SUNROAD INDUSTRIAL PARK

Drainage Report

OTAY MESA ROAD AT PIPER RANCH ROAD
SAN DIEGO, CA 92154

OCTOBER 6, 2017

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This Drainage Report has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

Registered Civil Engineer

Date

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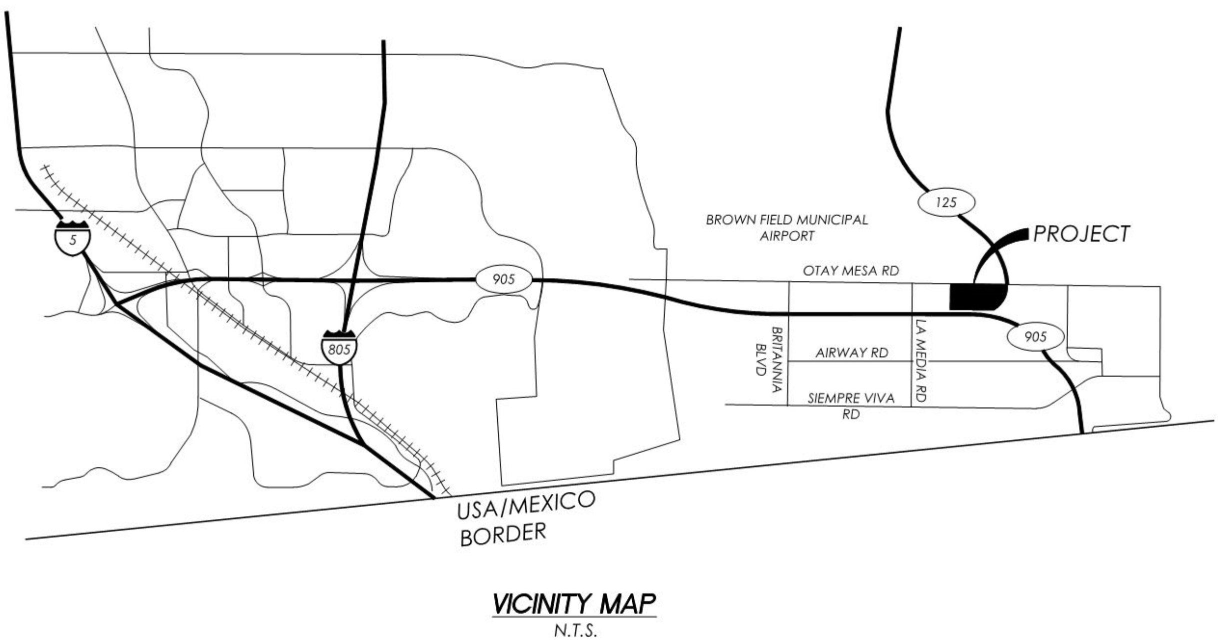
1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Sunroad Industrial Park project consists of industrial distribution centers on an approximately 49.1-acre area located within the Otay Mesa community of San Diego, California. The 49.1-acre property is bounded by Otay Mesa Road to the north, CA Route 125 to the east, CA Route 905 to the south, and an undeveloped lot to the west, see Figure 1-1 for Vicinity Map. The property is comprised of Assessor Parcel Numbers 646-290-04, 646-290-08, 646-290-17, 646-290-18, 646-290-19, 646-290-24, 646-290-25, 646-290-26, 646-290-27, 646-290-29, and 646-290-31. The project includes the grading of eleven existing parcels for industrial distribution centers along with parking areas, loading docks, and driveways. See the vicinity map in **Figure 1-1**. The purpose of this report is to present the hydrology analysis and drainage calculations for the design of the Sunroad Industrial Park project.

Figure 1–1 Vicinity Map



2 PROJECT SETTING

2.1 TOPOGRAPHY

Topographic information for the project was obtained from a land survey by Kimley-Horn in January 2017. The project is located on the USGS Otay Mesa quadrangle map, see **Appendix A**. The project is located within the Tijuana Valley watershed with onsite slopes starting in the northeast corner (approximate elevation 520) leading initially southwest over to Piper Ranch Road and then west to the end of the property (approximate elevation 484). The undeveloped property to the west continues slopes to the west leading to existing storm drain structures at the corner of La Media Road and Otay Mesa Road.

2.2 PRECIPITATION

Storm intensity values were taken from the County of San Diego Hydrology Manual, 2003. The design storm was the 50-year and 100-year rainfall event calculated from the County of San Diego Hydrology Manual Rainfall Isopluvials and Figure 3-1 (see **Appendix C**) and determined to be 2.1 inches for the 50-year 6-hour event and 2.3 for the 100-year 6-hour event.

2.3 SOIL TYPES

The condition and type of soil are major factors affecting infiltration and runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general categories for comparing infiltration and runoff rates. The categories are based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount storm water runoff at the end of a long duration storm that occurs after the soil is saturated.

Soil types were determined using the United States Department of Agriculture (USDA) Web Soil Survey. The project site consists of a mix of type C and type D soils. Hydrologic soil group D soils have a very slow infiltration rate 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. See **Appendix B** for soils information.

2.4 LAND USE

The project site location is within the Otay Mesa community of San Diego, California. The zoning is Light Industrial (IL-3-1) for urbanized communities. The land use designation is Commercial Employment, Retail, and Services.

2.5 GROUNDWATER

Based on the Geotechnical Investigation dated October 10, 2006 by Geocon, Inc., groundwater was encountered at depths ranging from 16 feet to 36 feet below the existing ground surface. Groundwater elevations may fluctuate seasonally.

2.6 FEMA MAPPING

The project site is not located in a flood zone mapped by the FEMA Flood Insurance Rate Map (FIRM). See **Appendix H** for FEMA map.

2.7 CLEAN WATER ACT SECTION 404 PERMIT AND 401 CERTIFICATION

The physical alteration of water bodies, including wetlands and streams, are regulated by federal and state statues under Section 401 (Certification) and Section 404 (Permits) of the Federal Clean Water Act. This project does not propose any discharge of dredged and/or fill material within any Waters of the U.S., therefore, is not subject to the Clean Water Act Sections 404 Permit and 401 Certification.

3 HYDROLOGIC ANALYSIS

3.1 METHODOLOGY

The Modified Rational Method was used to analyze the hydrology for the project. This methodology is typically used for small basins less than 500 acres in size because a uniform rainfall distribution is assumed for the entire duration. Drainage calculations comply with the requirements outlined in the County of San Diego Hydrology Manual, 2003. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 5, 10, 25, 50, and 100-year storm events under existing and proposed conditions. This program uses parameters from the County of San Diego Hydrology Manual to estimate times of concentration and peak flow rates.

3.1.1 GEOMETRY

Sub-basin boundaries, initial subareas, and flow paths were delineated for each sub-basin with AutoCAD Civil 3D software. These hydrologic parameters are shown for existing conditions and proposed conditions in **Exhibit A** and **Exhibit B**. Point elevations and surfaces within Civil 3D were also used to determine flow path slopes and estimate the shape of routing reaches. A summary of the existing condition and proposed condition inputs into the AES models are included in **Appendix A.** The proposed condition sub-basins were each given a sub-basin ID. The sub-basin routing nodes in AES are based on the sub-basin ID plus an increment of 1 as flows are routed downstream. For example, the AES input for the existing condition sub-basin 1 is an initial sub-area from node 10 to 11 and overland flow from 11 to 12. Topography for the project area was obtained from a land survey by Kimley-Horn in 2017 and is based on the mean sea level (NAVD 29).

3.1.2 INTENSITY AND TIME OF CONCENTRATION

Rainfall data for frequency events were taken from the County of San Diego Hydrology Manual Rainfall Isopluvials to determine the appropriate precipitation for the project site. This duration precipitation value was then inputted directly into AES for each frequency event. AES software was used to calculate the appropriate time of concentration for each sub-basin The AES software then calculates an intensity based on the calculated time of concentration.

3.1.3 RUNOFF COEFFICIENT AND LOSS RATES

AES software was used to calculate loss rates and subsequent runoff coefficients for each sub-basin based on land use type, and hydrologic soil group. The existing conditions land utilized for the model was undeveloped natural grass. The proposed conditions land use is general industrial, which is defined as 95% impervious and a runoff coefficient of 0.87. Hydrologic soil group D was used for the entire site.

3.2 EXISTING CONDITIONS

The project site overland flows from the northeast corner leading initially southwest over to Piper Ranch Road and then west to the end of the property. The undeveloped property to the west continues slopes to the west leading to existing storm drain structures at the corner of La Media Road and Otay Mesa Road.

Runoff coefficients for the existing site was based on the County of San Diego Hydrology Manual and is identified below in **Table 3-1** for undeveloped sites. See **Exhibit A** for **Existing Drainage Exhibit.** The hydrology model results are presented in **Appendix D.**

Table 3–1 Existing Conditions Hydrology

Basin ID	Runoff Coefficient	Area (acres)	Flow Rate (cfs)				
			5 Year	10 Year	25 Year	50 Year	100 Year
1	0.35	3.6	2.18	2.63	3.07	3.58	3.91
2	0.35	21.1	7.82	9.03	10.53	12.63	14.14
3+4	0.35	26	9.9	12.5	14.35	17.25	19.21
5	0.35	3.1	0.1	1.8	2.04	2.4	2.65
Total		53.8	20	25.96	29.99	35.86	39.91

3.3 PROPOSED CONDITIONS

Proposed hydrologic calculations have been prepared for the project. Tributary areas were delineated based on proposed grading for the project. The final development will be approximately 83% impervious area and 17% landscape. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 5, 10, 25 50, and 100-year storm events under proposed conditions. Runoff generated from the site will be collected by onsite inlets, conveyed through an underground storm drain system, and discharge into onsite detention basins for treatment and detention. This basin will be designed to filter and treat the water quality storm event volume by means of biofiltration as documented in the project specific SWQMP.

The project will discharge all flows through the point of compliance in the south-western portion of the project by making a connection within the Caltrans right of way in an existing drop inlet with a 42” culvert that crosses under State Route 905.

With the project site being 83% impervious the Runoff Coefficient used in the AES calculations was 0.87 which matches closely to the Table A-1 of the San Diego Drainage Design Manual Commercial land use with 80% impervious carrying a runoff coefficient of 0.85. See **Exhibit B** for **Proposed Drainage Exhibit.** The hydrology model results are presented in **Appendix E.**

4 HYDRAULIC ANALYSIS

4.1 METHODOLOGY

Drainage structures were designed for the Sunroad Industrial Park project according to the procedures and methodologies outlined in the County of San Diego Drainage Design Manual, 2005. The proposed drainage network is included on the **Proposed Drainage Exhibit**, **Exhibit B**.

4.1.1 STORM DRAIN DESIGN

The storm drain network pipe sizes were estimated for preliminary design utilizing the AES computer program for non-pressure pipe flow included in the **Proposed Condition Hydrology Calculations**, see **Appendix E**. The Modified Rational Method was used to calculate peak flow for the 50-year storm event.

4.1.2 DETENTION BASIN CALCULATIONS

The development of this site results in an increase of peak discharge runoff. Three detention basins are proposed to mitigate peak flows by storing stormwater runoff and controlling the release of flow. The project is required to mitigate for downstream hydromodification and detain for the 50-year peak flow rate. The project specific Stormwater Quality Management Plan (SWQMP) determined the storage volume and outlet orifice required to mitigate for hydromodification. Orifice calculations were prepared to determine the size of the outlets to meet hydromodification requirements and are used in the flood routing for the peak storm events. See **Appendix F** for the outlet rating curves for each basin. See project specific SWQMP for hydromodification compliance documentation.

Per the Mo Sammak, City Engineer, City of San Diego, memo to Industry in the early 1980's, the Otay Mesa drainage watersheds were required to detain developed flow to pre-existing conditions for the 5, 10, 25 and 50 year storm events with the 100-year storm passing undetained over the spillway. The Otay Mesa Community Plan Update Drainage Study also provides this design criteria. This project adheres to those design criteria for detention basin sizing.

To size the peak attenuation volume required, the Rational Method hydrology results were input into Rick Rat Hydrographs to develop a hydrograph. The proposed hydrograph was routed using Hydraflow Hydrographs Computer Software with the calculated orifice sizes and a riser structure to determine peak flow rates and maximum elevation of each basin. See **Appendix F** for detention basin calculations and **Table 4-1** summarizing the basin routing results. The project peak flow rate are less than the pre-project flow rate for all storm events per the criteria above. Note that the values are provided for the 100 year however the criteria will only require that we safely convey the 100 year undetained flow rate of safely to the right of way. The safe conveyance for the emergency 100 year passage will be done by means of an emergency spill way on the south western portion of Basin 1. Calculations to size this spillway are provided in **Appendix F**. The spill way will be set to elevation 486.62 per preliminary designs.

Table 4–1 Proposed Detention Basin Summary

Storm Event	Existing	Proposed Runoff	Proposed Released	Runoff Detained	Maximum Water Surface Elevation		
					Basin 7 (North)	Basin 6 (Middle)	Basin 1 (Southern)
(yr)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	ft	ft	ft
5	20	78.22	13.06	65.16	482.41	484.37	484.32
10	25.96	92.37	14.4	77.97	482.64	484.61	484.65
25	29.99	107.89	15.53	92.36	482.88	484.75	484.97
50	35.86	127.76	19.55	108.21	483.08	484.96	485.41
100	39.91	140.52	29.54	110.98	483.15	485.09	485.62
Top of Basin					484.50	486.82	486.62
100 Year Freeboard					1.35	1.73	1.00
Required Volume (cubic feet)					49,808	33,796	174,363
Basin Volume Provided (cubic feet)					67,787	57,375	193,585

Drawdown times for the detention basins are required to drawdown the surface ponding within 96 hours per section 6.3.7 Drawdown Time of the 2016 Storm Water Standards Part 1: BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodification Management. See **Table 4-2** Below for a summary of storm event drawdown times for various storm events. These drawdown times represent the duration it takes to drain the surface storage area after the end of the storm event for each basin and are supported by the hydrographs and hydraflow results in **Appendix F**. **Tables 4-3** through **4-5** provides the time ordinates of the end of the storm event (6hrs, typ) and the time ordinate for the surface storage to drain completely to calculate the total drawdown time.

Table 4–2 Proposed Detention Basin Drawdown Summary

	Basin 7 (North)		Basin 6 (Middle)		Basin 1 (Southern)	
Storm Event	Max WSEL	Drawdown Time	Max WSEL	Drawdown Time	Max WSEL	Drawdown Time
(yr)	ft	hrs	ft	hrs	ft	hrs
5	482.57	0	484.31	19.33	482.89	21.08
10	482.84	3.67	484.6	18.42	483.24	21.25
25	483.09	8.25	484.74	23.33	483.55	21.42
50	483.24	15.08	484.95	24.5	483.94	21.83
100	483.32	18.67	485.09	24.58	484.12	22.00

Table 4-3: Basin 7 drawdown time

	Basin 7 (North)		
Storm Event	Time at end of inflow hydrograph	Time for Basin to Drain Surface Storage (elevation 484.5)	Drawdown Time
(yr)	hrs	hrs	hrs
5	6	6	0
10	6	9.67	3.67
25	6	14.25	8.25
50	6	21.08	15.08
100	6	24.67	18.67

Table 4-4: Basin 6 drawdown time

	Basin 6 (Middle)		
Storm Event	Time at end of inflow hydrograph	Time for Basin to Drain Surface Storage (elevation 481.5)	Drawdown Time
(yr)	hrs	hrs	hrs
5	6	25.33	19.33
10	6	24.42	18.42
25	6	29.33	23.33
50	6	30.50	24.5
100	6	30.58	24.58

Table 4-4: Basin 6 drawdown time

	Basin 1 (Southern)		
Storm Event	Time at end of inflow hydrograph	Time for Basin to Drain Surface Storage (elevation 482.0)	Drawdown Time
(yr)	hrs	hrs	hrs
5	6	27.08	21.08
10	6	27.25	21.25
25	6	27.42	21.42
50	6	27.83	21.83
100	6	28	22

4.1.3 INLET DESIGN

Proposed inlets are located along Otay Mesa Road and between Buildings 3 and 4. Storm drain inlet sizes were calculated using the FlowMaster computer program. This program's input consists of street grade, gutter grade, cross-slope, local depression, length of opening, height of opening and whether the inlet is in a sump or on grade condition. The inlets were designed at 100% interception capacity for the 50-year storm. The FlowMaster inlet design output files can be referenced in **Appendix G**. Onsite inlet sizing will be performed during the final construction drawing phase.

5 WATER QUALITY

5.1 POST CONSTRUCTION BMP

A project specific Storm Water Quality Management Plan (SWQMP) has been prepared. Biofiltration areas are proposed throughout the project to provide stormwater treatment for the pollutants discharged from the proposed improvements. Biofiltration areas were incorporated into the project where it was practical. These biofiltration areas are a mitigation measure for stormwater runoff treatment. Biofiltration calculations are provided in the project specific SWQMP.

5.2 EROSION AND SEDIMENTATION

The proposed commercial site will be approximately 83% impervious with landscaped slopes and parkway landscaped areas. Graded and disturbed areas will be re-vegetated and landscaped to minimize erosion. The post construction site will have minimal risks of erosion occurring given proper plant establishment and transport of sediments downstream will be significantly reduced by means of pretreatment and an onsite underground infiltration/retention basin with no offsite discharge location. It will be critical to maintain construction site BMP's throughout the construction duration.

6 DRAINAGE IMPROVEMENTS

This drainage study was prepared to document the storm drain design for Sunroad Industrial Park. The project includes the construction of four industrial buildings, associated truck docks, parking, and utilities. The drainage improvements throughout the project consist of installing inlets, storm drain facilities, and biofiltration basins.

The proposed drainage improvements are designed to mitigate flood and water quality impacts such that no adjacent properties will be negatively impacted from runoff generated by the development of this project.

APPENDICES

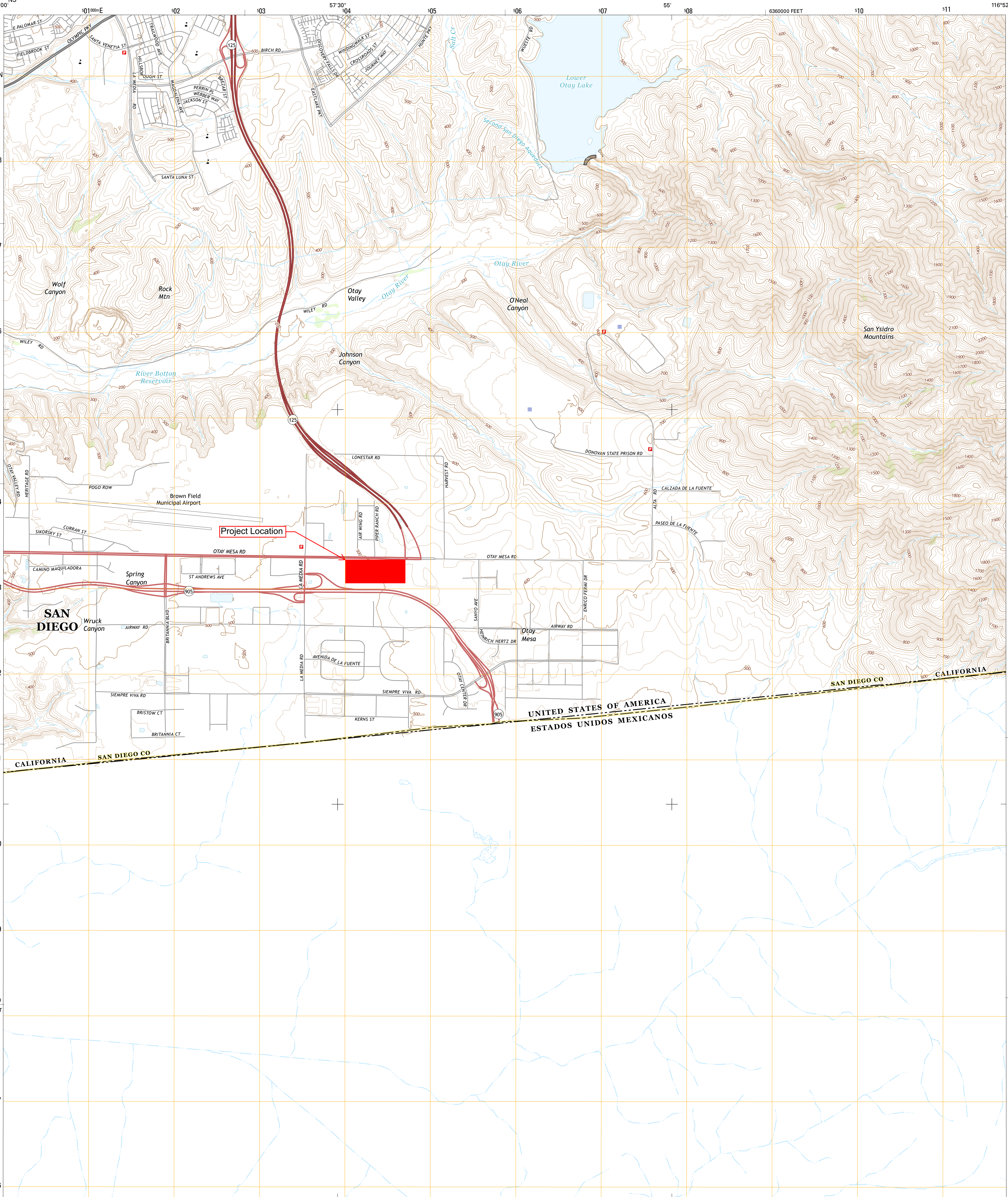
APPENDIX A

USGS MAP

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

OTAY MESA QUADRANGLE
CALIFORNIA-BAJA CALIFORNIA NORTE
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 11S
10 000-foot ticks: California Coordinate System of 1983 (zone 6)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, May 2012
Roads.... HERE, ©2013 - 2014
Names....GNIS, 2015
Hydrography....National Hydrography Dataset, 2012
Contours....National Elevation Dataset, 2012
Boundaries....Multiple sources; see metadata file 1972 - 2015
Public Land Survey System....BLM, 2011

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
MN 11° 41′ 208 MILS; GN 0° 2′ 1 MILS

U.S. National Grid
100,000-m Square ID: NS / NR
Grid Zone Designation 11S

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 National City
2 Jamul Mountains
3 Dulzura
4 Imperial Beach
5 Otay Mountain
6
7
8

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

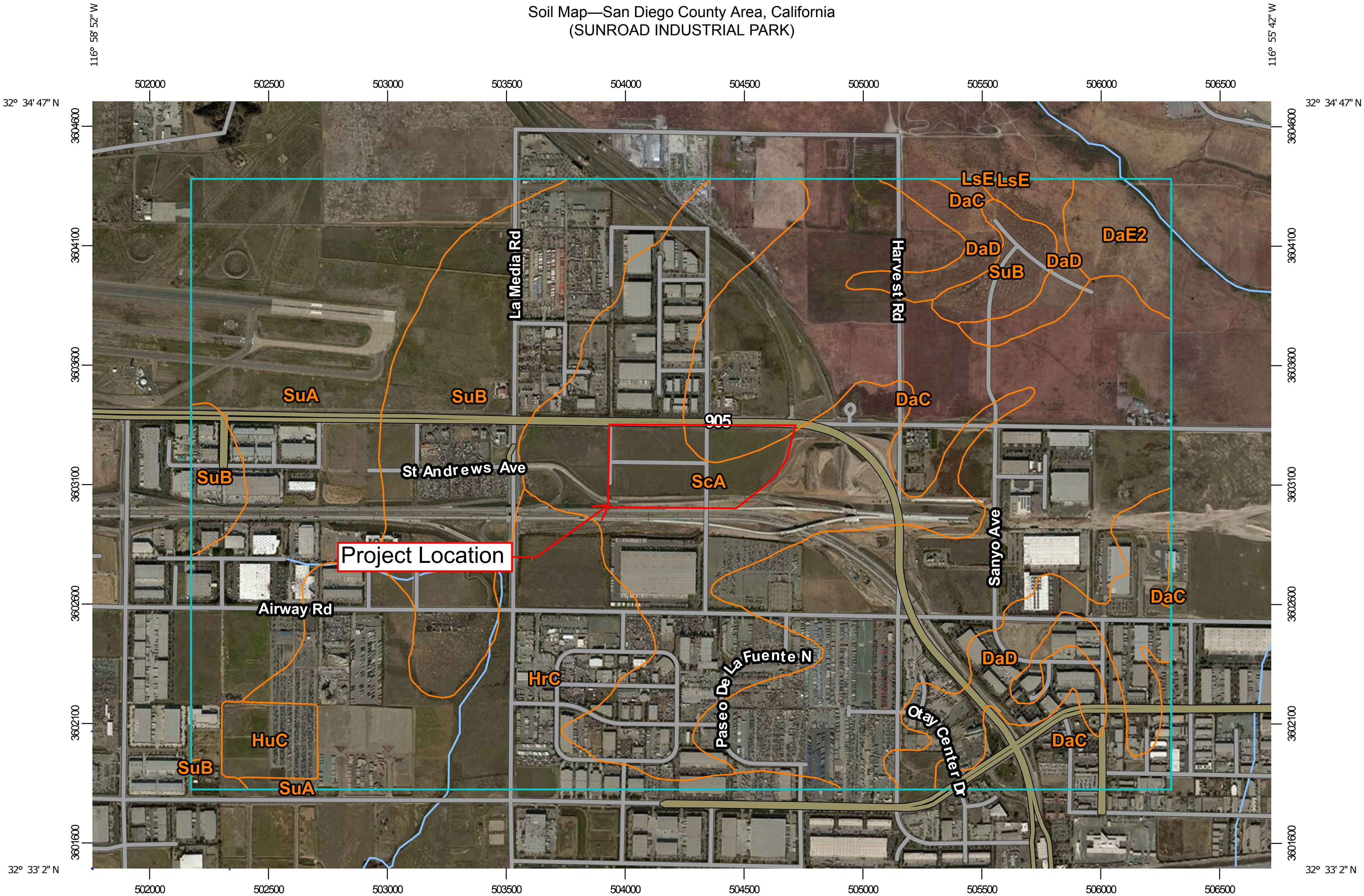
OTAY MESA, CA-BCN
2015

NSN. 7643016357281
NGA REF NO. USGSX24K33589

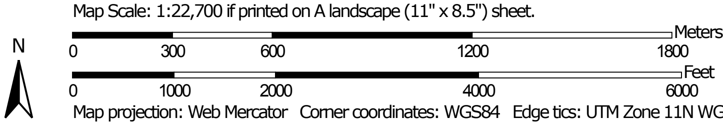
APPENDIX B

SOIL INFORMATION

Soil Map—San Diego County Area, California
(SUNROAD INDUSTRIAL PARK)



Map Scale: 1:22,700 if printed on A landscape (11" x 8.5") sheet.



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 Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

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.

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 10, Sep 12, 2016

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

Date(s) aerial images were photographed: May 2, 2010—Jan 4, 2015

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.

Map Unit Legend

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
DaC	Diablo clay, 2 to 9 percent slopes	763.8	29.2%
DaD	Diablo clay, 9 to 15 percent slopes, warm MAAT, MLRA 20	198.6	7.6%
DaE2	Diablo clay, 15 to 30 percent slopes, eroded, warm MAAT, MLRA 20	48.7	1.9%
HrC	Huerhuero loam, 2 to 9 percent slopes	304.2	11.6%
HuC	Huerhuero-Urban land complex, 2 to 9 percent slopes	31.4	1.2%
LsE	Linne clay loam, 9 to 30 percent slopes	0.5	0.0%
ScA	Salinas clay, 0 to 2 percent slopes	461.4	17.6%
SuA	Stockpen gravelly clay loam, 0 to 2 percent slopes	422.6	16.2%
SuB	Stockpen gravelly clay loam, 2 to 5 percent slopes	383.3	14.7%
Totals for Area of Interest		**2,614.4**	**100.0%**

San Diego County Area, California

DaC—Diablo clay, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbb8
Elevation: 30 to 3,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 320 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Diablo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Diablo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandstone and shale

Typical profile

H1 - 0 to 15 inches: clay
H2 - 15 to 32 inches: silty clay loam, clay
H2 - 15 to 32 inches: weathered bedrock
H3 - 32 to 36 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent
Hydric soil rating: No

Linne

Percent of map unit: 3 percent
Hydric soil rating: No

Olivenhain

Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

San Diego County Area, California

ScA—Salinas clay, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hbgh
Elevation: 50 to 300 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Salinas and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Salinas

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 22 inches: clay
H2 - 22 to 46 inches: clay loam, clay
H2 - 22 to 46 inches: loam, clay loam
H3 - 46 to 64 inches:
H3 - 46 to 64 inches:

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 16.2 inches)

Interpretive groups

Land capability classification (irrigated): 2s

Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Diablo
Percent of map unit: 5 percent
Hydric soil rating: No

Huerhuero
Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

APPENDIX C

HYDROLOGY MANUAL EXCERPTS

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

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

Table 3-2

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

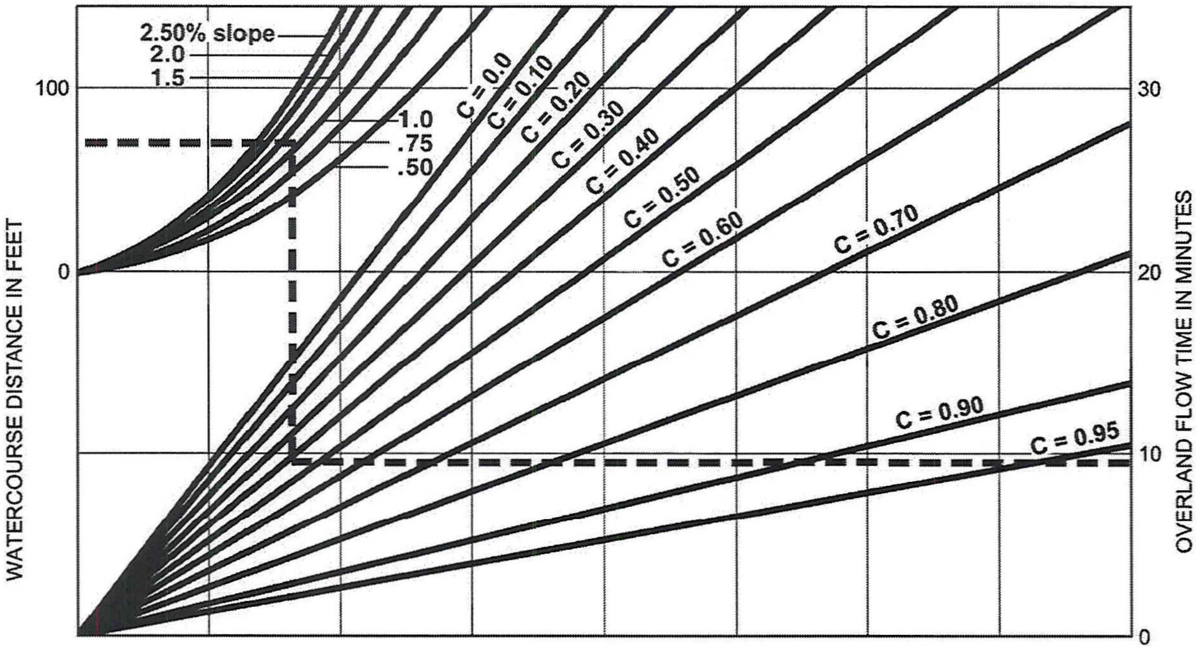
Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0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

*See Table 3-1 for more detailed description

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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



EXAMPLE:

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

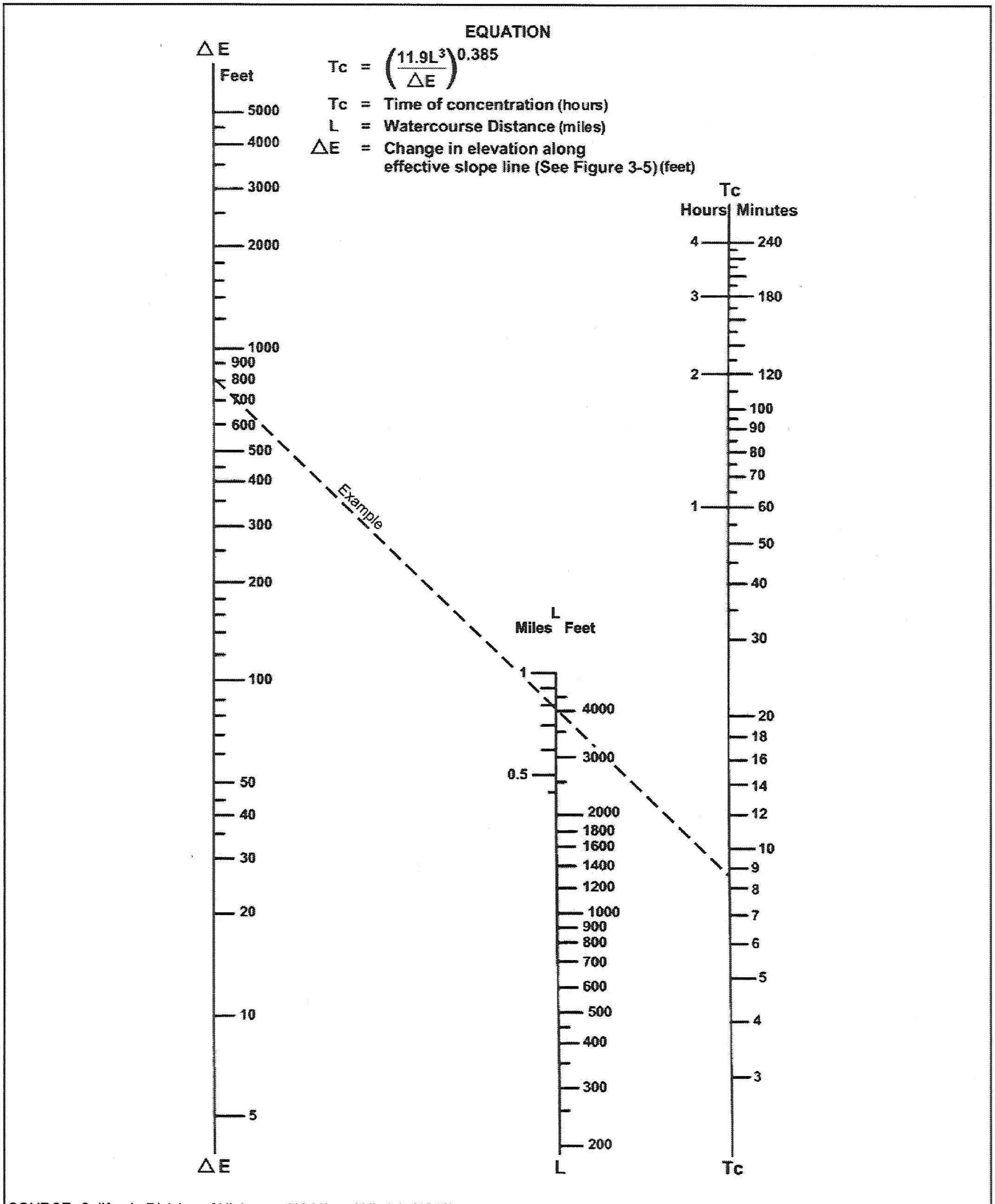
$$T = \frac{1.8\,(1.1\text{-}C)\sqrt{D}}{\sqrt[3]{s}}$$

OURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

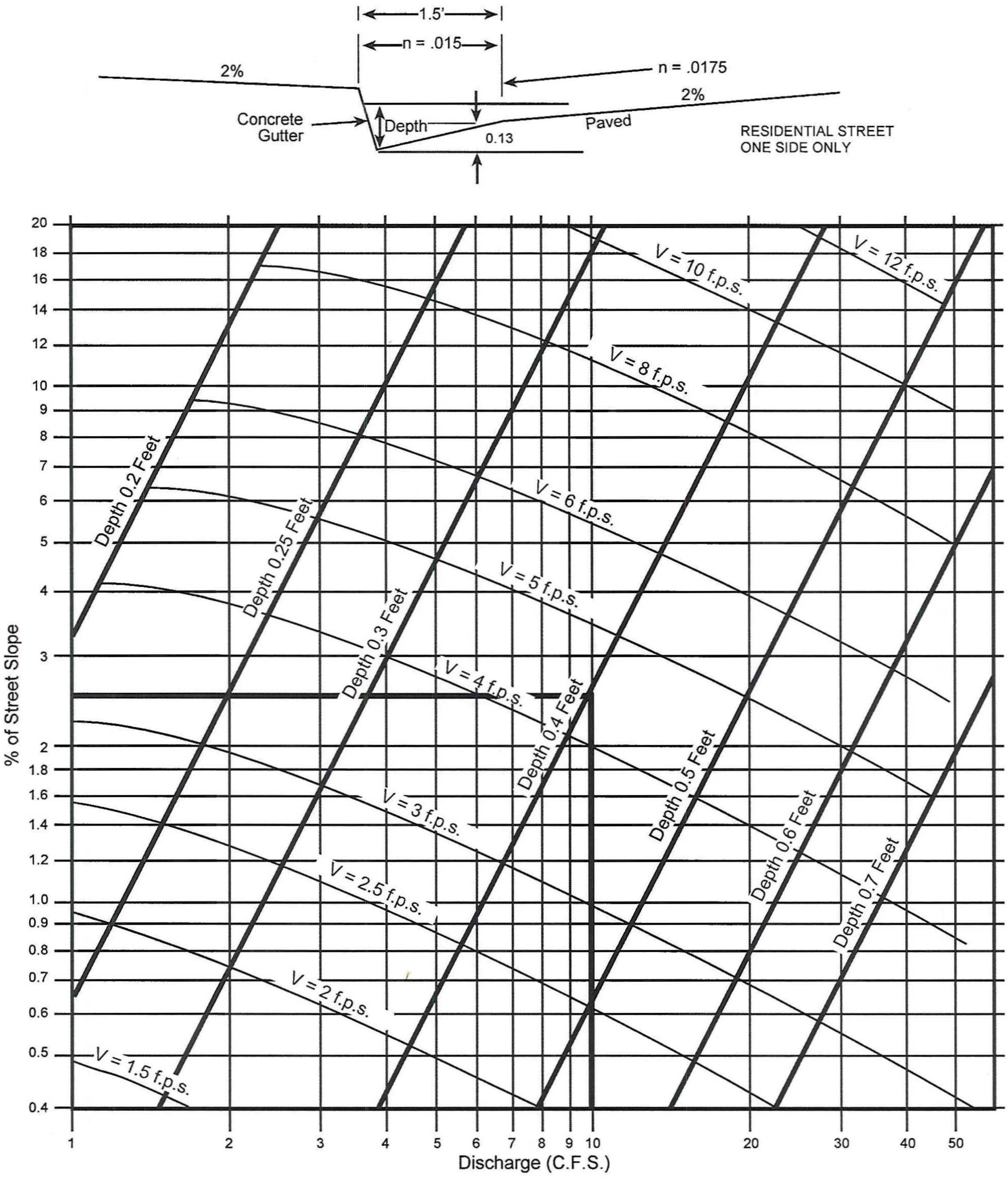


SOURCE: California Division of Highways (1941) and Kirpich (1940)

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

FIGURE

3-4

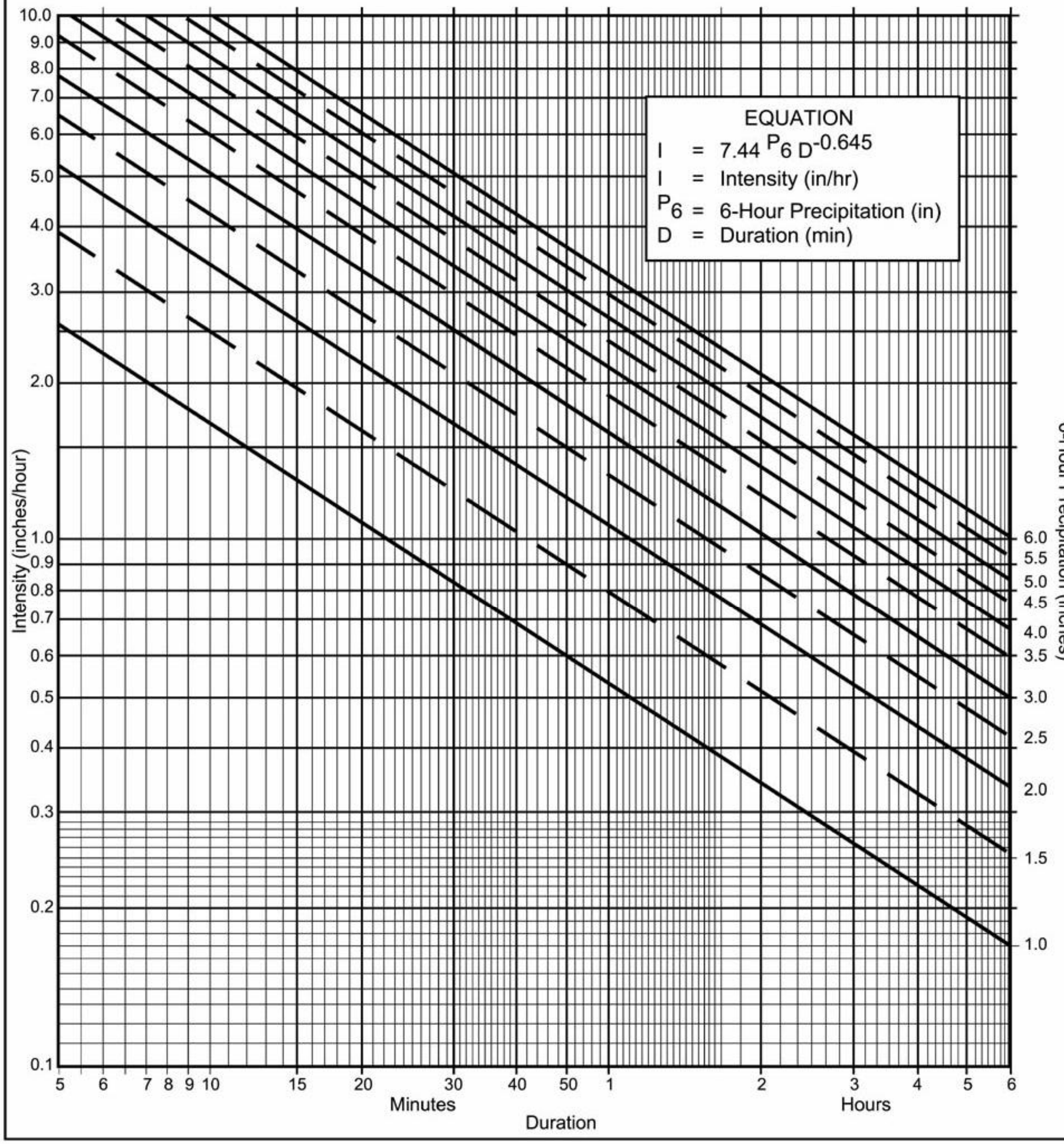


EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

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

Gutter and Roadway Discharge - Velocity Chart

FIGURE **3-6**



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 50 year

(b) P_6 = 2.1 in., P_{24} = 4.5, $\frac{P_6}{P_{24}}$ = 47 %(2)

(c) Adjusted $P_6^{(2)}$ = 2.1 in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

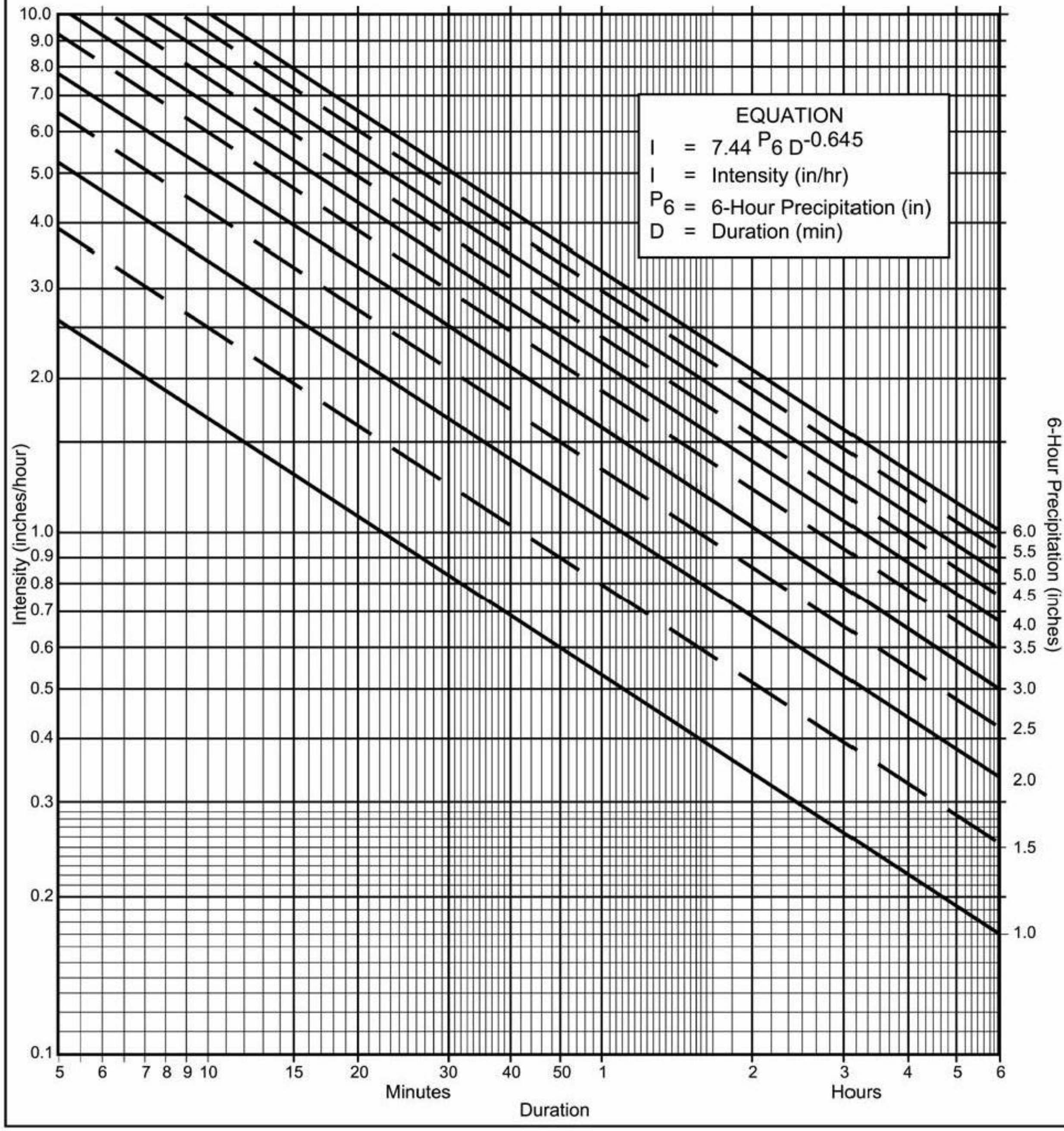
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.3 in., P_{24} = 4.5 , $\frac{P_6}{P_{24}}$ = 51 %[(2)]

(c) Adjusted $P_6^{(2)}$ = 2.3 in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

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

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

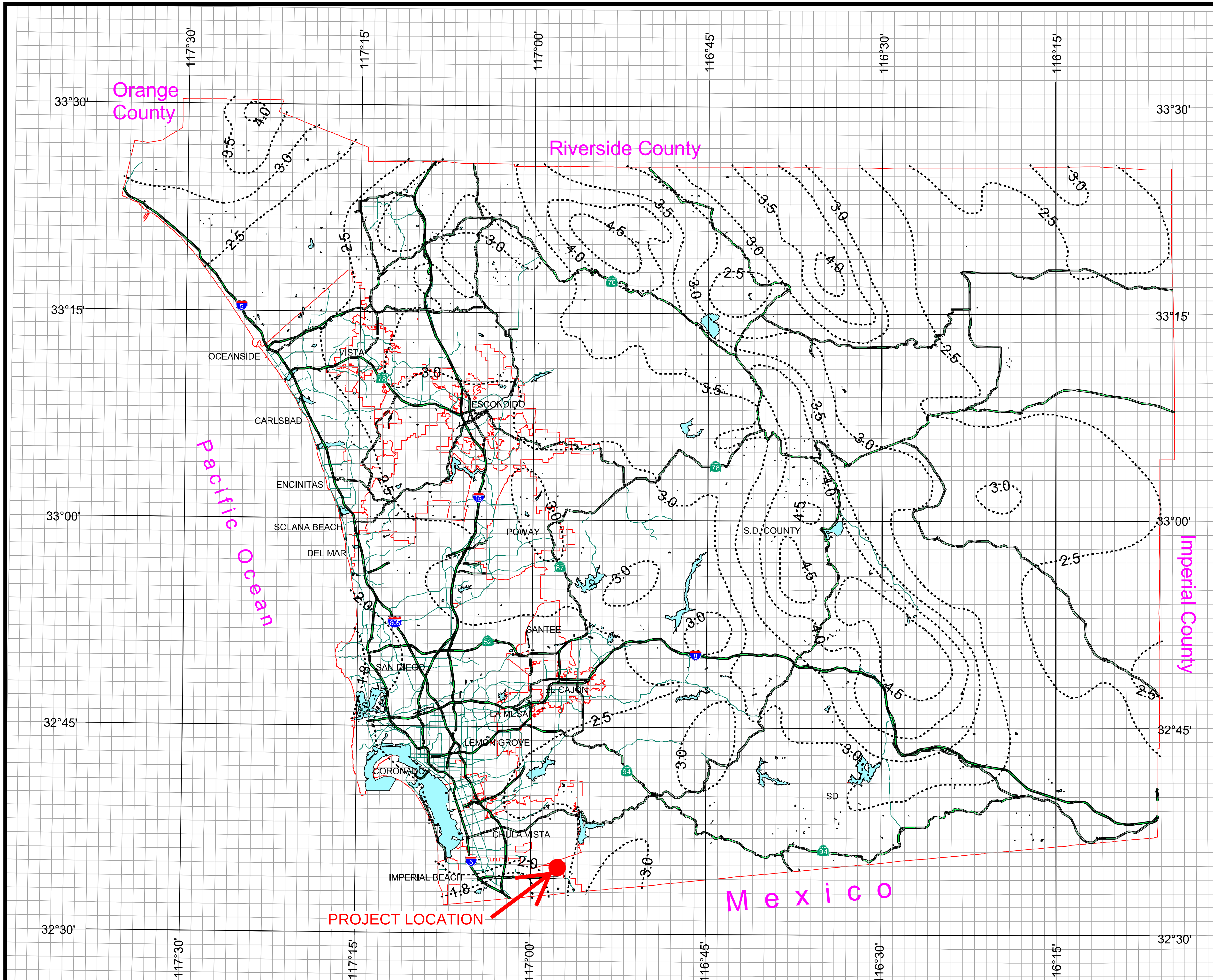
Intensity-Duration Design Chart - Template

FIGURE

3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials



50 Year Rainfall Event - 6 Hours

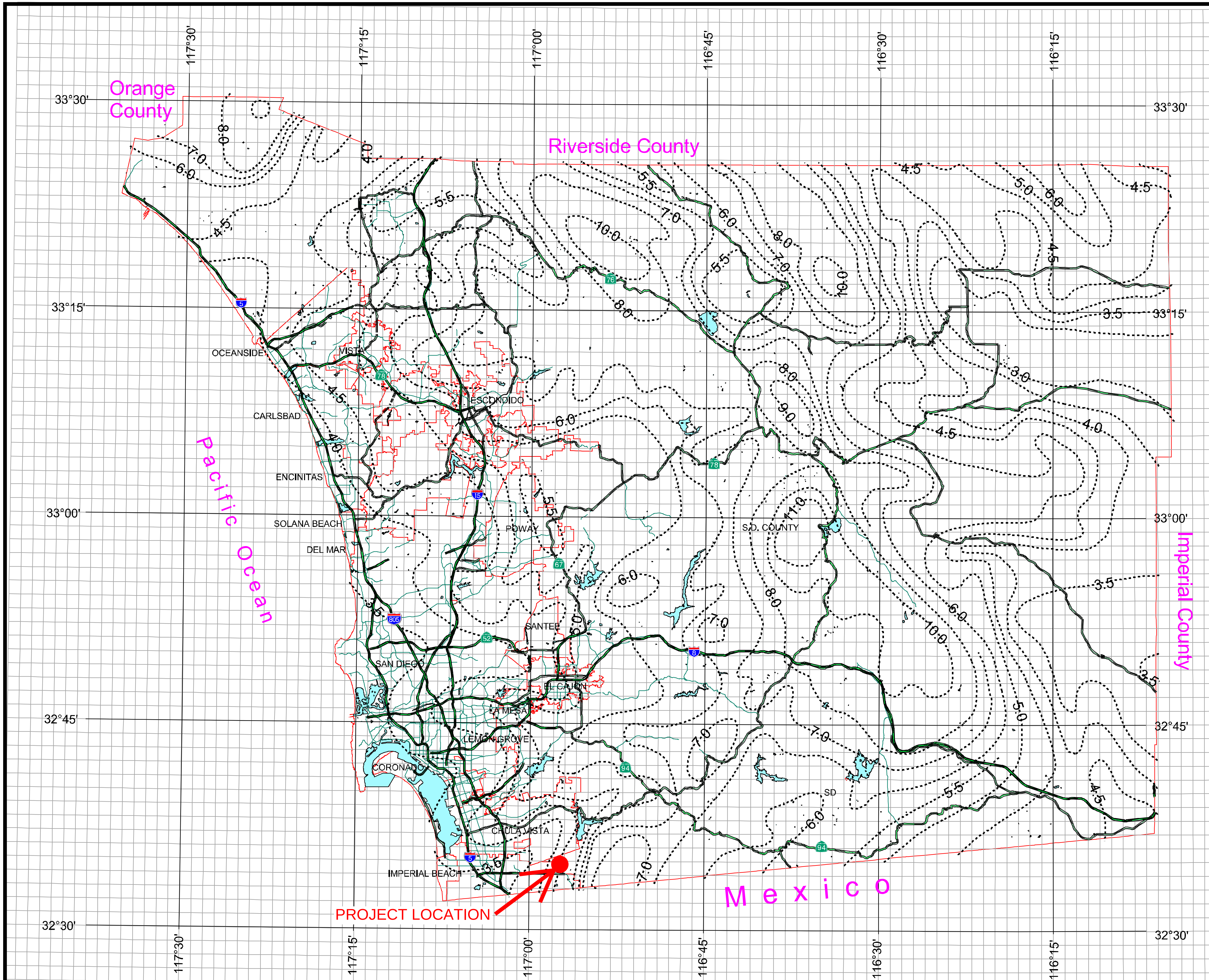
....	Isopluvial (inches)

P6 = 2.1 INCHES

DPW GIS Department of Public Works Geographic Information Services

SanGIS We Have San Diego Covered!

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 4.5 INCHES

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

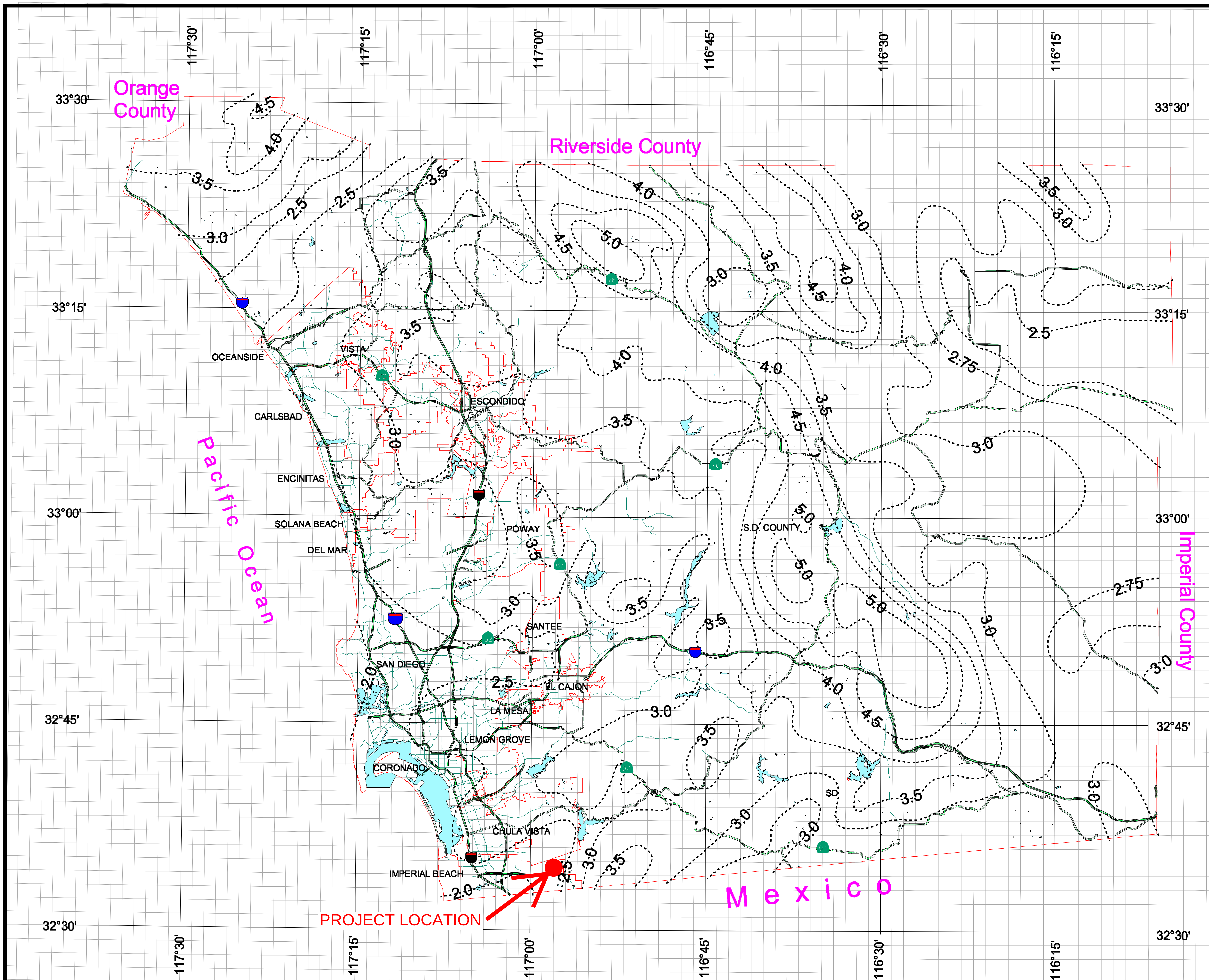
N E S W

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

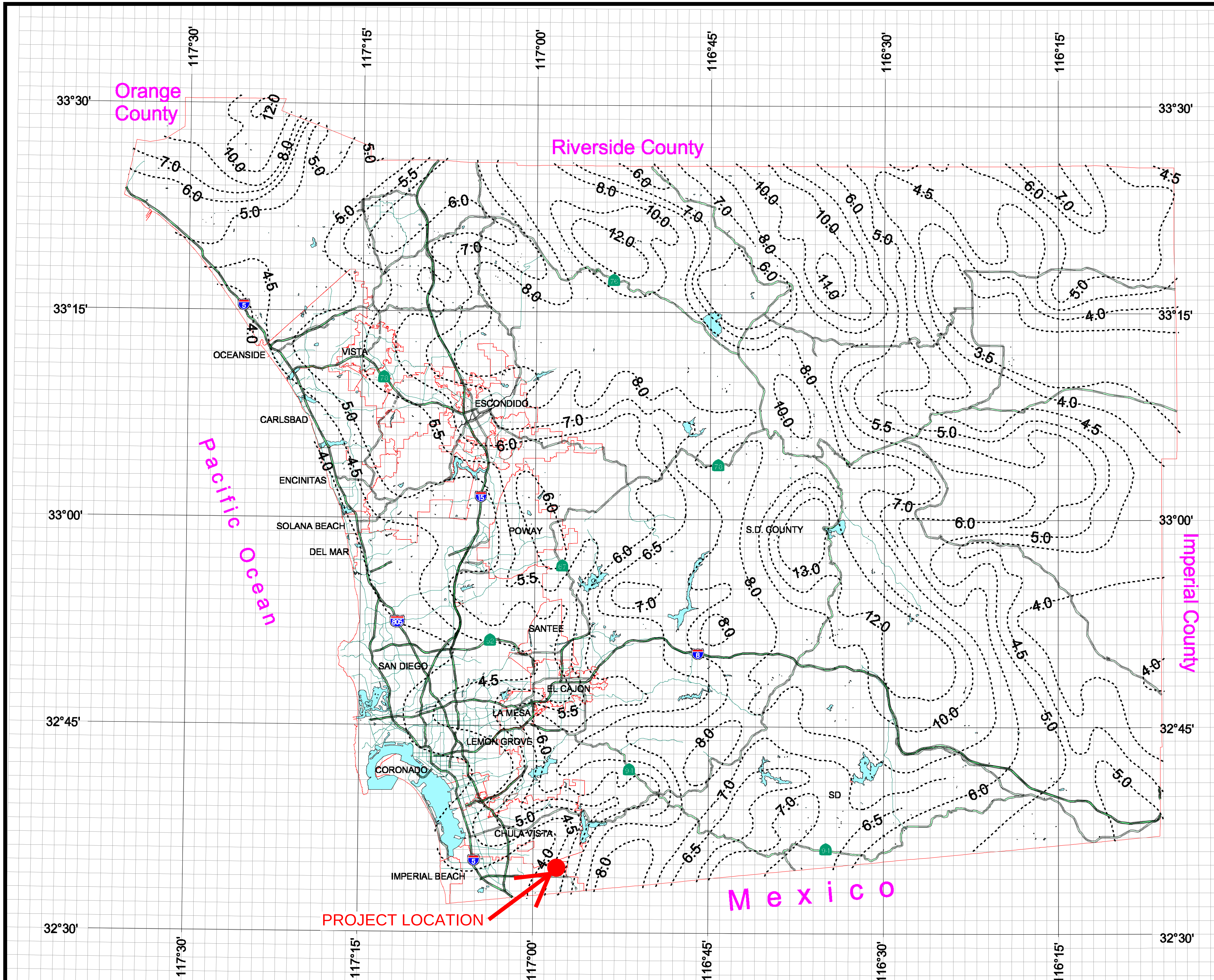
100 Year Rainfall Event - 6 Hours



Isopluvial (inches)

P6 = 2.3 INCHES

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 4.5 INCHES

Department of Public Works Geographic Information Services

We Have San Diego Covered!

N S W E

3 0 3 Miles

APPENDIX D

EXISTING CONDITION HYDROLOGY CALCULATIONS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                            Analysis prepared by:

                                 Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions - Sunroad Otay                                       *
* 100 Year Storm Event                                                     *
* 5-23-2017                                                                *
 **************************************************************************

  FILE NAME: EXIST100.DAT
  TIME/DATE OF STUDY: 09:43 05/23/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.300
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    522.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.380
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.102
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.03
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   8.10
  Tc(MIN.) =   14.12
  SUBAREA AREA(ACRES) =     1.75       SUBAREA RUNOFF(CFS) =    1.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       2.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     550.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.102
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.75   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       3.91
  TC(MIN.) =   14.12

******************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
------------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.380
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.19

******************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.914
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.26
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =  23.83
  Tc(MIN.) =   29.85
  SUBAREA AREA(ACRES) =    10.50       SUBAREA RUNOFF(CFS) =    7.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =       7.10

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.52
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.914
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.50   SUBAREA RUNOFF(CFS) =    7.03
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =      14.14
  TC(MIN.) =   29.85

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.380
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.591
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.16
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.45
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =  12.65
  Tc(MIN.) =   18.67
  SUBAREA AREA(ACRES) =    12.15       SUBAREA RUNOFF(CFS) =   11.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =      11.11
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   1.74
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   18.67
  RAINFALL INTENSITY(INCH/HR) =   2.59
  TOTAL STREAM AREA(ACRES) =    12.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.11

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    523.00
  DOWNSTREAM ELEVATION(FEET) =    522.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.635
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =   800.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.97
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    3.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.38
  STREET FLOW TRAVEL TIME(MIN.) =   7.05   Tc(MIN.) =   14.63
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.032
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.59
  TOTAL AREA(ACRES) =       1.6       PEAK FLOW RATE(CFS) =       1.70

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.48
  FLOW VELOCITY(FEET/SEC.) =  2.03   DEPTH*VELOCITY(FT*FT/SEC.) =   0.48
```

```
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     850.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    402.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00
 REPRESENTATIVE CHANNEL SLOPE =  0.0200
 CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 CHANNEL FLOW THRU SUBAREA(CFS) =       1.70
 FLOW VELOCITY(FEET/SEC.) =   1.11   FLOW DEPTH(FEET) =   0.07
 TRAVEL TIME(MIN.) =  10.53   Tc(MIN.) =   25.16
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   25.16
 RAINFALL INTENSITY(INCH/HR) =   2.14
 TOTAL STREAM AREA(ACRES) =     1.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.70

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       11.11    18.67        2.591         12.25
    2        1.70    25.16        2.137          1.60

 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       12.37    18.67       2.591
    2       10.86    25.16       2.137

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      12.37   Tc(MIN.) =   18.67
 TOTAL AREA(ACRES) =       13.9
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    301.50 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00
 REPRESENTATIVE CHANNEL SLOPE =  0.0100
 CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.111
 *USER SPECIFIED(GLOBAL):
 RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.59
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.91
 AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   6.97
 Tc(MIN.) =   25.64
 SUBAREA AREA(ACRES) =     6.00       SUBAREA RUNOFF(CFS) =    4.43
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =       19.9         PEAK FLOW RATE(CFS) =      14.67
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.92
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.111
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    6.15   SUBAREA RUNOFF(CFS) =    4.54
  TOTAL AREA(ACRES) =       26.0   TOTAL RUNOFF(CFS) =      19.21
  TC(MIN.) =   25.64

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    511.00
  DOWNSTREAM ELEVATION(FEET) =    510.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.635
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =  1550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.49
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.45
  STREET FLOW TRAVEL TIME(MIN.) =  12.92   Tc(MIN.) =   20.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.439
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    3.00      SUBAREA RUNOFF(CFS) =    2.56
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =       2.65

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.89
  FLOW VELOCITY(FEET/SEC.) =  2.23   DEPTH*VELOCITY(FT*FT/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1600.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =     20.49
  PEAK FLOW RATE(CFS)   =       2.65
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions - Sunroad Otay Plaza                                 *
* 50 Year Storm Event                                                      *
* 5-23-2017 - NAR                                                          *
 **************************************************************************

  FILE NAME: EXIST50.DAT
  TIME/DATE OF STUDY: 09:44 05/23/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.100
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    522.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.912
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.838
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.03
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   8.07
  Tc(MIN.) =   14.08
  SUBAREA AREA(ACRES) =     1.75       SUBAREA RUNOFF(CFS) =    1.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       1.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.838
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.75   SUBAREA RUNOFF(CFS) =    1.74
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       3.58
  TC(MIN.) =   14.08

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.912
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.710
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.21
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =  24.85
  Tc(MIN.) =   30.86
  SUBAREA AREA(ACRES) =    10.50       SUBAREA RUNOFF(CFS) =    6.29
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =       6.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.710
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.50   SUBAREA RUNOFF(CFS) =    6.29
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =      12.63
  TC(MIN.) =   30.86

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.912
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.328
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.40
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =  13.12
  Tc(MIN.) =   19.13
  SUBAREA AREA(ACRES) =    12.15       SUBAREA RUNOFF(CFS) =    9.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =       9.98
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   1.68
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   19.13
  RAINFALL INTENSITY(INCH/HR) =   2.33
  TOTAL STREAM AREA(ACRES) =    12.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.98

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    523.00
  DOWNSTREAM ELEVATION(FEET) =    522.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.232
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =   800.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    3.44
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.86
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.36
  STREET FLOW TRAVEL TIME(MIN.) =   7.16   Tc(MIN.) =   14.74
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.755
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.45
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       1.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.13
  FLOW VELOCITY(FEET/SEC.) =  2.02   DEPTH*VELOCITY(FT*FT/SEC.) =   0.46
```

```
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.54
  FLOW VELOCITY(FEET/SEC.) =   1.10   FLOW DEPTH(FEET) =   0.07
  TRAVEL TIME(MIN.) =  10.61   Tc(MIN.) =   25.34
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   25.34
  RAINFALL INTENSITY(INCH/HR) =   1.94
  TOTAL STREAM AREA(ACRES) =     1.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         9.98    19.13        2.328         12.25
     2         1.54    25.34        1.942          1.60

  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        11.15    19.13       2.328
     2         9.87    25.34       1.942

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.15   Tc(MIN.) =   19.13
  TOTAL AREA(ACRES) =       13.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.895
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.85
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   7.20
  Tc(MIN.) =   26.33
  SUBAREA AREA(ACRES) =     6.00       SUBAREA RUNOFF(CFS) =    3.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       19.9         PEAK FLOW RATE(CFS) =      13.17
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   1.86
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.895
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    6.15   SUBAREA RUNOFF(CFS) =    4.08
  TOTAL AREA(ACRES) =       26.0   TOTAL RUNOFF(CFS) =      17.25
  TC(MIN.) =   26.33

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    511.00
  DOWNSTREAM ELEVATION(FEET) =    510.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.232
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =  1550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.36
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.75
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.44
  STREET FLOW TRAVEL TIME(MIN.) =  13.11   Tc(MIN.) =   20.68
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.214
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    3.00      SUBAREA RUNOFF(CFS) =    2.33
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       2.40

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.63
  FLOW VELOCITY(FEET/SEC.) =  2.16   DEPTH*VELOCITY(FT*FT/SEC.) =   0.56
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1600.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =     20.68
  PEAK FLOW RATE(CFS)   =       2.40
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                            Analysis prepared by:

                                 Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions - Sunroad Otay Plaza                                 *
* 25 Year Storm Event                                                      *
* 5-23-2017 - NAR                                                          *
 **************************************************************************

  FILE NAME: EXIST25.DAT
  TIME/DATE OF STUDY: 09:48 05/23/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  25.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    522.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.210
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.433
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.03
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   8.06
  Tc(MIN.) =   14.07
  SUBAREA AREA(ACRES) =     1.75       SUBAREA RUNOFF(CFS) =    1.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       1.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.433
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.75   SUBAREA RUNOFF(CFS) =    1.49
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       3.07
  TC(MIN.) =   14.07

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.210
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.425
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.14
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =  26.23
  Tc(MIN.) =   32.24
  SUBAREA AREA(ACRES) =    10.50       SUBAREA RUNOFF(CFS) =    5.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =       5.29

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.425
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.50   SUBAREA RUNOFF(CFS) =    5.24
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =      10.53
  TC(MIN.) =   32.24

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.210
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.937
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.31
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =  14.02
  Tc(MIN.) =   20.04
  SUBAREA AREA(ACRES) =    12.15       SUBAREA RUNOFF(CFS) =    8.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =       8.31
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   1.58
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   20.04
  RAINFALL INTENSITY(INCH/HR) =   1.94
  TOTAL STREAM AREA(ACRES) =    12.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.31

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    523.00
  DOWNSTREAM ELEVATION(FEET) =    522.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.627
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =   800.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.18
    HALFSTREET FLOOD WIDTH(FEET) =    2.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.35
  STREET FLOW TRAVEL TIME(MIN.) =   7.04   Tc(MIN.) =   14.62
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.374
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.25
  TOTAL AREA(ACRES) =       1.6       PEAK FLOW RATE(CFS) =       1.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.70
  FLOW VELOCITY(FEET/SEC.) =  1.96   DEPTH*VELOCITY(FT*FT/SEC.) =   0.43
```

```
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.33
  FLOW VELOCITY(FEET/SEC.) =   1.08   FLOW DEPTH(FEET) =   0.06
  TRAVEL TIME(MIN.) =  10.81   Tc(MIN.) =   25.43
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   25.43
  RAINFALL INTENSITY(INCH/HR) =   1.66
  TOTAL STREAM AREA(ACRES) =     1.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.31    20.04        1.937         12.25
     2        1.33    25.43        1.661          1.60

  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        9.35    20.04       1.937
     2        8.45    25.43       1.661

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.35   Tc(MIN.) =   20.04
  TOTAL AREA(ACRES) =       13.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.577
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.77
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   7.53
  Tc(MIN.) =   27.57
  SUBAREA AREA(ACRES) =     6.00       SUBAREA RUNOFF(CFS) =    3.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       19.9         PEAK FLOW RATE(CFS) =      10.95
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.577
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    6.15   SUBAREA RUNOFF(CFS) =    3.39
  TOTAL AREA(ACRES) =       26.0   TOTAL RUNOFF(CFS) =      14.35
  TC(MIN.) =   27.57

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    511.00
  DOWNSTREAM ELEVATION(FEET) =    510.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.627
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =  1550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.15
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    4.26
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.41
  STREET FLOW TRAVEL TIME(MIN.) =  13.43   Tc(MIN.) =   21.01
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.879
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    3.00      SUBAREA RUNOFF(CFS) =    1.97
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       2.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.01
  FLOW VELOCITY(FEET/SEC.) =  2.13   DEPTH*VELOCITY(FT*FT/SEC.) =   0.52
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1600.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =     21.01
  PEAK FLOW RATE(CFS)   =       2.04
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                            Analysis prepared by:

                                 Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions - Sunroad Otay Plaza                                 *
* 10 Year Storm Event                                                      *
* 5-23-2017 - NAR                                                          *
 **************************************************************************

  FILE NAME: EXIST10.DAT
  TIME/DATE OF STUDY: 09:49 05/23/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    522.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.742
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.086
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   8.86
  Tc(MIN.) =   14.88
  SUBAREA AREA(ACRES) =     1.75       SUBAREA RUNOFF(CFS) =    1.28
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       1.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.086
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.75   SUBAREA RUNOFF(CFS) =    1.28
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       2.63
  TC(MIN.) =   14.88

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.742
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.223
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.07
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =  28.05
  Tc(MIN.) =   34.06
  SUBAREA AREA(ACRES) =    10.50       SUBAREA RUNOFF(CFS) =    4.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =       4.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   1.32
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.223
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.50   SUBAREA RUNOFF(CFS) =    4.49
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =       9.03
  TC(MIN.) =   34.06

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.742
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.698
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.27
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =  14.46
  Tc(MIN.) =   20.48
  SUBAREA AREA(ACRES) =    12.15       SUBAREA RUNOFF(CFS) =    7.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =       7.28
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.51
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   20.48
  RAINFALL INTENSITY(INCH/HR) =   1.70
  TOTAL STREAM AREA(ACRES) =    12.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.28

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    523.00
  DOWNSTREAM ELEVATION(FEET) =    522.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.224
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =   800.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.66
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.17
    HALFSTREET FLOOD WIDTH(FEET) =    2.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.34
  STREET FLOW TRAVEL TIME(MIN.) =   6.85   Tc(MIN.) =   14.42
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.129
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.12
  TOTAL AREA(ACRES) =        1.6       PEAK FLOW RATE(CFS) =       1.19

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   4.37
  FLOW VELOCITY(FEET/SEC.) =  1.93   DEPTH*VELOCITY(FT*FT/SEC.) =   0.41
```

```
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.19
  FLOW VELOCITY(FEET/SEC.) =   1.00   FLOW DEPTH(FEET) =   0.06
  TRAVEL TIME(MIN.) =  11.63   Tc(MIN.) =   26.06
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   26.06
  RAINFALL INTENSITY(INCH/HR) =   1.45
  TOTAL STREAM AREA(ACRES) =     1.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.19

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        7.28    20.48        1.698         12.25
     2        1.19    26.06        1.454          1.60

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        8.22    20.48       1.698
     2        7.42    26.06       1.454

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.22   Tc(MIN.) =   20.48
  TOTAL AREA(ACRES) =       13.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    301.50 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.374
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.68
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   7.96
  Tc(MIN.) =   28.43
  SUBAREA AREA(ACRES) =     6.00       SUBAREA RUNOFF(CFS) =    2.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       19.9         PEAK FLOW RATE(CFS) =       9.55
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   1.67
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.374
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    6.15   SUBAREA RUNOFF(CFS) =    2.96
  TOTAL AREA(ACRES) =       26.0   TOTAL RUNOFF(CFS) =      12.50
  TC(MIN.) =   28.43

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    511.00
  DOWNSTREAM ELEVATION(FEET) =    510.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.224
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0200
  STREET LENGTH(FEET) =  1550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  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) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    3.88
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.38
  STREET FLOW TRAVEL TIME(MIN.) =  13.68   Tc(MIN.) =   21.26
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.658
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  SUBAREA AREA(ACRES) =    3.00      SUBAREA RUNOFF(CFS) =    1.74
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       1.80

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.66
  FLOW VELOCITY(FEET/SEC.) =  2.05   DEPTH*VELOCITY(FT*FT/SEC.) =   0.49
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1600.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =     21.26
  PEAK FLOW RATE(CFS)   =       1.80
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions - Sunroad Otay Plaza                                 *
* 5 Year Storm Event                                                       *
* 5-23-2017 - NAR                                                          *
 **************************************************************************

  FILE NAME: EXIST5.DAT
  TIME/DATE OF STUDY: 09:50 05/23/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   5.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.400
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    522.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.727
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =  10.20
  Tc(MIN.) =   16.21
  SUBAREA AREA(ACRES) =     1.75       SUBAREA RUNOFF(CFS) =    1.06
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       1.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.05
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.727
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.75   SUBAREA RUNOFF(CFS) =    1.06
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       2.18
  TC(MIN.) =   16.21

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.059
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.05
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =  28.59
  Tc(MIN.) =   34.61
  SUBAREA AREA(ACRES) =    10.50       SUBAREA RUNOFF(CFS) =    3.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =       3.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   1.23
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.059
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.50   SUBAREA RUNOFF(CFS) =    3.89
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =       7.82
  TC(MIN.) =   34.61

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    520.00
  DOWNSTREAM ELEVATION(FEET) =    518.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.014
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.436
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.18
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =  15.58
  Tc(MIN.) =   21.60
  SUBAREA AREA(ACRES) =    12.15       SUBAREA RUNOFF(CFS) =    6.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =       6.15
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =   21.60
  RAINFALL INTENSITY(INCH/HR) =   1.44
  TOTAL STREAM AREA(ACRES) =    12.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.15

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    523.00
  DOWNSTREAM ELEVATION(FEET) =    522.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.821
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  61
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
              Routing Algorithm is UNAVAILABLE.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    301.50 IS CODE =  51
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
              Routing Algorithm is UNAVAILABLE.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    301.50 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.) =    7.58
  RAINFALL INTENSITY(INCH/HR) =   2.82
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.10

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.15    21.60        1.436         12.25
      2        0.10     7.58        2.821          0.10

  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        2.26     7.58       2.821
     2        6.21    21.60       1.436

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.21   Tc(MIN.) =   21.60
  TOTAL AREA(ACRES) =       12.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    301.50 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.50 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00
  REPRESENTATIVE CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.154
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.42
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.54
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   8.68
  Tc(MIN.) =   30.28
  SUBAREA AREA(ACRES) =     6.00       SUBAREA RUNOFF(CFS) =    2.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       18.4         PEAK FLOW RATE(CFS) =       7.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.53
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1950.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.154
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    6.15   SUBAREA RUNOFF(CFS) =    2.48
  TOTAL AREA(ACRES) =       24.5   TOTAL RUNOFF(CFS) =       9.90
  TC(MIN.) =   30.28

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    511.00
  DOWNSTREAM ELEVATION(FEET) =    510.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.577
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.821
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  61
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
              Routing Algorithm is UNAVAILABLE.
============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      7.58
  PEAK FLOW RATE(CFS)   =       0.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX E

PROPOSED CONDITION HYDROLOGY CALCULATIONS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* SUNROAD OTAY PLAZA                                                        *
* 100 YEAR STORM EVENT                                                      *
* 2017.05.22                                                                *
 **************************************************************************

  FILE NAME: OSR100.DAT
  TIME/DATE OF STUDY: 10:09 05/22/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.300
  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   45.0     40.0    0.020/0.020/0.050   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   125.00
  UPSTREAM ELEVATION(FEET) =    523.70
  DOWNSTREAM ELEVATION(FEET) =    503.90
  ELEVATION DIFFERENCE(FEET) =     19.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.922
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    503.90  DOWNSTREAM(FEET) =    502.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   282.00   CHANNEL SLOPE =  0.0039
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.953
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.96
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   4.91
  Tc(MIN.) =    6.84
  SUBAREA AREA(ACRES) =     0.42       SUBAREA RUNOFF(CFS) =    1.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.24

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.16
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.953
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.81
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       4.05
  TC(MIN.) =    6.84

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    502.80  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1373.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.730
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.21
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =  10.38
  Tc(MIN.) =   17.21
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    4.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       7.22

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.730
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.10   SUBAREA RUNOFF(CFS) =    4.99
  TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =      12.21
  TC(MIN.) =   17.21

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   17.21
  RAINFALL INTENSITY(INCH/HR) =   2.73
  TOTAL STREAM AREA(ACRES) =     5.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.21

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  UPSTREAM ELEVATION(FEET) =    508.60
  DOWNSTREAM ELEVATION(FEET) =    495.40
  ELEVATION DIFFERENCE(FEET) =     13.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.932
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    99.56
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   827.00   CHANNEL SLOPE =  0.0053
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.568
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.09
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.46
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   9.43
  Tc(MIN.) =   11.37
  SUBAREA AREA(ACRES) =     1.55       SUBAREA RUNOFF(CFS) =    4.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       5.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.71
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     40.00 =     962.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.568
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    4.78
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       9.90
  TC(MIN.) =   11.37

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   11.37
  RAINFALL INTENSITY(INCH/HR) =   3.57
  TOTAL STREAM AREA(ACRES) =     3.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.90

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =    506.40
  DOWNSTREAM ELEVATION(FEET) =    505.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.10  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0085
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.659
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.89
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =  14.73
  Tc(MIN.) =   17.94
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    7.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       7.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   2.27
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.659
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.09   SUBAREA RUNOFF(CFS) =    7.15
  TOTAL AREA(ACRES) =        6.3   TOTAL RUNOFF(CFS) =      14.53
  TC(MIN.) =   17.94

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   17.94
  RAINFALL INTENSITY(INCH/HR) =   2.66
  TOTAL STREAM AREA(ACRES) =     6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.53

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.21    17.21        2.730          5.14
      2        9.90    11.37        3.568          3.19
      3       14.53    17.94        2.659          6.28

  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       27.17    11.37       3.568
      2       33.73    17.21       2.730
      3       33.79    17.94       2.659

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.79   Tc(MIN.) =   17.94
  TOTAL AREA(ACRES) =       14.6
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   536.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.536
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.54
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   1.37
  Tc(MIN.) =   19.30
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    2.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =       15.5         PEAK FLOW RATE(CFS) =      34.30
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.34   FLOW VELOCITY(FEET/SEC.) =   6.56
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.536
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    2.07
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      36.38
  TC(MIN.) =   19.30

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  UPSTREAM ELEVATION(FEET) =    505.30
  DOWNSTREAM ELEVATION(FEET) =    500.00
  ELEVATION DIFFERENCE(FEET) =      5.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.08
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   743.00   CHANNEL SLOPE =  0.0054
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.495
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.37
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   9.04
  Tc(MIN.) =   11.74
  SUBAREA AREA(ACRES) =     3.95       SUBAREA RUNOFF(CFS) =   12.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =      12.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.72
```

```
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     983.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.495
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.96   SUBAREA RUNOFF(CFS) =   12.04
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      24.36
  TC(MIN.) =   11.74

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =  1133.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.50
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.36
  PIPE TRAVEL TIME(MIN.) =   2.22    Tc(MIN.) =   13.96
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       24.36    13.96       3.125        8.01
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       36.38    19.30       2.536       16.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      50.66      13.96        3.125
      2      56.14      19.30        2.536

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      56.14   Tc(MIN.) =   19.30
  TOTAL AREA(ACRES) =       24.5

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   493.00
  UPSTREAM ELEVATION(FEET) =    498.08
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      9.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.794
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.704
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.77
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   7.93
  Tc(MIN.) =   10.72
  SUBAREA AREA(ACRES) =     3.75       SUBAREA RUNOFF(CFS) =   12.08
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =      12.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.16
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.704
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.75   SUBAREA RUNOFF(CFS) =   12.08
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      24.49
  TC(MIN.) =   10.72

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   10.72
  RAINFALL INTENSITY(INCH/HR) =   3.70
```

```
  TOTAL STREAM AREA(ACRES) =     7.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.49

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   188.00
  UPSTREAM ELEVATION(FEET) =    492.00
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.877
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.96
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.944
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.13
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =  12.44
  Tc(MIN.) =   15.32
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    3.41
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    100.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.944
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.33   SUBAREA RUNOFF(CFS) =    3.41
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       7.07
  TC(MIN.) =   15.32

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   15.32
  RAINFALL INTENSITY(INCH/HR) =   2.94
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.49    10.72        3.704          7.60
      2        7.07    15.32        2.944          2.76

  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       29.44    10.72       3.704
      2       26.53    15.32       2.944

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.44   Tc(MIN.) =   10.72
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       29.44    10.72       3.704       10.36
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       56.14    19.30       2.536       24.50
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      60.64      10.72        3.704
      2      76.29      19.30        2.536

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      76.29   Tc(MIN.) =   19.30
  TOTAL AREA(ACRES) =       34.9

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =    492.10
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    488.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0381
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.78
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.26
  Tc(MIN.) =    4.31
  SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    5.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       6.33

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.61
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.11   SUBAREA RUNOFF(CFS) =    5.85
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      12.18
  TC(MIN.) =    4.31

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    4.31
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     2.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.18
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     91.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   360.00
  UPSTREAM ELEVATION(FEET) =    488.50
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.432
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.265
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.85
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   2.79
  Tc(MIN.) =    6.22
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    3.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.38
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.265
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    3.30
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       7.05
  TC(MIN.) =    6.22

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    6.22
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.05

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       12.18     4.31        6.060          2.31
     2        7.05     6.22        5.265          1.54

  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       17.07     4.31       6.060
     2       17.64     6.22       5.265

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.64   Tc(MIN.) =    6.22
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       17.64     6.22       5.265        3.85
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       76.29    19.30       2.536       34.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      42.21       6.22        5.265
     2      84.79      19.30        2.536

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      84.79   Tc(MIN.) =   19.30
  TOTAL AREA(ACRES) =       38.7

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    527.00
  DOWNSTREAM ELEVATION(FEET) =    526.00
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.53
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  526.00  DOWNSTREAM ELEVATION(FEET) =  509.00
 STREET LENGTH(FEET) =   975.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 45.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.58
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    8.95
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.81
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
 STREET FLOW TRAVEL TIME(MIN.) =   5.79   Tc(MIN.) =    8.11
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.435
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    4.01
 TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       4.40

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.29
 FLOW VELOCITY(FEET/SEC.) =  3.16   DEPTH*VELOCITY(FT*FT/SEC.) =   1.11
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1025.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.435
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    4.05
 TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       8.45
 TC(MIN.) =    8.11

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   490.25  DOWNSTREAM(FEET) =   485.80
 FLOW LENGTH(FEET) =   871.54   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.06
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.45
```

```
 PIPE TRAVEL TIME(MIN.) =   2.87    Tc(MIN.) =   10.99
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =   10.99
 RAINFALL INTENSITY(INCH/HR) =   3.65
 TOTAL STREAM AREA(ACRES) =     2.19
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.45

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    507.00
 DOWNSTREAM ELEVATION(FEET) =    505.00
 ELEVATION DIFFERENCE(FEET) =      2.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.749
 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) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.53
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  505.00  DOWNSTREAM ELEVATION(FEET) =  487.00
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 45.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.52
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.29
   HALFSTREET FLOOD WIDTH(FEET) =    8.16
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.21
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
 STREET FLOW TRAVEL TIME(MIN.) =   3.80   Tc(MIN.) =    6.54
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.094
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 SUBAREA AREA(ACRES) =    0.89      SUBAREA RUNOFF(CFS) =    3.94
 TOTAL AREA(ACRES) =       1.0        PEAK FLOW RATE(CFS) =      4.39
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.51
  FLOW VELOCITY(FEET/SEC.) =  3.59   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     830.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.094
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    3.99
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       8.38
  TC(MIN.) =    6.54

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =    6.54
  RAINFALL INTENSITY(INCH/HR) =   5.09
  TOTAL STREAM AREA(ACRES) =     1.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.38

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.45    10.99        3.647          2.19
     2        8.38     6.54        5.094          1.89

  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       13.41     6.54       5.094
     2       14.45    10.99       3.647

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.45   Tc(MIN.) =   10.99
  TOTAL AREA(ACRES) =        4.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.80  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.77
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.45
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =   12.52
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    487.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.00  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.55
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.52
  STREET FLOW TRAVEL TIME(MIN.) =   5.20   Tc(MIN.) =    7.53
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.654
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.31

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.35
  FLOW VELOCITY(FEET/SEC.) =  1.94   DEPTH*VELOCITY(FT*FT/SEC.) =   0.65
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.654
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       4.21
```

```
  TC(MIN.) =    7.53

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    7.53
  RAINFALL INTENSITY(INCH/HR) =   4.65
  TOTAL STREAM AREA(ACRES) =     1.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.21

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  UPSTREAM ELEVATION(FEET) =    495.10
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.258
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    58.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.1200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.10
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.25
  Tc(MIN.) =    3.50
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =   11.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =      12.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   6.37
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.19   SUBAREA RUNOFF(CFS) =   11.55
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      23.57
  TC(MIN.) =    3.50

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    3.50
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     4.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.57

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.21     7.53        4.654          1.04
      2       23.57     3.50        6.060          4.47

  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       25.53     3.50       6.060
      2       22.31     7.53       4.654

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.53   Tc(MIN.) =    3.50
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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       25.53     3.50       6.060        5.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       14.45    12.52       3.353        4.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      29.57       3.50        6.060
      2      28.57      12.52        3.353

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.57   Tc(MIN.) =    3.50
  TOTAL AREA(ACRES) =        9.6

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =    494.10
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.043
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    485.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0500
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.96
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.42
  Tc(MIN.) =    3.46
  SUBAREA AREA(ACRES) =     2.43       SUBAREA RUNOFF(CFS) =   12.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =      13.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.00
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =   12.81
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      26.15
  TC(MIN.) =    3.46
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      3.46
  PEAK FLOW RATE(CFS)   =      26.15
============================================================================
```

==
END OF RATIONAL METHOD ANALYSIS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:





 ************************** DESCRIPTION OF STUDY **************************
* SUNROAD OTAY PLAZA                                                       *
* 50 YEAR - 6 HOUR STORM EVENT                                             *
* 2017.02.10 - ARL                                                         *
 **************************************************************************

  FILE NAME: OSR50-6.DAT
  TIME/DATE OF STUDY: 13:37 02/10/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.100
  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   45.0     40.0    0.020/0.020/0.050   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   125.00
  UPSTREAM ELEVATION(FEET) =    523.70
  DOWNSTREAM ELEVATION(FEET) =    503.90
  ELEVATION DIFFERENCE(FEET) =     19.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.922
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    503.90  DOWNSTREAM(FEET) =    502.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   282.00   CHANNEL SLOPE =  0.0039
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.545
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.97
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   4.86
  Tc(MIN.) =    6.78
  SUBAREA AREA(ACRES) =     0.42       SUBAREA RUNOFF(CFS) =    1.66
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.06

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.545
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.66
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.72
  TC(MIN.) =    6.78

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    502.80  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1373.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.473
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.15
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =  10.64
  Tc(MIN.) =   17.43
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    4.52
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       6.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.18
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.473
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.10   SUBAREA RUNOFF(CFS) =    4.52
  TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =      11.06
  TC(MIN.) =   17.43

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   17.43
  RAINFALL INTENSITY(INCH/HR) =   2.47
  TOTAL STREAM AREA(ACRES) =     5.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.06

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  UPSTREAM ELEVATION(FEET) =    508.60
  DOWNSTREAM ELEVATION(FEET) =    495.40
  ELEVATION DIFFERENCE(FEET) =     13.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.932
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    99.56
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   827.00   CHANNEL SLOPE =  0.0053
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.123
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.35
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =  10.20
  Tc(MIN.) =   12.13
  SUBAREA AREA(ACRES) =     1.55       SUBAREA RUNOFF(CFS) =    4.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       4.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.68
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     40.00 =     962.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.123
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    4.18
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       8.67
  TC(MIN.) =   12.13

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   12.13
  RAINFALL INTENSITY(INCH/HR) =   3.12
  TOTAL STREAM AREA(ACRES) =     3.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.67

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =    506.40
  DOWNSTREAM ELEVATION(FEET) =    505.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.10  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0085
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.393
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.83
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =  15.13
  Tc(MIN.) =   18.34
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    6.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       6.64

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.21
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.393
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.09   SUBAREA RUNOFF(CFS) =    6.43
  TOTAL AREA(ACRES) =        6.3   TOTAL RUNOFF(CFS) =      13.07
  TC(MIN.) =   18.34

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   18.34
  RAINFALL INTENSITY(INCH/HR) =   2.39
  TOTAL STREAM AREA(ACRES) =     6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.06    17.43        2.473          5.14
      2        8.67    12.13        3.123          3.19
      3       13.07    18.34        2.393          6.28

  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       25.02    12.13       3.123
      2       30.34    17.43       2.473
      3       30.41    18.34       2.393

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.41   Tc(MIN.) =   18.34
  TOTAL AREA(ACRES) =       14.6
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   536.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.281
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      31.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.34
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   1.41
  Tc(MIN.) =   19.75
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =       15.5         PEAK FLOW RATE(CFS) =      30.86
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   6.24
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.281
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    1.87
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      32.73
  TC(MIN.) =   19.75

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  UPSTREAM ELEVATION(FEET) =    505.30
  DOWNSTREAM ELEVATION(FEET) =    500.00
  ELEVATION DIFFERENCE(FEET) =      5.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.08
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   743.00   CHANNEL SLOPE =  0.0054
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.179
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   9.11
  Tc(MIN.) =   11.80
  SUBAREA AREA(ACRES) =     3.95       SUBAREA RUNOFF(CFS) =   10.93
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =      11.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.68
```

```
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     983.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.179
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.96   SUBAREA RUNOFF(CFS) =   10.95
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      22.16
  TC(MIN.) =   11.80

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =  1133.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.06
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.16
  PIPE TRAVEL TIME(MIN.) =   2.34    Tc(MIN.) =   14.15
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       22.16    14.15       2.829        8.01
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       32.73    19.75       2.281       16.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      45.60      14.15        2.829
      2      50.59      19.75        2.281

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      50.59   Tc(MIN.) =   19.75
  TOTAL AREA(ACRES) =       24.5

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   493.00
  UPSTREAM ELEVATION(FEET) =    498.08
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      9.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.794
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.266
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.64
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   8.53
  Tc(MIN.) =   11.32
  SUBAREA AREA(ACRES) =     3.75       SUBAREA RUNOFF(CFS) =   10.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =      10.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.07
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.266
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.75   SUBAREA RUNOFF(CFS) =   10.65
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      21.59
  TC(MIN.) =   11.32

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   11.32
  RAINFALL INTENSITY(INCH/HR) =   3.27
```

```
  TOTAL STREAM AREA(ACRES) =     7.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.59

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   188.00
  UPSTREAM ELEVATION(FEET) =    492.00
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.877
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.96
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.792
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.21
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =  11.56
  Tc(MIN.) =   14.44
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    3.23
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.47

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    100.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.792
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.33   SUBAREA RUNOFF(CFS) =    3.23
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       6.70
  TC(MIN.) =   14.44

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   14.44
  RAINFALL INTENSITY(INCH/HR) =   2.79
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.70

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       21.59    11.32        3.266          7.60
      2        6.70    14.44        2.792          2.76

  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       26.85    11.32       3.266
      2       25.17    14.44       2.792

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.85   Tc(MIN.) =   11.32
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       26.85    11.32       3.266       10.36
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       50.59    19.75       2.281       24.50
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      55.86      11.32        3.266
      2      69.35      19.75        2.281

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      69.35   Tc(MIN.) =   19.75
  TOTAL AREA(ACRES) =       34.9

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =    492.10
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    488.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0381
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.63
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.33
  Tc(MIN.) =    4.38
  SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    5.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       5.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.38
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.11   SUBAREA RUNOFF(CFS) =    5.34
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      11.12
  TC(MIN.) =    4.38

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    4.38
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     2.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.12
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     91.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   360.00
  UPSTREAM ELEVATION(FEET) =    488.50
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.432
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.821
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.87
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.76
  Tc(MIN.) =    6.19
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    3.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.24
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.821
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    3.02
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       6.46
  TC(MIN.) =    6.19

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    6.19
  RAINFALL INTENSITY(INCH/HR) =   4.82
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.12     4.38        5.533          2.31
      2        6.46     6.19        4.821          1.54

  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       15.69     4.38       5.533
      2       16.15     6.19       4.821

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.15   Tc(MIN.) =    6.19
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       16.15     6.19       4.821        3.85
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       69.35    19.75       2.281       34.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      37.88       6.19        4.821
      2      76.99      19.75        2.281

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      76.99   Tc(MIN.) =   19.75
  TOTAL AREA(ACRES) =       38.7

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| DONE FOR BASIN 1                                                         |
| ALRIGHT ALRIGHT ALRIGHT                                                  |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    527.00
  DOWNSTREAM ELEVATION(FEET) =    526.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  526.00  DOWNSTREAM ELEVATION(FEET) =  509.00
  STREET LENGTH(FEET) =   975.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.34
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.55
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.75
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   5.91   Tc(MIN.) =    8.23
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.011
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    3.63
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.82
  FLOW VELOCITY(FEET/SEC.) =  3.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1025.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.011
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    3.66
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       7.64
  TC(MIN.) =    8.23

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   490.25  DOWNSTREAM(FEET) =   485.80
  FLOW LENGTH(FEET) =   871.54   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.95
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.64
  PIPE TRAVEL TIME(MIN.) =   2.93    Tc(MIN.) =   11.17
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =   11.17
  RAINFALL INTENSITY(INCH/HR) =   3.30
  TOTAL STREAM AREA(ACRES) =     2.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.64

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    507.00
  DOWNSTREAM ELEVATION(FEET) =    505.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.749
  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!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  505.00  DOWNSTREAM ELEVATION(FEET) =  487.00
  STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.85
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.88
  STREET FLOW TRAVEL TIME(MIN.) =   3.91   Tc(MIN.) =    6.65
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.601
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.89      SUBAREA RUNOFF(CFS) =    3.56
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.04
  FLOW VELOCITY(FEET/SEC.) =  3.52   DEPTH*VELOCITY(FT*FT/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     830.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.601
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    3.60
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       7.57
  TC(MIN.) =    6.65

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =    6.65
  RAINFALL INTENSITY(INCH/HR) =   4.60
  TOTAL STREAM AREA(ACRES) =     1.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.57

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        7.64    11.17        3.295          2.19
     2        7.57     6.65        4.601          1.89

  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       12.12     6.65       4.601
     2       13.06    11.17       3.295

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.06   Tc(MIN.) =   11.17
  TOTAL AREA(ACRES) =        4.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.80  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.69
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.06
  PIPE TRAVEL TIME(MIN.) =   1.55    Tc(MIN.) =   12.72
```

```
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    487.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.00  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.73
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.50
  STREET FLOW TRAVEL TIME(MIN.) =   5.31   Tc(MIN.) =    7.63
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.212
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.09

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.88
  FLOW VELOCITY(FEET/SEC.) =  1.91   DEPTH*VELOCITY(FT*FT/SEC.) =   0.62
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.212
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.81
  TC(MIN.) =    7.63

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    7.63
  RAINFALL INTENSITY(INCH/HR) =   4.21
  TOTAL STREAM AREA(ACRES) =     1.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.81

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  UPSTREAM ELEVATION(FEET) =    495.10
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.258
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    58.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.1200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.26
  Tc(MIN.) =    3.52
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =   10.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =      10.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   6.26
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.19   SUBAREA RUNOFF(CFS) =   10.54
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      21.52
  TC(MIN.) =    3.52

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    3.52
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     4.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.52

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.81     7.63        4.212          1.04
      2       21.52     3.52        5.533          4.47

  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       23.27     3.52       5.533
      2       20.19     7.63       4.212

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.27   Tc(MIN.) =    3.52
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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       23.27     3.52       5.533        5.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       13.06    12.72       3.030        4.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      26.89       3.52        5.533
      2      25.80      12.72        3.030

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      26.89   Tc(MIN.) =    3.52
  TOTAL AREA(ACRES) =        9.6

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| DONE FOR BASIN 2                                                         |
| YEAH YEAH YEAH                                                           |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =    494.10
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.043
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    485.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0500
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.71
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.45
  Tc(MIN.) =    3.49
  SUBAREA AREA(ACRES) =     2.43       SUBAREA RUNOFF(CFS) =   11.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =      12.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   4.91
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =   11.70
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      23.88
  TC(MIN.) =    3.49

+--------------------------------------------------------------------------+
| DONE FOR BASIN 3                                                         |
| NICE NICE NICE                                                           |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      3.49
  PEAK FLOW RATE(CFS)   =      23.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* SUNROAD OTAY PLAZA                                                       *
* 25 YEAR STORM EVENT                                                      *
* 2017.05.22                                                               *
 **************************************************************************

  FILE NAME: OSR25.DAT
  TIME/DATE OF STUDY: 10:12 05/22/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  25.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.800
  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   45.0     40.0    0.020/0.020/0.050   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   125.00
  UPSTREAM ELEVATION(FEET) =    523.70
  DOWNSTREAM ELEVATION(FEET) =    503.90
  ELEVATION DIFFERENCE(FEET) =     19.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.922
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    503.90  DOWNSTREAM(FEET) =    502.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   282.00   CHANNEL SLOPE =  0.0039
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.779
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.91
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   5.19
  Tc(MIN.) =    7.11
  SUBAREA AREA(ACRES) =     0.42       SUBAREA RUNOFF(CFS) =    1.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.779
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.38
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.09
  TC(MIN.) =    7.11

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    502.80  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1373.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.044
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =  11.32
  Tc(MIN.) =   18.43
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    3.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       5.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.044
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.10   SUBAREA RUNOFF(CFS) =    3.74
  TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =      9.14
  TC(MIN.) =   18.43

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   18.43
  RAINFALL INTENSITY(INCH/HR) =   2.04
  TOTAL STREAM AREA(ACRES) =     5.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.14

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  UPSTREAM ELEVATION(FEET) =    508.60
  DOWNSTREAM ELEVATION(FEET) =    495.40
  ELEVATION DIFFERENCE(FEET) =     13.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.932
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    99.56
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   827.00   CHANNEL SLOPE =  0.0053
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.679
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.35
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =  10.19
  Tc(MIN.) =   12.12
  SUBAREA AREA(ACRES) =     1.55       SUBAREA RUNOFF(CFS) =    3.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       3.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.55
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     40.00 =     962.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.679
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    3.59
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       7.43
  TC(MIN.) =   12.12

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   12.12
  RAINFALL INTENSITY(INCH/HR) =   2.68
  TOTAL STREAM AREA(ACRES) =     3.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.43

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =    506.40
  DOWNSTREAM ELEVATION(FEET) =    505.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.10  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0085
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.026
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.79
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =  15.49
  Tc(MIN.) =   18.70
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    5.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       5.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.11
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.026
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.09   SUBAREA RUNOFF(CFS) =    5.45
  TOTAL AREA(ACRES) =        6.3   TOTAL RUNOFF(CFS) =      11.07
  TC(MIN.) =   18.70

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   18.70
  RAINFALL INTENSITY(INCH/HR) =   2.03
  TOTAL STREAM AREA(ACRES) =     6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.14    18.43        2.044          5.14
      2        7.43    12.12        2.679          3.19
      3       11.07    18.70        2.026          6.28

  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       20.62    12.12       2.679
      2       25.72    18.43       2.044
      3       25.75    18.70       2.026

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.75   Tc(MIN.) =   18.70
  TOTAL AREA(ACRES) =       14.6
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   536.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.927
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      26.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.93
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.51
  Tc(MIN.) =   20.20
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =       15.5         PEAK FLOW RATE(CFS) =      26.07
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   5.87
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.927
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    1.58
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      27.64
  TC(MIN.) =   20.20

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  UPSTREAM ELEVATION(FEET) =    505.30
  DOWNSTREAM ELEVATION(FEET) =    500.00
  ELEVATION DIFFERENCE(FEET) =      5.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.08
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   743.00   CHANNEL SLOPE =  0.0054
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.606
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.24
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   9.95
  Tc(MIN.) =   12.65
  SUBAREA AREA(ACRES) =     3.95       SUBAREA RUNOFF(CFS) =    8.95
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       9.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.51
```

```
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     983.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.606
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.96   SUBAREA RUNOFF(CFS) =    8.98
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      18.16
  TC(MIN.) =   12.65

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =  1133.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.88
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       18.16
  PIPE TRAVEL TIME(MIN.) =   2.40    Tc(MIN.) =   15.05
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       18.16    15.05       2.330        8.01
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       27.64    20.20       1.927       16.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      38.75      15.05        2.330
      2      42.66      20.20        1.927

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.66   Tc(MIN.) =   20.20
  TOTAL AREA(ACRES) =       24.5

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   493.00
  UPSTREAM ELEVATION(FEET) =    498.08
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      9.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.794
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.720
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.55
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   9.05
  Tc(MIN.) =   11.84
  SUBAREA AREA(ACRES) =     3.75       SUBAREA RUNOFF(CFS) =    8.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       9.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.93
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.720
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.75   SUBAREA RUNOFF(CFS) =    8.87
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      17.98
  TC(MIN.) =   11.84

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   11.84
  RAINFALL INTENSITY(INCH/HR) =   2.72
```

```
  TOTAL STREAM AREA(ACRES) =     7.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.98

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   188.00
  UPSTREAM ELEVATION(FEET) =    492.00
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.877
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.96
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.222
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.05
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =  13.32
  Tc(MIN.) =   16.20
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    2.57
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       2.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.24
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    100.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.222
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.33   SUBAREA RUNOFF(CFS) =    2.57
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       5.34
  TC(MIN.) =   16.20

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   16.20
  RAINFALL INTENSITY(INCH/HR) =   2.22
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.98    11.84        2.720          7.60
      2        5.34    16.20        2.222          2.76

  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       21.88    11.84       2.720
      2       20.03    16.20       2.222

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.88   Tc(MIN.) =   11.84
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       21.88    11.84       2.720       10.36
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       42.66    20.20       1.927       24.50
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      46.88      11.84        2.720
      2      58.16      20.20        1.927

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      58.16   Tc(MIN.) =   20.20
  TOTAL AREA(ACRES) =       34.9

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =    492.10
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    488.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0381
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.53
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.39
  Tc(MIN.) =    4.44
  SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    4.54
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.23
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.11   SUBAREA RUNOFF(CFS) =    4.58
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       9.53
  TC(MIN.) =    4.44

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    4.44
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     2.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.53
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     91.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   360.00
  UPSTREAM ELEVATION(FEET) =    488.50
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.432
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.984
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.66
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   3.12
  Tc(MIN.) =    6.55
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    2.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.09
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.984
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    2.50
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       5.34
  TC(MIN.) =    6.55

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    6.55
  RAINFALL INTENSITY(INCH/HR) =   3.98
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        9.53     4.44        4.743          2.31
     2        5.34     6.55        3.984          1.54

  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       13.15     4.44       4.743
     2       13.34     6.55       3.984

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.34   Tc(MIN.) =    6.55
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       13.34     6.55       3.984        3.85
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       58.16    20.20       1.927       34.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      32.21       6.55        3.984
     2      64.62      20.20        1.927

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      64.62   Tc(MIN.) =   20.20
  TOTAL AREA(ACRES) =       38.7

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    527.00
  DOWNSTREAM ELEVATION(FEET) =    526.00
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  526.00  DOWNSTREAM ELEVATION(FEET) =  509.00
  STREET LENGTH(FEET) =   975.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.93
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =   6.14   Tc(MIN.) =    8.46
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.378
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    3.06
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.04
  FLOW VELOCITY(FEET/SEC.) =  2.98   DEPTH*VELOCITY(FT*FT/SEC.) =   0.97
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1025.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.378
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    3.09
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       6.44
  TC(MIN.) =    8.46

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   490.25  DOWNSTREAM(FEET) =   485.80
  FLOW LENGTH(FEET) =   871.54   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.44
```

```
  PIPE TRAVEL TIME(MIN.) =   3.11    Tc(MIN.) =   11.57
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =   11.57
  RAINFALL INTENSITY(INCH/HR) =   2.76
  TOTAL STREAM AREA(ACRES) =     2.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.44

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    507.00
  DOWNSTREAM ELEVATION(FEET) =    505.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.749
  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!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  505.00  DOWNSTREAM ELEVATION(FEET) =  487.00
  STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.94
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.23
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.03
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   4.02   Tc(MIN.) =    6.77
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.901
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.89      SUBAREA RUNOFF(CFS) =    3.02
  TOTAL AREA(ACRES) =       1.0       PEAK FLOW RATE(CFS) =      3.36
```

```
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.34
 FLOW VELOCITY(FEET/SEC.) =  3.40   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     830.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.901
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    3.05
 TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       6.42
 TC(MIN.) =    6.77

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =    6.77
 RAINFALL INTENSITY(INCH/HR) =   3.90
 TOTAL STREAM AREA(ACRES) =     1.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.42

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        6.44    11.57        2.760          2.19
     2        6.42     6.77        3.901          1.89

 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       10.18     6.77       3.901
     2       10.97    11.57       2.760

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.97   Tc(MIN.) =   11.57
 TOTAL AREA(ACRES) =        4.1
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   485.80  DOWNSTREAM(FEET) =   483.00
 FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.32
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.97
 PIPE TRAVEL TIME(MIN.) =   1.66    Tc(MIN.) =   13.23
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    487.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.00  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.15
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.54
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.46
  STREET FLOW TRAVEL TIME(MIN.) =   5.46   Tc(MIN.) =    7.79
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.564
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.46
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       1.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.18
  FLOW VELOCITY(FEET/SEC.) =  1.84   DEPTH*VELOCITY(FT*FT/SEC.) =   0.57
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.564
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.46
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.22
```

```
  TC(MIN.) =    7.79

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    7.79
  RAINFALL INTENSITY(INCH/HR) =   3.56
  TOTAL STREAM AREA(ACRES) =     1.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.22

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  UPSTREAM ELEVATION(FEET) =    495.10
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.258
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    58.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.1200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.62
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.27
  Tc(MIN.) =    3.53
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    8.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       9.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   5.97
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.19   SUBAREA RUNOFF(CFS) =    9.04
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      18.44
  TC(MIN.) =    3.53

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    3.53
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     4.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.44

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         3.22     7.79        3.564          1.04
     2        18.44     3.53        4.743          4.47

  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        19.90     3.53       4.743
     2        17.08     7.79       3.564

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.90   Tc(MIN.) =    3.53
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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        19.90     3.53       4.743        5.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        10.97    13.23       2.532        4.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      22.83       3.53        4.743
     2      21.60      13.23        2.532

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.83   Tc(MIN.) =    3.53
  TOTAL AREA(ACRES) =        9.6

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =    494.10
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.043
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    485.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0500
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.54
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.47
  Tc(MIN.) =    3.51
  SUBAREA AREA(ACRES) =     2.43       SUBAREA RUNOFF(CFS) =   10.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =      10.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   4.55
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =   10.03
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      20.46
  TC(MIN.) =    3.51
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      3.51
  PEAK FLOW RATE(CFS)   =      20.46
============================================================================
```

===
END OF RATIONAL METHOD ANALYSIS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
* SUNROAD OTAY PLAZA 25 YEAR STORM EVENT                                   *
* 10 YEAR STORM EVENT                                                      *
* 2017.05.22                                                               *
 **************************************************************************

  FILE NAME: OSR10.DAT
  TIME/DATE OF STUDY: 10:14 05/22/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.600
  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   45.0     40.0    0.020/0.020/0.050   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   125.00
  UPSTREAM ELEVATION(FEET) =    523.70
  DOWNSTREAM ELEVATION(FEET) =    503.90
  ELEVATION DIFFERENCE(FEET) =     19.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.922
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    503.90  DOWNSTREAM(FEET) =    502.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   282.00   CHANNEL SLOPE =  0.0039
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.221
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.83
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   5.67
  Tc(MIN.) =    7.59
  SUBAREA AREA(ACRES) =     0.42       SUBAREA RUNOFF(CFS) =    1.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.221
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.18
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.63
  TC(MIN.) =    7.59

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    502.80  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1373.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.747
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.91
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =  12.00
  Tc(MIN.) =   19.59
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    3.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       4.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.90
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.747
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.10   SUBAREA RUNOFF(CFS) =    3.19
  TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =       7.81
  TC(MIN.) =   19.59

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   19.59
  RAINFALL INTENSITY(INCH/HR) =   1.75
  TOTAL STREAM AREA(ACRES) =     5.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.81

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  UPSTREAM ELEVATION(FEET) =    508.60
  DOWNSTREAM ELEVATION(FEET) =    495.40
  ELEVATION DIFFERENCE(FEET) =     13.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.932
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    99.56
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   827.00   CHANNEL SLOPE =  0.0053
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.311
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  10.76
  Tc(MIN.) =   12.69
  SUBAREA AREA(ACRES) =     1.55       SUBAREA RUNOFF(CFS) =    3.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       3.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.48
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     40.00 =     962.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.311
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    3.10
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       6.42
  TC(MIN.) =   12.69

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   12.69
  RAINFALL INTENSITY(INCH/HR) =   2.31
  TOTAL STREAM AREA(ACRES) =     3.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.42

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =    506.40
  DOWNSTREAM ELEVATION(FEET) =    505.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.10  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0085
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.696
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.60
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =  17.30
  Tc(MIN.) =   20.51
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    4.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       4.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.93
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.696
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.09   SUBAREA RUNOFF(CFS) =    4.56
  TOTAL AREA(ACRES) =        6.3   TOTAL RUNOFF(CFS) =       9.27
  TC(MIN.) =   20.51

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   20.51
  RAINFALL INTENSITY(INCH/HR) =   1.70
  TOTAL STREAM AREA(ACRES) =     6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.27

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.81    19.59        1.747          5.14
      2        6.42    12.69        2.311          3.19
      3        9.27    20.51        1.696          6.28

  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       17.21    12.69       2.311
      2       21.52    19.59       1.747
      3       21.56    20.51       1.696

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.56   Tc(MIN.) =   20.51
  TOTAL AREA(ACRES) =       14.6
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   536.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.616
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.59
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.60
  Tc(MIN.) =   22.11
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.32
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =       15.5         PEAK FLOW RATE(CFS) =      21.86
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   5.54
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.616
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      23.19
  TC(MIN.) =   22.11

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  UPSTREAM ELEVATION(FEET) =    505.30
  DOWNSTREAM ELEVATION(FEET) =    500.00
  ELEVATION DIFFERENCE(FEET) =      5.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.08
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   743.00   CHANNEL SLOPE =  0.0054
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.287
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.21
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  10.21
  Tc(MIN.) =   12.90
  SUBAREA AREA(ACRES) =     3.95       SUBAREA RUNOFF(CFS) =    7.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       8.06

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.43
```

```
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     983.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.287
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.96   SUBAREA RUNOFF(CFS) =    7.88
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      15.94
  TC(MIN.) =   12.90

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =  1133.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.69
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.94
  PIPE TRAVEL TIME(MIN.) =   2.46    Tc(MIN.) =   15.36
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       15.94    15.36       2.044        8.01
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       23.19    22.11       1.616       16.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      32.05      15.36        2.044
      2      35.79      22.11        1.616

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.79   Tc(MIN.) =   22.11
  TOTAL AREA(ACRES) =       24.5

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   493.00
  UPSTREAM ELEVATION(FEET) =    498.08
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      9.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.794
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.348
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.46
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   9.60
  Tc(MIN.) =   12.39
  SUBAREA AREA(ACRES) =     3.75       SUBAREA RUNOFF(CFS) =    7.66
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       7.86

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.348
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.75   SUBAREA RUNOFF(CFS) =    7.66
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      15.52
  TC(MIN.) =   12.39

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   12.39
  RAINFALL INTENSITY(INCH/HR) =   2.35
```

```
  TOTAL STREAM AREA(ACRES) =     7.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.52

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   188.00
  UPSTREAM ELEVATION(FEET) =    492.00
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.877
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.96
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.860
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =  14.91
  Tc(MIN.) =   17.79
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    2.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       2.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    100.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.860
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.33   SUBAREA RUNOFF(CFS) =    2.15
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       4.47
  TC(MIN.) =   17.79

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   17.79
  RAINFALL INTENSITY(INCH/HR) =   1.86
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.47

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       15.52    12.39        2.348          7.60
      2        4.47    17.79        1.860          2.76

  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       18.63    12.39       2.348
      2       16.76    17.79       1.860

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.63   Tc(MIN.) =   12.39
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       18.63    12.39       2.348       10.36
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       35.79    22.11       1.616       24.50
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      38.69      12.39        2.348
      2      48.61      22.11        1.616

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      48.61   Tc(MIN.) =   22.11
  TOTAL AREA(ACRES) =       34.9

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =    492.10
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

******************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE    100.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    488.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0381
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.34
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.50
  Tc(MIN.) =    4.55
  SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    4.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.14
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     545.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.11   SUBAREA RUNOFF(CFS) =    4.07
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       8.47
  TC(MIN.) =    4.55

******************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    4.55
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     2.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.47
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     91.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   360.00
  UPSTREAM ELEVATION(FEET) =    488.50
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.432
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.536
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.65
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   3.13
  Tc(MIN.) =    6.57
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    2.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.05
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.536
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    2.21
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.74
  TC(MIN.) =    6.57

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    6.57
  RAINFALL INTENSITY(INCH/HR) =   3.54
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.47     4.55        4.216          2.31
     2        4.74     6.57        3.536          1.54

  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       11.76     4.55       4.216
     2       11.84     6.57       3.536

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.84   Tc(MIN.) =    6.57
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       11.84     6.57       3.536       3.85
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       48.61    22.11       1.616       34.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      26.28       6.57        3.536
     2      54.03      22.11        1.616

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      54.03   Tc(MIN.) =   22.11
  TOTAL AREA(ACRES) =       38.7

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    527.00
  DOWNSTREAM ELEVATION(FEET) =    526.00
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  526.00  DOWNSTREAM ELEVATION(FEET) =  509.00
  STREET LENGTH(FEET) =   975.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.46
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
  STREET FLOW TRAVEL TIME(MIN.) =   6.30   Tc(MIN.) =    8.62
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.967
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    2.68
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.49
  FLOW VELOCITY(FEET/SEC.) =  2.89   DEPTH*VELOCITY(FT*FT/SEC.) =   0.91
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1025.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.967
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    2.71
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       5.65
  TC(MIN.) =    8.62

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   490.25  DOWNSTREAM(FEET) =   485.80
  FLOW LENGTH(FEET) =   871.54   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.57
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.65
```

```
 PIPE TRAVEL TIME(MIN.) =   3.18    Tc(MIN.) =   11.80
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =   11.80
 RAINFALL INTENSITY(INCH/HR) =   2.42
 TOTAL STREAM AREA(ACRES) =     2.19
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.65

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    507.00
 DOWNSTREAM ELEVATION(FEET) =    505.00
 ELEVATION DIFFERENCE(FEET) =      2.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.749
 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!
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.37
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  505.00  DOWNSTREAM ELEVATION(FEET) =  487.00
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 45.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.71
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.26
   HALFSTREET FLOOD WIDTH(FEET) =    6.84
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.92
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.77
 STREET FLOW TRAVEL TIME(MIN.) =   4.17   Tc(MIN.) =    6.92
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.418
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 SUBAREA AREA(ACRES) =    0.89      SUBAREA RUNOFF(CFS) =    2.65
 TOTAL AREA(ACRES) =       1.0       PEAK FLOW RATE(CFS) =      2.94
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.79
  FLOW VELOCITY(FEET/SEC.) =  3.31   DEPTH*VELOCITY(FT*FT/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     830.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.418
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    2.68
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       5.62
  TC(MIN.) =    6.92

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =    6.92
  RAINFALL INTENSITY(INCH/HR) =   3.42
  TOTAL STREAM AREA(ACRES) =     1.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.62

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        5.65    11.80        2.423          2.19
     2        5.62     6.92        3.418          1.89

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        8.94     6.92       3.418
     2        9.64    11.80       2.423

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.64   Tc(MIN.) =   11.80
  TOTAL AREA(ACRES) =        4.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.80  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.25
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.64
  PIPE TRAVEL TIME(MIN.) =   1.68    Tc(MIN.) =   13.48
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    487.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.00  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.02
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.62
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.44
  STREET FLOW TRAVEL TIME(MIN.) =   5.66   Tc(MIN.) =    7.99
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.117
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.27
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       1.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.63
  FLOW VELOCITY(FEET/SEC.) =  1.79   DEPTH*VELOCITY(FT*FT/SEC.) =   0.54
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.117
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.27
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.82
```

```
  TC(MIN.) =    7.99

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    7.99
  RAINFALL INTENSITY(INCH/HR) =   3.12
  TOTAL STREAM AREA(ACRES) =     1.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.82

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  UPSTREAM ELEVATION(FEET) =    495.10
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.258
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    58.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.1200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.28
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.29
  Tc(MIN.) =    3.55
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    8.00
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       8.36

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   5.46
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.19   SUBAREA RUNOFF(CFS) =    8.03
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      16.39
  TC(MIN.) =    3.55

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    3.55
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     4.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        2.82     7.99        3.117          1.04
     2       16.39     3.55        4.216          4.47

  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       17.65     3.55       4.216
     2       14.94     7.99       3.117

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.65   Tc(MIN.) =    3.55
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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       17.65     3.55       4.216        5.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        9.64    13.48       2.223        4.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      20.19       3.55        4.216
     2      18.95      13.48        2.223

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.19   Tc(MIN.) =    3.55
  TOTAL AREA(ACRES) =        9.6

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =    494.10
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.043
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    485.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0500
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.44
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.48
  Tc(MIN.) =    3.53
  SUBAREA AREA(ACRES) =     2.43       SUBAREA RUNOFF(CFS) =    8.91
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       9.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   4.39
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =    8.91
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      18.19
  TC(MIN.) =    3.53
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      3.53
  PEAK FLOW RATE(CFS)   =      18.19
============================================================================
```

==
END OF RATIONAL METHOD ANALYSIS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                                Kimley-Horn



 ************************** DESCRIPTION OF STUDY **************************
 * SUNROAD OTAY PLAZA                                                       *
 * 5 YEAR STORM EVENT                                                       *
 * 2017.05.22 - NAR                                                         *
 **************************************************************************

  FILE NAME: OSR5.DAT
  TIME/DATE OF STUDY: 10:15 05/22/2017
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   5.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.400
  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   45.0     40.0    0.020/0.020/0.050   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   125.00
  UPSTREAM ELEVATION(FEET) =    523.70
  DOWNSTREAM ELEVATION(FEET) =    503.90
  ELEVATION DIFFERENCE(FEET) =     19.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.922
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    503.90  DOWNSTREAM(FEET) =    502.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   282.00   CHANNEL SLOPE =  0.0039
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.806
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   5.72
  Tc(MIN.) =    7.64
  SUBAREA AREA(ACRES) =     0.42       SUBAREA RUNOFF(CFS) =    1.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.806
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.03
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.29
  TC(MIN.) =    7.64

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    502.80  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1373.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.490
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.80
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =  12.73
  Tc(MIN.) =   20.38
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    2.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.87
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.490
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    2.10   SUBAREA RUNOFF(CFS) =    2.72
 TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =       6.66
 TC(MIN.) =   20.38

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   20.38
 RAINFALL INTENSITY(INCH/HR) =   1.49
 TOTAL STREAM AREA(ACRES) =     5.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.66

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
 UPSTREAM ELEVATION(FEET) =    508.60
 DOWNSTREAM ELEVATION(FEET) =    495.40
 ELEVATION DIFFERENCE(FEET) =     13.20
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.932
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    99.56
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.32
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
 FLOW PROCESS FROM NODE     51.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    491.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   827.00   CHANNEL SLOPE =  0.0053
 CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.886
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.73
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.13
 AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  12.22
 Tc(MIN.) =   14.15
 SUBAREA AREA(ACRES) =     1.55       SUBAREA RUNOFF(CFS) =    2.54
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       2.71

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.40
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     40.00 =     962.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.886
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    2.53
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       5.23
  TC(MIN.) =   14.15

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   14.15
  RAINFALL INTENSITY(INCH/HR) =   1.89
  TOTAL STREAM AREA(ACRES) =     3.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.23

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =    506.40
  DOWNSTREAM ELEVATION(FEET) =    505.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.10  DOWNSTREAM(FEET) =    491.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0085
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.434
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.51
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =  18.44
  Tc(MIN.) =   21.64
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    3.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       3.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.88
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.434
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.09   SUBAREA RUNOFF(CFS) =    3.85
  TOTAL AREA(ACRES) =        6.3   TOTAL RUNOFF(CFS) =       7.83
  TC(MIN.) =   21.64

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =   21.64
  RAINFALL INTENSITY(INCH/HR) =   1.43
  TOTAL STREAM AREA(ACRES) =     6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.83

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.66    20.38        1.490          5.14
      2        5.23    14.15        1.886          3.19
      3        7.83    21.64        1.434          6.28

  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       14.98    14.15       1.886
      2       18.18    20.38       1.490
      3       18.22    21.64       1.434

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.22   Tc(MIN.) =   21.64
  TOTAL AREA(ACRES) =       14.6
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   536.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.365
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.78
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.25
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.70
  Tc(MIN.) =   23.35
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =       15.5         PEAK FLOW RATE(CFS) =      18.47
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   5.16
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.365
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    1.12
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      19.59
  TC(MIN.) =   23.35

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  UPSTREAM ELEVATION(FEET) =    505.30
  DOWNSTREAM ELEVATION(FEET) =    500.00
  ELEVATION DIFFERENCE(FEET) =      5.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.08
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   743.00   CHANNEL SLOPE =  0.0054
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.936
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.14
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =  10.89
  Tc(MIN.) =   13.59
  SUBAREA AREA(ACRES) =     3.95       SUBAREA RUNOFF(CFS) =    6.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       6.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.41
```

```
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     983.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.936
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.96   SUBAREA RUNOFF(CFS) =    6.67
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      13.49
  TC(MIN.) =   13.59

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =  1133.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.28
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.49
  PIPE TRAVEL TIME(MIN.) =   2.60    Tc(MIN.) =   16.18
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       13.49    16.18       1.729        8.01
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE    100.00 =    2116.50 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.59    23.35       1.365       16.49
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      27.07      16.18        1.729
      2      30.24      23.35        1.365

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.24   Tc(MIN.) =   23.35
  TOTAL AREA(ACRES) =       24.5

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   493.00
  UPSTREAM ELEVATION(FEET) =    498.08
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      9.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.794
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.058
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.46
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   9.57
  Tc(MIN.) =   12.36
  SUBAREA AREA(ACRES) =     3.75       SUBAREA RUNOFF(CFS) =    6.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       6.89

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.75
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.058
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    3.75   SUBAREA RUNOFF(CFS) =    6.71
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      13.60
  TC(MIN.) =   12.36

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   12.36
  RAINFALL INTENSITY(INCH/HR) =   2.06
```

```
  TOTAL STREAM AREA(ACRES) =     7.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.60

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   188.00
  UPSTREAM ELEVATION(FEET) =    492.00
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.877
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.96
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    489.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.650
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.96
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =  14.53
  Tc(MIN.) =   17.41
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    1.91
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       2.05

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    100.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.650
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.33   SUBAREA RUNOFF(CFS) =    1.91
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       3.96
  TC(MIN.) =   17.41

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =   17.41
  RAINFALL INTENSITY(INCH/HR) =   1.65
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.60    12.36        2.058          7.60
      2        3.96    17.41        1.650          2.76

  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       16.42    12.36       2.058
      2       14.87    17.41       1.650

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.42   Tc(MIN.) =   12.36
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       16.42    12.36       2.058       10.36
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE    100.00 =    1333.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       30.24    23.35       1.365       24.50
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      32.43      12.36        2.058
      2      41.13      23.35        1.365

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      41.13   Tc(MIN.) =   23.35
  TOTAL AREA(ACRES) =       34.9

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =    492.10
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    488.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0381
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.09
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.50
  Tc(MIN.) =    4.56
  SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    3.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.83
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.11   SUBAREA RUNOFF(CFS) =    3.56
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       7.41
  TC(MIN.) =    4.56

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    4.56
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =     2.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.41
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     91.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   360.00
  UPSTREAM ELEVATION(FEET) =    488.50
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.432
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE    100.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    480.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.010
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.51
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   3.42
  Tc(MIN.) =    6.85
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    1.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.81
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.010
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    1.89
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.03
  TC(MIN.) =    6.85

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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.) =    6.85
  RAINFALL INTENSITY(INCH/HR) =   3.01
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.03

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         7.41     4.56        3.689          2.31
     2         4.03     6.85        3.010          1.54

  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       10.09     4.56       3.689
     2       10.08     6.85       3.010

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.09   Tc(MIN.) =    4.56
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 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       10.09     4.56       3.689       3.85
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    100.00 =     670.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       41.13    23.35       1.365      34.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      18.12       4.56        3.689
     2      44.87      23.35        1.365

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      44.87   Tc(MIN.) =   23.35
  TOTAL AREA(ACRES) =       38.7

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    527.00
  DOWNSTREAM ELEVATION(FEET) =    526.00
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.32
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  526.00  DOWNSTREAM ELEVATION(FEET) =  509.00
 STREET LENGTH(FEET) =   975.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 45.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.51
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.27
   HALFSTREET FLOOD WIDTH(FEET) =    6.99
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.49
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.66
 STREET FLOW TRAVEL TIME(MIN.) =   6.52   Tc(MIN.) =    8.84
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.553
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    2.31
 TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.53

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.87
 FLOW VELOCITY(FEET/SEC.) =  2.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1025.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.553
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    2.33
 TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       4.87
 TC(MIN.) =    8.84

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   490.25  DOWNSTREAM(FEET) =   485.80
 FLOW LENGTH(FEET) =   871.54   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.43
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.87
```

```
  PIPE TRAVEL TIME(MIN.) =   3.28    Tc(MIN.) =   12.12
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =   12.12
  RAINFALL INTENSITY(INCH/HR) =   2.08
  TOTAL STREAM AREA(ACRES) =     2.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.87

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    507.00
  DOWNSTREAM ELEVATION(FEET) =    505.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.749
  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!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  505.00  DOWNSTREAM ELEVATION(FEET) =  487.00
  STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.37
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.72
  STREET FLOW TRAVEL TIME(MIN.) =   4.30   Tc(MIN.) =    7.05
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.956
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.89      SUBAREA RUNOFF(CFS) =    2.29
  TOTAL AREA(ACRES) =       1.0       PEAK FLOW RATE(CFS) =      2.55
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.24
  FLOW VELOCITY(FEET/SEC.) =  3.19   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     830.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.956
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    2.31
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       4.86
  TC(MIN.) =    7.05

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 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.) =    7.05
  RAINFALL INTENSITY(INCH/HR) =   2.96
  TOTAL STREAM AREA(ACRES) =     1.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.86

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        4.87    12.12        2.083          2.19
     2        4.86     7.05        2.956          1.89

  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        7.69     7.05       2.956
     2        8.29    12.12       2.083

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.29   Tc(MIN.) =   12.12
  TOTAL AREA(ACRES) =        4.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =    1896.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.80  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.11
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.29
  PIPE TRAVEL TIME(MIN.) =   1.73    Tc(MIN.) =   13.85
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    487.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.324
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.00  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.050
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.68
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.57
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.41
  STREET FLOW TRAVEL TIME(MIN.) =   5.86   Tc(MIN.) =    8.18
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.685
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =       0.6       PEAK FLOW RATE(CFS) =       1.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.09
  FLOW VELOCITY(FEET/SEC.) =  1.72   DEPTH*VELOCITY(FT*FT/SEC.) =   0.50
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.685
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =       1.0   TOTAL RUNOFF(CFS) =       2.43
```

```
  TC(MIN.) =    8.18

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    8.18
  RAINFALL INTENSITY(INCH/HR) =   2.69
  TOTAL STREAM AREA(ACRES) =     1.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.43

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  UPSTREAM ELEVATION(FEET) =    495.10
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.258
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    58.24
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.1200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.27
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.29
  Tc(MIN.) =    3.55
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    7.00
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       7.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   5.38
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.19   SUBAREA RUNOFF(CFS) =    7.03
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      14.34
  TC(MIN.) =    3.55

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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.) =    3.55
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =     4.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         2.43     8.18        2.685          1.04
     2        14.34     3.55        3.689          4.47

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        15.40     3.55       3.689
     2        12.87     8.18       2.685

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.40   Tc(MIN.) =    3.55
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 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        15.40     3.55       3.689        5.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     600.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         8.29    13.85       1.911        4.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    142.00 =    2426.54 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      17.52       3.55        3.689
     2      16.27      13.85        1.911

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.52   Tc(MIN.) =    3.55
  TOTAL AREA(ACRES) =        9.6

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =    494.10
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.043
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.42
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    485.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0500
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.43
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.49
  Tc(MIN.) =    3.53
  SUBAREA AREA(ACRES) =     2.43       SUBAREA RUNOFF(CFS) =    7.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       8.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   4.20
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =    7.80
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      15.92
  TC(MIN.) =    3.53
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      3.53
  PEAK FLOW RATE(CFS)   =      15.92
============================================================================
```

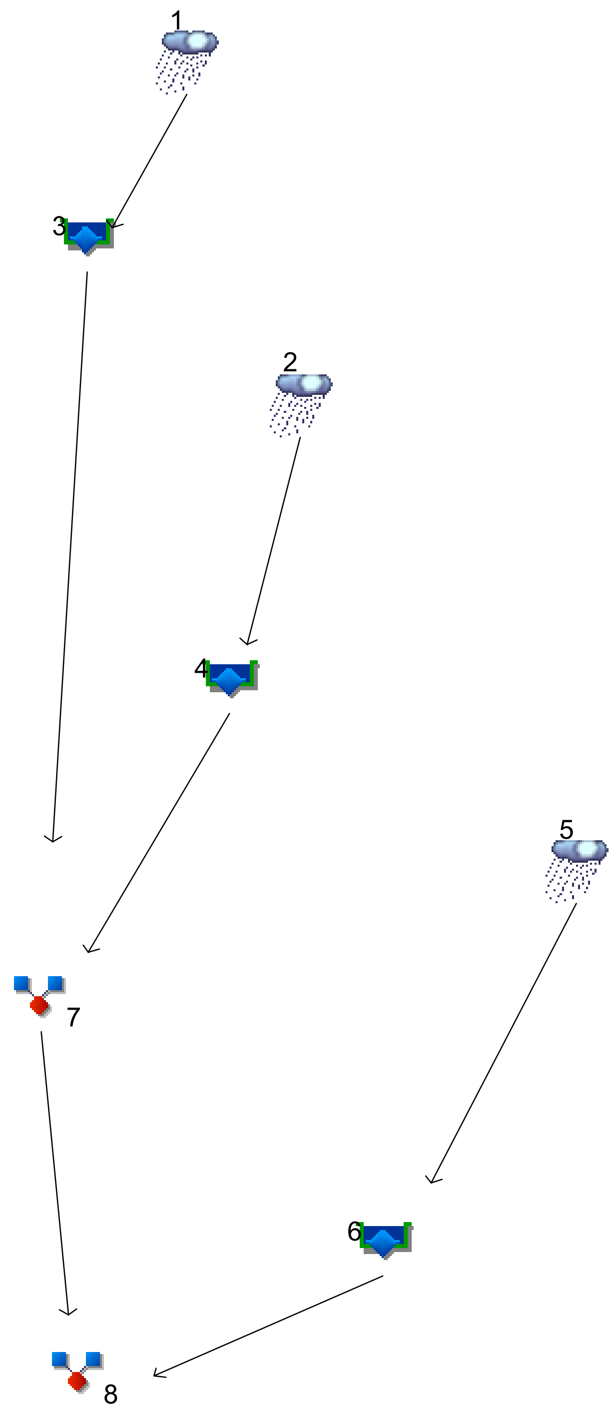
==
END OF RATIONAL METHOD ANALYSIS

APPENDIX F

DETENTION BASINS CALCULATIONS

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

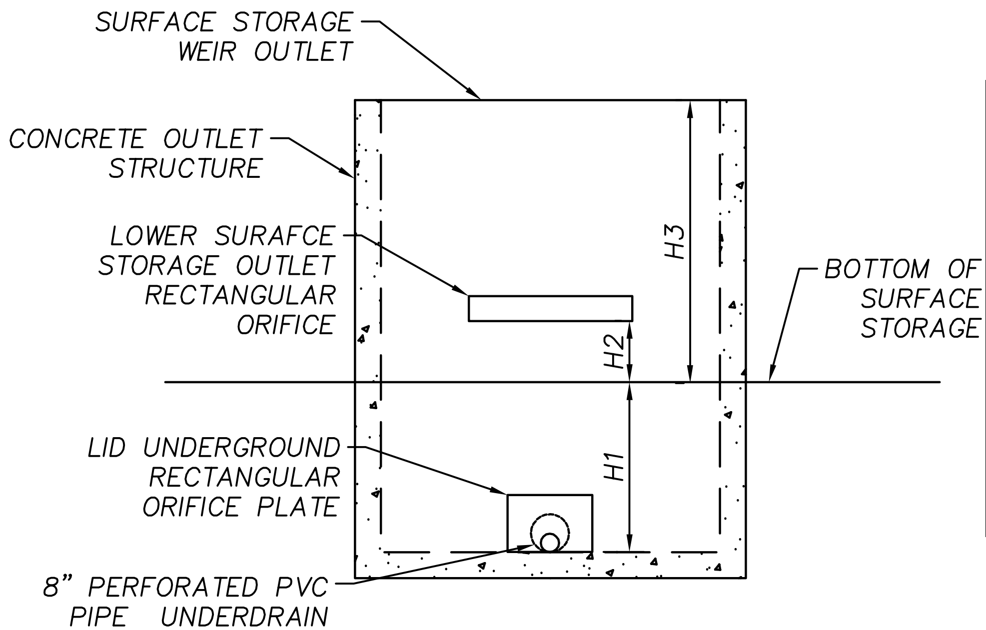


Legend

Hyd.	Origin	Description
1	Manual	Basin 7 Inflow
2	Manual	Basin 6 Inflow
3	Reservoir	Basin 7 Routing
4	Reservoir	Basin 6 Routing
5	Manual	Basin 1 Inflow
6	Reservoir	Basin 1 Routing
7	Combine	Confluence Basin 6 + Basin 7
8	Combine	Confluence Basin 1 + Basin 6 + Basin 7

Project: Sunroad Otay - 2017.10.03 - Revised per hydromod.gpw | Thursday, 10 / 5 / 2017

BASIN OUTLET STRUCTURE DETAIL



TYPICAL OUTLET STRUCTURE DETAIL

BASIN ID	LID ORIFICE PLATE		LOWER SURFACE RECTANGULAR ORIFICE			SURFACE STORAGE WEIR OUTLET	
	H1	DIAMETER	H2	LENGTH	HEIGHT	H3	LENGTH
	INCHES	INCHES	INCHES	INCHES	INCHES	FT	FT
1	36	2.5	6	48	6	3.3	18
2	36	1.5	N/A	N/A	N/A	0.5	10
3	36	1.5	N/A	N/A	N/A	0.5	10
4	36	1.75	N/A	N/A	N/A	0.5	10
5	36	1.75	N/A	N/A	N/A	0.5	10
6	36	2	6	12	1	1.3	12
7	36	2	6	12	1	2	12

BASIN SPECIFIC OUTLET TABLE

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	------	-------	-------	-------	17.52	20.19	22.83	26.89	29.57	Basin 7 Inflow
2	Manual	------	-------	-------	-------	15.92	18.19	20.46	23.88	26.15	Basin 6 Inflow
3	Reservoir	1	-------	-------	-------	0.565	0.670	0.760	1.801	3.178	Basin 7 Routing
4	Reservoir	2	-------	-------	-------	0.173	0.180	0.184	0.191	0.279	Basin 6 Routing
5	Manual	------	-------	-------	-------	44.80	54.00	64.60	76.99	84.80	Basin 1 Inflow
6	Reservoir	5	-------	-------	-------	12.37	13.59	14.63	17.75	26.37	Basin 1 Routing
7	Combine	3, 4,	-------	-------	-------	0.737	0.850	0.945	1.989	3.367	Confluence Basin 6 + Basin 7
8	Combine	6, 7	-------	-------	-------	13.06	14.40	15.53	19.55	29.54	Confluence Basin 1 + Basin 6 + Basin

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	17.52	5	245	39,189	------	------	------	Basin 7 Inflow
2	Manual	15.92	5	245	21,996	------	------	------	Basin 6 Inflow
3	Reservoir	0.565	5	360	36,839	1	482.41	34,565	Basin 7 Routing
4	Reservoir	0.173	5	365	19,194	2	484.37	20,428	Basin 6 Routing
5	Manual	44.80	5	275	171,990	------	------	------	Basin 1 Inflow
6	Reservoir	12.37	5	295	171,782	5	484.32	117,268	Basin 1 Routing
7	Combine	0.737	5	360	56,033	3, 4,	------	------	Confluence Basin 6 + Basin 7
8	Combine	13.06	5	295	227,814	6, 7	------	------	Confluence Basin 1 + Basin 6 + Basin

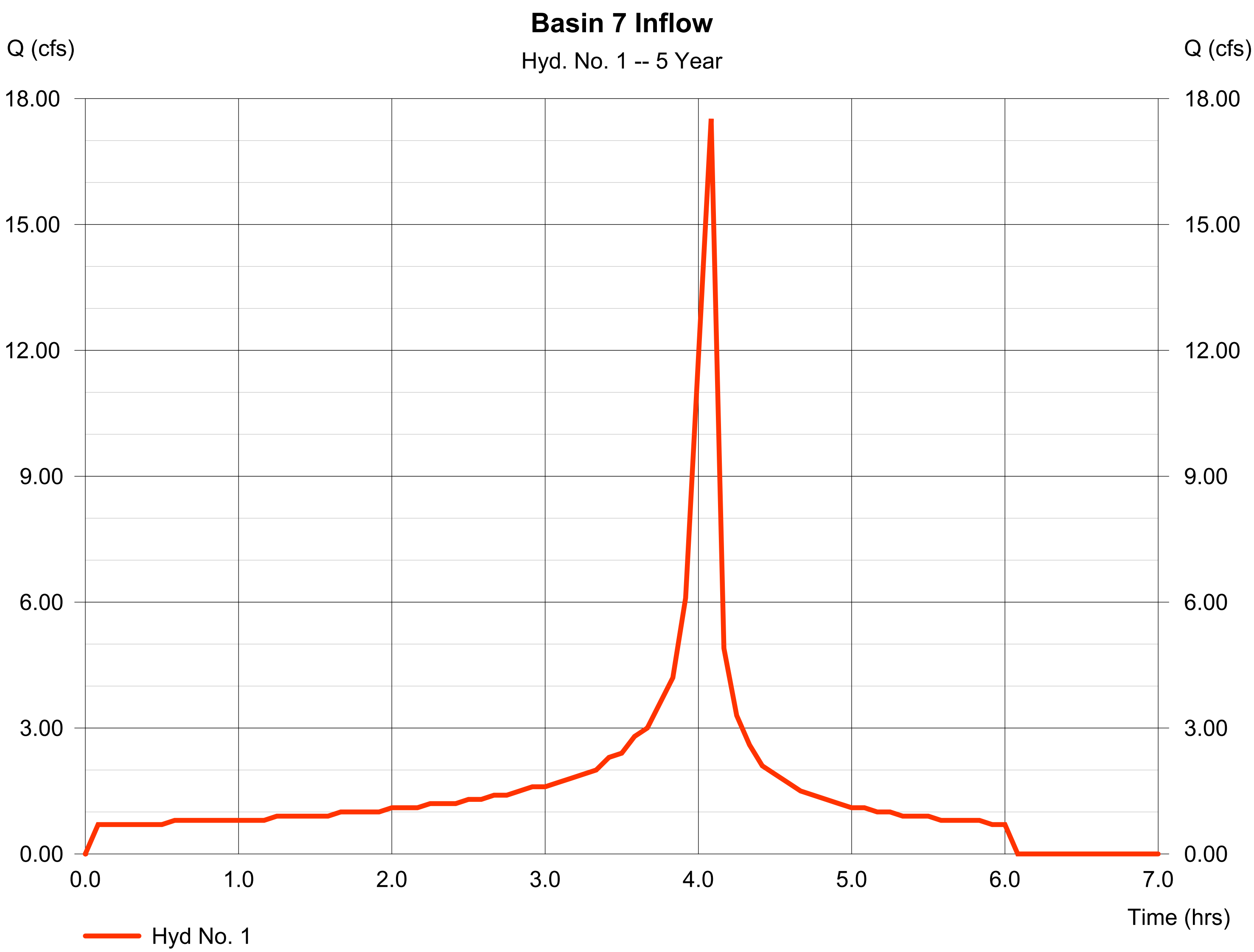
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 1

Basin 7 Inflow

Hydrograph type	= Manual	Peak discharge	= 17.52 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 39,189 cuft



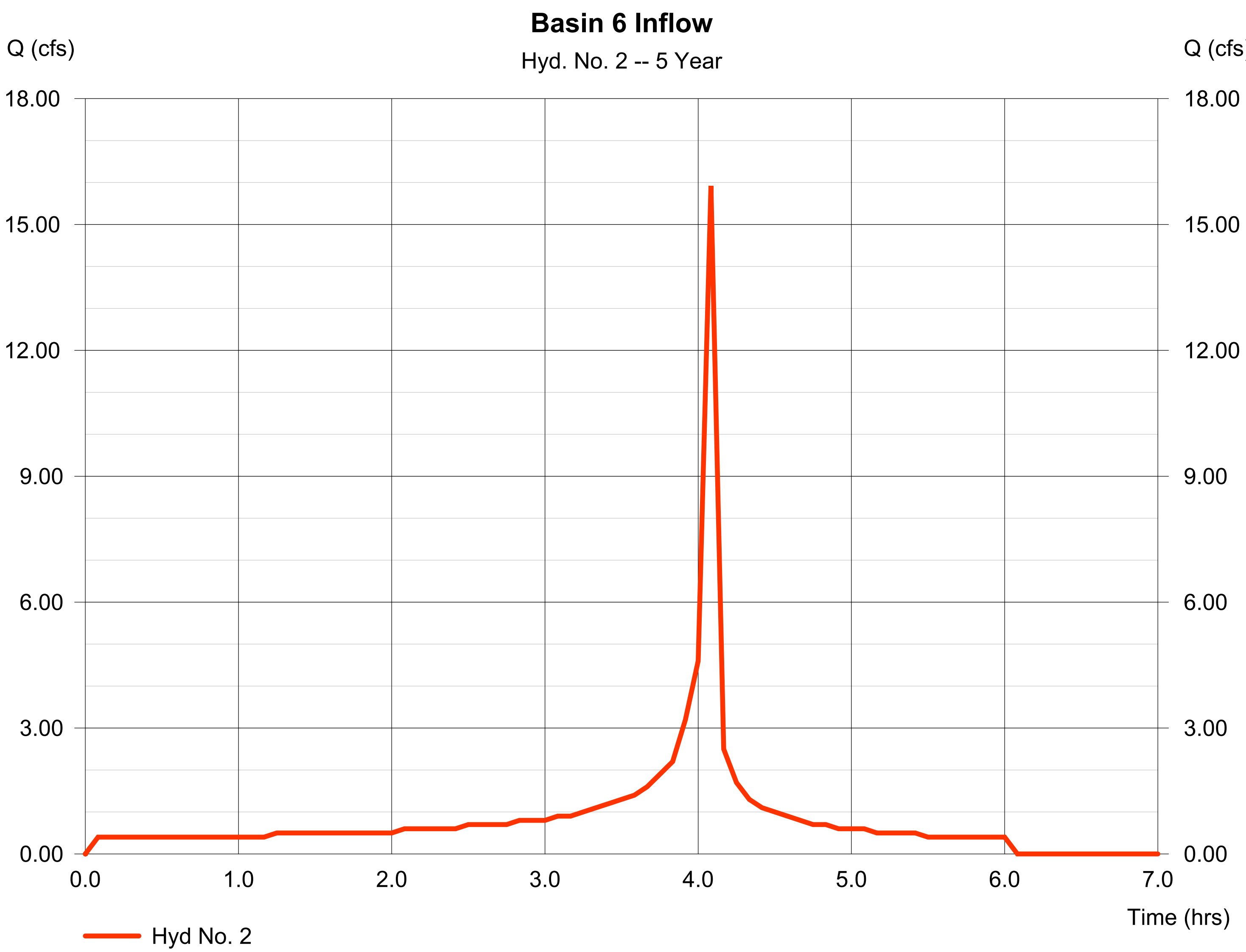
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 2

Basin 6 Inflow

Hydrograph type	= Manual	Peak discharge	= 15.92 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 21,996 cuft



Hydrograph Report

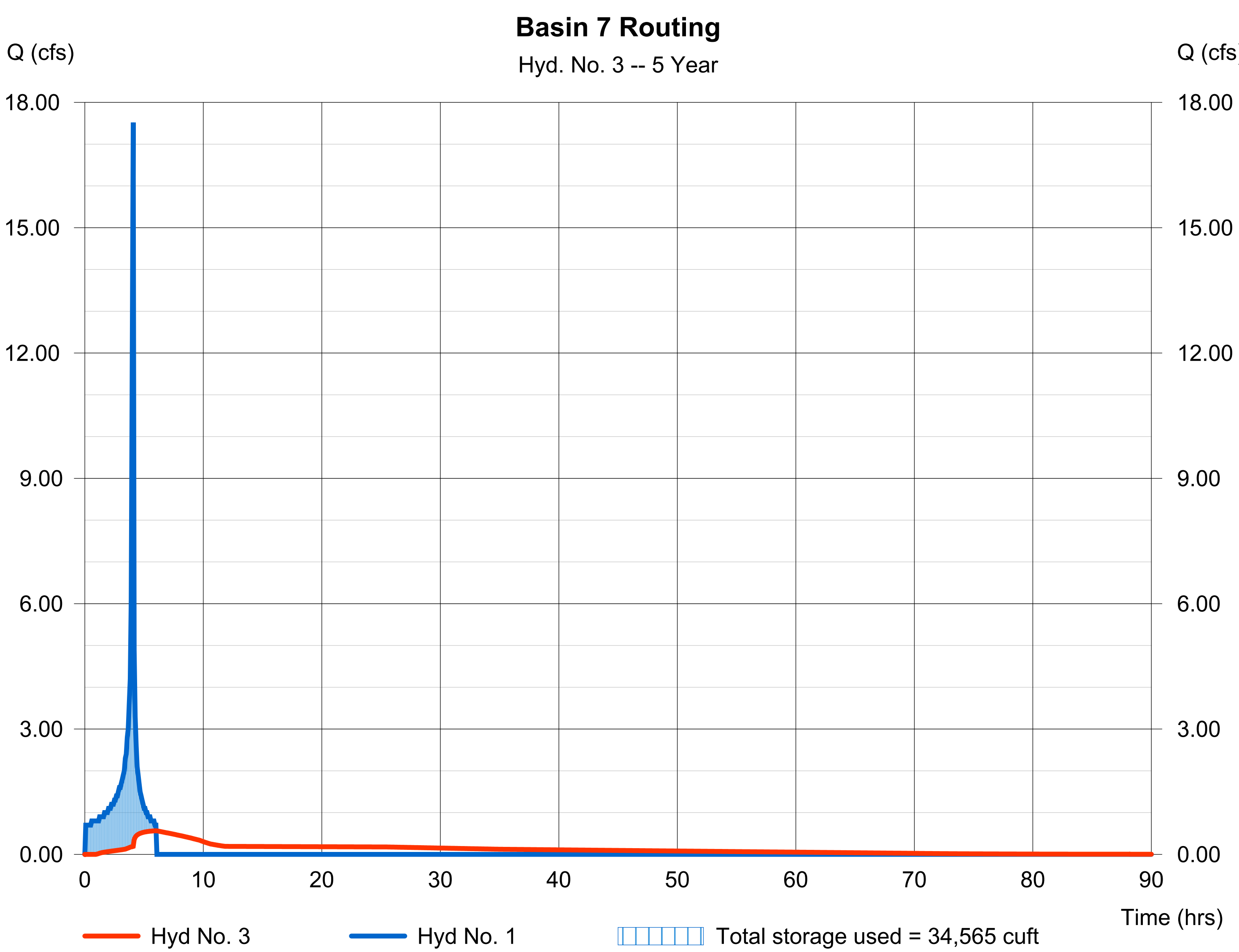
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 3

Basin 7 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.565 cfs
Storm frequency	= 5 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 36,839 cuft
Inflow hyd. No.	= 1 - Basin 7 Inflow	Max. Elevation	= 482.41 ft
Reservoir name	= Basin 7	Max. Storage	= 34,565 cuft

Storage Indication method used.



Pond No. 2 - Basin 7

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	478.17	n/a	0	0
0.33	478.50	n/a	2,269	2,269
0.83	479.00	n/a	3,404	5,672
1.33	479.50	n/a	3,403	9,076
1.83	480.00	n/a	3,403	12,479
2.33	480.50	n/a	1,702	14,181
2.83	481.00	n/a	1,702	15,883
3.33	481.50	n/a	1,702	17,584
3.83	482.00	n/a	9,072	26,656
4.33	482.50	n/a	9,648	36,304
4.83	483.00	n/a	10,235	46,539
5.33	483.50	n/a	10,835	57,375

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.00	1.00	Inactive
Span (in)	= 24.00	2.00	18.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 478.50	478.50	482.00	0.00
Length (ft)	= 50.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 483.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	478.17	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.03	227	478.20	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.07	454	478.24	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.10	681	478.27	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.13	908	478.30	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.17	1,134	478.33	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.20	1,361	478.37	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.23	1,588	478.40	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.26	1,815	478.43	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.30	2,042	478.47	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.33	2,269	478.50	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.38	2,609	478.55	0.00 ic	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	0.004
0.43	2,950	478.60	0.01 ic	0.01 ic	0.00	---	0.00	0.00	---	---	---	---	0.015
0.48	3,290	478.65	0.03 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.027
0.53	3,630	478.70	0.04 ic	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.036
0.58	3,971	478.75	0.04 ic	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.043
0.63	4,311	478.80	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.049
0.68	4,651	478.85	0.06 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.054
0.73	4,992	478.90	0.06 ic	0.06 ic	0.00	---	0.00	0.00	---	---	---	---	0.058
0.78	5,332	478.95	0.06 ic	0.06 ic	0.00	---	0.00	0.00	---	---	---	---	0.063
0.83	5,672	479.00	0.07 ic	0.07 ic	0.00	---	0.00	0.00	---	---	---	---	0.066
0.88	6,013	479.05	0.07 ic	0.07 ic	0.00	---	0.00	0.00	---	---	---	---	0.070
0.93	6,353	479.10	0.07 ic	0.07 ic	0.00	---	0.00	0.00	---	---	---	---	0.074
0.98	6,693	479.15	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.077
1.03	7,034	479.20	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.081
1.08	7,374	479.25	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.084
1.13	7,714	479.30	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.087
1.18	8,055	479.35	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.090
1.23	8,395	479.40	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.093
1.28	8,735	479.45	0.10 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.096
1.33	9,076	479.50	0.11 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.098
1.38	9,416	479.55	0.11 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.101

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Basin 7

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.43	9,756	479.60	0.11 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.104
1.48	10,097	479.65	0.11 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.106
1.53	10,437	479.70	0.12 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.109
1.58	10,778	479.75	0.12 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.111
1.63	11,118	479.80	0.12 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.114
1.68	11,458	479.85	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.116
1.73	11,799	479.90	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.118
1.78	12,139	479.95	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.120
1.83	12,479	480.00	0.13 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.123
1.88	12,649	480.05	0.13 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.125
1.93	12,820	480.10	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.127
1.98	12,990	480.15	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.129
2.03	13,160	480.20	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.131
2.08	13,330	480.25	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.133
2.13	13,500	480.30	0.14 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.135
2.18	13,670	480.35	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.137
2.23	13,841	480.40	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.139
2.28	14,011	480.45	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.141
2.33	14,181	480.50	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.143
2.38	14,351	480.55	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.145
2.43	14,521	480.60	0.15 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.147
2.48	14,691	480.65	0.15 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.149
2.53	14,862	480.70	0.15 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.150
2.58	15,032	480.75	0.16 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.152
2.63	15,202	480.80	0.16 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.154
2.68	15,372	480.85	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.156
2.73	15,542	480.90	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.157
2.78	15,712	480.95	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.159
2.83	15,883	481.00	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.161
2.88	16,053	481.05	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.163
2.93	16,223	481.10	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.164
2.98	16,393	481.15	0.17 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.166
3.03	16,563	481.20	0.17 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.167
3.08	16,733	481.25	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.169
3.13	16,904	481.30	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.171
3.18	17,074	481.35	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.172
3.23	17,244	481.40	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.174
3.28	17,414	481.45	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.175
3.33	17,584	481.50	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.177
3.38	18,492	481.55	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.178
3.43	19,399	481.60	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.180
3.48	20,306	481.65	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.181
3.53	21,213	481.70	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.183
3.58	22,120	481.75	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.184
3.63	23,028	481.80	0.19 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.186
3.68	23,935	481.85	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.187
3.73	24,842	481.90	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.189
3.78	25,749	481.95	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.190
3.83	26,656	482.00	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.192
3.88	27,621	482.05	0.25 ic	0.19 ic	0.06 ic	---	0.00	0.00	---	---	---	---	0.249
3.93	28,586	482.10	0.35 ic	0.19 ic	0.15 ic	---	0.00	0.00	---	---	---	---	0.338
3.98	29,551	482.15	0.41 ic	0.19 ic	0.20 ic	---	0.00	0.00	---	---	---	---	0.392
4.03	30,515	482.20	0.44 ic	0.19 ic	0.24 ic	---	0.00	0.00	---	---	---	---	0.434
4.08	31,480	482.25	0.48 ic	0.20 ic	0.27 ic	---	0.00	0.00	---	---	---	---	0.470
4.13	32,445	482.30	0.52 ic	0.20 ic	0.31 ic	---	0.00	0.00	---	---	---	---	0.503
4.18	33,410	482.35	0.56 ic	0.20 ic	0.33 ic	---	0.00	0.00	---	---	---	---	0.532
4.23	34,375	482.40	0.56 ic	0.20 ic	0.36 ic	---	0.00	0.00	---	---	---	---	0.560
4.28	35,339	482.45	0.60 ic	0.20 ic	0.38 ic	---	0.00	0.00	---	---	---	---	0.585
4.33	36,304	482.50	0.64 ic	0.20 ic	0.41 ic	---	0.00	0.00	---	---	---	---	0.609
4.38	37,328	482.55	0.64 ic	0.20 ic	0.43 ic	---	0.00	0.00	---	---	---	---	0.632
4.43	38,351	482.60	0.69 ic	0.20 ic	0.45 ic	---	0.00	0.00	---	---	---	---	0.654
4.48	39,375	482.65	0.69 ic	0.21 ic	0.47 ic	---	0.00	0.00	---	---	---	---	0.675
4.53	40,398	482.70	0.69 ic	0.21 ic	0.49 ic	---	0.00	0.00	---	---	---	---	0.695
4.58	41,422	482.75	0.73 ic	0.21 ic	0.51 ic	---	0.00	0.00	---	---	---	---	0.714
4.63	42,445	482.80	0.73 ic	0.21 ic	0.52 ic	---	0.00	0.00	---	---	---	---	0.733
4.68	43,469	482.85	0.78 ic	0.21 ic	0.54 ic	---	0.00	0.00	---	---	---	---	0.751
4.73	44,492	482.90	0.78 ic	0.21 ic	0.56 ic	---	0.00	0.00	---	---	---	---	0.769
4.78	45,516	482.95	0.79 ic	0.21 ic	0.57 ic	---	0.00	0.00	---	---	---	---	0.786
4.83	46,539	483.00	0.84 ic	0.21 ic	0.59 ic	---	0.00	0.00	---	---	---	---	0.803
4.88	47,623	483.05	1.26 ic	0.21 ic	0.60 ic	---	0.45	0.00	---	---	---	---	1.262
4.93	48,706	483.10	2.10 oc	0.21 ic	0.62 ic	---	1.26	0.00	---	---	---	---	2.091
4.98	49,790	483.15	3.21 oc	0.21 ic	0.63 ic	---	2.32	0.00	---	---	---	---	3.157

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Basin 7

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
5.03	50,873	483.20	4.43 oc	0.20 ic	0.65 ic	---	3.57	0.00	---	---	---	---	4.418
5.08	51,957	483.25	5.91 oc	0.20 ic	0.66 ic	---	4.99	0.00	---	---	---	---	5.847
5.13	53,040	483.30	7.45 oc	0.19 ic	0.68 ic	---	6.56	0.00	---	---	---	---	7.425
5.18	54,124	483.35	9.13 oc	0.18 ic	0.69 ic	---	8.27	0.00	---	---	---	---	9.132
5.23	55,207	483.40	10.98 oc	0.17 ic	0.70 ic	---	10.10	0.00	---	---	---	---	10.98
5.28	56,291	483.45	12.94 oc	0.17 ic	0.71 ic	---	12.05	0.00	---	---	---	---	12.94
5.33	57,375	483.50	15.02 oc	0.17 ic	0.73 ic	---	14.12	0.00	---	---	---	---	15.02

...End

Hydrograph Report

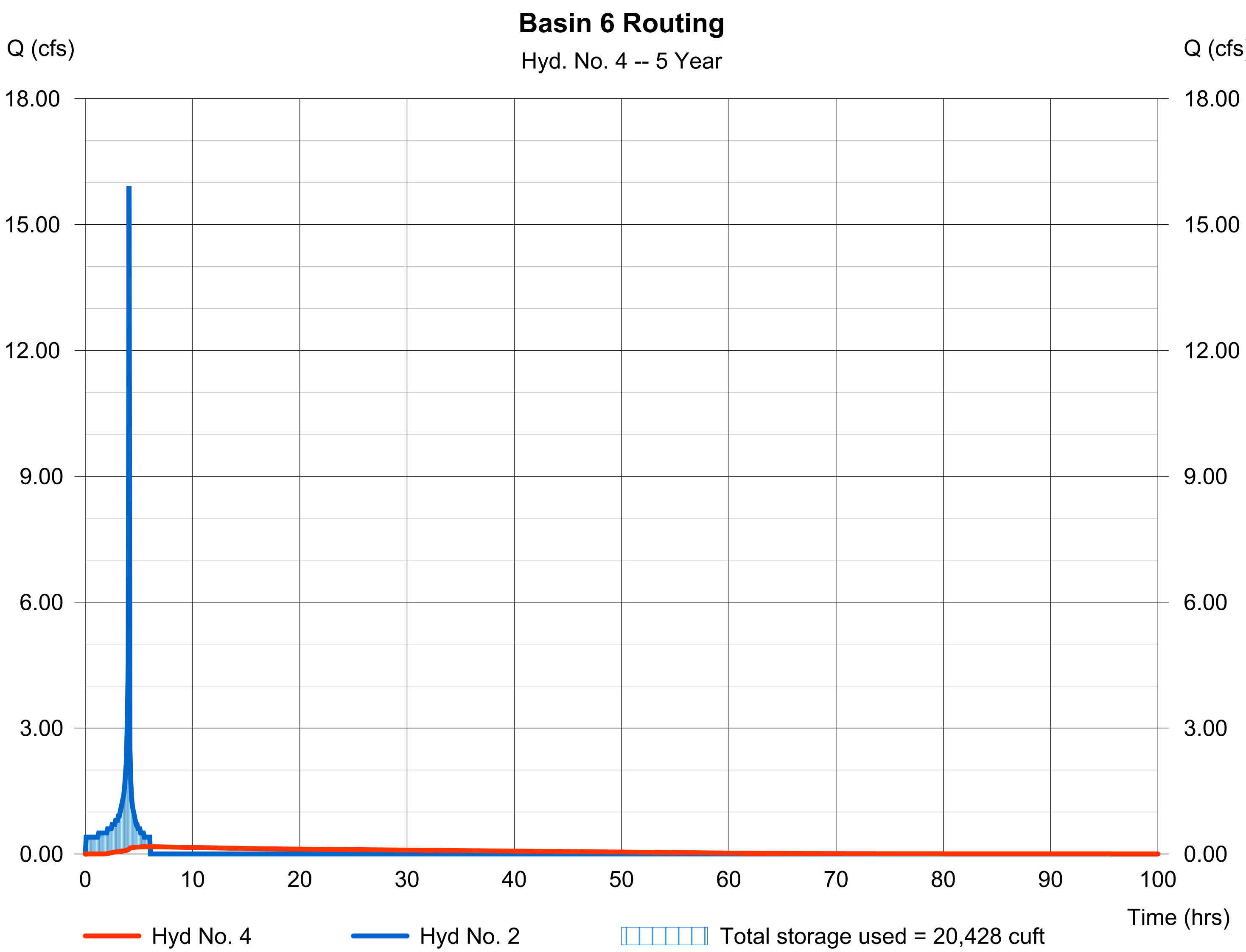
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 4

Basin 6 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.173 cfs
Storm frequency	= 5 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 19,194 cuft
Inflow hyd. No.	= 2 - Basin 6 Inflow	Max. Elevation	= 484.37 ft
Reservoir name	= Basin 6	Max. Storage	= 20,428 cuft

Storage Indication method used.



Pond Report

Pond No. 3 - Basin 6

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	481.17	n/a	0	0
0.33	481.50	n/a	2,706	2,706
0.83	482.00	n/a	4,059	6,766
1.33	482.50	n/a	4,059	10,825
1.83	483.00	n/a	4,059	14,885
2.33	483.50	n/a	2,030	16,914
2.83	484.00	n/a	2,030	18,944
3.33	484.50	n/a	2,030	20,974
3.83	485.00	n/a	10,763	31,736
4.33	485.50	n/a	11,385	43,121
4.83	486.00	n/a	12,014	55,135
5.33	486.50	n/a	12,652	67,787

Culvert / Orifice Structures

		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	24.00	2.00	1.00	Inactive
Span (in)	=	24.00	2.00	12.00	0.00
No. Barrels	=	1	1	1	0
Invert El. (ft)	=	481.50	481.50	485.00	0.00
Length (ft)	=	50.00	0.50	0.50	0.00
Slope (%)	=	0.50	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	Yes	Yes	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	12.00	Inactive	Inactive	Inactive
Crest El. (ft)	=	485.80	0.00	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	1	---	---	---
Multi-Stage	=	Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	481.17	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.03	271	481.20	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.07	541	481.24	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.10	812	481.27	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.13	1,083	481.30	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.17	1,353	481.33	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.20	1,624	481.37	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.23	1,894	481.40	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.26	2,165	481.43	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.30	2,436	481.47	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.33	2,706	481.50	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.38	3,112	481.55	0.00 ic	0.00 ic	0.00	---	0.00	---	---	---	---	---	0.004
0.43	3,518	481.60	0.01 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.015
0.48	3,924	481.65	0.03 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.027
0.53	4,330	481.70	0.04 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.036
0.58	4,736	481.75	0.04 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.043
0.63	5,142	481.80	0.05 ic	0.05 ic	0.00	---	0.00	---	---	---	---	---	0.049
0.68	5,548	481.85	0.06 ic	0.05 ic	0.00	---	0.00	---	---	---	---	---	0.054
0.73	5,954	481.90	0.06 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.058
0.78	6,360	481.95	0.06 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.063
0.83	6,766	482.00	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.066
0.88	7,172	482.05	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.070
0.93	7,578	482.10	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.074
0.98	7,984	482.15	0.08 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.077
1.03	8,389	482.20	0.08 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.081
1.08	8,795	482.25	0.08 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.084
1.13	9,201	482.30	0.09 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.087
1.18	9,607	482.35	0.09 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.090
1.23	10,013	482.40	0.09 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.093
1.28	10,419	482.45	0.10 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.096
1.33	10,825	482.50	0.11 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.098
1.38	11,231	482.55	0.11 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.101

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Basin 6

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.43	11,637	482.60	0.11 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.104
1.48	12,043	482.65	0.11 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.106
1.53	12,449	482.70	0.12 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.109
1.58	12,855	482.75	0.12 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.111
1.63	13,261	482.80	0.12 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.114
1.68	13,667	482.85	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.116
1.73	14,073	482.90	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.118
1.78	14,479	482.95	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.120
1.83	14,885	483.00	0.13 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.123
1.88	15,087	483.05	0.13 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.125
1.93	15,290	483.10	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.127
1.98	15,493	483.15	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.129
2.03	15,696	483.20	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.131
2.08	15,899	483.25	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.133
2.13	16,102	483.30	0.14 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.135
2.18	16,305	483.35	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.137
2.23	16,508	483.40	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.139
2.28	16,711	483.45	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.141
2.33	16,914	483.50	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.143
2.38	17,117	483.55	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.145
2.43	17,320	483.60	0.15 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.147
2.48	17,523	483.65	0.15 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.149
2.53	17,726	483.70	0.15 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.150
2.58	17,929	483.75	0.16 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.152
2.63	18,132	483.80	0.16 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.154
2.68	18,335	483.85	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.156
2.73	18,538	483.90	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.157
2.78	18,741	483.95	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.159
2.83	18,944	484.00	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.161
2.88	19,147	484.05	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.163
2.93	19,350	484.10	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.164
2.98	19,553	484.15	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.166
3.03	19,756	484.20	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.167
3.08	19,959	484.25	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.169
3.13	20,162	484.30	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.171
3.18	20,365	484.35	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.172
3.23	20,568	484.40	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.174
3.28	20,771	484.45	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.175
3.33	20,974	484.50	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.177
3.38	22,050	484.55	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.178
3.43	23,126	484.60	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.180
3.48	24,202	484.65	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.181
3.53	25,279	484.70	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.183
3.58	26,355	484.75	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.184
3.63	27,431	484.80	0.19 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.186
3.68	28,507	484.85	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.187
3.73	29,584	484.90	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.189
3.78	30,660	484.95	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.190
3.83	31,736	485.00	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.192
3.88	32,875	485.05	0.24 ic	0.19 ic	0.04 ic	---	0.00	---	---	---	---	---	0.230
3.93	34,013	485.10	0.29 ic	0.19 ic	0.10 ic	---	0.00	---	---	---	---	---	0.290
3.98	35,151	485.15	0.35 ic	0.19 ic	0.13 ic	---	0.00	---	---	---	---	---	0.326
4.03	36,290	485.20	0.38 ic	0.20 ic	0.16 ic	---	0.00	---	---	---	---	---	0.355
4.08	37,428	485.25	0.38 ic	0.20 ic	0.18 ic	---	0.00	---	---	---	---	---	0.380
4.13	38,567	485.30	0.41 ic	0.20 ic	0.20 ic	---	0.00	---	---	---	---	---	0.402
4.18	39,705	485.35	0.44 ic	0.20 ic	0.22 ic	---	0.00	---	---	---	---	---	0.422
4.23	40,844	485.40	0.44 ic	0.20 ic	0.24 ic	---	0.00	---	---	---	---	---	0.441
4.28	41,982	485.45	0.48 ic	0.20 ic	0.26 ic	---	0.00	---	---	---	---	---	0.458
4.33	43,121	485.50	0.48 ic	0.20 ic	0.27 ic	---	0.00	---	---	---	---	---	0.474
4.38	44,322	485.55	0.52 ic	0.20 ic	0.29 ic	---	0.00	---	---	---	---	---	0.490
4.43	45,523	485.60	0.52 ic	0.21 ic	0.30 ic	---	0.00	---	---	---	---	---	0.505
4.48	46,725	485.65	0.52 ic	0.21 ic	0.31 ic	---	0.00	---	---	---	---	---	0.519
4.53	47,926	485.70	0.56 ic	0.21 ic	0.33 ic	---	0.00	---	---	---	---	---	0.533
4.58	49,128	485.75	0.56 ic	0.21 ic	0.34 ic	---	0.00	---	---	---	---	---	0.547
4.63	50,329	485.80	0.56 ic	0.21 ic	0.35 ic	---	0.00	---	---	---	---	---	0.560
4.68	51,531	485.85	1.01 ic	0.21 ic	0.36 ic	---	0.44	---	---	---	---	---	1.013
4.73	52,732	485.90	1.87 oc	0.21 ic	0.37 ic	---	1.26	---	---	---	---	---	1.838
4.78	53,933	485.95	2.94 oc	0.20 ic	0.38 ic	---	2.32	---	---	---	---	---	2.901
4.83	55,135	486.00	4.24 oc	0.20 ic	0.39 ic	---	3.57	---	---	---	---	---	4.162
4.88	56,400	486.05	5.64 oc	0.19 ic	0.40 ic	---	4.99	---	---	---	---	---	5.587
4.93	57,665	486.10	7.18 oc	0.19 ic	0.41 ic	---	6.56	---	---	---	---	---	7.162
4.98	58,931	486.15	8.86 oc	0.17 ic	0.42 ic	---	8.27	---	---	---	---	---	8.864

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Basin 6

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
5.03	60,196	486.20	10.71 oc	0.17 ic	0.43 ic	---	10.11	---	---	---	---	---	10.71
5.08	61,461	486.25	12.66 oc	0.16 ic	0.44 ic	---	12.05	---	---	---	---	---	12.66
5.13	62,726	486.30	14.73 oc	0.16 ic	0.45 ic	---	14.12	---	---	---	---	---	14.73
5.18	63,991	486.35	16.90 oc	0.15 ic	0.46 ic	---	16.29	---	---	---	---	---	16.90
5.23	65,257	486.40	19.18 oc	0.15 ic	0.47 ic	---	18.56	---	---	---	---	---	19.18
5.28	66,522	486.45	21.54 oc	0.14 ic	0.48 ic	---	20.93	---	---	---	---	---	21.54
5.33	67,787	486.50	23.98 oc	0.12 ic	0.46 ic	---	23.40	---	---	---	---	---	23.98

...End

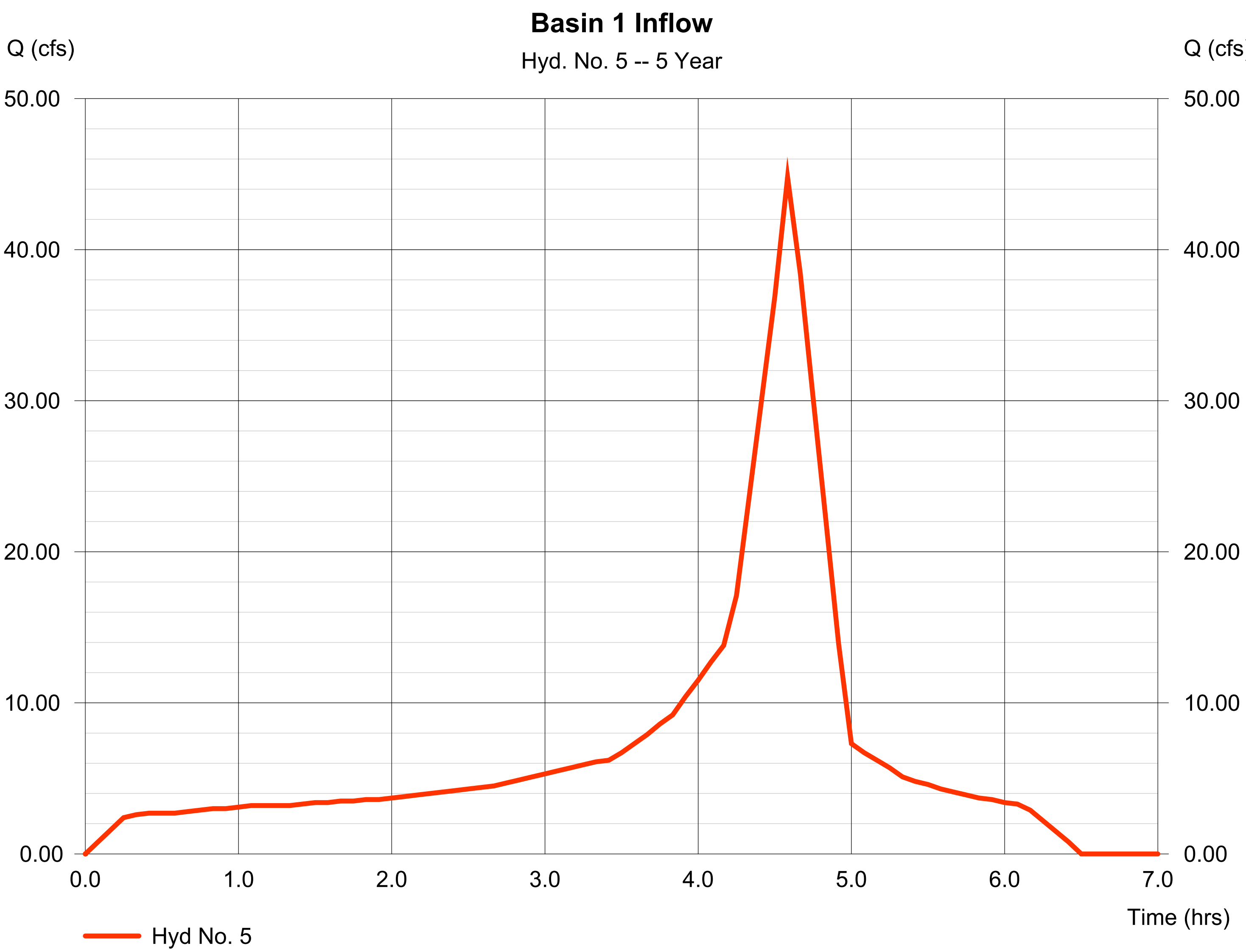
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 5

Basin 1 Inflow

Hydrograph type	= Manual	Peak discharge	= 44.80 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.58 hrs
Time interval	= 5 min	Hyd. volume	= 171,990 cuft



Hydrograph Report

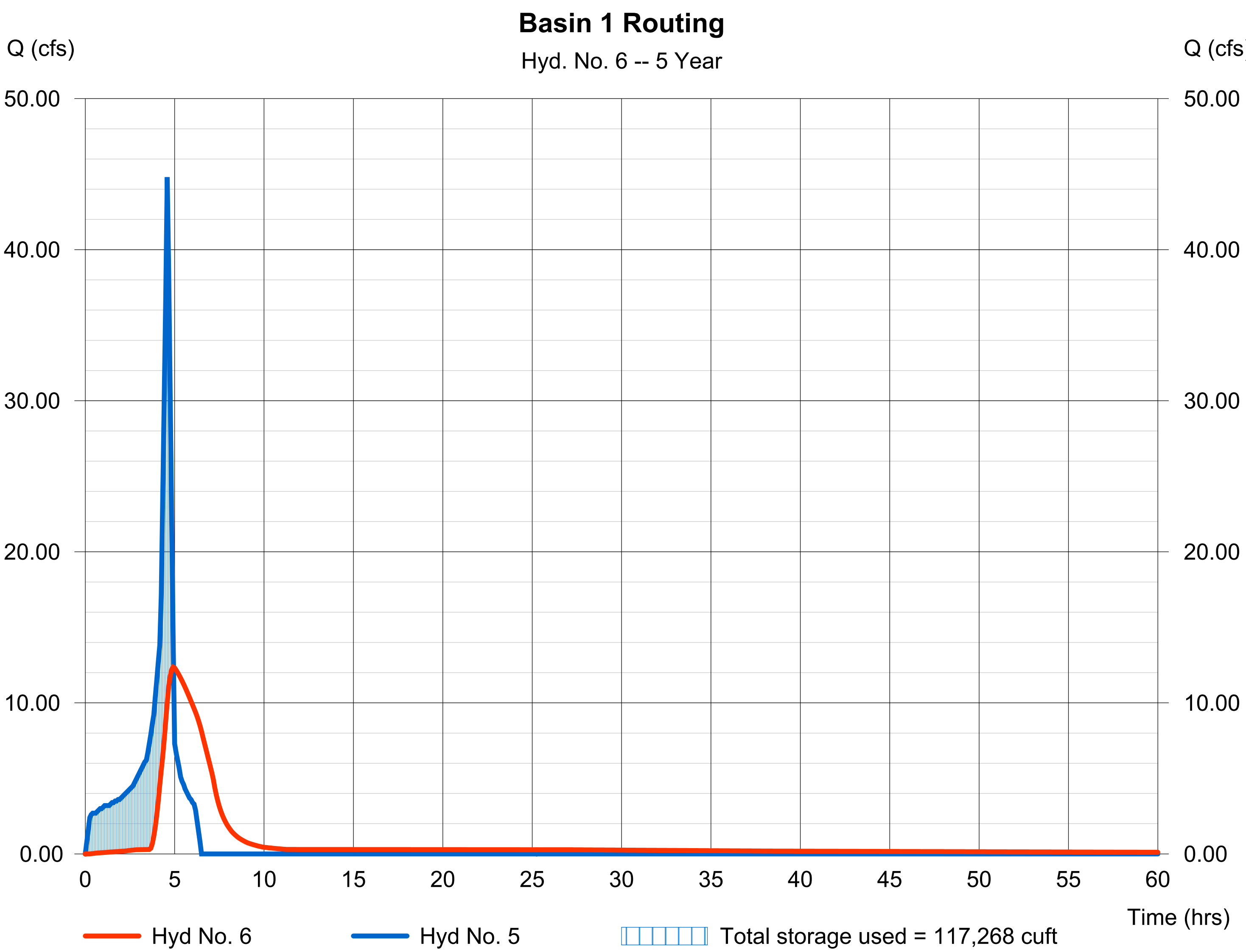
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 6

Basin 1 Routing

Hydrograph type	= Reservoir	Peak discharge	= 12.37 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.92 hrs
Time interval	= 5 min	Hyd. volume	= 171,782 cuft
Inflow hyd. No.	= 5 - Basin 1 Inflow	Max. Elevation	= 484.32 ft
Reservoir name	= Basin 1	Max. Storage	= 117,268 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Pond No. 1 - Basin 1

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	479.00	n/a	0	0
0.50	479.50	n/a	10,319	10,319
1.00	480.00	n/a	6,191	16,510
1.50	480.50	n/a	6,191	22,701
2.00	481.00	n/a	3,096	25,797
2.50	481.50	n/a	3,096	28,893
3.00	482.00	n/a	3,095	31,988
3.50	482.50	n/a	16,512	48,500
4.00	483.00	n/a	17,546	66,046
4.50	483.50	n/a	18,595	84,641
5.00	484.00	n/a	19,646	104,287
5.50	484.50	n/a	20,712	124,999
6.00	485.00	n/a	21,779	146,778
6.50	485.50	n/a	22,862	169,640
7.00	486.00	n/a	23,945	193,585

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	2.50	6.00	Inactive
Span (in)	= 36.00	2.50	48.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 479.00	479.00	482.50	0.00
Length (ft)	= 50.00	0.50	0.50	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 18.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 485.30	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	479.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.05	1,032	479.05	0.01 ic	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	0.005
0.10	2,064	479.10	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.018
0.15	3,096	479.15	0.04 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.035
0.20	4,128	479.20	0.06 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.051
0.25	5,160	479.25	0.07 ic	0.06 ic	0.00	---	0.00	0.00	---	---	---	---	0.063
0.30	6,191	479.30	0.07 ic	0.07 ic	0.00	---	0.00	0.00	---	---	---	---	0.073
0.35	7,223	479.35	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.081
0.40	8,255	479.40	0.10 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.089
0.45	9,287	479.45	0.10 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.096
0.50	10,319	479.50	0.11 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.102
0.55	10,938	479.55	0.11 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.108
0.60	11,557	479.60	0.11 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.114
0.65	12,176	479.65	0.13 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.119
0.70	12,795	479.70	0.13 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.125
0.75	13,415	479.75	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.130
0.80	14,034	479.80	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.135
0.85	14,653	479.85	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.139
0.90	15,272	479.90	0.15 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.144
0.95	15,891	479.95	0.15 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.148
1.00	16,510	480.00	0.15 ic	0.15 ic	0.00	---	0.00	0.00	---	---	---	---	0.153
1.05	17,129	480.05	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.157
1.10	17,748	480.10	0.18 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.161
1.15	18,367	480.15	0.18 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.165
1.20	18,986	480.20	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.169
1.25	19,606	480.25	0.18 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.173
1.30	20,225	480.30	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.176
1.35	20,844	480.35	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.180
1.40	21,463	480.40	0.20 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.183

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Basin 1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.45	22,082	480.45	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.187
1.50	22,701	480.50	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.190
1.55	23,011	480.55	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.194
1.60	23,320	480.60	0.20 ic	0.20 ic	0.00	---	0.00	0.00	---	---	---	---	0.197
1.65	23,630	480.65	0.20 ic	0.20 ic	0.00	---	0.00	0.00	---	---	---	---	0.201
1.70	23,939	480.70	0.20 ic	0.20 ic	0.00	---	0.00	0.00	---	---	---	---	0.204
1.75	24,249	480.75	0.23 ic	0.21 ic	0.00	---	0.00	0.00	---	---	---	---	0.207
1.80	24,559	480.80	0.23 ic	0.21 ic	0.00	---	0.00	0.00	---	---	---	---	0.210
1.85	24,868	480.85	0.23 ic	0.21 ic	0.00	---	0.00	0.00	---	---	---	---	0.213
1.90	25,178	480.90	0.23 ic	0.22 ic	0.00	---	0.00	0.00	---	---	---	---	0.216
1.95	25,487	480.95	0.23 ic	0.22 ic	0.00	---	0.00	0.00	---	---	---	---	0.219
2.00	25,797	481.00	0.23 ic	0.22 ic	0.00	---	0.00	0.00	---	---	---	---	0.222
2.05	26,107	481.05	0.23 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.225
2.10	26,416	481.10	0.23 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.228
2.15	26,726	481.15	0.23 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.231
2.20	27,035	481.20	0.23 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.234
2.25	27,345	481.25	0.26 ic	0.24 ic	0.00	---	0.00	0.00	---	---	---	---	0.236
2.30	27,655	481.30	0.26 ic	0.24 ic	0.00	---	0.00	0.00	---	---	---	---	0.239
2.35	27,964	481.35	0.26 ic	0.24 ic	0.00	---	0.00	0.00	---	---	---	---	0.242
2.40	28,274	481.40	0.26 ic	0.24 ic	0.00	---	0.00	0.00	---	---	---	---	0.245
2.45	28,583	481.45	0.26 ic	0.25 ic	0.00	---	0.00	0.00	---	---	---	---	0.248
2.50	28,893	481.50	0.26 ic	0.25 ic	0.00	---	0.00	0.00	---	---	---	---	0.250
2.55	29,203	481.55	0.26 ic	0.25 ic	0.00	---	0.00	0.00	---	---	---	---	0.253
2.60	29,512	481.60	0.26 ic	0.26 ic	0.00	---	0.00	0.00	---	---	---	---	0.256
2.65	29,822	481.65	0.26 ic	0.26 ic	0.00	---	0.00	0.00	---	---	---	---	0.258
2.70	30,131	481.70	0.26 ic	0.26 ic	0.00	---	0.00	0.00	---	---	---	---	0.261
2.75	30,441	481.75	0.26 ic	0.26 ic	0.00	---	0.00	0.00	---	---	---	---	0.263
2.80	30,750	481.80	0.27 ic	0.27 ic	0.00	---	0.00	0.00	---	---	---	---	0.265
2.85	31,060	481.85	0.29 ic	0.27 ic	0.00	---	0.00	0.00	---	---	---	---	0.268
2.90	31,369	481.90	0.29 ic	0.27 ic	0.00	---	0.00	0.00	---	---	---	---	0.270
2.95	31,679	481.95	0.29 ic	0.27 ic	0.00	---	0.00	0.00	---	---	---	---	0.273
3.00	31,988	482.00	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.275
3.05	33,639	482.05	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.278
3.10	35,290	482.10	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.280
3.15	36,942	482.15	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.283
3.20	38,593	482.20	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.285
3.25	40,244	482.25	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.287
3.30	41,895	482.30	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.290
3.35	43,546	482.35	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.292
3.40	45,198	482.40	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.294
3.45	46,849	482.45	0.30 ic	0.30 ic	0.00	---	0.00	0.00	---	---	---	---	0.296
3.50	48,500	482.50	0.30 ic	0.30 ic	0.00	---	0.00	0.00	---	---	---	---	0.298
3.55	50,255	482.55	0.45 ic	0.30 ic	0.15 ic	---	0.00	0.00	---	---	---	---	0.451
3.60	52,009	482.60	0.74 ic	0.30 ic	0.43 ic	---	0.00	0.00	---	---	---	---	0.729
3.65	53,764	482.65	1.13 ic	0.30 ic	0.79 ic	---	0.00	0.00	---	---	---	---	1.088
3.70	55,518	482.70	1.53 ic	0.30 ic	1.22 ic	---	0.00	0.00	---	---	---	---	1.514
3.75	57,273	482.75	2.02 ic	0.30 ic	1.70 ic	---	0.00	0.00	---	---	---	---	1.997
3.80	59,028	482.80	2.61 ic	0.29 ic	2.24 ic	---	0.00	0.00	---	---	---	---	2.531
3.85	60,782	482.85	3.11 ic	0.29 ic	2.82 ic	---	0.00	0.00	---	---	---	---	3.113
3.90	62,537	482.90	3.88 ic	0.29 ic	3.44 ic	---	0.00	0.00	---	---	---	---	3.737
3.95	64,291	482.95	4.53 ic	0.29 ic	4.11 ic	---	0.00	0.00	---	---	---	---	4.402
4.00	66,046	483.00	5.24 ic	0.29 ic	4.81 ic	---	0.00	0.00	---	---	---	---	5.107
4.05	67,906	483.05	5.74 ic	0.29 ic	5.27 ic	---	0.00	0.00	---	---	---	---	5.567
4.10	69,765	483.10	6.01 ic	0.29 ic	5.70 ic	---	0.00	0.00	---	---	---	---	5.990
4.15	71,625	483.15	6.55 ic	0.29 ic	6.09 ic	---	0.00	0.00	---	---	---	---	6.384
4.20	73,484	483.20	6.84 ic	0.29 ic	6.46 ic	---	0.00	0.00	---	---	---	---	6.755
4.25	75,344	483.25	7.13 ic	0.30 ic	6.81 ic	---	0.00	0.00	---	---	---	---	7.105
4.30	77,203	483.30	7.44 ic	0.30 ic	7.14 ic	---	0.00	0.00	---	---	---	---	7.439
4.35	79,063	483.35	7.76 ic	0.30 ic	7.46 ic	---	0.00	0.00	---	---	---	---	7.757
4.40	80,922	483.40	8.06 ic	0.30 ic	7.76 ic	---	0.00	0.00	---	---	---	---	8.063
4.45	82,782	483.45	8.36 ic	0.30 ic	8.06 ic	---	0.00	0.00	---	---	---	---	8.358
4.50	84,641	483.50	8.68 ic	0.30 ic	8.34 ic	---	0.00	0.00	---	---	---	---	8.642
4.55	86,606	483.55	9.01 ic	0.30 ic	8.61 ic	---	0.00	0.00	---	---	---	---	8.917
4.60	88,570	483.60	9.35 ic	0.30 ic	8.88 ic	---	0.00	0.00	---	---	---	---	9.183
4.65	90,535	483.65	9.69 ic	0.31 ic	9.14 ic	---	0.00	0.00	---	---	---	---	9.442
4.70	92,499	483.70	9.69 ic	0.31 ic	9.39 ic	---	0.00	0.00	---	---	---	---	9.694
4.75	94,464	483.75	10.04 ic	0.31 ic	9.63 ic	---	0.00	0.00	---	---	---	---	9.939
4.80	96,429	483.80	10.39 ic	0.31 ic	9.87 ic	---	0.00	0.00	---	---	---	---	10.18
4.85	98,393	483.85	10.41 ic	0.31 ic	10.10 ic	---	0.00	0.00	---	---	---	---	10.41
4.90	100,358	483.90	10.75 ic	0.31 ic	10.33 ic	---	0.00	0.00	---	---	---	---	10.64
4.95	102,322	483.95	11.12 ic	0.32 ic	10.55 ic	---	0.00	0.00	---	---	---	---	10.86
5.00	104,287	484.00	11.12 ic	0.32 ic	10.77 ic	---	0.00	0.00	---	---	---	---	11.08

Continues on next page...

Basin 1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
5.05	106,358	484.05	11.49 ic	0.32 ic	10.98 ic	---	0.00	0.00	---	---	---	---	11.30
5.10	108,429	484.10	11.51 ic	0.32 ic	11.19 ic	---	0.00	0.00	---	---	---	---	11.51
5.15	110,501	484.15	11.86 ic	0.32 ic	11.39 ic	---	0.00	0.00	---	---	---	---	11.72
5.20	112,572	484.20	11.92 ic	0.32 ic	11.60 ic	---	0.00	0.00	---	---	---	---	11.92
5.25	114,643	484.25	12.24 ic	0.32 ic	11.79 ic	---	0.00	0.00	---	---	---	---	12.12
5.30	116,714	484.30	12.32 ic	0.33 ic	11.99 ic	---	0.00	0.00	---	---	---	---	12.32
5.35	118,785	484.35	12.63 ic	0.33 ic	12.18 ic	---	0.00	0.00	---	---	---	---	12.51
5.40	120,857	484.40	12.70 ic	0.33 ic	12.37 ic	---	0.00	0.00	---	---	---	---	12.70
5.45	122,928	484.45	13.02 ic	0.33 ic	12.56 ic	---	0.00	0.00	---	---	---	---	12.89
5.50	124,999	484.50	13.07 ic	0.33 ic	12.74 ic	---	0.00	0.00	---	---	---	---	13.07
5.55	127,177	484.55	13.41 ic	0.33 ic	12.92 ic	---	0.00	0.00	---	---	---	---	13.25
5.60	129,355	484.60	13.43 ic	0.34 ic	13.10 ic	---	0.00	0.00	---	---	---	---	13.43
5.65	131,533	484.65	13.81 ic	0.34 ic	13.27 ic	---	0.00	0.00	---	---	---	---	13.61
5.70	133,711	484.70	13.81 ic	0.34 ic	13.45 ic	---	0.00	0.00	---	---	---	---	13.79
5.75	135,889	484.75	14.21 ic	0.34 ic	13.62 ic	---	0.00	0.00	---	---	---	---	13.96
5.80	138,066	484.80	14.21 ic	0.34 ic	13.79 ic	---	0.00	0.00	---	---	---	---	14.13
5.85	140,244	484.85	14.30 ic	0.34 ic	13.95 ic	---	0.00	0.00	---	---	---	---	14.30
5.90	142,422	484.90	14.62 ic	0.35 ic	14.12 ic	---	0.00	0.00	---	---	---	---	14.47
5.95	144,600	484.95	14.63 ic	0.35 ic	14.28 ic	---	0.00	0.00	---	---	---	---	14.63
6.00	146,778	485.00	15.02 oc	0.35 ic	14.44 ic	---	0.00	0.00	---	---	---	---	14.79
6.05	149,064	485.05	15.02 oc	0.35 ic	14.60 ic	---	0.00	0.00	---	---	---	---	14.95
6.10	151,350	485.10	15.33 oc	0.35 ic	14.76 ic	---	0.00	0.00	---	---	---	---	15.11
6.15	153,637	485.15	15.33 oc	0.35 ic	14.92 ic	---	0.00	0.00	---	---	---	---	15.27
6.20	155,923	485.20	15.65 oc	0.35 ic	15.07 ic	---	0.00	0.00	---	---	---	---	15.43
6.25	158,209	485.25	15.65 oc	0.36 ic	15.23 ic	---	0.00	0.00	---	---	---	---	15.58
6.30	160,495	485.30	15.96 oc	0.36 ic	15.38 ic	---	0.00	0.00	---	---	---	---	15.73
6.35	162,781	485.35	16.58 oc	0.36 ic	15.53 ic	---	0.67	0.00	---	---	---	---	16.55
6.40	165,068	485.40	18.12 oc	0.35 ic	15.68 ic	---	1.89	0.00	---	---	---	---	17.92
6.45	167,354	485.45	19.90 oc	0.35 ic	15.82 ic	---	3.48	0.00	---	---	---	---	19.65
6.50	169,640	485.50	21.86 oc	0.35 ic	15.97 ic	---	5.36	0.00	---	---	---	---	21.68
6.55	172,035	485.55	24.11 oc	0.34 ic	16.11 ic	---	7.49	0.00	---	---	---	---	23.95
6.60	174,429	485.60	26.55 oc	0.33 ic	16.26 ic	---	9.85	0.00	---	---	---	---	26.44
6.65	176,824	485.65	29.17 oc	0.32 ic	16.40 ic	---	12.41	0.00	---	---	---	---	29.13
6.70	179,218	485.70	32.01 oc	0.31 ic	16.54 ic	---	15.16	0.00	---	---	---	---	32.01
6.75	181,613	485.75	35.08 oc	0.31 ic	16.68 ic	---	18.09	0.00	---	---	---	---	35.08
6.80	184,007	485.80	38.31 oc	0.30 ic	16.82 ic	---	21.19	0.00	---	---	---	---	38.31
6.85	186,402	485.85	41.70 oc	0.30 ic	16.96 ic	---	24.44	0.00	---	---	---	---	41.70
6.90	188,796	485.90	45.24 oc	0.29 ic	17.09 ic	---	27.85	0.00	---	---	---	---	45.24
6.95	191,191	485.95	48.61 oc	0.29 ic	16.91 ic	---	31.40	0.00	---	---	---	---	48.60
7.00	193,585	486.00	51.91 oc	0.28 ic	16.52 ic	---	35.11	0.00	---	---	---	---	51.91

...End

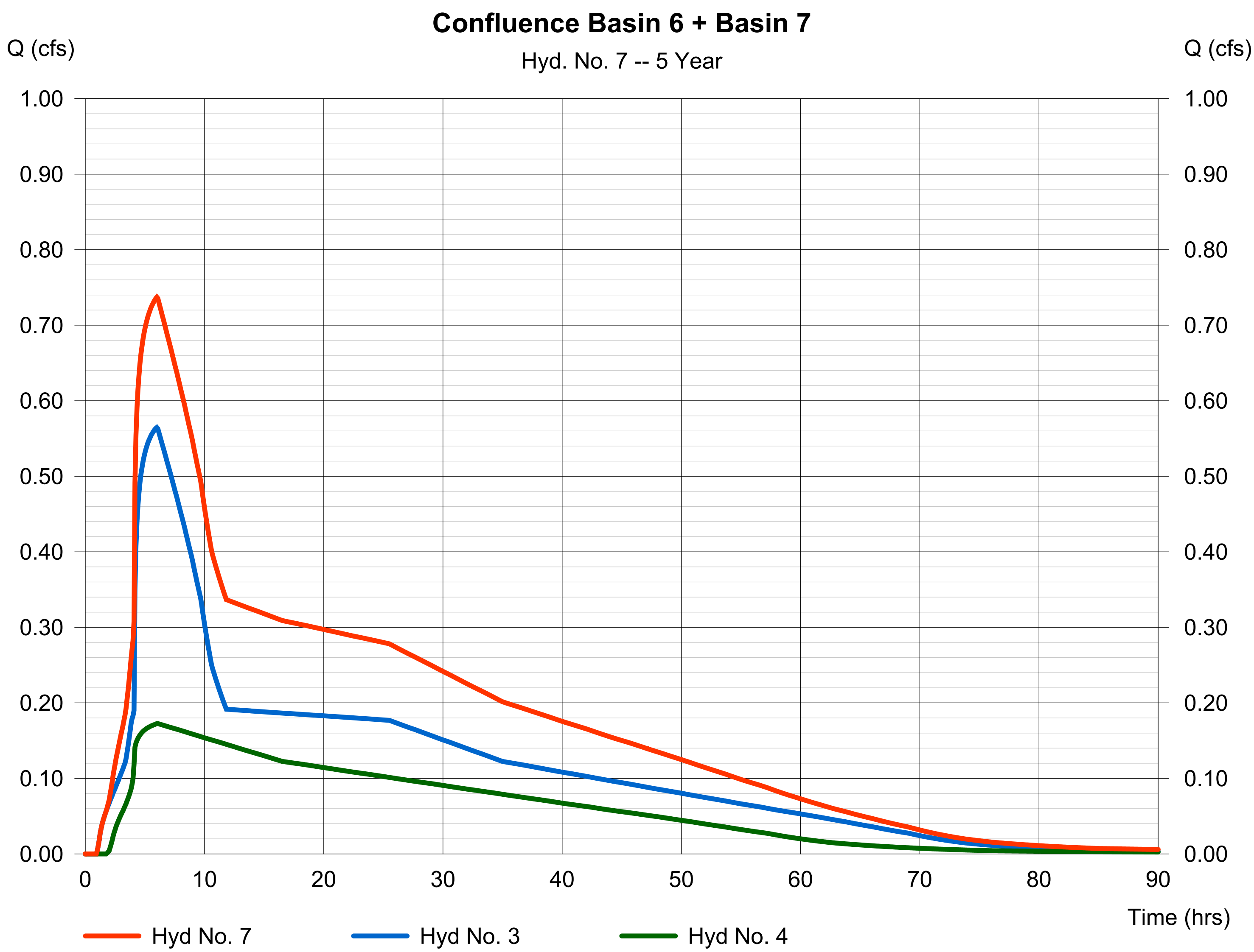
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 7

Confluence Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 0.737 cfs
Storm frequency	= 5 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 56,033 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.000 ac



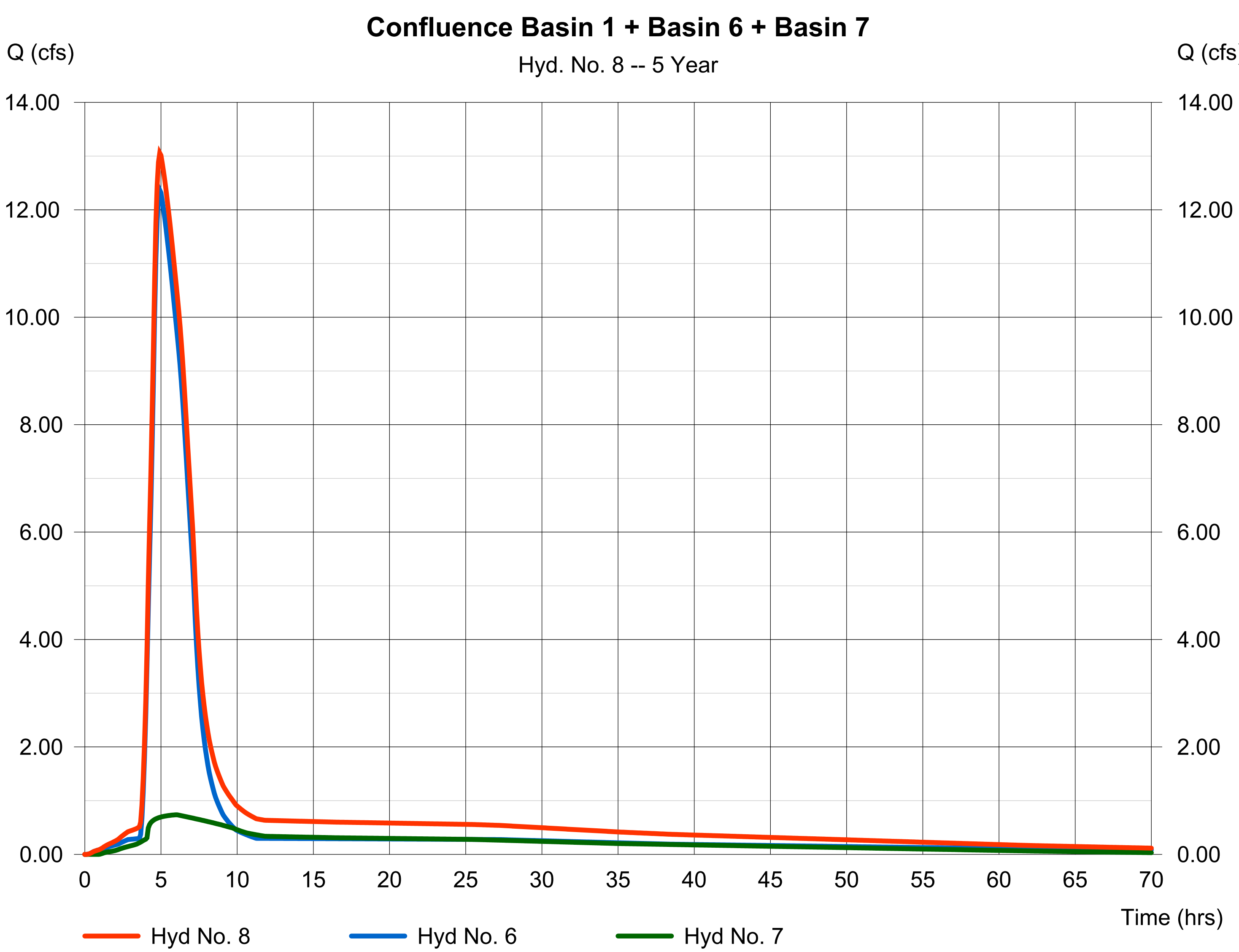
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 8

Confluence Basin 1 + Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 13.06 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.92 hrs
Time interval	= 5 min	Hyd. volume	= 227,814 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	20.19	5	245	44,757	------	------	------	Basin 7 Inflow
2	Manual	18.19	5	245	25,077	------	------	------	Basin 6 Inflow
3	Reservoir	0.670	5	360	42,407	1	482.64	39,140	Basin 7 Routing
4	Reservoir	0.180	5	365	22,274	2	484.61	23,329	Basin 6 Routing
5	Manual	54.00	5	265	194,520	------	------	------	Basin 1 Inflow
6	Reservoir	13.59	5	285	194,311	5	484.65	131,267	Basin 1 Routing
7	Combine	0.850	5	360	64,682	3, 4,	------	------	Confluence Basin 6 + Basin 7
8	Combine	14.40	5	285	258,993	6, 7	------	------	Confluence Basin 1 + Basin 6 + Basin

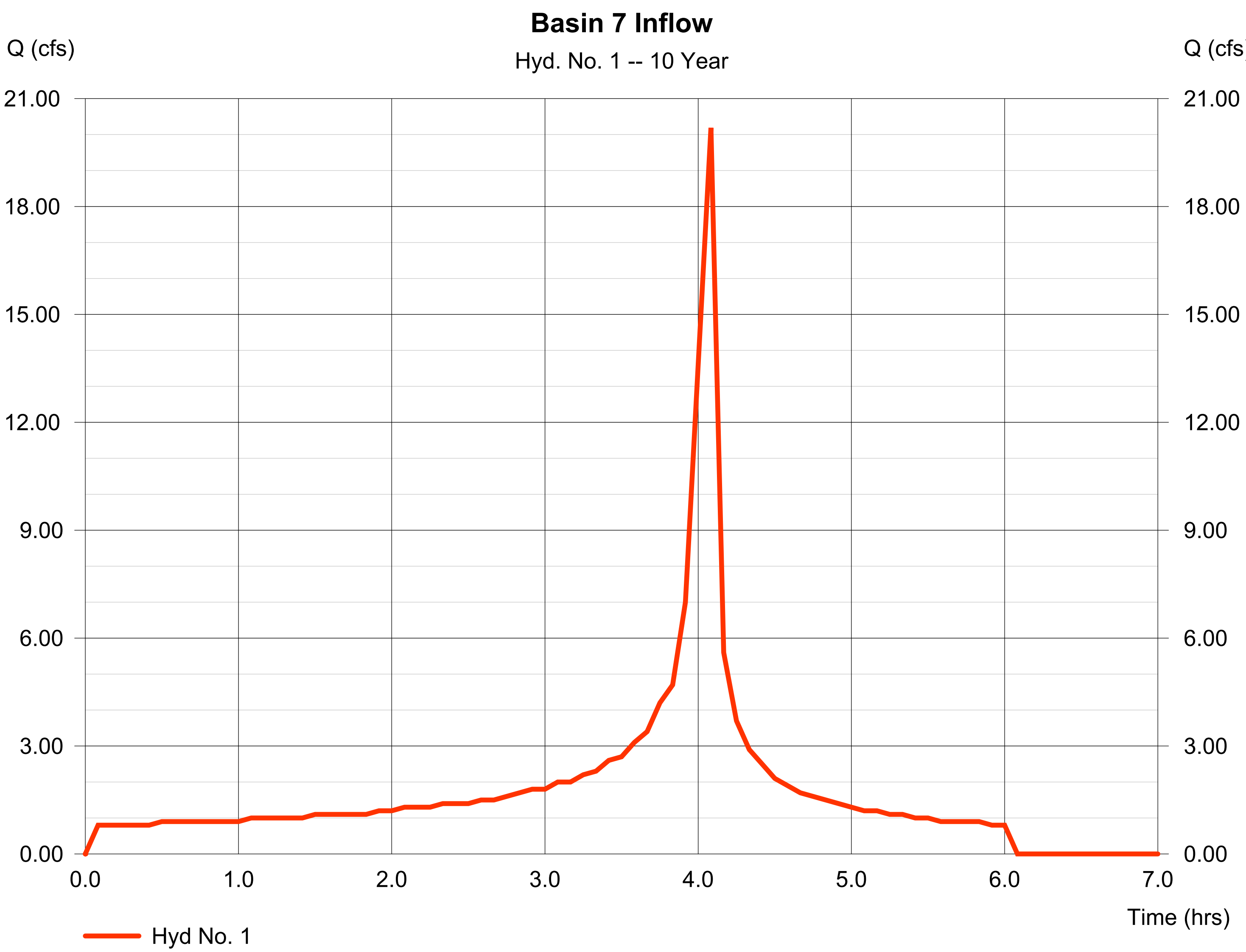
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 1

Basin 7 Inflow

Hydrograph type	= Manual	Peak discharge	= 20.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 44,757 cuft



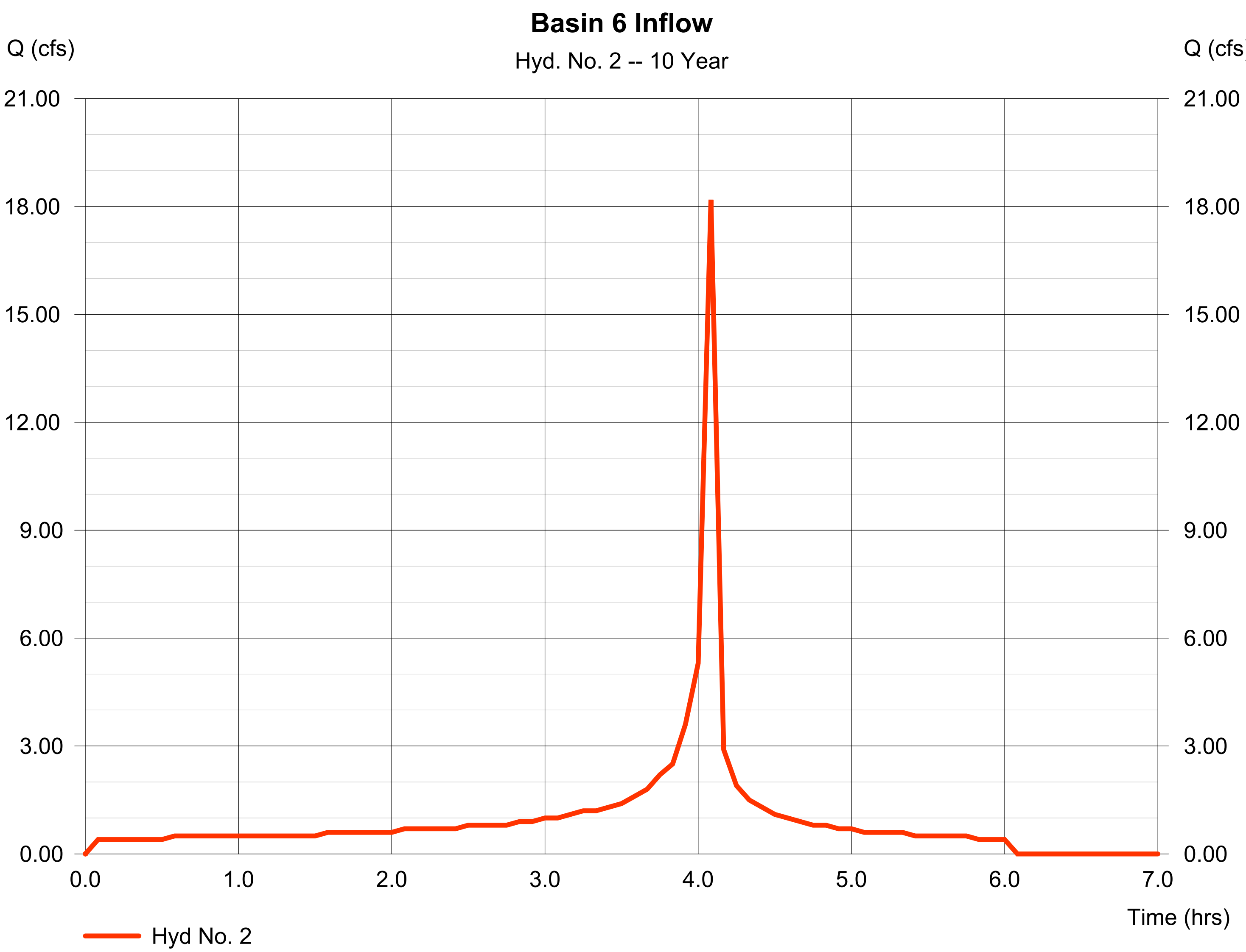
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 2

Basin 6 Inflow

Hydrograph type	= Manual	Peak discharge	= 18.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 25,077 cuft



Hydrograph Report

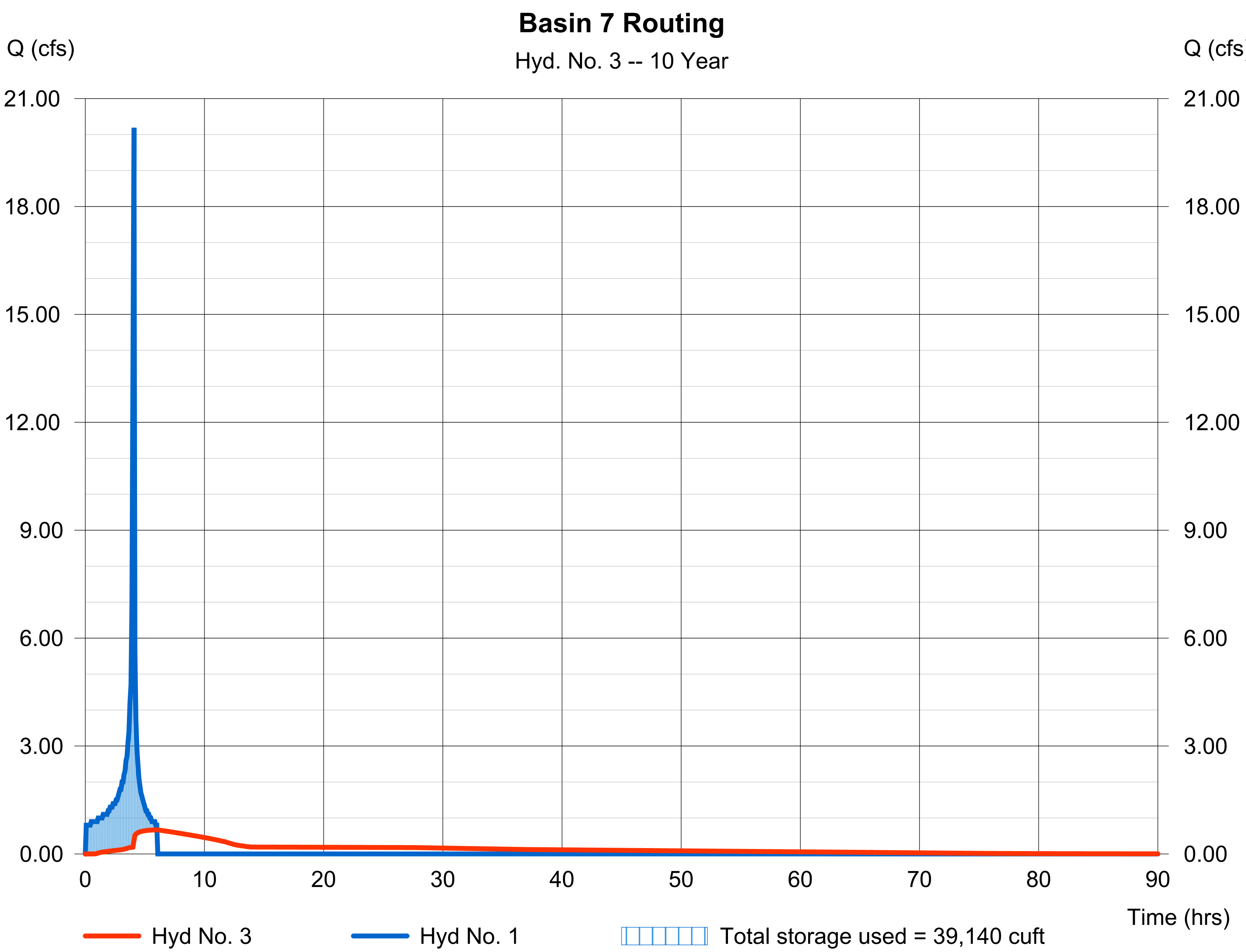
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 3

Basin 7 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.670 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 42,407 cuft
Inflow hyd. No.	= 1 - Basin 7 Inflow	Max. Elevation	= 482.64 ft
Reservoir name	= Basin 7	Max. Storage	= 39,140 cuft

Storage Indication method used.



Hydrograph Report

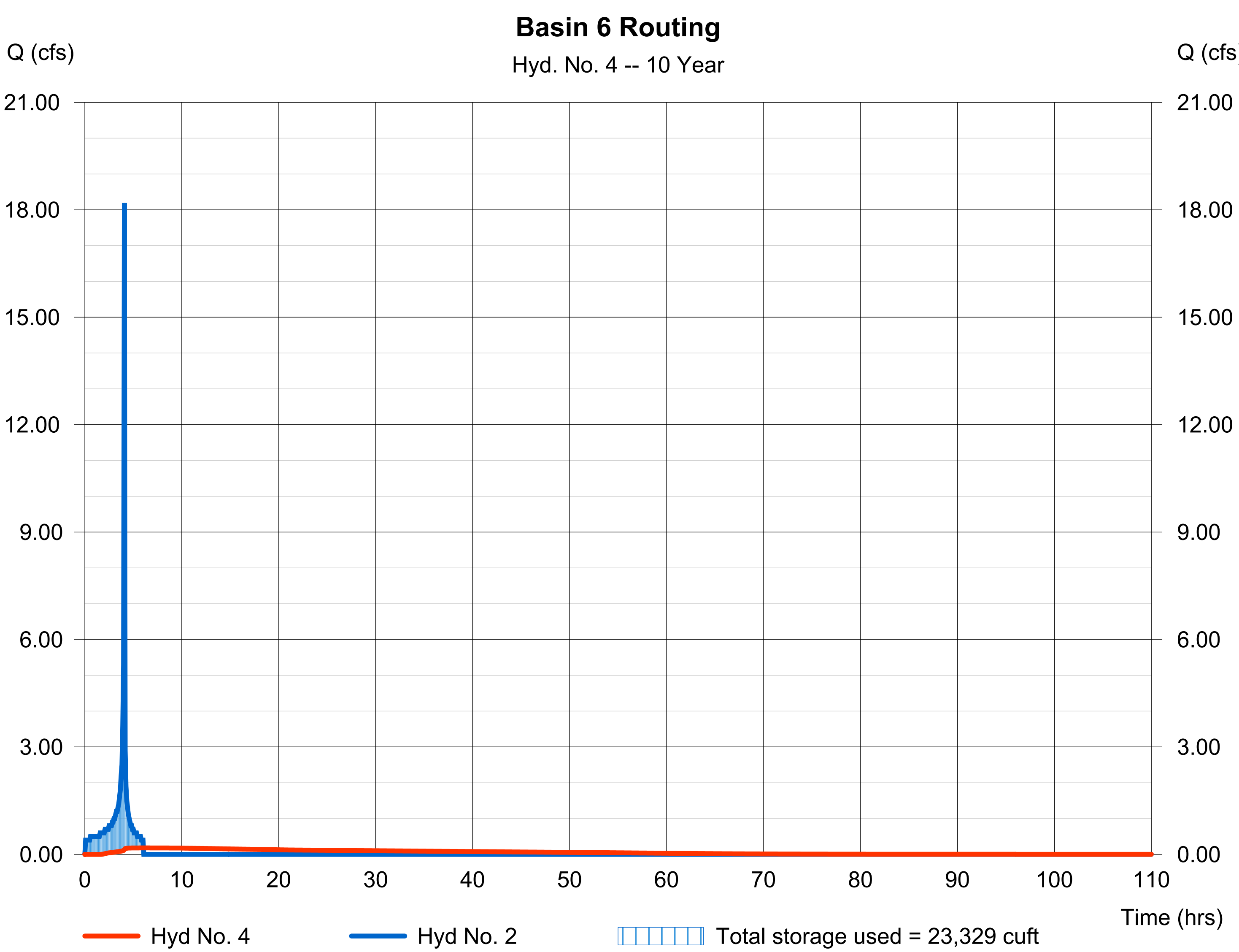
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 4

Basin 6 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.180 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 22,274 cuft
Inflow hyd. No.	= 2 - Basin 6 Inflow	Max. Elevation	= 484.61 ft
Reservoir name	= Basin 6	Max. Storage	= 23,329 cuft

Storage Indication method used.



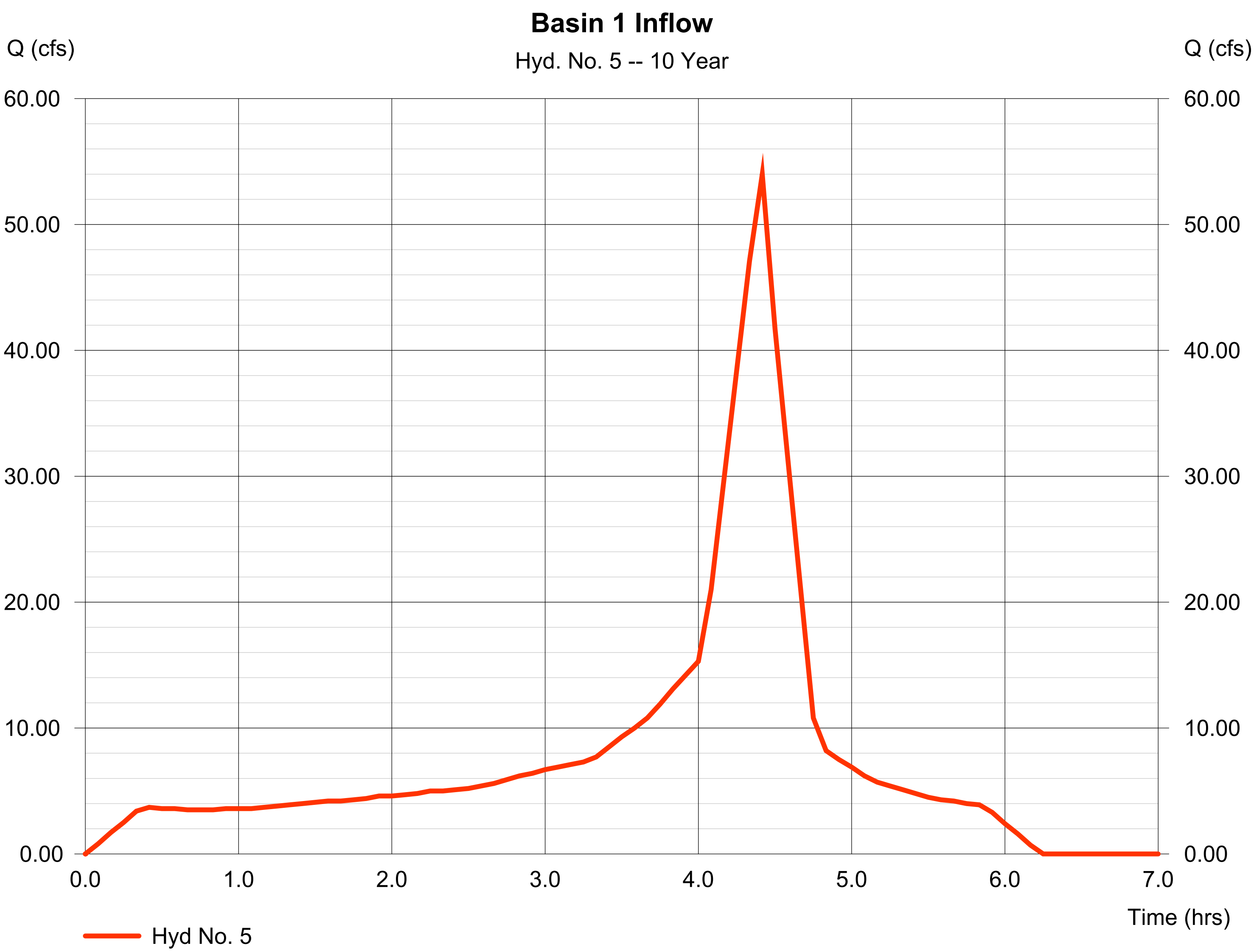
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 5

Basin 1 Inflow

Hydrograph type	= Manual	Peak discharge	= 54.00 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.42 hrs
Time interval	= 5 min	Hyd. volume	= 194,520 cuft



Hydrograph Report

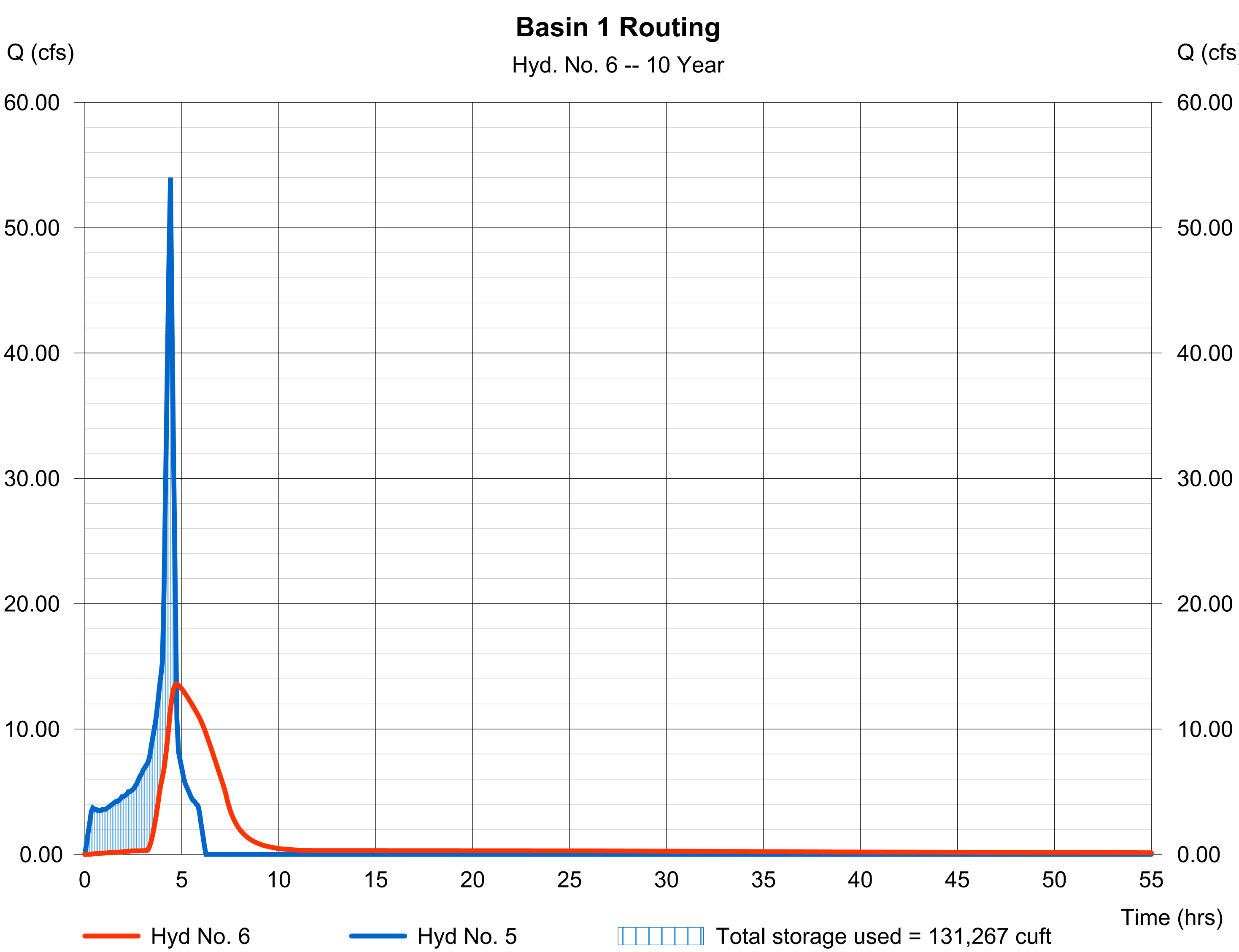
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 6

Basin 1 Routing

Hydrograph type	= Reservoir	Peak discharge	= 13.59 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.75 hrs
Time interval	= 5 min	Hyd. volume	= 194,311 cuft
Inflow hyd. No.	= 5 - Basin 1 Inflow	Max. Elevation	= 484.65 ft
Reservoir name	= Basin 1	Max. Storage	= 131,267 cuft

Storage Indication method used.



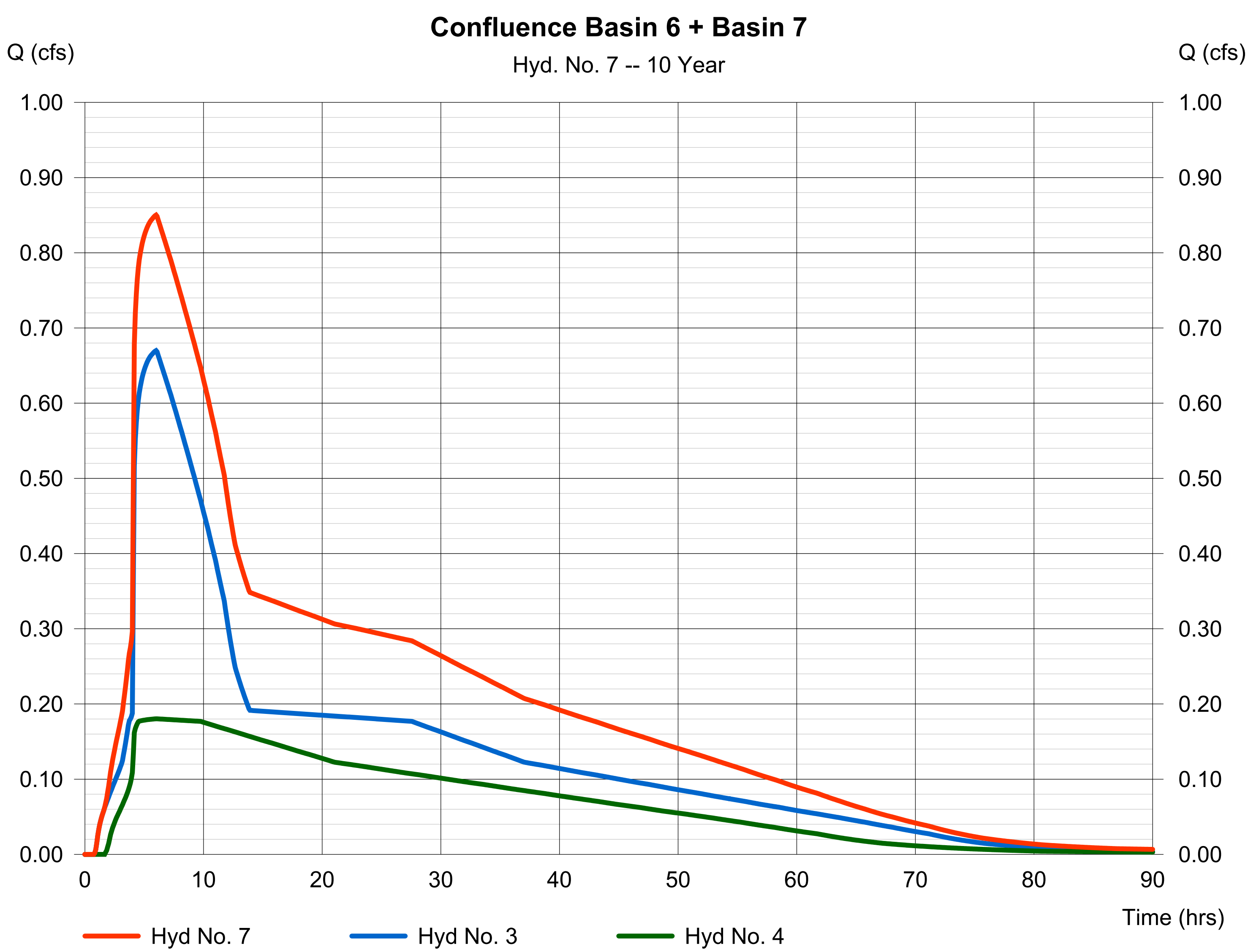
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 7

Confluence Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 0.850 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 64,682 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.000 ac



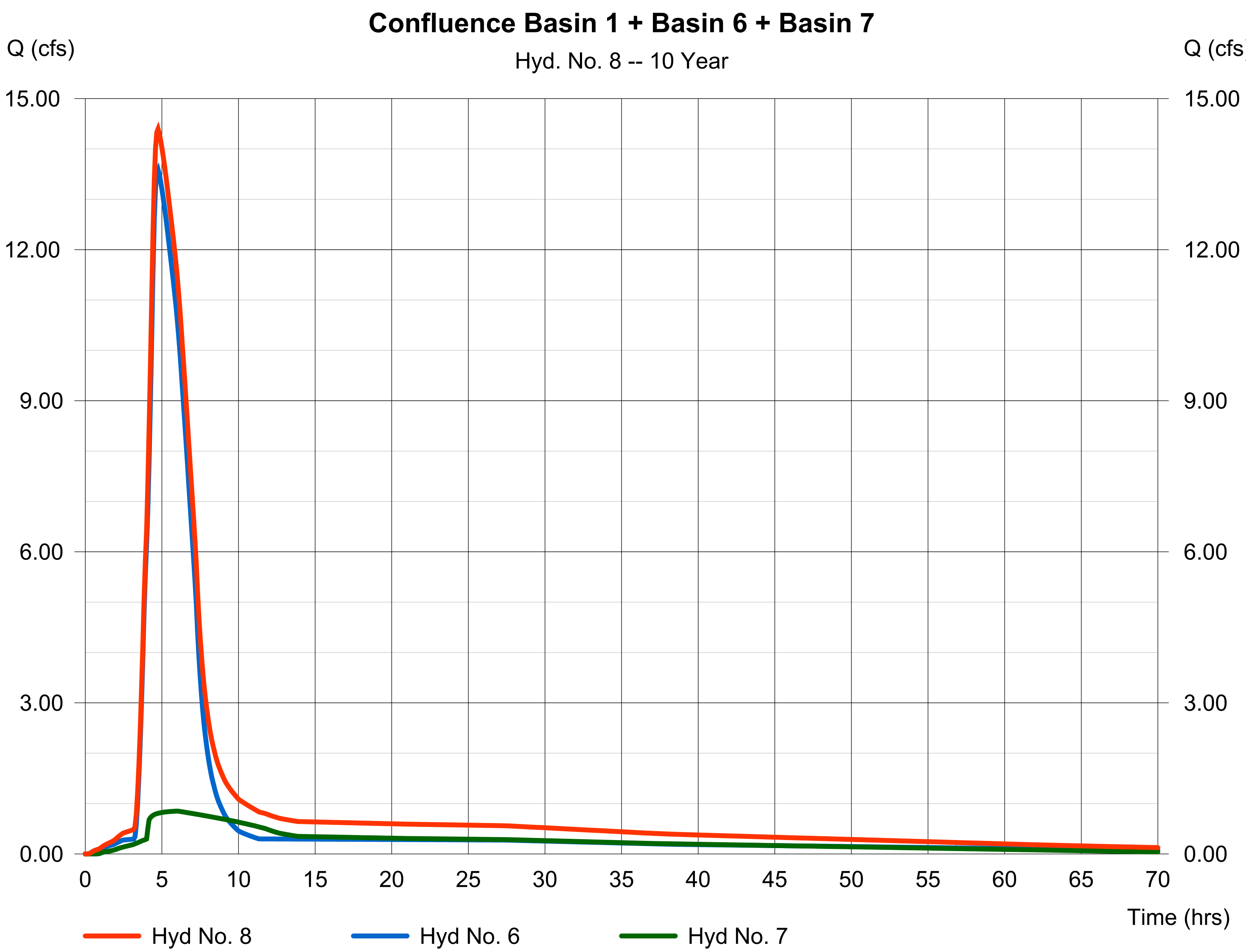
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 8

Confluence Basin 1 + Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 14.40 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.75 hrs
Time interval	= 5 min	Hyd. volume	= 258,993 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	22.83	5	245	50,409	------	------	------	Basin 7 Inflow
2	Manual	20.46	5	245	28,248	------	------	------	Basin 6 Inflow
3	Reservoir	0.760	5	360	48,059	1	482.88	43,987	Basin 7 Routing
4	Reservoir	0.184	5	365	25,445	2	484.75	26,386	Basin 6 Routing
5	Manual	64.60	5	260	218,880	------	------	------	Basin 1 Inflow
6	Reservoir	14.63	5	280	218,671	5	484.97	144,647	Basin 1 Routing
7	Combine	0.945	5	360	73,505	3, 4,	------	------	Confluence Basin 6 + Basin 7
8	Combine	15.53	5	280	292,176	6, 7	------	------	Confluence Basin 1 + Basin 6 + Basin

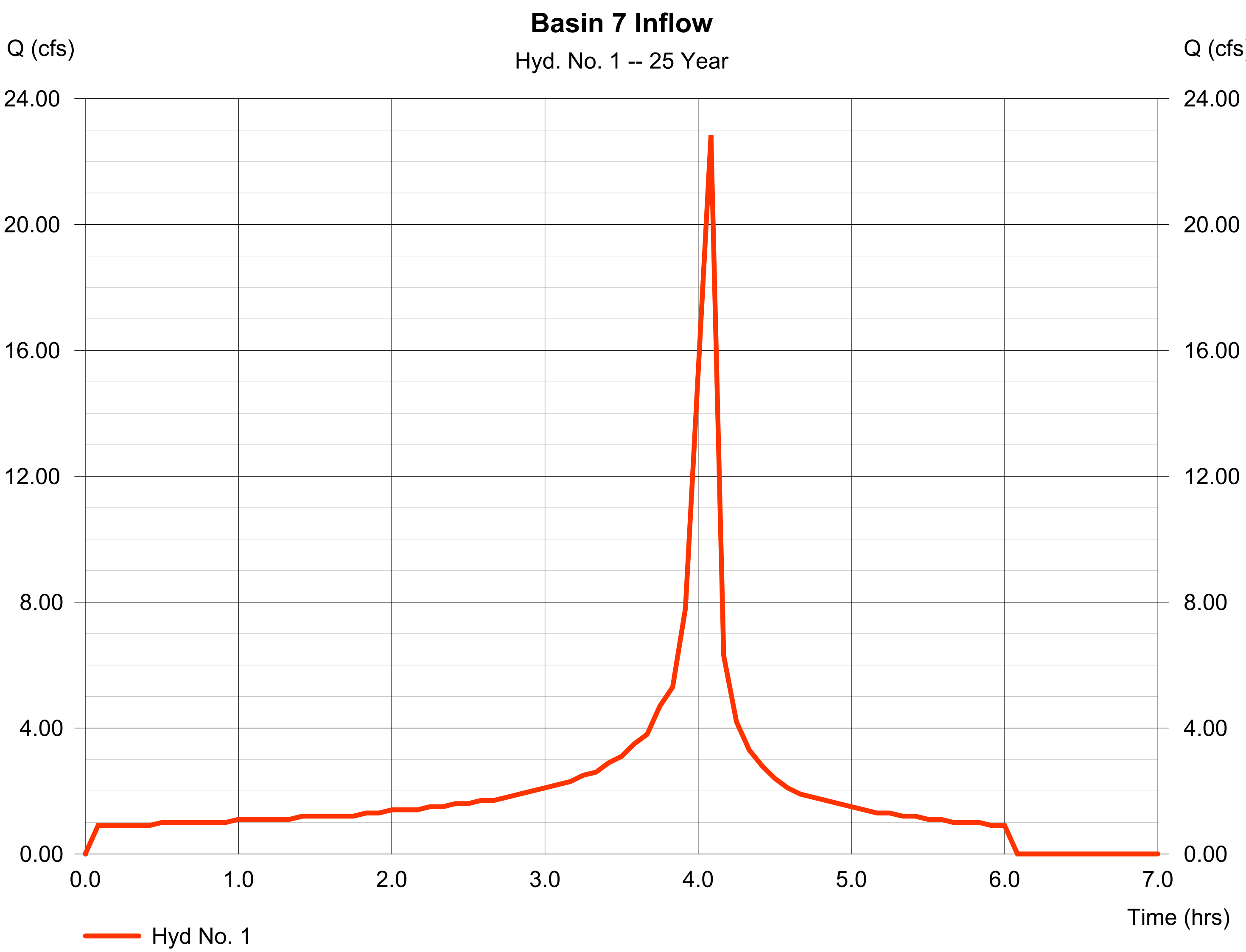
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 1

Basin 7 Inflow

Hydrograph type	= Manual	Peak discharge	= 22.83 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 50,409 cuft



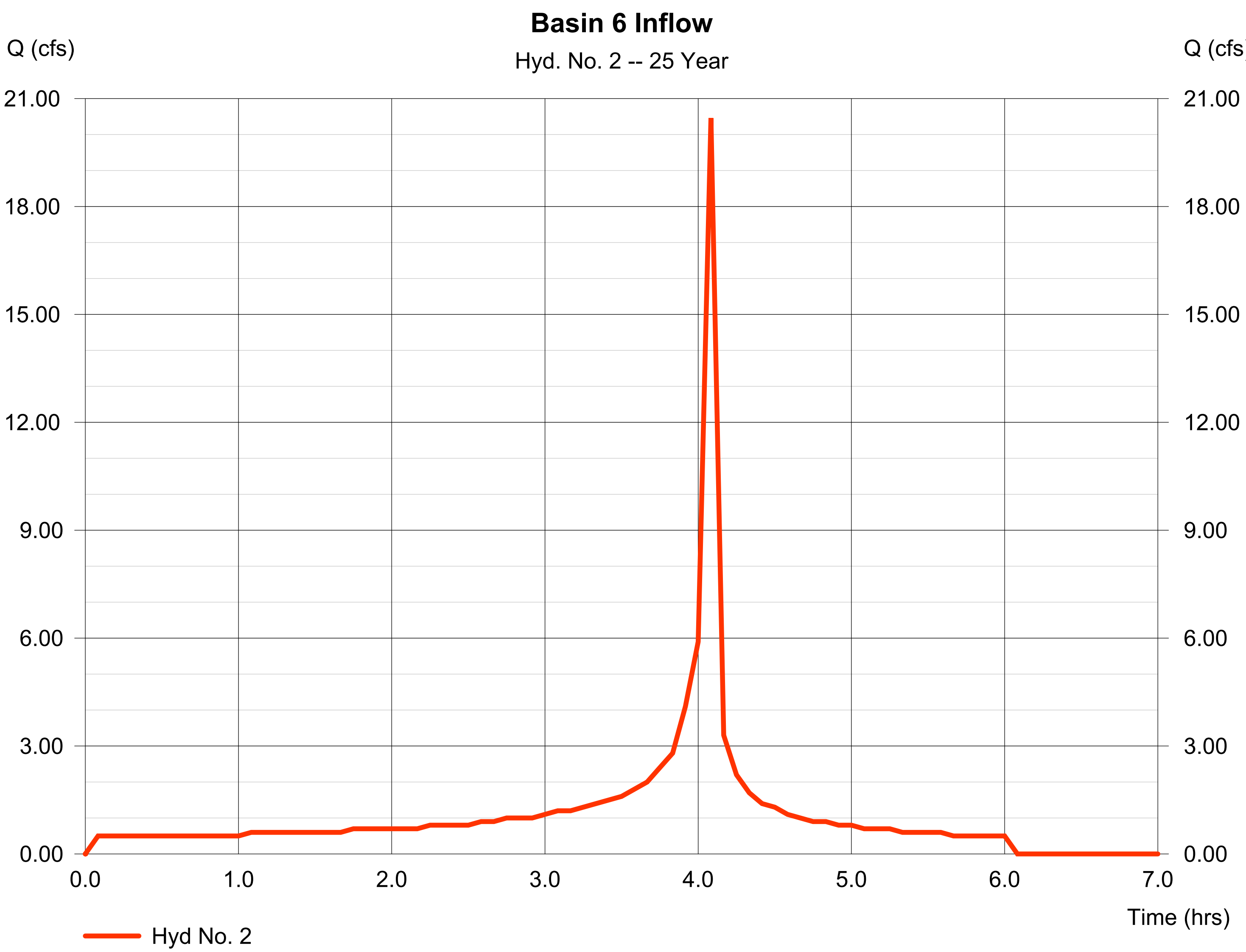
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 2

Basin 6 Inflow

Hydrograph type	= Manual	Peak discharge	= 20.46 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 28,248 cuft



Hydrograph Report

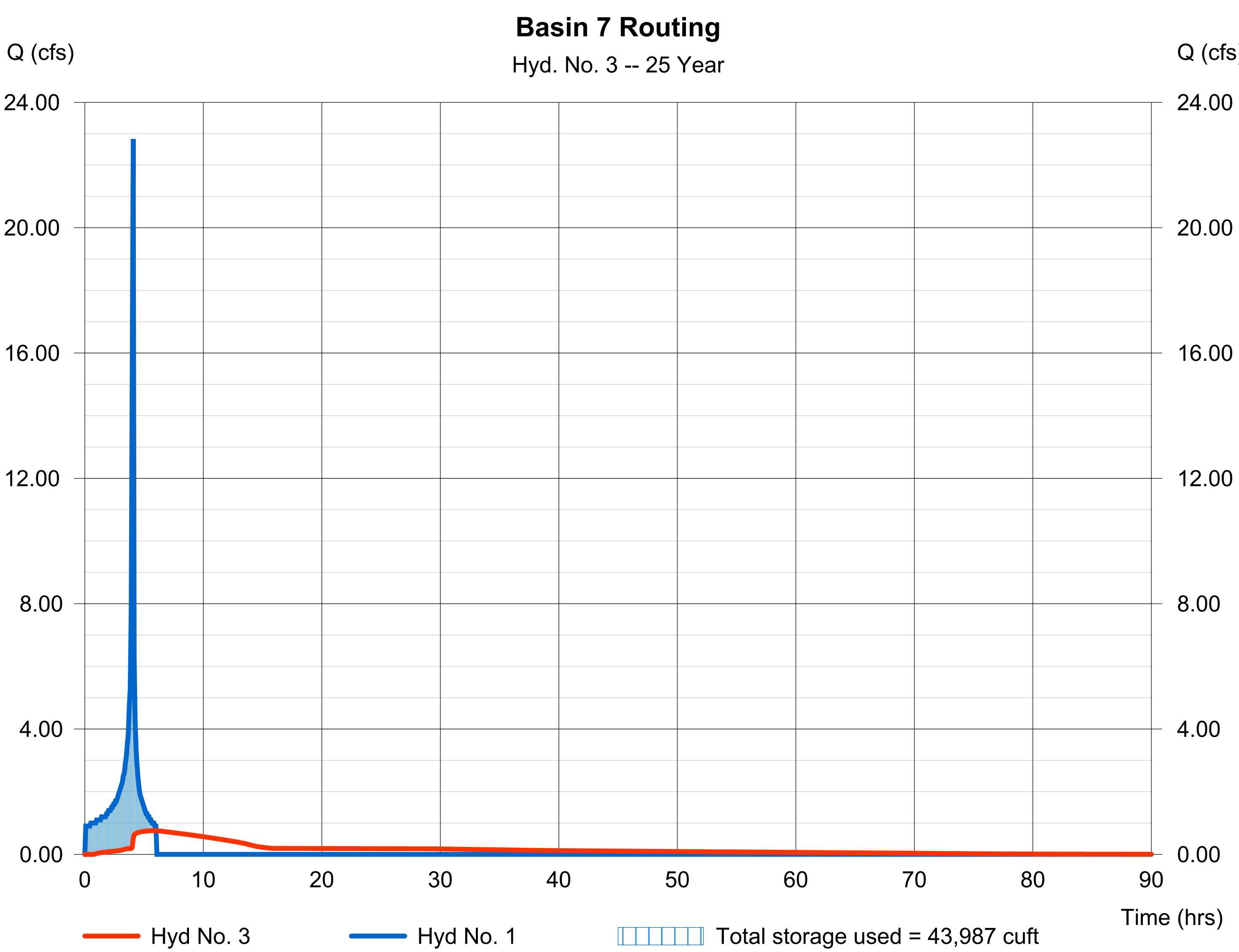
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 3

Basin 7 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.760 cfs
Storm frequency	= 25 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 48,059 cuft
Inflow hyd. No.	= 1 - Basin 7 Inflow	Max. Elevation	= 482.88 ft
Reservoir name	= Basin 7	Max. Storage	= 43,987 cuft

Storage Indication method used.



Hydrograph Report

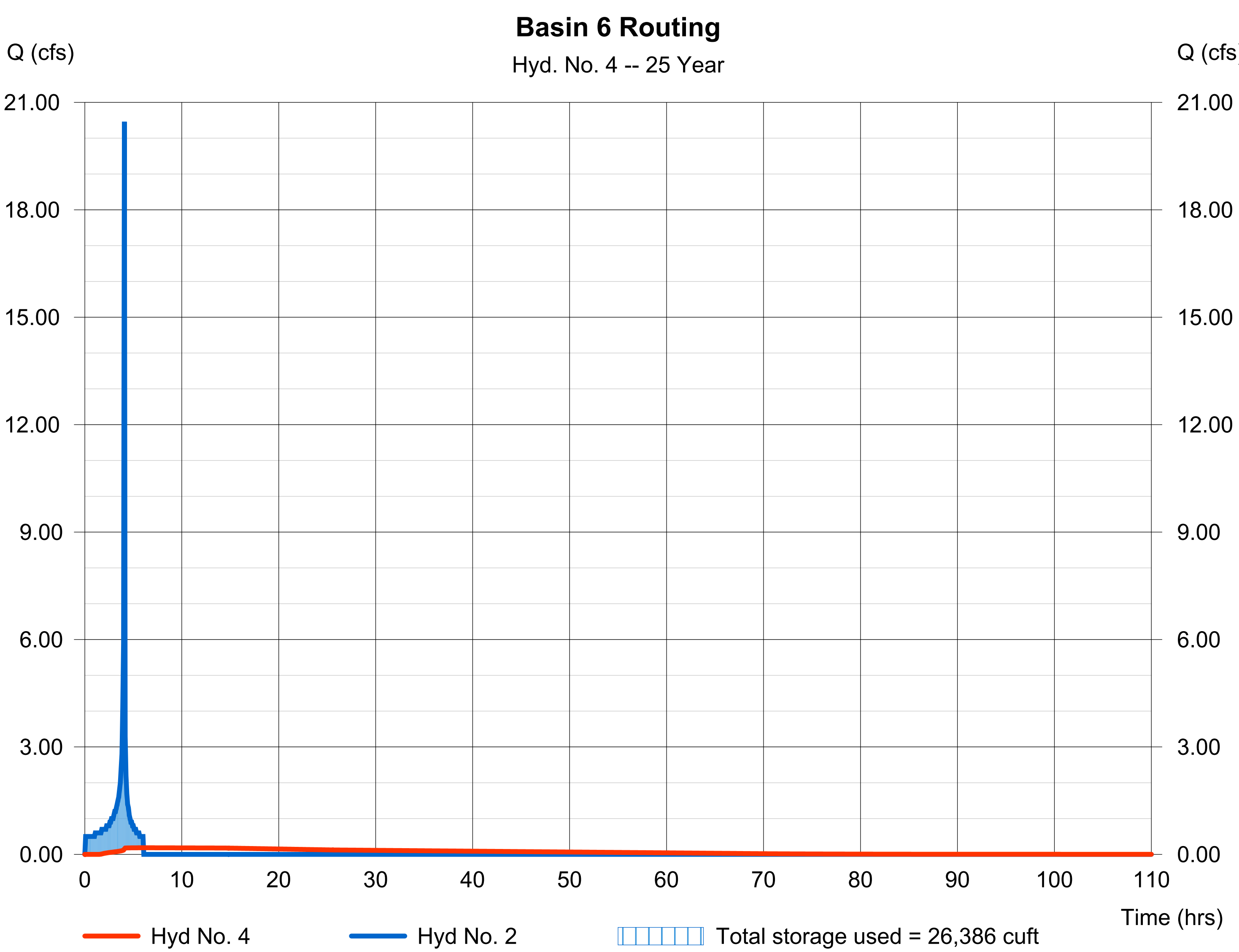
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 4

Basin 6 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.184 cfs
Storm frequency	= 25 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 25,445 cuft
Inflow hyd. No.	= 2 - Basin 6 Inflow	Max. Elevation	= 484.75 ft
Reservoir name	= Basin 6	Max. Storage	= 26,386 cuft

Storage Indication method used.

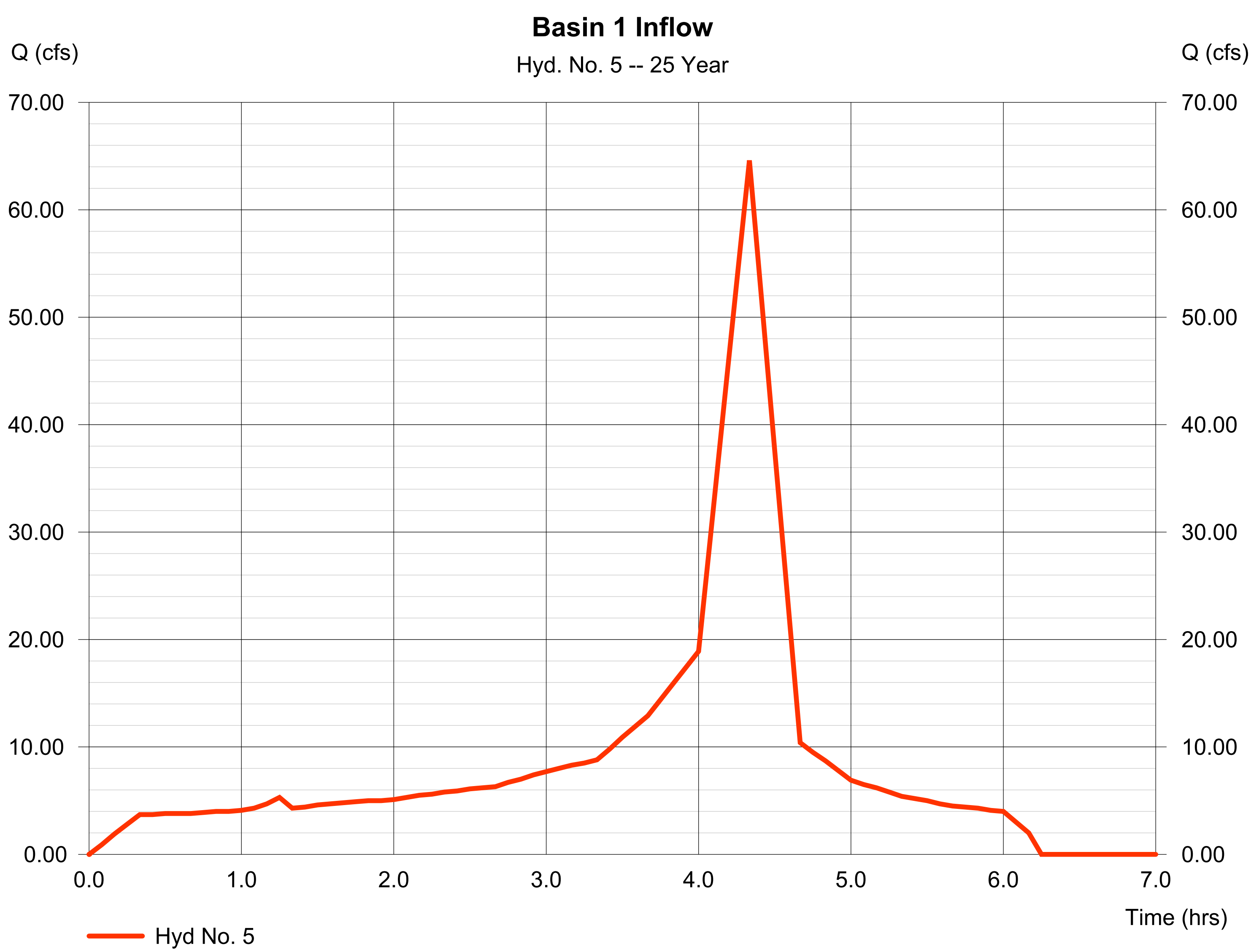


Hydrograph Report

Hyd. No. 5

Basin 1 Inflow

Hydrograph type	= Manual	Peak discharge	= 64.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.33 hrs
Time interval	= 5 min	Hyd. volume	= 218,880 cuft



Hydrograph Report

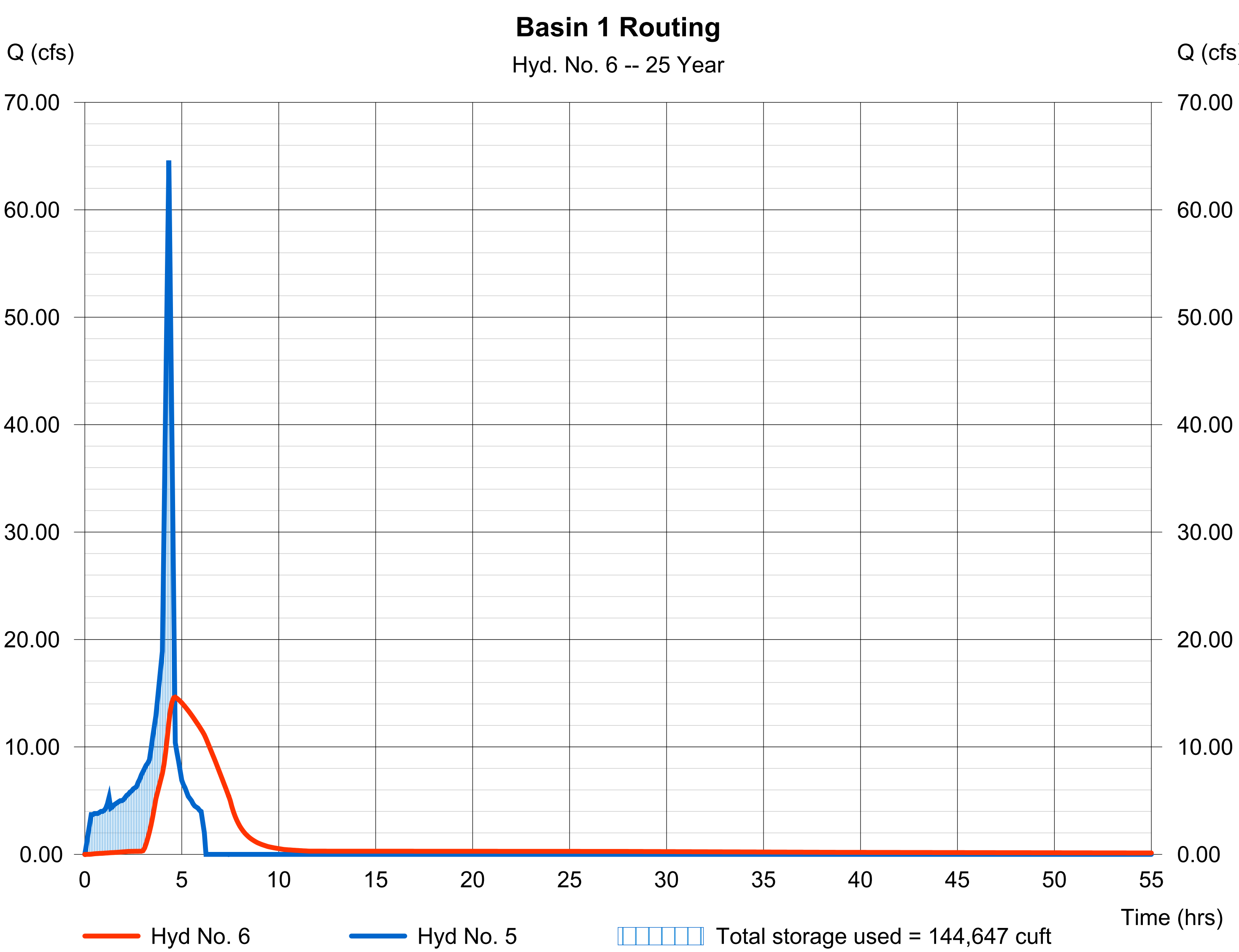
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 6

Basin 1 Routing

Hydrograph type	= Reservoir	Peak discharge	= 14.63 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 218,671 cuft
Inflow hyd. No.	= 5 - Basin 1 Inflow	Max. Elevation	= 484.97 ft
Reservoir name	= Basin 1	Max. Storage	= 144,647 cuft

Storage Indication method used.

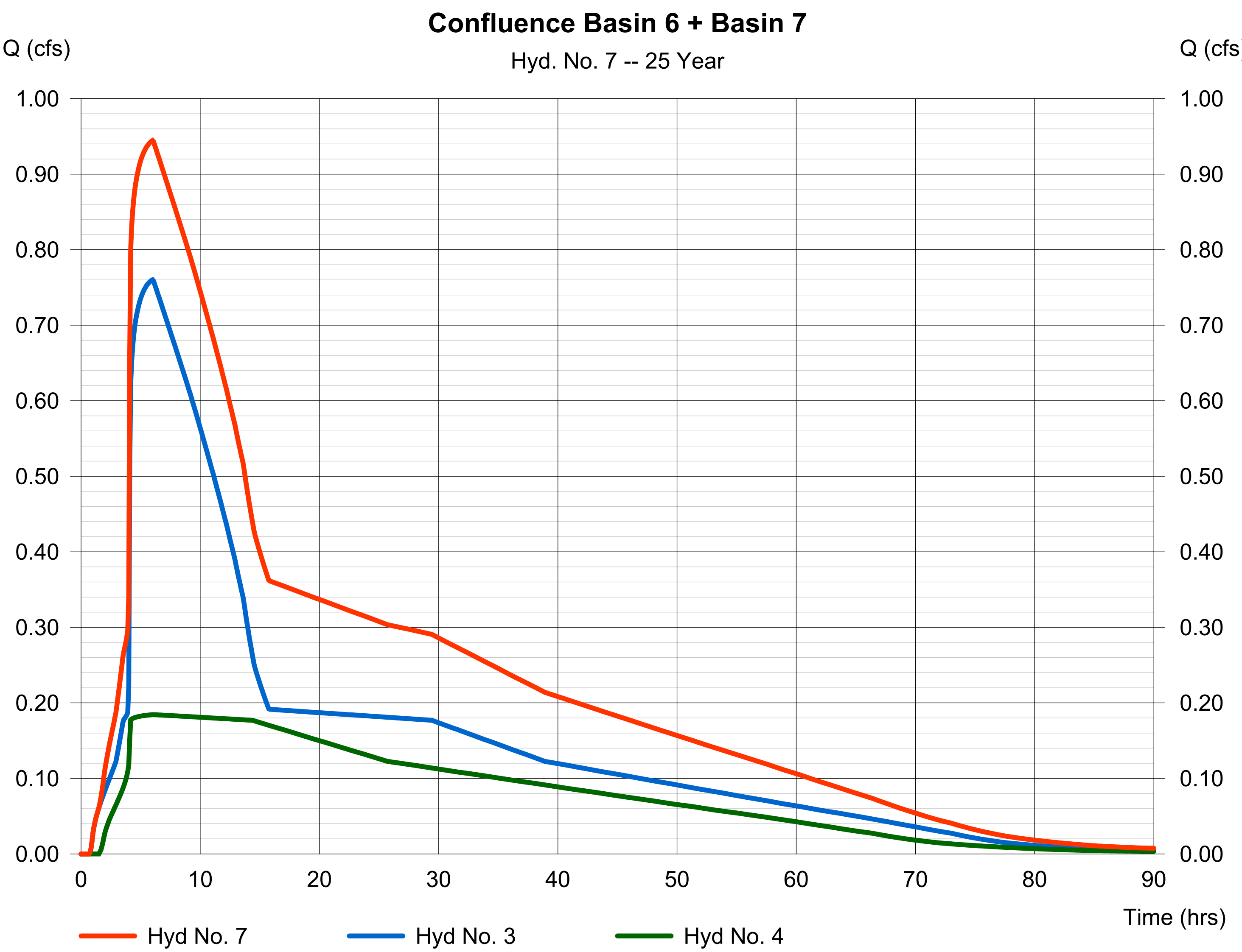


Hydrograph Report

Hyd. No. 7

Confluence Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 0.945 cfs
Storm frequency	= 25 yrs	Time to peak	= 6.00 hrs
Time interval	= 5 min	Hyd. volume	= 73,505 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.000 ac



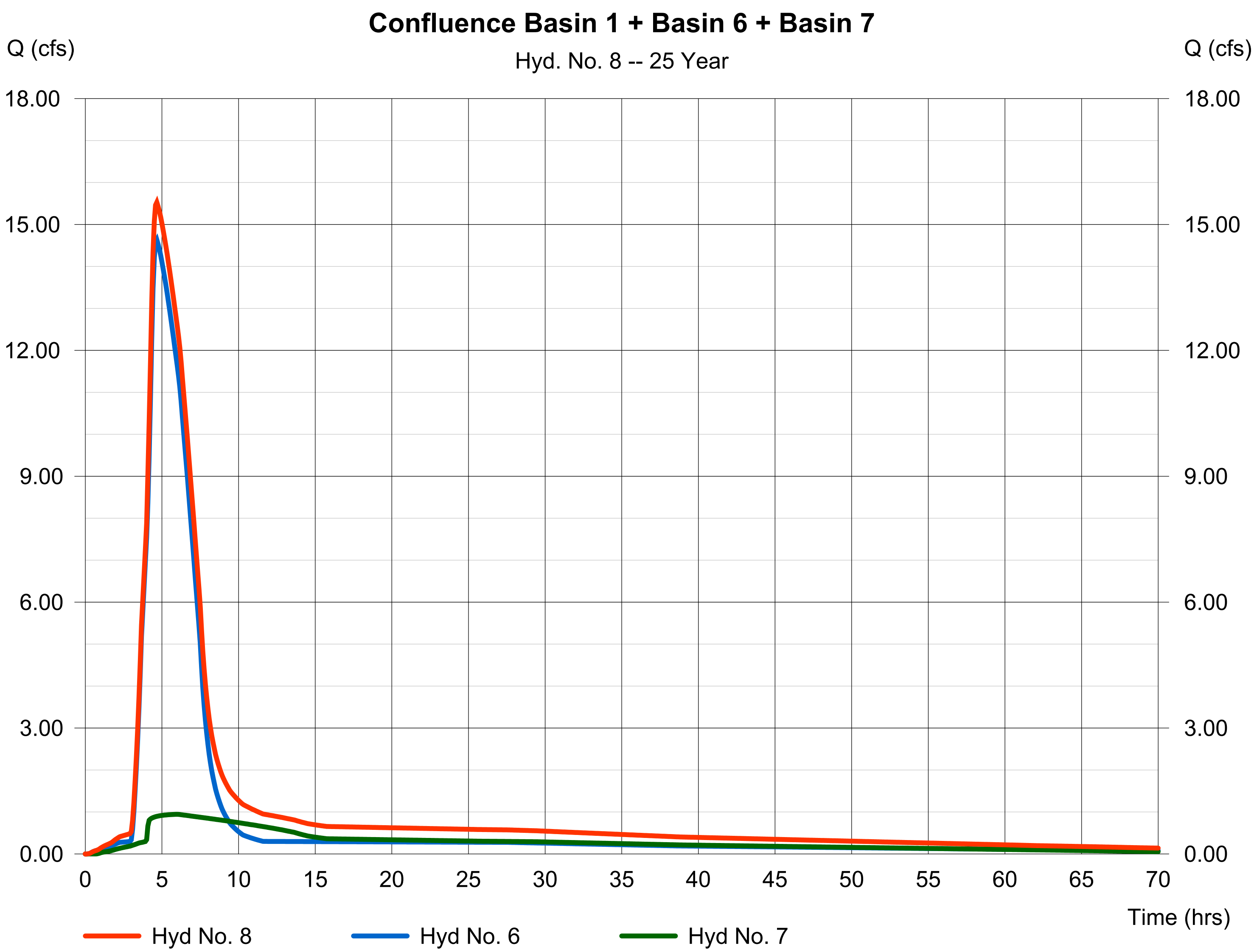
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 8

Confluence Basin 1 + Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 15.53 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 292,176 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	26.89	5	245	59,007	------	------	------	Basin 7 Inflow
2	Manual	23.88	5	245	32,964	------	------	------	Basin 6 Inflow
3	Reservoir	1.801	5	295	56,657	1	483.08	48,327	Basin 7 Routing
4	Reservoir	0.191	5	365	30,161	2	484.96	30,947	Basin 6 Routing
5	Manual	76.99	5	260	254,892	------	------	------	Basin 1 Inflow
6	Reservoir	17.75	5	280	254,683	5	485.41	164,781	Basin 1 Routing
7	Combine	1.989	5	295	86,819	3, 4,	------	------	Confluence Basin 6 + Basin 7
8	Combine	19.55	5	280	341,502	6, 7	------	------	Confluence Basin 1 + Basin 6 + Basin

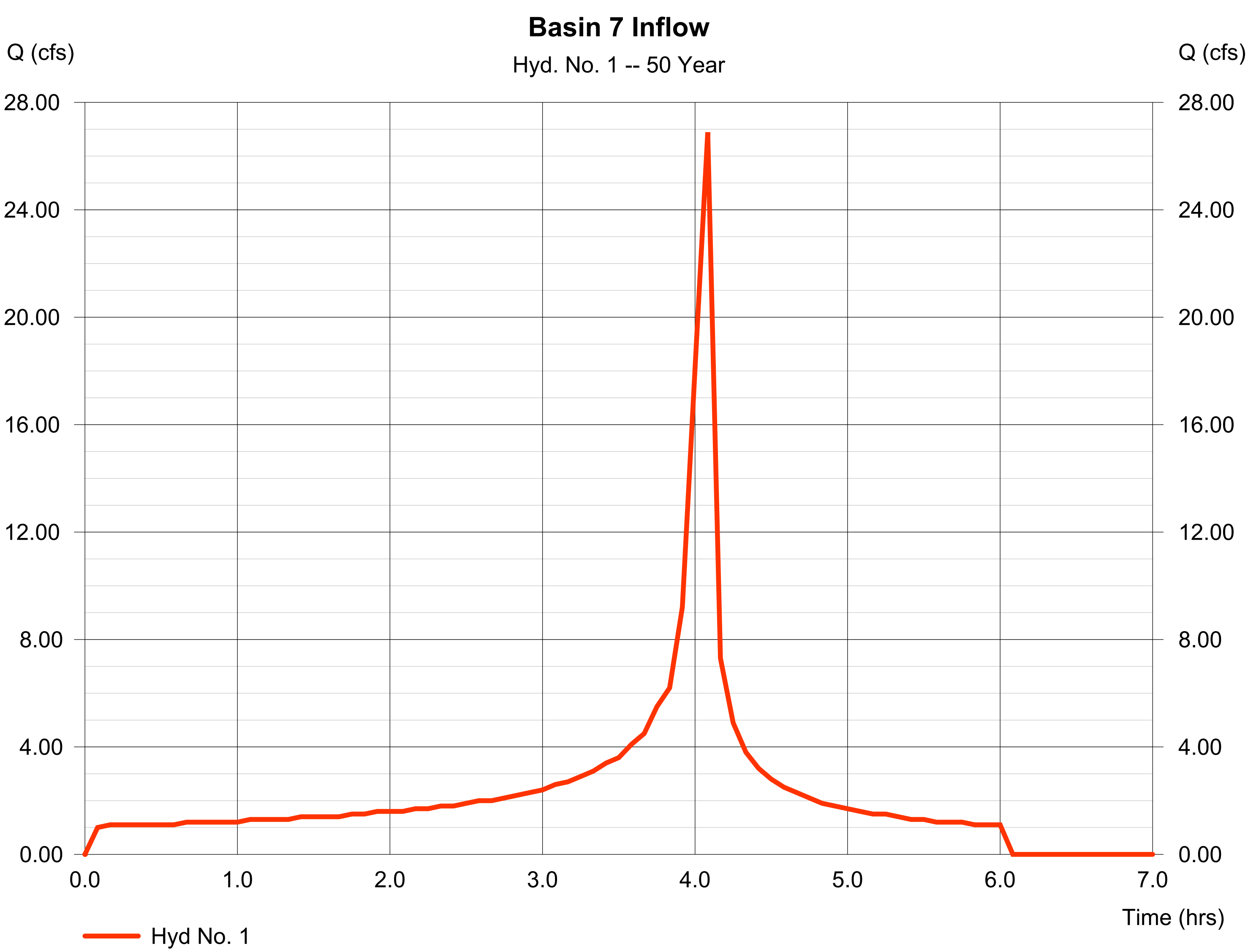
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 1

Basin 7 Inflow

Hydrograph type	= Manual	Peak discharge	= 26.89 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 59,007 cuft



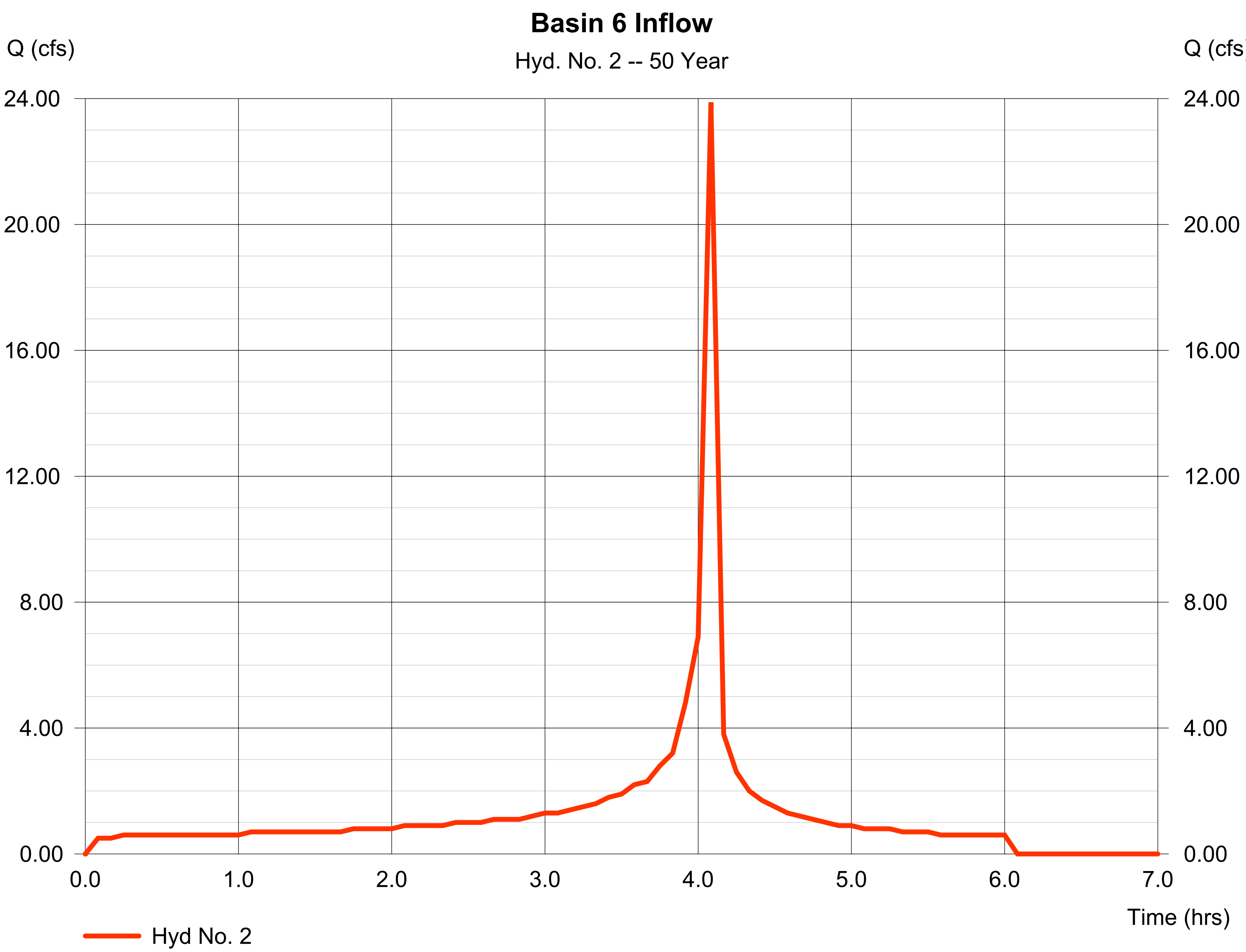
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 2

Basin 6 Inflow

Hydrograph type	= Manual	Peak discharge	= 23.88 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 32,964 cuft



Hydrograph Report

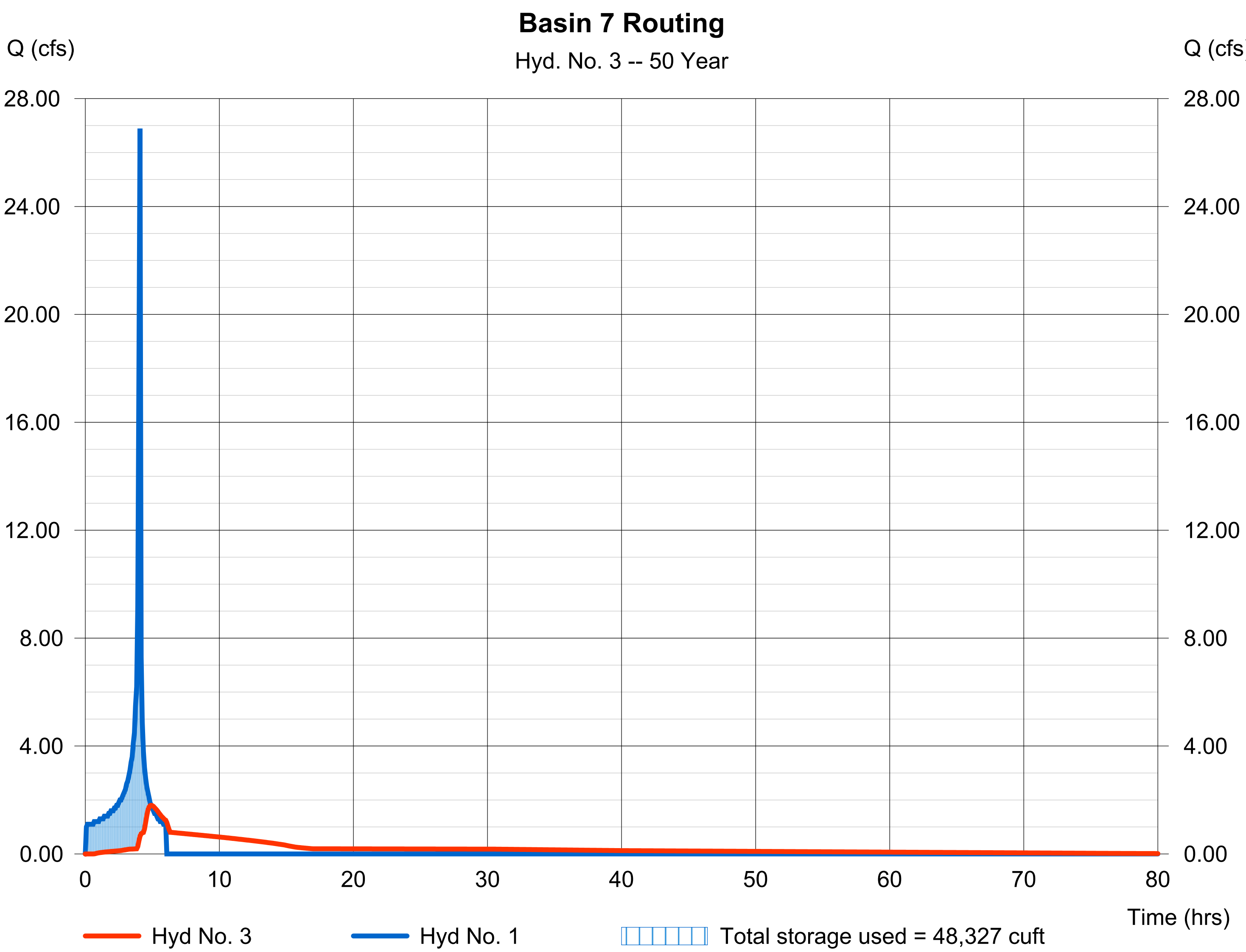
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 | Thursday, 10 / 5 / 2017

Hyd. No. 3

Basin 7 Routing

Hydrograph type	= Reservoir	Peak discharge	= 1.801 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.92 hrs
Time interval	= 5 min	Hyd. volume	= 56,657 cuft
Inflow hyd. No.	= 1 - Basin 7 Inflow	Max. Elevation	= 483.08 ft
Reservoir name	= Basin 7	Max. Storage	= 48,327 cuft

Storage Indication method used.



Hydrograph Report

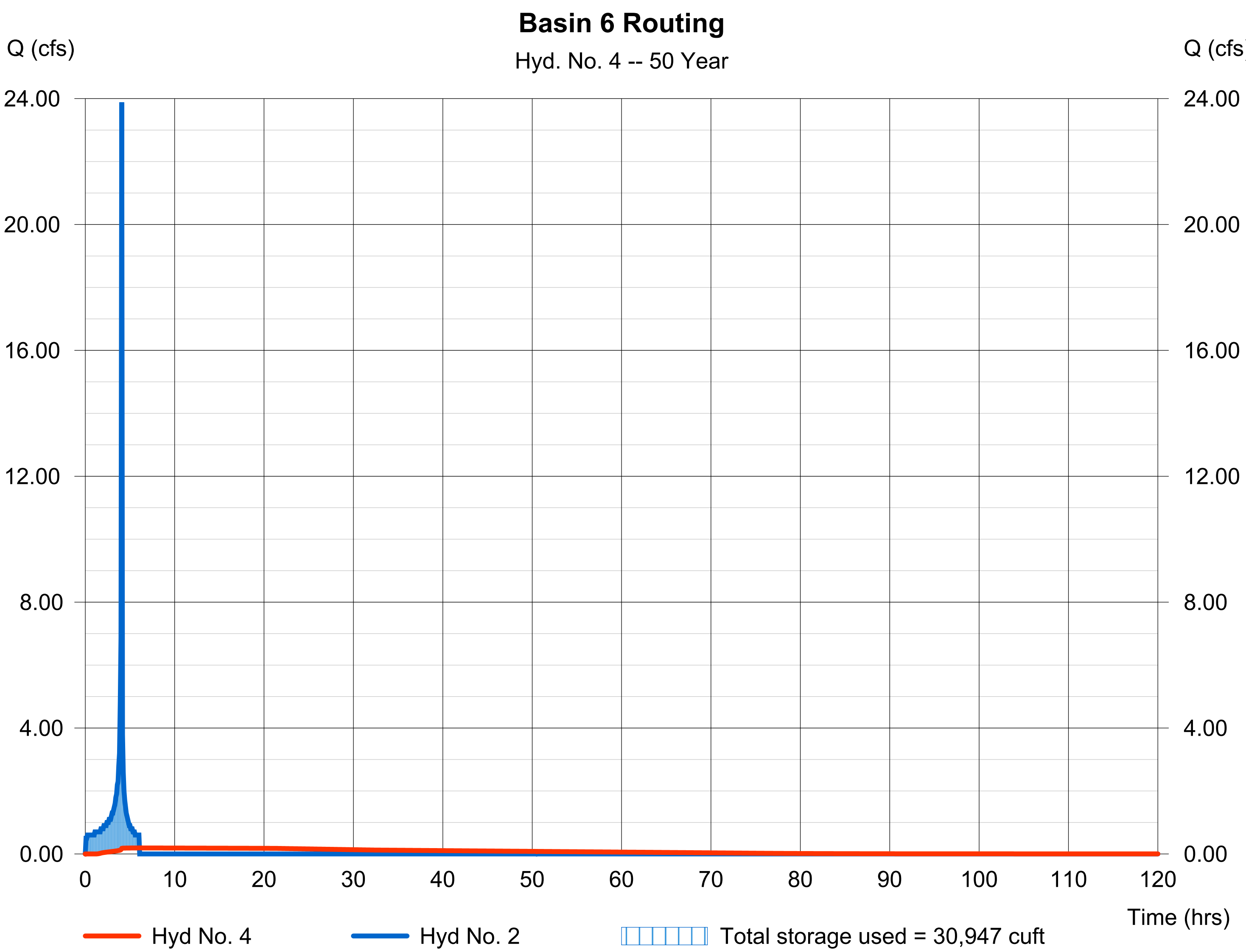
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 4

Basin 6 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.191 cfs
Storm frequency	= 50 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 30,161 cuft
Inflow hyd. No.	= 2 - Basin 6 Inflow	Max. Elevation	= 484.96 ft
Reservoir name	= Basin 6	Max. Storage	= 30,947 cuft

Storage Indication method used.



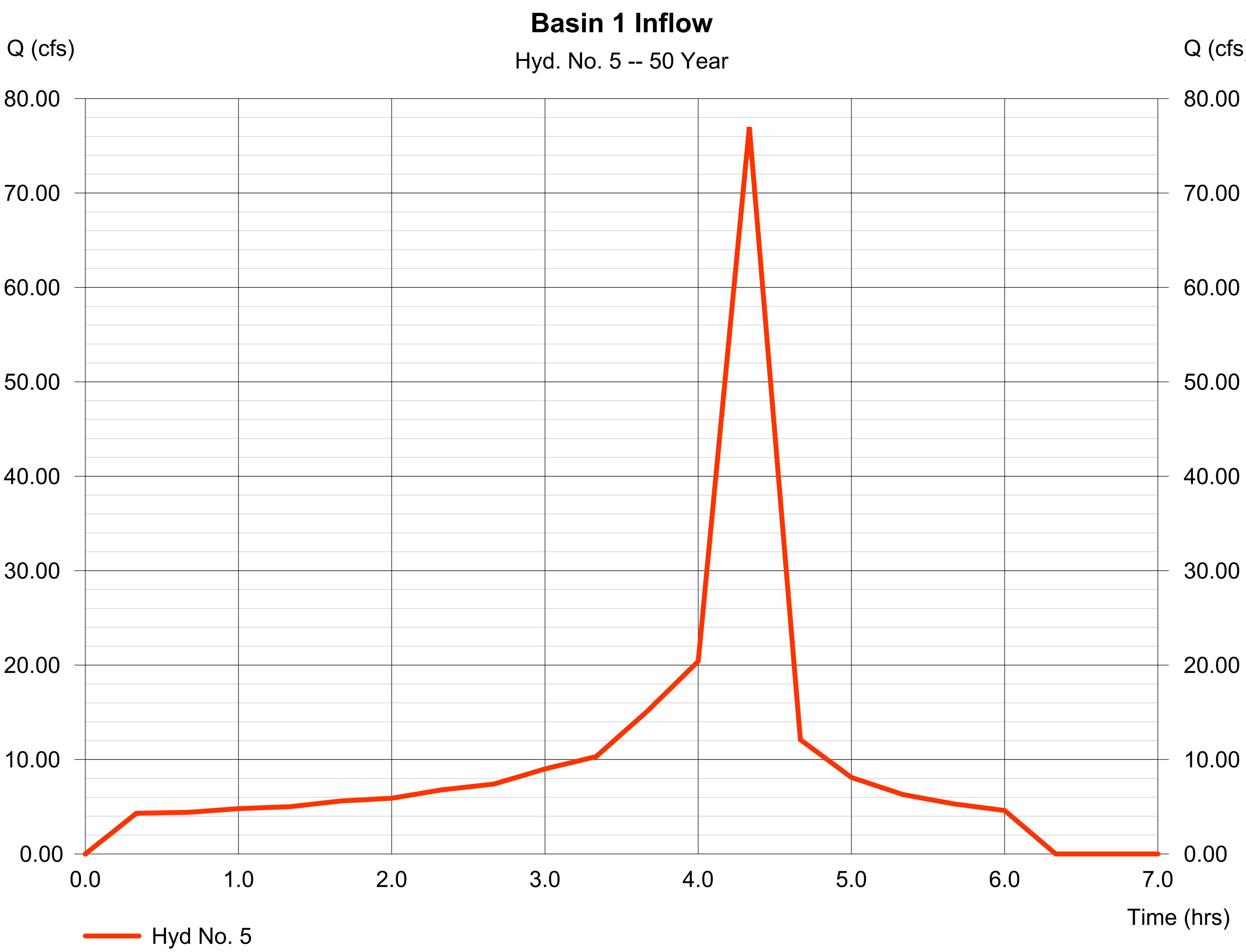
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 5

Basin 1 Inflow

Hydrograph type	= Manual	Peak discharge	= 76.99 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.33 hrs
Time interval	= 5 min	Hyd. volume	= 254,892 cuft



Hydrograph Report

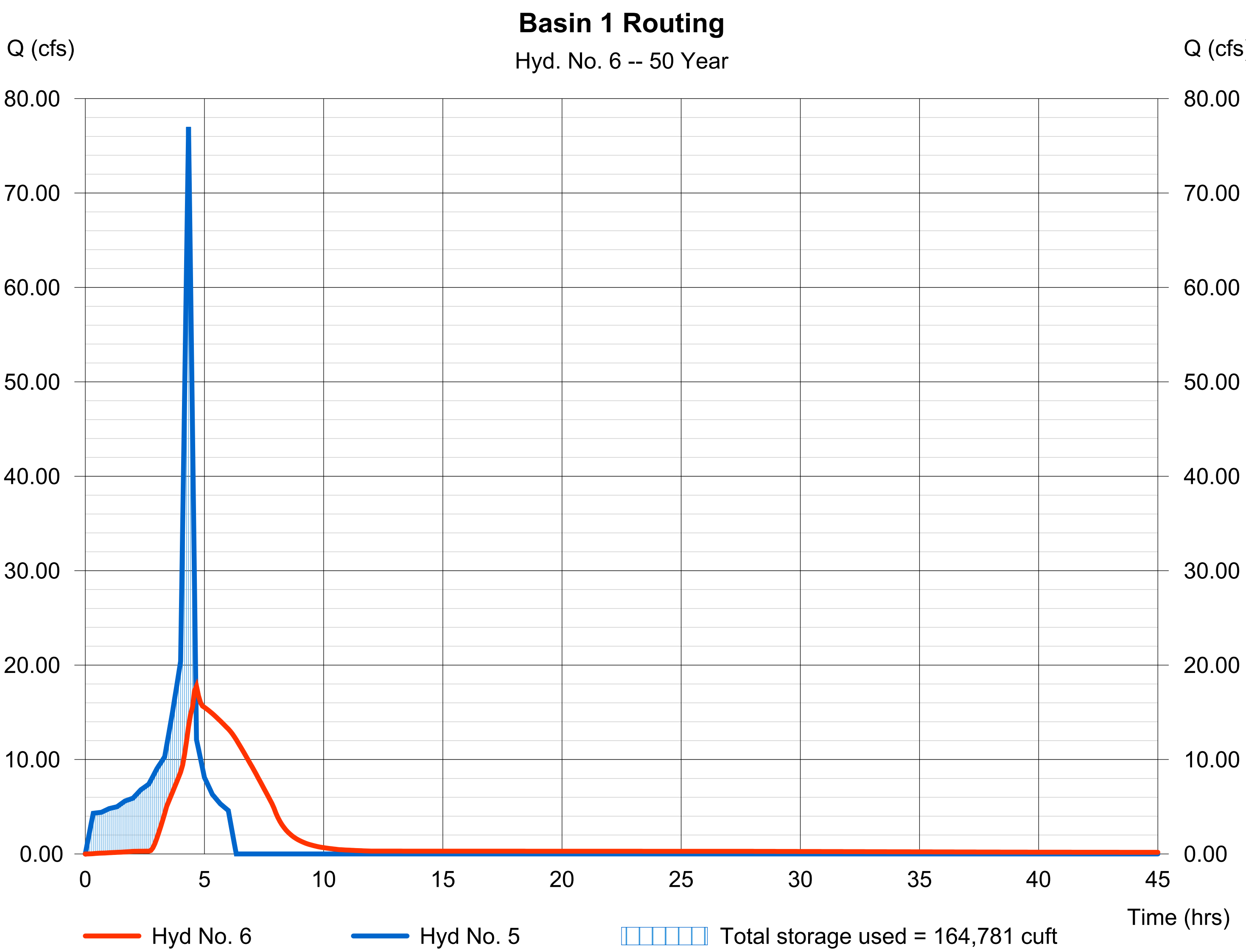
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 6

Basin 1 Routing

Hydrograph type	= Reservoir	Peak discharge	= 17.75 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 254,683 cuft
Inflow hyd. No.	= 5 - Basin 1 Inflow	Max. Elevation	= 485.41 ft
Reservoir name	= Basin 1	Max. Storage	= 164,781 cuft

Storage Indication method used.



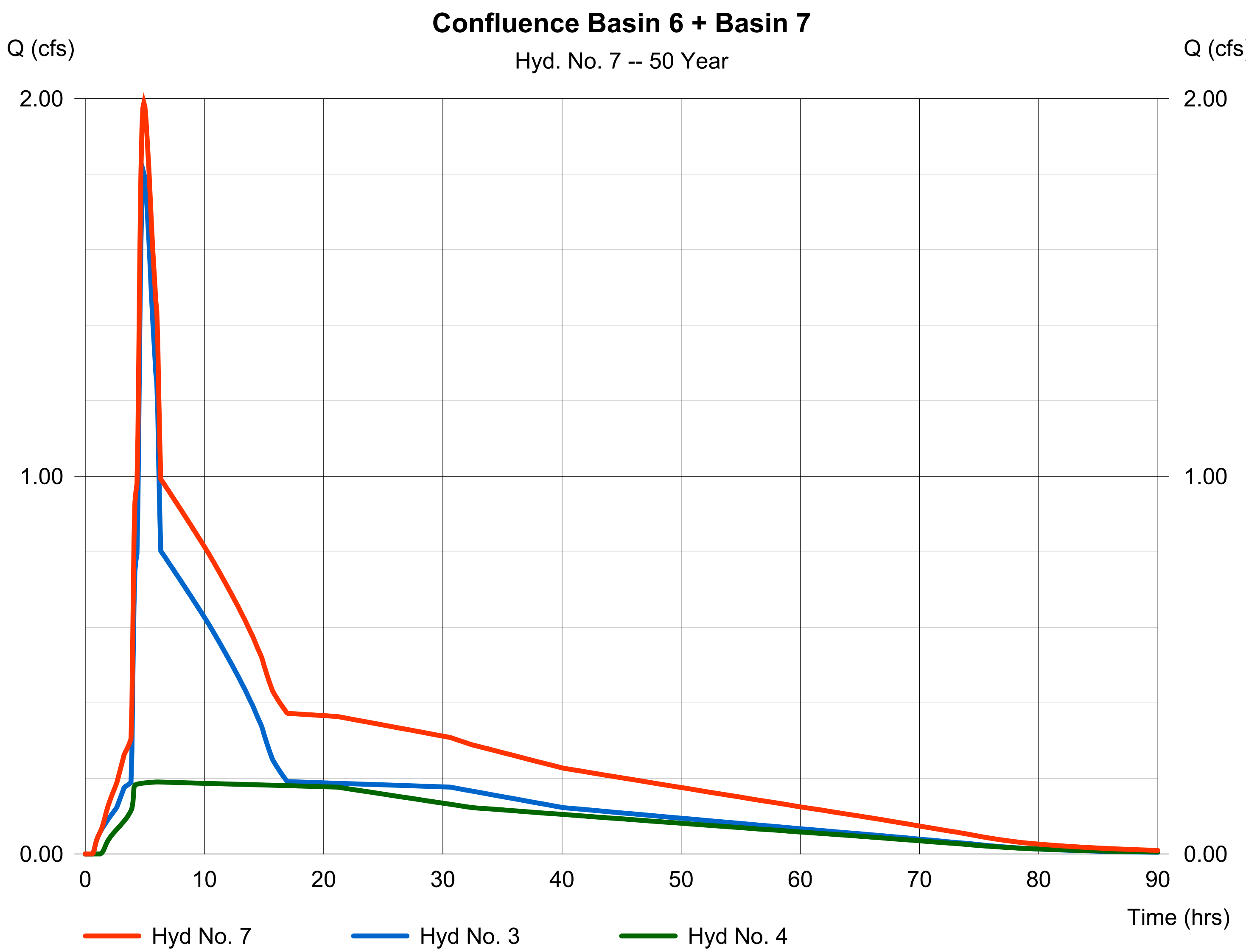
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 7

Confluence Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 1.989 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.92 hrs
Time interval	= 5 min	Hyd. volume	= 86,819 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.000 ac



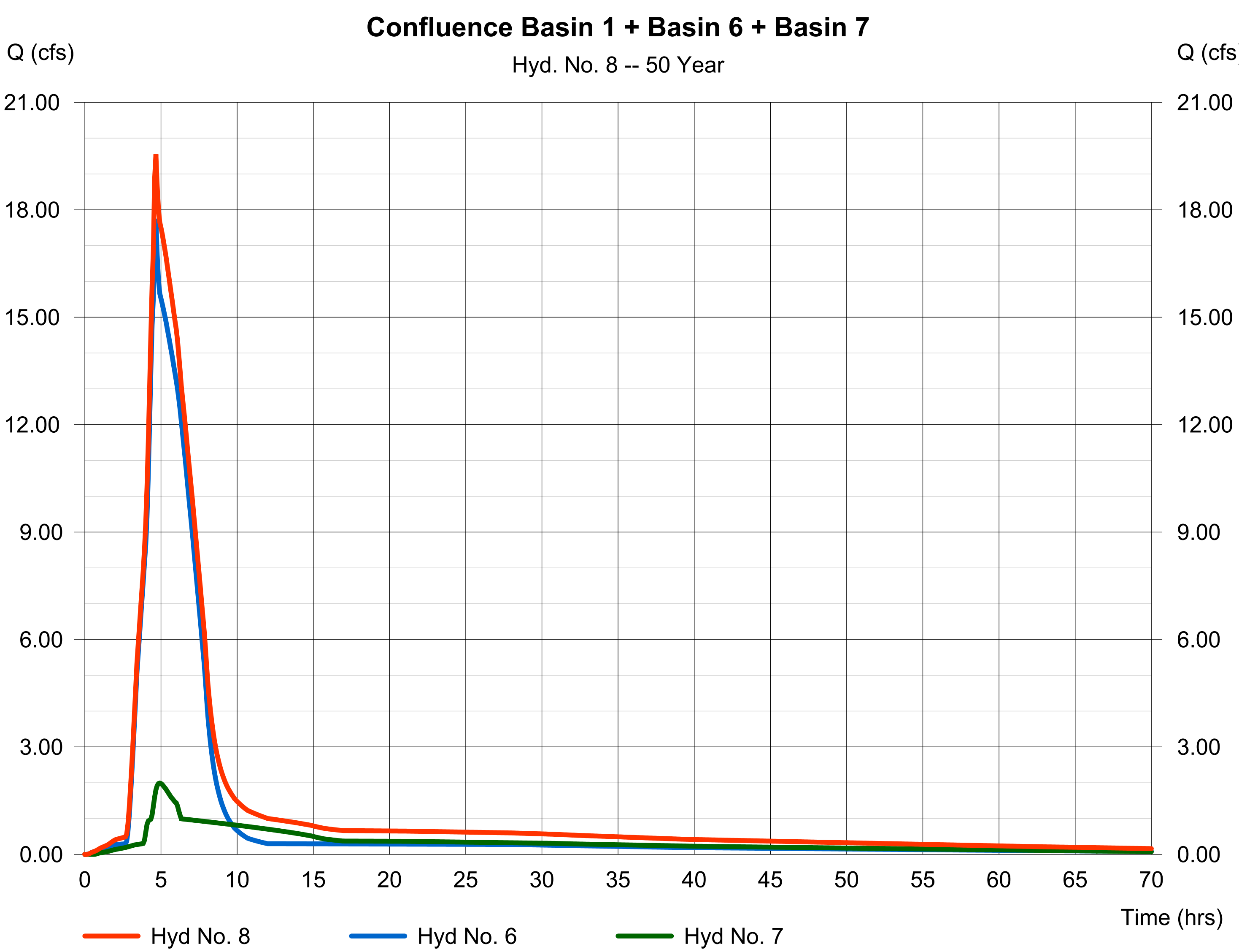
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 8

Confluence Basin 1 + Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 19.55 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 341,502 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	29.57	5	245	64,641	------	------	------	Basin 7 Inflow
2	Manual	26.15	5	245	36,105	------	------	------	Basin 6 Inflow
3	Reservoir	3.178	5	270	62,291	1	483.15	49,808	Basin 7 Routing
4	Reservoir	0.279	5	365	33,302	2	485.09	33,796	Basin 6 Routing
5	Manual	84.80	5	265	274,470	------	------	------	Basin 1 Inflow
6	Reservoir	26.37	5	280	274,261	5	485.62	174,363	Basin 1 Routing
7	Combine	3.367	5	270	95,594	3, 4,	------	------	Confluence Basin 6 + Basin 7
8	Combine	29.54	5	280	369,855	6, 7	------	------	Confluence Basin 1 + Basin 6 + Basin

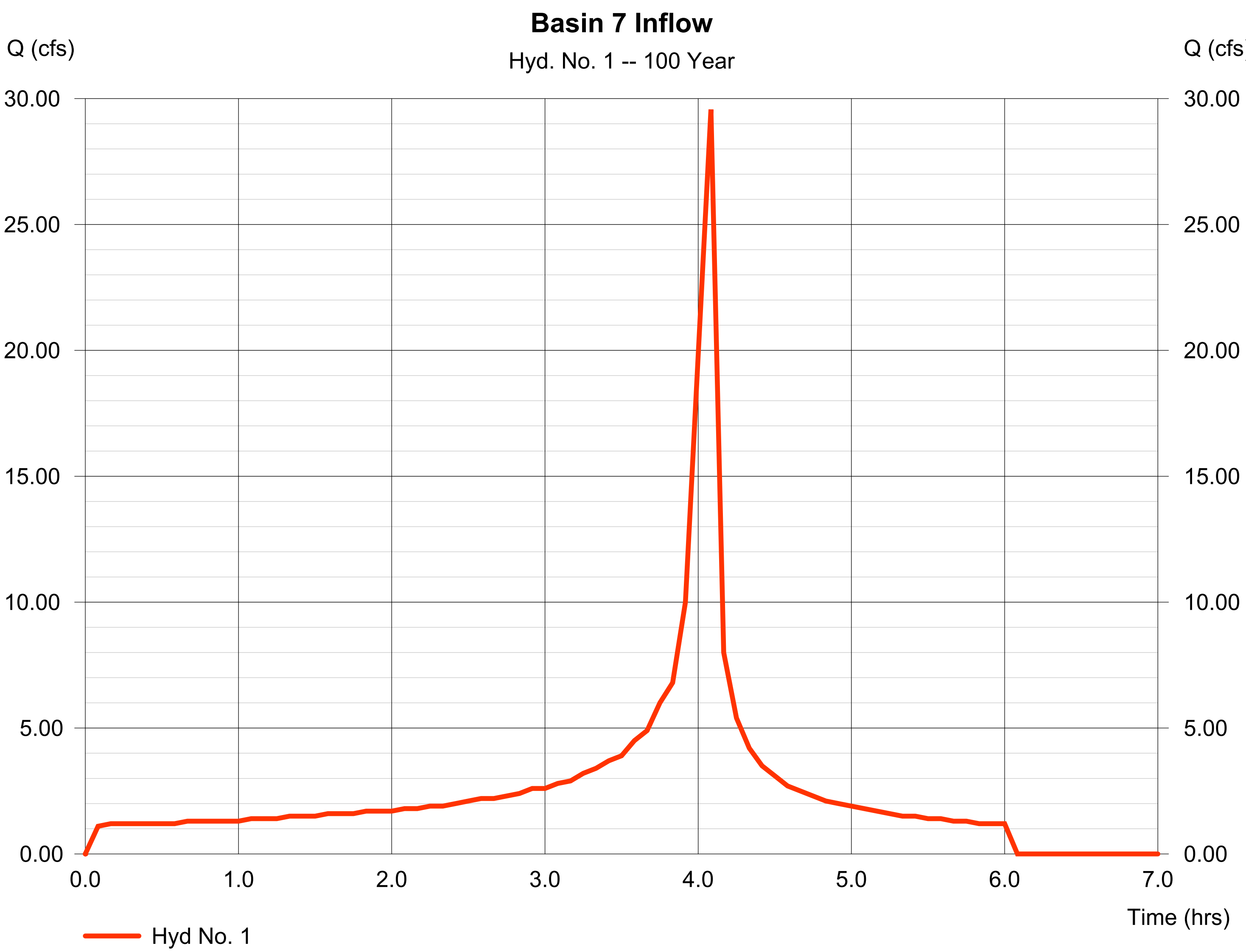
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 1

Basin 7 Inflow

Hydrograph type	= Manual	Peak discharge	= 29.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 64,641 cuft



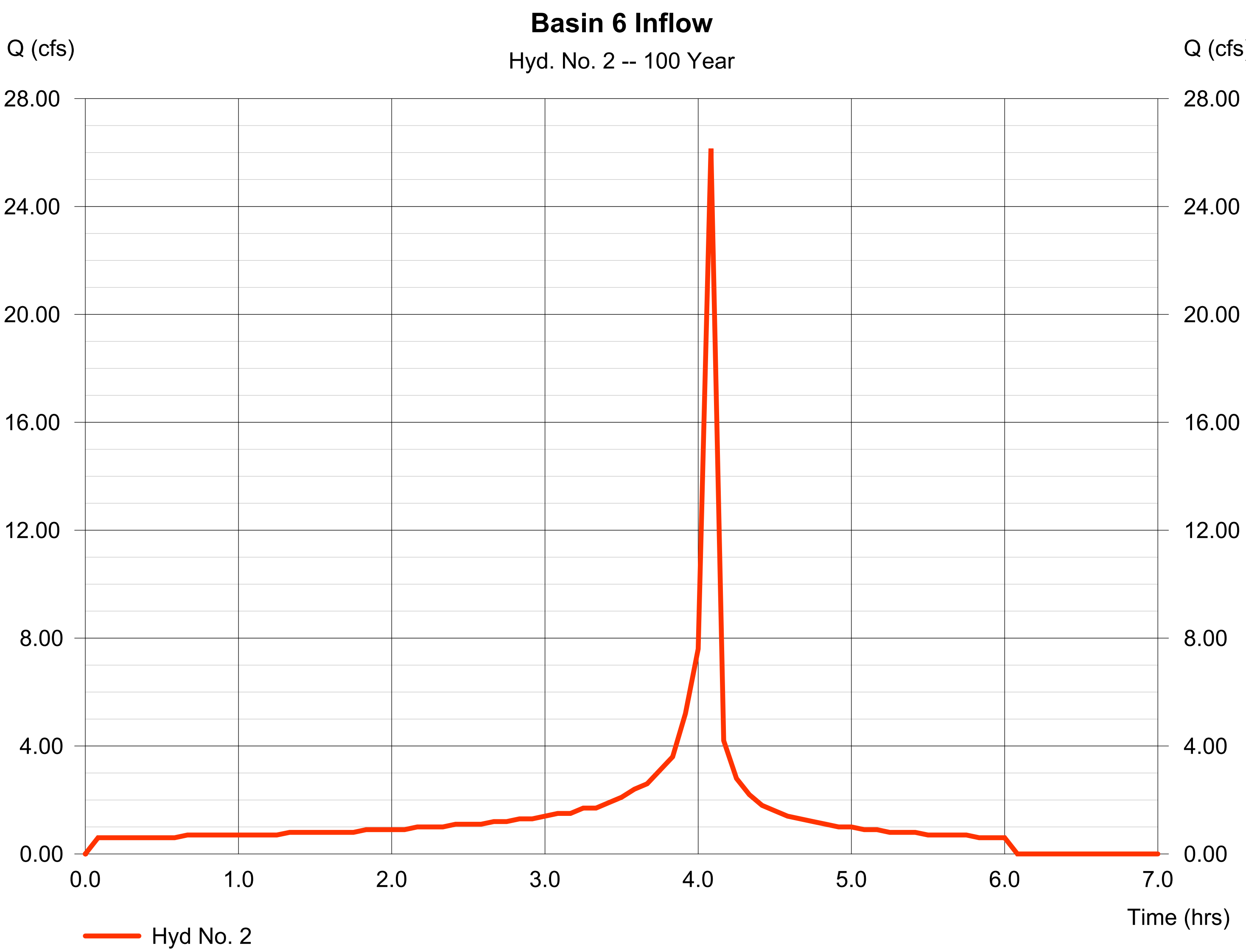
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 2

Basin 6 Inflow

Hydrograph type	= Manual	Peak discharge	= 26.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 36,105 cuft



Hydrograph Report

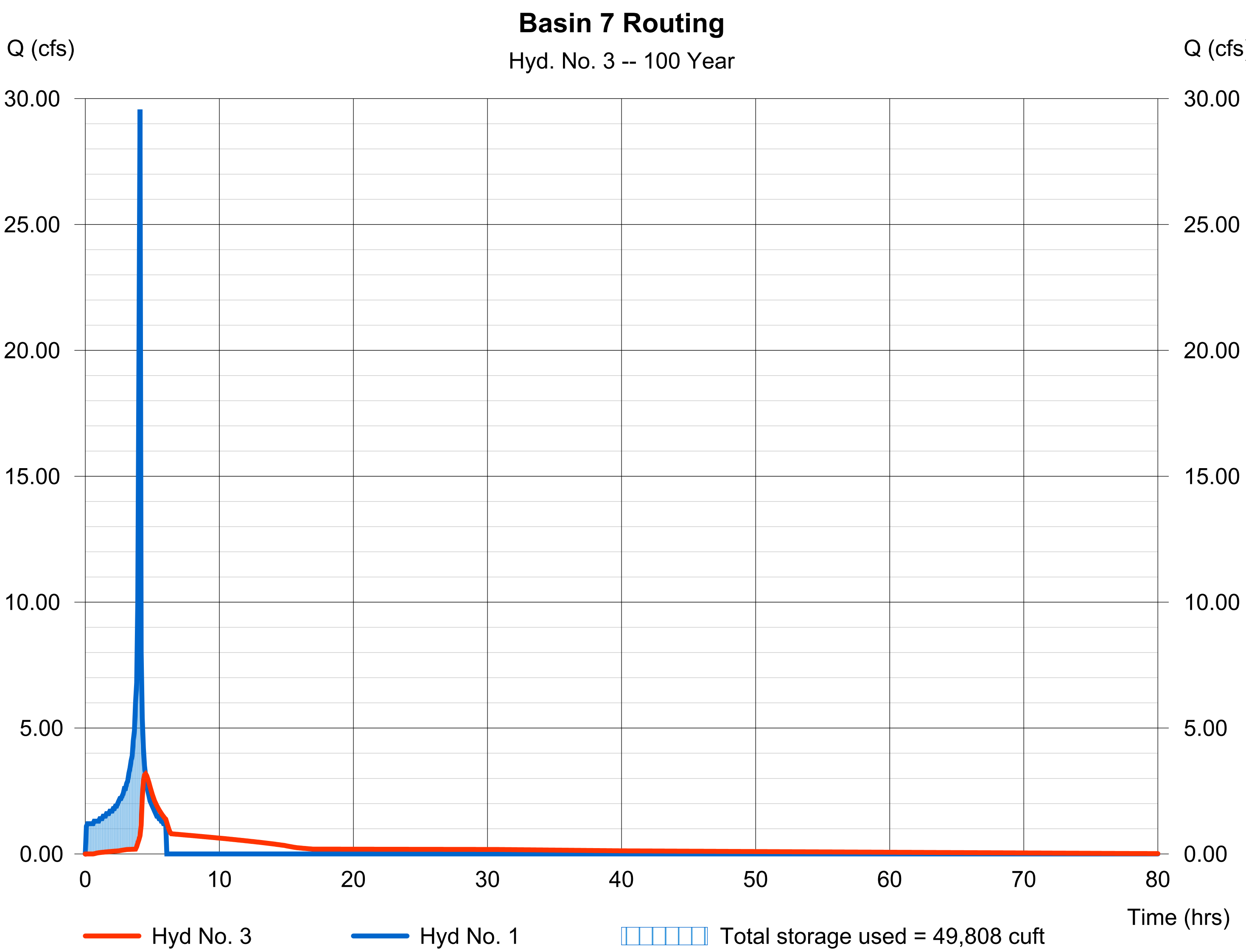
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 3

Basin 7 Routing

Hydrograph type	= Reservoir	Peak discharge	= 3.178 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.50 hrs
Time interval	= 5 min	Hyd. volume	= 62,291 cuft
Inflow hyd. No.	= 1 - Basin 7 Inflow	Max. Elevation	= 483.15 ft
Reservoir name	= Basin 7	Max. Storage	= 49,808 cuft

Storage Indication method used.



Hydrograph Report

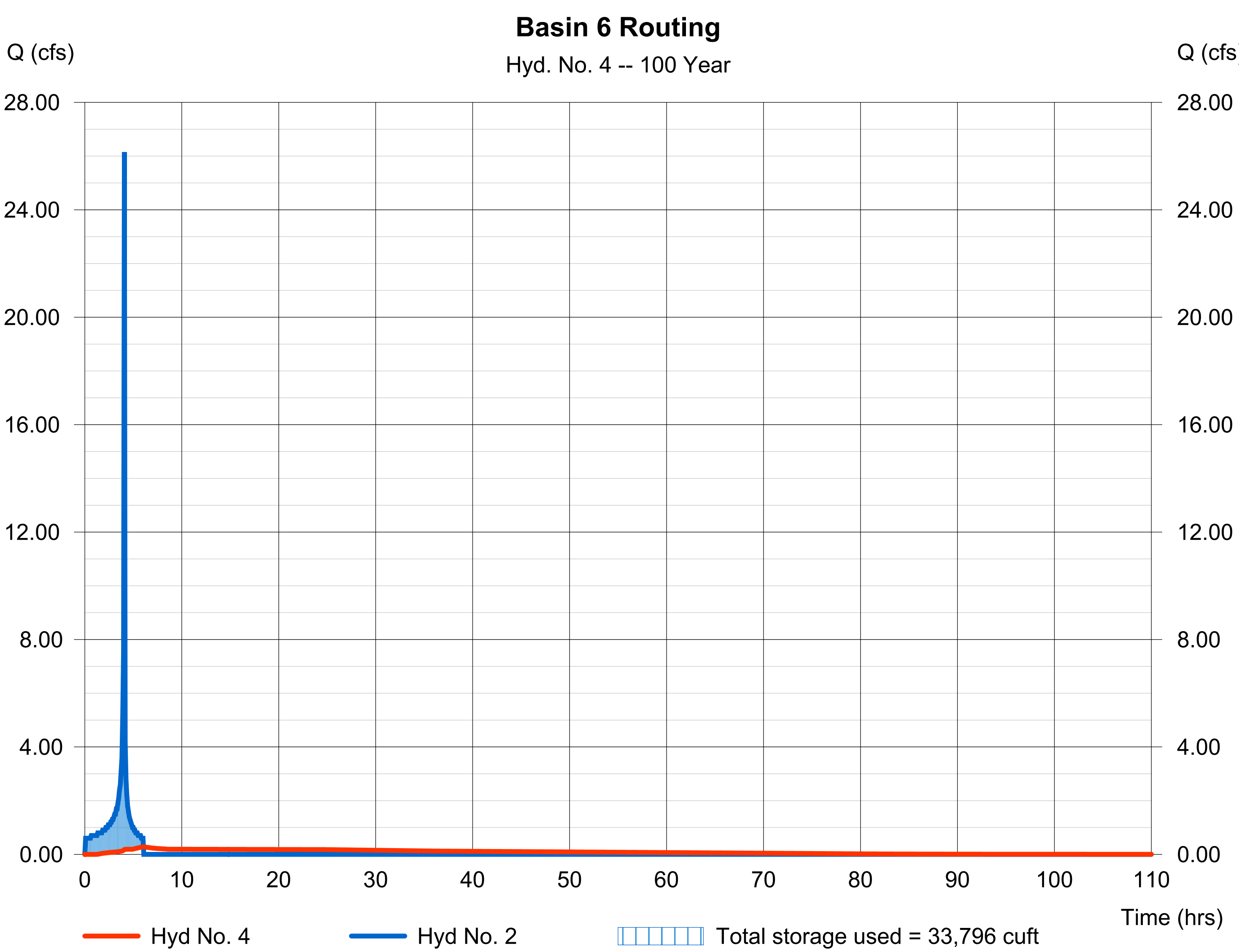
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 4

Basin 6 Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.279 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 33,302 cuft
Inflow hyd. No.	= 2 - Basin 6 Inflow	Max. Elevation	= 485.09 ft
Reservoir name	= Basin 6	Max. Storage	= 33,796 cuft

Storage Indication method used.



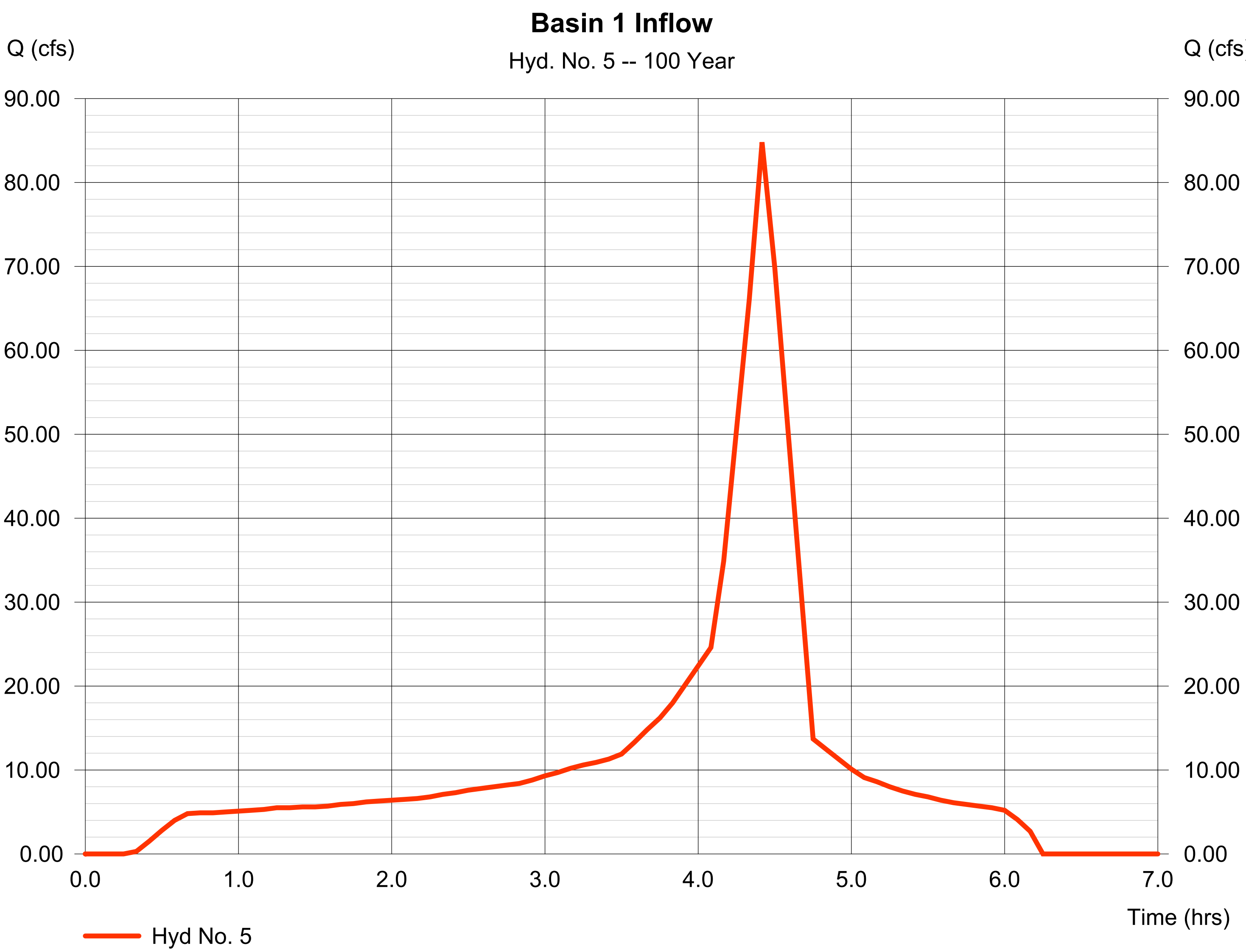
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 10 / 5 / 2017

Hyd. No. 5

Basin 1 Inflow

Hydrograph type	= Manual	Peak discharge	= 84.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.42 hrs
Time interval	= 5 min	Hyd. volume	= 274,470 cuft



Hydrograph Report

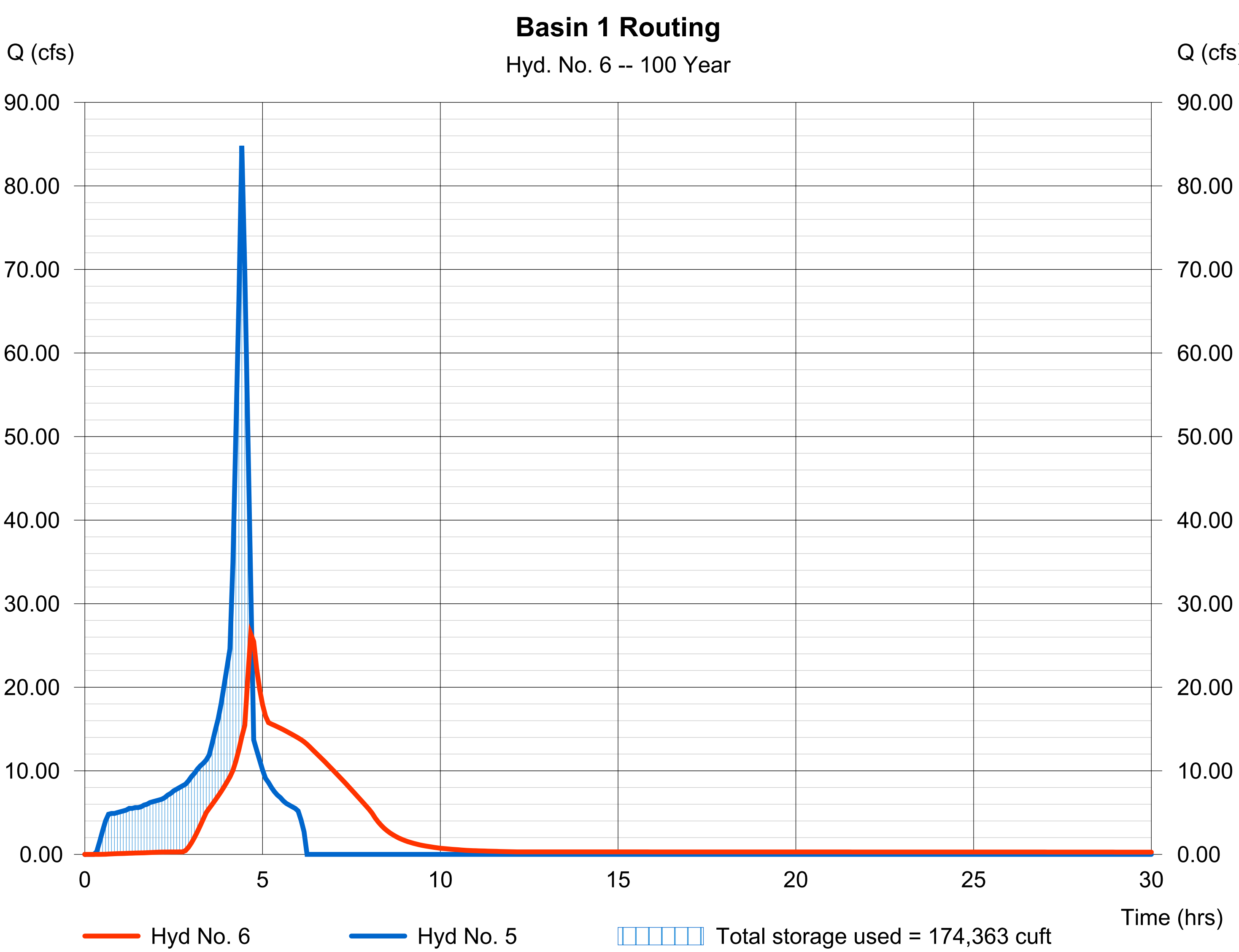
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 6

Basin 1 Routing

Hydrograph type	= Reservoir	Peak discharge	= 26.37 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 274,261 cuft
Inflow hyd. No.	= 5 - Basin 1 Inflow	Max. Elevation	= 485.62 ft
Reservoir name	= Basin 1	Max. Storage	= 174,363 cuft

Storage Indication method used.



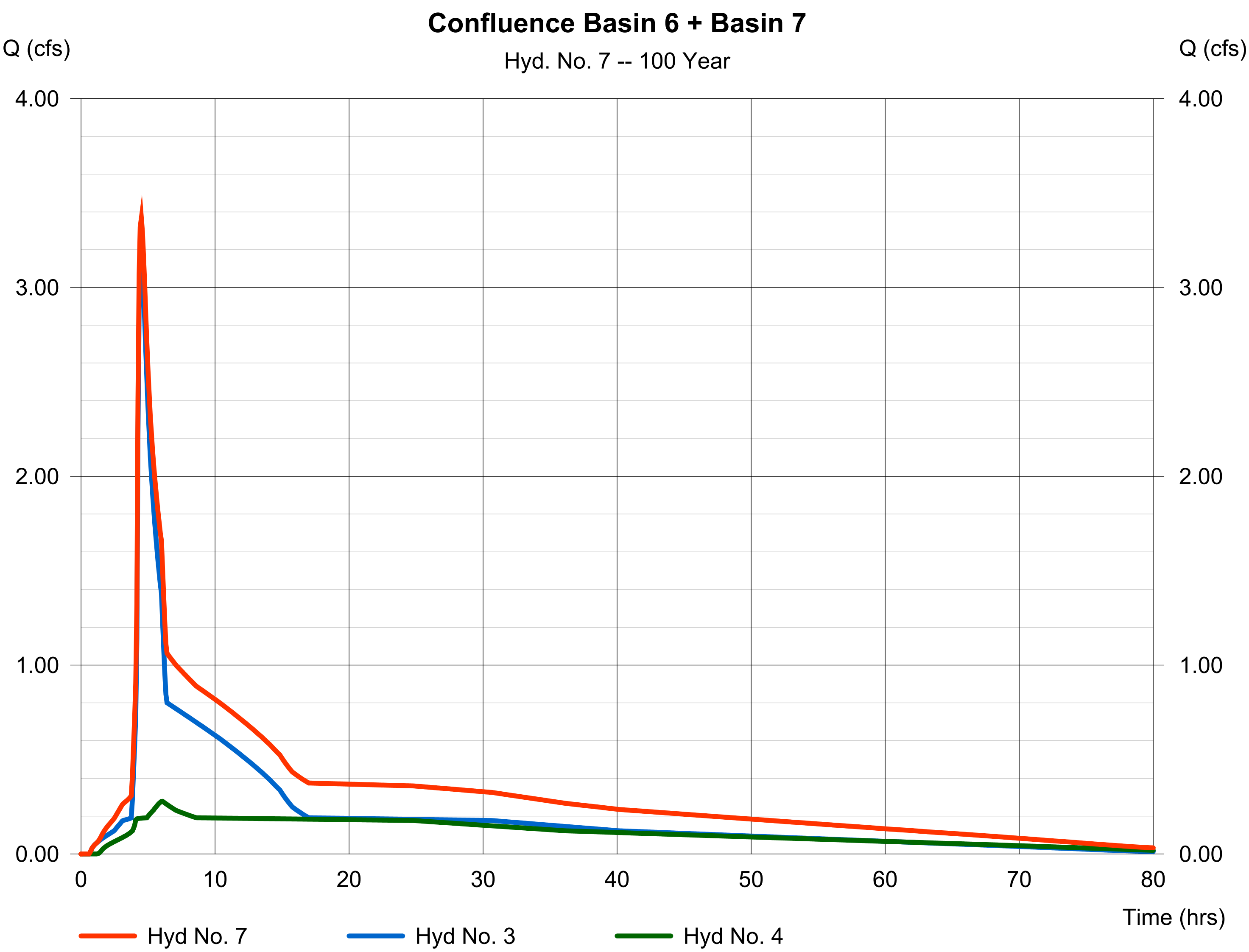
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 7

Confluence Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 3.367 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.50 hrs
Time interval	= 5 min	Hyd. volume	= 95,594 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.000 ac



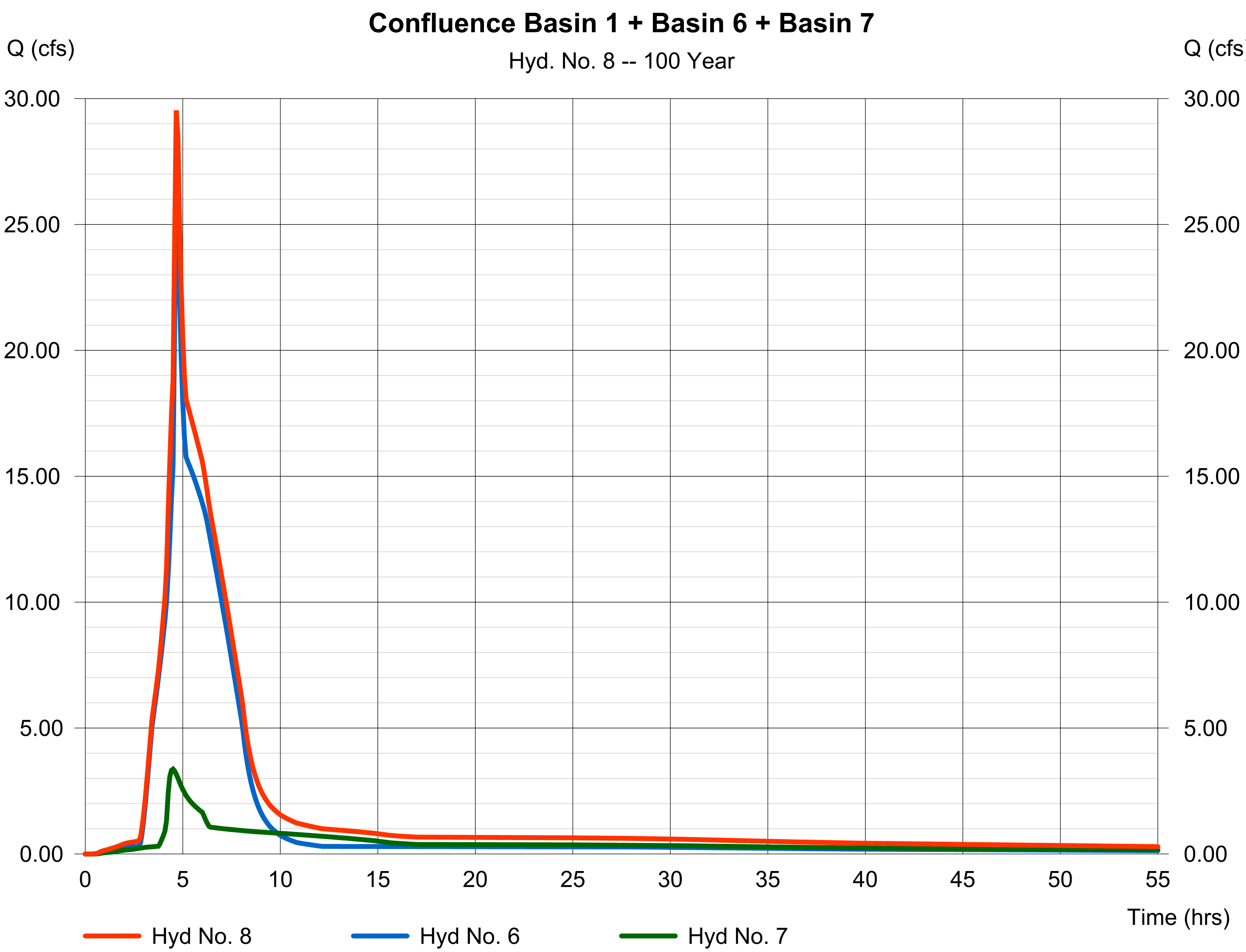
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 10 / 5 / 2017

Hyd. No. 8

Confluence Basin 1 + Basin 6 + Basin 7

Hydrograph type	= Combine	Peak discharge	= 29.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.67 hrs
Time interval	= 5 min	Hyd. volume	= 369,855 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.000 ac



100 Year Emergency Spill Way

Project Description

Solve For	Crest Length

Input Data

Discharge		140.52	ft³/s
Headwater Elevation		487.00	ft
Crest Elevation		486.62	ft
Tailwater Elevation		0.00	ft
Crest Surface Type	Paved		
Crest Breadth		1.00	ft

Results

Crest Length	194.32	ft
Headwater Height Above Crest	0.38	ft
Tailwater Height Above Crest	-486.62	ft
Weir Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	3.09	US
Flow Area	73.84	ft²
Velocity	1.90	ft/s
Wetted Perimeter	195.08	ft
Top Width	194.32	ft

APPENDIX G

INLET CALCULATIONS

Curb Inlet On Grade (Sunroad Otay Plaza.fm8) Report

Label	Solve For	Efficiency (%)	Curb Opening Length (ft)
Curb Inlet On Grade - 1	Efficiency	100.00	14.00
Curb Inlet On Grade - 2	Efficiency	100.00	12.00

Local Depression (in)	Local Depression Width (ft)	Discharge (ft^3/s)	Slope (%)
4.00	1.50	7.60	2.60000
4.00	1.50	7.60	1.00000

Gutter Width (ft)	Gutter Cross Slope (%)	Road Cross Slope (%)	Manning Coefficient
1.50	22.22	2.00	0.013
1.50	22.22	2.00	0.013

Intercepted Flow (ft^3/s)	Bypass Flow (ft^3/s)	Spread (ft)	Depth (ft)
7.60	0.00	9.87	0.50
7.60	0.00	12.64	0.56

Flow Area (ft^2)	Gutter Depression (ft)	Total Depression (ft)	Velocity (ft/s)
1.20	0.30	0.64	6.33
1.82	0.30	0.64	4.17

Equivalent Cross Slope (ft/ft)	Length Factor	Total Interception Length (ft)	Notes

Curb Inlet On Grade (Sunroad Otay Plaza.fm8) Report

Equivalent Cross Slope (ft/ft)	Length Factor	Total Interception Length (ft)	Notes
0.28009	1.02	13.67	
0.22591	1.03	11.68	

Messages

Ditch Inlet On Grade (Sunroad Otay Plaza.fm8) Report

Label	Solve For	Manning Coefficient	Slope (%)
Ditch Inlet On Grade - 3	Efficiency	0.013	0.50000

Left Side Slope (%)	Right Side Slope (%)	Bottom Width (ft)	Discharge (ft^3/s)
0.84	2.48	0.00	22.16

Efficiency (%)	Grate Width (ft)	Grate Length (ft)	Grate Type
104.24	28.00	3.00	P-50 mm (P-1-7/8")

Clogging (%)	Intercepted Flow (ft^3/s)	Bypass Flow (ft^3/s)	Flow Area (ft^2)
30.00	23.10	-0.94	9.00

Wetted Perimeter (ft)	Top Width (ft)	Velocity (ft/s)	Splash Over Velocity (ft/s)
53.57	53.56	2.46	8.34

Frontal Flow Factor	Side Flow Factor	Grate Flow Ratio	Active Grate Length (ft)
1.00	0.07	1.05	2.10

Critical Depth (ft)	Critical Slope (ft/ft)	Froude Number	Flow Type
0.34	0.00443	1.06	Supercritical

Ditch Inlet On Grade (Sunroad Otay Plaza.fm8) Report

Critical Depth (ft)	Critical Slope (ft/ft)	Froude Number	Flow Type

Specific Energy (ft)	Velocity Head (ft)	Depth (ft)	Grate Flow Option
0.43	0.09	0.34	Exclude None

Notes	Messages
	the defined range of HEC-22's Chart

APPENDIX H

FEMA MAP

JOINS PANEL 2200

6345000 FT

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2179G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 2179 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHULA VISTA, CITY OF	065021	2179	G
SAN DIEGO COUNTY	060284	2179	G
SAN DIEGO, CITY OF	060295	2179	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
06073C2179G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

EXHIBIT A

EXISTING DRAINAGE EXHIBIT

K:\SND_LDEV\095128024 — Sunroad Otay\Drainage\Exhibits\Existing Drainage Exhibit.dwg 5-22-17-2:12 PM

Kimley»Horn

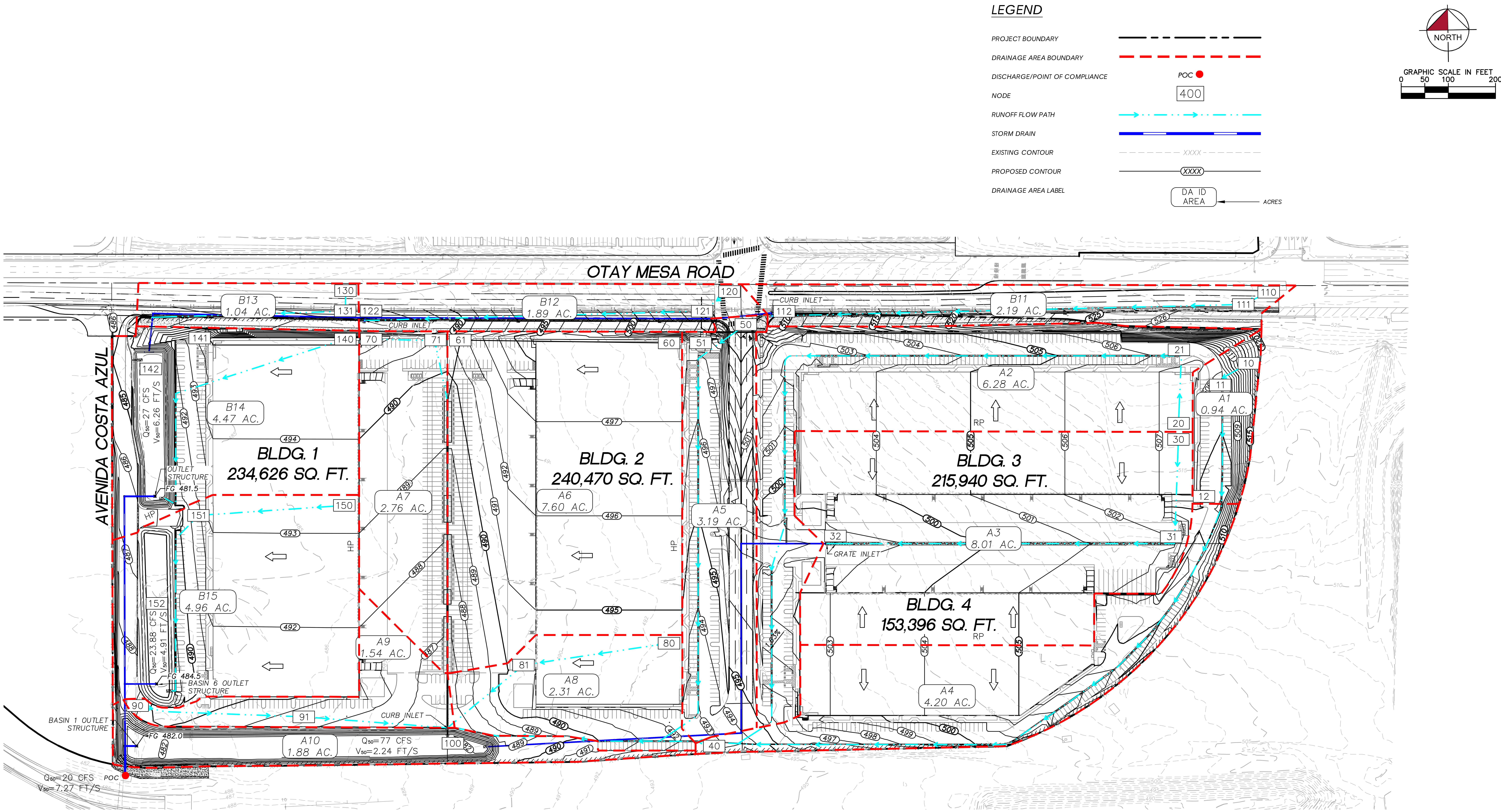
May 2017

EXISTING DRAINAGE EXHIBIT

SUNROAD OTAY PLAZA

EXHIBIT B

PROPOSED DRAINAGE EXHIBIT



K:\SNO_LDEV\095128024 - Sunroad Otay\Drainage\Exhibits\Proposed Drainage Exhibit.dwg 10-05-17-6:52 PM

Kimley»Horn

October 2017

PROPOSED DRAINAGE EXHIBIT
SUNROAD OTAY PLAZA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

UPDATE GEOTECHNICAL INVESTIGATION

SUNROAD OTAY 50
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

PREPARED FOR

COMMERCE CONSTRUCTION CORPORATION, L.P.
SAN DIEGO, CALIFORNIA

MARCH 31, 2017
PROJECT NO. 07740-42-02

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07740-42-02
March 31, 2017

Commerce Construction Corporation, L.P.
13191 Crossroads Parkway North, 6th Floor
City of Industry, California 91746

Attention: Mr. Ali A. Zare

Subject: UPDATE GEOTECHNICAL INVESTIGATION
SUNROAD OTAY 50
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

Dear Mr. Zare:

In accordance with your authorization of our proposal No. LG-17014, dated January 10, 2017, we have prepared this update geotechnical investigation for the subject project. The accompanying report discusses soil and geologic conditions at the site and provides recommendations relative to the geotechnical engineering aspects for developing the project as presently proposed.

Provided that the recommendations of the report are followed, the site is considered suitable for construction of the planned development.

Should you have questions regarding this update report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Raul R. Garcia
GE 2842

Garry W. Cannon
CEG 2201
RCE 56468

REGISTERED PROFESSIONAL ENGINEER RAUL R. GARCIA No. 2842 GEOTECHNICAL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER GARRY WELLS CANNON No. C 056468 CIVIL STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST GARRY WELLS CANNON NO. 2201 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

RRG:GWC:ejc:dmc

(2) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report summarizes the findings of our update geotechnical investigation of the proposed new Sunroad Otay 50 project located south of Otay Mesa Road and east of Toll Road 125 Offramp in the Otay Mesa area of San Diego, California (See Vicinity Map, Figure 1). The purpose of this study is to update previous geotechnical investigations performed by Geocon Incorporated, to evaluate whether the conclusions and recommendations presented in the referenced reports are relevant to the existing conditions, and to provide additional and pertinent recommendations for site development.

The scope of the study included a review of the following geotechnical reports previously prepared for the industrial subdivision and the current project plan:

1. *Soil and Geologic Investigation for Otay Mesa III Limited, San Diego, California,* dated April 26, 1989 revised October 13, 1989 (Project No. D-4341-J01).

2. *Soil and Geologic Investigation for San Diego Mesa Center, Tract 86-1006, San Diego, California*, prepared by Geocon Incorporated, dated October 19, 1989 (Project No. D-4435-J01).

3. *Preliminary Grading Plan for Sunroad Otay 50*, prepared by Kimley Horn and Associates Incorporated, plot date February 15, 2017.

The scope of this update geotechnical investigation also included a review of readily available geologic literature and in-house reports pertinent to the property. Reports and published literature reviewed for this investigation are summarized in the *List of References* at the end of this report.

The purpose of the referenced geotechnical investigations was to evaluate the surface and subsurface soil and geologic conditions at the site and, based on the conditions encountered, provide recommendations pertinent to the geotechnical engineering aspects of proposed site development. Previous subsurface exploration included 4 large-diameter borings and 15 exploratory trenches used to estimate the thickness of the soil types (undocumented fill, topsoil, Very Old Paralic Deposits and Otay Formation), collect samples for laboratory testing, and to roughly delineate the near-surface geologic units. Details of the previous field investigations and the boring and trench logs are presented in Appendix A.

Laboratory testing was performed on selected representative samples collected during the 1989 subsurface investigations. The purpose of the laboratory testing was to evaluate pertinent physical and chemical soil properties for engineering analysis to assist in providing recommendations for site grading and development. Details of the laboratory testing and a summary of the test results are presented in Appendix B.

The Geologic Map, Figure 2 (map pocket) depicts the configuration of the property, proposed grading, existing topography and geology, and the approximate locations of exploratory excavations. The proposed grading is based on the referenced preliminary grading plan prepared by Kimley Horn and Associates.

Conclusions and recommendations presented herein are based on an analysis of the data obtained from our recent geologic reconnaissance; our review of our previous studies; previous laboratory testing; and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The site consists of approximately 50 acres of undeveloped land located south of Otay Mesa Road and north of Interstate 905 and west of Toll Road 125 Offramp in the Otay Mesa area of San Diego, California. The site is a semi-rectangular parcel extending approximately 970 feet to the south from Otay Mesa Road and approximately 2,450 feet to the west from Toll Road 125 Offramp. The project limits are presented on the Geologic Map, Figure 2.

The site is relatively level with a southwesterly drainage gradient. Elevations vary from approximately 520 feet Mean Sea Level (MSL) in the northeastern corner to approximately 483 feet MSL at the central west property line. Vegetation typically consists of weeds and grasses.

Based on our review of the preliminary grading plan, we understand that proposed project will consist of developing an industrial park containing 4 building pads with at grade parking areas, two access streets, associated utilities and three desilting basins. We expect that the buildings will be one- to two-story structures with concrete slab-on-grade supported on conventional continuous and isolated spread footings. Grading to construct the building pads is expected to be relatively minor consisting of cuts and fills of less than 20 feet. The desilting basins are planned at the west and south ends.

3. SOIL AND GEOLOGIC CONDITIONS

Three surficial soil deposits and one geologic formation exist at the site. Surficial soil consists of undocumented fill, topsoil, and Quaternary-age Very Old Paralic Deposits (formerly Lindavista Formation). The geologic unit is the Tertiary-age Otay Formation. Descriptions of the surficial soils and formational units are provided in order of increasing age. The expected subsurface relationship between the surficial soils and geologic units is presented on the Geologic Map, Figure 2, and Geologic Cross-Sections A-A’, B-B’ and C-C’, Figure 3.

3.1 Undocumented Fill (Qudf)

Undocumented fill exists at isolated locations in the southwest and southern portions of the site. Fill thickness with an approximate thickness of 5 to 6 feet, consisted of loose silty, gravelly clayey sand. The undocumented fill is unsuitable for support of settlement sensitive structures and/or improvements and will require complete removal and recompaction.

3.2 Topsoil (unmapped)

Topsoil exists throughout the site with thicknesses of approximately 2 to 3½ feet. The topsoil, as exposed in exploratory borings and trenches, consists of soft, dry to damp sandy clay and loose, dry, clayey sand. The topsoil is also unsuitable for support of settlement sensitive structures and/or improvements and will require complete removal and recompaction.

3.3 Very Old Paralic Deposits (Qvop)

Very Old Paralic Deposits (formerly Lindavista Formation) underlie the topsoil over the majority of the site. Very Old Paralic Deposits consist of two relatively distinct layers; an upper, highly expansive clay layer over a lower granular layer. The upper clay layer consists of approximately 4 to 17 feet of firm to very stiff clay. The clay layer is generally thicker in the northern and western portions of the site. The lower granular layer consists of dense silty sand, sandy gravel and clayey sand. Results of our previous laboratory testing indicate that the lower granular soils have a *low* to *medium* expansion potential and therefore should provide adequate capping material. Cobble content increases with depth within the sandier portions. The Very Old Paralic Deposits should provide adequate foundation support in their present condition or as compacted fill. Highly expansive Very Old Paralic Deposits, if exposed at finish grade, will require special remedial grading and/or foundation design criteria, as discussed in subsequent sections.

3.4 Otay Formation (To)

The Otay Formation exists at grade in the eastern corner of the site and in the subsurface across the site. This geologic formation consists of very dense, moist to very moist, fine- to medium-grained silty clayey sandstone to sandy clayey siltstone. The Otay Formation exhibits *low* to *medium* expansion characteristics and should provide suitable capping material for the proposed building pads. The Otay Formation is suitable for the support of compacted fill and structural loads.

4. GROUNDWATER

Perched groundwater was encountered at depths of 36 feet in Boring B-2A and at 16, 23½, and 36 feet in Boring B-2B. Groundwater or seepage was not encountered in the other exploratory excavations conducted on the property. Perched groundwater conditions should be expected to occur seasonally and may affect site grading if grading operations are performed during or shortly after rainy season. Groundwater is not expected to impact the site; however, if grading operations are performed during the rainy season, saturated conditions and extensive moisture conditioning operations should be expected. Proper surface drainage of irrigation water and precipitation will be critical to future performance of project.

5. GEOLOGIC STRUCTURE

Bedding within the Very Old Paralic Deposits ranges from massive to well-developed and bedding attitudes are typically horizontal. Geologic structure is not expected to present a constraint to the proposed project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego *Seismic Safety Study, Geologic Hazards and Faults*, 2008 Edition, Map Sheets 3 and 7 define the site as Hazard Category 53: *Level or Sloping Terrain, unfavorable geologic structure, low to moderate risk.*

6.2 Faulting and Seismicity

Review of the referenced geologic reports and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faulting. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within State of California Earthquake Fault Zone.

A deterministic seismic hazard analysis was performed using the computer program *EZ-FRISK* (Risk Engineering, 2015), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active fault is the Newport-Inglewood/Rose Canyon Fault, located approximately 11 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.25g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the 6 most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-

Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	**Distance from Site (miles)**	**Maximum Earthquake Magnitude (Mw)**	**Peak Ground Acceleration**		
			Boore-Atkinson 2008 (g)	**Campbell-Bozorgnia 2008 (g)**	**Chiou-Youngs 2007 (g)**
Newport-Inglewood/Rose Canyon	11	7.5	0.25	0.20	0.25
Rose Canyon	11	6.9	0.21	0.18	0.20
Coronado Bank	18	7.4	0.20	0.14	0.17
Palos Verdes Connected	18	7.7	0.22	0.15	0.20
Elsinore	42	7.85	0.14	0.09	0.11
Earthquake Valley	46	6.8	0.08	0.06	0.05

A probalistic seismic hazard analysis was performed using the computer program *EZ-FRISK* (Risk Engineering, 2015). *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.41	0.34	0.40
5% in a 50 Year Period	0.31	0.26	0.28
10% in a 50 Year Period	0.23	0.20	0.21

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) and other guidelines currently adopted by the City of San Diego.

6.3 Landslides

No landslides were encountered at the site or mapped in an area that could impact the property. Landslides are mapped outside and to the southwest of the site. The risk associated with landslide hazard is low for this project.

6.4 Soil Liquefaction

Soil liquefaction occurs within relatively loose, cohesionless sands located below the permanent table that are subjected to ground accelerations from earthquakes. Due to the anticipated depth to permanent groundwater (≥50 feet) and dense nature of the surficial soils at the site, the risk associated with liquefaction hazard at the site is low.

6.5 Tsunamis and Seiches

The site is located approximately 10 miles east of the Pacific Ocean at an elevation of approximately 500 feet above Mean Sea Level (MSL). No large bodies of water are located upstream of the site. The risk associated with inundation hazard due to tsunamis or seiches is low.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 Based on our geologic reconnaissance, the site is in a similar condition to that encountered during our previous geotechnical investigations. It is the opinion of Geocon Incorporated that the conclusions and recommendations presented in this update report and in the previous geotechnical investigations are valid for the proposed site development.

7.1.2 No soil or geologic conditions were observed that would preclude development of the property as planned provided the recommendations of this report are followed.

7.1.3 Localized areas of undocumented fill with thickness on the order of 5 to 6 feet are located at the southwest and southern portions of the Site. Topsoil underlies the majority of the site to depths up to 3½ feet. Highly expansive clays comprise the upper portions of Very Old Paralic Deposits, extending to depths ranging from approximately 4 to 17 feet. Granular, *low*- to *medium*-expansive Very Old Paralic Deposits underlie this clay layer. Otay Formation is exposed beneath the topsoil in the northeast corner of the site.

7.1.4 The undocumented fill, topsoil, and isolated, soft portions of the Very Old Paralic Deposits are unsuitable in their present condition for support of settlement sensitive structures and/or surface improvements. As such, removal and recompaction of these materials will be required. The majority of the Very Old Paralic Deposits and Otay Formation are suitable for the support of compacted fill and structural loads.

7.1.5 The primary geotechnical constraint to the property is the presence of highly expansive clayey soil. To mitigate expansive soil, removal of highly expansive soil within the upper 5 feet of pad grade and replacement with *low*- to *medium*-expansive materials or lime treatment of the existing clay should be performed. Recommendations for both of these options are provided herein. Foundation recommendations, pavement, and concrete slabs-on-grade will require deeper foundations and structural sections in the event that highly expansive soil remains within 5 feet of finish grade.

7.1.6 The deeper Very Old Paralic Deposits consist predominately of silty to clayey sand and gravelly sand. This material has *low* to *medium* expansion characteristics and would be beneficial material for use in capping of the building pads and parking areas. In order to get sufficient quantities to cap the site, stockpiling and mining of the deeper Very Old Paralic Deposits will be required. Alternatively, import of *low*-expansive soils as capping material could be performed.

7.1.7 The proposed structures can be supported on conventional shallow foundations founded in compacted fill, Very Old Paralic Deposits, or formational materials.

7.1.8 Surface settlement monuments or canyon subdrains will not be necessary for the project.

7.2 Soil and Excavation Characteristics

7.2.1 Excavations of the *in situ* soils should be suitable with moderate effort using heavy-duty grading equipment. Layers of cohesionless sand (if encountered within the Very Old Paralic Deposits) will require special attention with respect to the stability of excavations during trenching for utility lines. Planned excavations into the Very Old Paralic Deposits may be difficult due to localized cemented zones, cobbles, and boulders. The presence of cobbles and boulders could require special excavation methods. Cuts in excess of approximately 10 to 15 feet could generate oversize rocks.

7.2.2 Excavation and compaction difficulties may be experienced if grading operations are performed when clayey soils that are very wet or very dry. Extensive moisture conditioning may be required if either case is encountered.

7.2.3 The soils encountered in the field investigation are considered to be expansive (expansion index [EI] greater than 20 as defined by 2016 California Building Code (CBC) Section 1803.5.3. Based on extensive studies performed in the area, the clayey sands and sandy gravels of the Very Old Paralic Deposits and the sandy soils of the Otay Formation possess *low* to *medium* expansion potential (Expansion Index <90). Existing topsoil, clayey soil of the Very Old Paralic Deposits, and the clayey soil of the Otay Formation possess *high* expansion potential. (Expansion Index >91). Table 7.2.1 presents soil classifications based on the expansion index.

TABLE 7.2.1
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

<table>
<tr><th>Expansion Index (EI)</th><th>ASTM D 4829
Expansion Classification</th><th>2016 CBC
Expansion Classification</th></tr>
<tr><td>0 – 20</td><td>Very Low</td><td>Non-Expansive</td></tr>
<tr><td>21 – 50</td><td>Low</td><td rowspan="4">Expansive</td></tr>
<tr><td>51 – 90</td><td>Medium</td></tr>
<tr><td>91 – 130</td><td>High</td></tr>
<tr><td>Greater Than 130</td><td>Very High</td></tr>
</table>

7.2.4 We performed laboratory tests on three samples of the site materials to evaluate water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B and indicate that the near-surface on-site materials at the locations tested possess *not applicable* sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 7.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Severity	Exposure Class	Water-Soluble Sulfate % by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	I or II	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V + pozzolan or slag	0.45	4,500

7.2.5 We performed laboratory tests on one sample of the near-surface site materials to evaluate the corrosion potential to subsurface metal structures as part of our original geotechnical investigation. The laboratory test results are presented in Table B-IV. The laboratory tests were performed in accordance with California Test Method No. 643. Minimum resistivity test results indicated a moderate corrosion potential with respect to buried metal pipes.

7.2.6 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, further evaluation by a corrosion engineer should be performed.

7.3 Temporary Excavations

7.3.1 Temporary excavations should be constructed in conformance with OSHA requirements. The onsite fill soil should be considered Type B soil in accordance with OSHA requirements. The Very Old Paralic Deposits and the Otay Formation should be considered

Type A. In general, special shoring requirements will not be necessary if temporary excavations are less than 3 feet high. Temporary excavation depths greater than 3 feet should be laid back at an appropriate inclination or shored. The soils exposed in these excavations should not become saturated or allowed to dry. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.4 Grading

7.4.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of this report conflict with those of Appendix C; this section of the report takes precedence. All grading should be observed by a representative of Geocon Incorporated to verify that the recommendations of this report have been followed.

7.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner and/or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.4.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.4.4 Compressible surficial deposits (undocumented fill/topsoil/soft, clayey Very Old Paralic Deposits) should be completely removed and recompacted prior to placement of additional fill. The grading should be observed by a representative of Geocon Incorporated to evaluate removals of the compressible surficial deposits.

7.4.5 Import soil, if required, should consist of granular materials with a *low* expansion potential (EI less than 50). Prior to importing, representative samples of proposed borrow materials should be obtained and subjected to laboratory expansion testing to verify if the soil conforms to the recommended expansion criteria.

7.4.6 The primary geotechnical constraint to the property is the presence of highly expansive soil in the near surface. To mitigate heaving potential of expansive soil, removal of highly expansive soil and replacement with *low*- to *medium*-expansive materials or lime treatment of the existing clay should be performed. Recommendations for both these options are provided below.

7.5 Grading Option 1 – Replacement of Expansive Soils

7.5.1 One method of obtaining material for a *low*- to *medium*-expansive cap on the site is to mine the deeper on-site *low*- to *medium*-expansive Very Old Paralic Deposits. Mining of the Otay Formation at the northeast section should be considered. Based on borings and trench excavations, the deeper Very Old Paralic Deposits consist of silty, gravelly sands with cobble contents up to 40 percent by weight. Alternatively, removal of the clays and replacement with imported *low*-expansive soil can be performed; although this option may be cost prohibitive. Typically, dependent upon location of import materials, mining of on-site soils is a better cost effective alternative. Trench excavations indicate that *low*-expansive materials are more readily available (shallow depths) for mining at the east section of the property.

7.5.2 For the mining option, we recommend that sufficient *low*- to *medium*-expansive material be excavated to provide a minimum cap of 5 feet for building pads and hardscape parking areas. Where dock high doors are planned, the 5-foot thickness should be with respect to the lower elevations where the building footings will be placed. The project Civil Engineer should determine the size, depth, and location of excavation required to generate sufficient capping materials based on depths to *low*- to *medium*-expansive materials encountered in the exploratory excavations. The mined area should be sized so that overexcavated highly expansive materials can be placed back in the mined area and be covered with the recommended thickness of *low*- to *medium*-expansive soil. The mining areas should be selected to avoid differential fill thickness within building pads.

7.5.3 Overexcavations will be required in some locations to establish the compacted mat of *low*- to *medium*-expansive materials. Where fills are planned, overexcavations should extend to 5 feet below proposed rough grades or through existing undocumented fill/topsoil, whichever is deeper. The excavation should also extend at least 5 feet beyond the building perimeter. The base of the overexcavation should expose competent Very Old Paralic Deposits or Otay Formation. For footing areas at dock high walls, overexcavation depths should be measured from the lowest adjacent grade.

7.5.4 The exposed ground surface following removals, overexcavation or mining should be scarified, moisture conditioned and compacted. Fill soils may then be placed and compacted in layers to the design finish grade elevations. All fill should be compacted to at least 90 percent of laboratory maximum dry density as determined by ASTM D 1557, at or slightly above optimum moisture content. Fill areas where in-place density tests indicate moisture contents less than optimum will require additional moisture conditioning prior to placing fill.

7.5.5 Dependent upon the *in situ* moisture content of the clay, special equipment (i.e. discs and/or sheepsfoot compactors) may be required to place, mix, and properly compact the expansive soils. Overexcavated clays should be placed with a moisture content at least 4 percent above optimum moisture content.

7.6 Grading Option 2 – Lime-Treated Soils

7.6.1 As an alternative to replacement with *low*-to *medium*-expansive soils, lime treatment of the on-site clay can be used to mitigate expansive soil conditions. If used, lime-treated soils should be placed such that a 5-foot-thick, lime-treated soil mat is located beneath buildings, hardscape and pavement. Use of lime-treated soils in pavement areas would result in reduced structural pavement sections as compared to those required for untreated soils. Depending on the final location of pavement and the type of traffic, the thickness of lime treatment in pavement and hardscape areas may be modified.

7.6.2 Typical in-place lime-treatment operations result in treatment of the upper 12 inches of soil. As such, overexcavation and stockpiling will be required to process, lime treat, place and compact the treated soils to achieve the above recommended thicknesses. The initial excavation should extend through the undocumented fill/topsoil and at least 4 feet below proposed grades, whichever is deepest. The base of the excavation should be scarified to a depth of 12 inches, treated with a lime at a ratio of 6 percent quick lime by dry weight, moisture conditioned to 1 to 3 percent above optimum moisture content and recompacted to at least 90 percent of laboratory maximum dry density as determined by ASTM D 1557.

7.6.3 Excavated and stockpiled soils should then be mixed with quick lime by dry weight, uniformly moisture conditioned to 1 to 3 percent above optimum moisture content, placed in 6-to 8-inch thick layers and compacted to at least 90 percent relative compaction. Typical lime content for clays in the Otay Mesa is approximately 6 percent quick lime.

7.6.4 Application of lime, mixing, placing, and compacting should be performed in accordance with procedures contained in Section 24 of the *Caltrans Manual* and Section 301-5 of the *Standard Specifications for Public Works Construction* (Green Book).

7.6.5 The above recommended lime percentages are based on laboratory tests results conducted for nearby projects on Otay Mesa with similar soil conditions. If lime treatment is selected, representative samples of the clayey soil should be obtained and subjected to laboratory testing with varying lime contents to determine the optimum percentage to achieve stabilization. For preliminary criteria, lime treatment should result in a Plasticity Index (PI) of 15 or less.

7.6.6 Due to the recommended lime content and clayey nature of the soils, difficult compaction should be expected. Lime treatment of the highly expansive clays will substantially reduce the potential for future expansion of the soils and associated distress to foundations and surface improvements.

7.7 Slope Stability

7.7.1 Slope stability analyses using laboratory shear strength information and experience with similar soil conditions in nearby areas indicate that 2:1 (horizontal:vertical) fill slopes constructed of on-site granular materials should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions for heights of 30 feet. The 2:1 cut slopes are expected to be excavated predominantly in the Otay Formation. Based on the calculations and experience with similar conditions, 2:1 cut slopes to the planned heights should possess a factor of safety of at least 1.5 with respect to slope stability if free of adversely oriented bedding, joints or fractures. Slope stability calculations for deep-seated and surficial stability conditions are presented on Figures 4 through 7. For the slope stability calculations, we used typical soil parameters from previous geotechnical investigations performed in the area with similar soil types.

7.7.2 Keying and benching operations during grading of the slopes should be performed in accordance with Appendix C. Due to the presence of highly weathered Otay Formation at some locations, keying operations may extend deeper than normal (on the order of 3 to 5 feet).

7.7.3 Cut slopes within the Otay Formation may require further evaluation due to the possible presence of claystone and siltstone lenses. Stability fills may be necessary to prevent surficial sloughage of the slope faces. The potential presence of bentonitic clay lenses and the associated slope stability considerations can be addressed at the time of grading.

7.7.4 The outer 15 feet of fill slopes should be composed of properly compacted granular fill or lime treated soils to reduce the potential for surficial sloughing. In general, soils with an Expansion Index of less than 90 and at least 35 percent sand size particles should be acceptable as granular fill. Slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

7.7.5 All slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion. Slope planting should generally consist of drought-tolerant plants having a variable root depth. Slope watering should be kept to a minimum to just support the plant growth. A landscape architect should be contacted to provide recommendations for vegetation planned on slopes constructed with lime treated soils.

7.8 Slope Maintenance

7.8.1 Slopes steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer three feet of the slope and usually does not directly impact the improvements on pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation or the migration of subsurface seepage. Disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. We recommend that, to the maximum extent practical, (a) disturbed/loosened surficial soils be either removed or properly compacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.9 Seismic Design Criteria

7.9.1 We used the computer program *U.S. Seismic Design Maps* (USGS, 2014), to evaluate the seismic design criteria. Table 7.9.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. For preliminary purposes, the building structures and improvements should be designed using a Site Class D. Once final grading plans with specific building locations are available, Geocon Incorporated should be contacted to provide specific seismic design criteria. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.9.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.9.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.813g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.312g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.175	Table 1613.3.3(1)
Site Coefficient, F_V	1.777	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.955g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.554g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.637g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.369g	Section 1613.3.4 (Eqn 16-40)

7.9.2 Table 7.9.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.9.2
2013 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.311g	Figure 22-7
Site Coefficient, F_{PGA}	1.183	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.375g	Section 11.8.3 (Eqn 11.8-1)

7.9.3 Conformance to the criteria in Tables 7.9.1 and 7.9.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.10 Foundation Recommendations

7.10.1 Foundation recommendations presented herein are based on *low*- to *medium*-expansive or lime-treated soils within 5 feet of rough pad grade placed and compacted in accordance with the recommendations presented above.

7.10.2 Conventional continuous and/or isolated spread footings are suitable for support of the proposed building. Continuous footings should be at least 12 inches wide and 18 inches deep (below lowest adjacent grade). Isolated spread footings should be at least 2 feet wide and extend 18 inches below lowest adjacent grade. A typical wall/column footing dimension detail is presented in Figure 8.

7.10.3 Continuous footings should be reinforced with four, No. 4 steel, reinforcing bars, two placed near the top of the footing and two near the bottom. The project structural engineer should design reinforcement for spread footings.

7.10.4 Foundations proportioned as recommended may be designed for an allowable soil bearing pressure of 2,500 psf (dead plus live loads). This bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

7.10.5 The allowable soil bearing recommendations presented above are for dead plus live loads only and may be increased by up to one third when considering transient loads such as those due to wind or seismic forces.

7.11 Concrete Slabs-on-Grade

7.11.1 Interior concrete slabs-on-grade should be at least 5 inches thick. Where heavy concentrated floor loads are anticipated, the slab thickness should be increased to 6 inches and should be underlain by 4 inches of Class 2 aggregate base material compacted to at least 95 percent relative compaction.

7.11.2 Minimum reinforcement of slabs-on-grade should consist of No. 3 reinforcing bars placed at 18 inches on center in both horizontal directions. The concrete slabs-on-grade should also be doweled into the foundation system to prevent vertical movement between the slabs, footings, and walls.

7.11.3 The concrete slab-on-grade recommendations are minimums based on soil support characteristics only. We recommend that the project structural engineer evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

7.11.4 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The membrane should be installed in a manner that prevents puncture in accordance with manufacturer's recommendations and ASTM requirements. The project architect or developer should specify the type of vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.11.5 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

7.11.6 All exterior concrete flatwork not subject to vehicular traffic should be a minimum of 4 inches thick and conform to the following recommendations. Slab panels in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh to reduce the potential for cracking. In addition, all concrete flatwork should be provided with crack-control joints to reduce and/or control shrinkage cracking. Crack-control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack-control spacing. Subgrade soils for exterior slabs should be compacted in accordance with criteria presented in the grading section of this report. The subgrade soils should not be allowed to dry prior to placing concrete.

7.11.7 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential soil movement. However, even with the incorporation of these recommendations, foundations and slabs-on-grade will still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack-control joints and proper concrete placement and curing. Crack-control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Cement Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.12 Lateral Loads for Retaining Walls

7.12.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soil should not be used as backfill material behind retaining walls. Soil placed for retaining wall backfill should have an Expansion Index less than 50. Existing soils exhibited a *low* to *high* expansion potential. Therefore, we expect select grading or import of *low*-expansive granular soil will be required for retaining wall backfill.

7.12.2 Where walls are restrained from movement at the top, an active soil pressure equivalent to the pressure exerted by a fluid density of 60 pcf should be used for horizontal backfill. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added (unit weight 125 pcf).

7.12.3 Soil contemplated for use as retaining wall backfill should be identified in the field prior to backfilling. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, onsite soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the onsite soil for use as wall backfill if standard wall designs will be used.

7.12.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the structures adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 9, attached. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.12.5 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.375g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.12.6 To resist lateral loads, a passive pressure equivalent to the pressure exerted by a fluid density of 300 pcf should be used for design of footings or shear keys poured neat against properly compacted granular fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.12.7 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design. To resist lateral loads, the passive resistance can be combined with friction.

7.12.8 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

7.13 Preliminary Pavement Recommendations

7.13.1 The following recommendations are for preliminary purposes and are provided for private driveways and parking areas. The final pavement section design will depend upon soil conditions exposed at subgrade elevation and the results of additional Resistance Value (R-Value). The following preliminary pavement section recommendations for existing mined soils are based on an assumed R-Value of 10. We are also presenting pavement sections with lime-treated subgrade. Sections are presented for both flexible (asphalt concrete) and rigid (Portland cement concrete) pavement.

7.13.2 The pavement sections for public streets will be determined by the City of San Diego Engineering Department. The final pavement sections of public streets will be dependent on the traffic index designated by the City of San Diego Engineering Department and the R-Value laboratory test results of the exposed subgrade soils.

TABLE 7.13.1
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS – MINED SUBGRADE SOIL

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	10	3	7
Driveways for automobiles and light-duty vehicles	5.5	10	4	9
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	10	4	14.5

TABLE 7.13.2
PRELIMINARY RIGID PAVEMENT SECTIONS – MINED SUBGRADE SOIL

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	10	5	4
Driveways[3] for automobiles and light-duty vehicles	300-500	10	6[†]	4
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	10	7[‡]	6

TABLE 7.13.3
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS – LIME-TREATED SUBGRADE

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	50	3	4
Driveways for automobiles and light-duty vehicles	5.5	50	4	4
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	50	4	5

TABLE 7.13.4
PRELIMINARY RIGID PAVEMENT SECTIONS – LIME-TREATED SUBGRADE

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	50	5	4*
Driveways[3] for automobiles and light-duty vehicles	300-500	50	6[†]	4*
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	50	7[‡]	4*

[1]ADTT values have been assumed for planning purposes herein and should be confirmed by the design team during future plan development.

[2]Concrete shall have a minimum $M_R \geq 600$ psi**.** This analysis assumes the construction of concrete shoulders.

[3]Parking stalls and driveways assume typical light truck and car traffic.

[†]Slabs should be reinforced with No. 3 reinforcing bars at 24 inches on center in both horizontal directions.

[‡]Slabs should be reinforced with No. 4 reinforcing bars at 24 inches on center in both horizontal directions.

*Placement of aggregate base to reduce potential of shrinkage cracks on concrete.

7.13.3 The subgrade soils should be compacted to a minimum relative compaction of 95 percent at near the optimum moisture content. The depth of subgrade compaction should be approximately 12 inches.

7.13.4 Class 2 aggregate base should conform to Section 26-1.-02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* and should be compacted to a minimum of 95 percent of the maximum dry density at near optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Green Book)*.

7.13.5 Where trash bin enclosures are planned within asphalt paved areas, we recommend that the pavement sections be equivalent to the heavy-duty truck categories presented in the respective tables. The concrete should extend into the roadway sufficiently so that all wheels of the trash truck are on the concrete when loading.

7.13.6 Rigid Portland cement concrete sections were evaluated using methods suggested by the American Concrete Institute *Guide for Design and Construction of Concrete Parking Lots (ACI330R-08).*

7.13.7 Construction joints should be provided at a maximum spacing of 12 feet each way to control shrinkage. Installation of these types of joints should be made immediately after concrete finishing.

7.13.8 Construction jointing, doweling, and reinforcing should be provided in accordance with recommendations of the American Concrete Institute.

7.13.9 The performance of asphalt concrete pavements and Portland cement concrete pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. If planter islands are proposed, the perimeter curb should extend at least 12 inches below proposed subgrade elevations. In addition, the surface drainage within the planter should be such that ponding will not occur.

7.13.10 Our experience indicates that even with these provisions, a groundwater condition can develop as a result of increased irrigation, landscaping and surface runoff.

7.14 Bio-Retention Basin and Bio-Swale Recommendations

7.14.1 The site is underlain by clayey soil and the Very Old Paralic Deposits that are generally composed of clay and very clayey sand with gravel. Based on our experience with the on-site soils and infiltration testing in nearby projects, the onsite soil have very low permeability and generally very low infiltration characteristics. It is our opinion the existing soil is unsuitable for infiltration of storm water runoff. A separate Storm Water Management report is being prepared by Geocon Incorporated.

7.14.2 Any bio-retention basins, bioswales, and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Water should not be allowed to infiltrate adjacent to the planned improvements. We recommend that retention basins, be properly lined to prevent water infiltration into the underlying soil. Prior to discharging into the storm drain pipe or other approved outlet structure, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drainpipe. The concrete cut-off wall should extend at least 6 inches beyond the perimeter of the gravel-packed subdrain system. Figure 10 presents a typical bioswale detail.

7.14.3 The landscape architect should be consulted to provide the appropriate plant recommendations if a vegetated swale is to be implemented. If drought resistant plants are not used, irrigation may be required.

7.15 Drainage and Maintenance

7.15.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1803.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into storm drains and conduits that carry runoff away from the proposed structure.

7.15.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.15.3 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

7.16 Grading and Foundation Plan Review

7.16.1 Geocon Incorporated should review the grading and foundation plans prior to finalization to verify their compliance with the recommendations of this report and determine the need for additional comments, recommendations, and/or analysis.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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N

NO SCALE

VICINITY MAP

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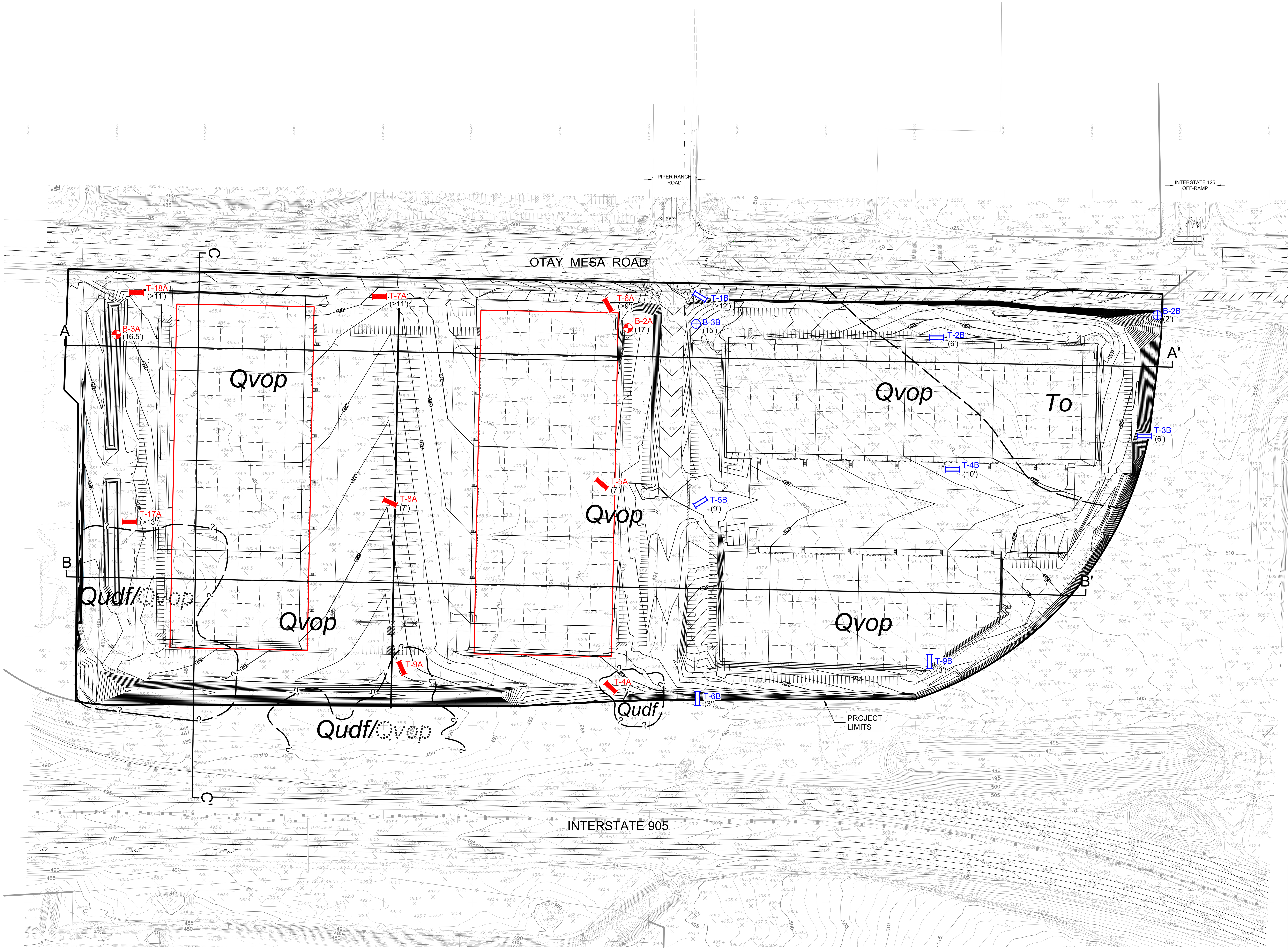
SUNROAD OTAY 50
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 1

Plotted:03/31/2017 12:05PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07740-42-02 Sunroad Otay\DETAILS\07740-42-02_Vicinity Map.dwg



0' 100' 200' 300' 400'

SCALE 1"=100' (On 36x24)

GEOCON LEGEND

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To ....OTAY FORMATION

Qvop ....VERY OLD PARALIC DEPOSITS

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-18A ....APPROX. TRENCH LOCATION FROM PREVIOUS GEOCON STUDY (D-4341-J01)

B-3A ....APPROX. BORING LOCATION FROM PREVIOUS GEOCON STUDY (D-4341-J01)

T-9B ....APPROX. TRENCH LOCATION FROM PREVIOUS GEOCON STUDY (D-4435-J01)

B-33 ....APPROX. BORING LOCATION FROM PREVIOUS GEOCON STUDY (D-4435-J01)

(17') ....ESTIMATED DEPTH TO BOTTOM OF CLAY (In Feet)

C C' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

GEOLOGIC MAP

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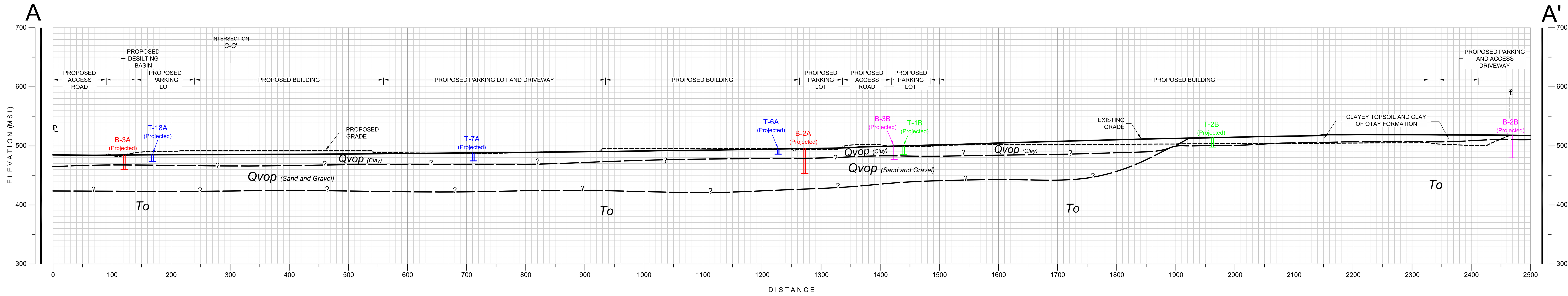
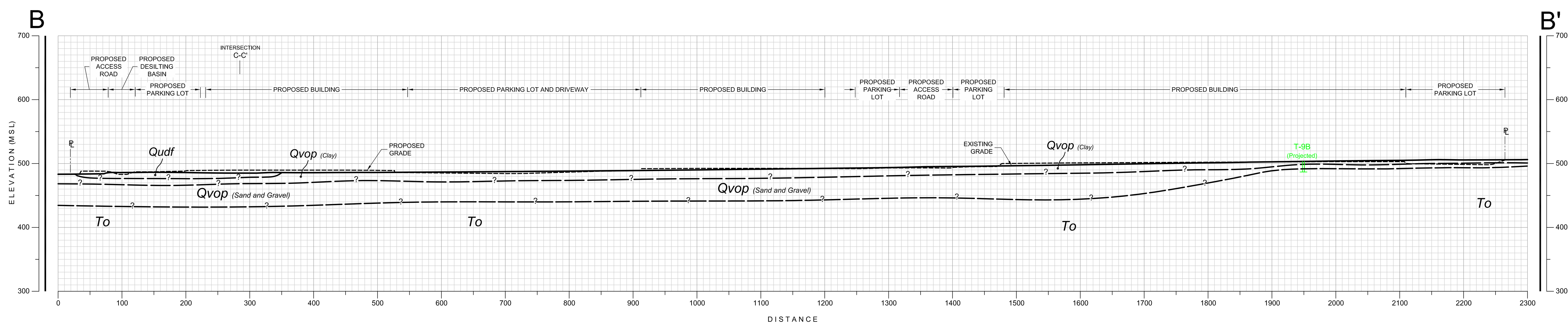
SCALE 1" = 100'	DATE 03 - 31 - 2017		
PROJECT NO. 07740 - 42 - 02		FIGURE 2	
SHEET 1 OF 1			

Plotted:03/31/2017 12:02PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07740-42-02 Sunroad Otay\SHEETS\07740-42-02 GeoMap.dwg



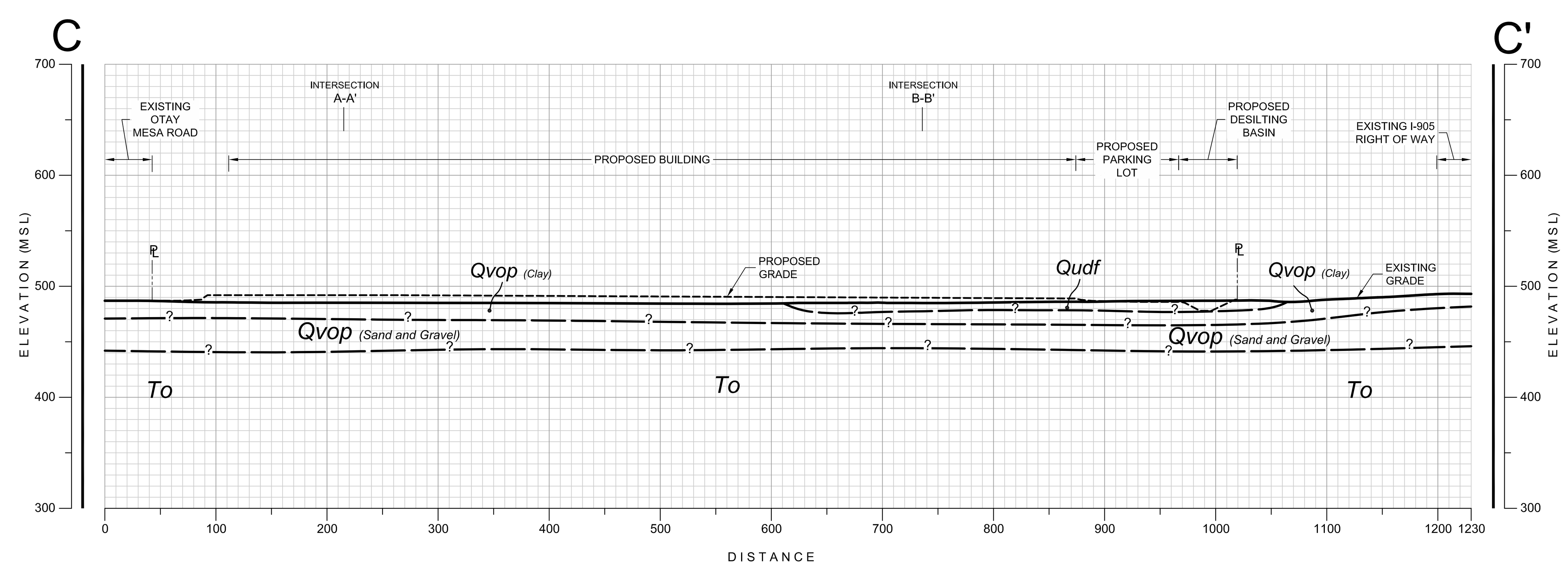
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 100' (Vert. = Horiz.)

GEOCON LEGEND

- Qudf ........UNDOCUMENTED FILL
- To ....OTAY FORMATION
- Qvop ....VERY OLD PARALIC DEPOSITS
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- B-3A ....APPROX. TRENCH LOCATION FROM PREVIOUS GEOCON STUDY (D-4341-J01)
- B-3B ....APPROX. BORING LOCATION FROM PREVIOUS GEOCON STUDY (D-4341-J01)
- T-18A ....APPROX. TRENCH LOCATION FROM PREVIOUS GEOCON STUDY (D-4435-J01)
- T-9B ....APPROX. BORING LOCATION FROM PREVIOUS GEOCON STUDY (D-4435-J01)

GEOLOGIC CROSS SECTION

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SCALE 1" = 100'	DATE 03 - 31 - 2017	
PROJECT NO. 07740 - 42 - 02		FIGURE 3
SHEET 1 OF 1		

Plotted:03/31/2017 12:01PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07740-42-02 Sunroad Otay\SHEETS\07740-42-02 XSection.dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 125.0 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 28 degrees
APPARENT COHESION	C	= 400 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 3.2$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPES

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 30 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 125.0 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 28 degrees
APPARENT COHESION	C	= 400 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi} = \dfrac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
$FS = \dfrac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi} = 2.5$	CALCULATED USING EQ. (3-3)
$N_{cf} = 14$	DETERMINED USING FIGURE 10, REFERENCE 2
$FS = 3.0$	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 5

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 127.4 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 31 degrees
APPARENT COHESION	C	= 250 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 2.2$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - CUT SLOPES

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	15
SLOPE INCLINATION		2 : 1 (Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 127.4 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 31 degrees
APPARENT COHESION	C	= 250 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi}$	$= \dfrac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	$= \dfrac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	= 4.6	CALCULATED USING EQ. (3-3)
Ncf	= 20	DETERMINED USING FIGURE 10, REFERENCE 2
FS	= 2.6	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - CUT SLOPES

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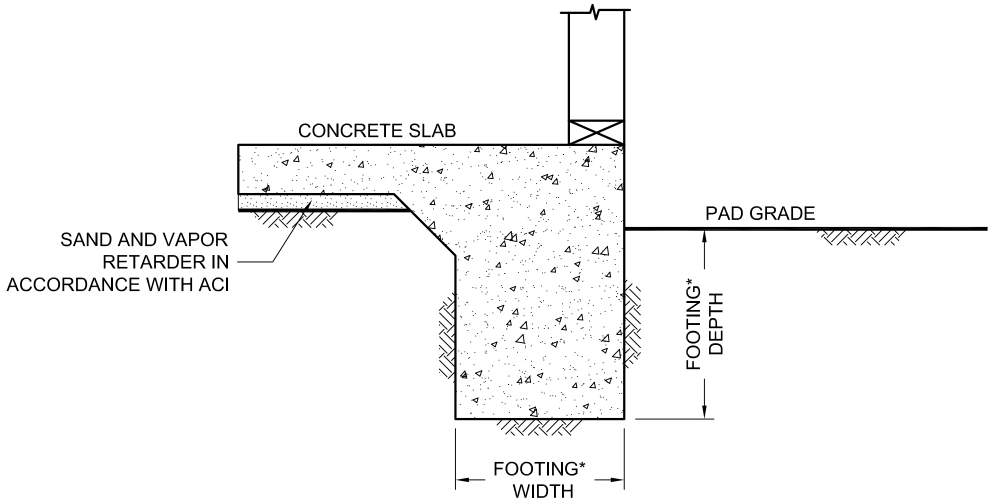
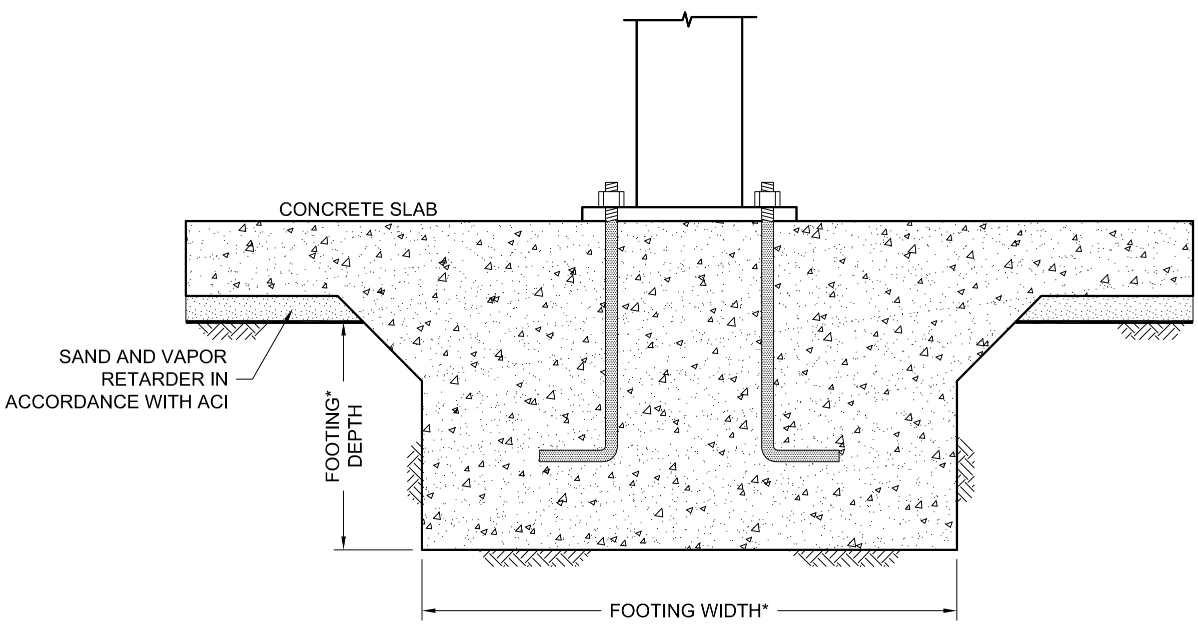
SUNROAD OTAY 50
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 7





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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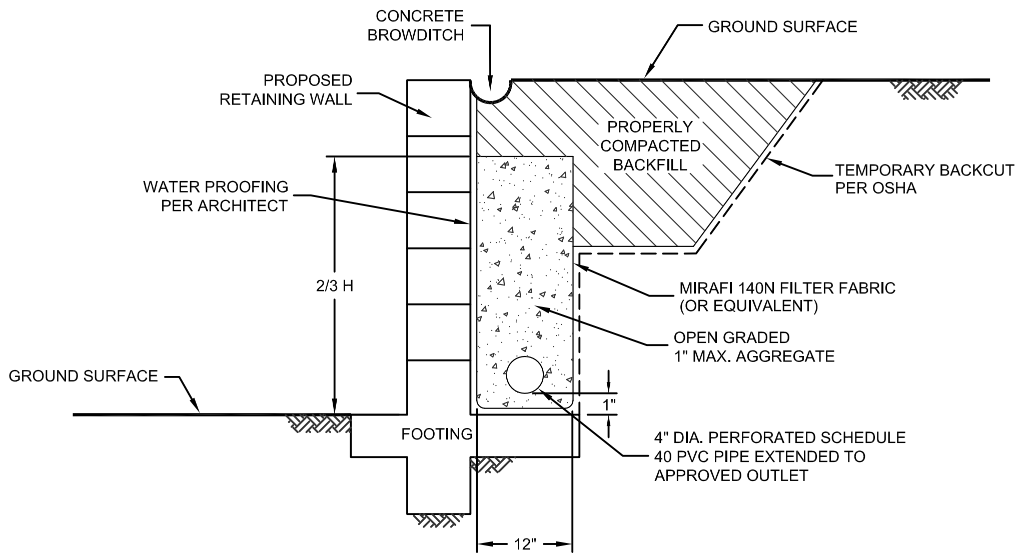
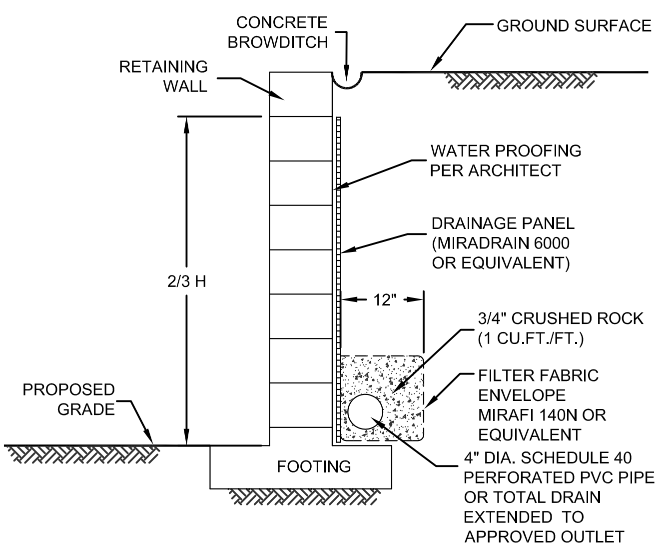
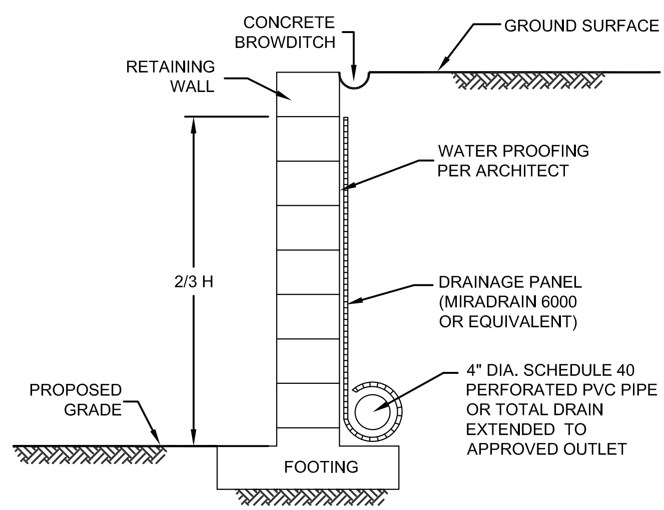
RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 8







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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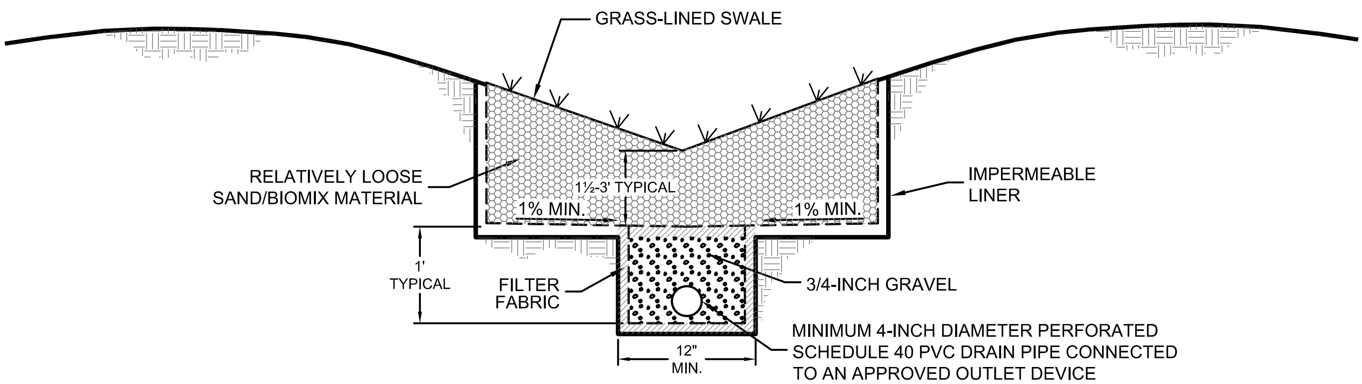
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 9



NO SCALE

TYPICAL BIORETENTION BASIN DETAIL

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SAN DIEGO, CALIFORNIA

RRG / CW		DSK/GTYPD	DATE 03 - 31 - 2017	PROJECT NO. 07740 - 42 - 02	FIG. 10

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed between April and September, 1989 and consisted of a site reconnaissance by an engineering geologist and the excavation of 4 large diameter borings and 15 backhoe trenches. Borings extended to depths ranging from 21 to 43 feet below the existing ground surface. The large-diameter borings were drilled using an E-100 drill rig equipped with a 30-inch-diameter bucket. Trenches were excavated to depths varying from 5.5 feet to 17 feet below the existing ground surface using a John Deere 510 rubber tire backhoe equipped with a 24-inch-wide bucket. Relatively undisturbed drive samples and disturbed bulk samples were obtained at selected locations within the exploratory excavations.

The soils encountered in the exploratory borings and trenches were visually examined, classified, and logged. Logs of the large diameter borings and trenches are presented on Figures A-1 through A-18. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The approximate location of the exploratory excavations is depicted on the Geologic Map, Figure 2 (map pocket).

File No. D-4341-J01
April 26, 1989

BORING B-2A

ELEVATION 500 MSL DATE DRILLED 3/27/89

EQUIPMENT E-100

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0–2				CL	TOPSOIL Soft, moist, dark brown, fine to medium Sandy CLAY			
2				CL	TERRACE DEPOSITS Firm, moist, orange-brown, fine Sandy CLAY			
6	B2-1					1	92.7	26.3
9					alternating layers of reddish-brown, Clayey fine SANDSTONE, micaceous			
11	B2-2					2	101.3	22.5
16	B2-3					2		
17	B2-4						BULK	SAMPL
17–20				SM	Dense, moist, orange-brown, Silty fine SANDSTONE			
20–21.5				GM	Dense, moist, orange, Silty, fine to coarse Sandy GRAVEL			
21.5–28	B2-5			SC	Dense, moist, dark orange, Clayey, fine to coarse SANDSTONE, some gravel	4	116.6	15.5
28–30				GM	Dense, moist, light gray, Silty, fine to very coarse Sandy GRAVEL			

Figure A-1 Log Test Boring B-2

Continued next pag

SAMPLE SYMBOLS

- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	BORING B-2A CONTINUED ELEVATION ______ DATE DRILLED ______ EQUIPMENT ______ MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
30	B2-6			SM	Dense, moist, dark gray, Silty, very fine SAND, micaceous, scattered pockets of dark orange CLAYSTONE, non-continuous	5		
34					well cemented SANDSTONE, 10"-12" thick			
					strong seepage			
36				ML	Hard, moist, grayish-brown, Clayey SILTSTONE, thinly laminated			
38				SM	Dense, moist, dark gray, Silty, very fine SAND, micaceous standing water			
40	B2-7					7	116.7	14.0
42					BORING TERMINATED AT 41.0 FEET			

Figure A-1 Log of Test Boring B-2 Continued

SAMPLE SYMBOLS
- SAMPLING UNSUCCESSFUL
- DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

BORING B-3A

ELEVATION 487 MSL DATE DRILLED 3/27/89

EQUIPMENT E-100

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0–2				CL	TOPSOIL Soft, moist, dark brown, fine to medium, Sandy CLAY			
2–8				CL	TERRACE DEPOSITS Soft, wet, dark reddish-brown, fine Sandy CLAY			
~5	B3-1					push		
8–16.5				CL	Hard, moist, dark orange, fine Sandy CLAYSTONE			
~10	B3-2					3	82.3	32.1
~15	B3-3					4		
16.5–23				GC	Dense, moist, dark reddish-orange, Clayey fine Sandy GRAVEL and cobbles to 18"			
23					BORING TERMINATED AT 23.0 FEET (REFUSAL)			

Figure A-2 Log of Test Boring B-3

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

File No. D-4341-J01
April 26, 1989

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	TRENCH T-4A ELEVATION 496 MSL DATE DRILLED 3/17/89 EQUIPMENT JD 555	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					MATERIAL DESCRIPTION			
0–6				SM	FILL Loose, damp, brown, Silty, fine to medium SAND			
6–11				SM	TERRACE DEPOSITS Dense, moist, orange-yellow, Silty, fine to very coarse SAND, some gravel			
11–13					Very dense, moist, white to light gray, Silty fine to very coarse Sandy GRAVEL to and Cobbles 16"			
					TRENCH TERMINATED AT 13.0 FEET			

Figure A-3 Log of Test Trench T-4

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- ◧ — STANDARD PENETRATION TEST
- ◩ — CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- ⊻ — WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

TRENCH T 5A
ELEVATION 496 MSL DATE DRILLED 3/17/89
EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0–3	T5-1			CL	TOPSOIL Soft, dry, dark brown, fine Sandy CLAY		113.5	11.4
3–7	T5-2			CL	TERRACE DEPOSITS Stiff, moist, light orange, fine Sandy CLAY		116.3	12.9
7–13	T5-3			SM	Dense, moist, dark gray, Silty, very fine SAND		105.3	15.3
13					TRENCH TERMINATED AT 13.0 FEET			
					TRENCH T-6A Elevation 498 MSL			
0–3	T6-1			CL	TOPSOIL Soft, dry, dark brown, fine Sandy CLAY		106.6	13.3
3–7	T6-2			SC	TERRACE DEPOSITS Dense, moist, orange-brown, Clayey fine SAND with layers of coarse sand		99.7	13.1
7–9	T6-3			CL	Stiff, moist, orange, fine Sandy CLAY		101.6	21.4
9					TRENCH TERMINATED AT 9.0 FEET			

Figure A-4 Log of Test Trenches T-5 and T-6

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

TRENCH T-7A

ELEVATION 490 MSL DATE DRILLED 3/17/89

EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0								
2	T7-1			CL	TOPSOIL Soft, dry, dark brown, fine to coarse, Sandy CLAY		115.5	8.8
4	T7-2			CL	TERRACE DEPOSITS Firm, moist, dark gray-brown, fine Sandy CLAY		98.8	15.4
6								
8								
10	T7-3			CL	Stiff, moist, dark orange, fine Sandy CLAY		100.3	20.5
12					TRENCH TERMINATED AT 11.0 FEET			

Figure A-5 , Log of Test Trench T-7

SAMPLE SYMBOLS

- SAMPLING UNSUCCESSFUL
- DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

TRENCH T-8A

ELEVATION 490 MSL DATE DRILLED 3/17/89

EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0								
	T8-1			CL	TOPSOIL Soft, dry, dark brown, fine to medium, Sandy CLAY		BULK	SAMPLE
2								
4	T8-2			CL-SC	TERRACE DEPOSITS Stiff, moist, dark orange-brown, fine to medium, Sandy CLAY to Clayey fine SAND		101.6	21.3
6								
8					Dense, moist, light orange, Silty fine SAND, some clay			
10	T8-3			SM			99.8	15.5
12					grades into light yellowish-gray, Silty fine SANDSTONE			
14					scattered GRAVEL			
16					TRENCH TERMINATED AT 15.5 FEET			

Figure A-6 Log of Test Trench T-8

SAMPLE SYMBOLS

- SAMPLING UNSUCCESSFUL
- STANDARD PENETRATION TEST
- DRIVE SAMPLE (UNDISTURBED)
- DISTURBED OR BAG SAMPLE
- CHUNK SAMPLE
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

TRENCH T-9A

ELEVATION 493 MSL DATE DRILLED 3/17/89

EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0 – 5				SM	FILL Loose, damp, white to light gray, Gravelly, fine to coarse SAND			
5 – 9				SC	TERRACE DEPOSITS Dense, moist, light brown-orange, Clayey fine to very coarse SAND, some gravel			
9 – 11				SM	Dense, moist, white, Silty, fine to medium SANDSTONE			
					TRENCH TERMINATED AT 11.0 FEET			

TRENCH T-10A Elevation 495 MSL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0 – 5				SC	FILL Loose, moist, dark brown, Clayey, fine to medium SAND, some gravel, abundant glass, plastic, wood, etc.			
5 – 7				~~SC~~	TERRACE DEPOSITS Dense, moist, light orange, slightly Clayey, Gravelly, fine to coarse SAND – GRAVEL and Cobbles to 8"			
					TRENCH TERMINATED AT 7.0 FEET			

Figure A-7 Log of Test Trenches T-9 and T-10

SAMPLE SYMBOLS

- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4341-J01
April 26, 1989

TRENCH T-17A
ELEVATION 487 MSL DATE DRILLED 3/20/89
EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0					TOPSOIL			
2	T17-1			CL	Soft, damp, dark brown, fine to medium Sandy CLAY		107.0	8.6
4				CL	TERRACE DEPOSITS Stiff, moist, dark reddish-brown, fine to medium Sandy CLAY			
6	T17-2						99.4	8.0
8				CL	Firm, wet, dark gray, fine Sandy CLAY			
10	T17-3						104.8	20.2
12								
14					TRENCH TERMINATED AT 13.0 FEET			

TRENCH T-18A Elevation 487 MSL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0					TOPSOIL			
2				CL	Soft, dry, dark brown, fine to medium, Sandy CLAY			
4				CL	TERRACE DEPOSITS Stiff, wet, reddish-brown, fine Sandy CLAY			
6								
8					Hard, moist, dark orange, fine to medium Sandy CLAYSTONE			
10								
12					TRENCH TERMINATED AT 11.0 FEET			

Figure A-8 , Log of Test Trenches T-17 and T-18

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

BORING B 2B

ELEVATION 520 DATE COMPLETED 9/12/89

EQUIPMENT EARTH 120 BUCKET RIG

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Loose, dry, dark brown, Clayey medium SAND			
2				SM	**OTAY FORMATION** Medium dense, moist, light gray, Silty fine SANDSTONE, micaceous, massive			
5	B2-1					2	98.3	17.9
7				CL/ML	Firm, moist, light pink-gray, Silty CLAY to Clayey SILT			
8	B2-2							
9					becomes hard, thinly laminated claystone/ siltstone, block fractured at 9 feet			
10	B2-3					3	100.5	23.2
15	B2-4					4		
16					light seepage at 16 feet			
19					becomes very hard, light orange, claystone, massive, block fractured at 19 feet			
20	B2-5					6	102.1	23.8
22	B2-6							
23.5					heavy seepage at 23.5 feet (perched)			
26				SM	Dense, moist, gray Silty fine SANDSTONE massive, micaceous with alternating layers of thinly laminated light yellow SILTSTONE			

Figure A-9 **Log of Test Boring B 2, page 1 of 2**

SDMC

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

BORING B 2B

ELEVATION 520 DATE COMPLETED 9/12/89

EQUIPMENT EARTH 120 BUCKET RIG

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-7					8		
31–38				CL	Hard, moist, light pink-gray, Silty CLAYSTONE, massive blocky fractured			
					layer of dense, light gray, fine sandstone, 16 inches thick at 33 feet			
35	B2-8					4	68.9	54.9
36			▼		Perched water			
38					BORING TERMINATED AT 38 FEET (REFUSAL)			

Figure A- 9 Log of Test Boring B 2, page 2 of 2

SDMC

SAMPLE SYMBOLS
- □ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

BORING B 3B

ELEVATION 500 DATE COMPLETED 9/12/89

EQUIPMENT EARTH 120 BUCKET RIG

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3.5		CL	**TOPSOIL** Soft, dry, dark brown, fine to Sandy <u>CLAY</u>			
3.5–9	B3-1, B3-2	CL	**TERRACE DEPOSITS** Firm, moist, light orange, fine to medium Sandy <u>CLAY</u>	2	110.2	15.6
9–11.5	B3-3	CL	Hard, moist, dark orange, Silty <u>CLAYSTONE</u>, blocky fractured	2	95.2	23.6
11.5–15	B3-4	SC/CL	Dense, to stiff, moist, orange, Clayey fine <u>SAND</u> to fine Sandy <u>CLAY</u>			
15–19.5	B3-5, B3-5	SM	Dense, moist, light orange, Silty fine to medium <u>SANDSTONE</u>, massive	7	119.3	13.0
19.5–21		GM	Dense, moist, orange, Silty fine to coarse Sandy <u>GRAVEL</u> with boulders up to 18 inches in dimension			

BORING TERMINATED AT 21 FEET (REFUSAL)

Figure A-10 Log of Test Boring B 3, page 1 of 1

SDMC

SAMPLE SYMBOLS □ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED) ⊠ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 1B

ELEVATION 502 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3	T1-1			CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY			
3–5	T1-2			CL	**TERRACE DEPOSITS** Stiff, moist, orange, fine Sandy CLAY		104.0	17.2
5–9	T1-3			SC	Dense, moist, light orange-yellow, Clayey fine to medium SAND		92.0	16.8
9–12	T1-4			CL	Hard, moist, dark orange, Silty CLAYSTONE, blocky fractured, massive		93.4	27.4
12					TRENCH TERMINATED AT 12 FEET			

Figure A-11 Log of Test Trench T 1

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 2B

ELEVATION 516 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3				CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY			
3–6	T2-1			CL	**OTAY FORMATION** Firm, moist, grayish-brown, Silty CLAY areas of thin laminations, some calcium carbonate		98.8	14.9
6–14.5	T2-2			SM	Dense, moist, gray, Silty fine SANDSTONE, micaceous thinly laminated, areas of light gray SILTSTONE		103.9	16.5
	T2-3						95.6	28.0

TRENCH TERMINATED AT 14.5 FEET

Figure A-12 Log of Test Trench T 2

SDMC

SAMPLE SYMBOLS ... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED) ... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 3B

ELEVATION 514 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY			
2				CL	**OTAY FORMATION** Firm, dense, orange-brown, fine Sandy CLAY, abundant calcium carbonates, very fractured			
4	T3-1			SC/CL			102.9	16.5
6				GC	Dense to hard, moist, orange, Clayey fine SANDSTONE to fine Sandy CLAYSTONE			
8					Dense, moist, orange, Clayey medium to coarse SAND with cobbles to 18 inches			
					TRENCH TERMINATED AT 9 FEET			

Figure A-13, Log of Test Trench T 3

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 4B

ELEVATION 509 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3	T4-1			CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY		96.3	19.0
3–7				SM	**TERRACE DEPOSITS** Dense, moist, light orange, Silty fine SANDSTONE, massive, some layers of CLAYSTONE some gravel to 6 inches at 6 feet			
7–10	T4-2			CL	Hard, moist, dark orange, Silty CLAYSTONE, blocky fractured		101.0	20.2
10–13				SP	Dense, moist, orange, Clayey fine to medium Gravelly SAND with cobbles to 14 inches			

TRENCH TERMINATED AT 13 FEET (REFUSAL)

Figure A-14 Log of Test Trench T 4

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 5B

ELEVATION 496 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	T5-1			CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY		104.3	17.2
4 – 8	T5-2			CL	**TERRACE DEPOSITS** Stiff, moist, orange-brown, medium sandy CLAYSTONE, alternating layers of fine SANDSTONE		101.7	17.7
10				SP-SC	Dense, moist, orange, Clayey fine SAND with gravels			

TRENCH TERMINATED AT 11 FEET (REFUSAL)

Figure A-15 Log of Test Trench T 5

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 6B

ELEVATION 490 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Soft, dry, brown, fine Sandy CLAY			
2								
				GM	**TERRACE DEPOSITS** Dense, moist, orange, fine to medium Sandy GRAVEL			
4				SC				
6					Dense, moist, orange, Clayey fine to medium SANDSTONE			
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-16 Log of Test Trench T 6

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. D-4435-J01

TRENCH T 9B

ELEVATION 500 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3				CL	**TOPSOIL** Soft, moist, dark brown, fine Sandy <u>CLAY</u>			
					gravel layer at 3 feet			
3–9				SC	**TERRACE DEPOSITS** Dense,moist, light orange-brown, Clayey fine to medium <u>SAND</u>			
9–14	T9-1			SM	**OTAY FORMATION** Dense, moist, dark gray, Silty fine <u>SANDSTONE</u> with layers of brown, Silty <u>CLAYSTONE</u>, thinly laminated		93.6	28.2
14–17	T9-2			ML	Hard, moist, dark gray, Clayey <u>SILTSTONE</u>, blocky fractured, thinly laminated, alternating layers of light brown, <u>CLAYSTONE</u>		94.0	28.0
					TRENCH TERMINATED AT 17 FEET			

Figure A-17, Log of Test Trench T 9

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4435-J01

TRENCH T 10B

ELEVATION 506 DATE COMPLETED 9/14/89

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3	T10-1			CL	**TOPSOIL** Soft, dry, dark brown, fine Sandy CLAY; gravel at contact at 3 feet		93.3	23.7
3–10	T10-2			CL	**OTAY FORMATION** Stiff, moist, orange-brown, Silty CLAYSTONE		83.3	35.6
10–13	T10-3			ML	Hard, moist, dark gray-green, fine Sandy SILTSTONE, thinly laminated, pockets of white Silty CLAYSTONE		95.5	27.8

TRENCH TERMINATED AT 13 FEET

Figure A-18 Log of Test Trench T 10

SDMC

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their maximum dry density and optimum moisture content, expansion index, and shear strength characteristics. Selected soils samples were also tested to evaluate plasticity, water-soluble sulfate contents, pH and minimum resistivity characteristics.

The results of our laboratory tests are presented as follows on Tables B-I through B-VI. The in-place dry density and moisture content results are indicated on the exploratory boring and trench logs.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T8A-1	Gray brown, fine to medium, Clayey SAND	123.8	11.1
B2B-2	Light pink-gray, Silty CLAY	105.0	19.1
T1B-1	Dark brown, Silty, Sandy CLAY	120.7	13.1

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T8A-1*	111.4	11.2	310	20
B2B-1	98.3	17.9	440	29
B3B-2	95.2	23.6	760	39
T1B-1*	109.1	12.5	690	10

*Soil sample remolded to 90 percent of the maximum dry density at near optimum moisture content.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Classification	Soil Type
	Before Test	After Tests				
T8A-1	10.4	25.5	107.7	93	High	Topsoil
B2B-2	13.1	37.7	98.3	127	High	Otay Formation
B3B-1	12.3	29.6	107.5	102	High	Very Old Paralic Deposits
T1B-1	11.1	29.2	105.1	93	High	Topsoil

TABLE B-IV
SUMMARY OF LABORATORY PLASTICITY INDEX TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	USCS Classification
T8A-1	45	14	31	CL

TABLE B-V
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST METHOD NO. 417

Sample No.	Water Soluble Sulfate (%)
T8A-1	0.02
B2B-2	0.03
T1B-1	0.01

TABLE B-VI
SUMMARY OF LABORATORY (PH) AND MINIMUM RESISTIVITY TEST RESULTS
(CALIFORNIA TEST METHOD NO. 643)

Sample No.	pH	Resistivity (ohm-centimeters)
T8A-1	7.9	440

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

SUNROAD OTAY 50
OTAY MESA ROAD
SAN DIEGO, CALIFORNIA

PROJECT NO. 07740-22-02

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

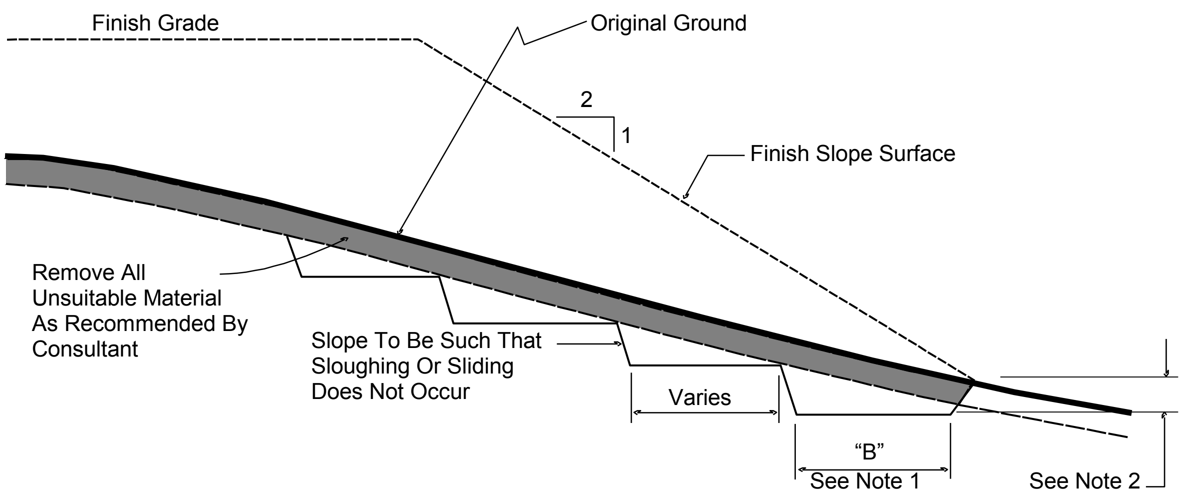
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

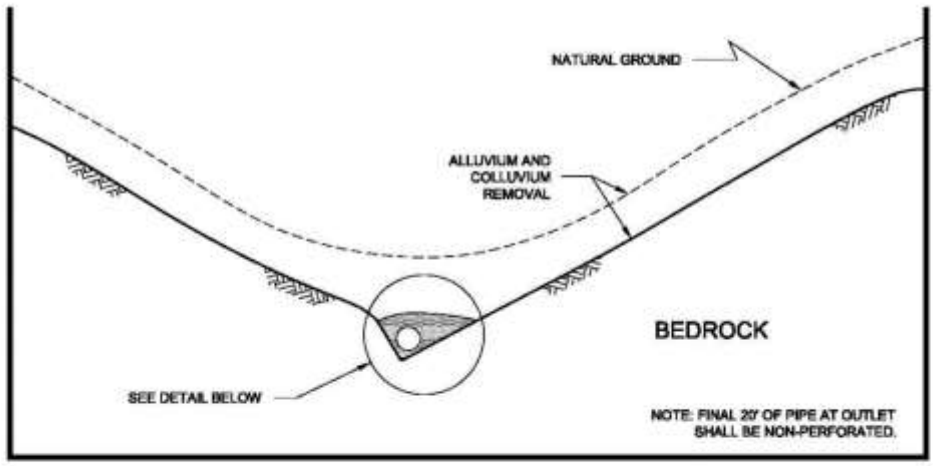
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

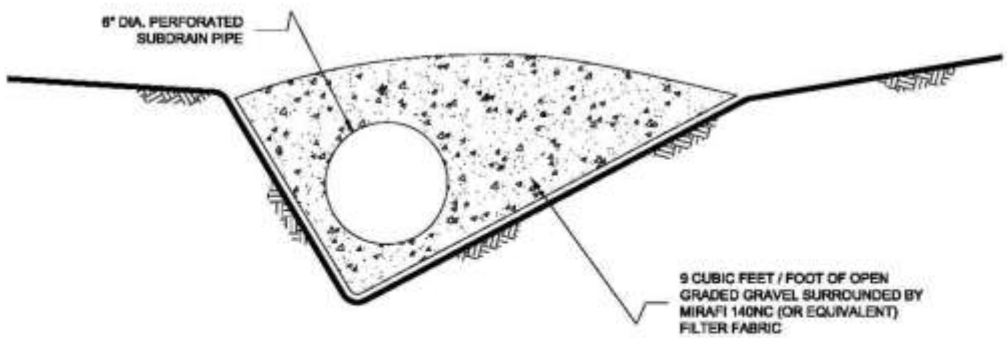
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

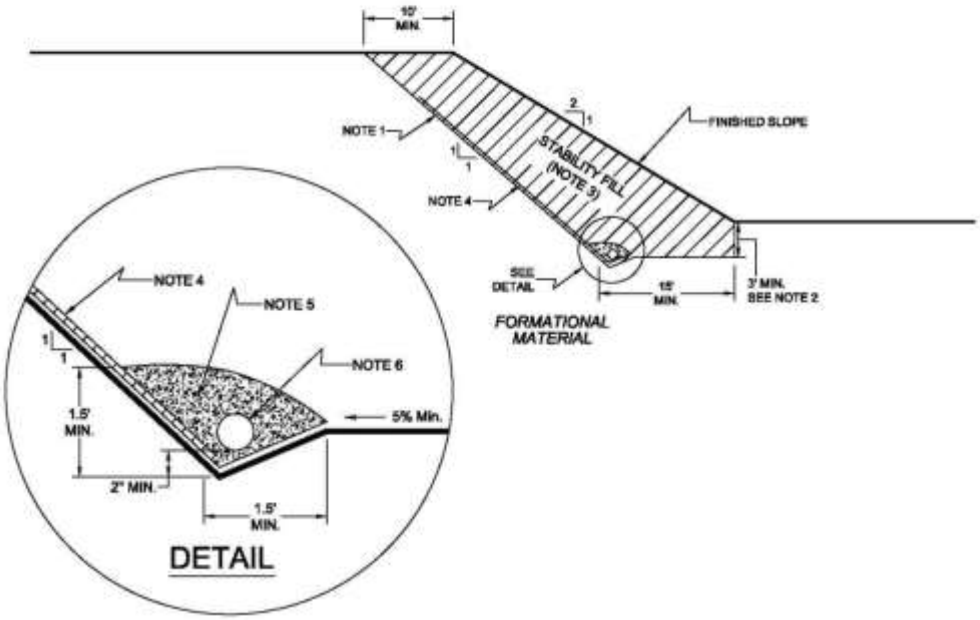
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

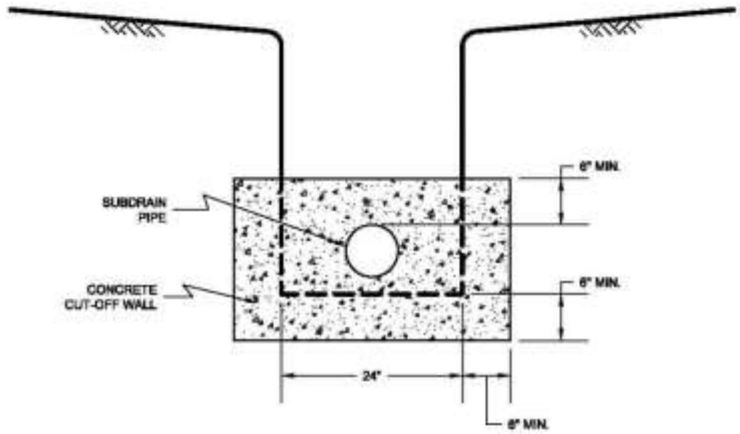
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

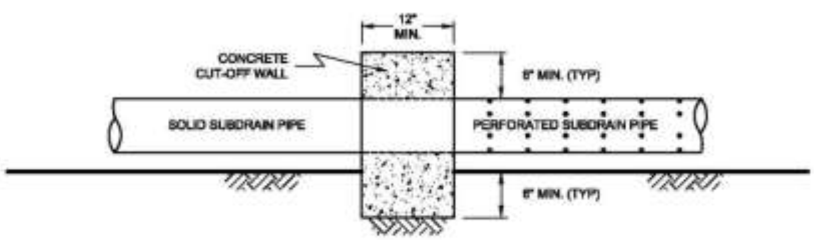
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

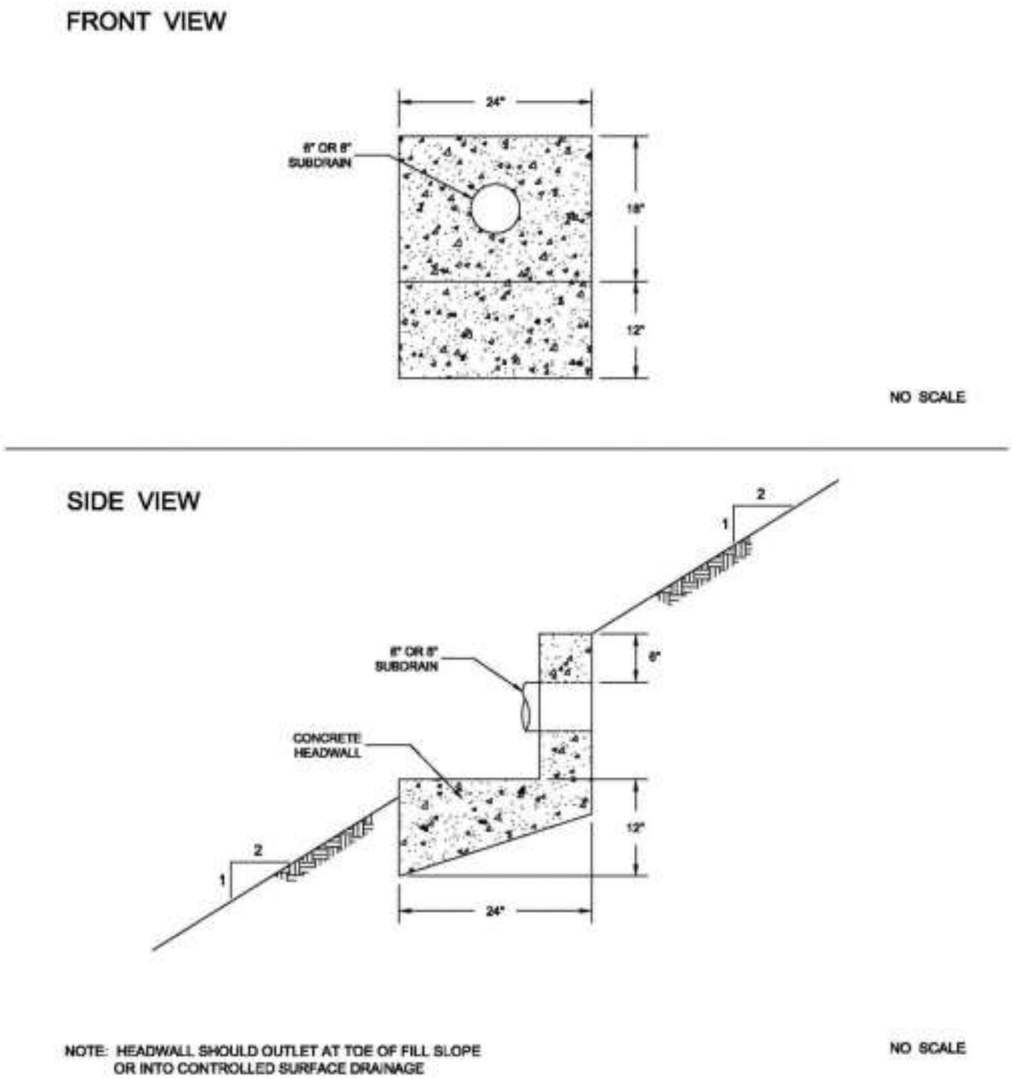
SIDE VIEW



NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

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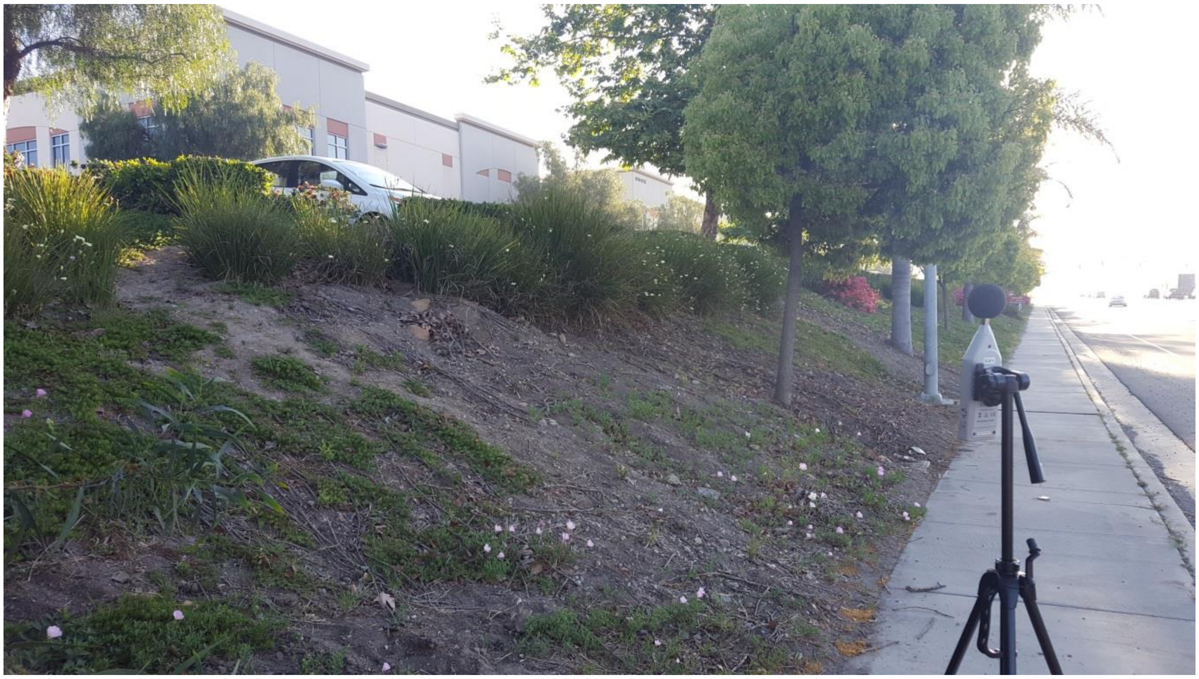

Noise Study

Sunroad Otay Plaza Project
Otay Mesa, San Diego, California

prepared for
KLR Planning
926 Camino De La Reina
San Diego, California 92108-2353

prepared by
Rincon Consultants
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May 2017

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Project Description

Introduction

This report is an analysis of the potential noise impacts of a proposed light industrial development north of State Route 905 (SR-905, Otay Mesa Freeway), south of Otay Mesa Road, east of La Media Road, and west of State Route 125 (SR-125, South Bay Expressway) in Otay Mesa, California. The report has been prepared by Rincon Consultants, Inc. under contract to and for use by Sunroad Enterprises. The purpose of this report is to analyze the proposed project's potential temporary noise impacts associated with construction activity and potential long-term noise impacts associated with project operation.

Project Summary

The approximately 48-acre project site is located north of SR-905, south of Otay Mesa Road, east of the La Media Road, and west of SR-125 in Otay Mesa, California. The site consists of 11 parcels: Assessor's Parcel Numbers (APN) 646-290-17, 646-290-18, 646-290-19, 646-290-04, 646-290-08, 646-290-24, 646-290-25, 646-290-26, 646-290-27, 646-121-31 and 646-121-29. The site is currently vacant.

The project involves a Vesting Tentative Map to consolidate the existing 11 parcels and then split the property into four lots. Lot 1 would be 11.97 acres and would include a 216,320-square-foot building; Lot 2 would be 9.09 acres and would include a 153,500-square-foot building; Lot 3 would be 11.90 acres and would include a 240,560-square-foot building; and Lot 4 would be 15.10 acres and would include a 234,670-square-foot building. The total building space would be 845,050 square feet for light industrial warehouse and office use, and landscaped area would total 465,538 square feet. The project would include 143 trailer parking spaces and 909 car parking spaces, of which 76 would be designated for clean air, vanpool, and EV parking. Forty-five bicycle parking spaces would also be provided in lockers. The project includes bioretention areas in the central and western portions of the site, with a detention basin proposed for the southwest portion of the site. Primary access to the project would occur via two driveways from Otay Mesa Road on the north side of the project site. Figure 1 shows the project site location and Figure 2 shows the proposed site plan.

Proposed development would require grading of the entire site. Earthwork would be balanced on-site, with a total of 395,000 cubic yard of cut and fill. The maximum height of fill slopes would be eight feet; the maximum height of cut slopes would be 11 feet. The project includes 890 linear feet of retaining/crib walls, ranging in heights of less than two feet to a maximum height of 17 feet. Construction is expected to begin in November 2017 with project opening scheduled for 2021.

Surrounding land uses include light industrial buildings on the north and west, vacant land and State Route 125 on the east and State Route 905 on the south.

Figure 1. Project Site Location

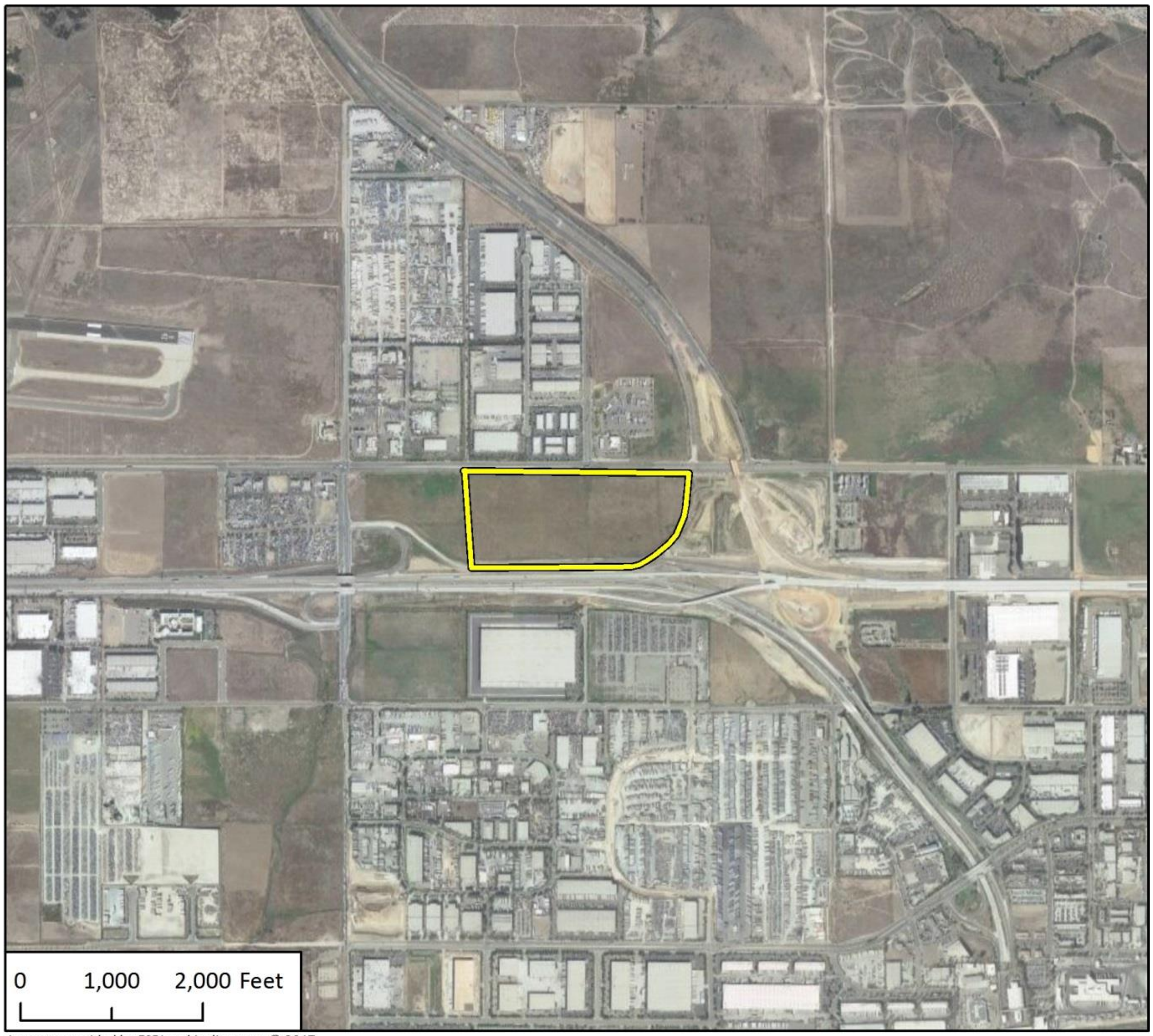

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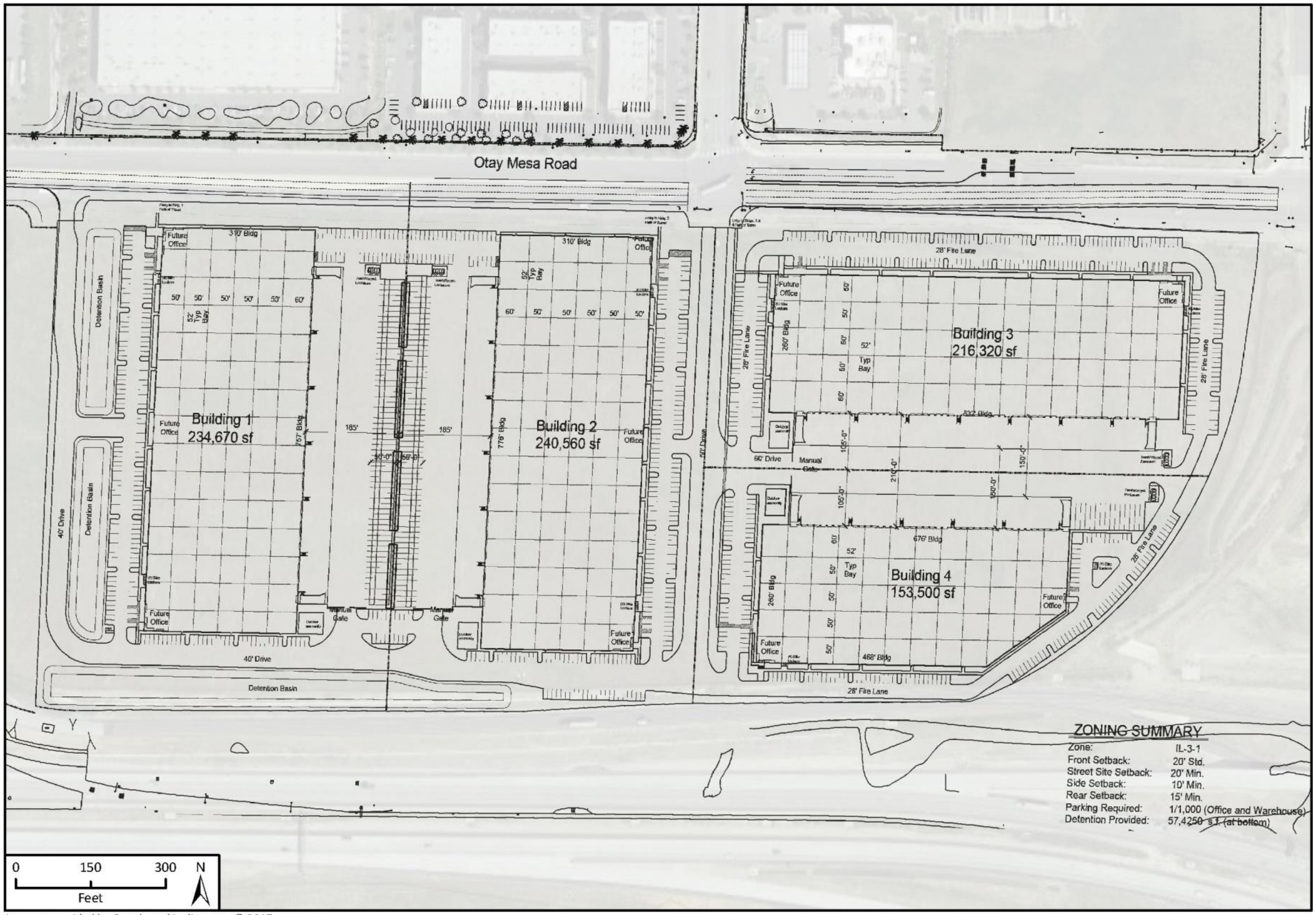
Fig Project Location

Figure 2. Site Plan



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Additional data provided by Commerce Construction Co., Lp, 2017.

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Noise

Overview of Sound Measurement

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Sound pressure level is measured on a logarithmic scale with the 0 dBA level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dBA, and a sound that is 10 dBA less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dBA greater than the ambient noise level to be judged as twice as loud. In general, a 3 dBA change in the ambient noise level is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while areas adjacent to arterial streets are in the 50-60+ dBA range. Normal conversational levels are in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations.

Noise levels typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from point sources (such as industrial machinery). Noise from lightly traveled roads typically attenuates at a rate of about 4.5 dBA per doubling of distance. Noise from heavily traveled roads typically attenuates at about 3 dBA per doubling of distance. Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA (Federal Transit Administration [FTA] 2006). The manner in which homes in California are constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows (FTA 2006).

In addition to the instantaneous measurement of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). Typically, Leq is summed over a one-hour period. Lmax is the highest RMS (root mean squared) sound pressure level within the measuring period, and Lmin is the lowest RMS sound pressure level within the measuring period.

The time period in which noise occurs is also important since noise that occurs at night tends to be more disturbing than that which occurs during the day. Community noise is usually measured using Day-Night Average Level (DNL), which is the 24-hour average noise level with a 10-dBA penalty for noise occurring during nighttime (10 PM to 7 AM) hours, or Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a 5 dBA penalty for noise occurring from 7 PM to 10 PM and a 10 dBA penalty for noise occurring from 10 PM to 7 AM Noise levels described by DNL and CNEL usually do not differ by more than 1 dBA. In practice, CNEL and DNL are used interchangeably.

The relationship between peak hourly Leq values and associated Ldn or CNEL values depends on the distribution of traffic over the entire day. There is no precise way to convert a peak hourly Leq to Ldn or

CNEL. However, in urban areas near heavy traffic, the peak hourly Leq is typically 2-4 dBA lower than the daily Ldn/CNEL (California SWRCB 1999).

Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with each land use type. The City of San Diego General Plan Noise Element describes noise-sensitive land uses as residential uses, hospitals, nursing facilities, intermediate care facilities, child care and educational facilities, libraries, museums, places of worship, and certain types of passive recreational parks and open space (City of San Diego 2008). These uses are considered sensitive because the presence of excessive noise may interrupt normal activities typically associated with their uses. Noise-sensitive receptors nearest to the project site are approximately three miles west. There are no sensitive receptors in the immediate vicinity of the project site.

Regulatory Setting

City of San Diego General Plan Noise Element

Table NE-2 of the *Noise Element* summarizes the related regulations and plans used to implement the *Noise Element* (City of San Diego 2008). Table 1 shows the regulation and description, including the noise levels found acceptable for specific land uses, such as indoor noise levels for multi-unit residential structures and outdoor noise levels for residential units near an airport.

Table 1 Related Regulations and Plans Used to Implement the City of San Diego Noise Element

Regulation	Description
California Environmental Quality Act (CEQA)	CEQA considers exposure to excessive noise an environmental impact. Implementation of CEQA ensures that during the decision-making stage of development, City officials and the public will be informed of any potentially excessive noise levels and available mitigation measures to reduce them to acceptable levels.
The City of San Diego Noise Abatement and Control Ordinance (Municipal Code Section 59.5.0101 et seq.)	Provides controls for excessive and annoying noise from sources such as refuse vehicles, parking lot sweepers, Warcraft, animals, leaf blowers, alarms, loud music, and construction activities.

Source: Table NE-2 of the City of San Diego General Plan Noise Element (2008)

Sections B through H of the Noise Element provide goals and policies specific to certain land uses and activities, such as motor vehicle traffic noise, trolley and train noise, aircraft noise, commercial and mixed-use activity noise, industrial activity noise, construction, refuse vehicles, parking lot sweepers, and public activity noise, as well as event noise. The goals and policies of the Noise Element that are applicable to the proposed project are summarized below (City of San Diego 2008):

> ***Goal A.*** *Consider existing and future noise levels when making land use planning decisions to minimize people's exposure to excessive noise.*
>
> > ***NE-A.2.*** *Assure the appropriateness of proposed developments relative to existing and future noise levels by consulting the guidelines for noise-compatible land use (shown on Table NE-3) to minimize the effects on noise-sensitive land uses.*
>
> ***Goal F.*** *Minimal exposure of residential and other noise-sensitive land uses to excessive industrial-related noise.*

NE-F.1. *Provide for sufficient spatial separation between industrial uses and residential and other noise-sensitive uses. This would include utilizing other feasible mitigation measures to reduce the noise source, such as noise attenuation methods, interrupting the noise path, or insulating the receptor to minimize the exposure of noise-sensitive uses to excessive industrial-related noise*

Goal G. *Minimal exposure of residential and other noise-sensitive land uses to excessive construction, refuse vehicles, parking lot sweeper-related noise and public noise.*

NE-G.1. *Implement limits on the hours of operation for non-emergency construction and refuse vehicle and parking lot sweeper activity in residential areas and areas abutting residential areas.*

City of San Diego Municipal Code

The City of San Diego has issued sound level limits for the land uses described previously in Table 1. Table 2 summarizes these limits.

Table 2 Table of Applicable Sound Level Limits

Land Use	Time of Day	One-Hour Average Sound Level (dBA Leq)
Single-Family Residential	7:00 AM to 7:00 PM	50
	7:00 PM to 10:00 PM	45
	10:00 PM to 7:00 AM	40
Multi-Family Residential (Up to a maximum density of 1/2000)	7:00 AM to 7:00 PM	55
	7:00 PM to 10:00 PM	50
	10:00 PM to 7:00 AM	45
All other Residential	7:00 AM to 7:00 PM	60
	7:00 PM to 10:00 PM	55
	10:00 PM to 7:00 AM	50
Commercial	7:00 AM to 7:00 PM	65
	7:00 PM to 10:00 PM	60
	10:00 PM to 7:00 AM	
Industrial or Agricultural	Any time	75

Source: Section 59.5.0401 of the City of San Diego Municipal Code NDa

Policy NE-G.1 of the Noise Element advises implementation of limits on the hours of non-emergency construction (City of San Diego 2008). The City of San Diego Municipal Code, Chapter 5 Public Safety, Morals and Welfare, Article 9.5 Noise Abatement and Control, Section 59.5.0404 Construction Noise, limits the hours of construction to the hours between 7:00 AM and 7:00 PM, Monday through Saturday. No construction is permitted on Sunday or legal holidays. Construction may be permitted if a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator (City of San Diego NDa). Lastly, construction activity cannot cause noise levels greater than 75 dBA CNEL at or beyond the property lines of any property zoned residential between the hours of 7:00 AM and 7:00 PM.

Otay Mesa Community Plan

The Otay Mesa Community Plan *Noise Element* specifies additional goals and policies to guide compatible land uses and the incorporation of noise attenuation measures for new uses, specific to Otay

Mesa. The Community Plan *Noise Element* complements the General Plan *Noise Element* goals and policies by addressing Otay Mesa-specific noise sources and issues. Otay Mesa is recognized as an active community with a mix of residential, commercial, and industrial uses. Industrial and commercial areas tend to have higher ambient noise levels than in residential areas (City of San Diego 2014b).

The goals and policies of the Community Plan *Noise Element* that are applicable to the proposed project are summarized below (City of San Diego 2014b):

> ***Goal 9.2.*** *Minimal exposure of residential and other noise-sensitive land uses to commercial and industrial noise.*
>
> > ***9.2-2.*** *Demonstrate that required noise levels for individual development projects within Otay Mesa are considered compatible with the General Plan Noise Land Use Compatibility Guidelines prior to the approval of the project.*
>
> ***Goal 9.3.*** *Minimal exposure of residential and other noise-sensitive land uses to excessive truck and other motor vehicle traffic noise.*
>
> > ***9.3-2.*** *Minimize noise impacts to adjacent uses along the Truck Route. (Figure 3-6 of the Community Plan Noise Element identifies truck routes in the Community Plan Area.)*

Otay Mesa Community Plan Update Environmental Impact Report (EIR)

The Otay Mesa Community Plan Update (CPU) EIR found that traffic-generated noise impacts based on future traffic volumes would result in potentially significant impacts due to the proximity of noise sensitive land uses in areas where exterior noise levels would exceed noise and land use compatibility standards established in the City's General Plan *Noise Element* (City of San Diego 2014a). Stationary noise from commercial and industrial uses located in proximity to noise sensitive uses were determined to be a potentially significant impact (City of San Diego 2014a). While it was not anticipated that projects implemented under the CPU would result in significant noise impacts, as noise generation from future developments within the CPU area could not be adequately quantified at that time, it was determined future projects that would exceed the City's noise thresholds would be required to adhere to the following mitigation measures:

- **Traffic Noise. NOI-1:** Prior to the issuance of building permits, site-specific exterior noise analyses that demonstrate that the project would not place residential receptors in locations where the exterior existing or future noise levels would exceed the noise compatibility standards of the City's General Plan shall be required as part of the review of future residential development proposals. Noise reduction measures, including but not limited to building noise barriers, increased building setbacks, speed reductions on surrounding roadways, alternative pavement surfaces, or other relevant noise attenuation measures, may be used to achieve the noise compatibility standards. Exact noise mitigation measures and their effectiveness shall be determined by the site-specific exterior noise analyses.
- **Stationary Noise. NOI-3**: Prior to the issuance of a building permit, a site-specific acoustical/noise analysis of any on-site generated noise sources, including generators, mechanical equipment, and trucks, shall be prepared which identifies all noise generating equipment, predicts noise levels at property lines from all identified equipment, and recommends mitigation to be implemented (e.g., enclosures, barriers, site orientation), to ensure compliance with the City's Noise Abatement and Control Ordinance. Noise reduction measures shall include building noise-attenuating walls, reducing noise at the source by requiring quieter machinery or limiting the hours of operation, or other attenuation measures. Additionally, future projects shall be required to buffer sensitive receptors from noise sources through the use of open space and other separation techniques as recommended after thorough

analysis by a qualified acoustical engineer. Exact noise mitigation measures and their effectiveness shall be determined by the site specific noise analyses.

In addition, the CPU EIR determined that any new construction in the CPU area would potentially generate short-term noise impacts to noise-sensitive land uses located adjacent to construction sites (City of San Diego 2014a). Temporary noise impacts could have potentially significant impacts since some construction activities have the potential to generate noise in excess of 75 dBA Leq. Therefore, the following CPU EIR mitigation measure would apply for construction activities:

- **Construction Noise. NOI-4:** For projects that exceed daily construction noise thresholds established by the City of San Diego, best construction management practices shall be used to reduce construction noise levels to comply with standards established by the Municipal Code in Chapter 5, Article 9.5, Noise Abatement and Control. Project applicant shall prepare and implement a Construction Noise Management Plan. Appropriate management practices shall be determined on a project-by-project basis, and are specific to the location. Control measures shall include:
    a) Minimizing simultaneous operation of multiple construction equipment units;
    b) Locating stationary equipment as far as reasonable from sensitive receptors;
    c) Requiring all internal combustion-engine-driven equipment to be equipped with mufflers that are in good operating condition and appropriate for the equipment; and
    d) Construction of temporary noise barriers around construction sites that block the line-of-sight to surrounding receptors.

Project Noise Setting

As shown in Figure 1, the project site is located north of SR-905, south of Otay Mesa Road, east of La Media Road, and west of SR-125. La Media Road and SR-125 are identified as a truck activity roads and SR-905 is identified as a truck route in the Otay Mesa Community Plan Mobility Element (2014). The most common source of noise in the project site vicinity is traffic on surrounding highways and roads. Motor vehicle noise, primarily from cars and trucks, is of concern because it is characterized by a high number of individual events, which often create sustained noise levels. Ambient noise levels would be expected to be highest during the daytime and rush hour unless congestion slows speeds substantially. There are no sensitive receptors on the project site or vicinity.

The project site is located in the Airport District of the Otay Mesa Community Plan. Due to airport operations, the eastern and western areas adjacent to the airport are suited for low occupancy uses, including but not limited to: warehousing, distribution, auto salvaging, and truck yards for cross-border movement of goods (City of San Diego 2014). Secondary off-site noise sources include overhead flight noise from Brown Field Municipal Airport, located approximately one mile west of the project site along Otay Mesa Road. The project site is located in the inner approach/departure zone (Safety Zone 2) of Brown Field Municipal Airport, which permits office, commercial, service, transportation, communication, utilities, industrial, manufacturing, and warehouse land uses (San Diego County 2010). Based on the Noise Technical Report completed for the Otay Mesa Community Plan Update (2013), the project site is outside of the 60 dBA CNEL noise contour for Brown Field Municipal Airport.

To determine ambient noise levels at and near the project site, 15-minute noise measurements were recorded during the morning peak hour between 7:00 a.m. and 9:00 a.m. on April 21, 2017 using an ANSI Type II integrating sound level meter at three locations in the vicinity of the project site and one location at a comparable facility, 1.25 miles west of the project site (refer to Appendix A for noise measurement data). Figure 3 shows the noise measurement locations and Table 3 lists the ambient noise levels measured at all four locations. Measured noise in the vicinity of the project site was constant at 70.0 dBA

Leq. Noise measured at a land use similar to the proposed project, a light industrial campus, was lower at 60.5 dBA Leq than ambient noise in the vicinity of the project site. The results indicate that traffic noise from Otay Mesa Road, La Media Road, and SR-905 are the primary noise sources for the project site.

Table 3 Project Vicinity Noise Monitoring Results

Measurement Number	Measurement Location	Sample Times	Approximate Distance to Primary Noise Source	dBA Leq [15][1]	dBA Lmin	dBA Lmax
1	South side of the project site, on SR-11W	6:52 a.m – 7:08 a.m.	76 feet from median of SR-905	70.0	59.5	86.6
2	North of the project site, on Otay Mesa Road	7:20 a.m. – 7:35 a.m.	85 feet from centerline of Otay Mesa Road	70.0	56.6	90.3
3	West of project site, on La Media Road	7:49 a.m. – 8:04 a.m.	50 feet from centerline of La Media Road	70.0	57.6	93.1
Comparable	West of project site, on St. Andrews Avenue in the middle of a light-industrial campus, comparable to proposed project	8:15 a.m. – 8:30 a.m.	30 feet from centerline of St. Andrews Avenue	60.5	51.0	76.0

Source: Rincon Consultants, field visit on March 2, 2017 using ANSI Type 2 Integrating sound level meter.

See Appendix A for noise monitoring data

[1] The equivalent noise level (Leq) is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). For this measurement the Leq was over a 15-minute period (Leq[15]).

Figure 3. Noise Measurement Locations

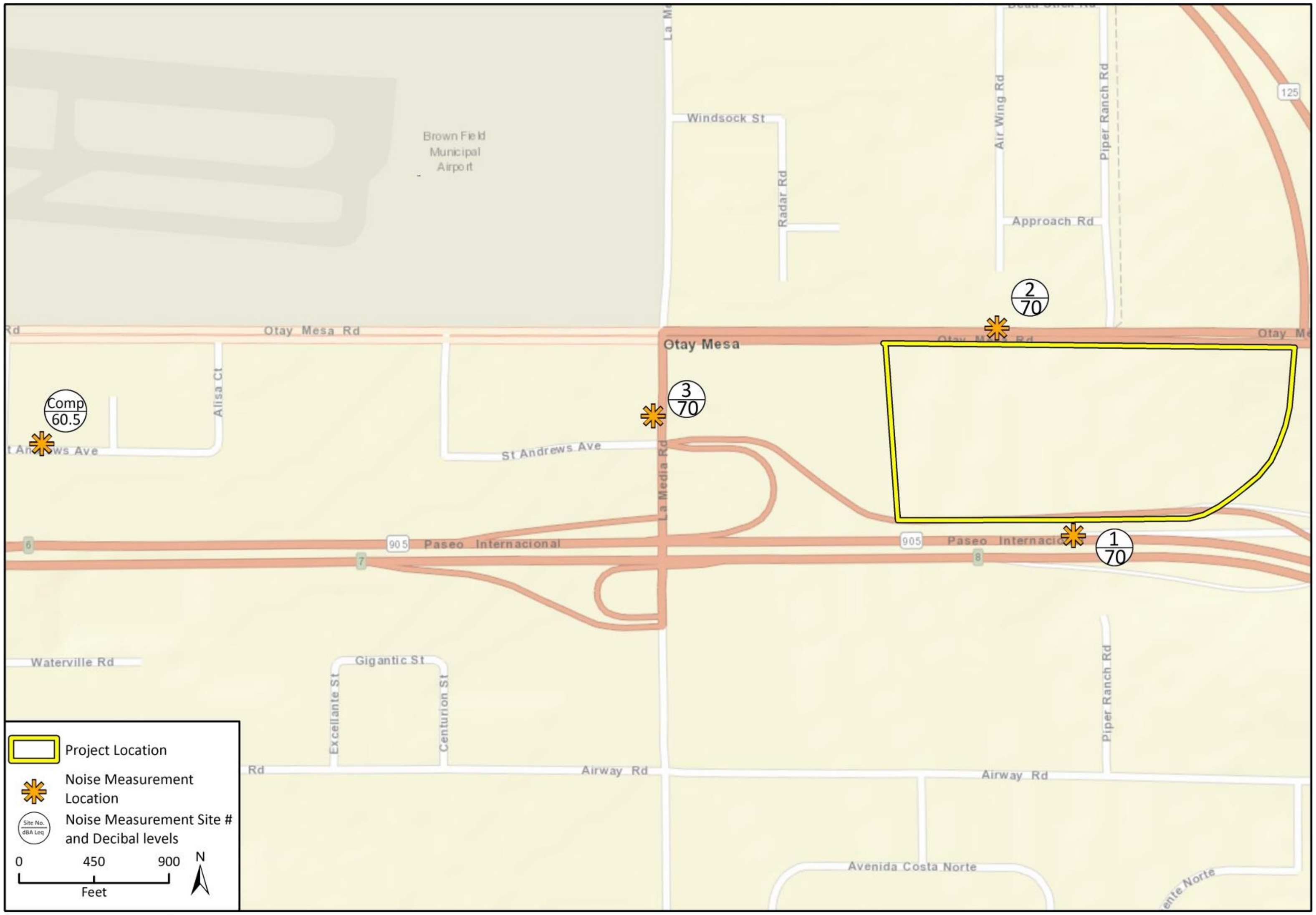

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Fig 1 Noise Sensitive Receptor Location Map 2

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Impact Analysis

Methodology and Significance Thresholds

The analysis of noise impacts considers the effects of both temporary construction-related noise and long-term noise associated with operation of the project. The City of San Diego has four thresholds within the initial study checklist for noise, as described in the *CEQA Significance Determination Thresholds* (2011). According to the City's CEQA thresholds, impacts associated with noise would be significant if the project would:

1. *Result in or create a significant increase in the existing ambient noise levels.*
2. *Expose people to noise levels which exceed the City's adopted noise ordinance or are incompatible with Table 5.*
3. *Expose people to current or future transportation noise levels which exceed standards established in the Transportation Element of the General Plan or an adopted airport Comprehensive Land Use Plan (CLUP).*
4. *Result in land uses which are not compatible with aircraft noise levels as defined by an adopted airport CLUP.*

Table K-2 of the City's *CEQA Significance Determination Thresholds* establishes significance thresholds for interior and exterior noise impacts from traffic-generated noise (2011). Table 4 shows the City's CEQA thresholds for traffic noise.

Table 4 Traffic Noise Significance Thresholds (dBA CNEL)

Structure or Proposed Use that would be impacted by Traffic Noise	Interior Space	Exterior Usable Space[1]	General Indication of Potential Significance
Single-family detached	45 dB	65 dB	Structure or outdoor useable area[2] is < 50 feet from the center of the closest (outside) lane on a street with existing or future ADTs > 7500[3]
Multi-family, schools, libraries, hospitals, day care, hotels, motels, parks, convalescent homes.	Development Services Department (DSD) ensures 45 dB pursuant to Title 24	65 dB	
Offices, Churches, Business, Professional Uses	N/A	70 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 20,000
Commercial, Retail, Industrial, Outdoor Spectator Sports Uses	N/A	75 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 40,000

Source: City of San Diego CEQA Significance Determination Thresholds 2011.

[1] If a project is currently at or exceeds the significance thresholds for traffic noise described above and noise levels would result in less than a 3 dB increase, then the impact is not considered significant.

[2] Exterior usable areas do not include residential front yards or balconies, unless the areas such as balconies are part of the required usable open space calculation for multi-family units.

[3] Traffic counts are available from: San Diego Regional Association of Governments (SANDAG); Regional Economic Development Information System (REDI): http://cart.sandag.cog.ca.us/REDI/; SANDAG Traffic Forecast Information Center: http://pele.sandag.org/trfic.html

Table K-4 of the City's *CEQA Significance Determination Thresholds* identifies noise levels for land use compatibility (2011). Table 5 shows the City's CEQA thresholds for land use compatibility for the uses relevant to the project.

Table 5 City of San Diego Noise Land Use Compatibility Chart

Land Use	Annual dBA CNEL
Office buildings, business and professional	60
Commercial-wholesale, industrial manufacturing, utilities	70

Source: Adapted from City of San Diego CEQA Significance Determination Thresholds 2011.

The City's CEQA thresholds state that temporary construction noise measured at or beyond the property lines of a residential property shall not exceed an average sound level greater than 75 dBA Leq during the 12-hour period from 7:00 AM and 7:00 PM. Construction activity is prohibited between the hours of 7:00 PM of any day and 7:00 AM of the following day, legal holidays, and on Sunday.

METHODOLOGY FOR CONSTRUCTION NOISE ANALYSIS

Construction noise was estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). RCNM predicts construction noise levels for a variety of construction operations based on empirical data and the application of acoustical propagation formulas. Using RCNM, construction noise levels were estimated at nearby existing uses since there are no noise sensitive receptors in the project site vicinity. RCNM provides reference noise levels for standard construction equipment, with an attenuation of 6 dBA per doubling of distance for stationary equipment and 3 dBA per doubling of distance for mobile equipment. The model does not take into consideration topographic variation or staging locations of construction equipment, thus making the analysis conservative. Construction equipment modeled was based on the CalEEMod equipment defaults by phase used in the Sunroad Otay Plaza Project Air Quality Study (Rincon Consultants, Inc. 2017). The threshold for temporary construction noise is an average of 75 dBA Leq at a residential property over a 12-hour period between 7:00 AM and 7:00 PM with construction prohibited between the hours of 7:00 PM of any day to 7:00 AM the following day, legal holidays, and on Sunday per City of San Diego Municipal Code, Section 59.5.0404 (City of San Diego NDa).

TRAFFIC NOISE

The project would generate vehicle trips, thereby increasing traffic on area roadways as a result of the project. The analysis of anticipated roadway noise impacts is based on the 2017 Traffic Impact Analysis (TIA) for the Sunroad Otay Mesa Project (Kimley Horn 2017).

According to the City's CEQA thresholds for traffic noise (Table 4), 70 dBA CNEL is the limit for exterior traffic noise levels around offices and professional uses, and 75 dBA CNEL is the limit for exterior traffic noise levels around commercial and industrial uses. According to Table 4, if a project is currently at or exceeds the significance thresholds for traffic noise described above and noise levels would result in less than a 3 dB increase, then the impact is not considered significant

Impact Analysis

TEMPORARY CONSTRUCTION NOISE IMPACTS

Project construction would include site excavation and grading, building construction, paving, and architectural coating of four buildings totaling 845,050 square feet and associated parking lot and landscaping. There are no noise sensitive uses in the vicinity of the project site, as described by the

City's General Plan *Noise Element*. Existing uses in the vicinity of the project site are light to heavy commercial and light to heavy industrial uses. A list of typical peak noise levels associated with common types of heavy construction equipment are available in Appendix C. Table 6 shows noise levels generated during different phases of project construction at 200 feet and 650 feet from the project site. The two distances were chosen based on existing uses in the vicinity of the project site, where light industrial uses exist on the north side of Otay Mesa Road 200 feet from the north edge of the project site where noise measurement 2 was collected, and light industrial uses exist on the south side of SR-905 directly south of the project site.

Table 6 Noise Levels During Construction Phases

Construction Phase	Equipment	Estimated Noise at 200 Feet (dBA Leq)	Estimated Noise at 650 Feet (dBA Leq)
Excavation/Grading	Excavator, Grader, Rubber-Tired Dozer, Scraper, Tractors/Loaders/Backhoes	75	65
Building Construction	Crane, Forklift, Generator, Tractors/Loaders/Backhoes, Welders	70	60
Paving Phase I	Pavers, Paving Equipment, Rollers	75	64
Paving Phase II	Pavers, Paving Equipment, Rollers	75	64
Architectural Coating Phase I	Air Compressor (stationary)	62	51
Architectural Coating Phase II	Air Compressor (stationary)	62	51

Source: Federal Highway Administration. Roadway Construction Noise Model. 2006.

See Appendix B for RCNM data sheets.

The noise levels presented in Table 6 represent a conservative estimate of construction noise because they assume the simultaneous use of construction equipment in the same construction staging location, closest to existing receptors. In practice, equipment would be dispersed temporally and spatially on the project site during construction activities. Due to spatial and equipment limitations, only a limited amount of equipment can operate near a given location at any particular time.

As shown in Table 6, construction noise could be as high as 75 dBA Leq at the nearest adjacent property, which is light industrial campus north of Otay Mesa Road. However, the City's construction noise threshold of 75 dBA Leq over a 12-hour period is only applicable to residential receptors. Therefore, construction noise would not exceed the City's construction noise level thresholds because there are no noise sensitive receptors located within a 0.25 mile radius of the project site. In addition, the project would be required to comply with the construction hour restrictions of Chapter 5, Section 59.5.0404 of the City of San Diego Municipal Code, which prohibits construction outside the hours of 7:00 AM and 7:00 PM.

On-Site Operational Noise Impacts

Surrounding land uses include light industrial buildings on the north and west. On-site operation noise would be significant only if exterior noise levels exceeded City's CEQA thresholds standards of 70 dBA CNEL for commercial and industrial uses (Table 5). The 15-minute noise measurement taken at the comparable location (a light industrial campus located at Gailes Boulevard and St. Andrews Avenue 1.25 miles west of the project site) resulted in 60.5 dBA Leq. The comparable location was chosen due to the similarities to the proposed project in building configuration, landscape and hardscape composition, and location relative to SR-905 and Otay Mesa Road. Therefore, on-site operational noise impacts for the project are anticipated to be similar to the comparable location. Assuming the proposed buildings would be in operation during daytime hours (7 AM to 7 PM), project-related hourly noise would equate to 60.5 dBA CNEL.[1] Therefore, the project would not result in noise levels exceeding 70 dBA CNEL at adjacent commercial and industrial uses.

At 60.5 dBA Leq, the project would exceed exterior sound level limits for office uses (60 dBA CNEL), and not exceed exterior sound level limits for commercial and industrial uses (70 dBA CNEL) as stated in Table 5.Operation of the site would be restricted to daytime hours, and ambient exterior noise from the project would be similar to the comparable location, which operates within the City's sound level limits. Comparable noise levels exceed exterior sound level limits for office uses by 0.5 dBA. However, there are no noise sensitive uses located in the immediate vicinity of the project site. Furthermore, adherence to mitigation measure NOI-3 from the CPU EIR requires the completion of a project-specific noise analysis and to ensure compliance with the City's Noise Abatement and Control Ordinance (City of San Diego 2014a). Therefore, on-site operational noise impacts would be less than significant.

LAND USE COMPATIBILITY

The proposed project does not include any noise-sensitive land uses on the project site. Exterior noise would be dominated by vehicular traffic along area roadways. Exterior noise compatibility thresholds are up to 60 dBA CNEL for office uses and 70 dBA CNEL for industrial uses (Table 5). Noise measurements taken by Rincon Consultants (Table 3) show an existing ambient noise level of 70 dBA Leq during peak traffic hours in the vicinity of the project site. The peak hourly Leq in an urban area with traffic is approximately 2-4 dBA lower than the daily CNEL value (California SWRCB 1999). Therefore, daily CNEL in the project site vicinity is likely 72 to 74 dBA CNEL. The project does not include outdoor activity areas, therefore, the project would not expose outdoor activity areas to noise levels in excess of the exterior noise compatibility thresholds. Based on the City's General Plan *Noise Element*, the applicable interior noise compatibility threshold is 50 dBA CNEL for both industrial and office uses (City of San Diego General, 2008, updated 2015). Modern building construction typically provides noise attenuation from the exterior environment to the interior environment of 25 dBA (FTA 2006). Therefore, proposed buildings would experience an interior noise level of at most 49 dBA CNEL (74 dBA CNEL minus 25 dBA of building attenuation). Therefore, the project would not be exposed to interior noise levels in excess of 50 dBA CNEL.

TRAFFIC NOISE IMPACTS

Primary noise sources in the vicinity of the project site originate from motor vehicle activities and traffic. The analysis of anticipated roadway noise impacts is based on the 2017 Traffic Impact Analysis (TIA) for the Sunroad Otay Mesa Project (Kimley Horn 2017). According to the City's CEQA threshold for traffic noise (Table 4), if a project is currently at or exceeds the significance thresholds and noise levels would result in less than a 3 dBA CNEL increase, then the impact is not considered significant.

The project would generate a total of 4,225 daily trips with a total of 633 morning and 676 afternoon peak hour trips (Kimley Horn 2017). This is an approximate 1.5% increase from the estimated 282,184 existing peak hour and average daily trip (ADT) volumes generated within the project site vicinity (Kimley Horn 2017). Table 7 provides a summary of daily traffic changes on roadway segments, resulting from the project.

[1] CNEL was calculated using Ldn, Lden, CNEL – Community Noise Calculators provided by NoiseMeters Inc. at https://www.noisemeters.com/apps/ldn-calculator.asp

Table 7 Projected Generated Daily Traffic Changes

Roadway Segment	Existing ADT	Project ADT	Total ADT	Percent Increase	Noise Level Increase (dBA)
Otay Mesa Road					
Harvest Road to SR-125 Ramps	9,795	507	10,302	5.2%	<0.4
SR-125 Ramps to Piper Ranch Road	16,170	845	17,015	5.2%	<0.4
Piper Ranch Road to La Media Road	13,420	3,296	16,716	24.6%	<1.1
Otay Mesa Center Road to Gailes Boulevard	10,399	1,141	11,540	11.0%	<0.8
La Media Road					
Otay Mesa Road to SR-905	18,170	2,070	20,240	11.4%	<0.8

Source: Kimley Horn 2017

As shown in Table 7, project traffic would increase most along the segment of Otay Mesa Road between Piper Ranch Road and La Media Road. Nonetheless, traffic noise would increases by at most 1.1 dBA, which is below the City’s allowable traffic noise increase threshold of 3 dBA.

Recommendations

There are no sensitive receptors in the vicinity of the project site. Therefore, the project would not expose residents or nearby sensitive receptors to noise levels in excess of City standards. Noise generated by the project would not substantially increase noise levels in the area. No measures are needed to reduce project noise impacts.

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Appendix A

Noise Measurement Data and Events Log

Measurement 1		Measurement 2	
Location:	11W	**Location:**	Otay Mesa Rd
Start:	6:52AM	**Start:**	7:20AM
Stop:	7:07AM	**Stop:**	7:35AM
Weather:	Daytime 3 - Sunny <20%	**Weather:**	Daytime 3 - Sunny <20%
Temp:	65.4 F	**Temp:**	67.8 F
Wind:	0 mph	**Wind:**	0 mph
Primary Noise Source:	Traffic on SR-905	**Primary Noise Source:**	Traffic on Otay Mesa Rd
Distance:	76 feet	**Distance:**	85 ft
Secondary Noise Source:	Traffic on SR-11W	**Secondary Noise Source:**	Traffic on SR-905
Notes:		**Notes:**	
Leq:	70.0	**Leq:**	70.0
Lmin:	59.5	**Lmin:**	56.6
Lmax:	86.6	**Lmax:**	90.3
SEL:		**SEL:**	
L(10):	72.3	**L(10):**	75.6
Cars:	24	**Cars:**	153
Light Trucks:	1	**Light Trucks:**	2
Heavy Trucks:	8	**Heavy Trucks:**	30
Response:	Fast	**Response:**	Fast
Weighting:	A	**Weighting:**	A
Calibrated Start:	94.0	**Calibrated Start:**	94.0
Calibrated Stop:	93.9	**Calibrated Stop:**	94.1

Measurement 3		**Measurement 4**	Comparable
Location:	La Media Rd	**Location:**	St Andrews Ave, Business Park
Start:	7:49AM	**Start:**	8:15AM
Stop:	8:04AM	**Stop:**	8:30AM
Weather:	Daytime 3 - Sunny <20%	**Weather:**	Daytime 3 - Sunny <20%
Temp:	80.9 F	**Temp:**	82.2 F
Wind:	0	**Wind:**	0
Primary Noise Source:	Traffic on La Media Rd	**Primary Noise Source:**	Traffic on St Andrews Ave
Distance:	50 ft	**Distance:**	30 ft
Secondary Noise Source:	Intersection at La Media Rd and on/off ramp SR-905	**Secondary Noise Source:**	
Notes:		**Notes:**	
Leq:	70.0	**Leq:**	60.5
Lmin:	57.6	**Lmin:**	51.0
Lmax:	93.1	**Lmax:**	76.0
SEL:		**SEL:**	61.9
L(10):	75.2	**L(10):**	
Cars:	193	**Cars:**	9
Light Trucks:	3	**Light Trucks:**	0
Heavy Trucks:	46	**Heavy Trucks:**	5
Response:	Fast	**Response:**	Fast
Weighting:	A	**Weighting:**	A
Calibrated Start:	94.0	**Calibrated Start:**	94.0
Calibrated Stop:	93.5	**Calibrated Stop:**	93.9

Data Logger
Location 1
A
FAST
40-100

2017/04/21 06:54:31
99.5
70.0

No.s	Date Time	dB
1	2017/04/21 06:51:09	64.1
2	2017/04/21 06:51:10	66.9
3	2017/04/21 06:51:11	71.2
4	2017/04/21 06:51:12	79.4
5	2017/04/21 06:51:13	75.9
6	2017/04/21 06:51:14	68.7
7	2017/04/21 06:51:15	66.1
8	2017/04/21 06:51:16	65.7
9	2017/04/21 06:51:17	65.7
10	2017/04/21 06:51:18	64.9
11	2017/04/21 06:51:19	66.1
12	2017/04/21 06:51:20	65.1
13	2017/04/21 06:51:21	65.6
14	2017/04/21 06:51:22	69.2
15	2017/04/21 06:51:23	74.1
16	2017/04/21 06:51:24	77.7
17	2017/04/21 06:51:25	73.6
18	2017/04/21 06:51:26	71.2
19	2017/04/21 06:51:27	68.9
20	2017/04/21 06:51:28	68.4
21	2017/04/21 06:51:29	67.6
22	2017/04/21 06:51:30	67.8
23	2017/04/21 06:51:31	69.0
24	2017/04/21 06:51:32	69.6
25	2017/04/21 06:51:33	70.5
26	2017/04/21 06:51:34	69.9
27	2017/04/21 06:51:35	68.6
28	2017/04/21 06:51:36	67.0
29	2017/04/21 06:51:37	66.7
30	2017/04/21 06:51:38	67.0
31	2017/04/21 06:51:39	67.6
32	2017/04/21 06:51:40	67.7
33	2017/04/21 06:51:41	69.4
34	2017/04/21 06:51:42	70.8
35	2017/04/21 06:51:43	69.2
36	2017/04/21 06:51:44	69.9
37	2017/04/21 06:51:45	69.0
38	2017/04/21 06:51:46	70.1
39	2017/04/21 06:51:47	69.7
40	2017/04/21 06:51:48	68.8
41	2017/04/21 06:51:49	68.0
42	2017/04/21 06:51:50	67.2
43	2017/04/21 06:51:51	67.2
44	2017/04/21 06:51:52	73.1
45	2017/04/21 06:51:53	83.6
46	2017/04/21 06:51:54	78.2
47	2017/04/21 06:51:55	70.9
48	2017/04/21 06:51:56	66.5
49	2017/04/21 06:51:57	65.2
50	2017/04/21 06:51:58	64.0
51	2017/04/21 06:51:59	64.0
52	2017/04/21 06:52:00	65.0
53	2017/04/21 06:52:01	67.4

54	2017/04/21 06:52:02	70.4
55	2017/04/21 06:52:03	76.3
56	2017/04/21 06:52:04	78.4
57	2017/04/21 06:52:05	76.9
58	2017/04/21 06:52:06	71.9
59	2017/04/21 06:52:07	74.3
60	2017/04/21 06:52:08	71.9
61	2017/04/21 06:52:09	71.5
62	2017/04/21 06:52:10	67.0
63	2017/04/21 06:52:11	64.4
64	2017/04/21 06:52:12	64.5
65	2017/04/21 06:52:13	62.4
66	2017/04/21 06:52:14	63.1
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Data Logger
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40-100

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516	2017/04/21 08:22:18	53.1
517	2017/04/21 08:22:19	52.0
518	2017/04/21 08:22:20	51.9
519	2017/04/21 08:22:21	51.5
520	2017/04/21 08:22:22	51.7
521	2017/04/21 08:22:23	51.8
522	2017/04/21 08:22:24	51.8
523	2017/04/21 08:22:25	51.9
524	2017/04/21 08:22:26	52.0
525	2017/04/21 08:22:27	51.6
526	2017/04/21 08:22:28	52.1
527	2017/04/21 08:22:29	51.6
528	2017/04/21 08:22:30	51.5
529	2017/04/21 08:22:31	52.0
530	2017/04/21 08:22:32	51.9
531	2017/04/21 08:22:33	52.2
532	2017/04/21 08:22:34	52.4
533	2017/04/21 08:22:35	51.8
534	2017/04/21 08:22:36	56.2
535	2017/04/21 08:22:37	55.3
536	2017/04/21 08:22:38	56.5
537	2017/04/21 08:22:39	57.0
538	2017/04/21 08:22:40	59.4
539	2017/04/21 08:22:41	63.0
540	2017/04/21 08:22:42	67.4
541	2017/04/21 08:22:43	70.0
542	2017/04/21 08:22:44	66.0
543	2017/04/21 08:22:45	61.6
544	2017/04/21 08:22:46	60.4
545	2017/04/21 08:22:47	59.5
546	2017/04/21 08:22:48	57.4
547	2017/04/21 08:22:49	56.5
548	2017/04/21 08:22:50	56.1
549	2017/04/21 08:22:51	57.1
550	2017/04/21 08:22:52	56.5
551	2017/04/21 08:22:53	56.7
552	2017/04/21 08:22:54	55.6
553	2017/04/21 08:22:55	64.0
554	2017/04/21 08:22:56	57.4
555	2017/04/21 08:22:57	57.4
556	2017/04/21 08:22:58	59.7
557	2017/04/21 08:22:59	62.2

558	2017/04/21 08:23:00	64.1
559	2017/04/21 08:23:01	63.8
560	2017/04/21 08:23:02	59.8
561	2017/04/21 08:23:03	57.9
562	2017/04/21 08:23:04	56.6
563	2017/04/21 08:23:05	56.6
564	2017/04/21 08:23:06	56.2
565	2017/04/21 08:23:07	58.0
566	2017/04/21 08:23:08	59.4
567	2017/04/21 08:23:09	61.5
568	2017/04/21 08:23:10	61.9
569	2017/04/21 08:23:11	62.9
570	2017/04/21 08:23:12	62.8
571	2017/04/21 08:23:13	61.2
572	2017/04/21 08:23:14	60.5
573	2017/04/21 08:23:15	57.9
574	2017/04/21 08:23:16	58.2
575	2017/04/21 08:23:17	56.4
576	2017/04/21 08:23:18	56.8
577	2017/04/21 08:23:19	53.8
578	2017/04/21 08:23:20	51.8
579	2017/04/21 08:23:21	51.5
580	2017/04/21 08:23:22	51.9
581	2017/04/21 08:23:23	51.2
582	2017/04/21 08:23:24	51.3
583	2017/04/21 08:23:25	51.5
584	2017/04/21 08:23:26	51.7
585	2017/04/21 08:23:27	51.8
586	2017/04/21 08:23:28	52.3
587	2017/04/21 08:23:29	52.2
588	2017/04/21 08:23:30	52.4
589	2017/04/21 08:23:31	53.4
590	2017/04/21 08:23:32	53.8
591	2017/04/21 08:23:33	52.8
592	2017/04/21 08:23:34	52.8
593	2017/04/21 08:23:35	52.9
594	2017/04/21 08:23:36	52.5
595	2017/04/21 08:23:37	53.7
596	2017/04/21 08:23:38	53.6
597	2017/04/21 08:23:39	55.1
598	2017/04/21 08:23:40	55.6
599	2017/04/21 08:23:41	57.1
600	2017/04/21 08:23:42	58.5
601	2017/04/21 08:23:43	61.7
602	2017/04/21 08:23:44	63.9
603	2017/04/21 08:23:45	67.8
604	2017/04/21 08:23:46	68.4
605	2017/04/21 08:23:47	63.7
606	2017/04/21 08:23:48	58.0
607	2017/04/21 08:23:49	55.9
608	2017/04/21 08:23:50	53.9
609	2017/04/21 08:23:51	53.5
610	2017/04/21 08:23:52	52.6
611	2017/04/21 08:23:53	51.9
612	2017/04/21 08:23:54	51.7
613	2017/04/21 08:23:55	52.3
614	2017/04/21 08:23:56	52.3
615	2017/04/21 08:23:57	52.5
616	2017/04/21 08:23:58	52.5
617	2017/04/21 08:23:59	51.8
618	2017/04/21 08:24:00	52.8
619	2017/04/21 08:24:01	52.2
620	2017/04/21 08:24:02	52.2

621	2017/04/21 08:24:03	52.4
622	2017/04/21 08:24:04	55.5
623	2017/04/21 08:24:05	53.5
624	2017/04/21 08:24:06	53.9
625	2017/04/21 08:24:07	53.4
626	2017/04/21 08:24:08	53.3
627	2017/04/21 08:24:09	54.3
628	2017/04/21 08:24:10	54.7
629	2017/04/21 08:24:11	54.9
630	2017/04/21 08:24:12	54.1
631	2017/04/21 08:24:13	54.4
632	2017/04/21 08:24:14	53.6
633	2017/04/21 08:24:15	54.2
634	2017/04/21 08:24:16	53.6
635	2017/04/21 08:24:17	55.0
636	2017/04/21 08:24:18	55.6
637	2017/04/21 08:24:19	54.6
638	2017/04/21 08:24:20	54.9
639	2017/04/21 08:24:21	55.5
640	2017/04/21 08:24:22	57.4
641	2017/04/21 08:24:23	58.7
642	2017/04/21 08:24:24	60.6
643	2017/04/21 08:24:25	60.4
644	2017/04/21 08:24:26	63.2
645	2017/04/21 08:24:27	64.7
646	2017/04/21 08:24:28	66.3
647	2017/04/21 08:24:29	67.0
648	2017/04/21 08:24:30	68.8
649	2017/04/21 08:24:31	67.4
650	2017/04/21 08:24:32	73.2
651	2017/04/21 08:24:33	75.1
652	2017/04/21 08:24:34	75.8
653	2017/04/21 08:24:35	74.9
654	2017/04/21 08:24:36	74.5
655	2017/04/21 08:24:37	74.9
656	2017/04/21 08:24:38	74.3
657	2017/04/21 08:24:39	73.8
658	2017/04/21 08:24:40	71.0
659	2017/04/21 08:24:41	68.1
660	2017/04/21 08:24:42	65.0
661	2017/04/21 08:24:43	62.9
662	2017/04/21 08:24:44	61.3
663	2017/04/21 08:24:45	58.9
664	2017/04/21 08:24:46	60.9
665	2017/04/21 08:24:47	56.6
666	2017/04/21 08:24:48	55.1
667	2017/04/21 08:24:49	57.6
668	2017/04/21 08:24:50	55.2
669	2017/04/21 08:24:51	54.7
670	2017/04/21 08:24:52	55.6
671	2017/04/21 08:24:53	54.6
672	2017/04/21 08:24:54	56.3
673	2017/04/21 08:24:55	57.5
674	2017/04/21 08:24:56	57.2
675	2017/04/21 08:24:57	56.5
676	2017/04/21 08:24:58	56.1
677	2017/04/21 08:24:59	55.8
678	2017/04/21 08:25:00	55.9
679	2017/04/21 08:25:01	55.1
680	2017/04/21 08:25:02	56.3
681	2017/04/21 08:25:03	56.2
682	2017/04/21 08:25:04	55.7
683	2017/04/21 08:25:05	55.9

684	2017/04/21 08:25:06	61.5
685	2017/04/21 08:25:07	55.0
686	2017/04/21 08:25:08	55.7
687	2017/04/21 08:25:09	54.1
688	2017/04/21 08:25:10	54.4
689	2017/04/21 08:25:11	54.4
690	2017/04/21 08:25:12	54.0
691	2017/04/21 08:25:13	53.9
692	2017/04/21 08:25:14	53.8
693	2017/04/21 08:25:15	53.9
694	2017/04/21 08:25:16	54.0
695	2017/04/21 08:25:17	53.9
696	2017/04/21 08:25:18	53.7
697	2017/04/21 08:25:19	54.7
698	2017/04/21 08:25:20	53.9
699	2017/04/21 08:25:21	53.6
700	2017/04/21 08:25:22	53.7
701	2017/04/21 08:25:23	54.2
702	2017/04/21 08:25:24	53.6
703	2017/04/21 08:25:25	53.9
704	2017/04/21 08:25:26	54.7
705	2017/04/21 08:25:27	55.8
706	2017/04/21 08:25:28	54.9
707	2017/04/21 08:25:29	56.6
708	2017/04/21 08:25:30	56.6
709	2017/04/21 08:25:31	55.8
710	2017/04/21 08:25:32	56.4
711	2017/04/21 08:25:33	56.6
712	2017/04/21 08:25:34	56.6
713	2017/04/21 08:25:35	58.3
714	2017/04/21 08:25:36	57.3
715	2017/04/21 08:25:37	61.1
716	2017/04/21 08:25:38	55.4
717	2017/04/21 08:25:39	54.6
718	2017/04/21 08:25:40	57.1
719	2017/04/21 08:25:41	59.5
720	2017/04/21 08:25:42	55.3
721	2017/04/21 08:25:43	55.4
722	2017/04/21 08:25:44	70.3
723	2017/04/21 08:25:45	55.7
724	2017/04/21 08:25:46	54.0
725	2017/04/21 08:25:47	54.3
726	2017/04/21 08:25:48	54.1
727	2017/04/21 08:25:49	53.4
728	2017/04/21 08:25:50	52.8
729	2017/04/21 08:25:51	52.9
730	2017/04/21 08:25:52	53.1
731	2017/04/21 08:25:53	54.0
732	2017/04/21 08:25:54	53.9
733	2017/04/21 08:25:55	55.1
734	2017/04/21 08:25:56	53.2
735	2017/04/21 08:25:57	53.9
736	2017/04/21 08:25:58	53.2
737	2017/04/21 08:25:59	53.3
738	2017/04/21 08:26:00	53.8
739	2017/04/21 08:26:01	53.4
740	2017/04/21 08:26:02	53.7
741	2017/04/21 08:26:03	54.1
742	2017/04/21 08:26:04	53.2
743	2017/04/21 08:26:05	53.7
744	2017/04/21 08:26:06	53.6
745	2017/04/21 08:26:07	54.2
746	2017/04/21 08:26:08	54.0

747	2017/04/21 08:26:09	53.8
748	2017/04/21 08:26:10	58.6
749	2017/04/21 08:26:11	55.0
750	2017/04/21 08:26:12	53.9
751	2017/04/21 08:26:13	53.9
752	2017/04/21 08:26:14	55.1
753	2017/04/21 08:26:15	53.7
754	2017/04/21 08:26:16	58.7
755	2017/04/21 08:26:17	53.8
756	2017/04/21 08:26:18	54.4
757	2017/04/21 08:26:19	53.1
758	2017/04/21 08:26:20	53.4
759	2017/04/21 08:26:21	53.8
760	2017/04/21 08:26:22	53.7
761	2017/04/21 08:26:23	54.1
762	2017/04/21 08:26:24	55.0
763	2017/04/21 08:26:25	54.8
764	2017/04/21 08:26:26	53.9
765	2017/04/21 08:26:27	53.6
766	2017/04/21 08:26:28	52.8
767	2017/04/21 08:26:29	60.9
768	2017/04/21 08:26:30	54.9
769	2017/04/21 08:26:31	55.0
770	2017/04/21 08:26:32	53.2
771	2017/04/21 08:26:33	53.2
772	2017/04/21 08:26:34	58.4
773	2017/04/21 08:26:35	53.8
774	2017/04/21 08:26:36	52.7
775	2017/04/21 08:26:37	53.6
776	2017/04/21 08:26:38	53.2
777	2017/04/21 08:26:39	53.0
778	2017/04/21 08:26:40	52.6
779	2017/04/21 08:26:41	52.7
780	2017/04/21 08:26:42	53.6
781	2017/04/21 08:26:43	52.5
782	2017/04/21 08:26:44	52.1
783	2017/04/21 08:26:45	52.2
784	2017/04/21 08:26:46	52.3
785	2017/04/21 08:26:47	52.2
786	2017/04/21 08:26:48	52.4
787	2017/04/21 08:26:49	52.3
788	2017/04/21 08:26:50	52.2
789	2017/04/21 08:26:51	52.8
790	2017/04/21 08:26:52	52.4
791	2017/04/21 08:26:53	53.0
792	2017/04/21 08:26:54	53.0
793	2017/04/21 08:26:55	52.9
794	2017/04/21 08:26:56	53.2
795	2017/04/21 08:26:57	53.2
796	2017/04/21 08:26:58	52.7
797	2017/04/21 08:26:59	52.9
798	2017/04/21 08:27:00	54.3
799	2017/04/21 08:27:01	54.4
800	2017/04/21 08:27:02	53.5
801	2017/04/21 08:27:03	53.3
802	2017/04/21 08:27:04	53.3
803	2017/04/21 08:27:05	52.7
804	2017/04/21 08:27:06	52.6
805	2017/04/21 08:27:07	53.3
806	2017/04/21 08:27:08	55.3
807	2017/04/21 08:27:09	55.8
808	2017/04/21 08:27:10	53.4
809	2017/04/21 08:27:11	53.7

810	2017/04/21 08:27:12	54.3
811	2017/04/21 08:27:13	53.3
812	2017/04/21 08:27:14	53.8
813	2017/04/21 08:27:15	54.3
814	2017/04/21 08:27:16	53.9
815	2017/04/21 08:27:17	54.7
816	2017/04/21 08:27:18	54.5
817	2017/04/21 08:27:19	54.9
818	2017/04/21 08:27:20	55.8
819	2017/04/21 08:27:21	58.1
820	2017/04/21 08:27:22	62.1
821	2017/04/21 08:27:23	63.6
822	2017/04/21 08:27:24	67.6
823	2017/04/21 08:27:25	69.7
824	2017/04/21 08:27:26	63.7
825	2017/04/21 08:27:27	58.6
826	2017/04/21 08:27:28	56.9
827	2017/04/21 08:27:29	55.0
828	2017/04/21 08:27:30	55.0
829	2017/04/21 08:27:31	56.9
830	2017/04/21 08:27:32	57.1
831	2017/04/21 08:27:33	59.8
832	2017/04/21 08:27:34	61.7
833	2017/04/21 08:27:35	64.2
834	2017/04/21 08:27:36	64.6
835	2017/04/21 08:27:37	60.7
836	2017/04/21 08:27:38	57.2
837	2017/04/21 08:27:39	55.2
838	2017/04/21 08:27:40	54.8
839	2017/04/21 08:27:41	54.8
840	2017/04/21 08:27:42	54.6
841	2017/04/21 08:27:43	54.5
842	2017/04/21 08:27:44	55.5
843	2017/04/21 08:27:45	54.7
844	2017/04/21 08:27:46	54.6
845	2017/04/21 08:27:47	55.0
846	2017/04/21 08:27:48	54.0
847	2017/04/21 08:27:49	55.3
848	2017/04/21 08:27:50	55.2
849	2017/04/21 08:27:51	55.6
850	2017/04/21 08:27:52	56.8
851	2017/04/21 08:27:53	61.5
852	2017/04/21 08:27:54	63.1
853	2017/04/21 08:27:55	60.9
854	2017/04/21 08:27:56	59.2
855	2017/04/21 08:27:57	58.4
856	2017/04/21 08:27:58	55.9
857	2017/04/21 08:27:59	54.7
858	2017/04/21 08:28:00	55.0
859	2017/04/21 08:28:01	57.7
860	2017/04/21 08:28:02	59.3
861	2017/04/21 08:28:03	61.1
862	2017/04/21 08:28:04	63.2
863	2017/04/21 08:28:05	68.4
864	2017/04/21 08:28:06	67.4
865	2017/04/21 08:28:07	65.3
866	2017/04/21 08:28:08	60.6
867	2017/04/21 08:28:09	59.0
868	2017/04/21 08:28:10	57.8
869	2017/04/21 08:28:11	56.8
870	2017/04/21 08:28:12	56.4
871	2017/04/21 08:28:13	54.9
872	2017/04/21 08:28:14	54.6

873	2017/04/21 08:28:15	54.0
874	2017/04/21 08:28:16	54.7
875	2017/04/21 08:28:17	54.8
876	2017/04/21 08:28:18	56.7
877	2017/04/21 08:28:19	55.5
878	2017/04/21 08:28:20	54.4
879	2017/04/21 08:28:21	54.5
880	2017/04/21 08:28:22	54.2
881	2017/04/21 08:28:23	54.2
882	2017/04/21 08:28:24	53.7
883	2017/04/21 08:28:25	53.6
884	2017/04/21 08:28:26	54.3
885	2017/04/21 08:28:27	53.9
886	2017/04/21 08:28:28	54.1
887	2017/04/21 08:28:29	54.5
888	2017/04/21 08:28:30	54.4
889	2017/04/21 08:28:31	54.3
890	2017/04/21 08:28:32	54.5
891	2017/04/21 08:28:33	54.6
892	2017/04/21 08:28:34	54.3
893	2017/04/21 08:28:35	54.0
894	2017/04/21 08:28:36	54.1
895	2017/04/21 08:28:37	54.9
896	2017/04/21 08:28:38	54.6
897	2017/04/21 08:28:39	54.8
898	2017/04/21 08:28:40	54.8
899	2017/04/21 08:28:41	53.9
900	2017/04/21 08:28:42	54.2

Appendix B

FHWA Roadway Construction Noise Model (RCNM) Data

Sunroad_Excavation+Grading.txt
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Excavation/Grading

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	200.0	0.0
Excavator	No	40		80.7	200.0	0.0
Grader	No	40	85.0		200.0	0.0
Dozer	No	40		81.7	200.0	0.0
Scraper	No	40		83.6	200.0	0.0
Scraper	No	40		83.6	200.0	0.0
Backhoe	No	40		77.6	200.0	0.0
Backhoe	No	40		77.6	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	68.7	64.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	68.7	64.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	73.0	69.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	69.6	65.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	71.5	67.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	71.5	67.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	65.5	61.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	65.5	61.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	73.0	75.0	N/A	N/A	N/A	N/A	N/A							

N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	650.0	0.0
Excavator	No	40		80.7	650.0	0.0
Grader	No	40	85.0		650.0	0.0
Dozer	No	40		81.7	650.0	0.0
Scraper	No	40		83.6	650.0	0.0
Scraper	No	40		83.6	650.0	0.0
Backhoe	No	40		77.6	650.0	0.0
Backhoe	No	40		77.6	650.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	58.4	54.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	58.4	54.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	62.7	58.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	59.4	55.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	61.3	57.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	61.3	57.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.3	51.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.3	51.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	62.7	64.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Building Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	200.0	0.0
Man Lift	No	20		74.7	200.0	0.0
Man Lift	No	20		74.7	200.0	0.0
Man Lift	No	20		74.7	200.0	0.0
Generator	No	50		80.6	200.0	0.0
Backhoe	No	40		77.6	200.0	0.0
Backhoe	No	40		77.6	200.0	0.0
Backhoe	No	40		77.6	200.0	0.0
Welder / Torch	No	40		74.0	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	68.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	62.7	55.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	62.7	55.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	62.7	55.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	68.6	65.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	65.5	61.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	65.5	61.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	65.5	61.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Welder / Torch	62.0	58.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	68.6	70.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	650.0	0.0
Man Lift	No	20		74.7	650.0	0.0
Man Lift	No	20		74.7	650.0	0.0
Man Lift	No	20		74.7	650.0	0.0
Generator	No	50		80.6	650.0	0.0
Backhoe	No	40		77.6	650.0	0.0
Backhoe	No	40		77.6	650.0	0.0
Backhoe	No	40		77.6	650.0	0.0
Welder / Torch	No	40		74.0	650.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	58.3	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	52.4	45.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	52.4	45.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	52.4	45.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	58.4	55.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.3	51.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.3	51.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.3	51.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	51.7	47.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	58.4	60.1	N/A	N/A	N/A	N/A	N/A							

N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Paving Phase I

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	200.0	0.0
Paver	No	50		77.2	200.0	0.0
Pavement Scarafier	No	20		89.5	200.0	0.0
Pavement Scarafier	No	20		89.5	200.0	0.0
Roller	No	20		80.0	200.0	0.0
Roller	No	20		80.0	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	65.2	62.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	65.2	62.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	77.5	70.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	77.5	70.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	68.0	61.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	68.0	61.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.5	74.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night

Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	650.0	0.0
Paver	No	50		77.2	650.0	0.0
Pavement Scarafier	No	20		89.5	650.0	0.0
Pavement Scarafier	No	20		89.5	650.0	0.0
Roller	No	20		80.0	650.0	0.0
Roller	No	20		80.0	650.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	54.9	51.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	54.9	51.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	67.2	60.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	67.2	60.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	57.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	57.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	67.2	64.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Paving Phase I

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	200.0	0.0
Paver	No	50		77.2	200.0	0.0
Pavement Scarafier	No	20		89.5	200.0	0.0
Pavement Scarafier	No	20		89.5	200.0	0.0
Roller	No	20		80.0	200.0	0.0
Roller	No	20		80.0	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	65.2	62.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	65.2	62.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	77.5	70.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	77.5	70.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	68.0	61.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	68.0	61.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.5	74.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night

Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	650.0	0.0
Paver	No	50		77.2	650.0	0.0
Pavement Scarafier	No	20		89.5	650.0	0.0
Pavement Scarafier	No	20		89.5	650.0	0.0
Roller	No	20		80.0	650.0	0.0
Roller	No	20		80.0	650.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	54.9	51.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	54.9	51.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	67.2	60.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	67.2	60.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	57.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	57.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	67.2	64.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Architectural Coating Phase I

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	65.6	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.6	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	650.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	55.4	51.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	55.4	51.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/28/2017
Case Description: Sunroad Otay Plaza - Architectural Coating Phase I

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - North of Otay Mesa Road	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	200.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	65.6	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.6	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Warehouse Complex - South of SR-905	Industrial	70.0	70.0	70.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	650.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	55.4	51.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	55.4	51.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix C

FHWA Roadway Construction Noise Model (RCNM) Reference Table

Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} @ 50 feet (dBA, slow)	Actual Measured L_{max} @ 50 feet (dBA, slow) (Samples Averaged)	Number of Actual Data Samples (Count)
All Other Equipment > 5 HP	No	50	85	N/A	0
Auger Drill Rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar Bender	No	20	80	N/A	0
Blasting	Yes	N/A	94	N/A	0
Boring Jack Power Unit	No	50	80	83	1
Chain Saw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Batch Plant	No	15	83	N/A	0
Concrete Mixer Truck	No	40	85	79	40
Concrete Pump Truck	No	20	82	81	30
Concrete Saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill Rig Truck	No	20	84	79	22
Drum Mixer	No	50	80	80	1
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flat Bed Truck	No	40	84	74	4
Front End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25KVA, VMS Signs)	No	50	70	73	74

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} @ 50 feet (dBA, slow)	Actual Measured L_{max} @ 50 feet (dBA, slow) (Samples Averaged)	Number of Actual Data Samples (Count)
Gradall	No	40	85	83	70
Grader	No	40	85	N/A	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal Boring Hydraulic Jack	No	25	80	82	6
Hydra Break Ram	Yes	10	90	N/A	0
Impact Pile Driver	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man Lift	No	20	85	75	23
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	212
Pavement Scarifier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Refrigerator Unit	No	100	82	73	3
Rivit Buster/Chipping Gun	Yes	20	85	79	19
Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand Blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Sheers (on backhoe)	No	40	85	96	5
Slurry Plant	No	100	78	78	1
Slurry Trenching Machine	No	50	82	80	75
Soil Mix Drill Rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum Excavator	No	40	85	85	149

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} @ 50 feet (dBA, slow)	Actual Measured L_{max} @ 50 feet (dBA, slow) (Samples Averaged)	Number of Actual Data Samples (Count)
(Vac-Truck)					
Vacuum Street Sweeper	No	10	80	82	19
Ventilation Fan	No	100	85	79	13
Vibrating Hopper	No	50	85	87	1
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder/Torch	No	40	73	74	5

Federal Highway Administration (FHWA). 2006. FHWA Highway Construction Noise Handbook. (FHWAHEP-06-015; DOT-VNTSC-FHWA-06-02). http://www.fhwa.dot.gov/environment/construction_noise/handbook.