Project Specific
Hydrology / Hydraulics Report

FOR:
PRELIMINARY GRADING FOR
CENTERPOINTE 78
990 North Broadway
Escondido, CA 92026

PREPARED FOR:
PACIFIC CHASSE PARTNERS, LLC
501 Santa Monica Blvd, Suite 312
Santa Monica, CA 90401

PREPARED BY:
EXCEL ENGINEERING
440 State Place
Escondido, CA 92029
Tel: (760) 745-8118
Engineer of Work
Project No: 12-005

DATE PREPARED:
April 3, 2013
Revision Date:
July 1, 2014

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION AND PURPOSE

The purposes of this project are to develop a multi retail center improve the water quality and on-site drainage system, and to analyze the proposed facilities associated with this project to ensure that downstream or offsite properties will not be adversely affected by our project's proposed development. The improvements are: parking lots, buildings, and drainage facilities. Drainage facilities, such as the bio-retention basins, are utilized for water quality purposes. Please see Water Quality Report prepared by Excel Engineering, dated May 31, 2013 and Revised June 30, 2014.

Due to the constraints of the site such as low soil infiltration rate, fairly flat topography and short hydraulic head differential therefore, a connection to an existing storm drain at the intersection of N Broadway and Lincoln Ave is anticipated to drain the bio-retention underdrain pipe. This connection is necessary in order the bioretention to work properly for a low infiltration rate project site. The big storm such as 50-year storm event will be drained to the street like the existing condition. The low flow drains into this existing public stormdrain will be insignificant flow with maximum flow of 0.14 cfs. Please see Section 6 for the analysis of this flow rate.

2.0 VICINITY MAP

The project site is located on North Broadway, in between Lincoln Avenue and Highway 78 in Escondido, San Diego County, CA. Please see Attachment A- Vicinity map.

3.0 SITE MAP

Please see Attachment B – Site map

4.0 DESCRIPTION OF WATERSHED

4.1 Existing Conditions Topography

The existing project site is a developed automobile dealership property which is no longer operated. The site size is approximately 3.69 acres, bounded on the west by residential housing, north by Lincoln Avenue, North Broadway on the east, and an earthen swale and Highway 78 to the south. The site consists of parcels in a rectangular shape, located north of Highway 78, in the City of Escondido.

There are 3 (three) outfalls in the existing project site. Three basins label as Basin A-1, B-1, C-1 drain to Outfall 1. Basin D-2 drains to Outfall 2 and Basin E-3 and F-3 drain to Outfall 3. Much of the storm water flows over the asphalt parking lots, collected in concrete gutters, and then to west Lincoln Avenue. The storm water easterly portion of the project area drains into an existing curb inlet at the corner of North Broadway and Highway 78. The southwest and southern portions flow over land and into an existing brow ditch, located in between Highway 78 and the project site.

Land use in the surrounding areas is predominantly zoned for commercial development. The soil type in this area is predominantly type “D.”
For more features of the site, please see Attachment D – Watershed Information Topographic Maps: Pre-Development Map.

4.2 Existing Conditions + Project Conditions Topography

For the purpose of hydrologic analysis, the project hydrologic condition was mimicked as close as possible to the existing conditions. There are three outfalls similar to the existing condition outfalls. Basins A-1, B-1, and E-1 drain to Outfall 1. Basin C-2 drains to Outfall 2 and Basins D-3 and E-3 drain to Outfall 3.
The flow generated on basins A, B, and C will be directed to bio-retention facilities parallel to Lincoln Avenue. Flow from Basin D-3 enters pervious paver and bio-retention facility on the southerly side of the project site. The pervious pavers/porous pavement is calculated as a detention storage to attenuate the peak flow of pre-development.
The discharge of low flow from these bio-retention facility is routed to the northeast corner of the site, where it will connect to a proposed storm drain cleanout structure, which eventually ties into the existing storm drain system at the northwest corner of North Broadway and Lincoln Ave. The storm water from the loading dock and receiving area on the southwest corner of the project is Basin E and is directed to a flume shaped structure. A 36-inch Bio Clean Flume Filters will be installed within the flume shaped structure. Please see Attachment F for the Bio Clean Fume Filter details. Basin C1 storm water is routed to a bio-retention facility on the southeast corner of the site, where it eventually discharges onto North Broadway and to an existing catch basin on the corner of North Broadway and Highway 78. Both Basins B1 and E1 storm water flows overland and onto Lincoln Ave. Please see Attachment D – Watershed Information Topographic Maps: Post-Development Map.

4.3 Hydrologic Unit Contribution

The project is within the Carlsbad Hydrologic Unit (904), Escondido Creek HA (904.6), and Escondido HSA (904.62)
Impaired Receiving Water Bodies – Escondido Creek
303(d) Listed Pollutant / Stressor – DDT, Manganese, Phosphate, Selenium, Sulfates, and Total Dissolved Solid.

5.0 METHODOLOGY

This study complies with the 2003 San Diego Hydrology Manual and City of Escondido Design and Standard Drawing. The Rational Method, as presented in section 3, workbook examples, and Escondido C factor, Intensity and T_C were utilized. Even though the amount of imperviousness in the post-development is less than the existing imperviousness, however the runoff factor for the Post-development is assumed 0.85 equal to the pre-development C factor.

5.1 Hydrology Software

The "Rational Hydrology Method, San Diego County (2003 Manual)" module of the *CIVILCADD/CIVIL DESIGN* Engineering software version 7.4 is used in this study. Rick Engineering Hydrograph software was also used to develop hydrographs from the Rational Method results. This procedure also complies with the 2003 San Diego Hydrology Manual as presented in Section 6.

City of San Diego method was selected in the program since the rainfall intensity calculation yield a similar result with City of Escondido figure 1 runoff intensity duration curve.

6.0 CALCULATIONS

6.1 Determine the Watersheds that affect the project

Please see the "Watershed Topographic Maps" for both the "Pre & Post Development" conditions in Attachment D.

6.2 Analyze 2 Year & 50 Year Storm Event using Rational Method

Please see "Pre & Post Development Hydrologic 2 Year & 50 Year 6 Storm Event Analysis" in Attachment E for the details & printouts of the calculation involved in determining the runoffs for both the 2 year & 50 year.

6.3 Analyze Q_2 and Q_{50} Year Storm using Hydrograph

In order for this project to comply with the City of Escondido Water Quality requirements as outlined in Drainage Design Standard, Section 1 point B, the 2 & 50 years storm event shall be analyzed.

6.4 Analyses and Recapitulation

For the existing condition, some amount of the storm water flows north towards Lincoln Avenue. The remaining storm water flows south towards Highway 78 and the landscaping in between the project site and Highway 78. This assumption is considered per existing gutters, buildings, and topography. In the post development, there will be similar outfalls.

Basin A-1 (1.091 Acres), Basin B-1 (0.774 Acres) and Basin E-1 (0.079) drain to Outfall 1 with peak flow rate of 50 year storm event of 5.317 cfs. Basin C-2 (0.652 Acres) flows to a bio-retention facility on the southeast corner of the project site

(Outfall 2) with peak flow rate of 1.24 cfs. Basin D-3 (0.736 Acres) enters a bio-retention facility with gravel storage underneath the parking lots southern side of the project site and is routed to west (Outfall 3) with total peak flow after storage detention 1.398 cfs. Basin E-3 (0.36 Acres) flows to a BMP flume structure on the southwest corner of the project and discharges to an existing gutter, which is located in the landscaping between the project site and Highway 78. (Please see attachment E for Hydrology calculation using CivilD program.)

Existing Condition

As we can see from Table 1, the ultimate Q_2 and Q_{50} peak flows are 6.718 cfs and 12.283 cfs, respectively. Existing condition is calculated as a whole area with 3.69 Acres in size.

Table 1. Pre-Development 2 Year and 50 Year Storm Event Peak flows

	Q (cfs)		Area (Acres)
	2 Year	50 Year	
Outfall 1	4.831	8.920	2.709
Outfall 2	0.778	1.441	0.461
Outfall 3	1.109	1.922	0.52
Total	6.718	12.283	3.69

Post Development Condition

See Table 2 and 3 below for more detail calculations:

Table 2. 2 Year Storm and 50 Year Event Peak flows

	Q (cfs)		Area (Acres)
	2 Year	50 Year	
Outfall 1	2.738	5.317	1.944
Outfall 2	0.969	1.24	0.652
Outfall 3	0.967	1.398	1.096
Total	4.674	7.955	3.69

Table 3. Runoff Recapitulation

	2 Year Storm		50 Year Storm	
	Pre	Post	Pre	Post
Q Peak runoff (cfs)	6.718	4.674	12.283	7.955

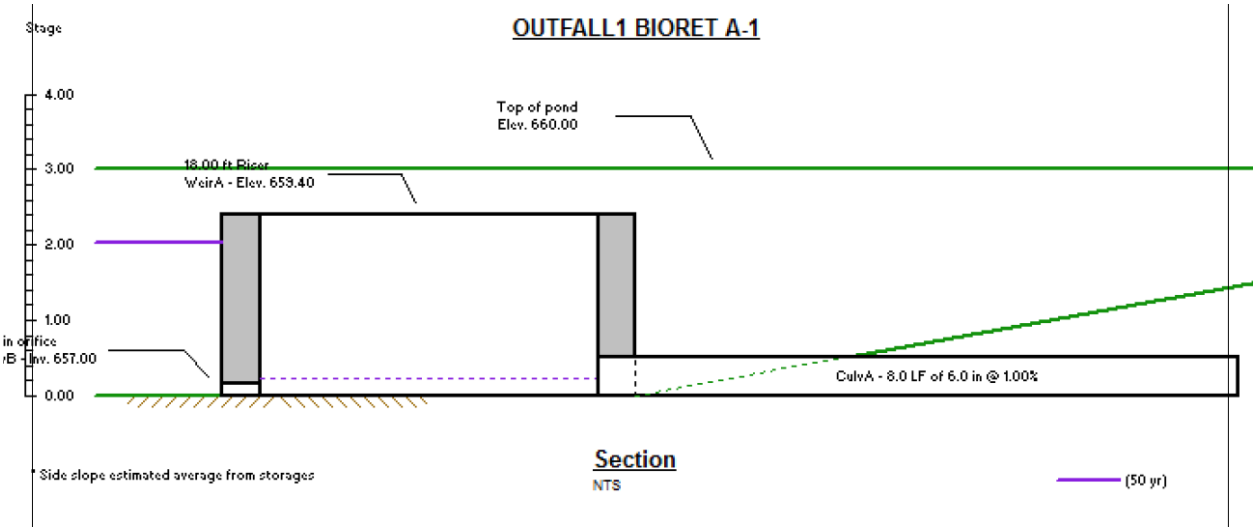
Table 2 and 3 shows that the peak flows of the 2 and 50 year storm of the Post-development are less than that of the Pre-Development. Note that Outfall 2 of the post-development is 0.191 cfs larger than that of the pre-development; this increase is not significant moreover we used a very conservative approach on using the coefficient of runoff for the calculation (assuming same C factor while the project proposed less impervious area than the existing).

6.5 Underdrain Pipe Flow and Drawdown Time Calculation (Typical)

Basin A-1 from the post-development hydrologic tributary map is analyzed to represent a typical flowrate coming out of the underdrain pipe to the existing public stormdrain. Drawdown time also can be analyzed from the outflow graph where the whole bioretention system will empty within 10.1 hours. The reason of this basin was chosen to represent the other bioretentions in this project is because Basin A-1 is the largest tributary are and has the largest peak flow rate for the bioretention inflow hydrograph.

50-YEAR STORM EVENT BIORETENTION UNDERDRAIN PIPE OUTFLOW CALCULATION

Due to the soil low infiltration rate, bioretention with underdrain is proposed. However, there is no storm drain network in the existing project site and the runoff drains to public streets without runoff treatment. This project proposes a connection to an existing public stormdrain where the existing flow is not drained to this network. The connection is meant to drain the low flow only; larger flow rate will drain over the curb outlet.
Please note that this project is exempted to Hydromodification because we are proposing less impervious area than the pre-development. Each bioretention has a 2 inch-orifice to control flowrate and is connected to a cleanout box.



Using Hydraflow Hydrograph software, the bioretention with its outlet structure was modeled. A hydrograph from basin A-1 was generated using Rick Engineering Rational Hydrograph program and then exported the result to Hydraflow software. Culvert A represents the pipe outlet to the existing public stormdrain. Culvert B is a 2-inch orifice at the base of the bioretention. Weir A is the riser or a cleanout box in this case. Weir B is the curb outlet acting as an open channel. Please see the highlighted table on the Pond Report next page.

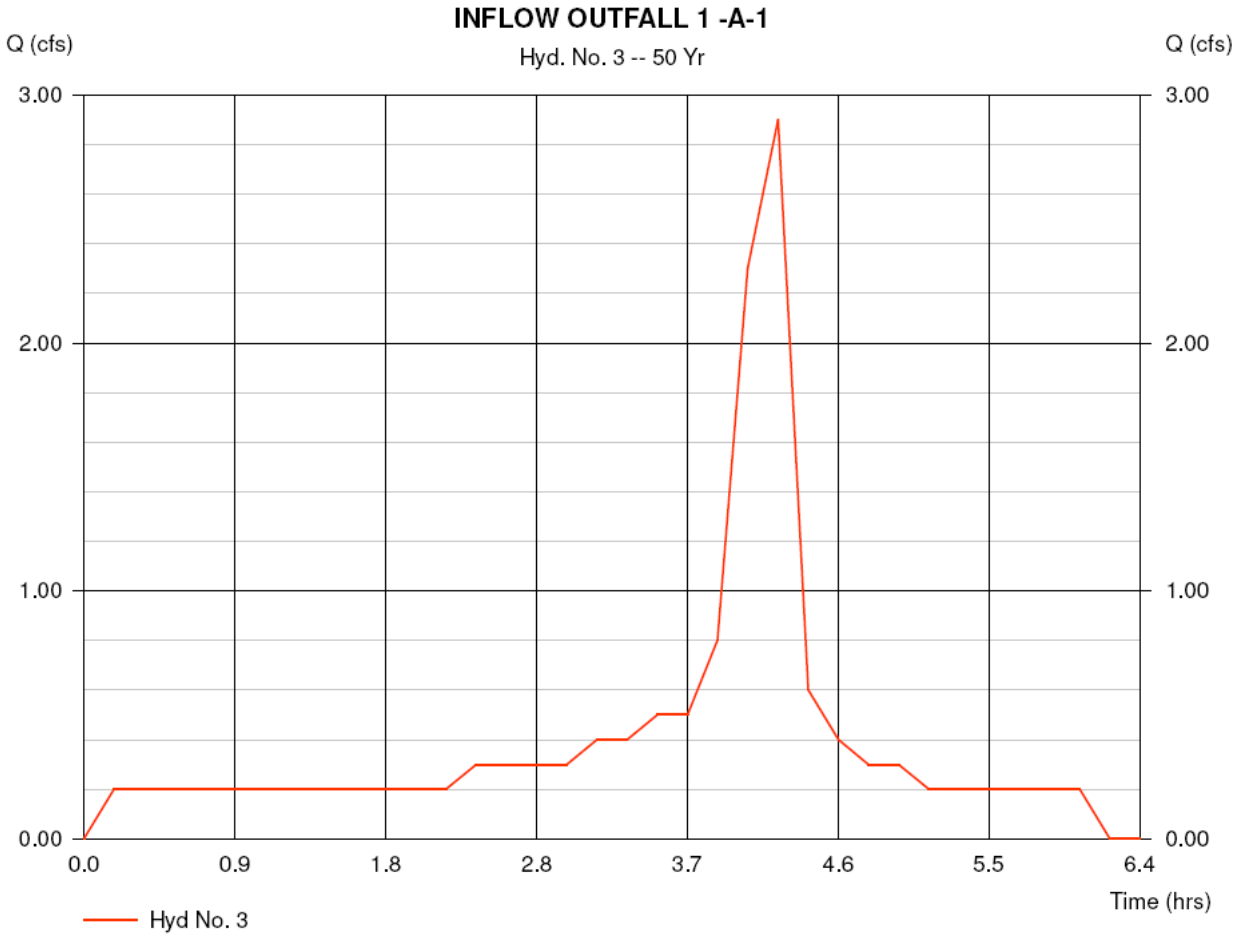
Hydrograph Plot

Hyd. No. 3

INFLOW OUTFALL 1 -A-1

Hydrograph type	= Manual	Peak discharge	= 2.90 cfs
Storm frequency	= 50 yrs	Time interval	= 11 min

Hydrograph Volume = 9,372 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Tuesday, Jul 1 2014, 3:17 PM

Pond No. 3 - OUTFALL1 BIORET A-1

Pond Data

Pond storage is based on known values

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	657.00	00	0	0
2.00	659.00	00	1,209	1,209
2.50	659.50	00	863	2,072
3.00	660.00	00	863	2,935

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	6.00	2.00	0.00	0.00
Span (in)	6.00	2.00	0.00	0.00
No. Barrels	1	1	0	0
Invert El. (ft)	657.00	657.00	0.00	0.00
Length (ft)	8.00	0.00	0.00	0.00
Slope (%)	1.00	0.00	0.00	0.00
N-Value	.013	.013	.013	.000
Orif. Coeff.	0.60	0.60	0.60	0.00
Multi-Stage	n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	18.00	3.00	0.00	0.00
Crest El. (ft)	659.40	658.60	0.00	0.00
Weir Coeff.	3.33	3.33	0.00	0.00
Weir Type	Riser	Rect	---	---
Multi-Stage	Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	657.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	1,209	659.00	0.14	0.14	---	---	0.00	2.53	---	---	---	2.67
2.50	2,072	659.50	1.41	0.02	---	---	1.39	8.53	---	---	---	9.94
3.00	2,935	660.00	1.57	0.00	---	---	0.00	16.55	---	---	---	18.12

Stage/Discharge was calculated with orifice and weir formula. In the program, the operation of these structures is treated as a function of the water surface elevation in the pond.

$$Q = C_o A \sqrt{\frac{2gh}{k}} \times Nb$$

Under Inlet Control

Q = Discharge (cfs)
A = Culvert area (sqft)
h = Distance between the water surface and the centroid of the culvert barrel (1/2 flow depth during partial flow) (ft)
Nb = Number of barrels
Co = Orifice coefficient
k = 1

Under Outlet Control

Q = Discharge (cfs)
A = Culvert area (sqft)
h = Distance between the upstream and downstream water surface
Nb = Number of barrels
Co = 1
$k = 1.5 + [(29n^2L)/R^{1.33}]$

$$Q = C_W \, L H^{1.5}$$

Q = Discharge over weir (cfs)
L = Length of the weir crest (ft)
H = Distance between water surface and the crest (ft)
Cw = Weir coefficient, typically 3.33

Hydrograph Plot

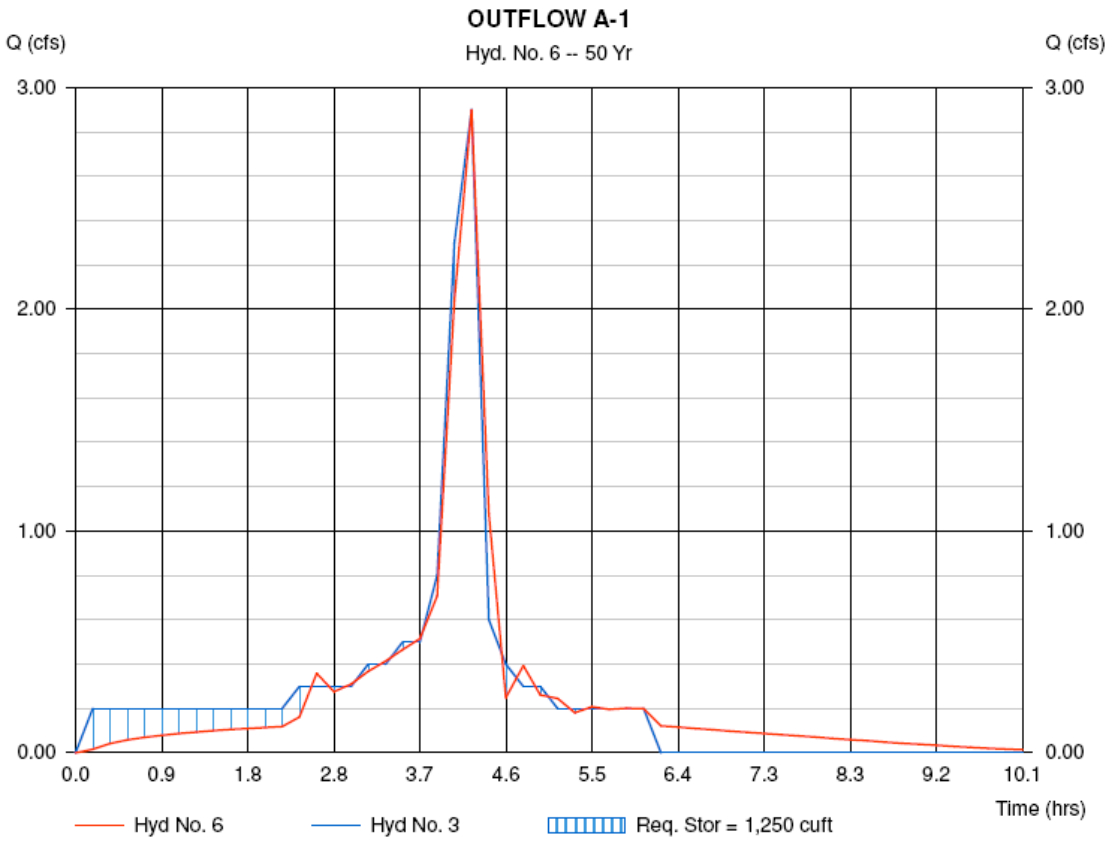
Hydraflow Hydrographs by Intelisolve — Tuesday, Jul 1 2014, 3:27 PM

Hyd. No. 6

OUTFLOW A-1

Hydrograph type	= Reservoir	Peak discharge	= 2.90 cfs
Storm frequency	= 50 yrs	Time interval	= 11 min
Inflow hyd. No.	= 3	Max. Elevation	= 659.02 ft
Reservoir name	= OUTFALL1 BIORET A-1	Max. Storage	= 1,250 cuft

Storage Indication method used. — Hydrograph Volume = 9,368 cuft



As shown on the graph above there is no detention value for the basin A-1 bio-retention system. The outflow hydrograph peak is equal to the inflow hydrograph peak. The outflow Q-50 is also 2.90 cfs as well as the inflow. This system is designed to have small low flow so that we limit the flowrate to the existing public storm drain. The Stage/Storage/Discharge table shows that when the bioretention is in its maximum water surface level (659.02), the flow rate to the existing public storm drain is 0.14 cfs.

7.0 SUMMARY

This Hydrology/Hydraulic report is prepared to evaluate the conditions of concern for the Centerpointe 78 Project. The site area is approximately 3.69 acres with the majority of the storm water flows to west Lincoln Avenue. On the south of the site there is an existing gutter surrounded by vegetation, which is where the remaining storm water flows to.

From the calculation, the peak flows of the 2 and 50 year storm of the Post-development are less than the Pre-Development peak flows. This decrease is due to the implementation of gravel storage detention and a longer time of concentration proposed in this project. Since the Bioretention infiltration is not feasible for this project, bioretention with underdrain pipe is proposed and the low flow is connected to an existing public storm drain at the corner of Lincoln Ave and Broadway. The large storms such as 50-year storm event and higher will overflow to the street similar to in the existing condition. The under drain pipe (low flow) is utilized to drain the bioretention and is connected to an existing public stormdrain in the corner of N Broadway and Lincoln Ave. The maximum of this low flow is insignificant (0.14 cfs). Therefore, we can conclude confidently that this method is not diverting the existing flow.

As presented in this study, we have shown that this project will not increase storm runoff and thus not adversely affect the existing downstream storm drain facilities.

8.0 REFERENCES

Domingue Edward N., Design Standards and Standard Drawings; City of Escondido April 2, 2014

City of Escondido; Storm Water Management Requirements and Local Standard Urban Storm Water Mitigation Plan, January 2011.

California Stormwater Quality Association; Stormwater Best Management Practice Handbook- New Development and Redevelopment, January 2003.

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

9.0 DECLARATION OF RESPONSIBLE CHARGE

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

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

ENGINEER OF WORK
Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
Fax – (760)745-1890

Project Number: 12-005

_____ _____

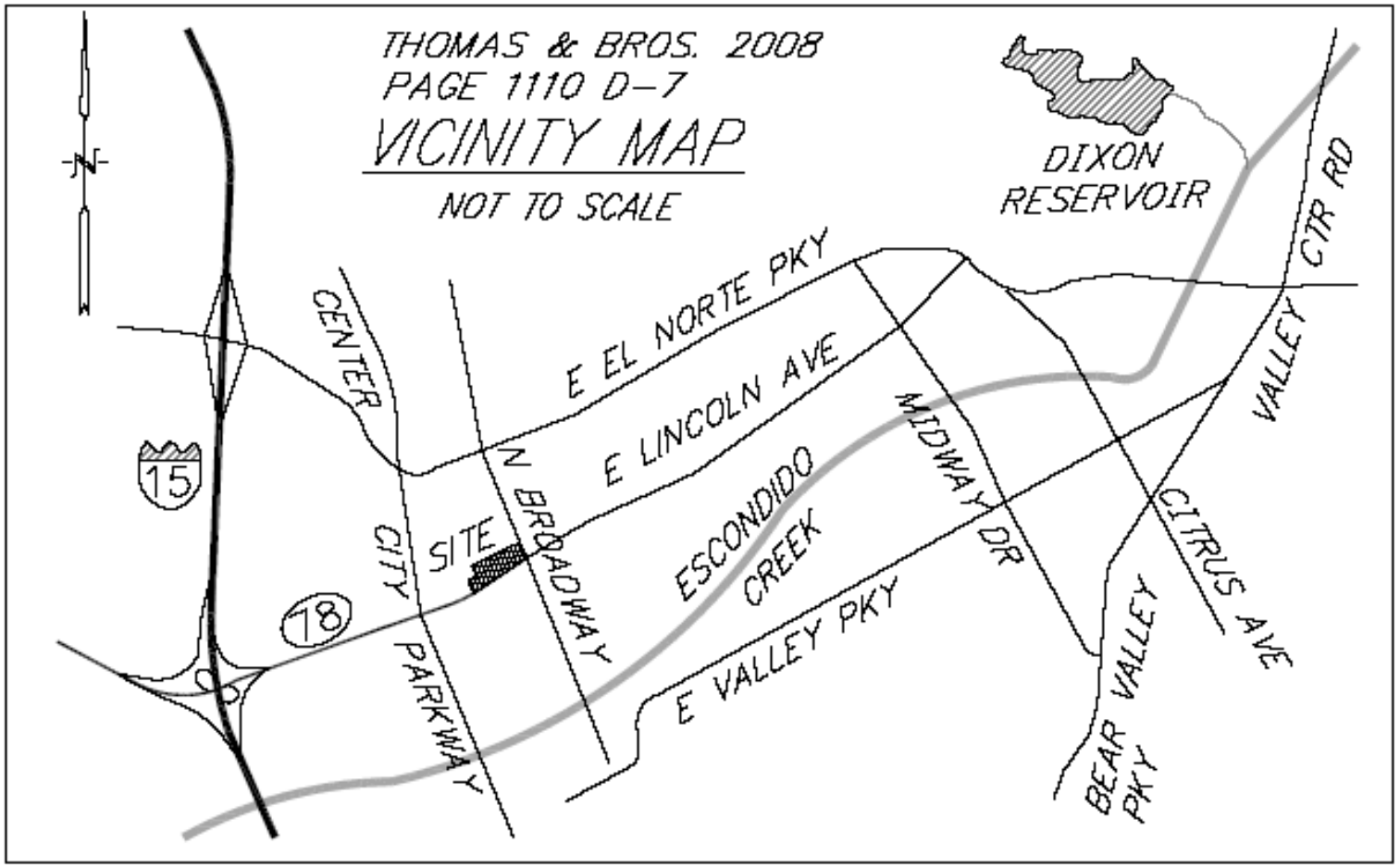
Robert D. Dentino, RCE 45629 Date
Registration Expire: December 31, 2014

ATTACHMENTS

ATTACHMENT A

VICINITY MAP

VICINITY MAP



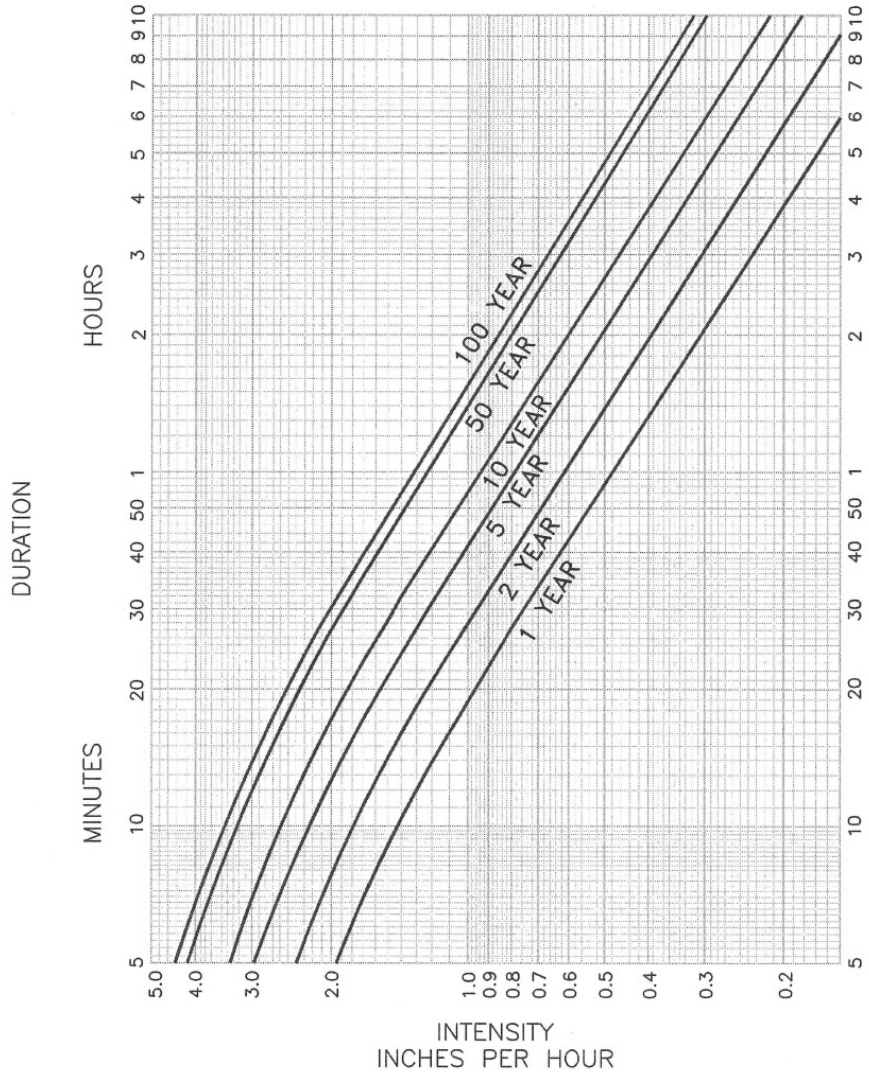
ATTACHMENT B

SITE MAP

See 36”x24” map at the attached pocket

ATTACHMENT C

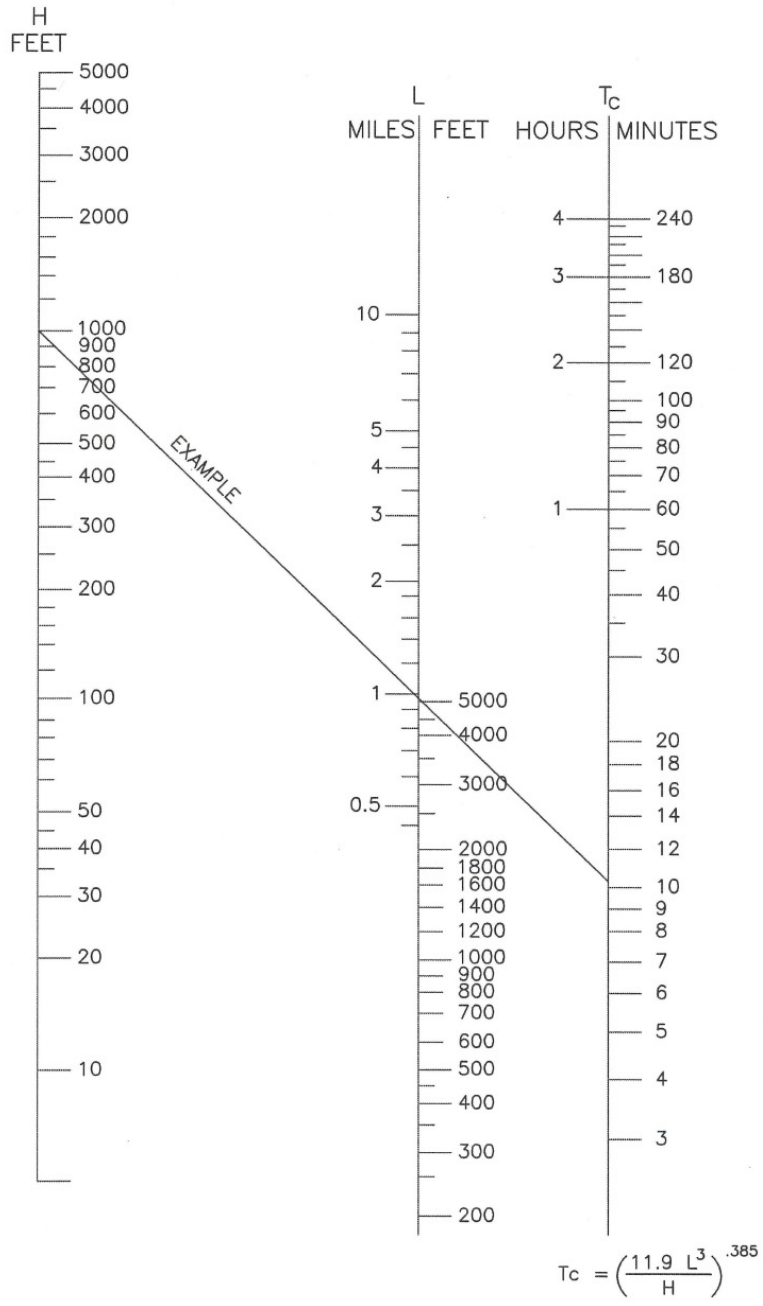
FIGURES & TABLES FROM SAN DIEGO COUNTY HYDROLOGY MANUAL



ESCONDIDO RUNOFF COEFFICIENTS

PARKS, GOLF COURSES, CEMETERIES	0.25
UNDEVELOPED LAND, OPEN SPACE	0.35
RURAL – OVER 1/2 ACRE LOTS	0.45
SINGLE FAMILY	0.55
MOBILE HOME	0.65
MULTIPLE UNITS	0.70
COMMERCIAL	0.85
INDUSTRIAL	0.95

APPROVED: DATE: 04-02-2014 P. W. DIRECTOR/CITY ENGINEER		CITY OF ESCONDIDO DEPARTMENT OF PUBLIC WORKS	SCALE: NOT TO SCALE
REVISED	APPROVED	RUN-OFF INTENSITY DURATION CURVE	FIGURE NO. 1



$$Tc = \left(\frac{11.9\ L^3}{H}\right)^{.385}$$

NOTE:

THIS CHART SHALL BE USED FOR ALL BASINS WITHIN THE CITY OF ESCONDIDO LESS 0.5 SQUARE MILE. THE MINIMUM Tc TO BE USED IS 10 MINUTES

Tc = TIME OF CONCENTRATION (HOURS)
L = LENGTH OF DRAINAGE COURSE (MILES)
H = DIFFERENCE IN ELEVATION FROM FURTHER MOST POINT OF DESIGN (FEET)

APPROVED: Edward N. Domingue P. W. DIRECTOR/CITY ENGINEER — DATE: 04-02-2014	CITY OF ESCONDIDO DEPARTMENT OF PUBLIC WORKS	SCALE: NOT TO SCALE
REVISED / APPROVED	RUNOFF TIME CHART	FIGURE NO. 2

ATTACHMENT D
WATERSHED INFORMATION

Topographic Maps

ATTACHMENT E

PRE/POST DEVELOPMENT HYDROLOGIC
2 YEAR & 50 YEAR 6 HR STORM ANALYSES

PRE-DEVELOPMENT

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/30/14
--------------------------------------------------------------------------
12005 OUTFALL 1 BASIN A-1, B-1, AND C-1
PRE-DEVELPMENT - 2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005PRE2YROUT1
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   57.000(Ft.)
Highest elevation =  663.500(Ft.)
Lowest elevation =  662.800(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0108^3)/(  0.70)]^.385=  0.96 +   4.10 min. =     5.06 min.
Rainfall intensity (I) =      2.475(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.261(CFS)
Total initial stream area =        0.117(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.716(CFS)
Depth of flow =   0.429(Ft.), Average velocity =   3.102(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              1.50              0.00
```

```
       3             3.00              0.50
Manning's 'N' friction factor =   0.014
-----------------------------------------------------------------
Sub-Channel flow  =      1.716(CFS)
  '     '       flow top width =      2.577(Ft.)
  '     '    velocity=    3.102(Ft/s)
  '     '       area =      0.553(Sq.Ft)
  '     '       Froude number =     1.180

Upstream point elevation =   662.800(Ft.)
Downstream point elevation =   659.800(Ft.)
Flow length =   421.000(Ft.)
Travel time  =    2.26 min.
Time of concentration =    7.32 min.
Depth of flow =   0.429(Ft.)
Average velocity =   3.102(Ft/s)
Total irregular channel flow =     1.716(CFS)
Irregular channel normal depth above invert elev. =   0.429(Ft.)
Average velocity of channel(s) =   3.102(Ft/s)

Sub-Channel No. 1 Critical depth =      0.457(Ft.)
  '     '       '     Critical flow top width =      2.742(Ft.)
  '     '       '     Critical flow velocity=    2.739(Ft/s)
  '     '       '     Critical flow area =      0.627(Sq.Ft)

 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      2.029(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      2.385(CFS) for    1.302(Ac.)
Total runoff =      2.647(CFS)        Total area =        1.42(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        7.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Depth of flow =   0.249(Ft.), Average velocity =   2.127(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.014
-----------------------------------------------------------------
Sub-Channel flow  =      2.647(CFS)
  '     '       flow top width =      9.976(Ft.)
  '     '    velocity=    2.127(Ft/s)
  '     '       area =      1.244(Sq.Ft)
  '     '       Froude number =     1.062

Upstream point elevation =   659.800(Ft.)
Downstream point elevation =   658.500(Ft.)
Flow length =   195.000(Ft.)
Travel time  =    1.53 min.
Time of concentration =    8.85 min.
Depth of flow =   0.249(Ft.)
Average velocity =   2.127(Ft/s)
Total irregular channel flow =     2.647(CFS)
Irregular channel normal depth above invert elev. =   0.249(Ft.)
Average velocity of channel(s) =   2.127(Ft/s)

Sub-Channel No. 1 Critical depth =      0.256(Ft.)
  '     '       '     Critical flow top width =     10.234(Ft.)
```

```
  '     '       '     Critical flow velocity=    2.022(Ft/s)
  '     '       '     Critical flow area =      1.309(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.419(Ac.)
Runoff from this stream =      2.647(CFS)
Time of concentration =    8.85 min.
Rainfall intensity =     1.837(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  661.000(Ft.)
Lowest elevation =  660.300(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0114^3)/(  0.70)]^.385=  1.01 +   4.10 min. =     5.11 min.
Rainfall intensity (I) =      2.459(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.169(CFS)
Total initial stream area =        0.076(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        7.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   660.300(Ft.)
Downstream point elevation =   659.000(Ft.)
Channel length thru subarea  =   216.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.788(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.788(CFS)
Depth of flow =   0.117(Ft.), Average velocity =   1.156(Ft/s)
Channel flow top width =   11.677(Ft.)
Flow Velocity =    1.16(Ft/s)
Travel time  =    3.11 min.
Time of concentration =    8.23 min.
Critical depth =      0.109(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      1.908(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      0.961(CFS) for    0.558(Ac.)
```

```
Total runoff =      1.130(CFS)        Total area =        0.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.634(Ac.)
Runoff from this stream =      1.130(CFS)
Time of concentration =    8.23 min.
Rainfall intensity =     1.908(In/Hr)
Summary of stream data:

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


1        2.647      8.85               1.837
2        1.130      8.23               1.908
Qmax(1) =
          1.000 *    1.000 *     2.647) +
          0.963 *    1.000 *     1.130) + =       3.735
Qmax(2) =
          1.000 *    0.930 *     2.647) +
          1.000 *    1.000 *     1.130) + =       3.592

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.647       1.130
Maximum flow rates at confluence using above data:
        3.735        3.592
Area of streams before confluence:
        1.419        0.634
Results of confluence:
Total flow rate =      3.735(CFS)
Time of concentration =     8.845 min.
Effective stream area after confluence =      2.053(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station       10.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.276(Ft.), Average velocity =   2.447(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.014
------------------------------------------------------------------
Sub-Channel flow  =      3.735(CFS)
  '     '       flow top width =     11.051(Ft.)
  '     '    velocity=    2.447(Ft/s)
  '     '       area =      1.527(Sq.Ft)
  '     '       Froude number =     1.160

Upstream point elevation =   658.500(Ft.)
Downstream point elevation =   658.000(Ft.)
Flow length =    65.000(Ft.)
Travel time  =    0.44 min.
Time of concentration =    9.29 min.
Depth of flow =   0.276(Ft.)
Average velocity =   2.447(Ft/s)
Total irregular channel flow =     3.735(CFS)
Irregular channel normal depth above invert elev. =   0.276(Ft.)
Average velocity of channel(s) =   2.447(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.293(Ft.)
  '     '       '     Critical flow top width =     11.719(Ft.)
  '     '       '     Critical flow velocity=    2.176(Ft/s)
  '     '       '     Critical flow area =      1.717(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.053(Ac.)
Runoff from this stream =      3.735(CFS)
Time of concentration =    9.29 min.
Rainfall intensity =     1.791(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  662.200(Ft.)
Lowest elevation =  661.300(Ft.)
Elevation difference =    0.900(Ft.)
TC=[(11.9*0.0114^3)/(  0.90)]^.385=  0.92 +   4.10 min. =     5.02 min.
Rainfall intensity (I) =      2.484(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.184(CFS)
Total initial stream area =        0.082(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   661.300(Ft.)
Downstream point elevation =   658.000(Ft.)
Channel length thru subarea  =   256.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.828(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.828(CFS)
Depth of flow =   0.103(Ft.), Average velocity =   1.558(Ft/s)
Channel flow top width =   10.310(Ft.)
Flow Velocity =    1.56(Ft/s)
Travel time  =    2.74 min.
Time of concentration =    7.76 min.
Critical depth =      0.111(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      1.967(In/Hr) for a     2.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      1.020(CFS) for    0.574(Ac.)
Total runoff =      1.204(CFS)       Total area =        0.66(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.656(Ac.)
Runoff from this stream =      1.204(CFS)
Time of concentration =    7.76 min.
Rainfall intensity =     1.967(In/Hr)
Summary of stream data:

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


1        3.735      9.29               1.791
2        1.204      7.76               1.967
Qmax(1) =
          1.000 *    1.000 *     3.735) +
          0.911 *    1.000 *     1.204) + =       4.831
Qmax(2) =
          1.000 *    0.835 *     3.735) +
          1.000 *    1.000 *     1.204) + =       4.324

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.735       1.204
Maximum flow rates at confluence using above data:
        4.831        4.324
Area of streams before confluence:
        2.053        0.656
Results of confluence:
Total flow rate =      4.831(CFS)
Time of concentration =     9.288 min.
Effective stream area after confluence =      2.709(Ac.)
End of computations, total study area =           2.709 (Ac.)
```

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/30/14
--------------------------------------------------------------------------
12005 OUTFALL 2 BASIN D-2 - PREDEVELOPMENT
2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005PRE2YROUT2
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.54 min.
Initial subarea flow distance  =   30.000(Ft.)
Highest elevation =  663.000(Ft.)
Lowest elevation =  662.300(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0057^3)/(  0.70)]^.385=  0.46 +   4.54 min. =     5.00 min.
Rainfall intensity (I) =      2.491(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.209(CFS)
Total initial stream area =        0.093(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.623(CFS)
Depth of flow =   0.108(Ft.), Average velocity =   1.523(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
```

```
       3             35.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.623(CFS)
  '     '       flow top width =      7.568(Ft.)
  '     '    velocity=    1.523(Ft/s)
  '     '       area =      0.409(Sq.Ft)
  '     '       Froude number =     1.154

Upstream point elevation =   662.300(Ft.)
Downstream point elevation =   658.130(Ft.)
Flow length =   471.000(Ft.)
Travel time  =    5.15 min.
Time of concentration =   10.15 min.
Depth of flow =   0.108(Ft.)
Average velocity =   1.523(Ft/s)
Total irregular channel flow =     0.623(CFS)
Irregular channel normal depth above invert elev. =   0.108(Ft.)
Average velocity of channel(s) =   1.523(Ft/s)

Sub-Channel No. 1 Critical depth =      0.114(Ft.)
  '     '       '     Critical flow top width =      7.998(Ft.)
  '     '       '     Critical flow velocity=    1.364(Ft/s)
  '     '       '     Critical flow area =      0.457(Sq.Ft)

 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      1.711(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      0.569(CFS) for    0.368(Ac.)
Total runoff =      0.778(CFS)        Total area =        0.46(Ac.)
End of computations, total study area =           0.461 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/30/14
--------------------------------------------------------------------------
12-005 OUTFALL 3  BASIN E-3 AND F-3 - PREDEVELOPMENT
2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE: 12005PRE2YROUT3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.15 min.
Initial subarea flow distance  =   49.000(Ft.)
Highest elevation =  661.000(Ft.)
Lowest elevation =  660.400(Ft.)
Elevation difference =    0.600(Ft.)
TC=[(11.9*0.0093^3)/(  0.60)]^.385=  0.85 +   4.15 min. =     5.00 min.
Rainfall intensity (I) =      2.489(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      1.050(CFS)
Total initial stream area =        0.467(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Depth of flow =   0.178(Ft.), Average velocity =   0.659(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
```

```
Manning's 'N' friction factor =   0.040
-----------------------------------------------------------------
Sub-Channel flow  =      1.050(CFS)
  '     '       flow top width =     17.849(Ft.)
  '     '    velocity=    0.659(Ft/s)
  '     '       area =      1.593(Sq.Ft)
  '     '       Froude number =     0.389

Upstream point elevation =   660.400(Ft.)
Downstream point elevation =   655.900(Ft.)
Flow length =   570.000(Ft.)
Travel time  =   14.41 min.
Time of concentration =   19.42 min.
Depth of flow =   0.178(Ft.)
Average velocity =   0.659(Ft/s)
Total irregular channel flow =     1.050(CFS)
Irregular channel normal depth above invert elev. =   0.178(Ft.)
Average velocity of channel(s) =   0.659(Ft/s)

Sub-Channel No. 1 Critical depth =      0.122(Ft.)
  '     '       '     Critical flow top width =     12.207(Ft.)
  '     '       '     Critical flow velocity=    1.409(Ft/s)
  '     '       '     Critical flow area =      0.745(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
_________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration =    19.42 min.
Rainfall intensity =      1.220(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      0.059(CFS) for    0.054(Ac.)
Total runoff =      1.109(CFS)        Total area =        0.52(Ac.)
End of computations, total study area =           0.521 (Ac.)
```

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/25/14
--------------------------------------------------------------------------
12005 OUTFALL 1 BASIN A-1, B-1, AND C-1
PRE-DEVELPMENT - 50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005PREOUT1
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   57.000(Ft.)
Highest elevation =  663.500(Ft.)
Lowest elevation =  662.800(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0108^3)/(  0.70)]^.385=  0.96 +   4.10 min. =     5.06 min.
Rainfall intensity (I) =      4.244(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.448(CFS)
Total initial stream area =        0.117(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.944(CFS)
Depth of flow =   0.521(Ft.), Average velocity =   3.622(Ft/s)
!!Warning: Water is above left or right bank elevations
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
```

```
       2             1.50              0.00
       3             3.00              0.50
Manning's 'N' friction factor =   0.014
-----------------------------------------------------------------
Sub-Channel flow  =      2.944(CFS)
  '     '       flow top width =      3.000(Ft.)
  '     '    velocity=    3.622(Ft/s)
  '     '       area =      0.813(Sq.Ft)
  '     '       Froude number =     1.226

Upstream point elevation =   662.800(Ft.)
Downstream point elevation =   659.800(Ft.)
Flow length =   421.000(Ft.)
Travel time  =    1.94 min.
Time of concentration =    6.99 min.
Depth of flow =   0.521(Ft.)
Average velocity =   3.622(Ft/s)
Total irregular channel flow =     2.944(CFS)
Irregular channel normal depth above invert elev. =   0.521(Ft.)
Average velocity of channel(s) =   3.622(Ft/s)
!!Warning: Water is above left or right bank elevations

Sub-Channel No. 1 Critical depth =      0.559(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    3.180(Ft/s)
  '     '       '     Critical flow area =      0.926(Sq.Ft)

 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      3.690(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      4.339(CFS) for    1.302(Ac.)
Total runoff =      4.788(CFS)        Total area =        1.42(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        7.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Depth of flow =   0.311(Ft.), Average velocity =   2.467(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.014
-----------------------------------------------------------------
Sub-Channel flow  =      4.788(CFS)
  '     '       flow top width =     12.460(Ft.)
  '     '    velocity=    2.467(Ft/s)
  '     '       area =      1.941(Sq.Ft)
  '     '       Froude number =     1.102

Upstream point elevation =   659.800(Ft.)
Downstream point elevation =   658.500(Ft.)
Flow length =   195.000(Ft.)
Travel time  =    1.32 min.
Time of concentration =    8.31 min.
Depth of flow =   0.311(Ft.)
Average velocity =   2.467(Ft/s)
Total irregular channel flow =     4.788(CFS)
Irregular channel normal depth above invert elev. =   0.311(Ft.)
Average velocity of channel(s) =   2.467(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.324(Ft.)
  '     '       '     Critical flow top width =     12.969(Ft.)
  '     '       '     Critical flow velocity=    2.277(Ft/s)
  '     '       '     Critical flow area =      2.102(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.419(Ac.)
Runoff from this stream =      4.788(CFS)
Time of concentration =    8.31 min.
Rainfall intensity =     3.437(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  661.000(Ft.)
Lowest elevation =  660.300(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0114^3)/(  0.70)]^.385=  1.01 +   4.10 min. =     5.11 min.
Rainfall intensity (I) =      4.223(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.290(CFS)
Total initial stream area =        0.076(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        7.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   660.300(Ft.)
Downstream point elevation =   659.000(Ft.)
Channel length thru subarea  =   216.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      1.354(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      1.354(CFS)
Depth of flow =   0.143(Ft.), Average velocity =   1.324(Ft/s)
Channel flow top width =   14.301(Ft.)
Flow Velocity =    1.32(Ft/s)
Travel time  =    2.72 min.
Time of concentration =    7.83 min.
Critical depth =      0.136(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      3.521(In/Hr) for a    50.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      1.775(CFS) for    0.558(Ac.)
Total runoff =      2.064(CFS)       Total area =        0.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.634(Ac.)
Runoff from this stream =      2.064(CFS)
Time of concentration =    7.83 min.
Rainfall intensity =     3.521(In/Hr)
Summary of stream data:

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


1        4.788      8.31               3.437
2        2.064      7.83               3.521
Qmax(1) =
          1.000 *    1.000 *     4.788) +
          0.976 *    1.000 *     2.064) + =       6.803
Qmax(2) =
          1.000 *    0.943 *     4.788) +
          1.000 *    1.000 *     2.064) + =       6.578

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.788       2.064
Maximum flow rates at confluence using above data:
        6.803        6.578
Area of streams before confluence:
        1.419        0.634
Results of confluence:
Total flow rate =      6.803(CFS)
Time of concentration =     8.310 min.
Effective stream area after confluence =      2.053(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station       10.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.346(Ft.), Average velocity =   2.842(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              0.50
       2             0.00              0.00
       3            20.00              0.50
Manning's 'N' friction factor =   0.014
------------------------------------------------------------------
Sub-Channel flow  =      6.803(CFS)
  '     '       flow top width =     13.838(Ft.)
  '     '    velocity=    2.842(Ft/s)
  '     '       area =      2.394(Sq.Ft)
  '     '       Froude number =     1.204

Upstream point elevation =   658.500(Ft.)
Downstream point elevation =   658.000(Ft.)
Flow length =    65.000(Ft.)
Travel time  =    0.38 min.
Time of concentration =    8.69 min.
Depth of flow =   0.346(Ft.)
Average velocity =   2.842(Ft/s)
Total irregular channel flow =     6.803(CFS)
Irregular channel normal depth above invert elev. =   0.346(Ft.)
```

```
Average velocity of channel(s) =   2.842(Ft/s)

Sub-Channel No. 1 Critical depth =      0.373(Ft.)
  '     '       '     Critical flow top width =     14.922(Ft.)
  '     '       '     Critical flow velocity=    2.444(Ft/s)
  '     '       '     Critical flow area =      2.783(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.053(Ac.)
Runoff from this stream =      6.803(CFS)
Time of concentration =    8.69 min.
Rainfall intensity =     3.375(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  662.200(Ft.)
Lowest elevation =  661.300(Ft.)
Elevation difference =    0.900(Ft.)
TC=[(11.9*0.0114^3)/(  0.90)]^.385=  0.92 +   4.10 min. =     5.02 min.
Rainfall intensity (I) =      4.257(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.315(CFS)
Total initial stream area =        0.082(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   661.300(Ft.)
Downstream point elevation =   658.000(Ft.)
Channel length thru subarea  =   256.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      1.419(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      1.419(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   1.782(Ft/s)
Channel flow top width =   12.618(Ft.)
Flow Velocity =    1.78(Ft/s)
Travel time  =    2.39 min.
Time of concentration =    7.41 min.
Critical depth =      0.138(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
```

```
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      3.602(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      1.867(CFS) for    0.574(Ac.)
Total runoff =      2.182(CFS)        Total area =        0.66(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.656(Ac.)
Runoff from this stream =      2.182(CFS)
Time of concentration =    7.41 min.
Rainfall intensity =     3.602(In/Hr)
Summary of stream data:

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


1        6.803      8.69               3.375
2        2.182      7.41               3.602
Qmax(1) =
          1.000 *    1.000 *     6.803) +
          0.937 *    1.000 *     2.182) + =       8.848
Qmax(2) =
          1.000 *    0.853 *     6.803) +
          1.000 *    1.000 *     2.182) + =       7.986

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.803       2.182
Maximum flow rates at confluence using above data:
        8.848        7.986
Area of streams before confluence:
        2.053        0.656
Results of confluence:
Total flow rate =      8.848(CFS)
Time of concentration =     8.691 min.
Effective stream area after confluence =      2.709(Ac.)
End of computations, total study area =           2.709 (Ac.)
```

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 07/01/14
--------------------------------------------------------------------------
12005 OUTFALL 2 BASIN D-2 - PREDEVELOPMENT
50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005PREOUT2
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.54 min.
Initial subarea flow distance  =   30.000(Ft.)
Highest elevation =  663.000(Ft.)
Lowest elevation =  662.300(Ft.)
Elevation difference =    0.700(Ft.)
TC=[(11.9*0.0057^3)/(  0.70)]^.385=  0.46 +   4.54 min. =     5.00 min.
Rainfall intensity (I) =      4.267(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      0.358(CFS)
Total initial stream area =        0.093(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.067(CFS)
Depth of flow =   0.132(Ft.), Average velocity =   1.743(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
```

```
       3             35.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      1.067(CFS)
  '     '       flow top width =      9.261(Ft.)
  '     '    velocity=    1.743(Ft/s)
  '     '       area =      0.613(Sq.Ft)
  '     '       Froude number =     1.194

Upstream point elevation =   662.300(Ft.)
Downstream point elevation =   658.130(Ft.)
Flow length =   471.000(Ft.)
Travel time  =    4.50 min.
Time of concentration =    9.50 min.
Depth of flow =   0.132(Ft.)
Average velocity =   1.743(Ft/s)
Total irregular channel flow =     1.067(CFS)
Irregular channel normal depth above invert elev. =   0.132(Ft.)
Average velocity of channel(s) =   1.743(Ft/s)

Sub-Channel No. 1 Critical depth =      0.143(Ft.)
  '     '       '     Critical flow top width =      9.980(Ft.)
  '     '       '     Critical flow velocity=    1.500(Ft/s)
  '     '       '     Critical flow area =      0.712(Sq.Ft)

 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Rainfall intensity =      3.257(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      1.082(CFS) for    0.368(Ac.)
Total runoff =      1.441(CFS)        Total area =        0.46(Ac.)
End of computations, total study area =           0.461 (Ac.)
```

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/27/14
--------------------------------------------------------------------------
12-005 OUTFALL 3  BASIN E-3 AND F-3 - PREDEVELOPMENT
50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE: 12005PREOUT3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.15 min.
Initial subarea flow distance  =   49.000(Ft.)
Highest elevation =  661.000(Ft.)
Lowest elevation =  660.400(Ft.)
Elevation difference =    0.600(Ft.)
TC=[(11.9*0.0093^3)/(  0.60)]^.385=  0.85 +   4.15 min. =     5.00 min.
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.903
Subarea runoff =      1.799(CFS)
Total initial stream area =        0.467(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.218(Ft.), Average velocity =   0.754(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.040
------------------------------------------------------------------
Sub-Channel flow  =      1.799(CFS)
  '     '       flow top width =     21.842(Ft.)
  '     '    velocity=    0.754(Ft/s)
  '     '       area =      2.385(Sq.Ft)
  '     '       Froude number =     0.402

Upstream point elevation =   660.400(Ft.)
Downstream point elevation =   655.900(Ft.)
Flow length =   570.000(Ft.)
Travel time  =   12.60 min.
Time of concentration =   17.60 min.
Depth of flow =   0.218(Ft.)
Average velocity =   0.754(Ft/s)
Total irregular channel flow =     1.799(CFS)
Irregular channel normal depth above invert elev. =   0.218(Ft.)
Average velocity of channel(s) =   0.754(Ft/s)

Sub-Channel No. 1 Critical depth =      0.151(Ft.)
  '     '       '     Critical flow top width =     15.137(Ft.)
  '     '       '     Critical flow velocity=    1.570(Ft/s)
  '     '       '     Critical flow area =      1.146(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.850
Time of concentration =    17.60 min.
Rainfall intensity =      2.527(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.903
Subarea runoff =      0.123(CFS) for    0.054(Ac.)
Total runoff =      1.922(CFS)        Total area =        0.52(Ac.)
End of computations, total study area =           0.521 (Ac.)
```

POST-DEVELOPMENT

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 07/01/14
--------------------------------------------------------------------------
12005 OUTFALL 1 BASIN A-1, B-1, AND E-1
POST-DEVELOPMENT - 2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POST2YROUT1
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.20 min.
Initial subarea flow distance  =   56.000(Ft.)
Highest elevation =  662.000(Ft.)
Lowest elevation =  661.500(Ft.)
Elevation difference =    0.500(Ft.)
TC=[(11.9*0.0106^3)/(  0.50)]^.385=  1.07 +   4.20 min. =     5.27 min.
Rainfall intensity (I) =      2.420(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.051(CFS)
Total initial stream area =        0.025(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
__________________________________________________________________________
Upstream point elevation =   661.500(Ft.)
Downstream point elevation =   661.300(Ft.)
Channel length thru subarea  =    35.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.120(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.120(CFS)
Depth of flow =   0.058(Ft.), Average velocity =   0.709(Ft/s)
Channel flow top width =    5.827(Ft.)
Flow Velocity =    0.71(Ft/s)
```

```
Travel time  =    0.82 min.
Time of concentration =    6.09 min.
Critical depth =      0.051(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      2.237(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.127(CFS) for    0.067(Ac.)
Total runoff =      0.179(CFS)        Total area =        0.09(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   661.300(Ft.)
Downstream point/station elevation =   660.100(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.179(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.179(CFS)
Normal flow depth in pipe =    1.62(In.)
Flow top width inside pipe =    5.33(In.)
Critical Depth =    2.54(In.)
Pipe flow velocity =      4.19(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     6.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   660.100(Ft.)
Downstream point elevation =   658.900(Ft.)
Channel length thru subarea  =   216.000(Ft.)
Channel base width     =    5.700(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.263(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.263(CFS)
Depth of flow =   0.085(Ft.), Average velocity =   0.525(Ft/s)
Channel flow top width =    6.042(Ft.)
Flow Velocity =    0.52(Ft/s)
Travel time  =    6.86 min.
Time of concentration =   13.07 min.
Critical depth =      0.040(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      1.502(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.111(CFS) for    0.087(Ac.)
Total runoff =      0.290(CFS)        Total area =        0.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration =    13.07 min.
Rainfall intensity =      1.502(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.164(CFS) for    0.912(Ac.)
Total runoff =      1.454(CFS)        Total area =        1.09(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.100
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   658.370(Ft.)
Downstream point/station elevation =   658.230(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.454(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.454(CFS)
Normal flow depth in pipe =    6.54(In.)
Flow top width inside pipe =   11.95(In.)
Critical Depth =    6.12(In.)
Pipe flow velocity =      3.32(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    13.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.091(Ac.)
Runoff from this stream =      1.454(CFS)
Time of concentration =   13.21 min.
Rainfall intensity =     1.494(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.28 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  663.300(Ft.)
Lowest elevation =  661.600(Ft.)
Elevation difference =    1.700(Ft.)
TC=[(11.9*0.0114^3)/(  1.70)]^.385=  0.72 +   4.28 min. =     5.00 min.
Rainfall intensity (I) =      2.490(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.080(CFS)
Total initial stream area =        0.038(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________________
Upstream point elevation =   661.600(Ft.)
Downstream point elevation =   660.700(Ft.)
Channel length thru subarea  =   167.000(Ft.)
Channel base width     =    8.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      0.859(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.859(CFS)
Depth of flow =   0.080(Ft.), Average velocity =   1.332(Ft/s)
Channel flow top width =    8.160(Ft.)
Flow Velocity =    1.33(Ft/s)
Travel time  =    2.09 min.
Time of concentration =    7.09 min.
Critical depth =      0.071(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      2.063(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
```

```
Subarea runoff =      1.290(CFS) for    0.736(Ac.)
Total runoff =      1.371(CFS)        Total area =        0.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   660.700(Ft.)
Downstream point/station elevation =   660.560(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.371(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.371(CFS)
Normal flow depth in pipe =    6.51(In.)
Flow top width inside pipe =   11.96(In.)
Critical Depth =    5.94(In.)
Pipe flow velocity =      3.15(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     7.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        5.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Depth of flow =   0.194(Ft.), Average velocity =   1.822(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.371(CFS)
  '     '       flow top width =      7.759(Ft.)
  '     '    velocity=    1.822(Ft/s)
  '     '       area =      0.753(Sq.Ft)
  '     '       Froude number =     1.031

Upstream point elevation =   660.560(Ft.)
Downstream point elevation =   658.230(Ft.)
Flow length =   297.000(Ft.)
Travel time  =    2.72 min.
Time of concentration =    9.97 min.
Depth of flow =   0.194(Ft.)
Average velocity =   1.822(Ft/s)
Total irregular channel flow =     1.371(CFS)
Irregular channel normal depth above invert elev. =   0.194(Ft.)
Average velocity of channel(s) =   1.822(Ft/s)

Sub-Channel No. 1 Critical depth =      0.196(Ft.)
  '     '       '     Critical flow top width =      7.852(Ft.)
  '     '       '     Critical flow velocity=    1.779(Ft/s)
  '     '       '     Critical flow area =      0.771(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.774(Ac.)
Runoff from this stream =      1.371(CFS)
Time of concentration =    9.97 min.
Rainfall intensity =     1.726(In/Hr)
Summary of stream data:
```

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


1        1.454     13.21               1.494
2        1.371      9.97               1.726
Qmax(1) =
          1.000 *    1.000 *     1.454) +
          0.865 *    1.000 *     1.371) + =       2.640
Qmax(2) =
          1.000 *    0.755 *     1.454) +
          1.000 *    1.000 *     1.371) + =       2.469

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.454       1.371
Maximum flow rates at confluence using above data:
        2.640        2.469
Area of streams before confluence:
        1.091        0.774
Results of confluence:
Total flow rate =      2.640(CFS)
Time of concentration =    13.208 min.
Effective stream area after confluence =      1.865(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.278(Ft.), Average velocity =   1.707(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.640(CFS)
  '     '       flow top width =     11.125(Ft.)
  '     '    velocity=    1.707(Ft/s)
  '     '       area =      1.547(Sq.Ft)
  '     '       Froude number =     0.807

Upstream point elevation =   658.230(Ft.)
Downstream point elevation =   658.000(Ft.)
Flow length =    54.000(Ft.)
Travel time  =    0.53 min.
Time of concentration =   13.74 min.
Depth of flow =   0.278(Ft.)
Average velocity =   1.707(Ft/s)
Total irregular channel flow =     2.640(CFS)
Irregular channel normal depth above invert elev. =   0.278(Ft.)
Average velocity of channel(s) =   1.707(Ft/s)

Sub-Channel No. 1 Critical depth =      0.256(Ft.)
  '     '       '     Critical flow top width =     10.234(Ft.)
  '     '       '     Critical flow velocity=    2.016(Ft/s)
  '     '       '     Critical flow area =      1.309(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.865(Ac.)
Runoff from this stream =      2.640(CFS)
```

```
Time of concentration =   13.74 min.
Rainfall intensity =     1.464(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       32.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   83.000(Ft.)
Highest elevation =  661.100(Ft.)
Lowest elevation =  658.000(Ft.)
Elevation difference =    3.100(Ft.)
TC=[(11.9*0.0157^3)/(  3.10)]^.385=  0.83 +   4.10 min. =     4.93 min.
Rainfall intensity (I) =      2.509(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.168(CFS)
Total initial stream area =        0.079(Ac.)


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Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.079(Ac.)
Runoff from this stream =      0.168(CFS)
Time of concentration =    4.93 min.
Rainfall intensity =     2.509(In/Hr)
Summary of stream data:

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


1        2.640     13.74               1.464
2        0.168      4.93               2.509
Qmax(1) =
          1.000 *    1.000 *     2.640) +
          0.583 *    1.000 *     0.168) + =       2.738
Qmax(2) =
          1.000 *    0.359 *     2.640) +
          1.000 *    1.000 *     0.168) + =       1.116

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.640       0.168
Maximum flow rates at confluence using above data:
        2.738        1.116
Area of streams before confluence:
        1.865        0.079
Results of confluence:
Total flow rate =      2.738(CFS)
Time of concentration =    13.735 min.
Effective stream area after confluence =      1.944(Ac.)
End of computations, total study area =           1.944 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 07/01/14
--------------------------------------------------------------------------
12005 OUTFALL 2 BASIN C-2
POST-DEVELOPMENT - 2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POS2YRTOUT2
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------
Program License Serial Number 6312
--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   58.000(Ft.)
Highest elevation =  663.400(Ft.)
Lowest elevation =  662.600(Ft.)
Elevation difference =    0.800(Ft.)
TC=[(11.9*0.0110^3)/(  0.80)]^.385=  0.93 +   4.10 min. =     5.03 min.
Rainfall intensity (I) =      2.483(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.093(CFS)
Total initial stream area =        0.044(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       26.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.734(CFS)
Depth of flow =   0.170(Ft.), Average velocity =   1.081(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3              4.00              0.00
       4              4.00              0.80
Manning's 'N' friction factor =   0.040
--------------------------------------------------------------------
Sub-Channel flow  =      0.734(CFS)
  '     '       flow top width =      4.000(Ft.)
  '     '    velocity=    1.081(Ft/s)
  '     '       area =      0.679(Sq.Ft)
  '     '       Froude number =     0.462

Upstream point elevation =   662.600(Ft.)
Downstream point elevation =   659.160(Ft.)
Flow length =   343.000(Ft.)
```

```
Travel time  =    5.29 min.
Time of concentration =   10.32 min.
Depth of flow =   0.170(Ft.)
Average velocity =   1.081(Ft/s)
Total irregular channel flow =     0.734(CFS)
Irregular channel normal depth above invert elev. =   0.170(Ft.)
Average velocity of channel(s) =   1.081(Ft/s)

Sub-Channel No. 1 Critical depth =      0.102(Ft.)
  '     '       '     Critical flow top width =      4.000(Ft.)
  '     '       '     Critical flow velocity=    1.808(Ft/s)
  '     '       '     Critical flow area =      0.406(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      1.696(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.877(CFS) for    0.608(Ac.)
Total runoff =      0.969(CFS)        Total area =        0.65(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   659.160(Ft.)
Downstream point/station elevation =   659.000(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.969(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.969(CFS)
Normal flow depth in pipe =    5.56(In.)
Flow top width inside pipe =    8.75(In.)
Critical Depth =    5.42(In.)
Pipe flow velocity =      3.38(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.43 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.160(Ft.), Average velocity =   1.884(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.014
------------------------------------------------------------------
Sub-Channel flow  =      0.970(CFS)
  '     '       flow top width =      6.416(Ft.)
  '     '    velocity=    1.884(Ft/s)
  '     '       area =      0.515(Sq.Ft)
  '     '       Froude number =     1.172

Upstream point elevation =   659.000(Ft.)
Downstream point elevation =   657.870(Ft.)
Flow length =   120.000(Ft.)
Travel time  =    1.06 min.
Time of concentration =   11.49 min.
Depth of flow =   0.160(Ft.)
Average velocity =   1.884(Ft/s)
Total irregular channel flow =     0.969(CFS)
Irregular channel normal depth above invert elev. =   0.160(Ft.)
Average velocity of channel(s) =   1.884(Ft/s)

Sub-Channel No. 1 Critical depth =      0.171(Ft.)
  '     '       '     Critical flow top width =      6.836(Ft.)
  '     '       '     Critical flow velocity=    1.660(Ft/s)
  '     '       '     Critical flow area =      0.584(Sq.Ft)

End of computations, total study area =           0.652 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 07/01/14
--------------------------------------------------------------------------
12005 OUTFALL 3 BASIN D-3 AND E-3
POST-DEVELOPMENT - 2 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POST2YROUT3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------

Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station       18.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.33 min.
Initial subarea flow distance  =   35.000(Ft.)
Highest elevation =  663.000(Ft.)
Lowest elevation =  662.600(Ft.)
Elevation difference =    0.400(Ft.)
TC=[(11.9*0.0066^3)/(  0.40)]^.385=  0.67 +   4.33 min. =     5.00 min.
Rainfall intensity (I) =      2.488(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.051(CFS)
Total initial stream area =        0.024(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.804(CFS)
Depth of flow =   0.130(Ft.), Average velocity =   0.952(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.025
--------------------------------------------------------------------
Sub-Channel flow  =      0.804(CFS)
  '     '       flow top width =     12.996(Ft.)
  '     '    velocity=    0.952(Ft/s)
  '     '       area =      0.845(Sq.Ft)
  '     '       Froude number =     0.658

Upstream point elevation =   662.600(Ft.)
```

```
Downstream point elevation =   660.470(Ft.)
Flow length =   217.000(Ft.)
Travel time  =    3.80 min.
Time of concentration =    8.81 min.
Depth of flow =   0.130(Ft.)
Average velocity =   0.952(Ft/s)
Total irregular channel flow =     0.804(CFS)
Irregular channel normal depth above invert elev. =   0.130(Ft.)
Average velocity of channel(s) =   0.952(Ft/s)

Sub-Channel No. 1 Critical depth =      0.110(Ft.)
  '     '       '     Critical flow top width =     11.035(Ft.)
  '     '       '     Critical flow velocity=    1.320(Ft/s)
  '     '       '     Critical flow area =      0.609(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      1.841(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.114(CFS) for    0.712(Ac.)
Total runoff =      1.165(CFS)        Total area =        0.74(Ac.)


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Process from Point/Station       19.100 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.192(Ft.), Average velocity =   0.633(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.045
------------------------------------------------------------------
Sub-Channel flow  =      1.165(CFS)
  '     '       flow top width =     19.183(Ft.)
  '     '    velocity=    0.633(Ft/s)
  '     '       area =      1.840(Sq.Ft)
  '     '       Froude number =     0.360

Upstream point elevation =   660.470(Ft.)
Downstream point elevation =   656.600(Ft.)
Flow length =   462.000(Ft.)
Travel time  =   12.16 min.
Time of concentration =   20.97 min.
Depth of flow =   0.192(Ft.)
Average velocity =   0.633(Ft/s)
Total irregular channel flow =     1.165(CFS)
Irregular channel normal depth above invert elev. =   0.192(Ft.)
Average velocity of channel(s) =   0.633(Ft/s)

Sub-Channel No. 1 Critical depth =      0.128(Ft.)
  '     '       '     Critical flow top width =     12.793(Ft.)
  '     '       '     Critical flow velocity=    1.424(Ft/s)
  '     '       '     Critical flow area =      0.818(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.736(Ac.)
Runoff from this stream =      1.165(CFS)
Time of concentration =   20.97 min.
Rainfall intensity =     1.170(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       30.000
```

```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.30 min.
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  661.100(Ft.)
Lowest elevation =  658.800(Ft.)
Elevation difference =    2.300(Ft.)
TC=[(11.9*0.0142^3)/(  2.30)]^.385=  0.83 +   4.30 min. =     5.13 min.
Rainfall intensity (I) =      2.455(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.154(CFS)
Total initial stream area =        0.074(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.419(CFS)
Depth of flow =   0.063(Ft.), Average velocity =   1.067(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.014
----------------------------------------------------------------
Sub-Channel flow  =      0.419(CFS)
  '     '       flow top width =     12.541(Ft.)
  '     '    velocity=    1.067(Ft/s)
  '     '       area =      0.393(Sq.Ft)
  '     '       Froude number =     1.062

Upstream point elevation =   658.800(Ft.)
Downstream point elevation =   657.400(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    2.14 min.
Time of concentration =    7.27 min.
Depth of flow =   0.063(Ft.)
Average velocity =   1.067(Ft/s)
Total irregular channel flow =     0.419(CFS)
Irregular channel normal depth above invert elev. =   0.063(Ft.)
Average velocity of channel(s) =   1.067(Ft/s)

Sub-Channel No. 1 Critical depth =      0.064(Ft.)
  '     '       '     Critical flow top width =     12.891(Ft.)
  '     '       '     Critical flow velocity=    1.010(Ft/s)
  '     '       '     Critical flow area =      0.415(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      2.035(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.439(CFS) for    0.254(Ac.)
Total runoff =      0.594(CFS)       Total area =        0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.623(CFS)
Depth of flow =   0.103(Ft.), Average velocity =   1.006(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
```

```
       2              0.00              0.00
       3              6.00              0.00
       4              6.00              0.50
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =      0.623(CFS)
  '     '       flow top width =      6.000(Ft.)
  '     '    velocity=    1.006(Ft/s)
  '     '       area =      0.619(Sq.Ft)
  '     '       Froude number =     0.552

Upstream point elevation =   657.400(Ft.)
Downstream point elevation =   656.600(Ft.)
Flow length =    66.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =    8.36 min.
Depth of flow =   0.103(Ft.)
Average velocity =   1.006(Ft/s)
Total irregular channel flow =     0.623(CFS)
Irregular channel normal depth above invert elev. =   0.103(Ft.)
Average velocity of channel(s) =   1.006(Ft/s)

Sub-Channel No. 1 Critical depth =      0.069(Ft.)
  '     '       '     Critical flow top width =      6.000(Ft.)
  '     '       '     Critical flow velocity=    1.497(Ft/s)
  '     '       '     Critical flow area =      0.416(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      1.891(In/Hr) for a     2.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.051(CFS) for    0.032(Ac.)
Total runoff =      0.645(CFS)        Total area =        0.36(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.360(Ac.)
Runoff from this stream =      0.645(CFS)
Time of concentration =    8.36 min.
Rainfall intensity =     1.891(In/Hr)
Summary of stream data:

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


1        1.165     20.97               1.170
2        0.645      8.36               1.891
Qmax(1) =
          1.000 *    1.000 *     1.165) +
          0.619 *    1.000 *     0.645) + =       1.564
Qmax(2) =
          1.000 *    0.399 *     1.165) +
          1.000 *    1.000 *     0.645) + =       1.110

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.165       0.645
Maximum flow rates at confluence using above data:
        1.564        1.110
Area of streams before confluence:
        0.736        0.360
Results of confluence:
Total flow rate =      1.564(CFS)
Time of concentration =    20.966 min.
Effective stream area after confluence =      1.096(Ac.)
End of computations, total study area =           1.096 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/27/14
--------------------------------------------------------------------------
12005 OUTFALL 1 BASIN A-1, B-1, AND E-1
POST-DEVELOPMENT - 50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POSTOUT1
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.20 min.
Initial subarea flow distance  =   56.000(Ft.)
Highest elevation =  662.000(Ft.)
Lowest elevation =  661.500(Ft.)
Elevation difference =    0.500(Ft.)
TC=[(11.9*0.0106^3)/(  0.50)]^.385=  1.07 +   4.20 min. =     5.27 min.
Rainfall intensity (I) =      4.168(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.089(CFS)
Total initial stream area =        0.025(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
__________________________________________________________________________
Upstream point elevation =   661.500(Ft.)
Downstream point elevation =   661.300(Ft.)
Channel length thru subarea  =    35.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.207(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.207(CFS)
Depth of flow =   0.071(Ft.), Average velocity =   0.812(Ft/s)
Channel flow top width =    7.144(Ft.)
Flow Velocity =    0.81(Ft/s)
```

```
Travel time  =    0.72 min.
Time of concentration =    5.98 min.
Critical depth =      0.064(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.942(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.225(CFS) for    0.067(Ac.)
Total runoff =      0.313(CFS)        Total area =        0.09(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   661.300(Ft.)
Downstream point/station elevation =   660.100(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.313(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.313(CFS)
Normal flow depth in pipe =    2.17(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    3.40(In.)
Pipe flow velocity =      4.90(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     6.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   660.100(Ft.)
Downstream point elevation =   658.900(Ft.)
Channel length thru subarea  =   216.000(Ft.)
Channel base width     =    5.700(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.461(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.461(CFS)
Depth of flow =   0.119(Ft.), Average velocity =   0.650(Ft/s)
Channel flow top width =    6.178(Ft.)
Flow Velocity =    0.65(Ft/s)
Travel time  =    5.54 min.
Time of concentration =   11.62 min.
Critical depth =      0.059(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.004(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.222(CFS) for    0.087(Ac.)
Total runoff =      0.535(CFS)        Total area =        0.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration =    11.62 min.
Rainfall intensity =      3.004(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.329(CFS) for    0.912(Ac.)
Total runoff =      2.864(CFS)        Total area =        1.09(Ac.)


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Process from Point/Station        5.000 to Point/Station        5.100
```

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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   658.370(Ft.)
Downstream point/station elevation =   658.230(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.864(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.864(CFS)
Normal flow depth in pipe =    8.61(In.)
Flow top width inside pipe =   14.83(In.)
Critical Depth =    8.16(In.)
Pipe flow velocity =      3.93(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    11.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.091(Ac.)
Runoff from this stream =      2.864(CFS)
Time of concentration =   11.74 min.
Rainfall intensity =     2.992(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.28 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  663.300(Ft.)
Lowest elevation =  661.600(Ft.)
Elevation difference =    1.700(Ft.)
TC=[(11.9*0.0114^3)/(  1.70)]^.385=  0.72 +   4.28 min. =     5.00 min.
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.138(CFS)
Total initial stream area =        0.038(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________________
Upstream point elevation =   661.600(Ft.)
Downstream point elevation =   660.700(Ft.)
Channel length thru subarea  =   167.000(Ft.)
Channel base width     =    8.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      1.472(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      1.472(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   1.645(Ft/s)
Channel flow top width =    8.221(Ft.)
Flow Velocity =    1.65(Ft/s)
Travel time  =    1.69 min.
Time of concentration =    6.69 min.
Critical depth =      0.102(Ft.)
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.759(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
```

```
Subarea runoff =      2.352(CFS) for    0.736(Ac.)
Total runoff =      2.489(CFS)        Total area =        0.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   660.700(Ft.)
Downstream point/station elevation =   660.560(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.489(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.489(CFS)
Normal flow depth in pipe =    8.14(In.)
Flow top width inside pipe =   14.94(In.)
Critical Depth =    7.58(In.)
Pipe flow velocity =      3.66(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     6.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        5.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Depth of flow =   0.243(Ft.), Average velocity =   2.115(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.489(CFS)
  '     '       flow top width =      9.705(Ft.)
  '     '    velocity=    2.115(Ft/s)
  '     '       area =      1.177(Sq.Ft)
  '     '       Froude number =     1.070

Upstream point elevation =   660.560(Ft.)
Downstream point elevation =   658.230(Ft.)
Flow length =   297.000(Ft.)
Travel time  =    2.34 min.
Time of concentration =    9.17 min.
Depth of flow =   0.243(Ft.)
Average velocity =   2.115(Ft/s)
Total irregular channel flow =     2.489(CFS)
Irregular channel normal depth above invert elev. =   0.243(Ft.)
Average velocity of channel(s) =   2.115(Ft/s)

Sub-Channel No. 1 Critical depth =      0.250(Ft.)
  '     '       '     Critical flow top width =     10.000(Ft.)
  '     '       '     Critical flow velocity=    1.992(Ft/s)
  '     '       '     Critical flow area =      1.250(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.774(Ac.)
Runoff from this stream =      2.489(CFS)
Time of concentration =    9.17 min.
Rainfall intensity =     3.303(In/Hr)
Summary of stream data:
```

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


1        2.864     11.74               2.992
2        2.489      9.17               3.303
Qmax(1) =
          1.000 *    1.000 *     2.864) +
          0.906 *    1.000 *     2.489) + =       5.119
Qmax(2) =
          1.000 *    0.781 *     2.864) +
          1.000 *    1.000 *     2.489) + =       4.727

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.864       2.489
Maximum flow rates at confluence using above data:
        5.119        4.727
Area of streams before confluence:
        1.091        0.774
Results of confluence:
Total flow rate =      5.119(CFS)
Time of concentration =    11.742 min.
Effective stream area after confluence =      1.865(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.356(Ft.), Average velocity =   2.014(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      5.119(CFS)
  '     '       flow top width =     14.260(Ft.)
  '     '    velocity=    2.014(Ft/s)
  '     '       area =      2.542(Sq.Ft)
  '     '       Froude number =     0.841

Upstream point elevation =   658.230(Ft.)
Downstream point elevation =   658.000(Ft.)
Flow length =    54.000(Ft.)
Travel time  =    0.45 min.
Time of concentration =   12.19 min.
Depth of flow =   0.356(Ft.)
Average velocity =   2.014(Ft/s)
Total irregular channel flow =     5.119(CFS)
Irregular channel normal depth above invert elev. =   0.356(Ft.)
Average velocity of channel(s) =   2.014(Ft/s)

Sub-Channel No. 1 Critical depth =      0.332(Ft.)
  '     '       '     Critical flow top width =     13.281(Ft.)
  '     '       '     Critical flow velocity=    2.322(Ft/s)
  '     '       '     Critical flow area =      2.205(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.865(Ac.)
Runoff from this stream =      5.119(CFS)
```

```
Time of concentration =   12.19 min.
Rainfall intensity =     2.947(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       32.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   83.000(Ft.)
Highest elevation =  661.100(Ft.)
Lowest elevation =  658.000(Ft.)
Elevation difference =    3.100(Ft.)
TC=[(11.9*0.0157^3)/(  3.10)]^.385=  0.83 +   4.10 min. =     4.93 min.
Rainfall intensity (I) =      4.292(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.079(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.079(Ac.)
Runoff from this stream =      0.288(CFS)
Time of concentration =    4.93 min.
Rainfall intensity =     4.292(In/Hr)
Summary of stream data:

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


1        5.119     12.19               2.947
2        0.288      4.93               4.292
Qmax(1) =
          1.000 *    1.000 *     5.119) +
          0.687 *    1.000 *     0.288) + =       5.317
Qmax(2) =
          1.000 *    0.405 *     5.119) +
          1.000 *    1.000 *     0.288) + =       2.359

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.119       0.288
Maximum flow rates at confluence using above data:
        5.317        2.359
Area of streams before confluence:
        1.865        0.079
Results of confluence:
Total flow rate =      5.317(CFS)
Time of concentration =    12.189 min.
Effective stream area after confluence =      1.944(Ac.)
End of computations, total study area =           1.944 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/27/14
--------------------------------------------------------------------------
12005 OUTFALL 2 BASIN C-2
POST-DEVELOPMENT - 50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POSTOUT2
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------
Program License Serial Number 6312
--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.10 min.
Initial subarea flow distance  =   58.000(Ft.)
Highest elevation =  663.400(Ft.)
Lowest elevation =  662.600(Ft.)
Elevation difference =    0.800(Ft.)
TC=[(11.9*0.0110^3)/(  0.80)]^.385=  0.93 +   4.10 min. =     5.03 min.
Rainfall intensity (I) =      4.255(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.159(CFS)
Total initial stream area =        0.044(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       26.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   1.324(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3              4.00              0.00
       4              4.00              0.80
Manning's 'N' friction factor =   0.040
----------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '       flow top width =      4.000(Ft.)
  '     '    velocity=    1.324(Ft/s)
  '     '       area =      0.950(Sq.Ft)
  '     '       Froude number =     0.479

Upstream point elevation =   662.600(Ft.)
Downstream point elevation =   659.160(Ft.)
Flow length =   343.000(Ft.)
Travel time  =    4.32 min.
Time of concentration =    9.34 min.
Depth of flow =   0.238(Ft.)
Average velocity =   1.324(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.238(Ft.)
Average velocity of channel(s) =   1.324(Ft/s)

Sub-Channel No. 1 Critical depth =      0.145(Ft.)
  '     '       '     Critical flow top width =      4.000(Ft.)
  '     '       '     Critical flow velocity=    2.177(Ft/s)
  '     '       '     Critical flow area =      0.578(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.279(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.694(CFS) for    0.608(Ac.)
Total runoff =      1.854(CFS)        Total area =        0.65(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   659.160(Ft.)
Downstream point/station elevation =   659.000(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.854(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.854(CFS)
Normal flow depth in pipe =    6.87(In.)
Flow top width inside pipe =   11.87(In.)
Critical Depth =    6.97(In.)
Pipe flow velocity =      3.99(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.44 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
Depth of flow =   0.205(Ft.), Average velocity =   2.215(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             20.00              0.50
Manning's 'N' friction factor =   0.014
----------------------------------------------------------------
Sub-Channel flow  =      1.854(CFS)
  '     '       flow top width =      8.181(Ft.)
  '     '    velocity=    2.215(Ft/s)
  '     '       area =      0.837(Sq.Ft)
  '     '       Froude number =     1.221

Upstream point elevation =   659.000(Ft.)
Downstream point elevation =   657.870(Ft.)
Flow length =   120.000(Ft.)
Travel time  =    0.90 min.
Time of concentration =   10.34 min.
Depth of flow =   0.205(Ft.)
Average velocity =   2.215(Ft/s)
Total irregular channel flow =     1.854(CFS)
Irregular channel normal depth above invert elev. =   0.205(Ft.)
Average velocity of channel(s) =   2.215(Ft/s)

Sub-Channel No. 1 Critical depth =      0.221(Ft.)
  '     '       '     Critical flow top width =      8.828(Ft.)
  '     '       '     Critical flow velocity=    1.903(Ft/s)
  '     '       '     Critical flow area =      0.974(Sq.Ft)

End of computations, total study area =           0.652 (Ac.)
```

Hydrograph Plot

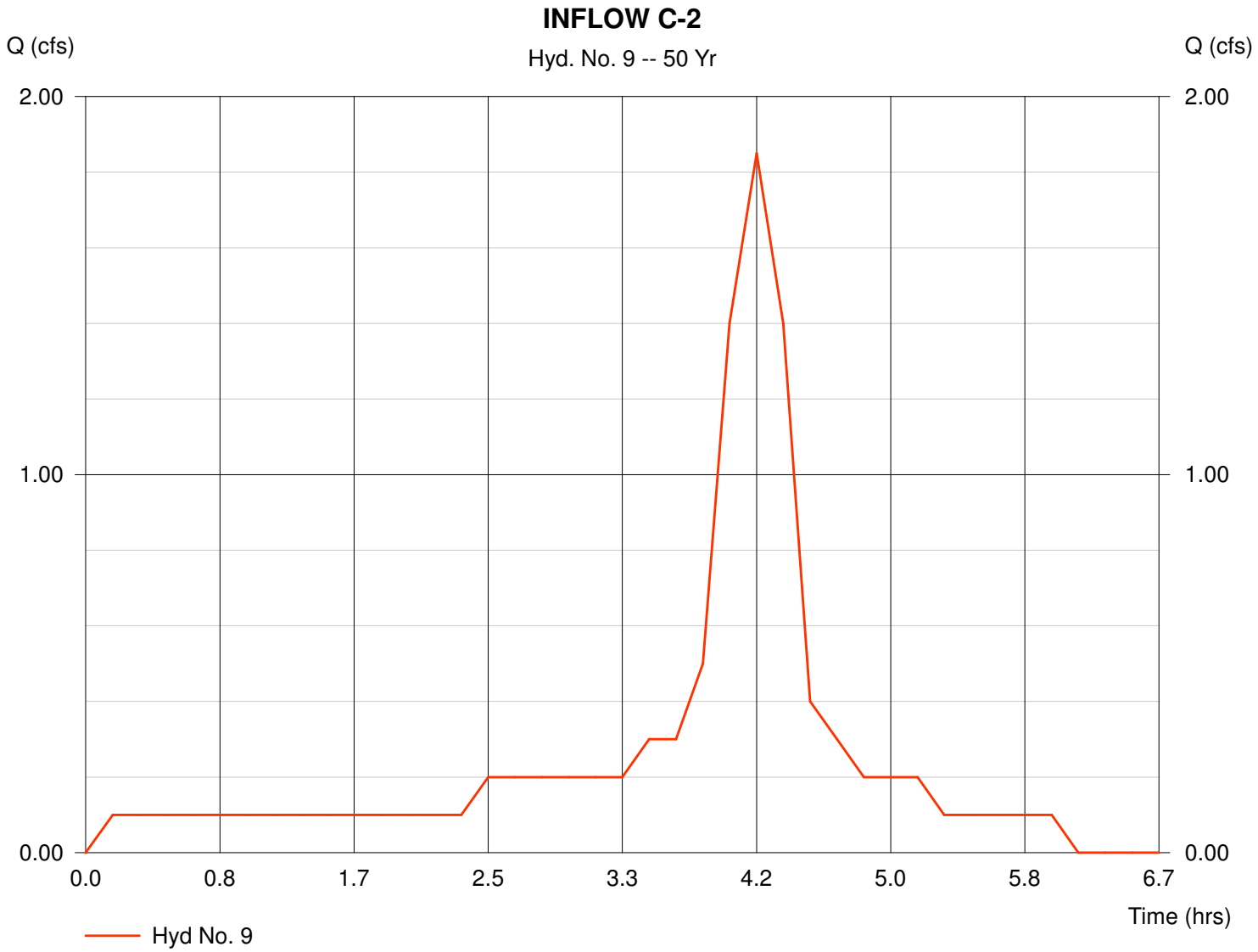
Hydraflow Hydrographs by Intelisolve | Wednesday, Jul 2 2014, 8:58 AM

Hyd. No. 9

INFLOW C-2

Hydrograph type	= Manual	Peak discharge	= 1.85 cfs
Storm frequency	= 50 yrs	Time interval	= 10 min

Hydrograph Volume = 6,090 cuft



Hydrograph Plot

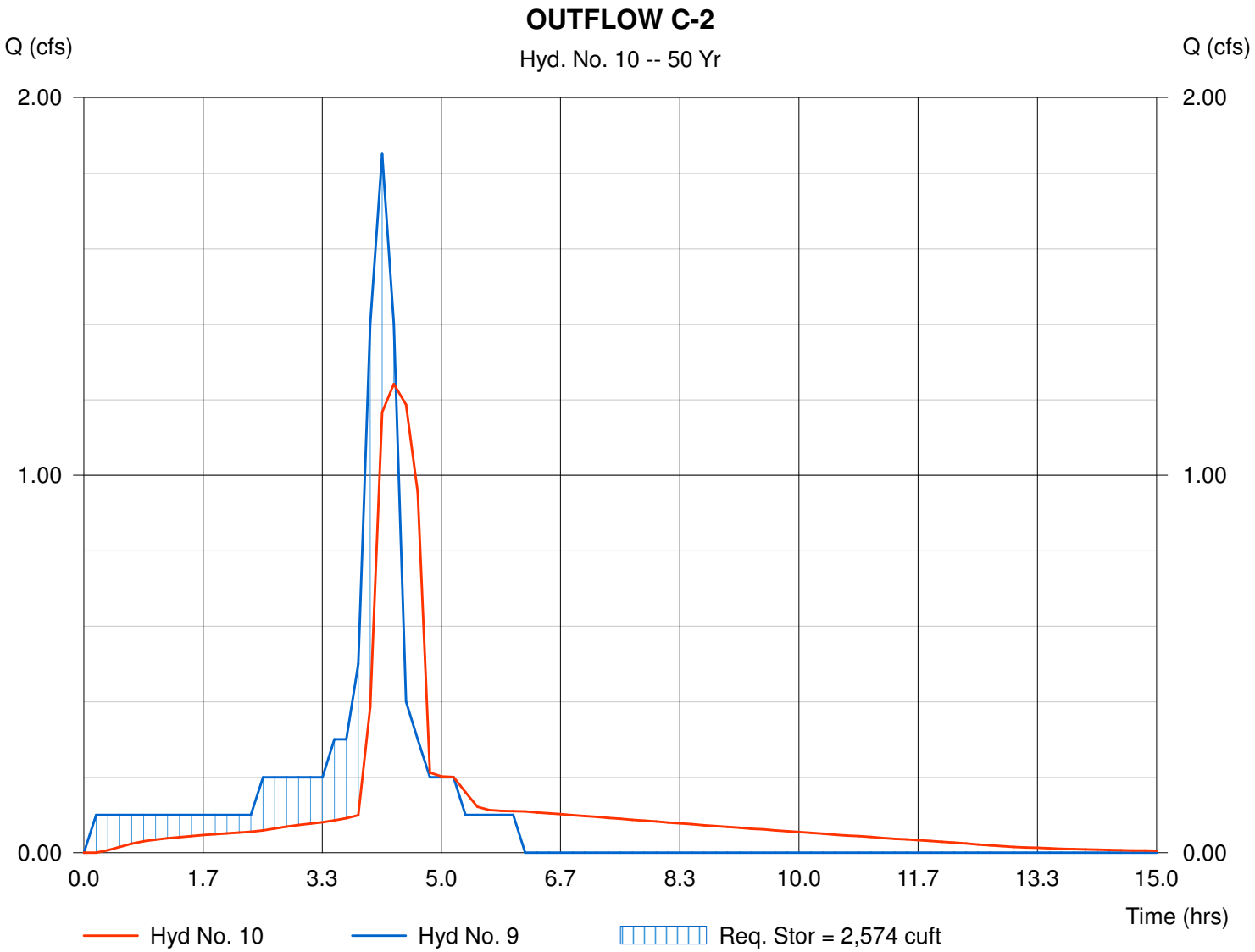
Hydraflow Hydrographs by Intelisolve | Wednesday, Jul 2 2014, 8:54 AM

Hyd. No. 10

OUTFLOW C-2

Hydrograph type	=	Reservoir	Peak discharge	=	1.24 cfs
Storm frequency	=	50 yrs	Time interval	=	10 min
Inflow hyd. No.	=	9	Max. Elevation	=	661.99 ft
Reservoir name	=	OUTFALL 2 BIORETENTION	Max. Storage	=	2,574 cuft

Storage Indication method used. | Hydrograph Volume = 6,057 cuft



```
               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/27/14
--------------------------------------------------------------------------
12005 OUTFALL 3 BASIN D-3 AND E-3
POST-DEVELOPMENT - 50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POSTOUT3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.33 min.
Initial subarea flow distance  =   35.000(Ft.)
Highest elevation =  663.000(Ft.)
Lowest elevation =  662.600(Ft.)
Elevation difference =    0.400(Ft.)
TC=[(11.9*0.0066^3)/(  0.40)]^.385=  0.67 +   4.33 min. =     5.00 min.
Rainfall intensity (I) =      4.263(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.087(CFS)
Total initial stream area =        0.024(Ac.)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.377(CFS)
Depth of flow =   0.159(Ft.), Average velocity =   1.089(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.025
--------------------------------------------------------------------
```

```
Sub-Channel flow  =      1.377(CFS)
  '     '       flow top width =     15.904(Ft.)
  '     '    velocity=    1.089(Ft/s)
  '     '       area =      1.265(Sq.Ft)
  '     '       Froude number =     0.680

Upstream point elevation =   662.600(Ft.)
Downstream point elevation =   660.470(Ft.)
Flow length =   217.000(Ft.)
Travel time  =    3.32 min.
Time of concentration =    8.33 min.
Depth of flow =   0.159(Ft.)
Average velocity =   1.089(Ft/s)
Total irregular channel flow =     1.377(CFS)
Irregular channel normal depth above invert elev. =   0.159(Ft.)
Average velocity of channel(s) =   1.089(Ft/s)

Sub-Channel No. 1 Critical depth =      0.137(Ft.)
  '     '       '     Critical flow top width =     13.672(Ft.)
  '     '       '     Critical flow velocity=    1.473(Ft/s)
  '     '       '     Critical flow area =      0.935(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.435(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.079(CFS) for    0.712(Ac.)
Total runoff =      2.166(CFS)        Total area =        0.74(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.100 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.242(Ft.), Average velocity =   0.739(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.045
------------------------------------------------------------------
Sub-Channel flow  =      2.166(CFS)
  '     '       flow top width =     24.204(Ft.)
  '     '    velocity=    0.739(Ft/s)
  '     '       area =      2.929(Sq.Ft)
  '     '       Froude number =     0.375

Upstream point elevation =   660.470(Ft.)
Downstream point elevation =   656.600(Ft.)
Flow length =   462.000(Ft.)
Travel time  =   10.41 min.
Time of concentration =   18.74 min.
Depth of flow =   0.242(Ft.)
Average velocity =   0.739(Ft/s)
Total irregular channel flow =     2.166(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =   0.739(Ft/s)

Sub-Channel No. 1 Critical depth =      0.164(Ft.)
  '     '       '     Critical flow top width =     16.406(Ft.)
  '     '       '     Critical flow velocity=    1.609(Ft/s)
  '     '       '     Critical flow area =      1.346(Sq.Ft)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.736(Ac.)
Runoff from this stream =      2.166(CFS)
Time of concentration =   18.74 min.
Rainfall intensity =     2.457(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       30.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.30 min.
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  661.100(Ft.)
Lowest elevation =  658.800(Ft.)
Elevation difference =    2.300(Ft.)
TC=[(11.9*0.0142^3)/(  2.30)]^.385=  0.83 +   4.30 min. =     5.13 min.
Rainfall intensity (I) =      4.217(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.265(CFS)
Total initial stream area =        0.074(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.720(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   1.221(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.014
------------------------------------------------------------------
Sub-Channel flow  =      0.720(CFS)
  '     '       flow top width =     15.361(Ft.)
  '     '    velocity=    1.221(Ft/s)
  '     '       area =      0.590(Sq.Ft)
  '     '       Froude number =     1.098

Upstream point elevation =   658.800(Ft.)
Downstream point elevation =   657.400(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    1.87 min.
Time of concentration =    7.00 min.
Depth of flow =   0.077(Ft.)
Average velocity =   1.221(Ft/s)
Total irregular channel flow =     0.720(CFS)
Irregular channel normal depth above invert elev. =   0.077(Ft.)
Average velocity of channel(s) =   1.221(Ft/s)

Sub-Channel No. 1 Critical depth =      0.080(Ft.)
  '     '       '     Critical flow top width =     15.918(Ft.)
  '     '       '     Critical flow velocity=    1.137(Ft/s)
  '     '       '     Critical flow area =      0.633(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.689(In/Hr) for a    50.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.796(CFS) for    0.254(Ac.)
Total runoff =      1.062(CFS)        Total area =        0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.113(CFS)
Depth of flow =   0.147(Ft.), Average velocity =   1.262(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3              6.00              0.00
       4              6.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      1.113(CFS)
  '     '       flow top width =      6.000(Ft.)
  '     '    velocity=    1.262(Ft/s)
  '     '       area =      0.883(Sq.Ft)
  '     '       Froude number =     0.580

Upstream point elevation =   657.400(Ft.)
Downstream point elevation =   656.600(Ft.)
Flow length =    66.000(Ft.)
Travel time  =    0.87 min.
Time of concentration =    7.87 min.
Depth of flow =   0.147(Ft.)
Average velocity =   1.262(Ft/s)
Total irregular channel flow =     1.113(CFS)
Irregular channel normal depth above invert elev. =   0.147(Ft.)
Average velocity of channel(s) =   1.262(Ft/s)

Sub-Channel No. 1 Critical depth =      0.103(Ft.)
  '     '       '     Critical flow top width =      6.000(Ft.)
  '     '       '     Critical flow velocity=    1.810(Ft/s)
  '     '       '     Critical flow area =      0.615(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.514(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.096(CFS) for    0.032(Ac.)
Total runoff =      1.157(CFS)        Total area =        0.36(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.360(Ac.)
Runoff from this stream =      1.157(CFS)
Time of concentration =    7.87 min.
Rainfall intensity =     3.514(In/Hr)
Summary of stream data:

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


1        2.166     18.74               2.457
2        1.157      7.87               3.514
Qmax(1) =
           1.000 *    1.000 *     2.166) +
           0.699 *    1.000 *     1.157) + =       2.975
Qmax(2) =
           1.000 *    0.420 *     2.166) +
           1.000 *    1.000 *     1.157) + =       2.067

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.166       1.157
Maximum flow rates at confluence using above data:
        2.975        2.067
Area of streams before confluence:
        0.736        0.360
Results of confluence:
Total flow rate =      2.975(CFS)
Time of concentration =    18.741 min.
Effective stream area after confluence =      1.096(Ac.)
End of computations, total study area =           1.096 (Ac.)
```

Hydrograph Plot

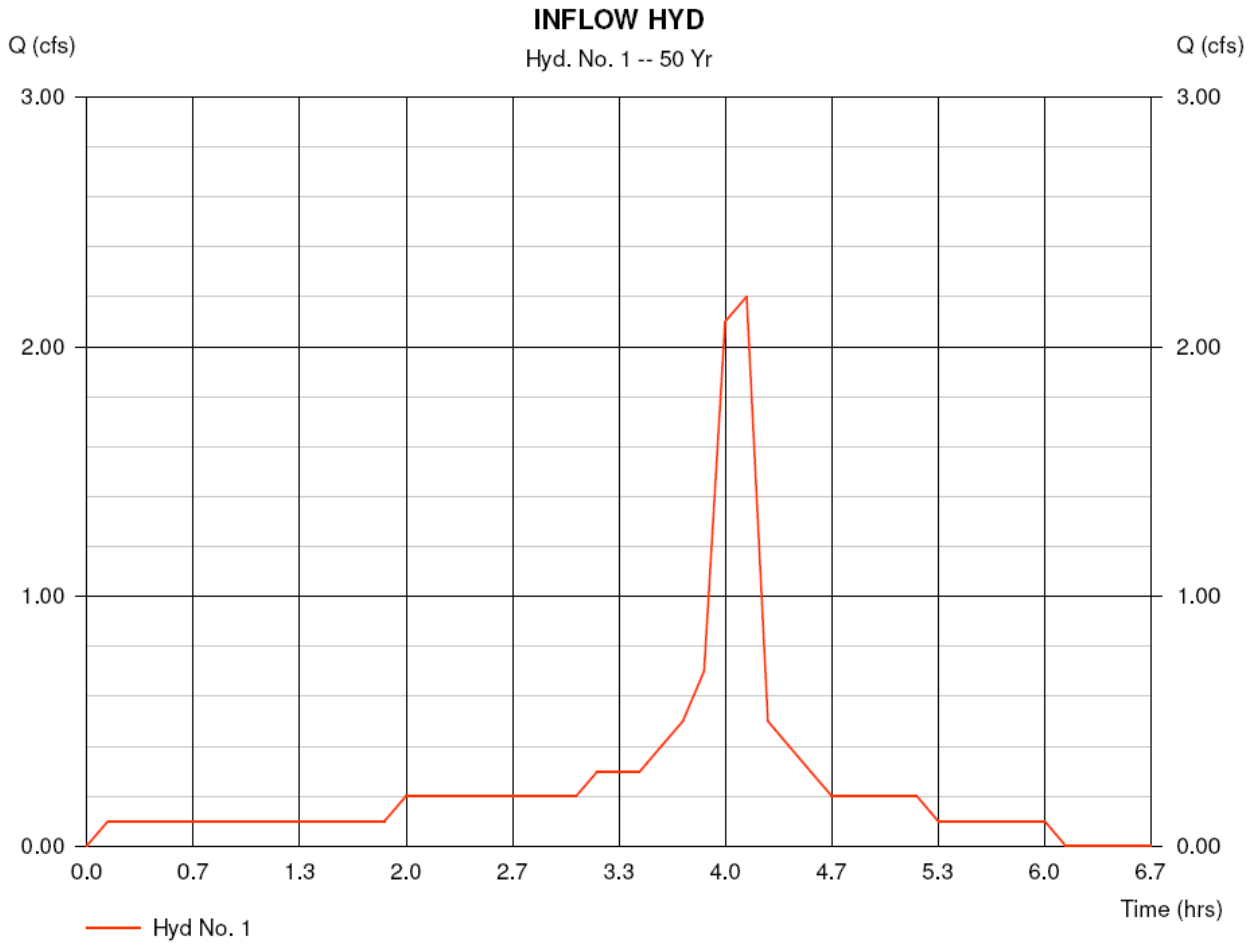
Hydraflow Hydrographs by Intelisolve — Tuesday, Jul 1 2014, 11:52 AM

Hyd. No. 1

INFLOW HYD

Hydrograph type	= Manual	Peak discharge	= 2.20 cfs
Storm frequency	= 50 yrs	Time interval	= 8 min

Hydrograph Volume = 6,144 cuft



An inflow hydrograph was created to calculate the detention capacity of the gravel storage underneath the south parking lot. Rick Engineering Rational hydrograph software was used to create this hydrograph. This inflow was taken from node 19.1 from Hydrology Post-Development Map.

The result was used in the Hydraflow Hydrograph software and then routed to the gravel storage. The effective volume for this storage is calculated based on 35% of void of the 18'x261'x2' storage size.

Pond Report

Hydraflow Hydrographs by Intelisolve — Tuesday, Jul 1 2014, 11:33 AM

Pond No. 2 - Pervious Pavement

Pond Data

Bottom LxW = 261.0 x 18.0 ft Side slope = 0.0:1 Bottom elev. = 658.98 ft Depth = 2.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)*	Total storage (cuft)*
0.00	658.98	4,698	0	0
0.10	659.08	4,698	164	164
0.20	659.18	4,698	164	329
0.30	659.28	4,698	164	493
0.40	659.38	4,698	164	658
0.50	659.48	4,698	164	822
0.60	659.58	4,698	164	987
0.70	659.68	4,698	164	1,151
0.80	659.78	4,698	164	1,315
0.90	659.88	4,698	164	1,480
1.00	659.98	4,698	164	1,644
1.10	660.08	4,698	164	1,809
1.20	660.18	4,698	164	1,973
1.30	660.28	4,698	164	2,138
1.40	660.38	4,698	164	2,302
1.50	660.48	4,698	164	2,466
1.60	660.58	4,698	164	2,631
1.70	660.68	4,698	164	2,795
1.80	660.78	4,698	164	2,960
1.90	660.88	4,698	164	3,124
2.00	660.98	4,698	164	3,289

(*35.00% voids applied)

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 4.00	0.00	0.00	0.00
Span (in)	= 4.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 658.98	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 161.00	0.00	0.00	0.00
Crest El. (ft)	= 660.88	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.020 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	658.98	0.00	---	---	---	0.00	---	---	---	0.000	0.00
0.10	164	659.08	0.02	---	---	---	0.00	---	---	---	0.002	0.03
0.20	329	659.18	0.08	---	---	---	0.00	---	---	---	0.002	0.09
0.30	493	659.28	0.15	---	---	---	0.00	---	---	---	0.002	0.16
0.40	658	659.38	0.20	---	---	---	0.00	---	---	---	0.002	0.21
0.50	822	659.48	0.24	---	---	---	0.00	---	---	---	0.002	0.24
0.60	987	659.58	0.28	---	---	---	0.00	---	---	---	0.002	0.28
0.70	1,151	659.68	0.31	---	---	---	0.00	---	---	---	0.002	0.31
0.80	1,315	659.78	0.33	---	---	---	0.00	---	---	---	0.002	0.34
0.90	1,480	659.88	0.36	---	---	---	0.00	---	---	---	0.002	0.36
1.00	1,644	659.98	0.38	---	---	---	0.00	---	---	---	0.002	0.39
1.10	1,809	660.08	0.41	---	---	---	0.00	---	---	---	0.002	0.41
1.20	1,973	660.18	0.43	---	---	---	0.00	---	---	---	0.002	0.43
1.30	2,138	660.28	0.45	---	---	---	0.00	---	---	---	0.003	0.45
1.40	2,302	660.38	0.47	---	---	---	0.00	---	---	---	0.003	0.47
1.50	2,466	660.48	0.49	---	---	---	0.00	---	---	---	0.003	0.49
1.60	2,631	660.58	0.50	---	---	---	0.00	---	---	---	0.003	0.51
1.70	2,795	660.68	0.52	---	---	---	0.00	---	---	---	0.003	0.52
1.80	2,960	660.78	0.54	---	---	---	0.00	---	---	---	0.003	0.54
1.90	3,124	660.88	0.55	---	---	---	0.00	---	---	---	0.003	0.56
2.00	3,289	660.98	0.57	---	---	---	16.95	---	---	---	0.003	17.52

Hydrograph Plot

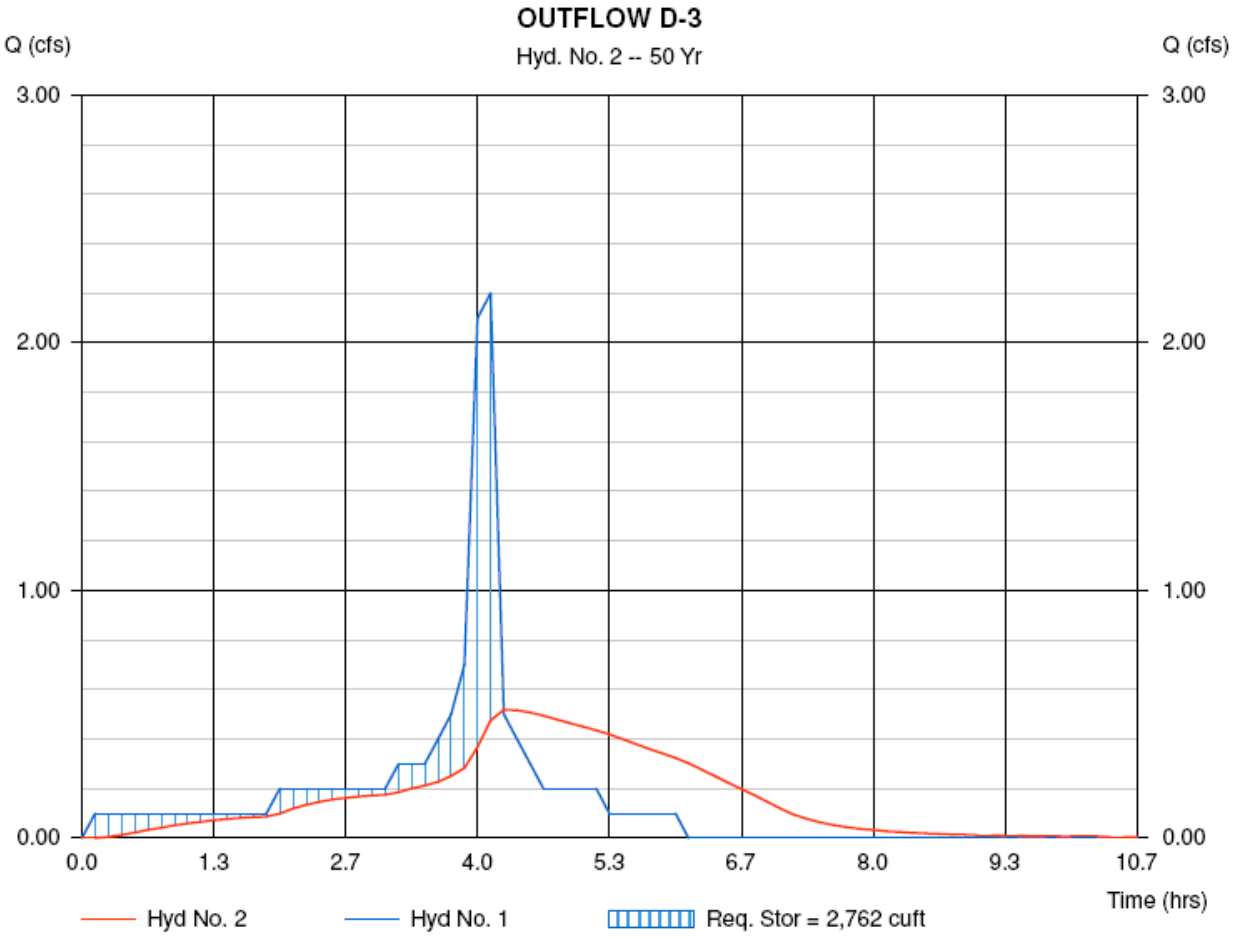
Hydraflow Hydrographs by Intelisolve — Tuesday, Jul 1 2014, 11:54 AM

Hyd. No. 2

OUTFLOW D-3

Hydrograph type	=	Reservoir	Peak discharge	=	0.52 cfs
Storm frequency	=	50 yrs	Time interval	=	8 min
Inflow hyd. No.	=	1	Max. Elevation	=	660.66 ft
Reservoir name	=	Pervious Pavement	Max. Storage	=	2,762 cuft

Storage Indication method used. — Hydrograph Volume = 6,119 cuft



The maximum water elevation for the 50 yr storm is 660.66 ft with flow rate of 0.52 cfs. Therefore, the Peak flow has been attenuated from 2.2 cfs to 0.52 cfs.

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 06/30/14
--------------------------------------------------------------------------
12005 OUTFALL 3 BASIN D-3 AND E-3 - AFTER DETENTION
POST-DEVELOPMENT - 50 YEAR STORM EVENT
GATEWAY CENTER - ESCONDIDO
FILE:12005POSTOUT3AFTDET
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6312

--------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.100 to Point/Station       19.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Rainfall intensity (I) =      2.634(In/Hr) for a    50.0 year storm
User specified values are as follows:
TC =  16.00 min.  Rain intensity =       2.63(In/Hr)
Total area =        0.736(Ac.)  Total runoff =     0.520(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.100 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   658.900(Ft.)
Downstream point/station elevation =   657.000(Ft.)
Pipe length  =   360.00(Ft.)   Manning's N = 0.014
No. of pipes = 1  Required pipe flow  =     0.520(CFS)
Given pipe size =      4.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    30.087(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     31.160(Ft.)
 Minor friction loss =      0.827(Ft.)       K-factor =   1.50
Pipe flow velocity =      5.96(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =    17.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.736(Ac.)
Runoff from this stream =      0.520(CFS)
Time of concentration =   17.01 min.
Rainfall intensity =     2.566(In/Hr)


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

```
Process from Point/Station       29.000 to Point/Station       30.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
User specified 'C' value of 0.850 given for subarea
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 + user specified time of   4.30 min.
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  661.100(Ft.)
Lowest elevation =  658.800(Ft.)
Elevation difference =    2.300(Ft.)
TC=[(11.9*0.0142^3)/(  2.30)]^.385=  0.83 +   4.30 min. =     5.13 min.
Rainfall intensity (I) =      4.217(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.265(CFS)
Total initial stream area =        0.074(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.720(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   1.221(Ft/s)
       ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00             0.50
       2            50.00             0.00
       3           100.00             0.50
Manning's 'N' friction factor =   0.014
---------------------------------------------------------------
Sub-Channel flow  =      0.720(CFS)
  '     '       flow top width =     15.361(Ft.)
  '     '    velocity=    1.221(Ft/s)
  '     '       area =      0.590(Sq.Ft)
  '     '       Froude number =     1.098

Upstream point elevation =   658.800(Ft.)
Downstream point elevation =   657.400(Ft.)
Flow length =   137.000(Ft.)
Travel time  =    1.87 min.
Time of concentration =    7.00 min.
Depth of flow =   0.077(Ft.)
Average velocity =   1.221(Ft/s)
Total irregular channel flow =     0.720(CFS)
Irregular channel normal depth above invert elev. =   0.077(Ft.)
Average velocity of channel(s) =   1.221(Ft/s)

Sub-Channel No. 1 Critical depth =      0.080(Ft.)
  '     '       '     Critical flow top width =     15.918(Ft.)
  '     '       '     Critical flow velocity=    1.137(Ft/s)
  '     '       '     Critical flow area =      0.633(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.689(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.796(CFS) for    0.254(Ac.)
Total runoff =      1.062(CFS)       Total area =        0.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.113(CFS)
Depth of flow =   0.147(Ft.), Average velocity =   1.262(Ft/s)
       ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00             0.50
```

```
       2              0.00              0.00
       3              6.00              0.00
       4              6.00              0.50
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =      1.113(CFS)
  '     '       flow top width =      6.000(Ft.)
  '     '    velocity=    1.262(Ft/s)
  '     '       area =      0.883(Sq.Ft)
  '     '       Froude number =     0.580

Upstream point elevation =   657.400(Ft.)
Downstream point elevation =   656.600(Ft.)
Flow length =    66.000(Ft.)
Travel time  =    0.87 min.
Time of concentration =    7.87 min.
Depth of flow =   0.147(Ft.)
Average velocity =   1.262(Ft/s)
Total irregular channel flow =     1.113(CFS)
Irregular channel normal depth above invert elev. =   0.147(Ft.)
Average velocity of channel(s) =   1.262(Ft/s)

Sub-Channel No. 1 Critical depth =      0.103(Ft.)
  '     '       '     Critical flow top width =      6.000(Ft.)
  '     '       '     Critical flow velocity=    1.810(Ft/s)
  '     '       '     Critical flow area =      0.615(Sq.Ft)

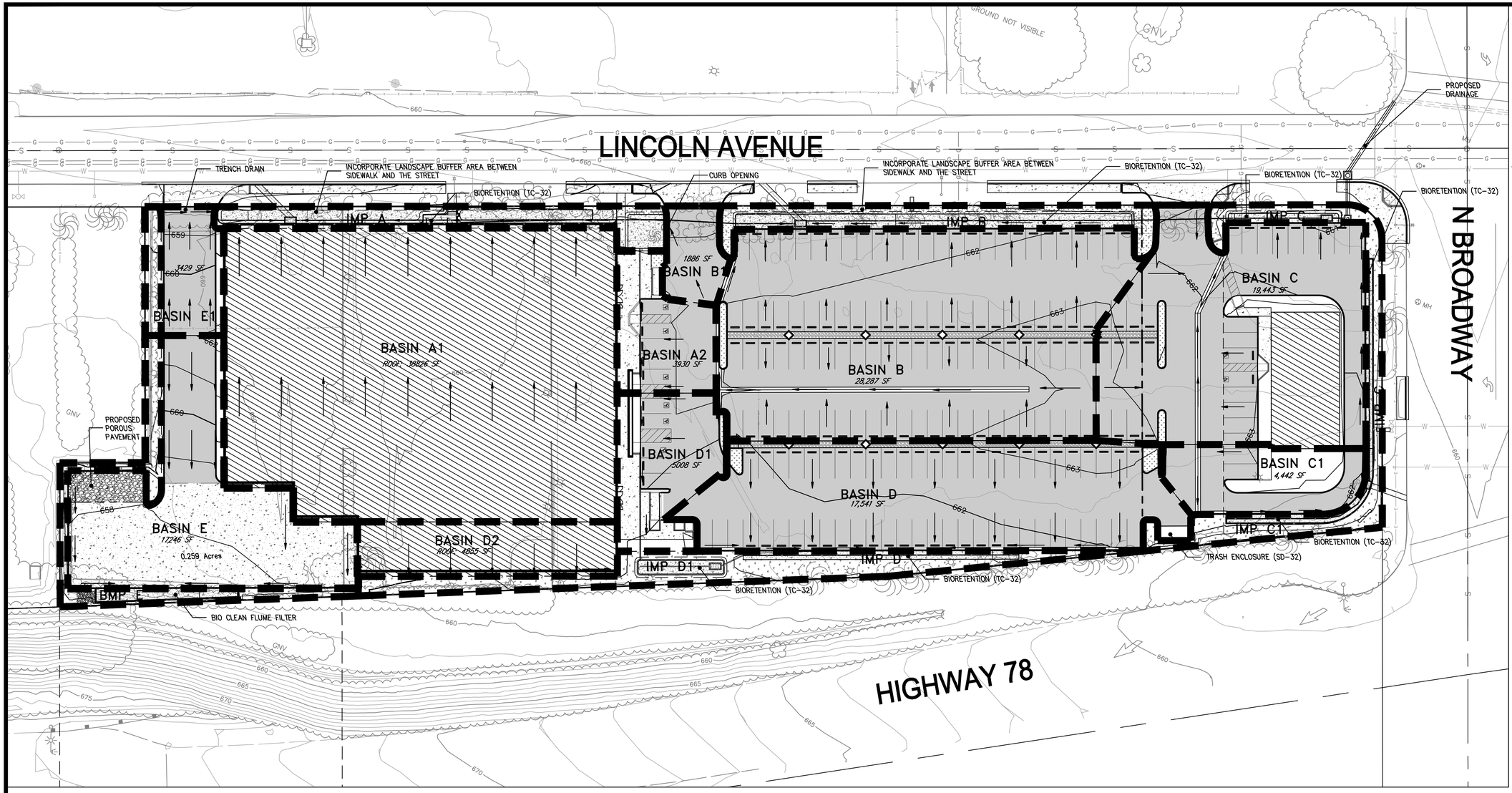
 Adding area flow to channel
User specified 'C' value of 0.850 given for subarea
Rainfall intensity =      3.514(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.096(CFS) for    0.032(Ac.)
Total runoff =      1.157(CFS)        Total area =        0.36(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.360(Ac.)
Runoff from this stream =      1.157(CFS)
Time of concentration =    7.87 min.
Rainfall intensity =     3.514(In/Hr)
Summary of stream data:

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


1        0.520     17.01               2.566
2        1.157      7.87               3.514
Qmax(1) =
          1.000 *    1.000 *     0.520) +
          0.730 *    1.000 *     1.157) + =       1.365
Qmax(2) =
          1.000 *    0.463 *     0.520) +
          1.000 *    1.000 *     1.157) + =       1.398

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.520       1.157
Maximum flow rates at confluence using above data:
        1.365        1.398
Area of streams before confluence:
        0.736        0.360
Results of confluence:
Total flow rate =      1.398(CFS)
Time of concentration =     7.871 min.
Effective stream area after confluence =      1.096(Ac.)
End of computations, total study area =           1.096 (Ac.)
```



SCALE 1"=30'

0 30 60 90 120

LEGEND - ABBREVIATIONS:

- INDICATES DMA BOUNDARY.
- FLOW LINE

IMPERVIOUS AREAS
- A/C PAVEMENT
- PCC PAVEMENT
- ROOF

PERVIOUS AREAS
- LANDSCAPE AREAS
- BIORETENTION

ENGINEER OF WORK

EXCEL ENGINEERING

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PH (760)745-8118 FAX (760)745-1890

ROBERT D. DENTINO
RCE: 45629 EXP:12/31/16

07-15-2015
DATE

REGISTERED PROFESSIONAL ENGINEER
ROBERT D. DENTINO
No. 45629
Exp.12-31-16
CIVIL
STATE OF CALIFORNIA

DESCRIPTION

THE EXISTING CONDITION IS A COMMERCIAL LOT AND CONSISTS OF A DEVELOPED AUTOMOBILE DEALERSHIP. THIS PROPERTY CURRENTLY IS NO LONGER OPERATING (ABANDONED). THE NEW DEVELOPMENT WILL INCLUDE COMPLETE DEMOLITION AND REMOVAL OF EXISTING SITE STRUCTURES AND IMPROVEMENTS, AND CONSTRUCTION OF A LARGE GROCERY STORE AND THREE SMALLER COMMERCIAL BUILDINGS, WITH THE ASSOCIATED PAVING AND LID STORMWATER TREATMENT CONTROL.

THE SOIL GROUP FOR THIS SITE IS "D" OR LOW INFILTRATION RATE AND THE GROUNDWATER DEPTHS RANGING FROM 13 TO 21 FEET.

SITE DESIGN BMPs

DELAY RAINFALL RUNOFF TIME:

- BIORETENTION FACILITY
  BIORETENTION FACILITIES TEMPORARILY STORES AND ALLOWS RUN OFF TO PERCOLATE AND FILTER THE POLLUTANTS THROUGH THE BIORETENTION AREA MEDIA.

MINIMIZING IMPERVIOUS AREAS

INCORPORATE LANDSCAPE BUFFER AREA BETWEEN SIDEWALK AND STREET.

MINIMIZE DCIAs

DIRECTING ROOF STORM WATER TO LANDSCAPE AREA AND THEN TO BIORETENTION FACILITY PRIOR TO THE STORMDRAIN.

DMA AREAS: *TABLE 1. DRAINAGE MANAGEMENT AREAS*

DMA NAME	AREA (FT²)	AREA(ACRES)	SURFACE TYPE	TREATED AREA
BASIN A1	38,826	0.89	ROOF	100%
BASIN A2	3930	0.09	A/C PAVEMENT	100%
BASIN B	28,287	0.65	A/C PAVEMENT	100%
BASIN C	19,443	0.45	ROOF, CONCRETE AND A/C	100%
BASIN D	17,541	0.40	A/C PAVEMENT	100%
BASIN D1	5008	0.115	A/C PAVEMENT	100%
BASIN D2	4855	0.112	ROOF	100%
BASIN E	17,246	0.30	CONCRETE PAVEMENT	100%
IMP A	1733	0.04	BIORETENTION	100%
IMP B	1932	0.044	BIORETENTION	100%
IMP C	778	0.018	BIORETENTION	100%
IMP C1	504	0.012	BIORETENTION	100%
IMP D	808	0.019	BIORETENTION	100%
IMP D1	399	0.009	BIORETENTION	100%
TC-BMP E	519	0.012	BIO CLEAN FLUME FILTER	100%
BASIN E1	3429	0.062	CONCRETE PAVEMENT	100%
BASIN B1	1886	0.043	A/C PAVEMENT	100%
BASIN C1	4442	0.102	A/C PAVEMENT	100%
PERVIOUS	14,026	0.322	LANDSCAPED SURFACE	100%
TOTAL	160,801	3.69 AC		100%

PROJECT SITE AREA: 3.69 AC.
TOTAL DRAINAGE MANAGEMENT AREAS=TOTAL PROJECT AREA, THEREFORE ALL PROJECT AREAS ARE ACCOUNTED FOR.
NOTE: ALL PERVIOUS AREAS IN THIS PROJECT WILL BE LANDSCAPED

TREATMENT CONTROL BMPs

BIORETENTION

POLUTANT TYPES THAT ARE EXPECTED:
- SEDIMENT, NUTRIENTS, TRASH, METALS, BACTERIA, ORGANICS
- OIL AND GREASE

TABLE 2. AREAS DRAIN TO TC-BMP BIORETENTION

BASIN	DMA AREA (SF)	C	DMA AREA X RUNOFF FACTOR	IMP SIZING FACTOR	Minimum Area req'd (sq.ft)	Area Provided (sq.ft.)	IMP NAME
BASIN A1,A2,B1,E1	47,343	1.00	47,343	0.04	1,894	2,597	IMP A
BASIN B	28,270	1.00	28,270	0.04	1,132	1,932	IMP B
BASIN C	19,428	1.00	19,428	0.04	778	788	IMP C
BASIN C1	4,443	1.00	4,443	0.04	177	504	IMP C1
BASIN D	17,555	1.00	17,555	0.04	702	808	IMP D
BASIN D1 & D2	9,844	1.00	9,844	0.04	395	399	IMP D1
BASIN E*	12,937	1.00	12,937	0.04	517	519	BMP E

MINIMUM AREA OF THE BIORETENTION FACILITY IS DETERMINED BY MULTIPLYING THE PRODUCT OF THE DMA AREA TIMES THE DMA RUNOFF FACTOR WITH THE IMP SIZING FACTOR.

C= DMA RUNOFF FACTOR 1 FOR A CONSERVATIVE ASSUMPTION AND TO COMPLY WITH 4% RULE OF THUMB

*MINIMUM AREA WAS DETERMINED IN THE SAME MANNER AS IF A BIORETENTION FACILITY WAS PROPOSED. HOWEVER IN THIS CASE, TWO 5' BIO CLEAN FLUME FILTERS WILL BE INSTALLED IN THE AREA THAT WAS DETERMINED FOR A PROPOSED BIORETENTION FACILITY.

IMPERVIOUS AREA REDUCTION				
BASIN NAME	AREA (SQFT)	PRE-DEVELOPMENT	POST-DEVELOPMENT	+INCREASE/ -DECREASE
BASIN A	46314	43890	43362	-528
BASIN B	33976	30240	29165	-1075
BASIN C	28248	27051	21710	-5341
BASIN D	31588	30849	25318	-5531
BASIN E	20675	14733	15011	-572
TOTAL	160801			

TABLE 3. AREA DRAINS TO ALTERNATIVE TREATMENT CONTROL BMP

BASIN	DMA AREA (AC)	C	DMA AREA X RUNOFF FACTOR	WQ INTENSITY	FLOW RATE (CFS)	TREATMENT FLOW (CFS.)	BMP NAME
BASIN E	0.259	1.00	0.259	0.20	0.052	0.78	BIOCLEAN

SEE WATER QUALITY TECHNICAL REPORT FOR PRODUCT'S DETAIL AND INSTALLATION.

ANTICIPATED POLLUTANTS REMOVAL EFFICIENCY

POLLUTANTS	BIORETENTION	FLUME FILTER *
SEDIMENT	HIGH	HIGH
NUTRIENTS	MEDIUM	MEDIUM-HIGH
TRASH	HIGH	HIGH
METALS	HIGH	MEDIUM-HIGH
BACTERIA	HIGH	MEDIUM-HIGH
OIL AND GREASE	HIGH	HIGH
ORGANICS	HIGH	HIGH
OXYGEN DEMANDING	HIGH	MEDIUM-HIGH

BIO CLEAN ENVIRONMENTAL SERVICE PO BOX 869 OCEANSIDE CA 92046
(760)433-7640 , www.biocleanenvironmental.com, www.modularwetlands.com

SOURCE CONTROL BMPs

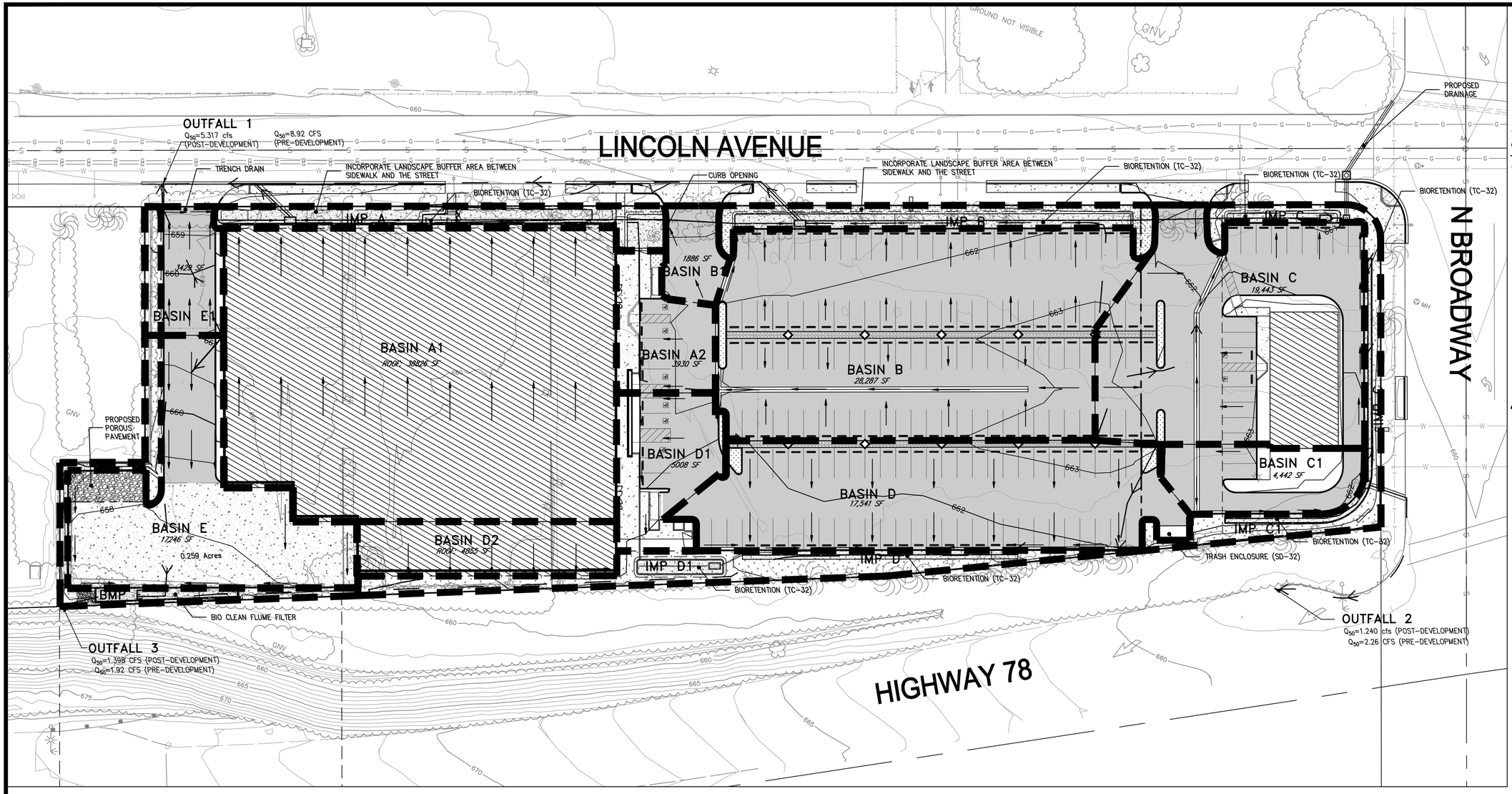
- TRASH STORAGE AREA IS PAVED WITH CONCRETE AND DESIGNED NOT TO ALLOW RUN-ON FROM ADJOINING AREAS, WALLED AND CONTAINS A ROOF OR AWNING.
- PRIVATE PARKING SWEEPING SHALL BE NO LESS THAN THE FREQUENCY OF STREET SWEEPING BY THE CITY OF ESCONDIDO ON PUBLIC STREETS.
  - PARKING AREA TO BE SWEPT BI-MONTHLY
  - SWEEP PRIOR TO THE RAINING SEASON
- DRAINAGE FACILITY INSPECTION AND MAINTENANCE:
  - INSPECTION AND MAINTENANCE GENERALLY INVOLVES ROUTINE PERIODIC MAINTENANCE SIMILAR TO LANDSCAPE AREAS.
- STENCILING AND SIGNAGE:
  - PROVIDE LABEL OF ALL STORM DRAIN INLETS AND CATCH BASINS WITHIN THE PROJECT AREA WITH PROHIBITIVE LANGUAGE SUCH AS:"NO DUMPING/ ONLY RAIN IN THE DRAIN"

CENTERPOINTE 78
DRAINAGE MANAGEMENT AREAS (DMAs) MAP, TREATMENT CONTROL BMP CALCULATIONS AND SOURCE CONTROL

APN 229-121-08, 09, 10, 11, 12, 13, 14, 15

SITE ADDRESS: 990 NORTH BROADWAY
ESCONDIDO, CA 92026

ESCONDIDO City of Choice



SCALE 1"=30'

0 30 60 90 120

LEGEND - ABBREVIATIONS:

- INDICATES DMA BOUNDARY.
- SHEET FLOW
- INDICATES FLOW LINE

IMPERVIOUS AREAS
- A/C PAVEMENT
- PCC PAVEMENT
- ROOF

PERVIOUS AREAS
- LANDSCAPE AREAS
- BIORETENTION

ENGINEER OF WORK

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ROBERT D. DENTINO
RCE: 45629 EXP:12/31/16

07-15-2015
DATE

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BASIN A1	38,826	0.89	ROOF	100%	OUTFALL 1 QPRE=8.92 CFS QPOST=5.32 CFS
BASIN A2	3930	0.09	A/C PAVEMENT	100%	
BASIN B	28,287	0.65	A/C PAVEMENT	100%	
BASIN B1	1886	0.043	A/C PAVEMENT	100%	
BASIN E1	3429	0.062	CONCRETE PAVEMENT	100%	
IMP A	1733	0.04	BIORETENTION	100%	
IMP B	1932	0.044	BIORETENTION	100%	
BASIN C	19,443	0.45	ROOF, CONCRETE AND A/C	100%	OUTFALL 2 QPRE=2.26 CFS QPOST=1.24 CFS
BASIN C1	4442	0.102	A/C PAVEMENT	100%	
IMP C	778	0.018	BIORETENTION	100%	
IMP C1	504	0.012	BIORETENTION	100%	
BASIN D2	4855	0.112	ROOF	100%	OUTFALL 3 QPRE=1.92 CFS QPOST=1.40 CFS
BASIN D	17,541	0.40	A/C PAVEMENT	100%	
BASIN D1	5008	0.115	A/C PAVEMENT	100%	
BASIN E	17,246	0.30	CONCRETE PAVEMENT	100%	
IMP D	808	0.019	BIORETENTION	100%	
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TC-BMP E	519	0.012	BIO CLEAN FLUME FILTER	100%	
PERVIOUS	14,026	0.322	LANDSCAPED SURFACE	100%	
TOTAL	160,801	3.69 AC		100%	

TREATMENT CONTROL BMPs

BIORETENTION

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POLLUTANTS	BIORETENTION	FLUME FILTER *
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METALS	HIGH	MEDIUM-HIGH
BACTERIA	HIGH	MEDIUM-HIGH
OIL AND GREASE	HIGH	HIGH
ORGANICS	HIGH	HIGH
OXYGEN DEMANDING	HIGH	MEDIUM-HIGH

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- DRAINAGE FACILITY INSPECTION AND MAINTENANCE:
  - INSPECTION AND MAINTENANCE GENERALLY INVOLVES ROUTINE PERIODIC MAINTENANCE SIMILAR TO LANDSCAPE AREAS.
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