DRAFT

Duke Patterson and Nance
P21-00005
City of Perris, Riverside County, California

Preliminary Drainage Study

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Original Date Prepared: April 2021
Revision Date(s): March 2022, October 2021

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SECTION 1 - SUMMARY

PURPOSE

The purpose of this report is to document the hydrologic and hydraulic analyses performed in support of the Duke Patterson and Nance project located in the City of Perris, County of Riverside, California. The Duke Patterson and Nance Project is located south of Harley Knox Boulevard, north of Nance Street, and situated between Patterson Avenue and Nevada Avenue. The existing land use is mostly vacant and barren with minimal vegetative scrub. There is an existing pervious area in the northwest corner that seems to be an area where container trailers are stored. The trailers will be moved and none of the existing buildings between the northerly property boundary and Harley Knox Boulevard will be demolished. The planned site condition will propose a commercial/ industrial warehouse on roughly 35.6 acres. This report will summarize the hydrologic and hydraulic analyses that were conducted 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.
- Preparation of a preliminary report summarizing the hydrology and hydraulic results.

DESCRIPTION OF WATERSHED

As previously described, the Duke Patterson & Nance Project is located south of Harley Knox Boulevard, north of Nance Street, and situated between Patterson Avenue and Nevada Avenue. The existing land use is mostly vacant and barren with minimal vegetative scrub. There is an existing pervious area in the northwest corner that seems to be an area where container trailers are stored. The trailers will be moved and none of the existing buildings between the northerly property boundary and Harley Knox Boulevard will be demolished. The existing topography slopes approximately 1.0% in a southwest to northeast direction. Existing elevations range from approximately 1499 in the southwest corner to 1486 in the northeast corner (NAVD88). The existing drainage path is characterized by sheet flows that follow the existing topography.

The project is located within the Perris Valley Commerce Center (PVCC) specific plan and is also within the Perris Valley Master Drainage Plan (PVMDP) watershed area.

PROPOSED CONDITIONS

The planned site condition will propose a commercial/ industrial warehouse (approximately 760,000 square-feet) on roughly 35.6 acres. The project proposes truck and auto parking as well as 10% of landscaped area. All on-site flows generated from the project will be collected by proposed underground chambers located in the easternmost drive aisle. The underground chambers will fully store the water quality volume which will be pumped into a Contech Bioscape modular wetland for treatment. All high intensity flows will overflow into a high flow bypass within the underground chambers and gravity flow north via MDP Lateral-B6.1 in Nevada Avenue to the existing Caltrans RCB running parallel to Harley Knox Boulevard. The proposed project is within an HCOC exemption area; proposed land use flowrates will not be required to match existing land use flowrates.

Two Perris Valley MDP drainage facilities will have to be constructed to flood protect this project and the surrounding area. A portion of MDP Lateral-B6 in Patterson Avenue is needed to flood protect the site

from the tributary area between Patterson Avenue and Interstate-215; it will have to be designed to ultimate tributary runoff conditions. MDP Lateral-B6.1 in Nevada Avenue is needed to drain the proposed project.

The tributary drainage capacity of these two MDP facilities highly depends on the capacity of the existing 8'Wx7'H to 8'Wx6'H Caltrans RCB running parallel to Harley Knox Boulevard. Currently, there is roughly 50 cfs of capacity in the Caltrans RCB assuming 5" of freeboard per the Caltrans RCB Capacity technical memo provided in Appendix C. The two MDP storm drains will add approximately 180-cfs during the ultimate condition.

However, Perris Valley MDP facility Lateral-B Stage 4 (currently under design) will cutoff roughly 300-cfs of tributary runoff, after accounting for confluences, from the existing Caltrans RCB. The Lateral-B Stage 4 plan is proposing to construct a stub out for future connection to the existing Caltrans RCB. The Lateral B-Stage 4 and the future connection will be constructed by RCFC&WCD from the proposed Lateral-B stub out, across APN(s) 294-220-007 and/or -010 to the existing Caltrans RCB where it turns south along Patterson Avenue (see long axis exhibit in Line-B references in Appendix C).

The upstream connection to MDP Lateral-B will provide an additional 300-cfs of capacity in the Caltrans RCB. This connection must be made for the Caltrans RCB to have capacity for unrestricted runoff from MDP Lateral-B6 and Lateral-B6.1 under ultimate conditions. However, in the interim condition the timing of the runoff from the project is such that the time to drain down is significantly less than the time of concentration of waters upstream have to travel to reach the connection point for Lateral-B6 and Lateral B6.1.

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 on-site flows through the site to the proposed basin. 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/existing layout and grading. See Section 2 for additional information and results regarding the hydrologic analyses performed for this project

HYDRAULICS

Hydraulic analyses were completed using CivilD normal depth calculations provided by the rational method output. Analyses were also completed using normal depth calculations from FHWA Hydraulic Toolbox v. 4.4. See section 3 for additional information and results regarding the hydraulic analyses performed for this project.

FIG. 1 VICINITY MAP

FIG. 2 USGS TOPOGRAPHY MAP

FIG. 3 AERIAL PHOTOGRAPH

FIG. 4 RECEIVING WATERBODIES

FIG. 5 SOILS MAP

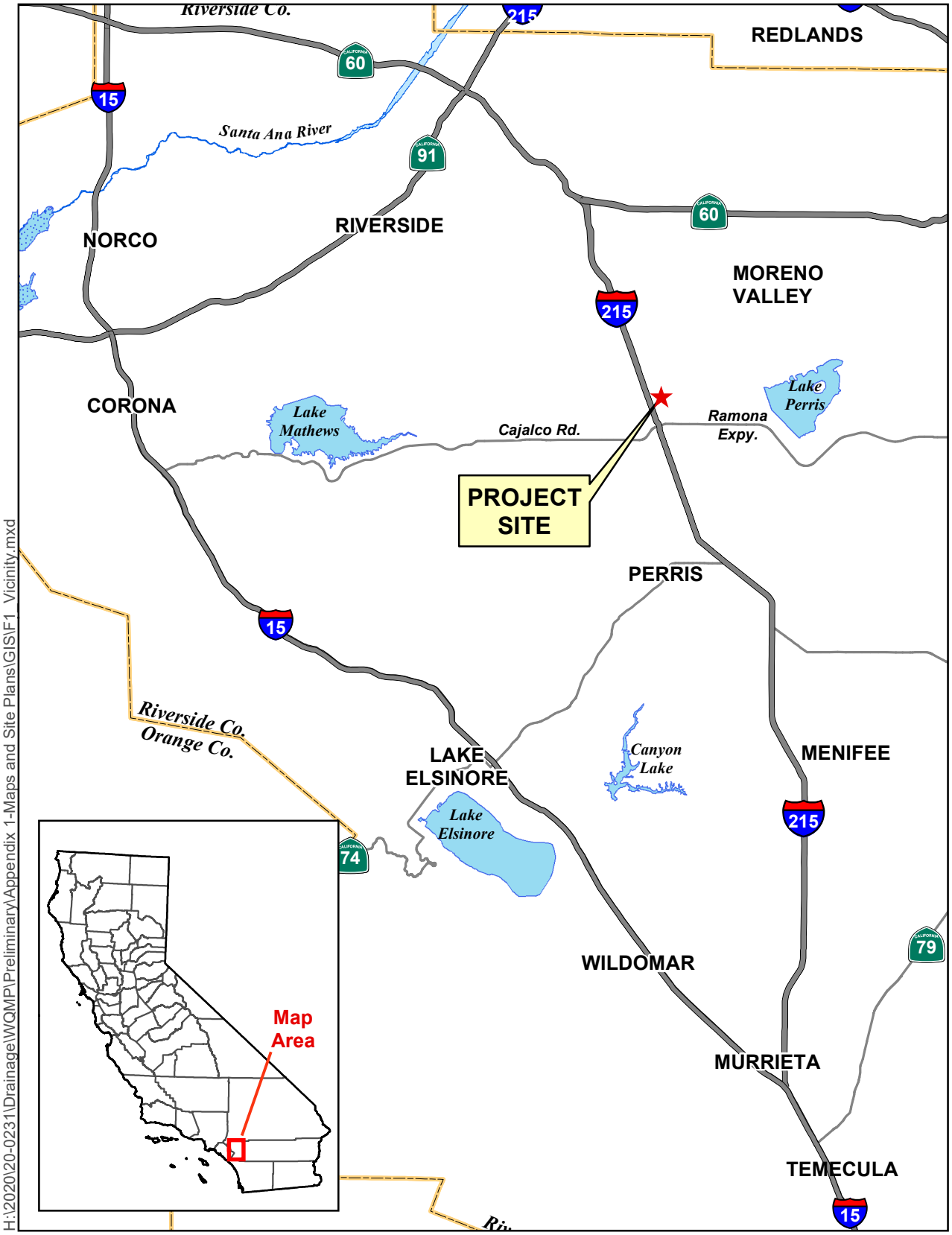

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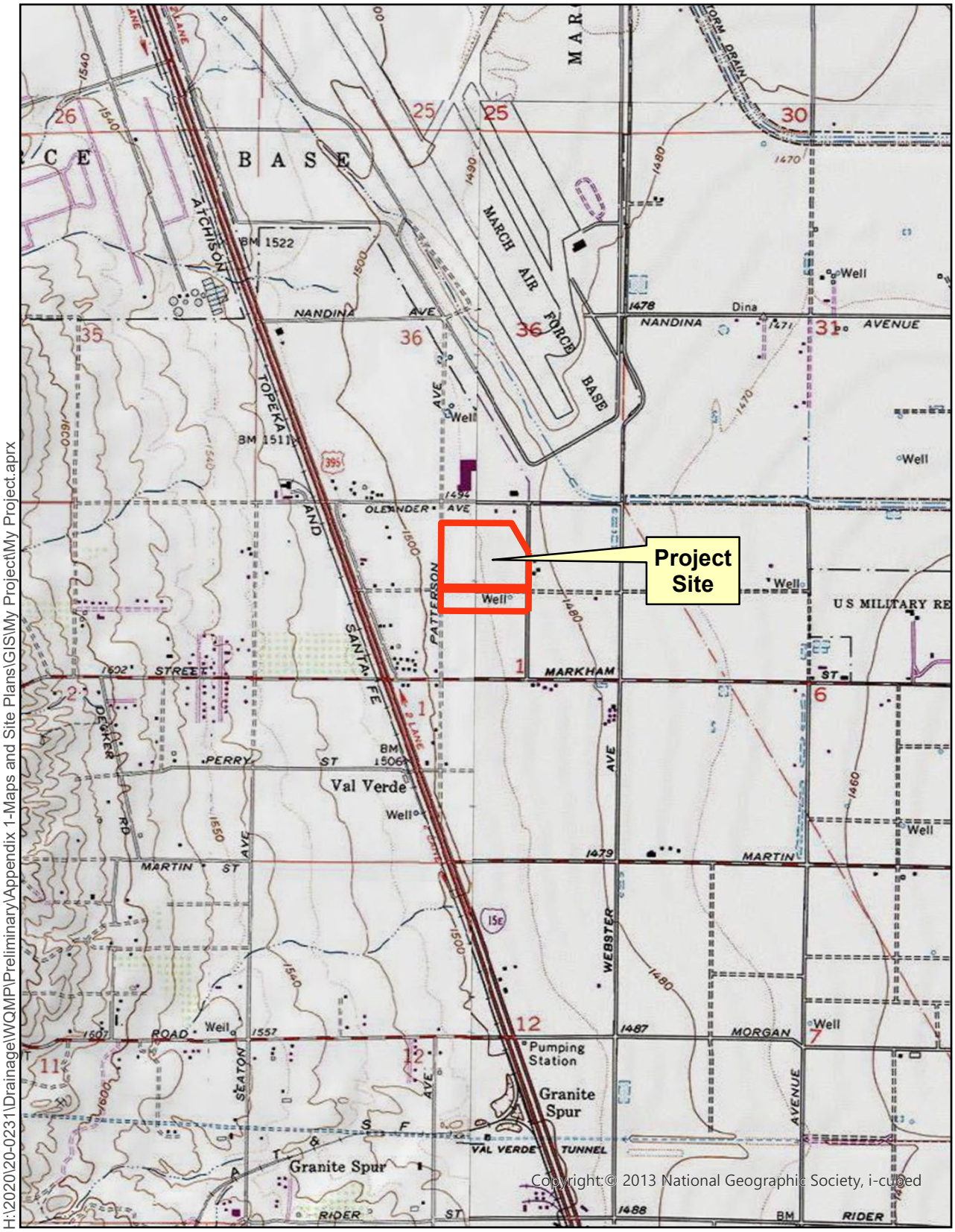
Figure 1. Vicinity Map

0 2.5 5 Miles

Albert A. WEBB Associates



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Sources: ESRI / USGS 7.5min Quad
DRGs: PERRIS

Figure 2. USGS Topography Map

0 1,000 2,000
Feet

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Sources: County of Riverside GIS; Eagle Aerial, 2016.

Figure 3. Aerial Photograph

0 500 1,000 Feet

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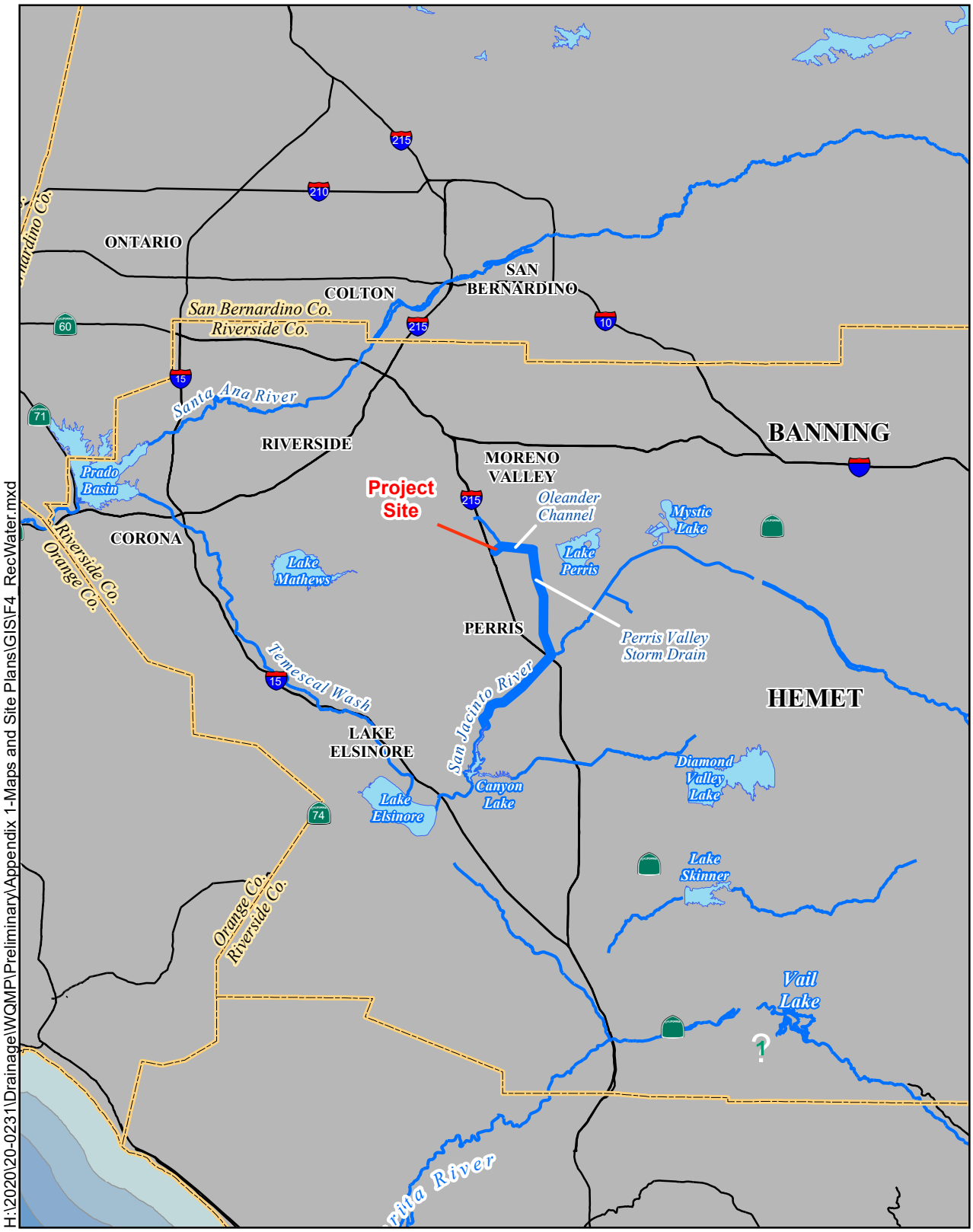

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Sources: USGS 30 Meter DEM;
USGS Digital Line Graph

Figure 4. Receiving Waterbodies

0 2 4 6
Miles

Flowpath

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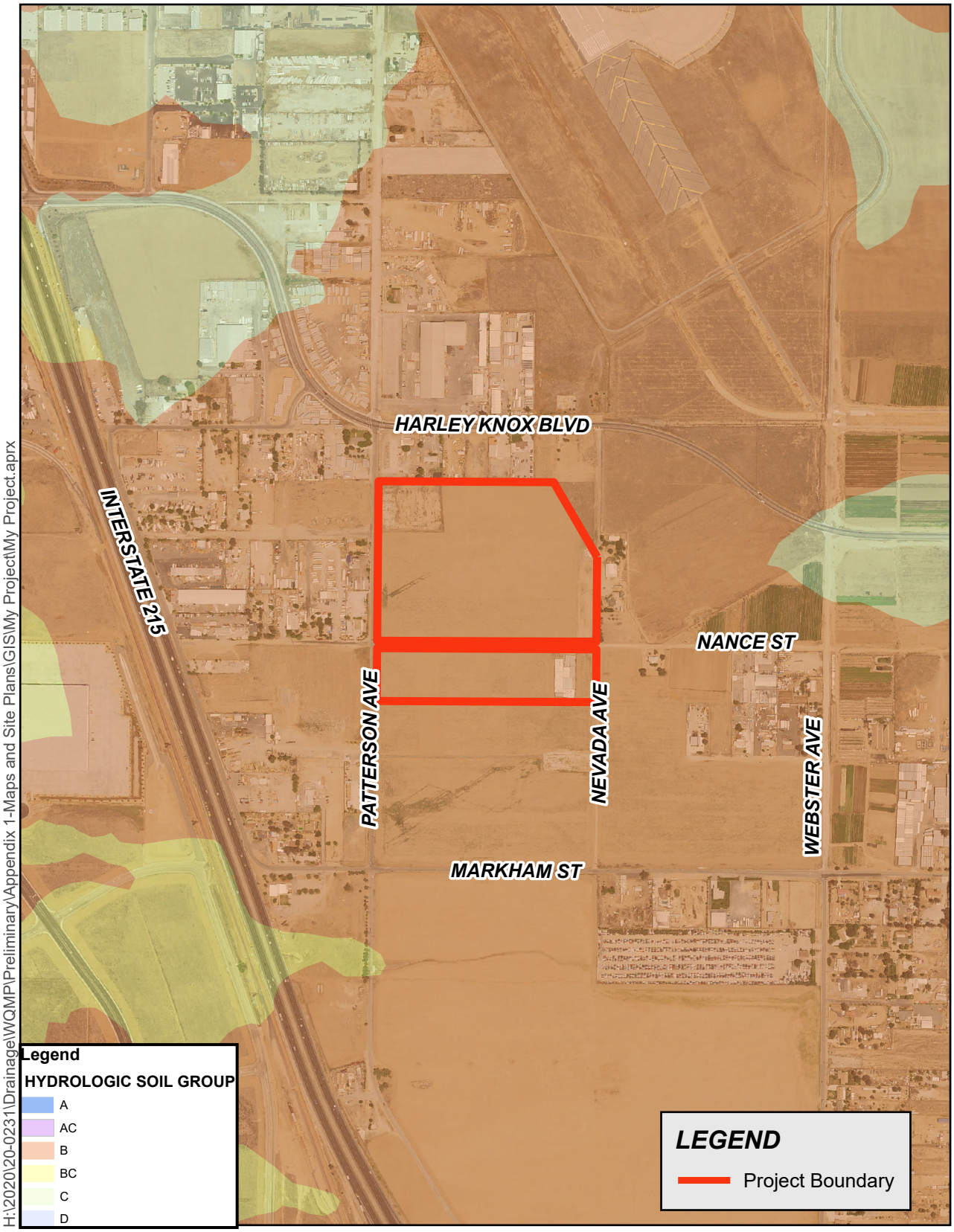

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Eagle Aerial, April 2010;
Riverside County GIS, 2012
RCFC&WCD Hydology Manual Plate C-1.30

N
W E
S

0 500 1,000
Feet

Figure 5. Soils Map

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 Plate D-4.1 provided in the RCFC&WCD Hydrology Manual:

Table 1 – Precipitation Values

	Duration
Storm Event	**1-Hour (inches)**
10-Year	0.78
100-Year	1.12

The value for slope of intensity was determined to be 0.49. The hydrological parameters have been included in Appendix A.

Based on the Plates C-1.29 and -1.30 in the RCFC&WCD Hydrology Manual, the project site is classified as soil type B. The soils maps are 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 'Undeveloped – Poor Cover'. The residential\commercial landscaping cover type was used to represent the developed condition. Table 2 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
Undeveloped Poor Cover	67	78	86	89	0%
Commercial Landscaping	32	56	69	75	90%

ON-SITE RATIONAL METHOD HYDROLOGY

The rational method was used to determine peak flow rates to adequately size the proposed subsurface storm drains and associated inlets used to convey on-site flows through the site and into the existing Caltrans RCB via MDP Lateral-B6.1.

The site is broken up into two watersheds, north and south. Watershed-1 is the northern portion of the site tributary to Line-1, and Watershed-2 is the southern portion tributary to Line-2. Watershed-1 produces 35.9-cfs and Watershed-2 produces 41.2-cfs during a 100-yr storm event.

A peak 100-year flow rate of 72.4-cfs is generated by the site. An emergency outlet in the proposed underground chambers will be provided that is capable of bypassing the peak 100-year flow rate.

Table 3 – On-Site Rational Method Results

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Node 101 – Flow tributary to upstream Line-1	11.4	16.6
Node 102 – Flow tributary to Lat-1B	6.0	8.0
Node 103 – Flow tributary to Lat-1A	7.2	10.6
Node 104 – Flow tributary to downstream Line-1	24.7	35.9
Node 201 – Flow tributary to upstream Line-2	15.6	22.6
Node 202 – Flow tributary to Lat-2B	6.8	10.0
Node 203 – Flow tributary to Lat-2A	5.8	8.6
Node 204 – Flow tributary to downstream Line-2	28.2	41.2
Total Site Runoff – Flow tributary to Lateral-B6.1	49.8	72.4

OFF-SITE RATIONAL METHOD HYDROLOGY

The off-site rational method was used to determine peak flow rates to adequately size MDP Lateral-B6 and its associated inlets in the ultimate and interim conditions. Lateral-B6 will convey 53.3-cfs in the interim and 101.7-cfs in the ultimate. Lateral-B6 is designed for the ultimate flowrates, but the interim surface inlets west adjacent of Patterson Avenue will be designed for the interim flowrates.

The ultimate condition assumes all tributary areas are commercial land use and are connected directly to Lateral-B6 via yet to be designed laterals.

The interim condition uses the existing land use of a mix between undeveloped poor cover and commercial. The interim condition will require runoff south of California Avenue to be collected in the west flowline of Patterson Avenue just south of the California/Patterson intersection; this is to keep the flow spread from overtopping the Patterson Avenue crown. Because of this, Lateral-B6 only needs to be constructed up to California Avenue in the interim.

Interim subarea boundaries were based off available topography from RCFC&WCD.

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

Table 4 – Off-Site Rational Method Results

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Interim Condition		
Node OSB-2 – Flow tributary to Lateral-B6-3	23.8	36.4
Node OSB-3 – Flow tributary to Lateral-B6-1	11.2	16.9
Total Interim Flow to Lateral-B6	35.0	53.3
Ultimate Condition		
Node OSB-1 – Flow tributary to upstream Lateral-B6	12.6	18.2
Node OSB-2 – Flow tributary to downstream Lateral-B6	39.5	58.1
Total Ultimate Flow to Lateral-B6	69.9	101.7

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

SECTION 3 - HYDRAULIC ANALYSIS

ON-SITE STORM DRAIN FACILITIES

The project proposes two subsurface storm drain systems and will utilize curb and gutter to convey on-site flows to the proposed underground chambers located in the easternmost drive aisle and Line-B6.1. From Line-B6.1, the runoff continues north to an existing Caltrans RCB before entering the Perris Valley Storm Drain Channel.

A brief summary of each system has been provided. The peak flow rates determined during the 100-year rational method on-site hydrology analysis were utilized to evaluate the proposed storm drain systems.

See Appendix B for all hydraulic calculations.

Line-1

The northern portion of the project site will surface flow and be collected by Line-1. Line-1 is a 24-inch HDPE storm drain that transitions into a 36-inch HDPE storm drain. Line-1 proposes to convey the 100-year peak flow rate to the proposed underground chambers. A normal depth calculation from the CivilD rational method output was used to determine the appropriate size for Line-1. A hydraulic model for Line-1 will be provided during final engineering to further assess the storm drain design.

Line-2

The southern portion of the project site will surface flow and be collected by Line-2. Line-2 is a 27-inch HDPE storm drain that transitions into a 36-inch HDPE storm drain. Line-2 proposes to convey the 100-year peak flow rate to the proposed underground chambers. A normal depth calculation from the CivilD rational method output was used to determine the appropriate size for Line-2. A hydraulic model for Line-2 will be provided during final engineering to further assess the storm drain design.

High Flow Bypass Outlet Structure

The proposed underground chambers will fully store the water quality volume. All high intensity flows will push out of the chambers from a raised outlet pipe and gravity flow to Lateral-B6.1. It will be sized to convey the 100-yr flowrate of 72.4-cfs.

West Collector Channel

The west collector channel will convey nuisance runoff from three CMP culverts under Patterson Avenue. The nuisance runoff was calculated by finding the capacity of a 12-inch CMP pipe at 2% slope and multiplying by three. The design runoff of the west collector channel is 14-cfs. The channel will be 2-feet deep with 2:1 side slopes and a 4-foot bottom width. The channel will have a concrete bottom up to one foot above the channel invert. The flow depth will be approximately 6-inches and will convey flow to Lateral-B6 via Lateral-B6-2.

OFF-SITE STORM DRAIN FACILITIES

Lateral-B6.1 (On-site/Off-site)

Lateral-B6.1 is a Perris Valley MDP facility proposed to be a 48-inch RCP that connects to the existing Caltrans RCB storm drain. It will convey all runoff produced on-site and by Nevada Avenue; approximately 80-cfs. A normal depth calculation was used to determine the appropriate size for Lateral-B6.1. A hydraulic model for Lateral-B6.1 will be provided during final engineering to further assess the storm drain design.

Lateral-B6

Lateral-B6 is a Perris Valley MDP facility proposed to be a 48-inch RCP that transitions to a 24-inch RCP upstream. It will connect to the existing Caltrans RCB storm drain. A normal depth calculation from the ultimate condition CivilD rational method output was used to determine the appropriate size for Lateral-B6. A hydraulic model for Lateral-B6 will be provided during final engineering to further assess the storm drain design.

Lateral-B6 will be designed for the ultimate condition flowrates. However, Lateral-B6 only needs to be constructed up to California Avenue in the interim since Patterson Avenue has capacity to convey interim condition runoff north within the westerly half of the street up to the intersection with California Avenue.

The interim inlets and laterals along the west edge-of-pavement of Patterson Avenue will be designed for the interim condition since the ultimate condition tributary areas will likely result in direct connection to Lateral-B6 via additional laterals.

Lateral-B6-1 and Inlet

Lateral-B6-1 will convey interim runoff from the tributary between California Avenue and Old Oleander. Lateral-B6-1 is a 24-inch RCP that will convey roughly 17-cfs. A normal depth calculation was used to determine the appropriate size for Lateral-B6-1. A hydraulic model for Lateral-B6-1 will be provided during final engineering to further assess the storm drain design.

The inlet for Lateral-B6-1 is sized using a weir equation. It will be a grated inlet with 3-grates and produce approximately 0.4-feet of head to capture the runoff.

Lateral-B6-2

Lateral-B6-2 will convey nuisance runoff collected by the on-site west collector channel. Lateral-B6-2 is an 18-inch RCP that will convey roughly 15-cfs. A normal depth calculation was used to determine the appropriate size for Lateral-B6-2. A hydraulic model for Lateral-B6-2 will be provided during final engineering to further assess the storm drain design.

Lateral-B6-3 and Inlet

Lateral-B6-3 will convey interim runoff from the tributary between California Avenue and Old Oleander. Lateral-B6-3 is a 30-inch RCP that will convey roughly 36-cfs. A normal depth calculation was used to determine the appropriate size for Lateral-B6-3. A hydraulic model for Lateral-B6-3 will be provided during final engineering to further assess the storm drain design.

The inlet for Lateral-B6-3 is sized using a weir equation. It will be a grated inlet with 8-grates and produce approximately 0.4-feet of head to capture the runoff.

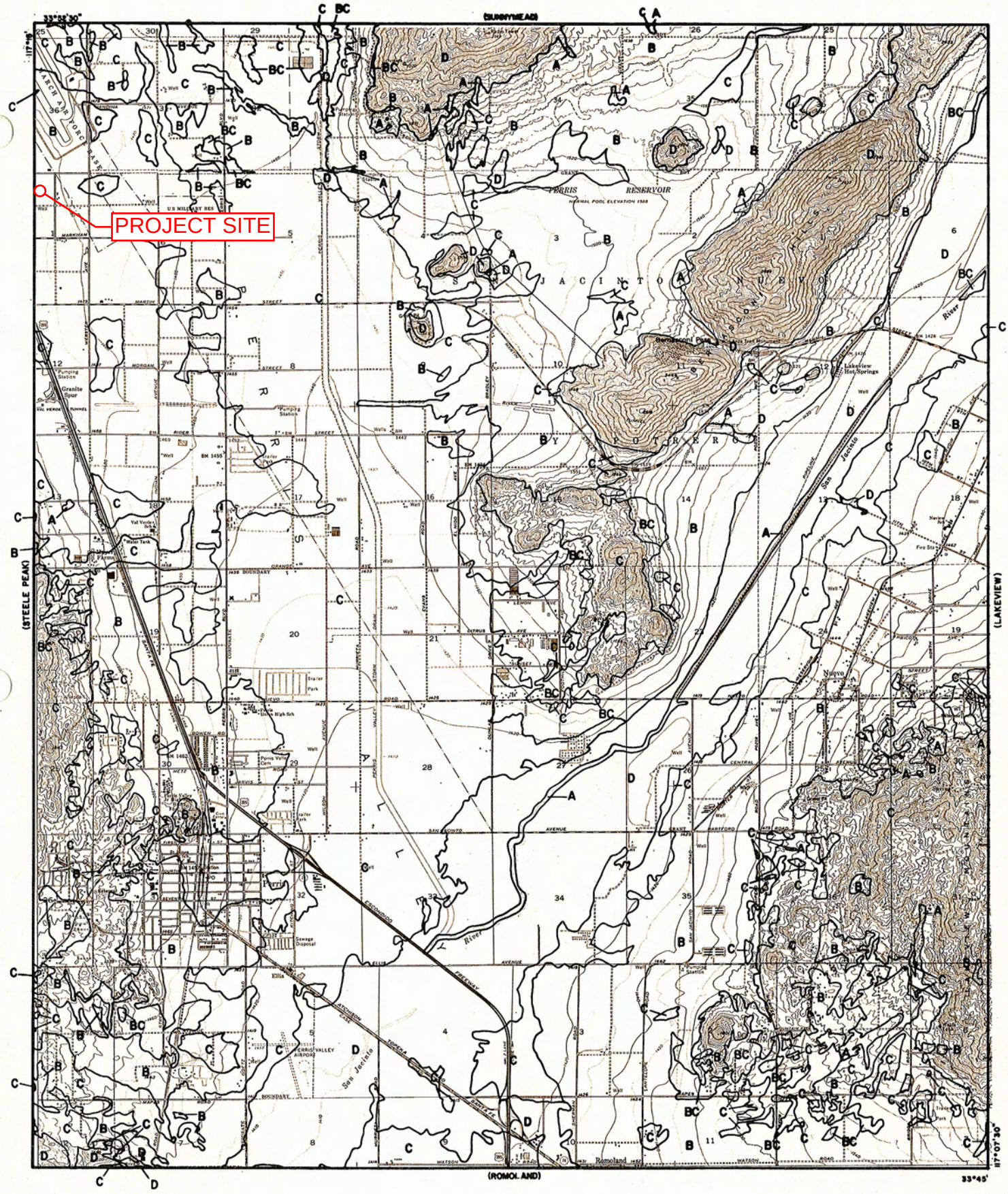
SECTION 4 - CONCLUSION

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 and from the underground chambers and provide flood protection for the 100-year storm event.
- The proposed project will not impact flooding condition to upstream or downstream properties.

APPENDIX A – HYDROLOGY

HYDROLOGICAL PARAMETERS



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC & WCD

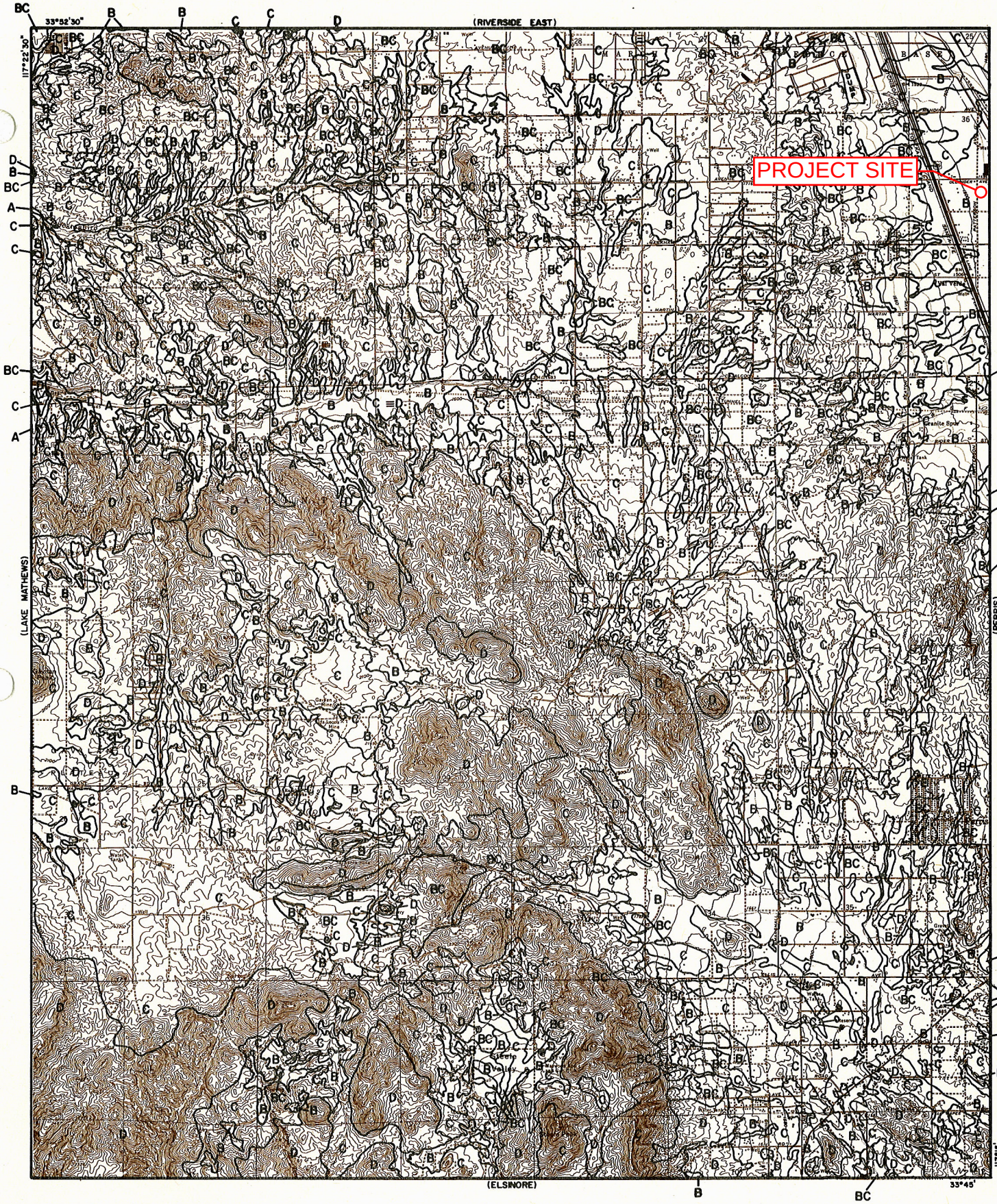
HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-1.30



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR STEELE PEAK

PLATE C-1.29

RAINFALL INTENSITY—INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
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	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY-DURATION CURVES DATA

10-YEAR ON-SITE HYDROLOGY (RATIONAL METHOD)

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 03/09/22  File:PROP10.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
ONSITE RATIONAL METHOD HYDROLOGY
10 YEAR STORM EVENT
FN: PROP10.OUT ABE
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.780(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   935.000(Ft.)
Top (of initial area) elevation =  1501.400(Ft.)
Bottom (of initial area) elevation =  1487.900(Ft.)
Difference in elevation =    13.500(Ft.)
Slope =    0.01444  s(percent)=       1.44
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.803 min.
Rainfall intensity =      1.807(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.436(CFS)
Total initial stream area =        7.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.100(Ft.)
Downstream point/station elevation =  1481.100(Ft.)
Pipe length  =   840.00(Ft.)   Manning's N = 0.012
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No. of pipes = 1  Required pipe flow  =    11.436(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    11.436(CFS)
Normal flow depth in pipe =   15.96(In.)
Flow top width inside pipe =   22.65(In.)
Critical Depth =   14.57(In.)
Pipe flow velocity =      5.16(Ft/s)
Travel time through pipe =    2.71 min.
Time of concentration (TC) =    13.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.52 min.
Rainfall intensity =      1.619(In/Hr) for a    10.0 year storm
Subarea runoff =      6.019(CFS) for      4.300(Ac.)
Total runoff =     17.456(CFS)       Total area =      11.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1481.100(Ft.)
Downstream point/station elevation =  1478.500(Ft.)
Pipe length  =   798.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    17.456(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    17.456(CFS)
Normal flow depth in pipe =   20.25(In.)
Flow top width inside pipe =   23.38(In.)
Critical Depth =   17.53(In.)
Pipe flow velocity =      5.46(Ft/s)
Travel time through pipe =    2.44 min.
Time of concentration (TC) =    15.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    15.95 min.
Rainfall intensity =      1.493(In/Hr) for a    10.0 year storm
Subarea runoff =      7.213(CFS) for      5.600(Ac.)
Total runoff =     24.669(CFS)       Total area =      17.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1478.500(Ft.)
Downstream point/station elevation =  1478.400(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    24.669(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    24.669(CFS)
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```
Normal flow depth in pipe =   23.63(In.)
Flow top width inside pipe =   24.54(In.)
Critical Depth =   20.32(In.)
Pipe flow velocity =      5.95(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    16.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     17.200(Ac.)
Runoff from this stream =     24.669(CFS)
Time of concentration =   16.04 min.
Rainfall intensity =     1.489(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   590.000(Ft.)
Top (of initial area) elevation =  1500.900(Ft.)
Bottom (of initial area) elevation =  1487.900(Ft.)
Difference in elevation =    13.000(Ft.)
Slope =    0.02203  s(percent)=       2.20
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.257 min.
Rainfall intensity =      2.061(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     15.596(CFS)
Total initial stream area =        8.700(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.000(Ft.)
Downstream point/station elevation =  1478.700(Ft.)
Pipe length  =  1468.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    15.596(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.596(CFS)
Normal flow depth in pipe =   17.84(In.)
Flow top width inside pipe =   25.57(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =      5.60(Ft/s)
Travel time through pipe =    4.37 min.
Time of concentration (TC) =    12.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
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Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.63 min.
Rainfall intensity =      1.674(In/Hr) for a    10.0 year storm
Subarea runoff =      6.808(CFS) for      4.700(Ac.)
Total runoff =     22.404(CFS)       Total area =      13.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1478.700(Ft.)
Downstream point/station elevation =  1477.400(Ft.)
Pipe length  =   380.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    22.404(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    22.404(CFS)
Normal flow depth in pipe =   21.47(In.)
Flow top width inside pipe =   27.07(In.)
Critical Depth =   19.34(In.)
Pipe flow velocity =      5.96(Ft/s)
Travel time through pipe =    1.06 min.
Time of concentration (TC) =    13.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.69 min.
Rainfall intensity =      1.609(In/Hr) for a    10.0 year storm
Subarea runoff =      5.842(CFS) for      4.200(Ac.)
Total runoff =     28.246(CFS)       Total area =      17.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1477.400(Ft.)
Downstream point/station elevation =  1477.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    28.246(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    28.246(CFS)
Normal flow depth in pipe =   26.06(In.)
Flow top width inside pipe =   32.19(In.)
Critical Depth =   20.62(In.)
Pipe flow velocity =      5.15(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    14.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      105.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     17.600(Ac.)
Runoff from this stream =     28.246(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     1.591(In/Hr)
Summary of stream data:

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

```
1       24.669     16.04               1.489
2       28.246     14.01               1.591
Largest stream flow has longer or shorter time of concentration
Qp =     28.246 + sum of
          Qa          Tb/Ta
          24.669 *    0.874 =     21.556
Qp =     49.802

Total of 2 main streams to confluence:
Flow rates before confluence point:
      24.669      28.246
Area of streams before confluence:
       17.200       17.600


Results of confluence:
Total flow rate =     49.802(CFS)
Time of concentration =    14.015 min.
Effective stream area after confluence  =     34.800(Ac.)
End of computations, total study area =           34.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

100-YEAR ON-SITE HYDROLOGY (RATIONAL METHOD)

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 03/09/22  File:PROP100.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
ONSITE RATIONAL METHOD HYDROLOGY
100 YEAR STORM EVENT
FN: PROP100.OUT ABE
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   935.000(Ft.)
Top (of initial area) elevation =  1501.400(Ft.)
Bottom (of initial area) elevation =  1487.900(Ft.)
Difference in elevation =    13.500(Ft.)
Slope =    0.01444  s(percent)=       1.44
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.803 min.
Rainfall intensity =      2.595(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     16.556(CFS)
Total initial stream area =        7.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.100(Ft.)
Downstream point/station elevation =  1481.100(Ft.)
Pipe length  =   840.00(Ft.)   Manning's N = 0.012
```

```
No. of pipes = 1  Required pipe flow  =    16.556(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    16.556(CFS)
Normal flow depth in pipe =   18.70(In.)
Flow top width inside pipe =   24.91(In.)
Critical Depth =   17.04(In.)
Pipe flow velocity =      5.63(Ft/s)
Travel time through pipe =    2.48 min.
Time of concentration (TC) =    13.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.29 min.
Rainfall intensity =      2.344(In/Hr) for a   100.0 year storm
Subarea runoff =      8.792(CFS) for      4.300(Ac.)
Total runoff =     25.349(CFS)        Total area =      11.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1481.100(Ft.)
Downstream point/station elevation =  1478.500(Ft.)
Pipe length  =   798.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    25.349(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    25.349(CFS)
Normal flow depth in pipe =   24.56(In.)
Flow top width inside pipe =   23.11(In.)
Critical Depth =   20.60(In.)
Pipe flow velocity =      5.89(Ft/s)
Travel time through pipe =    2.26 min.
Time of concentration (TC) =    15.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    15.55 min.
Rainfall intensity =      2.171(In/Hr) for a   100.0 year storm
Subarea runoff =     10.585(CFS) for      5.600(Ac.)
Total runoff =     35.934(CFS)        Total area =      17.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1478.500(Ft.)
Downstream point/station elevation =  1478.400(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    35.934(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    35.934(CFS)
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```
Normal flow depth in pipe =   25.78(In.)
Flow top width inside pipe =   32.46(In.)
Critical Depth =   23.37(In.)
Pipe flow velocity =      6.64(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    15.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     17.200(Ac.)
Runoff from this stream =     35.934(CFS)
Time of concentration =   15.62 min.
Rainfall intensity =     2.166(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   590.000(Ft.)
Top (of initial area) elevation =  1500.900(Ft.)
Bottom (of initial area) elevation =  1487.900(Ft.)
Difference in elevation =    13.000(Ft.)
Slope =    0.02203  s(percent)=       2.20
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.257 min.
Rainfall intensity =      2.960(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     22.569(CFS)
Total initial stream area =        8.700(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.000(Ft.)
Downstream point/station elevation =  1478.700(Ft.)
Pipe length  =  1468.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    22.569(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    22.569(CFS)
Normal flow depth in pipe =   21.14(In.)
Flow top width inside pipe =   27.37(In.)
Critical Depth =   19.38(In.)
Pipe flow velocity =      6.10(Ft/s)
Travel time through pipe =    4.01 min.
Time of concentration (TC) =    12.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
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```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.27 min.
Rainfall intensity =      2.438(In/Hr) for a   100.0 year storm
Subarea runoff =     10.002(CFS) for      4.700(Ac.)
Total runoff =     32.571(CFS)       Total area =      13.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1478.700(Ft.)
Downstream point/station elevation =  1477.400(Ft.)
Pipe length  =   380.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    32.571(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    32.571(CFS)
Normal flow depth in pipe =   26.25(In.)
Flow top width inside pipe =   26.62(In.)
Critical Depth =   22.79(In.)
Pipe flow velocity =      6.43(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =    13.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.25 min.
Rainfall intensity =      2.347(In/Hr) for a   100.0 year storm
Subarea runoff =      8.599(CFS) for      4.200(Ac.)
Total runoff =     41.170(CFS)       Total area =      17.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1477.400(Ft.)
Downstream point/station elevation =  1477.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    41.170(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    41.170(CFS)
Normal flow depth in pipe =   33.09(In.)
Flow top width inside pipe =   27.96(In.)
Critical Depth =   24.53(In.)
Pipe flow velocity =      5.49(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    13.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      105.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     17.600(Ac.)
Runoff from this stream =     41.170(CFS)
Time of concentration =   13.56 min.
Rainfall intensity =     2.321(In/Hr)
Summary of stream data:

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

```
1       35.934     15.62               2.166
2       41.170     13.56               2.321
Largest stream flow has longer or shorter time of concentration
Qp =     41.170 + sum of
          Qa          Tb/Ta
          35.934 *    0.868 =     31.187
Qp =     72.357

Total of 2 main streams to confluence:
Flow rates before confluence point:
      35.934      41.170
Area of streams before confluence:
       17.200       17.600


Results of confluence:
Total flow rate =     72.357(CFS)
Time of concentration =    13.558 min.
Effective stream area after confluence  =     34.800(Ac.)
End of computations, total study area =           34.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

10-YEAR OFF-SITE HYDROLOGY (RATIONAL METHOD)

INTERIM CONDITION

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 10/13/21  File:OFF10INT.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
OFFSITE RATIONAL METHOD HYDROLOGY - LAT-B6: INTERIM CONDITION
10 YEAR STORM EVENT
FN: OFF10INT.OUT TSW
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.780(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        0.000 to Point/Station        1.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.100(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    12.100(Ft.)
Slope =    0.01210  s(percent)=       1.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.310 min.
Rainfall intensity =      1.326(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
```

```
Runoff Coefficient = 0.701
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.718(CFS)
Total initial stream area =        8.300(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     15.782(CFS)
Depth of flow =   1.079(Ft.), Average velocity =   1.451(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.64
        2             60.00              0.65
        3             64.70              0.00
        4             68.50              1.27
        5             90.70              1.70
Manning's 'N' friction factor =   0.025
----------------------------------------------------------------
Sub-Channel flow  =     15.782(CFS)
  '     '        flow top width =     33.958(Ft.)
  '     '    velocity=    1.451(Ft/s)
  '     '        area =     10.878(Sq.Ft)
  '     '        Froude number =     0.452

Upstream point elevation =  1500.000(Ft.)
Downstream point elevation =  1498.300(Ft.)
Flow length =   620.000(Ft.)
Travel time  =    7.12 min.
Time of concentration =   27.43 min.
Depth of flow =   1.079(Ft.)
Average velocity =   1.451(Ft/s)
Total irregular channel flow =    15.782(CFS)
Irregular channel normal depth above invert elev. =   1.079(Ft.)
Average velocity of channel(s) =   1.451(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  66.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.145(In/Hr) for a    10.0 year storm
Subarea runoff =     16.069(CFS) for     19.200(Ac.)
```

```
Total runoff =     23.787(CFS)  Total area =      27.500(Ac.)
Depth of flow =   1.189(Ft.), Average velocity =   1.587(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1488.500(Ft.)
Downstream point/station elevation =  1484.400(Ft.)
Pipe length  =   578.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.787(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    23.787(CFS)
Normal flow depth in pipe =   20.25(In.)
Flow top width inside pipe =   23.38(In.)
Critical Depth =   20.48(In.)
Pipe flow velocity =      7.44(Ft/s)
Travel time through pipe =    1.30 min.
Time of concentration (TC) =    28.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
USER INPUT of soil data for subarea
Runoff Coefficient = 0.752
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  63.00
Pervious area fraction =  0.400; Impervious fraction =  0.600
Time of concentration =    28.73 min.
Rainfall intensity =      1.119(In/Hr) for a    10.0 year storm
Subarea runoff =     11.188(CFS) for     13.300(Ac.)
Total runoff =     34.975(CFS)  Total area =      40.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.400(Ft.)
Downstream point/station elevation =  1483.200(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.975(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    34.975(CFS)
Normal flow depth in pipe =   22.95(In.)
Flow top width inside pipe =   30.38(In.)
Critical Depth =   23.64(In.)
Pipe flow velocity =      7.93(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =    29.13 min.
```

```
End of computations, total study area =          40.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.569
Area averaged RI index number =  67.5
```

ULTIMATE CONDITION

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 10/13/21  File:OFF10ULT.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
OFFSITE RATIONAL METHOD HYDROLOGY - LAT-B6: ULTIMATE CONDITION
10 YEAR STORM EVENT
FN: OFF10ULT.OUT TSW
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.780(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        0.000 to Point/Station        1.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.100(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    12.100(Ft.)
Slope =    0.01210  s(percent)=       1.21
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.496 min.
Rainfall intensity =      1.753(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
```

```
Runoff Coefficient = 0.866
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     12.603(CFS)
Total initial stream area =        8.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.000(Ft.)
Downstream point/station elevation =  1488.400(Ft.)
Pipe length  =   610.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.603(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.603(CFS)
Normal flow depth in pipe =   15.82(In.)
Flow top width inside pipe =   18.10(In.)
Critical Depth =   15.86(In.)
Pipe flow velocity =      6.49(Ft/s)
Travel time through pipe =    1.57 min.
Time of concentration (TC) =    13.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.06 min.
Rainfall intensity =      1.646(In/Hr) for a    10.0 year storm
Subarea runoff =     27.342(CFS) for     19.200(Ac.)
Total runoff =     39.945(CFS)  Total area =      27.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1488.400(Ft.)
Downstream point/station elevation =  1484.400(Ft.)
Pipe length  =   563.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.945(CFS)
```

```
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    39.945(CFS)
Normal flow depth in pipe =   24.38(In.)
Flow top width inside pipe =   29.00(In.)
Critical Depth =   25.24(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    1.11 min.
Time of concentration (TC) =    14.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    14.17 min.
Rainfall intensity =      1.582(In/Hr) for a    10.0 year storm
Subarea runoff =     29.941(CFS) for     21.900(Ac.)
Total runoff =     69.886(CFS)  Total area =      49.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.400(Ft.)
Downstream point/station elevation =  1483.200(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.886(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    69.886(CFS)
Normal flow depth in pipe =   34.88(In.)
Flow top width inside pipe =   23.99(In.)
Critical Depth =   31.84(In.)
Pipe flow velocity =      8.93(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    14.52 min.
End of computations, total study area =           49.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

100-YEAR OFF-SITE HYDROLOGY (RATIONAL METHOD)

INTERIM CONDITION

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 10/13/21  File:OFF100INT.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
OFFSITE RATIONAL METHOD HYDROLOGY - LAT-B6: INTERIM CONDITION
100 YEAR STORM EVENT
FN: OFF100INT.OUT TSW
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        0.000 to Point/Station        1.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.100(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    12.100(Ft.)
Slope =    0.01210  s(percent)=       1.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.310 min.
Rainfall intensity =      1.904(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
```

```
Runoff Coefficient = 0.752
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.879(CFS)
Total initial stream area =        8.300(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     24.192(CFS)
Depth of flow =   1.194(Ft.), Average velocity =   1.593(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.64
        2             60.00              0.65
        3             64.70              0.00
        4             68.50              1.27
        5             90.70              1.70
Manning's 'N' friction factor =   0.025
----------------------------------------------------------------
Sub-Channel flow  =     24.192(CFS)
  '     '        flow top width =     41.248(Ft.)
  '     '    velocity=    1.593(Ft/s)
  '     '        area =     15.189(Sq.Ft)
  '     '        Froude number =     0.463

Upstream point elevation =  1500.000(Ft.)
Downstream point elevation =  1498.300(Ft.)
Flow length =   620.000(Ft.)
Travel time  =    6.49 min.
Time of concentration =   26.80 min.
Depth of flow =   1.194(Ft.)
Average velocity =   1.593(Ft/s)
Total irregular channel flow =    24.192(CFS)
Irregular channel normal depth above invert elev. =   1.194(Ft.)
Average velocity of channel(s) =   1.593(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  66.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.662(In/Hr) for a   100.0 year storm
Subarea runoff =     24.527(CFS) for     19.200(Ac.)
```

```
Total runoff =     36.406(CFS)  Total area =      27.500(Ac.)
Depth of flow =   1.328(Ft.), Average velocity =   1.702(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1488.500(Ft.)
Downstream point/station elevation =  1484.400(Ft.)
Pipe length  =   578.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.406(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    36.406(CFS)
Normal flow depth in pipe =   26.34(In.)
Flow top width inside pipe =   19.63(In.)
Critical Depth =   24.54(In.)
Pipe flow velocity =      7.96(Ft/s)
Travel time through pipe =    1.21 min.
Time of concentration (TC) =    28.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
USER INPUT of soil data for subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  63.00
Pervious area fraction =  0.400; Impervious fraction =  0.600
Time of concentration =    28.01 min.
Rainfall intensity =      1.627(In/Hr) for a   100.0 year storm
Subarea runoff =     16.942(CFS) for     13.300(Ac.)
Total runoff =     53.348(CFS)  Total area =      40.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.400(Ft.)
Downstream point/station elevation =  1483.200(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    53.348(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    53.348(CFS)
Normal flow depth in pipe =   29.63(In.)
Flow top width inside pipe =   27.49(In.)
Critical Depth =   28.49(In.)
Pipe flow velocity =      8.57(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    28.38 min.
```

```
End of computations, total study area =          40.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.569
Area averaged RI index number =  67.5
```

ULTIMATE CONDITION

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
        Rational Hydrology Study        Date: 10/13/21  File:OFF100ULT.out
------------------------------------------------------------------------
20-0231 - DUKE NANCE
OFFSITE RATIONAL METHOD HYDROLOGY - LAT-B6: ULTIMATE CONDITION
100 YEAR STORM EVENT
FN: OFF100ULT.OUT TSW
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        0.000 to Point/Station        1.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.100(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    12.100(Ft.)
Slope =    0.01210  s(percent)=       1.21
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.496 min.
Rainfall intensity =      2.517(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
```

```
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     18.247(CFS)
Total initial stream area =        8.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.000(Ft.)
Downstream point/station elevation =  1488.400(Ft.)
Pipe length  =   610.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.247(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.247(CFS)
Normal flow depth in pipe =   18.28(In.)
Flow top width inside pipe =   20.45(In.)
Critical Depth =   18.47(In.)
Pipe flow velocity =      7.10(Ft/s)
Travel time through pipe =    1.43 min.
Time of concentration (TC) =    12.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.93 min.
Rainfall intensity =      2.376(In/Hr) for a   100.0 year storm
Subarea runoff =     39.802(CFS) for     19.200(Ac.)
Total runoff =     58.050(CFS)  Total area =      27.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1488.400(Ft.)
Downstream point/station elevation =  1484.400(Ft.)
Pipe length  =   563.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    58.050(CFS)
```

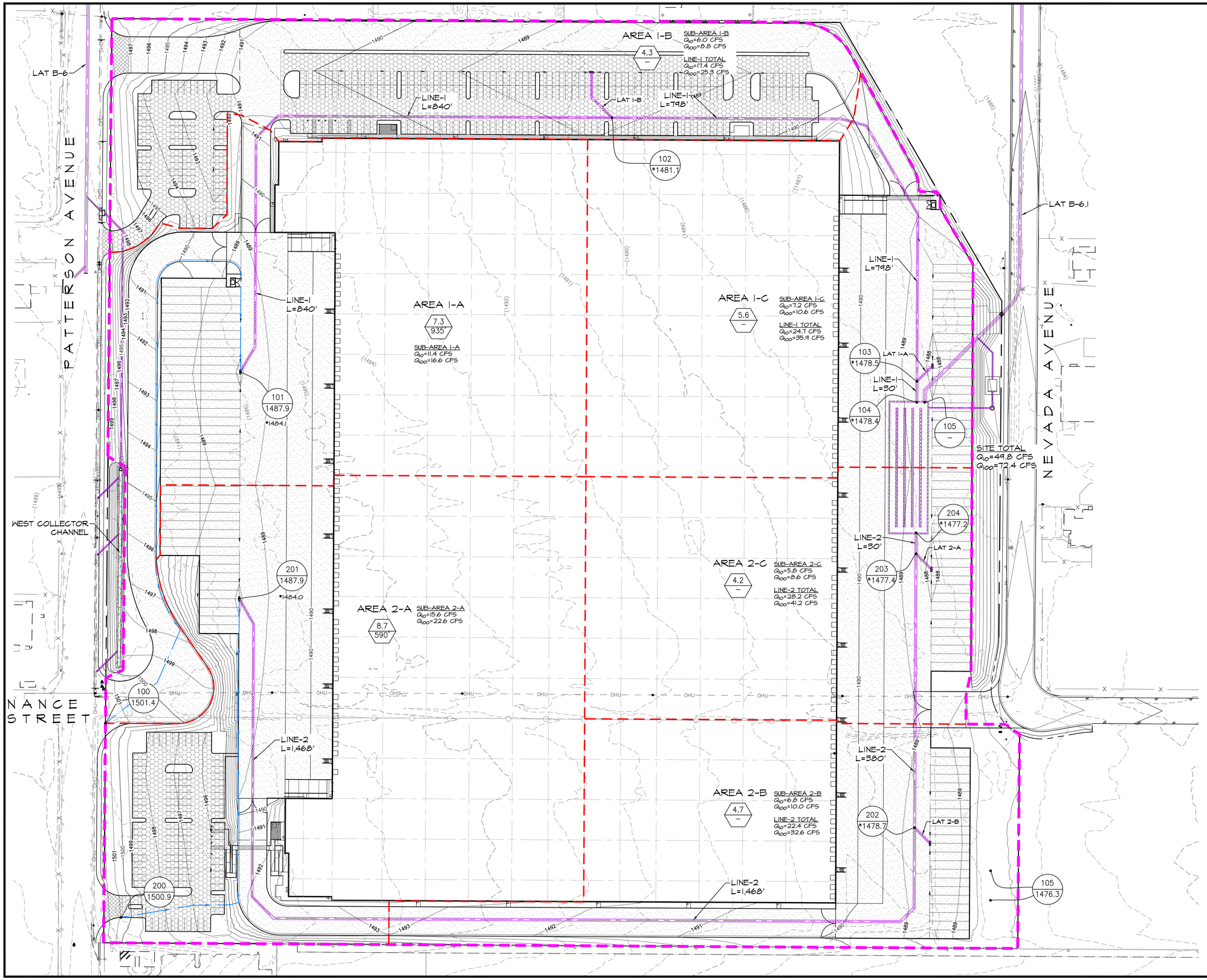
```
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    58.050(CFS)
Normal flow depth in pipe =   30.66(In.)
Flow top width inside pipe =   25.60(In.)
Critical Depth =   29.59(In.)
Pipe flow velocity =      9.04(Ft/s)
Travel time through pipe =    1.04 min.
Time of concentration (TC) =    13.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.97 min.
Rainfall intensity =      2.288(In/Hr) for a   100.0 year storm
Subarea runoff =     43.678(CFS) for     21.900(Ac.)
Total runoff =    101.727(CFS)  Total area =      49.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1484.400(Ft.)
Downstream point/station elevation =  1483.200(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   101.727(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   101.727(CFS)
Normal flow depth in pipe =   39.75(In.)
Flow top width inside pipe =   28.89(In.)
Critical Depth =   37.02(In.)
Pipe flow velocity =      9.86(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    14.29 min.
End of computations, total study area =           49.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

HYDROLOGY MAPS



LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- SUB-AREA BOUNDARY
- FLOW DIRECTION
- 101 / 14xx — NODE DESIGNATION / NODE ELEVATION
- *14xx — *INVERT ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES) / LONGEST WATER PATH (FT)

PRELIMINARY

CITY OF PERRIS

ONSITE/OFFSITE RATIONAL METHOD HYDROLOGY
DEVELOPED CONDITION: LATERAL-B6.1
DUKE - PATTERSON AND NANCE
P21-00005

SCALE: 1"=60'	ALBERT A. WEBB ASSOCIATES — ENGINEERING CONSULTANTS, 3788 McCRAY STREET, RIVERSIDE CA. 92506, PH. (951) 686-1070, FAX (951) 788-1256	W.O. 20-0231
DATE: 3/9/2022		SHEET 1
DESIGNED: ABE		OF 1 SHEETS
CHECKED: SKK		
PLN CK REF:		DWG. NO.
F.B.		

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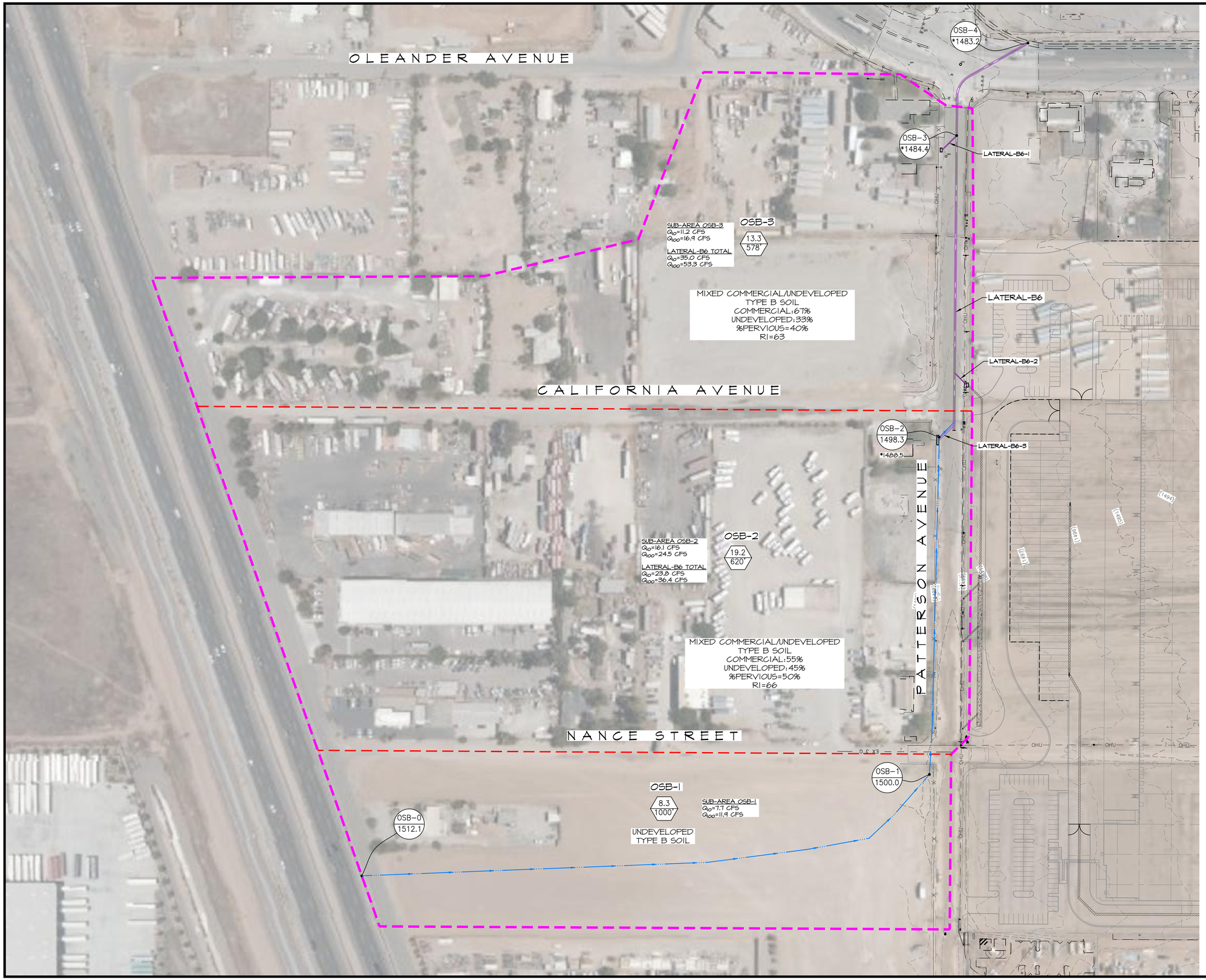

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- SUB-AREA BOUNDARY
- FLOW DIRECTION
- 101 / 14xx — NODE DESIGNATION / NODE ELEVATION
- *14XX — *INVERT ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES) / LONGEST WATER PATH (FT)

NOTES:

1. OFFSITE AREAS (OSB-X) ARE BASED OFF INTERIM CONDITION LAND COVER.

N W E S

1" = 80'

80 0 80 160 240

PRELIMINARY

CITY OF PERRIS

OFFSITE RATIONAL METHOD HYDROLOGY
INTERIM CONDITION: LATERAL-B6
DUKE - PATTERSON AND NANCE
P21-00005

SCALE: 1"=80'	ALBERT A. WEBB ASSOCIATES — ENGINEERING CONSULTANTS, 3788 McCRAY STREET, RIVERSIDE CA. 92506, PH. (951) 686-1070, FAX (951) 788-1256	W.O. 20-0231
DATE: 10/4/2021		SHEET 1
DESIGNED:		OF 2 SHEETS
CHECKED:		
PLN CK REF:		DWG. NO.
F.B.		

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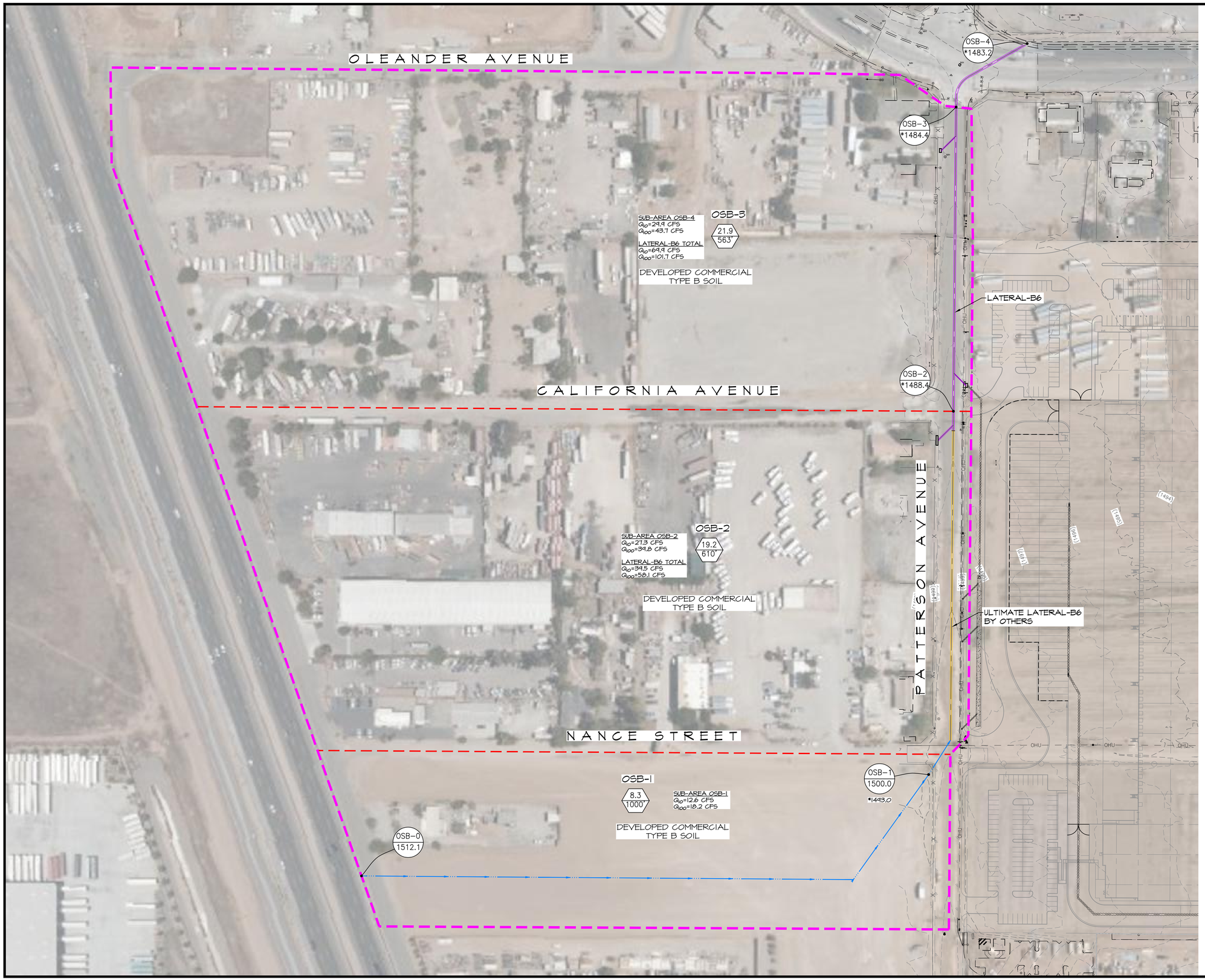

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- SUB-AREA BOUNDARY
- FLOW DIRECTION
- 101 / 14xx — NODE DESIGNATION / NODE ELEVATION
- *14xx — *INVERT ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES) / LONGEST WATER PATH (FT)

NOTES:

1. OFFSITE AREAS (OSB-X) ARE BASED OFF ULTIMATE CONDITION LANDCOVER AND DIRECT CONNECTION TO LATERAL-B6.

N W E S

1" = 80'

80 0 80 160 240

PRELIMINARY

CITY OF PERRIS

OFFSITE RATIONAL METHOD HYDROLOGY
ULTIMATE CONDITION: LATERAL-B6
DUKE - PATTERSON AND NANCE
P21-00005

SCALE: 1"=80'	ALBERT A. WEBB ASSOCIATES — ENGINEERING CONSULTANTS, 3788 McCRAY STREET, RIVERSIDE CA. 92506, PH. (951) 686-1070, FAX (951) 788-1256	W.O. 20-0231
DATE: 10/4/2021		SHEET 2 OF 2 SHEETS
DESIGNED:		
CHECKED:		
PLN CK REF:		DWG. NO.
F.B.		

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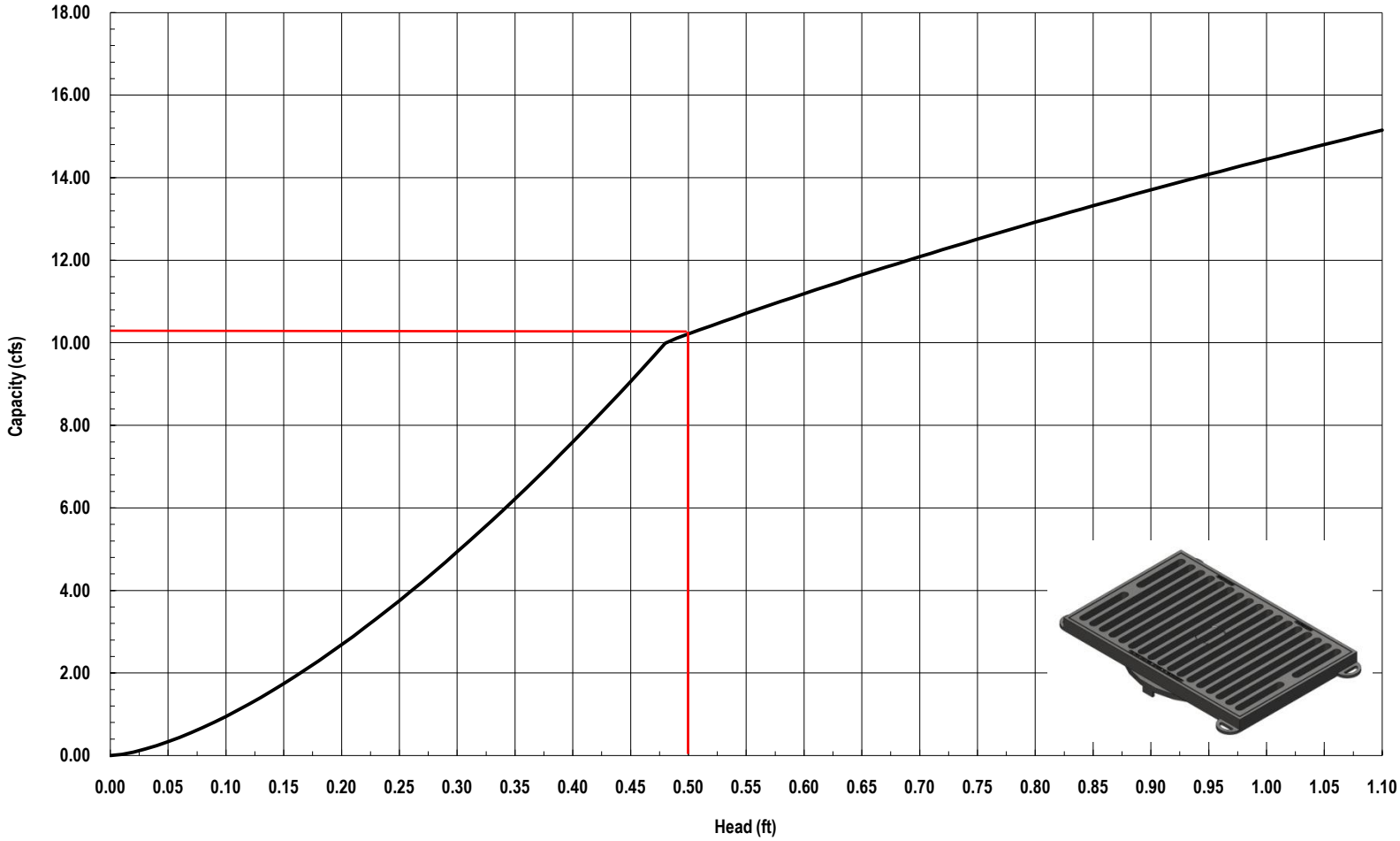
APPENDIX B – HYDRAULICS

ON-SITE INLETS

Nyloplast 2' x 3' Road & Highway Grate Inlet Capacity Chart



Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
© Nyloplast Inlet Capacity Charts June 2012

EXISTING 12-INCH CMP CULVERTS

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: 12in CMP

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0160

Depth: 0.9000 ft

Result Parameters

Flow: 4.3632 cfs

Area of Flow: 0.7445 ft^2

Wetted Perimeter: 2.4981 ft

Hydraulic Radius: 0.2980 ft

Average Velocity: 5.8604 ft/s

Top Width: 0.6000 ft

Froude Number: 0.9271

Critical Depth: 0.8770 ft

Critical Velocity: 5.9768 ft/s

Critical Slope: 0.0205 ft/ft

Critical Top Width: 0.66 ft

Calculated Max Shear Stress: 1.1232 lb/ft^2

Calculated Avg Shear Stress: 0.3719 lb/ft^2

WEST COLLECTOR CHANNEL

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: West Collector

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width: 4.0000 ft

Longitudinal Slope: 0.0140 ft/ft

Manning's n: 0.0150

Flow: 14.0000 cfs

12" CMP flow rate multiplied by 3 because of 3 total tributary culverts

Result Parameters

Depth: 0.4642 ft

Area of Flow: 2.2875 ft^2

Wetted Perimeter: 6.0758 ft

Hydraulic Radius: 0.3765 ft

Average Velocity: 6.1201 ft/s

Top Width: 5.8567 ft

Froude Number: 1.7257

Critical Depth: 0.6468 ft

Critical Velocity: 4.0886 ft/s

Critical Slope: 0.0043 ft/ft

Critical Top Width: 6.59 ft

Calculated Max Shear Stress: 0.4055 lb/ft^2

Calculated Avg Shear Stress: 0.3289 lb/ft^2

LATERAL-B6-1 AND INLET

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LAT-B6-1

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0130

Flow: 16.9000 cfs

Result Parameters

Depth: 1.0332 ft

Area of Flow: 1.6371 ft^2

Wetted Perimeter: 3.2079 ft

Hydraulic Radius: 0.5103 ft

Average Velocity: 10.3230 ft/s

Top Width: 1.9989 ft

Froude Number: 2.0102

Critical Depth: 1.4824 ft

Critical Velocity: 6.7687 ft/s

Critical Slope: 0.0069 ft/ft

Critical Top Width: 1.75 ft

Calculated Max Shear Stress: 1.2894 lb/ft^2

Calculated Avg Shear Stress: 0.6369 lb/ft^2

Weir Inlet
Ponding Depth Calculation

Designer:	TSW
Date:	10/13/2021
Project:	Duke Nance and Patterson
Location:	Interim inlet for Lateral-B6-1

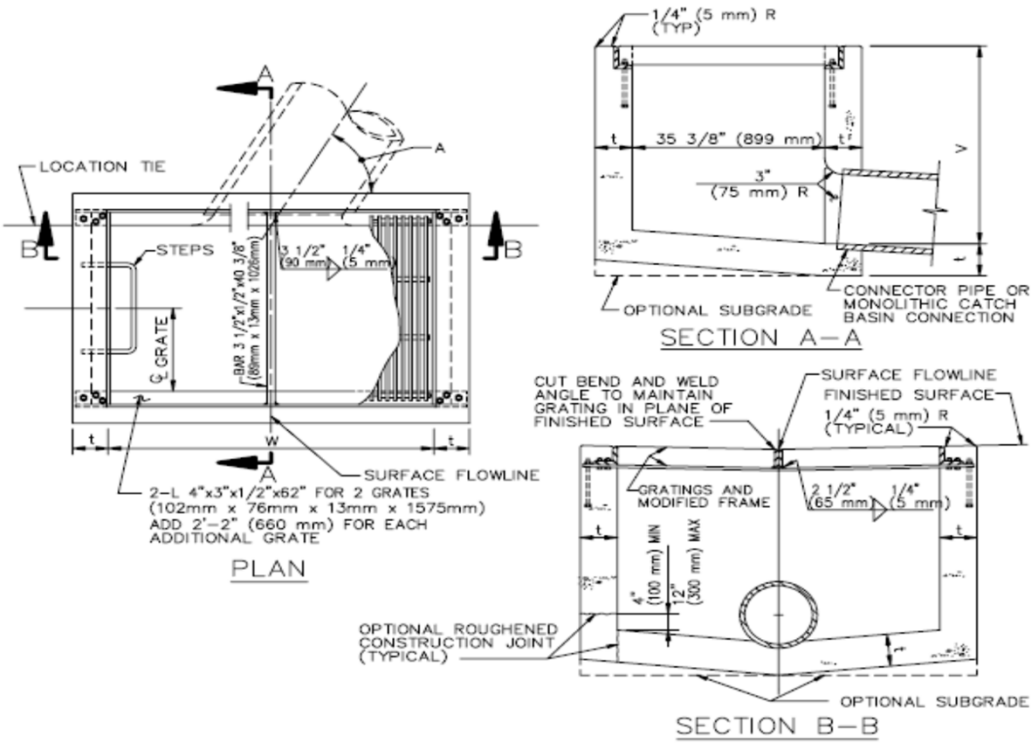
OUTLET STRUCTURE PONDING DEPTH SPPWC 305-4 (Transverse)

DISCHARGE (cfs)	16.9
NUMBER OF GRATES	3
LENGTH (ft)	20.736

$$Q = C L (h)^{3/2}$$

WEIR COEFFICIENT	C	3	
WEIR LENGTH	L	20.736	ft^2
HEAD	h	0.42	ft
Flow	Q	16.90	cfs

Top of Weir Elevation: 1496.5
Water Surface Elevation: 1496.92



LATERAL-B6-2

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LAT-B6-2

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0130

Flow: 15.0000 cfs

Result Parameters

Depth: 1.2431 ft

Area of Flow: 1.5658 ft^2

Wetted Perimeter: 3.4324 ft

Hydraulic Radius: 0.4562 ft

Average Velocity: 9.5797 ft/s

Top Width: 1.1302 ft

Froude Number: 1.4343

Critical Depth: 1.4055 ft

Critical Velocity: 8.7178 ft/s

Critical Slope: 0.0176 ft/ft

Critical Top Width: 0.73 ft

Calculated Max Shear Stress: 1.5514 lb/ft^2

Calculated Avg Shear Stress: 0.5693 lb/ft^2

LATERAL-B6-3 AND INLET

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LAT-B6-3

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0130

Flow: 36.4000 cfs

Result Parameters

Depth: 1.8326 ft

Area of Flow: 3.8563 ft^2

Wetted Perimeter: 5.1391 ft

Hydraulic Radius: 0.7504 ft

Average Velocity: 9.4391 ft/s

Top Width: 2.2118 ft

Froude Number: 1.2598

Critical Depth: 2.0447 ft

Critical Velocity: 8.4697 ft/s

Critical Slope: 0.0079 ft/ft

Critical Top Width: 1.93 ft

Calculated Max Shear Stress: 1.1435 lb/ft^2

Calculated Avg Shear Stress: 0.4682 lb/ft^2

Weir Inlet
Ponding Depth Calculation

Designer:	TSW
Date:	10/13/2021
Project:	Duke Nance and Patterson
Location:	Interim inlet for Lateral-B6-3

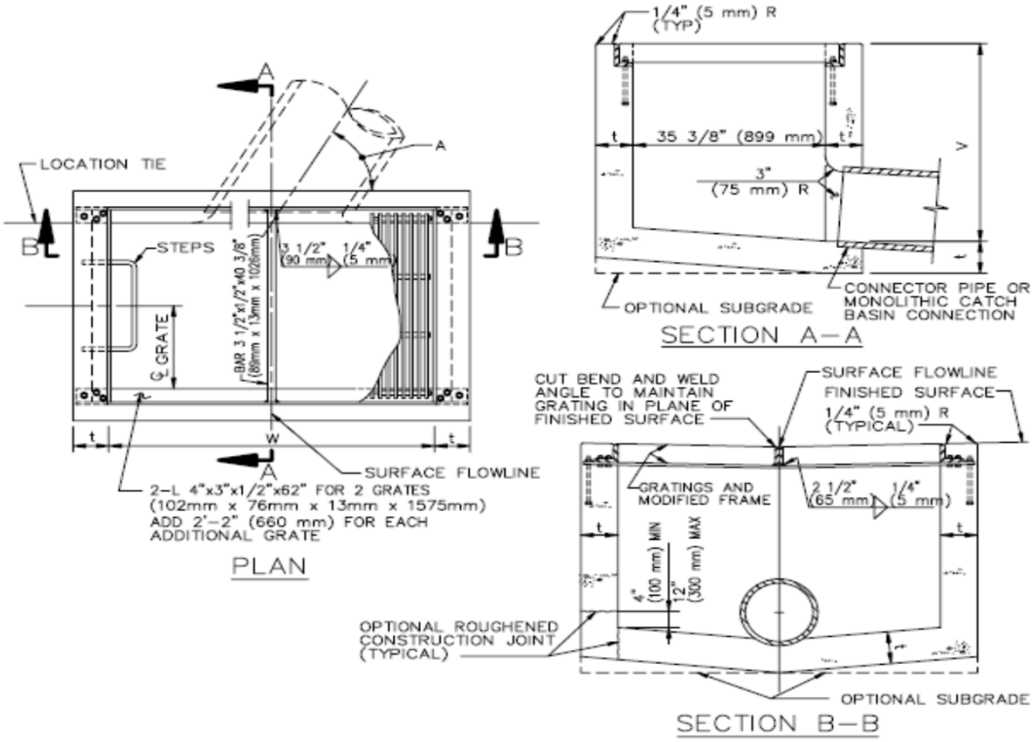
OUTLET STRUCTURE PONDING DEPTH SPPWC 305-4 (Transverse)

DISCHARGE (cfs)	36.4
NUMBER OF GRATES	8
LENGTH (ft)	52.021

$$Q = C L (h)^{3/2}$$

WEIR COEFFICIENT	C	3	
WEIR LENGTH	L	52.021	ft^2
HEAD	h	0.38	ft
Flow	Q	36.40	cfs

Top of Weir Elevation: 1498.2
Water Surface Elevation: 1498.58



LATERAL-B6.1

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Wednesday, October 13, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LAT-B61

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 4.0000 ft

Longitudinal Slope: 0.0040 ft/ft

Manning's n: 0.0130

Flow: 80.0000 cfs

Result Parameters

Depth: 2.9137 ft

Area of Flow: 9.8064 ft^2

Wetted Perimeter: 8.1809 ft

Hydraulic Radius: 1.1987 ft

Average Velocity: 8.1579 ft/s

Top Width: 3.5582 ft

Froude Number: 0.8660

Critical Depth: 2.7090 ft

Critical Velocity: 8.8314 ft/s

Critical Slope: 0.0048 ft/ft

Critical Top Width: 3.74 ft

Calculated Max Shear Stress: 0.7272 lb/ft^2

Calculated Avg Shear Stress: 0.2992 lb/ft^2

APPENDIX C – REFERENCES

CALTRANS RCB TECHNICAL MEMO

ALBERT A. WEBB ASSOCIATES

Memorandum

To: WHOM IT MAY CONCERN

From: Eric T. Hays, PE. Senior Engineer

Date: October 4, 2021

Re: Revised Existing CALTRANS Storm Drain Capacity Analysis

REGISTERED PROFESSIONAL ENGINEER ERIC T. HAYS NO. C73614 CIVIL STATE OF CALIFORNIA

10/4/21

INTRODUCTION

The purpose of this memorandum is to document the capacity analysis that runs along Harley Knox Blvd. A future industrial building will propose to connect to the existing CALTRANS RCB east of Patterson Ave. This memorandum will document the flows tributary to the CALTRANS facilities west of the I-215 freeway, hereon referred as Connection Points 1, 2, and 3 (see Figure 1 and Exhibit 1). This memorandum will also

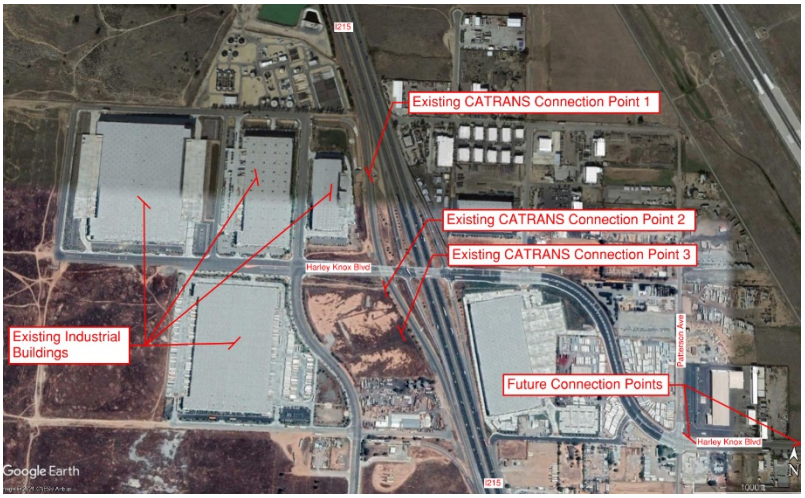


Figure 1 Vicinity Map

assess the inflows east of I-215 Freeway that are tributary to the CALTRANS facility that runs parallel to Harley Knox east of Patterson Ave. This will be accomplished by documenting the flows from the industrial developments, streets, and local hydrology. Hydrology studies have been prepared in the area. Selected pages from the approved Knox Logistics Center Hydrology Report are included in Appendix 1. For locations of the Connection Points 1, 2, and 3 existing facilities and local hydrology areas, see Exhibit 1- Existing CALTRANS Facility Inlet Points. Lastly, this memorandum will determine the available capacity of the CALTRANS facility via an iterative hydraulic analysis.

EXISTING DRAINAGE FACILITIES

Currently the area to the west of the I-215 is almost completely built out except for one property bounded by Harley Knox, Harvill Ave, and Old Oleander Ave. The ultimate drainage facilities that have been constructed in the area connect into the existing CALTRANS facilities shown in Exhibit 1 as Connection Points 1 and 2.

Also see Appendix 1, Figure 2, for photos of each connection point. Below are the existing facilities that connect to Connection Points 1, 2 and 3:

- Connection Point 1 – Line B per RCFC&WCD approved Drawing No. 4-1061
    - Existing (2) 54" RCP @ Railroad & 5'(W)x3'(H) RCB @ I-215 Freeway
- Connection Point 2 – Lateral B-8 per RCFC&WCD approved Drawing No. 4-1060
    - Existing (2) 42" RCP @ Railroad & 5'(W)x4'(H) RCB @ I-215 Freeway
- Connection Point 3 – Future developed industrial center
    - Existing (2) 36" RCP @ Railroad & 6'(W)x4'(H) RCB @ I-215 Freeway

To understand the design capacity of Connection Points 1, 2, and 3, US Federal Highway Administration (FHWA) Nomographs were utilized. Exhibit 1 references the picture numbers that correlate to Figure 2 in Appendix 1. The corresponding nomograph calculations can also be found in Appendix 1.

On the east side of I-215 Freeway the existing facilities are considered ultimate due to the area being completely built out. The existing facilities include CATRANS and City of Perris maintained drainage facilities. These facilities are shown in Exhibit 1 and are outlined below:

- 8'(W)x6'(H) & 8'(W)x7'(H) RCB per CALTRANS Plans ACNH-215-1(220)87E
    - Alignment – Flows north to south along Patterson Ave and west to east along Harley Knox
    - Inlets-2 inlets along Patterson Ave north of Harley Knox
- 5'(W)x2'(H) RCB CALTRANS per CALTRANS Plans 076461 D-20 & D-52
    - Alignment is perpendicular to Harley Knox– Flows west to east
    - Connection with Gateway Commerce Center onsite basin
- Line A – 24" RCP PER City of Perris approved plans City File No. P8-1271
- Lateral A2– 36" RCP PER City of Perris approved plans City File No. P8-1271

Relevant Plan sheets have been included in Appendix 2 for reference. The Gateway Commerce existing and proposed Hydrology Maps are included for reference in Appendix 2 as well.

Flow Rate Assessment & Local Hydrology

To understand the inflows into Connection Points (1, 2, and 3), flows from the Railroad/Freeway area, and the flows from existing facilities located on the east of the I-215, a flow rate assessment was conducted. The flows were primarily obtained from approved as-built plans for Connection Points 1 and 2. There are 3 locations that required local hydrology calculations which can be found in Appendix 1. The first location is a future industrial development located on the west side of the I-215 freeway and is bounded by Harley Knox, Harvill Ave and Old Oleander Ave. This area required local hydrology calculation using an area yield of 2.1 cfs/acre which is consistent with the adjacent industrial buildings. See Appendix 1 for the future industrial building yield calculation backup. This area contributes flows to Connection Point 3. The second location is the railroad and I-215 Freeway contribution, with an area yield of 3 cfs/acre. This area also contributes flows to Connection Point 3. The third location is on the east side of I-215 Freeway bounded by Harley Knox and Patterson Ave, this area receives flow from the CALTRANS culvert under Harley Knox and flows to two inlets located within Patterson Ave right of way. This analysis also assumed that flow generated from the property is also picked up in the two inlets that connect to the CALTRANS facility. The area yield for this location was assumed to be 2 cfs/acre. See Exhibit 1 for additional information and Table 1 below for summary of the flow contributions. There are 3 inlets along Harley Knox east of the Patterson Ave intersection. Each of the 3 inlets picks up street and local property drainage. The total flow contribution for the 3 inlets are detailed in Table 1 and Exhibit 1.

Table 1, Inflow rate to CALTRANS facility within Harley Knox Right of Way.

Inflow Rates		
Connection Point	Facility	Q [cfs]
1	(2) 5'(W)X3'(H) RCB	173
2	5(W)x4'(H) RCB	195.3
3*	(2) 36" RCP	52
	6'(W)x4'(H) RCB	
Freeway & Railroad**		45
Inlets along Patterson		33.3
	LATERAL A2	30
Inlets along East Harley Knox		24
Total		552.6

The results of the local hydrology calculations and flow assessment results in a revised flow of 553 cfs. The CALTRANS design flowrate is 536cfs per the approved as-built plan located in Appendix 2. Without a capacity analysis the available capacity in the CALTRANS 8'(W)x7'(H) RCB is 0 cfs at the point of the future connection. It should be noted that the CALTRANS design flow has 1.5 feet of freeboard within the most upstream connection. See Appendix 2 for annotations.

Capacity Analysis

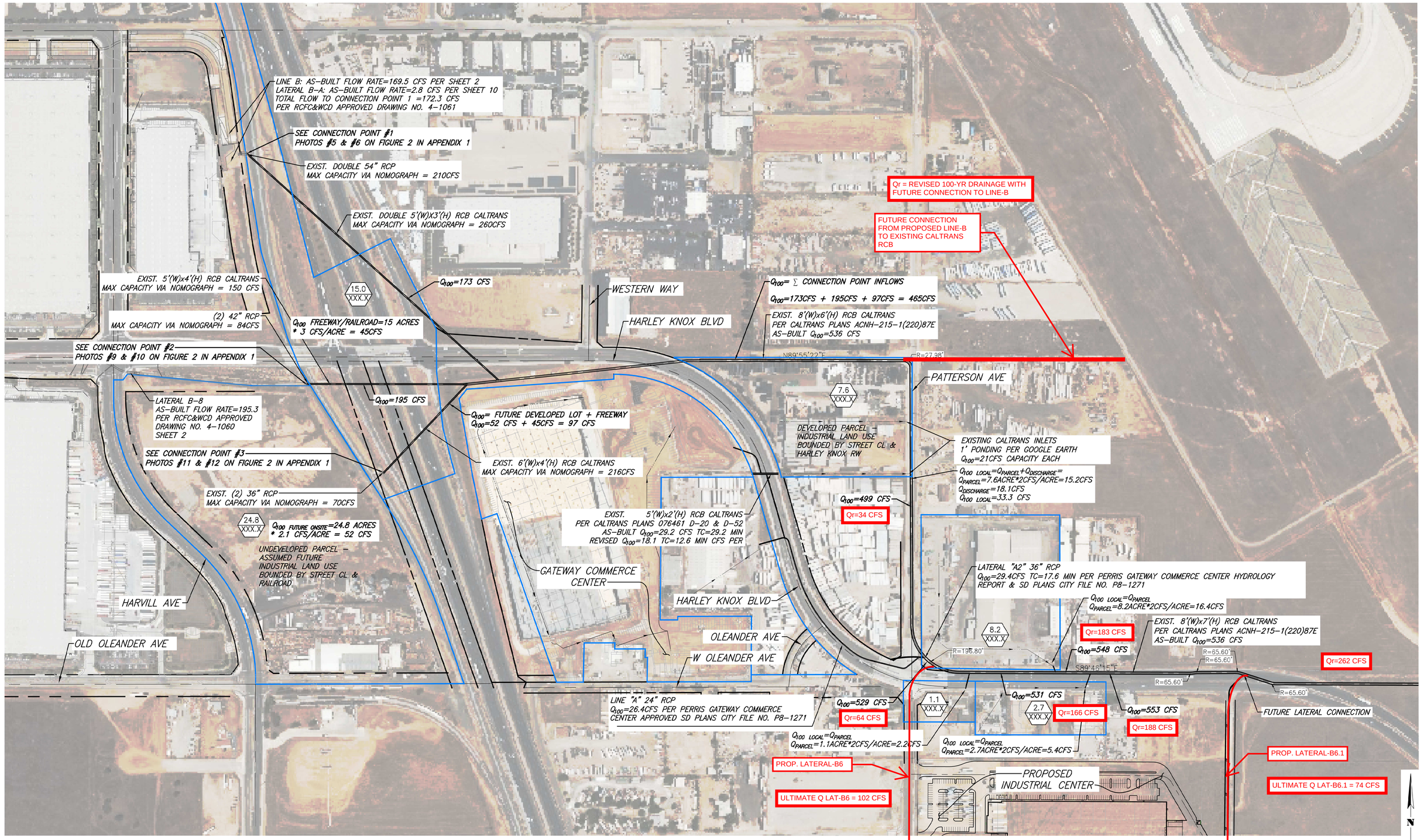
To assess the excess capacity of the CALTRANS 8'(W)x6'(H) RCB along Patterson Ave and CALTRANS 8'(W)x7'(H) RCB that runs parallel north of the Harley Knox centerline, a WSPG model was built. The model converts the metric units to US units and was iteratively ran with increasing flows. The goal was to understand what the maximum flow is without causing the RCB to seal in the 100-year event. The iterative WSPG analysis can be found in Appendix 3. Based on the results the maximum capacity for the CALTRANS RCB facility is 600 cfs. With a flow rate of 600 cfs there is still approximately 5” of freeboard available within the RCB. Therefore, the available capacity is the difference between the revised flow rate and the WSPG max capacity. Based on this assumption, the available capacity is 71 cfs [600cfs-553cfs= 47cfs].

Conclusion

Based on this analysis, the following items are concluded:

- The As-built flow rate in the Caltrans RCB is 536 CFS
- The actual flow rate based on this analysis is 553 cfs
- The max capacity of the CALTRANS RCB is 600cfs assuming 5" freeboard at upstream end.
- The available capacity is 0 CFS based on the As-built flow rate
- The available capacity is 47 cfs based on the excess capacity analysis.

EXHIBIT 1



PRELIMINARY

EXHIBIT 1
EXISTING CALTRANS FACILITY INLET POINTS

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE, CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

W.O. Work Order
SHEET 1 OF 1 SHEETS

H:\2020\20 02311\DRAINAGE\CALTRANS CAPACITY ANALYSIS\FIGURE 2.DWG 10/4/2021 7:20:33 AM

APPENDIX 1

Figure 2

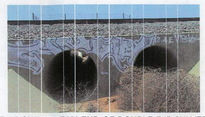
PLOT PLAN 20699R - TRAMMELL CROW BUSINESS PARK

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

FIELD RECONAISSANCE MAP

#1 - CHANNEL AGAINST FENCE

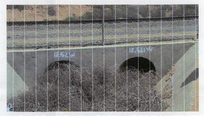
#2 - RAILROAD FACING NORTH



#5 - DOWNSTREAM END OF DOUBLE 54" CULVERT

#6 - DOUBLE 3FT HEIGHT BY 5FT WIDE RCB CROSSING RAILROAD FACING EAST

#9 - SINGLE 4FT HEIGHT BY 6FT WIDE RCB FACING EAST



#10 - DOUBLE 42IN PIPE UNDER RAILROAD FACING EAST

#13 - DOUBLE 36IN PIPE AT THE UPSTREAM END FACING EAST

#14 - EROSION AT DOUBLE 36IN PIPE FACING NORTH

#17 - LOOKING UPSTREAM FROM HARVILL AVE FACING NORTH WEST

#18 - SINGLE 42IN PIPE CROSSING HARVILL AVE FACING NORTH EAST

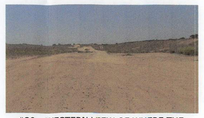
#21 - LOOKING UPSTREAM AT OLEANDER AVE AND HARVILL AVE FACING WEST

#22 - SINGLE 36IN PIPE AT HARVILLE AVE AND OLEANDER AVE FACING SOUTH

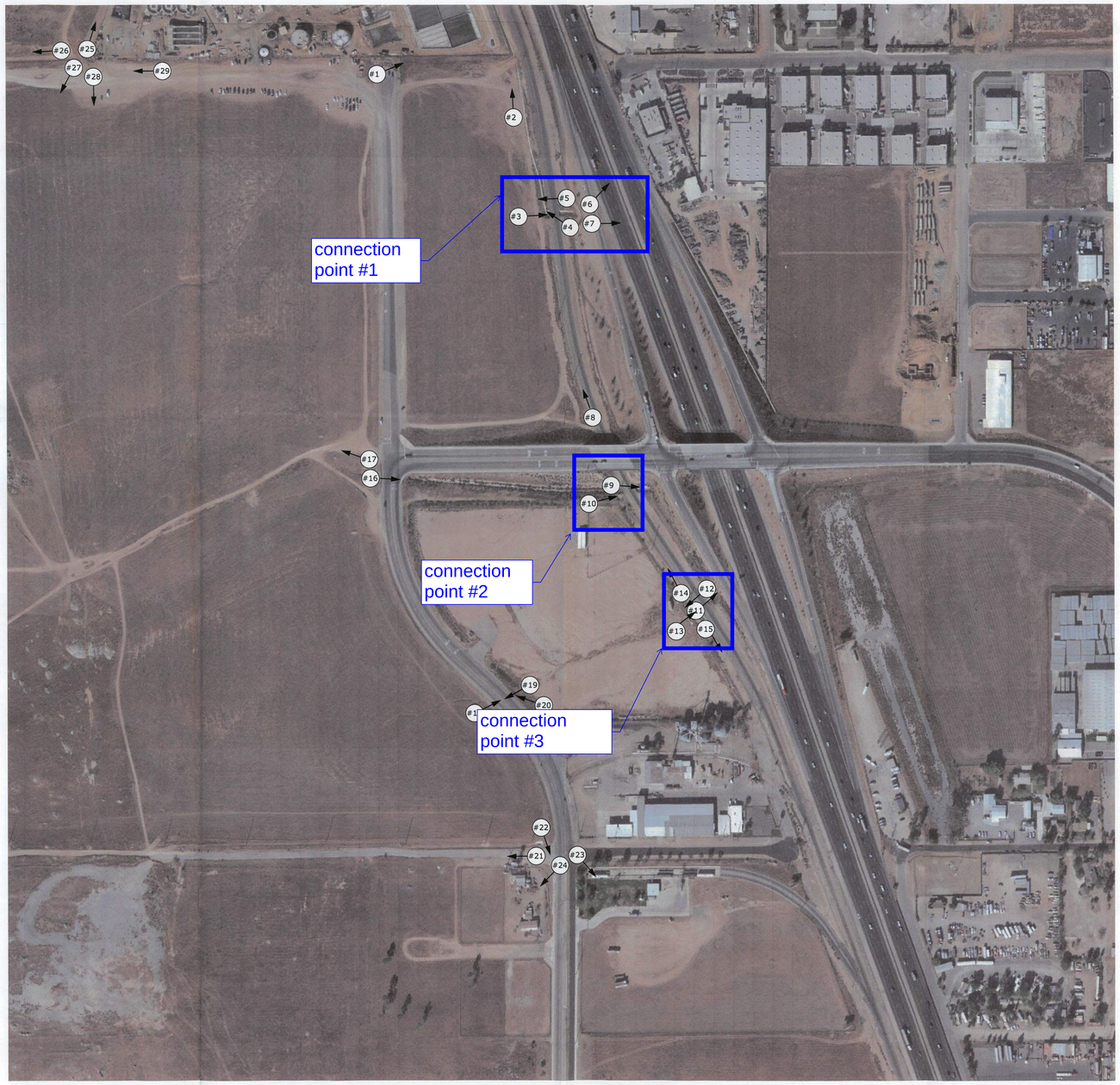
#25 - NORTHEASTERN PANORAMIC VIEW OF WHERE FLOWS POSSIBLY SPLIT

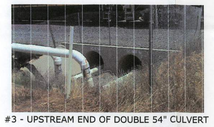
#26 - WESTERN PANORAMIC VIEW OF WHERE FLOWS POSSIBLY SPLIT

#28 - SOUTHERN PANORAMIC VIEW OF WHERE THE FLOWS POSSIBLY SPLIT



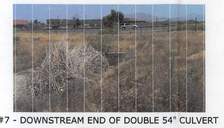
#29 - WESTERN VIEW OF WHERE THE FLOWS POSSIBLY SPLIT





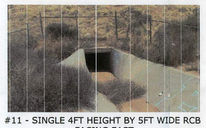
#3 - UPSTREAM END OF DOUBLE 54" CULVERT CROSSING RAILROAD FACEING EAST

#4 - WATER PIPES FROM WATER TREAMENT PLANT

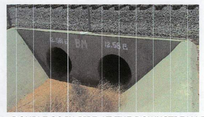


#7 - DOWNSTREAM END OF DOUBLE 54" CULVERT FACING EAST

#8 - NORTH VIEW ALONG RAILROAD



#11 - SINGLE 4FT HEIGHT BY 5FT WIDE RCB FACING EAST



#12 - DOUBLE 36 IN PIPE AT THE DOWNSTREAM END FACING WEST

#15 - EROSION AT DOUBLE 36IN PIPE FACING SOUTH

#16 - DOUBLE 54IN PIPE CROSSING HARVILL AVE FACING SOUTHEAST

#19 - DOWNSTREAM END OF SINGLE 42IN PIPE CROSSING HARVILL AVE FACING SOUTHWEST

#20 - DOWNSTREAM END OF SINGLE 42IN PIPE CROSSING HARVILL AVE FACING WEST

#23 - CATCH BASIN ON HARVILLE AVE AND AND OLEANDER AVE FACING SOUTHEAST

#24 - CATCH BASIN ON HARVILL AVE AND OLEANDER AVE FACNING SOUTHWEST

#27 - SOUTHWESTERN PANORAMIC VIEW OF WHERE THE FLOWS POSSIBLY SPLIT

N

GRAPHIC SCALE
150' 0 75' 150' 300'
1" = 150'

JLC Engineering & Consulting, Inc.
40040 COLISEUM WAY
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "I"

PLOT PLAN 20699RI

FIELD RECONAISSANCE MAP

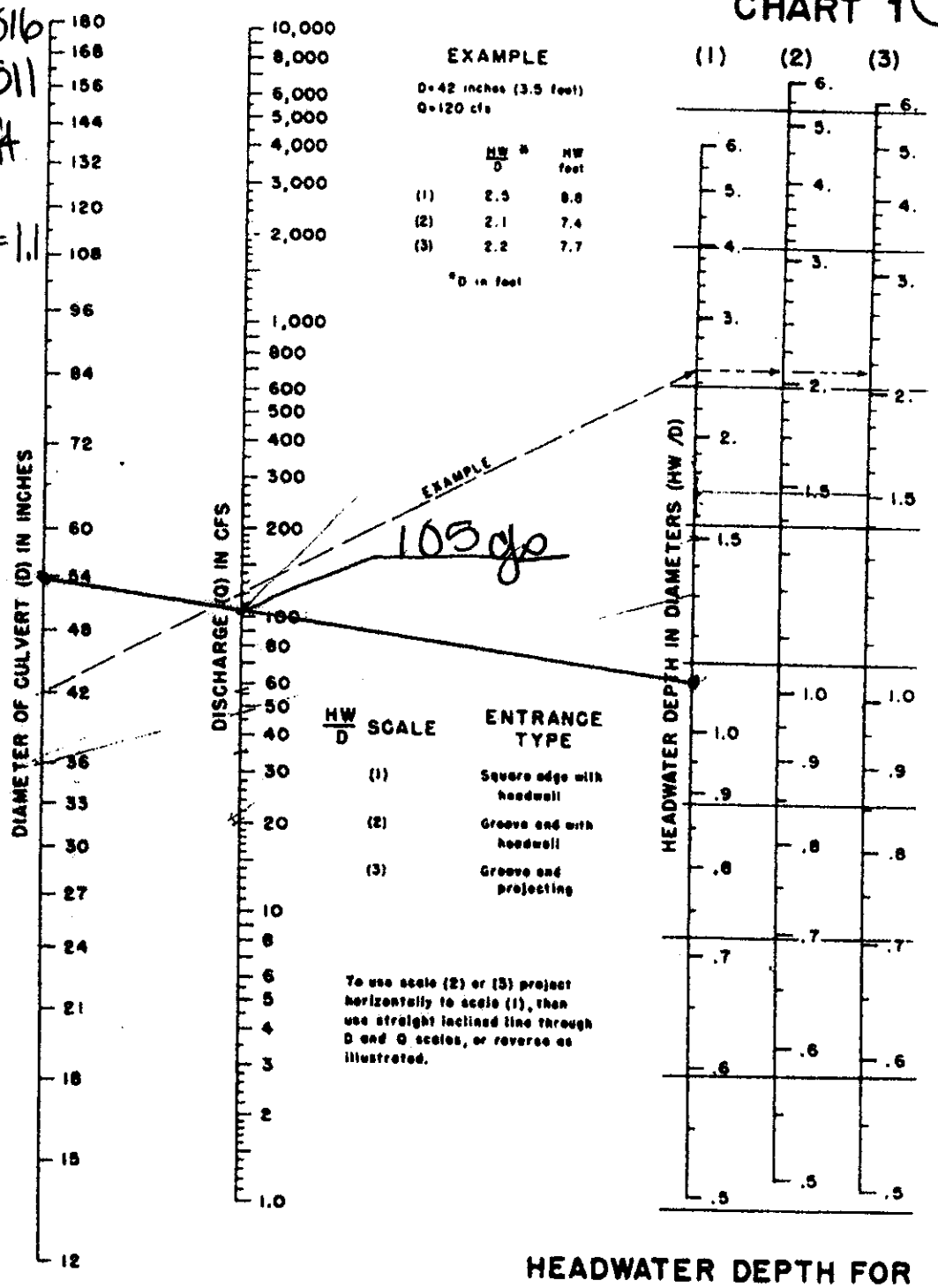
DBL 54" crossing RR

PHOTO 5

Max Elev. = 1516
Inv. Elev. = 1511
Max H = 5 ft

$\frac{HW}{D} = \frac{5}{4.5} = 1.1$

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2 & 3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN 1963

181

DBL 54" capacity
= 105 cfs * 2 = 210 cfs

DBL 3' H X 5' W D.S. of DBL 54"

PHOTO 6

Max Elev. = 1514

Inv. Elev. = 1509

Max H = 5'

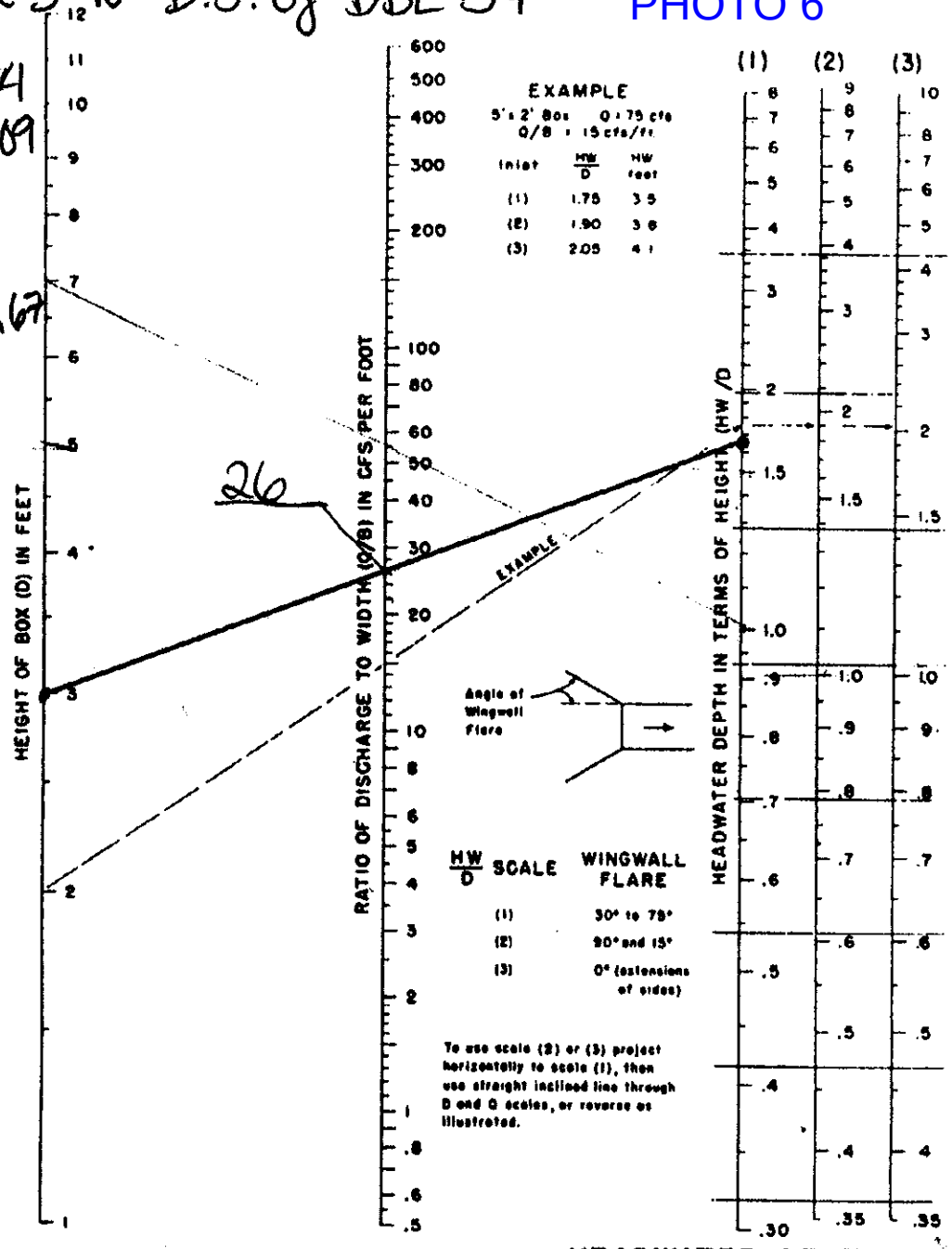
$\frac{HW}{D} = \frac{5}{3} = 1.67$

$\frac{Q}{B} = 26$

Q = 26 * B

Q = 26 * 5

Q = 130 cfs



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN 1963

DBL 3' H X 5' W Capacity

= 130 cfs * 2 = $\boxed{260 \text{ cfs}}$

~~$Q_{BOX} > Q_{PIPE}$ so DBL 54" pipes control~~

DBL 42" crossing Railroad

PHOTO 10

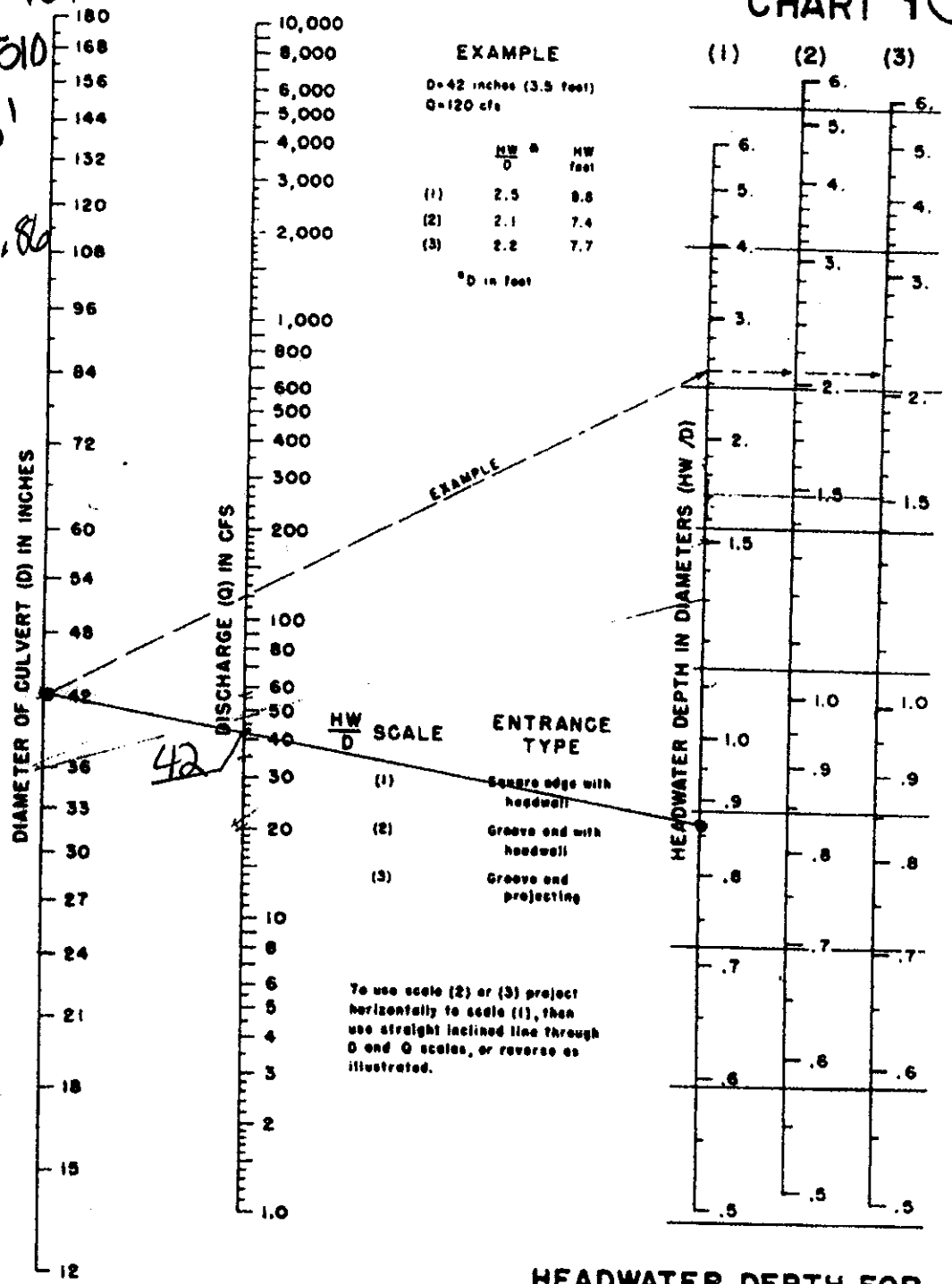
Max Elev. = 1513

Inv. Elev. = 1510

Max H = 3'

$\frac{HW}{D} = \frac{3}{3.5} = .86$

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN 1963

DBL 42" Capacity

= 42 cfs * 2 = 84 cfs

4' H x 6' W Box Crossing 215 PHOTO 11

Max Elev. = 1514

Inv. Elev. = 1508

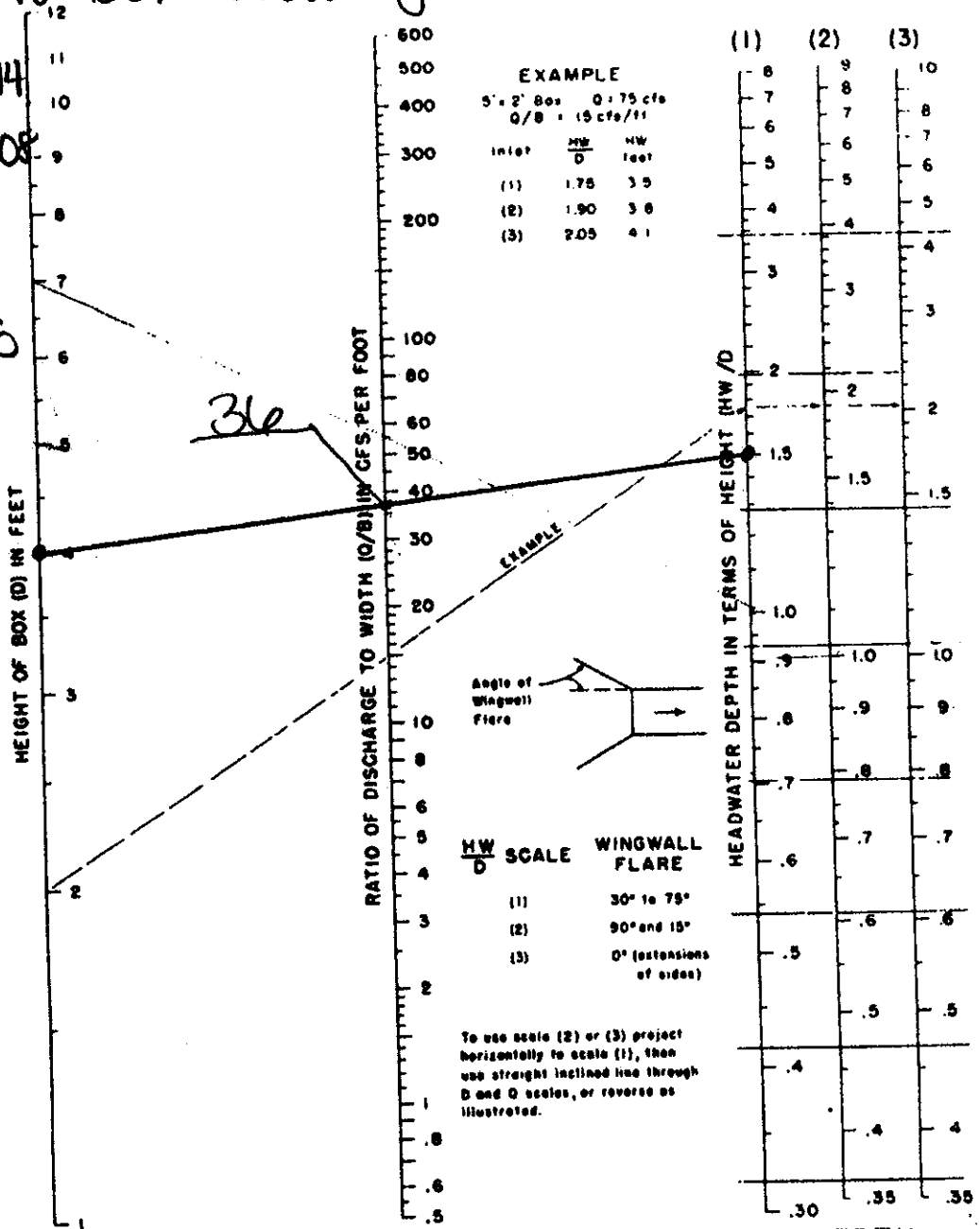
Max H = 6'

$\frac{HW}{D} = \frac{6}{4} = 1.5$

$\frac{Q}{B} = 36$

$Q = 36 * B$

$Q = 216$



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

4' H x 6' W max capacity

= 216 cfs

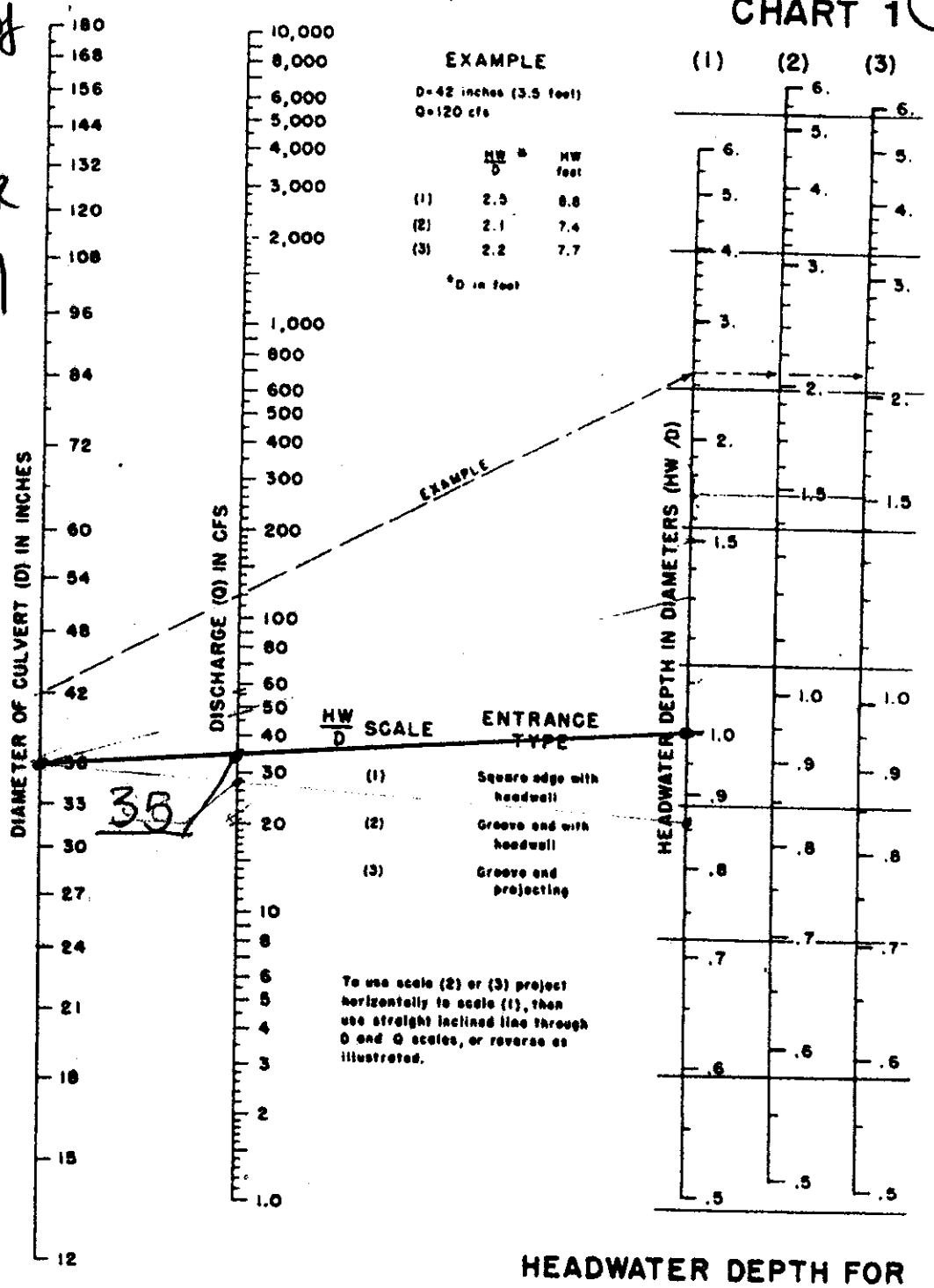
PHOTO 12

DBL 36" Crossing Rail Road

Since elevations are unknown, will use lowest H of 36 for facilities crossing RR

$\frac{HW}{D} = \frac{3}{3} = 1$

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN 1963

181

DBL 36" Capacity
= 35 cfs * 2 = $\boxed{70 \text{ cfs}}$

4' H x 5' W Box Crossing Freeway PHOTO 9

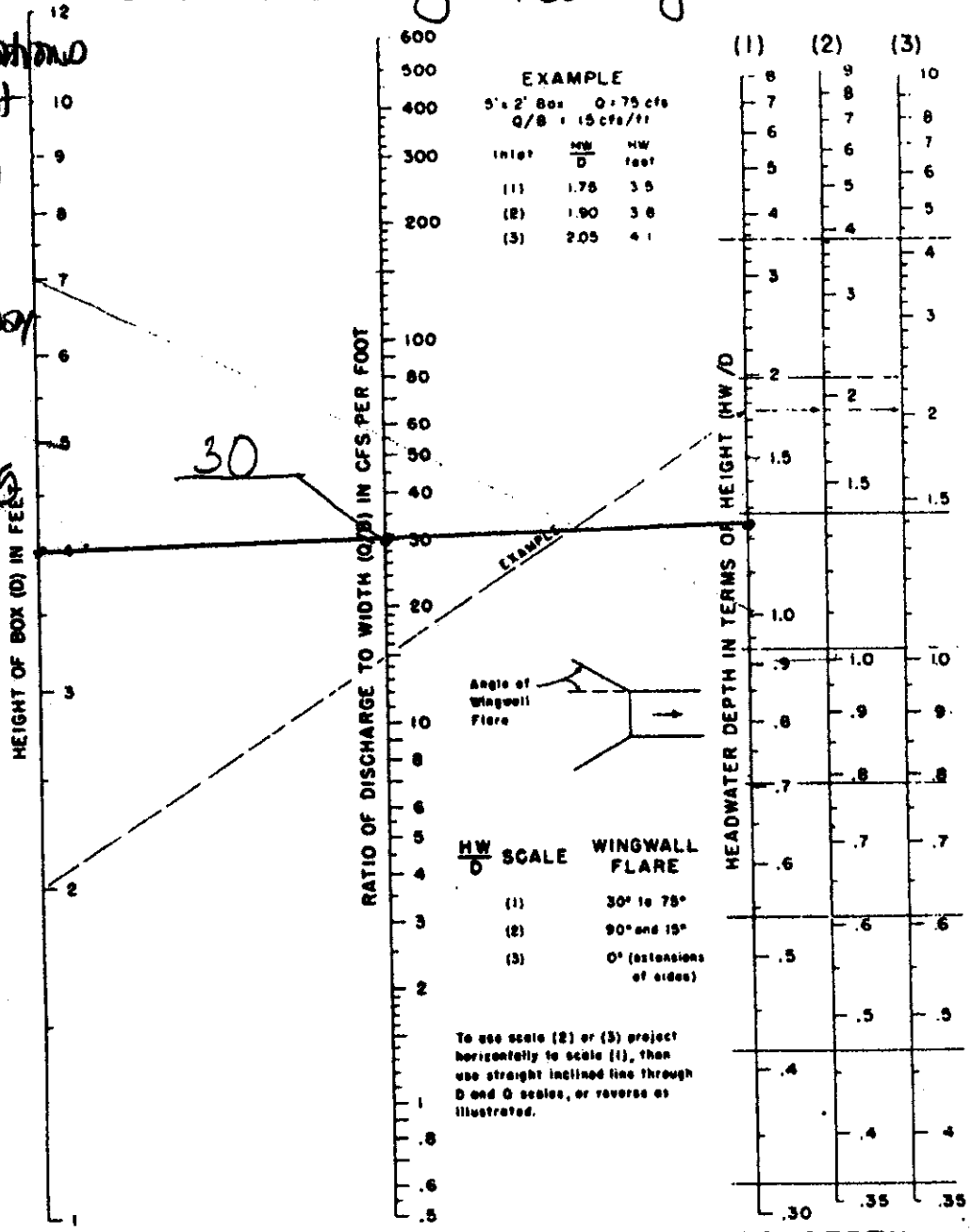
Unknown elevations
Assume lowest
H of other
facilities
Crossing freeway
of 55

$\frac{HW}{D} = \frac{5}{4} = 1.25$

$\frac{Q}{B} = 30$

$Q = 30 * B$

$Q = 150$



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Max Capacity for
4' H x 5' W = 150 cfs

Knox Logistics Center

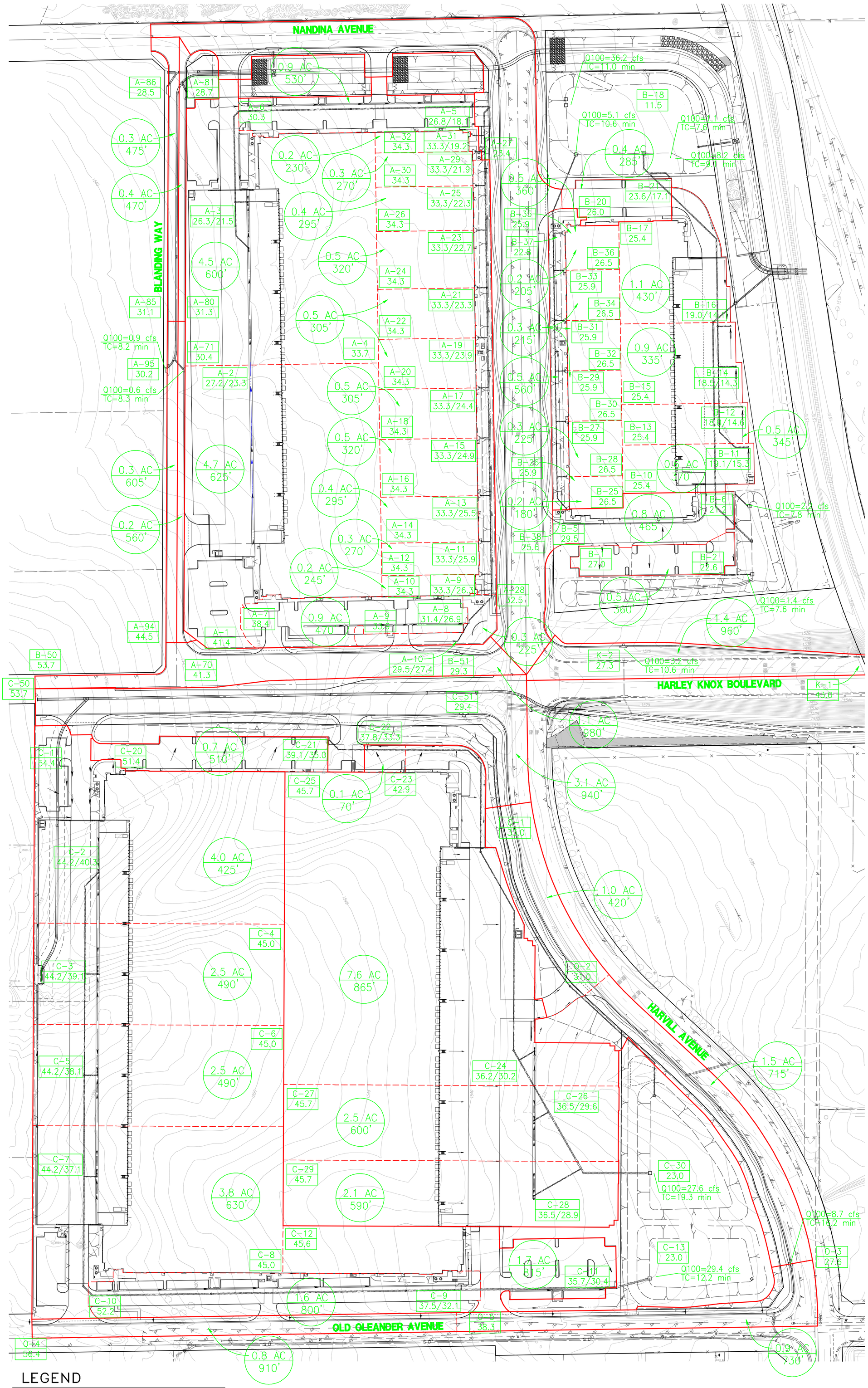
Drainage Study

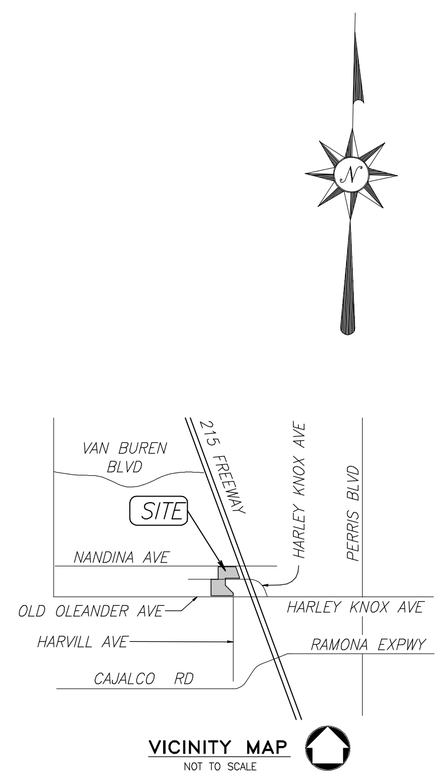
Prepared for
Trammell Crow Company

Unincorporated Area West of the City of Perris, Riverside County, California

October 2012

TRAMMELL CROW BUSINESS CENTER
ULTIMATE HYDROLOGY MAP





VICINITY MAP
NOT TO SCALE

GRAPHIC SCALE 1"=200'
0 200 400 600

LEGEND

- HYDROLOGIC BOUNDARY
- DRAINAGE AREA (SUBAREA)
- FLOW DIRECTION
- 94 / 45.0 — NODE / ELEVATION
- 98.6 AC / 1834' — ACREAGE / FLOW DISTANCE

SEAL: REGISTERED PROFESSIONAL ENGINEER — MATTHEW L. ARELLANO — NO. C74749 — CIVIL — STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
3788 McCRAY STREET
RIVERSIDE, CA 92506
(951) 686-1070

APPROVED BY _____ DATE _____
R.C.E. NO. C74749

SCALE: 1"=80'
DATE: Mar 2012

COUNTY OF RIVERSIDE

HYDROLOGY MAP FOR:
TRAMMELL CROW BUSINESS CENTER

FOR: TRAMMELL CROW COMPANY

W.O. 11-0054

SHEET 1 OF 1 SHEETS

DWG. NO. 11-0054HY.pro

G:\2011\11-0054\HYD\11-0054HY.pro|3/7/2012|9:08:55AM

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study        Date: 09/14/11  File:A.out
------------------------------------------------------------------------
11-0054     Knox Logistics Center
100-Year Rational Method Hydrology
Building A Area
mla     09-14-2011
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   625.000(Ft.)
Top (of initial area) elevation =    41.400(Ft.)
Bottom (of initial area) elevation =    27.200(Ft.)
Difference in elevation =    14.200(Ft.)
Slope =    0.02272  s(percent)=       2.27
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.398 min.
Rainfall intensity =      2.935(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     12.206(CFS)
Total initial stream area =        4.700(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =    23.300(Ft.)
Downstream point/station elevation =    21.500(Ft.)
Pipe length  =   350.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    12.206(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.206(CFS)
Normal flow depth in pipe =   17.06(In.)
Flow top width inside pipe =   16.39(In.)
Critical Depth =   15.64(In.)
Pipe flow velocity =      5.83(Ft/s)
Travel time through pipe =    1.00 min.
Time of concentration (TC) =     9.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.700(Ac.)
Runoff from this stream =     12.206(CFS)
Time of concentration =    9.40 min.
Rainfall intensity =     2.778(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   600.000(Ft.)
Top (of initial area) elevation =    33.700(Ft.)
Bottom (of initial area) elevation =    26.300(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.01233  s(percent)=       1.23
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.336 min.
Rainfall intensity =      2.787(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.088(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =     11.088(CFS)
Time of concentration =    9.34 min.
Rainfall intensity =     2.787(In/Hr)
Summary of stream data:

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


1       12.206      9.40               2.778
2       11.088      9.34               2.787
```

```
Largest stream flow has longer time of concentration
Qp =     12.206 + sum of
          Qb         Ia/Ib
          11.088 *    0.997 =     11.052
Qp =     23.258

Total of 2 main streams to confluence:
Flow rates before confluence point:
      12.206      11.088
Area of streams before confluence:
        4.700        4.500


Results of confluence:
Total flow rate =     23.258(CFS)
Time of concentration =     9.398 min.
Effective stream area after confluence  =      9.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    21.500(Ft.)
Downstream point/station elevation =    18.100(Ft.)
Pipe length  =   675.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    23.258(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    23.258(CFS)
Normal flow depth in pipe =   21.56(In.)
Flow top width inside pipe =   21.66(In.)
Critical Depth =   20.25(In.)
Pipe flow velocity =      6.83(Ft/s)
Travel time through pipe =    1.65 min.
Time of concentration (TC) =    11.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.200(Ac.)
Runoff from this stream =     23.258(CFS)
Time of concentration =   11.05 min.
Rainfall intensity =     2.566(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   530.000(Ft.)
Top (of initial area) elevation =    30.300(Ft.)
Bottom (of initial area) elevation =    26.800(Ft.)
Difference in elevation =     3.500(Ft.)
Slope =    0.00660  s(percent)=       0.66
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.066 min.
Rainfall intensity =      2.686(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.61
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.135(CFS)
```

```
Total initial stream area =        0.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.900(Ac.)
Runoff from this stream =      2.135(CFS)
Time of concentration =   10.07 min.
Rainfall intensity =     2.686(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =    38.400(Ft.)
Bottom (of initial area) elevation =    31.400(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.01489  s(percent)=       1.49
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.154 min.
Rainfall intensity =      2.978(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.372(CFS)
Total initial stream area =        0.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.900(Ac.)
Runoff from this stream =      2.372(CFS)
Time of concentration =    8.15 min.
Rainfall intensity =     2.978(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   225.000(Ft.)
Top (of initial area) elevation =    33.900(Ft.)
Bottom (of initial area) elevation =    29.500(Ft.)
Difference in elevation =     4.400(Ft.)
Slope =    0.01956  s(percent)=       1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.751 min.
Rainfall intensity =      3.534(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.940(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    27.400(Ft.)
Downstream point/station elevation =    26.900(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.940(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.940(CFS)
Normal flow depth in pipe =    4.63(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.33(In.)
Pipe flow velocity =      4.10(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     5.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.940(CFS)
Time of concentration =    5.95 min.
Rainfall intensity =     3.474(In/Hr)
Summary of stream data:

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


1        2.372      8.15                 2.978
2        0.940      5.95                 3.474
Largest stream flow has longer time of concentration
Qp =      2.372 + sum of
          Qb         Ia/Ib
           0.940 *    0.857 =      0.806
Qp =      3.178

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.372       0.940
Area of streams before confluence:
        0.900        0.300
Results of confluence:
Total flow rate =      3.178(CFS)
Time of concentration =     8.154 min.
Effective stream area after confluence =      1.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    26.900(Ft.)
Downstream point/station elevation =    26.300(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     3.178(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.178(CFS)
Normal flow depth in pipe =    8.74(In.)
Flow top width inside pipe =   14.79(In.)
```

```
Critical Depth =    8.61(In.)
Pipe flow velocity =      4.28(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =     8.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      1.200(Ac.)
Runoff from this stream =      3.178(CFS)
Time of concentration =    8.62 min.
Rainfall intensity =     2.898(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   245.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00408  s(percent)=       0.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.140 min.
Rainfall intensity =      2.981(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.528(CFS)
Total initial stream area =        0.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    26.300(Ft.)
Downstream point/station elevation =    25.900(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.528(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.528(CFS)
Normal flow depth in pipe =    3.90(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    3.94(In.)
Pipe flow velocity =      2.88(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =     8.55 min.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Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.200(Ac.)
Runoff from this stream =      0.528(CFS)
Time of concentration =    8.55 min.
Rainfall intensity =     2.910(In/Hr)
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Process from Point/Station       12.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00370  s(percent)=       0.37
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.629 min.
Rainfall intensity =      2.897(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.769(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.769(CFS)
Time of concentration =    8.63 min.
Rainfall intensity =     2.897(In/Hr)
Summary of stream data:

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


1        0.528      8.55                 2.910
2        0.769      8.63                 2.897
Largest stream flow has longer time of concentration
Qp =      0.769 + sum of
          Qb         Ia/Ib
           0.528 *    0.995 =      0.525
Qp =      1.294

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.528       0.769
Area of streams before confluence:
        0.200        0.300
Results of confluence:
Total flow rate =      1.294(CFS)
Time of concentration =     8.629 min.
Effective stream area after confluence =      0.500(Ac.)


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Process from Point/Station       11.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    25.900(Ft.)
Downstream point/station elevation =    25.500(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.294(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.294(CFS)
Normal flow depth in pipe =    6.12(In.)
Flow top width inside pipe =   12.00(In.)
```

```
Critical Depth =    5.77(In.)
Pipe flow velocity =      3.21(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =     9.12 min.


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.294(CFS)
Time of concentration =    9.12 min.
Rainfall intensity =     2.819(In/Hr)


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Process from Point/Station       14.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   295.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00339  s(percent)=       0.34
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.099 min.
Rainfall intensity =      2.822(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.998(CFS)
Total initial stream area =        0.400(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.400(Ac.)
Runoff from this stream =      0.998(CFS)
Time of concentration =    9.10 min.
Rainfall intensity =     2.822(In/Hr)
Summary of stream data:

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


1        1.294      9.12                 2.819
2        0.998      9.10                 2.822
Largest stream flow has longer time of concentration
Qp =      1.294 + sum of
          Qb         Ia/Ib
           0.998 *    0.999 =      0.997
Qp =      2.291

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.294       0.998
Area of streams before confluence:
        0.500        0.400
Results of confluence:
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Total flow rate =      2.291(CFS)
Time of concentration =     9.121 min.
Effective stream area after confluence =      0.900(Ac.)


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Process from Point/Station       13.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    25.500(Ft.)
Downstream point/station elevation =    24.900(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     2.291(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.291(CFS)
Normal flow depth in pipe =    8.41(In.)
Flow top width inside pipe =   10.99(In.)
Critical Depth =    7.77(In.)
Pipe flow velocity =      3.89(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     9.63 min.


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Process from Point/Station       15.000 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.900(Ac.)
Runoff from this stream =      2.291(CFS)
Time of concentration =    9.63 min.
Rainfall intensity =     2.744(In/Hr)


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Process from Point/Station       16.000 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00313  s(percent)=       0.31
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.555 min.
Rainfall intensity =      2.756(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.218(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       15.000 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.218(CFS)
Time of concentration =    9.55 min.
Rainfall intensity =     2.756(In/Hr)
Summary of stream data:

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


1        2.291      9.63                 2.744
2        1.218      9.55                 2.756
Largest stream flow has longer time of concentration
Qp =      2.291 + sum of
          Qb         Ia/Ib
           1.218 *    0.996 =      1.213
Qp =      3.504

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.291       1.218
Area of streams before confluence:
        0.900        0.500
Results of confluence:
Total flow rate =      3.504(CFS)
Time of concentration =     9.635 min.
Effective stream area after confluence =      1.400(Ac.)


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Process from Point/Station       15.000 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    24.900(Ft.)
Downstream point/station elevation =    24.400(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     3.504(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.504(CFS)
Normal flow depth in pipe =    9.47(In.)
Flow top width inside pipe =   14.47(In.)
Critical Depth =    9.06(In.)
Pipe flow velocity =      4.29(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    10.04 min.


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Process from Point/Station       17.000 to Point/Station       17.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      1.400(Ac.)
Runoff from this stream =      3.504(CFS)
Time of concentration =   10.04 min.
Rainfall intensity =     2.689(In/Hr)


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Process from Point/Station       18.000 to Point/Station       17.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   305.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00328  s(percent)=       0.33
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.283 min.
Rainfall intensity =      2.795(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
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Initial subarea runoff =      1.235(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       17.000 to Point/Station       17.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.235(CFS)
Time of concentration =    9.28 min.
Rainfall intensity =     2.795(In/Hr)
Summary of stream data:

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


1        3.504     10.04                 2.689
2        1.235      9.28                 2.795
Largest stream flow has longer time of concentration
Qp =      3.504 + sum of
         Qb         Ia/Ib
          1.235 *    0.962 =      1.189
Qp =      4.692

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.504       1.235
Area of streams before confluence:
        1.400        0.500
Results of confluence:
Total flow rate =      4.692(CFS)
Time of concentration =    10.043 min.
Effective stream area after confluence =      1.900(Ac.)


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Process from Point/Station       17.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    24.400(Ft.)
Downstream point/station elevation =    23.900(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     4.692(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.692(CFS)
Normal flow depth in pipe =   11.93(In.)
Flow top width inside pipe =   12.10(In.)
Critical Depth =   10.54(In.)
Pipe flow velocity =      4.48(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    10.43 min.


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      1.900(Ac.)
Runoff from this stream =      4.692(CFS)
Time of concentration =   10.43 min.
Rainfall intensity =     2.639(In/Hr)


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Process from Point/Station       20.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
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____________________________________________________________________
Initial area flow distance =   305.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00328  s(percent)=       0.33
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.283 min.
Rainfall intensity =      2.795(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.235(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.235(CFS)
Time of concentration =    9.28 min.
Rainfall intensity =     2.795(In/Hr)
Summary of stream data:

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


1        4.692     10.43                 2.639
2        1.235      9.28                 2.795
Largest stream flow has longer time of concentration
Qp =      4.692 + sum of
          Qb         Ia/Ib
           1.235 *    0.944 =      1.167
Qp =      5.859

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.692       1.235
Area of streams before confluence:
        1.900        0.500
Results of confluence:
Total flow rate =      5.859(CFS)
Time of concentration =    10.433 min.
Effective stream area after confluence =      2.400(Ac.)


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Process from Point/Station       19.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =    23.900(Ft.)
Downstream point/station elevation =    23.300(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     5.859(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.859(CFS)
Normal flow depth in pipe =   10.90(In.)
Flow top width inside pipe =   17.59(In.)
Critical Depth =   11.21(In.)
Pipe flow velocity =      5.24(Ft/s)
Travel time through pipe =    0.33 min.
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Time of concentration (TC) =    10.77 min.


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Process from Point/Station       21.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      2.400(Ac.)
Runoff from this stream =      5.859(CFS)
Time of concentration =   10.77 min.
Rainfall intensity =     2.599(In/Hr)


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Process from Point/Station       22.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   305.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00328  s(percent)=       0.33
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.283 min.
Rainfall intensity =      2.795(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.235(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.235(CFS)
Time of concentration =    9.28 min.
Rainfall intensity =     2.795(In/Hr)
Summary of stream data:

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


1        5.859     10.77                 2.599
2        1.235      9.28                 2.795
Largest stream flow has longer time of concentration
Qp =      5.859 + sum of
          Qb         Ia/Ib
           1.235 *    0.930 =      1.149
Qp =      7.008

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.859       1.235
Area of streams before confluence:
        2.400        0.500
Results of confluence:
Total flow rate =      7.008(CFS)
Time of concentration =    10.767 min.
Effective stream area after confluence =      2.900(Ac.)
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Process from Point/Station       21.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    23.300(Ft.)
Downstream point/station elevation =    22.700(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     7.008(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.008(CFS)
Normal flow depth in pipe =   13.00(In.)
Flow top width inside pipe =   16.13(In.)
Critical Depth =   12.30(In.)
Pipe flow velocity =      5.13(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    11.16 min.


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Process from Point/Station       23.000 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      2.900(Ac.)
Runoff from this stream =      7.008(CFS)
Time of concentration =   11.16 min.
Rainfall intensity =     2.554(In/Hr)


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Process from Point/Station       24.000 to Point/Station       23.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00313  s(percent)=       0.31
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.555 min.
Rainfall intensity =      2.756(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.260
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.62
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.215(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       23.000 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.215(CFS)
Time of concentration =    9.55 min.
Rainfall intensity =     2.756(In/Hr)
Summary of stream data:

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

```
1        7.008     11.16                 2.554
2        1.215      9.55                 2.756
Largest stream flow has longer time of concentration
Qp =      7.008 + sum of
          Qb         Ia/Ib
           1.215 *    0.927 =      1.126
Qp =      8.134

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.008       1.215
Area of streams before confluence:
        2.900        0.500
Results of confluence:
Total flow rate =      8.134(CFS)
Time of concentration =    11.157 min.
Effective stream area after confluence =      3.400(Ac.)


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Process from Point/Station       23.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    22.700(Ft.)
Downstream point/station elevation =    22.300(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     8.134(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.134(CFS)
Normal flow depth in pipe =   13.32(In.)
Flow top width inside pipe =   20.23(In.)
Critical Depth =   12.70(In.)
Pipe flow velocity =      5.06(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    11.47 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      3.400(Ac.)
Runoff from this stream =      8.134(CFS)
Time of concentration =   11.47 min.
Rainfall intensity =     2.520(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       25.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   295.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00339  s(percent)=       0.34
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.099 min.
Rainfall intensity =      2.822(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.76
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.994(CFS)
Total initial stream area =        0.400(Ac.)
Pervious area fraction = 0.100
```

```
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Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.400(Ac.)
Runoff from this stream =      0.994(CFS)
Time of concentration =    9.10 min.
Rainfall intensity =     2.822(In/Hr)
Summary of stream data:

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


1        8.134     11.47                 2.520
2        0.994      9.10                 2.822
Largest stream flow has longer time of concentration
Qp =      8.134 + sum of
          Qb         Ia/Ib
           0.994 *    0.893 =      0.887
Qp =      9.021

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.134       0.994
Area of streams before confluence:
        3.400        0.400
Results of confluence:
Total flow rate =      9.021(CFS)
Time of concentration =    11.470 min.
Effective stream area after confluence =      3.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    22.300(Ft.)
Downstream point/station elevation =    22.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     9.021(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.021(CFS)
Normal flow depth in pipe =   13.55(In.)
Flow top width inside pipe =   15.53(In.)
Critical Depth =   13.94(In.)
Pipe flow velocity =      6.32(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    11.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       27.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      3.800(Ac.)
Runoff from this stream =      9.021(CFS)
Time of concentration =   11.58 min.
Rainfall intensity =     2.508(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   880.000(Ft.)
Top (of initial area) elevation =    32.500(Ft.)
```

```
Bottom (of initial area) elevation =    23.400(Ft.)
Difference in elevation =     9.100(Ft.)
Slope =    0.01034  s(percent)=       1.03
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.272 min.
Rainfall intensity =      2.541(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.720
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.36
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.566(CFS)
Total initial stream area =        0.700(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       27.000 to Point/Station       27.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.700(Ac.)
Runoff from this stream =      1.566(CFS)
Time of concentration =   11.27 min.
Rainfall intensity =     2.541(In/Hr)
Summary of stream data:

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


1        9.021     11.58                 2.508
2        1.566     11.27                 2.541
Largest stream flow has longer time of concentration
Qp =      9.021 + sum of
          Qb         Ia/Ib
           1.566 *    0.987 =      1.546
Qp =     10.567

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.021       1.566
Area of streams before confluence:
        3.800        0.700
Results of confluence:
Total flow rate =     10.567(CFS)
Time of concentration =    11.576 min.
Effective stream area after confluence =      4.500(Ac.)


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Process from Point/Station       27.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    22.000(Ft.)
Downstream point/station elevation =    21.900(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    10.567(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.567(CFS)
Normal flow depth in pipe =   16.34(In.)
Flow top width inside pipe =   22.38(In.)
Critical Depth =   13.97(In.)
Pipe flow velocity =      4.64(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    11.70 min.
```

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Process from Point/Station       29.000 to Point/Station       29.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      4.500(Ac.)
Runoff from this stream =     10.567(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.495(In/Hr)


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Process from Point/Station       30.000 to Point/Station       29.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00370  s(percent)=       0.37
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.629 min.
Rainfall intensity =      2.897(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.470
Decimal fraction soil group C = 0.530
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.89
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.765(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       29.000 to Point/Station       29.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.765(CFS)
Time of concentration =    8.63 min.
Rainfall intensity =     2.897(In/Hr)
Summary of stream data:

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


1       10.567     11.70                 2.495
2        0.765      8.63                 2.897
Largest stream flow has longer time of concentration
Qp =     10.567 + sum of
          Qb         Ia/Ib
           0.765 *    0.861 =      0.659
Qp =     11.226

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.567       0.765
Area of streams before confluence:
        4.500        0.300
Results of confluence:
Total flow rate =     11.226(CFS)
Time of concentration =    11.702 min.
Effective stream area after confluence =      4.800(Ac.)


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Process from Point/Station       29.000 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    21.900(Ft.)
Downstream point/station elevation =    19.200(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    11.226(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    11.226(CFS)
Normal flow depth in pipe =    8.18(In.)
Flow top width inside pipe =   14.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.41(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.74 min.


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Process from Point/Station       31.000 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      4.800(Ac.)
Runoff from this stream =     11.226(CFS)
Time of concentration =   11.74 min.
Rainfall intensity =     2.491(In/Hr)


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Process from Point/Station       32.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   230.000(Ft.)
Top (of initial area) elevation =    34.300(Ft.)
Bottom (of initial area) elevation =    33.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00435  s(percent)=       0.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.837 min.
Rainfall intensity =      3.037(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.320
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.536(CFS)
Total initial stream area =        0.200(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       31.000 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.200(Ac.)
Runoff from this stream =      0.536(CFS)
Time of concentration =    7.84 min.
Rainfall intensity =     3.037(In/Hr)
Summary of stream data:

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


1       11.226     11.74                 2.491
2        0.536      7.84                 3.037
Largest stream flow has longer time of concentration
```

```
Qp =     11.226 + sum of
          Qb         Ia/Ib
           0.536 *    0.820 =      0.440
Qp =     11.666

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.226       0.536
Area of streams before confluence:
        4.800        0.200
Results of confluence:
Total flow rate =     11.666(CFS)
Time of concentration =    11.737 min.
Effective stream area after confluence =      5.000(Ac.)


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Process from Point/Station       31.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    19.200(Ft.)
Downstream point/station elevation =    18.100(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    11.666(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.666(CFS)
Normal flow depth in pipe =   11.71(In.)
Flow top width inside pipe =   17.17(In.)
Critical Depth =   15.60(In.)
Pipe flow velocity =      9.59(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    11.84 min.


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =     11.666(CFS)
Time of concentration =   11.84 min.
Rainfall intensity =     2.481(In/Hr)
Summary of stream data:

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


1       23.258     11.05               2.566
2        2.135     10.07               2.686
3       11.666     11.84               2.481
Largest stream flow has longer or shorter time of concentration
Qp =     23.258 + sum of
          Qb         Ia/Ib
           2.135 *    0.955 =      2.040
          Qa          Tb/Ta
          11.666 *    0.933 =     10.883
Qp =     36.181

Total of 3 main streams to confluence:
Flow rates before confluence point:
      23.258       2.135      11.666
Area of streams before confluence:
        9.200        0.900        5.000


Results of confluence:
Total flow rate =     36.181(CFS)
Time of concentration =    11.046 min.
```

Yield=36.2/16.3 acres/cfs =2.22cfs/acre

```
Effective stream area after confluence  =     15.100(Ac.)
End of computations, total study area =           16.30 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  68.4
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study        Date: 09/13/11  File:Cwest.out
----------------------------------------------------------------------
11-0054     Knox Logistics Center
100-Year Rational Method Hydrology
Western Building C Area
mla     09-13-2011
----------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




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Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   425.000(Ft.)
Top (of initial area) elevation =    54.400(Ft.)
Bottom (of initial area) elevation =    44.200(Ft.)
Difference in elevation =    10.200(Ft.)
Slope =    0.02400  s(percent)=       2.40
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.119 min.
Rainfall intensity =      3.183(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.277(CFS)
Total initial stream area =        4.000(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =    40.300(Ft.)
Downstream point/station elevation =    39.100(Ft.)
Pipe length  =   220.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    11.277(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.277(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   18.55(In.)
Critical Depth =   15.01(In.)
Pipe flow velocity =      5.96(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =     7.73 min.


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Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.000(Ac.)
Runoff from this stream =     11.277(CFS)
Time of concentration =    7.73 min.
Rainfall intensity =     3.056(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station        4.000 to Point/Station        3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   490.000(Ft.)
Top (of initial area) elevation =    45.000(Ft.)
Bottom (of initial area) elevation =    44.200(Ft.)
Difference in elevation =     0.800(Ft.)
Slope =    0.00163  s(percent)=       0.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.901 min.
Rainfall intensity =      2.379(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.130
Decimal fraction soil group C = 0.870
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.31
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.237(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.500(Ac.)
Runoff from this stream =      5.237(CFS)
Time of concentration =   12.90 min.
Rainfall intensity =     2.379(In/Hr)
Summary of stream data:

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


1       11.277      7.73               3.056
2        5.237     12.90               2.379
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     11.277 + sum of
          Qa          Tb/Ta
           5.237 *    0.600 =      3.140
Qp =     14.417

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.277       5.237
Area of streams before confluence:
        4.000        2.500


Results of confluence:
Total flow rate =     14.417(CFS)
Time of concentration =     7.735 min.
Effective stream area after confluence  =      6.500(Ac.)


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Process from Point/Station        3.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    39.100(Ft.)
Downstream point/station elevation =    38.100(Ft.)
Pipe length  =   210.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    14.417(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.417(CFS)
Normal flow depth in pipe =   17.04(In.)
Flow top width inside pipe =   21.78(In.)
Critical Depth =   16.41(In.)
Pipe flow velocity =      6.05(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =     8.31 min.


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.500(Ac.)
Runoff from this stream =     14.417(CFS)
Time of concentration =    8.31 min.
Rainfall intensity =     2.950(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station        6.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   490.000(Ft.)
Top (of initial area) elevation =    45.000(Ft.)
Bottom (of initial area) elevation =    44.200(Ft.)
Difference in elevation =     0.800(Ft.)
Slope =    0.00163  s(percent)=       0.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.901 min.
Rainfall intensity =      2.379(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.23
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.229(CFS)
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Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.500(Ac.)
Runoff from this stream =      5.229(CFS)
Time of concentration =   12.90 min.
Rainfall intensity =     2.379(In/Hr)
Summary of stream data:

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


1       14.417      8.31               2.950
2        5.229     12.90               2.379
Largest stream flow has longer or shorter time of concentration
Qp =     14.417 + sum of
          Qa          Tb/Ta
           5.229 *    0.644 =      3.369
Qp =     17.786

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.417       5.229
Area of streams before confluence:
        6.500        2.500


Results of confluence:
Total flow rate =     17.786(CFS)
Time of concentration =     8.314 min.
Effective stream area after confluence  =      9.000(Ac.)


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Process from Point/Station        5.000 to Point/Station        7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    38.100(Ft.)
Downstream point/station elevation =    37.100(Ft.)
Pipe length  =   210.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    17.786(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    17.786(CFS)
Normal flow depth in pipe =   21.00(In.)
Flow top width inside pipe =   15.87(In.)
Critical Depth =   18.24(In.)
Pipe flow velocity =      6.10(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =     8.89 min.


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Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.000(Ac.)
Runoff from this stream =     17.786(CFS)
Time of concentration =    8.89 min.
Rainfall intensity =     2.855(In/Hr)
Program is now starting with Main Stream No. 2
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Process from Point/Station        8.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   630.000(Ft.)
Top (of initial area) elevation =    45.000(Ft.)
Bottom (of initial area) elevation =    44.200(Ft.)
Difference in elevation =     0.800(Ft.)
Slope =    0.00127  s(percent)=       0.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.001 min.
Rainfall intensity =      2.209(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.61
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.392(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.800(Ac.)
Runoff from this stream =      7.392(CFS)
Time of concentration =   15.00 min.
Rainfall intensity =     2.209(In/Hr)
Summary of stream data:

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


1       17.786      8.89               2.855
2        7.392     15.00               2.209
Largest stream flow has longer or shorter time of concentration
Qp =     17.786 + sum of
          Qa          Tb/Ta
           7.392 *    0.593 =      4.380
Qp =     22.166

Total of 2 main streams to confluence:
Flow rates before confluence point:
      17.786       7.392
Area of streams before confluence:
        9.000        3.800


Results of confluence:
Total flow rate =     22.166(CFS)
Time of concentration =     8.888 min.
Effective stream area after confluence  =     12.800(Ac.)


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Process from Point/Station        7.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    37.100(Ft.)
Downstream point/station elevation =    32.100(Ft.)
Pipe length  =  1010.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    22.166(CFS)
```

```
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.166(CFS)
Normal flow depth in pipe =   20.77(In.)
Flow top width inside pipe =   22.76(In.)
Critical Depth =   19.76(In.)
Pipe flow velocity =      6.75(Ft/s)
Travel time through pipe =    2.49 min.
Time of concentration (TC) =    11.38 min.


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.800(Ac.)
Runoff from this stream =     22.166(CFS)
Time of concentration =   11.38 min.
Rainfall intensity =     2.529(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       10.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =    52.200(Ft.)
Bottom (of initial area) elevation =    37.500(Ft.)
Difference in elevation =    14.700(Ft.)
Slope =    0.01838  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.672 min.
Rainfall intensity =      2.739(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.680
Decimal fraction soil group C = 0.320
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.16
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.848(CFS)
Total initial stream area =        1.600(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.600(Ac.)
Runoff from this stream =      3.848(CFS)
Time of concentration =    9.67 min.
Rainfall intensity =     2.739(In/Hr)
Summary of stream data:

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


1       22.166     11.38               2.529
2        3.848      9.67               2.739
Largest stream flow has longer time of concentration
Qp =     22.166 + sum of
          Qb         Ia/Ib
           3.848 *    0.923 =      3.553
Qp =     25.719
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.166       3.848
Area of streams before confluence:
       12.800        1.600


Results of confluence:
Total flow rate =     25.719(CFS)
Time of concentration =    11.382 min.
Effective stream area after confluence  =     14.400(Ac.)


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Process from Point/Station        9.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    32.100(Ft.)
Downstream point/station elevation =    30.400(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    25.719(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    25.719(CFS)
Normal flow depth in pipe =   23.63(In.)
Flow top width inside pipe =   17.86(In.)
Critical Depth =   21.24(In.)
Pipe flow velocity =      6.96(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    12.15 min.


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Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.400(Ac.)
Runoff from this stream =     25.719(CFS)
Time of concentration =   12.15 min.
Rainfall intensity =     2.450(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   815.000(Ft.)
Top (of initial area) elevation =    45.600(Ft.)
Bottom (of initial area) elevation =    35.700(Ft.)
Difference in elevation =     9.900(Ft.)
Slope =    0.01215  s(percent)=       1.21
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.585 min.
Rainfall intensity =      2.621(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.895(CFS)
Total initial stream area =        1.700(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.700(Ac.)
Runoff from this stream =      3.895(CFS)
Time of concentration =   10.58 min.
Rainfall intensity =     2.621(In/Hr)
Summary of stream data:

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


1       25.719     12.15               2.450
2        3.895     10.58               2.621
Largest stream flow has longer time of concentration
Qp =     25.719 + sum of
          Qb         Ia/Ib
           3.895 *    0.935 =      3.641
Qp =     29.360

Total of 2 main streams to confluence:
Flow rates before confluence point:
      25.719       3.895
Area of streams before confluence:
       14.400        1.700


Results of confluence:
Total flow rate =     29.360(CFS)
Time of concentration =    12.148 min.
Effective stream area after confluence  =     16.100(Ac.)
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Process from Point/Station       11.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =    30.400(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    29.360(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    29.360(CFS)
Normal flow depth in pipe =   13.03(In.)
Flow top width inside pipe =   16.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.42(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    12.21 min.
End of computations, total study area =           16.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  65.8
```

Yield=29.4/16.1 cfs/acre =1.83 cfs/acre

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study        Date: 09/13/11  File:Ceast.out
------------------------------------------------------------------------
11-0054     Knox Logistics Center
100-Year Rational Method Hydrology
Eastern Building C Area
mla    09-13-2011
------------------------------------------------------------------------
 *********   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 [ Perris Valley ] area used.
10 year storm 10 minute intensity =  1.880(In/Hr)
10 year storm 60 minute intensity =  0.780(In/Hr)
100 year storm 10 minute intensity =  2.690(In/Hr)
100 year storm 60 minute intensity =  1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.120(In/Hr)
Slope of intensity duration curve = 0.4900




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Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   510.000(Ft.)
Top (of initial area) elevation =    51.400(Ft.)
Bottom (of initial area) elevation =    39.100(Ft.)
Difference in elevation =    12.300(Ft.)
Slope =    0.02412  s(percent)=       2.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.650 min.
Rainfall intensity =      3.073(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.904(CFS)
Total initial stream area =        0.700(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =    35.000(Ft.)
Downstream point/station elevation =    33.300(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.904(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.904(CFS)
Normal flow depth in pipe =    5.94(In.)
Flow top width inside pipe =    8.53(In.)
Critical Depth =    7.56(In.)
Pipe flow velocity =      6.16(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     7.89 min.


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Process from Point/Station       22.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.700(Ac.)
Runoff from this stream =      1.904(CFS)
Time of concentration =    7.89 min.
Rainfall intensity =     3.026(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       23.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =    70.000(Ft.)
Top (of initial area) elevation =    42.900(Ft.)
Bottom (of initial area) elevation =    37.800(Ft.)
Difference in elevation =     5.100(Ft.)
Slope =    0.07286  s(percent)=       7.29
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.336(CFS)
Total initial stream area =        0.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       22.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.100(Ac.)
Runoff from this stream =      0.336(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     3.785(In/Hr)
Summary of stream data:

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

```
1        1.904      7.89               3.026
2        0.336      5.00               3.785
Largest stream flow has longer time of concentration
Qp =      1.904 + sum of
          Qb         Ia/Ib
           0.336 *    0.799 =      0.269
Qp =      2.173

Total of 2 main streams to confluence:
Flow rates before confluence point:
       1.904       0.336
Area of streams before confluence:
        0.700        0.100


Results of confluence:
Total flow rate =      2.173(CFS)
Time of concentration =     7.894 min.
Effective stream area after confluence  =      0.800(Ac.)


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Process from Point/Station       22.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    33.300(Ft.)
Downstream point/station elevation =    30.200(Ft.)
Pipe length  =   875.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     2.173(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.173(CFS)
Normal flow depth in pipe =    9.30(In.)
Flow top width inside pipe =   10.02(In.)
Critical Depth =    7.57(In.)
Pipe flow velocity =      3.33(Ft/s)
Travel time through pipe =    4.38 min.
Time of concentration (TC) =    12.28 min.


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.800(Ac.)
Runoff from this stream =      2.173(CFS)
Time of concentration =   12.28 min.
Rainfall intensity =     2.437(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       25.000 to Point/Station       24.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   865.000(Ft.)
Top (of initial area) elevation =    45.700(Ft.)
Bottom (of initial area) elevation =    36.200(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.01098  s(percent)=       1.10
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.061 min.
Rainfall intensity =      2.565(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.340
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.58
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     17.154(CFS)
Total initial stream area =        7.600(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.600(Ac.)
Runoff from this stream =     17.154(CFS)
Time of concentration =   11.06 min.
Rainfall intensity =     2.565(In/Hr)
Summary of stream data:

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


1        2.173     12.28               2.437
2       17.154     11.06               2.565
Largest stream flow has longer or shorter time of concentration
Qp =     17.154 + sum of
          Qa          Tb/Ta
           2.173 *    0.901 =      1.958
Qp =     19.112

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.173      17.154
Area of streams before confluence:
        0.800        7.600


Results of confluence:
Total flow rate =     19.112(CFS)
Time of concentration =    11.061 min.
Effective stream area after confluence  =      8.400(Ac.)


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Process from Point/Station       24.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    30.200(Ft.)
Downstream point/station elevation =    29.600(Ft.)
Pipe length  =  1253.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    19.112(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    19.112(CFS)
Normal flow depth in pipe =   31.17(In.)
Flow top width inside pipe =   31.24(In.)
Critical Depth =   16.39(In.)
Pipe flow velocity =      2.69(Ft/s)
Travel time through pipe =    7.77 min.
Time of concentration (TC) =    18.83 min.


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Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.400(Ac.)
Runoff from this stream =     19.112(CFS)
Time of concentration =   18.83 min.
Rainfall intensity =     1.976(In/Hr)
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Program is now starting with Main Stream No. 2


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Process from Point/Station       27.000 to Point/Station       26.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   600.000(Ft.)
Top (of initial area) elevation =    45.700(Ft.)
Bottom (of initial area) elevation =    36.500(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.01533  s(percent)=       1.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.938 min.
Rainfall intensity =      2.847(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.870
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.69
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.242(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.500(Ac.)
Runoff from this stream =      6.242(CFS)
Time of concentration =    8.94 min.
Rainfall intensity =     2.847(In/Hr)
Summary of stream data:

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


1       19.112     18.83               1.976
2        6.242      8.94               2.847
Largest stream flow has longer time of concentration
Qp =     19.112 + sum of
          Qb         Ia/Ib
           6.242 *    0.694 =      4.333
Qp =     23.445

Total of 2 main streams to confluence:
Flow rates before confluence point:
      19.112       6.242
Area of streams before confluence:
        8.400        2.500


Results of confluence:
Total flow rate =     23.445(CFS)
Time of concentration =    18.827 min.
Effective stream area after confluence  =     10.900(Ac.)


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Process from Point/Station       26.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    29.600(Ft.)
Downstream point/station elevation =    28.900(Ft.)
```

```
Pipe length  =   135.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    23.445(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    23.445(CFS)
Normal flow depth in pipe =   21.45(In.)
Flow top width inside pipe =   21.83(In.)
Critical Depth =   20.33(In.)
Pipe flow velocity =      6.92(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    19.15 min.


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Process from Point/Station       28.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.900(Ac.)
Runoff from this stream =     23.445(CFS)
Time of concentration =   19.15 min.
Rainfall intensity =     1.960(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       29.000 to Point/Station       28.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   590.000(Ft.)
Top (of initial area) elevation =    45.700(Ft.)
Bottom (of initial area) elevation =    36.500(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.01559  s(percent)=       1.56
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.849 min.
Rainfall intensity =      2.861(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.014(CFS)
Total initial stream area =        2.400(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       28.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.400(Ac.)
Runoff from this stream =      6.014(CFS)
Time of concentration =    8.85 min.
Rainfall intensity =     2.861(In/Hr)
Summary of stream data:

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


1       23.445     19.15               1.960
2        6.014      8.85               2.861
Largest stream flow has longer time of concentration
Qp =     23.445 + sum of
          Qb         Ia/Ib
```

```
          6.014 *    0.685 =      4.120
Qp =     27.565

Total of 2 main streams to confluence:
Flow rates before confluence point:
      23.445       6.014
Area of streams before confluence:
       10.900        2.400


Results of confluence:
Total flow rate =     27.565(CFS)
Time of concentration =    19.152 min.
Effective stream area after confluence  =     13.300(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    28.900(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length  =   155.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    27.565(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    27.565(CFS)
Normal flow depth in pipe =   14.51(In.)
Flow top width inside pipe =   19.41(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.55(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    19.32 min.
End of computations, total study area =           13.30 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  62.0
```

Yield=27.6/13.3 cfs/acre =2.067cfs/acre

Average Yield Calculation for Future Industrial Area

Yield=36.2/16.3 cfs/acre =2.22 cfs/acre

Yield=29.4/16.1 cfs/acre =1.83 cfs/acre

Yield=27.6/13.3 cfs/acre =2.06 cfs/acre

Average Yield (2.22,1.83,2.06)=2.04 cfs/acre

use 2.1cfs/acre

Q100 Future= 28.4 acres * 2.1 cfs/acre = 52 cfs

APPENDIX 2

CALTRANS AS-BUILT PLAN

ACNH-215-1(220)87E

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	1	23

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR STORM DRAIN CONSTRUCTION ADJACENT TO

STATE HIGHWAY

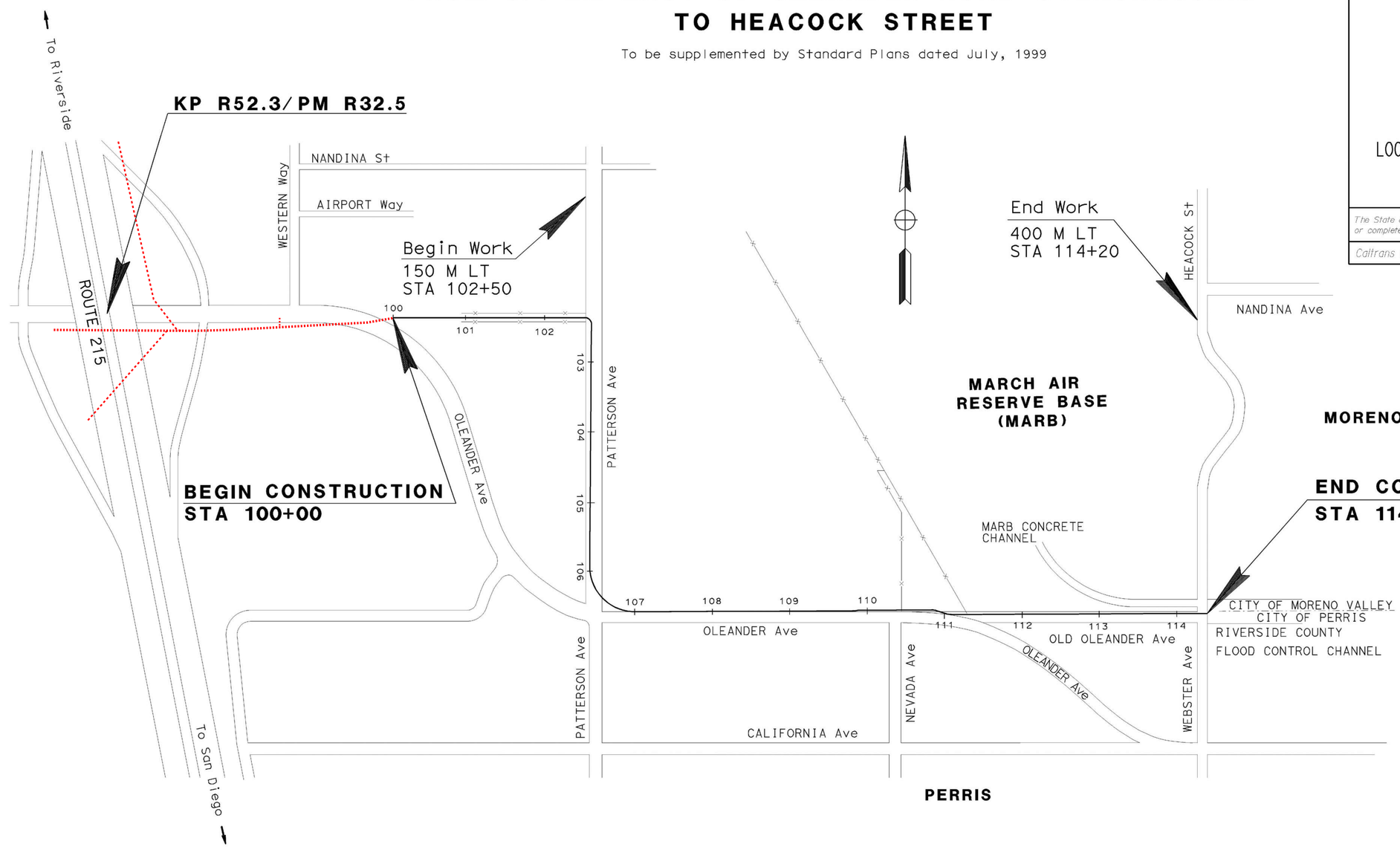
IN RIVERSIDE COUNTY
IN PERRIS
FROM 0.4 km EAST OF OLEANDER ROAD OVERCROSSING
TO HEACOCK STREET

To be supplemented by Standard Plans dated July, 1999

INDEX OF SHEETS

Sheet No.	Description
1	Title and Location Map
2-4	Construction Details
5-11	Drainage Plans, Profiles, Details and Quantities
12-14	Utility Plans
15-19	Traffic Handling Plans
20-21	Construction Area Signs
22	Summary of Quantities
23	Revised Standard Plan

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO CONTRACTORS AND SPECIAL PRIVISIONS BOOK.



NO SCALE

LOCATION MAP

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

2-10-03
Project Engineer Date
Registered Civil Engineer

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER GONZALEZ
No. C-63491
Exp. 9-30-06
CIVIL
STATE OF CALIFORNIA

September 15, 2003
Plans Approval Date

The Contractor shall possess the Class (or classes) of license as specified in the ''Notice to Contractors''.

Contract No. 08-420404

PROJECT ENGINEER	DATE	PROJECT MANAGER	DATE
KIRK BAYLESS	7-02	CLIFF SHIEH	1-03

LAST REVISION 02-10-03
DATE PLOTTED => 20-DEC-2004
TIME PLOTTED => 13:54

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	2	23

REGISTERED CIVIL ENGINEER 2-10-03

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

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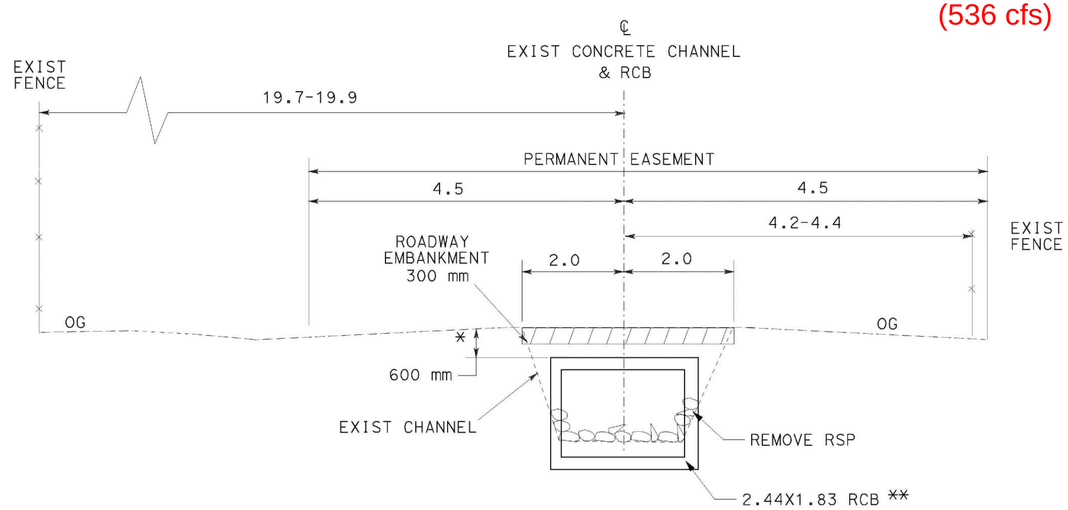
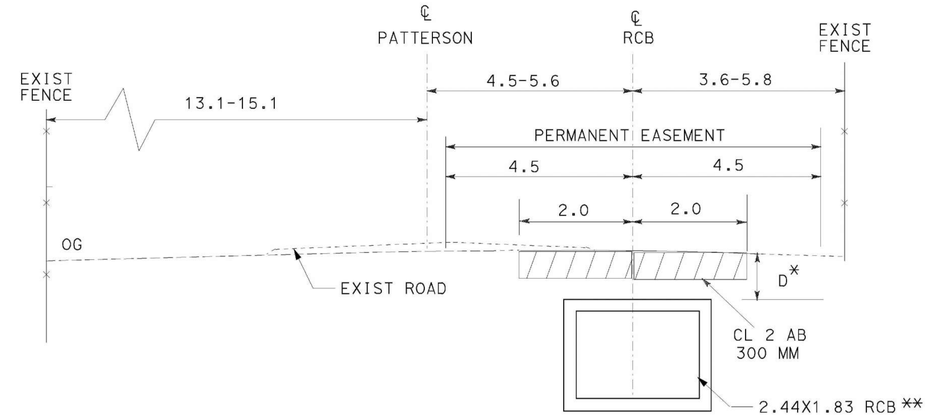
Caltrans Metric

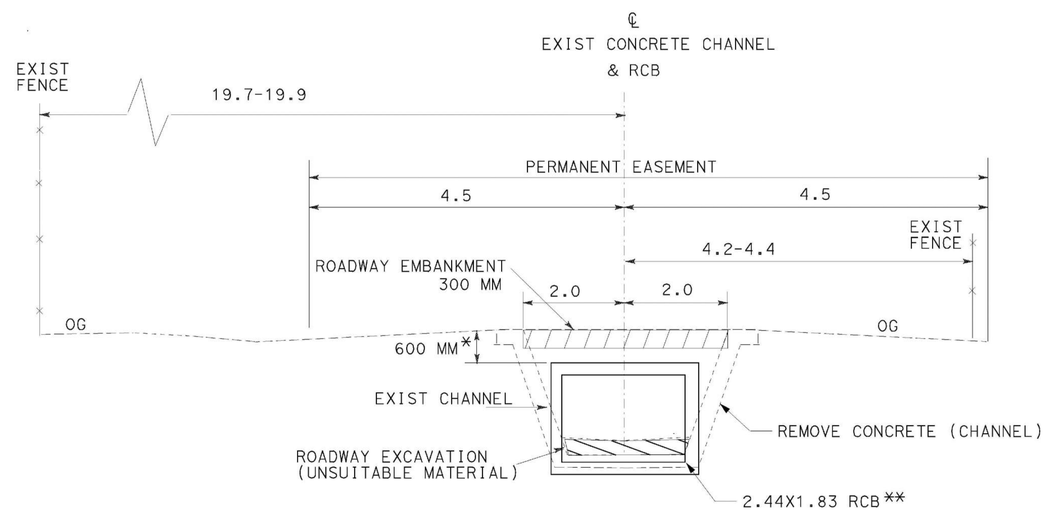
Q100=15.17 CUBIC METERS PER SECOND
(536 cfs)



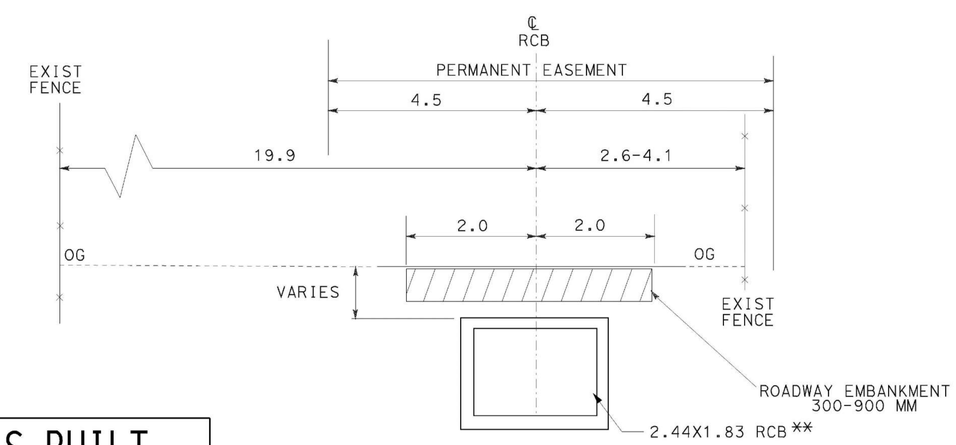
CHANNEL WITH RSP (1/4 TON) TO BE REPLACED BY RCB WEST OF PATTERSON Ave
STA 101+45.886 TO STA 101+61.131



ON PATTERSON Ave
STA 102+54.084 TO STA 105+87.238



CONCRETE LINED CHANNEL TO BE REPLACED BY RCB WEST OF PATTERSON Ave
STA 100+00 TO STA 101+45.886



ADJACENT TO DIRT DITCH WEST OF PATTERSON Ave
STA 101+61.131 TO STA 102+54.084

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

LEGEND:

TCE = TEMPORARY CONSTRUCTION EASEMENT

NOTES:

* - MINIMUM DEPTH OF COVER FOR RCB IS 600 MM; SEE PROFILE SHEET FOR EXACT DEPTHS.

** - FOR EXCAVATION AND BACKFILL SEE STANDARD PLAN A62E, AND FOR DETAILS SEE STANDARD PLAN D80.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

CONSTRUCTION DETAILS

NO SCALE

C-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER KIRK BAYLESS

CALCULATED/ DESIGNED BY	KIRK BAYLESS	DATE 8-02	REVISED BY	DATE REVISED
CHECKED BY				

LAST REVISION 02-10-03 | DATE PLOTTED => 20-DEC-2004 | TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 842040g01.dgn

CU 08228 | EA 420401

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	5	23

REGISTERED CIVIL ENGINEER 2-10-03

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

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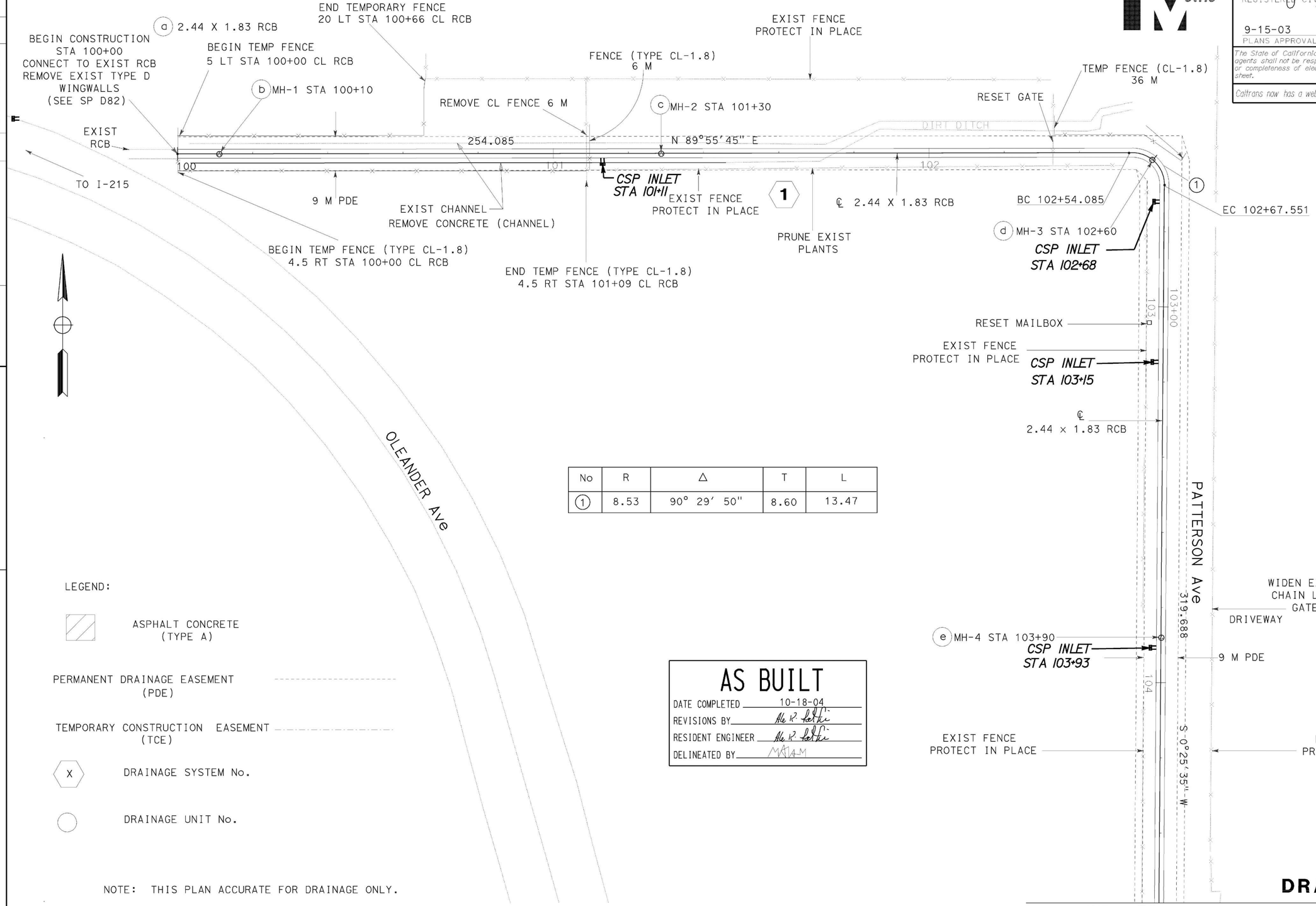
Caltrans Metric

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.



No	R	Δ	T	L
1	8.53	90° 29′ 50″	8.60	13.47

LEGEND:

ASPHALT CONCRETE (TYPE A)

PERMANENT DRAINAGE EASEMENT (PDE)

TEMPORARY CONSTRUCTION EASEMENT (TCE)

X DRAINAGE SYSTEM No.

DRAINAGE UNIT No.

NOTE: THIS PLAN ACCURATE FOR DRAINAGE ONLY.

AS BUILT
DATE COMPLETED 10-18-04
REVISIONS BY
RESIDENT ENGINEER
DELINEATED BY

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PLAN

SCALE 1:500

D-1

DATE	REVISED BY	DATE REVISED
8-02		

KIRK BAYLESS

CALCULATED/DESIGNED BY
CHECKED BY

PROJECT ENGINEER K. BAYLESS

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

LAST REVISION 02-10-03
DATE PLOTTED => 20-DEC-2004
TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 842040i01.dgn

CU 08228

EA 420401

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	Riv	215	R52.3	6	23

CMgonzalez 2-10-03
REGISTERED CIVIL ENGINEER

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

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Caltrans Metric

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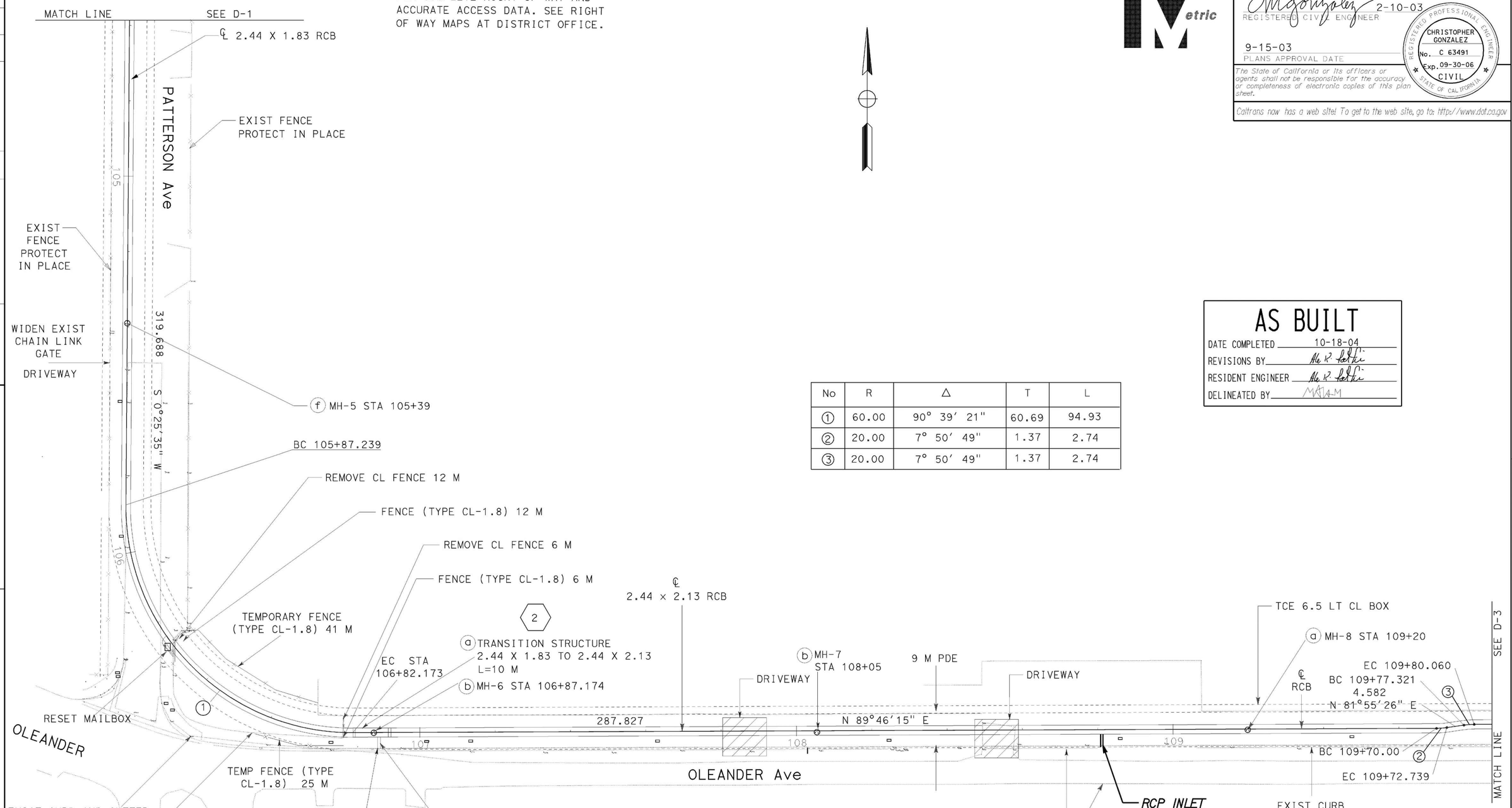
FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA. SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.



No	R	Δ	T	L
1	60.00	90° 39′ 21"	60.69	94.93
2	20.00	7° 50′ 49"	1.37	2.74
3	20.00	7° 50′ 49"	1.37	2.74

AS BUILT
DATE COMPLETED 10-18-04
REVISIONS BY
RESIDENT ENGINEER
DELINEATED BY MAM

NOTE: THIS PLAN ACCURATE FOR DRAINAGE ONLY.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PLAN

SCALE 1:500 **D-2**

DATE	REVISED BY	DATE REVISED

KIRK BAYLESS — CALCULATED/DESIGNED BY — CHECKED BY

PROJECT ENGINEER K. BAYLESS

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

LAST REVISION 02-10-03 — DATE PLOTTED => 20-DEC-2004 TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 842040i02.dgn

CU 08228 EA 420401

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	7	23

CMGonzalez 3-25-03
REGISTERED CIVIL ENGINEER

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

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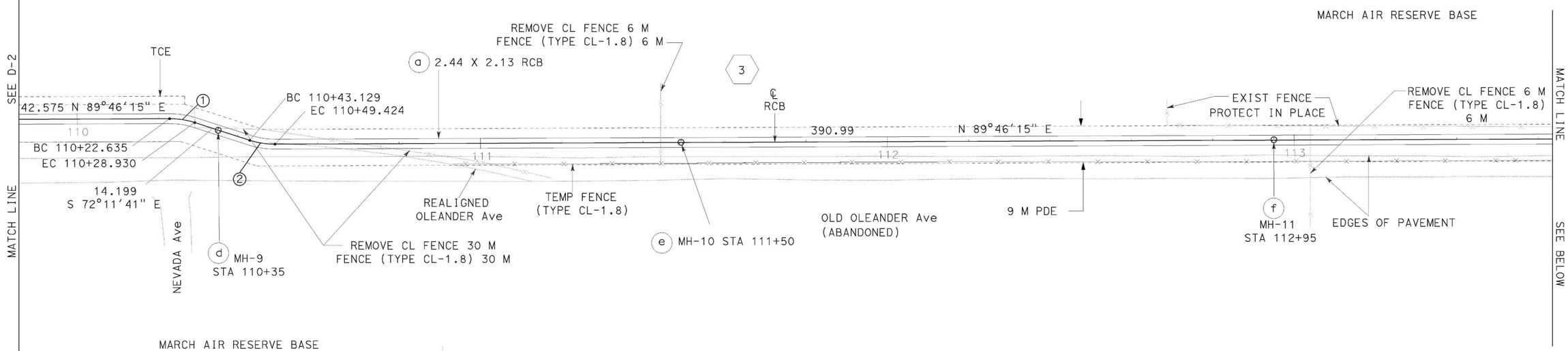
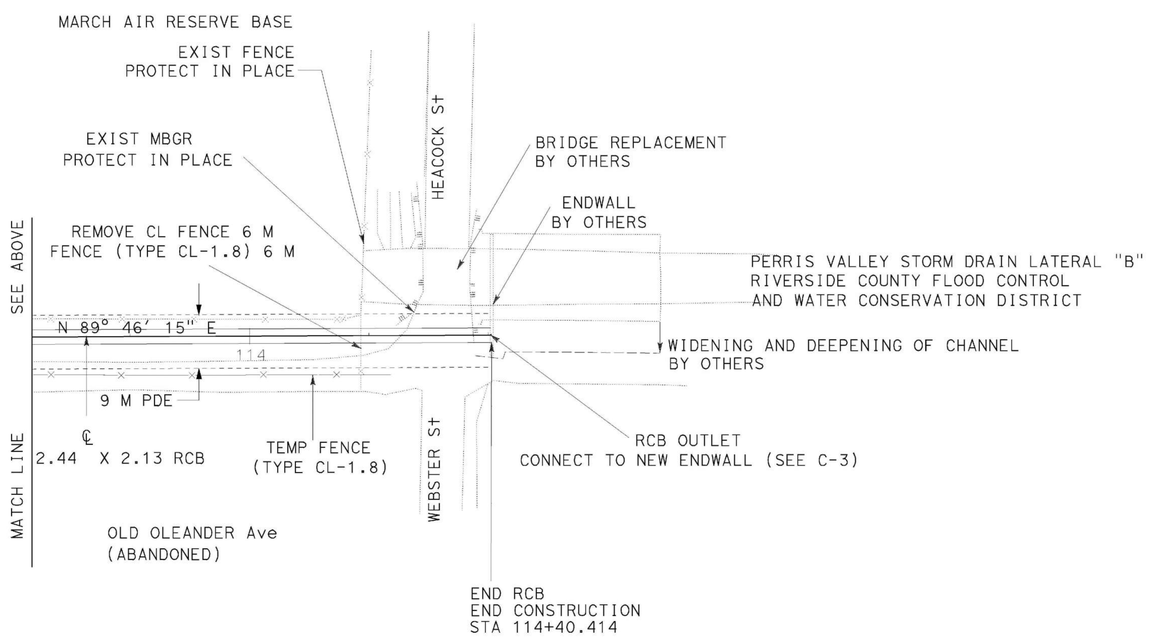
Caltrans Metric

NOTE :
FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA. SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.





No	R	Δ	T	L
1	20.000	18° 02' 04"	3.17	6.30
2	20.000	18° 02' 04"	3.17	6.30

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

NOTE: THIS PLAN ACCURATE FOR DRAINAGE ONLY.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PLAN

SCALE 1:500 **D-3**

DATE	REVISED BY	DATE REVISED

CALCULATED/DESIGNED BY: KIRK BAYLESS
CHECKED BY:

PROJECT ENGINEER: K. BAYLESS

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 8420401d3.dgn

CU 08228 EA 420401

LAST REVISION 03-25-03 DATE PLOTTED => 20-DEC-2004 TIME PLOTTED => 13:52

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	8	23

Caltrans Metric

CMGonzalez 3-25-03
REGISTERED CIVIL ENGINEER

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

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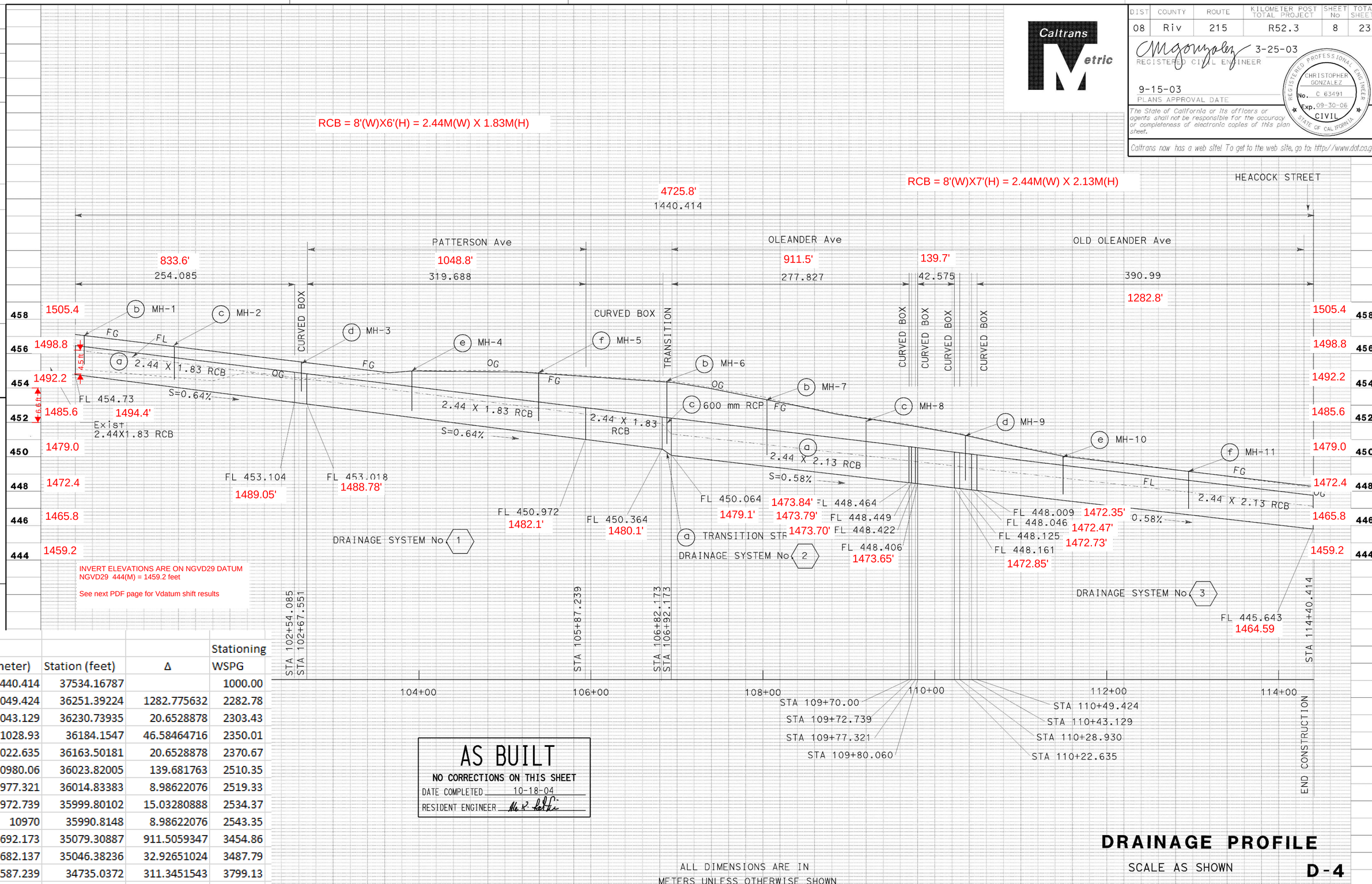
DATE	REVISED BY	DATE REVISED
8-02	KIRK BAYLESS	

CALCULATED/DESIGNED BY KIRK BAYLESS
CHECKED BY

PROJECT ENGINEER KIRK BAYLESS



INVERT ELEVATIONS ARE ON NGVD29 DATUM
NGVD29 444(M) = 1459.2 feet

See next PDF page for Vdatum shift results

Station (meter)	Station (feet)	Δ	Stationing WSPG
11440.414	37534.16787		1000.00
11049.424	36251.39224	1282.775632	2282.78
11043.129	36230.73935	20.6528878	2303.43
11028.93	36184.1547	46.58464716	2350.01
11022.635	36163.50181	20.6528878	2370.67
10980.06	36023.82005	139.681763	2510.35
10977.321	36014.83383	8.98622076	2519.33
10972.739	35999.80102	15.03280888	2534.37
10970	35990.8148	8.98622076	2543.35
10692.173	35079.30887	911.5059347	3454.86
10682.137	35046.38236	32.92651024	3487.79
10587.239	34735.0372	311.3451543	3799.13
10267.551	33686.19202	1048.845178	4847.98
10254.085	33642.01223	44.17979144	4892.16
10000	32808.4	833.6122314	5725.77

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PROFILE

SCALE AS SHOWN

D-4

LAST REVISION 03-25-03
DATE PLOTTED => 20-DEC-2004
TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 842040i04.dgn

CU 08228

EA 420401

ONLINE VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

Home | About VDatum | Download | Docs & Support | Contact Us

Regional Information

* Region : Contiguous United States

Horizontal Information

	Source	Target
Reference Frame:	NAD 1927	NAD83(2011)
Coor. System:	Geographic (Longitude, Latitude)	Geographic (Longitude, Latitude)
Unit:	meter (m)	meter (m)
Zone:	AL E - 0101	AL E - 0101

Vertical Information

	Source	Target
Reference Frame:	NGVD 1929	NAVD 88
Unit:	meter (m)	foot (U.S. Survey) (US_ft)
	Height / Sounding	Height / Sounding
	GEOID model:	GEOID model:

Point Conversion | ASCII File Conversion

Input			Output	
Latitude:	33.862353	Convert	Latitude:	33.8623743035
Longitude:	-117.258048	Reset	Longitude:	-117.2589238233
Height:	444	DMS	Height:	1459.197
Drive to on map / Reset Map			Drive to on map / Reset Map	

to DMS

Vertical Uncertainty (+/-): 0.1640581 US_ft

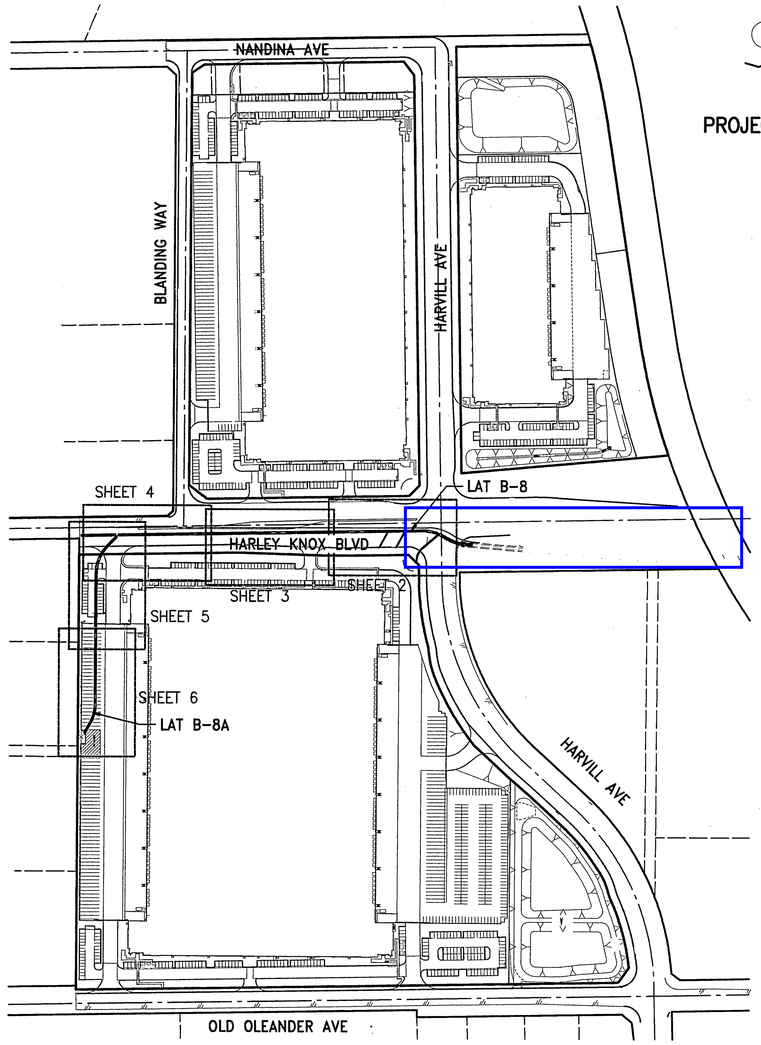
Vertical_Area: null

Valid Tidal area | Non-Tidal area | Non-Valid area | IGLD85

Alternative Horz. Datum | Ellipsoidal Datum | Orthometric Datum | Tidal Datum

LATERAL B-8 AS-BUILT SELECTED SHEETS

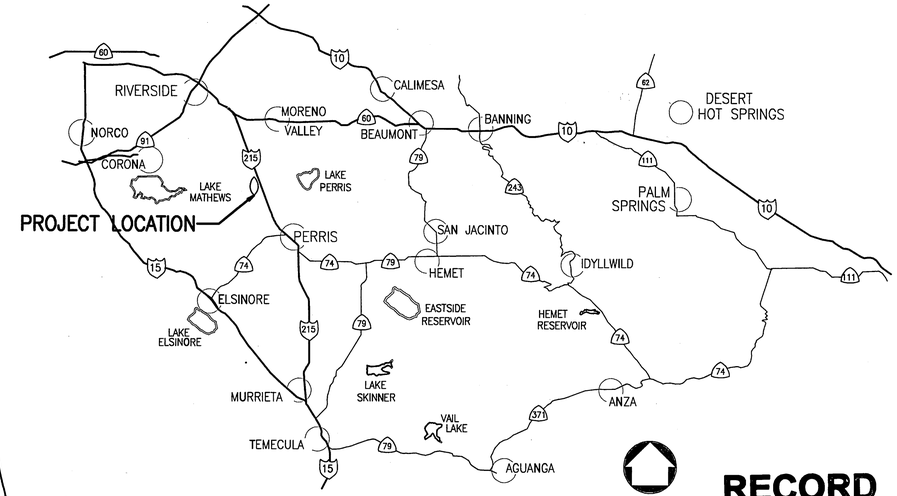
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT



INDEX MAP

GRAPHIC SCALE 1"=200'

0 200 400 600



VICINITY MAP

N.T.S.

RECORD DRAWINGS

APPROVED BY: Scott R. Hildebrandt

DATE: 4/3/14

UNDERGROUND UTILITIES NOTE

ALL UNDERGROUND STRUCTURES OR UTILITIES REPORTED BY THE OWNER OR OTHERS AND THOSE SHOWN ON THE RECORDS EXAMINED ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT.

THE OWNER, BY ACCEPTING THESE PLANS OR PROCEEDING WITH THE IMPROVEMENTS PURSUANT THERETO AGREE TO ASSUME LIABILITY AND TO HOLD THE UNDERSIGNED HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, OR LOCATED AT A VARIANCE WITH THAT REPORTED OR SHOWN ON THE RECORDS EXAMINED.

THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

CALL UNDERGROUND SERVICE ALERT (U.S.A.) 1-800-227-2600 AT LEAST 2 WORKING DAYS PRIOR TO EXCAVATION.

NOTICE TO CONTRACTOR

CONTRACTOR AGREES THAT HE SHALL ASSUME COMPLETE AND SOLE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE IN EFFECT CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD COUNTY OF RIVERSIDE, THE OWNER, AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FROM LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.

R.C.F.C. & W.C.D. STD. DRAWINGS

CB101	CATCH BASIN #4
CB109	CORNER CONNECTION TO CATCH BASIN
MH251	MANHOLE No. 1
MH252	MANHOLE No. 2
MH254	MANHOLE No. 4
M801	CHAIN LINK FENCE
M803	CONCRETE COLLAR
M816	CONCRETE BULKHEAD
M827	VEHICULAR TURN AROUND AREA

CALTRANS STD. DRAWINGS

D86B	HEADWALL AND WINGWALLS
D77A	GRATE DETAILS

SHEET INDEX

	SHEET NO.
TITLE SHEET	1
LAT B-8 PLAN AND PROFILES	2-4
LAT B-8A PLAN AND PROFILES	5-6
LAT B-8B, LAT. B-8C AND LAT B-8D PROFILES CONNECTION DETAIL	7

STATE PLANE BEARING

STATE PLANE SYSTEM BEARINGS ARE ROTATED 0°51'19" FROM RECORD BEARINGS PER PM 33942. COORDINATES SHOWN ON PLANS HAVE BEEN ADJUSTED TO STATE PLANE SYSTEM.

GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S M.O.U STANDARD SPECIFICATIONS, DATED JUNE 24, 2008, AND RCFC&WCD STANDARD MANUAL. FOR THE LATEST DRAWINGS OF THE STANDARD MANUAL, PLEASE REFER TO THE "PUBLICATIONS AND RECORDS" PAGE FOUND ON THE DISTRICT'S WEB SITE.
2. CONTACT THE ENCROACHMENT PERMIT ENGINEER AT (951) 955-1266 IF ANENCROACHMENT PERMIT IS REQUIRED FROM RIVERSIDE COUNTY FLOOD CONTROL. AFTER THE PERMIT IS ISSUED THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
3. CONTACT CONTRACT ADMINISTRATOR AT (951) 955-1288 IF CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. THE DISTRICT MUST BE NOTIFIED TWENTY DAYS (20) PRIOR TO COSTRUCTION.
4. ALL STATIONING REFERS TO THE CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE INTERSECTION STATION.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1-800-227-2600.
7. ALL ELEVATIONS SHOWN ARE IN FEET AND DECIMALS THEREOF BASED ON NATIONAL GEODETIC VERTICAL DATUM (NGVD 1929).
8. ALL COORDINATES ARE SHOWN IN FEET AND DECIMALS THEREOF BASED ON THE NORTH AMERICAN DATUM (NAD 83), CALIFORNIA COORDINATE SYSTEM (CCS), ZONE 6. EPOCH 1991.35
9. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
10. ELEVATIONS AND LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE UNLESS OTHERWISE NOTED.
11. UNLESS OTHERWISE SPECIFIED, MINIMUM STREET RECONSTRUCTION SHALL BE 4" TYPE "B" HOT MIX ASPHALT OVER 6" CLASS 2 AGGREGATE BASE OR AS SPECIFIED BY THE ENGINEER.
12. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6 INCHES OF CLASS "B" CONCRETE.
13. PIPE CONNECTED TO THE MAINLINE PIPE SHALL CONFORM TO JUNCTION STRUCTURE NO. 4 (JS 229) UNLESS OTHERWISE NOTED.
14. PIPE BEDDING SHALL CONFORM TO RCFC&WCD STD. DWG. M815, EXCEPT FOR COVER <2 FEET. FOR COVER <2 FEET, CONCRETE SLURRY (2000 PSI-2 SACK) SHALL BE USED. THE ENTIRE TRENCH SHALL BE SLURRY EXTENDING 4 INCHES MINIMUM AND 12 INCHES MAXIMUM ABOVE THE TOP OF THE PIPE.
15. BH-1 INDICATES SOIL BORING LOCATIONS BASED ON THE SOILS REPORT DATED JUNE 1, 2011. LOCATIONS SHOWN ARE APPROXIMATE.
16. "V" IS THE DEPTH OF INLET AND CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
17. CATCH BASINS SHALL BE LOCATED SO THAT LOCAL DEPRESSIONS SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
18. ALL CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
19. STANDARD DRAWINGS CALLED FOR ON THE PLAN AND PROFILE SHALL CONFORM TO DISTRICT STANDARD DRAWINGS UNLESS OTHERWISE NOTED.
20. THE CONTRACTOR IS REQUIRED TO CALL ALL UTILITY AGENCIES REGARDING TEMPORARY SHORING AND SUPPORT REQUIREMENTS FOR THE VARIOUS UTILITY LINES SHOWN ON THESE PLANS.
21. DURING ROUGH GRADING OPERATIONS AND PRIOR TO CONSTRUCTION OF PERMANENT DRAINAGE STRUCTURES, TEMPORARY DRAINAGE CONTROL SHOULD BE PROVIDED TO PREVENT PONDING WATER AND DAMAGE TO ADJACENT PROPERTIES.
22. APPROVAL OF THESE PLANS BY THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT DOES NOT RELIEVE THE DEVELOPER'S ENGINEERS OF RESPONSIBILITY FOR THE ENGINEERING DESIGN. IF FIELD CHANGES ARE REQUIRED, IT WILL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO MAKE NECESSARY CORRECTIONS.
23. THE CONTRACTOR OR DEVELOPER SHALL SECURE ALL REQUIRED ENCROACHMENT AND/OR STATE AND FEDERAL REGULATORY PERMITS PRIOR TO ALL COMMENCEMENT OF ANY WORK.
24. THE CONCRETE COATING ON THE INSIDE OF ALL REINFORCED CONCRETE PIPES MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2 INCHES OVER THE REINFORCING AND INCREASED TO A MINIMUM OF 3-1/2 INCHES OVER THE REINFORCING FOR BOX CULVERT, WHEN DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE F'c=5,000 PSI FOR VELOCITIES EXCEEDING 20 FEET PER SECOND AND F'c=6,000 PSI FOR VELOCITIES EXCEEDING 30 FEET PER SECOND.
25. CONSTRUCTION JOINT FOR CALTRANS STANDARD REINFORCED CONCRETE BOX SHALL BE ACCORDING TO RCFC&WCD STD DWG. NO. BX 401.

P.M. NO. 33942/P.P. NO. 20699R1/I.P. NO. 110029

G:\2011\11-005A\DWG & PRO\Design\11-005450.pre 1/30/2013

PLAN CHECK OVERSIGHT ENGINEER: Allen Friend — REGISTRATION NUMBER: 45702 — DATE SIGNED: 2-13-13

APPROVED AS TO CONFORMANCE WITH APPLICABLE COUNTY STANDARDS AND PRACTICES.

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT NO. C44762 CIVIL STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
3788 McCRAY ST.
RIVERSIDE CA. 92506
PH: (951) 686-1070
FAX: (951) 788-1256
PREPARED BY: Scott R. Hildebrandt
DATE: 1/31/13 R.C.E. NO. C44762

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.

TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK:
RIVERSIDE COUNTY B.M.
600-40-68
ALUMINUM DISK ON CONCRETE
FROM THIENES ENGINEERING ALTA
ELEV. 1505.08'
DATUM: NGVD 1929 +2.513' FOR NGVD 1988

REF.	REVISIONS	APPR.	DATE
1	RECORD DRAWINGS	HKT	04/07/14

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Mark H. Wills — PLANNING ENGINEER — DATE: 2/19/2013

APPROVED BY: — CHIEF ENGINEER — DATE: 3/22/13

PERRIS VALLEY MDP LATERAL B-8
PERRIS VALLEY LATERAL B-8A

TITLE SHEET

PROJECT NO. 4-0-00457 4-0-00458

DRAWING NO. 4-1060

SHEET NO. 1 OF 7

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES CROSSING OR PARALLELING THE STORM DRAIN, UNLESS OTHERWISE NOTED.

RECORD DRAWINGS
APPROVED BY: [signature]
DATE: 4/3/14

CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING CHANNEL

STA 20+92.25 LAT B-8=
STA 19+63.97 HARVILL AVE

STA 21+01.05
C/L MH NO. 4
1531.72 RIM ELEV.

STA 21+97.00
C/L MH NO. 2
1530.34 RIM ELEV.

EXISTING SURFACE OVER SD C/L

PROPOSED SURFACE OVER SD C/L

PIPE SUPPORT PER DETAIL HEREON

REMOVE EXISTING DOUBLE 54" RCP

PROP. 12" WATER

1.1' CLEAR

1525.99 BOT 18" SD
1525.82 TOP 48" SD

HGL

STA 21+00.00
1521.05 (24" RCP)
ELEV "S"

(S=0.0370)

STA 21+96.44
1521.36 (18" RCP)
ELEV "S"

STA 22+43.81
1521.48 (18" RCP)
ELEV "S"

S=0.0060

S=0.0060

S=0.0030

S=0.0240

1524.05
INV

STA 20+79.89 PRC
1520.64 INV

STA 21+50.87 PRC
1521.07 INV

PROP. 8" SEWER

PROP. 8" SEWER

HYDRAULIC DATA
Q_{00}=195.3 cfs
V_{100}=16.7 fps

HYDRAULIC DATA
Q_{00}=189.6 cfs
V_{100}=15.3 fps

HYDRAULIC DATA
Q_{00}=182.0 cfs
V_{100}=14.5 fps

HYDRAULIC DATA
Q_{00}=182.0 cfs
V_{100}=14.5 fps

SEE SHEET 7 FOR OUTLET STRUCTURE DETAILS

STA 20+00.00
1520.16 INV

STA 20+20.00 BC
1520.28 INV

STA 20+98.42
1520.75 INV

STA 21+03.38
1520.78 INV

STA 21+94.66 GB
1521.33 INV

STA 21+99.34
1521.35 INV

STA 23+00.00
1521.65 INV

98.42 L.F. 60" RCP (D-1200)

91.28 L.F. 48" RCP (D-1400)

200.66 L.F. 48" RCP (D-1200)

MAINTAINED BY R.C.F.C. & W.C.D.

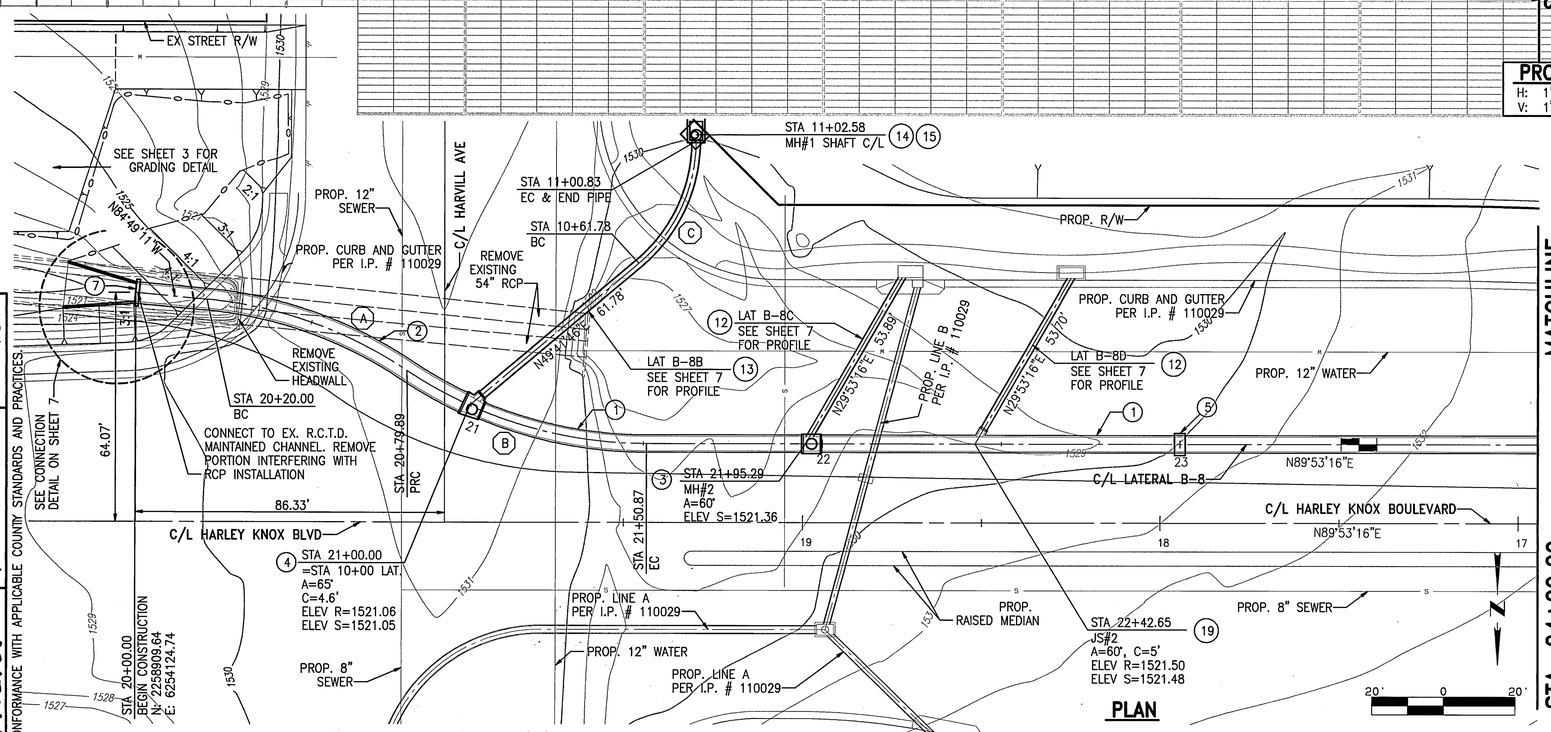
1540 1530 1520 1510

20+00 21+00 22+00 23+00 24+00

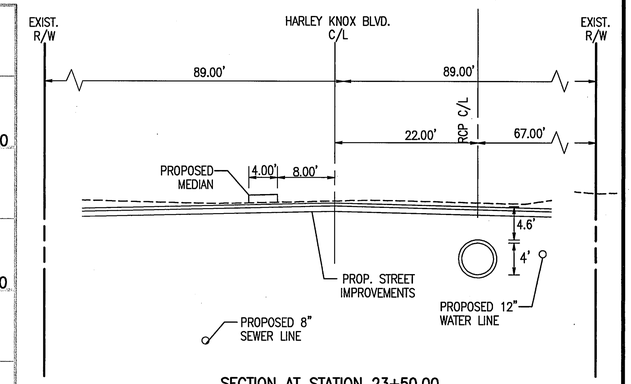
MATCHLINE

STA. 24+00.00
SEE SHEET 3

PROFILE
H: 1"= 20'
V: 1"= 5'



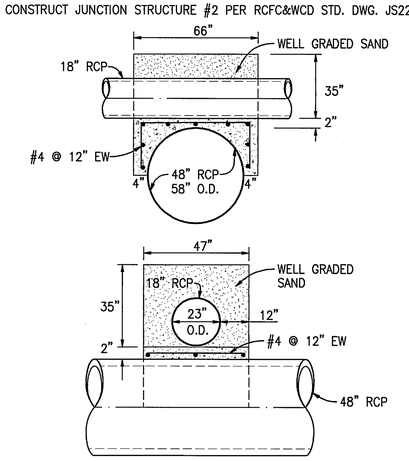
PLAN



SECTION AT STATION 23+50.00
SCALE 1"=10'

CONSTRUCTION NOTES

1. CONSTRUCT 48" RCP (D-LOAD PER PROFILE)
2. CONSTRUCT 60" RCP (D-LOAD PER PROFILE)
3. CONSTRUCT MANHOLE No.2 PER RCFC&WCD STD. DWG. MH252
4. CONSTRUCT MANHOLE No.4 PER RCFC&WCD STD. DWG. MH254
5. CONSTRUCT CONCRETE COLLAR PER RCFC&WCD STD. DWG. M803
7. CONSTRUCT HEADWALL PER CALTRANS STD. D86B AND DETAILS ON SHEET 7
12. CONSTRUCT 18" RCP (CLASS IV)
13. CONSTRUCT 24" RCP (CLASS IV)
14. CONSTRUCT MANHOLE No.1 PER RCFC&WCD STD. DWG. MH251
15. CONSTRUCT 6'x5.4'x6" CONCRETE PAD W/#4@18" E.W. AROUND MANHOLE FRAME
19. CONSTRUCT JUNCTION STRUCTURE #2 PER RCFC&WCD STD. DWG. JS227



PIPE SUPPORT DETAIL
N.T.S.

(A) ℄ CURVE DATA
Δ=28°35'52"
R=120.00'
L=59.90'
T=30.59'
BC=STA 20+20.00
EC=STA 20+79.89
PI= N 2258914.21
E 6254074.36

(B) ℄ CURVE DATA
Δ=33°53'25"
R=120.00'
L=70.98'
T=36.56'
BC=STA 20+79.89
EC=STA 21+50.87
PI= N 2258951.54
E 6254018.55

(C) ℄ CURVE DATA
Δ=49°43'26"
R=45.00'
L=39.05'
T=20.85'
BC=STA 10+61.78
EC=STA 11+00.83
PI= N 2258887.50
E 6253968.36

P.M. NO. 33942/P.P. NO. 20699R1/I.P. NO. 110029

G:\2011\11-005A\DWG & PRO\Design\11-005A5D.pro 1/28/2013

PLAN CHECK OVERSIGHT ENGINEER: Allen Hurd
REGISTRATION NUMBER: 45702
DATE SIGNED: 2-13-13
APPROVED AS TO CONFORMANCE WITH APPLICABLE COUNTY STANDARDS AND PRACTICES.

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT NO. C44762 CIVIL STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
3788 McCRAY ST.
RIVERSIDE CA. 92506
PH: (951) 686-1070
FAX: (951) 788-1256
PREPARED BY: [signature]
DATE: 1/29/13
R.C.E. NO. C44762

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK:
RIV. CO. BM# "600-40-68"
ALUM. DISK ON CONC.
ELEV.=1505.08'
DATUM: 1929
ELEV. 647.374

REF.	REVISIONS	APPR.	DATE

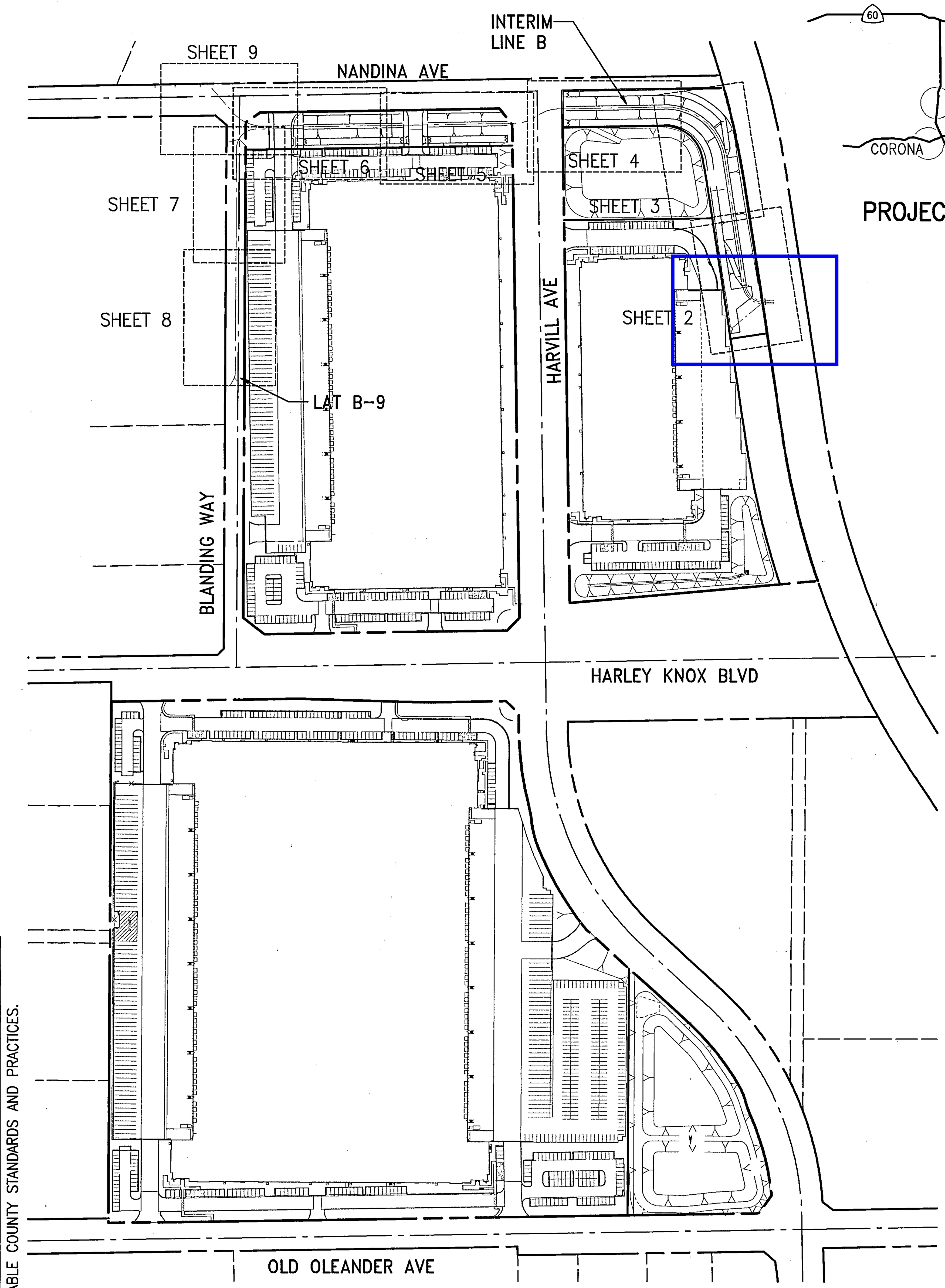
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: [signature] DATE: 2/19/2013
APPROVED BY: Mark W. Wills DATE: 2/19/2013

PERRIS VALLEY MDP
LATERAL B-8
STA 20+00.00 TO STA. 24+00.00

PROJECT NO. 4-0-00457
DRAWING NO. 4-1060
SHEET NO. 2 OF 7

LINE B AS-BUILT SELECTED SHEETS

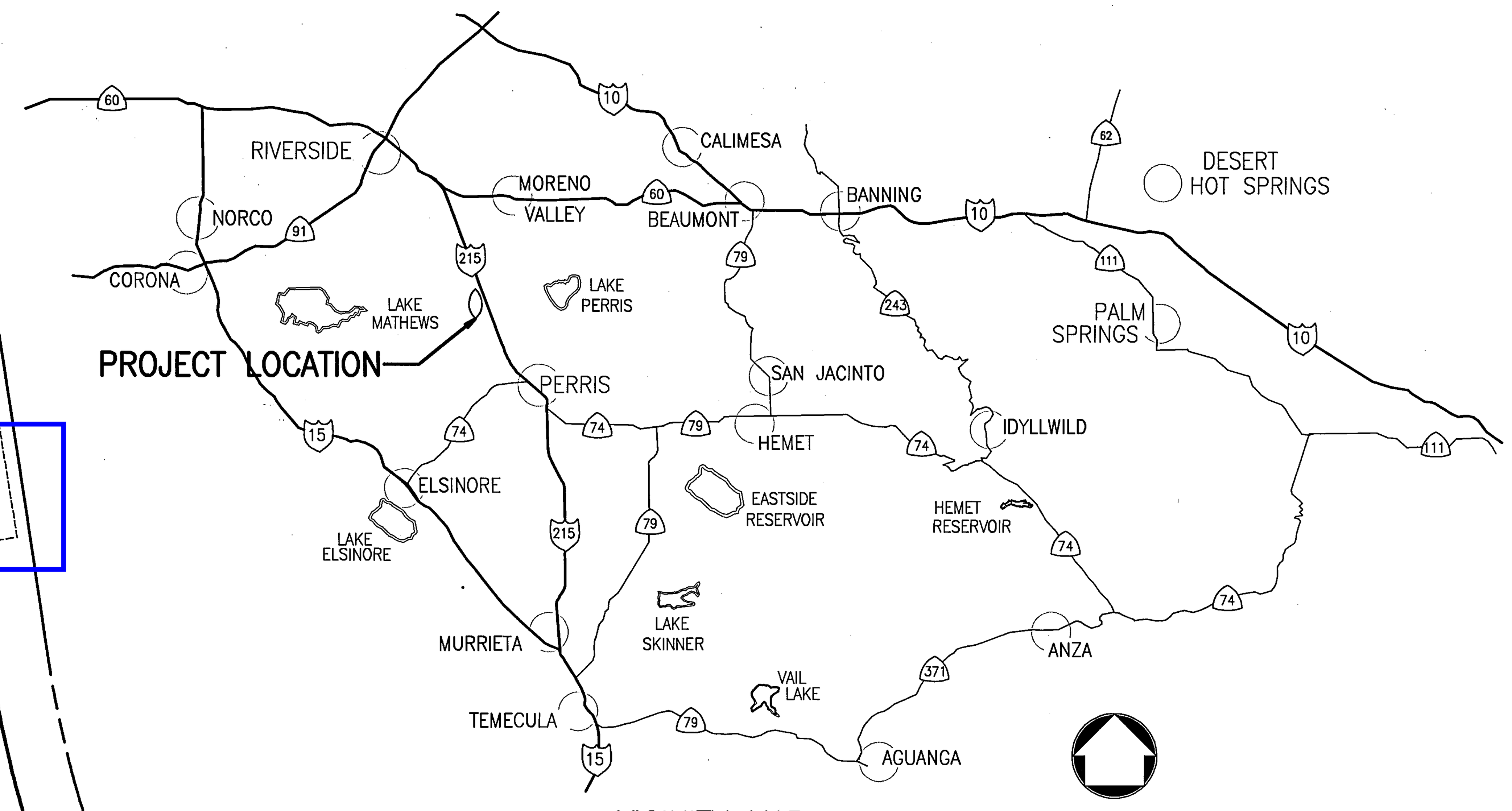
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT



INDEX MAP

GRAPHIC SCALE 1"=200'

0 200 400 600



VICINITY MAP

N.T.S.

GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S M.O.U STANDARD SPECIFICATIONS, DATED JUNE 24, 2008, AND RCFC&WCD STANDARD MANUAL. FOR THE LATEST DRAWINGS OF THE STANDARD MANUAL, PLEASE REFER TO THE "PUBLICATIONS AND RECORDS" PAGE FOUND ON THE DISTRICT'S WEBSITE.
2. CONTACT THE ENCROACHMENT PERMIT ENGINEER AT (951) 955-1266 IF AN ENCROACHMENT PERMIT IS REQUIRED FROM RIVERSIDE COUNTY FLOOD CONTROL. AFTER THE PERMIT IS ISSUED THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
3. CONTACT CONTRACT ADMINISTRATOR AT (951) 955-1288 IF CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. THE DISTRICT MUST BE NOTIFIED TWENTY DAYS (20) PRIOR TO COSTRUCTION.
4. ALL STATIONING REFERS TO THE CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE INTERSECTION STATION.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1-800-227-2600.
7. ALL ELEVATIONS SHOWN ARE IN FEET AND DECIMALS THEREOF BASED ON NATIONAL GEODETIC VERTICAL DATUM (NGVD 1929).
8. ALL COORDINATES ARE SHOWN IN FEET AND DECIMALS THEREOF BASED ON THE NORTH AMERICAN DATUM (NAD 83), CALIFORNIA COORDINATE SYSTEM (CCS), ZONE 6. EPOCH 1991.35.
9. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
10. ELEVATIONS AND LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE UNLESS OTHERWISE NOTED.
11. UNLESS OTHERWISE SPECIFIED, MINIMUM STREET RECONSTRUCTION SHALL BE 4" TYPE "B" HOT MIX ASPHALT OVER 6" CLASS 2 AGGREGATE BASE OR AS SPECIFIED BY THE ENGINEER.
12. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6 INCHES OF CLASS "B" CONCRETE.
13. PIPE CONNECTED TO THE MAINLINE PIPE SHALL CONFORM TO JUNCTION STRUCTURE NO. 4 (JS 229) UNLESS OTHERWISE NOTED.
14. PIPE BEDDING SHALL CONFORM TO RCFC&WCD STD. DWG. M815, EXCEPT FOR COVER <2 FEET. FOR COVER <2 FEET, CONCRETE SLURRY (2000 PSI-2 SACK) SHALL BE USED. THE ENTIRE TRENCH SHALL BE SLURRY EXTENDING 4 INCHES MINIMUM AND 12 INCHES MAXIMUM ABOVE THE TOP OF THE PIPE.
15. BH-1 INDICATES SOIL BORING LOCATIONS BASED ON THE SOILS REPORT DATED JUNE 1, 2011. LOCATIONS SHOWN ARE APPROXIMATE.
16. "V" IS THE DEPTH OF INLET AND CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
17. CATCH BASINS SHALL BE LOCATED SO THAT LOCAL DEPRESSIONS SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
18. ALL CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
19. STANDARD DRAWINGS CALLED FOR ON THE PLAN AND PROFILE SHALL CONFORM TO DISTRICT STANDARD DRAWINGS UNLESS OTHERWISE NOTED.
20. THE CONTRACTOR IS REQUIRED TO CALL ALL UTILITY AGENCIES REGARDING TEMPORARY SHORING AND SUPPORT REQUIREMENTS FOR THE VARIOUS UTILITY LINES SHOWN ON THESE PLANS.
21. DURING ROUGH GRADING OPERATIONS AND PRIOR TO CONSTRUCTION OF PERMANENT DRAINAGE STRUCTURES, TEMPORARY DRAINAGE CONTROL SHOULD BE PROVIDED TO PREVENT PONDING WATER AND DAMAGE TO ADJACENT PROPERTIES.
22. APPROVAL OF THESE PLANS BY THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT DOES NOT RELIEVE THE DEVELOPER'S ENGINEERS OF RESPONSIBILITY FOR THE ENGINEERING DESIGN. IF FIELD CHANGES ARE REQUIRED, IT WILL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO MAKE NECESSARY CORRECTIONS.
23. THE CONTRACTOR OR DEVELOPER SHALL SECURE ALL REQUIRED ENCROACHMENT AND/OR STATE AND FEDERAL REGULATORY PERMITS PRIOR TO ALL COMMENCEMENT OF ANY WORK.
24. THE CONCRETE COATING ON THE INSIDE OF ALL REINFORCED CONCRETE PIPES MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2 INCHES OVER THE REINFORCING AND INCREASED TO A MINIMUM OF 3-1/2 INCHES OVER THE REINFORCING FOR BOX CULVERT, WHEN DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE F'c=5,000 PSI FOR VELOCITIES EXCEEDING 20 FEET PER SECOND AND F'c=6,000 PSI FOR VELOCITIES EXCEEDING 30 FEET PER SECOND.
25. CONSTRUCTION JOINT FOR CALTRANS STANDARD REINFORCED CONCRETE BOX SHALL BE ACCORDING TO RCFC&WCD STD DWG. NO. BX 401.

(P.M. NO. 33942/P.P. NO. 20699R1/I.P. NO. 110029)

UNDERGROUND UTILITIES NOTE

ALL UNDERGROUND STRUCTURES OR UTILITIES REPORTED BY THE OWNER OR OTHERS AND THOSE SHOWN ON THE RECORDS EXAMINED ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT.

THE OWNER, BY ACCEPTING THESE PLANS OR PROCEEDING WITH THE IMPROVEMENTS PURSUANT THERETO AGREE TO ASSUME LIABILITY AND TO HOLD THE UNDERSIGNED HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, OR LOCATED AT A VARIANCE WITH THAT REPORTED OR SHOWN ON THE RECORDS EXAMINED.

THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

CALL UNDERGROUND SERVICE ALERT (U.S.A.) 1-800-227-2600 AT LEAST 2 WORKING DAYS PRIOR TO EXCAVATION.

NOTICE TO CONTRACTOR

CONTRACTOR AGREES THAT HE SHALL ASSUME COMPLETE AND SOLE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE IN EFFECT CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD COUNTY OF RIVERSIDE, THE OWNER, AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FROM LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.

R.C.F.C. & W.C.D. STD. DRAWINGS

CH324	UNLINED CHANNEL
CH325	ROCK LINED CHANNEL
CH326	TRAPEZOIDAL CHANNEL
CH333	DRAINAGE APRON
CH334	MAINTENANCE RAMP
CB109	CONNECTON TO CATH BASIN
CB110	CONCRETE DROP INLET
JS229	JUNCTION STRUCTURE #4
JS233	JUNCTION STRUCTURE #8
M801	CHAIN LINK FENCE/DOUBLE DRIVE GATE
M803	CONCRETE COLLAR
M827	VEHICULAR TURN AROUND
MH251	MANHOLE #1
MH252	MANHOLE #2
MH254	MANHOLE #4

CALTRANS STD. DRAWINGS

D80	SINGLE BOX CULVERT
D84	BOX CULVERT WINGWALLS
D90	PIPE CULVERT WINGWALLS

SHEET INDEX

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LATERAL B-9	7-8
LATERAL B-9A	9
LATERAL B-A, B-B, DETAIL B	10
LATERAL B-9B, B-9C, B-9D	11
DETAILS	12

STATE PLANE BEARING

STATE PLANE SYSTEM BEARINGS ARE ROTATED 0°51'19" FROM RECORD BEARINGS PER PM 33942. COORDINATES SHOWN ON PLANS HAVE BEEN ADJUSTED TO STATE PLANE SYSTEM.

RIV. CO. ROAD IMP. STANDARDS

STD. 810 BARRICADE

RECORD DRAWINGS

APPROVED BY: [signature]

DATE: 4/3/14

PLAN CHECK OVERSIGHT ENGINEER	REGISTRATION NUMBER	DATE SIGNED
Alan French	45702	2-13-13

APPROVED AS TO CONFORMANCE WITH APPLICABLE COUNTY STANDARDS AND PRACTICES.

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT NO. C44762 CIVIL STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES — CIVIL ENGINEERS
3788 McCRAY ST.
RIVERSIDE CA. 92506
PH: (951) 686-1070
FAX: (951) 788-1256

PREPARED BY: [signature]
DATE: 1/29/13
R.C.E. NO. C44762

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK:
RIVERSIDE COUNTY B.M.
600-40-68
ALUMINUM DISK ON CONCRETE
FROM THIENES ENGINEERING ALTA
ELEV. 1505.08'
DATUM: NGVD 1929 +2.513' FOR NGVD 1988

REVISIONS

REF.	DESCRIPTION	APPR.	DATE
1	RECORD DRAWINGS	[initials]	1Apr14

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Mark A. Wills — PLANNING ENGINEER — DATE: 2/19/2013

APPROVED BY: [signature] — CHIEF ENGINEER — DATE: 2/22/13

PERRIS VALLEY MDP INTERIM LINE B AND MDP LATERAL B-9

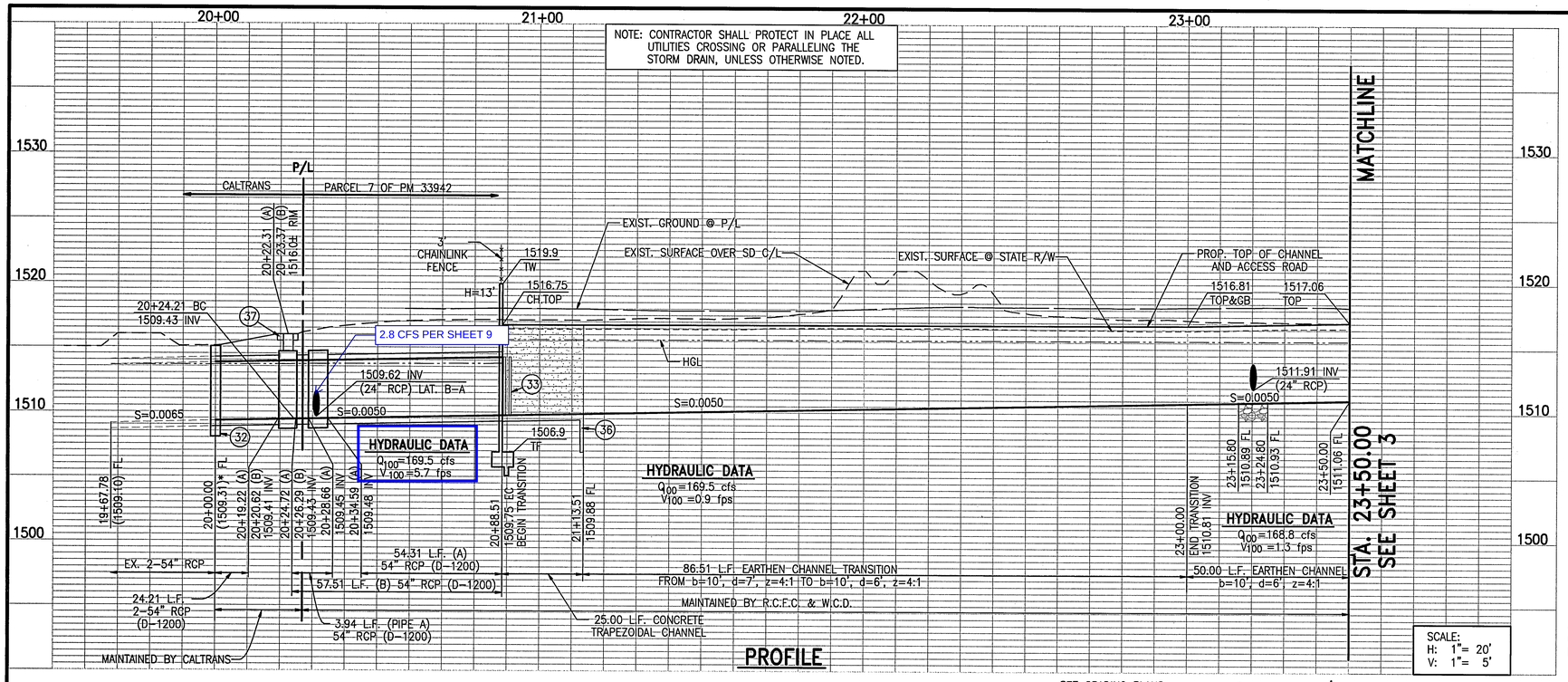
TITLE SHEET

PROJECT NO. 4-0-00459

DRAWING NO. 4-1061

SHEET NO. 1 OF 12

G:\2011\11-0054\DWG & PRD\Design\11-0054S0-CHANNEL.pro 1/28/2013

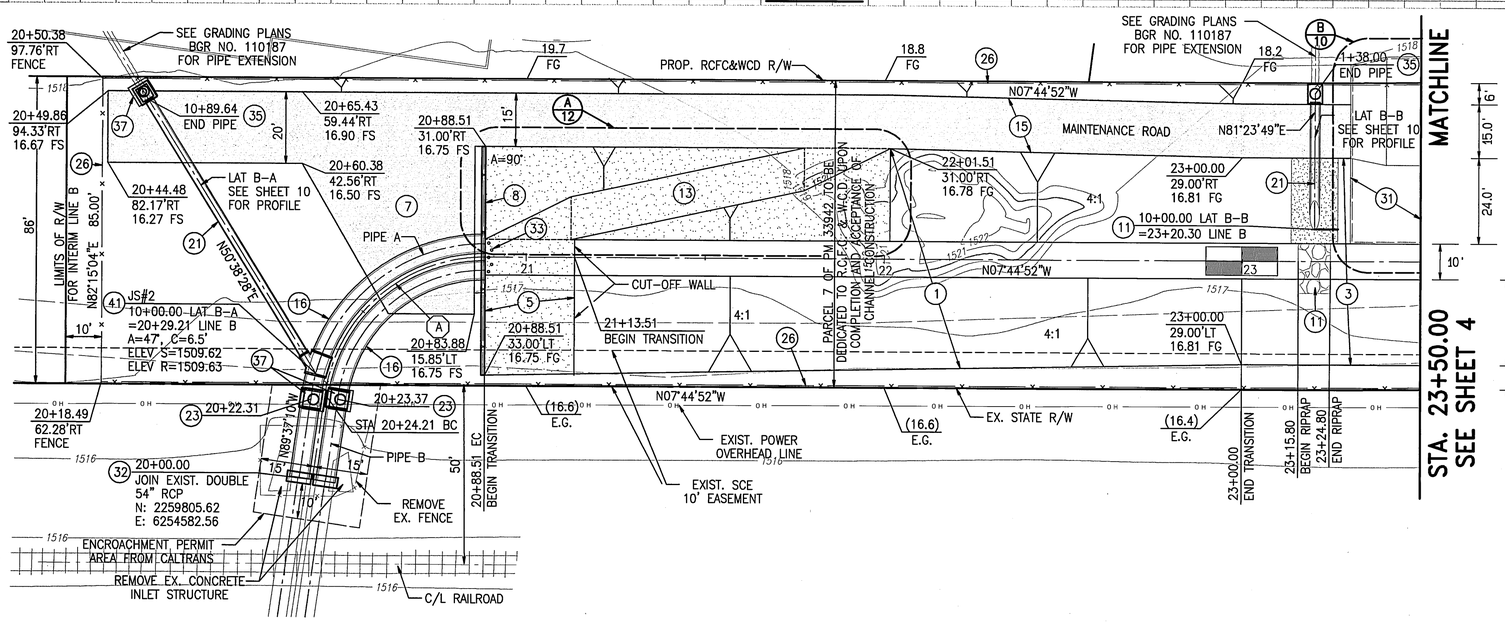


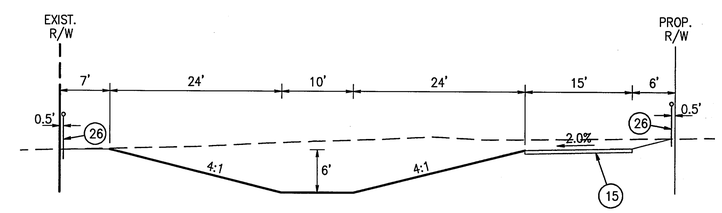
CONSTRUCTION NOTES

1. CONSTRUCT EARTHEN CHANNEL PER RCFC&WCD STD. CH324. TRANSITION FROM B=10', D=7', Z=4:1 TO B=10', D=6', Z=4:1
3. CONSTRUCT EARTHEN CHANNEL PER RCFC&WCD STD. CH324. B=10', D=6', Z=4:1
5. CONSTRUCT TRAPEZOIDAL CHANNEL PER R.C.F.C. & W.C.D. STD. DWG. NO. CH326. B=10', D=7.0', Z=4:1
7. CONSTRUCT VEHICULAR TURN AROUND AREA PER RCFC&WCD STD. M827
8. CONSTRUCT PIPE CULVERT WINGWALLS (TYPE B) PER CALTRANS PLAN NO. D90. HEIGHT AND ANGLE PER PLAN
11. CONSTRUCT JUNCTION STRUCTURE No.8 PER RCFC&WCD STD. JS233
13. CONSTRUCT MAINTENANCE RAMP PER RCFC&WCD STD. CH334
15. CONSTRUCT 3" THICK CLASS II A.B. 15' WIDE MAINTENANCE ROAD (UNLESS OTHERWISE NOTED)
16. CONSTRUCT 54" RCP (D-LOAD PER PROFILE)
21. CONSTRUCT 24" RCP (D-LOAD PER PROFILE)
23. CONSTRUCT MANHOLE No.2 PER RCFC&WCD STD. MH252
24. CONSTRUCT MANHOLE No.4 PER RCFC&WCD STD. DWG. MH254
26. INSTALL 6' CHAINLINK FENCE PER RCFC&WCD STD. M801. SEE SECTION HEREON FOR TYPICAL FENCE LOCATION.
31. CONSTRUCT MODIFIED CONCRETE APRON PER RCFC&WCD STD. CH333 AND DETAIL B ON SHEET 10.
32. CONSTRUCT CONCRETE COLLAR PER RCFC&WCD STD. M803
33. INSTALL DEBRIS BARRIER POSTS, AT 4' O.C. – 2 ROWS STAGGERED PER DETAIL ON SHEET 8
35. CONSTRUCT MANHOLE No.1 PER RCFC&WCD STD. MH251
36. CONSTRUCT 3' CUT-OFF WALL PER DETAIL ON SHEET 5
37. CONSTRUCT 6'x6'x6" CONC. PAD #4 @ 18" EW
41. CONSTRUCT JUNCTION STRUCTURE No.2 PER RCFC&WCD STD. JS227

*** NOTE:**

CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF THE EXISITNG FACILITIES PRIOR TO THE BEGINING OF CONSTRUCTION.





SECTION AT STA. 23+00.00

TYPICAL FROM STA. 20+00.00 TO STA. 23+50.00
SCALE: 1" = 10'

(A) ℄ CURVE DATA

Δ=81°52'18"
R=45.00'
L=64.30'
T=39.03'
BC=STA 20+24.19
EC=STA 20+88.49
PI= N 2259806.04 E 6254519.32

RECORD DRAWINGS

APPROVED BY:

DATE: 4-3-14

20' 0 20'

G:\2011\11-0054\DWG & PRO\Design\11-00459-CHANNEL.pro 1/30/2013

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT NO. C44762 CIVIL STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
3788 McCRAY ST.
RIVERSIDE CA. 92506
PH: (951) 686-1070
FAX: (951) 788-1256
PREPARED BY:
R.C.E. NO. C44762
DATE: 1/31/13

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK:
RIVERSIDE COUNTY B.M.
600-40-68
ALUMINUM DISK ON CONCRETE
FROM THIENES ENGINEERING ALTA
ELEV. 1505.08'
DATUM: NGVD 1929 +2.513' FOR NGVD 1988

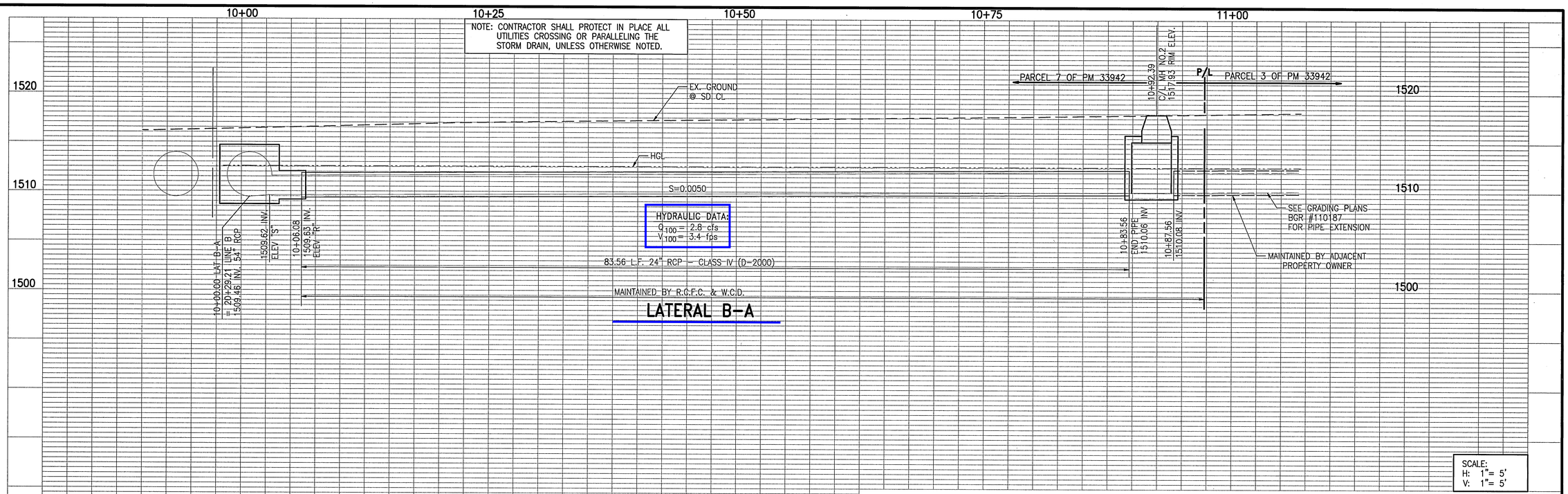
REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

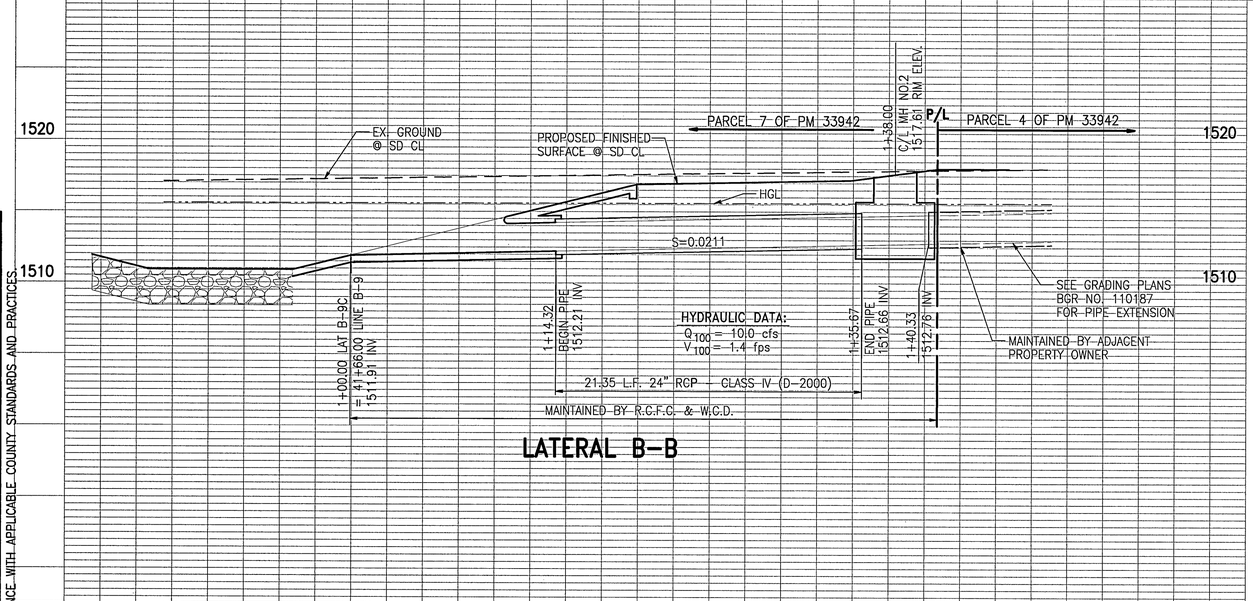
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: DATE: 2/19/2013
APPROVED BY: DATE: 2/19/2013

PERRIS VALLEY MDP INTERIM LINE B

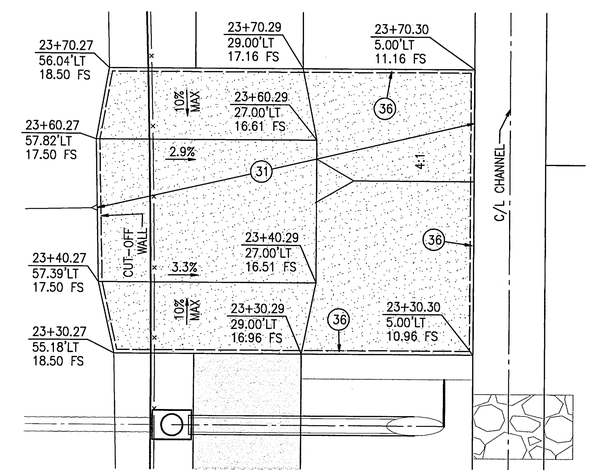
STA. 20+00.00 TO STA. 23+50.00

PROJECT NO. 4-0-00459
DRAWING NO. 4-1061
SHEET NO. 2 OF 12





PROFILE



DETAIL B/2
1"=10'

CONSTRUCTION NOTES

(31) CONSTRUCT MODIFIED CONCRETE APRON PER RCFC&WCD STD. CH333 AND DETAIL B ON SHEET 10.

(36) CONSTRUCT 3' CUT-OFF WALL PER DETAIL ON SHEET 5

RECORD DRAWINGS

APPROVED BY: [signature]

DATE: 4/3/14

G:\2011\LV-0054\DWG & PRO\Design\11-0054SD-CHANNEL.pro 1/28/2013

PLAN CHECK OVERSIGHT ENGINEER: Alan Frank

REGISTRATION NUMBER: 45702

DATE SIGNED: 2-13-13

APPROVED AS TO CONFORMANCE WITH APPLICABLE COUNTY STANDARDS AND PRACTICES

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT NO. C44762 CIVIL STATE OF CALIFORNIA

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
3788 McCRAY ST.
RIVERSIDE CA. 92506
PH: (951) 686-1070
FAX: (951) 788-1256

PREPARED BY: [signature]
DATE: 1/28/13
R.C.E. NO. C44762

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RIVERSIDE COUNTY B.M.
600-40-68
ALUMINUM DISK ON CONCRETE
FROM THIENES ENGINEERING ALTA
ELEV. 1505.08'
DATUM: NGVD 1929 +2.513' FOR NGVD 1988

REVISIONS		
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: [signature] DATE: 2/15/2013

APPROVED BY: Mark H. Wills DATE: 2/19/2013

PERRIS VALLEY MDP
INTERIM LINE B

LATERALS B-A, B-B, DETAIL B

PROJECT NO. 4-0-00459

DRAWING NO. 4-1061

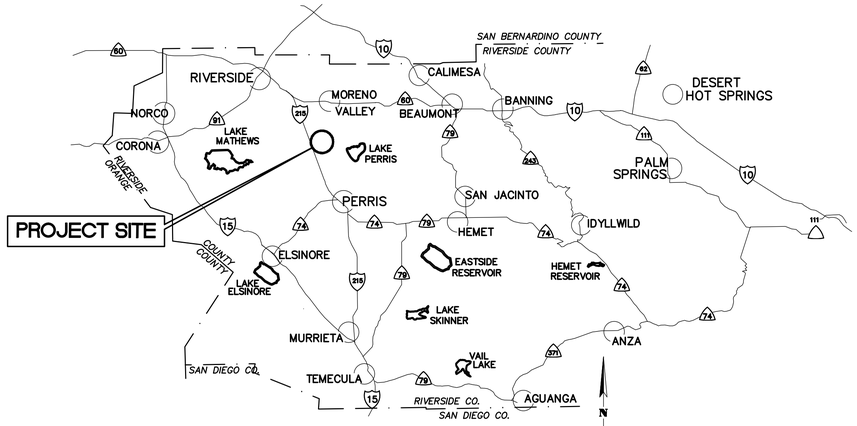
SHEET NO. 10 OF 12

LINE A & LATERAL "A2" AS-BUILT
SELECTED SHEETS

CITY OF PERRIS

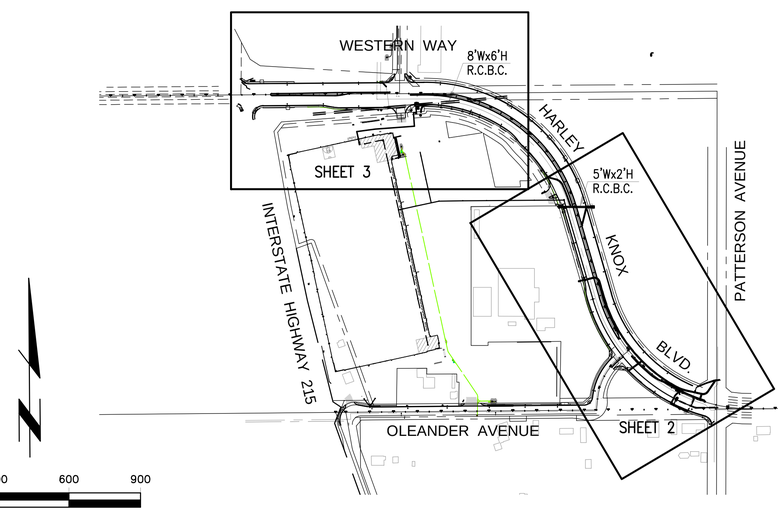
PERRIS GATEWAY COMMERCE CENTER

DPR 16-00003 SPA05050



VICINITY MAP

NTS



INDEX MAP

SCALE: 1"=300'

LEGEND:

ℙ	—PROPERTY LINE
R/W	—RIGHT OF WAY
℄	—CENTERLINE
T.C.	—TOP OF CURB
F.L.	—FLOW LINE
F.S.	—FINISH SURFACE
H.P.	—HIGH POINT
F.F.	—FINISH FLOOR
R.C.P.	—REINFORCED CONCRETE PIPE
INV.	—INVERT
S =	—SLOPE
F.G.	—FINISH GRADE
S.D.	—STORM DRAIN
ST.LT.	—STREET LIGHT
G.B.	—GRADE BREAK
H.P.	—HIGH POINT
E.C.	—EDGE OF CONCRETE
G.A.	—GUY ANCHOR
A.B.	—AGGREGATE BASE
F.H.	—FIRE HYDRANT
P.P.	—POWER POLE
C.B.	—CATCH BASIN
R=	—RATE OF GRADE
B.C.R.	—BEGIN OF CURB RETURN
E.C.R.	—END OF CURB RETURN
L.P.	—LOW POINT
T.O.P.	—TOP OF PIPE
B.O.P.	—BOTTOM OF PIPE
R	—RATE OF GRADE
T.F.	—TOP OF FOOTING
T.W.	—TOP OF WALL
S.F.	—SQUARE FEET
C.F.	—CURB FACE
F.P.	—FINISHED PAVEMENT
S.F.O.W	—SOUTH FACE OF WALL
N.F.O.W	—NORTH FACE OF WALL
E.F.O.W	—EAST FACE OF WALL
W.F.O.W	—WEST FACE OF WALL
T.P.	—TOP OF PIPE
(O.OO)	—EXISTING ELEVATION
B.O.W.	—BOTTOM OF WALL
T.G.	—TOP OF GRATE
N.G.	—NATURAL GRADE
TOP	—TOP OF SLOPE
TOE	—TOE OF SLOPE
E.P.	—EDGE OF PAVEMENT
A.C.	—ASPHALT CONCRETE
C.L.F.	—CHAIN LINK FENCE
CONC.	—CONCRETE
PKWY DRAIN	—PARKWAY DRAIN
EXIST.	—EXISTING
EMH	—EDISON MANHOLE
M.H.	—MANHOLE
T.B.	—TOP OF BERM
E.T.W.	—EDGE OF TRAVELWAY
B.W.	—BACK OF WALK
TC—TX	—TOP OF CURB@DRIVEWAY
TC—BX	—BOT. OF CURB@DRIVEWAY
	—BORING LOCATION

STORM DRAIN CONSTRUCTION NOTES:

- ✳ PER CITY OF PERRIS STD. UTILITY TRENCH SURFACE REPAIR ON SHEET 5
- (10) CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.W.C.D. STD. DWG. NO JS227
- (11) PROTECT IN PLACE EXISTING R.C.P. STORM DRAIN LINE, PIPE SIZE PER PLAN
- (12) CONSTRUCT STORM DRAIN MANHOLE NO.1 PER R.C.F.C.W.C.D. STD. DWG. NO MH251
- (13) REMOVE CATCH BASIN AND ABANDON IN PLACE EXISTING STORM DRAIN. CAP END OF PIPE WITH CONCRETE
- (14) CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB101, "W" PER PLAN.
- (15) CONSTRUCT LOCAL DEPRESSION NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO LD202 CASE "B"
- (16) CONSTRUCT BMP "NO DUMPING" STENCIL PER DETAIL ON SHEET 5
- (17) CONSTRUCT CATCH BASIN NO. 1 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB100, "W" PER PLAN.
- ✳ (18) CONSTRUCT 5' SPAN x 1' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D83A
- ✳ (19) CONSTRUCT 18" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
- ✳ (20) CONSTRUCT 24" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
- (21) CONSTRUCT CONCRETE HEADWALL AND WINGWALL PER CALTRANS, STD. DWG. D83A, D83B AND D84 WITH TYPE "B" WINGWALL AND REMOVABLE TRASH RACK
- (22) CONSTRUCT RIPRAP PAD, DETAILS ON SHEET 5
- ✳ (23) CONSTRUCT 5' SPAN x 2' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D80
- (24) CONSTRUCT JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226
- (25) REMOVE EXISTING CONCRETE HEADWALL
- (26) CONSTRUCT SPECIAL CONNECTION TO CATCH BASIN PER R.C.F.C.W.C.D. STD. DWG. NO CB109
- (27) CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION NO. 3 CASE "A" PER R.C.F.C.W.C.D. STD. DWG. NO CB101 AND LD202, "W" PER PLAN.
- (28) PROTECT IN PLACE EXISTING 5'x2' R.C.B.C.
- (29) CONSTRUCT CATCH BASIN NO. 6 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB102
- (30) CONSTRUCT CONCRETE BULKHEAD PER R.C.F.C.W.C.D. STD. DWG. NO M816
- (31) CONSTRUCT 24"x24" CATCH BASIN DETAILS ON SHEET 5
- (32) CONSTRUCT STORM DRAIN MANHOLE NO.3 PER R.C.F.C.W.C.D. STD. DWG. NO MH253
- (33) CONSTRUCT 30"x8" WALL OPENING, DETAILS ON SHEET 5
- (34) CONSTRUCT CONCRETE COLLAR PER R.C.F.C.W.C.D. STD. DWG. NO M803
- ✳ (35) CONSTRUCT 30"x8" R.C.B.C. , DETAILS ON SHEET 5
- (36) REMOVE TOP PORTION OF OF EXISTING CURB OPENING CATCH BASIN AND CONSTRUCT MANHOLE SEE PROFILE ON SHEET 3
- (37) CONSTRUCT DROP INLET PER R.C.F.C.W.C.D. STD. DWG. NO CB110
- (38) CONSTRUCT 12" AREA DRAIN FOR LANDSCAPING
- (39) REMOVE EXISTING CURB OPENING CATCH BASIN AND APPROXIMATELY 2.4 L.F. OF EXISTING 18" R.C.P.
- (40) CONSTRUCT JUNCTION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO. JS228
- (41) CONSTRUCT MODIFIED JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226, DETAILS ON SHEET 5
- (42) CONSTRUCT 2-15" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
- (43) CONSTRUCT TRANSITION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO TS303, FOR MODIFIED T.S. SEE DETAILS ON SHEET 4
- (44) CONSTRUCT 18" C.M.P. RISER, DETAILS ON SHEET 4 (8)

GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S M.O.U. STANDARD SPECIFICATIONS DATED JUNE 24, 2008, AND RCFC&WCD STANDARD MANUAL. FOR THE LATEST DRAWINGS OF THE STANDARD MANUAL, PLEASE REFER TO THE "PUBLICATIONS AND RECORDS" PAGE FOUND ON THE DISTRICT'S WEBSITE.
2. CONTACT THE ENCROACHMENT PERMIT ENGINEER AT 951.955.1266 IF AN ENCROACHMENT PERMIT IS REQUIRED FROM RIVERSIDE COUNTY FLOOD CONTROL. AFTER THE PERMIT IS ISSUED THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
3. CONTACT CONTRACT ADMINISTRATION AT 951.955.1288 IF CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. THE DISTRICT MUST BE NOTIFIED TWENTY DAYS (20) PRIOR TO CONSTRUCTION.
4. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE INTERSECTION STATIONS.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1.800.227.2600.
7. ALL ELEVATIONS SHOWN ARE IN FEET AND DECIMALS THEREOF BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD 1929).
8. ALL COORDINATES ARE SHOWN IN FEET AND DECIMALS THEREOF BASED ON THE NORTH AMERICAN DATUM (NAD 83), CALIFORNIA COORDINATE SYSTEM (CCS), ZONE 6 AND EPOCH 2011.00.
9. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
10. ELEVATIONS OF UTILITIES ARE APPROXIMATE UNLESS OTHERWISE NOTED.
11. UNLESS OTHERWISE SPECIFIED, MINIMUM STREET RECONSTRUCTION SHALL BE 4" TYPE "B" HOT MIX ASPHALT OVER 6" CLASS 2 AGGREGATE BASE OR AS SPECIFIED BY THE ENGINEER
12. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6" OF CLASS "B" CONCRETE.
13. PIPE CONNECTED TO THE MAINLINE PIPE SHALL CONFORM TO JUNCTION STRUCTURE NO. 4 (JS 229) UNLESS OTHERWISE NOTED.
14. PIPE BEDDING SHALL CONFORM TO RCFC&WCD STD. DWG. NO. M815 EXCEPT FOR COVER <2 FEET. FOR COVER <2 FEET, CONCRETE SLURRY (2000 PSI) SHALL BE USED. THE ENTIRE TRENCH SHALL BE SLURRY EXTENDING 4 INCHES MINIMUM AND 12 INCHES MAXIMUM ABOVE THE TOP OF THE PIPE.
15. BH-1 INDICATES SOIL BORING LOCATIONS BASED ON THE SOILS REPORT DATED 11-19-2009. LOCATIONS SHOWN ARE APPROXIMATE.
16. "V" IS THE DEPTH OF CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
17. CATCH BASINS SHALL BE LOCATED SO THAT LOCAL DEPRESSION SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
18. ALL CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
19. STANDARD DRAWINGS CALLED FOR ON THE PLAN AND PROFILE SHALL CONFORM TO DISTRICT STANDARD DRAWINGS UNLESS NOTED OTHERWISE.
20. THE CONTRACTOR IS REQUIRED TO CALL ALL UTILITY AGENCIES REGARDING TEMPORARY SHORING AND SUPPORT REQUIREMENTS FOR THE VARIOUS UTILITY LINES SHOWN ON THESE PLANS.
21. DURING ROUGH GRADING OPERATIONS AND PRIOR TO CONSTRUCTION OF PERMANENT DRAINAGE STRUCTURES, TEMPORARY DRAINAGE CONTROL SHOULD BE PROVIDED TO PREVENT PONDING WATER AND DAMAGE TO ADJACENT PROPERTIES.
22. APPROVAL OF THESE PLANS BY THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT DOES NOT RELIEVE THE DEVELOPER'S ENGINEER OF RESPONSIBILITY FOR THE ENGINEERING DESIGN. IF FIELD CHANGES ARE REQUIRED, IT WILL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO MAKE THE NECESSARY CORRECTIONS.
23. THE CONTRACTOR OR DEVELOPER SHALL SECURE ALL REQUIRED ENCROACHMENT AND/OR STATE AND FEDERAL REGULATORY PERMITS PRIOR TO THE COMMENCEMENT OF ANY WORK.
24. THE CONCRETE COATING ON THE INSIDE OF ALL REINFORCED CONCRETE PIPES MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2 INCHES OVER THE REINFORCING AND INCREASED TO A MINIMUM OF 3-1/2 INCHES OVER REINFORCING FOR BOX CULVERT, WHEN DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE F'C=5,000 PSI FOR VELOCITIES EXCEEDING 20 FEET PER SECOND AND F'C=6,000 PSI FOR VELOCITIES EXCEEDING 30 FEET PER SECOND.
25. CONSTRUCTION JOINTS FOR CALTRANS STANDARD REINFORCED CONCRETE BOX SHALL BE PLACED ACCORDING TO RCFC&WCD STANDARD DRAWING NO. BOX 401.
26. VIDEO OF STORM DRAINAGE SHALL BE SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PAVEMENT CAPPING OR CONCRETING.

INDEX

	SHEET NO.:
TITLE SHEET	1
PLAN & PROFILES	2-3-3A
PIPE PROFILES	4
STORM DRAIN DETAILS	5

"AS-BUILT"

ALL IMPROVEMENTS SHOWN HEREIN HAVE BEEN CONSTRUCTED IN SUBSTANTIAL CONFORMANCE WITH THE DIMENSIONS, LINE AND ELEVATION INDICATED.

05/06/19

HAIDOOK I. AGHAIAN, RCE 43293 EXP. 03/31/20 DATE

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

PM 37055

Last Update: 11/8/18
G:\3500-3599\3526\STORM DRAIN PUBLIC\3526-SD_SHT1.dwg

SOIL ENGINEER:

SOUTHERN CALIFORNIA GEOTECHNICAL
22855 EAST SAVI RANCH PARKWAY
SUITE E, YORBA LINDA, CA 92887
PHONE: (714)685-1115

OWNER:

REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

REVISIONS:

DATE	BY	MARK	REVISION	APPR.	DATE
12/05/18	EDT	9	ADDED SHEET 3A FOR 18" RCP STORM DRAIN LINE AT MEDIAN.		
11/09/18	EDT	8	ADDED 18" CMP RISER AND LF OF 18" RCP, SEE SHEET 2 AND 4. ADD CONSTRUCTION NOTES 42 AND 43, SEE SHEET 2 AND 4.		
9/30/18	EDT	7	ABANDON LAT. "A1" ADD LAT. "A4" AND "5A",REVISED PROFILE.		

ENGINEER — CITY

CITY OF PERRIS
APPROVED BY:

CITY ENGINEER DATE

SEAL—ENGINEER

REGISTERED PROFESSIONAL ENGINEER HAIDOOK I. AGHAIAN R.C.E. NO. 43293 Exp. 3-31-20 CIVIL STATE OF CALIFORNIA

PREPARED BY:

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Date: 05/06/19

HAIDOOK I. AGHAIAN RCE NO. 43293

BENCHMARK:

RIVERSIDE COUNTY BENCHMARK NO. "M-31"
SET 3 1/4 INCH ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31. RESET APRIL 1996, FLUSH, AT THE SOUTH WEST CORNER OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BOULEVARD AND RIVERSIDE COUNTY FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"), 43 FEET WEST OF THE CENTERLINE OF PERRIS BOULEVARD AND 4.5 FEET EAST OF CONCRETE BRIDGE BARRIER (EDGE OF BRIDGE).
ELEVATION = 1474.674' (NGVD '29 / MAY,1996 ADJ.)

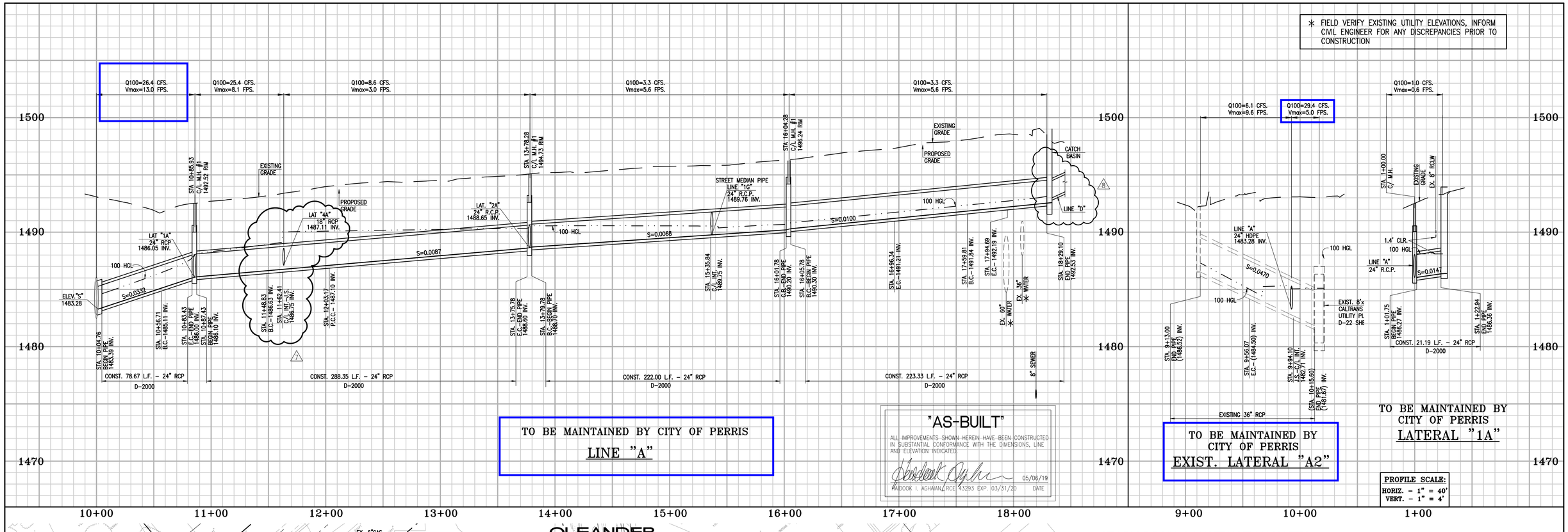
SCALE: AS SHOWN

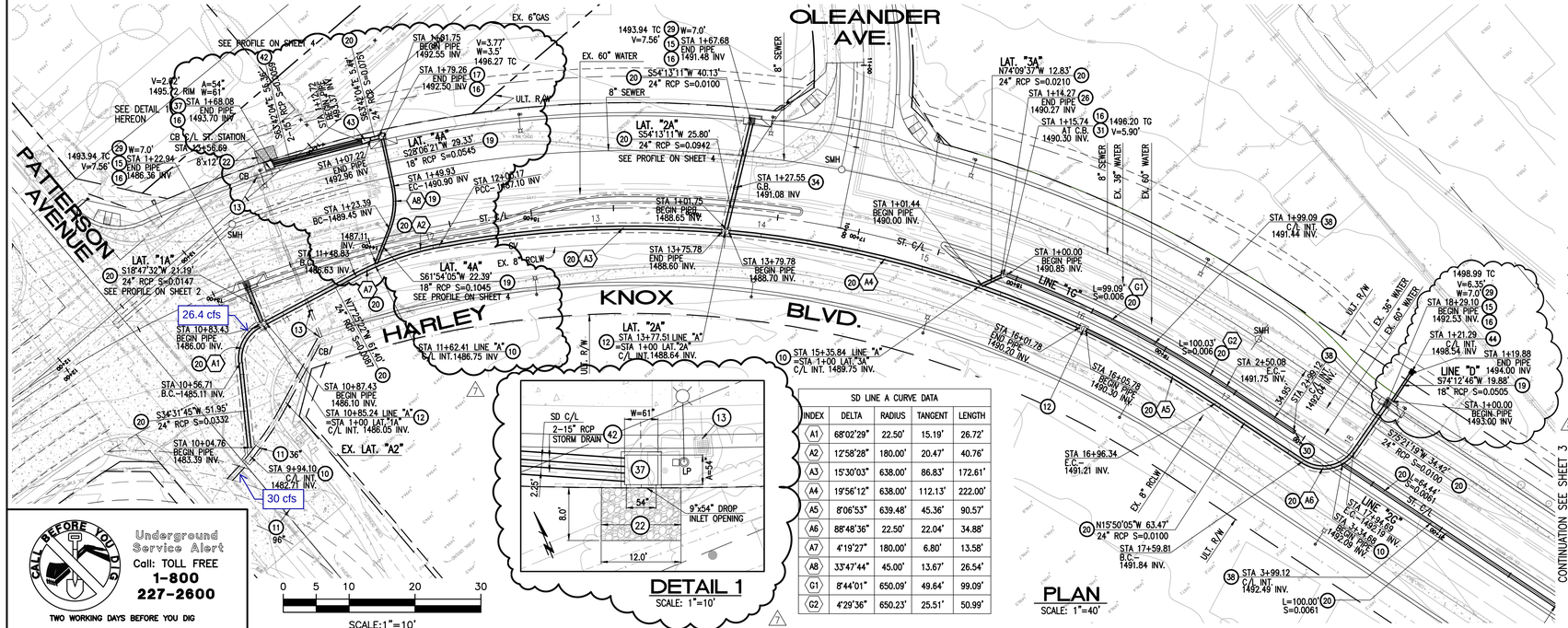
CITY OF PERRIS
COUNTY OF RIVERSIDE
STORM DRAIN TITLE SHEET
PERRIS GATEWAY COMMERCE CENTER
DPR 16-00003, SPA05050

FOR: W.O. CITY FILE No. P8-1271

SHEET No. 1 OF 5

FILE NO. ---





DETAIL 1
SCALE: 1"=10'

SD LINE A CURVE DATA

INDEX	DELTA	RADIUS	TANGENT	LENGTH
A1	68°02'29"	22.50'	15.19'	26.72'
A2	12°58'28"	180.00'	20.47'	40.76'
A3	15°30'03"	638.00'	86.83'	172.61'
A4	19°56'12"	638.00'	112.13'	222.00'
A5	8°06'53"	639.48'	45.36'	90.57'
A6	88°48'36"	22.50'	22.04'	34.88'
A7	4°19'27"	180.00'	6.80'	13.58'
A8	33°47'44"	45.00'	13.67'	26.54'
G1	8°44'01"	650.09'	49.64'	99.09'
G2	4°29'36"	650.23'	25.51'	50.99'

STORM DRAIN CONSTRUCTION NOTES:

(*) PER CITY OF PERRIS STD. UTILITY TRENCH SURFACE REPAIR ON SHEET 5

10 CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.W.C.D. STD. DWG. NO JS227
11 PROTECT IN PLACE EXISTING R.C.P. STORM DRAIN LINE, PIPE SIZE PER PLAN
12 CONSTRUCT STORM DRAIN MANHOLE NO.1 PER R.C.F.C.W.C.D. STD. DWG. NO MH251
13 REMOVE CATCH BASIN AND ABANDON IN PLACE EXISTING STORM DRAIN. CAP END PIPE WITH CONCRETE
14 CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB101, "W" PER PLAN.
15 CONSTRUCT LOCAL DEPRESSION NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO LD202 CASE "B"
16 CONSTRUCT BMP "NO DUMPING" STENCIL PER DETAIL ON SHEET 5
17 CONSTRUCT CATCH BASIN NO. 1 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB100, "W" PER PLAN.
(*) 18 CONSTRUCT 5' SPAN x 1' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D83A
(*) 19 CONSTRUCT 18" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
(*) 20 CONSTRUCT 24" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
21 CONSTRUCT CONCRETE HEADWALL AND WINGWALL PER CALTRANS, STD. DWG. D83A, D83B AND D84 WITH TYPE "B" WINGWALL AND REMOVABLE TRASH RACK
22 CONSTRUCT RIPRAP PAD, DETAILS ON SHEET 5
(*) 23 CONSTRUCT 5' SPAN x 2' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D80
24 CONSTRUCT JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226
25 REMOVE EXISTING CONCRETE HEADWALL
26 CONSTRUCT SPECIAL CONNECTION TO CATCH BASIN PER R.C.F.C.W.C.D. STD. DWG. NO CB109
27 CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION NO. 3 CASE "A" PER R.C.F.C.W.C.D. STD. DWG. NO CB101 AND LD202, "W" PER PLAN.
28 PROTECT IN PLACE EXISTING 5'x2' R.C.B.C.
29 CONSTRUCT CATCH BASIN NO. 6 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB102
30 CONSTRUCT CONCRETE BULKHEAD PER R.C.F.C.W.C.D. STD. DWG. NO M816
31 CONSTRUCT 24"x24" CATCH BASIN DETAILS ON SHEET 5
32 CONSTRUCT STORM DRAIN MANHOLE NO.3 PER R.C.F.C.W.C.D. STD. DWG. NO MH253
33 CONSTRUCT 30"x8" WALL OPENING, DETAILS ON SHEET 5
34 CONSTRUCT CONCRETE COLLAR PER R.C.F.C.W.C.D. STD. DWG. NO M803
(*) 35 CONSTRUCT 30"x8" R.C.B.C. , DETAILS ON SHEET 5
36 REMOVE TOP PORTION OF OF EXISTING CURB OPENING CATCH BASIN AND CONSTRUCT MANHOLE SEE PROFILE ON SHEET 3
37 CONSTRUCT DROP INLET PER R.C.F.C.W.C.D. STD. DWG. NO CB110
38 CONSTRUCT 12" AREA DRAIN FOR LANDSCAPING
39 REMOVE EXISTING CURB OPENING CATCH BASIN AND APPROXIMATELY 2.4 L.F. OF EXISTING 18" R.C.P.
40 CONSTRUCT JUNCTION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO. JS228
41 CONSTRUCT MODIFIED JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226, DETAILS ON SHEET 5
42 CONSTRUCT 2-15" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
43 CONSTRUCT TRANSITION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO TS303, FOR MODIFIED T.S. SEE DETAILS ON SHEET 4
44 CONSTRUCT 18" C.M.P. RISER, DETAILS ON SHEET 4

NOTE:
VIDEO OF STORM DRAINAGE SHALL BE SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PAVEMENT CAPPING OR CONCRETING

Last Update:5/16/18
O:\3500-3599\3526\STORM DRAIN PUBLIC\3526-SD-SHT2.dwg

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TWO WORKING DAYS BEFORE YOU DIG

PM 37055

SOIL ENGINEER:
SOUTHERN CALIFORNIA GEOTECHNICAL
22855 EAST SAVI RANCH PARKWAY
SUITE E, YORBA LINDA, CA 92887
PHONE: (714)685-1115

OWNER:
REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

REVISIONS:

DATE	BY	MARK	REVISION	APPR.	DATE
11/09/18	EDT	6	ADDED 18" CMP RISER AND LF OF 18" RCP ADD CONSTRUCTION NOTES 42 AND 43		
9/30/18	EDT	7	ABANDON LAT. "A1" ADD LAT. "4A" AND "5A",REVISED PROFILE.		
ENGINEER				CITY	

CITY OF PERRIS
APPROVED BY:
CITY ENGINEER DATE

SEAL—ENGINEER
REGISTERED PROFESSIONAL ENGINEER HAIDOOK I. AGHAIAN R.C.E. NO. 43293 Exp. 3-31-20 CIVIL STATE OF CALIFORNIA

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173
Date: 05/06/19
HAIDOOK I. AGHAIAN RCE NO. 43293

BENCHMARK:
RIVERSIDE COUNTY BENCHMARK NO. "M-31"
SET 3 1/4 INCH ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31. RESET APRIL 1996, FLUSH, AT THE SOUTH WEST CORNER OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BOULEVARD AND RIVERSIDE COUNTY FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"), 43 FEET WEST OF THE CENTERLINE OF PERRIS BOULEVARD AND 4.5 FEET EAST OF CONCRETE BRIDGE BARRIER (EDGE OF BRIDGE).
ELEVATION = 1474.674' (NGVD '29 / MAY,1996 ADJ.)

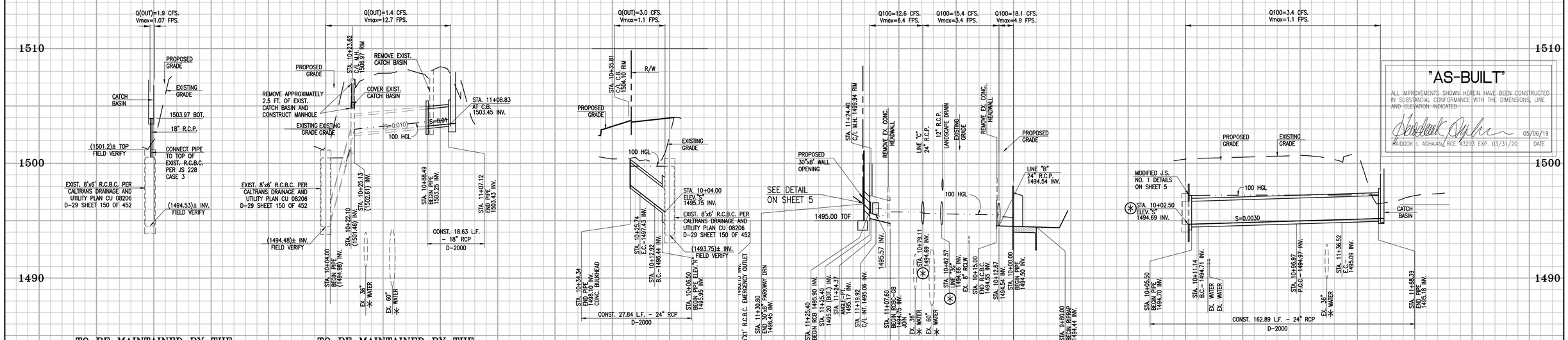
SCALE AS SHOWN

CITY OF PERRIS
COUNTY OF RIVERSIDE
PLAN AND PROFILE
PERRIS GATEWAY COMMERCE CENTER
DPR 16-00003, SPA05050

FOR:
W.O.
CITY FILE No. P8-1271

SHEET No. 2 OF 5
FILE NO. ---

✳ FIELD VERIFY EXISTING UTILITY ELEVATIONS, INFORM CIVIL ENGINEER FOR ANY DISCREPANCIES PRIOR TO CONSTRUCTION



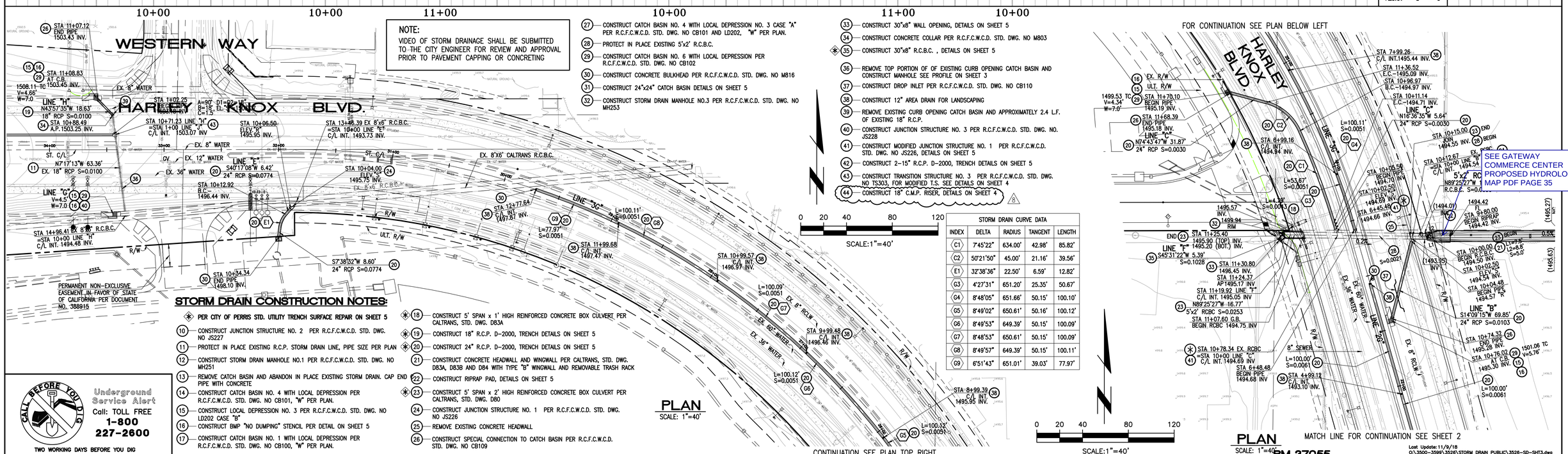
"AS-BUILT"

ALL IMPROVEMENTS SHOWN HEREIN HAVE BEEN CONSTRUCTED IN SUBSTANTIAL CONFORMANCE WITH THE DIMENSIONS, LINE AND ELEVATION INDICATED.

HAIDOOK I. AGHAIAN, RCE 43293 EXP. 03/31/20 — DATE 05/06/19

✳ DENOTES PIPE CONNECTION REQUIRES EDGE BEAM, SEE NOTE NO. 9 PER R.C.F.C.W.C.D. STD. DWG. NO. JS 226

PROFILE SCALE:
HORIZ. - 1" = 40'
VERT. - 1" = 4'



NOTE:
VIDEO OF STORM DRAINAGE SHALL BE SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PAVEMENT CAPPING OR CONCRETING

(27) CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION NO. 3 CASE "A" PER R.C.F.C.W.C.D. STD. DWG. NO CB101 AND LD202, "W" PER PLAN.
(28) PROTECT IN PLACE EXISTING 5'x2' R.C.B.C.
(29) CONSTRUCT CATCH BASIN NO. 6 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB102
(30) CONSTRUCT CONCRETE BULKHEAD PER R.C.F.C.W.C.D. STD. DWG. NO M816
(31) CONSTRUCT 24"x24" CATCH BASIN DETAILS ON SHEET 5
(32) CONSTRUCT STORM DRAIN MANHOLE NO.3 PER R.C.F.C.W.C.D. STD. DWG. NO MH253
(33) CONSTRUCT 30"x8" WALL OPENING, DETAILS ON SHEET 5
(34) CONSTRUCT CONCRETE COLLAR PER R.C.F.C.W.C.D. STD. DWG. NO M803
✳ (35) CONSTRUCT 30"x8" R.C.B.C. , DETAILS ON SHEET 5
(36) REMOVE TOP PORTION OF OF EXISTING CURB OPENING CATCH BASIN AND CONSTRUCT MANHOLE SEE PROFILE ON SHEET 3
(37) CONSTRUCT DROP INLET PER R.C.F.C.W.C.D. STD. DWG. NO CB110
(38) CONSTRUCT 12" AREA DRAIN FOR LANDSCAPING
(39) REMOVE EXISTING CURB OPENING CATCH BASIN AND APPROXIMATELY 2.4 L.F. OF EXISTING 18" R.C.P.
(40) CONSTRUCT JUNCTION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO. JS228
(41) CONSTRUCT MODIFIED JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226, DETAILS ON SHEET 5
(42) CONSTRUCT 2-15" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
(43) CONSTRUCT TRANSITION STRUCTURE NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO TS303, FOR MODIFIED T.S. SEE DETAILS ON SHEET 4
(44) CONSTRUCT 18" C.M.P. RISER, DETAILS ON SHEET 4

STORM DRAIN CURVE DATA

INDEX	DELTA	RADIUS	TANGENT	LENGTH
C1	7°45'22"	634.00'	42.98'	85.82'
C2	50°21'50"	45.00'	21.16'	39.56'
E1	32°38'36"	22.50'	6.59'	12.82'
G3	4°27'31"	651.20'	25.35'	50.67'
G4	8°48'05"	651.66'	50.15'	100.10'
G5	8°49'02"	650.61'	50.16'	100.12'
G6	8°49'53"	649.39'	50.15'	100.09'
G7	8°48'53"	650.61'	50.15'	100.09'
G8	8°49'57"	649.39'	50.15'	100.11'
G9	6°51'43"	651.01'	39.03'	77.97'

STORM DRAIN CONSTRUCTION NOTES:

✳ PER CITY OF PERRIS STD. UTILITY TRENCH SURFACE REPAIR ON SHEET 5
(10) CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.W.C.D. STD. DWG. NO JS227
(11) PROTECT IN PLACE EXISTING R.C.P. STORM DRAIN LINE, PIPE SIZE PER PLAN
(12) CONSTRUCT STORM DRAIN MANHOLE NO.1 PER R.C.F.C.W.C.D. STD. DWG. NO MH251
(13) REMOVE CATCH BASIN AND ABANDON IN PLACE EXISTING STORM DRAIN. CAP END PIPE WITH CONCRETE
(14) CONSTRUCT CATCH BASIN NO. 4 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB101, "W" PER PLAN.
(15) CONSTRUCT LOCAL DEPRESSION NO. 3 PER R.C.F.C.W.C.D. STD. DWG. NO LD202 CASE "B"
(16) CONSTRUCT BMP "NO DUMPING" STENCIL PER DETAIL ON SHEET 5
(17) CONSTRUCT CATCH BASIN NO. 1 WITH LOCAL DEPRESSION PER R.C.F.C.W.C.D. STD. DWG. NO CB100, "W" PER PLAN.
✳ (18) CONSTRUCT 5' SPAN x 1' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D83A
✳ (19) CONSTRUCT 18" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
✳ (20) CONSTRUCT 24" R.C.P. D-2000, TRENCH DETAILS ON SHEET 5
(21) CONSTRUCT CONCRETE HEADWALL AND WINGWALL PER CALTRANS, STD. DWG. D83A, D83B AND D84 WITH TYPE "B" WINGWALL AND REMOVABLE TRASH RACK
(22) CONSTRUCT RIPRAP PAD, DETAILS ON SHEET 5
✳ (23) CONSTRUCT 5' SPAN x 2' HIGH REINFORCED CONCRETE BOX CULVERT PER CALTRANS, STD. DWG. D80
(24) CONSTRUCT JUNCTION STRUCTURE NO. 1 PER R.C.F.C.W.C.D. STD. DWG. NO JS226
(25) REMOVE EXISTING CONCRETE HEADWALL
(26) CONSTRUCT SPECIAL CONNECTION TO CATCH BASIN PER R.C.F.C.W.C.D. STD. DWG. NO CB109

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PHONE: (714)685-1115

OWNER:
REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

REVISIONS:

DATE	BY	MARK	REVISION	APPR.	DATE

ENGINEER — CITY

CITY OF PERRIS
APPROVED BY:
CITY ENGINEER — DATE

SEAL-ENGINEER
REGISTERED PROFESSIONAL ENGINEER — HAIDOOK I. AGHAIAN — R.C.E. NO. 43293 — Exp. 3-31-20 — CIVIL — STATE OF CALIFORNIA

PREPARED BY:
Thienes Engineering, Inc.
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LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173
HAIDOOK I. AGHAIAN — Date: 05/06/19 — RCE NO. 43293

BENCHMARK:
RIVERSIDE COUNTY BENCHMARK NO. "M-31"
SET 3 1/4 INCH ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31. RESET APRIL 1996, FLUSH, AT THE SOUTH WEST CORNER OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BOULEVARD AND RIVERSIDE COUNTY FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"), 43 FEET WEST OF THE CENTERLINE OF PERRIS BOULEVARD AND 4.5 FEET EAST OF CONCRETE BRIDGE BARRIER (EDGE OF BRIDGE).
ELEVATION = 1474.674' (NGVD '29 / MAY,1996 ADJ.)

SCALE: AS SHOWN — FOR: — W.O. — CITY FILE No. P8-1271

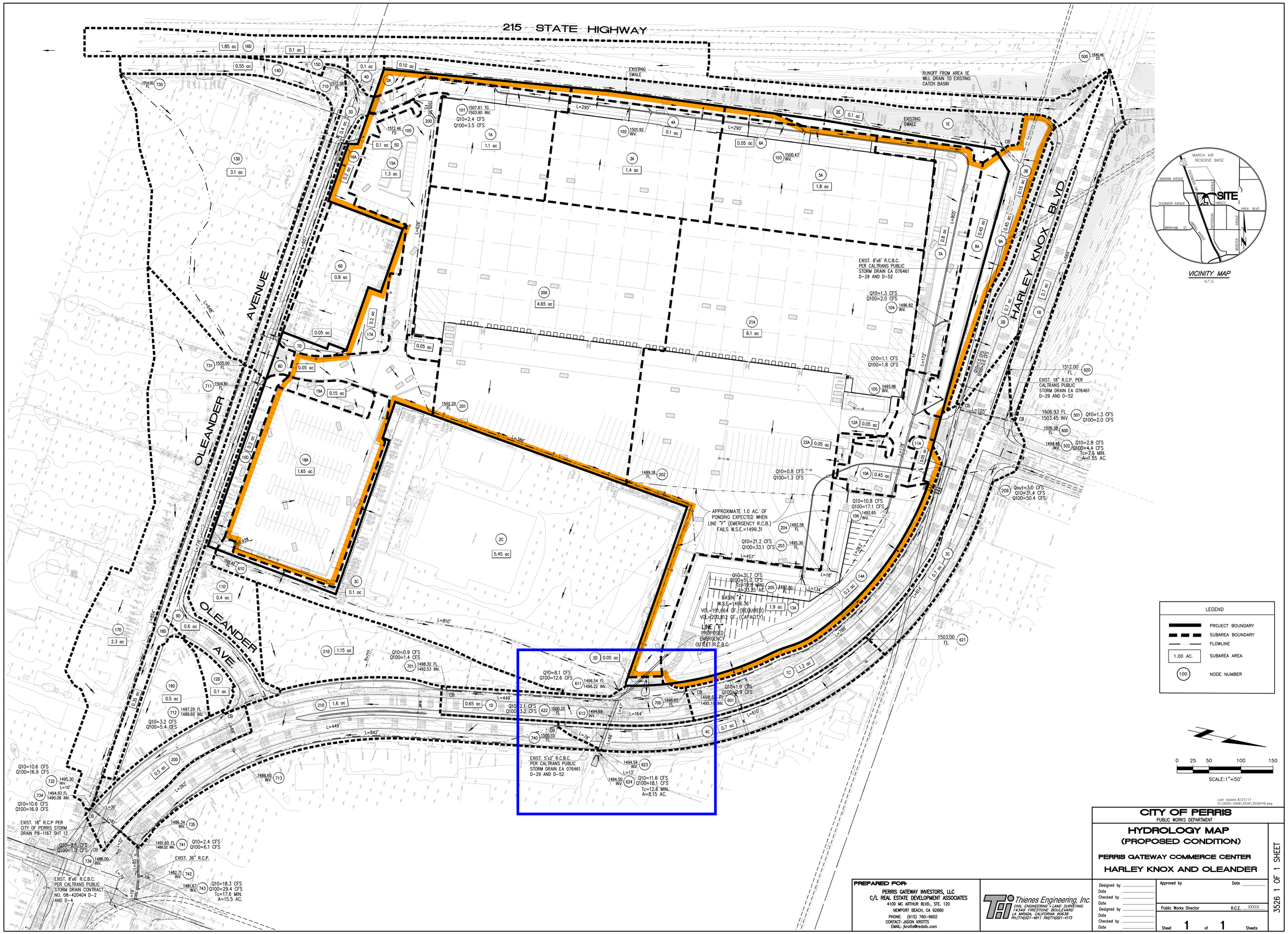
PM 37055

CITY OF PERRIS
COUNTY OF RIVERSIDE
PLAN AND PROFILE
PERRIS GATEWAY COMMERCE CENTER
DPR 16-00003, SPA05050

SHEET No. 3 OF 5
FILE NO. ---

Last Update: 11/9/18
G:\3500-3599\3526\STORM DRAIN PUBLIC\3526-SD-SHT3.dwg

CALTRANS HARLEY KNOX FLOWRATE & GATEWAY COMMERCE CENTER HYDROLOGY MAPS



Last Update:8/27/17
O:\3500-3599\3526\3526HYD.dwg

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP
(PROPOSED CONDITION)

PERRIS GATEWAY COMMERCE CENTER

HARLEY KNOX AND OLEANDER

PREPARED FOR:

PERRIS GATEWAY INVESTORS, LLC
C/L REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MC ARTHUR BLVD., STE. 120
NEWPORT BEACH, CA 92660
PHONE: (615) 760-9602
CONTACT: JASON KROTTS
EMAIL: jkrotts@redallc.com

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14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by	Approved by	Date
Date		
Checked by		
Date	Public Works Director	R.C.E. XXXXX
Designed by		
Date		
Checked by		
Date	Sheet 1 of 1 Sheets	

3526 1 OF 1 SHEET

FOR REFERENCE

215 STATE HIGHWAY

EXISTING SWALE

EXISTING SWALE

EXIST. AREA 1E DRAINS TO EXISTING CATCH BASIN

EXIST. 5'x4' R.C.B.C.

EXIST. 8'x6' R.C.B.C.

EXIST. 8'x6' R.C.B.C. PER CALTRANS PUBLIC STORM DRAIN EA 076461 D-29 AND D-52

HARLEY KNOX BLVD

OLEANDER AVENUE

OLEANDER AVE.

Q10=1.1 CFS
Q100=1.7 CFS
502 1506.66 FL
L=18'

Q10=2.2 CFS
Q100=3.4 CFS
Tc=7.8 MIN.
A=1.2 AC.
503 1499.00 INV.
1505.51 INV.

501 1507.32 FL
Q10=1.1 CFS
Q100=1.7 CFS

EXIST. 18" R.C.P. PER CALTRANS PUBLIC STORM DRAIN EA 076461 D-29 AND D-52

EXIST. 8'x6' R.C.B.C.

EXIST. 24" CMP RISER

Q10=21.2 CFS
Q100=39.5 CFS
611 1494.74 FL

Q10=21.2 CFS
Q100=39.5 CFS
Tc=29.2 MIN.
A=30.75 AC.
624 1494.55 FL

EXIST. 5'x2' R.C.B.C. PER CALTRANS PUBLIC STORM DRAIN EA 076461 D-29 AND D-52

EXISTING PARKWAY DRAIN

Q10=10.3 CFS
Q100=16.5 CFS
732 1493.93 FL
1490.07 INV.

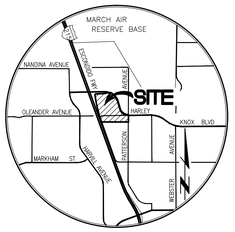
EXIST. 18" R.C.P. PER CITY OF PERRIS STORM DRAIN P8-1167 SHT 12

741 1491.65 FL
1487.97 INV.
1486.52 INV.
Q10=8.5 CFS
Q100=13.5 CFS

EXIST. 36" R.C.P.

743 1481.67 INV.
Q10=18.2 CFS
Q100=29.1 CFS
Tc=20.4 MIN.
A=15.75 AC.

EXIST. 8'x6' R.C.B.C. PER CALTRANS PUBLIC STORM DRAIN CONTRACT NO. 08-420404 D-2 AND D-4



VICINITY MAP

N.T.S.

LEGEND

	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOWLINE
1.00 AC.	SUBAREA AREA
100	NODE NUMBER

0 30 60 120 180

SCALE:1"=60'

Last Update: 8/30/17
O:\3500-3599\3526\3526HYD-EX.dwg

PREPARED FOR:

PERRIS GATEWAY INVESTORS, LLC
C/L REAL ESTATE DEVELOPMENT ASSOCIATES
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PH.(714)521-4811 FAX(714)521-4173

Designed by
Date
Checked by
Date
Designed by
Date
Checked by
Date

Approved by Date

Public Works Director R.C.E. XXXXX

Sheet 1 of 1 Sheets

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP
(EXISTING CONDITION)
PERRIS GATEWAY COMMERCE CENTER
HARLEY KNOX AND OLEANDER

3526 1 OF 1 SHEET

APPENDIX 3

```
T1 DUKE - CALTRANS RCB CAPACITY ANALYSIS                                    0
T2 Q=536 CFS PER AS-BIULT PLAN
T3 JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)
SO  1000.0001464.590  1                          1464.590
R   2282.7801472.350  1      .013                                   .000    .000 2
R   2303.4301472.470  1      .013                                 -38.587    .000 1
R   2350.0101472.730  1      .013                                   .000    .000 0
R   2370.6701472.850  1      .013                                 272.759    .000 1
R   2510.3501473.650  1      .013                                   .000    .000 0
R   2519.3301473.700  1      .013                                -796.114    .000 0
R   2534.3701473.790  1      .013                                   .000    .000 0
R   2543.3501473.840  1      .013                                   .000    .000 0
R   3454.8601479.100  1      .013                                   .000    .000 1
TS  3487.7901480.100  2      .013                                   .000
REM RCB TURNS NORTH ON PATTERSON
R   3799.1301482.100  2      .013                                  -6.012    .000 0
R   4847.9801488.780  2      .013                                   .000    .000 2
R   4892.1601489.050  2      .013                                  42.260    .000 1
REM RCB TERMINUS EAST OF I215
R   5725.7701494.400  2      .013                                   .000    .000 2
WE  5725.7701494.400  3      .500
SH  5730.7701494.400  3                          1494.400
CD   1  3   0    .000   7.000    8.000  .000  .000   .00
CD   2  3   0    .000   6.000    8.000  .000  .000   .00
CD   3  2   0    .000  10.000   10.000  .000  .000   .00
Q           536.000   .0
Q           600.000   .0
Q           625.000   .0
```

```
FILE: DUKE_CALTRANS.WSW                    W S P G W  - EDIT LISTING - Version 14.06              Date: 9- 2-2021  Time: 3:35:31
                                     WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                  PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    3      0     .000    7.000    8.000    .000   .000    .00
 CD      2    3      0     .000    6.000    8.000    .000   .000    .00
 CD      3    2      0     .000   10.000   10.000                   .00
                                                  W S P G W                                                          PAGE NO   1
                           WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                             DUKE - CALTRANS RCB CAPACITY ANALYSIS
HEADING LINE NO 2 IS -
                             Q=536 CFS PER AS-BIULT PLAN
HEADING LINE NO 3 IS -
                             JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)
                                                  W S P G W                                                          PAGE NO   2
                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                        W S ELEV
                                1000.000  464.590    1                                           464.590
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2282.780  472.350    1              .013                              .000     .000      .000     2
 ELEMENT NO   3 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2303.430  472.470    1              .013                            30.662  -38.587      .000     1
 ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2350.010  472.730    1              .013                              .000     .000      .000     0
 ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2370.670  472.850    1              .013                             4.340  272.759      .000     1
 ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2510.350  473.650    1              .013                              .000     .000      .000     0
 ELEMENT NO   7 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2519.330  473.700    1              .013                              .646  796.114      .000     0
 ELEMENT NO   8 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2534.370  473.790    1              .013                              .000     .000      .000     0
 ELEMENT NO   9 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                2543.350  473.840    1              .013                              .000     .000      .000     0
 ELEMENT NO  10 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS    ANGLE     ANG PT  MAN H
                                3454.860  479.100    1              .013                              .000     .000      .000     1
 ELEMENT NO  11 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                             RADIUS   ANGLE
                                3487.790  480.100    2              .013                              .000     .000
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REMARKS:  RCB TURNS NORTH ON PATTERSON
ELEMENT NO  12 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               3799.130  482.100    2              .013                     2967.145   -6.012      .000     0
                                                     W S P G W                                                        PAGE NO   3
                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  13 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               4847.980  488.780    2              .013                         .000     .000      .000     2
ELEMENT NO  14 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               4892.160  489.050    2              .013                       59.899   42.260      .000     1
REMARKS:  RCB TERMINUS EAST OF I215
ELEMENT NO  15 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               5725.770  494.400    2              .013                         .000     .000      .000     2
ELEMENT NO  16 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               5725.770  494.400    3              .500
ELEMENT NO  17 IS A SYSTEM HEADWORKS                 *                     *
                    U/S DATA   STATION    INVERT  SECT                                W S ELEV
                               5730.770  494.400    3                                 494.400
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Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	464.590	4.553	469.143	536.00	14.72	3.36	472.51	.00	5.19	8.00	7.000	8.000	.00	0 .0
1026.048	.0060					.0060	6.21	4.55	1.22	4.55	.013	.00	.00	BOX
2026.049	470.797	4.553	475.350	536.00	14.72	3.36	478.71	.00	5.19	8.00	7.000	8.000	.00	0 .0
256.731	.0060					.0059	1.51	4.55	1.22	4.55	.013	.00	.00	BOX
2282.780	472.350	4.654	477.004	536.00	14.40	3.22	480.22	1.68	5.19	8.00	7.000	8.000	.00	0 .0
20.650	.0058					.0057	.12	6.33	1.18	4.62	.013	.00	.00	BOX
2303.430	472.470	4.660	477.130	536.00	14.38	3.21	480.34	.00	5.19	8.00	7.000	8.000	.00	0 .0
46.580	.0056					.0057	.27	4.66	1.17	4.70	.013	.00	.00	BOX
2350.010	472.730	4.643	477.373	536.00	14.43	3.23	480.61	7.00	5.19	8.00	7.000	8.000	.00	0 .0
20.660	.0058					.0057	.12	7.00	1.18	4.62	.013	.00	.00	BOX
2370.670	472.850	4.646	477.496	536.00	14.42	3.23	480.73	.00	5.19	8.00	7.000	8.000	.00	0 .0
139.680	.0057					.0058	.80	4.65	1.18	4.65	.013	.00	.00	BOX
2510.350	473.650	4.637	478.287	536.00	14.45	3.24	481.53	7.00	5.19	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	7.00	1.18	4.70	.013	.00	.00	BOX
2519.330	473.700	4.633	478.333	536.00	14.46	3.25	481.58	.00	5.19	8.00	7.000	8.000	.00	0 .0
15.040	.0060					.0058	.09	4.63	1.18	4.57	.013	.00	.00	BOX
2534.370	473.790	4.640	478.430	536.00	14.44	3.24	481.67	.00	5.19	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	4.64	1.18	4.70	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2543.350	473.840	4.636	478.476	536.00	14.45	3.24	481.72	.00	5.19	8.00	7.000	8.000	.00	0 .0
104.200	.0058					.0058	.60	4.64	1.18	4.64	.013	.00	.00	BOX
2647.550	474.441	4.636	479.077	536.00	14.45	3.24	482.32	.00	5.19	8.00	7.000	8.000	.00	0 .0
236.180	.0058					.0058	1.36	4.64	1.18	4.64	.013	.00	.00	BOX
2883.730	475.804	4.634	480.439	536.00	14.46	3.25	483.68	.00	5.19	8.00	7.000	8.000	.00	0 .0
279.206	.0058					.0062	1.72	4.63	1.18	4.64	.013	.00	.00	BOX
3162.936	477.415	4.419	481.834	536.00	15.16	3.57	485.40	.00	5.19	8.00	7.000	8.000	.00	0 .0
124.704	.0058					.0070	.87	4.42	1.27	4.64	.013	.00	.00	BOX
3287.640	478.135	4.213	482.348	536.00	15.90	3.93	486.28	.00	5.19	8.00	7.000	8.000	.00	0 .0
91.295	.0058					.0079	.72	4.21	1.37	4.64	.013	.00	.00	BOX
3378.935	478.662	4.017	482.679	536.00	16.68	4.32	487.00	.00	5.19	8.00	7.000	8.000	.00	0 .0
75.925	.0058					.0090	.68	4.02	1.47	4.64	.013	.00	.00	BOX
3454.860	479.100	3.830	482.930	536.00	17.49	4.75	487.68	.00	5.19	8.00	7.000	8.000	.00	0 .0
TRANS STR	.0304					.0080	.26	3.83	1.58		.013	.00	.00	BOX
3487.790	480.100	4.450	484.550	536.00	15.06	3.52	488.07	.02	5.19	8.00	6.000	8.000	.00	0 .0
6.095	.0064					.0064	.04	4.47	1.26	4.45	.013	.00	.00	BOX
3493.885	480.139	4.450	484.589	536.00	15.06	3.52	488.11	.02	5.19	8.00	6.000	8.000	.00	0 .0
305.245	.0064					.0064	1.95	4.47	1.26	4.45	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3799.130	482.100	4.465	486.565	536.00	15.01	3.50	490.06	.00	5.19	8.00	6.000	8.000	.00	0 .0
748.371	.0064					.0064	4.77	4.46	1.25	4.46	.013	.00	.00	BOX
4547.501	486.866	4.465	491.331	536.00	15.01	3.50	494.83	.00	5.19	8.00	6.000	8.000	.00	0 .0
300.479	.0064					.0064	1.91	4.46	1.25	4.46	.013	.00	.00	BOX
4847.980	488.780	4.473	493.253	536.00	14.98	3.48	496.74	.93	5.19	8.00	6.000	8.000	.00	0 .0
44.180	.0061					.0064	.28	5.40	1.25	4.54	.013	.00	.00	BOX
4892.160	489.050	4.452	493.502	536.00	15.05	3.52	497.02	.00	5.19	8.00	6.000	8.000	.00	0 .0
297.683	.0064					.0064	1.91	4.45	1.26	4.45	.013	.00	.00	BOX
5189.843	490.960	4.452	495.412	536.00	15.05	3.52	498.93	.00	5.19	8.00	6.000	8.000	.00	0 .0
299.478	.0064					.0063	1.90	4.45	1.26	4.45	.013	.00	.00	BOX
5489.321	492.883	4.493	497.376	536.00	14.91	3.45	500.83	.00	5.19	8.00	6.000	8.000	.00	0 .0
180.888	.0064					.0059	1.07	4.49	1.24	4.45	.013	.00	.00	BOX
5670.209	494.043	4.713	498.756	536.00	14.22	3.14	501.89	.00	5.19	8.00	6.000	8.000	.00	0 .0
45.593	.0064					.0052	.24	4.71	1.15	4.45	.013	.00	.00	BOX
5715.802	494.336	4.943	499.279	536.00	13.56	2.85	502.13	.00	5.19	8.00	6.000	8.000	.00	0 .0
9.968	.0064					.0046	.05	4.94	1.07	4.45	.013	.00	.00	BOX
5725.770	494.400	5.185	499.585	536.00	12.92	2.59	502.18	.00	5.19	8.00	6.000	8.000	.00	0 .0
WALL	ENTRANCE													

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
5725.770	494.400	8.482	502.882	536.00	6.32	.62	503.50	.00	4.47	10.00	10.000	10.000	.00	0 .0
WALL ENTRANCE														
5730.770	494.400	8.482	502.882	536.00	6.32	.62	503.50	.00	4.47	10.00	10.000	10.000	.00	0 .0

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	464.590	4.964	469.554	600.00	15.11	3.54	473.10	.00	5.59	8.00	7.000	8.000	.00	0 .0
1031.591	.0060					.0060	6.24	4.96	1.19	4.96	.013	.00	.00	BOX
2031.591	470.830	4.964	475.795	600.00	15.11	3.54	479.34	.00	5.59	8.00	7.000	8.000	.00	0 .0
251.189	.0060					.0059	1.48	4.96	1.19	4.96	.013	.00	.00	BOX
2282.780	472.350	5.076	477.426	600.00	14.77	3.39	480.82	1.77	5.59	8.00	7.000	8.000	.00	0 .0
20.650	.0058					.0057	.12	6.85	1.16	5.04	.013	.00	.00	BOX
2303.430	472.470	5.083	477.553	600.00	14.76	3.38	480.93	.00	5.59	8.00	7.000	8.000	.00	0 .0
46.580	.0056					.0057	.27	5.08	1.15	5.12	.013	.00	.00	BOX
2350.010	472.730	5.063	477.793	600.00	14.81	3.41	481.20	7.00	5.59	8.00	7.000	8.000	.00	0 .0
20.660	.0058					.0057	.12	7.00	1.16	5.04	.013	.00	.00	BOX
2370.670	472.850	5.067	477.917	600.00	14.80	3.40	481.32	.00	5.59	8.00	7.000	8.000	.00	0 .0
139.680	.0057					.0057	.80	5.07	1.16	5.07	.013	.00	.00	BOX
2510.350	473.650	5.058	478.708	600.00	14.83	3.41	482.12	7.00	5.59	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	7.00	1.16	5.13	.013	.00	.00	BOX
2519.330	473.700	5.052	478.752	600.00	14.85	3.42	482.17	.00	5.59	8.00	7.000	8.000	.00	0 .0
15.040	.0060					.0058	.09	5.05	1.16	4.99	.013	.00	.00	BOX
2534.370	473.790	5.061	478.851	600.00	14.82	3.41	482.26	.00	5.59	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	5.06	1.16	5.13	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2543.350	473.840	5.056	478.895	600.00	14.84	3.42	482.31	.00	5.59	8.00	7.000	8.000	.00	0 .0
329.471	.0058					.0058	1.90	5.06	1.16	5.06	.013	.00	.00	BOX
2872.821	475.741	5.056	480.797	600.00	14.84	3.42	484.21	.00	5.59	8.00	7.000	8.000	.00	0 .0
278.781	.0058					.0061	1.71	5.06	1.16	5.06	.013	.00	.00	BOX
3151.602	477.350	4.828	482.178	600.00	15.53	3.75	485.93	.00	5.59	8.00	7.000	8.000	.00	0 .0
128.948	.0058					.0069	.89	4.83	1.25	5.06	.013	.00	.00	BOX
3280.551	478.094	4.603	482.698	600.00	16.29	4.12	486.82	.00	5.59	8.00	7.000	8.000	.00	0 .0
94.904	.0058					.0079	.75	4.60	1.34	5.06	.013	.00	.00	BOX
3375.454	478.642	4.389	483.031	600.00	17.09	4.53	487.56	.00	5.59	8.00	7.000	8.000	.00	0 .0
79.406	.0058					.0089	.71	4.39	1.44	5.06	.013	.00	.00	BOX
3454.860	479.100	4.185	483.285	600.00	17.92	4.99	488.27	.00	5.59	8.00	7.000	8.000	.00	0 .0
TRANS STR	.0304					.0079	.26	4.18	1.54		.013	.00	.00	BOX
3487.790	480.100	4.851	484.951	600.00	15.46	3.71	488.66	.02	5.59	8.00	6.000	8.000	.00	0 .0
6.391	.0064					.0064	.04	4.87	1.24	4.85	.013	.00	.00	BOX
3494.181	480.141	4.851	484.992	600.00	15.46	3.71	488.70	.02	5.59	8.00	6.000	8.000	.00	0 .0
304.949	.0064					.0064	1.95	4.87	1.24	4.85	.013	.00	.00	BOX
3799.130	482.100	4.867	486.967	600.00	15.41	3.69	490.65	.00	5.59	8.00	6.000	8.000	.00	0 .0
744.640	.0064					.0064	4.74	4.87	1.23	4.87	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
4543.771	486.843	4.867	491.709	600.00	15.41	3.69	495.40	.00	5.59	8.00	6.000	8.000	.00	0 .0
304.209	.0064					.0064	1.93	4.87	1.23	4.87	.013	.00	.00	BOX
4847.980	488.780	4.876	493.656	600.00	15.38	3.67	497.33	.98	5.59	8.00	6.000	8.000	.00	0 .0
44.180	.0061					.0064	.28	5.86	1.23	4.94	.013	.00	.00	BOX
4892.161	489.050	4.853	493.903	600.00	15.46	3.71	497.61	.00	5.59	8.00	6.000	8.000	.00	0 .0
494.865	.0064					.0064	3.18	4.85	1.24	4.85	.013	.00	.00	BOX
5387.026	492.226	4.853	497.079	600.00	15.46	3.71	500.79	.00	5.59	8.00	6.000	8.000	.00	0 .0
270.364	.0064					.0061	1.64	4.85	1.24	4.85	.013	.00	.00	BOX
5657.390	493.961	5.081	499.042	600.00	14.76	3.38	502.43	.00	5.59	8.00	6.000	8.000	.00	0 .0
56.693	.0064					.0054	.30	5.08	1.15	4.85	.013	.00	.00	BOX
5714.083	494.325	5.329	499.654	600.00	14.07	3.08	502.73	.00	5.59	8.00	6.000	8.000	.00	0 .0
11.688	.0064					.0047	.06	5.33	1.07	4.85	.013	.00	.00	BOX
5725.770	494.400	5.590	499.990	600.00	13.42	2.80	502.79	.00	5.59	8.00	6.000	8.000	.00	0 .0
WALL ENTRANCE														

---------- WARNING - Flow depth near top of box conduit ----------

5725.770	494.400	9.600	504.000	600.00	6.25	.61	504.61	.00	4.82	10.00	10.000	10.000	.00	0 .0
WALL ENTRANCE														

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5730.770	494.400	9.600	504.000	600.00	6.25	.61	504.61	.00	4.82	10.00	10.000	10.000	.00	0 .0

Program Package Serial Number: 1585

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DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	464.590	5.123	469.713	625.00	15.25	3.61	473.32	.00	5.75	8.00	7.000	8.000	.00	0 .0
1034.768	.0060					.0060	6.26	5.12	1.19	5.12	.013	.00	.00	BOX
2034.768	470.850	5.123	475.973	625.00	15.25	3.61	479.58	.00	5.75	8.00	7.000	8.000	.00	0 .0
248.012	.0060					.0059	1.46	5.12	1.19	5.12	.013	.00	.00	BOX
2282.780	472.350	5.239	477.589	625.00	14.91	3.45	481.04	7.00	5.75	8.00	7.000	8.000	.00	0 .0
20.650	.0058					.0057	.12	7.00	1.15	5.20	.013	.00	.00	BOX
2303.430	472.470	5.246	477.716	625.00	14.89	3.44	481.16	.00	5.75	8.00	7.000	8.000	.00	0 .0
46.580	.0056					.0057	.27	5.25	1.15	5.29	.013	.00	.00	BOX
2350.010	472.730	5.226	477.956	625.00	14.95	3.47	481.43	7.00	5.75	8.00	7.000	8.000	.00	0 .0
20.660	.0058					.0057	.12	7.00	1.15	5.20	.013	.00	.00	BOX
2370.670	472.850	5.230	478.080	625.00	14.94	3.46	481.54	.00	5.75	8.00	7.000	8.000	.00	0 .0
139.680	.0057					.0057	.80	5.23	1.15	5.23	.013	.00	.00	BOX
2510.350	473.650	5.220	478.870	625.00	14.97	3.48	482.35	7.00	5.75	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	7.00	1.15	5.29	.013	.00	.00	BOX
2519.330	473.700	5.214	478.914	625.00	14.98	3.49	482.40	.00	5.75	8.00	7.000	8.000	.00	0 .0
15.040	.0060					.0058	.09	5.21	1.16	5.14	.013	.00	.00	BOX
2534.370	473.790	5.224	479.014	625.00	14.96	3.47	482.49	.00	5.75	8.00	7.000	8.000	.00	0 .0
8.980	.0056					.0058	.05	5.22	1.15	5.29	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2543.350	473.840	5.218	479.058	625.00	14.97	3.48	482.54	.00	5.75	8.00	7.000	8.000	.00	0 .0
328.772	.0058					.0058	1.90	5.22	1.16	5.22	.013	.00	.00	BOX
2872.122	475.737	5.218	480.955	625.00	14.97	3.48	484.44	.00	5.75	8.00	7.000	8.000	.00	0 .0
276.317	.0058					.0061	1.69	5.22	1.16	5.22	.013	.00	.00	BOX
3148.439	477.332	4.986	482.318	625.00	15.67	3.81	486.13	.00	5.75	8.00	7.000	8.000	.00	0 .0
129.928	.0058					.0069	.90	4.99	1.24	5.22	.013	.00	.00	BOX
3278.366	478.082	4.754	482.835	625.00	16.43	4.19	487.03	.00	5.75	8.00	7.000	8.000	.00	0 .0
95.964	.0058					.0078	.75	4.75	1.33	5.22	.013	.00	.00	BOX
3374.330	478.635	4.533	483.168	625.00	17.24	4.61	487.78	.00	5.75	8.00	7.000	8.000	.00	0 .0
80.530	.0058					.0089	.72	4.53	1.43	5.22	.013	.00	.00	BOX
3454.860	479.100	4.322	483.422	625.00	18.08	5.07	488.50	.00	5.75	8.00	7.000	8.000	.00	0 .0
TRANS STR	.0304					.0079	.26	4.32	1.53		.013	.00	.00	BOX
3487.790	480.100	5.006	485.106	625.00	15.61	3.78	488.89	.02	5.75	8.00	6.000	8.000	.00	0 .0
6.901	.0064					.0064	.04	5.03	1.23	5.01	.013	.00	.00	BOX
3494.691	480.144	5.006	485.150	625.00	15.61	3.78	488.93	.02	5.75	8.00	6.000	8.000	.00	0 .0
304.439	.0064					.0064	1.95	5.03	1.23	5.01	.013	.00	.00	BOX
3799.130	482.100	5.022	487.122	625.00	15.56	3.76	490.88	.00	5.75	8.00	6.000	8.000	.00	0 .0
746.882	.0064					.0064	4.76	5.02	1.22	5.02	.013	.00	.00	BOX

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
4546.012	486.857	5.022	491.879	625.00	15.56	3.76	495.64	.00	5.75	8.00	6.000	8.000	.00	0 .0
301.968	.0064					.0064	1.92	5.02	1.22	5.02	.013	.00	.00	BOX
4847.980	488.780	5.032	493.812	625.00	15.53	3.74	497.56	6.00	5.75	8.00	6.000	8.000	.00	0 .0
44.180	.0061					.0064	.28	6.00	1.22	5.10	.013	.00	.00	BOX
4892.160	489.050	5.008	494.058	625.00	15.60	3.78	497.84	.00	5.75	8.00	6.000	8.000	.00	0 .0
488.006	.0064					.0064	3.13	5.01	1.23	5.01	.013	.00	.00	BOX
5380.166	492.182	5.008	497.190	625.00	15.60	3.78	500.97	.00	5.75	8.00	6.000	8.000	.00	0 .0
271.739	.0064					.0061	1.65	5.01	1.23	5.01	.013	.00	.00	BOX
5651.905	493.926	5.222	499.148	625.00	14.96	3.48	502.62	.00	5.75	8.00	6.000	8.000	.00	0 .0
61.559	.0064					.0054	.33	5.22	1.15	5.01	.013	.00	.00	BOX
5713.463	494.321	5.477	499.798	625.00	14.26	3.16	502.96	.00	5.75	8.00	6.000	8.000	.00	0 .0
12.307	.0064					.0048	.06	5.48	1.07	5.01	.013	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
5725.770	494.400	5.745	500.145	625.00	13.60	2.87	503.02	.00	5.75	8.00	6.000	8.000	.00	0 .0
WALL ENTRANCE														
		---------- WARNING - Flow depth near top of box conduit ----------												

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 9- 2-2021 Time: 3:35:34

DUKE - CALTRANS RCB CAPACITY ANALYSIS

Q=536 CFS PER AS-BIULT PLAN

JJO 9-1-21 INV ELEV. CONVERTED FROM NAVD27(M) TO NAVD88(FT)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
5725.770	494.400	10.048	504.448	625.00	6.22	.60	505.05	.00	4.95	10.00	10.000	10.000	.00	0 .0
WALL ENTRANCE														
5730.770	494.400	10.048	504.448	625.00	6.22	.60	505.05	.00	4.95	10.00	10.000	10.000	.00	0 .0

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	8	23

Caltrans Metric

CMGonzalez 3-25-03
REGISTERED CIVIL ENGINEER

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

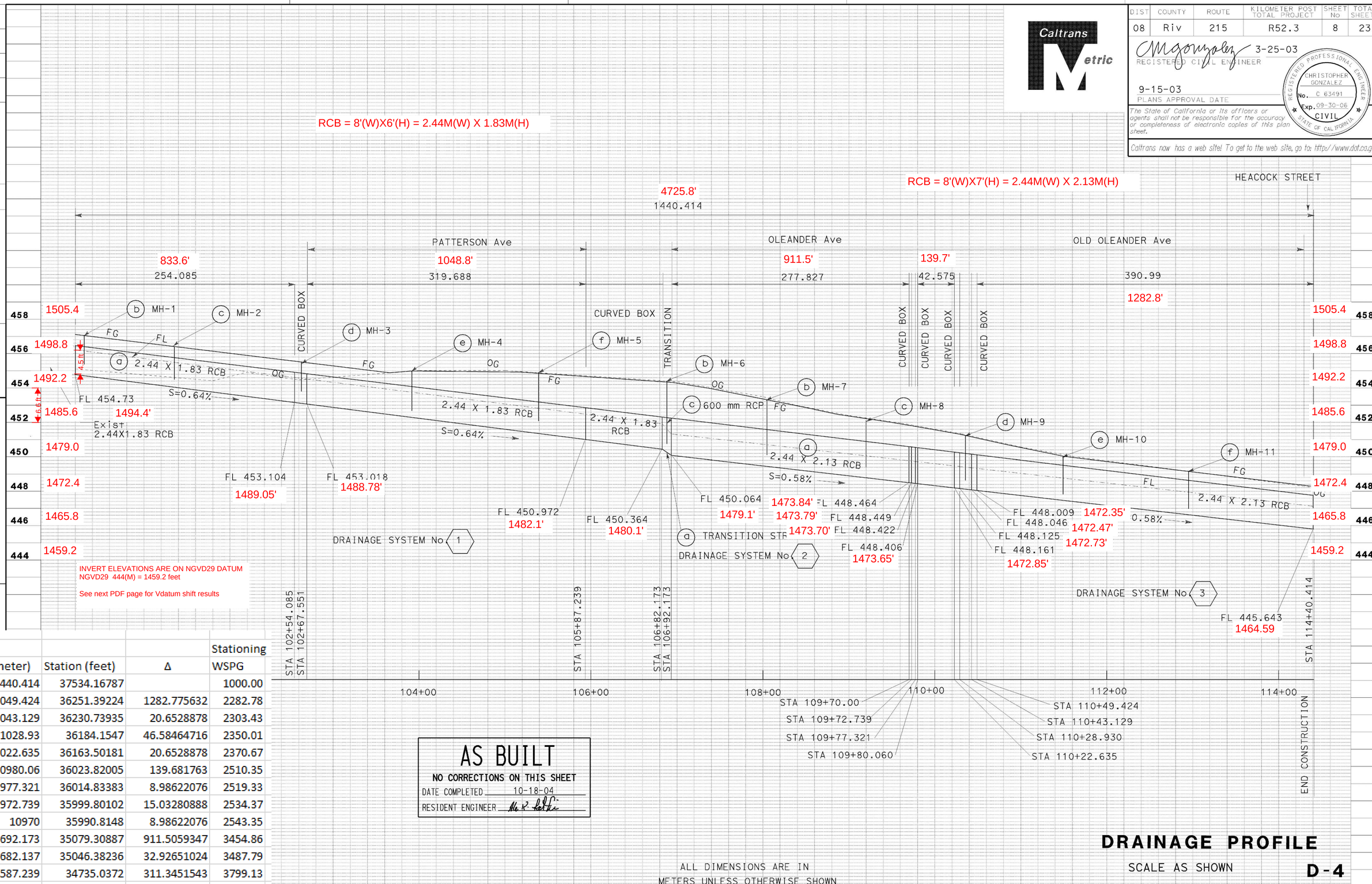
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

DATE	REVISED BY	DATE REVISED
8-02	KIRK BAYLESS	

CALCULATED/DESIGNED BY KIRK BAYLESS
CHECKED BY

PROJECT ENGINEER KIRK BAYLESS



INVERT ELEVATIONS ARE ON NGVD29 DATUM
NGVD29 444(M) = 1459.2 feet

See next PDF page for Vdatum shift results

Station (meter)	Station (feet)	Δ	Stationing WSPG
11440.414	37534.16787		1000.00
11049.424	36251.39224	1282.775632	2282.78
11043.129	36230.73935	20.6528878	2303.43
11028.93	36184.1547	46.58464716	2350.01
11022.635	36163.50181	20.6528878	2370.67
10980.06	36023.82005	139.681763	2510.35
10977.321	36014.83383	8.98622076	2519.33
10972.739	35999.80102	15.03280888	2534.37
10970	35990.8148	8.98622076	2543.35
10692.173	35079.30887	911.5059347	3454.86
10682.137	35046.38236	32.92651024	3487.79
10587.239	34735.0372	311.3451543	3799.13
10267.551	33686.19202	1048.845178	4847.98
10254.085	33642.01223	44.17979144	4892.16
10000	32808.4	833.6122314	5725.77

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PROFILE

SCALE AS SHOWN

D-4

LAST REVISION 03-25-03
DATE PLOTTED => 20-DEC-2004
TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien
DGN FILE => 842040i04.dgn

CU 08228

EA 420401

			Stationing
Station (meter)	Station (feet)	Δ	WSPG
11440.414	37534.16787		1000.00
11049.424	36251.39224	1282.775632	2282.78
11043.129	36230.73935	20.6528878	2303.43
11028.93	36184.1547	46.58464716	2350.01
11022.635	36163.50181	20.6528878	2370.67
10980.06	36023.82005	139.681763	2510.35
10977.321	36014.83383	8.98622076	2519.33
10972.739	35999.80102	15.03280888	2534.37
10970	35990.8148	8.98622076	2543.35
10692.173	35079.30887	911.5059347	3454.86
10682.137	35046.38236	32.92651024	3487.79
10587.239	34735.0372	311.3451543	3799.13
10267.551	33686.19202	1048.845178	4847.98
10254.085	33642.01223	44.17979144	4892.16
10000	32808.4	833.6122314	5725.77

PVSD MDP LINE-B REFERENCES

MARCH JOINT POWERS
TECHNICAL ADVISORY COMMITTEE
OF THE
MARCH JOINT POWERS AUTHORITY

Agenda Item No. 4c & 4c(1)

Meeting Date: April 8, 2019

Presentation/Report: Riverside County Flood Control Findings / Recommendations

Background:

On January 14, 2019, K&A Engineering (Consultant) and MJPA staff presentations were made regarding the Master Drainage Plan and the Veterans Industrial Park 215 Project. Major topics of discussion/comments from the TAC were related to the West March Master Drainage plan, VIP 215 Project drainage and how they impact March Air Reserve Base. At the conclusion of the presentations, the MJPA Staff was asked to meet with Riverside County Flood Control (RCFC) to discuss these drainage issues.

On January 30, 2019, MJPA staff, Consultant, March ARB staff and RCFC staff met to discuss and review the proposed five alignment segments of the West March Master Drainage Plan and the proposed drainage solution for the VIP 215 Project. RCFC was tasked to compare the drainage areas, storm drain areas and alternatives, and flow rates by reviewing technical studies, supporting documentation and project exhibits.

From January 31 through March 7, RCFC reviewed the provided documentation and submitted a letter to MJPA staff on March 22, 2019, outlining their findings and recommendations. RCFC presented their findings and recommendations to MJPA staff, Consultant and March ARB staff on March 26, 2019. A subsequent meeting was held on March 28, 2019, where RCFC presented their findings and recommendations to the VIP 215 Project development team.

RCFC, VIP 215 developers, MJPA staff and Consultant will be present to review the findings and recommendations to the Technical Advisory Committee.

Attachments:

1. Riverside County Flood Control Letter, March 21, 2019 (Civaldo Corporation)
2. Excerpt Summary of VIP 215 Drainage Studies / Review Findings
3. RCFC Exhibits: Exhibit 1: Predevelopment Condition
   Exhibit 2: Current Condition
   Exhibit 3A: Preferred Alternative with Master Plan
   Exhibit 3B: Preferred Alternative

ATTACHMENT 1

Riverside County Flood Control Letter, March 21, 2019 (Civaldo Corporation)

CVALDO CORPORATION
CIVIL ENGINEERING

RECEIVED
MAR 25 2019
By PB3

March 21, 2019

Mr. Jeffrey Smith, AICP
Senior Planner
March Joint Powers Authority
14205 Meridian Parkway, Suite 140
Riverside CA 92518

Re: TPM 37220 - VIP-215
Multiple Drainage Study and
Supporting Documents Review
Account 137-0-3-90201

Dear Mr. Smith:

As requested by the Riverside County Flood Control and Water Conservation District, we have reviewed studies, supporting documents, and exhibits, as submitted to the District for the subject project. The District received the following materials for review between January 31 and March 7, 2019:

Reports Received

1. Working Copy - In Progress, October 17, 2017, Perris Valley Master Drainage Plan Line "B" Revision to Master Drainage Plan, prepared by K&A Engineering (file name: PV MDP Lat B 0517.06Feb2018.pdf). A description of this report is provided in Reports Item 1 of this letter below.

2. Flood Hazard Study, March Air Reserve Base, North and South Oleander Drainage, prepared by AECOM, dated June 30, 2017 (file name: March ARBFinal AFB Flood Hazard Study 063017 - INTERNAL USE ONLY-DO NOT DISTRIBUTE.pdf). A description of this report is provided in Reports Item 2 of this letter below.

3. Draft Veterans Industrial Park 215 Project Environmental Impact Report, prepared by ESA, dated October 2018 (file name: Admin Draft EIR - Compiled.09Oct2018.pdf). A description of this report and relevant appendices is provided in Reports Item 3 of this letter below.

   - EIR Appendices A through M (file name Admin Draft EIR_Appendices Master - Compiled.09Octo2018.pdf)

   - EIR Figure 3.8-1 (file name: Admin Draft EIR_Fig3.8-1_Drainage Areas for Proposed Street_revised.09Oct2018.pdf)

4901 Morena Blvd., Suite 1110 San Diego, CA 92117 Phone (858) 866-0128 Fax (858) 866-0131

- EIR Figure 3.14-1 (file name: Admin Draft EIR_Fig3-14-1_Study Area Transportation Facilities09Oct2018.pdf)

4. Drainage Design Report for Meridian Business Park, Van Buren Culvert, County of Riverside MS 158, prepared by K&A Engineering, dated August, 2016 (file name: MS 158 MBP-VBCul DrainReport,final-complete-0816.pdf). A description of this report is provided in Reports Item 2 (Offsite Hydrologic Analysis) of this letter below.

5. March Air Force Base Reuse Drainage Master Plan, County of Riverside, State of California, Main Report, prepared by RBF Consulting, dated May 2008 (file names: VA DRAINAGE CHANNEL.PDF, and App C-4a - MAFB-RDMP RBF May 2008.pdf). A description of this report is provided in Reports Item 4 of this letter below.

6. Drainage Study – Meridian Unit 4 Interim Conditions, prepared by Kimley-Horn Associates, dated July 2010 (file name: App C-4b - MERIDIAN Unit 4 Int Drain Study KHA July 2010.pdf). A description of this report is provided in Reports Item 3.f.ii of this letter below.

7. Draft Drainage Study - Meridian Business Center - Ultimate Drainage Conditions, prepared by Kimley-Horn Associates, dated June 2010 (file name: App C-4c - Drain Study MBC Ultimate Draft June 2010.pdf). A description of this report is provided in Reports Item 3.f.i of this letter below.

8. Final Drainage Report - I-215 / Van Buren Boulevard Interchange PS&E, prepared by Kimley-Horn Associates, dated June 2011 (file name: App C-4d - Drainage Report-June2011 100% SUBMITTAL[1].pdf). A description of this report is provided in Reports Item 3.f.iii of this letter below.

9. Specific Plan March Business Center, prepared by Kimley-Horn and Associates, dated February 2003 (file name: App C-4e - MBC Spec Plan Feb 2003.pdf). A description of this report is provided in Reports Item 5 of this letter below.

10. SP-5 An Amendment to the North Campus of the Meridian Specific Plan, dated July 2010 (file name: App -C4f - SP-5 Amend ti No Campus MSP July 2010.pdf). A description of this report is provided in Reports Item 6 of this letter below.

11. Final Report Stormwater Capacity Analysis for Contract/Task Order Nos. F41624-03-D-8596 0015, Task 013 - March ARB - Base Specific Requirements, prepared by EA Engineering, dated January 2006. A description of this report is provided in Reports Item 2 (Onsite Hydrologic Analysis) of this letter below

12. Technical Memorandum - Offsite Drainage and Flooding Limits Downstream of the Proposed VIP-215 Project, prepared by Albert A. Webb Associates, dated July 13, 2018. A description of this report is provided in Reports Item 3.f of this letter below.

13. Preliminary Drainage Report for Veterans Industrial Park 215, prepared by Huitt-Zollars, dated October 14, 2016. A description of this report is provided in Reports Item 3.d of this letter below.

Exhibits Received

1. Master Drainage Plan - MJPA/MARB West Side - exhibit prepared by K&A Engineering, dated January 2019 (file names: 322 - EXH-SD Alternative - 3 - simplified.pdf and 322 - EXH - SD ALTERNATIVE - 3May 2018.pdf). A description of this exhibit is provided in Exhibits Item 1 of this letter below.

2. March Air Force Base - Drainage Master Plan Tributary to Perris Valley Storm Drain (PVSD) - Lateral B, exhibit prepared by K&A Engineering, plot date 8/18/2017 (file name: 476 - Drainage-profile-0317 30x42 L.pdf). A description of this exhibit is provided in Exhibits Item 2 of this letter below.

3. Drainage Facility Map - 2015, March Air Force Base - Drainage Master Plan Tributary to Perris Valley Storm Drain (PVSD) - Lateral B, exhibit prepared by K&A Engineering, plot date 8-18-2017 (file name: 476 - Drn-Facility-2015-0517 24x36 - L.pdf). A description of this exhibit is provided in Exhibits Item 3 of this letter below.

4. Exhibit A Van Buren & I-215 Offsite Drainage Basins, exhibit prepared by Kimley-Horn and Associates, dated April 2010 (file name: Drainage Report- June2011 exhibit pages, 2014.pdf). A description of this exhibit is provided in Reports Item 3.f.iii of this letter below.

CValdo was tasked with reviewing the above documents in order to: a) determine the appropriate peak flow rate (800 vs. 1,600 cfs) and parameters to be utilized for analysis of the existing drainage channel across the VIP-215 site, and b) determine the approximate capacity and erosion potential of the existing drainage channel across the VIP-215 site. Complete plan check of each document was not performed, but rather, the documents were reviewed in order to determine if they provided relevant information toward establishing the appropriate peak flow rate and channel capacity as described above. The following is a summary of each item reviewed considering the stated goals. Note that many of the studies and exhibits were reviewed as reference documents to another study, and thus, reviews of the study and its reference documents may appear under one heading below. The reader is directed below to Reports Item 3.f.iii for discussion of the appropriate peak flow rate and Item 2 Hydraulic Analysis for discussion of the VIP-215 site existing channel capacity.

Reports

1. Working Copy - In Progress, October 17, 2017, Perris Valley Master Drainage Plan Line "B" Revision to Master Drainage Plan, prepared by K&A Engineering (file name: PV MDP Lat B 0517.06Feb2018.pdf)

The study appears to be an alignment alternatives analysis for drainage facilities extending from the Van Buren culvert on the west side of I-215 downstream to PVSD Line B. There are no recommended alternatives as it was submitted as a work in progress. The following items are noted in review of this study:

a. The study is in draft format as submitted.

b. The study includes a rough summary of some of the history of the Meridian project, but is not all inclusive, and would only be accurate up to the preparation date, which was 10/17/17

c. The study mentions 1,600 cfs as a peak flow rate for the channel downstream of the VIP-215 site (Segment 4 per the study) in one instance (page 14) but it provides no reference to where the 1,600 cfs comes from

The above items considered, we do not find this study useful for establishment of flow rates for the VIP-215 site.

2. Flood Hazard Study, March Air Reserve Base, North and South Oleander Drainage, prepared by AECOM, dated June 30, 2017 (file name: March ARBFinal AFB Flood Hazard Study 063017 - INTERNAL USE ONLY-DO NOT DISTRIBUTE.pdf)

In summary, the AECOM study:

a. Included an onsite hydrologic analysis to determine peak flow rates from drainage areas on the March ARB (areas located east of I-215).

b. Referenced a peak flow rate of 800 cfs coming onto the base from the west side of I-215. The flow was stated to enter the base approximately 2,400 feet south of Van Buren Boulevard. This information was stated to be established in the August 2016 study by K&A Engineering entitled *Drainage Design Report for Meridian Business Park, Van Buren Culvert (County of Riverside MS 158.)*. As described below, we can find no supporting calculations for the 800 cfs flow rate in the materials reviewed.

c. Included a hydraulic analysis to evaluate flooding conditions within the March ARB for several watercourses. Our review was limited to the watercourse conveying flows from the west across the development site within what is referred to as the Offsite Drainage Channel. The analysis for the Offsite Drainage Channel utilized the 800 cfs stated to come on to the base from the west, but did not include any onsite flows.

Onsite Hydrologic Analysis

The onsite hydrologic analysis in the AECOM study was performed using the same modeling parameters as those utilized in a reference study entitled *Stormwater Capacity Analysis for March ARB*, dated January 2006, prepared by EA Engineering, Science and Technology, Inc. This reference study was included in the AECOM study appendix. The

EA Engineering study was prepared to analyze major and minor channels throughout the March Air Reserve Base. As described below, some of the hydrologic analysis parameters used in both the EA Engineering Study and the AECOM study were inconsistent with RCFCWCD methodology, and thus, the flow rates established and utilized within these studies would not be considered valid. Notable hydrologic analysis methodology and parameters utilized, as well as review issues, are as follows:

a. Unit hydrograph hydrologic calculations within the AECOM study were performed using HEC-HMS, which is appropriate. Hydrologic calculations within the EA Engineering study were performed using HydroCAD, which is not on the RCFCWCD list of accepted software.

b. The storm event analyzed was the 100-year 24-hour, which may not be the governing storm event for many of the drainage facilities. Note that RCFCWCD requires the 3-hour and 6-hour events also be analyzed using a unit hydrograph analysis for watersheds over 300-500 acres. The studies should be revised to analyze each of the required storm events.

c. The soils (Group C) utilized in the analyses appears to be appropriate.

d. The soil cover utilized in the analyses (arid rangelands and desert shrub), appears reasonable however, these are not taken from the RCFCWCD Hydrology Manual. The study should be revised to reflect District soil covers and runoff index numbers.

e. The AMC value of II utilized in the analyses is appropriate.

f. The rainfall distribution utilized was the Type I distribution, which is not the appropriate rainfall distribution. Note that the RCFCWCD Hydrology Manual provides 3-, 6-, and 24-hour rainfall distributions that are to be utilized. The analyses should be revised to reflect District rainfall distributions.

g. NOAA Atlas 14 rainfall data was utilized rather than NOAA Atlas 2 as stipulated in the Hydrology Manual. Prior studies for the offsite watershed to the west utilized NOAA Atlas 2, and for consistency, the studies should be revised to reflect NOAA Atlas 2 values.

h. Exhibits in the AECOM report (e.g. Exhibit 8) have Perris Valley MDP Line B labeled as PVSD Lateral A, and PVSD at the junction with Heacock Channel labeled as Perris Valley Channel Lateral B, which can be a source of confusion to the reader. The exhibits and text should be revised for consistency with the Perris Valley MDP.

Offsite Hydrologic Analysis

The AECOM study states that the 2016 K&A Engineering study entitled *Drainage Design Report for Meridian Business Park, Van Buren Culvert (County of Riverside MS 158)* stipulates that flow coming to the March ARB from the west is approximately 800

cfs, but provides no further backup for this flow rate. Review of this K&A study reveals the following.

a. The purpose of the 2016 K&A study was to evaluate if further buildout of areas tributary to the Van Buren culvert (areas north of Van Buren plus the South Campus located south of Van Buren) could take place without construction of new improvements south of Van Buren. The study demonstrated that utilization of a greater storage volume within the Lot E/49, East, and South Channel basins, would mitigate increased runoff associated with development of the watershed tributary to the Van Buren culvert to below historical levels (180 cfs).

b. Page 63 of the 2016 K&A study states that the peak flow rate at location C2, which is located approximately 2,400 feet south of Van Buren and consists of the combined flows from the north (Van Buren Culvert outflow) and from the west (Riverside National Cemetery), is 1,844 cfs in the pre-development condition and less than 800 cfs in the post-development condition. No supporting calculations are provided for these values. The post-development condition, per the K&A study, includes buildout of the North and South Meridian Campuses, and construction of the three detention basins (Lot E/49, East, South Channel).

c. The 2016 K&A study includes supporting hydrologic calculations for the Van Buren culvert, for which the peak mitigated outflow is 156.6 cfs with the governing storm being the 100-year 24-hour event. However, there are no supporting hydrologic calculations for flows from the Riverside National Cemetery, and thus, no apparent justification for the claim that the combined flows at location C2 would be less than 800 cfs. It is worth noting that the purpose of the 2016 K&A Study was to show that development of the Meridian South Campus would not increase flows discharged from the Van Buren culvert, and the study achieved that goal.

d. The 2016 K&A study refers to the July 2010 report by Kimley Horn and Associates (KHA) entitled Drainage Study Meridian Unit 4 Interim Conditions TR 30857-4. We have reviewed this 2010 KHA study, the goal of which was to establish existing and developed condition peak flow rates at the Van Buren culvert associated with development of a portion of the Meridian North Campus. This 2010 KHA study demonstrates that increased runoff due to development of a portion of the North Campus is mitigated by a combination of the Lot E/49, East, and South Channel detention basins. Per this 2010 KHA Study, the peak mitigated developed condition outflow from the Van Buren culvert is 131 cfs, with the governing storm being the 100-year 24-hour event. The downstream end of the hydrologic calculations presented in this study is the outflow from the Van Buren culvert. There appear to be no calculations for the Riverside National Cemetery and no analysis of combined flows from the cemetery and the Van Buren culvert outflow. Although there are several exhibits that show flow at location C2, there appear to be no supporting calculations.

Hydraulic Analysis

The AECOM study includes hydraulic analyses to evaluate several floodplains through the March ARB. The analyses are for what are referred to as: 1) the Offsite Drainage Channel, an existing earthen channel which conveys offsite flows (stated as 800 cfs) from the west across the proposed VIP-215 development; 2) the North Oleander Channel, which conveys flows southerly to the South Oleander Channel; and 3) the South Oleander Channel (upstream and downstream of the confluence with the Offsite Drainage channel). Notable hydraulic methodology and criteria, as well as review issues, for the Offsite Drainage Channel (the focus of this review) are as follows:

a. Hydraulic calculations were performed using HEC-RAS, which is appropriate.

b. The report includes a HEC-RAS workmap, cross section plots, channel profiles, and an output summary table. No input files or digital model files were included, and thus, the model could not be checked in detail.

c. The HEC-RAS workmap is presented at 8.5 x 11 and the cross sections are not labeled, so review is difficult.

d. Manning's n values utilized for the Offsite Drainage Channel (across VIP-215 project) were modeled as 0.040 for the channel and 0.080 for the overbanks. The channel appears to be near capacity as modeled with approximately one foot of freeboard, unless one considers the grade immediately adjacent to the channel, for which freeboard is greater than one foot. It appears dirt has been mounded along the westerly bank to increase capacity, although this capacity increase would result in a levee situation. If the channel were maintained and mowed, a lower n value of 0.030 or 0.035 could be utilized, which would result in increased capacity.

e. Velocities in the Offsite Drainage Channel, assuming a flow rate of 800 cfs, are generally non-erosive (less than 6 fps with the exception of the downstream end), with the longitudinal channel slope being approximately 0.4%.

3. Draft Veterans Industrial Park 215 Project Environmental Impact Report, prepared by ESA, dated October 2018 (file name: Admin Draft EIR - Compiled.09Oct2018.pdf)

- EIR Appendices A through M (file name Admin Draft EIR_Appendices Master - Compiled.09Octo2018.pdf)

- EIR Figure 3.8-1 (file name: Admin Draft EIR_Fig3.8-1_Drainage Areas for Proposed Street_revised.09Oct2018.pdf)

- EIR Figure 3.14-1 (file name: Admin Draft EIR_Fig3-14-1_Study Area Transportation Facilities09Oct2018.pdf)

Our review of the EIR, appendices, and figures, as listed above, was limited to the drainage related aspects. Relevant sections include EIR Chapter 3.8 - Hydrology and Water Quality, EIR Appendix D-4 - Delineation of State and Federal Jurisdictional Waters, EIR Appendix F-1 - Geotechnical Investigation Report, EIR Appendix F-2 - Stormwater Infiltration, and EIR Appendix I - Hydrology and Water Quality.

a. EIR Chapter 3.8 - This chapter included only a high level overview of the onsite and offsite drainage characteristics.

b. EIR Appendix D-4 - This appendix included discussion of the onsite drainage courses only as relates to resource agency issues.

c. EIR Appendices F-1 and F-2 - These appendices included boring data showing that groundwater ranges between 22 and 36 feet below the ground surface, and that near surface soils consist of silty and clayey sands, silty clays, and sandy clays. The soils are described as being relatively impermeable with respect to stormwater infiltration, however, no infiltration testing was performed.

d. Appendix I-1 - Preliminary Drainage Report for Veterans Industrial Park 215, prepared by Huitt-Zollars, dated October 14, 2016. This report was submitted to RCFCWCD in December of 2016 and CValdo did one plan check, with a letter issued on February 1, 2017. There were no subsequent submittals and thus the plan check comments were never addressed. The report includes rational method and unit hydrograph hydrologic calculations to establish peak flow rates from the VIP-215 Building 1 and Building 2 sites. No offsite calculations are included. The comments from the 2017 CValdo plan check letter are repeated below for reference.

    i. Please note that the District has determined that portions of the adopted March AFB Reuse Drainage Master Plan ("MAFB-RMDP") prepared by RBF in 2008 are no longer viable and that the MAFB-RMDP must be updated to a) remove currently proposed drainage facilities (in the adopted MAFB-RMDP) along the west side of the I-215 freeway that are no longer viable, b) incorporate proposed and constructed drainage facilities by the Meridian Business Park, and c) incorporate proposed drainage facilities east and/or west of freeway I-215 that may be necessary for the ultimate development/reuse of the MJPA and MARB properties (east and west of freeway I-215) and to adequately convey storm flows to the Perris Valley Storm Drain Lateral B at Harley Knox Boulevard.

    ii. Our review of the submitted plans and drainage report indicates that the project only presents a conceptual design of the backbone facilities (i.e., storm drain alignment, preliminary sizing of proposed channel running along the easterly project boundary with no backup analyses) proposed for capturing a) offsite storm flows that may reach the site (via the existing Caltrans freeway I-215 facilities or any other facility identified in the updated master plan discussed above), and b) proposed Van Buren Boulevard storm flows. Please submit a drainage report providing backup analyses for sizing the facilities needed to convey storm flows

for the ultimate development of the MJPA/MARB properties to the Perris Valley Storm Drain Lateral B at Harley Knox Boulevard in conformance with the updated master drainage plan discussed above.

iii. The District considers that construction and funding of the backbone drainage facilities identified by the updated master plan must be the responsibility of TPM37220 or the MJPA. Said required facilities must include all offsite drainage improvements (located south of the property) needed to adequately convey the design storm flows to the Perris Valley Storm Drain Lateral B at Harley Knox Boulevard. Please identify in the TPM, plans, and drainage report the entity responsible for constructing and funding the proposed drainage facilities.

e. Appendix I-2 - Stormwater Infiltration letter, prepared by Southern California Geotechnical, dated February 23, 2016. This is a copy of the letter provided in Appendix F-2 that describes the onsite soils as being relatively impermeable with respect to stormwater infiltration. No infiltration testing was performed.

f. Appendix I-3 - Technical Memorandum - Offsite Drainage and Flooding Limits Downstream of the Proposed VIP-215 Project, prepared by Albert A. Webb Associates, dated July 13, 2018. This study includes the results of a 2-D hydraulic model of the floodplain across the development site. The 2-D hydraulic modeling results are presented only as exhibits that depict depth and velocity color coded for the study area. The hydraulic analysis appears to be intended to map flooding for the South Oleander Channel downstream of the project (as stated in the title), rather than the VIP-215 project site itself, as the exhibits provided only include flood mapping for the easterly portion of the site. The hydraulic model was run utilizing peak flow rates stated by Webb to be obtained from reference studies (see below), however, specific references to which study provided each flow rate were not provided, and we were unable to match each flow rate with the referenced studies.

This Webb memorandum includes a summary table as repeated below for the 100-year peak flow rates at several locations. It is worth noting that storm durations were not mentioned in the memorandum, and there is no description of specifically what the historical, existing, and proposed conditions represent. The second row (Offsite Flow Tributary to VIP-215) is the flow rate that would impact the proposed VIP-215 development.

Location	**Historical Flow (cfs)**	**Existing Flow (cfs)**	**Proposed Flow (cfs)**
NE of VIP215	800	200	200
Offsite Flow Tributary to VIP215	1,377	1,534	1,534
VIP 215 Runoff	150	150	33
Flow to MARB	2,327	1,887	1,767

The referenced studies as stated in the memorandum were:

i. Draft Drainage Study - Meridian Business Center - Ultimate Drainage Conditions, prepared by Kimley-Horn Associates, dated June 2010 (file name: App C-4c - Drain Study MBC Ultimate Draft June 2010.pdf). Review of this document reveals that the purpose was to facilitate development of areas north of Van Buren Boulevard as well as to provide calculations supporting replacement of the 6' x 3' RCB at Van Buren with a double 8' x 8' RCB. This study does not appear to have been approved by the RCFCWCD.

ii. Drainage Study – Meridian Unit 4 Interim Conditions, prepared by Kimley-Horn Associates, dated July 2010 (file name: App C-4b - MERIDIAN Unit 4 Int Drain Study KHA July 2010.pdf). This report included supporting calculations for design of the Lot E/49 detention basin, as well as modifications to the East detention basin, and design of the South Channel Basin. Hydrologic calculations within this study included areas upstream of the Van Buren culvert, with detention basin routing for the South Channel Basin through the culvert serving as the downstream limit of the calculations. This report was reviewed by CValdo and approved by the RCFCWCD in 2010 as part of Tract 30857-4 processing.

iii. Final Drainage Report - I-215 / Van Buren Boulevard Interchange PS&E, prepared by Kimley-Horn Associates, dated June 2011 (file name: App C-4d - Drainage Report- June2011 100% SUBMITTAL[1].pdf). This report was prepared for Caltrans as part of the I-215 / Van Buren Interchange project and was to the best of our knowledge was not submitted to RCFCWCD for review. This report is particularly useful as it includes a drainage map (Exhibit A on page 22) with the tributary watersheds and peak flow rates for the culverts draining toward the VIP-215 project from the west. While we did not plan check the calculations supporting the exhibit, the flow rates appear reasonable based on yield, and the exhibit is useful for understanding the overall picture. The following items are worth noting:

- Exhibit A provides a plan view of delineated drainage areas (with topographic base mapping) located west of I-215 and draining easterly between Oleander Avenue to the south and Alessandro Boulevard to the north. The exhibit also includes locations and sizes of existing culverts between the northerly end of the East Basin and Oleander Avenue, most of which drain easterly across the railroad and/or I-215. The exhibit includes flow rates at some locations, including watersheds southerly of Van Buren Boulevard that drain easterly across the railroad and I-215 to the March ARB and the VIP-215 project. The flow rates given appear to be the tributary flow rates to the westerly side of the culverts, not necessarily the flow rates that can pass through the culverts based on the culvert sizes and available ponding head.

- The drainage pattern north of Van Buren per the exhibit is not consistent with the development as constructed today. The Central Watershed is shown to

flow easterly north of Van Buren, but in the current condition, is actually conveyed southerly (routed in the East and South Channel Basins) through the Van Buren Culvert.

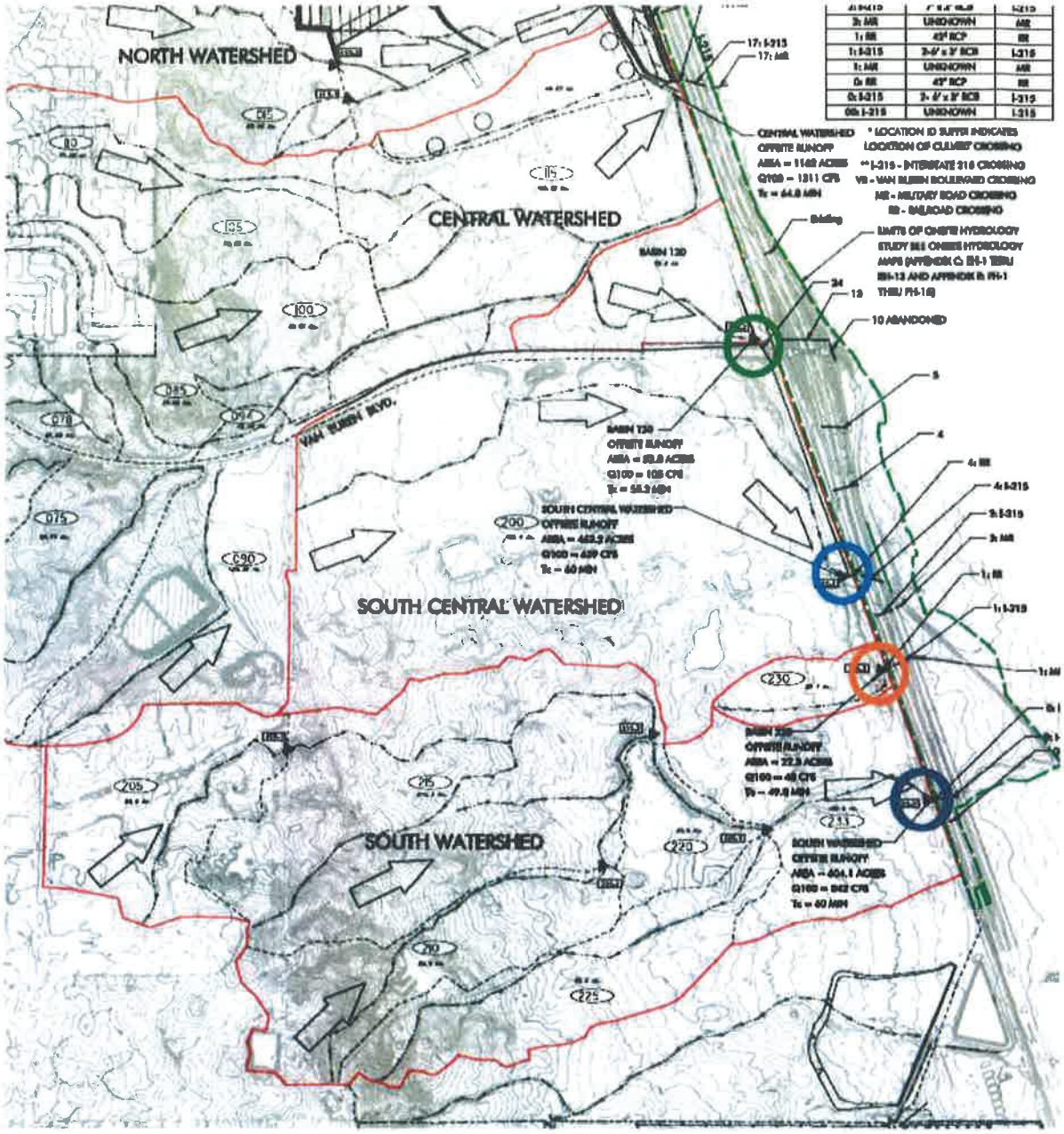
- Discharge from the Van Buren culvert is shown as 105 cfs, which is not consistent with prior or subsequent studies of this culvert.

- We believe that AECOM obtained their stated 800 cfs value for the VIP-215 offsite drainage from the K&A Engineering MS158 study (page 63 of that study). Based on Exhibit A (see below or on following page), this 800 cfs appears to have consisted of 639 cfs from the South Central Watershed and 156.6 cfs from the Van Buren culvert (MS158 routing study, location shown with green circle below), which totals 796 cfs. The MS158 study stated that a flow rate of less than 800 cfs would occur at location C2 (blue circle below), but provided no backup for the flow rate. Specifically, the study did not mention the South Central Watershed and the Q of 639 cfs. What appears to have been overlooked in the AECOM study, is that an additional 48 cfs crosses I-215 at the orange circle, and 842 cfs at the purple circle, each of which would impact the VIP-215 site. Adding the tributary flow rates from the four watersheds that drain to the VIP-215 project per the exhibit (Basin 120, Basin 230, South Central Watershed, and South Watershed) would yield a peak flow rate of 1,634 cfs (639 cfs + Van Buren culvert discharge of 105 cfs + 48 cfs + 842 cfs). This flow rate is 1685.6 cfs if we use the MS158 value of 156.6 cfs at the Van Buren culvert. Note that this assumes no confluencing effects east of I-215 and the associated decrease in peak flow rate. It also includes no routing effects that may occur due to ponding west of I-215.

iv. Drainage Design Report for Meridian Business Park, Van Buren Culvert, prepared by K&A Engineering, dated August 2016. This report was reviewed by CValdo and approved by the RCFCWCD in 2016 under the District project title MS158. Findings from this report are summarized under Reports Item 2 (Offsite Hydrologic Analysis) of this letter.

b. Appendix I-4 Technical Memorandum - Offsite Street Drainage Memo, prepared by Albert A. Webb Associates, dated August 22, 2018. This memorandum identifies flow rates for catch basins and storm drain systems associated with street improvements proposed as part of the VIP-215 project, and does not cover offsite flows from the west.

c. Appendix I-5 - Preliminary WQMP for VIP215. This document covers onsite improvements from a water quality perspective and was not reviewed.



4. March Air Force Base Reuse Drainage Master Plan, County of Riverside, State of California, Main Report, prepared by RBF Consulting, dated May 2008 (file names: VA DRAINAGE CHANNEL.PDF, and App C-4a - MAFB-RDMP RBF May 2008.pdf). This report presented an overall drainage plan for redevelopment of the March Air Force Base. However, many aspects of this plan have been superseded by subsequent studies, and thus, this report is only useful as a reference to the drainage plan as originally intended.

5. Specific Plan March Business Center, prepared by Kimley-Horn and Associates, dated February 2003 (file name: App C-4e - MBC Spec Plan Feb 2003.pdf). Section VI.E of this document provides a brief discussion on drainage issues, and Figure VI-4 schematically depicts the onsite drainage paths and storm drain locations. Detailed discussion and supporting calculations regarding drainage facility sizes and flow rates are not included in this document.

6. SP-5 An Amendment to the North Campus of the Meridian Specific Plan, dated July 2010 (file name: App -C4f - SP-5 Amend ti No Campus MSP July 2010.pdf). This document, which is in draft format, appears to have been prepared to address proposed land use changes within the North Campus. As in the 2003 Specific Plan discussed above, Section VI.E of this document provides a brief discussion on drainage issues, and Figure VI-4 schematically depicts the onsite drainage paths and storm drain locations. Also as in the 2003 Specific Plan, detailed discussion and supporting calculations regarding drainage facility sizes and flow rates are not included in this document.

Exhibits

1. Master Drainage Plan - MJPA/MARB West Side - exhibit prepared by K&A Engineering, dated January 2019 (file name: 322 - EXH-SD Alternative - 3 - simplified.pdf). This exhibit, which may be in draft format, shows a proposed storm drain alignment extending from the Van Buren Culvert southerly, then easterly under the railroad and I-215, then southerly and easterly across the VIP-215 project, ultimately connecting to Perris Valley MDP Line B. Flow rates and/or facility sizes are provided for some of the alignment.

2. March Air Force Base - Drainage Master Plan Tributary to Perris Valley Storm Drain (PVSD) - Lateral B, exhibit prepared by K&A Engineering, plot date 8/18/2017 (file name: 476 - Drainage-profile-0317 30x42 L.pdf). This exhibit, which may be in draft format, identifies what appears to be existing condition flood inundation areas west of I-215 in plan view, and provides a profile of what appears to be approximately the location of the westerly I-215 right-of-way, although there is no indication on the plan view of where the profile is taken. The plan view identifies culverts that cross the railroad and/or I-215. Color coded flow rates are provided adjacent to and downstream of the culverts, but there is no legend, and thus, no way to determine what the flow rates represent (i.e. capacity, tributary flow rate, etc.).

3. Drainage Facility Map - 2015, March Air Force Base - Drainage Master Plan Tributary to Perris Valley Storm Drain (PVSD) - Lateral B, exhibit prepared by K&A Engineering, plot date 8-18-2017. This exhibit, which may be in draft format, provides a plan view of delineated drainage areas (without topographic base mapping) located north of Oleander Avenue that drain across the I-215 to the MARB. The exhibit also includes locations and sizes of existing culverts between the northerly end of the East Basin and Oleander Avenue, most of which drain easterly across the railroad and/or I-215. There is also a schematic diagram showing culvert sizes and flow rates between Van Buren Boulevard

and the Harley Knox / I-215 Interchange, but the lettering on the diagram isn't consistent with the legend provided that identifies existing drainage structures on the plan, and thus, the diagram is difficult to follow.

It is noted that many of the reports described above include references to one or more of the other reports. There are instances where information is taken from one report and utilized in another, but the information from the source document was either incorrect or incomplete, and thus should not have been utilized as a basis for further analysis or design.

Sincerely,
CValdo Corporation

Michael Cairns, P.E.
Principal

REGISTERED PROFESSIONAL ENGINEER
MICHAEL DAVID CAIRNS
No. 58839
CIVIL
STATE OF CALIFORNIA

RCFCWCD

Mike Wong, P.E.
Engineering Project Manager

c. Habib Motlagh, Tri Lake Consultants
Stuart McKibbin, Tri Lake Consultants

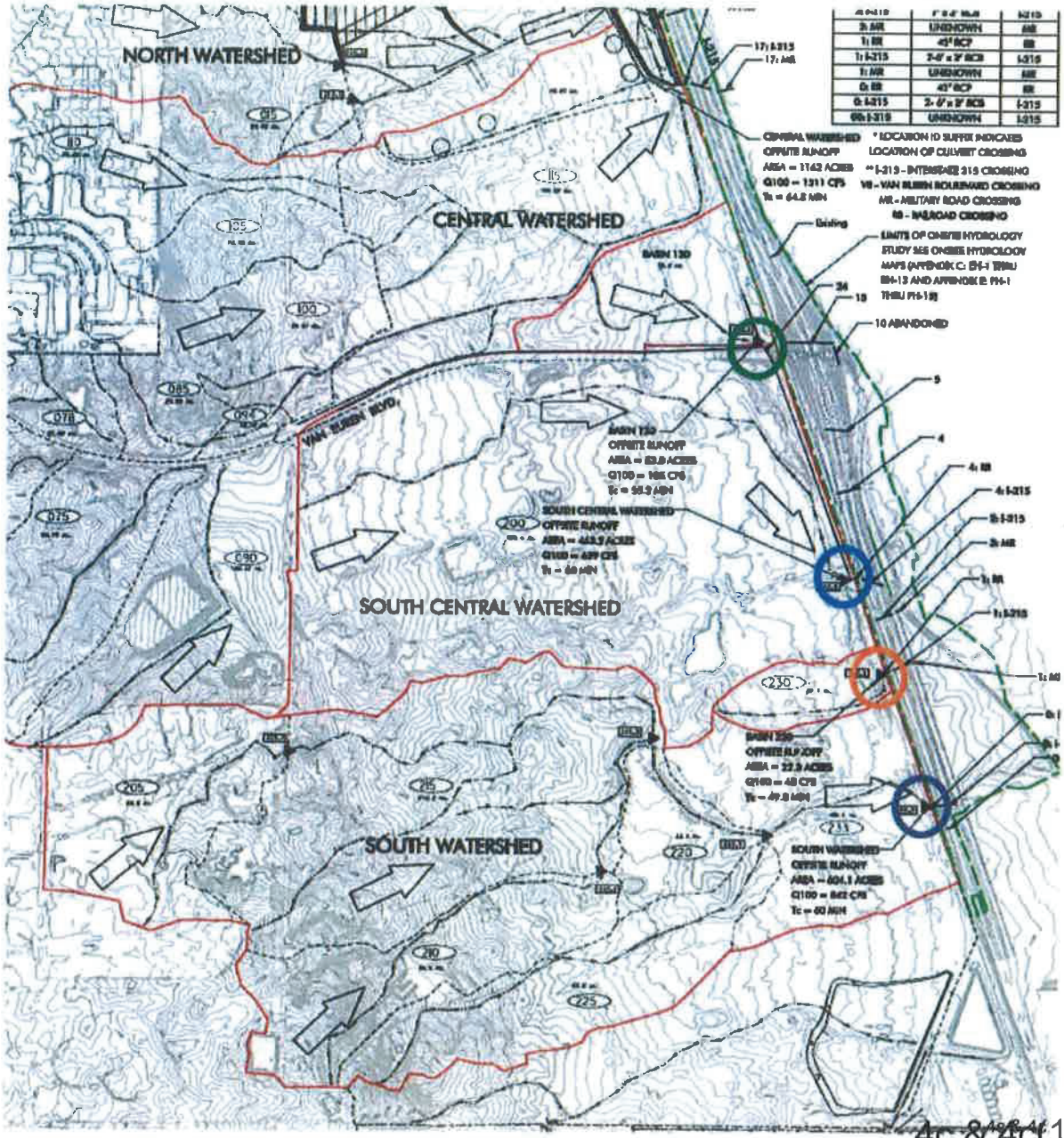
ec Bob Cullen, RCFCWCD
Edwin Quinonez, RCFCWCD
Cory Jones, CValdo Corporation

ATTACHMENT 2

Excerpt Summary of VIP 215 Drainage Studies / Review Findings

PG 11

- We believe that AECOM obtained their stated 800 cfs value for the VIP-215 offsite drainage from the K&A Engineering MS158 study (page 63 of that study). Based on Exhibit A (see below or on following page), this 800 cfs appears to have consisted of 639 cfs from the South Central Watershed and 156.6 cfs from the Van Buren culvert (MS158 routing study, location shown with green circle below), which totals 796 cfs. The MS158 study stated that a flow rate of less than 800 cfs would occur at location C2 (blue circle below), but provided no backup for the flow rate. Specifically, the study did not mention the South Central Watershed and the Q of 639 cfs. What appears to have been overlooked in the AECOM study, is that an additional 48 cfs crosses I-215 at the orange circle, and 842 cfs at the purple circle, each of which would impact the VIP-215 site. Adding the tributary flow rates from the four watersheds that drain to the VIP-215 project per the exhibit (Basin 120, Basin 230, South Central Watershed, and South Watershed) would yield a peak flow rate of 1,634 cfs (639 cfs + Van Buren culvert discharge of 105 cfs + 48 cfs + 842 cfs). This flow rate is 1685.6 cfs if we use the MS158 value of 156.6 cfs at the Van Buren culvert. Note that this assumes no confluencing effects east of I-215 and the associated decrease in peak flow rate. It also includes no routing effects that may occur due to ponding west of I-215.



PG 9

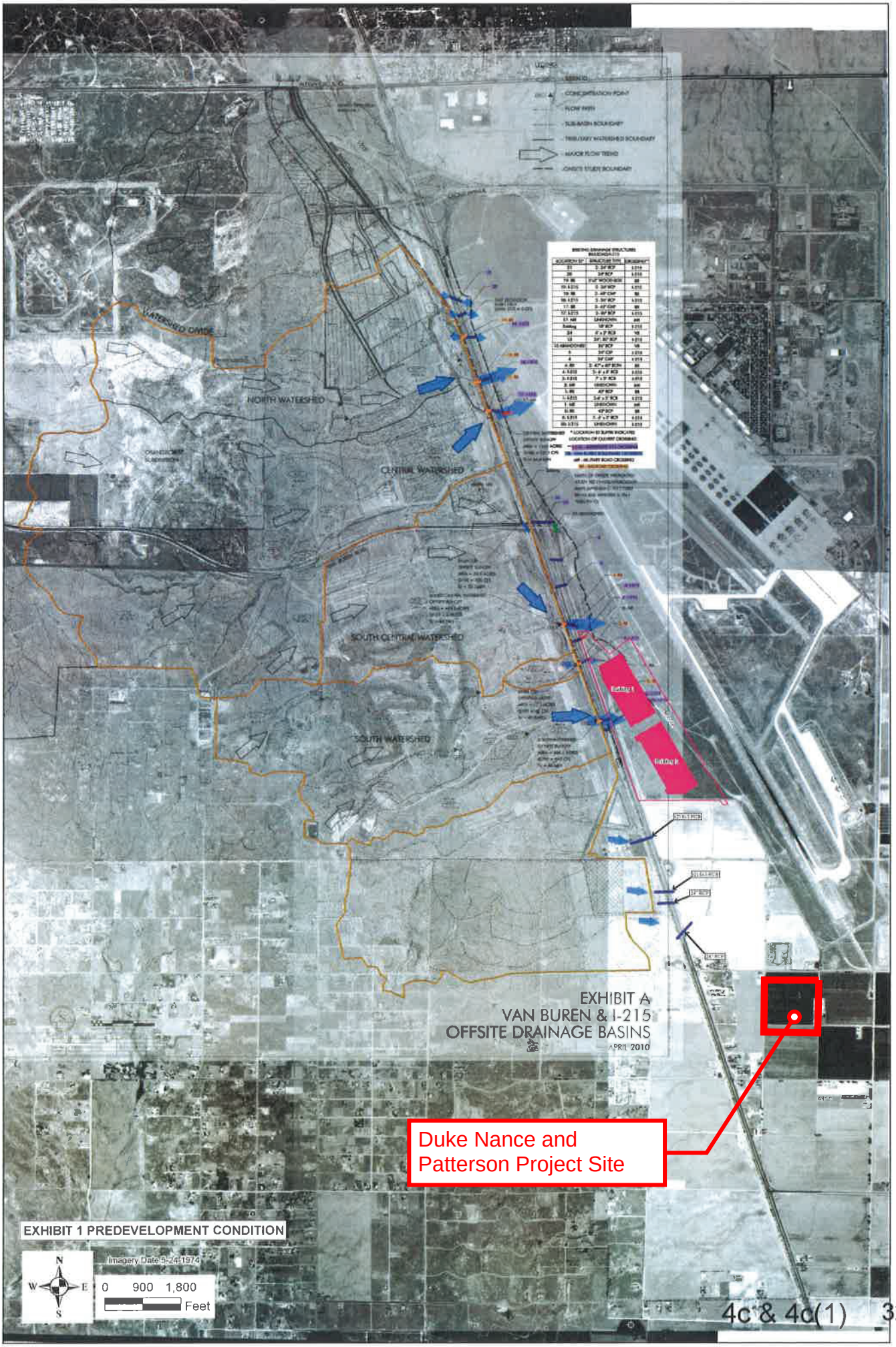
iii. The District considers that construction and funding of the backbone drainage facilities identified by the updated master plan must be the responsibility of TPM37220 or the MJPA. Said required facilities must include all offsite drainage improvements (located south of the property) needed to adequately convey the design storm flows to the Perris Valley Storm Drain Lateral B at Harley Knox Boulevard. Please identify in the TPM, plans, and drainage report the entity responsible for constructing and funding the proposed drainage facilities.

PG 8

i. Please note that the District has determined that portions of the adopted March AFB Reuse Drainage Master Plan ("MAFB-RMDP") prepared by RBF in 2008 are no longer viable and that the MAFB-RMDP must be updated to a) remove currently proposed drainage facilities (in the adopted MAFB-RMDP) along the west side of the I-215 freeway that are no longer viable, b) incorporate proposed and constructed drainage facilities by the Meridian Business Park, and c) incorporate proposed drainage facilities east and/or west of freeway I-215 that may be necessary for the ultimate development/reuse of the MJPA and MARB properties (east and west of freeway I-215) and to adequately convey storm flows to the Perris Valley Storm Drain Lateral B at Harley Knox Boulevard.

ATTACHMENT 3

RCFC Exhibits:	Exhibit 1:	Predevelopment Condition
	Exhibit 2:	Current Condition
	Exhibit 3A:	Preferred Alternative with Master Plan
	Exhibit 3B:	Preferred Alternative


NORTH WATERSHED
CENTRAL WATERSHED
SOUTH CENTRAL WATERSHED
SOUTH WATERSHED
EXHIBIT A
VAN BUREN & I-215
OFFSITE DRAINAGE BASINS
APRIL 2010
Duke Nance and
Patterson Project Site
EXHIBIT 1 PREDEVELOPMENT CONDITION
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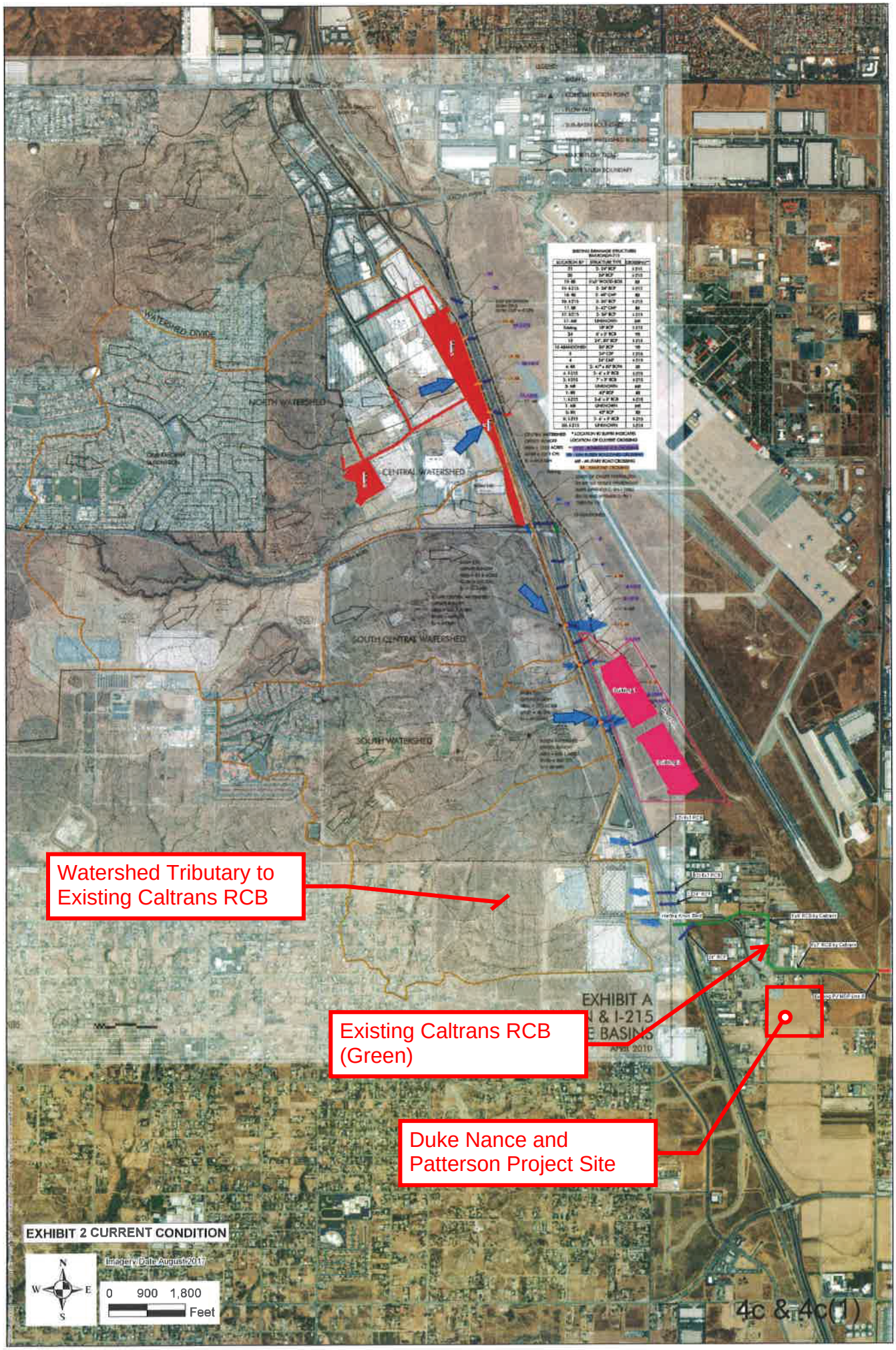
Watershed Tributary to Existing Caltrans RCB
Existing Caltrans RCB (Green)
Duke Nance and Patterson Project Site
WATERSHED DIVIDE
NORTH WATERSHED
CENTRAL WATERSHED
SOUTH CENTRAL WATERSHED
SOUTH WATERSHED
EXHIBIT A
& I-215
BASINS
EXHIBIT 2 CURRENT CONDITION
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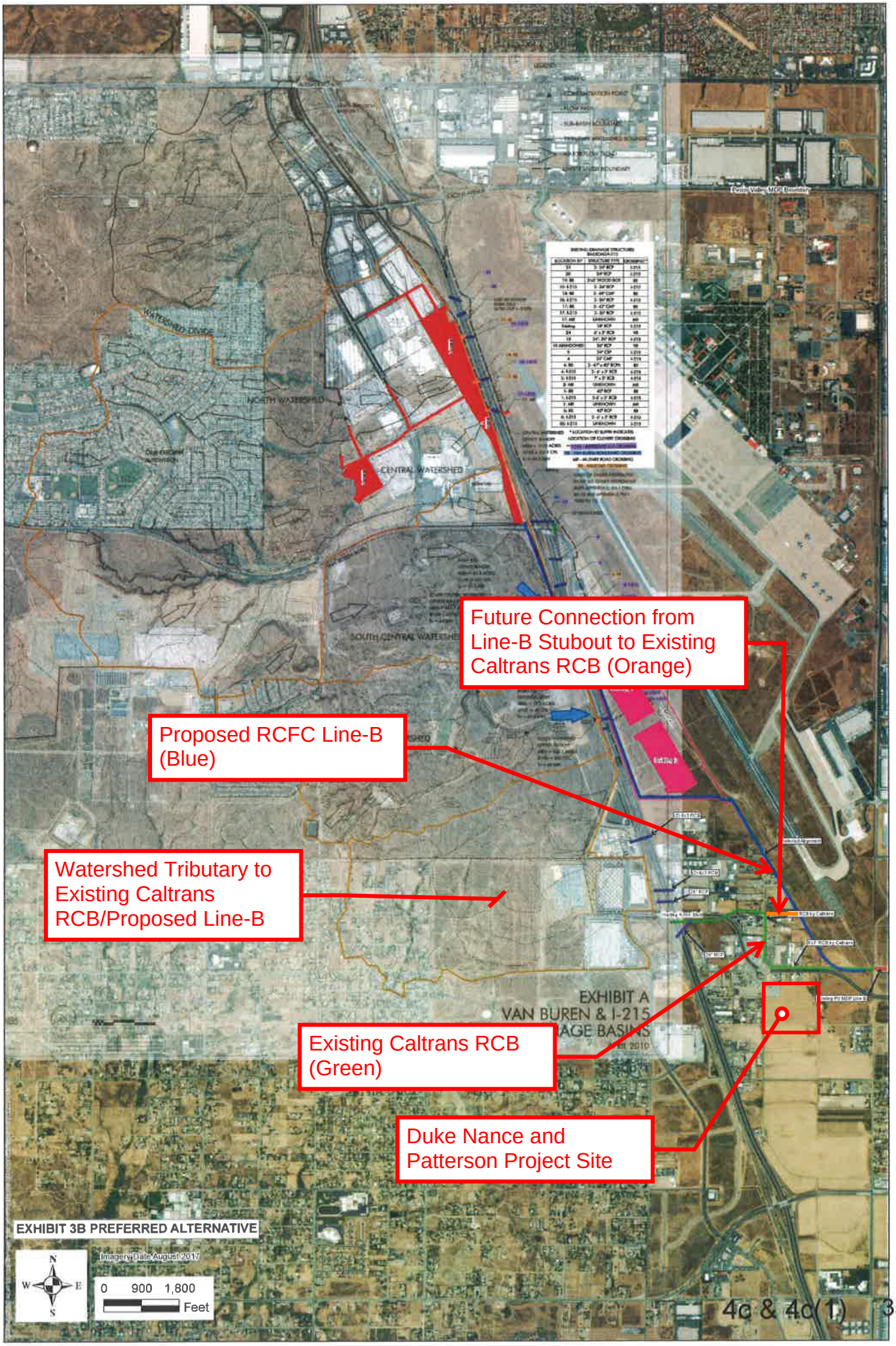
Future Connection from Line-B Stubout to Existing Caltrans RCB (Orange)
Proposed RCFC Line-B (Blue)
Watershed Tributary to Existing Caltrans RCB/Proposed Line-B
Existing Caltrans RCB (Green)
Duke Nance and Patterson Project Site
WATERSHED DIVIDE
NORTH WATERSHED
CENTRAL WATERSHED
SOUTH CENTRAL WATERSHED
EXHIBIT A
VAN BUREN & I-215
EXHIBIT 3B PREFERRED ALTERNATIVE
Imagery Date August 2017
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Riverside County Flood Control and Water Conservation District

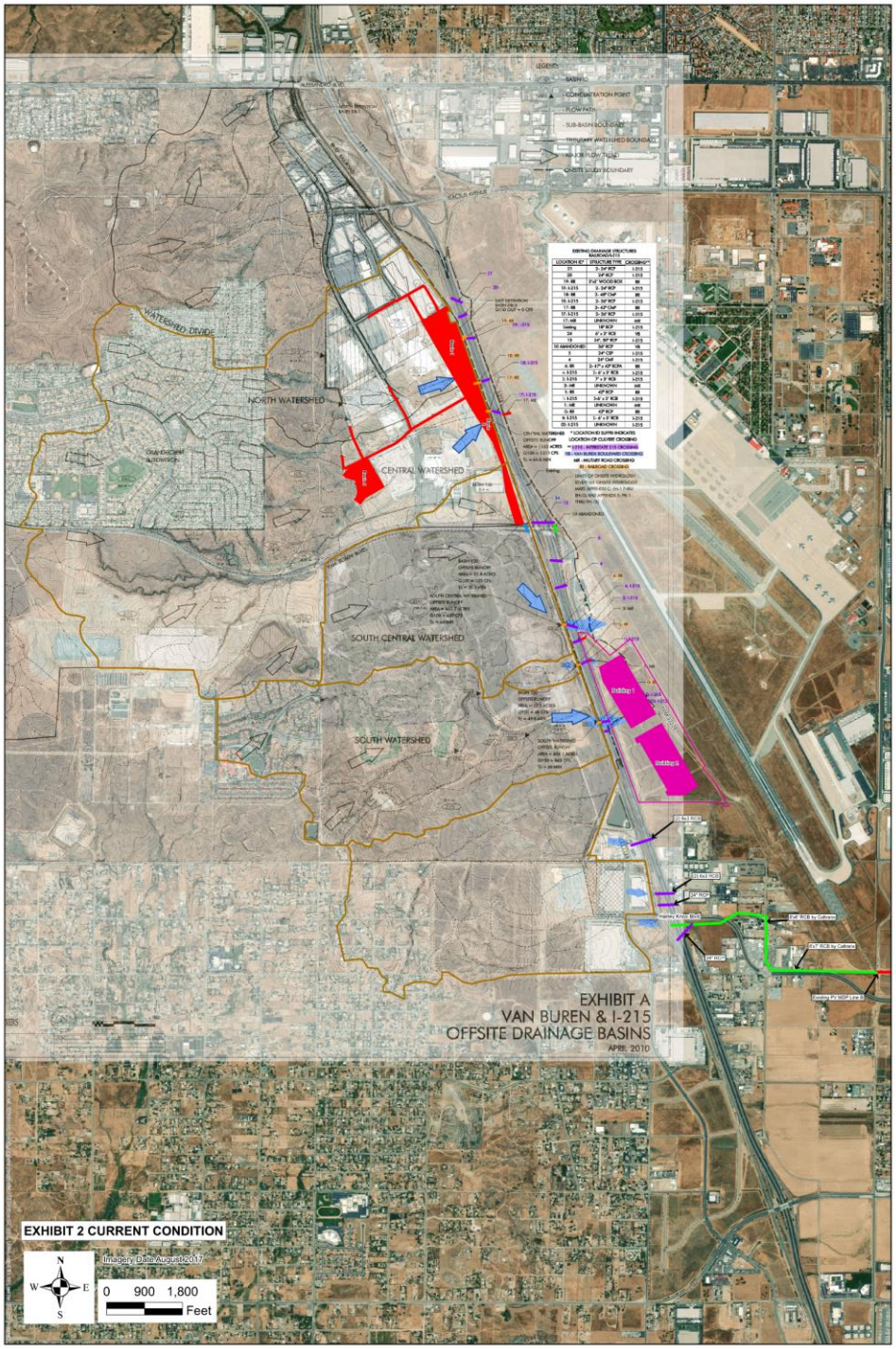
VIP 215 Drainage Review

April 8, 2019

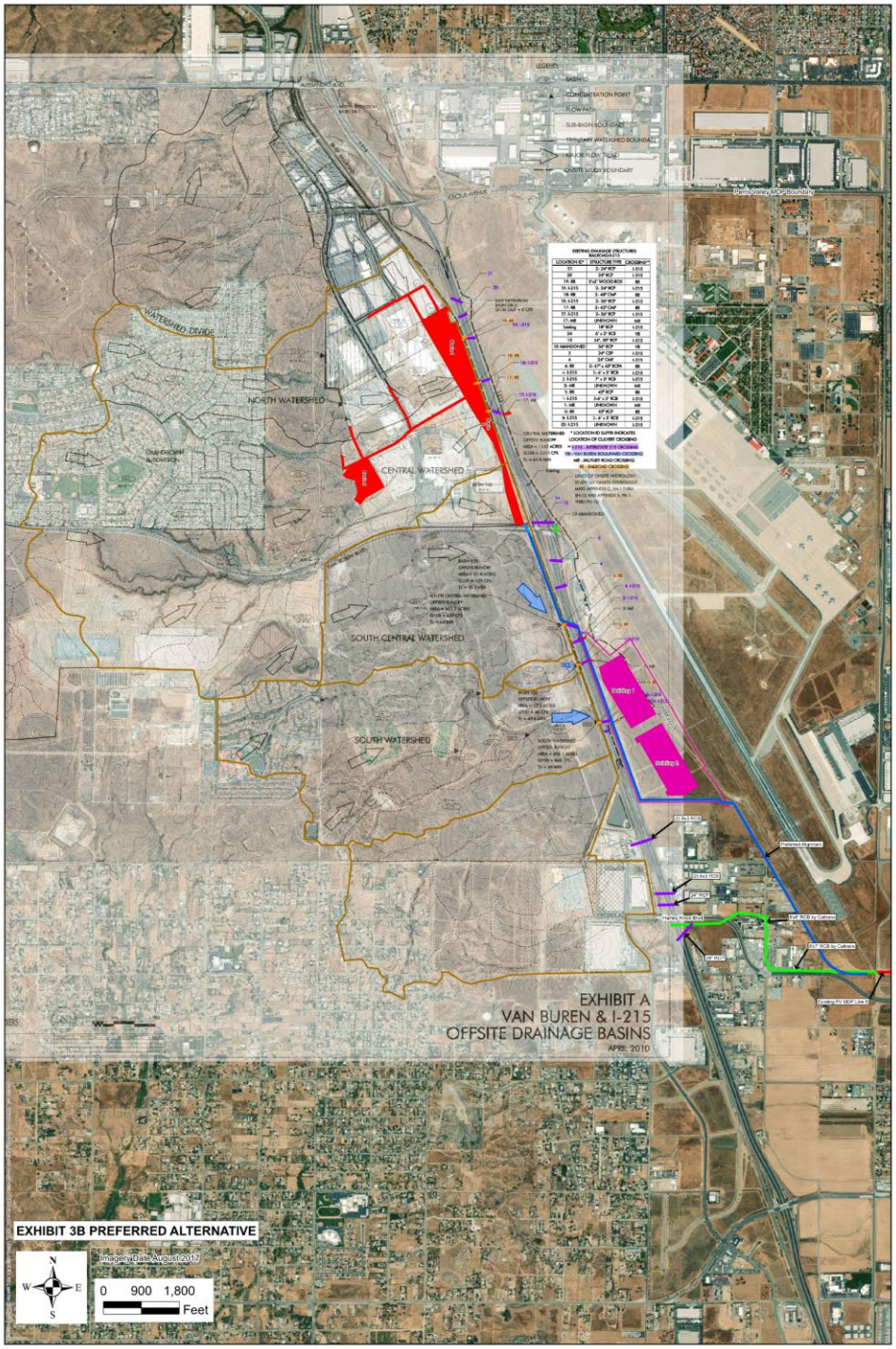
Edwin Quinonez
Chief of Planning Division

District Task

- Determine appropriate flow rate for drainage analysis across VIP-215 site
- Review approved and on-going technical studies within project area including:
  - Preliminary Drainage Report for Veterans Industrial Park 215, prepared by Huitt-Zollars
  - Technical Memorandum - Offsite Drainage and Flooding Limits Downstream of the Proposed VIP-215 Project, prepared by Albert A. Webb Associates
  - Flood Hazard Study, March Air Reserve Base, North and South Oleander Drainage, prepared by AECOM
  - Perris Valley Master Drainage Plan Line "B" Revision to Master Drainage Plan, prepared by K&A Engineering
  - Drainage Design Report for Meridian Business Park, Van Buren Culvert, County of Riverside MS 158, prepared by K&A Engineering
  - March Air Force Base Reuse Drainage Master Plan, County of Riverside, State of California, Main Report, prepared by RBF Consulting



RIVERSIDE COUNTY FLOOD CONTROL WATER CONSERVATION DISTRICT



RIVERSIDE COUNTY FLOOD CONTROL WATER CONSERVATION DISTRICT

District Findings

- Flow rate tributary to VIP-215 project site is approximately 1,600cfs
- MDP facility proposed along the west side of I-215 is not feasible
- Regional drainage solution should collect and convey flows on east side of I-215 to Perris Valley MDP Lateral B

RCFC PERRIS VALLEY CHANNEL
LATERAL B - STAGE 4 PROJECT

PLAN & PROFILE

SCALE: 1:20	ALBERT A. WEBB ASSOCIATES	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 21-0137
DATE: 11/09/21			SHEET 1 OF 2 SHEETS
DESIGNED: EX			
CHECKED: JC			DWG. NO.
PLN CK REF: XX			
F.B. XX			

RCFC PERRIS VALLEY CHANNEL
LATERAL B - STAGE 4 PROJECT

PLAN & PROFILE

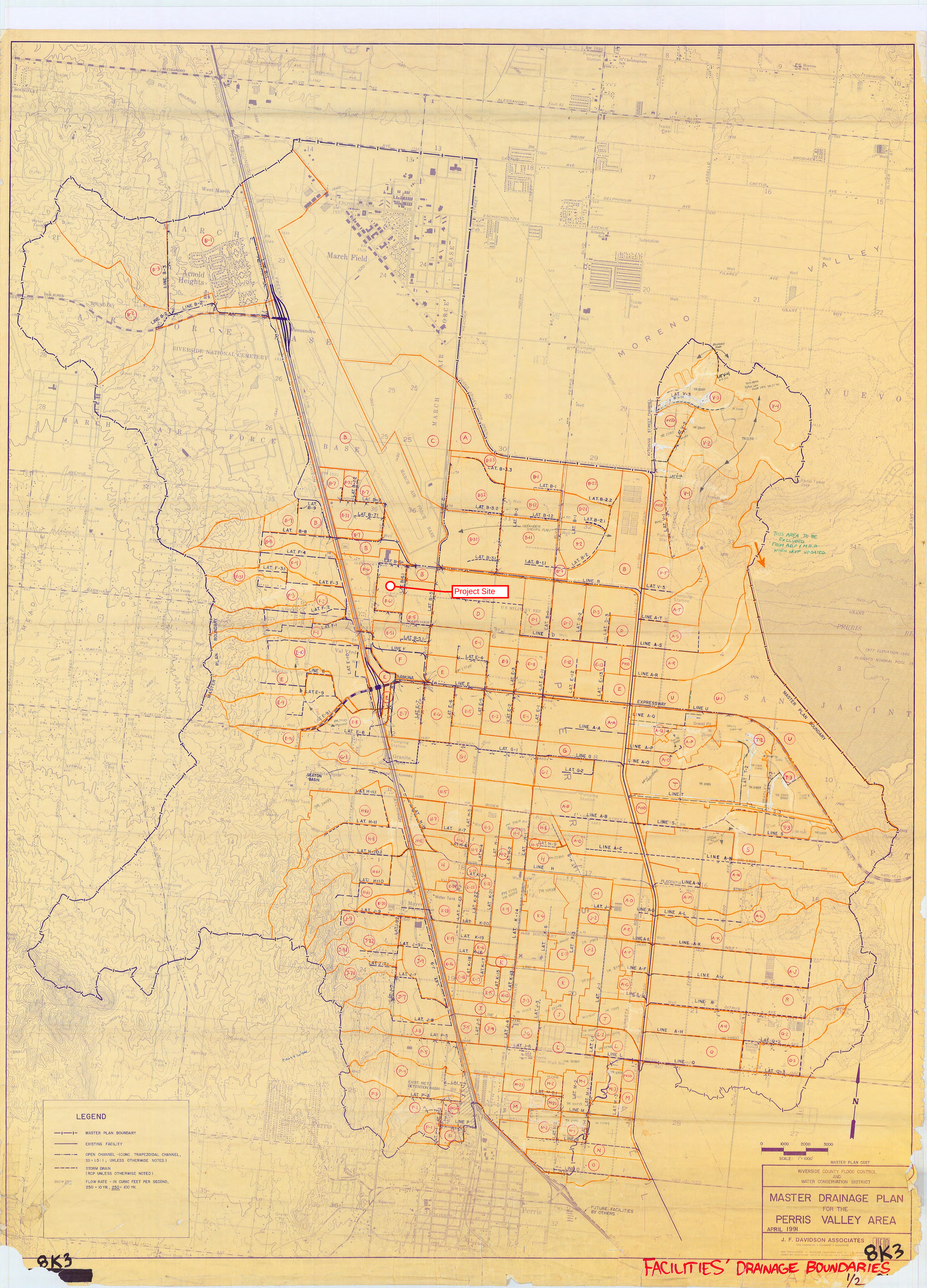
SCALE:	1:20
DATE:	11/09/21
DESIGNED:	EX
CHECKED:	JC
PLN CK REF:	XX
F.B.	XX

ALBERT A. WEBB ASSOCIATES

ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

W.O. 21-0137
SHEET 2 OF 2 SHEETS
DWG. NO.

PVSD MDP TRIBUTARIES


Project Site
LEGEND
MASTER PLAN BOUNDARY
EXISTING FACILITY
OPEN CHANNEL -(CONC. TRAPEZOIDAL CHANNEL, SS = 1.5:1 ; UNLESS OTHERWISE NOTED)
STORM DRAIN (RCP UNLESS OTHERWISE NOTED)
250 or 250 FLOW RATE - IN CUBIC FEET PER SECOND, 250 = 10 YR, 250 = 100 YR.
SCALE: 1" = 1000'
MASTER PLAN COST
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
MASTER DRAINAGE PLAN FOR THE PERRIS VALLEY AREA
APRIL 1991
J. F. DAVIDSON ASSOCIATES
FUTURE FACILITIES BY OTHERS.
THIS AREA TO BE EXCLUDED FROM A.D.P. & M.D.P. WHEN NEXT UPDATED.
8K3
FACILITIES' DRAINAGE BOUNDARIES
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