PRELIMINARY DRAINAGE STUDY
For
SMILAX

APN'S 217-191-02, 217-191-03-00

Preparation/Revision Date:
July 07, 2020

PDS2019-TM-5634

Prepared for:
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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 code, and that the design is consistent with current standards.

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

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Alisa S. Vialpando, R.C.E. 47945 Date
Vice President

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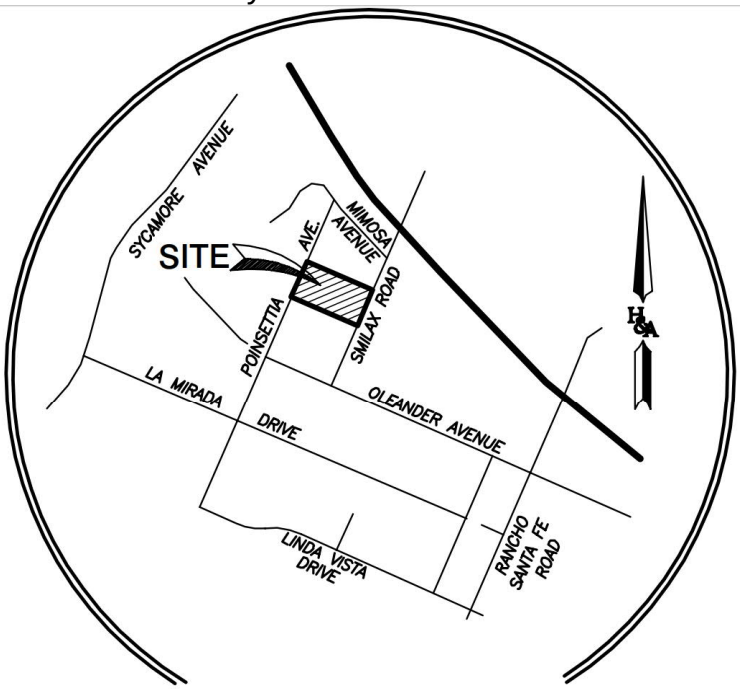
CHAPTER 1 EXECUTIVE SUMMARY

1.1 Introduction

Smilax project is located at 425 Smilax Road, south of the 78 Freeway between Smilax Road (east) and Poinsettia Avenue (west), with existing residential properties to the north and south, in the City of Vista, California. The property is within the unincorporated area of the County of San Diego. (See the Vicinity Map below) The development proposes multi-family structures containing 62 attached condominium within 4.90 acres, and removing and replacing existing sidewalk and curb with minor road widening to accommodate a lift turn pocket at Smilax Road.

The runoff generated from the road widening of Smilax Road, as proposed per this project, is captured by a proposed inlet located just north of the entrance which is sized\restricted only to capture the flow from the newly added or replaced pavement. The flow will be connected to the project drainage system via storm drain pipe sized minimally to convey only said flow, and routed though the project biofiltration basin (BF-1-1) to meet pollutant, flow control and detention requirements.

The site will also include two open spaces, a biofiltration basin, sidewalks, access road and private driveways. The lots are connected by private drives which are accessible via Smilax Rd on the east boundary and Poinsettia Ave on the west boundary.



VICINITY MAP

NTS

This report will analyze both the existing and proposed hydrologic conditions relative to development of the site. Proposed stormwater facilities include storm drain, curb inlets, catch basins, a water quality/ hydromodification and detention basin, brow ditches, and energy dissipation devices. The proposed basin for the site will not only act to address water quality, but will also address flow control hydromodification concerns and detention.

Potential failure of basin berm would not expose people or structures to a significant risk of loss, injury or death.

A separate report has been prepared which details the proposed treatment and flow control features for the project. Refer to the *Stormwater Quality Management Plan (SWQMP) for the Smilax* prepared by Hunsaker & Associates San Diego, Inc. (July 2020).

Summary of Existing Conditions

The existing condition hydrology map (Exhibit 1) is located in Chapter 5. An existing residential structure currently occupies the eastern portion of the northern parcel. Vegetation on the southern parcel and the western portion of the northern parcel, consist primarily of grasses, scattered weeds. The western portion of the northern parcel and the entire southern parcel have been periodically used for row crops. The site's drainage area is 6.45 acres, including the 1.58 acres off-site drainage area. The runoff from off-site area conveyed through the project site via overland flow. The existing topography of the site is gently sloping from southeasterly to northwesterly falling approximately 4% from a high point of about 467 feet to a low point of approximately 425 feet in elevation. The imperviousness of the site in its existing condition is approximately 10%.

The associated runoff coefficient for the subareas was weighed depending on the respective subarea imperviousness and in accordance with the San Diego County Hydrology Manual Table 3-1.
(0% imperviousness →C=0.35, 65% imperviousness →C=0.71...etc.)
An area-average runoff coefficient has been provided in Table-3 below. (From AES)

Runoff from the project site is conveyed via overland flow and then confluences with the offsite flows to be conveyed via 18" storm drain pipe crossing Poinsettia Ave at the middle of west border of the site. The out-flow is conveyed southwest via overland flow towards Oleander Ave., and eventually discharging into Agua Hedionda creek.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary. A runoff coefficient was used per the Table 3-1 of the San Diego County Hydrology Manual. Supporting calculations for the data presented in Table 1 is located in Chapter 3 of this report. The corresponding hydrology map (Exhibit 1) is located in Chapter 5.

TABLE 1 - Summary of Existing Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	C Area-Average Runoff Coefficient	Tc (min)	I (in\hr)	V100* Velocity (ft\sec)	Q100-Year Peak Flow (cfs)
1	3	Middle of west border of the site	6.45	0.480	8.08	6.281	3.11	15.1

Summary of Developed Conditions

The post-developed condition of the site will consist of improvements consistent of multi-family structures containing 56 residential units, driveways, access roads, sidewalks, landscaped open spaces and removing and replacing existing sidewalk and curb with road widening to accommodate a lift turn pocket at Smilax Road. The run off from the widening area will be collected by a proposed curb inlet located north of the entrance and sized\restricted to capture just the flow generated from the newly added and replaced area. The flow will be conveyed via proposed storm drain to the proposed biofiltration basin BF-1-1.

The site also proposes an open space dedicated for a water quality basin facility. The water quality basin will treat onsite runoff and the street widening runoff, attenuate peak flows and aid in addressing flow control hydromodification. For additional discussion on the proposed water quality features of the site, refer to the *Stormwater Quality Management Plan for the Smilax* (July, 2020) prepared by Hunsaker & Associates San Diego, Inc. The infrastructure will include streets and associated utilities including a storm drain system (pipes, inlets, cleanouts) necessary to collect and convey site runoff through the project area. The site will not place housing within a 100-year flood hazard area. The site is located within an unmapped area per the FEMA website and will therefore not require a letter of map revision.

Cut and fill grading techniques are anticipated in order to bring the site to the desired grades. Based on existing and proposed site, maximum cut and fill thicknesses, appear to be on the order of approximately 10 feet, or less. Graded slopes are anticipated to heights of approximately 10 feet, or less, at gradients of 2:1 (H: V), or flatter. Several retaining walls are used as needed.

The proposed condition hydrology Exhibit 2 in Chapter 5 shows the developed site with its subareas to each inlet location. Street grades throughout the site vary between 1% and 4.0%. The general direction of flows for the subareas is relatively consistent with the existing condition. On-site runoff from 4.44 acres drainage area will be conveyed via storm drains towards the proposed water quality basin located at the west of the site to detain and attenuate the 100-year peak flows. At the eastern border of the site, there is a road widening area along Smilax Road. The runoff from Smilax Road widening,

entrance driveway, and the adjusted landscaped area (total of 0.25 acres) is collected by a proposed curb inlet locate north of the entrance and conveyed west via proposed storm drain to the project biofiltration basin BF-1-1. In order to capture the flow from the street widening added and replaced pavement and routed it to the proposed biofiltration basin, 0.05 acres at the eastern border of the site, which used to drain in south-north direction in the existing condition, is diverted west in the proposed condition to be treated in the biofiltration basin (BF-1-1). As a consequence, the project depicts an increase of 0.05 acres in the drainage area to the west as compared to existing condition.

The separate runoff from 1.81 acres, including off-site drainage area south and on-site self-mitigating pervious area north and west, is conveyed via brow ditches towards the middle of west border of the site and confluences with the onsite runoff, which has been routed through the respective basin outlet and spillway, the total runoff is conveyed via 18" storm drain pipe crossing Poinsettia Ave. The out-flow is conveyed southwest via overland flow towards Oleander Ave., and eventually discharging into Agua Hedionda Creek, as in pre-project condition.

The table below summarizes the Q100 flow at the discharge point.

TABLE 2 - Summary of Developed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	100-Year Peak Flow (cfs)	Detained 100-Year Peak Flow (cfs)
2	15	Middle of west border of the site	6.50	24.51	12.36

The associated runoff coefficient for the residential areas was weighed depending on the respective subarea imperviousness and in accordance with the San Diego County Hydrology Manual Table 3-1.

(66% impervious →C=0.73, 21.6% impervious →C=0.43...etc) (For the street widening 70.68% imperviousness →C=0.742)

An area-average runoff coefficient has been provided in Table-3 below. (From AES)

Supporting calculations for the data presented in Table 2 is located in Chapter 3. The reduced flows at the discharge point can be attributed to the reduction in runoff coefficient compared to existing condition. The corresponding hydrology map (Exhibit 2) is located in Chapter 5.

Summary of Results

The proposed basin located at the west of the site will treat stormwater runoff prior to exiting the site. The basin will be constructed with an upper engineered soil layer to aid in the removal of pollutants generated by the site. In addition, the basin will be constructed with a lower gravel section which will be utilized for detention storage to

help in addressing flow control hydromodification. The outlet structure for the basin will consist of a riser box with a top opening and side orifices sized to moderate flow outlet to meet flow control requirements. Refer to the *Stormwater Quality Management Plan (SWQMP) for the Smilax* prepared by Hunsaker & Associates San Diego, Inc. (July, 2020).

Due to the increase of runoff coefficient compared with the existing condition, the peak flows generated from the site will be increased. Therefore, attenuation of peak flows is required. Peak flows will be attenuated within the detention basin to minimize the flows being generated from the site. Once runoff has been routed through the basin outlet structure and spillway, it confluences and with the separate off-site flows and then conveyed via existing 18" storm drain pipe crossing Poinsettia Ave as in pre-project condition.

The table below summarizes the comparison between the existing and proposed flow rates from the site.

TABLE 3 – Existing Condition vs. Proposed Condition

From the AES report See Chapter 3

	Discharge Location	**Area (ac)***	**C* Area-Average Runoff Coefficient**	**Tc* Time of Concentration (min)***	**I* Intensity (inch\hr)**	**V100** Velocity (ft\sec)**	**Q100* Peak Flow (cfs)***
Existing	Middle of west border of the site	6.45	0.48	8.08	6.281	3.11	15.29
Proposed Unmitigated	Middle of west border of the site	6.50	0.6875 On-site & 0.4742 Off-site	9.26	5.756	2.55	24.51
Proposed Mitigated	Middle of west border of the site	6.50	0.6875 On-site & 0.4742 Off-site	18.49	3.684	2.02	11.93

* From AES report

**Per the county comment; to provide preliminary velocity V100 in the pre-development condition a channel analysis has been provided assuming a 5' bottom width channel with 10:1 (H:V) side slopes.(See Chapter 3)

**To calculate the 100-year Velocity in the proposed condition, a weir analysis has been provided for the spillway (Mitigated and Unmitigated conditions). (See Chapter 3)

Rip rap is proposed at the storm drain discharge location at the basin will aid in dissipating outlet velocities. Brow ditches are proposed to collect and convey off-site

runoffs from south and north borders of the site. The brow ditch will continue along the northern and southern project boundaries and empty into the middle of west border of the site and then conveyed via existing18” storm drain pipe crossing Poinsettia Ave as in pre-project condition.

Design calculations for these brow ditches as well as the storm drain hydraulics will be conducted as part of the final engineering drainage study.

The proposed development will drain/convey its runoff towards the middle of west border of the site similar to existing conditions. However, the site will include a basin which will provide the added benefit of water quality treatment, flow control (HMP) measures, and peak flow attenuation. These benefits will provide improvements over the existing condition relative to erosion potential at the existing downstream discharge point.

Conclusion

As seen from table 3, the project attenuates flows to below pre-project conditions and as a result, there are no adverse effects to be expected downstream. Therefore, slope stability, vegetative stress, and other susceptible areas are not impacted.

References

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

San Diego County Hydraulic Design Manual, County of San Diego Department of Public Works Flood Control Division, September 2014

San Diego County Drainage Design Manual, County of San Diego Department of Public Works Flood Control Division, July 2005

County of San Diego San Diego SUSMP, County of San Diego, January 2011

Stormwater Quality Management Plan for Smilax, Hunsaker & Associates San Diego, Inc., July 2020.

CHAPTER 2 METHODOLOGY

Modified Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100- year return interval

Land Use – Multi-family Residential, Open Space

Soil Type – Hydrologic soil group D was assumed for all areas. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficients were based on land use and slope per San Diego County Hydrology Manual.

Rainfall Intensity- The rainfall intensity is determined per the San Diego County Hydrology Manual based on 6-hour precipitation amounts and calculated time of concentrations. Six-hour precipitations are taken from the San Diego County Hydrology Manual isopluvials.

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 square miles, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

- Q = the peak runoff rate in cubic feet per second at the point of analysis.
- C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.
- I = the time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.
- A = the drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into subareas with the initial subarea being less than 10 acres in size (generally 1 lot will do), and subsequent subareas gradually increasing in size. Assign upstream and downstream nodal numbers to each subarea to correlate calculations to the watershed map.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of me. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2003 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$$Q_P = Q_a + Q_b;\ T_p = T_a = T_b$$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

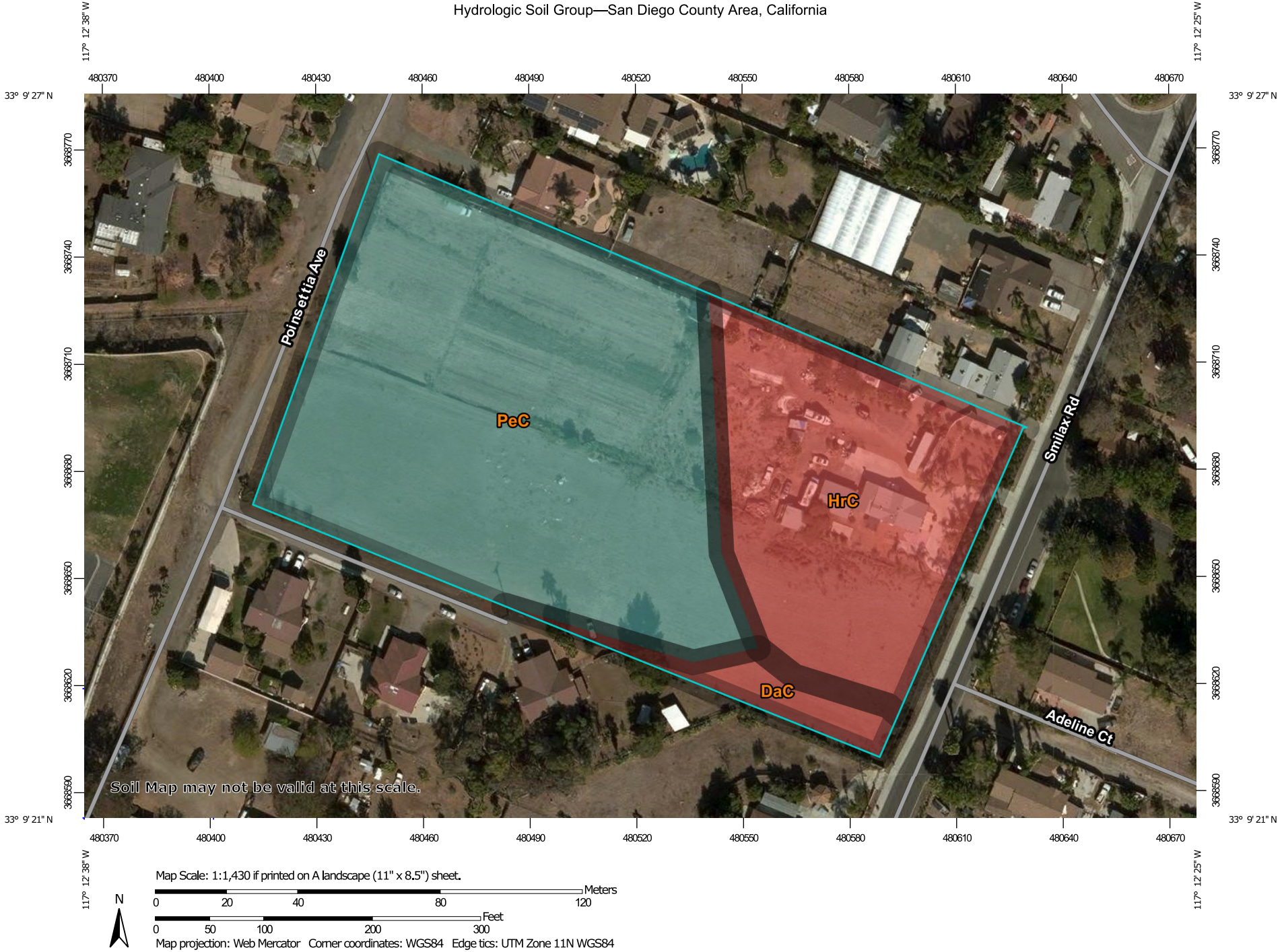
$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$Q_P = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

Underground storm drains are analyzed in a similar way. Flow data obtained from the surface model for inlets and collection points are input into the nodes representing those structures. Design grades and lengths are used to compute the capacity of the storm drains and to model the downstream travel times.

SOIL’s INFORMATION



Map Scale: 1:1,430 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

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 13, Sep 12, 2018

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

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

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	0.2	4.5%
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.6	32.4%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	3.1	63.2%
Totals for Area of Interest			**4.9**	**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.

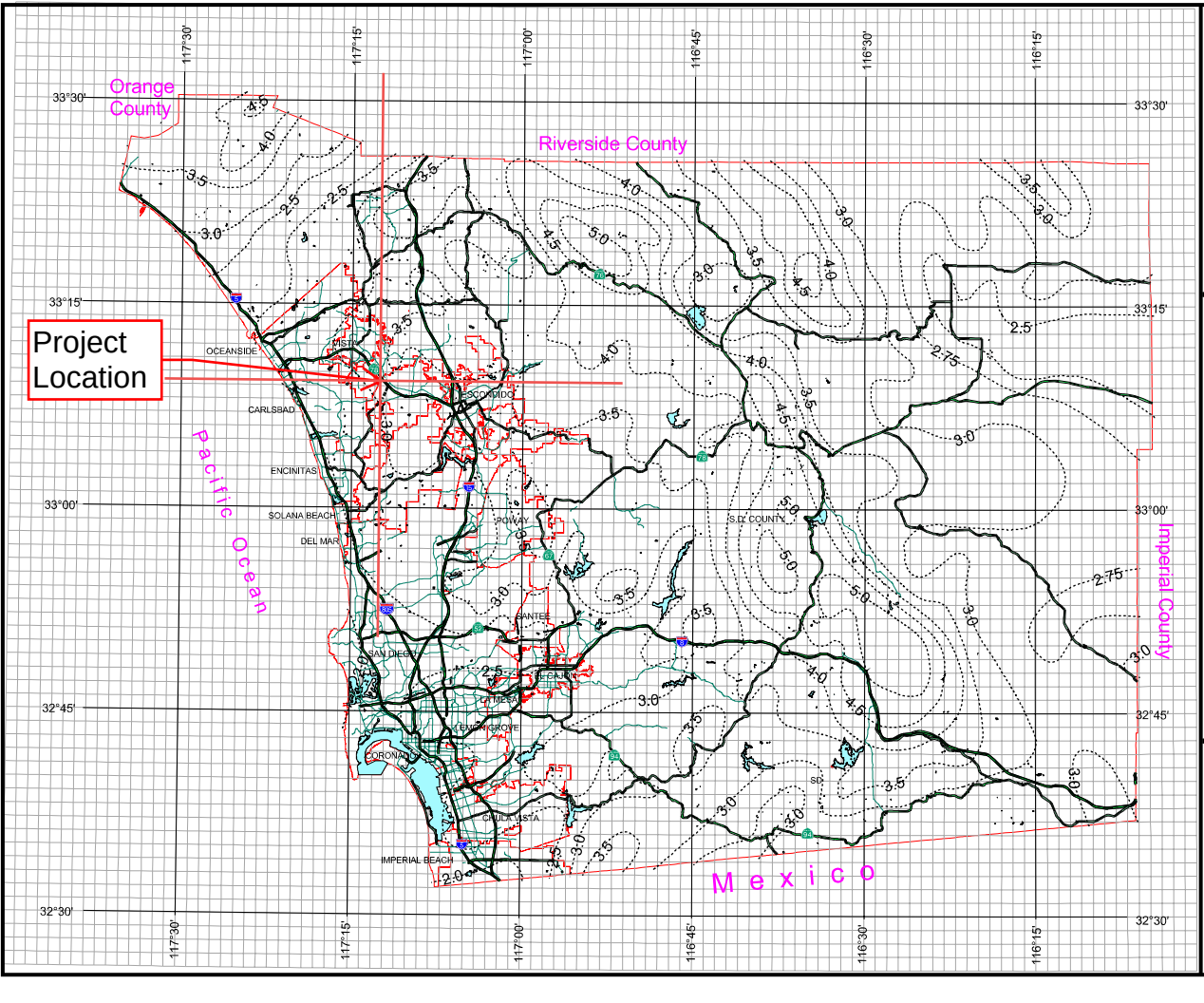
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

RAINFALL DATA



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

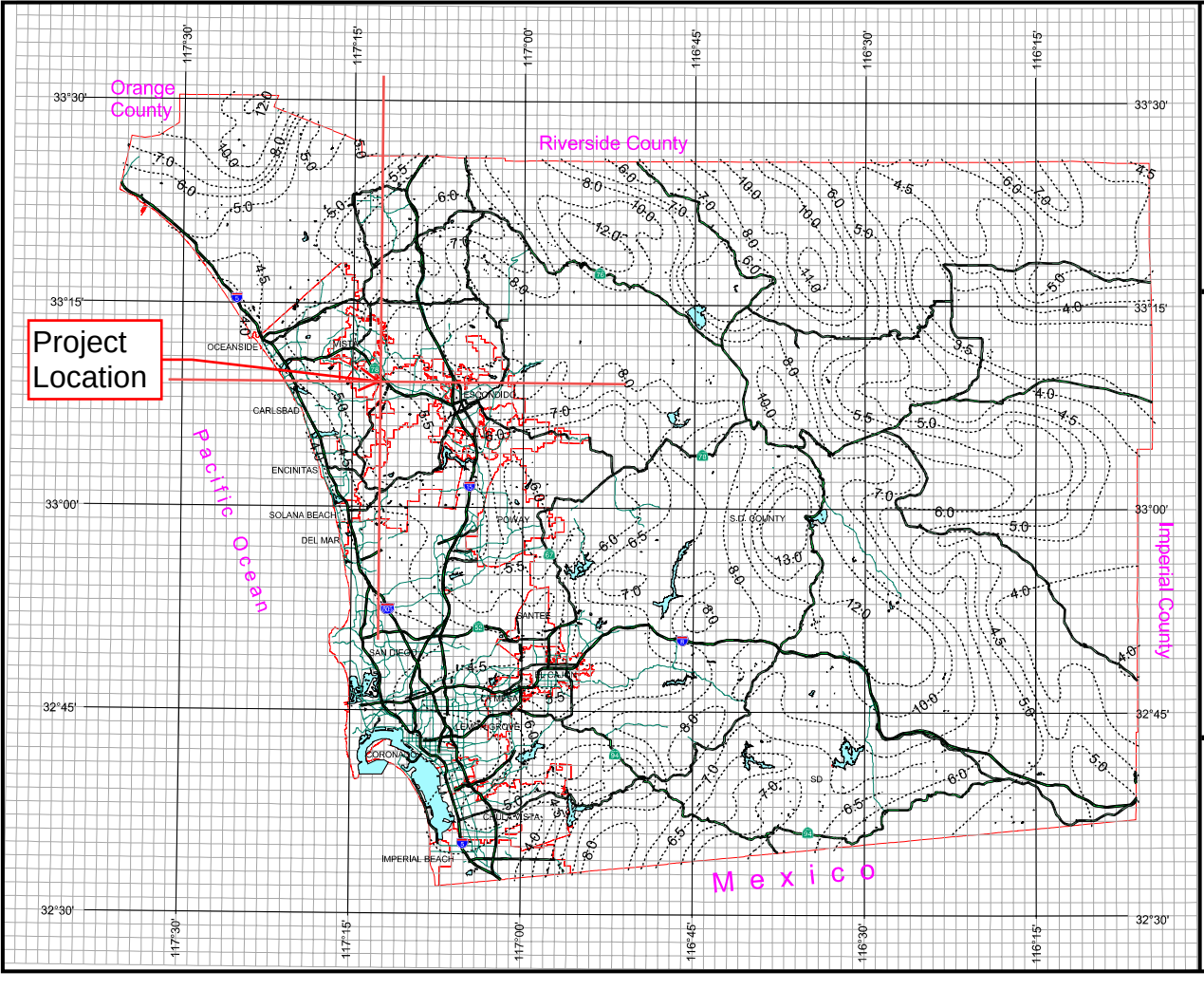
P6 = 3.25 in

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

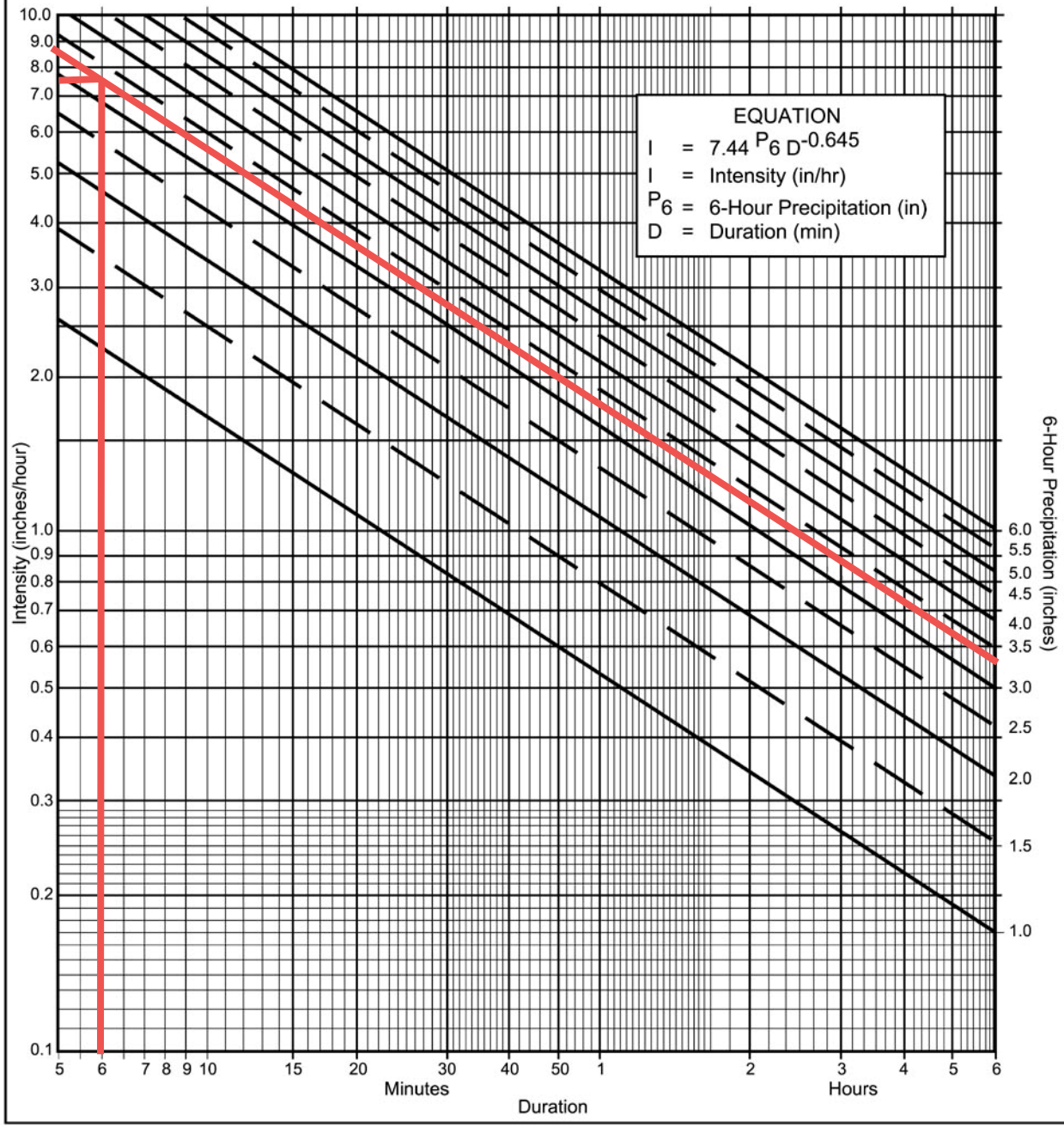
P24 = 5.55 in

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



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 applicaple 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 100 year

(b) P_6 = 3.25 in., P_{24} = 5.55, $\frac{P_6}{P_{24}} = \frac{3.25}{5.55}$ = 59%(2)

(c) Adjusted P_6(2) = 3.25 in.

(d) t_x = 6.0 min.

(e) I = 8.5 in./hr.

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

P6	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

FIGURE 3-1

RUNOFF COEFFICIENTS

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% 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

EXISTING

PROPOSED

66 → 0.73

PROPOSED

*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)

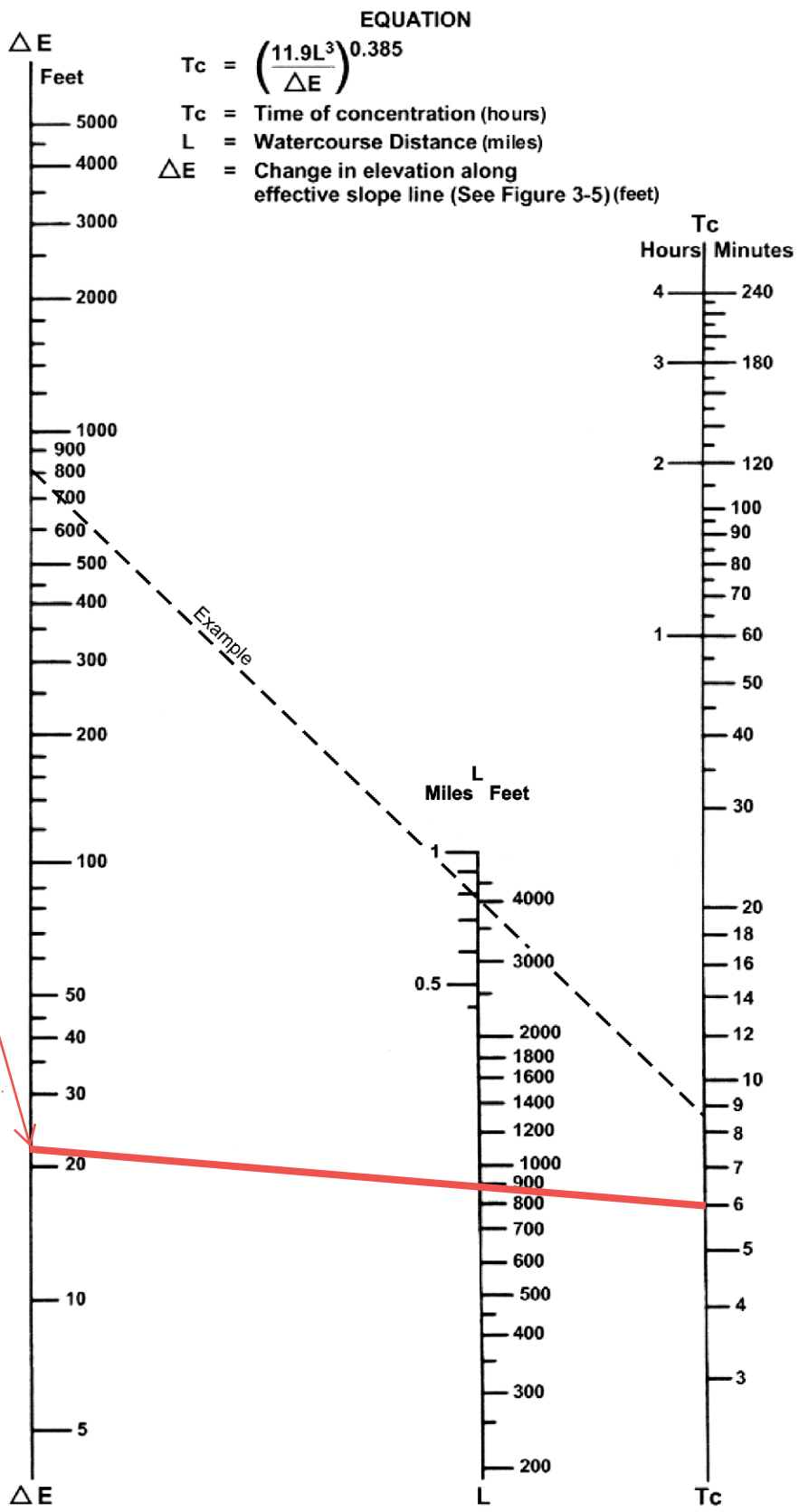
existing conditions

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

proposed conditions

Nomographs



effective height

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

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

CHAPTER 3
HYDROLOGIC ANALYSIS
100 – Year Design Storm

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************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                          Analysis prepared by:
```

```
 ************************** DESCRIPTION OF STUDY **************************
* SMILAX W.O. 0490-0174                                                  *
* EXISTING CONDITION 100 YEAR RAIN EVENT                                 *
* 07/06/2020                                                             *
 ************************************************************************

  FILE NAME: R:\1516\HYD\CALCS\TM\AES\EX100.DAT
  TIME/DATE OF STUDY: 14:37 07/07/2020
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.250
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    468.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.106
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.03
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      1.03

************************************************************************
```

```
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    463.00  DOWNSTREAM(FEET) =    425.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   731.25   CHANNEL SLOPE =  0.0520
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  22.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.281
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.29
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.06
 AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   3.98
 Tc(MIN.) =    8.08
 SUBAREA AREA(ACRES) =     4.91       SUBAREA RUNOFF(CFS) =   11.72
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.391
 TOTAL AREA(ACRES) =        5.1         PEAK FLOW RATE(CFS) =      12.48

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   3.53
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     831.25 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.08
 RAINFALL INTENSITY(INCH/HR) =   6.28
 TOTAL STREAM AREA(ACRES) =     5.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.48

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   180.00
 UPSTREAM ELEVATION(FEET) =    467.00
 DOWNSTREAM ELEVATION(FEET) =    449.00
 ELEVATION DIFFERENCE(FEET) =     18.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.016
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.600
 SUBAREA RUNOFF(CFS) =      0.35
 TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    449.00  DOWNSTREAM(FEET) =    425.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   580.00   CHANNEL SLOPE =  0.0414
 CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  18.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.404
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4900
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.00
```

```
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.31
 AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   4.19
 Tc(MIN.) =   10.21
 SUBAREA AREA(ACRES) =     1.25       SUBAREA RUNOFF(CFS) =    3.31
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
 TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.56

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   2.64
 LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =     760.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.21
 RAINFALL INTENSITY(INCH/HR) =   5.40
 TOTAL STREAM AREA(ACRES) =     1.37
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.56

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       12.48     8.08        6.281          5.08
     2        3.56    10.21        5.404          1.37

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       15.29     8.08       6.281
     2       14.29    10.21       5.404

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      15.29   Tc(MIN.) =    8.08
 TOTAL AREA(ACRES) =        6.4
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     831.25 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        6.4  TC(MIN.) =      8.08
 PEAK FLOW RATE(CFS)   =      15.29
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

Area Average runoff Co-efficient for Existing Condition

```
************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* SMILAX W.O. 0490-0174                                                 *
* PROPOSED UNMITIGATED CONDITION 100 YEAR RAIN EVENT                    *
* 07/06/2020                                                            *
 ************************************************************************

  FILE NAME: R:\1516\HYD\CALCS\TM\AES\PR100.DAT
  TIME/DATE OF STUDY: 15:23 07/07/2020
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.250
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    446.00
  DOWNSTREAM ELEVATION(FEET) =    445.70
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.933
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.668
  SUBAREA RUNOFF(CFS) =      0.56
```

```
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  445.70  DOWNSTREAM ELEVATION(FEET) =  434.30
  STREET LENGTH(FEET) =   590.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =    8.90
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.904
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    1.82      SUBAREA RUNOFF(CFS) =    7.84
  TOTAL AREA(ACRES) =        1.9        PEAK FLOW RATE(CFS) =       8.27

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.90
  RAINFALL INTENSITY(INCH/HR) =   5.90
  TOTAL STREAM AREA(ACRES) =     1.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.27

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7420
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    452.60
  ELEVATION DIFFERENCE(FEET) =      7.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.113
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  452.60  DOWNSTREAM ELEVATION(FEET) =  446.00
  STREET LENGTH(FEET) =   314.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
  STREET FLOW TRAVEL TIME(MIN.) =   2.10   Tc(MIN.) =    5.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.335
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7420
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.742
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.79
  FLOW VELOCITY(FEET/SEC.) =  2.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.70
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   440.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =   656.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.55
  PIPE TRAVEL TIME(MIN.) =   2.09    Tc(MIN.) =    7.31
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      3.00 =    1063.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.31
  RAINFALL INTENSITY(INCH/HR) =   6.70
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.55

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.27     8.90        5.904          1.92
      2        1.55     7.31        6.705          0.25

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        8.34     7.31       6.705
      2        9.64     8.90       5.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.64   Tc(MIN.) =    8.90
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      3.00 =    1063.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   434.30  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    32.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.64
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.93
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      4.00 =    1095.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.01  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    31.40   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.80
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.64
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    9.22
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      9.00 =    1126.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    450.00
  DOWNSTREAM ELEVATION(FEET) =    445.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.894
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
```

```
==============================================================================
  UPSTREAM ELEVATION(FEET) =  445.70  DOWNSTREAM ELEVATION(FEET) =  431.70
  STREET LENGTH(FEET) =   610.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.44
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.37   FLOOD WIDTH(FEET) =   12.00
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.76
    SPLIT DEPTH(FEET) =    0.20   SPLIT FLOOD WIDTH(FEET) =    3.44
    SPLIT FLOW(CFS) =    0.57   SPLIT VELOCITY(FEET/SEC.) =    2.43
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   2.70   Tc(MIN.) =    5.59
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.964
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    2.00      SUBAREA RUNOFF(CFS) =   11.63
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =      12.21

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.83   DEPTH*VELOCITY(FT*FT/SEC.) =   1.41
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     680.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   431.70  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.21
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.65
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      8.00 =     725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.01  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    50.37   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.58
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.21
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    6.18
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      9.00 =     775.37 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.470
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6875
  SUBAREA AREA(ACRES) =    0.41   SUBAREA RUNOFF(CFS) =    1.44
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      12.89
  TC(MIN.) =    6.18

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       12.89     6.18       7.470        2.51
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      9.00 =     775.37 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.64     9.22       5.771        2.17
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      9.00 =    1126.40 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.35       6.18        7.470
      2      19.60       9.22        5.771

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.60   Tc(MIN.) =    9.22
  TOTAL AREA(ACRES) =        4.7

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.44
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.60
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    9.26
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
```

Area Average Runoff Coefficient for Onsite

Flows to basin

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    468.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.002
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    95.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.03
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      1.03

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   463.00  DOWNSTREAM(FEET) =   438.00
  FLOW LENGTH(FEET) =   511.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.40
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.03
  PIPE TRAVEL TIME(MIN.) =   1.33    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.214
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4889
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.22
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.21
  TC(MIN.) =    5.33

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.33
  RAINFALL INTENSITY(INCH/HR) =   8.21
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.21

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    467.00
  DOWNSTREAM ELEVATION(FEET) =    449.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.402
  SUBAREA RUNOFF(CFS) =      0.31
```

```
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   449.00  DOWNSTREAM(FEET) =   438.00
  FLOW LENGTH(FEET) =   310.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.31
  PIPE TRAVEL TIME(MIN.) =   1.29    Tc(MIN.) =    7.55
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     12.00 =     410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.562
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4742
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    3.02
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       3.30
  TC(MIN.) =    7.55

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.55
  RAINFALL INTENSITY(INCH/HR) =   6.56
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.21     5.33        8.214          0.55
      2        3.30     7.55        6.562          1.06

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.54     5.33       8.214
      2        5.06     7.55       6.562

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.06   Tc(MIN.) =    7.55
  TOTAL AREA(ACRES) =        1.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
```

Area Average runoff Coefficient for the Off-site area

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.06
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    7.96
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     861.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     17.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    444.50
  DOWNSTREAM ELEVATION(FEET) =    441.70
  ELEVATION DIFFERENCE(FEET) =      2.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.434
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    97.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.686
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   427.50  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.28
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.14
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =   10.67
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     270.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.37
  TC(MIN.) =   10.67

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.37    10.67       5.250        0.20
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     270.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.60     9.26       5.756        4.68
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.91       9.26        5.756
      2      18.24      10.67        5.250

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.91   Tc(MIN.) =    9.26
  TOTAL AREA(ACRES) =        4.9

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.91     9.26       5.756        4.88
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        5.06     7.96       6.346        1.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     861.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      22.18       7.96        6.346
      2      24.51       9.26        5.756

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.51   Tc(MIN.) =    9.26
  TOTAL AREA(ACRES) =        6.5

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.5  TC(MIN.) =      9.26
  PEAK FLOW RATE(CFS)   =      24.51
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* SMILAX W.O. 0490-0174                                                 *
* PROPOSED MITIGATED CONDITION 100YEAR RAIN EVENT                       *
* 07/06/2020                                                            *
 ************************************************************************

  FILE NAME: R:\1516\HYD\CALCS\TM\AES\PR100MIT.DAT
  TIME/DATE OF STUDY: 15:16 07/07/2020
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.250
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    446.00
  DOWNSTREAM ELEVATION(FEET) =    445.70
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.933
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.668
  SUBAREA RUNOFF(CFS) =      0.56
```

```
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  445.70  DOWNSTREAM ELEVATION(FEET) =  434.30
  STREET LENGTH(FEET) =   590.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =    8.90
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.904
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    1.82      SUBAREA RUNOFF(CFS) =    7.84
  TOTAL AREA(ACRES) =        1.9        PEAK FLOW RATE(CFS) =       8.27

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.90
  RAINFALL INTENSITY(INCH/HR) =   5.90
  TOTAL STREAM AREA(ACRES) =     1.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.27

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7420
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    452.60
  ELEVATION DIFFERENCE(FEET) =      7.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.113
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
```

```
------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
========================================================================
  UPSTREAM ELEVATION(FEET) =  452.60  DOWNSTREAM ELEVATION(FEET) =  446.00
  STREET LENGTH(FEET) =   314.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
  STREET FLOW TRAVEL TIME(MIN.) =   2.10   Tc(MIN.) =    5.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.335
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7420
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.742
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.79
  FLOW VELOCITY(FEET/SEC.) =  2.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.70
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   440.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =   656.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.55
  PIPE TRAVEL TIME(MIN.) =   2.09    Tc(MIN.) =    7.31
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      3.00 =    1063.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.31
  RAINFALL INTENSITY(INCH/HR) =   6.70
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.55

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.27     8.90        5.904          1.92
      2        1.55     7.31        6.705          0.25

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        8.34     7.31       6.705
      2        9.64     8.90       5.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.64   Tc(MIN.) =    8.90
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      3.00 =    1063.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   434.30  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    32.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.64
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.93
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      4.00 =    1095.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.01  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    31.40   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.80
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.64
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    9.22
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      9.00 =    1126.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    450.00
  DOWNSTREAM ELEVATION(FEET) =    445.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.894
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
```

```
==============================================================================
  UPSTREAM ELEVATION(FEET) =  445.70  DOWNSTREAM ELEVATION(FEET) =  431.70
  STREET LENGTH(FEET) =   610.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.44
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.37   FLOOD WIDTH(FEET) =   12.00
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.76
    SPLIT DEPTH(FEET) =    0.20   SPLIT FLOOD WIDTH(FEET) =    3.44
    SPLIT FLOW(CFS) =    0.57   SPLIT VELOCITY(FEET/SEC.) =    2.43
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   2.70   Tc(MIN.) =    5.59
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.964
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    2.00      SUBAREA RUNOFF(CFS) =   11.63
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =      12.21

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.83   DEPTH*VELOCITY(FT*FT/SEC.) =   1.41
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     680.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   431.70  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.21
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.65
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      8.00 =     725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.01  DOWNSTREAM(FEET) =   429.00
  FLOW LENGTH(FEET) =    50.37   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.58
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.21
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    6.18
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      9.00 =     775.37 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.470
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6875
  SUBAREA AREA(ACRES) =    0.41   SUBAREA RUNOFF(CFS) =    1.44
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      12.89
  TC(MIN.) =    6.18

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       12.89     6.18       7.470        2.51
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      9.00 =     775.37 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.64     9.22       5.771        2.17
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      9.00 =    1126.40 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.35       6.18        7.470
      2      19.60       9.22        5.771

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.60   Tc(MIN.) =    9.22
  TOTAL AREA(ACRES) =        4.7

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  18.44   RAIN INTENSITY(INCH/HOUR) =  3.69
  TOTAL AREA(ACRES) =     4.69   TOTAL RUNOFF(CFS) =      8.73

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.98
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.73
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   18.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
```

Please see the detention analysis in chapter 4

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

********************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    468.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.002
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    95.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.563
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.03
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      1.03

********************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   463.00  DOWNSTREAM(FEET) =   438.00
  FLOW LENGTH(FEET) =   511.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.40
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.03
  PIPE TRAVEL TIME(MIN.) =   1.33    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.214
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4889
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.22
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.21
  TC(MIN.) =    5.33

********************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.33
  RAINFALL INTENSITY(INCH/HR) =   8.21
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.21

********************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    467.00
  DOWNSTREAM ELEVATION(FEET) =    449.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.402
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   449.00  DOWNSTREAM(FEET) =   438.00
  FLOW LENGTH(FEET) =   310.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.31
  PIPE TRAVEL TIME(MIN.) =   1.29    Tc(MIN.) =    7.55
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     12.00 =     410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.562
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4742
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    3.02
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       3.30
  TC(MIN.) =    7.55

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.55
  RAINFALL INTENSITY(INCH/HR) =   6.56
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.21     5.33        8.214          0.55
      2        3.30     7.55        6.562          1.06

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.54     5.33       8.214
      2        5.06     7.55       6.562

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.06   Tc(MIN.) =    7.55
  TOTAL AREA(ACRES) =        1.6
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.06
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    7.96
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     861.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     17.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    444.50
  DOWNSTREAM ELEVATION(FEET) =    441.70
  ELEVATION DIFFERENCE(FEET) =      2.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.434
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    97.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.686
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   427.50  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.28
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.14
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =   10.67
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     270.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.37
```

```
  TC(MIN.) =   10.67

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.37    10.67       5.250        0.20
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     270.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.73    18.49       3.684        4.69
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       5.41      10.67        5.250
      2       8.99      18.49        3.684

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.99   Tc(MIN.) =   18.49
  TOTAL AREA(ACRES) =        4.9

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.99    18.49       3.684        4.89
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     15.00 =    1168.40 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        5.06     7.96       6.346        1.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     861.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       8.93       7.96        6.346
      2      11.93      18.49        3.684

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.93   Tc(MIN.) =   18.49
  TOTAL AREA(ACRES) =        6.5

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
|                                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.5  TC(MIN.) =     18.49
  PEAK FLOW RATE(CFS)   =      11.93
```

==========

==========

END OF RATIONAL METHOD ANALYSIS

PRELIMINARY VELOCITY CALCULATIONS- 100 YEAR

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 6 2020

Smilax- Existing Conditions-Discharge Point at Node 3

Trapezoidal

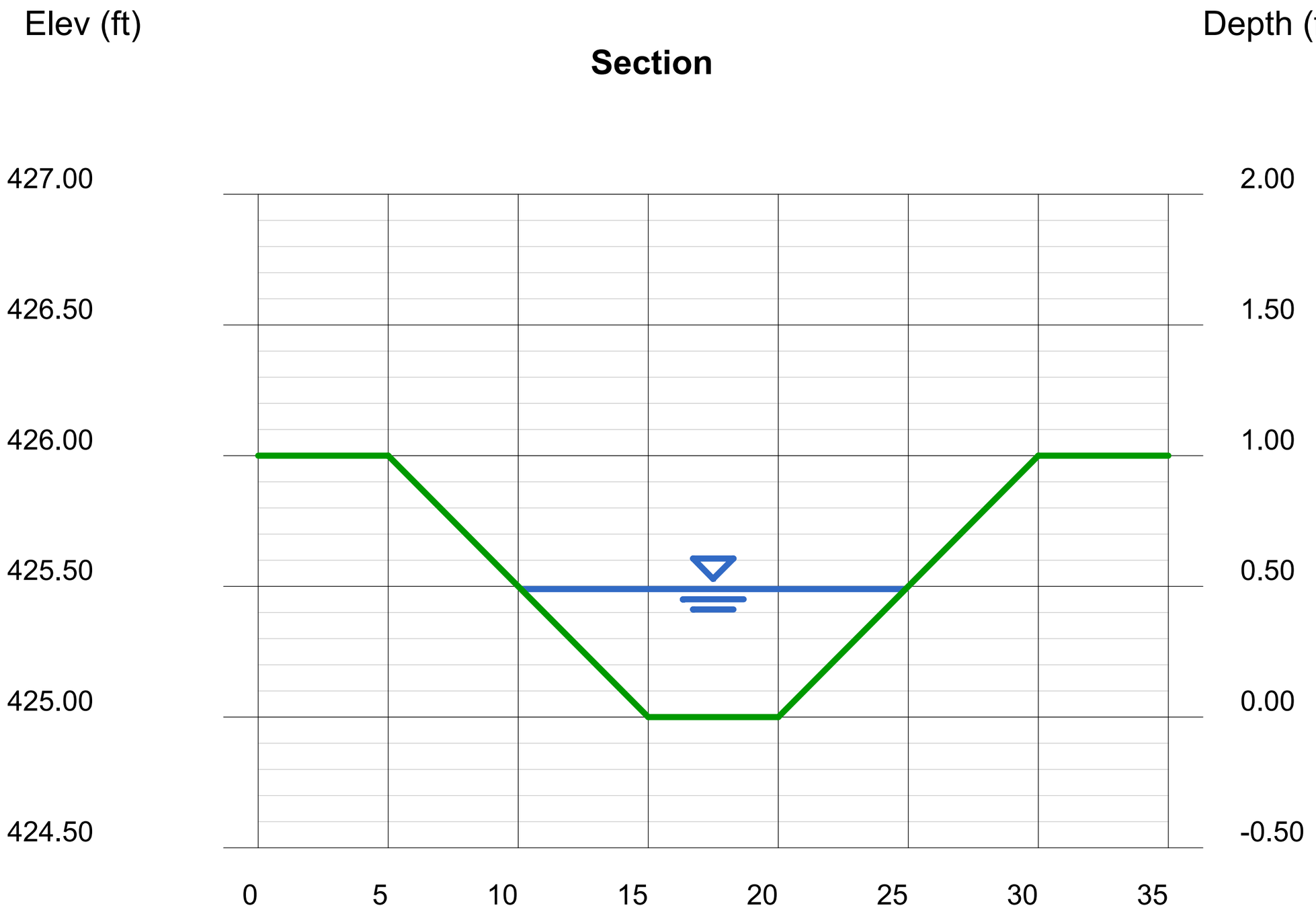
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 425.00
Slope (%)	= 2.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 15.29

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 15.29
Area (sqft)	= 4.85
Velocity (ft/s)	= 3.15
Wetted Perim (ft)	= 14.85
Crit Depth, Yc (ft)	= 0.49
Top Width (ft)	= 14.80
EGL (ft)	= 0.64



Weir Report

Smilax-Proposed-Spillway-Velocity at Node 15-Unmitigated Q100

Trapezoidal Weir

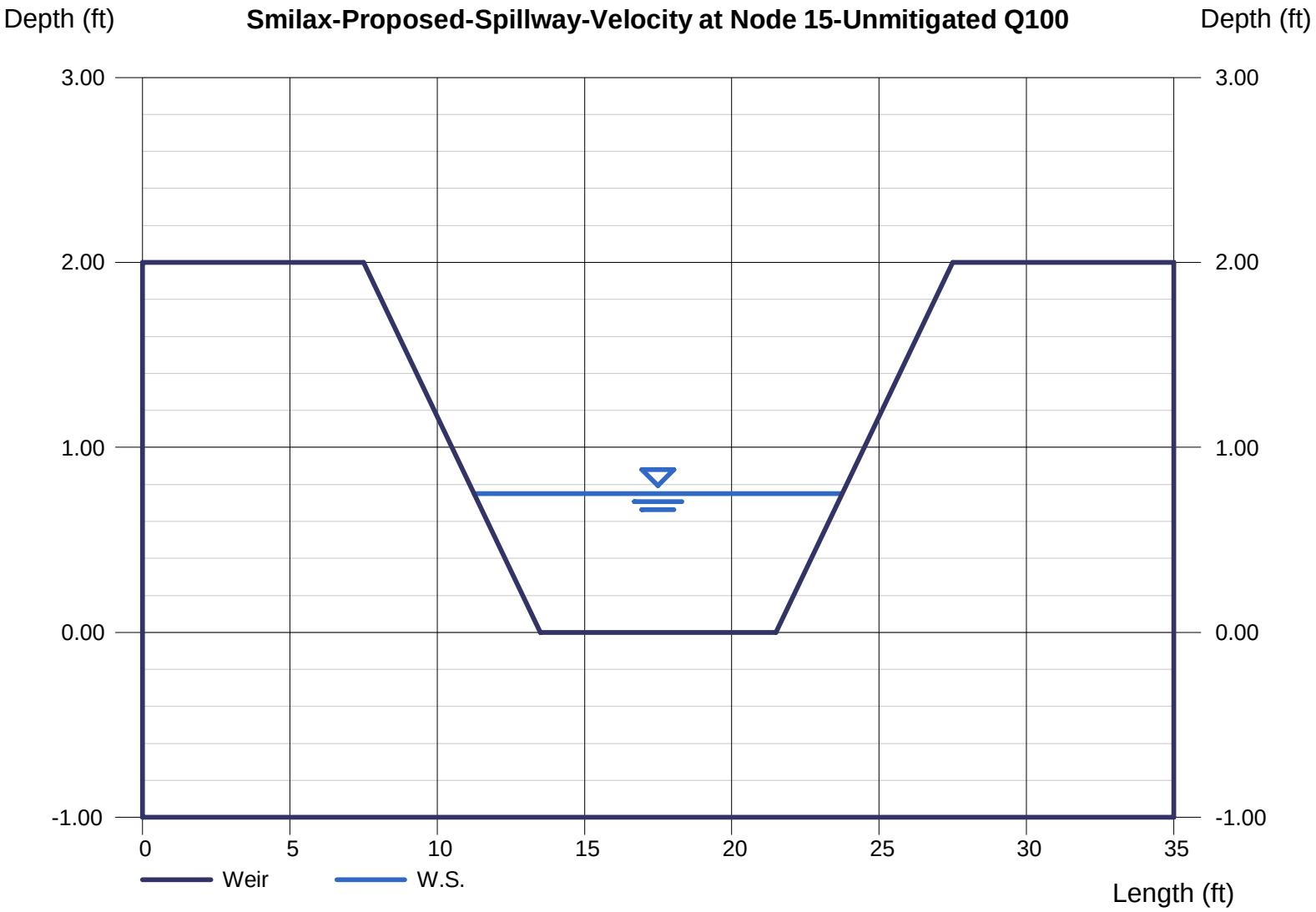
Crest	= Sharp
Bottom Length (ft)	= 8.00
Total Depth (ft)	= 2.00
Side Slope (z:1)	= 3.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 19.60

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 19.60
Area (sqft)	= 7.69
Velocity (ft/s)	= 2.55
Top Width (ft)	= 12.50



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 7 2020

Smilax-Proposed-Spillway-Velocity at Node 15-Mitigated Q100

Trapezoidal Weir

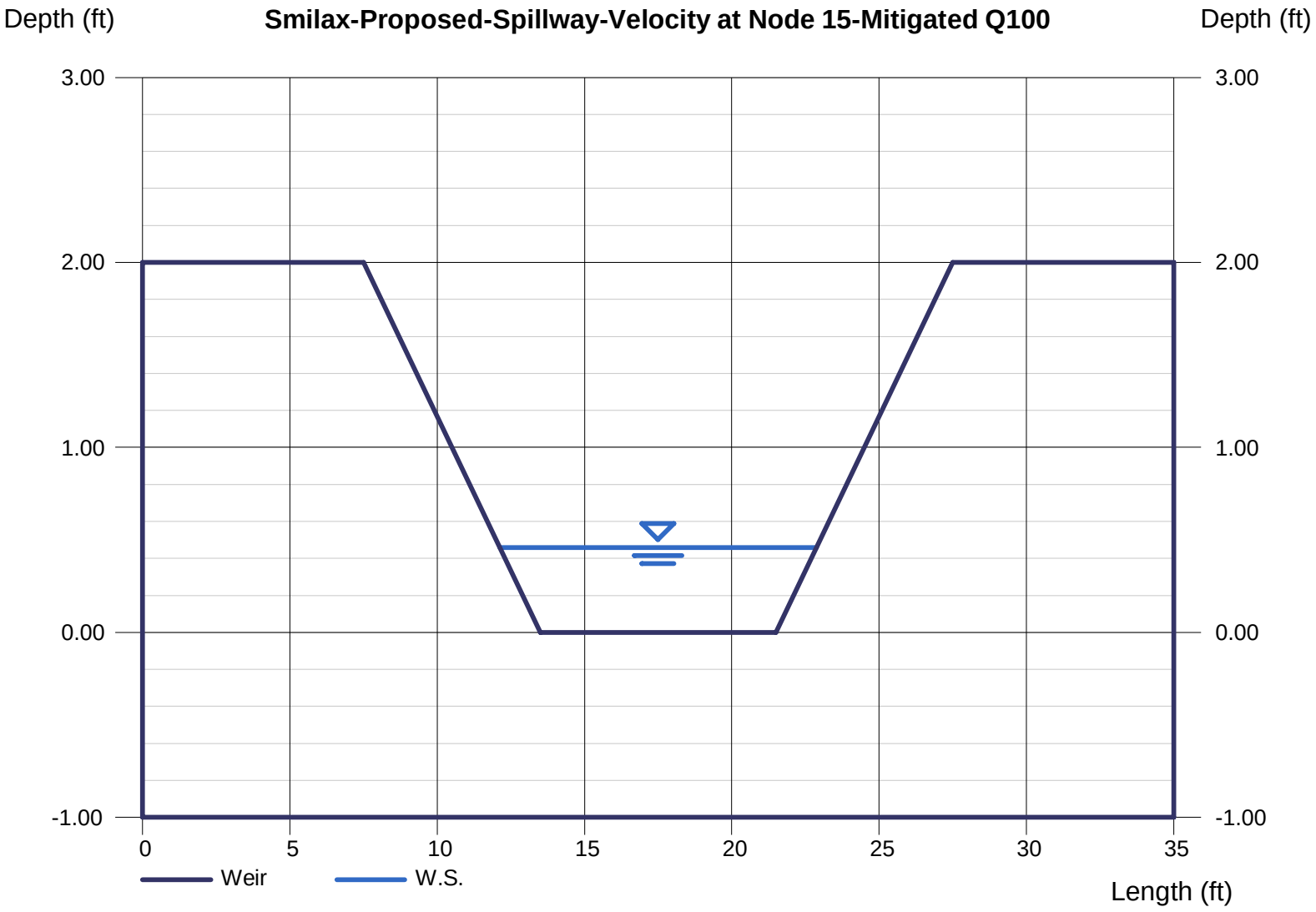
Crest	= Sharp
Bottom Length (ft)	= 8.00
Total Depth (ft)	= 2.00
Side Slope (z:1)	= 3.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 8.73

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 8.730
Area (sqft)	= 4.31
Velocity (ft/s)	= 2.02
Top Width (ft)	= 10.76



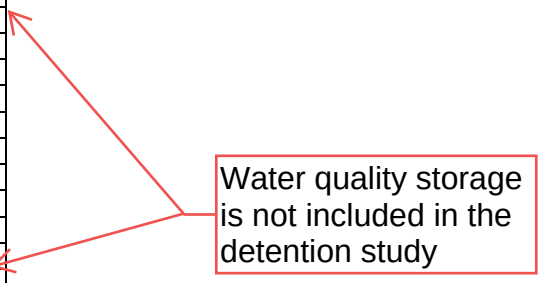
CHAPTER 4
DETENTION BASIN ANALYSIS

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 7/7/2020
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 3.25 INCHES
BASIN AREA 4.69 ACRES
RUNOFF COEFFICIENT 0.6875
PEAK DISCHARGE 19.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.6
TIME (MIN) = 27	DISCHARGE (CFS) = 0.6
TIME (MIN) = 36	DISCHARGE (CFS) = 0.7
TIME (MIN) = 45	DISCHARGE (CFS) = 0.7
TIME (MIN) = 54	DISCHARGE (CFS) = 0.7
TIME (MIN) = 63	DISCHARGE (CFS) = 0.7
TIME (MIN) = 72	DISCHARGE (CFS) = 0.8
TIME (MIN) = 81	DISCHARGE (CFS) = 0.8
TIME (MIN) = 90	DISCHARGE (CFS) = 0.8
TIME (MIN) = 99	DISCHARGE (CFS) = 0.8
TIME (MIN) = 108	DISCHARGE (CFS) = 0.9
TIME (MIN) = 117	DISCHARGE (CFS) = 0.9
TIME (MIN) = 126	DISCHARGE (CFS) = 1
TIME (MIN) = 135	DISCHARGE (CFS) = 1
TIME (MIN) = 144	DISCHARGE (CFS) = 1.1
TIME (MIN) = 153	DISCHARGE (CFS) = 1.1
TIME (MIN) = 162	DISCHARGE (CFS) = 1.2
TIME (MIN) = 171	DISCHARGE (CFS) = 1.3
TIME (MIN) = 180	DISCHARGE (CFS) = 1.4
TIME (MIN) = 189	DISCHARGE (CFS) = 1.5
TIME (MIN) = 198	DISCHARGE (CFS) = 1.7
TIME (MIN) = 207	DISCHARGE (CFS) = 1.8
TIME (MIN) = 216	DISCHARGE (CFS) = 2.2
TIME (MIN) = 225	DISCHARGE (CFS) = 2.5
TIME (MIN) = 234	DISCHARGE (CFS) = 3.7
TIME (MIN) = 243	DISCHARGE (CFS) = 4.6
TIME (MIN) = 252	DISCHARGE (CFS) = 19.6
TIME (MIN) = 261	DISCHARGE (CFS) = 3
TIME (MIN) = 270	DISCHARGE (CFS) = 2
TIME (MIN) = 279	DISCHARGE (CFS) = 1.6
TIME (MIN) = 288	DISCHARGE (CFS) = 1.3
TIME (MIN) = 297	DISCHARGE (CFS) = 1.1
TIME (MIN) = 306	DISCHARGE (CFS) = 1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.9
TIME (MIN) = 324	DISCHARGE (CFS) = 0.9
TIME (MIN) = 333	DISCHARGE (CFS) = 0.8
TIME (MIN) = 342	DISCHARGE (CFS) = 0.7
TIME (MIN) = 351	DISCHARGE (CFS) = 0.7
TIME (MIN) = 360	DISCHARGE (CFS) = 0.7
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Smilax Stage Storage	
BF-1-1	
depth	area
0.00	4228
0.05	4274
0.10	4320
0.15	4367
0.20	4413
0.25	4459
0.30	4505
0.35	4552
0.40	4598
0.45	4644
0.50	4690
0.55	4737
0.60	4783
0.65	4829
0.70	4875
0.75	4921
0.80	4968
0.85	5014
0.90	5060
0.95	5106
1.00	5153
1.05	5201
1.10	5249
1.15	5297
1.20	5345
1.25	5392
1.30	5440
1.35	5488
1.40	5536
1.45	5584
1.50	5632
1.55	5680
1.60	5728
1.65	5776
1.70	5824
1.75	5872
1.80	5920
1.85	5968
1.90	6016
1.95	6064
2.00	6112
2.05	6164
2.10	6216
2.15	6267
2.20	6319
2.25	6371
2.30	6423
2.35	6475
2.40	6526
2.45	6578
2.50	6630
2.55	6682
2.60	6733
2.65	6785
2.70	6837
2.75	6889
2.80	6941
2.85	6992
2.90	7044
2.95	7096
3.00	7148
3.05	7204
3.10	7260
3.15	7316
3.20	7371



Smilax Stage Storage	
BF-1-1	
3.25	7427
3.30	7483
3.35	7539
3.40	7595
3.45	7651
3.50	7707
3.55	7763
3.60	7819
3.65	7875
3.70	7930
3.75	7986
3.80	8042
3.85	8098
3.90	8154
3.95	8210
4.00	8266
4.05	8323
4.10	8381
4.15	8438
4.20	8496
4.25	8554
4.30	8611
4.35	8669
4.40	8726
4.45	8784
4.50	8841
4.55	8899
4.60	8956
4.65	9014
4.70	9071
4.75	9129
4.80	9186
4.85	9244
4.90	9302
4.95	9359
5.00	9417
5.05	9477
5.10	9537
5.15	9598
5.20	9658
5.25	9718
5.30	9779
5.35	9839
5.40	9900
5.45	9960
5.50	10020
5.55	10081
5.60	10141
5.65	10201
5.70	10262
5.75	10322
5.80	10383
5.85	10443
5.90	10503
5.95	10564
6.00	10624

Smilax HMP-1

Discharge vs Elevation Table

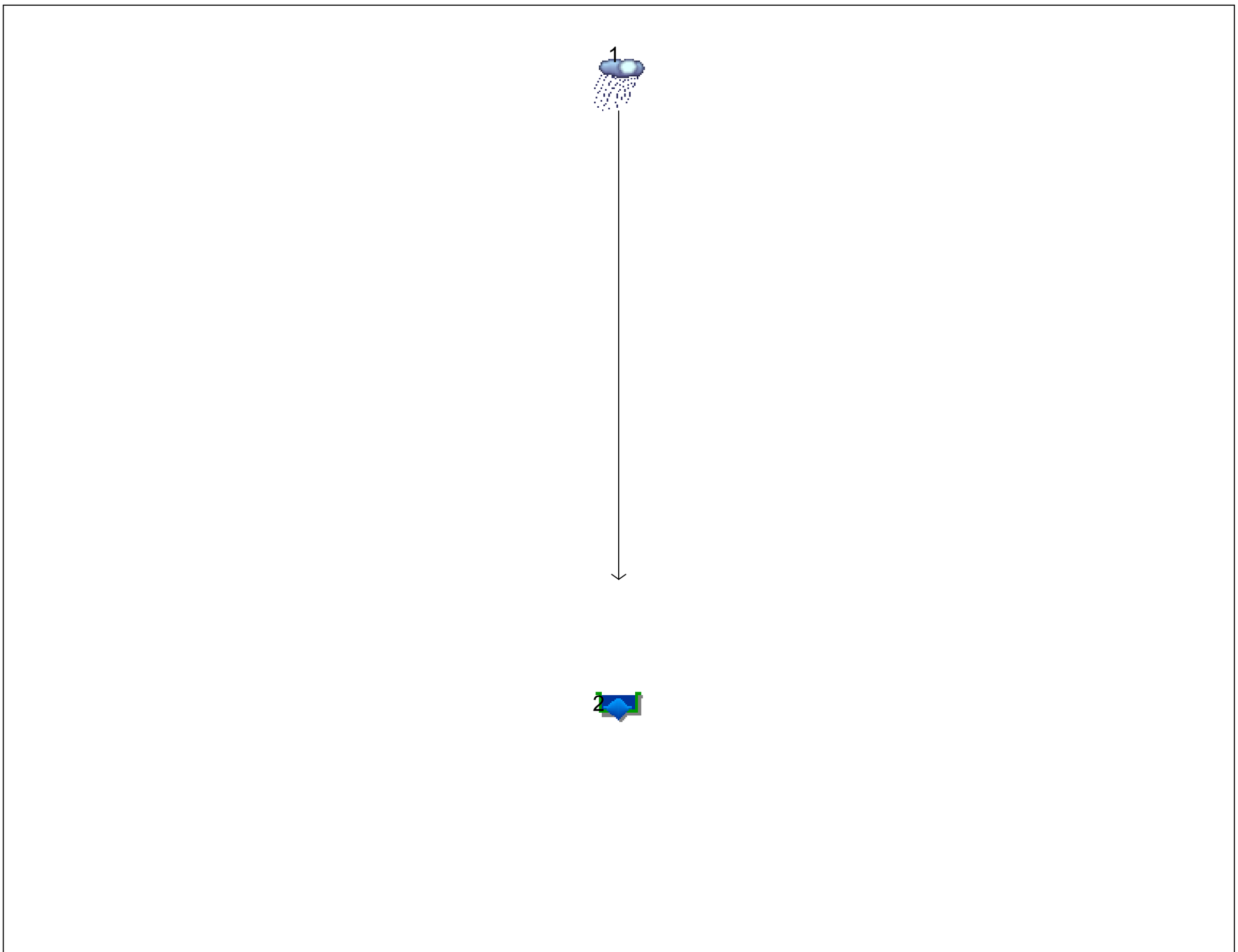
Bottom orifice diameter:	1 "	Top orifice diameter:	3 "
Number:	1	Number:	1
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.50 ft	invert elev:	3.00 ft
Middle orifice diameter:	2 "	Emergency weir:	
number of orif:	1	Invert:	4.00 ft
Cg-middle:	0.61	Weir Length (ft)	8.00 ft
invert elev: 1.00 ft s		Spillway	

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.000
0.55	0.60	0.00	0.00	0.00	0.00	0.00	0.002	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.002
0.60	1.20	0.00	0.00	0.00	0.01	0.01	0.006	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.006
0.65	1.80	0.00	0.00	0.00	0.01	0.01	0.009	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.009
0.70	2.40	0.00	0.00	0.00	0.01	0.01	0.011	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.011
0.75	3.00	0.00	0.00	0.00	0.01	0.01	0.012	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.012
0.80	3.60	0.00	0.00	0.00	0.01	0.02	0.014	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.014
0.85	4.20	0.00	0.00	0.00	0.01	0.03	0.015	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.015
0.90	4.80	0.00	0.00	0.00	0.02	0.07	0.016	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.016
0.95	5.40	0.00	0.00	0.00	0.02	0.16	0.017	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.017
1.00	6.00	0.00	0.00	0.00	0.02	0.34	0.018	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.018
1.05	6.60	0.30	0.00	0.00	0.02	0.65	0.019	0.00	0.00	0.003	0.00	0.00	0.000	0.000	0.022
1.10	7.20	0.60	0.00	0.00	0.02	1.15	0.020	0.01	0.01	0.012	0.00	0.00	0.000	0.000	0.032
1.15	7.80	0.90	0.00	0.00	0.02	1.92	0.021	0.03	0.02	0.025	0.00	0.00	0.000	0.000	0.046
1.20	8.40	1.20	0.00	0.00	0.02	3.03	0.022	0.04	0.04	0.036	0.00	0.00	0.000	0.000	0.058
1.25	9.00	1.50	0.00	0.00	0.02	4.60	0.022	0.04	0.05	0.044	0.00	0.00	0.000	0.000	0.066
1.30	9.60	1.80	0.00	0.00	0.02	6.74	0.023	0.05	0.06	0.050	0.00	0.00	0.000	0.000	0.073
1.35	10.20	2.10	0.00	0.00	0.02	9.61	0.024	0.06	0.07	0.055	0.00	0.00	0.000	0.000	0.079
1.40	10.80	2.40	0.00	0.00	0.02	13.38	0.025	0.06	0.08	0.060	0.00	0.00	0.000	0.000	0.085
1.45	11.40	2.70	0.00	0.00	0.03	18.22	0.025	0.06	0.08	0.065	0.00	0.00	0.000	0.000	0.090
1.50	12.00	3.00	0.00	0.00	0.03	24.36	0.026	0.07	0.08	0.069	0.00	0.00	0.000	0.000	0.095
1.55	12.60	3.30	0.00	0.00	0.03	32.03	0.027	0.07	0.08	0.073	0.00	0.00	0.000	0.000	0.100
1.60	13.20	3.60	0.00	0.00	0.03	41.50	0.027	0.08	0.09	0.077	0.00	0.00	0.000	0.000	0.104
1.65	13.80	3.90	0.00	0.00	0.03	53.07	0.028	0.08	0.12	0.080	0.00	0.00	0.000	0.000	0.109
1.70	14.40	4.20	0.00	0.00	0.03	67.08	0.029	0.08	0.17	0.084	0.00	0.00	0.000	0.000	0.113
1.75	15.00	4.50	0.00	0.00	0.03	83.87	0.029	0.09	0.26	0.087	0.00	0.00	0.000	0.000	0.117
1.80	15.60	4.80	0.00	0.00	0.03	103.84	0.030	0.09	0.41	0.090	0.00	0.00	0.000	0.000	0.120
1.85	16.20	5.10	0.00	0.00	0.03	127.43	0.031	0.09	0.62	0.094	0.00	0.00	0.000	0.000	0.124
1.90	16.80	5.40	0.00	0.00	0.03	155.09	0.031	0.10	0.93	0.097	0.00	0.00	0.000	0.000	0.128
1.95	17.40	5.70	0.00	0.00	0.03	187.34	0.032	0.10	1.36	0.099	0.00	0.00	0.000	0.000	0.131
2.00	18.00	6.00	0.00	0.00	0.03	224.72	0.032	0.10	1.94	0.102	0.00	0.00	0.000	0.000	0.134
2.05	18.60	6.30	0.00	0.00	0.03	267.80	0.033	0.11	2.71	0.105	0.00	0.00	0.000	0.000	0.138
2.10	19.20	6.60	0.00	0.00	0.03	317.23	0.033	0.11	3.70	0.108	0.00	0.00	0.000	0.000	0.141
2.15	19.80	6.90	0.00	0.00	0.03	373.67	0.034	0.11	4.96	0.110	0.00	0.00	0.000	0.000	0.144
2.20	20.40	7.20	0.00	0.00	0.03	437.84	0.034	0.11	6.53	0.113	0.00	0.00	0.000	0.000	0.147
2.25	21.00	7.50	0.00	0.00	0.03	510.51	0.035	0.12	8.47	0.115	0.00	0.00	0.000	0.000	0.150
2.30	21.60	7.80	0.00	0.00	0.04	592.48	0.035	0.12	10.84	0.118	0.00	0.00	0.000	0.000	0.153
2.35	22.20	8.10	0.00	0.00	0.04	684.63	0.036	0.12	13.70	0.120	0.00	0.00	0.000	0.000	0.156
2.40	22.80	8.40	0.00	0.00	0.04	787.87	0.036	0.12	17.13	0.123	0.00	0.00	0.000	0.000	0.159
2.45	23.40	8.70	0.00	0.00	0.04	903.17	0.037	0.12	21.20	0.125	0.00	0.00	0.000	0.000	0.162
2.50	24.00	9.00	0.00	0.00	0.04	1031.55	0.037	0.13	26.00	0.127	0.00	0.00	0.000	0.000	0.164
2.55	24.60	9.30	0.00	0.00	0.04	1174.09	0.038	0.13	31.61	0.129	0.00	0.00	0.000	0.000	0.167
2.60	25.20	9.60	0.00	0.00	0.04	1331.93	0.038	0.13	38.14	0.132	0.00	0.00	0.000	0.000	0.170
2.65	25.80	9.90	0.00	0.00	0.04	1506.26	0.039	0.13	45.70	0.134	0.00	0.00	0.000	0.000	0.172
2.70	26.40	10.20	0.00	0.00	0.04	1698.35	0.039	0.14	54.39	0.136	0.00	0.00	0.000	0.000	0.175
2.75	27.00	10.50	0.00	0.00	0.04	1909.52	0.040	0.14	64.34	0.138	0.00	0.00	0.000	0.000	0.178
2.80	27.60	10.80	0.00	0.00	0.04	2141.14	0.040	0.14	75.67	0.140	0.00	0.00	0.000	0.000	0.180
2.85	28.20	11.10	0.00	0.00	0.04	2394.66	0.041	0.14	88.53	0.142	0.00	0.00	0.000	0.000	0.183
2.90	28.80	11.40	0.00	0.00	0.04	2671.61	0.041	0.14	103.06	0.144	0.00	0.00	0.000	0.000	0.185
2.95	29.40	11.70	0.00	0.00	0.04	2973.56	0.041	0.15	119.42	0.146	0.00	0.00	0.000	0.000	0.187
3.00	30.00	12.00	0.00	0.00	0.04	3302.17	0.042	0.15	137.77	0.148	0.00	0.00	0.000	0.000	0.190
3.05	30.60	12.30	0.20	0.00	0.04	3659.16	0.042	0.15	158.29	0.150	0.00	0.00	0.004	0.000	0.196
3.10	31.20	12.60	0.40	0.00	0.04	4046.33	0.043	0.15	181.17	0.152	0.00	0.02	0.016	0.000	0.210
3.15	31.80	12.90	0.60	0.00	0.04	4465.55	0.043	0.15	206.59	0.154	0.04	0.03	0.034	0.000	0.230
3.20	32.40	13.20	0.80	0.00	0.04	4918.76	0.044	0.16	234.76	0.155	0.07	0.06	0.056	0.000	0.255
3.25	33.00	13.50	1.00	0.00	0.04	5408.00	0.044	0.16	265.90	0.157	0.08	0.08	0.081	0.000	0.282
3.30	33.60	13.80	1.20	0.00	0.04	5935.36	0.044	0.16	300.23	0.159	0.10	0.11	0.101	0.000	0.304
3.35	34.20	14.10	1.40	0.00	0.04	6503.02	0.045	0.16	337.99	0.161	0.11	0.13	0.114	0.000	0.320
3.40	34.80	14.40	1.60	0.00	0.05	7113.25	0.045	0.16	379.44	0.163	0.13	0.16	0.126	0.000	0.334
3.45	35.40	14.70	1.80	0.00	0.05	7768.41	0.046	0.16	424.82	0.164	0.14	0.18	0.137	0.000	0.347
3.50	36.00	15.00	2.00	0.00	0.05	8470.91	0.046	0.17	474.42	0.166	0.15	0.20	0.147	0.000	0.359
3.55	36.60	15.30	2.20	0.00	0.05	9223.28	0.046	0.17	528.52	0.168	0.16	0.21	0.157	0.000	0.371
3.60	37.20	15.60	2.40	0.00	0.05	10028.13	0.047	0.17	587.42	0.169	0.17	0.22	0.166	0.000	0.382
3.65	37.80	15.90	2.60	0.00	0.05	10888.14	0.047	0.17	651.41	0.171	0.17	0.22	0.174	0.000	0.392
3.70	38.40	16.20	2.80	0.00	0.05	11806.11	0.047	0.17	720.84	0.173	0.18	0.22	0.182	0.000	0.402
3.75	39.00	16.50	3.00	0.00	0.05	12784.92	0.048	0.17	796.03	0.174	0.19	0.22	0.190	0.000	0.412

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
3.80	39.60	16.80	3.20	0.00	0.05	13827.53	0.048	0.18	877.34	0.176	0.20	0.22	0.197	0.000	0.422
3.85	40.20	17.10	3.40	0.00	0.05	14937.02	0.049	0.18	965.12	0.178	0.20	0.24	0.205	0.000	0.431
3.90	40.80	17.40	3.60	0.00	0.05	16116.54	0.049	0.18	1059.76	0.179	0.21	0.26	0.212	0.000	0.440
3.95	41.40	17.70	3.80	0.00	0.05	17369.36	0.049	0.18	1161.65	0.181	0.22	0.30	0.218	0.000	0.448
4.00	42.00	18.00	4.00	0.00	0.05	18698.83	0.050	0.18	1271.19	0.182	0.22	0.37	0.225	0.000	0.457
4.05	42.60	18.30	4.20	0.07	0.05	20108.43	0.050	0.18	1388.80	0.184	0.23	0.47	0.231	0.298	0.763
4.10	43.20	18.60	4.40	0.15	0.05	21601.72	0.050	0.19	1514.93	0.185	0.24	0.62	0.237	0.842	1.316
4.15	43.80	18.90	4.60	0.22	0.05	23182.36	0.051	0.19	1650.01	0.187	0.24	0.83	0.243	1.548	2.029
4.20	44.40	19.20	4.80	0.30	0.05	24854.13	0.051	0.19	1794.53	0.189	0.25	1.12	0.249	2.383	2.872
4.25	45.00	19.50	5.00	0.37	0.05	26620.91	0.051	0.19	1948.96	0.190	0.25	1.49	0.255	3.330	3.826
4.30	45.60	19.80	5.20	0.45	0.05	28486.69	0.052	0.19	2113.80	0.192	0.26	1.96	0.260	4.377	4.881
4.35	46.20	20.10	5.40	0.52	0.05	30455.58	0.052	0.19	2289.57	0.193	0.27	2.57	0.266	5.516	6.027
4.40	46.80	20.40	5.60	0.60	0.05	32531.79	0.052	0.19	2476.80	0.194	0.27	3.32	0.271	6.739	7.258
4.45	47.40	20.70	5.80	0.67	0.05	34719.63	0.053	0.20	2676.05	0.196	0.28	4.24	0.277	8.042	8.567
4.50	48.00	21.00	6.00	0.75	0.05	37023.56	0.053	0.20	2887.86	0.197	0.28	5.36	0.282	9.419	9.951
4.55	48.60	21.30	6.20	0.82	0.05	39448.12	0.053	0.20	3112.84	0.199	0.29	6.70	0.287	10.866	11.405
4.60	49.20	21.60	6.40	0.90	0.05	41997.99	0.054	0.20	3351.59	0.200	0.29	8.31	0.292	12.381	12.927
4.65	49.80	21.90	6.60	0.97	0.05	44677.97	0.054	0.20	3604.71	0.202	0.30	10.20	0.297	13.961	14.513
4.70	50.40	22.20	6.80	1.05	0.05	47492.96	0.054	0.20	3872.86	0.203	0.30	12.42	0.302	15.602	16.161
4.75	51.00	22.50	7.00	1.12	0.05	50448.01	0.055	0.20	4156.69	0.205	0.31	15.00	0.306	17.303	17.869
4.80	51.60	22.80	7.20	1.20	0.06	53548.26	0.055	0.21	4456.87	0.206	0.31	17.99	0.311	19.062	19.634
4.85	52.20	23.10	7.40	1.27	0.06	56799.02	0.055	0.21	4774.09	0.207	0.32	21.43	0.316	20.877	21.455
4.90	52.80	23.40	7.60	1.35	0.06	60205.68	0.056	0.21	5109.08	0.209	0.32	25.37	0.320	22.746	23.330
4.95	53.40	23.70	7.80	1.42	0.06	63773.78	0.056	0.21	5462.57	0.210	0.32	29.87	0.325	24.667	25.258
5.00	54.00	24.00	8.00	1.50	0.06	67509.00	0.056	0.21	5835.30	0.211	0.33	34.96	0.329	26.640	27.237
5.05	54.60	24.30	8.20	1.57	0.06	71417.13	0.057	0.21	6228.06	0.213	0.33	40.72	0.333	28.663	29.266
5.10	55.20	24.60	8.40	1.65	0.06	75504.11	0.057	0.21	6641.63	0.214	0.34	47.20	0.338	30.734	31.343
5.15	55.80	24.90	8.60	1.72	0.06	79776.00	0.057	0.22	7076.84	0.215	0.34	54.47	0.342	32.853	33.468
5.20	56.40	25.20	8.80	1.80	0.06	84239.00	0.058	0.22	7534.51	0.217	0.35	62.59	0.346	35.019	35.640
5.25	57.00	25.50	9.00	1.87	0.06	88899.46	0.058	0.22	8015.51	0.218	0.35	71.64	0.350	37.231	37.857
5.30	57.60	25.80	9.20	1.95	0.06	93763.84	0.058	0.22	8520.71	0.219	0.35	81.69	0.354	39.487	40.118
5.35	58.20	26.10	9.40	2.02	0.06	98838.78	0.059	0.22	9051.01	0.221	0.36	92.82	0.358	41.786	42.424
5.40	58.80	26.40	9.60	2.10	0.06	104131.02	0.059	0.22	9607.34	0.222	0.36	105.11	0.362	44.129	44.772
5.45	59.40	26.70	9.80	2.17	0.06	109647.47	0.059	0.22	10190.63	0.223	0.37	118.66	0.366	46.514	47.163
5.50	60.00	27.00	10.00	2.25	0.06	115395.17	0.059	0.22	10801.86	0.224	0.37	133.55	0.370	48.941	49.595
5.55	60.60	27.30	10.20	2.32	0.06	121381.33	0.060	0.23	11442.02	0.226	0.37	149.88	0.374	51.408	52.068
5.60	61.20	27.60	10.40	2.40	0.06	127613.27	0.060	0.23	12112.11	0.227	0.38	167.75	0.378	53.916	54.581
5.65	61.80	27.90	10.60	2.47	0.06	134098.49	0.060	0.23	12813.17	0.228	0.38	187.26	0.382	56.463	57.133
5.70	62.40	28.20	10.80	2.55	0.06	140844.63	0.061	0.23	13546.27	0.229	0.39	208.52	0.386	59.048	59.724
5.75	63.00	28.50	11.00	2.62	0.06	147859.48	0.061	0.23	14312.48	0.231	0.39	231.66	0.389	61.672	62.353
5.80	63.60	28.80	11.20	2.70	0.06	155150.98	0.061	0.23	15112.92	0.232	0.39	256.77	0.393	64.334	65.021
5.85	64.20	29.10	11.40	2.77	0.06	162727.25	0.062	0.23	15948.71	0.233	0.40	284.00	0.397	67.033	67.725
5.90	64.80	29.40	11.60	2.85	0.06	170596.52	0.062	0.23	16821.01	0.234	0.40	313.47	0.400	69.769	70.466
5.95	65.40	29.70	11.80	2.92	0.06	178767.23	0.062	0.24	17731.01	0.236	0.40	345.31	0.404	72.541	73.243
6.00	66.00	30.00	12.00	3.00	0.06	187247.94	0.062	0.24	18679.90	0.237	0.41	379.66	0.407	75.349	76.056

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

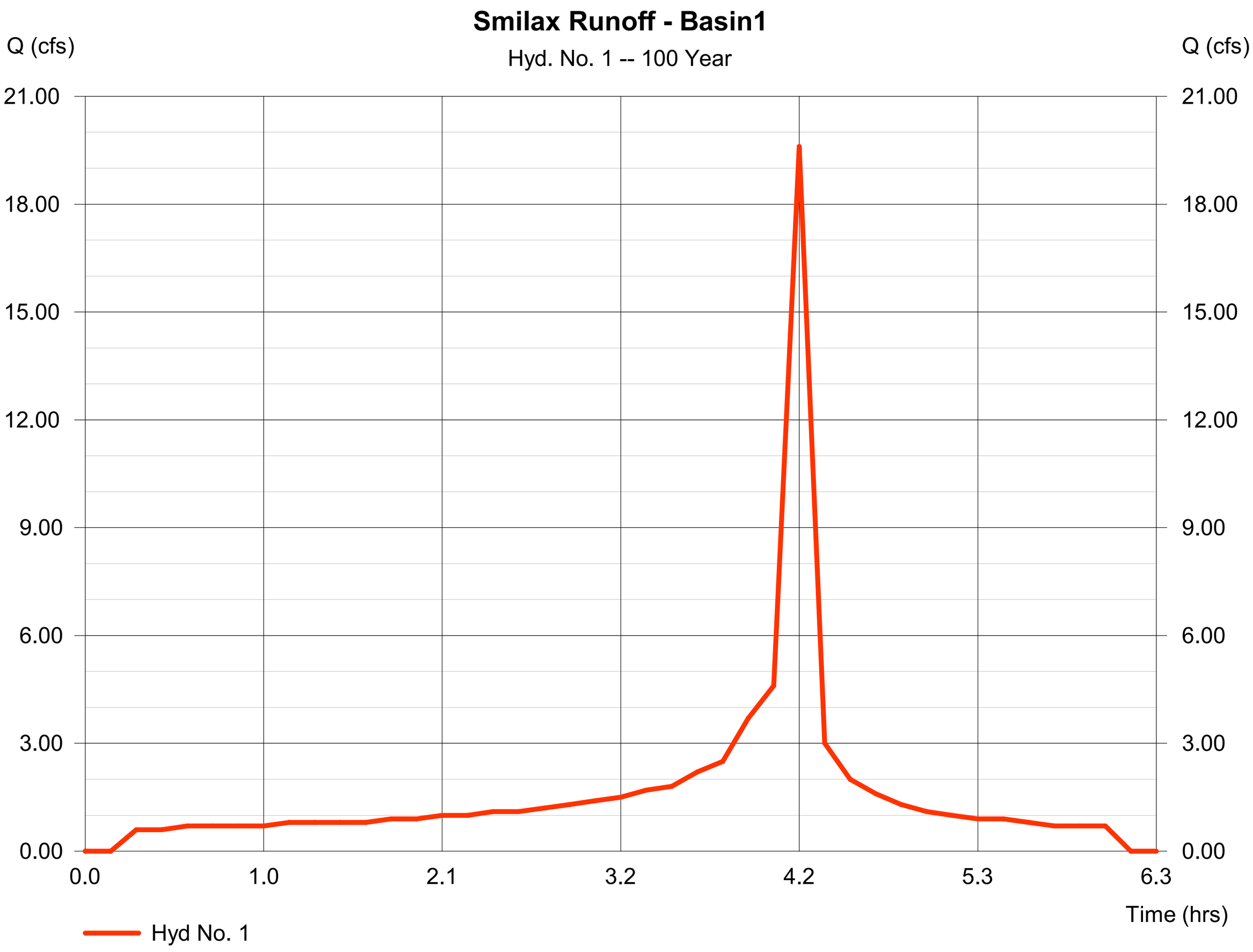
Hyd.	Origin	Description
1	Manual	Smilax Runoff - Basin1
2	Reservoir	Smilax Deten Basin1

Hydrograph Report

Hyd. No. 1

Smilax Runoff - Basin1

Hydrograph type	= Manual	Peak discharge	= 19.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.20 hrs
Time interval	= 9 min	Hyd. volume	= 37,476 cuft



Hydrograph Report

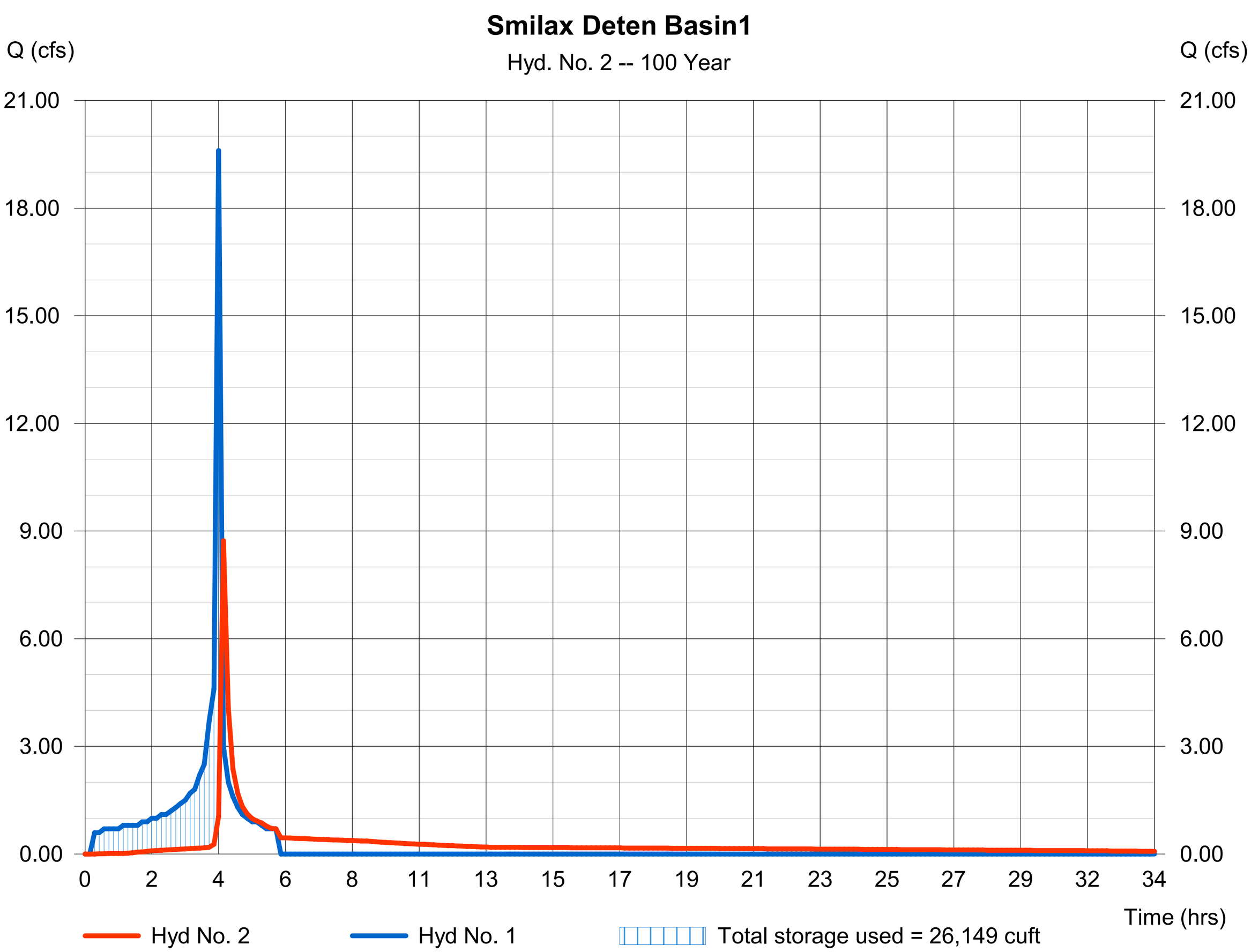
Hyd. No. 2

Free board = 434-432.61 = 1.39 ft

Smilax Deten Basin1

Hydrograph type	=	Reservoir	Peak discharge	=	8.732 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.35 hrs
Time interval	=	9 min	Hyd. volume	=	37,397 cuft
Inflow hyd. No.	=	1 - Smilax Runoff - Basin1	Max. Elevation	=	432.61 ft
Reservoir name	=	Smilax Detention Basin1	Max. Storage	=	26,149 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Smilax Detention Basin1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 428.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	428.50	4,690	0	0
0.10	428.60	4,783	474	474
0.20	428.70	4,875	483	956
0.50	429.00	5,153	1,504	2,460
1.00	429.50	5,632	2,695	5,155
1.50	430.00	6,112	2,935	8,090
2.00	430.50	6,630	3,184	11,275
2.50	431.00	7,148	3,443	14,718
3.00	431.50	7,707	3,713	18,430
3.50	432.00	8,266	3,992	22,422
4.00	432.50	8,841	4,276	26,698
4.50	433.00	9,417	4,563	31,261
5.00	433.50	10,020	4,858	36,119
5.50	434.00	10,624	5,160	41,279

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.61	0.61	0.61	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	Inactive	Inactive	Inactive
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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	428.50	---	---	---	---	---	---	---	---	---	---	0.000
0.10	474	428.60	---	---	---	---	---	---	---	---	---	0.006	0.006
0.20	956	428.70	---	---	---	---	---	---	---	---	---	0.011	0.011
0.50	2,460	429.00	---	---	---	---	---	---	---	---	---	0.018	0.018
1.00	5,155	429.50	---	---	---	---	---	---	---	---	---	0.095	0.095
1.50	8,090	430.00	---	---	---	---	---	---	---	---	---	0.134	0.134
2.00	11,275	430.50	---	---	---	---	---	---	---	---	---	0.164	0.164
2.50	14,718	431.00	---	---	---	---	---	---	---	---	---	0.190	0.190
3.00	18,430	431.50	---	---	---	---	---	---	---	---	---	0.359	0.359
3.50	22,422	432.00	---	---	---	---	---	---	---	---	---	0.457	0.457
4.00	26,698	432.50	---	---	---	---	---	---	---	---	---	9.951	9.951
4.50	31,261	433.00	---	---	---	---	---	---	---	---	---	27.24	27.24
5.00	36,119	433.50	---	---	---	---	---	---	---	---	---	49.60	49.60
5.50	41,279	434.00	---	---	---	---	---	---	---	---	---	76.06	76.06

Hydraflow Table of Contents

1516-Detention Basin-2.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Tuesday, 07 / 7 / 2020

Draw Down*				
Elevation	Q_{AVG} (CFS)	$DV_{n, n+1}$ (CF)	DT (HR)	Total T
0.00	0.045	212.6	1.31	53.85
0.05	0.045	214.9	1.33	52.54
0.10	0.045	217.2	1.34	51.21
0.15	0.045	219.5	1.35	49.87
0.20	0.045	221.8	1.37	48.52
0.25	0.045	224.1	1.38	47.15
0.30	0.045	226.4	1.40	45.77
0.35	0.045	228.7	1.41	44.37
0.40	0.045	231.0	1.43	42.96
0.45	0.045	233.4	1.44	41.53
0.50	0.046	235.7	1.42	40.09
0.55	0.049	238.0	1.34	38.67
0.60	0.053	240.3	1.27	37.33
0.65	0.055	242.6	1.23	36.06
0.70	0.056	244.9	1.21	34.83
0.75	0.058	247.2	1.19	33.62
0.80	0.059	249.5	1.17	32.44
0.85	0.060	251.9	1.16	31.26
0.90	0.062	254.2	1.15	30.11
0.95	0.063	256.5	1.14	28.96
1.00	0.065	258.8	1.10	27.82
1.05	0.072	261.2	1.00	26.72
1.10	0.084	263.6	0.87	25.71
1.15	0.097	266.0	0.76	24.84
1.20	0.107	268.4	0.70	24.08
1.25	0.115	270.8	0.66	23.38
1.30	0.121	273.2	0.63	22.72
1.35	0.127	275.6	0.60	22.10
1.40	0.132	278.0	0.58	21.49
1.45	0.138	280.4	0.57	20.91
1.50	0.142	282.8	0.55	20.34
1.55	0.147	285.2	0.54	19.79
1.60	0.151	287.6	0.53	19.25
1.65	0.156	290.0	0.52	18.73
1.70	0.160	292.4	0.51	18.21

Elevation	Q_{AVG} (CFS)	$DV_{n, n+1}$ (CF)	DT (HR)	Total T
1.75	0.163	294.8	0.50	17.70
1.80	0.167	297.2	0.49	17.20
1.85	0.171	299.6	0.49	16.70
1.90	0.174	302.0	0.48	16.22
1.95	0.178	304.4	0.48	15.74
2.00	0.181	306.9	0.47	15.26
2.05	0.184	309.5	0.47	14.79
2.10	0.188	312.1	0.46	14.32
2.15	0.191	314.7	0.46	13.86
2.20	0.194	317.3	0.45	13.40
2.25	0.197	319.8	0.45	12.95
2.30	0.200	322.4	0.45	12.50
2.35	0.203	325.0	0.45	12.05
2.40	0.205	327.6	0.44	11.60
2.45	0.208	330.2	0.44	11.16
2.50	0.211	332.8	0.44	10.72
2.55	0.214	335.4	0.44	10.28
2.60	0.216	338.0	0.43	9.84
2.65	0.219	340.6	0.43	9.41
2.70	0.221	343.1	0.43	8.98
2.75	0.224	345.7	0.43	8.55
2.80	0.226	348.3	0.43	8.12
2.85	0.229	350.9	0.43	7.69
2.90	0.231	353.5	0.42	7.26
2.95	0.234	356.1	0.42	6.84
3.00	0.238	358.8	0.42	6.42
3.05	0.248	361.6	0.40	6.00
3.10	0.265	364.4	0.38	5.59
3.15	0.287	367.2	0.35	5.21
3.20	0.314	370.0	0.33	4.86
3.25	0.338	372.8	0.31	4.53
3.30	0.357	375.6	0.29	4.22
3.35	0.372	378.4	0.28	3.93
3.40	0.385	381.1	0.27	3.65
3.45	0.398	383.9	0.27	3.37
3.50	0.410	386.7	0.26	3.10
3.55	0.421	389.5	0.26	2.84
3.60	0.432	392.3	0.25	2.58
3.65	0.442	395.1	0.25	2.33
3.70	0.452	397.9	0.24	2.08
3.75	0.462	400.7	0.24	1.84
3.80	0.471	403.5	0.24	1.60
3.85	0.480	406.3	0.24	1.36
3.90	0.489	409.1	0.23	1.13
3.95	0.498	411.9	0.23	0.89
4.00	0.655	414.7	0.18	0.66

Elevation	Q_{AVG} (CFS)	$DV_{n, n+1}$ (CF)	DT (HR)	Total T
4.05	1.084	417.6	0.11	0.49
4.10	1.717	420.5	0.07	0.38
4.15	2.495	423.4	0.05	0.31
4.20	3.394	426.2	0.03	0.27
4.25	4.399	429.1	0.03	0.23
4.30	5.499	432.0	0.02	0.20
4.35	6.687	434.9	0.02	0.18
4.40	7.957	437.7	0.02	0.16
4.45	9.304	440.6	0.01	0.15
4.50	10.723	443.5	0.01	0.13
4.55	12.211	446.4	0.01	0.12
4.60	13.765	449.3	0.01	0.11
4.65	15.382	452.1	0.01	0.10
4.70	17.060	455.0	0.01	0.10
4.75	18.796	457.9	0.01	0.09
4.80	20.590	460.8	0.01	0.08
4.85	22.438	463.6	0.01	0.08
4.90	24.339	466.5	0.01	0.07
4.95	26.292	469.4	0.00	0.06
5.00	28.296	472.3	0.00	0.06
5.05	30.349	475.4	0.00	0.05
5.10	32.451	478.4	0.00	0.05
5.15	34.599	481.4	0.00	0.05
5.20	36.793	484.4	0.00	0.04
5.25	39.033	487.4	0.00	0.04
5.30	41.316	490.5	0.00	0.04
5.35	43.643	493.5	0.00	0.03
5.40	46.013	496.5	0.00	0.03
5.45	48.424	499.5	0.00	0.03
5.50	50.876	502.5	0.00	0.02
5.55	53.347	505.5	0.00	0.02
5.60	55.857	508.6	0.00	0.02
5.65	58.428	511.6	0.00	0.02
5.70	61.039	514.6	0.00	0.01
5.75	63.687	517.6	0.00	0.01
5.80	66.373	520.6	0.00	0.01
5.85	69.095	523.7	0.00	0.01
5.90	71.854	526.7	0.00	0.00
5.95	74.649	529.7	0.00	0.00
6.00				0.00

CHAPTER 5
HYDROLOGY MAPS

0.05 ACRES WILL BE DIVERTED TO THE BIOFILTRATION BASIN IN THE PROPOSED CONDITION TO ADDRESS WATER QUALITY, HYDROMODIFICATION REQUIREMENTS AND PEAK FLOW ATTENUATION FOR THE RUN OFF GENERATED FROM THE PROPOSED SMILAX ROAD WIDENING

EXISTING
Q100=15.29 CFS
AREA = 6.45 AC
TC = 8.08 MIN

4.91 ACRES

1.25 ACRES

0.12 ACRES

0.17 ACRES

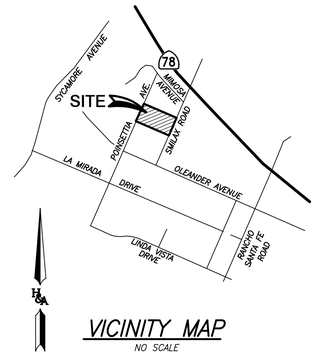
POINSETTIA AVE.

SMILAX ROAD

GRAVEL DRIVE

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INTIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER



VICINITY MAP
NO SCALE

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 15'
NO CRITICAL COARSE AREAS REQUIRE PRESERVATION

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	C Area-Average Runoff Coefficient	Tc (min)	I (in\hr)	V100* Velocity (ft\sec)	Q100-Year Peak Flow (cfs)
1	3	Middle of west border of the site	6.45	0.480	8.08	6.281	3.11	15.1

30 0 30 60 90
SCALE 1" = 30'

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC.
PLANNING ENGINEERING SURVEYING
9707 Waples Street
San Diego, Ca 92121
PH(858)558-4500 FX(858)558-1414

EXISTING
DRAINAGE MAP

SMILAX

COUNTY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.# 0480-0174

R:\1516\Hyd\ACAD\HYDRO\1516-HYD_EX-PR.dwg[]Jul-07-2020:21:43

PROPOSED
PRE-DETAINED Q100=19.60 CFS
DETAINED Q100=8.73 CFS
AREA = 4.69 AC
TC = 18.44 MIN

PROPOSED
PRE-DETAINED Q100=24.51 CFS
DETAINED Q100=11.93 CFS
AREA = 6.50 AC
TC = 18.49 MIN

POINSETTIA AVE

GRAVEL DRIVE

BLDG 5 BLDG 4 BLDG 3 BLDG 2 BLDG 1

PRIVATE DR 'A'

BIO-FILTRATION BASIN 428.0 BOTTOM ELEVATION

BLDG 6 BLDG 7 BLDG 8 BLDG 9 BLDG 10

RECREATION AREA 6,885 S.F.

PRIVATE DR 'E' PRIVATE DR 'F' PRIVATE DR 'D'

PRIVATE DR 'B'

BLDG. 15 BLDG 14 BLDG 13 BLDG 12 BLDG 11

RECREATION 2,197 S.F.

CONC. GRAVEL DRIVE BLDG. DIRT SHED MATERIALS PILE ASPHALT CARPORT METER

0.07 ACRES
0.13 ACRES
0.41 ACRES
1.82 ACRES
2.00 ACRES
0.10 ACRES
0.10 ACRES
0.18 ACRES
0.07 ACRES
0.38 ACRES
0.17 ACRES
0.12 ACRES
0.94 ACRES

S-19 S-18 S-13 S-01 S-05 S-06 S-10 H-12 H-11 P-24 P-30

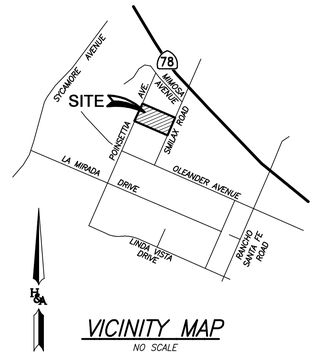
	Discharge Location	Area (ac)*	C* Area-Average Runoff Coefficient	Tc* Time of Concentration (min)*	I* Intensity (inch\hr)	V100** Velocity (ft\sec)	Q100* Peak Flow (cfs)*
Existing	Middle of west border of the site	6.45	0.48	8.08	6.281	3.11	15.29
Proposed Unmitigated	Middle of west border of the site	6.50	0.6875 On-site & 0.4742 Off-site	9.26	5.756	2.55	24.51
Proposed Mitigated	Middle of west border of the site	6.50	0.6875 On-site & 0.4742 Off-site	18.49	3.684	2.02	11.93

* from AES report
**Per the county comment; to provide preliminary velocity V100 in the pre-development condition a channel analysis has been provided assuming a 5' bottom width channel with 10:1 (H:V) side slopes.(See Chapter 3)

**To calculate the 100-year Velocity in the proposed condition, a weir analysis has been provided for the spillway (Mitigated and Unmitigated conditions). (See Chapter 3)

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INTIAL SUBAREA
- FLOW DIRECTION
- x.xx ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- x — NODE NUMBER



VICINITY MAP
NO SCALE

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 15'
NO CRITICAL COARSE AREAS REQUIRE PRESERVATION

30 0 30 60 90
SCALE 1" = 30'

PREPARED BY:
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PROPOSED DRAINAGE MAP

SMILAX

COUNTY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.# 6490-0174

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CHAPTER 6
REFERENCE INFORMATION
(Reports, Plans, Etc.)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

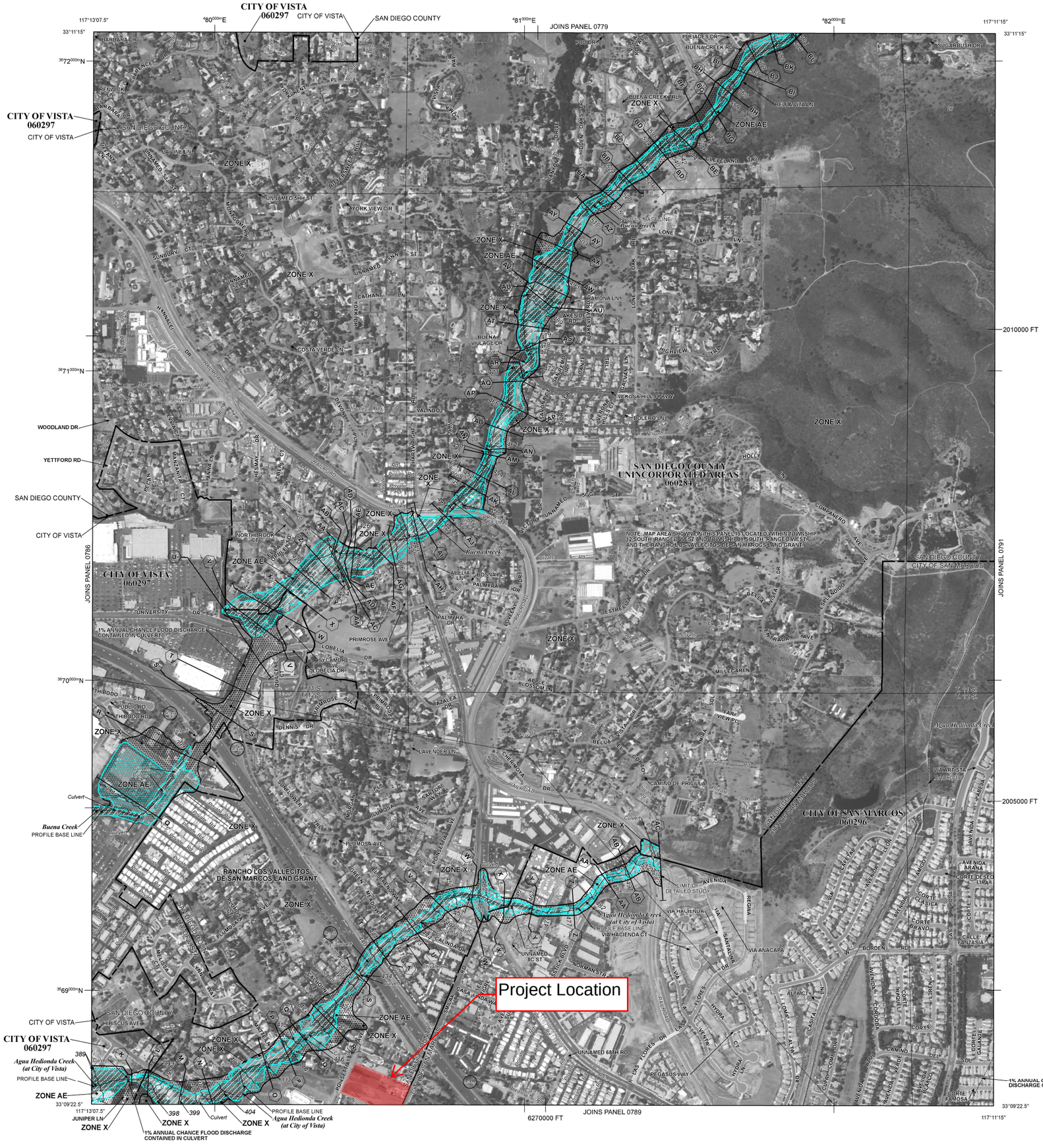
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988
A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE 1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 16, 1999

May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0787H

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 787 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY	060284	0787	H
SAN MARCOS, CITY OF	060296	0787	H
VISTA, CITY OF	060297	0787	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C0787H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/12/2019 at 3:38:22 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.