

APPENDIX 3.1.4-1
Hydrology/Drainage Study

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PRELIMINARY HYDROLOGY AND DRAINAGE STUDY
for the
Jacumba Solar Energy Project
Major Use Permit PDS2014-MUP-14-041
Environmental Review Project Number PDS2014-MPA-14-015
Jacumba, San Diego County, California

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JUNE 2015

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1 DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Civil Engineer of work for this report, that I have exercised responsible charge over the preparation of this report as defined in section 6703 of the business and professional code, and that the report is consistent with current project concept.

I understand that the check of the report by the County of San Diego is confined to a review only and does not relieve me, as the Civil Engineer of work, of my responsibilities for the report.

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2 INTRODUCTION

Jacumba Solar, LLC is in the process of developing a solar energy facility, named the Jacumba Solar Energy Project (Proposed Project), in the southeastern part of San Diego County (the County). This Preliminary Hydrology and Drainage Study, referred to as the report, was prepared for the Proposed Project as a part of the Draft Environmental Impact Report (EIR) in accordance with the San Diego County Hydrology Manual (SDCHM).

The purpose of this report is to identify hydrologic impacts as a result of the development of the Proposed Project. This report includes quantification of off-site and on-site runoff discharging onto and from the Proposed Project for pre-development and post-development conditions. Additionally, this report identifies and discusses the mitigation measures proposed for mitigating the increase in runoff. Runoff calculations were performed for the 100-year storm event in accordance with the Rational Method as described in the SDCHM by using the Advanced Engineering Software (AES). Analyses of the existing and proposed 100-year flood inundation levels were conducted using the Army Corps of Engineers' Hydrologic Engineering Centers River Analysis System (HEC-RAS) software.

The hydrologic analysis including watershed delineation, results, and mitigation measures presented in this report are preliminary in nature and subject to change should the boundary, site plan, or other components of the Proposed Project change. Plans, specifications, and recommendations found within this report are not approved and are not for construction purposes; contractors shall refer to the final approved construction documents for construction details.

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3 PROJECT DESCRIPTION

3.1 Project Location

The Proposed Project encompasses a total of approximately 304 acres of which approximately 108 acres would be disturbed for the development of the solar energy facility. The disturbed area for the purposes of this report does not include vegetation management areas outside the fence line. The Proposed Project falls within the Mountain Empire Subregional Plan Area in unincorporated San Diego County and is located approximately 2.5 miles to the east of the community of Jacumba Hot Springs, south of Interstate 8 (I-8), and immediately north of the U.S./Mexico International Border. Figure 1 shows the vicinity map for the Proposed Project.

3.2 Project Description

The Proposed Project encompasses a total of approximately 304 acres within the Mountain Empire Subregional Plan Area in unincorporated San Diego County; however, the solar energy facility comprising the Proposed Project would encompass approximately 108 acres. The solar energy facility would use photovoltaic (PV) fixed-tilt rack electric generation system technology to produce solar energy at the utility scale, producing approximately 20 megawatts (MW).

Implementation of the Proposed Project would include installation of individual fixed-tilt-mounted PV modules, which would comprise the majority of the proposed facilities. PV modules generate electricity by safely converting the energy of the sun's photons into direct current (DC) electrons. The PV module arrays (a row of PV modules) would be a fixed-tilt system that would be oriented along an east-west axis. The PV modules, at their highest point, would be approximately 8 feet above the ground surface. The mounting structures are typically mounted on metal pipe pile or beam foundations 4 to 6 inches in diameter. The beams would be driven into the soil using a pile/vibratory/rotary driving technique.

Depending on final engineering, the arrays may be equal in length, creating a uniform rectangular Project footprint, or may vary in length in order to avoid sensitive resources. The east-west arranged fixed-tilt arrays, if used, would be constructed approximately 25 feet apart (centerline to centerline) in a north-south direction, with an east-west array spacing of approximately 12.5 feet. Each PV module array "row" would measure approximately 144 feet in total combined length and approximately 6.5 feet in width. The PV module arrays' final elevations from ground surface would be determined during detailed Project design; however, it is common to maintain as low an elevation profile as possible to reduce potential wind loads on the PV module arrays. All solar panels at maximum tilt would be raised above the 100-year base flood elevation. The Proposed Project would not place housing within a 100-year flood hazard area.

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Following this section of the report, the portion of the Proposed Project that would be disturbed for the development of the solar energy facility (approximately 108 acres) is referred to as the Proposed Project. The hydrologic characteristic would only be impacted within the disturbed area that does not include vegetation management areas outside the fence line.

3.3 Project Hydrologic Characteristics

The Proposed Project falls within the Jacumba Valley hydrologic subarea of the Jacumba hydrologic area located within the Anza Borrego hydrologic unit as identified in Table 1, Project Hydrologic Characteristics. The hydrologic unit, hydrologic area, and hydrologic subarea information was obtained from the Water Quality Control Plan for the Colorado River Basin (Region No. 7), prepared by the California Regional Water Quality Control Board (RWQCB) under the State Water Resources Control Board (RWQCB 2005).

**Table 1
Project Hydrologic Characteristics**

Hydrologic Unit (HU)	Hydrologic Area (HA)	Hydrologic Subarea (HSA)
Anza Borrego (722.00)	Jacumba (722.70)	Jacumba Valley (722.72)

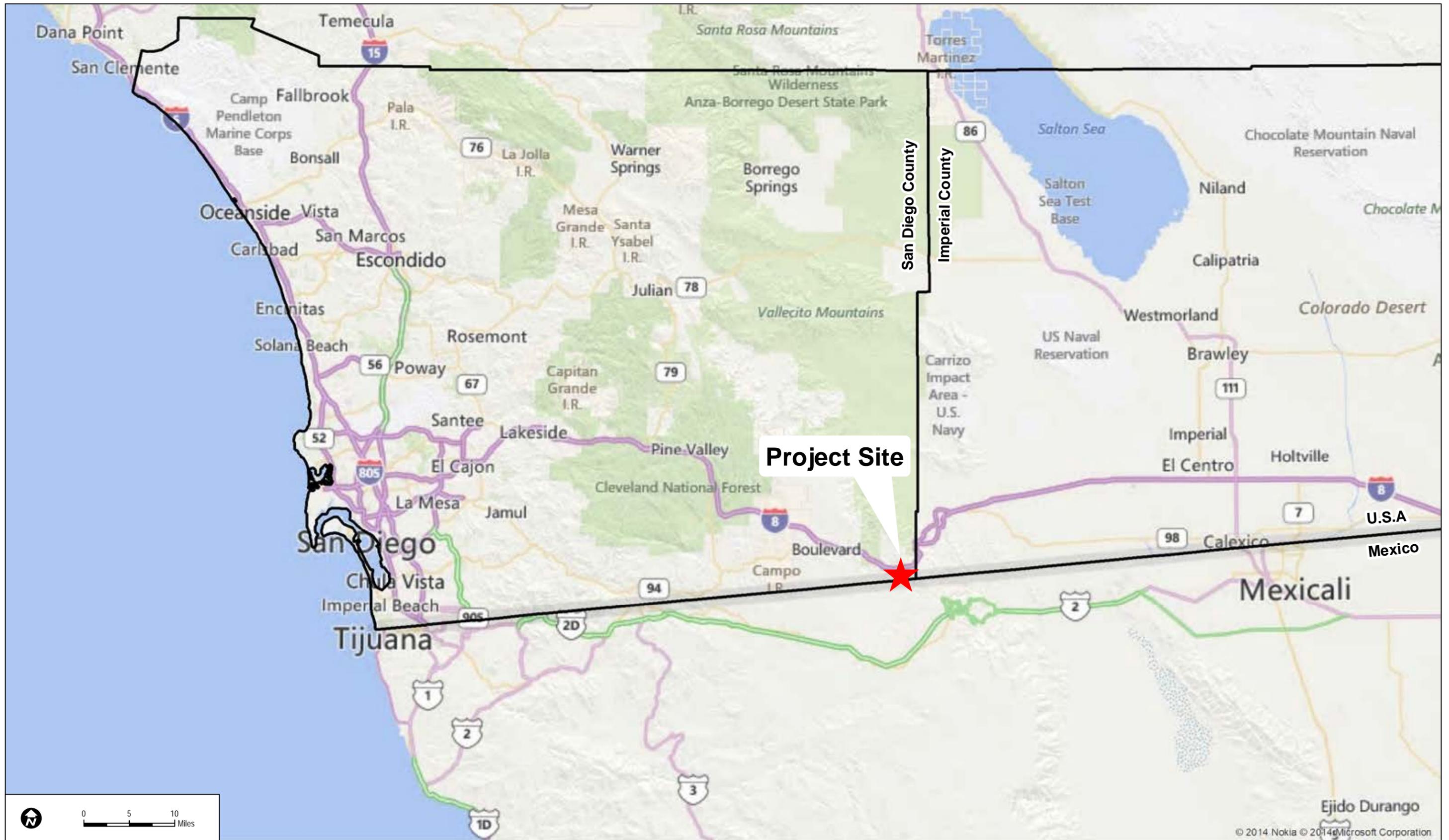
Figure 2 shows the location of the Proposed Project with reference to the Jacumba Valley hydrologic subarea. A comparison of the Proposed Project area with respect to the acreage of the Jacumba Valley hydrologic subarea is presented in Table 2, Project Contribution to Hydrologic Subarea.

**Table 2
Project Contribution to Hydrologic Subarea**

Hydrologic Subarea (HSA)	Area (Acres)	Approximate Proposed Project Area (Acres)	Estimated Project Contribution (Percent)
Jacumba Valley HSA (722.72)	16,284	108 ^a	0.7

^a The Proposed Project is approximately 304 acres; however, approximately 108 acres of the Proposed Project would be disturbed for the development of the solar energy facility and is considered as the area of the Proposed Project for this report. The disturbed area does not include vegetation management areas outside the fence line.

The Proposed Project area is less than 1% of the area encompassed by the affected Jacumba Valley hydrologic subarea.



Project Site

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Legend

 Jacumba Valley Hydrologic Subarea



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SOURCE: Bing Maps, SANGIS

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FIGURE 2
Hydrologic Subarea

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3.4 Rainfall

The rainfall isopluvial values for the Proposed Project were obtained from the SDCHM. The rainfall isopluvial values for the 100-year 6-hour and 100-year 24-hour storm events are as follows:

100-year 6-hour Rainfall (P_6) = 3.0 inches

100-year 24-hour Rainfall (P_{24}) = 5.0 inches

$P_6 / P_{24} = 60\%$

Per the SDCHM, P_6 for the selected storm event should be between 45% and 65% of P_{24} . This criterion was met as the P_6 for the Proposed Project falls within the specified range. The P_6 and P_{24} isopluvial maps and the Intensity-Duration Design Chart are presented in Appendix C.

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4 EXISTING DRAINAGE (PRE-DEVELOPMENT CONDITION)

4.1 Existing Topography

The Proposed Project is located within the Mountain Empire Subregional Plan Area in unincorporated San Diego County on vacant and undeveloped land that ranges in elevation from approximately 3,096 to 3,168 feet above mean sea level (amsl). An existing topographic map of the Proposed Project for the pre-development condition is shown on Figure 3.

The watershed contributing runoff to the Proposed Project is designated as undisturbed natural terrain based on its topography and terrain, and in accordance with the Natural Resources Conservation Service (NRCS) land use elements described in the Rational Method of the SDCHM that ranges in elevation from approximately 3,096 to 4,325 feet amsl.

4.2 Existing Hydrologic Soil Groups

Soil properties influence the rainfall–runoff relationship due to their varying rate of infiltration. Soils are classified by the NRCS into four hydrologic soil groups based on the soil’s runoff potential. The four hydrologic soil groups are A, B, C, and D. Soil Group A generally has the smallest runoff potential and Soil Group D has the highest. A geographic information system (GIS)-based soils analysis was performed to determine the distribution of soil groups within the watershed contributing runoff to the Proposed Project, as shown in tabular format in Table 3, Hydrologic Soil Groups, and in spatial format on Figure 4. The watershed that contributes runoff to the Proposed Project is approximately 555 acres. Soil Group A is the predominant soil group in the contributing watershed, followed by Soil Groups D and B. Approximately 7% of soils in the contributing watershed are undetermined, according to the SDCHM. These undetermined soils were assumed to be Soil Group D due to its highest runoff potential. Additionally, due to the lack of availability of soil group information in the Imperial County and Mexico, these soil groups were assumed based on aerial photography and adjacent soil groups.

Table 3
Hydrologic Soil Groups

Soil Group	Area (Acres)	Area (Percent)
A	228.54	41.16
B	62.85	11.32
C	—	—
D	223.53	40.25
Undetermined	40.37	7.27
Total	555.30^a	100.00

^a Approximately 555 acres is the area of the watershed that contributes runoff to the Proposed Project.

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4.3 Existing Land Use

The Proposed Project is in the Mountain Empire Subregional Plan Area on vacant, undeveloped land in unincorporated San Diego County. The Proposed Project and its contributing watershed is generally an arid desert environment that supports a limited range of habitats and biological communities. These habitats and communities include desert scrub and chaparral. Additionally, these habitats and communities may vary depending on the ecoregion, soils and substrate, and topography. Based on the topography and terrain, the Proposed Project as well as its contributing watershed is designated as undisturbed natural terrain in accordance with the NRCS land use elements described in the Rational Method of the SDCHM.

Major land uses surrounding the Proposed Project include the following:

The surrounding Jacumba area, which includes the community of Jacumba Hot Springs, can be characterized as a predominantly rural landscape featuring large-lot ranches and single-family homes with a mixture of small-scale agriculture, recreational opportunities, and vast areas of undeveloped lands. The community also has an old rail line running to the north, with the town characterized by Old Highway 80 as its main street, single-family homes throughout the town, and agricultural uses to the east. Very few single-family homes are scattered amongst the mountainous landscape; however, recent developments have resulted in a variable physical setting that includes both rural and major infrastructure elements, including the East County (ECO) Substation, Kumeyaay Wind Energy Facility, and Sunrise Powerlink.

South of I-8, major infrastructure elements of the landscape include the Sunrise Powerlink, which consists of a 500-kilovolt (kV) electric transmission line supported by 150-foot-tall steel lattice structures and the Southwest Powerlink, which also consists of a 500 kV electric transmission line supported by 150-foot-tall steel lattice structures, as well as several large, vertical, metallic communication towers located at the White Star Communication Facility, and the linear rust-colored U.S./Mexico international border fence located immediately south of the Proposed Project.

In addition, the Golden Acorn Casino and Travel Center is located south of I-8 near the Tecate Divide on reservation lands of the Campo Kumeyaay Nation, and the existing Boulevard Border Protection Station and the adjacent Lux Motel are located south of the interstate near the Ribbonwood Road exit.

Legend

- 10 Feet Contour
- Property Boundary
- Project Site

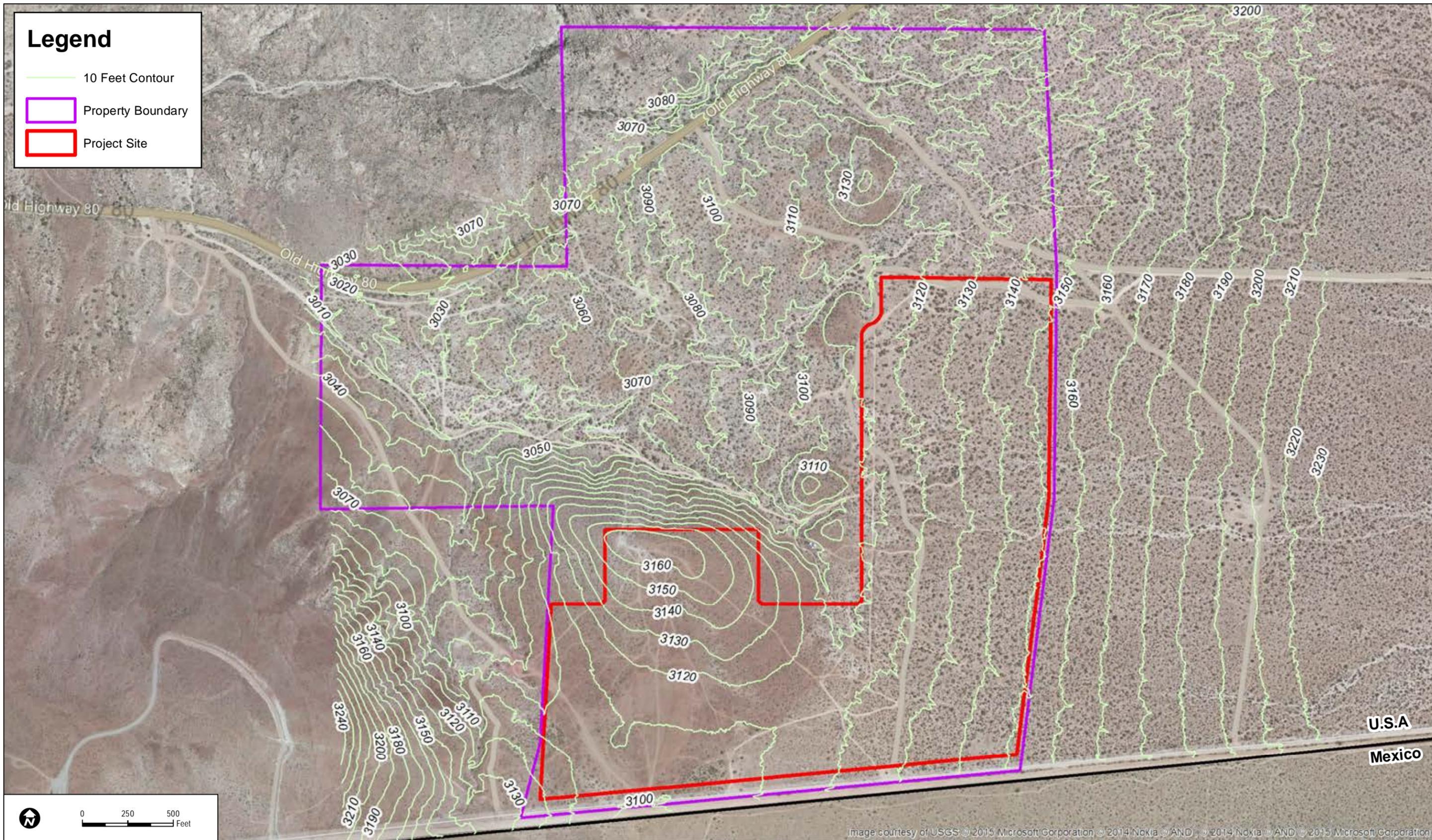
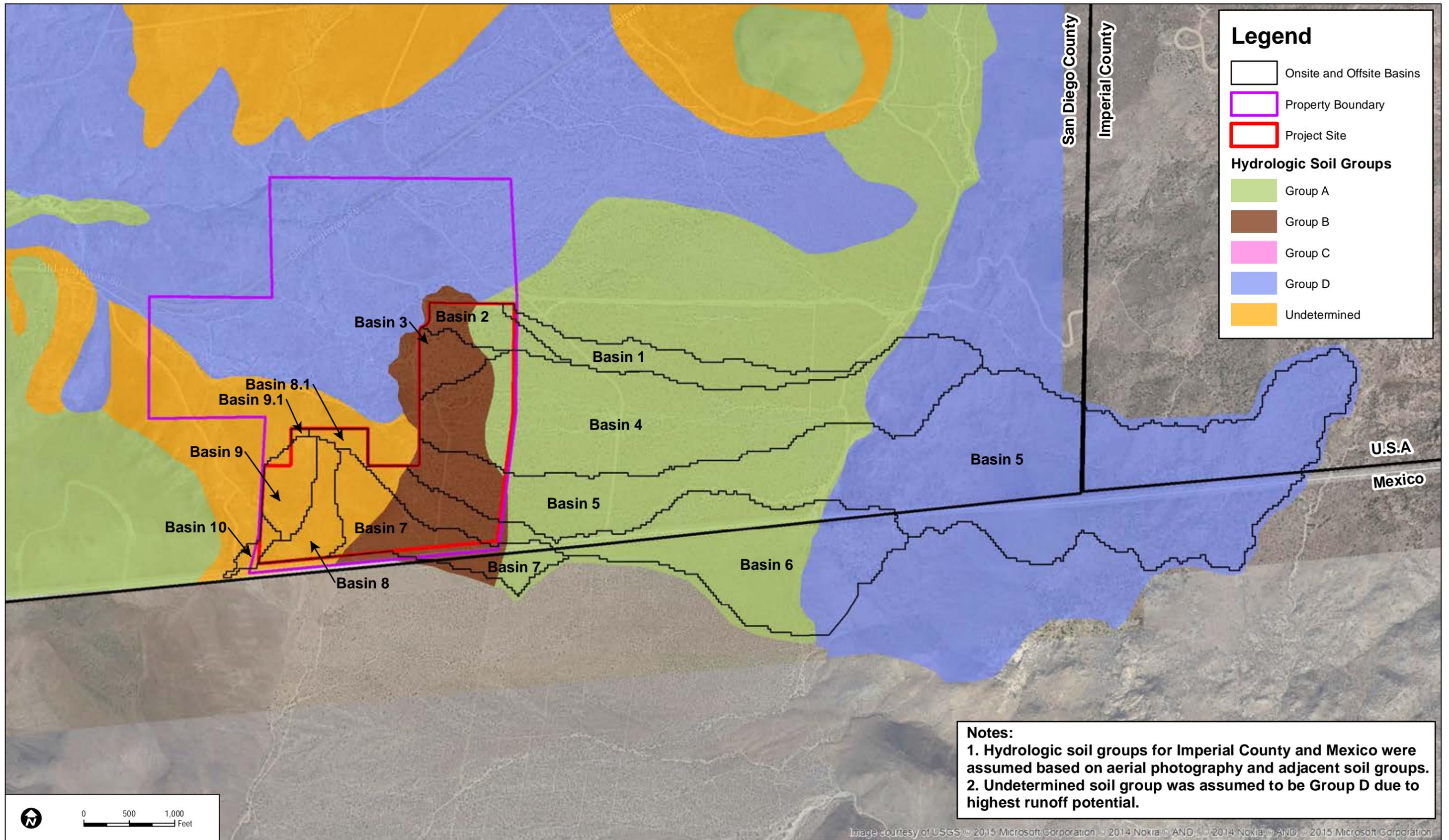


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4.4 Existing Runoff

The Proposed Project is located approximately 4,000 feet west of the Sierra Juarez Mountains. Runoff discharging from the Sierra Juarez Mountains generally flows in the westerly direction toward the Proposed Project. A hill located at the western portion of the Proposed Project also flows toward the Proposed Project to the south, west, and east.

For the purpose of quantifying existing runoff discharging onto the Proposed Project for the pre-development condition, the contributing watershed was delineated to determine the extent of the hydrologic unit of land contributing runoff to the Proposed Project. The contributing watershed is approximately 555 acres and was divided into twelve (12) basins, which were further subdivided into smaller sub-basins such that each basin has its own initial subarea followed by subsequent sub-basins. Figure 5 shows the existing drainage for the pre-development condition.

The contributing watershed and its corresponding basins and sub-basins were delineated using the Esri ArcHydro tool in GIS. The ArcHydro tool uses a Digital Elevation Model (DEM) to calculate flow paths between grid cells to generate streams and then subsequently delineates basins and sub-basins within a larger watershed based on the grid cells. The U.S. Geological Survey's National Elevation Dataset with a 1/3 arc second spatial resolution was used as the DEM to delineate the basins and sub-basins within the contributing watershed. Various hydrologic parameters associated with hydrologic modeling, such as area, slope, and length, were also determined as a part of the delineation process.

The existing runoff calculations were performed to quantify peak runoff discharging onto the Proposed Project for the pre-development condition based on the Rational Method as described in the SDCHM by using AES (see Appendix A of this report). AES is a computer-aided watershed modeling program that comes pre-loaded with the County Hydrology Method module. Peak runoff was calculated for all discharge points representing each basin within the contributing watershed for the 100-year storm event. The runoff coefficients (C) used to calculate existing runoff were obtained from the SDCHM (see Appendix C of this report) as shown below:

Soil Type: A; C = 0.20

Soil Type: B; C = 0.25

Soil Type: C; C = 0.30

Soil Type: D; C = 0.35

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A GIS-based analysis was performed to calculate weighted C for each basin based on the soil groups (see Appendix A of this report).

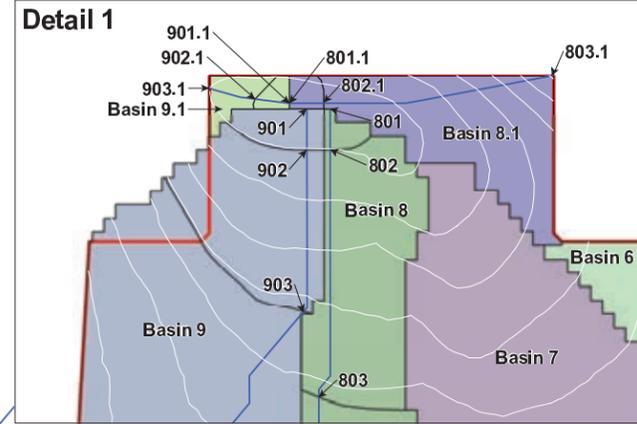
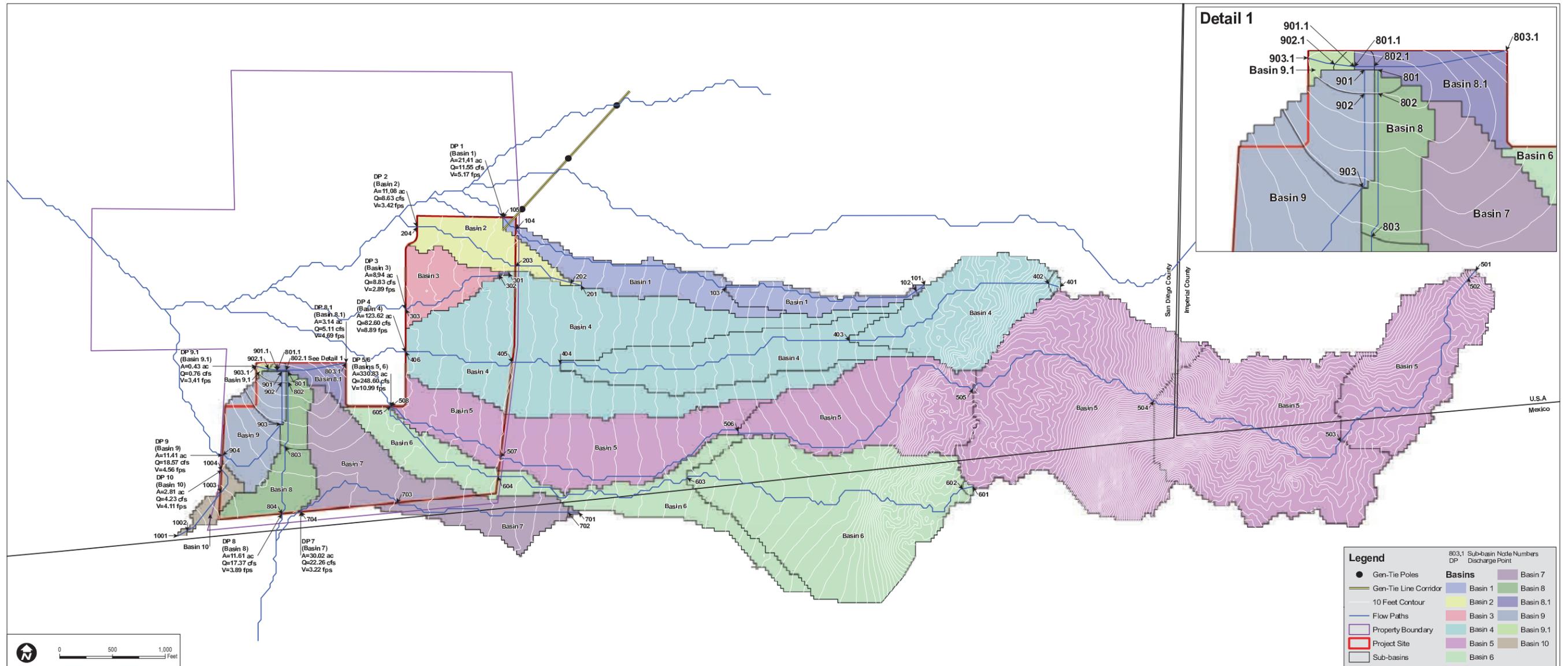
The results of the existing runoff calculations for the pre-development condition are presented in Table 4, Existing Results for Pre-Development Condition.

**Table 4
Existing Results for Pre-Development Condition**

Discharge Point	Existing Results per the San Diego County Hydrology Manual (Rational Method) using AES						
	Basin	Area (Acres)	Weighted C	T _c (min)	I (in/hr)	Peak Q ₁₀₀ (cfs)	V (fps)
DP 1	1	21.41	0.20	26.48	2.70	11.55	5.17
DP 2	2	11.08	0.22	17.01	3.59	8.63	3.42
DP 3	3	8.94	0.25	14.71	3.94	8.83	2.89
DP 4	4	123.62	0.23	23.44	2.92	82.60	8.89
DP 5/6	5 and 6	330.83	0.30	29.63	2.51	248.60	10.99
DP 7	7	30.02	0.27	26.23	2.71	22.26	3.22
DP 8	8	11.61	0.35	12.98	4.27	17.37	3.89
DP 8.1	8.1	3.14	0.35	11.39	4.65	5.11	4.69
DP 9	9	11.41	0.35	11.36	4.65	18.57	4.56
DP 9.1	9.1	0.43	0.35	9.92	5.08	0.76	3.41
DP 10	10	2.81	0.35	12.85	4.30	4.23	4.11

Source: Appendix A, AES Modeling Results.

Notes: C = Runoff Coefficient; T_c = Time of Concentration; I = Intensity; Q = Runoff; V = Velocity.
min = minutes; in/hr = inch per hour; cfs = cubic feet per second; fps = feet per second.



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FIGURE 5
Existing Drainage

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5 PROPOSED DRAINAGE (POST-DEVELOPMENT CONDITION)

5.1 Proposed Topography

Modification to the existing topography is proposed for the post-development condition that would result in on-site topography ranging in elevation from 3,098 to 3,162 feet amsl. A proposed topographic map of the Proposed Project for the post-development condition is shown on Figures 6 and 7. The proposed topography was obtained from the preliminary grading plans prepared by WorleyParsons (see Appendix B of this report).

During the post-development condition, the proposed topography would allow the on-site runoff generated from the Proposed Project to flow generally to the west in the northern portion of the Proposed Project. A hill located at the western portion of the Proposed Project would be graded and flow to the south, west, and east, maintaining drainage patterns similar to the pre-development condition to the maximum extent practical.

5.2 Proposed Hydrologic Soil Groups

The hydrologic soil groups for the post-development condition were assumed to remain the same as the pre-development condition as described in Section 3.2.

5.3 Proposed Land Use

The Proposed Project as well as its contributing watershed is currently vacant and undeveloped, and designated as undisturbed natural terrain in accordance with the NRCS land use elements described in the Rational Method of the SDCHM. The post-development condition would change the existing land use from undisturbed natural terrain to impervious surfaces that would include battery storage area, substation area, and inverter pads. The undisturbed natural terrain includes approximately 555 acres of contributing watershed discharging onto the Proposed Project, of which approximately 1.9 acres (approximately 0.34% of the contributing watershed) would be converted to impervious surfaces comprising battery storage area, substation area, and inverter pads during the post-development condition.

The increase in impervious surfaces due to the development of the Proposed Project would result in a change in imperviousness from approximately 0 acres (0% of the contributing watershed) to approximately 1.9 acres (approximately 0.34% of the contributing watershed). Table 5, Proposed Land Use and Imperviousness for Post-Development Condition, shows the distribution of the proposed land use and percentage of imperviousness after the Proposed Project is developed. The proposed site plan showing the proposed land use for the post-development

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condition is shown on Figures 6 and 7. The addition of impervious surfaces is minimal. The Proposed Project would not place housing within a 100-year flood hazard area.

Table 5
Proposed Land Use and Imperviousness for Post-Development Condition

Land Use	Percent Impervious	Proposed Post-Development Condition	
		Area (Acres)	Area (Percent)
Natural	0	553.42	99.66
Battery storage area	100	0.50	0.09
Substation area	100	0.54	0.10
Inverter pads	100	0.84	0.15
Total		555.30	100.00

Additionally, the surroundings of the Proposed Project are experiencing major changes in environmental conditions that are expected to occur before implementation of the Proposed Project. Major projects either approved, in construction, or completed include the San Diego Gas & Electric (SDG&E) ECO Substation project, which includes the rebuilt Boulevard Substation and the 138 kV ECO Transmission Line between the ECO Substation and the rebuilt Boulevard Substation, and the Tule Wind project, which includes 67 wind turbines that would produce up to 186 MW of electricity, a collector substation / operations and maintenance facility on Rough Acres Ranch, and a 3.8-mile-long 138 kV gen-tie (Tule gen-tie) that would connect the on-site collector substation to the rebuilt Boulevard Substation (Department of the Interior 2013).

5.4 Proposed Runoff

Based on the preliminary grading plans prepared by WorleyParsons, proposed runoff would maintain similar drainage patterns as existing runoff to the maximum extent practical. Per the preliminary grading plans, off-site runoff would be collected at the eastern boundary and conveyed across the Proposed Project to the western and northern boundaries via the proposed drainage channels recommended for the post-development condition. Off-site runoff discharging onto the Proposed Project during the post-development condition was anticipated to be similar to the pre-development condition. In other words, for the purpose of this report, no change was anticipated in the off-site runoff discharging onto the Proposed Project for the post-development condition.

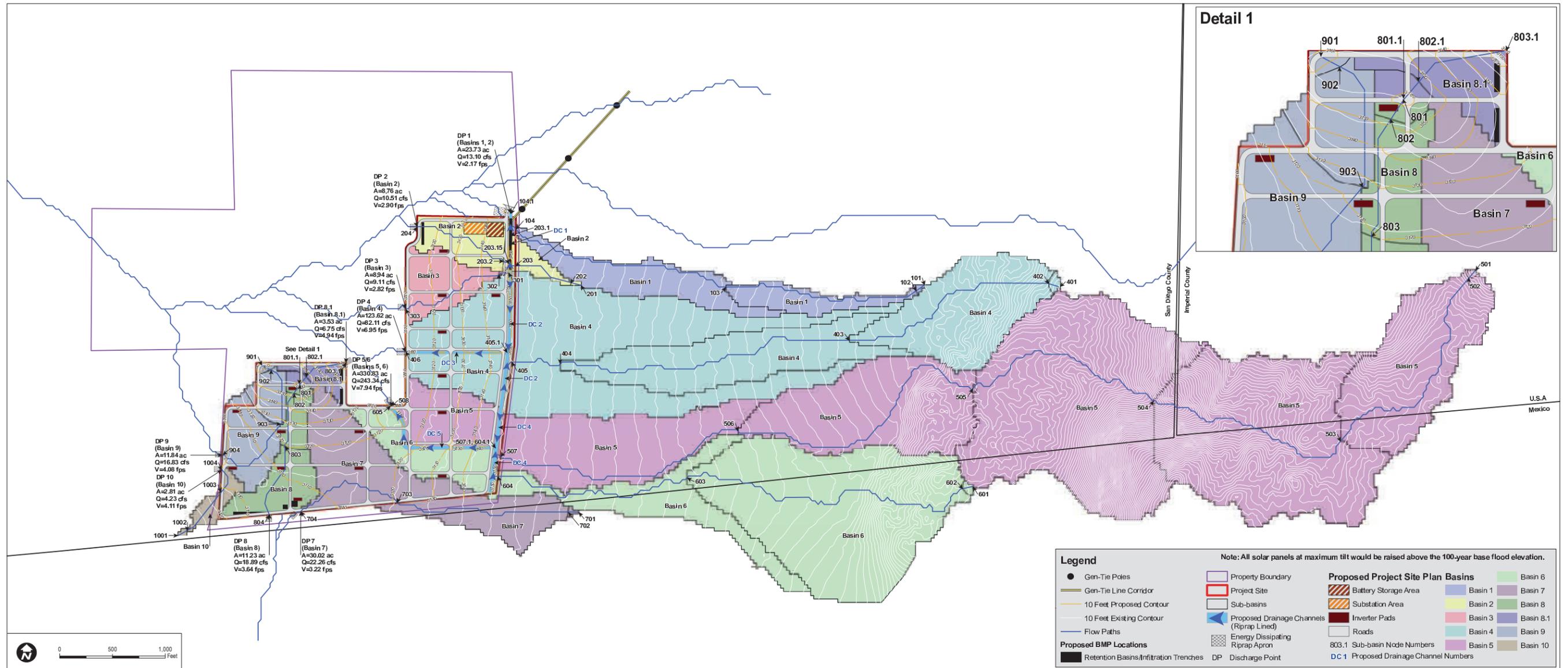
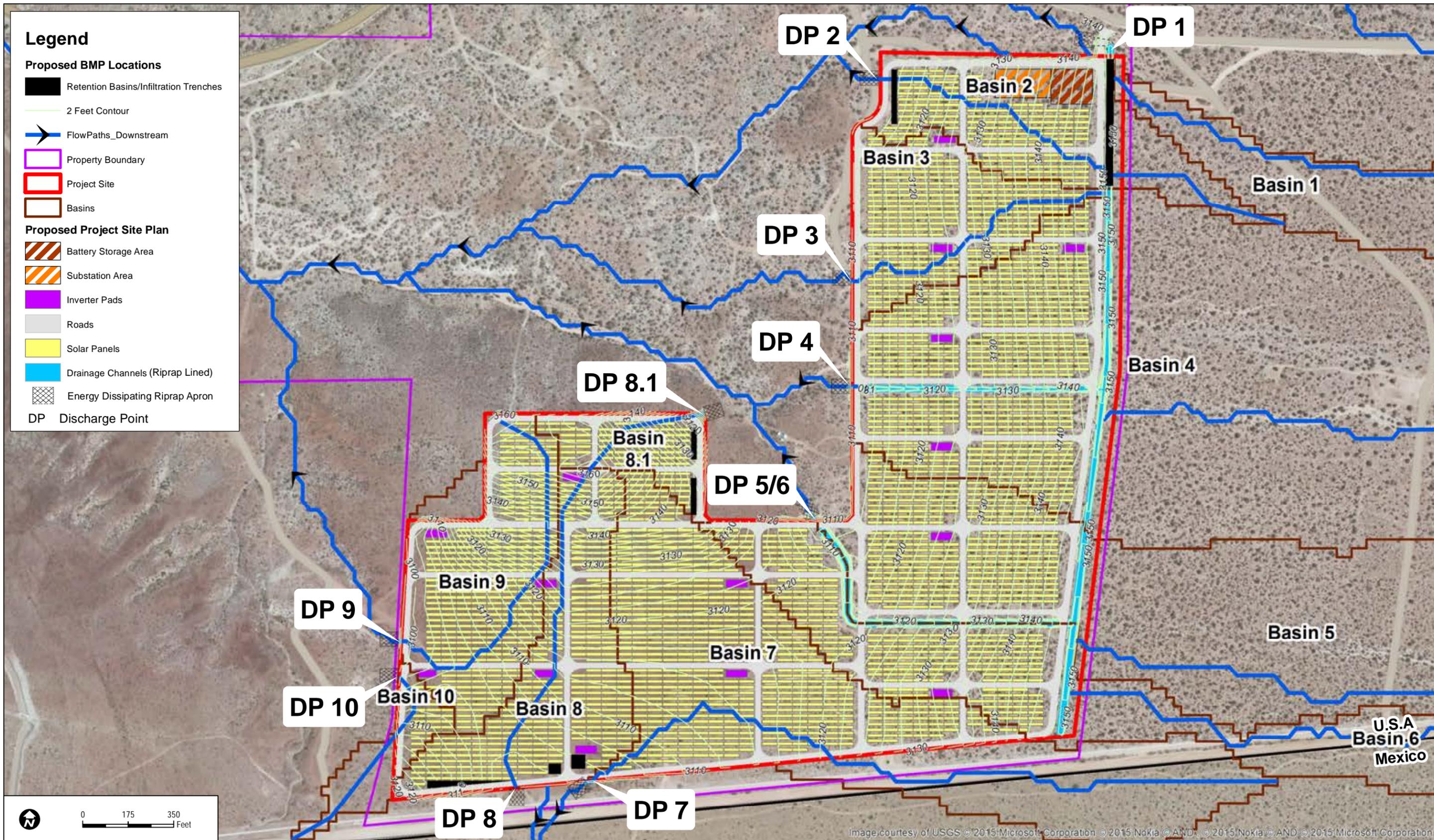


FIGURE 6
Proposed Drainage

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DUDEK SOURCE: Bing Maps

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FIGURE 7
Proposed Project Site Plan

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A brief description of the proposed drainage channels recommended in the preliminary grading plans is as follows:

1. **Proposed Drainage Channel No. 1** – consists of a drainage channel located along the northeastern boundary of the Proposed Project. This drainage channel would collect the off-site runoff generated from Basins 1 and 2 and would convey it to the north at Drainage Point 1 (DP 1). This drainage channel would also act as a retention basin to mitigate the increase in runoff at DP 1.
2. **Proposed Drainage Channel No. 2** – consists of a drainage channel located along the eastern boundary of the Proposed Project. This drainage channel would collect the off-site runoff generated from Basin 4 and would convey it toward the Proposed Drainage Channel No. 3 located in the middle of the Proposed Project in the east–west direction.
3. **Proposed Drainage Channel No. 3** – consists of a drainage channel located in the middle of the Proposed Project in the east–west direction. This drainage channel would collect the off-site runoff discharging from the Proposed Drainage Channel No. 2 located along the eastern boundary and would convey it across the Proposed Project to the western boundary at DP 4 where the off-site runoff would be discharged into Carrizo Creek, which is an existing natural channel.
4. **Proposed Drainage Channel No. 4** – consists of a drainage channel located along the southeastern boundary of the Proposed Project. This drainage channel would collect the off-site runoff generated from Basins 5 and 6 and would convey it toward the Proposed Drainage Channel No. 5 located in the southern portion of the Proposed Project in the east–west and north–west directions.
5. **Proposed Drainage Channel No. 5** – consists of a drainage channel located in the southern portion of the Proposed Project in the east–west and north–west directions. This drainage channel would collect the off-site runoff discharging from the Proposed Drainage Channel No. 4 located along the southeastern boundary and would convey it across the Proposed Project to the western boundary at DP 5/6 where the off-site runoff would be discharged into Carrizo Creek, which is an existing natural channel.

Figure 6 shows the proposed drainage for the post-development condition.

For the purpose of quantifying proposed runoff discharging onto the Proposed Project for the post-development condition, the contributing watershed was divided into eleven (11) basins retaining the drainage patterns similar to the pre-development condition to the maximum extent practical, except Basin 9.1 which was merged with Basin 9 based on the preliminary grading plans. For the post-development condition, there is no DP 9.1 because runoff from

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Basin 9.1 flows to Basin 9 based on the preliminary grading plans. Therefore, Basin 9.1 was merged with Basin 9.

The proposed runoff calculations were performed to quantify peak runoff discharging onto the Proposed Project for the post-development condition based on the Rational Method as described in the SDCHM by using AES (see Appendix A of this report). Peak runoff was calculated for all discharge points representing each basin within the contributing watershed for the 100-year storm event. The runoff coefficients (C) used to calculate proposed runoff were obtained from the SDCHM (see Appendix C of this report) as shown below:

Soil Type: A; C = 0.20

Soil Type: B; C = 0.25

Soil Type: C; C = 0.30

Soil Type: D; C = 0.35

Impervious Surface; C = 1.0

A GIS-based analysis was performed to calculate weighted C for each basin based on the soil groups (see Appendix A of this report).

The results of the proposed runoff calculations for the post-development condition are presented in Table 6, Proposed Results for Post-Development Condition.

**Table 6
Proposed Results for Post-Development Condition**

Discharge Point	Proposed Results per the San Diego County Hydrology Manual (Rational Method) using AES						
	Basin	Area (Acres)	Weighted C	T _c (min)	I (in/hr)	Peak Q ₁₀₀ (cfs)	V (fps)
DP 1	1 and 2	23.73	0.20	27.60	2.63	13.10	2.17
DP 2	2	8.76	0.32	15.77	3.77	10.51	2.90
DP 3	3	8.94	0.26	14.88	3.91	9.11	2.82
DP 4	4	123.62	0.23	23.87	2.88	82.11	6.95
DP 5/6	5 and 6	330.83	0.30	30.54	2.46	243.34	7.94
DP 7	7	30.02	0.27	26.23	2.71	22.26	3.22
DP 8	8	11.23	0.36	11.44	4.63	18.89	3.64
DP 8.1	8.1	3.53	0.35	8.84	5.47	6.75	4.94
DP 9	9	11.84	0.36	14.47	3.98	16.83	4.08
DP 10	10	2.81	0.35	12.85	4.30	4.23	4.11

Source: Appendix A, AES Modeling Results.

Notes: C = Runoff Coefficient; T_c = Time of Concentration; I = Intensity; Q = Runoff; V = Velocity.
min = minutes; in/hr = inch per hour; cfs = cubic feet per second; fps = feet per second.

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6 HYDROLOGIC IMPACTS AND MITIGATION

As a result of the development of the Proposed Project, approximately 1.9 acres (approximately 0.34% of the contributing watershed) of the approximately 555-acre contributing watershed that discharges onto the Proposed Project would be converted from undisturbed natural terrain to impervious surfaces comprising battery storage area, substation area, and inverter pads during the post-development condition.

The increase in impervious surfaces due to the development of the Proposed Project would result in a change in imperviousness from approximately 0 acres (0% of the contributing watershed) to approximately 1.9 acres (approximately 0.34% of the contributing watershed). The addition of impervious surfaces is minimal. Table 7, Comparison of Land Use and Imperviousness for Proposed Project, shows the difference between the distribution of land use and imperviousness for pre-development and post-development conditions.

**Table 7
Comparison of Land Use and Imperviousness for Proposed Project**

Land Use	Percent Impervious	Existing Pre-Development Condition		Proposed Post-Development Condition	
		Area (Acres)	Area (Percent)	Area (Acres)	Area (Percent)
Natural	0	555.30	100.00	553.42	99.66
Battery storage area	100	—	—	0.50	0.09
Substation area	100	—	—	0.54	0.10
Inverter pads	100	—	—	0.84	0.15
Total		555.30	100.00	555.30	100.00

Following is a description of anticipated hydrologic impacts:

- The Proposed Project would maintain the drainage patterns similar to the pre-development condition by mimicking the natural drainage pathways of the contributing watershed to the maximum extent practical. The Proposed Project would not substantially alter the existing drainage pattern of the site, which would result in substantial erosion.
- The Proposed Project would not substantially increase the rate of runoff in a manner, which would result in on-site or off-site flooding. The Proposed Project would not create or contribute runoff, which would exceed the capacity of the proposed drainage system.
- The Proposed Drainage Channel No. 1 would collect the off-site runoff generated from Basins 1 and 2 at the eastern boundary and would convey it to the north at DP 1. The increase in runoff at DP 1 would be minimal and mitigated prior to discharging. All other

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proposed drainage channels would collect the off-site runoff generated from Basins 4, 5, and 6 at the eastern boundary and would convey it across the Proposed Project to the western boundary at DP 4 and 5/6. Other than these modifications, the Proposed Project would not place structures within a 100-year flood hazard area which would impede or redirect flood flows.

- During the pre-development condition, existing runoff is likely to produce erosive velocities at DP 4 and 5/6 (approximately 9 and 11 fps, respectively) for the 100-year storm event. However, during the post-development condition, these erosive velocities are likely to reduce at DP 4 and 5/6 (approximately 7 and 8 fps, respectively) based on the AES modeling. The erosion is proposed to be mitigated by the use of fiber rolls, gravel or sand bags, outlet protection, and energy dissipation. These proposed erosion control mitigation measures would provide mitigation for erosion.
- The development of the Proposed Project and changes in the land use and imperviousness would result in a small increase in runoff from the pre-development condition to the post-development condition for DP 1, 2, 8, and 8.1. The anticipated increase in runoff would be minimal and proposed to be mitigated by the use of retention basins/infiltration trenches. The potential locations of the proposed mitigation measures (retention basins/infiltration trenches) shown in this report are conceptual and subject to change depending on the final design.

A comparison of existing and proposed results for the 100-year storm event is presented in Table 8, Results Comparison. The comparison of results is made at same discharge points.

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**Table 8
Results Comparison**

Discharge Point	Existing Pre-development Condition Results							Proposed Post-development Condition Results						
	Basin	Area (Acres)	Weighted C	Tc (min)	I (in/hr)	Peak Q ₁₀₀ (cfs)	V (fps)	Basin	Area (Acres)	Weighted C	Tc (min)	I (in/hr)	Peak Q ₁₀₀ (cfs)	V (fps)
DP 1	1	21.41	0.20	26.48	2.70	11.55	5.17	1 and 2	23.73	0.20	27.60	2.63	13.10	2.17
DP 2	2	11.08	0.22	17.01	3.59	8.63	3.42	2	8.76	0.32	15.77	3.77	10.51	2.90
DP 3	3	8.94	0.25	14.71	3.94	8.83	2.89	3	8.94	0.26	14.88	3.91	9.11	2.82
DP 4	4	123.62	0.23	23.44	2.92	82.60	8.89	4	123.62	0.23	23.87	2.88	82.11	6.95
DP 5/6	5 and 6	330.83	0.30	29.63	2.51	248.60	10.99	5 and 6	330.83	0.30	30.54	2.46	243.34	7.94
DP 7	7	30.02	0.27	26.23	2.71	22.26	3.22	7	30.02	0.27	26.23	2.71	22.26	3.22
DP 8	8	11.61	0.35	12.98	4.27	17.37	3.89	8	11.23	0.36	11.44	4.63	18.89	3.64
DP 8.1	8.1	3.14	0.35	11.39	4.65	5.11	4.69	8.1	3.53	0.35	8.84	5.47	6.75	4.94
DP 9	9	11.41	0.35	11.36	4.65	18.57	4.56	9	11.84	0.36	14.47	3.98	16.83	4.08
DP 9.1 ^a	9.1	0.43	0.35	9.92	5.08	0.76	3.41	9.1	Basin 9.1 is a part of Basin 9 for the post-development condition					
DP 10	10	2.81	0.35	12.85	4.30	4.23	4.11	10	2.81	0.35	12.85	4.30	4.23	4.11

Source: Appendix A, AES Modeling Results.

Notes: C = Runoff Coefficient; Tc = Time of Concentration; I = Intensity; Q = Runoff; V = Velocity.
min = minutes; in/hr = inch per hour; cfs = cubic feet per second; fps = feet per second.

^a For the post-development condition, there is no DP 9.1 because runoff from Basin 9.1 flows to Basin 9 based on the preliminary grading plans. Therefore, Basin 9.1 was merged with Basin 9.

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7 100-YEAR FLOOD INUNDATION

There were no recorded 100-year floodplain limits available within the Proposed Project per the Federal Emergency Management Agency (FEMA) Fire Insurance Rate Maps (FIRMs) or the County's San Diego Geographic Information Source (SanGIS). Analyses of the existing and proposed 100-year flood inundation levels were conducted using the Army Corps of Engineers' Hydrologic Engineering Centers River Analysis System (HEC-RAS) software.

HEC-RAS analysis

Proposed drainage channels 4 and 5 drain more than 100 acres of watershed and convey 83 cfs and 243 cfs, respectively, during a 100-year storm event. Due to the size of the watershed, flow depths and velocity need to be known for design purposes, as well as analysis of the effect of the project on the upstream and downstream properties.

A HEC-RAS hydraulic model was prepared to analyze the existing and post project off-site and on-site drainage flow paths to delineate the 100-yr floodplain limits, and to characterize the drainage path flow hydraulics in order to evaluate the risk level they present to development of the site. The proposed access road crossings are not incorporated in the HEC-RAS model for inundation mapping at this preliminary phase. The access road crossings will be refined and designed per county standards in the design phase.

The Rational method flow rate has been established for the existing and proposed project conditions. The reach boundary conditions that were used in the Jacumba NextEra solar project hydraulic model(s) is critical depth. Each model used critical depth for the upstream reach boundary conditions. There are several stream path junction points in the hydraulic model(s) for the various channel reaches and tributaries. Each of the tributary channel reaches used the actual calculated flow depth at the junction as the downstream reach boundary condition. At the upstream of the tributary channel, critical depth was used as the upstream boundary condition. Each tributary terminates at the stream junction point. The main channel(s) that extend downstream of the tributary junction point(s) used critical depth as the downstream boundary condition. Critical depth is an accurate representation of flow conditions in a natural floodplain or creek. There are many variation in confining boundaries, conveyance cross section, slope, and boundary roughness in natural conveyance systems; therefore most natural systems flow at or near critical depth.

Please refer to Figures 8 and 9 in Appendix E for the pre and post project inundation limits and Tables 9 and 10 below for HEC-RAS summary results. Please refer to Appendix E for the pre project and post project HEC-RAS model runs. The results of the HEC-RAS analyses are provided to aide in a qualitative evaluation of the site development risks. The HEC-RAS model results were used to map the approximate limits of the off-site floodplain in a 100-yr storm event.

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Table 9
Existing Condition HEC-RAS Output Data Table for 100-yr Rational Method Discharge

Reach	River Station	Q Total	W.S. Elevation	Velocity Channel	Flow Area	Top Width	Froude # Channel
		(cfs)	(ft)	(ft/s)	(sq ft)	(ft)	
4	3200	83	3164.4	4.1	25.7	68.2	1.2
4	3100	83	3158.8	6.0	13.9	28.3	1.5
4	3000	83	3154.3	3.5	23.6	64.5	1.0
4	2900	83	3148.8	5.6	14.7	40.8	1.7
4	2800	83	3144.2	3.7	22.5	52.9	1.0
4	2700	83	3138.4	5.7	14.7	49.6	1.8
4	2600	83	3134.4	3.4	24.2	66.0	1.0
4	2500	83	3129.4	5.8	14.4	32.5	1.5
4	2400	83	3124.7	4.4	18.7	36.0	1.1
4	2300	83	3120.8	5.0	16.5	31.0	1.2
4	2200	83	3117.4	4.5	18.6	31.3	1.0
4	2100	83	3113.0	5.6	14.9	32.5	1.5
4	2000	83	3109.1	3.1	26.7	83.1	1.0
4	1900	83	3105.3	4.5	18.6	37.9	1.1
4	1800	83	3101.1	6.4	13.0	16.2	1.3
4	1700	83	3097.0	6.4	12.9	16.7	1.3
4	1600	83	3092.9	5.8	14.3	21.0	1.2
4	1524	83	3089.1	7.1	11.7	14.8	1.4
5	2025	193	3161.4	4.9	39.1	52.0	1.0
5	1925	193	3156.7	7.4	26.1	44.2	1.7
5	1825	193	3153.0	3.9	50.1	111.9	1.0
5	1725	193	3149.5	6.3	30.8	67.6	1.1
5	1625	193	3144.5	6.9	28.2	57.0	1.7
5	1525	193	3142.0	6.3	30.6	24.6	1.0
5	1425	193	3138.2	6.7	28.9	54.0	1.6
5	1325	193	3133.7	6.7	28.9	27.1	1.1
5	1225	193	3130.2	6.2	31.4	44.6	1.3
5	1125	193	3127.0	4.9	40.2	54.0	1.0
5	1025	193	3122.7	6.3	30.8	55.8	1.5
5	925	193	3119.1	5.5	36.8	47.7	1.0
5	825	193	3115.4	5.5	34.9	72.8	1.4
5	725	193	3112.1	5.6	40.0	109.7	1.0
5	625	193	3109.0	7.4	33.0	43.2	1.3
6	1600	60	3162.3	3.0	19.9	70.2	1.0
6	1500	60	3158.1	3.0	20.2	98.8	1.2
6	1400	60	3154.1	2.6	22.7	103.7	1.0
6	1300	60	3149.7	4.0	15.0	43.6	1.2

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Table 9
Existing Condition HEC-RAS Output Data Table for 100-yr Rational Method Discharge

Reach	River Station	Q Total	W.S. Elevation	Velocity Channel	Flow Area	Top Width	Froude # Channel
		(cfs)	(ft)	(ft/s)	(sq ft)	(ft)	
6	1200	60	3145.8	2.9	20.5	77.5	1.0
6	1100	60	3142.3	2.6	23.5	104.8	1.0
6	1000	60	3138.1	2.5	24.2	156.2	1.1
6	800	60	3129.0	3.2	18.7	39.5	0.8
6	700	60	3126.3	2.9	20.4	75.0	1.0
6	600	60	3122.5	4.0	14.8	36.7	1.1
6	500	60	3119.1	4.1	14.7	26.7	1.0
6	400	60	3116.2	3.5	17.4	48.7	1.0
6	300	60	3112.9	4.3	14.0	31.2	1.1
6	200	60	3109.9	3.8	15.9	37.6	1.0
6	100	60	3106.7	4.1	14.5	28.4	1.0
5-2	484	249	3103.7	4.9	52.2	37.6	0.7
5-2	425	249	3102.5	6.8	36.9	26.5	1.0
5-2	325	249	3100.1	6.9	36.0	28.9	1.1
5-2	225	249	3097.5	5.8	43.2	47.5	1.1
5-2	125	249	3093.7	6.9	36.1	45.9	1.4
5-2	56	249	3091.8	6.3	39.8	33.3	1.0
4-2	1400	249	3085.0	20.9	11.9	16.2	4.3
4-2	1300	249	3083.3	6.0	41.8	38.4	1.0
4-2	1200	249	3080.9	5.5	45.2	51.6	1.0
4-2	1100	249	3077.7	6.8	36.8	36.3	1.2
4-2	1000	249	3075.3	5.7	43.4	43.0	1.0
4-2	900	249	3071.9	7.1	35.1	38.5	1.3
4-2	800	249	3069.4	4.7	52.7	49.1	0.8
4-2	700	249	3067.3	5.9	42.4	39.9	1.0
4-2	600	249	3063.6	8.1	30.9	29.9	1.4
4-2	500	249	3061.1	5.6	44.7	47.2	1.0
4-2	400	249	3057.6	6.7	37.1	48.4	1.4
4-2	300	249	3055.4	6.1	40.9	36.0	1.0
4-2	200	249	3051.8	8.3	30.1	26.9	1.4
4-2	100	249	3049.4	5.9	43.0	42.8	1.0

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Table 10
Proposed Condition HEC-RAS Output Data Table for 100-yr Rational Method Discharge

Reach	Proposed River Station	Existing River Station *	Q Total	W.S. Elevation	Velocity Channel	Flow Area	Top Width	Froude # Channel
			(cfs)	(ft)	(ft/s)	(sq ft)		
4	3190	3200	74	3164.4	3.3	22.5	66.5	1.0
4	3090	3100	74	3158.6	8.0	9.3	24.6	2.3
4	2847		82	3143.0	7.4	11.0	13.1	1.4
4	2791		82	3141.1	6.9	11.9	13.3	1.3
4	2734		82	3139.0	7.2	11.4	13.3	1.4
4	2634		82	3135.1	7.6	10.8	12.0	1.4
4	2534		82	3131.3	7.7	10.6	11.0	1.4
4	2434		82	3128.6	5.7	14.3	17.4	1.1
4	2334		82	3124.7	6.6	12.5	25.6	1.7
4	2234		82	3121.2	6.2	13.2	13.7	1.1
4	2134		82	3117.0	8.8	9.4	11.4	1.7
4	2034		82	3113.4	7.0	11.7	11.2	1.2
4	1934		82	3110.3	7.0	11.8	13.3	1.3
4	1864		82	3104.5	10.2	8.1	22.4	3.0
4	1800	1800	82	3101.1	6.3	13.1	16.2	1.2
4	1700	1700	82	3096.8	7.7	10.7	15.8	1.6
4	1600	1600	82	3092.8	5.9	13.9	20.8	1.3
4	1524	1524	82	3089.0	8.2	10.0	13.9	1.7
5	2164	2025	193	3161.4	5.0	39.0	51.9	1.0
5	2064	1925	193	3156.6	8.9	21.7	42.2	2.2
5	1964	1825	193	3152.9	4.9	41.1	104.3	1.4
6	587	1600	56	3162.3	3.0	18.9	69.3	1.0
6	483	1500	56	3158.0	5.5	14.9	93.9	1.6
6	389	1400	56	3154.1	2.4	22.0	103.0	1.1
6	225		56	3147.2	2.1	26.3	23.7	0.4
6	138		56	3146.6	4.2	13.3	24.5	1.0
5-2	1716		243	3141.7	9.7	25.2	18.8	1.5
5-2	1616		243	3137.4	10.2	23.9	19.7	1.6
5-2	1516		243	3133.4	9.3	26.2	21.7	1.5
5-2	1416		243	3129.0	9.8	24.7	22.0	1.6
5-2	1316		243	3125.5	8.5	28.5	21.6	1.3
5-2	1219		243	3123.6	7.0	34.7	25.4	1.1
5-2	1113		243	3119.3	10.6	22.9	20.8	1.8
5-2	1013		243	3117.6	6.7	36.2	26.2	1.0
5-2	954		243	3115.2	9.6	25.3	23.7	1.6
5-2	864		243	3114.4	4.4	54.7	27.9	0.6
5-2	790		243	3113.4	6.4	37.9	29.9	1.0

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Table 10
Proposed Condition HEC-RAS Output Data Table for 100-yr Rational Method Discharge

Reach	Proposed River Station	Existing River Station *	Q Total	W.S. Elevation	Velocity Channel	Flow Area	Top Width	Froude # Channel
			(cfs)	(ft)	(ft/s)	(sq ft)		
5-2	726		243	3111.2	8.8	27.6	26.3	1.5
5-2	669		243	3109.3	8.0	30.3	26.0	1.3
5-2	581		243	3107.4	6.8	35.7	28.8	1.1
5-2	425	425	243	3101.9	10.1	24.1	20.2	1.6
5-2	325	325	243	3100.1	6.5	37.7	29.6	1.0
5-2	225	225	243	3097.3	7.4	33.0	42.6	1.5
5-2	125	125	243	3093.8	6.6	37.1	46.3	1.3
5-2	56	56	243	3091.5	7.4	33.1	30.7	1.2
4-2	1400	1400	249	3085.0	20.9	11.9	16.2	4.3
4-2	1300	1300	249	3083.2	6.7	37.3	37.1	1.2
4-2	1200	1200	249	3080.9	5.9	42.0	51.3	1.2
4-2	1100	1100	249	3077.6	7.5	33.2	34.7	1.3
4-2	1000	1000	249	3075.2	6.1	40.9	42.1	1.1
4-2	900	900	249	3071.8	7.9	31.4	36.7	1.5
4-2	800	800	249	3069.1	5.9	41.9	45.7	1.1
4-2	700	700	249	3067.2	6.5	39.4	39.1	1.1
4-2	600	600	249	3063.5	9.3	27.0	28.4	1.6
4-2	500	500	249	3061.1	5.9	42.6	46.6	1.1
4-2	400	400	249	3057.5	7.8	31.8	46.0	1.7
4-2	300	300	249	3055.4	6.1	40.8	36.0	1.0
4-2	200	200	249	3051.6	9.8	25.5	24.8	1.7
4-2	100	100	249	3049.4	5.8	42.8	42.8	1.0

* Off site Existing condition station at same location as Proposed condition Cross section

HEC-RAS results & recommendations

The floodplain hydraulic analyses indicate that the resultant off-site floodplain limits for the pre and post project condition have similar flooding patterns. For the both existing and proposed condition, the average flow velocity in the wash ranges from 4.5 fps to 9 fps and the average flow depth is less than 2-ft. The flood damage and risk of erosion losses are moderate to significant for both the existing and the proposed conditions. There are no significant differences in flow depths and flow velocities between existing condition and proposed condition. However both existing and proposed flow velocities are in the erosive range for unlined/unarmored creek/channel. The creek/channel would experience erosion in a significant storm event. We recommend that proposed channel be armored to protect against erosion, particularly at downstream discharge locations near property line and access road crossings.

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Legend

- HEC-RAS Sections
- HEC-RAS C/L
- Existing Floodplain (100 year)
- Existing Contour
- Property Boundary
- Project Site

Subject to Inundation by the 100-Year Flood

Subject to Inundation by the 100-Year Flood

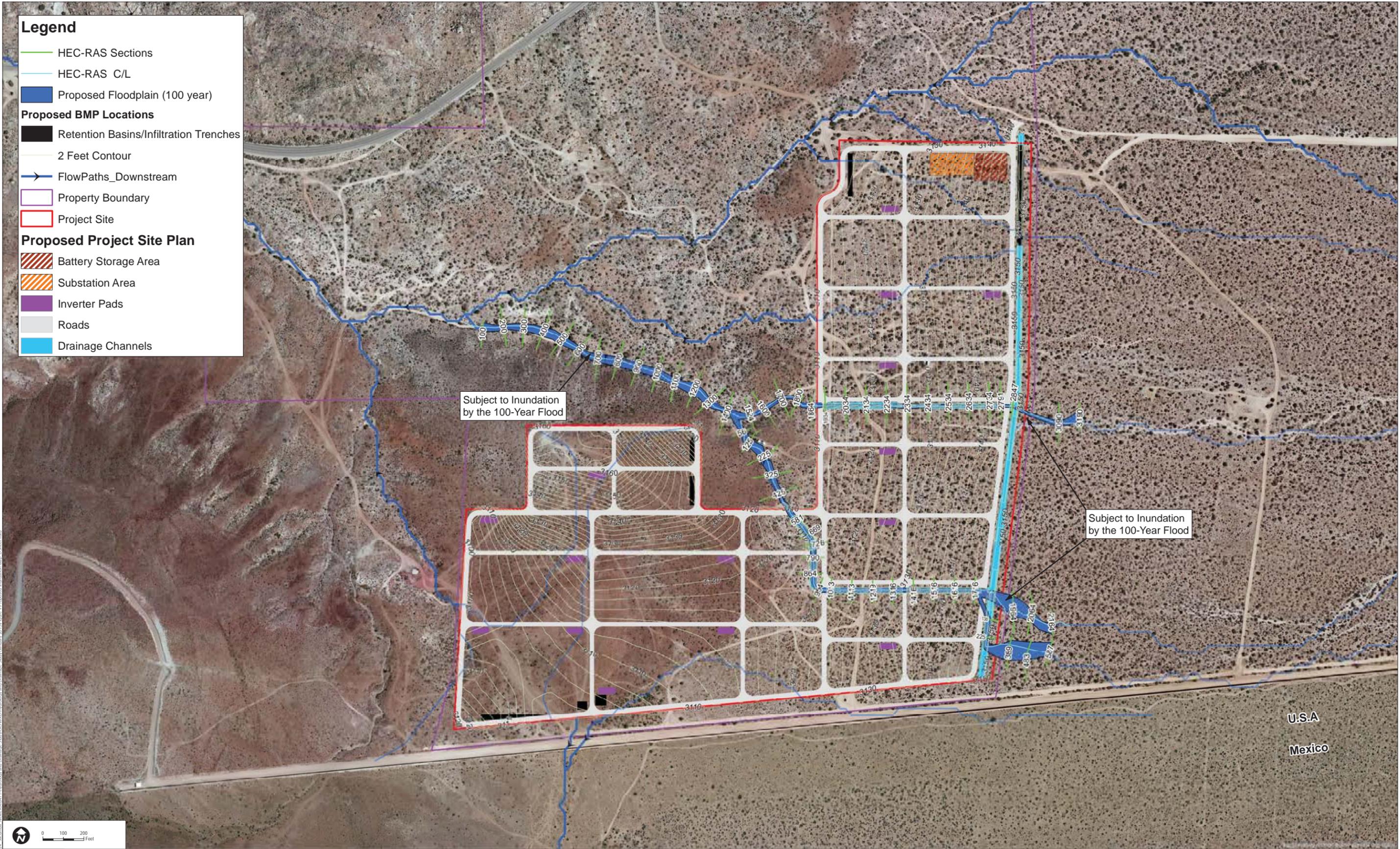
U.S.A
Mexico



DUDEK SOURCE: Bing Maps

FIGURE 8
Existing Condition Inundation Map

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Path: P:\400 Hydrology\7524_Jacumba_Nest\ER080817_Hydrology and Drainage_S1\Map\GIS\MapX\Hydrology and Drainage_Study\January 2018\Figures\Proposed Inundation Map_DSheet.mxd



DUDEK SOURCE: Bing Maps

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Jacumba Solar Energy Project - Preliminary Hydrology and Drainage Study

FIGURE 9
Proposed Inundation Map

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The HEC-RAS results clearly show that the effects of the Project on the upstream and downstream properties are negligible. The average post project difference in water surface elevation and velocity upstream of the Project is 0.02 feet and 0.5 fps, respectively, and downstream is 0.03 feet and 0.09 fps. There also are no structures within the inundation limits on the adjacent properties that could potentially be affected by a change in water surface elevation or flow velocity. Please refer to Appendix E for a complete comparison of each cross section upstream and downstream of the Project.

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8 CONCLUSIONS

Following are the conclusions of this Preliminary Hydrology and Drainage Study:

1. The increase in impervious surfaces due to the development of the Proposed Project would result in a change in imperviousness from approximately 0 acres (0% of the contributing watershed) to approximately 1.9 acres (approximately 0.34% of the contributing watershed). The addition of impervious surfaces is minimal.
2. The Proposed Project would maintain the drainage patterns similar to the pre-development condition by mimicking the natural drainage pathways of the contributing watershed to the maximum extent practical. The Proposed Project would not substantially alter the existing drainage pattern of the site which would result in substantial erosion. The Proposed Project would not place housing within a 100-year flood hazard area.
3. The Proposed Project would not substantially increase the rate of runoff in a manner which would result in on-site or off-site flooding. The Proposed Project would not create or contribute runoff which would exceed the capacity of the proposed drainage system.
4. The Proposed Drainage Channel No. 1 would collect the off-site runoff generated from Basins 1 and 2 at the eastern boundary and would convey it to the north at DP 1. The increase in runoff at DP 1 would be minimal and mitigated prior to discharging. The increase in runoff at DP 1 would not result in substantial erosion. All other proposed drainage channels would collect the off-site runoff generated from Basins 4, 5, and 6 at the eastern boundary and would convey it across the Proposed Project to the western boundary at DP 4 and 5/6. Other than these modifications, the Proposed Project would not place structures within a 100-year flood hazard area which would impede or redirect flood flows.
5. During the pre-development condition, existing runoff is likely to produce erosive velocities at DP 4 and 5/6 (approximately 9 and 11 fps, respectively) for the 100-year storm event. However, during the post-development condition, these erosive velocities are likely to reduce at DP 4 and 5/6 (approximately 7 and 8 fps, respectively) based on the AES modeling. The erosion is proposed to be mitigated by the use of fiber rolls, gravel or sand bags, outlet protection, and energy dissipation. These proposed erosion control mitigation measures would provide mitigation for erosion.
6. The development of the Proposed Project and changes in the land use and imperviousness would result in a small increase in runoff from the pre-development condition to the post-development condition for DP 1, 2, 3, 8, and 8.1. The anticipated increase in runoff would be minimal and proposed to be mitigated by the use of retention basins/infiltration

Draft Preliminary Hydrology and Drainage Study for the Jacumba Solar Energy Project

trenches. The potential locations of the proposed mitigation measures (retention basins/infiltration trenches) shown in this report are conceptual and subject to change depending on the final design.

7. The increase in runoff as a result of the Proposed Project will increase the 100-year floodplain stage upstream and downstream the subject property area by 0.02 feet and 0.03 feet, respectively. This small increase in flood stage will not impact any existing features adjacent to the subject property.

Draft Preliminary Hydrology and Drainage Study for the Jacumba Solar Energy Project

9 REFERENCES

County of San Diego. 2003. *San Diego County Hydrology Manual*. June 2003.

County of San Diego. 2012. *County of San Diego SUSMP: Standard Urban Stormwater Mitigation Plan Requirements for Development Applications*. January 8, 2011; revised August 1, 2012.

RWQCB (Regional Water Quality Control Board), Region 7. 1994. *Water Quality Control Plan: Colorado River Basin – Region 7*. Adopted November 17, 1993; last amended October 2005.

San Diego Geographic Information Source (SanGIS). http://rdw.sandag.org/file_store%5CHydrology/FLOOD_PLAIN.pdf

**Draft Preliminary Hydrology and Drainage Study
for the Jacumba Solar Energy Project**

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APPENDIX A
AES Modeling Results

APPENDIX A AES Modeling Results

Existing Results for Pre-development Condition

Rainfall Isopluvial Values

P Values	100-Year
P ₆	3 inch
P ₂₄	5 inch
P ₆ /P ₂₄ ^a	60%

Notes: P₆ = Adjusted 6-hour storm rainfall amount in inches, P₂₄ = 24-hour storm rainfall amount in inches.

^a Per the San Diego County Hydrology Manual (Rational Method), P₆ should be between 45% and 65% of P₂₄ for the selected frequency of the storm event. This criterion was met.

Existing Basin Node Structure for AES Model for Pre-Development Condition

Basin	Sub-basin	Area (ac)	US Node	DS Node	US Ele (ft)	DS Ele (ft)	Length (ft)	Weighted C
Basin 1	101	0.12	101	102	3,380	3,374	100	0.20
	102	6.83	102	103	3,374	3,252	1,959	0.20
	103	14.07	103	104	3,252	3,148	2,242	0.20
	104	0.39	104	105	3,148	3,141	176	0.20
DP 1 (Basin 1)		21.41					4,477	0.20
Basin 2	201	0.08	201	202	3,183	3,179	100	0.35 ^a
	202	2.23	202	203	3,179	3,154	584	0.20
	203	8.77	203	204	3,154	3,112	1,101	0.22
DP 2 (Basin 2)		11.08					1,785	0.22
Basin 3	301	0.08	301	302	3,152	3,148	100	0.35 ^a
	302	8.85	302	303	3,148	3,108	1,077	0.25
DP 3 (Basin 3)		8.94					1,177	0.25
Basin 4	401	0.37	401	402	3,601	3,573	100	0.35
	402	26.51	402	403	3,573	3,326	2,191	0.31
	403	26.79	403	404	3,326	3,174	2,995	0.20
	404	49.53	404	405	3,174	3,150	510	0.20
	405	20.42	405	406	3,150	3,104	1,087	0.23
DP 4 (Basin 4)		123.62					6,882	0.23
Basin 5	501	0.14	501	502	4,323	4,277	100	0.35
	502	32.32	502	503	4,277	4,070	2,417	0.35
	503	61.50	503	504	4,070	3,715	2,173	0.35
	504	72.77	504	505	3,715	3,446	2,196	0.35
	505	34.62	505	506	3,446	3,255	2,839	0.26
	506	29.29	506	507	3,255	3,149	2,577	0.20
	507	11.54	507	508	3,149	3,104	1,255	0.25
Basin 5		242.18					13,558	0.31
Basin 6	601	0.23	601	602	3,518	3,502	100	0.35
	602	59.48	602	603	3,502	3,226	3,248	0.26

APPENDIX A (Continued)

Existing Basin Node Structure for AES Model for Pre-Development Condition

Basin	Sub-basin	Area (ac)	US Node	DS Node	US Ele (ft)	DS Ele (ft)	Length (ft)	Weighted C
	603	18.04	603	604	3,226	3,151	2,071	0.20
	604	10.91	604	605	3,151	3,103	1,378	0.27
Basin 6		88.65					6,798	0.25
DP 5/6 (Basins 5 and 6)		330.83						0.30
Basin 7	701	0.14	701	702	3,187	3,183	100	0.20
	702	11.25	702	703	3,183	3,121	1,719	0.23
	703	18.63	703	704	3,121	3,100	1,155	0.30
DP 7 (Basin 7)		30.02					2,975	0.27
Basin 8	801	0.18	801	802	3,166	3,160	100	0.35
	802	3.51	802	803	3,160	3,120	620	0.35
	803	7.93	803	804	3,120	3,100	664	0.35
DP 8 (Basin 8)		11.61					1,384	0.35
Basin 9	901	0.46	901	902	3,168	3,160	100	0.35
	902	2.77	902	903	3,160	3,130	402	0.35
	903	8.17	903	904	3,130	3,096	819	0.35
DP 9 (Basin 9)		11.41					1,321	0.35
Basin 10	1001	0.11	1001	1002	3,140	3,137	100	0.35
	1002	1.43	1002	1003	3,137	3,114	476	0.35
	1003	1.27	1003	1004	3,114	3,100	268	0.35
DP 10 (Basin 10)		2.81					844	0.35
Basin 8.1	801.1	0.15	801.1	802.1	3,168	3,166	85	0.35
	802.1	2.99	802.1	803.1	3,166	3,110	572	0.35
DP 8.1 (Basin 8.1)		3.14					657	0.35
Basin 9.1	901.1	0.12	901.1	902.1	3,168	3,166	85	0.35
	902.1	0.31	902.1	903.1	3,166	3,160	116	0.35
DP 9.1 (Basin 9.1)		0.43					201	0.35
Total		555.30						

Notes: ac = acres; US = Upstream; DS = Downstream; Ele = Elevation; ft = feet; C = Runoff Coefficient; DP = Discharge Point.

^a Runoff coefficient assumed for Soil Group D (C = 0.35) for its highest runoff potential because the area is too small to produce runoff in AES.

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2013 Advanced Engineering Software (aes)
Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Existing Condition Results)

FILE NAME: J100E16.DAT
TIME/DATE OF STUDY: 13:04 01/16/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/	PARK- WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020			0.67	2.00	0.0313	0.167	0.0150

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

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3380.00
DOWNSTREAM ELEVATION(FEET) = 3374.00
ELEVATION DIFFERENCE(FEET) = 6.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.916
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.443
SUBAREA RUNOFF(CFS) = 0.13
TOTAL AREA(ACRES) = 0.12 TOTAL RUNOFF(CFS) = 0.13

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3374.00 DOWNSTREAM(FEET) = 3252.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1959.00 CHANNEL SLOPE = 0.0623
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.13

FLOW VELOCITY (FEET/SEC) = 3.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 8.72 Tc (MIN.) = 17.64
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 103.00 = 2059.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.505
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2000
SUBAREA AREA (ACRES) = 6.83 SUBAREA RUNOFF (CFS) = 4.79
TOTAL AREA (ACRES) = 6.9 TOTAL RUNOFF (CFS) = 4.87
TC (MIN.) = 17.64

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3252.00 DOWNSTREAM (FEET) = 3148.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2242.00 CHANNEL SLOPE = 0.0464
CHANNEL FLOW THRU SUBAREA (CFS) = 4.87
FLOW VELOCITY (FEET/SEC) = 4.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 8.27 Tc (MIN.) = 25.91
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 4301.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.735
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2000
SUBAREA AREA (ACRES) = 14.07 SUBAREA RUNOFF (CFS) = 7.70
TOTAL AREA (ACRES) = 21.0 TOTAL RUNOFF (CFS) = 11.50
TC (MIN.) = 25.91

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3148.00 DOWNSTREAM (FEET) = 3141.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 176.00 CHANNEL SLOPE = 0.0398
CHANNEL FLOW THRU SUBAREA (CFS) = 11.50
FLOW VELOCITY (FEET/SEC) = 5.17 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 0.57 Tc (MIN.) = 26.48
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 105.00 = 4477.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.697
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2000
SUBAREA AREA (ACRES) = 0.39 SUBAREA RUNOFF (CFS) = 0.21
TOTAL AREA (ACRES) = 21.4 TOTAL RUNOFF (CFS) = 11.55
TC (MIN.) = 26.48

FLOW PROCESS FROM NODE 101.00 TO NODE 105.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 26.48
RAINFALL INTENSITY(INCH/HR) = 2.70
TOTAL STREAM AREA(ACRES) = 21.41
PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.55

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3183.00
DOWNSTREAM ELEVATION(FEET) = 3179.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.505
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.611
SUBAREA RUNOFF(CFS) = 0.16
TOTAL AREA(ACRES) = 0.08 TOTAL RUNOFF(CFS) = 0.16

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3179.00 DOWNSTREAM(FEET) = 3154.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 584.00 CHANNEL SLOPE = 0.0428
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.16
FLOW VELOCITY(FEET/SEC) = 3.10 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.14 Tc(MIN.) = 11.64
LONGEST FLOWPATH FROM NODE 201.00 TO NODE 203.00 = 684.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.583
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2052
SUBAREA AREA(ACRES) = 2.23 SUBAREA RUNOFF(CFS) = 2.04
TOTAL AREA(ACRES) = 2.3 TOTAL RUNOFF(CFS) = 2.17
TC(MIN.) = 11.64

FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3154.00 DOWNSTREAM(FEET) = 3112.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1101.00 CHANNEL SLOPE = 0.0381
CHANNEL FLOW THRU SUBAREA(CFS) = 2.17
FLOW VELOCITY(FEET/SEC) = 3.42 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 5.37 Tc(MIN.) = 17.01
LONGEST FLOWPATH FROM NODE 201.00 TO NODE 204.00 = 1785.00 FEET.

FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.589
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2200
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2169
SUBAREA AREA(ACRES) = 8.77 SUBAREA RUNOFF(CFS) = 6.92
TOTAL AREA(ACRES) = 11.1 TOTAL RUNOFF(CFS) = 8.63
TC(MIN.) = 17.01

FLOW PROCESS FROM NODE 201.00 TO NODE 204.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 17.01
RAINFALL INTENSITY(INCH/HR) = 3.59
TOTAL STREAM AREA(ACRES) = 11.08
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.63

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3152.00
DOWNSTREAM ELEVATION(FEET) = 3148.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.505
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.611
SUBAREA RUNOFF(CFS) = 0.16
TOTAL AREA(ACRES) = 0.08 TOTAL RUNOFF(CFS) = 0.16

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3148.00 DOWNSTREAM(FEET) = 3108.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1077.00 CHANNEL SLOPE = 0.0371
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.16
FLOW VELOCITY(FEET/SEC) = 2.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 6.21 Tc(MIN.) = 14.71
LONGEST FLOWPATH FROM NODE 301.00 TO NODE 303.00 = 1177.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.940
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2509
SUBAREA AREA(ACRES) = 8.85 SUBAREA RUNOFF(CFS) = 8.72
TOTAL AREA(ACRES) = 8.9 TOTAL RUNOFF(CFS) = 8.83
TC(MIN.) = 14.71

```

*****
FLOW PROCESS FROM NODE      301.00 TO NODE      303.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION(MIN.) = 14.71
RAINFALL INTENSITY(INCH/HR) = 3.94
TOTAL STREAM AREA(ACRES) = 8.93
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.83
*****
FLOW PROCESS FROM NODE      401.00 TO NODE      402.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3601.00
DOWNSTREAM ELEVATION(FEET) = 3573.00
ELEVATION DIFFERENCE(FEET) = 28.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.833
SUBAREA RUNOFF(CFS) = 0.88
TOTAL AREA(ACRES) = 0.37 TOTAL RUNOFF(CFS) = 0.88
*****
FLOW PROCESS FROM NODE      402.00 TO NODE      403.00 IS CODE = 52
-----
>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 3573.00 DOWNSTREAM(FEET) = 3326.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2191.00 CHANNEL SLOPE = 0.1127
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.88
FLOW VELOCITY(FEET/SEC) = 4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 7.70 Tc(MIN.) = 13.97
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 403.00 = 2291.00 FEET.
*****
FLOW PROCESS FROM NODE      402.00 TO NODE      403.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.075
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3106
SUBAREA AREA(ACRES) = 26.51 SUBAREA RUNOFF(CFS) = 33.49
TOTAL AREA(ACRES) = 26.9 TOTAL RUNOFF(CFS) = 34.02
TC(MIN.) = 13.97
*****
FLOW PROCESS FROM NODE      403.00 TO NODE      404.00 IS CODE = 52
-----
>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 3326.00 DOWNSTREAM(FEET) = 3174.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2995.00 CHANNEL SLOPE = 0.0508
CHANNEL FLOW THRU SUBAREA(CFS) = 34.02
FLOW VELOCITY(FEET/SEC) = 7.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 6.39 Tc(MIN.) = 20.35
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 404.00 = 5286.00 FEET.

```

FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.196
*USER SPECIFIED(SUBAREA):	
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2000
S.C.S. CURVE NUMBER (AMC II) =	0
AREA-AVERAGE RUNOFF COEFFICIENT =	0.2554
SUBAREA AREA (ACRES) =	26.79
SUBAREA RUNOFF (CFS) =	17.12
TOTAL AREA (ACRES) =	53.7
TOTAL RUNOFF (CFS) =	43.81
TC (MIN.) =	20.35

FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	3174.00	DOWNSTREAM(FEET) =	3150.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	510.00	CHANNEL SLOPE =	0.0471
CHANNEL FLOW THRU SUBAREA (CFS) =	43.81		
FLOW VELOCITY (FEET/SEC) =	8.08	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	1.05	Tc (MIN.) =	21.40
LONGEST FLOWPATH FROM NODE	401.00	TO NODE	405.00 =
			5796.00 FEET.

FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.094
*USER SPECIFIED(SUBAREA):	
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2000
S.C.S. CURVE NUMBER (AMC II) =	0
AREA-AVERAGE RUNOFF COEFFICIENT =	0.2288
SUBAREA AREA (ACRES) =	49.53
SUBAREA RUNOFF (CFS) =	30.65
TOTAL AREA (ACRES) =	103.2
TOTAL RUNOFF (CFS) =	73.05
TC (MIN.) =	21.40

FLOW PROCESS FROM NODE 405.00 TO NODE 406.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	3150.00	DOWNSTREAM(FEET) =	3104.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	1087.00	CHANNEL SLOPE =	0.0423
CHANNEL FLOW THRU SUBAREA (CFS) =	73.05		
FLOW VELOCITY (FEET/SEC) =	8.89	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	2.04	Tc (MIN.) =	23.44
LONGEST FLOWPATH FROM NODE	401.00	TO NODE	406.00 =
			6883.00 FEET.

FLOW PROCESS FROM NODE 405.00 TO NODE 406.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.918
*USER SPECIFIED(SUBAREA):	
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2300
S.C.S. CURVE NUMBER (AMC II) =	0
AREA-AVERAGE RUNOFF COEFFICIENT =	0.2290
SUBAREA AREA (ACRES) =	20.42
SUBAREA RUNOFF (CFS) =	13.70
TOTAL AREA (ACRES) =	123.6
TOTAL RUNOFF (CFS) =	82.60
TC (MIN.) =	23.44

FLOW PROCESS FROM NODE 401.00 TO NODE 406.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 4 ARE:
TIME OF CONCENTRATION (MIN.) = 23.44
RAINFALL INTENSITY (INCH/HR) = 2.92
TOTAL STREAM AREA (ACRES) = 123.62
PEAK FLOW RATE (CFS) AT CONFLUENCE = 82.60

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	11.55	26.48	2.697	21.41
2	8.63	17.01	3.589	11.08
3	8.83	14.71	3.940	8.93
4	82.60	23.44	2.918	123.62

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 4 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	74.55	14.71	3.940
2	84.00	17.01	3.589
3	106.37	23.44	2.918
4	100.43	26.48	2.697

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 106.37 Tc (MIN.) = 23.44
TOTAL AREA (ACRES) = 165.0
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 406.00 = 6883.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 406.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====

FLOW PROCESS FROM NODE 101.00 TO NODE 406.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<
=====

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 4323.00
DOWNSTREAM ELEVATION (FEET) = 4277.00
ELEVATION DIFFERENCE (FEET) = 46.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.833
SUBAREA RUNOFF (CFS) = 0.33
TOTAL AREA (ACRES) = 0.14 TOTAL RUNOFF (CFS) = 0.33

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 4277.00 DOWNSTREAM(FEET) = 4070.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2417.00 CHANNEL SLOPE = 0.0856
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.33
FLOW VELOCITY(FEET/SEC) = 4.39 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 9.18 Tc(MIN.) = 15.44
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 503.00 = 2517.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.819
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) = 32.32 SUBAREA RUNOFF(CFS) = 43.20
TOTAL AREA(ACRES) = 32.5 TOTAL RUNOFF(CFS) = 43.39
TC(MIN.) = 15.44

FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 4070.00 DOWNSTREAM(FEET) = 3715.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2173.00 CHANNEL SLOPE = 0.1634
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 43.39
FLOW VELOCITY(FEET/SEC) = 11.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.08 Tc(MIN.) = 18.53
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 504.00 = 4690.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.396
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) = 61.50 SUBAREA RUNOFF(CFS) = 73.10
TOTAL AREA(ACRES) = 94.0 TOTAL RUNOFF(CFS) = 111.69
TC(MIN.) = 18.53

FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3715.00 DOWNSTREAM(FEET) = 3446.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2196.00 CHANNEL SLOPE = 0.1225
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 111.69
FLOW VELOCITY(FEET/SEC) = 15.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.36 Tc(MIN.) = 20.88
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 505.00 = 6886.00 FEET.

FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.144
*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 72.77 SUBAREA RUNOFF (CFS) = 80.06
TOTAL AREA (ACRES) = 166.7 TOTAL RUNOFF (CFS) = 183.44
TC (MIN.) = 20.88

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3446.00	DOWNSTREAM (FEET) =	3255.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	2839.00	CHANNEL SLOPE =	0.0673
CHANNEL FLOW THRU SUBAREA (CFS) =	183.44		
FLOW VELOCITY (FEET/SEC) =	14.81	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	3.19	Tc (MIN.) =	24.08
LONGEST FLOWPATH FROM NODE	501.00	TO NODE	506.00 = 9725.00 FEET.

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	2.868		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2600		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3345		
SUBAREA AREA (ACRES) =	34.62	SUBAREA RUNOFF (CFS) =	25.81
TOTAL AREA (ACRES) =	201.3	TOTAL RUNOFF (CFS) =	193.16
TC (MIN.) =	24.08		

FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3255.00	DOWNSTREAM (FEET) =	3149.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	2577.00	CHANNEL SLOPE =	0.0411
CHANNEL FLOW THRU SUBAREA (CFS) =	193.16		
FLOW VELOCITY (FEET/SEC) =	11.77	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	3.65	Tc (MIN.) =	27.73
LONGEST FLOWPATH FROM NODE	501.00	TO NODE	507.00 = 12302.00 FEET.

FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	2.618		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2000		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3174		
SUBAREA AREA (ACRES) =	29.29	SUBAREA RUNOFF (CFS) =	15.34
TOTAL AREA (ACRES) =	230.6	TOTAL RUNOFF (CFS) =	193.16
TC (MIN.) =	27.73		
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE			

FLOW PROCESS FROM NODE 507.00 TO NODE 508.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3149.00	DOWNSTREAM (FEET) =	3104.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	1255.00	CHANNEL SLOPE =	0.0359
CHANNEL FLOW THRU SUBAREA (CFS) =	193.16		

FLOW VELOCITY (FEET/SEC) = 10.99 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 1.90 Tc (MIN.) = 29.63
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 508.00 = 13557.00 FEET.

FLOW PROCESS FROM NODE 507.00 TO NODE 508.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.508
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3142
SUBAREA AREA (ACRES) = 11.54 SUBAREA RUNOFF (CFS) = 7.24
TOTAL AREA (ACRES) = 242.2 TOTAL RUNOFF (CFS) = 193.16
TC (MIN.) = 29.63
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 501.00 TO NODE 508.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 29.63
RAINFALL INTENSITY (INCH/HR) = 2.51
TOTAL STREAM AREA (ACRES) = 242.18
PEAK FLOW RATE (CFS) AT CONFLUENCE = 193.16

FLOW PROCESS FROM NODE 601.00 TO NODE 602.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3518.00
DOWNSTREAM ELEVATION (FEET) = 3502.00
ELEVATION DIFFERENCE (FEET) = 16.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.833
SUBAREA RUNOFF (CFS) = 0.55
TOTAL AREA (ACRES) = 0.23 TOTAL RUNOFF (CFS) = 0.55

FLOW PROCESS FROM NODE 602.00 TO NODE 603.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3502.00 DOWNSTREAM (FEET) = 3226.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 3248.00 CHANNEL SLOPE = 0.0850
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.55
FLOW VELOCITY (FEET/SEC) = 4.37 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 12.38 Tc (MIN.) = 18.65
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 603.00 = 3348.00 FEET.

FLOW PROCESS FROM NODE 602.00 TO NODE 603.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.382
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2600

S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2603
SUBAREA AREA (ACRES) = 59.48 SUBAREA RUNOFF (CFS) = 52.30
TOTAL AREA (ACRES) = 59.7 TOTAL RUNOFF (CFS) = 52.57
TC (MIN.) = 18.65

FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3226.00 DOWNSTREAM (FEET) = 3151.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2071.00 CHANNEL SLOPE = 0.0362
CHANNEL FLOW THRU SUBAREA (CFS) = 52.57
FLOW VELOCITY (FEET/SEC) = 7.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 4.62 Tc (MIN.) = 23.27
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 604.00 = 5419.00 FEET.

FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.932
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2463
SUBAREA AREA (ACRES) = 18.04 SUBAREA RUNOFF (CFS) = 10.58
TOTAL AREA (ACRES) = 77.8 TOTAL RUNOFF (CFS) = 56.16
TC (MIN.) = 23.27

FLOW PROCESS FROM NODE 604.00 TO NODE 605.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3151.00 DOWNSTREAM (FEET) = 3103.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 1378.00 CHANNEL SLOPE = 0.0348
CHANNEL FLOW THRU SUBAREA (CFS) = 56.16
FLOW VELOCITY (FEET/SEC) = 7.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 3.07 Tc (MIN.) = 26.34
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 605.00 = 6797.00 FEET.

FLOW PROCESS FROM NODE 604.00 TO NODE 605.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.706
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2700
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2493
SUBAREA AREA (ACRES) = 10.91 SUBAREA RUNOFF (CFS) = 7.97
TOTAL AREA (ACRES) = 88.7 TOTAL RUNOFF (CFS) = 59.81
TC (MIN.) = 26.34

FLOW PROCESS FROM NODE 601.00 TO NODE 605.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 26.34
RAINFALL INTENSITY (INCH/HR) = 2.71
TOTAL STREAM AREA (ACRES) = 88.66

PEAK FLOW RATE (CFS) AT CONFLUENCE = 59.81

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	193.16	29.63	2.508	242.18
2	59.81	26.34	2.706	88.66

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	231.51	26.34	2.706
2	248.60	29.63	2.508

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 248.60 Tc (MIN.) = 29.63

TOTAL AREA (ACRES) = 330.8

LONGEST FLOWPATH FROM NODE 501.00 TO NODE 605.00 = 13557.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 330.8 TC (MIN.) = 29.63

PEAK FLOW RATE (CFS) = 248.60

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2013 Advanced Engineering Software (aes)
Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Existing Condition Results)

FILE NAME: J100E78.DAT
TIME/DATE OF STUDY: 18:04 01/15/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0312	0.167	0.0150

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

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3187.00
DOWNSTREAM ELEVATION(FEET) = 3183.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 10.206
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.989
SUBAREA RUNOFF(CFS) = 0.14
TOTAL AREA(ACRES) = 0.14 TOTAL RUNOFF(CFS) = 0.14

FLOW PROCESS FROM NODE 702.00 TO NODE 703.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 3183.00 DOWNSTREAM(FEET) = 3121.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1719.00 CHANNEL SLOPE = 0.0361
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.14

FLOW VELOCITY (FEET/SEC) = 2.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 10.06 Tc (MIN.) = 20.26
LONGEST FLOWPATH FROM NODE 701.00 TO NODE 703.00 = 1819.00 FEET.

FLOW PROCESS FROM NODE 702.00 TO NODE 703.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.205
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2296
SUBAREA AREA (ACRES) = 11.25 SUBAREA RUNOFF (CFS) = 8.29
TOTAL AREA (ACRES) = 11.4 TOTAL RUNOFF (CFS) = 8.38
TC (MIN.) = 20.26

FLOW PROCESS FROM NODE 703.00 TO NODE 704.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3121.00 DOWNSTREAM (FEET) = 3100.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 1155.00 CHANNEL SLOPE = 0.0182
CHANNEL FLOW THRU SUBAREA (CFS) = 8.38
FLOW VELOCITY (FEET/SEC) = 3.22 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 5.97 Tc (MIN.) = 26.23
LONGEST FLOWPATH FROM NODE 701.00 TO NODE 704.00 = 2974.00 FEET.

FLOW PROCESS FROM NODE 703.00 TO NODE 704.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.713
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2733
SUBAREA AREA (ACRES) = 18.63 SUBAREA RUNOFF (CFS) = 15.17
TOTAL AREA (ACRES) = 30.0 TOTAL RUNOFF (CFS) = 22.26
TC (MIN.) = 26.23

FLOW PROCESS FROM NODE 701.00 TO NODE 704.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 26.23
RAINFALL INTENSITY (INCH/HR) = 2.71
TOTAL STREAM AREA (ACRES) = 30.02
PEAK FLOW RATE (CFS) AT CONFLUENCE = 22.26

FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3166.00
DOWNSTREAM ELEVATION (FEET) = 3160.00
ELEVATION DIFFERENCE (FEET) = 6.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 7.430
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.122

SUBAREA RUNOFF (CFS) = 0.39
TOTAL AREA (ACRES) = 0.18 TOTAL RUNOFF (CFS) = 0.39

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3160.00 DOWNSTREAM (FEET) = 3120.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 620.00 CHANNEL SLOPE = 0.0645
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.39
FLOW VELOCITY (FEET/SEC) = 3.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 2.71 Tc (MIN.) = 10.14
LONGEST FLOWPATH FROM NODE 801.00 TO NODE 803.00 = 720.00 FEET.

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.009
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 3.51 SUBAREA RUNOFF (CFS) = 6.15
TOTAL AREA (ACRES) = 3.7 TOTAL RUNOFF (CFS) = 6.47
TC (MIN.) = 10.14

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3120.00 DOWNSTREAM (FEET) = 3100.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 664.00 CHANNEL SLOPE = 0.0301
CHANNEL FLOW THRU SUBAREA (CFS) = 6.47
FLOW VELOCITY (FEET/SEC) = 3.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 2.84 Tc (MIN.) = 12.98
LONGEST FLOWPATH FROM NODE 801.00 TO NODE 804.00 = 1384.00 FEET.

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.271
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 7.93 SUBAREA RUNOFF (CFS) = 11.85
TOTAL AREA (ACRES) = 11.6 TOTAL RUNOFF (CFS) = 17.37
TC (MIN.) = 12.98

FLOW PROCESS FROM NODE 801.00 TO NODE 804.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 12.98
RAINFALL INTENSITY (INCH/HR) = 4.27
TOTAL STREAM AREA (ACRES) = 11.62
PEAK FLOW RATE (CFS) AT CONFLUENCE = 17.37

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	22.26	26.23	2.713	30.02
2	17.37	12.98	4.271	11.62

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	28.39	12.98	4.271
2	33.30	26.23	2.713

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 33.30 Tc (MIN.) = 26.23

TOTAL AREA (ACRES) = 41.6

LONGEST FLOWPATH FROM NODE 701.00 TO NODE 804.00 = 2974.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 41.6 TC (MIN.) = 26.23

PEAK FLOW RATE (CFS) = 33.30
=====

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2013 Advanced Engineering Software (aes)
Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Existing Condition Results)

FILE NAME: J100E910.DAT
TIME/DATE OF STUDY: 15:06 01/22/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/	PARK- WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020			0.67	2.00	0.0313	0.167	0.0150

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

FLOW PROCESS FROM NODE 901.00 TO NODE 902.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3168.00
DOWNSTREAM ELEVATION(FEET) = 3160.00
ELEVATION DIFFERENCE(FEET) = 8.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.750
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.513
SUBAREA RUNOFF(CFS) = 1.05
TOTAL AREA(ACRES) = 0.46 TOTAL RUNOFF(CFS) = 1.05

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 3160.00 DOWNSTREAM(FEET) = 3130.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 402.00 CHANNEL SLOPE = 0.0746
CHANNEL FLOW THRU SUBAREA(CFS) = 1.05
FLOW VELOCITY(FEET/SEC) = 4.13 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 1.62 Tc(MIN.) = 8.37
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 903.00 = 502.00 FEET.

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.669
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 2.77 SUBAREA RUNOFF (CFS) = 5.50
TOTAL AREA (ACRES) = 3.2 TOTAL RUNOFF (CFS) = 6.41
TC (MIN.) = 8.37

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3130.00 DOWNSTREAM(FEET) = 3096.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 819.00 CHANNEL SLOPE = 0.0415
CHANNEL FLOW THRU SUBAREA(CFS) = 6.41
FLOW VELOCITY (FEET/SEC) = 4.56 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.99 Tc(MIN.) = 11.36
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 904.00 = 1321.00 FEET.

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.655
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 8.17 SUBAREA RUNOFF (CFS) = 13.31
TOTAL AREA (ACRES) = 11.4 TOTAL RUNOFF (CFS) = 18.57
TC (MIN.) = 11.36

FLOW PROCESS FROM NODE 901.00 TO NODE 904.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 11.36
RAINFALL INTENSITY(INCH/HR) = 4.65
TOTAL STREAM AREA (ACRES) = 11.40
PEAK FLOW RATE (CFS) AT CONFLUENCE = 18.57

FLOW PROCESS FROM NODE 1001.00 TO NODE 1002.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3140.00
DOWNSTREAM ELEVATION(FEET) = 3137.00
ELEVATION DIFFERENCE(FEET) = 3.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.361
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.275
SUBAREA RUNOFF (CFS) = 0.20

TOTAL AREA (ACRES) = 0.11 TOTAL RUNOFF (CFS) = 0.20

FLOW PROCESS FROM NODE 1002.00 TO NODE 1003.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3137.00	DOWNSTREAM (FEET) =	3114.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	476.00	CHANNEL SLOPE =	0.0483
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION			
CHANNEL FLOW THRU SUBAREA (CFS) =	0.20		
FLOW VELOCITY (FEET/SEC) =	3.30	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	2.41	Tc (MIN.) =	11.77
LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1003.00 =	576.00	FEET.	

FLOW PROCESS FROM NODE 1002.00 TO NODE 1003.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	4.551		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.3500		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3500		
SUBAREA AREA (ACRES) =	1.43	SUBAREA RUNOFF (CFS) =	2.28
TOTAL AREA (ACRES) =	1.5	TOTAL RUNOFF (CFS) =	2.45
TC (MIN.) =	11.77		

FLOW PROCESS FROM NODE 1003.00 TO NODE 1004.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3114.00	DOWNSTREAM (FEET) =	3100.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	268.00	CHANNEL SLOPE =	0.0522
CHANNEL FLOW THRU SUBAREA (CFS) =	2.45		
FLOW VELOCITY (FEET/SEC) =	4.11	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	1.09	Tc (MIN.) =	12.85
LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1004.00 =	844.00	FEET.	

FLOW PROCESS FROM NODE 1003.00 TO NODE 1004.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	4.299		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.3500		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3500		
SUBAREA AREA (ACRES) =	1.27	SUBAREA RUNOFF (CFS) =	1.91
TOTAL AREA (ACRES) =	2.8	TOTAL RUNOFF (CFS) =	4.23
TC (MIN.) =	12.85		

FLOW PROCESS FROM NODE 1001.00 TO NODE 1004.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS =	2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:	
TIME OF CONCENTRATION (MIN.) =	12.85
RAINFALL INTENSITY (INCH/HR) =	4.30
TOTAL STREAM AREA (ACRES) =	2.81
PEAK FLOW RATE (CFS) AT CONFLUENCE =	4.23

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	18.57	11.36	4.655	11.40
2	4.23	12.85	4.299	2.81

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	22.31	11.36	4.655
2	21.38	12.85	4.299

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 22.31 Tc (MIN.) = 11.36
TOTAL AREA (ACRES) = 14.2
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 1004.00 = 1321.00 FEET.

FLOW PROCESS FROM NODE 901.00 TO NODE 1004.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 11.36
RAINFALL INTENSITY (INCH/HR) = 4.65
TOTAL STREAM AREA (ACRES) = 14.21
PEAK FLOW RATE (CFS) AT CONFLUENCE = 22.31

FLOW PROCESS FROM NODE 801.10 TO NODE 802.10 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 85.00
UPSTREAM ELEVATION (FEET) = 3168.00
DOWNSTREAM ELEVATION (FEET) = 3166.00
ELEVATION DIFFERENCE (FEET) = 2.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 9.358
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.276
SUBAREA RUNOFF (CFS) = 0.28
TOTAL AREA (ACRES) = 0.15 TOTAL RUNOFF (CFS) = 0.28

FLOW PROCESS FROM NODE 802.10 TO NODE 803.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3166.00 DOWNSTREAM (FEET) = 3110.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 572.00 CHANNEL SLOPE = 0.0979
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.28
FLOW VELOCITY (FEET/SEC) = 4.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 2.03 Tc (MIN.) = 11.39
LONGEST FLOWPATH FROM NODE 801.10 TO NODE 803.10 = 657.00 FEET.

FLOW PROCESS FROM NODE 802.10 TO NODE 803.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.648
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 2.99 SUBAREA RUNOFF (CFS) = 4.86
TOTAL AREA (ACRES) = 3.1 TOTAL RUNOFF (CFS) = 5.11
TC (MIN.) = 11.39

FLOW PROCESS FROM NODE 801.10 TO NODE 803.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 11.39
RAINFALL INTENSITY (INCH/HR) = 4.65
TOTAL STREAM AREA (ACRES) = 3.14
PEAK FLOW RATE (CFS) AT CONFLUENCE = 5.11

FLOW PROCESS FROM NODE 901.10 TO NODE 902.10 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 85.00
UPSTREAM ELEVATION (FEET) = 3168.00
DOWNSTREAM ELEVATION (FEET) = 3166.00
ELEVATION DIFFERENCE (FEET) = 2.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 9.358
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.276
SUBAREA RUNOFF (CFS) = 0.22
TOTAL AREA (ACRES) = 0.12 TOTAL RUNOFF (CFS) = 0.22

FLOW PROCESS FROM NODE 902.10 TO NODE 903.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3166.00 DOWNSTREAM (FEET) = 3160.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 116.00 CHANNEL SLOPE = 0.0517
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.22
FLOW VELOCITY (FEET/SEC) = 3.41 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 0.57 Tc (MIN.) = 9.92
LONGEST FLOWPATH FROM NODE 901.10 TO NODE 903.10 = 201.00 FEET.

FLOW PROCESS FROM NODE 902.10 TO NODE 903.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.079
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 0.31 SUBAREA RUNOFF (CFS) = 0.55
TOTAL AREA (ACRES) = 0.4 TOTAL RUNOFF (CFS) = 0.76
TC (MIN.) = 9.92

FLOW PROCESS FROM NODE 901.10 TO NODE 903.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION (MIN.) = 9.92

RAINFALL INTENSITY (INCH/HR) = 5.08
TOTAL STREAM AREA (ACRES) = 0.43
PEAK FLOW RATE (CFS) AT CONFLUENCE = 0.76

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	22.31	11.36	4.655	14.21
2	5.11	11.39	4.648	3.14
3	0.76	9.92	5.079	0.43

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	25.66	9.92	5.079
2	28.11	11.36	4.655
3	28.08	11.39	4.648

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 28.11 Tc (MIN.) = 11.36
TOTAL AREA (ACRES) = 17.8
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 903.10 = 1321.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 17.8 TC (MIN.) = 11.36
PEAK FLOW RATE (CFS) = 28.11
=====

END OF RATIONAL METHOD ANALYSIS

APPENDIX A AES Modeling Results

Proposed Results for Post-development Condition

Rainfall Isopluvial Values

P Values	100-Year
P ₆	3 inch
P ₂₄	5 inch
P ₆ /P ₂₄ ^a	60%

Notes: P₆ = Adjusted 6-hour storm rainfall amount in inches, P₂₄ = 24-hour storm rainfall amount in inches.

^a Per the San Diego County Hydrology Manual (Rational Method), P₆ should be between 45% and 65% of P₂₄ for the selected frequency of the storm event. This criterion was met.

Proposed Basin Node Structure for AES Model for Post-Development Condition

Basin	Sub-basin	Area (ac)	US Node	DS Node	US Ele (ft)	DS Ele (ft)	Length (ft)	Weighted C
Basin 1	101	0.12	101	102	3,380	3,374	100	0.20
	102	6.83	102	103	3,374	3,252	1,959	0.20
	103	14.07	103	104	3,252	3,148	2,242	0.20
	104.1	0.14	104	104.1	3,148	3,146	220	0.20
Basin 1		21.16					4,521	0.20
Basin 2	201	0.08	201	202	3,183	3,179	100	0.35 ^a
	202	2.23	202	203	3,179	3,154	584	0.20
	203.1	0.27	203	203.1	3,154	3,152	338	0.20
Basin 2		2.58						0.20
DP 1 (Basins 1 and 2)		23.73						0.20
Basin 2	203.2	0.75	203.15	203.2	3,152	3,148	100	0.20
	203	8.00	203.2	204	3,148	3,112	966	0.33
DP 2 (Basin 2)		8.76					2,088	0.32
Basin 3	301	0.08	301	302	3,152	3,148	100	0.35 ^a
	302	8.85	302	303	3,148	3,110	1,077	0.26
DP 3 (Basin 3)		8.94					1,177	0.26
Basin 4	401	0.37	401	402	3,601	3,573	100	0.35
	402	26.51	402	403	3,573	3,326	2,191	0.31
	403	26.79	403	404	3,326	3,174	2,995	0.20
	404	49.53	404	405	3,174	3,150	510	0.20
	405.1	1.12	405	405.1	3,150	3,146	57	0.20
	405	19.30	405.1	406	3,146	3,110	988	0.24
DP 4 (Basin 4)		123.62					6,840	0.23
Basin 5	501	0.14	501	502	4,323	4,277	100	0.35
	502	32.32	502	503	4,277	4,070	2,417	0.35
	503	61.50	503	504	4,070	3,715	2,173	0.35
	504	72.77	504	505	3,715	3,446	2,196	0.35
	505	34.62	505	506	3,446	3,255	2,839	0.26

APPENDIX A (Continued)

Proposed Basin Node Structure for AES Model for Post-Development Condition

Basin	Sub-basin	Area (ac)	US Node	DS Node	US Ele (ft)	DS Ele (ft)	Length (ft)	Weighted C
	506	29.29	506	507	3,255	3,149	2,577	0.20
	507.1	0.43	507	507.1	3,149	3,148	42	0.24
	507	11.43	507.1	508	3,148	3,110	1,309	0.25
Basin 5		242.49					13,653	0.31
Basin 6	601	0.23	601	602	3,518	3,502	100	0.35
	602	59.48	602	603	3,502	3,226	3,248	0.26
	603	18.04	603	604	3,226	3,151	2,071	0.20
	604.1	0.19	604	604.1	3,151	3,150	35	0.25
	604	10.41	604.1	605	3,150	3,110	1,309	0.27
Basin 6		88.34					6,764	0.25
DP 5/6 (Basins 5 and 6)		330.83						0.30
Basin 7	701	0.14	701	702	3,187	3,183	100	0.20
	702	11.25	702	703	3,183	3,121	1,719	0.23
	703	18.63	703	704	3,121	3,100	1,155	0.30
DP 7 (Basin 7)		30.02					2,975	0.27
Basin 8	801	0.42	801	802	3,160	3,152	100	0.44
	802	2.88	802	803	3,152	3,120	526	0.36
	803	7.93	803	804	3,120	3,102	710	0.36
DP 8 (Basin 8)		11.23					1,335	0.36
Basin 9	901	0.35	901	902	3,162	3,158	100	0.35
	902	3.32	902	903	3,158	3,126	563	0.35
	903	8.17	903	904	3,126	3,098	819	0.36
DP 9 (Basin 9)		11.84					1,483	0.36
Basin 10	1001	0.11	1001	1002	3,140	3,137	100	0.35
	1002	1.43	1002	1003	3,137	3,114	476	0.35
	1003	1.27	1003	1004	3,114	3,100	268	0.35
DP 10 (Basin 10)		2.81					844	0.35
Basin 8.1	801.1	0.58	801.1	802.1	3,160	3,154	100	0.35
	802.1	2.94	802.1	803.1	3,154	3,110	417	0.35
DP 8.1 (Basin 8.1)		3.53					517	0.35
Total		555.30						

Notes: ac = acres; US = Upstream; DS = Downstream; Ele = Elevation; ft = feet; C = Runoff Coefficient; DP = Discharge Point.

^a Runoff coefficient assumed for Soil Group D (C = 0.35) for its highest runoff potential because the area is too small to produce runoff in AES.

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2013 Advanced Engineering Software (aes)
Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Proposed Condition Results)

FILE NAME: J100P16.DAT
TIME/DATE OF STUDY: 12:54 01/22/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0313	0.167	0.0150

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

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3380.00
DOWNSTREAM ELEVATION(FEET) = 3374.00
ELEVATION DIFFERENCE(FEET) = 6.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.916
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.443
SUBAREA RUNOFF(CFS) = 0.13
TOTAL AREA(ACRES) = 0.12 TOTAL RUNOFF(CFS) = 0.13

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3374.00 DOWNSTREAM(FEET) = 3252.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1959.00 CHANNEL SLOPE = 0.0623
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.13

FLOW VELOCITY (FEET/SEC) = 3.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 8.72 Tc (MIN.) = 17.64
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 103.00 = 2059.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.505
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2000
SUBAREA AREA (ACRES) = 6.83 SUBAREA RUNOFF (CFS) = 4.79
TOTAL AREA (ACRES) = 6.9 TOTAL RUNOFF (CFS) = 4.87
TC (MIN.) = 17.64

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3252.00 DOWNSTREAM (FEET) = 3148.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2242.00 CHANNEL SLOPE = 0.0464
CHANNEL FLOW THRU SUBAREA (CFS) = 4.87
FLOW VELOCITY (FEET/SEC) = 4.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 8.27 Tc (MIN.) = 25.91
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 4301.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.735
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2000
SUBAREA AREA (ACRES) = 14.07 SUBAREA RUNOFF (CFS) = 7.70
TOTAL AREA (ACRES) = 21.0 TOTAL RUNOFF (CFS) = 11.50
TC (MIN.) = 25.91

FLOW PROCESS FROM NODE 101.00 TO NODE 104.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 25.91
RAINFALL INTENSITY (INCH/HR) = 2.74
TOTAL STREAM AREA (ACRES) = 21.02
PEAK FLOW RATE (CFS) AT CONFLUENCE = 11.50

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3183.00
DOWNSTREAM ELEVATION (FEET) = 3179.00
ELEVATION DIFFERENCE (FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 8.505
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.611

SUBAREA RUNOFF (CFS) = 0.16
TOTAL AREA (ACRES) = 0.08 TOTAL RUNOFF (CFS) = 0.16

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3179.00 DOWNSTREAM (FEET) = 3154.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 584.00 CHANNEL SLOPE = 0.0428
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.16
FLOW VELOCITY (FEET/SEC) = 3.10 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 3.14 Tc (MIN.) = 11.64
LONGEST FLOWPATH FROM NODE 201.00 TO NODE 203.00 = 684.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.583
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2052
SUBAREA AREA (ACRES) = 2.23 SUBAREA RUNOFF (CFS) = 2.04
TOTAL AREA (ACRES) = 2.3 TOTAL RUNOFF (CFS) = 2.17
TC (MIN.) = 11.64

FLOW PROCESS FROM NODE 203.00 TO NODE 203.10 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3148.00 DOWNSTREAM (FEET) = 3144.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 338.00 CHANNEL SLOPE = 0.0118
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.040 MAXIMUM DEPTH (FEET) = 3.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.700
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 2.27
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.23
AVERAGE FLOW DEPTH (FEET) = 0.18 TRAVEL TIME (MIN.) = 4.58
Tc (MIN.) = 16.22
SUBAREA AREA (ACRES) = 0.27 SUBAREA RUNOFF (CFS) = 0.20
AREA-AVERAGE RUNOFF COEFFICIENT = 0.205
TOTAL AREA (ACRES) = 2.6 PEAK FLOW RATE (CFS) = 2.17

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.17 FLOW VELOCITY (FEET/SEC.) = 1.22
LONGEST FLOWPATH FROM NODE 201.00 TO NODE 203.10 = 1022.00 FEET.

FLOW PROCESS FROM NODE 201.00 TO NODE 203.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 16.22
RAINFALL INTENSITY (INCH/HR) = 3.70
TOTAL STREAM AREA (ACRES) = 2.58
PEAK FLOW RATE (CFS) AT CONFLUENCE = 2.17

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	11.50	25.91	2.735	21.02
2	2.17	16.22	3.700	2.58

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	9.37	16.22	3.700
2	13.10	25.91	2.735

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 13.10 Tc (MIN.) = 25.91
TOTAL AREA (ACRES) = 23.6
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 203.10 = 4301.00 FEET.

FLOW PROCESS FROM NODE 203.10 TO NODE 104.10 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3144.00 DOWNSTREAM (FEET) = 3142.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 220.00 CHANNEL SLOPE = 0.0091
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.040 MAXIMUM DEPTH (FEET) = 3.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.626

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 13.14
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.18
AVERAGE FLOW DEPTH (FEET) = 0.54 TRAVEL TIME (MIN.) = 1.68
Tc (MIN.) = 27.60
SUBAREA AREA (ACRES) = 0.14 SUBAREA RUNOFF (CFS) = 0.07
AREA-AVERAGE RUNOFF COEFFICIENT = 0.201
TOTAL AREA (ACRES) = 23.7 PEAK FLOW RATE (CFS) = 13.10

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.54 FLOW VELOCITY (FEET/SEC.) = 2.17
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.10 = 4521.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 104.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 27.60
RAINFALL INTENSITY (INCH/HR) = 2.63
TOTAL STREAM AREA (ACRES) = 23.74
PEAK FLOW RATE (CFS) AT CONFLUENCE = 13.10

FLOW PROCESS FROM NODE 203.15 TO NODE 203.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3152.00
DOWNSTREAM ELEVATION (FEET) = 3148.00
ELEVATION DIFFERENCE (FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 10.206
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.989

SUBAREA RUNOFF(CFS) = 0.75
TOTAL AREA(ACRES) = 0.75 TOTAL RUNOFF(CFS) = 0.75

FLOW PROCESS FROM NODE 203.20 TO NODE 204.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3148.00 DOWNSTREAM(FEET) = 3112.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 966.00 CHANNEL SLOPE = 0.0373
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.75
FLOW VELOCITY(FEET/SEC) = 2.90 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 5.56 Tc(MIN.) = 15.77
LONGEST FLOWPATH FROM NODE 203.15 TO NODE 204.00 = 1066.00 FEET.

FLOW PROCESS FROM NODE 203.20 TO NODE 204.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.768
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3189
SUBAREA AREA(ACRES) = 8.00 SUBAREA RUNOFF(CFS) = 9.95
TOTAL AREA(ACRES) = 8.8 TOTAL RUNOFF(CFS) = 10.51
TC(MIN.) = 15.77

FLOW PROCESS FROM NODE 203.15 TO NODE 204.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 15.77
RAINFALL INTENSITY(INCH/HR) = 3.77
TOTAL STREAM AREA(ACRES) = 8.75
PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.51

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3152.00
DOWNSTREAM ELEVATION(FEET) = 3148.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.505
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.611
SUBAREA RUNOFF(CFS) = 0.16
TOTAL AREA(ACRES) = 0.08 TOTAL RUNOFF(CFS) = 0.16

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3148.00 DOWNSTREAM(FEET) = 3110.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1077.00 CHANNEL SLOPE = 0.0353
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.16
FLOW VELOCITY(FEET/SEC) = 2.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 6.37 Tc(MIN.) = 14.88
LONGEST FLOWPATH FROM NODE 301.00 TO NODE 303.00 = 1177.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.912
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2608
SUBAREA AREA (ACRES) = 8.85 SUBAREA RUNOFF(CFS) = 9.00
TOTAL AREA (ACRES) = 8.9 TOTAL RUNOFF(CFS) = 9.11
TC(MIN.) = 14.88

FLOW PROCESS FROM NODE 301.00 TO NODE 303.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION(MIN.) = 14.88
RAINFALL INTENSITY(INCH/HR) = 3.91
TOTAL STREAM AREA (ACRES) = 8.93
PEAK FLOW RATE (CFS) AT CONFLUENCE = 9.11

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3601.00
DOWNSTREAM ELEVATION(FEET) = 3573.00
ELEVATION DIFFERENCE(FEET) = 28.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.833
SUBAREA RUNOFF(CFS) = 0.88
TOTAL AREA (ACRES) = 0.37 TOTAL RUNOFF(CFS) = 0.88

FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3573.00 DOWNSTREAM(FEET) = 3326.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2191.00 CHANNEL SLOPE = 0.1127
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.88
FLOW VELOCITY(FEET/SEC) = 4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 7.70 Tc(MIN.) = 13.97
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 403.00 = 2291.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.075
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3106
SUBAREA AREA (ACRES) = 26.51 SUBAREA RUNOFF (CFS) = 33.49
TOTAL AREA (ACRES) = 26.9 TOTAL RUNOFF (CFS) = 34.02
TC (MIN.) = 13.97

FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3326.00	DOWNSTREAM (FEET) =	3174.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	2995.00	CHANNEL SLOPE =	0.0508
CHANNEL FLOW THRU SUBAREA (CFS) =	34.02		
FLOW VELOCITY (FEET/SEC) =	7.81	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	6.39	Tc (MIN.) =	20.35
LONGEST FLOWPATH FROM NODE	401.00 TO NODE	404.00 =	5286.00 FEET.

FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	3.196		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2000		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.2554		
SUBAREA AREA (ACRES) =	26.79	SUBAREA RUNOFF (CFS) =	17.12
TOTAL AREA (ACRES) =	53.7	TOTAL RUNOFF (CFS) =	43.81
TC (MIN.) =	20.35		

FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3174.00	DOWNSTREAM (FEET) =	3150.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	510.00	CHANNEL SLOPE =	0.0471
CHANNEL FLOW THRU SUBAREA (CFS) =	43.81		
FLOW VELOCITY (FEET/SEC) =	8.08	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	1.05	Tc (MIN.) =	21.40
LONGEST FLOWPATH FROM NODE	401.00 TO NODE	405.00 =	5796.00 FEET.

FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	3.094		
*USER SPECIFIED (SUBAREA):			
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT =	.2000		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.2288		
SUBAREA AREA (ACRES) =	49.53	SUBAREA RUNOFF (CFS) =	30.65
TOTAL AREA (ACRES) =	103.2	TOTAL RUNOFF (CFS) =	73.05
TC (MIN.) =	21.40		

FLOW PROCESS FROM NODE 405.00 TO NODE 405.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	3150.00	DOWNSTREAM (FEET) =	3146.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	57.00	CHANNEL SLOPE =	0.0702
CHANNEL FLOW THRU SUBAREA (CFS) =	73.05		
FLOW VELOCITY (FEET/SEC) =	11.45	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME (MIN.) =	0.08	Tc (MIN.) =	21.49
LONGEST FLOWPATH FROM NODE	401.00 TO NODE	405.10 =	5853.00 FEET.

FLOW PROCESS FROM NODE 405.00 TO NODE 405.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.086
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2285
SUBAREA AREA (ACRES) = 1.12 SUBAREA RUNOFF (CFS) = 0.69
TOTAL AREA (ACRES) = 104.3 TOTAL RUNOFF (CFS) = 73.56
TC (MIN.) = 21.49

FLOW PROCESS FROM NODE 405.10 TO NODE 406.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3142.00 DOWNSTREAM(FEET) = 3108.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 988.00 CHANNEL SLOPE = 0.0344
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.040 MAXIMUM DEPTH(FEET) = 4.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.884
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2400
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 80.24
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.93
AVERAGE FLOW DEPTH(FEET) = 1.46 TRAVEL TIME(MIN.) = 2.38
Tc (MIN.) = 23.87
SUBAREA AREA (ACRES) = 19.30 SUBAREA RUNOFF (CFS) = 13.36
AREA-AVERAGE RUNOFF COEFFICIENT = 0.230
TOTAL AREA (ACRES) = 123.6 PEAK FLOW RATE (CFS) = 82.11

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 1.48 FLOW VELOCITY(FEET/SEC.) = 6.95
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 406.00 = 6841.00 FEET.

FLOW PROCESS FROM NODE 401.00 TO NODE 406.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 4 ARE:
TIME OF CONCENTRATION(MIN.) = 23.87
RAINFALL INTENSITY(INCH/HR) = 2.88
TOTAL STREAM AREA (ACRES) = 123.62
PEAK FLOW RATE (CFS) AT CONFLUENCE = 82.11

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	13.10	27.60	2.626	23.74
2	10.51	15.77	3.768	8.75
3	9.11	14.88	3.912	8.93
4	82.11	23.87	2.884	123.62

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 4 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	79.01	14.88	3.912
2	82.67	15.77	3.768
3	108.81	23.87	2.884

4 101.31 27.60 2.626

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 108.81 Tc (MIN.) = 23.87
TOTAL AREA (ACRES) = 165.0
LONGEST FLOWPATH FROM NODE 401.00 TO NODE 406.00 = 6841.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 406.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 101.00 TO NODE 406.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 4323.00
DOWNSTREAM ELEVATION (FEET) = 4277.00
ELEVATION DIFFERENCE (FEET) = 46.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.833
SUBAREA RUNOFF (CFS) = 0.33
TOTAL AREA (ACRES) = 0.14 TOTAL RUNOFF (CFS) = 0.33

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 4277.00 DOWNSTREAM (FEET) = 4070.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2417.00 CHANNEL SLOPE = 0.0856
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.33
FLOW VELOCITY (FEET/SEC) = 4.39 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 9.18 Tc (MIN.) = 15.44
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 503.00 = 2517.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.819
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 32.32 SUBAREA RUNOFF (CFS) = 43.20
TOTAL AREA (ACRES) = 32.5 TOTAL RUNOFF (CFS) = 43.39
TC (MIN.) = 15.44

FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 4070.00 DOWNSTREAM(FEET) = 3715.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2173.00 CHANNEL SLOPE = 0.1634
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 43.39
FLOW VELOCITY(FEET/SEC) = 11.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.08 Tc(MIN.) = 18.53
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 504.00 = 4690.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.396
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) = 61.50 SUBAREA RUNOFF(CFS) = 73.10
TOTAL AREA(ACRES) = 94.0 TOTAL RUNOFF(CFS) = 111.69
TC(MIN.) = 18.53

FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3715.00 DOWNSTREAM(FEET) = 3446.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2196.00 CHANNEL SLOPE = 0.1225
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 111.69
FLOW VELOCITY(FEET/SEC) = 15.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.36 Tc(MIN.) = 20.88
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 505.00 = 6886.00 FEET.

FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.144
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) = 72.77 SUBAREA RUNOFF(CFS) = 80.06
TOTAL AREA(ACRES) = 166.7 TOTAL RUNOFF(CFS) = 183.44
TC(MIN.) = 20.88

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3446.00 DOWNSTREAM(FEET) = 3255.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2839.00 CHANNEL SLOPE = 0.0673
CHANNEL FLOW THRU SUBAREA(CFS) = 183.44
FLOW VELOCITY(FEET/SEC) = 14.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.19 Tc(MIN.) = 24.08
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 506.00 = 9725.00 FEET.

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.868
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2600

S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3345
SUBAREA AREA (ACRES) = 34.62 SUBAREA RUNOFF (CFS) = 25.81
TOTAL AREA (ACRES) = 201.3 TOTAL RUNOFF (CFS) = 193.16
TC (MIN.) = 24.08

FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3255.00 DOWNSTREAM (FEET) = 3149.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2577.00 CHANNEL SLOPE = 0.0411
CHANNEL FLOW THRU SUBAREA (CFS) = 193.16
FLOW VELOCITY (FEET/SEC) = 11.77 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 3.65 Tc (MIN.) = 27.73
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 507.00 = 12302.00 FEET.

FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.618
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3174
SUBAREA AREA (ACRES) = 29.29 SUBAREA RUNOFF (CFS) = 15.34
TOTAL AREA (ACRES) = 230.6 TOTAL RUNOFF (CFS) = 193.16
TC (MIN.) = 27.73
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 507.00 TO NODE 507.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3149.00 DOWNSTREAM (FEET) = 3148.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 42.00 CHANNEL SLOPE = 0.0238
CHANNEL FLOW THRU SUBAREA (CFS) = 193.16
FLOW VELOCITY (FEET/SEC) = 8.95 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 0.08 Tc (MIN.) = 27.81
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 507.10 = 12344.00 FEET.

FLOW PROCESS FROM NODE 507.00 TO NODE 507.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.613
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2400
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3173
SUBAREA AREA (ACRES) = 0.43 SUBAREA RUNOFF (CFS) = 0.27
TOTAL AREA (ACRES) = 231.1 TOTAL RUNOFF (CFS) = 193.16
TC (MIN.) = 27.81
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 501.00 TO NODE 507.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 27.81
RAINFALL INTENSITY (INCH/HR) = 2.61

TOTAL STREAM AREA (ACRES) = 231.07
PEAK FLOW RATE (CFS) AT CONFLUENCE = 193.16

FLOW PROCESS FROM NODE 601.00 TO NODE 602.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3518.00
DOWNSTREAM ELEVATION (FEET) = 3502.00
ELEVATION DIFFERENCE (FEET) = 16.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.833
SUBAREA RUNOFF (CFS) = 0.55
TOTAL AREA (ACRES) = 0.23 TOTAL RUNOFF (CFS) = 0.55

FLOW PROCESS FROM NODE 602.00 TO NODE 603.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3502.00 DOWNSTREAM (FEET) = 3226.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 3248.00 CHANNEL SLOPE = 0.0850
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.55
FLOW VELOCITY (FEET/SEC) = 4.37 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 12.38 Tc (MIN.) = 18.65
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 603.00 = 3348.00 FEET.

FLOW PROCESS FROM NODE 602.00 TO NODE 603.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.382
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2603
SUBAREA AREA (ACRES) = 59.48 SUBAREA RUNOFF (CFS) = 52.30
TOTAL AREA (ACRES) = 59.7 TOTAL RUNOFF (CFS) = 52.57
TC (MIN.) = 18.65

FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3226.00 DOWNSTREAM (FEET) = 3151.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 2071.00 CHANNEL SLOPE = 0.0362
CHANNEL FLOW THRU SUBAREA (CFS) = 52.57
FLOW VELOCITY (FEET/SEC) = 7.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 4.62 Tc (MIN.) = 23.27
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 604.00 = 5419.00 FEET.

FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.932
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.2463
SUBAREA AREA (ACRES) = 18.04 SUBAREA RUNOFF (CFS) = 10.58
TOTAL AREA (ACRES) = 77.8 TOTAL RUNOFF (CFS) = 56.16
TC (MIN.) = 23.27

FLOW PROCESS FROM NODE 604.00 TO NODE 604.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3151.00 DOWNSTREAM (FEET) = 3150.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 35.00 CHANNEL SLOPE = 0.0286
CHANNEL FLOW THRU SUBAREA (CFS) = 56.16
FLOW VELOCITY (FEET/SEC) = 6.77 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 0.09 Tc (MIN.) = 23.35
LONGEST FLOWPATH FROM NODE 601.00 TO NODE 604.10 = 5454.00 FEET.

FLOW PROCESS FROM NODE 604.00 TO NODE 604.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.925
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2464
SUBAREA AREA (ACRES) = 0.19 SUBAREA RUNOFF (CFS) = 0.14
TOTAL AREA (ACRES) = 77.9 TOTAL RUNOFF (CFS) = 56.16
TC (MIN.) = 23.35

FLOW PROCESS FROM NODE 601.00 TO NODE 604.10 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 23.35
RAINFALL INTENSITY (INCH/HR) = 2.93
TOTAL STREAM AREA (ACRES) = 77.94
PEAK FLOW RATE (CFS) AT CONFLUENCE = 56.16

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	193.16	27.81	2.613	231.07
2	56.16	23.35	2.925	77.94

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	218.38	23.35	2.925
2	243.34	27.81	2.613

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 243.34 Tc (MIN.) = 27.81
TOTAL AREA (ACRES) = 309.0
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 604.10 = 12344.00 FEET.

FLOW PROCESS FROM NODE 507.10 TO NODE 508.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3144.00 DOWNSTREAM(FEET) = 3106.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1309.00 CHANNEL SLOPE = 0.0290
CHANNEL BASE(FEET) = 14.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.040 MAXIMUM DEPTH(FEET) = 4.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.460
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 246.86
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.98
AVERAGE FLOW DEPTH(FEET) = 1.77 TRAVEL TIME(MIN.) = 2.73
Tc(MIN.) = 30.54
SUBAREA AREA(ACRES) = 11.43 SUBAREA RUNOFF(CFS) = 7.03
AREA-AVERAGE RUNOFF COEFFICIENT = 0.298
TOTAL AREA(ACRES) = 320.4 PEAK FLOW RATE(CFS) = 243.34

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 1.75 FLOW VELOCITY(FEET/SEC.) = 7.94
LONGEST FLOWPATH FROM NODE 501.00 TO NODE 508.00 = 13653.00 FEET.

FLOW PROCESS FROM NODE 604.10 TO NODE 508.00 IS CODE = 81

=====
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.460
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2700
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2968
SUBAREA AREA(ACRES) = 10.41 SUBAREA RUNOFF(CFS) = 6.91
TOTAL AREA(ACRES) = 330.8 TOTAL RUNOFF(CFS) = 243.34
TC(MIN.) = 30.54
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 501.00 TO NODE 508.00 IS CODE = 1

=====
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 30.54
RAINFALL INTENSITY(INCH/HR) = 2.46
TOTAL STREAM AREA(ACRES) = 330.85
PEAK FLOW RATE(CFS) AT CONFLUENCE = 243.34

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 330.8 TC(MIN.) = 30.54
PEAK FLOW RATE(CFS) = 243.34
=====

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2013 Advanced Engineering Software (aes)
Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Proposed Condition Results)

FILE NAME: J100P78.DAT
TIME/DATE OF STUDY: 12:26 01/22/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0312	0.167	0.0150

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

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3187.00
DOWNSTREAM ELEVATION(FEET) = 3183.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 10.206
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.989
SUBAREA RUNOFF(CFS) = 0.14
TOTAL AREA(ACRES) = 0.14 TOTAL RUNOFF(CFS) = 0.14

FLOW PROCESS FROM NODE 702.00 TO NODE 703.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3183.00 DOWNSTREAM(FEET) = 3121.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1719.00 CHANNEL SLOPE = 0.0361
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.14

FLOW VELOCITY (FEET/SEC) = 2.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 10.06 Tc (MIN.) = 20.26
LONGEST FLOWPATH FROM NODE 701.00 TO NODE 703.00 = 1819.00 FEET.

FLOW PROCESS FROM NODE 702.00 TO NODE 703.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.205
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2296
SUBAREA AREA (ACRES) = 11.25 SUBAREA RUNOFF (CFS) = 8.29
TOTAL AREA (ACRES) = 11.4 TOTAL RUNOFF (CFS) = 8.38
TC (MIN.) = 20.26

FLOW PROCESS FROM NODE 703.00 TO NODE 704.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3121.00 DOWNSTREAM (FEET) = 3100.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 1155.00 CHANNEL SLOPE = 0.0182
CHANNEL FLOW THRU SUBAREA (CFS) = 8.38
FLOW VELOCITY (FEET/SEC) = 3.22 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 5.97 Tc (MIN.) = 26.23
LONGEST FLOWPATH FROM NODE 701.00 TO NODE 704.00 = 2974.00 FEET.

FLOW PROCESS FROM NODE 703.00 TO NODE 704.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.713
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2733
SUBAREA AREA (ACRES) = 18.63 SUBAREA RUNOFF (CFS) = 15.17
TOTAL AREA (ACRES) = 30.0 TOTAL RUNOFF (CFS) = 22.26
TC (MIN.) = 26.23

FLOW PROCESS FROM NODE 701.00 TO NODE 704.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 26.23
RAINFALL INTENSITY (INCH/HR) = 2.71
TOTAL STREAM AREA (ACRES) = 30.02
PEAK FLOW RATE (CFS) AT CONFLUENCE = 22.26

FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4400
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3160.00
DOWNSTREAM ELEVATION (FEET) = 3152.00
ELEVATION DIFFERENCE (FEET) = 8.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.940
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.073

SUBAREA RUNOFF(CFS) = 1.31
TOTAL AREA(ACRES) = 0.42 TOTAL RUNOFF(CFS) = 1.31

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3152.00 DOWNSTREAM(FEET) = 3120.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 526.00 CHANNEL SLOPE = 0.0608
CHANNEL FLOW THRU SUBAREA(CFS) = 1.31
FLOW VELOCITY(FEET/SEC) = 3.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.25 Tc(MIN.) = 8.19
LONGEST FLOWPATH FROM NODE 801.00 TO NODE 803.00 = 626.00 FEET.

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.749
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3702
SUBAREA AREA(ACRES) = 2.88 SUBAREA RUNOFF(CFS) = 5.96
TOTAL AREA(ACRES) = 3.3 TOTAL RUNOFF(CFS) = 7.02
TC(MIN.) = 8.19

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 3120.00 DOWNSTREAM(FEET) = 3102.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 710.00 CHANNEL SLOPE = 0.0254
CHANNEL FLOW THRU SUBAREA(CFS) = 7.02
FLOW VELOCITY(FEET/SEC) = 3.64 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.25 Tc(MIN.) = 11.44
LONGEST FLOWPATH FROM NODE 801.00 TO NODE 804.00 = 1336.00 FEET.

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.635
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3630
SUBAREA AREA(ACRES) = 7.93 SUBAREA RUNOFF(CFS) = 13.23
TOTAL AREA(ACRES) = 11.2 TOTAL RUNOFF(CFS) = 18.89
TC(MIN.) = 11.44

FLOW PROCESS FROM NODE 801.00 TO NODE 804.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 11.44
RAINFALL INTENSITY(INCH/HR) = 4.63
TOTAL STREAM AREA(ACRES) = 11.23
PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.89

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	22.26	26.23	2.713	30.02
2	18.89	11.44	4.635	11.23

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	28.60	11.44	4.635
2	33.32	26.23	2.713

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 33.32 Tc (MIN.) = 26.23
 TOTAL AREA (ACRES) = 41.2
 LONGEST FLOWPATH FROM NODE 701.00 TO NODE 804.00 = 2974.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 41.2 TC (MIN.) = 26.23
 PEAK FLOW RATE (CFS) = 33.32

=====
 END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
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Ver. 20.0 Release Date: 06/01/2013 License ID 1419

Analysis prepared by: Dudek (Proposed Condition Results)

FILE NAME: J100P910.DAT
TIME/DATE OF STUDY: 12:27 01/22/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE /	OUT-/ SIDE/	PARK- WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020			0.67	2.00	0.0312	0.167	0.0150

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

FLOW PROCESS FROM NODE 901.00 TO NODE 902.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 3162.00
DOWNSTREAM ELEVATION(FEET) = 3158.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.505
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.611
SUBAREA RUNOFF(CFS) = 0.69
TOTAL AREA(ACRES) = 0.35 TOTAL RUNOFF(CFS) = 0.69

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 3158.00 DOWNSTREAM(FEET) = 3126.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 563.00 CHANNEL SLOPE = 0.0568
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.69

FLOW VELOCITY (FEET/SEC) = 3.58 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 2.62 Tc (MIN.) = 11.13
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 903.00 = 663.00 FEET.

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.718
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 3.32 SUBAREA RUNOFF (CFS) = 5.48
TOTAL AREA (ACRES) = 3.7 TOTAL RUNOFF (CFS) = 6.06
TC (MIN.) = 11.13

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3126.00 DOWNSTREAM (FEET) = 3098.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 819.00 CHANNEL SLOPE = 0.0342
CHANNEL FLOW THRU SUBAREA (CFS) = 6.06
FLOW VELOCITY (FEET/SEC) = 4.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 3.34 Tc (MIN.) = 14.47
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 904.00 = 1482.00 FEET.

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.983
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3569
SUBAREA AREA (ACRES) = 8.17 SUBAREA RUNOFF (CFS) = 11.71
TOTAL AREA (ACRES) = 11.8 TOTAL RUNOFF (CFS) = 16.83
TC (MIN.) = 14.47

FLOW PROCESS FROM NODE 901.00 TO NODE 904.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 14.47
RAINFALL INTENSITY (INCH/HR) = 3.98
TOTAL STREAM AREA (ACRES) = 11.84
PEAK FLOW RATE (CFS) AT CONFLUENCE = 16.83

FLOW PROCESS FROM NODE 1001.00 TO NODE 1002.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3140.00
DOWNSTREAM ELEVATION (FEET) = 3137.00
ELEVATION DIFFERENCE (FEET) = 3.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 9.361
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.275

SUBAREA RUNOFF (CFS) = 0.20
TOTAL AREA (ACRES) = 0.11 TOTAL RUNOFF (CFS) = 0.20

FLOW PROCESS FROM NODE 1002.00 TO NODE 1003.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3137.00 DOWNSTREAM (FEET) = 3114.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 476.00 CHANNEL SLOPE = 0.0483
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.20
FLOW VELOCITY (FEET/SEC) = 3.30 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 2.41 Tc (MIN.) = 11.77
LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1003.00 = 576.00 FEET.

FLOW PROCESS FROM NODE 1002.00 TO NODE 1003.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.551
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 1.43 SUBAREA RUNOFF (CFS) = 2.28
TOTAL AREA (ACRES) = 1.5 TOTAL RUNOFF (CFS) = 2.45
TC (MIN.) = 11.77

FLOW PROCESS FROM NODE 1003.00 TO NODE 1004.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3114.00 DOWNSTREAM (FEET) = 3100.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 268.00 CHANNEL SLOPE = 0.0522
CHANNEL FLOW THRU SUBAREA (CFS) = 2.45
FLOW VELOCITY (FEET/SEC) = 4.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 1.09 Tc (MIN.) = 12.85
LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1004.00 = 844.00 FEET.

FLOW PROCESS FROM NODE 1003.00 TO NODE 1004.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.299
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA (ACRES) = 1.27 SUBAREA RUNOFF (CFS) = 1.91
TOTAL AREA (ACRES) = 2.8 TOTAL RUNOFF (CFS) = 4.23
TC (MIN.) = 12.85

FLOW PROCESS FROM NODE 1001.00 TO NODE 1004.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 12.85
RAINFALL INTENSITY (INCH/HR) = 4.30
TOTAL STREAM AREA (ACRES) = 2.81
PEAK FLOW RATE (CFS) AT CONFLUENCE = 4.23

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	16.83	14.47	3.983	11.84
2	4.23	12.85	4.299	2.81

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	19.18	12.85	4.299
2	20.75	14.47	3.983

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 20.75 Tc (MIN.) = 14.47
TOTAL AREA (ACRES) = 14.6
LONGEST FLOWPATH FROM NODE 901.00 TO NODE 1004.00 = 1482.00 FEET.

FLOW PROCESS FROM NODE 901.00 TO NODE 1004.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 14.47
RAINFALL INTENSITY (INCH/HR) = 3.98
TOTAL STREAM AREA (ACRES) = 14.65
PEAK FLOW RATE (CFS) AT CONFLUENCE = 20.75

FLOW PROCESS FROM NODE 801.10 TO NODE 802.10 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 3160.00
DOWNSTREAM ELEVATION (FEET) = 3154.00
ELEVATION DIFFERENCE (FEET) = 6.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 7.430
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.122
SUBAREA RUNOFF (CFS) = 1.24
TOTAL AREA (ACRES) = 0.58 TOTAL RUNOFF (CFS) = 1.24

FLOW PROCESS FROM NODE 802.10 TO NODE 803.10 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 3154.00 DOWNSTREAM (FEET) = 3110.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 417.00 CHANNEL SLOPE = 0.1055
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 1.24
FLOW VELOCITY (FEET/SEC) = 4.94 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 1.41 Tc (MIN.) = 8.84
LONGEST FLOWPATH FROM NODE 801.10 TO NODE 803.10 = 517.00 FEET.

FLOW PROCESS FROM NODE 802.10 TO NODE 803.10 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.475
*USER SPECIFIED (SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA (ACRES) = 2.94 SUBAREA RUNOFF (CFS) = 5.63
 TOTAL AREA (ACRES) = 3.5 TOTAL RUNOFF (CFS) = 6.75
 TC (MIN.) = 8.84

 FLOW PROCESS FROM NODE 801.10 TO NODE 803.10 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 8.84
 RAINFALL INTENSITY (INCH/HR) = 5.47
 TOTAL STREAM AREA (ACRES) = 3.52
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 6.75

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	20.75	14.47	3.983	14.65
2	6.75	8.84	5.475	3.52

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	21.84	8.84	5.475
2	25.65	14.47	3.983

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 25.65 Tc (MIN.) = 14.47
 TOTAL AREA (ACRES) = 18.2
 LONGEST FLOWPATH FROM NODE 901.00 TO NODE 803.10 = 1482.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 18.2 TC (MIN.) = 14.47
 PEAK FLOW RATE (CFS) = 25.65

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END OF RATIONAL METHOD ANALYSIS

APPENDIX B

Preliminary Grading Plans (See Attached CD)

VICINITY MAP



SITE

VICINITY MAP
NOT TO SCALE

< THIS SITE IS LOCATED ON PAGE 430 OF THE THOMAS GUIDE, IN SECTION F9 >

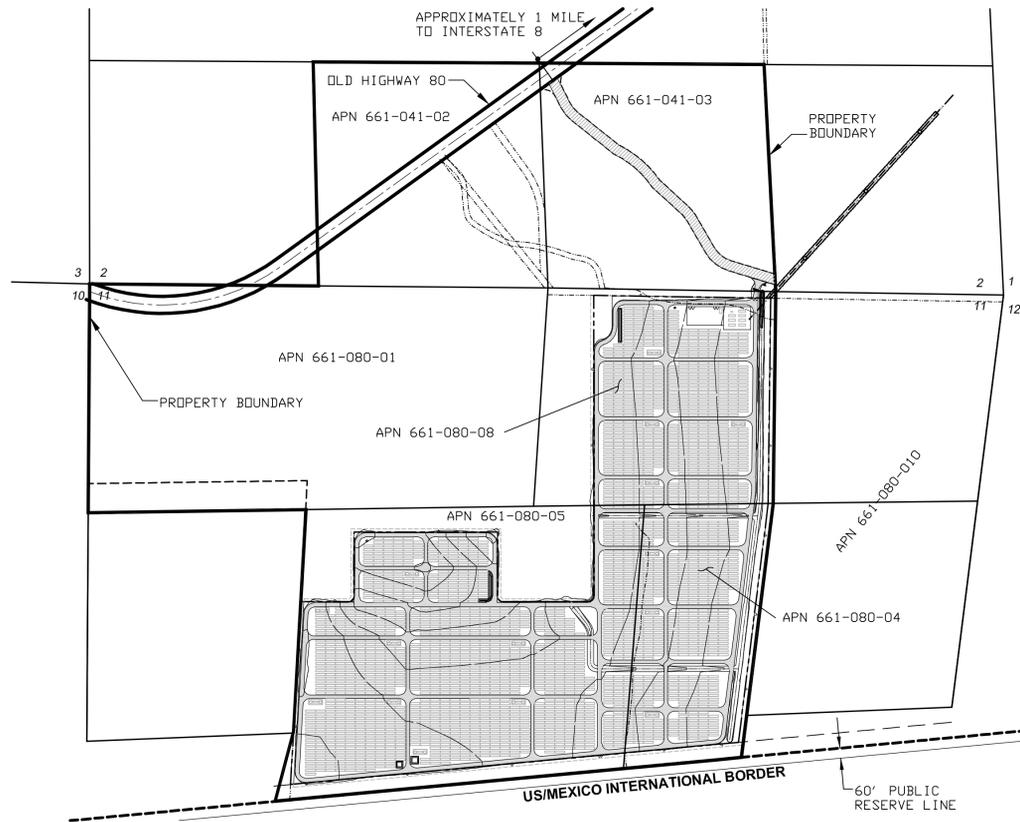


REGIONAL MAP
NOT TO SCALE

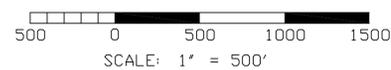
**NOT FOR CONSTRUCTION
FOR PERMITTING ONLY**

PRELIMINARY GRADING PLANS FOR JACUMBA SOLAR ENERGY PROJECT SAN DIEGO COUNTY, CA

SYSTEM SUMMARY	
MODULE	YINGLI YL345P-35B
MODULE STC RATING	345W*
NO. OF MODULES	81,108
MODULES PER STRING	30
DC/AC RATIO	1.4
TOTAL STC DC SYSTEM SIZE	28 MW
TOTAL STC AC SYSTEM SIZE	20 MW
DC SYSTEM VOLTAGE	1500 VDC**
NO. OF INVERTERS	24 - 750KW
	4 - 500KW
INVERTER SPECIFICATIONS	SMA SUNNY CENTRAL 750KW, 1500VDC SMA SUNNY CENTRAL 500KW, 1500VDC
NO. OF FIXED TILT RACKS	2,253
FIXED TILT RACK	UNIRAC ISYS GROUND MOUNT
MODULE TILT	25 DEGREES
GCR	55%
*MODULE IS BASED ON THE YINGLI 310P-35B, 310W MODEL; IT IS ANTICIPATED THAT A SIMILAR 345W PANEL WILL BE AVAILABLE WHEN THIS PROJECT IS UNDER CONSTRUCTION.	
**INVERTERS ARE BASED ON THE SMA SUNNY CENTRAL 750KW AND 500KW, 1000VDC MODELS; IT IS ANTICIPATED THAT A SIMILAR 1500VDC INVERTERS WILL BE AVAILABLE WHEN THIS PROJECT IS UNDER CONSTRUCTION.	



PLAN VIEW



SHEET INDEX		
SHEET NO.	DRAWING NO.	TITLE
1	JSEP-2-DW-112-101-000	COVER SHEET
2	JSEP-2-DW-112-002-001	PLOT PLAN
3	JSEP-2-DW-112-735-001	PRELIMINARY GRADING PLAN
4	JSEP-2-DW-112-735-002	GRADING SECTIONS AND DETAILS
5	JSEP-2-DW-112-735-003	FENCE, PANEL AND RACKING DETAILS
6	JSEP-2-DW-112-717-001	EROSION CONTROL PLAN
7	JSEP-2-DW-601-206-010	CONCEPTUAL ONE LINE DIAGRAM

GRADING NOTES

- ALL GRADING SHALL CONFORM OF THE REQUIREMENTS OF THE GRADING ORDINANCE SECTIONS 87.101 THROUGH 87.804 OF THE SAN DIEGO COUNTY CODE OF REGULATORY ORDINANCES.
- A REGISTERED CIVIL ENGINEER IS REQUIRED TO SUPERVISE INSTALLATION OF THE FILL KEYWAY AND ALL FILL BENCHING AND COMPACTION. A SOILS REPORT WITH COMPACTION TESTS IS REQUIRED FOR ALL FILL THAT IS OVER 12" IN DEPTH. FORM POS 073, MINOR GRADING CERTIFICATION, AND THREE (3) COPIES OF THE COMPACTION REPORT COMPLETED BY A SOILS ENGINEER SHALL BE SUBMITTED PRIOR TO ROUGH GRADE APPROVAL.
- ALL FILL MATERIAL SHALL BE COMPACTED TO AT LEAST 90% MAXIMUM DRY DENSITY.
- NATURAL DRAINAGE SHALL NOT BE DIVERTED OR CONCENTRATED ONTO ADJACENT PROPERTY.
- MAINTAIN 1% (MINIMUM) SLOPE AWAY FROM ALL BUILDINGS FOR AT LEAST 5'.
- ALL GRADING DETAILS SHALL BE IN CONFORMANCE WITH THE FOLLOWING SAN DIEGO COUNTY DESIGN STANDARDS OR REGIONAL STANDARD DRAWINGS:
 - A. DS-8 LOT GRADING
 - B. DS-10 GRADING OF SLOPES
 - C. DS-11 REQUIRED SETBACKS
 - D. D-40 RIP RAP ENERGY DISSIPATOR
 - E. D-75 DRAINAGE DITCHES
- BERMS SHALL BE REQUIRED AT THE TOP OF ALL FILL SLOPES AND SWALES OR BROW DITCHES SHALL BE REQUIRED AT THE TOP OF ALL CUT SLOPES. ALL BERMS, SWALES, OR BROW DITCHES SHALL CONFORM TO THE DESIGN STANDARDS OR REGIONAL STANDARD DRAWINGS LISTED ABOVE.
- REGARDLESS OF WHICH BMP'S ARE IMPLEMENTED THE FACE OF ALL CUT AND FILL SLOPES IN EXCESS OF 3' VERTICAL HEIGHT SHALL BE PLANTED AND MAINTAINED WITH A GROUND COVER OR OTHER PLANTING TO PROTECT THE SLOPES AGAINST EROSION AND INSTABILITY. PLANTING SHALL COMMENCE AS SOON AS SLOPES ARE COMPLETED. ALL PLANTING MUST HAVE A PERMANENTLY INSTALLED IRRIGATION SYSTEM
- REQUIRED SLOPE RATIOS ARE AS FOLLOWS:
 - A. CUTS - 1.5:1 FOR MINOR SLOPES (UP TO 15' VERTICAL HEIGHT)
 - B. CUTS - 2:1 FOR MAJOR SLOPES (OVER 15' VERTICAL HEIGHT)
 - C. FILLS - 2:1 (MAXIMUM) FOR ALL FILL SLOPES
- NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE GRADING PLANS, THE OWNER AND PERMITEE ARE RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO ADJACENT PROPERTIES. NO PERSON SHALL EXCAVATE SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET OR SIDEWALK, OR THE FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM OR ANY OTHER PUBLIC OR PRIVATE PROPERTY.
- THE DIRECTOR OF PLANNING & DEVELOPMENT SERVICES MAY IMPOSE CONDITIONS THAT ARE REASONABLY NECESSARY TO PREVENT THE CREATION OF A NUISANCE OR HAZARD TO PERSONS OR TO PUBLIC OR PRIVATE PROPERTY. THE DIRECTOR MAY ALSO MODIFY OR ADD CONDITIONS TO ANY VALID GRADING PERMIT WHEN SUCH MODIFICATIONS OR ADDITIONS ARE REASONABLY NECESSARY TO PREVENT THE CREATION OF A NUISANCE OR HAZARD TO PERSONS OR TO PUBLIC OR PRIVATE PROPERTY. SUCH CONDITIONS MAY INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
 - A. IMPROVEMENT OF EXISTING GRADING TO CONFORM WITH THE GRADING ORDINANCE, AND;
 - B. REQUIREMENTS FOR FENCING OF EXCAVATIONS OR FILLS THAT WOULD OTHERWISE BE HAZARDOUS, AND;
 - C. ADEQUATE DUST CONTROL MEASURES.
- ALL OPERATIONS CONDUCTED ON THE PREMISES, INCLUDING THE WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR RUNNING OF TRUCKS, EARTH MOVING EQUIPMENT, CONSTRUCTION EQUIPMENT OR ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00AM AND 6:00PM MONDAY THROUGH SATURDAY. NO EARTH MOVING OR GRADING SHALL BE CONDUCTED ON SUNDAYS OR HOLIDAYS.
- THE CONTRACTOR SHALL VERIFY THE EXISTENCE AND LOCATION OF ALL UTILITIES BEFORE COMMENCING WORK. NOTICE OF THE PROPOSED WORK SHALL BE PROVIDED TO THE FOLLOWING AGENCIES:
 - A. SAN DIEGO GAS AND ELECTRIC (800) 422-4133
 - B. PACIFIC BELL (800) 422-4133
 - C. CATV (800) 422-4133
 - D. WATER UTILITY (800) 422-4133
 - E. SEWER UTILITY (800) 422-4133
- APPROVAL OF THESE PLANS BY THE DIRECTOR OF PLANNING & DEVELOPMENT SERVICES DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION IS OBTAINED, RIGHT TO ENTRY FORM COMPLETED AND VALID GRADING PERMIT ISSUED.
- THE ISSUANCE OF A GRADING PERMIT SHALL CONSTITUTE AN AUTHORIZATION TO PERFORM ONLY THAT WORK WHICH IS DESCRIBED OR SHOWN ON THE GRADING PERMIT APPLICATION AND APPROVED GRADING PLANS. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ANY CONDITIONS IMPOSED BY THE DIRECTOR OF PLANNING & DEVELOPMENT SERVICES AND IN ACCORDANCE WITH THE GRADING ORDINANCE.
- EARTHWORK QUANTITIES:
 - EXCAVATION: 180,000 CUBIC YARDS
 - FILL: 180,000 CUBIC YARDS
 - IMPORT: 0 CUBIC YARDS
 - EXPORT: 0 CUBIC YARDS

PROPERTY OWNER INFORMATION

NAME: JACUMBA SOLAR, LLC.
 ADDRESS: 700 UNIVERSE BLVD
 JUNO BEACH, FL 33408

TELEPHONE NUMBER: _____
 (24 HOUR CONTACT NUMBER)
 661-041-02, 661-041-03, 661-080-01, 661-080-04
 SITE A.P.N. NUMBER: 661-080-05, 661-080-08

SITE ADDRESS: XXX OLD HWY 80
 JACUMBA, CA 91934

GRADING ON ADJACENT PARCELS

LIST ANY ADJACENT PARCELS UNDER THE SAME OWNERSHIP AS THIS PARCEL FOR WHICH A GRADING PLAN HAS BEEN SUBMITTED OR A GRADING PERMIT ISSUED:

APN(s): _____

PROPERTY OWNER CERTIFICATION

I CERTIFY THAT I HAVE READ AND UNDERSTAND THE STORMWATER MANAGEMENT NOTES AND THE GRADING NOTES:

OWNER'S SIGNATURE (REQUIRED): _____ DATE: _____

DISTURBED AREA CALCS

PAD + SLOPES: _____ SF

DRIVEWAY: _____ SF

PRIMARY SEPTIC: _____ SF

FIRE CLEARING: _____ SF

TOTAL: _____ SF

IF ≥ 1 AC, PROVIDE WID# : _____

MINOR GRADING PLAN FOR:
 JACUMBA SOLAR, LLC.
 JACUMBA SOLAR ENERGY PROJECT
 20MW PV

SHEET: 1 OF 7
 COVER SHEET

APPROVED: _____
 DIRECTOR OF PLANNING & DEVELOPMENT SERVICES

GRADING RECORD ID:
 JSEP-2-DW-112-101-000

ENGINEER WORLEYPARSONS
 2330 E. BIDWELL ST., SUITE 150
 FOLSOM, CA 95630
 (916) 817-3920

