FIR Wilson 2
PXX-XXXXX
City of Perris, Riverside County, California

Preliminary Drainage Study

Prepared for:
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Revision Date(s):

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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 First Industrial Realty Trust (FIR) Wilson 2 project located in the City of Perris, County of Riverside, California. The project site is located south of Rider Street, north of Placentia Avenue and situated between Wilson Avenue and the Perris Valley Storm Drain Channel. The project proposes to build a commercial/industrial building on approximately 8.3 net acres. This report will summarize the hydrologic and hydraulic analyses that were conducted in order to determine the necessary drainage improvements required to provide flood protection for the proposed building and safely convey the runoff through the site.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the developed condition using the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Rational Method.
- Determine the required storm drain facilities, alignment, and sizes required to flood protect the project site.
- Determine the necessary basin area and media depth required for water quality treatment
- Preparation of a preliminary report summarizing the hydrology and hydraulic results.

DESCRIPTION OF WATERSHED

As previously described, the project is proposing a commercial/industrial building (approximately 154,600 square feet) on approximately 9.7 gross acres of vacant land. Existing elevations across the site vary from 1441 at the northwest corner to 1439 at the southeast corner (NAVD 88). The site currently slopes down at an approximate 0.2% grade to the southeast. The existing drainage pattern for the site and the general area is characterized by sheet flows that follow the slope to the southeast. The runoff discharges into the Perris Valley Storm Drain Channel which drains into the San Jacinto River before finally reaching Canyon Lake and Lake Elsinore.

The project is located within the Perris Valley Commerce Center (PVCC) specific plan and is also within the Perris Valley Master Drainage Plan (PVMDP) adopted July 1987 and revised June 1991. This project is tabled to discharge into MDP Line A-C, which does not currently exist. Line A-C will be built with FIR Wilson 1 (P19-00007) and designed per guidelines listed in the Line A-B, Line A-C Reallocation Memo due to future impacts of RCTC's Mid-County Parkway.

PROPOSED CONDITIONS

The proposed project will only generate on-site flows. This runoff will surface flow through the site utilizing curb and gutter. All on-site flow will discharge into a proposed bio-retention basin which will treat the water quality volume and bypass higher intensity runoff. Mitigation for HCOC is not required; the project will connect to MDP facility Line A-C before out falling to the Perris Valley Storm Drain.

Since the project is HCOC exempt, a comparison analysis between existing and proposed drainage conditions will not be required. Only analyses demonstrating how proposed designs will flood protect the proposed site are necessary.

The project proposes two main on-site drainage paths. The southern and western portions of the site will surface flow to the eastern screen wall in the truck court, and runoff will outfall into the proposed bio-retention basin via a wall cut and swale. The northern and eastern portions will surface flow into the proposed bio-retention basin via curb cuts and u-channels. See the Rational Method Map in Appendix A.

This project will not be subject to off-site run-on. All adjacent vacant properties currently and will continue to sheet flow into the Perris Valley Storm Drain Channel. In addition, Wilson Avenue already safely conveys road runoff via existing curb and gutter. Street improvements will not be considered since Wilson Avenue is already constructed to its ultimate width. Therefore, no analyses need to be done for off-site flows.

METHODOLOGY

HYDROLOGY

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

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

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

The Rational Method was used to determine the peak flow rates to size and design the drainage facilities need to convey onsite flows through the site to the proposed 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 layout and grading.

The Unit Hydrograph Method will not be utilized since there is no need to compare existing and proposed conditions due to the HCOC exemption for this project.

HYDRAULICS

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

Basin routing will not be utilized since there is no need to show flow mitigation and volume containment due to the HCOC exemption for this project.

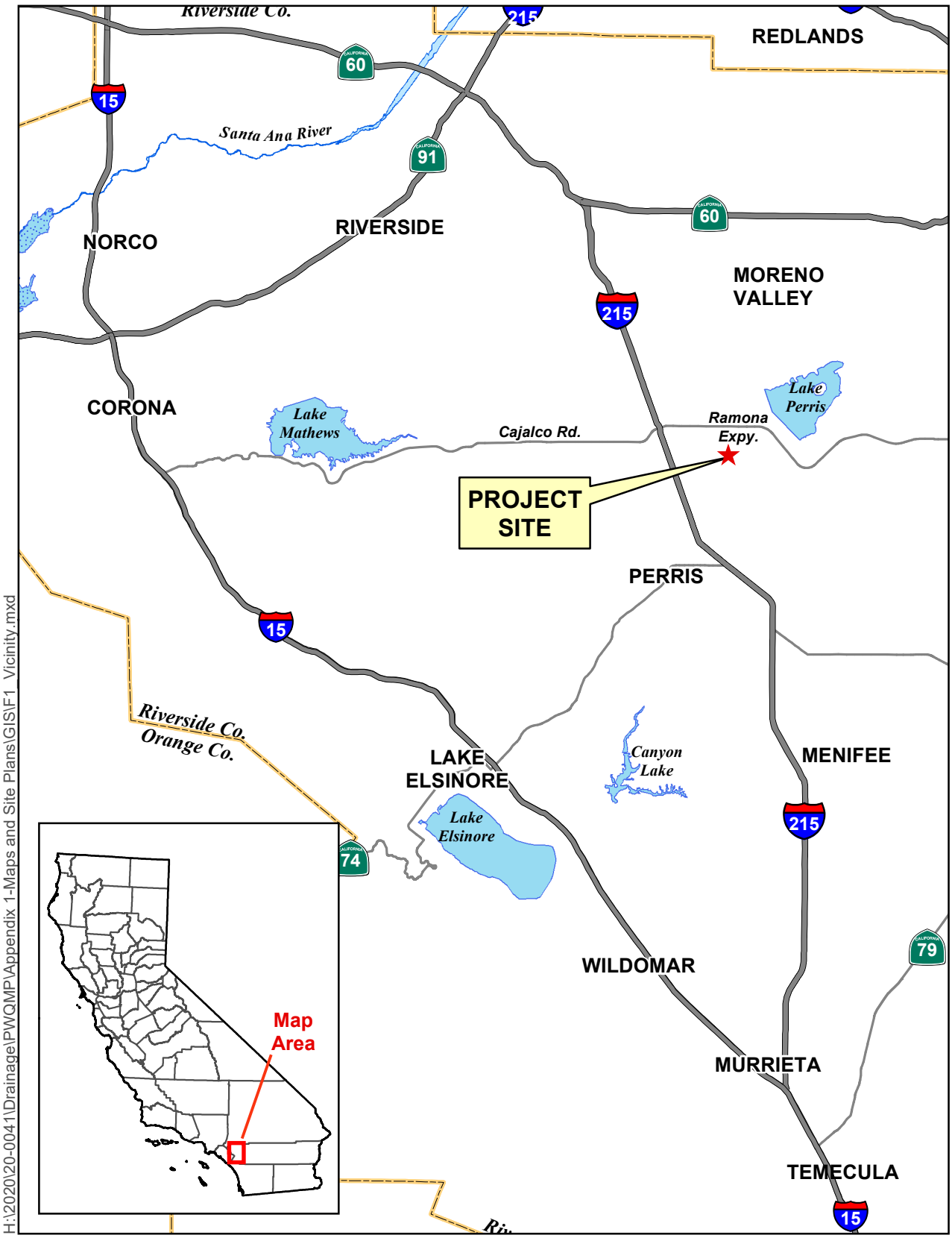
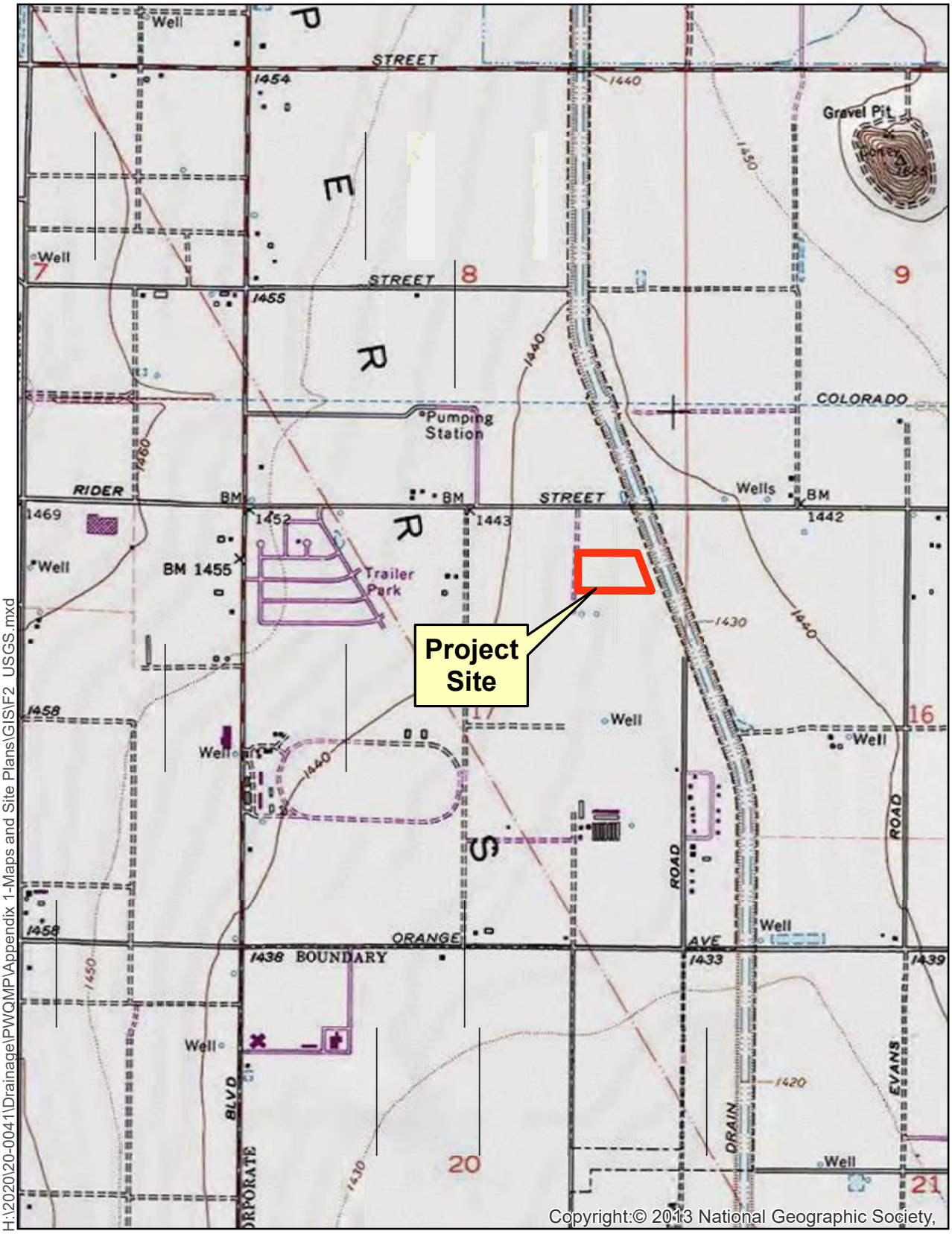


Figure 1. Vicinity Map

0 2.5 5 Miles



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Sources: ESRI / USGS 7.5min Quad
DRGs: PERRIS

Figure 2. USGS Topography Map

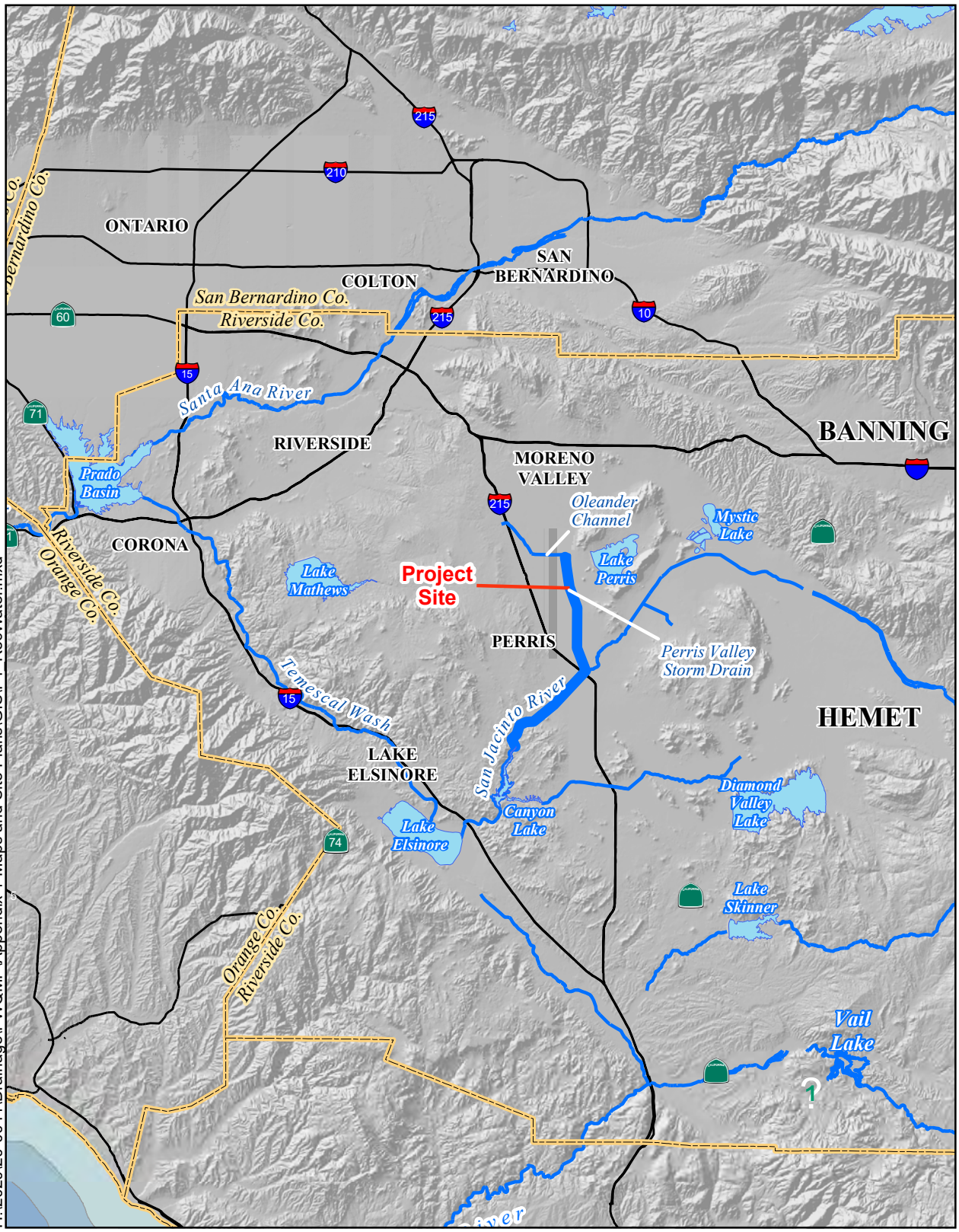
0 1,000 2,000 Feet

Albert A. WEBB Associates

Sources: County of Riverside GIS, 2013; Eagle Aerial, April 2012.

Figure 3. Aerial Photograph

0 400 800 Feet



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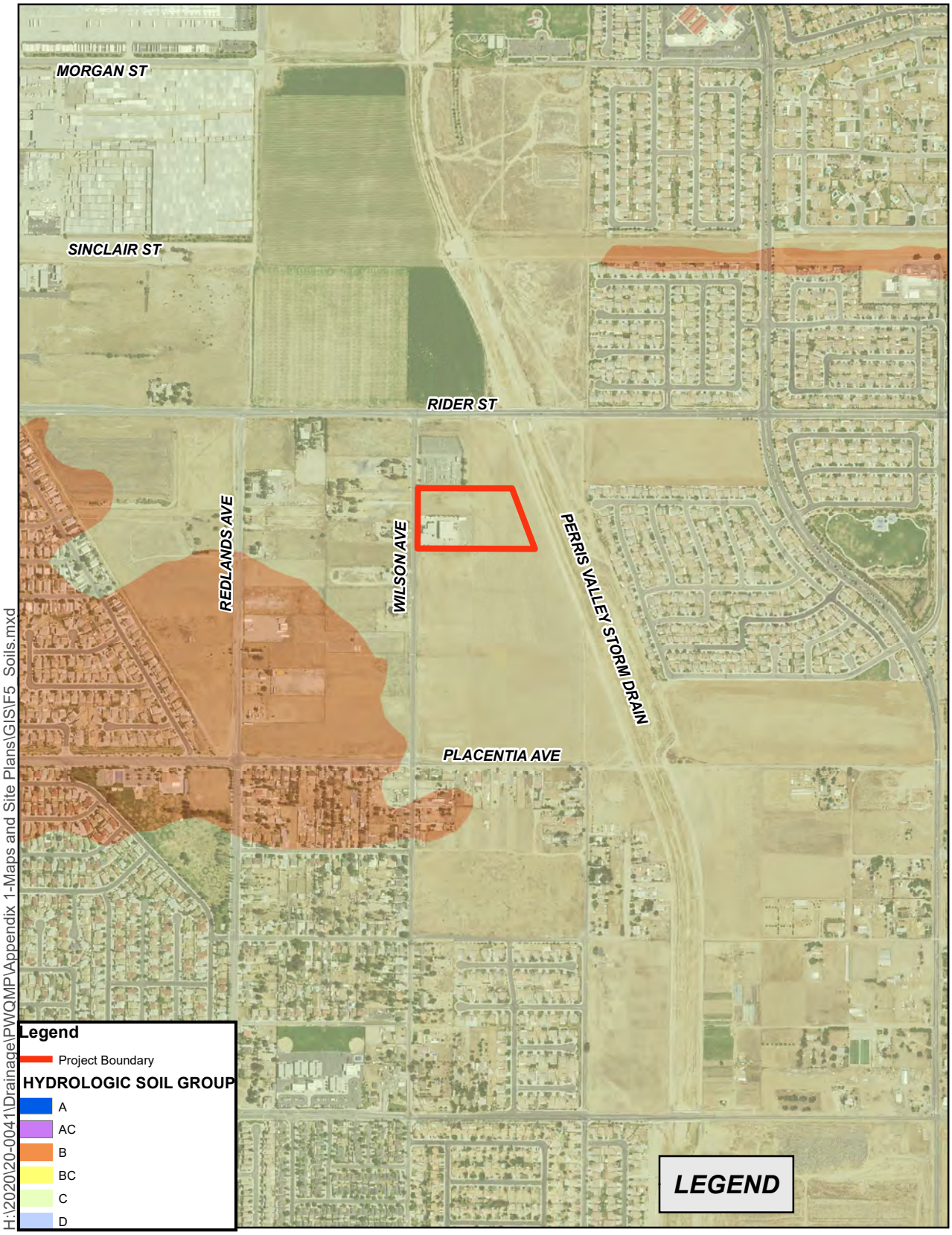
Sources: USGS 30 Meter DEM;
USGS Digital Line Graph

Figure 4. Receiving Waterbodies

Flowpath

0 2 4 6
Miles



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 the isohyetal maps provided in the RCFC&WCD Hydrology Manual:

Table 1 – Precipitation Values

	Duration
Storm Event	**1-Hour (inches)**
2-Year	0.45
100-Year	1.21

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

Based on the Plate C-1.30 (Perris) in the RCFC&WCD Hydrology Manual, the project site is classified as soil type C. The soils map is included in Appendix A.

The cover type was determined based on the existing land cover and proposed land use of the site. Hydrological computations for the existing condition were done using 'Undeveloped – Poor Cover'. The 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 in order to adequately size the proposed swales and u-channels used to convey on-site flows to the proposed basin. The project site was separated into four sub areas.

Areas A-1 and A-2 account for the southern and western portions of the site; including the entire building. They produce a 100-year peak flowrate of 12.0 cfs. This runoff will surface flow only and discharge into the proposed bio-retention basin via a wall opening and concrete u-channel.

Areas B and C account for the northern and eastern portions of the site. They produce a 100-year peak flowrate of 2.0 cfs and 2.8 cfs, respectively. Areas B and C will drain to BMP-A via u-channels.

Area D is the area including the proposed basin. This area is self-draining.

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

Table 3 – Rational Method Results

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Node 102 – Flow from Areas A-1 and A-2	8.2	12.0
Node 201 – Flow from Area B	1.4	2.0
Node 301 – Flow from Area C	1.9	2.8
Total Flow	11.6	16.9

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 no subsurface storm drain and will utilize curb and gutter, curb cuts, and u-channels to convey on-site flows to the proposed bio-retention basin (BMP-A). From the basin, the runoff will discharge into Outlet Structure A. The runoff from Outlet Structure A discharges into the Perris Valley Storm Drain Channel via proposed Line AC-2.

A brief summary of each system has been provided and the results of the hydraulic analyses are included in Appendix B. The peak flow rates determined from the 100-year rational method on-site hydrology analysis were utilized to evaluate the proposed storm drain systems.

Outlet Structure A

The outlet structure was sized using the peak 100-year flow rate of 16.9 cfs. A weir calculation was employed to size the BMP-A's outlet. A grated inlet with 3 grates is proposed to handle the 100-year overflow. Based on a peak flow rate of 16.9 cfs, a total of 0.5-feet of head is required to bypass the 100-year flow rate resulting in a water surface elevation of 1436.0 feet. The calculation has been included in Appendix B.

U-Channel

The southern and western portion of the project site will surface flow into one low point at the easterly truck court screen wall. A u-channel will convey this runoff to BMP-A. A normal depth calculation was used to determine the appropriate size for the u-channel with a worst case flowrate of 12.0 cfs; the bottom width was determined to be 6-feet.

All other u-channels will receive less than 3.0 cfs so they will only be 2-feet wide.

Line AC-2 (Line A-C Connection)

Line AC-2 will convey the entire runoff generated from the site into Line A-C. A normal depth calculation was used with the 100-year peak flow rate (16.9 cfs) produced from the entire site to determine the appropriate size for Line-B. It was determined that a 30-inch pipe will safely convey runoff to Line A-C. A hydraulic model for Line AC-2 will be provided during final engineering to further assess the storm drain design.

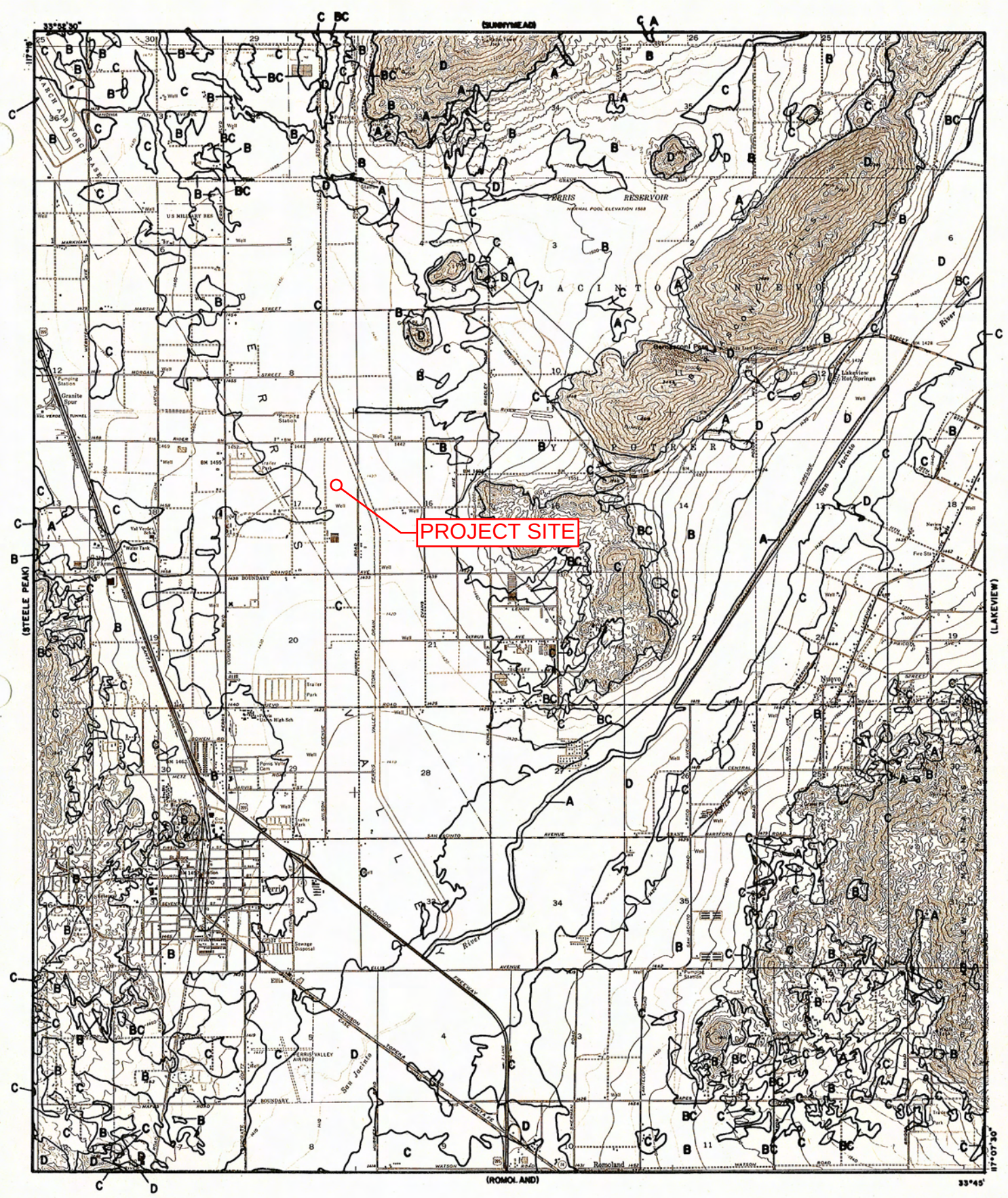
SECTION 4 - CONCLUSION

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 the basin and provide flood protection for the 100-year storm event.
- The proposed basin will provide adequate water quality treatment (see P-WQMP)
- The proposed project will not impact flooding condition to upstream or downstream properties.

APPENDIX A – HYDROLOGY

HYDROLOGIC PARAMETERS



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-1.30

RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	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

PLATE D-4.1 (4 of 6)

10-YEAR ONSITE HYDROLOGY (RATIONAL METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 01/27/21 File:PROP10.out

20-0041 - FIR WILSON 2.0
ONSITE RATIONAL METHOD HYDROLOGY
10 YEAR STORM EVENT
FN: PROP10.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 = 1

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 = 554.000(Ft.)
Top (of initial area) elevation = 1440.900(Ft.)
Bottom (of initial area) elevation = 1438.000(Ft.)
Difference in elevation = 2.900(Ft.)
Slope = 0.00523 s(percent)= 0.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.734 min.
Rainfall intensity = 1.813(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type

```
Runoff Coefficient = 0.862
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.280(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100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Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1438.000(Ft.)
Downstream point elevation =  1436.400(Ft.)
Channel length thru subarea  =   407.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =  48.000
Slope or 'Z' of right channel bank =  33.000
Estimated mean flow rate at midpoint of channel =      5.775(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.775(CFS)
Depth of flow =   0.289(Ft.), Average velocity =   1.709(Ft/s)
Channel flow top width =   23.394(Ft.)
Flow Velocity =    1.71(Ft/s)
Travel time  =    3.97 min.
Time of concentration =   14.70 min.

Sub-Channel No. 1 Critical depth =      0.264(Ft.)
  '     '       '     Critical flow top width =     21.357(Ft.)
  '     '       '     Critical flow velocity=    2.051(Ft/s)
  '     '       '     Critical flow area =      2.816(Sq.Ft)

 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.858
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.554(In/Hr) for a    10.0 year storm
Subarea runoff =      4.934(CFS) for      3.700(Ac.)
Total runoff =      8.214(CFS)  Total area =       5.800(Ac.)
Depth of flow =   0.330(Ft.), Average velocity =   1.867(Ft/s)

Sub-Channel No. 1 Critical depth =      0.303(Ft.)
  '     '       '     Critical flow top width =     24.521(Ft.)
  '     '       '     Critical flow velocity=    2.213(Ft/s)
  '     '       '     Critical flow area =      3.712(Sq.Ft)
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Process from Point/Station      102.000 to Point/Station      102.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.800(Ac.)
Runoff from this stream =      8.214(CFS)
Time of concentration =   14.70 min.
Rainfall intensity =     1.554(In/Hr)


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Process from Point/Station      100.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   959.000(Ft.)
Top (of initial area) elevation =  1440.900(Ft.)
Bottom (of initial area) elevation =  1437.300(Ft.)
Difference in elevation =     3.600(Ft.)
Slope =    0.00375  s(percent)=       0.38
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.287 min.
Rainfall intensity =      1.576(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.353(CFS)
Total initial stream area =        1.000(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      201.000 to Point/Station      201.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.000(Ac.)
Runoff from this stream =      1.353(CFS)
Time of concentration =   14.29 min.
Rainfall intensity =     1.576(In/Hr)


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   372.000(Ft.)
Top (of initial area) elevation =  1444.000(Ft.)
Bottom (of initial area) elevation =  1437.200(Ft.)
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Difference in elevation =     6.800(Ft.)
Slope =    0.01828  s(percent)=       1.83
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.128 min.
Rainfall intensity =      2.215(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.919(CFS)
Total initial stream area =        1.000(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      301.000 to Point/Station      301.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.000(Ac.)
Runoff from this stream =      1.919(CFS)
Time of concentration =    7.13 min.
Rainfall intensity =     2.215(In/Hr)
Summary of stream data:

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


1        8.214     14.70                1.554
2        1.353     14.29                1.576
3        1.919      7.13                2.215
Largest stream flow has longer time of concentration
Qp =      8.214 + sum of
          Qb         Ia/Ib
           1.353 *    0.986 =      1.334
          Qb         Ia/Ib
           1.919 *    0.701 =      1.346
Qp =     10.894

Total of 3 streams to confluence:
Flow rates before confluence point:
       8.214       1.353       1.919
Area of streams before confluence:
        5.800        1.000        1.000
Results of confluence:
Total flow rate =     10.894(CFS)
Time of concentration =    14.702 min.
Effective stream area after confluence =      7.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Process from Point/Station 301.000 to Point/Station 301.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.858
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 1) = 49.80
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 14.70 min.
Rainfall intensity = 1.554(In/Hr) for a 10.0 year storm
Subarea runoff = 0.667(CFS) for 0.500(Ac.)
Total runoff = 11.560(CFS) Total area = 8.300(Ac.)
End of computations, total study area = 8.30 (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 = 69.0

100-YEAR ONSITE HYDROLOGY (RATIONAL METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 01/27/21 File:PROP100.out

20-0041 - FIR WILSON 2.0
ONSITE RATIONAL METHOD HYDROLOGY
100 YEAR STORM EVENT
FN: PROP100.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 = 1

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 = 554.000(Ft.)
Top (of initial area) elevation = 1440.900(Ft.)
Bottom (of initial area) elevation = 1438.000(Ft.)
Difference in elevation = 2.900(Ft.)
Slope = 0.00523 s(percent)= 0.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.734 min.
Rainfall intensity = 2.603(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type

```
Runoff Coefficient = 0.869
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.752(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1438.000(Ft.)
Downstream point elevation =  1436.400(Ft.)
Channel length thru subarea  =   407.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =  48.000
Slope or 'Z' of right channel bank =  33.000
Estimated mean flow rate at midpoint of channel =      8.408(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      8.408(CFS)
Depth of flow =   0.333(Ft.), Average velocity =   1.878(Ft/s)
Channel flow top width =   26.934(Ft.)
Flow Velocity =    1.88(Ft/s)
Travel time  =    3.61 min.
Time of concentration =   14.35 min.

Sub-Channel No. 1 Critical depth =      0.305(Ft.)
  '     '       '     Critical flow top width =     24.680(Ft.)
  '     '       '     Critical flow velocity=    2.236(Ft/s)
  '     '       '     Critical flow area =      3.760(Sq.Ft)

 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.258(In/Hr) for a   100.0 year storm
Subarea runoff =      7.238(CFS) for      3.700(Ac.)
Total runoff =     11.990(CFS)  Total area =       5.800(Ac.)
Depth of flow =   0.380(Ft.), Average velocity =   2.052(Ft/s)

Sub-Channel No. 1 Critical depth =      0.352(Ft.)
  '     '       '     Critical flow top width =     28.477(Ft.)
  '     '       '     Critical flow velocity=    2.395(Ft/s)
  '     '       '     Critical flow area =      5.006(Sq.Ft)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.800(Ac.)
Runoff from this stream =     11.990(CFS)
Time of concentration =   14.35 min.
Rainfall intensity =     2.258(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   959.000(Ft.)
Top (of initial area) elevation =  1440.900(Ft.)
Bottom (of initial area) elevation =  1437.300(Ft.)
Difference in elevation =     3.600(Ft.)
Slope =    0.00375  s(percent)=       0.38
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.287 min.
Rainfall intensity =      2.262(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.960(CFS)
Total initial stream area =        1.000(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      201.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.000(Ac.)
Runoff from this stream =      1.960(CFS)
Time of concentration =   14.29 min.
Rainfall intensity =     2.262(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   372.000(Ft.)
Top (of initial area) elevation =  1444.000(Ft.)
Bottom (of initial area) elevation =  1437.200(Ft.)
```

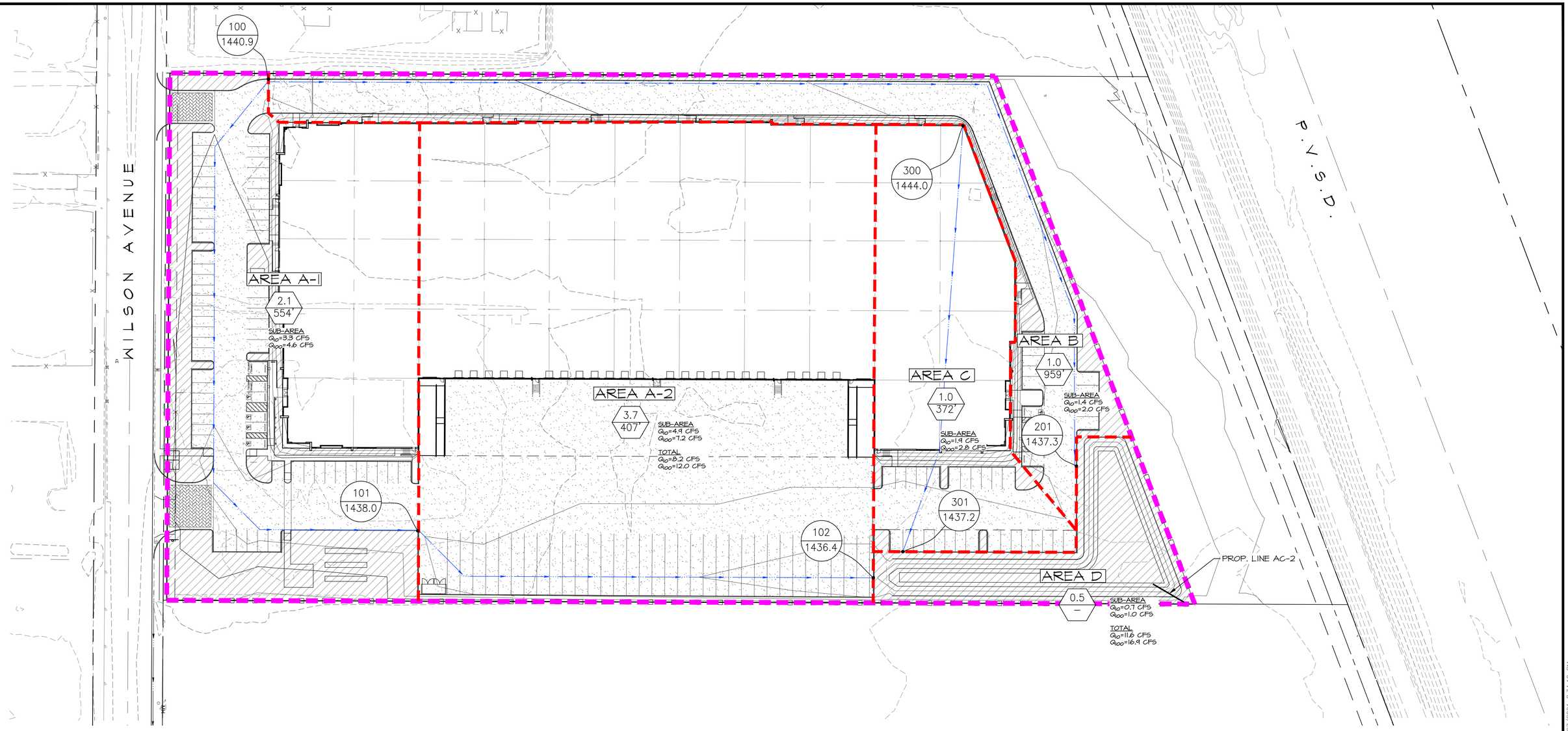
```
Difference in elevation =     6.800(Ft.)
Slope =    0.01828  s(percent)=       1.83
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.128 min.
Rainfall intensity =      3.181(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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 1)  =  49.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.778(CFS)
Total initial stream area =        1.000(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      301.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.000(Ac.)
Runoff from this stream =      2.778(CFS)
Time of concentration =    7.13 min.
Rainfall intensity =     3.181(In/Hr)
Summary of stream data:

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


1       11.990     14.35                2.258
2        1.960     14.29                2.262
3        2.778      7.13                3.181
Largest stream flow has longer time of concentration
Qp =     11.990 + sum of
          Qb         Ia/Ib
           1.960 *    0.998 =      1.956
          Qb         Ia/Ib
           2.778 *    0.710 =      1.972
Qp =     15.918

Total of 3 streams to confluence:
Flow rates before confluence point:
      11.990       1.960       2.778
Area of streams before confluence:
        5.800        1.000        1.000
Results of confluence:
Total flow rate =     15.918(CFS)
Time of concentration =    14.346 min.
Effective stream area after confluence =      7.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Process from Point/Station 301.000 to Point/Station 301.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 1) = 49.80
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 14.35 min.
Rainfall intensity = 2.258(In/Hr) for a 100.0 year storm
Subarea runoff = 0.978(CFS) for 0.500(Ac.)
Total runoff = 16.896(CFS) Total area = 8.300(Ac.)
End of computations, total study area = 8.30 (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 = 69.0

RATIONAL METHOD HYDROLOGY MAP



LEGEND

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

N W E S

1" = 40'

40 0 40 80 120

CITY OF PERRIS

RATIONAL METHOD HYDROLOGY MAP
FIR WILSON 2
PXX-XXXXX

SCALE: 1"=40'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0041
DATE: 01/26/2021	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET |
DESIGNED:		OF 1 SHEETS
CHECKED:		DWG. NO.
PLN CK REF:		
F.B.		

H:\2020\20-0041\DRAINAGE\HYDROLOGY\DWG FOLDER\20-0041-PHYD-RATIONAL.DWG 1/27/2021 8:34:12 PM

APPENDIX B – HYDRAULICS

U-CHANNEL AND SWALE

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Thursday, December 17, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: U-Channel

Notes:

Input Parameters

Channel Type: Rectangular

Channel Width: 6.0000 ft

Longitudinal Slope: 0.0040 ft/ft

Manning's n: 0.0150

Flow: 12.0000 cfs

Result Parameters

Depth: 0.5381 ft

Area of Flow: 3.2289 ft^2

Wetted Perimeter: 7.0763 ft

Hydraulic Radius: 0.4563 ft

Average Velocity: 3.7165 ft/s

Top Width: 6.0000 ft

Froude Number: 0.8928

Critical Depth: 0.4990 ft

Critical Velocity: 4.0083 ft/s

Critical Slope: 0.0051 ft/ft

Critical Top Width: 6.00 ft

Calculated Max Shear Stress: 0.1343 lb/ft^2

Calculated Avg Shear Stress: 0.1139 lb/ft^2

LINE AC-2

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Thursday, December 17, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Line AC-2

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.5000 ft

Longitudinal Slope: 0.0030 ft/ft

Manning's n: 0.0130

Flow: 16.9000 cfs

Result Parameters

Depth: 1.6188 ft

Area of Flow: 3.3627 ft^2

Wetted Perimeter: 4.6756 ft

Hydraulic Radius: 0.7192 ft

Average Velocity: 5.0257 ft/s

Top Width: 2.3887 ft

Froude Number: 0.7465

Critical Depth: 1.3904 ft

Critical Velocity: 6.0259 ft/s

Critical Slope: 0.0048 ft/ft

Critical Top Width: 2.48 ft

Calculated Max Shear Stress: 0.3030 lb/ft^2

Calculated Avg Shear Stress: 0.1346 lb/ft^2

OUTLET STRUCTURE-A CALCULATION

Weir Inlet
Ponding Depth Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

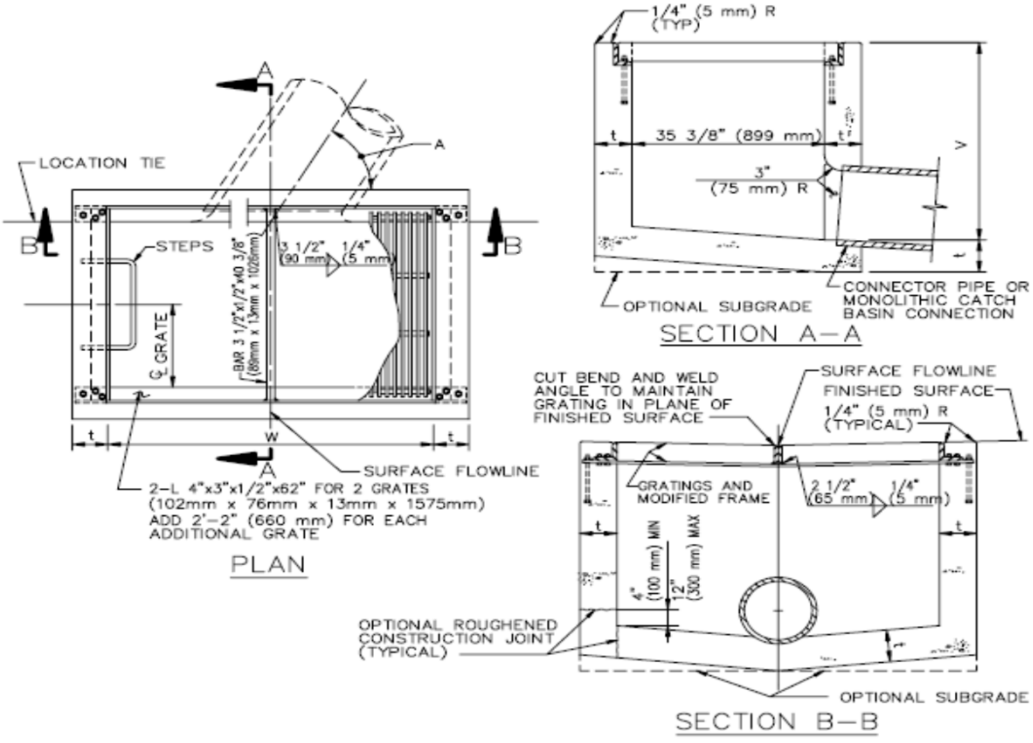
Designer:	TSW
Date:	12/1/2020
Project:	FIR Wilson 2.0
Location:	Outlet Structure for WQ Basin A

OUTLET STRUCTURE PONDING DEPTH SPPWC 305-3

DISCHARGE (cfs)		16.9	
NUMBER OF GRATES		3	
LENGTH (ft)		18.813	
WEIR COEFFICIENT	C	3	
WEIR LENGTH	L	18.813	ft^2
HEAD	h	0.45	ft
Flow	Q	16.90	cfs

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

Top of Weir Elevation: 1435.6
Water Surface Elevation: 1436.05



APPENDIX C – REFERENCES

LINE A-B, LINE A-C FLOW REALLOCATION MEMO

Technical Memorandum

To: Stuart E. McKibbin, P.E. (City of Perris)

From: Tyler Webb, E.I.T. (Webb)
DJ Arellano, P.E. (Webb)

Date: February 12, 2020

Re: Perris Valley MDP: Line A-B and Line A-C Tributary Watershed Modification

This technical memorandum has been prepared to document to the City of Perris and Riverside County Flood Control that the modification of tributary watersheds for Perris Valley MDP facilities Line A-B and Line A-C will not significantly impact the existing design of Line A-B or the design flow rate for the Perris Valley Storm Drain (PVSD). Master Drainage Plans are prepared based on the best data available at the time, and they provide guidance on how drainage in a particular area can be handled. It is often the case that development patterns required the modification of MDPs. Perris Valley Line A-B was designed by Thienes Engineering in conjunction with the development of an industrial building that is located on the southwesterly side of the intersection of Rider Street and Redlands Avenue. The design was sized based on assumed land uses and drainage strategies for the tributary watershed. Subsequent to the construction of Line A-B, several additional industrial buildings have either been constructed, or are planned to be constructed. The drainage design for these sites, coupled with site specific drainage strategies, has resulted in reduced flow rates for Line A-B compared to the original design assumptions. This memo documents the changes from the original design assumptions and proposes to introduce additional tributary area into Line A-B to take advantage of the unused capacity in the facility. This is done in such a manner that the peak design flows of PVSD are not changed and the tributary area for Line A-C can be reduced. This change in the MDP will accommodate the forthcoming construction of RCTC's Mid-County Parkway as well.

Section 1-A: Line A-B Capacity

Line A-B is located in Rider Street and has been constructed to accommodate the peak flowrates determined by Thienes Engineering when they designed the facility. As-built plans, to the intersection of Rider Street and Perris Boulevard, are included as part of this memorandum as reference. The facility is designed to accommodate runoff as depicted in the line A-B rational method map and analysis completed by Thienes Engineering (see Appendix A).

The proposed modification of tributary watershed areas, and the corresponding peak flow rates were determined using an area-yield analysis. The yield is based on the Line A-B rational method map and analysis stated above. The average yield was rounded up to the nearest whole number of 2.0 cfs/acre to conservatively calculate the peak flow rates (see Appendix A for modified drainage areas).

Hydraulic models were developed, based on the as-built plans for Line A-B. One model used the modified flow rates (revised model) determined using the methodology outlined above. The revised model was compared to a model using the original tributary flowrates (original model) to determine if Line A-B has adequate capacity. The hydraulic models were only completed to just before Lateral AB-11; this is because the tributary flowrates upstream of Lateral AB-10 remained unchanged. It should be noted that the revised model shows an increase in total flowrate for Line A-B; the area-yield method does not utilize confluences between the laterals and Line A-B which can lower the total flowrate by considering the time of concentration. The initial HGL for this model was taken from the ultimate Perris Valley Storm Drain Channel plans and double checked with the initial HGL in the Line A-B as-built plans, which both match and use the NGVD29 datum. The hydraulic analyses of Line A-B, even the one initially conducted by Thienes Engineering, assume ultimate improvements of the Channel have been completed. Capacity will be limited until the ultimate Channel improvements have been made.

The following are brief descriptions of the revised laterals for reference: **Lateral AB-1** is unchanged, **Lateral AB-2** is the single discharge point for the Rider II Distribution Center (DPR No. 19-00004) and removes flow from laterals AB-3 and AB-6, **Lateral AB-4** is the single discharge point for the Core 5 Rider Industrial project (DPR No. 19-05267) and removes flow from laterals AB-5 and AB-7, **Lateral AB-7.5** is the single discharge point for the FIR Rider Industrial project (DPR No. 19-05161) and removes flow from Lateral AB-8, **Lateral AB-9** is the single discharge point for the constructed Rider III Distribution Center which will discharge via pump at a constant 8 cfs instead of the original gravity flow of 61 cfs, **Lateral AB-10** will not remove flow from any laterals and be extended further south to add an additional 33 cfs.

Table 1 shows the HGL's (NGVD29) and total tributary flowrates at significant points for the original and revised Line A-B hydraulic models. For reference, Line A-B is an 8'x7' RCB from STA. 9+97.60 (outlet) to STA. 17+77.51 (Lateral AB-4), an 8'x6' RCB from STA. 17+77.51 (Lateral AB-4) to STA. 30+93.93 (Lateral AB-9), and a 7'x5' RCB from STA. 30+93.93 (Lateral AB-9) to the end of the model.

Table 1 – Line A-B hydraulics

Station and Lateral	Lateral Q's Original/Revised (cfs)	Line A-B Original Model HGL/Q* (ft/cfs)	Line A-B Revised Model HGL/Q* (ft/cfs)	Line A-B Revised minus Original ΔHGL/ΔQ (ft/cfs)
9+97.60 (Outlet)	--	1433.0/483.0	1433.0/506.1	0.0/23.1
12+63.33 (Lat AB-1)	21.1/21.1	1433.9/461.9	1434.0/485.0	0.1/23.1
12+75.33 (Lat AB-2)	15.9/87.0	1434.2/446.0	1434.7/398.0	0.5/-48.0
17+71.51 (Lat AB-4)	12.8/25.0	1435.0/413.0	1434.9/373.0	-0.1/-40.0
25+00.00 (Lat AB-7.5)	0.0/35.0	**1437.5/367.0	1437.4/338.0	-0.1/-29.0
30+83.49 (Lat AB-9)	61.0/8.0	1439.1/295.0	1438.1/330.0	***-1.0/35.0
31+16.47 (Lat AB-10)	13.0/48.0	1439.4/282.0	1439.2/282.0	-0.2/0.0

*Q is the flowrate in Line A-B directly upstream of the lateral junction
**Approximate HGL for proposed Lat AB-7.5 in the original model
***HGL is lower with higher Q because of downstream hydraulic jump, flow at Lat AB-9 is super critical

Per the results above, the flow reallocation will not significantly impact the hydraulics in Line A-B. The greatest HGL increase of 0.5-feet was located at Lateral AB-2 (Rider II Distribution Center outlet); all other HGL changes either decreased or were insignificant. This means the Line A-B HGL will not rise above the Rider Street pavement surface as previously designed. It should be mentioned that the revised lateral hydraulics will need to be analyzed separately with the construction of the proposed projects, and they might need to be upsized given the onsite designs.

See Appendix B for the Line A-B hydraulic calculations and plan and profile.

See Appendix D for the Line A-B as-built plans for reference.

See Appendix E for Ultimate Perris Valley Storm Drain Channel plans for reference.

Section 1-B: Line A-C Capacity

Line A-C is a proposed storm drain line whose MDP alignment is disrupted by the Mid County Parkway. As stated above, the tributary areas for Line A-C and Line A-B will be reduced because of this. The modified area for Line A-C was roughly cut in half from the original MDP area; it is our understanding through preliminary correspondence with Mark Lancaster at Riverside County Transportation Commission (RCTC), that the Mid County Parkway will address its own generated runoff by constructing and draining to MDP facility Line H. The proposed tributary flowrate to Line A-C was calculated using area-yield method of 2.0 cfs/acre which yields a total flowrate of 72.6 cfs (see Appendix A for reallocated drainage areas).

A preliminary hydraulic model, in NAVD88, was developed to analyze the proposed alignment and profile of Line A-C. The initial HGL for this model was taken from the ultimate Perris Valley Storm Drain Channel plans, which use the NGVD29 datum and were converted to NAVD88 (NAVD88 = NGVD29 + 2.6'). The hydraulic analysis of Line A-C assumes ultimate improvements of the PVSD have been completed. Capacity will be limited, just like other Channel connections, until the ultimate PVSD improvements have been completed. Based upon our analysis a 42-inch storm drain downstream and 36-inch storm drain upstream will adequately convey the modified flow; the HGL will be below the street and ground surface, and the facilities should provide backbone drainage for the tributary area.

See Appendix C for Line A-C hydraulic calculations and plan and profile.

See Appendix E for Ultimate Perris Valley Storm Drain Channel plans for reference.

Section 2: Impacts to the Perris Valley Storm Drain Channel

Per the area-yield flow analysis, an additional 23.1 cfs will be added upstream to the Perris Valley Storm Drain Channel via Line A-B. This change is insignificant – roughly 0.17% of the peak design flow of the Perris Valley Storm Drain Channel. This is especially inconsequential since variations in the peak flow timing were not considered.

Section 3: Conclusions

Per the hydrologic and hydraulic analyses listed above, we conclude that the revised MDP tributary areas and updated flowrates will not significantly impact the hydraulics of Line A-B. The greatest increase in HGL is only 6-inches, which remains well under the Rider Street pavement surface. The change in HGL at other

stations was either negligible or decreased. Also, the proposed alignment and profile of Line A-C will work hydraulically with the updated flow rates.

The Perris Valley Storm Drain Channel will not be impacted hydraulically since the increase in tributary flow reallocated upstream is one-one thousandth of a percent of the 100-year design flow per the MDP. Finally, this update is consistent with the forthcoming impacts of RCTC's Mid County Parkway to the original MDP drainage areas. It is our understanding through preliminary correspondence with Mark Lancaster at RCTC, that Mid County Parkway will accommodate their own generated runoff by constructing and draining to MDP facility Line H.

Should you have any questions regarding this analysis, please give me a call at (951) 320-6039 or email me at tyler.webb@webbassociates.com

Appendix A: Original and Revised Hydrology

SEE PERRIS VALLEY HYDROLOGY FOR LATERAL H-1

PERRIS BLVD.

EXISTING N'LY 1/2 OF SINCLAIR

FLOW IN STREET

SINCLAIR STREET

FLOW IN STREET

EXISTING RIBBON GUTTER

FLOW

EXISTING VEGETATED SWALE

FLOW

SPILLOVER FROM CHANNEL (TO NORTH)

FLOW

FLOW

100

5.00 AC.

6.20 AC.

5.80 AC.

6.00 AC.

6.60 AC.

7.10 AC.

103 Q100=38.2 CFS Tc=18.6 MIN.

101 Q100=12.7 CFS Tc=12.5 MIN.

102 Q100=25.5 CFS Tc=15.8 MIN.

190

191 Q100=13.0 CFS Tc=8.3 MIN.

192 Q100=27.5 CFS Tc=10.4 MIN.

193 Q100=40.3 CFS Tc=11.8 MIN.

3.90 AC.

COMMERCE DRIVE

BUSINESS PARK DRIVE

LAKEVIEW DRIVE

104 Q100=62.0 CFS Tc=19.7 MIN.

13.7 AC.

13.1 AC.

194 Q100=72.0 CFS Tc=15.4 MIN.

120

170

171 Q100=5.0 CFS Q(in basin)=6.8 CFS Tc=10.8 MIN.

2.70 AC.

2.30 AC.

4.20 AC.

2.20 AC.

LAT. "A-20"

4 Q100=133.3 CFS Tc=18.5 MIN.

121 Q100=6.0 CFS Tc=11.4 MIN.

122 Q100=10.5 CFS Q(in basin)=9.4 CFS Tc=14.8 MIN.

123 Q100(conf)=164.5 CFS Tc=20.8 MIN.

LAT. "A-18"

130 140 1.1 CFS FLOWBY

LAT. "A-16"

Q100=225.6 CFS Tc=21.3 MIN.

124

141 Q100=8.3 CFS Q(in basin)=7.6 CFS Tc=14.9 MIN.

LAT. "A-14"

132 Q100=227.2 CFS Tc=22.6 MIN.

Q100=234.1 CFS Tc=22.7 MIN.

142

Q100=277.4 CFS Tc=22.8 MIN.

1.8 CFS FLOWBY

154

LAT. "A-11"

Q100=282.1 CFS Tc=23.3 MIN.

172

LAT. "A-9"

RIDER STREET

0.70 AC.

LAT. "A-17"

11.5 CFS FLOWBY

LAT. "A-15"

LAT. "A-13"

6.5 CFS FLOWBY

0.70 AC.

LAT. "A-12"

LAT. "A-10"

111 Q100=6.3 CFS Tc=11.8 MIN.

113 Q100=155.4 CFS Tc=20.8 MIN.

112 Q100=25.2 CFS Q(in basin)=13.7 CFS Tc=15.5 MIN.

LAT. "A-19"

1.00 AC.

131 Q100=2.0 CFS Q(in basin)=7.0 CFS Tc=14.8 MIN.

160 162 Q100=278.5 CFS Tc=23.3 MIN.

Q100=1.7 CFS Q(in basin)=8.2 CFS Tc=10.2 MIN.

161

181 Q100=15.4 CFS Tc=15.4 MIN.

9.70 AC.

153 Q100=49.4 CFS Tc=28.4 MIN.

2.90 AC.

80 110

9.6 AC.

7.90 AC.

4.40 AC.

3.60 AC.

151 Q100=29.6 CFS Tc=24.9 MIN.

152 Q100=35.1 CFS Tc=26.0 MIN.

REDLANDS AVENUE

2.90 AC.

90

2.10 AC.

91 Q100=4.0 CFS Tc=14.2 MIN.

1.80 AC.

180

200

Q100=5.9 CFS Tc=12.3 MIN.

81

4.20 AC.

92 Q100=22.5 CFS Tc=23.5 MIN.

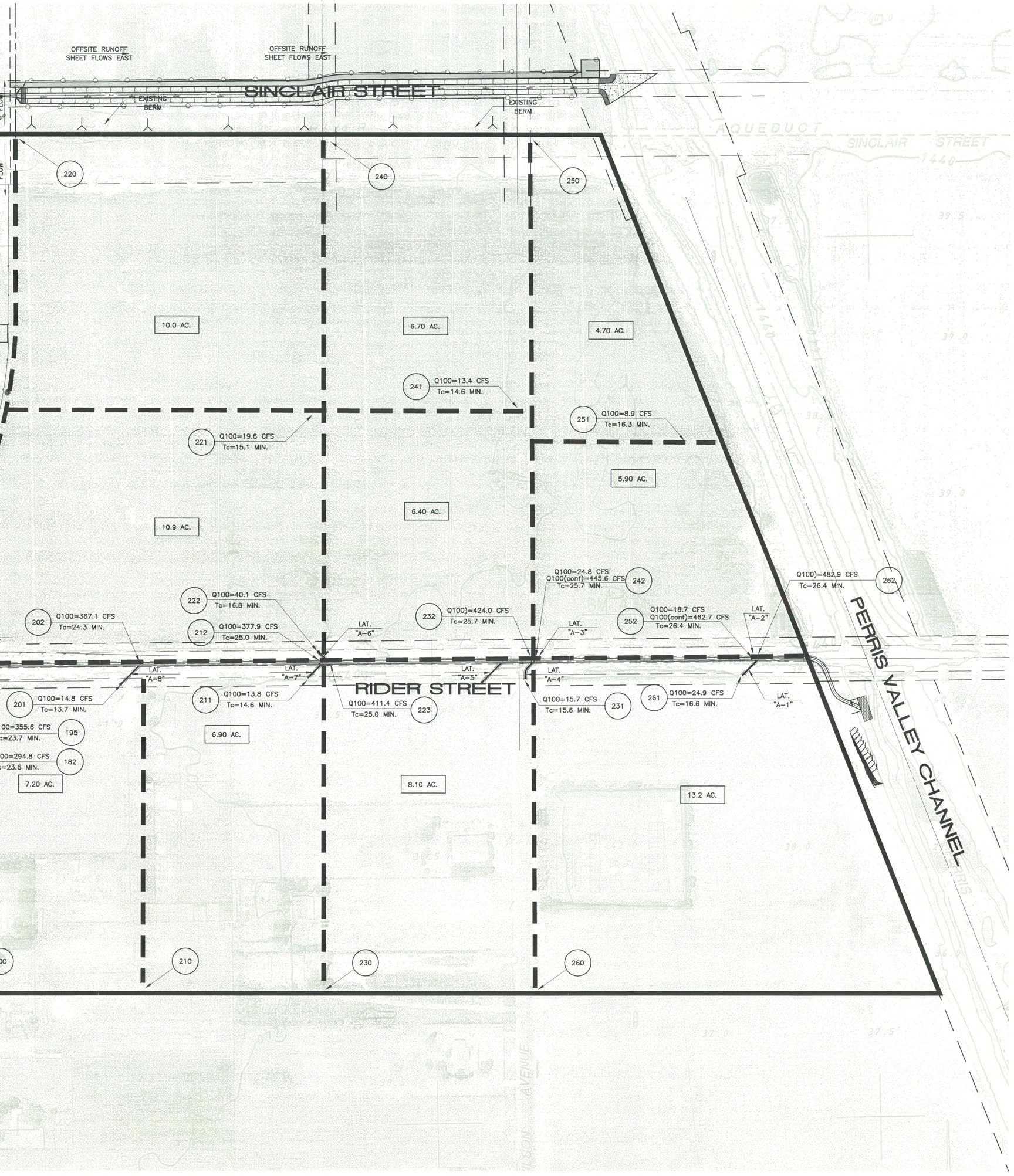
0.10 AC.

Q100=22.7 CFS Tc=24.4 MIN.

93

82 Q100=12.8 CFS Tc=19.5 MIN.

2.20 AC.



LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- 1.00 AC. — SUBAREA AREA
- (100) — NODE NUMBER
- ANTICIPATED PONDING AREA

Last Update: 8/26/09
G:\2700-2799\2702\2702-hyd-mtd-box.dwg

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP
PROPOSED CONDITIONS

PERRIS VALLEY MDP
LINE A-B (RIDER ST.)

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

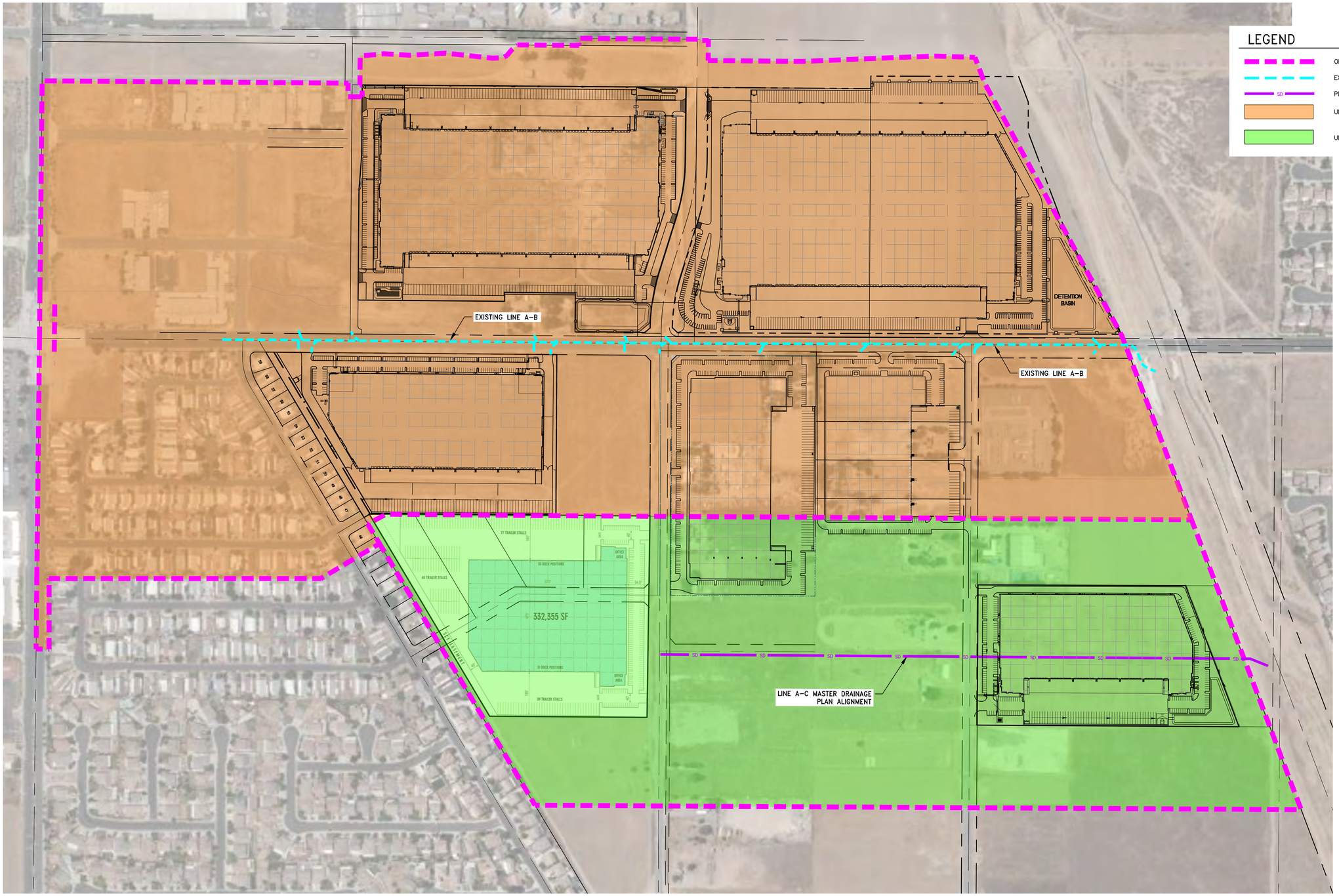
Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Aproved by _____ Date _____

Public Works Director _____ R.C.E. 28129

Sheet 2 of 2 Sheets

2702/ 2 OF 2 SHEET



N
W WEBB E
S

1" = 200'

100 0 200 400 600

CITY OF PERRIS

LINE A–B, LINE A–C
ORIGINAL TRIBUTARIES

SCALE: AS SHOWN	ALBERT A. WEBB ASSOCIATES	W.O. 18–0305
DATE: 1/30/20	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686–1070 FAX (951) 788–1256	SHEET 1
DESIGNED: TSW		OF 2 SHEETS
CHECKED: DJA		DWG. NO.
PLN CK REF:		
F.B.		

G:\2018\18-0305\DRAINAGE\PHYD\DWG FOLDER\LINEAB_LINEAC_TRIBUTARIES.DWG 1/29/2020 6:09:16 PM

XYZ DRW

LEGEND

- PROPOSED LINE A–B BOUNDARY
- PROPOSED LINE A–C BOUNDARY
- PROJECT BOUNDARIES
- EXISTING STORM DRAIN
- PLANNED STORM DRAIN (SD)
- UNDEVELOPED/DEVELOPED AREA CURRENTLY TRIBUTARY TO LINE A–B
- RIDER DISTRIBUTION CENTER III – MITIGATES FLOWS FROM 72 CFS TO 8 CFS
- AREA PROPOSED TRIBUTARY TO LINE A–C
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–10
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–7
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–4
- RCTC MID COUNTY PARKWAY IMPACT AREA
- 10.0 — DRAINAGE AREA

RIDER DISTRIBUTION CENTER III PROJECT TRIBUTARY TO LATERAL AB–9
(CONSTRUCTED)
37.2
Q_{100}= 8.0 CFS

RIDER DISTRIBUTION CENTER II PROJECT TRIBUTARY TO LATERAL AB–2
DPR NO. 19–00004
42.2

EX. LAT AB–9
OLD=61.0 CFS
NEW=8.0 CFS

EX. LAT AB–6
OLD=32.7 CFS
NEW=0.0 CFS

EX. LAT AB–3
OLD=20.2 CFS
NEW=0.0 CFS

DETENTION BASIN

EX. LAT AB–2
OLD=15.9 CFS
NEW=87.0 CFS

EX. LINE A–B

EX. LAT AB–1
NO CHANGE

EX. LAT AB–4
OLD=12.8 CFS
NEW=25.0 CFS

EX. LINE A–B OUTLET
OLD=483.0 CFS
*NEW=506.1 CFS

RIDER DISTRIBUTION CENTER I PROJECT TRIBUTARY TO LATERAL AB–13
(CONSTRUCTED)
17.4

EX. LAT AB–10
OLD=13.0 CFS
NEW=48.0 CFS

7.8
PROP. LAT AB–10 EXTENSION

EX. LAT AB–8
OLD=11.0 CFS
NEW=0.0 CFS

PROP. LAT AB–7.5
OLD=0.0 CFS
NEW=34.6 CFS

FIRST RIDER INDUSTRIAL PROJECT TRIBUTARY TO LATERAL AB–7
DPR NO. 19–05161
17.3
Q_{100}=(17.3 ACRES * 2.0 CFS/ACRE) = 34.6 CFS

EX. LAT AB–7
OLD=11.3 CFS
NEW=0.0 CFS

EX. LAT AB–5
OLD=2.0 CFS
NEW=0.0 CFS

CORE 5 RIDER INDUSTRIAL PROJECT TRIBUTARY TO LATERAL AB–4
DPR NO. 19–05267
12.5
Q_{100}=(12.5 ACRES * 2.0 CFS/ACRE) = 25.0 CFS

9.6
Q_{100}=(9.6 ACRES * 2.0 CFS/ACRE) = 19.2 CFS

PROP. LINE A–C

LINE A–C TRIBUTARY TOTALS
72.6 CFS

IPT – REDLANDS PROJECT TRIBUTARY TO LAT AB–10
16.3
Q_{100}=(16.3 ACRES * 2.0 CFS/ACRE) = 32.6 CFS

PROPOSED AREA TRIBUTARY TO LINE A–C
11.1
Q_{100}=(11.1 ACRES * 2.0 CFS/ACRE) = 22.2 CFS

FIRST WILSON INDUSTRIAL PROJECT TRIBUTARY TO LINE A–C
DPR NO. 19–00007
15.6
Q_{100}=(15.6 ACRES * 2.0 CFS/ACRE) = 31.2 CFS

LOTS TRIBUTARY TO PVSD

MID COUNTY PARKWAY IMPACT AREA, PARKWAY WILL DRAIN TO AND CONSTRUCT LINE H

***NOTE**
NEW OUTLET FLOWRATE IS GREATER THAN OLD OUTLET FLOWRATE BECAUSE OF AREA–YIELD FLOW REALLOCATION METHOD. THIS WAS DONE TO BE MORE CONSERVATIVE IN THE REVISED HYDRAULIC MODEL EVALUATION. THE AREA–YIELD METHOD IS MORE CONSERVATIVE BECAUSE IT IGNORES STREAM CONFLUENCES WHICH CAN LOWER THE TRIBUTARY FLOWRATES.

N W E S WEBB

1" = 200'
100 0 200 400 600

CITY OF PERRIS

LINE A–B, LINE A–C PROPOSED TRIBUTARIES

SCALE: AS SHOWN	W.O. 18–0305
DATE: 1/30/20	SHEET 2
DESIGNED: TSW	OF 2 SHEETS
CHECKED: DJA	
PLN CK REF:	DWG. NO.
F.B.	

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

Appendix B: Line A-B Original and Revised Hydraulics, Plan and Profile

```
T1 LINE A-B HYDRAULIC MODEL - ORIGINAL TRIBUTARIES

T2 FN:LINEABORIGINAL.WSW
SO    997.6001426.790  1                          1433.000
R    1019.8401426.870  1      .013                                .000    .000 0
R    1055.1801426.990  1      .014                              45.000    .000 0
R    1099.8201427.160  1      .013                                .000    .000 0
R    1154.0801427.350  1      .014                             -69.080    .000 0
R    1263.3301427.730  1      .013                                .000    .000 1
JX   1263.3301427.740  1  3   .013   21.100         1428.810       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-1
R    1275.3301427.760  1      .013                                .000    .000 0
JX   1275.3301427.770  1  2   .013   15.900         1428.840        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-2
R    1758.8201429.460  1      .013                                .000    .000 0
JX   1758.8201429.470  1  3   .013   20.200         1430.540        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-3
R    1771.5101429.500  1      .013                                .000    .000 1
JX   1777.5101430.000  7  2   .013   12.800         1430.000       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-4
R    1841.8901430.190  7      .013                                .000    .000 0
JX   1841.8901430.200  7  8   .013    2.000         1431.690       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-5
R    2236.2101431.380  7      .013                                .000    .000 1
JX   2236.2101431.390  7  6   .013   32.700         1431.970        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-6
R    2249.4101431.420  7      .013                                .000    .000 0
JX   2249.4101431.430  7  2   .013   11.300         1432.000       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-7
R    2690.0001432.740  7      .013                                .000    .000 1
JX   2690.0001432.750  7  2   .013   11.000         1433.830       -60.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-8
R    3083.4901433.930  7      .013                                .000    .000 1
JX   3093.9301433.960  4  9   .013   61.000         1434.520        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-9
R    3116.4701434.030  4      .013                                .000    .000 0
JX   3116.4701434.040  4  2   .013   13.000         1434.620        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-10
R    3271.3701434.490  4      .013                                .000    .000 1
SH   3271.3701434.490  4                          1434.490
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.000     .000  .000  .000   .00
CD   8  4   1    .000   1.500     .000  .000  .000   .00
CD   9  4   1    .000   3.500     .000  .000  .000   .00
CD   1  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   4  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   5  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   6  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   7  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
PTS  1 8  1.000  7.330  1.000  1.670  1.670  1.000  8.330  1.000  9.000  1.670
PTS       9.000  7.330  8.330  8.000  1.670  8.000
PTS  4 8  1.000  5.330  1.000  1.670  1.670  1.000  7.330  1.000  8.000  1.670
PTS       8.000  5.330  7.330  6.000  1.670  6.000
PTS  5 8  1.000  4.830  1.000  1.670  1.670  1.000  7.330  1.000  8.000  1.670
PTS       8.000  4.830  7.330  5.500  1.670  5.500
PTS  6 8  1.000  4.420  1.000  1.580  1.580  1.000  6.420  1.000  7.000  1.580
PTS       7.000  4.420  6.420  5.000  1.580  5.000
PTS  7 8  1.000  6.330  1.000  1.670  1.670  1.000  8.330  1.000  9.000  1.670
PTS       9.000  6.330  8.330  7.000  1.670  7.000
Q           282.000   .0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	2	4	1		2.000														
CD	3	4	1		2.500														
CD	6	4	1		3.000														
CD	8	4	1		1.500														
CD	9	4	1		3.500														
CD	1	6	0	.000															
CD	4	6	0	.000															
CD	5	6	0	.000															
CD	6	6	0	.000															
CD	7	6	0	.000															

WATER SURFACE PROFILE - CROSS SECTION POINT LISTING

CARD CODE	SECT NO	NO OF POINTS	X(1) , Y(1)	X(2) , Y(2)	X(3) , Y(3)	X(4) , Y(4)	X(5) , Y(5)	X(6) , Y(6)	X(7) , Y(7)	X(8) , Y(8)	X(9) , Y(9)	X(10) ,Y(10)	X(11) ,Y(11)	X(N) , Y(N)	X(N+1),Y(N+1)	X(35) ,Y(35)
PTS	1	8	1.000	7.330	1.000	1.670	1.670	1.000	8.330	1.000	9.000	1.670	9.000	7.330	8.000	
PTS			1.670	8.000												
PTS	4	8	1.000	5.330	1.000	1.670	1.670	1.000	7.330	1.000	8.000	1.670	8.000	5.330	7.330	6.000
PTS			1.670	6.000												
PTS	5	8	1.000	4.830	1.000	1.670	1.670	1.000	7.330	1.000	8.000	1.670	8.000	4.830	7.330	5.500
PTS			1.670	5.500												
PTS	6	8	1.000	4.420	1.000	1.580	1.580	1.000	6.420	1.000	7.000	1.580	7.000	4.420	6.420	5.000
PTS			1.580	5.000												
PTS	7	8	1.000	6.330	1.000	1.670	1.670	1.000	8.330	1.000	9.000	1.670	9.000	6.330	8.330	7.000
PTS			1.670	7.000												

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

LINE A-B HYDRAULIC MODEL - ORIGINAL TRIBUTARIES

HEADING LINE NO 2 IS -

FN:LINEABORIGINAL.WSW

HEADING LINE NO 3 IS -

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	997.600	1426.790	1	1433.000

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1019.840	1426.870	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1055.180	1426.990	1	.014	44.996	45.000	.000	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1099.820	1427.160	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
	1154.080	1427.350	1	.014	45.004	-69.080	.000	0

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS

```
   ANGLE     ANG PT  MAN H
                              1263.330 1427.730    1               .013                          .000
   .000      .000     1
  ELEMENT NO   7 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1263.330 1427.740    1     3     0   .013    21.100       .000  1428.810
    .000 -45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-1

  ELEMENT NO   8 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1275.330 1427.760    1               .013                          .000
   .000      .000     0
  ELEMENT NO   9 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1275.330 1427.770    1     2     0   .013    15.900       .000  1428.840
    .000  45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
                                                        W S P G W
            PAGE NO   3
                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-2

  ELEMENT NO  10 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1758.820 1429.460    1               .013                          .000
   .000      .000     0
  ELEMENT NO  11 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1758.820 1429.470    1     3     0   .013    20.200       .000  1430.540
    .000  45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-3

  ELEMENT NO  12 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1771.510 1429.500    1               .013                          .000
   .000      .000     1
  ELEMENT NO  13 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1777.510 1430.000    7     2     0   .013    12.800       .000  1430.000
    .000 -45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-4

  ELEMENT NO  14 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1841.890 1430.190    7               .013                          .000
   .000      .000     0
  ELEMENT NO  15 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1841.890 1430.200    7     8     0   .013     2.000       .000  1431.690
```

.000 -45.000 .000

RADIUS

ANGLE

.000

.000

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-5

ELEMENT NO 16 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2236.210	1431.380	7		.013		.000
.000	.000	1						

ELEMENT NO 17 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2236.210	1431.390	7	6	0	.013	32.700	.000	1431.970
.000	45.000	.000								

RADIUS

ANGLE

.000

.000

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-6

ELEMENT NO 18 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2249.410	1431.420	7		.013		.000
.000	.000	0						

ELEMENT NO 19 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2249.410	1431.430	7	2	0	.013	11.300	.000	1432.000
.000	-45.000	.000								

RADIUS

ANGLE

.000

.000

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-7

ELEMENT NO 20 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2690.000	1432.740	7		.013		.000
.000	.000	1						

ELEMENT NO 21 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2690.000	1432.750	7	2	0	.013	11.000	.000	1433.830
.000	-60.000	.000								

RADIUS

ANGLE

.000

.000

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-8

ELEMENT NO 22 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		3083.490	1433.930	7		.013		.000
.000	.000	1						

ELEMENT NO 23 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		3093.930	1433.960	4	9	0	.013	61.000	.000	1434.520
.000	45.000	.000								

RADIUS

ANGLE

.000

.000

```
 REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-9

 ELEMENT NO  24 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT               N                           RADIUS
  ANGLE     ANG PT  MAN H
                               3116.470 1434.030    4               .013                           .000
  .000       .000     0
 ELEMENT NO  25 IS A JUNCTION           *         *     *     *                *                   *
          *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4      INVERT-3
INVERT-4   PHI 3   PHI 4
                               3116.470 1434.040    4     2     0   .013    13.000       .000  1434.620
    .000  45.000     .000
                                                                                               RADIUS
  ANGLE
                                                                                                .000
  .000
 REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-10

 ELEMENT NO  26 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT               N                           RADIUS
  ANGLE     ANG PT  MAN H
                               3271.370 1434.490    4               .013                           .000
  .000       .000     1
 ELEMENT NO  27 IS A SYSTEM HEADWORKS                  *                     *
                    U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                               3271.370 1434.490    4                                   1434.490
```

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 1-27-2020 Time:10:17:40

LINE A-B HYDRAULIC MODEL - ORIGINAL TRIBUTARIES

FN:LINEABORIGINAL.WSW

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
997.600	1426.790	6.210	1433.000	483.00	9.81	1.49	1434.49	.00	4.89	8.00			1	0 .0
22.240	.0036					.0022	.05	6.21	.70	5.090	.013			IR-COV
1019.840	1426.870	6.148	1433.018	483.00	9.91	1.53	1434.54	.31	4.89	8.00			1	0 .0
35.340	.0034					.0026	.09	6.46	.71	5.512	.014			IR-COV
1055.180	1426.990	6.092	1433.082	483.00	10.00	1.55	1434.64	.00	4.89	8.00			1	0 .0
44.640	.0038					.0023	.10	6.09	.72	4.978	.013			IR-COV
1099.820	1427.160	5.951	1433.111	483.00	10.24	1.63	1434.74	.33	4.89	8.00			1	0 .0
54.260	.0035					.0028	.15	6.28	.74	5.447	.014			IR-COV
1154.080	1427.350	5.869	1433.219	483.00	10.39	1.67	1434.89	.00	4.89	8.00			1	0 .0
109.250	.0035					.0025	.27	5.87	.76	5.155	.013			IR-COV
1263.330	1427.730	5.631	1433.361	483.00	10.83	1.82	1435.18	.00	4.89	8.00			1	0 .0
JUNCT STR	.0000					.0020	.00	5.63	.81		.013			IR-COV

---------- WARNING - Junction Analysis - Irregular Channel----------

1263.330	1427.740	6.144	1433.884	461.90	9.48	1.40	1435.28	.00	4.75	8.00			1	0 .0
12.000	.0017					.0020	.02	6.14	.68	6.729	.013			IR-COV
1275.330	1427.760	6.152	1433.912	461.90	9.47	1.39	1435.31	.00	4.75	8.00			1	0 .0
JUNCT STR	.0000					.0017	.00	6.15	.68		.013			IR-COV

---------- WARNING - Junction Analysis - Irregular Channel----------