APPENDIX K

Preliminary Hydrology Study

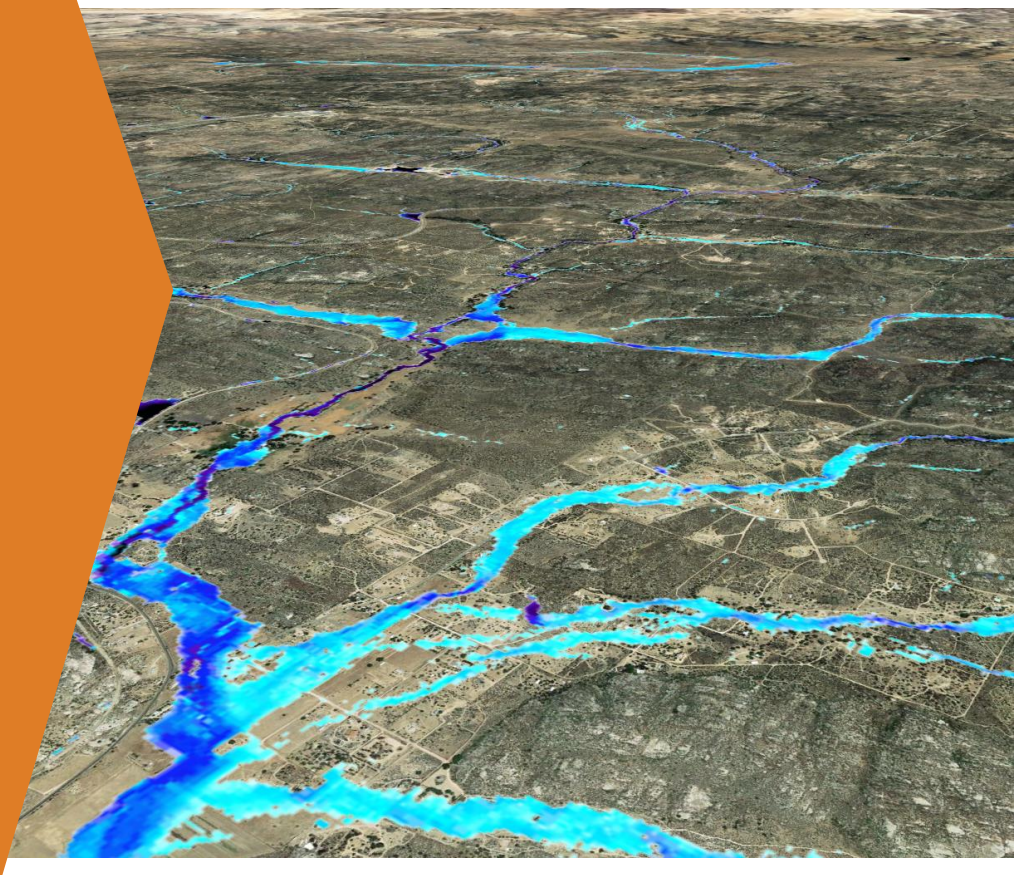
Westwood

Preliminary Hydrology Study

Boulder Brush Facilities

San Diego County, California

November 2019



Prepared For:

TERRA-GEN

Westwood

Preliminary Hydrology Study for

Boulder Brush Facilities

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TERRA-GEN

REGISTERED PROFESSIONAL ENGINEER
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STATE OF CALIFORNIA

11/8/2019

Project Number: 0013118.00
Date: 11/82019

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APPENDICES

OVERVIEW

The purpose of the study is to describe the hydrology of the proposed Boulder Brush Facilities ("the project") and any impacts that the hydrology may play in the design of the roads and transmission line and for use in San Diego County permitting.

The project includes the installation of 6.6 miles of paved and gravel roads and an electrical transmission line within San Diego County, CA, approximately 3.5 miles northwest of the city of Boulevard, CA. (Exhibit 1). At the time of this report, the project consists of roads and a transmission line. No residential construction is involved in the project; therefore, no housing will be placed within any FEMA-identified flood-prone areas. No levees or dams are planned as a part of the project. The crossing structures are culverts and low water crossings that are designed to overtop during significant storm events. As such, no additional erosion, siltation, substantial alteration of the existing drainage patterns, or contribution of additional runoff which would exceed capacity of existing or planned stormwater drainage systems is expected.

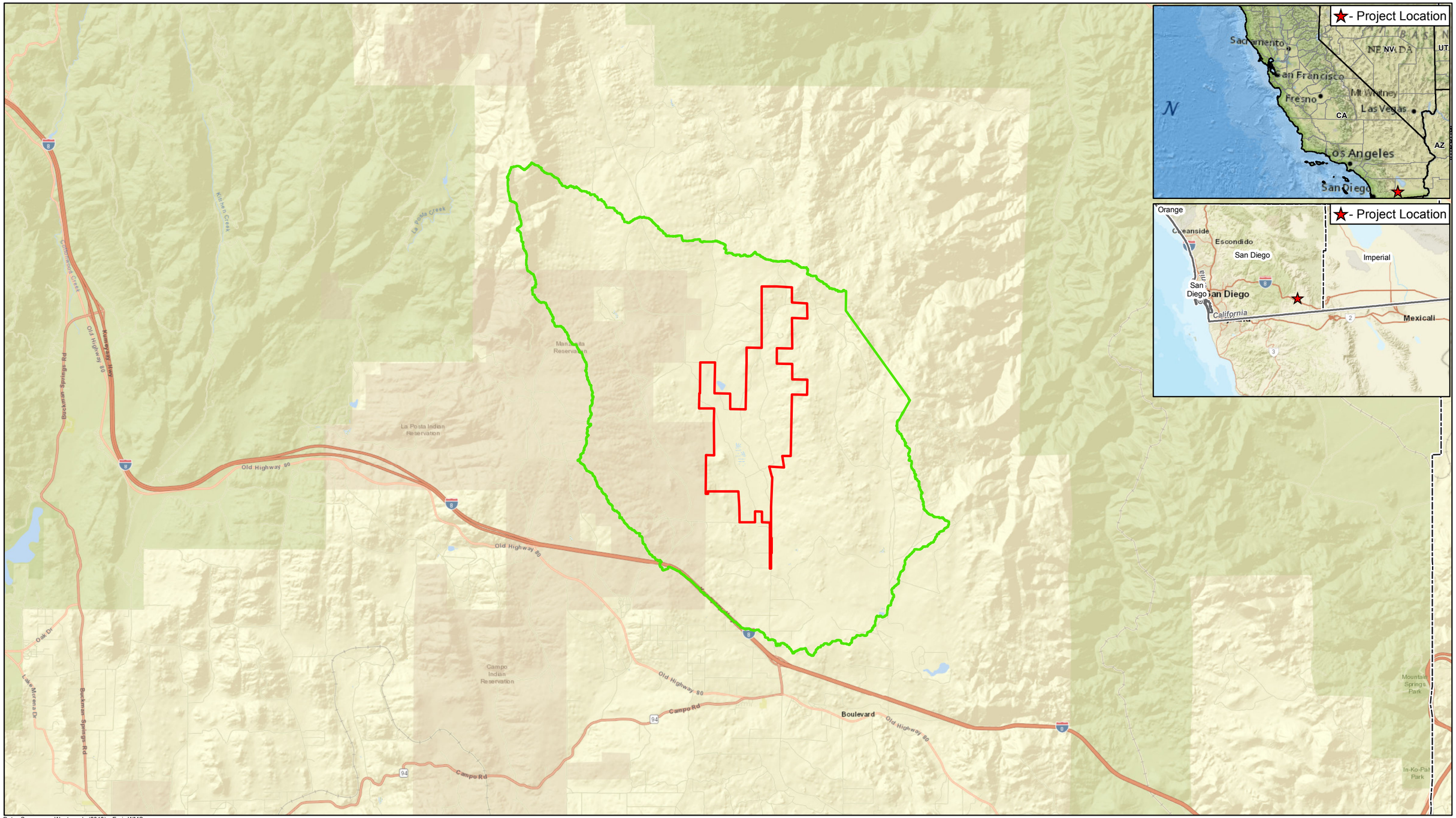
With the project being located within San Diego County, the stormwater requirements for San Diego County will need to be researched and applicable regulations will need to be followed.

The project site contains many ridges that generally run north to south and slope to the east and west. The watershed area encompasses ~32 square miles and includes an area starting northwest of the project. The project area is on a series of steep slopes and ridges that overall drain to the southeast.

FEMA has not completed a study to determine flood hazard for the selected location. The project area is covered by panels 06073C2050F, 06073C2075F, and 06073C2100F. The project area contains FEMA Zone D, which is designated for areas where there are possible but undetermined flood hazards but no analysis of flood hazards has been conducted (Exhibit 2).

The hydrologic modeling in this report was created using two different methodologies: HEC-RAS software and FLO-2D modeling software. HEC-RAS software was used to determine the inundation areas and flood depths throughout the project area. Also, because of the complex and distributary nature of flow paths upstream and through the project site, FLO-2D hydrologic/hydraulic modeling software was utilized to determine flow depths and velocities throughout the site.

Overall, the analysis shows low water depths and velocities (Exhibits 6 and 7) across the majority of the site, with the exception of main channels and ravines between the ridges. During a 100 year storm, the flood depths across the majority of the project area are less than 0.5 feet with velocities less than 1 foot/second, with the exception of narrow channelized areas between local ridges, where flows near the project can reach depths of up to 6 feet and velocities up to 7 feet per second. Areas of higher flood depths and velocities also exist throughout the contributing watershed but are not anticipated to affect the project. See FLO-2D Exhibits 6 and 7 for areas within the project with higher flood depths and velocities and HEC-RAS (Exhibit 3) for Flood Extents. Based on experience on other similar projects, the site is suitable for the planned development by avoiding areas of high flood depths and velocities in channelized flow areas where feasible and providing engineered solutions, such as culverts and low water crossings, where avoiding these areas is unfeasible.



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary

N

0 1.5 Miles

Boulder Brush Facilities

San Diego County, California

Exhibit 1: Location Map

June 11, 2019

Westwood
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Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-07 Tony and BBSDWP_EX1LocationMap_180118.mxd 6/11/2019 1:29:02 PM

DATA SOURCES

The models and methods for this project utilize a combination of public and private data as shown in Table 1.

Table 1: Data Sources

Data Type	Format	Source	Use
Elevation	1-meter LiDAR	USGS National Map	Site HEC-RAS and FLO-2D Model Elevations
Elevation	10-meter DEM	USGS National Map	Offsite HEC-RAS and FLO-2D Model Elevations
Crop Data	Shapefile	USDA 2013 Crop Data Layer	Landcover
Soils	Shapefile	USGS SSURGO Dataset	Curve Numbers
Precipitation	PDF File	NOAA Atlas 14 Website	Design storms
HUC-12 Drainage Boundary	Shapefile	USGS	Define Model Extents
Access Roads	Shapefile	Terra-Gen, LLC	Define Model Extents
2015 Aerial Photography	ArcGIS Map Service	USDA FSA	Reference

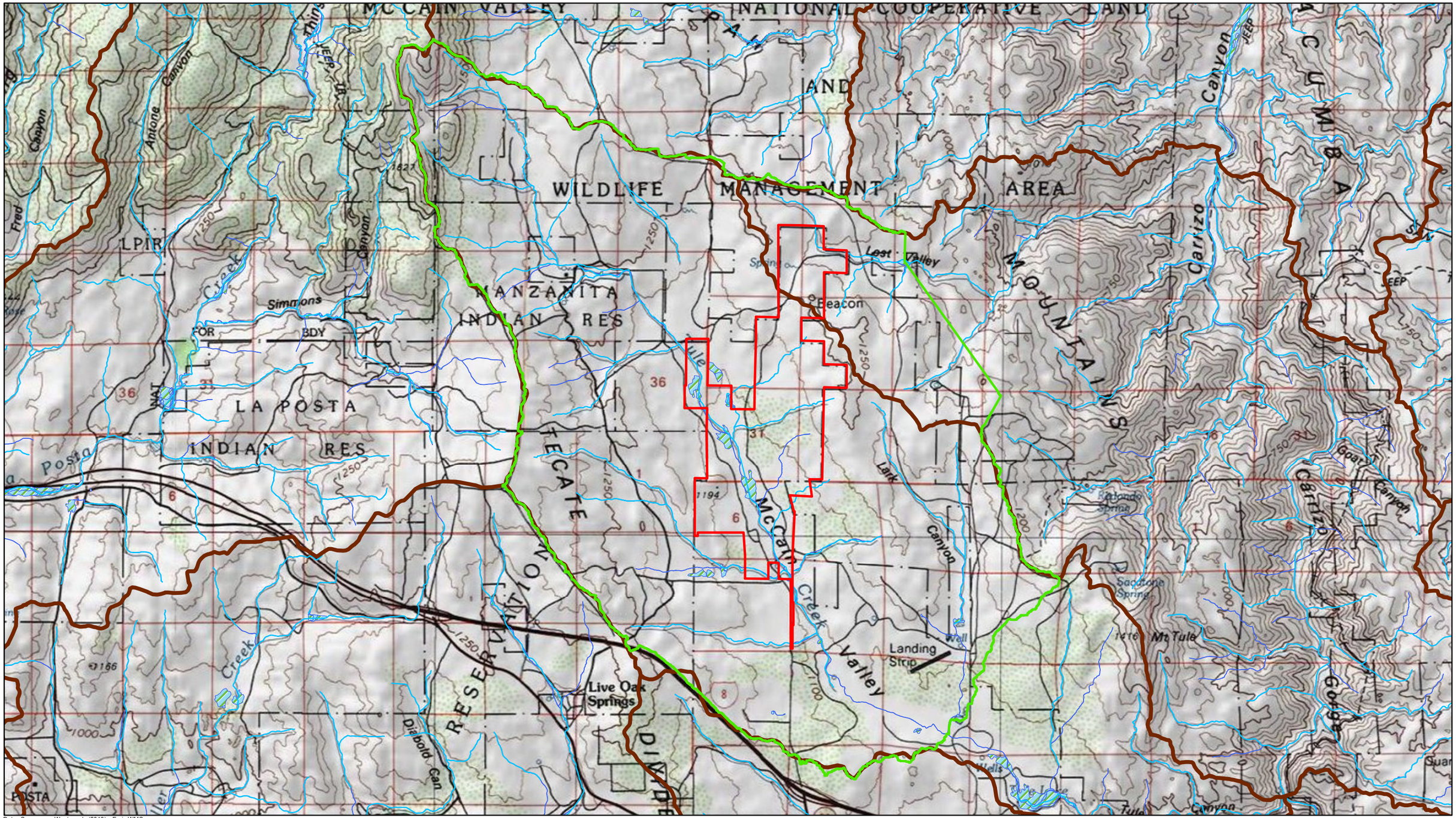
Declaration of Responsible Charge

I HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT DESIGN

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES OF PROJECTE DESIGN.

Christopher J. Carda — 11/8/2019

CHRISTOPHER CARDA — DATE
R.C.E. C75322
EXP: 12-31-2019



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline
- NWI Wetlands
- FEMA Zone A
- FEMA Zone AE

*Note: No FEMA Zones A nor AE exist on site. The project and watershed consist of FEMA Zone D, see report for additional details

N

0 Miles 1

Boulder Brush Facilities

San Diego County, California

Exhibit 2: Base Map

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PROJECT HYDROLOGY

The project area is located in the Southern California, approximately 3.5 miles northwest of Boulevard, CA. The project site is located on a series of slopes and ridges that drain to both the east and the west before ultimately flowing south. The project watershed encompass roughly 32 square miles and includes areas northwest of the project. The potential hydrologic issues in this general landscape are flooding and erosive velocities; no existing flood flows will be altered by the project.

100 Year Flooding Extents for Drainage Areas Greater than 100 Acres

HEC-RAS modeling software was used to determine inundation limits for streams with more than 100 acres of drainage area. HEC-RAS is a one-dimensional steady flow hydraulic model for channel flow analysis and WSEL determination. The software primarily assumes a steady, gradually varied flow scenario and uses the direct step method to compute water surface profiles. HEC-RAS offers advantages over broader surface models by allowing in-depth studies of a specific reach or reaches of a given channel, giving the opportunity to adjust details such as the exact contours and Manning's Coefficients of the channel banks. The primary inputs are a DTM (elevation data), peak channel flows and channel cross section data.

Inflow data for the modeled reaches was determined using online StreamStats reports (Appendix H). Modeled reaches were determined using 1-meter LiDAR to define 100 Acre drainage areas. The 100 Year Peak Flood Value was used at inflow locations. Using the 100 Year rainfall allows for the best initial analysis in order to determine the worst areas of flooding and is the basis of the National Flood Insurance Program (NFIP). Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located (Exhibit 11). The inflow at the southern cross section "1100" was split to also accommodate cross section "1400" due to the upstream hydraulic feature that causes the stream to diverge into two sections.

FLO-2D Modeling

FLO-2D is a physical process model that routes rainfall runoff and flood hydrographs over flow surfaces or in channels using the dynamic wave approximation to the momentum equation. FLO-2D offers advantages over 1-D models and unit hydrograph methods by allowing for breakout flows and visualization of flows across a potential site. This is particularly useful on a moderately and steeply sloped distributed area such as the project site. The primary inputs are a DTM (elevation data), curve numbers and precipitation. A grid system is set up within the FLO-2D software, and based upon the large watershed size, the FLO-2D grid cells were optimized at 40'.

Precipitation data was downloaded from NOAA Atlas 14 (sample in Appendix A) for a 100 year rain event. The 100 year rain depth for the site is 7.31 inches. Variable rainfall distribution data was input into FLO-2D using the Atlas 14 rainfall curves. By using the 100-year rainfall event for deign purposes, it allows for the best initial analysis in order to determine the worst areas of flooding and erosion.

The bulk of the elevation data input into the FLO-2D model was 1m-LiDAR data with the northwest mountainous portion of the watershed consisting of publically available 10-meter DEM elevation data. The 10-meter elevation data was blended with the 1-meter LiDAR and incorporated into the DTM using the export to xyz file function in Global Mapper. These XYZ files are read directly into FLO-2D.

USDA-NRCS SSURGO soil data provides soil types within the project boundary and full coverage of the contributing watershed. Soils in the area are primarily classified as hydrologic group A (Exhibit 3). Land

cover was obtained from the USDA 2013 Crop Data Layer. Exhibit 4 displays the Land Cover Classes for the entire watershed. The majority of land in this area is assumed to be shrubland. Curve numbers were applied to each grid cell in the FLO-2D model based on intersecting the grid with the soil and land cover data (Exhibit 5). The majority of the project area has a curve number between 50 and 60. Areas with a higher curve number will have more runoff and areas with a lower curve number will have less runoff. This is based on the type of soils, "A" soils have the highest infiltration rates and "D" soils have the lowest infiltration rates, along with the landcover of the area, dense vegetation will have less runoff and fallow farm fields and impervious areas will have more runoff (Appendix B).

Determining the Effect of the Project on Runoff Rates

HydroCAD modeling was used to determine flow rates where runoff was discharging from the project (Appendix J). Due to the size of the watershed the SCS Curve Number method was used. The site was divided into ten drainage areas to analyze the peak discharge rates from the site (Exhibit 9, Table 2). The north drainage area drains offsite to the west before joining the overall site drainage area, which flows south. The far north drainage area flows to the east. To calculate the existing and proposed discharge rates overall curve numbers for each the watershed was determined and combined with each areas Time of Concentration (ToC) and Altas-14 precipitation data. Due to the acreage attributed to each watershed and minimal addition of impervious surfaces the average curve number and runoff rates did not change. No levees or dams are planned to be constructed or altered in any way during this project.

Table 2. Pre-Development vs Post-Development Site Discharge Rates

Pre-Development Conditions - Based on Atlas 14 100-Year 24-Hour Storm (7.31 inches)							
	Tc (min)	Hydrulic Length (ft)	Average Slope (ft/ft)	Area (Acres)	Average Curve Number	Velocity at Discharge Point (ft/s)	Q_{100} (cfs)
1S-Overall Site	601.99	47,361	0.049	13,418.0	56	8.50	2,402.15
2S-Northern	146.76	7,392	0.0444	526.7	55	10.17	212.88
3S-Far North	180.51	8,712	0.0363	645.0	56	9.19	241.59
4S-Northwest	353.13	32,250	0.077	4,741.7	56	11.33	1,189.84
5S-West-North	264.78	18,585	0.0567	1,723.3	56	8.14	514.79
6S-West-Central	202.05	13,152	0.056	607.8	56	4.98	212.41
7S-West-South	180.65	11,901	0.0597	595.6	56	8.50	222.97
8S-East	73.34	4,794	0.0823	82.9	56	7.49	53.44
9S-Central	549.87	43,945	0.0521	11,721.0	56	8.63	2,212.46
10S-Northwest Central	81.59	5,233	.0.786	165.0	56	8.18	100.33
Post-Development Conditions - Based on Atlas 14 100-Year 24-Hour Storm (7.31 inches)							
	Tc (min)	Hydrulic Length (ft)	Average Slope (ft/ft)	Area (Acres)	Average Curve Number	Velocity at Discharge Point (ft/s)	Q_{100} (cfs)
11S-Overall Site	601.99	47,361	0.049	13,418.0	56	8.50	2,402.15
12S-Northern Section	146.76	7,392	0.0444	526.7	55	10.17	212.88
13S-Far North	180.51	8,712	0.0363	645.0	56	9.19	241.59
14S-Northwest	353.13	32,250	0.077	4,741.7	56	11.33	1,189.84
15S-West-North	264.78	18,585	0.0567	1,723.3	56	8.14	514.79
16S-West-Central	202.05	13,152	0.056	607.8	56	4.98	212.41
17S-West-South	180.65	11,901	0.0597	595.6	56	8.50	222.97
18S-East	73.34	4,794	0.0823	82.9	56	7.49	53.44
19S-Central	549.87	43,945	0.0521	11,721.0	56	8.63	2,212.46
10S-Northwest Central	81.59	5,233	.0.786	165.0	56	8.18	100.33

LAND USE AND ZONING

The project area is east of the Salton Sea Divide, which means the site ultimately drains to the Salton Sea. Development that lies east of this divide is not eligible for consideration as a Priority Development Project (PDP), as specified in the County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance (Appendix F). The proposed impervious area makes up roughly 1.3% of the overall project area, distributed across the entirety of the 2252.8 acre site. The minimal increase of impervious cover and its disconnected nature will result in negligible impacts to stormwater flow within the

project watershed; therefore, post-construction site discharge is expected to be equal to that of existing conditions.

STREAM ALTERATION AND DRAINAGE PATTERNS

The project layout is designed in a manner that will minimalize impacts to existing drainage and flow paths. Proposed grading is minimal and will avoid defined flow paths where possible. When the avoidance of streamlines is not possible for the proposed layout, crossing structures, such as culverts and low water crossings, have been designed in compliance with the appropriate jurisdictions, including the Army Corps of Engineers, California Department of Fish and Wildlife, and the Regional Water Quality Board. The crossing structures have been designed to pass storm flows in a similar manner to that of existing conditions, and will not alter the flow patterns, runoff quantity, or increase the erosive effects of the storm flow. Details for these crossings can be seen below and in Appendix D.

CULVERTS AND CROSSINGS

There are 42 culverts, low water crossings (LWC) and culvert / LWC combinations proposed for the project. Also, in the southern portion of the project a ford crossing with cutoff walls is recommended near crossing B4. A proposed transmission line extends across extends across a large flow path; crossings B39, B41 and B42 will have 24" culverts to pass routine flows. See Exhibit 8 for the identified crossing locations.

Culverts and crossings were sized based on flow rates generated using HydroCAD and the SCS methodology for a 10-year 24 hour storm return interval. Culvert hydraulics were evaluated using Bentley CulvertMaster software. Generally, all proposed culverts are inlet controlled for the 10-year design flow.

The culverts were sized to pass the 10-year design flow rate with one foot of headwater above the pipe entrance. The minimum pipe diameter considered was 18 inches. Single barrel, double barrel, and triple barrel designs were all sized for each crossing (with the exception of areas of low flow where the increase in the quantity of barrels was not necessary to pass the design flow), along with a low water crossing (LWC). Appendix D summarizes the recommended culvert or LWC size for each identified crossing location.

RESULTS AND DESIGN INFORMATION

Overall, the analysis shows low water depths and velocities (Exhibits 6 and 7) across the majority of the site (with the exception of the channelized areas between local ridges). During a 100 year storm, the flood depths across the majority of the project area are less than 0.5 feet with velocities less than 1 foot/second. Due to the varying and ridged landscape in the area, water is directed to low-laying channels that convey the water during flood events. This creates areas of localized flooding. These flows have a depth >1', and therefore these areas of the site should be avoided when feasible.

FEMA has not completed a study to determine flood hazard for the selected location. The project area is covered by panels 06073C2050F, 06073C2075F, and 06073C2100F. The project area contains FEMA Zone D, which is designated for areas where there are possible but undetermined flood hazards but no analysis of flood hazards has been conducted (Exhibit 2).

The minimal amount of impervious surfaces being added to No residential construction is involved in the project; therefore, no housing will be placed within any FEMA-identified flood-prone areas. No levees or dams are planned to be constructed or altered during this project. The crossing structures are culverts

and low water crossings that are designed to overtop during significant storm events. As such, no additional erosion, siltation, substantial alteration of the existing drainage patterns, or contribution of additional runoff which would exceed capacity of existing or planned stormwater drainage systems is expected.

There are some roads that cross over or run adjacent to defined flow paths. As such, there are isolated portions of access road which are anticipated to be inundated during a 100-yr rainfall event. Avoidance of these areas is not practical but are minimized in the access road design. Any impacts to defined flow paths will have an increased risk of erosion and should be stabilized as soon as possible per the project Storm Water Pollution Prevention Plan (SWPPP).

In conclusion, the project will avoid areas of high flood depths and velocities in channelized flow areas where feasible and will employ engineered solutions, such as culverts and low water crossings, where avoiding these areas is unfeasible. The Boulder Brush Facilities project meets the drainage requirements of the county.

Included Output Files:

1. Shapefile of Flow Depth
   San_Diego_Flow Depth_Preliminary_180118.shp
   Attribute "ID" = Grid Cell Number
   Attribute "VAR" = Max Flow Depth (Feet)

2. KMZ of Flow Depth
   San_Diego_Flow Depth_Preliminary_180118.kmz
   Overlay in Google Earth for graphical representation.

3. Shapefile of Velocity
   San_Diego_Velocity_Preliminary _180118.shp
   Attribute "ID" = Grid Cell Number
   Attribute "VAR" = Velocity (FPS)

4. KMZ of Velocity
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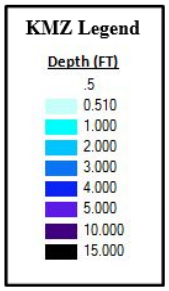
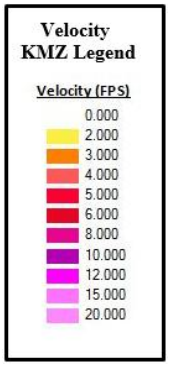
   Overlay in Google Earth for graphical representation





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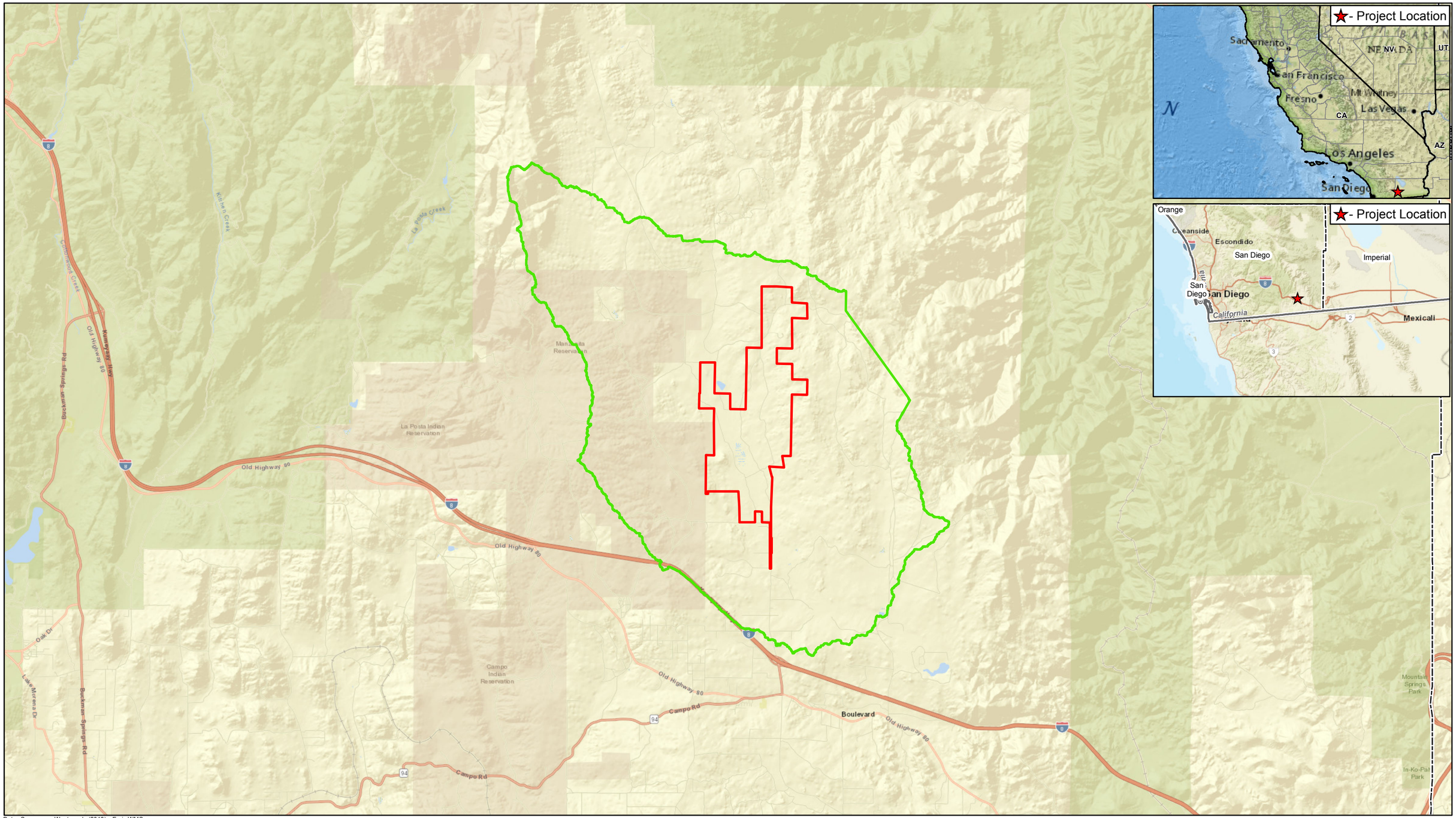
Exhibits



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary

N

0 1.5 Miles

Boulder Brush Facilities

San Diego County, California

Exhibit 1: Location Map

June 11, 2019

Westwood
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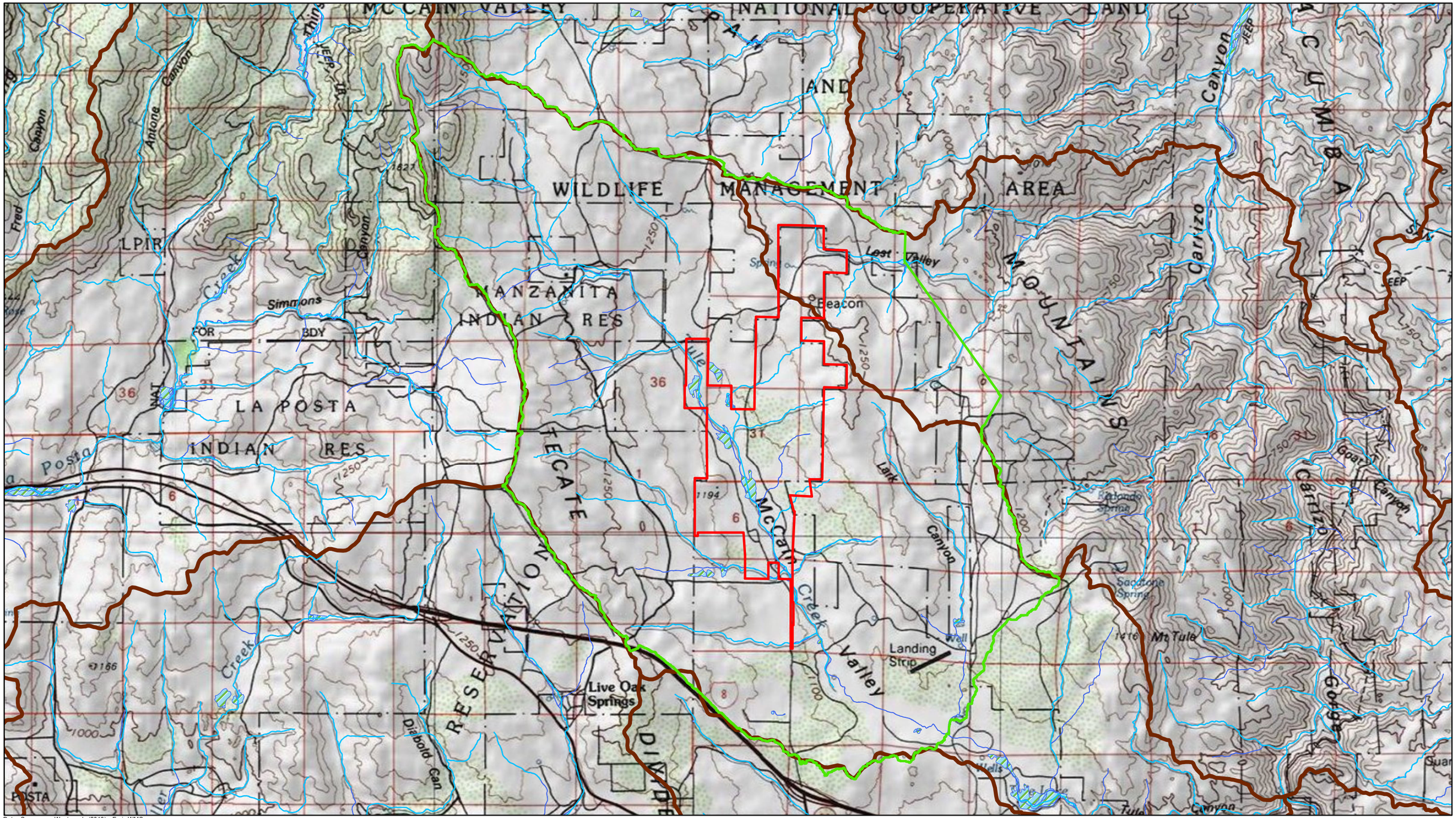
Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-07 Tony and BBSDWP_EX1LocationMap_180118.mxd 6/11/2019 1:29:02 PM



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline
- NWI Wetlands
- FEMA Zone A
- FEMA Zone AE

*Note: No FEMA Zones A nor AE exist on site. The project and watershed consist of FEMA Zone D, see report for additional details

N

0 Miles 1

Boulder Brush Facilities

San Diego County, California

Exhibit 2: Base Map

June 13, 2019

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Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline

Hydrologic Soils Group

- A
- B
- C
- D

N

0 Miles 1

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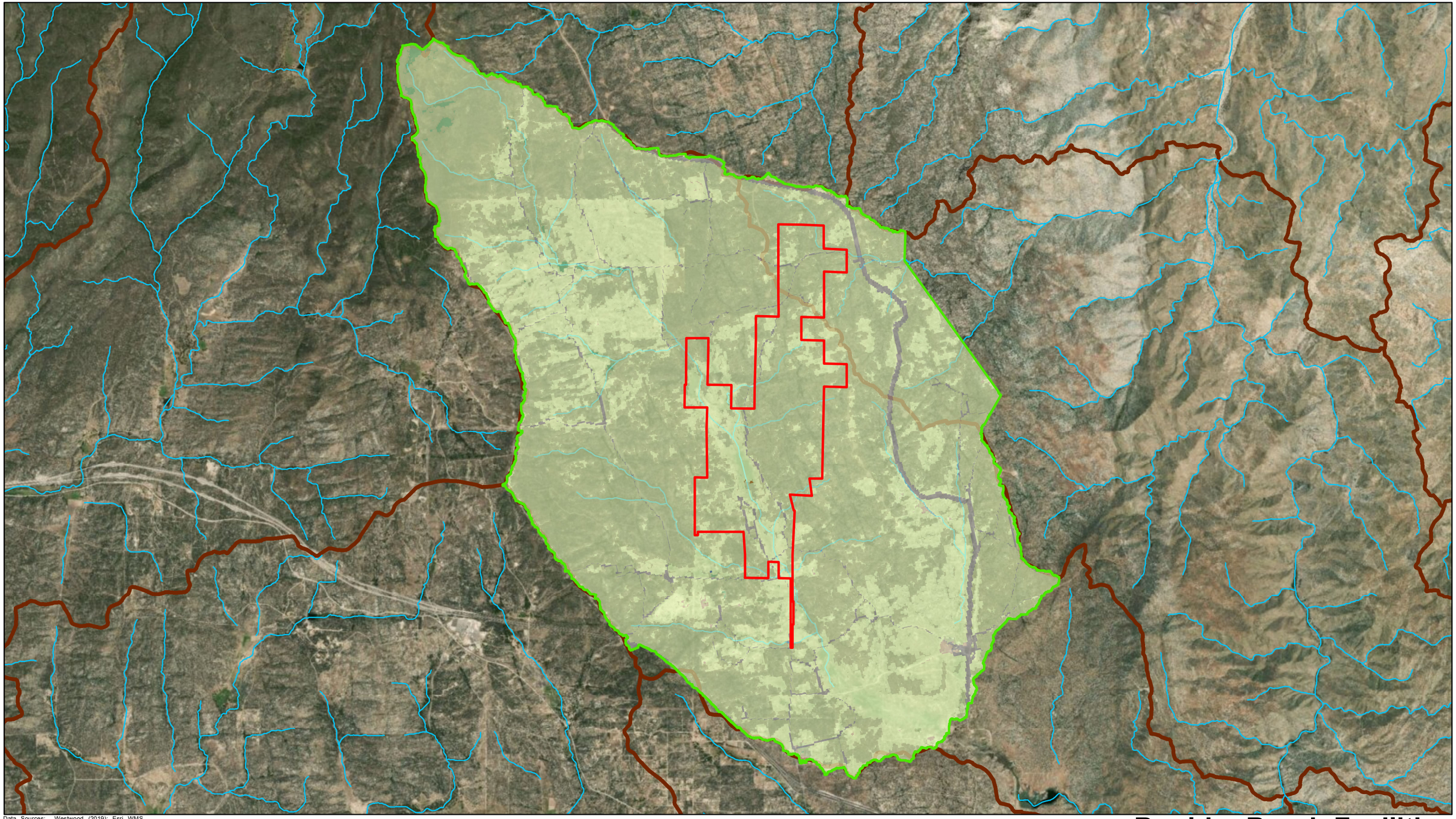
Boulder Brush Facilities

San Diego County, California

Exhibit 3: Soils Map

June 11, 2019

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EX3SoilsMap_180118.mxd 6/11/2019 1:32:40 PM



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline

Landcover

- Barren
- Cultivated
- Developed
- Forested
- Prairie/Pasture
- Shrubland
- Water

N

0 Miles 1

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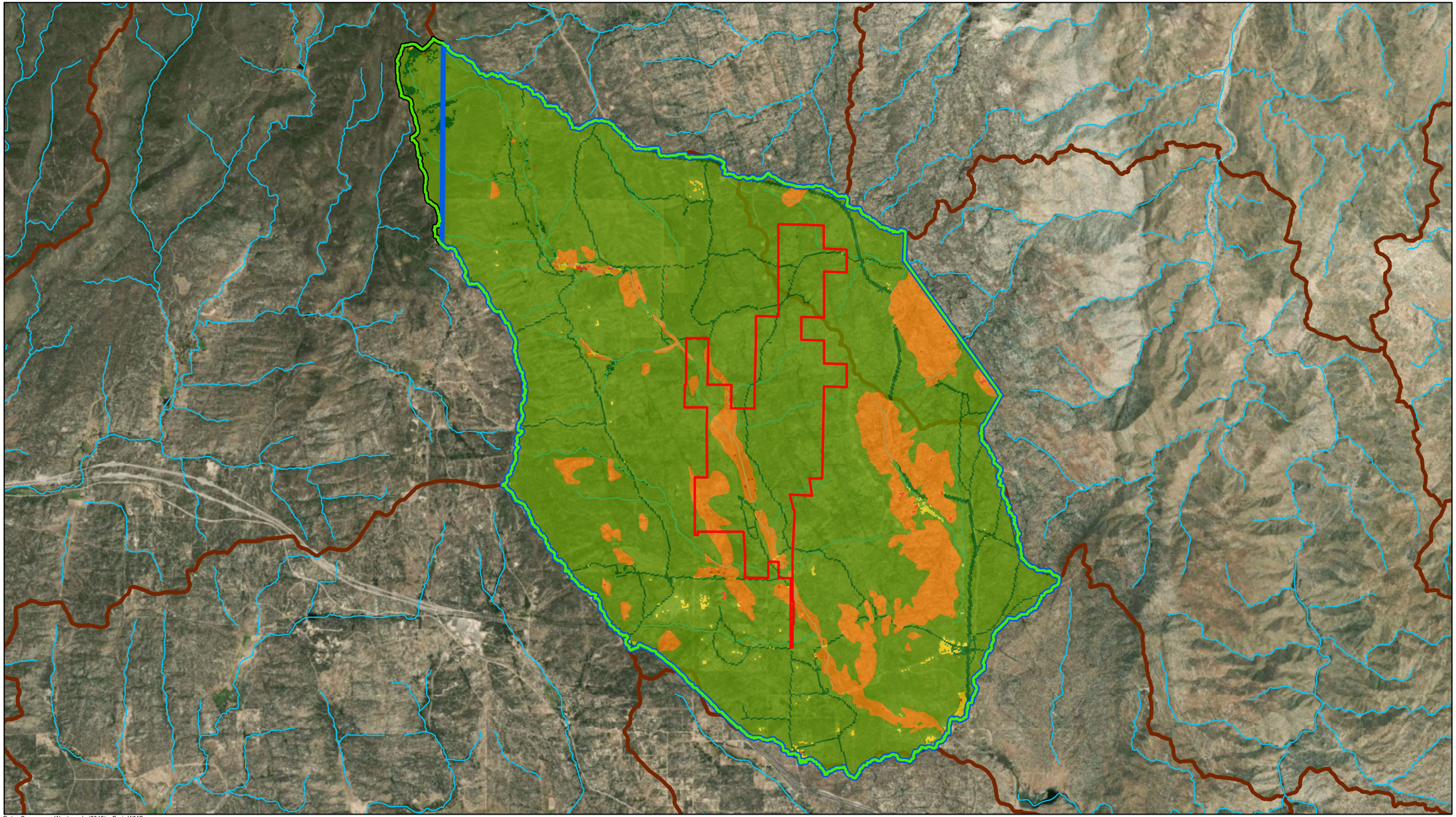
Boulder Brush Facilities

San Diego County, California

Exhibit 4: Landcover Map

June 11, 2019

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EX4LandcoverMap_180118.mxd 6/11/2019 1:33:48 PM



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline
- 1-meter LiDAR Extents
- 10-Meter DEM Extents

Curve Number

- 40 - 49
- 50 - 59
- 60 - 69
- 70 - 79
- 80 - 89
- 90 - 99

N

0 Miles 1

Boulder Brush Facilities

San Diego County, California

Exhibit 5: Curve Number and Topographic Extents Map

June 13, 2019

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Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EX5CurveNumberMap_180118.mxd 6/13/2019 12:40:49 PM

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline
- Gravel Access Roads
- Paved Access Roads

Max Flow Depth (ft)

0.50 - 1.00
1.01 - 1.50
1.51 - 2.00
2.01 - 2.50
2.51 - 3.00
3.01 - 4.00
4.01 - 5.00
5.01 - 6.00
6.01+

N

0 Feet 3,000

Boulder Brush Facilities

San Diego County, California

Exhibit 6: 100-Year Max Water Depth Map

June 11, 2019

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EX6_100YearMaxWaterDepth_180118.mxd 6/11/2019 4:03:46 PM

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- FLO-2D Boundary
- County Boundary
- HUC 12 Boundary
- NHD Flowline
- Gravel Access Roads
- Paved Access Roads

Peak Velocity (fps)

1.00 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01+

N

0 — 3,000 Feet

Boulder Brush Facilities

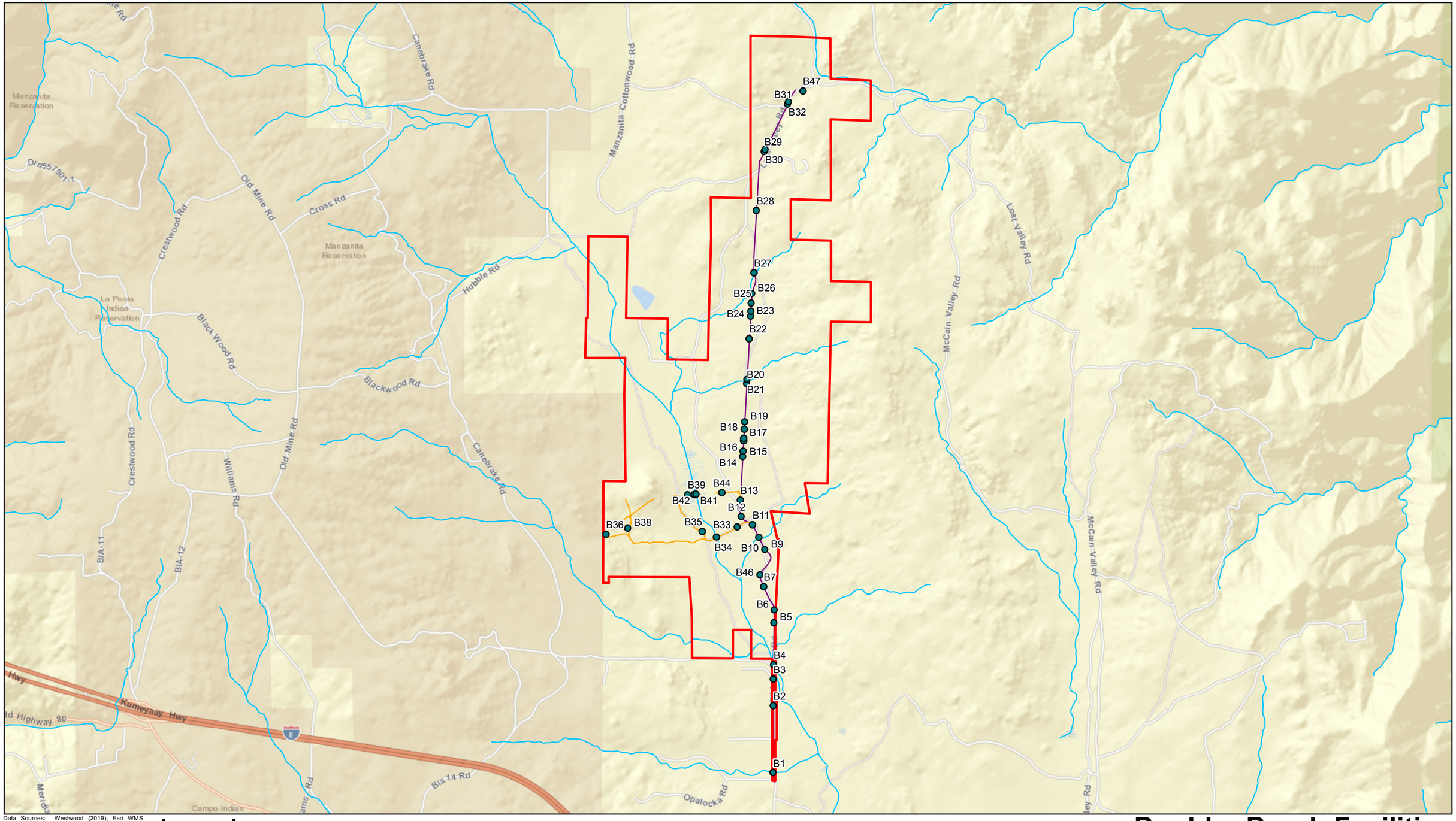
San Diego County, California

Exhibit 7: 100-Year Peak Velocity Map

June 11, 2019

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EX7_100YearPeakVelocityMap_180118.mxd 6/11/2019 4:03:52 PM



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Legend

- Project Boundary
- NHD Flowline
- Proposed Crossing Locations
- Gravel Access Roads
- Paved Access Roads

*See Crossing Table in Appendix C for additional crossing information

N

0 — 3,000 Feet

Boulder Brush Facilities

San Diego County, California

Exhibit 8: Crossings Map

June 28, 2019

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\SDWP_EXBCrossingsMap_180402.mxd 6/28/2019 11:23:30 AM

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-07 Drainage Areas to Discharge with labels.mxd 11/8/2019 12:29:38 PM mmhealy

Northwest

Far North

Watershed Area: 645 Acres
Discharge Rate: 241.59 cfs

Watershed Area: 526 Acres
Discharge Rate: 212.88 cfs

North

Watershed Area: 4,741.7 Acres
Discharge Rate: 1,189.84 cfs

Watershed Area: 165.0 Acres
Discharge Rate: 100.33 cfs

NW Central

East

West-North

Watershed Area: 82.9 Acres
Discharge Rate: 53.44 cfs

Watershed Area: 1,723.3 Acres
Discharge Rate: 514.79 cfs

West-Central

Watershed Area: 11,721.0 Acres
Discharge Rate: 2,212.46 cfs

Watershed Area: 607.8 Acres
Discharge Rate: 212.41 cfs

West-South

Watershed Area: 595.6 Acres
Discharge Rate: 222.97 cfs

Watershed Area: 13,418.0 Acres
Discharge Rate: 2,402.15 cfs

Legend

- Project Boundary
- NHD Lines
- Drainage Areas
- Central Drainage Area
- Overall Site Drainage Area

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

N

0 3,000 Feet

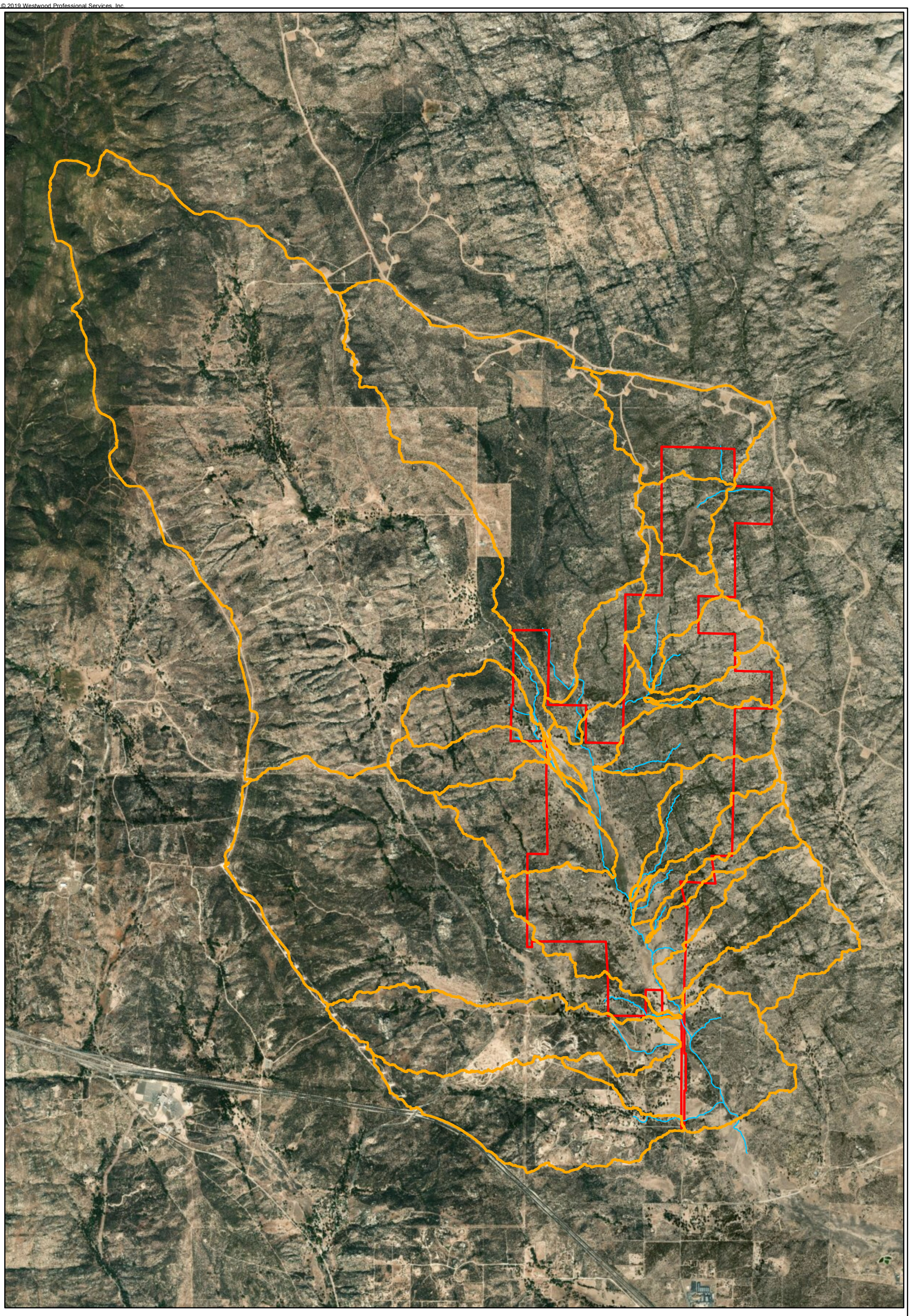
Boulder Brush Facilities

San Diego County, California

Exhibit 9: Drainage Areas to Site Discharge Locations

November 08, 2019

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\2019-11-07 Ex10 100 acres+ DAs.mxd 11/7/2019 4:45:23 PM mmhealy



Legend

Project Boundary

Modeled Reaches

Drainage Areas

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood

Toll Free (888) 937-5150 westwoodps.com

Westwood Professional Services, Inc.

N

0 Feet 3,200

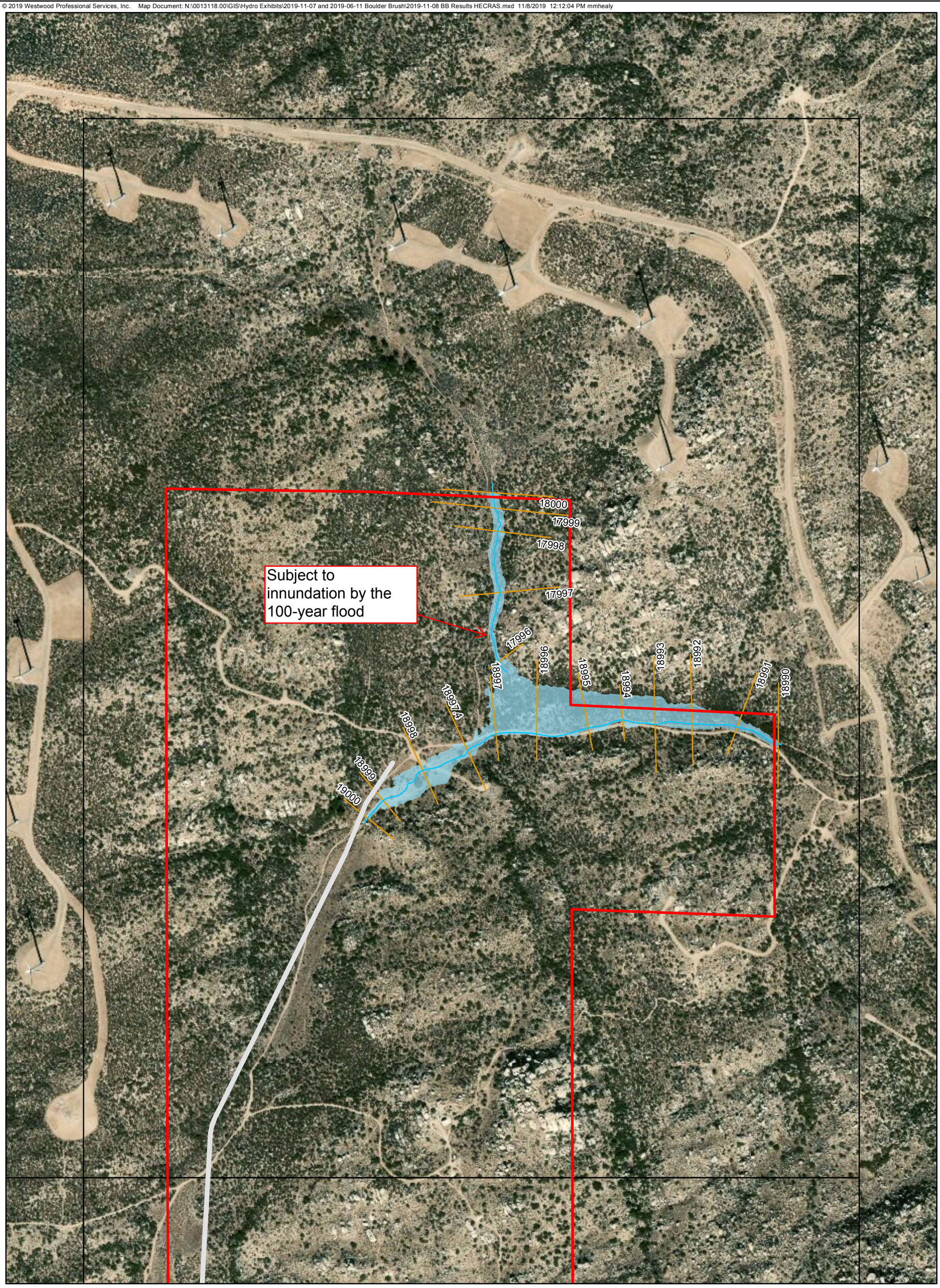
Boulder Brush Facilities

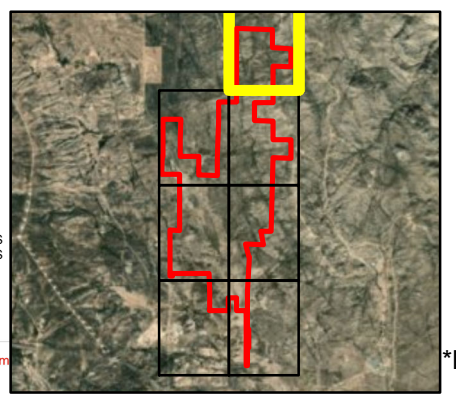
San Diego County, California

Exhibit 10: Drainage Areas Greater Than 100 Acres

November 07, 2019

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:12:04 PM mmhealy





Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

0 600 Feet

November 08, 2019

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:12:21 PM mmhealy

Subject to innundation by the 100-year flood

Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

0 600 Feet

November 08, 2019

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:12:37 PM mmhealy

11000
10999
10998
10997
10996
10995
10994
10993
11999
11998
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11996
11995
11994
11993
11992
12000
14000
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15000
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14998
13000
12998
12999
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12996
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25000
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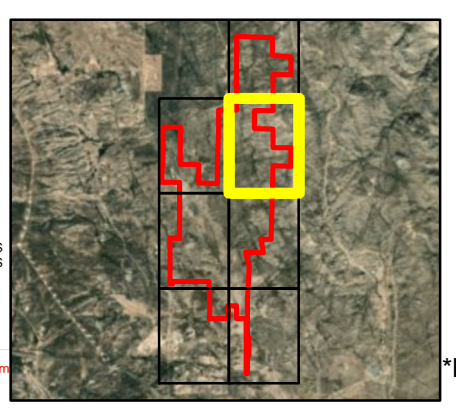
24998
24997
24996
24995
24994

Subject to innundation by the 100-year flood



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

0 600 Feet

November 08, 2019

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:12:59 PM mmhealy

Subject to innundation by the 100-year flood

Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

0 600 Feet

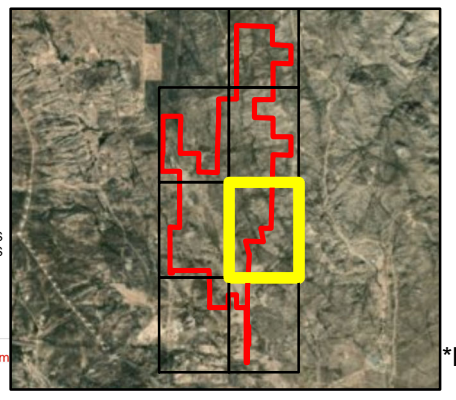
November 08, 2019

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:13:18 PM mmhealy

Subject to innundation by the 100-year flood



Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

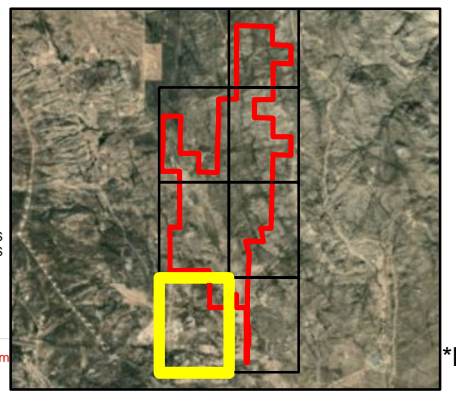
0 600 Feet

November 08, 2019

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:13:34 PM mmhealy



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
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Westwood Professional Services, Inc.

Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

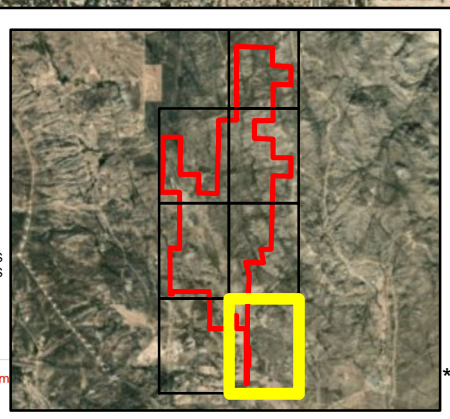
N

0 600 Feet

November 08, 2019

 Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-11-07 and 2019-06-11 Boulder Brush\2019-11-08 BB Results HECRAS.mxd 11/8/2019 12:13:50 PM mmhealy

Subject to innundation by the 100-year flood



Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Boulder Brush Facilities

San Diego County, California

Exhibit 11: 100-Year Flood Extents for Drainage Areas Greater Than 100 Acres

Legend

- Project Boundary
- GeoHECRAS Cross Sections
- Modeled Reaches
- Gravel Access Roads
- Paved Access Roads
- HECRAS Flood Extents

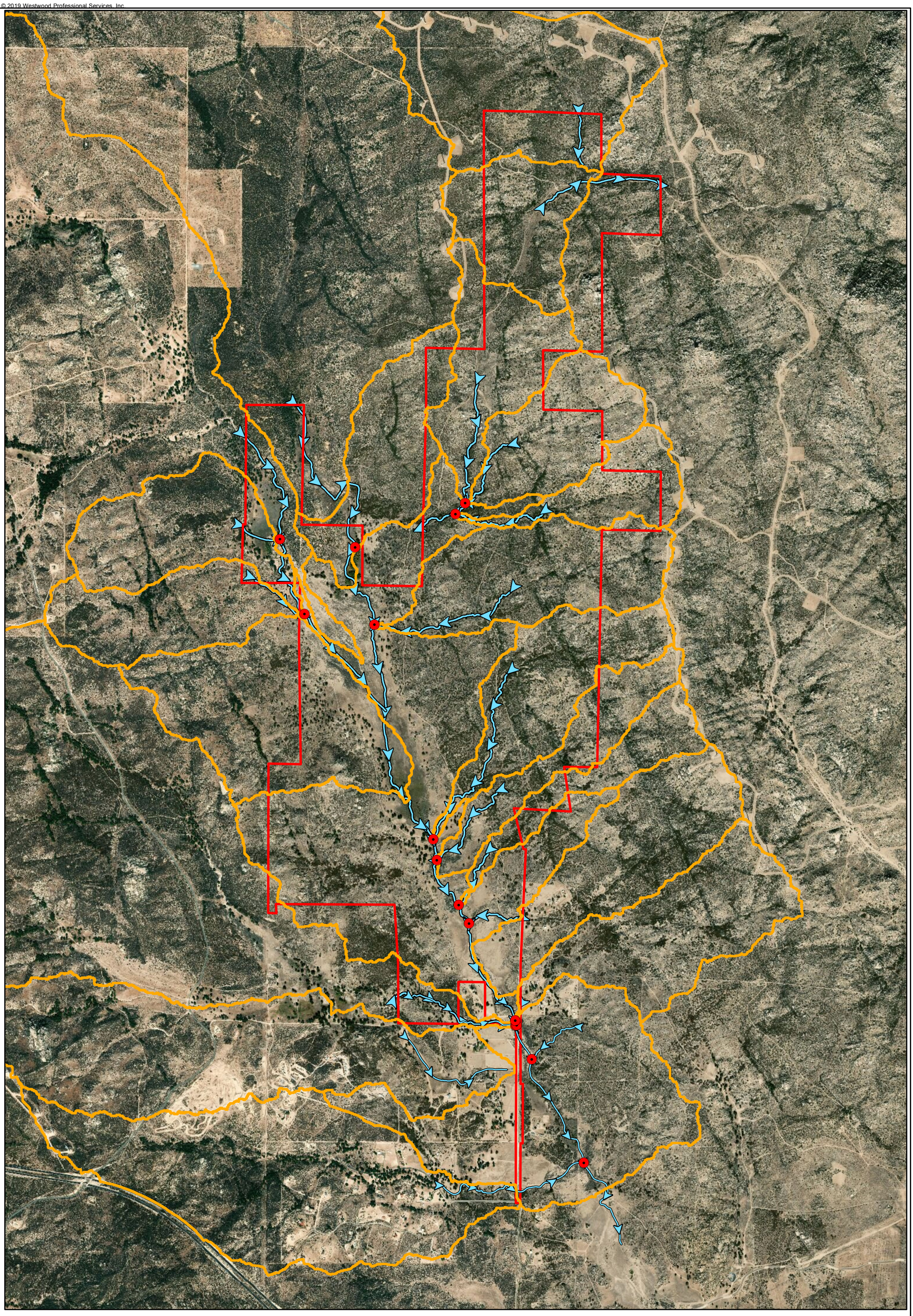
*Note: Two HEC-RAS models were used to create the flood extents, these models overlap where the southern cross section "1000" is located

N

0 600 Feet

November 08, 2019

Map Document: N:\0013118.00\GIS\Hydro Exhibits\2019-06-11 Boulder Brush\2019-11-07 Ex12 Node-discharge-direction map.mxd 11/7/2019 4:39:17 PM mmhealy



Legend

Project Boundary

Modeled Reaches

Drainage Areas

Reach Nodes

Data Sources: Westwood (2019); Esri WMS Basemap Imagery (Accessed 2019); USGS (2019); FEMA (2019); USDA (2019)

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

N

0 2,000 Feet

Boulder Brush Facilities

San Diego County, California

Exhibit 12: Drainage Direction and Node Map

November 07, 2019

Appendix A

Sample of Atlas 14 Rainfall Data

NOAA Atlas 14, Volume 6, Version 2
Location name: California, USA*
Latitude: 32.6713°, Longitude: -116.3648°
Elevation: 3570.24 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	**0.146** (0.123-0.174)	**0.187** (0.157-0.224)	**0.250** (0.210-0.301)	**0.311** (0.259-0.378)	**0.410** (0.330-0.516)	**0.502** (0.394-0.645)	**0.610** (0.467-0.805)	**0.741** (0.551-1.01)	**0.957** (0.680-1.36)	**1.16** (0.795-1.71)
10-min	**0.209** (0.176-0.250)	**0.268** (0.225-0.321)	**0.359** (0.302-0.432)	**0.446** (0.372-0.541)	**0.588** (0.473-0.739)	**0.719** (0.565-0.924)	**0.875** (0.670-1.15)	**1.06** (0.790-1.44)	**1.37** (0.975-1.95)	**1.66** (1.14-2.45)
15-min	**0.252** (0.213-0.302)	**0.324** (0.273-0.388)	**0.434** (0.365-0.522)	**0.540** (0.450-0.655)	**0.711** (0.572-0.894)	**0.870** (0.683-1.12)	**1.06** (0.810-1.40)	**1.29** (0.955-1.75)	**1.66** (1.18-2.36)	**2.01** (1.38-2.96)
30-min	**0.346** (0.292-0.414)	**0.444** (0.374-0.532)	**0.595** (0.500-0.716)	**0.740** (0.617-0.898)	**0.975** (0.784-1.23)	**1.19** (0.937-1.53)	**1.45** (1.11-1.91)	**1.76** (1.31-2.40)	**2.27** (1.62-3.23)	**2.76** (1.89-4.06)
60-min	**0.476** (0.402-0.570)	**0.610** (0.514-0.732)	**0.819** (0.688-0.985)	**1.02** (0.848-1.24)	**1.34** (1.08-1.69)	**1.64** (1.29-2.11)	**2.00** (1.53-2.63)	**2.42** (1.80-3.30)	**3.13** (2.23-4.44)	**3.79** (2.60-5.58)
2-hr	**0.640** (0.540-0.766)	**0.815** (0.687-0.977)	**1.09** (0.912-1.31)	**1.34** (1.12-1.63)	**1.76** (1.42-2.21)	**2.14** (1.68-2.75)	**2.59** (1.99-3.42)	**3.14** (2.33-4.26)	**4.02** (2.86-5.71)	**4.84** (3.32-7.13)
3-hr	**0.754** (0.636-0.903)	**0.960** (0.809-1.15)	**1.28** (1.07-1.54)	**1.58** (1.31-1.91)	**2.06** (1.66-2.59)	**2.50** (1.96-3.21)	**3.01** (2.31-3.97)	**3.62** (2.69-4.92)	**4.61** (3.28-6.55)	**5.52** (3.79-8.14)
6-hr	**1.01** (0.854-1.21)	**1.30** (1.09-1.56)	**1.73** (1.46-2.08)	**2.13** (1.78-2.59)	**2.77** (2.22-3.48)	**3.33** (2.62-4.28)	**3.98** (3.05-5.25)	**4.74** (3.52-6.44)	**5.93** (4.22-8.43)	**7.01** (4.81-10.3)
12-hr	**1.34** (1.13-1.60)	**1.76** (1.48-2.11)	**2.37** (1.99-2.85)	**2.92** (2.43-3.54)	**3.75** (3.02-4.72)	**4.47** (3.51-5.74)	**5.27** (4.04-6.95)	**6.17** (4.59-8.39)	**7.55** (5.37-10.7)	**8.73** (5.99-12.9)
24-hr	**1.81** (1.60-2.10)	**2.44** (2.15-2.83)	**3.34** (2.93-3.88)	**4.12** (3.59-4.83)	**5.28** (4.46-6.38)	**6.25** (5.18-7.69)	**7.31** (5.92-9.20)	**8.48** (6.70-10.9)	**10.2** (7.76-13.7)	**11.7** (8.59-16.2)
2-day	**2.31** (2.03-2.67)	**3.14** (2.77-3.65)	**4.34** (3.81-5.05)	**5.40** (4.71-6.33)	**6.98** (5.90-8.43)	**8.31** (6.89-10.2)	**9.77** (7.92-12.3)	**11.4** (9.00-14.7)	**13.8** (10.5-18.5)	**15.9** (11.7-22.0)
3-day	**2.57** (2.26-2.97)	**3.51** (3.09-4.07)	**4.87** (4.28-5.67)	**6.09** (5.31-7.13)	**7.92** (6.69-9.56)	**9.48** (7.86-11.7)	**11.2** (9.08-14.1)	**13.1** (10.4-17.0)	**16.0** (12.2-21.5)	**18.5** (13.6-25.6)
4-day	**2.77** (2.44-3.21)	**3.79** (3.34-4.40)	**5.27** (4.63-6.13)	**6.60** (5.75-7.73)	**8.60** (7.27-10.4)	**10.3** (8.55-12.7)	**12.2** (9.90-15.4)	**14.4** (11.3-18.5)	**17.6** (13.4-23.6)	**20.3** (15.0-28.2)
7-day	**3.24** (2.86-3.76)	**4.41** (3.88-5.11)	**6.10** (5.36-7.10)	**7.63** (6.65-8.94)	**9.94** (8.40-12.0)	**11.9** (9.88-14.7)	**14.1** (11.5-17.8)	**16.6** (13.1-21.5)	**20.4** (15.5-27.4)	**23.7** (17.4-32.8)
10-day	**3.58** (3.16-4.15)	**4.85** (4.26-5.62)	**6.69** (5.87-7.77)	**8.34** (7.26-9.77)	**10.8** (9.16-13.1)	**13.0** (10.8-16.0)	**15.4** (12.5-19.4)	**18.1** (14.3-23.4)	**22.3** (16.9-29.9)	**25.9** (19.1-35.9)
20-day	**4.34** (3.83-5.03)	**5.83** (5.13-6.76)	**7.98** (7.01-9.28)	**9.92** (8.64-11.6)	**12.8** (10.9-15.5)	**15.4** (12.7-18.9)	**18.2** (14.7-22.9)	**21.4** (16.9-27.6)	**26.2** (19.9-35.2)	**30.5** (22.4-42.2)
30-day	**5.24** (4.62-6.07)	**7.01** (6.17-8.13)	**9.56** (8.39-11.1)	**11.8** (10.3-13.9)	**15.3** (12.9-18.5)	**18.2** (15.1-22.4)	**21.5** (17.5-27.1)	**25.3** (20.0-32.6)	**30.9** (23.5-41.5)	**35.8** (26.4-49.7)
45-day	**6.28** (5.53-7.27)	**8.35** (7.35-9.68)	**11.3** (9.95-13.2)	**14.0** (12.2-16.4)	**18.0** (15.2-21.7)	**21.4** (17.7-26.3)	**25.2** (20.4-31.7)	**29.4** (23.3-38.0)	**35.9** (27.3-48.1)	**41.5** (30.5-57.4)
60-day	**7.30** (6.43-8.46)	**9.68** (8.52-11.2)	**13.1** (11.5-15.2)	**16.1** (14.0-18.9)	**20.6** (17.4-24.9)	**24.4** (20.3-30.1)	**28.7** (23.2-36.1)	**33.4** (26.4-43.2)	**40.6** (30.9-54.5)	**46.8** (34.5-64.8)

[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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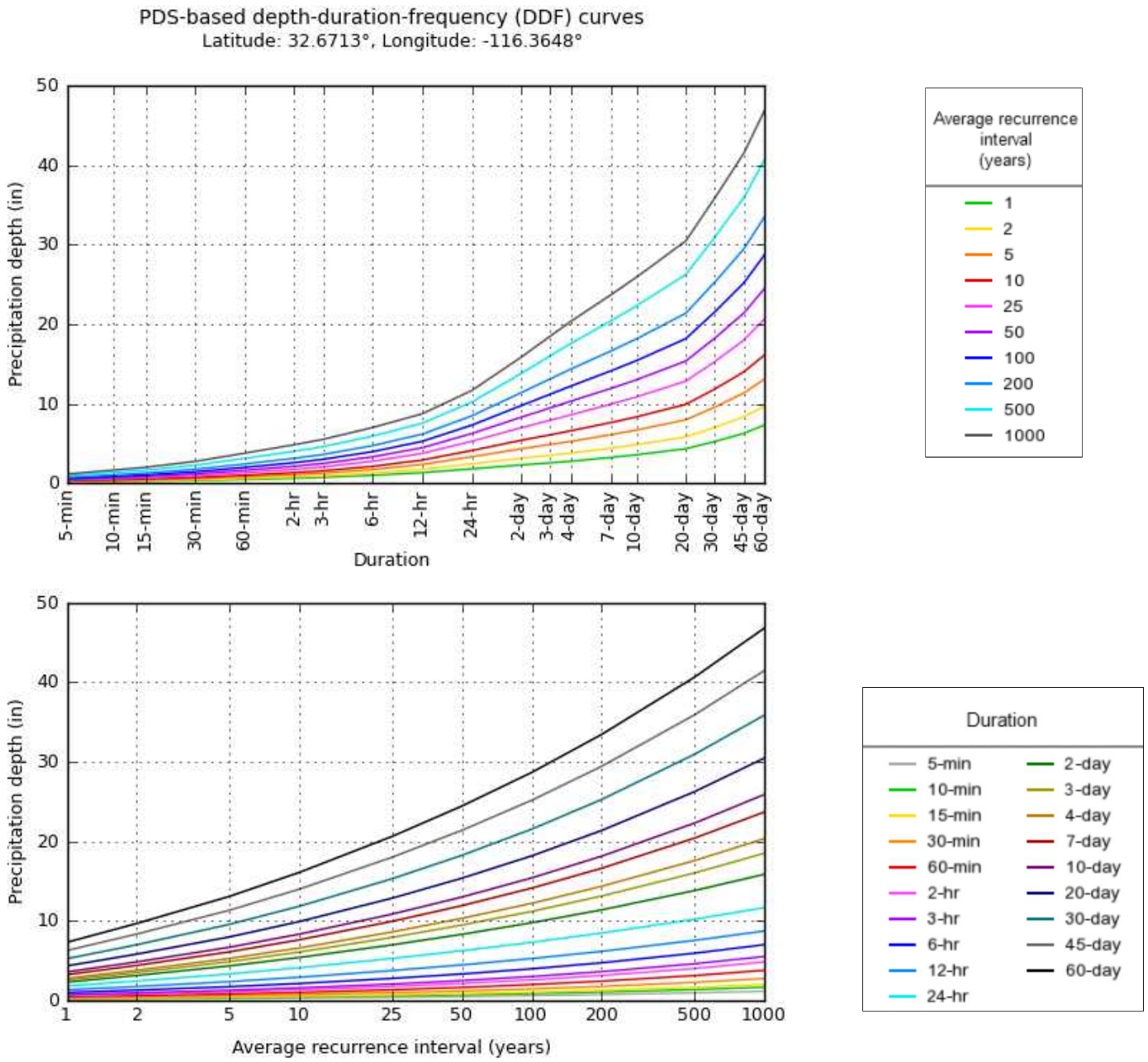
PF graphical



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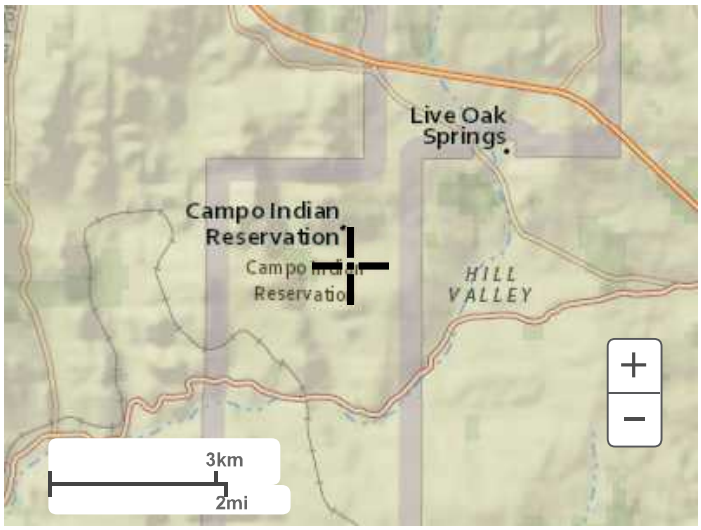
Maps & aerials

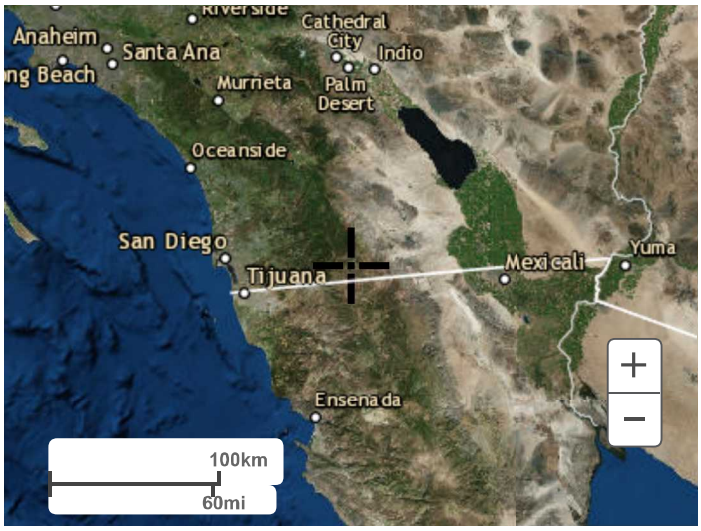
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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Disclaimer

Appendix B

Curve Number Table

Table 2. Semi-Arid Curve Numbers (adapted from NEH 630)

Class	Value	Classification Description	Curve Number				
			Soil Type*				
			A	B	C	D	W
Water	11	Open Water - areas of open water, generally with less than 25% cover of vegetation or soil.	98	98	98	98	100
	12	Perennial Ice/Snow - areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.	98	98	98	98	100
Developed	21	Developed, Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	46	65	77	82	100
	22	Developed, Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.	61	75	83	87	100
	23	Developed, Medium Intensity – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.	77	85	90	95	100
	24	Developed High Intensity -highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.	89	92	94	95	100
Barren	31	Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.	77	86	91	94	100
Forest	41	Deciduous Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.	43	55	70	77	100
	42	Evergreen Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.	43	55	70	77	100
	43	Mixed Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.	43	55	70	77	100
Shrubland	51	Dwarf Scrub - Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.	55	71	81	89	100
	52	Shrub/Scrub - areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.	55	71	81	89	100
Herbaceous	71	Grassland/Herbaceous - areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.	55	71	81	89	100
	72	Sedge/Herbaceous - Alaska only areas dominated by sedges and forbs, generally greater than 80% of total vegetation. This type can occur with significant other grasses or other grass like plants, and includes sedge tundra, and sedge tussock tundra.	55	71	81	89	100
	73	Lichens - Alaska only areas dominated by fruticose or foliose lichens generally greater than 80% of total vegetation.	55	71	81	89	100
	74	Moss - Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.	55	71	81	89	100
Planted/Cultivated	81	Pasture/Hay – areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.	55	71	81	89	100
	82	Cultivated Crops – areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.	67	78	85	89	100
	83	Small Grains	63	75	83	87	100
Wetlands	91	Woody Wetlands - areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100
	92	Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100

*A/D, B/D and C/D soils lumped as D soils, W denotes water

**Curve Numbers for NLCD Codes 41-43 have been increased from 30 to 43 as many of these areas are partially grazed Woods-grass combination.

Appendix C

Culverts and Crossings

Crossing ID	Type of Crossing	Proposed Culvert Size
B1	CULVERT	3-30"
B2	PAVED LWC	
B3	PAVED LWC	
B4	PAVED LWC	
B5	PAVED LWC	
B6	CULVERT	1-18"
B7	CULVERT	1-36"
B9	PAVED LWC	
B10	CULVERT	1-24"
B11	PAVED LWC	1-18"
B12	CULVERT	1-24"
B13	CULVERT	1-36"
B14	CULVERT	1-18"
B15	CULVERT	1-18"
B16	CULVERT	1-18"
B17	CULVERT	1-18"
B18	CULVERT	1-18"
B19	CULVERT	1-18"
B20	CULVERT	1-18"
B21	CULVERT	2-24"
B22	CULVERT	1-18"
B23	CULVERT	1-24"
B24	CULVERT	1-18"
B25	CULVERT	1-18"
B26	CULVERT	1-18"
B27	CULVERT	1-30"
B28	CULVERT	1-18"
B29	CULVERT	1-18"
B30	CULVERT	1-18"
B31	CULVERT	1-18"
B32	CULVERT	1-18"
B33	LWC - STANDARD DUTY	
B34	CULVERT & PAVED CROSSING	2-48"
B35	CULVERT	1-30"
B36	LWC - STANDARD DUTY	
B38	LWC - HEAVY DUTY	
B39	CULVERT	1-24"
B41	CULVERT	1-24"
B42	CULVERT	1-24"
B44	LWC - STANDARD DUTY	
B46	CULVERT	2-18"
B47	LWC-STANDARD DUTY	

Culvert Design Report
B1

Peak Discharge Method: User-Specified			
Design Discharge	57.80 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-42 inch Circular	57.80 cfs	104.33 ft	8.29 ft/s
	Trial-2	2-36 inch Circular	57.80 cfs	103.02 ft	6.80 ft/s
	Trial-3	3-30 inch Circular	57.80 cfs	102.63 ft	6.32 ft/s

Culvert Design Report
B1

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	104.33	ft	Discharge	57.80	cfs
Headwater Depth/Height	1.24		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	104.13	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	104.33	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	2.38	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	2.38	ft
Velocity Downstream	8.29	ft/s	Critical Slope	0.017305	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	3.50	ft
Section Size	42 inch		Rise	3.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	104.33	ft	Upstream Velocity Head	0.63	ft
Ke	0.90		Entrance Loss	0.56	ft

Inlet Control Properties					
Inlet Control HW Elev.	104.13	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	9.6	ft^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B1

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	103.02	ft	Discharge	57.80	cfs
Headwater Depth/Height	1.01		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.82	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	103.02	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.74	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.74	ft
Velocity Downstream	6.80	ft/s	Critical Slope	0.015742	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	103.02	ft	Upstream Velocity Head	0.39	ft
Ke	0.90		Entrance Loss	0.35	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.82	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	14.1	ft^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B1

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.63	ft	Discharge	57.80	cfs
Headwater Depth/Height	1.05		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.44	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.63	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.49	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.49	ft
Velocity Downstream	6.32	ft/s	Critical Slope	0.017048	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	102.63	ft	Upstream Velocity Head	0.32	ft
Ke	0.90		Entrance Loss	0.29	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.44	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	14.7	ft^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B10

Peak Discharge Method: User-Specified			
Design Discharge	13.09 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-24 inch Circular	13.09 cfs	102.43 ft	6.04 ft/s
	Trial-2	2-18 inch Circular	13.09 cfs	102.02 ft	5.29 ft/s

Culvert Design Report
B10

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.43	ft	Discharge	13.09	cfs
Headwater Depth/Height	1.22		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.21	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.43	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.30	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.30	ft
Velocity Downstream	6.04	ft/s	Critical Slope	0.019850	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.43	ft	Upstream Velocity Head	0.28	ft
Ke	0.90		Entrance Loss	0.25	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.21	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B10

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.02	ft	Discharge	13.09	cfs
Headwater Depth/Height	1.35		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.69	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.02	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.99	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.99	ft
Velocity Downstream	5.29	ft/s	Critical Slope	0.022178	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.02	ft	Upstream Velocity Head	0.21	ft
Ke	0.90		Entrance Loss	0.19	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.69	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.5	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B12

Peak Discharge Method: User-Specified			
Design Discharge	14.38 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-24 inch Circular	14.38 cfs	102.69 ft	6.29 ft/s
	Trial-2	2-18 inch Circular	14.38 cfs	102.27 ft	5.51 ft/s

Culvert Design Report
B12

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.69	ft	Discharge	14.38	cfs
Headwater Depth/Height	1.35		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.37	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.69	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.37	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.37	ft
Velocity Downstream	6.29	ft/s	Critical Slope	0.020967	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.69	ft	Upstream Velocity Head	0.33	ft
Ke	0.90		Entrance Loss	0.29	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.37	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B12

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.27	ft	Discharge	14.38	cfs
Headwater Depth/Height	1.52		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.82	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.27	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.04	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.04	ft
Velocity Downstream	5.51	ft/s	Critical Slope	0.023456	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.27	ft	Upstream Velocity Head	0.26	ft
Ke	0.90		Entrance Loss	0.23	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.82	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.5	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B13

Peak Discharge Method: User-Specified			
Design Discharge	27.26 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-36 inch Circular	27.26 cfs	102.91 ft	6.66 ft/s
	Trial-2	2-24 inch Circular	27.26 cfs	102.53 ft	6.15 ft/s
	Trial-3	4-18 inch Circular	27.26 cfs	102.12 ft	5.38 ft/s

Culvert Design Report
B13

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.91	ft	Discharge	27.26	cfs
Headwater Depth/Height	0.97		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.71	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.91	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.69	ft
Slope Type	Mild		Normal Depth	2.71	ft
Flow Regime	Subcritical		Critical Depth	1.69	ft
Velocity Downstream	6.66	ft/s	Critical Slope	0.015434	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.91	ft	Upstream Velocity Head	0.37	ft
Ke	0.90		Entrance Loss	0.34	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.71	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	7.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B13

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.53	ft	Discharge	27.26	cfs
Headwater Depth/Height	1.26		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.28	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.53	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.33	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.33	ft
Velocity Downstream	6.15	ft/s	Critical Slope	0.020312	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.53	ft	Upstream Velocity Head	0.29	ft
Ke	0.90		Entrance Loss	0.27	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.28	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	6.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B13

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.12	ft	Discharge	27.26	cfs
Headwater Depth/Height	1.42		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.74	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.12	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.01	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.01	ft
Velocity Downstream	5.38	ft/s	Critical Slope	0.022688	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev.	102.12	ft	Upstream Velocity Head	0.23	ft
Ke	0.90		Entrance Loss	0.21	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.74	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	7.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B14

Peak Discharge Method: User-Specified			
Design Discharge	0.15 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	0.15 cfs	100.23 ft	1.76 ft/s

Culvert Design Report
B14

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.23	ft	Discharge	0.15	cfs
Headwater Depth/Height	0.16		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.19	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.23	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.14	ft
Slope Type	Mild		Normal Depth	0.20	ft
Flow Regime	Subcritical		Critical Depth	0.14	ft
Velocity Downstream	1.76	ft/s	Critical Slope	0.019924	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.23	ft	Upstream Velocity Head	0.02	ft
Ke	0.90		Entrance Loss	0.02	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.19	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B15

Peak Discharge Method: User-Specified			
Design Discharge	0.50 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	0.50 cfs	100.43 ft	2.42 ft/s

Culvert Design Report
B15

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.43	ft	Discharge	0.50	cfs
Headwater Depth/Height	0.29		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.35	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.43	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.26	ft
Slope Type	Mild		Normal Depth	0.36	ft
Flow Regime	Subcritical		Critical Depth	0.26	ft
Velocity Downstream	2.42	ft/s	Critical Slope	0.017518	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.43	ft	Upstream Velocity Head	0.04	ft
Ke	0.90		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.35	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B16

Peak Discharge Method: User-Specified			
Design Discharge	0.15 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	0.15 cfs	100.23 ft	1.76 ft/s

Culvert Design Report
B16

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.23	ft	Discharge	0.15	cfs
Headwater Depth/Height	0.16		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.19	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.23	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.14	ft
Slope Type	Mild		Normal Depth	0.20	ft
Flow Regime	Subcritical		Critical Depth	0.14	ft
Velocity Downstream	1.76	ft/s	Critical Slope	0.019924	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.23	ft	Upstream Velocity Head	0.02	ft
Ke	0.90		Entrance Loss	0.02	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.19	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B17

Peak Discharge Method: User-Specified			
Design Discharge	0.49 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	0.49 cfs	100.42 ft	2.40 ft/s

Culvert Design Report
B17

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.42	ft	Discharge	0.49	cfs
Headwater Depth/Height	0.28		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.35	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.42	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.26	ft
Slope Type	Mild		Normal Depth	0.35	ft
Flow Regime	Subcritical		Critical Depth	0.26	ft
Velocity Downstream	2.40	ft/s	Critical Slope	0.017542	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.42	ft	Upstream Velocity Head	0.04	ft
Ke	0.90		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.35	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B18

Peak Discharge Method: User-Specified			
Design Discharge	0.21 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	0.21 cfs	100.28 ft	1.93 ft/s

Culvert Design Report
B18

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.28	ft	Discharge	0.21	cfs
Headwater Depth/Height	0.18		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.22	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.28	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.17	ft
Slope Type	Mild		Normal Depth	0.23	ft
Flow Regime	Subcritical		Critical Depth	0.17	ft
Velocity Downstream	1.93	ft/s	Critical Slope	0.019187	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.28	ft	Upstream Velocity Head	0.02	ft
Ke	0.90		Entrance Loss	0.02	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.22	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B19

Peak Discharge Method: User-Specified			
Design Discharge	3.31 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	3.31 cfs	101.20 ft	4.14 ft/s

Culvert Design Report
B19

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.20	ft	Discharge	3.31	cfs
Headwater Depth/Height	0.80		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.05	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.20	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.69	ft
Slope Type	Mild		Normal Depth	1.04	ft
Flow Regime	Subcritical		Critical Depth	0.69	ft
Velocity Downstream	4.14	ft/s	Critical Slope	0.017749	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.20	ft	Upstream Velocity Head	0.11	ft
Ke	0.90		Entrance Loss	0.10	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.05	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B20

Peak Discharge Method: User-Specified			
Design Discharge	0.29 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	0.29 cfs	100.32 ft	2.09 ft/s

Culvert Design Report
B20

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.32	ft	Discharge	0.29	cfs
Headwater Depth/Height	0.22		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.27	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.32	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.20	ft
Slope Type	Mild		Normal Depth	0.27	ft
Flow Regime	Subcritical		Critical Depth	0.20	ft
Velocity Downstream	2.09	ft/s	Critical Slope	0.018495	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.32	ft	Upstream Velocity Head	0.03	ft
Ke	0.90		Entrance Loss	0.02	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.27	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B21

Peak Discharge Method: User-Specified			
Design Discharge	23.09 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-30 inch Circular	23.09 cfs	102.99 ft	6.78 ft/s
	Trial-2	2-24 inch Circular	23.09 cfs	102.21 ft	5.75 ft/s
	Trial-3	3-18 inch Circular	23.09 cfs	102.49 ft	5.68 ft/s

Culvert Design Report
B21

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.99	ft	Discharge	23.09	cfs
Headwater Depth/Height	1.20		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.78	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.99	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.64	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.64	ft
Velocity Downstream	6.78	ft/s	Critical Slope	0.018526	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.99	ft	Upstream Velocity Head	0.38	ft
Ke	0.90		Entrance Loss	0.34	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.78	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	4.9	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B21

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.21	ft	Discharge	23.09	cfs
Headwater Depth/Height	1.10		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.01	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.21	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.22	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.22	ft
Velocity Downstream	5.75	ft/s	Critical Slope	0.018712	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.21	ft	Upstream Velocity Head	0.25	ft
Ke	0.90		Entrance Loss	0.22	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.01	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	6.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B21

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.49	ft	Discharge	23.09	cfs
Headwater Depth/Height	1.66		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.92	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.49	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.07	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.07	ft
Velocity Downstream	5.68	ft/s	Critical Slope	0.024583	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	102.49	ft	Upstream Velocity Head	0.29	ft
Ke	0.90		Entrance Loss	0.27	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.92	ft	Flow Control	Transition	
Inlet Type	Projecting		Area Full	5.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B22

Peak Discharge Method: User-Specified			
Design Discharge	0.51 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	0.51 cfs	100.43 ft	2.43 ft/s

Culvert Design Report
B22

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.43	ft	Discharge	0.51	cfs
Headwater Depth/Height	0.29		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.36	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.43	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.26	ft
Slope Type	Mild		Normal Depth	0.36	ft
Flow Regime	Subcritical		Critical Depth	0.26	ft
Velocity Downstream	2.43	ft/s	Critical Slope	0.017495	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.43	ft	Upstream Velocity Head	0.04	ft
Ke	0.90		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.36	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B23

Peak Discharge Method: User-Specified			
Design Discharge	15.78 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-24 inch Circular	15.78 cfs	103.01 ft	6.55 ft/s
	Trial-2	3-18 inch Circular	15.78 cfs	101.62 ft	4.86 ft/s

Culvert Design Report
B23

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	103.01	ft	Discharge	15.78	cfs
Headwater Depth/Height	1.50		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.55	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	103.01	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.43	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.43	ft
Velocity Downstream	6.55	ft/s	Critical Slope	0.022312	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	103.01	ft	Upstream Velocity Head	0.39	ft
Ke	0.90		Entrance Loss	0.35	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.55	ft	Flow Control	Transition	
Inlet Type	Projecting		Area Full	3.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B23

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.62	ft	Discharge	15.78	cfs
Headwater Depth/Height	1.08		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.44	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.62	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.88	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.88	ft
Velocity Downstream	4.86	ft/s	Critical Slope	0.020065	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	101.62	ft	Upstream Velocity Head	0.16	ft
Ke	0.90		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.44	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	5.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B24

Peak Discharge Method: User-Specified			
Design Discharge	2.28 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	2.28 cfs	100.96 ft	3.69 ft/s

Culvert Design Report
B24

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.96	ft	Discharge	2.28	cfs
Headwater Depth/Height	0.64		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.83	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.96	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.57	ft
Slope Type	Mild		Normal Depth	0.81	ft
Flow Regime	Subcritical		Critical Depth	0.57	ft
Velocity Downstream	3.69	ft/s	Critical Slope	0.016989	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.96	ft	Upstream Velocity Head	0.09	ft
Ke	0.90		Entrance Loss	0.08	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.83	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B25

Peak Discharge Method: User-Specified			
Design Discharge	5.06 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	5.06 cfs	101.58 ft	4.79 ft/s

Culvert Design Report
B25

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.58	ft	Discharge	5.06	cfs
Headwater Depth/Height	1.05		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.40	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.58	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.87	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.87	ft
Velocity Downstream	4.79	ft/s	Critical Slope	0.019774	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.58	ft	Upstream Velocity Head	0.15	ft
Ke	0.90		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.40	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B26

Peak Discharge Method: User-Specified			
Design Discharge	5.29 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	5.29 cfs	101.63 ft	4.87 ft/s

Culvert Design Report
B26

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	N/A ft	Storm Event	Design
Computed Headwater Elevation	101.63 ft	Discharge	5.29 cfs
Headwater Depth/Height	1.09	Tailwater Elevation	N/A ft
Inlet Control HW Elev.	101.45 ft	Control Type	Outlet Control
Outlet Control HW Elev.	101.63 ft		

Grades			
Upstream Invert	100.00 ft	Downstream Invert	99.75 ft
Length	50.00 ft	Constructed Slope	0.005000 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.89 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	0.89 ft
Velocity Downstream	4.87 ft/s	Critical Slope	0.020103 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.50 ft
Section Size	18 inch	Rise	1.50 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	101.63 ft	Upstream Velocity Head	0.16 ft
Ke	0.90	Entrance Loss	0.14 ft

Inlet Control Properties			
Inlet Control HW Elev.	101.45 ft	Flow Control	Unsubmerged
Inlet Type	Projecting	Area Full	1.8 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
B27

Peak Discharge Method: User-Specified			
Design Discharge	20.36 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-30 inch Circular	20.36 cfs	102.73 ft	6.45 ft/s
	Trial-2	2-24 inch Circular	20.36 cfs	102.02 ft	5.49 ft/s
	Trial-3	4-18 inch Circular	20.36 cfs	101.58 ft	4.80 ft/s

Culvert Design Report
B27

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.73	ft	Discharge	20.36	cfs
Headwater Depth/Height	1.09		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.53	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.73	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.53	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.53	ft
Velocity Downstream	6.45	ft/s	Critical Slope	0.017435	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.73	ft	Upstream Velocity Head	0.33	ft
Ke	0.90		Entrance Loss	0.30	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.53	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	4.9	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B27

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.02	ft	Discharge	20.36	cfs
Headwater Depth/Height	1.01		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.84	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.02	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.14	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.14	ft
Velocity Downstream	5.49	ft/s	Critical Slope	0.017832	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.02	ft	Upstream Velocity Head	0.22	ft
Ke	0.90		Entrance Loss	0.20	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.84	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	6.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B27

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.58	ft	Discharge	20.36	cfs
Headwater Depth/Height	1.06		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.41	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.58	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.87	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.87	ft
Velocity Downstream	4.80	ft/s	Critical Slope	0.019809	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev.	101.58	ft	Upstream Velocity Head	0.15	ft
Ke	0.90		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.41	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	7.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B28

Peak Discharge Method: User-Specified			
Design Discharge	3.50 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	3.50 cfs	101.24 ft	4.22 ft/s

Culvert Design Report
B28

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.24	ft	Discharge	3.50	cfs
Headwater Depth/Height	0.82		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.09	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.24	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.71	ft
Slope Type	Mild		Normal Depth	1.08	ft
Flow Regime	Subcritical		Critical Depth	0.71	ft
Velocity Downstream	4.22	ft/s	Critical Slope	0.017931	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.24	ft	Upstream Velocity Head	0.12	ft
Ke	0.90		Entrance Loss	0.11	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.09	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B29

Peak Discharge Method: User-Specified			
Design Discharge	0.47 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	0.47 cfs	100.41 ft	2.38 ft/s

Culvert Design Report
B29

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.41	ft	Discharge	0.47	cfs
Headwater Depth/Height	0.28		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.34	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.41	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.25	ft
Slope Type	Mild		Normal Depth	0.35	ft
Flow Regime	Subcritical		Critical Depth	0.25	ft
Velocity Downstream	2.38	ft/s	Critical Slope	0.017592	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.41	ft	Upstream Velocity Head	0.04	ft
Ke	0.90		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.34	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B30

Peak Discharge Method: User-Specified			
Design Discharge	0.45 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	0.45 cfs	100.41 ft	2.35 ft/s

Culvert Design Report
B30

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.41	ft	Discharge	0.45	cfs
Headwater Depth/Height	0.27		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.34	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.41	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.25	ft
Slope Type	Mild		Normal Depth	0.34	ft
Flow Regime	Subcritical		Critical Depth	0.25	ft
Velocity Downstream	2.35	ft/s	Critical Slope	0.017643	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.41	ft	Upstream Velocity Head	0.04	ft
Ke	0.90		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.34	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B31

Peak Discharge Method: User-Specified			
Design Discharge	7.54 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	7.54 cfs	102.42 ft	5.63 ft/s

Culvert Design Report
B31

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.42	ft	Discharge	7.54	cfs
Headwater Depth/Height	1.61		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.88	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.42	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.06	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.06	ft
Velocity Downstream	5.63	ft/s	Critical Slope	0.024219	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.42	ft	Upstream Velocity Head	0.28	ft
Ke	0.90		Entrance Loss	0.25	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.88	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B32

Peak Discharge Method: User-Specified			
Design Discharge	6.17 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	6.17 cfs	101.88 ft	5.17 ft/s

Culvert Design Report
B32

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.88	ft	Discharge	6.17	cfs
Headwater Depth/Height	1.25		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.62	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.88	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.96	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.96	ft
Velocity Downstream	5.17	ft/s	Critical Slope	0.021506	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.88	ft	Upstream Velocity Head	0.19	ft
Ke	0.90		Entrance Loss	0.17	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.62	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B35

Peak Discharge Method: User-Specified			
Design Discharge	16.04 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-30 inch Circular	16.04 cfs	102.33 ft	5.92 ft/s
	Trial-2	2-24 inch Circular	16.04 cfs	101.73 ft	5.05 ft/s
	Trial-3	3-18 inch Circular	16.04 cfs	101.64 ft	4.89 ft/s

Culvert Design Report
B35

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.33	ft	Discharge	16.04	cfs
Headwater Depth/Height	0.93		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.14	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.33	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.35	ft
Slope Type	Mild		Normal Depth	2.10	ft
Flow Regime	Subcritical		Critical Depth	1.35	ft
Velocity Downstream	5.92	ft/s	Critical Slope	0.016027	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	102.33	ft	Upstream Velocity Head	0.28	ft
Ke	0.90		Entrance Loss	0.25	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.14	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	4.9	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B35

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.73	ft	Discharge	16.04	cfs
Headwater Depth/Height	0.87		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.56	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.73	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.01	ft
Slope Type	Mild		Normal Depth	1.52	ft
Flow Regime	Subcritical		Critical Depth	1.01	ft
Velocity Downstream	5.05	ft/s	Critical Slope	0.016671	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	101.73	ft	Upstream Velocity Head	0.19	ft
Ke	0.90		Entrance Loss	0.17	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.56	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	6.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B35

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.64	ft	Discharge	16.04	cfs
Headwater Depth/Height	1.10		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.46	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.64	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.89	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.89	ft
Velocity Downstream	4.89	ft/s	Critical Slope	0.020182	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	101.64	ft	Upstream Velocity Head	0.16	ft
Ke	0.90		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.46	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	5.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B46

Peak Discharge Method: User-Specified			
Design Discharge	9.25 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-24 inch Circular	9.25 cfs	101.90 ft	5.31 ft/s
	Trial-2	2-18 inch Circular	9.25 cfs	101.48 ft	4.64 ft/s

Culvert Design Report
B46

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.90	ft	Discharge	9.25	cfs
Headwater Depth/Height	0.95		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.72	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.90	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.09	ft
Slope Type	Mild		Normal Depth	1.81	ft
Flow Regime	Subcritical		Critical Depth	1.09	ft
Velocity Downstream	5.31	ft/s	Critical Slope	0.017302	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.90	ft	Upstream Velocity Head	0.21	ft
Ke	0.90		Entrance Loss	0.19	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.72	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B46

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.48	ft	Discharge	9.25	cfs
Headwater Depth/Height	0.99		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.32	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.48	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.83	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.83	ft
Velocity Downstream	4.64	ft/s	Critical Slope	0.019187	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	101.48	ft	Upstream Velocity Head	0.14	ft
Ke	0.90		Entrance Loss	0.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.32	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	3.5	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B46

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	101.50	ft	Discharge	4.69	cfs
Headwater Depth/Height	1.00		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.33	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	101.50	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.83	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	0.83	ft
Velocity Downstream	4.66	ft/s	Critical Slope	0.019276	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	101.50	ft	Upstream Velocity Head	0.14	ft
Ke	0.90		Entrance Loss	0.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.33	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B6

Peak Discharge Method: User-Specified			
Design Discharge	0.78 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	0.78 cfs	100.54 ft	2.72 ft/s

Culvert Design Report
B6

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	100.54	ft	Discharge	0.78	cfs
Headwater Depth/Height	0.36		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	100.45	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	100.54	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.33	ft
Slope Type	Mild		Normal Depth	0.45	ft
Flow Regime	Subcritical		Critical Depth	0.33	ft
Velocity Downstream	2.72	ft/s	Critical Slope	0.016980	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	100.54	ft	Upstream Velocity Head	0.05	ft
Ke	0.90		Entrance Loss	0.04	ft

Inlet Control Properties					
Inlet Control HW Elev.	100.45	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.8	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B7

Peak Discharge Method: User-Specified			
Design Discharge	28.91 cfs	Check Discharge	0.00 cfs

Grades Model: Inverts			
Invert Upstream	100.00 ft	Invert Downstream	99.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-36 inch Circular	28.91 cfs	103.03 ft	6.80 ft/s
	Trial-2	2-24 inch Circular	28.91 cfs	102.71 ft	6.30 ft/s
	Trial-3	4-18 inch Circular	28.91 cfs	102.29 ft	5.52 ft/s

Culvert Design Report
B7

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	103.03	ft	Discharge	28.91	cfs
Headwater Depth/Height	1.01		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.82	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	103.03	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.74	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.74	ft
Velocity Downstream	6.80	ft/s	Critical Slope	0.015737	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	103.03	ft	Upstream Velocity Head	0.39	ft
Ke	0.90		Entrance Loss	0.35	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.82	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	7.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B7

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.71	ft	Discharge	28.91	cfs
Headwater Depth/Height	1.35		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	102.38	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.71	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.37	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.37	ft
Velocity Downstream	6.30	ft/s	Critical Slope	0.021031	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	102.71	ft	Upstream Velocity Head	0.33	ft
Ke	0.90		Entrance Loss	0.30	ft

Inlet Control Properties					
Inlet Control HW Elev.	102.38	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	6.3	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
B7

Design:Trial-3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	ft	Storm Event	Design	
Computed Headwater Elevation	102.29	ft	Discharge	28.91	cfs
Headwater Depth/Height	1.53		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	101.82	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	102.29	ft			

Grades					
Upstream Invert	100.00	ft	Downstream Invert	99.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.04	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.04	ft
Velocity Downstream	5.52	ft/s	Critical Slope	0.023527	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev.	102.29	ft	Upstream Velocity Head	0.26	ft
Ke	0.90		Entrance Loss	0.23	ft

Inlet Control Properties					
Inlet Control HW Elev.	101.82	ft	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	7.1	ft²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Appendix D

Standard SWQMP and Intake Form

County of San Diego
Standard Project SWQMP

This Standard Project Stormwater Quality Management Plan (SWQMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with Standard development projects. To determine whether your project is required to submit a Standard Project SWQMP or Priority Development Project (PDP) SWQMP, please reference the County's "Storm Water Intake Form for All Permit Applications."

Step A: Project identification

Applicant name:	Applicant phone:	Applicant email:
Boulder Brush, LLC	858-764-3740	kwagner@terra-gen.com

Record ID: PDS2019-MUP-19-002 Boulder Brush Facilities MUP	Assessor's Parcel Number(s): See Attached
Project address: Ribbonwood Road, Boulevard, CA 91905	
Project estimated start date: 1/1/2019	Project estimated completion date: 12/31/2019

Step B: Applicant Certification:

I have read and understand the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from construction and land development activities, as described in the BMP Design Manual.

This Standard Project SWQMP is intended to comply with the Standard Project requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100) requirements for storm water management.

I certify the BMPs selected on this form will be implemented to minimize the potentially negative impacts of this project's construction and land development activities on water quality. I further agree to install, monitor, maintain, or revise the selected BMPs to ensure their effectiveness. I also understand that non-compliance with the County's Watershed Protection Ordinance and Grading Ordinance may result in enforcement by the County, including fines, cease and desist orders, or other actions.

Signature of applicant:	Date:
	7/8/19

Step C: Construction Storm Water BMP Checklist

Minimum Required Standard Construction Storm Water BMPs

If you answer "Yes" to any of the questions below, your project is subject to Table 1 on the following page (Minimum Required Standard Construction Stormwater BMPs). As noted in Table 1, please select at least the minimum number of required BMPs, or as many as are feasible for your project. If no BMP is selected, an explanation must be given in the box provided. The following questions are intended to aid in determining construction BMP requirements for your project.

Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.

1. Will there be soil disturbing activities that will result in exposed soil areas? (This includes minor grading and trenching.) **Reference Table 1 Items A, B, D, and E** Note: Soil disturbances NOT considered significant include, but are not limited to, change in use, mechanical/electrical/plumbing activities, signs, temporary trailers, interior remodeling, and minor tenant improvement.	☑Yes	☐No
2. Will there be asphalt paving, including patching? **Reference Table 1 Items D and F**	☑Yes	☐No
3. Will there be slurries from mortar mixing, coring, or concrete saw cutting? **Reference Table 1 Items D and F**	☐Yes	☑No
4. Will there be solid wastes from concrete demolition and removal, wall construction, or form work? **Reference Table 1 Items D and F**	☐Yes	☑No
5. Will there be stockpiling (soil, compost, asphalt, concrete, solid waste) for over 24 hours? **Reference Table 1 Items D and F**	☑Yes	☐No
6. Will there be dewatering operations? **Reference Table 1 Items C and D**	☑Yes	☐No
7. Will there be temporary on-site storage of construction materials, including mortar mix, raw landscaping and soil stabilization materials, treated lumber, rebar, and plated metal fencing materials? **Reference Table 1 Items E and F**	☑Yes	☐No
8. Will trash or solid waste product be generated from this project? **Reference Table 1 Item F**	☑Yes	☐No
9. Will construction equipment be stored on site (e.g.: fuels, oils, trucks, etc.?) **Reference Table 1 Item F**	☑Yes	☐No
10. Will Portable Sanitary Services ("Porta-potty") be used on the site? **Reference Table 1 Item F**	☑Yes	☐No

Table 1 Construction Storm Water BMP Checklist (continued)			
Minimum Required Best Management Practices (BMPs)	**CALTRANS SW Handbook[1] Detail or County Std. Detail**	**✔ BMP Selected**	**Reference sheet No's where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.**
A. Select Erosion Control Method for Disturbed Slopes (choose at least one for the appropriate season)			
Vegetation Stabilization Planting[2] (Summer)	SS-2, SS-4	☐	
Hydraulic Stabilization Hydroseeding[2] (Summer)	SS-4	☑	
Bonded Fiber Matrix or Stabilized Fiber Matrix[3] (Winter)	SS-3	☑	
Physical Stabilization Erosion Control Blanket[3] (Winter)	SS-7	☑	
B. Select erosion control method for disturbed flat areas (slope < 5%) (choose at least one)			
County Standard Lot Perimeter Protection Detail	PDS 659[4], SC-2	☑	
Will use erosion control measures from Item A on flat areas also	SS-3, 4, 7	☑	
County Standard Desilting Basin (must treat all site runoff)	PDS 660[5], SC-2	☐	
Mulch, straw, wood chips, soil application	SS-6, SS-8	☐	

[1] State of California Department of Transportation (Caltrans). 2003. Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual. March. Available online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

[2] If Vegetation Stabilization (Planting or Hydroseeding) is proposed for erosion control it may be installed between May 1st and August 15th. Slope irrigation is in place and needs to be operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. The owner must implement a contingency physical BMP by August 15th if vegetation establishment does not occur by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.

[3] All slopes over three feet must have established vegetative cover prior to final permit approval.

[4] County of San Diego, Planning & Development Services. 2012. Standard Lot Perimeter Protection Design System. Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds659.pdf.

[5] County of San Diego, Planning & Development Services. 2012. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds660.pdf.

Table 1 Construction Storm Water BMP Checklist (continued)			
Minimum Required Best Management Practices (BMPs)	**CALTRANS SW Handbook Detail or County Std. Detail**	**✔ BMP Selected**	**Reference sheet No's where each selected BMP is shown on the plan If no BMP is selected, an explanation must be provided.**
C. If runoff or dewatering operation is concentrated, velocity must be controlled using an energy dissipater			
Energy Dissipater Outlet Protection[6]	SS-10	☑	
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☑	
Fiber Rolls (Straw Wattles)	SC-5	☑	
Gravel & Sand Bags	SC-6 & 8	☑	
Dewatering Filtration	NS-2	☑	
Storm Drain Inlet Protection	SC-10	☐	
Engineered Desilting Basin (sized for 10-year flow)	SC-2	☐	
E. Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☑	
Construction Road Stabilization	TC-2	☑	
Entrance/Exit Tire Wash	TC-3	☐	
Entrance/Exit Inspection & Cleaning Facility	TC-1	☑	
Street Sweeping and Vacuuming	SC-7	☐	
F. Select the general site management BMPs			
F.1 Materials Management			
Material Delivery & Storage	WM-1	☑	
Spill Prevention and Control	WM-4	☑	
F.2 Waste Management[7]			
Waste Management Concrete Waste Management	WM-8	☑	
Solid Waste Management	WM-5	☑	
Sanitary Waste Management	WM-9	☑	
Hazardous Waste Management	WM-6	☑	

Note: The Construction General Permit (Order No. 2009-0009-DWQ) also requires all projects not subject to the BMP Design Manual to comply with runoff reduction requirements through the implementation of post-construction BMPs as described in Section XIII of the order.

[6] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater is also acceptable for velocity reduction.
[7] Not all projects will have every waste identified. The applicant is responsible for identifying wastes that will be onsite and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 must be selected.

Step D: Post-Construction Source Control BMP Checklist

Source Control BMPs

All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the County BMP Design Manual for information to implement source control BMPs shown in this checklist.

Answers for each source control requirement must be pursuant to the following:

- "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the County BMP Design Manual. Discussion/justification is not required.
- "No" means the BMP is applicable to the project but not feasible to implement. Discussion/justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion/justification must be provided.

Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.

Source Control Requirement	Applied?		
4.2.1 Prevention of Illicit Discharges into the MS4	☑Yes	☐No	☐N/A
4.2.2 Storm Drain Stenciling or Signage	☐Yes	☐No	☑N/A
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑Yes	☐No	☐N/A
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑Yes	☐No	☐N/A
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑Yes	☐No	☐N/A
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☐ A. On-site storm drain inlets	☐Yes	☐No	☑N/A
☐ B. Interior floor drains and elevator shaft sump pumps	☐Yes	☐No	☑N/A
☐ C. Interior parking garages	☐Yes	☐No	☑N/A
☐ D. Need for future indoor & structural pest control	☐Yes	☐No	☑N/A
☐ E. Landscape/outdoor pesticide use	☐Yes	☐No	☑N/A
☐ F. Pools, spas, ponds, fountains, and other water features	☐Yes	☐No	☑N/A
☐ G. Food service	☐Yes	☐No	☑N/A
☐ H. Trash or Refuse areas	☑Yes	☐No	☐N/A
☐ I. Industrial processes	☐Yes	☐No	☑N/A
☐ J. Outdoor storage of equipment or materials	☑Yes	☐No	☐N/A
☐ K. Vehicle and equipment cleaning	☑Yes	☐No	☐N/A
☐ L. Vehicle/equipment repair and maintenance	☑Yes	☐No	☐N/A
☐ M. Fuel dispensing areas	☑Yes	☐No	☐N/A
☐ N. Loading docks	☐Yes	☐No	☑N/A
☐ O. Fire sprinkler test water	☐Yes	☐No	☑N/A
☐ P. Miscellaneous drain or wash water	☑Yes	☐No	☐N/A
☐ Q. Plazas, sidewalks, driveways, and parking lots	☐Yes	☐No	☑N/A

Discussion/justification for <u>all</u> "No" answers shown above:

Attach additional pages as necessary.

Step E: Post-Construction Site Design BMP Checklist

Site Design BMPs

All development projects must implement site design BMPs 4.3.1 through 4.3.8 where applicable and feasible. See Chapter 4.3 and Appendix E of the County BMP Design Manual for information to implement site design BMPs shown in this checklist.

Answers for each site design requirement must be pursuant to the following:

- "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the County BMP Design Manual. Discussion/justification is not required.
- "No" means the BMP is applicable to the project but not feasible to implement. Discussion/justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion/justification must be provided.

Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☑Yes	☐No	☐N/A
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☑Yes	☐No	☐N/A
4.3.3 Minimize Impervious Area	☑Yes	☐No	☐N/A
4.3.4 Minimize Soil Compaction	☑Yes	☐No	☐N/A
4.3.5 Impervious Area Dispersion	☑Yes	☐No	☐N/A
4.3.6 Runoff Collection	☐Yes	☐No	☑N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑Yes	☐No	☐N/A
4.3.8 Harvesting and Using Precipitation	☐Yes	☐No	☑N/A

Discussion/justification for all "No" answers shown above:

Attach additional pages as necessary.

County of San Diego
Storm Water Intake Form for All Permit Applications

This form must be completed in its entirety and accompany applications for any of the discretionary or ministerial permits and approvals referenced in Sections 67.809 and 67.811 of the County of San Diego Watershed Protection, Stormwater Management and Discharge Control Ordinance (WPO). The purpose of this form is to establish the Stormwater Quality Management Plan (SWQMP) requirements applicable to the project.

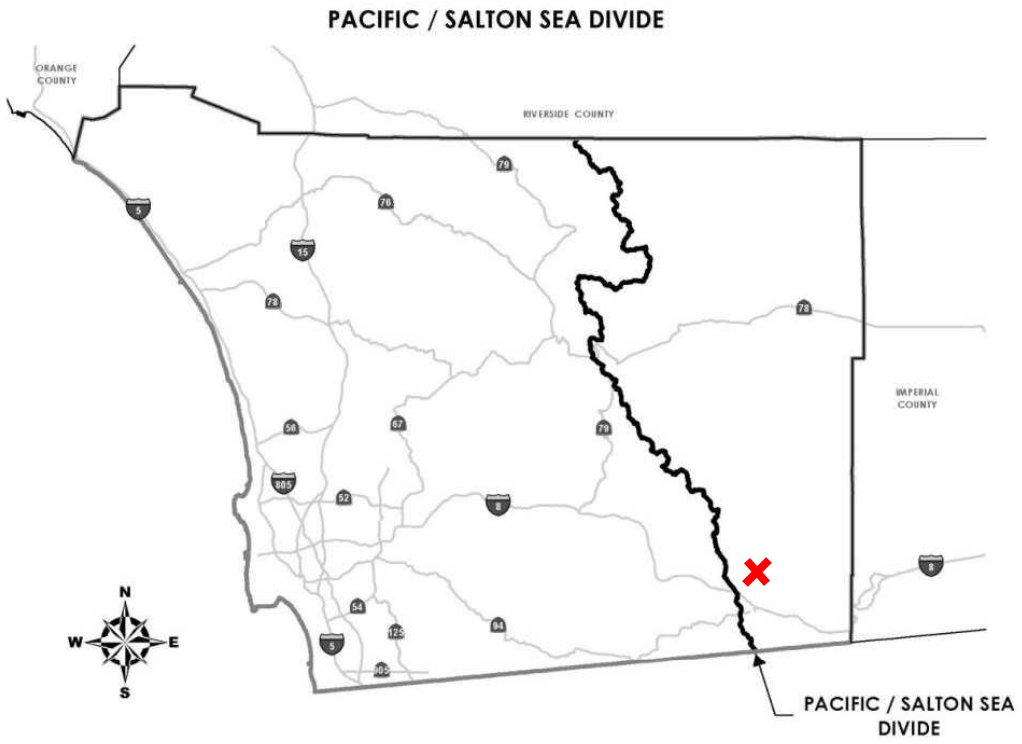
Step 1: Project identification

Applicant name: Boulder Brush, LLC	APN: See Attached List	Record ID: Boulder Brush Project MUP

Step 2: Geographic location

Step	Answer	Progression
Is the project west or east of the Pacific / Salton Sea Divide? See below for discussion and an exhibit of the Pacific / Salton Sea Divide.	☐West	**Go to Step 3.**
	☑East	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**

PDP requirements in the BMP Design Manual only pertain to projects in areas west of the Pacific/Salton Sea Divide (Region 9 of the Water Quality Control Board). Projects east of the Pacific/Salton Sea Divide are subject to Standard Project requirements in the County BMP Design Manual and, as applicable, Post-Construction Standards of the Construction General Permit.



Show with an "X" the Approximate Project Location

Step 3: Project type determination (Standard or Priority Development Project)

Is the project part of another Priority Development Project (PDP)? ☐ Yes ☑ No If so, a PDP SWQMP is required. Go to Step 4.			
The project is (select one): ☑ New Development ☐ Redevelopment[1]			
The total proposed newly created or replaced impervious area is:	900,326	____	ft^2
The total existing (pre-project) impervious area is:	1,185,800		ft^2
The total area disturbed by the project is:	5,501,799	__	ft^2
If the total area disturbed by the project is 1 acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development (e.g., a building permit within a previously approved subdivision) disturbing 1 acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: _____			
Is the project in any of the following categories, (a) through (f)?[2]			

Yes ☑	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces[3] (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☑	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☑	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

[1] Redevelopment is defined as: The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure. Replacement of impervious surfaces includes any activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways, sidewalks, pedestrian ramps, or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

[3] For solar energy farm projects, the area of the solar panels does not count toward the total impervious area of the site.

County of San Diego Storm Water Intake Form

Project type determination (continued)			
Yes ☐	No ☑	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.*
Yes ☐	No ☑	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☐	No ☑	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See BMP Design Manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?

☑ No – the project is not a Priority Development Project (Standard Project).

☐ Yes – the project is a Priority Development Project (PDP).

Further guidance may be found in Chapter 1 and Table 1-2 of the BMP Design Manual.

The following is for **redevelopment PDPs only**:

The area of existing (pre-project) impervious area at the project site is: _____ ft^2 (A)

The total proposed newly created or replaced impervious area is _____ ft^2 (B)

Percent impervious surface created or replaced (B/A)*100: _____%

The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – **only newly created or replaced impervious areas are considered a PDP and subject to stormwater requirements.**

OR

☐ greater than fifty percent (50%) – **the entire project site is considered a PDP and subject to stormwater requirements.**

County of San Diego Storm Water Intake Form

Step 4: Storm Water Quality Management Plan requirements

Step	Answer	Progression
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, complete the Project Type Determination Checklist on Pages 2 and 3 of this form, and see PDP exemption information below. For further guidance, see Section 1.4 of the BMP Design Manual *in its entirety*.	☑ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**
	☐ PDP	Standard and PDP requirements apply, including PDP SWQMP. **Complete PDP SWQMP.**
	☐ PDP Exemption	**Go to Step 5 below.**

Step 5: Exemption to PDP definitions

Is the project exempt from PDP definitions based on either of the following:	If so:
☐ Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria: (i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR (ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR (iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Guidance on Green Infrastructure;	Standard Project requirements apply, AND any additional requirements specific to the type of project. County concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.* **Complete Standard Project SWQMP.**
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the County of San Diego Guidance on Green Infrastructure.	**Complete Green Streets PDP Exempt SWQMP.**

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Step 6: Certification

Applicant Certification: I have read and understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from construction and land development activities, as described in the BMP Design Manual. I certify that this intake form has been completed to the best of my ability and accurately reflects the project being proposed. I also understand that non-compliance with the County's WPO and Grading Ordinance may result in enforcement by the County, including fines, cease and desist orders, or other actions.

Signature of Applicant:	*Date:*
	7/8/19

For County Only:
- ☐ Standard SWQMP
- ☐ PDP SWQMP
- ☐ Green Streets PDP Exempt SWQMP
- ☐ ACP SWQMP

Appendix E

County of San Diego Watershed Protection, Stormwater Management, And Discharge Control Ordinance

AN ORDINANCE TO AMEND SECTION 67.801 ET SEQ. OF THE SAN DIEGO COUNTY CODE OF REGULATORY ORDINANCES RELATING TO WATERSHED PROTECTION

The Board of Supervisors of the County of San Diego ordains as follows:

Section 1. The Board of Supervisors finds and determines that it is necessary to amend Title 6, Division 7, Chapter 8 of the San Diego County Code of Regulatory Ordinances relating to watershed protection, stormwater management and discharge control to ensure the County's ordinances enacted as part of its Jurisdictional Runoff Management Program implements California Regional Water Quality Control Board Order R9-2013-0001, NPDES No. CAS0109266, adopted by the California Regional Water Quality Control Board, San Diego Region, on May 8, 2013 as amended by Order Numbers R9-2015-0001 and R9-2015-0100.

Section 2. Amend Chapter 8 (Sections 67.801 through and including 67.821) to read as follows:

SEC. 67.801. PURPOSE AND INTENT.

(a) The purpose of this Chapter is to protect water resources and to improve water quality by controlling the stormwater conveyance system and receiving waters; to cause the use of management practices by the County and its citizens that will reduce the adverse effects of non-stormwater and polluted stormwater discharges to the stormwater conveyance system and receiving waters; to secure benefits from the use of stormwater as a resource; and to ensure the County is compliant with applicable state and federal law and California Regional Water Quality Control Board Order No. R9-2013-0001, NPDES No. CAS0109266 as amended by Order Numbers R9-2015-0001 and R9-2015-0100.

(b) The requirements of this Chapter are specifically intended to implement a Jurisdictional Runoff Management Program in accordance with California Regional Water Quality Control Board amended Order No. R9-2013-0001, NPDES No. CAS0109266. To the extent necessary to ensure compliance with this order, this Ordinance shall require the following:

(1) Prohibit non-stormwater discharges to the stormwater conveyance system and receiving waters unless otherwise authorized by this Chapter.

(2) Establish requirements to prevent and reduce pollution to water resources.

(3) Establish requirements for development project site design to prevent non-stormwater discharges to the stormwater conveyance system and reduce stormwater pollution and erosion.

(4) Establish requirements for the management of stormwater flows from development projects to prevent erosion and to protect and enhance existing water-dependent habitats.

(5) Establish standards for the use of off-site facilities, when permissible, for stormwater management to supplement on-site practices at new development sites.

(6) Establish notice procedures and standards for adjusting stormwater and non-stormwater management requirements, where necessary.

SEC. 67.802. DEFINITIONS.

Unless a different meaning is clearly intended and more protective of water quality under the circumstances, terms used in this Chapter shall have the same meaning as the same or equivalent term when defined in Attachment C of California Regional Water Quality Control Board amended Order No. R9-2013-0001, NPDES No. CAS0109266. For purposes of this Chapter subject to the foregoing limitation, the following definitions shall apply:

(a) "Authorized enforcement official" means the Director of Public Works, the Director of Planning and Development Services, the Director of Environmental Health, the Agricultural Commissioner, Department of Agriculture, Weights and Measures, or their designees.

(b) "Active/Passive Sediment Treatment" means using mechanical, electrical or chemical means to flocculate or coagulate suspended sediment for removal from runoff from construction sites prior to discharge.

(c) "Authorized non-stormwater discharge" means a discharge allowed to enter the stormwater conveyance system or receiving waters in accordance with a permit under the National Pollutant Discharge Elimination System or as specifically authorized by this Chapter.

(d) "Best management practices" (BMPs) shall have the same meaning as defined in the NPDES Order. Best management practices may include any type of pollution prevention and pollution control measure that achieves compliance with this Chapter.

(e) "Biofiltration" means practices that use vegetation and amended soils to detain and treat runoff from impervious areas. Treatment is through filtration, infiltration, adsorption, ion exchange, and biological uptake of pollutants.

(f) "BMP Design Manual" means the plan developed by the County in accordance with the NPDES Order to eliminate, reduce, or mitigate the impacts of water runoff from development projects and existing development.

(g) "Detention" means the temporary storage of storm run-off in a manner that controls peak discharge rates and provides some gravity settling of pollutants.

(h) "Detention facility" means a detention basin or alternative structure designed for the purpose of temporary storage of stream flow or surface run-off and gradual release of stored water at controlled rates.

(i) "Development project" means construction, rehabilitation, redevelopment, land disturbance activity, or reconstruction of any public improvement projects or private projects.

(j) "Discharge", when used as a verb, means to allow pollutants to directly or indirectly enter stormwater, or to allow stormwater or non-stormwater to directly or indirectly enter the stormwater conveyance system or receiving waters, from an activity or operations which one owns or

operates. When used as a noun, "discharge" means the pollutants, stormwater, or non-stormwater that are discharged.

(k) "Discharger" means any person or entity engaged in activities or operations or owning facilities, from which an allowed non-stormwater discharge to the stormwater conveyance system may or does originate or which will or may result in pollutants entering stormwater, the stormwater conveyance system, or receiving waters or the owners of real property on which such activities, operations or facilities are located, except that a local government or public authority is not a discharger as to activities conducted by others in public rights-of-way.

(l) "Environmentally sensitive area" or "ESA" means impaired water bodies, as defined by the federal Clean Water Act, Section 303(d), areas designated as Areas of Special Biological Significance or with the RARE beneficial use by the SWRCB in the Water Quality Control Plan for the San Diego Basin (1994 and amendments) and areas designated as preserves for species-protection purposes by the State of California or a local government.

(m) "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, and technological factors as determined in the sole discretion of the County. Feasibility may be limited in this Chapter to eliminate consideration of economic, environmental and other factors as, for example, where feasibility is specifically defined as technological feasibility.

(n) "Flow-thru treatment control BMPs" mean structural, engineered facilities that are designed to remove pollutants from stormwater runoff using treatment processes that do no incorporate significant biological methods. Examples include dry extended detention basins, sand filters, media filters, and vegetated swales.

(o) "Illicit connection" means any man-made conveyance or drainage system through which non-stormwater or pollutants in water, not authorized by an NPDES permit or the NPDES Order are discharged or may be discharged to the stormwater conveyance system.

(p) "Impervious surface area" means the ground area covered or sheltered by an impervious surface, measured in plan view. For example, the "impervious surface area" for a pitched roof is equal to the ground area it shelters, rather than the surface area of the roof itself.

(q) "Infiltration BMPs" mean structural measures that capture, store, and infiltrate stormwater runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Infiltration BMPs may also support evapotranspiration processes, but are characterized by having their most dominant volume losses due to infiltration. They are a type of retention BMP.

(r) "Land disturbance activity" means any activity, whether or not a stormwater quality management plan or County permit or approval is required, that moves soils or substantially alters the land such as grading, digging, cutting, scraping, stockpiling or excavating of soil; placement of fill materials; paving, pavement removal, exterior construction; substantial removal of vegetation where soils are disturbed including but not limited to removal by clearing or grubbing; clearing or road- cutting associated with geotechnical exploration and assessment, percolation testing, or any

other activity that is a condition of a permit application; or any activity which bares soil or rock or involves streambed alterations or the diversion or piping of any watercourse.

(s) "Maximum extent practicable" (MEP) shall have the same meaning as defined in the NPDES Order.

(t) "Natural drainage" means a naturally occurring drainage consisting of native soils such as a natural swale or topographic depression which gathers or conveys run-off to a permanent or intermittent watercourse or water body.

(u) "Natural System Management Practices" (NSMP) means stormwater practices implemented to restore and/or preserve predevelopment watershed functions in lieu of providing direct pollutant removal and hydromodification flow control. NSMPs may include structural or engineered elements, but these elements do not expressly provide pollutant removal. NSMPs include land restoration, land preservation and stream rehabilitation projects.

(v) "Non-Stormwater" means all discharges to and from the stormwater conveyance system that do not originate from precipitation.

(w) "NPDES Order" shall mean and refer to California Regional Water Quality Control Board, San Diego Region Order No. R9-2013-0001, NPDES No. CAS00109266, as the same may be amended, modified or replaced from time to time.

(x) "Offsite Alternative Compliance Project" means a project implemented, either as a structural BMP or a Natural System Management Practice, which provides a greater overall water quality Benefit to the watershed management area and offset stormwater pollutant control impacts and hydromodification flow control impacts associated with Priority Development Projects (PDPs). Offsite Alternative Compliance Projects (ACP) may be implemented as an applicant-implemented ACP in which the ACP is owned or constructed by the same party that is generating the PDP impact. ACPs may be either structural BMPs or stormwater management practices implemented to restore and/or preserve predevelopment watershed function of a natural system.

(y) "Pollutant" means any agent that may cause, potentially cause or contribute to the degradation of water quality such that a condition of pollution or contamination is created or aggravated.

(z) "Pollutant Control BMP" (PC-BMP) means any engineered system designed to remove pollutants from stormwater by simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption or any other physical, biological, or chemical process. They are also known as treatment control BMPs.

(aa) "Pollution prevention" means the practices and processes that reduce or eliminate the generation of pollutants such as the use of smaller quantities of toxic materials or substitution of less toxic materials; changes to production processes to reduce waste; decreases in waste water flows; recycling of wastes as part of the production process; segregation of wastes, and treatment of wastes on site to decrease volume or toxicity.

(bb) "Priority Development Projects" (PDPs) are new development and redevelopment projects that are subject to general, source control site design, pollutant control, and hydromodification management BMP requirements, and that must demonstrate compliance through a stormwater quality management plan to be approved by the County.

(cc) "Public improvement projects" means any project for the erection, construction, alteration, repair or improvement of any public structure, building, road, or other public improvement of any kind.

(dd) "Rainy season" means from October 1 through April 30.

(ee) "Receiving waters" shall mean waters of the United States.

(ff) "Redevelopment" means creation, addition, or replacement of impervious surface on an already developed site. Examples include the expansion of building footprints, road widening, the addition or replacement of a structure, and creation or addition of impervious surfaces. Replacement of existing impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work, resurfacing existing roadways, new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair.

(gg) "Residential discharger" means the occupant, owner, manager, caretaker, or owner's association that owns, occupies or has responsibility for a discharge from a single-family dwelling, a multiple-family dwelling, mobile home park, condominium complex, board-and-care house, or other housing structure or portion of a residential development from which the discharge originated.

(hh) "Regional Water Quality Control Board" or "RWQCB" means the California Regional Water Quality Control Board for the San Diego Region.

(ii) "Source control BMP" means land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between pollutants and runoff.

(jj) "Stormwater conveyance system" means private and public drainage facilities other than sanitary sewers within the unincorporated area of San Diego County by which water run-off may be conveyed to receiving waters, and includes but is not limited to roads, streets, constructed channels, aqueducts, storm drains, pipes, street gutters, inlets to storm drains or pipes, or catch basins.

(kk) "Stormwater Quality Management Plan" or "SWQMP" means a plan, submitted on a County form or in a County approved format with an application for a County permit or other County approval, identifying the measures that will be used for stormwater and non-stormwater management for a development project. There are two types of SWQMPs: a Standard SWQMP and a PDP SWQMP. A PDP SWQMP is required for all Priority Development Projects. Standard SWQMPs are required for all other development projects.

(ll) "Stormwater pollution prevention plan" (SWPPP) means an approved site-specific plan that (1) identifies and evaluates sources of pollutants associated with activities that may affect the quality of stormwater discharges, (2) eliminates non-stormwater discharges, and (3) identifies and implements site-specific BMPs to reduce or to prevent pollutants in stormwater or retain non-stormwater discharges.

(mm) "Structural BMPs" are a subset of BMPs which detain, retain, filter, remove, or prevent the release of pollutants and control runoff discharge rates to surface waters from development projects in perpetuity, after construction of a project is completed. These BMPs can satisfy the requirements for Pollutant Control BMPs and Hydromodification BMP requirements for Priority Development Projects.

(nn) "SUSMP" or standard urban stormwater mitigation plan for land development projects and public improvement projects means the SUSMP adopted by the County Board of Supervisors on November 13, 2002 pursuant to California Regional Water Quality Control Board Order No. 2001-01, as it may thereafter be revised by the Director, Department of Public Works. The County BMP Design Manual will supersede the SUSMP pursuant to the NPDES Order.

(oo) "Treatment control BMPs" are also known as a Pollutant Control BMPs (PC-BMPs).

(pp) "Tributary to an impaired water body" means any facility or activity that is a tributary to an impaired water body because urban run-off from that facility or activity enters (1) the stormwater conveyance system at a place and in a manner that will carry pollutants for which that water body is impaired to the impaired water body; (2) a flowing stream that will carry pollutants for which that water body is impaired to the impaired water body; or (3) an ephemeral stream that reaches the impaired water body during storm events and that will carry pollutants for which that water body is impaired during such storm events.

(qq) "Water quality standards" mean those regionally determined beneficial uses and water quality objectives in applicable water quality control and basin plans, together with anti-degradation policies that serve as water quality standards under the Clean Water Act.

(rr) "Watershed Management Areas" mean those areas identified in Table B-1 of the NPDES Order where the County is identified as a responsible Copermittee.

(ss) "Watershed Management Area Analysis" means the analysis completed pursuant to Section II.B.3.b.(4) of the NPDES Order.

(tt) "Water Quality Improvement Plans" mean the plans developed by the County in accordance with Section II.B. of the NPDES Order for the Watershed Management Areas.

SEC. 67.803. GENERAL PROVISIONS.

(a) Interpretation of this Chapter shall be consistent with the provisions of state and federal clean water laws and the NPDES Order. The requirements of this Chapter are not intended to interfere with, abrogate or annul any other ordinance, rule, regulation, statute, or terms of the NPDES Order that apply to the operation of the stormwater conveyance system. The requirements of this Chapter are minimum requirements, and where any provision of this Chapter imposes restrictions different

from those imposed by any other ordinance (e.g., such as the County Subdivision Ordinance, Title 8, Division 1 of the San Diego County Code of Regulatory Ordinances, the County Grading Ordinance, Title 8, Division 7, Chapter 4, of the San Diego County Code of Regulatory Ordinances, or Part 3, commencing with Section 3000 of the San Diego County Zoning Ordinance regulating animal care), rule, regulation, statute, Stormwater Quality Management Plan, the BMP Design Manual, or the NPDES Order, whichever provisions are more restrictive or impose higher protective standards for human health or the environment shall take precedence.

(b) Except as set forth in Section 67.805, this Chapter shall apply to any development project in the County, whether or not a permit or other approval is required.

(c) If the authorized enforcement official identifies a discharge or category of facility or activity that is a source of a non-stormwater discharge in excess of what is allowed by this Chapter or of pollutants in stormwater or non-stormwater to the stormwater conveyance system or receiving waters, the discharger may be ordered by the authorized enforcement official to install, implement and maintain additional source control, structural or other BMPs to prevent or reduce the pollutant discharges to the MEP and non-stormwater discharges to the extent necessary to bring the discharge into compliance with this Chapter. Any such order shall specify a reasonable date by which those BMPs must be put in place. Failure to install, implement, or maintain additional BMPs as required by such order, is a violation of this Chapter.

(d) Areas within which facilities and sources will be presumed to be tributary to an impaired water body are identified on the most current listing in the Clean Water Act, Section 303(d). The presumption that a discharge is tributary to an impaired water body can be overcome for a particular discharge based on specific facts and analysis presented by a discharger. In making a site-specific determination as to whether a discharge is tributary to an impaired water body, consideration may be given to the amount of water and pollutant discharged; to whether the pollutant for which the water body is impaired is a suspended or dissolved pollutant; to whether the pollutant is volatile or degradable; and to whether the pollutant is substantially removed during transport by any natural or man-made features (sinks, infiltration areas, ponds or impoundments, vegetated swales or wetlands, media filtration devices, etc.) located between the site and the impaired water body. Any such analysis must consider common mechanisms for pollutant mobilization, remobilization, and transport over time.

(e) An authorized enforcement official may modify any requirement imposed by this Chapter to allow the on-site collection and use of stormwater, or the collection of stormwater for delivery to and use at County-designated sites, provided the modified requirements are enforceable, consistent with the NPDES Order and provide equivalent environmental protection.

SEC. 67.804. DISCHARGE PROHIBITIONS.

(a) It is unlawful for any person to discharge or cause the discharge of pollutants or non-stormwater directly or indirectly into the stormwater conveyance system or receiving waters, except as set forth in Section 67.805 or as otherwise authorized by law.

(b) It is unlawful for any person to construct, use or maintain a connection to the stormwater conveyance system that discharges any matter other than stormwater, except as set forth in Section

67.805(a). This Section expressly supersedes any previously issued permit or authorization granted by the County and expressly prohibits any previously legal non-conforming connection.

(c) It is unlawful to throw, deposit, leave, abandon, maintain, or keep materials or wastes on public or private lands in a manner and place where they may result in a discharge.

(d) Stormwater discharges from the site may not contain sediments in amounts in excess of the sediments that would have been discharged from the site in an undisturbed condition.

SEC. 67.805. EXEMPTIONS FROM DISCHARGE PROHIBITIONS.

The following are exempt from the prohibitions in Section 67.804:

(a) Any discharge or connection regulated under a valid facility-specific NPDES permit or non-stormwater discharges exempted pursuant to Section II.E.2. of the NPDES Order, provided that the discharge or connection is in compliance with all relevant permit conditions and the requirements of the NPDES Order to the satisfaction of the County or Regional Water Quality Control Board.

(b) Discharges of non-stormwater to the stormwater conveyance system covered by or meeting the exception criteria under NPDES Permit No. CAG919003 (Order No. R9-2015-0013, as it may be amended or reissued) for discharges to surface waters within the San Diego Region meeting the requirements enumerated below are allowed unless determined by the County or RWQCB to be a source of pollutants to receiving waters:

(1) Uncontaminated pumped ground water;

(2) Discharges from foundation drains if the system is designed to be located at or below the groundwater table to actively or passively extract groundwater during any part of the year;

(3) Water from crawl space pumps; and

(4) Water from footing drains if the system is designed to be located at or below the groundwater table to actively or passively extract groundwater during any part of the year.

(c) Non-stormwater discharges from water line flushing and water main breaks to the stormwater conveyance system are allowed provided the discharge is covered by NPDES Permit No. CAG679001 (Order No. R9-2010-0003, as it may be amended or reissued) or NPDES General Permit No. CAG140001 (Order 2014-0194-DWQ, as it may be amended or reissued) unless determined by the County or RWQCB to be a source of pollutants to receiving waters. This exemption does not cover discharges from recycled or reclaimed water lines unless covered by a separate NPDES permit.

(d) Discharges of non-stormwater to the stormwater conveyance system meeting the requirements enumerated below are allowed unless determined by the County or RWQCB to be a source of pollutants to receiving waters:

(1) Diverted stream flows;

(2) Rising ground waters;

(3) Uncontaminated ground water infiltration to stormwater conveyance system;

(4) Springs;

(5) Flows from riparian habitats and wetlands;

(6) Discharges from potable water sources;

(7) Discharges from foundation drains where the system is designed to be located above the groundwater table at all times of the year, and the system is only expected to discharge non-stormwater under unusual circumstances; and

(8) Discharges from footing drains where the system is designed to be located above the groundwater table at all times of the year, and the system is only expected to discharge non-stormwater under unusual circumstances.

(e) Discharges of non-stormwater to the stormwater conveyance system as enumerated below are allowed unless determined by the County or RWQCB to be a source of pollutants to receiving waters:

(1) Air conditioning condensation

(A) Whenever feasible, the discharge of air conditioning condensation shall be directed to landscaped areas, pervious surfaces, or to the sanitary sewer.

(2) Individual residential vehicle washing at a residence in accordance with Section 67.807(b)

(A) Whenever feasible, the discharge of wash water shall be directed to landscaped areas or other pervious surfaces; and

(B) The amount of water, washing detergent and other vehicle wash products used shall be the minimum amount necessary to completely wash the vehicle. This requirement shall be deemed violated if visible soap scum, oil sheen, or other by-products of residential vehicle washing reach the gutter or other drainage conveyance device in front of the residence where the vehicle is being washed.

(3) Dechlorinated swimming pool discharges

(A) Residual chlorine from swimming pools and fountains must be eliminated prior to discharging to the stormwater conveyance system or receiving waters;

(B) Filter backwash, acid-wash water (pH <7.2 and > 8.0), and algaecide-treated pool water shall be prohibited from discharge to the stormwater conveyance system or receiving water; and

(C) The discharge of saline swimming pool water must be directed to the sanitary sewer, landscaped areas, or other pervious surfaces that can accommodate the volume of water, unless the saline swimming pool water can be discharged via a pipe or concrete channel directly to a naturally saline water body (e.g. Pacific Ocean).

(f) Firefighting discharges to the stormwater conveyance system are only prohibited if determined to be a significant source of pollutants to receiving waters by the County or RWQCB. Firefighting discharges to the stormwater conveyance system not identified as a significant source of pollutants to receiving waters are allowed provided they meet the following requirements:

(1) Non-emergency firefighting discharges

(A) Building fire suppression system maintenance discharges (e.g. sprinkler line flushing) to the stormwater conveyance system are prohibited unless BMPs are implemented to prevent pollutants associated with such discharges from entering the stormwater conveyance system.

(B) Non-emergency firefighting discharges (i.e., discharges from controlled or practice blazes, firefighting training, and maintenance activities not associated with building fire suppression systems) must be addressed by a program developed and implemented by the County, to reduce or eliminate pollutants in such discharges from entering the stormwater conveyance system.

(2) Emergency firefighting discharges

(A) The development and implementation of BMPs to reduce or eliminate pollutants in emergency firefighting discharges to the stormwater conveyance system and receiving waters is encouraged, but not required. Notwithstanding the foregoing, the County may require the use of BMPs for firefighting discharges when determined by the authorized enforcement official to be necessary to eliminate or reduce the discharge of pollutants to the stormwater conveyance system or receiving waters. As applicable, required BMPs may include those described in Sections 67.806 and 67.808. Any BMPs that interfere with immediate emergency response operations or impact public health and safety need not be used.

(g) In the event that any non-stormwater discharge identified in Section 67.805 (a) through (f) is determined to be a source of pollutants to receiving waters, it may only be allowed to continue within an applicable Watershed Management Area if controls set forth by the County in the corresponding Water Quality Improvement Plan are implemented to the satisfaction of the RWQCB.

(h) Discharges exempted from compliance by operation or law; any permits, orders or decisions issued by the RWQCB; and any waivers, or renewals of waivers issued by the RWQCB such as those covered by Regional Board Order No. R9-2014-0041, adopted June 26, 2014.

(i) Discharges of critical coarse sediment necessary to comply with Section 67.811(b)(5)(C).

SEC. 67.806. GENERAL BEST MANAGEMENT PRACTICE REQUIREMENTS.

The following requirements apply to all dischargers:

(a) All dischargers must perform and maintain the following BMPs:

(1) Prior to the rainy season, except as required to maintain critical coarse sediment supply pursuant to Section 67.811(b)(5)(C), remove or secure any significant accumulations of eroded soils from slopes previously disturbed by landscaping, clearing or grading, if those eroded soils could otherwise enter and impact the stormwater conveyance system or receiving waters during the rainy season.

(2) Implement, as practicable, those stormwater pollution prevention practices that are generally recognized in that discharger's industry or business as being effective and economically advantageous.

(3) Eliminate illicit connections.

(4) Except as required to maintain critical coarse sediment supply pursuant to Section 67.811(b)(5)(C), protect from erosion those slopes that have been disturbed by clearing, grading, or landscaping and are more than three feet in height or steeper than 3:1 (run-to-rise). Slope protection shall occur prior to the first rainy season following the clearing, grading or landscaping of the slope and continuously thereafter.

(5) Store all materials and wastes with the potential to pollute stormwater in a manner that prevents contact with rainfall, run-on, run-off and wind dispersal.

(6) Except as required to maintain critical coarse sediment supply pursuant to Section 67.811(b)(5)(C), locate, configure, and manage stockpiles of soil, green waste and compost to prevent the release of materials to the stormwater conveyance system or receiving waters.

(7) Use all materials with the potential to pollute run-off, such as outdoor cleaning and maintenance products, fertilizers, pesticides and herbicides in accordance with label directions. No such product may be disposed of or rinsed into receiving waters or the stormwater conveyance system.

(8) Use dry methods such as sweeping, vacuuming, raking, and application of absorbents to cleanup pollutants, unless wet cleanup methods are otherwise allowed in this Chapter.

(b) BMPs shall be maintained to function as intended and designed. BMPs which fail shall be repaired or replaced as soon as it is safe or practicable. If BMPs fail notwithstanding their intent or design, the BMPs shall be modified or upgraded to prevent any further failure in the same or similar circumstances.

(c) Notwithstanding the provisions of this Chapter, an authorized enforcement official may require a discharger to prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) for approval by the authorized enforcement official as follows:

(1) If the discharger fails to comply with any applicable requirement of this Chapter after one or more written notifications or other enforcement actions have been taken because BMPs have been determined to be inadequate or are not being adequately maintained.

(2) The activity at issue is considered a significant source of pollutants or a source of a non-stormwater discharge in excess of what is allowed by this Chapter to the stormwater conveyance system or receiving waters. Any discharger required to submit and to obtain approval of a SWPPP shall install, implement and maintain the BMPs specified in the approved SWPPP.

(3) The SWPPP shall identify the BMPs or corrective measures that will be used by the discharger to prevent or control pollution of stormwater to the MEP and bring the non-stormwater discharge into conformance with the requirements of this Chapter. If a facility discharges non-stormwater to ground water, the facility shall obtain an RWQCB permit as required by the State Water Code, and shall describe the requirements of that permit in the SWPPP.

(d) Notification of Spills, Releases and Illegal Discharges.

(1) Spills, releases, or discharges of pollutants or non-stormwater in excess of what is allowed by this Chapter to receiving waters or to the stormwater conveyance system shall be reported by the discharger as required by all applicable state and federal laws.

(2) Any such spills, releases or discharges with the potential to endanger health, safety or the environment shall be reported to the Director, Department of Public Works, within 24 hours after discovery of the spill, release or discharge. Spills that have been completely contained and cleaned up on-site are not considered significant unless they pose a threat to human health or safety.

(3) If safe to do so, necessary actions shall be taken to contain and minimize the spill, release or discharge of any pollutants to the MEP and bring any allowed discharge of non-stormwater into compliance with this Chapter.

(e) Sampling, Testing, Monitoring, and Reporting.

(1) Dischargers shall perform the sampling, testing, monitoring and reporting required by this Chapter.

(2) An authorized enforcement official may order a discharger to conduct testing or monitoring and to report the results to the County if one or more of the following occurs:

(A) The authorized enforcement official determines that testing or monitoring is needed to determine whether BMPs are effectively preventing or reducing pollution in stormwater to the MEP or necessary to allow for the continued discharge of non-stormwater under the limited circumstances permitted by this Chapter.

(B) Testing or monitoring is needed to determine whether the facility is a significant source of pollutants or of otherwise prohibited non-stormwater discharges to receiving waters or the stormwater conveyance system.

(C) The authorized enforcement official determines that testing or monitoring is needed to assess the impacts of a discharge on the public's health, safety or the environment.

(D) A discharge has not been eliminated after written notice by an authorized enforcement official.

(E) The RWQCB requires the County to provide any information related to the discharger's activities.

(3) Sampling, testing or monitoring ordered pursuant to this Section may include one or more of the following:

(A) Visual monitoring of dry weather flows, wet weather erosion, discharge points or conditions of BMPs.

(B) Visual monitoring of premises for spills or discharges.

(C) Laboratory analyses of discharges for pollutants.

(D) Background or baseline monitoring or analysis.

(E) Monitoring of receiving waters or sediments that may be affected by pollutant discharges by the discharger or by a group of dischargers including the discharger.

(4) The authorized enforcement official may direct the manner in which the results of required testing and monitoring are reported, and may determine that sampling, testing or monitoring may discontinue.

SEC. 67.807. ADDITIONAL MINIMUM BEST MANAGEMENT AND POLLUTION PREVENTION PRACTICES FOR RESIDENTIAL ACTIVITIES AND USES.

Residential dischargers shall install and maintain BMPs and implement pollution prevention practices, as follows:

(a) Motor Vehicle or Boat Repair and Maintenance.

(1) All repair and maintenance activities shall be performed under a permanent roof or other permanent cover, where feasible.

(2) All maintenance and repair activities conducted without cover or without BMPs to prevent discharges are prohibited during times of precipitation.

(3) Any release of fluids, including boat bilge water, during repair or maintenance shall be promptly contained and cleaned up. Any absorbent materials used shall be disposed of as required by law.

(4) Degreasing or pressure washing of engines and other parts is prohibited unless the liquid wastes are contained and properly disposed of as required by law.

(5) Automotive and boat materials and wastes shall be stored indoors, under cover, or in secure and watertight containers.

(b) Residential Motor Vehicle Washing.

(1) Individual motor vehicles shall be washed over porous surfaces such as lawns and gravel areas where feasible.

(2) Unused detergent solutions shall not be disposed of directly or indirectly into the stormwater conveyance system or receiving waters. Disposal to the sanitary sewer, such as a sink, toilet or floor drain or to a porous surface, where allowed by this Chapter, is required.

(3) The use of "hose off" or single use engine degreasing chemicals is prohibited, unless captured and disposed of properly.

(4) Motor vehicle washing other than individual residential motor vehicle washing is prohibited.

(5) Degreasing or pressure washing of engines and other parts is prohibited unless the liquid wastes are contained and properly disposed of as required by law.

(c) Motor Vehicle Parking.

(1) Residential dischargers shall remove excessive accumulations of oil and grease deposited by vehicles they own from parking areas, using dry clean-up methods such as absorbents, scraping, vacuuming, sweeping, mop and bucket.

(2) Residential dischargers shall move vehicles from streets when notified to allow street cleaning.

(d) Home and garden care activities and product use.

(1) Residential dischargers or their contractors shall adjust irrigation systems to avoid run-off that causes discharges to the stormwater conveyance system or receiving waters.

(2) Residential dischargers or their contractors shall clean up and properly dispose of spills from gardening chemicals, fertilizers or soils to non- porous surfaces.

(3) Lawn and garden care products shall be stored in closed, labeled containers, such as in covered areas, off the ground, or under protective tarps, and in a manner that will not lead to a discharge.

(4) Disposal of household hazardous waste directly or indirectly to the trash or to the street, gutter or storm drain is prohibited.

(e) Home care and maintenance.

(1) Cleaning of painting equipment in or over streets, sidewalks, gutters, or yard drains is prohibited.

(2) Action shall be taken to minimize and contain all spills of hazardous materials, if it is safe to do so.

(3) Household hazardous materials shall be stored indoors or under cover, and in closed and labeled containers.

(f) Manure and pet waste management.

(1) Where practicable, all areas where livestock, horses or other large animals are confined, shall be bermed or curbed to contain animal waste where it is produced or managed to prevent discharge of waste or waste byproducts to the stormwater conveyance system or receiving waters. If compliance is not practicable, manure shall be cleaned up at least twice weekly and must be composted or properly stored prior to disposal.

(2) Wastes from small animals (e.g., dogs and cats) shall be cleaned up and properly disposed of at least weekly.

(3) Areas used for storing or composting manure shall be located, configured or managed to prevent run-off to stormwater conveyance system or receiving waters.

(g) Private sewer laterals and on-site wastewater systems.

(1) Private sewer laterals shall be cleaned, maintained and when necessary replaced to prevent seepage and spills. On-site wastewater systems shall be pumped, maintained and when necessary modified or replaced to prevent spills.

(2) Spills from private sewer laterals and on-site wastewater systems shall be contained and cleaned-up in a manner that minimizes any release of pollutants to the stormwater conveyance system or receiving waters.

(3) Any release from a private sewer lateral that enters the stormwater conveyance system or receiving waters shall be immediately reported to the County.

(4) Failed on-site wastewater systems shall be repaired or replaced.

SEC. 67.808. ADDITIONAL MINIMUM BEST MANAGEMENT AND POLLUTION PREVENTION PRACTICES FOR INDUSTRIAL, COMMERCIAL AND MUNICIPAL FACILITIES AND ACTIVITIES.

The following requirements apply to all industrial, commercial and municipal facilities and activities:

(a) The owner or operator shall install and maintain BMPs and implement a pollution prevention program appropriate to the activity, as specified in the following areas and manner:

(1) Stormwater BMP training

(A) Provide stormwater BMP training at least annually to all operators, employees, and workers with responsibility for activities that could result in unauthorized discharges of pollution or non-stormwater.

(B) Training shall address the pollution and non-stormwater generating activities conducted at the facility, the pollutants or risk of non-stormwater discharge associated with those activities, and the BMPs or pollution prevention practices used to minimize or eliminate the discharge of non-stormwater and pollutants.

(C) The following BMP categories shall be included in training ,where applicable:

i. Preventive maintenance.

ii. Good housekeeping.

iii. Proper waste disposal.

iv. Non-stormwater disposal alternatives.

v. Equipment/vehicle maintenance and repair.

vi. Spill response, containment, and recovery.

vii. Recycling, re-use, and volume reduction in materials, water consumption and wastes.

viii. BMP maintenance.

(2) Where required to implement a SWPPP, retain on site a copy of a current, complete, site-specific SWPPP and make it available for review by the authorized enforcement official, upon request.

(3) Review the operations and procedures relating to protecting the stormwater conveyance system and receiving waters from pollutants and prohibited, non-stormwater discharges at least annually.

(4) Implement pollution prevention methods or those stormwater pollution prevention practices that are generally recognized in that discharger's industry or business to eliminate or reduce pollutants in run-off to the MEP and eliminate the discharge of non-stormwater in an amount or manner beyond what is allowed by this Chapter.

(5) Housekeeping.

(A) The property on which the business activity is located shall be inspected for accumulations of debris, litter, waste, organic matter, such as leaves or cut grass or other materials. Such accumulations shall be removed, transported and disposed of in accordance with this Chapter.

(B) Areas where work is being actively conducted shall be cleaned daily using dry clean-up methods such as sweeping, wiping, vacuuming, or raking. Wet clean-up methods such as hosing may only be used if precautions have been taken to prevent the discharge of wash water or other materials to the stormwater conveyance system or receiving waters.

(6) Liquid waste management

(A) Wet clean-up or cleaning methods such as hosing, steaming or pressure washing are prohibited except where adequate precautions have been taken to prevent the discharge of wash water and pollutants into the stormwater conveyance system or receiving waters.

(B) Disposal of slurries to the stormwater conveyance system or receiving waters is prohibited.

(C) Rinse water shall be confined to a designated area such as a sanitary sewer, dead-end sump, process treatment system, or hole where water percolates or evaporates and solids are removed for collection and disposal. Rinse water and solids shall be re-used, recycled, or disposed of in accordance with this Chapter.

(D) Wash water shall be directed to an approved sanitary sewer or landscaped locations.

(E) Wash racks.

i. Wash rack areas shall have perimeter control and be properly sloped to a grated floor drain.

ii. Wash rack areas shall drain to the sanitary sewer or to a holding tank, except that wash racks for animals may drain to the ground in accordance with this Chapter.

(F) Disposal of wastewater to the stormwater conveyance system, receiving waters, or the ground, is prohibited.

(G) If provided, pump-out services for boats, portable toilets, or other holding tanks shall be conducted in a manner that prevents the release of sewage to the stormwater conveyance system or receiving waters.

(H) Wastewater shall be disposed to the sanitary sewer at the job site or to a holding tank. Disposal of wastewater contained in holding tanks shall be disposed of

to the sanitary sewer at the business's company headquarters or at an approved facility.

(I) Discharging backwash wastewater to the stormwater conveyance system or receiving waters is prohibited. Backwash wastewater may be disposed to the sanitary sewer; to a holding tank or settling pond; or where allowed by this Chapter, by infiltration to the soil.

(J) Under the limited circumstances allowed by this Chapter, pool and spa water intended for discharge to the stormwater conveyance system shall be dechlorinated or debrominated prior to discharge.

(K) Under the limited circumstances allowed by this Chapter, pool and spa water discharged after acid washing shall be neutralized to a pH of 7.2 - 8.0.

(L) If rinse water from the cleaning of portable sanitary toilet closets cannot be properly disposed of to the sanitary sewer at a job site, it shall be contained prior to disposal at the service facility or other approved facility.

(M) Wash and rinse water from building and pavement washing that cannot be properly disposed of at the job site shall be collected and contained for recycling, reuse, or proper disposal.

(N) Where irrigation tail-water return ponds are used, the ponds shall be designed with the appropriate vertical separation between the base of the pond and the seasonal high groundwater mark and must be lined or managed to prevent the movement of water-soluble chemicals to the groundwater and to stormwater flows.

(7) Materials and waste management.

(A) Spill prevention and response.

i. Materials and equipment necessary for spill response shall be maintained and kept readily accessible.

ii. All operators, employees, and workers conducting potential discharge activities shall be trained in their proper use.

iii. Spills and leaks shall be promptly cleaned up and the generated waste disposed of in accordance with the applicable federal, state and local laws and regulations.

(B) Hazardous materials and hazardous wastes.

i. Hazardous materials and wastes shall be stored, managed, and disposed in accordance with applicable federal, state and local laws and regulations.

ii. Hazardous materials and wastes shall be stored above the ground. Where practicable, provide overhead coverage for all outside hazardous materials or waste storage areas. If overhead coverage is not available, stored materials shall be covered with an impervious material such as a tarp or other similar method.

iii. Paints, coatings, thinners, and other materials shall be disposed of in accordance with this Chapter.

iv. Secondary containment of hazardous materials or waste shall be provided around storage areas if the authorized enforcement official has determined that a significant potential exists to discharge materials or wastes to the stormwater conveyance system or receiving waters.

v. Hazardous waste storage areas shall be inspected by the owner or operator, at least once prior to the rainy season and monthly during the rainy season.

vi. Pesticides and other chemical products shall be used, stored, and disposed of in accordance with applicable federal, state, and local laws and regulations.

vii. The outdoor application of fertilizers and pesticides is prohibited during rainfall.

viii. Pesticide use shall be reduced whenever practical in areas where recurring applications of pesticides are performed.

(C) Solid, non-hazardous materials and waste.

i. Trash storage and disposal areas shall be kept clean and free of debris.

ii. Dumpsters, grease bins, grease traps, and interceptors, and other containers shall be maintained in a clean and leak -proof condition and shall be kept securely closed when not in use.

iii. Materials and equipment necessary for the clean-up of trash and debris shall be maintained and kept readily accessible.

iv. Loose aggregate, mortar, and dust shall be routinely cleaned up using dry clean-up methods such as sweeping or vacuuming. Wet methods may be used only if necessary to adequately clean equipment for reuse, or where water must be used to lubricate and flush a cut, but only if performed in accordance with this Chapter.

v. All areas where livestock, horses or other large animals are confined shall be bermed or curbed in a manner that avoids a discharge of manure to the stormwater conveyance system or receiving water. If berms or curbs are not practicable, manure shall be cleaned up at least twice weekly and must be composted or properly stored prior to disposal.

vi. Wastes from small animals (e.g., dogs and cats) shall be cleaned up and properly disposed of at least weekly.

(D) Loading and unloading.

i. Storm drain inlets located within or down-gradient of loading or unloading areas shall be covered or otherwise protected during loading and unloading activities to prevent the entry of pollutants and prohibited non-stormwater discharges into the stormwater conveyance system or receiving waters.

ii. Equipment and supplies stored in loading and unloading areas shall be properly maintained to prevent leaks and spills to the stormwater conveyance system or receiving waters, and to prevent their contact with rainfall and run-on.

(E) Storage.

i. Outdoor storage areas of materials and equipment shall be configured using berms, dikes, or other diversion structures or other measures that elevate stored materials and equipment from site surfaces.

ii. Containers shall be kept in a leak-proof condition, securely closed when not in use, and stored in a manner that protects them from contact with precipitation or surface waters.

iii. Storage of cement and masonry materials shall be above ground and covered.

iv. Except as required to maintain critical coarse sediment supply pursuant to Section 67.811(b)(5)(C), placement of stock piles within any drainage system is prohibited.

v. Stockpiles and bulk materials, such as soil, fertilizer, and potting mixture shall be covered during windy and rainy conditions where practicable. Prior to the onset of predicted rain, stockpiles shall be covered and bermed to prevent contact with stormwater.

(8) Vehicles and equipment.

(A) All vehicles and equipment shall be properly maintained and inspected to ensure their proper functioning to prevent discharges.

(B) Vehicles and equipment shall not be washed in areas where wash water or rinse water will drain to the stormwater conveyance system or receiving waters.

(C) Infiltration of wash or rinse water to pervious surfaces is allowed with a minimum of 10 feet separation between the groundwater and the pervious surface, except that wash or rinse water generated from cleaning engines, mechanical parts, or heavy equipment shall not infiltrate a pervious surface.

(D) The use of hose-off or single-use engine degreasing chemicals is prohibited, unless captured and properly disposed.

(E) Maintenance and repair equipment shall be kept clean to avoid the build-up of grease and oil.

(F) Fluids shall be drained from any retired vehicles or equipment stored on site.

(G) Vehicle and equipment maintenance and repair work such as body work shall be conducted indoors or under cover, where practicable. If work cannot be conducted indoors or under cover, other BMPs shall be implemented to prevent the discharge of pollutants into the stormwater conveyance system or receiving waters. Discharge of non-stormwater to the stormwater conveyance system is prohibited.

(H) Major repair and maintenance work on boats over or in the water is prohibited. Touch-up painting, tune ups, or other similar activities are not considered major repair or maintenance work, but may only be conducted over or in the water if adequate precautions have been taken to prevent the entry of pollutants into the water.

(9) Outdoor areas - housekeeping and grounds keeping practices.

(A) Storm drain inlets located within or down gradient of the activity shall be covered or otherwise protected from the entry of pollutants and non-stormwater during the work activity.

(B) Landscaping, grounds keeping and agriculture unless exempt pursuant to Section 67.805(h).

i. Except as required to maintain critical coarse sediment supply pursuant to Section 67.811(b)(5)(C), exposed slopes shall be stabilized as soon as possible.

ii. Paved surfaces such as sidewalks shall be cleaned regularly using dry clean-up methods such as sweeping or vacuuming. Hosing is permissible only after surfaces have previously been cleaned using dry methods, and only if precautions have been taken to prevent the discharge of run-off to the storm drain.

iii. Business, industrial and municipal facilities owners and their contractors shall clean-up and properly dispose of spills from any pesticides, herbicides and fertilizers to non-porous surfaces. These materials shall be stored in closed, labeled containers, such as in covered areas, off the ground, or under protective tarps, and in a manner that will not lead to a discharge. Disposal of pesticides, herbicides and fertilizers to the stormwater conveyance system and receiving waters is prohibited.

(C) Parking lots and vehicle storage areas.

i. Wet clean-up methods may only be used where adequate precautions have been taken to prevent the entry of wash water and pollutants into the stormwater conveyance system or receiving waters.

ii. Vehicle maintenance and repair operations with the potential to release non-stormwater or pollutants are prohibited at commercial parking lots and storage facilities.

(D) Rooftops.

i. Materials which may contaminate stormwater shall not be stored on rooftops unless adequate precautions have been taken to prevent their contact with stormwater.

ii. Equipment such as emergency generators, HVAC systems and other similar items located on rooftops shall be inspected and preventive maintenance conducted to prevent leaks and spills.

iii. Substances such as bird droppings, grease, leaves, that have accumulated on rooftops shall be removed, as practicable, to prevent or reduce the discharge of contaminants directly or indirectly to the stormwater conveyance system or receiving waters.

iv. Where feasible, roof downspouts shall be routed away from work areas and toward pervious areas such as lawns, except where required under Sections 67.810 and 67.811.

(b) Other requirements.

(1) Any commercial, industrial, or municipal facility or activity operating under the statewide Industrial General Permit shall provide the following documents for on-site review by the authorized enforcement official as applicable, and if requested:

(A) The Notice of Intent letter or a Waste Discharge Identification Number issued by the SWRCB.

(B) A SWPPP satisfying the requirements of the Industrial General Permit.

(C) A monitoring program satisfying the requirements of the Industrial General Permit.

(D) Training records satisfying the requirements of the Industrial General Permit.

(2) Any discharger whose facilities or activities are not in compliance with this Chapter, or any discharger or category of dischargers determined to pose a significant threat to water quality, may be required to implement additional controls as determined by the authorized enforcement official. The authorized enforcement official may require dischargers to maintain,

on site, written documentation of these additional requirements, and to provide such documentation upon request.

SEC. 67.809. ADDITIONAL REQUIREMENTS FOR CONSTRUCTION PROJECTS.

(a) All owners of land on which a construction project is performed and all persons performing the work, including without limitation any construction projects involving land disturbance activities, except that a local government or public authority is not a discharger for purposes of land disturbance activities conducted by others in connection with a private construction project in public rights-of-way, shall ensure that the following additional types of BMPs shall be installed, implemented, and maintained year round:

(1) Project planning;

(2) Good site management "Housekeeping", including waste management;

(3) Non-stormwater management;

(4) Erosion control;

(5) Sediment control;

(6) Run-on and run-off control; and

(7) Active/passive sediment treatment systems, where applicable.

(8) BMPs must be site specific, seasonably appropriate, and construction plan appropriate. Dry season BMPs must plan for and address unusual rain events that may occur during the dry season (May 1 through September 30th).

(b) Prior to obtaining any permit that allows for commencement of a construction project that includes land disturbance activities that can potentially generate pollutants in stormwater runoff, the owner of the property on which the land disturbance activities are performed or the person performing the work shall submit, to the satisfaction of the Director of Public Works or the authorized enforcement official, the following:

(1) A plan describing the pollution control strategies to be implemented on-site that complies with local ordinances and the NPDES Order. The plan submittal shall include the following information:

(A) The name, address, phone number and email for the owner and person performing the work;

(B) Basic site information including the address, hydrologic subarea, Waste Discharge Identification Number (WDID), if applicable, and approximate area of disturbance;

(C) Whether the site is considered a high threat to water quality pursuant to the NPDES Order;

(D) The project's estimated start and completion dates; and

(E) Identification of seasonally appropriate and effective BMPs and management measures as described in Section 67.809(a).

(c) BMPs shall be inspected routinely by the person performing the land disturbance activity or construction project and the property owner to ensure the BMPs are maintained and continue to function as intended. In addition, BMPs shall be inspected and maintenance, repair or replacement performed following every rain event to ensure the BMPs continue to function as intended.

SEC. 67.810. RESERVED FOR FUTURE USE.

SEC. 67.811. ADDITIONAL PLANNING, DESIGN AND POST-CONSTRUCTION REQUIREMENTS FOR DEVELOPMENT PROJECTS.

(a) Requirements for all Development Projects:

(1) Follow as applicable the approach and criteria described in the State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.

(2) Except as noted in Section 67.811(b), submit a Standard Stormwater Quality Management Plan (SWQMP), with an application for a County permit or other County approval, identifying the measures that will be used for stormwater and non-stormwater management for the project consistent with the County BMP Design Manual.

(3) General Requirements. BMPs shall be designed, constructed and maintained as follows:

(A) Onsite BMPs must be located so as to remove pollutants from runoff prior to its discharge to any receiving waters, and as close to the source as possible;

(B) Structural BMPs may not be constructed in receiving waters; and

(C) Onsite BMPs must be designed and implemented with measures to avoid the creation of nuisance or pollution associated with vectors (e.g., mosquitos, rodents, or flies).

(4) Source Control BMP Requirements. Where applicable and feasible, the following source control BMPs must be implemented at all development projects:

(A) Prevention of illicit discharges into the stormwater conveyance system;

(B) Stenciling and marking of all storm drains in accordance with the BMP Design Manual;

(C) Protection of all outdoor material storage areas from rainfall, run-on, runoff, and wind dispersal including the following:

- Storage areas must be paved and sufficiently impervious to contain leaks and spills, where necessary.
- The storage area shall be sloped towards a sump or another equivalent measure that is effective to contain spills.
- Runoff from downspouts/roofs must be directed away from storage areas.
- The storage area must have a roof or awning that extends beyond the storage area to minimize collection of storm water within the secondary containment area. A manufactured storage shed may be used for small containers.
- Use other methods approved by the County.

(D) Protection of materials stored in outdoor work areas from rainfall, run-on, runoff, and wind dispersal including the following:

- Create an impermeable surface such as concrete or asphalt, or a prefabricated metal drip pan, depending on the size needed to protect the materials.
- Cover the area with a roof or other acceptable cover.
- Berm the perimeter of the area to prevent water from adjacent areas from flowing on to the surface of the work area.
- Directly connect runoff to sanitary sewer or other specialized containment system(s), as needed and where feasible. Approval for this connection must be obtained from the appropriate sanitary sewer agency.
- Locate the work area away from storm drains or catch basins.
- Use other methods approved by the County.

(E) Protection of trash storage areas from rainfall, run-on, runoff, and wind dispersal including the following:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This can include berming or grading the waste handling area to prevent run-on of storm water.
- Ensure trash container areas are screened or walled to prevent offsite transport of trash.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Locate storm drains away from immediate vicinity of the trash storage area and vice versa.

- Post signs on all dumpsters informing users that hazardous material are not to be disposed.
- Use other methods approved by the County.

(F) Implementation of additional BMPs as the County determines necessary to minimize pollutant generation.

(5) Site Design Requirements. Where applicable and feasible, the following Site Design BMPs must be implemented at all development projects:

(A) Natural storage reservoirs and drainage corridors (including topographic depressions, areas of permeable soils, natural swales, and ephemeral and intermittent streams) must be maintained or restored;

(B) Buffer zones must be provided for natural water bodies whenever technically feasible. When buffer zones are technically infeasible, other buffers such as trees and access restrictions are required;

(C) Natural areas within the project footprint should be conserved whenever possible;

(D) Streets, sidewalks, and parking lot aisles shall be constructed to the minimum widths necessary consistent with public safety;

(E) The impervious footprint of the project shall be minimized;

(F) Soil compaction to landscaped areas shall be minimized where doing so does not create an excessive risk of slope failure or erosion;

(G) Impervious surfaces shall be disconnected by disturbed pervious areas that can be used to infiltrate runoff;

(H) Landscaped or other pervious areas shall be designed and constructed to effectively receive and infiltrate, retain, and/or treat runoff from impervious areas prior to discharging to the stormwater conveyance system;

(I) Small collection strategies shall be located at, or as close as possible to, the source of the discharge;

(J) Permeable materials shall be used for projects with low traffic areas and appropriate soil conditions;

(K) Native or drought tolerant landscaping shall be used; and

(L) Precipitation shall be harvested and used for landscaping or other permitted use.

(b) Additional Requirements for Priority Development Projects. These requirements apply only to projects west of the Pacific/Salton Sea Divide. In addition to meeting the BMP requirements applicable to all other development projects as required by the NPDES Order and set forth above, the following are applicable to Priority Development Projects.

(1) Priority Development Projects include:

(A) New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.

(B) Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.

(C) New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses:

i. Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812).

ii. Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater.

iii. Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.

iv. Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

(D) New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an ESA. "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e., not commingled with flows from adjacent lands).

(E) New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses:

i. Automotive repair shops. This category is defined as a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.

ii. Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria:

a. 5,000 square feet or more; or
b. A projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

(F) New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.

(2) The following projects shall not be considered priority development projects:

(A) New or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria:

i. Designed and constructed to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas; or

ii. Designed and constructed to be hydraulically disconnected from paved streets or roads; or

iii. Designed and constructed with permeable pavements or surfaces in accordance with USEPA Green Streets guidance.

(B) Retrofitting or redevelopment of existing paved alleys, streets or roads that are designed and constructed in accordance with the USEPA Green Streets guidance. Compliance with any Green Street guidance developed by the County shall be deemed to satisfy this requirement as long as that guidance is as protective of water quality as the USEPA Green Streets guidance. Green Streets projects are subject to County review and approval.

(3) Special considerations for redevelopment projects:

(A) Where redevelopment results in the creation or replacement of impervious surface in an amount of less than fifty percent of the surface area of the previously existing development, then the structural BMP performance requirements defined in the BMP Design Manual apply only to the creation or replacement of impervious surface, and not the entire development; or

(B) Where redevelopment results in the creation or replacement of impervious surface in an amount of more than fifty percent of the surface area of the previously existing development, then the structural BMP performance requirements defined in the BMP Design Manual apply to the entire development.

(4) Priority Development Projects must submit a PDP Stormwater Quality Management Plan (PDP SWQMP), with an application for a County permit or other County approval, identifying the measures that will be used for stormwater and non-stormwater management for the project consistent with the County BMP Design Manual, and implement structural BMPs that conform to performance requirements described below:

(A) Each PDP must implement BMPs that are designed to retain (i.e., intercept, store, infiltrate, evaporate, and evapotranspire) onsite the pollutants contained in the volume of stormwater runoff produced from a 24-hour 85th percentile storm event (design capture volume); or

(B) If retaining the full design capture volume onsite is not technically feasible, biofiltration BMPs may be used. Biofiltration BMPs must be designed to have an appropriate hydraulic loading rate to maximize stormwater retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP, and must be sized to:

i. Treat 1.5 times the design capture volume not reliably retained onsite, or

ii. Treat the design capture volume not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the design capture volume not reliably retained onsite.

(C) If the County determines that biofiltration is not technically feasible, then a PDP may be allowed to utilize flow-thru treatment control BMPs to treat runoff leaving the site, AND mitigate for the design capture volume not reliably retained onsite pursuant to the requirements in Section 67.811(b)(6). Flow thru treatment control BMPs must be sized and designed to:

i. Remove pollutants from storm water to the MEP;

ii. Filter or treat either: 1) the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour, for each hour of a storm event, or 2) the maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity (for each hour of a storm event), as determined from the local historical rainfall record, multiplied by a factor of two;

iii. Be ranked with high or medium pollutant removal efficiency for the PDP's most significant pollutants of concern. Flow-thru treatment control BMPs with a low removal efficiency ranking will only be approved by the County if a feasibility analysis has been conducted which exhibits that implementation of flow-thru treatment control BMPs with high or medium removal efficiency rankings are infeasible for the applicable portion of a PDP.

(5) Hydromodification Management BMP Requirements. Priority Development Projects must implement BMPs to manage hydromodification that may be caused by stormwater runoff discharged from a project as follows:

(A) Hydromodification BMPs must be sized and designed such that post-project runoff conditions (flow rates and durations) will not exceed pre-development runoff conditions by more than 10 percent (for the range of flows that result in increased potential for erosion, or degraded instream habitat downstream of Priority Development Projects).

i. In evaluating the range of flows that results in increased potential for erosion of natural (non-hardened) channels, the lower boundary must correspond with the critical channel flow that produces the critical shear stress that initiates channel bed movement or that erodes the toe of channel banks.

(B) A Priority Development Project may be exempted from the hydromodification management BMP performance requirements where the project discharges stormwater runoff to:

i. Existing underground storm drains that discharge directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean; or

ii. Conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments or the Pacific Ocean; or

iii. An area identified by the County as appropriate for an exemption through a Watershed Management Area Analysis incorporated into a Water Quality Improvement Plan accepted by the RWQCB.

(C) PDP projects must avoid critical coarse sediment yield areas as identified by the County unless measures are implemented consistent with the BMP Design Manual that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water.

(6) A PDP may be allowed at the County's discretion to utilize offsite alternative compliance in lieu of complying with the storm water pollutant control and hydromodification BMP performance requirements in Section 67.811(b)(4)-(5). The PDP must mitigate for the portion of the pollutant load in the design capture volume not retained onsite and/or post-project runoff conditions not fully managed onsite consistent with a Water Quality Equivalency (WQE) Guidance Document accepted by the RWQCB. If a PDP is allowed to utilize offsite alternative compliance, flow-thru treatment control BMPs must be implemented to treat the portion of the design capture volume that is not reliably retained onsite. Flow-thru treatment control BMPs must be sized and designed in accordance with the requirements of Section 67.811(b)(4)(C). An offsite alternative compliance project for a private PDP may be partially or wholly located within the County Right-of-way upon approval of the Authorized Enforcement Officer. Any and all costs associated with the project shall be the sole responsibility of the applicant, including design and installation and the effective operation and maintenance in perpetuity of any and all treatment and hydromodification controls

required under this Chapter. The County shall retain the authority to recoup as necessary any and all such costs.

(7) The following requirements apply to the use of infiltration BMPs:

(A) Infiltration BMPs shall not cause or contribute to an exceedance of applicable groundwater quality objectives as set out in the RWQCB "Basin Plan" for the San Diego area;

(B) Runoff must undergo pretreatment such as sedimentation or filtration prior to infiltration;

(C) Pollution prevention and source control BMPs must be implemented at a level appropriate to protect groundwater quality at sites where infiltration BMPs are to be used;

(D) Infiltration BMPs must be adequately maintained to remove pollutants in stormwater to the MEP;

(E) The vertical distance from the base of any infiltration BMP to the seasonal high groundwater mark must be at least 10 feet. Where groundwater basins do not support beneficial uses, this vertical distance criteria may be reduced, provided groundwater quality is maintained;

(F) The soil through which infiltration is to occur must have physical and chemical characteristics (e.g., appropriate cation exchange capacity, organic content, clay content, and infiltration rate) which are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses;

(G) Infiltration BMPs must not be used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities as designated by the County , unless source control BMPs to prevent exposure of high threat activities are implemented, or runoff from such activities is first treated or filtered to remove pollutants prior to infiltration; and

(H) Infiltration BMPs must be located a minimum of 100 feet horizontally from any water supply wells and 25 feet from any septic system or as prescribed by County of San Diego Department of Environmental Health.

(8) A priority development project shall not receive a certificate of occupancy or other final approval allowing use of the project site or any portion thereof, until after all required structural BMPs have been constructed in accordance with the PDP SWQMP, BMP Design Manual, this Chapter, and the NPDES Order.

(c) Grandfathering under Previous Land Development Requirements. The requirements of Sections 67.811(a) and (b) apply to all development projects unless a prior lawful approval to proceed under the provisions of a prior MS4 Permit has been obtained from the County. The

Authorized Enforcement Official may partially or wholly waive these requirements for any private or public development project meeting the conditions of either Section 67.811(c)(1) or (2) below.

(1) Previous land development requirements may be allowed to apply to any portion or phase of a development project for which the Authorized Enforcement Official determines the County lacks the land use authority or legal authority to require the project to implement the requirements of Sections 67.811(a) and/or (b).

(2) At its discretion, the Authorized Enforcement Official may allow the requirements of the immediately prior MS4 Permit to apply to any portion or phase of a Priority Development Project for which all of the conditions below have been satisfied.

(A) Initial Approvals. Prior to the effective date of the current MS4 Permit provisions, the applicant must have:

i. Obtained an approval of a design that incorporates the storm water drainage system for the Priority Development Project in its entirety, including all applicable structural and hydromodification management BMPs consistent with the requirements of the prior MS4 permit. For public projects, a design stamped by the County Engineer or engineer of record for the project is considered an approved design; and

ii. Been issued a project permit or approval that authorizes the commencement of construction activities based on the design approved in Section 67.811(c)(2)(A)i;

For purpose of Section 67.811(c), the effective date of the 2013 MS4 Permit provisions is February 26, 2016.

(B) Demonstrated to the County's satisfaction that construction activities have commenced on any portion of the Priority Development Project site within 365 days prior to, or 180 days after, the effective date of the current MS4 Permit provisions, where construction activities are undertaken in reliance on the permit or approval.

(C) Subsequent Approvals. Within five years of the effective date of the current MS4 Permit provisions, the applicant must have obtained all subsequent project permits or approvals that are needed to implement the design initially approved in conformance with Section 67.811(c)(2)(A)i. After that time, any portion or phase of a Priority Development Project for which subsequent approvals have not been obtained is required to meet the updated requirements of Section 67.811(a) and (b).

(D) Substantial Conformance. The storm water drainage system for the Priority Development Project in its entirety, including all applicable structural pollutant treatment control and hydromodification management BMPs must remain in substantial conformity with the design initially approved in conformance with Section 67.811(c)(2)(A)i. Any portion or phase of a Priority Development

Project not maintaining substantial conformity with this design is required to meet the updated requirements of Sections 67.811(a) and (b).

SEC. 67.812. MAINTENANCE OF STRUCTURAL BMPS AND NATURAL SYSTEM MANAGEMENT PRACTICES.

(a) All existing and new development shall maintain the post-construction structural BMPs and natural system management practices (NSMP), relied upon to achieve and maintain compliance with this Chapter and NPDES Order. The owner of the land on which the BMPs and/or NSMPs are located or the person responsible for completing the BMPs and/or NSMPs as part of a development project shall implement, maintain, replace, or retrofit the pollutant control BMPs, hydromodification control BMPs and/or NSMPs as necessary to ensure pollutants are removed from stormwater to the MEP and all prohibited non-stormwater discharges are prevented from reaching the stormwater conveyance system or receiving waters. BMPs shall remain effective and function in the manner intended. All BMPs must be maintained to avoid the creation of nuisance or pollution associated with vectors (e.g. mosquitos, rodents, or flies).

(b) The owners and occupants of lands on which post-construction structural BMPs and/or NSMPs have been installed to meet the requirements of this Chapter and the NPDES Order shall ensure the maintenance and effective operation of those BMPs and/or NSMPs, and shall themselves maintain, replace, or retrofit those BMPs or NSMPs if other persons or entities who are also obliged to maintain those BMPs fail to do so. The owners and occupants shall provide documentation of such maintenance and effective operation annually and as requested by the authorized enforcement official.

(c) Primary responsibility to maintain post-construction structural BMPs and/or NSMPs may be transferred through a contract or other agreement. If that contract provides that it will be submitted to the County pursuant to this Chapter as part of a development permit application, and if that contract is so submitted, the person or entity accepting a maintenance obligation in such a contract or agreement will also be legally obliged to maintain that BMP or NSMP pursuant to this Chapter.

(d) For purposes of County enforcement, no contract or other agreement imposing an obligation to maintain a BMP or NSMP can relieve a person or entity of any obligation to maintain a BMP or NSMP imposed by this Chapter.

(e) Any developer or property owner who transfers ownership of land on which a post-construction, structural BMP and/or NSMP is located or will be located, or who otherwise transfers ownership of a post-construction structural BMP and/or NSMP or responsibility for the maintenance of such a BMP to another person or entity, shall provide clear written notice of the maintenance obligations associated with that BMP to the new or additional responsible party prior to that transfer. If directed, the developer or property owner must provide a copy of the written notice to the County.

(f) The proponents of any land development project for which post-construction structural BMPs and/or NSMPs are required must enter into a maintenance agreement for each practice. The maintenance agreement shall be provided to the County for review and approval prior to issuance of permits, and must include a plan for maintenance of all post-construction structural BMPs and NSMPs associated with the project. The plan shall specify the persons or entities responsible for maintenance activity, the persons or entities responsible for funding, schedules and procedures for

inspection and maintenance of the BMPs, worker training requirements, and any other activities necessary to ensure BMP or NSMP maintenance. The plan shall provide for servicing of all post-construction structural BMPs and NSMPs at least annually and for the retention of inspection and maintenance records for at least three (3) years. Maintenance agreements must be recorded and shall run with the land.

(g) The proponents of any development project that requires a discretionary County permit shall provide to the County for review and approval prior to issuance of permits, an executed, permanent easement onto the land on which post-construction structural BMPs or NSMPs will be located, and across other lands as necessary for access, to allow inspection and maintenance of those practices.

(h) The proponents of any project that requires a discretionary County permit shall provide to the County prior to issuance of such permit, proof of a mechanism acceptable to the County which will ensure ongoing long-term maintenance of all post-construction structural BMPs and NSMPs associated with the proposed project. The proponents shall be responsible for maintenance, repair and replacement of BMPs and/or NSMPs unless and until an alternative mechanism for ensuring maintenance is accepted by the County and becomes effective.

(i) The County or another public entity may accept responsibility for maintenance of any post-construction structural BMP or NSMP, under such conditions as the County or other public entity determines are appropriate. Where a maintenance obligation is proposed to be accepted by a public entity other than the County, the County shall be involved in the negotiations with that agency, and in negotiations with the resource agencies responsible for issuing permits for the construction or maintenance of the post-construction, structural BMP or NSMP. The County must be identified as a third party beneficiary empowered to enforce any such maintenance agreement.

SEC. 67.813. INSPECTION/SAMPLING.

(a) Authorized enforcement officials may inspect facilities, activities and residences subject to this Chapter at reasonable times and in a reasonable manner to carry out the purposes of this Chapter. If entry for a regulatory inspection is refused by the owner or operator, or by the occupant of a residence, an inspection warrant shall be obtained prior to inspection.

(b) When any new post-construction structural BMP is installed on private property as part of a project that requires a County permit, in order to comply with this Chapter, the property owner shall grant to the County an easement to enter the property at reasonable times and in a reasonable manner to ensure that the BMP is working properly. This includes the right to enter the property without prior notice once per year or as otherwise required by the NPDES Order for routine inspections, to enter as needed for additional inspections when the County has a reasonable basis to believe that the BMP is not working properly, to enter for any needed follow-up inspections, and to enter when necessary for abatement of a nuisance or correction of a violation of this Chapter.

(c) Inspections may include all actions necessary to determine whether any illegal discharges or illicit connections exist, whether the BMPs installed and implemented are adequate to comply with this Chapter, whether those BMPs are being properly maintained, and whether the facility or activity complies with the other requirements of this Chapter. This may include but may not be limited to sampling, metering, visual inspections, and records review. Where samples are collected the owner or operator may request and receive split samples. Records, reports, analyses, or other information

required under this Chapter may be inspected and copied, and photographs taken to document a condition and/or a violation of this Chapter.

SEC. 67.814. ENFORCEMENT.

(a) General. The authorized enforcement official and each agent or deputy thereof who is assigned to duties which include the enforcement of this Chapter in the San Diego County Code of Regulatory Ordinances, and any peace officer, are authorized to enforce the provisions of this Chapter, including the activities set forth in this Section below.

(b) Order to Stop, Repair Work and Bonds. Whenever the authorized enforcement official determines that any activity regulated by this Chapter causes or threatens to cause the discharge of pollutants in stormwater, the prohibited discharge of non-stormwater to the stormwater conveyance system or receiving waters, or otherwise violate a requirement of this Chapter, he or she may order work to be stopped and/or repairs, BMPs, pollution prevention practices or other corrections to be made, by serving written notice on the owner, permittee or any person engaged in the doing or causing such activity to be performed, and such persons shall immediately stop such work until authorized by the authorized enforcement official in writing to proceed. The authorized enforcement official may require performance and payment bonds for the full cost of any repair work in a form meeting the substantive requirement for bonds specified by the County Subdivision Ordinance.

(c) Notice of Violation. The authorized enforcement official may issue and enforce Notices of Violation and Notices of Ineligibility for Land Development, pursuant to this Chapter.

(d) Administrative Remedies, Fines and Liens. The authorized enforcement official may pursue the Administrative Remedies set forth at Division 8 of Title 1 of this Code, including the issuance of Administrative Citations pursuant to Chapter 1 (commencing with Section 18.101) of said Division 8. Unpaid administrative citations may be recorded against the property on which the violation occurred and may be foreclosed in any manner allowed by State law or County ordinance for the foreclosure of liens.

(e) Arrests and Citations. The authorized enforcement official shall have the power to make arrests for violations of this Chapter and State laws which he or she has a duty to enforce, and to issue citations for such violations. Any person so arrested who does not demand to be taken before a magistrate may instead be cited in the manner prescribed in Chapter 5C (commencing with Section 853.5) of Title 3, Part 2 of the Penal Code. The authorized enforcement official may arrest an owner without warrant whenever they have reasonable cause to believe that the person arrested has committed a violation of this Chapter, provided that the officer or employee making the arrest shall have completed a course of training that meets the minimum standards prescribed by the Commission on Peace Officer Standards and Training as prescribed by Section 832(a) of the Penal Code. An officer or employee making an arrest under this Section shall follow the citation-release procedures prescribed by the Penal Code.

(f) Non-Liability. The authorized enforcement official charged with the enforcement of this Chapter, acting in good faith and without malice for the County in the discharge of his duties, shall not thereby render himself or herself liable personally and he or she is hereby relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or by reason of any act or omission in the discharge of his duties. Any suit brought against

the authorized enforcement official, because of such act or omission performed by him or her in the enforcement of any provisions of this Chapter, shall be defended by the legal department of the County until final termination of the proceedings.

SEC. 67.815. VIOLATIONS - CRIMINAL PENALTIES.

(a) Any person violating any provision of this Chapter shall be deemed guilty of a misdemeanor, unless, in the discretion of the prosecutor, it is charged as an infraction. A person convicted of a third or subsequent such violation within two years from the date of the first conviction shall be deemed guilty of a misdemeanor.

(b) Any person convicted of an infraction under this Chapter shall be punished by a fine not exceeding one hundred dollars for the first violation, two hundred dollars for the second violation within one year, and five hundred dollars for each subsequent violation within one year. Any person convicted of a misdemeanor under this Chapter shall be punished by imprisonment in the County jail for a term not exceeding six months, or by a fine not exceeding one thousand dollars, or both.

(c) Each day or any portion of a day that any person violates or continues to violate provisions of this Chapter constitutes a separate offense and may be charged and punished separately without awaiting conviction on any prior offense. The penalties imposed by this Section are in addition to penalties imposed under other provisions of this Code and other County ordinances.

(d) Paying a fine or serving a jail sentence shall not relieve any owner or permittee from responsibility for correcting any condition which violates any provision of this Chapter.

SEC. 67.816. VIOLATIONS - PUBLIC NUISANCE.

In addition to any penalty prescribed for violation of this Code, any discharge of pollutants in stormwater, prohibited discharge of non-stormwater to the stormwater conveyance system or receiving waters, or act done contrary to the provisions of this Chapter is unlawful and a public nuisance. Any work performed without a Standard SWQMP, PDP SWQMP, SWPPP or other plan required by this Chapter prior to commencement of work, regardless of whether such failure is due to neglect or refusal, shall be prima facie evidence that a public nuisance has been committed. A public nuisance may be abated in accordance with the Uniform Public Nuisance Abatement Procedure contained in Chapter 2, Division 6, Title 1 (commencing with Section 16.201) of this Code or, upon order of the Board of Supervisors, the County Counsel is authorized to commence necessary proceedings provided by law to abate, remove and/or enjoin such public nuisance.

SEC. 67.817. VIOLATIONS - DENIAL OF SUBSEQUENT PERMITS AND OCCUPANCY.

Any work performed on a priority development project or land disturbance activities on a construction project performed without first obtaining a Standard SWQMP, PDP SWQMP, SWPPP or other plan required by this Chapter and any violation of one or more conditions contained in such a plan where the violation results in or threatens to result in the discharge of pollutants in stormwater or a prohibited, non-stormwater discharge to the stormwater conveyance system or receiving waters, shall be grounds for denying for five years all applications for grading permits, administrative permits, site plans, use permits, major and minor subdivisions, rezones, specific plans, specific plan amendments, general plan amendments and other land development applications proposed for the property on which the violation occurred. The "property" shall be deemed to include the lot or parcel

on which the violation occurred, together with all adjacent parcels owned by the same person or entity or which are part of a common plan of development. The five-year period shall commence from the date of the violation, if documented, or from the date of discovery of the violation. The Board of Supervisors may waive the penalty imposed by this subsection, for good cause. Any such waiver, if granted, shall in no way relieve the owner or applicant for any such subsequent land development application, of their duty to include the environmental effects of the violation in any environmental analysis performed for the subsequent application, to restore or rehabilitate the site, implement such BMPs and/or pollution prevention practices as may be necessary to resolve the violation, and provide substitute or compensating resources, or perform other appropriate measures to mitigate the adverse effects of the illegal activity.

SEC. 67.818. VIOLATIONS - INJUNCTIVE OR DECLARATORY RELIEF.

In addition to or in lieu of other remedies specified in this Chapter, any violation of this Chapter may be enforced by a judicial action for injunctive or declaratory relief.

SEC. 67.819. VIOLATIONS - CIVIL PENALTIES.

(a) As part of a civil action filed by the County to enforce provisions of this Chapter, a court may assess a maximum civil penalty of $2,500 per violation of this Chapter for each day during which any violation of any provision of this Chapter is committed, continued, permitted or maintained by such person(s).

(b) In determining the amount of any civil liability to be imposed pursuant to this Chapter, the superior court shall take into consideration the nature, circumstances, extent, and gravity of the violation or violations, whether any discharge caused by the violation is susceptible to cleanup or abatement, and, with respect to the violator, the ability to pay, the effect on ability to continue in business, the extent of any advantage gained by an unfair business practice, any voluntary cleanup efforts undertaken, any prior history of violations, the degree of culpability, economic savings, if any, resulting from the violation, and such other matters as justice may require.

SEC. 67.820. VIOLATIONS - COST RECOVERY.

In addition to other penalties and remedies permitted in this Chapter, the following may be awarded without monetary limitations in any civil action:

(a) Costs to investigate, inspect, monitor, survey, or litigate;

(b) Costs to place or remove BMPs; costs to correct any violation; and costs to end any adverse effects of a violation;

(c) Compensatory damages for losses to the County or any other plaintiff caused by violations; and/or

(d) Restitution to third parties for losses caused by violations.

SEC. 67.821. NOTICE OF INELIGIBILITY FOR LAND DEVELOPMENT.

(a) If the authorized enforcement official believes that work has been performed on a priority development project or land disturbance activities on a construction project have been performed without first obtaining a Standard SWQMP, PDP SWQMP, SWPPP or other plan required by this Chapter and any violation of one or more conditions contained in such a plan where the violation results in or threatens to result in the discharge of pollutants in stormwater or a prohibited, non-stormwater discharge to the stormwater conveyance system or receiving waters, he or she may deliver to the owner of the property upon which the activity occurred a Notice of Intent to File a Notice of Ineligibility for Land Development with the Departments of Planning and Development Services and Public Works. The notice of intent shall be either served upon the owner personally or be both mailed (via certified mail, return receipt requested) to the owner at the address shown on the most recent tax assessment records and posted on the property. The notice of intent shall state the authorized enforcement official's intention to file the Notice of Ineligibility for Land Development, and shall fix a location, time and date (which shall not be less than fifteen days after the delivery of the notice), at which the authorized enforcement official will hold a hearing at which the owner may submit to the authorized enforcement official written comments or reasons why a Notice of Ineligibility for Land Development should not be filed. The authorized enforcement official shall hold the hearing at the appointed time, shall consider any information provided by the owner, and shall determine whether a violation occurred, whether it has been remedied, and whether to file a Notice of Ineligibility for Land Development.

(b) If the authorized enforcement official files a Notice of Ineligibility for Land Development, and for so long as said notice remains in effect, no application for a building permit, administrative permit, site plan, use permit, variance, tentative parcel map, tentative map, parcel map or final map or any other permit for the development of the subject property shall be approved. All such applications shall be denied, and the authorized enforcement official receiving such an application shall not be required to undertake further review of the application. The "subject property" shall be deemed to include the lot or parcel on which the violation occurred, together with all adjacent parcels owned by the same person or entity or which are part of a common plan of development. The Notice of Ineligibility for Land Development shall remain in effect until the authorized enforcement official files a "Release of Notice of Ineligibility for Land Development," which the authorized enforcement official shall file when the Standard SWQMP, PDP SWQMP, SWPPP or other plan as required by this Chapter has been obtained, and that all necessary BMPs, pollution prevention practices and other site conditions or activities have been inspected and approved in writing by the authorized enforcement official as being in compliance with the requirements of this Chapter.

Section 3. Within 15 days after adoption of this ordinance, a summary hereof shall be published once, with the names of the members of this Board voting for and against the same in the San Diego Commerce, a newspaper of general circulation published in the County of San Diego. This ordinance shall be effective thirty days after its adoption.

APPROVED AS TO FORM AND LEGALITY
COUNTY COUNSEL

By: _____
Thomas Deak, Sr. Deputy County Counsel

PASSED, APPROVED, AND ADOPTED by the Board of Supervisors of the County of San Diego this 27th day of January, 2016.

RON ROBERTS
Chairman, Board of Supervisors
County of San Diego, State of California

The above Ordinance was adopted by the following vote:

AYES: Cox, Jacob, D. Roberts, R. Roberts, Horn

ATTEST my hand and the seal of the Board of Supervisors this 27th day of January, 2016.

DAVID HALL
Clerk of the Board of Supervisors

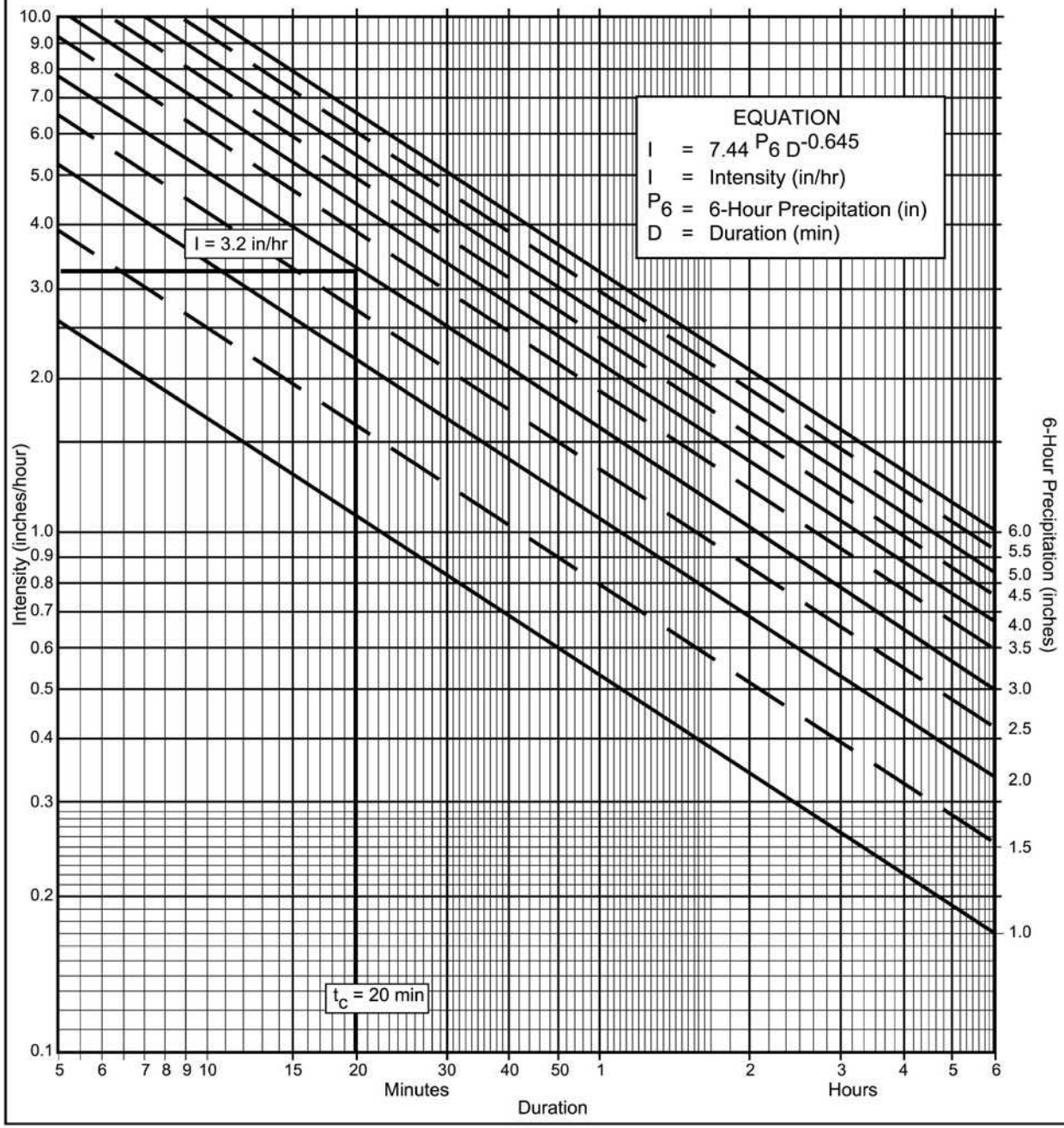
By
Elizabeth Miller, Deputy

Ordinance No. 10410 (N.S.)

01/27/16 (7)

Appendix F

Intensity-Duration Design Chart



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 50 year

(b) P_6 = 3 in., P_{24} = 5.5, $\frac{P_6}{P_{24}}$ = 54.5 %(2)

(c) Adjusted P_6(2) = 3 in.

(d) t_x = 20 min.

(e) I = 3.2 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Example

FIGURE 3-2

Appendix G

HEC-RAS / Streamstats

Inflow Identification Table

Boulder Brush Facilities HECRAS Cross Section Peak 100-Year Flow		
Cross Section #	Streamstats File Name	100-Year Peak Flow (cfs)
944	6-3-1000	5970
946	6-3-1000	5970
946	6-3-1000	5970
956	6-3-1000	5970
958	5-5-1000-Actual	5840
963	5-5-1000-Actual	5840
966	5-3-1000	5110
974	3-3-996	5020
979	3-3-1000	4920
987	3-1-991	2760
991	3-1-995	2350
996	3-1-1000	2230
1000	4-1-1000	2190
11000	9-1-1000	734
12000	9-2-1000	598
13000	9-3-1000	598
14000	9-4-1000	951
15000	9-3-1000 & 9-4-1000	1549
18000	1-1-1000	1040
18996	1-2-995	1350
19000	1-2-1000	734
21000	6-2-1000	849
22000	5-6-1000	598
23000	5-4-1000	598
24000	5-2-1000	598
25000	3-2-1000	849
29985	2-5-1000	3870
29992	2-3-1000	3770
30000	2-1-1000	3610
31000	2-2-1000	734
32000	2-4-1000	421
40000	6-4-1000	951
50000	8-1-1000	2470
Southern Gen Tie Cross Sections		
700	700	6230
800	800	5940
1000	1000	5780
1100; 1400	1100	2200 (1100 cfs per x-section)
1200	1200	421
1300	1300	1100

Appendix H

StreamStats Reports

1-1-1000

Region ID: CA
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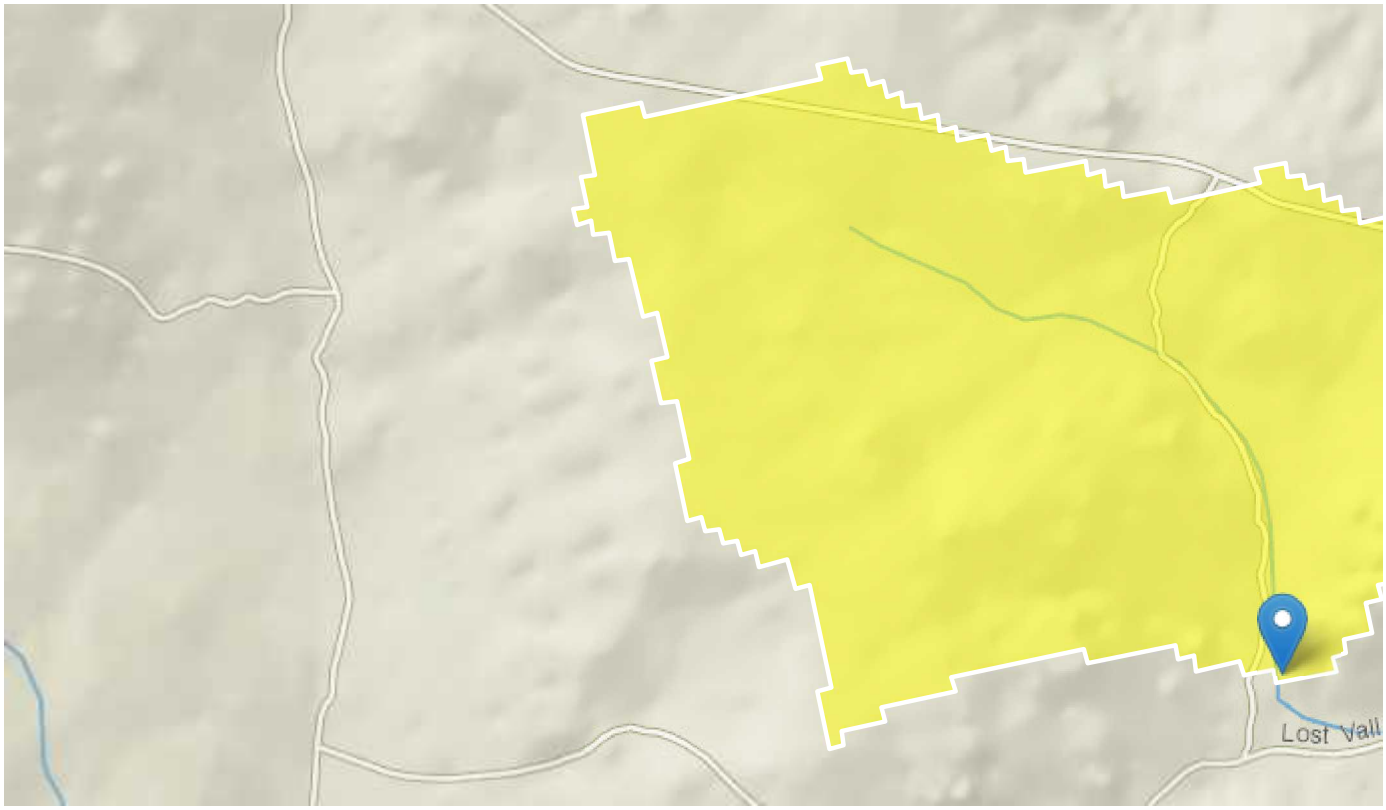

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.6	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.6	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	7.95	ft^3/s	214
5 Year Peak Flood	46.3	ft^3/s	226
10 Year Peak Flood	117	ft^3/s	248
25 Year Peak Flood	311	ft^3/s	298
50 Year Peak Flood	587	ft^3/s	357
100 Year Peak Flood	1040	ft^3/s	444
200 Year Peak Flood	1750	ft^3/s	575
500 Year Peak Flood	3310	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

1-2-995

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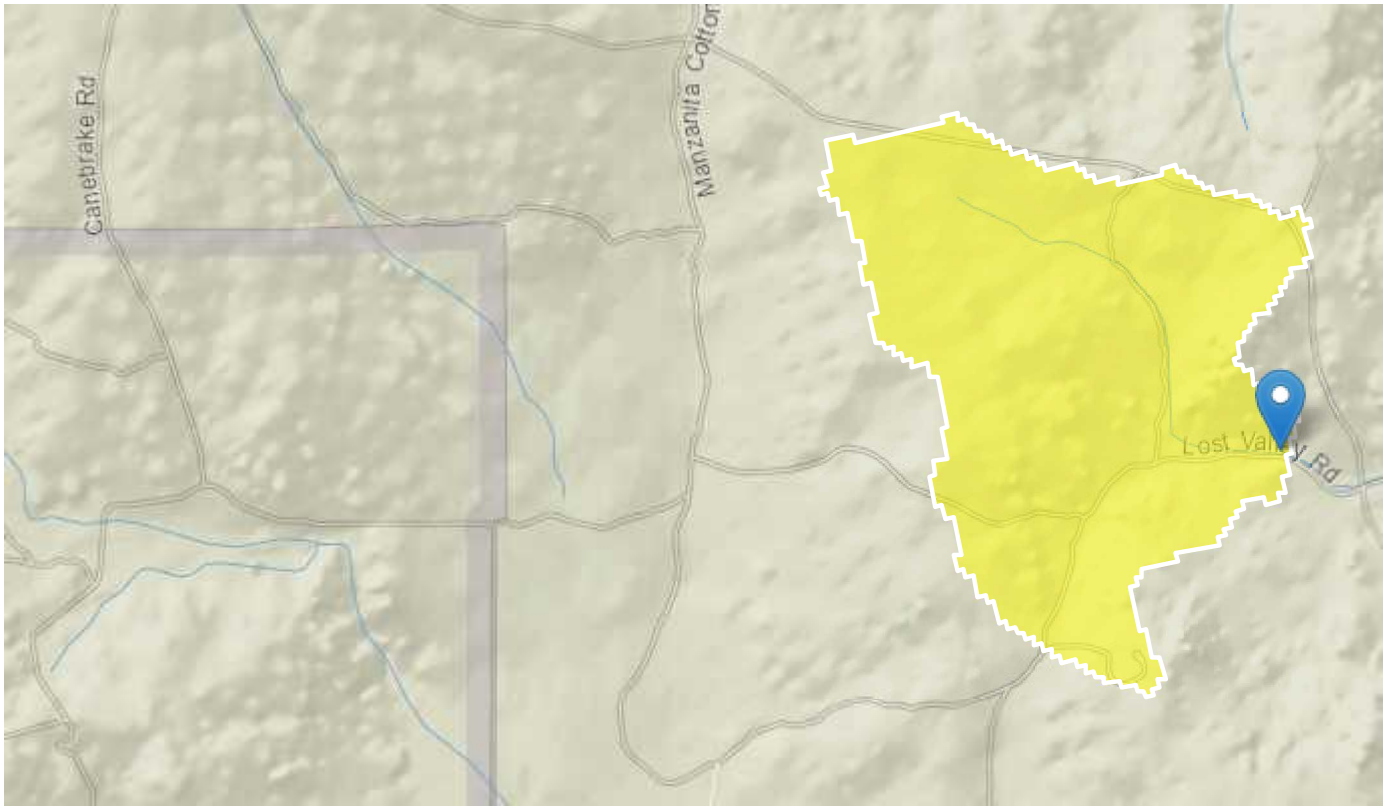

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	10.3	ft^3/s	214
5 Year Peak Flood	60	ft^3/s	226
10 Year Peak Flood	151	ft^3/s	248
25 Year Peak Flood	403	ft^3/s	298
50 Year Peak Flood	760	ft^3/s	357
100 Year Peak Flood	1350	ft^3/s	444
200 Year Peak Flood	2270	ft^3/s	575
500 Year Peak Flood	4280	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

1-2-1000

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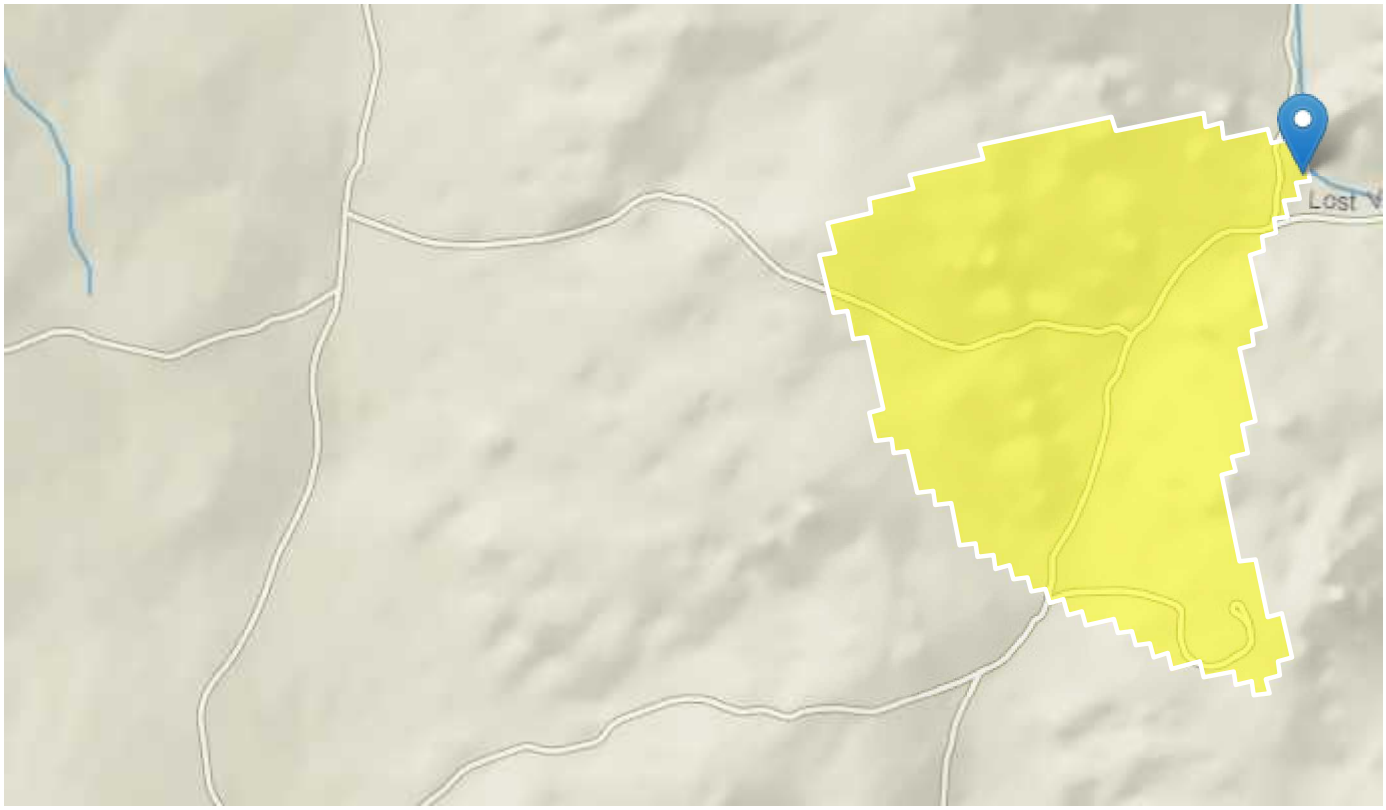

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.3	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.3	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	5.6	ft^3/s	214
5 Year Peak Flood	32.6	ft^3/s	226
10 Year Peak Flood	82.1	ft^3/s	248
25 Year Peak Flood	219	ft^3/s	298
50 Year Peak Flood	413	ft^3/s	357
100 Year Peak Flood	734	ft^3/s	444
200 Year Peak Flood	1230	ft^3/s	575
500 Year Peak Flood	2330	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

2-1-1000

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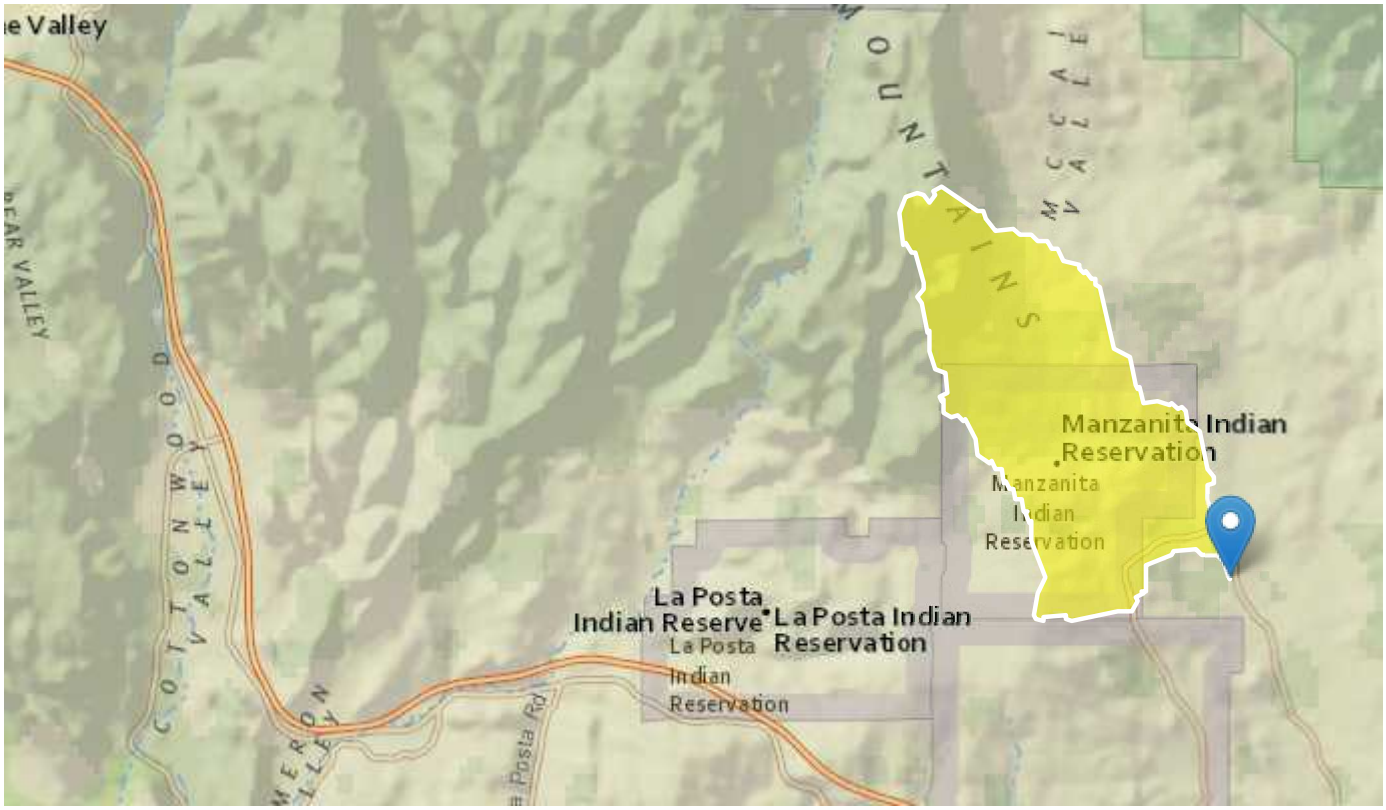

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	7	square miles

Peak-Flow Statistics Parameters [100 Percent (7.05 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (7.05 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	27.6	ft^3/s	214
5 Year Peak Flood	161	ft^3/s	226
10 Year Peak Flood	404	ft^3/s	248
25 Year Peak Flood	1080	ft^3/s	298
50 Year Peak Flood	2030	ft^3/s	357
100 Year Peak Flood	3610	ft^3/s	444
200 Year Peak Flood	6080	ft^3/s	575
500 Year Peak Flood	11500	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

2-2-1000

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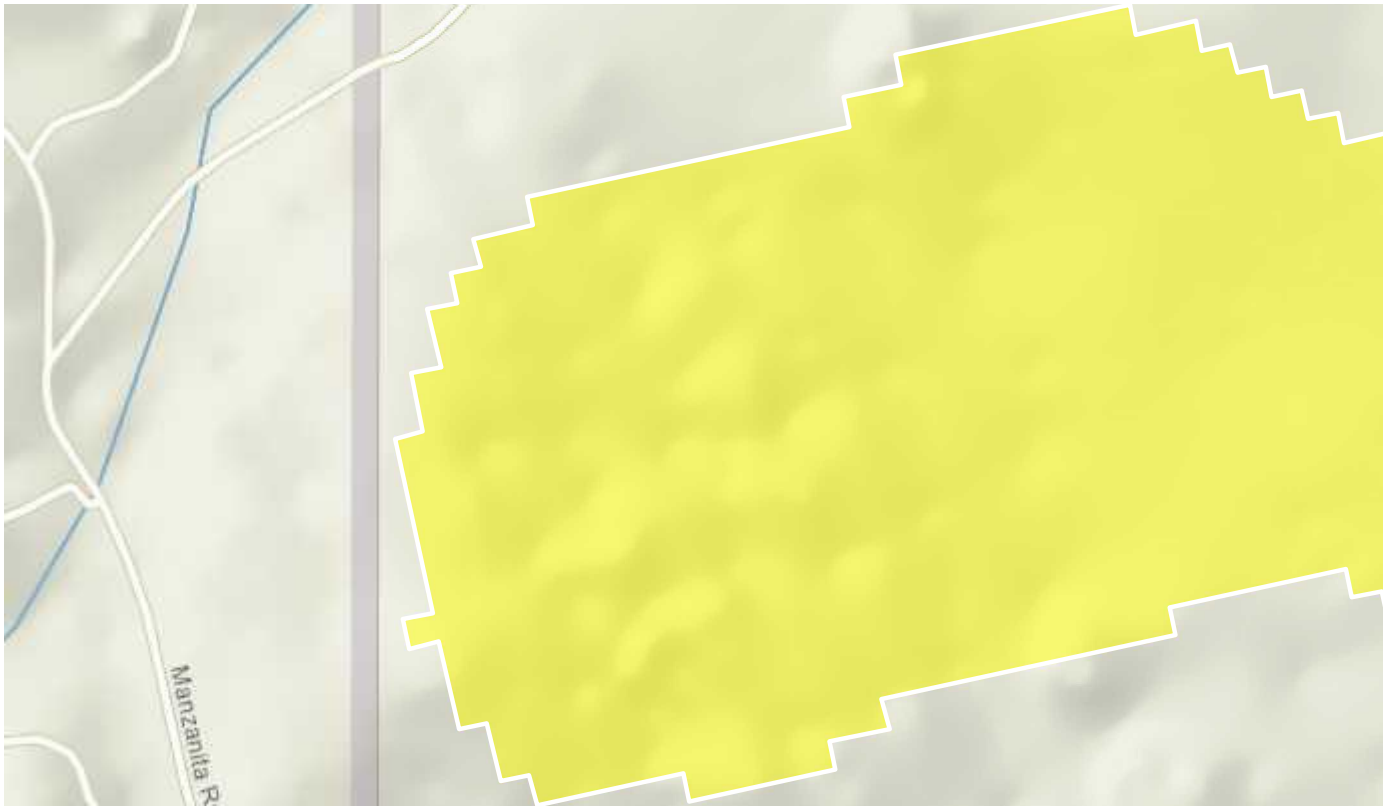

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.3	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.3	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	5.6	ft^3/s	214
5 Year Peak Flood	32.6	ft^3/s	226
10 Year Peak Flood	82.1	ft^3/s	248
25 Year Peak Flood	219	ft^3/s	298
50 Year Peak Flood	413	ft^3/s	357
100 Year Peak Flood	734	ft^3/s	444
200 Year Peak Flood	1230	ft^3/s	575
500 Year Peak Flood	2330	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

2-3-1000

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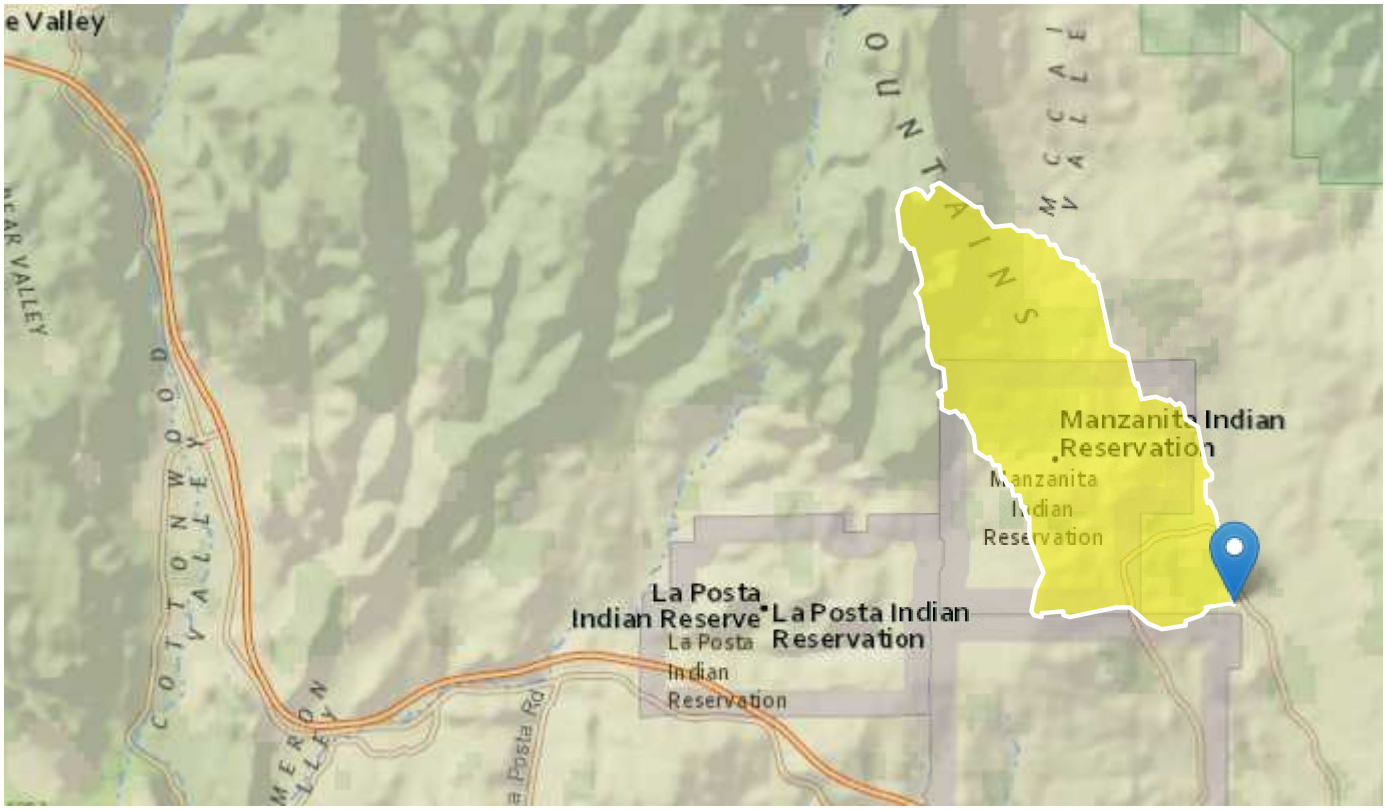

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	7.6	square miles

Peak-Flow Statistics Parameters [100 Percent (7.64 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.6	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (7.64 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	28.7	ft^3/s	214
5 Year Peak Flood	167	ft^3/s	226
10 Year Peak Flood	421	ft^3/s	248
25 Year Peak Flood	1120	ft^3/s	298
50 Year Peak Flood	2120	ft^3/s	357
100 Year Peak Flood	3770	ft^3/s	444
200 Year Peak Flood	6330	ft^3/s	575
500 Year Peak Flood	11900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

2-4-1000

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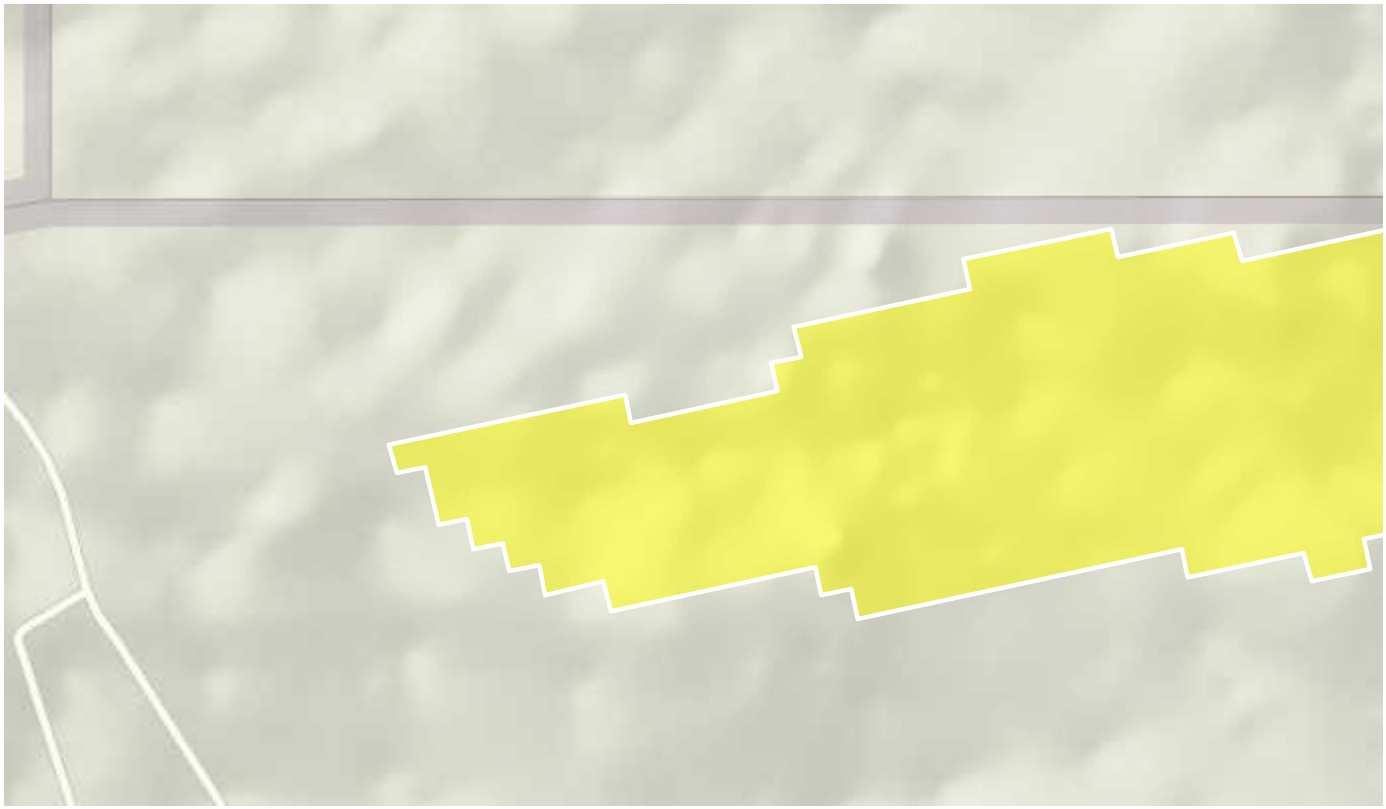

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.1	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.1	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	3.21	ft^3/s	214
5 Year Peak Flood	18.7	ft^3/s	226
10 Year Peak Flood	47.1	ft^3/s	248
25 Year Peak Flood	126	ft^3/s	298
50 Year Peak Flood	237	ft^3/s	357
100 Year Peak Flood	421	ft^3/s	444
200 Year Peak Flood	708	ft^3/s	575
500 Year Peak Flood	1330	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

2-5-1000

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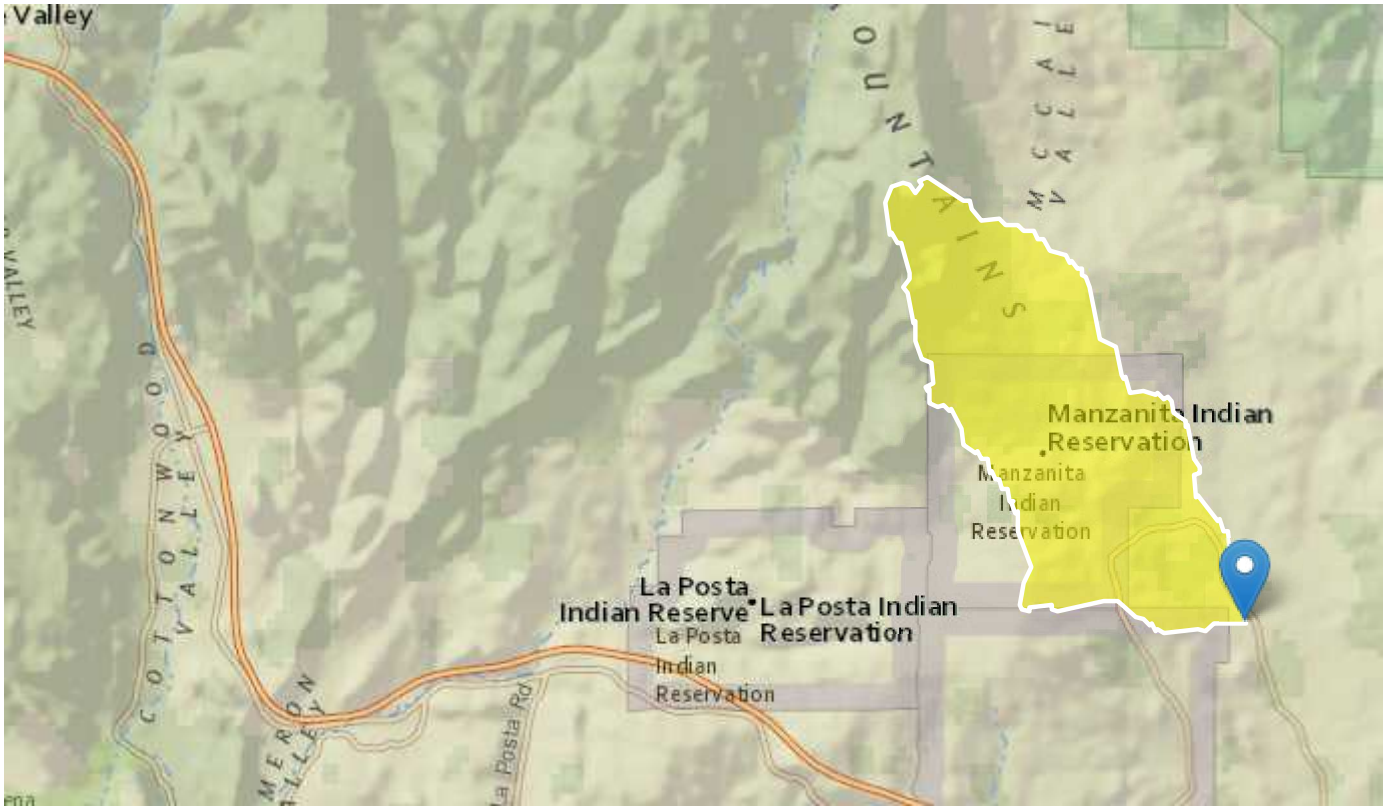

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	8	square miles

Peak-Flow Statistics Parameters [100 Percent (7.99 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	8	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (7.99 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	29.5	ft^3/s	214
5 Year Peak Flood	172	ft^3/s	226
10 Year Peak Flood	432	ft^3/s	248
25 Year Peak Flood	1150	ft^3/s	298
50 Year Peak Flood	2180	ft^3/s	357
100 Year Peak Flood	3870	ft^3/s	444
200 Year Peak Flood	6500	ft^3/s	575
500 Year Peak Flood	12300	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-1-991

Region ID: CA
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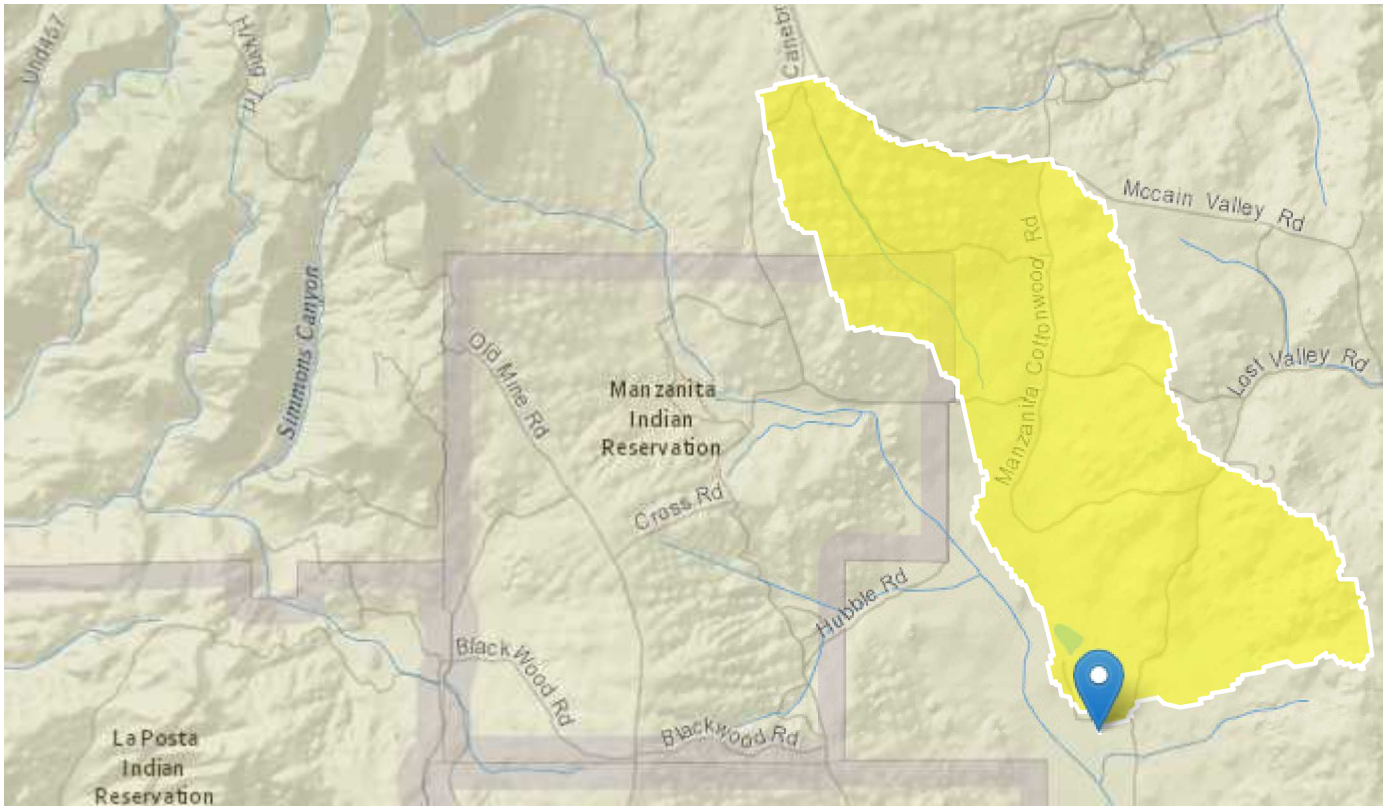

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	4.1	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.1	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	21	ft^3/s	214
5 Year Peak Flood	123	ft^3/s	226
10 Year Peak Flood	308	ft^3/s	248
25 Year Peak Flood	823	ft^3/s	298
50 Year Peak Flood	1550	ft^3/s	357
100 Year Peak Flood	2760	ft^3/s	444
200 Year Peak Flood	4640	ft^3/s	575
500 Year Peak Flood	8740	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-1-995

Region ID: CA
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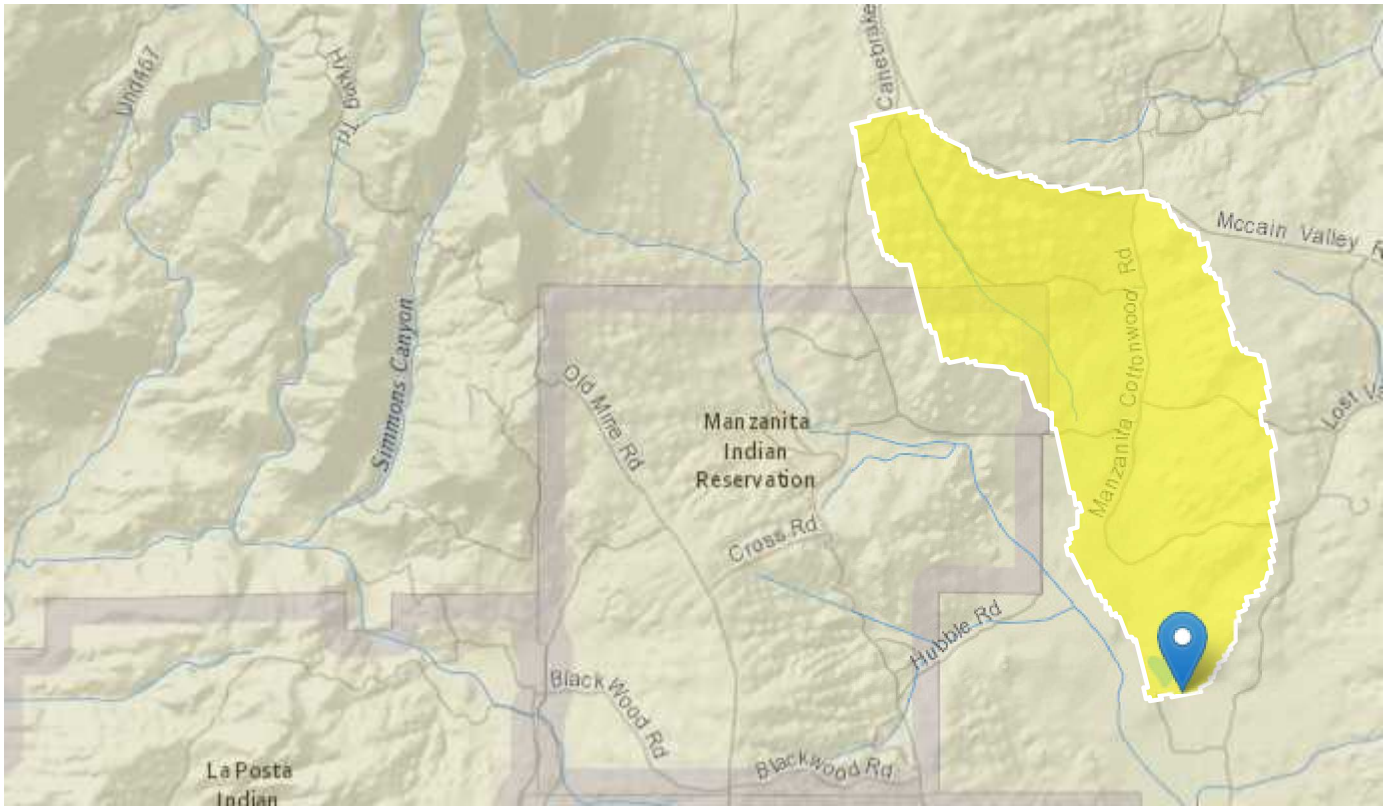

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	18	ft^3/s	214
5 Year Peak Flood	105	ft^3/s	226
10 Year Peak Flood	263	ft^3/s	248
25 Year Peak Flood	703	ft^3/s	298
50 Year Peak Flood	1330	ft^3/s	357
100 Year Peak Flood	2350	ft^3/s	444
200 Year Peak Flood	3960	ft^3/s	575
500 Year Peak Flood	7460	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-1-1000

Region ID: CA
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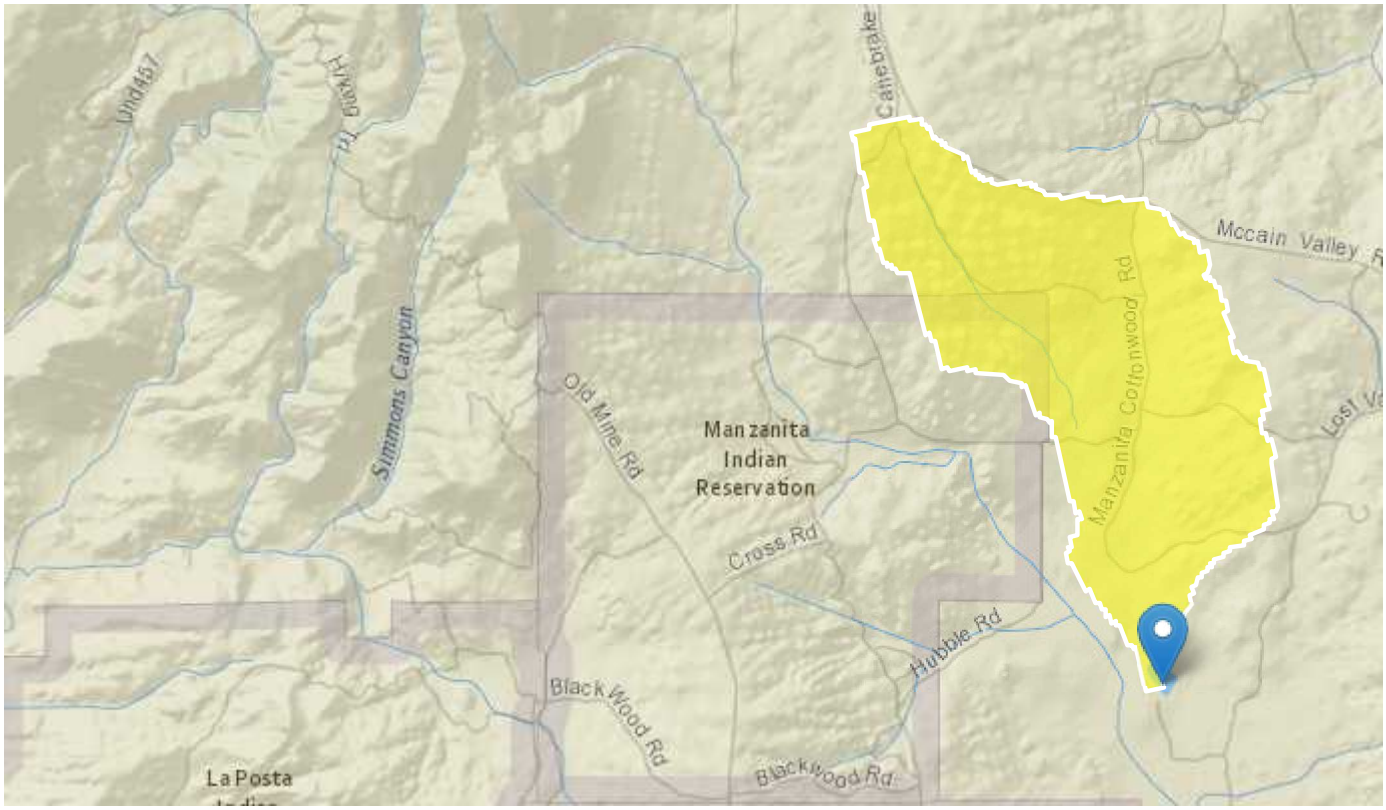

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.7	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.7	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	17	ft^3/s	214
5 Year Peak Flood	99.2	ft^3/s	226
10 Year Peak Flood	250	ft^3/s	248
25 Year Peak Flood	666	ft^3/s	298
50 Year Peak Flood	1260	ft^3/s	357
100 Year Peak Flood	2230	ft^3/s	444
200 Year Peak Flood	3750	ft^3/s	575
500 Year Peak Flood	7070	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-2-1000

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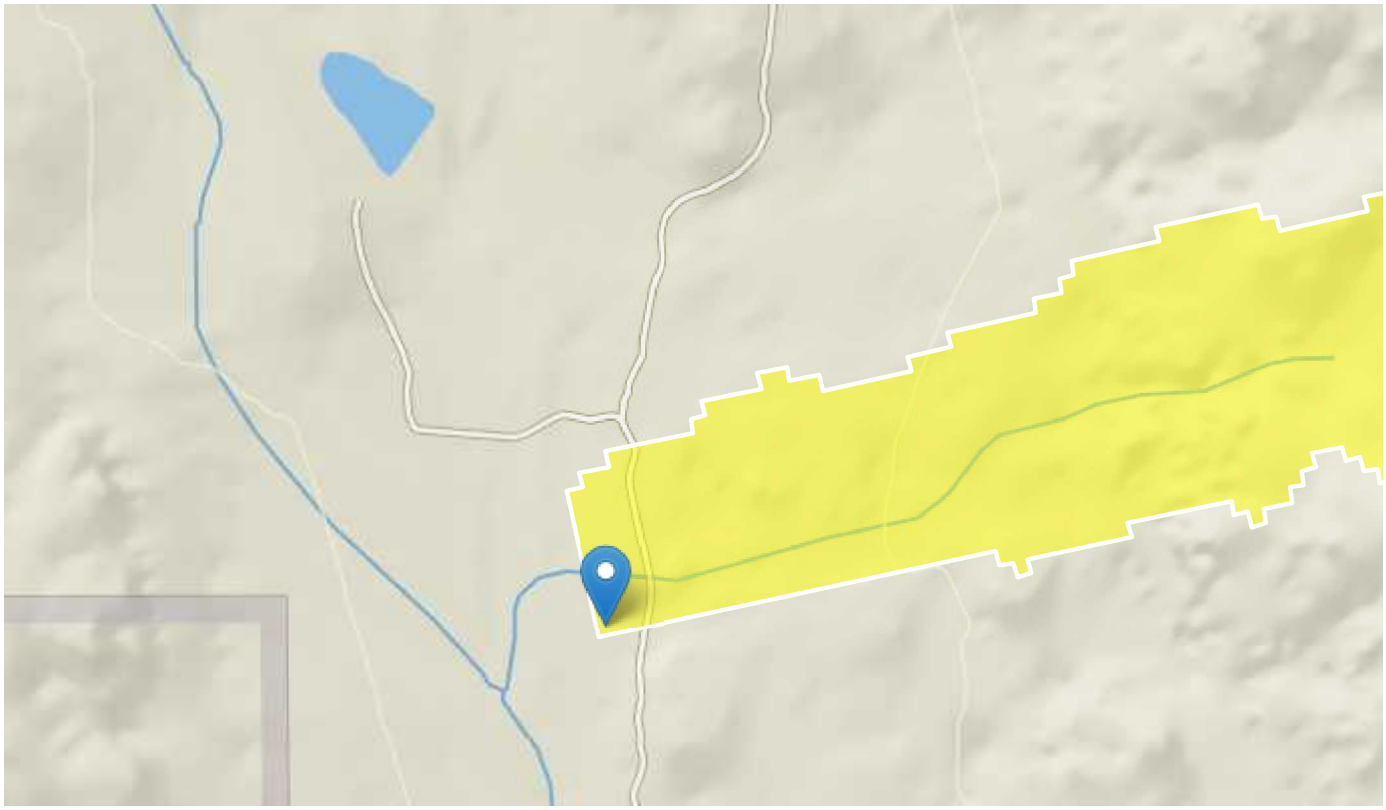

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.4	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.4	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	6.48	ft^3/s	214
5 Year Peak Flood	37.7	ft^3/s	226
10 Year Peak Flood	95	ft^3/s	248
25 Year Peak Flood	253	ft^3/s	298
50 Year Peak Flood	478	ft^3/s	357
100 Year Peak Flood	849	ft^3/s	444
200 Year Peak Flood	1430	ft^3/s	575
500 Year Peak Flood	2690	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-3-996

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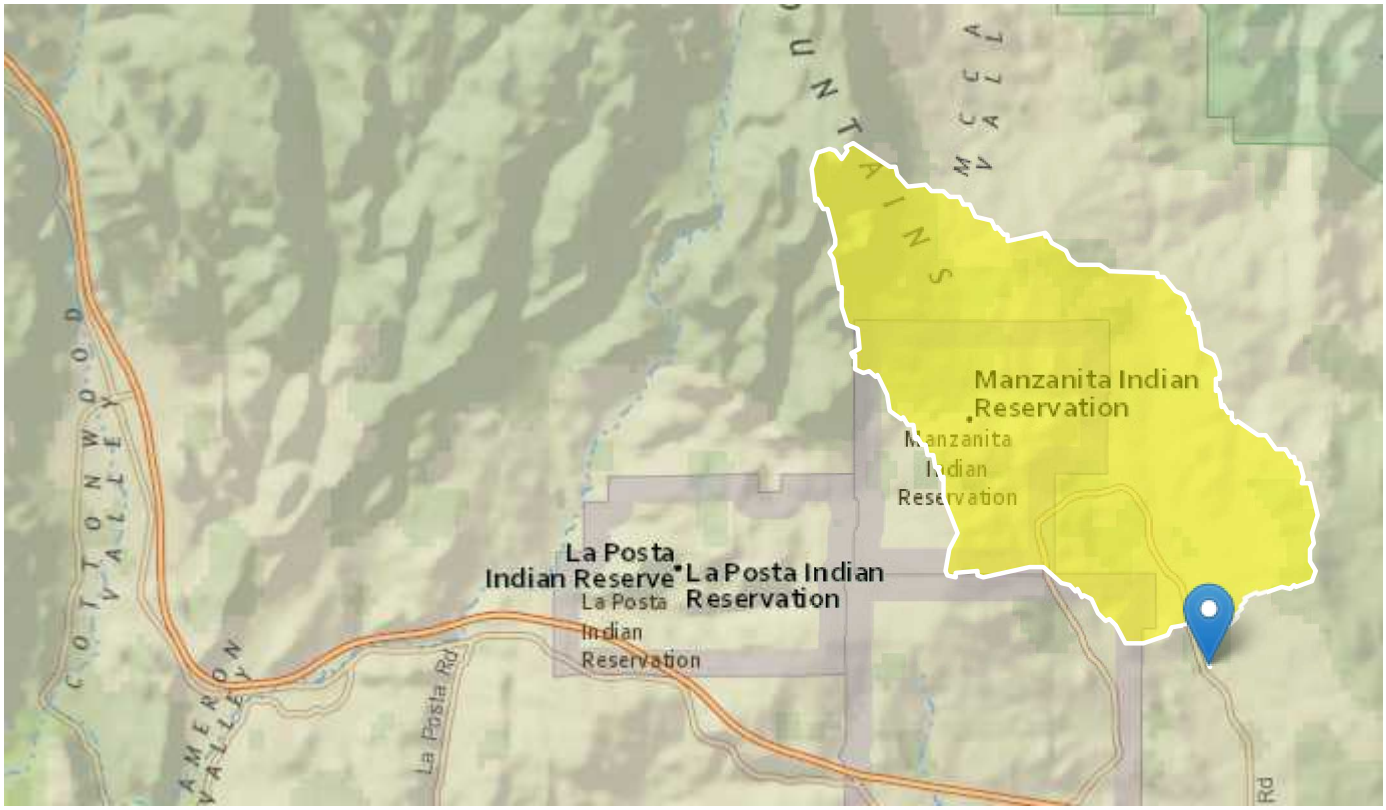

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	13.4	square miles

Peak-Flow Statistics Parameters [100 Percent (13.4 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	13.4	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (13.4 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	38.3	ft^3/s	214
5 Year Peak Flood	223	ft^3/s	226
10 Year Peak Flood	561	ft^3/s	248
25 Year Peak Flood	1500	ft^3/s	298
50 Year Peak Flood	2830	ft^3/s	357
100 Year Peak Flood	5020	ft^3/s	444
200 Year Peak Flood	8440	ft^3/s	575
500 Year Peak Flood	15900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

3-3-1000

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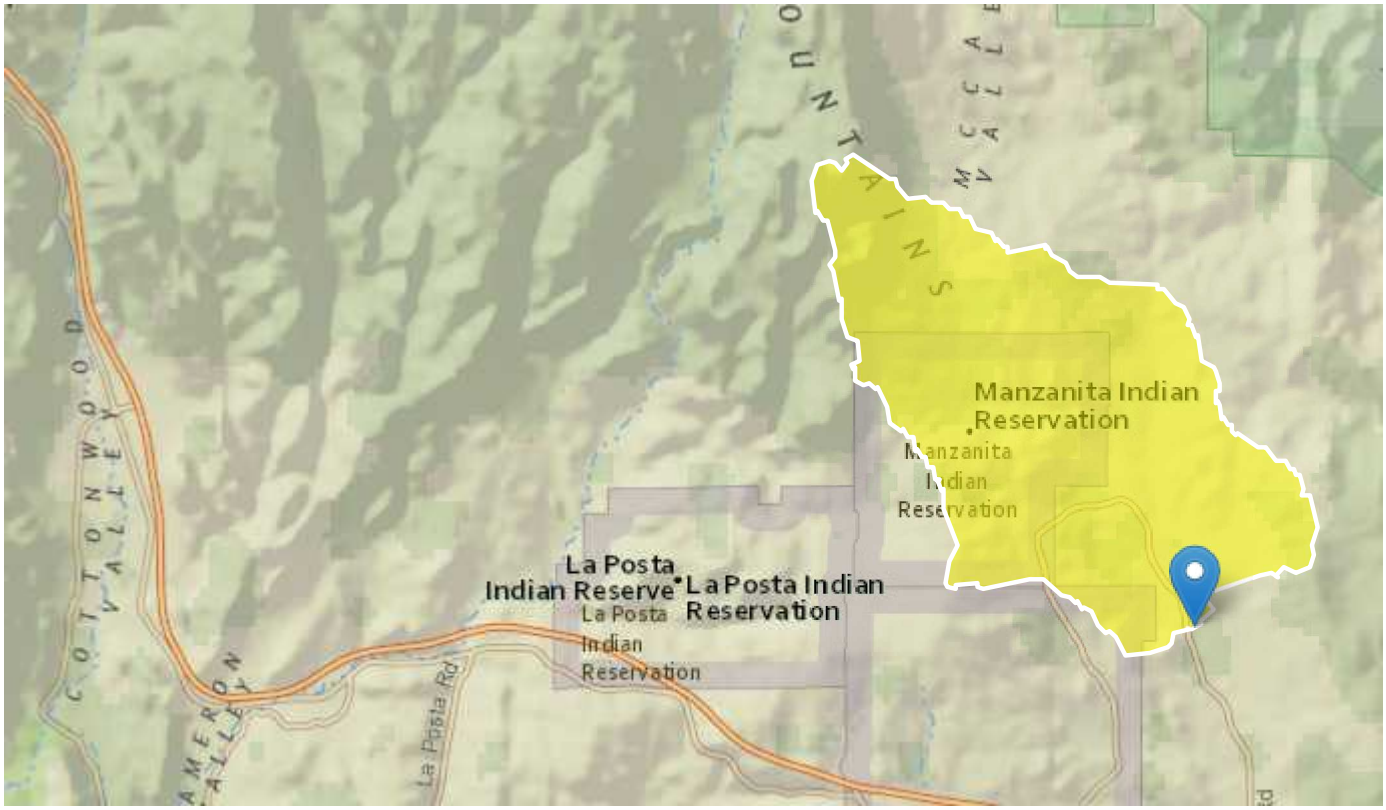

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	12.9	square miles

Peak-Flow Statistics Parameters [100 Percent (12.9 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	12.9	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (12.9 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	37.6	ft^3/s	214
5 Year Peak Flood	219	ft^3/s	226
10 Year Peak Flood	551	ft^3/s	248
25 Year Peak Flood	1470	ft^3/s	298
50 Year Peak Flood	2770	ft^3/s	357
100 Year Peak Flood	4920	ft^3/s	444
200 Year Peak Flood	8280	ft^3/s	575
500 Year Peak Flood	15600	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

4-1-1000

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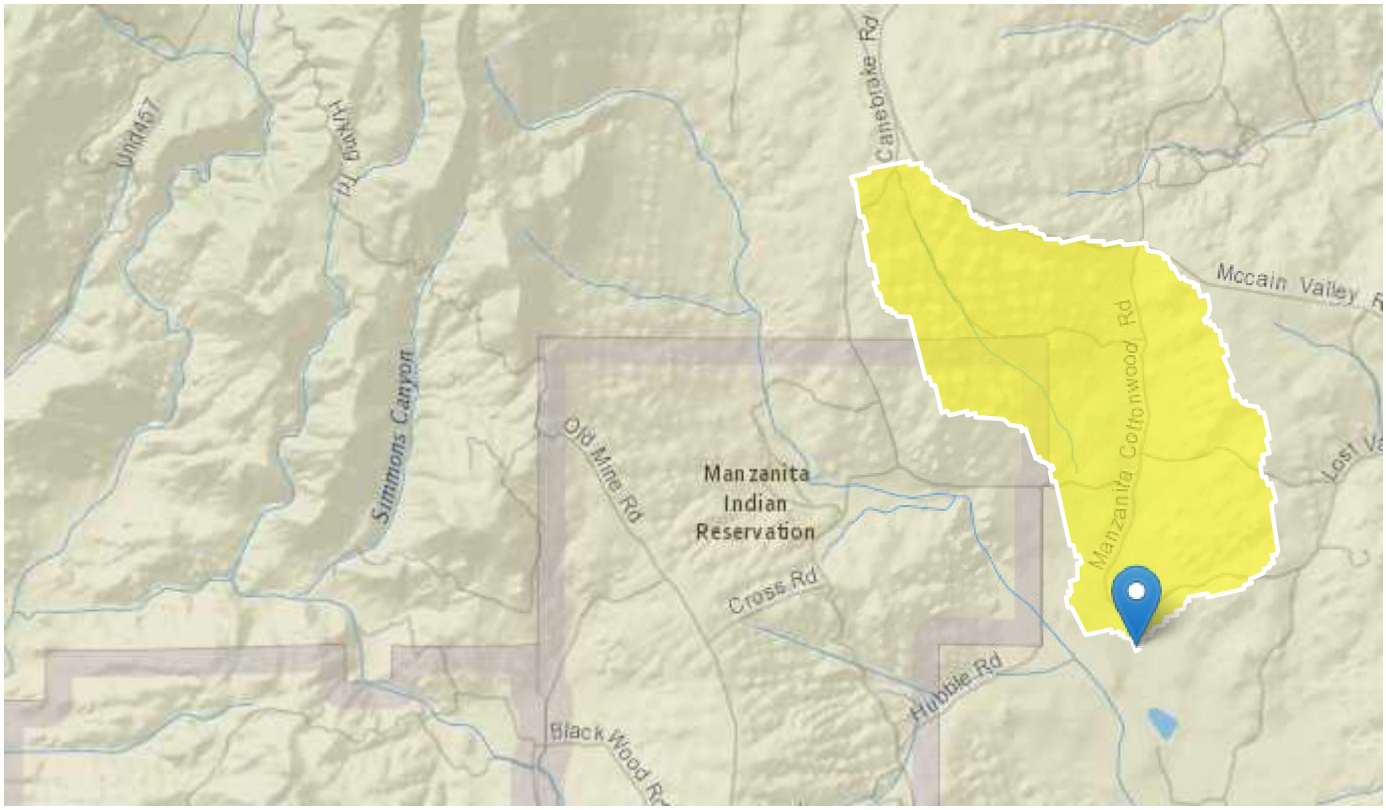

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.6	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.6	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	16.7	ft^3/s	214
5 Year Peak Flood	97.3	ft^3/s	226
10 Year Peak Flood	245	ft^3/s	248
25 Year Peak Flood	654	ft^3/s	298
50 Year Peak Flood	1230	ft^3/s	357
100 Year Peak Flood	2190	ft^3/s	444
200 Year Peak Flood	3680	ft^3/s	575
500 Year Peak Flood	6940	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-2-1000

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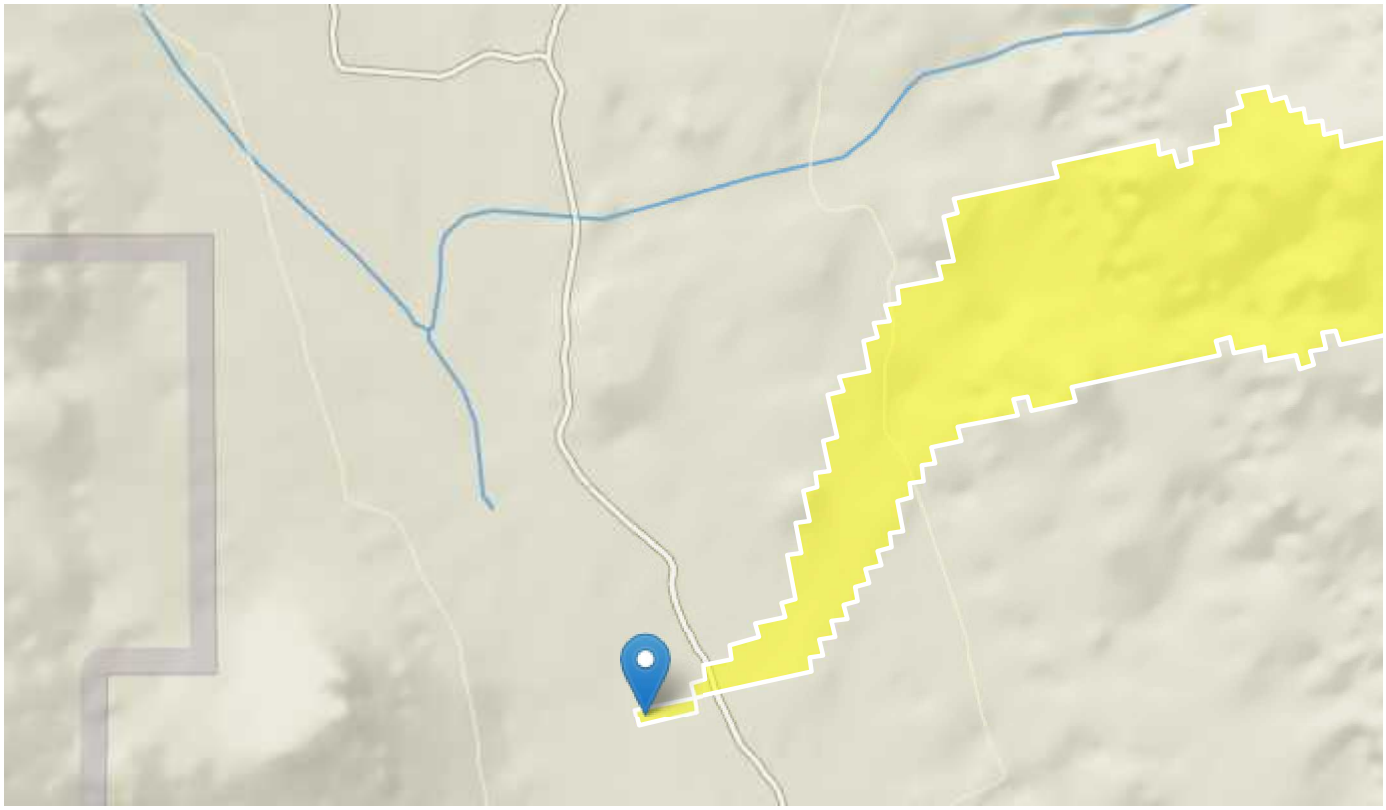

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	4.56	ft^3/s	214
5 Year Peak Flood	26.6	ft^3/s	226
10 Year Peak Flood	66.9	ft^3/s	248
25 Year Peak Flood	178	ft^3/s	298
50 Year Peak Flood	337	ft^3/s	357
100 Year Peak Flood	598	ft^3/s	444
200 Year Peak Flood	1010	ft^3/s	575
500 Year Peak Flood	1900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-3-1000

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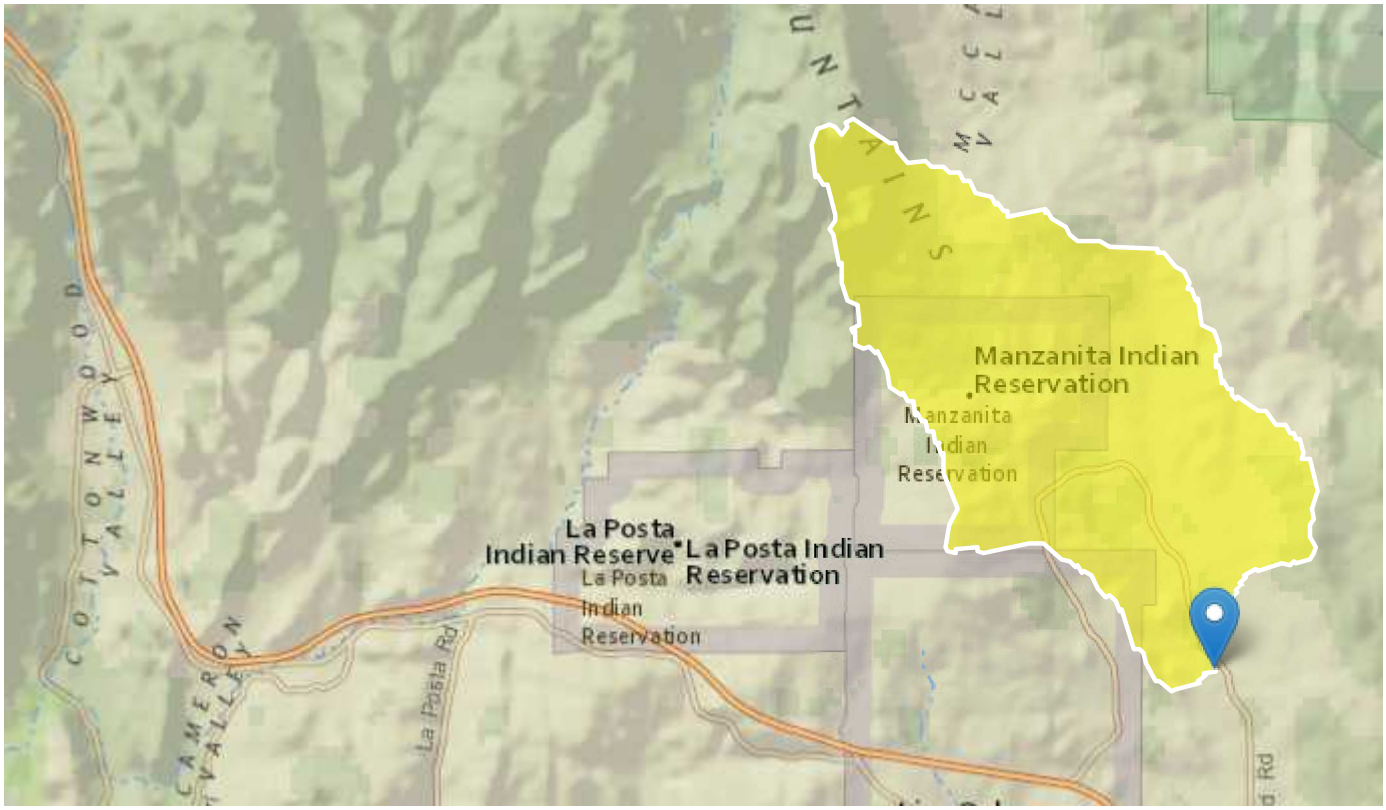

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	13.9	square miles

Peak-Flow Statistics Parameters [100 Percent (13.9 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	13.9	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (13.9 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	39	ft^3/s	214
5 Year Peak Flood	227	ft^3/s	226
10 Year Peak Flood	572	ft^3/s	248
25 Year Peak Flood	1530	ft^3/s	298
50 Year Peak Flood	2880	ft^3/s	357
100 Year Peak Flood	5110	ft^3/s	444
200 Year Peak Flood	8600	ft^3/s	575
500 Year Peak Flood	16200	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-4-1000

Region ID: CA
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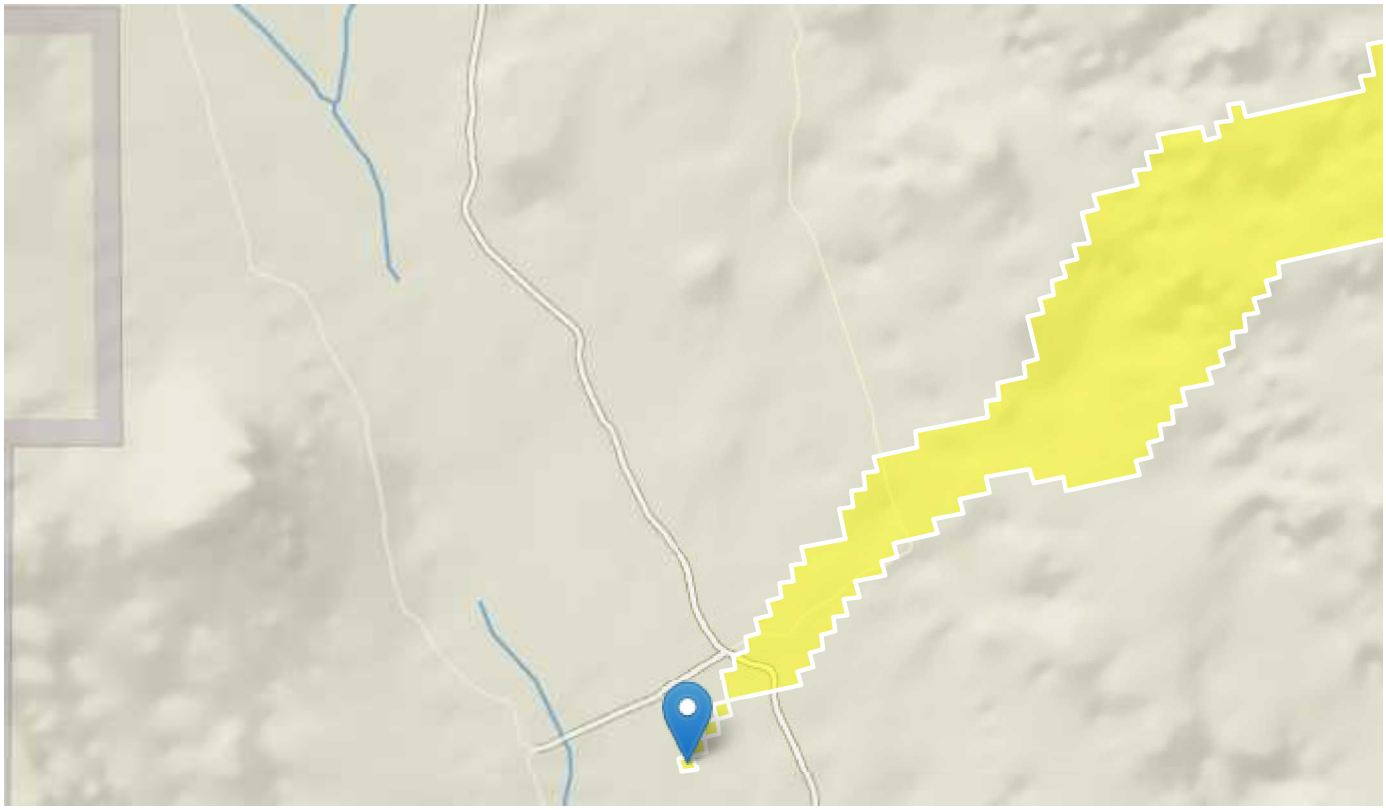

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	4.56	ft^3/s	214
5 Year Peak Flood	26.6	ft^3/s	226
10 Year Peak Flood	66.9	ft^3/s	248
25 Year Peak Flood	178	ft^3/s	298
50 Year Peak Flood	337	ft^3/s	357
100 Year Peak Flood	598	ft^3/s	444
200 Year Peak Flood	1010	ft^3/s	575
500 Year Peak Flood	1900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-5-1000-1

Region ID: CA
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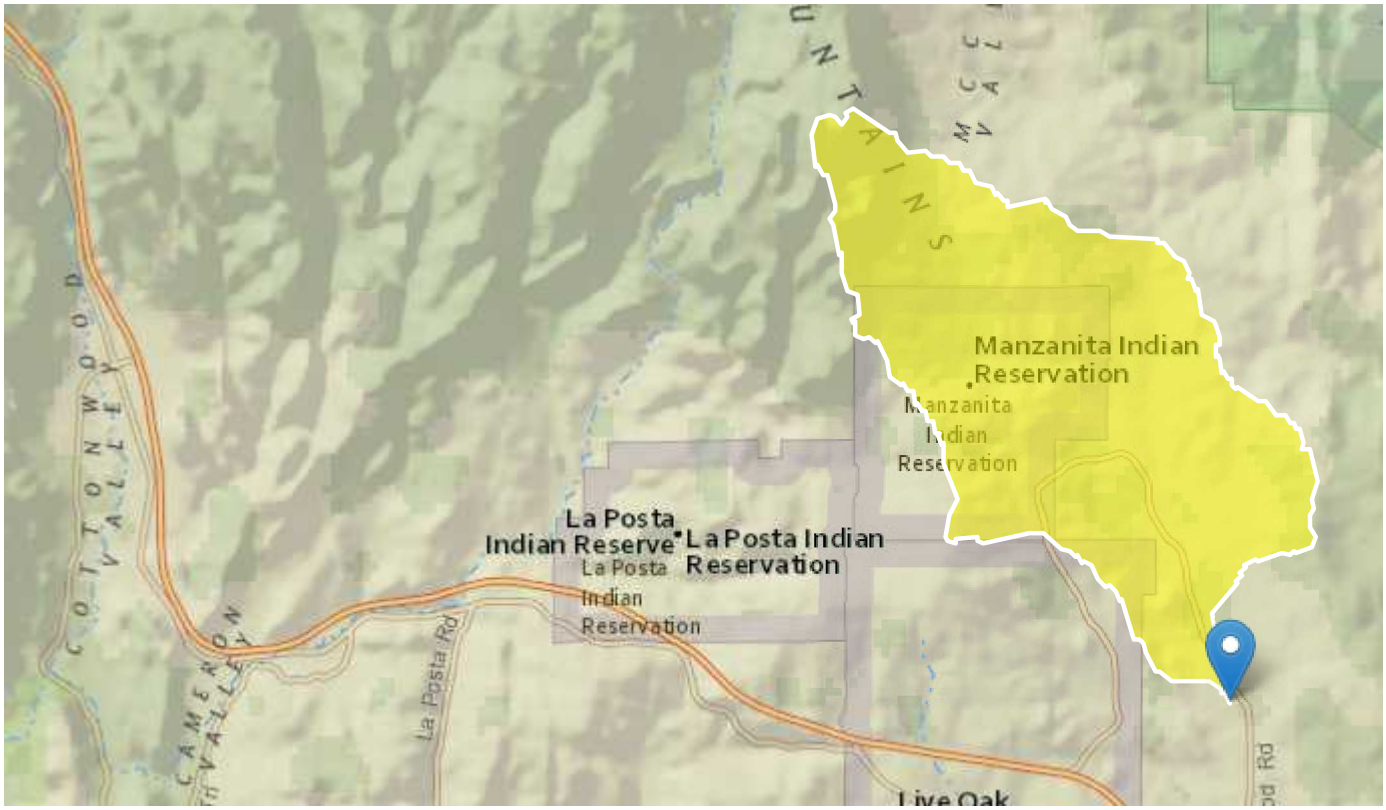

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	14	square miles

Peak-Flow Statistics Parameters [100 Percent (14 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (14 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	39.2	ft^3/s	214
5 Year Peak Flood	228	ft^3/s	226
10 Year Peak Flood	574	ft^3/s	248
25 Year Peak Flood	1530	ft^3/s	298
50 Year Peak Flood	2890	ft^3/s	357
100 Year Peak Flood	5130	ft^3/s	444
200 Year Peak Flood	8630	ft^3/s	575
500 Year Peak Flood	16300	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-5-1000-2

Region ID: CA
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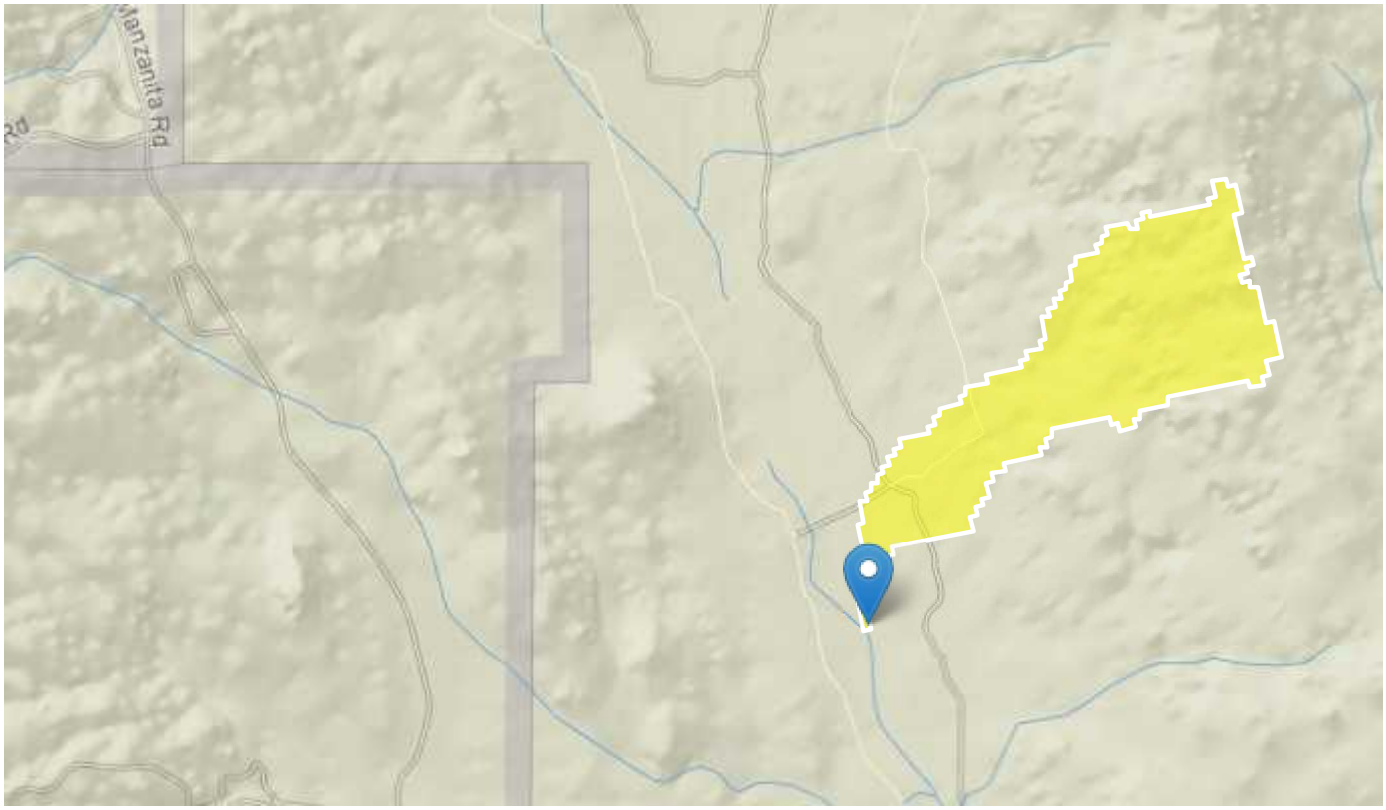

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.4	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.4	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	6.48	ft^3/s	214
5 Year Peak Flood	37.7	ft^3/s	226
10 Year Peak Flood	95	ft^3/s	248
25 Year Peak Flood	253	ft^3/s	298
50 Year Peak Flood	478	ft^3/s	357
100 Year Peak Flood	849	ft^3/s	444
200 Year Peak Flood	1430	ft^3/s	575
500 Year Peak Flood	2690	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-5-1000

Region ID: CA
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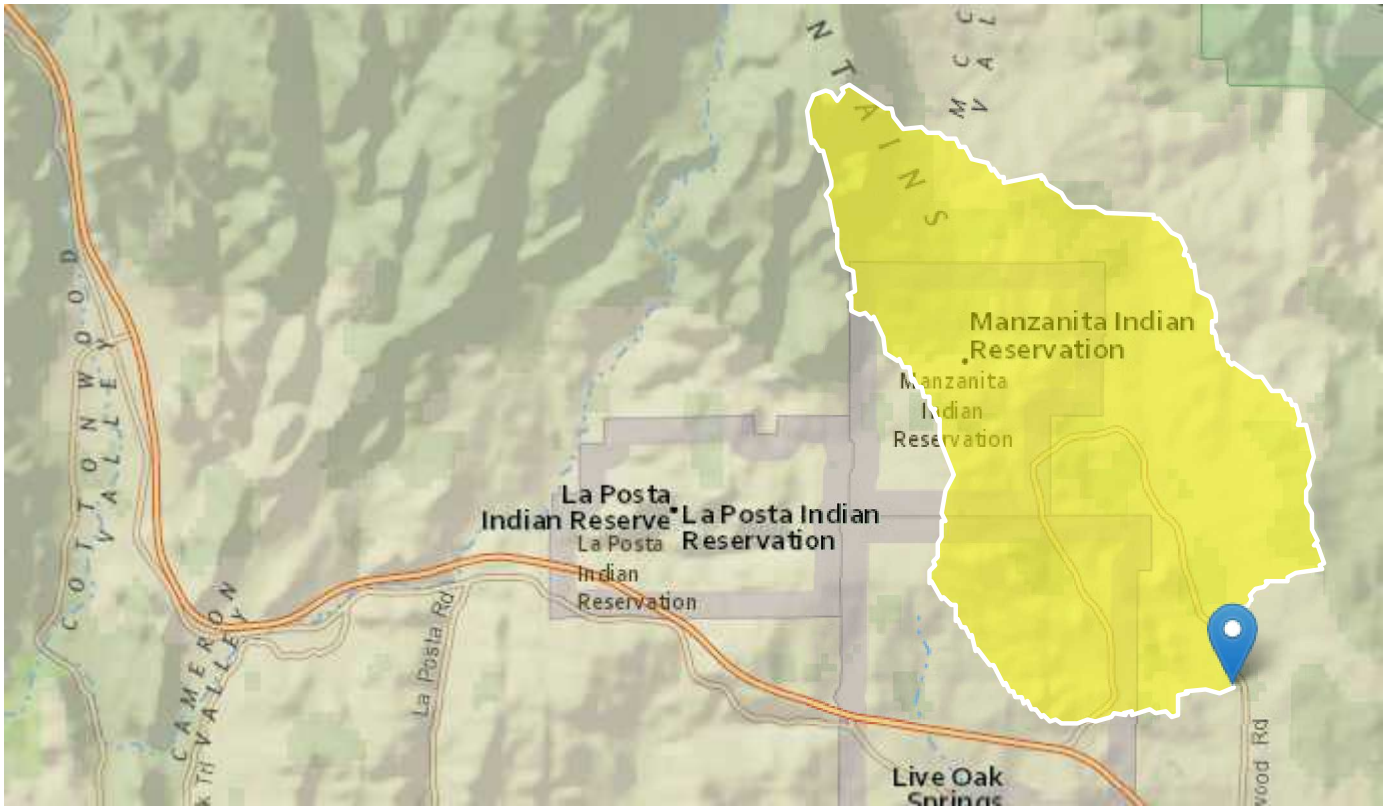

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	18.1	square miles

Peak-Flow Statistics Parameters [100 Percent (18.1 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	18.1	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (18.1 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	44.6	ft^3/s	214
5 Year Peak Flood	260	ft^3/s	226
10 Year Peak Flood	654	ft^3/s	248
25 Year Peak Flood	1740	ft^3/s	298
50 Year Peak Flood	3290	ft^3/s	357
100 Year Peak Flood	5840	ft^3/s	444
200 Year Peak Flood	9830	ft^3/s	575
500 Year Peak Flood	18500	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

5-6-1000

Region ID: CA
Workspace ID: CA20190320154227347000
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Time: 2019-03-20 10:42:41 -0500

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	4.56	ft^3/s	214
5 Year Peak Flood	26.6	ft^3/s	226
10 Year Peak Flood	66.9	ft^3/s	248
25 Year Peak Flood	178	ft^3/s	298
50 Year Peak Flood	337	ft^3/s	357
100 Year Peak Flood	598	ft^3/s	444
200 Year Peak Flood	1010	ft^3/s	575
500 Year Peak Flood	1900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

6-2-1000

Region ID: CA
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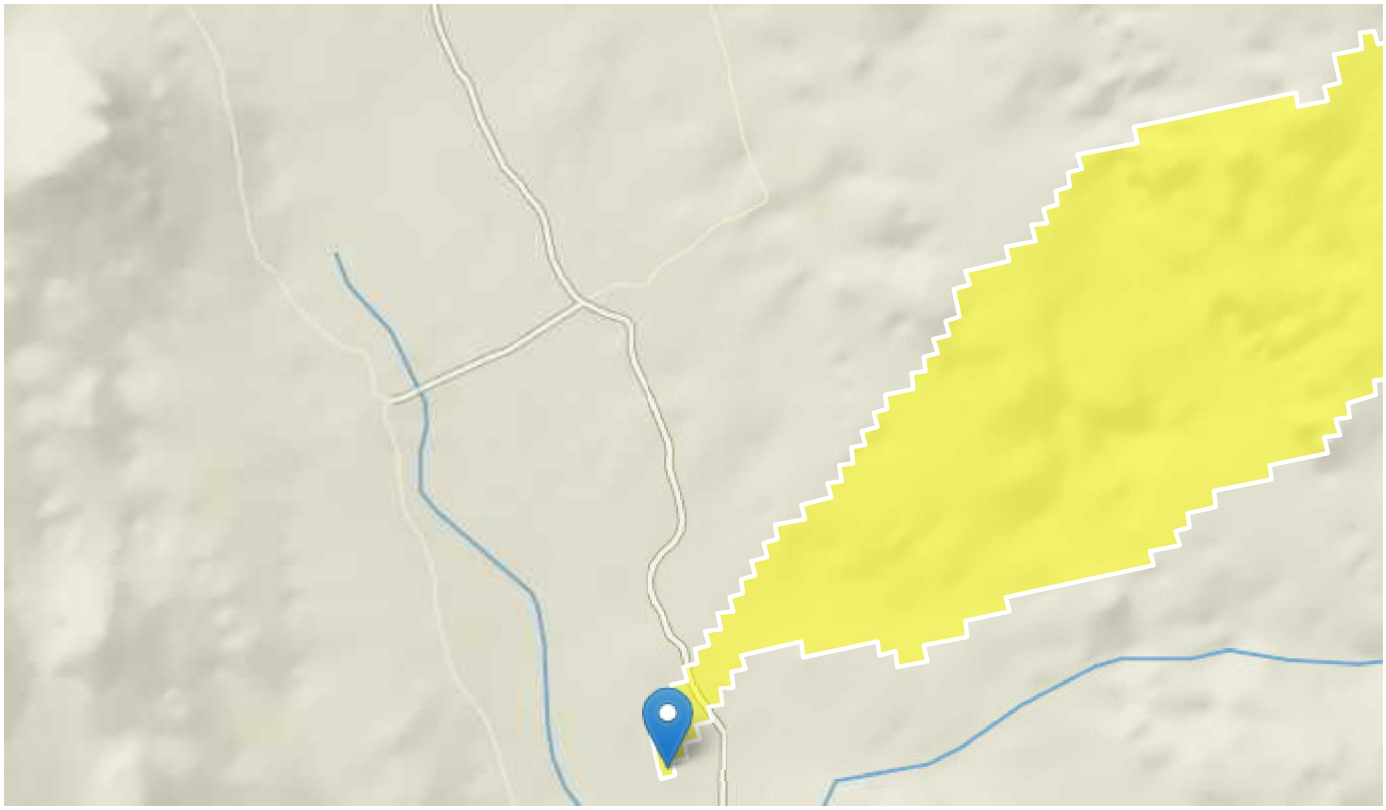

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.4	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.4	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	6.48	ft^3/s	214
5 Year Peak Flood	37.7	ft^3/s	226
10 Year Peak Flood	95	ft^3/s	248
25 Year Peak Flood	253	ft^3/s	298
50 Year Peak Flood	478	ft^3/s	357
100 Year Peak Flood	849	ft^3/s	444
200 Year Peak Flood	1430	ft^3/s	575
500 Year Peak Flood	2690	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

6-3-1000

Region ID: CA
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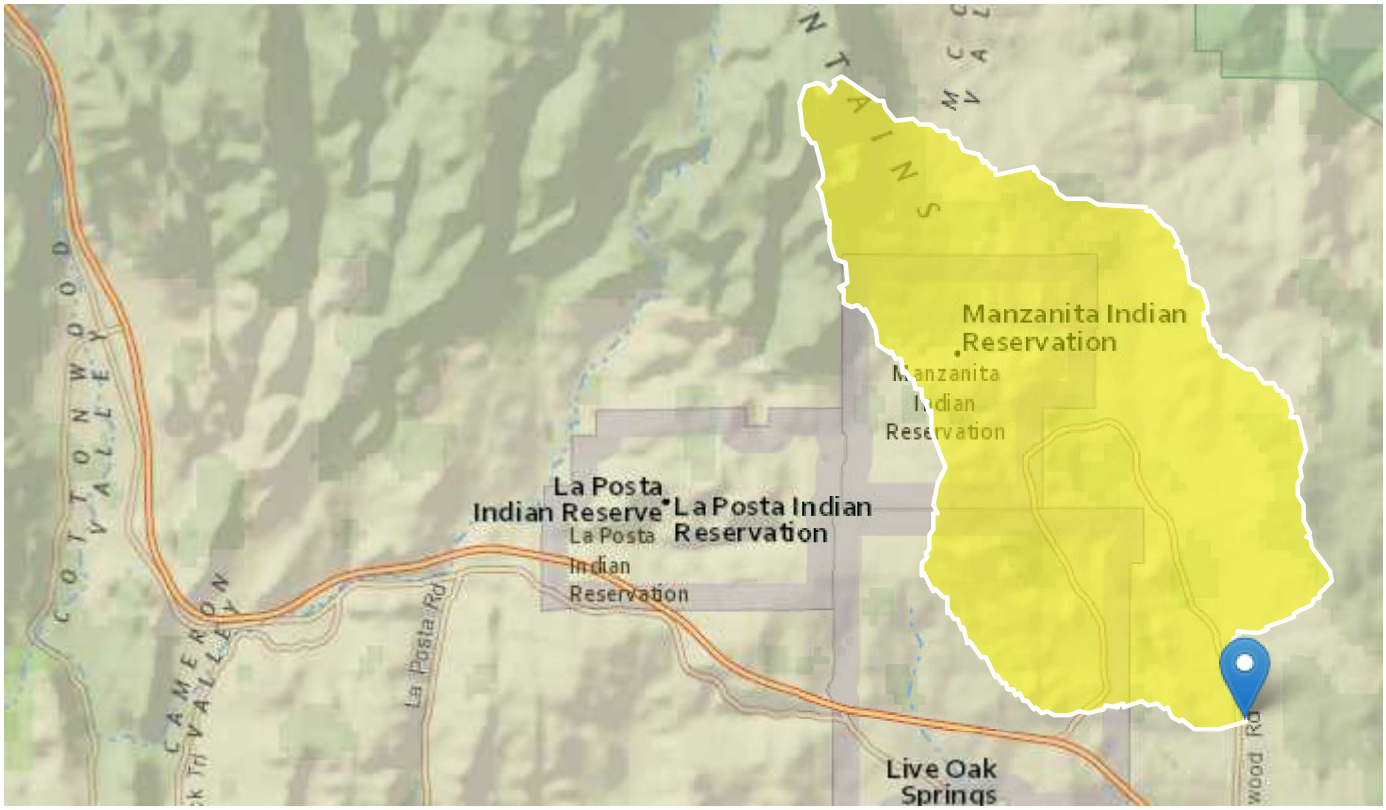

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	18.9	square miles

Peak-Flow Statistics Parameters [100 Percent (18.9 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	18.9	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (18.9 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	45.6	ft^3/s	214
5 Year Peak Flood	265	ft^3/s	226
10 Year Peak Flood	668	ft^3/s	248
25 Year Peak Flood	1780	ft^3/s	298
50 Year Peak Flood	3360	ft^3/s	357
100 Year Peak Flood	5970	ft^3/s	444
200 Year Peak Flood	10000	ft^3/s	575
500 Year Peak Flood	18900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

6-4-1000

Region ID: CA
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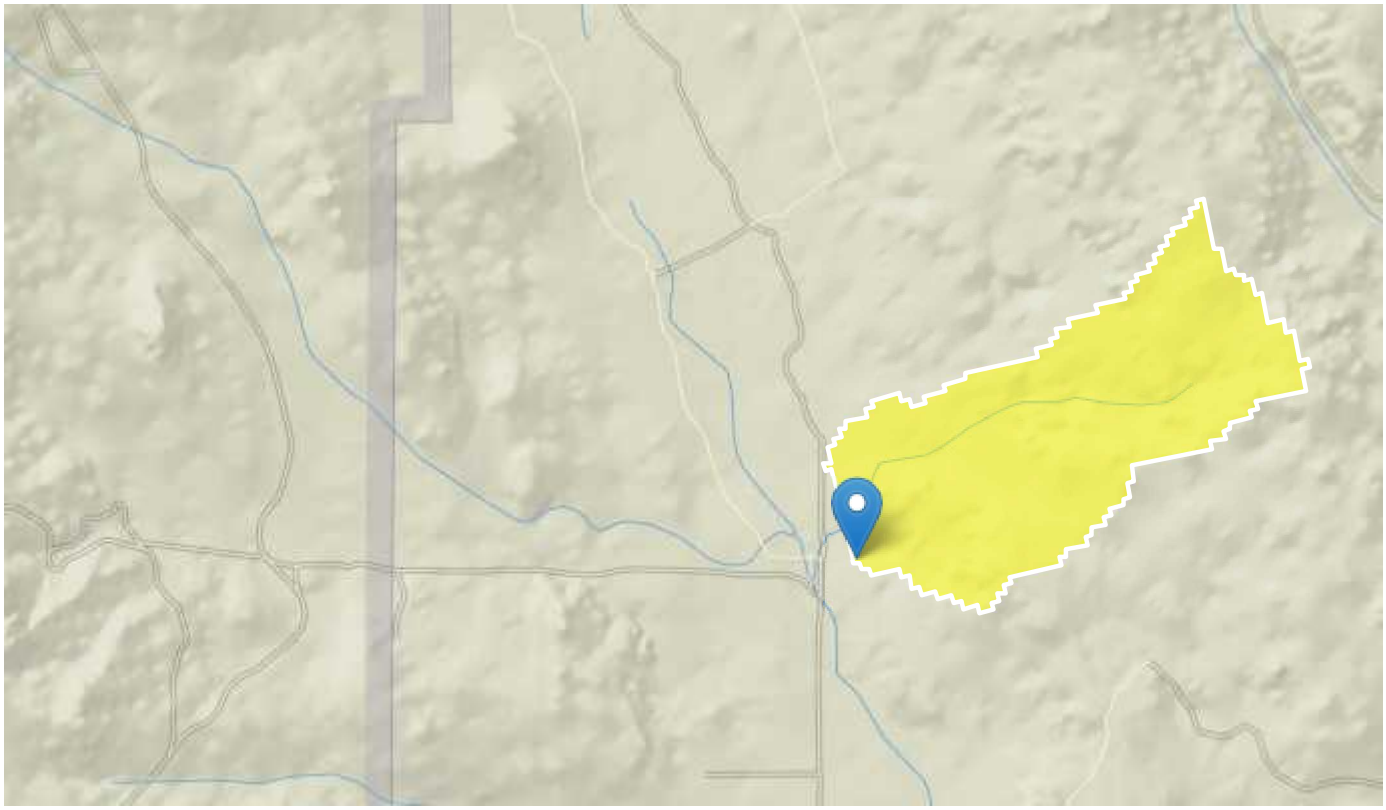

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.5	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.5	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	7.25	ft^3/s	214
5 Year Peak Flood	42.3	ft^3/s	226
10 Year Peak Flood	106	ft^3/s	248
25 Year Peak Flood	284	ft^3/s	298
50 Year Peak Flood	535	ft^3/s	357
100 Year Peak Flood	951	ft^3/s	444
200 Year Peak Flood	1600	ft^3/s	575
500 Year Peak Flood	3010	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

7-2-1000

Region ID: CA
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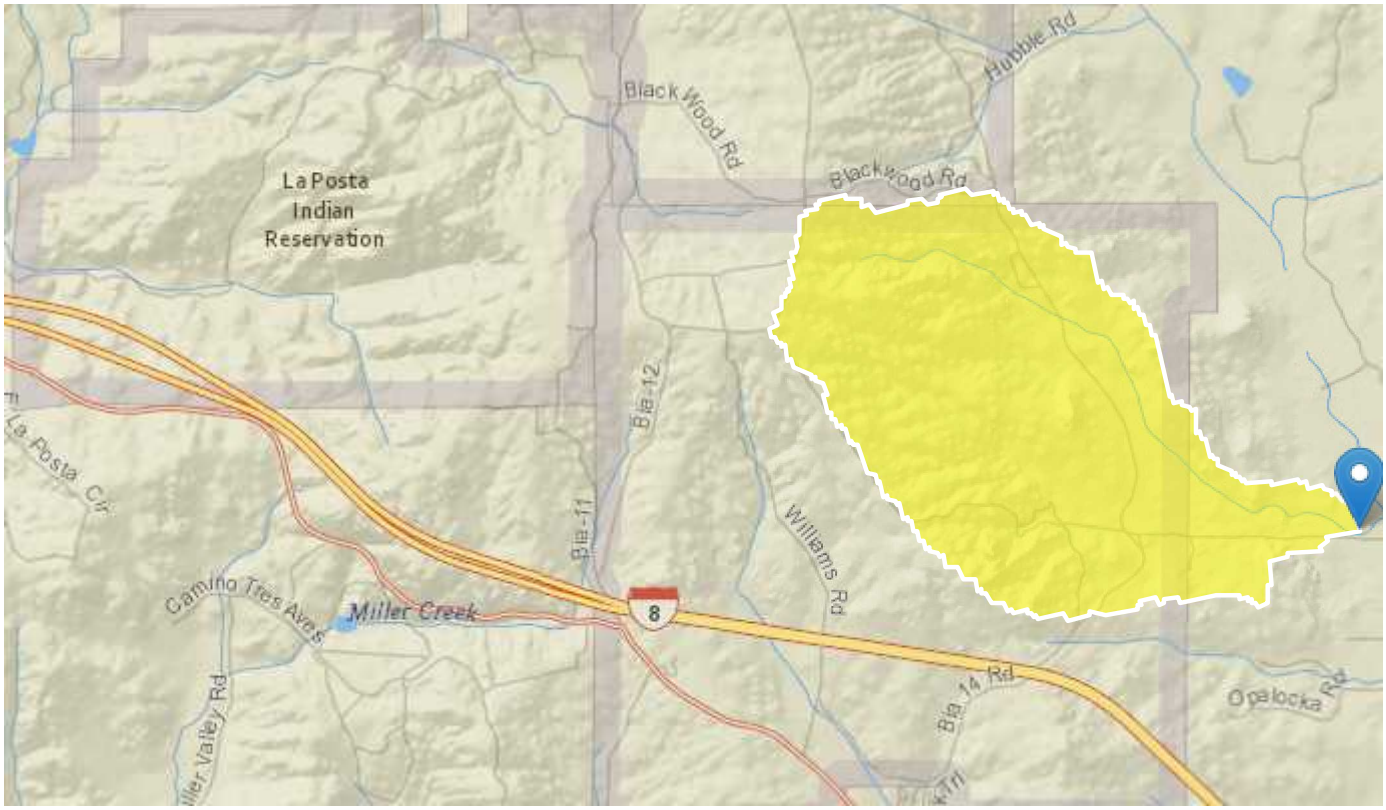

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3.5	square miles

Peak-Flow Statistics Parameters [100 Percent (3.48 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.5	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (3.48 square miles) 2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	19.4	ft^3/s	214
5 Year Peak Flood	113	ft^3/s	226
10 Year Peak Flood	285	ft^3/s	248
25 Year Peak Flood	760	ft^3/s	298
50 Year Peak Flood	1430	ft^3/s	357
100 Year Peak Flood	2540	ft^3/s	444
200 Year Peak Flood	4280	ft^3/s	575
500 Year Peak Flood	8070	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

8-1-1000

Region ID: CA
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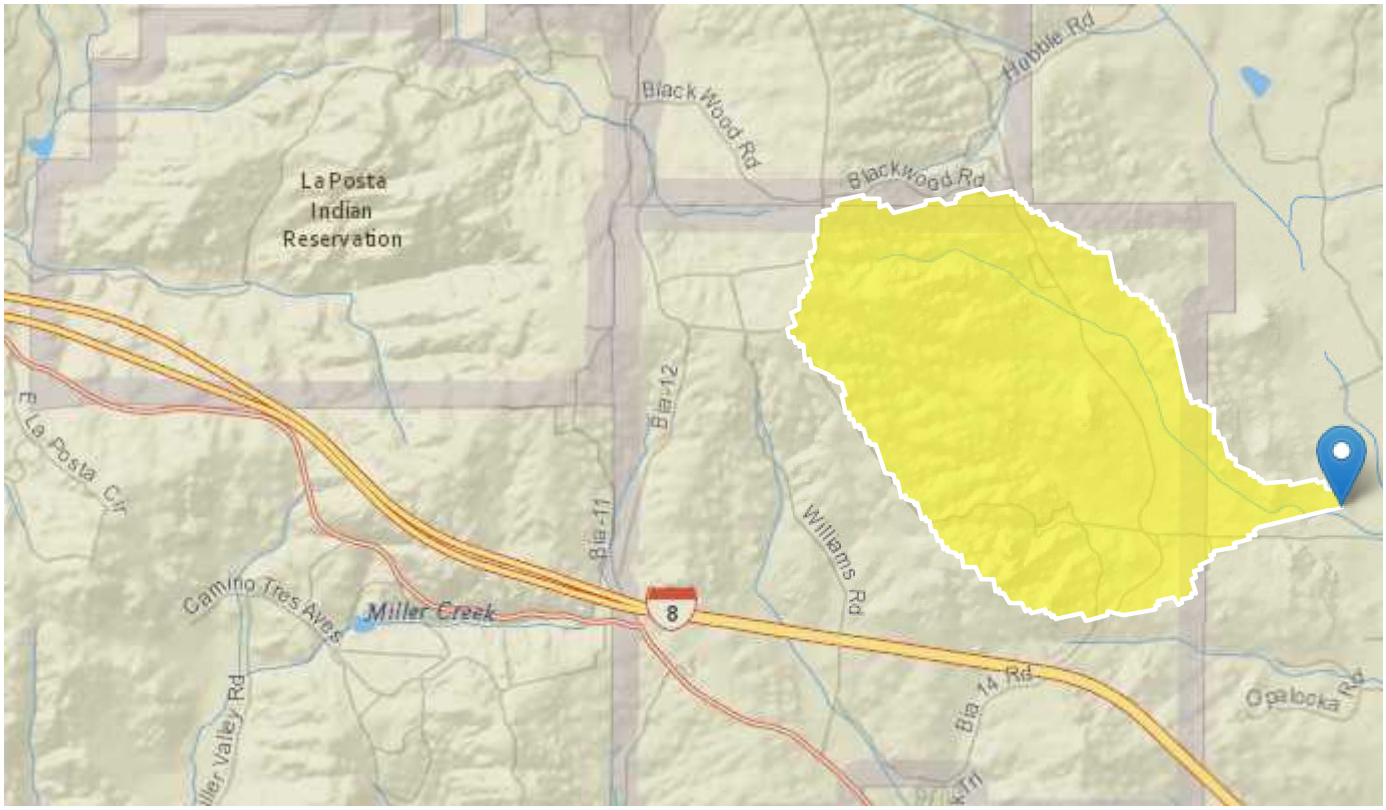

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3.3	square miles

Peak-Flow Statistics Parameters [100 Percent (3.26 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.3	square miles	0.04	173

Peak-Flow Statistics Flow Report [100 Percent (3.26 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	18.8	ft^3/s	214
5 Year Peak Flood	110	ft^3/s	226
10 Year Peak Flood	276	ft^3/s	248
25 Year Peak Flood	737	ft^3/s	298
50 Year Peak Flood	1390	ft^3/s	357
100 Year Peak Flood	2470	ft^3/s	444
200 Year Peak Flood	4150	ft^3/s	575
500 Year Peak Flood	7830	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

9-1-1000

Region ID: CA
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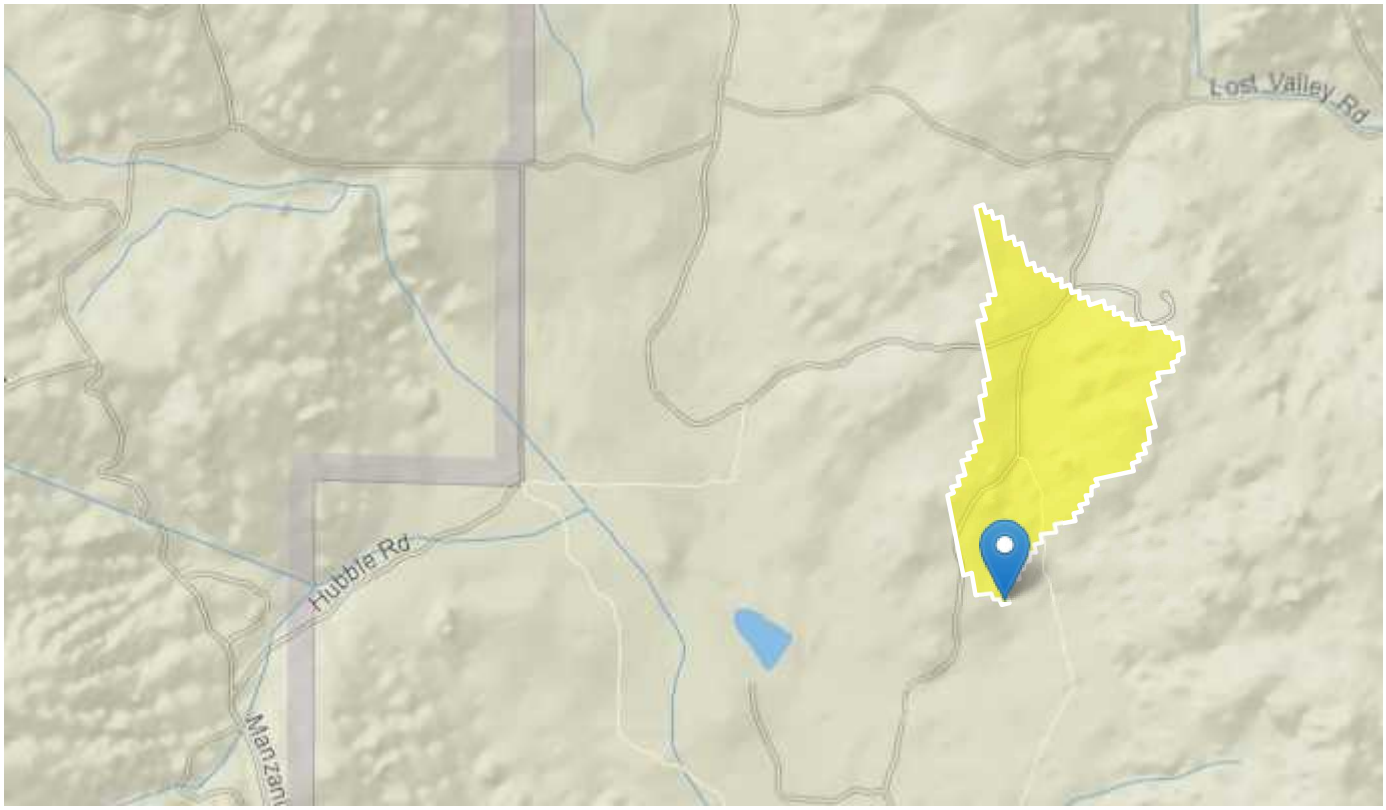

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.3	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.3	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	5.6	ft^3/s	214
5 Year Peak Flood	32.6	ft^3/s	226
10 Year Peak Flood	82.1	ft^3/s	248
25 Year Peak Flood	219	ft^3/s	298
50 Year Peak Flood	413	ft^3/s	357
100 Year Peak Flood	734	ft^3/s	444
200 Year Peak Flood	1230	ft^3/s	575
500 Year Peak Flood	2330	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

9-2-1000

Region ID: CA
Workspace ID: CA20190320200515924000
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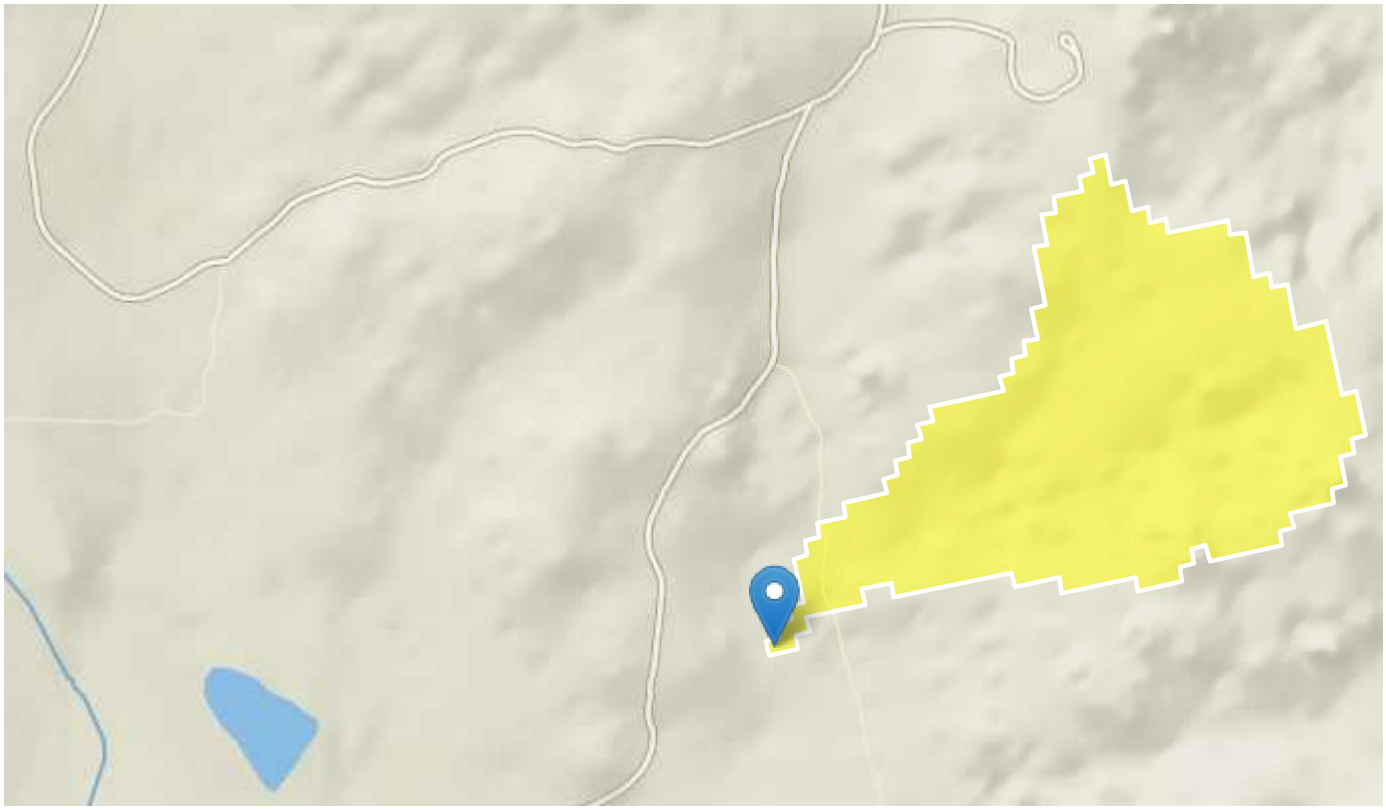

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	4.56	ft^3/s	214
5 Year Peak Flood	26.6	ft^3/s	226
10 Year Peak Flood	66.9	ft^3/s	248
25 Year Peak Flood	178	ft^3/s	298
50 Year Peak Flood	337	ft^3/s	357
100 Year Peak Flood	598	ft^3/s	444
200 Year Peak Flood	1010	ft^3/s	575
500 Year Peak Flood	1900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

9-3-1000

Region ID: CA
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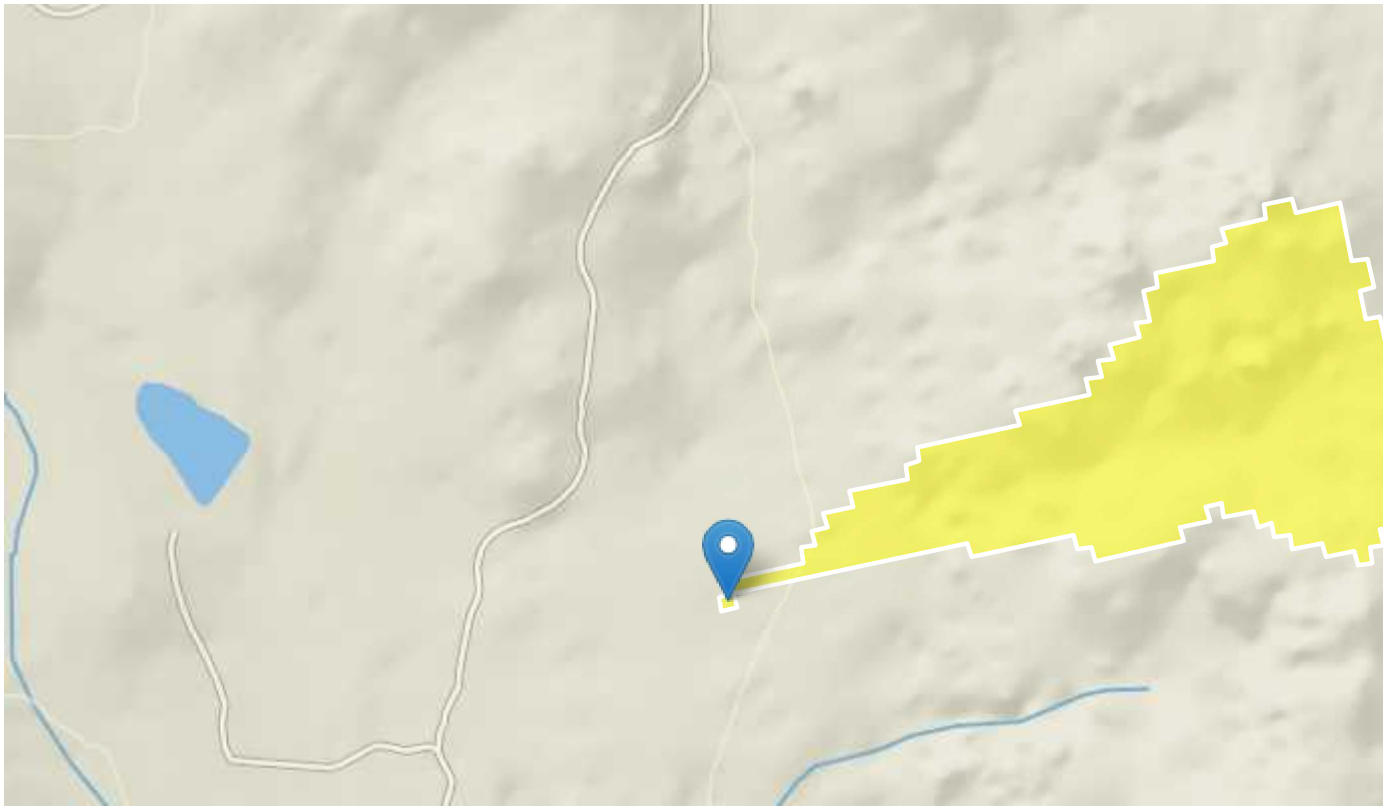

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	4.56	ft^3/s	214
5 Year Peak Flood	26.6	ft^3/s	226
10 Year Peak Flood	66.9	ft^3/s	248
25 Year Peak Flood	178	ft^3/s	298
50 Year Peak Flood	337	ft^3/s	357
100 Year Peak Flood	598	ft^3/s	444
200 Year Peak Flood	1010	ft^3/s	575
500 Year Peak Flood	1900	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

9-4-1000

Region ID: CA
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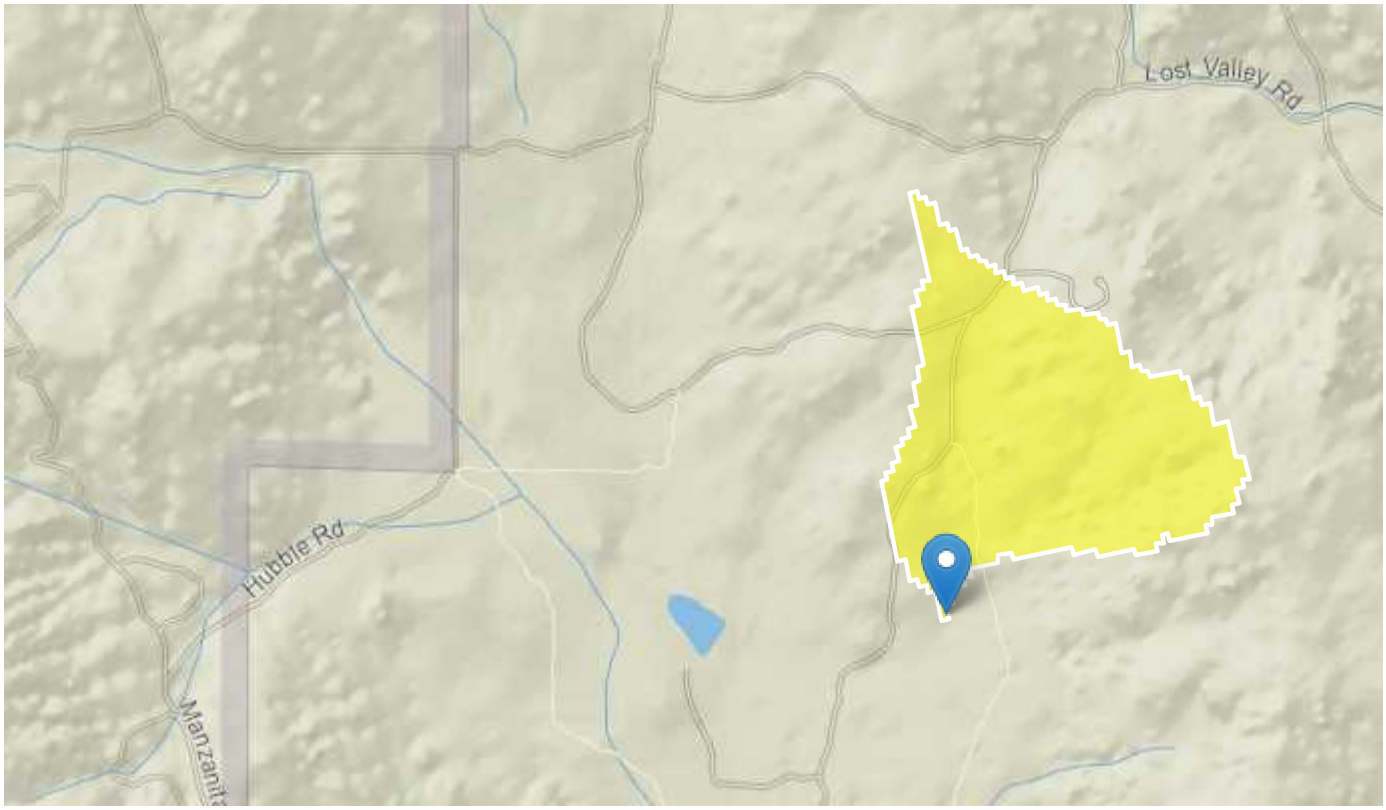

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.5	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.5	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	7.25	ft^3/s	214
5 Year Peak Flood	42.3	ft^3/s	226
10 Year Peak Flood	106	ft^3/s	248
25 Year Peak Flood	284	ft^3/s	298
50 Year Peak Flood	535	ft^3/s	357
100 Year Peak Flood	951	ft^3/s	444
200 Year Peak Flood	1600	ft^3/s	575
500 Year Peak Flood	3010	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

Southern Gen-Tie Access Road

Cross Sections

700

Region ID: CA
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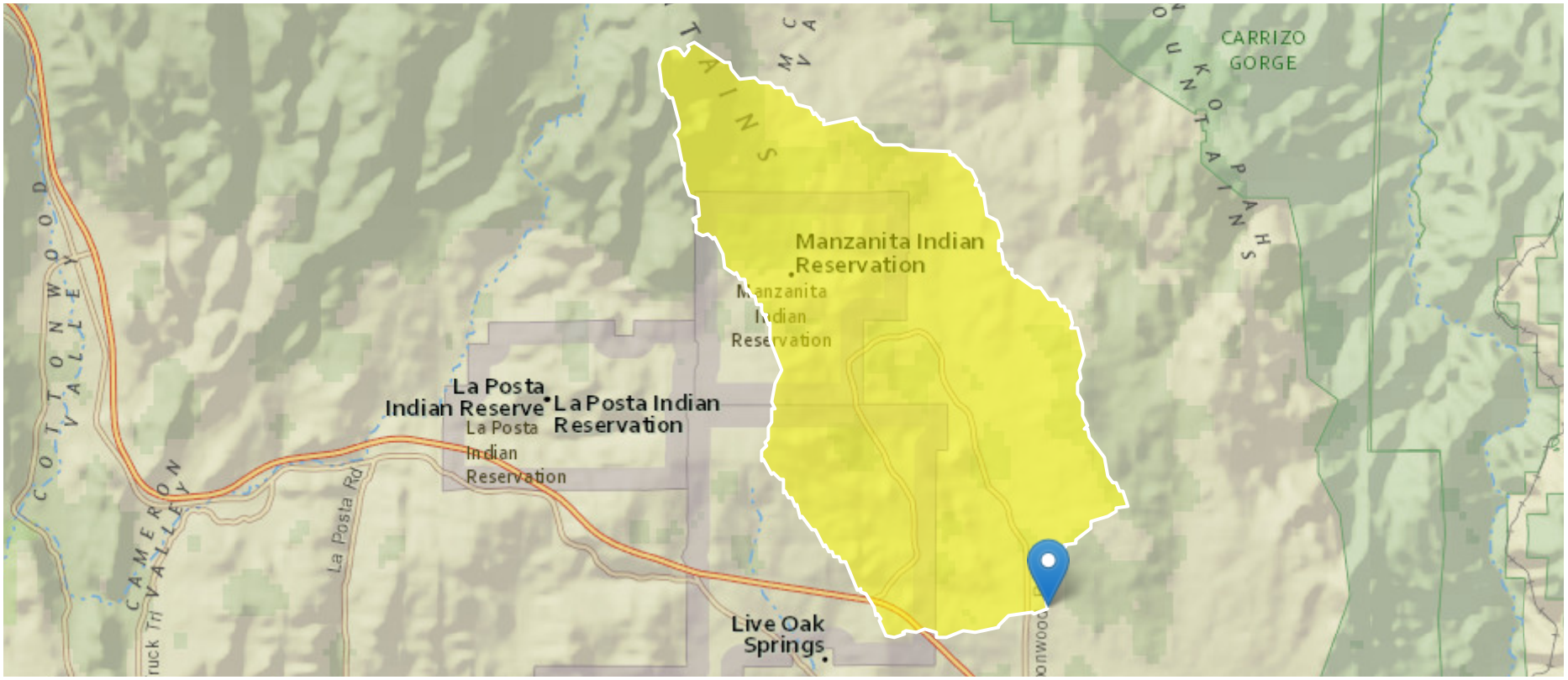

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	20.8	square miles
PRECIP	Mean Annual Precipitation	20.5	inches

Peak-Flow Statistics Parameters [12 Percent (2.21 square miles) 2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	20.8	square miles	0.04	850
PRECIP	Mean Annual Precipitation	20.5	inches	10	45

Peak-Flow Statistics Parameters [88 Percent (16.1 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	20.8	square miles	0.04	173

Peak-Flow Statistics Flow Report [12 Percent (2.21 square miles) 2012 5113 Region 5 South Coast]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	269	ft^3/s	50.5	1430	134
5 Year Peak Flood	975	ft^3/s	297	3200	83.1
10 Year Peak Flood	1790	ft^3/s	685	4670	64
25 Year Peak Flood	3170	ft^3/s	1430	7010	51.5
50 Year Peak Flood	4480	ft^3/s	2160	9300	47.6
100 Year Peak Flood	5970	ft^3/s	2870	12400	47.2
200 Year Peak Flood	7750	ft^3/s	3690	16300	47.7

Statistic	Value	Unit	PIl	Plu	SEp
500 Year Peak Flood	10200	ft^3/s	4620	22300	52

Peak-Flow Statistics Flow Report [88 Percent (16.1 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	47.8	ft^3/s	214
5 Year Peak Flood	279	ft^3/s	226
10 Year Peak Flood	701	ft^3/s	248
25 Year Peak Flood	1870	ft^3/s	298
50 Year Peak Flood	3530	ft^3/s	357
100 Year Peak Flood	6270	ft^3/s	444
200 Year Peak Flood	10500	ft^3/s	575
500 Year Peak Flood	19900	ft^3/s	856

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
2 Year Peak Flood	74.6	ft^3/s
5 Year Peak Flood	363	ft^3/s
10 Year Peak Flood	833	ft^3/s
25 Year Peak Flood	2030	ft^3/s
50 Year Peak Flood	3640	ft^3/s
100 Year Peak Flood	6230	ft^3/s
200 Year Peak Flood	10200	ft^3/s

Statistic	Value	Unit
500 Year Peak Flood	18700	ft^3/s

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

800

Region ID: CA
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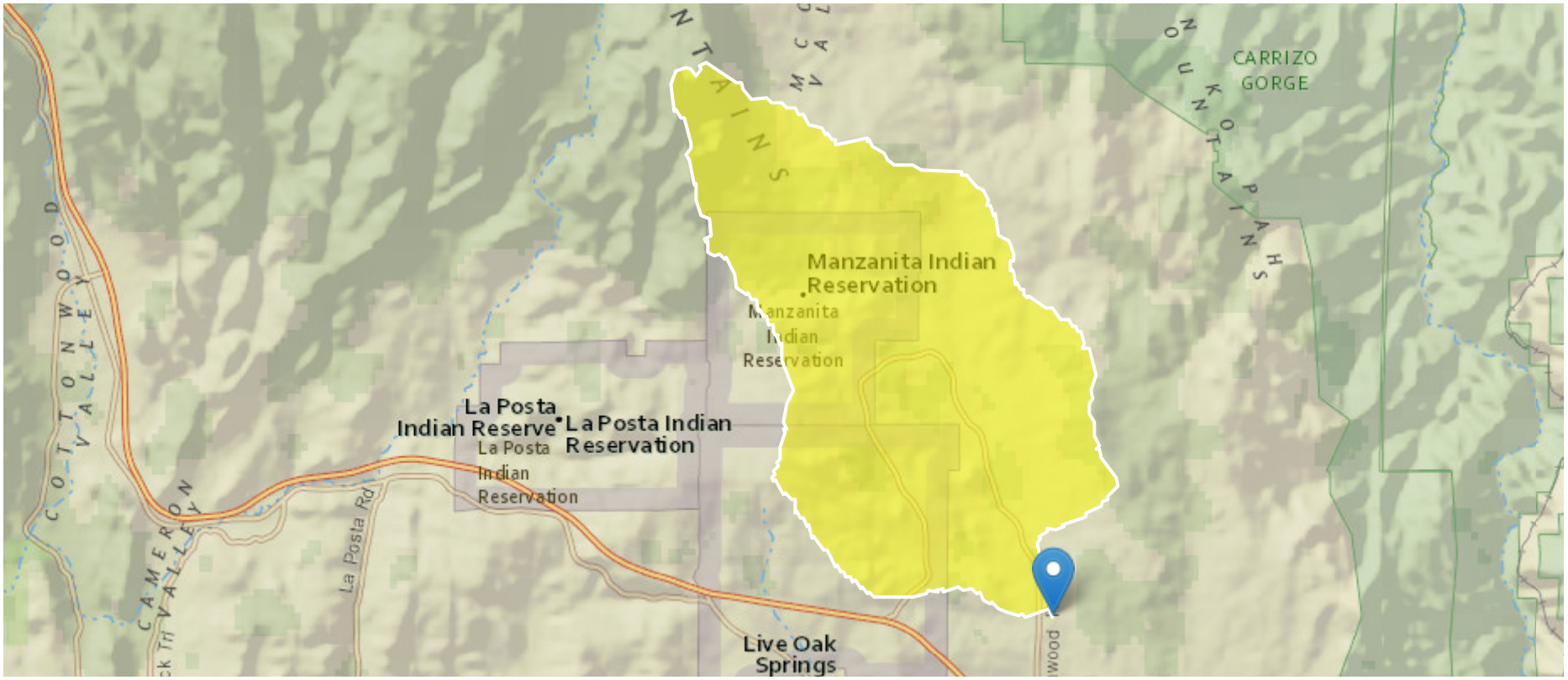

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	19	square miles
PRECIP	Mean Annual Precipitation	20.6	inches

Peak-Flow Statistics Parameters [12 Percent (2 square miles) 2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	19	square miles	0.04	850
PRECIP	Mean Annual Precipitation	20.6	inches	10	45

Peak-Flow Statistics Parameters [88 Percent (14.7 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	19	square miles	0.04	173

Peak-Flow Statistics Flow Report [12 Percent (2 square miles) 2012 5113 Region 5 South Coast]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	254	ft^3/s	47.7	1350	134
5 Year Peak Flood	916	ft^3/s	279	3000	83.1
10 Year Peak Flood	1670	ft^3/s	642	4370	64
25 Year Peak Flood	2960	ft^3/s	1340	6540	51.5
50 Year Peak Flood	4170	ft^3/s	2010	8660	47.6
100 Year Peak Flood	5550	ft^3/s	2670	11500	47.2
200 Year Peak Flood	7190	ft^3/s	3430	15100	47.7

Statistic	Value	Unit	PIl	PIu	SEp
500 Year Peak Flood	9420	ft^3/s	4280	20700	52

Peak-Flow Statistics Flow Report [88 Percent (14.7 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	45.7	ft^3/s	214
5 Year Peak Flood	266	ft^3/s	226
10 Year Peak Flood	670	ft^3/s	248
25 Year Peak Flood	1790	ft^3/s	298
50 Year Peak Flood	3370	ft^3/s	357
100 Year Peak Flood	5990	ft^3/s	444
200 Year Peak Flood	10100	ft^3/s	575
500 Year Peak Flood	19000	ft^3/s	856

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
2 Year Peak Flood	70.6	ft^3/s
5 Year Peak Flood	344	ft^3/s
10 Year Peak Flood	790	ft^3/s
25 Year Peak Flood	1930	ft^3/s
50 Year Peak Flood	3470	ft^3/s
100 Year Peak Flood	5940	ft^3/s
200 Year Peak Flood	9730	ft^3/s

Statistic	Value	Unit
500 Year Peak Flood	17800	ft^3/s

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

1000

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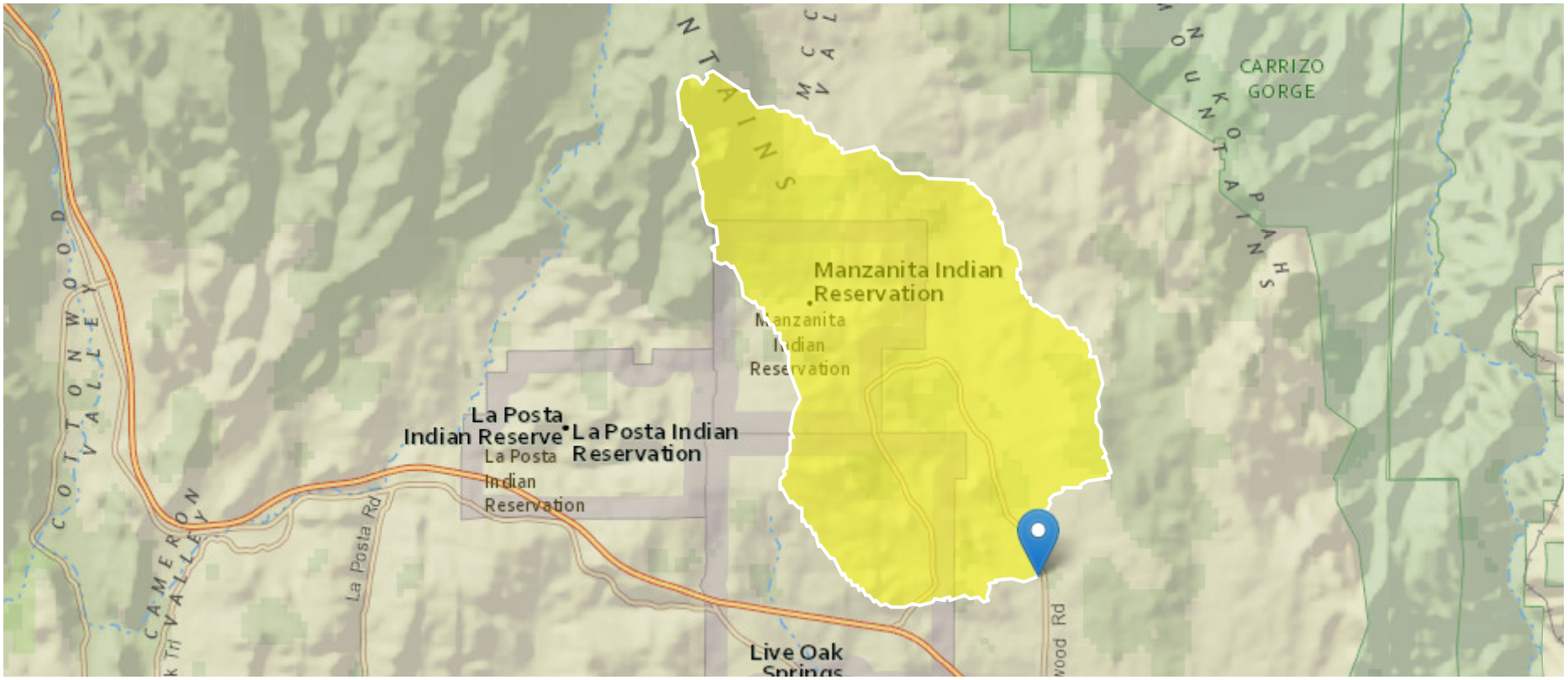

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	18.1	square miles
PRECIP	Mean Annual Precipitation	20.7	inches

Peak-Flow Statistics Parameters [13 Percent (1.99 square miles) 2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	18.1	square miles	0.04	850
PRECIP	Mean Annual Precipitation	20.7	inches	10	45

Peak-Flow Statistics Parameters [87 Percent (13.8 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	18.1	square miles	0.04	173

Peak-Flow Statistics Flow Report [13 Percent (1.99 square miles) 2012 5113 Region 5 South Coast]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	247	ft^3/s	46.4	1310	134
5 Year Peak Flood	887	ft^3/s	271	2910	83.1
10 Year Peak Flood	1620	ft^3/s	621	4230	64
25 Year Peak Flood	2860	ft^3/s	1300	6320	51.5
50 Year Peak Flood	4030	ft^3/s	1940	8360	47.6
100 Year Peak Flood	5360	ft^3/s	2580	11100	47.2
200 Year Peak Flood	6940	ft^3/s	3310	14500	47.7

Statistic	Value	Unit	PIl	PIu	SEp
500 Year Peak Flood	9070	ft^3/s	4130	19900	52

Peak-Flow Statistics Flow Report [87 Percent (13.8 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	44.6	ft^3/s	214
5 Year Peak Flood	260	ft^3/s	226
10 Year Peak Flood	654	ft^3/s	248
25 Year Peak Flood	1740	ft^3/s	298
50 Year Peak Flood	3290	ft^3/s	357
100 Year Peak Flood	5840	ft^3/s	444
200 Year Peak Flood	9830	ft^3/s	575
500 Year Peak Flood	18500	ft^3/s	856

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
2 Year Peak Flood	70	ft^3/s
5 Year Peak Flood	339	ft^3/s
10 Year Peak Flood	775	ft^3/s
25 Year Peak Flood	1890	ft^3/s
50 Year Peak Flood	3380	ft^3/s
100 Year Peak Flood	5780	ft^3/s
200 Year Peak Flood	9460	ft^3/s

Statistic	Value	Unit
500 Year Peak Flood	17300	ft^3/s

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

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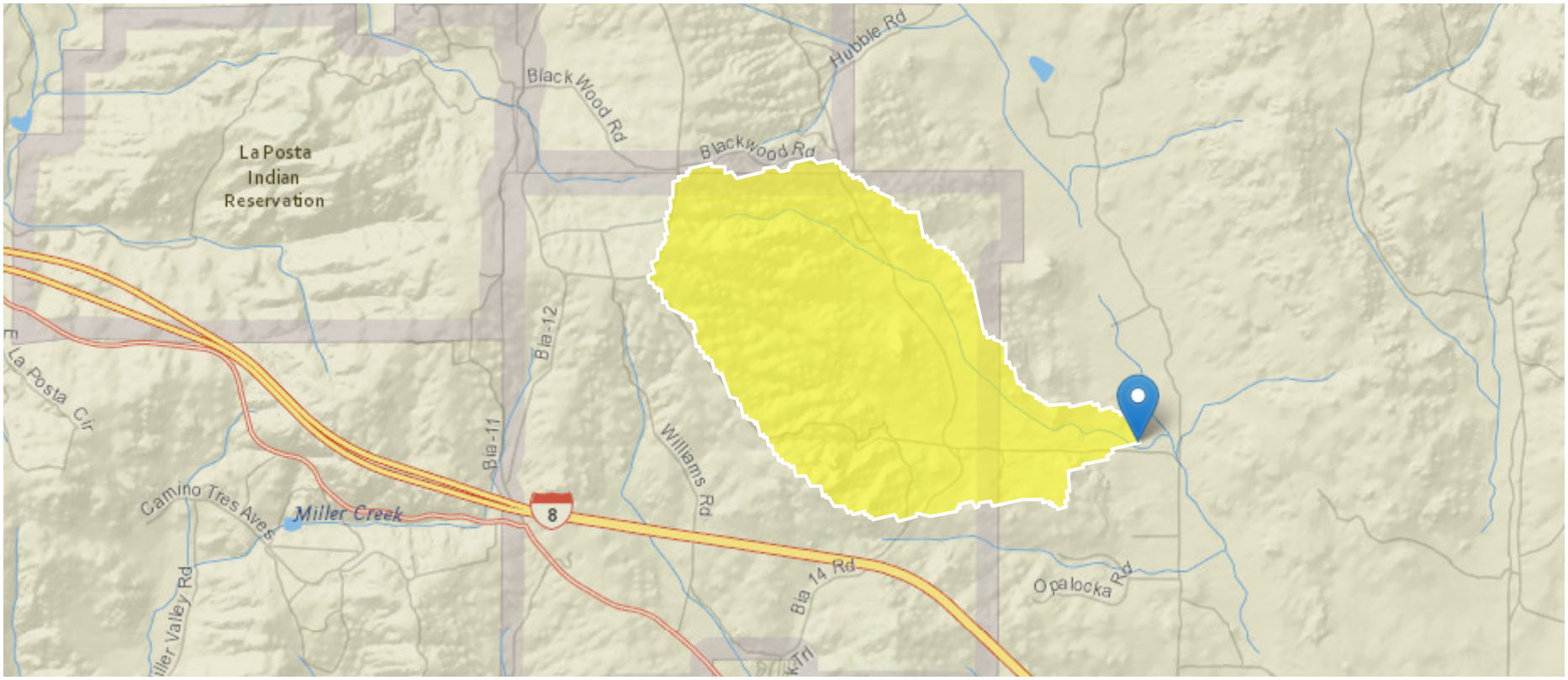

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3.5	square miles
PRECIP	Mean Annual Precipitation	19.9	inches

Peak-Flow Statistics Parameters [25 Percent (0.652 square miles) 2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.5	square miles	0.04	850
PRECIP	Mean Annual Precipitation	19.9	inches	10	45

Peak-Flow Statistics Parameters [75 Percent (1.95 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.5	square miles	0.04	173

Peak-Flow Statistics Flow Report [25 Percent (0.652 square miles) 2012 5113 Region 5 South Coast]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	79.4	ft^3/s	14.7	428	134
5 Year Peak Flood	254	ft^3/s	76.9	842	83.1
10 Year Peak Flood	429	ft^3/s	163	1130	64
25 Year Peak Flood	692	ft^3/s	311	1540	51.5
50 Year Peak Flood	920	ft^3/s	441	1920	47.6
100 Year Peak Flood	1160	ft^3/s	558	2430	47.2
200 Year Peak Flood	1440	ft^3/s	685	3040	47.7

Statistic	Value	Unit	PIl	PIu	SEp
500 Year Peak Flood	1790	ft^3/s	812	3960	52

Peak-Flow Statistics Flow Report [75 Percent (1.95 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	19.4	ft^3/s	214
5 Year Peak Flood	113	ft^3/s	226
10 Year Peak Flood	285	ft^3/s	248
25 Year Peak Flood	760	ft^3/s	298
50 Year Peak Flood	1430	ft^3/s	357
100 Year Peak Flood	2540	ft^3/s	444
200 Year Peak Flood	4280	ft^3/s	575
500 Year Peak Flood	8070	ft^3/s	856

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
2 Year Peak Flood	34.5	ft^3/s
5 Year Peak Flood	149	ft^3/s
10 Year Peak Flood	321	ft^3/s
25 Year Peak Flood	743	ft^3/s
50 Year Peak Flood	1300	ft^3/s
100 Year Peak Flood	2200	ft^3/s
200 Year Peak Flood	3570	ft^3/s

Statistic	Value	Unit
500 Year Peak Flood	6500	ft^3/s

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

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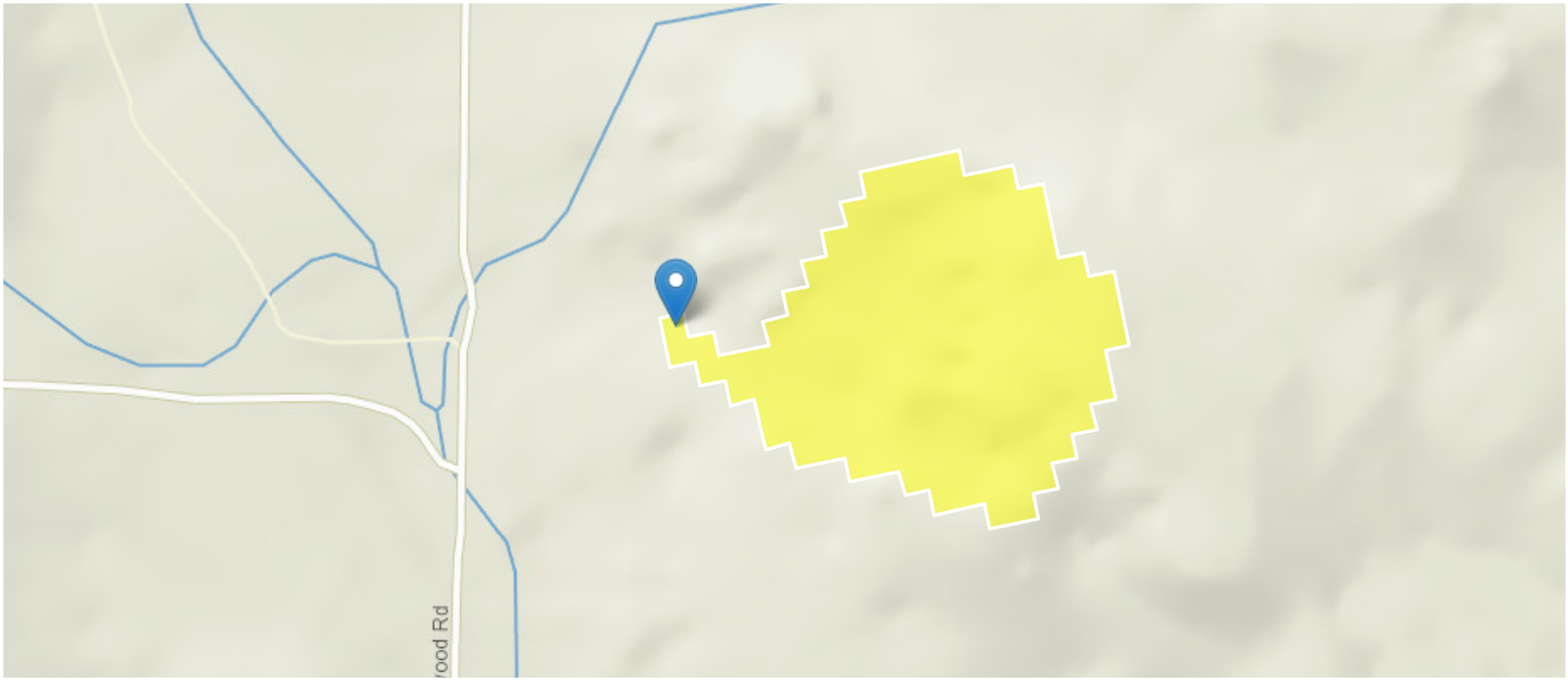

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.1	square miles

Peak-Flow Statistics Parameters [2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.1	square miles	0.04	173

Peak-Flow Statistics Flow Report [2012 5113 Region 6 Desert]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	3.21	ft^3/s	214
5 Year Peak Flood	18.7	ft^3/s	226
10 Year Peak Flood	47.1	ft^3/s	248
25 Year Peak Flood	126	ft^3/s	298
50 Year Peak Flood	237	ft^3/s	357
100 Year Peak Flood	421	ft^3/s	444
200 Year Peak Flood	708	ft^3/s	575
500 Year Peak Flood	1330	ft^3/s	856

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.3.0

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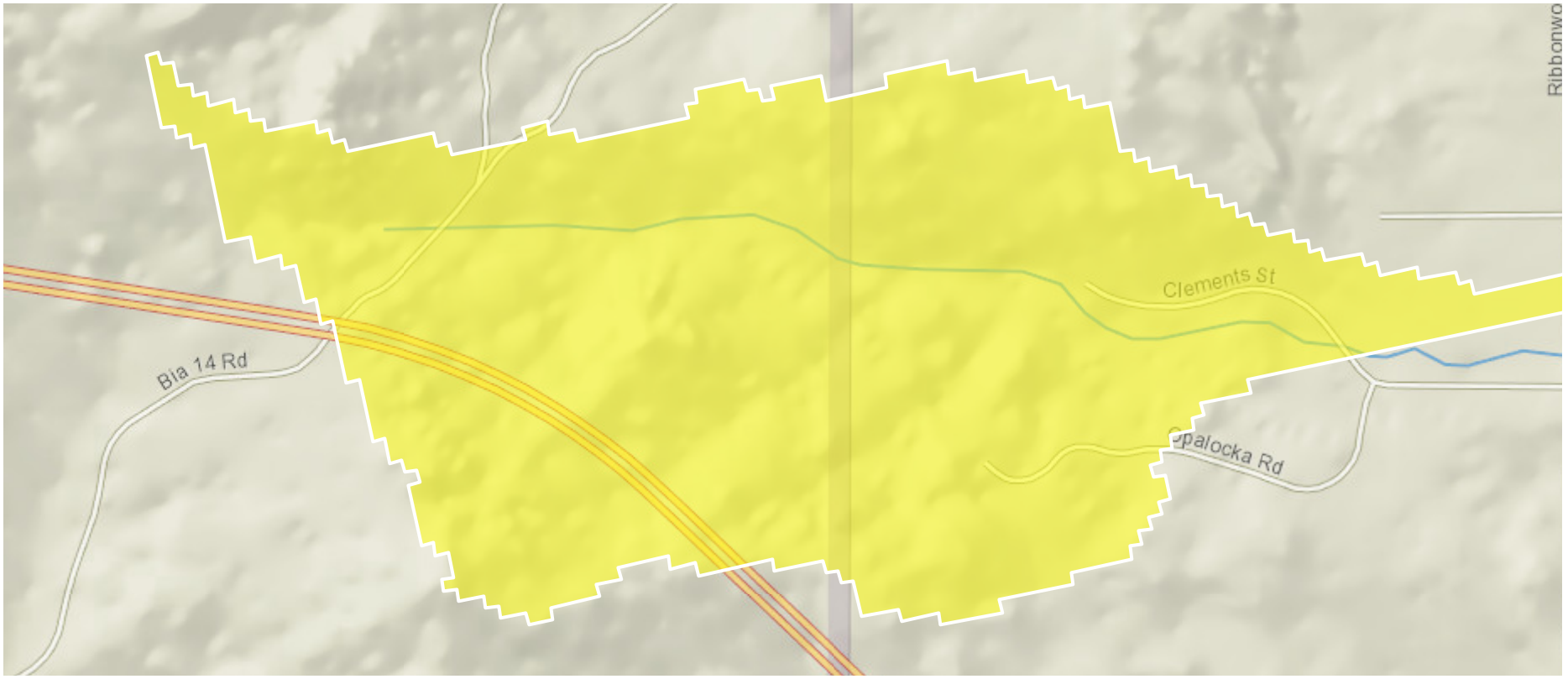


Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1	square miles
PRECIP	Mean Annual Precipitation	18.9	inches

Peak-Flow Statistics Parameters [25 Percent (0.184 square miles) 2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1	square miles	0.04	850
PRECIP	Mean Annual Precipitation	18.9	inches	10	45

Peak-Flow Statistics Parameters [75 Percent (0.561 square miles) 2012 5113 Region 6 Desert]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1	square miles	0.04	173

Peak-Flow Statistics Flow Report [25 Percent (0.184 square miles) 2012 5113 Region 5 South Coast]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	32.9	ft^3/s	5.97	182	134
5 Year Peak Flood	96.4	ft^3/s	28.6	325	83.1
10 Year Peak Flood	152	ft^3/s	57	407	64
25 Year Peak Flood	228	ft^3/s	101	515	51.5
50 Year Peak Flood	289	ft^3/s	136	612	47.6
100 Year Peak Flood	351	ft^3/s	166	744	47.2
200 Year Peak Flood	420	ft^3/s	196	900	47.7

Statistic	Value	Unit	PIl	PIu	SEp
500 Year Peak Flood	501	ft^3/s	223	1130	52

Peak-Flow Statistics Flow Report [75 Percent (0.561 square miles) 2012 5113 Region 6 Desert]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	10.3	ft^3/s	214
5 Year Peak Flood	60	ft^3/s	226
10 Year Peak Flood	151	ft^3/s	248
25 Year Peak Flood	403	ft^3/s	298
50 Year Peak Flood	760	ft^3/s	357
100 Year Peak Flood	1350	ft^3/s	444
200 Year Peak Flood	2270	ft^3/s	575
500 Year Peak Flood	4280	ft^3/s	856

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
2 Year Peak Flood	15.9	ft^3/s
5 Year Peak Flood	69	ft^3/s
10 Year Peak Flood	151	ft^3/s
25 Year Peak Flood	360	ft^3/s
50 Year Peak Flood	644	ft^3/s
100 Year Peak Flood	1100	ft^3/s
200 Year Peak Flood	1810	ft^3/s

Statistic	Value	Unit
500 Year Peak Flood	3350	ft^3/s

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (http://pubs.usgs.gov/sir/2012/5113/)

Application Version: 4.3.0

Appendix I

Project Discharge Location

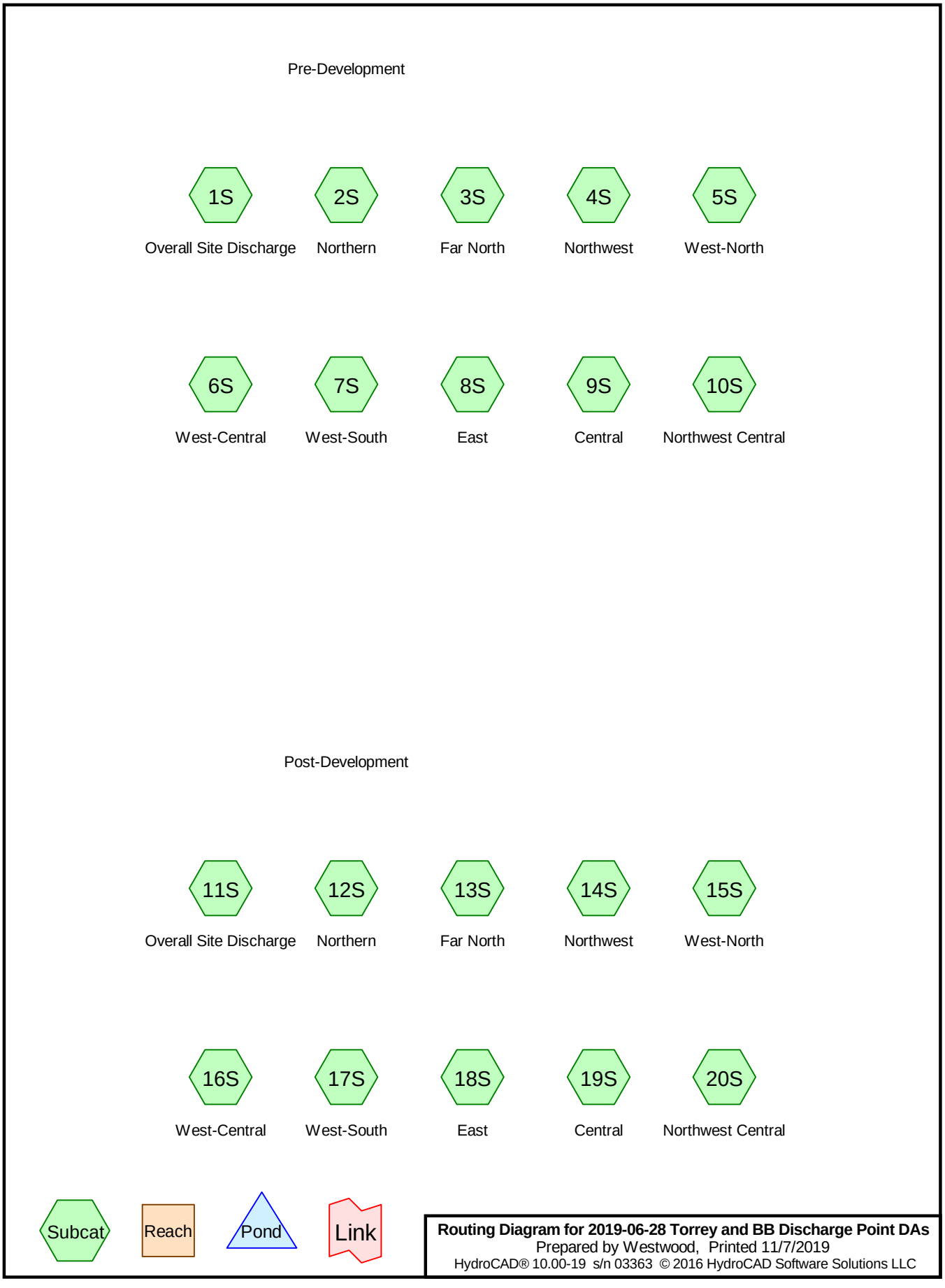
HydroCAD Report Summary

Pre-Development Conditions - Based on Atlas 14 100-Year 24-Hour Storm (7.31 inches)							
	Tc (min)	Hydrulic Length (ft)	Average Slope (ft/ft)	Area (Acres)	Average Curve Number	Velocity at Discharge Point (ft/s)	Q_{100} (cfs)
1S-Overall Site	601.99	47,361	0.049	13,418.0	56	8.50	2,402.15
2S-Northern	146.76	7,392	0.0444	526.7	55	10.17	212.88
3S-Far North	180.51	8,712	0.0363	645.0	56	9.19	241.59
4S-Northwest	353.13	32,250	0.077	4,741.7	56	11.33	1,189.84
5S-West-North	264.78	18,585	0.0567	1,723.3	56	8.14	514.79
6S-West-Central	202.05	13,152	0.056	607.8	56	4.98	212.41
7S-West-South	180.65	11,901	0.0597	595.6	56	8.50	222.97
8S-East	73.34	4,794	0.0823	82.9	56	7.49	53.44
9S-Central	549.87	43,945	0.0521	11,721.0	56	8.63	2,212.46
10S-Northwest Central	81.59	5,233	.0.786	165.0	56	8.18	100.33
Post-Development Conditions - Based on Atlas 14 100-Year 24-Hour Storm (7.31 inches)							
	Tc (min)	Hydrulic Length (ft)	Average Slope (ft/ft)	Area (Acres)	Average Curve Number	Velocity at Discharge Point (ft/s)	Q_{100} (cfs)
11S-Overall Site	601.99	47,361	0.049	13,418.0	56	8.50	2,402.15
12S-Northern Section	146.76	7,392	0.0444	526.7	55	10.17	212.88
13S-Far North	180.51	8,712	0.0363	645.0	56	9.19	241.59
14S-Northwest	353.13	32,250	0.077	4,741.7	56	11.33	1,189.84
15S-West-North	264.78	18,585	0.0567	1,723.3	56	8.14	514.79
16S-West-Central	202.05	13,152	0.056	607.8	56	4.98	212.41
17S-West-South	180.65	11,901	0.0597	595.6	56	8.50	222.97
18S-East	73.34	4,794	0.0823	82.9	56	7.49	53.44
19S-Central	549.87	43,945	0.0521	11,721.0	56	8.63	2,212.46
10S-Northwest Central	81.59	5,233	.0.786	165.0	56	8.18	100.33

Appendix J

Project Discharge Location

HydroCAD Reports



Routing Diagram for 2019-06-28 Torrey and BB Discharge Point DAs
Prepared by Westwood, Printed 11/7/2019

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
67,349.976	56	(1S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S)
1,049.361	55	(2S, 12S)
15.908	96	Gravel surface, HSG A (11S, 19S)
38.695	98	Paved parking, HSG A (11S, 12S, 13S, 16S, 17S, 19S)
68,453.940	**56**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
54.603	HSG A	11S, 12S, 13S, 16S, 17S, 19S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
68,399.337	Other	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S
68,453.940		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	68,399.337	68,399.337		1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S
15.908	0.000	0.000	0.000	0.000	15.908	Gravel surface	11S, 19S
38.695	0.000	0.000	0.000	0.000	38.695	Paved parking	11S, 12S, 13S, 16S, 17S, 19S
54.603	**0.000**	**0.000**	**0.000**	**68,399.337**	**68,453.940**	**TOTAL AREA**	

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Overall Site Discharge Runoff Area=13,418.000 ac 0.00% Impervious Runoff Depth>2.39"
Flow Length=47,361' Slope=0.0490 '/' Tc=601.99 min CN=56 Runoff=2,402.15 cfs 2,671.186 af

Subcatchment 2S: Northern Runoff Area=526.700 ac 0.00% Impervious Runoff Depth=2.32"
Flow Length=7,392' Slope=0.0444 '/' Tc=146.76 min CN=55 Runoff=212.88 cfs 101.973 af

Subcatchment 3S: Far North Runoff Area=645.000 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=8,712' Slope=0.0363 '/' Tc=180.51 min CN=56 Runoff=241.59 cfs 130.192 af

Subcatchment 4S: Northwest Runoff Area=4,741.700 ac 0.00% Impervious Runoff Depth>2.42"
Flow Length=32,250' Slope=0.0770 '/' Tc=353.13 min CN=56 Runoff=1,189.84 cfs 956.921 af

Subcatchment 5S: West-North Runoff Area=1,723.300 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=18,585' Slope=0.0567 '/' Tc=264.78 min CN=56 Runoff=514.79 cfs 347.845 af

Subcatchment 6S: West-Central Runoff Area=607.800 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=13,152' Slope=0.0560 '/' Tc=202.05 min CN=56 Runoff=212.41 cfs 122.683 af

Subcatchment 7S: West-South Runoff Area=595.600 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=11,901' Slope=0.0597 '/' Tc=180.65 min CN=56 Runoff=222.97 cfs 120.221 af

Subcatchment 8S: East Runoff Area=82.900 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=4,794' Slope=0.0823 '/' Tc=74.34 min CN=56 Runoff=53.44 cfs 16.733 af

Subcatchment 9S: Central Runoff Area=11,721.000 ac 0.00% Impervious Runoff Depth>2.40"
Flow Length=43,945' Slope=0.0521 '/' Tc=549.87 min CN=56 Runoff=2,212.46 cfs 2,346.762 af

Subcatchment 10S: Northwest Central Runoff Area=164.970 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=5,233' Slope=0.0786 '/' Tc=81.59 min CN=56 Runoff=100.33 cfs 33.299 af

Subcatchment 11S: Overall Site Discharge Runoff Area=13,418.000 ac 0.12% Impervious Runoff Depth>2.39"
Flow Length=47,361' Slope=0.0490 '/' Tc=601.99 min CN=56 Runoff=2,402.15 cfs 2,671.186 af

Subcatchment 12S: Northern Runoff Area=526.700 ac 0.77% Impervious Runoff Depth=2.32"
Flow Length=7,392' Slope=0.0444 '/' Tc=146.76 min CN=55 Runoff=212.88 cfs 101.973 af

Subcatchment 13S: Far North Runoff Area=645.000 ac 0.27% Impervious Runoff Depth=2.42"
Flow Length=8,712' Slope=0.0363 '/' Tc=180.51 min CN=56 Runoff=241.59 cfs 130.192 af

Subcatchment 14S: Northwest Runoff Area=4,741.700 ac 0.00% Impervious Runoff Depth>2.42"
Flow Length=32,250' Slope=0.0770 '/' Tc=353.13 min CN=56 Runoff=1,189.84 cfs 956.921 af

Subcatchment 15S: West-North Runoff Area=1,723.300 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=18,585' Slope=0.0567 '/' Tc=264.78 min CN=56 Runoff=514.79 cfs 347.845 af

Subcatchment 16S: West-Central Runoff Area=607.800 ac 0.07% Impervious Runoff Depth=2.42"
Flow Length=13,152' Slope=0.0560 '/' Tc=202.05 min CN=56 Runoff=212.41 cfs 122.683 af

Subcatchment 17S: West-South Runoff Area=595.600 ac 0.16% Impervious Runoff Depth=2.42"
Flow Length=11,901' Slope=0.0597 '/' Tc=180.65 min CN=56 Runoff=222.97 cfs 120.221 af

Subcatchment 18S: East Runoff Area=82.900 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=4,794' Slope=0.0823 '/' Tc=74.34 min CN=56 Runoff=53.44 cfs 16.733 af

Subcatchment 19S: Central Runoff Area=11,721.000 ac 0.13% Impervious Runoff Depth>2.40"
Flow Length=43,945' Slope=0.0521 '/' Tc=549.87 min CN=56 Runoff=2,212.46 cfs 2,346.762 af

Subcatchment 20S: Northwest Central Runoff Area=164.970 ac 0.00% Impervious Runoff Depth=2.42"
Flow Length=5,233' Slope=0.0786 '/' Tc=81.59 min CN=56 Runoff=100.33 cfs 33.299 af

Total Runoff Area = 68,453.940 ac Runoff Volume = 13,695.626 af Average Runoff Depth = 2.40"
99.94% Pervious = 68,415.245 ac 0.06% Impervious = 38.695 ac

Summary for Subcatchment 1S: Overall Site Discharge

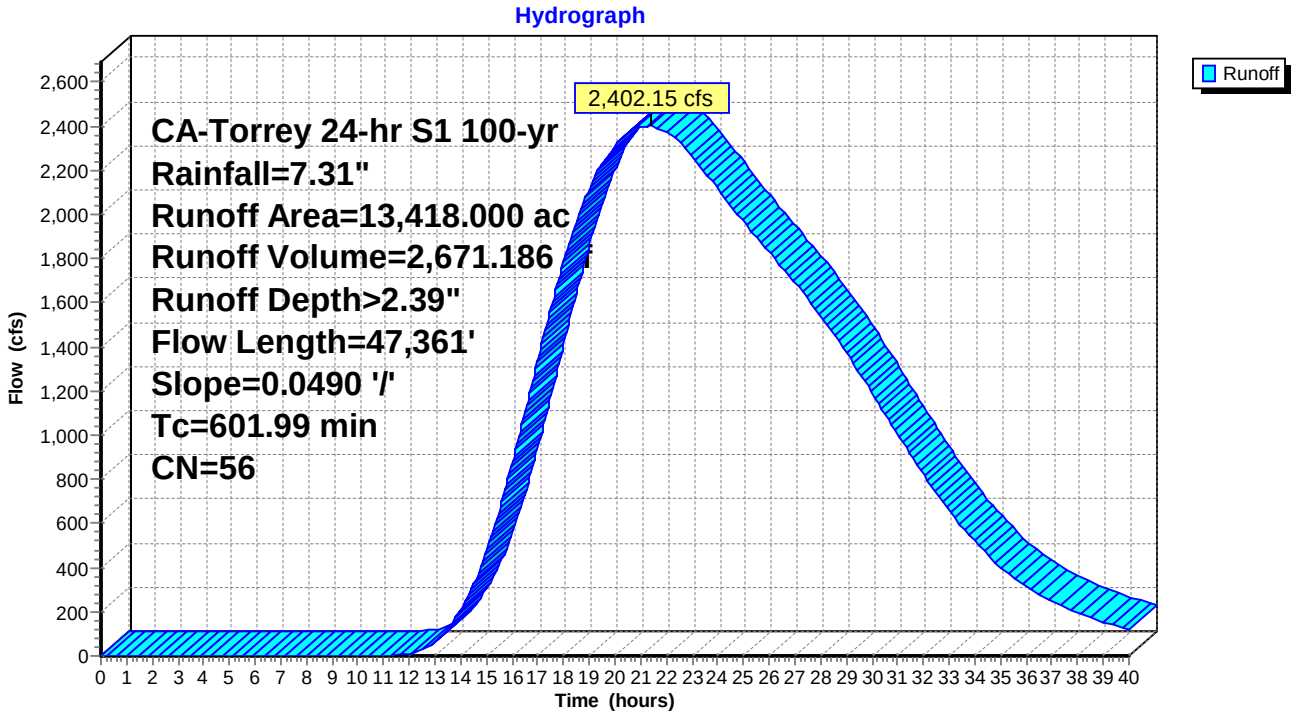
Runoff = 2,402.15 cfs @ 21.40 hrs, Volume= 2,671.186 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

Area (ac)	CN	Description
* 13,418.000	56	
13,418.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
601.99	47,361	0.0490	1.31		**Lag/CN Method,**

Subcatchment 1S: Overall Site Discharge



Summary for Subcatchment 2S: Northern

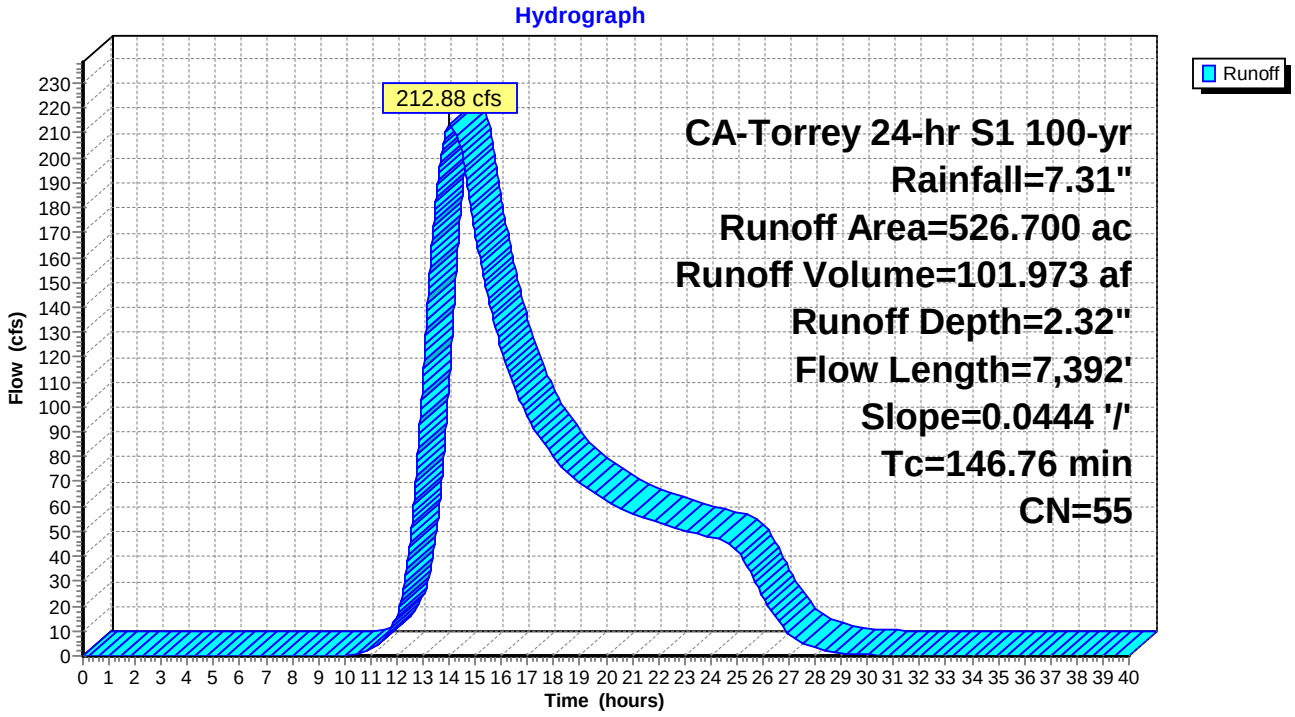
Runoff = 212.88 cfs @ 14.03 hrs, Volume= 101.973 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	526.700	55	
	526.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
146.76	7,392	0.0444	0.84		**Lag/CN Method,**

Subcatchment 2S: Northern



Summary for Subcatchment 3S: Far North

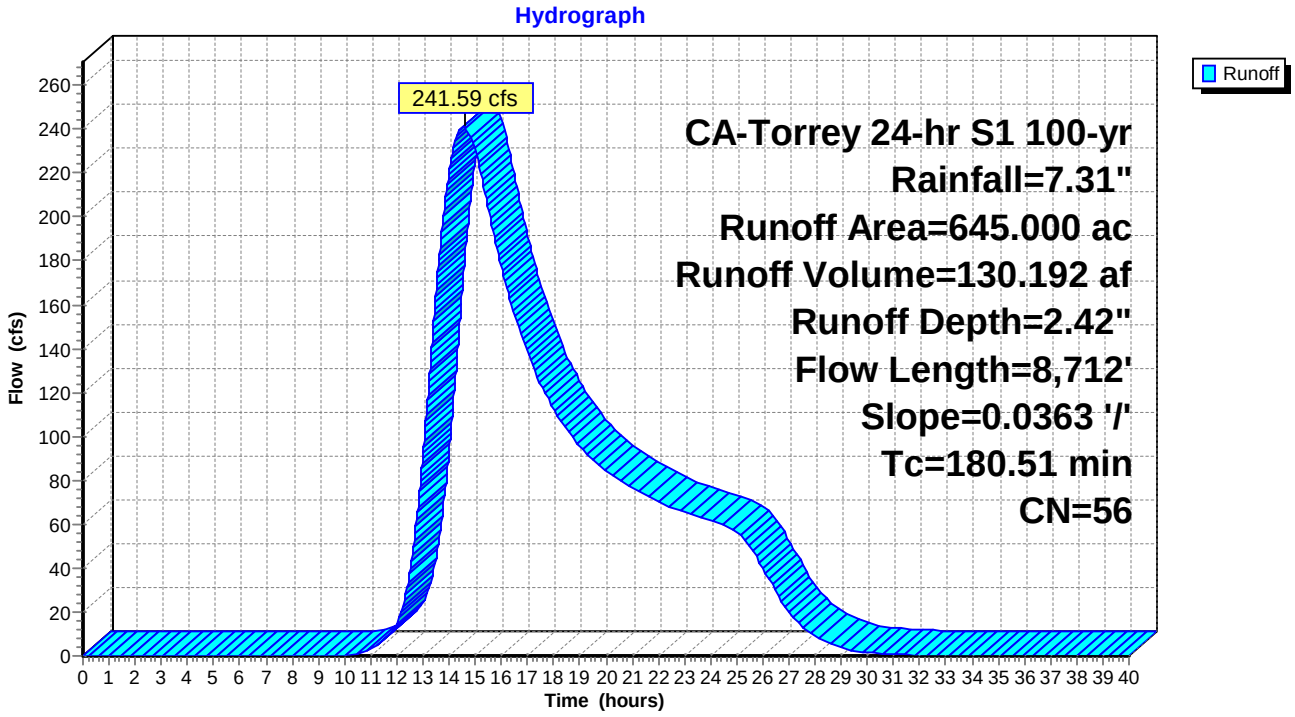
Runoff = 241.59 cfs @ 14.64 hrs, Volume= 130.192 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	645.000	56	
	645.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
180.51	8,712	0.0363	0.80		**Lag/CN Method,**

Subcatchment 3S: Far North



Summary for Subcatchment 4S: Northwest

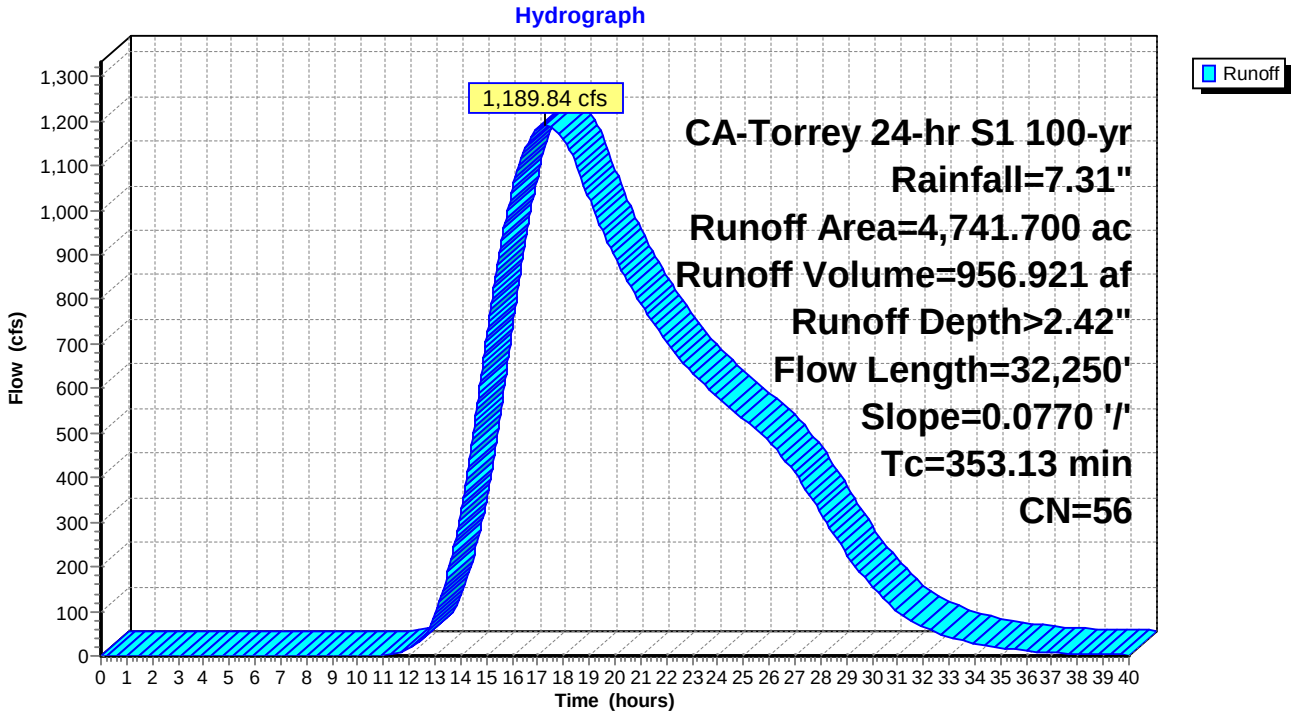
Runoff = 1,189.84 cfs @ 17.26 hrs, Volume= 956.921 af, Depth> 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	4,741.700	56	
	4,741.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
353.13	32,250	0.0770	1.52		**Lag/CN Method,**

Subcatchment 4S: Northwest



Summary for Subcatchment 5S: West-North

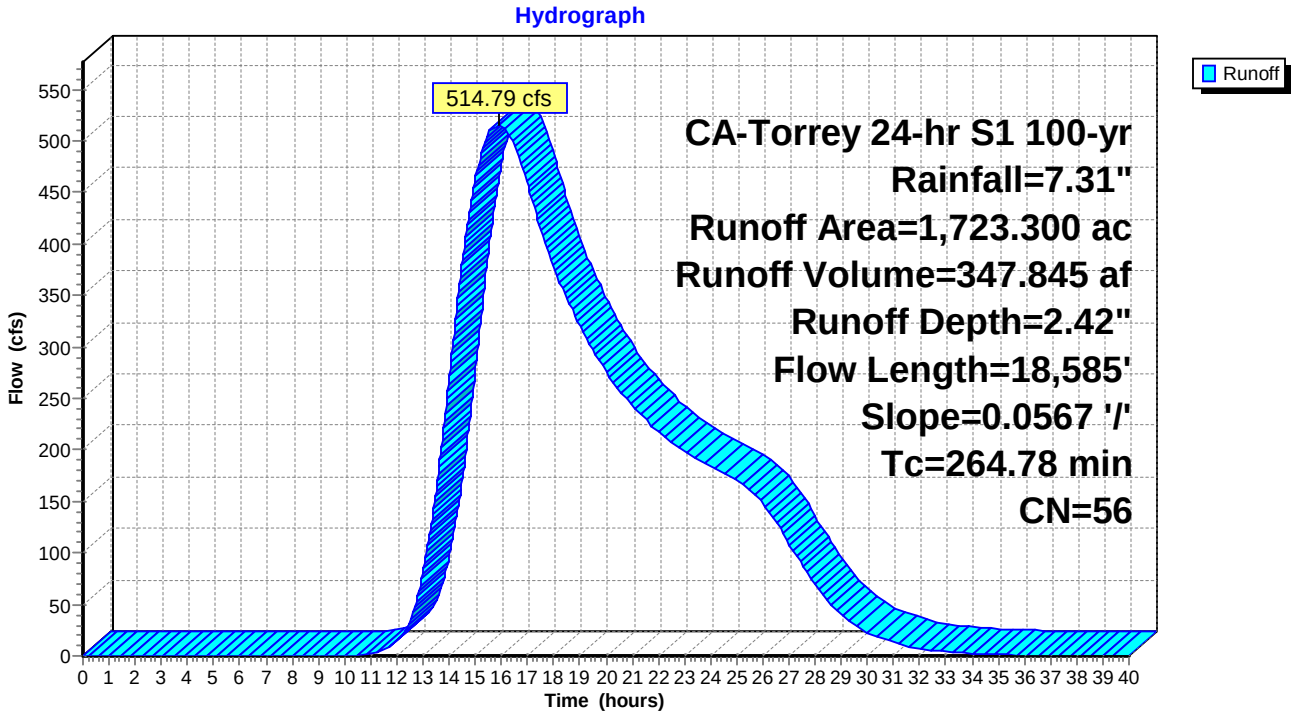
Runoff = 514.79 cfs @ 15.89 hrs, Volume= 347.845 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	1,723.300	56	
	1,723.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
264.78	18,585	0.0567	1.17		**Lag/CN Method,**

Subcatchment 5S: West-North



Summary for Subcatchment 6S: West-Central

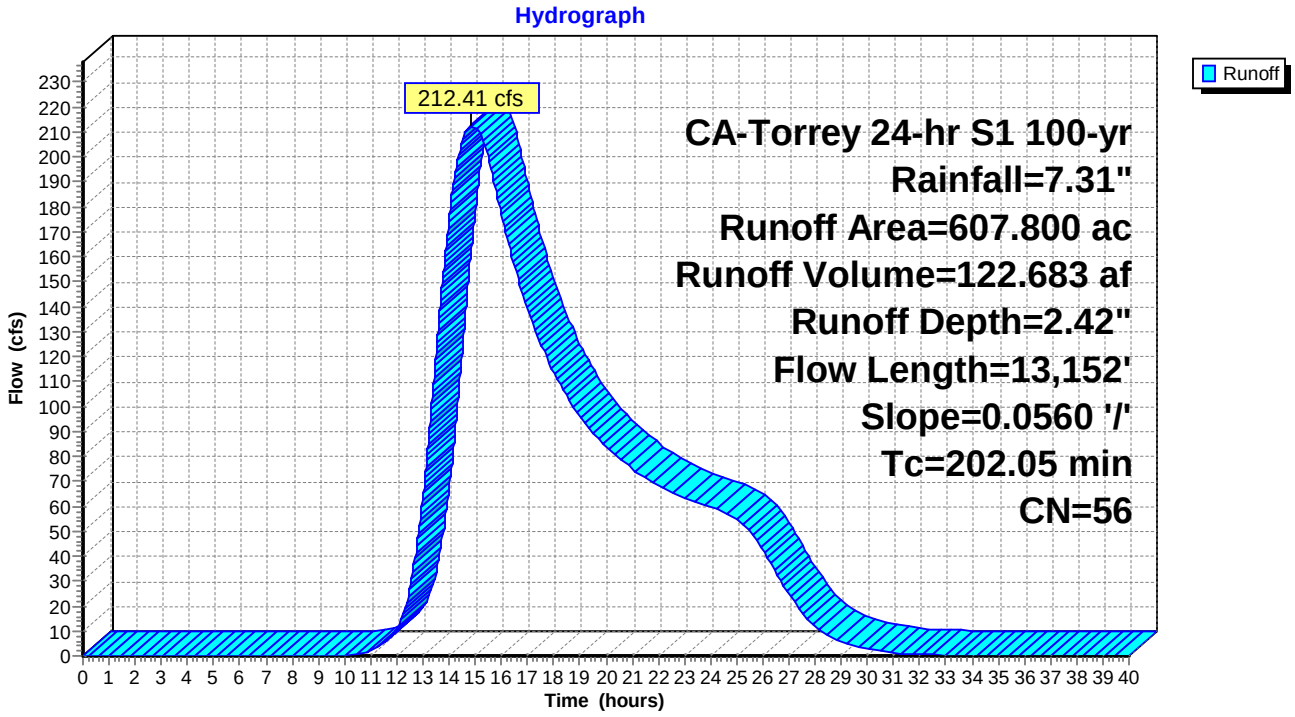
Runoff = 212.41 cfs @ 14.83 hrs, Volume= 122.683 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	607.800	56	
	607.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
202.05	13,152	0.0560	1.08		**Lag/CN Method,**

Subcatchment 6S: West-Central



Summary for Subcatchment 7S: West-South

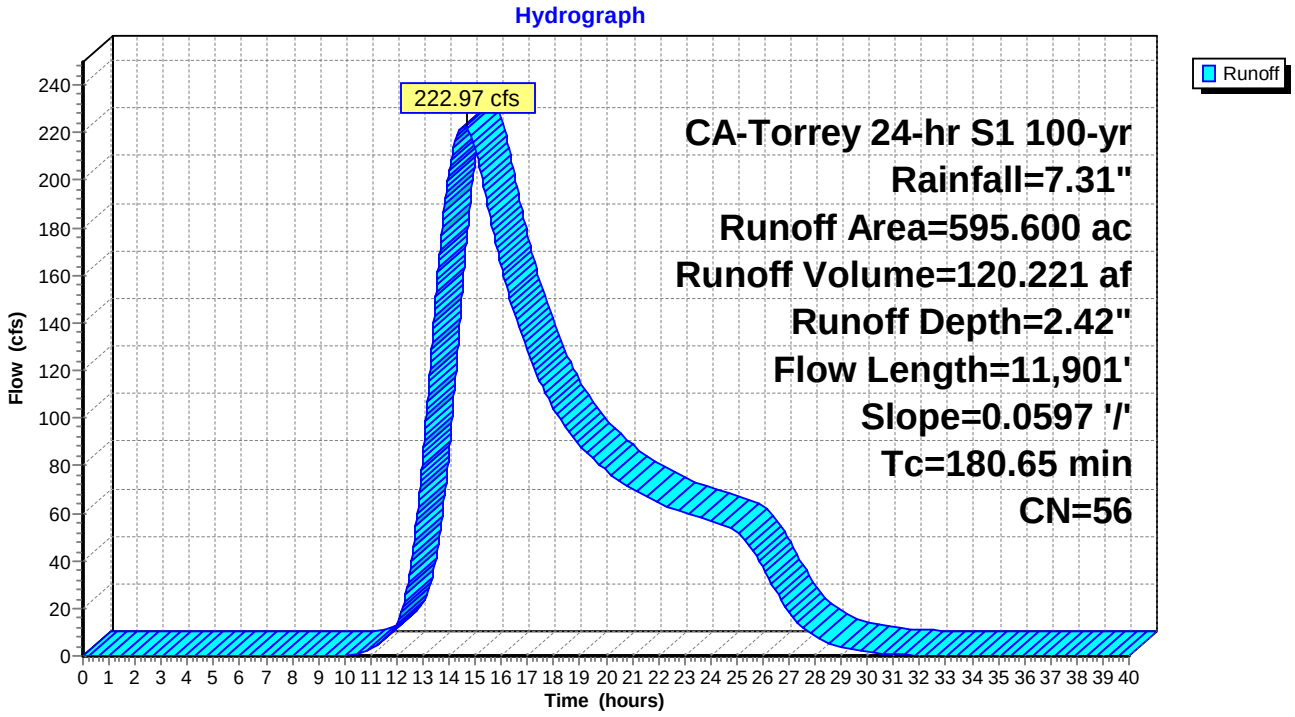
Runoff = 222.97 cfs @ 14.65 hrs, Volume= 120.221 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	595.600	56	
	595.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
180.65	11,901	0.0597	1.10		**Lag/CN Method,**

Subcatchment 7S: West-South



Summary for Subcatchment 8S: East

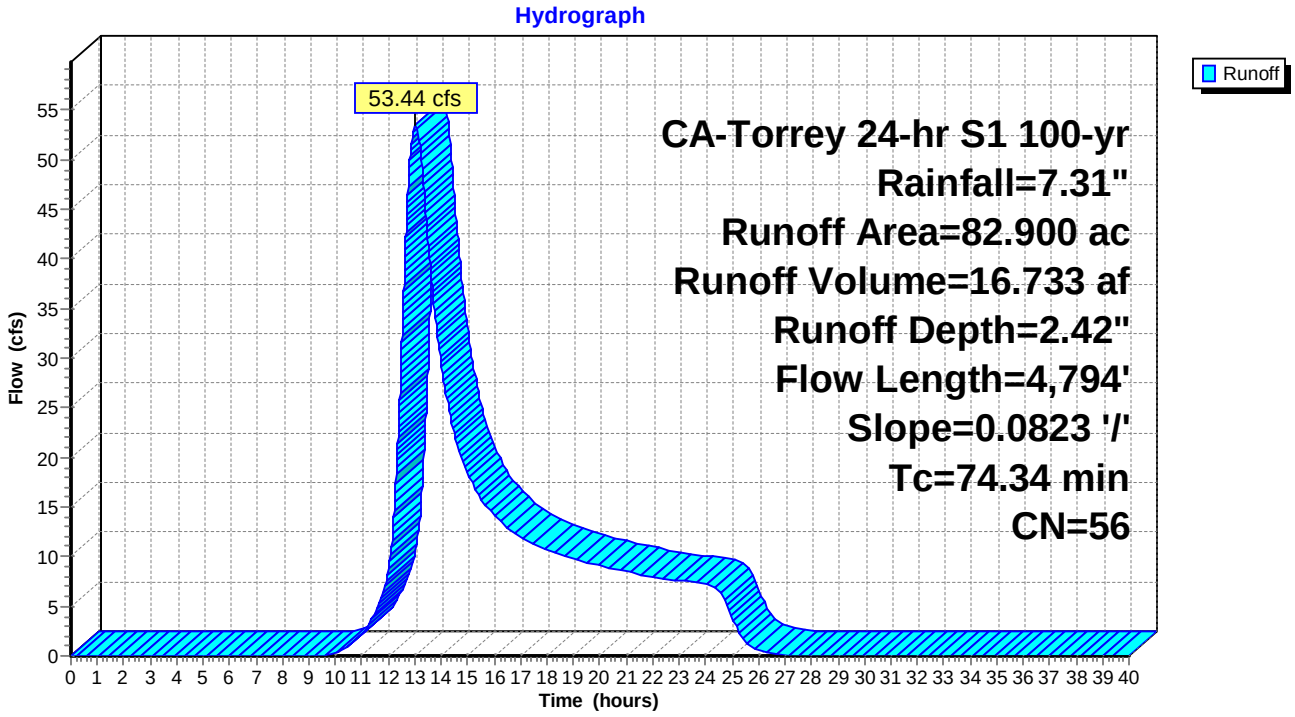
Runoff = 53.44 cfs @ 12.97 hrs, Volume= 16.733 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	82.900	56	
	82.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
74.34	4,794	0.0823	1.07		**Lag/CN Method,**

Subcatchment 8S: East



Summary for Subcatchment 9S: Central

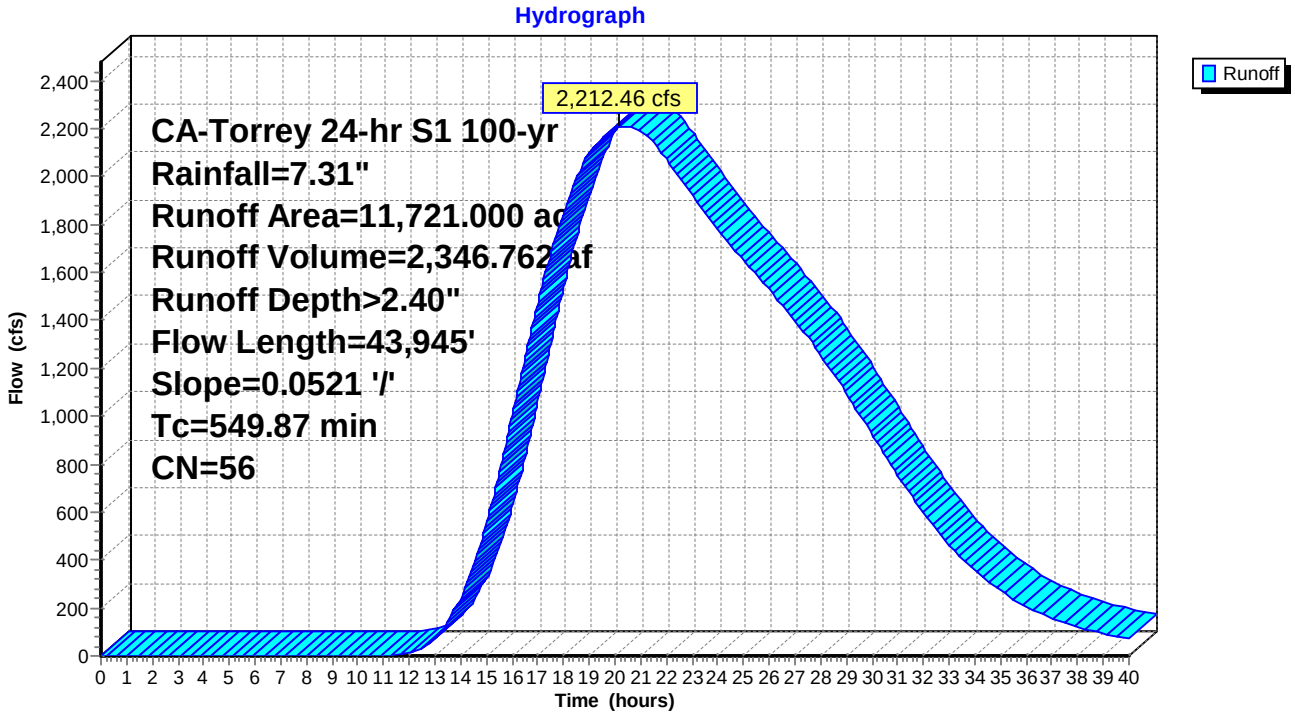
Runoff = 2,212.46 cfs @ 20.17 hrs, Volume= 2,346.762 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

Area (ac)	CN	Description
* 11,721.000	56	
11,721.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
549.87	43,945	0.0521	1.33		**Lag/CN Method,**

Subcatchment 9S: Central



Summary for Subcatchment 10S: Northwest Central

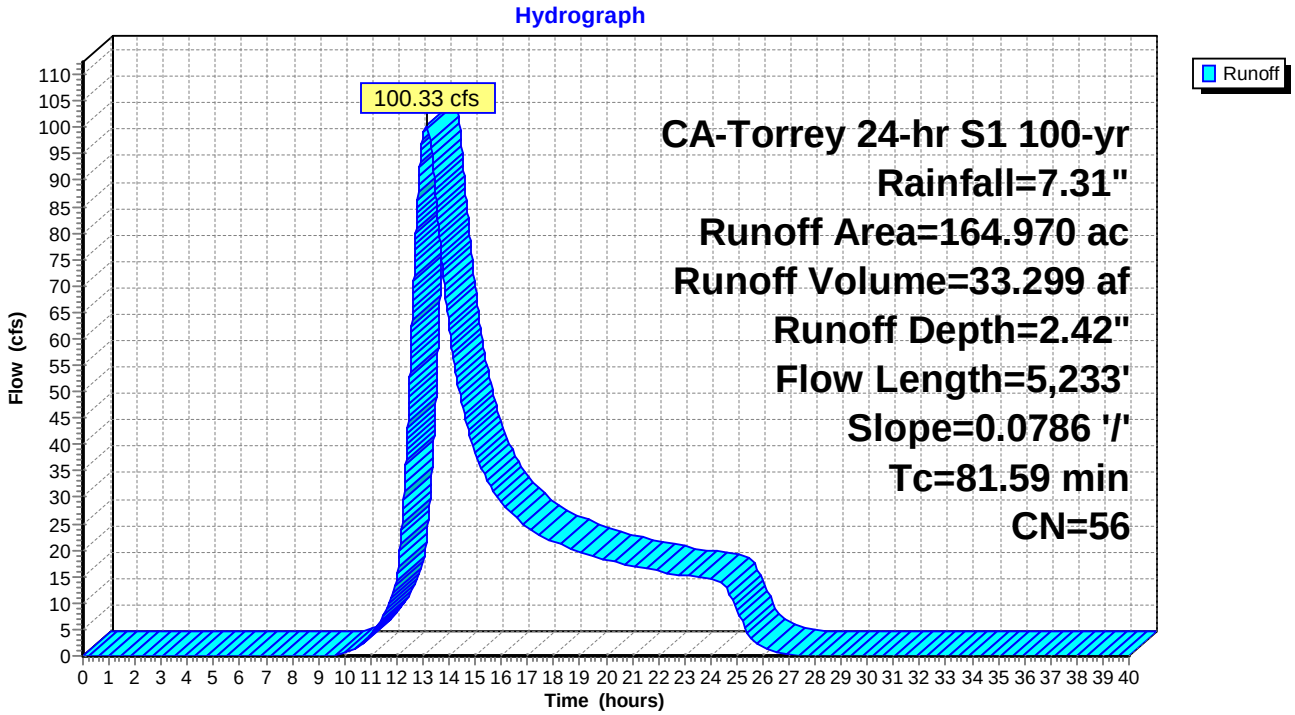
Runoff = 100.33 cfs @ 13.14 hrs, Volume= 33.299 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	164.970	56	
	164.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
81.59	5,233	0.0786	1.07		**Lag/CN Method,**

Subcatchment 10S: Northwest Central



Summary for Subcatchment 11S: Overall Site Discharge

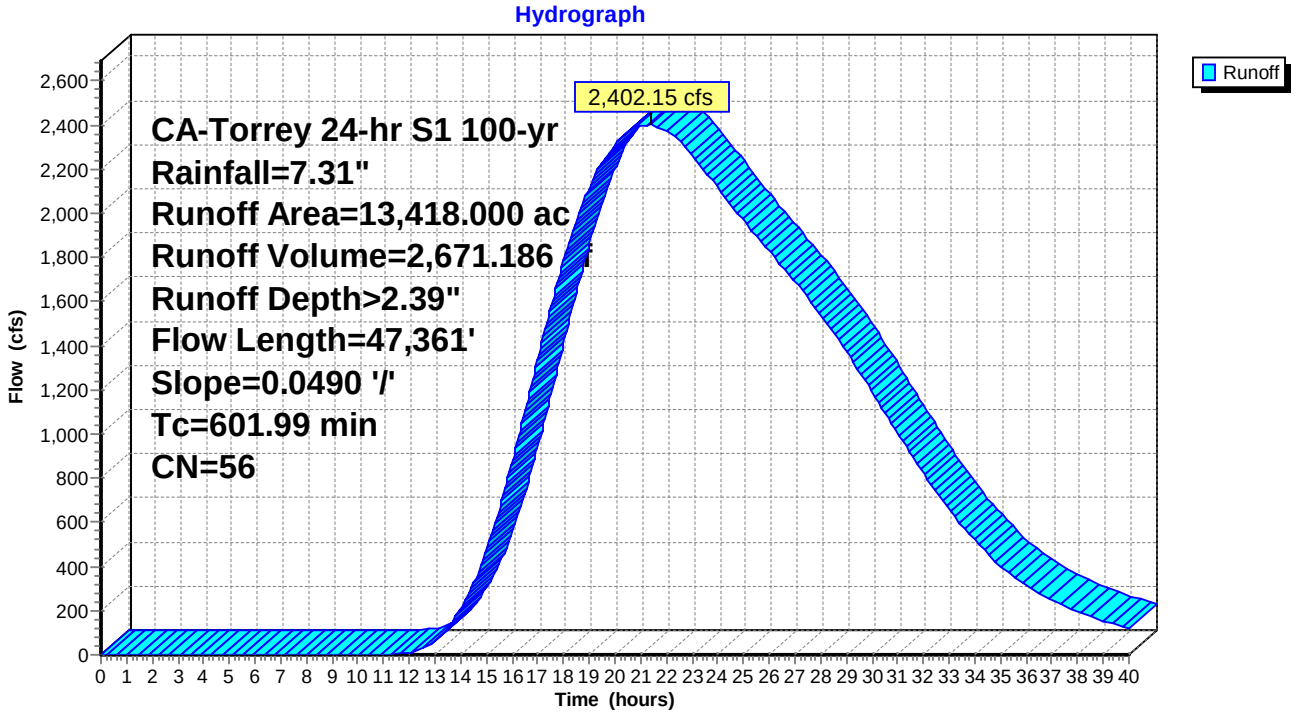
Runoff = 2,402.15 cfs @ 21.40 hrs, Volume= 2,671.186 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

Area (ac)	CN	Description
* 13,394.282	56	
15.764	98	Paved parking, HSG A
7.954	96	Gravel surface, HSG A
13,418.000	56	Weighted Average
13,402.236		99.88% Pervious Area
15.764		0.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
601.99	47,361	0.0490	1.31		**Lag/CN Method,**

Subcatchment 11S: Overall Site Discharge



Summary for Subcatchment 12S: Northern

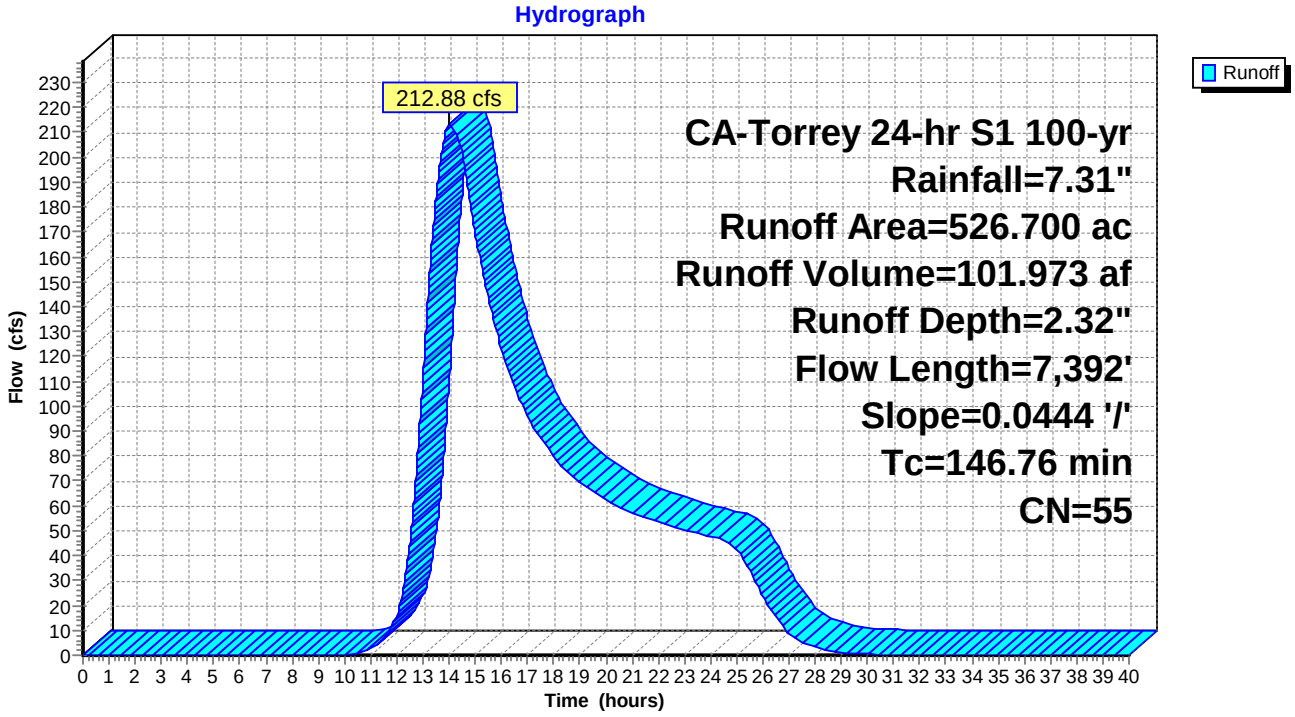
Runoff = 212.88 cfs @ 14.03 hrs, Volume= 101.973 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	522.661	55	
	4.039	98	Paved parking, HSG A
	526.700	55	Weighted Average
	522.661		99.23% Pervious Area
	4.039		0.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
146.76	7,392	0.0444	0.84		**Lag/CN Method,**

Subcatchment 12S: Northern



Summary for Subcatchment 13S: Far North

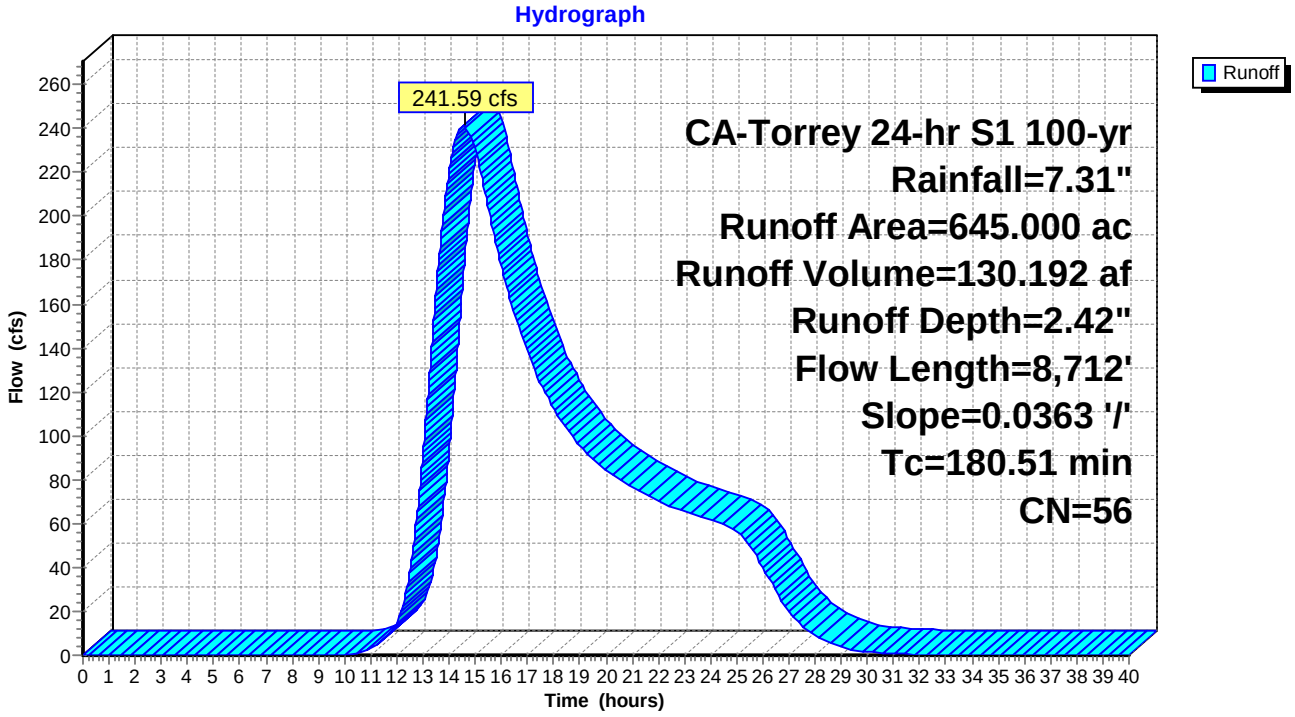
Runoff = 241.59 cfs @ 14.64 hrs, Volume= 130.192 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	643.262	56	
	1.738	98	Paved parking, HSG A
	645.000	56	Weighted Average
	643.262		99.73% Pervious Area
	1.738		0.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
180.51	8,712	0.0363	0.80		**Lag/CN Method,**

Subcatchment 13S: Far North



Summary for Subcatchment 14S: Northwest

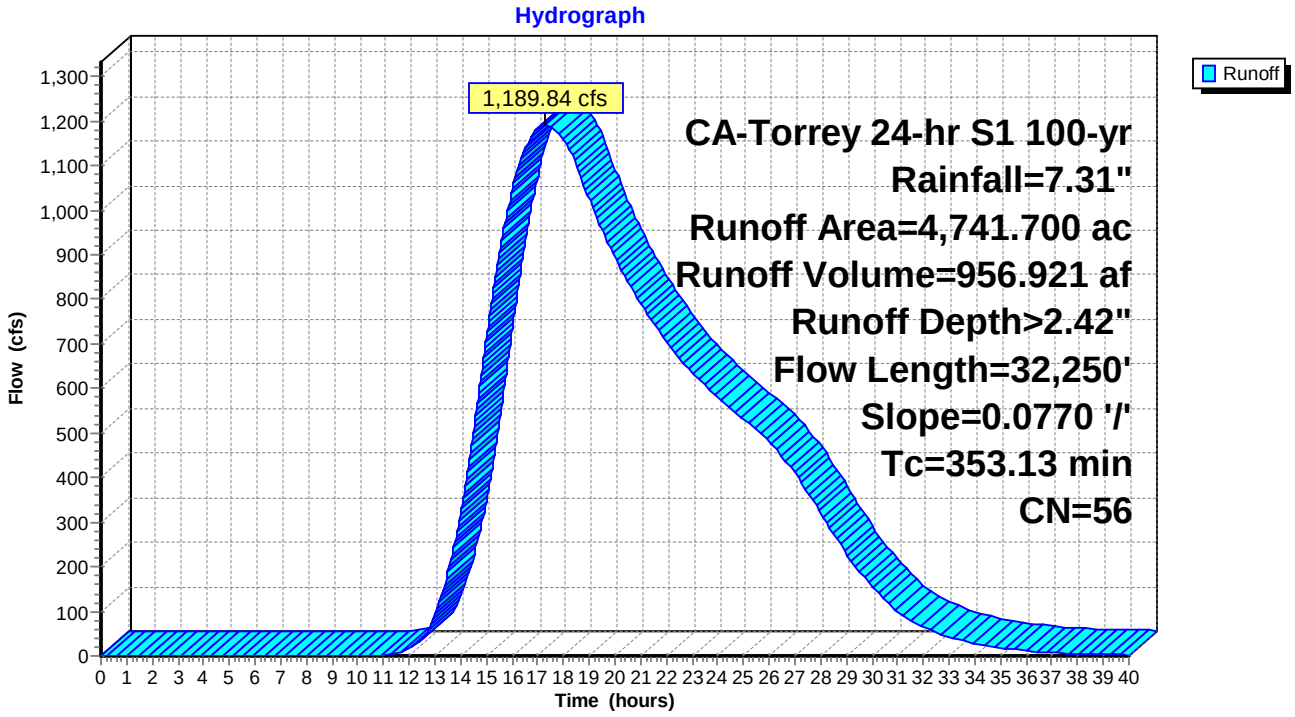
Runoff = 1,189.84 cfs @ 17.26 hrs, Volume= 956.921 af, Depth> 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	4,741.700	56	
	4,741.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
353.13	32,250	0.0770	1.52		**Lag/CN Method,**

Subcatchment 14S: Northwest



Summary for Subcatchment 15S: West-North

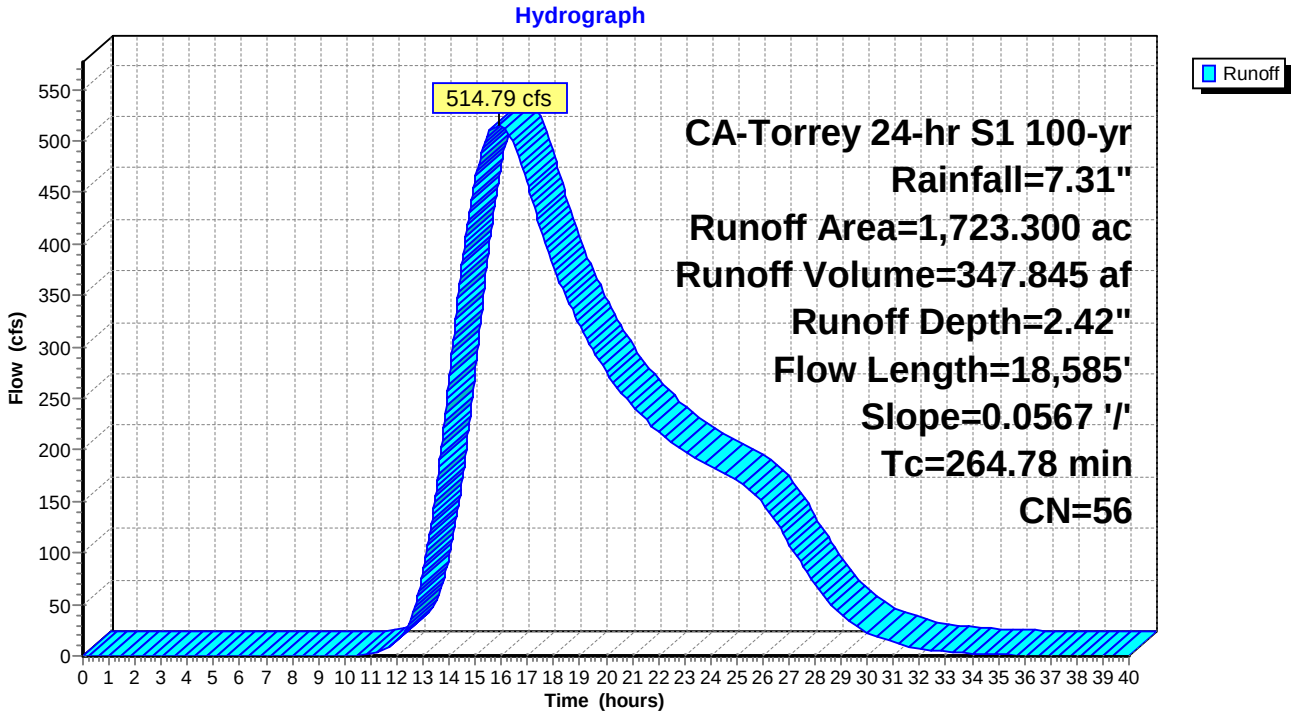
Runoff = 514.79 cfs @ 15.89 hrs, Volume= 347.845 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	1,723.300	56	
	1,723.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
264.78	18,585	0.0567	1.17		**Lag/CN Method,**

Subcatchment 15S: West-North



Summary for Subcatchment 16S: West-Central

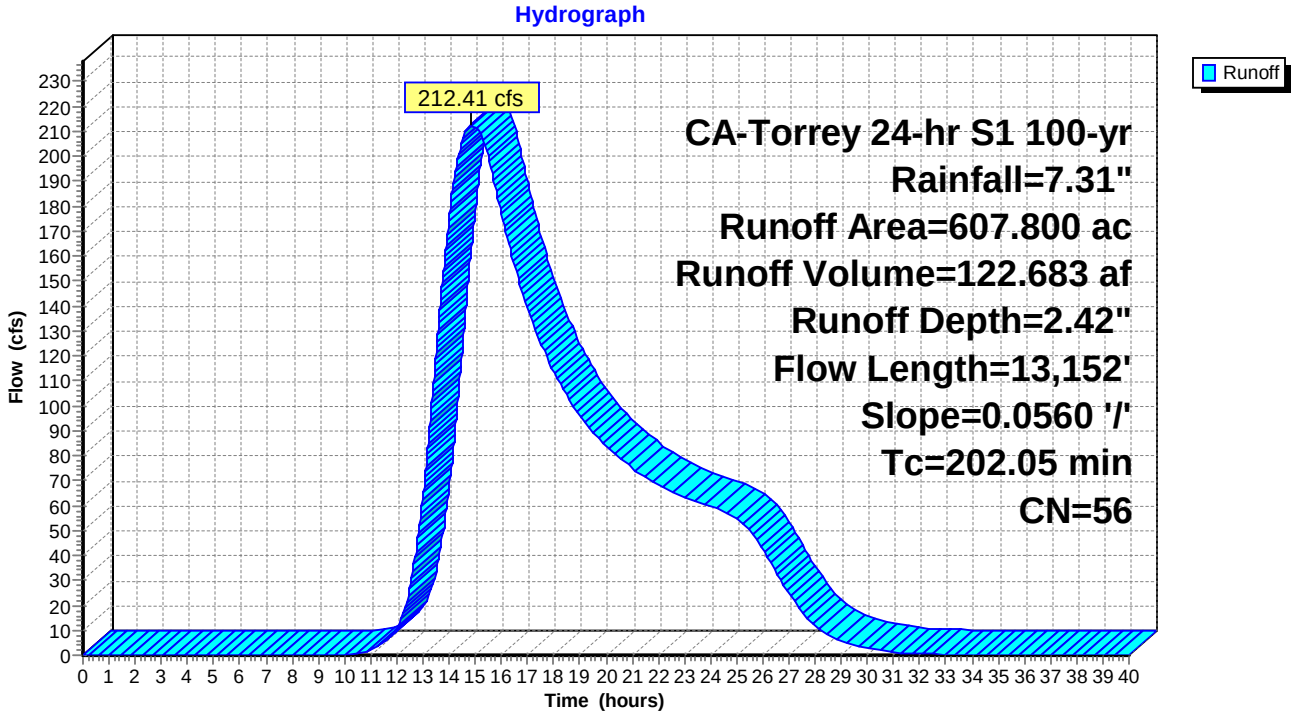
Runoff = 212.41 cfs @ 14.83 hrs, Volume= 122.683 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	607.360	56	
	0.440	98	Paved parking, HSG A
	607.800	56	Weighted Average
	607.360		99.93% Pervious Area
	0.440		0.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
202.05	13,152	0.0560	1.08		**Lag/CN Method,**

Subcatchment 16S: West-Central



Summary for Subcatchment 17S: West-South

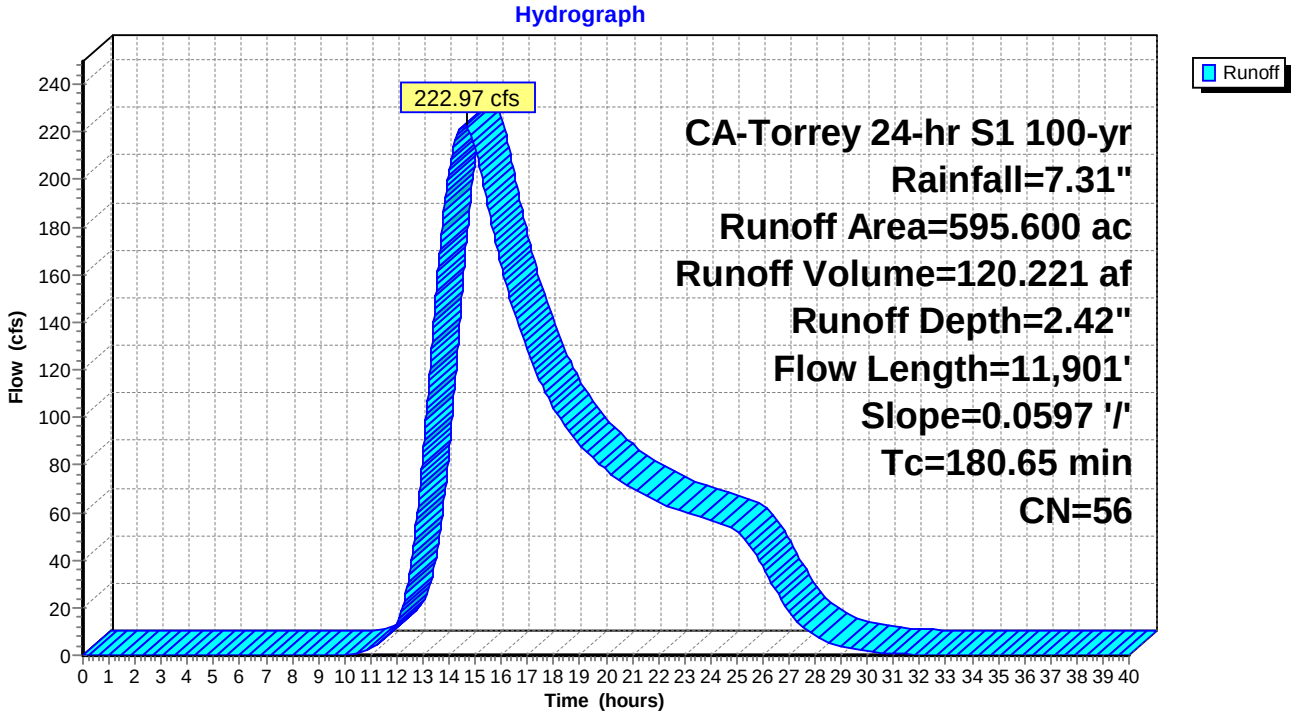
Runoff = 222.97 cfs @ 14.65 hrs, Volume= 120.221 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	594.650	56	
	0.950	98	Paved parking, HSG A
	595.600	56	Weighted Average
	594.650		99.84% Pervious Area
	0.950		0.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
180.65	11,901	0.0597	1.10		**Lag/CN Method,**

Subcatchment 17S: West-South



Summary for Subcatchment 18S: East

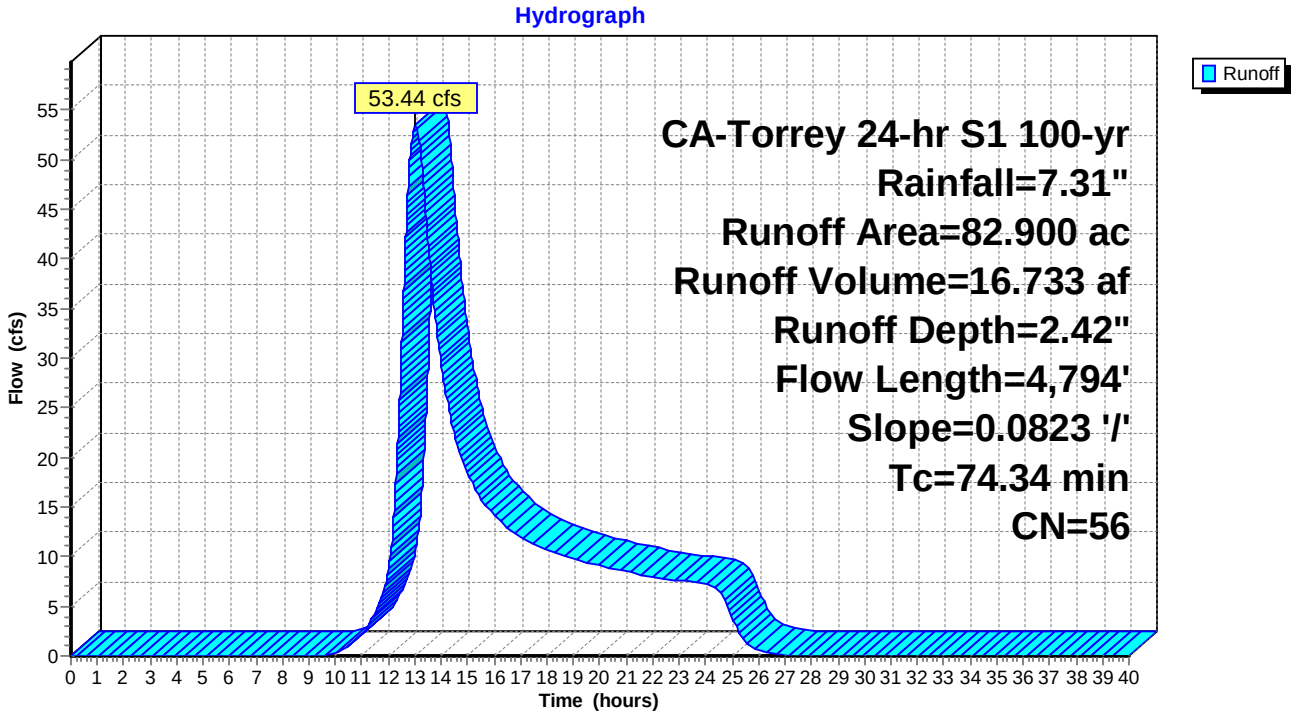
Runoff = 53.44 cfs @ 12.97 hrs, Volume= 16.733 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	82.900	56	
	82.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
74.34	4,794	0.0823	1.07		**Lag/CN Method,**

Subcatchment 18S: East



Summary for Subcatchment 19S: Central

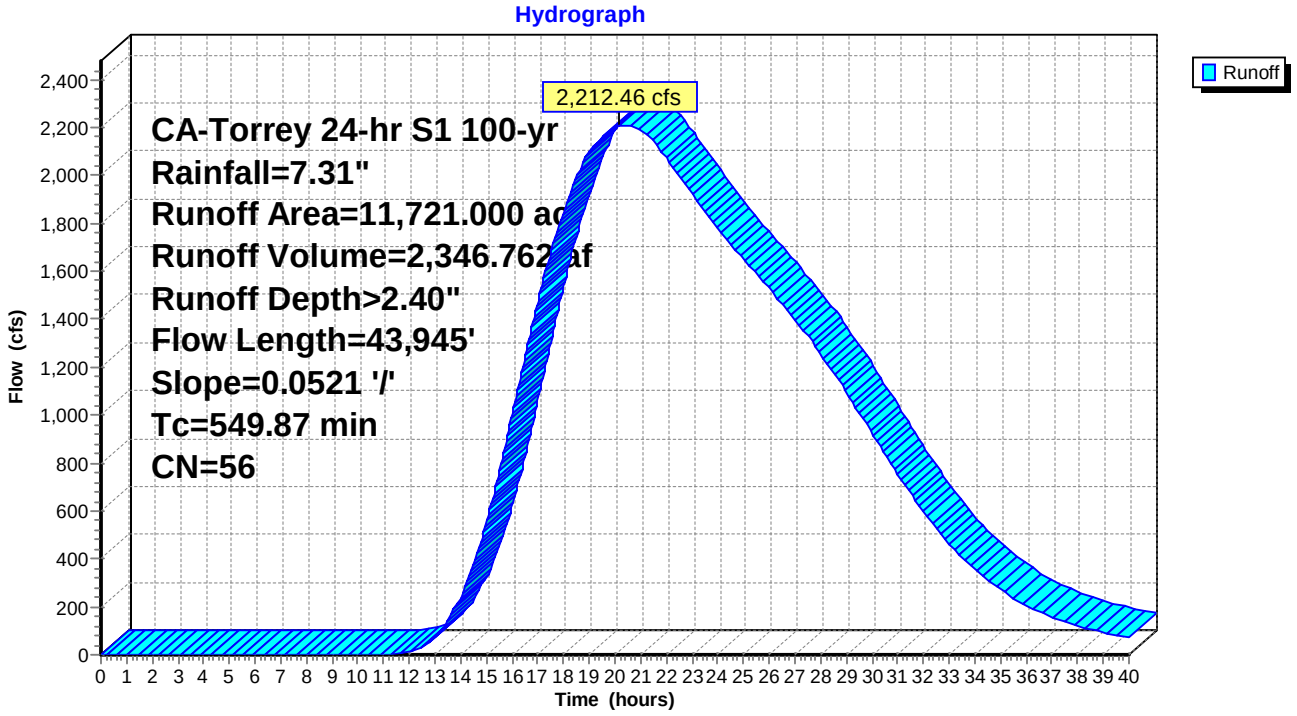
Runoff = 2,212.46 cfs @ 20.17 hrs, Volume= 2,346.762 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

Area (ac)	CN	Description
*11,697.282	56	
15.764	98	Paved parking, HSG A
7.954	96	Gravel surface, HSG A
11,721.000	56	Weighted Average
11,705.236		99.87% Pervious Area
15.764		0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
549.87	43,945	0.0521	1.33		**Lag/CN Method,**

Subcatchment 19S: Central



Summary for Subcatchment 20S: Northwest Central

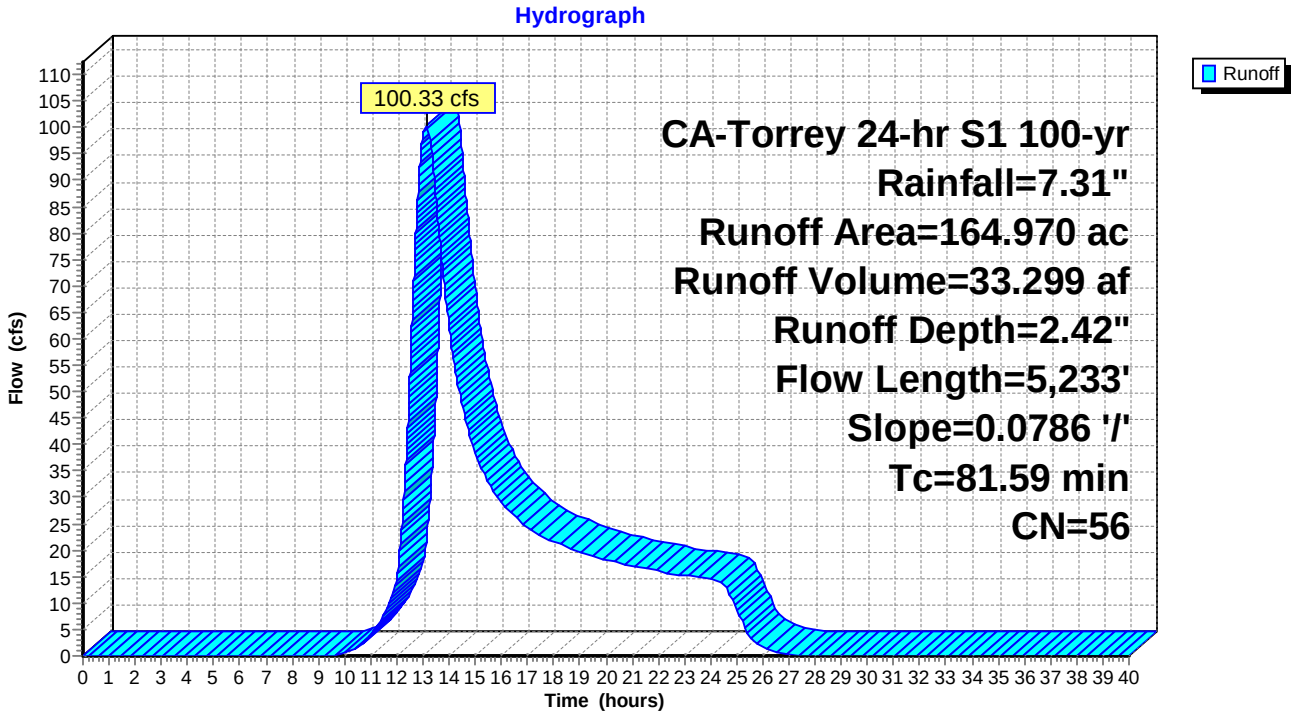
Runoff = 100.33 cfs @ 13.14 hrs, Volume= 33.299 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
CA-Torrey 24-hr S1 100-yr Rainfall=7.31"

	Area (ac)	CN	Description
*	164.970	56	
	164.970		100.00% Pervious Area

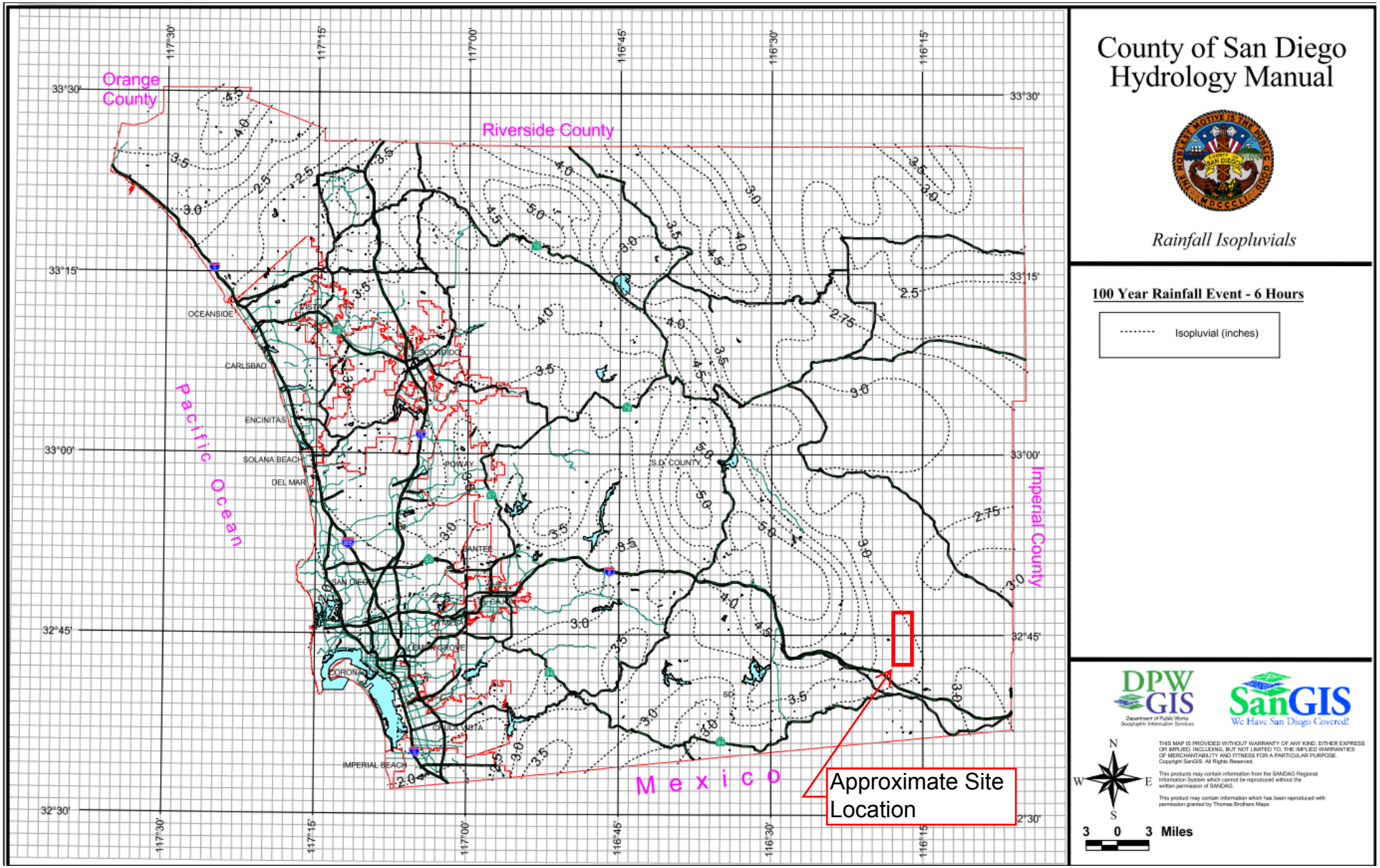
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
81.59	5,233	0.0786	1.07		**Lag/CN Method,**

Subcatchment 20S: Northwest Central



Appendix K

Isopluvial Maps



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

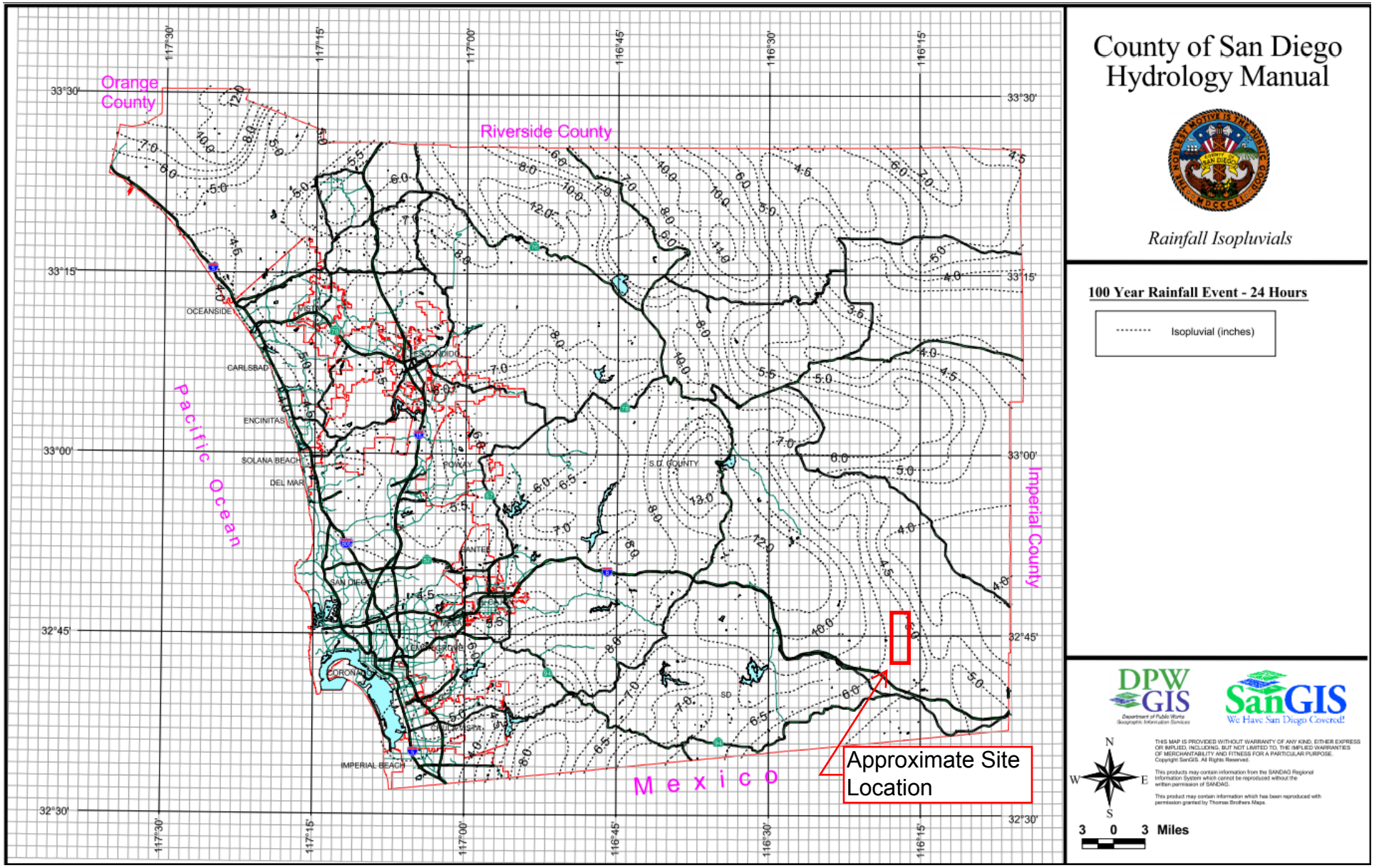
Isopluvial (inches)

DPW GIS — Department of Public Works, Geographic Information Services

SanGIS — We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
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N W E S

3 0 3 Miles

Appendix L

Manning's Numbers Table

Table A-5 Average Manning Roughness Coefficients for Natural Channels

Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060
Flood Plains (Adjacent To Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140