

APPENDIX F-1

Hydrology Study

PRIORITY PROJECT HYDROLOGY STUDY

FOR:

HUGHES CIRCUITS

APN No. 219-223-20&22

NE Corner of South Pacific Street, San Marcos, California

PREPARED FOR:

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DATE PREPARED:

6/3/2022

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1.0 PROJECT DESCRIPTION

1.1 Project Purpose

The purpose of this project is to develop a vacant site into an industrial building with supporting parking lot and landscape area. The site is located at the northeast corner of south pacific street, San Marcos, CA. The total development area is 2.926 acres. This study will demonstrate that the post-development 100-year peak runoff will not exceed the existing peak runoff rates.

1.2 Project Proposed Drainage Facilities

The project is proposing to build approximately 2.44 acres of impervious area consisting of a single industrial building with supporting parking lot, and landscape area. The project proposes to build a parking lot which slopes at 0.5% to onsite biofiltration basins (BMP A and BMP B). To decrease impervious area on the site, the parking stalls will be pervious concrete. The building's roof is directed into two biofiltration basins along the east boundary of the development footprint.

The project includes onsite storage consisting of 600 ft of 48 inches HDPE pipe located at north and east edge of the project site. Once the stormwater gets treated in the water quality treatment systems, the stormwater flows through a pipe to the storage tank. This storage tank accepts onsite stormwater from proposed building roof and parking lot. The storage tank is used for detaining onsite stormwater. At the end of the storage tank, a weir plate with two orifices is used for regulating low flow.

The project will extend the existing dual 66 inches culvert from the current terminus through the site to the development limits on the north side of the project parking lot. A 24 inches pipe connects the weir structure and storage facility through the existing dual 66 inches pipe to proposed culvert. The proposed culvert routes stormwater to POC at South Pacific Street. From here, flows will follow the existing offsite flow path. Final design will include a WSPG fun of the extended dual 66 inches pipes.

The west and south edge of the project is approximately 0.497 acres section that includes pervious and landscaped slope. This is a self-mitigating area that will not flow to the basins. This section drains stormwater from the north to the south and collects water in an existing 18 inches storm drainpipe and ties to an existing 27 inches storm drainpipe to the POC.

2.0 VICINITY MAP

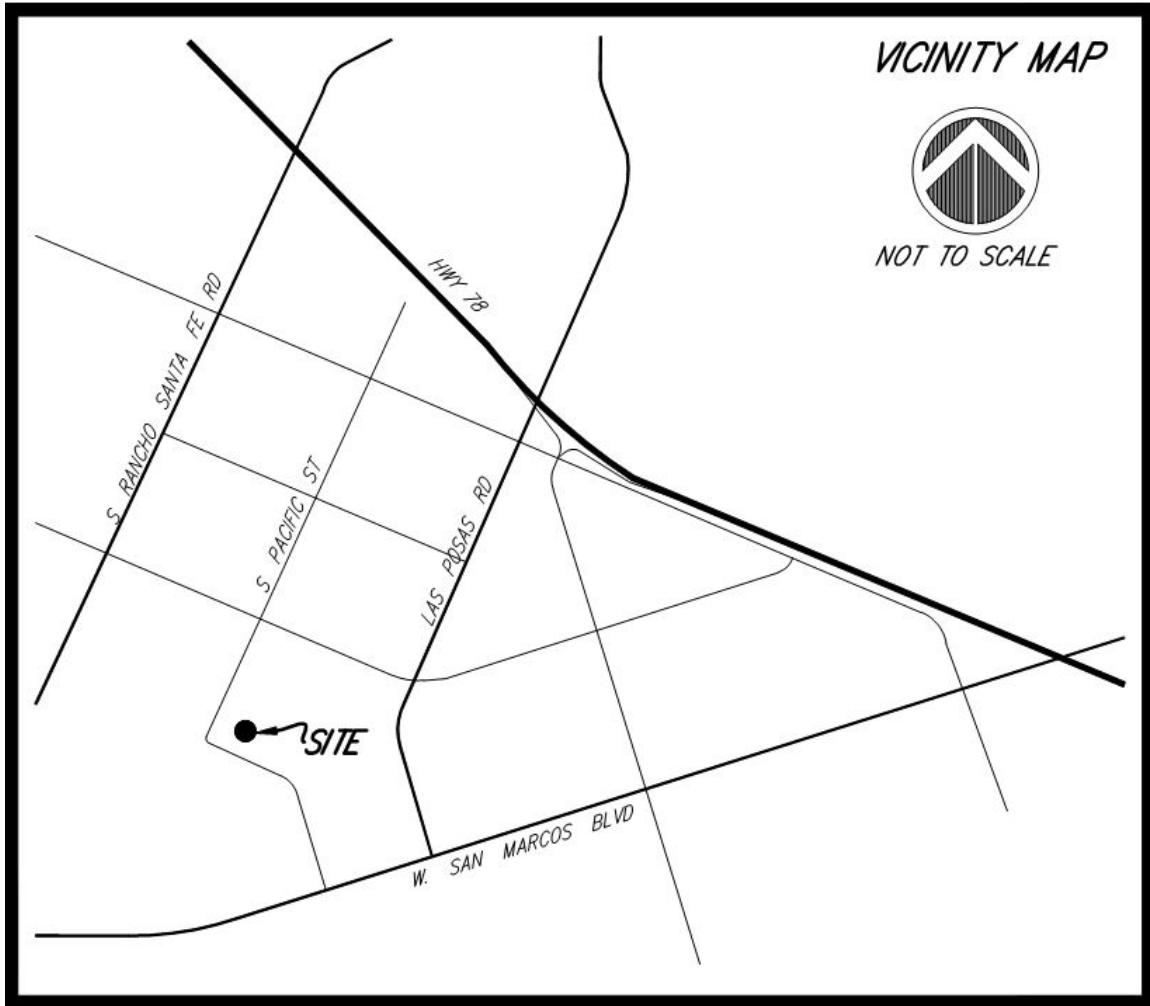


Figure 1. Project Site Map

3.0 Site Map

Please see Attachment 1 – Site Map

4.0 DESCRIPTION OF WATERSHED

4.1 Pre-Development Topography

The majority of the existing offsite surface slopes generally from the north to the south. When the water reaches South Pacific Street along the west border of the project, it flows into the existing dual 48 inches pipes then flow through vacant property before entry the project area.

The site is currently undeveloped. The existing onsite surface slope is approximately 2% and runs generally from the north to the south. When the water from offsite reaches to the north edge of the project, it flows along the slope until it reaches the project's POC at the south edge of the property. According to the Web Soil Survey, the entire existing site is Soil Type D.

The land use of the existing **offsite** area was estimated based on the City of San Marcos Land Use Plan. The runoff coefficient C of the offsite area is calculated using weighted average value. The land use of the existing **onsite** area was estimated based on the aerial photography and detailed aerial topographic mapping, and the value of the undisturbed natural terrain is used in the pre-development onsite runoff calculations.

A pre-developed drainage map can be found as Attachment 4 in this report.

4.2 Post-Development Topography

The project proposes to build a building, parking and landscape areas. The proposed parking slopes to the project's biofiltration basin (BMP-A) at 0.5%. To decrease impervious area on the site, the parking stalls will be installed with pervious concrete. The proposed building is approximately 1.298 acres. The 1.024 acres of the building will discharge roof water into BMP-A, another 0.274 acres of the building will discharge roof water into BMP-B. After all stormwater from parking lot and roof get collected and treated in BMP-A and BMP-B, it flows into the 48 inches storage tank, which is located at the north and east edge of the project site. This storage tank is used for detaining post-developed onsite water. At the end of the storage tank, a weir plate with two orifices is used for regulating low flow.

A 24 inches pipe connect the storage tank with two proposed new 66 inches culverts. These two new 66 inches culverts run from the north to the south and meet with the existing two 66 inches culvert at south pacific street. These two 66 inches culverts route stormwater through the site and finally collects into the POC at the South Pacific Street.

At the west and south edge of the project site, there is approximately 0.497 acres which include pervious and landscaped slope that will not flow to the basins. This

section drains surface water from the north to the south and collects in an existing 18 inches storm drainpipe which ties to an existing 27 inches storm drain to the POC.

According to the Web Soil Survey, the entire proposed project site is composed of type D soil. The land use of the post development condition includes Undisturbed Natural Terrain, Limited Industrial, General Industrial, High Density Residential 43.0 DU/A or less, and Medium Density Residential 14.5 DU/A or less. Values of runoff coefficient C related to these land use types were used in the post-development runoff calculations.

A post-developed drainage map can be found as Attachment 5 in this report.

4.3 Hydrologic Unit Contribution

The project is located in the Richland Hydrologic Sub Area of the San Marcos Hydrologic Area of the Carlsbad Hydrologic Unit (904.52).

Please find the watershed map as Attachment 3 in this report.

5.0 METHODOLOGY

This report is prepared in accordance with the 2003 San Diego County Hydrology Manual. Based on the overall tributary study area, calculations area on the Rational Method.

5.1 Hydrology Software

The “Rational Hydrology Method, San Diego County (2003 Manual)” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.4 is used in this study. Referred to as CivilD within this report, this software was also used to develop hydrographs from the rational method results. This procedure also complies with the 2003 San Diego Hydrology Manual as presented in Section 6.

5.2 Routing Software

Hydraflow Hydrographs Extension for Autodesk Civil 3D, Version 2021 is used for hydrologic routing of the entire project site. the hydrograph developed from the rational method is then manually entered into this software and routed into each detention pipe. The hydrograph report can be found in Attachment 8 in this report.

5.3 Soil Type Determination

The soil type for the proposed project was determined by mapping the project limits on the EPA Web Soil Survey website. The Web Soil Survey indicate that

the entire site is composed of soil type D. The soil report and soil index map can be found in Attachment 3 in this report.

5.4 Isopluvial Value Determination

The isopluvial values for the 100-year 6 hour and 24 hour storm events were determined by plotting the projects location on the respective exhibits from Appendix B of the Hydrology Manual. The rainfall isopluvial maps can be found in Attachment 3 in this report.

5.5 Conjunctive Use Considerations

Since BMP-A and BMP-B is being used to handle peak flows and hydromodification, conjunctive use as described by the County of San Diego Conjunctive Use Handout (January 2020) must be considered. For this site, the peak flow storage pond built in Hydraflow Hydrographs does not account for the first 9 inches of water quality ponding that accounts for the water up to the lowest surface outlet. An additional 6 inches is shown to be required for adequate storage space for water quality ponding and hydrology storage. When using a Biofiltration Basin for Conjunctive use, it is required that there be 1 foot of freeboard above the maximum depth achieved by the peak flows. The proposed design leaves 12 inches of freeboard in addition to the 6 inches of space needed for mitigation and 9 inches of water quality ponding. This leaves a total of 27 inches from the surface of the basin to the top.

6.0 CALCULATIONS

6.1 Determine the Watershed that affects the project

To ensure that the proposed project **onsite area** will not have a negative impact to the downstream facilities, the project design checks that the peak flow and velocity from the 100-year storm and make sure they are identical or less when comparing the Post Development conditions to the Pre Development conditions.

6.2 Calculate Runoff Coefficient

The proposed project and offsite runoff area lie primarily within hydraulic soil group D. Relevant soil properties are assigned according to this designation unless stated otherwise below. The runoff coefficient C is based on the land use for this project.

For both pre- and post- development **offsite** area, the runoff coefficient C value is estimated based on the City of San Marcos Land Use Plan. This was done closely match the City of San Marcos General Plan Land Use Map. The runoff coefficient C of the offsite area is calculated using the weighted average value.

For the pre-development **onsite** area, the site is an existing undeveloped area and not graded, therefore, the value of the undisturbed natural terrain is used in the pre-development onsite runoff calculations.

For the post-development **onsite** area, the land use condition includes Undisturbed Natural Terrain, Limited Industrial, General Industrial, High Density Residential 43.0 DU/A or less, and Medium Density Residential 14.5 DU/A or less. Values of runoff coefficient C related to these land use types were used in the post-development runoff calculations.

The runoff coefficients for each of the drainage areas are taken from Table 3-1 of the Hydrology Manual. Table 3-1 is included in the CIVILD software, and the values chosen based on the program input parameters. The output file was checked to ensure that the correct C values are used.

In order to not have a negative impact on the post development downstream facilities, detention structure is needed in this project. We are using the resulting outflow hydrograph to recalculate the runoff coefficient C based on the fix values of the outflow hydrograph to achieve a C_{out} . The detailed description and calculation of the C_{out} value can be found in Attachment 8 in this report.

Please find the City of San Marcos Land Use Plan in Attachment 7 in this report.

6.3 Manning Roughness Coefficient

Manning Roughness Coefficients are taken from Table A-1, Average Manning Roughness Coefficients for Pavement and Gutters, Table A-2, Average Manning Roughness Coefficients for Closed Conduits, and Table A-5, Average Manning Roughness Coefficients for Natural Channels. Values of 0.015 for concrete gutter, 0.013 for PVC pipe, and 0.03 for fairly regular section natural channels are used in the hydrology calculations. Table of Manning's n value can be found in Attachment 2 in this report.

6.4 Calculate Storm Flows using the Rational Method

The Rational Method (RM) is used to determine the maximum runoff rate from the 100-year storm event. The RM application is highly effective in urban and rural watersheds for the design of storm drains and small drainage structures. Application of the rational method is based on a simple formula that relates runoff producing potential of the watershed drainage area (A), runoff coefficient (C) rainfall intensity (I) for a particular length of time (T_c), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. Thus, the following equation is used:

$$Q = CIA$$

Where:

- Q = peak discharge, in cubic feet per second (cfs)
- C = runoff coefficient
- I = average rainfall intensity for a duration equal to T_c
- T_c = time of concentration (note: if the computed T_c is less than 5 minutes, then use 5 minutes for computing the peak discharge, Q)
- A = Drainage area contributing to the design location, in acres

The peak runoff calculations for the 100-year storm are performed using the CIVILD software. A summary of the initial calculations is summarized in the table below:

ONSITE	PRE	POST	POST MIT
Q (CFS)	258.68	258.84	258.50
Tc (MIN)	51.74	49.85	49.85
V (FT/S)	15.49	15.49	15.49
A (AC)	170.63	170.63	170.63

Table 1. Q100 Onsite Analysis Results

The offsite tributary area flows were provided by the City of San Marcos and were used to is larger than the onsite area, the offsite tributary area controls the overall site runoff. Detention of the post-developed **onsite** area occurs. The detention system is 600 ft of 48 inches HDPE storm drain. Per Table 1 (see above), the post development onsite flow of 258.84 cfs is higher than the pre development onsite flow of 258.68 cfs. Therefore, mitigation is to be used. Upon analysis of the mitigated flow is 258.50 cfs, which is lower than the pre development onsite flow.

CIVILD data and output files can be found in Attachment 6 of this report.

By observation of the results in the summary table, the proposed development of the site will have an overall decrease in the 100-year peak flow discharge from the site.

7.0 CONCLUSION

Based on the results of this report the project does not increase the 100-year peak flow rate. The mitigated stormwater discharge from the site is lower than those of the Pre-development. The project meets the County of San Diego standards for

peak flow control and therefore we can conclude that this project will not impact the existing downstream storm drainage facilities.

8.0 REFERENCES

County of San Diego, Department of Public Works, Flood Control Section, June 2003 San Diego County Hydrology Manual

9.0 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the City of San Marcos is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK

Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
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Project Number: 21-088

Robert D. Dentino, RCE 45629
Registration Expire: December 31, 2022

6/3/2022

Date

ATTACHMENT 1
SITE MAP

ATTACHMENT 2
FIGURES & TABLES FROM THE SAN DIEGO COUNTY HYDROLOGY MANUAL 2003

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	Soil Type				
		% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

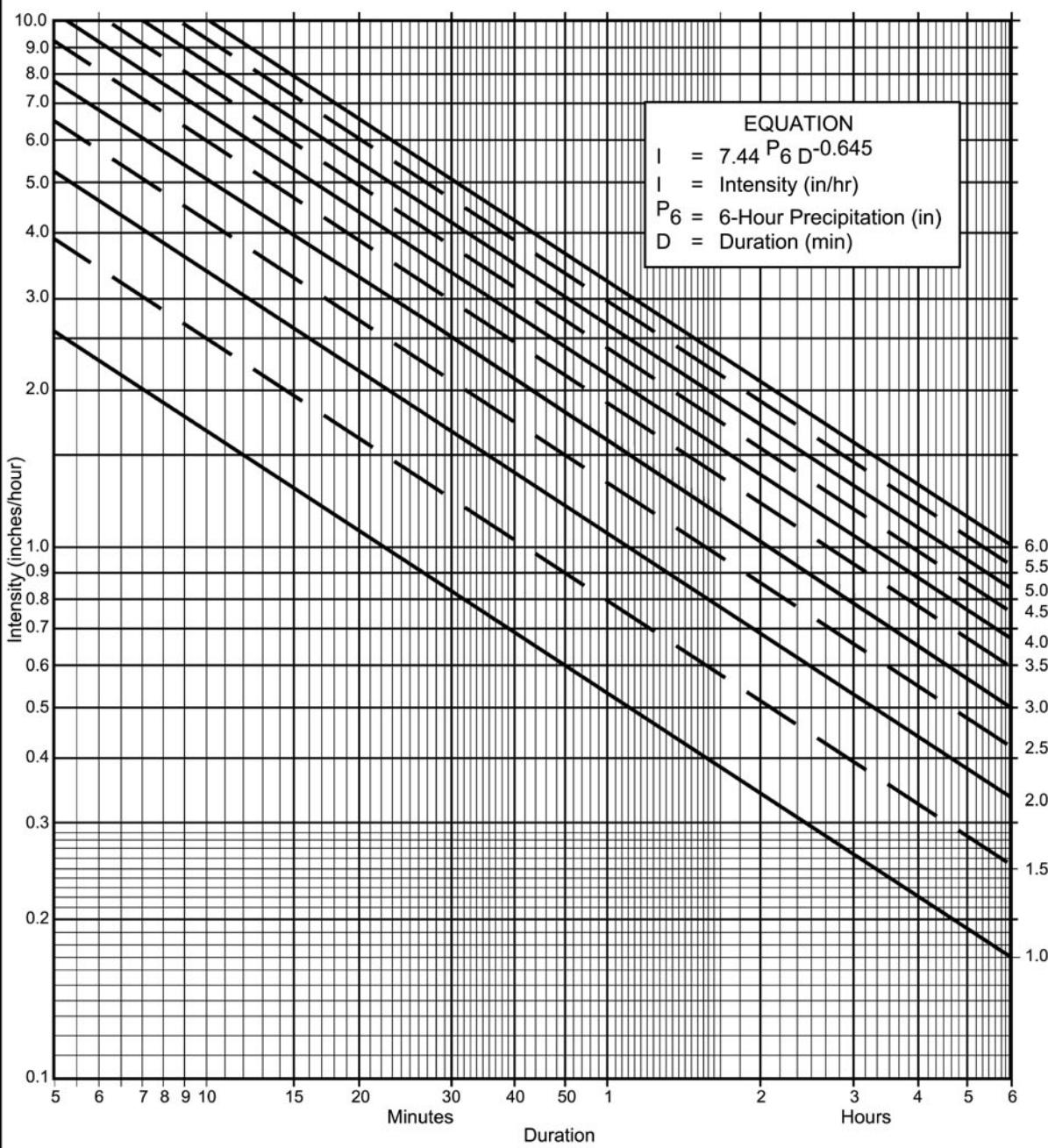
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the “Regulating Agency” when submitted with a detailed study.

Table 3-2

**MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)**

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

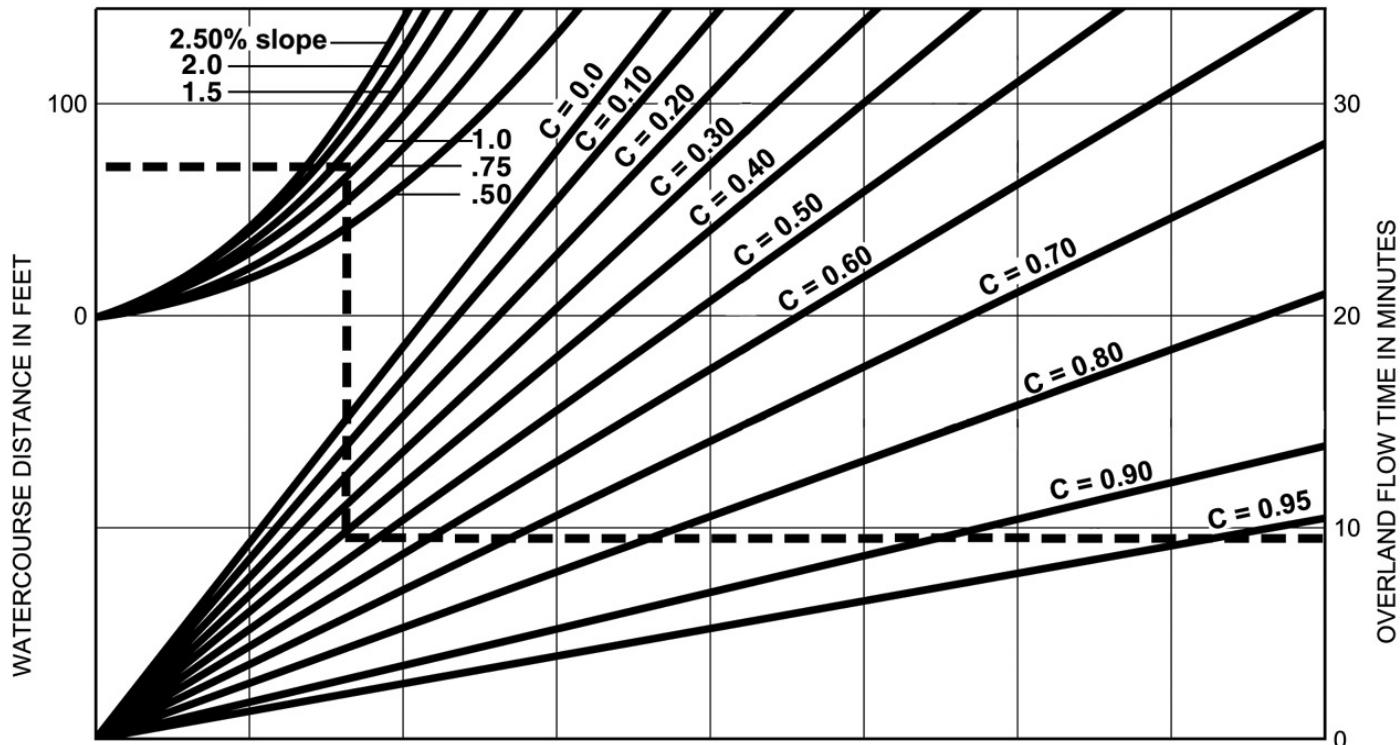
- (a) Selected frequency _____ year
- (b) $P_6 = \text{_____ in.}$, $P_{24} = \text{_____}$, $\frac{P_6}{P_{24}} = \text{_____ \%}$ ⁽²⁾
- (c) Adjusted $P_6^{(2)} = \text{_____ in.}$
- (d) $t_x = \text{_____ min.}$
- (e) $I = \text{_____ in./hr.}$

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P ₆	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

F I G U R E
3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
 Slope (s) = 1.3%
 Runoff Coefficient (C) = 0.41
 Overland Flow Time (T) = 9.5 Minutes

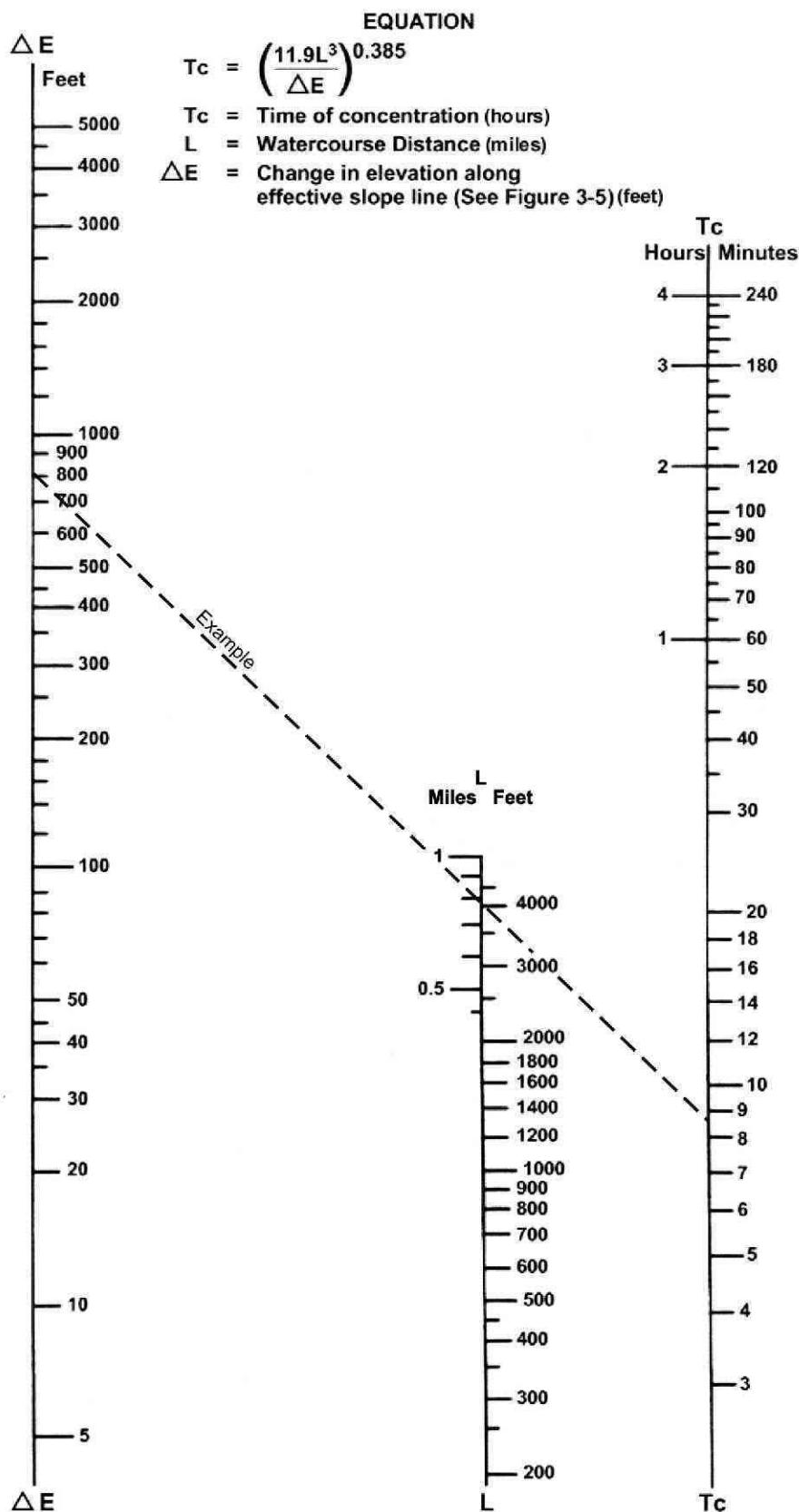
$$T = \frac{1.8 (1.1-C) \sqrt[3]{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

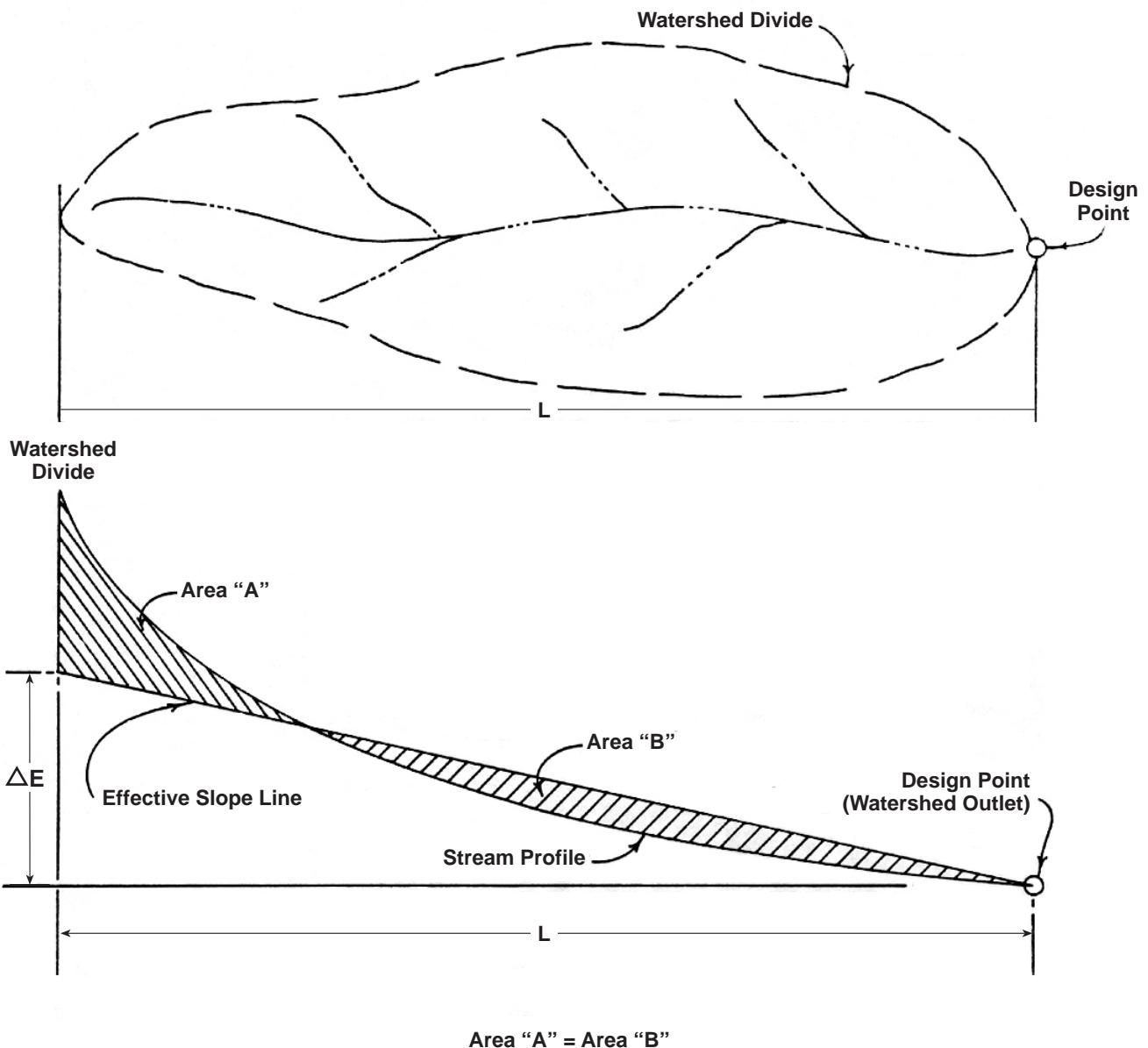
3-3



SOURCE: California Division of Highways (1941) and Kirpich (1940)

Nomograph for Determination of
Time of Concentration (T_c) or Travel Time (T_t) for Natural Watersheds

3-4

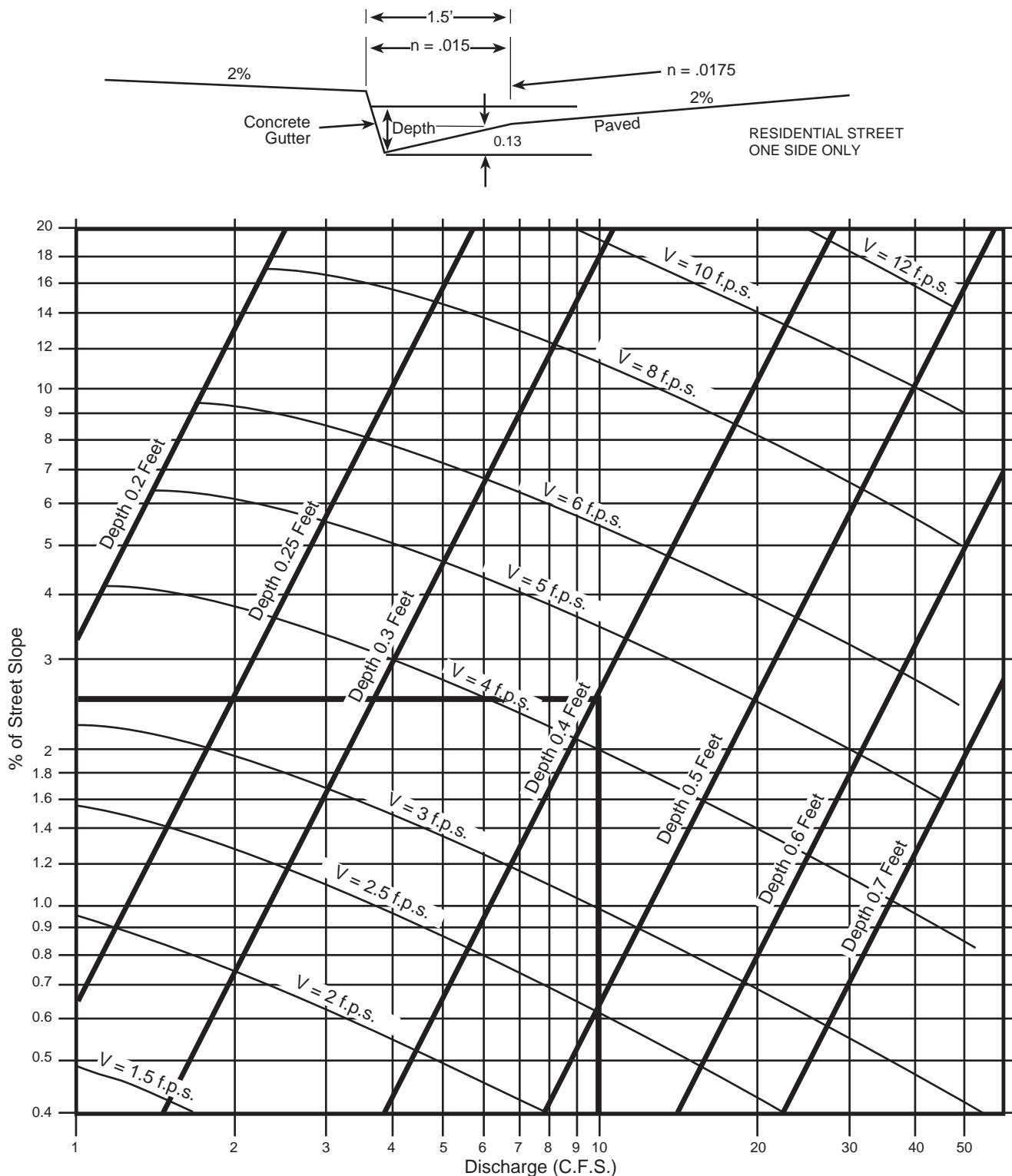


SOURCE: California Division of Highways (1941) and Kirpich (1940)

Computation of Effective Slope for Natural Watersheds

F I G U R E

3-5



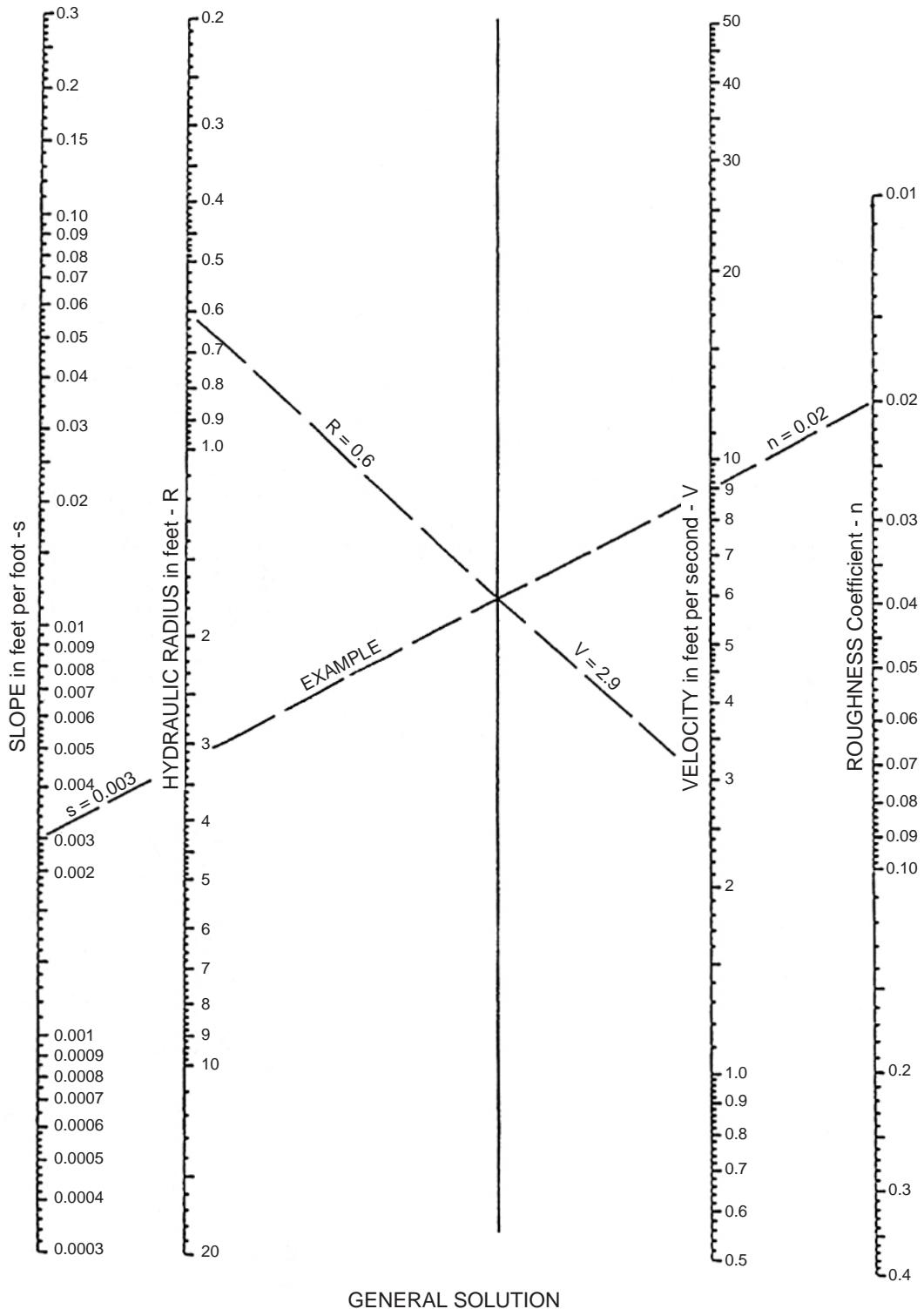
SOURCE: San Diego County Department of Special District Services Design Manual

F I G U R E

3-6

Gutter and Roadway Discharge - Velocity Chart

EQUATION: $V = \frac{1.49}{n} R^{2/3} S^{1/2}$



SOURCE: USDOT, FHWA, HDS-3 (1961)

Manning's Equation Nomograph

3-7

Table A-1

Table A-1 Average Manning Roughness Coefficients for Pavement and Gutters¹

Concrete Gutter²	.....	0.015
Concrete Pavement		
Float Finish .....	.....	0.014
Broom Finish.....	.....	0.016
Concrete Gutter with Asphalt Pavement		
Smooth Finish.....	.....	0.013
Rough Texture.....	.....	0.015
Asphalt Pavement		
Smooth Finish.....	.....	0.013
Rough Texture.....	.....	0.016

Based on FHWA HEC-22.

¹ Based on materials and workmanship required by standard specifications.

² Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

Table A-2

Table A-2 Average Manning Roughness Coefficients for Closed Conduits³

Reinforced Concrete Pipe (RCP)	0.013
Corrugated Metal Pipe and Pipe Arch	
2-3/8 x 1/2 inch Corrugations	
Unlined	0.024
Half Lined	
Full Flow	0.018
$d/D \geq 0.60$	0.016
$d/D < 0.60$	0.013
Fully Lined	0.013
3 x 1 inch Corrugations	0.027
6 x 2 inch Corrugations	0.032
Spiral Rib Pipe	0.013
Helically Wound Pipe	
18-inch	0.015
24-inch	0.017
30-inch	0.019
36-inch	0.021
42-inch	0.022
48-inch	0.023
Plastic Pipe (HPDE and PVC)	
Smooth	0.013
Corrugated	0.024
Vitrified Clay Pipe	0.014
Cast-Iron Pipe (Uncoated)	0.013
Steel Pipe	0.011
Brick	0.017
Cast-In-Place Concrete Pipe	
Rough Wood Forms	0.017
Smooth Wood or Steel Forms	0.014

³ Based on materials and workmanship required by standard specifications.

Table A-5**Table A-5** Average Manning Roughness Coefficients for Natural Channels**Minor Streams (Surface Width at Flood Stage < 100 ft)**

Fairly Regular Section

(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks.....	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By.....	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders.....	0.060

Flood Plains (Adjacent To Natural Streams)

Pasture, No Brush

(A) Short Grass	0.030
(B) High Grass	0.040

Cultivated Areas

(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops.....	0.050

Heavy Weeds, Scattered Brush

Light Brush and Trees

Medium To Dense Brush.....

Dense Willows

Cleared Land with Tree Stumps, 100-150 Per Acre.....

Heavy Stand of Timber, Little Undergrowth

(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

ATTACHMENT 3
WATERSHED INFORMATION

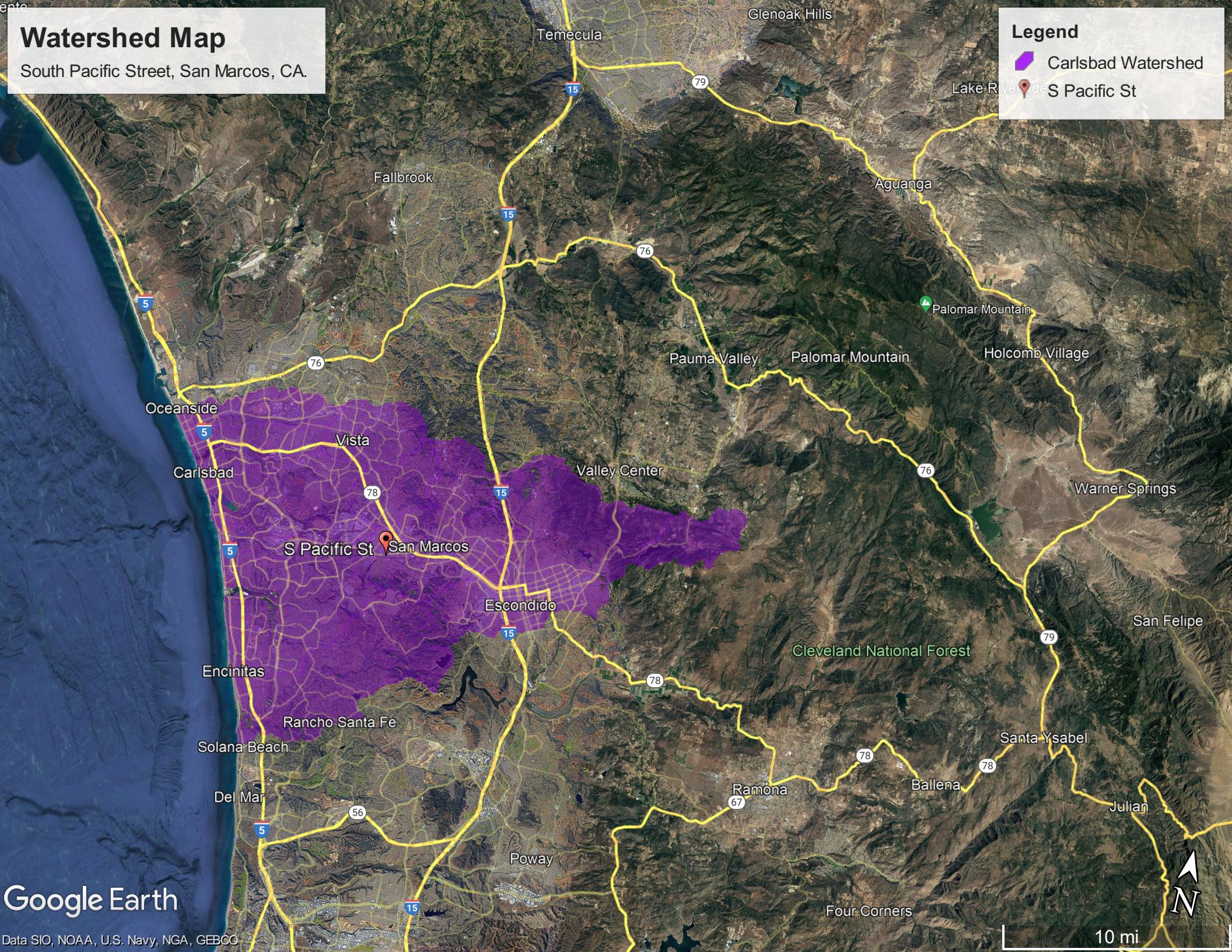
WATERSHED MAP

Watershed Map

South Pacific Street, San Marcos, CA.

Legend

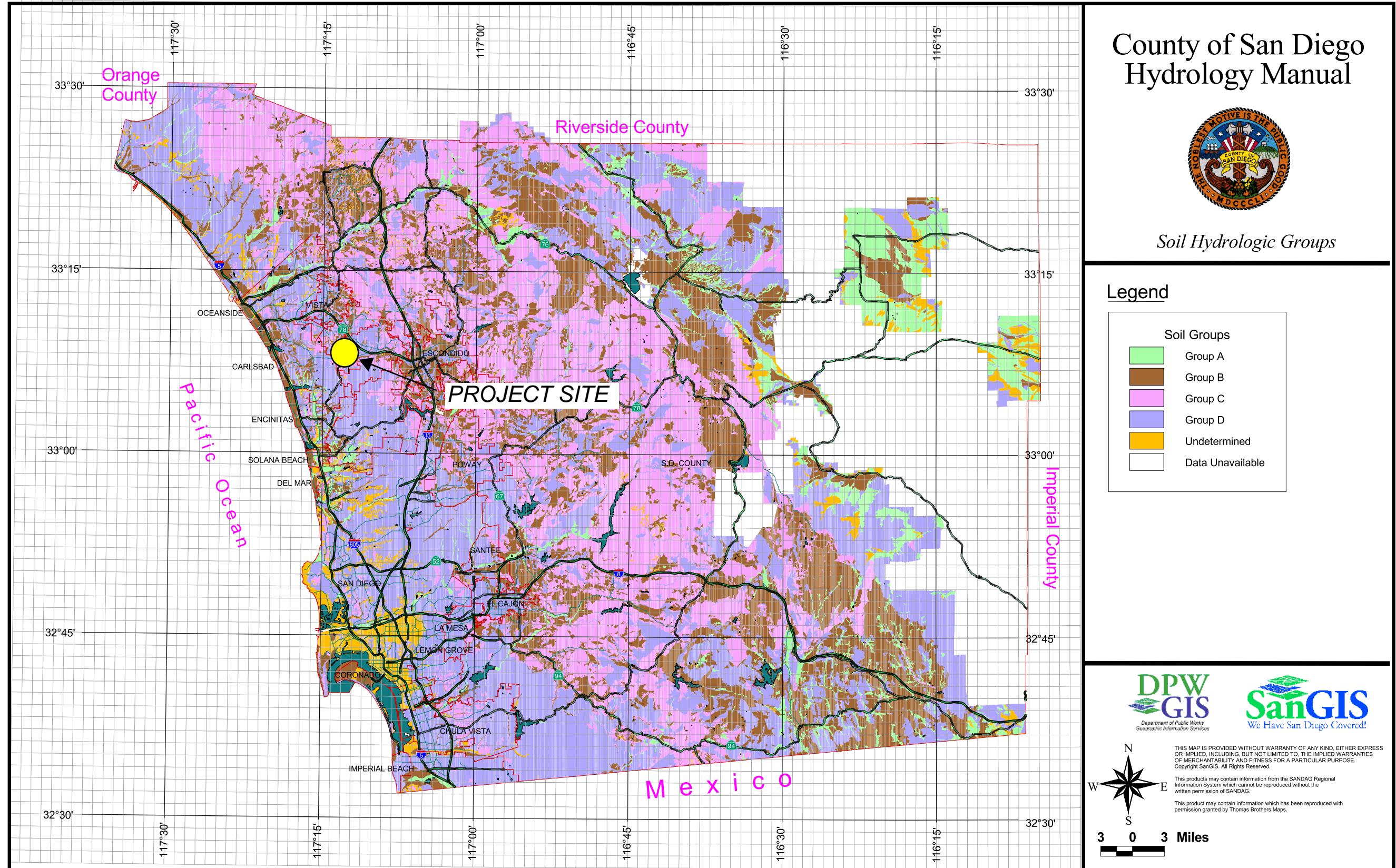
- Carlsbad Watershed
- S Pacific St



Google Earth

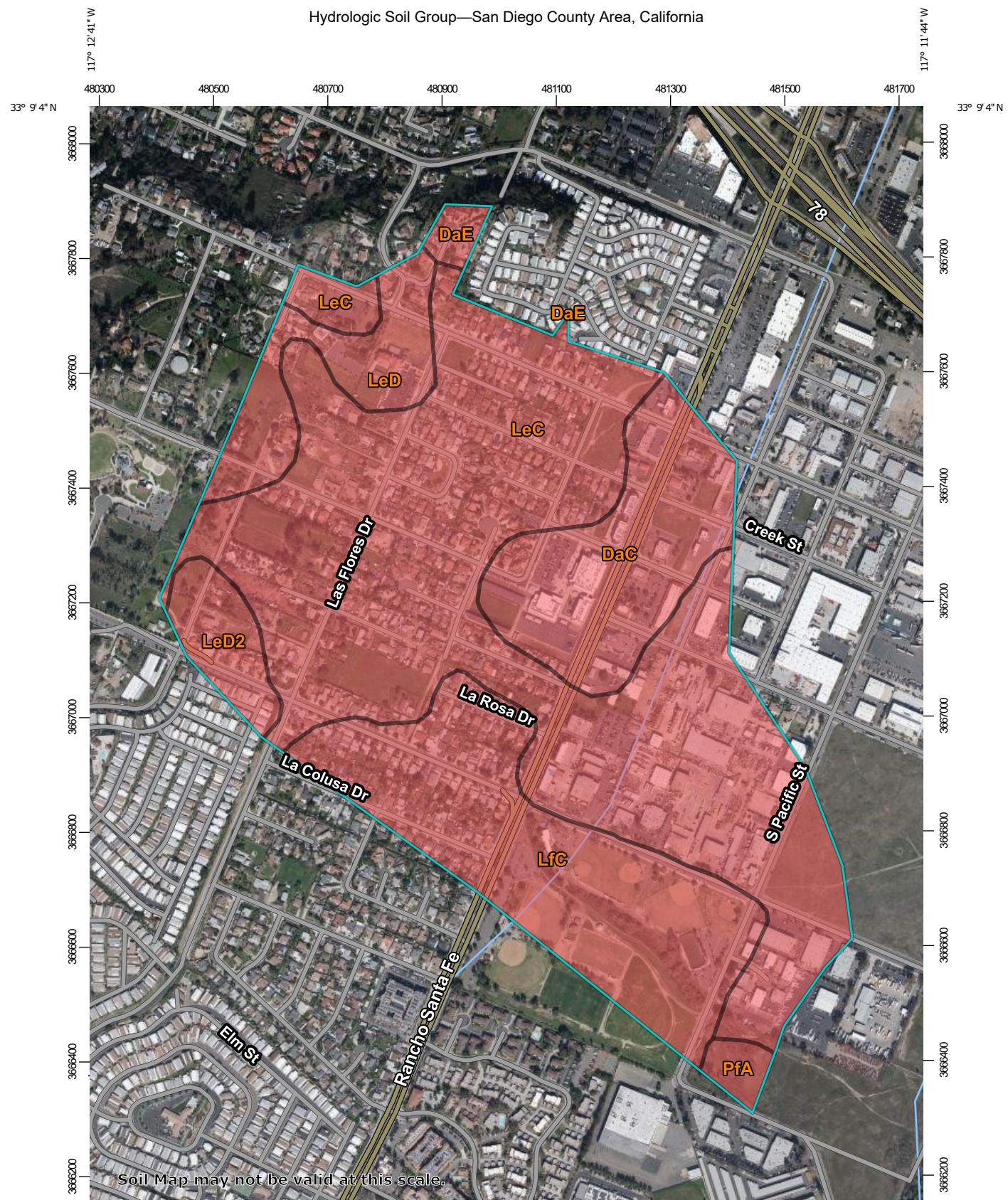
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

SOIL INDEX MAP



SOIL REPORT

Hydrologic Soil Group—San Diego County Area, California



Map Scale: 1:9,410 if printed on A portrait (8.5" x 11") sheet.

0 100 200 300 400 500 Meters

0 450 900 1800 2700 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84



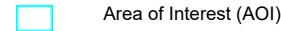
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

2/7/2022
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)



Soils

Soil Rating Polygons

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Lines

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Points

	A
	A/D
	B
	B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California

Survey Area Data: Version 16, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DaC	Diablo clay, 2 to 9 percent slopes	D	31.1	12.3%
DaE	Diablo clay, 15 to 30 percent slopes	D	2.2	0.9%
LeC	Las Flores loamy fine sand, 2 to 9 percent slopes	D	141.1	56.0%
LeD	Las Flores loamy fine sand, 9 to 15 percent slopes	D	15.9	6.3%
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	D	8.2	3.3%
LfC	Las Flores-Urban land complex, 2 to 9 percent slopes	D	50.9	20.2%
PfA	Placentia sandy loam, thick surface, 0 to 2 percent slopes	D	2.6	1.0%
Totals for Area of Interest			251.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

RAINFALL ISOPLUVIAL MAPS

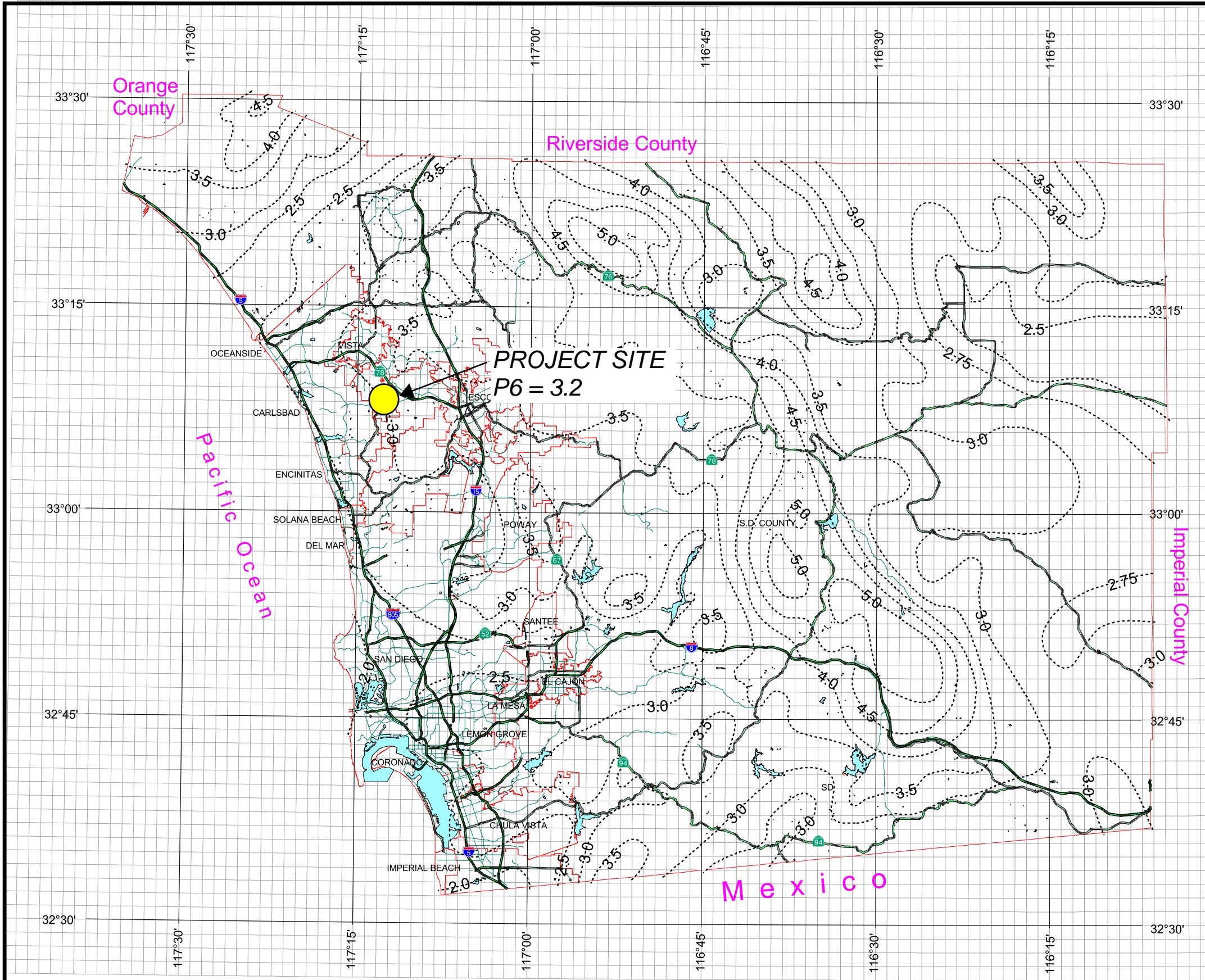
County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

----- Isopluvial (inches)



Department of Public Works
Geographic Information Services



We Have San Diego Covered!



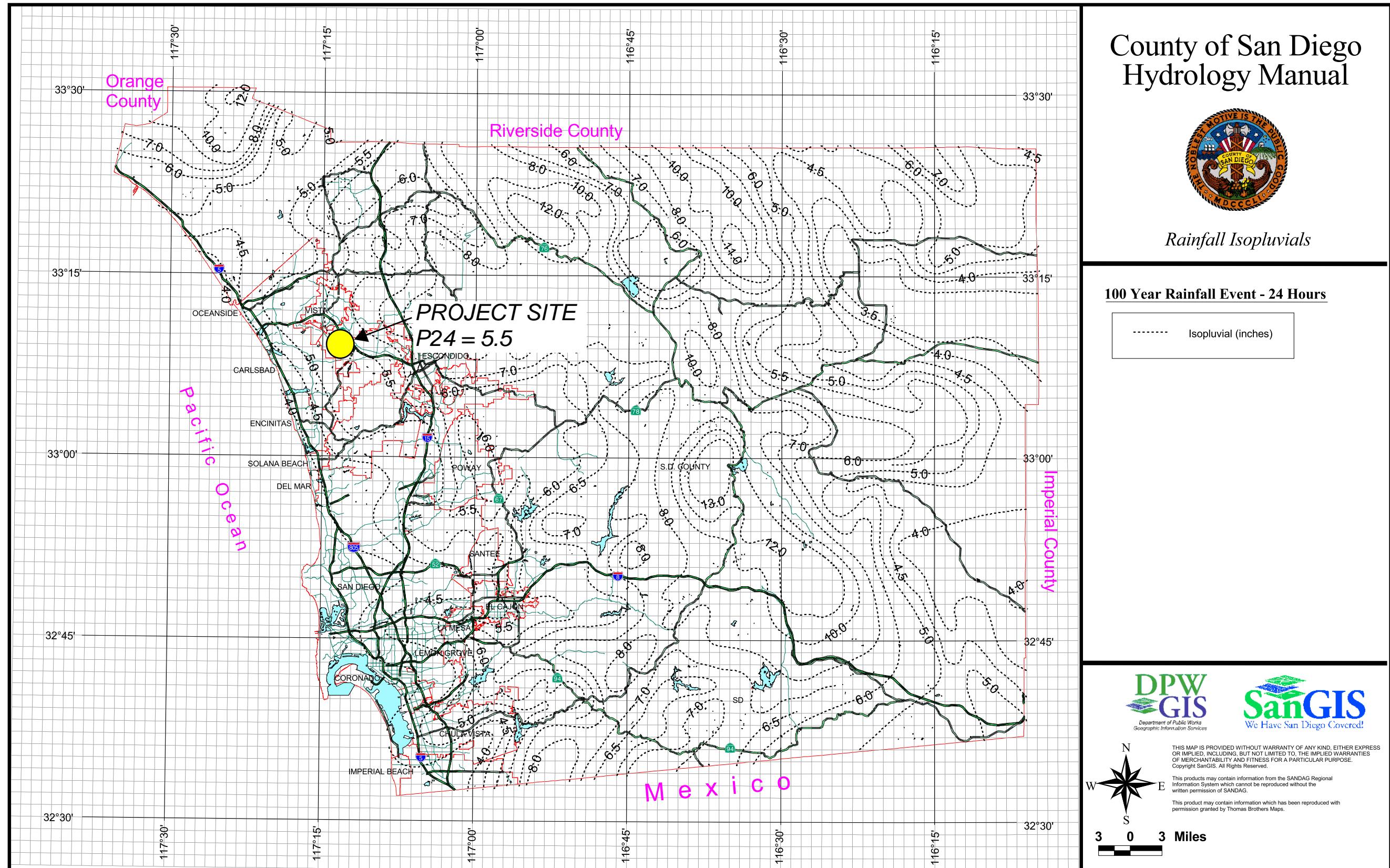
3 Miles

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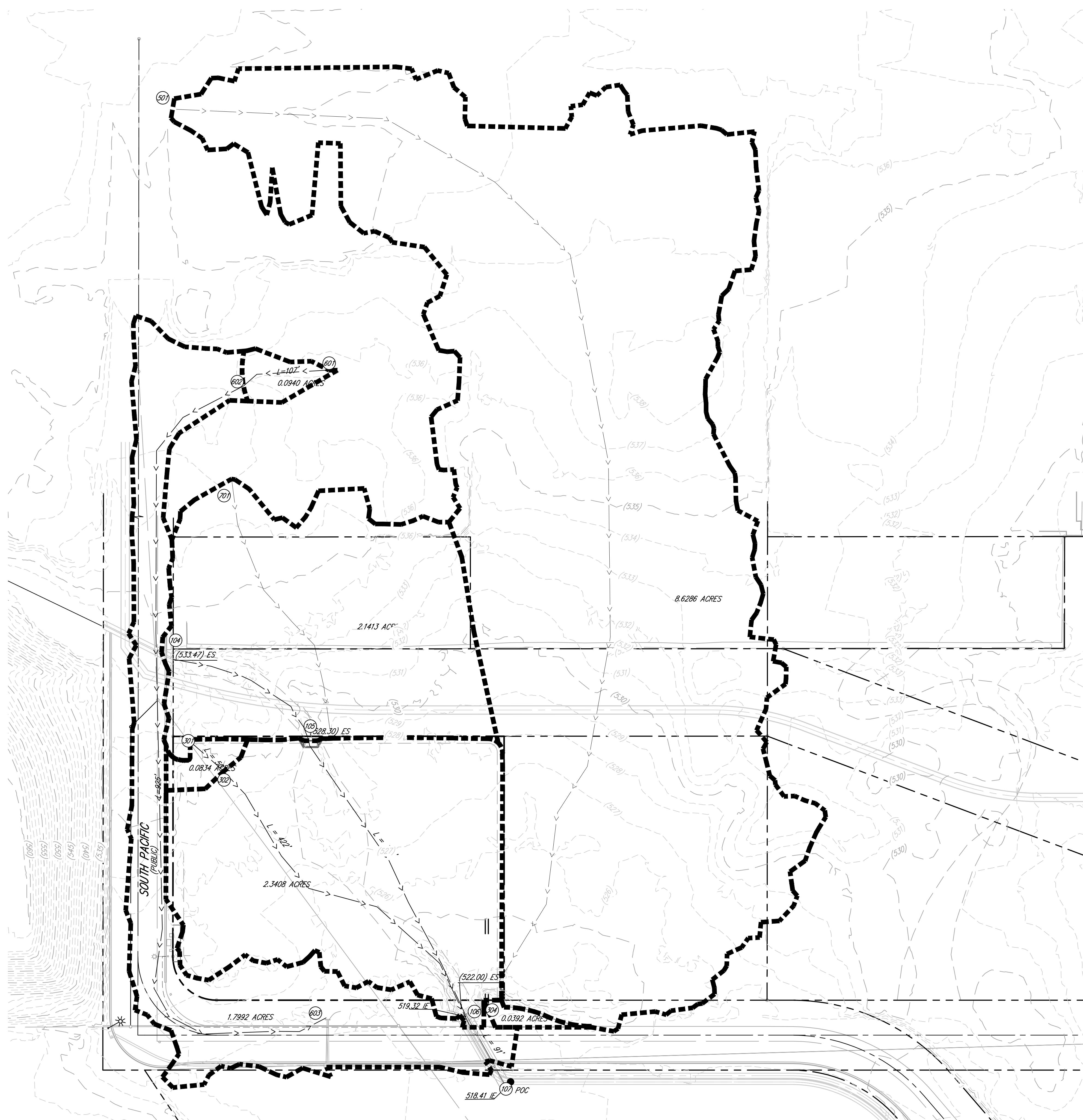
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PROJECT ISOPULIVIAL MAP



PROJECT ISOPULIVIAL MAP

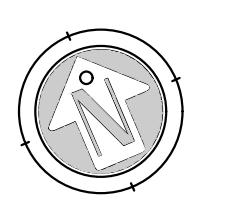
ATTACHMENT 4
PRE-DEVELOPMENT HYDROLOGY EXHIBIT



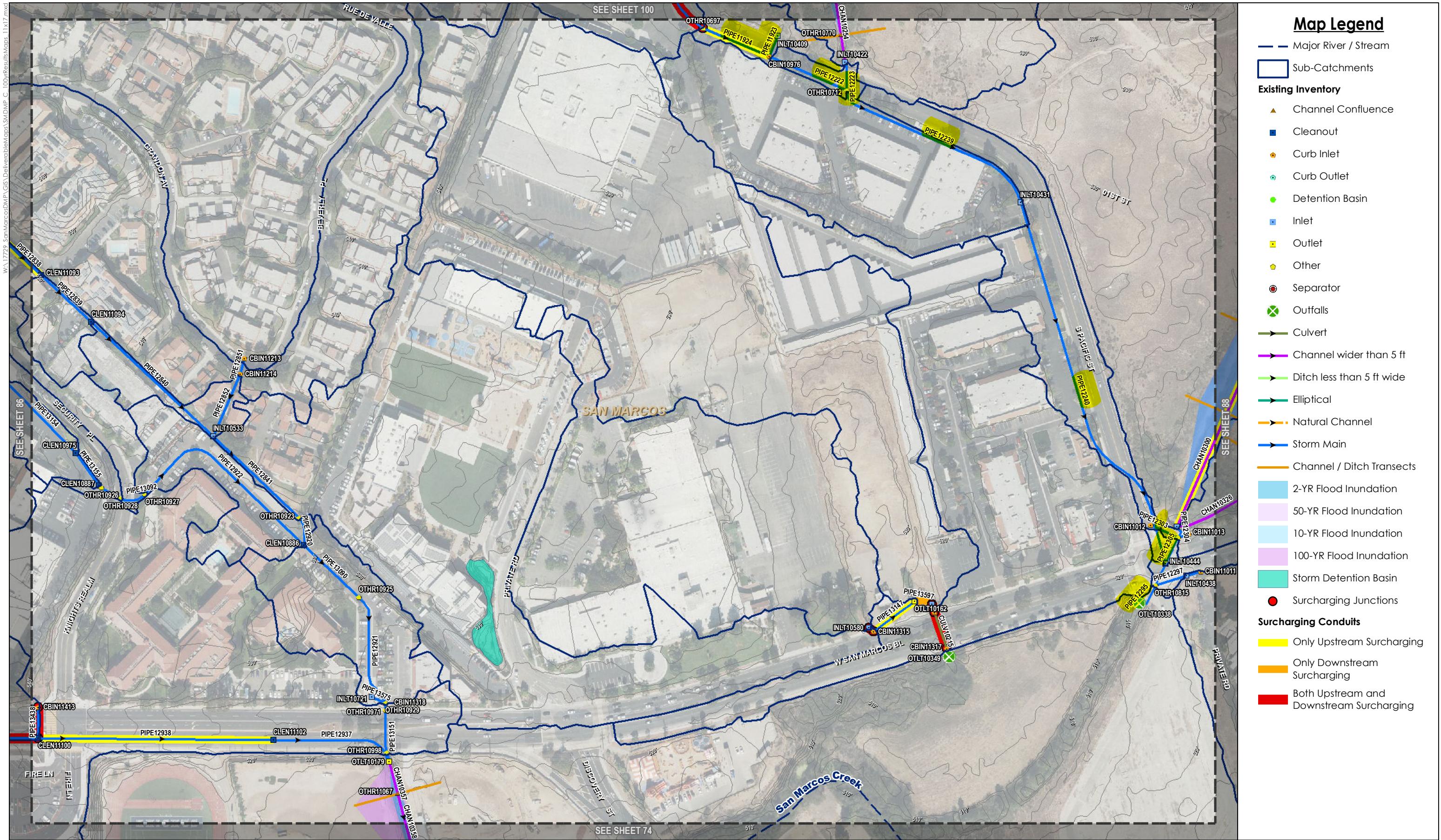
HYDROLOGY ANALYSIS RESULTS

	PRE	POST	POST MIT
Q (CFS)	258.68	258.84	258.50
TG (MIN)	51.74	49.85	49.85
V (FT/S)	15.49	15.49	15.49
A (AC)	170.63	170.63	170.63

SCALE: 1:30



SOUTH PACIFIC STREET
PRE HYDROLOGY EXHIBIT
SHEETS 1 OF 2 ONSITE



Source: City of San Marcos, Rick Engineering Company,
SANGIS/USGS Aerial Imagery: 11/2014



RICK
ENGINEERING COMPANY

A scale bar representing distance in feet. The bar is divided into four equal segments by tick marks at 0, 200, and 400. The first segment is shaded black, while the other three are white.



City of San Marcos - Drainage Master Plan
Existing Deficient Systems, 100 Year Results - Sheet 87

April, 2019



Source: City of San Marcos, Rick Engineering Company,
SANGIS/USGS Aerial Imagery: 11/2014



RICK
ENGINEERING COMPANY

Scale in Feet

0 200 400



**City of San Marcos - Drainage Master Plan
Existing Deficient Systems, 100 Year Results - Sheet 100**

April, 2019

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (100- year) (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
FLOW10091	A2		0	0	1	DUMMY	0.012	RCP	0.0	98.7	None		0	0.0	167.6	None	0.0	243.8	None	285.8	285.8	None
FLOW10092	A2		0	0	1	DUMMY	0.006	RCP	0.0	98.2	None		0	0.0	167.0	None	0.0	300.2	None	308.0	308.0	None
PIPE11928	A3	ZPIP11347	1.5	0	1	CIRCULAR	0.006	RCP	56.0	40.5	Both Upstream and Downstream		5.17	90.5	52.8	Both Upstream and Downstream	133.4	66.2	Both Upstream and Downstream	153.2	71.9	Both Upstream and Downstream
PIPE11995	A3	ZPIP17423	1.5	0	1	CIRCULAR	0.001	PVC	10.8	9.2	Upstream		3.41	18.0	13.4	Upstream	27.1	18.1	Upstream	30.9	20.1	Upstream
PIPE11871	A3	ZPIP11140	2	0	2	CIRCULAR	0.001	RCP	43.5	44.2	Both Upstream and Downstream		2.56	86.2	75.3	Both Upstream and Downstream	110.5	107.7	Both Upstream and Downstream	126.5	123.9	Both Upstream and Downstream
PIPE11796	A3	ZPIP13803	1.5	0	1	CIRCULAR	0.004	RCP	15.1	14.5	Downstream		2.32	25.8	23.7	Both Upstream and Downstream	39.2	34.9	Both Upstream and Downstream	44.9	39.6	Both Upstream and Downstream
PIPE11654	A3	ZPIP16773	1.083	0	1	CIRCULAR	0.005	CMP	7.2	4.9	Upstream		2.9	12.2	6.8	Upstream	18.3	8.8	Upstream	20.8	9.6	Upstream
PIPE11655	A3	ZPIP16774	1.083	0	1	CIRCULAR	0.006	CMP	7.2	4.9	None		2.68	12.2	6.8	None	18.3	8.8	None	20.8	9.6	None
PIPE12066	A3	ZPIP17503	1.5	0	1	CIRCULAR	0.001	RCP	8.7	9.0	None		2.46	15.3	15.3	None	26.0	17.5	Upstream	28.6	18.7	Upstream
PIPE12202	A3	ZPIP15865	4	0	1	CIRCULAR	0.000	HDPE	30.5	24.7	None		1.84	90.4	52.7	Both Upstream and Downstream	78.8	70.0	Both Upstream and Downstream	85.5	65.0	Both Upstream and Downstream
CULV10154	A3	CUL13262	3.583	2.25	1	ARCH	0.003	CMP	26.3	19.5	None		0.88	50.0	35.5	None	72.3	94.5	Upstream	83.4	106.1	Both Upstream and Downstream
PIPE12290	A3	ZPIP11574	1.5	0	1	CIRCULAR	0.001	RCP	0.1	2.9	None		0.96	0.8	6.0	Both Upstream and Downstream	5.7	15.4	Both Upstream and Downstream	13.0	12.2	Both Upstream and Downstream
PIPE12133	A3	ZPIP16083	1	0	1	CIRCULAR	0.042	CMP	9.0	7.2	Upstream		1.83	15.0	10.5	Upstream	41.0	14.1	Both Upstream and Downstream	43.8	15.9	Both Upstream and Downstream
PIPE12210	A3	ZPIP14864	2	0	1	CIRCULAR	0.003	RCP	15.9	16.1	None		1.4	27.2	27.1	None	41.3	40.1	Upstream	47.3	45.7	Upstream
PIPE12015	A3	ZPIP15401	2.5	0	1	CIRCULAR	0.002	RCP	28.4	34.2	None		2.06	39.2	58.2	None	42.2	64.2	None	45.0	65.2	None
PIPE11801	A3	ZPIP17042	3.25	0	1	CIRCULAR	0.001	RCP	53.2	52.4	None		2.01	89.3	88.0	None	139.5	98.2	Upstream	158.9	100.7	Upstream
PIPE11929	A3	ZPIP14874	2	0	1	CIRCULAR	0.007	RCP	57.8	40.9	Both Upstream and Downstream		2.17	93.9	53.1	Both Upstream and Downstream	138.2	66.6	Both Upstream and Downstream	158.7	72.4	Both Upstream and Downstream
PIPE11898	A3	ZPIP11209	1.5	0	1	CIRCULAR	0.002	RCP	0.0	0.0	None		0	0.0	0.0	None	0.1	0.1	None	0.1	18.1	None
PIPE11799	A3	ZPIP17040	3.5	0	1	CIRCULAR	0.001	RCP	60.6	60.6	None		1.95	100.9	97.3	None	163.9	108.9	None	183.1	112.2	None
PIPE11925	A3	ZPIP14866	2.5	0	1	CIRCULAR	0.003	RCP	27.7	27.6	None		1.18	51.9	48.3	Both Upstream and Downstream	81.3	71.7	Both Upstream and Downstream	93.4	81.6	Both Upstream and Downstream
PIPE11953	A3	ZPIP11498	2.5	0	1	CIRCULAR	0.005	CMP	29.4	27.6	None		1.71	47.5	38.0	Upstream	68.2	48.6	Upstream	77.7	53.3	Upstream
PIPE12156	A3	ZPIP16535	1.5	0	1	CIRCULAR	0.002	RCP	4.9	5.0	None		1.18	8.3	9.0	None	12.5	13.4	None	14.2	13.8	None
PIPE11927	A3	ZPIP11346	2	0	1	CIRCULAR	0.010	RCP	57.8	40.9	Both Upstream and Downstream		1.81	93.9	53.0	Both Upstream and Downstream	138.4	65.5	Both Upstream and Downstream	158.8	72.2	Both Upstream and Downstream
PIPE11931	A3	ZPIP17269	2	0	1	CIRCULAR	0.011	RCP	62.1	42.5	Both Upstream and Downstream		1.8	101.3	55.0	Both Upstream and Downstream	149.3	68.9	Both Upstream and Downstream	171.4	74.8	Both Upstream and Downstream
PIPE11800	A3	ZPIP17041	3	0	1	CIRCULAR	0.001	RCP	31.0	30.2	None		1.37	53.1	56.5	None	82.0	66.9	Both Upstream and Downstream	94.6	68.9	Both Upstream and Downstream
PIPE12302	A3	ZPIP10920	2.5	0	1	CIRCULAR	0.004	RCP	73.4	50.7	None		2.06	110.5	60.3	Upstream	247.7	72.0	Upstream	239.3	77.0	Upstream
PIPE11642	A3	ZPIP16768	3.5	0	1	CIRCULAR	0.005	CIPCP	362.4	182.5	Upstream		2.86	605.4	192.5	Upstream	894.2	196.6	Upstream	998.4	198.3	Upstream
PIPE11782	A3	ZPIP10625	1.5	0	1	CIRCULAR	0.006	RCP	0.1	2.8	None		0.33	0.1	22.3	Both Upstream and Downstream	0.2	24.6	Both Upstream and Downstream	0.2	25.4	Both Upstream and Downstream
PIPE12225	A3	ZPIP10627	2.5	0	1	CIRCULAR	0.002	RCP	26.4	23.9	None		1.29	48.6	38.0	None	74.9	51.4	None	82.9	54.1	Upstream
PIPE12164	A3	ZPIP19069	4	0	2	CIRCULAR	0.005	CIPCP	524.9	138.0	None		0.8	903.3	253.2	None	1258.3	482.9	Upstream	1371.1	486.5	Upstream
PIPE11906	A3	ZPIP14764	3	0	1	CIRCULAR	0.004	HDPE	64.5	64.5	None		1.52	102.0	99.8	None	149.7	113.5	None	169.3	116.0	None
PIPE12163	A3	ZPIP19068	4	0	2	CIRCULAR	0.005	CIPCP	523.5	134.9	None		0.78	896.8	247.9	None	1245.9	471.7	Both Upstream and Downstream	1355.5	471.1	Both Upstream and Downstream
PIPE12161	A3	ZPIP17908	1.5	0	1	CIRCULAR	0.006	RCP	7.7	7.7	None		0.92	12.8								

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11667	A3	ZPIP10366	1.5	0	1	CIRCULAR	0.027	RCP	6.0	6.0	None		0.35	9.5	9.5	None	13.9	16.1	None	15.6	21.5	None
PIPE11717	A3	ZPIP10443	2.25	0	1	CIRCULAR	0.011	RCP	16.5	16.5	None		0.52	27.4	26.1	None	41.1	40.0	None	46.9	40.2	None
CULV10137	A3	ZCUL12204	4	8	1	RECT_CLOSED	0.002	RCP	110.6	120.6	None		0.57	168.8	191.2	None	241.4	248.0	None	253.0	267.7	None
PIPE12018	A3	ZPIP11635	3.5	0	1	CIRCULAR	0.004	RCP	44.5	44.4	None		0.66	73.2	91.9	None	111.3	82.4	Both Upstream and Downstream	126.7	84.1	Both Upstream and Downstream
PIPE11840	A3	ZPIP17070	1.5	0	1	CIRCULAR	0.010	RCP	4.5	4.6	None		0.45	7.3	7.5	None	11.2	11.2	None	12.8	12.8	None
PIPE12022	A3	ZPIP15406	3	0	1	CIRCULAR	0.012	RCP	38.5	38.6	None		0.53	63.7	77.0	None	97.3	91.0	Both Upstream and Downstream	110.9	91.2	Both Upstream and Downstream
PIPE12251	A3	ZPIP15290	1.5	0	1	CIRCULAR	0.005	RCP	2.1	6.5	None		0.87	3.4	3.4	Both Upstream and Downstream	6.6	4.7	Both Upstream and Downstream	5.5	9.2	Both Upstream and Downstream
CHAN10221	A3	CH10142C	0	0	1	IRREGULAR	0.005	Earthen	199.0	225.6	None		0.72	314.6	362.0	Upstream	326.2	417.8	Upstream	268.2	388.0	Upstream
DTCH10276	A3	DD055A	0	0	1	IRREGULAR	0.001	CONCRETE	522.0	178.6	None		0.45	921.3	262.3	None	1171.5	485.5	Both Upstream and Downstream	1353.8	500.1	Both Upstream and Downstream
PIPE12017	A3	ZPIP11634	3.5	0	1	CIRCULAR	0.004	RCP	48.0	47.4	None		0.74	79.4	80.9	Downstream	120.4	82.0	Both Upstream and Downstream	136.8	78.8	Both Upstream and Downstream
PIPE12064	A3	ZPIP15559	1.5	0	1	CIRCULAR	0.002	RCP	0.7	3.6	None		0.7	1.1	5.8	None	1.7	5.7	None	1.6	6.3	Downstream
PIPE12124	A3	ZPIP11929	3.5	0	3	CIRCULAR	0.003	RCP	81.4	91.2	None		0.56	127.3	141.7	None	169.9	176.2	None	187.8	200.3	None
PIPE11682	A3	ZPIP10379	6	0	1	CIRCULAR	0.015	CIPCP	499.0	325.6	None		0.72	820.0	444.9	None	1199.0	543.5	None	1362.6	549.8	None
PIPE11804	A3	ZPIP10820	2.5	0	1	CIRCULAR	0.058	CMP	26.5	26.7	None		0.5	41.7	42.1	None	63.3	58.8	None	75.2	65.0	None
PIPE11836	A3	ZPIP13972	2	0	1	CIRCULAR	0.005	RCP	7.2	7.2	None		0.44	11.3	11.4	None	16.5	17.3	None	18.6	19.9	None
CHAN10285	A3	CH050A	0	0	1	IRREGULAR	0.002	Concrete	93.7	112.5	None		0.62	146.9	172.3	None	204.8	206.4	None	228.7	221.7	None
PIPE11588	A3	ZPIP12751	1.5	0	1	CIRCULAR	0.033	RCP	8.6	8.6	None		0.45	13.7	13.7	None	20.2	20.1	None	22.8	23.1	None
PIPE11661	A3	ZPIP12992	1.75	0	1	CIRCULAR	0.096	RCP	27.2	27.3	None		0.56	47.7	47.7	None	72.1	58.0	Upstream	82.3	59.7	Upstream
PIPE12285	A3	ZPIP15293	1.5	0	1	CIRCULAR	0.004	RCP	0.0	0.0	None		0	0.7	2.9	Both Upstream and Downstream	25.6	4.0	Both Upstream and Downstream	7.5	8.4	Both Upstream and Downstream
PIPE11534	A3	ZPIP12709	4.5	0	1	CIRCULAR	0.015	RCP	99.7	100.1	None		0.42	172.8	173.1	None	254.5	255.5	None	281.5	290.4	None
PIPE11681	A3	ZPIP10378	6	0	1	CIRCULAR	0.015	CIPCP	496.1	322.7	None		0.72	814.9	440.6	None	1193.3	526.5	None	1354.6	537.9	None
PIPE11720	A3	ZPIP10446	1.5	0	1	CIRCULAR	0.019	RCP	6.8	6.8	None		0.47	11.1	12.0	None	16.6	18.4	None	18.8	17.4	None
CULV10146	A3	CUL051A	4	0	1	CIRCULAR	0.010	RCP	99.9	89.7	None		0.63	166.3	131.4	Upstream	214.6	160.8	Upstream	232.2	172.0	Upstream
PIPE12197	A3	ZPIP10825	2	0	1	CIRCULAR	0.025	PVC	32.4	30.5	None		0.85	60.0	39.4	None	91.5	42.5	None	103.3	43.1	None
PIPE11828	A3	ZPIP10855	2.5	0	1	CIRCULAR	0.056	RCP	34.4	34.4	None		0.35	70.7	71.6	None	109.1	107.5	None	127.0	114.5	Upstream
PIPE12051	A3	ZPIP17471	2	0	1	CIRCULAR	0.011	RCP	9.9	9.9	None		0.43	17.0	16.2	None	25.5	23.1	None	29.1	27.4	None
PIPE12199	A3	ZPIP18000	1.5	0	1	CIRCULAR	0.024	RCP	5.7	5.3	None		0.33	9.3	9.2	None	11.0	17.4	None	11.9	19.1	None
PIPE12294	A3	ZPIP15301	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	34.7	35.1	None		0.67	63.7	50.4	Both Upstream and Downstream	115.5	53.9	Both Upstream and Downstream	107.6	61.3	Both Upstream and Downstream
PIPE11908	A3	ZPIP11288	4	0	1	CIRCULAR	0.005	HDPE	65.7	65.5	None		0.64	104.2	105.2	None	153.0	117.6	None	173.3	119.4	None
PIPE11613	A3	ZPIP10259	7	0	1	CIRCULAR	0.013	CIPCP	314.0	314.6	None		0.49	530.0	518.4	None	784.0	702.8	Upstream	866.9	742.8	Both Upstream and Downstream
PIPE11636	A3	ZPIP10269	2	0	1	CIRCULAR	0.095	RCP	28.2	28.1	None		0.4	46.3	45.1	None	69.5	70.7	Both Upstream and Downstream	79.0	80.5	Both Upstream and Downstream
PIPE11650	A3	ZPIP16769	1.5	0	1	CIRCULAR	0.096	RCP	10.2	10.2	None		0.31	17.1	17.1	None	25.4	30.3	None	28.8	37.7	None
CHAN10218	A3	CH10142B	0	0	1	IRREGULAR	0.005	Earthen	236.3	243.9	Downstream		1.08	417.2	249.5	Downstream	596.3	249.0	Downstream	646.6	262.3	Downstream

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100-year) (cfs)	Surcharging (100-year)	
PIPE11987	A3	ZPIP17409	1.5	0	1	CIRCULAR	0.008	PVC	3.3	3.3	None		0.36	4.1	5.4	None	8.4	8.1	None	9.5	9.2	None
PIPE12125	A3	ZPIP15995	4	0	3	CIRCULAR	0.005	RCP	102.8	134.6	None		0.44	185.9	208.6	None	285.1	262.1	None	329.3	302.1	None
PIPE12248	A3		6.5	0	1	CIRCULAR	0.016	CIPCP	502.6	331.7	None		0.58	825.8	462.2	None	1211.3	548.9	None	1371.3	557.8	None
PIPE11628	A3	ZPIP10266	5	0	1	CIRCULAR	0.032	CIPCP	140.8	141.4	None		0.35	245.3	246.1	None	362.7	365.4	None	405.7	388.1	None
PIPE11695	A3	ZPIP13072	3	0	1	CIRCULAR	0.018	RCP	29.6	29.8	None		0.33	50.5	50.2	None	76.3	75.5	None	87.4	87.2	None
PIPE12194	A3	PIP10788	4	0	1	CIRCULAR	0.016	RCP	70.6	66.7	None		0.36	141.3	113.6	None	214.0	158.6	None	243.4	176.3	None
PIPE12243	A3	ZPIP13176	3	0	1	CIRCULAR	0.052	RCP	52.5	52.8	None		0.35	88.0	88.0	None	134.5	136.2	None	152.8	145.3	None
PIPE11747	A3	ZPIP13182	1.75	0	1	CIRCULAR	0.016	RCP	5.0	5.1	None		0.25	9.8	9.8	None	15.2	15.2	None	17.5	18.8	None
PIPE12293	A3	ZPIP15300	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	34.8	34.1	None		0.65	64.0	52.4	Both Upstream and Downstream	116.6	46.3	Both Upstream and Downstream	107.9	49.9	Both Upstream and Downstream
PIPE11538	A3	ZPIP12713	1.5	0	1	CIRCULAR	0.018	RCP	5.1	5.1	None		0.36	8.1	8.1	None	11.9	11.9	None	13.4	13.4	None
PIPE11669	A3	ZPIP12997	1.75	0	1	CIRCULAR	0.092	RCP	15.4	15.5	None		0.32	28.7	28.7	None	44.0	42.9	Downstream	50.4	45.5	Downstream
PIPE11716	A3	ZPIP13144	1.5	0	1	CIRCULAR	0.010	RCP	1.1	1.1	None		0.1	1.7	2.6	None	2.6	14.7	None	2.9	9.8	None
PIPE11990	A3	ZPIP11590	2	0	1	CIRCULAR	0.021	RCP	8.6	8.7	None		0.27	16.0	16.0	None	24.4	27.4	None	27.9	30.6	None
PIPE11750	A3	ZPIP13185	1.5	0	1	CIRCULAR	0.070	RCP	10.4	10.4	None		0.38	16.8	16.8	None	24.8	24.0	None	28.1	25.9	None
PIPE11841	A3	ZPIP17071	6.5	0	1	CIRCULAR	0.003	RCP	108.7	118.4	None		0.43	167.8	185.5	None	240.2	237.9	None	251.8	255.6	None
PIPE11842	A3	ZPIP17072	6.5	0	1	CIRCULAR	0.003	RCP	109.3	117.4	None		0.43	175.4	183.7	None	266.5	236.7	None	278.3	253.6	None
PIPE11843	A3	ZPIP17073	6.5	0	1	CIRCULAR	0.003	RCP	110.4	117.2	None		0.42	179.9	183.9	None	281.8	241.3	None	305.4	261.4	None
PIPE11941	A3	ZPIP11352	6	0	2	CIRCULAR	0.004	RCP	186.5	229.3	None		0.41	317.1	354.4	None	461.0	451.5	None	523.1	519.2	None
PIPE12178	A3	ZPIP20007	3.5	0	1	CIRCULAR	0.015	HDPE	62.8	62.9	None		0.52	99.6	109.3	None	146.0	110.9	Both Upstream and Downstream	165.1	113.2	Both Upstream and Downstream
PIPE11631	A3	ZPIP16760	2.75	0	1	CIRCULAR	0.034	RCP	31.6	31.7	None		0.32	49.6	49.7	None	72.3	84.8	None	81.5	90.6	Downstream
PIPE11885	A3	ZPIP14599	2	0	1	CIRCULAR	0.016	RCP	9.9	9.9	None		0.35	15.8	15.8	None	23.4	23.2	None	26.5	26.1	None
PIPE11975	A3	ZPIP15243	1.5	0	1	CIRCULAR	0.013	RCP	3.8	3.8	None		0.32	6.5	6.5	None	9.8	9.8	None	11.1	11.1	None
PIPE12135	A3	ZPIP11973	2.5	0	1	CIRCULAR	0.116	RCP	58.0	58.0	None		0.41	93.5	174.9	None	676.6	149.6	Both Upstream and Downstream	688.7	129.3	Both Upstream and Downstream
CHUL10169	A3	CUL033B	4	6	1	RECT_CLOSED	0.003	RCP	80.2	55.1	Both Upstream and Downstream		0.32	127.0	67.1	Both Upstream and Downstream	384.3	139.7	Both Upstream and Downstream	371.8	160.7	Both Upstream and Downstream
PIPE12292	A3	ZPIP15299	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	39.6	36.8	None		0.71	68.6	52.9	Both Upstream and Downstream	132.4	47.6	Both Upstream and Downstream	122.0	47.9	Both Upstream and Downstream
PIPE11751	A3	ZPIP13186	1.5	0	1	CIRCULAR	0.084	RCP	10.4	10.4	None		0.34	16.8	16.8	None	24.8	24.8	None	28.1	27.6	None
PIPE11770	A3	ZPIP13200	4	0	1	CIRCULAR	0.015	RCP	56.5	56.8	None		0.32	94.4	94.2	None	143.8	145.2	None	163.3	159.6	None
PIPE11919	A3	ZPIP14855	2	0	1	CIRCULAR	0.030	RCP	12.0	12.0	None		0.3	21.0	20.9	None	31.7	31.4	None	36.1	35.7	None
PIPE11563	A3	ZPIP16736	3.5	0	1	CIRCULAR	0.043	RCP	77.2	74.9	None		0.36	129.7	122.8	None	193.8	169.0	None	220.5	187.6	None
PIPE11632	A3	ZPIP16761	6.5	0	1	CIRCULAR	0.013	CIPCP	168.7	169.4	None		0.32	290.0	290.3	None	428.4	461.8	Downstream	472.5	472.0	Both Upstream and Downstream
PIPE11988	A3	ZPIP17410	2	0	1	CIRCULAR	0.007	PVC	6.3	6.3	None		0.34	6.1	10.1	None	15.9	15.0	None	17.6	16.9	None
PIPE12048	A3	ZPIP15483	1.5	0	1	CIRCULAR	0.015	RCP	7.2	4.9	None		0.39	12.2	6.8	None	18.4	9.4	None	20.9	11.4	None
PIPE11728	A3	ZPIP13168	2	0	1	CIRCULAR	0.034	RCP	13.2	13.2	None		0.32	21.6	21.6	None	32.7	33.9	Downstream	37.3	37.4	Downstream
PIPE11763	A3	ZPIP13195	1.5	0	1	CIRCULAR	0.008	RCP	3.1	3.1	None		0.33	4.7	5.							

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (100- year) (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11532	A3	ZPIP10215	4	0	1	CIRCULAR	0.064	RCP	82.2	82.3	None		0.23	139.8	139.9	None	208.0	209.1	None	237.1	238.4	None
PIPE11604	A3	ZPIP12788	4	0	1	CIRCULAR	0.061	RCP	80.5	80.5	None		0.23	136.9	137.0	None	204.4	204.7	None	233.0	233.6	None
PIPE11677	A3	ZPIP13002	2	0	1	CIRCULAR	0.045	RCP	12.4	12.4	None		0.26	19.5	19.4	None	28.4	28.2	None	32.1	31.8	None
PIPE11758	A3	ZPIP13190	1.5	0	1	CIRCULAR	0.010	RCP	0.0	0.0	None		0	0.0	0.0	None	0.0	0.2	None	0.0	6.9	None
PIPE12239	A3	ZPIP14861	5.5	0	2	CIRCULAR	0.004	CIPCP	174.1	114.0	None		0.31	189.9	162.3	None	327.6	218.7	None	331.8	244.1	None
CHAN10309	A3	CH062A	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.0	88.4	None		0.09	0.0	353.9	None	0.0	613.3	None	0.0	659.6	None
PIPE12318	A3	ZPIP16815	2	0	1	CIRCULAR	0.005	RCP	3.6	3.6	Both Upstream and Downstream		0.23	6.8	5.5	Both Upstream and Downstream	10.7	9.0	Both Upstream and Downstream	11.5	10.2	Both Upstream and Downstream
PIPE11530	A3	ZPIP12708	1.5	0	1	CIRCULAR	0.021	RCP	3.7	3.8	None		0.25	6.0	6.0	None	8.7	8.7	None	9.8	9.9	None
PIPE11586	A3	ZPIP10235	2	0	1	CIRCULAR	0.053	RCP	15.2	20.0	None		0.38	24.2	34.1	Downstream	35.5	34.9	Both Upstream and Downstream	40.1	33.9	Both Upstream and Downstream
PIPE11684	A3	ZPIP13026	1.5	0	1	CIRCULAR	0.015	RCP	3.2	2.9	None		0.23	5.8	5.3	None	7.0	7.3	None	9.4	8.2	None
CULV10153	A3	CUL055B	3.583	2.25	1	ARCH	0.046	CMP	16.8	14.5	None		0.16	37.7	28.2	None	48.3	65.5	None	56.1	57.3	None
PIPE12095	A3	ZPIP15866	4	0	1	CIRCULAR	0.005	RCP	32.0	25.6	None		0.25	86.2	42.3	Both Upstream and Downstream	73.0	72.3	Both Upstream and Downstream	88.3	66.9	Both Upstream and Downstream
PIPE12260	A3	ZPIP14000	4.5	0	1	CIRCULAR	0.003	RCP	24.4	24.2	None		0.24	38.7	39.3	None	53.6	56.7	None	51.3	65.5	None
PIPE11519	A3	ZPIP12700	4.5	0	1	CIRCULAR	0.058	RCP	104.6	105.1	None		0.22	180.8	181.2	None	265.6	266.9	None	295.2	305.4	None
PIPE11550	A3	ZPIP10221	3	0	1	CIRCULAR	0.064	RCP	39.8	39.8	None		0.24	64.9	64.9	None	95.3	95.3	None	109.1	109.1	None
PIPE11560	A3	ZPIP12727	1.5	0	1	CIRCULAR	0.021	RCP	3.7	3.7	None		0.24	5.9	5.9	None	8.7	8.6	None	9.7	9.7	None
PIPE11733	A3	ZPIP13170	2	0	1	CIRCULAR	0.020	RCP	5.0	5.0	None		0.16	10.1	10.1	None	18.0	18.0	None	20.5	20.5	None
PIPE11792	A3	ZPIP10786	2	0	2	CIRCULAR	0.018	CMP	8.0	8.0	None		0.24	12.9	13.0	None	15.1	18.3	Downstream	17.2	21.2	Downstream
PIPE12273	A3	ZPIP14484	2	0	1	CIRCULAR	0.005	RCP	3.1	3.6	Both Upstream and Downstream		0.23	6.8	4.9	Both Upstream and Downstream	11.0	8.7	Both Upstream and Downstream	11.5	9.9	Both Upstream and Downstream
CULV10170	A3	ZCUL16855	6	14	1	RECT_CLOSED	0.003	RCP	446.5	172.9	None		0.2	756.3	281.9	None	1554.3	538.0	None	1577.2	556.9	None
PIPE11845	A3	ZPIP10959	2	3.167	1	HORIZ_ELLIPSE	0.004	RCP	5.4	14.3	None		0.56	12.1	20.0	Downstream	18.0	16.4	Both Upstream and Downstream	19.1	15.9	Both Upstream and Downstream
PIPE11989	A3	ZPIP11589	2	0	1	CIRCULAR	0.027	RCP	7.0	7.0	None		0.19	13.1	13.1	None	20.0	20.0	None	23.0	23.4	None
CULV10178	A3	ZCUL069A	3	8	3	RECT_CLOSED	0.008	RCP	478.5	164.8	None		0.22	689.2	249.1	None	1129.6	468.1	Both Upstream and Downstream	1302.5	478.6	Both Upstream and Downstream
CHAN10314	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.5	65.3	None		0.06	1.5	311.3	None	2.5	565.8	None	3.0	631.1	None
CHAN10317	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.5	53.5	None		0.05	1.3	286.9	None	2.3	563.4	None	2.7	630.1	None
CHAN10319	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	2.3	49.0	None		0.05	5.0	271.5	None	8.5	566.6	None	10.1	634.9	None
CHAN10320	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	1.9	46.5	None		0.05	4.4	261.7	None	11.0	565.2	None	19.7	634.6	None
CHAN10321	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	1.8	45.8	None		0.05	5.0	260.9	None	35.3	562.9	None	86.9	634.1	None
PIPE11536	A3	ZPIP12711	3	0	1	CIRCULAR	0.079	RCP	37.8	37.9	None		0.2	66.8	67.0	None	101.0	101.3	None	115.2	115.9	None
CULV10138	A3	CUL066	3.5	8.5	2	RECT_CLOSED	0.007	RCP	192.7	219.3	None		0.34	333.8	360.2	Both Upstream and Downstream	372.5	421.7	Both Upstream and Downstream	284.3	395.2	Both Upstream and Downstream
PIPE11870	A3	ZPIP11138	2.75	0	1	CIRCULAR	0.051	CSP	14.0	14.1	Both Upstream and Downstream		0.22	27.1	25.9	Both Upstream and Downstream	35.4	34.7	Both Upstream and Downstream	40.6	39.9	Both Upstream and Downstream
CULV10144	A3	ZCUL14827	7	10	1	RECT_CLOSED	0.005	RCP	412.4	230.5	Both Upstream and Downstream		0.25	794.7	363.4	Both Upstream and Downstream	1284.6	530.7	Both Upstream and Downstream	1421.9	564.6	Both Upstream and Downstream
PIPE11888	A3	ZPIP17211	2	0	1	CIRCULAR	0.035	RCP	9.9	9.9	None		0.23	15.8	15.8	None	61.1	23.2	None	148.6	26.1	None

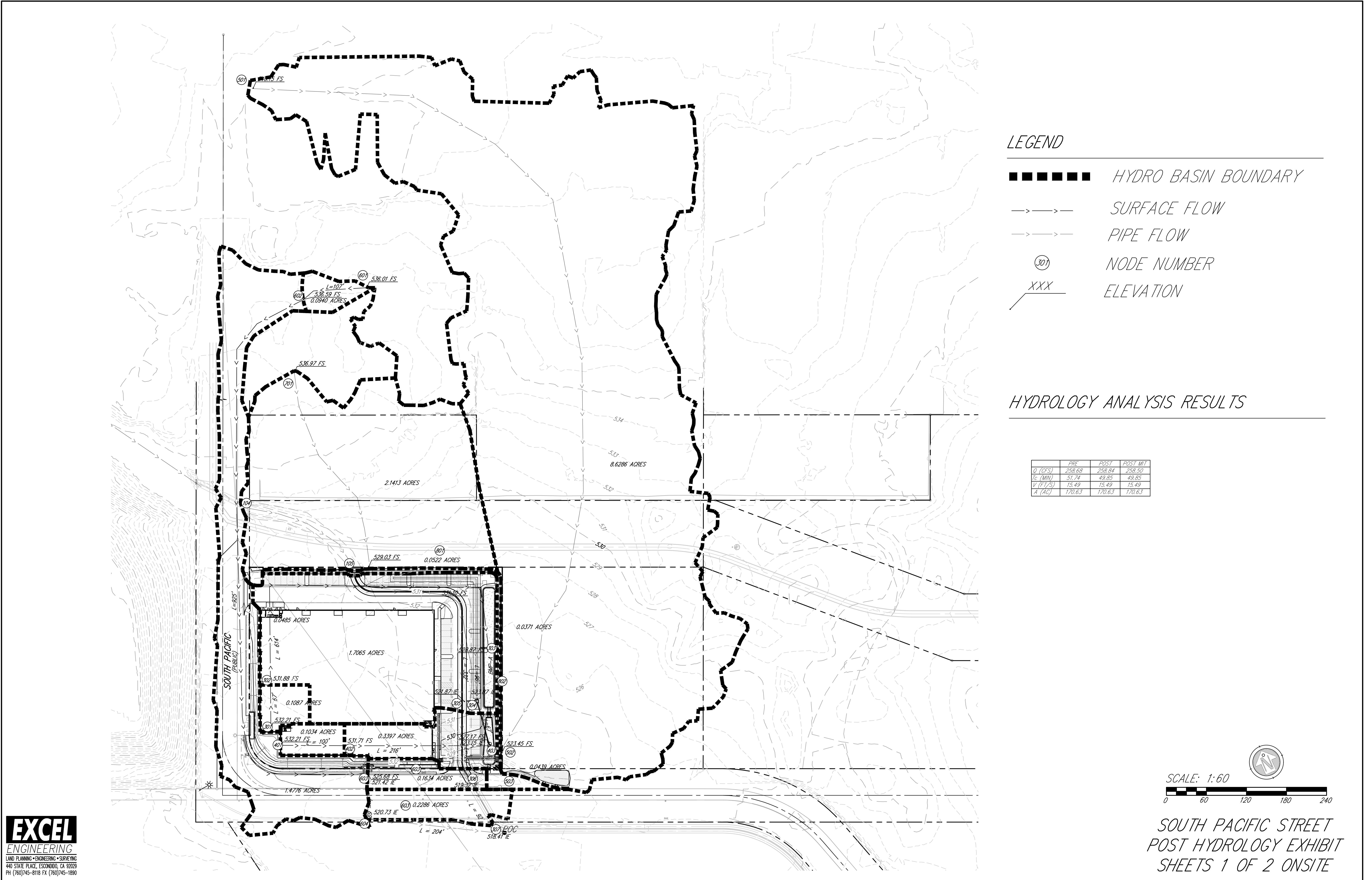
Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11778	A3	ZPIP10476	1.5	0	1	CIRCULAR	0.074	RCP	3.5	3.5	None		0.12	5.9	5.9	None	8.9	8.9	None	10.1	10.1	None
PIPE11876	A3	ZPIP14493	1.5	0	1	CIRCULAR	0.017	RCP	0.4	0.1	None		0.01	1.2	18.6	Both Upstream and Downstream	10.0	9.3	Both Upstream and Downstream	18.8	4.7	Both Upstream and Downstream
CULV10148	A3	ZCUL13955	7	11	1	RECT_CLOSED	0.005	RCP	133.7	138.2	Both Upstream and Downstream		0.13	261.9	226.6	Both Upstream and Downstream	399.2	370.0	Both Upstream and Downstream	300.2	369.8	Both Upstream and Downstream
PIPE12042	A3	ZPIP15444	2.5	0	1	CIRCULAR	0.008	RCP	4.9	5.0	None		0.13	7.8	7.9	None	11.4	11.5	None	12.8	13.0	None
PIPE12102	A3	ZPIP11872	2	0	1	CIRCULAR	0.005	HDPE	4.8	2.1	None		0.14	15.8	3.3	None	5.9	4.9	None	6.0	5.5	None
PIPE12136	A3	ZPIP11974	5.5	0	1	CIRCULAR	0.013	RCP	58.4	58.4	None		0.15	94.4	195.8	None	664.9	150.4	Both Upstream and Downstream	631.8	134.4	Both Upstream and Downstream
PIPE12177	A3	ZPIP20006	3.5	0	1	CIRCULAR	0.097	RCP	61.0	61.2	None		0.2	97.3	108.2	None	142.8	108.5	Both Upstream and Downstream	161.5	110.9	Both Upstream and Downstream
CULV10162	A3	ZCUL13082	3	5	2	RECT_CLOSED	0.031	RCP	78.6	81.7	None		0.14	127.8	127.6	None	267.5	181.3	None	323.1	198.7	None
PIPE11525	A3	ZPIP12703	2	0	1	CIRCULAR	0.035	RCP	5.6	5.6	None		0.13	8.8	8.8	None	12.8	12.8	None	14.4	14.5	None
PIPE11556	A3	ZPIP16734	1.5	0	1	CIRCULAR	0.012	RCP	1.6	1.6	None		0.13	2.5	2.5	None	3.6	3.6	None	4.0	4.0	None
PIPE11893	A3	ZPIP14610	2	8	1	RECT_CLOSED	0.017	RCP	22.8	23.0	None		0.11	39.8	40.0	None	60.8	60.9	None	69.6	69.8	None
PIPE12084	A3	ZPIP15858	2	0	1	CIRCULAR	0.004	HDPE	1.9	1.8	None		0.13	10.8	2.9	None	17.9	4.3	None	26.2	4.8	None
CULV10161	A3	ZCUL16808B	2	6	3	RECT_CLOSED	0.009	RCP	61.0	61.2	None		0.19	97.3	100.7	None	142.8	108.5	Both Upstream and Downstream	161.5	110.5	Both Upstream and Downstream
PIPE11561	A3	ZPIP12728	2	0	1	CIRCULAR	0.035	RCP	5.4	5.5	None		0.13	8.6	8.6	None	12.5	12.5	None	14.1	14.2	None
PIPE11754	A3	ZPIP10465	2.5	0	1	CIRCULAR	0.206	RCP	20.9	20.9	None		0.11	34.1	34.4	None	50.6	52.4	None	57.4	62.2	None
PIPE11761	A3	ZPIP13193	1.75	0	1	CIRCULAR	0.023	RCP	2.2	2.2	None		0.09	4.4	4.4	None	6.9	6.9	None	7.9	7.9	None
PIPE12023	A3	ZPIP17459	3	0	1	CIRCULAR	0.202	RCP	33.0	33.1	None		0.11	55.0	73.2	None	84.4	99.3	Both Upstream and Downstream	96.3	99.8	Both Upstream and Downstream
PIPE12053	A3	ZPIP17484	2.25	0	1	CIRCULAR	0.017	RCP	4.9	4.9	None		0.12	8.0	8.0	None	11.8	11.8	None	13.4	13.4	None
PIPE12233	A3	ZPIP16084	5.5	0	1	CIRCULAR	0.013	RCP	0.1	1.7	None		0	0.1	126.4	None	15.8	98.2	Both Upstream and Downstream	37.3	125.5	Both Upstream and Downstream
CULV10165	A3	ZCUL16808A	2	6	3	RECT_CLOSED	0.010	RCP	61.6	60.8	None		0.18	96.8	99.5	None	142.2	110.5	Both Upstream and Downstream	160.8	111.0	Both Upstream and Downstream
PIPE11766	A3	ZPIP13196	1.5	0	1	CIRCULAR	0.178	RCP	0.0	0.0	None		0	0.0	0.2	None	0.0	10.8	None	0.0	14.4	None
PIPE11889	A3	ZPIP17212	2	0	1	CIRCULAR	0.037	RCP	5.0	5.0	None		0.12	8.1	8.1	None	12.1	12.1	None	13.7	13.7	None
PIPE12092	A3	ZPIP17584	4	10	1	TRAPEZOIDAL	0.000	CMP	10.0	8.3	None		0.12	17.5	13.1	None	28.3	19.3	None	49.2	21.8	None
CHAN10297	A3	CH043B	4	4	1	TRAPEZOIDAL	0.003	Concrete	77.2	60.2	Both Upstream and Downstream		0.12	122.5	76.3	Both Upstream and Downstream	373.3	138.7	Both Upstream and Downstream	360.0	159.2	Both Upstream and Downstream
PIPE11616	A3	ZPIP12802	2.75	0	1	CIRCULAR	0.034	RCP	1.8	1.8	None		0.02	2.9	2.9	None	4.2	33.1	None	4.8	30.2	None
PIPE11873	A3	ZPIP14489	1.5	0	1	CIRCULAR	0.058	RCP	2.9	2.9	Both Upstream and Downstream		0.11	4.7	4.7	Both Upstream and Downstream	7.1	6.9	Both Upstream and Downstream	8.1	7.9	Both Upstream and Downstream
PIPE12132	A3	ZPIP16082	7	11	1	RECT_CLOSED	0.005	RCP	132.0	120.9	None		0.11	205.5	304.8	Downstream	327.8	294.8	Both Upstream and Downstream	395.8	329.2	Both Upstream and Downstream
PIPE11739	A3	ZPIP10461	3	0	1	CIRCULAR	0.062	RCP	15.7	15.7	None		0.09	27.3	27.4	None	43.6	42.9	None	49.5	49.7	None
PIPE11812	A3	ZPIP13902	1.5	0	1	CIRCULAR	0.010	RCP	1.2	1.2	None		0.11	1.9	1.9	None	2.7	2.7	None	3.1	3.1	None
PIPE11820	A3	ZPIP10844	2.5	0	1	CIRCULAR	0.140	RCP	13.5	13.5	None		0.09	25.7	25.7	None	39.8	39.7	None	45.7	45.6	None
PIPE11832	A3	ZPIP13930	2.5	0	1	CIRCULAR	0.085	RCP	11.1	11.1	None		0.09	20.5	20.5	None	31.4	31.4	None	36.0	36.0	None
CHAN10296	A3	CH060C	0	0	1	IRREGULAR	0.001	Earthen	671.8	437.4	Both Upstream and Downstream		0.15	759.4	596.1	Both Upstream and Downstream	767.1	784.1	Both Upstream and Downstream	1070.9	857.4	Both Upstream and Downstream
PIPE12304	A3	ZPIP19073	5.5	12	3	RECT_CLOSED	0.005	RCP	186.8	180.1	None		0.08	639.2	607.0	None	763.2	669.2	None	803.3	707.1	None
PIPE12305	A3	ZPIP19074	5.5	12	3																	

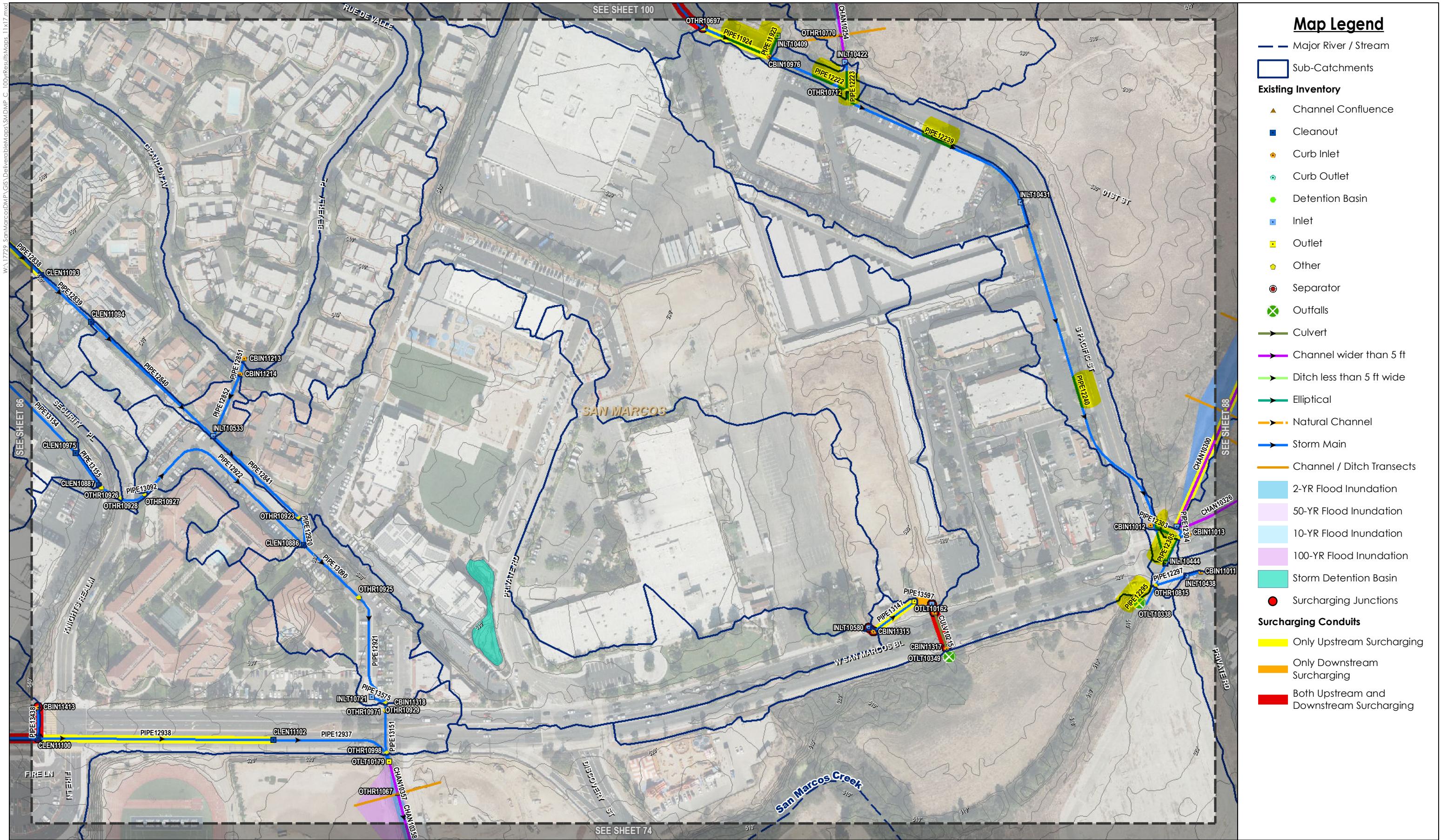
Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (100- year) (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11960	A3	ZPIP17377	7	10	1	RECT_CLOSED	0.006	RCP	493.0	207.4	None		0.21	832.2	333.5	None	1264.3	536.2	None	1391.8	559.0	None
CULV10172	A3	ZCUL064B	6	14	1	RECT_CLOSED	0.004	RCP	446.1	173.3	None		0.18	755.6	282.1	None	1574.9	537.2	None	1605.6	563.4	None
PIPE11533	A3	ZPIP10216	4	0	1	CIRCULAR	0.095	RCP	85.9	85.8	None		0.19	145.3	145.5	None	215.7	217.2	None	245.8	248.6	None
PIPE11809	A3	ZPIP17062	3	0	1	CIRCULAR	0.058	RCP	29.0	29.0	None		0.18	51.7	51.7	None	78.3	78.4	None	89.5	89.6	None
PIPE11894	A3	ZPIP14612	7	10	1	RECT_CLOSED	0.006	RCP	449.9	175.4	None		0.18	762.4	284.2	None	1335.3	530.6	None	1291.2	549.9	None
PIPE11899	A3	ZPIP14616	3	0	2	CIRCULAR	0.007	RCP	36.1	32.0	None		0.28	59.1	48.9	None	85.6	66.1	Downstream	91.5	63.9	Downstream
PIPE11900	A3	ZPIP14617	3	0	2	CIRCULAR	0.007	RCP	36.0	32.0	None		0.28	57.4	47.8	Downstream	76.1	66.2	Both Upstream and Downstream	82.2	63.9	Both Upstream and Downstream
PIPE11959	A3	ZPIP17376	7	10	1	RECT_CLOSED	0.006	RCP	491.9	204.9	None		0.21	830.7	329.5	None	1263.4	534.9	None	1389.4	557.2	None
PIPE11965	A3	ZPIP1521	7	10	1	RECT_CLOSED	0.006	RCP	491.8	204.7	None		0.21	830.6	329.1	None	1264.7	535.1	None	1389.4	557.2	None
PIPE11966	A3	ZPIP11522	7	10	1	RECT_CLOSED	0.006	RCP	451.3	176.5	None		0.18	764.1	285.1	None	1297.1	532.1	None	1293.8	548.0	None
PIPE11967	A3	ZPIP15192	7	10	1	RECT_CLOSED	0.006	RCP	450.6	175.8	None		0.18	763.2	284.5	None	1292.5	529.6	None	1293.0	549.5	None
PIPE11539	A3	ZPIP12714	3	0	1	CIRCULAR	0.090	RCP	40.1	40.1	None		0.2	65.5	65.5	None	96.1	96.1	None	110.0	110.0	None
PIPE11591	A3	ZPIP16744	2	0	1	CIRCULAR	0.028	RCP	7.9	8.0	None		0.21	12.6	12.6	None	18.3	18.4	None	20.7	20.7	None
PIPE11679	A3	ZPIP13024	3	0	1	CIRCULAR	0.010	RCP	10.1	10.2	None		0.15	17.1	17.3	None	25.7	30.1	None	29.3	36.4	None
PIPE11732	A3	ZPIP13169	1.5	0	1	CIRCULAR	0.057	RCP	5.1	5.2	None		0.2	8.2	8.3	None	12.2	12.3	None	13.8	13.9	None
PIPE11935	A3	ZPIP14878	2.5	0	1	CIRCULAR	0.069	RCP	27.3	24.8	None		0.23	48.6	39.5	None	74.3	57.6	None	83.0	59.0	None
PIPE12108	A3	ZPIP15876	3	0	1	CIRCULAR	0.005	HDPE	14.6	9.4	None		0.21	14.4	15.0	None	25.0	22.2	None	27.7	25.1	None
PIPE12240	A3	ZPIP11525	5.5	0	2	CIRCULAR	0.005	RCP	122.4	118.5	None		0.26	191.8	164.4	None	285.4	225.1	None	320.9	250.7	None
PIPE12242	A3	ZPIP10225	4	0	1	CIRCULAR	0.075	RCP	88.5	86.2	None		0.22	147.7	140.5	None	219.7	195.0	None	249.9	216.8	None
CHAN10224	A3	CH10142D	0	0	1	IRREGULAR	0.014	Earthen	197.4	225.0	Downstream		0.33	278.6	355.6	Downstream	248.2	410.2	Downstream	259.1	380.7	Downstream
PIPE11615	A3	ZPIP12798	3.5	0	1	CIRCULAR	0.050	CIPCP	31.6	31.7	None		0.16	49.6	49.7	None	72.3	104.2	None	81.4	104.8	Both Upstream and Downstream
PIPE11659	A3	ZPIP12990	1.5	0	1	CIRCULAR	0.042	RCP	4.5	4.5	None		0.21	7.1	7.1	None	10.4	10.4	None	11.7	11.7	None
PIPE12006	A3	ZPIP15332	2	0	1	CIRCULAR	0.034	RCP	8.0	8.2	None		0.19	13.4	13.4	None	19.9	19.8	None	22.6	22.8	None
PIPE12119	A3	ZPIP11880	1.75	0	1	CIRCULAR	0.010	RCP	3.1	3.2	None		0.2	5.1	5.1	None	7.5	7.6	None	8.6	8.6	None
PIPE12291	A3	ZPIP15298	2.417	3.75	2	HORIZ_ELLIPSE	0.004	RCP	43.1	35.7	None		0.42	74.3	47.9	Both Upstream and Downstream	144.0	45.5	Both Upstream and Downstream	132.7	45.6	Both Upstream and Downstream
PIPE11545	A3	ZPIP12717	5.5	0	1	CIRCULAR	0.019	RCP	98.5	97.5	None		0.21	163.7	156.4	None	243.1	217.9	None	271.0	242.8	None
PIPE11921	A3	ZPIP14857	1.5	0	1	CIRCULAR	0.007	RCP	1.8	1.8	None		0.2	2.9	2.9	None	4.2	4.2	None	4.7	4.7	None
PIPE11922	A3	ZPIP14858	1.5	0	1	CIRCULAR	0.007	RCP	1.8	1.8	None		0.2	2.9	2.9	None	4.2	4.2	None	4.8	4.8	None
CHAN10310	A3	CH062A	6	25	1	TRAPEZOIDAL	0.008	Earthen	0.0	88.4	None		0.07	0.0	351.4	None	0.0	573.6	None	0.0	630.3	None
PIPE11589	A3	ZPIP12752	2	0	1	CIRCULAR	0.050	RCP	11.1	11.1	None		0.22	17.7	17.9	None	25.9	25.4	Downstream	29.3	26.4	Downstream
PIPE12170	A3	PIP19083	3	0	2	CIRCULAR	0.007	RCP	33.0	28.8	None		0.25	53.7	43.7	None	78.3	55.7	None	89.5	59.9	None
PIPE11946	A3	ZPIP14887	3	0	1	CIRCULAR	0.010	RCP	11.7	12.0	None		0.18	19.5	19.6	None	29.3	29.0	None	33.4	33.5	None
PIPE12087	A3	ZPIP11865	2.5	0	1	CIRCULAR	0.004	HDPE	5.2	5.2	None		0.19	15.3	8.1	None	15.8	11.9	None	33.6	13.4	None
PIPE12107	A3	ZPIP15875	3	0	1	CIRCULAR	0.															

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Qcap	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11818	A3	ZPIP13908	3	0	1	CIRCULAR	0.028	RCP	15.1	15.1	None		0.14	28.1	28.1	None	43.3	43.2	None	49.7	49.6	None
PIPE12068	A3	ZPIP17578	3.5	0	1	CIRCULAR	0.006	HDPE	12.6	12.6	None		0.16	18.6	20.7	None	19.1	30.4	None	36.6	34.6	None
CULV10157	A3	ZCUL11918E	3	5	3	RECT_CLOSED	0.009	RCP	82.6	92.9	None		0.2	129.4	144.3	None	172.7	183.6	None	191.5	211.2	None
CHAN10290	A3	ZCH10206	0	0	1	IRREGULAR	0.031	Concrete	98.7	126.8	None		0.1	164.3	193.3	None	232.4	233.8	Downstream	261.9	556.3	Downstream
PIPE12313	A3	ZPIP15195	2	8	1	RECT_CLOSED	0.013	RCP	24.2	27.9	None		0.15	46.9	47.3	None	164.5	71.8	None	317.3	81.4	None
PIPE11522	A3	ZPIP10211	1.5	0	1	CIRCULAR	0.067	RCP	0.0	0.0	None		0	0.0	0.0	None	0.0	0.0	None	0.0	12.1	None
PIPE11743	A3	ZPIP13178	1.5	0	1	CIRCULAR	0.081	RCP	0.0	0.0	None		0	0.0	0.0	None	0.0	10.2	None	0.0	13.1	None
PIPE11772	A3	ZPIP10473	1.5	0	1	CIRCULAR	0.029	RCP	0.5	0.9	None		0.05	1.5	5.6	None	1.3	4.9	None	1.6	7.9	None
PIPE11847	A3	ZPIP14230	1.5	0	1	CIRCULAR	0.055	RCP	4.0	4.0	None		0.16	6.5	6.5	None	9.6	9.6	None	11.1	10.9	None
PIPE11865	A3	ZPIP14307	1.5	0	1	CIRCULAR	0.008	RCP	0.9	1.4	None		0.15	2.1	2.4	None	3.5	3.7	None	4.0	4.2	None
CULV10145	A3	ZCUL11918C	3	5	3	RECT_CLOSED	0.009	RCP	82.6	92.9	None		0.2	129.4	144.3	None	172.7	183.6	None	191.5	211.0	None
PIPE12169	A3	ZPIP19076	3	0	1	CIRCULAR	0.105	RCP	31.8	31.9	None		0.15	53.1	53.0	None	81.5	81.2	None	93.0	95.2	None
PIPE12276	A3	ZPIP14825	1.5	0	1	CIRCULAR	0.007	RCP	9.9	4.0	Both Upstream and Downstream		0.46	2.8	1.9	Both Upstream and Downstream	4.4	3.0	Both Upstream and Downstream	4.7	3.8	Both Upstream and Downstream
PIPE11567	A3	ZPIP12732	1.5	0	1	CIRCULAR	0.037	RCP	3.4	3.4	None		0.17	5.3	5.3	None	7.8	7.8	None	8.7	8.7	None
PIPE11596	A3	ZPIP12783	3.5	0	1	CIRCULAR	0.053	RCP	31.5	31.3	None		0.14	57.5	57.2	None	87.8	87.4	None	100.6	100.0	None
PIPE11657	A3	ZPIP10282	1.5	0	1	CIRCULAR	0.015	ACP	0.0	0.0	None		0	0.1	0.1	None	0.1	3.6	Downstream	0.1	5.5	Both Upstream and Downstream
PIPE11745	A3	ZPIP13180	2	0	1	CIRCULAR	0.034	RCP	7.0	7.0	None		0.17	11.0	11.0	None	16.0	15.7	None	18.1	18.1	None
PIPE11838	A3	ZPIP13974	1.5	0	1	CIRCULAR	0.027	RCP	2.9	2.9	None		0.17	4.5	4.5	None	6.5	6.5	None	7.4	7.4	None
PIPE11998	A3	ZPIP11592	2.5	0	1	CIRCULAR	0.025	RCP	9.8	10.0	None		0.16	16.4	16.5	None	24.4	24.3	None	27.8	27.9	None
PIPE12028	A3	ZPIP11648	3	0	1	CIRCULAR	0.005	RCP	6.7	6.6	None		0.14	12.0	11.9	None	17.8	17.5	None	20.4	20.3	None
PIPE12209	A3	ZPIP14614	4	0	1	CIRCULAR	0.011	RCP	21.0	21.1	None		0.14	36.8	37.0	None	56.2	56.6	None	64.4	64.8	None
PIPE11505	A3	ZPIP12684	1.5	0	1	CIRCULAR	0.084	RCP	4.4	4.4	None		0.14	7.4	7.4	None	11.2	11.2	None	12.8	12.8	None
PIPE11508	A3	ZPIP12691	1.5	0	1	CIRCULAR	0.082	RCP	4.4	4.4	None		0.15	7.4	7.4	None	11.2	11.2	None	12.8	12.8	None
PIPE11697	A3	ZPIP10403	3.5	0	1	CIRCULAR	0.033	RCP	26.1	26.0	None		0.14	43.8	43.9	None	64.1	66.8	None	72.9	76.5	None
PIPE11719	A3	ZPIP10445	1.5	0	1	CIRCULAR	0.019	RCP	0.0	0.0	None		0	0.0	0.9	None	0.0	6.1	None	0.0	6.0	None
PIPE12075	A3	ZPIP15839	2.5	0	1	CIRCULAR	0.005	HDPE	4.6	4.6	None		0.16	7.3	7.3	None	11.5	10.7	None	16.7	12.0	None
PIPE12090	A3	ZPIP15860	2.5	0	1	CIRCULAR	0.006	HDPE	5.2	5.2	None		0.16	15.2	8.1	None	17.0	11.9	None	36.4	13.4	None
CULV10156	A3	ZCUL11918D	3	5	3	RECT_CLOSED	0.009	RCP	81.3	91.1	None		0.19	127.1	141.6	None	169.4	176.2	None	187.6	199.9	None
PIPE12295	A3	ZPIP15928	5.5	12	3	RECT_CLOSED	0.005	RCP	300.1	283.7	None		0.12	821.3	725.2	None	1039.6	896.1	None	1105.3	975.3	None
PIPE12306	A3	ZPIP19074	5.5	12	3	RECT_CLOSED	0.005	RCP	299.3	285.6	None		0.12	822.2	725.1	None	1041.2	896.1	None	1106.8	975.4	None
PIPE11674	A3	ZPIP10367	1.5	0	1	CIRCULAR	0.009	RCP	1.6	1.6	None		0.16	2.5	2.5	None	3.6	3.6	None	4.1	4.1	None
PIPE11970	A3	ZPIP15198	6	0	2	CIRCULAR	0.022	RCP	186.2	228.5	None		0.18	316.7	354.4	None	459.9	450.0	None	523.1	513.4	None
PIPE12010	A3	ZPIP11631	1.5	0	1	CIRCULAR	0.028	RCP	0.0	0.0	None		0	0.0	5.3	None	0.0	7.4	None	0.0	7.2	None
PIPE12172	A3	ZPIP19091	3.5	0	1	CIRCULAR	0.036	CIPCP	19.8	19.8	None		0.12	38.2	38.1	None	58.9	58.9	None	67.7	67.7	None
PIPE12173	A3	ZPIP19092	3.5																			

Existing Condition Storm Conveyance Results Summary Table																					
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year		
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)
PIPE11629	A3	ZPIP10267	1.5	0	1	CIRCULAR	0.060	RCP	2.0	2.0	None	0.08	3.2	3.2	None	4.7	4.7	None	5.3	5.3	None
CULV10143	A3	ZCUL13009	7	10	1	RECT_CLOSED	0.010	RCP	235.1	245.1	Both Upstream and Downstream	0.19	445.9	236.1	Both Upstream and Downstream	594.5	250.9	Both Upstream and Downstream	664.7	264.8	Both Upstream and Downstream
PIPE11956	A3	ZPIP15183	7	10	1	RECT_CLOSED	0.010	RCP	235.3	244.3	Both Upstream and Downstream	0.19	447.0	242.5	Both Upstream and Downstream	596.6	249.9	Both Upstream and Downstream	667.1	263.5	Both Upstream and Downstream
PIPE11957	A3	ZPIP15184	7	10	1	RECT_CLOSED	0.010	RCP	234.9	243.6	Both Upstream and Downstream	0.19	447.9	243.2	Both Upstream and Downstream	598.1	249.4	Both Upstream and Downstream	668.8	263.0	Both Upstream and Downstream
PIPE12058	A3	ZPIP17499	2.5	0	1	CIRCULAR	0.011	RCP	3.0	3.0	None	0.07	4.9	5.0	None	7.4	7.5	None	8.5	8.5	None
CULV10163	A3	ZCUL16633	4	4	1	RECT_CLOSED	0.046	RCP	54.7	27.8	None	0.07	94.5	46.9	None	137.2	69.7	None	147.9	79.6	None
CULV10164	A3	ZCUL11893	4	10	1	RECT_CLOSED	0.006	RCP	56.5	30.9	None	0.07	93.2	51.9	None	169.3	77.4	None	170.6	91.6	None
CHAN10225	A3	ZCH10143A	0	0	1	IRREGULAR	0.020	Earthen	111.2	100.1	None	0.1	182.4	144.9	None	234.7	182.5	None	253.9	204.0	None
CHAN10226	A3	ZCH10143A	0	0	1	IRREGULAR	0.020	Earthen	111.2	100.1	None	0.1	182.4	144.9	None	234.7	182.5	None	253.9	203.9	None
CHAN10274	A3		0	0	1	IRREGULAR	0.012	Concrete	6.2	6.7	None	0.09	10.1	10.3	None	15.3	14.5	None	17.1	14.9	None
PIPE11506	A3	ZPIP12685	1.5	0	1	CIRCULAR	0.204	RCP	2.9	2.9	None	0.06	5.1	5.1	None	7.7	7.7	None	8.8	8.8	None
PIPE11913	A3	ZPIP11322	2	0	1	CIRCULAR	0.029	RCP	2.5	2.9	None	0.07	4.0	4.5	None	6.7	6.6	None	7.6	7.5	None
PIPE12005	A3	ZPIP15331	2	0	1	CIRCULAR	0.037	RCP	2.8	2.8	None	0.06	4.8	4.9	None	7.3	7.3	None	8.3	8.3	None
CULV10159	A3	ZCUL16801	4	4	1	RECT_CLOSED	0.046	RCP	54.0	26.1	None	0.07	97.3	44.1	None	133.2	65.5	None	146.3	74.8	None
CHAN10298	A3	CHO43D	4	4	1	TRAPEZOIDAL	0.005	Concrete	83.6	59.6	Both Upstream and Downstream	0.1	121.2	76.8	Both Upstream and Downstream	294.5	103.5	Both Upstream and Downstream	284.8	113.5	Both Upstream and Downstream
PIPE11544	A3	ZPIP12716	1.5	0	1	CIRCULAR	0.043	RCP	1.5	1.5	None	0.07	2.2	3.1	None	3.1	3.3	None	5.7	3.8	None
PIPE11789	A3	ZPIP13606	2.5	0	1	CIRCULAR	0.014	RCP	3.0	3.0	None	0.06	5.0	5.0	None	7.5	7.5	None	8.5	8.5	None
PIPE11611	A3	ZPIP12793	1.5	0	1	CIRCULAR	0.090	RCP	2.1	2.1	None	0.07	3.3	3.3	None	4.7	4.7	None	5.3	5.3	None
PIPE11869	A3	ZPIP17190	1.5	0	1	CIRCULAR	0.048	RCP	2.0	0.6	Both Upstream and Downstream	0.03	3.6	5.7	Both Upstream and Downstream	0.9	3.8	Both Upstream and Downstream	1.1	4.0	Both Upstream and Downstream
PIPE11880	A3	ZPIP14533	1.5	0	1	CIRCULAR	0.086	RCP	2.0	2.0	None	0.06	3.2	3.2	None	70.5	4.8	None	80.1	5.4	None
PIPE12049	A3	ZPIP17469	1.5	0	1	CIRCULAR	0.380	RCP	7.2	4.9	None	0.08	12.2	6.8	None	18.3	8.8	None	20.8	11.1	None
PIPE12205	A3		6	0	1	CIRCULAR	0.012	RCP	54.7	27.9	None	0.06	93.0	46.9	None	142.2	69.8	None	147.8	79.8	None
PIPE12206	A3		6	0	1	CIRCULAR	0.013	RCP	55.0	28.5	None	0.06	93.5	47.9	None	146.1	71.3	None	148.3	81.5	None
PIPE12232	A3	ZPIP17192	7	11	1	RECT_CLOSED	0.003	RCP	66.9	54.9	None	0.06	122.7	115.5	None	203.0	126.7	None	275.9	142.3	None
PIPE12274	A3	ZPIP11323	2	0	1	CIRCULAR	0.009	RCP	11.1	1.7	Both Upstream and Downstream	0.08	2.8	1.4	Both Upstream and Downstream	4.8	2.8	Both Upstream and Downstream	4.7	3.6	Both Upstream and Downstream
DTCH10272	A3	DD10036	0	0	1	IRREGULAR	0.073	CONCRETE	443.7	161.9	None	0.05	744.8	272.1	None	1172.0	509.5	None	1360.4	524.7	None
PIPE11668	A3	ZPIP12996	1.5	0	1	CIRCULAR	0.100	RCP	0.0	0.0	None	0	0.0	0.0	None	0.0	4.8	Downstream	0.0	5.4	Both Upstream and Downstream
PIPE11727	A3	ZPIP13167	1.5	0	1	CIRCULAR	0.042	RCP	0.0	0.0	None	0	0.0	0.0	None	0.0	0.7	None	0.0	3.5	None
PIPE11920	A3	ZPIP14856	1.5	0	1	CIRCULAR	0.079	RCP	1.8	1.8	None	0.06	2.8	2.8	None	4.1	4.1	None	4.7	4.7	None
PIPE12140	A3	ZPIP12205	3.5	5	1	RECT_OPEN	0.056	RCP	44.1	32.1	None	0.05	69.5	53.3	None	80.7	92.6	None	92.5	97.1	None
PIPE12204	A3	ZPIP17216	6	0	1	CIRCULAR	0.015	RCP	54.9	28.3	None	0.05	92.1	47.7	None	145.5	70.9	None	148.3	80.9	None
PIPE11529	A3	ZPIP12707	1.5	0	1	CIRCULAR	0.156	RCP	2.4	2.4	None	0.06	3.9	3.9	None	5.6	5.6	None	6.4	6.4	None
PIPE11566	A3	ZPIP10228	1.5	0	1	CIRCULAR	0.134	RCP	2.3	2.3	None	0.06	3.6	3.6	None	5.2	5.2	None	5.8	5.8	None
PIPE12283	A3	ZPIP11571	1.5	0	1	CIRCULAR	0.039	RCP	0.1	1.3	None	0.06	2.4	4.8	Both Upstream and Downstream	1.4	3.4	Both Upstream and Downstream	1.4	3.1	Both Upstream and Downstream
PIPE11552	A3	ZPIP12721	1.5	0	1	CIRCULAR	0.080	RCP	1.6	1.6	None										

ATTACHMENT 5
POST-DEVELOPMENT HYDROLOGY EXHIBIT





Source: City of San Marcos, Rick Engineering Company,
SANGIS/USGS Aerial Imagery: 11/2014



RICK
ENGINEERING COMPANY

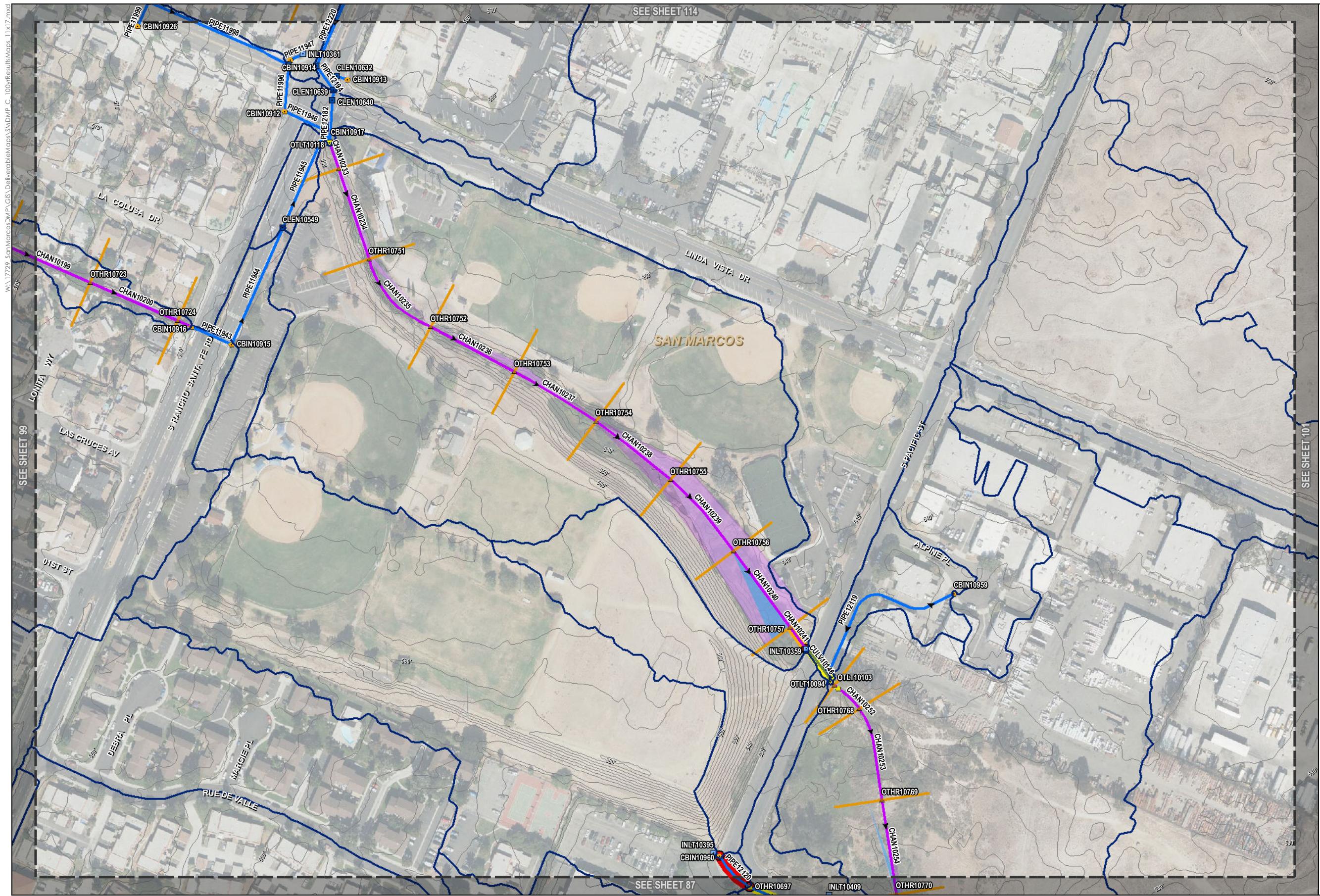
Scale in Feet

0 200 400



City of San Marcos - Drainage Master Plan
Existing Deficient Systems, 100 Year Results - Sheet 87

April, 2019



Source: City of San Marcos, Rick Engineering Company,
SANGIS/USGS Aerial Imagery: 11/2014



RICK
ENGINEERING COMPANY

Scale in Feet

0 200 400



City of San Marcos - Drainage Master Plan
Existing Deficient Systems, 100 Year Results - Sheet 100

April, 2019

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100-year) (cfs)	Surcharging (100-year)	
FLOW10091	A2		0	0	1	DUMMY	0.012	RCP	0.0	98.7	None		0	0.0	167.6	None	0.0	243.8	None	285.8	285.8	None
FLOW10092	A2		0	0	1	DUMMY	0.006	RCP	0.0	98.2	None		0	0.0	167.0	None	0.0	300.2	None	308.0	308.0	None
PIPE11928	A3	ZPIP11347	1.5	0	1	CIRCULAR	0.006	RCP	56.0	40.5	Both Upstream and Downstream		5.17	90.5	52.8	Both Upstream and Downstream	133.4	66.2	Both Upstream and Downstream	153.2	71.9	Both Upstream and Downstream
PIPE11995	A3	ZPIP17423	1.5	0	1	CIRCULAR	0.001	PVC	10.8	9.2	Upstream		3.41	18.0	13.4	Upstream	27.1	18.1	Upstream	30.9	20.1	Upstream
PIPE11871	A3	ZPIP11140	2	0	2	CIRCULAR	0.001	RCP	43.5	44.2	Both Upstream and Downstream		2.56	86.2	75.3	Both Upstream and Downstream	110.5	107.7	Both Upstream and Downstream	126.5	123.9	Both Upstream and Downstream
PIPE11796	A3	ZPIP13803	1.5	0	1	CIRCULAR	0.004	RCP	15.1	14.5	Downstream		2.32	25.8	23.7	Both Upstream and Downstream	39.2	34.9	Both Upstream and Downstream	44.9	39.6	Both Upstream and Downstream
PIPE11654	A3	ZPIP16773	1.083	0	1	CIRCULAR	0.005	CMP	7.2	4.9	Upstream		2.9	12.2	6.8	Upstream	18.3	8.8	Upstream	20.8	9.6	Upstream
PIPE11655	A3	ZPIP16774	1.083	0	1	CIRCULAR	0.006	CMP	7.2	4.9	None		2.68	12.2	6.8	None	18.3	8.8	None	20.8	9.6	None
PIPE12066	A3	ZPIP17503	1.5	0	1	CIRCULAR	0.001	RCP	8.7	9.0	None		2.46	15.3	15.3	None	26.0	17.5	Upstream	28.6	18.7	Upstream
PIPE12202	A3	ZPIP15865	4	0	1	CIRCULAR	0.000	HDPE	30.5	24.7	None		1.84	90.4	52.7	Both Upstream and Downstream	78.8	70.0	Both Upstream and Downstream	85.5	65.0	Both Upstream and Downstream
CULV10154	A3	CUL13262	3.583	2.25	1	ARCH	0.003	CMP	26.3	19.5	None		0.88	50.0	35.5	None	72.3	94.5	Upstream	83.4	106.1	Both Upstream and Downstream
PIPE12290	A3	ZPIP11574	1.5	0	1	CIRCULAR	0.001	RCP	0.1	2.9	None		0.96	0.8	6.0	Both Upstream and Downstream	5.7	15.4	Both Upstream and Downstream	13.0	12.2	Both Upstream and Downstream
PIPE12133	A3	ZPIP16083	1	0	1	CIRCULAR	0.042	CMP	9.0	7.2	Upstream		1.83	15.0	10.5	Upstream	41.0	14.1	Both Upstream and Downstream	43.8	15.9	Both Upstream and Downstream
PIPE12210	A3	ZPIP14864	2	0	1	CIRCULAR	0.003	RCP	15.9	16.1	None		1.4	27.2	27.1	None	41.3	40.1	Upstream	47.3	45.7	Upstream
PIPE12015	A3	ZPIP15401	2.5	0	1	CIRCULAR	0.002	RCP	28.4	34.2	None		2.06	39.2	58.2	None	42.2	64.2	None	45.0	65.2	None
PIPE11801	A3	ZPIP17042	3.25	0	1	CIRCULAR	0.001	RCP	53.2	52.4	None		2.01	89.3	88.0	None	139.5	98.2	Upstream	158.9	100.7	Upstream
PIPE11929	A3	ZPIP14874	2	0	1	CIRCULAR	0.007	RCP	57.8	40.9	Both Upstream and Downstream		2.17	93.9	53.1	Both Upstream and Downstream	138.2	66.6	Both Upstream and Downstream	158.7	72.4	Both Upstream and Downstream
PIPE11898	A3	ZPIP11209	1.5	0	1	CIRCULAR	0.002	RCP	0.0	0.0	None		0	0.0	0.0	None	0.1	0.1	None	0.1	18.1	None
PIPE11799	A3	ZPIP17040	3.5	0	1	CIRCULAR	0.001	RCP	60.6	60.6	None		1.95	100.9	97.3	None	163.9	108.9	None	183.1	112.2	None
PIPE11925	A3	ZPIP14866	2.5	0	1	CIRCULAR	0.003	RCP	27.7	27.6	None		1.18	51.9	48.3	Both Upstream and Downstream	81.3	71.7	Both Upstream and Downstream	93.4	81.6	Both Upstream and Downstream
PIPE11953	A3	ZPIP11498	2.5	0	1	CIRCULAR	0.005	CMP	29.4	27.6	None		1.71	47.5	38.0	Upstream	68.2	48.6	Upstream	77.7	53.3	Upstream
PIPE12156	A3	ZPIP16535	1.5	0	1	CIRCULAR	0.002	RCP	4.9	5.0	None		1.18	8.3	9.0	None	12.5	13.4	None	14.2	13.8	None
PIPE11927	A3	ZPIP11346	2	0	1	CIRCULAR	0.010	RCP	57.8	40.9	Both Upstream and Downstream		1.81	93.9	53.0	Both Upstream and Downstream	138.4	65.5	Both Upstream and Downstream	158.8	72.2	Both Upstream and Downstream
PIPE11931	A3	ZPIP17269	2	0	1	CIRCULAR	0.011	RCP	62.1	42.5	Both Upstream and Downstream		1.8	101.3	55.0	Both Upstream and Downstream	149.3	68.9	Both Upstream and Downstream	171.4	74.8	Both Upstream and Downstream
PIPE11800	A3	ZPIP17041	3	0	1	CIRCULAR	0.001	RCP	31.0	30.2	None		1.37	53.1	56.5	None	82.0	66.9	Both Upstream and Downstream	94.6	68.9	Both Upstream and Downstream
PIPE12302	A3	ZPIP10920	2.5	0	1	CIRCULAR	0.004	RCP	73.4	50.7	None		2.06	110.5	60.3	Upstream	247.7	72.0	Upstream	239.3	77.0	Upstream
PIPE11642	A3	ZPIP16768	3.5	0	1	CIRCULAR	0.005	CIPCP	362.4	182.5	Upstream		2.86	605.4	192.5	Upstream	894.2	196.6	Upstream	998.4	198.3	Upstream
PIPE11782	A3	ZPIP10625	1.5	0	1	CIRCULAR	0.006	RCP	0.1	2.8	None		0.33	0.1	22.3	Both Upstream and Downstream	0.2	24.6	Both Upstream and Downstream	0.2	25.4	Both Upstream and Downstream
PIPE12225	A3	ZPIP10627	2.5	0	1	CIRCULAR	0.002	RCP	26.4	23.9	None		1.29	48.6	38.0	None	74.9	51.4	None	82.9	54.1	Upstream
PIPE12164	A3	ZPIP19069	4	0	2	CIRCULAR	0.005	CIPCP	524.9	138.0	None		0.8	903.3	253.2	None	1258.3	482.9	Upstream	1371.1	486.5	Upstream
PIPE11906	A3	ZPIP14764	3	0	1	CIRCULAR	0.004	HDPE	64.5	64.5	None		1.52	102.0	99.8	None	149.7	113.5	None	169.3	116.0	None
PIPE12163	A3	ZPIP19068	4	0	2	CIRCULAR	0.005	CIPCP	523.5	134.9	None		0.78	896.8	247.9	None	1245.9	471.7	Both Upstream and Downstream	1355.5	471.1	Both Upstream and Downstream
PIPE12161	A3	ZPIP17908	1.5	0	1	CIRCULAR	0.006	RCP	7.7	7.7	None		0.92	12.8	12.8	None	19.5	19.5	None	22.5	22.4	None
PIPE11855	A3	ZPIP143																				

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11667	A3	ZPIP10366	1.5	0	1	CIRCULAR	0.027	RCP	6.0	6.0	None		0.35	9.5	9.5	None	13.9	16.1	None	15.6	21.5	None
PIPE11717	A3	ZPIP10443	2.25	0	1	CIRCULAR	0.011	RCP	16.5	16.5	None		0.52	27.4	26.1	None	41.1	40.0	None	46.9	40.2	None
CULV10137	A3	ZCUL12204	4	8	1	RECT_CLOSED	0.002	RCP	110.6	120.6	None		0.57	168.8	191.2	None	241.4	248.0	None	253.0	267.7	None
PIPE12018	A3	ZPIP11635	3.5	0	1	CIRCULAR	0.004	RCP	44.5	44.4	None		0.66	73.2	91.9	None	111.3	82.4	Both Upstream and Downstream	126.7	84.1	Both Upstream and Downstream
PIPE11840	A3	ZPIP17070	1.5	0	1	CIRCULAR	0.010	RCP	4.5	4.6	None		0.45	7.3	7.5	None	11.2	11.2	None	12.8	12.8	None
PIPE12022	A3	ZPIP15406	3	0	1	CIRCULAR	0.012	RCP	38.5	38.6	None		0.53	63.7	77.0	None	97.3	91.0	Both Upstream and Downstream	110.9	91.2	Both Upstream and Downstream
PIPE12251	A3	ZPIP15290	1.5	0	1	CIRCULAR	0.005	RCP	2.1	6.5	None		0.87	3.4	3.4	Both Upstream and Downstream	6.6	4.7	Both Upstream and Downstream	5.5	9.2	Both Upstream and Downstream
CHAN10221	A3	CH10142C	0	0	1	IRREGULAR	0.005	Earthen	199.0	225.6	None		0.72	314.6	362.0	Upstream	326.2	417.8	Upstream	268.2	388.0	Upstream
DTCH10276	A3	DD055A	0	0	1	IRREGULAR	0.001	CONCRETE	522.0	178.6	None		0.45	921.3	262.3	None	1171.5	485.5	Both Upstream and Downstream	1353.8	500.1	Both Upstream and Downstream
PIPE12017	A3	ZPIP11634	3.5	0	1	CIRCULAR	0.004	RCP	48.0	47.4	None		0.74	79.4	80.9	Downstream	120.4	82.0	Both Upstream and Downstream	136.8	78.8	Both Upstream and Downstream
PIPE12064	A3	ZPIP15559	1.5	0	1	CIRCULAR	0.002	RCP	0.7	3.6	None		0.7	1.1	5.8	None	1.7	5.7	None	1.6	6.3	Downstream
PIPE12124	A3	ZPIP11929	3.5	0	3	CIRCULAR	0.003	RCP	81.4	91.2	None		0.56	127.3	141.7	None	169.9	176.2	None	187.8	200.3	None
PIPE11682	A3	ZPIP10379	6	0	1	CIRCULAR	0.015	CIPCP	499.0	325.6	None		0.72	820.0	444.9	None	1199.0	543.5	None	1362.6	549.8	None
PIPE11804	A3	ZPIP10820	2.5	0	1	CIRCULAR	0.058	CMP	26.5	26.7	None		0.5	41.7	42.1	None	63.3	58.8	None	75.2	65.0	None
PIPE11836	A3	ZPIP13972	2	0	1	CIRCULAR	0.005	RCP	7.2	7.2	None		0.44	11.3	11.4	None	16.5	17.3	None	18.6	19.9	None
CHAN10285	A3	CH050A	0	0	1	IRREGULAR	0.002	Concrete	93.7	112.5	None		0.62	146.9	172.3	None	204.8	206.4	None	228.7	221.7	None
PIPE11588	A3	ZPIP12751	1.5	0	1	CIRCULAR	0.033	RCP	8.6	8.6	None		0.45	13.7	13.7	None	20.2	20.1	None	22.8	23.1	None
PIPE11661	A3	ZPIP12992	1.75	0	1	CIRCULAR	0.096	RCP	27.2	27.3	None		0.56	47.7	47.7	None	72.1	58.0	Upstream	82.3	59.7	Upstream
PIPE12285	A3	ZPIP15293	1.5	0	1	CIRCULAR	0.004	RCP	0.0	0.0	None		0	0.7	2.9	Both Upstream and Downstream	25.6	4.0	Both Upstream and Downstream	7.5	8.4	Both Upstream and Downstream
PIPE11534	A3	ZPIP12709	4.5	0	1	CIRCULAR	0.015	RCP	99.7	100.1	None		0.42	172.8	173.1	None	254.5	255.5	None	281.5	290.4	None
PIPE11681	A3	ZPIP10378	6	0	1	CIRCULAR	0.015	CIPCP	496.1	322.7	None		0.72	814.9	440.6	None	1193.3	526.5	None	1354.6	537.9	None
PIPE11720	A3	ZPIP10446	1.5	0	1	CIRCULAR	0.019	RCP	6.8	6.8	None		0.47	11.1	12.0	None	16.6	18.4	None	18.8	17.4	None
CULV10146	A3	CUL051A	4	0	1	CIRCULAR	0.010	RCP	99.9	89.7	None		0.63	166.3	131.4	Upstream	214.6	160.8	Upstream	232.2	172.0	Upstream
PIPE12197	A3	ZPIP10825	2	0	1	CIRCULAR	0.025	PVC	32.4	30.5	None		0.85	60.0	39.4	None	91.5	42.5	None	103.3	43.1	None
PIPE11828	A3	ZPIP10855	2.5	0	1	CIRCULAR	0.056	RCP	34.4	34.4	None		0.35	70.7	71.6	None	109.1	107.5	None	127.0	114.5	Upstream
PIPE12051	A3	ZPIP17471	2	0	1	CIRCULAR	0.011	RCP	9.9	9.9	None		0.43	17.0	16.2	None	25.5	23.1	None	29.1	27.4	None
PIPE12199	A3	ZPIP18000	1.5	0	1	CIRCULAR	0.024	RCP	5.7	5.3	None		0.33	9.3	9.2	None	11.0	17.4	None	11.9	19.1	None
PIPE12294	A3	ZPIP15301	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	34.7	35.1	None		0.67	63.7	50.4	Both Upstream and Downstream	115.5	53.9	Both Upstream and Downstream	107.6	61.3	Both Upstream and Downstream
PIPE11908	A3	ZPIP11288	4	0	1	CIRCULAR	0.005	HDPE	65.7	65.5	None		0.64	104.2	105.2	None	153.0	117.6	None	173.3	119.4	None
PIPE11613	A3	ZPIP10259	7	0	1	CIRCULAR	0.013	CIPCP	314.0	314.6	None		0.49	530.0	518.4	None	784.0	702.8	Upstream	866.9	742.8	Both Upstream and Downstream
PIPE11636	A3	ZPIP10269	2	0	1	CIRCULAR	0.095	RCP	28.2	28.1	None		0.4	46.3	45.1	None	69.5	70.7	Both Upstream and Downstream	79.0	80.5	Both Upstream and Downstream
PIPE11650	A3	ZPIP16769	1.5	0	1	CIRCULAR	0.096	RCP	10.2	10.2	None		0.31	17.1	17.1	None	25.4	30.3	None	28.8	37.7	None
CHAN10218	A3	CH10142B	0	0	1	IRREGULAR	0.005	Earthen	236.3	243.9	Downstream		1.08	417.2	249.5	Downstream	596.3	249.0	Downstream	646.6	262.3	Downstream

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11987	A3	ZPIP17409	1.5	0	1	CIRCULAR	0.008	PVC	3.3	3.3	None		0.36	4.1	5.4	None	8.4	8.1	None	9.5	9.2	None
PIPE12125	A3	ZPIP15995	4	0	3	CIRCULAR	0.005	RCP	102.8	134.6	None		0.44	185.9	208.6	None	285.1	262.1	None	329.3	302.1	None
PIPE12248	A3		6.5	0	1	CIRCULAR	0.016	CIPCP	502.6	331.7	None		0.58	825.8	462.2	None	1211.3	548.9	None	1371.3	557.8	None
PIPE11628	A3	ZPIP10266	5	0	1	CIRCULAR	0.032	CIPCP	140.8	141.4	None		0.35	245.3	246.1	None	362.7	365.4	None	405.7	388.1	None
PIPE11695	A3	ZPIP13072	3	0	1	CIRCULAR	0.018	RCP	29.6	29.8	None		0.33	50.5	50.2	None	76.3	75.5	None	87.4	87.2	None
PIPE12194	A3	PIP10788	4	0	1	CIRCULAR	0.016	RCP	70.6	66.7	None		0.36	141.3	113.6	None	214.0	158.6	None	243.4	176.3	None
PIPE12243	A3	ZPIP13176	3	0	1	CIRCULAR	0.052	RCP	52.5	52.8	None		0.35	88.0	88.0	None	134.5	136.2	None	152.8	145.3	None
PIPE11747	A3	ZPIP13182	1.75	0	1	CIRCULAR	0.016	RCP	5.0	5.1	None		0.25	9.8	9.8	None	15.2	15.2	None	17.5	18.8	None
PIPE12293	A3	ZPIP15300	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	34.8	34.1	None		0.65	64.0	52.4	Both Upstream and Downstream	116.6	46.3	Both Upstream and Downstream	107.9	49.9	Both Upstream and Downstream
PIPE11538	A3	ZPIP12713	1.5	0	1	CIRCULAR	0.018	RCP	5.1	5.1	None		0.36	8.1	8.1	None	11.9	11.9	None	13.4	13.4	None
PIPE11669	A3	ZPIP12997	1.75	0	1	CIRCULAR	0.092	RCP	15.4	15.5	None		0.32	28.7	28.7	None	44.0	42.9	Downstream	50.4	45.5	Downstream
PIPE11716	A3	ZPIP13144	1.5	0	1	CIRCULAR	0.010	RCP	1.1	1.1	None		0.1	1.7	2.6	None	2.6	14.7	None	2.9	9.8	None
PIPE11990	A3	ZPIP11590	2	0	1	CIRCULAR	0.021	RCP	8.6	8.7	None		0.27	16.0	16.0	None	24.4	27.4	None	27.9	30.6	None
PIPE11750	A3	ZPIP13185	1.5	0	1	CIRCULAR	0.070	RCP	10.4	10.4	None		0.38	16.8	16.8	None	24.8	24.0	None	28.1	25.9	None
PIPE11841	A3	ZPIP17071	6.5	0	1	CIRCULAR	0.003	RCP	108.7	118.4	None		0.43	167.8	185.5	None	240.2	237.9	None	251.8	255.6	None
PIPE11842	A3	ZPIP17072	6.5	0	1	CIRCULAR	0.003	RCP	109.3	117.4	None		0.43	175.4	183.7	None	266.5	236.7	None	278.3	253.6	None
PIPE11843	A3	ZPIP17073	6.5	0	1	CIRCULAR	0.003	RCP	110.4	117.2	None		0.42	179.9	183.9	None	281.8	241.3	None	305.4	261.4	None
PIPE11941	A3	ZPIP11352	6	0	2	CIRCULAR	0.004	RCP	186.5	229.3	None		0.41	317.1	354.4	None	461.0	451.5	None	523.1	519.2	None
PIPE12178	A3	ZPIP20007	3.5	0	1	CIRCULAR	0.015	HDPE	62.8	62.9	None		0.52	99.6	109.3	None	146.0	110.9	Both Upstream and Downstream	165.1	113.2	Both Upstream and Downstream
PIPE11631	A3	ZPIP16760	2.75	0	1	CIRCULAR	0.034	RCP	31.6	31.7	None		0.32	49.6	49.7	None	72.3	84.8	None	81.5	90.6	Downstream
PIPE11885	A3	ZPIP14599	2	0	1	CIRCULAR	0.016	RCP	9.9	9.9	None		0.35	15.8	15.8	None	23.4	23.2	None	26.5	26.1	None
PIPE11975	A3	ZPIP15243	1.5	0	1	CIRCULAR	0.013	RCP	3.8	3.8	None		0.32	6.5	6.5	None	9.8	9.8	None	11.1	11.1	None
PIPE12135	A3	ZPIP11973	2.5	0	1	CIRCULAR	0.116	RCP	58.0	58.0	None		0.41	93.5	174.9	None	676.6	149.6	Both Upstream and Downstream	688.7	129.3	Both Upstream and Downstream
CHUL10169	A3	CUL033B	4	6	1	RECT_CLOSED	0.003	RCP	80.2	55.1	Both Upstream and Downstream		0.32	127.0	67.1	Both Upstream and Downstream	384.3	139.7	Both Upstream and Downstream	371.8	160.7	Both Upstream and Downstream
PIPE12292	A3	ZPIP15299	2	3.167	2	HORIZ_ELLIPSE	0.004	RCP	39.6	36.8	None		0.71	68.6	52.9	Both Upstream and Downstream	132.4	47.6	Both Upstream and Downstream	122.0	47.9	Both Upstream and Downstream
PIPE11751	A3	ZPIP13186	1.5	0	1	CIRCULAR	0.084	RCP	10.4	10.4	None		0.34	16.8	16.8	None	24.8	24.8	None	28.1	27.6	None
PIPE11770	A3	ZPIP13200	4	0	1	CIRCULAR	0.015	RCP	56.5	56.8	None		0.32	94.4	94.2	None	143.8	145.2	None	163.3	159.6	None
PIPE11919	A3	ZPIP14855	2	0	1	CIRCULAR	0.030	RCP	12.0	12.0	None		0.3	21.0	20.9	None	31.7	31.4	None	36.1	35.7	None
PIPE11563	A3	ZPIP16736	3.5	0	1	CIRCULAR	0.043	RCP	77.2	74.9	None		0.36	129.7	122.8	None	193.8	169.0	None	220.5	187.6	None
PIPE11632	A3	ZPIP16761	6.5	0	1	CIRCULAR	0.013	CIPCP	168.7	169.4	None		0.32	290.0	290.3	None	428.4	461.8	Downstream	472.5	472.0	Both Upstream and Downstream
PIPE11988	A3	ZPIP17410	2	0	1	CIRCULAR	0.007	PVC	6.3	6.3	None		0.34	6.1	10.1	None	15.9	15.0	None	17.6	16.9	None
PIPE12048	A3	ZPIP15483	1.5	0	1	CIRCULAR	0.015	RCP	7.2	4.9	None		0.39	12.2	6.8	None	18.4	9.4	None	20.9	11.4	None
PIPE11728	A3	ZPIP13168	2	0	1	CIRCULAR	0.034	RCP	13.2	13.2	None		0.32	21.6	21.6	None	32.7	33.9	Downstream	37.3	37.4	Downstream
PIPE11763	A3	ZPIP13195	1.5</																			

Existing Condition Storm Conveyance Results Summary Table																					
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year		
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100-year) (cfs)	Surcharging (100-year)
PIPE11532	A3	ZPIP10215	4	0	1	CIRCULAR	0.064	RCP	82.2	82.3	None	0.23	139.8	139.9	None	208.0	209.1	None	237.1	238.4	None
PIPE11604	A3	ZPIP12788	4	0	1	CIRCULAR	0.061	RCP	80.5	80.5	None	0.23	136.9	137.0	None	204.4	204.7	None	233.0	233.6	None
PIPE11677	A3	ZPIP13002	2	0	1	CIRCULAR	0.045	RCP	12.4	12.4	None	0.26	19.5	19.4	None	28.4	28.2	None	32.1	31.8	None
PIPE11758	A3	ZPIP13190	1.5	0	1	CIRCULAR	0.010	RCP	0.0	0.0	None	0	0.0	0.0	None	0.0	0.2	None	0.0	0.6	None
PIPE12239	A3	ZPIP14861	5.5	0	2	CIRCULAR	0.004	CIPCP	174.1	114.0	None	0.31	189.9	162.3	None	327.6	218.7	None	331.8	244.1	None
CHAN10309	A3	CH062A	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.0	88.4	None	0.09	0.0	353.9	None	0.0	613.3	None	0.0	659.6	None
PIPE12318	A3	ZPIP16815	2	0	1	CIRCULAR	0.005	RCP	3.6	3.6	Both Upstream and Downstream	0.23	6.8	5.5	Both Upstream and Downstream	10.7	9.0	Both Upstream and Downstream	11.5	10.2	Both Upstream and Downstream
PIPE11530	A3	ZPIP12708	1.5	0	1	CIRCULAR	0.021	RCP	3.7	3.8	None	0.25	6.0	6.0	None	8.7	8.7	None	9.8	9.9	None
PIPE11586	A3	ZPIP10235	2	0	1	CIRCULAR	0.053	RCP	15.2	20.0	None	0.38	24.2	34.1	Downstream	35.5	34.9	Both Upstream and Downstream	40.1	33.9	Both Upstream and Downstream
PIPE11684	A3	ZPIP13026	1.5	0	1	CIRCULAR	0.015	RCP	3.2	2.9	None	0.23	5.8	5.3	None	7.0	7.3	None	9.4	8.2	None
CULV10153	A3	CUL055B	3.583	2.25	1	ARCH	0.046	CMP	16.8	14.5	None	0.16	37.7	28.2	None	48.3	65.5	None	56.1	57.3	None
PIPE12095	A3	ZPIP15866	4	0	1	CIRCULAR	0.005	RCP	32.0	25.6	None	0.25	86.2	42.3	Both Upstream and Downstream	73.0	72.3	Both Upstream and Downstream	88.3	66.9	Both Upstream and Downstream
PIPE12260	A3	ZPIP14000	4.5	0	1	CIRCULAR	0.003	RCP	24.4	24.2	None	0.24	38.7	39.3	None	53.6	56.7	None	51.3	65.5	None
PIPE11519	A3	ZPIP12700	4.5	0	1	CIRCULAR	0.058	RCP	104.6	105.1	None	0.22	180.8	181.2	None	265.6	266.9	None	295.2	305.4	None
PIPE11550	A3	ZPIP10221	3	0	1	CIRCULAR	0.064	RCP	39.8	39.8	None	0.24	64.9	64.9	None	95.3	95.3	None	109.1	109.1	None
PIPE11560	A3	ZPIP12727	1.5	0	1	CIRCULAR	0.021	RCP	3.7	3.7	None	0.24	5.9	5.9	None	8.7	8.6	None	9.7	9.7	None
PIPE11733	A3	ZPIP13170	2	0	1	CIRCULAR	0.020	RCP	5.0	5.0	None	0.16	10.1	10.1	None	18.0	18.0	None	20.5	20.5	None
PIPE11792	A3	ZPIP10786	2	0	2	CIRCULAR	0.018	CMP	8.0	8.0	None	0.24	12.9	13.0	None	15.1	18.3	Downstream	17.2	21.2	Downstream
PIPE12273	A3	ZPIP14484	2	0	1	CIRCULAR	0.005	RCP	3.1	3.6	Both Upstream and Downstream	0.23	6.8	4.9	Both Upstream and Downstream	11.0	8.7	Both Upstream and Downstream	11.5	9.9	Both Upstream and Downstream
CULV10170	A3	ZCUL16855	6	14	1	RECT_CLOSED	0.003	RCP	446.5	172.9	None	0.2	756.3	281.9	None	1554.3	538.0	None	1577.2	556.9	None
PIPE11845	A3	ZPIP10959	2	3.167	1	HORIZ_ELLIPSE	0.004	RCP	5.4	14.3	None	0.56	12.1	20.0	Downstream	18.0	16.4	Both Upstream and Downstream	19.1	15.9	Both Upstream and Downstream
PIPE11989	A3	ZPIP11589	2	0	1	CIRCULAR	0.027	RCP	7.0	7.0	None	0.19	13.1	13.1	None	20.0	20.0	None	23.0	23.4	None
CULV10178	A3	ZCUL069A	3	8	3	RECT_CLOSED	0.008	RCP	478.5	164.8	None	0.22	689.2	249.1	None	1129.6	468.1	Both Upstream and Downstream	1302.5	478.6	Both Upstream and Downstream
CHAN10314	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.5	65.3	None	0.06	1.5	311.3	None	2.5	565.8	None	3.0	631.1	None
CHAN10317	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	0.5	53.5	None	0.05	1.3	286.9	None	2.3	563.4	None	2.7	630.1	None
CHAN10319	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	2.3	49.0	None	0.05	5.0	271.5	None	8.5	566.6	None	10.1	634.9	None
CHAN10320	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	1.9	46.5	None	0.05	4.4	261.7	None	11.0	565.2	None	19.7	634.6	None
CHAN10321	A3	CH062B	6	25	1	TRAPEZOIDAL	0.006	Earthen	1.8	45.8	None	0.05	5.0	260.9	None	35.3	562.9	None	86.9	634.1	None
PIPE11536	A3	ZPIP12711	3	0	1	CIRCULAR	0.079	RCP	37.8	37.9	None	0.2	66.8	67.0	None	101.0	101.3	None	115.2	115.9	None
CULV10138	A3	CUL066	3.5	8.5	2	RECT_CLOSED	0.007	RCP	192.7	219.3	None	0.34	333.8	360.2	Both Upstream and Downstream	372.5	421.7	Both Upstream and Downstream	284.3	395.2	Both Upstream and Downstream
PIPE11870	A3	ZPIP11138	2.75	0	1	CIRCULAR	0.051	CSP	14.0	14.1	Both Upstream and Downstream	0.22	27.1	25.9	Both Upstream and Downstream	35.4	34.7	Both Upstream and Downstream	40.6	39.9	Both Upstream and Downstream
CULV10144	A3	ZCUL14827	7	10	1	RECT_CLOSED	0.005	RCP	412.4	230.5	Both Upstream and Downstream	0.25	794.7	363.4	Both Upstream and Downstream	1284.6	530.7	Both Upstream and Downstream	1421.9	564.6	Both Upstream and Downstream
PIPE11888	A3	ZPIP17211	2	0	1	CIRCULAR	0.035	RCP	9.9	9.9	None	0.23	15.8	15.8	None	61.1	23.2	None	148.6	26.1	None
PIPE11952	A3	ZPIP11497	3	0	2	CIRCULAR	0.005	RCP	30.6	26.3	None	0.29	49.6	39.8	None	71.7	50.9	None	81.8	55.8	None
CULV10149	A3	ZCUL16854	6	14</td																	

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11778	A3	ZPIP10476	1.5	0	1	CIRCULAR	0.074	RCP	3.5	3.5	None		0.12	5.9	5.9	None	8.9	8.9	None	10.1	10.1	None
PIPE11876	A3	ZPIP14493	1.5	0	1	CIRCULAR	0.017	RCP	0.4	0.1	None		0.01	1.2	18.6	Both Upstream and Downstream	10.0	9.3	Both Upstream and Downstream	18.8	4.7	Both Upstream and Downstream
CULV10148	A3	ZCUL13955	7	11	1	RECT_CLOSED	0.005	RCP	133.7	138.2	Both Upstream and Downstream		0.13	261.9	226.6	Both Upstream and Downstream	399.2	370.0	Both Upstream and Downstream	300.2	369.8	Both Upstream and Downstream
PIPE12042	A3	ZPIP15444	2.5	0	1	CIRCULAR	0.008	RCP	4.9	5.0	None		0.13	7.8	7.9	None	11.4	11.5	None	12.8	13.0	None
PIPE12102	A3	ZPIP11872	2	0	1	CIRCULAR	0.005	HDPE	4.8	2.1	None		0.14	15.8	3.3	None	5.9	4.9	None	6.0	5.5	None
PIPE12136	A3	ZPIP11974	5.5	0	1	CIRCULAR	0.013	RCP	58.4	58.4	None		0.15	94.4	195.8	None	664.9	150.4	Both Upstream and Downstream	631.8	134.4	Both Upstream and Downstream
PIPE12177	A3	ZPIP20006	3.5	0	1	CIRCULAR	0.097	RCP	61.0	61.2	None		0.2	97.3	108.2	None	142.8	108.5	Both Upstream and Downstream	161.5	110.9	Both Upstream and Downstream
CULV10162	A3	ZCUL13082	3	5	2	RECT_CLOSED	0.031	RCP	78.6	81.7	None		0.14	127.8	127.6	None	267.5	181.3	None	323.1	198.7	None
PIPE11525	A3	ZPIP12703	2	0	1	CIRCULAR	0.035	RCP	5.6	5.6	None		0.13	8.8	8.8	None	12.8	12.8	None	14.4	14.5	None
PIPE11556	A3	ZPIP16734	1.5	0	1	CIRCULAR	0.012	RCP	1.6	1.6	None		0.13	2.5	2.5	None	3.6	3.6	None	4.0	4.0	None
PIPE11893	A3	ZPIP14610	2	8	1	RECT_CLOSED	0.017	RCP	22.8	23.0	None		0.11	39.8	40.0	None	60.8	60.9	None	69.6	69.8	None
PIPE12084	A3	ZPIP15858	2	0	1	CIRCULAR	0.004	HDPE	1.9	1.8	None		0.13	10.8	2.9	None	17.9	4.3	None	26.2	4.8	None
CULV10161	A3	ZCUL16808B	2	6	3	RECT_CLOSED	0.009	RCP	61.0	61.2	None		0.19	97.3	100.7	None	142.8	108.5	Both Upstream and Downstream	161.5	110.5	Both Upstream and Downstream
PIPE11561	A3	ZPIP12728	2	0	1	CIRCULAR	0.035	RCP	5.4	5.5	None		0.13	8.6	8.6	None	12.5	12.5	None	14.1	14.2	None
PIPE11754	A3	ZPIP10465	2.5	0	1	CIRCULAR	0.206	RCP	20.9	20.9	None		0.11	34.1	34.4	None	50.6	52.4	None	57.4	62.2	None
PIPE11761	A3	ZPIP13193	1.75	0	1	CIRCULAR	0.023	RCP	2.2	2.2	None		0.09	4.4	4.4	None	6.9	6.9	None	7.9	7.9	None
PIPE12023	A3	ZPIP17459	3	0	1	CIRCULAR	0.202	RCP	33.0	33.1	None		0.11	55.0	73.2	None	84.4	99.3	Both Upstream and Downstream	96.3	99.8	Both Upstream and Downstream
PIPE12053	A3	ZPIP17484	2.25	0	1	CIRCULAR	0.017	RCP	4.9	4.9	None		0.12	8.0	8.0	None	11.8	11.8	None	13.4	13.4	None
PIPE12233	A3	ZPIP16084	5.5	0	1	CIRCULAR	0.013	RCP	0.1	1.7	None		0	0.1	126.4	None	15.8	98.2	Both Upstream and Downstream	37.3	125.5	Both Upstream and Downstream
CULV10165	A3	ZCUL16808A	2	6	3	RECT_CLOSED	0.010	RCP	61.6	60.8	None		0.18	96.8	99.5	None	142.2	110.5	Both Upstream and Downstream	160.8	111.0	Both Upstream and Downstream
PIPE11766	A3	ZPIP13196	1.5	0	1	CIRCULAR	0.178	RCP	0.0	0.0	None		0	0.0	0.2	None	0.0	10.8	None	0.0	14.4	None
PIPE11889	A3	ZPIP17212	2	0	1	CIRCULAR	0.037	RCP	5.0	5.0	None		0.12	8.1	8.1	None	12.1	12.1	None	13.7	13.7	None
PIPE12092	A3	ZPIP17584	4	10	1	TRAPEZOIDAL	0.000	CMP	10.0	8.3	None		0.12	17.5	13.1	None	28.3	19.3	None	49.2	21.8	None
CHAN10297	A3	CHO43B	4	4	1	TRAPEZOIDAL	0.003	Concrete	77.2	60.2	Both Upstream and Downstream		0.12	122.5	76.3	Both Upstream and Downstream	373.3	138.7	Both Upstream and Downstream	360.0	159.2	Both Upstream and Downstream
PIPE11616	A3	ZPIP12802	2.75	0	1	CIRCULAR	0.034	RCP	1.8	1.8	None		0.02	2.9	2.9	None	4.2	33.1	None	4.8	30.2	None
PIPE11873	A3	ZPIP14489	1.5	0	1	CIRCULAR	0.058	RCP	2.9	2.9	Both Upstream and Downstream		0.11	4.7	4.7	Both Upstream and Downstream	7.1	6.9	Both Upstream and Downstream	8.1	7.9	Both Upstream and Downstream
PIPE12132	A3	ZPIP16082	7	11	1	RECT_CLOSED	0.005	RCP	132.0	120.9	None		0.11	205.5	304.8	Downstream	327.8	294.8	Both Upstream and Downstream	395.8	329.2	Both Upstream and Downstream
PIPE11739	A3	ZPIP10461	3	0	1	CIRCULAR	0.062	RCP	15.7	15.7	None		0.09	27.3	27.4	None	43.6	42.9	None	49.5	49.7	None
PIPE11812	A3	ZPIP13902	1.5	0	1	CIRCULAR	0.010	RCP	1.2	1.2	None		0.11	1.9	1.9	None	2.7	2.7	None	3.1	3.1	None
PIPE11820	A3	ZPIP10844	2.5	0	1	CIRCULAR	0.140	RCP	13.5	13.5	None		0.09	25.7	25.7	None	39.8	39.7	None	45.7	45.6	None
PIPE11832	A3	ZPIP13930	2.5	0	1	CIRCULAR	0.085	RCP	11.1	11.1	None		0.09	20.5	20.5	None	31.4	31.4	None	36.0	36.0	None
CHAN10296	A3	CHO60C	0	0	1	IRREGULAR	0.001	Earthen	671.8	437.4	Both Upstream and Downstream		0.15	759.4	596.1	Both Upstream and Downstream	767.1	784.1	Both Upstream and Downstream	1070.9	857.4	Both Upstream and Downstream
PIPE12304	A3	ZPIP19073	5.5	12	3	RECT_CLOSED	0.005	RCP	186.8	180.1	None		0.08	639.2	607.0	None	763.2	669.2	None	803.3	707.1	None
PIPE12305	A3	ZPIP19074	5.5																			

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (100- year) (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11960	A3	ZPIP17377	7	10	1	RECT_CLOSED	0.006	RCP	493.0	207.4	None		0.21	832.2	333.5	None	1264.3	536.2	None	1391.8	559.0	None
CULV10172	A3	ZCUL064B	6	14	1	RECT_CLOSED	0.004	RCP	446.1	173.3	None		0.18	755.6	282.1	None	1574.9	537.2	None	1605.6	563.4	None
PIPE11533	A3	ZPIP10216	4	0	1	CIRCULAR	0.095	RCP	85.9	85.8	None		0.19	145.3	145.5	None	215.7	217.2	None	245.8	248.6	None
PIPE11809	A3	ZPIP17062	3	0	1	CIRCULAR	0.058	RCP	29.0	29.0	None		0.18	51.7	51.7	None	78.3	78.4	None	89.5	89.6	None
PIPE11894	A3	ZPIP14612	7	10	1	RECT_CLOSED	0.006	RCP	449.9	175.4	None		0.18	762.4	284.2	None	1335.3	530.6	None	1291.2	549.9	None
PIPE11899	A3	ZPIP14616	3	0	2	CIRCULAR	0.007	RCP	36.1	32.0	None		0.28	59.1	48.9	None	85.6	66.1	Downstream	91.5	63.9	Downstream
PIPE11900	A3	ZPIP14617	3	0	2	CIRCULAR	0.007	RCP	36.0	32.0	None		0.28	57.4	47.8	Downstream	76.1	66.2	Both Upstream and Downstream	82.2	63.9	Both Upstream and Downstream
PIPE11959	A3	ZPIP17376	7	10	1	RECT_CLOSED	0.006	RCP	491.9	204.9	None		0.21	830.7	329.5	None	1263.4	534.9	None	1389.4	557.2	None
PIPE11965	A3	ZPIP15211	7	10	1	RECT_CLOSED	0.006	RCP	491.8	204.7	None		0.21	830.6	329.1	None	1264.7	535.1	None	1389.4	557.2	None
PIPE11966	A3	ZPIP11522	7	10	1	RECT_CLOSED	0.006	RCP	451.3	176.5	None		0.18	764.1	285.1	None	1297.1	532.1	None	1293.8	548.0	None
PIPE11967	A3	ZPIP15192	7	10	1	RECT_CLOSED	0.006	RCP	450.6	175.8	None		0.18	763.2	284.5	None	1292.5	529.6	None	1293.0	549.5	None
PIPE11539	A3	ZPIP12714	3	0	1	CIRCULAR	0.090	RCP	40.1	40.1	None		0.2	65.5	65.5	None	96.1	96.1	None	110.0	110.0	None
PIPE11591	A3	ZPIP16744	2	0	1	CIRCULAR	0.028	RCP	7.9	8.0	None		0.21	12.6	12.6	None	18.3	18.4	None	20.7	20.7	None
PIPE11679	A3	ZPIP13024	3	0	1	CIRCULAR	0.010	RCP	10.1	10.2	None		0.15	17.1	17.3	None	25.7	30.1	None	29.3	36.4	None
PIPE11732	A3	ZPIP13169	1.5	0	1	CIRCULAR	0.057	RCP	5.1	5.2	None		0.2	8.2	8.3	None	12.2	12.3	None	13.8	13.9	None
PIPE11935	A3	ZPIP14878	2.5	0	1	CIRCULAR	0.069	RCP	27.3	24.8	None		0.23	48.6	39.5	None	74.3	57.6	None	83.0	59.0	None
PIPE12108	A3	ZPIP15876	3	0	1	CIRCULAR	0.005	HDPE	14.6	9.4	None		0.21	14.4	15.0	None	25.0	22.2	None	27.7	25.1	None
PIPE12240	A3	ZPIP11525	5.5	0	2	CIRCULAR	0.005	RCP	122.4	118.5	None		0.26	191.8	164.4	None	285.4	225.1	None	320.9	250.7	None
PIPE12242	A3	ZPIP10225	4	0	1	CIRCULAR	0.075	RCP	88.5	86.2	None		0.22	147.7	140.5	None	219.7	195.0	None	249.9	216.8	None
CHAN10224	A3	CH10142D	0	0	1	IRREGULAR	0.014	Earthen	197.4	225.0	Downstream		0.33	278.6	355.6	Downstream	248.2	410.2	Downstream	259.1	380.7	Downstream
PIPE11615	A3	ZPIP12798	3.5	0	1	CIRCULAR	0.050	CIPCP	31.6	31.7	None		0.16	49.6	49.7	None	72.3	104.2	None	81.4	104.8	Both Upstream and Downstream
PIPE11659	A3	ZPIP12990	1.5	0	1	CIRCULAR	0.042	RCP	4.5	4.5	None		0.21	7.1	7.1	None	10.4	10.4	None	11.7	11.7	None
PIPE12006	A3	ZPIP15332	2	0	1	CIRCULAR	0.034	RCP	8.0	8.2	None		0.19	13.4	13.4	None	19.9	19.8	None	22.6	22.8	None
PIPE12119	A3	ZPIP11880	1.75	0	1	CIRCULAR	0.010	RCP	3.1	3.2	None		0.2	5.1	5.1	None	7.5	7.6	None	8.6	8.6	None
PIPE12291	A3	ZPIP15298	2.417	3.75	2	HORIZ_ELLIPSE	0.004	RCP	43.1	35.7	None		0.42	74.3	47.9	Both Upstream and Downstream	144.0	45.5	Both Upstream and Downstream	132.7	45.6	Both Upstream and Downstream
PIPE11545	A3	ZPIP12717	5.5	0	1	CIRCULAR	0.019	RCP	98.5	97.5	None		0.21	163.7	156.4	None	243.1	217.9	None	271.0	242.8	None
PIPE11921	A3	ZPIP14857	1.5	0	1	CIRCULAR	0.007	RCP	1.8	1.8	None		0.2	2.9	2.9	None	4.2	4.2	None	4.7	4.7	None
PIPE11922	A3	ZPIP14858	1.5	0	1	CIRCULAR	0.007	RCP	1.8	1.8	None		0.2	2.9	2.9	None	4.2	4.2	None	4.8	4.8	None
CHAN10310	A3	CH062A	6	25	1	TRAPEZOIDAL	0.008	Earthen	0.0	88.4	None		0.07	0.0	351.4	None	0.0	573.6	None	0.0	630.3	None
PIPE11589	A3	ZPIP12752	2	0	1	CIRCULAR	0.050	RCP	11.1	11.1	None		0.22	17.7	17.9	None	25.9	25.4	Downstream	29.3	26.4	Downstream
PIPE12170	A3	PIP19083	3	0	2	CIRCULAR	0.007	RCP	33.0	28.8	None		0.25	53.7	43.7	None	78.3	55.7	None	89.5	59.9	None
PIPE11946	A3	ZPIP14887	3	0	1	CIRCULAR	0.010	RCP	11.7	12.0	None		0.18	19.5	19.6	None	29.3	29.0	None	33.4	33.5	None
PIPE12087	A3	ZPIP11865	2.5	0	1	CIRCULAR	0.004	HDPE	5.2	5.2	None		0.19	15.3	8.1	None	15.8	11.9	None	33.6	13.4	None
PIPE12107	A3	ZPIP15875	3	0	1	CIRCULAR	0															

Existing Condition Storm Conveyance Results Summary Table																						
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year			
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Qcap	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100- year) (cfs)	Surcharging (100-year)	
PIPE11818	A3	ZPIP13908	3	0	1	CIRCULAR	0.028	RCP	15.1	15.1	None		0.14	28.1	28.1	None	43.3	43.2	None	49.7	49.6	None
PIPE12068	A3	ZPIP17578	3.5	0	1	CIRCULAR	0.006	HDPE	12.6	12.6	None		0.16	18.6	20.7	None	19.1	30.4	None	36.6	34.6	None
CULV10157	A3	ZCUL11918E	3	5	3	RECT_CLOSED	0.009	RCP	82.6	92.9	None		0.2	129.4	144.3	None	172.7	183.6	None	191.5	211.2	None
CHAN10290	A3	ZCH10206	0	0	1	IRREGULAR	0.031	Concrete	98.7	126.8	None		0.1	164.3	193.3	None	232.4	233.8	Downstream	261.9	556.3	Downstream
PIPE12313	A3	ZPIP15195	2	8	1	RECT_CLOSED	0.013	RCP	24.2	27.9	None		0.15	46.9	47.3	None	164.5	71.8	None	317.3	81.4	None
PIPE11522	A3	ZPIP10211	1.5	0	1	CIRCULAR	0.067	RCP	0.0	0.0	None		0	0.0	0.0	None	0.0	0.0	None	0.0	12.1	None
PIPE11743	A3	ZPIP13178	1.5	0	1	CIRCULAR	0.081	RCP	0.0	0.0	None		0	0.0	0.0	None	0.0	10.2	None	0.0	13.1	None
PIPE11772	A3	ZPIP10473	1.5	0	1	CIRCULAR	0.029	RCP	0.5	0.9	None		0.05	1.5	5.6	None	1.3	4.9	None	1.6	7.9	None
PIPE11847	A3	ZPIP14230	1.5	0	1	CIRCULAR	0.055	RCP	4.0	4.0	None		0.16	6.5	6.5	None	9.6	9.6	None	11.1	10.9	None
PIPE11865	A3	ZPIP14307	1.5	0	1	CIRCULAR	0.008	RCP	0.9	1.4	None		0.15	2.1	2.4	None	3.5	3.7	None	4.0	4.2	None
CULV10145	A3	ZCUL11918C	3	5	3	RECT_CLOSED	0.009	RCP	82.6	92.9	None		0.2	129.4	144.3	None	172.7	183.6	None	191.5	211.0	None
PIPE12169	A3	ZPIP19076	3	0	1	CIRCULAR	0.105	RCP	31.8	31.9	None		0.15	53.1	53.0	None	81.5	81.2	None	93.0	95.2	None
PIPE12276	A3	ZPIP14825	1.5	0	1	CIRCULAR	0.007	RCP	9.9	4.0	Both Upstream and Downstream		0.46	2.8	1.9	Both Upstream and Downstream	4.4	3.0	Both Upstream and Downstream	4.7	3.8	Both Upstream and Downstream
PIPE11567	A3	ZPIP12732	1.5	0	1	CIRCULAR	0.037	RCP	3.4	3.4	None		0.17	5.3	5.3	None	7.8	7.8	None	8.7	8.7	None
PIPE11596	A3	ZPIP12783	3.5	0	1	CIRCULAR	0.053	RCP	31.5	31.3	None		0.14	57.5	57.2	None	87.8	87.4	None	100.6	100.0	None
PIPE11657	A3	ZPIP10282	1.5	0	1	CIRCULAR	0.015	ACP	0.0	0.0	None		0	0.1	0.1	None	0.1	3.6	Downstream	0.1	5.5	Both Upstream and Downstream
PIPE11745	A3	ZPIP13180	2	0	1	CIRCULAR	0.034	RCP	7.0	7.0	None		0.17	11.0	11.0	None	16.0	15.7	None	18.1	18.1	None
PIPE11838	A3	ZPIP13974	1.5	0	1	CIRCULAR	0.027	RCP	2.9	2.9	None		0.17	4.5	4.5	None	6.5	6.5	None	7.4	7.4	None
PIPE11998	A3	ZPIP11592	2.5	0	1	CIRCULAR	0.025	RCP	9.8	10.0	None		0.16	16.4	16.5	None	24.4	24.3	None	27.8	27.9	None
PIPE12028	A3	ZPIP11648	3	0	1	CIRCULAR	0.005	RCP	6.7	6.6	None		0.14	12.0	11.9	None	17.8	17.5	None	20.4	20.3	None
PIPE12209	A3	ZPIP14614	4	0	1	CIRCULAR	0.011	RCP	21.0	21.1	None		0.14	36.8	37.0	None	56.2	56.6	None	64.4	64.8	None
PIPE11505	A3	ZPIP12684	1.5	0	1	CIRCULAR	0.084	RCP	4.4	4.4	None		0.14	7.4	7.4	None	11.2	11.2	None	12.8	12.8	None
PIPE11508	A3	ZPIP12691	1.5	0	1	CIRCULAR	0.082	RCP	4.4	4.4	None		0.15	7.4	7.4	None	11.2	11.2	None	12.8	12.8	None
PIPE11697	A3	ZPIP10403	3.5	0	1	CIRCULAR	0.033	RCP	26.1	26.0	None		0.14	43.8	43.9	None	64.1	66.8	None	72.9	76.5	None
PIPE11719	A3	ZPIP10445	1.5	0	1	CIRCULAR	0.019	RCP	0.0	0.0	None		0	0.0	0.9	None	0.0	6.1	None	0.0	6.0	None
PIPE12075	A3	ZPIP15839	2.5	0	1	CIRCULAR	0.005	HDPE	4.6	4.6	None		0.16	7.3	7.3	None	11.5	10.7	None	16.7	12.0	None
PIPE12090	A3	ZPIP15860	2.5	0	1	CIRCULAR	0.006	HDPE	5.2	5.2	None		0.16	15.2	8.1	None	17.0	11.9	None	36.4	13.4	None
CULV10156	A3	ZCUL11918D	3	5	3	RECT_CLOSED	0.009	RCP	81.3	91.1	None		0.19	127.1	141.6	None	169.4	176.2	None	187.6	199.9	None
PIPE12295	A3	ZPIP15928	5.5	12	3	RECT_CLOSED	0.005	RCP	300.1	283.7	None		0.12	821.3	725.2	None	1039.6	896.1	None	1105.3	975.3	None
PIPE12306	A3	ZPIP19074	5.5	12	3	RECT_CLOSED	0.005	RCP	299.3	285.6	None		0.12	822.2	725.1	None	1041.2	896.1	None	1106.8	975.4	None
PIPE11674	A3	ZPIP10367	1.5	0	1	CIRCULAR	0.009	RCP	1.6	1.6	None		0.16	2.5	2.5	None	3.6	3.6	None	4.1	4.1	None
PIPE11970	A3	ZPIP15198	6	0	2	CIRCULAR	0.022	RCP	186.2	228.5	None		0.18	316.7	354.4	None	459.9	450.0	None	523.1	513.4	None
PIPE12010	A3	ZPIP11631	1.5	0	1	CIRCULAR	0.028	RCP	0.0	0.0	None		0	0.0	5.3	None	0.0	7.4	None	0.0	7.2	None
PIPE12172	A3	ZPIP19091	3.5	0	1	CIRCULAR	0.036	CIPCP	19.8	19.8	None		0.12	38.2	38.1	None	58.9	58.9	None	67.7	67.7	None
PIPE12173	A3	ZPIP19092	3.5																			

Existing Condition Storm Conveyance Results Summary Table																					
Conveyance Info			Dimensions					2-year				10-year				50-year			100-year		
Facility ID	SubWatershed	Original FacilityID	D' or H' (diameter) or (height)	B' (width)	Barrels	Shape	Slope (ft/ft)	Material	Q ₂ (cfs)	Q _{con} (2-year) (cfs)	Surcharging (2-year)	Q _{con} vs Q _{cap}	Q ₁₀ (cfs)	Q _{con} (10-year) (cfs)	Surcharging (10-year)	Q ₅₀ (cfs)	Q _{con} (50-year) (cfs)	Surcharging (50-year)	Q ₁₀₀ (cfs)	Q _{con} (100-year) (cfs)	Surcharging (100-year)
PIPE11629	A3	ZPIP10267	1.5	0	1	CIRCULAR	0.060	RCP	2.0	2.0	None	0.08	3.2	3.2	None	4.7	4.7	None	5.3	5.3	None
CULV10143	A3	ZCUL13009	7	10	1	RECT_CLOSED	0.010	RCP	235.1	245.1	Both Upstream and Downstream	0.19	445.9	236.1	Both Upstream and Downstream	594.5	250.9	Both Upstream and Downstream	664.7	264.8	Both Upstream and Downstream
PIPE11956	A3	ZPIP15183	7	10	1	RECT_CLOSED	0.010	RCP	235.3	244.3	Both Upstream and Downstream	0.19	447.0	242.5	Both Upstream and Downstream	596.6	249.9	Both Upstream and Downstream	667.1	263.5	Both Upstream and Downstream
PIPE11957	A3	ZPIP15184	7	10	1	RECT_CLOSED	0.010	RCP	234.9	243.6	Both Upstream and Downstream	0.19	447.9	243.2	Both Upstream and Downstream	598.1	249.4	Both Upstream and Downstream	668.8	263.0	Both Upstream and Downstream
PIPE12058	A3	ZPIP17499	2.5	0	1	CIRCULAR	0.011	RCP	3.0	3.0	None	0.07	4.9	5.0	None	7.4	7.5	None	8.5	8.5	None
CULV10163	A3	ZCUL16633	4	4	1	RECT_CLOSED	0.046	RCP	54.7	27.8	None	0.07	94.5	46.9	None	137.2	69.7	None	147.9	79.6	None
CULV10164	A3	ZCUL11893	4	10	1	RECT_CLOSED	0.006	RCP	56.5	30.9	None	0.07	93.2	51.9	None	169.3	77.4	None	170.6	91.6	None
CHAN10225	A3	ZCH10143A	0	0	1	IRREGULAR	0.020	Earthen	111.2	100.1	None	0.1	182.4	144.9	None	234.7	182.5	None	253.9	204.0	None
CHAN10226	A3	ZCH10143A	0	0	1	IRREGULAR	0.020	Earthen	111.2	100.1	None	0.1	182.4	144.9	None	234.7	182.5	None	253.9	203.9	None
CHAN10274	A3		0	0	1	IRREGULAR	0.012	Concrete	6.2	6.7	None	0.09	10.1	10.3	None	15.3	14.5	None	17.1	14.9	None
PIPE11506	A3	ZPIP12685	1.5	0	1	CIRCULAR	0.204	RCP	2.9	2.9	None	0.06	5.1	5.1	None	7.7	7.7	None	8.8	8.8	None
PIPE11913	A3	ZPIP11322	2	0	1	CIRCULAR	0.029	RCP	2.5	2.9	None	0.07	4.0	4.5	None	6.7	6.6	None	7.6	7.5	None
PIPE12005	A3	ZPIP15331	2	0	1	CIRCULAR	0.037	RCP	2.8	2.8	None	0.06	4.8	4.9	None	7.3	7.3	None	8.3	8.3	None
CULV10159	A3	ZCUL16801	4	4	1	RECT_CLOSED	0.046	RCP	54.0	26.1	None	0.07	97.3	44.1	None	133.2	65.5	None	146.3	74.8	None
CHAN10298	A3	CHO43D	4	4	1	TRAPEZOIDAL	0.005	Concrete	83.6	59.6	Both Upstream and Downstream	0.1	121.2	76.8	Both Upstream and Downstream	294.5	103.5	Both Upstream and Downstream	284.8	113.5	Both Upstream and Downstream
PIPE11544	A3	ZPIP12716	1.5	0	1	CIRCULAR	0.043	RCP	1.5	1.5	None	0.07	2.2	3.1	None	3.1	3.3	None	5.7	3.8	None
PIPE11789	A3	ZPIP13606	2.5	0	1	CIRCULAR	0.014	RCP	3.0	3.0	None	0.06	5.0	5.0	None	7.5	7.5	None	8.5	8.5	None
PIPE11611	A3	ZPIP12793	1.5	0	1	CIRCULAR	0.090	RCP	2.1	2.1	None	0.07	3.3	3.3	None	4.7	4.7	None	5.3	5.3	None
PIPE11869	A3	ZPIP17190	1.5	0	1	CIRCULAR	0.048	RCP	2.0	0.6	Both Upstream and Downstream	0.03	3.6	5.7	Both Upstream and Downstream	0.9	3.8	Both Upstream and Downstream	1.1	4.0	Both Upstream and Downstream
PIPE11880	A3	ZPIP14533	1.5	0	1	CIRCULAR	0.086	RCP	2.0	2.0	None	0.06	3.2	3.2	None	70.5	4.8	None	80.1	5.4	None
PIPE12049	A3	ZPIP17469	1.5	0	1	CIRCULAR	0.380	RCP	7.2	4.9	None	0.08	12.2	6.8	None	18.3	8.8	None	20.8	11.1	None
PIPE12205	A3		6	0	1	CIRCULAR	0.012	RCP	54.7	27.9	None	0.06	93.0	46.9	None	142.2	69.8	None	147.8	79.8	None
PIPE12206	A3		6	0	1	CIRCULAR	0.013	RCP	55.0	28.5	None	0.06	93.5	47.9	None	146.1	71.3	None	148.3	81.5	None
PIPE12232	A3	ZPIP17192	7	11	1	RECT_CLOSED	0.003	RCP	66.9	54.9	None	0.06	122.7	115.5	None	203.0	126.7	None	275.9	142.3	None
PIPE12274	A3	ZPIP11323	2	0	1	CIRCULAR	0.009	RCP	11.1	1.7	Both Upstream and Downstream	0.08	2.8	1.4	Both Upstream and Downstream	4.8	2.8	Both Upstream and Downstream	4.7	3.6	Both Upstream and Downstream
DTCH10272	A3	DD10036	0	0	1	IRREGULAR	0.073	CONCRETE	443.7	161.9	None	0.05	744.8	272.1	None	1172.0	509.5	None	1360.4	524.7	None
PIPE11668	A3	ZPIP12996	1.5	0	1	CIRCULAR	0.100	RCP	0.0	0.0	None	0	0.0	0.0	None	0.0	4.8	Downstream	0.0	5.4	Both Upstream and Downstream
PIPE11727	A3	ZPIP13167	1.5	0	1	CIRCULAR	0.042	RCP	0.0	0.0	None	0	0.0	0.0	None	0.0	0.7	None	0.0	3.5	None
PIPE11920	A3	ZPIP14856	1.5	0	1	CIRCULAR	0.079	RCP	1.8	1.8	None	0.06	2.8	2.8	None	4.1	4.1	None	4.7	4.7	None
PIPE12140	A3	ZPIP12205	3.5	5	1	RECT_OPEN	0.056	RCP	44.1	32.1	None	0.05	69.5	53.3	None	80.7	92.6	None	92.5	97.1	None
PIPE12204	A3	ZPIP17216	6	0	1	CIRCULAR	0.015	RCP	54.9	28.3	None	0.05	92.1	47.7	None	145.5	70.9	None	148.3	80.9	None
PIPE11529	A3	ZPIP12707	1.5	0	1	CIRCULAR	0.156	RCP	2.4	2.4	None	0.06	3.9	3.9	None	5.6	5.6	None	6.4	6.4	None
PIPE11566	A3	ZPIP10228	1.5	0	1	CIRCULAR	0.134	RCP	2.3	2.3	None	0.06	3.6	3.6	None	5.2	5.2	None	5.8	5.8	None
PIPE12283	A3	ZPIP11571	1.5	0	1	CIRCULAR	0.039	RCP	0.1	1.3	None	0.06	2.4	4.8	Both Upstream and Downstream	1.4	3.4	Both Upstream and Downstream	1.4	3.1	Both Upstream and Downstream
PIPE11552	A3	ZPIP12721	1.5	0	1	CIRCULAR	0.080	RCP	1.6	1.6	None	0.05	2.5	2.5	None	3.6	3.6	None	4.0	4.0	

ATTACHMENT 6

MODIFIED RATIONAL METHOD RUNOFF CALCULATIONS

Steps Taken To Analyze This Condition

The Rational Method Runoff Calculations are followed here. The software that we are using is the “Rational Hydrology Method, San Diego County (2003 Manual)” module of the CIVILCADD/CIVILDESIGN Engineering Software, Version 9.1.

Please see the subsequent pages for the calculations. These calculations are for the Q100. The results are outlined/summarized in Section 6.

6a. CivilD Pre-Development Q100 Calculations

1 San Diego County Rational Hydrology Program
2
3 CIVILCADD/CIVILDESIGN Engineering Software, (c) 1991-2019 Version 9.1
4
5 Rational method hydrology program based on
6 San Diego County Flood Control Division 2003 hydrology manual
7 Rational Hydrology Study Date: 05/03/22

8
9 21088-pre-onsite
10 user defined initial area
11
12
13
14 ***** Hydrology Study Control Information *****
15
16
17
18
19
20 Program License Serial Number 6332
21
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.200
28 24 hour precipitation(inches) = 5.500
29 P6/P24 = 58.2%
30 San Diego hydrology manual 'C' values used
31
32 ++++++
33 Process from Point/Station 104.000 to Point/Station 104.000
34 **** USER DEFINED FLOW INFORMATION AT A POINT ****
35
36 User specified 'C' value of 0.790 given for subarea
37 Rainfall intensity (I) = 1.960 (In/Hr) for a 100.0 year storm
38 User specified values are as follows:
39 TC = 48.00 min. Rain intensity = 1.96 (In/Hr)
40 Total area = 155.500 (Ac.) Total runoff = 240.800 (CFS)
41
42
43 ++++++
44 Process from Point/Station 104.000 to Point/Station 105.000
45 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
46
47 Depth of flow = 1.312 (Ft.), Average velocity = 4.006 (Ft/s)
48 !Warning: Water is above left or right bank elevations
49 ***** Irregular Channel Data *****
50
51 Information entered for subchannel number 1 :
52 Point number 'X' coordinate 'Y' coordinate
53 1 0.00 1.12
54 2 75.00 0.00
55 3 89.00 3.21
56 4 105.20 4.76
57 Manning's 'N' friction factor = 0.040
58
59 Sub-Channel flow = 240.801 (CFS)
60 ' ' flow top width = 80.720 (Ft.)
61 ' ' velocity= 4.006 (Ft/s)
62 ' ' area = 60.116 (Sq.Ft)
63 ' ' Froude number = 0.818
64
65 Upstream point elevation = 528.920 (Ft.)
66 Downstream point elevation = 519.320 (Ft.)
67 Flow length = 556.000 (Ft.)
68 Travel time = 2.31 min.

```

70 Time of concentration = 50.31 min.
71 Depth of flow = 1.312(Ft.)
72 Average velocity = 4.006(Ft/s)
73 Total irregular channel flow = 240.800(CFS)
74 Irregular channel normal depth above invert elev. = 1.312(Ft.)
75 Average velocity of channel(s) = 4.006(Ft/s)
76 !Warning: Water is above left or right bank elevations
77
78
79 ++++++
80 Process from Point/Station 105.000 to Point/Station 105.000
81 **** CONFLUENCE OF MINOR STREAMS ****
82
83 Along Main Stream number: 1 in normal stream number 1
84 Stream flow area = 155.500(Ac.)
85 Runoff from this stream = 240.800(CFS)
86 Time of concentration = 50.31 min.
87 Rainfall intensity = 1.902(In/Hr)
88
89
90 ++++++
91 Process from Point/Station 701.000 to Point/Station 105.000
92 **** USER DEFINED FLOW INFORMATION AT A POINT ****
93
94 User specified 'C' value of 0.640 given for subarea
95 Rainfall intensity (I) = 8.431(In/Hr) for a 100.0 year storm
96 User specified values are as follows:
97 TC = 5.00 min. Rain intensity = 8.431(In/Hr)
98 Total area = 2.141(Ac.) Total runoff = 11.550(CFS)
99
100
101 ++++++
102 Process from Point/Station 105.000 to Point/Station 105.000
103 **** CONFLUENCE OF MINOR STREAMS ****
104
105 Along Main Stream number: 1 in normal stream number 2
106 Stream flow area = 2.141(Ac.)
107 Runoff from this stream = 11.550(CFS)
108 Time of concentration = 5.00 min.
109 Rainfall intensity = 8.431(In/Hr)
110 Summary of stream data:
111
112 Stream Flow rate TC Rainfall Intensity
113 No. (CFS) (min) (In/Hr)
114
115
116 1 240.800 50.31 1.902
117 2 11.550 5.00 8.431
118 Qmax(1) =
119 1.000 * 1.000 * 240.800) +
120 0.226 * 1.000 * 11.550) + = 243.405
121 Qmax(2) =
122 1.000 * 0.099 * 240.800) +
123 1.000 * 1.000 * 11.550) + = 35.480
124
125 Total of 2 streams to confluence:
126 Flow rates before confluence point:
127 240.800 11.550
128 Maximum flow rates at confluence using above data:
129 243.405 35.480
130 Area of streams before confluence:
131 155.500 2.141
132 Results of confluence:
133 Total flow rate = 243.405(CFS)
134 Time of concentration = 50.313 min.
135 Effective stream area after confluence = 157.641(Ac.)
136
137
138 ++++++

```

139 Process from Point/Station 105.000 to Point/Station 106.000
 140 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 141
 142 Depth of flow = 1.397(Ft.), Average velocity = 4.587(Ft/s)
 143 ***** Irregular Channel Data *****
 144
 145 Information entered for subchannel number 1 :
 146 Point number 'X' coordinate 'Y' coordinate
 147 1 0.00 1.50
 148 2 75.00 0.00
 149 3 89.00 3.21
 150 4 105.20 4.76
 151 Manning's 'N' friction factor = 0.040
 152
 153 Sub-Channel flow = 243.405(CFS)
 154 ' ' flow top width = 75.954(Ft.)
 155 ' ' velocity= 4.587(Ft/s)
 156 ' ' area = 53.062(Sq.Ft)
 157 ' ' Froude number = 0.967
 158
 159 Upstream point elevation = 528.300(Ft.)
 160 Downstream point elevation = 519.320(Ft.)
 161 Flow length = 364.000(Ft.)
 162 Travel time = 1.32 min.
 163 Time of concentration = 51.64 min.
 164 Depth of flow = 1.397(Ft.)
 165 Average velocity = 4.587(Ft/s)
 166 Total irregular channel flow = 243.405(CFS)
 167 Irregular channel normal depth above invert elev. = 1.397(Ft.)
 168 Average velocity of channel(s) = 4.587(Ft/s)
 169
 170
 171 ++++++
 172 Process from Point/Station 106.000 to Point/Station 106.000
 173 **** CONFLUENCE OF MINOR STREAMS ****
 174
 175 Along Main Stream number: 1 in normal stream number 1
 176 Stream flow area = 157.641(Ac.)
 177 Runoff from this stream = 243.405(CFS)
 178 Time of concentration = 51.64 min.
 179 Rainfall intensity = 1.870(In/Hr)
 180
 181
 182 ++++++
 183 Process from Point/Station 301.000 to Point/Station 302.000
 184 **** INITIAL AREA EVALUATION ****
 185
 186 Decimal fraction soil group A = 0.000
 187 Decimal fraction soil group B = 0.000
 188 Decimal fraction soil group C = 0.000
 189 Decimal fraction soil group D = 1.000
 190 [UNDISTURBED NATURAL TERRAIN]
 191 (Permanent Open Space)
 192 Impervious value, Ai = 0.000
 193 Sub-Area C Value = 0.350
 194 Initial subarea total flow distance = 50.000(Ft.)
 195 Highest elevation = 530.380(Ft.)
 196 Lowest elevation = 528.790(Ft.)
 197 Elevation difference = 1.590(Ft.) Slope = 3.180 %
 198 Top of Initial Area Slope adjusted by User to 0.032 %
 199 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 200 The maximum overland flow distance is 50.00 (Ft)
 201 for the top area slope value of 0.03 %, in a development type of
 202 Permanent Open Space
 203 In Accordance With Table 3-2
 204 Initial Area Time of Concentration = 13.20 minutes
 205 (for slope value of 0.50 %)
 206 Rainfall intensity (I) = 4.508(In/Hr) for a 100.0 year storm
 207 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350

```

208 Subarea runoff =      0.131(CFS)
209 Total initial stream area =      0.083(Ac.)
210
211
212 ++++++
213 Process from Point/Station      302.000 to Point/Station      106.000
214 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
215
216 Estimated mean flow rate at midpoint of channel =      1.680(CFS)
217 Depth of flow =    0.179(Ft.), Average velocity =    1.483(Ft/s)
218     ***** Irregular Channel Data *****
219 -----
220 Information entered for subchannel number 1 :
221 Point number      'X' coordinate      'Y' coordinate
222     1            0.00                  1.00
223     2            43.00                 0.00
224     3            71.00                 1.00
225 Manning's 'N' friction factor =    0.030
226 -----
227 Sub-Channel flow =      1.680(CFS)
228     '        flow top width =    12.687(Ft.)
229     '        velocity=    1.483(Ft/s)
230     '        area =      1.134(Sq.Ft)
231     '        Froude number =    0.874
232
233 Upstream point elevation =    528.790(Ft.)
234 Downstream point elevation =   519.320(Ft.)
235 Flow length =    422.000(Ft.)
236 Travel time =    4.74 min.
237 Time of concentration = 17.94 min.
238 Depth of flow =    0.179(Ft.)
239 Average velocity =    1.483(Ft/s)
240 Total irregular channel flow =    1.680(CFS)
241 Irregular channel normal depth above invert elev. =    0.179(Ft.)
242 Average velocity of channel(s) =    1.483(Ft/s)
243 Adding area flow to channel
244 Rainfall intensity (I) =    3.698(In/Hr) for a    100.0 year storm
245 Decimal fraction soil group A = 0.000
246 Decimal fraction soil group B = 0.000
247 Decimal fraction soil group C = 0.000
248 Decimal fraction soil group D = 1.000
249 [UNDISTURBED NATURAL TERRAIN]
250 (Permanent Open Space )
251 Impervious value, Ai = 0.000
252 Sub-Area C Value = 0.350
253 Rainfall intensity =    3.698(In/Hr) for a    100.0 year storm
254 Effective runoff coefficient used for total area
255 (Q=KCIA) is C = 0.350 CA =    0.848
256 Subarea runoff =    3.006(CFS) for    2.341(Ac.)
257 Total runoff =    3.137(CFS) Total area =    2.424(Ac.)
258 Depth of flow =    0.226(Ft.), Average velocity =    1.733(Ft/s)
259
260
261 ++++++
262 Process from Point/Station      106.000 to Point/Station      106.000
263 **** CONFLUENCE OF MINOR STREAMS ****
264
265 Along Main Stream number: 1 in normal stream number 2
266 Stream flow area =    2.424(Ac.)
267 Runoff from this stream =    3.137(CFS)
268 Time of concentration = 17.94 min.
269 Rainfall intensity =    3.698(In/Hr)
270
271
272 ++++++
273 Process from Point/Station      501.000 to Point/Station      106.000
274 **** USER DEFINED FLOW INFORMATION AT A POINT ****
275
276 User specified 'C' value of 0.670 given for subarea

```

```

277 Rainfall intensity (I) =      5.052(In/Hr) for a   100.0 year storm
278 User specified values are as follows:
279 TC =  11.06 min.  Rain intensity =      5.05(In/Hr)
280 Total area =      8.629(Ac.)  Total runoff =     29.200(CFS)
281
282
283 ++++++
284 Process from Point/Station    502.000 to Point/Station    106.000
285 **** SUBAREA FLOW ADDITION ****
286
287 Rainfall intensity (I) =      5.052(In/Hr) for a   100.0 year storm
288 Decimal fraction soil group A = 0.000
289 Decimal fraction soil group B = 0.000
290 Decimal fraction soil group C = 0.000
291 Decimal fraction soil group D = 1.000
292 [UNDISTURBED NATURAL TERRAIN] ]
293 (Permanent Open Space )
294 Impervious value, Ai = 0.000
295 Sub-Area C Value = 0.350
296 Time of concentration = 11.06 min.
297 Rainfall intensity = 5.052(In/Hr) for a 100.0 year storm
298 Effective runoff coefficient used for total area
299 (Q=KCIA) is C = 0.669 CA = 5.795
300 Subarea runoff = 0.079(CFS) for 0.039(Ac.)
301 Total runoff = 29.279(CFS) Total area = 8.668(Ac.)
302
303
304 ++++++
305 Process from Point/Station    106.000 to Point/Station    106.000
306 **** CONFLUENCE OF MINOR STREAMS ****
307
308 Along Main Stream number: 1 in normal stream number 3
309 Stream flow area = 8.668(Ac.)
310 Runoff from this stream = 29.279(CFS)
311 Time of concentration = 11.06 min.
312 Rainfall intensity = 5.052(In/Hr)
313 Summary of stream data:
314
315 Stream      Flow rate          TC           Rainfall Intensity
316 No.        (CFS)            (min)         (In/Hr)
317
318
319   1       243.405      51.64          1.870
320   2       3.137        17.94          3.698
321   3       29.279      11.06          5.052
322 Qmax(1) =
323   1.000 *  1.000 *  243.405) +
324   0.506 *  1.000 *  3.137) +
325   0.370 *  1.000 *  29.279) + = 255.829
326 Qmax(2) =
327   1.000 *  0.348 *  243.405) +
328   1.000 *  1.000 *  3.137) +
329   0.732 *  1.000 *  29.279) + = 109.152
330 Qmax(3) =
331   1.000 *  0.214 *  243.405) +
332   1.000 *  0.616 *  3.137) +
333   1.000 *  1.000 *  29.279) + = 83.348
334
335 Total of 3 streams to confluence:
336 Flow rates before confluence point:
337   243.405      3.137      29.279
338 Maximum flow rates at confluence using above data:
339   255.829      109.152     83.348
340 Area of streams before confluence:
341   157.641      2.424      8.668
342 Results of confluence:
343 Total flow rate = 255.829(CFS)
344 Time of concentration = 51.636 min.
345 Effective stream area after confluence = 168.733(Ac.)

```

```

346
347
348 ++++++
349 Process from Point/Station      106.000 to Point/Station      107.000
350 **** PIPEFLOW TRAVEL TIME (User specified size) ****
351
352 Upstream point/station elevation = 519.320(Ft.)
353 Downstream point/station elevation = 518.410(Ft.)
354 Pipe length = 92.00(Ft.) Slope = 0.0099 Manning's N = 0.013
355 No. of pipes = 1 Required pipe flow = 255.829(CFS)
356 Given pipe size = 66.00(In.)
357 Calculated individual pipe flow = 255.829(CFS)
358 Normal flow depth in pipe = 43.31(In.)
359 Flow top width inside pipe = 62.69(In.)
360 Critical Depth = 53.47(In.)
361 Pipe flow velocity = 15.49(Ft/s)
362 Travel time through pipe = 0.10 min.
363 Time of concentration (TC) = 51.73 min.
364
365
366 ++++++
367 Process from Point/Station      107.000 to Point/Station      107.000
368 **** CONFLUENCE OF MINOR STREAMS ****
369
370 Along Main Stream number: 1 in normal stream number 1
371 Stream flow area = 168.733(Ac.)
372 Runoff from this stream = 255.829(CFS)
373 Time of concentration = 51.73 min.
374 Rainfall intensity = 1.868(In/Hr)
375
376
377 ++++++
378 Process from Point/Station      601.000 to Point/Station      602.000
379 **** INITIAL AREA EVALUATION ****
380
381 Decimal fraction soil group A = 0.000
382 Decimal fraction soil group B = 0.000
383 Decimal fraction soil group C = 0.000
384 Decimal fraction soil group D = 1.000
385 [MEDIUM DENSITY RESIDENTIAL ]  

386 (14.5 DU/A or Less )
387 Impervious value, Ai = 0.500
388 Sub-Area C Value = 0.630
389 Initial subarea total flow distance = 107.000(Ft.)
390 Highest elevation = 532.000(Ft.)
391 Lowest elevation = 526.000(Ft.)
392 Elevation difference = 6.000(Ft.) Slope = 5.607 %
393 Top of Initial Area Slope adjusted by User to 3.510 %
394 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
395 The maximum overland flow distance is 90.00 (Ft)
396 for the top area slope value of 3.51 %, in a development type of
397 14.5 DU/A or Less
398 In Accordance With Figure 3-3
399 Initial Area Time of Concentration = 5.28 minutes
400 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
401 TC = [1.8*(1.1-0.6300)*( 90.000^.5)/( 3.510^(1/3))] = 5.28
402 Rainfall intensity (I) = 8.139(In/Hr) for a 100.0 year storm
403 Effective runoff coefficient used for area (Q=KCIA) is C = 0.630
404 Subarea runoff = 0.482(CFS)
405 Total initial stream area = 0.094(Ac.)
406
407
408 ++++++
409 Process from Point/Station      602.000 to Point/Station      603.000
410 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
411
412 Estimated mean flow rate at midpoint of channel = 3.357(CFS)
413 Depth of flow = 0.392(Ft.), Average velocity = 1.588(Ft/s)
414 ***** Irregular Channel Data *****
```

```

415
416 Information entered for subchannel number 1 :
417 Point number      'X' coordinate      'Y' coordinate
418     1          0.00              0.60
419     2          20.00             0.13
420     3          22.00             0.00
421     4          22.00             0.50
422 Manning's 'N' friction factor =  0.015
423
424 Sub-Channel flow = 3.357(CFS)
425   '   ' flow top width = 13.146(Ft.)
426   '   ' velocity= 1.588(Ft/s)
427   '   ' area = 2.114(Sq.Ft)
428   '   ' Froude number = 0.698
429
430 Upstream point elevation = 528.490(Ft.)
431 Downstream point elevation = 525.660(Ft.)
432 Flow length = 925.000(Ft.)
433 Travel time = 9.71 min.
434 Time of concentration = 14.99 min.
435 Depth of flow = 0.392(Ft.)
436 Average velocity = 1.588(Ft/s)
437 Total irregular channel flow = 3.357(CFS)
438 Irregular channel normal depth above invert elev. = 0.392(Ft.)
439 Average velocity of channel(s) = 1.588(Ft/s)
440 Adding area flow to channel
441 Rainfall intensity (I) = 4.153(In/Hr) for a 100.0 year storm
442 Decimal fraction soil group A = 0.000
443 Decimal fraction soil group B = 0.000
444 Decimal fraction soil group C = 0.000
445 Decimal fraction soil group D = 1.000
446 [HIGH DENSITY RESIDENTIAL]
447 (43.0 DU/A or Less)
448 Impervious value, Ai = 0.800
449 Sub-Area C Value = 0.790
450 Rainfall intensity = 4.153(In/Hr) for a 100.0 year storm
451 Effective runoff coefficient used for total area
452 (Q=KCIA) is C = 0.782 CA = 1.480
453 Subarea runoff = 5.666(CFS) for 1.799(Ac.)
454 Total runoff = 6.148(CFS) Total area = 1.893(Ac.)
455 Depth of flow = 0.474(Ft.), Average velocity = 1.842(Ft/s)
456
457
458 ++++++
459 Process from Point/Station 603.000 to Point/Station 604.000
460 **** PIPEFLOW TRAVEL TIME (User specified size) ****
461
462 Upstream point/station elevation = 521.420(Ft.)
463 Downstream point/station elevation = 520.730(Ft.)
464 Pipe length = 69.00(Ft.) Slope = 0.0100 Manning's N = 0.013
465 No. of pipes = 1 Required pipe flow = 6.148(CFS)
466 Given pipe size = 18.00(In.)
467 Calculated individual pipe flow = 6.148(CFS)
468 Normal flow depth in pipe = 9.89(In.)
469 Flow top width inside pipe = 17.91(In.)
470 Critical Depth = 11.49(In.)
471 Pipe flow velocity = 6.18(Ft/s)
472 Travel time through pipe = 0.19 min.
473 Time of concentration (TC) = 15.17 min.
474
475
476 ++++++
477 Process from Point/Station 604.000 to Point/Station 107.000
478 **** PIPEFLOW TRAVEL TIME (User specified size) ****
479
480 Upstream point/station elevation = 520.730(Ft.)
481 Downstream point/station elevation = 518.410(Ft.)
482 Pipe length = 204.00(Ft.) Slope = 0.0114 Manning's N = 0.013
483 No. of pipes = 1 Required pipe flow = 6.148(CFS)

```

```

484 Given pipe size = 27.00 (In.)
485 Calculated individual pipe flow = 6.148 (CFS)
486 Normal flow depth in pipe = 7.89 (In.)
487 Flow top width inside pipe = 24.56 (In.)
488 Critical Depth = 10.15 (In.)
489 Pipe flow velocity = 6.36 (Ft/s)
490 Travel time through pipe = 0.53 min.
491 Time of concentration (TC) = 15.71 min.
492
493
494 ++++++
495 Process from Point/Station 107.000 to Point/Station 107.000
496 **** CONFLUENCE OF MINOR STREAMS ****
497
498 Along Main Stream number: 1 in normal stream number 2
499 Stream flow area = 1.893 (Ac.)
500 Runoff from this stream = 6.148 (CFS)
501 Time of concentration = 15.71 min.
502 Rainfall intensity = 4.029 (In/Hr)
503 Summary of stream data:
504
505 Stream Flow rate TC Rainfall Intensity
506 No. (CFS) (min) (In/Hr)
507
508
509 1 255.829 51.73 1.868
510 2 6.148 15.71 4.029
511 Qmax(1) =
512     1.000 * 1.000 * 255.829) +
513     0.464 * 1.000 * 6.148) + = 258.679
514 Qmax(2) =
515     1.000 * 0.304 * 255.829) +
516     1.000 * 1.000 * 6.148) + = 83.831
517
518 Total of 2 streams to confluence:
519 Flow rates before confluence point:
520     255.829 6.148
521 Maximum flow rates at confluence using above data:
522     258.679 83.831
523 Area of streams before confluence:
524     168.733 1.893
525 Results of confluence:
526 Total flow rate = 258.679 (CFS)
527 Time of concentration = 51.735 min.
528 Effective stream area after confluence = 170.626 (Ac.)
529 End of computations, total study area = 170.626 (Ac.)
530
531
532

```

6b. CivilD Post-Development Q100 Calculations

1 San Diego County Rational Hydrology Program
2
3 CIVILCADD/CIVILDESIGN Engineering Software, (c) 1991-2019 Version 9.1
4
5 Rational method hydrology program based on
6 San Diego County Flood Control Division 2003 hydrology manual
7 Rational Hydrology Study Date: 05/03/22

10 21088-post-onsite
11
12
13
14 -----
15 ***** Hydrology Study Control Information *****
16
17 -----
18
19
20 Program License Serial Number 6332
21
22 -----
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.200
28 24 hour precipitation(inches) = 5.500
29 P6/P24 = 58.2%
30 San Diego hydrology manual 'C' values used
31
32 ++++++
33 Process from Point/Station 301.000 to Point/Station 302.000
34 **** INITIAL AREA EVALUATION ****
35
36 -----
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 0.000
40 Decimal fraction soil group D = 1.000
41 [INDUSTRIAL area type]
42 (General Industrial)
43 Impervious value, Ai = 0.950
44 Sub-Area C Value = 0.870
45 Initial subarea total flow distance = 67.000 (Ft.)
46 Highest elevation = 532.210 (Ft.)
47 Lowest elevation = 531.880 (Ft.)
48 Elevation difference = 0.330 (Ft.) Slope = 0.493 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 50.00 (Ft)
51 for the top area slope value of 0.49 %, in a development type of
52 General Industrial
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 3.71 minutes
55 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
56 TC = [1.8*(1.1-0.8700)*(50.000^.5)/(0.493^(1/3))] = 3.71
57 Calculated TC of 3.706 minutes is less than 5 minutes,
58 resetting TC to 5.0 minutes for rainfall intensity calculations
59 Rainfall intensity (I) = 8.431 (In/Hr) for a 100.0 year storm
60 Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
61 Subarea runoff = 0.800 (CFS)
62 Total initial stream area = 0.109 (Ac.)
63
64
65 ++++++
66 Process from Point/Station 302.000 to Point/Station 303.000
67 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
68
69 Estimated mean flow rate at midpoint of channel = 5.210 (CFS)

```

70 Depth of flow = 0.398(Ft.), Average velocity = 2.106(Ft/s)
71 ***** Irregular Channel Data *****
72 -----
73 Information entered for subchannel number 1 :
74 Point number 'X' coordinate 'Y' coordinate
75 1 0.00 1.30
76 2 59.00 0.13
77 3 61.00 0.00
78 4 61.00 0.50
79 Manning's 'N' friction factor = 0.015
80 -----
81 Sub-Channel flow = 5.210(CFS)
82 ' ' flow top width = 15.505(Ft.)
83 ' ' velocity= 2.106(Ft/s)
84 ' ' area = 2.474(Sq.Ft)
85 ' ' Froude number = 0.929
86
87 Upstream point elevation = 531.880(Ft.)
88 Downstream point elevation = 528.870(Ft.)
89 Flow length = 557.000(Ft.)
90 Travel time = 4.41 min.
91 Time of concentration = 8.11 min.
92 Depth of flow = 0.398(Ft.)
93 Average velocity = 2.106(Ft/s)
94 Total irregular channel flow = 5.210(CFS)
95 Irregular channel normal depth above invert elev. = 0.398(Ft.)
96 Average velocity of channel(s) = 2.106(Ft/s)
97 Adding area flow to channel
98 Rainfall intensity (I) = 6.170(In/Hr) for a 100.0 year storm
99 Decimal fraction soil group A = 0.000
100 Decimal fraction soil group B = 0.000
101 Decimal fraction soil group C = 0.000
102 Decimal fraction soil group D = 1.000
103 [INDUSTRIAL area type ]  

104 (Limited Industrial )
105 Impervious value, Ai = 0.900
106 Sub-Area C Value = 0.850
107 Rainfall intensity = 6.170(In/Hr) for a 100.0 year storm
108 Effective runoff coefficient used for total area
109 (Q=KCIA) is C = 0.851 CA = 1.546
110 Subarea runoff = 8.738(CFS) for 1.707(Ac.)
111 Total runoff = 9.537(CFS) Total area = 1.816(Ac.)
112 Depth of flow = 0.479(Ft.), Average velocity = 2.443(Ft/s)
113
114
115 ++++++
116 Process from Point/Station 303.000 to Point/Station 304.000
117 **** PIPEFLOW TRAVEL TIME (User specified size) ****
118
119 Upstream point/station elevation = 523.870(Ft.)
120 Downstream point/station elevation = 521.740(Ft.)
121 Pipe length = 96.00(Ft.) Slope = 0.0222 Manning's N = 0.013
122 No. of pipes = 1 Required pipe flow = 9.537(CFS)
123 Given pipe size = 18.00(In.)
124 Calculated individual pipe flow = 9.537(CFS)
125 Normal flow depth in pipe = 10.15(In.)
126 Flow top width inside pipe = 17.85(In.)
127 Critical Depth = 14.30(In.)
128 Pipe flow velocity = 9.29(Ft/s)
129 Travel time through pipe = 0.17 min.
130 Time of concentration (TC) = 8.29 min.
131
132
133 ++++++
134 Process from Point/Station 304.000 to Point/Station 304.000
135 **** CONFLUENCE OF MINOR STREAMS ****
136
137 Along Main Stream number: 1 in normal stream number 1
138 Stream flow area = 1.816(Ac.)

```

```

139 Runoff from this stream = 9.537(CFS)
140 Time of concentration = 8.29 min.
141 Rainfall intensity = 6.087(In/Hr)
142
143
144 ++++++
145 Process from Point/Station 401.000 to Point/Station 402.000
146 **** INITIAL AREA EVALUATION ****
147
148 Decimal fraction soil group A = 0.000
149 Decimal fraction soil group B = 0.000
150 Decimal fraction soil group C = 0.000
151 Decimal fraction soil group D = 1.000
152 [INDUSTRIAL area type ]  

153 (General Industrial )
154 Impervious value, Ai = 0.950
155 Sub-Area C Value = 0.870
156 Initial subarea total flow distance = 100.000(Ft.)
157 Highest elevation = 532.210(Ft.)
158 Lowest elevation = 531.710(Ft.)
159 Elevation difference = 0.500(Ft.) Slope = 0.500 %
160 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
161 The maximum overland flow distance is 50.00 (Ft)
162 for the top area slope value of 0.50 %, in a development type of
163 General Industrial
164 In Accordance With Figure 3-3
165 Initial Area Time of Concentration = 3.69 minutes
166 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
167 TC = [1.8*(1.1-0.8700)*( 50.000^.5)/( 0.500^(1/3)]= 3.69
168 Calculated TC of 3.688 minutes is less than 5 minutes,
169 resetting TC to 5.0 minutes for rainfall intensity calculations
170 Rainfall intensity (I) = 8.431(In/Hr) for a 100.0 year storm
171 Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
172 Subarea runoff = 0.756(CFS)
173 Total initial stream area = 0.103(Ac.)
174
175
176 ++++++
177 Process from Point/Station 402.000 to Point/Station 403.000
178 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
179
180 Estimated mean flow rate at midpoint of channel = 1.915(CFS)
181 Depth of flow = 0.163(Ft.), Average velocity = 2.704(Ft/s)
182 ***** Irregular Channel Data *****
183
184 Information entered for subchannel number 1 :
185 Point number 'X' coordinate 'Y' coordinate
186 1 0.00 1.00
187 2 20.00 0.00
188 3 53.00 1.00
189 Manning's 'N' friction factor = 0.015
190
191 Sub-Channel flow = 1.915(CFS)
192 ' ' flow top width = 8.664(Ft.)
193 ' ' velocity= 2.704(Ft/s)
194 ' ' area = 0.708(Sq.Ft)
195 ' ' Froude number = 1.667
196
197 Upstream point elevation = 531.710(Ft.)
198 Downstream point elevation = 527.170(Ft.)
199 Flow length = 216.000(Ft.)
200 Travel time = 1.33 min.
201 Time of concentration = 5.02 min.
202 Depth of flow = 0.163(Ft.)
203 Average velocity = 2.704(Ft/s)
204 Total irregular channel flow = 1.915(CFS)
205 Irregular channel normal depth above invert elev. = 0.163(Ft.)
206 Average velocity of channel(s) = 2.704(Ft/s)
207 Adding area flow to channel

```

```

208 Rainfall intensity (I) = 8.410 (In/Hr) for a 100.0 year storm
209 Decimal fraction soil group A = 0.000
210 Decimal fraction soil group B = 0.000
211 Decimal fraction soil group C = 0.000
212 Decimal fraction soil group D = 1.000
213 [HIGH DENSITY RESIDENTIAL ]]
214 (43.0 DU/A or Less )
215 Impervious value, Ai = 0.800
216 Sub-Area C Value = 0.790
217 Rainfall intensity = 8.410 (In/Hr) for a 100.0 year storm
218 Effective runoff coefficient used for total area
219 (Q=KCIA) is C = 0.809 CA = 0.358
220 Subarea runoff = 2.257 (CFS) for 0.340 (Ac.)
221 Total runoff = 3.012 (CFS) Total area = 0.443 (Ac.)
222 Depth of flow = 0.194 (Ft.), Average velocity = 3.028 (Ft/s)
223
224
225 ++++++
226 Process from Point/Station 403.000 to Point/Station 304.000
227 **** PIPEFLOW TRAVEL TIME (User specified size) ****
228
229 Upstream point/station elevation = 523.870 (Ft.)
230 Downstream point/station elevation = 521.740 (Ft.)
231 Pipe length = 96.00 (Ft.) Slope = 0.0222 Manning's N = 0.013
232 No. of pipes = 1 Required pipe flow = 3.012 (CFS)
233 Given pipe size = 18.00 (In.)
234 Calculated individual pipe flow = 3.012 (CFS)
235 Normal flow depth in pipe = 5.36 (In.)
236 Flow top width inside pipe = 16.46 (In.)
237 Critical Depth = 7.92 (In.)
238 Pipe flow velocity = 6.84 (Ft/s)
239 Travel time through pipe = 0.23 min.
240 Time of concentration (TC) = 5.25 min.
241
242
243 ++++++
244 Process from Point/Station 304.000 to Point/Station 304.000
245 **** CONFLUENCE OF MINOR STREAMS ****
246
247 Along Main Stream number: 1 in normal stream number 2
248 Stream flow area = 0.443 (Ac.)
249 Runoff from this stream = 3.012 (CFS)
250 Time of concentration = 5.25 min.
251 Rainfall intensity = 8.166 (In/Hr)
252 Summary of stream data:
253
254 Stream Flow rate TC Rainfall Intensity
255 No. (CFS) (min) (In/Hr)
256
257
258 1 9.537 8.29 6.087
259 2 3.012 5.25 8.166
260 Qmax(1) =
261 1.000 * 1.000 * 9.537) +
262 0.745 * 1.000 * 3.012) + = 11.783
263 Qmax(2) =
264 1.000 * 0.634 * 9.537) +
265 1.000 * 1.000 * 3.012) + = 9.059
266
267 Total of 2 streams to confluence:
268 Flow rates before confluence point:
269 9.537 3.012
270 Maximum flow rates at confluence using above data:
271 11.783 9.059
272 Area of streams before confluence:
273 1.816 0.443
274 Results of confluence:
275 Total flow rate = 11.783 (CFS)
276 Time of concentration = 8.286 min.

```

277 Effective stream area after confluence = 2.259 (Ac.)
 278
 279
 280 ++++++
 281 Process from Point/Station 304.000 to Point/Station 304.000
 282 **** 6 HOUR HYDROGRAPH ****
 283
 284 ++++++
 285 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
 286
 287
 288 Time of Concentration = 8.29
 289 Basin Area = 2.26 Acres
 290 6 Hour Rainfall = 3.200 Inches
 291 Runoff Coefficient = 0.843
 292 Peak Discharge = 11.78 CFS
 293 Time (**Min**) Discharge (CFS)
 294 0 0.000
 295 8 0.364
 296 16 0.369
 297 24 0.381
 298 32 0.387
 299 40 0.399
 300 48 0.406
 301 56 0.421
 302 64 0.429
 303 72 0.446
 304 80 0.455
 305 88 0.474
 306 96 0.485
 307 104 0.508
 308 112 0.521
 309 120 0.549
 310 128 0.565
 311 136 0.600
 312 144 0.620
 313 152 0.664
 314 160 0.690
 315 168 0.750
 316 176 0.786
 317 184 0.871
 318 192 0.924
 319 200 1.059
 320 208 1.148
 321 216 1.404
 322 224 1.599
 323 232 2.347
 324 240 3.307
 325 248 11.783
 326 256 1.883
 327 264 1.260
 328 272 0.986
 329 280 0.826
 330 288 0.719
 331 296 0.641
 332 304 0.582
 333 312 0.535
 334 320 0.496
 335 328 0.464
 336 336 0.437
 337 344 0.413
 338 352 0.393
 339 360 0.375
 340 368 0.359
 341 ++++++
 342 6 - H O U R S T O R M
 343 Run off Hydrograph
 344 -----
 345 Hydrograph in 1 Minute intervals ((CFS))

346

347

348

349

Time (h+m)	Volume	Ac.Ft	Q (CFS)	0	2.9	5.9	8.8	11.8
350	0+ 0	0.0000	0.00	Q				
351	0+ 1	0.0001	0.05	Q				
352	0+ 2	0.0002	0.09	Q				
353	0+ 3	0.0004	0.14	Q				
354	0+ 4	0.0006	0.18	Q				
355	0+ 5	0.0009	0.23	Q				
356	0+ 6	0.0013	0.27	Q				
357	0+ 7	0.0018	0.32	VQ				
358	0+ 8	0.0023	0.36	VQ				
359	0+ 9	0.0028	0.36	VQ				
360	0+10	0.0033	0.37	VQ				
361	0+11	0.0038	0.37	VQ				
362	0+12	0.0043	0.37	VQ				
363	0+13	0.0048	0.37	VQ				
364	0+14	0.0053	0.37	VQ				
365	0+15	0.0058	0.37	VQ				
366	0+16	0.0063	0.37	VQ				
367	0+17	0.0068	0.37	VQ				
368	0+18	0.0073	0.37	VQ				
369	0+19	0.0078	0.37	VQ				
370	0+20	0.0084	0.37	VQ				
371	0+21	0.0089	0.38	VQ				
372	0+22	0.0094	0.38	VQ				
373	0+23	0.0099	0.38	VQ				
374	0+24	0.0104	0.38	VQ				
375	0+25	0.0110	0.38	VQ				
376	0+26	0.0115	0.38	VQ				
377	0+27	0.0120	0.38	VQ				
378	0+28	0.0125	0.38	VQ				
379	0+29	0.0131	0.38	|Q				
380	0+30	0.0136	0.39	|Q				
381	0+31	0.0141	0.39	|Q				
382	0+32	0.0147	0.39	|Q				
383	0+33	0.0152	0.39	|Q				
384	0+34	0.0157	0.39	|Q				
385	0+35	0.0163	0.39	|Q				
386	0+36	0.0168	0.39	|Q				
387	0+37	0.0174	0.39	|Q				
388	0+38	0.0179	0.40	|Q				
389	0+39	0.0185	0.40	|Q				
390	0+40	0.0190	0.40	|Q				
391	0+41	0.0196	0.40	|Q				
392	0+42	0.0201	0.40	|Q				
393	0+43	0.0207	0.40	|Q				
394	0+44	0.0212	0.40	|Q				
395	0+45	0.0218	0.40	|Q				
396	0+46	0.0223	0.40	|Q				
397	0+47	0.0229	0.41	|Q				
398	0+48	0.0235	0.41	|Q				
399	0+49	0.0240	0.41	|Q				
400	0+50	0.0246	0.41	|Q				
401	0+51	0.0251	0.41	|Q				
402	0+52	0.0257	0.41	|QV				
403	0+53	0.0263	0.42	|QV				
404	0+54	0.0269	0.42	|QV				
405	0+55	0.0274	0.42	|QV				
406	0+56	0.0280	0.42	|QV				
407	0+57	0.0286	0.42	|QV				
408	0+58	0.0292	0.42	|QV				
409	0+59	0.0298	0.42	|QV				
410	1+ 0	0.0304	0.42	|QV				
411	1+ 1	0.0309	0.43	|QV				
412	1+ 2	0.0315	0.43	|QV				
413	1+ 3	0.0321	0.43	|QV				
414	1+ 4	0.0327	0.43	|QV				

415	1+ 5	0.0333	0.43	| QV				
416	1+ 6	0.0339	0.43	| QV				
417	1+ 7	0.0345	0.44	| QV				
418	1+ 8	0.0351	0.44	| QV				
419	1+ 9	0.0357	0.44	| QV				
420	1+10	0.0363	0.44	| QV				
421	1+11	0.0369	0.44	| QV				
422	1+12	0.0375	0.45	| QV				
423	1+13	0.0382	0.45	| Q V				
424	1+14	0.0388	0.45	| Q V				
425	1+15	0.0394	0.45	| Q V				
426	1+16	0.0400	0.45	| Q V				
427	1+17	0.0406	0.45	| Q V				
428	1+18	0.0413	0.45	| Q V				
429	1+19	0.0419	0.45	| Q V				
430	1+20	0.0425	0.45	| Q V				
431	1+21	0.0431	0.46	| Q V				
432	1+22	0.0438	0.46	| Q V				
433	1+23	0.0444	0.46	| Q V				
434	1+24	0.0450	0.46	| Q V				
435	1+25	0.0457	0.47	| Q V				
436	1+26	0.0463	0.47	| Q V				
437	1+27	0.0470	0.47	| Q V				
438	1+28	0.0476	0.47	| Q V				
439	1+29	0.0483	0.48	| Q V				
440	1+30	0.0490	0.48	| Q V				
441	1+31	0.0496	0.48	| Q V				
442	1+32	0.0503	0.48	| Q V				
443	1+33	0.0509	0.48	| Q V				
444	1+34	0.0516	0.48	| Q V				
445	1+35	0.0523	0.48	| Q V				
446	1+36	0.0529	0.49	| Q V				
447	1+37	0.0536	0.49	| Q V				
448	1+38	0.0543	0.49	| Q V				
449	1+39	0.0550	0.49	| Q V				
450	1+40	0.0556	0.50	| Q V				
451	1+41	0.0563	0.50	| Q V				
452	1+42	0.0570	0.50	| Q V				
453	1+43	0.0577	0.51	| Q V				
454	1+44	0.0584	0.51	| Q V				
455	1+45	0.0591	0.51	| Q V				
456	1+46	0.0598	0.51	| Q V				
457	1+47	0.0605	0.51	| Q V				
458	1+48	0.0612	0.51	| Q V				
459	1+49	0.0620	0.52	| Q V				
460	1+50	0.0627	0.52	| Q V				
461	1+51	0.0634	0.52	| Q V				
462	1+52	0.0641	0.52	| Q V				
463	1+53	0.0648	0.52	| Q V				
464	1+54	0.0656	0.53	| Q V				
465	1+55	0.0663	0.53	| Q V				
466	1+56	0.0670	0.54	| Q V				
467	1+57	0.0678	0.54	| Q V				
468	1+58	0.0685	0.54	| Q V				
469	1+59	0.0693	0.55	| Q V				
470	2+ 0	0.0700	0.55	| Q V				
471	2+ 1	0.0708	0.55	| Q V				
472	2+ 2	0.0715	0.55	| Q V				
473	2+ 3	0.0723	0.56	| Q V				
474	2+ 4	0.0731	0.56	| Q V				
475	2+ 5	0.0738	0.56	| Q V				
476	2+ 6	0.0746	0.56	| Q V				
477	2+ 7	0.0754	0.56	| Q V				
478	2+ 8	0.0762	0.56	| Q V				
479	2+ 9	0.0770	0.57	| Q V				
480	2+10	0.0777	0.57	| Q V				
481	2+11	0.0785	0.58	| Q V				
482	2+12	0.0793	0.58	| Q V				
483	2+13	0.0801	0.59	| Q V				

484	2+14	0.0810	0.59	| Q	V	|	|	|
485	2+15	0.0818	0.60	| Q	V	|	|	|
486	2+16	0.0826	0.60	| Q	V	|	|	|
487	2+17	0.0834	0.60	| Q	V	|	|	|
488	2+18	0.0843	0.60	| Q	V	|	|	|
489	2+19	0.0851	0.61	| Q	V	|	|	|
490	2+20	0.0859	0.61	| Q	V	|	|	|
491	2+21	0.0868	0.61	| Q	V	|	|	|
492	2+22	0.0876	0.61	| Q	V	|	|	|
493	2+23	0.0885	0.62	| Q	V	|	|	|
494	2+24	0.0893	0.62	| Q	V	|	|	|
495	2+25	0.0902	0.63	| Q	V	|	|	|
496	2+26	0.0911	0.63	| Q	V	|	|	|
497	2+27	0.0919	0.64	| Q	V	|	|	|
498	2+28	0.0928	0.64	| Q	V	|	|	|
499	2+29	0.0937	0.65	| Q	V	|	|	|
500	2+30	0.0946	0.65	| Q	V	|	|	|
501	2+31	0.0955	0.66	| Q	V	|	|	|
502	2+32	0.0964	0.66	| Q	V	|	|	|
503	2+33	0.0974	0.67	| Q	V	|	|	|
504	2+34	0.0983	0.67	| Q	V	|	|	|
505	2+35	0.0992	0.67	| Q	V	|	|	|
506	2+36	0.1002	0.68	| Q	V	|	|	|
507	2+37	0.1011	0.68	| Q	V	|	|	|
508	2+38	0.1020	0.68	| Q	V	|	|	|
509	2+39	0.1030	0.69	| Q	V	|	|	|
510	2+40	0.1039	0.69	| Q	V	|	|	|
511	2+41	0.1049	0.70	| Q	V	|	|	|
512	2+42	0.1059	0.71	| Q	V	|	|	|
513	2+43	0.1068	0.71	| Q	V	|	|	|
514	2+44	0.1078	0.72	| Q	V	|	|	|
515	2+45	0.1088	0.73	| Q	V	|	|	|
516	2+46	0.1098	0.74	| Q	V	|	|	|
517	2+47	0.1109	0.74	| Q	V	|	|	|
518	2+48	0.1119	0.75	| Q	V	|	|	|
519	2+49	0.1129	0.75	| Q	V	|	|	|
520	2+50	0.1140	0.76	| Q	V	|	|	|
521	2+51	0.1150	0.76	| Q	V	|	|	|
522	2+52	0.1161	0.77	| Q	V	|	|	|
523	2+53	0.1172	0.77	| Q	V	|	|	|
524	2+54	0.1182	0.78	| Q	V	|	|	|
525	2+55	0.1193	0.78	| Q	V	|	|	|
526	2+56	0.1204	0.79	| Q	V	|	|	|
527	2+57	0.1215	0.80	| Q	V	|	|	|
528	2+58	0.1226	0.81	| Q	V	|	|	|
529	2+59	0.1237	0.82	| Q	V	|	|	|
530	3+ 0	0.1249	0.83	| Q	V	|	|	|
531	3+ 1	0.1260	0.84	| Q	V	|	|	|
532	3+ 2	0.1272	0.85	| Q	V	|	|	|
533	3+ 3	0.1284	0.86	| Q	V	|	|	|
534	3+ 4	0.1296	0.87	| Q	V	|	|	|
535	3+ 5	0.1308	0.88	| Q	V	|	|	|
536	3+ 6	0.1320	0.88	| Q	V	|	|	|
537	3+ 7	0.1332	0.89	| Q	V	|	|	|
538	3+ 8	0.1345	0.90	| Q	V	|	|	|
539	3+ 9	0.1357	0.90	| Q	V	|	|	|
540	3+10	0.1370	0.91	| Q	V	|	|	|
541	3+11	0.1382	0.92	| Q	V	|	|	|
542	3+12	0.1395	0.92	| Q	| V	|	|	|
543	3+13	0.1408	0.94	| Q	| V	|	|	|
544	3+14	0.1421	0.96	| Q	| V	|	|	|
545	3+15	0.1435	0.97	| Q	| V	|	|	|
546	3+16	0.1448	0.99	| Q	| V	|	|	|
547	3+17	0.1462	1.01	| Q	| V	|	|	|
548	3+18	0.1476	1.03	| Q	| V	|	|	|
549	3+19	0.1491	1.04	| Q	| V	|	|	|
550	3+20	0.1505	1.06	| Q	| V	|	|	|
551	3+21	0.1520	1.07	| Q	| V	|	|	|
552	3+22	0.1535	1.08	| Q	| V	|	|	|

553	3+23	0.1550	1.09	| Q	| V				
554	3+24	0.1565	1.10	| Q	| V				
555	3+25	0.1580	1.11	| Q	| V				
556	3+26	0.1596	1.13	| Q	| V				
557	3+27	0.1612	1.14	| Q	| V				
558	3+28	0.1627	1.15	| Q	| V				
559	3+29	0.1644	1.18	| Q	| V				
560	3+30	0.1660	1.21	| Q	| V				
561	3+31	0.1678	1.24	| Q	| V				
562	3+32	0.1695	1.28	| Q	| V				
563	3+33	0.1713	1.31	| Q	| V				
564	3+34	0.1732	1.34	| Q	| V				
565	3+35	0.1750	1.37	| Q	| V				
566	3+36	0.1770	1.40	| Q	| V				
567	3+37	0.1789	1.43	| Q	| V				
568	3+38	0.1809	1.45	| Q	| V				
569	3+39	0.1830	1.48	| Q	| V				
570	3+40	0.1850	1.50	| Q	| V				
571	3+41	0.1872	1.53	| Q	| V				
572	3+42	0.1893	1.55	| Q	| V				
573	3+43	0.1915	1.57	| Q	| V				
574	3+44	0.1937	1.60	| Q	| V				
575	3+45	0.1960	1.69	| Q	| V				
576	3+46	0.1984	1.79	| Q	| V				
577	3+47	0.2010	1.88	| Q	| V				
578	3+48	0.2038	1.97	| Q	| V				
579	3+49	0.2066	2.07	| Q	| V				
580	3+50	0.2096	2.16	| Q	| V				
581	3+51	0.2127	2.25	| Q	| V				
582	3+52	0.2159	2.35	| Q	| V				
583	3+53	0.2193	2.47	| Q	| V				
584	3+54	0.2229	2.59	| Q	| V				
585	3+55	0.2266	2.71	| Q	| V				
586	3+56	0.2305	2.83	| Q	| V				
587	3+57	0.2346	2.95	| Q	| V				
588	3+58	0.2388	3.07	| Q	| V				
589	3+59	0.2432	3.19	| Q	| V				
590	4+ 0	0.2477	3.31	| Q	| VI				
591	4+ 1	0.2537	4.37	| Q	| V				
592	4+ 2	0.2612	5.43	| Q	| V				
593	4+ 3	0.2702	6.49		| VQ				
594	4+ 4	0.2805	7.54		| V				
595	4+ 5	0.2924	8.60		| V				
596	4+ 6	0.3057	9.66		| V				
597	4+ 7	0.3205	10.72		| V				
598	4+ 8	0.3367	11.78		| V				
599	4+ 9	0.3512	10.55		| V				
600	4+10	0.3641	9.31		| V				
601	4+11	0.3752	8.07		| Q	| V			
602	4+12	0.3846	6.83		| Q	| V			
603	4+13	0.3923	5.60		| Q	| V			
604	4+14	0.3983	4.36		| Q	| V			
605	4+15	0.4026	3.12		| Q	| V			
606	4+16	0.4052	1.88		| Q	| V			
607	4+17	0.4077	1.80		| Q	| V			
608	4+18	0.4100	1.73		| Q	| V			
609	4+19	0.4123	1.65		| Q	| V			
610	4+20	0.4145	1.57		| Q	| V			
611	4+21	0.4165	1.49		| Q	| V			
612	4+22	0.4185	1.42		| Q	| V			
613	4+23	0.4203	1.34		| Q	| V			
614	4+24	0.4221	1.26		| Q	| V			
615	4+25	0.4237	1.23		| Q	| V			
616	4+26	0.4254	1.19		| Q	| V			
617	4+27	0.4270	1.16		| Q	| V			
618	4+28	0.4285	1.12		| Q	| V			
619	4+29	0.4300	1.09		| Q	| V			
620	4+30	0.4315	1.05		| Q	| V			
621	4+31	0.4329	1.02		| Q	| V			

622	4+32	0.4342	0.99	|	Q				V	
623	4+33	0.4356	0.97	|	Q				V	
624	4+34	0.4369	0.95	|	Q				V	
625	4+35	0.4382	0.93	|	Q				V	
626	4+36	0.4394	0.91	|	Q				V	
627	4+37	0.4406	0.89	|	Q				V	
628	4+38	0.4418	0.87	|	Q				V	
629	4+39	0.4430	0.85	|	Q				V	
630	4+40	0.4441	0.83	|	Q				V	
631	4+41	0.4452	0.81	|	Q				V	
632	4+42	0.4463	0.80	|	Q				V	
633	4+43	0.4474	0.79	|	Q				V	
634	4+44	0.4485	0.77	|	Q				V	
635	4+45	0.4495	0.76	|	Q				V	
636	4+46	0.4505	0.75	|	Q				V	
637	4+47	0.4516	0.73	|	Q				V	
638	4+48	0.4525	0.72	|	Q				V	
639	4+49	0.4535	0.71	|	Q				V	
640	4+50	0.4545	0.70	|	Q				V	
641	4+51	0.4554	0.69	|	Q				V	
642	4+52	0.4564	0.68	|	Q				V	
643	4+53	0.4573	0.67	|	Q				V	
644	4+54	0.4582	0.66	|	Q				V	
645	4+55	0.4591	0.65	|	Q				V	
646	4+56	0.4600	0.64	|	Q				V	
647	4+57	0.4609	0.63	|	Q				V	
648	4+58	0.4617	0.63	|	Q				V	
649	4+59	0.4626	0.62	|	Q				V	
650	5+ 0	0.4634	0.61	|	Q				V	
651	5+ 1	0.4642	0.60	|	Q				V	
652	5+ 2	0.4651	0.60	|	Q				V	
653	5+ 3	0.4659	0.59	|	Q				V	
654	5+ 4	0.4667	0.58	|	Q				V	
655	5+ 5	0.4675	0.58	|	Q				V	
656	5+ 6	0.4683	0.57	|	Q				V	
657	5+ 7	0.4690	0.56	|	Q				V	
658	5+ 8	0.4698	0.56	|	Q				V	
659	5+ 9	0.4706	0.55	|	Q				V	
660	5+10	0.4713	0.55	|	Q				V	
661	5+11	0.4721	0.54	|	Q				V	
662	5+12	0.4728	0.53	|	Q				V	
663	5+13	0.4735	0.53	|	Q				V	
664	5+14	0.4743	0.53	|	Q				V	
665	5+15	0.4750	0.52	|	Q				V	
666	5+16	0.4757	0.52	|	Q				V	
667	5+17	0.4764	0.51	|	Q				V	
668	5+18	0.4771	0.51	|	Q				V	
669	5+19	0.4778	0.50	|	Q				V	
670	5+20	0.4785	0.50	|	Q				V	
671	5+21	0.4791	0.49	|	Q				V	
672	5+22	0.4798	0.49	|	Q				V	
673	5+23	0.4805	0.48	|	Q				V	
674	5+24	0.4811	0.48	|	Q				V	
675	5+25	0.4818	0.48	|	Q				V	
676	5+26	0.4824	0.47	|	Q				V	
677	5+27	0.4831	0.47	|	Q				V	
678	5+28	0.4837	0.46	|	Q				V	
679	5+29	0.4844	0.46	|	Q				V	
680	5+30	0.4850	0.46	|	Q				V	
681	5+31	0.4856	0.45	|	Q				V	
682	5+32	0.4862	0.45	|	Q				V	
683	5+33	0.4868	0.45	|	Q				V	
684	5+34	0.4875	0.44	|	Q				V	
685	5+35	0.4881	0.44	|	Q				V	
686	5+36	0.4887	0.44	|	Q				V	
687	5+37	0.4893	0.43	|	Q				V	
688	5+38	0.4899	0.43	|	Q				V	
689	5+39	0.4905	0.43	|	Q				V	
690	5+40	0.4910	0.43	|	Q				V	

691	5+41	0.4916	0.42	|Q				V
692	5+42	0.4922	0.42	|Q				V
693	5+43	0.4928	0.42	|Q				V
694	5+44	0.4933	0.41	|Q				V
695	5+45	0.4939	0.41	|Q				V
696	5+46	0.4945	0.41	|Q				V
697	5+47	0.4950	0.41	|Q				V
698	5+48	0.4956	0.40	|Q				V
699	5+49	0.4961	0.40	|Q				V
700	5+50	0.4967	0.40	|Q				V
701	5+51	0.4972	0.40	|Q				V
702	5+52	0.4978	0.39	|Q				V
703	5+53	0.4983	0.39	|Q				V
704	5+54	0.4988	0.39	|Q				V
705	5+55	0.4994	0.39	|Q				V
706	5+56	0.4999	0.38	|Q				V
707	5+57	0.5004	0.38	|Q				V
708	5+58	0.5010	0.38	|Q				V
709	5+59	0.5015	0.38	|Q				V
710	6+ 0	0.5020	0.37	|Q				V
711	6+ 1	0.5025	0.37	|Q				V
712	6+ 2	0.5030	0.37	|Q				V
713	6+ 3	0.5035	0.37	|Q				V
714	6+ 4	0.5040	0.37	|Q				V
715	6+ 5	0.5045	0.36	Q				V
716	6+ 6	0.5050	0.36	Q				V
717	6+ 7	0.5055	0.36	Q				V
718	6+ 8	0.5060	0.36	Q				V

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726 ++++++
 727 Process from Point/Station 304.000 to Point/Station 305.000
 728 **** PIPEFLOW TRAVEL TIME (User specified size) ****

730 Upstream point/station elevation = 521.680 (Ft.)
 731 Downstream point/station elevation = 519.940 (Ft.)
 732 Pipe length = 20.56 (Ft.) Slope = 0.0846 Manning's N = 0.013
 733 No. of pipes = 1 Required pipe flow = 11.783 (CFS)
 734 Given pipe size = 18.00 (In.)
 735 Calculated individual pipe flow = 11.783 (CFS)
 736 Normal flow depth in pipe = 7.76 (In.)
 737 Flow top width inside pipe = 17.83 (In.)
 738 Critical Depth = 15.65 (In.)
 739 Pipe flow velocity = 16.17 (Ft/s)
 740 Travel time through pipe = 0.02 min.
 741 Time of concentration (TC) = 8.31 min.

744 ++++++
 745 Process from Point/Station 305.000 to Point/Station 305.000
 746 **** CONFLUENCE OF MINOR STREAMS ****

748 Along Main Stream number: 1 in normal stream number 1
 749 Stream flow area = 2.259 (Ac.)
 750 Runoff from this stream = 11.783 (CFS)
 751 Time of concentration = 8.31 min.
 752 Rainfall intensity = 6.077 (In/Hr)

755 ++++++
 756 Process from Point/Station 104.000 to Point/Station 104.000
 757 **** USER DEFINED FLOW INFORMATION AT A POINT ****

758 User specified 'C' value of 0.790 given for subarea

760 Rainfall intensity (I) = 1.960 (In/Hr) for a 100.0 year storm
 761 User specified values are as follows:
 762 TC = 48.00 min. Rain intensity = 1.96 (In/Hr)
 763 Total area = 155.500 (Ac.) Total runoff = 240.800 (CFS)
 764
 765
 766 ++++++
 767 Process from Point/Station 104.000 to Point/Station 105.000
 768 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 769
 770 Depth of flow = 2.406 (Ft.), Average velocity = 2.420 (Ft/s)
 771 ***** Irregular Channel Data *****
 772 -----
 773 Information entered for subchannel number 1 :
 774 Point number 'X' coordinate 'Y' coordinate
 775 1 0.00 2.50
 776 2 75.00 0.00
 777 3 89.00 3.21
 778 4 105.20 4.76
 779 Manning's 'N' friction factor = 0.040
 780 -----
 781 Sub-Channel flow = 240.800 (CFS)
 782 ' ' flow top width = 82.688 (Ft.)
 783 ' ' velocity = 2.420 (Ft/s)
 784 ' ' area = 99.492 (Sq.Ft)
 785 ' ' Froude number = 0.389
 786
 787 Upstream point elevation = 528.920 (Ft.)
 788 Downstream point elevation = 528.280 (Ft.)
 789 Flow length = 192.000 (Ft.)
 790 Travel time = 1.32 min.
 791 Time of concentration = 49.32 min.
 792 Depth of flow = 2.406 (Ft.)
 793 Average velocity = 2.420 (Ft/s)
 794 Total irregular channel flow = 240.800 (CFS)
 795 Irregular channel normal depth above invert elev. = 2.406 (Ft.)
 796 Average velocity of channel(s) = 2.420 (Ft/s)
 797
 798 ++++++
 800 Process from Point/Station 701.000 to Point/Station 105.000
 801 **** SUBAREA FLOW ADDITION ****
 802
 803 Rainfall intensity (I) = 1.926 (In/Hr) for a 100.0 year storm
 804 User specified 'C' value of 0.640 given for subarea
 805 The area added to the existing stream causes a
 806 a lower flow rate of Q = 239.269 (CFS)
 807 therefore the upstream flow rate of Q = 240.800 (CFS) is being used
 808 Time of concentration = 49.32 min.
 809 Rainfall intensity = 1.926 (In/Hr) for a 100.0 year storm
 810 Effective runoff coefficient used for total area
 811 (Q=KCIA) is C = 0.788 CA = 124.215
 812 Subarea runoff = 0.000 (CFS) for 2.141 (Ac.)
 813 Total runoff = 240.800 (CFS) Total area = 157.641 (Ac.)
 814
 815
 816 ++++++
 817 Process from Point/Station 801.000 to Point/Station 105.000
 818 **** SUBAREA FLOW ADDITION ****
 819
 820 Rainfall intensity (I) = 1.926 (In/Hr) for a 100.0 year storm
 821 Decimal fraction soil group A = 0.000
 822 Decimal fraction soil group B = 0.000
 823 Decimal fraction soil group C = 0.000
 824 Decimal fraction soil group D = 1.000
 825 [UNDISTURBED NATURAL TERRAIN]
 826 (Permanent Open Space)
 827 Impervious value, Ai = 0.000
 828 Sub-Area C Value = 0.350

829 The area added to the existing stream causes a
 830 a lower flow rate of $Q = 239.304$ (CFS)
 831 therefore the upstream flow rate of $Q = 240.800$ (CFS) is being used
 832 Time of concentration = 49.32 min.
 833 Rainfall intensity = 1.926 (In/Hr) for a 100.0 year storm
 834 Effective runoff coefficient used for total area
 835 ($Q=KCIA$) is $C = 0.788$ CA = 124.233
 836 Subarea runoff = 0.000 (CFS) for 0.052 (Ac.)
 837 Total runoff = 240.800 (CFS) Total area = 157.693 (Ac.)
 838
 839
 840 ++++++
 841 Process from Point/Station 105.000 to Point/Station 305.000
 842 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 843
 844 Upstream point/station elevation = 528.270 (Ft.)
 845 Downstream point/station elevation = 519.940 (Ft.)
 846 Pipe length = 332.00 (Ft.) Slope = 0.0251 Manning's N = 0.013
 847 No. of pipes = 2 Required pipe flow = 240.800 (CFS)
 848 Given pipe size = 66.00 (In.)
 849 Calculated individual pipe flow = 120.400 (CFS)
 850 Normal flow depth in pipe = 21.35 (In.)
 851 Flow top width inside pipe = 61.75 (In.)
 852 Critical Depth = 36.56 (In.)
 853 Pipe flow velocity = 18.10 (Ft/s)
 854 Travel time through pipe = 0.31 min.
 855 Time of concentration (TC) = 49.63 min.
 856
 857
 858 ++++++
 859 Process from Point/Station 305.000 to Point/Station 305.000
 860 **** CONFLUENCE OF MINOR STREAMS ****
 861
 862 Along Main Stream number: 1 in normal stream number 2
 863 Stream flow area = 157.693 (Ac.)
 864 Runoff from this stream = 240.800 (CFS)
 865 Time of concentration = 49.63 min.
 866 Rainfall intensity = 1.919 (In/Hr)
 867 Summary of stream data:
 868
 869 Stream Flow rate TC Rainfall Intensity
 870 No. (CFS) (min) (In/Hr)
 871
 872
 873 1 11.783 8.31 6.077
 874 2 240.800 49.63 1.919
 875 Qmax(1) =
 876 1.000 * 1.000 * 11.783) +
 877 1.000 * 0.167 * 240.800) + = 52.090
 878 Qmax(2) =
 879 0.316 * 1.000 * 11.783) +
 880 1.000 * 1.000 * 240.800) + = 244.520
 881
 882 Total of 2 streams to confluence:
 883 Flow rates before confluence point:
 884 11.783 240.800
 885 Maximum flow rates at confluence using above data:
 886 52.090 244.520
 887 Area of streams before confluence:
 888 2.259 157.693
 889 Results of confluence:
 890 Total flow rate = 244.520 (CFS)
 891 Time of concentration = 49.628 min.
 892 Effective stream area after confluence = 159.952 (Ac.)
 893
 894
 895 ++++++
 896 Process from Point/Station 305.000 to Point/Station 306.000
 897 **** PIPEFLOW TRAVEL TIME (User specified size) ****

```

898
899 Upstream point/station elevation = 519.940 (Ft.)
900 Downstream point/station elevation = 519.320 (Ft.)
901 Pipe length = 84.00 (Ft.) Slope = 0.0074 Manning's N = 0.013
902 No. of pipes = 2 Required pipe flow = 244.520 (CFS)
903 Given pipe size = 66.00 (In.)
904 Calculated individual pipe flow = 122.260 (CFS)
905 Normal flow depth in pipe = 30.00 (In.)
906 Flow top width inside pipe = 65.73 (In.)
907 Critical Depth = 36.87 (In.)
908 Pipe flow velocity = 11.64 (Ft/s)
909 Travel time through pipe = 0.12 min.
910 Time of concentration (TC) = 49.75 min.
911
912
913 ++++++
914 Process from Point/Station 306.000 to Point/Station 306.000
915 **** CONFLUENCE OF MINOR STREAMS ****
916
917 Along Main Stream number: 1 in normal stream number 1
918 Stream flow area = 159.952 (Ac.)
919 Runoff from this stream = 244.520 (CFS)
920 Time of concentration = 49.75 min.
921 Rainfall intensity = 1.916 (In/Hr)
922
923
924 ++++++
925 Process from Point/Station 501.000 to Point/Station 502.000
926 **** USER DEFINED FLOW INFORMATION AT A POINT ****
927
928 User specified 'C' value of 0.670 given for subarea
929 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
930 User specified values are as follows:
931 TC = 11.06 min. Rain intensity = 5.05 (In/Hr)
932 Total area = 8.629 (Ac.) Total runoff = 11.600 (CFS)
933
934
935 ++++++
936 Process from Point/Station 503.000 to Point/Station 502.000
937 **** SUBAREA FLOW ADDITION ****
938
939 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
940 Decimal fraction soil group A = 0.000
941 Decimal fraction soil group B = 0.000
942 Decimal fraction soil group C = 0.000
943 Decimal fraction soil group D = 1.000
944 [INDUSTRIAL area type ]  

945 (General Industrial )
946 Impervious value, Ai = 0.950
947 Sub-Area C Value = 0.870
948 Time of concentration = 11.06 min.
949 Rainfall intensity = 5.052 (In/Hr) for a 100.0 year storm
950 Effective runoff coefficient used for total area
951 (Q=KCIA) is C = 0.671 CA = 5.820
952 Subarea runoff = 17.804 (CFS) for 0.044 (Ac.)
953 Total runoff = 29.404 (CFS) Total area = 8.673 (Ac.)
954
955
956 ++++++
957 Process from Point/Station 802.000 to Point/Station 502.000
958 **** SUBAREA FLOW ADDITION ****
959
960 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
961 Decimal fraction soil group A = 0.000
962 Decimal fraction soil group B = 0.000
963 Decimal fraction soil group C = 0.000
964 Decimal fraction soil group D = 1.000
965 [UNDISTURBED NATURAL TERRAIN ]  

966 (Permanent Open Space )
```

```

967 Impervious value, Ai = 0.000
968 Sub-Area C Value = 0.350
969 Time of concentration = 11.06 min.
970 Rainfall intensity = 5.052(In/Hr) for a 100.0 year storm
971 Effective runoff coefficient used for total area
972 (Q=KCIA) is C = 0.670 CA = 5.833
973 Subarea runoff = 0.065(CFS) for 0.037(Ac.)
974 Total runoff = 29.469(CFS) Total area = 8.710(Ac.)
975
976
977 ++++++
978 Process from Point/Station 502.000 to Point/Station 306.000
979 **** PIPEFLOW TRAVEL TIME (User specified size) ****
980
981 Upstream point/station elevation = 522.270(Ft.)
982 Downstream point/station elevation = 519.320(Ft.)
983 Pipe length = 92.00(Ft.) Slope = 0.0321 Manning's N = 0.013
984 No. of pipes = 1 Required pipe flow = 29.469(CFS)
985 Given pipe size = 30.00(In.)
986 Calculated individual pipe flow = 29.469(CFS)
987 Normal flow depth in pipe = 13.22(In.)
988 Flow top width inside pipe = 29.79(In.)
989 Critical Depth = 22.20(In.)
990 Pipe flow velocity = 14.14(Ft/s)
991 Travel time through pipe = 0.11 min.
992 Time of concentration (TC) = 11.17 min.
993
994
995 ++++++
996 Process from Point/Station 306.000 to Point/Station 306.000
997 **** CONFLUENCE OF MINOR STREAMS ****
998
999 Along Main Stream number: 1 in normal stream number 2
1000 Stream flow area = 8.710(Ac.)
1001 Runoff from this stream = 29.469(CFS)
1002 Time of concentration = 11.17 min.
1003 Rainfall intensity = 5.021(In/Hr)
1004 Summary of stream data:
1005
1006 Stream Flow rate TC Rainfall Intensity
1007 No. (CFS) (min) (In/Hr)
1008
1009
1010 1 244.520 49.75 1.916
1011 2 29.469 11.17 5.021
1012 Qmax(1) =
1013   1.000 * 1.000 * 244.520) +
1014   0.382 * 1.000 * 29.469) + = 255.764
1015 Qmax(2) =
1016   1.000 * 0.224 * 244.520) +
1017   1.000 * 1.000 * 29.469) + = 84.364
1018
1019 Total of 2 streams to confluence:
1020 Flow rates before confluence point:
1021   244.520 29.469
1022 Maximum flow rates at confluence using above data:
1023   255.764 84.364
1024 Area of streams before confluence:
1025   159.952 8.710
1026 Results of confluence:
1027 Total flow rate = 255.764(CFS)
1028 Time of concentration = 49.748 min.
1029 Effective stream area after confluence = 168.662(Ac.)
1030
1031
1032 ++++++
1033 Process from Point/Station 306.000 to Point/Station 307.000
1034 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1035

```

```

1036 Upstream point/station elevation = 519.320(Ft.)
1037 Downstream point/station elevation = 518.410(Ft.)
1038 Pipe length = 92.00(Ft.) Slope = 0.0099 Manning's N = 0.013
1039 No. of pipes = 1 Required pipe flow = 255.764(CFS)
1040 Given pipe size = 66.00(In.)
1041 Calculated individual pipe flow = 255.764(CFS)
1042 Normal flow depth in pipe = 43.27(In.)
1043 Flow top width inside pipe = 62.73(In.)
1044 Critical Depth = 53.47(In.)
1045 Pipe flow velocity = 15.49(Ft/s)
1046 Travel time through pipe = 0.10 min.
1047 Time of concentration (TC) = 49.85 min.
1048
1049
1050 ++++++
1051 Process from Point/Station 307.000 to Point/Station 307.000
1052 **** CONFLUENCE OF MINOR STREAMS ****
1053
1054 Along Main Stream number: 1 in normal stream number 1
1055 Stream flow area = 168.662(Ac.)
1056 Runoff from this stream = 255.764(CFS)
1057 Time of concentration = 49.85 min.
1058 Rainfall intensity = 1.913(In/Hr)
1059
1060
1061 ++++++
1062 Process from Point/Station 601.000 to Point/Station 602.000
1063 **** INITIAL AREA EVALUATION ****
1064
1065 Decimal fraction soil group A = 0.000
1066 Decimal fraction soil group B = 0.000
1067 Decimal fraction soil group C = 0.000
1068 Decimal fraction soil group D = 1.000
1069 [MEDIUM DENSITY RESIDENTIAL ]  

1070 (14.5 DU/A or Less )
1071 Impervious value, Ai = 0.500
1072 Sub-Area C Value = 0.630
1073 Initial subarea total flow distance = 107.000(Ft.)
1074 Highest elevation = 532.000(Ft.)
1075 Lowest elevation = 528.490(Ft.)
1076 Elevation difference = 3.510(Ft.) Slope = 3.280 %
1077 Top of Initial Area Slope adjusted by User to 3.510 %
1078 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1079 The maximum overland flow distance is 90.00 (Ft)
1080 for the top area slope value of 3.51 %, in a development type of
1081 14.5 DU/A or Less
1082 In Accordance With Figure 3-3
1083 Initial Area Time of Concentration = 5.28 minutes
1084 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
1085 TC = [1.8*(1.1-0.6300)*( 90.000^.5)/( 3.510^(1/3)] = 5.28
1086 Rainfall intensity (I) = 8.139(In/Hr) for a 100.0 year storm
1087 Effective runoff coefficient used for area (Q=KCIA) is C = 0.630
1088 Subarea runoff = 0.482(CFS)
1089 Total initial stream area = 0.094(Ac.)
1090
1091
1092 ++++++
1093 Process from Point/Station 602.000 to Point/Station 603.000
1094 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1095
1096 Estimated mean flow rate at midpoint of channel = 2.775(CFS)
1097 Depth of flow = 0.370(Ft.), Average velocity = 1.516(Ft/s)
1098 ***** Irregular Channel Data *****
1099
1100 Information entered for subchannel number 1 :
1101 Point number 'X' coordinate 'Y' coordinate
1102 1 0.00 0.60
1103 2 20.00 0.13
1104 3 22.00 0.00

```

```

1105          4           22.00           0.50
1106 Manning's 'N' friction factor =   0.015
1107 -----
1108 Sub-Channel flow =    2.775(CFS)
1109     '      flow top width = 12.194(Ft.)
1110     '      velocity= 1.516(Ft/s)
1111     '      area = 1.830(Sq.Ft)
1112     '      Froude number = 0.690
1113
1114 Upstream point elevation = 528.490(Ft.)
1115 Downstream point elevation = 525.660(Ft.)
1116 Flow length = 925.000(Ft.)
1117 Travel time = 10.17 min.
1118 Time of concentration = 15.45 min.
1119 Depth of flow = 0.370(Ft.)
1120 Average velocity = 1.516(Ft/s)
1121 Total irregular channel flow = 2.775(CFS)
1122 Irregular channel normal depth above invert elev. = 0.370(Ft.)
1123 Average velocity of channel(s) = 1.516(Ft/s)
1124 Adding area flow to channel
1125 Rainfall intensity (I) = 4.073(In/Hr) for a 100.0 year storm
1126 Decimal fraction soil group A = 0.000
1127 Decimal fraction soil group B = 0.000
1128 Decimal fraction soil group C = 0.000
1129 Decimal fraction soil group D = 1.000
1130 [HIGH DENSITY RESIDENTIAL]
1131 (43.0 DU/A or Less)
1132 Impervious value, Ai = 0.800
1133 Sub-Area C Value = 0.790
1134 Rainfall intensity = 4.073(In/Hr) for a 100.0 year storm
1135 Effective runoff coefficient used for total area
1136 (Q=KCIA) is C = 0.780 CA = 1.227
1137 Subarea runoff = 4.515(CFS) for 1.478(Ac.)
1138 Total runoff = 4.997(CFS) Total area = 1.572(Ac.)
1139 Depth of flow = 0.444(Ft.), Average velocity = 1.750(Ft/s)
1140
1141
1142 ++++++
1143 Process from Point/Station 603.000 to Point/Station 603.000
1144 **** SUBAREA FLOW ADDITION ****
1145
1146 Rainfall intensity (I) = 4.073(In/Hr) for a 100.0 year storm
1147 Decimal fraction soil group A = 0.000
1148 Decimal fraction soil group B = 0.000
1149 Decimal fraction soil group C = 0.000
1150 Decimal fraction soil group D = 1.000
1151 [INDUSTRIAL area type]
1152 (Limited Industrial)
1153 Impervious value, Ai = 0.900
1154 Sub-Area C Value = 0.850
1155 Time of concentration = 15.45 min.
1156 Rainfall intensity = 4.073(In/Hr) for a 100.0 year storm
1157 Effective runoff coefficient used for total area
1158 (Q=KCIA) is C = 0.787 CA = 1.365
1159 Subarea runoff = 0.564(CFS) for 0.163(Ac.)
1160 Total runoff = 5.561(CFS) Total area = 1.735(Ac.)
1161
1162
1163 ++++++
1164 Process from Point/Station 603.000 to Point/Station 603.000
1165 **** SUBAREA FLOW ADDITION ****
1166
1167 Rainfall intensity (I) = 4.073(In/Hr) for a 100.0 year storm
1168 Decimal fraction soil group A = 0.000
1169 Decimal fraction soil group B = 0.000
1170 Decimal fraction soil group C = 0.000
1171 Decimal fraction soil group D = 1.000
1172 [INDUSTRIAL area type]
1173 (Limited Industrial)

```

1174 Impervious value, $A_i = 0.900$
 1175 Sub-Area C Value = 0.850
 1176 Time of concentration = 15.45 min.
 1177 Rainfall intensity = 4.073 (In/Hr) for a 100.0 year storm
 1178 Effective runoff coefficient used for total area
 1179 ($Q=KCIA$) is $C = 0.794$ CA = 1.560
 1180 Subarea runoff = 0.793 (CFS) for 0.229 (Ac.)
 1181 Total runoff = 6.354 (CFS) Total area = 1.964 (Ac.)
 1182
 1183
 1184 ++++++
 1185 Process from Point/Station 603.000 to Point/Station 604.000
 1186 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 1187
 1188 Upstream point/station elevation = 521.420 (Ft.)
 1189 Downstream point/station elevation = 520.730 (Ft.)
 1190 Pipe length = 69.00 (Ft.) Slope = 0.0100 Manning's N = 0.013
 1191 No. of pipes = 1 Required pipe flow = 6.354 (CFS)
 1192 Given pipe size = 18.00 (In.)
 1193 Calculated individual pipe flow = 6.354 (CFS)
 1194 Normal flow depth in pipe = 10.10 (In.)
 1195 Flow top width inside pipe = 17.86 (In.)
 1196 Critical Depth = 11.69 (In.)
 1197 Pipe flow velocity = 6.23 (Ft/s)
 1198 Travel time through pipe = 0.18 min.
 1199 Time of concentration (TC) = 15.63 min.
 1200
 1201
 1202 ++++++
 1203 Process from Point/Station 604.000 to Point/Station 307.000
 1204 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 1205
 1206 Upstream point/station elevation = 520.730 (Ft.)
 1207 Downstream point/station elevation = 518.410 (Ft.)
 1208 Pipe length = 204.00 (Ft.) Slope = 0.0114 Manning's N = 0.013
 1209 No. of pipes = 1 Required pipe flow = 6.354 (CFS)
 1210 Given pipe size = 27.00 (In.)
 1211 Calculated individual pipe flow = 6.354 (CFS)
 1212 Normal flow depth in pipe = 8.03 (In.)
 1213 Flow top width inside pipe = 24.68 (In.)
 1214 Critical Depth = 10.31 (In.)
 1215 Pipe flow velocity = 6.42 (Ft/s)
 1216 Travel time through pipe = 0.53 min.
 1217 Time of concentration (TC) = 16.16 min.
 1218
 1219
 1220 ++++++
 1221 Process from Point/Station 307.000 to Point/Station 307.000
 1222 **** CONFLUENCE OF MINOR STREAMS ****
 1223
 1224 Along Main Stream number: 1 in normal stream number 2
 1225 Stream flow area = 1.964 (Ac.)
 1226 Runoff from this stream = 6.354 (CFS)
 1227 Time of concentration = 16.16 min.
 1228 Rainfall intensity = 3.956 (In/Hr)
 1229 Summary of stream data:
 1230
 1231 Stream Flow rate TC Rainfall Intensity
 1232 No. (CFS) (min) (In/Hr)
 1233
 1234
 1235 1 255.764 49.85 1.913
 1236 2 6.354 16.16 3.956
 1237 Qmax(1) =
 1238 1.000 * 1.000 * 255.764) +
 1239 0.484 * 1.000 * 6.354) + = 258.836
 1240 Qmax(2) =
 1241 1.000 * 0.324 * 255.764) +
 1242 1.000 * 1.000 * 6.354) + = 89.281

1243
1244 Total of 2 streams to confluence:
1245 Flow rates before confluence point:
1246 255.764 6.354
1247 Maximum flow rates at confluence using above data:
1248 258.836 89.281
1249 Area of streams before confluence:
1250 168.662 1.964
1251 Results of confluence:
1252 Total flow rate = 258.836 (CFS)
1253 Time of concentration = 49.847 min.
1254 Effective stream area after confluence = 170.626 (Ac.)
1255 End of computations, total study area = 170.626 (Ac.)
1256
1257
1258

6c. CivilD Mitigated Post-Development Q100 Calculations

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c) 1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 05/13/22

10 21088-post-onsite
11
12
13
14 -----
15 ***** Hydrology Study Control Information *****
16
17 -----
18
19
20 Program License Serial Number 6332
21
22 -----
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.200
28 24 hour precipitation(inches) = 5.500
29 P6/P24 = 58.2%
30 San Diego hydrology manual 'C' values used
31
32 ++++++
33 Process from Point/Station 301.000 to Point/Station 304.000
34 **** USER DEFINED FLOW INFORMATION AT A POINT ****
35
36 User specified 'C' value of 0.779 given for subarea
37 Rainfall intensity (I) = 3.919 (In/Hr) for a 100.0 year storm
38 User specified values are as follows:
39 TC = 16.40 min. Rain intensity = 3.92 (In/Hr)
40 Total area = 2.260 (Ac.) Total runoff = 6.898 (CFS)
41
42
43 ++++++
44 Process from Point/Station 304.000 to Point/Station 305.000
45 **** PIPEFLOW TRAVEL TIME (User specified size) ****
46
47 Upstream point/station elevation = 521.680 (Ft.)
48 Downstream point/station elevation = 519.940 (Ft.)
49 Pipe length = 20.56 (Ft.) Slope = 0.0846 Manning's N = 0.013
50 No. of pipes = 1 Required pipe flow = 6.898 (CFS)
51 Given pipe size = 18.00 (In.)
52 Calculated individual pipe flow = 6.898 (CFS)
53 Normal flow depth in pipe = 5.81 (In.)
54 Flow top width inside pipe = 16.83 (In.)
55 Critical Depth = 12.19 (In.)
56 Pipe flow velocity = 13.97 (Ft/s)
57 Travel time through pipe = 0.02 min.
58 Time of concentration (TC) = 16.42 min.
59
60
61
62 ++++++
63 Process from Point/Station 305.000 to Point/Station 305.000
64 **** CONFLUENCE OF MINOR STREAMS ****
65
66 Along Main Stream number: 1 in normal stream number 1
67 Stream flow area = 2.260 (Ac.)
68 Runoff from this stream = 6.898 (CFS)
69 Time of concentration = 16.42 min.

70 Rainfall intensity = 3.915 (In/Hr)
 71
 72
 73 ++++++
 74 Process from Point/Station 104.000 to Point/Station 104.000
 75 **** USER DEFINED FLOW INFORMATION AT A POINT ****
 76
 77 User specified 'C' value of 0.790 given for subarea
 78 Rainfall intensity (I) = 1.960 (In/Hr) for a 100.0 year storm
 79 User specified values are as follows:
 80 TC = 48.00 min. Rain intensity = 1.96 (In/Hr)
 81 Total area = 155.500 (Ac.) Total runoff = 240.800 (CFS)
 82
 83
 84 ++++++
 85 Process from Point/Station 104.000 to Point/Station 105.000
 86 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 87
 88 Depth of flow = 2.406 (Ft.), Average velocity = 2.420 (Ft/s)
 89 ***** Irregular Channel Data *****
 90 -----
 91 Information entered for subchannel number 1 :
 92 Point number 'X' coordinate 'Y' coordinate
 93 1 0.00 2.50
 94 2 75.00 0.00
 95 3 89.00 3.21
 96 4 105.20 4.76
 97 Manning's 'N' friction factor = 0.040
 98 -----
 99 Sub-Channel flow = 240.800 (CFS)
 100 ' ' flow top width = 82.688 (Ft.)
 101 ' ' velocity= 2.420 (Ft/s)
 102 ' ' area = 99.492 (Sq.Ft)
 103 ' ' Froude number = 0.389
 104
 105 Upstream point elevation = 528.920 (Ft.)
 106 Downstream point elevation = 528.280 (Ft.)
 107 Flow length = 192.000 (Ft.)
 108 Travel time = 1.32 min.
 109 Time of concentration = 49.32 min.
 110 Depth of flow = 2.406 (Ft.)
 111 Average velocity = 2.420 (Ft/s)
 112 Total irregular channel flow = 240.800 (CFS)
 113 Irregular channel normal depth above invert elev. = 2.406 (Ft.)
 114 Average velocity of channel(s) = 2.420 (Ft/s)
 115
 116
 117 ++++++
 118 Process from Point/Station 701.000 to Point/Station 105.000
 119 **** SUBAREA FLOW ADDITION ****
 120
 121 Rainfall intensity (I) = 1.926 (In/Hr) for a 100.0 year storm
 122 User specified 'C' value of 0.640 given for subarea
 123 The area added to the existing stream causes a
 124 a lower flow rate of Q = 239.269 (CFS)
 125 therefore the upstream flow rate of Q = 240.800 (CFS) is being used
 126 Time of concentration = 49.32 min.
 127 Rainfall intensity = 1.926 (In/Hr) for a 100.0 year storm
 128 Effective runoff coefficient used for total area
 129 (Q=KCIA) is C = 0.788 CA = 124.215
 130 Subarea runoff = 0.000 (CFS) for 2.141 (Ac.)
 131 Total runoff = 240.800 (CFS) Total area = 157.641 (Ac.)
 132
 133
 134 ++++++
 135 Process from Point/Station 801.000 to Point/Station 105.000
 136 **** SUBAREA FLOW ADDITION ****
 137
 138 Rainfall intensity (I) = 1.926 (In/Hr) for a 100.0 year storm

```

139 Decimal fraction soil group A = 0.000
140 Decimal fraction soil group B = 0.000
141 Decimal fraction soil group C = 0.000
142 Decimal fraction soil group D = 1.000
143 [UNDISTURBED NATURAL TERRAIN ]  

144 (Permanent Open Space )
145 Impervious value, Ai = 0.000
146 Sub-Area C Value = 0.350
147 The area added to the existing stream causes a
148 a lower flow rate of Q = 239.304(CFS)
149 therefore the upstream flow rate of Q = 240.800(CFS) is being used
150 Time of concentration = 49.32 min.
151 Rainfall intensity = 1.926(In/Hr) for a 100.0 year storm
152 Effective runoff coefficient used for total area
153 (Q=KCIA) is C = 0.788 CA = 124.233
154 Subarea runoff = 0.000(CFS) for 0.052(Ac.)
155 Total runoff = 240.800(CFS) Total area = 157.693(Ac.)
156
157
158 ++++++
159 Process from Point/Station 105.000 to Point/Station 305.000
160 **** PIPEFLOW TRAVEL TIME (User specified size) ****
161
162 Upstream point/station elevation = 528.270(Ft.)
163 Downstream point/station elevation = 519.940(Ft.)
164 Pipe length = 332.00(Ft.) Slope = 0.0251 Manning's N = 0.013
165 No. of pipes = 2 Required pipe flow = 240.800(CFS)
166 Given pipe size = 66.00(In.)
167 Calculated individual pipe flow = 120.400(CFS)
168 Normal flow depth in pipe = 21.35(In.)
169 Flow top width inside pipe = 61.75(In.)
170 Critical Depth = 36.56(In.)
171 Pipe flow velocity = 18.10(Ft/s)
172 Travel time through pipe = 0.31 min.
173 Time of concentration (TC) = 49.63 min.
174
175
176 ++++++
177 Process from Point/Station 305.000 to Point/Station 305.000
178 **** CONFLUENCE OF MINOR STREAMS ****
179
180 Along Main Stream number: 1 in normal stream number 2
181 Stream flow area = 157.693(Ac.)
182 Runoff from this stream = 240.800(CFS)
183 Time of concentration = 49.63 min.
184 Rainfall intensity = 1.919(In/Hr)
185 Summary of stream data:
186
187 Stream Flow rate TC Rainfall Intensity
188 No. (CFS) (min) (In/Hr)
189
190
191 1 6.898 16.42 3.915
192 2 240.800 49.63 1.919
193 Qmax(1) =
194 1.000 * 1.000 * 6.898) +
195 1.000 * 0.331 * 240.800) + = 86.592
196 Qmax(2) =
197 0.490 * 1.000 * 6.898) +
198 1.000 * 1.000 * 240.800) + = 244.180
199
200 Total of 2 streams to confluence:
201 Flow rates before confluence point:
202 6.898 240.800
203 Maximum flow rates at confluence using above data:
204 86.592 244.180
205 Area of streams before confluence:
206 2.260 157.693
207 Results of confluence:

```

```

208 Total flow rate = 244.180 (CFS)
209 Time of concentration = 49.628 min.
210 Effective stream area after confluence = 159.953 (Ac.)
211
212
213 ++++++
214 Process from Point/Station 305.000 to Point/Station 306.000
215 **** PIPEFLOW TRAVEL TIME (User specified size) ****
216
217 Upstream point/station elevation = 519.940 (Ft.)
218 Downstream point/station elevation = 519.320 (Ft.)
219 Pipe length = 84.00 (Ft.) Slope = 0.0074 Manning's N = 0.013
220 No. of pipes = 2 Required pipe flow = 244.180 (CFS)
221 Given pipe size = 66.00 (In.)
222 Calculated individual pipe flow = 122.090 (CFS)
223 Normal flow depth in pipe = 29.95 (In.)
224 Flow top width inside pipe = 65.72 (In.)
225 Critical Depth = 36.82 (In.)
226 Pipe flow velocity = 11.63 (Ft/s)
227 Travel time through pipe = 0.12 min.
228 Time of concentration (TC) = 49.75 min.
229
230
231 ++++++
232 Process from Point/Station 306.000 to Point/Station 306.000
233 **** CONFLUENCE OF MINOR STREAMS ****
234
235 Along Main Stream number: 1 in normal stream number 1
236 Stream flow area = 159.953 (Ac.)
237 Runoff from this stream = 244.180 (CFS)
238 Time of concentration = 49.75 min.
239 Rainfall intensity = 1.916 (In/Hr)
240
241
242 ++++++
243 Process from Point/Station 501.000 to Point/Station 502.000
244 **** USER DEFINED FLOW INFORMATION AT A POINT ****
245
246 User specified 'C' value of 0.670 given for subarea
247 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
248 User specified values are as follows:
249 TC = 11.06 min. Rain intensity = 5.05 (In/Hr)
250 Total area = 8.629 (Ac.) Total runoff = 11.600 (CFS)
251
252
253 ++++++
254 Process from Point/Station 503.000 to Point/Station 502.000
255 **** SUBAREA FLOW ADDITION ****
256
257 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
258 Decimal fraction soil group A = 0.000
259 Decimal fraction soil group B = 0.000
260 Decimal fraction soil group C = 0.000
261 Decimal fraction soil group D = 1.000
262 [INDUSTRIAL area type ]  

263 (General Industrial )
264 Impervious value, Ai = 0.950
265 Sub-Area C Value = 0.870
266 Time of concentration = 11.06 min.
267 Rainfall intensity = 5.052 (In/Hr) for a 100.0 year storm
268 Effective runoff coefficient used for total area
269 (Q=KCIA) is C = 0.671 CA = 5.820
270 Subarea runoff = 17.804 (CFS) for 0.044 (Ac.)
271 Total runoff = 29.404 (CFS) Total area = 8.673 (Ac.)
272
273
274 ++++++
275 Process from Point/Station 802.000 to Point/Station 502.000
276 **** SUBAREA FLOW ADDITION ****

```

277
 278 Rainfall intensity (I) = 5.052 (In/Hr) for a 100.0 year storm
 279 Decimal fraction soil group A = 0.000
 280 Decimal fraction soil group B = 0.000
 281 Decimal fraction soil group C = 0.000
 282 Decimal fraction soil group D = 1.000
 283 [UNDISTURBED NATURAL TERRAIN]
 284 (Permanent Open Space)
 285 Impervious value, Ai = 0.000
 286 Sub-Area C Value = 0.350
 287 Time of concentration = 11.06 min.
 288 Rainfall intensity = 5.052 (In/Hr) for a 100.0 year storm
 289 Effective runoff coefficient used for total area
 290 (Q=KCIA) is C = 0.670 CA = 5.833
 291 Subarea runoff = 0.065 (CFS) for 0.037 (Ac.)
 292 Total runoff = 29.469 (CFS) Total area = 8.710 (Ac.)
 293
 294
 295 ++++++
 296 Process from Point/Station 502.000 to Point/Station 306.000
 297 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 298
 299 Upstream point/station elevation = 522.270 (Ft.)
 300 Downstream point/station elevation = 519.320 (Ft.)
 301 Pipe length = 92.00 (Ft.) Slope = 0.0321 Manning's N = 0.013
 302 No. of pipes = 1 Required pipe flow = 29.469 (CFS)
 303 Given pipe size = 30.00 (In.)
 304 Calculated individual pipe flow = 29.469 (CFS)
 305 Normal flow depth in pipe = 13.22 (In.)
 306 Flow top width inside pipe = 29.79 (In.)
 307 Critical Depth = 22.20 (In.)
 308 Pipe flow velocity = 14.14 (Ft/s)
 309 Travel time through pipe = 0.11 min.
 310 Time of concentration (TC) = 11.17 min.
 311
 312
 313 ++++++
 314 Process from Point/Station 306.000 to Point/Station 306.000
 315 **** CONFLUENCE OF MINOR STREAMS ****
 316
 317 Along Main Stream number: 1 in normal stream number 2
 318 Stream flow area = 8.710 (Ac.)
 319 Runoff from this stream = 29.469 (CFS)
 320 Time of concentration = 11.17 min.
 321 Rainfall intensity = 5.021 (In/Hr)
 322 Summary of stream data:
 323
 324 Stream Flow rate TC Rainfall Intensity
 325 No. (CFS) (min) (In/Hr)
 326
 327
 328 1 244.180 49.75 1.916
 329 2 29.469 11.17 5.021
 330 Qmax(1) =
 331 1.000 * 1.000 * 244.180) +
 332 0.382 * 1.000 * 29.469) + = 255.424
 333 Qmax(2) =
 334 1.000 * 0.224 * 244.180) +
 335 1.000 * 1.000 * 29.469) + = 84.288
 336
 337 Total of 2 streams to confluence:
 338 Flow rates before confluence point:
 339 244.180 29.469
 340 Maximum flow rates at confluence using above data:
 341 255.424 84.288
 342 Area of streams before confluence:
 343 159.953 8.710
 344 Results of confluence:
 345 Total flow rate = 255.424 (CFS)

346 Time of concentration = 49.748 min.
 347 Effective stream area after confluence = 168.663 (Ac.)
 348
 349
 350 ++++++
 351 Process from Point/Station 306.000 to Point/Station 307.000
 352 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 353
 354 Upstream point/station elevation = 519.320 (Ft.)
 355 Downstream point/station elevation = 518.410 (Ft.)
 356 Pipe length = 92.00 (Ft.) Slope = 0.0099 Manning's N = 0.013
 357 No. of pipes = 1 Required pipe flow = 255.424 (CFS)
 358 Given pipe size = 66.00 (In.)
 359 Calculated individual pipe flow = 255.424 (CFS)
 360 Normal flow depth in pipe = 43.22 (In.)
 361 Flow top width inside pipe = 62.76 (In.)
 362 Critical Depth = 53.47 (In.)
 363 Pipe flow velocity = 15.49 (Ft/s)
 364 Travel time through pipe = 0.10 min.
 365 Time of concentration (TC) = 49.85 min.
 366
 367
 368 ++++++
 369 Process from Point/Station 307.000 to Point/Station 307.000
 370 **** CONFLUENCE OF MINOR STREAMS ****
 371
 372 Along Main Stream number: 1 in normal stream number 1
 373 Stream flow area = 168.663 (Ac.)
 374 Runoff from this stream = 255.424 (CFS)
 375 Time of concentration = 49.85 min.
 376 Rainfall intensity = 1.913 (In/Hr)
 377
 378
 379 ++++++
 380 Process from Point/Station 601.000 to Point/Station 602.000
 381 **** INITIAL AREA EVALUATION ****
 382
 383 Decimal fraction soil group A = 0.000
 384 Decimal fraction soil group B = 0.000
 385 Decimal fraction soil group C = 0.000
 386 Decimal fraction soil group D = 1.000
 387 [MEDIUM DENSITY RESIDENTIAL]
 388 (14.5 DU/A or Less)
 389 Impervious value, Ai = 0.500
 390 Sub-Area C Value = 0.630
 391 Initial subarea total flow distance = 107.000 (Ft.)
 392 Highest elevation = 532.000 (Ft.)
 393 Lowest elevation = 528.490 (Ft.)
 394 Elevation difference = 3.510 (Ft.) Slope = 3.280 %
 395 Top of Initial Area Slope adjusted by User to 3.510 %
 396 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 397 The maximum overland flow distance is 90.00 (Ft)
 398 for the top area slope value of 3.51 %, in a development type of
 399 14.5 DU/A or Less
 400 In Accordance With Figure 3-3
 401 Initial Area Time of Concentration = 5.28 minutes
 402 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
 403 TC = [1.8*(1.1-0.6300)*(90.000^.5)/(3.510^(1/3))] = 5.28
 404 Rainfall intensity (I) = 8.139 (In/Hr) for a 100.0 year storm
 405 Effective runoff coefficient used for area (Q=KCIA) is C = 0.630
 406 Subarea runoff = 0.482 (CFS)
 407 Total initial stream area = 0.094 (Ac.)
 408
 409
 410 ++++++
 411 Process from Point/Station 602.000 to Point/Station 603.000
 412 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 413
 414 Estimated mean flow rate at midpoint of channel = 2.775 (CFS)

```

415 Depth of flow = 0.370(Ft.), Average velocity = 1.516(Ft/s)
416 ***** Irregular Channel Data *****
417 -----
418 Information entered for subchannel number 1 :
419 Point number 'X' coordinate 'Y' coordinate
420 1 0.00 0.60
421 2 20.00 0.13
422 3 22.00 0.00
423 4 22.00 0.50
424 Manning's 'N' friction factor = 0.015
425 -----
426 Sub-Channel flow = 2.775(CFS)
427 ' ' flow top width = 12.194(Ft.)
428 ' ' velocity= 1.516(Ft/s)
429 ' ' area = 1.830(Sq.Ft)
430 ' ' Froude number = 0.690
431
432 Upstream point elevation = 528.490(Ft.)
433 Downstream point elevation = 525.660(Ft.)
434 Flow length = 925.000(Ft.)
435 Travel time = 10.17 min.
436 Time of concentration = 15.45 min.
437 Depth of flow = 0.370(Ft.)
438 Average velocity = 1.516(Ft/s)
439 Total irregular channel flow = 2.775(CFS)
440 Irregular channel normal depth above invert elev. = 0.370(Ft.)
441 Average velocity of channel(s) = 1.516(Ft/s)
442 Adding area flow to channel
443 Rainfall intensity (I) = 4.073(In/Hr) for a 100.0 year storm
444 Decimal fraction soil group A = 0.000
445 Decimal fraction soil group B = 0.000
446 Decimal fraction soil group C = 0.000
447 Decimal fraction soil group D = 1.000
448 [HIGH DENSITY RESIDENTIAL ]  

449 (43.0 DU/A or Less )
450 Impervious value, Ai = 0.800
451 Sub-Area C Value = 0.790
452 Rainfall intensity = 4.073(In/Hr) for a 100.0 year storm
453 Effective runoff coefficient used for total area
454 (Q=KCIA) is C = 0.780 CA = 1.227
455 Subarea runoff = 4.515(CFS) for 1.478(Ac.)
456 Total runoff = 4.997(CFS) Total area = 1.572(Ac.)
457 Depth of flow = 0.444(Ft.), Average velocity = 1.750(Ft/s)
458
459
460 ++++++
461 Process from Point/Station 603.000 to Point/Station 603.000
462 **** SUBAREA FLOW ADDITION ****
463
464 Rainfall intensity (I) = 4.073(In/Hr) for a 100.0 year storm
465 Decimal fraction soil group A = 0.000
466 Decimal fraction soil group B = 0.000
467 Decimal fraction soil group C = 0.000
468 Decimal fraction soil group D = 1.000
469 [INDUSTRIAL area type ]  

470 (Limited Industrial )
471 Impervious value, Ai = 0.900
472 Sub-Area C Value = 0.850
473 Time of concentration = 15.45 min.
474 Rainfall intensity = 4.073(In/Hr) for a 100.0 year storm
475 Effective runoff coefficient used for total area
476 (Q=KCIA) is C = 0.787 CA = 1.365
477 Subarea runoff = 0.564(CFS) for 0.163(Ac.)
478 Total runoff = 5.561(CFS) Total area = 1.735(Ac.)
479
480
481 ++++++
482 Process from Point/Station 603.000 to Point/Station 603.000
483 **** SUBAREA FLOW ADDITION ****

```

```

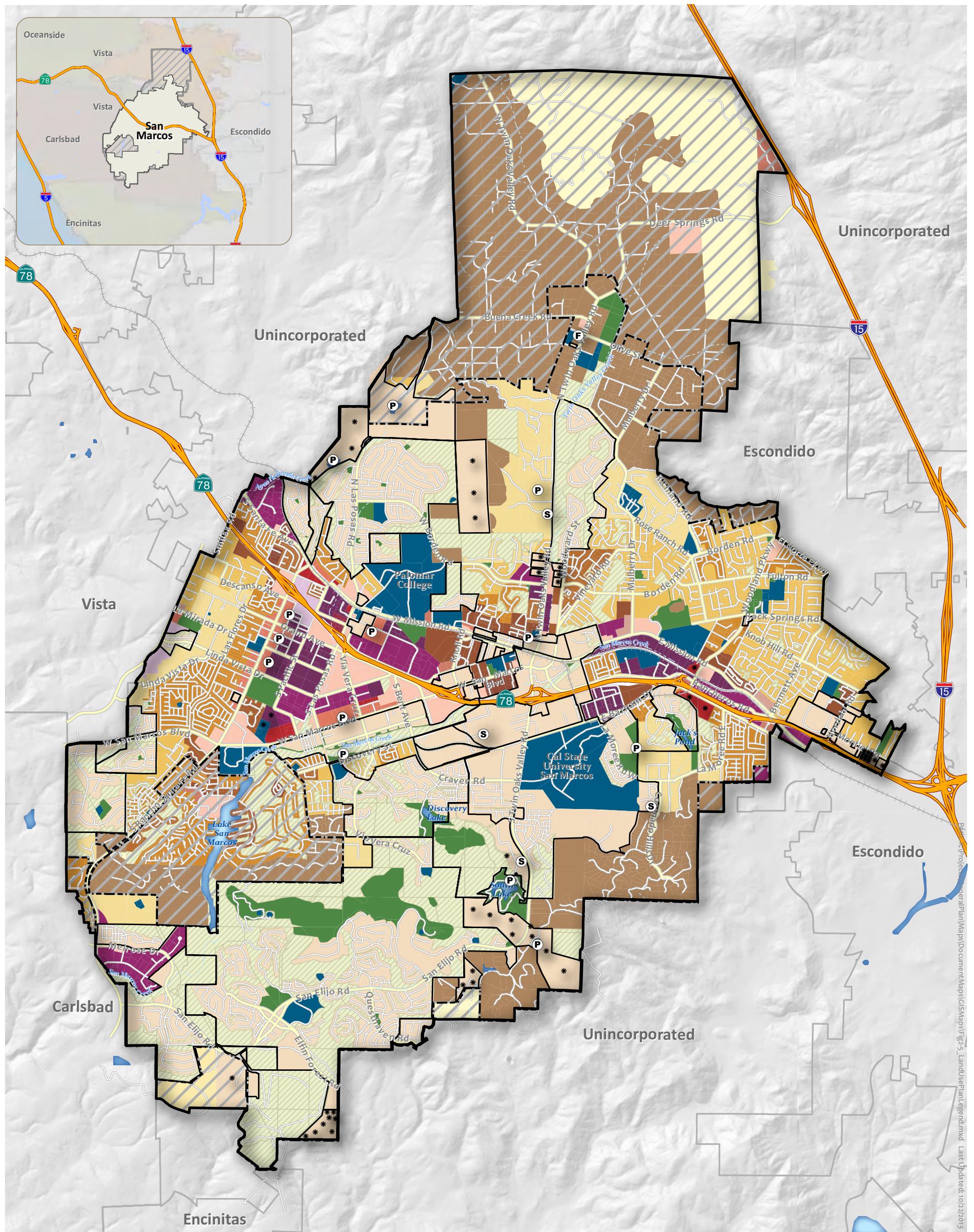
484
485 Rainfall intensity (I) = 4.073 (In/Hr) for a 100.0 year storm
486 Decimal fraction soil group A = 0.000
487 Decimal fraction soil group B = 0.000
488 Decimal fraction soil group C = 0.000
489 Decimal fraction soil group D = 1.000
490 [INDUSTRIAL area type ]  

491 (Limited Industrial )
492 Impervious value, Ai = 0.900
493 Sub-Area C Value = 0.850
494 Time of concentration = 15.45 min.
495 Rainfall intensity = 4.073 (In/Hr) for a 100.0 year storm
496 Effective runoff coefficient used for total area
497 (Q=KCIA) is C = 0.794 CA = 1.560
498 Subarea runoff = 0.793 (CFS) for 0.229 (Ac.)
499 Total runoff = 6.354 (CFS) Total area = 1.964 (Ac.)
500
501
502 ++++++
503 Process from Point/Station 603.000 to Point/Station 604.000
504 **** PIPEFLOW TRAVEL TIME (User specified size) ****
505
506 Upstream point/station elevation = 521.420 (Ft.)
507 Downstream point/station elevation = 520.730 (Ft.)
508 Pipe length = 69.00 (Ft.) Slope = 0.0100 Manning's N = 0.013
509 No. of pipes = 1 Required pipe flow = 6.354 (CFS)
510 Given pipe size = 18.00 (In.)
511 Calculated individual pipe flow = 6.354 (CFS)
512 Normal flow depth in pipe = 10.10 (In.)
513 Flow top width inside pipe = 17.86 (In.)
514 Critical Depth = 11.69 (In.)
515 Pipe flow velocity = 6.23 (Ft/s)
516 Travel time through pipe = 0.18 min.
517 Time of concentration (TC) = 15.63 min.
518
519
520 ++++++
521 Process from Point/Station 604.000 to Point/Station 307.000
522 **** PIPEFLOW TRAVEL TIME (User specified size) ****
523
524 Upstream point/station elevation = 520.730 (Ft.)
525 Downstream point/station elevation = 518.410 (Ft.)
526 Pipe length = 204.00 (Ft.) Slope = 0.0114 Manning's N = 0.013
527 No. of pipes = 1 Required pipe flow = 6.354 (CFS)
528 Given pipe size = 27.00 (In.)
529 Calculated individual pipe flow = 6.354 (CFS)
530 Normal flow depth in pipe = 8.03 (In.)
531 Flow top width inside pipe = 24.68 (In.)
532 Critical Depth = 10.31 (In.)
533 Pipe flow velocity = 6.42 (Ft/s)
534 Travel time through pipe = 0.53 min.
535 Time of concentration (TC) = 16.16 min.
536
537
538 ++++++
539 Process from Point/Station 307.000 to Point/Station 307.000
540 **** CONFLUENCE OF MINOR STREAMS ****
541
542 Along Main Stream number: 1 in normal stream number 2
543 Stream flow area = 1.964 (Ac.)
544 Runoff from this stream = 6.354 (CFS)
545 Time of concentration = 16.16 min.
546 Rainfall intensity = 3.956 (In/Hr)
547 Summary of stream data:
548
549 Stream Flow rate TC Rainfall Intensity
550 No. (CFS) (min) (In/Hr)
551
552

```

```
553      1      255.424      49.85      1.913
554      2      6.354       16.16      3.956
555 Qmax(1) =
556      1.000 * 1.000 * 255.424) +
557      0.484 * 1.000 * 6.354) + = 258.497
558 Qmax(2) =
559      1.000 * 0.324 * 255.424) +
560      1.000 * 1.000 * 6.354) + = 89.171
561
562 Total of 2 streams to confluence:
563 Flow rates before confluence point:
564      255.424      6.354
565 Maximum flow rates at confluence using above data:
566      258.497      89.171
567 Area of streams before confluence:
568      168.663      1.964
569 Results of confluence:
570 Total flow rate = 258.497 (CFS)
571 Time of concentration = 49.847 min.
572 Effective stream area after confluence = 170.627 (Ac.)
573 End of computations, total study area = 170.627 (Ac.)
574
575
576
```

ATTACHMENT 7
CITY OF SAN MARCOS LAND USE PLAN



2

LAND USE AND
COMMUNITY DESIGN ELEMENT

FIGURE 2-5
City of San Marcos
Land Use Plan

0 0.25 0.5 1 Miles

SOURCES OF DATA:
City of San Marcos 3/13 and AECOM, 12/11

Every effort has been made to assure the accuracy of the maps and data provided; however, some information may not be accurate or current. The City of San Marcos assumes no responsibility arising from use of this information and incorporates by reference its disclaimer regarding the lack of any warranties, whether expressed or implied, concerning the use of the same. For additional information, see the Disclaimer of the City's website.

San Marcos City Limits	General Plan Planned Land Use Types
	Agricultural/Residential
	Agricultural/Residential, AG (0.125 - 1 du/ac)
	Residential
	County Rural Residential, COUNTY RR
	Hillside Residential 1, HR1 (0.05 - 0.25 du/ac)
	Hillside Residential 2, HR2 (0.25 - 0.5 du/ac)
	Rural Residential, RR (1 - 2 du/ac)
	Very Low Density Residential, VLDR (2.1 - 4.0 du/ac)
	Low Density Residential, LDR (4.1 - 8.0 du/ac)
	Low Medium Density Residential, LMDR (8.1 - 12.0 du/ac)
	Medium Density Residential 1, MDR1 (12.1 - 15.0 du/ac)
	Medium Density Residential 2, MDR2 (15.1 - 20.0 du/ac)
	Light Industrial, LI
	Industrial, I
	Public/Institutional
	Public/Institutional, PI
	Recreation
	Parks, P
	Open Space, OS
	Specific Plan Area (SPA)
	Specific Plan Area, SPA (For more information regarding specific plans, refer to Figure 2-3 and Appendix D, Table D-3 in General Plan)
*	Identifies Land Use Special Conditions areas as it applies to specific parcels, refer to Appendix D, Table D-2 for details on those special conditions

Note 1: Contact the County of San Diego Land Use & Planning Department to verify the "County Land Use Designations" for all properties that fall within the San Marco Sphere of Influence.

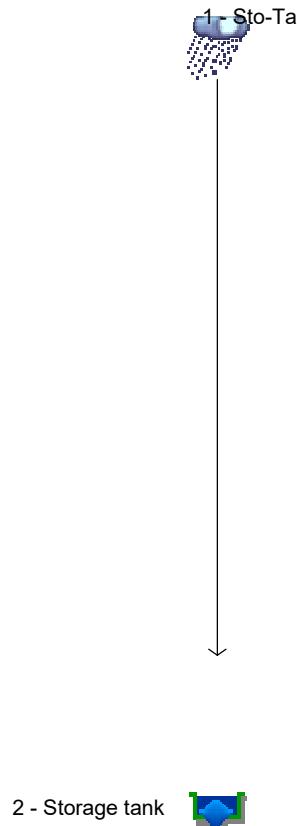
Note 2: Refer to Appendix D, Figure D-4 regarding the color coded properties represented on an exhibit portraying a "snap shot" in time where each recognized "transitional zone" property is located. Each property shall ultimately be removed from this exhibit pending a Rezone approval matching the adopted General Plan Land Use designation as represented on Figure 2-5.

ATTACHMENT 8
HYDROGRAPH

8a. Hydrograph Report

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021



Legend

<u>Hyd. Origin</u>	<u>Description</u>
--------------------	--------------------

- | | | |
|---|-----------|--------------|
| 1 | Manual | Sto-Tank |
| 2 | Reservoir | Storage tank |

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	11.78	8	248	21,178	-----	-----	-----	Sto-Tank
2	Reservoir	6.898	8	256	21,169	1	525.60	4,867	Storage tank
Sto-Tank-No Basin.gpw				Return Period: 100 Year				Monday, 06 / 6 / 2022	

Hydrograph Report

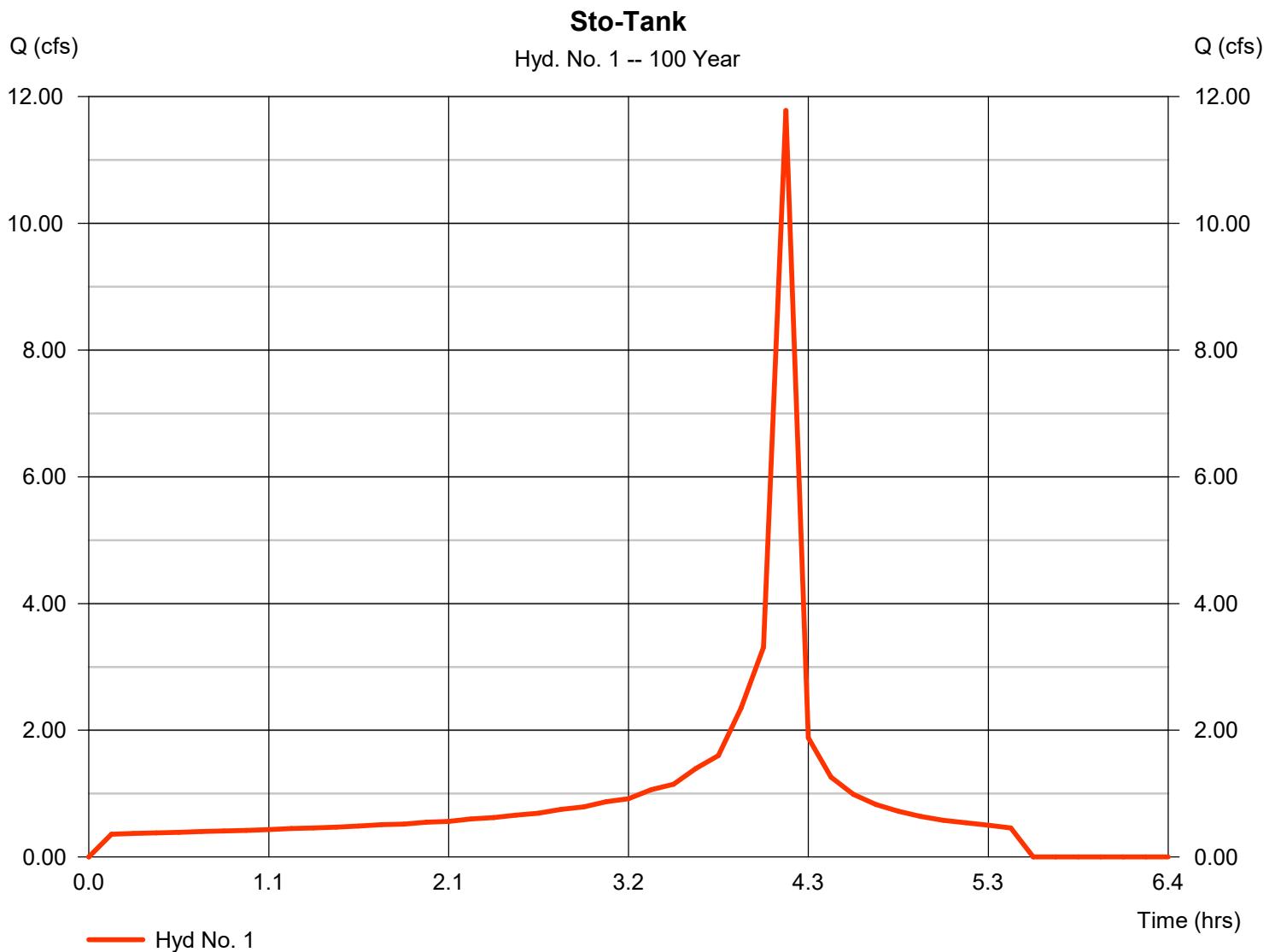
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Monday, 06 / 6 / 2022

Hyd. No. 1

Sto-Tank

Hydrograph type	= Manual	Peak discharge	= 11.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.13 hrs
Time interval	= 8 min	Hyd. volume	= 21,178 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

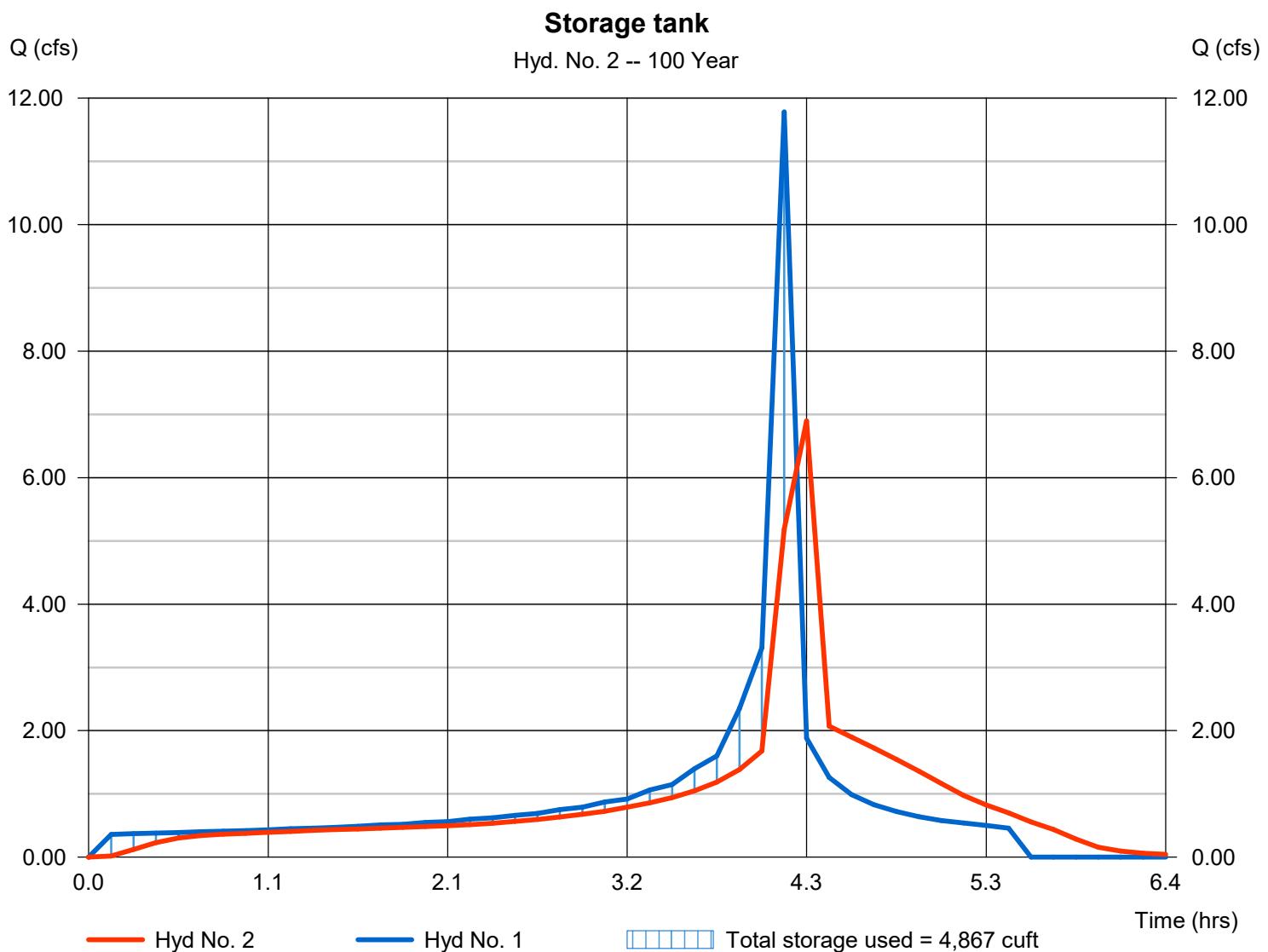
Monday, 06 / 6 / 2022

Hyd. No. 2

Storage tank

Hydrograph type	= Reservoir	Peak discharge	= 6.898 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.27 hrs
Time interval	= 8 min	Hyd. volume	= 21,169 cuft
Inflow hyd. No.	= 1 - Sto-Tank	Max. Elevation	= 525.60 ft
Reservoir name	= STO TANK	Max. Storage	= 4,867 cuft

Storage Indication method used.



Pond Report

5

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Monday, 06 / 6 / 2022

Pond No. 3 - STO TANK

Pond Data

UG Chambers -Invert elev. = 523.17 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 305.00 ft, No. Barrels = 2, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	523.17	n/a	0	0
0.40	523.57	n/a	400	400
0.80	523.97	n/a	692	1,092
1.20	524.37	n/a	843	1,935
1.60	524.77	n/a	929	2,864
2.00	525.17	n/a	970	3,834
2.40	525.57	n/a	970	4,805
2.80	525.97	n/a	928	5,733
3.20	526.37	n/a	843	6,576
3.60	526.77	n/a	693	7,269
4.00	527.17	n/a	398	7,667

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 24.00	6.00	6.00	0.00	Crest Len (ft)	= 16.00	4.00	Inactive	0.00
Span (in)	= 24.00	6.00	6.00	0.00	Crest El. (ft)	= 528.17	525.00	526.50	0.00
No. Barrels	= 1	1	1	0	Weir Coeff.	= 3.33	2.60	2.60	3.33
Invert El. (ft)	= 523.17	523.17	523.70	0.00	Weir Type	= 1	Broad	Broad	---
Length (ft)	= 6.00	0.00	0.00	0.00	Multi-Stage	= Yes	Yes	Yes	No
Slope (%)	= 5.00	0.00	0.00	n/a	Exfil.(in/hr)	= 0.000 (by Wet area)			
N-Value	= .013	.013	.013	n/a	TW Elev. (ft)	= 0.00			
Orifice Coeff.	= 0.60	0.60	0.60	0.60					
Multi-Stage	= n/a	Yes	Yes	No					

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	523.17	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.04	40	523.21	0.00 ic	0.00 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.005
0.08	80	523.25	0.02 ic	0.02 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.018
0.12	120	523.29	0.04 ic	0.04 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.038
0.16	160	523.33	0.06 ic	0.06 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.065
0.20	200	523.37	0.11 ic	0.10 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.099
0.24	240	523.41	0.15 ic	0.14 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.138
0.28	280	523.45	0.18 ic	0.18 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.184
0.32	320	523.49	0.24 ic	0.23 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.232
0.36	360	523.53	0.29 ic	0.28 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.282
0.40	400	523.57	0.35 ic	0.33 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.335
0.44	469	523.61	0.39 ic	0.38 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.385
0.48	538	523.65	0.44 ic	0.44 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.437
0.52	608	523.69	0.48 ic	0.47 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.472
0.56	677	523.73	0.52 ic	0.50 ic	0.00 ic	---	0.00	0.00	0.00	---	---	---	0.501
0.60	746	523.77	0.56 ic	0.52 ic	0.02 ic	---	0.00	0.00	0.00	---	---	---	0.539
0.64	815	523.81	0.60 ic	0.55 ic	0.04 ic	---	0.00	0.00	0.00	---	---	---	0.585
0.68	885	523.85	0.64 ic	0.57 ic	0.07 ic	---	0.00	0.00	0.00	---	---	---	0.636
0.72	954	523.89	0.69 ic	0.59 ic	0.10 ic	---	0.00	0.00	0.00	---	---	---	0.691
0.76	1,023	523.93	0.78 ic	0.60 ic	0.14 ic	---	0.00	0.00	0.00	---	---	---	0.749
0.80	1,092	523.97	0.84 ic	0.63 ic	0.19 ic	---	0.00	0.00	0.00	---	---	---	0.820
0.84	1,177	524.01	0.89 ic	0.64 ic	0.24 ic	---	0.00	0.00	0.00	---	---	---	0.889
0.88	1,261	524.05	0.96 ic	0.66 ic	0.30 ic	---	0.00	0.00	0.00	---	---	---	0.956
0.92	1,345	524.09	1.07 ic	0.67 ic	0.35 ic	---	0.00	0.00	0.00	---	---	---	1.023
0.96	1,430	524.13	1.13 ic	0.69 ic	0.40 ic	---	0.00	0.00	0.00	---	---	---	1.094
1.00	1,514	524.17	1.20 ic	0.71 ic	0.45 ic	---	0.00	0.00	0.00	---	---	---	1.156
1.04	1,598	524.21	1.21 ic	0.73 ic	0.48 ic	---	0.00	0.00	0.00	---	---	---	1.209
1.08	1,683	524.25	1.27 ic	0.75 ic	0.52 ic	---	0.00	0.00	0.00	---	---	---	1.266
1.12	1,767	524.29	1.34 ic	0.77 ic	0.55 ic	---	0.00	0.00	0.00	---	---	---	1.316
1.16	1,851	524.33	1.41 ic	0.78 ic	0.58 ic	---	0.00	0.00	0.00	---	---	---	1.363
1.20	1,935	524.37	1.41 ic	0.80 ic	0.61 ic	---	0.00	0.00	0.00	---	---	---	1.414
1.24	2,028	524.41	1.48 ic	0.82 ic	0.64 ic	---	0.00	0.00	0.00	---	---	---	1.459

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STO TANK

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	CIV A cfs	CIV B cfs	CIV C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.28	2,121	524.45	1.50 ic	0.83 ic	0.67 ic	---	0.00	0.00	0.00	---	---	---	1.502
1.32	2,214	524.49	1.56 ic	0.85 ic	0.69 ic	---	0.00	0.00	0.00	---	---	---	1.548
1.36	2,307	524.53	1.64 ic	0.87 ic	0.72 ic	---	0.00	0.00	0.00	---	---	---	1.587
1.40	2,400	524.57	1.64 ic	0.89 ic	0.74 ic	---	0.00	0.00	0.00	---	---	---	1.632
1.44	2,493	524.61	1.73 ic	0.90 ic	0.77 ic	---	0.00	0.00	0.00	---	---	---	1.669
1.48	2,586	524.65	1.73 ic	0.92 ic	0.79 ic	---	0.00	0.00	0.00	---	---	---	1.711
1.52	2,678	524.69	1.75 ic	0.93 ic	0.81 ic	---	0.00	0.00	0.00	---	---	---	1.747
1.56	2,771	524.73	1.81 ic	0.95 ic	0.83 ic	---	0.00	0.00	0.00	---	---	---	1.787
1.60	2,864	524.77	1.82 ic	0.97 ic	0.86 ic	---	0.00	0.00	0.00	---	---	---	1.823
1.64	2,961	524.81	1.90 ic	0.98 ic	0.88 ic	---	0.00	0.00	0.00	---	---	---	1.859
1.68	3,058	524.85	1.90 ic	1.00 ic	0.90 ic	---	0.00	0.00	0.00	---	---	---	1.897
1.72	3,155	524.89	1.99 ic	1.01 ic	0.92 ic	---	0.00	0.00	0.00	---	---	---	1.928
1.76	3,252	524.93	1.99 ic	1.03 ic	0.94 ic	---	0.00	0.00	0.00	---	---	---	1.965
1.80	3,349	524.97	2.00 ic	1.04 ic	0.95 ic	---	0.00	0.00	0.00	---	---	---	1.999
1.84	3,446	525.01	2.08 ic	1.06 ic	0.97 ic	---	0.00	0.01	0.00	---	---	---	2.041
1.88	3,543	525.05	2.18 ic	1.07 ic	0.99 ic	---	0.00	0.12	0.00	---	---	---	2.175
1.92	3,640	525.09	2.38 ic	1.07 ic	1.01 ic	---	0.00	0.28	0.00	---	---	---	2.362
1.96	3,737	525.13	2.59 ic	1.08 ic	1.03 ic	---	0.00	0.49	0.00	---	---	---	2.590
2.00	3,834	525.17	2.92 ic	1.08 ic	1.04 ic	---	0.00	0.73	0.00	---	---	---	2.848
2.04	3,931	525.21	3.15 ic	1.08 ic	1.06 ic	---	0.00	1.00	0.00	---	---	---	3.141
2.08	4,028	525.25	3.52 ic	1.08 ic	1.08 ic	---	0.00	1.30	0.00	---	---	---	3.454
2.12	4,125	525.29	3.78 ic	1.08 ic	1.08 ic	---	0.00	1.62	0.00	---	---	---	3.781
2.16	4,222	525.33	4.17 ic	1.08 ic	1.08 ic	---	0.00	1.97	0.00	---	---	---	4.127
2.20	4,319	525.37	4.58 ic	1.08 ic	1.08 ic	---	0.00	2.34	0.00	---	---	---	4.490
2.24	4,417	525.41	4.88 ic	1.08 ic	1.08 ic	---	0.00	2.73	0.00	---	---	---	4.882
2.28	4,514	525.45	5.31 ic	1.08 ic	1.08 ic	---	0.00	3.14	0.00	---	---	---	5.290
2.32	4,611	525.49	5.76 ic	1.07 ic	1.07 ic	---	0.00	3.57	0.00	---	---	---	5.711
2.36	4,708	525.53	6.17 oc	1.07 ic	1.07 ic	---	0.00	4.01	0.00	---	---	---	6.150
2.40	4,805	525.57	6.61 oc	1.06 ic	1.06 ic	---	0.00	4.48	0.00	---	---	---	6.597
2.44	4,897	525.61	7.15 oc	1.04 ic	1.04 ic	---	0.00	4.95	0.00	---	---	---	7.044
2.48	4,990	525.65	7.56 oc	1.04 ic	1.04 ic	---	0.00	5.45	0.00	---	---	---	7.522
2.52	5,083	525.69	8.06 oc	1.02 ic	1.02 ic	---	0.00	5.96	0.00	---	---	---	8.002
2.56	5,176	525.73	8.53 oc	1.01 ic	1.01 ic	---	0.00	6.49	0.00	---	---	---	8.499
2.60	5,269	525.77	9.04 oc	0.99 ic	0.99 ic	---	0.00	7.03	0.00	---	---	---	9.000
2.64	5,362	525.81	9.56 oc	0.96 ic	0.96 ic	---	0.00	7.58	0.00	---	---	---	9.507
2.68	5,455	525.85	10.06 oc	0.94 ic	0.94 ic	---	0.00	8.15	0.00	---	---	---	10.02
2.72	5,547	525.89	10.56 oc	0.90 ic	0.90 ic	---	0.00	8.73	0.00	---	---	---	10.53
2.76	5,640	525.93	10.92 oc	0.86 ic	0.86 ic	---	0.00	9.20 s	0.00	---	---	---	10.92
2.80	5,733	525.97	11.28 oc	0.84 ic	0.84 ic	---	0.00	9.61 s	0.00	---	---	---	11.28
2.84	5,817	526.01	11.82 oc	0.84 ic	0.84 ic	---	0.00	10.14 s	0.00	---	---	---	11.82
2.88	5,902	526.05	12.37 oc	0.85 ic	0.85 ic	---	0.00	10.67 s	0.00	---	---	---	12.37
2.92	5,986	526.09	12.91 oc	0.85 ic	0.85 ic	---	0.00	11.21 s	0.00	---	---	---	12.90
2.96	6,070	526.13	13.44 oc	0.85 ic	0.85 ic	---	0.00	11.74 s	0.00	---	---	---	13.44
3.00	6,154	526.17	13.98 oc	0.85 ic	0.85 ic	---	0.00	12.27 s	0.00	---	---	---	13.98
3.04	6,239	526.21	14.51 oc	0.86 ic	0.86 ic	---	0.00	12.80 s	0.00	---	---	---	14.51
3.08	6,323	526.25	15.04 oc	0.86 ic	0.86 ic	---	0.00	13.32 s	0.00	---	---	---	15.04
3.12	6,407	526.29	15.56 oc	0.86 ic	0.86 ic	---	0.00	13.85 s	0.00	---	---	---	15.56
3.16	6,492	526.33	16.08 oc	0.86 ic	0.86 ic	---	0.00	14.37 s	0.00	---	---	---	16.08
3.20	6,576	526.37	16.59 oc	0.85 ic	0.85 ic	---	0.00	14.88 s	0.00	---	---	---	16.59
3.24	6,645	526.41	17.10 oc	0.85 ic	0.85 ic	---	0.00	15.39 s	0.00	---	---	---	17.10
3.28	6,714	526.45	17.60 oc	0.85 ic	0.85 ic	---	0.00	15.90 s	0.00	---	---	---	17.60
3.32	6,784	526.49	18.10 oc	0.85 ic	0.85 ic	---	0.00	16.40 s	0.00	---	---	---	18.10
3.36	6,853	526.53	18.59 oc	0.85 ic	0.85 ic	---	0.00	16.90 s	0.00	---	---	---	18.59
3.40	6,922	526.57	19.08 oc	0.84 ic	0.84 ic	---	0.00	17.39 s	0.00	---	---	---	19.08
3.44	6,991	526.61	19.47 ic	0.84 ic	0.84 ic	---	0.00	17.80 s	0.00	---	---	---	19.47
3.48	7,061	526.65	19.82 ic	0.83 ic	0.83 ic	---	0.00	18.17 s	0.00	---	---	---	19.82
3.52	7,130	526.69	20.16 ic	0.81 ic	0.81 ic	---	0.00	18.53 s	0.00	---	---	---	20.16
3.56	7,199	526.73	20.49 ic	0.80 ic	0.80 ic	---	0.00	18.88 s	0.00	---	---	---	20.49
3.60	7,269	526.77	20.82 ic	0.79 ic	0.79 ic	---	0.00	19.23 s	0.00	---	---	---	20.82
3.64	7,308	526.81	21.13 ic	0.78 ic	0.78 ic	---	0.00	19.57 s	0.00	---	---	---	21.13
3.68	7,348	526.85	21.44 ic	0.77 ic	0.77 ic	---	0.00	19.89 s	0.00	---	---	---	21.44
3.72	7,388	526.89	21.74 ic	0.76 ic	0.76 ic	---	0.00	20.21 s	0.00	---	---	---	21.74
3.76	7,428	526.93	22.04 ic	0.75 ic	0.75 ic	---	0.00	20.53 s	0.00	---	---	---	22.04
3.80	7,468	526.97	22.33 ic	0.74 ic	0.74 ic	---	0.00	20.84 s	0.00	---	---	---	22.33
3.84	7,508	527.01	22.61 ic	0.74 ic	0.74 ic	---	0.00	21.14 s	0.00	---	---	---	22.61
3.88	7,547	527.05	22.89 ic	0.73 ic	0.73 ic	---	0.00	21.43 s	0.00	---	---	---	22.88
3.92	7,587	527.09	23.16 ic	0.72 ic	0.72 ic	---	0.00	21.72 s	0.00	---	---	---	23.16
3.96	7,627	527.13	23.42 ic	0.71 ic	0.71 ic	---	0.00	22.00 s	0.00	---	---	---	23.42
4.00	7,667	527.17	23.68 ic	0.70 ic	0.70 ic	---	0.00	22.28 s	0.00	---	---	---	23.68

...End

8b. Runoff Coefficient C After Detention Structure Calculations

CALCULATION AFTER THE DETENTION STRUCTURE

The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

For the purposes of this example there will be an association of the following values:

Q_{in} = Is equal to the inflow value that will enter the basin before storage

Q_{out} = Is equal to the outflow value that will exit the basin after storage

Tc_{in} = Is equal to the Time of Concentration flowing into the basin before detention

Tc_{out} = Is equal to the Time of Concentration exiting the basin after detention

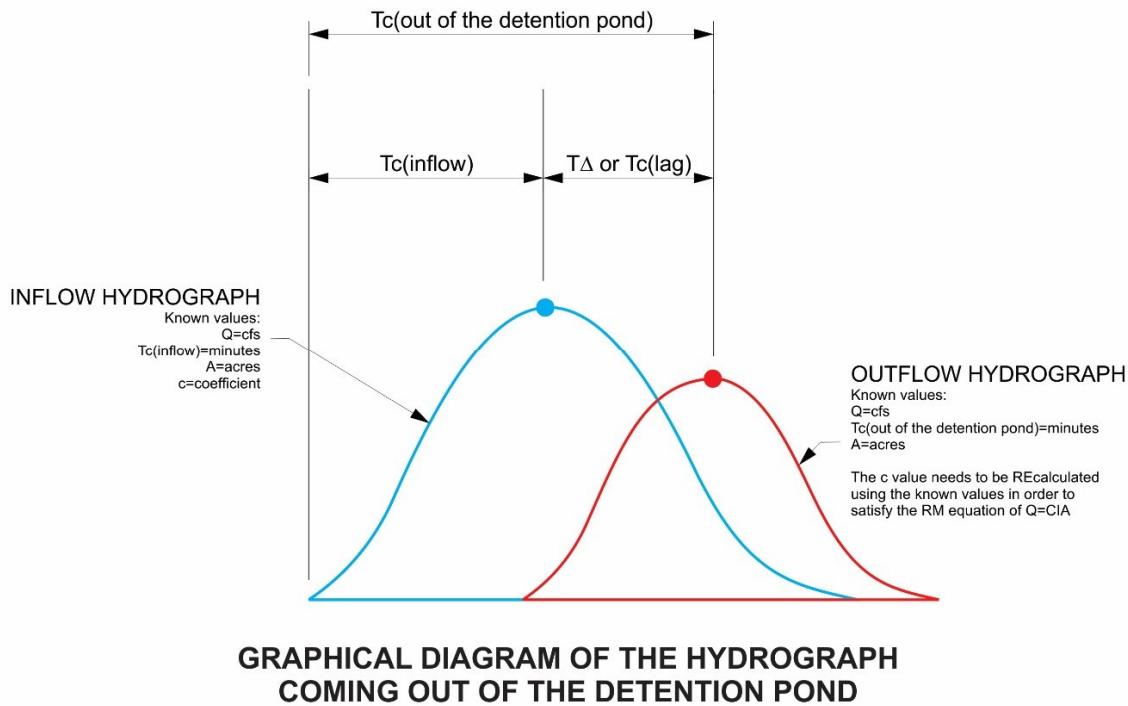
A = Area of the tributary area being examined; (This value does not change)

c_{inflow} = The runoff coefficient going into the basin for detention

c_{out} = The runoff coefficient recalculated taking into account water stored in pond for detention

One method is to keep the value of $c(inflow)$ and solve for the $I=$ intensity & $Tc(outflow)$. In this interpretation, we will get a Tc that will not match the value of the $Tc_{(out \text{ of the detention structure})}$ of the outflow hydrograph that was calculated using the detention pond. The Tc Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula $Q=cIA$.

The second method; that is the method we are using is to recalculate the $c=$ coefficient based on the fix values of the outflow hydrograph to achieve a c_{out} . This value uses the c_{inflow} from the flow into the detention basin and then is recalculated by the output of the hydrograph software using $Q=cIA$; translated as $c=Q/IA$. This method preserves the formula $Q=cIA$ & does not alter the $Tc_{(out \text{ of the detention structure})}$. This method shows that in order to maintain mathematical integrity of the rational equation ($Q=CIA$), the detention structure alters the runoff coefficient which is the only unknown in the equation. It is noted that the designer feels it is important to hold the value of Tc and the Q values that are calculated from the hydrograph.



The routing of the runoff through the detention structure gives us the $Q_{(out \text{ of the detention structure})}$ and $T\Delta$ time lag between $Q_{(inflow)}$ & $Q_{(out \text{ of the detention structure})}$.

The known fix values coming out of the detention structure are:

- $Q = \text{cfs}$
- $Tc_{(\text{out of the detention structure})} = \text{minutes}$
- $A = \text{acres}$
- *Please note that $c=\text{coefficient}$ is not given directly from the resulting hydrograph coming out of the detention pond.*

In order to satisfy the rational equation of $Q=CIA$ (see Section 3 of the 2003 San Diego County Hydrology Manual) coming out of the detention structure, we will calculate the only unknown value of the equation which is the outlet runoff coefficient, $C_{(\text{outlet})}$. By using the $Tc_{(\text{out of the detention structure})}$ we can solve for the intensity, I . With the intensity (I) value calculated, we can solve for the outlet runoff coefficient, $C_{(\text{outlet})}$.

The following equations are used in

this stage: $Q = CIA$

$$I = 7.44P_6 D^{-0.645}$$

Where:

$Q_{(\text{out of the detention structure})} = \text{runoff (cfs), known value}$

$Tc_{(\text{inflow})} = \text{detention structure inflow time of concentration (D)}$
(minutes)

$T\Delta = \text{time lag between } Q_{(\text{inflow})} \text{ & } Q_{(\text{out of the detention structure})}$

$$(\text{minutes}) Tc_{(\text{out of the detention structure})} = Tc_{(\text{inflow})} + T\Delta (\text{minutes})$$

P_6 = 6 hour precipitation (inches), known value.

I = intensity (inches/hour), calculated based on the value of $Tc_{(\text{out of the detention structure})}$

A = tributary area of the detention structure (acres),

known value $C_{(\text{outflow})}$ = runoff coefficient (unitless),

value to be solved

STO TANK (TC LAG FROM HYDRAFLOW HYDROGRAPH)			
LINE	ITEM	STORAGE PIPE	REMARKS
1	P6 inch	3.2	KNOWN VALUE
2	TC (inflow) mins	8	KNOWN VALUE
3	TC (lag) mins	8.4	FROM THE OUTFLOW HYDROGRAPH
4	TC (outflow) mins	16.4	LINE 2+3
5	I inches/hour	3.919	FROM THE INTENSITY FORMULA
6	Q(outflow)	6.898	KNOWN VALUE
7	A (inflow=outflow)	2.26	KNOWN VALUE
8	c(inflow)	0.84	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.779	CALCULATED FROM $C=Q/A$

The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

In summary these are the steps of the calculations presented here:

1. Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual was used upstream of the detention structure. These includes the methods of determining c , Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.
2. At the outflow of the detention structure, the c value was recalculated using the resulting values of the outflow hydrograph. This method preserves the values of $Tc_{(\text{out of the detention structure})}$, A & $Q_{(\text{outflow})}$. Methods and software satisfy the formula $Q=cIA$ & the 2003 San Diego Hydrology Manual. This step shows that in order to maintain mathematical integrity of the rational equation ($Q=CIA$), the detention structure alters the runoff coefficient which is the only unknown in the equation.
3. The values determined in step 2 were used in the continuation of the calculations using the Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual downstream of the detention structure. These includes the methods of determining c , Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.