

Appendix D-3
Grading and Hydrology Study

Acorn Environmental

Site Grading and Hydrology Study

Prepared by HydroScience Engineers



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SECTION 1 – INTRODUCTION AND BACKGROUND

HydroScience Engineers, Inc. (HydroScience) was retained by Acorn Environmental (Acorn) to prepare a preliminary site grading plan and hydrology study for the Shiloh Resort and Casino Project (Project) proposed by the Koi Nation of Northern California.

The project site is located at the southeastern corner of Shiloh Road and Old Redwood Highway in an unincorporated area of Sonoma County, California (see **Figure 1-1**). This report, and associated plans are intended to provide information for the environmental analysis of the Project.

1.1 Project Description

The study has been prepared for three development alternatives for the project site. Alternative A – Proposed Resort and Casino Project consists of a resort hotel and casino with event center and conference space, parking structure, and surface parking lots. Alternative B – Reduced Intensity Resort and Casino Project consists of a similar sized hotel and casino, but will not construct the event center or conference space. Due to this reduced intensity, a smaller parking structure will be constructed accommodate the site parking demands. The third proposed site, Alternative C – Proposed Non Gaming Site Project consists of a hotel, restaurant and winery with a visitors center. Surface parking lots will be constructed that meet the non-gaming project parking demands. All three of the site alternatives will also construct a wastewater treatment plant in the southeasterly portion of the site.

The proposed property is divided by Pruitt Creek in the north-south direction. The preliminary grading plan will incorporate an area for storm water detention to mitigate the increase in storm runoff created by the development of the proposed gaming facility and site improvements. The plan for the existing site is to elevate the proposed facilities a minimum of one foot above the floodplain to allow storm water to drain to the detention basin. The storm water detention basins will attenuate the increase in peak flow created by the development.

1.2 Existing Site Description and Topography

The existing site encompasses approximately 68.6 acres of agricultural land consisting of grape vineyards and a single-family residential home. The site is generally bounded by East Shiloh Road to the north, Old Redwood Highway to the west, low density residential to the south, and agricultural land to the east. The existing site is split into two areas that are divided by Pruitt Creek crossing the site in the north-south direction encompassing 5.0 acres.

The existing topography of the site is relatively flat ranging in elevation from 135 feet to 160 feet and generally slopes towards Pruitt Creek that runs through the site. With the creek flowing in the south-southwesterly direction (see **Figure 1-2**).

Figure 1-1: Vicinity and Project Location Map

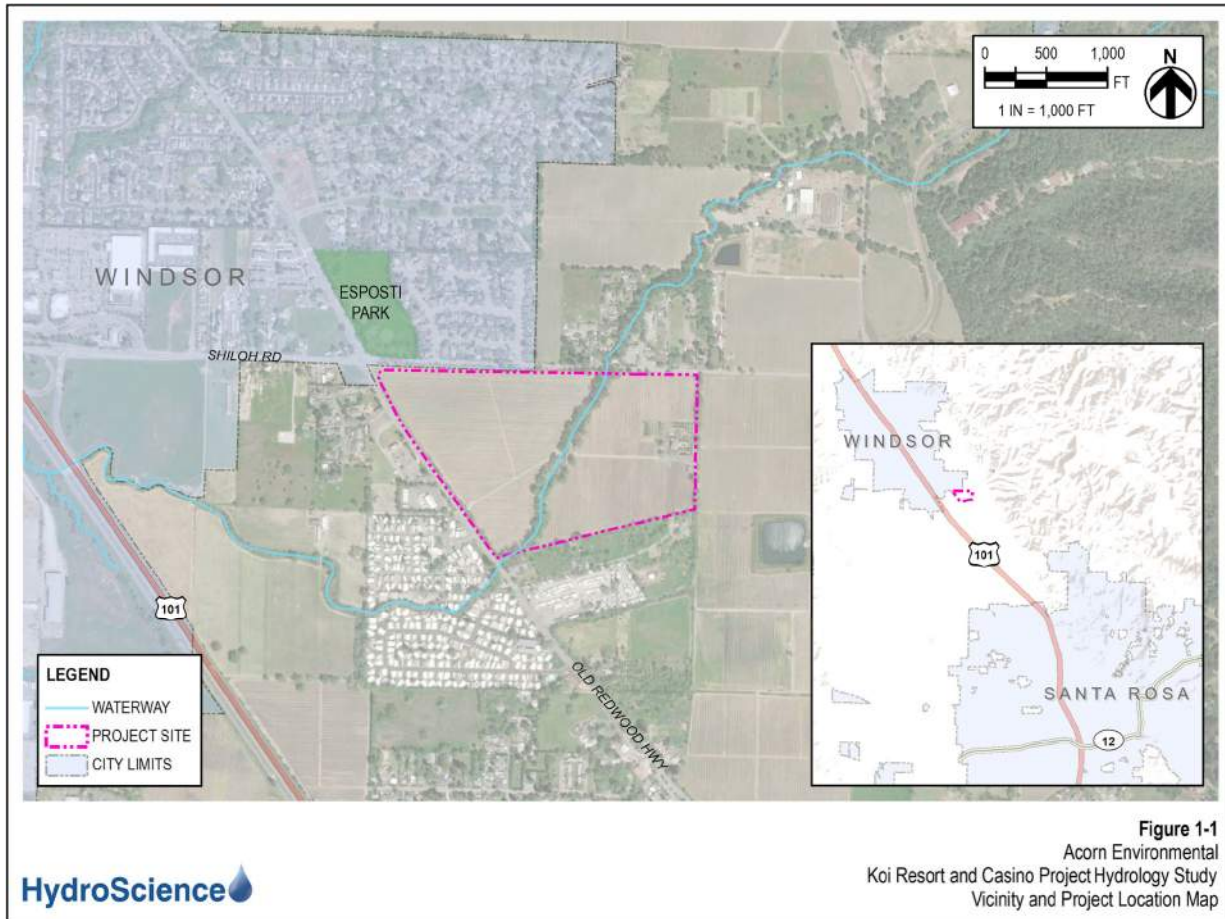
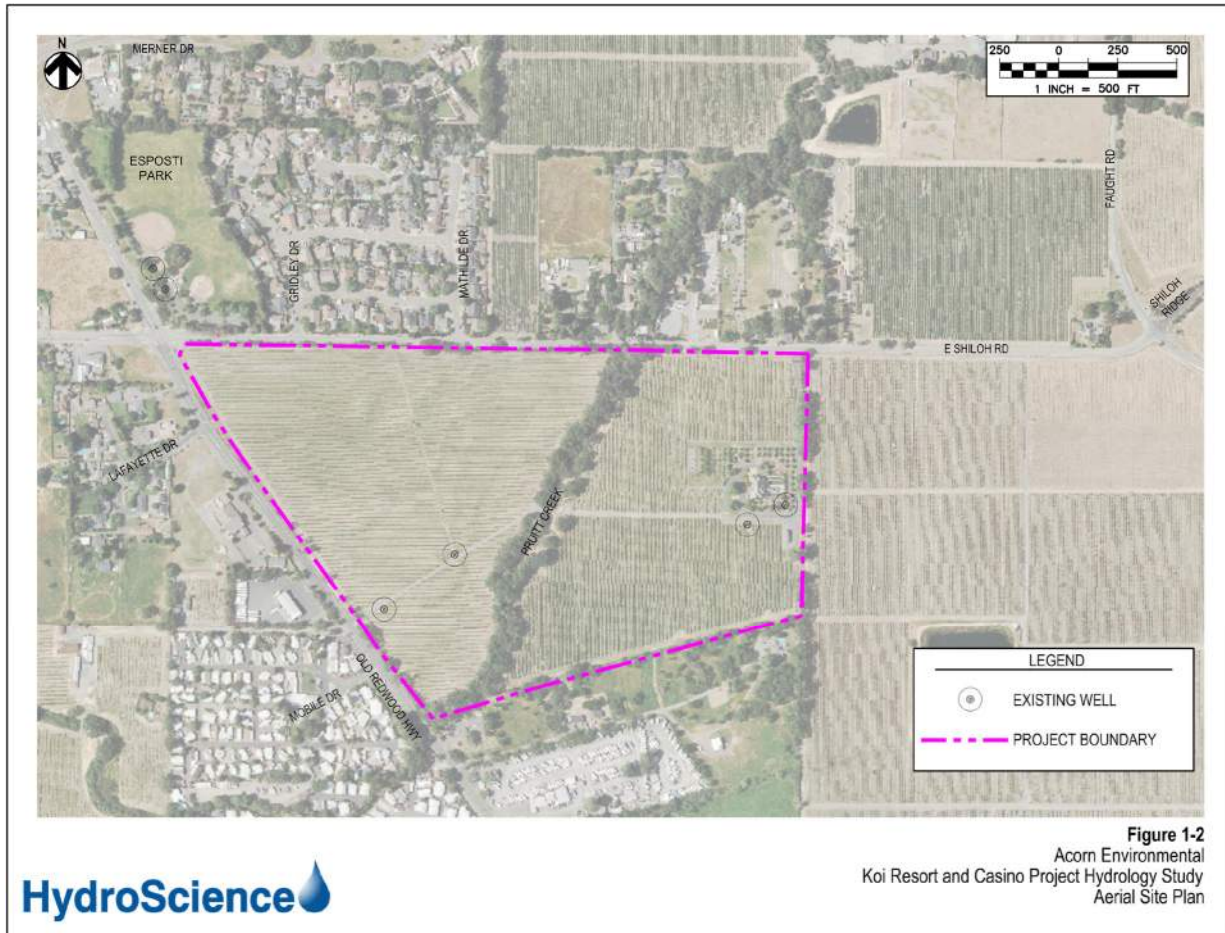


Figure 1-2: Aerial Site Plan



1.3 Flood Insurance Rate Map (FIRM) Floodplain

The property is in Flood Insurance Rate Map (FIRM) Panel 060375 entitled Sonoma County, California (Unincorporated Areas). A Firmette has been created for the project site from the FEMA Map Service Center and attached as **Appendix A**. The Firmette shows Pruitt Creek as a regulatory floodway with flood risk during any storm event and depicts the following Zones:

- Zone AE is the known base flood elevation for a 100-year storm event.
- Zone X (non-regulated) floodway is the area of a 100-year storm event with an average flood depth of less than one foot.
- Zone X are areas within a 500-year storm event.

Alternatives A, B and C have been developed to locate all structures outside of the regulatory floodplain and 100-year storm event flood limits.

SECTION 2 – PROPOSED SITE IMPROVEMENT PLANS

With the Pruitt Creek dividing the site, Alternative A proposes to construct a resort facility that includes a casino, a food court, restaurants/ service bars, a 400-room hotel and spa, approximately 74,000 square feet of meeting space, and a 2,800-seat event center, on the west side of Pruitt Creek. On the east side of Pruitt Creek, a parking structure, parking lot, wastewater treatment facilities and other supporting infrastructure are proposed. Vehicular traffic will be able to cross the creek via a bridge and on-site roadway used for internal circulation. Pedestrian traffic will cross the creek using an aerial bridge that connects the parking structure and the casino. Various areas on both the east and west side of the site will remain as grape vineyards (see **Figure 2-1**).

Alternative B would include the development of a casino, a food court, restaurants/service bars, and a 400-room hotel and spa on the west side of Pruitt Creek. Alternative B would not include the development of the approximately 74,000 square feet of meeting space and 2,800-seat event center. On the east side of Pruitt Creek, a parking structure, wastewater treatment facilities and other supporting infrastructure are proposed. Alternative B would not include the surface parking lot proposed under Alternative A. Vehicular and pedestrian circulation elements remain the same as Alternative A. A larger portion of the site will remain as grape vineyards as well (see **Figure 2-2**).

Alternative C is a non-gaming site plan that consists of a 400-room hotel and spa, restaurant and a winery with visitors center on the west side of Pruitt Creek. Parking for the non-gaming site plan will consist of two surface parking lots on the west side of creek. The easterly side of the site will mostly remain as vineyards with only a wastewater treatment facility being constructed. (see Figure 2-3).

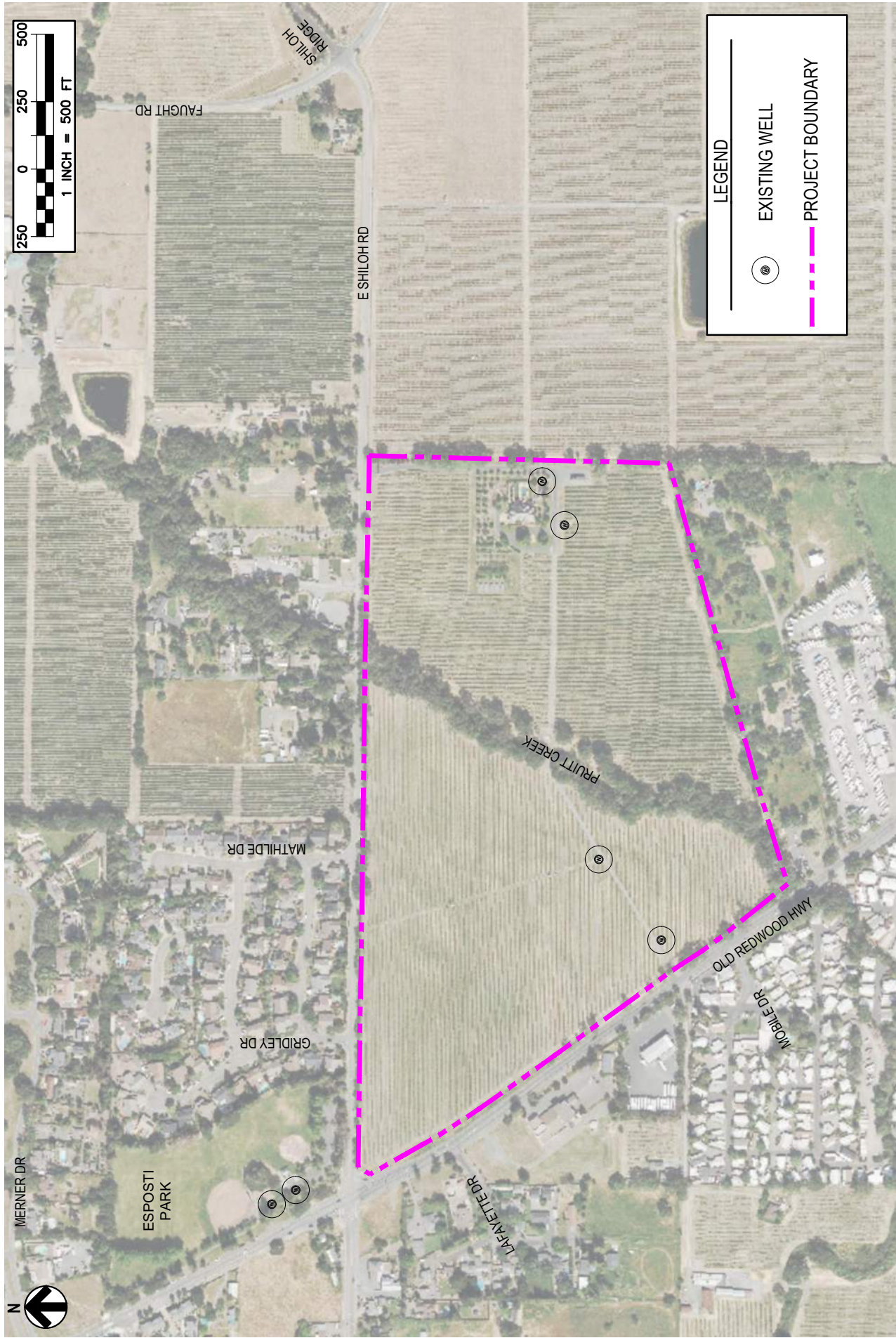


Figure 1-2
 Acorn Environmental
 Koi Resort and Casino Project Hydrology Study
 Aerial Site Plan

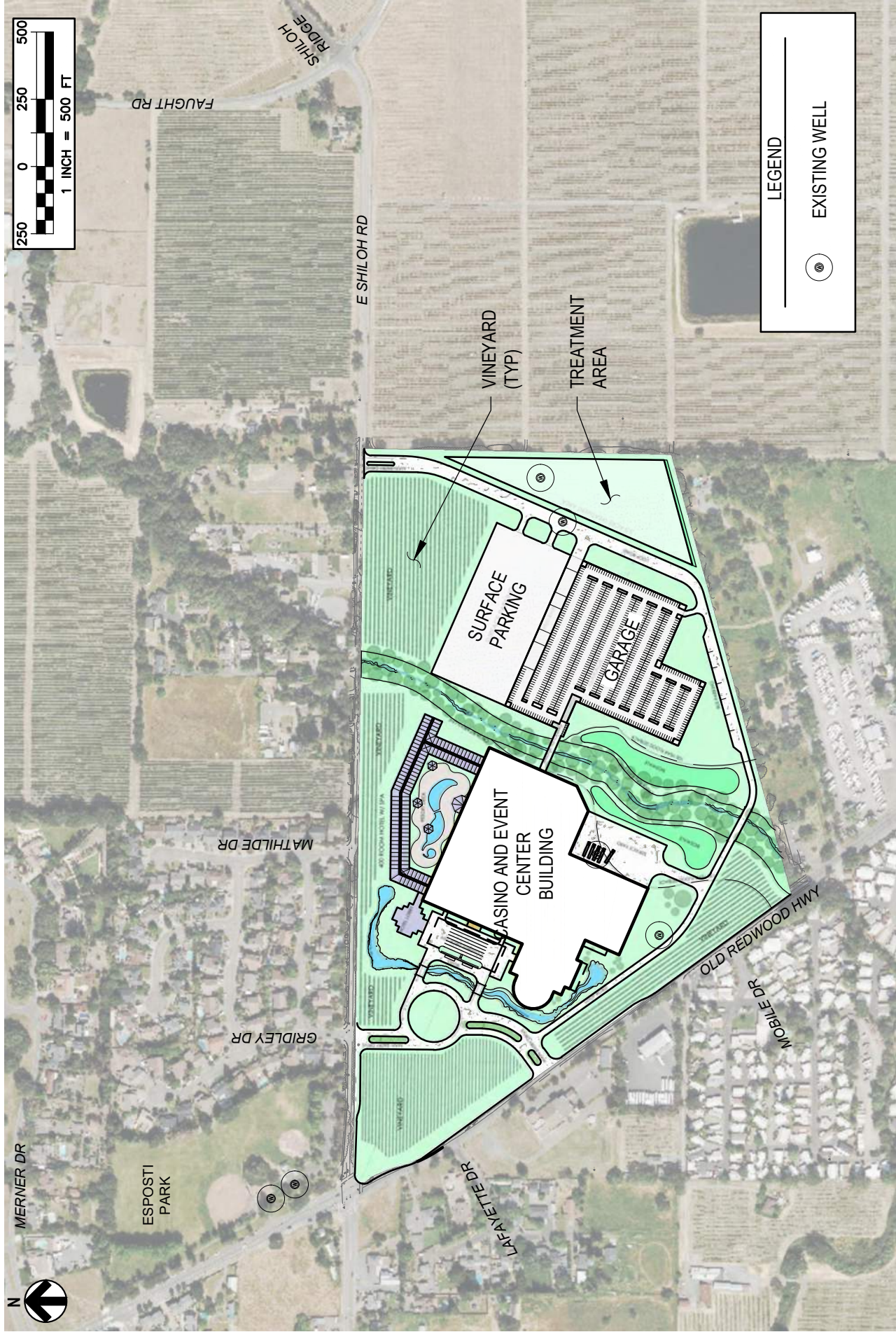


Figure 2-1
 Acorn Environmental
 Koi Resort and Casino Project Water and Wastewater Feasibility Study
 Proposed Site Plan - Buildout

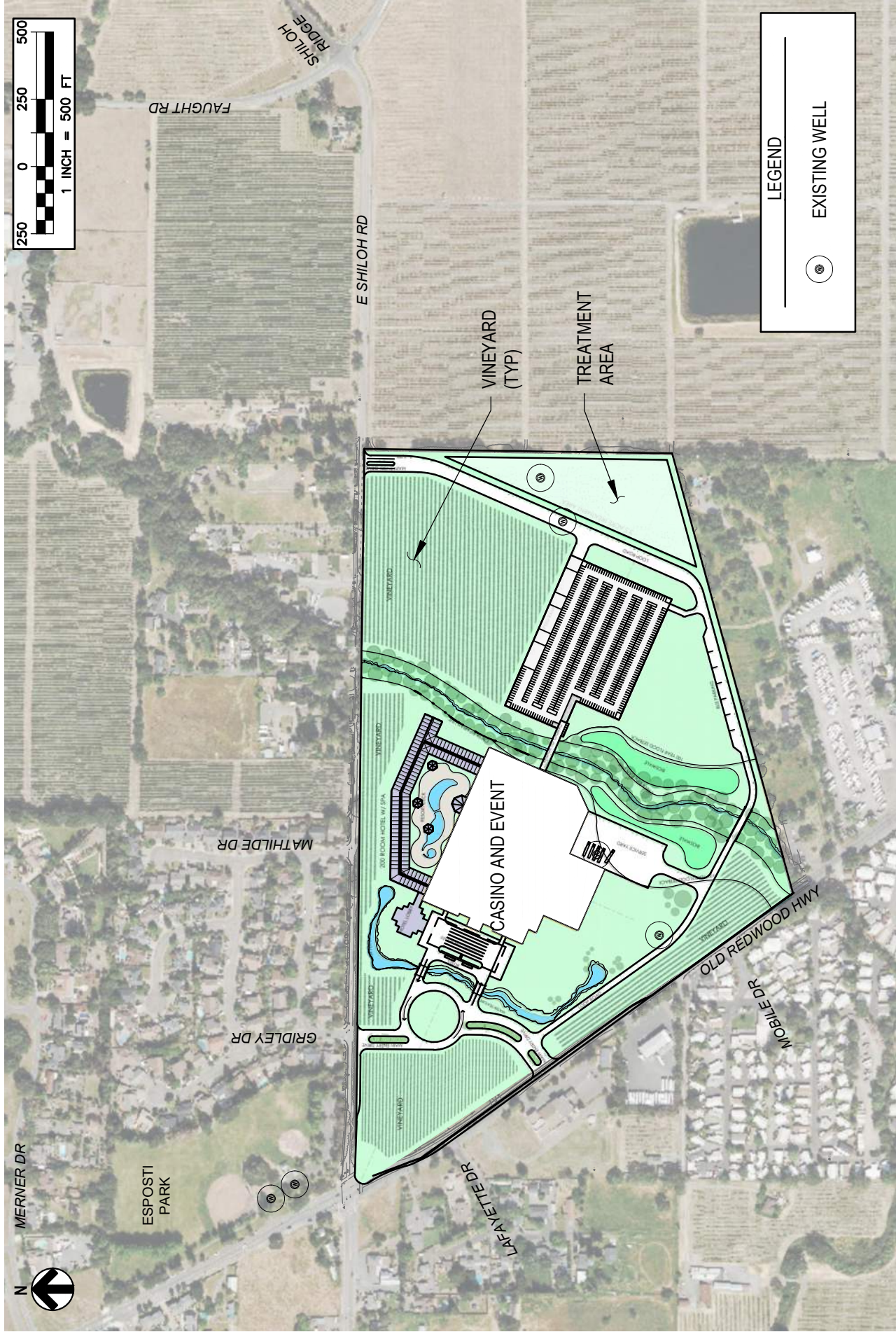


Figure 2-2
 Acorn Environmental
 Koi Resort and Casino Site Grading and Drainage Plans
 Proposed Site Plan - Reduced Intensity

SECTION 3 – HYDROLOGY AND SITE GRADING

Although not required for tribal trust lands, local jurisdictional guidelines will be used for the site hydrology calculations. The Sonoma County Water Agency Flood Management Design Manual (FMDM) is intended to be used to guide public agencies and private entities in Sonoma County that are planning, designing, constructing, or maintaining waterways, channels, closed conduits, or culverts. It provides methods and criteria for analyzing storm drain systems and facilities that are necessary to convey rainfall run-off due to large storm events.

3.1 Methodology

The FMDM requires one of two hydrologic analysis methods for typical projects and facilities, depending on the size of the project/watershed area and the complexity of the situation:

- The Incremental Rational Method (IRM) – for projects less than 200 acres (ac) with no detention; or
- The Synthetic Unit Hydrograph Method (SUHM) – for all other projects

To mitigate the impacts, the stormwater drainage system for the alternatives will be designed to limit the peak flow and stormwater volume from the developed site to the undeveloped peak flows. Storm water detention basins are being proposed to attenuate the increase in peak flow and runoff volumes created by the development. Per the FMDM, SUHM shall be used as the method of hydrological analysis when using detention basins.

3.2 Hydrology Parameters

The FMDM describes the following parameters as needed for the hydrograph model and hydrology calculations. These parameters are described below and summarized in **Table 3-1**.

The Sonoma County FMDM SUHM methods require the 100-year probability, 24-hour duration storm event to be analyzed for calculating the peak design flows. In addition, the FMDM defaults the intensity duration of the rainfall hyetograph is assumed to be five minutes to develop the model. For these calculations, time of concentration is assumed to be 30 minutes for the existing condition due to the length of flow of the large hydrology subareas and 15 minutes for the proposed condition with smaller hydrology subareas.

The existing watershed areas of the site are divided into east and west and will be analyzed as an individual watershed. The area of each shed (Eastern and Western) is calculated from by the area outside the regulatory floodway. A hydrology map of the existing site is provided as **Appendix B**.

Rainfall intensities were determined by site specific data retrieved from NOAA Atlas 14 Precipitation frequency estimates to determine storm depth, included as **Appendix C**.

The site Hydrologic Soils Group for the site can be determined by FMDM Figure 3-8 Hydrologic Soils Group Map, included as **Appendix D**. The soils group for the site has been determined to be Group C.

Curve numbers (CNs) are used to represent the proportion of direct runoff associated with a rainfall event as a function of land cover and soil characteristics. USDA Technical Release 55 – Urban Hydrology Tables 2-2a through 2-2d using Soil Group C was used to determine the pre-development and post-development CN's, refer to **Appendix E**. A summary of the hydrologic parameters is provided in **Table 3-1**.

Table 3-1: Hydrologic Model Parameters

Parameter	Value
Annual Storm Probability	100 Year Storm (1% Probability)
Intensity Duration	5 Minutes
Time of Concentration	30 minutes (Existing) 15 minutes (Proposed)
Storm Duration	24-Hour Storm Event
Watershed Areas	31.76 Ac (East) 36.22 Ac (West) 3.99 (Floodway)
Storm Depth (NOAA Point Precipitation Frequency Data)	0.327 inches/hour
Watershed Loss Curve Numbers (CN)	85 (Existing) Varies (Proposed) (Appendix E)

3.3 Existing Hydrology

The hydrology model and calculations were based on Type IA rainfall distribution pursuant to FMDM standards. The hydrographs for the existing site conditions have been provided as **Appendix F**.

The hydrology results of the Eastern and Western sheds are provided in **Table 3-2** below. It should be noted that additional runoff volume for the Zone X' ponding has been added to the hydrologic volume.

Table 3-2: Existing Hydrology

Drainage Shed	Peak Flow Rate (cfs)	Runoff Volume (cu. ft)
Western Shed	47.18	754,274
Western Flood Zone X'	n/a	155,831
Eastern Shed	42.87	684,501
Eastern Flood Zone X'	n/a	91,701
Total	90.05	1,686,307

3.4 Conceptual Grading and Stormwater Pollution Prevention

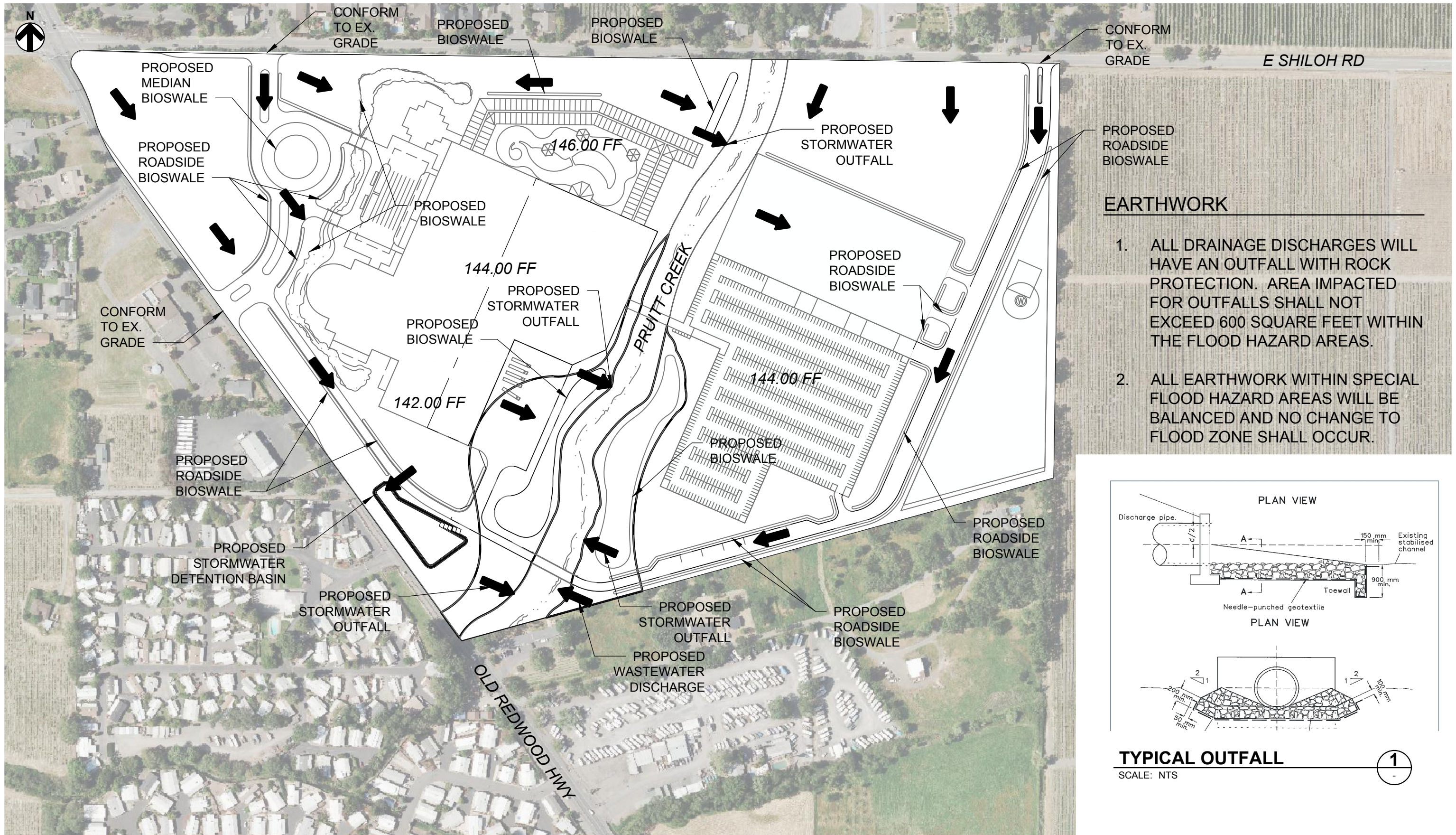
The biggest concern to the site grading and drainage is the presence of the Pruitt Creek floodplain. To minimize cut/fill quantities and maintain a balanced earthwork site, while providing adequate protection from the floodplain, building finish floors were chosen approximately 1'-2' above existing 500-year floodplain elevations adjacent the creek. These range from 142.00' for the conference center, 144.00' for the casino and parking structure, and 146.00' for the Hotel. Although some vineyard areas will remain undisturbed, the roadway adjacent vineyards are intended as decorative landscape areas. These areas are to be graded with slopes not to exceed 4:1. Parking lot and roadways are to be designed between 1% and 5% slope. The site grading design has an overall earthwork volume estimated to be 115,000 CY. The grading concept accomplishes a near balanced site with less than 10,000 CY of fill required to be imported from off-site sources to develop the site. Cut areas include the wastewater treatment plant and foundations of the structures, roadways and bioswales. Fill will primarily be placed on the southwesterly portion of the site, outside the floodplain. A conceptual Grading Plan and Over-Excavation Map have been provided is **Figure 3-1 & Figure 3-2**.

It should be noted in this report, the wastewater treatment plant is assumed to construct an on-site storage tank for recycled water storage. In the event, an on-site reservoir is used for recycled water storage in lieu of a tank, the excavations volumes from the different sized reservoirs that would be required for Alternative A, B and C would create a fill scenario. The additional fill would be used throughout westerly side of the creek. In this scenario, the site would have balanced earthwork volumes, therefore no import and or export of soils would be required.

On the easterly side of the creek, the grading design will convey the stormwater from the vineyard areas, the parking structure and surface parking lot towards the roadway to a drainage system. The easterly drainage system will convey the runoff to a grassy bioswale prior to discharge to Pruitt Creek. The wastewater treatment plant will be graded to contain stormwater runoff within the treatment plant. Runoff in this area will be captured and used in the wastewater treatment plant processing.

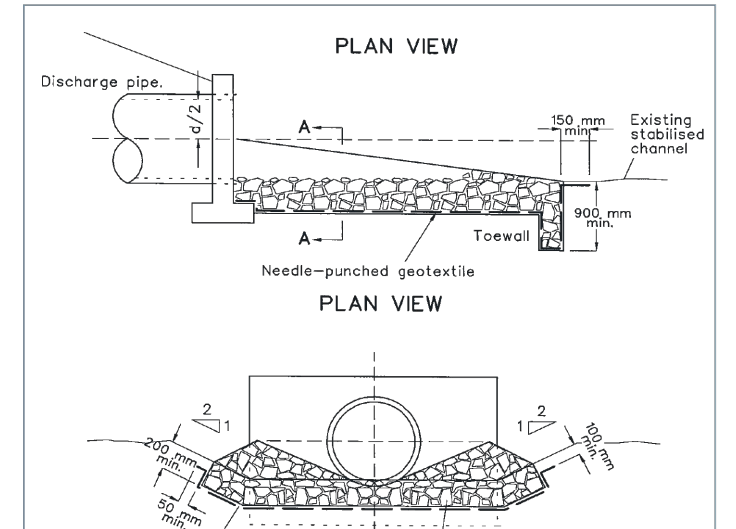
On the westerly side of the creek, stormwater will be conveyed towards the decorative bioswale and then routed to a detention basin prior to discharging to the creek. Roof drains for the buildings will be connected to the storm drain system and conveyed to a bioswale adjacent to the creek. While the service area located behind the casino will drain into a bioswale within the floodplain. This particular bioswale shall be designed with an elevation at or above the floodplain elevation to allow for treatment of pollutants from the roof drains and service yard during a storm event.

Stormwater pollution will be primarily mitigated using drainage bioswales and a detention basin. The bioswales will be sized per Sonoma County LID requirements for pollutant reduction. Storm drain outfalls to the creek will be designed with rock slope protection to mitigate erosion. Additional erosion and sediment control best management practices will also be prescribed by a stormwater pollution prevention plan, that will be prepared for the project in compliance with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit.



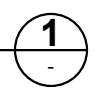
EARTHWORK

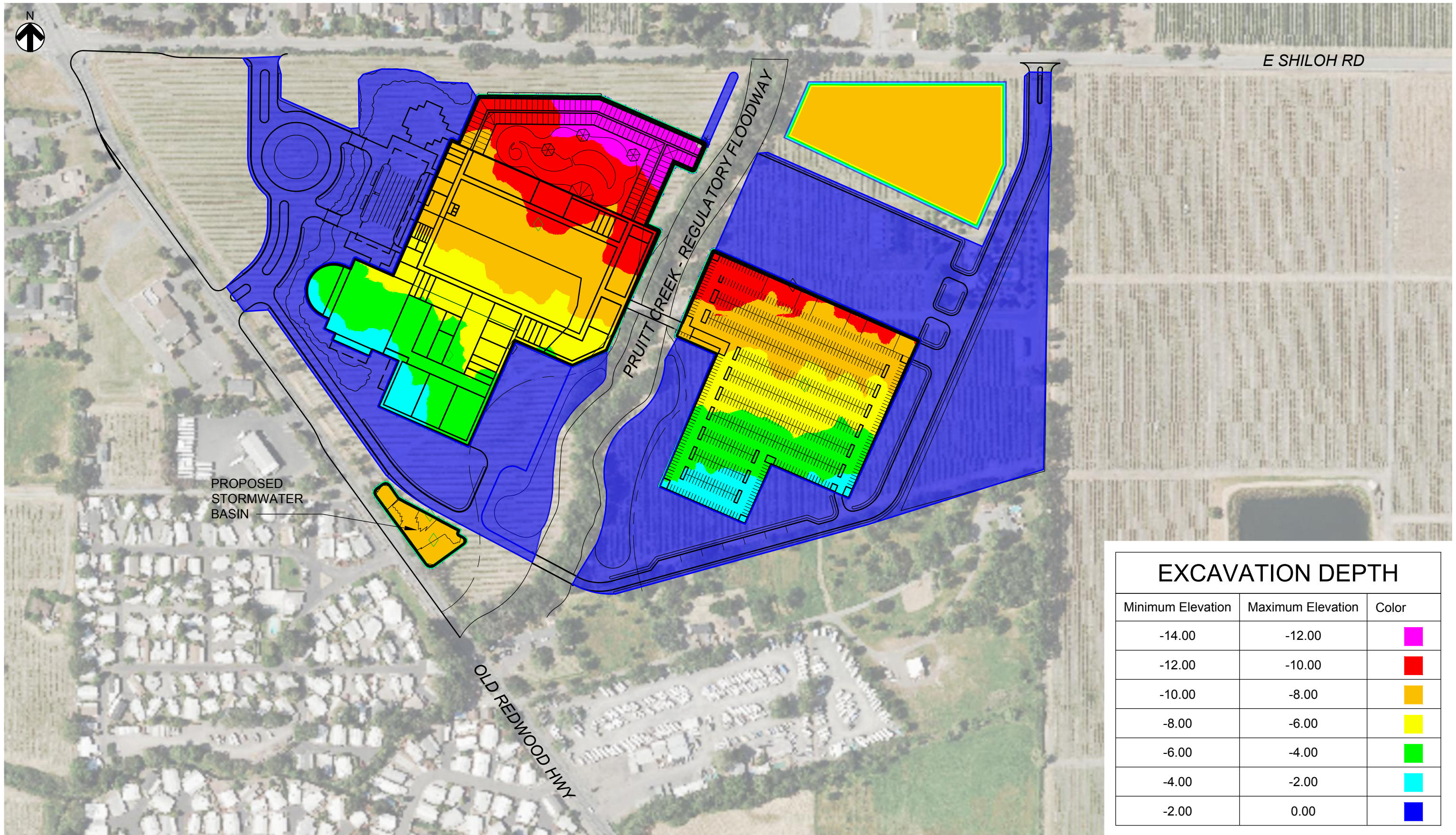
1. ALL DRAINAGE DISCHARGES WILL HAVE AN OUTFALL WITH ROCK PROTECTION. AREA IMPACTED FOR OUTFALLS SHALL NOT EXCEED 600 SQUARE FEET WITHIN THE FLOOD HAZARD AREAS.
2. ALL EARTHWORK WITHIN SPECIAL FLOOD HAZARD AREAS WILL BE BALANCED AND NO CHANGE TO FLOOD ZONE SHALL OCCUR.



TYPICAL OUTFALL

SCALE: NTS





3.5 Proposed Hydrology

The analysis below focuses on the impacts associated with Alternative A. **Table 3-3** is a comparison of impervious areas of the various site alternatives. With the largest impervious area, Alternative A will have the most significant impact to grading and hydrology. To be conservative, results of this analysis can also be applied to Alternative B and Alternative C due having less impervious area and thus generating less runoff.

Table 3-3: Site Impervious Areas

Site Feature	Impervious Area (S.F.)		
	Alternative A	Alternative B	Alternative C
Hotel	134,248	134,248	151,897
Casino/Entertainment	420,675	310,475	
Parking Structure	308,758	233,573	
Winery & Misc. Facilities			34,940
WWTP	163,337	163,337	163,337
Parking Lot	183,090		159,967
Roadway	281,337	287,375	95,345
Service Area	55,550	55,550	25,231
Total Impervious Area	1,546,995	1,175,558	630,717

The proposed grading for the Western shed will have three different sub-area watersheds with differing locations discharging stormwater to the creek. The largest shed, Sub Area A, will collect runoff from vineyards, roadways, and building roof drainage and convey the flows to the water feature in the front entrance of the casino, that will act as a decorative bioswale. For analysis, multiple subdrainage areas were routed in the model to create a single output hydrograph for the various sub areas.

Sub Area B will collect runoff from roof drainage and some landscape/vineyards into a direct discharge into the creek. Additional runoff volume from flood Zone X' will be added to Sub Area(s) A and B, respectively. Sub Area C will also collect runoff from roof drainage and the loading dock area and convey the flows through a bioswale and then discharge into the creek.

The Easterly shed will have four different sub-area watersheds. Three watersheds, Sub Area D, E, and F will convey all drainage runoff from the parking, roadways, and landscape areas into bioswales and then discharged into the creek. Sub Area E and F will also have additional runoff volume from flood Zone X'.

The Wastewater Treatment Plant (WWTP) area is the fourth sub area of the Easterly shed. Due to potential for sanitary sewer spill contamination of potential overflows, runoff in this area will be captured and conveyed to the WWTP disposal system, thus mitigating stormwater flow from the Eastern shed.

A hydrology map of the proposed site plan is provided as **Appendix G**. Proposed site hydrographs, **Appendix H**, were modeled for the sub areas as described above and results are provided in **Table 3-4: Proposed Hydrology Alternative A**

below.

Table 3-4: Proposed Hydrology Alternative A

Drainage Shed	Peak Flow Rate (cfs)	Runoff Volume (cu ft)
Western Shed Sub Area A	40.81	571,089
Western Shed Sub Area A (Zone X')	n/a	32,105
Western Shed Sub Area B	13.91	195,223
Western Shed Sub Area B (Zone X')	n/a	123,700
Western Shed Sub Area C	5.63	78,974
Eastern Shed Sub Area D	43.74	620,202
Eastern Shed Sub Area E	3.73	53,863
Eastern Shed Sub Area E (Zone X')	n/a	78,800
Eastern Shed Sub Area F	0.25	3,544
Eastern Shed Sub Area F (Zone X')	n/a	12,901
Eastern Shed Sub Area WWTP	8.27	117,875
Total	116.34	1,888,274

3.6 Peak Flow Mitigation

To mitigate the impacts of the proposed improvements, storm drain improvements will be designed to limit the flow to the creek to pre-developed conditions. The pre- and post-development flow rates and volumes are summarized in **Table 3-5: Pre and Post Development Flows**

below.

Table 3-5: Pre and Post Development Flows

Description	Peak Flow Rate (cfs)	Runoff Volume (cu ft)
Pre-Development Flows	90.05	1,686,307
Post Development Flows	116.34	1,888,274
Site Mitigation Required	26.29	201,967

As stated above, the WWTP will provide some mitigation for the Easterly shed by capturing all runoff in the area within the WWTP site area. For the Westerly shed, Detention Basin A will need to reduce peak flow by 18.02 cfs and have a minimum storage capacity of 84,092 cu ft. This will be achieved by using an outlet pipe sized to attenuate the Sub Area A hydrograph peak flow from 40.81 cfs to 22.79 cfs.

Attenuation of the Sub Area A hydrograph with a detention basin can be analyzed in the model to reduce the peak flow rate to produce an outfall hydrograph for peak flow rate mitigation, included

as **Appendix I**. Further analysis of the volume differential in hydrographs shows the basin storage volume needs to be a minimum of 103,975 cu ft, larger than what is required for the overall site mitigation. The model produces a pond depth versus outlet orifice sizing to achieve the time-lag and drawdown times required for mitigation, refer to **Appendix J**. Basin A is proposed to be five feet (5 ft) in depth, with a storage capacity of 103,975 cu ft. Based on the model, the basin will require a 21-inch outlet pipe to mitigate the peak flow.

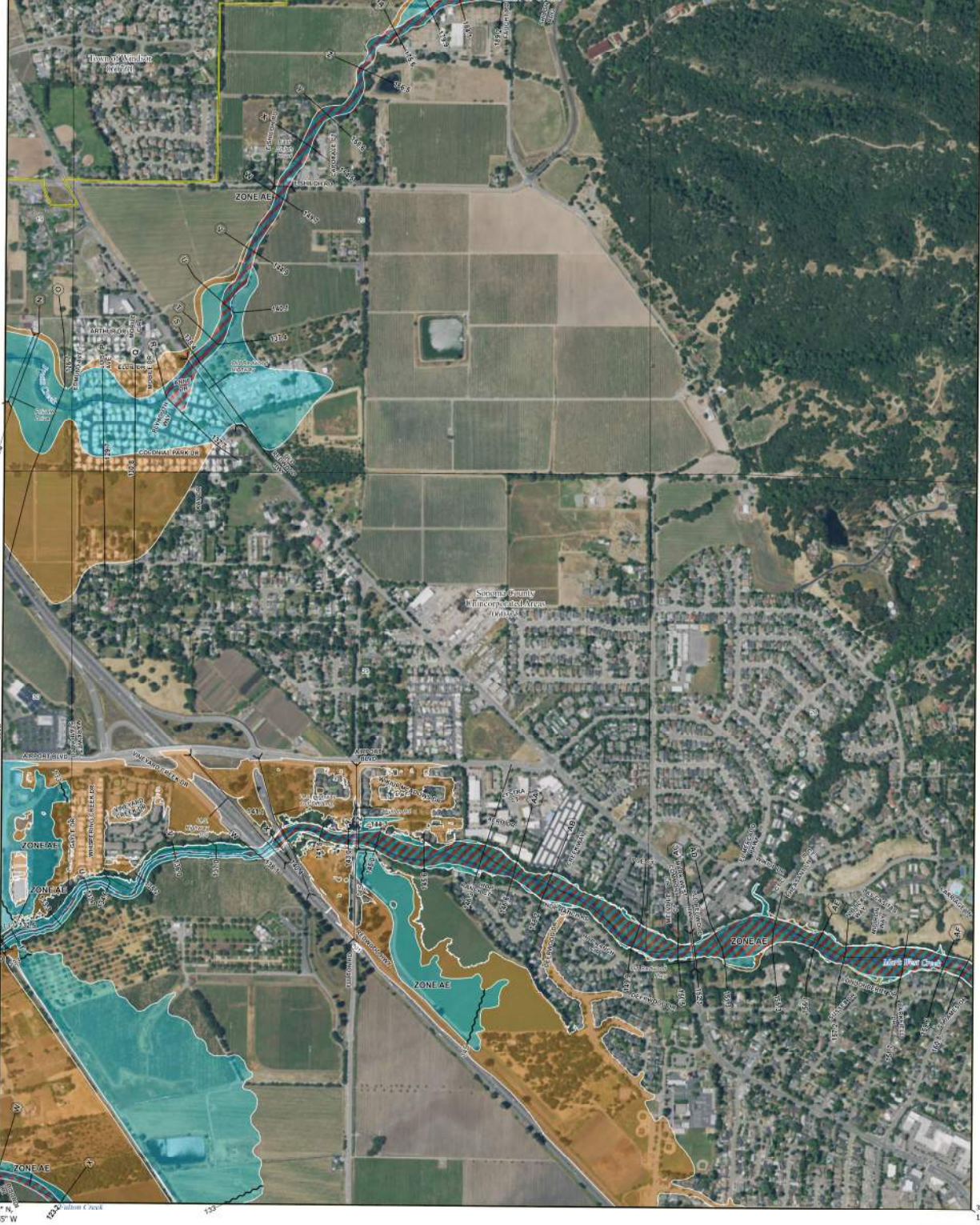
Table 3-6: Proposed Mitigation

Drainage Shed Mitigation	Reduction in Peak Flow Rate (cfs)	Mitigation Volume (cu ft)
Eastern Shed Sub Area WWTP (Capture)	8.27	117,875
Western Shed Sub Area A (Basin A)	18.02	103,975
Mitigation	26.29	221,850

3.7 Summary

The proposed drainage plan for each of the alternatives includes various storm drain improvements consisting of a decorative swale, catch basins with underground storm drain pipe, building roof drains, and a detention basin (Basin A). The proposed development of the alternatives increases runoff and peak flow rates. This will be mitigated by capture of flow by the WWTP and temporary storage in the detention basin that will limit the peak flow. Detention basin sizing and outlet piping will meter the flow into the creek to pre-development levels.

APPENDIX A
Acorn Environmental
Grading & Hydrology Report
FEMA Firmette



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT [HTTPS://MSC.FEMA.GOV](https://msc.fema.gov)

- SPECIAL FLOOD HAZARD AREAS**
 - Without Base Flood Elevation (BFE) Zone A, X, AB9
 - With BFE or Depth Zone AE, AO, AH, VE, AR
 - Regulatory Floodway
 - 0.2% Annual Chance Flood Hazard. Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile. Zone X
 - Future Conditions 1% Annual Chance Flood Hazard. Zone X
 - Area with Reduced Flood Risk due to Levee. See Notes. Zone X
 - Area with Flood Risk due to Levee. Zone D
- OTHER AREAS OF FLOOD HAZARD**
 - NO-SCREEN Area of Minimal Flood Hazard. Zone X
 - Area of Undetermined Flood Hazard. Zone D
- OTHER AREAS**
 - Channel, Culvert, or Storm Sewer
 - Levee, Dike, or Floodwall
- GENERAL STRUCTURES**
 - 20.2 Cross Sections with 1% Annual Chance
 - 17.8 Water Surface Elevation
 - Coastal Transect
 - Coastal Transect Baseline
 - Profile Baseline
 - Hydrographic Feature

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available effective flood hazard information for your community, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Mapping and Insurance Information Exchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at <https://www.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be downloaded from the website. Communities receiving levels of advanced FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM index. These may be acquired directly from the Flood Map Service Center or the website listed above.

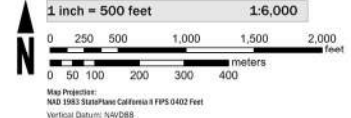
For community and countywide map data refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-426-6620.

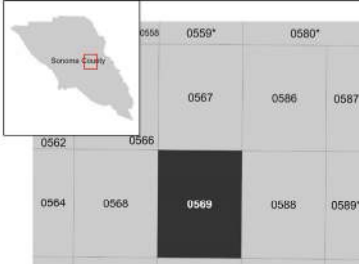
Base map information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The base map is the USGS National Map Orthometry, Last refreshed October, 2010.

Note: Some Special Flood Hazard Areas with elevations may not appear with elevation labels if the Base Flood Elevation or Cross-section line which communicates the elevation for the location appears on the adjacent panel. Please use the Panel Locator Diagram on this map panel to determine the adjacent panel and use the elevation feature there, or alternatively use the Flood Insurance Study report for detailed elevations by flood source.

SCALE



PANEL LOCATOR



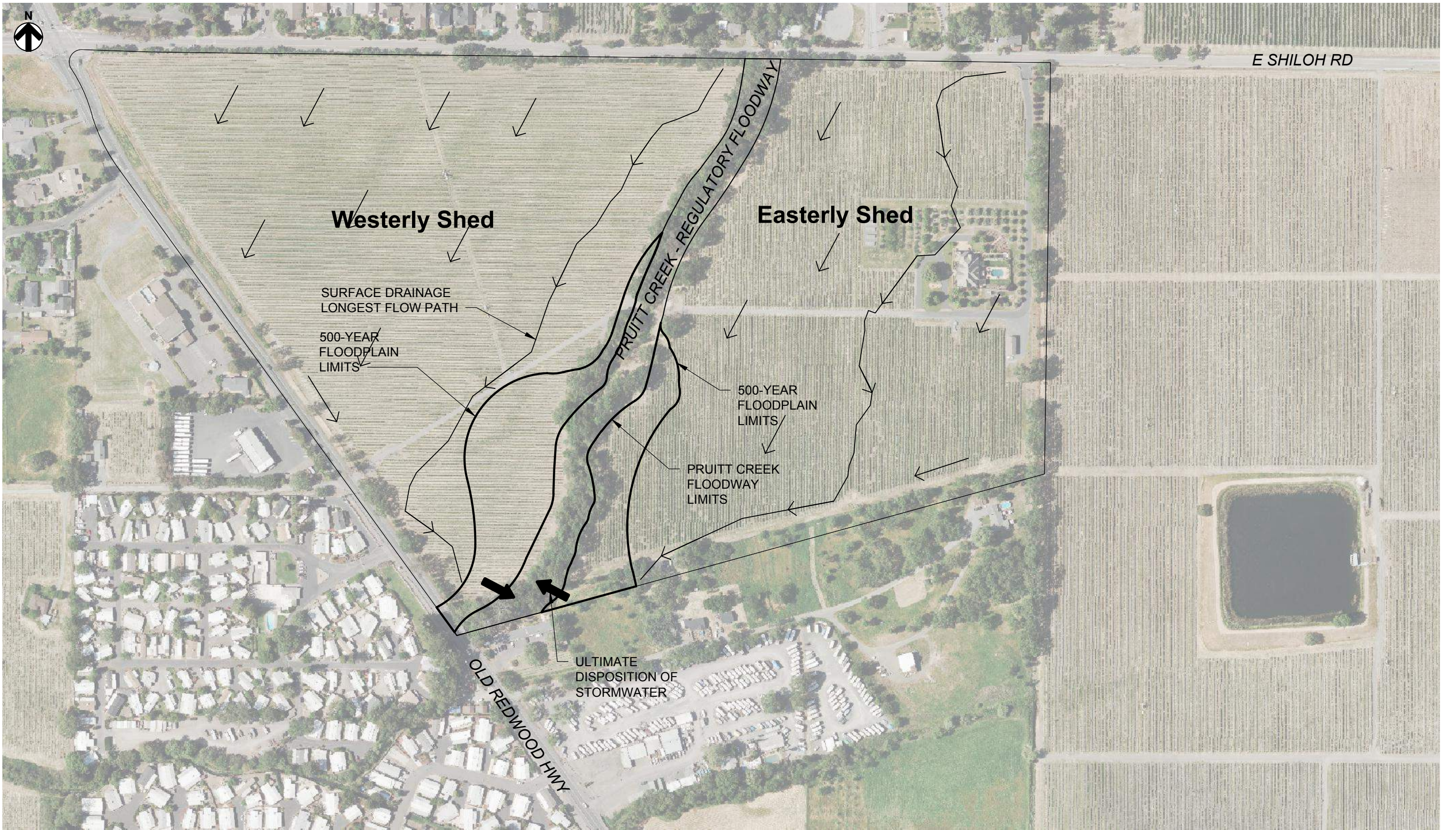
FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
 FLOOD INSURANCE RATE MAP

SONOMA COUNTY CALIFORNIA AND INCORPORATED AREAS

Panel Contain:
 COMMUNITY NUMBER PANEL SUFFIX
 TOWN OF WINDSOR 060761 0569 F
 SONOMA COUNTY UNINCORPORATED AREAS 060375 0569 F

APPENDIX B
Acorn Environmental
Grading & Hydrology Report
Pre-Development Hydrology Map



APPENDIX C
Acorn Environmental
Grading & Hydrology Report
NOAA Precipitation Estimates



NOAA Atlas 8 Volume 6 Series 2
 Location name: California USA
 Latitude: 38.52° N Longitude: -122.7759° W
 Elevation: 82.32 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 & aeriels](#)

PF tabular

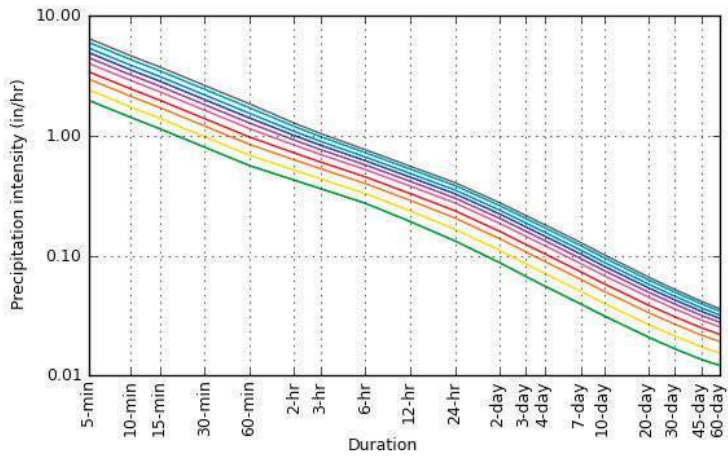
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	.97 (1.75-2.24)	2.8 (2.14-2.74)	2.96 (2.63-3.38)	3.8 (2.99-3.94)	0.8 (3.38-4.81)	.68 (3.67-5.48)	.92 (3.92-6.22)	5.3 (4.15-7.02)	5.99 (4.42-8.21)	6.68 (4.57-9.20)
0-min	.28 (1.26-1.61)	.72 (1.53-1.96)	2.28 (1.88-2.42)	2.58 (2.14-2.82)	2.78 (2.42-3.44)	3.20 (2.63-3.93)	3.52 (2.81-4.45)	3.58 (2.98-5.03)	.29 (3.16-5.88)	.62 (3.28-6.59)
5-min	.8 (1.01-1.30)	.39 (1.24-1.58)	.78 (1.52-1.96)	.97 (1.73-2.27)	2.32 (1.95-2.78)	2.58 (2.12-3.17)	2.8 (2.27-3.59)	3.08 (2.40-4.06)	3.68 (2.55-4.74)	3.73 (2.64-5.32)
30-min	0.00 (0.712-0.908)	0.97 (0.866-1.11)	.20 (1.06-1.37)	.38 (1.21-1.59)	.63 (1.37-1.95)	.8 (1.49-2.22)	.99 (1.59-2.52)	2.8 (1.69-2.85)	2.8 (1.79-3.33)	2.62 (1.85-3.73)
60-min	0.56 (0.500-0.639)	0.66 (0.609-0.780)	0.85 (0.748-0.965)	0.97 (0.853-1.12)	.8 (0.963-1.37)	.27 (1.05-1.56)	.08 (1.12-1.77)	.53 (1.19-2.00)	.78 (1.26-2.34)	.8 (1.30-2.62)
2-hr	0.25 (0.378-0.483)	0.58 (0.457-0.586)	0.62 (0.556-0.716)	0.78 (0.628-0.825)	0.32 (0.701-0.996)	0.98 (0.754-1.13)	.00 (0.800-1.26)	.08 (0.838-1.41)	.98 (0.877-1.63)	.27 (0.899-1.81)
3-hr	0.36 (0.321-0.410)	0.36 (0.387-0.496)	0.52 (0.469-0.604)	0.60 (0.527-0.693)	0.69 (0.586-0.833)	0.76 (0.628-0.939)	0.38 (0.664-1.05)	0.96 (0.693-1.17)	0.98 (0.722-1.34)	.08 (0.737-1.48)
6-hr	0.27 (0.243-0.310)	0.32 (0.293-0.375)	0.39 (0.353-0.455)	0.52 (0.397-0.521)	0.52 (0.439-0.624)	0.56 (0.468-0.699)	0.68 (0.493-0.779)	0.66 (0.512-0.865)	0.72 (0.531-0.987)	0.72 (0.540-1.09)
2-hr	0.92 (0.171-0.218)	0.23 (0.209-0.268)	0.28 (0.255-0.329)	0.32 (0.288-0.378)	0.37 (0.320-0.454)	0.85 (0.341-0.510)	0.50 (0.359-0.568)	0.83 (0.374-0.631)	0.52 (0.387-0.719)	0.55 (0.393-0.791)
2-hr	0.32 (0.119-0.150)	0.66 (0.149-0.188)	0.26 (0.184-0.234)	0.26 (0.210-0.271)	0.27 (0.237-0.324)	0.30 (0.255-0.362)	0.32 (0.271-0.402)	0.35 (0.285-0.443)	0.38 (0.299-0.500)	0.05 (0.307-0.546)
2-day	0.08 (0.078-0.099)	0.08 (0.099-0.125)	0.38 (0.124-0.157)	0.59 (0.141-0.182)	0.85 (0.160-0.219)	0.20 (0.173-0.245)	0.22 (0.184-0.272)	0.23 (0.193-0.301)	0.26 (0.203-0.340)	0.27 (0.208-0.371)
3-day	0.06 (0.060-0.076)	0.08 (0.076-0.097)	0.07 (0.096-0.122)	0.28 (0.110-0.142)	0.8 (0.125-0.170)	0.59 (0.135-0.191)	0.73 (0.144-0.213)	0.86 (0.151-0.235)	0.20 (0.159-0.265)	0.28 (0.163-0.290)
1-day	0.05 (0.050-0.063)	0.07 (0.064-0.081)	0.09 (0.080-0.102)	0.03 (0.092-0.119)	0.28 (0.105-0.143)	0.33 (0.113-0.160)	0.85 (0.120-0.178)	0.56 (0.127-0.197)	0.78 (0.133-0.223)	0.8 (0.137-0.244)
7-day	0.03 (0.035-0.045)	0.05 (0.045-0.057)	0.06 (0.057-0.072)	0.07 (0.065-0.084)	0.08 (0.074-0.101)	0.09 (0.080-0.113)	0.03 (0.085-0.126)	0.8 (0.090-0.139)	0.28 (0.094-0.158)	0.28 (0.097-0.173)
0-day	0.03 (0.028-0.036)	0.05 (0.036-0.046)	0.05 (0.045-0.057)	0.05 (0.052-0.067)	0.06 (0.059-0.080)	0.07 (0.064-0.090)	0.08 (0.068-0.100)	0.08 (0.071-0.118)	0.09 (0.075-0.125)	0.02 (0.077-0.137)
20-day	0.02 (0.019-0.024)	0.02 (0.024-0.030)	0.03 (0.030-0.038)	0.03 (0.034-0.044)	0.05 (0.039-0.053)	0.08 (0.042-0.059)	0.08 (0.044-0.066)	0.05 (0.047-0.073)	0.06 (0.049-0.082)	0.06 (0.050-0.089)
30-day	0.08 (0.015-0.019)	0.02 (0.019-0.024)	0.02 (0.024-0.030)	0.03 (0.027-0.035)	0.03 (0.031-0.042)	0.03 (0.033-0.047)	0.08 (0.035-0.052)	0.08 (0.037-0.058)	0.08 (0.039-0.065)	0.05 (0.039-0.070)
5-day	0.08 (0.012-0.015)	0.08 (0.016-0.020)	0.02 (0.019-0.025)	0.02 (0.022-0.029)	0.02 (0.025-0.034)	0.03 (0.027-0.038)	0.03 (0.028-0.042)	0.03 (0.030-0.046)	0.08 (0.031-0.052)	0.08 (0.031-0.056)
60-day	0.08 (0.011-0.014)	0.08 (0.014-0.017)	0.08 (0.017-0.022)	0.02 (0.020-0.025)	0.02 (0.022-0.030)	0.02 (0.024-0.033)	0.03 (0.025-0.037)	0.03 (0.026-0.040)	0.03 (0.027-0.045)	0.06 (0.027-0.049)

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.

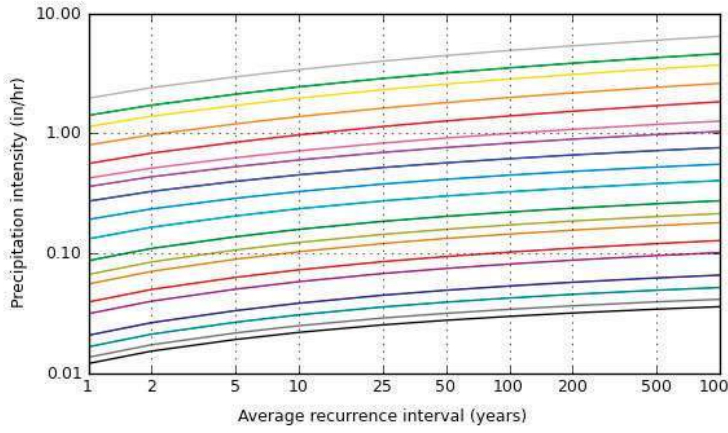
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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 38.5243°, Longitude: -122.7759°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

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Small c le terr in 0



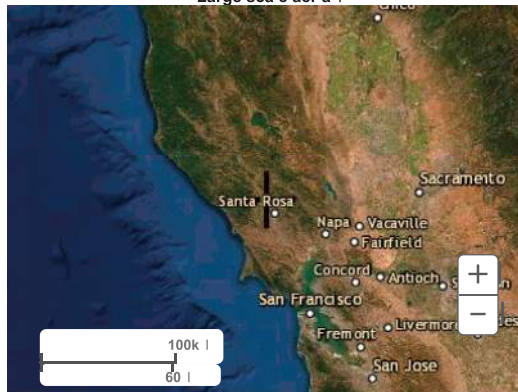
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Large scale air

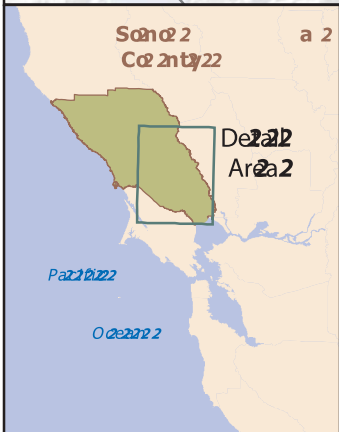
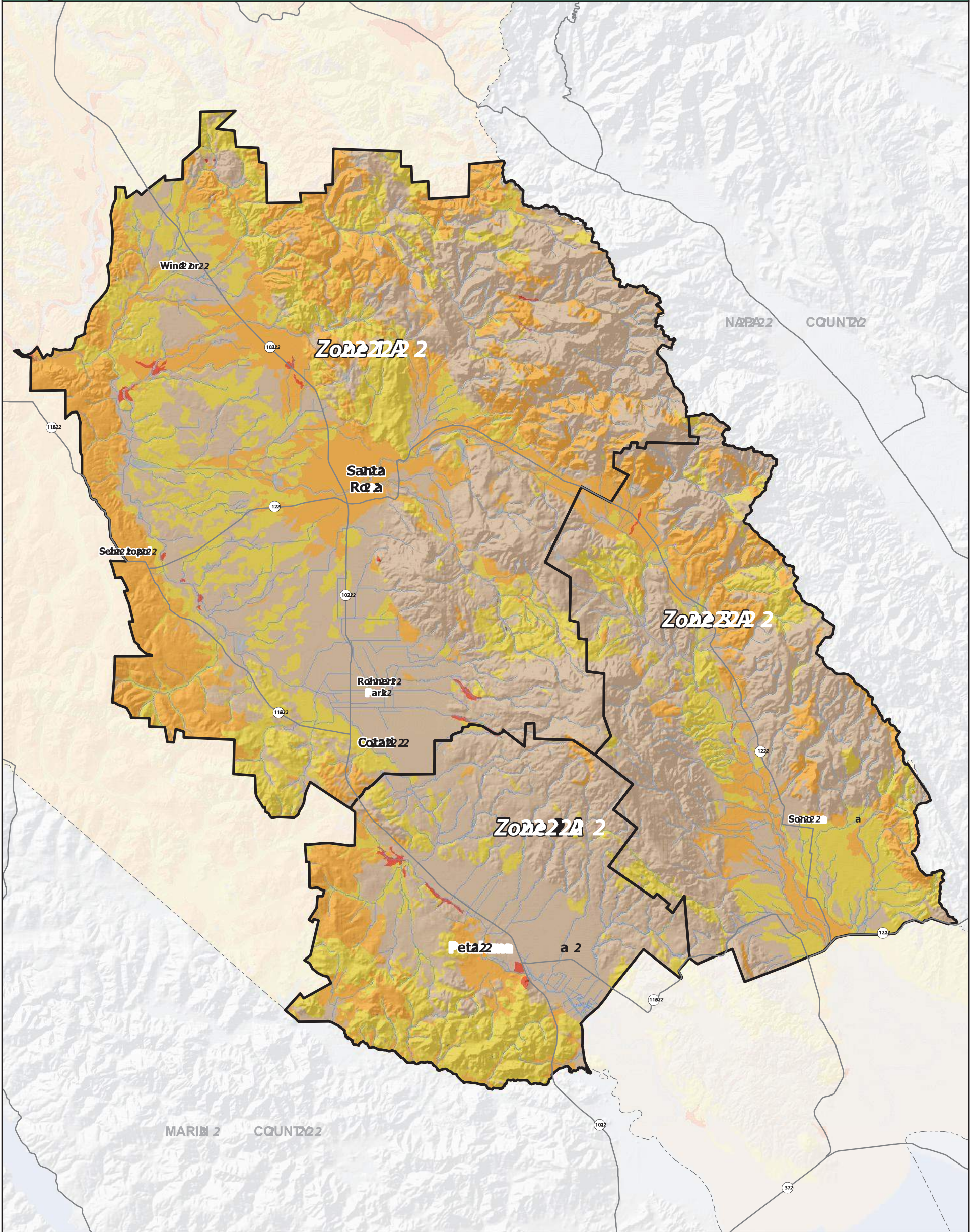


Large scale sea level



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APPENDIX D
Acorn Environmental
Grading & Hydrology Report
Sonoma County Hydrologic Soils Group Map





Hydrologic Soil Group

■ A	■ B	■ C	■ D
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Santa Clara County Zone
~ Stream and Channel
~ Highway
~ Water Body

**Figure 3-82
Hydrologic Soil Group**



 Miles

APPENDIX E
Acorn Environmental
Grading & Hydrology Report
TR-55 Table 2-2a through 2-2d: Curve Numbers

Table 9-1. a. Runoff curve numbers for urban areas 9

Cover type and hydrologic condition	Cover description	Average percent impervious area 9		Curve numbers for hydrologic soil group	
		A	B	C	D
Fully developed urban areas (vegetation established)					
Open space lawns, parks, golf courses, cemeteries, etc.) 9					
Poor condition grass cover < 0% 9		8	9	7	6
Fair condition grass cover 0% to 7% 9				1	7499
Good condition grass cover > 7% 9					809
Impervious areas:					
Paved parking lots, roofs, driveways, etc. excluding right-of-way 9		8	9	8	9
Streets and roads:					
Paved; curbs and storm sewers excluding right-of-way 9		8	9	8	9
Paved; open ditches including right-of-way 9		3	9	8	9
Gravel including right-of-way 9		6	9	8	9
Dirt including right-of-way 9				7	9
Western desert urban areas:					
Natural desert landscaping pervious areas only 9		3	9	7799	8
Artificial desert landscaping impervious weed barrier, desert shrub with 1-to 1-inch sand or gravel mulch and basin borders 9		6	9	6	9
Urban districts:					
Commercial and business 9				4	9
Industrial 9		1	88	9	1
Residential districts by average lot size:					
1/8 acre or less town houses 9		6	7	8	9
1/4 acre 9		3	7	7	3
1/3 acre 9		3	7	7	3
1/2 acre 9		2	4	70	80
1 acre 9		2	1	9	68
acres 9		1	6	9	7
Developing urban areas 9					
Newly graded areas					
pervious areas only, no vegetation) 9		77	9	8699	1
Idle lands CN's are determined using cover types similar to those in table 9-c).					

1. Average runoff condition, and $I_a = 0$.

The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 8, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 9-3 or 9-4.

2. CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

3. Composite CN's for natural desert landscaping should be computed using figures 9-3 or 9-4 based on the impervious area percentage (CN = 8) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

4. Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 9-3 or 9-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b R n runoff curve number for cultivated agricultural land \mathcal{V}

Cover typ n	Cover de cription n reatment \mathcal{V} n	Hydrologic condition \mathcal{V} n	Curve number for hydrologic oil group n
Fallo	are oi	oo	91
	Crop re idue cover (C n	Goo	0 93 88 90
ow crop n	traight row (S	oo	1 88 91
	S + C	Goo	8 8 9
	Contoured (C	oo	0 n 87 n 90
		Goo	2 8
		Goo	84 88
	C + C	oo	2 n 86
		Goo	83 87
	Contoured & terraced (C&T n	oo	4 81 8
		Goo n	4 80 n 82
	C&T+ C	oo	1 78 81
Small grai n		Goo	3 79 81
		oo	0 77n 80
		oo	84 88
	S + C n	Goo	3 87
		oo	3 86
		Goo	2 80 n 84
		oo	4 82 8
	C + C	Goo	3 81 84
		oo	3 81 84
	C&	Goo	2 80 83
Clo e- eede or broadca n legume o rotatio meado	C&T+ C n	oo	0 78 81
		Goo	1 n 78 81
		oo	9 77 80
		oo	7 8 9
		oo	2 81 8
		oo	3 n 8
		oo	9 78 83
		oo	3 80 n 83
		Goo n	7 76 n 80n

¹ Average runoff condition, and $I_a=0.2S$ n

² Crop re idue cover applic only if re idue i on at lea t % of the urface throughout the year.

³ Hydraulic condition i ba ed on combination factor that affect infiltration and runoff, including (a) den ity and canopy of vegetative area , (b) amount of year-round cover, (c) amount of gra or clo e- eede legume , (d) percent of re idue cover on the land urface (good $\geq 20\%$), and (e) degree of urface roughne .

Poor: Factor impair infiltration and tend to increa e runoff.

Good: Factor encourage average and better than average infiltration and tend to decrea e runoff. n

Table 8-1. Runoff coefficients for other agricultural lands

Cover type	Cover description	Hydrologic condition		Runoff coefficient	
		Hydrologic condition	Runoff coefficient	Hydrologic condition	Runoff coefficient
Pasture, grassland, or range—containing forage for grazing.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
		Poor	0.20	Poor	0.20
Meadow—containing grass, protected from grazing and generally mowed for hay.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
Brush—brushweed-grass mixture with brush as the major element.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
		Poor	0.20	Poor	0.20
Woods—grass combination orchard or tree farm.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
		Poor	0.20	Poor	0.20
Woods.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
		Poor	0.20	Poor	0.20
Farmsteads—buildings, lanes, driveways and surrounding lots.		Good	0.10	Good	0.10
		Fair	0.15	Fair	0.15
		Poor	0.20	Poor	0.20

1. Average runoff condition, and $I_{a1} = 0.5$.

Poor: <50% ground cover or heavily grazed with no mulch.

Fair: 50 to 50% ground cover and not heavily grazed.

Good: > 50% ground cover and lightly or only occasionally grazed.

2. *Poor:* <50% ground cover.

Fair: 50 to 50% ground cover.

Good: > 50% ground cover.

3. Actual runoff number is less than 30; see CN = 30 for runoff combinations.

4. CN's shown were computed for areas with 50% woods and 50% grass pasture cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

5. *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

Fair: Woods are grazed but not burned, and some forest litter covers the soil.

Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d R n unoff curve number for arid and semiarid rangeland 1/

Cover typ	Hydrologic condition 2/	n	Curve number for hydrologic soil group	A 3/
Herbaceous —mixture of gra , weed , an n low-growing bru h, with bru h th minor element n	oo ai n oo	8 8 7	8 8 7	83n 89 8 n
Oak-a pen—mountain bru h mixture of oak bru h n a pen, mountain mahogany, bitter bru h, maple n and other bru h	oo ai n oo	7 63 4	7 6 4	79n 63 48n
Pinyon-juniper—pinyon, juniper, or both n gra under tory n	oo ai n Goo	9 7 6	9 7 6	9 80 71n
Sagebru h with gra under tory	oo Fai Goo	8 6	8 6	8 n 70n
De ert hrub—major plant include althbu h grea ewood, creosotebu h, blackbru h, bur age palo verde, me quite, and cactu n	oo ai oo n	8 8 7	8 8 7	8 86 84n

1 Average runoff condition, and $I_w = 0.2S$. For range in humid region, use table 2-2c. n

2 Poor: <30% ground cover (litter, gra , and bru h over tory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

3 Curve number for group A have been developed only for de ert hrub. n

APPENDIX F
Acorn Environmental
Grading & Hydrology Report
Pre-Development Hydrographs

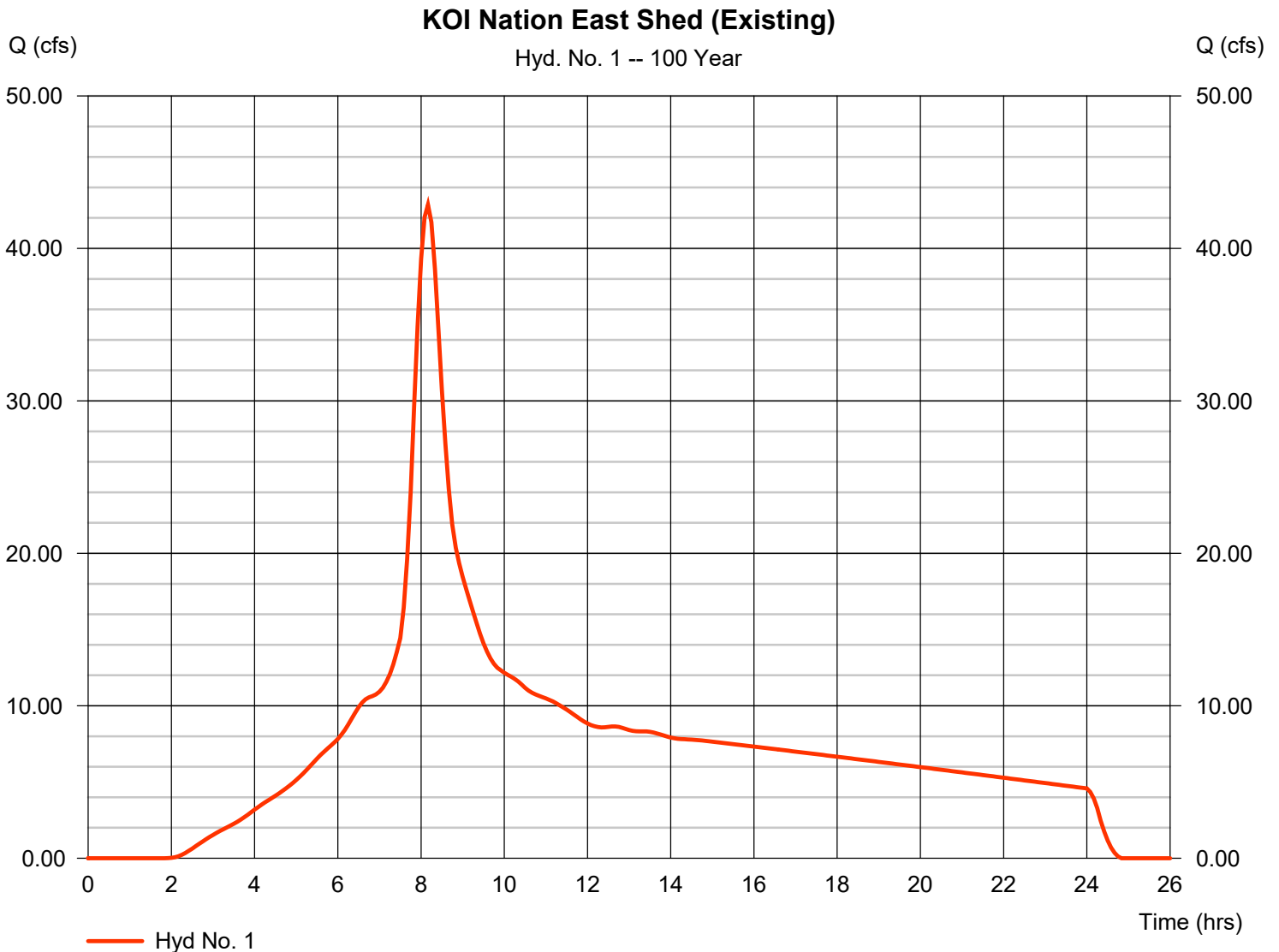
Hydrograph Report

Hyd. No. 1

KOI Nation East Shed (Existing)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 5 min
Drainage area = 29.660 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 7.95 in
Storm duration = 24 hrs

Peak discharge = 42.87 cfs
Time to peak = 8.17 hrs
Hyd. volume = 684,501 cuft
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 30.00 min
Distribution = Type IA
Shape factor = 484

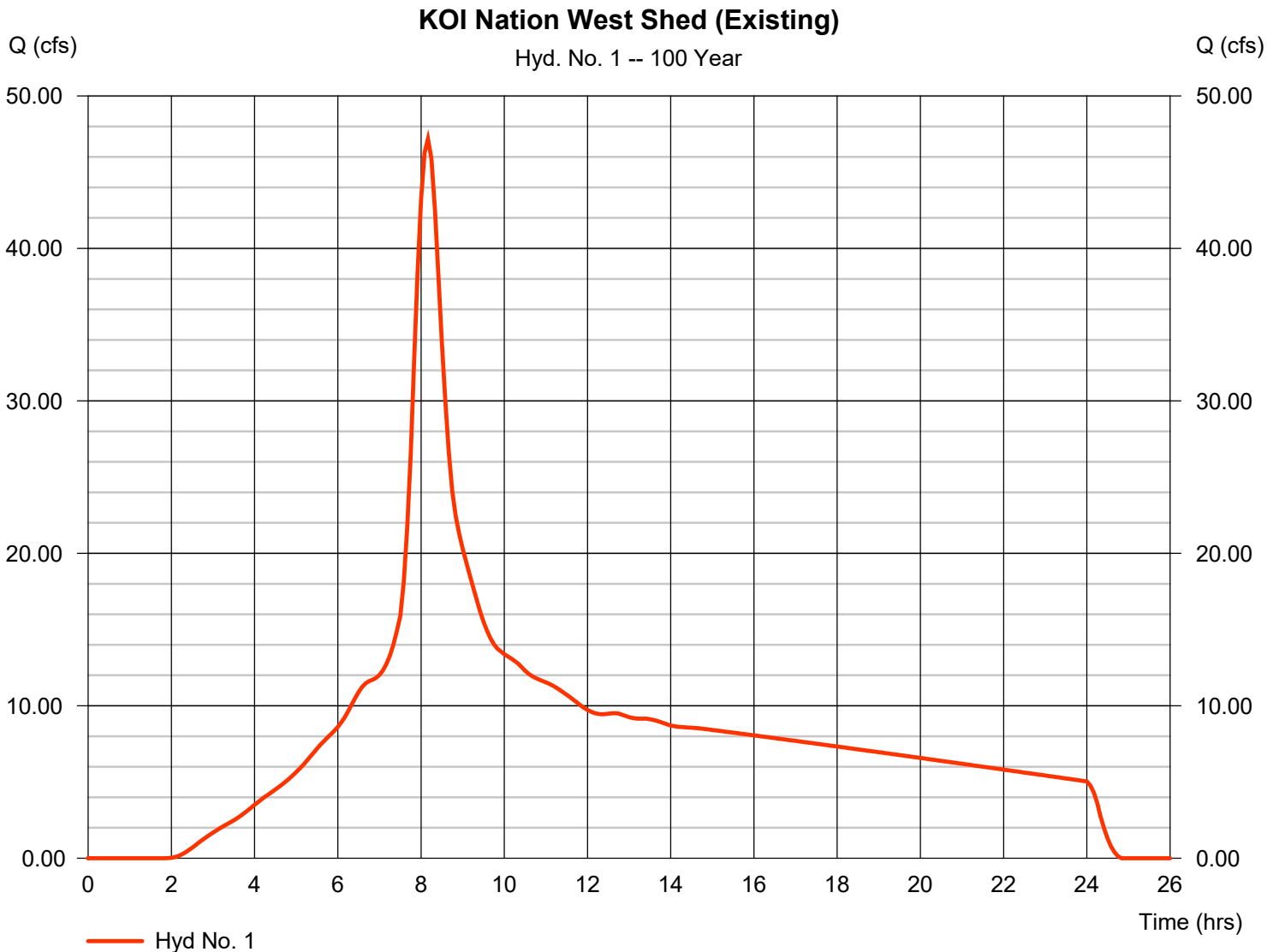


Hydrograph Report

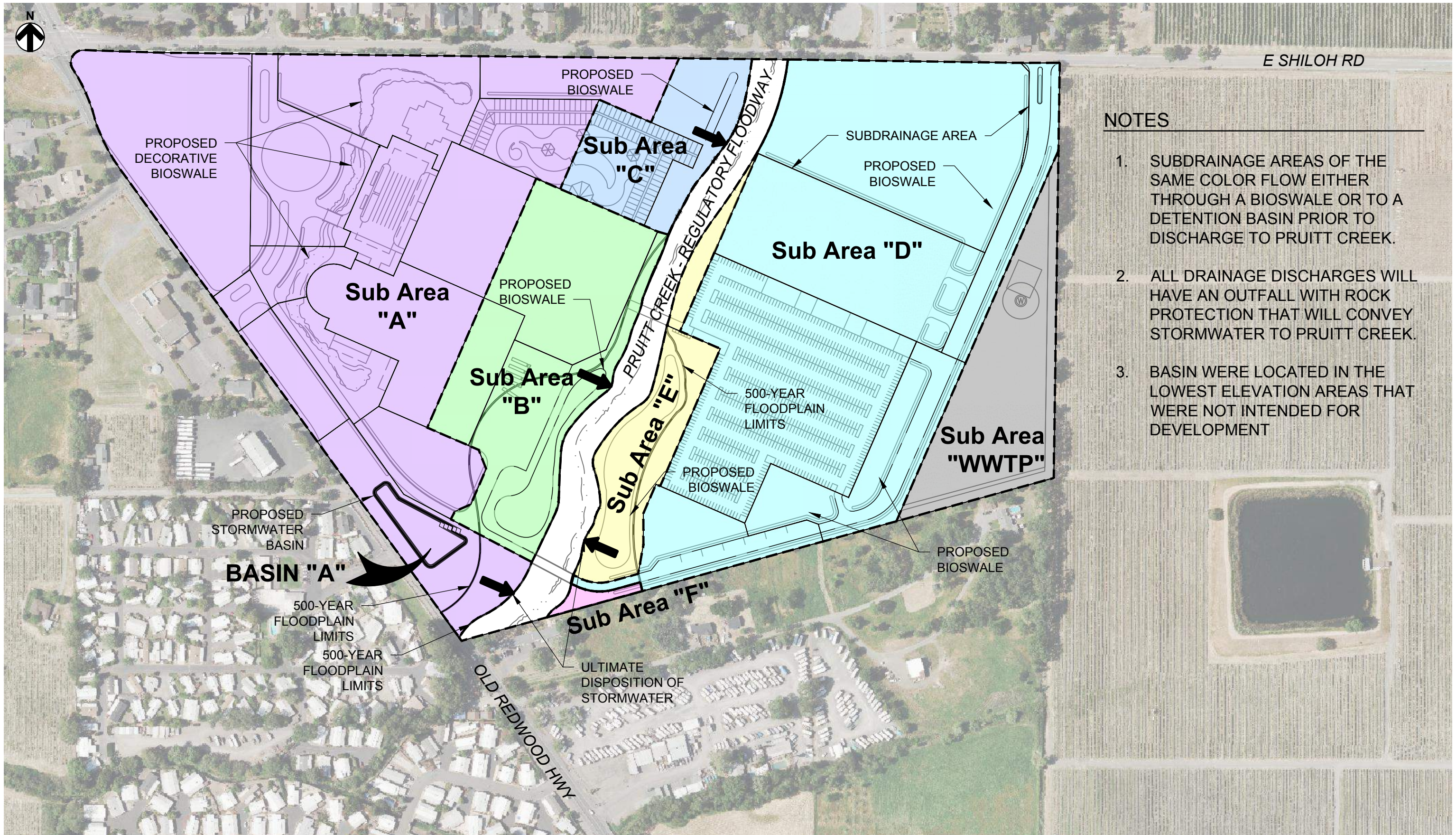
Hyd. No. 1

KOI Nation West Shed (Existing)

Hydrograph type	= SCS Runoff	Peak discharge	= 47.18 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.17 hrs
Time interval	= 5 min	Hyd. volume	= 753,274 cuft
Drainage area	= 32.640 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 30.00 min
Total precip.	= 7.95 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



APPENDIX G
Acorn Environmental
Grading & Hydrology Report
Post-Development Hydrology Map



NOTES

1. SUBDRAINAGE AREAS OF THE SAME COLOR FLOW EITHER THROUGH A BIOSWALE OR TO A DETENTION BASIN PRIOR TO DISCHARGE TO PRUITT CREEK.
2. ALL DRAINAGE DISCHARGES WILL HAVE AN OUTFALL WITH ROCK PROTECTION THAT WILL CONVEY STORMWATER TO PRUITT CREEK.
3. BASIN WERE LOCATED IN THE LOWEST ELEVATION AREAS THAT WERE NOT INTENDED FOR DEVELOPMENT

APPENDIX H
Acorn Environmental
Grading & Hydrology Report
Post-Development Hydrographs

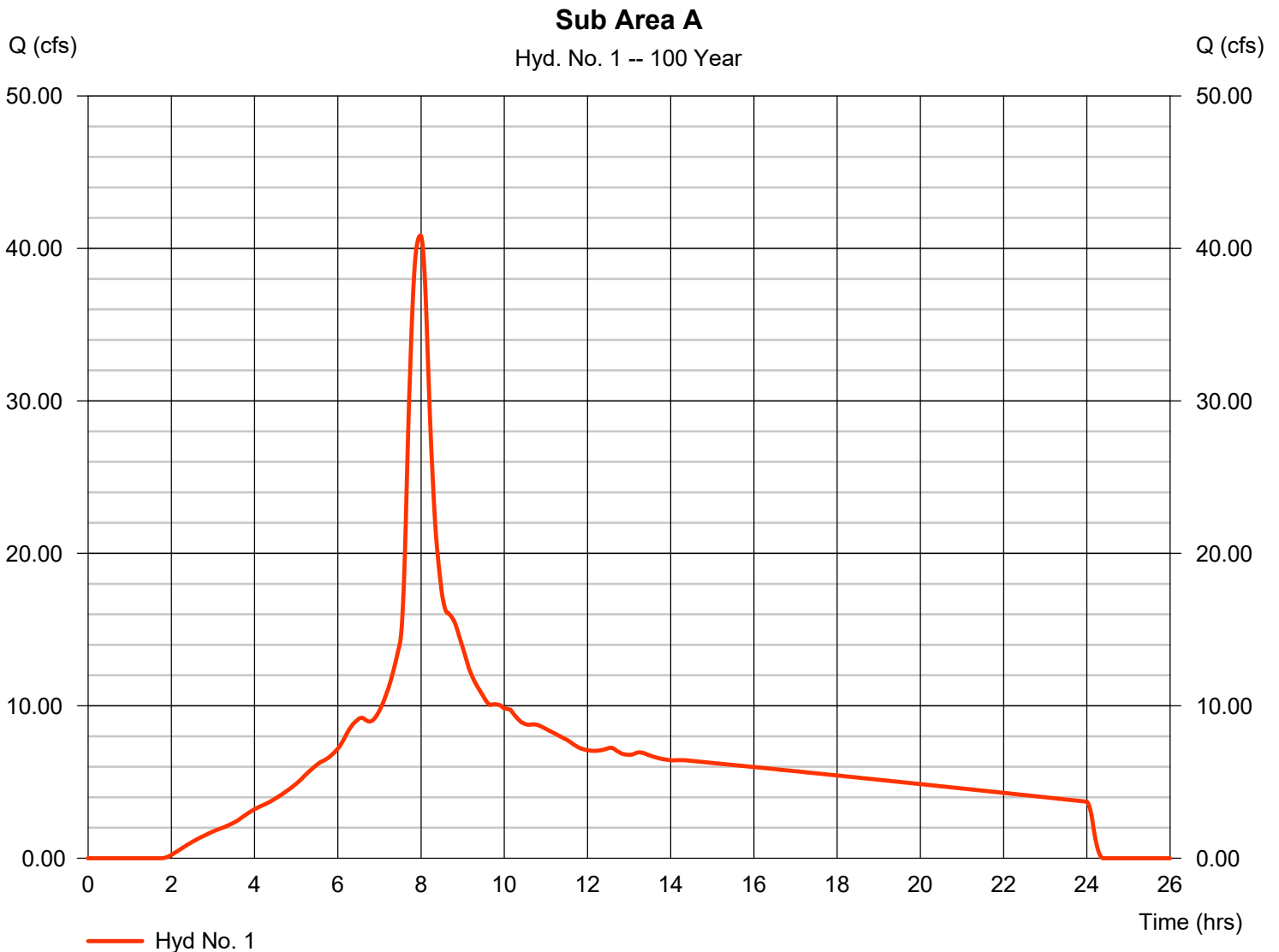
Hydrograph Report

Hyd. No. 1

Sub Area A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 25.040 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 7.95 in
Storm duration = 24 hrs

Peak discharge = 40.84 cfs
Time to peak = 7.98 hrs
Hyd. volume = 571,089 cuft
Curve number = 86
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type IA
Shape factor = 484



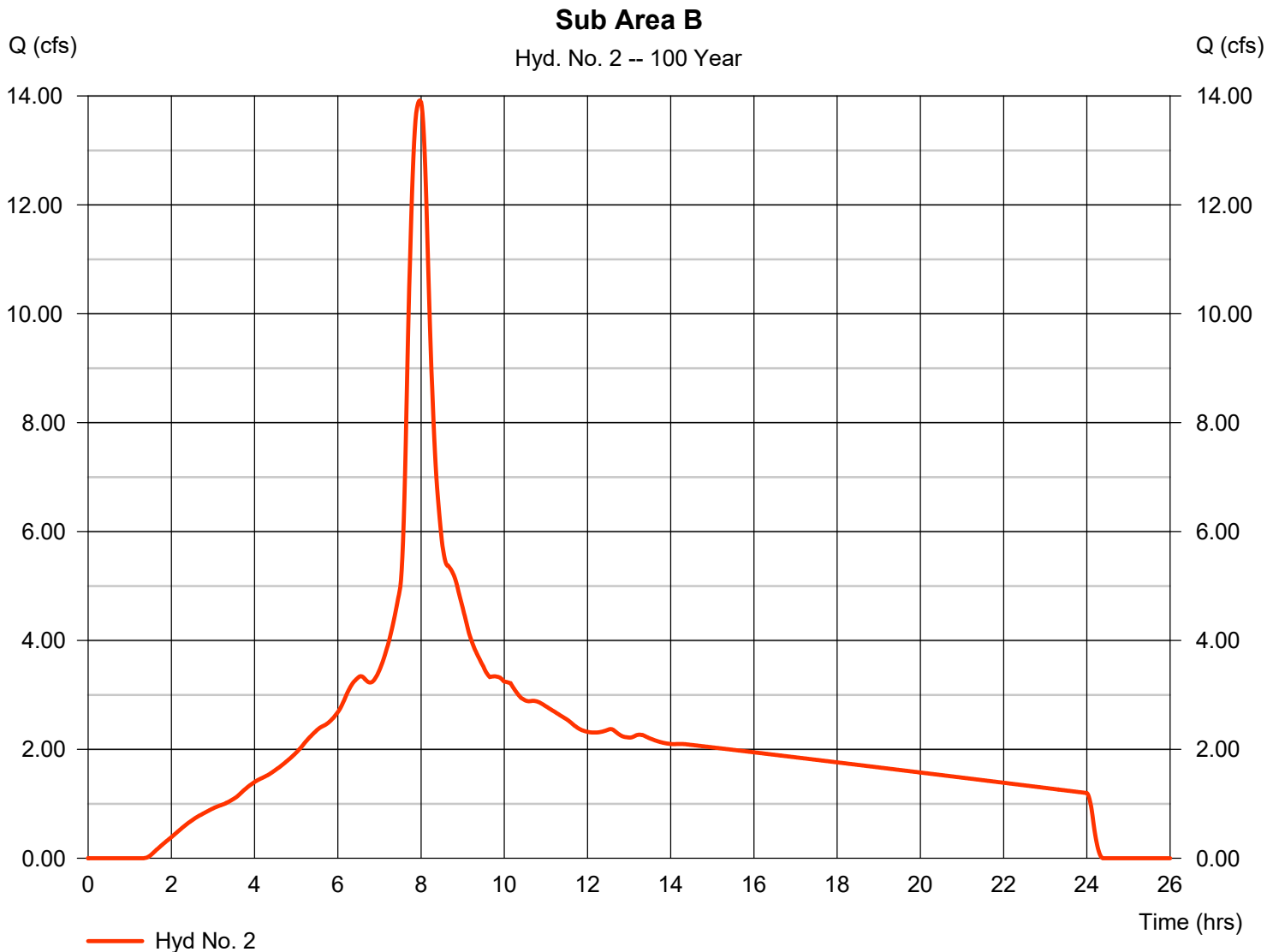
Hydrograph Report

Hyd. No. 2

Sub Area B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 7.960 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 7.95 in
Storm duration = 24 hrs

Peak discharge = 13.91 cfs
Time to peak = 7.97 hrs
Hyd. volume = 195,223 cuft
Curve number = 90
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type IA
Shape factor = 484

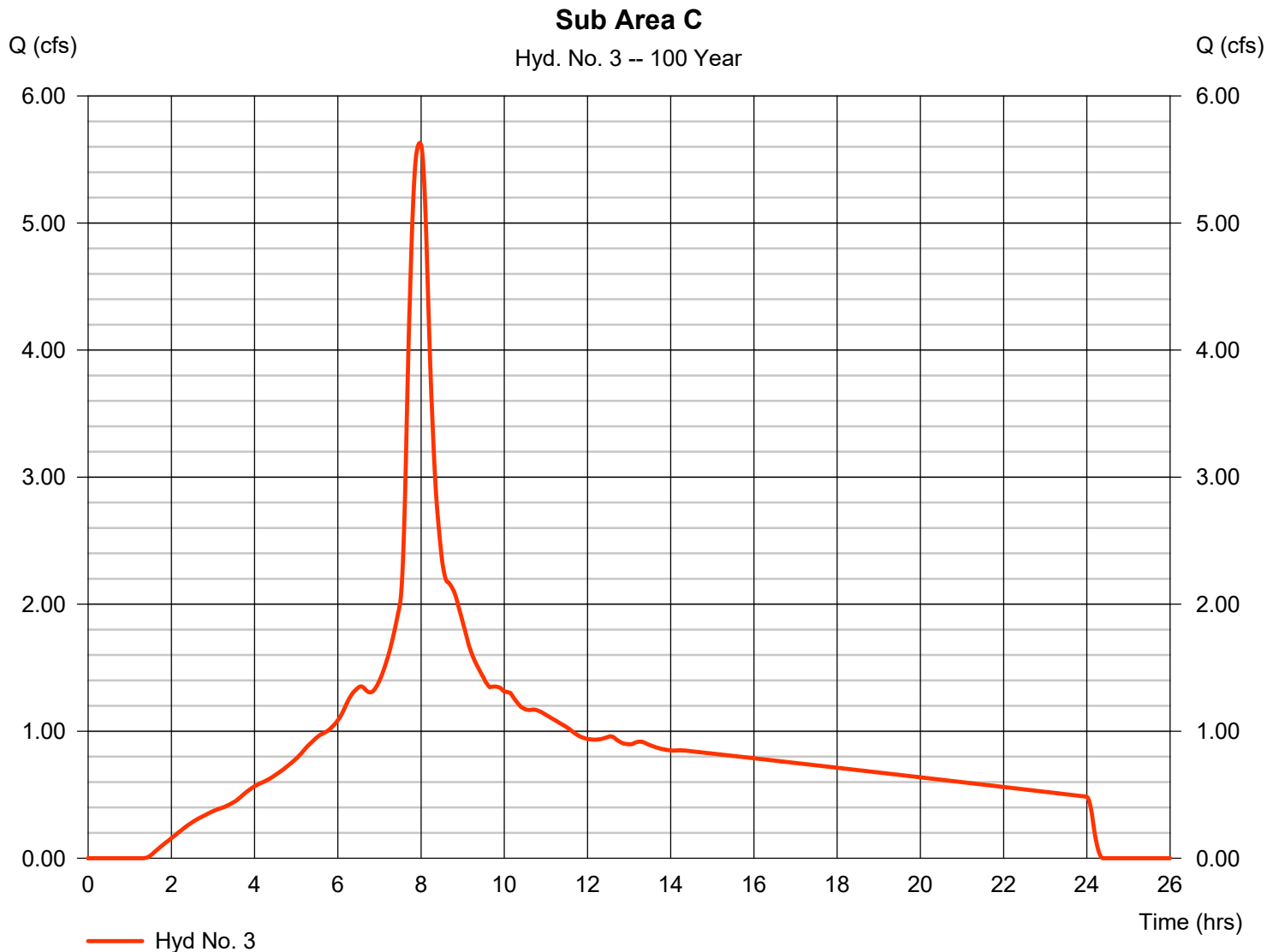


Hydrograph Report

Hyd. No. 3

Sub Area C

Hydrograph type	= SCS Runoff	Peak discharge	= 5.629 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.97 hrs
Time interval	= 1 min	Hyd. volume	= 78,972 cuft
Drainage area	= 3.220 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.95 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

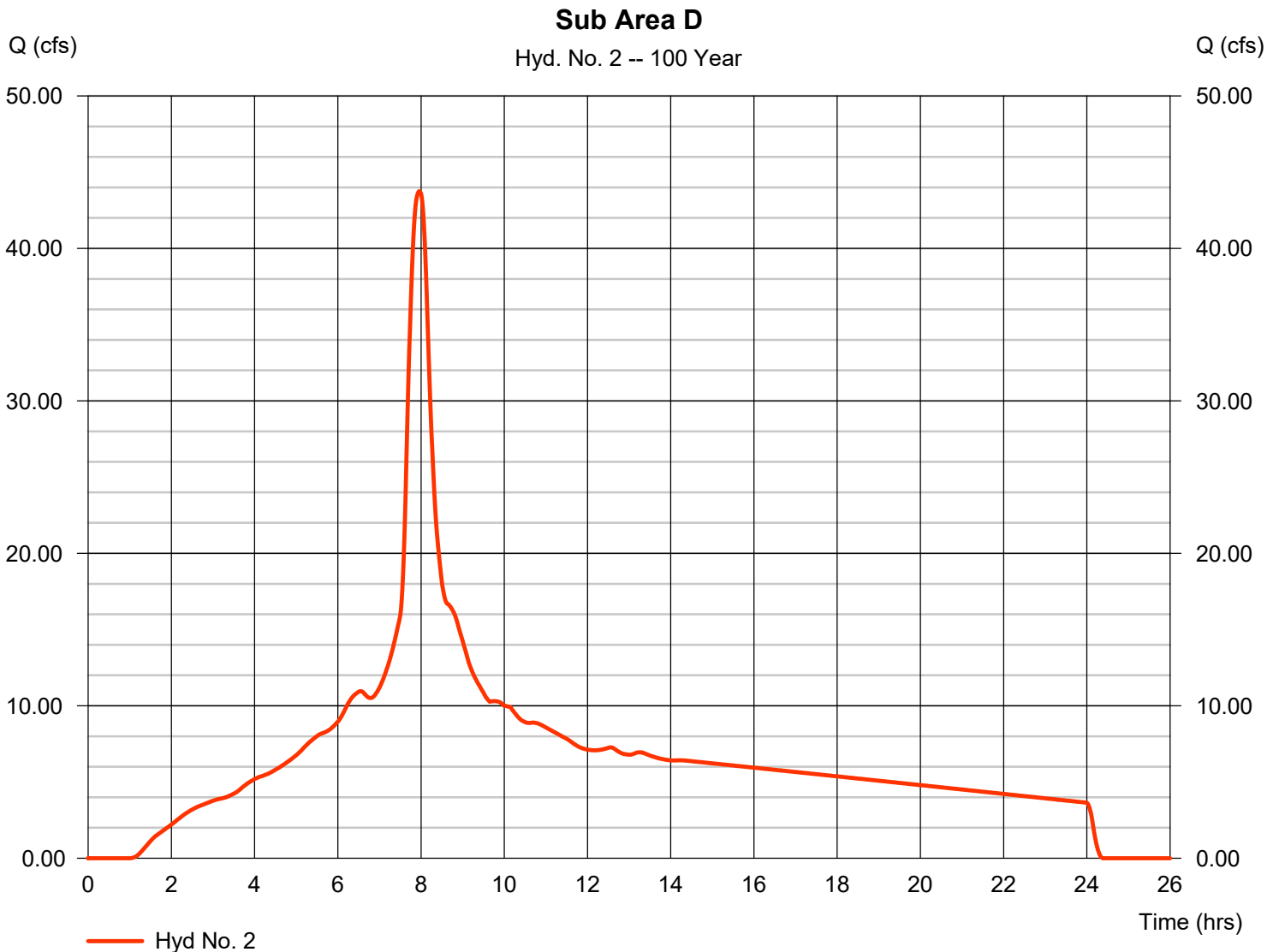


Hydrograph Report

Hyd. No. 2

Sub Area D

Hydrograph type	= SCS Runoff	Peak discharge	= 43.74 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.97 hrs
Time interval	= 1 min	Hyd. volume	= 620,202 cuft
Drainage area	= 24.020 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.95 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

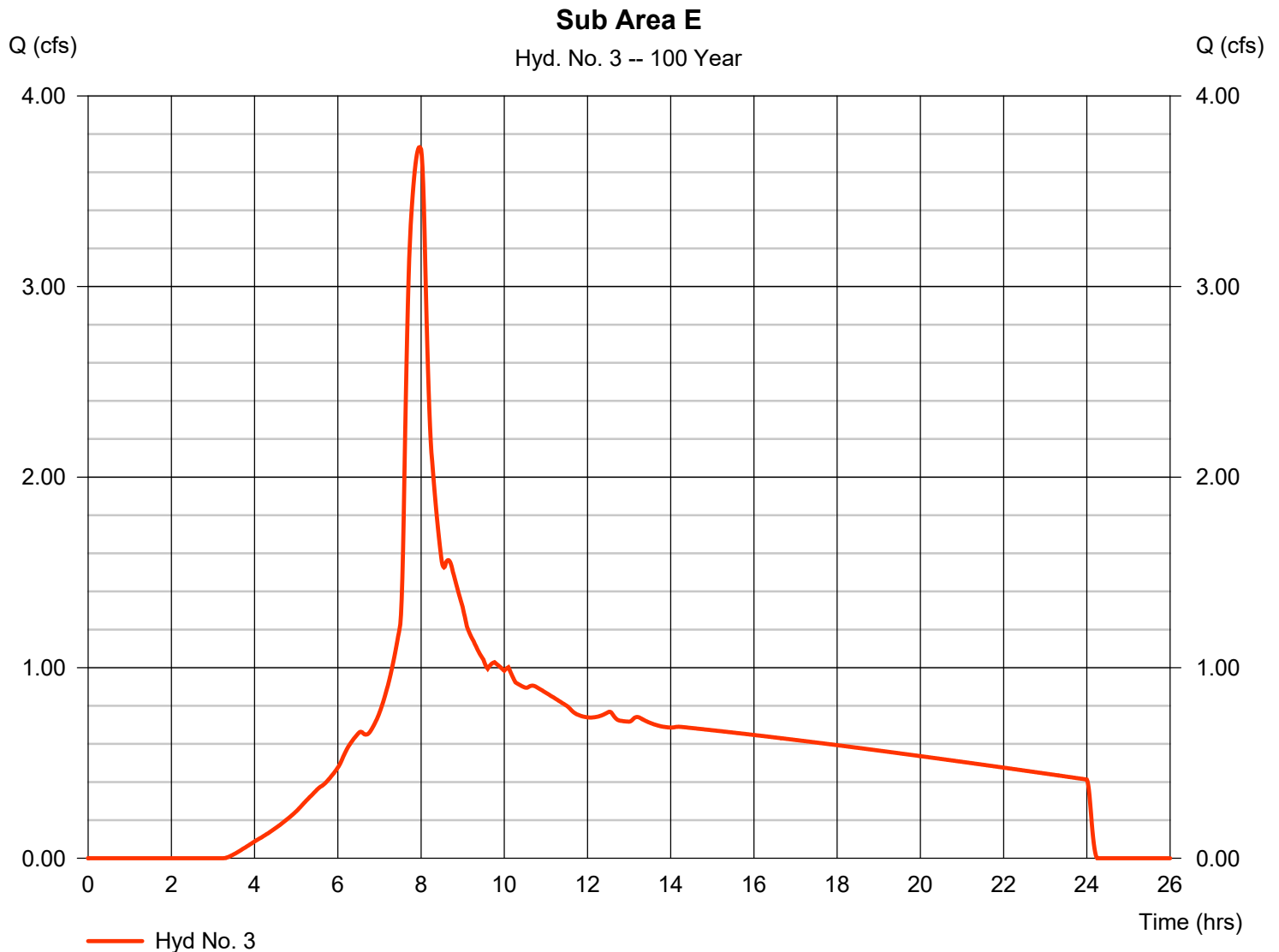


Hydrograph Report

Hyd. No. 3

Sub Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 3.731 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.97 hrs
Time interval	= 1 min	Hyd. volume	= 53,863 cuft
Drainage area	= 3.040 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.95 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

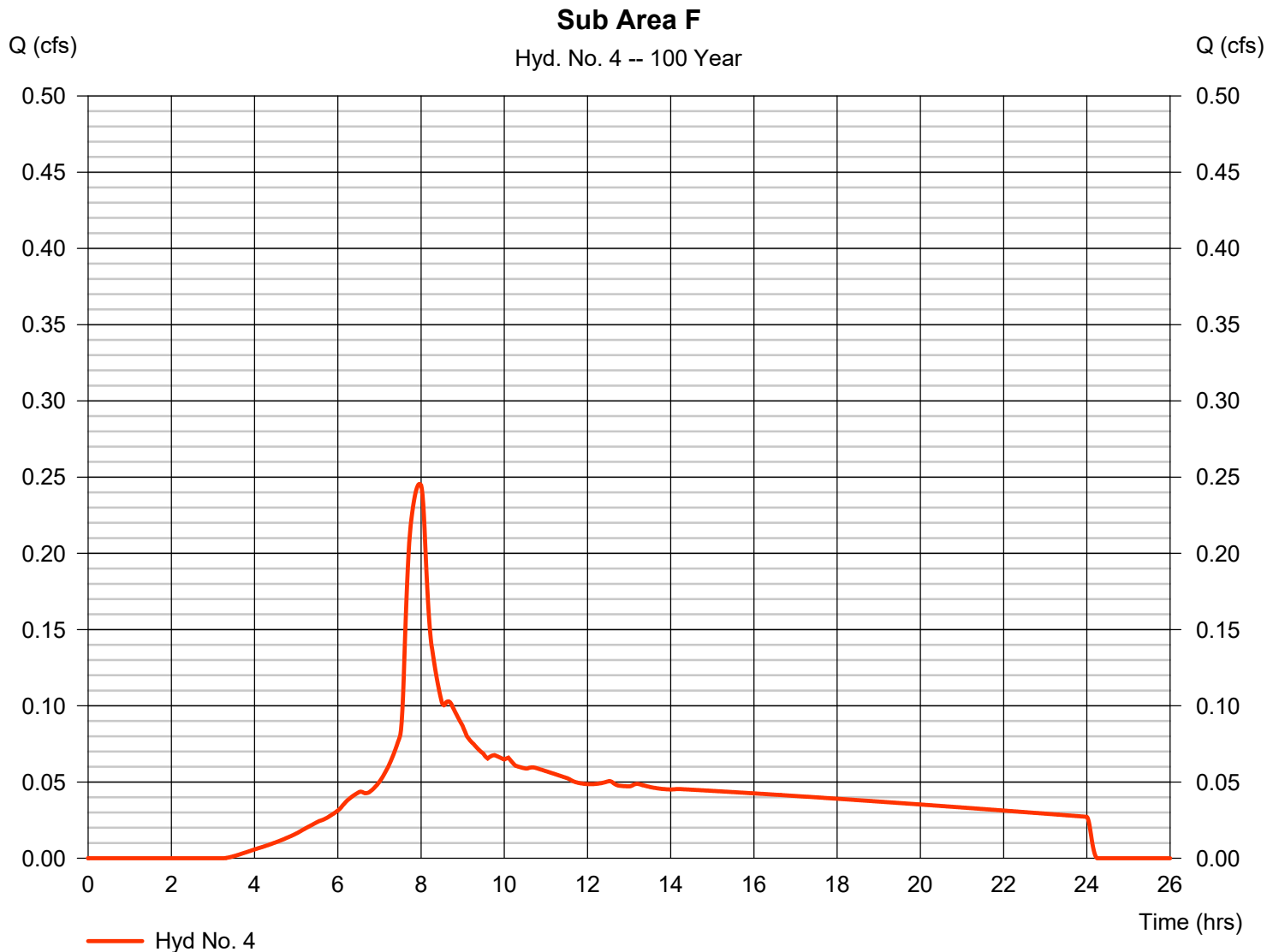


Hydrograph Report

Hyd. No. 4

Sub Area F

Hydrograph type	= SCS Runoff	Peak discharge	= 0.245 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.97 hrs
Time interval	= 1 min	Hyd. volume	= 3,544 cuft
Drainage area	= 0.200 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.95 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



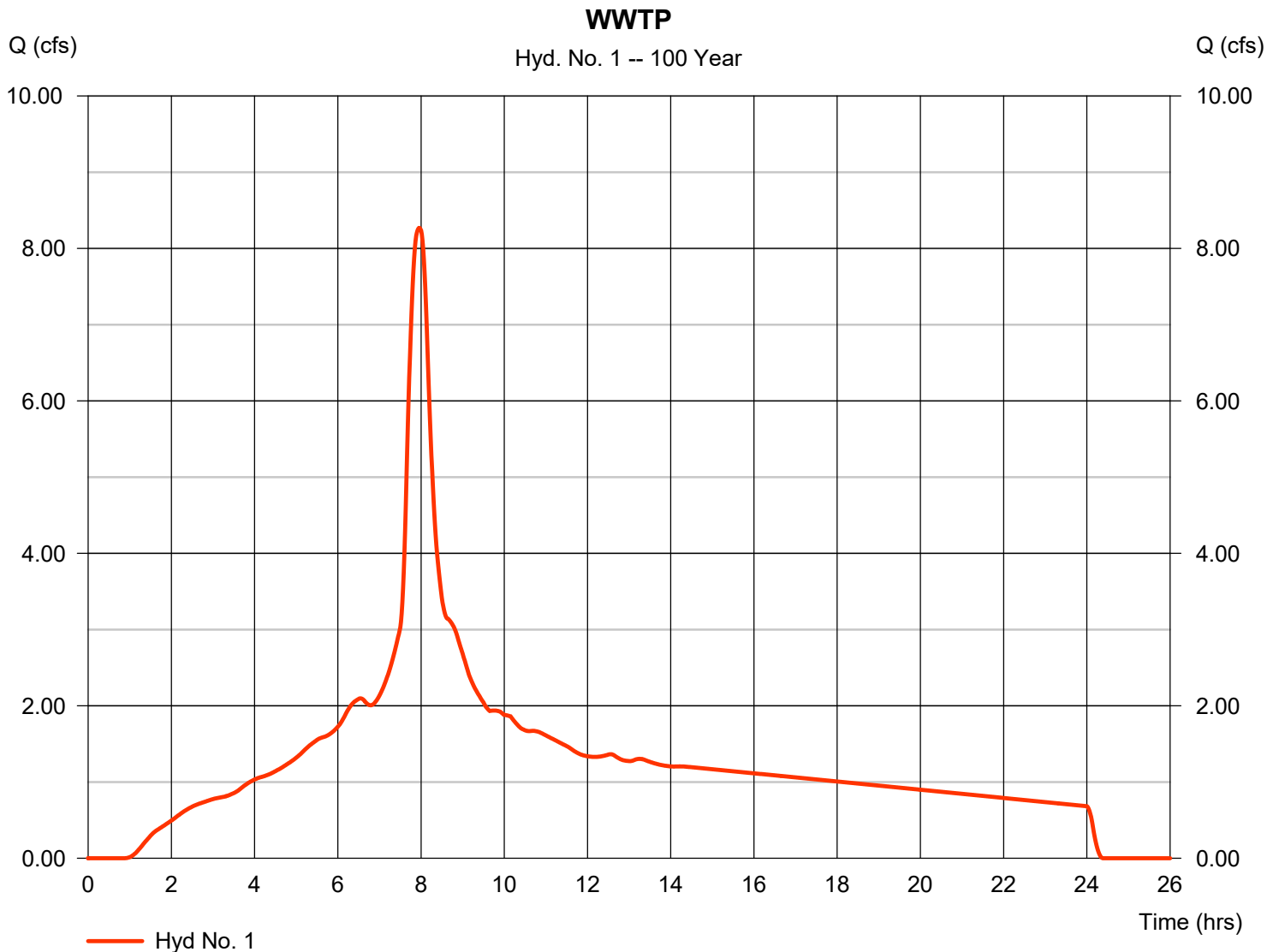
Hydrograph Report

Hyd. No. 1

WWTP

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 4.490 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 7.95 in
Storm duration = 24 hrs

Peak discharge = 8.268 cfs
Time to peak = 7.95 hrs
Hyd. volume = 117,875 cuft
Curve number = 94
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type IA
Shape factor = 484



APPENDIX I
Acorn Environmental
Grading & Hydrology Report
Peak Flow Rate Mitigation Hydrograph

Hydrology Report

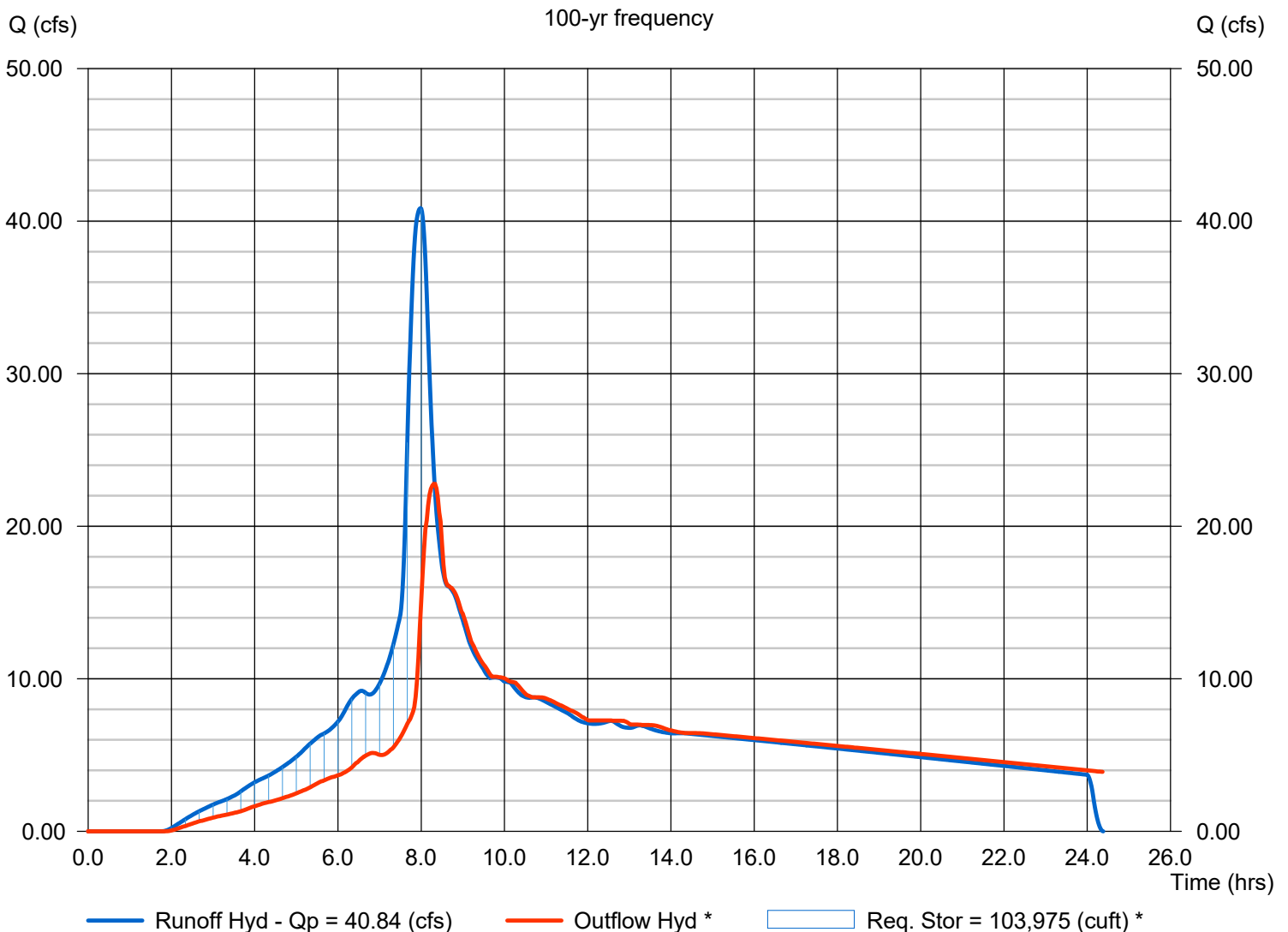
Proposed West - Peak Flow Rate Mitigation

Hydrograph type = SCS
Storm frequency (yrs) = 100
Drainage area (ac) = 25.040
Basin Slope (%) = n/a
Tc method = User
Total precip. (in) = 7.95
Storm duration (hrs) = 24

Peak discharge (cfs) = 40.84
Time interval (min) = 1
Curve number (CN) = 86
Hydraulic length (ft) = n/a
Time of conc. (min) = 15
Storm Distribution = Type IA
Shape factor = 484

Hydrograph Volume = 571,089 (cuft); 13.110 (acft)

Runoff Hydrograph



* Estimated

APPENDIX J
Acorn Environmental
Grading & Hydrology Report
Detention Basin and Outlet Pipe Sizing

Hydrology Report

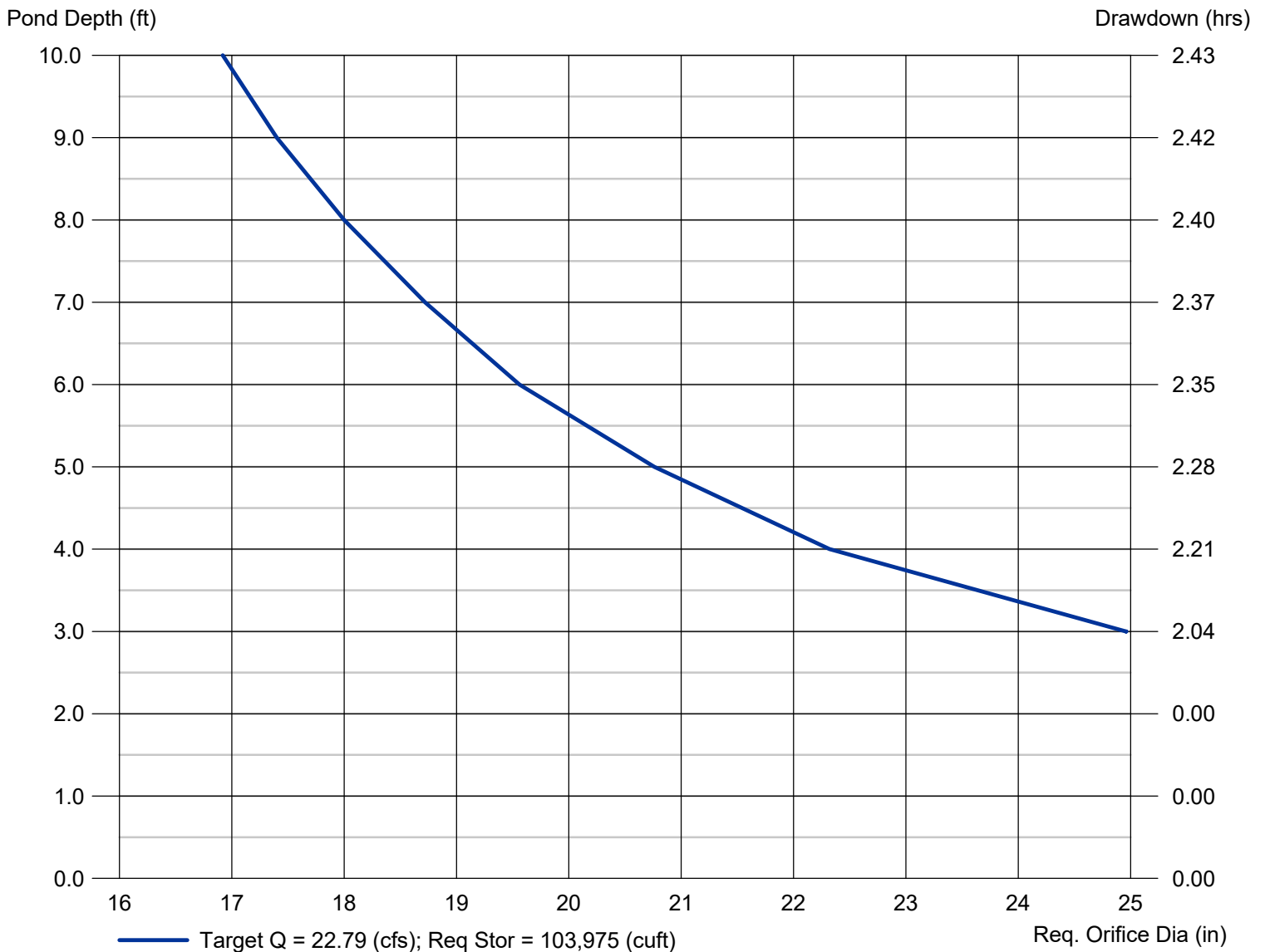
Proposed West - Peak Flow Rate Mitigation

Hydrograph type = SCS
Storm frequency (yrs) = 100
Drainage area (ac) = 25.040
Basin Slope (%) = n/a
Tc method = User
Total precip. (in) = 7.95
Storm duration (hrs) = 24

Peak discharge (cfs) = 40.84
Time interval (min) = 1
Curve number (CN) = 86
Hydraulic length (ft) = n/a
Time of conc. (min) = 15
Storm Distribution = Type IA
Shape factor = 484

Hydrograph Volume = 571,089 (cuft); 13.110 (acft)

Pond Depth vs Orifice Diameter



APPENDIX K
Acorn Environmental
Grading & Hydrology Report
Sonoma County LID Calculations



STORM WATER CALCULATOR

LID BMP Summary Page & Site Global Values

Project Information: Project Name: <u>Koi Nation Shiloh Resort & Casino</u> <u>Sonoma County, CA</u> <u>M. Fernandez</u> <u>9/19/2024</u>		Site Information: Mean Seasonal Precipitation (MSP) of Project Site: <u>40.00</u> (inches) K=MSP/3 K= <u>1.33</u> Impervious area - pre development: <u>0.0</u> ft ² <u>743,778.0</u> ft ²		Based upon the pre and post development impervious area, the post construction BMP requirement is: 100% Capture & Treatment
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Summary of Saved BMP Results:

BMP ID:	Tributary Area (ft ²)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Requirements	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
						Required V _{Hydromod} (ft ³)	Achieved (ft ³)	Required Q Treatment (cfs)	Achieved (ft ³)	Required Vdelta (ft ³)	Achieved (ft ³)
1	Area A 1,210,000	Yes	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	100.4	42413.1992	42596.8002				
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STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Koi Nation Shiloh Resort & Casino**

BMP ID: **Area A**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**

BMP's Physical Tributary Area: **1,210,000.0 ft²**

Description/Notes:

Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **876,668.0 ft²**

Total Runoff Reduction Measures = **333,332.0 ft²**

Interceptor Trees

Number of *new* **Evergreen Trees**: **0**

Number of *new* **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0 ft²**

Total Number of New trees in BMP Tributary Area: **0**

Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

Disconnected Roof Drains Method 1

Roof area of disconnected downsouts: **333,332 ft²**

Percent of rooftop area: **0 %**

Select Density: **1** Units per Acre

Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0 ft²**

Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0 ft²**

Hydromodification Requirement: 100% Volume Capture; V_{HYDROMOD}

Post development hydrologic soil type within tributary area: **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**

Post development ground cover description: **Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)**

CN_{Post}: **90.0**

User Composite post development CN:

V_{HYDROMOD} = **42,413.20 ft³**

BMP Sizing Tool: Hydromodification Requirement

BMP Volume

Below Ground		Ponded Water Above Ground	
Porosity:	0.10	Depth:	0.50 ft
Depth below perforated pipe if present:	6.00 ft	Width:	0.00 ft
Width:	0.00 ft	Length:	0.00 ft
Length:	0.00 ft	Area:	54,362.00 ft ²
Area:	25,693.00 ft ²		

Percent of Goal Achieved = **100.43 %**



STORM WATER CALCULATOR

LID BMP Summary Page & Site Global Values

Project Information: Project Name: <u>Koi Nation Shiloh Resort & Casino</u> <u>Sonoma County, CA</u> <u>M. Fernandez</u> <u>9/19/2024</u>		Site Information: Mean Seasonal Precipitation (MSP) of Project Site: <u>40.00</u> (inches) K=MSP/3 K= <u>1.33</u> Impervious area - pre development: <u>0.0</u> ft ² <u>72,137.0</u> ft ²		Based upon the pre and post development impervious area, the post construction BMP requirement is: 100% Capture & Treatment
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Summary of Saved BMP Results:

BMP ID:	Tributary Area (ft ²)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Requirements	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
						Required V _{Hydromod} (ft ³)	Achieved (ft ³)	Required Q Treatment (cfs)	Achieved (ft ³)	Required Vdelta (ft ³)	Achieved (ft ³)
1 Area B (B1-B3)	346,704	Yes	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	286.8	5360.0439	0.0000				

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STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Koi Nation Shiloh Resort & Casino**

BMP ID: **Area B (B1-B3)**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**

BMP's Physical Tributary Area: **346,704.0 ft²**

Description/Notes:

Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **173,352.0 ft²**

Total Runoff Reduction Measures = **173,352.0 ft²**

Interceptor Trees

Number of *new* **Evergreen Trees**: **0**

Number of *new* **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0 ft²**

Total Number of New trees in BMP Tributary Area: **0**

Disconnected Roof Drains

Select disconnection condition: **Select disconnection condition**

Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **194,947 ft²**

Percent of rooftop area: **0 %**

Select Density: **1** Units per Acre

Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0 ft²**

Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0 ft²**

Hydromodification Requirement: 100% Volume Capture; V_{HYDROMOD}

Post development hydrologic soil type within tributary area: **C: 0.05 - 0.15 in/hr infiltration (transmission) rate**

Post development ground cover description: **Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)**

CN_{Post}: **86.0**

User Composite post development CN:

V_{HYDROMOD} = **5,360.04 ft³**

BMP Sizing Tool: Hydromodification Requirement

BMP Volume

Below Ground		Ponded Water Above Ground	
Porosity:	0.10	Depth:	0.50 ft
Depth below perforated pipe if present:	0.00 ft	Width:	0.00 ft
Width:	0.00 ft	Length:	0.00 ft
Length:	0.00 ft	Area:	30,745.00 ft ²
Area:	0.00 ft ²		

Percent of Goal Achieved = **286.80 %**



STORM WATER CALCULATOR

LID BMP Summary Page & Site Global Values

Project Information: Project Name: <u>Koi Nation Shiloh Resort & Casino</u> <u>Sonoma County, CA</u> <u>M. Fernandez</u> <u>9/19/2024</u>		Site Information: Mean Seasonal Precipitation (MSP) of Project Site: <u>40.00</u> (inches) K=MSP/3 K= <u>1.33</u> Impervious area - pre development: <u>0.0</u> ft ² <u>72,137.0</u> ft ²		Based upon the pre and post development impervious area, the post construction BMP requirement is: 100% Capture & Treatment
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Summary of Saved BMP Results:

BMP ID:	Tributary Area (ft ²)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Requirements	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
						Required V _{Hydromod} (ft ³)	Achieved (ft ³)	Required Q Treatment (cfs)	Achieved (ft ³)	Required Vdelta (ft ³)	Achieved (ft ³)
1	rea C (C1-C2)	140,414	Yes	Hydromod Volume Capture	107.5	2790.0261	0.0000				
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STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Koi Nation Shiloh Resort & Casino**

BMP ID: **Area C (C1-C2)**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**

BMP's Physical Tributary Area: **140,414.0 ft²**

Description/Notes:

Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **70,207.0 ft²**

Total Runoff Reduction Measures = **70,207.0 ft²**

Interceptor Trees

Number of **new** *Evergreen Trees*: **0**

Number of **new** *Deciduous Trees*: **0**

Square footage of qualifying **existing** tree canopy: **0.0 ft²**

Total Number of **new** trees in BMP Tributary Area: **0**

Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **72,137 ft²**

Percent of rooftop area: **0 %**

Select Density: **1** Units per Acre

Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0 ft²**

Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0 ft²**

Hydromodification Requirement: 100% Volume Capture; V_{HYDROMOD}

Post development hydrologic soil type within tributary area: **A: greater than 0.30 in/hr infiltration (transmission) rate**

Post development ground cover description: **Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)**

CN_{Post}: **88.0**

User Composite post development CN:

V_{HYDROMOD} = **2,790.03 ft³**

BMP Sizing Tool: Hydromodification Requirement

BMP Volume

Below Ground		Ponded Water Above Ground	
Porosity:	0.10	Depth:	0.50 ft
Depth below perforated pipe if present:	0.00 ft	Width:	0.00 ft
Width:	0.00 ft	Length:	0.00 ft
Length:	0.00 ft	Area:	6,000.00 ft ²
Area:	0.00 ft ²		

Percent of Goal Achieved = **107.53 %**



STORM WATER CALCULATOR

LID BMP Summary Page & Site Global Values

Project Information: Project Name: <u>Koi Nation Shiloh Resort & Casino</u> <u>Sonoma County, CA</u> <u>M. Fernandez</u> <u>9/19/2024</u>		Site Information: Mean Seasonal Precipitation (MSP) of Project Site: <u>40.00</u> (inches) K=MSP/3 K= <u>1.33</u> Impervious area - pre development: <u>0.0</u> ft ² <u>612,557.0</u> ft ²		Based upon the pre and post development impervious area, the post construction BMP requirement is: 100% Capture & Treatment
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Summary of Saved BMP Results:

BMP ID:	Tributary Area (ft ²)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Requirements	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
						Required V _{Hydromod} (ft ³)	Achieved (ft ³)	Required Q Treatment (cfs)	Achieved (ft ³)	Required Vdelta (ft ³)	Achieved (ft ³)
1 d (No WWTP)	1,187,688	Yes	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	100.1	16758.8184	0.0000				
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STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Koi Nation Shiloh Resort & Casino**

BMP ID: **Easterly Shed (No WWTP)**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**

BMP's Physical Tributary Area: **1,187,688.0 ft²**

Description/Notes:

Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **883,438.0 ft²**

Total Runoff Reduction Measures = **304,250.0 ft²**

Interceptor Trees

Number of **new** *Evergreen Trees*: **0**

Number of **new** *Deciduous Trees*: **0**

Square footage of qualifying **existing** tree canopy: **0.0 ft²**

Total Number of **new** trees in BMP Tributary Area: **0**

Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **304,250 ft²**

Percent of rooftop area: **0 %**

Select Density: **1** Units per Acre

Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0 ft²**

Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0 ft²**

Hydromodification Requirement: 100% Volume Capture; V_{HYDROMOD}

Post development hydrologic soil type within tributary area: **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**

Post development ground cover description: **Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)**

CN_{POST}: **81.0**

User Composite post development CN:

V_{HYDROMOD} = **16,758.82 ft³**

BMP Sizing Tool: Hydromodification Requirement

BMP Volume

Below Ground		Ponded Water Above Ground	
Porosity:	0.10	Depth:	0.50 ft
Depth below perforated pipe if present:	0.00 ft	Width:	0.00 ft
Width:	0.00 ft	Length:	0.00 ft
Length:	0.00 ft	Area:	33,560.00 ft ²
Area:	0.00 ft ²		

Percent of Goal Achieved = **100.13 %**

