# Water Quality Management Plan

**For:**

## OLIVE GROVE

## TENTATIVE TRACT MAP NO. 20728

**APN 0264-032-21**

**Prepared for:**

**Rialto Olive Grove Partners LLC**

**285 W. Rialto Avenue**

**Rialto, CA 92376**

**(909) 263-7583**

**Prepared by:**

**Morlok Civil Engineering & Consulting**

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**Submittal Date: 02/15/2025**

**Revision Date: TBD**

**Approval Date: TBD**

# Project Owner's Certification

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

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

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| Project Data | | | |
|---|---|---|---|
| Permit/Application Number(s): | None | Grading Permit Number(s): | None |
| Tract/Parcel Map Number(s): | TTM 20728 | Building Permit Number(s): | None |
| CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract): | | | APN 0264-032-21 |

| Owner's Signature | | | |
|---|---|---|---|
| **Owner Name:** Rialto Olive Grove Partners LLC | | | |
| Title | Authorized Representative | | |
| Company | Rialto Olive Grove Partners LLC | | |
| Address | 285 W. Rialto Avenue, Rialto, CA 92376 | | |
| Email | | | |
| Telephone # | | | |
| Signature | | Date | |

# Preparer's Certification

| Project Data | | | |
|---|---|---|---|
| Permit/Application Number(s): | None | Grading Permit Number(s): | None |
| Tract/Parcel Map Number(s): | TTM 20728 | Building Permit Number(s): | None |
| CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract): | | | APN 0264-032-21 |

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

| **Engineer:** Chris Morlok, PE | | PE Stamp Below |
|---|---|---|
| Title | President | |
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| Signature | | |
| Date | | |

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**Insert Appendix Title if Applicable - Otherwise, please delete text**

**Insert Appendix Title if Applicable - Otherwise, please delete text**

# Section 1 Discretionary Permit(s)

## Form 1-1 Project Information

| | | | | | |
|---|---|---|---|---|---|
| Project Name | Olive Grove Tentative Tract No 20728 | | | | |
| Project Owner Contact Name: | Scott Beard | | | | |
| Mailing Address: | 285 W. Rialto Ave.<br>Rialto, CA 92376 | E-mail Address: | scottcbeard@gwbri.com | Telephone: | 909-578-6780 |
| Permit/Application Number(s): | None | | Tract/Parcel Map Number(s): | Tentative Tract | |
| Additional Information/ Comments: | | | | | |
| Description of Project: | Tentative Tract 20728 is a proposed 4 acre subdivision consisting of 29 lots for future residential development and lettered lots for common and open space usage.<br>The project is located on vacant undeveloped land adjacent to existing residential subdivision development identified as “River Ranch” of the Lyle Creek Ranch Specific Plan.<br><br>Existing project site drains to River Ranch Pkwy, where it is captured and conveyed through underground storm drain to Basin 2 within River Ranch Tract 20092. According to the approved WQMP for River Ranch, Basin 2 currently has 143% of the required BMP volume for water quality treatment. The project proposes to drain to and utilize Basin 2 as the project water quality BMP. Supporting calculations are provided herein.<br><br>See Section 6 for a Vicinity Map. | | | | |
| Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy. | None | | | | |

# Section 2 Project Description

## 2.1 Project Information

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

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

**Form 2.1-1 Description of Proposed Project**

| | | | |
|---|---|---|---|
| **1** Development Category (Select all that apply): | | | |
| ☐ Significant re-development involving the addition or replacement of 5,000 $ft^2$ or more of impervious surface on an already developed site | ☒ New development involving the creation of 10,000 $ft^2$ or more of impervious surface collectively over entire site | ☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539 | ☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 $ft^2$ or more |
| ☐ Hillside developments of 5,000 $ft^2$ or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more | ☐ Developments of 2,500 $ft^2$ of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters. | ☐ Parking lots of 5,000 $ft^2$ or more exposed to storm water | ☐ Retail gasoline outlets that are either 5,000 $ft^2$ or more, or have a projected average daily traffic of 100 or more vehicles per day |
| ☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*. | | | |

| | | | | | |
|---|---|---|---|---|---|
| **2** Project Area (ft2): | 180,363 | **3** Number of Dwelling Units: | 29 | **4** SIC Code: | 1521 |

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

**6** Does Project include roads? Yes ☒ No ☐ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

## 2.2 Property Ownership/Management

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

| Form 2.2-1 Property Ownership/Management |
| --- |
| Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities: |
| Water Quality Management Plan related issues will be managed as follows:<br><br>1. Lots 1-29 and Lots A-F, will be owned and maintained by Rialto Olive Grove Partners LLC, who will be responsible for their maintenance until they are sold.<br>2. Tract 20092 Lot F (Basin 2) will be owned and maintained by the River Ranch HOA. |

## 2.3 Potential Stormwater Pollutants

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

| Form 2.3-1 Pollutants of Concern | | | |
|---|---|---|---|
| Pollutant | Please check: E=Expected, N=Not Expected | | Additional Information and Comments |
| Pathogens (Bacterial / Virus) | E ☒ | N ☐ | |
| Nutrients - Phosphorous | E ☒ | N ☐ | |
| Nutrients - Nitrogen | E ☒ | N ☐ | |
| Noxious Aquatic Plants | E ☐ | N ☒ | |
| Sediment | E ☒ | N ☐ | |
| Metals | E ☒ | N ☐ | |
| Oil and Grease | E ☒ | N ☐ | |
| Trash/Debris | E ☒ | N ☐ | |
| Pesticides / Herbicides | E ☒ | N ☐ | |
| Organic Compounds | E ☒ | N ☐ | |
| Other: | E ☐ | N ☐ | |
| Other: | E ☐ | N ☐ | |
| Other: | E ☐ | N ☐ | |
| Other: | E ☐ | N ☐ | |
| Other: | E ☐ | N ☐ | |

## 2.4 Water Quality Credits

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

| **Form 2.4-1 Water Quality Credits** | | | |
|---|---|---|---|
| [1] Project Types that Qualify for Water Quality Credits: *Select all that apply* | | | |
| ☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced] | Higher density development projects<br>☐ Vertical density [20%]<br>☐ 7 units/ acre [5%] | ☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%] | ☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%] |
| ☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%] | ☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%] | ☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%] | ☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%] |
| [2] Total Credit % 0 *(Total all credit percentages up to a maximum allowable credit of 50 percent)* | | | |
| Description of Water Quality Credit Eligibility (if applicable) | | | |

# Section 3 Site and Watershed Description

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

## Form 3-1 Site Location and Hydrologic Features

| | | | |
|---|---|---|---|
| Site coordinates *take GPS measurement at approximate center of site* | Latitude 34° 7'58.16"N | Longitude 117°21'2.87"W | Thomas Bros Map page 576 |
| **1** San Bernardino County climatic region: ☒ Valley ☐ Mountain | | | |
| **2** Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached* | | | |
| | | | |

| Conveyance | Briefly describe on-site drainage features to convey runoff that is not retained within a DMA |
|---|---|
| DA1 DMA C flows to DA1 DMA A | *Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property* |
| DA1 DMA A to Outlet 1 | |
| DA1 DMA B to Outlet 1 | |
| DA2 to Outlet 2 | |

| Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 | | | | |
|---|---|---|---|---|
| For Drainage Area 1's sub-watershed DMA, provide the following characteristics | DMA 1 | | | |
| **1** DMA drainage area ($ft^2$) | 180,363 | | | |
| **2** Existing site impervious area ($ft^2$) | 0 | | | |
| **3** Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf* | II | | | |
| **4** Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/* | A | | | |
| **5** Longest flowpath length (ft) | 781 | | | |
| **6** Longest flowpath slope (ft/ft) | 0.0276 | | | |
| **7** Current land cover type(s) *Select from Fig C-3 of Hydrology Manual* | Open Brush | | | |
| **8** Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating* | Good | | | |

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

| Form 3-3 Watershed Description for Drainage Area | |
|---|---|
| Receiving waters<br>*Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/*<br>*See 'Drainage Facilities" link at this website* | Lytle Creek<br>Santa Ana River: Reach 3, Reach 4, Reach 5, and Prado Basin |
| Applicable TMDLs<br>*Refer to Local Implementation Plan* | Lytle Creek: Pathogens<br>Santa Ana River Reach 3: Pathogens & Metals<br>Santa Ana River Reach 4: Pathogens |
| 303(d) listed impairments<br>*Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml* | Lytle Creek: Pathogens (Immediate Receiving Water)<br>Santa Ana River Reach 3: Pathogens & Metals<br>Santa Ana River Reach 4: Pathogens |
| Environmentally Sensitive Areas (ESA)<br>*Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/* | |
| Unlined Downstream Water Bodies<br>*Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/* | Lytle Creek<br>Santa Ana River: Reach 3, Reach 4, Reach 5 |
| Hydrologic Conditions of Concern | ☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal*<br>☒ No |
| Watershed–based BMP included in a RWQCB approved WAP | ☐ Yes *Attach verification of regional BMP evaluation criteria in WAP*<br>• *More Effective than On-site LID*<br>• *Remaining Capacity for Project DCV*<br>• *Upstream of any Water of the US*<br>• *Operational at Project Completion*<br>• *Long-Term Maintenance Plan*<br>☒ No |

# Section 4 Best Management Practices (BMP)

## 4.1 Source Control BMP

### 4.1.1 Pollution Prevention

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

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

## Form 4.1-1 Non-Structural Source Control BMPs

| Identifier | Name | Check One | | Describe BMP Implementation OR, if not applicable, state reason |
|---|---|---|---|---|
| | | Included | Not Applicable | |
| N1 | Education of Property Owners, Tenants and Occupants on Stormwater BMPs | ☒ | ☐ | Relevant educational materials will be provided to the first tenants regarding general on-site storm water BMPs and maintenance requirements. |
| N2 | Activity Restrictions | ☒ | ☐ | It is anticipated that use restrictions are to be developed by a building operator through lease terms. |
| N3 | Landscape Management BMPs | ☒ | ☐ | Landscape areas are expected to be maintained with efficient water use. |
| N4 | BMP Maintenance | ☒ | ☐ | BMP maintenance will be implemented in accordance with the Operation and Maintenance (O&M) Plan. |
| N5 | Title 22 CCR Compliance (How development will comply) | ☐ | ☒ | Hazardous waste management is not anticipated. |
| N6 | Local Water Quality Ordinances | ☒ | ☐ | The project will comply with the City of Rialto Municipal Code Chapter 19.20. |
| N7 | Spill Contingency Plan | ☐ | ☒ | A spill contingency plan will be prepared by the building operator in accordance with CASQA BMP Handbook SC-11. |
| N8 | Underground Storage Tank Compliance | ☒ | ☐ | The proposed underground storage will follow applicable regulations by the County Environmental Health |
| N9 | Hazardous Materials Disclosure Compliance | ☒ | ☐ | The site is expected to comply with the City Ordinance and/or County San Bernardino Code of Ordinances. |

## Form 4.1-1 Non-Structural Source Control BMPs

| Identifier | Name | Check One | | Describe BMP Implementation OR, if not applicable, state reason |
|---|---|---|---|---|
| | | Included | Not Applicable | |
| N10 | Uniform Fire Code Implementation | ☒ | ☐ | Uniform Fire Code Implementation shall be in compliance with Article 80 of the Uniform Fire Code enforced by fire protection agency |
| N11 | Litter/Debris Control Program | ☒ | ☐ | The owner shall contract with a landscape maintenance company to provide trash management and litter control procedures |
| N12 | Employee Training | ☐ | ☒ | No applicable to this project |
| N13 | Housekeeping of Loading Docks | ☐ | ☒ | No loading docks on this project |
| N14 | Catch Basin Inspection Program | ☒ | ☐ | On-site catch basins shall be inspected and, if necessary, cleaned prior to the storm season, no later than October 15th each year |
| N15 | Vacuum Sweeping of Private Streets and Parking Lots | ☒ | ☐ | Privately owned streets and parking lots shall be swept prior to the storm season, no later than October 15th each year. |
| N16 | Other Non-structural Measures for Public Agency Projects | ☐ | ☒ | This is not a public agency project |
| N17 | Comply with all other applicable NPDES permits | ☐ | ☒ | None required |

## Form 4.1-2 Structural Source Control BMPs

| Identifier | Name | Check One | | Describe BMP Implementation OR, If not applicable, state reason |
|---|---|---|---|---|
| | | Included | Not Applicable | |
| S1 | Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13) | ☒ | ☐ | Stenciling or labeling of on-site storm drain catch basins will be provided with prohibitive language such as: "No Dumping – Flows to Creek" and/or graphical icons to discourage illegal dumping. |
| S2 | Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34) | ☐ | ☒ | Outdoor material storage areas are not anticipated to be applicable. |
| S3 | Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32) | ☐ | ☒ | Trash and waste storage areas are expected to have covers and drainage from adjoining roofs and pavements diverted around the areas. |
| S4 | Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12) | ☒ | ☐ | Landscape and irrigation systems shall be implemented as shown on the Landscape and Irrigation Plans approved by a licensed professional in the state of California and follow guidance per CASQA BMP Handbook SD-12. |
| S5 | Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement | ☒ | ☐ | Finish grade of landscaped areas shall be graded to a minimum of 1-2 inches below top of curb side walk or pavement in order to help promote dispersion of runoff from paved surfaces to drain to the landscape areas. |
| S6 | Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10) | ☒ | ☐ | Proposed slopes (if applicable) are expected to be vegetated. |
| S7 | Covered dock areas (CASQA New Development BMP Handbook SD-31) | ☐ | ☒ | No covered dock areas proposed with this project. |
| S8 | Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31) | ☐ | ☒ | Maintenance bays are not expected for this project. |
| S9 | Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33) | ☐ | ☒ | Vehicle wash areas are not expected for this project. |

| | | | | |
|---|---|---|---|---|
| S10 | Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36) | ☐ | ☒ | Outdoor processing areas are not expected with this project |

## Form 4.1-2 Structural Source Control BMPs

| Identifier | Name | Check One | | Describe BMP Implementation OR, If not applicable, state reason |
|---|---|---|---|---|
| | | Included | Not Applicable | |
| S11 | Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33) | ☐ | ☒ | Equipment wash areas are not expected for this project. |
| S12 | Fueling areas (CASQA New Development BMP Handbook SD-30) | ☐ | ☒ | Fueling areas not expected for this project. |
| S13 | Hillside landscaping (CASQA New Development BMP Handbook SD-10) | ☐ | ☒ | There will be landscaping areas for this project; however, steep hillside landscaping area is not expected for this project. |
| S14 | Wash water control for food preparation areas | ☐ | ☒ | Food preparation areas not expected for this project. |
| S15 | Community car wash racks (CASQA New Development BMP Handbook SD-33) | ☐ | ☒ | Community car wash racks are not expected for this project. |

### 4.1.2 Preventative LID Site Design Practices

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

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

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

| Form 4.1-3 Preventative LID Site Design Practices Checklist |
|---|
| Site Design Practices<br>*If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets* |
| Minimize impervious areas: Yes ☒ No ☐<br>Explanation: Streets and sidewalk widths set at minimum per City standards. Sidewalks will be designed to connect to the driveway eliminating some impervious area. |
| Maximize natural infiltration capacity: Yes ☒ No ☐<br>Explanation: Open space and infiltration basin areas will be flagged in the field to minimize compaction. |
| Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐<br>Explanation: Existing drainage patterns are maintained. Time of concentration extended via infiltration basin. |
| Disconnect impervious areas: Yes ☒ No ☐<br>Explanation: Home sites propose to utilize earthen swales to convey drainage from roofs to streets. |
| Protect existing vegetation and sensitive areas: Yes ☒ No ☐<br>Explanation: Project limits minimized in order to reduce disturbance to adjacent slope and landscaping |
| Re-vegetate disturbed areas: Yes ☒ No ☐<br>Explanation: All disturbed areas without impervious construction will be revegetated |
| Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☐ No ☒<br>Explanation: No stormwater basins are proposed as a part of this project. |
| Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐<br>Explanation: Home sites propose to utilize earthen swales to convey drainage from roofs to streets. |
| Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐<br>Explanation: Landscape areas and open spaces will be marked for limited compaction. |

## 4.2 Project Performance Criteria

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

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the $P_6$ method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

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

| **Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)** | | |
|---|---|---|
| **1** Project area DA 1 ($ft^2$): 180,363 | **2** Imperviousness after applying preventative site design practices (Imp%): 35% | **3** Runoff Coefficient (Rc): 0.22<br>*$R_c = 0.858(Imp\%)^3-0.78(Imp\%)^2+0.774(Imp\%)+0.04$* |
| **4** Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.679 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html* | | |
| **5** Compute $P_6$, Mean 6-hr Precipitation (inches): 1.005<br>*$P_6$ = Item 4 *$C_1$, where $C_1$ is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)* | | |
| **6** Drawdown Rate<br>*Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.* | | 24-hrs ☐<br>48-hrs ☒ |
| **7** Compute design capture volume, DCV ($ft^3$): 6,409<br>*DCV = 1/12 * [Item 1* Item 3 *Item 5 * $C_2$], where $C_2$ is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*<br>*Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2* | | |

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

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

*Go to*: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

*(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)*

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

| Condition | Runoff Volume ($ft^3$) | Time of Concentration (min) | Peak Runoff (cfs) |
|---|---|---|---|
| Pre-developed | **1**<br>*Form 4.2-3 Item 12* | **2**<br>*Form 4.2-4 Item 13* | **3**<br>*Form 4.2-5 Item 10* |
| Post-developed | **4**<br>*Form 4.2-3 Item 13* | **5**<br>*Form 4.2-4 Item 14* | **6**<br>*Form 4.2-5 Item 14* |
| Difference | **7**<br>*Item 4 – Item 1* | **8**<br>*Item 2 – Item 5* | **9**<br>*Item 6 – Item 3* |
| Difference<br>(as % of pre-developed) | **10** %<br>*Item 7 / Item 1* | **11** %<br>*Item 8 / Item 2* | **12** %<br>*Item 9 / Item 3* |

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

| **Weighted Curve Number Determination for: Pre-developed DA** | DMA A | DMA B | DMA C | DMA D | DMA E | DMA F | DMA G | DMA H |
|---|---|---|---|---|---|---|---|---|
| **1a** Land Cover type | | | | | | | | |
| **2a** Hydrologic Soil Group (HSG) | | | | | | | | |
| **3a** DMA Area, $ft^2$ *sum of areas of DMA should equal area of DA* | | | | | | | | |
| **4a** Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP* | | | | | | | | |
| **Weighted Curve Number Determination for: Post-developed DA** | DMA A | DMA B | DMA C | DMA D | DMA E | DMA F | DMA G | DMA H |
| **1b** Land Cover type | | | | | | | | |
| **2b** Hydrologic Soil Group (HSG) | | | | | | | | |
| **3b** DMA Area, $ft^2$ *sum of areas of DMA should equal area of DA* | | | | | | | | |
| **4b** Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP* | | | | | | | | |

| | | |
|---|---|---|
| **5** Pre-Developed area-weighted CN: | **7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10* | **9** Initial abstraction, $I_a$ (in): *$I_a$ = 0.2 * Item 7* |
| **6** Post-Developed area-weighted CN: | **8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10* | **10** Initial abstraction, $I_a$ (in): *$I_a$ = 0.2 * Item 8* |

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

**12** Pre-developed Volume ($ft^3$):
*$V_{pre}$ =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

**13** Post-developed Volume ($ft^3$):
*$V_{pre}$ =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

**14** Volume Reduction needed to meet HCOC Requirement, ($ft^3$):
*$V_{HCOC}$ = (Item 13 * 0.95) – Item 12*

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

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

| Variables | Pre-developed DA1 *Use additional forms if there are more than 4 DMA* | | | | Post-developed DA1 *Use additional forms if there are more than 4 DMA* | | | |
|---|---|---|---|---|---|---|---|---|
| | DMA A | DMA B | DMA C | DMA D | DMA A | DMA B | DMA C | DMA D |
| **1** Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition* | | | | | | | | |
| **2** Change in elevation (ft) | | | | | | | | |
| **3** Slope (ft/ft), $S_o$ = *Item 2 / Item 1* | | | | | | | | |
| **4** Land cover | | | | | | | | |
| **5** Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP* | | | | | | | | |
| **6** Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet* | | | | | | | | |
| **7** Cross-sectional area of channel ($ft^2$) | | | | | | | | |
| **8** Wetted perimeter of channel (ft) | | | | | | | | |
| **9** Manning's roughness of channel (n) | | | | | | | | |
| **10** Channel flow velocity (ft/sec) $V_{fps}$ = *(1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5* | | | | | | | | |
| **11** Travel time to outlet (min) $T_t$ = *Item 6 / (Item 10 * 60)* | | | | | | | | |
| **12** Total time of concentration (min) $T_c$ = *Item 5 + Item 11* | | | | | | | | |

**13** Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*

**14** Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*

**15** Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ = *(Item 13 * 0.95) – Item 14*

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

Compute peak runoff for pre- and post-developed conditions

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

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

**10** Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

| | | |
|---|---|---|
| **11** Post-developed $Q_p$ at $T_c$ for DMA A:<br>*Same as Item 8 for post-developed values* | **12** Post-developed $Q_p$ at $T_c$ for DMA B:<br>*Same as Item 9 for post-developed values* | **13** Post-developed $Q_p$ at $T_c$ for DMA C:<br>*Same as Item 10 for post-developed values* |

**14** Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

**15** Peak runoff reduction needed to meet HCOC Requirement (cfs): *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*

## 4.3 Project Conformance Analysis

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

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

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

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

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

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

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

## Form 4.3-1 Infiltration BMP Feasibility (DA 1)

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

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
*Refer to Section 5.3.2.1 of the TGD for WQMP*

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
*See Section 3.5 of the TGD for WQMP and WAP*

If Yes, Provide basis: (attach)

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

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

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

### 4.3.1 Site Design Hydrologic Source Control BMP

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

| **Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)** | | | |
|---|---|---|---|
| **1** Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6* | DA DMA BMP Type | DA DMA BMP Type | DA DMA BMP Type *(Use additional forms for more BMPs)* |
| **2** Total impervious area draining to pervious area ($ft^2$) | | | |
| **3** Ratio of pervious area receiving runoff to impervious area | | | |
| **4** Retention volume achieved from impervious area dispersion ($ft^3$) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff* | | | |
| **5** Sum of retention volume achieved from impervious area dispersion ($ft^3$): | $V_{retention}$ *=Sum of Item 4 for all BMPs* | | |
| **6** Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14* | DA DMA BMP Type | DA DMA BMP Type | DA DMA BMP Type *(Use additional forms for more BMPs)* |
| **7** Ponding surface area ($ft^2$) | | | |
| **8** Ponding depth (ft) | | | |
| **9** Surface area of amended soil/gravel ($ft^2$) | | | |
| **10** Average depth of amended soil/gravel (ft) | | | |
| **11** Average porosity of amended soil/gravel | | | |
| **12** Retention volume achieved from on-lot infiltration ($ft^3$) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)* | | | |
| **13** Runoff volume retention from on-lot infiltration ($ft^3$): | $V_{retention}$ *=Sum of Item 12 for all BMPs* | | |

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

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

| | | | |
|---|---|---|---|
| **14** Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒<br>*If yes, complete Items 15-20. If no, proceed to Item 21* | DA DMA<br>BMP Type | DA DMA<br>BMP Type | DA DMA<br>BMP Type<br>*(Use additional forms for more BMPs)* |
| **15** Rooftop area planned for ET BMP ($ft^2$) | | | |
| **16** Average wet season ET demand (in/day)<br>*Use local values, typical ~ 0.1* | | | |
| **17** Daily ET demand ($ft^3$/day)<br>*Item 15 * (Item 16 / 12)* | | | |
| **18** Drawdown time (hrs)<br>*Copy Item 6 in Form 4.2-1* | | | |
| **19** Retention Volume ($ft^3$)<br>*$V_{retention}$ = Item 17 * (Item 18 / 24)* | | | |
| **20** Runoff volume retention from evapotranspiration BMPs ($ft^3$): *$V_{retention}$ =Sum of Item 19 for all BMPs* | | | |
| **21** Implementation of Street Trees: Yes ☐ No ☒<br>*If yes, complete Items 22-25. If no, proceed to Item 26* | DA DMA<br>BMP Type | DA DMA<br>BMP Type | DA DMA<br>BMP Type<br>*(Use additional forms for more BMPs)* |
| **22** Number of Street Trees | | | |
| **23** Average canopy cover over impervious area ($ft^2$) | | | |
| **24** Runoff volume retention from street trees ($ft^3$)<br>*$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches* | | | |
| **25** Runoff volume retention from street tree BMPs ($ft^3$): *$V_{retention}$ = Sum of Item 24 for all BMPs* | | | |
| **26** Implementation of residential rain barrel/cisterns: Yes☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30* | DA DMA<br>BMP Type | DA DMA<br>BMP Type | DA DMA<br>BMP Type<br>*(Use additional forms for more BMPs)* |
| **27** Number of rain barrels/cisterns | | | |
| **28** Runoff volume retention from rain barrels/cisterns ($ft^3$)<br>*$V_{retention}$ = Item 27 * 3* | | | |
| **29** Runoff volume retention from residential rain barrels/Cisterns (ft3): *$V_{retention}$ =Sum of Item 28 for all BMPs* | | | |
| **30** Total Retention Volume from Site Design Hydrologic Source Control BMPs: *Sum of Items 5, 13, 20, 25 and 29* | | | |

### 4.3.2 Infiltration BMPs

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

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

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

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

**1** Remaining LID DCV not met by site design HSC BMP ($ft^3$): 6,409 + [1]584,286= 590,695 *$V_{unmet}$ = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

***1 – 584,286 CF is the DCV volume required for water quality treatment for River Ranch TR 20092***

| BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs* | DA 1 DMA A BMP Type Infiltration Basin | DA DMA BMP Type | DA DMA BMP Type *(Use additional forms for more BMPs)* |
|---|---|---|---|
| **2** Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods* | 27 | | |
| **3** Infiltration safety factor *See TGD Section 5.4.2 and Appendix D* | 3 | | |
| **4** Design percolation rate (in/hr) *$P_{design}$ = Item 2 / Item 3* | 9 | | |
| **5** Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1* | 48 | | |
| **6** Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details* | 1 | | |
| **7** Ponding Depth (ft) *$d_{BMP}$ = Minimum of (1/12*Item 4*Item 5) or Item 6* | 1 | | |
| **8** Infiltrating surface area, $SA_{BMP}$ ($ft^2$) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP* | 257,968 | | |
| **9** Amended soil depth, $d_{media}$ (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details* | N/A | | |
| **10** Amended soil porosity | N/A | | |
| **11** Gravel depth, $d_{media}$ (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details* | N/A | | |
| **12** Gravel porosity | N/A | | |
| **13** Duration of storm as basin is filling (hrs) *Typical ~ 3hrs* | 3 | | |
| **14** Above Ground Retention Volume ($ft^3$) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]* | 838,396 | | |
| **15** Underground Retention Volume ($ft^3$) *Volume determined using manufacturer's specifications and calculations* | N/A | | |

**16** Total Retention Volume from LID Infiltration BMPs: 838,396 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

**17** Fraction of DCV achieved with infiltration BMP: 142% *Retention% = Item 16 / Form 4.2-1 Item 7*

**18** Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

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

### 4.3.3 Harvest and Use BMP

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

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

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

**1** Remaining LID DCV not met by site design HSC or infiltration BMP ($ft^3$): 0

*$V_{unmet}$ = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*

| BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs* | DA DMA BMP Type | DA DMA BMP Type | DA DMA BMP Type *(Use additional forms for more BMPs)* |
|---|---|---|---|
| **2** Describe cistern or runoff detention facility | | | |
| **3** Storage volume for proposed detention type ($ft^3$) *Volume of cistern* | | | |
| **4** Landscaped area planned for use of harvested stormwater ($ft^2$) | | | |
| **5** Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day | | | |
| **6** Daily water demand ($ft^3$/day) *Item 4 * (Item 5 / 12)* | | | |
| **7** Drawdown time (hrs) *Copy Item 6 from Form 4.2-1* | | | |
| **8** Retention Volume ($ft^3$) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))* | | | |

**9** Total Retention Volume ($ft^3$) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*

**10** Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☐ No ☐

*If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*

### 4.3.4 Biotreatment BMP

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

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

**Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)**

| | | |
|---|---|---|
| **1** Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment ($ft^3$): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9* | List pollutants of concern *Copy from Form 2.3-1.* | |
| **2** Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)* | Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume* | Flow-based biotreatment *Use Form 4.3-8 to compute treated volume* |
| | ☐ Bioretention with underdrain<br>☐ Planter box with underdrain<br>☐ Constructed wetlands<br>☐ Wet extended detention<br>☐ Dry extended detention | ☐ Vegetated swale<br>☐ Vegetated filter strip<br>☐ Proprietary biotreatment |
| **3** Volume biotreated in volume based biotreatment BMP ($ft^3$): *Form 4.3-6 Item 15 + Form 4.3-7 Item 13* | **4** Compute remaining LID DCV with implementation of volume based biotreatment BMP ($ft^3$): *Item 1 – Item 3* | **5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1* |
| **6** Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)* | | |
| **7** Metrics for MEP determination:<br>• Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.* | | |

## Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

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

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

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

# Form 4.3-8 Flow Based Biotreatment (DA 1)

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

### 4.3.5 Conformance Summary

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

**Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)**

**1** Total LID DCV for the Project DA-1 ($ft^3$): 6,409 *Copy Item 7 in Form 4.2-1*

**2** On-site retention with site design hydrologic source control LID BMP ($ft^3$): 0 *Copy Item 30 in Form 4.3-2*

**3** On-site retention with LID infiltration BMP ($ft^3$): 838,396 *Copy Item 16 in Form 4.3-3*

**4** On-site retention with LID harvest and use BMP ($ft^3$): 0 *Copy Item 9 in Form 4.3-4*

**5** On-site biotreatment with volume based biotreatment BMP ($ft^3$): 0 *Copy Item 3 in Form 4.3-5*

**6** Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

**7** LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  *If yes, sum of Items 2, 3, and 4 is greater than Item 1*
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  *If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized*
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  *If yes, Form 4.3-1 Items 7 and 8 were both checked yes*

**8** If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance,* $V_{alt}$ *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  *Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed*

### 4.3.6 Hydromodification Control BMP

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

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

## 4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

# Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

**Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)**

| BMP | Reponsible Party(s) | Inspection/ Maintenance Activities Required | Minimum Frequency of Activities |
|---|---|---|---|
| Education of property owners, tenants, and occupants | Project owner and subsequent individual lot owners | Renew and update educational materials. Download new educational materials from the San Bernardino County Website. http://sbcountystormwater.org/agency.<br><br>Distribute the update. | Annually |
| Activity Restrictions | Property Owners | Verify Compliance | Annually |
| BMP Maintenance | Property Owners | The project owner is responsible for the implementation of all non-structural BMPs and schedule cleaning and/or maintenance off all structural BMP facilities. Each BMP should be maintained in accordance with its individual BMP reference. | See frequencies of activities under each specific non-structural or structural BMP in this section. |
| Local Water Ordinances | Property Owners | Verify compliance with the underlying conditions of approval and new ordinances. | Annually |
| Liter / Debris Control Program | Property Owners | Maintenance shall consist of litter patrol, emptying of trash receptacles, pickup up pet waste, and using the proper containers for trash pickup. Containers should be cleaned every six months | Daily and 6 months |
| Landscape Finish Grade | Property Owners | Verify compliance and repair | Yearly |

| | | | |
|---|---|---|---|
| Protect slopes and swales | Property Owners | Inspect, clean, repair, and replace all stabilization and vegetation. | Monthly |
| Landscape Planning | Property Owners | Landscapes shall be maintained to ensure water efficiency and healthy appearance. A regular maintenance schedule shall include, but not be limited to, checking, adjusting, and repairing the irrigation equipment: resetting the automatic controller: aerating and dethatching turf areas; replenishing mulch; fertilizing, pruning, weeding, removing litter, and replacement of plants as required.<br><br>Verify fertilizer and pesticide usage requirements consistent with the instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation. Comply with product labels. Update new regulations by the State Department of Pesticide Regulation. (heep://www.cdpr.ca.gove/) | Weekly |
| Efficient Irrigation | Property Owners | Inspect and repair timers, rain and pressure shut-off devices as necessary. Check for overspray and adjust system. Replace mulch as necessary. | Monthly |

# Section 6 WQMP Attachments

## 6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

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

## 6.2 Electronic Data Submittal

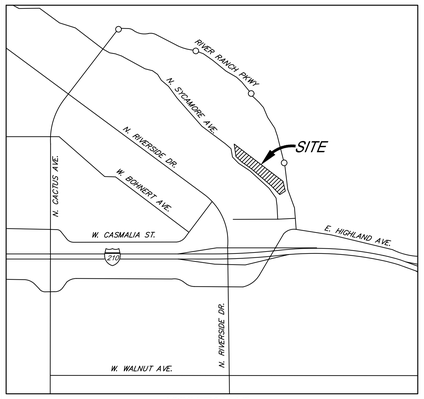
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents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

## 6.3 Post Construction

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

## 6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements




VICINITY MAP
NOT TO SCALE

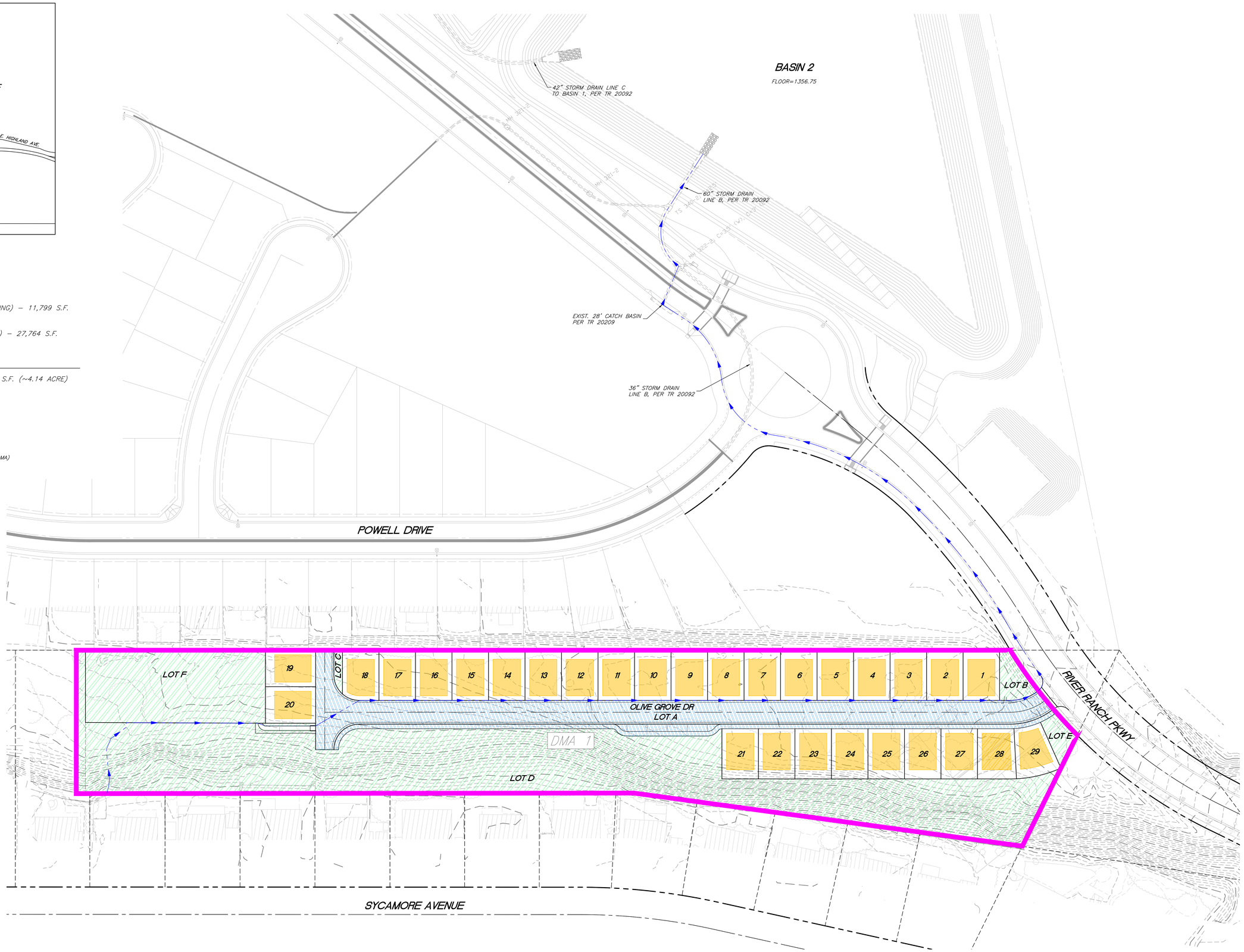
## DMA 1

- DMA 1 (ORNAMENTAL LANDSCAPING) – 11,799 S.F.
- DMA 1 (CONCRETE OR ASPHALT) – 27,764 S.F.
- DMA 1 (ROOFS) – 34,800 S.F.

TOTAL DMA 1 AREA = 180,363 S.F. (~4.14 ACRE)

## LEGEND

- TRACT BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA)
- SD — PROPOSED STORM DRAIN
- GENERAL SURFACE FLOW PATH




0 20 40 80 120 160
SCALE 1"=40'

| BENCHMARK: | | | | | | |
|---|---|---|---|---|---|---|
| CITY OF RIALTO BM NO. 036–88<br>DESC.: CITY OF RIALTO BRASS DISC SET IN PCC BASE FOR STREET LIGHT NO. 2162617E, 17–FT SOUTH OF CENTERLINE RIVERSIDE OUTER HIGHWAY, 68–FT WEST OF CENTERLINE CACTUS AVE.<br>ELEV. = 1490.698' (NGVD29) | MARK | BY | DATE | REVISIONS | APPR. | DATE |
| | | ENGINEER | | | COUNTY | |

ENGINEER SEAL: REGISTERED PROFESSIONAL ENGINEER CHRIS T. MORLOK C-76545 CIVIL STATE OF CALIFORNIA

ENGINEERING COMPANY:
MORLOK CIVIL ENGINEERING & CONSULTING
24046 CLINTON KEITH RD, STE 101-145
WILDOMAR, CA 92595
TEL: (619) 212-5935

CITY OF RIALTO
TENTATIVE TRACT MAP NO. 20728
OLIVE GROVE
WOMP SITE PLAN

FOR: RIALTO OLIVE GROVE PARTNERS LLC
SCALE: H.____ V. N/A

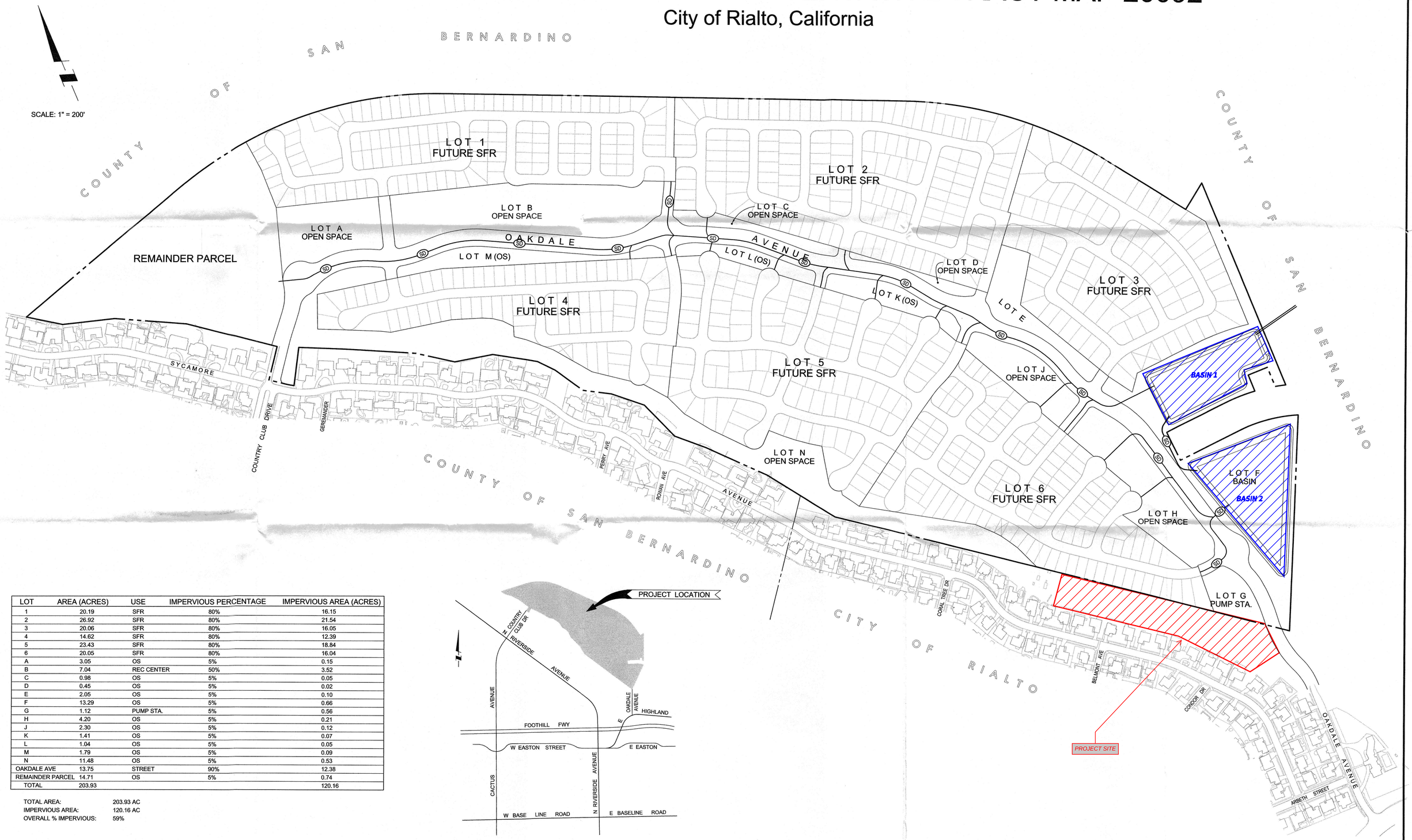
SHEET NO. 1 OF 1 SHTS

G:\MY DRIVE_JOBS – CTM\24-003 RIALTO RIVER RANCH\REPORTS\WQMP\EXHIBITS\PWQMP EXHIBIT.DWG 2/6/2025 11:47:15 AM

# PRELIMINARY WQMP EXHIBIT ~ TENTATIVE TRACT MAP 20092

City of Rialto, California

SCALE: 1" = 200'




| LOT | AREA (ACRES) | USE | IMPERVIOUS PERCENTAGE | IMPERVIOUS AREA (ACRES) |
|---|---|---|---|---|
| 1 | 20.19 | SFR | 80% | 16.15 |
| 2 | 26.92 | SFR | 80% | 21.54 |
| 3 | 20.06 | SFR | 80% | 16.05 |
| 4 | 14.62 | SFR | 80% | 12.39 |
| 5 | 23.43 | SFR | 80% | 18.84 |
| 6 | 20.05 | SFR | 80% | 16.04 |
| A | 3.05 | OS | 5% | 0.15 |
| B | 7.04 | REC CENTER | 50% | 3.52 |
| C | 0.98 | OS | 5% | 0.05 |
| D | 0.45 | OS | 5% | 0.02 |
| E | 2.05 | OS | 5% | 0.10 |
| F | 13.29 | OS | 5% | 0.66 |
| G | 1.12 | PUMP STA. | 5% | 0.56 |
| H | 4.20 | OS | 5% | 0.21 |
| J | 2.30 | OS | 5% | 0.12 |
| K | 1.41 | OS | 5% | 0.07 |
| L | 1.04 | OS | 5% | 0.05 |
| M | 1.79 | OS | 5% | 0.09 |
| N | 11.48 | OS | 5% | 0.53 |
| OAKDALE AVE | 13.75 | STREET | 90% | 12.38 |
| REMAINDER PARCEL | 14.71 | OS | 5% | 0.74 |
| TOTAL | 203.93 | | | 120.16 |

TOTAL AREA: 203.93 AC
IMPERVIOUS AREA: 120.16 AC
OVERALL % IMPERVIOUS: 59%




VICINITY MAP
NOT TO SCALE

OTTE - BERKELEY GROUPE
CIVIL ENGINEERS

## 4.2 Project Performance Criteria

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

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the $P_6$ method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 $mi^2$), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

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

| **Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)** | | |
|---|---|---|
| **1** Project area DA 1 ($ft^2$): 8,885,065 | **2** Imperviousness after applying preventative site design practices (Imp%): 59% | **3** Runoff Coefficient (Rc): _0.40<br>*$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$* |
| **4** Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.679 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html | | |
| **5** Compute $P_6$, Mean 6-hr Precipitation (inches): 1.005<br>*$P_6$ = Item 4 *$C_1$, where $C_1$ is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)* | | |
| **6** Drawdown Rate<br>*Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.* | | 24-hrs ☐<br>48-hrs ☒ |
| **7** Compute design capture volume, DCV ($ft^3$): 584,286<br>*DCV = 1/12 * [Item 1* Item 3 *Item 5 * $C_2$], where $C_2$ is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*<br>*Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2* | | |

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

| | | | |
|---|---|---|---|
| **1** Remaining LID DCV not met by site design HSC BMP ($ft^3$): 584,286 *$V_{unmet}$ = Form 4.2-1 Item 7 - Form 4.3-2 Item 30* | | | |
| BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs* | DA 1 DMA A BMP Type **Infiltration Basin** | DA DMA BMP Type | DA DMA BMP Type *(Use additional forms for more BMPs)* |
| **2** Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods* | 27 | | |
| **3** Infiltration safety factor *See TGD Section 5.4.2 and Appendix D* | 3 | | |
| **4** Design percolation rate (in/hr) *$P_{design}$ = Item 2 / Item 3* | 9 | | |
| **5** Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1* | 48 | | |
| **6** Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details* | 1 | | |
| **7** Ponding Depth (ft) *$d_{BMP}$ = Minimum of (1/12*Item 4*Item 5) or Item 6* | 1 | | |
| **8** Infiltrating surface area, $SA_{BMP}$ ($ft^2$) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP* | 257,968 | | |
| **9** Amended soil depth, $d_{media}$ (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details* | n/a | | |
| **10** Amended soil porosity | n/a | | |
| **11** Gravel depth, $d_{media}$ (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details* | n/a | | |
| **12** Gravel porosity | n/a | | |
| **13** Duration of storm as basin is filling (hrs) *Typical ~ 3hrs* | 3 | | |
| **14** Above Ground Retention Volume ($ft^3$) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]* | 838,396 | | |
| **15** Underground Retention Volume ($ft^3$) *Volume determined using manufacturer's specifications and calculations* | n/a | | |
| **16** Total Retention Volume from LID Infiltration BMPs: 838,396 **(** *(Sum of Items 14 and 15 for all infiltration BMP included in plan)* | | | |
| **17** Fraction of DCV achieved with infiltration BMP: 143% *Retention% = Item 16 / Form 4.2-1 Item 7* | | | |
| **18** Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.* | | | |

### 4.3.5 Conformance Summary

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

**Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)**

**1** Total LID DCV for the Project DA-1 ($ft^3$): 584,286 *Copy Item 7 in Form 4.2-1*

**2** On-site retention with site design hydrologic source control LID BMP ($ft^3$): 0 *Copy Item 30 in Form 4.3-2*

**3** On-site retention with LID infiltration BMP ($ft^3$): 838,396 *Copy Item 16 in Form 4.3-3*

**4** On-site retention with LID harvest and use BMP ($ft^3$): 0 *Copy Item 9 in Form 4.3-4*

**5** On-site biotreatment with volume based biotreatment BMP ($ft^3$): 0 *Copy Item 3 in Form 4.3-5*

**6** Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

**7** LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  *If yes, sum of Items 2, 3, and 4 is greater than Item 1*
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  *If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized*
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  *If yes, Form 4.3-1 Items 7 and 8 were both checked yes*

**8** If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance,* $V_{alt}$ *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  *Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed*

**NOAA Atlas 14, Volume 6, Version 2**
**Location name: Rialto, California, USA***
**Latitude: 34.141°, Longitude: -117.3675°**
**Elevation: 1391 ft****
* source: ESRI Maps
** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

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

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.131 (0.109-0.159) | 0.174 (0.144-0.211) | 0.231 (0.191-0.281) | 0.278 (0.229-0.342) | 0.345 (0.274-0.439) | 0.397 (0.309-0.517) | 0.453 (0.343-0.603) | 0.511 (0.376-0.701) | 0.594 (0.419-0.850) | 0.661 (0.450-0.980) |
| 10-min | 0.188 (0.157-0.228) | 0.249 (0.207-0.303) | 0.331 (0.274-0.403) | 0.399 (0.328-0.490) | 0.494 (0.392-0.629) | 0.570 (0.443-0.741) | 0.649 (0.492-0.865) | 0.733 (0.540-1.00) | 0.851 (0.601-1.22) | 0.947 (0.645-1.40) |
| 15-min | 0.228 (0.189-0.276) | 0.301 (0.250-0.366) | 0.400 (0.331-0.488) | 0.482 (0.396-0.593) | 0.598 (0.474-0.760) | 0.689 (0.535-0.896) | 0.785 (0.595-1.05) | 0.886 (0.653-1.22) | 1.03 (0.727-1.47) | 1.15 (0.780-1.70) |
| 30-min | 0.338 (0.281-0.411) | 0.448 (0.372-0.544) | 0.595 (0.493-0.725) | 0.717 (0.589-0.882) | 0.888 (0.705-1.13) | 1.02 (0.796-1.33) | 1.17 (0.884-1.56) | 1.32 (0.970-1.81) | 1.53 (1.08-2.19) | 1.70 (1.16-2.53) |
| 60-min | 0.503 (0.419-0.611) | 0.667 (0.554-0.810) | 0.885 (0.733-1.08) | 1.07 (0.877-1.31) | 1.32 (1.05-1.68) | 1.52 (1.18-1.98) | 1.74 (1.32-2.31) | 1.96 (1.44-2.69) | 2.28 (1.61-3.26) | 2.54 (1.73-3.76) |
| 2-hr | 0.747 (0.621-0.907) | 0.968 (0.804-1.18) | 1.26 (1.04-1.54) | 1.50 (1.23-1.85) | 1.84 (1.46-2.34) | 2.10 (1.63-2.73) | 2.37 (1.79-3.16) | 2.65 (1.95-3.64) | 3.04 (2.15-4.36) | 3.36 (2.29-4.98) |
| 3-hr | 0.937 (0.780-1.14) | 1.20 (1.00-1.46) | 1.56 (1.29-1.90) | 1.85 (1.52-2.27) | 2.24 (1.78-2.86) | 2.55 (1.98-3.32) | 2.87 (2.18-3.83) | 3.20 (2.36-4.39) | 3.66 (2.58-5.24) | 4.02 (2.74-5.96) |
| 6-hr | 1.36 (1.13-1.65) | 1.74 (1.44-2.11) | 2.23 (1.85-2.72) | 2.63 (2.16-3.23) | 3.18 (2.52-4.04) | 3.59 (2.79-4.67) | 4.02 (3.05-5.36) | 4.46 (3.28-6.12) | 5.06 (3.57-7.24) | 5.53 (3.76-8.20) |
| 12-hr | 1.82 (1.52-2.21) | 2.34 (1.94-2.84) | 3.01 (2.49-3.67) | 3.55 (2.92-4.36) | 4.27 (3.39-5.43) | 4.82 (3.74-6.27) | 5.37 (4.07-7.16) | 5.94 (4.37-8.14) | 6.69 (4.72-9.58) | 7.27 (4.95-10.8) |
| 24-hr | 2.46 (2.18-2.83) | 3.20 (2.83-3.69) | 4.14 (3.66-4.79) | 4.90 (4.29-5.72) | 5.91 (5.01-7.12) | 6.67 (5.54-8.20) | 7.43 (6.02-9.36) | 8.20 (6.46-10.6) | 9.23 (6.98-12.4) | 10.0 (7.32-14.0) |
| 2-day | 3.01 (2.67-3.47) | 3.99 (3.53-4.60) | 5.26 (4.64-6.09) | 6.29 (5.51-7.34) | 7.68 (6.50-9.25) | 8.74 (7.25-10.7) | 9.80 (7.94-12.3) | 10.9 (8.59-14.1) | 12.4 (9.36-16.7) | 13.5 (9.88-18.9) |
| 3-day | 3.21 (2.84-3.70) | 4.33 (3.83-5.00) | 5.80 (5.12-6.71) | 7.01 (6.13-8.17) | 8.66 (7.34-10.4) | 9.95 (8.26-12.2) | 11.3 (9.12-14.2) | 12.6 (9.95-16.4) | 14.5 (11.0-19.6) | 16.0 (11.7-22.3) |
| 4-day | 3.42 (3.03-3.95) | 4.66 (4.13-5.38) | 6.31 (5.57-7.30) | 7.68 (6.72-8.95) | 9.56 (8.10-11.5) | 11.0 (9.16-13.6) | 12.6 (10.2-15.8) | 14.2 (11.2-18.3) | 16.4 (12.4-22.1) | 18.1 (13.3-25.3) |
| 7-day | 3.88 (3.44-4.47) | 5.35 (4.73-6.17) | 7.31 (6.45-8.46) | 8.95 (7.83-10.4) | 11.2 (9.50-13.5) | 13.0 (10.8-16.0) | 14.9 (12.1-18.7) | 16.8 (13.3-21.8) | 19.6 (14.8-26.4) | 21.8 (15.9-30.4) |
| 10-day | 4.21 (3.73-4.85) | 5.85 (5.17-6.75) | 8.04 (7.10-9.30) | 9.88 (8.64-11.5) | 12.4 (10.5-15.0) | 14.5 (12.0-17.8) | 16.6 (13.4-20.9) | 18.8 (14.8-24.4) | 22.0 (16.6-29.6) | 24.5 (17.9-34.2) |
| 20-day | 5.12 (4.54-5.90) | 7.19 (6.36-8.29) | 9.99 (8.81-11.6) | 12.3 (10.8-14.4) | 15.7 (13.3-18.9) | 18.3 (15.2-22.5) | 21.1 (17.1-26.6) | 24.1 (19.0-31.2) | 28.3 (21.4-38.2) | 31.7 (23.2-44.3) |
| 30-day | 6.03 (5.34-6.94) | 8.47 (7.49-9.77) | 11.8 (10.4-13.6) | 14.6 (12.8-17.0) | 18.6 (15.8-22.4) | 21.8 (18.1-26.8) | 25.2 (20.4-31.8) | 28.8 (22.7-37.3) | 34.0 (25.7-45.9) | 38.2 (27.9-53.3) |
| 45-day | 7.23 (6.40-8.33) | 10.1 (8.94-11.7) | 14.0 (12.4-16.2) | 17.4 (15.2-20.3) | 22.1 (18.8-26.7) | 26.0 (21.6-32.0) | 30.1 (24.4-37.9) | 34.5 (27.2-44.6) | 40.8 (30.8-55.0) | 45.9 (33.6-64.1) |
| 60-day | 8.45 (7.48-9.74) | 11.7 (10.3-13.5) | 16.2 (14.3-18.7) | 20.0 (17.5-23.3) | 25.4 (21.5-30.6) | 29.8 (24.7-36.7) | 34.5 (27.9-43.5) | 39.6 (31.2-51.2) | 46.8 (35.4-63.2) | 52.8 (38.6-73.7) |

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

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

Please refer to NOAA Atlas 14 document for more information.

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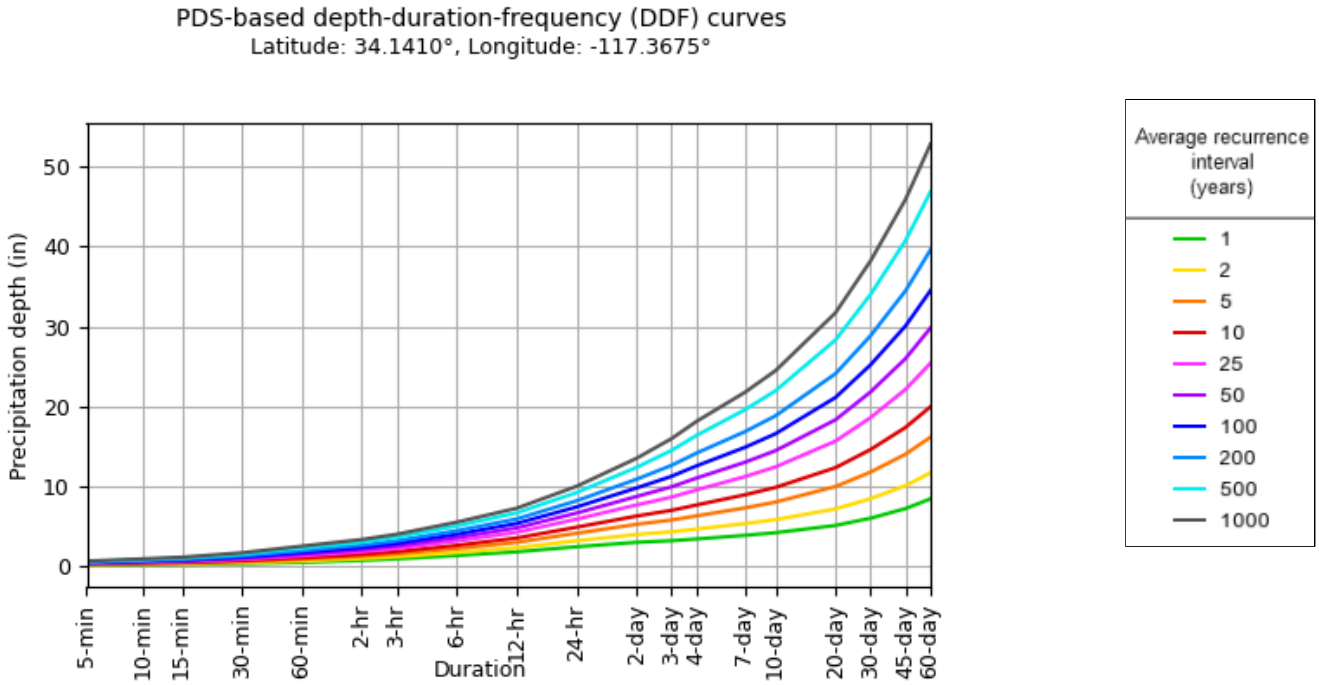
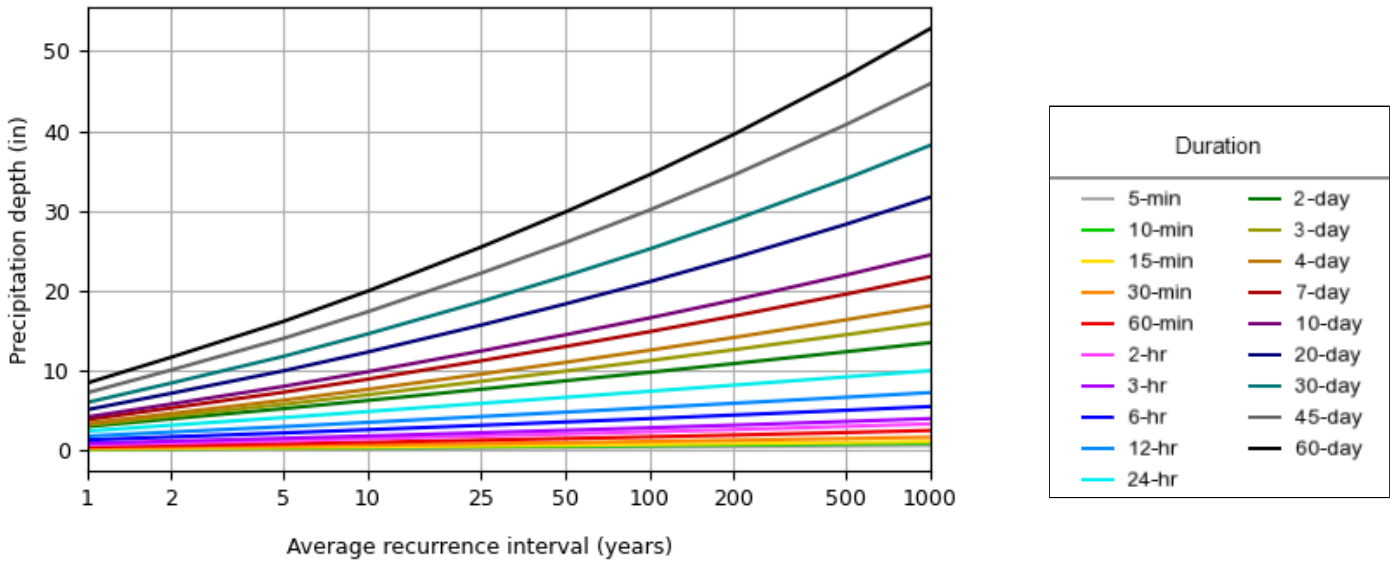
## PF graphical

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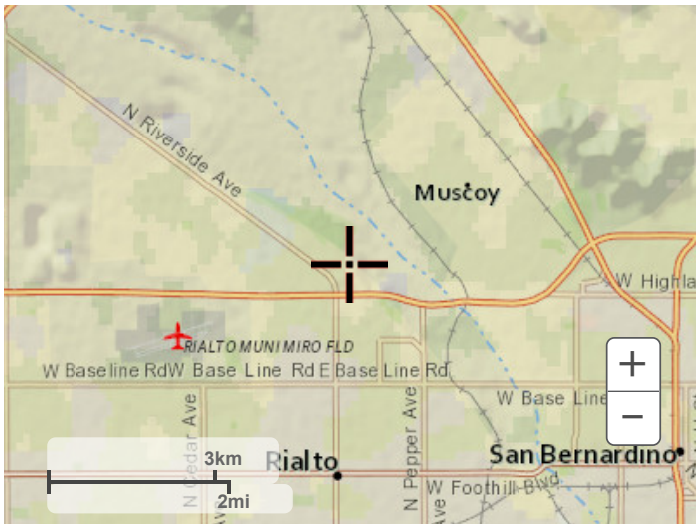
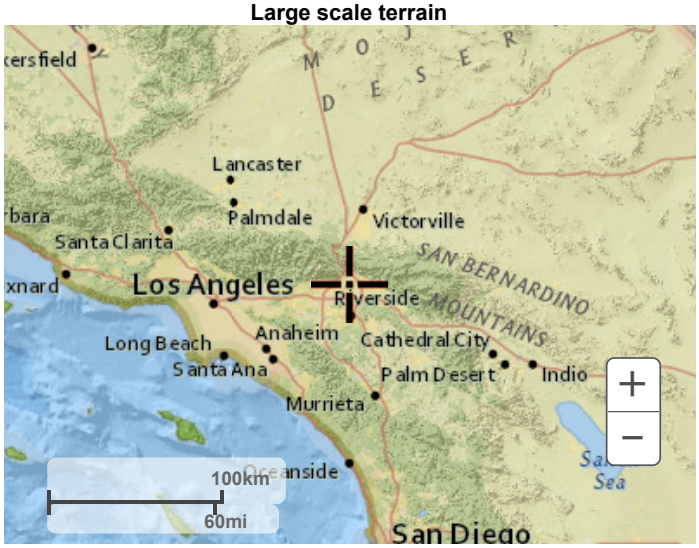
## Maps & aerials

**Small scale terrain**




**Large scale terrain**




**Large scale map**

**Large scale aerial**

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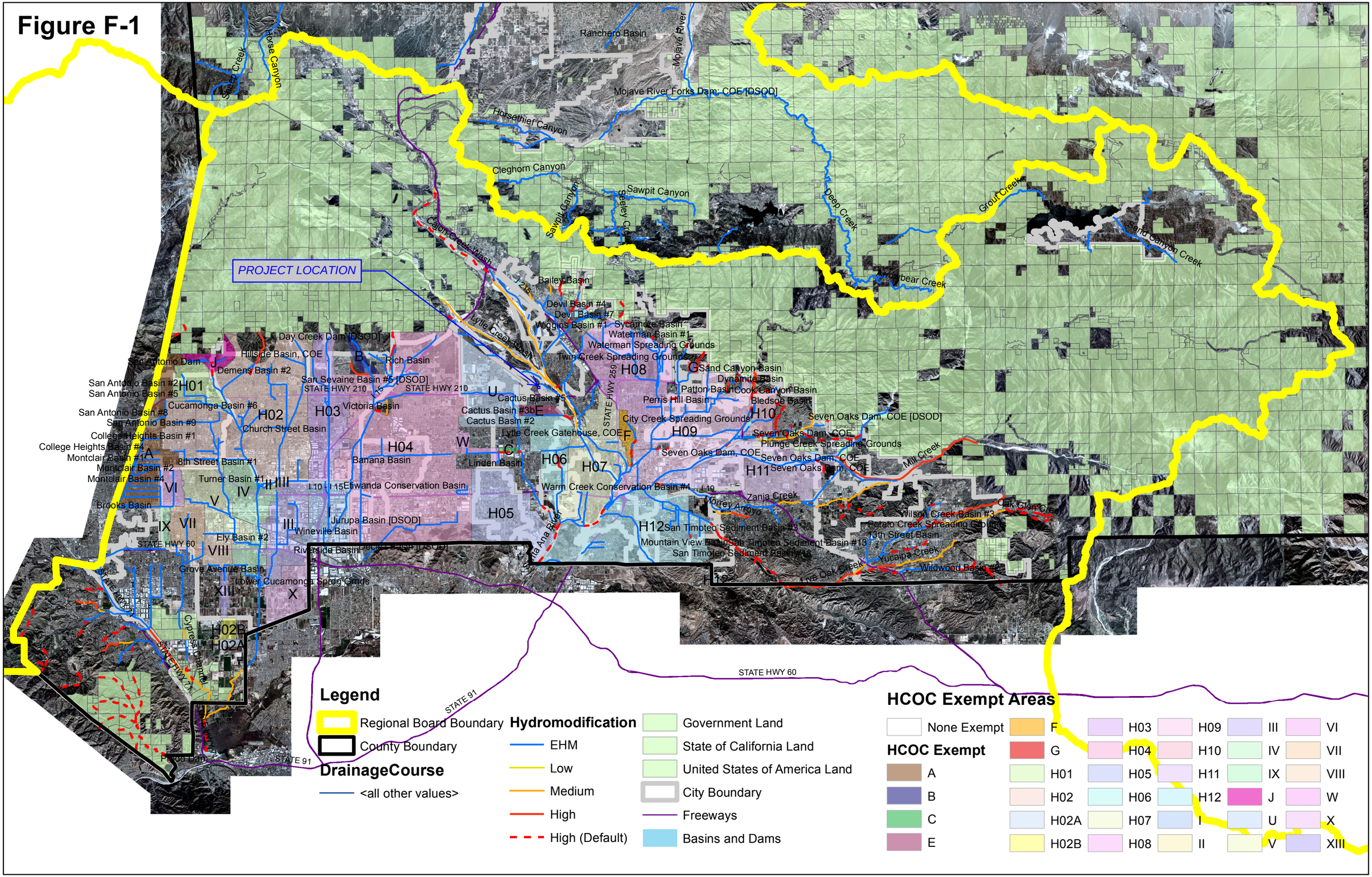
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

# Figure F-1



PROJECT LOCATION
Legend
Regional Board Boundary
County Boundary
DrainageCourse
<all other values>
Hydromodification
EHM
Low
Medium
High
High (Default)
Government Land
State of California Land
United States of America Land
City Boundary
Freeways
Basins and Dams
HCOC Exempt Areas
None Exempt
HCOC Exempt
A
B
C
E
F
G
H01
H02
H02A
H02B
H03
H04
H05
H06
H07
H08
H09
H10
H11
H12
I
II
III
IV
V
VI
VII
VIII
IX
J
U
X
XIII
W
Mojave River Forks Dam, COE [DSOD]
Horsethief Canyon
Cleghorn Canyon
Sawpit Canyon
Deep Creek
Grout Creek
Sand Canyon Creek
Arrowbear Creek
Mill Creek
Zanja Creek
Morrey Arroyo
Oak Glen Creek
Yucaipa Creek
Wildwood Basin #2
Live Oak Creek
Cypress Channel
Prado Dam
Santa Ana River
Lytle Creek Wash
Cajon Creek Wash
Bailey Basin
Devil Basin #4
Devil Basin #7
Wiggins Basin #1
Sycamore Basin
Waterman Basin #1
Waterman Spreading Grounds
Twin Creek Spreading Grounds
Day Creek Dam [DSOD]
Hillside Basin, COE
Demens Basin #2
San Antonio Dam
San Antonio Basin #2
San Antonio Basin #5
San Antonio Basin #8
San Antonio Basin #9
Cucamonga Basin #6
College Heights Basin #1
College Heights Basin #4
Montclair Basin #1
Montclair Basin #2
Montclair Basin #4
Brooks Basin
8th Street Basin #1
Turner Basin #1
Ely Basin #2
Grove Avenue Basin
Lower Cucamonga Sprdg Grnds
Rich Basin
San Sevaine Basin #5 [DSOD]
Victoria Basin
Church Street Basin
Banana Basin
Etiwanda Conservation Basin
Jurupa Basin [DSOD]
Wineville Basin
Riverside Basin
Cactus Basin #5
Cactus Basin #3b
Cactus Basin #2
Lytle Creek Gatehouse, COE
Linden Basin
Warm Creek Conservation Basin #4
Sand Canyon Basin
Dynamite Basin
Patton Basin
Cook Canyon Basin
Perris Hill Basin
Bledsoe Basin
City Creek Spreading Grounds
Seven Oaks Dam, COE [DSOD]
Seven Oaks Dam, COE
Plunge Creek Spreading Grounds
Seven Oaks Dam, COE
Seven Oaks Dam, COE
Seven Oaks Dam, COE
San Timoteo Sediment Basin #3
Mountain View Basin
San Timoteo Sediment Basin #13
San Timoteo Sediment Basin #18
Wilson Creek Basin #3
Potato Creek Spreading Grounds
13th Street Basin
STATE HWY 210
STATE HWY 259
STATE HWY 60
STATE 91
STATE HWY 71