

FOR REVIEW ONLY

Oak Valley North - Building 2  
DPR No. \_\_\_ - \_\_\_\_, CUP No. \_\_\_\_\_  
City of Calimesa, County of Riverside, California

## Preliminary Drainage Study

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**DRAFT**

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RELEVANT EXCERPTS AND MAPS FROM "HYDROLOGY AND HYDRAULICS STUDY: OAK VALLEY TOWN CENTER PARCEL MAP NO. 37862 MASS GRADING PLAN" BY PROACTIVE ENGINEERING

## SECTION 1 - SUMMARY

### PURPOSE

The purpose of this report is to document the hydrologic and hydraulic analyses performed in support of the Oak Valley North – Building 2 project located in the City of Calimesa in the County of Riverside, California. The overall Oak Valley North project site (TPM 38589) consists of approximately 110 acres of predominantly vacant land, with one existing single-family residence in the west-central region of the site and a natural watercourse running through the east-central region of the overall site. It is bounded by Calimesa Boulevard along the southwest, vacant land to the northwest, Beckwith Avenue to the northeast, and existing residential tracts to the southeast.

The Oak Valley North – Building 2 project is bounded by Calimesa Boulevard to the southwest, the Oak Valley North – Building 1 development to the northwest, the Oak Valley North – Building 3 and 4 developments to the southeast, and the Oak Valley North – Trailer Lot 1 to the northeast. The project proposes to build an industrial development on approximately 16 acres. This report will summarize the hydrologic and hydraulic analyses that were conducted in order to determine the necessary drainage improvements required to provide flood protection for the proposed building and safely convey the runoff through the site.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the developed condition using the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Rational Method.
- Determine the required storm drain facilities, alignment, and sizes required to flood protect the project site.
- Determine the necessary detention volume required to release flows such that they avoid causing hydromodification impacts and are consistent with the available capacity of the existing culverts.
- Preparation of a preliminary report summarizing the hydrology and hydraulic results.

### DESCRIPTION OF WATERSHED

As previously described, the project is proposing an industrial development on approximately 16 acres of vacant land within the boundaries of the overall Oak Valley North project boundary. The overall Oak Valley North project and all areas within its boundary, including the Oak Valley North – Building 2 project, is located within a proposed Specific Plan within the city of Calimesa.

The currently vacant overall Oak Valley North project site generally drains towards the southwest of the site, where existing culverts convey flows under Calimesa Boulevard and Interstate I-10 highway. The project site is currently impacted by offsite flow from the adjacent San Bernardino Mountains, located northeast of the overall Oak Valley North project site. The offsite flows combine with the existing onsite flows and are conveyed south through the site via existing streambed areas before ultimately discharging into the existing southerly Caltrans culverts. A separate drainage study titled “Hydraulic Analyses for Culverts Crossing I-10” was prepared by JLC Engineering & Consulting for an adjacent project to the south and encompasses the existing condition of the culverts toward which Oak Valley North drain. This report also describes how the project is impacted by offsite flows along Calimesa Boulevard as upstream culverts overflow to the ultimate local low point within the project frontage. This overflow and the existing onsite and offsite tributary flows currently backup onto the project site, causing flooding that does not overtop I-10 highway. Relevant excerpts from this report are included in **Appendix D**.

Existing elevations across the Oak Valley North – Building 2 project site vary from 2320 to 2286 (NAVD88 datum). The site currently slopes down at approximately 3% grade from the northeast to the southwest.

The existing drainage pattern for the site and the general area is characterized by sheet flow. Existing flows outlet into culverts before ultimately discharging into San Timoteo Creek.

The project is located within the currently proposed Oak Valley North Specific Plan and is also within the Santa Ana River watershed area.

## PROPOSED CONDITIONS

In the proposed condition of the Oak Valley North – Building 2 project, onsite runoff will be conveyed throughout the site via proposed curbs and gutters. Onsite runoff will then be captured by a network of drainage inlets provided at low points. Proposed private underground storm drain conveys captured flows towards proposed biotreatment devices for water quality treatment. Modular Wetland System (MWS) vaults are being proposed to provide water quality treatment. (Additional information regarding the MWS vaults can be found in the separate PWQMP Report.) Underground chamber detention systems with orifice outlets are proposed to release onsite flows for increased runoff and HCOC requirements.

All flows captured onsite are then conveyed towards a proposed storm drain outlet, which will be sized to convey the fully developed, routed flows generated by the Oak Valley North – Building 2 project towards the proposed backbone storm drain line, and ultimately toward the existing culvert outlets. As in the existing condition, these culverts will outlet south of I-10 before ultimately discharging into San Timoteo Creek.

Offsite flows from the northerly mountains will be intercepted by backbone improvements within Beckwith Avenue prior to impacting the Oak Valley North – Building 2 project site. A separate drainage study for the overall Oak Valley North project encompasses these improvements.

This project site exists within the San Timoteo sub-basin of the Santa Ana River Watershed. The onsite and offsite flows will ultimately outlet into an existing unimproved natural channel within the River and Land Conservancy (RLC) parcel. As part of the RLC, the channel will remain undeveloped and is not within the City of Calimesa or Riverside County Flood Control maintenance responsibility. The RLC parcel flows to the San Timoteo Creek and ultimately to the Santa Ana River. A total of 4,600 acres are tributary to the drainages impacted by the project site. Approximately 110 acres are proposed for development with the Oak Valley North project, consisting of less than 3% of the total tributary area. The project increased runoff would be inconsequential to the overall drainage of the tributaries into a larger water body. The Oak Valley North project proposes to mitigate flows for HCOC requirements and for the capacities of the existing culverts that outlet onsite and offsite flows.

## METHODOLOGY

### HYDROLOGY

Hydrologic calculations were performed in accordance with the RCFC&WCD Hydrology Manual, dated April 1978. The Rational Method was utilized in determining peak flow rates.

The hydrological parameters, including rainfall values and soil types were derived from the RCFC&WCD Hydrology Manual. The isohyetal maps and soil map have been included in Section 2.

Rational Method calculations were performed using a computer program developed by CivilDesign Corporation and Joseph E. Bonadiman and Associates Inc. The computer program is commonly referred to as CivilD which incorporates the hydrological parameters outlined in the RCFC&WCD Hydrology Manual.

The Rational Method was used to determine the peak flow rates to size and design the drainage facilities need to convey onsite flows through the site to the proposed underground chambers. The flow rates were computed by generating a hydrologic “link-node” model in which the overall area is divided into separate drainage sub-areas, each tributary to a concentration point (node) determined by the proposed layout and grading.

The Unit Hydrograph Method was used to determine the peak flow rates and volumes associated with the 2-year-24-hour and 100-year storm events for the site. Calculations were performed for both the existing condition and developed condition to be used in the analysis of the proposed detention systems. See Section 4 for additional information and results regarding the hydrologic analyses performed for this project.

### **HYDRAULICS**

Water quality calculations were performed using spreadsheets that were created by RCFC&WCD. Final calculations and additional details can be found in the Preliminary-WQMP.

Basin routing calculations to determine the proposed detention design will be provided in the Final Drainage Study.

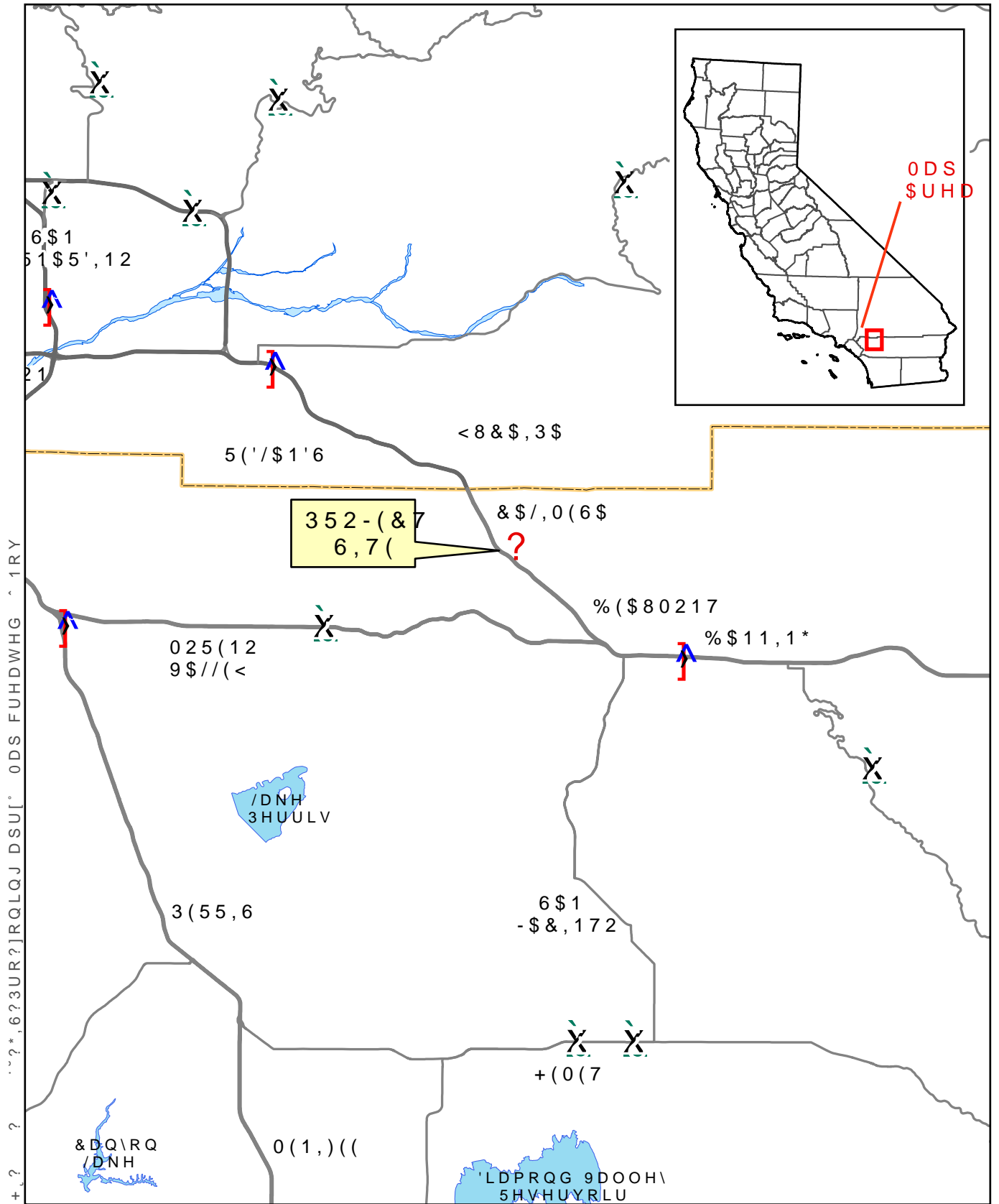
Hydraulic calculations to determine the required pipe sizes of proposed storm drain facilities will be provided in the Final Drainage Study.

**FIG. 1 VICINITY MAP**

**FIG. 2 USGS TOPOGRAPHY MAP**

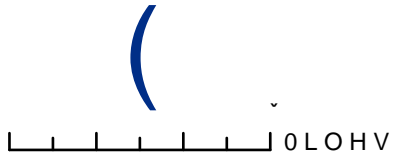
**FIG. 3 AERIAL PHOTOGRAPH**

**FIG. 4 RECEIVING WATERBODIES**



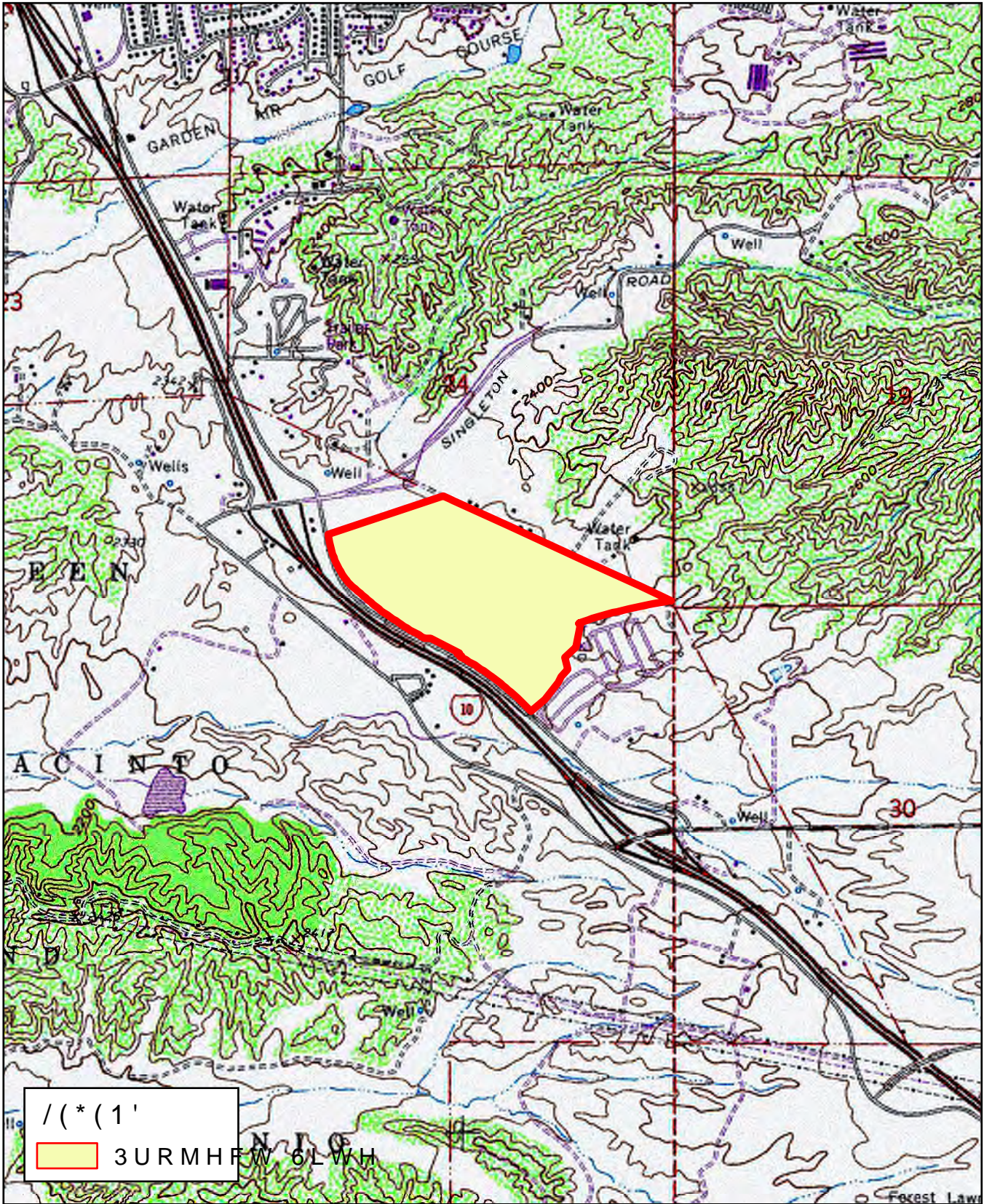
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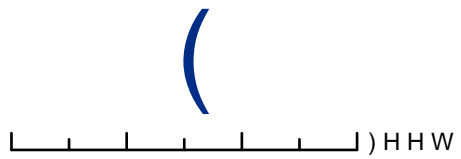
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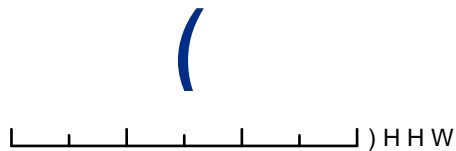


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ALBERT A.  
**WEBB**  
ASSOCIATES



## SECTION 2 - HYDROLOGY ANALYSIS

### HYDROLOGY PARAMETERS

The RCFC&WCD Hydrology Manual was used to determine several of the hydrological parameters. The following rainfall depths were utilized in the hydrology analyses, which were obtained from the isohyetal maps provided in the RCFC&WCD Hydrology Manual:

**Table 1 - Precipitation Values**

	Duration
Storm Event	1-Hour (inches)
10-Year	0.91
100-Year	1.35

The value for slope of intensity was determined to be 0.550. The standard intensity-duration curve data (Plate D-4.1) have been included in Appendix A.

Based on the Plate C-1.18 (El Casco) in the RCFC&WCD Hydrology Manual, the project site is classified as soil types B, and D, but it is predominantly soil type B. The soils map is included in Appendix A.

The cover type was determined based on the existing land cover and proposed land use of the site. Hydrological computations for the existing condition were done using ‘Annual Grasses (Poor)’. The ‘Urban, Commercial Landscaping’ cover type was used to represent the developed condition. The table below summarizes the runoff index values and the recommended values for percentage of impervious cover for each category:

**Table 2 - Cover Type**

Cover Type	Soil Group A	Soil Group B	Soil Group C	Soil Group D	Percentage of Impervious Cover
Annual Grasses (Poor)	67	78	86	89	0%
Commercial Landscaping	32	56	67	75	80-100%

### ON-SITE RATIONAL METHOD HYDROLOGY

The rational method was used to determine peak flow rates in order to adequately size the proposed subsurface storm drains and associated inlets used to convey on-site flows to the proposed underground detention chambers. Calculations were performed for approximately 16 acres of total area that is tributary to the proposed storm drain facilities within the Oak Valley North – Building 2 project boundary. A small

portion of the site, consisting mainly of the driveways and adjacent slopes areas will drain towards the frontage street, Calimesa Boulevard, and be captured in the proposed catch basins.

The Oak Valley North - Building 2 project drains to the proposed backbone storm drain line, and ultimately towards “Culvert B1” (an existing DBL 48” CMP per JLC Report included in Appendix D), which are located south of the project site along Calimesa Boulevard.

Subareas within the rational method calculations for the Oak Valley North - Building 2 project have been broken up based on the area tributary to the local low spots. The B200-series consist of the eastern and southern portions of the onsite project site area, and the B250-series consist of the western and northwestern portions of the onsite project site area. In final engineering, areas will be further broken up to determine the 100-year flow rates entering any proposed inlets located onsite. The majority of flows are directed towards the proposed inlets and/or curbs and gutters. Most subareas consist of a combination of the proposed building, parking stalls, drive aisles, concrete walkways, and landscaped areas. All onsite areas within the calculations were considered as commercial subarea types.

The following table summarizes the rational method results at key points:

**Table 3 - Rational Method Results**

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Node 203 - Flows from the northeastern portion of Building 2	7.4	11.1
Node 203 - Flows from the southeastern portion of Building 2	6.7	10.0
Node 203 - Flows from the southern portion of Building 2	4.3	6.5
Node 253 - Flows from the northwestern portion of Building 2	7.2	10.7
Node 253 - Flows from the western portion of Building 2	6.6	9.9
Node 208 - Cumulative eastern and southern onsite runoff	17.3	25.9
Node 256 - Cumulative western and northwestern onsite runoff	13.8	20.6

The rational method output files and hydrology map have been included in Appendix A.

**OFF-SITE RATIONAL METHOD HYDROLOGY**

As described in Section 1, the overall Oak Valley North project site is impacted by offsite flows generated by the San Bernardino Mountains located northeast of the project site at Beckwith Avenue. These flows will enter the backbone storm drain facilities and will not impact the Oak Valley North - Building 2 project. Details regarding these offsite flows and the backbone storm drain facilities can be found in the separate drainage study for the overall Oak Valley North project.

## SECTION 3 - HYDRAULIC ANALYSIS

### ON-SITE STORM DRAIN FACILITIES

The project will utilize curbs and gutters to convey onsite flows to the proposed storm drain systems. The storm drain systems convey flows to the underground chambers in the truck court areas on the west and east side of the project site. After entering the chambers, flows will outlet to the proposed backbone storm drain line, and ultimately towards “Culvert B1” (an existing DBL 48” CMP per JLC Report included in Appendix D) located south of the project site along Calimesa Boulevard.

#### Onsite Storm Drain

Hydraulic calculations will be performed for all proposed, onsite storm drain facilities, 12 inches in diameter or greater, in the Final Drainage Study.

#### Underground Chambers

To meet HCOC requirements and the capacity of existing culverts downstream of the project site, the underground detention systems are proposed to hold approximately 324,000 cubic feet of runoff. This would require the systems to consist of 3000’ cumulative length x 9’ deep x 12’ wide rectangular chambers, for the 100-yr 24-hr storm event. Solid chambers are proposed, as infiltration is not feasible. An outlet structure is proposed to consist of an orifice with the invert at the bottom of the chambers to release flows consistent with the capacity of the existing culvert pipes. Details of the chambers have been included in Appendix B.

Outlet structure orifice sizing will be provided in the Final Drainage Study.

#### Inlet Capacities

Grate inlets are proposed at the low points within gutters in order to capture onsite flows. For larger flows, a series of 3’x3’ or 2’x3’ grates may be proposed in gutters to prevent excessive ponding from occurring. Hydraulic calculations will be provided in the Final Drainage Study.

### OFF-SITE STORM DRAIN FACILITIES

As described in Section 1, the overall Oak Valley North project site is impacted by offsite flows generated by the San Bernardino Mountains located northeast of the project site at Beckwith Avenue. These flows will enter the backbone storm drain facilities and will not impact the Oak Valley North - Building 2 project. Details regarding these offsite flows and the backbone storm drain facilities can be found in the separate drainage study for the overall Oak Valley North project.

## SECTION 4 - DETENTION SYSTEM ANALYSIS

### ON-SITE UNIT HYDROGRAPH METHOD HYDROLOGY

The unit hydrograph method was used to determine the peak flow rates and volumes in order to adequately size the proposed underground chamber detention systems to address HCOC and increased runoff mitigation. Unit hydrographs were performed for both the existing condition and developed condition. The existing condition is used to establish a baseline for comparative purposes.

A routing analysis will be provided in the Final Drainage Study to demonstrate that the underground chamber systems contain substantial volume needed to route flows down to existing condition peak flow rates to avoid hydromodification impacts, and to limit flows such that they are consistent with the capacity of the existing culverts.

At this preliminary stage, the underground detention chambers are sized to detain the entire volume of the largest post-development storm event (24-hour, 100-year). In final engineering, storm drain lift stations and/or orifice plates will be designed to outlet onsite flows per the existing capacity of the culverts.

The unit hydrograph models the entire Oak Valley North – Building 2 project site as one drainage area in both the existing and developed conditions. In the existing condition analysis, the ‘Annual Grasses (Poor)’ cover type was utilized on a 100% pervious area. In the proposed condition analyses, the ‘Urban, Commercial Landscaping’ cover type was utilized.

The following table summarizes the results of the unit hydrograph analysis:

**Table 4 - Unit Hydrograph Results**

Storm Event	Existing Condition		Proposed Condition	
	Volume (Ac-ft)	Peak Flow (cfs)	Volume (Ac-ft)	Peak Flow (cfs)
2-Year, 24-Hour	0.32	0.52	2.6	4.3
100-Year, 1-Hour	1.4	50.6	1.6	57.3
100-Year, 3-Hour	1.7	24.9	2.3	28.7
100-Year, 6-Hour	2.1	22.4	3.3	27.7
100-Year, 24-Hour	4.0	11.0	7.3	13.0

The unit hydrograph output files and hydrology map have been included in Appendix C.

### OFF-SITE UNIT HYDROGRAPH METHOD HYDROLOGY

The 100-year flow rates for the existing culverts in Calimesa Boulevard were analyzed using the unit hydrograph method. As mentioned before, this hydrology analysis is presented in a separate drainage study prepared by JLC titled “Hydraulic Analyses for Culverts Crossing I-10.” This study encompasses the entire existing condition of the areas tributary to this section of existing culverts.

Relevant excerpts and maps for this separate report have been included in Appendix D.

## UNIT HYDROGRAPH ANALYSIS

The following table presents the result of unit hydrograph analysis for the 24-hour 2-year and 1-, 3-, 6-, and 24-hour 100-year storm events to preliminarily size the underground chamber systems to provide the necessary storage volume needed to restrict the outflow to existing condition flow rates.

Table 5 – Unit Hydrograph Analysis

Storm Event	Existing Condition		Proposed Condition		Unit Hydrograph Analysis Results
	Volume (AC-ft)	Peak Flow (cfs)	Volume (AC-ft)	Peak Flow (cfs)	Detention Volume (cf)
2-Year, 24-Hour	0.32	0.52	2.6	4.3	-
100-Year, 1-Hour	1.4	50.6	1.6	57.3	-
100-Year, 3-Hour	1.7	24.9	2.3	28.7	-
100-Year, 6-Hour	2.1	22.4	3.3	27.7	-
100-Year, 24-Hour	4.0	11.0	7.3	13.0	324,000

A routing analysis will be provided in the Final Drainage Study to demonstrate that the underground chamber systems contain substantial volume needed to route flows down to existing condition peak flow rates to avoid hydromodification impacts, and to limit flows such that they are consistent with the capacity of the existing culverts.

At this preliminary stage, an underground detention chamber is sized to detain the entire volume of the largest post-development storm event (24-hour, 100-year). In final engineering, storm drain lift stations and/or orifice plates will be designed to outlet onsite flows per the existing capacity of the culverts.



## SECTION 5 - CONCLUSION

Based on the analyses and results of this report, the following conclusions were derived from the hydrology and hydraulic results:

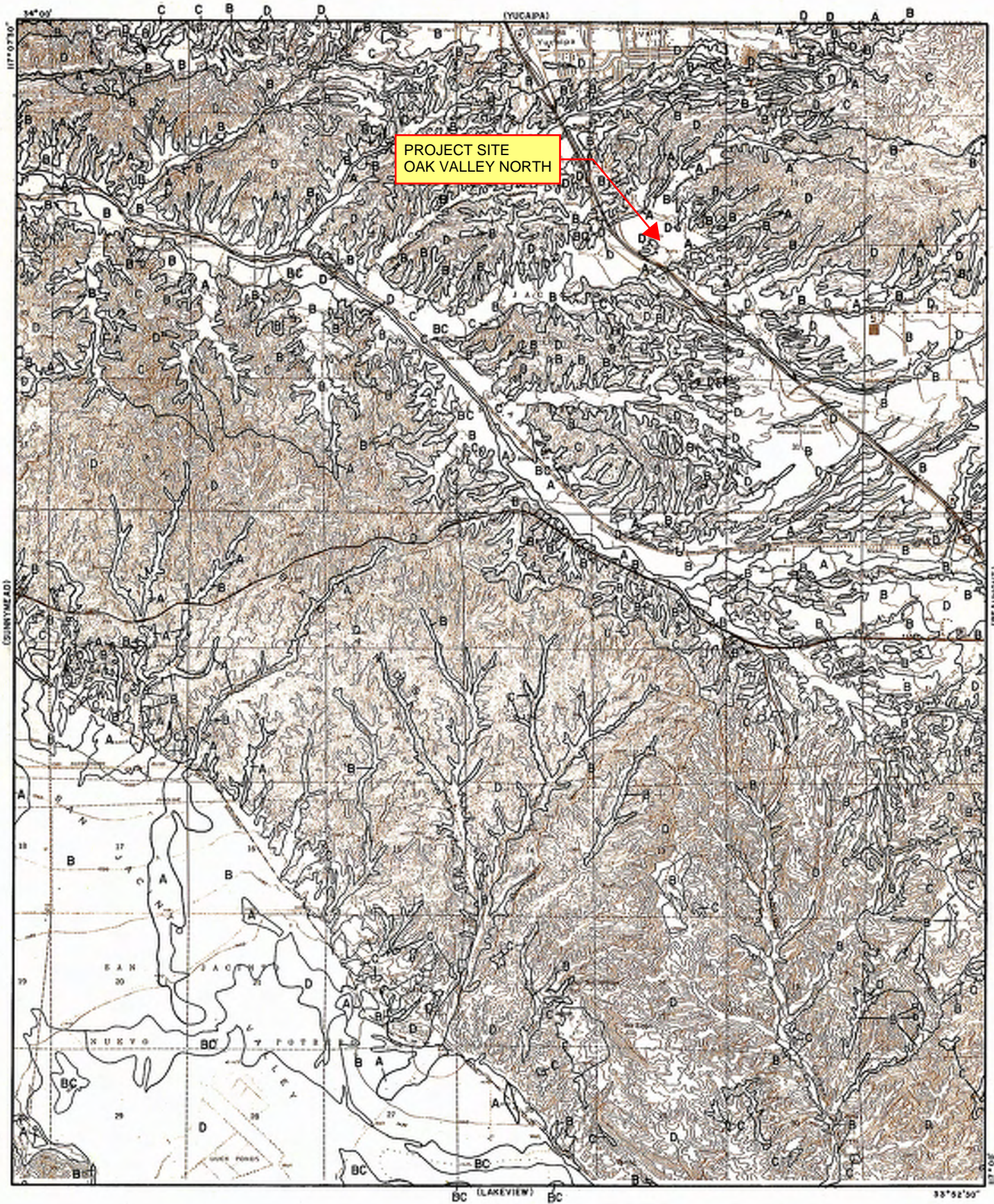
- The proposed drainage improvements will adequately convey flows to the existing culverts and provide flood protection for the 100-year storm event.
- The proposed underground detention chambers will adequately release flows such that they avoid hydromodification impacts and are consistent with the available capacity of the existing culverts.
- The proposed project will not impact flooding condition to upstream or downstream properties.

# APPENDIX A – HYDROLOGY ANALYSIS

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**HYDROLOGIC SOILS GROUP MAP (PLATE C-1.18 – EL CASCO)**

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**LEGEND**

- SOILS GROUP BOUNDARY
- A SOILS GROUP DESIGNATION

**RCFC & WCD**  
 Hydrology Manual



**HYDROLOGIC SOILS GROUP MAP  
 FOR  
 EL CASCO**

**STANDARD INTENSITY-DURATION CURVE DATA (PLATE D-4.1)**

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# RAINFALL INTENSITY - INCHES PER HOUR

ANZA			BANNING			REAUMONT			CALINESA			CANYON LAKE		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	4.23	6.85	5	3.32	4.93	5	3.32	4.93	5	3.57	5.30	5	3.07	4.61
6	3.80	6.16	6	3.02	4.47	6	3.02	4.47	6	3.23	4.79	6	2.81	4.23
7	3.48	5.63	7	2.78	4.12	7	2.78	4.12	7	2.97	4.40	7	2.61	3.93
8	3.22	5.21	8	2.59	3.84	8	2.59	3.84	8	2.76	4.09	8	2.45	3.68
9	3.01	4.87	9	2.43	3.61	9	2.43	3.61	9	2.58	3.83	9	2.31	3.48
10	2.83	4.58	10	2.30	3.41	10	2.30	3.41	10	2.44	3.62	10	2.20	3.31
11	2.67	4.33	11	2.19	3.24	11	2.19	3.24	11	2.31	3.43	11	2.10	3.16
12	2.54	4.12	12	2.09	3.10	12	2.09	3.10	12	2.21	3.27	12	2.01	3.03
13	2.43	3.93	13	2.00	2.97	13	2.00	2.97	13	2.11	3.13	13	1.94	2.92
14	2.33	3.77	14	1.92	2.85	14	1.92	2.85	14	2.03	3.01	14	1.87	2.82
15	2.23	3.62	15	1.86	2.75	15	1.86	2.75	15	1.95	2.89	15	1.81	2.72
16	2.15	3.49	16	1.79	2.66	16	1.79	2.66	16	1.88	2.79	16	1.75	2.64
17	2.08	3.37	17	1.74	2.58	17	1.74	2.58	17	1.82	2.70	17	1.70	2.56
18	2.01	3.26	18	1.68	2.50	18	1.68	2.50	18	1.76	2.62	18	1.66	2.50
19	1.95	3.16	19	1.64	2.43	19	1.64	2.43	19	1.71	2.54	19	1.62	2.43
20	1.89	3.06	20	1.59	2.36	20	1.59	2.36	20	1.67	2.47	20	1.58	2.37
22	1.79	2.90	22	1.51	2.25	22	1.51	2.25	22	1.58	2.34	22	1.51	2.27
24	1.70	2.76	24	1.45	2.15	24	1.45	2.15	24	1.51	2.23	24	1.44	2.17
26	1.62	2.63	26	1.39	2.06	26	1.39	2.06	26	1.44	2.14	26	1.39	2.09
28	1.56	2.52	28	1.33	1.98	28	1.33	1.98	28	1.38	2.05	28	1.34	2.02
30	1.49	2.42	30	1.29	1.91	30	1.29	1.91	30	1.33	1.98	30	1.30	1.95
32	1.44	2.33	32	1.24	1.84	32	1.24	1.84	32	1.29	1.91	32	1.26	1.89
34	1.39	2.25	34	1.20	1.78	34	1.20	1.78	34	1.24	1.85	34	1.22	1.84
36	1.34	2.18	36	1.17	1.73	36	1.17	1.73	36	1.21	1.79	36	1.19	1.79
38	1.30	2.11	38	1.13	1.68	38	1.13	1.68	38	1.17	1.74	38	1.16	1.74
40	1.27	2.05	40	1.10	1.64	40	1.10	1.64	40	1.14	1.69	40	1.13	1.70
45	1.18	1.91	45	1.04	1.54	45	1.04	1.54	45	1.07	1.58	45	1.07	1.61
50	1.11	1.80	50	.98	1.45	50	.98	1.45	50	1.01	1.49	50	1.02	1.53
55	1.05	1.70	55	.93	1.38	55	.93	1.38	55	.95	1.42	55	.97	1.46
60	1.00	1.62	60	.89	1.32	60	.89	1.32	60	.91	1.35	60	.93	1.40
65	.95	1.55	65	.85	1.27	65	.85	1.27	65	.87	1.29	65	.89	1.35
70	.91	1.48	70	.82	1.22	70	.82	1.22	70	.84	1.24	70	.86	1.30
75	.88	1.42	75	.79	1.17	75	.79	1.17	75	.80	1.19	75	.84	1.26
80	.85	1.37	80	.76	1.13	80	.76	1.13	80	.78	1.15	80	.81	1.22
85	.82	1.32	85	.74	1.10	85	.74	1.10	85	.75	1.11	85	.79	1.18

SLOPE = .580

SLOPE = .530

SLOPE = .530

SLOPE = .550

SLOPE = .480

**RCFC & WCD**  
HYDROLOGY MANUAL

STANDARD  
INTENSITY - DURATION  
CURVES DATA

**10-YEAR ONSITE HYDROLOGY (RATIONAL METHOD)**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1  
Rational Hydrology Study Date: 06/14/23 File:B200.out

-----  
OAK VALLEY NORTH - BUILDING 2  
10-YEAR STORM EVENT B200 SERIES  
22-0085 DEVELOPED CONDITION  
2023-06-14 AV  
-----

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file  
-----

Program License Serial Number 4010  
-----

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Calimesa ] area used.

10 year storm 10 minute intensity = 2.440(In/Hr)

10 year storm 60 minute intensity = 0.910(In/Hr)

100 year storm 10 minute intensity = 3.620(In/Hr)

100 year storm 60 minute intensity = 1.350(In/Hr)

Storm event year = 10.0

Calculated rainfall intensity data:

1 hour intensity = 0.910(In/Hr)

Slope of intensity duration curve = 0.5500

+++++  
Process from Point/Station 201.000 to Point/Station 202.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 360.000(Ft.)

Top (of initial area) elevation = 2305.900(Ft.)

Bottom (of initial area) elevation = 2298.200(Ft.)

Difference in elevation = 7.700(Ft.)

Slope = 0.02139 s(percent)= 2.14

TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 6.817 min.

Rainfall intensity = 3.010(In/Hr) for a 10.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.881

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.700

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.300



RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 7.421(CFS)  
Total initial stream area = 2.800(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 202.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2293.200(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 7.421(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 7.421(CFS)  
Normal flow depth in pipe = 6.81(In.)  
Flow top width inside pipe = 7.73(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 20.71(Ft/s)  
Travel time through pipe = 0.03 min.  
Time of concentration (TC) = 6.85 min.

\*\*\*\*\*  
Process from Point/Station 202.000 to Point/Station 203.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.800(Ac.)  
Runoff from this stream = 7.421(CFS)  
Time of concentration = 6.85 min.  
Rainfall intensity = 3.002(In/Hr)

\*\*\*\*\*  
Process from Point/Station 204.000 to Point/Station 205.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 350.000(Ft.)  
Top (of initial area) elevation = 2304.300(Ft.)  
Bottom (of initial area) elevation = 2296.700(Ft.)  
Difference in elevation = 7.600(Ft.)  
Slope = 0.02171 s(percent) = 2.17  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.720 min.  
Rainfall intensity = 3.034(In/Hr) for a 10.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.881  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 6.679(CFS)  
Total initial stream area = 2.500(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 205.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2291.700(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 45.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 6.679(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 6.679(CFS)  
Normal flow depth in pipe = 7.05(In.)  
Flow top width inside pipe = 7.41(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 17.98(Ft/s)  
Travel time through pipe = 0.04 min.  
Time of concentration (TC) = 6.76 min.

\*\*\*\*\*  
Process from Point/Station 205.000 to Point/Station 203.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 2.500(Ac.)  
Runoff from this stream = 6.679(CFS)  
Time of concentration = 6.76 min.  
Rainfall intensity = 3.023(In/Hr)

\*\*\*\*\*  
Process from Point/Station 206.000 to Point/Station 207.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 410.000(Ft.)  
Top (of initial area) elevation = 2295.000(Ft.)  
Bottom (of initial area) elevation = 2290.100(Ft.)  
Difference in elevation = 4.900(Ft.)  
Slope = 0.01195 s(percent) = 1.20  
TC =  $k(0.300) * [(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 8.068 min.  
Rainfall intensity = 2.744(In/Hr) for a 10.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.879  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 4.342(CFS)  
Total initial stream area = 1.800(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 207.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2285.100(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 275.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 4.342(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 4.342(CFS)  
 Normal flow depth in pipe = 11.58(In.)  
 Flow top width inside pipe = 12.59(In.)  
 Critical Depth = 10.14(In.)  
 Pipe flow velocity = 4.27(Ft/s)  
 Travel time through pipe = 1.07 min.  
 Time of concentration (TC) = 9.14 min.

\*\*\*\*\*  
 Process from Point/Station 207.000 to Point/Station 203.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 1 in normal stream number 3  
 Stream flow area = 1.800(Ac.)  
 Runoff from this stream = 4.342(CFS)  
 Time of concentration = 9.14 min.  
 Rainfall intensity = 2.561(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.421	6.85	3.002
2	6.679	6.76	3.023
3	4.342	9.14	2.561

Largest stream flow has longer or shorter time of concentration  
 $Q_p = 7.421 + \text{sum of}$   
 $Q_b \quad I_a/I_b$   
 $6.679 * 0.993 = 6.632$   
 $Q_a \quad T_b/T_a$   
 $4.342 * 0.749 = 3.253$   
 $Q_p = 17.307$

Total of 3 streams to confluence:  
 Flow rates before confluence point:  
 7.421      6.679      4.342  
 Area of streams before confluence:  
 2.800      2.500      1.800  
 Results of confluence:  
 Total flow rate = 17.307(CFS)  
 Time of concentration = 6.849 min.  
 Effective stream area after confluence = 7.100(Ac.)

\*\*\*\*\*  
 Process from Point/Station 203.000 to Point/Station 208.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 2283.700(Ft.)  
 Downstream point/station elevation = 2278.400(Ft.)  
 Pipe length = 55.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 17.307(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 17.307(CFS)  
 Normal flow depth in pipe = 10.76(In.)  
 Flow top width inside pipe = 13.51(In.)  
 Critical depth could not be calculated.

Pipe flow velocity = 18.39(Ft/s)  
Travel time through pipe = 0.05 min.  
Time of concentration (TC) = 6.90 min.  
End of computations, total study area = 7.10 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged RI index number = 61.7

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1  
Rational Hydrology Study Date: 06/14/23 File:B250.out

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OAK VALLEY NORTH - BUILDING 2  
10-YEAR STORM EVENT B250 SERIES  
22-0085 DEVELOPED CONDITION  
2023-06-14 AV  
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\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file  
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Program License Serial Number 4010  
-----

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Calimesa ] area used.

10 year storm 10 minute intensity = 2.440(In/Hr)

10 year storm 60 minute intensity = 0.910(In/Hr)

100 year storm 10 minute intensity = 3.620(In/Hr)

100 year storm 60 minute intensity = 1.350(In/Hr)

Storm event year = 10.0

Calculated rainfall intensity data:

1 hour intensity = 0.910(In/Hr)

Slope of intensity duration curve = 0.5500

+++++  
Process from Point/Station 251.000 to Point/Station 252.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
Initial area flow distance = 355.000(Ft.)

Top (of initial area) elevation = 2305.900(Ft.)

Bottom (of initial area) elevation = 2298.300(Ft.)

Difference in elevation = 7.600(Ft.)

Slope = 0.02141 s(percent)= 2.14

TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 6.778 min.

Rainfall intensity = 3.019(In/Hr) for a 10.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.881

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.700

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.300

RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 7.179(CFS)  
Total initial stream area = 2.700(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 252.000 to Point/Station 253.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2293.300(Ft.)  
Downstream point/station elevation = 2285.700(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 7.179(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 7.179(CFS)  
Normal flow depth in pipe = 7.34(In.)  
Flow top width inside pipe = 6.99(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 18.61(Ft/s)  
Travel time through pipe = 0.04 min.  
Time of concentration (TC) = 6.81 min.

\*\*\*\*\*  
Process from Point/Station 252.000 to Point/Station 253.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.700(Ac.)  
Runoff from this stream = 7.179(CFS)  
Time of concentration = 6.81 min.  
Rainfall intensity = 3.011(In/Hr)

\*\*\*\*\*  
Process from Point/Station 254.000 to Point/Station 255.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 355.000(Ft.)  
Top (of initial area) elevation = 2304.400(Ft.)  
Bottom (of initial area) elevation = 2296.700(Ft.)  
Difference in elevation = 7.700(Ft.)  
Slope = 0.02169 s(percent)= 2.17  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.760 min.  
Rainfall intensity = 3.024(In/Hr) for a 10.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.881  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 6.657(CFS)  
Total initial stream area = 2.500(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
 Process from Point/Station 255.000 to Point/Station 253.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2291.700(Ft.)  
 Downstream point/station elevation = 2285.700(Ft.)  
 Pipe length = 40.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 6.657(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 6.657(CFS)  
 Normal flow depth in pipe = 5.88(In.)  
 Flow top width inside pipe = 12.00(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 17.41(Ft/s)  
 Travel time through pipe = 0.04 min.  
 Time of concentration (TC) = 6.80 min.

\*\*\*\*\*  
 Process from Point/Station 255.000 to Point/Station 253.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 2.500(Ac.)  
 Runoff from this stream = 6.657(CFS)  
 Time of concentration = 6.80 min.  
 Rainfall intensity = 3.014(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	7.179	6.81	3.011
2	6.657	6.80	3.014

Largest stream flow has longer time of concentration

Qp = 7.179 + sum of  
 Qb Ia/Ib  
 6.657 \* 0.999 = 6.649  
 Qp = 13.828

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 7.179 6.657

Area of streams before confluence:  
 2.700 2.500

Results of confluence:

Total flow rate = 13.828(CFS)  
 Time of concentration = 6.814 min.  
 Effective stream area after confluence = 5.200(Ac.)

\*\*\*\*\*  
 Process from Point/Station 253.000 to Point/Station 256.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2285.700(Ft.)  
 Downstream point/station elevation = 2274.700(Ft.)  
 Pipe length = 730.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 13.828(CFS)  
 Nearest computed pipe diameter = 21.00(In.)

Calculated individual pipe flow = 13.828(CFS)  
Normal flow depth in pipe = 13.08(In.)  
Flow top width inside pipe = 20.36(In.)  
Critical Depth = 16.59(In.)  
Pipe flow velocity = 8.78(Ft/s)  
Travel time through pipe = 1.39 min.  
Time of concentration (TC) = 8.20 min.  
End of computations, total study area = 5.20 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged RI index number = 61.7



**100-YEAR ONSITE HYDROLOGY (RATIONAL METHOD)**

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1  
Rational Hydrology Study Date: 06/14/23 File:B200.out

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OAK VALLEY NORTH - BUILDING 2  
100-YEAR STORM EVENT B200 SERIES  
22-0085 DEVELOPED CONDITION  
2023-06-14 AV  
-----

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file  
-----

Program License Serial Number 4010  
-----

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Calimesa ] area used.

10 year storm 10 minute intensity = 2.440(In/Hr)

10 year storm 60 minute intensity = 0.910(In/Hr)

100 year storm 10 minute intensity = 3.620(In/Hr)

100 year storm 60 minute intensity = 1.350(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.350(In/Hr)

Slope of intensity duration curve = 0.5500

+++++  
Process from Point/Station 201.000 to Point/Station 202.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 360.000(Ft.)

Top (of initial area) elevation = 2305.900(Ft.)

Bottom (of initial area) elevation = 2298.200(Ft.)

Difference in elevation = 7.700(Ft.)

Slope = 0.02139 s(percent)= 2.14

TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 6.817 min.

Rainfall intensity = 4.465(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.886

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.700

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.300

RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 11.076(CFS)  
Total initial stream area = 2.800(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 202.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2293.200(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 11.076(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 11.076(CFS)  
Normal flow depth in pipe = 6.96(In.)  
Flow top width inside pipe = 11.85(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 23.43(Ft/s)  
Travel time through pipe = 0.03 min.  
Time of concentration (TC) = 6.85 min.

\*\*\*\*\*  
Process from Point/Station 202.000 to Point/Station 203.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.800(Ac.)  
Runoff from this stream = 11.076(CFS)  
Time of concentration = 6.85 min.  
Rainfall intensity = 4.455(In/Hr)

\*\*\*\*\*  
Process from Point/Station 204.000 to Point/Station 205.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 350.000(Ft.)  
Top (of initial area) elevation = 2304.300(Ft.)  
Bottom (of initial area) elevation = 2296.700(Ft.)  
Difference in elevation = 7.600(Ft.)  
Slope = 0.02171 s(percent) = 2.17  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.720 min.  
Rainfall intensity = 4.500(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.886  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 9.969(CFS)  
Total initial stream area = 2.500(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 205.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2291.700(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 45.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 9.969(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 9.969(CFS)  
Normal flow depth in pipe = 7.14(In.)  
Flow top width inside pipe = 11.78(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 20.46(Ft/s)  
Travel time through pipe = 0.04 min.  
Time of concentration (TC) = 6.76 min.

\*\*\*\*\*  
Process from Point/Station 205.000 to Point/Station 203.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 2.500(Ac.)  
Runoff from this stream = 9.969(CFS)  
Time of concentration = 6.76 min.  
Rainfall intensity = 4.487(In/Hr)

\*\*\*\*\*  
Process from Point/Station 206.000 to Point/Station 207.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 410.000(Ft.)  
Top (of initial area) elevation = 2295.000(Ft.)  
Bottom (of initial area) elevation = 2290.100(Ft.)  
Difference in elevation = 4.900(Ft.)  
Slope = 0.01195 s(percent) = 1.20  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 8.068 min.  
Rainfall intensity = 4.070(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 6.482(CFS)  
Total initial stream area = 1.800(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 207.000 to Point/Station 203.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2285.100(Ft.)  
Downstream point/station elevation = 2283.700(Ft.)  
Pipe length = 275.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 6.482(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 6.482(CFS)  
 Normal flow depth in pipe = 12.91(In.)  
 Flow top width inside pipe = 16.21(In.)  
 Critical Depth = 11.81(In.)  
 Pipe flow velocity = 4.77(Ft/s)  
 Travel time through pipe = 0.96 min.  
 Time of concentration (TC) = 9.03 min.

\*\*\*\*\*  
 Process from Point/Station 207.000 to Point/Station 203.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 1 in normal stream number 3  
 Stream flow area = 1.800(Ac.)  
 Runoff from this stream = 6.482(CFS)  
 Time of concentration = 9.03 min.  
 Rainfall intensity = 3.826(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.076	6.85	4.455
2	9.969	6.76	4.487
3	6.482	9.03	3.826

Largest stream flow has longer or shorter time of concentration  
 $Q_p = 11.076 + \text{sum of}$   
 $Q_b \quad I_a/I_b$   
 $9.969 * 0.993 = 9.897$   
 $Q_a \quad T_b/T_a$   
 $6.482 * 0.758 = 4.915$   
 $Q_p = 25.889$

Total of 3 streams to confluence:  
 Flow rates before confluence point:  
 11.076      9.969      6.482  
 Area of streams before confluence:  
 2.800      2.500      1.800  
 Results of confluence:  
 Total flow rate = 25.889(CFS)  
 Time of concentration = 6.846 min.  
 Effective stream area after confluence = 7.100(Ac.)

\*\*\*\*\*  
 Process from Point/Station 203.000 to Point/Station 208.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 2283.700(Ft.)  
 Downstream point/station elevation = 2278.400(Ft.)  
 Pipe length = 55.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 25.889(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 25.889(CFS)  
 Normal flow depth in pipe = 12.12(In.)  
 Flow top width inside pipe = 16.89(In.)  
 Critical depth could not be calculated.

Pipe flow velocity = 20.47(Ft/s)  
Travel time through pipe = 0.04 min.  
Time of concentration (TC) = 6.89 min.  
End of computations, total study area = 7.10 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged RI index number = 61.7

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1  
Rational Hydrology Study Date: 06/08/23 File:B250.out

-----  
OAK VALLEY NORTH - BUILDING 2  
100-YEAR STORM EVENT B250 SERIES  
22-0085 DEVELOPED CONDITION  
2023-06-08 AV  
-----

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file  
-----

Program License Serial Number 4010  
-----

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Calimesa ] area used.

10 year storm 10 minute intensity = 2.440(In/Hr)

10 year storm 60 minute intensity = 0.910(In/Hr)

100 year storm 10 minute intensity = 3.620(In/Hr)

100 year storm 60 minute intensity = 1.350(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.350(In/Hr)

Slope of intensity duration curve = 0.5500

+++++  
Process from Point/Station 251.000 to Point/Station 252.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
Initial area flow distance = 355.000(Ft.)

Top (of initial area) elevation = 2305.900(Ft.)

Bottom (of initial area) elevation = 2298.300(Ft.)

Difference in elevation = 7.600(Ft.)

Slope = 0.02141 s(percent)= 2.14

TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 6.778 min.

Rainfall intensity = 4.479(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.886

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.700

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.300

RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 10.715(CFS)  
Total initial stream area = 2.700(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 252.000 to Point/Station 253.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2293.300(Ft.)  
Downstream point/station elevation = 2285.700(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 10.715(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 10.715(CFS)  
Normal flow depth in pipe = 7.32(In.)  
Flow top width inside pipe = 11.70(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 21.33(Ft/s)  
Travel time through pipe = 0.03 min.  
Time of concentration (TC) = 6.81 min.

++++  
Process from Point/Station 252.000 to Point/Station 253.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.700(Ac.)  
Runoff from this stream = 10.715(CFS)  
Time of concentration = 6.81 min.  
Rainfall intensity = 4.468(In/Hr)

++++  
Process from Point/Station 254.000 to Point/Station 255.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 355.000(Ft.)  
Top (of initial area) elevation = 2304.400(Ft.)  
Bottom (of initial area) elevation = 2296.700(Ft.)  
Difference in elevation = 7.700(Ft.)  
Slope = 0.02169 s(percent) = 2.17  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.760 min.  
Rainfall intensity = 4.486(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.886  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.700  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.300  
RI index for soil(AMC 2) = 61.70  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 9.936(CFS)  
Total initial stream area = 2.500(Ac.)  
Pervious area fraction = 0.100



\*\*\*\*\*  
 Process from Point/Station 255.000 to Point/Station 253.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 2291.700(Ft.)  
 Downstream point/station elevation = 2285.700(Ft.)  
 Pipe length = 40.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 9.936(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 9.936(CFS)  
 Normal flow depth in pipe = 7.54(In.)  
 Flow top width inside pipe = 11.60(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 19.12(Ft/s)  
 Travel time through pipe = 0.03 min.  
 Time of concentration (TC) = 6.80 min.

\*\*\*\*\*  
 Process from Point/Station 255.000 to Point/Station 253.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 2.500(Ac.)  
 Runoff from this stream = 9.936(CFS)  
 Time of concentration = 6.80 min.  
 Rainfall intensity = 4.473(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	10.715	6.81	4.468
2	9.936	6.80	4.473

Largest stream flow has longer time of concentration

Qp = 10.715 + sum of  

$$Q_b \cdot \frac{I_a/I_b}{0.999} = 9.924$$
  
 Qp = 20.640

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 10.715 9.936

Area of streams before confluence:  
 2.700 2.500

Results of confluence:  
 Total flow rate = 20.640(CFS)  
 Time of concentration = 6.809 min.  
 Effective stream area after confluence = 5.200(Ac.)

\*\*\*\*\*  
 Process from Point/Station 253.000 to Point/Station 256.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

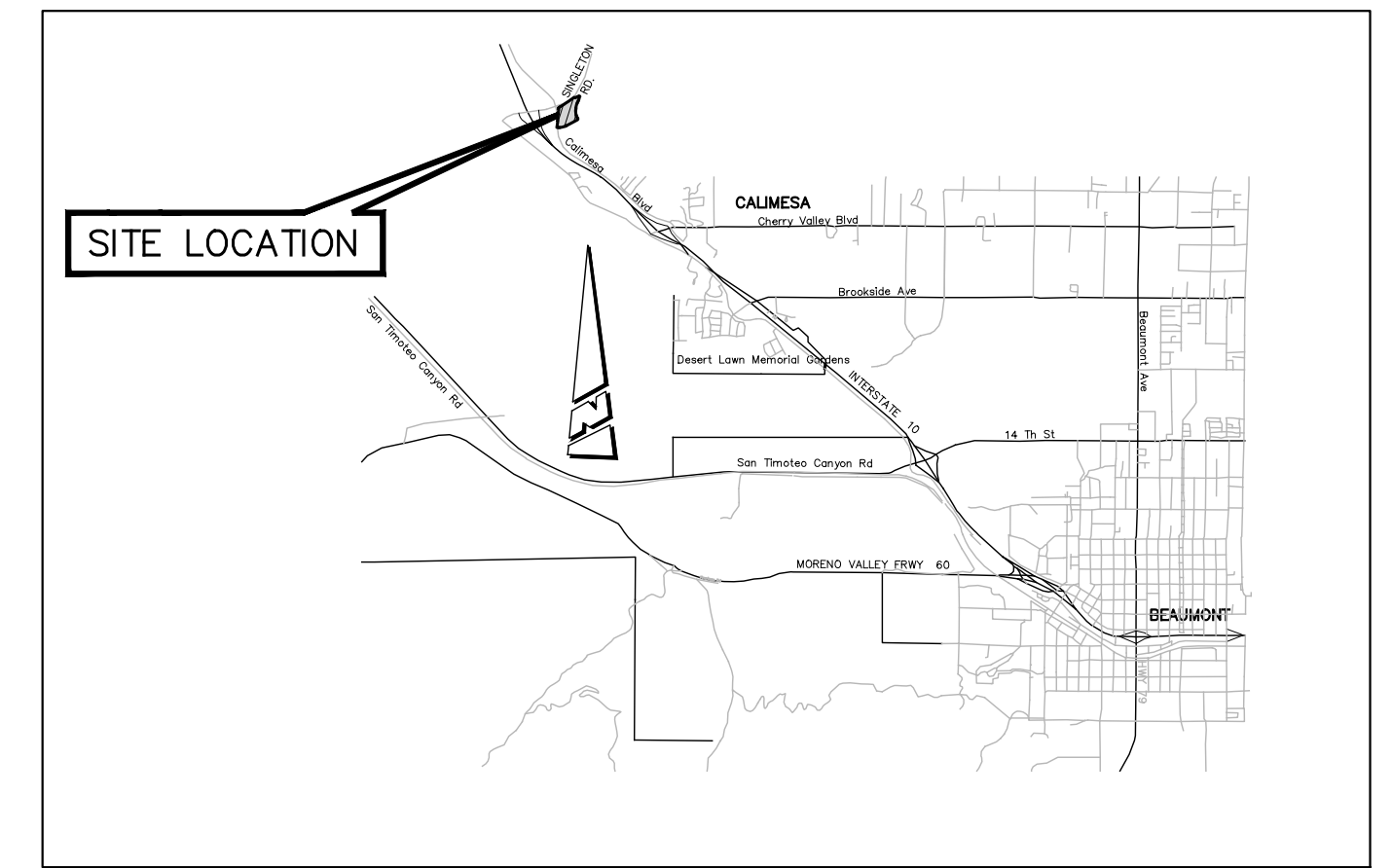
Upstream point/station elevation = 2285.700(Ft.)  
 Downstream point/station elevation = 2274.700(Ft.)  
 Pipe length = 730.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 20.640(CFS)  
 Nearest computed pipe diameter = 24.00(In.)

Calculated individual pipe flow = 20.640(CFS)  
Normal flow depth in pipe = 15.41(In.)  
Flow top width inside pipe = 23.01(In.)  
Critical Depth = 19.56(In.)  
Pipe flow velocity = 9.68(Ft/s)  
Travel time through pipe = 1.26 min.  
Time of concentration (TC) = 8.07 min.  
End of computations, total study area = 5.20 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

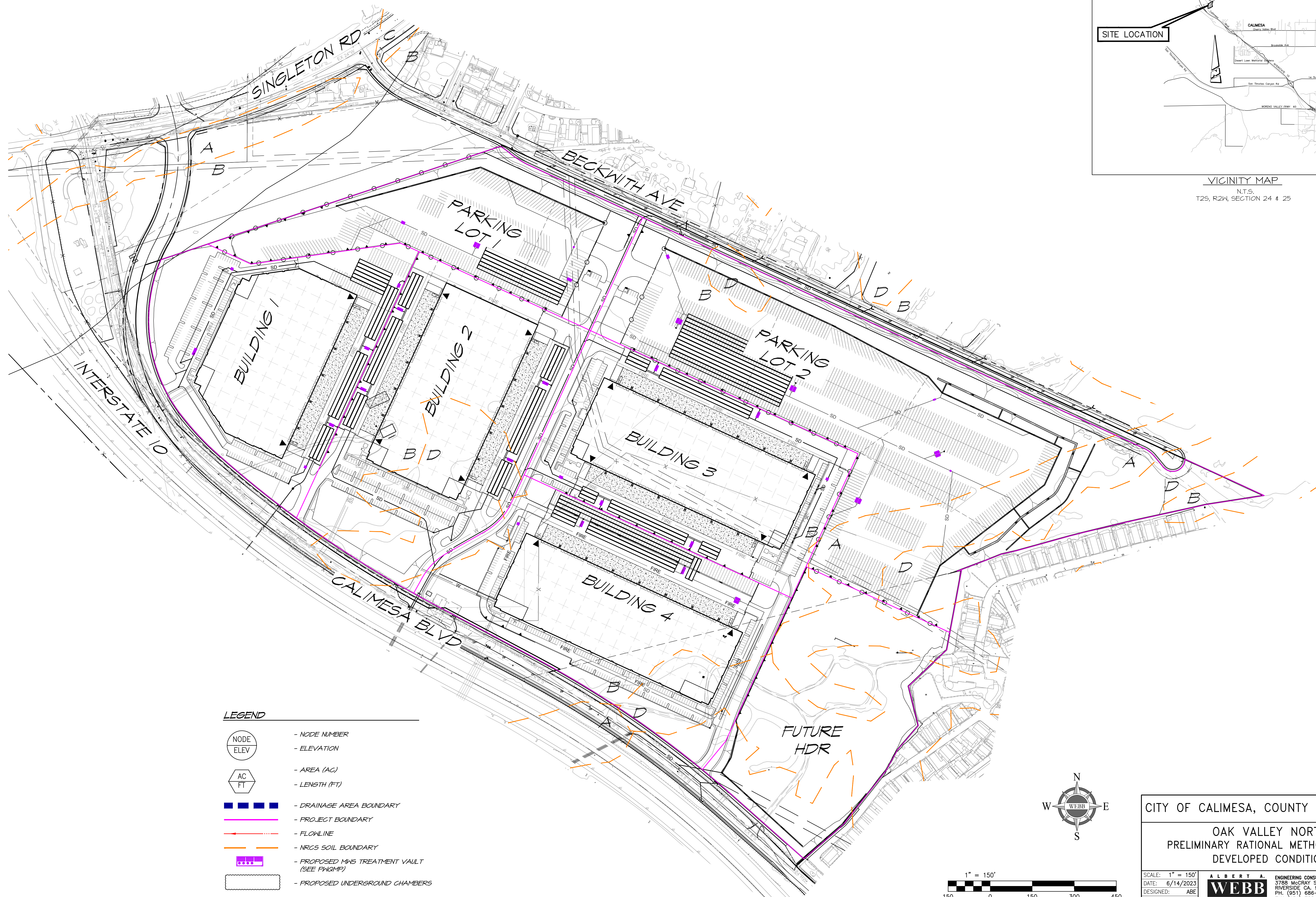
Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged RI index number = 61.7

**RATIONAL METHOD HYDROLOGY MAPS**

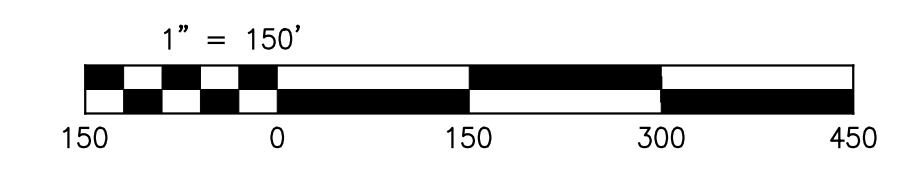
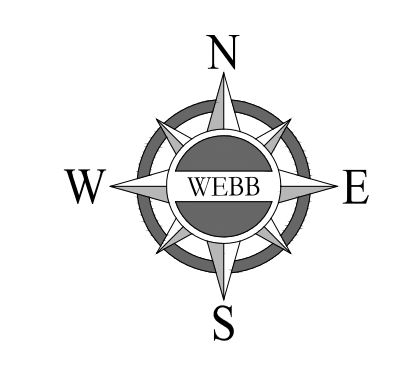
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VICINITY MAP  
N.T.S.  
T2S, R2W, SECTION 24 & 25



- LEGEND**
- NODE NUMBER
  - ELEVATION
  - AREA (AC)
  - LENGTH (FT)
  - DRAINAGE AREA BOUNDARY
  - PROJECT BOUNDARY
  - FLOWLINE
  - NRCS SOIL BOUNDARY
  - PROPOSED MMS TREATMENT VAULT (SEE PWQMP)
  - PROPOSED UNDERGROUND CHAMBERS

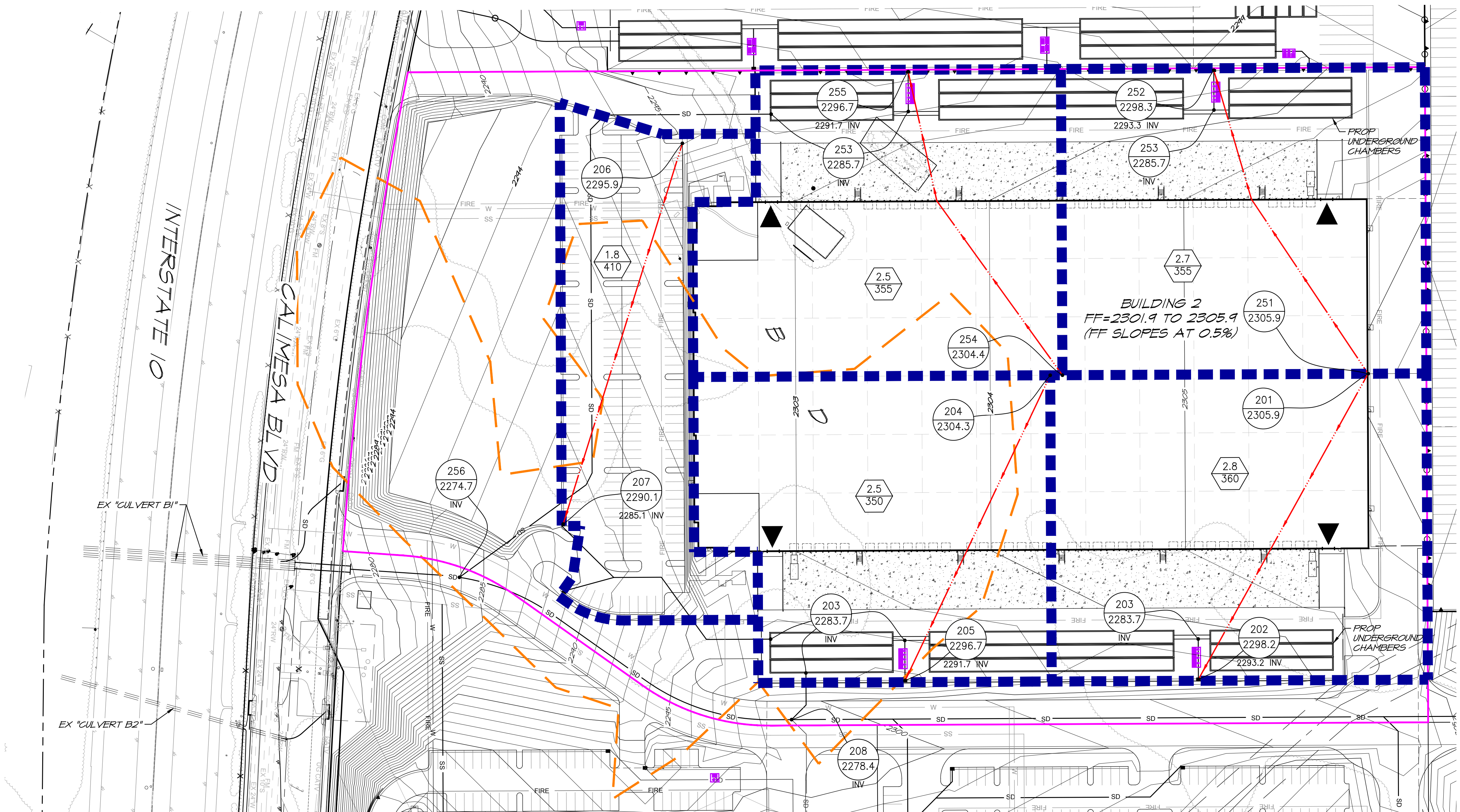


CITY OF CALIMESA, COUNTY OF RIVERSIDE  
OAK VALLEY NORTH  
PRELIMINARY RATIONAL METHOD EXHIBIT  
DEVELOPED CONDITION

SCALE: 1" = 150'	ALBERT A. ENGINEERING CONSULTANTS	W.O. 2022-0085
DATE: 6/14/2023	3785 MCGRAY STREET	SHEET 1
DESIGNED: ABE	RIVERSIDE CA 92506	OF 2 SHEETS
CHECKED: SKK	PH. (951) 686-1070	DWG. NO.
PLN CK REF:	FAX (951) 788-1256	
F.B.		

PRELIMINARY

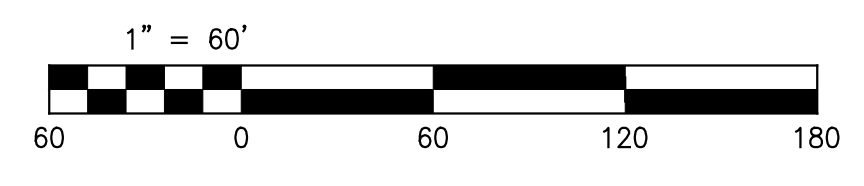
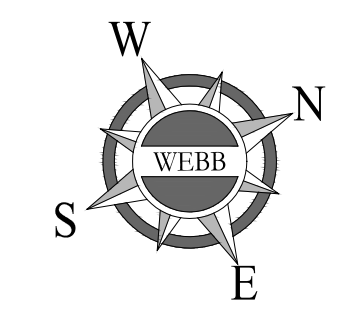
H:\2022\22-0085\DRAINAGE\HYD\DWG FOLDER\22-0085-C-PHYD-RAT.DWG 6/14/2023 4:30:26 PM Adgrom



**LEGEND**

	- NODE NUMBER
	- ELEVATION
	- AREA (AC)
	- LENGTH (FT)
	- DRAINAGE AREA BOUNDARY
	- PROJECT BOUNDARY
	- FLOWLINE
	- NRCS SOIL BOUNDARY
	- PROPOSED MWS TREATMENT VAULT (SEE PWQMP)
	- PROPOSED UNDERGROUND CHAMBERS

**NOTES:**  
 1. NODES 203 & 253 MODELED AT ALL CHAMBER INLETS AT A CONSISTENT ELEVATION OF 2293.7 & 2295.7  
 2. SOIL TYPE IS 10% TYPE B AND 30% TYPE D.



CITY OF CALIMESA, COUNTY OF RIVERSIDE  
 OAK VALLEY NORTH – BUILDING 2  
 PRELIMINARY RATIONAL METHOD EXHIBIT  
 DEVELOPED CONDITION

SCALE: 1" = 60'	ALBERT A. WEBB ASSOCIATES	ENGINEERING CONSULTANTS 3785 MCGRAY STREET RIVERSIDE CA 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 2022-0085
DATE: 6/14/2023	DESIGNED: ABE	CHECKED: SKK	SHEET 2
PLN CK REF:			OF 2 SHEETS
F.B.			DWG. NO.

PRELIMINARY

H:\2022\22-0085\DRAINAGE\HYD\DWG FOLDER\22-0085-C-PHYD-RAT.DWG 6/14/2023 4:30:26 PM Aditya

## **APPENDIX B – HYDRAULIC ANALYSIS**

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*Hydraulic calculations to be provided in Final Engineering.*

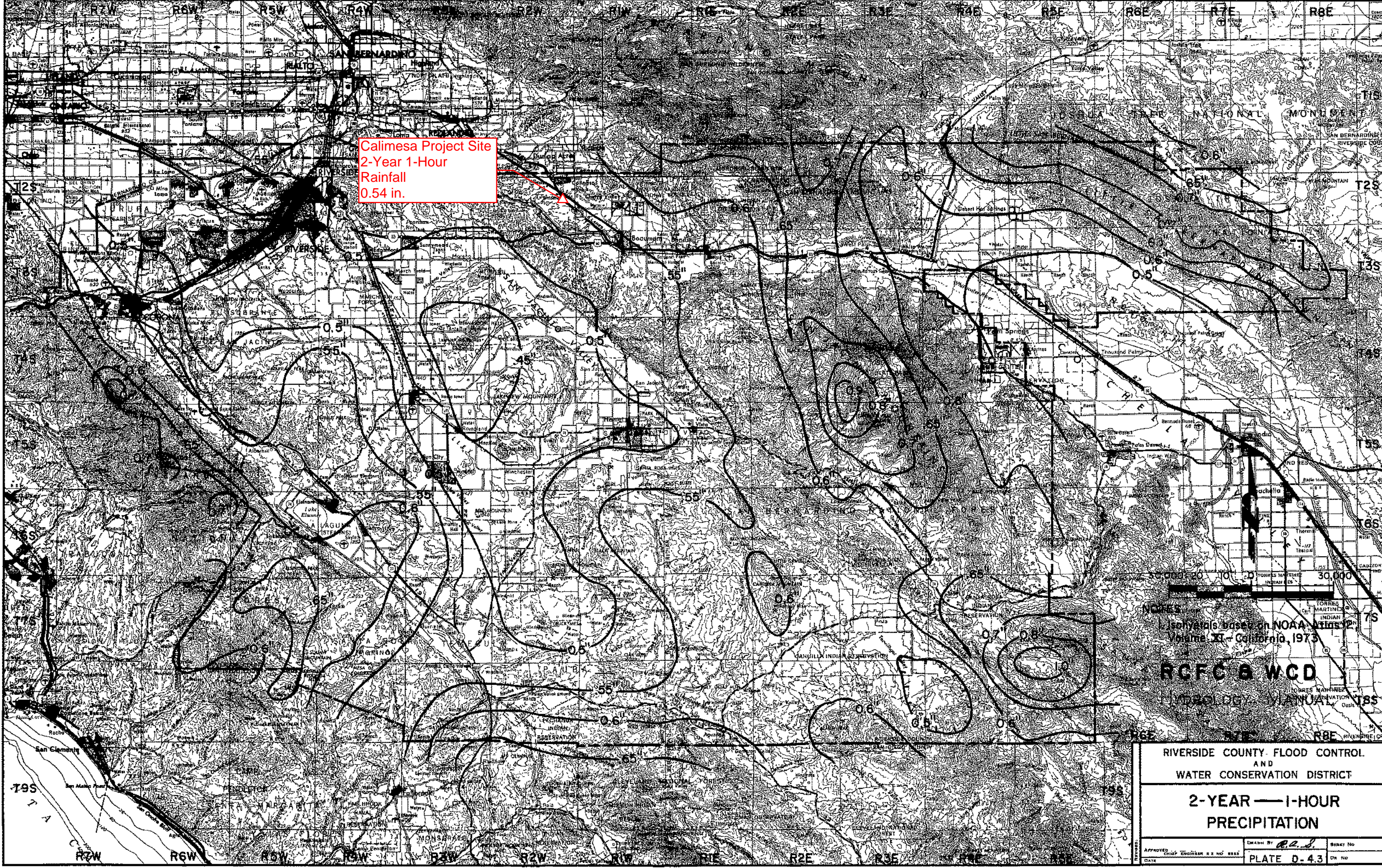
## **APPENDIX C – UNIT HYDROGRAPH ANALYSIS**

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**ISOHYETALS**

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Calimesa Project Site  
2-Year 1-Hour  
Rainfall  
0.54 in.

Isobets based on NOAA Atlas 14  
Volume XI - California, 1973

RCFC & WCD  
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR  
PRECIPITATION

APPROVED: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DRAWN BY: *B.L.* SHEET NO: \_\_\_\_\_  
PLATE D-43 ON NO: \_\_\_\_\_

Calimesa Project Site  
2-Year 3-Hour Rainfall  
0.95 in.

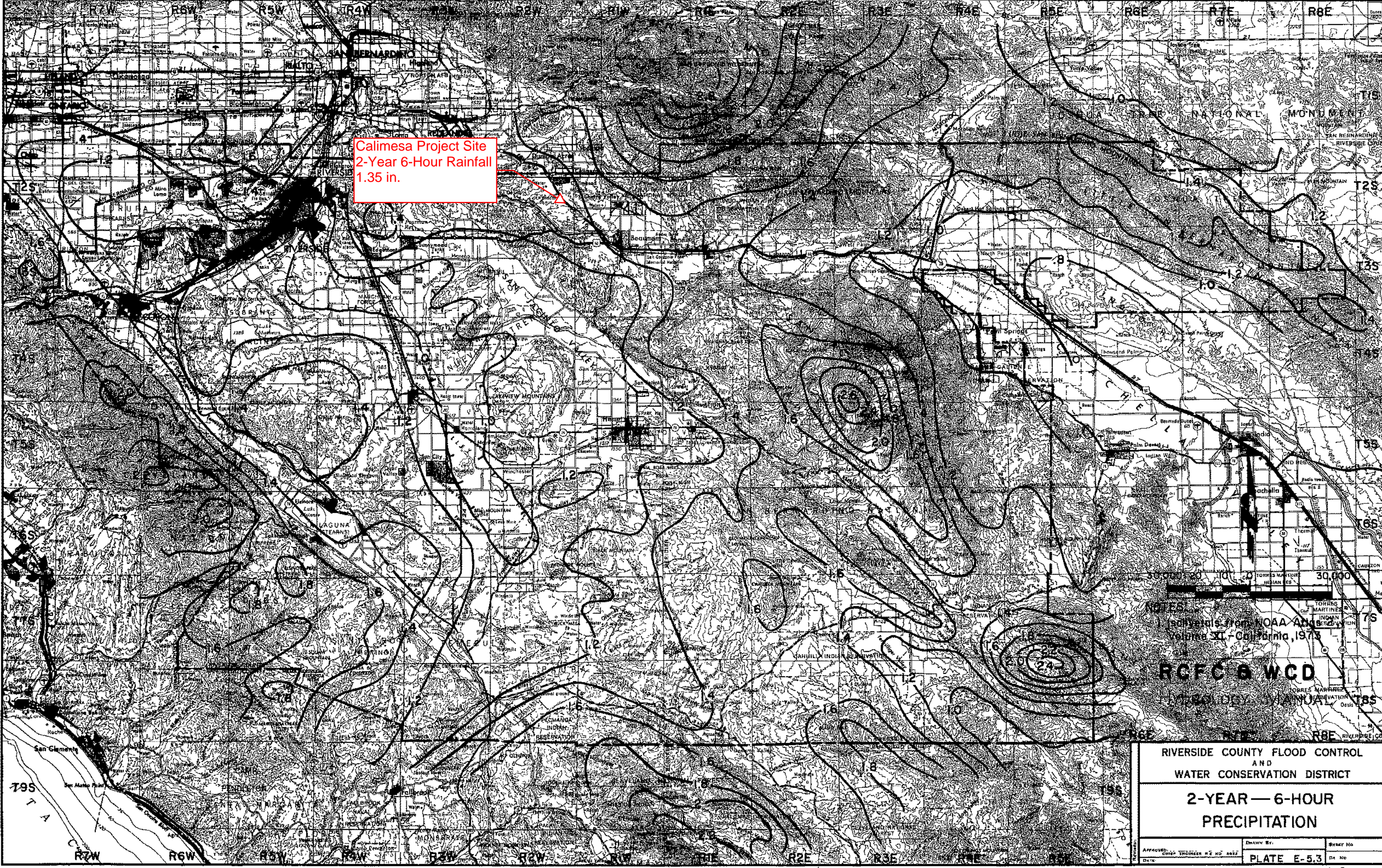
Isopleths based on NOAA Atlas  
Volume XI - California, 1973

RCFC & WCD

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT

2-YEAR — 3-HOUR  
PRECIPITATION

APPROVED CHIEF ENGINEER R.E. MOSE	DRAWN BY R.A.S.	SHEET NO.
DATE	PLATE E-5.1	OF NO.



Calimesa Project Site  
2-Year 6-Hour Rainfall  
1.35 in.

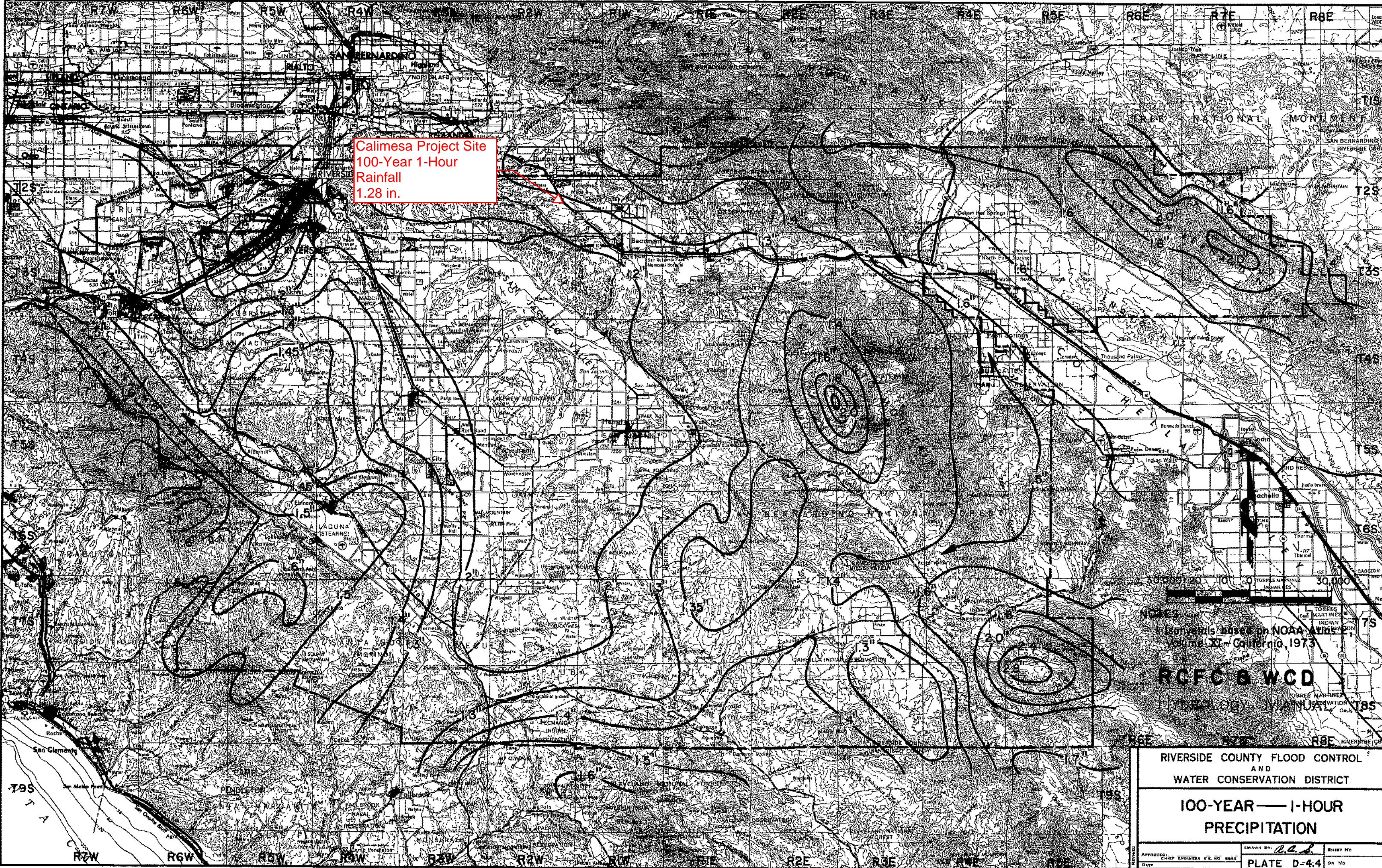
Isopleths from NOAA Atlas  
Volume XI - California, 1973  
**RCFC & WCD**  
RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT  
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT		
2-YEAR — 6-HOUR PRECIPITATION		
APPROVED: DATE:	DRAWN BY: DATE:	SHEET NO. DA NO.
PLATE E-5.3		

Calimesa Project Site  
2-Year 24-Hour  
Rainfall  
2.4 in.

Isopleths from NOAA Atlas  
Volume XI - California, 1973.  
RCFC & WCD  
HYDROLOGY DIVISION

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT		
2-YEAR — 24-HOUR PRECIPITATION		
APPROVED CHIEF ENGINEER R.L. NO. 8822 DATE	DRAWN BY P.O.S. PLATE E-5.5	SHEET NO. DATE



Calimesa Project Site  
100-Year 1-Hour  
Rainfall  
1.28 in.



Contours based on NOAA Atlas  
Volume XX - California, 1973

RCFC & WCD  
RIVERSIDE COUNTY WATER CONSERVATION DISTRICT

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT

100-YEAR — 1-HOUR  
PRECIPITATION

APPROVED: CHIEF ENGINEER R.C. NO. 8841  
DRAWN BY: *R.C.L.*  
SHEET NO.  
PLATE D-4.4 ON NO.

Calimesa Project Site  
100-Year 3-Hour  
Rainfall  
2.0 in.

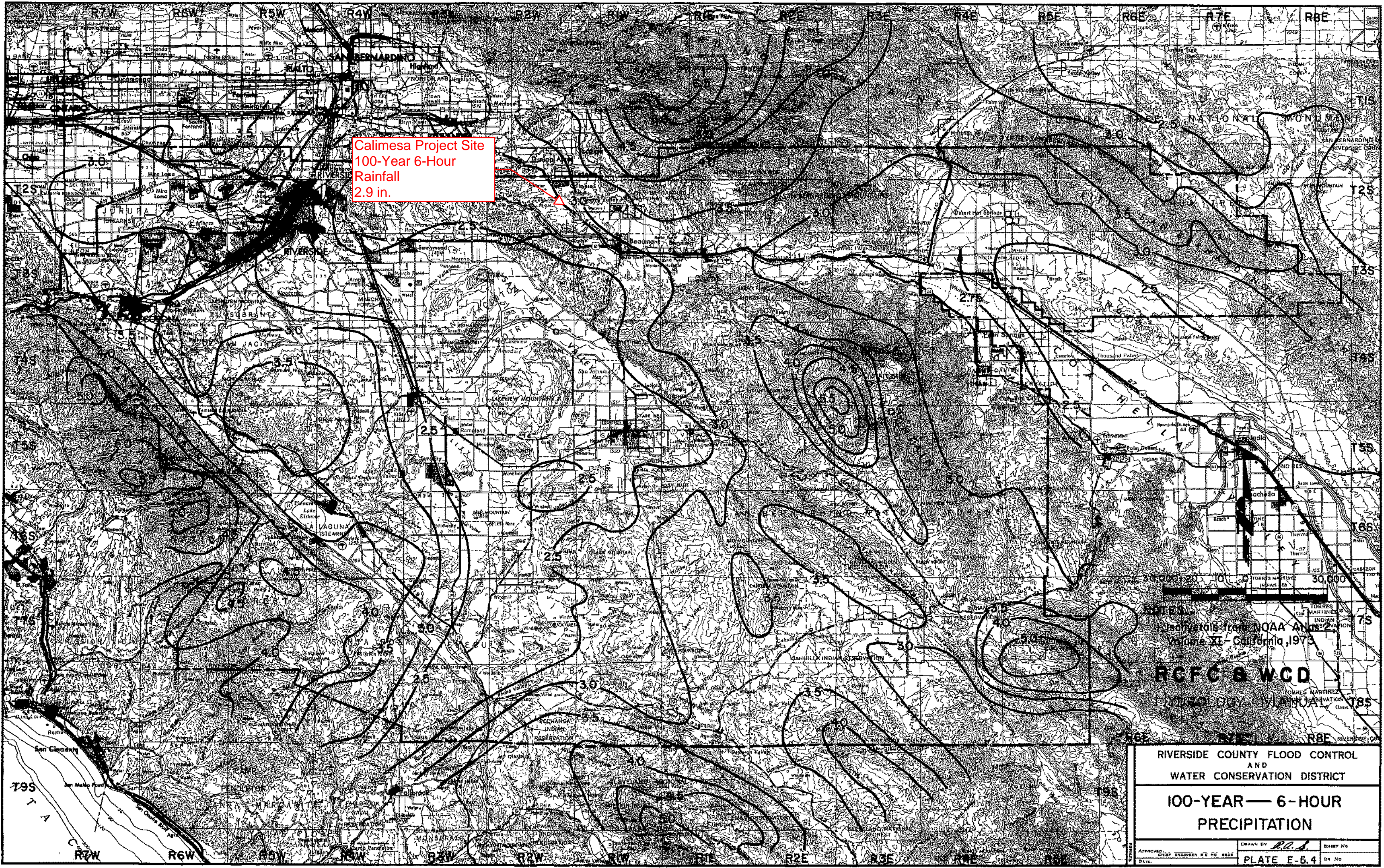
NOAA  
Isopleths based on NOAA Atlas 2  
Volume XI - California, 1973

RCFC & WCD

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT

100-YEAR — 3-HOUR  
PRECIPITATION

APPROVED	CHWEN BY	SHEET NO.
CHIEF ENGINEER	<i>R.L.S.</i>	
DATE	PLATE E-5.2	OF NO.



Calimesa Project Site  
100-Year 6-Hour  
Rainfall  
2.9 in.

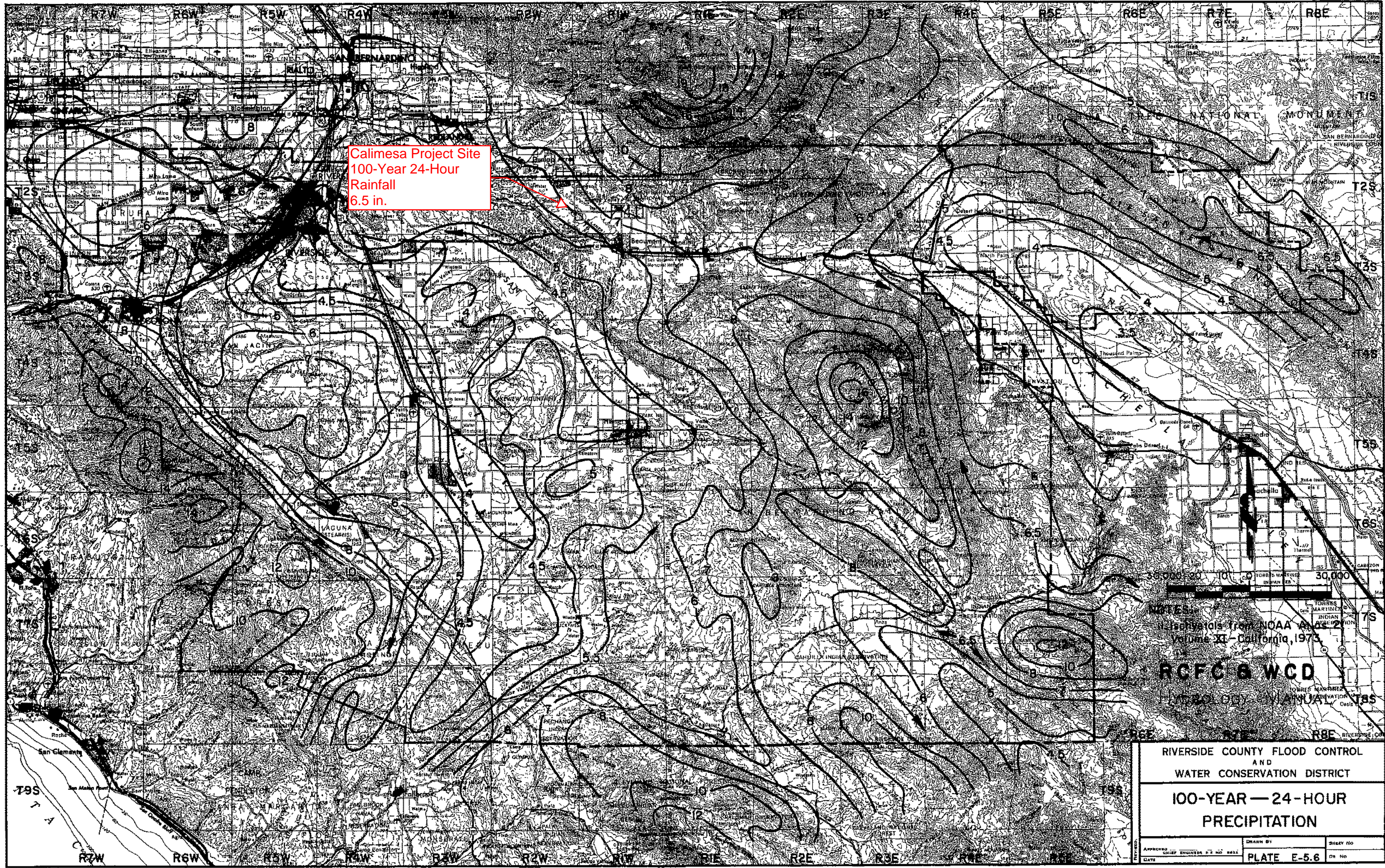


Isomets from NOAA Atlas  
Volume II - California, 1973

RCFC & WCD  
INDOLOGY IN ANNUAL

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT  
**100-YEAR — 6-HOUR  
PRECIPITATION**

APPROVED: CHIEF ENGINEER W.C. 0812  
DATE: \_\_\_\_\_  
DRAWN BY: P.S.  
SHEET NO. \_\_\_\_\_  
PLATE E-5.4  
DN NO. \_\_\_\_\_



Calimesa Project Site  
100-Year 24-Hour  
Rainfall  
6.5 in.

Isobhyals from NOAA Atlas 2  
Volume XI - California, 1973

RCFC & WCD

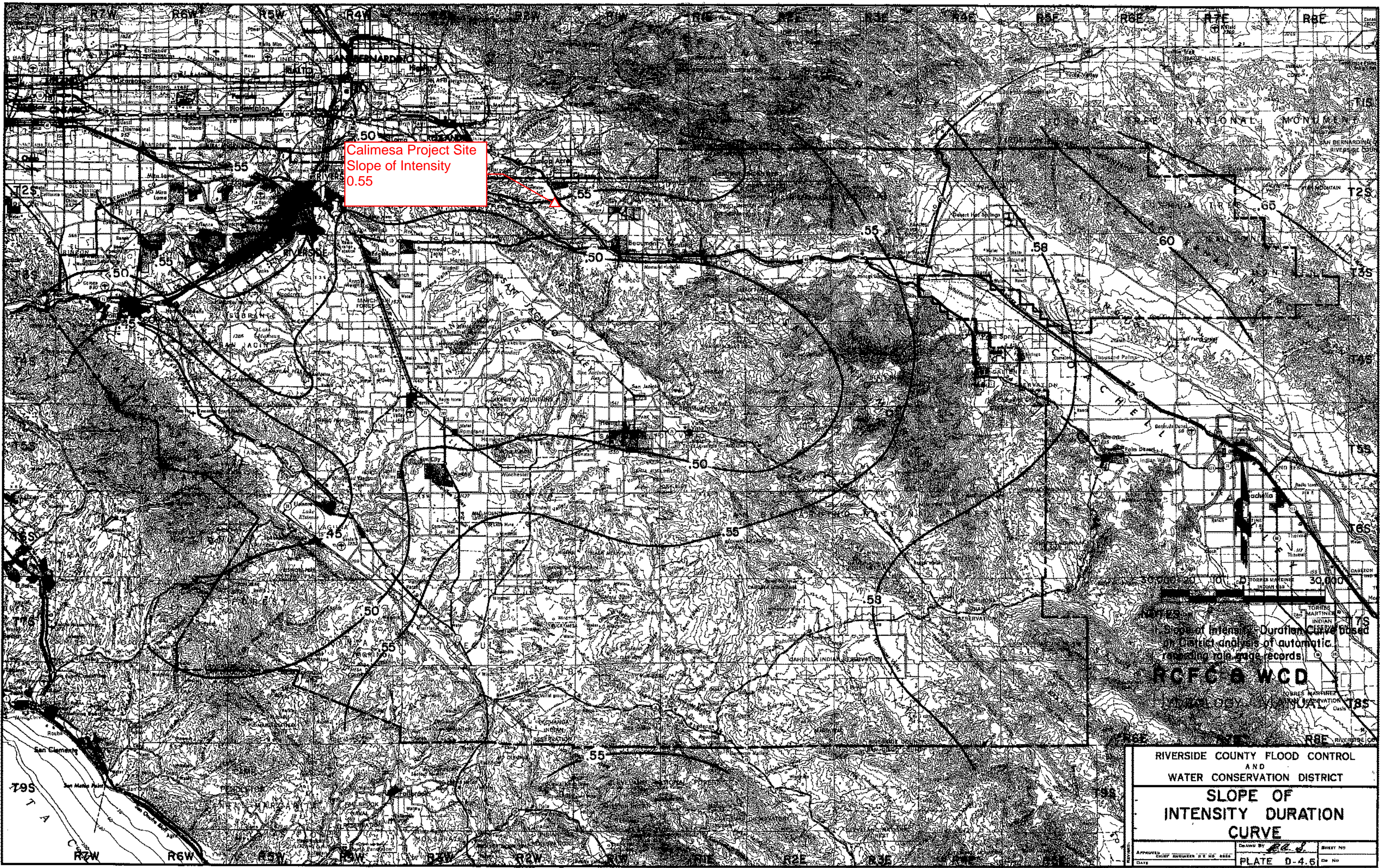
100-YEAR ANNUAL

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT

100-YEAR — 24-HOUR  
PRECIPITATION

APPROVED	DATE	CHIEF ENGINEER	DATE	DRAWN BY	SHEET NO
				PLATE E-5.6	DR No





Calimesa Project Site  
Slope of Intensity  
0.55

Slope of Intensity Duration Curve based  
on District analysis of automatic  
recording rain gage records

RCFC & WCD

RIVERSIDE COUNTY FLOOD CONTROL  
AND  
WATER CONSERVATION DISTRICT  
SLOPE OF  
INTENSITY DURATION  
CURVE

APPROVED: \_\_\_\_\_ DATE: \_\_\_\_\_  
DRAWN BY: \_\_\_\_\_ SHEET NO: \_\_\_\_\_  
DATE: \_\_\_\_\_ PLATE D-4.6 OF NO: \_\_\_\_\_

**EXISTING CONDITION UNIT HYDROGRAPHS**

---

**EXISTING CONDITION – 2-YEAR, 24-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 05/22/23 File: B2ONSITEPRE242.out

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-----

Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----

22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 2-YEAR 24-HOUR  
FN: B2ONSITEPRE242.OUT- AV

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 1310.00(Ft.)  
Length along longest watercourse measured to centroid = 750.00(Ft.)  
Length along longest watercourse = 0.248 Mi.  
Length along longest watercourse measured to centroid = 0.142 Mi.  
Difference in elevation = 34.80(Ft.)  
Slope along watercourse = 140.2626 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.079 Hr.  
Lag time = 4.74 Min.  
25% of lag time = 1.18 Min.  
40% of lag time = 1.89 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	2.40	38.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	6.50	103.35

STORM EVENT (YEAR) = 2.00  
Area Averaged 2-Year Rainfall = 2.400(In)

Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 2.400(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 2.400(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	78.00	0.000
4.770	89.00	0.000
Total Area Entered = 15.90(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
78.0	60.6	0.464	0.000	0.464	0.700	0.324
89.0	76.4	0.286	0.000	0.286	0.300	0.086
Sum (F) =						0.410

Area averaged mean soil loss (F) (In/Hr) = 0.410  
 Minimum soil loss rate ((In/Hr)) = 0.205  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

-----  
 U n i t H y d r o g r a p h  
 FOOTHILL S-Curve  
 -----

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	105.565	2.627
2	0.167	211.130	8.987
3	0.250	316.695	2.806
4	0.333	422.261	1.086
5	0.417	527.826	0.314
6	0.500	633.391	0.128
7	0.583	738.956	0.076
Sum =		100.000	Sum= 16.024

-----  
 The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.019	( 0.728)   0.017	0.002
2	0.17	0.019	( 0.725)   0.017	0.002
3	0.25	0.019	( 0.722)   0.017	0.002
4	0.33	0.029	( 0.719)   0.026	0.003
5	0.42	0.029	( 0.716)   0.026	0.003
6	0.50	0.029	( 0.714)   0.026	0.003
7	0.58	0.029	( 0.711)   0.026	0.003
8	0.67	0.029	( 0.708)   0.026	0.003
9	0.75	0.029	( 0.705)   0.026	0.003
10	0.83	0.038	( 0.702)   0.035	0.004
11	0.92	0.038	( 0.700)   0.035	0.004
12	1.00	0.038	( 0.697)   0.035	0.004
13	1.08	0.029	( 0.694)   0.026	0.003

14	1.17	0.10	0.029	( 0.691)	0.026	0.003
15	1.25	0.10	0.029	( 0.689)	0.026	0.003
16	1.33	0.10	0.029	( 0.686)	0.026	0.003
17	1.42	0.10	0.029	( 0.683)	0.026	0.003
18	1.50	0.10	0.029	( 0.680)	0.026	0.003
19	1.58	0.10	0.029	( 0.678)	0.026	0.003
20	1.67	0.10	0.029	( 0.675)	0.026	0.003
21	1.75	0.10	0.029	( 0.672)	0.026	0.003
22	1.83	0.13	0.038	( 0.670)	0.035	0.004
23	1.92	0.13	0.038	( 0.667)	0.035	0.004
24	2.00	0.13	0.038	( 0.664)	0.035	0.004
25	2.08	0.13	0.038	( 0.662)	0.035	0.004
26	2.17	0.13	0.038	( 0.659)	0.035	0.004
27	2.25	0.13	0.038	( 0.656)	0.035	0.004
28	2.33	0.13	0.038	( 0.653)	0.035	0.004
29	2.42	0.13	0.038	( 0.651)	0.035	0.004
30	2.50	0.13	0.038	( 0.648)	0.035	0.004
31	2.58	0.17	0.048	( 0.646)	0.043	0.005
32	2.67	0.17	0.048	( 0.643)	0.043	0.005
33	2.75	0.17	0.048	( 0.640)	0.043	0.005
34	2.83	0.17	0.048	( 0.638)	0.043	0.005
35	2.92	0.17	0.048	( 0.635)	0.043	0.005
36	3.00	0.17	0.048	( 0.632)	0.043	0.005
37	3.08	0.17	0.048	( 0.630)	0.043	0.005
38	3.17	0.17	0.048	( 0.627)	0.043	0.005
39	3.25	0.17	0.048	( 0.624)	0.043	0.005
40	3.33	0.17	0.048	( 0.622)	0.043	0.005
41	3.42	0.17	0.048	( 0.619)	0.043	0.005
42	3.50	0.17	0.048	( 0.617)	0.043	0.005
43	3.58	0.17	0.048	( 0.614)	0.043	0.005
44	3.67	0.17	0.048	( 0.612)	0.043	0.005
45	3.75	0.17	0.048	( 0.609)	0.043	0.005
46	3.83	0.20	0.058	( 0.606)	0.052	0.006
47	3.92	0.20	0.058	( 0.604)	0.052	0.006
48	4.00	0.20	0.058	( 0.601)	0.052	0.006
49	4.08	0.20	0.058	( 0.599)	0.052	0.006
50	4.17	0.20	0.058	( 0.596)	0.052	0.006
51	4.25	0.20	0.058	( 0.594)	0.052	0.006
52	4.33	0.23	0.067	( 0.591)	0.060	0.007
53	4.42	0.23	0.067	( 0.589)	0.060	0.007
54	4.50	0.23	0.067	( 0.586)	0.060	0.007
55	4.58	0.23	0.067	( 0.584)	0.060	0.007
56	4.67	0.23	0.067	( 0.581)	0.060	0.007
57	4.75	0.23	0.067	( 0.579)	0.060	0.007
58	4.83	0.27	0.077	( 0.576)	0.069	0.008
59	4.92	0.27	0.077	( 0.574)	0.069	0.008
60	5.00	0.27	0.077	( 0.571)	0.069	0.008
61	5.08	0.20	0.058	( 0.569)	0.052	0.006
62	5.17	0.20	0.058	( 0.566)	0.052	0.006
63	5.25	0.20	0.058	( 0.564)	0.052	0.006
64	5.33	0.23	0.067	( 0.561)	0.060	0.007
65	5.42	0.23	0.067	( 0.559)	0.060	0.007
66	5.50	0.23	0.067	( 0.556)	0.060	0.007
67	5.58	0.27	0.077	( 0.554)	0.069	0.008
68	5.67	0.27	0.077	( 0.551)	0.069	0.008
69	5.75	0.27	0.077	( 0.549)	0.069	0.008
70	5.83	0.27	0.077	( 0.547)	0.069	0.008
71	5.92	0.27	0.077	( 0.544)	0.069	0.008
72	6.00	0.27	0.077	( 0.542)	0.069	0.008
73	6.08	0.30	0.086	( 0.539)	0.078	0.009
74	6.17	0.30	0.086	( 0.537)	0.078	0.009

75	6.25	0.30	0.086	( 0.535)	0.078	0.009
76	6.33	0.30	0.086	( 0.532)	0.078	0.009
77	6.42	0.30	0.086	( 0.530)	0.078	0.009
78	6.50	0.30	0.086	( 0.527)	0.078	0.009
79	6.58	0.33	0.096	( 0.525)	0.086	0.010
80	6.67	0.33	0.096	( 0.523)	0.086	0.010
81	6.75	0.33	0.096	( 0.520)	0.086	0.010
82	6.83	0.33	0.096	( 0.518)	0.086	0.010
83	6.92	0.33	0.096	( 0.516)	0.086	0.010
84	7.00	0.33	0.096	( 0.513)	0.086	0.010
85	7.08	0.33	0.096	( 0.511)	0.086	0.010
86	7.17	0.33	0.096	( 0.509)	0.086	0.010
87	7.25	0.33	0.096	( 0.506)	0.086	0.010
88	7.33	0.37	0.106	( 0.504)	0.095	0.011
89	7.42	0.37	0.106	( 0.502)	0.095	0.011
90	7.50	0.37	0.106	( 0.499)	0.095	0.011
91	7.58	0.40	0.115	( 0.497)	0.104	0.012
92	7.67	0.40	0.115	( 0.495)	0.104	0.012
93	7.75	0.40	0.115	( 0.493)	0.104	0.012
94	7.83	0.43	0.125	( 0.490)	0.112	0.012
95	7.92	0.43	0.125	( 0.488)	0.112	0.012
96	8.00	0.43	0.125	( 0.486)	0.112	0.012
97	8.08	0.50	0.144	( 0.483)	0.130	0.014
98	8.17	0.50	0.144	( 0.481)	0.130	0.014
99	8.25	0.50	0.144	( 0.479)	0.130	0.014
100	8.33	0.50	0.144	( 0.477)	0.130	0.014
101	8.42	0.50	0.144	( 0.474)	0.130	0.014
102	8.50	0.50	0.144	( 0.472)	0.130	0.014
103	8.58	0.53	0.154	( 0.470)	0.138	0.015
104	8.67	0.53	0.154	( 0.468)	0.138	0.015
105	8.75	0.53	0.154	( 0.466)	0.138	0.015
106	8.83	0.57	0.163	( 0.463)	0.147	0.016
107	8.92	0.57	0.163	( 0.461)	0.147	0.016
108	9.00	0.57	0.163	( 0.459)	0.147	0.016
109	9.08	0.63	0.182	( 0.457)	0.164	0.018
110	9.17	0.63	0.182	( 0.455)	0.164	0.018
111	9.25	0.63	0.182	( 0.453)	0.164	0.018
112	9.33	0.67	0.192	( 0.450)	0.173	0.019
113	9.42	0.67	0.192	( 0.448)	0.173	0.019
114	9.50	0.67	0.192	( 0.446)	0.173	0.019
115	9.58	0.70	0.202	( 0.444)	0.181	0.020
116	9.67	0.70	0.202	( 0.442)	0.181	0.020
117	9.75	0.70	0.202	( 0.440)	0.181	0.020
118	9.83	0.73	0.211	( 0.438)	0.190	0.021
119	9.92	0.73	0.211	( 0.435)	0.190	0.021
120	10.00	0.73	0.211	( 0.433)	0.190	0.021
121	10.08	0.50	0.144	( 0.431)	0.130	0.014
122	10.17	0.50	0.144	( 0.429)	0.130	0.014
123	10.25	0.50	0.144	( 0.427)	0.130	0.014
124	10.33	0.50	0.144	( 0.425)	0.130	0.014
125	10.42	0.50	0.144	( 0.423)	0.130	0.014
126	10.50	0.50	0.144	( 0.421)	0.130	0.014
127	10.58	0.67	0.192	( 0.419)	0.173	0.019
128	10.67	0.67	0.192	( 0.417)	0.173	0.019
129	10.75	0.67	0.192	( 0.415)	0.173	0.019
130	10.83	0.67	0.192	( 0.413)	0.173	0.019
131	10.92	0.67	0.192	( 0.411)	0.173	0.019
132	11.00	0.67	0.192	( 0.409)	0.173	0.019
133	11.08	0.63	0.182	( 0.407)	0.164	0.018
134	11.17	0.63	0.182	( 0.405)	0.164	0.018
135	11.25	0.63	0.182	( 0.403)	0.164	0.018

136	11.33	0.63	0.182	( 0.401)	0.164	0.018
137	11.42	0.63	0.182	( 0.399)	0.164	0.018
138	11.50	0.63	0.182	( 0.397)	0.164	0.018
139	11.58	0.57	0.163	( 0.395)	0.147	0.016
140	11.67	0.57	0.163	( 0.393)	0.147	0.016
141	11.75	0.57	0.163	( 0.391)	0.147	0.016
142	11.83	0.60	0.173	( 0.389)	0.156	0.017
143	11.92	0.60	0.173	( 0.387)	0.156	0.017
144	12.00	0.60	0.173	( 0.385)	0.156	0.017
145	12.08	0.83	0.240	( 0.383)	0.216	0.024
146	12.17	0.83	0.240	( 0.381)	0.216	0.024
147	12.25	0.83	0.240	( 0.379)	0.216	0.024
148	12.33	0.87	0.250	( 0.377)	0.225	0.025
149	12.42	0.87	0.250	( 0.375)	0.225	0.025
150	12.50	0.87	0.250	( 0.374)	0.225	0.025
151	12.58	0.93	0.269	( 0.372)	0.242	0.027
152	12.67	0.93	0.269	( 0.370)	0.242	0.027
153	12.75	0.93	0.269	( 0.368)	0.242	0.027
154	12.83	0.97	0.278	( 0.366)	0.251	0.028
155	12.92	0.97	0.278	( 0.364)	0.251	0.028
156	13.00	0.97	0.278	( 0.362)	0.251	0.028
157	13.08	1.13	0.326	( 0.361)	0.294	0.033
158	13.17	1.13	0.326	( 0.359)	0.294	0.033
159	13.25	1.13	0.326	( 0.357)	0.294	0.033
160	13.33	1.13	0.326	( 0.355)	0.294	0.033
161	13.42	1.13	0.326	( 0.353)	0.294	0.033
162	13.50	1.13	0.326	( 0.352)	0.294	0.033
163	13.58	0.77	0.221	( 0.350)	0.199	0.022
164	13.67	0.77	0.221	( 0.348)	0.199	0.022
165	13.75	0.77	0.221	( 0.346)	0.199	0.022
166	13.83	0.77	0.221	( 0.344)	0.199	0.022
167	13.92	0.77	0.221	( 0.343)	0.199	0.022
168	14.00	0.77	0.221	( 0.341)	0.199	0.022
169	14.08	0.90	0.259	( 0.339)	0.233	0.026
170	14.17	0.90	0.259	( 0.337)	0.233	0.026
171	14.25	0.90	0.259	( 0.336)	0.233	0.026
172	14.33	0.87	0.250	( 0.334)	0.225	0.025
173	14.42	0.87	0.250	( 0.332)	0.225	0.025
174	14.50	0.87	0.250	( 0.331)	0.225	0.025
175	14.58	0.87	0.250	( 0.329)	0.225	0.025
176	14.67	0.87	0.250	( 0.327)	0.225	0.025
177	14.75	0.87	0.250	( 0.326)	0.225	0.025
178	14.83	0.83	0.240	( 0.324)	0.216	0.024
179	14.92	0.83	0.240	( 0.322)	0.216	0.024
180	15.00	0.83	0.240	( 0.321)	0.216	0.024
181	15.08	0.80	0.230	( 0.319)	0.207	0.023
182	15.17	0.80	0.230	( 0.317)	0.207	0.023
183	15.25	0.80	0.230	( 0.316)	0.207	0.023
184	15.33	0.77	0.221	( 0.314)	0.199	0.022
185	15.42	0.77	0.221	( 0.312)	0.199	0.022
186	15.50	0.77	0.221	( 0.311)	0.199	0.022
187	15.58	0.63	0.182	( 0.309)	0.164	0.018
188	15.67	0.63	0.182	( 0.308)	0.164	0.018
189	15.75	0.63	0.182	( 0.306)	0.164	0.018
190	15.83	0.63	0.182	( 0.304)	0.164	0.018
191	15.92	0.63	0.182	( 0.303)	0.164	0.018
192	16.00	0.63	0.182	( 0.301)	0.164	0.018
193	16.08	0.13	0.038	( 0.300)	0.035	0.004
194	16.17	0.13	0.038	( 0.298)	0.035	0.004
195	16.25	0.13	0.038	( 0.297)	0.035	0.004
196	16.33	0.13	0.038	( 0.295)	0.035	0.004



197	16.42	0.13	0.038	( 0.294)	0.035	0.004
198	16.50	0.13	0.038	( 0.292)	0.035	0.004
199	16.58	0.10	0.029	( 0.291)	0.026	0.003
200	16.67	0.10	0.029	( 0.289)	0.026	0.003
201	16.75	0.10	0.029	( 0.288)	0.026	0.003
202	16.83	0.10	0.029	( 0.286)	0.026	0.003
203	16.92	0.10	0.029	( 0.285)	0.026	0.003
204	17.00	0.10	0.029	( 0.283)	0.026	0.003
205	17.08	0.17	0.048	( 0.282)	0.043	0.005
206	17.17	0.17	0.048	( 0.281)	0.043	0.005
207	17.25	0.17	0.048	( 0.279)	0.043	0.005
208	17.33	0.17	0.048	( 0.278)	0.043	0.005
209	17.42	0.17	0.048	( 0.276)	0.043	0.005
210	17.50	0.17	0.048	( 0.275)	0.043	0.005
211	17.58	0.17	0.048	( 0.274)	0.043	0.005
212	17.67	0.17	0.048	( 0.272)	0.043	0.005
213	17.75	0.17	0.048	( 0.271)	0.043	0.005
214	17.83	0.13	0.038	( 0.270)	0.035	0.004
215	17.92	0.13	0.038	( 0.268)	0.035	0.004
216	18.00	0.13	0.038	( 0.267)	0.035	0.004
217	18.08	0.13	0.038	( 0.266)	0.035	0.004
218	18.17	0.13	0.038	( 0.264)	0.035	0.004
219	18.25	0.13	0.038	( 0.263)	0.035	0.004
220	18.33	0.13	0.038	( 0.262)	0.035	0.004
221	18.42	0.13	0.038	( 0.260)	0.035	0.004
222	18.50	0.13	0.038	( 0.259)	0.035	0.004
223	18.58	0.10	0.029	( 0.258)	0.026	0.003
224	18.67	0.10	0.029	( 0.257)	0.026	0.003
225	18.75	0.10	0.029	( 0.255)	0.026	0.003
226	18.83	0.07	0.019	( 0.254)	0.017	0.002
227	18.92	0.07	0.019	( 0.253)	0.017	0.002
228	19.00	0.07	0.019	( 0.252)	0.017	0.002
229	19.08	0.10	0.029	( 0.251)	0.026	0.003
230	19.17	0.10	0.029	( 0.249)	0.026	0.003
231	19.25	0.10	0.029	( 0.248)	0.026	0.003
232	19.33	0.13	0.038	( 0.247)	0.035	0.004
233	19.42	0.13	0.038	( 0.246)	0.035	0.004
234	19.50	0.13	0.038	( 0.245)	0.035	0.004
235	19.58	0.10	0.029	( 0.244)	0.026	0.003
236	19.67	0.10	0.029	( 0.243)	0.026	0.003
237	19.75	0.10	0.029	( 0.242)	0.026	0.003
238	19.83	0.07	0.019	( 0.240)	0.017	0.002
239	19.92	0.07	0.019	( 0.239)	0.017	0.002
240	20.00	0.07	0.019	( 0.238)	0.017	0.002
241	20.08	0.10	0.029	( 0.237)	0.026	0.003
242	20.17	0.10	0.029	( 0.236)	0.026	0.003
243	20.25	0.10	0.029	( 0.235)	0.026	0.003
244	20.33	0.10	0.029	( 0.234)	0.026	0.003
245	20.42	0.10	0.029	( 0.233)	0.026	0.003
246	20.50	0.10	0.029	( 0.232)	0.026	0.003
247	20.58	0.10	0.029	( 0.231)	0.026	0.003
248	20.67	0.10	0.029	( 0.230)	0.026	0.003
249	20.75	0.10	0.029	( 0.229)	0.026	0.003
250	20.83	0.07	0.019	( 0.228)	0.017	0.002
251	20.92	0.07	0.019	( 0.227)	0.017	0.002
252	21.00	0.07	0.019	( 0.227)	0.017	0.002
253	21.08	0.10	0.029	( 0.226)	0.026	0.003
254	21.17	0.10	0.029	( 0.225)	0.026	0.003
255	21.25	0.10	0.029	( 0.224)	0.026	0.003
256	21.33	0.07	0.019	( 0.223)	0.017	0.002
257	21.42	0.07	0.019	( 0.222)	0.017	0.002



0+50	0.0025	0.05	Q
0+55	0.0029	0.06	Q
1+ 0	0.0033	0.06	Q
1+ 5	0.0037	0.06	Q
1+10	0.0040	0.05	Q
1+15	0.0044	0.05	Q
1+20	0.0047	0.05	Q
1+25	0.0050	0.05	Q
1+30	0.0053	0.05	Q
1+35	0.0056	0.05	Q
1+40	0.0060	0.05	Q
1+45	0.0063	0.05	Q
1+50	0.0066	0.05	Q
1+55	0.0070	0.06	Q
2+ 0	0.0074	0.06	Q
2+ 5	0.0078	0.06	Q
2+10	0.0083	0.06	QV
2+15	0.0087	0.06	QV
2+20	0.0091	0.06	QV
2+25	0.0095	0.06	QV
2+30	0.0100	0.06	QV
2+35	0.0104	0.06	QV
2+40	0.0109	0.07	QV
2+45	0.0114	0.08	QV
2+50	0.0119	0.08	QV
2+55	0.0125	0.08	QV
3+ 0	0.0130	0.08	QV
3+ 5	0.0135	0.08	QV
3+10	0.0141	0.08	QV
3+15	0.0146	0.08	QV
3+20	0.0151	0.08	QV
3+25	0.0157	0.08	QV
3+30	0.0162	0.08	Q V
3+35	0.0167	0.08	Q V
3+40	0.0172	0.08	Q V
3+45	0.0178	0.08	Q V
3+50	0.0183	0.08	Q V
3+55	0.0189	0.09	Q V
4+ 0	0.0196	0.09	Q V
4+ 5	0.0202	0.09	Q V
4+10	0.0208	0.09	Q V
4+15	0.0215	0.09	Q V
4+20	0.0221	0.09	Q V
4+25	0.0228	0.10	Q V
4+30	0.0236	0.11	Q V
4+35	0.0243	0.11	Q V
4+40	0.0250	0.11	Q V
4+45	0.0258	0.11	Q V
4+50	0.0265	0.11	Q V
4+55	0.0274	0.12	Q V
5+ 0	0.0282	0.12	Q V
5+ 5	0.0290	0.12	Q V
5+10	0.0297	0.10	Q V
5+15	0.0304	0.10	Q V
5+20	0.0310	0.10	Q V
5+25	0.0317	0.10	Q V
5+30	0.0325	0.11	Q V
5+35	0.0332	0.11	Q V
5+40	0.0340	0.12	Q V
5+45	0.0349	0.12	Q V
5+50	0.0357	0.12	Q V

5+55	0.0366	0.12	Q	V				
6+ 0	0.0374	0.12	Q	V				
6+ 5	0.0383	0.13	Q	V				
6+10	0.0392	0.13	Q	V				
6+15	0.0401	0.14	Q	V				
6+20	0.0411	0.14	Q	V				
6+25	0.0420	0.14	Q	V				
6+30	0.0430	0.14	Q	V				
6+35	0.0440	0.14	Q	V				
6+40	0.0450	0.15	Q	V				
6+45	0.0460	0.15	Q	V				
6+50	0.0471	0.15	Q	V				
6+55	0.0482	0.15	Q	V				
7+ 0	0.0492	0.15	Q	V				
7+ 5	0.0503	0.15	Q	V				
7+10	0.0513	0.15	Q	V				
7+15	0.0524	0.15	Q	V				
7+20	0.0535	0.16	Q	V				
7+25	0.0546	0.17	Q	V				
7+30	0.0558	0.17	Q	V				
7+35	0.0570	0.17	Q	V				
7+40	0.0582	0.18	Q	V				
7+45	0.0595	0.18	Q	V				
7+50	0.0607	0.19	Q	V				
7+55	0.0621	0.20	Q	V				
8+ 0	0.0635	0.20	Q	V				
8+ 5	0.0649	0.20	Q	V				
8+10	0.0664	0.22	Q	V				
8+15	0.0680	0.23	Q	V				
8+20	0.0695	0.23	Q	V				
8+25	0.0711	0.23	Q	V				
8+30	0.0727	0.23	Q	V				
8+35	0.0743	0.23	Q	V				
8+40	0.0760	0.24	Q	V				
8+45	0.0777	0.24	Q	V				
8+50	0.0794	0.25	Q	V				
8+55	0.0812	0.26	Q	V				
9+ 0	0.0830	0.26	Q	V				
9+ 5	0.0848	0.27	Q	V				
9+10	0.0867	0.28	Q	V				
9+15	0.0887	0.29	Q	V				
9+20	0.0908	0.29	Q	V				
9+25	0.0928	0.30	Q	V				
9+30	0.0950	0.31	Q	V				
9+35	0.0971	0.31	Q	V				
9+40	0.0993	0.32	Q	V				
9+45	0.1015	0.32	Q	V				
9+50	0.1037	0.33	Q	V				
9+55	0.1060	0.33	Q	V				
10+ 0	0.1084	0.34	Q	V				
10+ 5	0.1106	0.32	Q	V				
10+10	0.1124	0.26	Q	V				
10+15	0.1140	0.24	Q	V				
10+20	0.1156	0.23	Q	V				
10+25	0.1172	0.23	Q	V				
10+30	0.1188	0.23	Q	V				
10+35	0.1205	0.24	Q	V				
10+40	0.1225	0.29	Q	V				
10+45	0.1245	0.30	Q	V				
10+50	0.1267	0.31	Q	V				
10+55	0.1288	0.31	Q	V				

11+ 0	0.1309	0.31	Q	V		
11+ 5	0.1330	0.31	Q	V		
11+10	0.1350	0.30	Q	V		
11+15	0.1371	0.29	Q	V		
11+20	0.1391	0.29	Q	V		
11+25	0.1411	0.29	Q	V		
11+30	0.1431	0.29	Q	V		
11+35	0.1451	0.29	Q	V		
11+40	0.1469	0.27	Q	V		
11+45	0.1488	0.26	Q	V		
11+50	0.1506	0.27	Q	V		
11+55	0.1525	0.27	Q	V		
12+ 0	0.1544	0.28	Q	V		
12+ 5	0.1564	0.29	Q	V		
12+10	0.1588	0.35	Q	V		
12+15	0.1614	0.37	Q	V		
12+20	0.1641	0.38	Q	V		
12+25	0.1668	0.39	Q	V		
12+30	0.1695	0.40	Q	V		
12+35	0.1723	0.40	Q	V		
12+40	0.1752	0.42	Q	V		
12+45	0.1782	0.43	Q	V		
12+50	0.1811	0.43	Q	V		
12+55	0.1842	0.44	Q	V		
13+ 0	0.1872	0.44	Q	V		
13+ 5	0.1904	0.46	Q	V		
13+10	0.1939	0.50	Q	V		
13+15	0.1974	0.52	Q	V		
13+20	0.2010	0.52	Q	V		
13+25	0.2046	0.52	Q	V		
13+30	0.2082	0.52	Q	V		
13+35	0.2116	0.50	Q	V		
13+40	0.2144	0.40	Q	V		
13+45	0.2169	0.37	Q	V		
13+50	0.2194	0.36	Q	V		
13+55	0.2218	0.36	Q	V		
14+ 0	0.2243	0.35	Q	V		
14+ 5	0.2268	0.36	Q	V		
14+10	0.2295	0.40	Q	V		
14+15	0.2324	0.41	Q	V		
14+20	0.2352	0.41	Q	V		
14+25	0.2380	0.40	Q	V		
14+30	0.2407	0.40	Q	V		
14+35	0.2435	0.40	Q	V		
14+40	0.2463	0.40	Q	V		
14+45	0.2490	0.40	Q	V		
14+50	0.2517	0.40	Q	V		
14+55	0.2544	0.39	Q	V		
15+ 0	0.2571	0.39	Q	V		
15+ 5	0.2597	0.38	Q	V		
15+10	0.2623	0.37	Q	V		
15+15	0.2649	0.37	Q	V		
15+20	0.2674	0.37	Q	V		
15+25	0.2699	0.36	Q	V		
15+30	0.2723	0.36	Q	V		
15+35	0.2747	0.34	Q	V		
15+40	0.2768	0.31	Q	V		
15+45	0.2789	0.30	Q	V		
15+50	0.2809	0.29	Q	V		
15+55	0.2829	0.29	Q	V		
16+ 0	0.2849	0.29	Q	V		

16+ 5	0.2867	0.25	Q	V
16+10	0.2875	0.13	Q	V
16+15	0.2881	0.08	Q	V
16+20	0.2886	0.07	Q	V
16+25	0.2890	0.06	Q	V
16+30	0.2895	0.06	Q	V
16+35	0.2899	0.06	Q	V
16+40	0.2902	0.05	Q	V
16+45	0.2906	0.05	Q	V
16+50	0.2909	0.05	Q	V
16+55	0.2912	0.05	Q	V
17+ 0	0.2915	0.05	Q	V
17+ 5	0.2919	0.05	Q	V
17+10	0.2923	0.07	Q	V
17+15	0.2928	0.07	Q	V
17+20	0.2934	0.08	Q	V
17+25	0.2939	0.08	Q	V
17+30	0.2944	0.08	Q	V
17+35	0.2950	0.08	Q	V
17+40	0.2955	0.08	Q	V
17+45	0.2960	0.08	Q	V
17+50	0.2965	0.07	Q	V
17+55	0.2970	0.07	Q	V
18+ 0	0.2974	0.06	Q	V
18+ 5	0.2978	0.06	Q	V
18+10	0.2983	0.06	Q	V
18+15	0.2987	0.06	Q	V
18+20	0.2991	0.06	Q	V
18+25	0.2995	0.06	Q	V
18+30	0.3000	0.06	Q	V
18+35	0.3004	0.06	Q	V
18+40	0.3007	0.05	Q	V
18+45	0.3010	0.05	Q	V
18+50	0.3014	0.04	Q	V
18+55	0.3016	0.04	Q	V
19+ 0	0.3018	0.03	Q	V
19+ 5	0.3021	0.03	Q	V
19+10	0.3023	0.04	Q	V
19+15	0.3026	0.04	Q	V
19+20	0.3030	0.05	Q	V
19+25	0.3034	0.06	Q	V
19+30	0.3038	0.06	Q	V
19+35	0.3042	0.06	Q	V
19+40	0.3045	0.05	Q	V
19+45	0.3049	0.05	Q	V
19+50	0.3052	0.04	Q	V
19+55	0.3054	0.04	Q	V
20+ 0	0.3056	0.03	Q	V
20+ 5	0.3059	0.03	Q	V
20+10	0.3062	0.04	Q	V
20+15	0.3065	0.04	Q	V
20+20	0.3068	0.05	Q	V
20+25	0.3071	0.05	Q	V
20+30	0.3074	0.05	Q	V
20+35	0.3077	0.05	Q	V
20+40	0.3080	0.05	Q	V
20+45	0.3084	0.05	Q	V
20+50	0.3087	0.04	Q	V
20+55	0.3089	0.04	Q	V
21+ 0	0.3091	0.03	Q	V
21+ 5	0.3094	0.03	Q	V

21+10	0.3097	0.04	Q				V
21+15	0.3100	0.04	Q				V
21+20	0.3103	0.04	Q				V
21+25	0.3105	0.03	Q				V
21+30	0.3107	0.03	Q				V
21+35	0.3110	0.03	Q				V
21+40	0.3112	0.04	Q				V
21+45	0.3116	0.04	Q				V
21+50	0.3118	0.04	Q				V
21+55	0.3121	0.03	Q				V
22+ 0	0.3123	0.03	Q				V
22+ 5	0.3125	0.03	Q				V
22+10	0.3128	0.04	Q				V
22+15	0.3131	0.04	Q				V
22+20	0.3134	0.04	Q				V
22+25	0.3137	0.03	Q				V
22+30	0.3139	0.03	Q				V
22+35	0.3141	0.03	Q				V
22+40	0.3143	0.03	Q				V
22+45	0.3145	0.03	Q				V
22+50	0.3148	0.03	Q				V
22+55	0.3150	0.03	Q				V
23+ 0	0.3152	0.03	Q				V
23+ 5	0.3154	0.03	Q				V
23+10	0.3156	0.03	Q				V
23+15	0.3158	0.03	Q				V
23+20	0.3160	0.03	Q				V
23+25	0.3162	0.03	Q				V
23+30	0.3165	0.03	Q				V
23+35	0.3167	0.03	Q				V
23+40	0.3169	0.03	Q				V
23+45	0.3171	0.03	Q				V
23+50	0.3173	0.03	Q				V
23+55	0.3175	0.03	Q				V
24+ 0	0.3177	0.03	Q				V
24+ 5	0.3179	0.03	Q				V
24+10	0.3180	0.01	Q				V
24+15	0.3180	0.00	Q				V
24+20	0.3180	0.00	Q				V
24+25	0.3180	0.00	Q				V
24+30	0.3180	0.00	Q				V

**EXISTING CONDITION – 100-YEAR, 1-HOUR UNIT HYDROGRAPH**



Unit Hydrograph Analysis

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Study date 05/22/23 File: B2ONSITEPRE1100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 100-YEAR 1-HOUR  
FN: B2ONSITEPRE1100.OUT- AV

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 1310.00(Ft.)  
Length along longest watercourse measured to centroid = 750.00(Ft.)  
Length along longest watercourse = 0.248 Mi.  
Length along longest watercourse measured to centroid = 0.142 Mi.  
Difference in elevation = 34.80(Ft.)  
Slope along watercourse = 140.2626 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.079 Hr.  
Lag time = 4.74 Min.  
25% of lag time = 1.18 Min.  
40% of lag time = 1.89 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	0.54	8.59

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	1.28	20.35

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.540(In)

Area Averaged 100-Year Rainfall = 1.280(In)

Point rain (area averaged) = 1.280(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 1.280(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	78.00	0.000
4.770	89.00	0.000
Total Area Entered = 15.90(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
78.0	78.0	0.268	0.000	0.268	0.700	0.187
89.0	89.0	0.141	0.000	0.141	0.300	0.042
Sum (F) =						0.230

Area averaged mean soil loss (F) (In/Hr) = 0.230  
 Minimum soil loss rate ((In/Hr)) = 0.115  
 (for 24 hour storm duration)  
 Soil loss rate (decimal) = 0.900

-----  
 Slope of intensity-duration curve for a 1 hour storm =0.5500  
 -----

U n i t H y d r o g r a p h  
 FOOTHILL S-Curve

-----  
 Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	105.565	2.627
2	0.167	211.130	8.987
3	0.250	316.695	2.806
4	0.333	422.261	1.086
5	0.417	527.826	0.314
6	0.500	633.391	0.128
7	0.583	738.956	0.076
Sum =		100.000	Sum= 16.024

-----  
 The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	3.30	0.507	( 0.230)	0.277
2	0.17	4.20	0.645	( 0.230)	0.415
3	0.25	4.40	0.676	( 0.230)	0.446
4	0.33	4.80	0.737	( 0.230)	0.507
5	0.42	5.20	0.799	( 0.230)	0.569
6	0.50	6.20	0.952	( 0.230)	0.722
7	0.58	6.80	1.044	( 0.230)	0.815
8	0.67	8.80	1.351	( 0.230)	1.122
9	0.75	13.90	2.135	( 0.230)	1.905
10	0.83	31.40	4.822	( 0.230)	4.593
11	0.92	7.20	1.106	( 0.230)	0.876

12 1.00 3.80 0.584 0.230 ( 0.525) 0.354  
 (Loss Rate Not Used)

Sum = 100.0 Sum = 12.6

Flood volume = Effective rainfall 1.05(In)  
 times area 15.9(Ac.)/[((In)/(Ft.))] = 1.4(Ac.Ft)  
 Total soil loss = 0.23(In)  
 Total soil loss = 0.304(Ac.Ft)  
 Total rainfall = 1.28(In)  
 Flood volume = 60607.2 Cubic Feet  
 Total soil loss = 13259.9 Cubic Feet

-----  
 Peak flow rate of this hydrograph = 50.556(CFS)  
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1 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h

-----  
 Hydrograph in 5 Minute intervals ((CFS))  
 -----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	15.0	30.0	45.0	60.0
0+ 5	0.0050	0.73	Q				
0+10	0.0297	3.58	V Q				
0+15	0.0688	5.68	V Q				
0+20	0.1157	6.81	V Q				
0+25	0.1698	7.85	V Q				
0+30	0.2324	9.09	V Q				
0+35	0.3082	11.00	V Q				
0+40	0.3988	13.17	V Q				
0+45	0.5259	18.44	V Q	Q V			
0+50	0.7571	33.57	V Q	Q V	V Q		
0+55	1.1053	50.56	V Q	Q V	V Q	V Q	
1+ 0	1.2725	24.28	V Q	Q V	V Q	V Q	V
1+ 5	1.3513	11.44	V Q	Q V	V Q	V Q	V
1+10	1.3769	3.72	V Q	Q V	V Q	V Q	V
1+15	1.3865	1.39	V Q	Q V	V Q	V Q	V
1+20	1.3904	0.57	V Q	Q V	V Q	V Q	V
1+25	1.3912	0.11	V Q	Q V	V Q	V Q	V
1+30	1.3914	0.03	V Q	Q V	V Q	V Q	V

**EXISTING CONDITION – 100-YEAR, 3-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

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Study date 05/22/23 File: B2ONSITEPRE3100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 100-YEAR 3-HOUR  
FN: B2ONSITEPRE3100.OUT- AV

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 1310.00(Ft.)  
Length along longest watercourse measured to centroid = 750.00(Ft.)  
Length along longest watercourse = 0.248 Mi.  
Length along longest watercourse measured to centroid = 0.142 Mi.  
Difference in elevation = 34.80(Ft.)  
Slope along watercourse = 140.2626 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.079 Hr.  
Lag time = 4.74 Min.  
25% of lag time = 1.18 Min.  
40% of lag time = 1.89 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	0.95	15.11

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	2.00	31.80

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.950(In)

Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	78.00	0.000
4.770	89.00	0.000
Total Area Entered = 15.90(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
78.0	78.0	0.268	0.000	0.268	0.700	0.187
89.0	89.0	0.141	0.000	0.141	0.300	0.042
						Sum (F) = 0.230

Area averaged mean soil loss (F) (In/Hr) = 0.230  
 Minimum soil loss rate ((In/Hr)) = 0.115  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

-----  
 U n i t H y d r o g r a p h  
 FOOTHILL S-Curve  
 -----

Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	105.565	2.627
2	0.167	211.130	8.987
3	0.250	316.695	2.806
4	0.333	422.261	1.086
5	0.417	527.826	0.314
6	0.500	633.391	0.128
7	0.583	738.956	0.076
		Sum = 100.000	Sum= 16.024

-----  
 The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	1.30	0.312	( 0.281)	0.082
2	0.17	1.30	0.312	( 0.281)	0.082
3	0.25	1.10	0.264	( 0.238)	0.034
4	0.33	1.50	0.360	( 0.324)	0.130
5	0.42	1.50	0.360	( 0.324)	0.130
6	0.50	1.80	0.432	( 0.389)	0.202
7	0.58	1.50	0.360	( 0.324)	0.130
8	0.67	1.80	0.432	( 0.389)	0.202
9	0.75	1.80	0.432	( 0.389)	0.202
10	0.83	1.50	0.360	( 0.324)	0.130
11	0.92	1.60	0.384	( 0.346)	0.154
12	1.00	1.80	0.432	( 0.389)	0.202
13	1.08	2.20	0.528	( 0.475)	0.298



1+30	0.3469	5.82	Q						
1+35	0.3897	6.20	Q						
1+40	0.4307	5.95	Q	V					
1+45	0.4778	6.84	Q	V					
1+50	0.5340	8.16	Q	V					
1+55	0.5896	8.07	Q	V					
2+ 0	0.6429	7.74	Q	V					
2+ 5	0.6972	7.88	Q	V					
2+10	0.7579	8.82	Q	V					
2+15	0.8391	11.78		Q	V				
2+20	0.9308	13.32			Q	V			
2+25	1.0204	13.00			Q	V			
2+30	1.1562	19.72				Q			
2+35	1.3167	23.30					VQ		
2+40	1.4883	24.92						QV	
2+45	1.6153	18.45				Q		V	
2+50	1.6753	8.71		Q				V	
2+55	1.7110	5.19		Q				V	
3+ 0	1.7345	3.41		Q				V	
3+ 5	1.7433	1.28	Q					V	
3+10	1.7464	0.45	Q					V	
3+15	1.7472	0.12	Q					V	
3+20	1.7475	0.05	Q					V	
3+25	1.7476	0.02	Q					V	
3+30	1.7477	0.00	Q					V	



**EXISTING CONDITION – 100-YEAR, 6-HOUR UNIT HYDROGRAPH**

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Unit Hydrograph Analysis

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Study date 05/22/23 File: B2ONSITEPRE6100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 100-YEAR 6-HOUR  
FN: B2ONSITEPRE6100.OUT- AV

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 1310.00(Ft.)  
Length along longest watercourse measured to centroid = 750.00(Ft.)  
Length along longest watercourse = 0.248 Mi.  
Length along longest watercourse measured to centroid = 0.142 Mi.  
Difference in elevation = 34.80(Ft.)  
Slope along watercourse = 140.2626 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.079 Hr.  
Lag time = 4.74 Min.  
25% of lag time = 1.18 Min.  
40% of lag time = 1.89 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	1.35	21.47

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	2.90	46.11

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 1.350(In)

Area Averaged 100-Year Rainfall = 2.900(In)

Point rain (area averaged) = 2.900(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 2.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	78.00	0.000
4.770	89.00	0.000
Total Area Entered = 15.90(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
78.0	78.0	0.268	0.000	0.268	0.700	0.187
89.0	89.0	0.141	0.000	0.141	0.300	0.042
						Sum (F) = 0.230

Area averaged mean soil loss (F) (In/Hr) = 0.230  
 Minimum soil loss rate ((In/Hr)) = 0.115  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

-----  
 U n i t H y d r o g r a p h  
 FOOTHILL S-Curve  
 -----

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	105.565	2.627
2	0.167	211.130	8.987
3	0.250	316.695	2.806
4	0.333	422.261	1.086
5	0.417	527.826	0.314
6	0.500	633.391	0.128
7	0.583	738.956	0.076
		Sum = 100.000	Sum= 16.024

-----  
 The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
			Max	Low	
1	0.08	0.50	( 0.230)	0.157	0.017
2	0.17	0.60	( 0.230)	0.188	0.021
3	0.25	0.60	( 0.230)	0.188	0.021
4	0.33	0.60	( 0.230)	0.188	0.021
5	0.42	0.60	( 0.230)	0.188	0.021
6	0.50	0.70	( 0.230)	0.219	0.024
7	0.58	0.70	( 0.230)	0.219	0.024
8	0.67	0.70	( 0.230)	0.219	0.024
9	0.75	0.70	( 0.230)	0.219	0.024
10	0.83	0.70	( 0.230)	0.219	0.024
11	0.92	0.70	( 0.230)	0.219	0.024
12	1.00	0.80	0.230	( 0.251)	0.049
13	1.08	0.80	0.230	( 0.251)	0.049

14	1.17	0.80	0.278	0.230	( 0.251)	0.049
15	1.25	0.80	0.278	0.230	( 0.251)	0.049
16	1.33	0.80	0.278	0.230	( 0.251)	0.049
17	1.42	0.80	0.278	0.230	( 0.251)	0.049
18	1.50	0.80	0.278	0.230	( 0.251)	0.049
19	1.58	0.80	0.278	0.230	( 0.251)	0.049
20	1.67	0.80	0.278	0.230	( 0.251)	0.049
21	1.75	0.80	0.278	0.230	( 0.251)	0.049
22	1.83	0.80	0.278	0.230	( 0.251)	0.049
23	1.92	0.80	0.278	0.230	( 0.251)	0.049
24	2.00	0.90	0.313	0.230	( 0.282)	0.083
25	2.08	0.80	0.278	0.230	( 0.251)	0.049
26	2.17	0.90	0.313	0.230	( 0.282)	0.083
27	2.25	0.90	0.313	0.230	( 0.282)	0.083
28	2.33	0.90	0.313	0.230	( 0.282)	0.083
29	2.42	0.90	0.313	0.230	( 0.282)	0.083
30	2.50	0.90	0.313	0.230	( 0.282)	0.083
31	2.58	0.90	0.313	0.230	( 0.282)	0.083
32	2.67	0.90	0.313	0.230	( 0.282)	0.083
33	2.75	1.00	0.348	0.230	( 0.313)	0.118
34	2.83	1.00	0.348	0.230	( 0.313)	0.118
35	2.92	1.00	0.348	0.230	( 0.313)	0.118
36	3.00	1.00	0.348	0.230	( 0.313)	0.118
37	3.08	1.00	0.348	0.230	( 0.313)	0.118
38	3.17	1.10	0.383	0.230	( 0.345)	0.153
39	3.25	1.10	0.383	0.230	( 0.345)	0.153
40	3.33	1.10	0.383	0.230	( 0.345)	0.153
41	3.42	1.20	0.418	0.230	( 0.376)	0.188
42	3.50	1.30	0.452	0.230	( 0.407)	0.223
43	3.58	1.40	0.487	0.230	( 0.438)	0.257
44	3.67	1.40	0.487	0.230	( 0.438)	0.257
45	3.75	1.50	0.522	0.230	( 0.470)	0.292
46	3.83	1.50	0.522	0.230	( 0.470)	0.292
47	3.92	1.60	0.557	0.230	( 0.501)	0.327
48	4.00	1.60	0.557	0.230	( 0.501)	0.327
49	4.08	1.70	0.592	0.230	( 0.532)	0.362
50	4.17	1.80	0.626	0.230	( 0.564)	0.397
51	4.25	1.90	0.661	0.230	( 0.595)	0.431
52	4.33	2.00	0.696	0.230	( 0.626)	0.466
53	4.42	2.10	0.731	0.230	( 0.658)	0.501
54	4.50	2.10	0.731	0.230	( 0.658)	0.501
55	4.58	2.20	0.766	0.230	( 0.689)	0.536
56	4.67	2.30	0.800	0.230	( 0.720)	0.571
57	4.75	2.40	0.835	0.230	( 0.752)	0.605
58	4.83	2.40	0.835	0.230	( 0.752)	0.605
59	4.92	2.50	0.870	0.230	( 0.783)	0.640
60	5.00	2.60	0.905	0.230	( 0.814)	0.675
61	5.08	3.10	1.079	0.230	( 0.971)	0.849
62	5.17	3.60	1.253	0.230	( 1.127)	1.023
63	5.25	3.90	1.357	0.230	( 1.221)	1.127
64	5.33	4.20	1.462	0.230	( 1.315)	1.232
65	5.42	4.70	1.636	0.230	( 1.472)	1.406
66	5.50	5.60	1.949	0.230	( 1.754)	1.719
67	5.58	1.90	0.661	0.230	( 0.595)	0.431
68	5.67	0.90	0.313	0.230	( 0.282)	0.083
69	5.75	0.60	0.209	( 0.230)	0.188	0.021
70	5.83	0.50	0.174	( 0.230)	0.157	0.017
71	5.92	0.30	0.104	( 0.230)	0.094	0.010
72	6.00	0.20	0.070	( 0.230)	0.063	0.007

(Loss Rate Not Used)

Sum = 100.0

Sum = 19.0

Flood volume = Effective rainfall 1.58(In)  
 times area 15.9(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)  
 Total soil loss = 1.32(In)  
 Total soil loss = 1.747(Ac.Ft)  
 Total rainfall = 2.90(In)  
 Flood volume = 91280.5 Cubic Feet  
 Total soil loss = 76089.6 Cubic Feet

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 Peak flow rate of this hydrograph = 22.425(CFS)  
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6 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h

-----  
 Hydrograph in 5 Minute intervals ((CFS))  
 -----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0003	0.05	Q				
0+10	0.0018	0.21	Q				
0+15	0.0038	0.29	Q				
0+20	0.0060	0.32	Q				
0+25	0.0083	0.33	Q				
0+30	0.0106	0.34	Q				
0+35	0.0132	0.37	Q				
0+40	0.0158	0.38	Q				
0+45	0.0185	0.39	Q				
0+50	0.0212	0.39	Q				
0+55	0.0239	0.39	Q				
1+ 0	0.0270	0.45	Q				
1+ 5	0.0317	0.67	Q				
1+10	0.0368	0.74	Q				
1+15	0.0420	0.77	VQ				
1+20	0.0474	0.77	VQ				
1+25	0.0527	0.78	Q				
1+30	0.0581	0.78	Q				
1+35	0.0635	0.78	Q				
1+40	0.0688	0.78	Q				
1+45	0.0742	0.78	Q				
1+50	0.0796	0.78	Q				
1+55	0.0850	0.78	Q				
2+ 0	0.0910	0.87	Q				
2+ 5	0.0985	1.09	Q				
2+10	0.1052	0.97	QV				
2+15	0.1136	1.22	QV				
2+20	0.1225	1.29	QV				
2+25	0.1316	1.32	QV				
2+30	0.1408	1.33	QV				
2+35	0.1500	1.34	QV				
2+40	0.1592	1.34	Q V				
2+45	0.1690	1.43	Q V				
2+50	0.1810	1.74	QV				
2+55	0.1937	1.84	QV				
3+ 0	0.2066	1.88	QV				
3+ 5	0.2196	1.89	Q V				
3+10	0.2333	1.98	Q V				
3+15	0.2492	2.30	QV				
3+20	0.2657	2.40	Q V				
3+25	0.2831	2.53	Q V				
3+30	0.3033	2.94	Q V				



**EXISTING CONDITION – 100-YEAR, 24-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 05/22/23 File: B2ONSITEPRE24100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 100-YEAR 24-HOUR  
FN: B2ONSITEPRE24100.OUT- AV

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 1310.00(Ft.)  
Length along longest watercourse measured to centroid = 750.00(Ft.)  
Length along longest watercourse = 0.248 Mi.  
Length along longest watercourse measured to centroid = 0.142 Mi.  
Difference in elevation = 34.80(Ft.)  
Slope along watercourse = 140.2626 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.079 Hr.  
Lag time = 4.74 Min.  
25% of lag time = 1.18 Min.  
40% of lag time = 1.89 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	2.40	38.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
15.90	6.50	103.35

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 2.400(In)



Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 6.500(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 6.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	78.00	0.000
4.770	89.00	0.000
Total Area Entered = 15.90(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
78.0	78.0	0.268	0.000	0.268	0.700	0.187
89.0	89.0	0.141	0.000	0.141	0.300	0.042
						Sum (F) = 0.230

Area averaged mean soil loss (F) (In/Hr) = 0.230  
 Minimum soil loss rate ((In/Hr)) = 0.115  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

-----  
 U n i t H y d r o g r a p h  
 FOOTHILL S-Curve  
 -----

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	105.565	2.627
2	0.167	211.130	8.987
3	0.250	316.695	2.806
4	0.333	422.261	1.086
5	0.417	527.826	0.314
6	0.500	633.391	0.128
7	0.583	738.956	0.076
Sum = 100.000			Sum= 16.024

-----  
 The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
			Max	Low	
1	0.08	0.052	( 0.407)	0.047	0.005
2	0.17	0.052	( 0.406)	0.047	0.005
3	0.25	0.052	( 0.404)	0.047	0.005
4	0.33	0.078	( 0.403)	0.070	0.008
5	0.42	0.078	( 0.401)	0.070	0.008
6	0.50	0.078	( 0.399)	0.070	0.008
7	0.58	0.078	( 0.398)	0.070	0.008
8	0.67	0.078	( 0.396)	0.070	0.008
9	0.75	0.078	( 0.395)	0.070	0.008
10	0.83	0.104	( 0.393)	0.094	0.010
11	0.92	0.104	( 0.392)	0.094	0.010
12	1.00	0.104	( 0.390)	0.094	0.010
13	1.08	0.078	( 0.389)	0.070	0.008

14	1.17	0.10	0.078	( 0.387)	0.070	0.008
15	1.25	0.10	0.078	( 0.385)	0.070	0.008
16	1.33	0.10	0.078	( 0.384)	0.070	0.008
17	1.42	0.10	0.078	( 0.382)	0.070	0.008
18	1.50	0.10	0.078	( 0.381)	0.070	0.008
19	1.58	0.10	0.078	( 0.379)	0.070	0.008
20	1.67	0.10	0.078	( 0.378)	0.070	0.008
21	1.75	0.10	0.078	( 0.376)	0.070	0.008
22	1.83	0.13	0.104	( 0.375)	0.094	0.010
23	1.92	0.13	0.104	( 0.373)	0.094	0.010
24	2.00	0.13	0.104	( 0.372)	0.094	0.010
25	2.08	0.13	0.104	( 0.370)	0.094	0.010
26	2.17	0.13	0.104	( 0.369)	0.094	0.010
27	2.25	0.13	0.104	( 0.367)	0.094	0.010
28	2.33	0.13	0.104	( 0.366)	0.094	0.010
29	2.42	0.13	0.104	( 0.364)	0.094	0.010
30	2.50	0.13	0.104	( 0.363)	0.094	0.010
31	2.58	0.17	0.130	( 0.361)	0.117	0.013
32	2.67	0.17	0.130	( 0.360)	0.117	0.013
33	2.75	0.17	0.130	( 0.358)	0.117	0.013
34	2.83	0.17	0.130	( 0.357)	0.117	0.013
35	2.92	0.17	0.130	( 0.355)	0.117	0.013
36	3.00	0.17	0.130	( 0.354)	0.117	0.013
37	3.08	0.17	0.130	( 0.353)	0.117	0.013
38	3.17	0.17	0.130	( 0.351)	0.117	0.013
39	3.25	0.17	0.130	( 0.350)	0.117	0.013
40	3.33	0.17	0.130	( 0.348)	0.117	0.013
41	3.42	0.17	0.130	( 0.347)	0.117	0.013
42	3.50	0.17	0.130	( 0.345)	0.117	0.013
43	3.58	0.17	0.130	( 0.344)	0.117	0.013
44	3.67	0.17	0.130	( 0.342)	0.117	0.013
45	3.75	0.17	0.130	( 0.341)	0.117	0.013
46	3.83	0.20	0.156	( 0.339)	0.140	0.016
47	3.92	0.20	0.156	( 0.338)	0.140	0.016
48	4.00	0.20	0.156	( 0.337)	0.140	0.016
49	4.08	0.20	0.156	( 0.335)	0.140	0.016
50	4.17	0.20	0.156	( 0.334)	0.140	0.016
51	4.25	0.20	0.156	( 0.332)	0.140	0.016
52	4.33	0.23	0.182	( 0.331)	0.164	0.018
53	4.42	0.23	0.182	( 0.329)	0.164	0.018
54	4.50	0.23	0.182	( 0.328)	0.164	0.018
55	4.58	0.23	0.182	( 0.327)	0.164	0.018
56	4.67	0.23	0.182	( 0.325)	0.164	0.018
57	4.75	0.23	0.182	( 0.324)	0.164	0.018
58	4.83	0.27	0.208	( 0.322)	0.187	0.021
59	4.92	0.27	0.208	( 0.321)	0.187	0.021
60	5.00	0.27	0.208	( 0.320)	0.187	0.021
61	5.08	0.20	0.156	( 0.318)	0.140	0.016
62	5.17	0.20	0.156	( 0.317)	0.140	0.016
63	5.25	0.20	0.156	( 0.316)	0.140	0.016
64	5.33	0.23	0.182	( 0.314)	0.164	0.018
65	5.42	0.23	0.182	( 0.313)	0.164	0.018
66	5.50	0.23	0.182	( 0.311)	0.164	0.018
67	5.58	0.27	0.208	( 0.310)	0.187	0.021
68	5.67	0.27	0.208	( 0.309)	0.187	0.021
69	5.75	0.27	0.208	( 0.307)	0.187	0.021
70	5.83	0.27	0.208	( 0.306)	0.187	0.021
71	5.92	0.27	0.208	( 0.305)	0.187	0.021
72	6.00	0.27	0.208	( 0.303)	0.187	0.021
73	6.08	0.30	0.234	( 0.302)	0.211	0.023
74	6.17	0.30	0.234	( 0.301)	0.211	0.023

75	6.25	0.30	0.234	( 0.299)	0.211	0.023
76	6.33	0.30	0.234	( 0.298)	0.211	0.023
77	6.42	0.30	0.234	( 0.297)	0.211	0.023
78	6.50	0.30	0.234	( 0.295)	0.211	0.023
79	6.58	0.33	0.260	( 0.294)	0.234	0.026
80	6.67	0.33	0.260	( 0.293)	0.234	0.026
81	6.75	0.33	0.260	( 0.291)	0.234	0.026
82	6.83	0.33	0.260	( 0.290)	0.234	0.026
83	6.92	0.33	0.260	( 0.289)	0.234	0.026
84	7.00	0.33	0.260	( 0.287)	0.234	0.026
85	7.08	0.33	0.260	( 0.286)	0.234	0.026
86	7.17	0.33	0.260	( 0.285)	0.234	0.026
87	7.25	0.33	0.260	( 0.283)	0.234	0.026
88	7.33	0.37	0.286	( 0.282)	0.257	0.029
89	7.42	0.37	0.286	( 0.281)	0.257	0.029
90	7.50	0.37	0.286	( 0.280)	0.257	0.029
91	7.58	0.40	0.312	0.278	( 0.281)	0.034
92	7.67	0.40	0.312	0.277	( 0.281)	0.035
93	7.75	0.40	0.312	0.276	( 0.281)	0.036
94	7.83	0.43	0.338	0.274	( 0.304)	0.064
95	7.92	0.43	0.338	0.273	( 0.304)	0.065
96	8.00	0.43	0.338	0.272	( 0.304)	0.066
97	8.08	0.50	0.390	0.271	( 0.351)	0.119
98	8.17	0.50	0.390	0.269	( 0.351)	0.121
99	8.25	0.50	0.390	0.268	( 0.351)	0.122
100	8.33	0.50	0.390	0.267	( 0.351)	0.123
101	8.42	0.50	0.390	0.266	( 0.351)	0.124
102	8.50	0.50	0.390	0.264	( 0.351)	0.126
103	8.58	0.53	0.416	0.263	( 0.374)	0.153
104	8.67	0.53	0.416	0.262	( 0.374)	0.154
105	8.75	0.53	0.416	0.261	( 0.374)	0.155
106	8.83	0.57	0.442	0.259	( 0.398)	0.183
107	8.92	0.57	0.442	0.258	( 0.398)	0.184
108	9.00	0.57	0.442	0.257	( 0.398)	0.185
109	9.08	0.63	0.494	0.256	( 0.445)	0.238
110	9.17	0.63	0.494	0.255	( 0.445)	0.239
111	9.25	0.63	0.494	0.253	( 0.445)	0.241
112	9.33	0.67	0.520	0.252	( 0.468)	0.268
113	9.42	0.67	0.520	0.251	( 0.468)	0.269
114	9.50	0.67	0.520	0.250	( 0.468)	0.270
115	9.58	0.70	0.546	0.249	( 0.491)	0.297
116	9.67	0.70	0.546	0.247	( 0.491)	0.299
117	9.75	0.70	0.546	0.246	( 0.491)	0.300
118	9.83	0.73	0.572	0.245	( 0.515)	0.327
119	9.92	0.73	0.572	0.244	( 0.515)	0.328
120	10.00	0.73	0.572	0.243	( 0.515)	0.329
121	10.08	0.50	0.390	0.241	( 0.351)	0.149
122	10.17	0.50	0.390	0.240	( 0.351)	0.150
123	10.25	0.50	0.390	0.239	( 0.351)	0.151
124	10.33	0.50	0.390	0.238	( 0.351)	0.152
125	10.42	0.50	0.390	0.237	( 0.351)	0.153
126	10.50	0.50	0.390	0.236	( 0.351)	0.154
127	10.58	0.67	0.520	0.234	( 0.468)	0.286
128	10.67	0.67	0.520	0.233	( 0.468)	0.287
129	10.75	0.67	0.520	0.232	( 0.468)	0.288
130	10.83	0.67	0.520	0.231	( 0.468)	0.289
131	10.92	0.67	0.520	0.230	( 0.468)	0.290
132	11.00	0.67	0.520	0.229	( 0.468)	0.291
133	11.08	0.63	0.494	0.228	( 0.445)	0.266
134	11.17	0.63	0.494	0.227	( 0.445)	0.267
135	11.25	0.63	0.494	0.225	( 0.445)	0.269

136	11.33	0.63	0.494	0.224	( 0.445)	0.270
137	11.42	0.63	0.494	0.223	( 0.445)	0.271
138	11.50	0.63	0.494	0.222	( 0.445)	0.272
139	11.58	0.57	0.442	0.221	( 0.398)	0.221
140	11.67	0.57	0.442	0.220	( 0.398)	0.222
141	11.75	0.57	0.442	0.219	( 0.398)	0.223
142	11.83	0.60	0.468	0.218	( 0.421)	0.250
143	11.92	0.60	0.468	0.217	( 0.421)	0.251
144	12.00	0.60	0.468	0.216	( 0.421)	0.252
145	12.08	0.83	0.650	0.214	( 0.585)	0.436
146	12.17	0.83	0.650	0.213	( 0.585)	0.437
147	12.25	0.83	0.650	0.212	( 0.585)	0.438
148	12.33	0.87	0.676	0.211	( 0.608)	0.465
149	12.42	0.87	0.676	0.210	( 0.608)	0.466
150	12.50	0.87	0.676	0.209	( 0.608)	0.467
151	12.58	0.93	0.728	0.208	( 0.655)	0.520
152	12.67	0.93	0.728	0.207	( 0.655)	0.521
153	12.75	0.93	0.728	0.206	( 0.655)	0.522
154	12.83	0.97	0.754	0.205	( 0.679)	0.549
155	12.92	0.97	0.754	0.204	( 0.679)	0.550
156	13.00	0.97	0.754	0.203	( 0.679)	0.551
157	13.08	1.13	0.884	0.202	( 0.796)	0.682
158	13.17	1.13	0.884	0.201	( 0.796)	0.683
159	13.25	1.13	0.884	0.200	( 0.796)	0.684
160	13.33	1.13	0.884	0.199	( 0.796)	0.685
161	13.42	1.13	0.884	0.198	( 0.796)	0.686
162	13.50	1.13	0.884	0.197	( 0.796)	0.687
163	13.58	0.77	0.598	0.196	( 0.538)	0.402
164	13.67	0.77	0.598	0.195	( 0.538)	0.403
165	13.75	0.77	0.598	0.194	( 0.538)	0.404
166	13.83	0.77	0.598	0.193	( 0.538)	0.405
167	13.92	0.77	0.598	0.192	( 0.538)	0.406
168	14.00	0.77	0.598	0.191	( 0.538)	0.407
169	14.08	0.90	0.702	0.190	( 0.632)	0.512
170	14.17	0.90	0.702	0.189	( 0.632)	0.513
171	14.25	0.90	0.702	0.188	( 0.632)	0.514
172	14.33	0.87	0.676	0.187	( 0.608)	0.489
173	14.42	0.87	0.676	0.186	( 0.608)	0.490
174	14.50	0.87	0.676	0.185	( 0.608)	0.491
175	14.58	0.87	0.676	0.184	( 0.608)	0.492
176	14.67	0.87	0.676	0.183	( 0.608)	0.493
177	14.75	0.87	0.676	0.182	( 0.608)	0.494
178	14.83	0.83	0.650	0.181	( 0.585)	0.469
179	14.92	0.83	0.650	0.180	( 0.585)	0.470
180	15.00	0.83	0.650	0.179	( 0.585)	0.471
181	15.08	0.80	0.624	0.179	( 0.562)	0.445
182	15.17	0.80	0.624	0.178	( 0.562)	0.446
183	15.25	0.80	0.624	0.177	( 0.562)	0.447
184	15.33	0.77	0.598	0.176	( 0.538)	0.422
185	15.42	0.77	0.598	0.175	( 0.538)	0.423
186	15.50	0.77	0.598	0.174	( 0.538)	0.424
187	15.58	0.63	0.494	0.173	( 0.445)	0.321
188	15.67	0.63	0.494	0.172	( 0.445)	0.322
189	15.75	0.63	0.494	0.171	( 0.445)	0.323
190	15.83	0.63	0.494	0.170	( 0.445)	0.324
191	15.92	0.63	0.494	0.170	( 0.445)	0.324
192	16.00	0.63	0.494	0.169	( 0.445)	0.325
193	16.08	0.13	0.104	( 0.168)	0.094	0.010
194	16.17	0.13	0.104	( 0.167)	0.094	0.010
195	16.25	0.13	0.104	( 0.166)	0.094	0.010
196	16.33	0.13	0.104	( 0.165)	0.094	0.010

197	16.42	0.13	0.104	( 0.164)	0.094	0.010
198	16.50	0.13	0.104	( 0.164)	0.094	0.010
199	16.58	0.10	0.078	( 0.163)	0.070	0.008
200	16.67	0.10	0.078	( 0.162)	0.070	0.008
201	16.75	0.10	0.078	( 0.161)	0.070	0.008
202	16.83	0.10	0.078	( 0.160)	0.070	0.008
203	16.92	0.10	0.078	( 0.160)	0.070	0.008
204	17.00	0.10	0.078	( 0.159)	0.070	0.008
205	17.08	0.17	0.130	( 0.158)	0.117	0.013
206	17.17	0.17	0.130	( 0.157)	0.117	0.013
207	17.25	0.17	0.130	( 0.156)	0.117	0.013
208	17.33	0.17	0.130	( 0.156)	0.117	0.013
209	17.42	0.17	0.130	( 0.155)	0.117	0.013
210	17.50	0.17	0.130	( 0.154)	0.117	0.013
211	17.58	0.17	0.130	( 0.153)	0.117	0.013
212	17.67	0.17	0.130	( 0.152)	0.117	0.013
213	17.75	0.17	0.130	( 0.152)	0.117	0.013
214	17.83	0.13	0.104	( 0.151)	0.094	0.010
215	17.92	0.13	0.104	( 0.150)	0.094	0.010
216	18.00	0.13	0.104	( 0.149)	0.094	0.010
217	18.08	0.13	0.104	( 0.149)	0.094	0.010
218	18.17	0.13	0.104	( 0.148)	0.094	0.010
219	18.25	0.13	0.104	( 0.147)	0.094	0.010
220	18.33	0.13	0.104	( 0.147)	0.094	0.010
221	18.42	0.13	0.104	( 0.146)	0.094	0.010
222	18.50	0.13	0.104	( 0.145)	0.094	0.010
223	18.58	0.10	0.078	( 0.144)	0.070	0.008
224	18.67	0.10	0.078	( 0.144)	0.070	0.008
225	18.75	0.10	0.078	( 0.143)	0.070	0.008
226	18.83	0.07	0.052	( 0.142)	0.047	0.005
227	18.92	0.07	0.052	( 0.142)	0.047	0.005
228	19.00	0.07	0.052	( 0.141)	0.047	0.005
229	19.08	0.10	0.078	( 0.140)	0.070	0.008
230	19.17	0.10	0.078	( 0.140)	0.070	0.008
231	19.25	0.10	0.078	( 0.139)	0.070	0.008
232	19.33	0.13	0.104	( 0.138)	0.094	0.010
233	19.42	0.13	0.104	( 0.138)	0.094	0.010
234	19.50	0.13	0.104	( 0.137)	0.094	0.010
235	19.58	0.10	0.078	( 0.136)	0.070	0.008
236	19.67	0.10	0.078	( 0.136)	0.070	0.008
237	19.75	0.10	0.078	( 0.135)	0.070	0.008
238	19.83	0.07	0.052	( 0.135)	0.047	0.005
239	19.92	0.07	0.052	( 0.134)	0.047	0.005
240	20.00	0.07	0.052	( 0.133)	0.047	0.005
241	20.08	0.10	0.078	( 0.133)	0.070	0.008
242	20.17	0.10	0.078	( 0.132)	0.070	0.008
243	20.25	0.10	0.078	( 0.132)	0.070	0.008
244	20.33	0.10	0.078	( 0.131)	0.070	0.008
245	20.42	0.10	0.078	( 0.131)	0.070	0.008
246	20.50	0.10	0.078	( 0.130)	0.070	0.008
247	20.58	0.10	0.078	( 0.129)	0.070	0.008
248	20.67	0.10	0.078	( 0.129)	0.070	0.008
249	20.75	0.10	0.078	( 0.128)	0.070	0.008
250	20.83	0.07	0.052	( 0.128)	0.047	0.005
251	20.92	0.07	0.052	( 0.127)	0.047	0.005
252	21.00	0.07	0.052	( 0.127)	0.047	0.005
253	21.08	0.10	0.078	( 0.126)	0.070	0.008
254	21.17	0.10	0.078	( 0.126)	0.070	0.008
255	21.25	0.10	0.078	( 0.125)	0.070	0.008
256	21.33	0.07	0.052	( 0.125)	0.047	0.005
257	21.42	0.07	0.052	( 0.124)	0.047	0.005



0+50	0.0067	0.13	Q
0+55	0.0078	0.16	Q
1+ 0	0.0089	0.16	Q
1+ 5	0.0100	0.16	Q
1+10	0.0109	0.14	Q
1+15	0.0118	0.13	Q
1+20	0.0127	0.13	Q
1+25	0.0136	0.13	Q
1+30	0.0144	0.13	Q
1+35	0.0153	0.13	Q
1+40	0.0161	0.13	Q
1+45	0.0170	0.13	Q
1+50	0.0179	0.13	Q
1+55	0.0190	0.16	Q
2+ 0	0.0201	0.16	Q
2+ 5	0.0212	0.17	Q
2+10	0.0224	0.17	Q
2+15	0.0235	0.17	Q
2+20	0.0247	0.17	Q
2+25	0.0258	0.17	Q
2+30	0.0270	0.17	Q
2+35	0.0282	0.17	Q
2+40	0.0295	0.20	Q
2+45	0.0309	0.20	Q
2+50	0.0324	0.21	Q
2+55	0.0338	0.21	Q
3+ 0	0.0352	0.21	Q
3+ 5	0.0367	0.21	Q
3+10	0.0381	0.21	Q
3+15	0.0395	0.21	Q
3+20	0.0410	0.21	Q
3+25	0.0424	0.21	Q
3+30	0.0438	0.21	Q
3+35	0.0453	0.21	Q
3+40	0.0467	0.21	Q
3+45	0.0481	0.21	Q
3+50	0.0496	0.22	Q
3+55	0.0513	0.24	Q
4+ 0	0.0530	0.25	Q
4+ 5	0.0547	0.25	Q
4+10	0.0564	0.25	Q
4+15	0.0581	0.25	Q
4+20	0.0599	0.26	Q
4+25	0.0618	0.28	Q
4+30	0.0638	0.29	Q
4+35	0.0658	0.29	Q
4+40	0.0678	0.29	Q
4+45	0.0698	0.29	Q
4+50	0.0719	0.30	Q
4+55	0.0741	0.32	Q
5+ 0	0.0764	0.33	Q
5+ 5	0.0785	0.32	Q
5+10	0.0804	0.27	Q
5+15	0.0822	0.26	Q
5+20	0.0840	0.26	Q
5+25	0.0859	0.28	Q
5+30	0.0879	0.29	Q
5+35	0.0900	0.30	Q
5+40	0.0922	0.32	Q
5+45	0.0944	0.33	Q
5+50	0.0967	0.33	Q

5+55	0.0990	0.33	Q
6+ 0	0.1013	0.33	QV
6+ 5	0.1037	0.34	QV
6+10	0.1062	0.36	QV
6+15	0.1087	0.37	QV
6+20	0.1113	0.37	QV
6+25	0.1139	0.37	QV
6+30	0.1165	0.37	QV
6+35	0.1191	0.38	QV
6+40	0.1219	0.41	QV
6+45	0.1247	0.41	QV
6+50	0.1276	0.42	QV
6+55	0.1304	0.42	QV
7+ 0	0.1333	0.42	QV
7+ 5	0.1362	0.42	QV
7+10	0.1391	0.42	QV
7+15	0.1419	0.42	QV
7+20	0.1448	0.42	QV
7+25	0.1479	0.45	QV
7+30	0.1511	0.45	QV
7+35	0.1543	0.47	QV
7+40	0.1579	0.52	Q
7+45	0.1617	0.55	Q
7+50	0.1661	0.64	Q
7+55	0.1723	0.90	Q
8+ 0	0.1791	0.99	Q
8+ 5	0.1872	1.18	VQ
8+10	0.1988	1.67	V Q
8+15	0.2115	1.84	VQ
8+20	0.2247	1.92	VQ
8+25	0.2382	1.96	VQ
8+30	0.2518	1.98	VQ
8+35	0.2662	2.08	V Q
8+40	0.2822	2.33	V Q
8+45	0.2989	2.42	V Q
8+50	0.3164	2.54	V Q
8+55	0.3357	2.80	V Q
9+ 0	0.3556	2.90	V Q
9+ 5	0.3769	3.08	V Q
9+10	0.4015	3.58	V Q
9+15	0.4273	3.75	V Q
9+20	0.4542	3.89	V Q
9+25	0.4828	4.16	V Q
9+30	0.5122	4.26	V Q
9+35	0.5424	4.38	V Q
9+40	0.5744	4.64	V Q
9+45	0.6070	4.74	V Q
9+50	0.6405	4.86	V Q
9+55	0.6757	5.12	V Q
10+ 0	0.7116	5.21	V Q
10+ 5	0.7446	4.78	V Q
10+10	0.7664	3.17	QV
10+15	0.7849	2.69	Q V
10+20	0.8022	2.51	Q V
10+25	0.8192	2.47	Q V
10+30	0.8362	2.47	Q V
10+35	0.8556	2.81	Q V
10+40	0.8831	4.00	QV
10+45	0.9133	4.38	QV
10+50	0.9446	4.54	Q
10+55	0.9762	4.60	Q



11+ 0	1.0082	4.64	QV			
11+ 5	1.0398	4.60	QV			
11+10	1.0700	4.38	Q V			
11+15	1.0998	4.32	Q  V			
11+20	1.1295	4.31	Q  V			
11+25	1.1593	4.32	Q  V			
11+30	1.1891	4.34	Q  V			
11+35	1.2182	4.22	Q  V			
11+40	1.2441	3.77	Q  V			
11+45	1.2692	3.64	Q  V			
11+50	1.2945	3.67	Q  V			
11+55	1.3214	3.90	Q  V			
12+ 0	1.3488	3.99	Q  V			
12+ 5	1.3799	4.51	Q  V			
12+10	1.4224	6.17	Q V			
12+15	1.4685	6.70	QV			
12+20	1.5166	6.99	Q V			
12+25	1.5669	7.29	QV			
12+30	1.6179	7.41	Q V			
12+35	1.6703	7.60	QV			
12+40	1.7260	8.10	QV			
12+45	1.7829	8.26	QV			
12+50	1.8408	8.41	Q V			
12+55	1.9005	8.67	Q V			
13+ 0	1.9609	8.77	Q V			
13+ 5	2.0240	9.16	Q V			
13+10	2.0953	10.35	Q			
13+15	2.1693	10.74	Q			
13+20	2.2443	10.90	QV			
13+25	2.3198	10.95	Q V			
13+30	2.3954	10.99	Q V			
13+35	2.4661	10.26	Q V			
13+40	2.5192	7.71	Q			
13+45	2.5668	6.92	Q			
13+50	2.6124	6.62	Q			
13+55	2.6576	6.55	Q			
14+ 0	2.7025	6.53	Q			
14+ 5	2.7493	6.80	Q			
14+10	2.8027	7.75	Q			
14+15	2.8582	8.06	Q			
14+20	2.9141	8.12	Q			
14+25	2.9687	7.93	Q			
14+30	3.0230	7.89	Q			
14+35	3.0772	7.88	Q			
14+40	3.1316	7.89	Q			
14+45	3.1860	7.90	Q			
14+50	3.2400	7.84	Q			
14+55	3.2925	7.63	Q			
15+ 0	3.3446	7.57	Q			
15+ 5	3.3962	7.49	Q			
15+10	3.4462	7.26	Q			
15+15	3.4957	7.20	Q			
15+20	3.5447	7.11	Q			
15+25	3.5921	6.89	Q			
15+30	3.6391	6.82	Q			
15+35	3.6841	6.53	Q			
15+40	3.7227	5.61	Q			
15+45	3.7594	5.32	Q			
15+50	3.7954	5.22	Q			
15+55	3.8312	5.20	Q			
16+ 0	3.8670	5.21	Q			

16+ 5	3.8972	4.38		Q				V	
16+10	3.9079	1.55		Q				V	
16+15	3.9125	0.67		Q				V	
16+20	3.9148	0.33	Q					V	
16+25	3.9164	0.23	Q					V	
16+30	3.9177	0.19	Q					V	
16+35	3.9188	0.16	Q					V	
16+40	3.9198	0.14	Q					V	
16+45	3.9207	0.13	Q					V	
16+50	3.9215	0.13	Q					V	
16+55	3.9224	0.13	Q					V	
17+ 0	3.9233	0.13	Q					V	
17+ 5	3.9242	0.14	Q					V	
17+10	3.9255	0.19	Q					V	
17+15	3.9269	0.20	Q					V	
17+20	3.9283	0.21	Q					V	
17+25	3.9297	0.21	Q					V	
17+30	3.9311	0.21	Q					V	
17+35	3.9326	0.21	Q					V	
17+40	3.9340	0.21	Q					V	
17+45	3.9354	0.21	Q					V	
17+50	3.9368	0.20	Q					V	
17+55	3.9381	0.18	Q					V	
18+ 0	3.9392	0.17	Q					V	
18+ 5	3.9404	0.17	Q					V	
18+10	3.9415	0.17	Q					V	
18+15	3.9427	0.17	Q					V	
18+20	3.9438	0.17	Q					V	
18+25	3.9450	0.17	Q					V	
18+30	3.9461	0.17	Q					V	
18+35	3.9472	0.16	Q					V	
18+40	3.9482	0.14	Q					V	
18+45	3.9491	0.13	Q					V	
18+50	3.9499	0.12	Q					V	
18+55	3.9506	0.10	Q					V	
19+ 0	3.9512	0.09	Q					V	
19+ 5	3.9518	0.09	Q					V	
19+10	3.9526	0.11	Q					V	
19+15	3.9534	0.12	Q					V	
19+20	3.9543	0.13	Q					V	
19+25	3.9554	0.15	Q					V	
19+30	3.9565	0.16	Q					V	
19+35	3.9576	0.16	Q					V	
19+40	3.9585	0.14	Q					V	
19+45	3.9594	0.13	Q					V	
19+50	3.9602	0.12	Q					V	
19+55	3.9609	0.10	Q					V	
20+ 0	3.9615	0.09	Q					V	
20+ 5	3.9621	0.09	Q					V	
20+10	3.9629	0.11	Q					V	
20+15	3.9637	0.12	Q					V	
20+20	3.9646	0.12	Q					V	
20+25	3.9655	0.12	Q					V	
20+30	3.9663	0.12	Q					V	
20+35	3.9672	0.13	Q					V	
20+40	3.9680	0.13	Q					V	
20+45	3.9689	0.13	Q					V	
20+50	3.9697	0.12	Q					V	
20+55	3.9704	0.09	Q					V	
21+ 0	3.9710	0.09	Q					V	
21+ 5	3.9716	0.09	Q					V	

21+10	3.9724	0.11	Q				V
21+15	3.9732	0.12	Q				V
21+20	3.9740	0.12	Q				V
21+25	3.9747	0.09	Q				V
21+30	3.9753	0.09	Q				V
21+35	3.9759	0.09	Q				V
21+40	3.9767	0.11	Q				V
21+45	3.9775	0.12	Q				V
21+50	3.9783	0.12	Q				V
21+55	3.9790	0.09	Q				V
22+ 0	3.9796	0.09	Q				V
22+ 5	3.9802	0.09	Q				V
22+10	3.9810	0.11	Q				V
22+15	3.9818	0.12	Q				V
22+20	3.9826	0.12	Q				V
22+25	3.9833	0.09	Q				V
22+30	3.9839	0.09	Q				V
22+35	3.9845	0.08	Q				V
22+40	3.9850	0.08	Q				V
22+45	3.9856	0.08	Q				V
22+50	3.9862	0.08	Q				V
22+55	3.9868	0.08	Q				V
23+ 0	3.9873	0.08	Q				V
23+ 5	3.9879	0.08	Q				V
23+10	3.9885	0.08	Q				V
23+15	3.9891	0.08	Q				V
23+20	3.9896	0.08	Q				V
23+25	3.9902	0.08	Q				V
23+30	3.9908	0.08	Q				V
23+35	3.9914	0.08	Q				V
23+40	3.9919	0.08	Q				V
23+45	3.9925	0.08	Q				V
23+50	3.9931	0.08	Q				V
23+55	3.9937	0.08	Q				V
24+ 0	3.9942	0.08	Q				V
24+ 5	3.9947	0.07	Q				V
24+10	3.9949	0.02	Q				V
24+15	3.9949	0.01	Q				V
24+20	3.9949	0.00	Q				V
24+25	3.9950	0.00	Q				V
24+30	3.9950	0.00	Q				V

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**PROPOSED CONDITION UNIT HYDROGRAPHS**

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**PROPOSED CONDITION – 2-YEAR, 24-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 06/12/23 File: B2ONSITEPROP242.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 2-YEAR 24-HOUR  
FN: B2ONSITEPROP242.OUT- ABE

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 890.00(Ft.)  
Length along longest watercourse measured to centroid = 400.00(Ft.)  
Length along longest watercourse = 0.169 Mi.  
Length along longest watercourse measured to centroid = 0.076 Mi.  
Difference in elevation = 18.90(Ft.)  
Slope along watercourse = 112.1258 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.028 Hr.  
Lag time = 1.68 Min.  
25% of lag time = 0.42 Min.  
40% of lag time = 0.67 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	2.40	38.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	6.50	103.35

STORM EVENT (YEAR) = 2.00  
Area Averaged 2-Year Rainfall = 2.400(In)  
Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 2.400(In)  
Areal adjustment factor = 100.00 %  
Adjusted average point rain = 2.400(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	56.00	0.900
4.770	75.00	0.900
Total Area Entered =	15.90(Ac.)	

RI RI Infil. Rate Impervious Adj. Infil. Rate Area% F

AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
56.0	36.0	0.706	0.900	0.134	0.700	0.094
75.0	57.0	0.501	0.900	0.095	0.300	0.029
						Sum (F) = 0.122

Area averaged mean soil loss (F) (In/Hr) = 0.122  
 Minimum soil loss rate ((In/Hr)) = 0.061  
 (for 24 hour storm duration)  
 Soil loss rate (decimal) = 0.180

Unit Hydrograph  
 FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.585	57.422
2	0.167	595.170	40.450
3	0.250	892.755	2.128
Sum = 100.000			Sum= 16.024

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)	
1	0.08	0.07	( 0.217)	0.003	0.016
2	0.17	0.07	( 0.216)	0.003	0.016
3	0.25	0.07	( 0.215)	0.003	0.016
4	0.33	0.10	( 0.215)	0.005	0.024
5	0.42	0.10	( 0.214)	0.005	0.024
6	0.50	0.10	( 0.213)	0.005	0.024
7	0.58	0.10	( 0.212)	0.005	0.024
8	0.67	0.10	( 0.211)	0.005	0.024
9	0.75	0.10	( 0.210)	0.005	0.024
10	0.83	0.13	( 0.210)	0.007	0.031
11	0.92	0.13	( 0.209)	0.007	0.031
12	1.00	0.13	( 0.208)	0.007	0.031
13	1.08	0.10	( 0.207)	0.005	0.024
14	1.17	0.10	( 0.206)	0.005	0.024
15	1.25	0.10	( 0.205)	0.005	0.024
16	1.33	0.10	( 0.205)	0.005	0.024
17	1.42	0.10	( 0.204)	0.005	0.024
18	1.50	0.10	( 0.203)	0.005	0.024
19	1.58	0.10	( 0.202)	0.005	0.024
20	1.67	0.10	( 0.201)	0.005	0.024
21	1.75	0.10	( 0.201)	0.005	0.024
22	1.83	0.13	( 0.200)	0.007	0.031
23	1.92	0.13	( 0.199)	0.007	0.031
24	2.00	0.13	( 0.198)	0.007	0.031
25	2.08	0.13	( 0.197)	0.007	0.031
26	2.17	0.13	( 0.197)	0.007	0.031
27	2.25	0.13	( 0.196)	0.007	0.031
28	2.33	0.13	( 0.195)	0.007	0.031
29	2.42	0.13	( 0.194)	0.007	0.031
30	2.50	0.13	( 0.193)	0.007	0.031
31	2.58	0.17	( 0.193)	0.009	0.039
32	2.67	0.17	( 0.192)	0.009	0.039
33	2.75	0.17	( 0.191)	0.009	0.039
34	2.83	0.17	( 0.190)	0.009	0.039
35	2.92	0.17	( 0.189)	0.009	0.039
36	3.00	0.17	( 0.189)	0.009	0.039
37	3.08	0.17	( 0.188)	0.009	0.039
38	3.17	0.17	( 0.187)	0.009	0.039
39	3.25	0.17	( 0.186)	0.009	0.039
40	3.33	0.17	( 0.186)	0.009	0.039
41	3.42	0.17	( 0.185)	0.009	0.039
42	3.50	0.17	( 0.184)	0.009	0.039
43	3.58	0.17	( 0.183)	0.009	0.039
44	3.67	0.17	( 0.182)	0.009	0.039
45	3.75	0.17	( 0.182)	0.009	0.039

46	3.83	0.20	0.058	( 0.181)	0.010	0.047
47	3.92	0.20	0.058	( 0.180)	0.010	0.047
48	4.00	0.20	0.058	( 0.179)	0.010	0.047
49	4.08	0.20	0.058	( 0.179)	0.010	0.047
50	4.17	0.20	0.058	( 0.178)	0.010	0.047
51	4.25	0.20	0.058	( 0.177)	0.010	0.047
52	4.33	0.23	0.067	( 0.176)	0.012	0.055
53	4.42	0.23	0.067	( 0.176)	0.012	0.055
54	4.50	0.23	0.067	( 0.175)	0.012	0.055
55	4.58	0.23	0.067	( 0.174)	0.012	0.055
56	4.67	0.23	0.067	( 0.173)	0.012	0.055
57	4.75	0.23	0.067	( 0.173)	0.012	0.055
58	4.83	0.27	0.077	( 0.172)	0.014	0.063
59	4.92	0.27	0.077	( 0.171)	0.014	0.063
60	5.00	0.27	0.077	( 0.170)	0.014	0.063
61	5.08	0.20	0.058	( 0.170)	0.010	0.047
62	5.17	0.20	0.058	( 0.169)	0.010	0.047
63	5.25	0.20	0.058	( 0.168)	0.010	0.047
64	5.33	0.23	0.067	( 0.167)	0.012	0.055
65	5.42	0.23	0.067	( 0.167)	0.012	0.055
66	5.50	0.23	0.067	( 0.166)	0.012	0.055
67	5.58	0.27	0.077	( 0.165)	0.014	0.063
68	5.67	0.27	0.077	( 0.164)	0.014	0.063
69	5.75	0.27	0.077	( 0.164)	0.014	0.063
70	5.83	0.27	0.077	( 0.163)	0.014	0.063
71	5.92	0.27	0.077	( 0.162)	0.014	0.063
72	6.00	0.27	0.077	( 0.162)	0.014	0.063
73	6.08	0.30	0.086	( 0.161)	0.016	0.071
74	6.17	0.30	0.086	( 0.160)	0.016	0.071
75	6.25	0.30	0.086	( 0.159)	0.016	0.071
76	6.33	0.30	0.086	( 0.159)	0.016	0.071
77	6.42	0.30	0.086	( 0.158)	0.016	0.071
78	6.50	0.30	0.086	( 0.157)	0.016	0.071
79	6.58	0.33	0.096	( 0.157)	0.017	0.079
80	6.67	0.33	0.096	( 0.156)	0.017	0.079
81	6.75	0.33	0.096	( 0.155)	0.017	0.079
82	6.83	0.33	0.096	( 0.155)	0.017	0.079
83	6.92	0.33	0.096	( 0.154)	0.017	0.079
84	7.00	0.33	0.096	( 0.153)	0.017	0.079
85	7.08	0.33	0.096	( 0.152)	0.017	0.079
86	7.17	0.33	0.096	( 0.152)	0.017	0.079
87	7.25	0.33	0.096	( 0.151)	0.017	0.079
88	7.33	0.37	0.106	( 0.150)	0.019	0.087
89	7.42	0.37	0.106	( 0.150)	0.019	0.087
90	7.50	0.37	0.106	( 0.149)	0.019	0.087
91	7.58	0.40	0.115	( 0.148)	0.021	0.094
92	7.67	0.40	0.115	( 0.148)	0.021	0.094
93	7.75	0.40	0.115	( 0.147)	0.021	0.094
94	7.83	0.43	0.125	( 0.146)	0.022	0.102
95	7.92	0.43	0.125	( 0.146)	0.022	0.102
96	8.00	0.43	0.125	( 0.145)	0.022	0.102
97	8.08	0.50	0.144	( 0.144)	0.026	0.118
98	8.17	0.50	0.144	( 0.144)	0.026	0.118
99	8.25	0.50	0.144	( 0.143)	0.026	0.118
100	8.33	0.50	0.144	( 0.142)	0.026	0.118
101	8.42	0.50	0.144	( 0.142)	0.026	0.118
102	8.50	0.50	0.144	( 0.141)	0.026	0.118
103	8.58	0.53	0.154	( 0.140)	0.028	0.126
104	8.67	0.53	0.154	( 0.140)	0.028	0.126
105	8.75	0.53	0.154	( 0.139)	0.028	0.126
106	8.83	0.57	0.163	( 0.138)	0.029	0.134
107	8.92	0.57	0.163	( 0.138)	0.029	0.134
108	9.00	0.57	0.163	( 0.137)	0.029	0.134
109	9.08	0.63	0.182	( 0.136)	0.033	0.150
110	9.17	0.63	0.182	( 0.136)	0.033	0.150
111	9.25	0.63	0.182	( 0.135)	0.033	0.150
112	9.33	0.67	0.192	( 0.134)	0.035	0.157
113	9.42	0.67	0.192	( 0.134)	0.035	0.157
114	9.50	0.67	0.192	( 0.133)	0.035	0.157
115	9.58	0.70	0.202	( 0.132)	0.036	0.165
116	9.67	0.70	0.202	( 0.132)	0.036	0.165
117	9.75	0.70	0.202	( 0.131)	0.036	0.165
118	9.83	0.73	0.211	( 0.131)	0.038	0.173
119	9.92	0.73	0.211	( 0.130)	0.038	0.173
120	10.00	0.73	0.211	( 0.129)	0.038	0.173



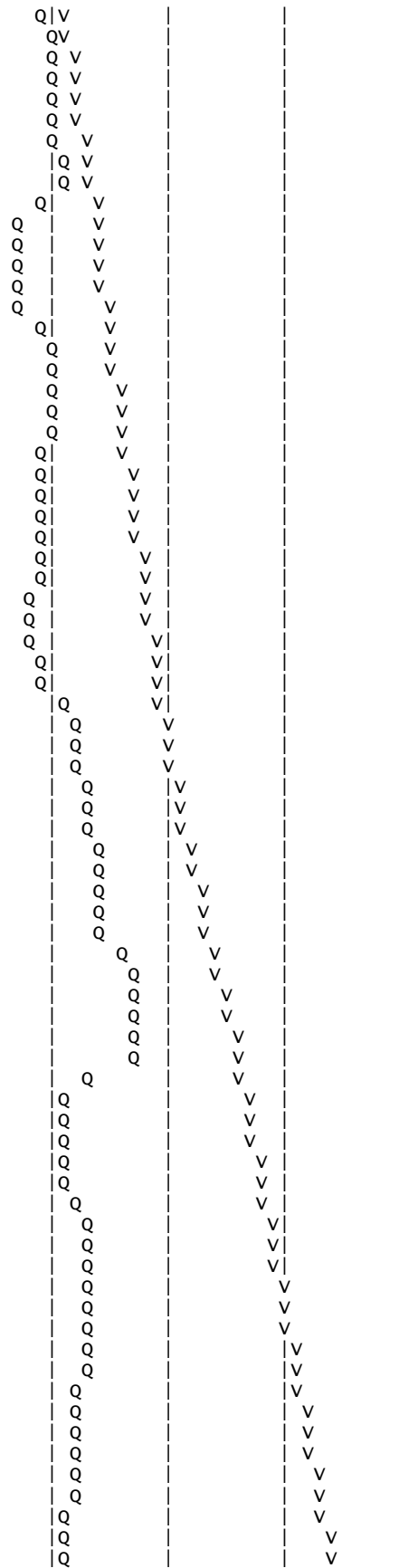
121	10.08	0.50	0.144	( 0.129)	0.026	0.118
122	10.17	0.50	0.144	( 0.128)	0.026	0.118
123	10.25	0.50	0.144	( 0.127)	0.026	0.118
124	10.33	0.50	0.144	( 0.127)	0.026	0.118
125	10.42	0.50	0.144	( 0.126)	0.026	0.118
126	10.50	0.50	0.144	( 0.126)	0.026	0.118
127	10.58	0.67	0.192	( 0.125)	0.035	0.157
128	10.67	0.67	0.192	( 0.124)	0.035	0.157
129	10.75	0.67	0.192	( 0.124)	0.035	0.157
130	10.83	0.67	0.192	( 0.123)	0.035	0.157
131	10.92	0.67	0.192	( 0.123)	0.035	0.157
132	11.00	0.67	0.192	( 0.122)	0.035	0.157
133	11.08	0.63	0.182	( 0.121)	0.033	0.150
134	11.17	0.63	0.182	( 0.121)	0.033	0.150
135	11.25	0.63	0.182	( 0.120)	0.033	0.150
136	11.33	0.63	0.182	( 0.120)	0.033	0.150
137	11.42	0.63	0.182	( 0.119)	0.033	0.150
138	11.50	0.63	0.182	( 0.118)	0.033	0.150
139	11.58	0.57	0.163	( 0.118)	0.029	0.134
140	11.67	0.57	0.163	( 0.117)	0.029	0.134
141	11.75	0.57	0.163	( 0.117)	0.029	0.134
142	11.83	0.60	0.173	( 0.116)	0.031	0.142
143	11.92	0.60	0.173	( 0.115)	0.031	0.142
144	12.00	0.60	0.173	( 0.115)	0.031	0.142
145	12.08	0.83	0.240	( 0.114)	0.043	0.197
146	12.17	0.83	0.240	( 0.114)	0.043	0.197
147	12.25	0.83	0.240	( 0.113)	0.043	0.197
148	12.33	0.87	0.250	( 0.113)	0.045	0.205
149	12.42	0.87	0.250	( 0.112)	0.045	0.205
150	12.50	0.87	0.250	( 0.111)	0.045	0.205
151	12.58	0.93	0.269	( 0.111)	0.048	0.220
152	12.67	0.93	0.269	( 0.110)	0.048	0.220
153	12.75	0.93	0.269	( 0.110)	0.048	0.220
154	12.83	0.97	0.278	( 0.109)	0.050	0.228
155	12.92	0.97	0.278	( 0.109)	0.050	0.228
156	13.00	0.97	0.278	( 0.108)	0.050	0.228
157	13.08	1.13	0.326	( 0.108)	0.059	0.268
158	13.17	1.13	0.326	( 0.107)	0.059	0.268
159	13.25	1.13	0.326	( 0.106)	0.059	0.268
160	13.33	1.13	0.326	( 0.106)	0.059	0.268
161	13.42	1.13	0.326	( 0.105)	0.059	0.268
162	13.50	1.13	0.326	( 0.105)	0.059	0.268
163	13.58	0.77	0.221	( 0.104)	0.040	0.181
164	13.67	0.77	0.221	( 0.104)	0.040	0.181
165	13.75	0.77	0.221	( 0.103)	0.040	0.181
166	13.83	0.77	0.221	( 0.103)	0.040	0.181
167	13.92	0.77	0.221	( 0.102)	0.040	0.181
168	14.00	0.77	0.221	( 0.102)	0.040	0.181
169	14.08	0.90	0.259	( 0.101)	0.047	0.213
170	14.17	0.90	0.259	( 0.101)	0.047	0.213
171	14.25	0.90	0.259	( 0.100)	0.047	0.213
172	14.33	0.87	0.250	( 0.100)	0.045	0.205
173	14.42	0.87	0.250	( 0.099)	0.045	0.205
174	14.50	0.87	0.250	( 0.099)	0.045	0.205
175	14.58	0.87	0.250	( 0.098)	0.045	0.205
176	14.67	0.87	0.250	( 0.098)	0.045	0.205
177	14.75	0.87	0.250	( 0.097)	0.045	0.205
178	14.83	0.83	0.240	( 0.097)	0.043	0.197
179	14.92	0.83	0.240	( 0.096)	0.043	0.197
180	15.00	0.83	0.240	( 0.096)	0.043	0.197
181	15.08	0.80	0.230	( 0.095)	0.041	0.189
182	15.17	0.80	0.230	( 0.095)	0.041	0.189
183	15.25	0.80	0.230	( 0.094)	0.041	0.189
184	15.33	0.77	0.221	( 0.094)	0.040	0.181
185	15.42	0.77	0.221	( 0.093)	0.040	0.181
186	15.50	0.77	0.221	( 0.093)	0.040	0.181
187	15.58	0.63	0.182	( 0.092)	0.033	0.150
188	15.67	0.63	0.182	( 0.092)	0.033	0.150
189	15.75	0.63	0.182	( 0.091)	0.033	0.150
190	15.83	0.63	0.182	( 0.091)	0.033	0.150
191	15.92	0.63	0.182	( 0.090)	0.033	0.150
192	16.00	0.63	0.182	( 0.090)	0.033	0.150
193	16.08	0.13	0.038	( 0.089)	0.007	0.031
194	16.17	0.13	0.038	( 0.089)	0.007	0.031
195	16.25	0.13	0.038	( 0.089)	0.007	0.031

196	16.33	0.13	0.038	( 0.088)	0.007	0.031
197	16.42	0.13	0.038	( 0.088)	0.007	0.031
198	16.50	0.13	0.038	( 0.087)	0.007	0.031
199	16.58	0.10	0.029	( 0.087)	0.005	0.024
200	16.67	0.10	0.029	( 0.086)	0.005	0.024
201	16.75	0.10	0.029	( 0.086)	0.005	0.024
202	16.83	0.10	0.029	( 0.085)	0.005	0.024
203	16.92	0.10	0.029	( 0.085)	0.005	0.024
204	17.00	0.10	0.029	( 0.085)	0.005	0.024
205	17.08	0.17	0.048	( 0.084)	0.009	0.039
206	17.17	0.17	0.048	( 0.084)	0.009	0.039
207	17.25	0.17	0.048	( 0.083)	0.009	0.039
208	17.33	0.17	0.048	( 0.083)	0.009	0.039
209	17.42	0.17	0.048	( 0.082)	0.009	0.039
210	17.50	0.17	0.048	( 0.082)	0.009	0.039
211	17.58	0.17	0.048	( 0.082)	0.009	0.039
212	17.67	0.17	0.048	( 0.081)	0.009	0.039
213	17.75	0.17	0.048	( 0.081)	0.009	0.039
214	17.83	0.13	0.038	( 0.080)	0.007	0.031
215	17.92	0.13	0.038	( 0.080)	0.007	0.031
216	18.00	0.13	0.038	( 0.080)	0.007	0.031
217	18.08	0.13	0.038	( 0.079)	0.007	0.031
218	18.17	0.13	0.038	( 0.079)	0.007	0.031
219	18.25	0.13	0.038	( 0.078)	0.007	0.031
220	18.33	0.13	0.038	( 0.078)	0.007	0.031
221	18.42	0.13	0.038	( 0.078)	0.007	0.031
222	18.50	0.13	0.038	( 0.077)	0.007	0.031
223	18.58	0.10	0.029	( 0.077)	0.005	0.024
224	18.67	0.10	0.029	( 0.077)	0.005	0.024
225	18.75	0.10	0.029	( 0.076)	0.005	0.024
226	18.83	0.07	0.019	( 0.076)	0.003	0.016
227	18.92	0.07	0.019	( 0.075)	0.003	0.016
228	19.00	0.07	0.019	( 0.075)	0.003	0.016
229	19.08	0.10	0.029	( 0.075)	0.005	0.024
230	19.17	0.10	0.029	( 0.074)	0.005	0.024
231	19.25	0.10	0.029	( 0.074)	0.005	0.024
232	19.33	0.13	0.038	( 0.074)	0.007	0.031
233	19.42	0.13	0.038	( 0.073)	0.007	0.031
234	19.50	0.13	0.038	( 0.073)	0.007	0.031
235	19.58	0.10	0.029	( 0.073)	0.005	0.024
236	19.67	0.10	0.029	( 0.072)	0.005	0.024
237	19.75	0.10	0.029	( 0.072)	0.005	0.024
238	19.83	0.07	0.019	( 0.072)	0.003	0.016
239	19.92	0.07	0.019	( 0.071)	0.003	0.016
240	20.00	0.07	0.019	( 0.071)	0.003	0.016
241	20.08	0.10	0.029	( 0.071)	0.005	0.024
242	20.17	0.10	0.029	( 0.070)	0.005	0.024
243	20.25	0.10	0.029	( 0.070)	0.005	0.024
244	20.33	0.10	0.029	( 0.070)	0.005	0.024
245	20.42	0.10	0.029	( 0.070)	0.005	0.024
246	20.50	0.10	0.029	( 0.069)	0.005	0.024
247	20.58	0.10	0.029	( 0.069)	0.005	0.024
248	20.67	0.10	0.029	( 0.069)	0.005	0.024
249	20.75	0.10	0.029	( 0.068)	0.005	0.024
250	20.83	0.07	0.019	( 0.068)	0.003	0.016
251	20.92	0.07	0.019	( 0.068)	0.003	0.016
252	21.00	0.07	0.019	( 0.068)	0.003	0.016
253	21.08	0.10	0.029	( 0.067)	0.005	0.024
254	21.17	0.10	0.029	( 0.067)	0.005	0.024
255	21.25	0.10	0.029	( 0.067)	0.005	0.024
256	21.33	0.07	0.019	( 0.067)	0.003	0.016
257	21.42	0.07	0.019	( 0.066)	0.003	0.016
258	21.50	0.07	0.019	( 0.066)	0.003	0.016
259	21.58	0.10	0.029	( 0.066)	0.005	0.024
260	21.67	0.10	0.029	( 0.066)	0.005	0.024
261	21.75	0.10	0.029	( 0.065)	0.005	0.024
262	21.83	0.07	0.019	( 0.065)	0.003	0.016
263	21.92	0.07	0.019	( 0.065)	0.003	0.016
264	22.00	0.07	0.019	( 0.065)	0.003	0.016
265	22.08	0.10	0.029	( 0.064)	0.005	0.024
266	22.17	0.10	0.029	( 0.064)	0.005	0.024
267	22.25	0.10	0.029	( 0.064)	0.005	0.024
268	22.33	0.07	0.019	( 0.064)	0.003	0.016
269	22.42	0.07	0.019	( 0.064)	0.003	0.016
270	22.50	0.07	0.019	( 0.063)	0.003	0.016



3+ 5	0.1145	0.63	VQ			
3+10	0.1189	0.63	VQ			
3+15	0.1232	0.63	VQ			
3+20	0.1276	0.63	VQ			
3+25	0.1319	0.63	Q			
3+30	0.1363	0.63	Q			
3+35	0.1406	0.63	Q			
3+40	0.1449	0.63	Q			
3+45	0.1493	0.63	Q			
3+50	0.1541	0.70	Q			
3+55	0.1593	0.75	VQ			
4+ 0	0.1645	0.76	VQ			
4+ 5	0.1698	0.76	VQ			
4+10	0.1750	0.76	VQ			
4+15	0.1802	0.76	VQ			
4+20	0.1859	0.83	VQ			
4+25	0.1920	0.88	VQ			
4+30	0.1981	0.88	Q			
4+35	0.2041	0.88	Q			
4+40	0.2102	0.88	Q			
4+45	0.2163	0.88	Q			
4+50	0.2229	0.96	Q			
4+55	0.2298	1.01	VQ			
5+ 0	0.2368	1.01	VQ			
5+ 5	0.2427	0.86	Q			
5+10	0.2480	0.76	Q			
5+15	0.2532	0.76	Q			
5+20	0.2589	0.83	Q			
5+25	0.2650	0.88	QV			
5+30	0.2711	0.88	QV			
5+35	0.2777	0.96	QV			
5+40	0.2846	1.01	Q			
5+45	0.2915	1.01	Q			
5+50	0.2985	1.01	Q			
5+55	0.3054	1.01	Q			
6+ 0	0.3124	1.01	Q			
6+ 5	0.3199	1.08	Q			
6+10	0.3277	1.13	QV			
6+15	0.3355	1.14	QV			
6+20	0.3433	1.14	QV			
6+25	0.3511	1.14	QV			
6+30	0.3589	1.14	QV			
6+35	0.3673	1.21	QV			
6+40	0.3759	1.26	Q			
6+45	0.3846	1.26	Q			
6+50	0.3933	1.26	QV			
6+55	0.4020	1.26	QV			
7+ 0	0.4107	1.26	QV			
7+ 5	0.4194	1.26	QV			
7+10	0.4281	1.26	QV			
7+15	0.4368	1.26	QV			
7+20	0.4460	1.33	QV			
7+25	0.4555	1.39	QV			
7+30	0.4651	1.39	Q V			
7+35	0.4751	1.46	Q V			
7+40	0.4856	1.51	QV			
7+45	0.4960	1.51	QV			
7+50	0.5069	1.59	QV			
7+55	0.5182	1.64	QV			
8+ 0	0.5295	1.64	Q V			
8+ 5	0.5418	1.79	QV			
8+10	0.5548	1.89	QV			
8+15	0.5678	1.89	QV			
8+20	0.5809	1.89	QV			
8+25	0.5939	1.89	Q V			
8+30	0.6069	1.89	Q V			
8+35	0.6205	1.97	Q V			
8+40	0.6344	2.02	QV			
8+45	0.6483	2.02	QV			
8+50	0.6627	2.09	Q V			
8+55	0.6774	2.14	Q V			
9+ 0	0.6922	2.15	Q V			
9+ 5	0.7080	2.29	QV			
9+10	0.7245	2.39	Q V			
9+15	0.7410	2.40	Q V			

9+20	0.7580	2.47
9+25	0.7754	2.52
9+30	0.7927	2.52
9+35	0.8106	2.60
9+40	0.8289	2.65
9+45	0.8471	2.65
9+50	0.8659	2.72
9+55	0.8850	2.77
10+ 0	0.9041	2.78
10+ 5	0.9197	2.27
10+10	0.9329	1.91
10+15	0.9459	1.89
10+20	0.9590	1.89
10+25	0.9720	1.89
10+30	0.9850	1.89
10+35	1.0006	2.26
10+40	1.0179	2.51
10+45	1.0352	2.52
10+50	1.0526	2.52
10+55	1.0700	2.52
11+ 0	1.0874	2.52
11+ 5	1.1043	2.45
11+10	1.1208	2.40
11+15	1.1373	2.40
11+20	1.1538	2.40
11+25	1.1703	2.40
11+30	1.1869	2.40
11+35	1.2024	2.25
11+40	1.2172	2.15
11+45	1.2320	2.15
11+50	1.2472	2.22
11+55	1.2629	2.27
12+ 0	1.2785	2.27
12+ 5	1.2977	2.78
12+10	1.3193	3.14
12+15	1.3410	3.16
12+20	1.3632	3.23
12+25	1.3858	3.28
12+30	1.4084	3.28
12+35	1.4320	3.43
12+40	1.4563	3.53
12+45	1.4806	3.53
12+50	1.5055	3.61
12+55	1.5306	3.66
13+ 0	1.5559	3.66
13+ 5	1.5836	4.02
13+10	1.6130	4.28
13+15	1.6426	4.29
13+20	1.6721	4.29
13+25	1.7017	4.29
13+30	1.7312	4.29
13+35	1.7553	3.49
13+40	1.7755	2.93
13+45	1.7955	2.90
13+50	1.8155	2.90
13+55	1.8354	2.90
14+ 0	1.8554	2.90
14+ 5	1.8774	3.19
14+10	1.9008	3.40
14+15	1.9243	3.41
14+20	1.9473	3.34
14+25	1.9699	3.28
14+30	1.9925	3.28
14+35	2.0151	3.28
14+40	2.0377	3.28
14+45	2.0603	3.28
14+50	2.0824	3.21
14+55	2.1041	3.16
15+ 0	2.1258	3.16
15+ 5	2.1471	3.08
15+10	2.1680	3.03
15+15	2.1888	3.03
15+20	2.2092	2.96
15+25	2.2292	2.91
15+30	2.2492	2.90



15+35	2.2672	2.61				V
15+40	2.2838	2.41				V
15+45	2.3003	2.40				V
15+50	2.3168	2.40				V
15+55	2.3333	2.40				V
16+ 0	2.3498	2.40				V
16+ 5	2.3588	1.31				V
16+10	2.3626	0.55				V
16+15	2.3661	0.50				V
16+20	2.3695	0.50				V
16+25	2.3730	0.50				V
16+30	2.3765	0.50				V
16+35	2.3795	0.43				V
16+40	2.3821	0.38				V
16+45	2.3847	0.38				V
16+50	2.3873	0.38				V
16+55	2.3899	0.38				V
17+ 0	2.3925	0.38				V
17+ 5	2.3961	0.52				V
17+10	2.4005	0.63				V
17+15	2.4048	0.63				V
17+20	2.4091	0.63				V
17+25	2.4135	0.63				V
17+30	2.4178	0.63				V
17+35	2.4222	0.63				V
17+40	2.4265	0.63				V
17+45	2.4309	0.63				V
17+50	2.4347	0.56				V
17+55	2.4382	0.51				V
18+ 0	2.4417	0.50				V
18+ 5	2.4452	0.50				V
18+10	2.4486	0.50				V
18+15	2.4521	0.50				V
18+20	2.4556	0.50				V
18+25	2.4591	0.50				V
18+30	2.4626	0.50				V
18+35	2.4655	0.43				V
18+40	2.4682	0.38				V
18+45	2.4708	0.38				V
18+50	2.4729	0.31				V
18+55	2.4746	0.26				V
19+ 0	2.4764	0.25				V
19+ 5	2.4786	0.32				V
19+10	2.4812	0.38				V
19+15	2.4838	0.38				V
19+20	2.4869	0.45				V
19+25	2.4904	0.50				V
19+30	2.4938	0.50				V
19+35	2.4968	0.43				V
19+40	2.4994	0.38				V
19+45	2.5021	0.38				V
19+50	2.5042	0.31				V
19+55	2.5059	0.26				V
20+ 0	2.5077	0.25				V
20+ 5	2.5099	0.32				V
20+10	2.5125	0.38				V
20+15	2.5151	0.38				V
20+20	2.5177	0.38				V
20+25	2.5203	0.38				V
20+30	2.5229	0.38				V
20+35	2.5255	0.38				V
20+40	2.5281	0.38				V
20+45	2.5307	0.38				V
20+50	2.5328	0.31				V
20+55	2.5346	0.26				V
21+ 0	2.5363	0.25				V
21+ 5	2.5386	0.32				V
21+10	2.5412	0.38				V
21+15	2.5438	0.38				V
21+20	2.5459	0.31				V
21+25	2.5476	0.26				V
21+30	2.5494	0.25				V
21+35	2.5516	0.32				V
21+40	2.5542	0.38				V
21+45	2.5568	0.38				V

21+50	2.5589	0.31	Q			V
21+55	2.5607	0.26	Q			V
22+ 0	2.5624	0.25	Q			V
22+ 5	2.5647	0.32	Q			V
22+10	2.5672	0.38	Q			V
22+15	2.5698	0.38	Q			V
22+20	2.5720	0.31	Q			V
22+25	2.5737	0.26	Q			V
22+30	2.5755	0.25	Q			V
22+35	2.5772	0.25	Q			V
22+40	2.5789	0.25	Q			V
22+45	2.5807	0.25	Q			V
22+50	2.5824	0.25	Q			V
22+55	2.5841	0.25	Q			V
23+ 0	2.5859	0.25	Q			V
23+ 5	2.5876	0.25	Q			V
23+10	2.5894	0.25	Q			V
23+15	2.5911	0.25	Q			V
23+20	2.5928	0.25	Q			V
23+25	2.5946	0.25	Q			V
23+30	2.5963	0.25	Q			V
23+35	2.5981	0.25	Q			V
23+40	2.5998	0.25	Q			V
23+45	2.6015	0.25	Q			V
23+50	2.6033	0.25	Q			V
23+55	2.6050	0.25	Q			V
24+ 0	2.6067	0.25	Q			V
24+ 5	2.6075	0.11	Q			V
24+10	2.6075	0.01	Q			V

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**PROPOSED CONDITION – 100-YEAR, 1-HOUR UNIT HYDROGRAPH**



Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 06/08/23 File: B2ONSITEPROP1100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 100-YEAR 1-HOUR  
FN: B2ONSITEPROP1100.OUT- ABE

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 890.00(Ft.)  
Length along longest watercourse measured to centroid = 400.00(Ft.)  
Length along longest watercourse = 0.169 Mi.  
Length along longest watercourse measured to centroid = 0.076 Mi.  
Difference in elevation = 18.90(Ft.)  
Slope along watercourse = 112.1258 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.028 Hr.  
Lag time = 1.68 Min.  
25% of lag time = 0.42 Min.  
40% of lag time = 0.67 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	0.54	8.59

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	1.28	20.35

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.540(In)  
Area Averaged 100-Year Rainfall = 1.280(In)

Point rain (area averaged) = 1.280(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 1.280(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	56.00	0.900
4.770	75.00	0.900
Total Area Entered =	15.90(Ac.)	

RI RI Infil. Rate Impervious Adj. Infil. Rate Area% F



0+55	1.4687	40.82						Q				V	
1+ 0	1.5570	12.82				Q						V	
1+ 5	1.5817	3.58		Q								V	
1+10	1.5829	0.17		Q								V	

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**PROPOSED CONDITION – 100-YEAR, 3-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 06/08/23 File: B2ONSITEPROP3100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 100-YEAR 3-HOUR  
FN: B2ONSITEPROP3100.OUT- ABE

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 890.00(Ft.)  
Length along longest watercourse measured to centroid = 400.00(Ft.)  
Length along longest watercourse = 0.169 Mi.  
Length along longest watercourse measured to centroid = 0.076 Mi.  
Difference in elevation = 18.90(Ft.)  
Slope along watercourse = 112.1258 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.028 Hr.  
Lag time = 1.68 Min.  
25% of lag time = 0.42 Min.  
40% of lag time = 0.67 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	0.95	15.11

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	2.00	31.80

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.950(In)  
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	56.00	0.900
4.770	75.00	0.900
Total Area Entered =	15.90(Ac.)	

RI RI Infil. Rate Impervious Adj. Infil. Rate Area% F



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 Peak flow rate of this hydrograph = 28.668(CFS)  
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 3 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h  
 -----

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0162	2.36	V	Q			
0+10	0.0439	4.01	V	Q			
0+15	0.0696	3.74	V	Q			
0+20	0.0986	4.21	V	Q			
0+25	0.1310	4.71	V	Q			
0+30	0.1673	5.28	V	Q			
0+35	0.2026	5.12	V	Q			
0+40	0.2390	5.30	V	Q			
0+45	0.2780	5.66	V	Q			
0+50	0.3134	5.14	V	Q			
0+55	0.3474	4.93	V	Q			
1+ 0	0.3846	5.40	V	Q			
1+ 5	0.4292	6.48	V	Q			
1+10	0.4779	7.07	V	Q			
1+15	0.5268	7.10	V	Q			
1+20	0.5726	6.66	V	Q			
1+25	0.6255	7.67	V	Q			
1+30	0.6861	8.81	V	Q			
1+35	0.7436	8.35	V	Q			
1+40	0.8026	8.56	V	Q			
1+45	0.8737	10.32	V	Q			
1+50	0.9483	10.84	V	Q			
1+55	1.0181	10.14	V	Q			
2+ 0	1.0872	10.03	V	Q			
2+ 5	1.1587	10.39	V	Q			
2+10	1.2482	12.98	V	Q			
2+15	1.3616	16.47	V	Q			
2+20	1.4614	14.49	V	Q			
2+25	1.5958	19.51	V	Q			
2+30	1.7723	25.63	V	Q			
2+35	1.9698	28.67	V	Q			
2+40	2.1421	25.03	V	Q			
2+45	2.2310	12.91	V	Q			
2+50	2.2742	6.28	V	Q			
2+55	2.3134	5.69	V	Q			
3+ 0	2.3376	3.50	V	Q			
3+ 5	2.3437	0.89	V	Q			
3+10	2.3440	0.04	V	Q			

**PROPOSED CONDITION – 100-YEAR, 6-HOUR UNIT HYDROGRAPH**



Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 06/12/23 File: B2ONSITEPROP6100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 100-YEAR 6-HOUR  
FN: B2ONSITEPROP6100.OUT- ABE

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 890.00(Ft.)  
Length along longest watercourse measured to centroid = 400.00(Ft.)  
Length along longest watercourse = 0.169 Mi.  
Length along longest watercourse measured to centroid = 0.076 Mi.  
Difference in elevation = 18.90(Ft.)  
Slope along watercourse = 112.1258 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.028 Hr.  
Lag time = 1.68 Min.  
25% of lag time = 0.42 Min.  
40% of lag time = 0.67 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	1.35	21.47

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	2.90	46.11

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 1.350(In)  
Area Averaged 100-Year Rainfall = 2.900(In)

Point rain (area averaged) = 2.900(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 2.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	56.00	0.900
4.770	75.00	0.900
Total Area Entered =	15.90(Ac.)	

RI RI Infil. Rate Impervious Adj. Infil. Rate Area% F

AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
56.0	56.0	0.511	0.900	0.097	0.700	0.068
75.0	75.0	0.303	0.900	0.058	0.300	0.017
						Sum (F) = 0.085

Area averaged mean soil loss (F) (In/Hr) = 0.085  
 Minimum soil loss rate ((In/Hr)) = 0.043  
 (for 24 hour storm duration)  
 Soil loss rate (decimal) = 0.180

Unit Hydrograph  
 FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.585	57.422
2	0.167	595.170	40.450
3	0.250	892.755	2.128
Sum = 100.000			Sum= 16.024

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.174	( 0.085)	0.031
2	0.17	0.209	( 0.085)	0.038
3	0.25	0.209	( 0.085)	0.038
4	0.33	0.209	( 0.085)	0.038
5	0.42	0.209	( 0.085)	0.038
6	0.50	0.244	( 0.085)	0.044
7	0.58	0.244	( 0.085)	0.044
8	0.67	0.244	( 0.085)	0.044
9	0.75	0.244	( 0.085)	0.044
10	0.83	0.244	( 0.085)	0.044
11	0.92	0.244	( 0.085)	0.044
12	1.00	0.278	( 0.085)	0.050
13	1.08	0.278	( 0.085)	0.050
14	1.17	0.278	( 0.085)	0.050
15	1.25	0.278	( 0.085)	0.050
16	1.33	0.278	( 0.085)	0.050
17	1.42	0.278	( 0.085)	0.050
18	1.50	0.278	( 0.085)	0.050
19	1.58	0.278	( 0.085)	0.050
20	1.67	0.278	( 0.085)	0.050
21	1.75	0.278	( 0.085)	0.050
22	1.83	0.278	( 0.085)	0.050
23	1.92	0.278	( 0.085)	0.050
24	2.00	0.313	( 0.085)	0.056
25	2.08	0.278	( 0.085)	0.050
26	2.17	0.313	( 0.085)	0.056
27	2.25	0.313	( 0.085)	0.056
28	2.33	0.313	( 0.085)	0.056
29	2.42	0.313	( 0.085)	0.056
30	2.50	0.313	( 0.085)	0.056
31	2.58	0.313	( 0.085)	0.056
32	2.67	0.313	( 0.085)	0.056
33	2.75	0.348	( 0.085)	0.063
34	2.83	0.348	( 0.085)	0.063
35	2.92	0.348	( 0.085)	0.063
36	3.00	0.348	( 0.085)	0.063
37	3.08	0.348	( 0.085)	0.063
38	3.17	0.383	( 0.085)	0.069
39	3.25	0.383	( 0.085)	0.069
40	3.33	0.383	( 0.085)	0.069
41	3.42	0.418	( 0.085)	0.075
42	3.50	0.452	( 0.085)	0.081
43	3.58	0.487	0.085 ( 0.088)	0.402
44	3.67	0.487	0.085 ( 0.088)	0.402
45	3.75	0.522	0.085 ( 0.094)	0.437



2+20	0.6521	4.12	Q	V				
2+25	0.6805	4.12	Q	V				
2+30	0.7088	4.12	Q	V				
2+35	0.7372	4.12	Q	V				
2+40	0.7655	4.12	Q	V				
2+45	0.7957	4.38	Q	V				
2+50	0.8271	4.57	Q	V				
2+55	0.8587	4.57	Q	V				
3+ 0	0.8902	4.57	Q	V				
3+ 5	0.9217	4.57	Q	V				
3+10	0.9550	4.84	Q	V				
3+15	0.9896	5.02	Q	V				
3+20	1.0242	5.03	Q	V				
3+25	1.0607	5.29	Q	V				
3+30	1.1002	5.74	Q	V				
3+35	1.1431	6.22	Q	V				
3+40	1.1874	6.43	Q	V				
3+45	1.2340	6.76	Q	V				
3+50	1.2822	6.99	Q	V				
3+55	1.3326	7.32	Q	V				
4+ 0	1.3846	7.55	Q	V				
4+ 5	1.4388	7.88	Q	V				
4+10	1.4969	8.43	Q	V				
4+15	1.5588	8.98	Q	V				
4+20	1.6245	9.54	Q	V				
4+25	1.6940	10.10	Q	V				
4+30	1.7652	10.34	Q	V				
4+35	1.8387	10.67	Q	V				
4+40	1.9160	11.22	Q	V				
4+45	1.9971	11.77	Q	V				
4+50	2.0798	12.01	Q	V				
4+55	2.1648	12.34	Q	V				
5+ 0	2.2536	12.89	Q	V				
5+ 5	2.3550	14.73	Q	V				
5+10	2.4753	17.47	Q	V				
5+15	2.6105	19.62	Q	V				
5+20	2.7573	21.32	Q	V				
5+25	2.9200	23.63	Q	V				
5+30	3.1107	27.68	Q	V				
5+35	3.2340	17.92	Q	V				
5+40	3.2804	6.74	Q	V				
5+45	3.3041	3.44	Q	V				
5+50	3.3214	2.51	Q	V				
5+55	3.3336	1.77	Q	V				
6+ 0	3.3414	1.13	Q	V				
6+ 5	3.3441	0.40	Q	V				
6+10	3.3443	0.02	Q	V				

**PROPOSED CONDITION – 100-YEAR, 24-HOUR UNIT HYDROGRAPH**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 06/12/23 File: B2ONSITEPROP24100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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22-0085 - OAK VALLEY NORTH BUILDING 2  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 100-YEAR 24-HOUR  
FN: B2ONSITEPROP24100.OUT- ABE

-----  
Drainage Area = 15.90(Ac.) = 0.025 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 15.90(Ac.) = 0.025 Sq. Mi.  
Length along longest watercourse = 890.00(Ft.)  
Length along longest watercourse measured to centroid = 400.00(Ft.)  
Length along longest watercourse = 0.169 Mi.  
Length along longest watercourse measured to centroid = 0.076 Mi.  
Difference in elevation = 18.90(Ft.)  
Slope along watercourse = 112.1258 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.028 Hr.  
Lag time = 1.68 Min.  
25% of lag time = 0.42 Min.  
40% of lag time = 0.67 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	2.40	38.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
15.90	6.50	103.35

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 2.400(In)  
Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 6.500(In)  
Areal adjustment factor = 100.00 %  
Adjusted average point rain = 6.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.130	56.00	0.900
4.770	75.00	0.900
Total Area Entered =	15.90(Ac.)	

RI RI Infil. Rate Impervious Adj. Infil. Rate Area% F

AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
56.0	56.0	0.511	0.900	0.097	0.700	0.068
75.0	75.0	0.303	0.900	0.058	0.300	0.017
						Sum (F) = 0.085

Area averaged mean soil loss (F) (In/Hr) = 0.085  
 Minimum soil loss rate ((In/Hr)) = 0.043  
 (for 24 hour storm duration)  
 Soil loss rate (decimal) = 0.180

Unit Hydrograph  
 FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.585	57.422
2	0.167	595.170	40.450
3	0.250	892.755	2.128
Sum = 100.000			Sum= 16.024

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)	
1	0.08	0.07	( 0.151)	0.009	0.043
2	0.17	0.07	( 0.150)	0.009	0.043
3	0.25	0.07	( 0.150)	0.009	0.043
4	0.33	0.10	( 0.149)	0.014	0.064
5	0.42	0.10	( 0.149)	0.014	0.064
6	0.50	0.10	( 0.148)	0.014	0.064
7	0.58	0.10	( 0.148)	0.014	0.064
8	0.67	0.10	( 0.147)	0.014	0.064
9	0.75	0.10	( 0.146)	0.014	0.064
10	0.83	0.13	( 0.146)	0.019	0.085
11	0.92	0.13	( 0.145)	0.019	0.085
12	1.00	0.13	( 0.145)	0.019	0.085
13	1.08	0.10	( 0.144)	0.014	0.064
14	1.17	0.10	( 0.144)	0.014	0.064
15	1.25	0.10	( 0.143)	0.014	0.064
16	1.33	0.10	( 0.142)	0.014	0.064
17	1.42	0.10	( 0.142)	0.014	0.064
18	1.50	0.10	( 0.141)	0.014	0.064
19	1.58	0.10	( 0.141)	0.014	0.064
20	1.67	0.10	( 0.140)	0.014	0.064
21	1.75	0.10	( 0.140)	0.014	0.064
22	1.83	0.13	( 0.139)	0.019	0.085
23	1.92	0.13	( 0.138)	0.019	0.085
24	2.00	0.13	( 0.138)	0.019	0.085
25	2.08	0.13	( 0.137)	0.019	0.085
26	2.17	0.13	( 0.137)	0.019	0.085
27	2.25	0.13	( 0.136)	0.019	0.085
28	2.33	0.13	( 0.136)	0.019	0.085
29	2.42	0.13	( 0.135)	0.019	0.085
30	2.50	0.13	( 0.135)	0.019	0.085
31	2.58	0.17	( 0.134)	0.023	0.107
32	2.67	0.17	( 0.133)	0.023	0.107
33	2.75	0.17	( 0.133)	0.023	0.107
34	2.83	0.17	( 0.132)	0.023	0.107
35	2.92	0.17	( 0.132)	0.023	0.107
36	3.00	0.17	( 0.131)	0.023	0.107
37	3.08	0.17	( 0.131)	0.023	0.107
38	3.17	0.17	( 0.130)	0.023	0.107
39	3.25	0.17	( 0.130)	0.023	0.107
40	3.33	0.17	( 0.129)	0.023	0.107
41	3.42	0.17	( 0.129)	0.023	0.107
42	3.50	0.17	( 0.128)	0.023	0.107
43	3.58	0.17	( 0.128)	0.023	0.107
44	3.67	0.17	( 0.127)	0.023	0.107
45	3.75	0.17	( 0.126)	0.023	0.107

46	3.83	0.20	0.156	( 0.126)	0.028	0.128
47	3.92	0.20	0.156	( 0.125)	0.028	0.128
48	4.00	0.20	0.156	( 0.125)	0.028	0.128
49	4.08	0.20	0.156	( 0.124)	0.028	0.128
50	4.17	0.20	0.156	( 0.124)	0.028	0.128
51	4.25	0.20	0.156	( 0.123)	0.028	0.128
52	4.33	0.23	0.182	( 0.123)	0.033	0.149
53	4.42	0.23	0.182	( 0.122)	0.033	0.149
54	4.50	0.23	0.182	( 0.122)	0.033	0.149
55	4.58	0.23	0.182	( 0.121)	0.033	0.149
56	4.67	0.23	0.182	( 0.121)	0.033	0.149
57	4.75	0.23	0.182	( 0.120)	0.033	0.149
58	4.83	0.27	0.208	( 0.120)	0.037	0.171
59	4.92	0.27	0.208	( 0.119)	0.037	0.171
60	5.00	0.27	0.208	( 0.119)	0.037	0.171
61	5.08	0.20	0.156	( 0.118)	0.028	0.128
62	5.17	0.20	0.156	( 0.118)	0.028	0.128
63	5.25	0.20	0.156	( 0.117)	0.028	0.128
64	5.33	0.23	0.182	( 0.117)	0.033	0.149
65	5.42	0.23	0.182	( 0.116)	0.033	0.149
66	5.50	0.23	0.182	( 0.115)	0.033	0.149
67	5.58	0.27	0.208	( 0.115)	0.037	0.171
68	5.67	0.27	0.208	( 0.114)	0.037	0.171
69	5.75	0.27	0.208	( 0.114)	0.037	0.171
70	5.83	0.27	0.208	( 0.113)	0.037	0.171
71	5.92	0.27	0.208	( 0.113)	0.037	0.171
72	6.00	0.27	0.208	( 0.112)	0.037	0.171
73	6.08	0.30	0.234	( 0.112)	0.042	0.192
74	6.17	0.30	0.234	( 0.111)	0.042	0.192
75	6.25	0.30	0.234	( 0.111)	0.042	0.192
76	6.33	0.30	0.234	( 0.110)	0.042	0.192
77	6.42	0.30	0.234	( 0.110)	0.042	0.192
78	6.50	0.30	0.234	( 0.109)	0.042	0.192
79	6.58	0.33	0.260	( 0.109)	0.047	0.213
80	6.67	0.33	0.260	( 0.109)	0.047	0.213
81	6.75	0.33	0.260	( 0.108)	0.047	0.213
82	6.83	0.33	0.260	( 0.108)	0.047	0.213
83	6.92	0.33	0.260	( 0.107)	0.047	0.213
84	7.00	0.33	0.260	( 0.107)	0.047	0.213
85	7.08	0.33	0.260	( 0.106)	0.047	0.213
86	7.17	0.33	0.260	( 0.106)	0.047	0.213
87	7.25	0.33	0.260	( 0.105)	0.047	0.213
88	7.33	0.37	0.286	( 0.105)	0.051	0.235
89	7.42	0.37	0.286	( 0.104)	0.051	0.235
90	7.50	0.37	0.286	( 0.104)	0.051	0.235
91	7.58	0.40	0.312	( 0.103)	0.056	0.256
92	7.67	0.40	0.312	( 0.103)	0.056	0.256
93	7.75	0.40	0.312	( 0.102)	0.056	0.256
94	7.83	0.43	0.338	( 0.102)	0.061	0.277
95	7.92	0.43	0.338	( 0.101)	0.061	0.277
96	8.00	0.43	0.338	( 0.101)	0.061	0.277
97	8.08	0.50	0.390	( 0.100)	0.070	0.320
98	8.17	0.50	0.390	( 0.100)	0.070	0.320
99	8.25	0.50	0.390	( 0.099)	0.070	0.320
100	8.33	0.50	0.390	( 0.099)	0.070	0.320
101	8.42	0.50	0.390	( 0.099)	0.070	0.320
102	8.50	0.50	0.390	( 0.098)	0.070	0.320
103	8.58	0.53	0.416	( 0.098)	0.075	0.341
104	8.67	0.53	0.416	( 0.097)	0.075	0.341
105	8.75	0.53	0.416	( 0.097)	0.075	0.341
106	8.83	0.57	0.442	( 0.096)	0.080	0.362
107	8.92	0.57	0.442	( 0.096)	0.080	0.362
108	9.00	0.57	0.442	( 0.095)	0.080	0.362
109	9.08	0.63	0.494	( 0.095)	0.089	0.405
110	9.17	0.63	0.494	( 0.094)	0.089	0.405
111	9.25	0.63	0.494	( 0.094)	0.089	0.405
112	9.33	0.67	0.520	0.094	( 0.094)	0.426
113	9.42	0.67	0.520	0.093	( 0.094)	0.427
114	9.50	0.67	0.520	0.093	( 0.094)	0.427
115	9.58	0.70	0.546	0.092	( 0.098)	0.454
116	9.67	0.70	0.546	0.092	( 0.098)	0.454
117	9.75	0.70	0.546	0.091	( 0.098)	0.455
118	9.83	0.73	0.572	0.091	( 0.103)	0.481
119	9.92	0.73	0.572	0.090	( 0.103)	0.482
120	10.00	0.73	0.572	0.090	( 0.103)	0.482



121	10.08	0.50	0.390	( 0.090)	0.070	0.320
122	10.17	0.50	0.390	( 0.089)	0.070	0.320
123	10.25	0.50	0.390	( 0.089)	0.070	0.320
124	10.33	0.50	0.390	( 0.088)	0.070	0.320
125	10.42	0.50	0.390	( 0.088)	0.070	0.320
126	10.50	0.50	0.390	( 0.087)	0.070	0.320
127	10.58	0.67	0.520	0.087	( 0.094)	0.433
128	10.67	0.67	0.520	0.087	( 0.094)	0.433
129	10.75	0.67	0.520	0.086	( 0.094)	0.434
130	10.83	0.67	0.520	0.086	( 0.094)	0.434
131	10.92	0.67	0.520	0.085	( 0.094)	0.435
132	11.00	0.67	0.520	0.085	( 0.094)	0.435
133	11.08	0.63	0.494	0.084	( 0.089)	0.410
134	11.17	0.63	0.494	0.084	( 0.089)	0.410
135	11.25	0.63	0.494	0.084	( 0.089)	0.410
136	11.33	0.63	0.494	0.083	( 0.089)	0.411
137	11.42	0.63	0.494	0.083	( 0.089)	0.411
138	11.50	0.63	0.494	0.082	( 0.089)	0.412
139	11.58	0.57	0.442	( 0.082)	0.080	0.362
140	11.67	0.57	0.442	( 0.082)	0.080	0.362
141	11.75	0.57	0.442	( 0.081)	0.080	0.362
142	11.83	0.60	0.468	0.081	( 0.084)	0.387
143	11.92	0.60	0.468	0.080	( 0.084)	0.388
144	12.00	0.60	0.468	0.080	( 0.084)	0.388
145	12.08	0.83	0.650	0.080	( 0.117)	0.570
146	12.17	0.83	0.650	0.079	( 0.117)	0.571
147	12.25	0.83	0.650	0.079	( 0.117)	0.571
148	12.33	0.87	0.676	0.078	( 0.122)	0.598
149	12.42	0.87	0.676	0.078	( 0.122)	0.598
150	12.50	0.87	0.676	0.078	( 0.122)	0.598
151	12.58	0.93	0.728	0.077	( 0.131)	0.651
152	12.67	0.93	0.728	0.077	( 0.131)	0.651
153	12.75	0.93	0.728	0.076	( 0.131)	0.652
154	12.83	0.97	0.754	0.076	( 0.136)	0.678
155	12.92	0.97	0.754	0.076	( 0.136)	0.678
156	13.00	0.97	0.754	0.075	( 0.136)	0.679
157	13.08	1.13	0.884	0.075	( 0.159)	0.809
158	13.17	1.13	0.884	0.074	( 0.159)	0.809
159	13.25	1.13	0.884	0.074	( 0.159)	0.810
160	13.33	1.13	0.884	0.074	( 0.159)	0.810
161	13.42	1.13	0.884	0.073	( 0.159)	0.811
162	13.50	1.13	0.884	0.073	( 0.159)	0.811
163	13.58	0.77	0.598	0.073	( 0.108)	0.525
164	13.67	0.77	0.598	0.072	( 0.108)	0.526
165	13.75	0.77	0.598	0.072	( 0.108)	0.526
166	13.83	0.77	0.598	0.072	( 0.108)	0.526
167	13.92	0.77	0.598	0.071	( 0.108)	0.527
168	14.00	0.77	0.598	0.071	( 0.108)	0.527
169	14.08	0.90	0.702	0.070	( 0.126)	0.632
170	14.17	0.90	0.702	0.070	( 0.126)	0.632
171	14.25	0.90	0.702	0.070	( 0.126)	0.632
172	14.33	0.87	0.676	0.069	( 0.122)	0.607
173	14.42	0.87	0.676	0.069	( 0.122)	0.607
174	14.50	0.87	0.676	0.069	( 0.122)	0.607
175	14.58	0.87	0.676	0.068	( 0.122)	0.608
176	14.67	0.87	0.676	0.068	( 0.122)	0.608
177	14.75	0.87	0.676	0.068	( 0.122)	0.608
178	14.83	0.83	0.650	0.067	( 0.117)	0.583
179	14.92	0.83	0.650	0.067	( 0.117)	0.583
180	15.00	0.83	0.650	0.067	( 0.117)	0.583
181	15.08	0.80	0.624	0.066	( 0.112)	0.558
182	15.17	0.80	0.624	0.066	( 0.112)	0.558
183	15.25	0.80	0.624	0.066	( 0.112)	0.558
184	15.33	0.77	0.598	0.065	( 0.108)	0.533
185	15.42	0.77	0.598	0.065	( 0.108)	0.533
186	15.50	0.77	0.598	0.065	( 0.108)	0.533
187	15.58	0.63	0.494	0.064	( 0.089)	0.430
188	15.67	0.63	0.494	0.064	( 0.089)	0.430
189	15.75	0.63	0.494	0.064	( 0.089)	0.430
190	15.83	0.63	0.494	0.063	( 0.089)	0.431
191	15.92	0.63	0.494	0.063	( 0.089)	0.431
192	16.00	0.63	0.494	0.063	( 0.089)	0.431
193	16.08	0.13	0.104	( 0.062)	0.019	0.085
194	16.17	0.13	0.104	( 0.062)	0.019	0.085
195	16.25	0.13	0.104	( 0.062)	0.019	0.085

196	16.33	0.13	0.104	( 0.061)	0.019	0.085
197	16.42	0.13	0.104	( 0.061)	0.019	0.085
198	16.50	0.13	0.104	( 0.061)	0.019	0.085
199	16.58	0.10	0.078	( 0.060)	0.014	0.064
200	16.67	0.10	0.078	( 0.060)	0.014	0.064
201	16.75	0.10	0.078	( 0.060)	0.014	0.064
202	16.83	0.10	0.078	( 0.059)	0.014	0.064
203	16.92	0.10	0.078	( 0.059)	0.014	0.064
204	17.00	0.10	0.078	( 0.059)	0.014	0.064
205	17.08	0.17	0.130	( 0.059)	0.023	0.107
206	17.17	0.17	0.130	( 0.058)	0.023	0.107
207	17.25	0.17	0.130	( 0.058)	0.023	0.107
208	17.33	0.17	0.130	( 0.058)	0.023	0.107
209	17.42	0.17	0.130	( 0.057)	0.023	0.107
210	17.50	0.17	0.130	( 0.057)	0.023	0.107
211	17.58	0.17	0.130	( 0.057)	0.023	0.107
212	17.67	0.17	0.130	( 0.057)	0.023	0.107
213	17.75	0.17	0.130	( 0.056)	0.023	0.107
214	17.83	0.13	0.104	( 0.056)	0.019	0.085
215	17.92	0.13	0.104	( 0.056)	0.019	0.085
216	18.00	0.13	0.104	( 0.055)	0.019	0.085
217	18.08	0.13	0.104	( 0.055)	0.019	0.085
218	18.17	0.13	0.104	( 0.055)	0.019	0.085
219	18.25	0.13	0.104	( 0.055)	0.019	0.085
220	18.33	0.13	0.104	( 0.054)	0.019	0.085
221	18.42	0.13	0.104	( 0.054)	0.019	0.085
222	18.50	0.13	0.104	( 0.054)	0.019	0.085
223	18.58	0.10	0.078	( 0.054)	0.014	0.064
224	18.67	0.10	0.078	( 0.053)	0.014	0.064
225	18.75	0.10	0.078	( 0.053)	0.014	0.064
226	18.83	0.07	0.052	( 0.053)	0.009	0.043
227	18.92	0.07	0.052	( 0.053)	0.009	0.043
228	19.00	0.07	0.052	( 0.052)	0.009	0.043
229	19.08	0.10	0.078	( 0.052)	0.014	0.064
230	19.17	0.10	0.078	( 0.052)	0.014	0.064
231	19.25	0.10	0.078	( 0.052)	0.014	0.064
232	19.33	0.13	0.104	( 0.051)	0.019	0.085
233	19.42	0.13	0.104	( 0.051)	0.019	0.085
234	19.50	0.13	0.104	( 0.051)	0.019	0.085
235	19.58	0.10	0.078	( 0.051)	0.014	0.064
236	19.67	0.10	0.078	( 0.050)	0.014	0.064
237	19.75	0.10	0.078	( 0.050)	0.014	0.064
238	19.83	0.07	0.052	( 0.050)	0.009	0.043
239	19.92	0.07	0.052	( 0.050)	0.009	0.043
240	20.00	0.07	0.052	( 0.049)	0.009	0.043
241	20.08	0.10	0.078	( 0.049)	0.014	0.064
242	20.17	0.10	0.078	( 0.049)	0.014	0.064
243	20.25	0.10	0.078	( 0.049)	0.014	0.064
244	20.33	0.10	0.078	( 0.049)	0.014	0.064
245	20.42	0.10	0.078	( 0.048)	0.014	0.064
246	20.50	0.10	0.078	( 0.048)	0.014	0.064
247	20.58	0.10	0.078	( 0.048)	0.014	0.064
248	20.67	0.10	0.078	( 0.048)	0.014	0.064
249	20.75	0.10	0.078	( 0.048)	0.014	0.064
250	20.83	0.07	0.052	( 0.047)	0.009	0.043
251	20.92	0.07	0.052	( 0.047)	0.009	0.043
252	21.00	0.07	0.052	( 0.047)	0.009	0.043
253	21.08	0.10	0.078	( 0.047)	0.014	0.064
254	21.17	0.10	0.078	( 0.047)	0.014	0.064
255	21.25	0.10	0.078	( 0.046)	0.014	0.064
256	21.33	0.07	0.052	( 0.046)	0.009	0.043
257	21.42	0.07	0.052	( 0.046)	0.009	0.043
258	21.50	0.07	0.052	( 0.046)	0.009	0.043
259	21.58	0.10	0.078	( 0.046)	0.014	0.064
260	21.67	0.10	0.078	( 0.046)	0.014	0.064
261	21.75	0.10	0.078	( 0.045)	0.014	0.064
262	21.83	0.07	0.052	( 0.045)	0.009	0.043
263	21.92	0.07	0.052	( 0.045)	0.009	0.043
264	22.00	0.07	0.052	( 0.045)	0.009	0.043
265	22.08	0.10	0.078	( 0.045)	0.014	0.064
266	22.17	0.10	0.078	( 0.045)	0.014	0.064
267	22.25	0.10	0.078	( 0.045)	0.014	0.064
268	22.33	0.07	0.052	( 0.044)	0.009	0.043
269	22.42	0.07	0.052	( 0.044)	0.009	0.043
270	22.50	0.07	0.052	( 0.044)	0.009	0.043



3+ 5	0.3102	1.71	V Q
3+10	0.3219	1.71	V Q
3+15	0.3337	1.71	V Q
3+20	0.3455	1.71	V Q
3+25	0.3573	1.71	V Q
3+30	0.3690	1.71	VQ
3+35	0.3808	1.71	VQ
3+40	0.3926	1.71	VQ
3+45	0.4043	1.71	VQ
3+50	0.4175	1.91	VQ
3+55	0.4315	2.04	V Q
4+ 0	0.4457	2.05	V Q
4+ 5	0.4598	2.05	V Q
4+10	0.4739	2.05	V Q
4+15	0.4880	2.05	V Q
4+20	0.5035	2.25	V Q
4+25	0.5199	2.39	V Q
4+30	0.5364	2.39	V Q
4+35	0.5529	2.39	VQ
4+40	0.5694	2.39	VQ
4+45	0.5858	2.39	VQ
4+50	0.6037	2.59	V Q
4+55	0.6225	2.73	V Q
5+ 0	0.6413	2.73	V Q
5+ 5	0.6574	2.34	VQ
5+10	0.6716	2.07	VQ
5+15	0.6858	2.05	VQ
5+20	0.7012	2.25	VQ
5+25	0.7177	2.39	VQ
5+30	0.7341	2.39	Q
5+35	0.7520	2.59	VQ
5+40	0.7708	2.73	VQ
5+45	0.7896	2.73	VQ
5+50	0.8084	2.73	VQ
5+55	0.8273	2.73	VQ
6+ 0	0.8461	2.73	VQ
6+ 5	0.8663	2.93	VQ
6+10	0.8874	3.07	V Q
6+15	0.9086	3.08	V Q
6+20	0.9298	3.08	VQ
6+25	0.9510	3.08	VQ
6+30	0.9722	3.08	VQ
6+35	0.9947	3.27	VQ
6+40	1.0182	3.41	VQ
6+45	1.0417	3.42	VQ
6+50	1.0653	3.42	VQ
6+55	1.0888	3.42	VQ
7+ 0	1.1123	3.42	Q
7+ 5	1.1359	3.42	Q
7+10	1.1594	3.42	Q
7+15	1.1830	3.42	Q
7+20	1.2079	3.61	VQ
7+25	1.2337	3.75	VQ
7+30	1.2596	3.76	VQ
7+35	1.2868	3.96	Q
7+40	1.3150	4.09	VQ
7+45	1.3433	4.10	VQ
7+50	1.3729	4.30	VQ
7+55	1.4034	4.44	VQ
8+ 0	1.4340	4.44	VQ
8+ 5	1.4673	4.84	V Q
8+10	1.5026	5.11	V Q
8+15	1.5379	5.13	V Q
8+20	1.5732	5.13	V Q
8+25	1.6085	5.13	V Q
8+30	1.6438	5.13	V Q
8+35	1.6805	5.32	VQ
8+40	1.7181	5.46	VQ
8+45	1.7557	5.47	VQ
8+50	1.7947	5.67	V Q
8+55	1.8347	5.80	V Q
9+ 0	1.8747	5.81	VQ
9+ 5	1.9175	6.20	V Q
9+10	1.9621	6.48	V Q
9+15	2.0068	6.49	V Q

9+20	2.0529	6.69	V	Q		
9+25	2.1000	6.83	V	Q		
9+30	2.1471	6.85	V	Q		
9+35	2.1960	7.10	V	Q		
9+40	2.2461	7.27	V	Q		
9+45	2.2962	7.29	V	Q		
9+50	2.3481	7.53	V	Q		
9+55	2.4012	7.71	V	Q		
10+ 0	2.4544	7.72	V	Q		
10+ 5	2.4974	6.23	Q	V		
10+10	2.5330	5.18	Q	V		
10+15	2.5684	5.13	Q	V		
10+20	2.6037	5.13	Q	V		
10+25	2.6390	5.13	Q	V		
10+30	2.6743	5.13	Q	V		
10+35	2.7168	6.17	Q	V		
10+40	2.7643	6.91	Q	V		
10+45	2.8122	6.95	Q	V		
10+50	2.8602	6.96	Q	V		
10+55	2.9081	6.97	Q	V		
11+ 0	2.9562	6.97	Q	V		
11+ 5	3.0026	6.74	Q	V		
11+10	3.0479	6.58	Q	V		
11+15	3.0932	6.58	Q	V		
11+20	3.1385	6.58	Q	V		
11+25	3.1839	6.59	Q	V		
11+30	3.2293	6.60	Q	V		
11+35	3.2717	6.15	Q	V		
11+40	3.3118	5.83	Q	V		
11+45	3.3518	5.81	Q	V		
11+50	3.3934	6.04	Q	V		
11+55	3.4361	6.20	Q	V		
12+ 0	3.4790	6.22	Q	V		
12+ 5	3.5334	7.90	Q	V		
12+10	3.5960	9.09	Q	V		
12+15	3.6590	9.16	Q	V		
12+20	3.7238	9.40	Q	V		
12+25	3.7897	9.58	Q	V		
12+30	3.8558	9.59	Q	V		
12+35	3.9252	10.08	Q	V		
12+40	3.9969	10.42	Q	V		
12+45	4.0689	10.44	Q	V		
12+50	4.1425	10.69	Q	V		
12+55	4.2173	10.86	Q	V		
13+ 0	4.2922	10.88	Q	V		
13+ 5	4.3754	12.08	Q	V		
13+10	4.4645	12.93	Q	V		
13+15	4.5539	12.98	Q	V		
13+20	4.6433	12.99	Q	V		
13+25	4.7328	12.99	Q	V		
13+30	4.8223	13.00	Q	V		
13+35	4.8938	10.37	Q	V		
13+40	4.9525	8.52	Q	V		
13+45	5.0106	8.43	Q	V		
13+50	5.0687	8.44	Q	V		
13+55	5.1268	8.44	Q	V		
14+ 0	5.1850	8.45	Q	V		
14+ 5	5.2498	9.41	Q	V		
14+10	5.3194	10.09	Q	V		
14+15	5.3892	10.13	Q	V		
14+20	5.4573	9.90	Q	V		
14+25	5.5244	9.74	Q	V		
14+30	5.5915	9.73	Q	V		
14+35	5.6585	9.74	Q	V		
14+40	5.7257	9.75	Q	V		
14+45	5.7928	9.75	Q	V		
14+50	5.8584	9.52	Q	V		
14+55	5.9228	9.35	Q	V		
15+ 0	5.9872	9.35	Q	V		
15+ 5	6.0500	9.12	Q	V		
15+10	6.1117	8.95	Q	V		
15+15	6.1733	8.95	Q	V		
15+20	6.2333	8.72	Q	V		
15+25	6.2922	8.55	Q	V		
15+30	6.3511	8.55	Q	V		

15+35	6.4035	7.60				V
15+40	6.4512	6.93				V
15+45	6.4987	6.90				V
15+50	6.5462	6.90				V
15+55	6.5938	6.91				V
16+ 0	6.6414	6.91				V
16+ 5	6.6671	3.73				V
16+10	6.6774	1.49				V
16+15	6.6868	1.37				V
16+20	6.6962	1.37				V
16+25	6.7056	1.37				V
16+30	6.7150	1.37				V
16+35	6.7231	1.17				V
16+40	6.7302	1.03				V
16+45	6.7373	1.03				V
16+50	6.7443	1.03				V
16+55	6.7514	1.03				V
17+ 0	6.7585	1.03				V
17+ 5	6.7682	1.42				V
17+10	6.7799	1.69				V
17+15	6.7917	1.71				V
17+20	6.8034	1.71				V
17+25	6.8152	1.71				V
17+30	6.8270	1.71				V
17+35	6.8387	1.71				V
17+40	6.8505	1.71				V
17+45	6.8623	1.71				V
17+50	6.8727	1.51				V
17+55	6.8822	1.37				V
18+ 0	6.8916	1.37				V
18+ 5	6.9010	1.37				V
18+10	6.9104	1.37				V
18+15	6.9198	1.37				V
18+20	6.9292	1.37				V
18+25	6.9387	1.37				V
18+30	6.9481	1.37				V
18+35	6.9561	1.17				V
18+40	6.9633	1.03				V
18+45	6.9703	1.03				V
18+50	6.9760	0.83				V
18+55	6.9808	0.69				V
19+ 0	6.9855	0.68				V
19+ 5	6.9915	0.88				V
19+10	6.9986	1.02				V
19+15	7.0056	1.03				V
19+20	7.0140	1.22				V
19+25	7.0234	1.36				V
19+30	7.0328	1.37				V
19+35	7.0409	1.17				V
19+40	7.0480	1.03				V
19+45	7.0551	1.03				V
19+50	7.0608	0.83				V
19+55	7.0655	0.69				V
20+ 0	7.0702	0.68				V
20+ 5	7.0763	0.88				V
20+10	7.0833	1.02				V
20+15	7.0904	1.03				V
20+20	7.0974	1.03				V
20+25	7.1045	1.03				V
20+30	7.1116	1.03				V
20+35	7.1186	1.03				V
20+40	7.1257	1.03				V
20+45	7.1327	1.03				V
20+50	7.1384	0.83				V
20+55	7.1432	0.69				V
21+ 0	7.1479	0.68				V
21+ 5	7.1540	0.88				V
21+10	7.1610	1.02				V
21+15	7.1680	1.03				V
21+20	7.1738	0.83				V
21+25	7.1785	0.69				V
21+30	7.1832	0.68				V
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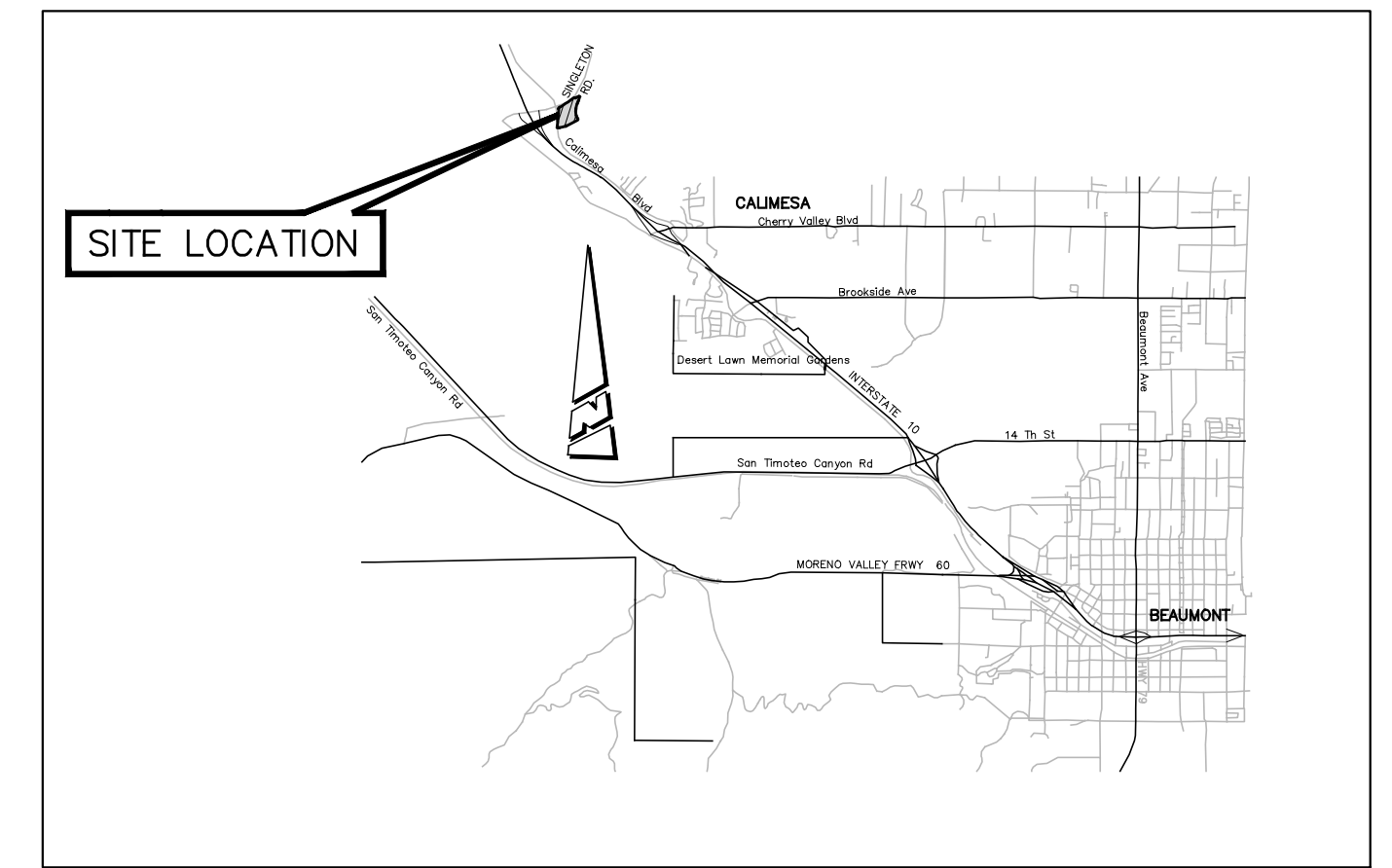
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22+ 5	7.2246	0.88	Q			V
22+10	7.2316	1.02	Q			V
22+15	7.2387	1.03	Q			V
22+20	7.2444	0.83	Q			V
22+25	7.2491	0.69	Q			V
22+30	7.2538	0.68	Q			V
22+35	7.2586	0.68	Q			V
22+40	7.2633	0.68	Q			V
22+45	7.2680	0.68	Q			V
22+50	7.2727	0.68	Q			V
22+55	7.2774	0.68	Q			V
23+ 0	7.2821	0.68	Q			V
23+ 5	7.2868	0.68	Q			V
23+10	7.2915	0.68	Q			V
23+15	7.2962	0.68	Q			V
23+20	7.3009	0.68	Q			V
23+25	7.3056	0.68	Q			V
23+30	7.3103	0.68	Q			V
23+35	7.3151	0.68	Q			V
23+40	7.3198	0.68	Q			V
23+45	7.3245	0.68	Q			V
23+50	7.3292	0.68	Q			V
23+55	7.3339	0.68	Q			V
24+ 0	7.3386	0.68	Q			V
24+ 5	7.3406	0.29	Q			V
24+10	7.3407	0.01	Q			V

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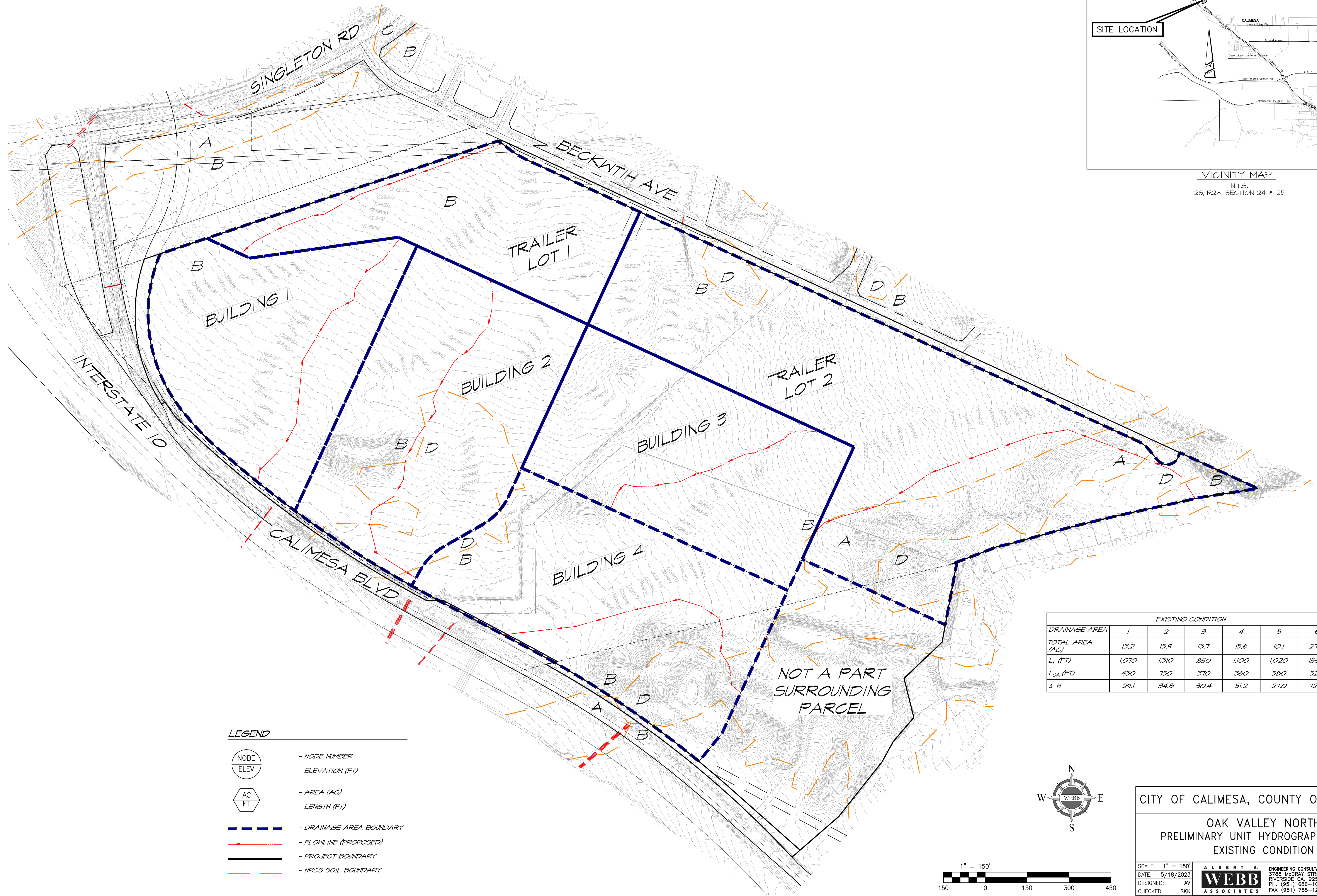
**UNIT HYDROGRAPH HYDROLOGY MAPS**

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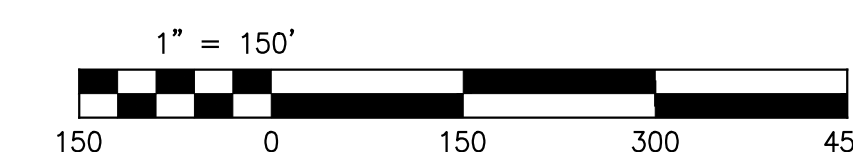
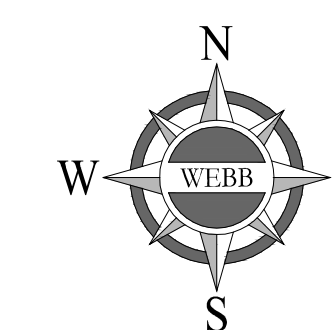
VICINITY MAP  
N.T.S.  
T2S, R2W, SECTION 24 & 25



EXISTING CONDITION						
DRAINAGE AREA	1	2	3	4	5	6
TOTAL AREA (AC)	13.2	15.9	13.7	15.6	10.1	27.2
L <sub>T</sub> (FT)	1,070	1,310	850	1,100	1,020	1,530
L <sub>CA</sub> (FT)	430	750	370	360	580	520
Δ H	29.1	34.8	30.4	51.2	27.0	72.8

LEGEND

- NODE NUMBER
- ELEVATION (FT)
- AREA (AC)
- LENGTH (FT)
- DRAINAGE AREA BOUNDARY
- FLOWLINE (PROPOSED)
- PROJECT BOUNDARY
- NRCS SOIL BOUNDARY



CITY OF CALIMESA, COUNTY OF RIVERSIDE

OAK VALLEY NORTH  
PRELIMINARY UNIT HYDROGRAPH EXHIBIT  
EXISTING CONDITION

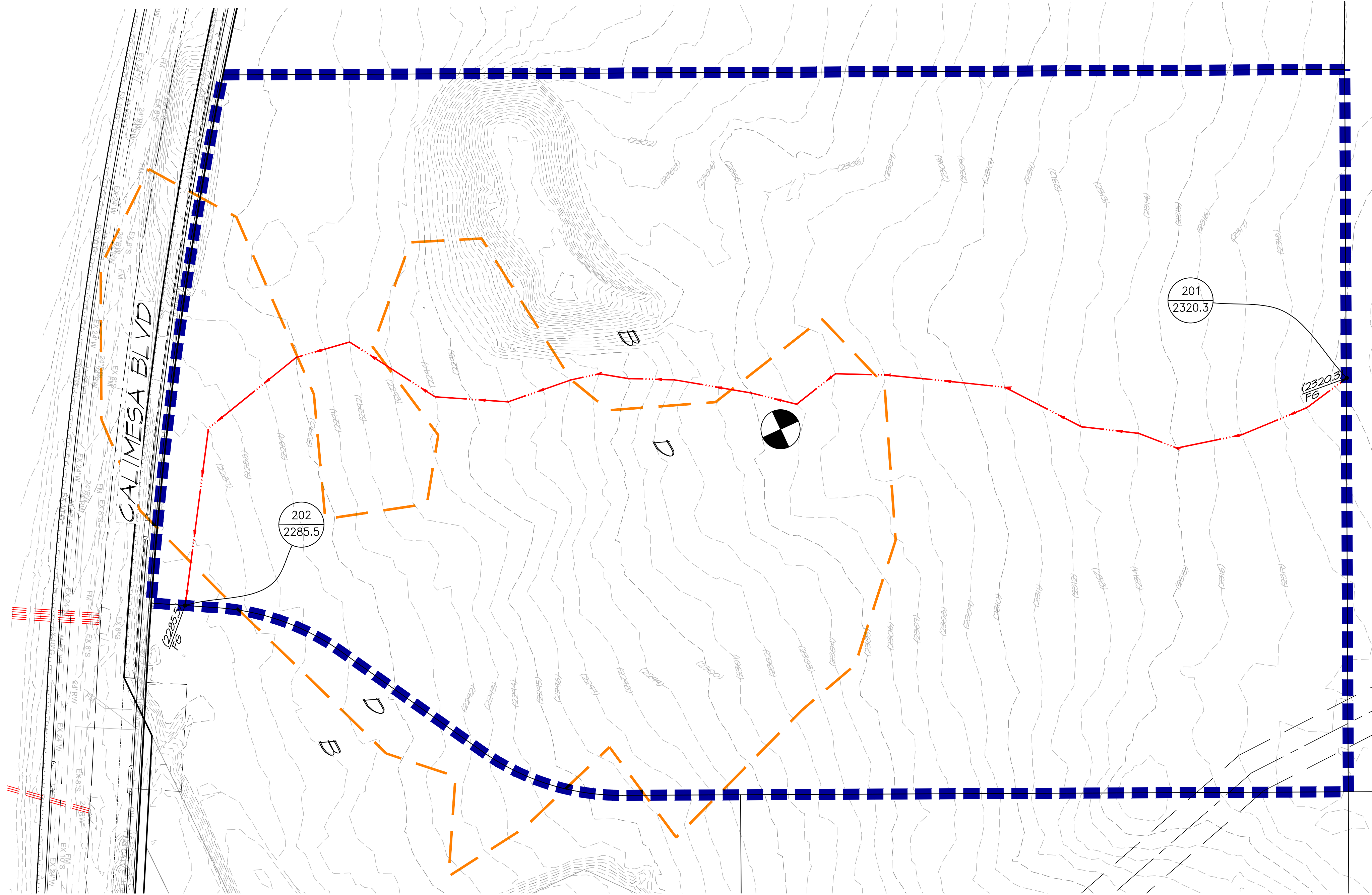
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CHECKED: SKK  
PLN CK REF:  
F.B.

ALBERT A. WEBB ASSOCIATES  
ENGINEERING CONSULTANTS  
3785 MCGRAY STREET  
RIVERSIDE CA 92506  
PH. (951) 686-1070  
FAX (951) 788-1256

W.O. 2022-0085  
SHEET 1  
OF 2 SHEETS  
DWG. NO.

PRELIMINARY

HY:2022\22-0085\DRAINAGE\HYD\DWG FOLDER\22-0085-C-PHYD-UH\DWG 5/18/2023 11:10:15 AM Adrform

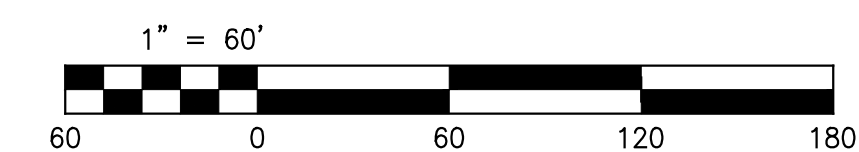
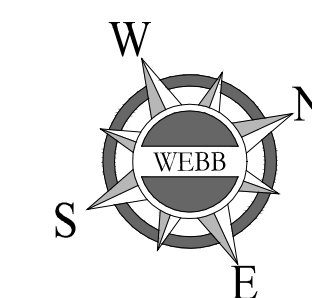


**LEGEND**

- NODE NUMBER
- ELEVATION (FT)
- AREA (AC)
- LENGTH (FT)
- DRAINAGE AREA BOUNDARY
- FLOWLINE (PROPOSED)
- PROJECT BOUNDARY
- NRCS SOIL BOUNDARY

EXISTING CONDITION	
DRAINAGE AREA	2
TOTAL AREA (AC)	15.9
L <sub>T</sub> (FT)	1,310
L <sub>CA</sub> (FT)	750
Δ H	34.8

SOIL TYPE (%)	
A	0
B	70
C	0
D	30

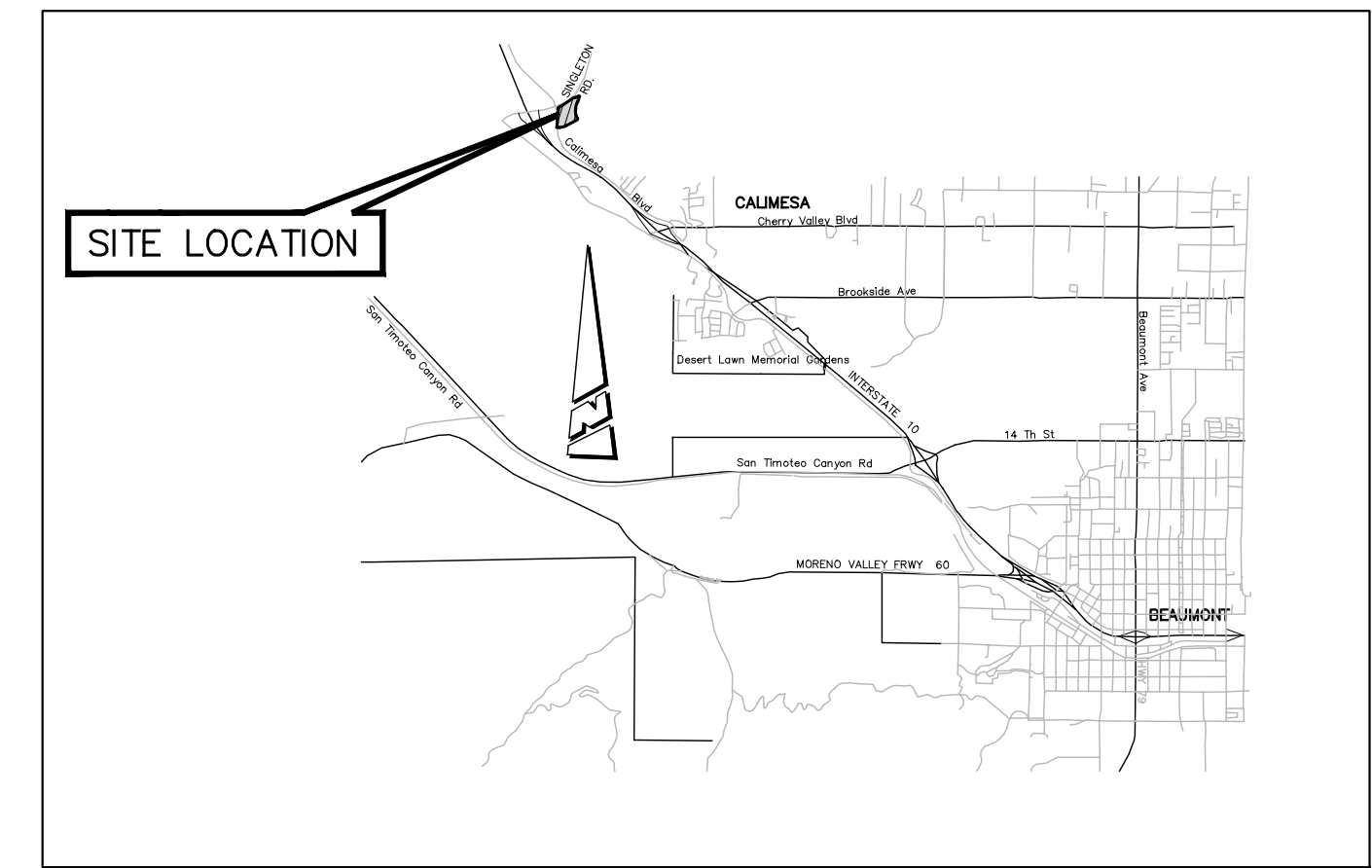


CITY OF CALIMESA, COUNTY OF RIVERSIDE  
 OAK VALLEY NORTH – BUILDING 2  
 PRELIMINARY UNIT HYDROGRAPH EXHIBIT  
 EXISTING CONDITION

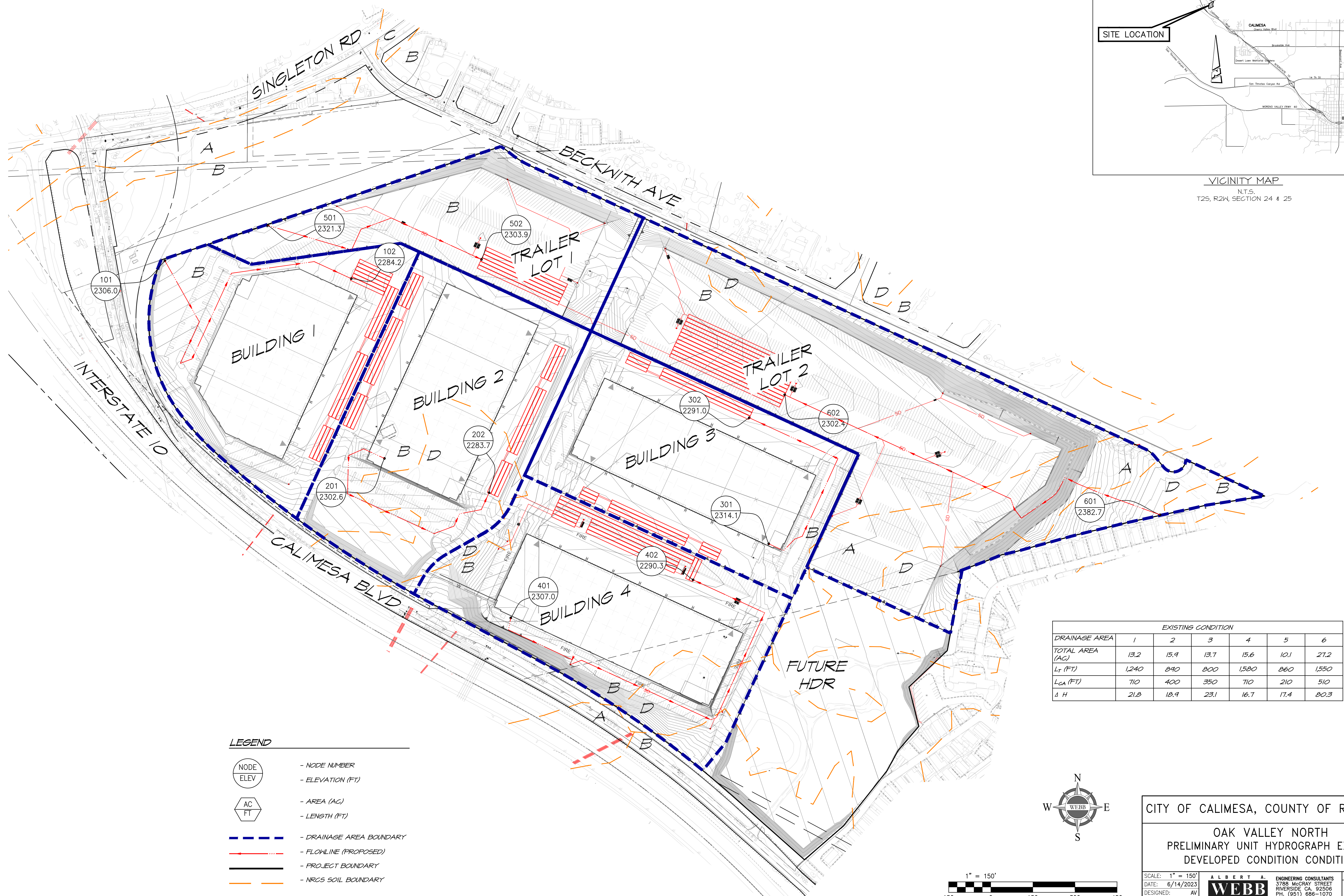
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DATE: 5/18/2023	3785 MCGRAW STREET RIVERSIDE CA 92506	SHEET 2
DESIGNED: AV	PH. (951) 686-1070	OF 2 SHEETS
CHECKED: SKK	FAX (951) 788-1256	DWG. NO.
PLN CK REF:		
F.B.		

PRELIMINARY

H:\2022\22-0085\DRAINAGE\HYD.DWG FOLDER\22-0085-C-PHYD-UH.DWG 5/18/2023 11:10:15 AM Adrfom

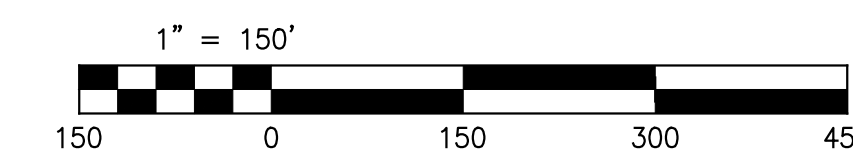
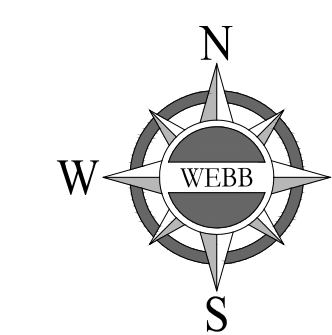


VICINITY MAP  
N.T.S.  
T2S, R2W, SECTION 24 & 25



DRAINAGE AREA	EXISTING CONDITION					
	1	2	3	4	5	6
TOTAL AREA (AC)	13.2	15.9	13.7	15.6	10.1	27.2
L <sub>T</sub> (FT)	1,240	890	800	1,580	860	1,550
L <sub>CA</sub> (FT)	710	400	350	710	210	510
Δ H	21.8	18.9	23.1	16.7	17.4	80.3

- LEGEND**
- NODE  
ELEV - NODE NUMBER
  - ELEV - ELEVATION (FT)
  - AC  
FT - AREA (AC)
  - FT - LENGTH (FT)
  - DRAINAGE AREA BOUNDARY
  - FLOWLINE (PROPOSED)
  - PROJECT BOUNDARY
  - NRCS SOIL BOUNDARY

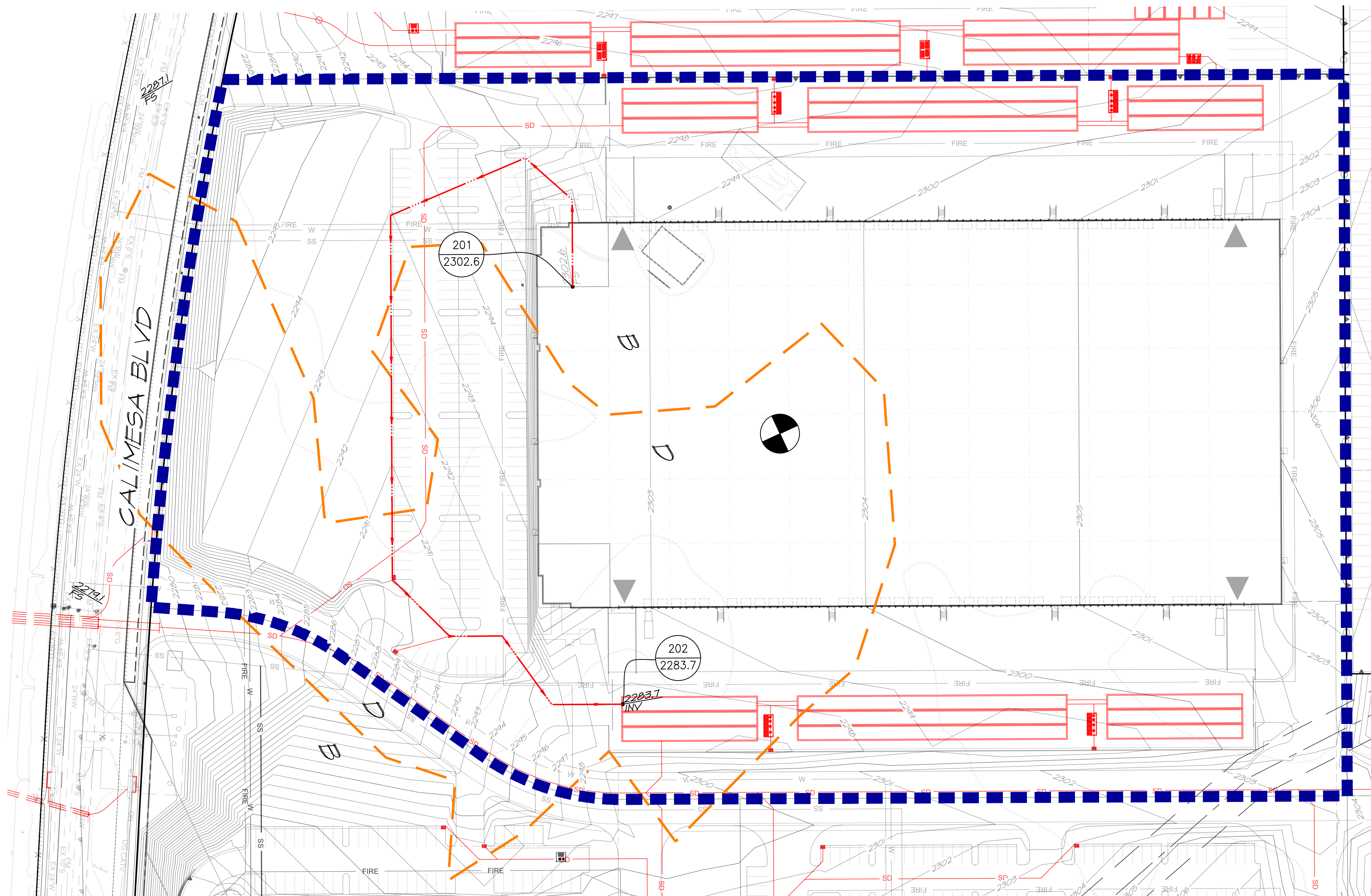


CITY OF CALIMESA, COUNTY OF RIVERSIDE

OAK VALLEY NORTH  
PRELIMINARY UNIT HYDROGRAPH EXHIBIT  
DEVELOPED CONDITION CONDITION

SCALE: 1" = 150'	<b>ALBERT A. WEBB ASSOCIATES</b> ENGINEERING CONSULTANTS 3785 MCGRAY STREET RIVERSIDE, CA 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 2022-0085
DATE: 6/14/2023		SHEET 1
DESIGNED: AV		OF 2 SHEETS
CHECKED: SKK		DWG. NO.
PLN CK REF:		
F.B.		

PRELIMINARY

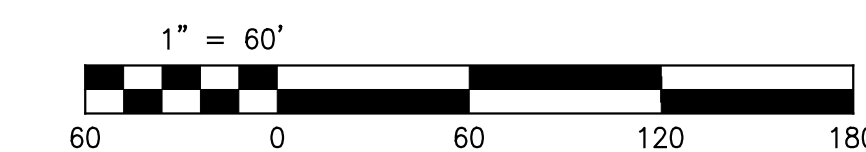
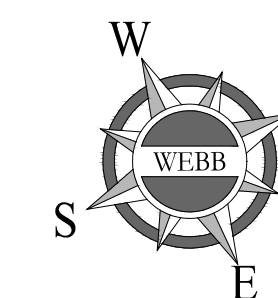


**LEGEND**

- NODE NUMBER
- AREA (AC)
- LENGTH (FT)
- DRAINAGE AREA BOUNDARY
- FLOWLINE (PROPOSED)
- PROJECT BOUNDARY
- NRCS SOIL BOUNDARY

EXISTING CONDITION	
DRAINAGE AREA	2
TOTAL AREA (AC)	15.9
L <sub>T</sub> (FT)	890
L <sub>CA</sub> (FT)	400
Δ H	10.9

SOIL TYPE (%)	
A	0
B	70
C	0
D	30



CITY OF CALIMESA, COUNTY OF RIVERSIDE  
**OAK VALLEY NORTH – BUILDING 2**  
 PRELIMINARY UNIT HYDROGRAPH EXHIBIT  
 DEVELOPED CONDITION

SCALE: 1" = 60'	ALBERT A. WEBB ASSOCIATES	ENGINEERING CONSULTANTS 3785 MCGRAY STREET RIVERSIDE CA 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 2022-0085
DATE: 6/14/2023	DESIGNED: AV	CHECKED: SKK	SHEET 2
PLN CK REF:	F.B.		OF 2 SHEETS
			DWG. NO.

PRELIMINARY

## **APPENDIX D – REFERENCES**

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**RELEVANT EXCERPTS AND MAPS FROM “HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10” BY JLC ENGINEERING AND CONSULTING**

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# HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10 TPM 37862

**COUNTY OF RIVERSIDE  
CALIFORNIA**

*PREPARED FOR:*

**OAK VALLEY DEVELOPMENT PARTNERS**

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*PREPARED BY:*



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*DATE PREPARED:*  
**NOVEMBER 9, 2020**

*REVISED:*  
**APRIL 12, 2021**

**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

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This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.



11/9/2020



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Joseph L. Castaneda RCE 59835  
Registered Civil Engineer

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Date

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Seal



**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

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**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

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# HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10 TENTATIVE PARCEL MAP 37862

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## I. INTRODUCTION

The purpose of this study is to analyze the existing culvert capacities crossing Interstate 10 and discharging into Tentative Tract Map 37862. The existing culverts are located along Interstate 10 between Cherry Valley Boulevard and just north of Singleton Road in the unincorporated area of Calimesa in the County of Riverside. The scope of this report will include the following:

- Determine the 100-year flow rates for the 3-hour, 6-hour and 24-hour storm durations for the existing condition watersheds tributary to the existing culverts using the Riverside County Flood Control and Water Conservation District (RCFC & WCD) Unit Hydrograph Method.
- Determine the maximum capacity for each culvert crossing Interstate 10 based upon the maximum ponded depth at the upstream culvert entrance.
- Determine the available storage upstream of the two culverts located at the low point of the freeway, and develop a storage volume vs. outflow table to be utilized in a basin routing analyses.
- Perform a routing in series analyses that incorporates the flows through the culverts to determine the actual flow rate discharging through the culverts into Tentative Tract Map 37862.

## II. PROJECT SITE AND DRAINAGE OVERVIEW

A commercial development is proposed on the south easterly side of Interstate 10 between Cherry Valley Boulevard and Singleton Road, including a portion north of Singleton Road. Based upon the area of the project, a total of 8 culverts currently cross Interstate 10 and discharge into the property. Additionally, due to the larger culvert crossing in the south portion of the project site, an existing stream traverses the project site from east to west. In order to accurately model the existing stream and pipes required to connect to the existing culverts, a hydraulic analysis was required.

Figure 2 shows the location of each culvert in relation to the proposed project, Tentative Tract Map 37862. Culvert A is located at the southerly project boundary, and discharges directly into the stream traversing the site. Flows in excess of the capacity of Culvert A are conveyed to Culvert B3. Culverts D1, D2, and C collect flows and discharge to the northerly portion of the project site. Flows in excess of the capacity for Culverts D1, D2, and C will overflow to Culvert E. Flows in excess of the capacity of Culvert E and Culvert B3 will be conveyed to the low point at Culverts B1 and B2.

## III. HYDROLOGY ANALYSIS

The RCFC & WCD Hydrology Manual (Reference 1) was used to develop the hydrological parameters for the unit hydrograph method. The calculations were performed using the computer program developed by Civil Cadd/Civil Design.



**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

The rainfall values were obtained from the Riverside County Hydrology Manual, and are summarized below:

<b>Duration</b>	<b>2-Year Rainfall</b>	<b>100-Year Rainfall</b>
1-Hour	0.58	1.30
3-Hour	0.90	2.13
6-Hour	1.50	3.10
24-Hour	2.75	7.00

The rainfall maps have been included as Exhibit E. The hydrologic soils were obtained from the USDA's Natural Resources Conservation Service Websoil Survey (see Exhibit D).

Five unit hydrograph watersheds were analyzed, and are shown on Exhibit A. The watersheds have been designated as Areas A, B, C, D and E. The watershed areas represent the naming convention for the downstream culverts in which the watersheds are tributary to (see Figure 2).

The unit hydrograph calculations were based upon the existing land use as determined by aerial imagery, and have been delineated on Exhibit C. The existing land uses and their corresponding impervious area and runoff index numbers are summarized below:

<b>Land Use</b>	<b>Impervious Fraction</b>	<b>Soil "A" Runoff Index</b>	<b>Soil "B" Runoff Index</b>	<b>Soil "C" Runoff Index</b>	<b>Soil "D" Runoff Index</b>
Open Space – Fair Cover	0	46	66	77	83
Open Space – Poor Cover	0	62	76	84	88
Rural Residential	0.05	46	66	77	83
1 Acre Residential	0.20	32	56	69	75
Residential Low	0.45	32	56	69	75
Residential Low Medium	0.55	32	56	69	75
Residential High	0.80	32	56	69	75
Commercial	0.90	32	56	69	75

The unit hydrograph calculations were performed for the 100-year, 3-hour, 6-hour and 24-hour duration. These unit hydrographs were used to perform basin routing in series in order to determine which duration would result in the largest flow rates through the systems. The unit hydrograph calculations have been included in Appendix A. The unit hydrograph hydrology map has been included as Exhibit A.

**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

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**IV. CULVERT CAPACITIES**

In order to perform the routing in series, the capacities for the culverts not located at the low point were necessary. The capacities for Culverts A, B3, C, D1, D2 and E were determined using Water Surface Profile Gradient Program iterations until the upstream water surface elevation was equal to the maximum upstream ponded depth (which was determined by the topographic mapping).

Culvert A is a double 10'W x 7'H reinforced concrete box with an existing tributary flow rate of 2,695.4 ft<sup>3</sup>/s. A HEC-RAS analyses was performed for the channel downstream of Culvert A, and including the Culvert A crossing, as well as a portion of the channel upstream of Culvert A. A lateral weir was modeled at the culvert where flows would leave the system. Based upon the HEC-RAS results included in Appendix E, the Culvert can convey 2,633.4 ft<sup>3</sup>/s and 62.0 ft<sup>3</sup>/s will leave the system and be conveyed to Culvert B3.

Culvert B3 is a double 42" CMP culvert. A flow rate for Culvert B3 was not determined since it is included in the Area B watershed, therefore a capacity was determined based upon the maximum allowable ponded depth before flows would overtop to the low point for Culverts B1 and B2. The maximum allowable ponded depth is 2284.00, and the maximum flow through the culverts with an upstream elevation of 2284.00 is 236 ft<sup>3</sup>/s per the WSPG analysis (see Appendix B.2) and the upstream water surface elevation analyses. The WSPG analyses utilized a pressure momentum calculation at the upstream end of the analyses that did not accurately represent the upstream water surface elevation, therefore a hand calculation was done and resulted in a lower water surface elevation than the WSPG analyses calculated, shown in the table below:

**CULVERT B3 UPSTREAM WSE CALCULATION**

<b>WSPG US INV</b>	<b>Dc</b>	<b>Vel. Head</b>	<b>1.5 Vh</b>	<b>Dc + 1.5 Vh</b>	<b>Actual US WSE</b>
2278.67	3.27	1.37	2.055	5.325	2284.00

The flows that overtop Culvert A are tributary to Culvert B3. Since only 62.0 ft<sup>3</sup>/s is tributary to Culvert B3 and the capacity is 236 ft<sup>3</sup>/s, the entire tributary flow will enter Culvert B3. Therefore, no flows will bypass from Culvert B3 to Culverts B1 and B2.

Culvert D1 and D2 are 30" CMP and 36" RCP, respectively, and were analyzed the same as Culvert B3 since individual flow rates to each culvert was not determined (both Culverts D1 and D2 are within the Area D watershed). Therefore, the maximum ponded depth that was contained at the upstream end of the culverts was utilized as the maximum ponded depth for the WSPG analyses. Culvert D1 can pond to elevation 2293.00 and Culvert D2 can pond to elevation 2291.00. The resulting maximum flow rates based upon these upstream elevations is 43 ft<sup>3</sup>/s for Culvert D1 and 104 ft<sup>3</sup>/s for



## HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10 TENTATIVE PARCEL MAP 37862

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Culvert D2. The WSPG calculations have been included in Appendix B.4 and B.5, respectively. Flows that cannot be conveyed through Culverts D1 and D2 will flow along the freeway to Culvert E.

Culvert C is an 6'W x 8'H RCB with a tributary flow rate of 1,325.0 ft<sup>3</sup>/s from Area C. A weir was analyzed at the breakout point for Culvert C, which is adjacent to Calimesa Boulevard (see Figure 3). The weir elevation is 2303.00, and based upon the WSPG Analyses, upstream water surface elevation analyses, and Weir Analyses, the maximum flow through the culvert is 914 ft<sup>3</sup>/s with a ponded elevation of 2306.14, while the weir will convey 411 ft<sup>3</sup>/s with a water surface elevation of 2306.14 as well. The WSPG calculations are included in Appendix B.3 and the weir analysis is included in Appendix C.2. The upstream water surface elevation based upon the WSPG calculations included a pressure/momentum calculation that raised the WSE higher than it actually is. Therefore, a hand calculation was included on the Weir Equation Analyses that more accurately represents the upstream water surface elevation, however, it is only lower by approximately 1 foot. Flows that overtop Culvert C will overflow to Culverts D1 and D2, and then due to the limited capacity of these culverts, the flows will ultimately be conveyed along the freeway to Culvert E.

Culvert E is a 30" RCP with a tributary flow rate of 62.0 ft<sup>3</sup>/s from Area E. A weir was analyzed with an invert elevation of 2285.00. Based upon the WSPG for Culvert E, the maximum flow rate through the culvert is 42 ft<sup>3</sup>/s with a water surface elevation of 2285.67, while the weir can pass 20 ft<sup>3</sup>/s with a water surface elevation of 2285.67. The WSPG calculations are included in Appendix B.6 and the weir analysis is included in Appendix C.3. Flows that cannot be conveyed through Culvert E will be conveyed to Culverts B1 and B2.

Culverts B1 and B2 are located within a low point that pass under the low point of the freeway. The culverts were used as the outflow for the final stage of the routing in series analyses. A volume vs. outflow table had to be compiled in order to accurately route the tributary flows and volume to Culverts B1 and B2. Culvert B1 is an existing double 48" CMP with an invert elevation of 2268.93 (the inverts of the two CMP culverts comprising of Culvert B1 differ slightly, so the higher of the two was utilized), and Culvert B2 is an existing 48" CMP with an invert of 2268.38. For depths above the soffit of the pipe (elevation 2273.00 and above), orifice equations were utilized to determine the flow through the culverts. However, for depths less than the soffit of the pipe, a different methodology had to be utilized. Critical depth analyses were performed for varying flow rates in the pipe to determine the water surface elevation that corresponds to that flow rate. The critical depth analysis was based upon the following equation:

$$\text{Depth} = Y_c + 1.5 (V_c^2 / 2g)$$

Where:



## HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10 TENTATIVE PARCEL MAP 37862

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$Y_C$  = Depth of flow at critical depth  
 $V_C$  = Velocity at critical depth

The spreadsheets included in Appendix D.1 iterate using the goal seek function to solve for the Depth value. Once the equivalent depths for the corresponding flow rates were determined, the flow rates corresponding to water surface elevations 2269, 2270, 2271 and 2272 were interpolated and utilized as the outflow for the culverts at these elevations. A weir was also analyzed for flows that could potentially overtop the freeway. The freeway low point is at elevation 2279.00, and includes a 3 foot barrier between the two travel ways. This barrier was added to the low point to include a weir flow line elevation of 2282.00 and a length of 877 feet, which represents the length along the low point of the freeway. A composite outflow was developed (shown on Table 4 of the Culvert B1 and B2 outflow calculations included in Appendix D.2) that represents the total flow rate from the low point through the culverts and overtopping the freeway. The storage upstream of Culverts B1 and B2 was developed using the existing contours, and is shown on Figure 3.

The hydraulic analyses for the culverts was used in the basin routing in series analyses discussed below.

### V. ROUTING IN SERIES

Using the unit hydrographs prepared for the watershed, and the culvert analyses, a routing in series was performed using the CivilD program. This would give the most accurate representation of what will be conveyed through culverts B1 and B2, as well as overtop the freeway. The analyses were performed for the 3-hour, 6-hour and 24-hour storm durations for the 100-year storm event. The process of routing the unit hydrographs in series is described below.

Since the flows that overtop Culvert A of 62 ft<sup>3</sup>/s are tributary to Culvert B3, which has a capacity of 236 ft<sup>3</sup>/s, the entirety of these bypass flows can be conveyed through Culvert B3. Therefore, Culvert A, Culvert B3 and Area A unit hydrograph were not included in the routing in series analyses since flows would not be tributary to Culverts B1 and B2.

The analyses started with Area C, in which the unit hydrograph was added from a file. A flowby basin was then used to model the 914 ft<sup>3</sup>/s leaving through Culvert C. The excess flow will bypass to Culverts D1 and D2, and was stored as stream 1. The Area D hydrograph was then added to Stream 1 at Culverts D1 and D2. A flowby was then modeled for the 147 ft<sup>3</sup>/s leaving through Culverts D1 and D2, and the overflow was stored in Stream 1, and is tributary to Culvert E. Area E was input and added to Stream 1, and then a flowby was modeled for 42 ft<sup>3</sup>/s leaving through Culvert E. The remaining flows are tributary to Culverts B1 and B2, and was stored as Stream 1. This stream was then combined with the Area B unit hydrograph for a total tributary flow

**HYDRAULIC ANALYSES FOR CULVERTS CROSSING I-10  
TENTATIVE PARCEL MAP 37862**

---

rate tributary to Culverts B1 and B2. This hydrograph is then routed through a retarding basing using the volume vs. outflow table developed for Culverts B1 and B2. The results of the routing in series for the outflow and upstream ponded depth for Culverts B1 and B2 are summarized below:

<b>Storm Duration</b>	<b>Flow Rate through Culverts B1 and B2</b>	<b>Upstream Ponded Depth for Culverts B1 and B2</b>
100-Year, 3-Hour	557.30 ft <sup>3</sup> /s	2278.55
100-Year, 6-Hour	556.53 ft <sup>3</sup> /s	2278.53
100-Year, 24-Hour	342.41 ft <sup>3</sup> /s	2273.71

Based upon the results, the 100-year, 3-hour storm event will result in the highest flow rate through the culverts of 565.96 ft<sup>3</sup>/s, and the highest ponded depth of 2278.55. Based upon this depth, the flows will not pond within the freeway which is at elevation 2279.00 and will not overtop the freeway.

The routing in series calculations have been included in Appendix D.

**VI. CONCLUSIONS AND RECOMMENDATIONS**

Hydrology and hydraulic analyses were performed for the culverts crossing Interstate 10 upstream of Tentative Tract Map 37862 to determine the maximum flow rates conveyed by the culverts, and if flows would overtop the freeway. Based upon the analyses, the following can be concluded:

1. Based upon the culvert capacities and the routing in series analyses, the maximum flow rate within the stream traversing the project site will be 4,355.7 ft<sup>3</sup>/s, which is the sum of the flows conveyed through Culverts A, B3, C, D1, D2, and E, plus the routed flow through Culverts B1 and B2.
2. The maximum water surface elevation at the low point is 2278.55. The freeway roadway is at 2279.00 and the 3 foot median barrier is at 2282.00, therefore flows will not pond over the roadway or overtop the freeway barrier.

**VII. REFERENCES**

1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978.
2. Los Angeles County Flood Control Design Manual, March 1982





## **FIGURES**

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**FIGURE 1: VICINITY MAP**

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Drawing Name: O:\221.03.20\Engineering\Hydrology\_Plan\Exhibits\FIGURE\_1.dwg  
Last Opened: Nov 04, 2020 - 12:34pm by jcarver



# TRACT MAP 37862 VICINITY MAP

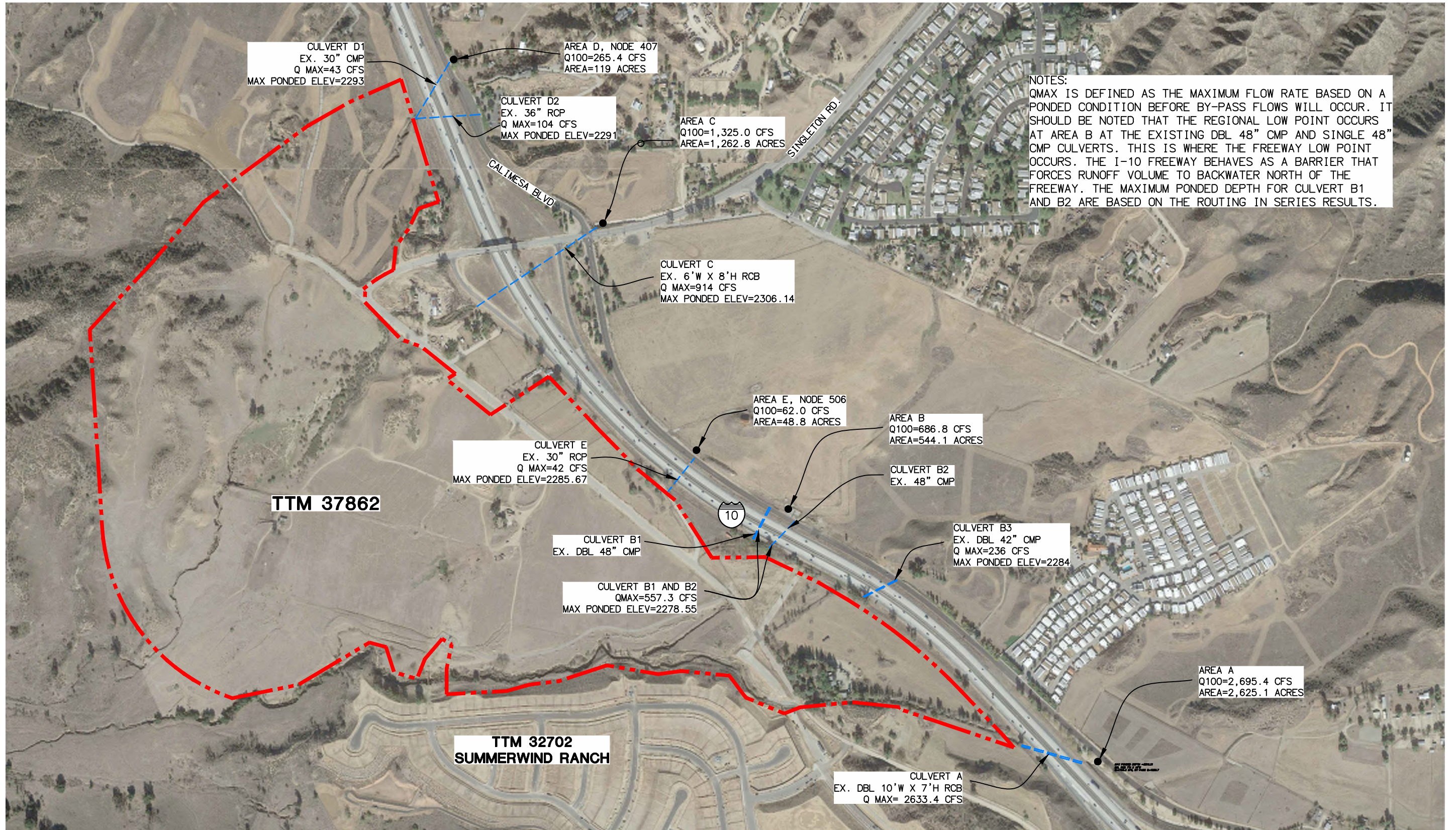
**JLC** Engineering & Consulting, Inc.  
41660 IVY STREET, SUITE A  
MURRIETA, CA 92562  
PH. 951.304.9552 FAX 951.304.3568

FIGURE 1

**FIGURE 2:            EXISTING I-10 CALTRANS CULVERTS**

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Drawing Name: O:\221.03.20\Engineering\Hydrology\_Plan\Exhibits\FIGURE\_2\_EX\_CALTRANS\_CULVERTS--updated.dwg  
Last Opened: Apr 12, 2021 - 3:16pm by jcarver



## TRACT MAP 37862 EXISTING I-10 CALTRANS CULVERTS



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FIGURE 2

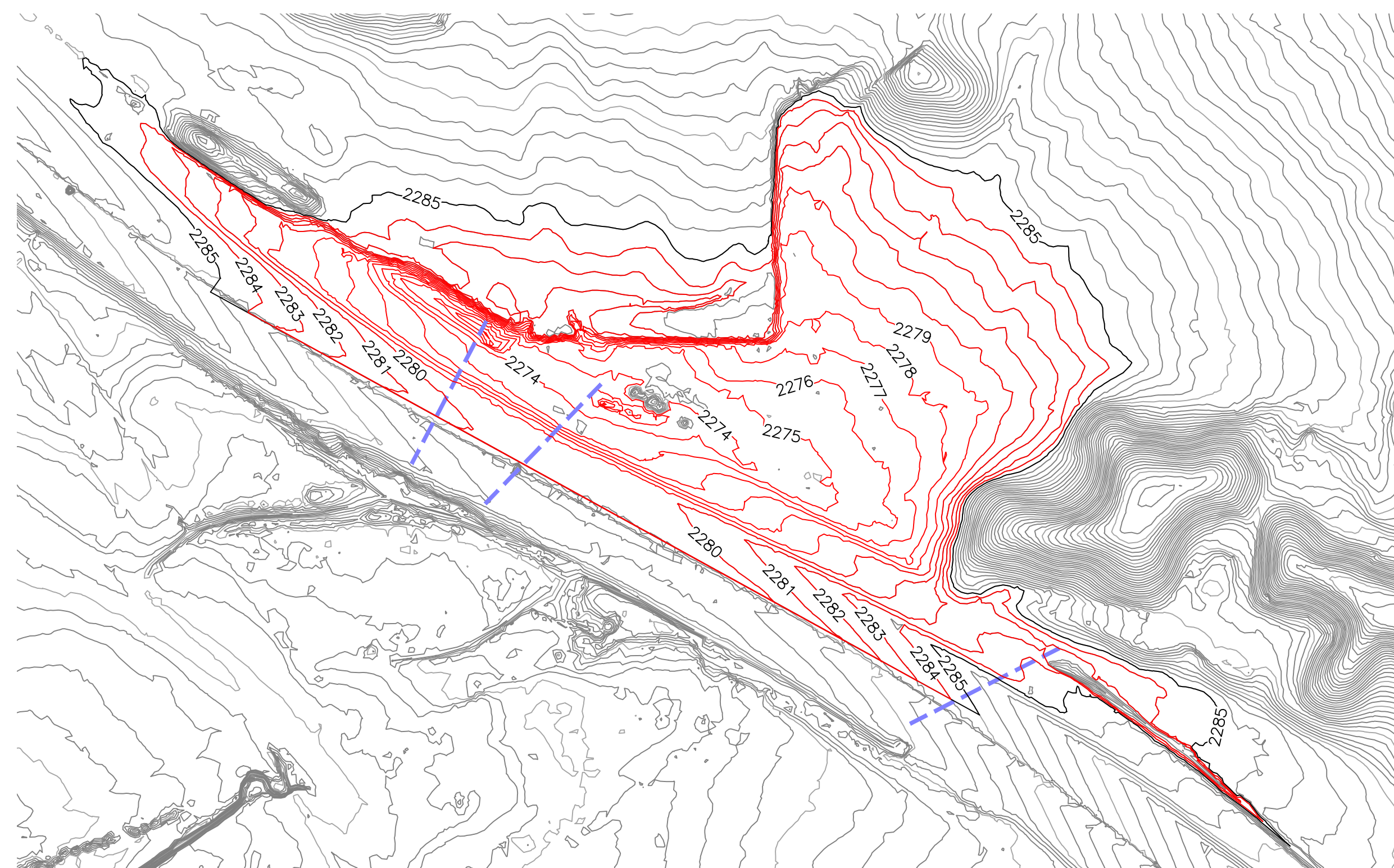
**FIGURE 3: CULVERT WEIRS AND UPSTREAM STORAGE**

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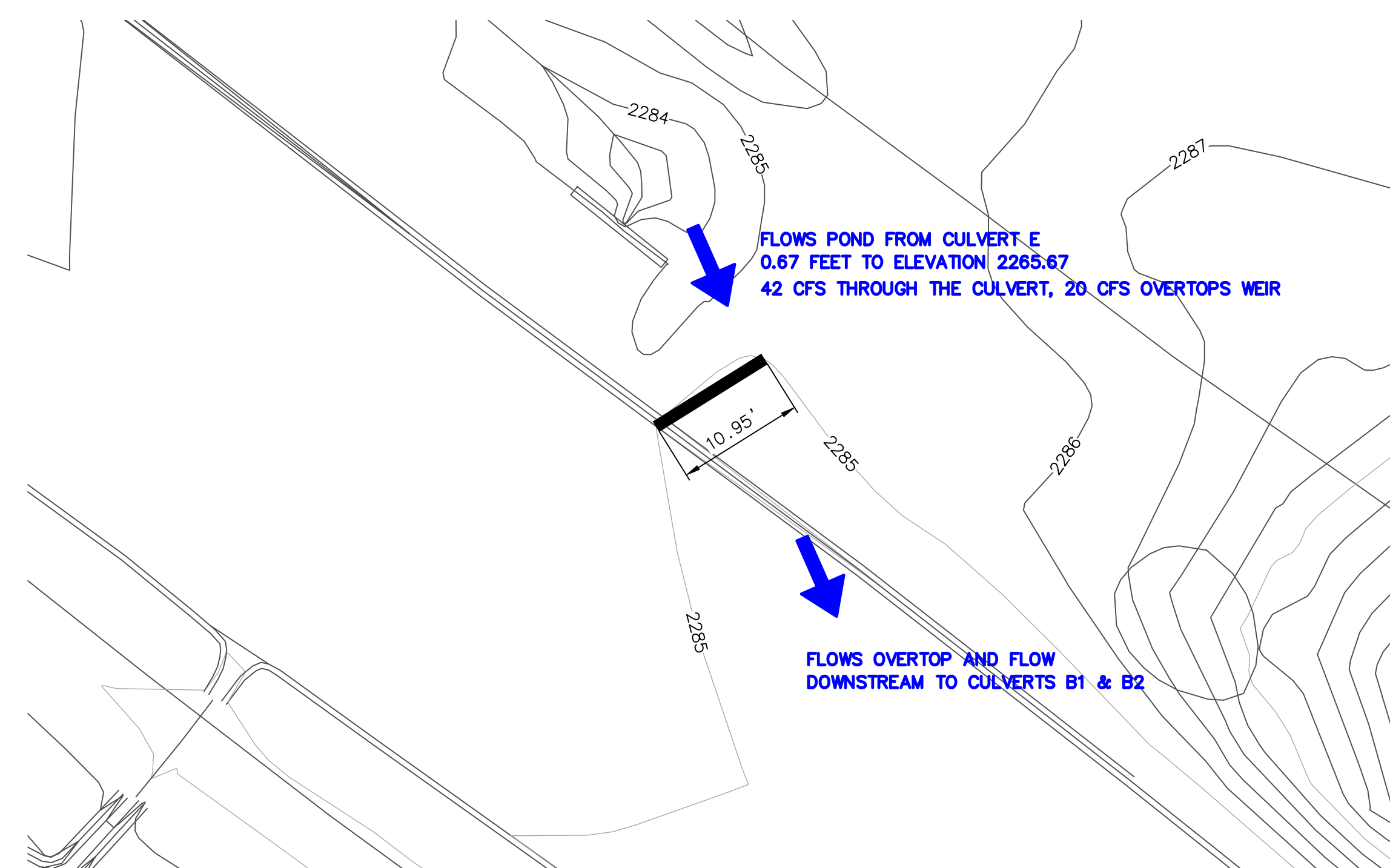
# TRACT MAP NO. 37862

CITY OF CALIMESA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

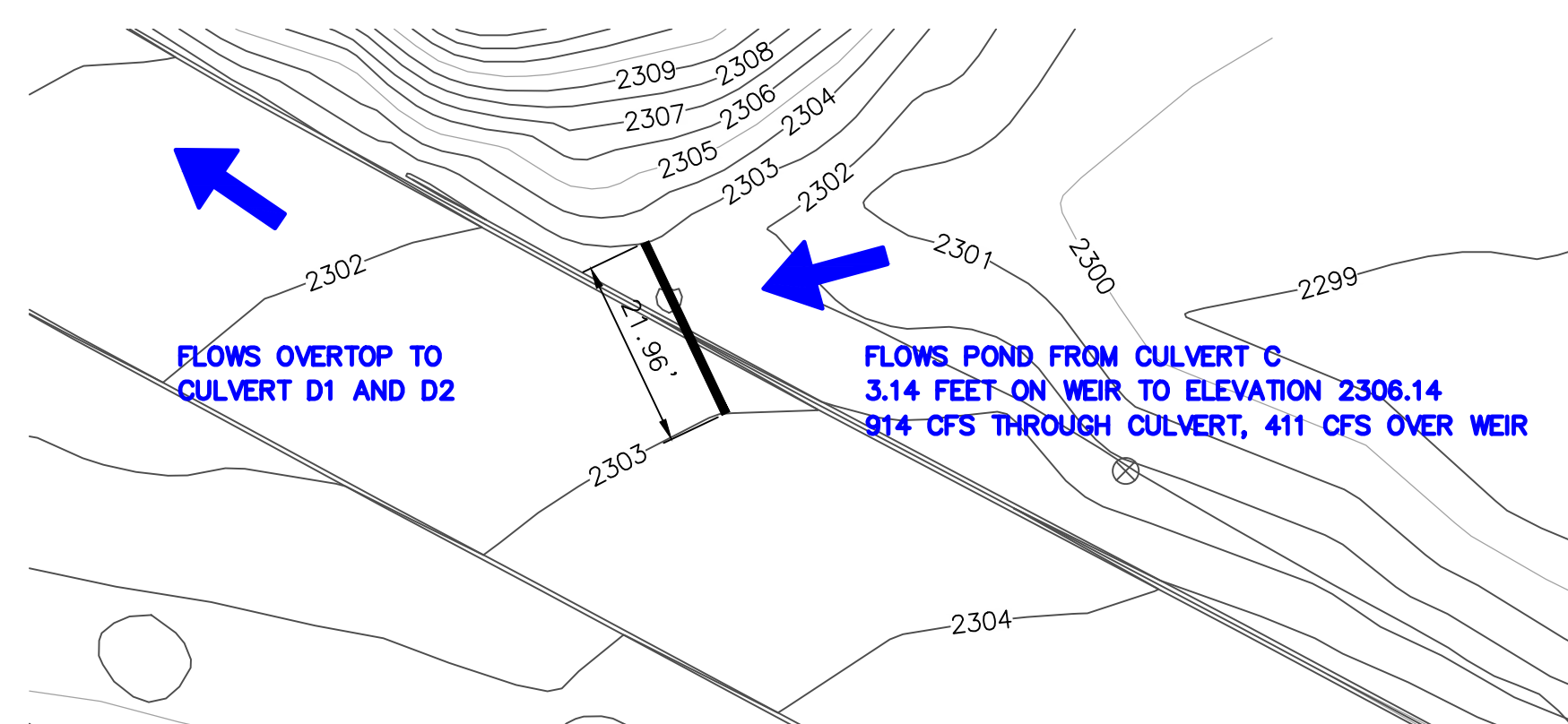
## CULVERT WEIRS AND UPSTREAM STORAGE



CULVERTS B1 AND B2 UPSTREAM STORAGE  
SCALE: 1" = 150'



CULVERT E WEIR  
SCALE: 1" = 10'



CULVERT C WEIR  
SCALE: 1" = 20'

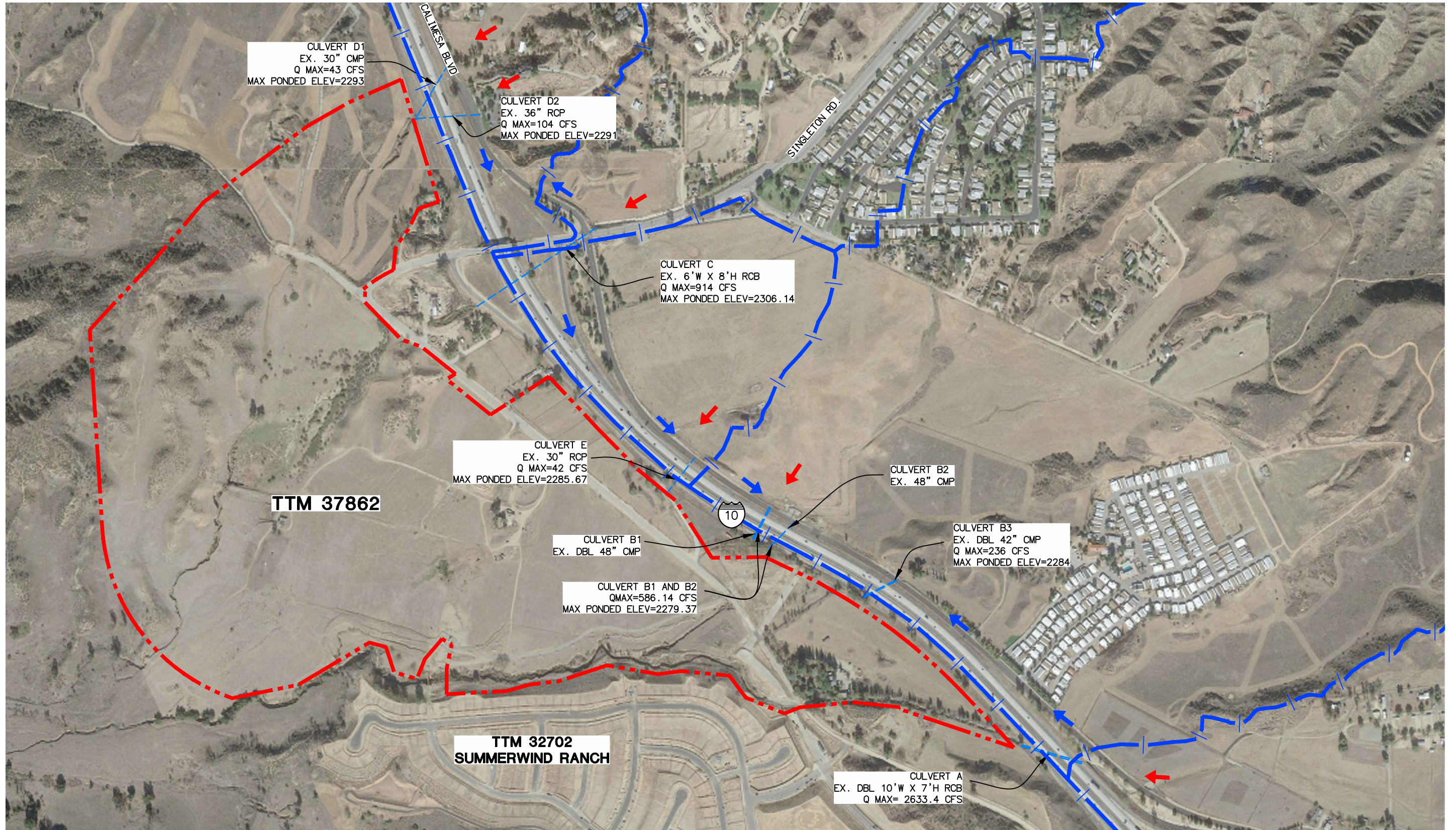
FIGURE 3  
TRACT MAP NO. 37862  
CULVERT WEIRS AND  
UPSTREAM STORAGE

**FIGURE 4:            EXISTING FLOW SCHEMATIC**

---



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Last Opened: Apr 12, 2021 - 2:18pm by jcarver



- ← OVERFLOW DIRECTION
- ← RUNOFF FROM WATERSHED

## TRACT MAP 37862 EXISTING FLOW SCHEMATIC



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FIGURE 5

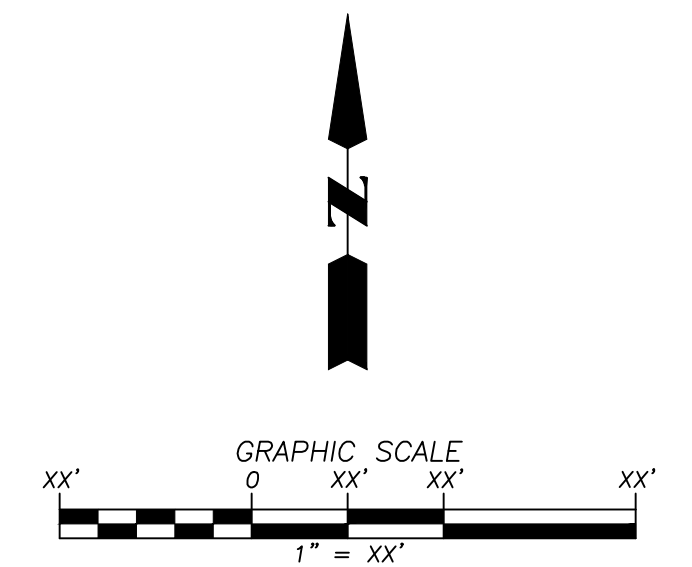
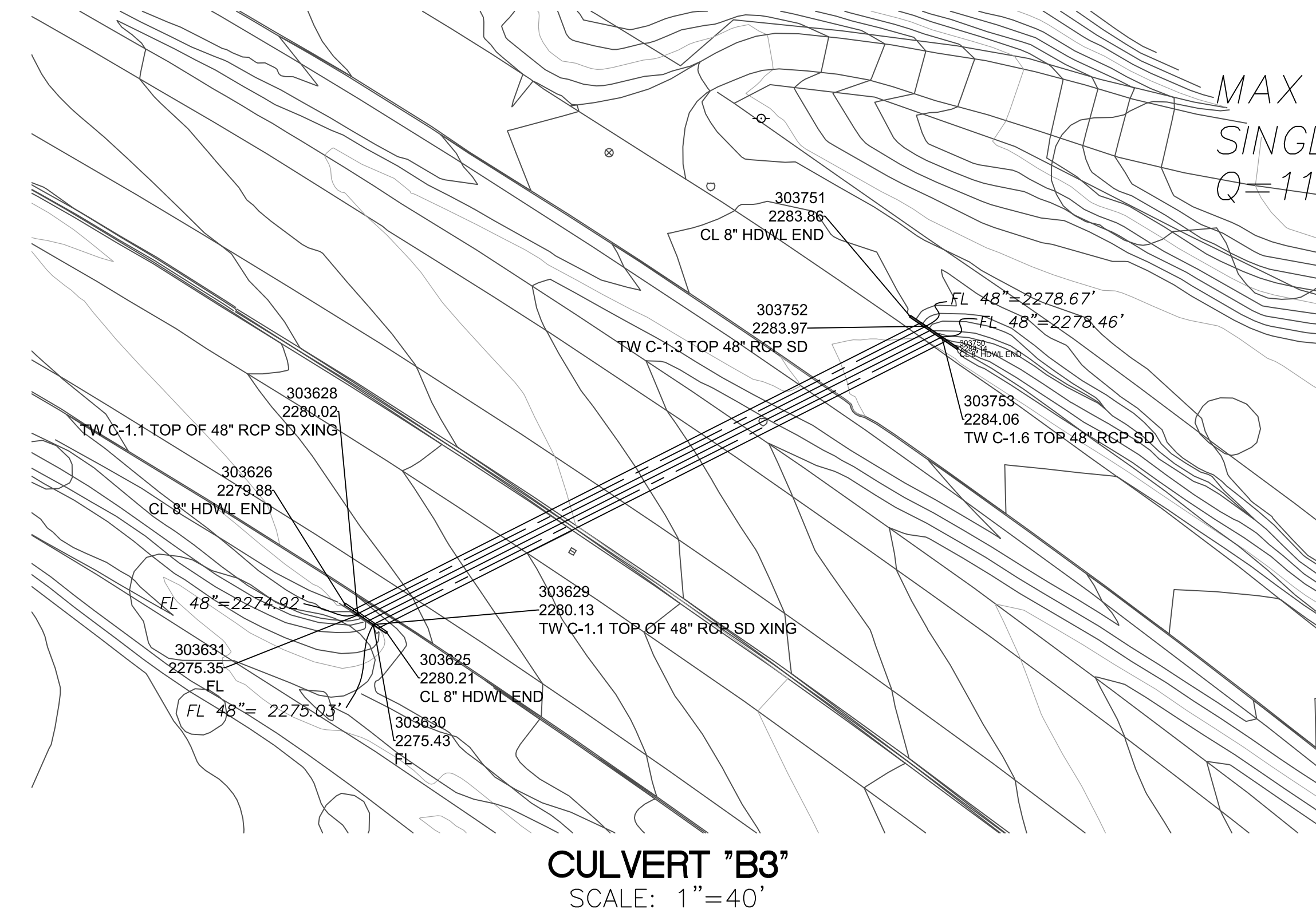
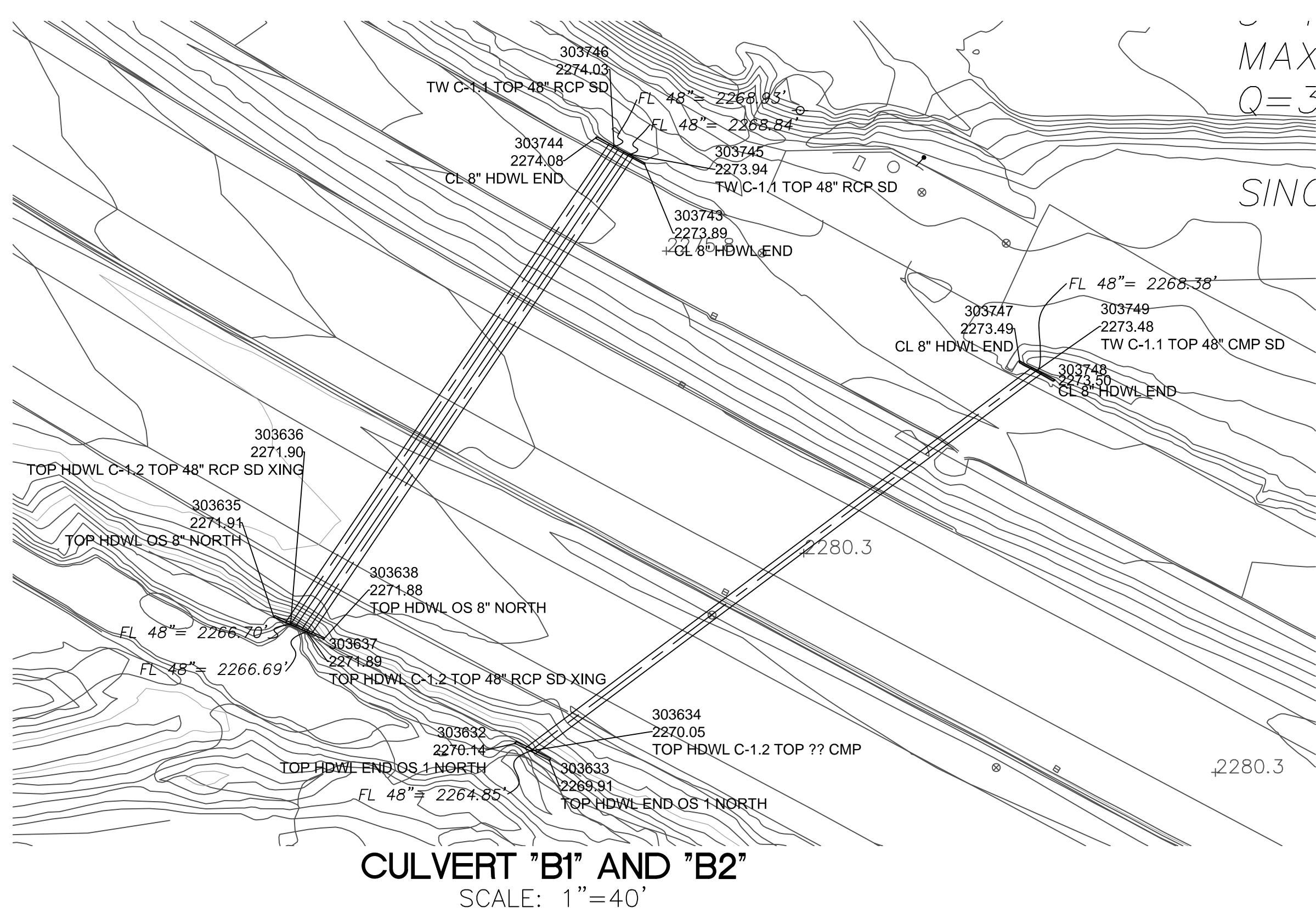
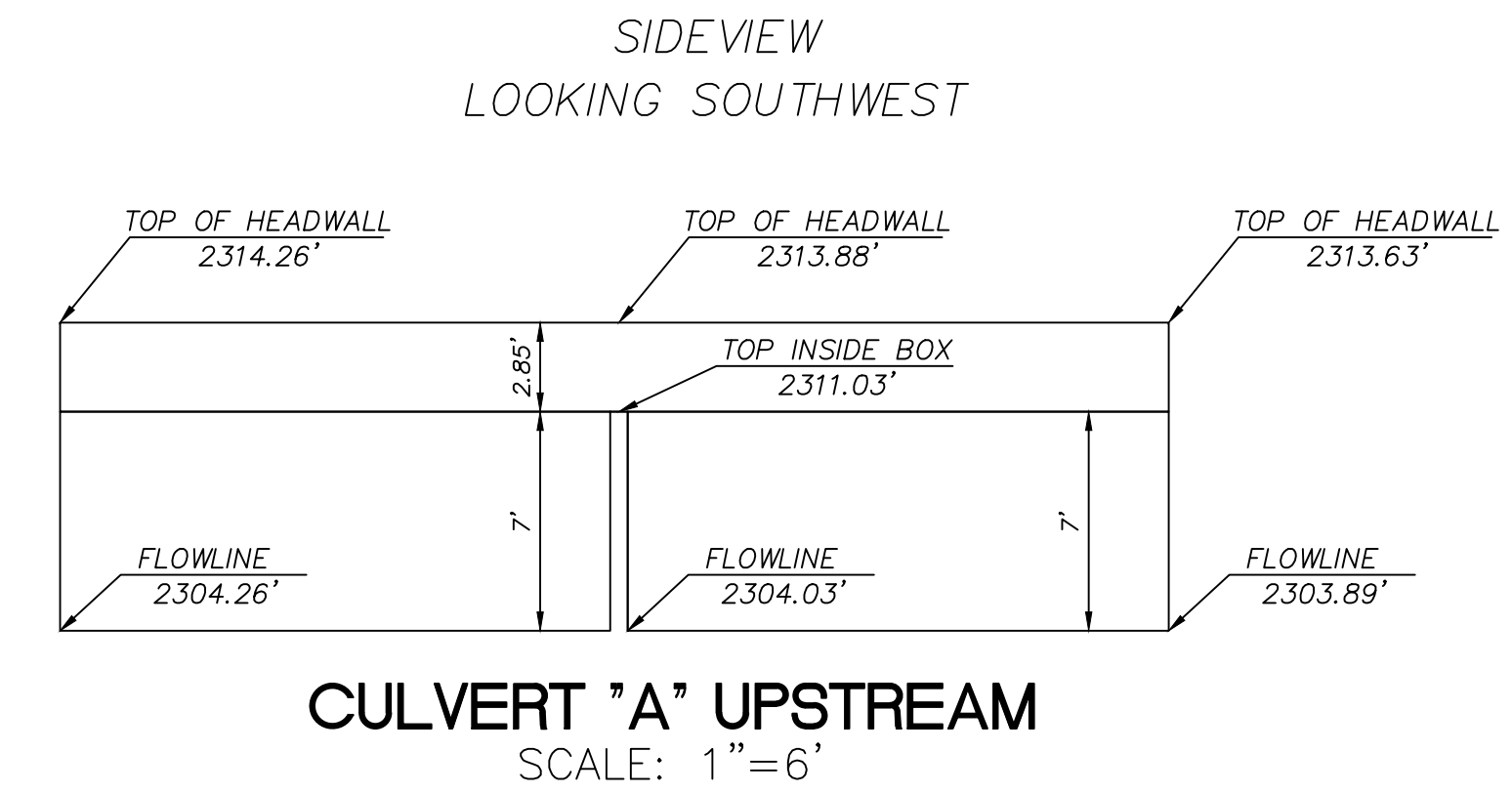
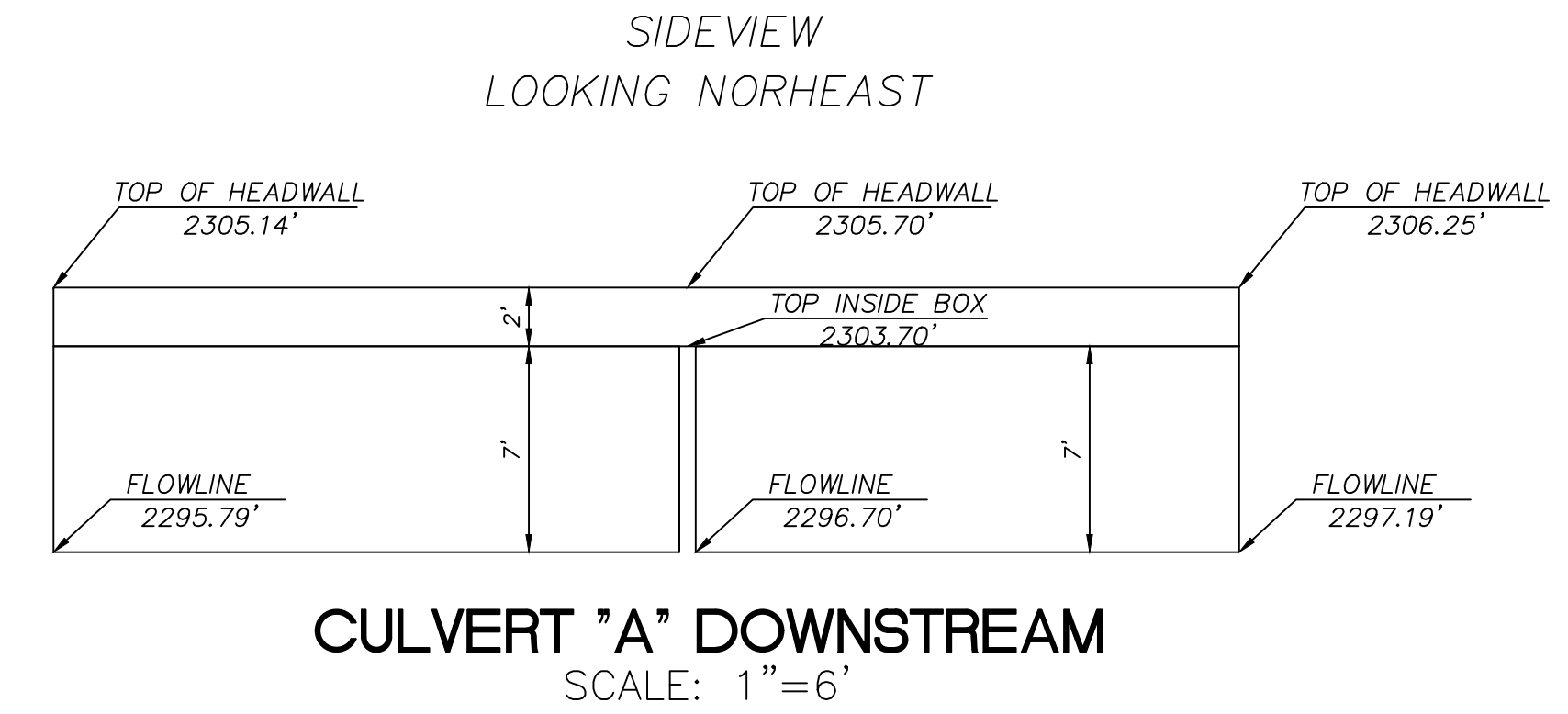
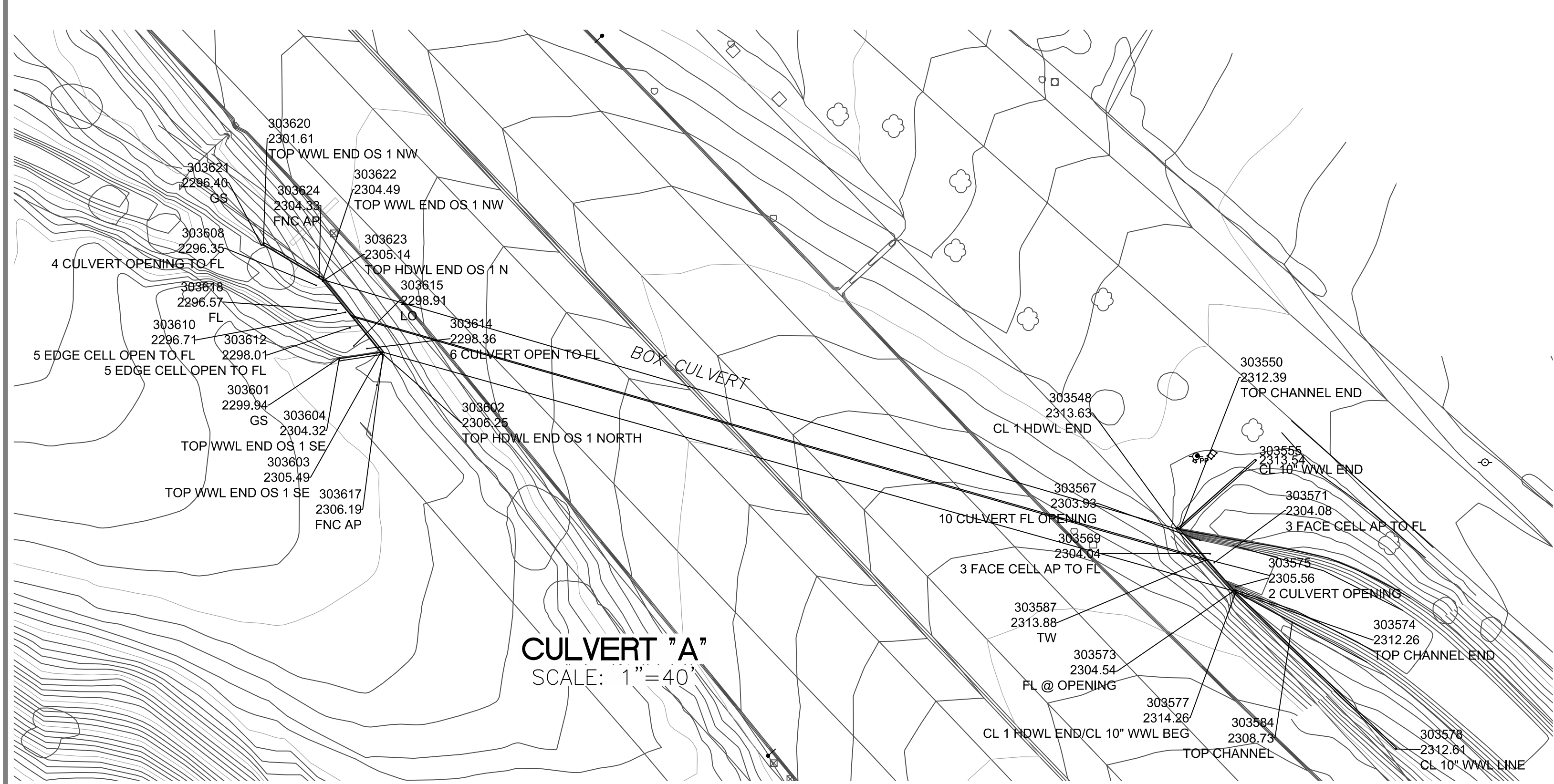
**FIGURE 5: CULVERT SURVEY DATA**

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# TENTATIVE PARCEL MAP 37862

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

## EXISTING CULVERT SURVEY DATA



**FIGURE 5A**  
TPM NO. 37862  
EXISTING CULVERT  
SURVEY DATA

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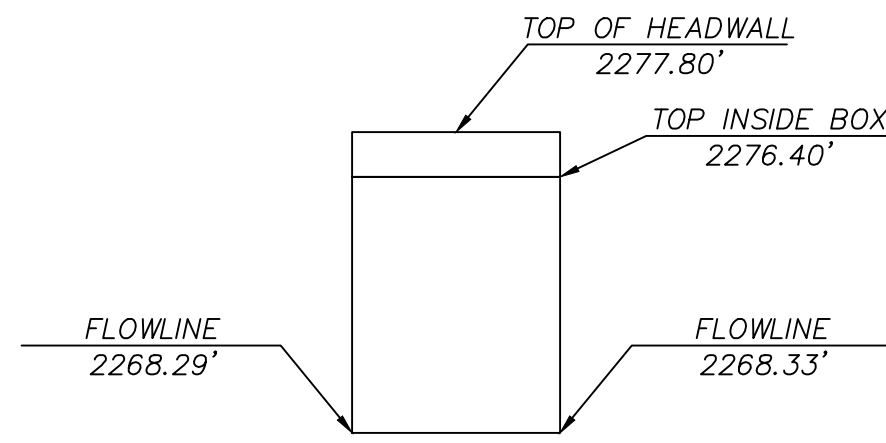
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# TENTATIVE PARCEL MAP 37862

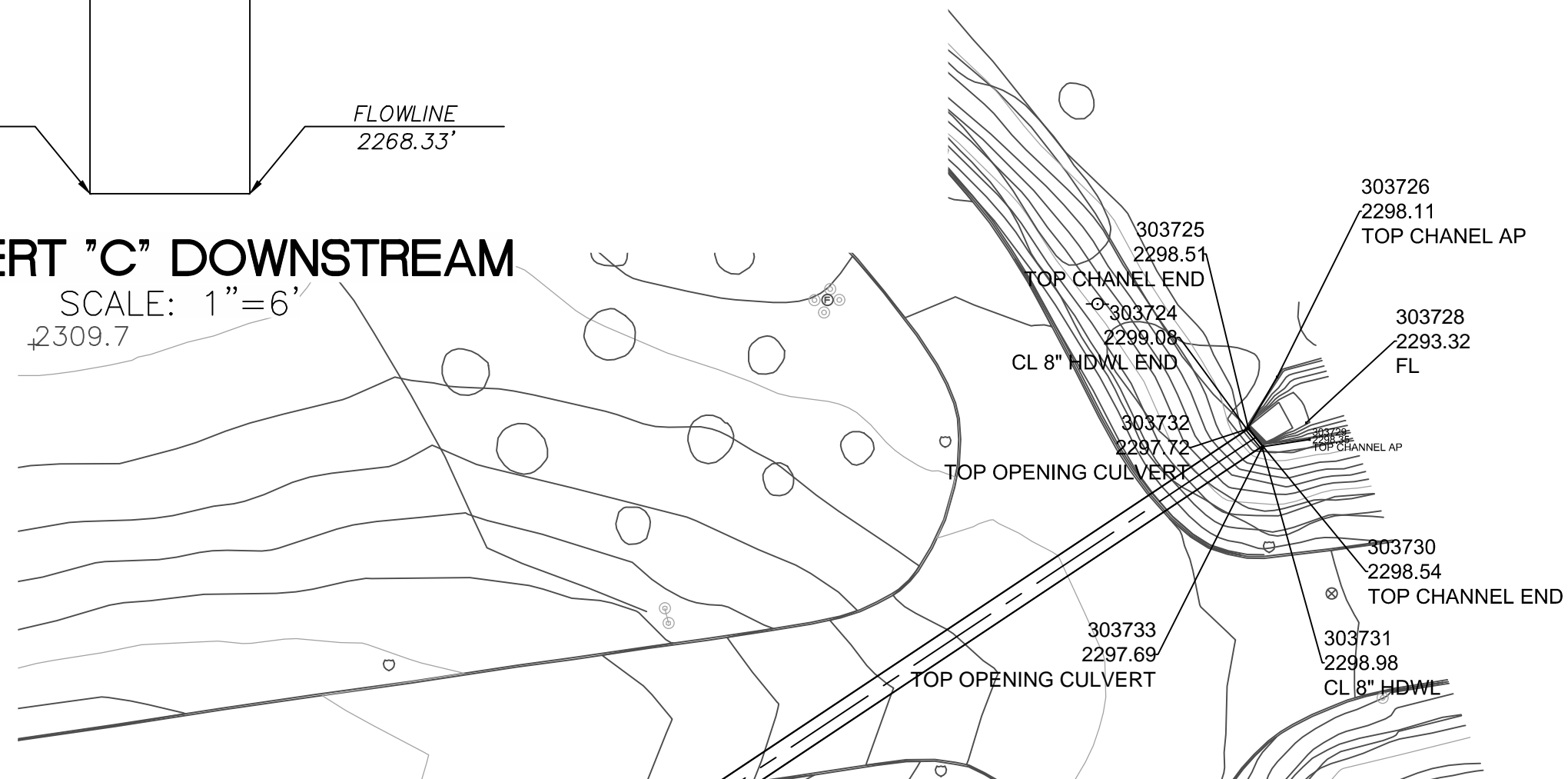
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

## EXISTING CULVERT SURVEY DATA

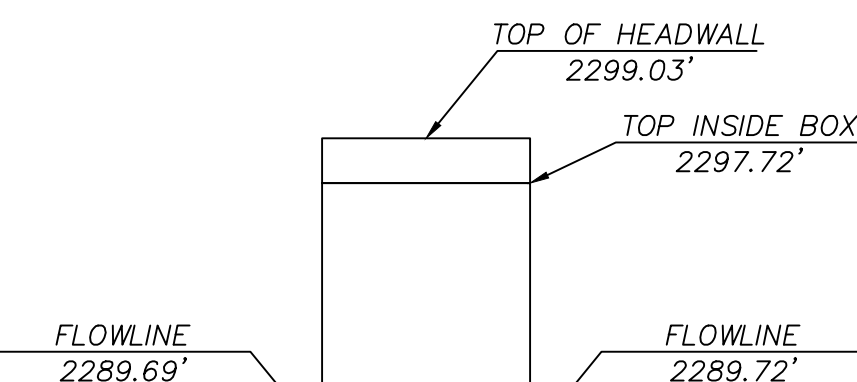
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LOOKING NORTHEAST



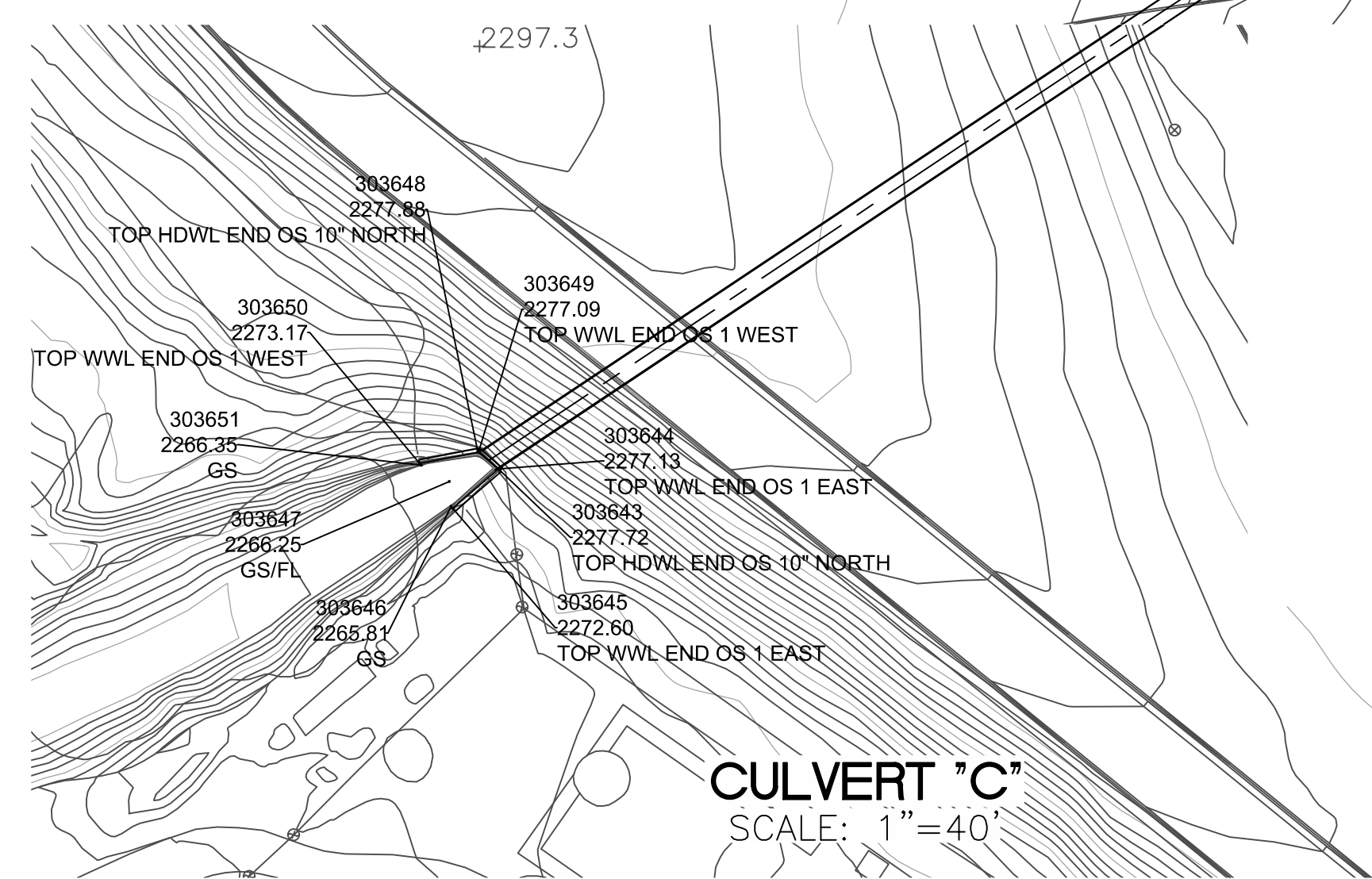
**CULVERT "C" DOWNSTREAM**  
SCALE: 1"=6'



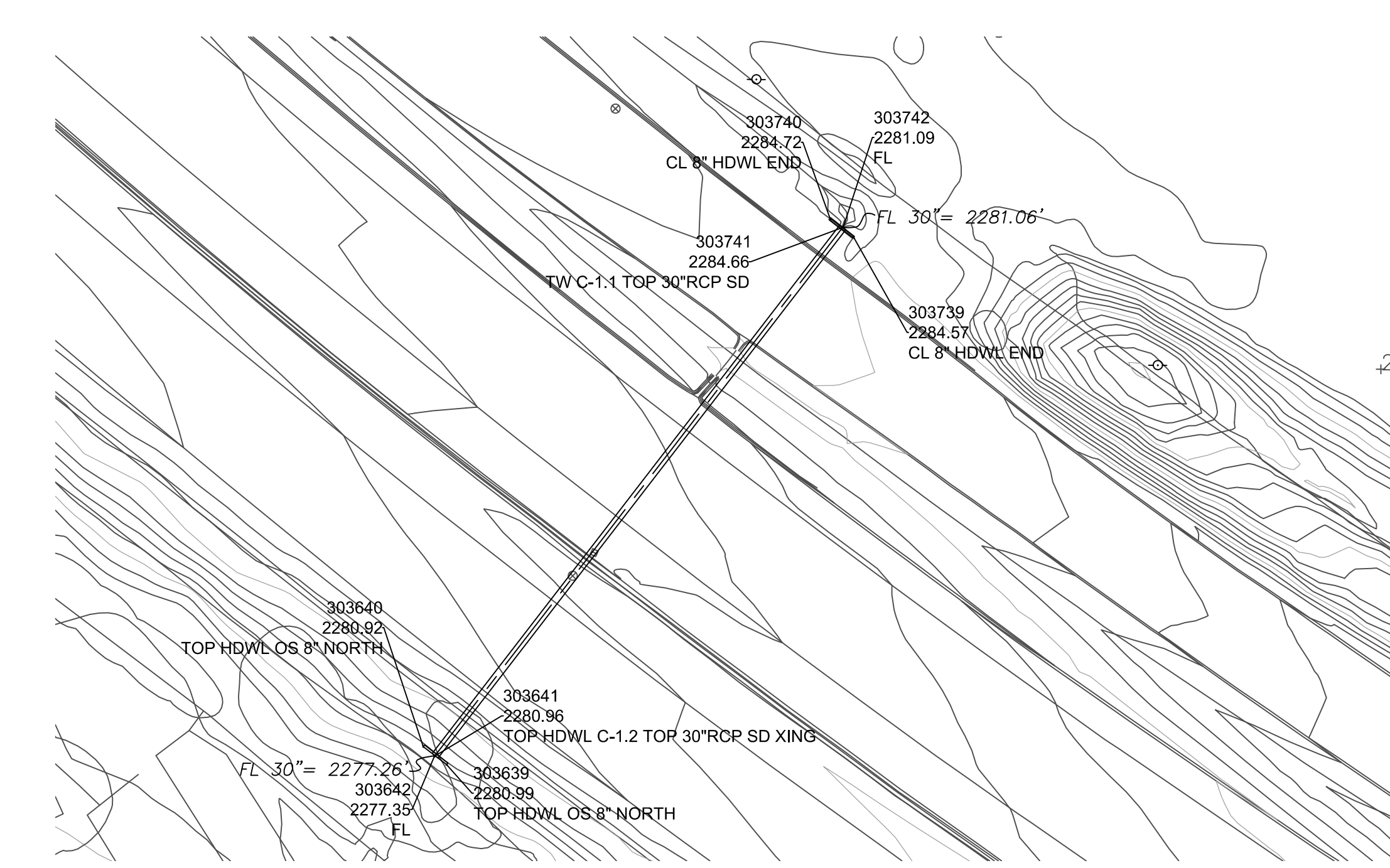
SIDEVIEW  
LOOKING SOUTHWEST



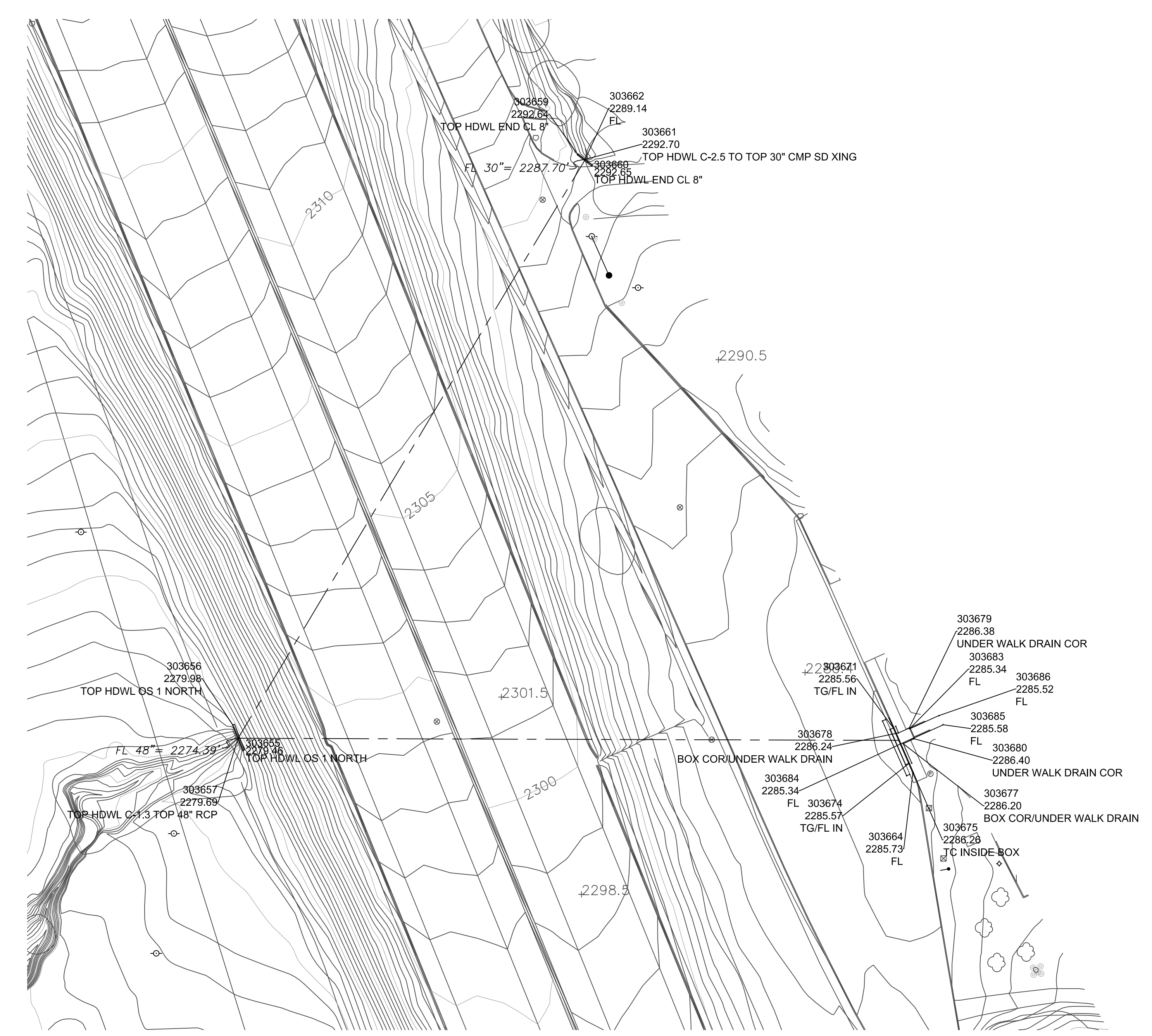
**CULVERT "C" UPSTREAM**  
SCALE: 1"=6'



**CULVERT "C"**  
SCALE: 1"=40'



**CULVERT "E"**  
SCALE: 1"=40'



**CULVERT "D1" AND "D2"**  
SCALE: 1"=40'

**FIGURE 5B**  
**TPM NO. 37862**  
**EXISTING CULVERT**  
**SURVEY DATA**

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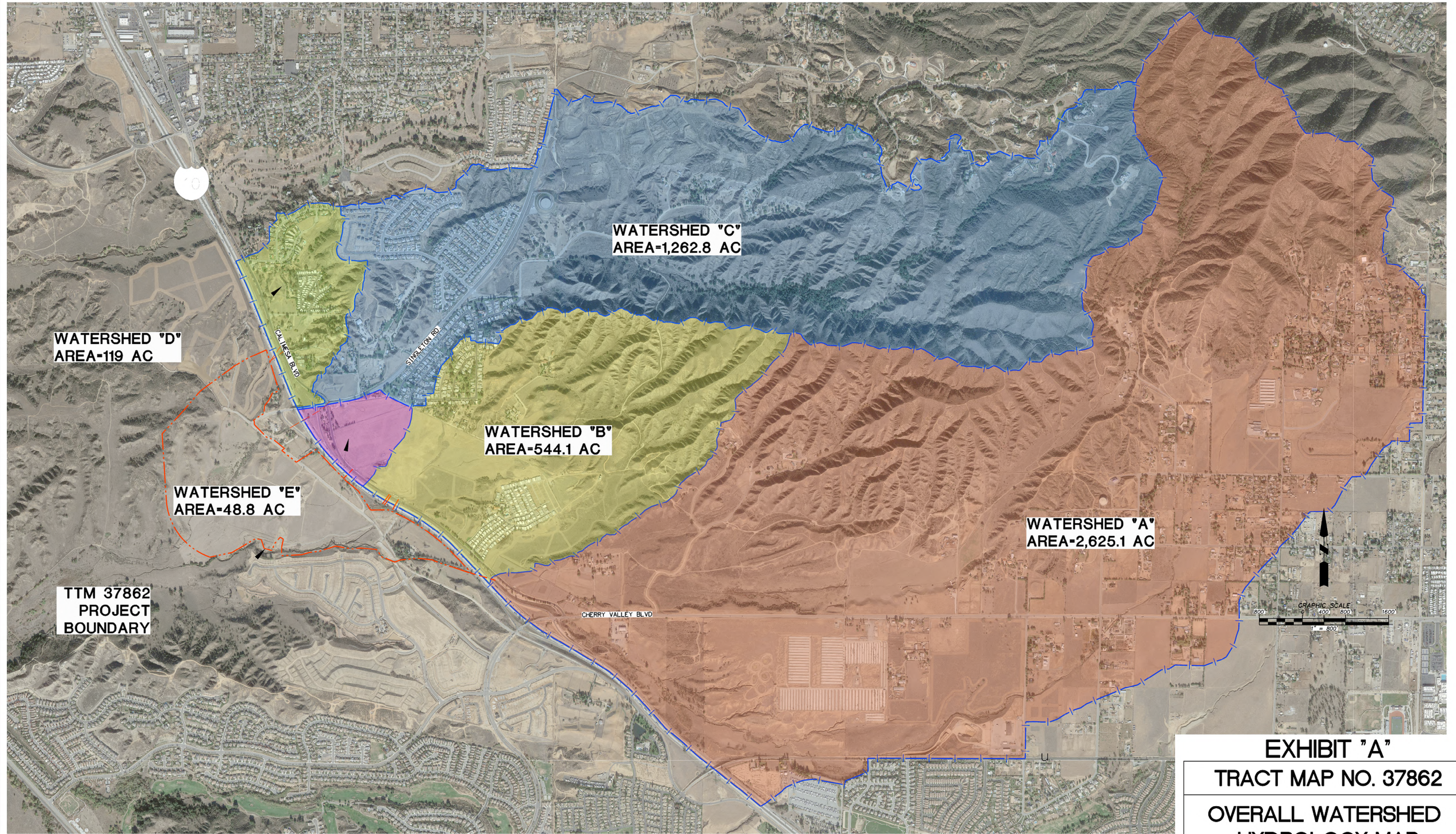
## **EXHIBITS**

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**EXHIBIT A:            OFFSITE WATERSHED AREA MAP**

---

**TRACT MAP NO. 37862**  
CITY OF CALIMESA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA  
**OFFSITE HYDROLOGY MAP**



**EXHIBIT "A"**  
**TRACT MAP NO. 37862**  
**OVERALL WATERSHED**  
**HYDROLOGY MAP**

**EXHIBIT B: UNIT HYDROGRAPH HYDROLOGY MAP**

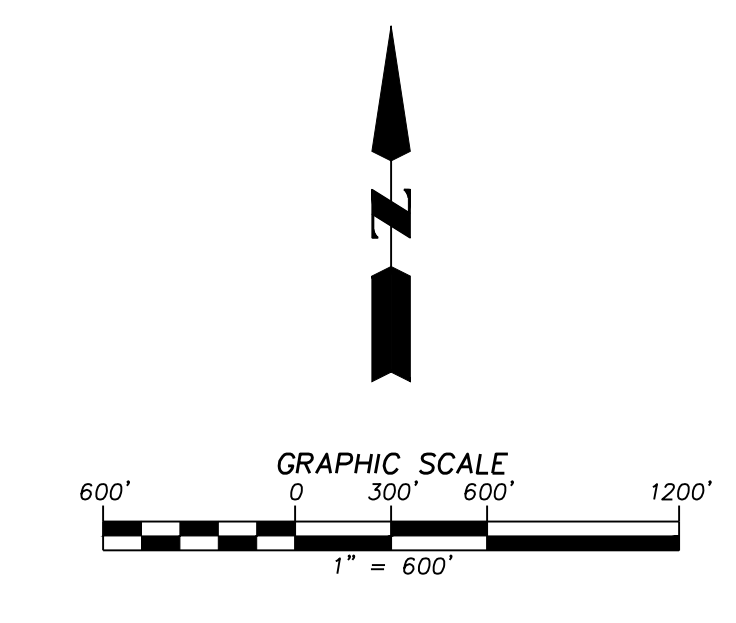
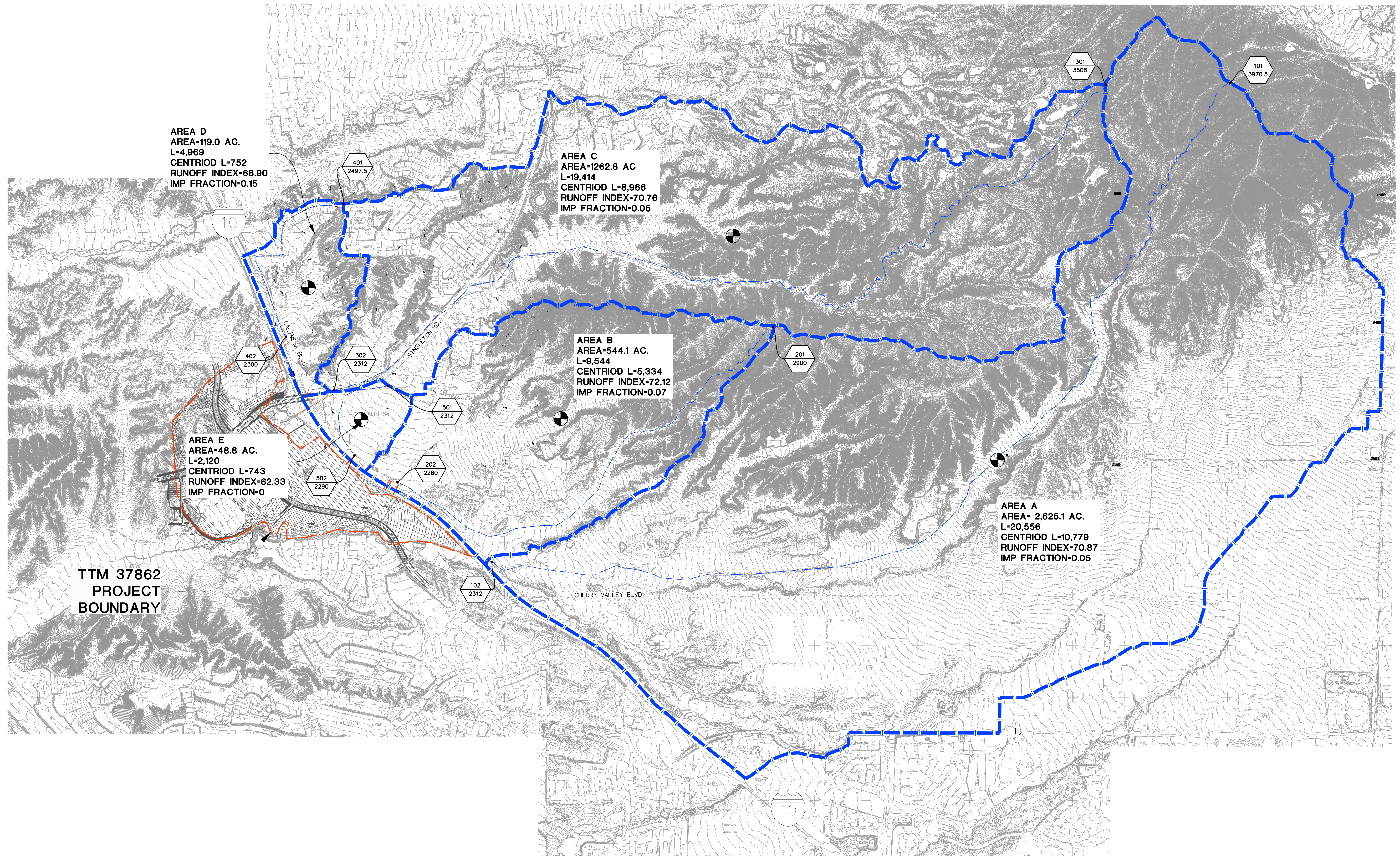
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# TRACT MAP NO. 37862

CITY OF CALIMESA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

## UNIT HYDROGRAPH HYDROLOGY MAP



**EXHIBIT 'B'**  
**TRACT MAP NO. 37862**  
**UNIT HYDROGRAPH**  
**HYDROLOGY MAP**

Project Name: CA 37862 (1) Hydrology Map; From: Calimesa Hydrology Map; Date: 07/19/18; Author: E-Designs Inc.;  
 User: graham; Date: 12/12/2021; 8:14am; by: graham

**EXHIBIT C:            EXISTING CONDITION LAND USE MAP**

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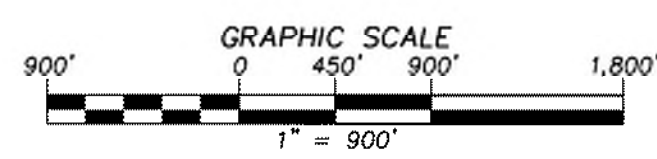
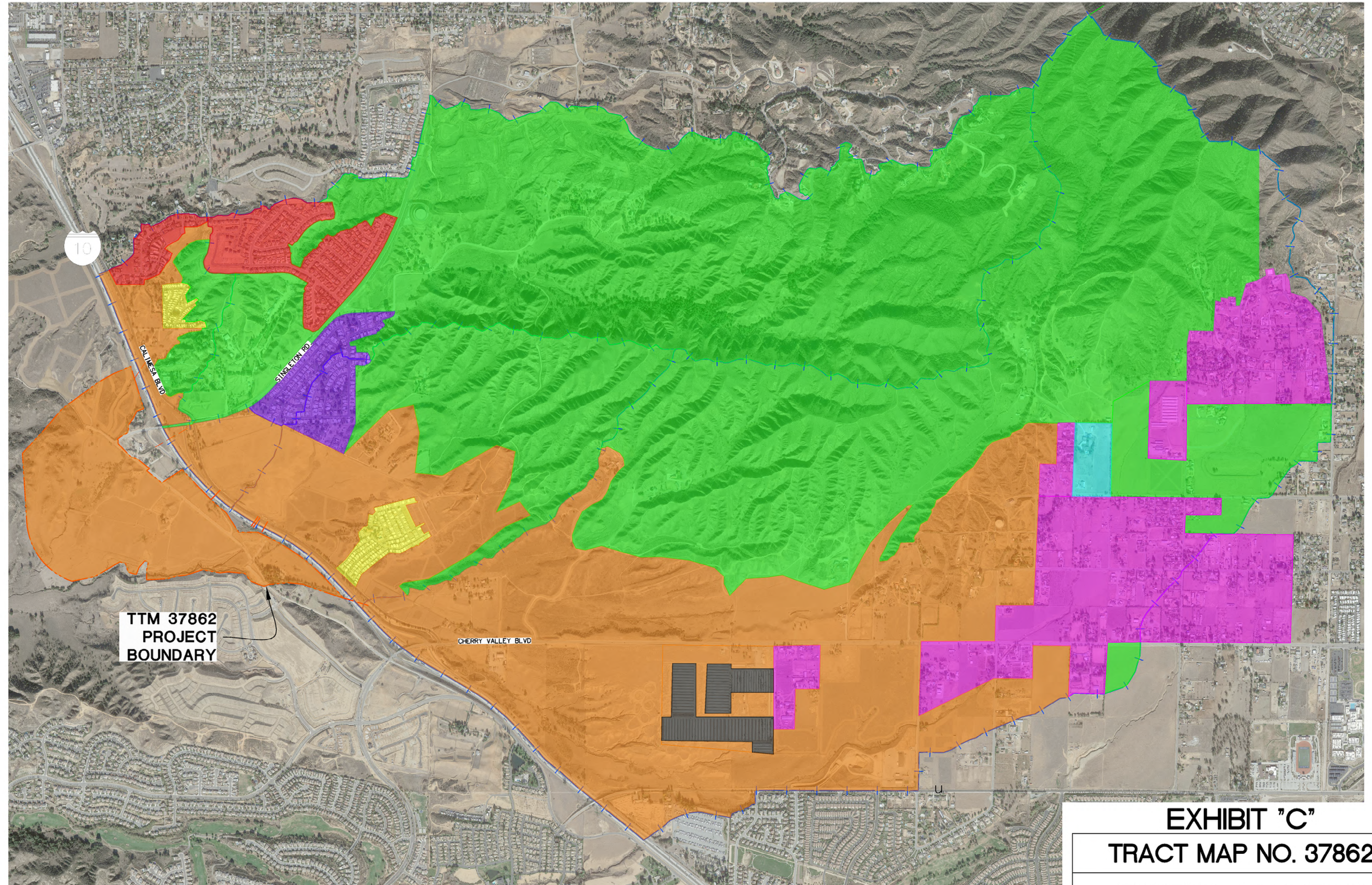
# TRACT MAP NO. 37862

CITY OF CALIMESA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

## EXISTING LAND USE MAP

LEGEND:

-  OPEN SPACE – FAIR COVER
-  OPEN SPACE – POOR COVER
-  RURAL RESIDENTIAL
-  1 ACRE RESIDENTIAL
-  RESIDENTIAL LOW
-  RESIDENTIAL LOW MEDIUM
-  RESIDENTIAL HIGH
-  COMMERCIAL



**EXHIBIT "C"**  
**TRACT MAP NO. 37862**  
**EXISTING CONDITION**  
**LAND USE MAP**

DATE: 11/11/11 11:57 AM DRAWN BY: JEFFREY W. HARRIS FOR: CITY OF CALIMESA PROJECT NO. 37862

**EXHIBIT D:           HYDROLOGIC SOILS MAP**

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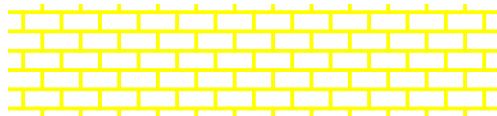


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# TRACT MAP NO. 37862

CITY OF CALIMESA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

## SOILS MAP

LEGEND:

-  SOIL A
-  SOIL B
-  SOIL C
-  SOIL D

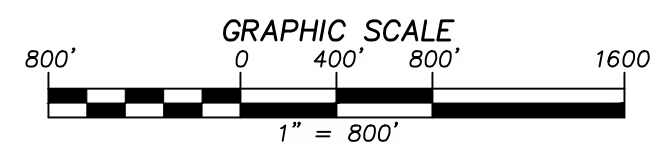
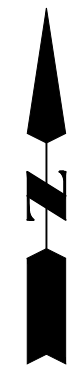
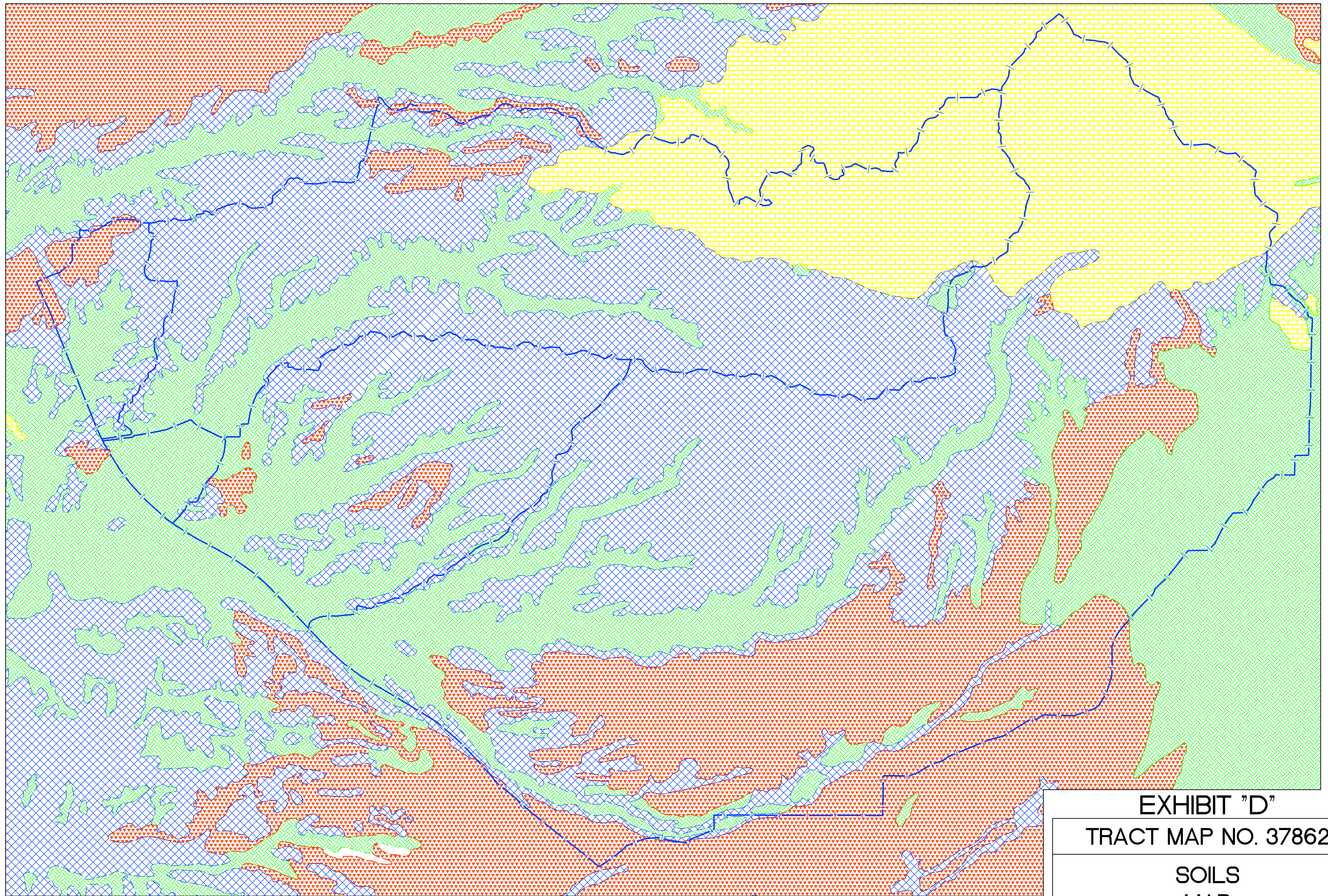


EXHIBIT "D"  
TRACT MAP NO. 37862  
SOILS  
MAP

**RELEVANT EXCERPTS AND MAPS FROM “HYDROLOGY AND HYDRAULICS STUDY:  
OAK VALLEY TOWN CENTER PARCEL MAP NO. 37862 MASS GRADING PLAN” BY  
PROACTIVE ENGINEERING**

---

# OAK VALLEY TOWN CENTER HYDROLOGY AND HYDRAULICS STUDY

PARCEL MAP NO. 37862

CITY OF CALIMESA, CALIFORNIA

PREPARED FOR:

*OAK VALLEY DEVELOPMENT PARTNERS*

10140 ROBERTS ROAD  
CALIMESA, CA 92320

PREPARED BY:



25109 JEFFERSON AVENUE, SUITE 200  
MURRIETA, CA 92562  
PHONE: 951-200-6840 • FAX: 866-454-4478

DATE PREPARED:

July 2021

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APPENDIX E-8:	CP-04
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APPENDIX E-11:	CP-07
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APPENDIX E-16:	CP-12
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APPENDIX E-18:	CP-14
APPENDIX E-19:	CP-15
APPENDIX E-20:	CP-16
APPENDIX E-21:	CP-17
APPENDIX E-22:	CP-18
APPENDIX E-23:	CP-19
APPENDIX E-24:	CP-20
APPENDIX E-25:	CP-21
APPENDIX E-26:	CP-22
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APPENDIX F-4:	Line B Point of Discharge Velocity Calculation – Developed Condition
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## EXHIBITS

EXHIBIT A:	Undeveloped Condition Hydrology Index Map
EXHIBIT B:	Developed Condition Hydrology Index Map
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## I. INTRODUCTION

Oak Valley Town Center (OVTC), Parcel Map No. 37862, is a proposed development in the City of Calimesa, lying southwesterly of the Interstate 10 Freeway (I-10) off the Singleton Road exit. The project is roughly 230 acres and will develop business park and commercial land use areas, as well as the infrastructure Singleton and Roberts Road. Oak Valley Town Center is a part of the Summerwind Ranch at Oak Valley Specific Plan that proposes the development of residential, business park, commercial and open space land use areas across roughly 2,600 acres of land.

The purpose of this study is to determine the existing and proposed hydrologic conditions to properly size the necessary drainage improvements to support the construction of Oak Valley Town Center. The scope of this report will include:

- Determine peak 100-year flow rates for the construction of the project's ultimate developed condition using the Rational Method outlined in the Riverside County Flood Control and Water Conservation District
- Based on the ultimate developed condition, determine the necessary drainage improvements that will properly convey the calculated 100-year flow rates
- Summarize analyses and proposed infrastructure storm drain improvements

## II. PROJECT SITE

Oak Valley Town Center is part of the Summerwind Ranch at Oak Valley Specific plan that lies within the San Timoteo sub-basin of the Santa Ana River Watershed. The project site lies within an open grassland valley that is bounded by the I-10 freeway to the east and rolling hills and ridgelines to the west and south. Most of the project is undeveloped. There are a handful of existing properties that are fairly spread apart from each other along the I-10, as well as a couple of properties within the central portion of the valley.

Large off-site tributary areas on the east side of the I-10 contribute significant drainage to the project site through multiple pipe and box culverts. Drainage from these tributary areas begin in the San Bernardino Mountain ranges and flow in a southwesterly manner, ultimately, flowing through the proposed project site until it reaches the San Timoteo Creek. The proposed storm drain system will maintain the existing drainage course and outlet on-site, as well, as intercepted off-site drainage, into the natural streambed areas leading to the San Timoteo Creek; ultimately joining the Santa Ana River. See Figures 1 and 2 for the project Vicinity Map and Site Plan, respectively.

### III. HYDROLOGY

The rational design parameters and methodologies outlined in the Riverside County Flood Control and Water Conservation District's (RCFCWCD) *Hydrology Manual*<sup>1</sup> were used to determine the 100-year design flow rates for the project. Calculations for the rational methodology were performed using the CivilDesign computer software.

Two hydrology analyses will be performed for this project site:

- On-site hydrology
  - The rational method was used to calculate the 100-year flow rates for the on-site tributary areas. We assume the ultimate developed condition to determine the peak flow rates tributary to the proposed OVTC storm drain infrastructure. This includes the OVTC project site, as well as future Summerwind developments located north of OVTC.
- Off-site hydrology
  - The unit hydrograph method will be used to calculate the 100-year flow rates for the off-site tributary areas. Off-site refers to the large tributary areas east of the I-10, where their respective flow rates are collected via pipe and box culverts that cross the I-10 and outlet onto the OVTC project site.

#### On-site Hydrology

The 100-year flow rates for Areas A and B, as shown on Exhibit B, will be analyzed using the rational method.

As directed by the *Hydrology Manual*<sup>1</sup>, Antecedent Moisture Condition II (AMC II) was used for all rational method analyses.

Soil classification for the project site is based on the Hydrologic Soils Group Map for El Casco (Plate C-1.18) of the *Hydrology Manual*<sup>1</sup>, as shown on Appendix A-4 of this report. Hydrologic soils group (HSG) "B" and "D" are what primarily occupies the project site. There are small patches of areas within the rolling hills and ridgelines where HSG "A" and "C" are present. Soil "B" is described as soils with a moderate rate of water transmission and soil "D" is described as soils with high runoff potential.

The rainfall values and slope of intensity duration curve were obtained from the isohyetal maps in the *Hydrology Manual*<sup>1</sup>, as shown on Appendices A-1 to A-3. Below is a summary of the design parameters used for calculation.

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2-Year-1-Hour Precipitation per Plate D-4.3 (Appendix A-1)	0.54"
100-Year-1-Hour Precipitation per Plate D-4.4 (Appendix A-2)	1.33"
Slope of Intensity Duration Curve per Plate D-4.6 (Appendix A-3)	0.55

For rational method purposes, the project site was analyzed as an undeveloped area – poor cover for the undeveloped condition. Since the hydrology study is split up into two parts (On-site and Off-site) for the undeveloped condition, the flow rates calculated in each report were simply added together to compute a total Q for each drainage area. Refer to Exhibit A for the total Q and on-site drainage area delineation.

The areas tributary to storm drain Line A are designated as Drainage Area A and Areas C, D and E, as shown on Exhibit B. Areas C, D and E are off-site tributary areas, while Drainage Area A is on-site. As mentioned before, off-site tributary areas are analyzed by the unit hydrograph method, per a separate study. The off-site areas were included in the rational method calculations as a user defined entry to account for the drainage coming from existing culverts crossing the I-10. The portion of Drainage Area A, where the OVTC project site is located, consists of industrial parcels, a commercial parcel and the infrastructure Singleton and Roberts Road streets for the ultimate developed condition. See Figure 2 for the Project Site plan. For hydrology purposes, the industrial parcels were analyzed as commercial land use. Since the ultimate developed condition is assumed to determine the peak 100-year flow rates tributary to the OVTC infrastructure storm drain system, Drainage Area A includes future Summerwind developments. Per Tentative Tract Map No. 33536, planning areas E-1, E-2 and D-1, which are delineated as Garden Courts, Townhomes and Community Recreation land use, respectively, are tributary to the OVTC storm drain infrastructure and are included in the rational method analysis calculations. For hydrology purposes, the Garden Courts and Townhomes were analyzed as commercial land use and the Community Recreation as condominium land use. See Exhibit B for the on-site hydrology map.

The areas tributary to storm drain line B are designated as Drainage Area B and Areas A and B, as shown on Exhibit B. Areas A and B are off-site tributary areas, while Drainage Area B is on-site. As mentioned before, off-site tributary areas are analyzed by the unit hydrograph method, per a separate study. Like Line A, the off-site drainage was used as a user defined entry to account for the drainage coming from the existing culverts crossing the I-10. Drainage Area B only consists of a commercial parcel for the developed condition. See Exhibit B for the Drainage Area B on-site hydrology map.

Calculations for the undeveloped and developed rational method analyses can be found in Appendix B and C, respectively, of this report.

### Off-site Hydrology

The 100-year flow rates for Areas A, B, C, D and E, as shown on Exhibit B, were analyzed using the unit hydrograph method. These areas are tributary to existing pipe and box culverts that cross the I-10 and outlet onto the OVTC project site. As mentioned before, the off-site hydrology analysis is presented in a separate study, *Hydraulic Analyses for Culverts Crossing I-10 TTM 37862*<sup>2</sup>.

## IV. STORM DRAIN HYDRAULICS

### Storm Drain

Three mainline storm drain systems (Lines A, B and C) are proposed to support the construction of OVTC.

Line A is a proposed reinforced box culvert (RCB) that runs through the infrastructure Singleton Road. It is the main storm drain system that is responsible for most of the on-site drainage but also takes on significant off-site drainage, as shown as Drainage Area A and Areas C, D and E per Exhibit B. The existing 72" CMP culvert that currently runs under the existing Roberts Road intercepts off-site drainage coming from the 6'x8' RCB crossing the I-10. The project will remove and replace the existing 72" CMP with an 8'x8' (WxH) RCB, where Line A begins. The upstream 72" CMP survey flowline elevation of 2249.61 was maintained to begin the Line A design. As you move downstream in Line A, two sub-mainline storm drain systems, Lines A1 and A2, confluence with Line A at the major intersection of Singleton and Roberts Road. As mentioned before, most of the on-site drainage are collected and conveyed in these storm drain systems (A, A1 and A2). Storm drain lateral stub outs are provided for the commercial and business park parcels. The locations of these lateral stub outs are based on the low points of the rough grading, where it is assumed the private storm drain systems within the parcels will join the infrastructure storm drain system. CP-09 is the only storm drain lateral that collects off-site drainage. It connects to the existing 48" RCP that crosses the I-10 near the eastbound Singleton off-ramp, where it intercepts off-site drainage from Area D. Line A

discharges in the southwest corner of the project site, where it joins the existing watercourse that leads to the San Timoteo Creek.

Line B is a proposed double 6'x4' (WxH) box culvert that crosses the proposed Roberts Road. It collects off-site drainage from Areas B and E that are tributary to four existing culverts that cross the I-10, as well as on-site drainage from a portion of a commercial parcel. Drainage from the four culverts confluence at the current OVTC project boundary where the existing Roberts Road and Cooper Drive intersect. For the rough grade condition, a trapezoidal channel conveys the off-site drainage from this confluence point to the starting point of Line B. The developer of the commercial parcel will be responsible to construct storm drain that collects off-site drainage from the confluence point to the double box culvert once the site plan is finalized. The double box culvert alignment roughly starts from the northerly Roberts Road right-of-way (ROW) line and ends roughly at the southerly ROW line where the collected drainage outlets into the existing watercourse that runs along the southside of the OVTC project site.

Line C is a proposed arch culvert. Like Line B, this culvert crosses Roberts Road and outlets into the existing watercourse that runs along the southside of the OVTC project site. It serves as a by-pass line for the off-site drainage tributary to the existing double 7'x10' box culvert (Culvert A) crossing the I-10 onto the project site.

The Water Surface Profile Gradient Program (WSPG) software was used to analyze the proposed storm drain lines and laterals. The hydraulics is based on the storm drain profile design and the 100-year flow rate calculations per the studies performed for this project site. The WSPG calculations can be found in Appendix E of this report.

Velocity calculations for Drainage Areas A and B for the undeveloped condition and the point of discharge for Lines A and B were calculated using the CivilDesign computer software. The increase in velocity at the point of discharge for Lines A and B will be mitigated by properly sized riprap aprons that contain 2-ton riprap. A Manning's number of 0.04 was used for the riprap apron for the developed condition and 0.025 for the undeveloped condition. Calculations for the exit velocities can be found in Appendix F.

The proposed storm drain alignments, pipe sizing and calculated flow rates can be found on the drainage facilities map, as shown on Exhibit C.

### Catch Basins

Twelve catch basins are proposed to support the construction of OVTC. Of the twelve proposed catch basins, four are sump and eight are on-grade. The AutoCAD Civil3D Hydraflow Express extension was used to properly size catch basins and determine their efficiency. The curb opening design parameters used in calculation are consistent with the Riverside County Transportation Department catch basin standard details. The flow rates captured by the catch basin are used for the WSPG calculations for their respective storm drain laterals.

A summary table for the proposed catch basins is provided on the next page and the catch basin calculations can be found in Appendix D of this report.

CB #	HYDRO MAP NODE	CATCH BASIN TYPE	SIZE (FEET)	Q <sub>100</sub> (CFS)	UPSTREAM Q <sub>BYPASS</sub>	Q <sub>TRIBUTARY</sub> (CFS)	Q <sub>CAPTURED</sub> (CFS)	Q <sub>BYPASS</sub> (CFS)	Q <sub>BYPASS TO CB #</sub>
1	10.2	On-Grade	21	12.1	0	12.1	12.1	0	N/A
2	10.4	On-Grade	14	6.3	0.71	7.01	7.01	0	N/A
3	4.3	On-Grade	14	7	0	7	5.97	1.03	12
4	6.24	Sag	14	7.6	0	7.6	7.6	0	N/A
5	6.17	Sag	14	6.7	1.3	8	8	0	N/A
6	6.17	Sag	4	3.5	0.53	4.03	4.03	0	N/A
7	6.11	On-Grade	10	7.1	1.36	8.46	7.16	1.3	5
8	6.11	On-Grade	10	5.2	1.31	6.51	5.98	0.53	6
9	6.3	On-Grade	10	5.7	0	5.7	4.39	1.31	8
10	6.3	On-Grade	10	5.8	0	5.8	4.44	1.36	7
11	7.1	On-Grade	10	5.9	0	5.9	5.19	0.71	2
12	7.13	Sag	7	4.4	1.03	5.43	5.43	0	N/A

V. WATER QUALITY

The developers of the proposed industrial and commercial parcels for OVTC will be responsible for treating their runoff before joining the infrastructure storm drain systems delineated in this drainage study. Catch basin inserts will be installed in all catch basin locations for treating street runoff. Refer to the OVTC Water Quality Management Plan report for more details.

VI. SUMMARY

The developed and undeveloped hydrology conditions were analyzed in this study. All proposed storm drain systems (Line A, B & C) intercept off-site drainage crossing the I-

10 freeway onto the project site. Lines A and B also convey on-site drainage from the proposed developments. On-site drainage from the proposed developments and streets will be treated by approved BMPs prior to discharging into the storm drain systems. The increased velocities at the point of discharge for both Lines A and B will be mitigated by properly sized riprap aprons.

Below are summary tables comparing the flow rates and exit velocities at the point of discharge for Lines A and B.

Flow Rate

Storm Drain Line	A	B
Undeveloped Flow Rate (CFS)	1,593	768
Developed Flow Rate (CFS)	1,775	829
Difference (CFS)	+182	+61

Velocity

Storm Drain Line	A	B
Undeveloped Exist Velocity (Feet per Second)	16.2	14.2
Developed Exist Velocity (Feet per Second)	8.5	6.6
Difference (Feet per Second)	-7.7	-7.6

VII. REFERENCES

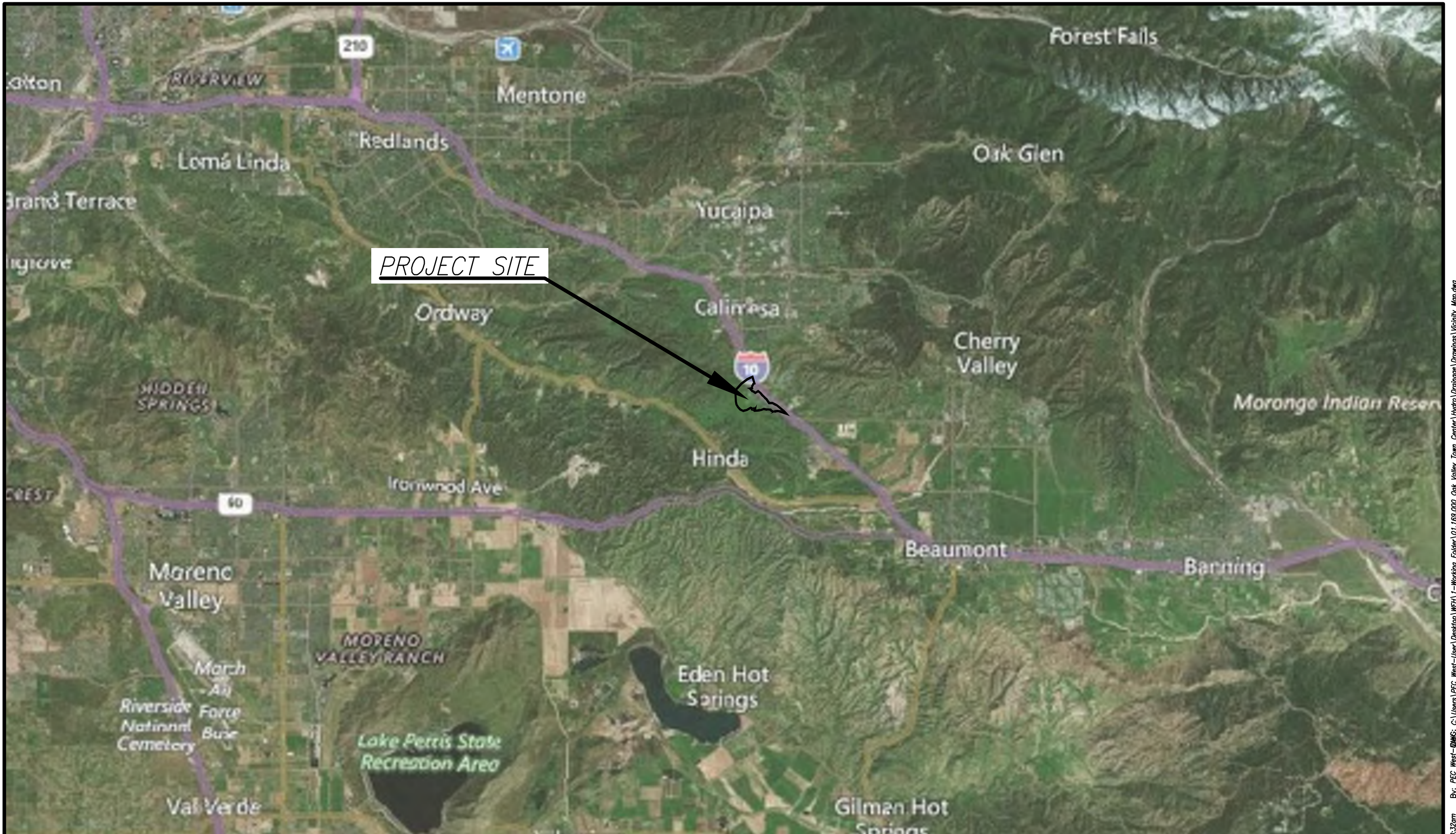
1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978
2. JLC Engineering & Consulting, Inc. Hydraulic Analyses for Culverts Crossing I-10 TTM 37862, November 2020.



FIGURE 1: Vicinity Map

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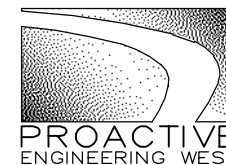
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PROJECT SITE



SCALE: 1"=10,000'



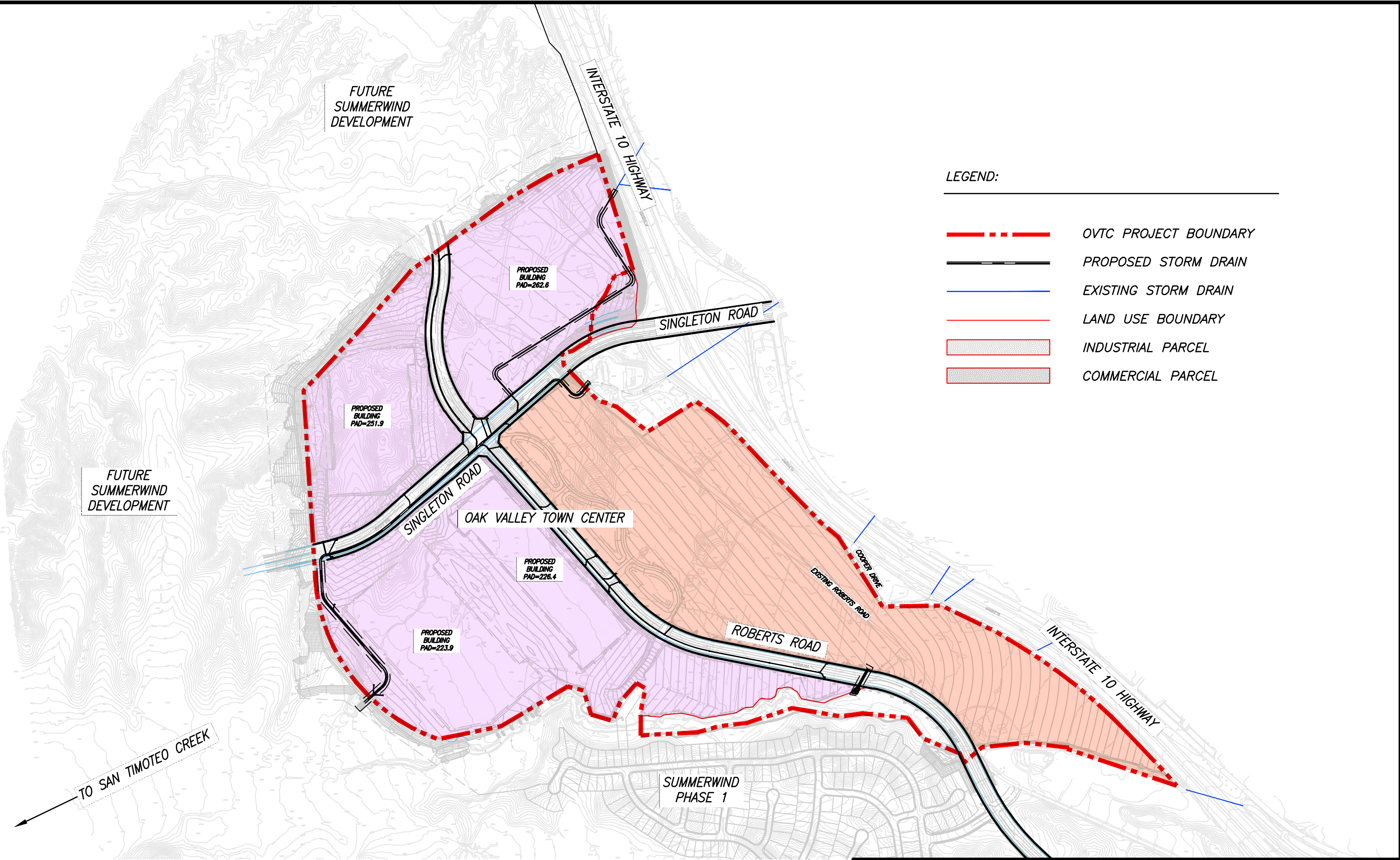
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**FIGURE 1**  
OAK VALLEY TOWN CENTER  
VICINITY MAP







FIGURE 2: Site Plan


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LEGEND:

-  OVTC PROJECT BOUNDARY
-  PROPOSED STORM DRAIN
-  EXISTING STORM DRAIN
-  LAND USE BOUNDARY
-  INDUSTRIAL PARCEL
-  COMMERCIAL PARCEL

  
 SCALE: 1"=600'

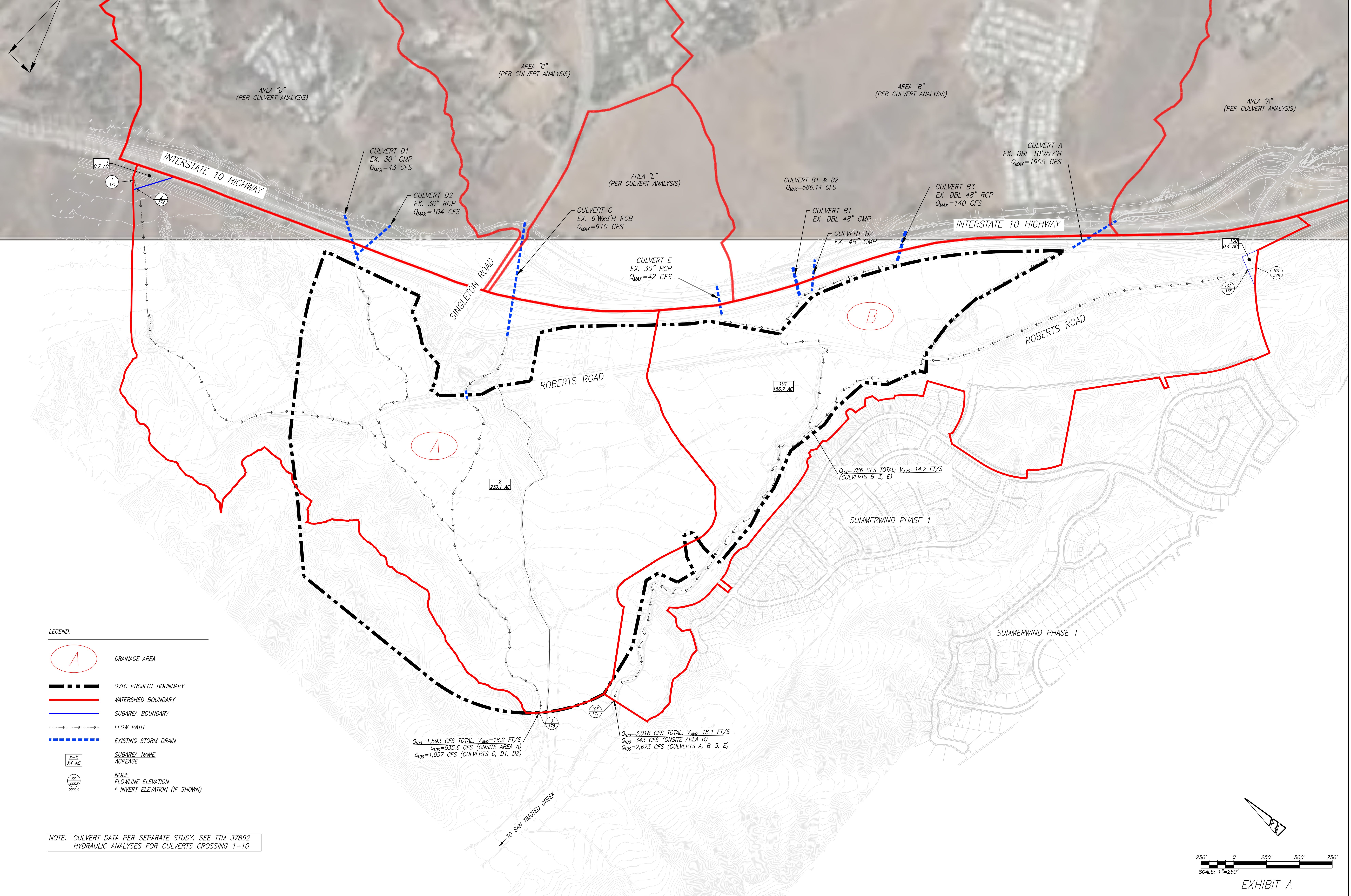

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**FIGURE 2**  
**OAK VALLEY TOWN CENTER**  
**SITE PLAN**

EXHIBIT A: Undeveloped Condition Hydrology Map

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AREA "D"  
(PER CULVERT ANALYSIS)

AREA "C"  
(PER CULVERT ANALYSIS)

AREA "B"  
(PER CULVERT ANALYSIS)

AREA "A"  
(PER CULVERT ANALYSIS)

AREA "E"  
(PER CULVERT ANALYSIS)

INTERSTATE 10 HIGHWAY

INTERSTATE 10 HIGHWAY

SINGLETON ROAD

ROBERTS ROAD

ROBERTS ROAD

SUMMERWIND PHASE 1

SUMMERWIND PHASE 1

2  
230.7 AC

101  
156.7 AC

100  
0.4 AC

107  
378

102  
376

CULVERT C  
EX. 6'Wx8'H RCB  
 $Q_{MAX}=910$  CFS

CULVERT D1  
EX. 30" CMP  
 $Q_{MAX}=43$  CFS

CULVERT D2  
EX. 36" RCP  
 $Q_{MAX}=104$  CFS

CULVERT E  
EX. 30" RCP  
 $Q_{MAX}=42$  CFS

CULVERT B1 & B2  
 $Q_{MAX}=586.14$  CFS

CULVERT B1  
EX. DBL 48" CMP

CULVERT B2  
EX. 48" CMP

CULVERT B3  
EX. DBL 48" RCP  
 $Q_{MAX}=140$  CFS

CULVERT A  
EX. DBL 10'Wx7'H  
 $Q_{MAX}=1905$  CFS

$Q_{100}=786$  CFS TOTAL;  $V_{AVG}=14.2$  FT/S  
(CULVERTS B-3, E)

$Q_{100}=1,593$  CFS TOTAL;  $V_{AVG}=16.2$  FT/S  
 $Q_{100}=535.6$  CFS (ONSITE AREA A)  
 $Q_{100}=1,057$  CFS (CULVERTS C, D1, D2)

$Q_{100}=3,016$  CFS TOTAL;  $V_{AVG}=18.1$  FT/S  
 $Q_{100}=343$  CFS (ONSITE AREA B)  
 $Q_{100}=2,673$  CFS (CULVERTS A, B-3, E)

103  
171

102  
178

10 SAN TIMOTEO CREEK

- LEGEND:
- A DRAINAGE AREA
  - OVTC PROJECT BOUNDARY
  - WATERSHED BOUNDARY
  - SUBAREA BOUNDARY
  - FLOW PATH
  - EXISTING STORM DRAIN
  - X-X  
XX AC SUBAREA NAME  
ACREAGE
  - XX  
XXXX NODE  
FLOWLINE ELEVATION  
\* INVERT ELEVATION (IF SHOWN)

NOTE: CULVERT DATA PER SEPARATE STUDY. SEE TTM 37862  
HYDRAULIC ANALYSES FOR CULVERTS CROSSING 1-10

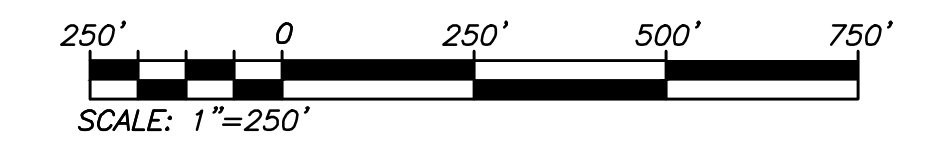


EXHIBIT A

CITY OF CALIMESA

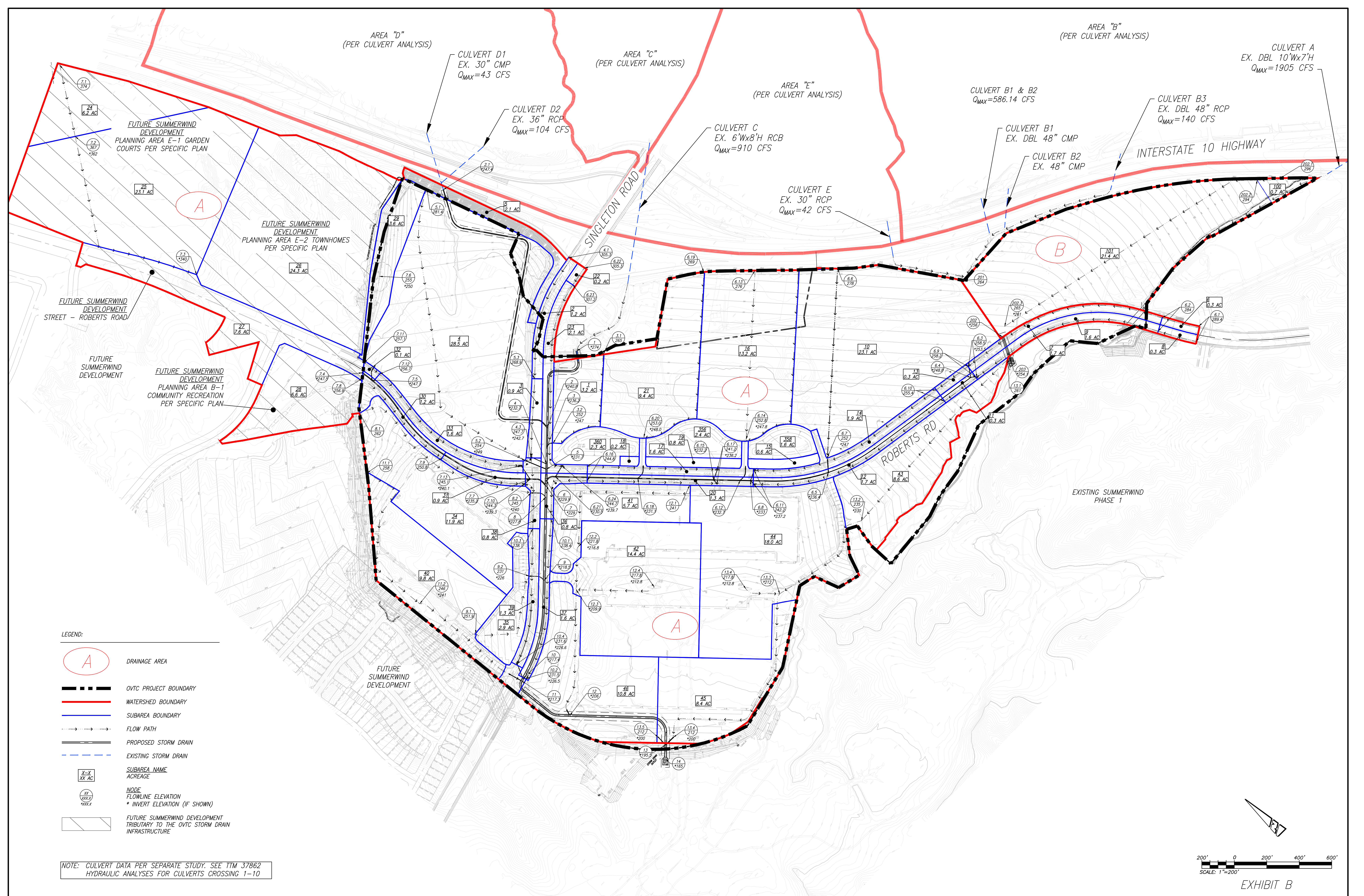
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OAK VALLEY TOWN CENTER  
 UNDEVELOPED CONDITION  
 ONSITE HYDROLOGY MAP

EXHIBIT B: Developed Condition Hydrology Index Map

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- LEGEND:
- A DRAINAGE AREA
  - OVTC PROJECT BOUNDARY
  - WATERSHED BOUNDARY
  - SUBAREA BOUNDARY
  - FLOW PATH
  - PROPOSED STORM DRAIN
  - EXISTING STORM DRAIN
  - X-X  
XX AC SUBAREA NAME  
ACREAGE
  - XX  
XXXX NODE  
FLOWLINE ELEVATION  
\* INVERT ELEVATION (IF SHOWN)
  - FUTURE SUMMERWIND DEVELOPMENT  
TRIBUTARY TO THE OVTC STORM DRAIN  
INFRASTRUCTURE

NOTE: CULVERT DATA PER SEPARATE STUDY. SEE TTM 37862  
HYDRAULIC ANALYSES FOR CULVERTS CROSSING 1-10

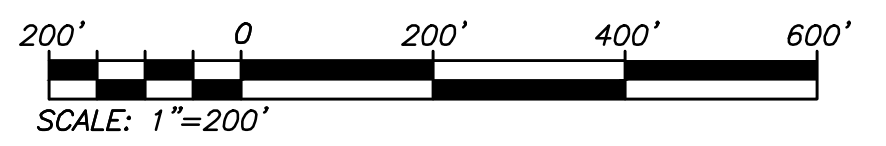


EXHIBIT B

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ENGINEERING WEST

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CITY OF CALIMESA

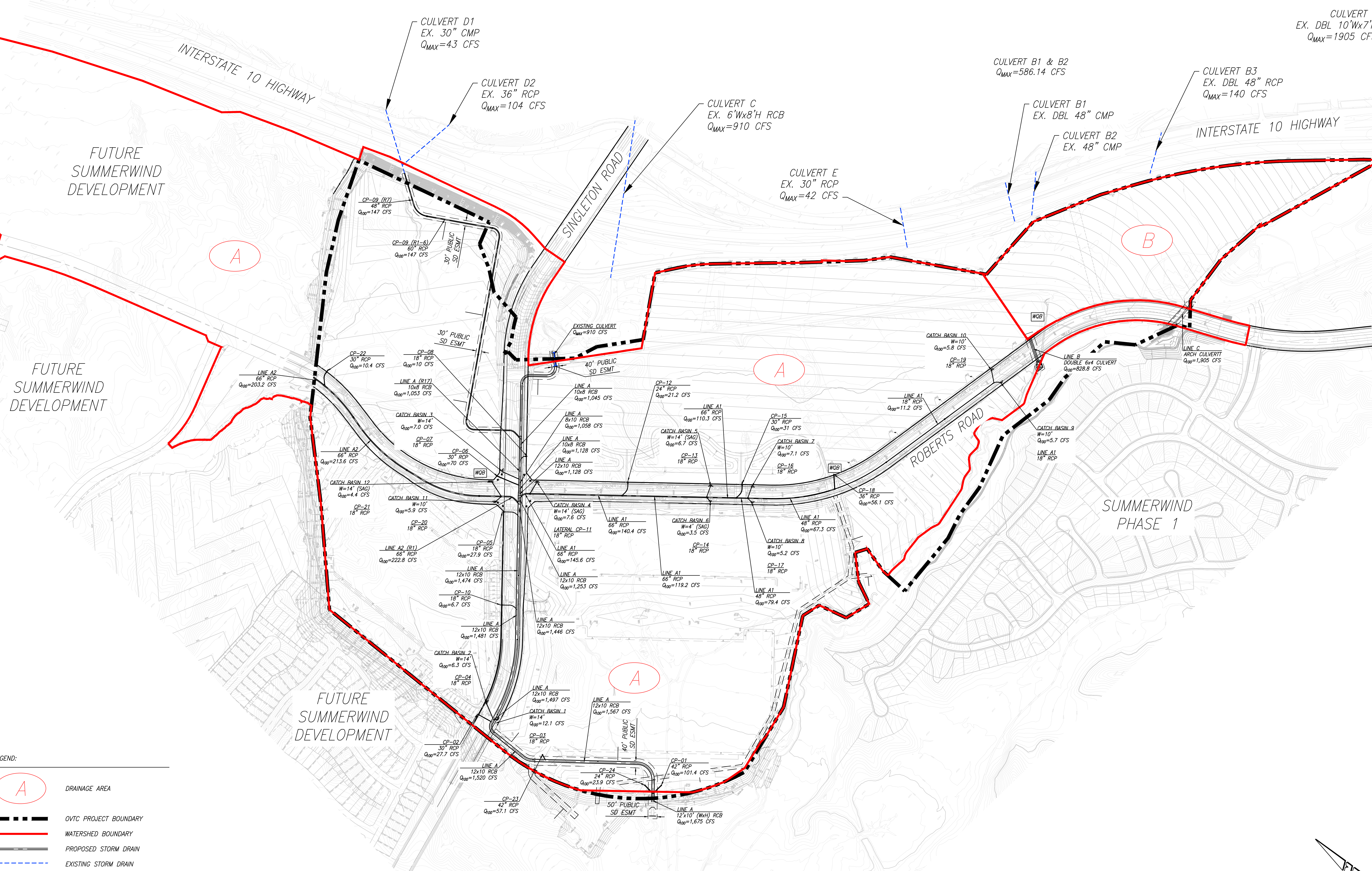
OAK VALLEY TOWN CENTER  
DEVELOPED CONDITION  
ONSITE HYDROLOGY MAP



EXHIBIT C: Drainage Facilities Map

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- LEGEND:
- A DRAINAGE AREA
  - OVTC PROJECT BOUNDARY
  - WATERSHED BOUNDARY
  - PROPOSED STORM DRAIN
  - EXISTING STORM DRAIN

NOTE: CULVERT DATA PER SEPARATE STUDY. SEE ITM 37862 HYDRAULIC ANALYSES FOR CULVERTS CROSSING 1-10

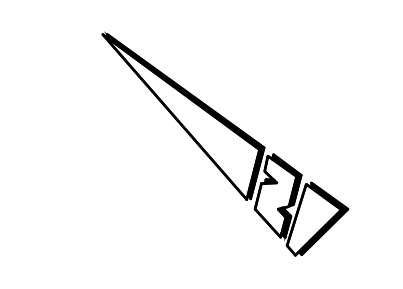
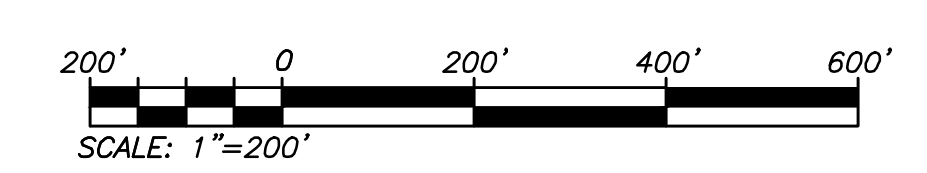


EXHIBIT C

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CITY OF CALIFESIA

OAK VALLEY TOWN CENTER  
 PRELIMINARY DRAINAGE FACILITIES MAP