PRELIMINARY DRAINAGE STUDY

FOR

PASQUAL HEIGHTS

PDS2024-TM-5657
PDS2025-DB-25-00
830 IDAHO AVENUE
ESCONDIDO, CA 92025
APN: 234-160-25

APPLICANT:
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Prepared By:

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DEVELOPMENT

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Job #:1058

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Preparation Date: July, 2025
Revised: March 2026

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PRELIMINARY DRAINAGE STUDY, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF SAID STUDY AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE RECOMMENDATIONS ARE CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF THIS PRELIMINARY DRAINAGE STUDY BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITES.

Michael Wagner RCE 74067

TABLE OF CONTENTS

APPENDICES

APPENDIX A:

Existing Condition Hydrology Map

Existing Condition Hydrology Calculations

APPENDIX B:

Proposed Condition Hydrology Map

Proposed Condition Hydrology Calculations

APPENDIX C:

Detention Basin Design

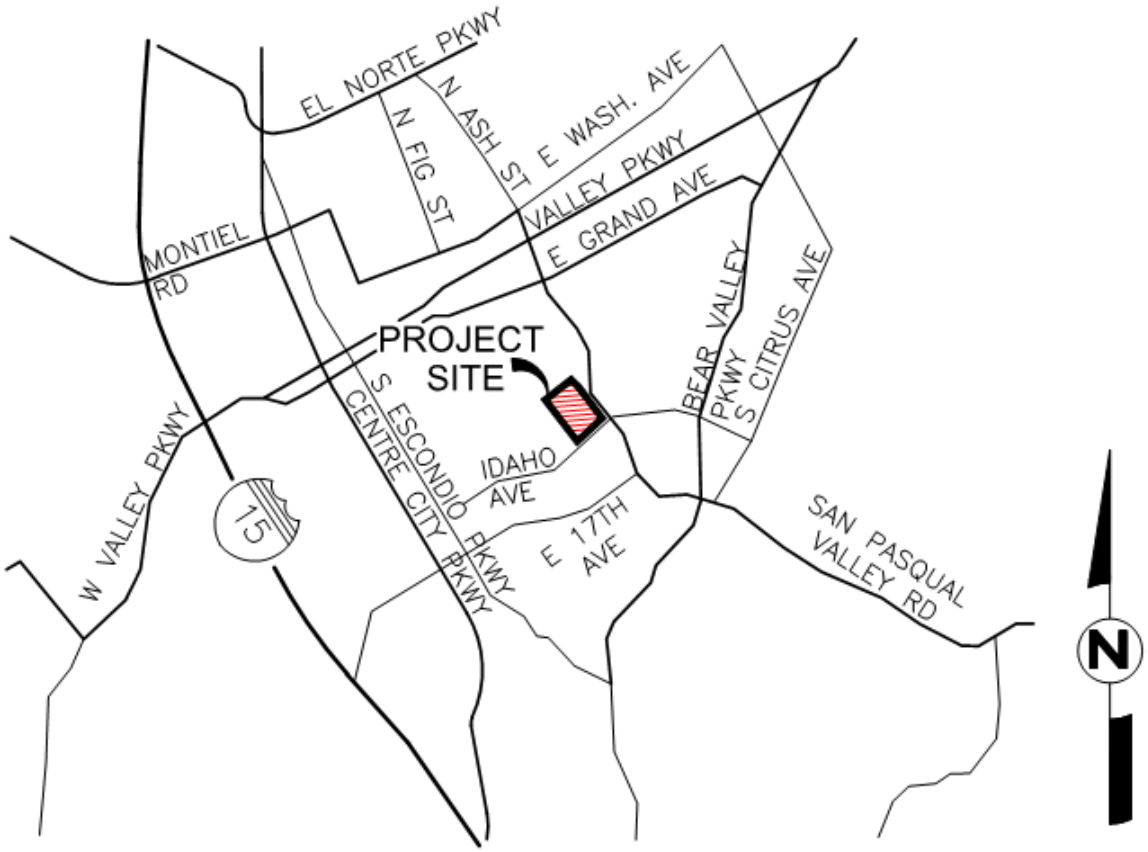
APPENDIX D:

Proposed SD Hydraulic Calculations (Capacity)
Proposed Idaho Avenue Peak Flow Capacity
Idaho Curb Inlet Sizing Calculation

APPENDIX E:

Reference Charts

VICINITY MAP



VICINITY MAP

CURRENT CONDITION

1. Introduction

The purpose of this preliminary drainage study is to analyze the existing and proposed drainage patterns, peak flow rates, and drainage systems associated with the Pasqual Heights residential project. The proposed project is on a 10.39-acre site, located on Idaho Avenue between San Pasqual Valley Road and Old Cedar Road. The project will consist of 42 single family homes, private roads, sidewalks, sewer lift station, Bio-Filtration basin and associated improvements. This drainage study has been prepared in accordance with the requirements of the County of San Diego Hydrology manual, analyzing the 6-hour 100-year storm event in conjunction with the preparation of Tentative Map preliminary grading plans.

2. Existing Conditions

The existing on-site area of 10.39 acres is mostly undeveloped covered mainly by low vegetation and medium sized trees covered throughout the property. The property contains an existing single-family home and detached garage structure. The topography of the site is gently sloped and generally slopes from the North-West to South-East. (See Existing Condition Hydrology Exhibit, Appendix A).

The hydrology of the site can be analyzed at two discharge points as described below:

Analysis Point #1:

Analysis point #1 is the confluence point for runoff from offsite and onsite flows that drain through the project site to the existing headwall & 30" culvert along Idaho Ave near the San Pasqual Valley Road intersection, that is then conveyed off-site. The drainage sub-basins to Analysis point # 1 consists of a total of 44.11 acres.

Run-on from the north and west (22.39 acres, basins 1-01 and 1-02) generally sheet flows to a low point near the project site's northern corner. Adjacent to San Pasqual Valley Road Flow is then conveyed via a natural swale on the property from the west to east to the to the existing 30" CMP culvert beneath Idaho Avenue which discharges on the church property on the east side of Idaho Road.

Run-on from the south and west (13.14 acres, basins 1-11, 1-12 and 1-13) is the confluence point for off-site runoff to the south of the property and a portion of the southern part of the property that drains to Idaho Avenue and drains toward the north along the western edge of Idaho Ave to the intersection at San Pasqual Valley Road. Runoff generally drains from the south to the northeast and eventually outfalls to Idaho Avenue pavement edge near the existing driveway (Node 112 → 103), then continues in the shoulder and eventually reaches the 30" CMP culvert beneath Idaho Avenue.

The 100-year storm event flowrate for Analysis point #1 is calculated at 76.18 CFS in the existing condition.

Analysis Point 2:

Analysis point #2 is the confluence of runoff collected in the eastern curbline of Idaho Avenue at the intersection of Idaho Ave. and San Pasqual Valley Road. This runoff is all

off-site runoff that is analyzed to determine the ultimate flow in Idaho Ave and is not directly affected by the proposed project.

The drainage sub-basins to Analysis point #2 (sub-basins 2-01 through 2-03) consists of 1.58 acres. Runoff is all off-site and includes a portion of Pedregal Drive which drains directly into Idaho Ave., and the easterly crowned portion of Idaho Avenue. (Node 200 → 203). The 100-year storm event flowrate for Analysis point #3 is calculated at 5.13 CFS in the existing condition.

The Existing 30" culvert does not fully convey the existing storm flows in the 100 year condition. The existing culvert conveys 45.83 CFS before over-topping the culvert and flowing into Idaho Avenue. The approximate remaining flow in the existing condition being conveyed from Idaho to San Pasqual Valley Road and ultimately the drainage channel downstream of the project is approximately 35.48 CFS. Idaho Avenue has capacity to convey 93 CFS within the ROW limits. (For Idaho Capacity calculation see Appendix D).

The project site is not located within the 100-year flood plain, County Floodway or hazard flood zone.

The "C" factors used to calculate existing flow rates were based on the existing land use type. The off-site run-on basins are approximately 1 dwelling unit per acre. For the on-site portion of existing run-off (basin 1-02) a C-Value of 0.35 was utilized because the site is significantly less than 1 DU/acre. See existing

3. Proposed Conditions

The major development activities include, but are not limited to, clearing & grubbing, demolition, grading, & construction of the 42 single family homes project. (See Proposed Hydrology Exhibit, Appendix B)

The associated improvements will also include drainage improvements, and construction of Best Management Practices (BMPs). A biofiltration basin BMP#1 is proposed for dual purpose for water quality/hydromodification management and detention to maintain the existing condition peak flow rates in the proposed condition. The treatment basin is designed to consider Conjunctive Use, and treatment ponding (1st 18" of depth) is not considered in the detention calculation.

A proprietary storm water treatment unit "Filterra" (BMP#2) will be used to treat a portion of widened roadway in Idaho Avenue. The site is designed to maintain the existing drainage patterns. A portion of Run-On from the south will be conveyed via a brow ditch at the boundary of the project and routed around the project to discharge into to Idaho Ave via a curb outlet. Run-on from the west will be conveyed via a brow ditch and directed to a new inlet and conveyed in a bypass storm drain system that is routed through the project to directly connect to the existing 30" culvert at Idaho Ave, to maintain drainage patterns. The storm drain is private and will be located on-site within HOA lot B.

Analysis Point 1:

To analyze the impacts of the project, Analysis point #1 is at the same location as the existing condition location, at the existing 30" storm drain culvert at Idaho Ave. The

drainage sub-basins to Analysis point #1 (sub-basins1-01 through 1-34) consists of 44.38 acres. Run-off to this analysis point includes run-on from the southwest and north west, as well as the majority of the proposed project site.

Off-site run on from the north west will be captured in a brow ditch and directed to a new type-F catch basin (Node 102) where drainage will be conveyed by a private bypass storm drain through the site to directly connect to the existing 30" culvert at Idaho Ave (Node 103). The majority of the project site area will be captured by proposed private storm drain infrastructure and discharged into the new bio-filtration basin for both treatment and flow control.

Off-site run on from the south west will be captured in a brow ditch and directed to a new curb outlet at Idaho Ave (Node 133) where drainage will then be conveyed via new curb and gutter to the proposed curb inlet (Node 103) which then connects to the existing 30" culvert at Idaho Ave.

The outlet pipe for the bio-filtration basin connects to the private bypass storm drain system before connecting to the existing 30" culvert. Runoff from the project site is not comingled with off-site run-on until properly treated and detained. The mitigated 100-year flow for analysis point #1 is calculated at 42.4 CFS (after detention). A curb inlet is sized to capture nuisance flows (2 CFS max) along Idaho Ave at the 30" culvert for smaller storm events. This added flow is shown in the overall hydraulic calculations for the storm drain system. The added flow still maintains existing peak flow at this analysis point. See hydraulic calculations, Appendix D, confirming adequate capacity to convey the 100-year storm through the existing 30" storm drain culvert.

The proposed condition will mimic the existing condition in that not all the storm water can enter the existing 30" culvert. The majority of runoff within Idaho Avenue will bypass the proposed curb inlet connecting to the 30" culvert and continue down Idaho to San Pasqual Valley Road and ultimately the drainage channel downstream of the project as in the existing condition. The proposed condition reduces that flow from 35.48 in the existing condition to 33.31 in the proposed. Proposed Idaho Avenue has capacity to convey 134 CFS within the ROW limits. (For Idaho Capacity calculation see Appendix D).

C-Values for the proposed project site area now utilize C=0.56 (minimum). (Basins 1-11, 1-12,1-13, 1-21 and 1-22)

Per County of San Diego Hydrology Manual Section 3.1.2
C = 0.9 (% Impervious) + 0.35 (1 - % Impervious)
C = 0.9 (0.38) + 0.35 (1-0.38)
C = 0.56

(Initial Sub-Areas use 7.3 DU/A which is C=0.57) See CIVILDESIGN calculations, appendix B.

Analysis Point 2:

Analysis point #2 is the confluence of runoff collected in the eastern curbline of Idaho Avenue at the intersection of Idaho Ave. and San Pasqual Valley Road. This runoff is all off-site runoff that is analyzed to determine the ultimate flow in Idaho Ave and is not directly affected by the proposed project. This run-off is unchanged in the proposed condition. See hydraulic calculations, Appendix D, to show the capacity of Idaho avenue using flows from Analysis point 1 and 2, for conservative conveyance.

The project site is not located within the 100 year flood plain, County Floodway or hazard flood zone.

The "C" factors ranging from 0.41 to 0.90 were used to calculate the proposed condition flows based on the proposed land use type. As noted for analysis point 1, C value of a minimum of 0.56 is used. See appendix B for proposed hydrology map.

4. Soil Characteristics

Soils are assumed as type D for both existing and proposed conditions.

5. Methodology

Rational Method:

To determine the impacts of the proposed development on the existing drainage patterns, the pre- and post-peak flow rates are analyzed and compared for the 100-year storm event using the Rational Method. This report has been prepared in accordance with the requirements of the County of San Diego Hydrology Manual.

A rational method analysis was utilized to perform hydrologic calculations in this study. The Rational Method is a physically based numerical method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage

Rational Equation: $Q = C * I * A$

Where;
Q = Peak discharge, cfs
C = Rational method runoff coefficient
I = Rainfall intensity, inch/hour (6 hour - 3.3 in/hr, 24 hour – 6.9 in/hr)
A = Drainage area, acre

A computer model CivilD is used to automate the hydrology analysis process. This computer version of the rational method analysis allows user to develop a node-link model of the watershed. CivilD computer program has the capability of performing calculations utilizing mathematical functions. These functions are assigned code numbers, which

appear in the printed results. The code numbers and their corresponding functions are described below;

Sub area Hydrologic Processes;

Code 1 - INITIAL subarea input, top of stream
Code 2 - STREET flow through subarea, includes subarea runoff
Code 3 - ADDITION of runoff from subarea to stream
Code 4 - STREET INLET + parallel street & pipe flow + area
Code 5 - PIPEFLOW travel time (program estimated pipe size)**
Code 6 - PIPEFLOW travel time (user specified pipe size)
Code 7 - IMPROVED channel travel time (open or box)**
Code 8 - IRREGULAR channel travel time**
Code 9 - USER specified entry of data at a point
Code 10 - CONFLUENCE at downstream point in current stream
Code 11 - CONFLUENCE of mainstreams
**NOTE: These options do not include subarea runoff
**NOTE: (#) - Required pipe size determined by the hydrology program

6. Calculations

Onsite Hydrology & Hydraulic Analysis: The peak flow rates for the 6-hour, 100-year storm events are calculated for both existing as well as proposed conditions and summarized in Table 7-1 for comparison purpose. The detailed calculations (CivilD results) for existing and proposed conditions analysis are in Appendices A and B, respectively.

Table 6.1: Existing and Proposed Peak Flow Rates Summary

Analysis Point	Existing Area (AC)	Proposed Area (AC)	Existing Q_{100} (cfs)	Existing V_{100} (ft/s)	Proposed Q_{100} (cfs)	Proposed V_{100} (fps) Mitigated	Proposed Mitigated Q_{100} (cfs)
1	44.10	44.10	76.18	9.52	88.75	9.10	62.90*
2	1.58	1.58	5.13	5.43	5.13	5.43	5.13
Total	**45.68**	**45.68**	**81.31**	--	**93.88**	--	**68.03**

*See BMP Detention Analysis Appendix C.

Table 6.2: Existing 30" Culvert and Idaho Ave Flow Comparisons

Condition	Q_{100} (cfs) 30" Culvert	V (ft/s) 30" Culvert	Q_{100} (cfs) Bypass in Idaho (Basin 1)	Q_{100} (cfs) Bypass in Idaho (Basin 1 and 2)
Existing	45.83	9.52	30.35	35.48
Proposed	44.6	9.10	28.18	33.31

In the proposed condition the unmitigated runoff during the 100-year, 6-hour storm event for the combined project is calculated to increase by 12.57 cfs. The increase in peak flow rate is primarily due to the increase in impervious area from the existing condition. The proposed condition 100-year peak flow rate is reduced from 93.88 cfs to 68.03 cfs due to flow routing through the detention system. The detained flow rate is subtracted from the unmitigated proposed condition peak flow rate to obtain the mitigated peak flow rate. (See Detention Calculations within Appendix C).

The proposed storm drain systems will be designed to convey the calculated 100-year, 6-hour peak flow rate. Detailed sizing calculations for detention routing are provided in Appendix D.

7. Conclusion

The site is designed to mitigate the stormwater impacts due to redevelopment. The new storm drain systems are designed to convey the runoff for the 6-hour, 100-year storm event.

The drainage patterns and flow rates between the existing condition and the proposed development are generally maintained. The runoff from the proposed development has been minimized by using a biofiltration basin to treat and detain runoff prior to discharging offsite. Downstream drainage impacts are not anticipated as a result of the development of this site.

For CEQA purposes, the following questions and answers are provided:

- *Does the project adversely impact downstream facilities or landowners?*
    - No, the project does not adversely impact downstream facilities or landowners. A Bio-Retention Basin is proposed and sized to significantly reduce peak storm water outflow and velocity.

- *Please discuss whether or not the proposed project would substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river in a manner which would result in substantial erosion or siltation on or off site.*
    - No, the project does not alter the existing drainage pattern of the site area. All hydrology analysis points are maintained throughout the site, including off-site run-on.

- *Discuss whether or not project would create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?*
    - Existing and proposed storm water facilities are design to have adequate capacity. The project reduces peak storm water outflows and velocities.

- *Discuss whether or not the proposed project would place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps?*
    - The project is not located within the 100 year flood hazard map, flood insurance rate map or any other flood hazard delineation map.

- *Discuss whether or not the proposed project would place structures within a 100-year flood hazard area which would impede or redirect flood flows.*
    - The project is not located within the 100 year flood hazard map, flood insurance rate map or any other flood hazard delineation map.

- *Discuss whether or not the proposed project would expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of levee or dam?*
    - Not applicable. Project is not located within an inundation zone of a levee or dam.

8. References

- County of San Diego Hydrology Manual, 2003
- County of San Diego Hydraulic Design Manual, 2014

APPENDIX A:

Existing Condition Hydrology Calculations
Existing Condition Hydrology Map

EXISTING CONDITIONS HYDROLOGY EXHIBIT

Existing Basin 1
(Analysis Point 1)

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                    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: 09/24/25
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6413

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  6.900
P6/P24 =    47.8%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** 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                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  930.000(Ft.)
Lowest elevation =  928.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.09 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
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```
TC = [1.8*(1.1-0.4100)*(  85.000^.5)/(   2.000^(1/3)]=   9.09
Rainfall intensity (I) =      5.914(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.558(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     22.221(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   6.493(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
        2             40.00              0.00
        3             80.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     22.221(CFS)
  '     '        flow top width =     16.547(Ft.)
  '     '    velocity=    6.493(Ft/s)
  '     '        area =      3.422(Sq.Ft)
  '     '        Froude number =     2.516

Upstream point elevation =   928.000(Ft.)
Downstream point elevation =   732.000(Ft.)
Flow length =  1393.000(Ft.)
Travel time  =    3.58 min.
Time of concentration =   12.66 min.
Depth of flow =   0.414(Ft.)
Average velocity =   6.493(Ft/s)
Total irregular channel flow =    22.221(CFS)
Irregular channel normal depth above invert elev. =   0.414(Ft.)
Average velocity of channel(s) =   6.493(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.774(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
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.774(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.410  CA =      9.180
Subarea runoff =     43.271(CFS) for     22.160(Ac.)
Total runoff =     43.829(CFS)  Total area =      22.390(Ac.)
Depth of flow =   0.534(Ft.), Average velocity =   7.695(Ft/s)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     47.932(CFS)
Depth of flow =   0.703(Ft.), Average velocity =   4.852(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
        2             40.00              0.00
        3             80.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     47.932(CFS)
  '     '        flow top width =     28.114(Ft.)
  '     '    velocity=    4.852(Ft/s)
  '     '        area =      9.880(Sq.Ft)
  '     '        Froude number =     1.442

Upstream point elevation =   732.000(Ft.)
Downstream point elevation =   706.000(Ft.)
Flow length =   671.000(Ft.)
Travel time  =    2.31 min.
Time of concentration =   14.97 min.
Depth of flow =   0.703(Ft.)
Average velocity =   4.852(Ft/s)
Total irregular channel flow =    47.932(CFS)
Irregular channel normal depth above invert elev. =   0.703(Ft.)
Average velocity of channel(s) =   4.852(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.286(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.350 given for subarea
Rainfall intensity =      4.286(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.394  CA =     12.123
Subarea runoff =      8.135(CFS) for      8.410(Ac.)
Total runoff =     51.965(CFS)  Total area =      30.800(Ac.)
Depth of flow =   0.724(Ft.), Average velocity =   4.951(Ft/s)


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Process from Point/Station      103.000 to Point/Station      103.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.800(Ac.)
Runoff from this stream =     51.965(CFS)
Time of concentration =   14.97 min.
Rainfall intensity =     4.286(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** 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                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  902.000(Ft.)
Lowest elevation =  892.000(Ft.)
Elevation difference =   10.000(Ft.) Slope = 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.76 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  10.000^(1/3)]=   5.76
Rainfall intensity (I) =      7.932(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.423(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     15.783(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   5.804(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
```

```
        2             40.00              0.00
        3             80.00              2.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     15.783(CFS)
  '     '        flow top width =     14.750(Ft.)
  '     '    velocity=    5.804(Ft/s)
  '     '        area =      2.719(Sq.Ft)
  '     '        Froude number =     2.382

Upstream point elevation =   892.000(Ft.)
Downstream point elevation =   724.000(Ft.)
Flow length =  1282.000(Ft.)
Travel time  =    3.68 min.
Time of concentration =    9.45 min.
Depth of flow =   0.369(Ft.)
Average velocity =   5.804(Ft/s)
Total irregular channel flow =    15.783(CFS)
Irregular channel normal depth above invert elev. =   0.369(Ft.)
Average velocity of channel(s) =   5.804(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.768(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
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.768(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      5.387
Subarea runoff =     30.653(CFS) for     13.010(Ac.)
Total runoff =     31.076(CFS)  Total area =      13.140(Ac.)
Depth of flow =   0.475(Ft.), Average velocity =   6.875(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     31.101(CFS)
Depth of flow =   0.935(Ft.), Average velocity =   7.110(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2              5.00              0.00
```

```
        3             10.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     31.101(CFS)
  '     '        flow top width =      9.354(Ft.)
  '     '    velocity=    7.110(Ft/s)
  '     '        area =      4.374(Sq.Ft)
  '     '        Froude number =     1.832

Upstream point elevation =   724.000(Ft.)
Downstream point elevation =   706.000(Ft.)
Flow length =   309.000(Ft.)
Travel time  =    0.72 min.
Time of concentration =   10.17 min.
Depth of flow =   0.935(Ft.)
Average velocity =   7.110(Ft/s)
Total irregular channel flow =    31.101(CFS)
Irregular channel normal depth above invert elev. =   0.935(Ft.)
Average velocity of channel(s) =   7.110(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.500(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.650 given for subarea
The area added to the existing stream causes a
a lower flow rate of Q =     30.237(CFS)
therefore the upstream flow rate of Q =     31.076(CFS) is being used
Rainfall intensity =      5.500(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.413  CA =      5.498
Subarea runoff =      0.000(CFS) for      0.170(Ac.)
Total runoff =     31.076(CFS)  Total area =      13.310(Ac.)
Depth of flow =   0.935(Ft.), Average velocity =   7.108(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     13.310(Ac.)
Runoff from this stream =     31.076(CFS)
Time of concentration =   10.17 min.
Rainfall intensity =     5.500(In/Hr)
Summary of stream data:

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


1       51.965     14.97                4.286
2       31.076     10.17                5.500
```

```
Qmax(1) =
           1.000 *    1.000 *    51.965) +
           0.779 *    1.000 *    31.076) + =      76.184
Qmax(2) =
           1.000 *    0.679 *    51.965) +
           1.000 *    1.000 *    31.076) + =      66.383

Total of 2 streams to confluence:
Flow rates before confluence point:
      51.965      31.076
Maximum flow rates at confluence using above data:
       76.184       66.383
Area of streams before confluence:
       30.800       13.310
Results of confluence:
Total flow rate =     76.184(CFS)
Time of concentration =    14.969 min.
Effective stream area after confluence =     44.110(Ac.)
End of computations, total study area =          44.110 (Ac.)
```

Existing Basin 2
(Analysis Point 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: 10/09/25
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6413

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  6.900
P6/P24 =    47.8%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** 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  =  100.000(Ft.)
Highest elevation =  818.500(Ft.)
Lowest elevation =  817.000(Ft.)
Elevation difference =    1.500(Ft.) Slope =  1.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   1.50 %, in a development type of
 2.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.28 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.4600)*(  85.000^.5)/(   1.500^(1/3)]=   9.28
Rainfall intensity (I) =      5.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.460
Subarea runoff =      0.268(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   817.000(Ft.)
End of street segment elevation =   800.500(Ft.)
Length of street segment  =   220.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      0.805(CFS)
Depth of flow =   0.197(Ft.), Average velocity =   4.160(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   3.018(Ft.)
Flow velocity =   4.16(Ft/s)
Travel time =    0.88 min.     TC =   10.16  min.
 Adding area flow to street
Rainfall intensity (I) =      5.504(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
[LOW DENSITY RESIDENTIAL                    ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Rainfall intensity =      5.504(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.460  CA =      0.230
Subarea runoff =      0.997(CFS) for      0.400(Ac.)
Total runoff =      1.266(CFS)  Total area =       0.500(Ac.)
Street flow at end of street =      1.266(CFS)
Half street flow at end of street =      1.266(CFS)
```

```
Depth of flow =   0.224(Ft.), Average velocity =   4.327(Ft/s)
Flow width (from curb towards crown)=   4.359(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   800.500(Ft.)
End of street segment elevation =   707.000(Ft.)
Length of street segment  =  1430.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      3.160(CFS)
Depth of flow =   0.284(Ft.), Average velocity =   4.874(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.389(Ft.)
Flow velocity =   4.87(Ft/s)
Travel time =    4.89 min.     TC =   15.05  min.
 Adding area flow to street
Rainfall intensity (I) =      4.271(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.900 given for subarea
Rainfall intensity =      4.271(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.761  CA =      1.202
Subarea runoff =      3.868(CFS) for      1.080(Ac.)
Total runoff =      5.134(CFS)  Total area =       1.580(Ac.)
Street flow at end of street =      5.134(CFS)
Half street flow at end of street =      5.134(CFS)
Depth of flow =   0.320(Ft.), Average velocity =   5.434(Ft/s)
Flow width (from curb towards crown)=   9.178(Ft.)
End of computations, total study area =          1.580 (Ac.)
```

APPENDIX B:

Proposed Condition Hydrology Calculations
Proposed Condition Hydrology Map

LEGEND

ITEMS	SYMBOL
OUTER BASIN BOUNDARY	
MAJOR BASIN BOUNDARY	
MINOR BASIN BOUNDARY	
EXISTING STORM DRAIN	
EXISTING CONTOUR	XXX
FLOW DIRECTION	
FLOW PATH	
HYDROLOGY NODE	100
ANALYSIS/EXIST POINT	1
BASIN INDENTIFIER/AREA (ACRES)	MAJOR BASIN IDENTIFIER, SUB-BASIN IDENTIFIER, 1-01 / 0.23, BASIN AREA (ACRES)

ANALYSIS POINT FLOW DATA

LEGEND

1

CUMULATIVE AREA: 44.11 ACRES
Q100 (UN-MITIGATED): 89.50 CFS
Q100 (MITIGATED): 62.90 CFS

2

CUMULATIVE AREA: 1.58 ACRES
Q100: 5.13 CFS

NOTE:
FLOW DATA CALCULATED WITH 'CIVILCADD/CIVILDESIGN HYDROLOGY-HYDRAULICS'®
SEE PRELIMINARY HYDROLOGY STUDY FOR DETAILS

930.0 EG
928 EG
898.0 EG
895.0 EG
793.0 EG
751.1 FG
748.2 FG
734.0 FG
734.7 FG
728.6 FG
723 FG
740 EG
800.5 EG
817.0 EG
818.5 EG

ANALYSIS POINT 1
30" CULVERT
710 FG
Q100 TOTAL= 88.75 CFS
Q100 MITIGATED*= 60.66 CFS

ANALYSIS POINT 2
IDAHO SOUTH CURB
707.0 EG
Q100 = 5.13 CFS

SCALE: 1"=100'

PROPOSED CONDITIONS HYDROLOGY EXHIBIT

TOUCHSTONE DEVELOPMENT

Proposed Basin 1
(Analysis Point 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: 09/25/25
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6413

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  6.900
P6/P24 =    47.8%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** 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                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  930.000(Ft.)
Lowest elevation =  928.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.09 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.4100)*(  85.000^.5)/(   2.000^(1/3)]=   9.09
Rainfall intensity (I) =      5.914(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.558(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     18.467(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   6.156(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
        2             40.00              0.00
        3             80.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     18.467(CFS)
  '     '        flow top width =     15.492(Ft.)
  '     '    velocity=    6.156(Ft/s)
  '     '        area =      3.000(Sq.Ft)
  '     '        Froude number =     2.465

Upstream point elevation =   928.000(Ft.)
Downstream point elevation =   734.000(Ft.)
Flow length =  1405.000(Ft.)
Travel time  =    3.80 min.
Time of concentration =   12.89 min.
Depth of flow =   0.387(Ft.)
Average velocity =   6.156(Ft/s)
Total irregular channel flow =    18.467(CFS)
Irregular channel normal depth above invert elev. =   0.387(Ft.)
Average velocity of channel(s) =   6.156(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.720(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
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.720(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.410  CA =      7.687
Subarea runoff =     35.725(CFS) for     18.520(Ac.)
Total runoff =     36.283(CFS)  Total area =      18.750(Ac.)
Depth of flow =   0.499(Ft.), Average velocity =   7.288(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   734.000(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =   775.00(Ft.) Slope =   0.0310  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.283(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    36.283(CFS)
Normal flow depth in pipe =   18.00(In.)
Flow top width inside pipe =   20.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.36(Ft/s)
Travel time through pipe =    0.90 min.
Time of concentration (TC) =    13.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      4.519(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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
The area added to the existing stream causes a
a lower flow rate of Q =     35.546(CFS)
therefore the upstream flow rate of Q =     36.283(CFS) is being used
Time of concentration =    13.79 min.
Rainfall intensity =      4.519(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.408  CA =      7.866
Subarea runoff =      0.000(CFS) for      0.510(Ac.)
Total runoff =     36.283(CFS)  Total area =      19.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
```

```
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     19.260(Ac.)
Runoff from this stream =     36.283(CFS)
Time of concentration =   13.79 min.
Rainfall intensity =     4.519(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** 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  =  224.000(Ft.)
Highest elevation =  751.100(Ft.)
Lowest elevation =  748.200(Ft.)
Elevation difference =    2.900(Ft.) Slope =  1.295 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.29 %, in a development type of
 7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.06 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5700)*(  65.000^.5)/(   1.295^(1/3)]=   7.06
Rainfall intensity (I) =      6.962(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.570
Subarea runoff =      2.143(CFS)
Total initial stream area =        0.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =   748.200(Ft.)
End of street segment elevation =   734.700(Ft.)
Length of street segment  =   321.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
```

```
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      6.708(CFS)
Depth of flow =   0.362(Ft.), Average velocity =   4.885(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.272(Ft.)
Flow velocity =   4.89(Ft/s)
Travel time =    1.10 min.     TC =    8.15  min.
 Adding area flow to street
Rainfall intensity (I) =      6.344(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.560 given for subarea
Rainfall intensity =      6.344(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.562  CA =      1.764
Subarea runoff =      9.046(CFS) for      2.600(Ac.)
Total runoff =     11.189(CFS)  Total area =       3.140(Ac.)
Street flow at end of street =     11.189(CFS)
Half street flow at end of street =     11.189(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   5.523(Ft/s)
Flow width (from curb towards crown)=  13.869(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   734.700(Ft.)
Downstream point/station elevation =   728.600(Ft.)
Pipe length  =   255.00(Ft.) Slope =   0.0239  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.189(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.189(CFS)
Normal flow depth in pipe =   10.98(In.)
Flow top width inside pipe =   17.56(In.)
Critical Depth =   15.34(In.)
Pipe flow velocity =      9.91(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =     8.58 min.


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

```
Process from Point/Station      113.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Rainfall intensity (I) =      6.137(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.560 given for subarea
Time of concentration =     8.58 min.
Rainfall intensity =      6.137(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.561  CA =      3.259
Subarea runoff =      8.813(CFS) for      2.670(Ac.)
Total runoff =     20.002(CFS)  Total area =       5.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      114.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   728.600(Ft.)
Downstream point/station elevation =   712.000(Ft.)
Pipe length  =   153.00(Ft.) Slope =   0.1085  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.002(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    20.002(CFS)
Normal flow depth in pipe =   11.55(In.)
Flow top width inside pipe =   12.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.71(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     8.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      114.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Rainfall intensity (I) =      6.078(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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     8.71 min.
Rainfall intensity =      6.078(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.541  CA =      3.469
Subarea runoff =      1.084(CFS) for      0.600(Ac.)
Total runoff =     21.086(CFS)  Total area =       6.410(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      6.410(Ac.)
Runoff from this stream =     21.086(CFS)
Time of concentration =    8.71 min.
Rainfall intensity =     6.078(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      121.000
**** 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  =  131.000(Ft.)
Highest elevation =  750.300(Ft.)
Lowest elevation =  748.200(Ft.)
Elevation difference =    2.100(Ft.) Slope =  1.603 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.60 %, in a development type of
 7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.29 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5700)*(  80.000^.5)/(   1.603^(1/3)]=   7.29
Rainfall intensity (I) =      6.817(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.570
Subarea runoff =      1.049(CFS)
Total initial stream area =        0.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      122.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   748.200(Ft.)
End of street segment elevation =   723.000(Ft.)
Length of street segment  =   501.000(Ft.)
```

```
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      6.334(CFS)
Depth of flow =   0.349(Ft.), Average velocity =   5.160(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.606(Ft.)
Flow velocity =   5.16(Ft/s)
Travel time =    1.62 min.     TC =    8.91  min.
 Adding area flow to street
Rainfall intensity (I) =      5.990(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.560 given for subarea
Rainfall intensity =      5.990(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.561  CA =      1.929
Subarea runoff =     10.507(CFS) for      3.170(Ac.)
Total runoff =     11.556(CFS)  Total area =       3.440(Ac.)
Street flow at end of street =     11.556(CFS)
Half street flow at end of street =     11.556(CFS)
Depth of flow =   0.408(Ft.), Average velocity =   5.957(Ft/s)
Flow width (from curb towards crown)=  13.555(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      114.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   723.000(Ft.)
Downstream point/station elevation =   712.000(Ft.)
Pipe length  =   131.00(Ft.) Slope =   0.0840  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.556(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    11.556(CFS)
Normal flow depth in pipe =    8.53(In.)
Flow top width inside pipe =   14.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.05(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     9.05 min.
```

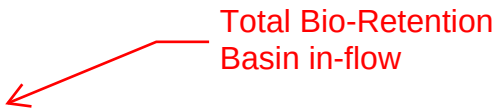
```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.440(Ac.)
Runoff from this stream =     11.556(CFS)
Time of concentration =    9.05 min.
Rainfall intensity =     5.932(In/Hr)
Summary of stream data:

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


1       21.086      8.71                6.078
2       11.556      9.05                5.932
Qmax(1) =
           1.000 *    1.000 *    21.086) +
           1.000 *    0.963 *    11.556) + =      32.213
Qmax(2) =
           0.976 *    1.000 *    21.086) +
           1.000 *    1.000 *    11.556) + =      32.134

Total of 2 streams to confluence:
Flow rates before confluence point:
      21.086      11.556
Maximum flow rates at confluence using above data:
       32.213       32.134
Area of streams before confluence:
        6.410        3.440
Results of confluence:
Total flow rate =     32.213(CFS)
Time of concentration =     8.710 min.
Effective stream area after confluence =      9.850(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   712.000(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =    10.00(Ft.) Slope =   0.2000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.213(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    32.213(CFS)
Normal flow depth in pipe =   10.95(In.)
Flow top width inside pipe =   17.57(In.)
```



```
Critical depth could not be calculated.
Pipe flow velocity =     28.64(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     8.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      9.850(Ac.)
Runoff from this stream =     32.213(CFS)
Time of concentration =    8.72 min.
Rainfall intensity =     6.076(In/Hr)
Summary of stream data:

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


1       36.283     13.79                4.519
2       32.213      8.72                6.076
Qmax(1) =
           1.000 *    1.000 *    36.283) +
           0.744 *    1.000 *    32.213) + =      60.242
Qmax(2) =
           1.000 *    0.632 *    36.283) +
           1.000 *    1.000 *    32.213) + =      55.141

Total of 2 main streams to confluence:
Flow rates before confluence point:
      36.283      32.213
Maximum flow rates at confluence using above data:
       60.242       55.141
Area of streams before confluence:
       19.260        9.850


Results of confluence:
Total flow rate =     60.242(CFS)
Time of concentration =    13.792 min.
Effective stream area after confluence  =     29.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     29.110(Ac.)
Runoff from this stream =     60.242(CFS)
Time of concentration =   13.79 min.
Rainfall intensity =     4.519(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      131.000
**** 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                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  898.000(Ft.)
Lowest elevation =  895.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   3.000^(1/3)]=   8.61
Rainfall intensity (I) =      6.123(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.678(CFS)
Total initial stream area =        0.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.107(Ft.), Average velocity =   2.981(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
        2             40.00              0.00
        3             80.00              2.00
Manning's 'N' friction factor =   0.030
```

```
------------------------------------------------------------------
Sub-Channel flow  =      0.678(CFS)
  '     '        flow top width =      4.265(Ft.)
  '     '    velocity=    2.981(Ft/s)
  '     '        area =      0.227(Sq.Ft)
  '     '        Froude number =     2.275

Upstream point elevation =   895.000(Ft.)
Downstream point elevation =   793.000(Ft.)
Flow length =   564.000(Ft.)
Travel time  =    3.15 min.
Time of concentration =   11.76 min.
Depth of flow =   0.107(Ft.)
Average velocity =   2.981(Ft/s)
Total irregular channel flow =     0.678(CFS)
Irregular channel normal depth above invert elev. =   0.107(Ft.)
Average velocity of channel(s) =   2.981(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      133.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   793.000(Ft.)
Downstream point elevation =   740.000(Ft.)
Channel length thru subarea  =   618.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =      4.775(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.100(Ft.)
Flow(q) thru subarea =      4.775(CFS)
Depth of flow =   1.072(Ft.), Average velocity =  23.362(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    0.200(Ft.)
Flow Velocity =   23.36(Ft/s)
Travel time  =    0.44 min.
Time of concentration =   12.21 min.
Critical depth =      2.656(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
Rainfall intensity (I) =      4.889(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
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.889(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      1.800
Subarea runoff =      8.123(CFS) for      4.120(Ac.)
Total runoff =      8.800(CFS)  Total area =       4.390(Ac.)
Depth of flow =   1.525(Ft.), Average velocity =  29.835(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.969(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      133.000 to Point/Station      133.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      4.889(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
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Time of concentration =    12.21 min.
Rainfall intensity =      4.889(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      5.925
Subarea runoff =     20.167(CFS) for     10.060(Ac.)
Total runoff =     28.967(CFS)  Total area =      14.450(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      133.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   740.000(Ft.)
Downstream point elevation =   710.000(Ft.)
Channel length thru subarea  =   586.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   0.100
!!Warning: Water is above left or right bank elevations
```

```
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =     29.547(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     29.547(CFS)
Depth of flow =   2.566(Ft.), Average velocity =  23.199(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    0.550(Ft.)
Flow Velocity =   23.20(Ft/s)
Travel time  =    0.42 min.
Time of concentration =   12.63 min.
Critical depth =      4.750(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
Rainfall intensity (I) =      4.784(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.700 given for subarea
Rainfall intensity =      4.784(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.421  CA =      6.309
Subarea runoff =      1.215(CFS) for      0.550(Ac.)
Total runoff =     30.182(CFS)  Total area =      15.000(Ac.)
Depth of flow =   2.595(Ft.), Average velocity =  23.397(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      4.813(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     30.182(CFS)
Time of concentration =   12.63 min.
Rainfall intensity =     4.784(In/Hr)
Summary of stream data:

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


1       60.242     13.79                4.519
2       30.182     12.63                4.784
Qmax(1) =
           1.000 *    1.000 *    60.242) +
           0.945 *    1.000 *    30.182) + =      88.754
Qmax(2) =
           1.000 *    0.916 *    60.242) +
           1.000 *    1.000 *    30.182) + =      85.334
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      60.242      30.182
Maximum flow rates at confluence using above data:
       88.754       85.334
Area of streams before confluence:
       29.110       15.000
Results of confluence:
Total flow rate =     88.754(CFS)
Time of concentration =    13.792 min.
Effective stream area after confluence =     44.110(Ac.)
End of computations, total study area =          44.110 (Ac.)
```

Total, Unmitigated flow, Basin 1

Proposed Basin 2
(Analysis Point 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: 10/09/25
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6413

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  6.900
P6/P24 =    47.8%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** 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  =  100.000(Ft.)
Highest elevation =  818.500(Ft.)
Lowest elevation =  817.000(Ft.)
Elevation difference =    1.500(Ft.) Slope =  1.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   1.50 %, in a development type of
 2.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.28 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.4600)*(  85.000^.5)/(   1.500^(1/3)]=   9.28
Rainfall intensity (I) =      5.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.460
Subarea runoff =      0.268(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   817.000(Ft.)
End of street segment elevation =   800.500(Ft.)
Length of street segment  =   220.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      0.805(CFS)
Depth of flow =   0.197(Ft.), Average velocity =   4.160(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   3.018(Ft.)
Flow velocity =   4.16(Ft/s)
Travel time =    0.88 min.     TC =   10.16  min.
 Adding area flow to street
Rainfall intensity (I) =      5.504(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
[LOW DENSITY RESIDENTIAL                    ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Rainfall intensity =      5.504(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.460  CA =      0.230
Subarea runoff =      0.997(CFS) for      0.400(Ac.)
Total runoff =      1.266(CFS)  Total area =       0.500(Ac.)
Street flow at end of street =      1.266(CFS)
Half street flow at end of street =      1.266(CFS)
```

```
Depth of flow =   0.224(Ft.), Average velocity =   4.327(Ft/s)
Flow width (from curb towards crown)=   4.359(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   800.500(Ft.)
End of street segment elevation =   707.000(Ft.)
Length of street segment  =  1430.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(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 [1] side(s) of the street
Distance from curb to property line  =   4.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(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 =      3.160(CFS)
Depth of flow =   0.284(Ft.), Average velocity =   4.874(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.389(Ft.)
Flow velocity =   4.87(Ft/s)
Travel time =    4.89 min.     TC =   15.05  min.
 Adding area flow to street
Rainfall intensity (I) =      4.271(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.900 given for subarea
Rainfall intensity =      4.271(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.761  CA =      1.202
Subarea runoff =      3.868(CFS) for      1.080(Ac.)
Total runoff =      5.134(CFS)  Total area =       1.580(Ac.)
Street flow at end of street =      5.134(CFS)
Half street flow at end of street =      5.134(CFS)
Depth of flow =   0.320(Ft.), Average velocity =   5.434(Ft/s)
Flow width (from curb towards crown)=   9.178(Ft.)
End of computations, total study area =           1.580 (Ac.)
```

APPENDIX C:

Detention Basin Design

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 9/25/2025
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 3.3 INCHES
BASIN AREA 9.85 ACRES
RUNOFF COEFFICIENT 0.56
PEAK DISCHARGE 32.213 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 1.1
TIME (MIN) = 27	DISCHARGE (CFS) = 1.1
TIME (MIN) = 36	DISCHARGE (CFS) = 1.2
TIME (MIN) = 45	DISCHARGE (CFS) = 1.2
TIME (MIN) = 54	DISCHARGE (CFS) = 1.2
TIME (MIN) = 63	DISCHARGE (CFS) = 1.3
TIME (MIN) = 72	DISCHARGE (CFS) = 1.3
TIME (MIN) = 81	DISCHARGE (CFS) = 1.3
TIME (MIN) = 90	DISCHARGE (CFS) = 1.4
TIME (MIN) = 99	DISCHARGE (CFS) = 1.4
TIME (MIN) = 108	DISCHARGE (CFS) = 1.5
TIME (MIN) = 117	DISCHARGE (CFS) = 1.6
TIME (MIN) = 126	DISCHARGE (CFS) = 1.7
TIME (MIN) = 135	DISCHARGE (CFS) = 1.7
TIME (MIN) = 144	DISCHARGE (CFS) = 1.8
TIME (MIN) = 153	DISCHARGE (CFS) = 1.9
TIME (MIN) = 162	DISCHARGE (CFS) = 2.1
TIME (MIN) = 171	DISCHARGE (CFS) = 2.2
TIME (MIN) = 180	DISCHARGE (CFS) = 2.4
TIME (MIN) = 189	DISCHARGE (CFS) = 2.6
TIME (MIN) = 198	DISCHARGE (CFS) = 2.9
TIME (MIN) = 207	DISCHARGE (CFS) = 3.2
TIME (MIN) = 216	DISCHARGE (CFS) = 3.9
TIME (MIN) = 225	DISCHARGE (CFS) = 4.4
TIME (MIN) = 234	DISCHARGE (CFS) = 6.5
TIME (MIN) = 243	DISCHARGE (CFS) = 9.8
TIME (MIN) = 252	DISCHARGE (CFS) = 32.213
TIME (MIN) = 261	DISCHARGE (CFS) = 5.2
TIME (MIN) = 270	DISCHARGE (CFS) = 3.5
TIME (MIN) = 279	DISCHARGE (CFS) = 2.7
TIME (MIN) = 288	DISCHARGE (CFS) = 2.3
TIME (MIN) = 297	DISCHARGE (CFS) = 2
TIME (MIN) = 306	DISCHARGE (CFS) = 1.8
TIME (MIN) = 315	DISCHARGE (CFS) = 1.6
TIME (MIN) = 324	DISCHARGE (CFS) = 1.5
TIME (MIN) = 333	DISCHARGE (CFS) = 1.4
TIME (MIN) = 342	DISCHARGE (CFS) = 1.3
TIME (MIN) = 351	DISCHARGE (CFS) = 1.2
TIME (MIN) = 360	DISCHARGE (CFS) = 1.1
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Watershed Model Schematic

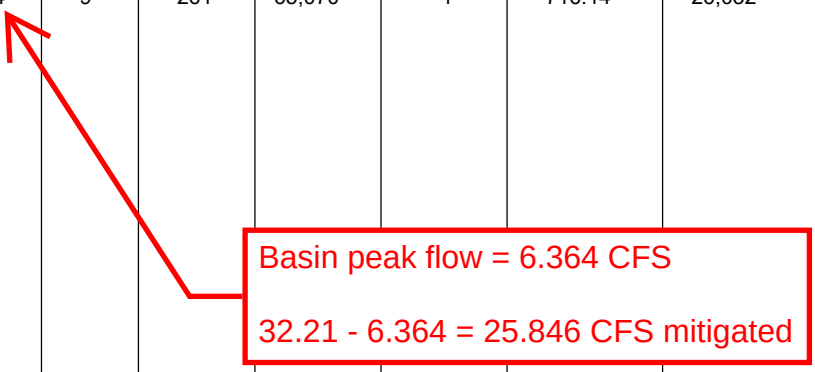
Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	------	-------	0.000	-------	-------	0.000	-------	-------	32.21	<no description>
2	Reservoir	1	-------	0.000	-------	-------	0.000	-------	-------	6.364	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	32.21	9	252	65,077	------	------	------	<no description>
2	Reservoir	6.364	9	261	65,070	1	716.14	26,032	<no description>

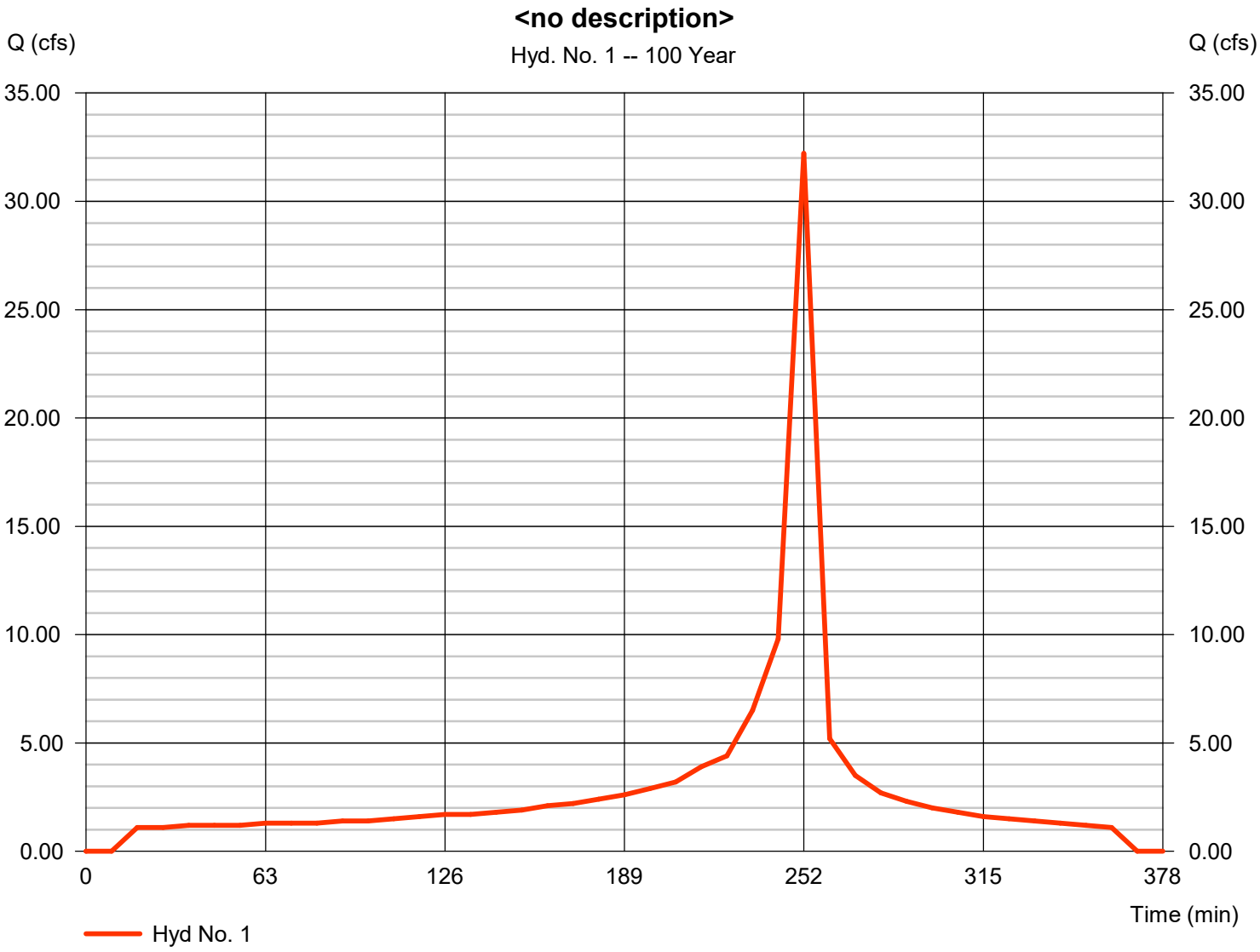


Hydrograph Report

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 32.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 252 min
Time interval	= 9 min	Hyd. volume	= 65,077 cuft



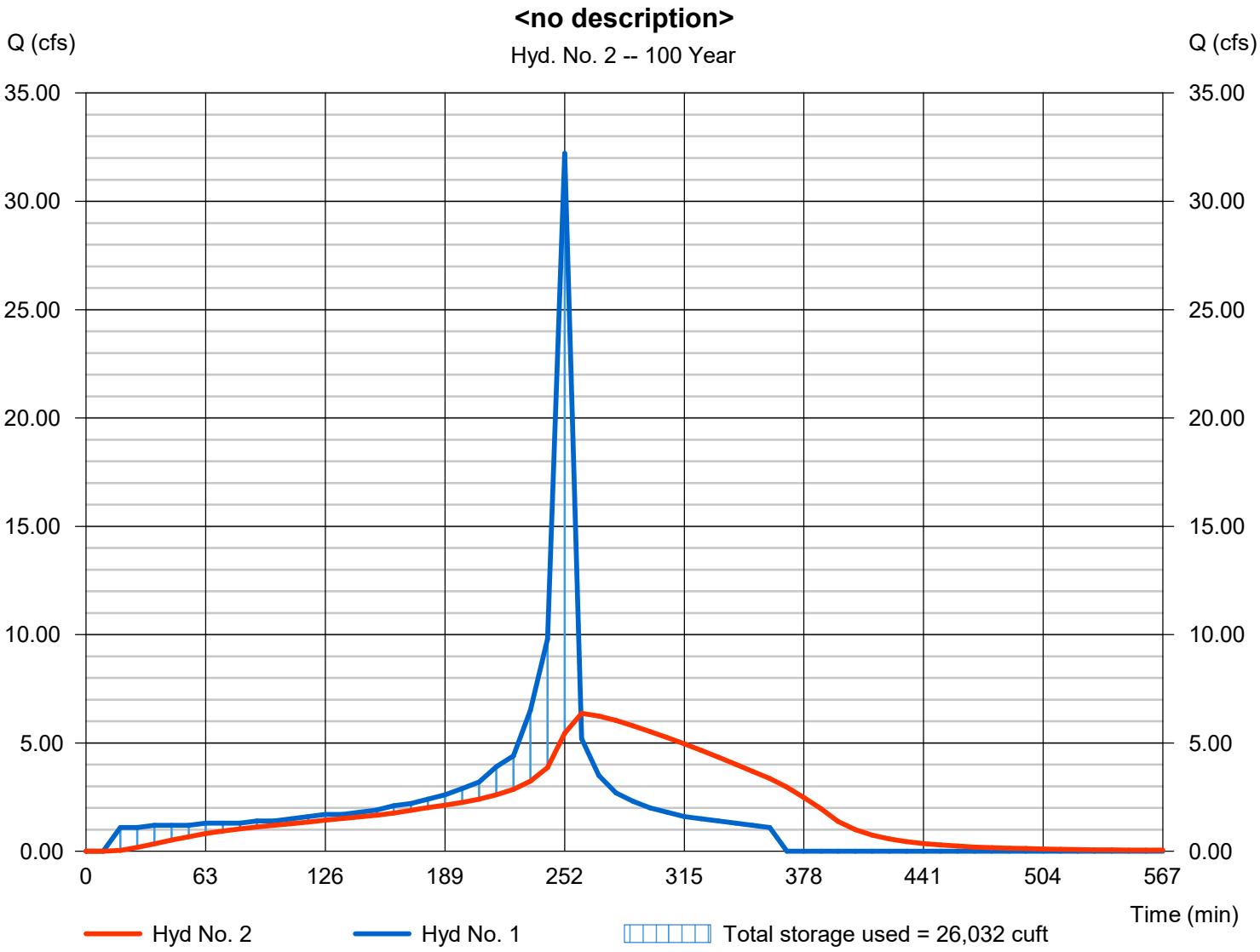
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 6.364 cfs
Storm frequency	= 100 yrs	Time to peak	= 261 min
Time interval	= 9 min	Hyd. volume	= 65,070 cuft
Inflow hyd. No.	= 1 - <no description>	Max. Elevation	= 716.14 ft
Reservoir name	= <New Pond>	Max. Storage	= 26,032 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - <New Pond>

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 713.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	713.50	8,339	0	0
0.50	714.00	8,888	4,307	4,307
1.50	715.00	10,007	9,448	13,754
2.50	716.00	11,151	10,579	24,333
3.50	717.00	12,320	11,736	36,069
4.50	718.00	13,514	12,917	48,986

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	6.00	0.00	0.00
Span (in)	= 30.00	20.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 708.50	713.50	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

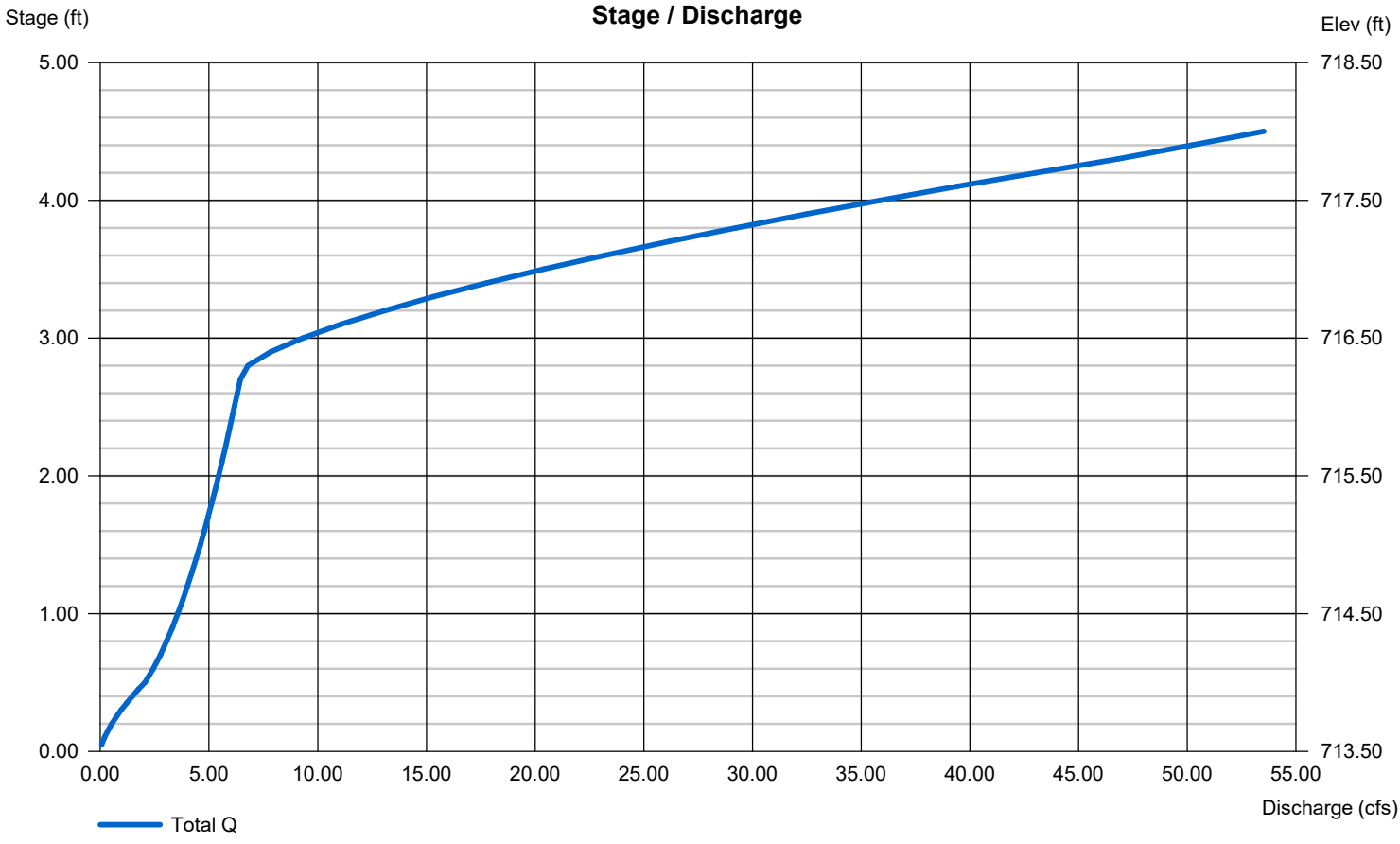
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 716.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

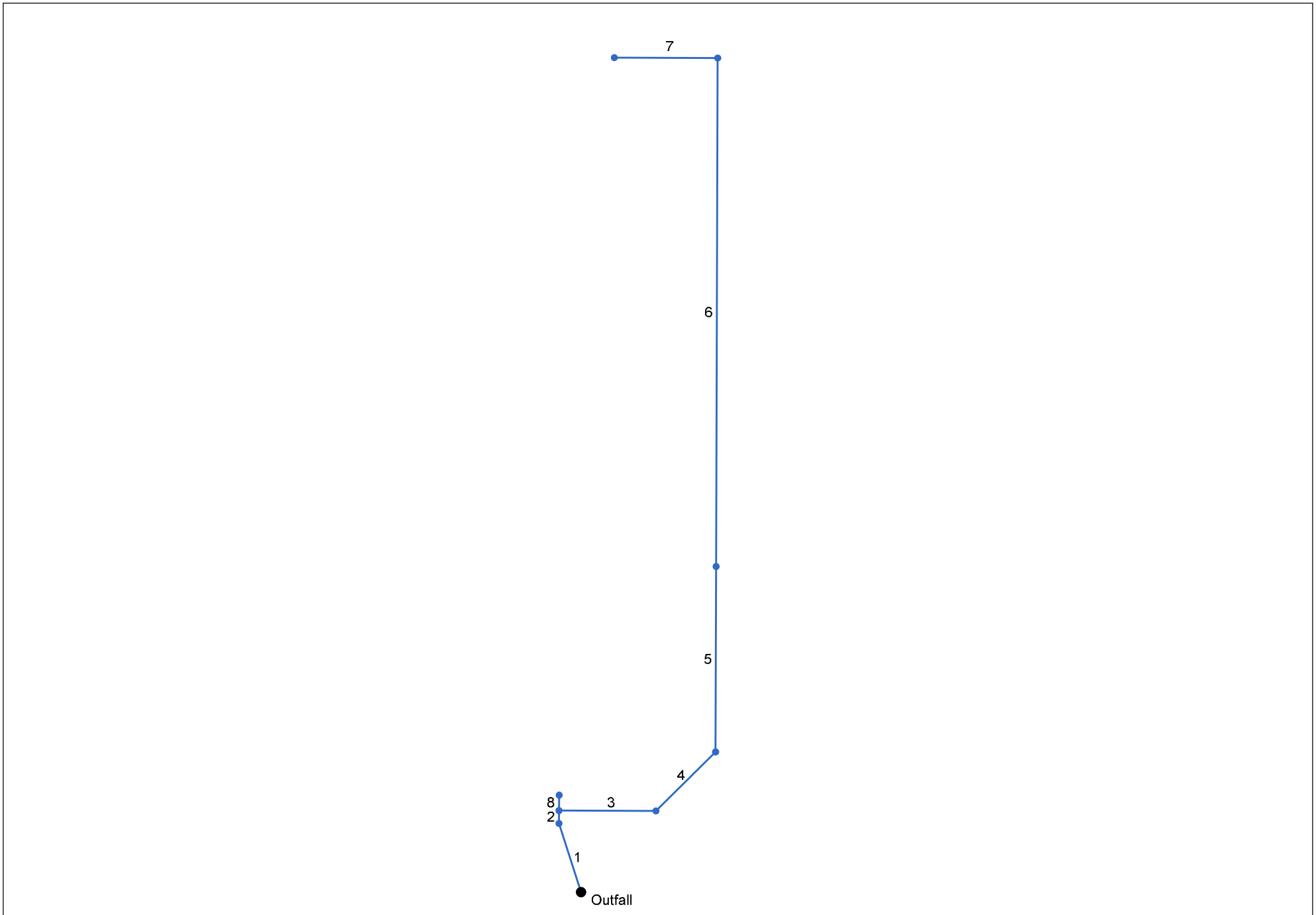
APPENDIX D:

Proposed SD Hydraulic Calculations (Capacity)

Proposed Idaho Avenue Peak Flow Capacity

Idaho Curb Inlet Sizing Calculation

Pasqual Revised



Project File: Pasqual SD (3rd Submittal).stm	Number of lines: 8	Date: 10/10/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	56.000	-107.708	MH	2.00	0.00	0.00	0.0	705.06	0.48	705.33	30	Cir	0.018	0.15	710.00	
2	1	10.000	17.708	MH	0.00	0.00	0.00	0.0	705.33	1.00	705.43	30	Cir	0.013	0.45	716.00	
3	2	75.000	90.176	MH	0.00	0.00	0.00	0.0	705.50	3.33	708.00	30	Cir	0.013	1.00	715.00	
4	3	65.000	-45.000	MH	0.00	0.00	0.00	0.0	708.00	3.54	710.30	24	Cir	0.013	0.75	718.00	
5	4	144.000	-45.000	MH	0.00	0.00	0.00	0.0	710.30	3.26	715.00	24	Cir	0.013	0.45	721.00	
6	5	395.000	0.000	MH	0.00	0.00	0.00	0.0	715.00	3.00	726.85	24	Cir	0.013	0.15	736.10	
7	6	80.000	-90.000	MH	36.28	0.00	0.00	0.0	726.85	2.00	728.45	24	Cir	0.013	1.00	735.50	
8	2	12.000	0.527	MH	6.36	0.00	0.00	0.0	705.33	26.42	708.50	30	Cir	0.013	0.15	718.00	

Hydraflow Storm Sewers Extension for Autodesk Civil 3D (US Customary) - Pasqual Revised

File Edit Compute I-D-F Curves Options Help

Open Save Report Codes IDF Edit Insert Delete Run Plot Profile In/Out Import

Plan Pipes Inlets Results

Line No.	Line ID	Dnstr Line No.	Line Length (ft)	Defl Angle (deg)	Junction Type	Known Q (cfs)	Drnge Area (ac)	Runoff Coeff (C)	Tc Method	Inlet Time (min)	Invert Elev Dn (ft)	Line Slope (%)	Invert Elev Up (ft)	Line Rise (in)	Line Type	Line Span (in)	No. Barrels	N Value (n)	J-Loss Coeff (K)	Inl/Rim Elev Dn (ft)	Inl/Rim Elev Up (ft)
1		Outfall	56.000	-107.708	Manhole	2.00	0.00	0.00	User	0.0	705.06	0.48	705.33	30	Cir	30	1	0.018	0.15	0.00	710.00
2		1	10.000	17.708	Manhole	0.00	0.00	0.00	User	0.0	705.33	1.00	705.43	30	Cir	30	1	0.013	0.45	710.00	716.00
3		2	75.000	90.176	Manhole	0.00	0.00	0.00	User	0.0	705.50	3.33	708.00	30	Cir	30	1	0.013	1.00	716.00	715.00
4		3	65.000	-45.000	Manhole	0.00	0.00	0.00	User	0.0	708.00	3.54	710.30	24	Cir	24	1	0.013	0.75	715.00	718.00
5		4	144.000	-45.000	Manhole	0.00	0.00	0.00	User	0.0	710.30	3.26	715.00	24	Cir	24	1	0.013	0.45	718.00	721.00
6		5	395.000	0.000	Manhole	0.00	0.00	0.00	User	0.0	715.00	3.00	726.85	24	Cir	24	1	0.013	0.15	721.00	736.10
7		6	80.000	-90.000	Manhole	36.28	0.00	0.00	User	0.0	726.85	2.00	728.45	24	Cir	24	1	0.013	1.00	736.10	735.50
8		2	12.000	0.527	Manhole	6.36	0.00	0.00	User	0.0	705.33	26.42	708.50	30	Cir	30	1	0.013	0.15	716.00	718.00

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1		Manhole	710.00	Cir	4.00	4.00	30	Cir	705.33	30	Cir	705.33
2		Manhole	716.00	Cir	4.00	4.00	30	Cir	705.43	30 30	Cir Cir	705.50 705.33
3		Manhole	715.00	Cir	4.00	4.00	30	Cir	708.00	24	Cir	708.00
4		Manhole	718.00	Cir	4.00	4.00	24	Cir	710.30	24	Cir	710.30
5		Manhole	721.00	Cir	4.00	4.00	24	Cir	715.00	24	Cir	715.00
6		Manhole	736.10	Cir	4.00	4.00	24	Cir	726.85	24	Cir	726.85
7		Manhole	735.50	Cir	4.00	4.00	24	Cir	728.45			
8		Manhole	718.00	Cir	4.00	4.00	30	Cir	708.50			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		44.64	30	Cir	56.000	705.06	705.33	0.482	707.56*	708.83*	0.19	709.03	End	Manhole
2		42.64	30	Cir	10.000	705.33	705.43	1.000	709.03*	709.13*	0.53	709.66	1	Manhole
3		36.28	30	Cir	75.000	705.50	708.00	3.333	709.10	710.04	n/a	710.04	2	Manhole
4		36.28	24	Cir	65.000	708.00	710.30	3.538	710.04	712.23	n/a	712.23	3	Manhole
5		36.28	24	Cir	144.000	710.30	715.00	3.264	712.23	716.93	n/a	716.93	4	Manhole
6		36.28	24	Cir	395.000	715.00	726.85	3.000	716.93	728.78	n/a	728.78	5	Manhole
7		36.28	24	Cir	80.000	726.85	728.45	2.000	728.85*	730.91*	n/a	732.98	6	Manhole
8		6.36	30	Cir	12.000	705.33	708.50	26.417	709.10	709.17	n/a	709.17	2	Manhole

Pasqual Revised | Number of lines: 8 | Run Date: 10/10/2025

NOTES: Known Qs only ; *Surcharged (HGL above crown).

MyReport

Line No.	Area Dn (sqft)	Area Up (sqft)	Byp Ln No	Coeff C1 (C)	Coeff C2 (C)	Coeff C3 (C)	Capac Full (cfs)	Crit Depth (ft)	Cross Sl, Sw (ft/ft)	Cross Sl, Sx (ft/ft)	Curb Len (ft)	Defl Ang (Deg)	Depth Dn (ft)	Depth Up (ft)	DnStm Ln No	Drng Area (ac)	Easting X (ft)	EGL Dn (ft)	EGL Up (ft)	Energy Loss (ft)	Flow Rate (cfs)	Sf Ave (%)
1	4.91	4.91	n/a	0.20	0.50	0.90	20.57	2.22	....	....	....	-107.708	2.50	2.50	Outfall	0.00	243.69	708.85	710.12	1.272	44.64	2.272
2	4.91	4.91	1	0.20	0.50	0.90	41.01	2.18	....	....	....	17.708	2.50	2.50	1	0.00	243.69	710.20	710.31	0.108	42.64	1.081
3	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	....	....	....	90.176	0.00	0.00**	2	0.00	318.69	709.95	710.04	0.000	36.28	0.000
4	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	....	....	....	-45.000	0.00	0.00**	3	0.00	364.79	712.11	712.23	0.000	36.28	0.000
5	0.00	0.00	4	0.20	0.50	0.90	0.00	0.00	....	....	....	-45.000	0.00	0.00**	4	0.00	365.24	714.35	716.93	0.000	36.28	0.000
6	0.00	0.00	5	0.20	0.50	0.90	0.00	0.00	....	....	....	0.000	0.00	0.00**	5	0.00	366.45	719.05	728.78	0.000	36.28	0.000
7	0.00	0.00	6	0.20	0.50	0.90	0.00	0.00	....	....	....	-90.000	0.00	0.00**	6	0.00	286.45	730.92	730.91	0.000	36.28	0.000
8	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	....	....	....	0.527	0.00	0.00**	2	0.00	243.80	709.11	709.17	0.000	6.36	0.000

Pasqual Revised | Number of lines: 8 | Date: 10/10/2025

NOTES: ** Critical depth

MyReport

Sf Dn (%)	Grate Area (sqft)	Grate Len (ft)	Grate Width (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Gutter Depth (ft)	Gutter Slope (ft/ft)	Gutter Spread (ft)	Gutter Width (ft)	HGL Dn (ft)	HGL Up (ft)	HGL Jnct (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Incr CxA	Incr Q (cfs)	Inlet Depth (ft)	Inlet Eff (%)	Inlet ID	Inlet Loc	Line No.	
2.272	....	....	....	0.00	710.00	....	....	....	....	707.56	708.83	709.03	....	....	0.00	2.00	....	....		Sag	1	
1.081	....	....	....	710.00	716.00	....	....	....	....	709.03	709.13	709.66	....	....	0.00	0.00	....	....		Sag	2	
0.000	....	....	....	716.00	715.00	....	....	....	....	709.10	710.04	710.04	....	....	0.00	0.00	....	....		Sag	3	
0.000	....	....	....	715.00	718.00	....	....	....	....	710.04	712.23	712.23	....	....	0.00	0.00	....	....		Sag	4	
0.000	....	....	....	718.00	721.00	....	....	....	....	712.23	716.93	716.93	....	....	0.00	0.00	....	....		Sag	5	
0.000	....	....	....	721.00	736.10	....	....	....	....	716.93	728.78	728.78	....	....	0.00	0.00	....	....		Sag	6	
0.000	....	....	....	736.10	735.50	....	....	....	....	728.85	730.91	732.98	....	....	0.00	36.28	....	....		Sag	7	
0.000	....	....	....	716.00	718.00	....	....	....	....	709.10	709.17	709.17	....	....	0.00	6.36	....	....		Sag	8	

Pasqual Revised | Number of lines: 8 | Date: 10/10/2025

NOTES: ** Critical depth

MyReport

Inlet Time (min)	i Sys (in/hr)	i Inlet (in/hr)	Invert Dn (ft)	Invert Up (ft)	Jump Loc (ft)	Jump Len (ft)	Vel Hd Jmp Dn (ft)	Vel Hd Jmp Up (ft)	J-Loss Coeff	Junct Type	Known Q (cfs)	Cost RCP ({0})	Cost CMP ({0})	Cost PVC ({0})	Line ID	Line Length (ft)	Line Size (in)	Line Slope (%)	Line Type	Local Depr (in)	n-val Gutter	
0.0	0.00	0.00	705.06	705.33	....	....	0.00	0.00	0.15	MH	2.00	2,364	2,128	2,009		56.000	30	0.48	Cir	....	....	
0.0	0.00	0.00	705.33	705.43	....	....	0.00	0.00	0.45	MH	0.00	738	664	627		10.000	30	1.00	Cir	....	....	
0.0	0.00	0.00	705.50	708.00	....	....	0.00	0.00	1.00	MH	0.00	4,842	4,358	4,116		75.000	30	3.33	Cir	....	....	
0.0	0.00	0.00	708.00	710.30	....	....	0.00	0.00	0.75	MH	0.00	3,510	3,159	2,984		65.000	24	3.54	Cir	....	....	
0.0	0.00	0.00	710.30	715.00	....	....	0.00	0.00	0.45	MH	0.00	7,604	6,844	6,463		144.000	24	3.26	Cir	....	....	
0.0	0.00	0.00	715.00	726.85	....	....	0.00	0.00	0.15	MH	0.00	21,896	19,706	18,612		395.000	24	3.00	Cir	....	....	
0.0	0.00	0.00	726.85	728.45	....	....	0.00	0.00	1.00	MH	36.28	4,650	4,185	3,953		80.000	24	2.00	Cir	....	....	
0.0	0.00	0.00	705.33	708.50	....	....	0.00	0.00	0.15	MH	6.36	960	864	816		12.000	30	26.42	Cir	....	....	

Pasqual Revised | Number of lines: 8 | Date: 10/10/2025

NOTES: Known Qs only. ; ** Critical depth

MyReport

n-val Pipe	Minor Loss (ft)	Northing Y (ft)	Pipe Travel (min)	Q Byp (cfs)	Q Capt (cfs)	Q Carry (cfs)	Line Rise (in)	Runoff Coeff (C)	Line Span (in)	Area A1 (ac)	Area A2 (ac)	Area A3 (ac)	Tc (min)	Throat Ht (in)	Total Area (ac)	Total CxA	Total Runoff (cfs)	Vel Ave (ft/s)	Vel Dn (ft/s)	Vel Hd Dn (ft)	Vel Hd Up (ft)	Vel Up (ft/s)	Cover Dn (ft)
0.018	0.19	173.16	0.10	....	....	....	30	0.00	30	0.00	0.00	0.00	1.2	....	0.00	0.00	0.00	9.09	9.10	1.29	1.29	9.09	n/a
0.013	0.53	183.16	0.02	....	....	....	30	0.00	30	0.00	0.00	0.00	1.2	....	0.00	0.00	0.00	8.69	8.69	1.17	1.17	8.69	2.17
0.013	n/a	182.93	0.17	....	....	....	30	0.00	30	0.00	0.00	0.00	1.0	....	0.00	0.00	0.00	7.93	7.39	0.00	0.00	8.46	8.00
0.013	n/a	228.75	0.09	....	....	....	24	0.00	24	0.00	0.00	0.00	0.9	....	0.00	0.00	0.00	11.61	11.55	0.00	0.00	11.68	5.00
0.013	n/a	372.75	0.21	....	....	....	24	0.00	24	0.00	0.00	0.00	0.7	....	0.00	0.00	0.00	11.68	11.68	0.00	0.00	11.68	5.70
0.013	n/a	767.75	0.57	....	....	....	24	0.00	24	0.00	0.00	0.00	0.1	....	0.00	0.00	0.00	11.68	11.68	0.00	0.00	11.68	4.00
0.013	n/a	768.00	0.12	....	....	....	24	0.00	24	0.00	0.00	0.00	0.0	....	0.00	0.00	0.00	11.55	11.55	0.00	0.00	11.55	7.25
0.013	n/a	195.16	0.15	....	....	....	30	0.00	30	0.00	0.00	0.00	0.0	....	0.00	0.00	0.00	2.38	0.84	0.00	0.00	3.92	8.17

Pasqual Revised | Number of lines: 8 | Date: 10/10/2025

NOTES: ** Critical depth

MyReport

Cover Up (ft)	Storage (cft)	Line Size (in)	
2.17	274.84	30	
8.07	49.08	30	
4.50	0.00	30	
5.70	0.00	24	
4.00	0.00	24	
7.25	0.00	24	
5.05	0.00	24	
7.00	0.00	30	

Pasqual Revised	Number of lines: 8	Date: 10/10/2025

NOTES: ** Critical depth

Hydraulic Grade Line Computations

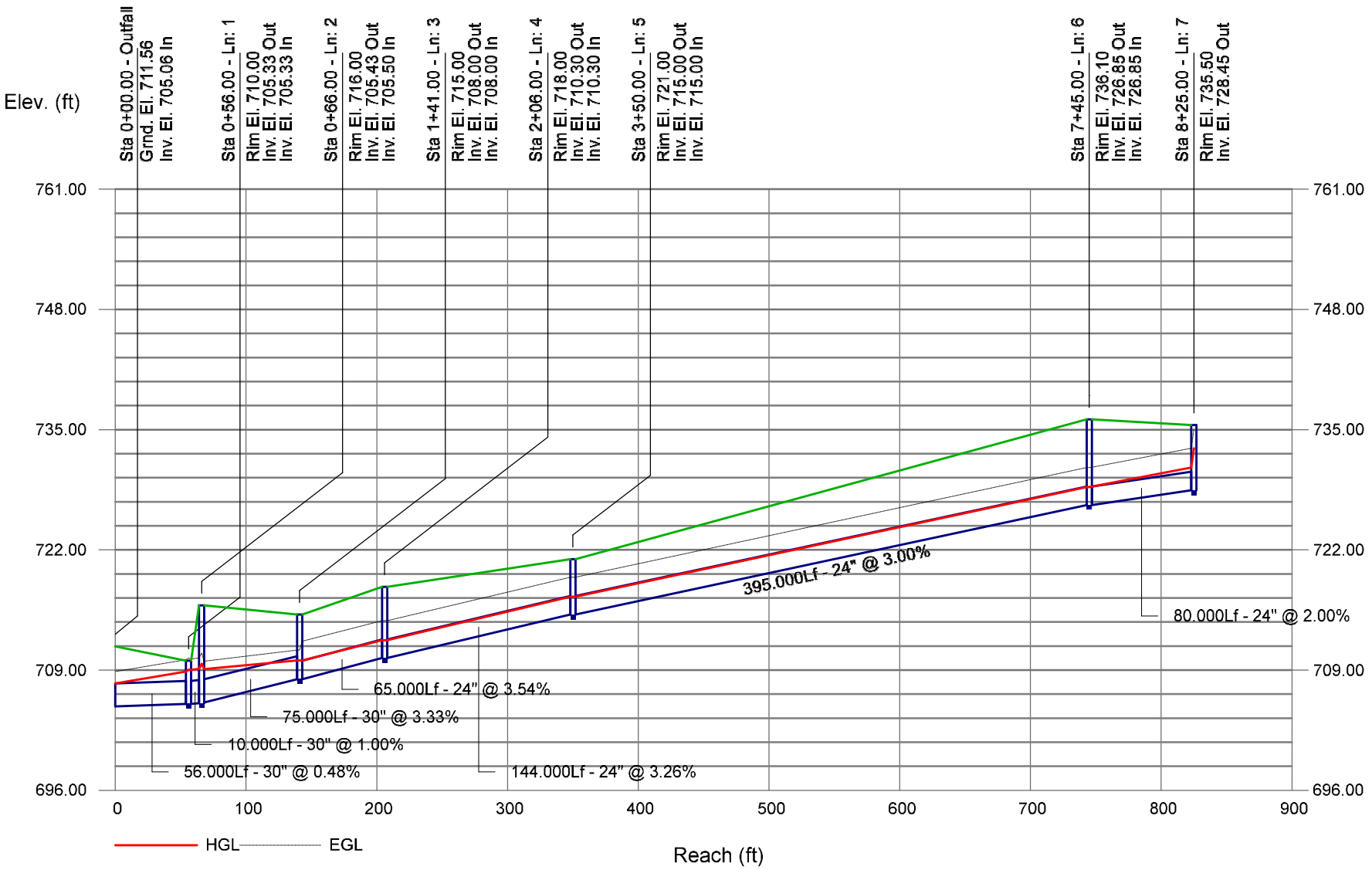
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	30	44.64	705.06	707.56	2.50	4.91	9.10	1.29	708.85	2.272	56.000	705.33	708.83	2.50	4.91	9.09	1.29	710.12	2.271	2.272	1.272	0.15	0.19
2	30	42.64	705.33	709.03	2.50	4.91	8.69	1.17	710.20	1.081	10.000	705.43	709.13	2.50	4.91	8.69	1.17	710.31	1.081	1.081	0.108	0.45	0.53
3	30	36.28	705.50	709.10	0.00	0.00	7.39	0.00	709.10	0.000	75.000	708.00	710.04	0.00**	0.00	8.46	0.00	710.04	0.000	0.000	0.000	1.00	n/a
4	24	36.28	708.00	710.04	0.00	0.00	11.55	0.00	710.04	0.000	65.000	710.30	712.23	0.00**	0.00	11.68	0.00	712.23	0.000	0.000	0.000	0.75	n/a
5	24	36.28	710.30	712.23	0.00	0.00	11.68	0.00	712.23	0.000	144.000	715.00	716.93	0.00**	0.00	11.68	0.00	716.93	0.000	0.000	0.000	0.45	n/a
6	24	36.28	715.00	716.93	0.00	0.00	11.68	0.00	716.93	0.000	395.000	726.85	728.78	0.00**	0.00	11.68	0.00	728.78	0.000	0.000	0.000	0.15	n/a
7	24	36.28	726.85	728.85	0.00*	0.00	11.55	0.00	728.85	0.000	80.000	728.45	730.91	0.00**	0.00	11.55	0.00	730.91	0.000	0.000	0.000	1.00	n/a
8	30	6.36	705.33	709.10	0.00	0.00	0.84	0.00	709.10	0.000	12.000	708.50	709.17	0.00**	0.00	3.92	0.00	709.17	0.000	0.000	0.000	0.15	n/a

Pasqual Revised | Number of lines: 8 | Run Date: 10/10/2025

Notes: * Normal depth assumed; ** Critical depth. ; c = cir e = ellip b = box

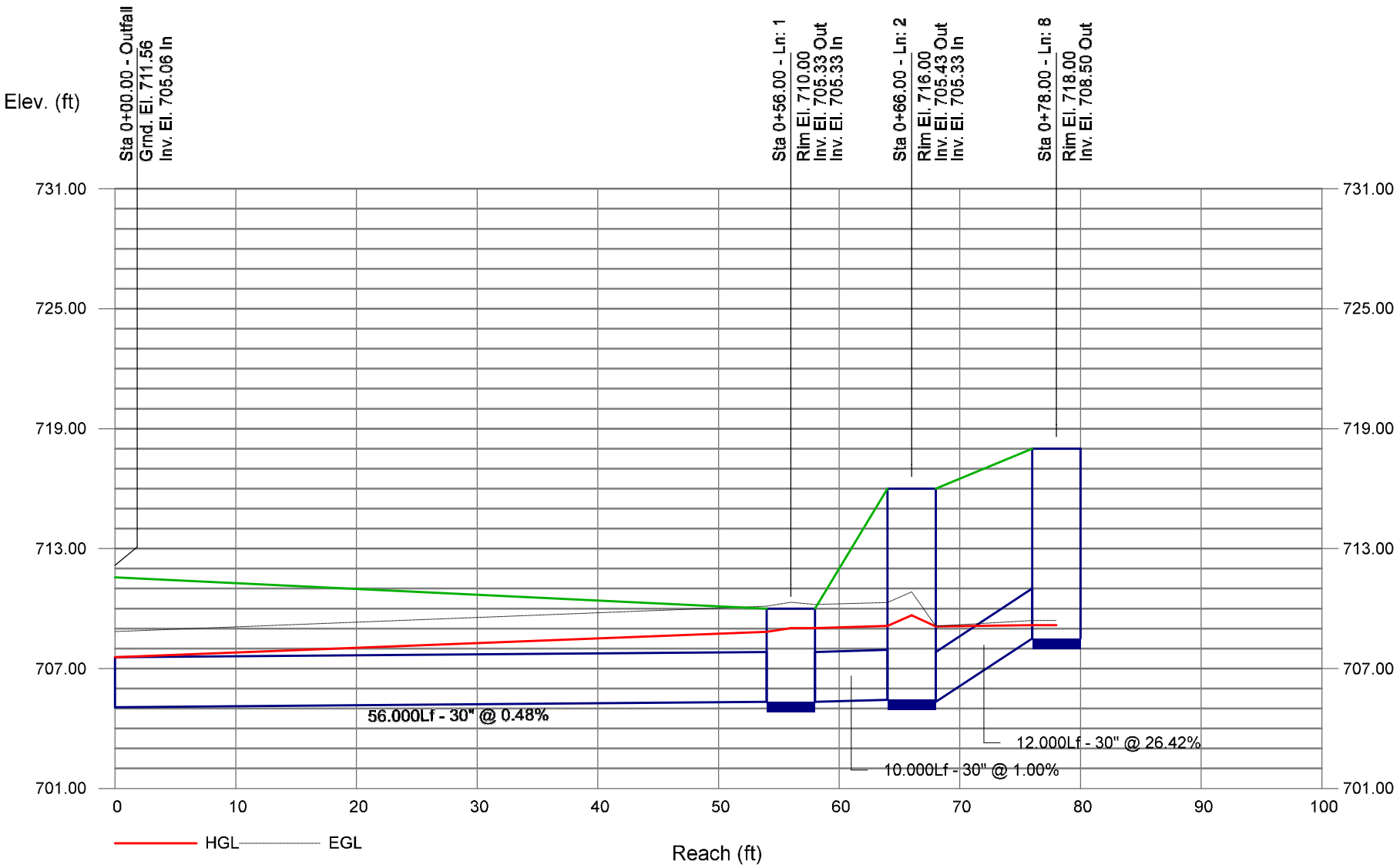
Storm Sewer Profile

Proj. file: Pasqual SD (3rd Submittal).stm



Storm Sewer Profile

Proj. file: Pasqual SD (3rd Submittal).stm



H_L = head loss at drainage structure (ft);
K = simplified structure head loss coefficient (ft);
v_o = outflow velocity (ft/s); and
g = gravitational acceleration (32.2 ft/s^2)

Table 3-11 presents values for the simplified head loss coefficient (K) across a drainage structure. This head loss can be used to estimate the drop between pipe crowns needed to offset energy losses at the structure, thus helping to avoid a submerged flow condition.

Table 3-11 Simplified Structure Head Loss Coefficient, K

Structure Configuration	Simplified Head Loss Coefficient, K
Inlet – Straight Run	0.50
Inlet – Angled Through	
90	1.50
60	1.25
45	1.10
22.5	0.70
Clean-Out – Straight Run	0.15
Clean-Out – Angled Through	
90	1.00
60	0.85
45	0.75
22.5	0.45

Inlets, Junctions, and Cleanout - Composite Method

For the design and evaluation of storm drain systems with high velocity head or having significant hydraulic constraints, it may be necessary to complete more detailed calculations to account for the various factors contributing to head loss. The head loss at clean-out or other drainage structures is expressed as an initial or basic loss ($K_o v^2/2g$) modified by several correction factors:

$$H_L = C_D C_Q C_P C_B \left(K_O \frac{v_2^2}{2g} \right) \qquad (3\text{-}19)$$

where …

H_L = structure head loss (ft);
C_D = relative flow depth correction factor;
C_Q = relative flow correction factor;
C_P = plunging flow correction factor;
C_B = benching correction factor;
K_O = initial or basic loss coefficient;
v_2 = outflow velocity (ft/s); and
g = gravitational acceleration (32.2 ft/s^2).

Table 3-12 below summarizes the head loss equations under conditions discussed above.

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Oct 10 2025

Circular Culvert

Invert Elev Dn (ft)	=	705.06
Pipe Length (ft)	=	58.00
Slope (%)	=	0.47
Invert Elev Up (ft)	=	705.33
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.018
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Headwall
Coeff. K,M,c,Y,k	=	0.0078, 2, 0.0379, 0.69, 0.5

Embankment

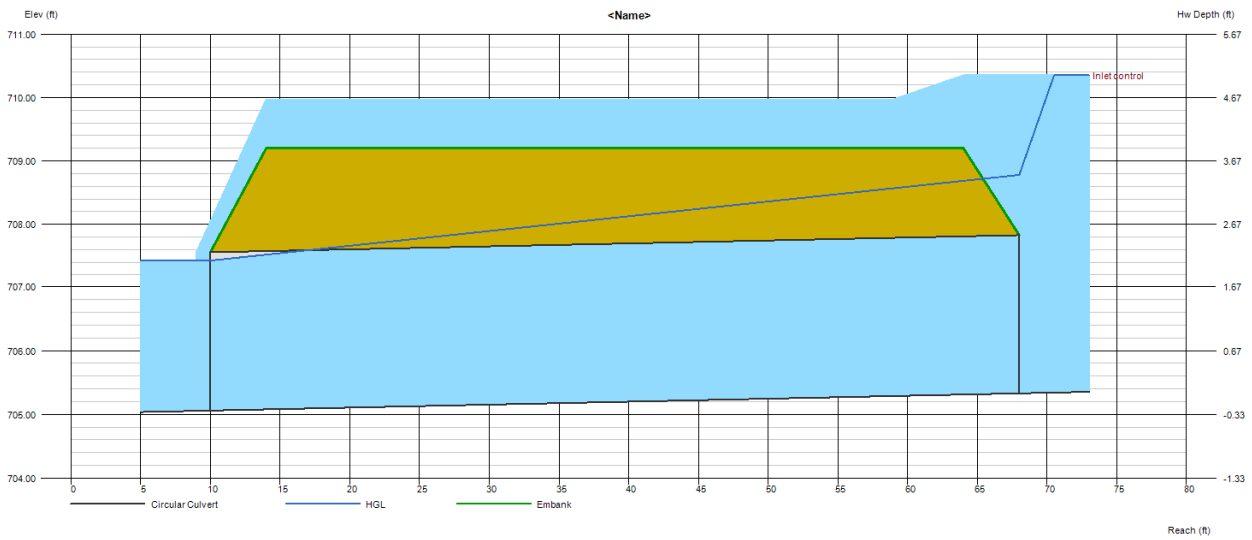
Top Elevation (ft)	=	709.20
Top Width (ft)	=	50.00
Crest Width (ft)	=	8.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	76.18
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	76.18
Qpipe (cfs)	=	45.83
Qovertop (cfs)	=	30.35
Veloc Dn (ft/s)	=	9.53
Veloc Up (ft/s)	=	9.34
HGL Dn (ft)	=	707.43
HGL Up (ft)	=	708.78
Hw Elev (ft)	=	710.35
Hw/D (ft)	=	2.01
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Oct 10 2025

Existing Idaho Section -- Capacity Calculation

User-defined		Highlighted	
Invert Elev (ft)	= 708.80	Depth (ft)	= 0.70
Slope (%)	= 1.00	Q (cfs)	= 93.00
N-Value	= 0.019	Area (sqft)	= 23.32
		Velocity (ft/s)	= 3.99
Calculations		Wetted Perim (ft)	= 63.25
Compute by:	Known Q	Crit Depth, Yc (ft)	= 0.74
Known Q (cfs)	= 93.00	Top Width (ft)	= 62.83
		EGL (ft)	= 0.95

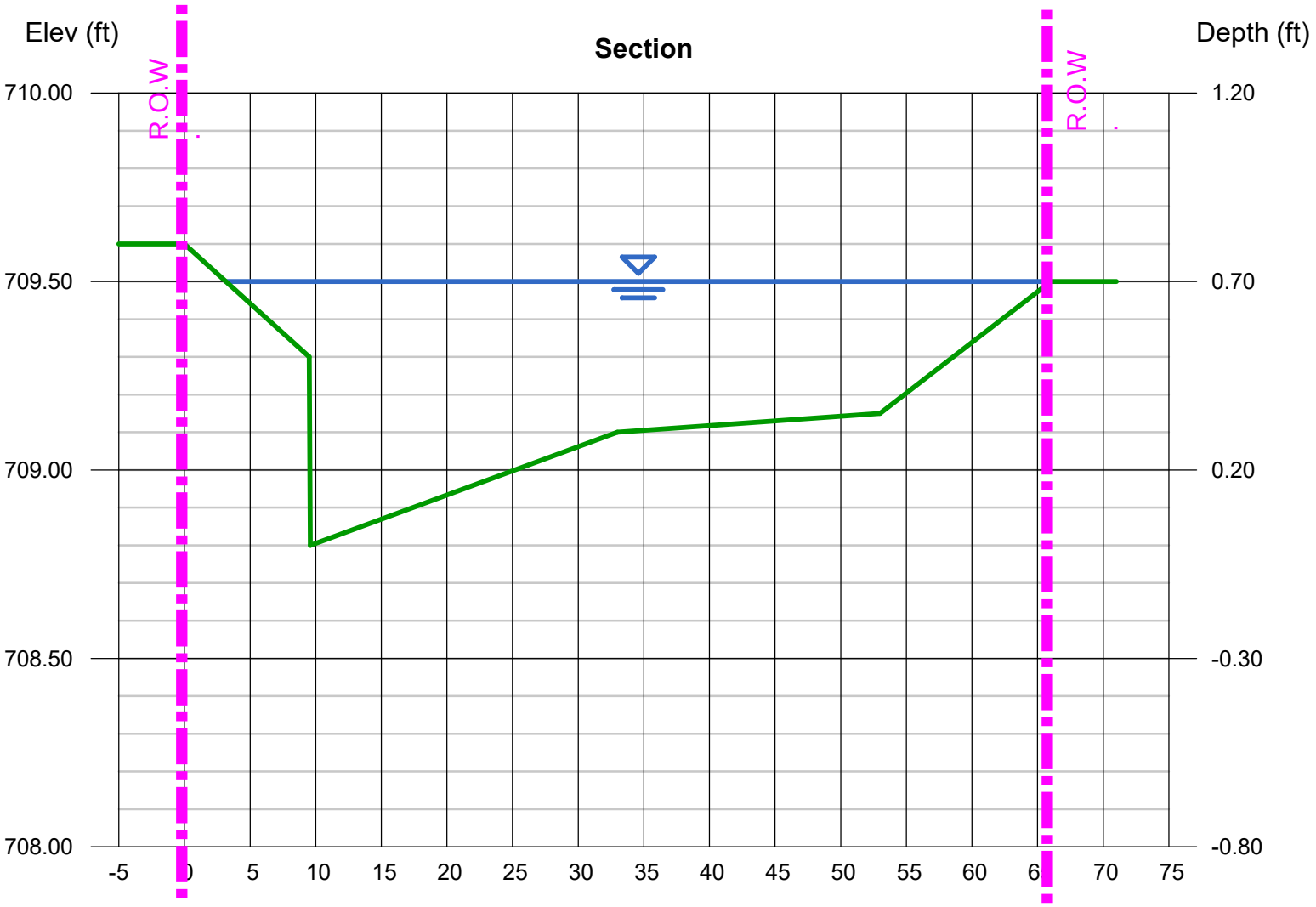
(Sta, El, n)-(Sta, El, n)...

(0.00, 709.60)-(9.50, 709.30, 0.030)-(9.60, 708.80, 0.013)-(33.00, 709.10, 0.013)-(53.00, 709.15, 0.013)-(66.00, 709.50, 0.030)

Max Capacity of the Existing Idaho Road Section = 93 CFS

100 year Peak Flow into Idaho = 5.13 CFS + 30.35 CFS = 35.48 CFS

93 > 35.48 O.K.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Oct 10 2025

Proposed Idaho Section -- Capacity Calculation

User-defined		Highlighted	
Invert Elev (ft)	= 708.80	Depth (ft)	= 0.80
Slope (%)	= 1.00	Q (cfs)	= 134.00
N-Value	= 0.019	Area (sqft)	= 28.95
		Velocity (ft/s)	= 4.63
Calculations		Wetted Perim (ft)	= 63.60
Compute by:	Known Q	Crit Depth, Yc (ft)	= 0.85
Known Q (cfs)	= 134.00	Top Width (ft)	= 62.77
		EGL (ft)	= 1.13

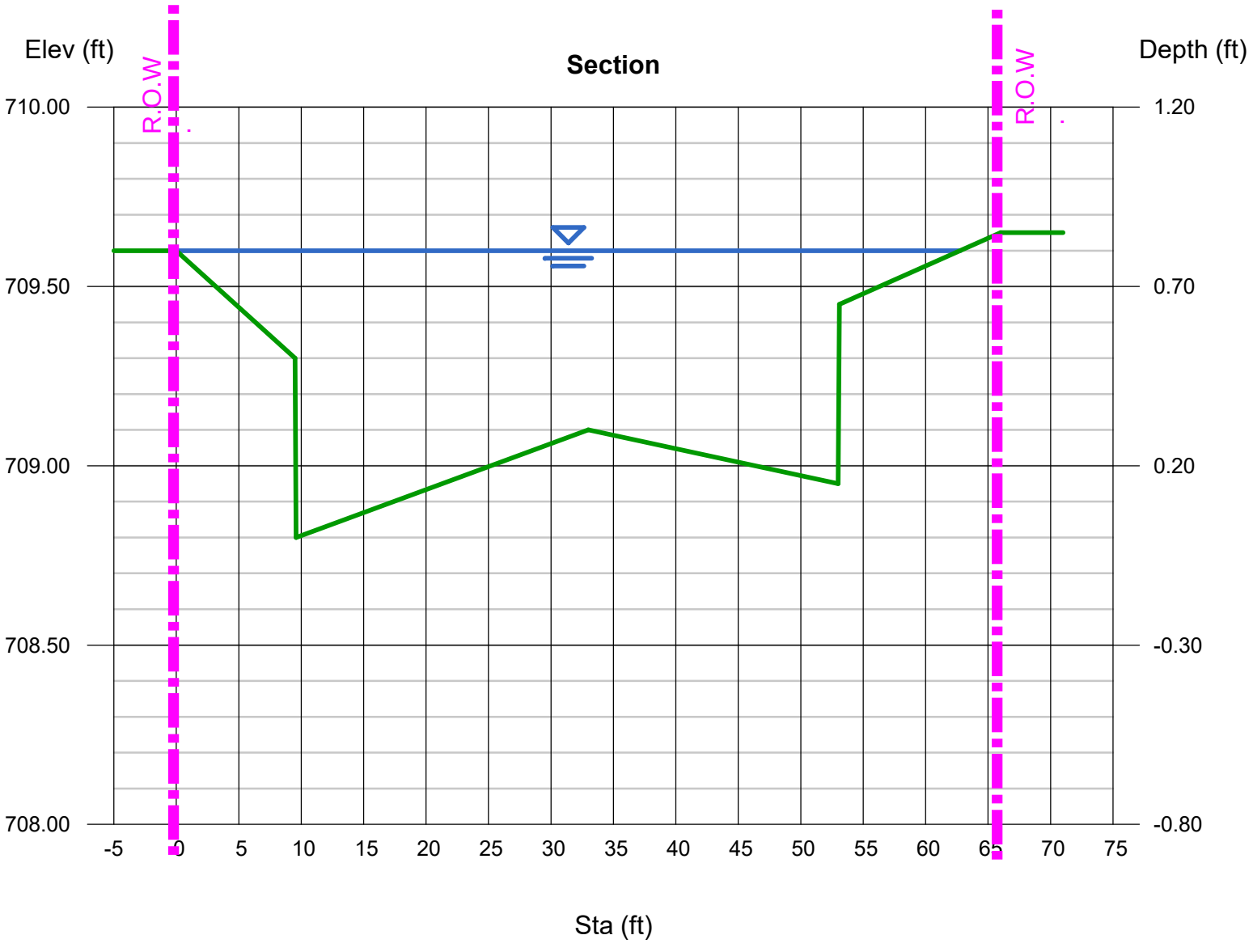
(Sta, El, n)-(Sta, El, n)...

(0.00, 709.60)-(9.50, 709.30, 0.030)-(9.60, 708.80, 0.013)-(33.00, 709.10, 0.013)-(53.00, 708.95, 0.013)-(53.10, 709.45, 0.013)-(66.00, 709.65, 0.030)

Max Capacity of the Proposed Idaho Road Section = 134 CFS

100 year Peak Flow into Idaho = 5.13 CFS + 28.18 CFS = 33.31 CFS

134 > 33.31 O.K.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Dec 11 2025

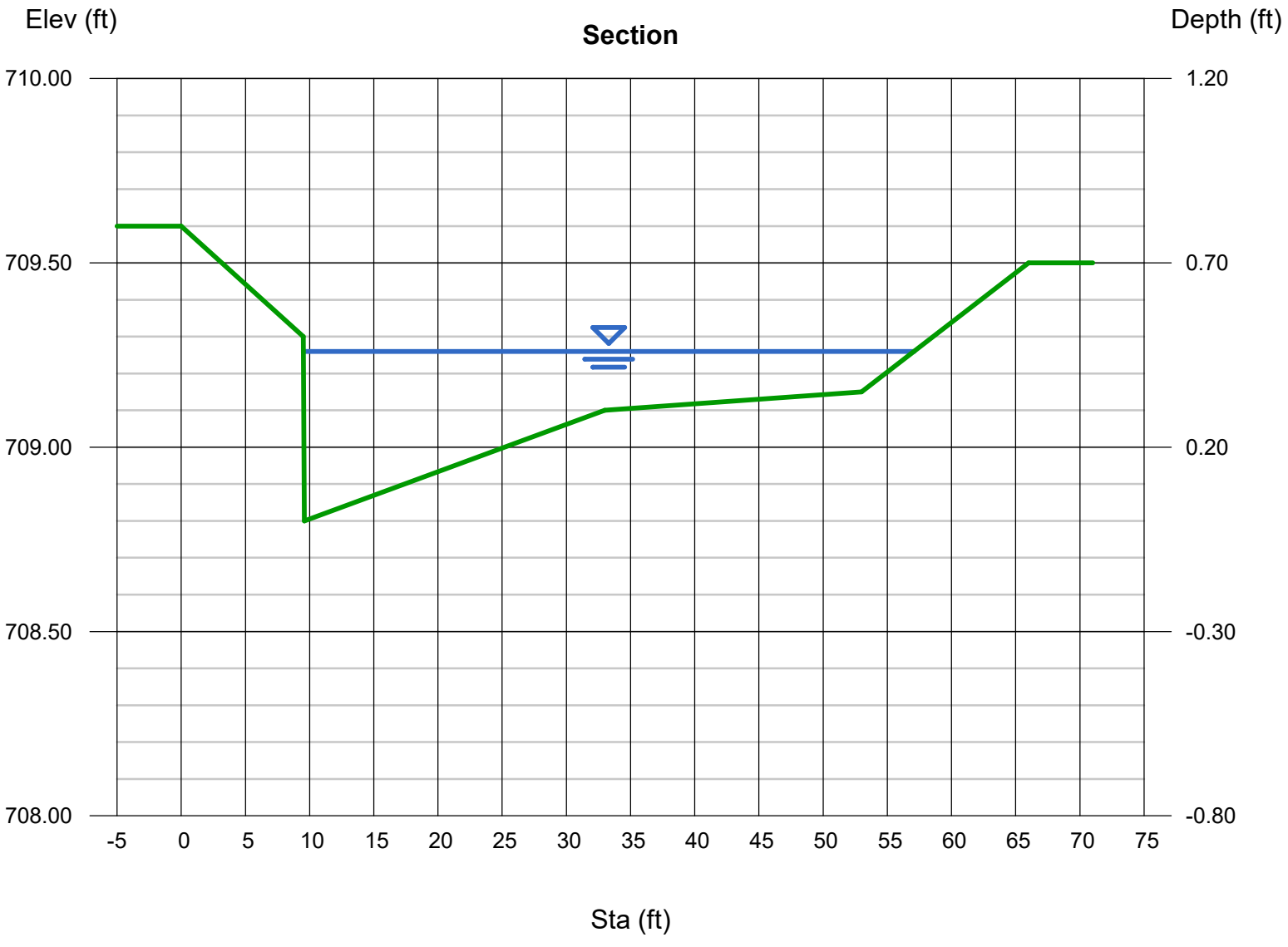
Existing Idaho Section -- Capacity Calculation (35.48 CFS)

User-defined		**Highlighted**	
Invert Elev (ft)	= 708.80	Depth (ft)	= 0.46
Slope (%)	= 1.00	Q (cfs)	= 35.48
N-Value	= 0.015	Area (sqft)	= 10.20
		Velocity (ft/s)	= 3.48
Calculations		Wetted Perim (ft)	= 47.96
Compute by:	Known Q	Crit Depth, Yc (ft)	= 0.51
Known Q (cfs)	= 35.48	Top Width (ft)	= 47.58
		EGL (ft)	= 0.65

(Sta, El, n)-(Sta, El, n)...

(0.00, 709.60)-(9.50, 709.30, 0.030)-(9.60, 708.80, 0.013)-(33.00, 709.10, 0.013)-(53.00, 709.15, 0.013)-(66.00, 709.50, 0.030)

Existing condition, 35.48 CFS in Idaho avenue.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Dec 11 2025

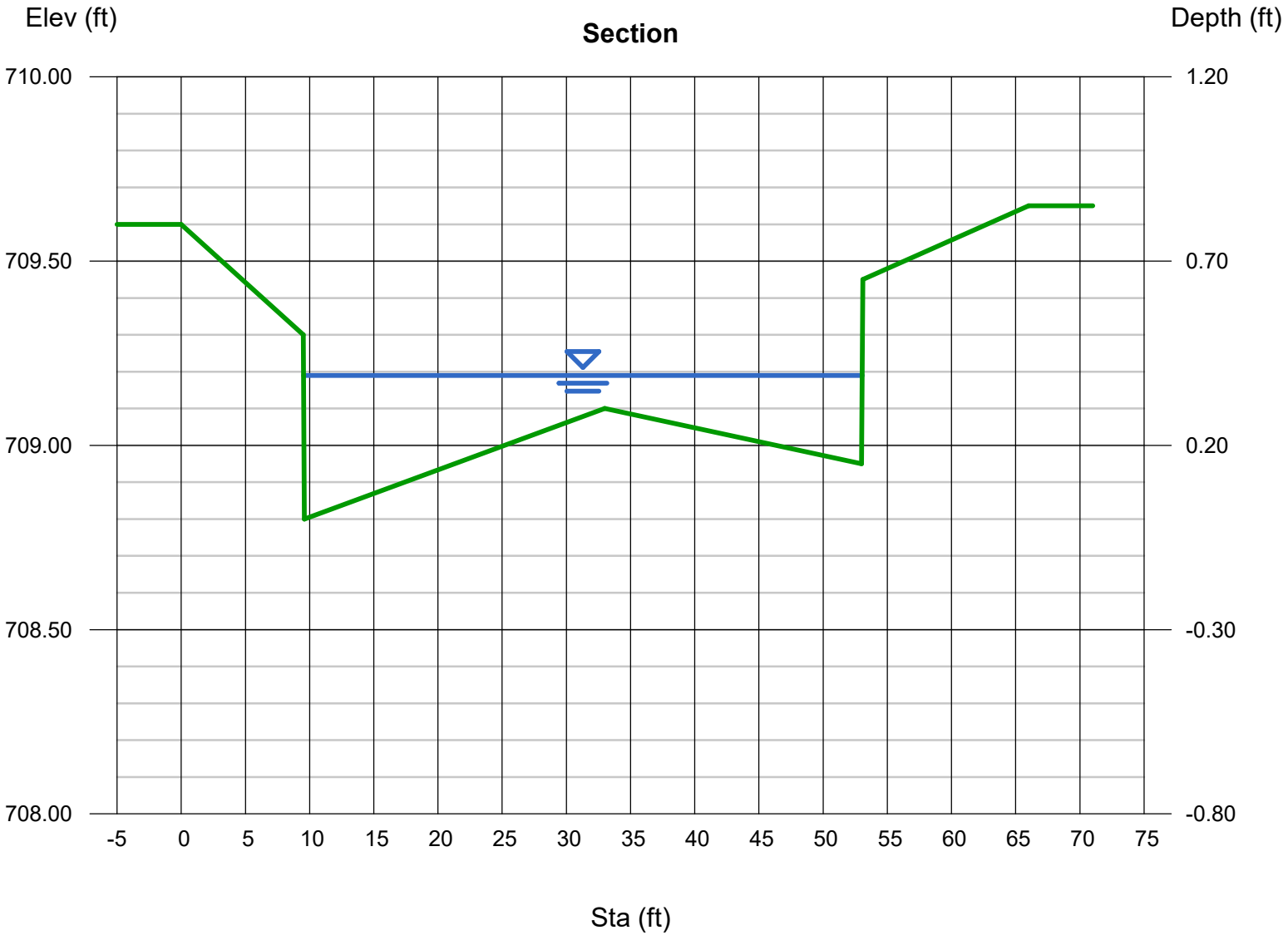
Proposed Idaho Section -- Capacity Calculation (33.31 CFS)

User-defined		Highlighted	
Invert Elev (ft)	= 708.80	Depth (ft)	= 0.39
Slope (%)	= 1.00	Q (cfs)	= 33.31
N-Value	= 0.013	Area (sqft)	= 8.94
		Velocity (ft/s)	= 3.73
Calculations		Wetted Perim (ft)	= 44.04
Compute by:	Known Q	Crit Depth, Yc (ft)	= 0.45
Known Q (cfs)	= 33.31	Top Width (ft)	= 43.53
		EGL (ft)	= 0.61

(Sta, El, n)-(Sta, El, n)...

(0.00, 709.60)-(9.50, 709.30, 0.030)-(9.60, 708.80, 0.013)-(33.00, 709.10, 0.013)-(53.00, 708.95, 0.013)-(53.10, 709.45, 0.013)-(66.00, 709.65, 0.030)

Proposed condition, 33.31 CFS in Idaho avenue.

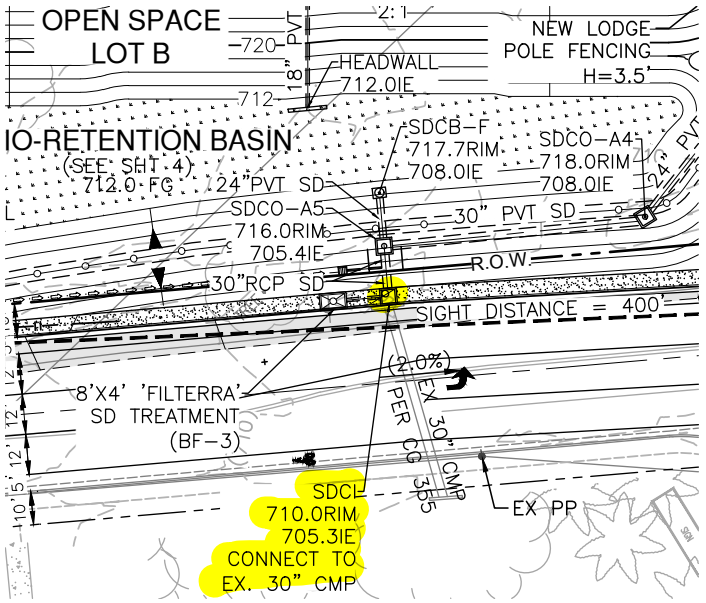


Curb Inlet @ Grade

Type of Inlet	Inlet at Node	Street Slope [1] S (%)	Surface Flow [2] Q (cfs)	Gutter Depression a (ft)	Flow Depth [3] y (ft)	Required Length of Opening [4] (ft)	Use Length [5] (ft.)
ON-GRADE	Idaho	2.00%	2.0	0.33	0.50	3.8	5

Note: flow at nodes 542 & 505 are assume 50/50 flow split because flow will be spread across entire roadway in 100 yr storm.

1 From street profiles in Improvement Plans
2 From CivilD ouput
3 From Manning's Equation: $Q = (1.49/n)*A*S^{1/2}*R^{2/3}$
The hydraulic radius, R, and area, A, are expressed as a function of the flow depth, y.
Typical cross-section of a Type G gutter is used for the analysis.
4 From Equation: Q = 0.7L(a+y)^3/2 Equation Taken from the San Diego County Drainage Design Manual
5 Length shown on plans (Required Length of Opening + 1 foot)
d = flow depth (ft)



APPENDIX E:

Reference Charts

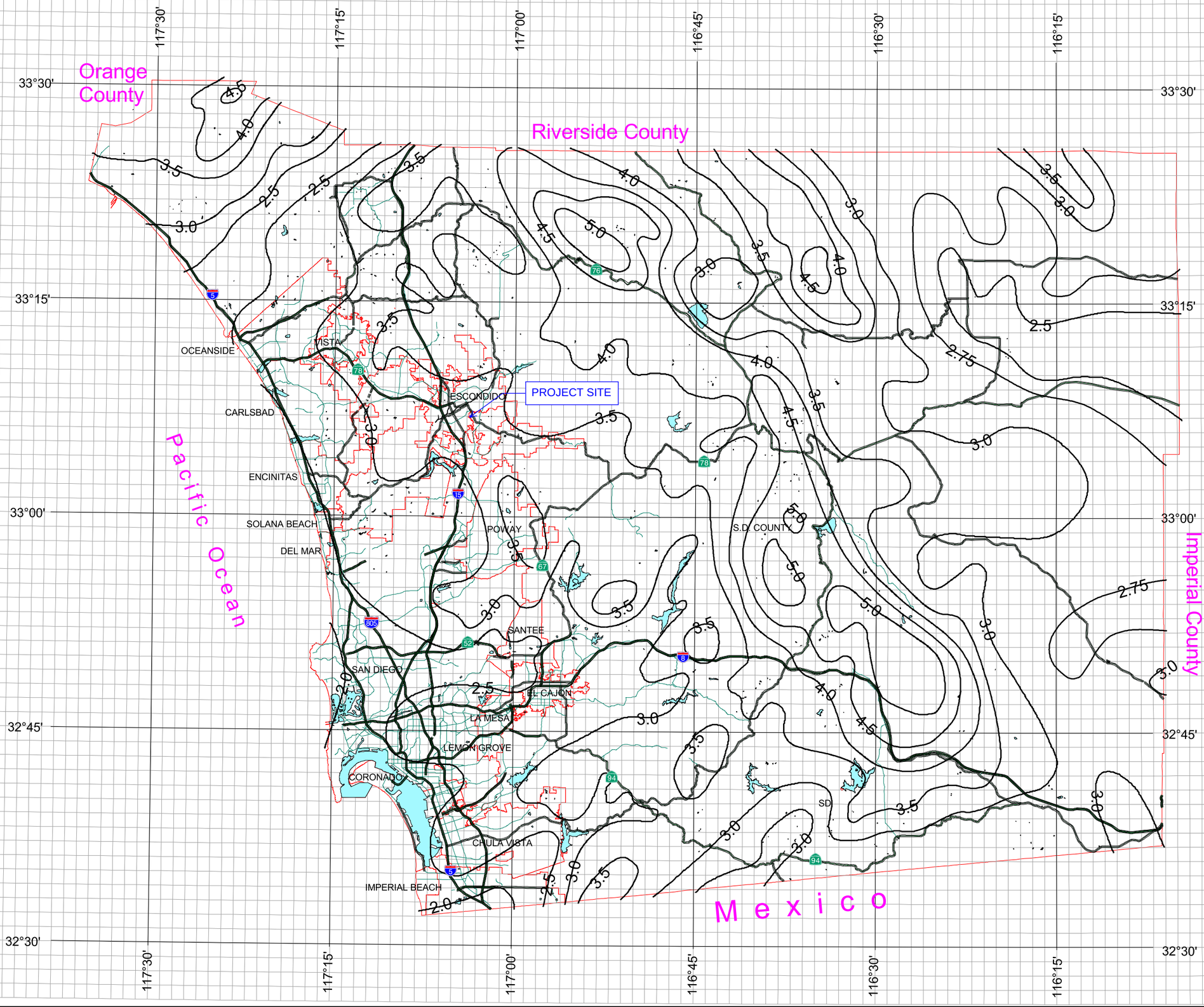
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Lat: 33°06'54"
Long: 117°03'38"
$P6_{100\ YR}$ = 3.3"



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Department of Public Works
Geographic Information Services

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County of San Diego Hydrology Manual

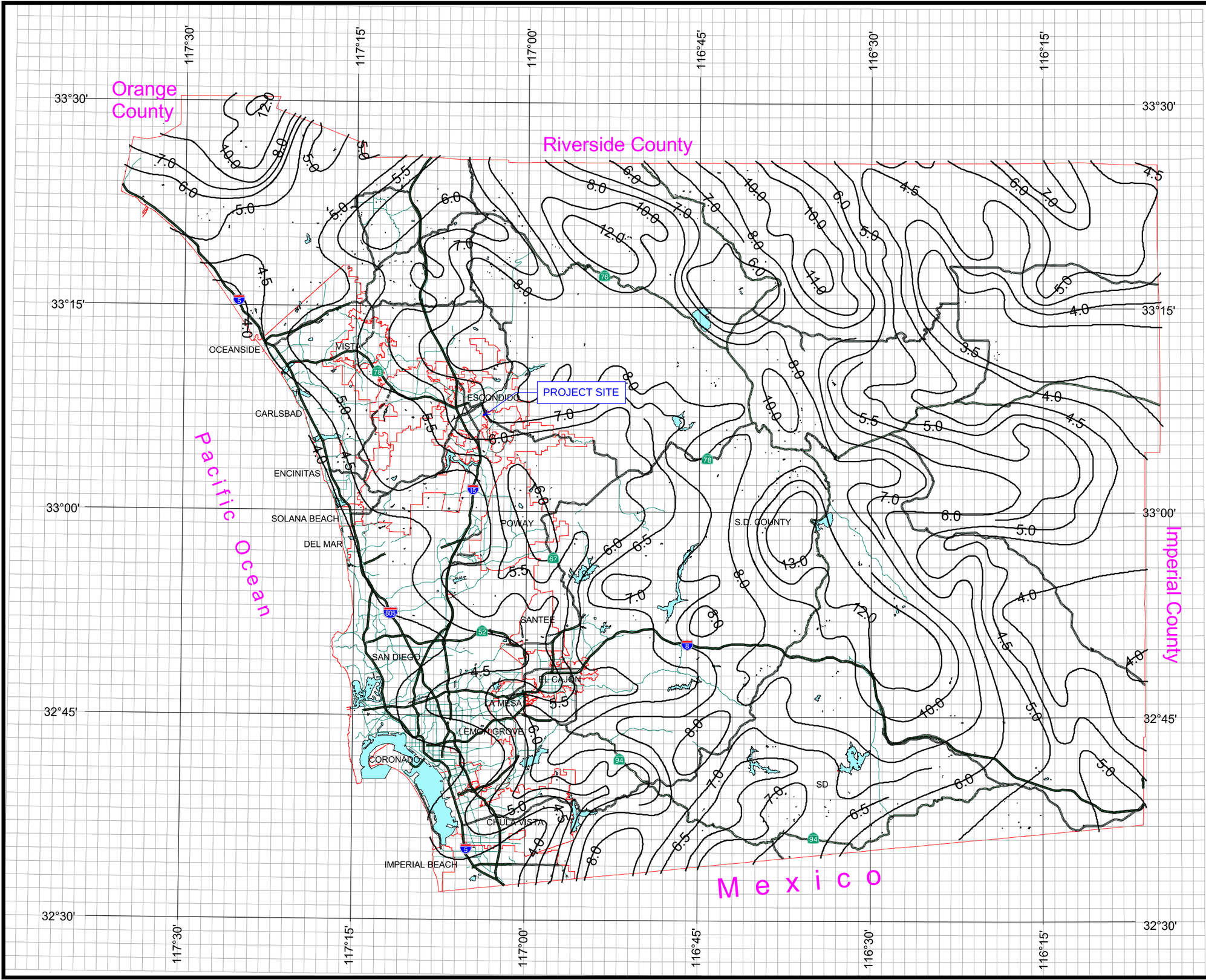
Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Lat: 33°06'54"
Long: 117°03'38"

$P24_{100\ YR}$ = 6.9"



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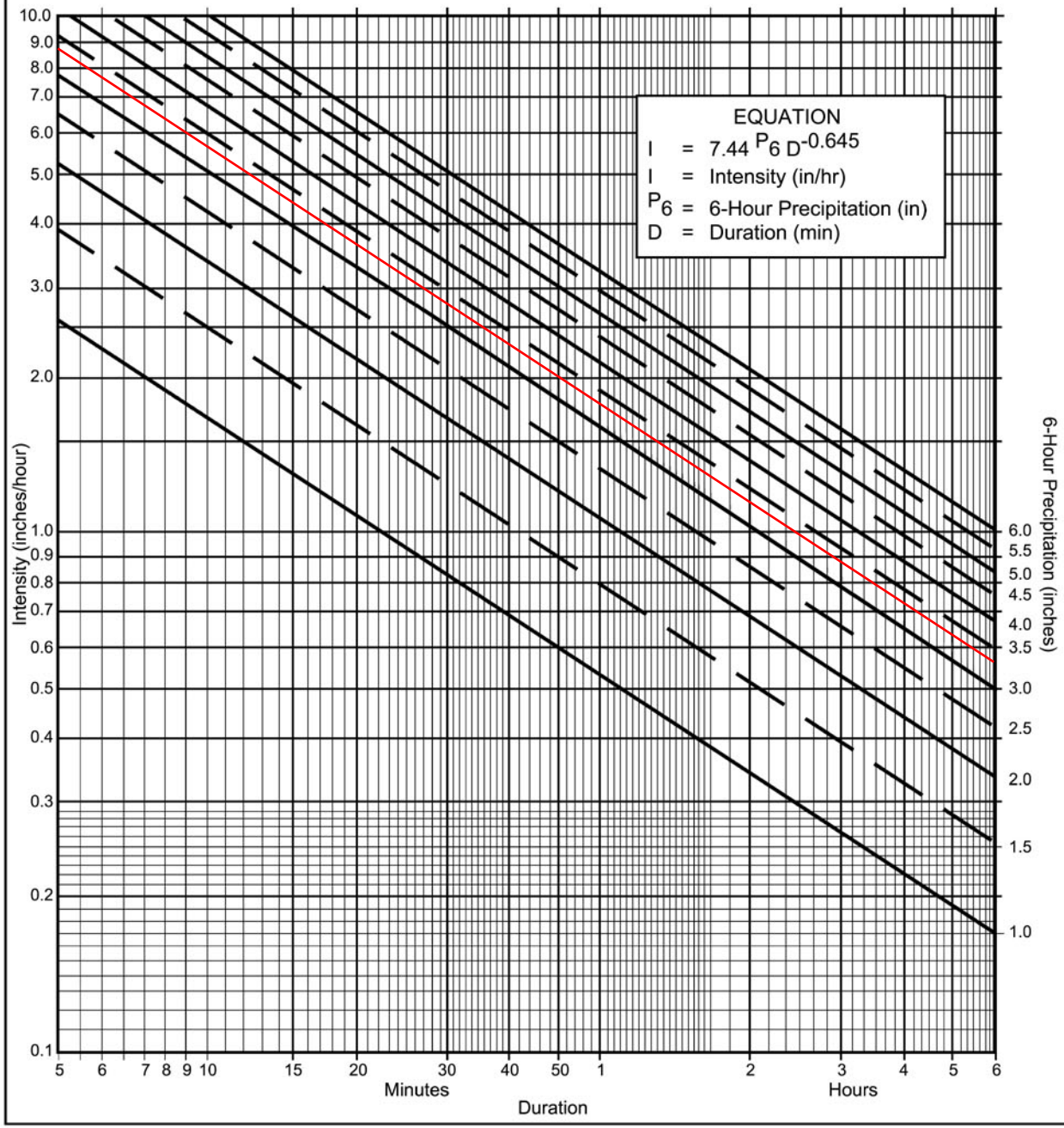


Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.3 in., P_{24} = 6.9, $\frac{P_6}{P_{24}}$ = 47.8 %(2)

(c) Adjusted P_6(2) = 3.3 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

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

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.

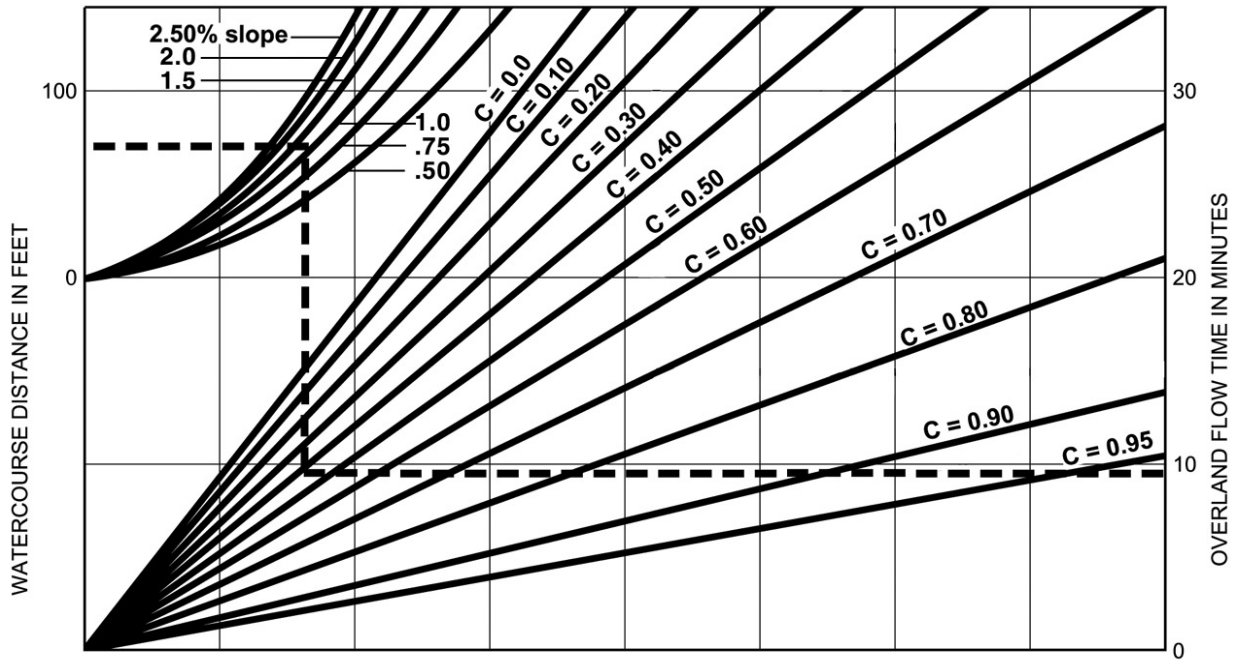
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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



EXAMPLE:

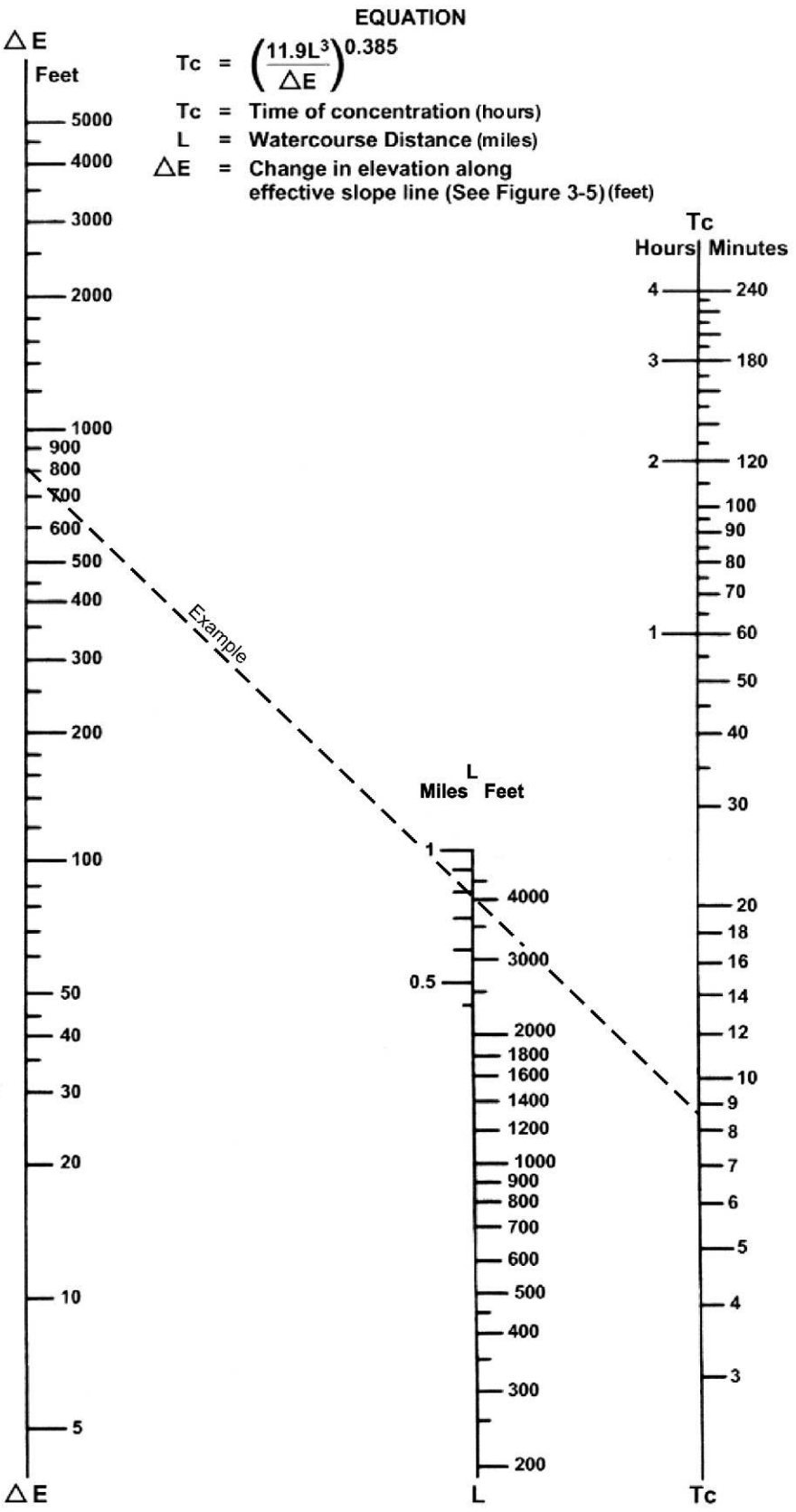
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

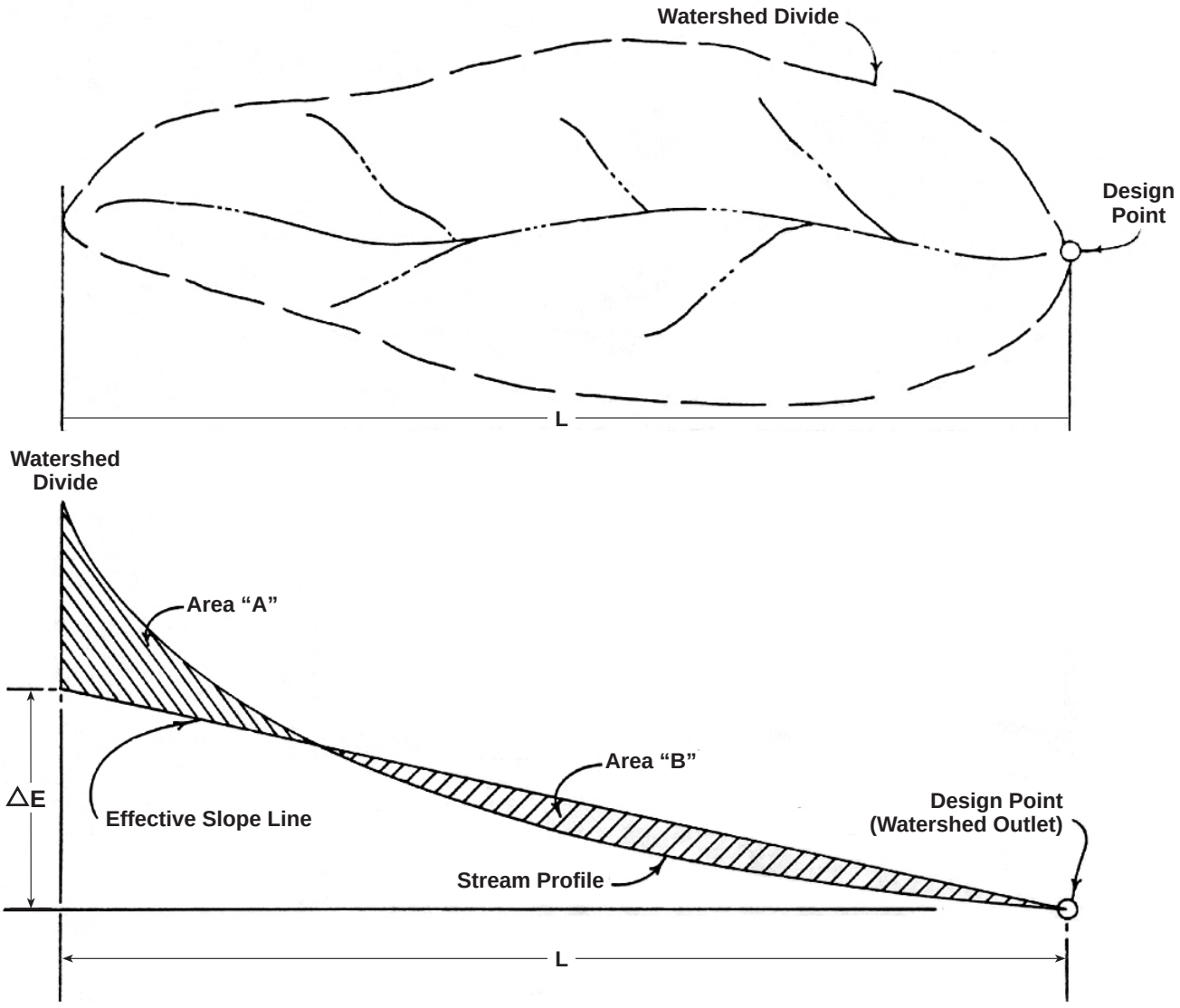
Rational Formula - Overland Time of Flow Nomograph



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

FIGURE 3-4

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



Area "A" = Area "B"

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

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5

Soil Map—San Diego County Area, California
(Pasqual Heights - Hydrologic Soil Group)

Map Scale: 1:2,220 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 20, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FvD	Fallbrook-Vista sandy loams, 9 to 15 percent slopes	7.0	65.8%
RaB	Ramona sandy loam, 2 to 5 percent slopes	3.4	31.5%
RaC2	Ramona sandy loam, 5 to 9 percent slopes, eroded	0.3	2.7%
Totals for Area of Interest		**10.6**	**100.0%**

Hydrologic Soil Group and Surface Runoff–San Diego County Area, California			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
FvD—Fallbrook-Vista sandy loams, 9 to 15 percent slopes			
Fallbrook	50	High	C
Vista	40	Low	B
RaB—Ramona sandy loam, 2 to 5 percent slopes			
Ramona	85	Medium	C
RaC2—Ramona sandy loam, 5 to 9 percent slopes, eroded			
Ramona	85	High	C