Appendix I

Preliminary Drainage Study for Harmon Oaks

PRELIMINARY DRAINAGE STUDY
For
HARMON OAKS

APN'S 317-501-01-00, 317-500-02, 03,09,10,11,12,13,14
Preparation/Revision Date:

June 17, 2022/ November 30, 2022/ September 01, 2023

Prepared for:

Lennar Homes of California, Inc.

16465 Via Esprillo, Ste. 150

San Diego, CA 92127

(858) 618-4942

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 City of Poway is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

Engineer of Work
Hunsaker & Associates San Diego, Inc.
9707 Waples Street
San Diego, CA 92121
Phone: (858)558-4500
Fax: (858)558-1414
Web: www.HunsakerSD.com

Alisa S. Vialpando 09/01/2023

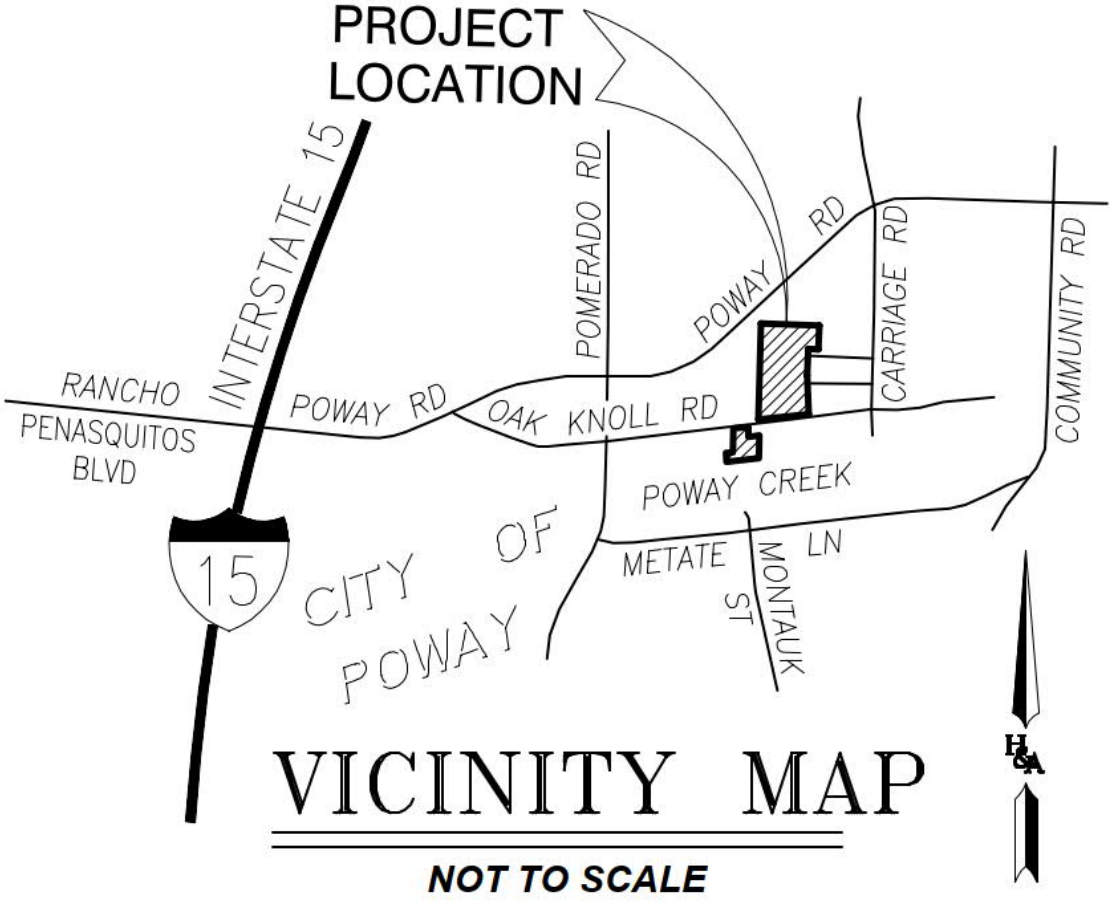
Alisa S. Vialpando, R.C.E. 47945 Date
President

TABLE OF CONTENTS

CHAPTER 1 EXECUTIVE SUMMARY

1.1 Introduction

The Harmon Oaks project is located in the City of Poway and is split by Oak Knoll Road, with a portion north of Oak Knoll Road and a smaller portion south of Oak Knoll Road. See below for vicinity map. The development proposes a single-family community with 63 residential lots within 10.77 acres. The site will also include detention underground vault, sidewalks, and parking stalls. The lots are connected by private drives which are accessible via Oak Knoll Road and Roca Grande Drive.



Scope

The scope of this report is to analyze both the existing and proposed hydrologic conditions relative to development of the site and prepare storm drain facilities based on the 100 year flow. Proposed stormwater facilities include storm drain, curb inlets, catch basins, proprietary biofiltration BMPs (curb type Filterra Units or equivalent), underground vault, outlet structure, a pump to pump the hydromodification low flows to the existing storm drain system under Oak Knoll Road, brow ditches, and energy

dissipation devices and will be calculated upon Final Engineering. The proposed proprietary biofiltration units for the site will address the water quality requirements, while the underground vault will address the 100 year peak flows, and flow control hydromodification concerns. 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 Harmon Oaks* prepared by Hunsaker & Associates San Diego, Inc. (June 2022).

Summary of Existing Conditions

The existing condition hydrology map (Exhibit 1) is located in Chapter 5. A portion of the project site is currently occupied by single family building structures, driveways, construction equipment yard, and vacant area north of Oak Knoll Road. There is a vegetated channel runs in a north-south direction along the northwestern border of the site. The remainder of the project site, found south of Oak Knoll Road, is a vacant area in its northern portion, except for a building structure northeast of the southern lot, and densely vegetated area in its southern portion. The total analyzed drainage area (on-site and off-site) is 13.79 acres. The elevation-range of the studied water-shed is between 540 feet down to 438 feet. The average slope across the site from the northeast corner to the southwest corner is approximately 5.3%. The imperviousness of the analyzed watershed in its existing condition is approximately 19% (20% for the onsite and offsite area drains to the northern portion of Oak Knoll Road (Node 1 to Node 5), 63% for the offsite area southeast of the northern portion (Node 3 to Node 5), 24% for onsite area and northwest portion of Oak Knoll Road (Node 6 to Node 8), 90% for Oak Knoll Road paved area (Node 9 to Node 11), 0% for the western slopes to Node 14, 8% for the southern portion at Node 16). Please refer to AES Input Data Table in Chapter 3.

Runoff from the northern portion of the project site with the run-on from the eastern offsite development is conveyed via overland flow towards Oak Knoll Road existing inlet (Node 1 to Node 5), where it is captured and comingled with the offsite flows from the southwestern existing development and northeastern half of Oak Knoll Road (Node 3 to Node 5). Total runoff from Node 5 is routed westerly via existing 36” RCP storm drain system to Node 8 per 801-05-1076. Runoff from the southwestern sub-watershed of northern portion of the project site is conveyed via overland flow towards Oak Knoll Road existing inlet, where it is captured and comingled with the offsite flows from the northwestern half of Oak Knoll Road (Node 6 to Node 8). Existing 36” RCP storm drain system carries the total runoff from Node 8 to Node 11, where it comingles with the captured flow from the southern portion of Oak Knoll Road before continues westerly to Node 15. Run-on from the offsite northern slope is conveyed with the runoff from the northwestern portion of the site via overland flow to enters the existing 8’ X 5’ RCP box culvert through the existing headwall per 801-04-150 sheet 5 (Node 12 to Node 14). The existing 8’X5’ RCP box culvert routes the captured flows southwesterly to Node 15, where it comingles with the discharge from (Node 11) the 36” existing storm drain, and then continues southerly to discharge into Poway Creek at Node 16.

Runoff from southern portion of the site with the adjacent eastern offsite area is also conveyed via overland flow to discharge directly into Poway Creek to Node 16.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary. A runoff coefficient was calculated for each subarea within the watershed based on soil type and impervious percentage using the following formula in accordance with Section 3.1.2 of San Diego County Hydrology Manual June 2003.

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value (Cp=0.35 for Soil D and 0.20 for Soil A per Table 3.1)

Runoff Coefficients

C Factor	Description
0.35 Soil D 0.20 Soil A	Cp= Pervious area per SDC Section 3.1.2 and table 3.1
0.90	Impervious areas (proposed and existing)

The calculations for each weighted run-off coefficient for each sub-area as determined in accordance with Section 3.2.1 are shown in Chapter 3. AES input data tables. 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)	100-Year Peak Flow (cfs)
1	16	SW of site	13.79	26.85

Summary of Developed Conditions

PROJECT DESCRIPTION

The proposed Harmon Ranch Specific Plan and Tentative Map project site ("Project Site") is located within the southern area of City of Poway, south of Poway Road and east of Pomerado Road. This Project Site is 11.5 acres and is currently designated Residential Single Family 7 (RS-7) in the Poway Comprehensive Plan: General Plan which permits single-family homes on a minimum of 4,500 square foot lots and a maximum density of eight dwelling units per acre. Surrounding land uses include mixed use retail land uses and the Kumeyaay Interpretive Center to the north, Oak Knoll Road, Poway Creek and existing single-family homes to the south and east which are also designated RS-7 and an apartment community to the west.

The current property owner is Harmon Family Trust. The majority of the site has been cleared for several years and was previously used as a construction staging yard for an SDG&E gas line project. The site includes four existing single-family residences. One of the existing homes is a locally designated historic building located at 12702 Oak Knoll Road (APN 317-500-14-00). The historic building was built in 1933 and is constructed of cobblestones. The building is presently designated as City of Poway Historical Site 113 and is documented and known as the "Harmon House." The historic home will be retained in place within a 0.25-acre site as part of the project. The historic home site will be designated Residential – Historic Home within the Specific Plan.

Lennar Homes of California, LLC ("Applicant"), is proposing a residential neighborhood on a 11.5-acre Project Site. The Project site is comprised of approximately 5.7 acres designated for residential development, a 0.25-acre historic home site, 3.2 acres of open space areas, 1.9 acres for private streets and 0.5 acres of public right-of-way (Oak Knoll Road). The Proposed Project would include 64 single family detached homes. The Proposed Project density (8.8 units/acre) is slightly higher than the 8.0 units/acre permitted in the existing RS-7 designation. Primary access to the Project Site is planned via existing Oak Knoll Road. Fifty-nine of the new homes are proposed to front newly constructed private streets, while four homes and an open space/overlook area front existing Oak Knoll Road. The existing historic home has direct access via Oak Knoll Road.

Land Use Summary

Use/Land Use	Approx. Net Acres (AC)	% of Planning Area (%)	Max. Dwelling Units (DU)	Density (DU/AC)[1]
Non-Residential Land Uses				
Open Space (OS-1 & 2) (Floodway)	1.88	16.3%		
Open Space (OS-3 & 4)	0.31	2.7%		
Open Space Recreation (OSR-1 to 7)	0.99	8.6%		
Subtotal Open Space	3.18	27.6%		
Private Internal Residential Streets	1.88	16.3%		
Oak Knoll Road ROW (existing)	0.49	4.3%		
Subtotal Streets	2.37	20.6%		
Subtotal Non-Residential	5.55	48.2%		
Residential (R) Land Use				
Residential Single Family (R-SF) (Lots 1 to 64)	5.96	51.8%	64	
Subtotal Residential	5.96	51.8%	64	
TOTAL Specific Plan Area	11.51	100%	64	8.8

1- Statistics are based upon preliminary design and may vary slightly from Development Plan, Tentative Map, and/or Final Map. Refer to Chapter 7 regarding substantial conformance.

2- Pursuant to State Law, local governments cannot preclude an Accessory Dwelling Unit (ADU) or Junior Accessory Dwelling Units (JADU). An ADU and JADU is an accessory use for the purposes of counting allowable density under general plan and zoning and is therefore not counted as an additional unit. An ADU and JADU shall be permissible in accordance with the PMC or, if the locally adopted ordinance is void, the State Government Code. See Section 3.2.2.G for information regarding ADUs.

3- Open Space areas within the floodway (OS-1 and OS-2) and public street (Oak Knoll Road) and internal private streets are excluded from the density calculation. The following calculation was utilized to determine the net residential density for the project: Residential (5.96 ac) + Open Space Recreation Lots 1-7 (0.99 ac) + Open Space Lots 3 and 4 (0.31 ac) = 7.26 ac. 64 / 7.26 = 8.8.

The Applicant is proposing a Specific Plan and Tentative Map to facilitate development of a 64 single family homes. The Harmon Ranch Specific Plan will establish three land use districts within the Project Site: Residential Single Family (R-SF); Open Space (OS); and Open Space Recreation (OS-R). The Specific Plan will also provide development regulations and permitted uses for each land use district.

The Proposed project is comprised of 64 single-family homes on lots 42-feet wide and 85- to 90-feet deep, with standard two-car garages, 20-foot-deep by 20-foot-wide driveways to accommodate an additional two off-street parking spaces within the private lots and private fenced rear yards. The Proposed Project also includes 40 guest parking spaces along the private streets, approximately 1.0 acres of Open Space Recreation areas, approximately 2.2 acres of natural Open Space areas and a segment of the General Plan Community trail (approximately 1,000 feet) within the Project Site. A potential off-site trail connection to the adjacent retail area located to the north may occur in the future, subject to property owner cooperation but is not part of the proposed project. The "Overlook" area located in the south portion of the Project Site is planned to provide public access and will be privately maintained.

Discretionary actions which require Poway City Council consideration include the following:

- Environmental Impact Report (EIR)
- General Plan Amendment/Zone Change (GPA/ZC) from Residential Single-Family 7 (RS-7) to Planned Community (PC)
- Tentative Map (TM)
- Development Review (DR) Permit
- Final Map

The post-developed condition of the site will include improvements consisting of a single-family residential development including building structures, driveways, access roads, sidewalks, and landscaped areas. The site also proposes proprietary biofiltration facilities to address water quality requirements (Filterra units or alternative), underground vault, storm drains, inlets, and brow ditches sized to collect and convey site runoff through the project area.

The proposed vault will attenuate the 100 year peak flows as well as address flow control hydromodification and pollutant control for water quality. For additional discussion on the proposed water quality and hydromod features of the site, refer to the *Stormwater Quality Management Plan (SWQMP) for Harmon Oaks* (June 2022) prepared by Hunsaker & Associates San Diego, Inc.

Runoff from the northern portion of the proposed development will be routed via street gutters to the proposed on site inlets and proprietary biofiltration units to address water quality requirements, and then travels via private proposed storm drain system southwesterly to the proposed underground vault (Node 50 to Node 74). Discharge from the vault will be controlled by an outlet structure equipped with orifices and weir with varying dimensions and invert elevations to meet current hydromodification requirements and attenuate the proposed 100-year peak flows to be equal or less than existing conditions 100-year peak flow. Due to existing storm drain flow elevation, the low flow orifice can't be routed directly to the downstream storm drain. Therefore, discharge from the low flow orifice will be pumped to the proposed cleanout\ manhole downstream of the vault, where the discharge from the rest of the orifices and weir (Vault outlet structure) will be routed to before discharging into the existing 36" RCP at Oak Knoll Road (Node 8). The proposed vault within northern portion of the project has been sized to provide additional hydromodification and 100-year peak flow control and mitigate impact from this area when measured at the analyzed discharge point (Node 16-POC1).

Runoff from northeastern offsite development -that drains through the site in existing conditions- will be conveyed via proposed ditch to a proposed catch basin west of La Vista Way and then routed vis proposed storm drain to the existing 36" storm drain at Oak Knoll Road (Node 3 to Node 5). Runoff from offsite area southeast of the northern portion of the project will drain similarly to existing conditions via overland flow towards Oak Knoll Road existing inlet (Node 4 to Node 5), where it will be captured and routed via existing 36" RCP storm drain system to Node 8, where it comingles with the discharge from the proposed development and runoff from the northwestern half of Oak Knoll Road (Node 5 to Node 8). Total runoff from Node 8 will be routed westerly

via existing 36" RCP storm drain system to Node 11. Existing 36" RCP storm drain system carries the total runoff from Node 8 to Node 11. Runoff from northern area of southern portion of the project will drain towards Oak Knoll Road gutter and routed westerly to proposed proprietary biofiltration unit (filterra unit or equivalent). The proposed proprietary biofiltration unit will provide water quality pollutant control prior to discharging into the existing storm drain system at Oak Knoll Road Node 11. Total runoff from southern portion of Oak Knoll Road and northern developed area of southern portion of the project will comingle with the total captured flow at Node 11, berfore continues westerly to Node 15.

Runoff from the offsite northern slope will be captured via a brow ditch and conveyed with the runoff from the proposed graded slope northwest of the northern portion of the site via overland flow to enters the existing 8' X 5' RCP box culvert through the existing headwall per 801-04-150 sheet 5 (Node 12 to Node 14). The existing 8'X5' RCP box culvert routes the captured flows southwesterly to Node 15, where it comingles with the discharge from (Node 11) the 36" existing storm drain, and then continues southerly to discharge into Poway Creek at Node 16.

Runoff from southern area of southern portion of the site with the adjacent eastern offsite area will also conveyed via overland flow similarly to existing conditions to discharge directly into Poway Creek to Node 16.

Table 2 below summarizes the 100-year proposed condition peak flow at the downstream project boundary. A runoff coefficient was calculated for each subarea within the watershed based on soil type and impervious percentage using the following formula in accordance with Section 3.1.2 of San Diego County Hydrology Manual June 2003.

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

The calculations for each weighted run-off coefficient for each sub-area as determined in accordance with Section 3.2.1 are shown in Chapter 3. AES input data tables. Supporting calculations for the data presented in Table 2 is located in Chapter 3 of this report. The corresponding hydrology map (Exhibit 2) is located in Chapter 5.

TABLE 2 - Summary of Proposed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	100-Year Peak Flow (cfs) ^	100-Year Peak Flow (cfs)*
1	16	SW of site	13.79	46.65	14.21

^runoff rates before flood attenuation
*runoff rates after flood attenuation

A portion of the site, at the south western corner of the northern portion of the project and northern developed area of the southern portion of the project, is located within Zone AE (within the flood plain for Poway Creek), per the FEMA Firmette found in Chapter 6 and will require a Floodplain Development Permit.

The Proposed Drainage Map in Chapter 5 shows the developed site with its subareas and flow paths. There is only one outfall location from the proposed site, as the proposed and existing storm drain conveys the flows towards Poway Creek, similarly to existing conditions. Due to the increase in impervious area compared with the existing condition, the peak flows generated from the site will be reduced through the proposed vault. Design calculations for the vault attenuation can be found in Chapter 4.

Summary of Results

Development of *Harmon Oaks* site required a storm drain system to capture and convey the Q100 peak flows safely to the existing storm drain system at Oak Knoll Road. See Chapters 3 hydrologic models. The corresponding hydrology maps are located in Chapter 5.

Ten proprietary biofiltraton units (Filterra units or equivalent) are proposed to address water quality requirements, and one underground vault for hydromodification, and peak flow attenuation. Flows from the site are attenuated to be less than the existing flows when measured at the point of compliance southwest of the project (POC-1) to Poway Creek.

Since the proposed vault onsite will mitigate the 100 year flow to below existing conditions, there will be no negative impacts to downstream drainage developments and facilities.

Inlet calculations, brow ditches and storm drain hydraulic will be provided in final engineering.

Table 3 below summarizes the comparison between existing and proposed flow rates from the site.

TABLE 3 – Existing Condition vs. Proposed Condition

Discharge Location	Existing Node	Proposed Node	Existing Condition Area (ac)	Proposed Condition Area (ac)	Existing: 100-Year Peak Flow (cfs)	Proposed: 100-Year Peak Flow (cfs)	Q100 Flow Difference (cfs)
SW of site	16	16	13.79	13.79	26.85	14.21	-12.64

Conclusions

Development of Harmon Oaks site will not alter the drainage patterns, and the proposed improvements will decrease the flows to below existing conditions. Therefore no adverse impacts are expected.

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

Stormwater Quality Management Plan (SWQMP) for Harmon Oaks, Hunsaker & Associates San Diego, Inc., June 2022

CHAPTER 2 METHODOLOGY

Modified Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100- year return interval

Land Use – Single-family Residential

Soil Type – Per the NRCS Web Soil Survey, the existing soil consists of Soil Type D for majority of the site and A for a small portion of the southern area. Group D soils have very slow rates. 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. Group A. Soils have 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.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficients were based on land use and soil type San Diego County Hydrology Manual. Runoff coefficient was calculated for each subarea within the watershed based on soil type and impervious percentage using the following formula in accordance with Section 3.1.2 of San Diego County Hydrology Manual June 2003.
C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value (Cp=0.35 for Soil D and 0.20 for Soil A per Table 3.1)

Runoff Coefficients

	C Factor	Description
Rainfall	0.35 Soil D 0.20 Soil A	Cp= Pervious area per SDC Section 3.1.2 and table 3.1
	0.90	Impervious areas (proposed and existing)

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 0.5 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 I. 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. Pipe flow travel time (computer estimated).
4. Pipe flow 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.

Detention

In order to provide adequate peak flow attenuation, increases in peak flow rates at the outfall location for this site has been mitigated using the design of the proposed vault. Mitigation within the vault has been modeled using SWMM 5.01.

RickRatHydro has been used to generate inflow hydrograph for the vault, based on area, time of concentration, P6 value, runoff coefficient, and peak flow rate for the drainage area (from hydrology analysis).

The inflow hydrograph was then imported into SWMM model as an inflow to the storage unit (representing the vault volume) and was connected to the outfall point by using an outlet link (represent the outlet structure). The vault Stage-Storage curve and Stage-Discharge curve were generated by Excel. Generating Stage-Storage curve is relatively simple for the vertical-sided vault, where volume increases linearly with the stage value. For the Stage-Discharge curve, both weir equation (for partially submerged condition) and orifice flow equation (for fully submerged condition) were adopted to evaluate the riser discharge based on the water depth in front of the orifice and emergency weir. These generated curves were modeled as tabular curves for the storage unit and the outlet link in SWMM to calculate the water surface elevation and outfall flow rate.

CHAPTER 3
HYDROLOGIC ANALYSIS
100 – Year Design Storm

EXISTING HYDROLOGIC ANALYSIS 100 – Year Design Storm

OAK KNOLL / EXISTING CONDITIONS																
AES INPUT DATA																
Node #			Elevation		Length		Area (AC)		imperviousness	Soil Type*	C value	If Channel			If memory
From	To	code	Up	Down	(FT)	slope	total	impervious				Base (ft)	Z:1	maning	Bank #
1	2	2	535	505	100	30%	0.05	0.01	20%	D	0.46				
2	5	5	505	449.17	979	6%	6.77	1.35	20%	D	0.46	10	1:10	0.030	
5	5	1													2-1
3	4	2	457.5	456	75	2%	0.14	0.10	69%	D	0.73				
4	5	6	456	449.17	477	1%	0.52	0.36	69%	D	0.73				
5	5	1													2-2
5	8	3	443.87	442.87	200	0.5%								0.013	
8	8	1													2-1
6	7	2	456.5	455	80	2%	0.10	0.02	24%	D	0.48				
7	8	5	455	448.12	465	1.5%	1.62	0.39	24%	D	0.48	10	1:10	0.030	
8	8	1													2-2
8	11	3	442.79	442.06	146	0.5%								0.013	
11	11	1													2-1
9	10	2	457.5	456	75	2%	0.05	0.05	90%	D	0.85				
10	11	6	456	449.17	477	1%	0.22	0.20	90%	D	0.85				
11	11	1													2-2
11	15	3	442.04	441.5	94	0.6%								0.013	
15	15	1													2-1
12	13	2	540	525	100	15%	0.16	0.00	0%	D	0.35				
13	14	5	525	446.95	715	10.9%	2.38	0.00	0%	D	0.35	10	1:10	0.035	
14	15	3	446.95	439.45	760	1.0%								0.013	
15	15	1													2-2
15	16	3	439.45	434.82	232	2.0%								0.013	
16	16	8					1.78	0.15	8%	D/A	0.30				
Total							13.79	2.63	19%	D	0.45				

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

            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 *************************
* OAK KNOLL                                                             *
* HYDROLOGY ANALYSIS                                                    *
* EXISTING CONDITIONS - 100 YR                                          *
 ************************************************************************

  FILE NAME: R:\1713\HYD\DR\CALCS\AES\100\EX100.DAT
  TIME/DATE OF STUDY: 10:31 06/28/2022
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  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   12.0      7.0    0.020/0.020/0.020   0.33    1.50 0.0313 0.125 0.0130
  2   15.0      7.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

  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 =  5.0 (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 (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    535.00
  DOWNSTREAM ELEVATION(FEET) =    505.00
  ELEVATION DIFFERENCE(FEET) =     30.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.348
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.064
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.16

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

```
 FLOW PROCESS FROM NODE      2.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    505.00  DOWNSTREAM(FEET) =    449.17
 CHANNEL LENGTH THRU SUBAREA(FEET) =   979.00   CHANNEL SLOPE =  0.0570
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.720
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.75
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.51
 AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   4.65
 Tc(MIN.) =    9.99
 SUBAREA AREA(ACRES) =     6.77       SUBAREA RUNOFF(CFS) =   14.70
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
 TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      14.81

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   4.32
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1079.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    9.99
 RAINFALL INTENSITY(INCH/HR) =   4.72
 TOTAL STREAM AREA(ACRES) =     6.82
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.81

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 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) =    75.00
 UPSTREAM ELEVATION(FEET) =    457.50
 DOWNSTREAM ELEVATION(FEET) =    456.00
 ELEVATION DIFFERENCE(FEET) =      1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.578
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.75
 TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
 STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 15.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
 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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   2.96   Tc(MIN.) =    7.54
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.659
  *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) =    0.52      SUBAREA RUNOFF(CFS) =    2.15
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       2.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.99
  FLOW VELOCITY(FEET/SEC.) =  2.94   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      5.00 =     552.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    7.54
  RAINFALL INTENSITY(INCH/HR) =   5.66
  TOTAL STREAM AREA(ACRES) =     0.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.73

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       14.81     9.99        4.720          6.82
      2        2.73     7.54        5.659          0.66

  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       13.90     7.54       5.659
      2       17.08     9.99       4.720

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.08   Tc(MIN.) =    9.99
  TOTAL AREA(ACRES) =        7.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1079.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =   443.87  DOWNSTREAM(FEET) =   442.87
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.96
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      17.08
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   10.55
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1279.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 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.) =   10.55
  RAINFALL INTENSITY(INCH/HR) =   4.56
  TOTAL STREAM AREA(ACRES) =     7.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.08

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    456.50
  DOWNSTREAM ELEVATION(FEET) =    455.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.095
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.407
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    455.00  DOWNSTREAM(FEET) =    448.12
  CHANNEL LENGTH THRU SUBAREA(FEET) =   465.00   CHANNEL SLOPE =  0.0148
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.834
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.78
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   5.70
  Tc(MIN.) =   13.79
  SUBAREA AREA(ACRES) =     1.62       SUBAREA RUNOFF(CFS) =    2.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       3.17

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   1.65
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE      8.00 =     545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 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.) =   13.79
  RAINFALL INTENSITY(INCH/HR) =   3.83
```

```
 TOTAL STREAM AREA(ACRES) =     1.72
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.17

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       17.08    10.55        4.557          7.48
     2        3.17    13.79        3.834          1.72

 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       19.50    10.55       4.557
     2       17.54    13.79       3.834

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      19.50   Tc(MIN.) =   10.55
 TOTAL AREA(ACRES) =        9.2
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1279.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   442.79  DOWNSTREAM(FEET) =   442.06
 FLOW LENGTH(FEET) =   146.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      19.50
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   10.95
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1425.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =   10.95
 RAINFALL INTENSITY(INCH/HR) =   4.45
 TOTAL STREAM AREA(ACRES) =     9.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.50

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    457.50
 DOWNSTREAM ELEVATION(FEET) =    456.00
 ELEVATION DIFFERENCE(FEET) =      1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.042
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.429
 SUBAREA RUNOFF(CFS) =      0.12
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  62
```

```
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
  STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.34
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.41
  STREET FLOW TRAVEL TIME(MIN.) =   3.05   Tc(MIN.) =   11.10
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.412
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.44
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       0.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.52
  FLOW VELOCITY(FEET/SEC.) =  2.22   DEPTH*VELOCITY(FT*FT/SEC.) =   0.44
  LONGEST FLOWPATH FROM NODE      9.00 TO NODE     11.00 =     552.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =   11.10
  RAINFALL INTENSITY(INCH/HR) =   4.41
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.50    10.95        4.449          9.20
      2        0.54    11.10        4.412          0.27

  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       20.03    10.95       4.449
      2       19.88    11.10       4.412

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.03   Tc(MIN.) =   10.95
  TOTAL AREA(ACRES) =        9.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1425.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 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) =   442.04  DOWNSTREAM(FEET) =   441.50
  FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.49
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.03
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   11.19
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =   11.19
  RAINFALL INTENSITY(INCH/HR) =   4.39
  TOTAL STREAM AREA(ACRES) =     9.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.03

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    540.00
  DOWNSTREAM ELEVATION(FEET) =    525.00
  ELEVATION DIFFERENCE(FEET) =     15.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.431
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.994
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    525.00  DOWNSTREAM(FEET) =    446.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   715.00   CHANNEL SLOPE =  0.1092
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.827
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.82
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   4.22
  Tc(MIN.) =    9.65
  SUBAREA AREA(ACRES) =     2.38       SUBAREA RUNOFF(CFS) =    5.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       5.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   3.45
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =   446.95  DOWNSTREAM(FEET) =   439.45
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.87
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.52
  PIPE TRAVEL TIME(MIN.) =   2.16    Tc(MIN.) =   11.81
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     15.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =   11.81
  RAINFALL INTENSITY(INCH/HR) =   4.24
  TOTAL STREAM AREA(ACRES) =     2.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.52

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       20.03    11.19        4.387          9.47
      2        5.52    11.81        4.238          2.54

  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       25.26    11.19       4.387
      2       24.87    11.81       4.238

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.26   Tc(MIN.) =   11.19
  TOTAL AREA(ACRES) =       12.0
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     15.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   439.45  DOWNSTREAM(FEET) =   434.82
  FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.04
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.26
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =   11.54
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     16.00 =    1807.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
```

```
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.300
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4527
  SUBAREA AREA(ACRES) =    1.78   SUBAREA RUNOFF(CFS) =    2.30
  TOTAL AREA(ACRES) =       13.8   TOTAL RUNOFF(CFS) =      26.85
  TC(MIN.) =   11.54
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.8  TC(MIN.) =     11.54
  PEAK FLOW RATE(CFS)   =      26.85
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED HYDROLOGIC ANALYSIS 100 – Year Design Storm

OAK KNOLL / PROPOSED CONDITIONS																
AES INPUT DATA																
Node #			Elevation		Length		Area		imperviousness	Soil Type*	C value	If Channel			If memory
From	To	code	Up	Down		slope	total	impervious				Base (ft)	Z:1	maning	Bank #
50	51	2	495	468	100	27%	0.10	0.00	0%	D	0.35				
51	52	6	468	462.3	213	3%	1.12	0.74	66%	D	0.71				
52	55	3	458.3	451.35	450	2%								0.012	
50	55	1													3-1
53	54	2	466.7	465.2	75	2%	0.09	0.06	66%	D	0.71				
54	55	6	465.2	455.7	328	3%	0.68	0.45	66%	D	0.71				
55	55	1													3-2
56	57	2	462.8	461.3	75	2%	0.06	0.04	66%	D	0.71				
57	55	6	461.3	454.8	316	2%	0.83	0.55	66%	D	0.71				
55	55	1													3-3
55	63	3	451.35	448.64	288	0.9%								0.012	
63	63	1													3-1
59	60	2	457.2	455.8	75	2%	0.09	0.06	66%	D	0.71				
60	63	6	455.8	451.6	397	1%	0.43	0.28	66%	D	0.71				
63	63	1													3-2
61	62	2	455.8	454.3	75	2%	0.09	0.06	66%	D	0.71				
62	63	6	454.3	451.6	293	1%	0.71	0.47	66%	D	0.71				
63	63	1													3-3
63	69	3	448.64	447.53	111	1%								0.012	
69	69	10													1
64	65	2	466	464.5	75	2%	0.10	0.07	66%	D	0.71				
65	65.1	6	464.5	459	236	2%	0.28	0.18	66%	D	0.71				
65.1	68	3	451.9	450.2	321	0.5%									
65.1	68	8					0.74	0.49	66%	D	0.71				
64	68	1													2-1
66	67	2	466	464	75	3%	0.07	0.05	66%	D	0.71				
67	68	6	464	452.7	576	2%	0.58	0.38	66%	D	0.71				
68	68	1													2-2
68	69	3	449.96	447.53	243	1%								0.012	
69	69	11													1
69	69	12													1
69	74	3	447.53	445.96	78	2%								0.012	
74	74	1													3-1
70	71	2	453.8	452.3	75	2%	0.09	0.06	66%	D	0.71				
71	74	6	452.3	448.3	331	1%	0.80	0.53	66%	D	0.71				
74	74	1													3-2
72	73	2	453.8	452.3	75	2%	0.09	0.06	66%	D	0.71				
73	74	6	452.3	448.3	331	1%	0.87	0.57	66%	D	0.71				
74	74	1													3-3
74	8	3	743.48	743.33	30	0.5%								0.012	
8	8	10													1
1	2	`2	535	504	100	31%	0.10	0.00	0%	D	0.35				
2	3	5	504	455	1168	4%	1.90	1.25	66%	D	0.71				
3	5	3	451.00	443.87	477	1%									
1	5	1													2-1
4	6	2	457.5	456.00	75	2%	0.14	0.10	69%	D	0.73				
6	5	6	456	449.17	477	1%	0.77	0.53	69%	D	0.73				
4	5	1													2-2
5	8	3	443.87	442.87	200	1%								0.013	
8	8	8					0.14	0.13	90%	D	0.85				
8	8	11													1
8	8	12													1
8	11	3	442.79	442.06	146	1%								0.013	
11	11	1													2-1
9	10	2	457.5	456	75	2%	0.05	0.05	90%	D	0.85				
10	11	6	456	449.17	477	1%	0.22	0.20	90%	D	0.85				
11	11	8					0.47	0.21	45%	D	0.60				
11	11	1													2-2
11	15	3	442.04	441.50	94	1%								0.013	
15	15	1													2-1
12	13	2	540	525	100	15%	0.17	0.00	0%	D	0.35				
13	14	5	525	446.95	780	10%	0.70	0.00	0%	D	0.35	3		0.035	
14	15	3	446.95	439.45	760	1%								0.013	
15	15	1													2-2
15	16	3	439.45	434.8182	232	2%								0.013	
16	16	8					1.31	0.13	10%	A\D	0.27				
Total							13.79	7.69	56%		0.70				

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

            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 *************************
* OAK KNOLL                                                             *
* HYDROLOGY ANALYSIS                                                    *
* PROPOSED CONDITIONS - 100 YR                                          *
 ************************************************************************

  FILE NAME: R:\1713\HYD\DR\CALCS\AES\100\PR100.DAT
  TIME/DATE OF STUDY: 16:29 12/01/2022
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  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   12.0      7.0    0.020/0.020/0.020   0.33    1.50 0.0313 0.125 0.0130
  2   15.0      7.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

  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 =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    495.00
  DOWNSTREAM ELEVATION(FEET) =    468.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  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) =  6.377
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

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

```
 FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  468.00  DOWNSTREAM ELEVATION(FEET) =  462.30
 STREET LENGTH(FEET) =   213.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 15.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.49
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.23
   HALFSTREET FLOOD WIDTH(FEET) =    5.20
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.21
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
 STREET FLOW TRAVEL TIME(MIN.) =   1.11   Tc(MIN.) =    7.37
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.742
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.680
 SUBAREA AREA(ACRES) =    1.12      SUBAREA RUNOFF(CFS) =    4.57
 TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       4.77

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.36
 FLOW VELOCITY(FEET/SEC.) =  3.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =     313.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     52.00 TO NODE     55.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   458.30  DOWNSTREAM(FEET) =   451.35
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.09
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.77
 PIPE TRAVEL TIME(MIN.) =   1.06    Tc(MIN.) =    8.43
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     55.00 =     763.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.43
 RAINFALL INTENSITY(INCH/HR) =   5.27
 TOTAL STREAM AREA(ACRES) =     1.22
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.77

****************************************************************************
 FLOW PROCESS FROM NODE     53.00 TO NODE     54.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    466.70
  DOWNSTREAM ELEVATION(FEET) =    465.20
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  465.20  DOWNSTREAM ELEVATION(FEET) =  455.70
  STREET LENGTH(FEET) =   328.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.61
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.62
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   1.51   Tc(MIN.) =    6.34
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.331
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.68      SUBAREA RUNOFF(CFS) =    3.06
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       3.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.58
  FLOW VELOCITY(FEET/SEC.) =  4.05   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE     53.00 TO NODE     55.00 =     403.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.34
  RAINFALL INTENSITY(INCH/HR) =   6.33
  TOTAL STREAM AREA(ACRES) =     0.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.46

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     57.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    462.80
  DOWNSTREAM ELEVATION(FEET) =    461.30
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.31

******************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     58.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  461.30  DOWNSTREAM ELEVATION(FEET) =  454.80
  STREET LENGTH(FEET) =   316.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.45
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.22
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
  STREET FLOW TRAVEL TIME(MIN.) =   1.64   Tc(MIN.) =    6.46
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.252
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.83      SUBAREA RUNOFF(CFS) =    3.68
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.81
  FLOW VELOCITY(FEET/SEC.) =  3.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.18
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     58.00 =     391.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.46
  RAINFALL INTENSITY(INCH/HR) =   6.25
  TOTAL STREAM AREA(ACRES) =     0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.95

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

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.77     8.43        5.267          1.22
      2        3.46     6.34        6.331          0.77
      3        3.95     6.46        6.252          0.89

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.92     6.34       6.331
      2       11.02     6.46       6.252
      3       10.97     8.43       5.267

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.02   Tc(MIN.) =    6.46
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     55.00 =     763.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     63.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.35  DOWNSTREAM(FEET) =   448.64
  FLOW LENGTH(FEET) =   288.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.25
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.02
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    7.13
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     63.00 =    1051.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.13
  RAINFALL INTENSITY(INCH/HR) =   5.87
  TOTAL STREAM AREA(ACRES) =     2.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.02

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     60.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    457.20
  DOWNSTREAM ELEVATION(FEET) =    455.80
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.894
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    73.67
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.47
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     63.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  455.80  DOWNSTREAM ELEVATION(FEET) =  451.60
  STREET LENGTH(FEET) =   397.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.32
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.89
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.23
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
  STREET FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =    7.86
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.509
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.43      SUBAREA RUNOFF(CFS) =    1.68
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       2.03

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.47
  FLOW VELOCITY(FEET/SEC.) =  2.44   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     63.00 =     472.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.86
  RAINFALL INTENSITY(INCH/HR) =   5.51
  TOTAL STREAM AREA(ACRES) =     0.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.03

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    455.80
  DOWNSTREAM ELEVATION(FEET) =    454.30
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.47
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  454.30  DOWNSTREAM ELEVATION(FEET) =  451.60
  STREET LENGTH(FEET) =   293.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.29
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   2.13   Tc(MIN.) =    6.95
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.963
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.71      SUBAREA RUNOFF(CFS) =    3.01
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       3.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.87
  FLOW VELOCITY(FEET/SEC.) =  2.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE     61.00 TO NODE     63.00 =     368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   5.96
  TOTAL STREAM AREA(ACRES) =     0.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.02     7.13        5.871         2.88
      2        2.03     7.86        5.509         0.52
      3        3.39     6.95        5.963         0.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       16.04     6.95       5.963
      2       16.20     7.13       5.871
      3       15.51     7.86       5.509
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.20   Tc(MIN.) =    7.13
  TOTAL AREA(ACRES) =        4.2
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     63.00 =    1051.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   448.64  DOWNSTREAM(FEET) =   447.53
  FLOW LENGTH(FEET) =   111.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.92
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.20
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    7.36
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    1162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     65.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    466.00
  DOWNSTREAM ELEVATION(FEET) =    464.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.52

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.10 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  464.50  DOWNSTREAM ELEVATION(FEET) =  459.00
  STREET LENGTH(FEET) =   236.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.20
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
```

```
  STREET FLOW TRAVEL TIME(MIN.) =   1.31   Tc(MIN.) =    6.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.464
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    1.29
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.74

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.52
  FLOW VELOCITY(FEET/SEC.) =  3.21   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE     64.00 TO NODE     65.10 =     311.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.10 TO NODE     68.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.90  DOWNSTREAM(FEET) =    50.20
  FLOW LENGTH(FEET) =   321.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.03
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.74
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    6.35
  LONGEST FLOWPATH FROM NODE     64.00 TO NODE     68.00 =     632.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.10 TO NODE     68.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7100
  SUBAREA AREA(ACRES) =    0.74   SUBAREA RUNOFF(CFS) =    3.32
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       5.03
  TC(MIN.) =    6.35

****************************************************************************
  FLOW PROCESS FROM NODE     68.00 TO NODE     68.00 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.) =    6.35
  RAINFALL INTENSITY(INCH/HR) =   6.32
  TOTAL STREAM AREA(ACRES) =     1.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.03

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     67.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    466.00
  DOWNSTREAM ELEVATION(FEET) =    464.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.384
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) =      0.37
TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
FLOW PROCESS FROM NODE     67.00 TO NODE     68.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  464.00  DOWNSTREAM ELEVATION(FEET) =  452.70
STREET LENGTH(FEET) =   576.00   CURB HEIGHT(INCHES) =  4.0
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) =   0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.53
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.25
  HALFSTREET FLOOD WIDTH(FEET) =    6.34
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.95
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
STREET FLOW TRAVEL TIME(MIN.) =   3.25   Tc(MIN.) =    7.64
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.613
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
SUBAREA AREA(ACRES) =    0.58      SUBAREA RUNOFF(CFS) =    2.31
TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.59

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.20
FLOW VELOCITY(FEET/SEC.) =  3.28   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
LONGEST FLOWPATH FROM NODE     66.00 TO NODE     68.00 =     651.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     68.00 TO NODE     68.00 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.) =    7.64
RAINFALL INTENSITY(INCH/HR) =   5.61
TOTAL STREAM AREA(ACRES) =     0.65
PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.59

** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1        5.03     6.35        6.323          1.12
    2        2.59     7.64        5.613          0.65

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        7.18     6.35       6.323
     2        7.05     7.64       5.613

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.18   Tc(MIN.) =    6.35
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE     66.00 TO NODE     68.00 =     651.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     68.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   449.96  DOWNSTREAM(FEET) =   447.53
  FLOW LENGTH(FEET) =   243.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.18
  PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE     66.00 TO NODE     69.00 =     894.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 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        7.18     6.96       5.961        1.77
  LONGEST FLOWPATH FROM NODE     66.00 TO NODE     69.00 =     894.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       16.20     7.36       5.750        4.20
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    1162.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      22.50       6.96        5.961
     2      23.13       7.36        5.750

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.13   Tc(MIN.) =    7.36
  TOTAL AREA(ACRES) =        6.0

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     74.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   447.53  DOWNSTREAM(FEET) =   445.96
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.25
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.13
```

```
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.47
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     74.00 =    1240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.47
  RAINFALL INTENSITY(INCH/HR) =   5.69
  TOTAL STREAM AREA(ACRES) =     5.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.13

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    453.80
  DOWNSTREAM ELEVATION(FEET) =    452.30
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     74.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  452.30  DOWNSTREAM ELEVATION(FEET) =  448.30
  STREET LENGTH(FEET) =   331.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.13
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.95
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.25
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.55
  STREET FLOW TRAVEL TIME(MIN.) =   2.45   Tc(MIN.) =    7.28
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.791
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.80      SUBAREA RUNOFF(CFS) =    3.29
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.82
```

```
  FLOW VELOCITY(FEET/SEC.) =  2.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.71
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE     74.00 =     406.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.28
  RAINFALL INTENSITY(INCH/HR) =   5.79
  TOTAL STREAM AREA(ACRES) =     0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.66

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     73.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    453.80
  DOWNSTREAM ELEVATION(FEET) =    452.30
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE     73.00 TO NODE     74.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  452.30  DOWNSTREAM ELEVATION(FEET) =  448.30
  STREET LENGTH(FEET) =   331.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.70
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.80
  STREET FLOW TRAVEL TIME(MIN.) =   2.07   Tc(MIN.) =    6.89
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.996
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    3.70
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       4.09

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.10
```

```
 FLOW VELOCITY(FEET/SEC.) =  3.03   DEPTH*VELOCITY(FT*FT/SEC.) =   1.05
 LONGEST FLOWPATH FROM NODE     72.00 TO NODE     74.00 =     406.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.89
 RAINFALL INTENSITY(INCH/HR) =   6.00
 TOTAL STREAM AREA(ACRES) =     0.96
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.09

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       23.13     7.47        5.692          5.97
     2        3.66     7.28        5.791          0.89
     3        4.09     6.89        5.996          0.96

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       28.89     6.89       5.996
     2       30.13     7.28       5.791
     3       30.60     7.47       5.692

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      30.60   Tc(MIN.) =    7.47
 TOTAL AREA(ACRES) =        7.8
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     74.00 =    1240.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     74.00 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) =   743.48  DOWNSTREAM(FEET) =   743.33
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  21.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.34
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      30.60
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    7.54
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE      8.00 =    1270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    535.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    504.00
  ELEVATION DIFFERENCE(FEET) =     31.00
  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) =  6.377
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  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) =    504.00  DOWNSTREAM(FEET) =    455.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1168.00   CHANNEL SLOPE =  0.0420
  CHANNEL BASE(FEET) =   17.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.091
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.50
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  12.99
  Tc(MIN.) =   19.26
  SUBAREA AREA(ACRES) =     1.90       SUBAREA RUNOFF(CFS) =    4.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.692
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       4.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.72
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1268.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.00  DOWNSTREAM(FEET) =   443.87
  FLOW LENGTH(FEET) =   477.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.28
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =   20.50
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      5.00 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.) =   20.50
  RAINFALL INTENSITY(INCH/HR) =   2.97
  TOTAL STREAM AREA(ACRES) =     2.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.28

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 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) =    75.00
  UPSTREAM ELEVATION(FEET) =    457.50
  DOWNSTREAM ELEVATION(FEET) =    456.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.578
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
  STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.85
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.79   Tc(MIN.) =    7.36
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.747
  *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) =    0.77      SUBAREA RUNOFF(CFS) =    3.23
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.82

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.40
  FLOW VELOCITY(FEET/SEC.) =  3.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      5.00 =     552.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 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.) =    7.36
  RAINFALL INTENSITY(INCH/HR) =   5.75
  TOTAL STREAM AREA(ACRES) =     0.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.28    20.50        2.969          2.00
      2        3.82     7.36        5.747          0.91
```

```
  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        5.35     7.36       5.747
      2        6.25    20.50       2.969

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.25   Tc(MIN.) =   20.50
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =   443.87  DOWNSTREAM(FEET) =   442.87
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.25
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =   21.22
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1945.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.904
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7106
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.35
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       6.29
  TC(MIN.) =   21.22

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 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        6.29    21.22       2.904        3.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1945.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       30.60     7.54       5.659        7.82
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE      8.00 =    1270.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      32.84       7.54        5.659
      2      22.00      21.22        2.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      32.84   Tc(MIN.) =    7.54
```

```
  TOTAL AREA(ACRES) =       10.9

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   442.79  DOWNSTREAM(FEET) =   442.06
  FLOW LENGTH(FEET) =   146.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.95
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.84
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    7.89
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    2091.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =    7.89
  RAINFALL INTENSITY(INCH/HR) =   5.50
  TOTAL STREAM AREA(ACRES) =    10.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     32.84

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    457.50
  DOWNSTREAM ELEVATION(FEET) =    456.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.988
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
  STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
  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) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.20
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.33
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.54
  STREET FLOW TRAVEL TIME(MIN.) =   3.41   Tc(MIN.) =    6.40
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.294
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    1.18
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.70
  FLOW VELOCITY(FEET/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.66
  LONGEST FLOWPATH FROM NODE      9.00 TO NODE     11.00 =     552.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.294
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6912
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.77
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       3.22
  TC(MIN.) =    6.40

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =    6.40
  RAINFALL INTENSITY(INCH/HR) =   6.29
  TOTAL STREAM AREA(ACRES) =     0.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.22

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       32.84     7.89        5.496         10.87
      2        3.22     6.40        6.294          0.74

  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       29.83     6.40       6.294
      2       35.65     7.89       5.496
```

```
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      35.65   Tc(MIN.) =    7.89
 TOTAL AREA(ACRES) =       11.6
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    2091.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 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) =   442.04  DOWNSTREAM(FEET) =   441.50
 FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.46
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      35.65
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    8.10
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    2185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =    8.10
 RAINFALL INTENSITY(INCH/HR) =   5.40
 TOTAL STREAM AREA(ACRES) =    11.61
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.65

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 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) =    540.00
 DOWNSTREAM ELEVATION(FEET) =    525.00
 ELEVATION DIFFERENCE(FEET) =     15.00
 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) =  6.377
 SUBAREA RUNOFF(CFS) =      0.38
 TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    525.00  DOWNSTREAM(FEET) =    446.95
 CHANNEL LENGTH THRU SUBAREA(FEET) =   780.00   CHANNEL SLOPE =  0.1001
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.467
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.94
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.82
 AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   4.62
 Tc(MIN.) =   10.88
 SUBAREA AREA(ACRES) =     0.70       SUBAREA RUNOFF(CFS) =    1.09
```

```
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       1.36

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   3.30
 LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     880.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 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) =   446.95  DOWNSTREAM(FEET) =   439.45
 FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.36
 PIPE TRAVEL TIME(MIN.) =   3.16    Tc(MIN.) =   14.04
 LONGEST FLOWPATH FROM NODE     12.00 TO NODE     15.00 =    1640.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =   14.04
 RAINFALL INTENSITY(INCH/HR) =   3.79
 TOTAL STREAM AREA(ACRES) =     0.87
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.36

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       35.65     8.10        5.403         11.61
     2        1.36    14.04        3.790          0.87

 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       36.44     8.10       5.403
     2       26.37    14.04       3.790

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.44   Tc(MIN.) =    8.10
 TOTAL AREA(ACRES) =       12.5
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    2185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   439.45  DOWNSTREAM(FEET) =   434.82
 FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.05
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.44
 PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    8.42
```

```
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     16.00 =    2417.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.270
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .2700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6420
 SUBAREA AREA(ACRES) =    1.31   SUBAREA RUNOFF(CFS) =    1.86
 TOTAL AREA(ACRES) =       13.8   TOTAL RUNOFF(CFS) =      46.65
 TC(MIN.) =    8.42
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       13.8  TC(MIN.) =      8.42
 PEAK FLOW RATE(CFS)   =      46.65
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

PROPOSED-MITIGATED HYDROLOGIC ANALYSIS 100 – Year Design Storm

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

            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 *************************
* OAK KNOLL                                                             *
* HYDROLOGY ANALYSIS                                                    *
* MITIGATED 100-YEAR                                                    *
 ************************************************************************

  FILE NAME: R:\1713\HYD\DR\CALCS\AES\MIT\PR100.DAT
  TIME/DATE OF STUDY: 16:47 12/01/2022
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  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   12.0      7.0    0.020/0.020/0.020   0.33    1.50 0.0313 0.125 0.0130
  2   15.0      7.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

  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 =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =   7
------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
========================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  16.00   RAIN INTENSITY(INCH/HOUR) =  3.48
  TOTAL AREA(ACRES) =     7.82   TOTAL RUNOFF(CFS) =      6.01

**************************************************************************
  FLOW PROCESS FROM NODE     74.00 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) =   743.48  DOWNSTREAM(FEET) =   743.33
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.89
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.01
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   16.10
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE      8.00 =      30.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    535.00
  DOWNSTREAM ELEVATION(FEET) =    504.00
  ELEVATION DIFFERENCE(FEET) =     31.00
  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) =  6.377
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  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) =    504.00  DOWNSTREAM(FEET) =    455.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1168.00   CHANNEL SLOPE =  0.0420
  CHANNEL BASE(FEET) =   17.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.091
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.50
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  12.99
  Tc(MIN.) =   19.26
  SUBAREA AREA(ACRES) =     1.90       SUBAREA RUNOFF(CFS) =    4.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.692
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       4.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.72
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1268.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.00  DOWNSTREAM(FEET) =   443.87
  FLOW LENGTH(FEET) =   477.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.28
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =   20.50
```

```
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1745.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      5.00 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.) =   20.50
 RAINFALL INTENSITY(INCH/HR) =   2.97
 TOTAL STREAM AREA(ACRES) =     2.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.28

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 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) =    75.00
 UPSTREAM ELEVATION(FEET) =    457.50
 DOWNSTREAM ELEVATION(FEET) =    456.00
 ELEVATION DIFFERENCE(FEET) =      1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.578
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.75
 TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
 STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 15.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
 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) =   0.0130
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.30
   HALFSTREET FLOOD WIDTH(FEET) =    8.47
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.85
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
 STREET FLOW TRAVEL TIME(MIN.) =   2.79   Tc(MIN.) =    7.36
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.747
 *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) =    0.77      SUBAREA RUNOFF(CFS) =    3.23
 TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.82

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.40
 FLOW VELOCITY(FEET/SEC.) =  3.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
```

```
 LONGEST FLOWPATH FROM NODE      4.00 TO NODE      5.00 =     552.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 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.) =    7.36
 RAINFALL INTENSITY(INCH/HR) =   5.75
 TOTAL STREAM AREA(ACRES) =     0.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.82

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        4.28    20.50        2.969          2.00
     2        3.82     7.36        5.747          0.91

 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        5.35     7.36       5.747
     2        6.25    20.50       2.969

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       6.25   Tc(MIN.) =   20.50
 TOTAL AREA(ACRES) =        2.9
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1745.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 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) =   443.87  DOWNSTREAM(FEET) =   442.87
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.25
 PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =   21.22
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1945.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.904
 *USER SPECIFIED(SUBAREA):
 STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7106
 SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.35
 TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       6.29
 TC(MIN.) =   21.22

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 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        6.29    21.22       2.904        3.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1945.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.01    16.10       3.470        7.82
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE      8.00 =      30.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      10.79      16.10        3.470
      2      11.32      21.22        2.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.32   Tc(MIN.) =   21.22
  TOTAL AREA(ACRES) =       10.9

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   442.79  DOWNSTREAM(FEET) =   442.06
  FLOW LENGTH(FEET) =   146.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.41
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.32
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   21.67
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    2091.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =   21.67
  RAINFALL INTENSITY(INCH/HR) =   2.86
  TOTAL STREAM AREA(ACRES) =    10.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.32

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    457.50
  DOWNSTREAM ELEVATION(FEET) =    456.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.988
```

```
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.31
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  456.00  DOWNSTREAM ELEVATION(FEET) =  449.17
 STREET LENGTH(FEET) =   477.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 15.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.50
 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) =   0.0130
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.91
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.23
   HALFSTREET FLOOD WIDTH(FEET) =    5.20
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.33
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.54
 STREET FLOW TRAVEL TIME(MIN.) =   3.41   Tc(MIN.) =    6.40
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.294
 *USER SPECIFIED(SUBAREA):
 STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    1.18
 TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.44

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.70
 FLOW VELOCITY(FEET/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.66
 LONGEST FLOWPATH FROM NODE      9.00 TO NODE     11.00 =     552.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.294
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6912
 SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.77
 TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       3.22
 TC(MIN.) =    6.40

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =    6.40
 RAINFALL INTENSITY(INCH/HR) =   6.29
 TOTAL STREAM AREA(ACRES) =     0.74
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.22

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       11.32    21.67        2.865         10.87
     2        3.22     6.40        6.294          0.74

 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        6.56     6.40       6.294
     2       12.79    21.67       2.865

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      12.79   Tc(MIN.) =   21.67
 TOTAL AREA(ACRES) =       11.6
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    2091.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 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) =   442.04  DOWNSTREAM(FEET) =   441.50
 FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.86
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.79
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   21.94
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    2185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =   21.94
 RAINFALL INTENSITY(INCH/HR) =   2.84
 TOTAL STREAM AREA(ACRES) =    11.61
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.79

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 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) =    540.00
 DOWNSTREAM ELEVATION(FEET) =    525.00
 ELEVATION DIFFERENCE(FEET) =     15.00
 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) =  6.377
 SUBAREA RUNOFF(CFS) =      0.38
```

```
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    525.00  DOWNSTREAM(FEET) =    446.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   780.00   CHANNEL SLOPE =  0.1001
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.467
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.82
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   4.62
  Tc(MIN.) =   10.88
  SUBAREA AREA(ACRES) =     0.70       SUBAREA RUNOFF(CFS) =    1.09
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       1.36

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   3.30
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     880.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =   446.95  DOWNSTREAM(FEET) =   439.45
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.36
  PIPE TRAVEL TIME(MIN.) =   3.16    Tc(MIN.) =   14.04
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     15.00 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =   14.04
  RAINFALL INTENSITY(INCH/HR) =   3.79
  TOTAL STREAM AREA(ACRES) =     0.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.79    21.94        2.842         11.61
      2        1.36    14.04        3.790          0.87

  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       10.95    14.04       3.790
     2       13.81    21.94       2.842

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.81   Tc(MIN.) =   21.94
  TOTAL AREA(ACRES) =       12.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    2185.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   439.45  DOWNSTREAM(FEET) =   434.82
  FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.81
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =   22.35
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     16.00 =    2417.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.808
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .2700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3671
  SUBAREA AREA(ACRES) =    1.31   SUBAREA RUNOFF(CFS) =    0.99
  TOTAL AREA(ACRES) =       13.8   TOTAL RUNOFF(CFS) =      14.21
  TC(MIN.) =   22.35
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.8  TC(MIN.) =     22.35
  PEAK FLOW RATE(CFS)   =      14.21
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4
Detention Analysis

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 12/1/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 7.82 ACRES
RUNOFF COEFFICIENT 0.71
PEAK DISCHARGE 30.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 8	DISCHARGE (CFS) = 0.9
TIME (MIN) = 16	DISCHARGE (CFS) = 0.9
TIME (MIN) = 24	DISCHARGE (CFS) = 1
TIME (MIN) = 32	DISCHARGE (CFS) = 1
TIME (MIN) = 40	DISCHARGE (CFS) = 1
TIME (MIN) = 48	DISCHARGE (CFS) = 1
TIME (MIN) = 56	DISCHARGE (CFS) = 1.1
TIME (MIN) = 64	DISCHARGE (CFS) = 1.1
TIME (MIN) = 72	DISCHARGE (CFS) = 1.1
TIME (MIN) = 80	DISCHARGE (CFS) = 1.2
TIME (MIN) = 88	DISCHARGE (CFS) = 1.2
TIME (MIN) = 96	DISCHARGE (CFS) = 1.2
TIME (MIN) = 104	DISCHARGE (CFS) = 1.3
TIME (MIN) = 112	DISCHARGE (CFS) = 1.3
TIME (MIN) = 120	DISCHARGE (CFS) = 1.4
TIME (MIN) = 128	DISCHARGE (CFS) = 1.4
TIME (MIN) = 136	DISCHARGE (CFS) = 1.5
TIME (MIN) = 144	DISCHARGE (CFS) = 1.6
TIME (MIN) = 152	DISCHARGE (CFS) = 1.7
TIME (MIN) = 160	DISCHARGE (CFS) = 1.8
TIME (MIN) = 168	DISCHARGE (CFS) = 1.9
TIME (MIN) = 176	DISCHARGE (CFS) = 2
TIME (MIN) = 184	DISCHARGE (CFS) = 2.2
TIME (MIN) = 192	DISCHARGE (CFS) = 2.4
TIME (MIN) = 200	DISCHARGE (CFS) = 2.7
TIME (MIN) = 208	DISCHARGE (CFS) = 2.9
TIME (MIN) = 216	DISCHARGE (CFS) = 3.6
TIME (MIN) = 224	DISCHARGE (CFS) = 4.1
TIME (MIN) = 232	DISCHARGE (CFS) = 6
TIME (MIN) = 240	DISCHARGE (CFS) = 8.1
TIME (MIN) = 248	DISCHARGE (CFS) = 30.6
TIME (MIN) = 256	DISCHARGE (CFS) = 4.8
TIME (MIN) = 264	DISCHARGE (CFS) = 3.2
TIME (MIN) = 272	DISCHARGE (CFS) = 2.5
TIME (MIN) = 280	DISCHARGE (CFS) = 2.1
TIME (MIN) = 288	DISCHARGE (CFS) = 1.8
TIME (MIN) = 296	DISCHARGE (CFS) = 1.6
TIME (MIN) = 304	DISCHARGE (CFS) = 1.5
TIME (MIN) = 312	DISCHARGE (CFS) = 1.4
TIME (MIN) = 320	DISCHARGE (CFS) = 1.3
TIME (MIN) = 328	DISCHARGE (CFS) = 1.2
TIME (MIN) = 336	DISCHARGE (CFS) = 1.1
TIME (MIN) = 344	DISCHARGE (CFS) = 1.1
TIME (MIN) = 352	DISCHARGE (CFS) = 1
TIME (MIN) = 360	DISCHARGE (CFS) = 1
TIME (MIN) = 368	DISCHARGE (CFS) = 0

Vault 1

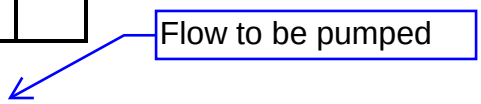
Vault #1 Stage Storage

depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.0	7440.0	0.1708	0.0	0	0.00
0.1	7440	0.1708	0.1	744	0.02
0.2	7440	0.1708	0.2	1,488	0.03
0.3	7440	0.1708	0.3	2,232	0.05
0.4	7440	0.1708	0.4	2,976	0.07
0.5	7440.0	0.1708	0.5	3,720	0.09
0.6	7440.0	0.1708	0.6	4,464	0.10
0.7	7440.0	0.1708	0.7	5,208	0.12
0.8	7440.0	0.1708	0.8	5,952	0.14
0.9	7440.0	0.1708	0.9	6,696	0.15
1.0	7440.0	0.1708	1.0	7,440	0.17
1.1	7440.0	0.1708	1.1	8,184	0.19
1.2	7440.0	0.1708	1.2	8,928	0.20
1.3	7440.0	0.1708	1.3	9,672	0.22
1.4	7440.0	0.1708	1.4	10,416	0.24
1.5	7440.0	0.1708	1.5	11,160	0.26
1.6	7440.0	0.1708	1.6	11,904	0.27
1.7	7440.0	0.1708	1.7	12,648	0.29
1.8	7440.0	0.1708	1.8	13,392	0.31
1.9	7440.0	0.1708	1.9	14,136	0.32
2.0	7440.0	0.1708	2.0	14,880	0.34
2.1	7440.0	0.1708	2.1	15,624	0.36
2.2	7440.0	0.1708	2.2	16,368	0.38
2.3	7440.0	0.1708	2.3	17,112	0.39
2.4	7440.0	0.1708	2.4	17,856	0.41
2.5	7440.0	0.1708	2.5	18,600	0.43
2.6	7440.0	0.1708	2.6	19,344	0.44
2.7	7440.0	0.1708	2.7	20,088	0.46
2.8	7440.0	0.1708	2.8	20,832	0.48
2.9	7440.0	0.1708	2.9	21,576	0.50
3.0	7440.0	0.1708	3.0	22,320	0.51
3.1	7440.0	0.1708	3.1	23,064	0.53
3.2	7440.0	0.1708	3.2	23,808	0.55
3.3	7440.0	0.1708	3.3	24,552	0.56
3.4	7440.0	0.1708	3.4	25,296	0.58
3.5	7440.0	0.1708	3.5	26,040	0.60
3.6	7440.0	0.1708	3.6	26,784	0.61
3.7	7440.0	0.1708	3.7	27,528	0.63
3.8	7440.0	0.1708	3.8	28,272	0.65
3.9	7440.0	0.1708	3.9	29,016	0.67
4.0	7440.0	0.1708	4.0	29,760	0.68
4.1	7440.0	0.1708	4.1	30,504	0.70
4.2	7440.0	0.1708	4.2	31,248	0.72
4.3	7440.0	0.1708	4.3	31,992	0.73
4.4	7440.0	0.1708	4.4	32,736	0.75
4.5	7440.0	0.1708	4.5	33,480	0.77
4.6	7440.0	0.1708	4.6	34,224	0.79
4.7	7440.0	0.1708	4.7	34,968	0.80
4.8	7440.0	0.1708	4.8	35,712	0.82
4.9	7440.0	0.1708	4.9	36,456	0.84
5.0	7440.0	0.1708	5.0	37,200	0.85
5.1	7440.0	0.1708	5.1	37,944	0.87
5.2	7440.0	0.1708	5.2	38,688	0.89
5.3	7440.0	0.1708	5.3	39,432	0.91
5.4	7440.0	0.1708	5.4	40,176	0.92
5.5	7440.0	0.1708	5.5	40,920	0.94
5.6	7440.0	0.1708	5.6	41,664	0.96
5.67	7440.0	0.1708	5.67	42,185	0.97
5.8	7440.0	0.1708	5.8	43,152	0.99
5.9	7440.0	0.1708	5.9	43,896	1.01
6.0	7440.0	0.1708	6.0	44,640	1.02

Vault #1 Discharge HMP Riser

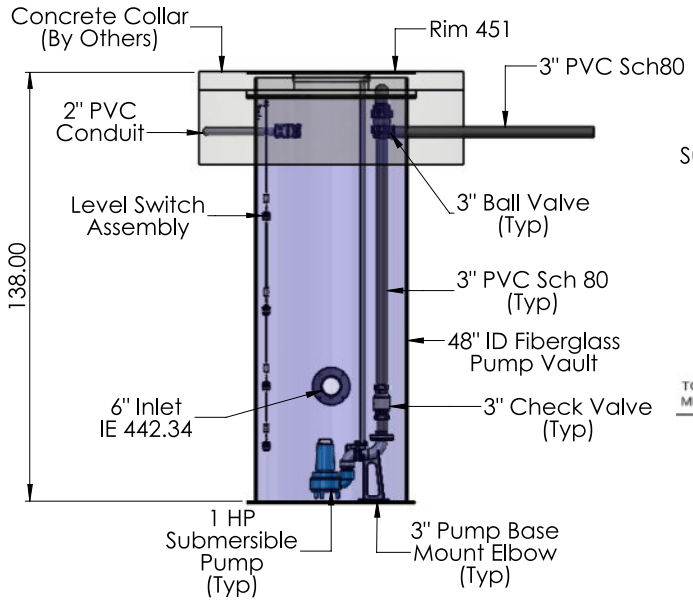
Discharge vs Elevation Table

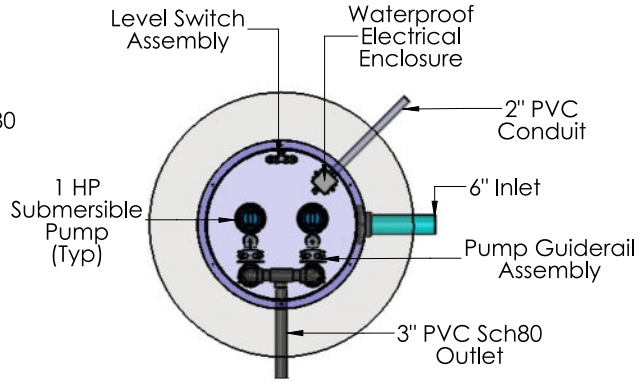
Low orifice:	1.75 "		Top orifice:	6 "	
Number:	1		Number:	2	
Cg-low:	0.61		Cg-low:	0.61	
invert elev:	0.00 ft		invert elev:	2.80 ft	
Middle orifice:	6 "		Emergency inlet:		
number of orif:	2		Rim height:	5.00 ft	
Cg-middle:	0.61		Riser Box D	3X2	
invert elev:	2.05 ft		Weir Length	10.00 ft	

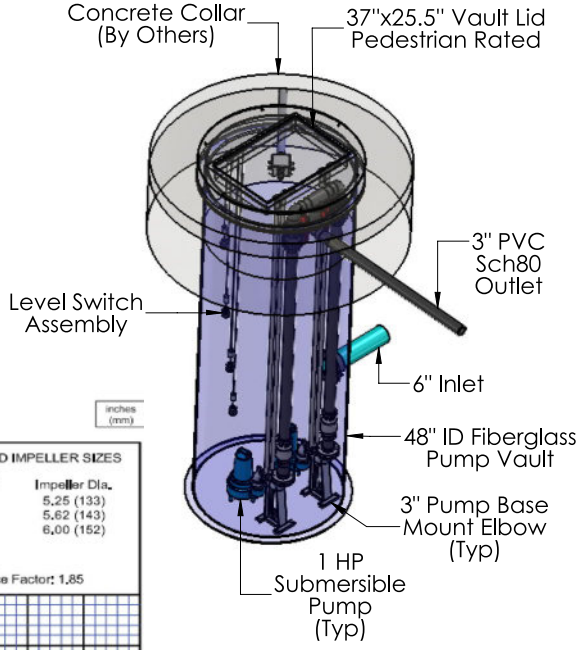


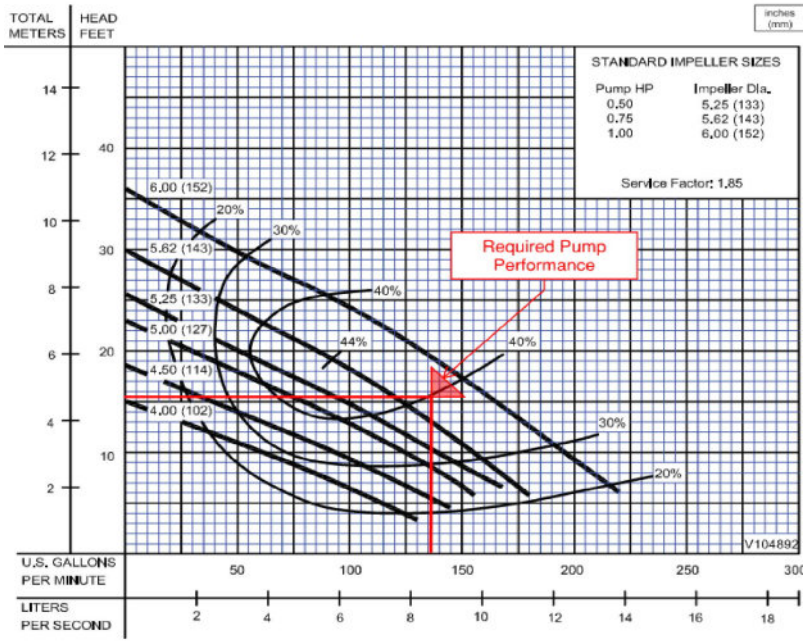
h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.1	0.69	0.00	0.00	0.013	0.011	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0111
0.2	1.37	0.00	0.00	0.029	0.034	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0291
0.3	2.06	0.00	0.00	0.039	0.052	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0390
0.4	2.74	0.00	0.00	0.047	0.057	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0468
0.5	3.43	0.00	0.00	0.053	0.062	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0534
0.6	4.11	0.00	0.00	0.059	0.110	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0594
0.7	4.80	0.00	0.00	0.065	0.290	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0647
0.8	5.49	0.00	0.00	0.070	0.746	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0697
0.9	6.17	0.00	0.00	0.074	1.688	0.074	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0744
1.0	6.86	0.00	0.00	0.079	3.408	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0787
1.1	7.54	0.00	0.00	0.083	6.288	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0829
1.2	8.23	0.00	0.00	0.087	10.812	0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0868
1.3	8.91	0.00	0.00	0.091	17.580	0.091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0906
1.4	9.60	0.00	0.00	0.094	27.318	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0942
1.5	10.29	0.00	0.00	0.098	40.891	0.098	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0977
1.6	10.97	0.00	0.00	0.101	59.316	0.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1010
1.7	11.66	0.00	0.00	0.104	83.768	0.104	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1043
1.8	12.34	0.00	0.00	0.107	115.600	0.107	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1075
1.9	13.03	0.00	0.00	0.111	156.348	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1105
2.0	13.71	0.00	0.00	0.114	207.749	0.114	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1135
2.1	14.40	0.10	0.00	0.116	271.745	0.116	0.000	0.012	0.012	0.000	0.000	0.000	0.000	0.1285
2.2	15.09	0.30	0.00	0.119	350.503	0.119	0.000	0.103	0.103	0.000	0.000	0.000	0.000	0.2221
2.3	15.77	0.50	0.00	0.122	446.422	0.122	0.000	0.271	0.271	0.000	0.000	0.000	0.000	0.3930
2.4	16.46	0.70	0.00	0.125	562.146	0.125	0.608	0.500	0.500	0.000	0.000	0.000	0.000	0.6250
2.5	17.14	0.90	0.00	0.127	700.574	0.127	0.860	0.772	0.772	0.000	0.000	0.000	0.000	0.8997
2.6	17.83	1.10	0.00	0.130	864.878	0.130	1.053	1.068	1.053	0.000	0.000	0.000	0.000	1.1829
2.7	18.51	1.30	0.00	0.133	1058.505	0.133	1.216	1.367	1.216	0.000	0.000	0.000	0.000	1.3483
2.8	19.20	1.50	0.00	0.135	1285.200	0.135	1.359	1.653	1.359	0.000	0.000	0.000	0.000	1.4943
2.9	19.89	1.70	0.20	0.137	1549.007	0.137	1.489	1.909	1.489	0.000	0.047	0.047	0.000	1.6735
3.0	20.57	1.90	0.40	0.140	1854.288	0.140	1.608	2.123	1.608	0.000	0.178	0.178	0.000	1.9265
3.1	21.26	2.10	0.60	0.142	2205.735	0.142	1.719	2.286	1.719	0.430	0.379	0.379	0.000	2.2408
3.2	21.94	2.30	0.80	0.145	2608.377	0.145	1.824	2.396	1.824	0.745	0.632	0.632	0.000	2.6004
3.3	22.63	2.50	1.00	0.147	3067.593	0.147	1.922	2.458	1.922	0.961	0.918	0.918	0.000	2.9876
3.4	23.31	2.70	1.20	0.149	3589.130	0.149	2.016	2.482	2.016	1.137	1.218	1.137	0.000	3.3026
3.5	24.00	2.90	1.40	0.151	4179.106	0.151	2.106	2.489	2.106	1.290	1.513	1.290	0.000	3.5468
3.6	24.69	3.10	1.60	0.154	4844.028	0.154	2.192	2.510	2.192	1.426	1.786	1.426	0.000	3.7710
3.7	25.37	3.30	1.80	0.156	5590.801	0.156	2.275	2.586	2.275	1.550	2.022	1.550	0.000	3.9801
3.8	26.06	3.50	2.00	0.158	6426.741	0.158	2.354	2.770	2.354	1.665	2.211	1.665	0.000	4.1770
3.9	26.74	3.70	2.20	0.160	7359.586	0.160	2.432	3.128	2.432	1.772	2.348	1.772	0.000	4.3639
4.0	27.43	3.90	2.40	0.162	8397.508	0.162	2.506	3.742	2.506	1.874	2.433	1.874	0.000	4.5422
4.1	28.11	4.10	2.60	0.164	9549.127	0.164	2.579	4.707	2.579	1.970	2.473	1.970	0.000	4.7130
4.2	28.80	4.30	2.80	0.166	10823.518	0.166	2.650	6.136	2.650	2.061	2.486	2.061	0.000	4.8774
4.3	29.49	4.50	3.00	0.168	12230.228	0.168	2.719	8.158	2.719	2.149	2.496	2.149	0.000	5.0360
4.4	30.17	4.70	3.20	0.170	13779.284	0.170	2.786	10.921	2.786	2.234	2.538	2.234	0.000	5.1894
4.5	30.86	4.90	3.40	0.172	15481.209	0.172	2.851	14.595	2.851	2.315	2.661	2.315	0.000	5.3382
4.6	31.54	5.10	3.60	0.174	17347.028	0.174	2.915	19.366	2.915	2.393	2.923	2.393	0.000	5.4827
4.7	32.23	5.30	3.80	0.176	19388.286	0.176	2.978	25.447	2.978	2.469	3.398	2.469	0.000	5.6233
4.8	32.91	5.50	4.00	0.178	21617.054	0.178	3.040	33.070	3.040	2.543	4.174	2.543	0.000	5.7603
4.9	33.60	5.70	4.20	0.180	24045.946	0.180	3.100	42.492	3.100	2.615	5.356	2.615	0.000	5.8940
5.0	34.29	5.90	4.40	0.181	26688.127	0.181	3.159	53.998	3.159	2.684	7.064	2.684	0.000	6.0247
5.1	34.97	6.10	4.60	0.183	29557.329	0.183	3.217	67.894	3.217	2.752	9.437	2.752	1.053	7.2055
5.2	35.66	6.30	4.80	0.185	32667.857	0.185	3.274	84.517	3.274	2.819	12.633	2.819	2.978	9.2560
5.3	36.34	6.50	5.00	0.187	36034.605	0.187	3.330	104.231	3.330	2.884	16.830	2.884	5.472	11.8718
5.4	37.03	6.70	5.20	0.189	39673.069	0.189	3.385	127.430	3.385	2.947	22.229	2.947	8.424	14.9446
5.5	37.71	6.90	5.40	0.190	43599.355	0.190	3.439	154.538	3.439	3.009	29.050	3.009	11.773	18.4116
5.6	38.40	7.10	5.60	0.192	47830.191	0.192	3.492	186.011	3.492	3.070	37.539	3.070	15.476	22.2305
5.70	39.09	7.30	5.80	0.194	52382.944	0.194	3.545	222.338	3.545	3.129	47.966	3.129	19.503	26.3705
5.8	39.77	7.50	6.00	0.196	57275.625	0.196	3.596	264.040	3.596	3.188	60.626	3.188	23.828	30.8075
5.9	40.46	7.70	6.20	0.197	62526.905	0.197	3.647	311.676	3.647	3.245	75.842	3.245	28.432	35.5221
6.0	41.14	7.90	6.40	0.199	68156.127	0.199	3.698	365.837	3.698	3.302	93.963	3.302	33.300	40.4985

HMP Drawdown @				87.24
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.10	0.01108	744	18.66	87.24
0.20	0.02011	744	10.28	68.59
0.30	0.03406	744	6.07	58.31
0.40	0.04286	744	4.82	52.24
0.50	0.05010	744	4.13	47.42
0.60	0.05640	744	3.66	43.30
0.70	0.06206	744	3.33	39.63
0.80	0.06724	744	3.07	36.30
0.90	0.07204	744	2.87	33.23
1.00	0.07655	744	2.70	30.36
1.10	0.08080	744	2.56	27.66
1.20	0.08484	744	2.44	25.10
1.30	0.08869	744	2.33	22.67
1.40	0.09239	744	2.24	20.34
1.50	0.09594	744	2.15	18.10
1.60	0.09936	744	2.08	15.95
1.70	0.10267	744	2.01	13.87
1.80	0.10588	744	1.95	11.85
1.90	0.10899	744	1.90	9.90
2.00	0.11202	744	1.84	8.00
2.10	0.12103	744	1.71	6.16
2.20	0.17534	744	1.18	4.45
2.30	0.30758	744	0.67	3.27
2.40	0.50900	744	0.41	2.60
2.50	0.76233	744	0.27	2.20
2.60	1.04128	744	0.20	1.92
2.70	1.26561	744	0.16	1.73
2.80	1.42133	744	0.15	1.56
2.90	1.58390	744	0.13	1.42
3.00	1.79997	744	0.11	1.29
3.10	2.08362	744	0.10	1.17
3.20	2.42058	744	0.09	1.07
3.30	2.79398	744	0.07	0.99
3.40	3.14508	744	0.07	0.91
3.50	3.42468	744	0.06	0.85
3.60	3.65889	744	0.06	0.79
3.70	3.87558	744	0.05	0.73
3.80	4.07859	744	0.05	0.68
3.90	4.27047	744	0.05	0.63
4.00	4.45302	744	0.05	0.58
4.10	4.62758	744	0.04	0.53
4.20	4.79520	744	0.04	0.49
4.30	4.95668	744	0.04	0.44
4.40	5.11269	744	0.04	0.40
4.50	5.26379	744	0.04	0.36
4.60	5.41042	744	0.04	0.32
4.70	5.55298	744	0.04	0.28
4.80	5.69180	744	0.04	0.25
4.90	5.82717	744	0.04	0.21
5.00	5.95934	744	0.03	0.18
5.10	6.61506	744	0.03	0.14
5.20	8.23071	744	0.03	0.11
5.30	10.56389	744	0.02	0.08
5.40	13.40821	744	0.02	0.06
5.50	16.67808	744	0.01	0.05
5.60	20.32106	744	0.01	0.04
5.70	24.30053	521	0.01	0.03
5.80	28.58899	967	0.01	0.02
5.90	33.16480	744	0.01	0.01
6.00	38.01033	744	0.01	0.01









NOTES:
1. All materials shown on this sheet shall be supplied by Santa Fe WinWater Company, Santa Fe Springs, CA, except where noted. Pumps shall be SFWW SWP-10, 200 - 240v, 1 phase, 8.8A max. Substitution of any component may void warranty.
2. Locate Pump Controller as required for site conditions or Owner direction. Route power and signal cable conduit to vault from controller accordingly. Connections shall be provided by Contractor.
3. Route 3" pump system outlet pipe as shown on Civil Sheets.
4. Contractor to provide concrete collar around manhole cover suitable for surface loading conditions.
5. Anti-Floatation flange to be provided on pump vault where required for groundwater conditions.
6. Pump performance requirements based on Civil Engineer's design calculations = 137 gpm.

Headloss Calculations		
Fitting	Qty / Length	Headloss
Pipe (2")	21	1.19'
Check Valve	1	1.72'
90 Elbow	2	0.96'
Tee	1	1.24'
45 Elbow	2	0.41'
Exit	1	0.69'
Elevation Head		9.17'
Total Headloss @ 137 gpm		15.37'

SANTA FE Winwater COMPANY
10244 Freeman Ave, Santa Fe Springs, CA 90670
562-777-9724 / www.santafewinwater.com

	NAME	DATE
DRAWN	SRG	7/01/22
CHECKED	MDF	7/01/22
ENG APPR.	CKL	7/01/22

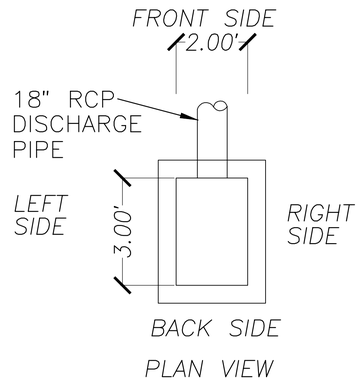
REV

TITLE: Harmon Oaks - Poway, CA Stormwater Treatment Discharge Pump

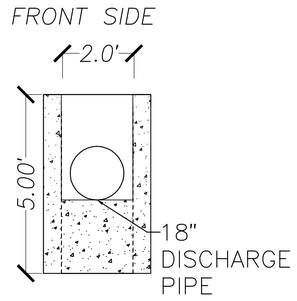
SIZE B | SHEET 1 OF 1

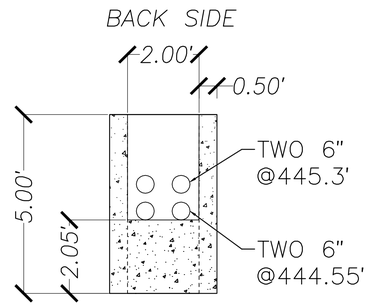
DETENTION VAULT 1
LOW ORIFICE DETAIL (B)

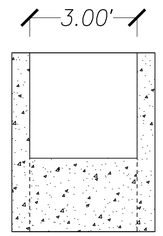
SCALE 1"=0.5'



PLAN VIEW

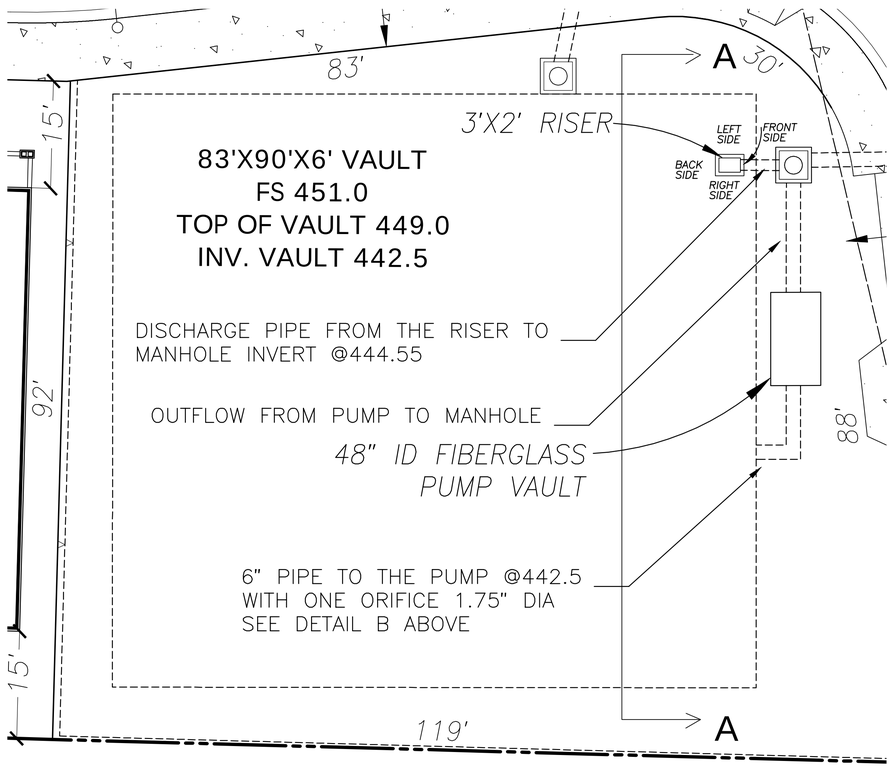






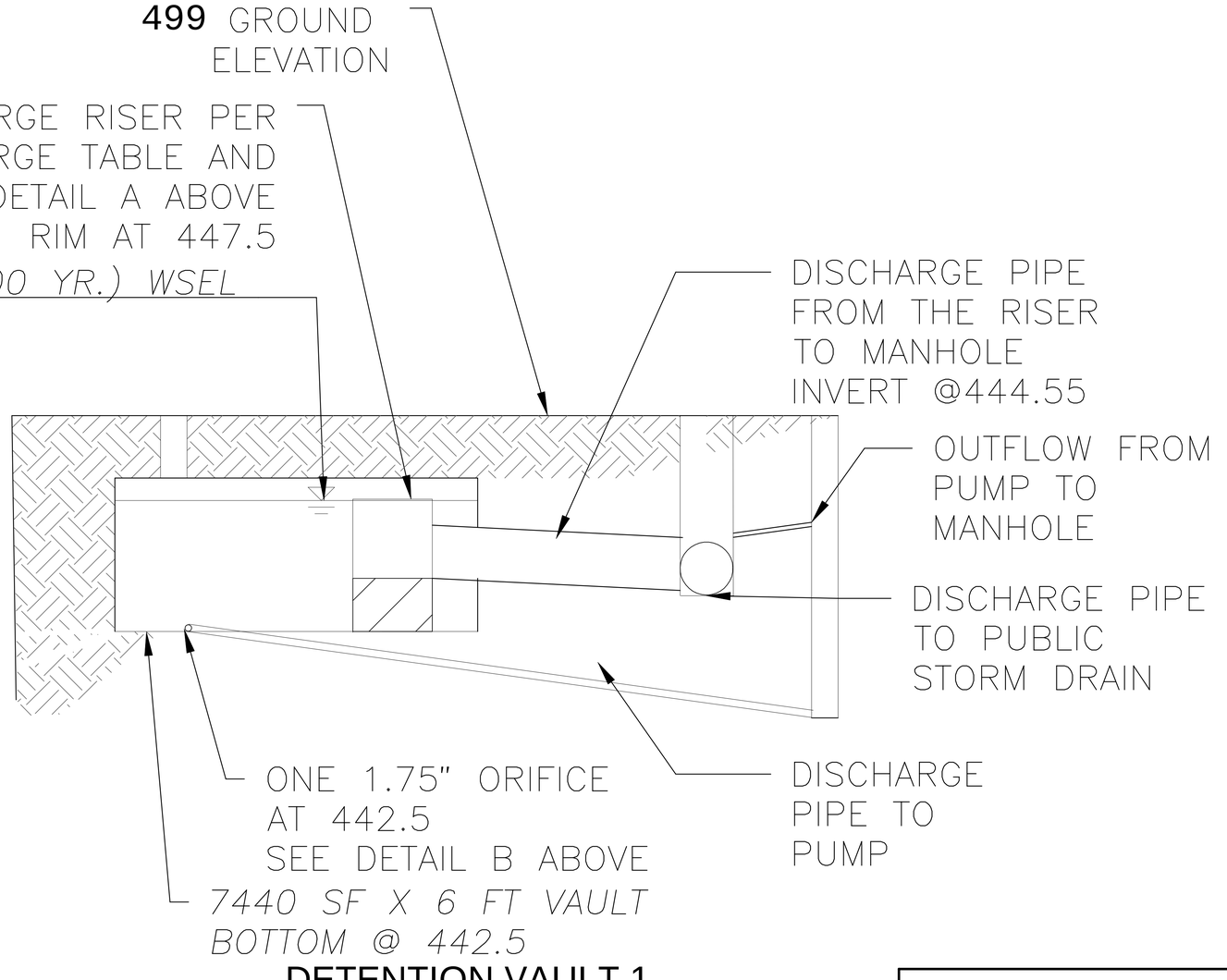
DETENTION VAULT 1
RISER DETAIL (A)

2 0 2 4 6
SCALE 1"= 2'



DETENTION VAULT 1
PLAN VIEW

0 10 20 30
SCALE 1" =10'



DETENTION VAULT 1
DETAIL A-A

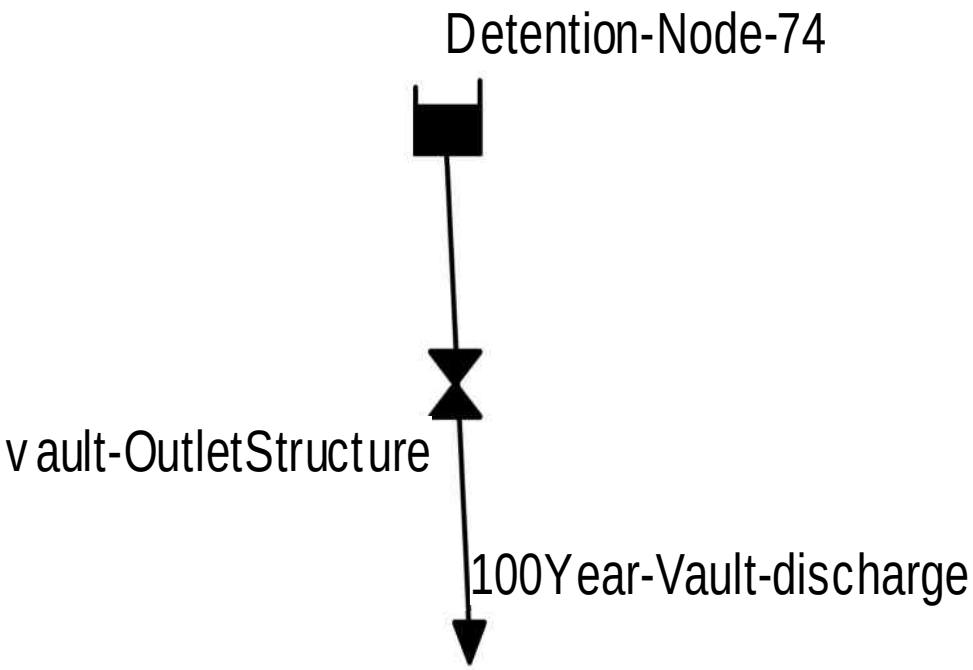
NOT TO SCALE

VAULT OUTLET STRUCTURE DETAILS
HARMON OAKS

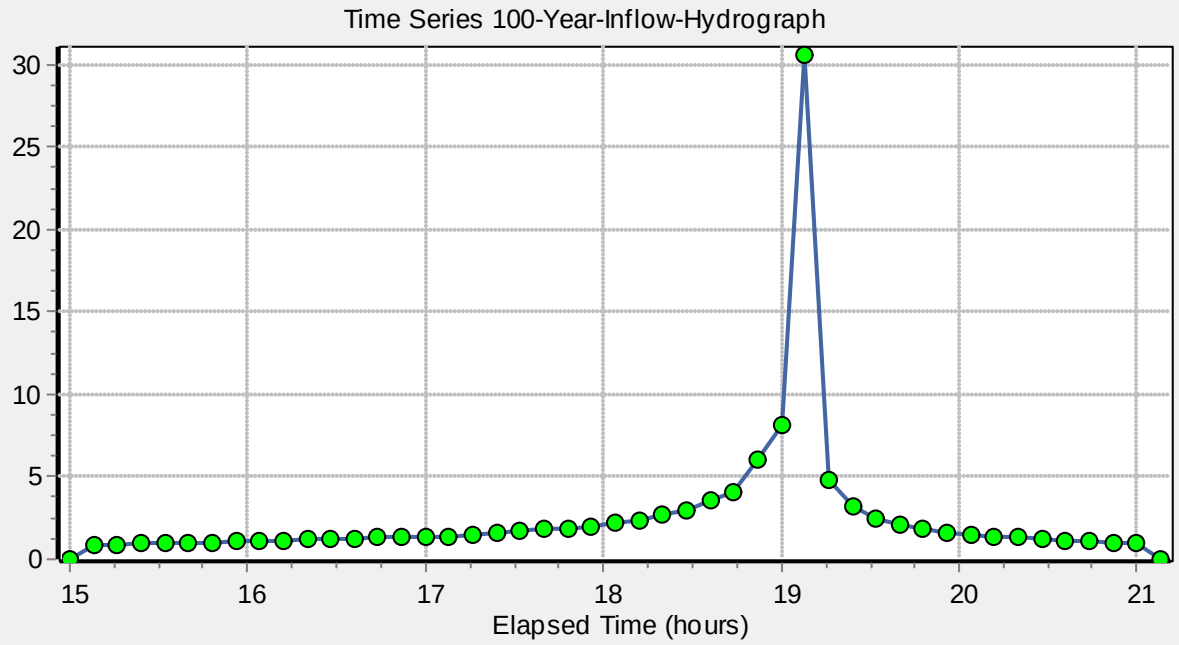
CITY OF POWAY, CALIFORNIA

Harmon Oaks,Post-develped Conditions

10/04/1962 16:00:00



Harmon Oaks, In Flow hydrograph



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

Harmon Oaks,Post-develped Conditions

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date 10/04/1962 15:00:00
Ending Date 05/23/2008 15:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 04:00:00
Routing Time Step ..... 60.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	636.511	558.180
Evaporation Loss	80.385	70.493
Infiltration Loss	223.125	195.666
Surface Runoff	337.826	296.252
Final Storage	0.048	0.042
Continuity Error (%)	-0.766	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	337.817	110.083

Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1.287	0.419
External Outflow	339.034	110.479
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.017	0.006
Continuity Error (%)	0.016	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Area-3	558.18	0.00	21.83	454.01	0.00	85.57	85.57	2.28	0.61	0.153
Area-4	558.18	0.00	89.18	86.48	362.80	25.28	388.08	4.64	0.35	0.695
Area-5	558.18	0.00	67.66	186.68	256.27	54.56	310.83	4.01	0.37	0.557
Area-1	558.18	0.00	79.96	141.93	303.05	38.17	341.22	72.45	6.05	0.611
Area-2	558.18	0.00	86.07	132.24	310.51	32.94	343.45	26.67	2.12	0.615
Area-6	558.18	0.00	0.45	556.62	0.00	1.23	1.23	0.04	0.22	0.002

****
Node Depth Summary
****

	Average	Maximum	Maximum	Time of Max	Reported

Node	Type	Depth Feet	Depth Feet	HGL Feet	Occurrence days	Occurrence hr:min	Max Depth Feet
POC1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
100Year-Vault-discharge	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
HMP-1	STORAGE	0.07	3.64	3.64	6348	09:10	3.54
Detention-Node-74	STORAGE	0.00	4.99	4.99	0	04:17	4.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC1	OUTFALL	3.68	7.36	6348	09:01	37.6	110	0.000
100Year-Vault-discharge	OUTFALL	0.00	6.01	0	04:17	0	0.419	0.000
HMP-1	STORAGE	6.05	6.05	6348	09:01	72.4	72.4	0.024
Detention-Node-74	STORAGE	30.60	30.60	0	04:09	0.419	0.419	0.079

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum Outflow CFS
HMP-1	0.487	1	0	0	27.069	64	6348	09:09	3.85
Detention-Node-74	0.002	0	0	0	37.120	83	0	04:17	6.01

****
Outfall Loading Summary
****

Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CFS	CFS	10^6 gal
POC1	17.32	0.06	7.36	110.052
100Year-Vault-discharge	0.03	0.13	6.01	0.419
System	8.68	0.19	6.01	110.471

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
HYDROMOD	DUMMY	3.85	6348 09:10			
vault-OutletStructure	DUMMY	6.01	0 04:17			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Dec 1 16:41:15 2022
Analysis ended on: Thu Dec 1 16:41:45 2022
Total elapsed time: 00:00:30

CHAPTER 5
Hydrology Maps

ROCA GRANDE DRIVE

LA VISTA WAY

OAK KNOLL ROAD

POWAY CREEK

12 — 0.16 ACRES

13

1 — 0.05 ACRES

2

4

0.14 ACRES

3

0.52 ACRES

D

A

6.77 ACRES

5

9 — 0.05 ACRES

10

2.38 ACRES

6

7

0.10 ACRES

14

1.62 ACRES

8

0.21 ACRES

11

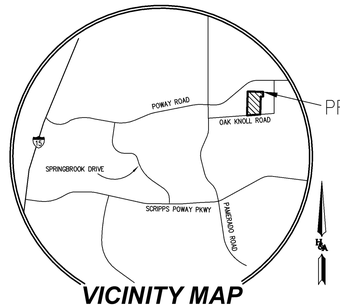
1.78 ACRES

15

16 — Q_{100} = 26.85 CFS. — 16
A= 13.79AC.
T_c = 11.54MIN.

VICINITY MAP

NOT TO SCALE



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- EXISTING STORM DRAIN
- 00.00 ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- 100 — NODE NUMBER
- HYDROLOGIC SOIL BOUNDARY

50 0 50 100 150

SCALE 1"= 50'

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
HYDROLOGY MAP

HARMON OAKS

CITY OF POWAY, CALIFORNIA

MAP 1 OF 2

W.O.# 2167-0225

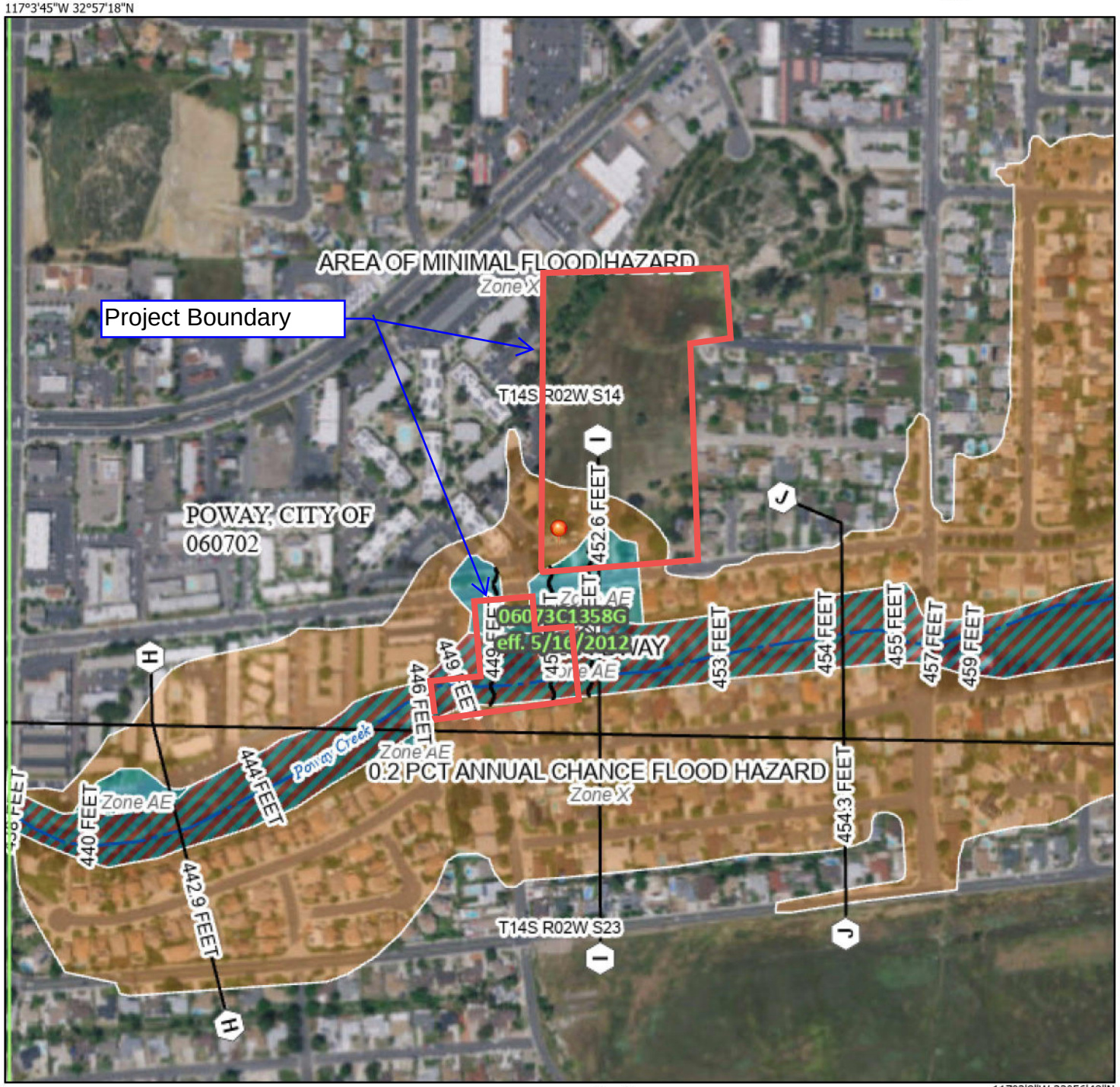
R:\1713\Hyd\DR\CAD\1713$Hydro_EX.dwg[]Dec-01-2022:17:01

Drainage Study for
Harmon Oaks

CHAPTER 6
Reference Information (Reports, Plans, etc.)

National Flood Hazard Layer FIRMette

FEMA



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
- 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 5/9/2022 at 7:53 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.

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.

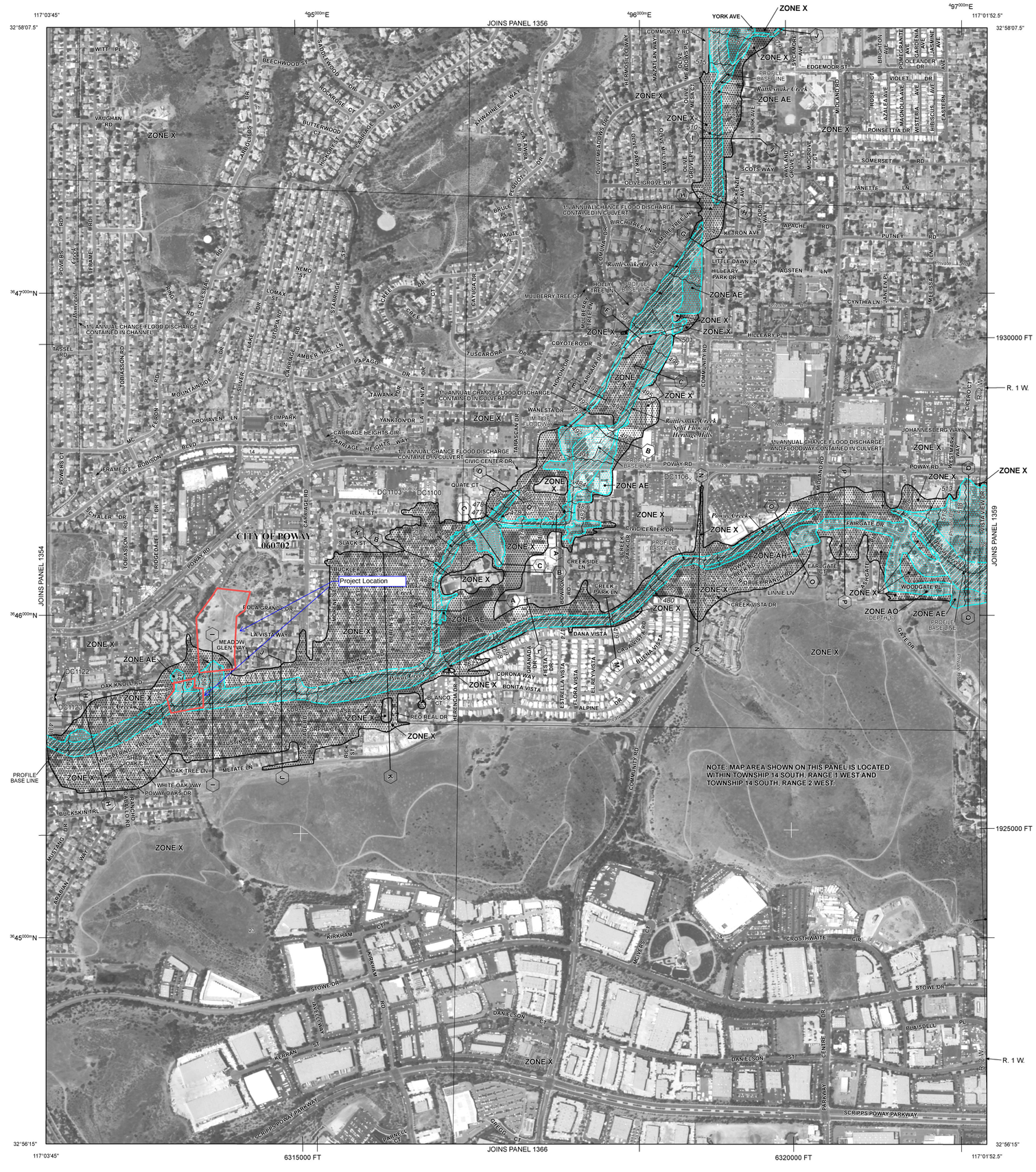
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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_1 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 (EL 987) Base Flood Elevation line and value; elevation in feet* / Base Flood Elevation value where uniform within zone; elevation in feet*

* Referred 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
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 1358G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1358 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
POWAY, CITY OF	060702	1358	G

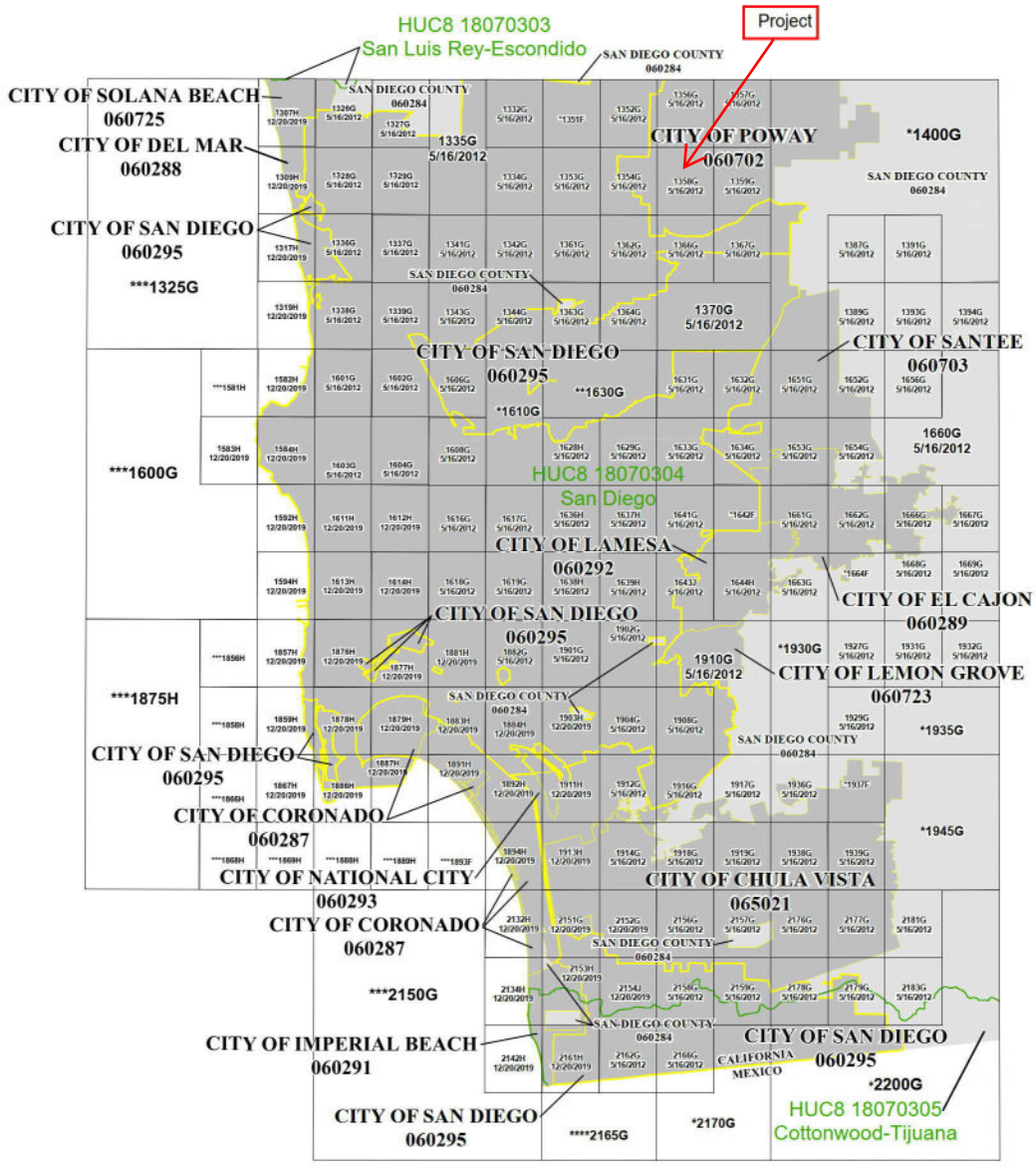
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06073C1358G

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

Figure 1: FIRM Panel Index



ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before March 22, 2022.

N

1 inch = 20,833 feet 1:250,000

0 6,000 12,000 24,000 36,000 48,000 feet

Map Projection:
Universal Transverse Mercator Zone 11 North;
North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
** PANEL NOT PRINTED - AREA IN ZONE D
*** PANEL NOT PRINTED - OPEN WATER AREA
**** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY

SAN DIEGO COUNTY, CA
INDEX LOCATOR DIAGRAM

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

SAN DIEGO COUNTY, CALIFORNIA and Incorporated Areas
SHEET 2 OF 3

PANELS PRINTED:

1307, 1309, 1317, 1319, 1326, 1327, 1328, 1329, 1332, 1334, 1335, 1336, 1337, 1338, 1339, 1341, 1342, 1343, 1344, 1352, 1353, 1354, 1356, 1357, 1358, 1359, 1361, 1362, 1363, 1364, 1366, 1367, 1370, 1387, 1389, 1391, 1393, 1394, 1582, 1583, 1584, 1592, 1594, 1601, 1602, 1603, 1604, 1606, 1608, 1611, 1612, 1613, 1614, 1616, 1617, 1618, 1619, 1628, 1629, 1631, 1632, 1633, 1634, 1636, 1637, 1638, 1639, 1641, 1643, 1644, 1651, 1652, 1653, 1654, 1656, 1660, 1661, 1662, 1663, 1666, 1667, 1668, 1669, 1857, 1859, 1867, 1876, 1877, 1878, 1879, 1881, 1882, 1883, 1884, 1886, 1887, 1891, 1892, 1894, 1901, 1902, 1903, 1904, 1908, 1910, 1911, 1912, 1913, 1914, 1916, 1917, 1918, 1919, 1927, 1929, 1931, 1932, 1936, 1938, 1939, 2132, 2134, 2142, 2151, 2152, 2153, 2154, 2156, 2157, 2158, 2159, 2161,2162, 2166, 2176, 2177, 2178, 2179, 2181, 2183

MAP NUMBER
06073CIND2F

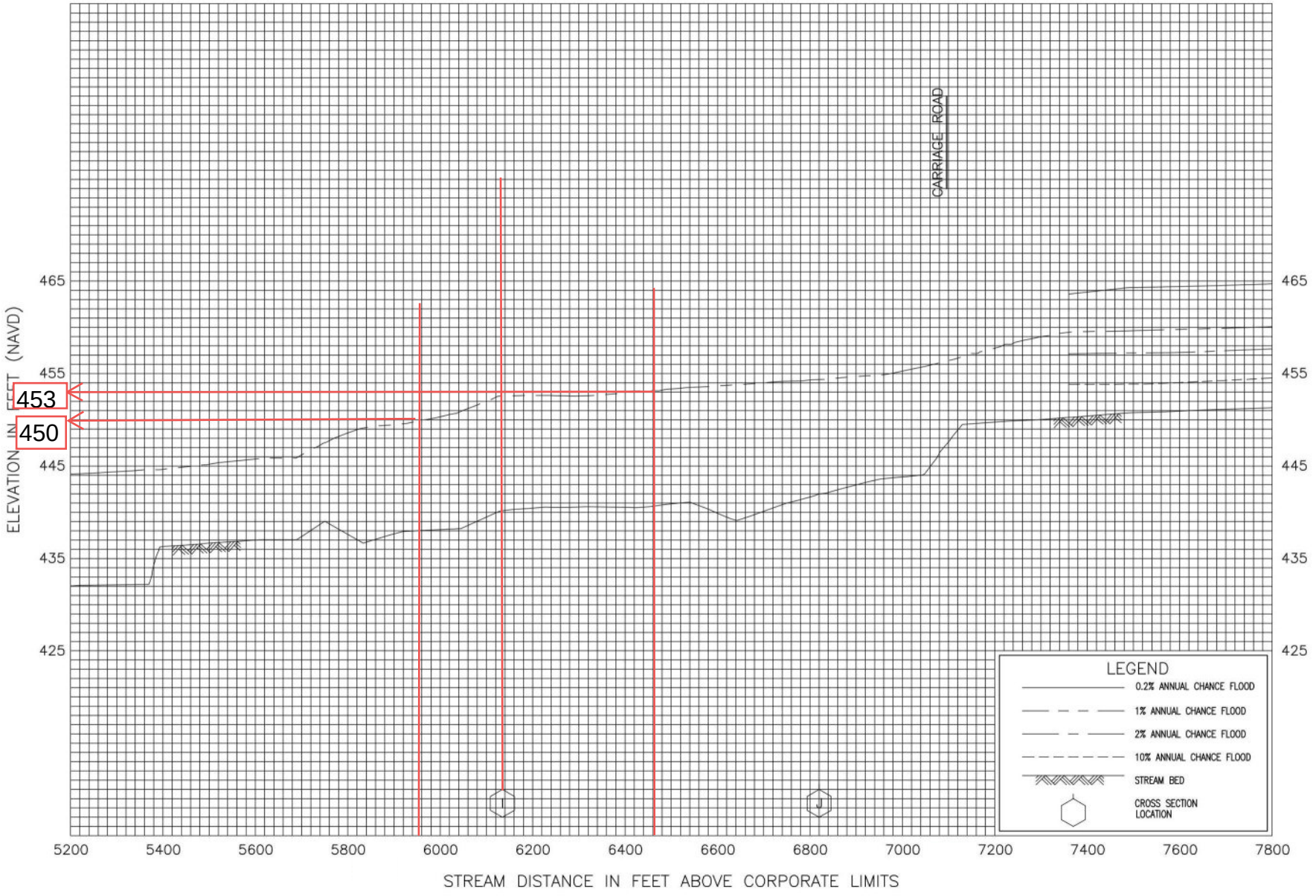
MAP REVISED
MARCH 22, 2022

Table 1: Listing of NFIP Jurisdictions, continued

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
National City, City of	060293	18070304	06073C1892H 06073C1894H 06073C1903H 06073C1904G 06073C1911H 06073C1912G 06073C1913H 06073C1914G 06073C1916G 06073C2151G	
Oceanside, City of	060294	18070303	06073C0464G 06073C0468H 06073C0469G 06073C0475G[1] 06073C0488G 06073C0490G 06073C0734J 06073C0742H 06073C0751H 06073C0752H 06073C0753J 06073C0754H 06073C0756H 06073C0757G 06073C0758G 06073C0759G 06073C0761H 06073C0762G 06073C0766G 06073C0767G 06073C0769G 06073C0776G 06073C0786J	
Poway, City of	060702	18070304	06073C1084G 06073C1091G 06073C1092G 06073C1093G 06073C1094G 06073C1115G[1] 06073C1352G 06073C1354G 06073C1356G 06073C1357G 06073C1358G 06073C1359G 06073C1362G 06073C1366G 06073C1367G 06073C1400G[1]	

Table 9: Summary of Discharges, continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pauma Creek	At Apex of Alluvial Fan	14.7	1,550	*	6,270	10,480	30,460
Pilgrim Creek	At Mouth	19.0	*	*	*	1,925	*
Pilgrim Creek	Just Upstream of the Confluence with Windmill Creek	15.8	*	*	*	1,888	*
Pilgrim Creek	Downstream End of Oceanside Golf Course	14.0	*	*	*	1,244	*
Pilgrim Creek	Upstream End of Oceanside Golf Course	14.0	*	*	*	5,775	*
Poggi Canyon Creek	At Confluence with Otay River	4.63	220	*	930	1,400	2,630
Poggi Canyon Creek	At City of Chula Vista Corporate Limit	3.74	180	*	830	1,280	2,470
Pomerado Creek	At confluence with Poway Creek	4.3	*	*	*	2,100	*
Pomerado Creek	At Tassel Road	3.9	*	*	*	1,990	*
Pomerado Creek	At Vaughn Road	3.3	*	*	*	1,750	*
Pomerado Creek	At Holland Road	2.9	*	*	*	1,570	*
Poway Creek	USGS Gage at Cobblestone Creek Road	31.2	2,500	*	8,700	14,000	34,000
Poway Creek	US GS Gage 1,000 feet Upstream of Standish Drive	7.9	1,100	*	3,700	5,600	14,000



FLOOD PROFILES

POWAY CREEK

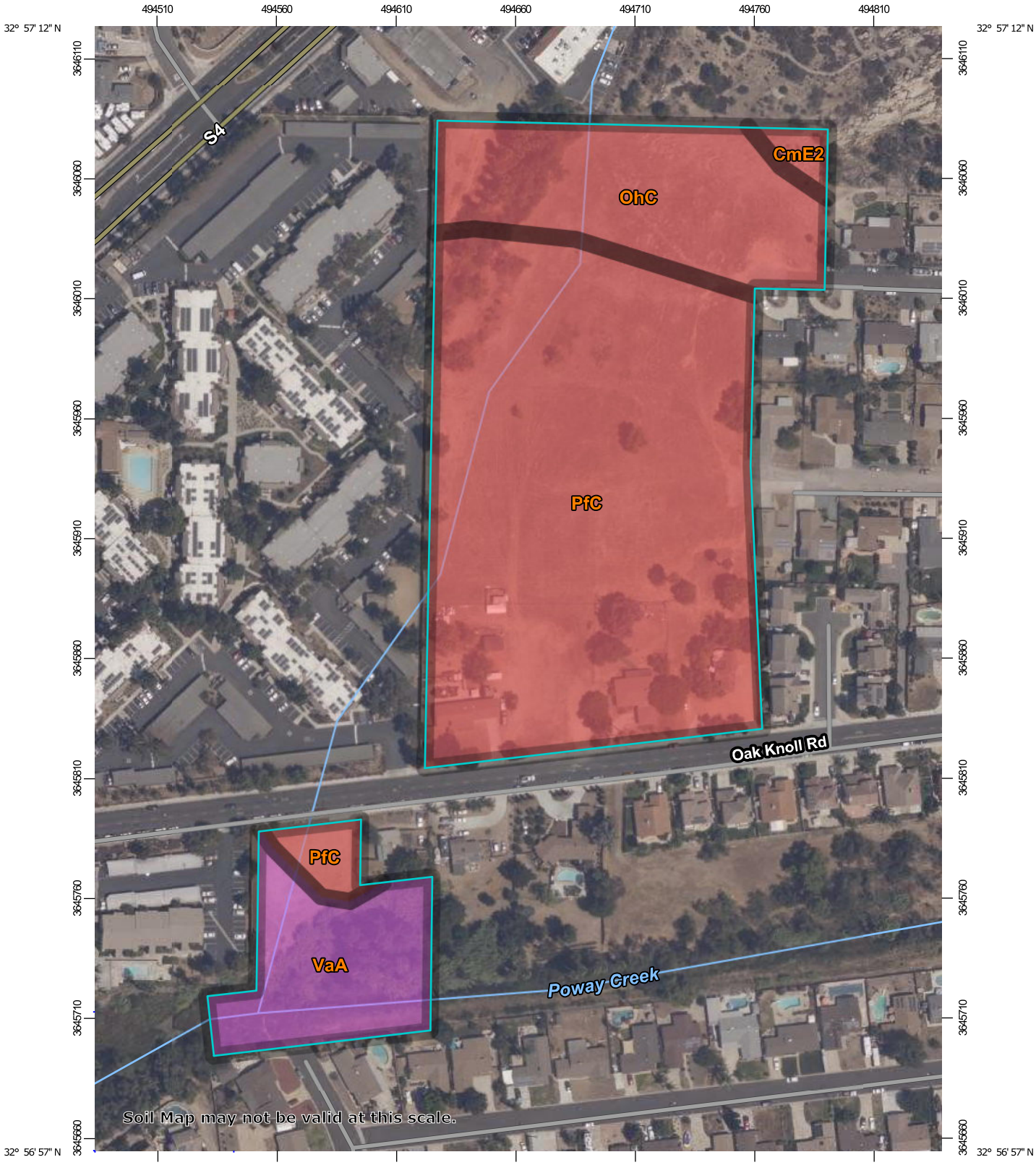
FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA

(AND INCORPORATED AREAS)

300P

Hydrologic Soil Group—San Diego County Area, California
(1713$Project Site)



Map Scale: 1:2,290 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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 16, Sep 13, 2021

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

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

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
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes, eroded	D	0.1	1.3%
OhC	Olivenhain cobbly loam, 2 to 9 percent slopes	D	2.1	19.8%
PfC	Placentia sandy loam, thick surface, 2 to 9 percent slo pes	D	7.2	66.6%
VaA	Visalia sandy loam, 0 to 2 percent slopes	A	1.3	12.3%
Totals for Area of Interest			**10.8**	**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

General Notes

[illegible]

8) [illegible] removal of existing sewer facilities shall be [illegible] ... because of conflicts with other facilities.

10) The existence and location of sewer facilities shown on these plans were obtained by a search of available City records. To the best of our knowledge there are no existing sewer facilities except as shown on these plans. The City of Poway shall not be held responsible for any error in the location and elevation of the existing sewer facilities.

12) The City's Inspector shall be notified at least two working days prior to commencing work on the sewers. City Inspector telephone number is (619) [illegible].

13) All sewer house connections shall be placed prior to surfacing of streets.

14) No house connections are to be made without approval from the City of Poway.

15) No sewer shall be constructed in any private way without prior approval from the City of Poway.

[illegible]

20) For Additional Construction required for this project, see R.S. 11?5, Sheets 4 & 6, revised 4/1/84.

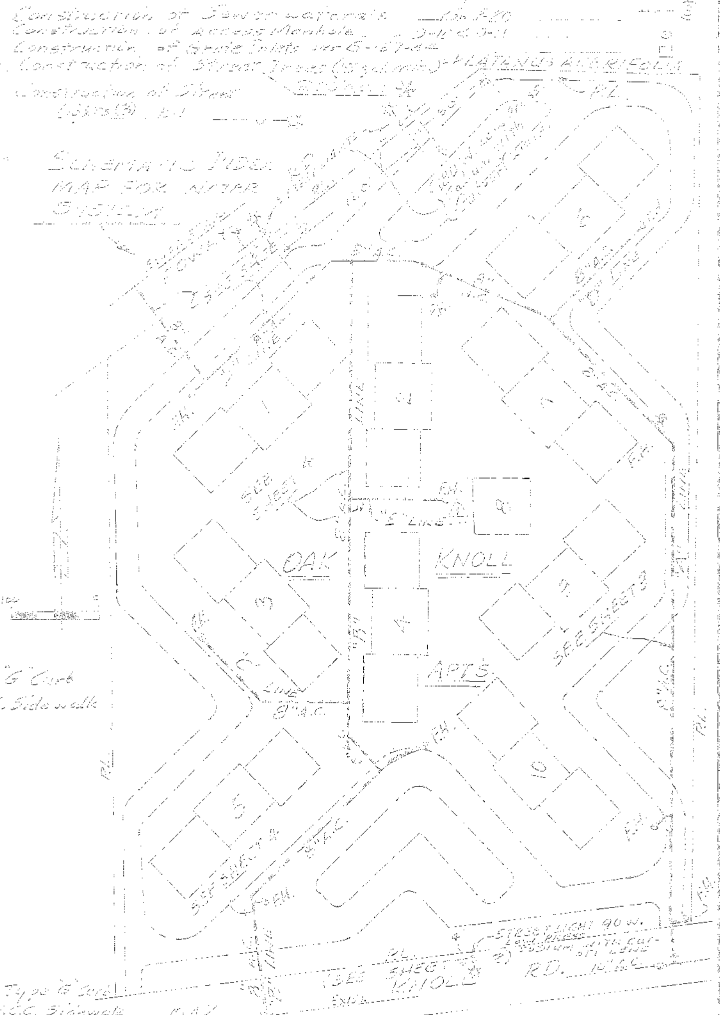
"AS BUILT"
[illegible] MUNICIPAL ENGINEERS INC. — 9/18/86
NAME — DATE 4-21-81

Work To Be Done

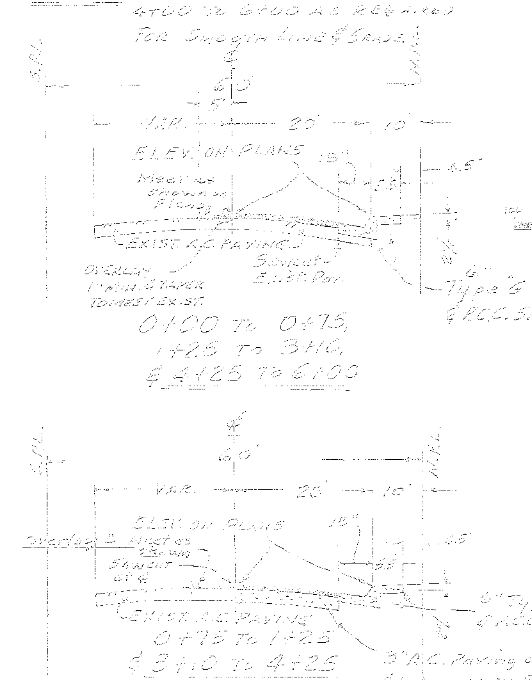
The improvement consists of the following work to be done according to these plans, the San Diego Reg. and Standards and the Standard Specifications of the City of Poway:

Item	Std. Dwg.	Legend
Construction of [illegible]		
Grading of the portion of the street as shown on the plans		
Construction of Type G Curb	G-2	
Construction of P.C.C. Sidewalk	G-7	
Construction of Type B Curb Inlet	D-2	
Construction of R.C.P. Storm Drain	D-76	
Construction of P.C.C. Driveway	G-14	
Construction of Paving and Base		
Construction of A.C. Overlay		
Construction of Rip Rap Energy Dissipator	D-40	
Construction of [illegible]	M-6	
Construction of Wingtype Head walls	D-33 & D-34	
Construction of P.C.C. [illegible]	G-?	
Construction of A.C. Water Main, appurtenances		
Construction of Fire Hydrants (Ewing Commercial)		
Construction of Sewer Manhole	S-1	
Construction of Drainage [illegible]	D-25	
Construction of Water Services		
Construction of Gate Valves		
Construction of Sewer Laterals		
Construction of Access Manhole		
Construction of Grate Inlets		
Construction of Street Trees (Sycamore)		
Construction of Street [illegible]		

SCHEMATIC INDEX MAP FOR WATER SYSTEM



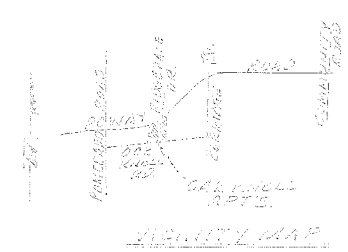
NOTE: Resurface South Half From 4+00 to 6+00 as Required for Smooth Line & Grade.



TYPICAL SECTIONS, OAK KNOLL ROAD (See General Note #5)
NO SCALE

Solar Access Note

THE GRADING PLAN HAS PRESERVED A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH DWELLING UNIT AND FOR EACH FUTURE BUILDING SITE WITHIN THE SUBDIVISION



VICINITY MAP
NO SCALE

Related Approvals	
Grading Permit	G-187
Use Permit	N/A
Dev. Review	DR-83-13
T.M.	T.P.M. 83-02

BENCH MARK is Brass Disc in Conc. Mon. at S.E. Cor. Pomerado Rd. & Metate Lane, 24' So. of ℄ Metate Lane & 59' East of ℄ Pomerado Road; Record from R.O.M. #0019, San Diego County; El. 448.185 U.S.C.&G.S. Datum.

Charles R. Quill
MUNICIPAL ENGINEERS INC.
[illegible] SAN DIEGO, CA. 92101

Revised Changes			
No.	Description	Approved by	Date
1	Work to be Done		
	As Built		

APPROVED: Poway Fire Department
By: [signature]
Date: 5/18/84

Sheet 1	CITY OF POWAY DEPARTMENT OF PUBLIC SERVICES	9 Sheets

PLANS FOR THE IMPROVEMENT OF OAK KNOLL ROAD AND OAK KNOLL APARTMENTS P.M. 13265

[signature] — 7-19-84
Engineer of Work: Charles R. Quill — 801-04-150