Appendix J1
Drainage Report

PRELIMINARY DRAINAGE STUDY

North Iris Lane

Project ID: PHG20-0032

City of Escondido
County of San Diego

PREPARED FOR:

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ALLEN L BUTCHER, PE C47107

April 25, 2022

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SELECTED COUNTY OF SAN DIEGO HYDROLOGY MANUAL EXCERPTS

DRAINAGE MAPS

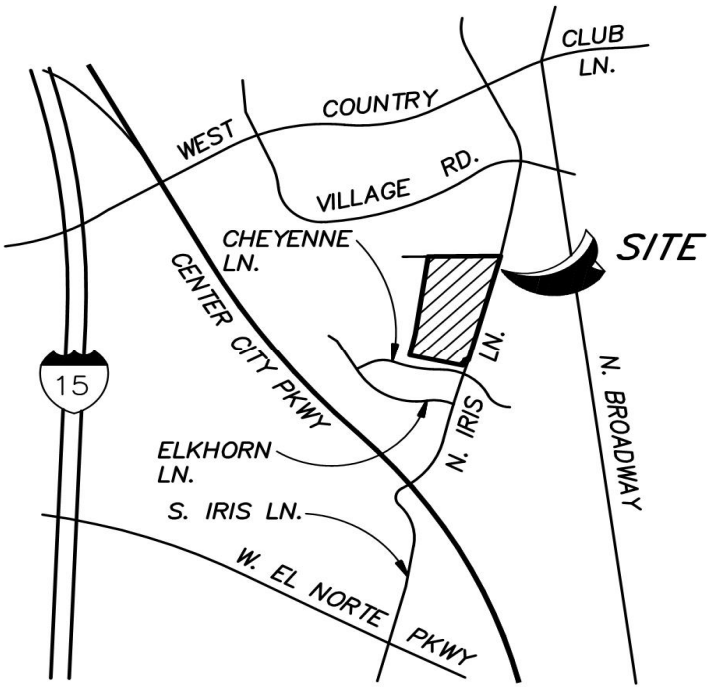
PRE-DEVELOPMENT ..... MAP POCKET #1
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1. Introduction

The scope of this preliminary report is limited to addressing the potential storm water impacts associated with the development of the site, in accordance with the San Diego County Hydrology Manual (June 2003) and the San Diego County Hydraulic Design Manual (September 2014). This report will provide estimates of the peak site discharges of storm water runoff generated pre- and post-development from the site for the 100-year storm events. Detailed hydrology and hydraulic calculations for the proposed storm drains system will be provided in the final report.

The project proposes to use combination facilities to provide treatment, HMP mitigation and peak flow attenuation. Details and calculations related to water quality treatment and HMP compliance are contained in a separate Storm Water Quality Management Plan (SWQMP) report for the project.

This project is considered a priority development project. The storm water treatment facility and hydromodification storage facility have been shown on the Proposed DMA Drainage Exhibit attached to this study. The total disturbed area is approximately 7.5 acres, necessitating a Storm Water Pollution Prevention Plan (SWPPP) for construction.



2. Declaration of Responsible Charge

DECLARATION OF RESPONSIBLE CHARGE:

I hereby declare that I am the Engineer of Work for this project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the current standards.

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

Project Name: North Iris Lane
Project ID: PHG20-0032

EINGINEER OF WORK:

SB&O, Inc.
3990 Ruffin Road, Suite 120
San Diego, CA 92123
Phone: 858-560-1141



April 25, 2022

Allen L Butcher , PE C47107 Date

3. Existing Drainage Conditions

The property is within the northern portion of the City of Escondido community, located north of Highway 78, east of Interstate 15 and Centre City Parkway, and south of Country Club Lane. The site is on the west side of North Iris Lane, between Cheyenne Lane to the south, and Robin Hill Lane to the north.

The property is tributary to the Reidy Creek, located 700 feet east of North Iris Lane, which flows 3 miles south to Escondido Creek channel, and then westerly 15 miles to the San Elijo Lagoon, part of the Carlsbad Watershed (904).

Site drainage patterns are overland (5% to 8% range) from west to east, with the majority of the site runoff discharging to the southeastern corner of the site. Street slopes adjacent to the site range from 1.5% along North Iris to 5% (or more) on Robin Hill Lane. A shallow trapezoidal channel conveys runoff from the westerly off-site areas through the site, to the shallow box culvert under North Iris Lane. The northerly portion of the site drains northeasterly towards the intersection of Robin Hill and North Iris, which continues northerly, approximately 450', in the gutter toward a curb inlet and public storm drain (MS-4) which conveys flows southerly and easterly to Reidy Creek.

See Existing Drainage Exhibit in Map Pocket #1.

4. Post-Development Drainage Conditions

The project proposes multiple attached residential buildings, supported by private driveways, parking spaces and landscape areas. Proposed finished grades in the development areas are expected to be mild (0.5% to 1.0% range), with manufactured slopes along the perimeter. The drainage systems onsite will include a mix of overland, gutter and pipe flows directed to the site basins for treatment, HMP control and peak flow attenuation. These will occur in the north and the south portions of the site, with discharge locations maintaining the existing north / south split.

The project will complete the frontage improvements, resulting in additional paving widths, curb and gutter, and sidewalk.

See Proposed Drainage Exhibit in Map Pocket #2.

5. Hydrology

5.1 Design Criteria

The San Diego County Hydrology Manual (June 2003) and the San Diego County Hydraulic Design Manual (September 2014) were utilized to perform rational method hydrology calculations for 100-year storm events. (See Appendix for reference materials)

5.2 Soils

The hydrologic soil type is “C” in the northerly portion of the site, and type “D” in the southerly portion, with generally poor infiltration characteristics.

5.3 Runoff Coefficient C-Factor

According to Table 3-1 of the San Diego County Hydrology Manual, the relevant runoff coefficients (C-Factor) for the site are summarized below tables.

Conditions	% Impervious To	Runoff Coefficient Type C Soil	Runoff Coefficient Type D Soil
Off-site Areas	25%	----	0.48
Existing site	20% to 30%	0.42	0.46
Existing Site	20% to 30%	0.45	0.52
Street Improvements	90%	0.84	0.85
Proposed Site	70%	0.72	0.74

Runoff for individual drainage areas will be based upon specific imperviousness and soil type.

5.4 Adjusted 6-Hour Rainfall

Rainfall intensities are based upon the rainfall data from the County 6-Hour and 24-Hour Isopluvial maps as follows;

Storm	6-Hour Rainfall (in)	24-Hour Rainfall (in)	Ratio P6/P24	Adjusted P6 (in)
2-Year	1.6	2.5	64%	1.6
5-Year	1.95	3.5	56%	1.95
10-Year	2.35	3.9	60%	2.35
25-Year	2.8	5.1	55%	2.8
50-Year	2.95	6.0	49%	2.95
100-Year	3.5	7.0	50%	3.5

5.5 Rational Method Hydrology

Rational Method peak flows were estimated for the site according to Chapter 3 of the 2003 County Hydrology Manual. The flow (Q) in CFS is equal to the Area (A) multiplied by the Runoff Factor (C) multiplied by the Rainfall Intensity (I). The Intensity of the storm (I) is formulated as follows: I= [7.44(P6) (Tc^-0.645)]. Intensity calculations have a minimum 5-minute time of concentration.

The time of concentration (Tc) for Existing Basins were estimated using the initial time of concentration using the maximum initial flow length (100 feet) for an overland slope (6-8 minutes) according to Table 3-2, plus additional time for the remaining overland flow distance as follows.

Existing Drainage - Rational Method Hydrology Results					
Basin	*Location*	*Area*	*C*	*T_C*	*Q100 (cfs)*
E-3	*Robin Hill*	*0.462*	*0.69*	*6.43*	*2.75*
E-2	*North*	*0.981*	*0.45*	*6.64*	*3.39*
E-1	*South*	*6.436*	*0.46*	*11.70*	*15.78*
Total		*7.42*			*21.92*

Since the basins have differences in time of concentration, and flow paths to the same downstream location, no attempt was made to confluence the flows.

See Exhibit "**A**" for Rational Method calculations.

Runoff from the developed site will include a combination of overland flow, gutter flow, and pipe flow. For multifamily residential land uses, overland flow lengths are limited to a 50' to 65' range for slopes between 1.0% and 2%, which results in initial times of concentration of approximately 4-8 minute range. Additional overland flow length, gutter and pipe lengths may add additional time, as follows;

Post-Development Rational Method Hydrology Results (Not Attenuated)					
Basin	DMAs	Area	C	T_C	Q100 (cfs)
North Basin BMP-3	N-1	0.575	0.72	10.66	2.33
South Middle BMP-2	S-1	3.815	0.72	5.0	25.32
South Basin BMP-1	S-2	2.322	0.72	6.91	12.50
Totals		7.42			

See Exhibit "**A**" for Rational Method calculations.

6. Rational Method Hydrographs

The project proposes to use combination facilities at 3 locations to provide treatment, HMP mitigation and peak flow attenuation. These analyses require a runoff hydrograph to route through the facilities. In accordance with the County of San Diego Hydrology Manual, the Rational Method Hydrograph procedure was used to develop a time-based runoff series. The methodology assumes a simple triangular runoff hydrograph and is based upon the 6-hour rainfall total, and the Rational Method input variables. The methodology provides runoff values at time intervals equal to multiples of the time of concentration. Details related to the procedure to develop the hydrograph are provided in Chapter 6 of the County of San Diego Hydrology Manual (See Appendix).

Post-Development Rational Method Hydrology Results (Not Attenuated)					
Basin	Location	Area	C	T_C (min)	Q100 (cfs)
BMP-3	North	0.575	0.72	10	2.44
BMP-2	South-Mid	3.815	0.72	5	25.32
BMP-1	South	2.322	0.75	6	11.20

The resulting hydrographs are available in Exhibit "B". See Section 9 for attenuated flows.
Note: The Rational Method Hydrograph Procedure is based upon an integer number of minutes.

7. HMP / Attenuation

The basin volumes and low flow orifice was determined by the SWMM modeling for the project. The final surface basin depth and overflow was verified by the detention routing. The following basin data was used to model the attenuation effects by the basin for the 100-year storm events;

Basin 3 - North HMP/Detention Storage = 0.148 ac-ft.

Depth	Description	Dimension	Comment
0.0	Bottom of Basin	2,010 sf	
0.5	Low Flow Orifice	1.5" dia.	Subdrain
2.55	Gravel and Stone	40% Void	
4.05	Soil 18"	30% Void	
4.05	Floor of Basin	2,010 sf	
4.55	Basin Treatment Area	2,200 sf	6" Depth
5.05	Overflow (6"Deep)	2,200 sf	Grated Inlet
5.55	Top of Basin	2,580 sf	18" deep

Basin 2 – South Mid HMP/Detention Storage = 0.28 ac-ft.

Depth	Description	Dimension	Comment
0.0	Bottom of Basin	2,320 sf	
0.5	Low Flow Orifice	1.5" dia.	Subdrain
3.0	Gravel and Stone	40% Void	
4.5	Soil 18"	30% Void	
4.5	Floor of Basin	4,110 sf	
5.0	Basin Treatment Area	4,580 sf	6" Depth
5.0	Overflow (6" Deep)	4,580 sf	Grated Inlet
5.5	Top of Treatment	5,150 sf	12" deep
6.8	Top of Basin	5,720 sf	21.6" deep

Basin 1 – South HMP/Detention Storage = 0.195 ac-ft.

Depth	Description	Dimension	Comment
0.0	Bottom of Basin	2,590 sf	
0.50	Low Flow Orifice	1.5" dia.	Subdrain
1.6	Gravel and Stone	40% Void	
3.4	Soil 18" / Sand	30% Void	
3.4	Floor of Basin	2,590 sf	
3.9	Basin Treatment Area	3,180 sf	6" Depth
3.9	Overflow (6" Deep)	3,180 sf	Grated Inlet
4.4	Top of Treatment	3,628 sf	12" Deep
4.9	Top of Basin	4,076 sf	18" deep

8. Detention Analyses

The County of San Diego Hydraulic Manual Section 6 discusses detention routing using the Storage Indication or Modified-Puls Routing Method and is discussed in further detail in the National Engineering Handbook (NEH). The methodology is a time step accounting of Inflow, Outflow and Storage during the storm event. The methodology requires detailed incremental basin data (depth vs. storage and depth vs. outflow) to create a Storage Indication Outflow table. The SIO table allows for the two unknown but related terms (storage volume and outflow) to be combined into a single value.

The SIO tables were prepare using the SWMM modeling data for the 3 basins. The Storage Indication Outflow Tables for the basins are provided in Exhibit **"C".** These show the elevation and incremental depth, surface area. The void ratio, storage volumes, and total outflow is broken down by the individual control openings & weirs.

The 100-year, 6-hour hydrographs were routed through their respective basins to determine the peak outflow, maximum water depth, and required storage volume and are summarized below;

Location	Peak Inflow (cfs)	Peak Outflow (cfs)	Basin Infiltration (cfs)	Max Surface Depth (ft)	Volume Required (cf)	Surface Drain time (hrs.)
North (BMP-3)	2.44	0.12	.01	0.3	3,365	2.6
South/Mid (BMP-2)	25.32	11.14	.012	1.4	12,208	7.9
South (BMP-1)	11.20	7.97	.02	1.0	6,586	4.6
Total	38.96	19.23	0.04			

A Summary of the detention analyses are included in Exhibit **"D"**. Routing calculations and the Inflow, Outflow and Storage graphs for the basins are provided in Exhibit **"E".**

9. Site Discharge Summary

To assess potential impacts, the site discharge was revised to reflect the effects of the HMP/Detention facilities (reduced by the basin infiltration);

Condition	Q100 Peak Flow (cfs)	Q100 Peak Attenuated (cfs)
Proposed Development	38.96	19.19
Existing Condition	19.17	19.17
Net Change		+0.02

The 100-year post-development peak site discharge will be consistent with the existing conditions.

10. Off-site Drainage

The project is tributary to Reidy Creek (R), and is located on Tile 29 of the Drainage Master Plan, City of Escondido, November 1995, prepared by Masson & Associates, Inc.

The off-site drainage area upstream of the site is significant (approximately 113 acres) and includes runoff from the areas located northwest of the site. Tributary areas include properties along Centre City Parkway, and residential development and commercial properties on the north and south sides of County Club Lane.

(See Off-site Drainage Exhibit in Map Pocket 3).

Overland flow lengths are limited, with significant lengths in concrete ditches, street gutters, storm drains, and unlined channels. The hydrologically most remote point is at the ridgeline just south of the Centre City Parkway / Interstate 15 offramps ("E" Hill). Runoff flows westerly down the hillside to the drainage ditch along the east side of Centre City Parkway (northbound), to the greenbelt north of Country Club Lane. Flows are intercepted by a 48" storm drain, routed southerly to discharge at a headwall at the south end of the athletic fields. A shallow semi-improved drainage channel conveys flows southerly and easterly between the residential lots, private driveways, and the unpaved portions of Robin Hill Lane to the westerly boundary of the project.

The resulting flow length is greater than 1-mile, with an average slope of 6.4%. The time of concentration is estimated at 28.6 minutes (10 minutes initial plus 18.6 minutes travel). A runoff coefficient of 0.49 was selected due to the limited impervious area (25%). The 100-year peak flow is estimated at 162 cfs at the westerly project boundary.

(See Off-site Hydrology Calculations in Exhibit **F**).

11. Bypass Storm Drain

The westerly boundary includes a shallow low flow channel which is conveyed easterly through the site, then southerly along existing paving to the upstream end of the box culvert which passes under North Iris Lane. Flows are then conveyed easterly by the paved concrete channel located at the southern limits of Meadowbrook Village development to Reidy Creek (approximately 700 feet). Project grading will elevate the southerly portion of the site which will interrupt the off-site channel. A bypass storm drain system will intercept and direct these off-site flows through the site, avoiding the need to enlarge the post-development treatment and hydromodification systems. A concrete drainage ditch will also be constructed along the westerly boundary to intercept local flows and direct them to the bypass system, which begins at the western boundary to the existing box culvert undercrossing to the south side of the North Iris Lane. In addition to the upstream flows, site discharge and runoff from the project frontage and the neighborhood to the south (Cheyene Lane) will be tributary to the box culvert.

Bypass Hydrology Location	Node #	Area (ac)	Q100 (cfs)	Cumulative Q100 (cfs)
Upstream – West Boundary	1-2	113.4	161.8	161.8
Project Site		7.0	20.5	182.3
North Iris / Cheyene	3-5	8.7	14.3	196.6
Downstream RCB	6	129.1		196.6

The existing off-site channel includes s shallow low flow central section with wide, relatively flat overbank, or "floodplains" on either side. The channel was modeled using an opening channel flow calculator using an irregular shaped section based upon the ground line near the westerly project boundary. A range of n values was used across the section (0.040 in the channel and 0.10 in the overbank) with a bed slope of 2%. The resulting flow depth was

calculated at 2.7' with an average velocity of 2 fps. The corresponding water surface elevation is 708.5, with a top width of 125 feet.

Since the proposed bypass headwall will be less considerably less than 125 feet wide, consideration of the inlet conditions will be necessary to minimize upstream ponding. If the approach velocity is neglected, the hydraulic condition may be approximated using a culvert routine passing under a roadbed. A reinforced concrete box culvert (7 feet wide and 3 feet high) section will provide the hydraulic capacity required to convey the peak flow with minimal additional headwater depth. The water surface elevation upstream of the headwall is estimated at 708.4, which is consistent with the existing water surface (708.5). This will minimize impacts to the upstream properties.

A separate backwater analysis was prepared to confirm that the downstream conditions do not require excessive headwater at the upstream end. Based upon the preliminary analysis, the hydraulic grade at the headwater is 708.4, which is consistent with the existing upstream water surface (708.4).

See Exhibit "F" for Bypass Strom Drain & Backwater Calculations.

12. Conclusion

Based upon the site basin modeling and the flow comparison, the 100-year post-development peak flows will be consistent with the existing conditions.

The project bypass storm drain will intercept the upstream flows and convey through the site to the N Iris Lane box culvert, with minimal impact to the upstream conditions.

EXHIBIT A

RATIONAL METHOD CALCULATIONS
EXISTING & PROPOSED

E-1

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/02/21

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.400
24 hour precipitation(inches) = 7.000
P6/P24 = 48.6%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 3.000 to Point/Station 4.000
**** 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
[LOW DENSITY RESIDENTIAL]
(2.0 DU/A or Less)
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Initial subarea total flow distance = 875.000(Ft.)
Highest elevation = 737.000(Ft.)
Lowest elevation = 701.300(Ft.)
Elevation difference = 35.700(Ft.) Slope = 4.080 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 4.08 %, in a development type of
2.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 7.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4600)*(100.000^.5)/(4.080^(1/3)]= 7.21
The initial area total distance of 875.00 (Ft.) entered leaves a

remaining distance of 775.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 4.49 minutes
for a distance of 775.00 (Ft.) and a slope of 4.08 %
with an elevation difference of 31.62(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 4.490 Minutes
Tt=[(11.9*0.1468^3)/(31.62)]^.385= 4.49
Total initial area Ti = 7.21 minutes from Figure 3-3 formula plus
4.49 minutes from the Figure 3-4 formula = 11.70 minutes
Rainfall intensity (I) = 5.177(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.460
Subarea runoff = 15.327(CFS)
Total initial stream area = 6.436(Ac.)
End of computations, total study area = 6.436 (Ac.)

E-2

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/02/21

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.400
24 hour precipitation(inches) = 7.000
P6/P24 = 48.6%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 3.000 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 = 1.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(2.9 DU/A or Less)
Impervious value, Ai = 0.250
Sub-Area C Value = 0.450
Initial subarea total flow distance = 444.000(Ft.)
Highest elevation = 737.000(Ft.)
Lowest elevation = 712.700(Ft.)
Elevation difference = 24.300(Ft.) Slope = 5.473 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 5.47 %, in a development type of
2.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(100.000^.5)/(5.473^(1/3)]= 6.64
The initial area total distance of 444.00 (Ft.) entered leaves a

remaining distance of 344.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.15 minutes
for a distance of 344.00 (Ft.) and a slope of 5.47 %
with an elevation difference of 18.83(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 2.145 Minutes
Tt=[(11.9*0.0652^3)/(18.83)]^.385= 2.15
Total initial area Ti = 6.64 minutes from Figure 3-3 formula plus
2.15 minutes from the Figure 3-4 formula = 8.78 minutes
Rainfall intensity (I) = 6.228(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 2.749(CFS)
Total initial stream area = 0.981(Ac.)
End of computations, total study area = 0.981 (Ac.)

E-3

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/02/21

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.400
24 hour precipitation(inches) = 7.000
P6/P24 = 48.6%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 6.000 to Point/Station 7.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.690
Initial subarea total flow distance = 460.000(Ft.)
Highest elevation = 736.000(Ft.)
Lowest elevation = 711.900(Ft.)
Elevation difference = 24.100(Ft.) Slope = 5.239 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 5.24 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.14 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6900)*(95.000^.5)/(5.239^(1/3)]= 4.14
The initial area total distance of 460.00 (Ft.) entered leaves a

remaining distance of 365.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.28 minutes
for a distance of 365.00 (Ft.) and a slope of 5.24 %
with an elevation difference of 19.12(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 2.284 Minutes
Tt=[(11.9*0.0691^3)/(19.12)]^.385= 2.28
Total initial area Ti = 4.14 minutes from Figure 3-3 formula plus
2.28 minutes from the Figure 3-4 formula = 6.43 minutes
Rainfall intensity (I) = 7.620(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.690
Subarea runoff = 2.429(CFS)
Total initial stream area = 0.462(Ac.)
End of computations, total study area = 0.462 (Ac.)

P-NORTH

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 03/16/22

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 7.000
P6/P24 = 50.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.690
Initial subarea total flow distance = 34.000(Ft.)
Highest elevation = 718.200(Ft.)
Lowest elevation = 718.000(Ft.)
Elevation difference = 0.200(Ft.) Slope = 0.588 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of 0.59 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6900)*(50.000^.5)/(0.588^(1/3)]= 6.23
Rainfall intensity (I) = 8.003(In/Hr) for a 100.0 year storm

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.690
Subarea runoff =       0.331(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   718.000(Ft.)
Downstream point elevation =   716.100(Ft.)
Channel length thru subarea  =   301.000(Ft.)
Channel base width    =    2.000(Ft.)
Slope or 'Z' of left channel bank = 100.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =      1.363(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      1.363(CFS)
Depth of flow =   0.100(Ft.), Average velocity =   1.133(Ft/s)
Channel flow top width =   22.028(Ft.)
Flow Velocity =    1.13(Ft/s)
Travel time  =    4.43 min.
Time of concentration =   10.66 min.
Critical depth =      0.094(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      5.660(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Rainfall intensity =      5.660(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.717  CA =      0.412
Subarea runoff =      2.002(CFS) for      0.515(Ac.)
Total runoff =      2.333(CFS)   Total area =       0.575(Ac.)
Depth of flow =   0.125(Ft.), Average velocity =   1.297(Ft/s)
Critical depth =      0.118(Ft.)
End of computations, total study area =          0.575 (Ac.)
```

P-MID

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 03/16/22

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 7.000
P6/P24 = 50.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.690
Initial subarea total flow distance = 127.000(Ft.)
Highest elevation = 737.500(Ft.)
Lowest elevation = 719.000(Ft.)
Elevation difference = 18.500(Ft.) Slope = 14.567 %
Top of Initial Area Slope adjusted by User to 14.600 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 14.60 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 3.02 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6900)*(100.000^.5)/(14.600^(1/3)]= 3.02

```
Calculated TC of    3.020 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.690
Subarea runoff =      0.318(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   716.100(Ft.)
Downstream point/station elevation =   714.000(Ft.)
Pipe length  =   173.00(Ft.) Slope =   0.0121  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.318(CFS)
Given pipe size =      8.00(In.)
Calculated individual pipe flow  =     0.318(CFS)
Normal flow depth in pipe =    2.66(In.)
Flow top width inside pipe =    7.54(In.)
Critical Depth =    3.14(In.)
Pipe flow velocity =      3.13(Ft/s)
Travel time through pipe =    0.92 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    3.940 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     3.94 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.718  CA =      0.526
Subarea runoff =      4.535(CFS) for      0.683(Ac.)
Total runoff =      4.853(CFS)   Total area =       0.733(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    3.940 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     3.94 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.718  CA =      0.569
Subarea runoff =      0.392(CFS) for      0.059(Ac.)
Total runoff =      5.245(CFS)   Total area =      0.792(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   713.700(Ft.)
Downstream point/station elevation =   712.100(Ft.)
Pipe length  =   143.40(Ft.) Slope =   0.0112  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.245(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     2.545(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.106(Ft.)
 Minor friction loss =      1.039(Ft.) K-factor =   1.50
Pipe flow velocity =      6.68(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =     4.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    4.298 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     4.30 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.030
Subarea runoff =      4.249(CFS) for      0.640(Ac.)
Total runoff =      9.494(CFS)   Total area =      1.432(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   711.800(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =   136.10(Ft.) Slope =   0.0132  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.494(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
```

```
    11.265(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      9.661(Ft.)
 Minor friction loss =     3.403(Ft.)K-factor =   1.50
Pipe flow velocity =     12.09(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     4.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    4.486 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     4.49 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.722
Subarea runoff =      6.387(CFS) for      0.962(Ac.)
Total runoff =     15.881(CFS)   Total area =       2.394(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    4.486 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     4.49 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      2.161
Subarea runoff =      4.050(CFS) for      0.610(Ac.)
Total runoff =     19.931(CFS)   Total area =       3.004(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of    4.486 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     4.49 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      2.544
```

```
Subarea runoff =       3.526(CFS) for       0.531(Ac.)
Total runoff =      23.457(CFS)   Total area =       3.535(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Calculated TC of     4.486 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =       9.222(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =      4.49 min.
Rainfall intensity =       9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =       2.745
Subarea runoff =       1.859(CFS) for       0.280(Ac.)
Total runoff =      25.316(CFS)   Total area =       3.815(Ac.)
End of computations, total study area =           3.815 (Ac.)
```

P-SOUTH

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 03/16/22

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 7.000
P6/P24 = 50.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 301.000 to Point/Station 302.000
**** 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
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.710
Initial subarea total flow distance = 75.000(Ft.)
Highest elevation = 717.600(Ft.)
Lowest elevation = 715.200(Ft.)
Elevation difference = 2.400(Ft.) Slope = 3.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of 3.20 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.52 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7100)*(90.000^.5)/(3.200^(1/3)]= 4.52
Calculated TC of 4.519 minutes is less than 5 minutes,

```
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.710
Subarea runoff =      0.373(CFS)
Total initial stream area =        0.057(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =   715.200(Ft.)
End of street segment elevation =   713.000(Ft.)
Length of street segment  =   171.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =  10.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.018(CFS)
Depth of flow =   0.227(Ft.), Average velocity =   1.985(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.611(Ft.)
Flow velocity =   1.99(Ft/s)
Travel time =    1.44 min.     TC =    5.95  min.
 Adding area flow to street
Rainfall intensity (I) =      8.238(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Rainfall intensity =      8.238(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      0.459
Subarea runoff =      3.407(CFS) for      0.581(Ac.)
Total runoff =      3.780(CFS)   Total area =       0.638(Ac.)
Street flow at end of street =      3.780(CFS)
Half street flow at end of street =      1.890(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   2.291(Ft/s)
Flow width (from curb towards crown)=   8.680(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   708.700(Ft.)
```

```
Downstream point/station elevation =   706.900(Ft.)
Pipe length  =   102.10(Ft.) Slope =   0.0176  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.780(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     3.780(CFS)
Normal flow depth in pipe =    8.11(In.)
Flow top width inside pipe =   11.23(In.)
Critical Depth =    9.93(In.)
Pipe flow velocity =      6.69(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     6.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   706.600(Ft.)
Downstream point/station elevation =   705.100(Ft.)
Pipe length  =   198.90(Ft.) Slope =   0.0075  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.780(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     1.277(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.238(Ft.)
 Minor friction loss =      0.539(Ft.)K-factor =   1.50
Pipe flow velocity =      4.81(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =     6.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      7.493(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =     6.90 min.
Rainfall intensity =      7.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      0.850
Subarea runoff =      2.588(CFS) for      0.543(Ac.)
Total runoff =      6.367(CFS)   Total area =       1.181(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      7.493(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
```

```
Time of concentration =      6.90 min.
Rainfall intensity =      7.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      1.404
Subarea runoff =      4.154(CFS) for      0.770(Ac.)
Total runoff =     10.521(CFS)   Total area =       1.951(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      7.493(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =      6.90 min.
Rainfall intensity =      7.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      1.556
Subarea runoff =      1.138(CFS) for      0.211(Ac.)
Total runoff =     11.660(CFS)   Total area =       2.162(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    704.800(Ft.)
Downstream point/station elevation =    704.500(Ft.)
Pipe length  =    10.70(Ft.) Slope =    0.0280  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.660(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    11.660(CFS)
Normal flow depth in pipe =    10.71(In.)
Flow top width inside pipe =    17.67(In.)
Critical Depth =    15.60(In.)
Pipe flow velocity =     10.64(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     6.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      307.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      7.481(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.720 given for subarea
Time of concentration =      6.91 min.
Rainfall intensity =      7.481(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.720  CA =      1.671
Subarea runoff =      0.844(CFS) for      0.160(Ac.)
Total runoff =     12.503(CFS)   Total area =       2.322(Ac.)
```

End of computations, total study area = 2.322 (Ac.)

EXHIBIT B

RATIONAL METHOD HYDROGRAPHS

North Iris Lane Preliminary Design 17-Mar-22 **10 Minute Hydrograph**

N-1 **Post Development Condition**

BMP-3

Rational Method Unit Hydrograph 6 hr Storm

45

County of San Diego Hydrology Manual - Chapter 6

Area	0.575	ac	P6	1.60	in	P24	3.50		
C	0.720		Storm	2	year				
Tc=	10.66							Q100=	2.44
Tc=	**10**	minutes	I2=	2.70	in/hr	7.44 P6 Tc ^-0.645			
Q2 =	1.12	cfs	I100=	5.90	in/hr				
Q100=	2.44	cfs				2,405		(15)	
N=	36	Number of Precipitation Blocks			Vol	2,390	1.15	0.62%	

North Iris Lane

360 17-Mar-22

Qn = 60 C A Pn/Tc

N-1

Pt(n) = 0.124 P6 (n Tc)^0.355

Pn = Pt(n) - Pt(n-1)

N	Pt(n)	Pn	Q(n)	Q(n)
1	0.45	0.45	1.116	1.116
2	0.57	0.13	0.311	0.311
3	0.66	0.09	0.221	0.221
4	0.73	0.07	0.177	0.177
5	0.80	0.06	0.151	0.151
6	0.85	0.05	0.132	0.132
7	0.90	0.05	0.119	0.119
8	0.94	0.04	0.108	0.108
9	0.98	0.04	0.100	0.100
10	1.02	0.04	0.093	0.093
11	1.05	0.04	0.087	0.087
12	1.09	0.03	0.082	0.082
13	1.12	0.03	0.078	0.078
14	1.15	0.03	0.074	0.074
15	1.18	0.03	0.071	0.071
16	1.20	0.03	0.068	0.068
17	1.23	0.03	0.065	0.065
18	1.25	0.03	0.063	0.063
19	1.28	0.02	0.060	0.060
20	1.30	0.02	0.058	0.058
21	1.32	0.02	0.056	0.056
22	1.35	0.02	0.055	0.055
23	1.37	0.02	0.053	0.053
24	1.39	0.02	0.052	0.052
25	1.41	0.02	0.050	0.050
26	1.43	0.02	0.049	0.049
27	1.45	0.02	0.048	0.048
28	1.47	0.02	0.047	0.047
29	1.48	0.02	0.046	0.046
30	1.50	0.02	0.045	0.045
31	1.52	0.02	0.044	0.044
32	1.54	0.02	0.043	0.043
33	1.55	0.02	0.042	0.042
34	1.57	0.02	0.041	0.041
35	1.59	0.02	0.040	0.040
36	1.60	0.02	0.040	0.040
37	1.62	0.02	0.039	0.000

N	Time (min)	Time (hrs)	Qn (cfs)
1	250	4.17	1.116
2	240	4.00	0.311
3	230	3.83	0.221
5	220	3.67	0.151
6	210	3.50	0.132
8	200	3.33	0.108
9	190	3.17	0.100
11	180	3.00	0.087
12	170	2.83	0.082
14	160	2.67	0.074
15	150	2.50	0.071
17	140	2.33	0.065
18	130	2.17	0.063
20	120	2.00	0.058
21	110	1.83	0.056
23	100	1.67	0.053
24	90	1.50	0.052
26	80	1.33	0.049
27	70	1.17	0.048
29	60	1.00	0.046
30	50	0.83	0.045
32	40	0.67	0.043
33	30	0.50	0.042
35	20	0.33	0.040
36	10	0.17	0.040
38	0	0.00	0.000

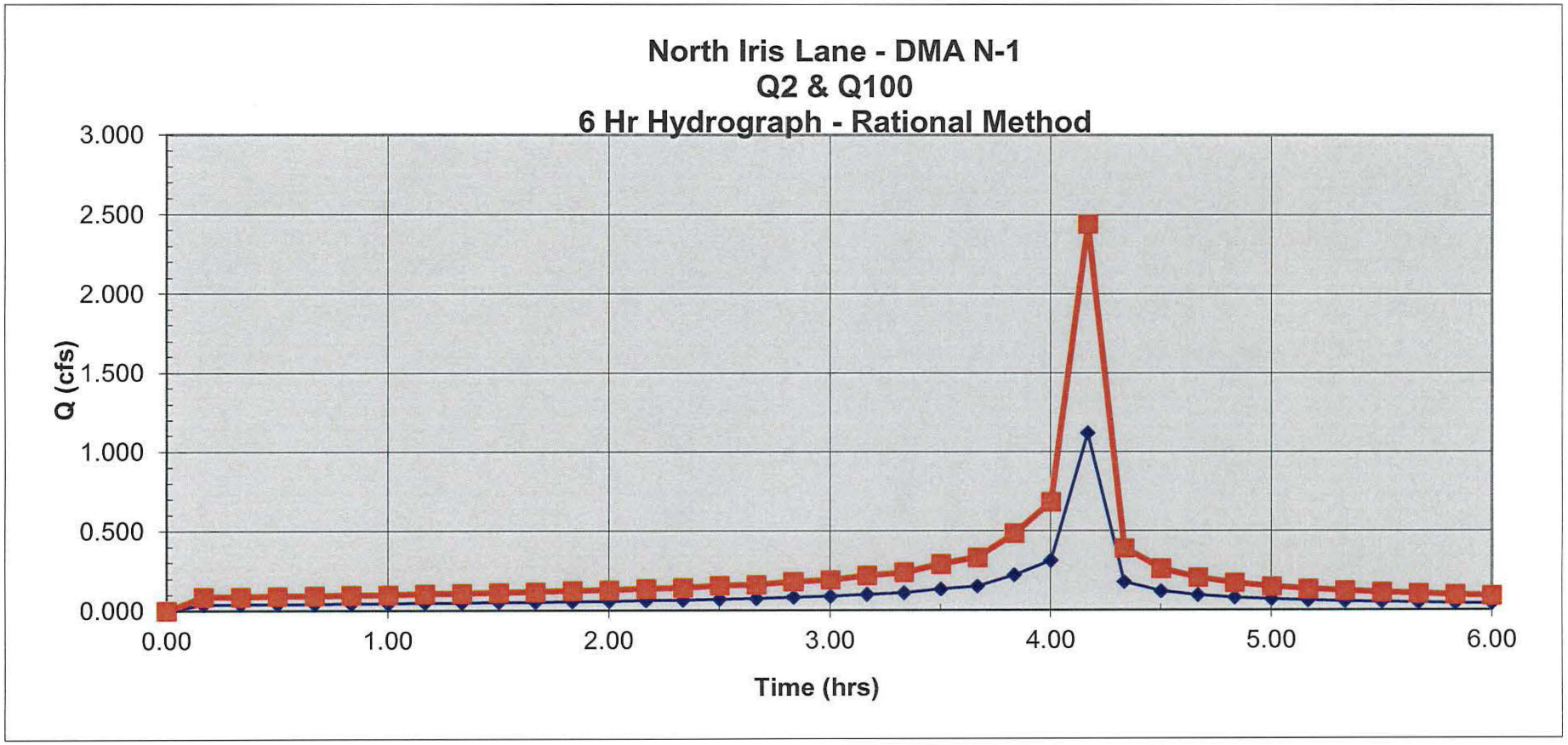
N	Time (min)	Time (hrs)	Qn (cfs)
4	260	4.33	0.000
7	270	4.50	0.119
10	280	4.67	0.093
13	290	4.83	0.078
16	300	5.00	0.068
19	310	5.17	0.060
22	320	5.33	0.055
25	330	5.50	0.050
28	340	5.67	0.047
31	350	5.83	0.044
34	360	6.00	0.041
37	370	6.17	0.000

North Iris Lane Preliminary Design 17-Mar-22

N-1

Post Development Hydrographs - 6 Hour Rational Method

N	Time (min)	Time (hrs)	2 Year Qn (cfs)	Vol (cf)	Time (hrs)	2 Q(n)	5 Q(n)	10 Q(n)	25 Q(n)	50 Q(n)	100 Q(n)
					Ratio X/2		1.219	1.469	1.750	1.844	2.188
					P6	1.6	1.95	2.35	2.8	2.95	3.5
					Pre-Deve	0.543	0.661	0.797	0.949	1.000	1.187
					Peak	1.116	1.360	1.639	1.953	2.058	2.441
					Return /Yr	**2**	**5**	**10**	**25**	**50**	**100**
	0	0.00	0.000	0	0.00	0.000	0.000	0.000	0.000	0.000	0.000
36	10	0.17	0.040	12	0.17	0.040	0.048	0.058	0.069	0.073	0.087
35	20	0.33	0.040	24	0.33	0.040	0.049	0.059	0.071	0.074	0.088
33	30	0.50	0.042	25	0.50	0.042	0.051	0.062	0.073	0.077	0.092
32	40	0.67	0.043	25	0.67	0.043	0.052	0.063	0.075	0.079	0.094
30	50	0.83	0.045	26	0.83	0.045	0.054	0.066	0.078	0.082	0.098
29	60	1.00	0.046	27	1.00	0.046	0.056	0.067	0.080	0.084	0.100
27	70	1.17	0.048	28	1.17	0.048	0.058	0.070	0.084	0.088	0.105
26	80	1.33	0.049	29	1.33	0.049	0.060	0.072	0.086	0.090	0.107
24	90	1.50	0.052	30	1.50	0.052	0.063	0.076	0.091	0.095	0.113
23	100	1.67	0.053	31	1.67	0.053	0.065	0.078	0.093	0.098	0.116
21	110	1.83	0.056	33	1.83	0.056	0.069	0.083	0.099	0.104	0.124
20	120	2.00	0.058	34	2.00	0.058	0.071	0.086	0.102	0.108	0.128
18	130	2.17	0.063	36	2.17	0.063	0.076	0.092	0.109	0.115	0.137
17	140	2.33	0.065	38	2.33	0.065	0.079	0.095	0.114	0.120	0.142
15	150	2.50	0.071	41	2.50	0.071	0.086	0.104	0.124	0.130	0.154
14	160	2.67	0.074	43	2.67	0.074	0.090	0.109	0.129	0.136	0.162
12	170	2.83	0.082	47	2.83	0.082	0.100	0.120	0.144	0.151	0.179
11	180	3.00	0.087	51	3.00	0.087	0.106	0.128	0.152	0.160	0.190
9	190	3.17	0.100	56	3.17	0.100	0.122	0.146	0.174	0.184	0.218
8	200	3.33	0.108	62	3.33	0.108	0.132	0.159	0.189	0.199	0.236
6	210	3.50	0.132	72	3.50	0.132	0.161	0.194	0.231	0.244	0.289
5	220	3.67	0.151	85	3.67	0.151	0.183	0.221	0.263	0.277	0.329
3	230	3.83	0.221	111	3.83	0.221	0.269	0.325	0.387	0.407	0.483
2	240	4.00	0.311	160	4.00	0.311	0.379	0.457	0.545	0.574	0.681
1	**250**	**4.17**	**1.116**	**428**	**4.17**	**1.116**	**1.360**	**1.639**	**1.953**	**2.058**	**2.441**
4	260	4.33	0.177	388	4.33	0.177	0.216	0.260	0.310	0.327	0.388
7	270	4.50	0.119	89	4.50	0.119	0.145	0.174	0.208	0.219	0.259
10	280	4.67	0.093	63	4.67	0.093	0.113	0.136	0.162	0.171	0.203
13	290	4.83	0.078	51	4.83	0.078	0.095	0.114	0.136	0.143	0.170
16	300	5.00	0.068	44	5.00	0.068	0.082	0.099	0.118	0.125	0.148
19	310	5.17	0.060	38	5.17	0.060	0.074	0.089	0.106	0.111	0.132
22	320	5.33	0.055	35	5.33	0.055	0.067	0.080	0.096	0.101	0.120
25	330	5.50	0.050	32	5.50	0.050	0.061	0.074	0.088	0.093	0.110
28	340	5.67	0.047	29	5.67	0.047	0.057	0.069	0.082	0.086	0.102
31	350	5.83	0.044	27	5.83	0.044	0.053	0.064	0.076	0.081	0.096
34	360	6.00	0.041	25	6.00	0.041	0.050	0.060	0.072	0.076	0.090
37	370	6.17	0.000	12	6.17	0.000	0.000	0.000	0.000	0.000	0.000


North Iris Lane - DMA N-1
Q2 & Q100
6 Hr Hydrograph - Rational Method
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Q (cfs)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Time (hrs)

North Iris Lane Preliminary Design 17-Mar-22 **6 Minute Hydrograph**

S-1 **Post Development Condition**

Basin 2 -Middle

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6

Area	2.322	ac	P6	1.60	in	P24	2.50		
C	0.720		Storm	2	year				
Tc=	6.91							Q100=	13.71
Tc=	**6**	minutes	I2=	3.75	in/hr	7.44 P6 Tc ^-0.645			
Q2 =	6.27	cfs	I100=	8.20	in/hr				
Q100=	13.71	cfs				9,710		(31)	
N=	60	Number of Precipitation Blocks			Vol	9,679	1.15	0.32%	

North Iris Lane Preliminary Design 17-Mar-22

S-1

Post Development Hydrographs - 6 Hour Rational Method

N	Time (min)	Time (hrs)	2 Year Qn (cfs)	Vol (cf)	Ratio X/2 P6 Pre-Deve Peak Return /Yr Time (hrs)	1.6 2.754 6.266 2 Q(n)	1.219 1.95 3.357 7.637 5 Q(n)	1.469 2.35 4.045 9.203 10 Q(n)	1.750 2.8 4.820 10.965 25 Q(n)	1.844 2.95 5.078 11.553 50 Q(n)	2.188 3.5 6.025 13.707 100 Q(n)
	0	0.00	0.000	0	0.00	0.000	0.000	0.000	0.000	0.000	0.000
60	6	0.10	0.159	29	0.10	0.159	0.194	0.234	0.279	0.294	0.349
59	12	0.20	0.161	58	0.20	0.161	0.196	0.237	0.282	0.297	0.353
57	18	0.30	0.165	59	0.30	0.165	0.201	0.242	0.289	0.304	0.361
56	24	0.40	0.167	60	0.40	0.167	0.203	0.245	0.292	0.308	0.365
54	30	0.50	0.171	61	0.50	0.171	0.208	0.251	0.299	0.315	0.374
53	36	0.60	0.173	62	0.60	0.173	0.211	0.254	0.303	0.319	0.378
51	42	0.70	0.177	63	0.70	0.177	0.216	0.260	0.310	0.327	0.388
50	48	0.80	0.180	64	0.80	0.180	0.219	0.264	0.314	0.331	0.393
48	54	0.90	0.184	66	0.90	0.184	0.225	0.271	0.323	0.340	0.403
47	60	1.00	0.187	67	1.00	0.187	0.228	0.275	0.327	0.345	0.409
45	66	1.10	0.192	68	1.10	0.192	0.234	0.282	0.337	0.355	0.421
44	72	1.20	0.195	70	1.20	0.195	0.238	0.287	0.342	0.360	0.427
42	78	1.30	0.201	71	1.30	0.201	0.245	0.295	0.352	0.371	0.440
41	84	1.40	0.204	73	1.40	0.204	0.249	0.300	0.358	0.377	0.447
39	90	1.50	0.211	75	1.50	0.211	0.257	0.310	0.370	0.389	0.462
38	96	1.60	0.215	77	1.60	0.215	0.262	0.315	0.376	0.396	0.470
36	102	1.70	0.222	79	1.70	0.222	0.271	0.327	0.389	0.410	0.487
35	108	1.80	0.227	81	1.80	0.227	0.276	0.333	0.397	0.418	0.496
33	114	1.90	0.236	83	1.90	0.236	0.287	0.346	0.412	0.434	0.515
32	120	2.00	0.240	86	2.00	0.240	0.293	0.353	0.421	0.443	0.526
30	126	2.10	0.251	88	2.10	0.251	0.306	0.368	0.439	0.462	0.548
29	132	2.20	0.256	91	2.20	0.256	0.312	0.377	0.449	0.473	0.561
27	138	2.30	0.269	95	2.30	0.269	0.327	0.395	0.470	0.495	0.588
26	144	2.40	0.275	98	2.40	0.275	0.336	0.405	0.482	0.508	0.603
24	**150**	**2.50**	**0.290**	**102**	**2.50**	**0.290**	**0.354**	**0.426**	**0.508**	**0.535**	**0.635**
23	156	2.60	0.299	106	2.60	0.299	0.364	0.439	0.523	0.551	0.653
21	162	2.70	0.317	111	2.70	0.317	0.386	0.466	0.555	0.585	0.694
20	168	2.80	0.327	116	2.80	0.327	0.399	0.481	0.573	0.604	0.716
18	174	2.90	0.351	122	2.90	0.351	0.428	0.516	0.615	0.647	0.768
17	180	3.00	0.365	129	3.00	0.365	0.445	0.536	0.638	0.673	0.798
15	186	3.10	0.396	137	3.10	0.396	0.483	0.582	0.694	0.731	0.867
14	192	3.20	0.415	146	3.20	0.415	0.506	0.610	0.727	0.766	0.908
12	198	3.30	0.460	158	3.30	0.460	0.561	0.676	0.806	0.849	1.007
11	204	3.40	0.488	171	3.40	0.488	0.595	0.717	0.855	0.900	1.068
9	210	3.50	0.560	189	3.50	0.560	0.682	0.822	0.980	1.032	1.224
8	216	3.60	0.607	210	3.60	0.607	0.740	0.891	1.062	1.119	1.328
6	222	3.70	0.742	243	3.70	0.742	0.904	1.090	1.298	1.368	1.623
5	228	3.80	0.845	286	3.80	0.845	1.030	1.241	1.479	1.558	1.848
3	234	3.90	1.241	375	3.90	1.241	1.512	1.822	2.171	2.287	2.714
2	240	4.00	1.748	538	4.00	1.748	2.130	2.567	3.059	3.223	3.824
1	246	4.10	6.266	1,443	4.10	6.266	7.637	9.203	10.965	11.553	13.707
4	252	4.20	0.995	1,307	4.20	0.995	1.213	1.462	1.741	1.835	2.177
7	258	4.30	0.666	299	4.30	0.666	0.811	0.978	1.165	1.228	1.456
10	264	4.40	0.521	214	4.40	0.521	0.635	0.765	0.912	0.960	1.140
13	270	4.50	0.436	172	4.50	0.436	0.532	0.641	0.764	0.805	0.954
16	276	4.60	0.380	147	4.60	0.380	0.463	0.558	0.665	0.700	0.831
19	282	4.70	0.339	129	4.70	0.339	0.413	0.498	0.593	0.625	0.741
22	288	4.80	0.307	116	4.80	0.307	0.375	0.452	0.538	0.567	0.673
25	294	4.90	0.283	106	4.90	0.283	0.344	0.415	0.495	0.521	0.618
28	300	5.00	0.262	98	5.00	0.262	0.320	0.385	0.459	0.484	0.574
31	306	5.10	0.245	91	5.10	0.245	0.299	0.360	0.429	0.452	0.537
34	312	5.20	0.231	86	5.20	0.231	0.282	0.339	0.404	0.426	0.505
37	318	5.30	0.219	81	5.30	0.219	0.266	0.321	0.382	0.403	0.478
40	324	5.40	0.208	77	5.40	0.208	0.253	0.305	0.363	0.383	0.454
43	330	5.50	0.198	73	5.50	0.198	0.241	0.291	0.347	0.365	0.433
46	336	5.60	0.190	70	5.60	0.190	0.231	0.278	0.332	0.350	0.415
49	342	5.70	0.182	67	5.70	0.182	0.222	0.267	0.318	0.335	0.398
52	348	5.80	0.175	64	5.80	0.175	0.213	0.257	0.306	0.323	0.383
55	354	5.90	0.169	62	5.90	0.169	0.206	0.248	0.295	0.311	0.369
58	360	6.00	0.163	60	6.00	0.163	0.199	0.239	0.285	0.301	0.357
61	366	6.10	0.000	29	6.10	0.000	0.000	0.000	0.000	0.000	0.000

North Iris Lane Preliminary Design 17-Mar-22 **6 Minute Hydrograph**

S-2 **Post Development Condition**

BMP-1 (South)

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6

Area	2.322	ac	P6	1.60	in	P24	2.50		
C	0.720		Storm	2	year				
Tc=	6.91							Q100=	13.71
Tc=	**6**	minutes	I2=	3.75	in/hr	7.44 P6 Tc ^-0.645			
Q2 =	6.27	cfs	I100=	8.20	in/hr				
Q100=	13.71	cfs				9,710		(31)	
N=	60	Number of Precipitation Blocks			Vol	9,679	1.15	0.32%	

North Iris Lane

360 17-Mar-22

Qn = 60 C A Pn/Tc

S-2

Pt(n) = 0.124 P6 (n Tc)^0.355

Pn = Pt(n) - Pt(n-1)

N	Pt(n)	Pn	Q(n)	Q(n)
1	0.37	0.37	6.266	6.266
2	0.48	0.10	1.748	1.748
3	0.55	0.07	1.241	1.241
4	0.61	0.06	0.995	0.995
5	0.66	0.05	0.845	0.845
6	0.71	0.04	0.742	0.742
7	0.75	0.04	0.666	0.666
8	0.78	0.04	0.607	0.607
9	0.82	0.03	0.560	0.560
10	0.85	0.03	0.521	0.521
11	0.88	0.03	0.488	0.488
12	0.91	0.03	0.460	0.460
13	0.93	0.03	0.436	0.436
14	0.96	0.02	0.415	0.415
15	0.98	0.02	0.396	0.396
16	1.00	0.02	0.380	0.380
17	1.02	0.02	0.365	0.365
18	1.05	0.02	0.351	0.351
19	1.07	0.02	0.339	0.339
20	1.09	0.02	0.327	0.327
21	1.10	0.02	0.317	0.317
22	1.12	0.02	0.307	0.307
23	1.14	0.02	0.299	0.299
24	1.16	0.02	0.290	0.290
25	1.18	0.02	0.283	0.283
26	1.19	0.02	0.275	0.275
27	1.21	0.02	0.269	0.269
28	1.22	0.02	0.262	0.262
29	1.24	0.02	0.256	0.256
30	1.25	0.01	0.251	0.251
31	1.27	0.01	0.245	0.245
32	1.28	0.01	0.240	0.240
33	1.30	0.01	0.236	0.236
34	1.31	0.01	0.231	0.231
35	1.32	0.01	0.227	0.227
36	1.34	0.01	0.222	0.222
37	1.35	0.01	0.219	0.219
38	1.36	0.01	0.215	0.215
39	1.38	0.01	0.211	0.211
40	1.39	0.01	0.208	0.208
41	1.40	0.01	0.204	0.204
42	1.41	0.01	0.201	0.201
43	1.42	0.01	0.198	0.198
44	1.44	0.01	0.195	0.195
45	1.45	0.01	0.192	0.192
46	1.46	0.01	0.190	0.190
47	1.47	0.01	0.187	0.187
48	1.48	0.01	0.184	0.184
49	1.49	0.01	0.182	0.182
50	1.50	0.01	0.180	0.180
51	1.51	0.01	0.177	0.177
52	1.52	0.01	0.175	0.175
53	1.53	0.01	0.173	0.173
54	1.54	0.01	0.171	0.171
55	1.55	0.01	0.169	0.169
56	1.56	0.01	0.167	0.167
57	1.57	0.01	0.165	0.165
58	1.58	0.01	0.163	0.163
59	1.59	0.01	0.161	0.161
60	1.60	0.01	0.159	0.159
61	1.61	0.01	0.158	0.000

N	Time (min)	Time (hrs)	Qn (cfs)
1	246	4.10	6.266
2	240	4.00	1.748
3	234	3.90	1.241
5	228	3.80	0.845
6	222	3.70	0.742
8	216	3.60	0.607
9	210	3.50	0.560
11	204	3.40	0.488
12	198	3.30	0.460
14	192	3.20	0.415
15	186	3.10	0.396
17	180	3.00	0.365
18	174	2.90	0.351
20	168	2.80	0.327
21	162	2.70	0.317
23	156	2.60	0.299
24	150	2.50	0.290
26	144	2.40	0.275
27	138	2.30	0.269
29	132	2.20	0.256
30	126	2.10	0.251
32	120	2.00	0.240
33	114	1.90	0.236
35	108	1.80	0.227
36	102	1.70	0.222
38	96	1.60	0.215
39	90	1.50	0.211
41	84	1.40	0.204
42	78	1.30	0.201
44	72	1.20	0.195
45	66	1.10	0.192
47	60	1.00	0.187
48	54	0.90	0.184
50	48	0.80	0.180
51	42	0.70	0.177
53	36	0.60	0.173
54	30	0.50	0.171
56	24	0.40	0.167
57	18	0.30	0.165
59	12	0.20	0.161
60	6	0.10	0.159

N	Time (min)	Time (hrs)	Qn (cfs)
4	252	4.20	0.000
7	258	4.30	0.666
10	264	4.40	0.521
13	270	4.50	0.436
16	276	4.60	0.380
19	282	4.70	0.339
22	288	4.80	0.307
25	294	4.90	0.283
28	300	5.00	0.262
31	306	5.10	0.245
34	312	5.20	0.231
37	318	5.30	0.219
40	324	5.40	0.208
43	330	5.50	0.198
46	336	5.60	0.190
49	342	5.70	0.182
52	348	5.80	0.175
55	354	5.90	0.169
58	360	6.00	0.163
61	366	6.10	0.000

North Iris Lane Preliminary Design 17-Mar-22

S-2

Post Development Hydrographs - 6 Hour Rational Method

					Ratio X/2		1.219	1.469	1.750	1.844	2.188
					P6	1.6	1.95	2.35	2.8	2.95	3.5
					Pre-Deve	2.754	3.357	4.045	4.820	5.078	6.025
					Peak	6.266	7.637	9.203	10.965	11.553	13.707
			2 Year		Return /Yr	2	5	10	25	50	100
N	Time (min)	Time (hrs)	Qn (cfs)	Vol (cf)	Time (hrs)	Q(n)	Q(n)	Q(n)	Q(n)	Q(n)	Q(n)
	0	0.00	0.000	0	0.00	0.000	0.000	0.000	0.000	0.000	0.000
60	6	0.10	0.159	29	0.10	0.159	0.194	0.234	0.279	0.294	0.349
59	12	0.20	0.161	58	0.20	0.161	0.196	0.237	0.282	0.297	0.353
57	18	0.30	0.165	59	0.30	0.165	0.201	0.242	0.289	0.304	0.361
56	24	0.40	0.167	60	0.40	0.167	0.203	0.245	0.292	0.308	0.365
54	30	0.50	0.171	61	0.50	0.171	0.208	0.251	0.299	0.315	0.374
53	36	0.60	0.173	62	0.60	0.173	0.211	0.254	0.303	0.319	0.378
51	42	0.70	0.177	63	0.70	0.177	0.216	0.260	0.310	0.327	0.388
50	48	0.80	0.180	64	0.80	0.180	0.219	0.264	0.314	0.331	0.393
48	54	0.90	0.184	66	0.90	0.184	0.225	0.271	0.323	0.340	0.403
47	60	1.00	0.187	67	1.00	0.187	0.228	0.275	0.327	0.345	0.409
45	66	1.10	0.192	68	1.10	0.192	0.234	0.282	0.337	0.355	0.421
44	72	1.20	0.195	70	1.20	0.195	0.238	0.287	0.342	0.360	0.427
42	78	1.30	0.201	71	1.30	0.201	0.245	0.295	0.352	0.371	0.440
41	84	1.40	0.204	73	1.40	0.204	0.249	0.300	0.358	0.377	0.447
39	90	1.50	0.211	75	1.50	0.211	0.257	0.310	0.370	0.389	0.462
38	96	1.60	0.215	77	1.60	0.215	0.262	0.315	0.376	0.396	0.470
36	102	1.70	0.222	79	1.70	0.222	0.271	0.327	0.389	0.410	0.487
35	108	1.80	0.227	81	1.80	0.227	0.276	0.333	0.397	0.418	0.496
33	114	1.90	0.236	83	1.90	0.236	0.287	0.346	0.412	0.434	0.515
32	120	2.00	0.240	86	2.00	0.240	0.293	0.353	0.421	0.443	0.526
30	126	2.10	0.251	88	2.10	0.251	0.306	0.368	0.439	0.462	0.548
29	132	2.20	0.256	91	2.20	0.256	0.312	0.377	0.449	0.473	0.561
27	138	2.30	0.269	95	2.30	0.269	0.327	0.395	0.470	0.495	0.588
26	144	2.40	0.275	98	2.40	0.275	0.336	0.405	0.482	0.508	0.603
24	150	2.50	0.290	102	2.50	0.290	0.354	0.426	0.508	0.535	0.635
23	156	2.60	0.299	106	2.60	0.299	0.364	0.439	0.523	0.551	0.653
21	162	2.70	0.317	111	2.70	0.317	0.386	0.466	0.555	0.585	0.694
20	168	2.80	0.327	116	2.80	0.327	0.399	0.481	0.573	0.604	0.716
18	174	2.90	0.351	122	2.90	0.351	0.428	0.516	0.615	0.647	0.768
17	180	3.00	0.365	129	3.00	0.365	0.445	0.536	0.638	0.673	0.798
15	186	3.10	0.396	137	3.10	0.396	0.483	0.582	0.694	0.731	0.867
14	192	3.20	0.415	146	3.20	0.415	0.506	0.610	0.727	0.766	0.908
12	198	3.30	0.460	158	3.30	0.460	0.561	0.676	0.806	0.849	1.007
11	204	3.40	0.488	171	3.40	0.488	0.595	0.717	0.855	0.900	1.068
9	210	3.50	0.560	189	3.50	0.560	0.682	0.822	0.980	1.032	1.224
8	216	3.60	0.607	210	3.60	0.607	0.740	0.891	1.062	1.119	1.328
6	222	3.70	0.742	243	3.70	0.742	0.904	1.090	1.298	1.368	1.623
5	228	3.80	0.845	286	3.80	0.845	1.030	1.241	1.479	1.558	1.848
3	234	3.90	1.241	375	3.90	1.241	1.512	1.822	2.171	2.287	2.714
2	240	4.00	1.748	538	4.00	1.748	2.130	2.567	3.059	3.223	3.824
1	246	4.10	6.266	1,443	4.10	6.266	7.637	9.203	10.965	11.553	13.707
4	252	4.20	0.995	1,307	4.20	0.995	1.213	1.462	1.741	1.835	2.177
7	258	4.30	0.666	299	4.30	0.666	0.811	0.978	1.165	1.228	1.456
10	264	4.40	0.521	214	4.40	0.521	0.635	0.765	0.912	0.960	1.140
13	270	4.50	0.436	172	4.50	0.436	0.532	0.641	0.764	0.805	0.954
16	276	4.60	0.380	147	4.60	0.380	0.463	0.558	0.665	0.700	0.831
19	282	4.70	0.339	129	4.70	0.339	0.413	0.498	0.593	0.625	0.741
22	288	4.80	0.307	116	4.80	0.307	0.375	0.452	0.538	0.567	0.673
25	294	4.90	0.283	106	4.90	0.283	0.344	0.415	0.495	0.521	0.618
28	300	5.00	0.262	98	5.00	0.262	0.320	0.385	0.459	0.484	0.574
31	306	5.10	0.245	91	5.10	0.245	0.299	0.360	0.429	0.452	0.537
34	312	5.20	0.231	86	5.20	0.231	0.282	0.339	0.404	0.426	0.505
37	318	5.30	0.219	81	5.30	0.219	0.266	0.321	0.382	0.403	0.478
40	324	5.40	0.208	77	5.40	0.208	0.253	0.305	0.363	0.383	0.454
43	330	5.50	0.198	73	5.50	0.198	0.241	0.291	0.347	0.365	0.433
46	336	5.60	0.190	70	5.60	0.190	0.231	0.278	0.332	0.350	0.415
49	342	5.70	0.182	67	5.70	0.182	0.222	0.267	0.318	0.335	0.398
52	348	5.80	0.175	64	5.80	0.175	0.213	0.257	0.306	0.323	0.383
55	354	5.90	0.169	62	5.90	0.169	0.206	0.248	0.295	0.311	0.369
58	360	6.00	0.163	60	6.00	0.163	0.199	0.239	0.285	0.301	0.357
61	366	6.10	0.000	29	6.10	0.000	0.000	0.000	0.000	0.000	0.000

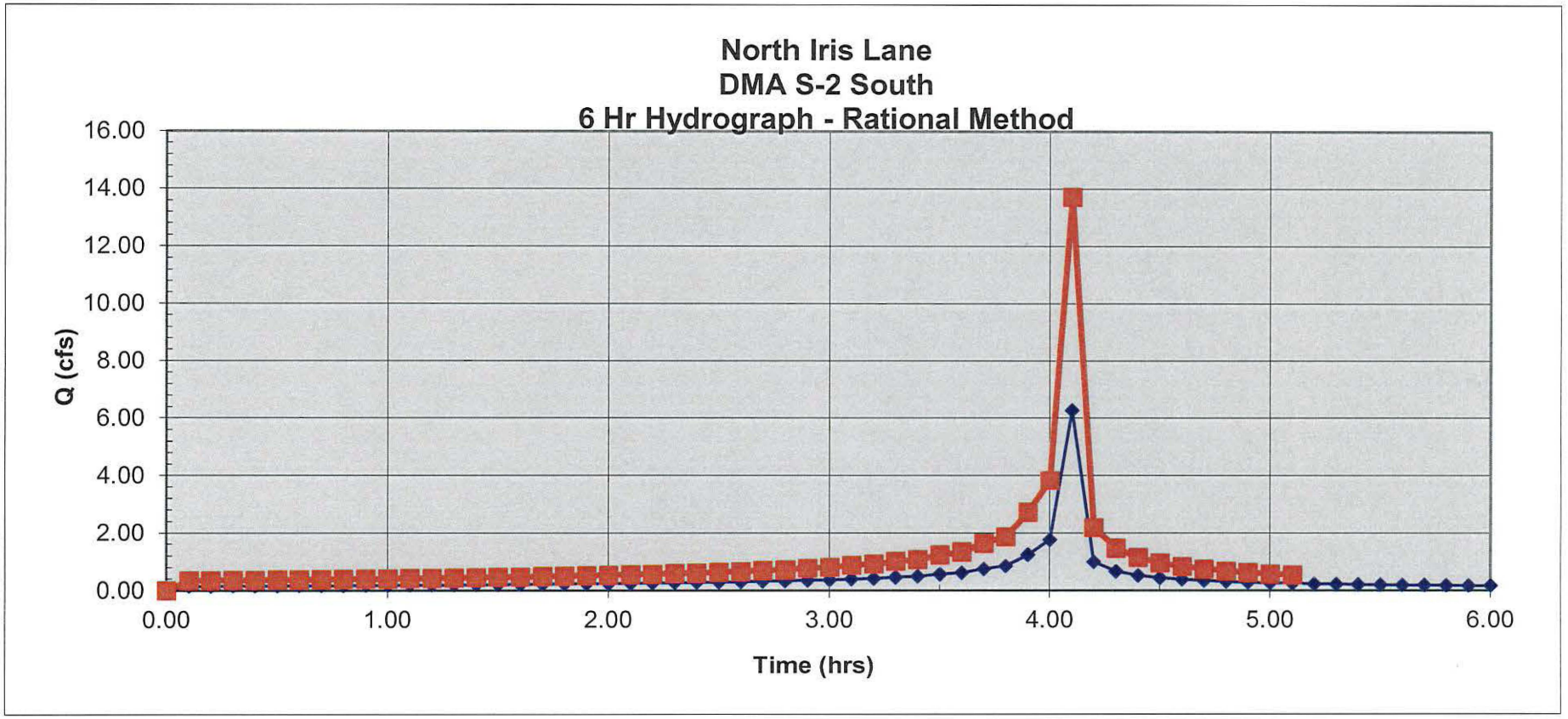

North Iris Lane
DMA S-2 South
6 Hr Hydrograph - Rational Method
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Q (cfs)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Time (hrs)

EXHIBIT C

STORAGE INDICATION TABLES

North Iris Lane

Basin 3				715.60				0.311	0.014					
BMP-3 / HMP 3		Top	717.10		6,201 cf					Height	0.30			4.80
		Storage @ Overflow	716.60		4,978 cf			711.80			1.500			48
Basin Storage Volumes			124.58%		dT= 10			dT= 15			1.500			48
											712.05	Not Used	Not Used	716.60
DEPTH (FT)	ELEVATION	AREA (SF)	Void Ratio	Volume (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	#1 (CFS)	#2 (CFS)	#3 (CFS)	Overflow (CFS)
0.00	711.55	2,010	0.40	0	0	0.00	0.00	0.00	0.00	0.00				
0.10	711.65	2,010	0.40	80	80	0.27	0.28	0.18	0.19	0.01				
0.20	711.75	2,010	0.40	80	161	0.54	0.55	0.36	0.37	0.01				
0.25	711.80	2,010	0.40	40	201	0.67	0.68	0.45	0.46	0.01	0.000			
0.35	711.90	2,010	0.40	80	281	0.94	0.97	0.63	0.66	0.03	0.017			
0.45	712.00	2,010	0.40	80	362	1.21	1.25	0.80	0.85	0.04	0.027			
0.55	712.10	2,010	0.40	80	442	1.47	1.52	0.98	1.03	0.05	0.033			
0.65	712.20	2,010	0.40	80	523	1.74	1.80	1.16	1.21	0.05	0.039			
0.75	712.30	2,010	0.40	80	603	2.01	2.07	1.34	1.40	0.06	0.043			
0.85	712.40	2,010	0.40	80	683	2.28	2.34	1.52	1.58	0.06	0.047			
0.95	712.50	2,010	0.40	80	764	2.55	2.61	1.70	1.76	0.07	0.051			
1.05	712.60	2,010	0.40	80	844	2.81	2.88	1.88	1.95	0.07	0.055			
1.15	712.70	2,010	0.40	80	925	3.08	3.15	2.05	2.13	0.07	0.058			
1.25	712.80	2,010	0.40	80	1,005	3.35	3.43	2.23	2.31	0.08	0.061			
1.35	712.90	2,010	0.40	80	1,085	3.62	3.70	2.41	2.49	0.08	0.064			
1.45	713.00	2,010	0.40	80	1,166	3.89	3.97	2.59	2.67	0.08	0.067			
1.55	713.10	2,010	0.40	80	1,246	4.15	4.24	2.77	2.85	0.08	0.070			
1.65	713.20	2,010	0.40	80	1,327	4.42	4.51	2.95	3.04	0.09	0.073			
1.75	713.30	2,010	0.40	80	1,407	4.69	4.78	3.13	3.22	0.09	0.076			
1.85	713.40	2,010	0.40	80	1,487	4.96	5.05	3.31	3.40	0.09	0.078			
1.95	713.50	2,010	0.40	80	1,568	5.23	5.32	3.48	3.58	0.10	0.081			
2.05	713.60	2,010	0.40	80	1,648	5.49	5.59	3.66	3.76	0.10	0.083			
2.15	713.70	2,010	0.40	80	1,729	5.76	5.86	3.84	3.94	0.10	0.085			
2.25	713.80	2,010	0.40	80	1,809	6.03	6.13	4.02	4.12	0.10	0.088			
2.35	713.90	2,010	0.40	80	1,889	6.30	6.40	4.20	4.30	0.10	0.090			
2.45	714.00	2,010	0.40	80	1,970	6.57	6.67	4.38	4.48	0.11	0.092			
2.55	714.10	2,010	0.30	70	2,040	6.80	6.91	4.53	4.64	0.11	0.094			
2.65	714.20	2,010	0.30	60	2,100	7.00	7.11	4.67	4.78	0.11	0.096			
2.75	714.30	2,010	0.30	60	2,161	7.20	7.32	4.80	4.91	0.11	0.098			
2.85	714.40	2,010	0.30	60	2,221	7.40	7.52	4.94	5.05	0.11	0.100			
2.95	714.50	2,010	0.30	60	2,281	7.60	7.72	5.07	5.19	0.12	0.102			
3.05	714.60	2,010	0.30	60	2,342	7.81	7.92	5.20	5.32	0.12	0.104			
3.15	714.70	2,010	0.30	60	2,402	8.01	8.13	5.34	5.46	0.12	0.106			
3.25	714.80	2,010	0.30	60	2,462	8.21	8.33	5.47	5.59	0.12	0.108			
3.35	714.90	2,010	0.30	60	2,523	8.41	8.53	5.61	5.73	0.12	0.110			
3.45	715.00	2,010	0.30	60	2,583	8.61	8.71	5.74	5.84	0.10	0.087			
3.55	715.10	2,010	0.30	60	2,643	8.81	8.91	5.87	5.98	0.10	0.089			
3.65	715.20	2,010	0.30	60	2,703	9.01	9.12	6.01	6.11	0.10	0.090			
3.75	715.30	2,010	0.30	60	2,764	9.21	9.32	6.14	6.25	0.11	0.091			
3.85	715.40	2,010	0.30	60	2,824	9.41	9.52	6.28	6.38	0.11	0.093			
3.95	715.50	2,010	0.30	60	2,884	9.61	9.72	6.41	6.52	0.11	0.094			
4.05	715.60	2,010	1.00	131	3,015	10.05	10.16	6.70	6.81	0.11	0.095			
4.15	715.70	2,048	1.00	203	3,218	10.73	10.84	7.15	7.26	0.11	0.096			
4.25	715.80	2,086	1.00	207	3,425	11.42	11.53	7.61	7.72	0.11	0.098			
4.35	715.90	2,124	1.00	211	3,635	12.12	12.23	8.08	8.19	0.11	0.099			
4.45	716.00	2,162	1.00	214	3,849	12.83	12.95	8.55	8.67	0.11	0.100			
4.55	716.10	2,200	1.00	218	4,068	13.56	13.67	9.04	9.15	0.12	0.101			0.00
4.65	716.20	2,238	1.00	222	4,289	14.30	15.10	9.53	10.33	0.80	0.103			0.68
4.75	716.30	2,276	1.00	226	4,515	15.05	17.10	10.03	12.08	2.05	0.104			1.93
4.85	716.40	2,314	1.00	230	4,745	15.82	19.48	10.54	14.21	3.67	0.105			3.55
4.95	716.50	2,352	1.00	233	4,978	16.59	22.18	11.06	16.65	5.58	0.106			5.46
5.05	716.60	2,390	1.00	237	5,215	17.38	25.14	11.59	19.35	7.76	0.107			7.64
5.15	716.70	2,428	1.00	241	5,456	18.19	28.35	12.12	22.29	10.16	0.108			10.04
5.25	716.80	2,466	1.00	245	5,701	19.00	31.78	12.67	25.44	12.77	0.109			12.65
5.35	716.90	2,504	1.00	249	5,949	19.83	35.41	13.22	28.80	15.58	0.110			15.46
5.45	717.00	2,542	1.00	252	6,201	20.67	39.24	13.78	32.35	18.57	0.112			18.44
5.55	717.10	2,580	1.00	256	6,458	21.53	43.25	14.35	36.08	21.73	0.113			21.60

North Iris Lane

Infiltration 0.22 0.012 11.14

BMP-2 / HMP 2 Middle Top 708.00 12,762 cf Height 0.50 5.50

Storage @ Overflow 706.50 6,026 cf 0.14 1.500 0 24

Basin Storage Volumes 211.81% dT= 5 dT= 15 1.500 0 24

702.00 0.00 Not Used

DEPTH (FT)	ELEVATION	AREA (SF)	Void Ratio	Volume (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	#1 (CFS)	#2 (CFS)	#3 (CFS)	Overflow (CFS)
0.00	701.50	2,320	0.40	0	0	0.00	0.00	0.00	0.00	0.00				
0.10	701.60	2,320	0.40	93	93	0.62	0.63	0.21	0.22	0.012				
0.20	701.70	2,320	0.40	93	186	1.24	1.25	0.41	0.42	0.012				
0.30	701.80	2,320	0.40	93	278	1.86	1.87	0.62	0.63	0.012				
0.40	701.90	2,320	0.40	93	371	2.47	2.49	0.82	0.84	0.012				
0.50	702.00	2,320	0.40	93	464	3.09	3.11	1.03	1.04	0.012	0.000			
0.60	702.10	2,320	0.40	93	557	3.71	3.74	1.24	1.27	0.028	0.017			
0.70	702.20	2,320	0.40	93	650	4.33	4.37	1.44	1.48	0.039	0.027			
0.80	702.30	2,320	0.40	93	742	4.95	4.99	1.65	1.69	0.043	0.032			
0.90	702.40	2,320	0.40	93	835	5.57	5.62	1.86	1.91	0.050	0.038			
1.00	702.50	2,320	0.40	93	928	6.19	6.24	2.06	2.12	0.055	0.043			
1.10	702.60	2,320	0.40	93	1,021	6.81	6.86	2.27	2.33	0.059	0.048			
1.20	702.70	2,320	0.40	93	1,114	7.42	7.49	2.47	2.54	0.064	0.052			
1.30	702.80	2,320	0.40	93	1,206	8.04	8.11	2.68	2.75	0.068	0.056			
1.40	702.90	2,320	0.40	93	1,299	8.66	8.73	2.89	2.96	0.071	0.059			
1.50	703.00	2,320	0.40	93	1,392	9.28	9.35	3.09	3.17	0.075	0.063			
1.60	703.10	2,320	0.40	93	1,485	9.90	9.98	3.30	3.38	0.078	0.066			
1.70	703.20	2,320	0.40	93	1,578	10.52	10.60	3.51	3.59	0.081	0.069			
1.80	703.30	2,320	0.40	93	1,670	11.14	11.22	3.71	3.80	0.084	0.072			
1.90	703.40	2,320	0.40	93	1,763	11.75	11.84	3.92	4.01	0.087	0.075			
2.00	703.50	2,320	0.40	93	1,856	12.37	12.46	4.12	4.21	0.090	0.078			
2.10	703.60	2,320	0.40	93	1,949	12.99	13.08	4.33	4.42	0.092	0.081			
2.20	703.70	2,320	0.40	93	2,042	13.61	13.71	4.54	4.63	0.095	0.083			
2.30	703.80	2,320	0.40	93	2,134	14.23	14.33	4.74	4.84	0.097	0.086			
2.40	703.90	2,320	0.40	93	2,227	14.85	14.95	4.95	5.05	0.100	0.088			
2.50	704.00	2,320	0.40	93	2,320	15.47	15.57	5.16	5.26	0.102	0.090			
2.60	704.10	2,320	0.40	93	2,413	16.09	16.19	5.36	5.47	0.105	0.093			
2.70	704.20	2,320	0.40	93	2,506	16.70	16.81	5.57	5.67	0.107	0.095			
2.80	704.30	2,320	0.40	93	2,598	17.32	17.43	5.77	5.88	0.109	0.097			
2.90	704.40	2,320	0.40	93	2,691	17.94	18.05	5.98	6.09	0.111	0.099			
3.00	704.50	2,320	0.40	93	2,784	18.56	18.67	6.19	6.30	0.113	0.101			
3.10	704.60	2,320	0.30	81	2,865	19.10	19.22	6.37	6.48	0.115	0.103			
3.20	704.70	2,320	0.30	70	2,935	19.57	19.68	6.52	6.64	0.117	0.106			
3.30	704.80	2,320	0.30	70	3,004	20.03	20.15	6.68	6.80	0.119	0.107			
3.40	704.90	2,320	0.30	70	3,074	20.49	20.61	6.83	6.95	0.121	0.109			
3.50	705.00	2,320	0.30	70	3,144	20.96	21.08	6.99	7.11	0.123	0.111			
3.60	705.10	2,320	0.30	70	3,213	21.42	21.55	7.14	7.27	0.125	0.113			
3.70	705.20	2,320	0.30	70	3,283	21.89	22.01	7.30	7.42	0.127	0.115			
3.80	705.30	2,320	0.30	70	3,352	22.35	22.48	7.45	7.58	0.129	0.117			
3.90	705.40	2,320	0.30	70	3,422	22.81	22.94	7.60	7.73	0.131	0.119			
4.00	705.50	2,320	0.30	70	3,492	23.28	23.41	7.76	7.89	0.132	0.120			
4.10	705.60	2,320	0.30	70	3,561	23.74	23.88	7.91	8.05	0.134	0.122			
4.20	705.70	2,320	0.30	70	3,631	24.21	24.34	8.07	8.20	0.136	0.124			
4.30	705.80	2,320	0.30	70	3,700	24.67	24.81	8.22	8.36	0.137	0.126			
4.40	705.90	2,320	0.30	70	3,770	25.13	25.27	8.38	8.52	0.139	0.127			
4.50	706.00	3,440	1.00	207	3,977	26.51	26.65	8.84	8.98	0.141	0.129			
4.60	706.10	3,554	1.00	350	4,327	28.84	28.99	9.61	9.76	0.142	0.131			
4.70	706.20	3,668	1.00	361	4,688	31.25	31.39	10.42	10.56	0.144	0.132			
4.80	706.30	3,782	1.00	559	5,246	34.98	35.12	11.66	11.80	0.146	0.134			
4.90	706.40	3,896	1.00	384	5,630	37.54	37.68	12.51	12.66	0.147	0.135			
5.00	706.50	4,010	1.00	395	6,026	40.17	40.32	13.39	13.54	0.149	0.137			0.00
5.10	706.60	4,124	1.00	407	6,432	42.88	43.37	14.29	14.79	0.492	0.138			0.34
5.20	706.70	4,238	1.00	418	6,850	45.67	46.79	15.22	16.34	1.118	0.140			0.97
5.30	706.80	4,352	1.00	430	7,280	48.53	50.46	16.18	18.11	1.928	0.141			1.77
5.40	706.90	4,466	1.00	447	7,726	51.51	54.40	17.17	20.06	2.887	0.143			2.73
5.50	707.00	4,580	1.00	452	8,179	54.53	58.50	18.18	22.15	3.975	0.144			3.82
5.60	707.10	4,694	1.00	464	8,642	57.62	62.79	19.21	24.38	5.177	0.146			5.02
5.70	707.20	4,808	1.00	475	9,118	60.78	67.27	20.26	26.75	6.484	0.147			6.33
5.80	707.30	4,922	1.00	487	9,604	64.03	71.92	21.34	29.23	7.888	0.149			7.73
5.90	707.40	5,036	1.00	498	10,102	67.35	76.64	22.45	31.74	9.294	0.150			9.13
6.00	707.50	5,150	1.00	509	10,611	70.74	80.53	23.58	33.37	9.790	0.151			9.63
6.10	707.60	5,264	1.00	521	11,132	74.21	84.47	24.74	35.00	10.261	0.153			10.10
6.20	707.70	5,378	1.00	532	11,664	77.76	88.47	25.92	36.63	10.711	0.154			10.54
6.30	707.80	5,492	1.00	544	12,208	81.38	92.53	27.13	38.27	11.143	0.156			10.98
6.40	707.90	5,606	1.00	555	12,762	85.08	96.64	28.36	39.92	11.559	0.157			11.39
6.50	708.00	5,720	1.00	566	13,329	88.86	100.82	29.62	41.58	11.960	0.158			11.79
6.60	708.10	5,834	1.00	578	13,906	92.71	105.06	30.90	43.25	12.348	0.160			12.18
6.70	708.20	5,948	1.00	589	14,496	96.64	109.36	32.21	44.94	12.724	0.161			12.55
6.80	708.30	6,062	1.00	601	15,096	100.64	113.73	33.55	46.64	13.089	0.162			12.91

North Iris Lane

											0.3110		
											0.019		
BMP-1 (South)			Top	706.00		8,924 cf				Height		0.25	
			Storage @ Overflow	704.80		4,567 cf		0.10				1.500	0
Basin Storage Volumes				195.40%		dT= 6		dT= 15				1.500	0
												100.00	0.00
DEPTH (FT)	ELEVATION	AREA (SF)	Void Ratio	Volume (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	#1 (CFS)	#2 (CFS)	
0.00	700.90	**2,590**	0.40	0	0	0.00	0.00	0.00	0.00	0.000			
0.10	701.00	2,590	0.40	104	104	0.58	0.59	0.23	0.25	0.019			
0.20	701.10	2,590	0.40	104	207	1.15	1.17	0.46	0.48	0.019			
0.30	701.20	2,590	0.40	104	311	1.73	1.75	0.69	0.71	0.019	0.0000		
0.40	701.30	2,590	0.40	104	414	2.30	2.34	0.92	0.96	0.035	0.0166		
0.50	701.40	2,590	0.40	104	518	2.88	2.92	1.15	1.20	0.046	0.0273		
0.60	701.50	2,590	0.40	104	622	3.45	3.51	1.38	1.43	0.052	0.0337		
0.70	701.60	2,590	0.40	104	725	4.03	4.09	1.61	1.67	0.059	0.0402		
0.80	701.70	2,590	0.40	104	829	4.60	4.67	1.84	1.90	0.063	0.0443		
0.90	701.80	2,590	0.40	104	932	5.18	5.25	2.07	2.14	0.066	0.0476		
1.00	701.90	2,590	0.40	104	1,036	5.76	5.83	2.30	2.37	0.071	0.0519		
1.10	702.00	2,590	0.40	104	1,140	6.33	6.41	2.53	2.61	0.074	0.0558		
1.20	702.10	2,590	0.40	104	1,243	6.91	6.98	2.76	2.84	0.078	0.0595		
1.30	702.20	2,590	0.40	104	1,347	7.48	7.56	2.99	3.07	0.082	0.0629		
1.40	702.30	2,590	0.40	104	1,450	8.06	8.14	3.22	3.31	0.085	0.0662		
1.50	702.40	2,590	0.40	104	1,554	8.63	8.72	3.45	3.54	0.088	0.0693		
1.60	702.50	2,590	0.40	104	1,658	9.21	9.30	3.68	3.77	0.091	0.0723		
1.70	702.60	2,590	0.30	91	1,748	9.71	9.81	3.89	3.98	0.094	0.0751		
1.80	702.70	2,590	0.30	78	1,826	10.14	10.24	4.06	4.15	0.097	0.0779		
1.90	702.80	2,590	0.30	78	1,904	10.58	10.68	4.23	4.33	0.099	0.0806		
2.00	702.90	2,590	0.30	78	1,981	11.01	11.11	4.40	4.50	0.102	0.0831		
2.10	703.00	2,590	0.30	78	2,059	11.44	11.54	4.58	4.68	0.104	0.0856		
2.20	703.10	2,590	0.30	78	2,137	11.87	11.98	4.75	4.86	0.107	0.0881		
2.30	703.20	2,590	0.30	78	2,214	12.30	12.41	4.92	5.03	0.109	0.0904		
2.40	703.30	2,590	0.30	78	2,292	12.73	12.85	5.09	5.21	0.111	0.0927		
2.50	703.40	2,590	0.30	78	2,370	13.17	13.28	5.27	5.38	0.114	0.0950		
2.60	703.50	2,590	0.30	78	2,448	13.60	13.71	5.44	5.55	0.116	0.0972		
2.70	703.60	2,590	0.30	78	2,525	14.03	14.15	5.61	5.73	0.118	0.0993		
2.80	703.70	2,590	0.30	78	2,603	14.46	14.58	5.78	5.90	0.120	0.1014		
2.90	703.80	2,590	0.30	78	2,681	14.89	15.01	5.96	6.08	0.122	0.1035		
3.00	703.90	2,590	0.30	78	2,758	15.32	15.45	6.13	6.25	0.124	0.1055		
3.10	704.00	2,590	0.30	78	2,836	15.76	15.88	6.30	6.43	0.126	0.1075		
3.20	704.10	2,590	0.30	78	2,914	16.19	16.32	6.48	6.60	0.128	0.1094		
3.30	704.20	2,590	0.30	220	3,134	17.41	17.54	6.96	7.09	0.130	0.1113		
3.40	704.30	3,053	1.00	192	3,325	18.47	18.61	7.39	7.52	0.132	0.1132		
3.50	704.40	3,078	1.00	307	3,632	20.18	20.31	8.07	8.20	0.134	0.1151		
3.60	704.50	3,104	1.00	309	3,941	21.89	22.03	8.76	8.89	0.136	0.1169		
3.70	704.60	3,129	1.00	312	4,253	23.63	23.76	9.45	9.59	0.137	0.1187		
3.80	704.70	3,155	1.00	314	4,567	25.37	25.51	10.15	10.29	0.139	0.1205		
3.90	704.80	3,180	1.00	317	4,884	27.13	27.27	10.85	10.99	0.141	0.1222		
4.00	704.90	3,270	1.00	322	5,206	28.92	29.35	11.57	12.00	0.432	0.1239		

EXHIBIT D

DETENTION SUMMARY

North Iris Lane

NORTH

N-1 Preliminary Design 17-Mar-22

BMP-3 / HMP 3

6-Hour Rational Method Hydrograph

Total 0.575 ac

		Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage	2,010 sf	711.55	0	0.00	0
Low Flow	2,010 sf	712.05	362	0.01	0.50
Bottom	2,010 sf	715.60	2,884	0.07	4.05
Overflow Weir	2,276 sf	716.10	3,849	0.09	4.55
Top Of Basin	2,390 sf	717.10	6,201	0.14	5.55

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qtotal (cfs)	WSEL (ft)	Depth (ft)
10% Q2					
2 YEAR	0.54	1.12	0.093	713.40	1.9
5 YEAR	0.66	1.36	0.102	713.80	2.3
10 YEAR	0.80	1.64	0.117	714.50	3.0
25 YEAR	0.95	1.95	0.124	715.40	3.9
50 YEAR	1.00	2.06	0.124	715.60	4.1
100 YEAR	1.19	2.44	0.124	715.90	4.4

Outlet Control Structure Overflow Weir

Opening	#1	#2	#3	Overflow
Elevation	712.05	Not Used	Not Used	716.1
Width (in)	1.500	0	Not	48.00
Height (in)	1.500	0	Used	48.00

Drain Time - Surface Volume below overflow elevation

Surface Area @ Overflow	2,276 sf
Surface Area Btm	2,010 sf
Depth @ Overflow	0.50 ft
Avg Area	2,143 sf
Surface Volume	1,072 cf
Drain Time	**2.6 hrs**
Qavg	0.114 cfs

North Iris Lane

SOUTH Basin Mid

Basin 2 Preliminary Design 17-Mar-22

BMP-2 / HMP 2 Middle

6-Hour Rational Method Hydrograph

Total 3.815 ac

			Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		2,320 sf	701.50	0	0.00	0.00
Low Flow Weir		2,320 sf	702.25	650	0.00	0.8
Bottom		4,010	706.50	5,630	0.00	4.3
Overflow Weir	0.50	4,580	707.00	7,726	0.18	5.5
Top Of WQ	1.00	5,150	707.50	10,102	0.23	6.0
Top of Detenition	1.80	5,720	708.30	14,496	0.33	6.8

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qtotal (cfs)	WSEL (ft)	Depth (ft)
2 YEAR	4.53	11.58	5.18	707.1	5.6
5 YEAR	5.52	14.11	7.89	707.3	5.8
10 YEAR	6.65	17.01	9.29	707.4	5.9
25 YEAR	7.92	20.26	9.79	707.5	6.0
50 YEAR	8.34	21.35	10.26	707.6	6.1
100 YEAR	9.90	25.33	11.14	707.8	6.3

Outlet Control Structure Overflow Weir

Opening	#1	#2	#3	Overflow
Elevation	702.25		Not Used	707.0
Width (in)	1.500	Not	Not	24.00
Height (in)	1.500	Used	Used	24.00

Drain Time - Surface Volume below overflow elevation

Btm Area	4,010 sf
Overflow Area	4,580 sf
Depth	0.80 ft
Avg Area	4,295 sf
Volume	3,436 cf
Drain Time	**7.9 hrs**
Avg Outflow	0.121 cfs

North Iris Lane

SOUTH Basin

S-2 Preliminary Design 17-Mar-22

BMP-1 (South)

6-Hour Rational Method Hydrograph

Total 2.322 ac

			Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		2,590 sf	700.90	0	0.00	0.00
Low Flow Weir		2,590 sf	701.40	414	0.00	0.50
Bottom		2,590	704.30	3,134	0.00	3.40
Overflow Weir	0.50	3,180	704.80	4,567	0.10	3.90
Top Of Treatment	1.00	3,628	705.30	6,227	0.14	4.40
Top Of Detention	1.50	4,076	705.80	8,108	0.19	1.50

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qdischarge (cfs)	Qout	WSEL (ft)	Depth (ft)
2 YEAR	2.75	6.27	3.38		705.10	4.2
5 YEAR	3.36	7.64	3.38		705.10	4.2
10 YEAR	4.05	9.20	5.51		705.20	4.3
25 YEAR	4.82	10.97	7.97		705.30	4.4
50 YEAR	5.08	11.55	7.97		705.30	4.4
100 YEAR	6.02	13.71	7.97	7.95	705.30	4.4

Outlet Control Structure Overflow Weir

Opening	#1	#2	#3	Overflow
Elevation	701.40		Not Used	704.80
Width (in)	1.500	Not	Not	37.00
Height (in)	1.500	Used	Used	37.00

Drain Time - Surface Volume below overflow elevation

Surface	2,590 sf
Overflow	3,180 sf
Depth	0.80 ft
Avg Area	2,885 sf
Volume	2,308 cf
Drain Time	**4.6 hrs**
Avg Outflow	0.139 cfs

EXHIBIT E

BASIN ROUTING

BMP-3 / HMP 3

DETENTION BASIN ROUTING

1.19 Allowable

2.44

0.124 Qout

100 YEAR EVENT ~ 6 Hour STORM

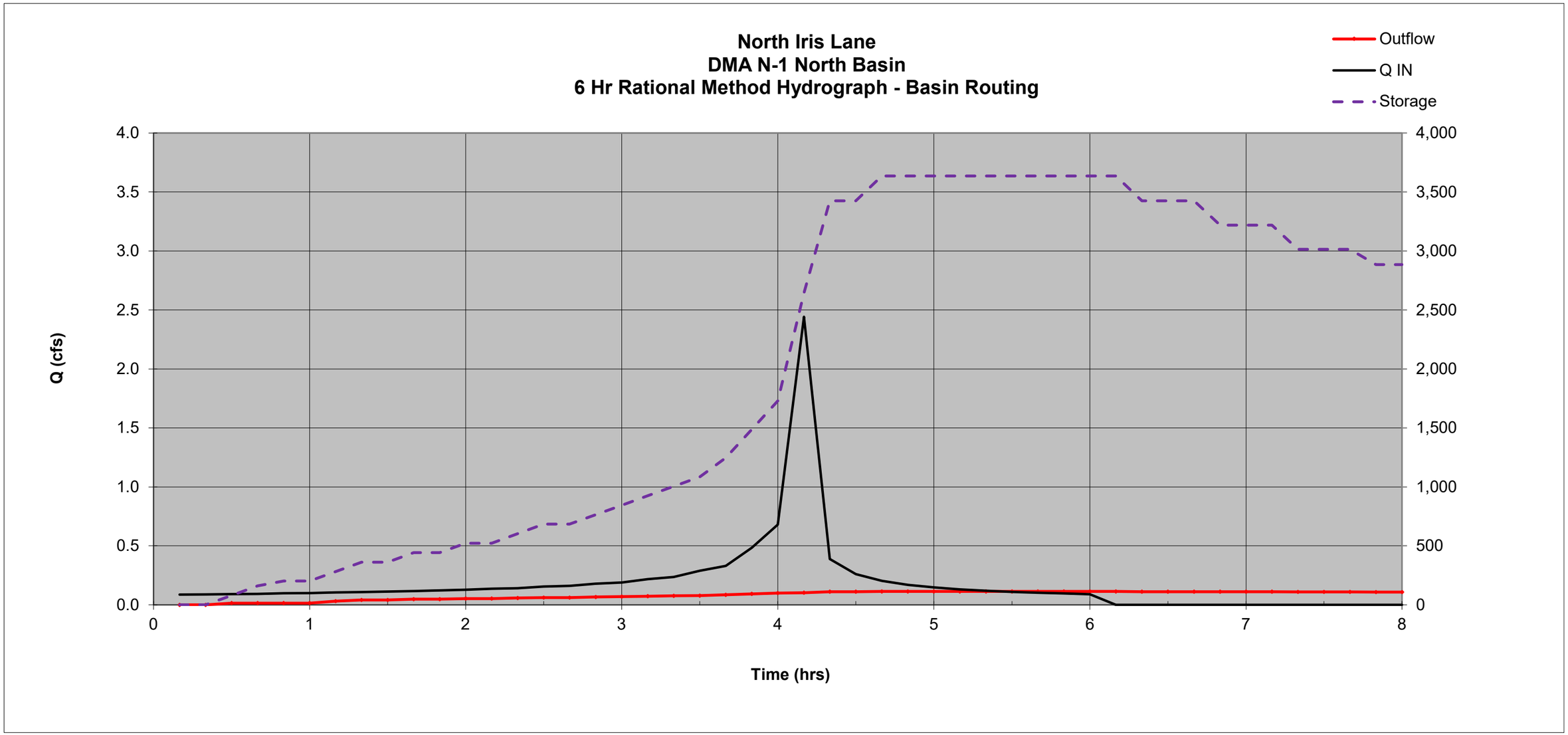
715.90 Max WSEL

10 Min

hrs Drain Time

Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)	Basin WSEL
1	0.17	0.087	0.09	0.09	0.0000	711.55
2	0.33	0.088	0.26	0.26	0.0000	711.55
3	0.50	0.092	0.44	0.41	0.0145	711.65
4	0.67	0.094	0.60	0.57	0.0145	711.75
5	0.83	0.098	0.76	0.73	0.0145	711.80
6	1.00	0.100	0.93	0.90	0.0145	711.80
7	1.17	0.105	1.10	1.04	0.0310	711.90
8	1.33	0.107	1.25	1.17	0.0418	712.00
9	1.50	0.113	1.39	1.31	0.0418	712.00
10	1.67	0.116	1.54	1.44	0.0479	712.10
11	1.83	0.124	1.68	1.59	0.0479	712.10
12	2.00	0.128	1.84	1.73	0.0531	712.20
13	2.17	0.137	2.00	1.89	0.0531	712.20
14	2.33	0.142	2.17	2.05	0.0576	712.30
15	2.50	0.154	2.35	2.23	0.0618	712.40
16	2.67	0.162	2.54	2.42	0.0618	712.40
17	2.83	0.179	2.76	2.63	0.0656	712.50
18	3.00	0.190	3.00	2.86	0.0691	712.60
19	3.17	0.218	3.27	3.12	0.0724	712.70
20	3.33	0.236	3.58	3.43	0.0755	712.80
21	3.50	0.289	3.95	3.80	0.0786	712.90
22	3.67	0.329	4.41	4.24	0.0846	713.10
23	3.83	0.483	5.06	4.87	0.0926	713.40
24	4.00	0.681	6.04	5.84	0.0999	713.70
25	4.17	2.441	8.96	8.75	0.1030	715.10
26	4.33	0.388	11.58	11.36	0.1121	715.80
27	4.50	0.259	12.01	11.78	0.1121	715.80
28	4.67	0.203	12.24	12.02	0.1134	715.90
29	4.83	0.170	12.39	12.16	0.1134	715.90
30	5.00	0.148	12.48	12.25	0.1134	715.90
31	5.17	**0.132**	12.53	12.31	0.1134	715.90
32	5.33	0.120	12.56	12.33	0.1134	715.90
33	5.50	0.110	12.56	12.34	0.1134	715.90
34	5.67	0.102	12.55	12.32	0.1134	715.90
35	5.83	0.096	12.52	12.29	0.1134	715.90
36	6.00	0.090	12.48	12.25	0.1134	715.90
37	6.17	0.000	12.34	12.11	0.1134	715.90
38	6.33	0.000	12.11	11.89	0.1121	715.80
39	6.50	0.000	11.89	11.67	0.1121	715.80
40	6.67	0.000	11.67	11.44	0.1121	715.80
41	6.83	0.000	11.44	11.22	0.1109	715.70
42	7.00	0.000	11.22	11.00	0.1109	715.70
43	7.17	0.000	11.00	10.78	0.1109	715.70
44	7.33	0.000	10.78	10.56	0.1096	715.60

45	7.50	0.000	10.56	10.34	0.1096	715.60
46	7.67	0.000	10.34	10.12	0.1096	715.60
47	7.83	0.000	10.12	9.90	0.1083	715.50
48	8.00	0.000	9.90	9.69	0.1083	715.50
49	8.17	0.000	9.69	9.47	0.1070	715.40
50	8.33	0.000	9.47	9.26	0.1057	715.30
51	8.50	0.000	9.26	9.05	0.1044	715.20
52	8.67	0.000	9.05	8.85	0.1030	715.10
53	8.83	0.000	8.85	8.64	0.1016	715.00
54	9.00	0.000	8.64	8.39	0.1243	714.90
55	9.17	0.000	8.39	8.15	0.1224	714.80
56	9.33	0.000	8.15	7.91	0.1206	714.70
57	9.50	0.000	7.91	7.67	0.1168	714.50
58	9.67	0.000	7.67	7.44	0.1148	714.40
59	9.83	0.000	7.44	7.22	0.1128	714.30
60	10.00	0.000	7.22	7.00	0.1108	714.20
61	10.17	0.000	7.00	6.78	0.1087	714.10
62	10.33	0.000	6.78	6.57	0.1066	714.00
63	10.50	0.000	6.57	6.36	0.1044	713.90
64	10.67	0.000	6.36	6.15	0.1022	713.80
65	10.83	0.000	6.15	5.95	0.1022	713.80
66	11.00	0.000	5.95	5.75	0.0999	713.70
67	11.17	0.000	5.75	5.55	0.0975	713.60
68	11.33	0.000	5.55	5.36	0.0951	713.50
69	11.50	0.000	5.36	5.17	0.0951	713.50
70	11.67	0.000	5.17	4.99	0.0926	713.40
71	11.83	0.000	4.99	4.81	0.0900	713.30
72	12.00	0.000	4.81	4.63	0.0900	713.30
73	12.17	0.000	4.63	4.45	0.0873	713.20
74	12.33	0.000	4.45	4.28	0.0846	713.10
75	12.50	0.000	4.28	4.12	0.0846	713.10
76	12.67	0.000	4.12	3.95	0.0817	713.00
77	12.83	0.000	3.95	3.80	0.0786	712.90
78	13.00	0.000	3.80	3.64	0.0786	712.90
79	13.17	0.000	3.64	3.49	0.0755	712.80
80	13.33	0.000	3.49	3.34	0.0755	712.80
81	13.50	0.000	3.34	3.19	0.0724	712.70
82	13.67	0.000	3.19	3.05	0.0724	712.70
83	13.83	0.000	3.05	2.91	0.0691	712.60
84	14.00	0.000	2.91	2.77	0.0691	712.60
85	14.17	0.000	2.77	2.64	0.0656	712.50
86	14.33	0.000	2.64	2.51	0.0656	712.50
87	14.50	0.000	2.51	2.38	0.0618	712.40
88	14.67	0.000	2.38	2.26	0.0618	712.40
89	14.83	0.000	2.26	2.15	0.0576	712.30
90	15.00	0.000	2.15	2.03	0.0576	712.30


North Iris Lane
DMA N-1 North Basin
6 Hr Rational Method Hydrograph - Basin Routing
Outflow
Q IN
Storage
Q (cfs)
Time (hrs)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
1
2
3
4
5
6
7
8

BMP-2 / HMP 2 Middle **DETENTION BASIN ROUTING**

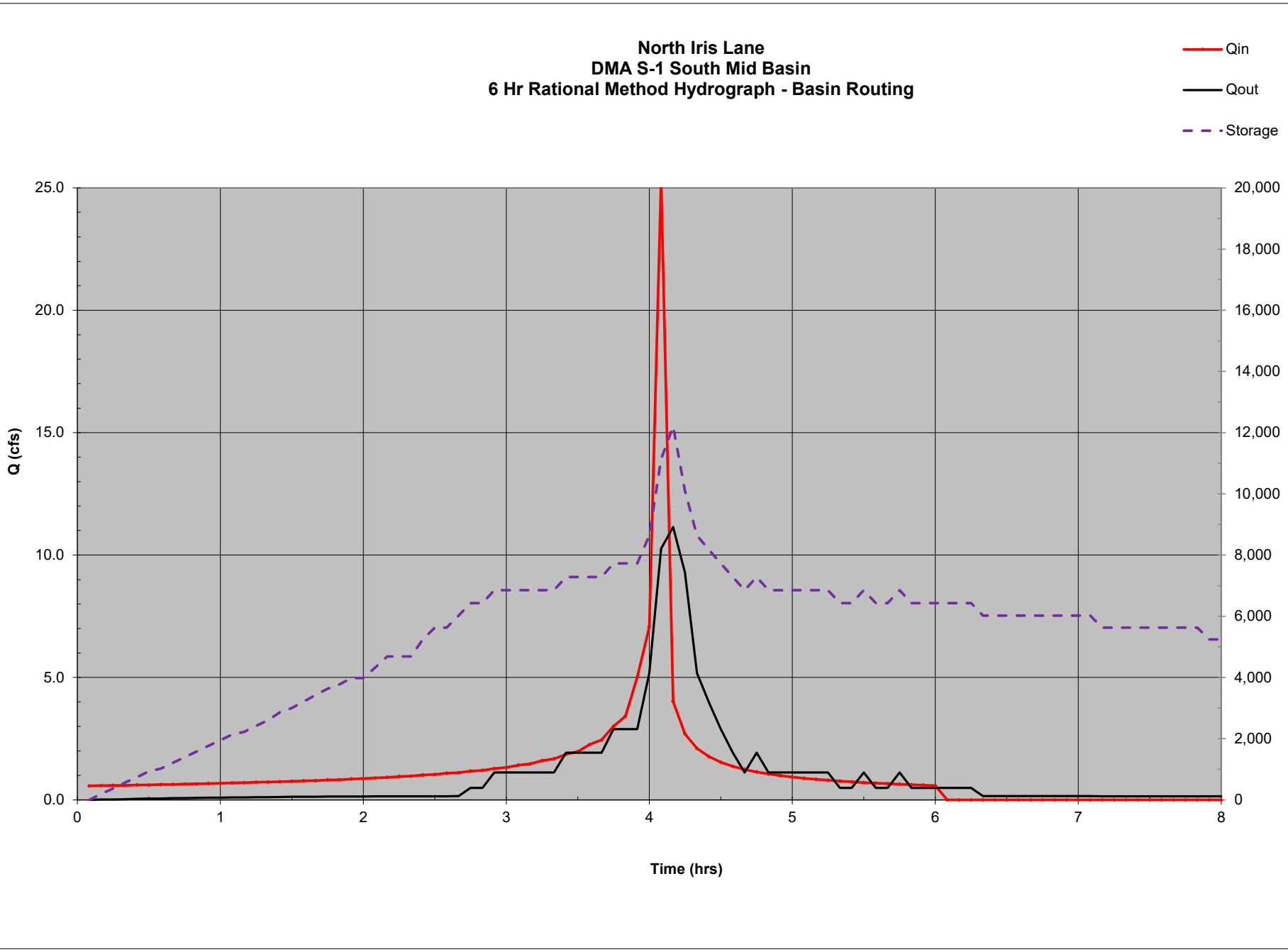
25.33

100 YEAR EVENT ~ 6 Hour STORM

9.90 Allowable
11.143 Qout
707.80 Max WSEL
hrs Drain Time

5 Min Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)	Basin WSEL
1	0.08	0.573	0.57	0.57	0.0000	701.50
2	0.17	0.578	1.72	1.70	0.0118	701.70
3	0.25	0.589	2.87	2.84	0.0118	701.90
4	0.33	0.594	4.03	3.97	0.0284	702.10
5	0.42	0.606	5.17	5.08	0.0435	702.30
6	0.50	0.612	6.30	6.19	0.0548	702.50
7	0.58	0.624	7.43	7.31	0.0594	702.60
8	0.67	0.631	8.56	8.43	0.0676	702.80
9	0.75	0.645	9.70	9.55	0.0747	703.00
10	0.83	0.652	10.85	10.69	0.0811	703.20
11	0.92	0.666	12.01	11.83	0.0869	703.40
12	1.00	0.674	13.17	12.99	0.0924	703.60
13	1.08	0.690	14.35	14.16	0.0975	703.80
14	1.17	0.699	15.55	15.35	0.0999	703.90
15	1.25	0.717	16.76	16.55	0.1045	704.10
16	1.33	0.726	18.00	17.78	0.1090	704.30
17	1.42	0.745	19.25	19.02	0.1153	704.60
18	1.50	0.756	20.52	20.28	0.1193	704.80
19	1.58	0.777	21.81	21.56	0.1250	705.10
20	1.67	0.789	23.13	22.87	0.1305	705.40
21	1.75	0.813	24.47	24.20	0.1357	705.70
22	1.83	0.826	25.84	25.56	0.1391	705.90
23	1.92	0.854	27.24	26.96	0.1407	706.00
24	2.00	0.868	28.68	28.40	0.1407	706.00
25	2.08	**0.899**	30.17	29.88	0.1424	706.10
26	2.17	0.916	31.70	31.41	0.1440	706.20
27	2.25	0.952	33.28	32.99	0.1440	706.20
28	2.33	0.972	34.91	34.63	0.1440	706.20
29	2.42	1.014	36.61	36.32	0.1456	706.30
30	2.50	1.036	38.37	38.08	0.1471	706.40
31	2.58	1.086	40.20	39.90	0.1471	706.40
32	2.67	1.113	42.10	41.81	0.1487	706.50
33	2.75	1.174	44.09	43.11	0.4917	706.60
34	2.83	1.207	45.49	44.51	0.4917	706.60
35	2.92	1.282	47.00	44.76	1.1177	706.70
36	3.00	1.324	47.37	45.13	1.1177	706.70
37	3.08	1.420	47.88	45.64	1.1177	706.70
38	3.17	1.475	48.53	46.30	1.1177	706.70
39	3.25	1.603	49.38	47.14	1.1177	706.70
40	3.33	1.678	50.42	48.19	1.1177	706.70
41	3.42	1.861	51.73	47.87	1.9278	706.80
42	3.50	1.974	51.71	47.85	1.9278	706.80
43	3.58	2.263	52.09	48.23	1.9278	706.80
44	3.67	2.454	52.95	49.09	1.9278	706.80
45	3.75	2.999	54.54	48.77	2.8869	706.90
46	3.83	3.416	55.19	49.41	2.8869	706.90

47	3.92	5.015	57.84	52.07	2.8869	706.90
48	4.00	7.067	64.15	53.80	5.1770	707.10
49	4.08	25.330	86.19	65.67	10.2608	707.60
50	4.17	4.023	95.02	72.74	11.1430	707.80
51	4.25	2.691	79.45	60.86	9.2941	707.40
52	4.33	2.106	65.66	55.31	5.1770	707.10
53	4.42	1.764	59.18	51.23	3.9746	707.00
54	4.50	1.535	54.53	48.75	2.8869	706.90
55	4.58	1.370	51.66	47.80	1.9278	706.80
56	4.67	1.243	50.42	48.18	1.1177	706.70
57	4.75	1.143	50.57	46.71	1.9278	706.80
58	4.83	1.061	48.91	46.68	1.1177	706.70
59	4.92	0.992	48.73	46.50	1.1177	706.70
60	5.00	0.934	48.42	46.19	1.1177	706.70
61	5.08	0.883	48.00	45.77	1.1177	706.70
62	5.17	0.840	47.49	45.26	1.1177	706.70
63	5.25	0.801	46.90	44.66	1.1177	706.70
64	5.33	0.766	46.23	45.24	0.4917	706.60
65	5.42	0.735	46.75	45.76	0.4917	706.60
66	5.50	0.708	47.21	44.97	1.1177	706.70
67	5.58	0.682	46.36	45.38	0.4917	706.60
68	5.67	0.659	46.72	45.73	0.4917	706.60
69	5.75	0.638	47.03	44.80	1.1177	706.70
70	5.83	0.618	46.05	45.07	0.4917	706.60
71	5.92	0.600	46.29	45.30	0.4917	706.60
72	6.00	0.583	46.49	45.50	0.4917	706.60
73	6.08	0.000	46.09	45.10	0.4917	706.60
74	6.17	0.000	45.10	44.12	0.4917	706.60
75	6.25	0.000	44.12	43.13	0.4917	706.60
76	6.33	0.000	43.13	42.84	0.1487	706.50
77	6.42	0.000	42.84	42.54	0.1487	706.50
78	6.50	0.000	42.54	42.24	0.1487	706.50
79	6.58	0.000	42.24	41.95	0.1487	706.50
80	6.67	0.000	41.95	41.65	0.1487	706.50
81	6.75	0.000	41.65	41.35	0.1487	706.50
82	6.83	0.000	41.35	41.05	0.1487	706.50
83	6.92	0.000	41.05	40.76	0.1487	706.50
84	7.00	0.000	40.76	40.46	0.1487	706.50
85	7.08	0.000	40.46	40.16	0.1487	706.50
86	7.17	0.000	40.16	39.87	0.1471	706.40
87	7.25	0.000	39.87	39.57	0.1471	706.40
88	7.33	0.000	39.57	39.28	0.1471	706.40
89	7.42	0.000	39.28	38.98	0.1471	706.40
90	7.50	0.000	38.98	38.69	0.1471	706.40
91	7.58	0.000	38.69	38.40	0.1471	706.40
92	7.67	0.000	38.40	38.10	0.1471	706.40
93	7.75	0.000	38.10	37.81	0.1471	706.40
94	7.83	0.000	37.81	37.51	0.1471	706.40
95	7.92	0.000	37.51	37.22	0.1456	706.30
96	8.00	0.000	37.22	36.93	0.1456	706.30


North Iris Lane
DMA S-1 South Mid Basin
6 Hr Rational Method Hydrograph - Basin Routing
Qin
Qout
Storage
Q (cfs)
25.0
20.0
15.0
10.0
5.0
0.0
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
1
2
3
4
5
6
7
8
Time (hrs)

BMP-1 (South) **DETENTION BASIN ROUTING** 6.02 Allowable

13.71 7.968 Qout

100 YEAR EVENT ~ 6 Hour STORM 705.30 Max WSEL

hrs Drain Time

Interval	6 Min T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)	Basin WSEL
1	0.10	0.349	0.35	0.35	0.0000	700.90
2	0.20	0.353	1.05	1.01	0.0186	701.00
3	0.30	0.361	1.73	1.69	0.0186	701.10
4	0.40	0.365	2.41	2.34	0.0352	701.30
5	0.50	0.374	3.08	2.99	0.0459	701.40
6	0.60	0.378	3.74	3.64	0.0524	701.50
7	0.70	0.388	4.40	4.29	0.0588	701.60
8	0.80	0.393	5.07	4.94	0.0629	701.70
9	0.90	0.403	5.74	5.60	0.0663	701.80
10	1.00	0.409	6.42	6.27	0.0744	702.00
11	1.10	0.421	7.10	6.94	0.0781	702.10
12	1.20	0.427	7.79	7.63	0.0815	702.20
13	1.30	0.440	8.49	8.32	0.0848	702.30
14	1.40	0.447	9.21	9.03	0.0879	702.40
15	1.50	0.462	9.94	9.76	0.0938	702.60
16	1.60	0.470	10.69	10.49	0.0992	702.80
17	1.70	0.487	11.45	11.24	0.1018	702.90
18	1.80	0.496	12.22	12.01	0.1067	703.10
19	1.90	0.515	13.02	12.80	0.1114	703.30
20	2.00	0.526	13.84	13.61	0.1158	703.50
21	2.10	0.548	14.68	14.44	0.1201	703.70
22	2.20	0.561	15.55	15.30	0.1242	703.90
23	2.30	0.588	16.45	16.20	0.1281	704.10
24	2.40	0.603	17.39	17.13	0.1281	704.10
25	2.50	**0.635**	18.37	18.11	0.1300	704.20
26	2.60	0.653	19.40	19.13	0.1319	704.30
27	2.70	0.694	20.48	20.21	0.1337	704.40
28	2.80	0.716	21.62	21.35	0.1337	704.40
29	2.90	0.768	22.84	22.57	0.1355	704.50
30	3.00	0.798	24.13	23.86	0.1373	704.60
31	3.10	0.867	25.52	25.25	0.1391	704.70
32	3.20	0.908	27.02	26.74	0.1391	704.70
33	3.30	1.007	28.66	28.38	0.1408	704.80
34	3.40	1.068	30.45	29.59	0.4321	704.90
35	3.50	1.224	31.88	31.02	0.4321	704.90
36	3.60	1.328	33.57	30.27	1.6489	705.00
37	3.70	1.623	33.22	29.92	1.6489	705.00
38	3.80	1.848	33.39	30.10	1.6489	705.00
39	3.90	2.714	34.66	31.36	1.6489	705.00
40	4.00	3.824	37.90	31.13	3.3834	705.10
41	4.10	13.707	48.66	32.73	7.9676	705.30
42	4.20	2.177	48.61	32.68	7.9676	705.30
43	4.30	1.456	36.31	29.54	3.3834	705.10
44	4.40	1.140	32.14	31.27	0.4321	704.90
45	4.50	0.954	33.37	30.07	1.6489	705.00
46	4.60	0.831	31.86	30.99	0.4321	704.90

47	4.70	0.741	32.56	29.27	1.6489	705.00
48	4.80	0.673	30.68	29.81	0.4321	704.90
49	4.90	0.618	31.11	30.24	0.4321	704.90
50	5.00	0.574	31.43	30.57	0.4321	704.90
51	5.10	0.537	31.68	30.82	0.4321	704.90
52	5.20	0.505	31.86	30.99	0.4321	704.90
53	5.30	0.478	31.98	31.11	0.4321	704.90
54	5.40	0.454	32.05	31.18	0.4321	704.90
55	5.50	0.433	32.07	31.20	0.4321	704.90
56	5.60	0.415	32.05	31.19	0.4321	704.90
57	5.70	0.398	32.00	31.14	0.4321	704.90
58	5.80	0.383	31.92	31.05	0.4321	704.90
59	5.90	0.369	31.81	30.94	0.4321	704.90
60	6.00	0.357	31.67	30.80	0.4321	704.90
61	6.10	0.000	31.16	30.29	0.4321	704.90
62	6.20	0.000	30.29	29.43	0.4321	704.90
63	6.30	0.000	29.43	28.57	0.4321	704.90
64	6.40	0.000	28.57	28.28	0.1408	704.80
65	6.50	0.000	28.28	28.00	0.1408	704.80
66	6.60	0.000	28.00	27.72	0.1408	704.80
67	6.70	0.000	27.72	27.44	0.1408	704.80
68	6.80	0.000	27.44	27.16	0.1408	704.80
69	6.90	0.000	27.16	26.88	0.1391	704.70
70	7.00	0.000	26.88	26.60	0.1391	704.70
71	7.10	0.000	26.60	26.32	0.1391	704.70
72	7.20	0.000	26.32	26.05	0.1391	704.70
73	7.30	0.000	26.05	25.77	0.1391	704.70
74	7.40	0.000	25.77	25.49	0.1391	704.70
75	7.50	0.000	25.49	25.21	0.1373	704.60
76	7.60	0.000	25.21	24.94	0.1373	704.60
77	7.70	0.000	24.94	24.66	0.1373	704.60
78	7.80	0.000	24.66	24.39	0.1373	704.60
79	7.90	0.000	24.39	24.12	0.1373	704.60
80	8.00	0.000	24.12	23.84	0.1373	704.60

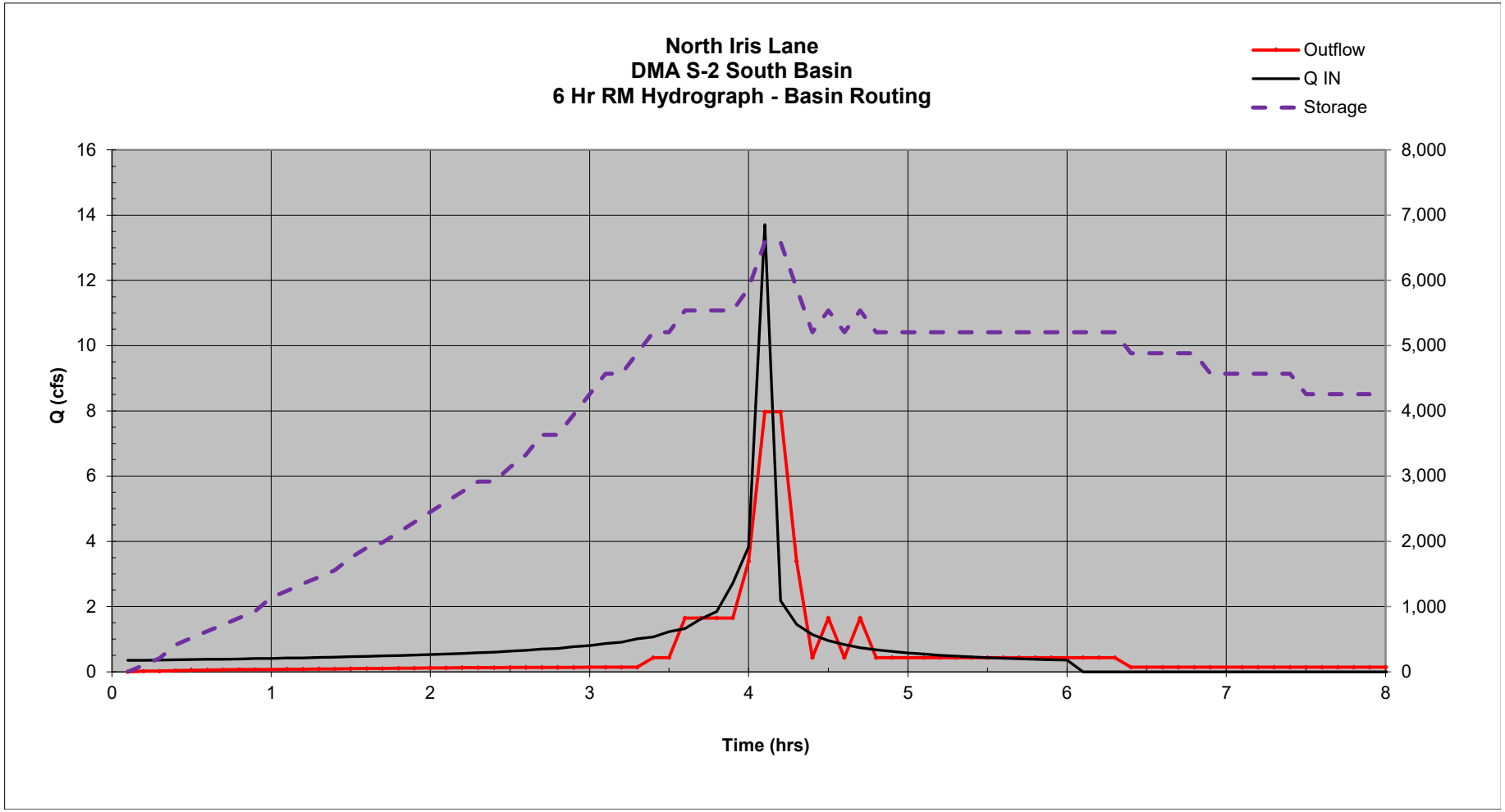

North Iris Lane
DMA S-2 South Basin
6 Hr RM Hydrograph - Basin Routing
Outflow
Q IN
Storage
Q (cfs)
Time (hrs)
0
2
4
6
8
10
12
14
16
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
1
3
5
7

EXHIBIT F

OFF-SITE HYDROLOGY
BYPSS STORM DRAIN
BACKWATER ANALYSIS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 06/29/21

IRIS
EXISTING
OFFSITE

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.400
24 hour precipitation(inches) = 7.000
P6/P24 = 48.6%
San Diego hydrology manual 'C' values used

++
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
[LOW DENSITY RESIDENTIAL]
(2.9 DU/A or Less)
Impervious value, Ai = 0.250
Sub-Area C Value = 0.490
Initial subarea total flow distance = 6200.000(Ft.)
Highest elevation = 1100.000(Ft.)
Lowest elevation = 705.800(Ft.)
Elevation difference = 394.200(Ft.) Slope = 6.358 %
Top of Initial Area Slope adjusted by User to 1.000 %
Bottom of Initial Area Slope adjusted by User to 6.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)

for the top area slope value of 1.00 %, in a development type of
 2.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration = 10.00 minutes
 (for slope value of 1.00 %)
The initial area total distance of 6200.00 (Ft.) entered leaves a
remaining distance of 6130.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 18.56 minutes
for a distance of 6130.00 (Ft.) and a slope of 6.40 %
with an elevation difference of 392.32(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 = 18.559 Minutes
Tt=[(11.9*1.1610^3)/(392.32)]^.385= 18.56
Total initial area Ti = 10.00 minutes from Table 3-2 plus
 18.56 minutes from the Figure 3-4 formula = 28.56 minutes
Rainfall intensity (I) = 2.911(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.490
Subarea runoff = 161.757(CFS)
Total initial stream area = 113.389(Ac.)
End of computations, total study area = 113.389 (Ac.)

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 10/18/21

IRIS
OFFSITE
CHEYENNE LANE

********* Hydrology Study Control Information **********

Program License Serial Number 6334

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.400
24 hour precipitation(inches) = 7.000
P6/P24 = 48.6%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 3.000 to Point/Station 4.000
**** 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
[MEDIUM DENSITY RESIDENTIAL]
(7.3 DU/A or Less)
Impervious value, Ai = 0.400
Sub-Area C Value = 0.570
Initial subarea total flow distance = 1975.000(Ft.)
Highest elevation = 764.000(Ft.)
Lowest elevation = 711.000(Ft.)
Elevation difference = 53.000(Ft.) Slope = 2.684 %
Top of Initial Area Slope adjusted by User to 1.000 %
Bottom of Initial Area Slope adjusted by User to 2.745 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)

```
for the top area slope value of   1.00 %, in a development type of
 7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.69 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5700)*(  65.000^.5)/(   1.000^(1/3)]=   7.69
The initial area total distance of 1975.00 (Ft.) entered leaves a
remaining distance of 1910.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  10.47 minutes
for a distance of 1910.00 (Ft.) and a slope of  2.75 %
with an elevation difference of  52.43(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   10.475 Minutes
Tt=[(11.9*0.3617^3)/( 52.43)]^.385= 10.47
Total initial area Ti =   7.69 minutes from Figure 3-3 formula plus
 10.47 minutes from the Figure 3-4 formula =  18.17 minutes
Rainfall intensity (I) =      3.898(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.570
Subarea runoff =     17.172(CFS)
Total initial stream area =        7.729(Ac.)

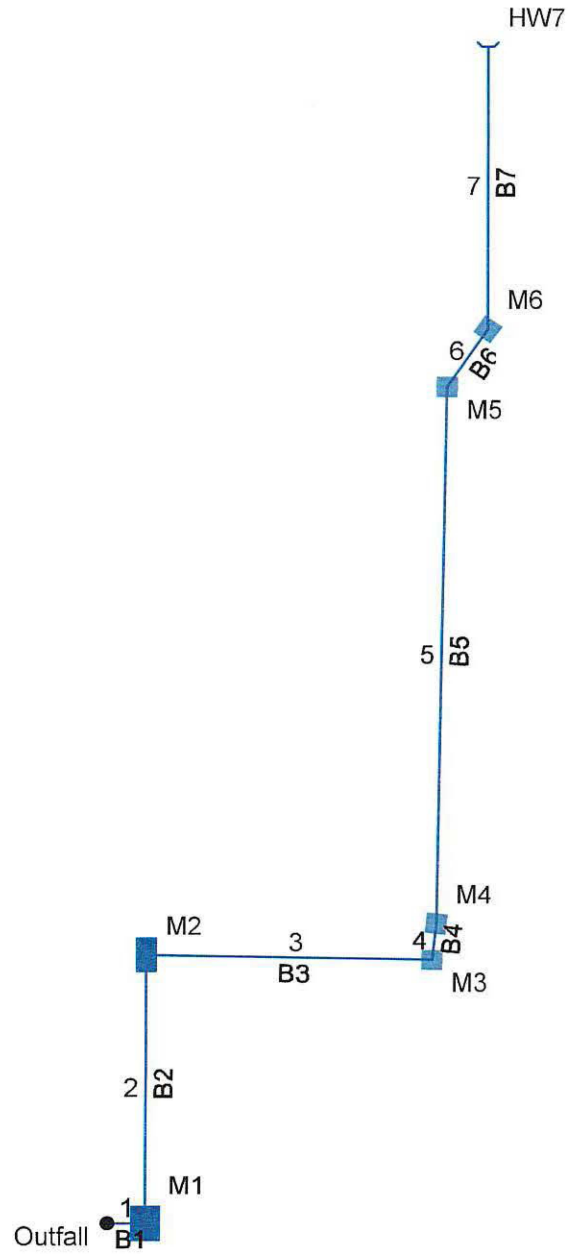

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Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   704.000(Ft.)
Downstream point/station elevation =   701.600(Ft.)
Pipe length  =   240.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.172(CFS)
Given pipe size =     33.00(In.)
Calculated individual pipe flow  =    17.172(CFS)
Normal flow depth in pipe =   12.94(In.)
Flow top width inside pipe =   32.22(In.)
Critical Depth =   16.32(In.)
Pipe flow velocity =      7.95(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    18.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Rainfall intensity (I) =      3.830(In/Hr) for a   100.0 year storm
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
[MEDIUM DENSITY RESIDENTIAL                ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
```

```
Sub-Area C Value = 0.570
Time of concentration =    18.67 min.
Rainfall intensity =      3.830(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.570  CA =      4.742
Subarea runoff =      0.990(CFS) for      0.591(Ac.)
Total runoff =     18.162(CFS)   Total area =       8.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Rainfall intensity (I) =      3.830(In/Hr) for a   100.0 year storm
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
[MEDIUM DENSITY RESIDENTIAL                    ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.570
Time of concentration =    18.67 min.
Rainfall intensity =      3.830(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.570  CA =      4.961
Subarea runoff =      0.838(CFS) for      0.384(Ac.)
Total runoff =     19.001(CFS)   Total area =       8.704(Ac.)
End of computations, total study area =          8.704 (Ac.)
```

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: IRIS, OFFSITE, BOX CULVERT.stm	Number of lines: 7	Date: 3/10/2022

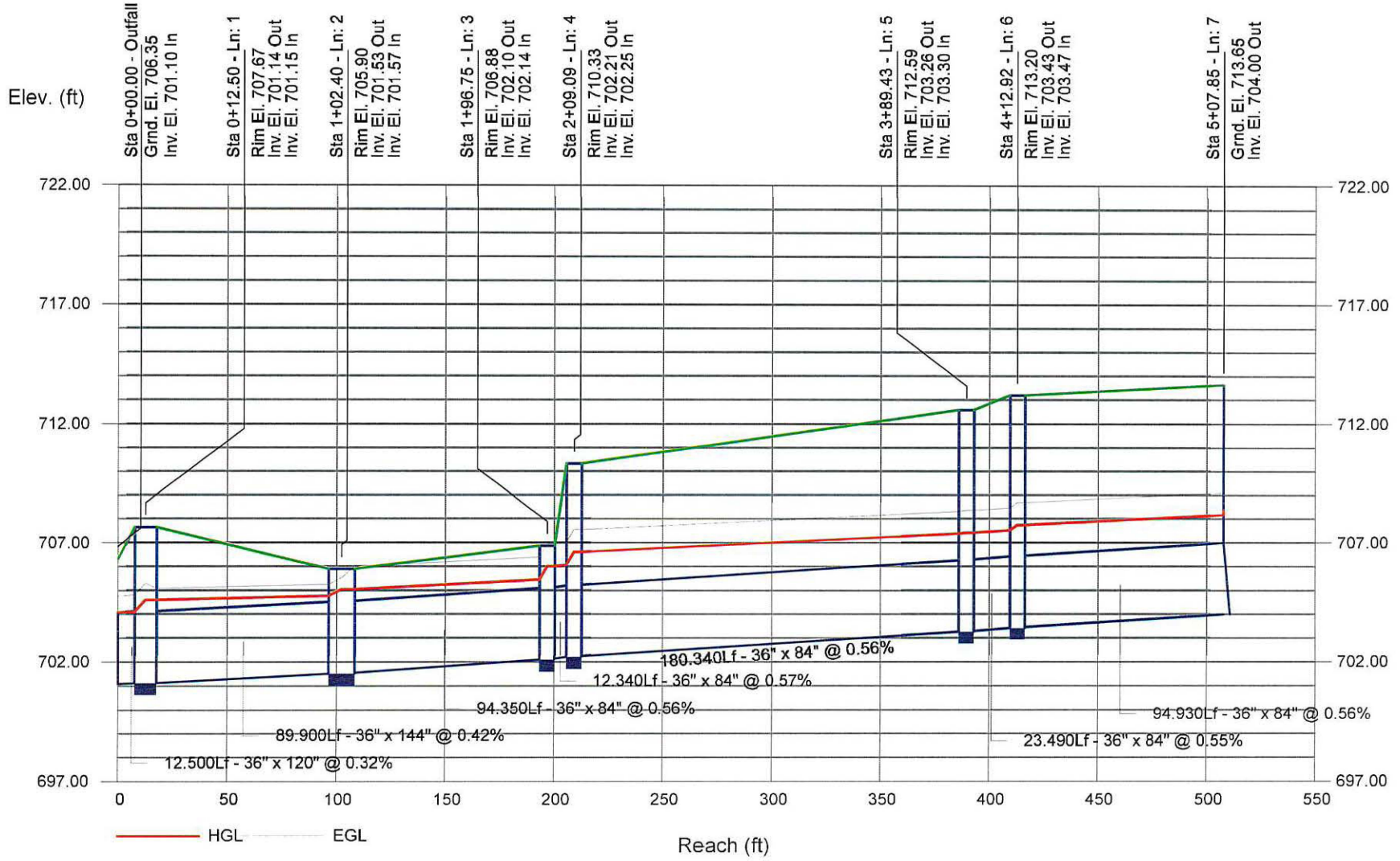
Line No.	Invert Dn (ft)	Invert Up (ft)	Line Length (ft)	Line Slope (%)	Line Size (in)	n-val Pipe	Flow Rate (cfs)	Junct Type	Defl Ang (Deg)	J-Loss Coeff	Crit Depth (ft)	Depth Dn (ft)	Depth Up (ft)	HGL Dn (ft)	HGL Up (ft)	HGL Jnct (ft)	EGL Dn (ft)	EGL Up (ft)	Energy Loss (ft)	Vel Ave (ft/s)
1	701.10	701.14	12.500	0.32	36 x 120	0.013	196.56	MH	0.000	0.75	2.29	3.00	2.97	704.10	704.11	704.62	704.77	704.79	0.026	6.58
2	701.15	701.53	89.900	0.42	36 x 144	0.013	196.56	MH	-90.000	0.60	2.03	3.00	3.00	704.62	704.78	705.06	705.08	705.25	0.161	5.46
3	701.57	702.10	94.350	0.56	36 x 84	0.013	161.76	MH	91.000	0.60	2.55	3.00	3.00	705.06	705.46	706.02	705.98	706.38	0.401	7.70
4	702.14	702.21	12.340	0.57	36 x 84	0.013	161.76	MH	-84.500	0.60	2.55	3.00	3.00	706.02	706.07	706.62	706.94	706.99	0.053	7.70
5	702.25	703.26	180.340	0.56	36 x 84	0.013	161.76	MH	-5.500	0.05	2.55	3.00	3.00	706.62	707.39	707.43	707.54	708.31	0.767	7.70
6	703.30	703.43	23.490	0.55	36 x 84	0.013	161.76	MH	34.000	0.25	2.55	3.00	3.00	707.43	707.53	707.77	708.36	708.46	0.100	7.70
7	703.47	704.00	94.930	0.56	36 x 84	0.013	161.76	Hdwall	-35.000	0.25	2.55	3.00	3.00	707.77	708.17	708.40	708.69	709.09	0.404	7.70

Project File: IRIS, OFFSITE, BOX CULVERT.stm | Number of lines: 7 | Date: 3/10/2022

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: IRIS, OFFSITE, BOX CULVERT.stm



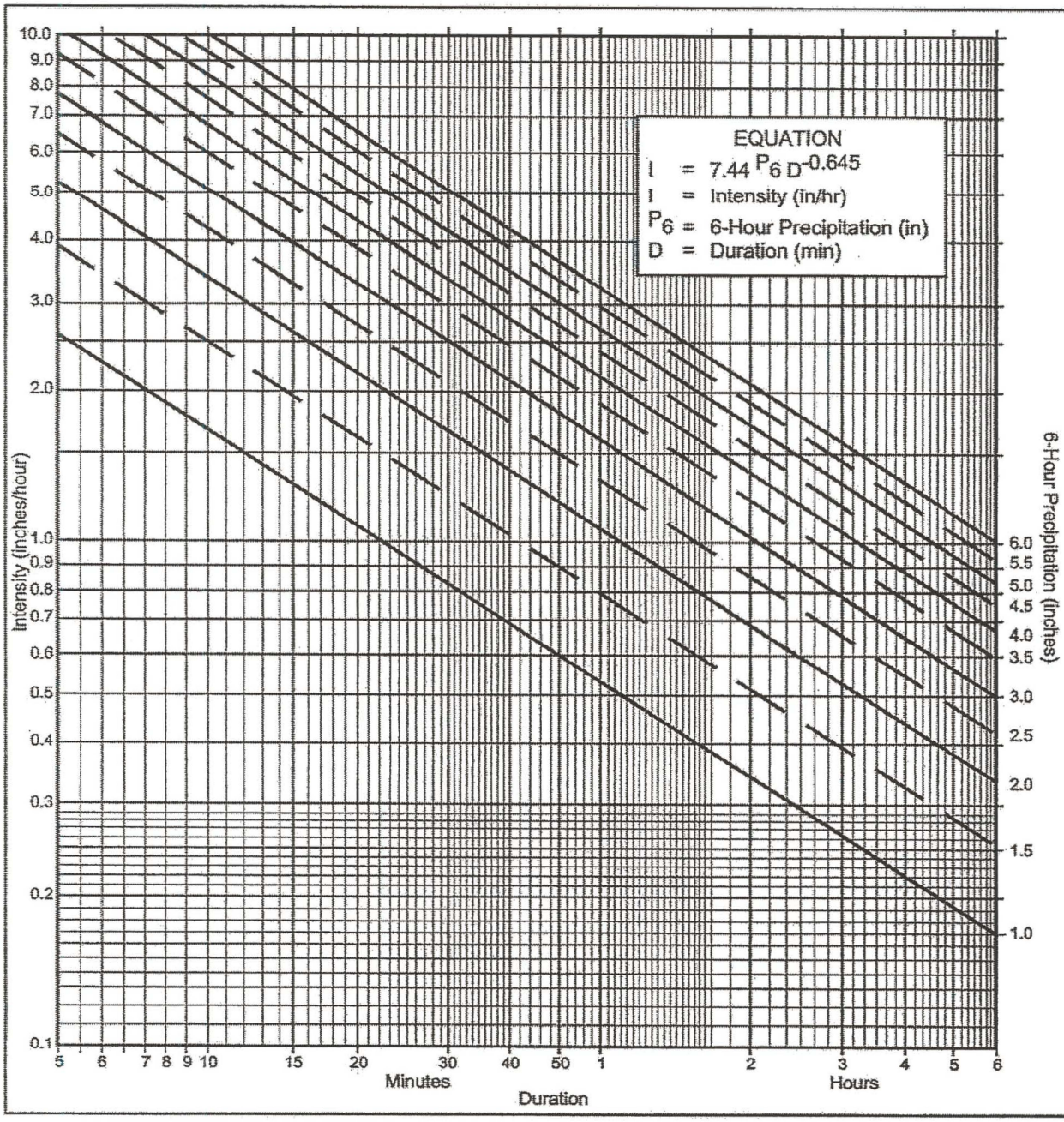
APPENDIX

COUNTY OF SAN DIEGO HYDROLOGY MANUAL EXCEPTS

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency _____ year

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

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

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

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

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

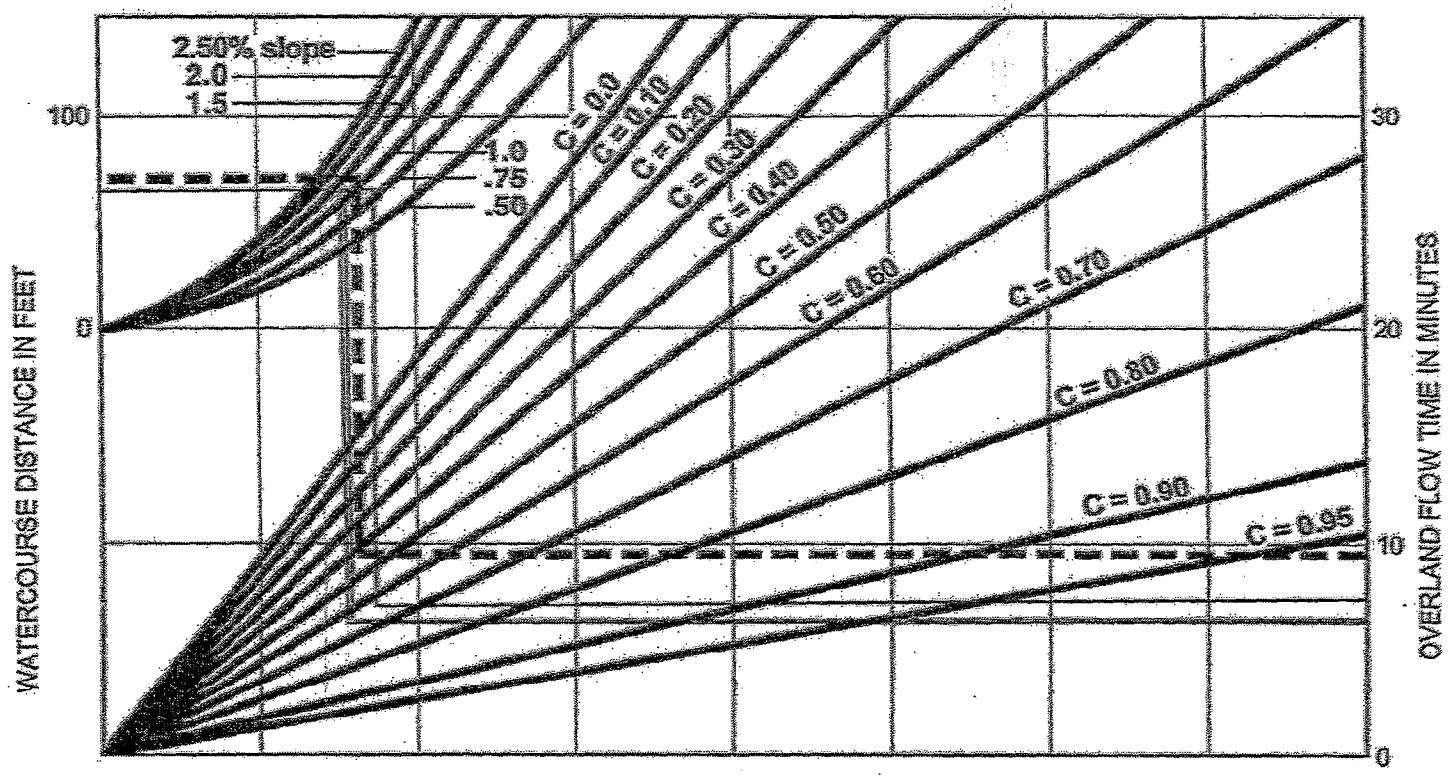
Table 3-2

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

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

*See Table 3-1 for more detailed description

Tc for Existing Drainage Basins A, B, & C



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

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

Basin A Tc = 1.8(1.1-.63)(65^(1/2))/(0.8^(1/3))
= 7.35 min.
Basin B Tc = 6.25 min.
Basin C Tc = 6.42 min.

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

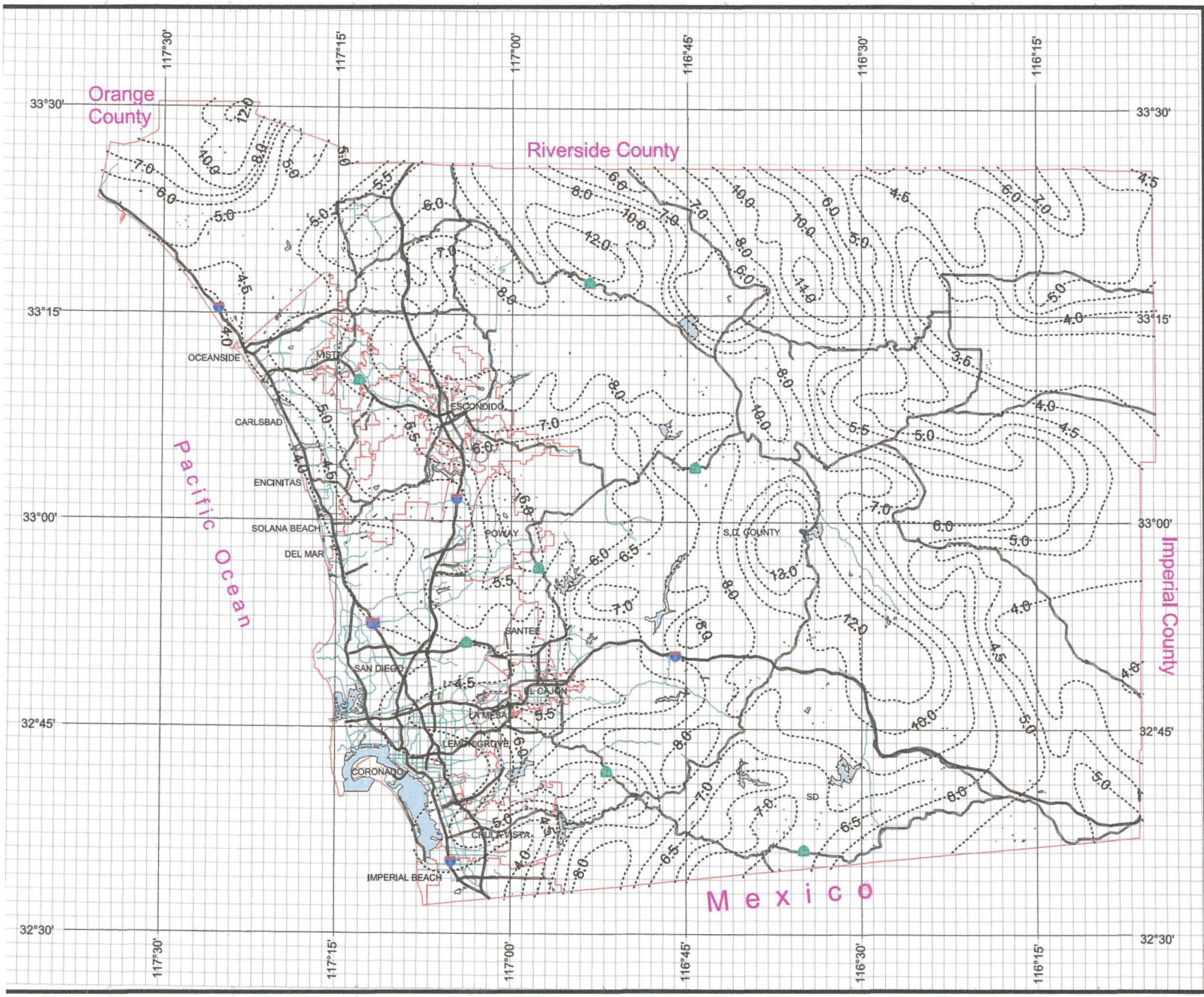
Rational Formula - Overland Time of Flow Nomograph

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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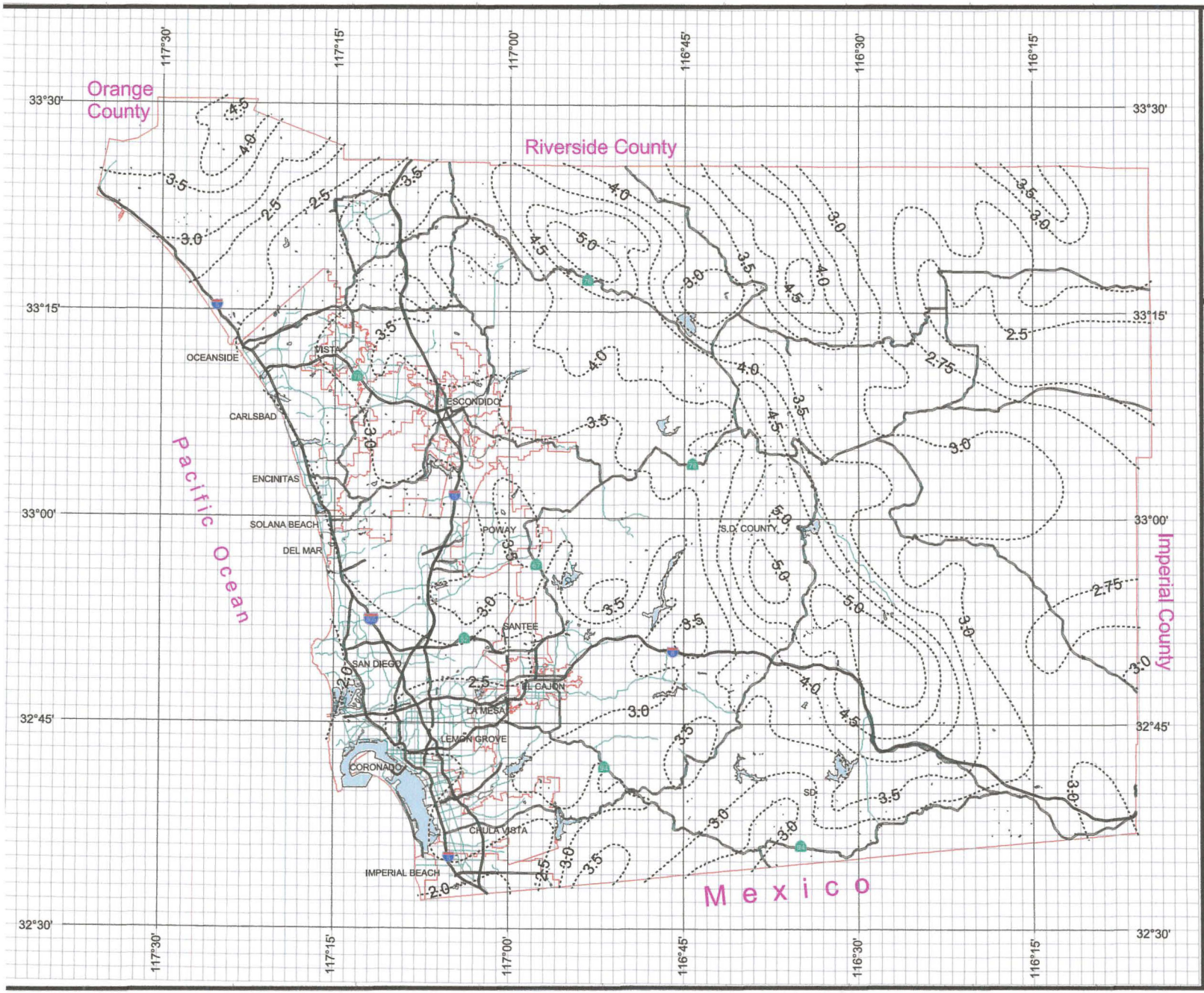
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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N W E S

3 0 3 Miles

SECTION 6
RATIONAL METHOD HYDROGRAPH PROCEDURE

6.1 INTRODUCTION

The procedures in this section are for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size. The RM, discussed in Section 3, is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. However, in some instances such as for design of detention basins, the peak runoff rate is insufficient information for the design, and a hydrograph is needed. Unlike the NRCS hydrologic method (discussed in Section 4), the RM itself does not create hydrographs. The procedures for detention basin design based on RM study results were first developed as part of the East Otay Mesa Drainage Study. Rick Engineering Company performed this study under the direction of County Flood Control. The procedures in this section may be used for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size.

6.2 HYDROGRAPH DEVELOPMENT

The concept of this hydrograph procedure is based on the RM formula:

$$Q = C\,I\,A$$

Where: Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)

I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour

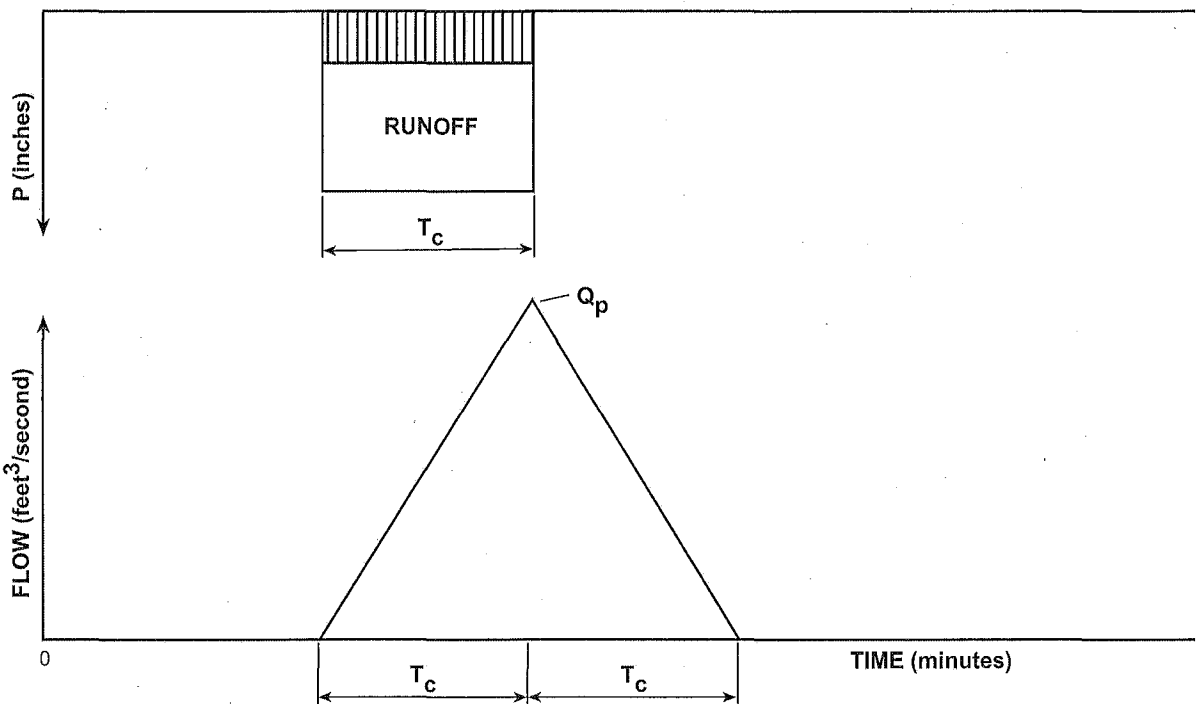
A = drainage area contributing to the design location, in acres

The RM formula is discussed in more detail in Section 3.

An assumption of the RM is that discharge increases linearly over the T_c for the drainage area until reaching the peak discharge as defined by the RM formula, and then decreases linearly. A linear hydrograph can be developed for the peak flow occurring over the T_c as shown in Figure 6-1. However, for designs that are dependent on the total storm volume, it is not sufficient to consider a single hydrograph for peak flow occurring over the T_c at the beginning of a 6-hour storm event because the hydrograph does not account for the entire volume of runoff from the storm event. The volume under the hydrograph shown in Figure 6-1 is equal to the rainfall intensity multiplied by the duration for which that intensity occurs (T_c), the drainage area (A) contributing to the design location, and the runoff coefficient (C) for the drainage area. For designs that are dependent on the total storm volume, a hydrograph must be generated to account for the entire volume of runoff from the 6-hour storm event. The hydrograph for the entire 6-hour storm event is generated by creating a rainfall distribution consisting of blocks of rain, creating an incremental hydrograph for each block of rain, and adding the hydrographs from each block of rain. This process creates a hydrograph that contains runoff from all the blocks of rain and accounts for the entire volume of runoff from the 6-hour storm event. The total volume under the resulting hydrograph is equal to the following equation:

$$VOL = CP_6A \qquad \text{(Eq. 6-1)}$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)



FIGURE

6-1

Triangular Hydrograph

6.2.1 Rainfall Distribution

Figure 6-2 shows a 6-hour rainfall distribution consisting of blocks of rain over increments of time equal to T_c. The number of blocks is determined by rounding T_c to the nearest whole number of minutes, dividing 360 minutes (6 hours) by T_c, and rounding again to the nearest whole number. The blocks are distributed using a (2/3, 1/3) distribution in which the peak rainfall block is placed at the 4-hour time within the 6-hour rainfall duration. The additional blocks are distributed in a sequence alternating two blocks to the left and one block to the right of the 4-hour time (see Figure 6-2). The total amount of rainfall ($P_{T(N)}$) for any given block (N) is determined as follows:

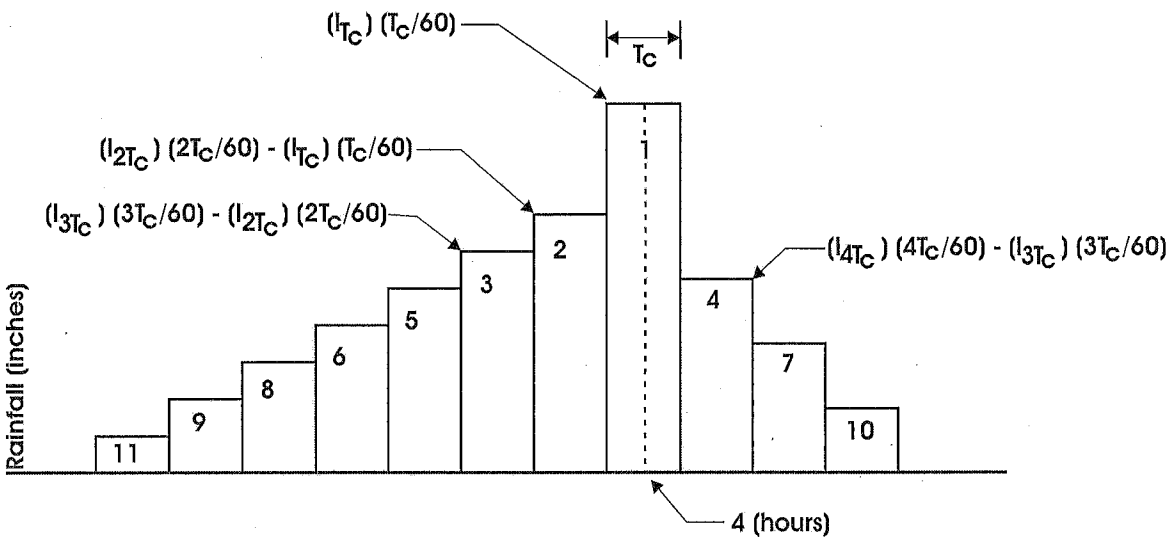
$$P_{T(N)} = (I_{T(N)}\ T_{T(N)}) / 60$$

Where: $P_{T(N)}$ = total amount of rainfall for any given block (N)
$I_{T(N)}$ = average rainfall intensity for a duration equal to $T_{T(N)}$ in inches per hour
$T_{T(N)} = NT_c$ in minutes (N is an integer representing the given block number of rainfall)

Intensity is calculated using the following equation (described in detail in Section 3):

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

Where: I = average rainfall intensity for a duration equal to D in inches per hour
P_6 = adjusted 6-hour storm rainfall
D = duration in minutes



FIGURE

6-2

Rainfall Distribution

Substituting the equation for I in the equation above for $P_{T(N)}$ and setting the duration (D) equal to $T_{T(N)}$ yields:

$$P_{T(N)} = [(7.44\ P_6/T_{T(N)}^{0.645})(T_{T(N)})] / 60$$
$$P_{T(N)} = 0.124\ P_6 T_{T(N)}^{0.355}$$

Substituting NT_c for T_T (where N equals the block number of rainfall) in the equation above yields:

$$P_{T(N)} = 0.124\ P_6\ (NT_c)^{0.355} \qquad \text{(Eq. 6-2)}$$

Equation 6-2 represents the total rainfall amount for a rainfall block with a time base equal to $T_{T(N)}$ (NT_c). The actual time base of each rainfall block in the rainfall distribution is T_c, as shown in Figure 6-2. The actual rainfall amount (P_N) for each block of rain is equal to P_T at N ($P_{T(N)}$) minus the previous P_T at N–1 ($P_{T(N-1)}$) at any given multiple of T_c (any NT_c). For example, the rainfall for block 2 is equal to $P_{T(N)}$ at $T_{T(N)} = 2T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 1T_c$, and the rainfall for block 3 equals $P_{T(N)}$ at $T_{T(N)} = 3T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 2T_c$, or P_N can be represented by the following equation:

$$P_N = P_{T(N)} - P_{T(N-1)} \qquad \text{(Eq. 6-3)}$$

For the rainfall distribution, the rainfall at block N = 1, ($1T_c$), is centered at 4 hours, the rainfall at block N = 2, ($2T_c$), is centered at 4 hours – $1T_c$, the rainfall at block N = 3, ($3T_c$), is centered at 4 hours – $2T_c$, and the rainfall at at block N = 4, ($4T_c$), is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

6.2.2 Construction of Incremental Hydrographs

Figure 6-1 shows the relationship of a single block of rain to a single hydrograph. Figure 6-3 shows the relationship of the rainfall distribution to the overall hydrograph for the storm event. The peak flow amount from each block of rain is determined by the RM formula, Q = CIA, where I equals I_N (the actual rainfall intensity for the rainfall block). I_N is determined by dividing P_N by the actual time base of the block, T_c. The following equation shows this relationship:

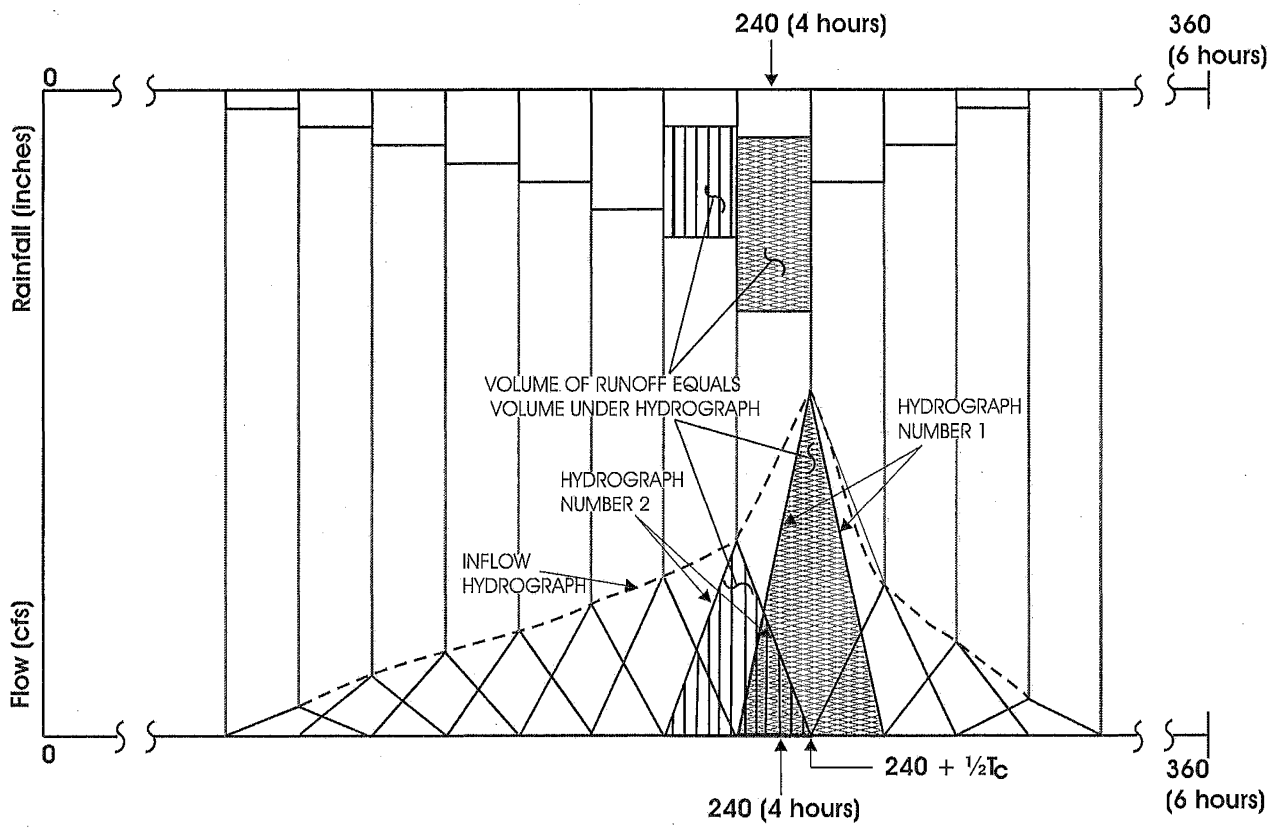
$$I_N = 60\ P_N/T_c \qquad \text{(Eq. 6-4)}$$

Where: I_N = average rainfall intensity for a duration equal to T_c in inches per hour
P_N = rainfall amount for the block in inches
T_c = time of concentration in minutes

By substituting equation 6-4 into the rational equation, the following relationship is obtained:

$$Q_N = 60\ CAP_N/T_c\ (cfs) \qquad \text{(Eq. 6-5)}$$

Finally, the overall hydrograph for the storm event is determined by adding all the hydrographs from each block of rain. Since the peak flow amount for each incremental hydrograph corresponds to a zero flow amount from the previous and proceeding hydrographs, as shown in Figure 6-3, the inflow hydrograph can be plotted by connecting the peak flow amounts (see the dashed line in Figure 6-3).



FIGURE

6-Hour Rational Method Hydrograph

6-3

6.3 GENERATING A HYDROGRAPH USING RATHYDRO

The rainfall distribution and related hydrographs can be developed using the RATHYDRO computer program provided to the County by Rick Engineering Company. A copy of this program is available at no cost from the County. The output from this computer program may be used with HEC-1 or other software for routing purposes.

The design storm pattern used by the RATHYDRO program is based on the (2/3, 1/3) distribution described in Sections 4.1.1 and 6.2.1. The ordinates on the hydrograph are calculated based on the County of San Diego Intensity-Duration Design Chart (Figure 3-1), which uses the intensity equation described in Sections 3.1.3 and 6.2.1 to relate the intensity (I) of the storm to T_c, $I = 7.44\ P_6 D^{-0.645}$. The computer program uses equations 6-2 and 6-3 described above and calculates I_N directly. The intensity at any given multiple of T_c is calculated by the following equation:

$$I_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})] / T_c \qquad \text{(Eq. 6-6)}$$

Where: N = number of rainfall blocks

$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)

I_N = actual rainfall intensity at rainfall block N in inches per hour

$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour

Figure 6-2 shows the rainfall distribution used in the RM hydrograph, computed at multiples of T_c. The rainfall at block N = 1, ($1T_c$), is centered at 4 hours, the rainfall at block N = 2, ($2T_c$), is centered at 4 hours – $1T_c$, the rainfall at block N = 3, ($3T_c$), is centered at 4 hours – $2T_c$, and the rainfall at at block N = 4, ($4T_c$), is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

As described in Section 6.2.2, the peak discharge (Q_N) of the hydrograph for any given rainfall block (N) is determined by the RM formula Q = CIA, where $I = I_N$ = the actual

rainfall intensity for the rainfall block. The RATHYDRO program substitutes equation 6-6 into the RM formula to determine Q_N yielding the following equation:

$$Q_N = [(I_{T(N)})(T_{T(N)}) - (I_{T(N-1)})(T_{T(N-1)})]\, CA / T_c \qquad \text{(Eq. 6-7)}$$

Where: Q_N = peak discharge for rainfall block N in cubic feet per second (cfs)
N = number of rainfall blocks
$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)
$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour
C = RM runoff coefficient
A = area of the watershed (acres)

To develop the hydrograph for the 6-hour design storm, a series of triangular hydrographs with ordinates at multiples of the given T_c are created and added to create the hydrograph. This hydrograph has its peak at 4 hours plus ½ of the T_c. The total volume under the hydrograph is equal to the following equation (equation 6-1):

$$VOL = CP_6A$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)

SEE TILE 32 (SHEET 25)

SEE TILE 30 (SHEET 23)

SEE TILE 28 (SHEET 21)

PARCEL LINE INFORMATION PROVIDED BY:
SAN DIEGO DATA PROCESSING CORPORATION
ACCORDING TO THE BASE MAP SUB LICENSE
AGREEMENT WITH THE CITY OF ESCONDIDO

TOPOGRAPHY COMPILED BY:
GEONEX NORTH AMERICAN OPERATIONS, INC.
DATED NOVEMBER, 1992

LEGEND
- EXISTING CONTOUR ELEVATION
- EXISTING NATURAL FLOW
- EXISTING IMPROVED CHANNEL
- EXISTING STORM DRAIN
- PROPOSED FACILITY
- EXISTING LAKES

LEGEND
- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- GENERAL PLAN BOUNDARY
- BASIN DESIGNATION
- EXIST. / PROP. DESILT BASIN
- FACILITY IDENTIFIER

SCALE IN FEET: 400 200 0 400 800 1200

N

"E" Hill

Project Site

48" SD

RCB 12' x3'

Cross Section Upstream Channel

Reidy Creek

SEE TILE 22 (SHEET 15)

MASSON & ASSOCIATES, INC.
PLANNING ▾ ENGINEERING ▾ SURVEYING
200 E. WASHINGTON AVE. ▾ SUITE 200 ▾ ESCONDIDO ▾ CA 92025-1516
TEL (619) 741-3570 ▾ FAX (619) 741-1786

Date	App'd	REVISIONS	By	Date

Checked By	Drawn by	Designed By
DWM-END	DAM	JAW-LBR-END

Plans Prepared Under Supervision Of: For Masson & Assoc. Inc.
EDWARD N. DOMINGUE R.C.E. 34131 DATE:

SCALE Horizontal 1" = 400'
DATE: 02-06-95
Drawn By: DAM

Submitted _____ Approved _____
By _____ Asst. City Engineer
By _____ Asst. Director of Public Works

CITY OF ESCONDIDO DEPT. OF PUBLIC WORKS
DRAINAGE MASTER PLAN FOR THE CITY OF ESCONDIDO:
EXISTING / PROPOSED STORM DRAINS TILE 29

Drawing No. D- 1114
Sheet 22 of 33

EXISTING DRAINAGE EXHIBIT FOR:
N. IRIS LANE

D.M.A. LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE/PROJECT BOUNDARY	
EXISTING CONTOUR	630
EXISTING DMA LIMITS	
DIRECTION OF DRAINAGE	
BASIN IDENTIFIER	E-1
BASIN AREA (AC.)	6.4364
NODE NUMBER	1
Q_{100} (C.F.S.)	17.29

OFFSITE DRAINAGE
SEE OFFSITE DRAINAGE EXHIBIT

TYPE D SOIL

TYPE C SOIL

ROBIN HILL LANE

ROBIN HILL LANE R/W

CHEYENNE LANE

N. IRIS LANE

R/W

APN: 224-310-08

APN: 224-310-05

APN: 224-310-20

APN: 224-310-06

APN: 224-310-07

MAP NO. 10888

MAP NO. 7449

MAP NO. 0723

E-1
6.4364

E-2
0.9811

FLOW PATH (TYP.)

LOT LINE (TYP.)

3
—

5
2.75

4
15.3

EXISTING DRAINAGE EXHIBIT FOR:
N. IRIS LANE

SCALE: 1" = 40'

GRAPHIC SCALE
40' 0 40' 80' 120'

REGISTERED PROFESSIONAL ENGINEER
AARON PARKER
No. 68547
CIVIL
STATE OF CALIFORNIA

SB&O INC.
PLANNING ENGINEERING SURVEYING
3990 Ruffin Road, Suite 120
San Diego, Ca. 92123
858-560-1141 858-560-8157
Fax

03-11-22

75280.65

FILE NAME: S:\75280 N. IRIS LANE\03 DWG\DA\75280D05-EXIST NODE EXHIBIT.DWG, PLOTTED BY: COLE FARGO ON 3/16/2022 4:37 PM

PROPOSED DRAINAGE EXHIBIT FOR:
N. IRIS LANE

LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE/PROJECT BOUNDARY	
PROPOSED CURB AND GUTTER	
EXISTING CONTOUR	630
PROPOSED BASIN LIMITS	
SOIL LIMITS	
DIRECTION OF DRAINAGE	
STORM DRAIN PIPE SIZE PER PLAN	
TREE WELL	
BASIN IDENTIFIER	1A
BASIN AREA (S.F.)	5,940
NODE NUMBER	1
Q_{100} (C.F.S.)	17.29

OFFSITE DRAINAGE

TYPE D SOIL

TYPE C SOIL

ROBIN HILL LANE

ROBIN HILL LANE

N. IRIS LANE

APN: 224-310-08

APN: 224-310-05

APN: 224-310-20

APN: 224-310-06

APN: 224-310-07

MAP NO. 10888

MAP NO. 7449

MAP NO. 0723

3B 23637

3A1 2482

2B 2559

2A1 2593

2A 29732

3A 25209

2C 41923

2D 27868

3G 6100

3D 9206

3C 33572

2F 23147

2E 26577

3A1 2622

3A 22433

3F 6959

3E 4646

2G 12193

BMP-1

BMP-2

BMP-3

401 (161.8)

303 3.78

301 —

203 5.25

202 0.32

304 3.78

302 0.37

206 25.5

207 9.75

205 9.49

204 9.49

102 0.33

103 2.33

104 0.12

104 17.2

601 (17.2)

305 11.7

306 12.5

105 196.6

501 19.0

201 —

101 —

DWY. "A"

DWY. "B"

DWY. "C"

DWY. "D"

DWY. "E"

DWY. "F"

DWY. "G"

DWY. "H"

DWY. "I"

DWY. "J"

DWY. "K"

DWY. "L"

DWY. "N"

3'x7' BYPASS R.C.B.C.

PROPOSED (PVT.) TYPE "B" INLET (TYP.)

PROPOSED OUTLET CONTROL STRUCTURE (TYP.)

PROPOSED (PUB.) TYPE "B" INLET

STREET TREE

PROPOSED BOX CULVERT EXTENSION

EXIST. 12'x3' BOX CULVERT

EXIST. INLET

DRAIN FROM BMP-2 CONTROL STRUCTURE TO BOX CULVERT EXTENSION

LOW FLOW DRAIN FROM BMP-3 TO CONTROL STRUCTURE BMP-2

OVERFLOW DRAIN TO GUTTER

POC 1

R/W

PROPOSED DRAINAGE EXHIBIT FOR:
N. IRIS LANE

SCALE: 1" = 40'

GRAPHIC SCALE

40' 0 40' 80' 120'

REGISTERED PROFESSIONAL ENGINEER
AARON PARKER
No. 68547
CIVIL
STATE OF CALIFORNIA

SB&O INC.
PLANNING ENGINEERING SURVEYING
3990 Ruffin Road, Suite 120
San Diego, Ca. 92123
858-560-1141 858-560-8157
Fax

FILE NAME: S:\75280 N. IRIS LANE\03 DWG\P-REPS\DRAINAGE AREAS.DWG, PLOTTED BY: COLE FARGO ON 3/10/2022 1:56 PM

EXISTING DRAINAGE EXHIBIT FOR:
N. IRIS LANE

DRAINAGE LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE/PROJECT BOUNDARY	
EXISTING CONTOUR	630
PROPOSED DRAINAGE BASIN LIMITS	
DIRECTION OF DRAINAGE	
NODE NUMBER / Q_{100} (C.F.S.)	1 / 17.29 ELEV. ℄
BASIN IDENTIFIER	E-5
BASIN AREA (AC.)	1.9600

1 — 3,100.0 F.S.

FLOW PATH

COUNTRY CLUB DRIVE

EXIST. 48" R.C.P. MASTER PLAN ID #320

3 — 764.0 F.S.

I-15

CENTRE CITY PARKWAY

E-4 — 113.3887

E-5 — 7.7288

PROJECT BOUNDARY

ROBIN HILL LANE

PROJECT SITE

N. IRIS LANE

E-7 — 0.3836

2 — 161.8 — 705.8 ℄

4 — 17.2 — 711.0 ℄ SD INLET

5 — 19.0 — 701.6 ℄

EXIST. 12'x3' R.C.B. MASTER PLAN ID #289

CHEYENNE LANE

6 — 196.6 — 701.2 ℄

E-6 — 0.5905

BROADWAY

REID CREEK

PROJECT BOUNDARY

1 SCALE: 1" = 150'

GRAPHIC SCALE
150' 0 150' 300' 450'

EXISTING DRAINAGE EXHIBIT FOR:
N. IRIS LANE

REGISTERED PROFESSIONAL ENGINEER
AARON PARKER
No. 68547
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E:\MAP\75280.25 N IRIS LANE\PROCESSED\EXHIBIT\EXHIBIT.DWG, PLOTTED BY: JONATHAN S. KNUDSEN ON 10/6/2021 1:41 PM