PRELIMINARY HYDROLOGY &
HYDRAULICS STUDY

FOR

SANTA FE 845 SUB-DIVISION
845 SANTA FE DRIVE
ENCINITAS, CA 92024
APN: 260-132-23
MULTI-004398-2021

PREPARED FOR:

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DATE:
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1.0 EXECUTIVE SUMMARY

1.1 Introduction

This Hydrology Study for the proposed development at 845 Santa Fe Drive has been prepared to analyze the hydrologic characteristics of the existing and proposed project site. This report presents both the methodology and the calculations used for determining the peak storm water runoff generated from the project site in the pre-developed (existing) condition and the post-developed (proposed) conditions. Additionally, per section 6.204 of the City of Encinitas Engineering Design Manual (EDM) , both 6-hour and 24-hour storms shall be considered in the hydrology study.

1.2 Existing Conditions

The project site is located at 845 Santa Fe Drive, Encinitas, and is bound by San Dieguito High School Academy to the north, residential lots to the south, , sports courts to the east, and church properties to the west.

VICINITY MAP
N.T.S.

The site is approximately 5.2 acres gross, 4.9 acres net. In the existing condition, storm water runoff mainly flows overland from the northeast corner of the property toward the southwest corner of the property where it flows into a manmade vegetated swale along the western PL and into the Munevar Road right-of-way. There is no storm water infrastructure onsite. The swale discharges onto the sidewalk on Munevar Road and flows to the gutter which conveys flows westerly to MacKinnon Ave. Runoff then flows south and westerly to a curb inlet at the northeast corner of MacKinnon Ave. and Cathy Ln. Storm water is then conveyed via a 36" CMP westerly into a drainage channel and picked up through a headwall and 54" CIPIP which continues westerly through the Encinitas Community Park into an unlined open channel and then into a natural creek which flows southwesterly. Storm water is then conveyed to a 60" RCP at Birmingham Dr. which discharges to a concrete channel that runs southerly along Highway 101. The concrete channel drains to the mouth of the San Elijo Lagoon approximately 800 feet east of the Pacific Ocean. The total distance traveled from the site to the outlet is approximately 1.6 miles.

Offsite storm water along the eastern boundary of the site is collected in a concrete ditch that runs parallel to the property line. The ditch conveys flow southerly to a 3'x3' concrete catch basin which outlets via a curb outlet onto Munevar Road. Small landscaped areas of off-site run-on exist to the east that are not captured in the concrete ditch and flow onto the project site.

Per the Soil Hydrologic Groups Map located in Appendix A of the San Diego County Hydrology Manual, the Web Soil Survey application available through the United States Department of Agriculture, and verified by the soils engineer, the site is categorized to have hydrologic group D soils. Based upon soil type and the amount of existing impervious area onsite, weighted runoff coefficients were calculated using the methodology described in Section 3.1.2 of the San Diego County Hydrology Manual. Using the Rational Method Procedure outlined in the San Diego County Hydrology Manual and the City of Encinitas Engineering Design Manual, a peak flow rate and time of concentration were calculated for the 100-year, 6-hour storm event. Additionally, per section 6.204 of the City of Encinitas EDM, both 6-hour and 24-hour storms shall be considered in the hydrology study. The 100-year, 24-hour storm isopluvial/rainfall depth was determined not to adjust the 100-year, 6-hour precipitation, due to the 6-hour being within the required 45%-65% of the 24-hour precipitation in accordance with the San Diego County Hydrology Manual (SDCHM). Figure 3-1 of the SDCHM has been included in Appendix A of this report showing this step for use in rainfall intensity, which is used in the Rational Method analysis.

1.3 Proposed Project

The proposed project includes the demolition of all existing onsite improvements and the construction of 35 single-family residences and 16 duplex residences, hardscape, landscape, private road access, associated utilities and one (1) Hydromodification (HMP) Biofiltration basin to meet the requirements for hydromodification management flow control, storm water pollutant control and to mitigate for the 100-year 6-hour storm event.

As in the existing condition, offsite storm water along the eastern boundary of the site is collected in a concrete ditch that runs parallel to the property line. The ditch

conveys flow southerly to a 3'x3' concrete catch basin which outlets via a curb outlet onto Munevar Road. Small landscaped areas of off-site run-on exist to the east that are not captured in the concrete ditch and flow onto the project site and be collected in the proposed stormdrain infrastructure located at the top of the proposed retaining walls. All offsite run-on will be collected and routed to the existing curb outlet onto Munevar Road.

In the proposed condition, storm water runoff from the project site will be conveyed to the HMP Biofiltration basin in the southwestern corner of the property. The BMP will discharge via a pipe and into an SDRSD D-9 type A8 cleanout, then out via two SDRSD curb outlets.

The HMP Biofiltration basin will provide storm water pollutant control for the site and combined with the gravel storage system will provide hydromodification management flow control to meet the requirements the California Regional Water Quality Control Board San Diego Region municipal storm water permit (Order No. R9-2013-0001, referred to as MS4 Permit). The basin will also provide mitigation for the 100-year storm event peak discharge. Refer to the Storm Water Quality Management Plan (SWQMP) for the project titled "Storm Water Quality Management Plan for 845 Santa Fe Drive Sub-Division" dated June 2024 prepared by Pasco Laret Suiter & Associates for the detailed HMP and storm water pollutant control analyses.

Proposed condition weighted runoff coefficients were calculated using the methodology described in Section 3.1.2 of the San Diego County Hydrology Manual. Using the Rational Method Procedure outlined in the San Diego County Hydrology Manual and the City of Encinitas Engineering Design Manual, a peak flow rate and time of concentration were calculated for the 100-year, 6-hour storm event. Additionally, per section 6.204 of the City of Encinitas EDM, both 6-hour and 24-hour storms shall be considered in the hydrology study. The 100-year, 24-hour storm isopluvial/rainfall depth was determined not to adjust the 100-year, 6-hour precipitation, due to the 6-hour being within the required 45%-65% of the 24-hour precipitation in accordance with the San Diego County Hydrology Manual (SDCHM). Figure 3-1 of the SDCHM has been included in Appendix A of this report showing this step for use in rainfall intensity, which is used in the Rational Method analysis.

1.4 Summary of City Hydrology Calculations

	Area (ac)	Runoff Coefficient C	Time of Concentration (Tc)	Un-detained Q100 (cfs)	Detained Q100 (cfs)
Existing	5.0	0.57	11.02	11.31	-
Proposed	4.9	0.73	5.93	21.28	6.98

See Section 3.0 for further calculations.

1.5 Conclusions

Based upon the analyses included in this report, the proposed HMP Biofiltration basin with gravel storage system is sized to accommodate the increase in peak runoff in the

proposed condition and is designed to meet the requirements of the MS4 Permit for both pollutant control and hydromodification management flow control.

The BMP will mitigate the proposed condition 100-yr peak flow rate to below the existing condition at the point of compliance. The table below summarizes the hydrologic calculations for the project.

1.6 References

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

"City of Encinitas Engineering Design Manual", October 28, 2009, City of Encinitas, Engineering Department

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov.

2.0 METHODOLOGY

Pursuant to the San Diego County Hydrology Manual dated June 2003, the Rational Method is recommended for analyzing the runoff response from drainage areas up to approximately 1 square mile in size. The proposed project and associated watershed basins are less than 1 square mile, therefore the Rational Method was used to analyze the project's hydrologic characteristics in the existing and proposed conditions.

2.1 Rational Method

The Rational Method (RM) formula estimates the peak rate of runoff based on the variables of area, runoff coefficient, and rainfall intensity. The rainfall intensity (I) is equal to:

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

Where:

I = Intensity (in/hr)
P_6 = 6-hour precipitation (in)
D = duration (min – use Tc)

Using the Time of Concentration (Tc), which is the time required for a given element of water that originates at the most remote point of the basin being analyzed to reach the point at which the runoff from the basin is being analyzed, the RM equation determines the storm water runoff rate (Q) for a given basin in terms of flow, typically in cubic feet per second (cfs). The Tc is calculated pursuant to the methodology described in Section 3.1.4 of the San Diego County Hydrology Manual. The RM equation is as follows:

$$Q = CIA$$

Where:

Q= flow (cfs)
C = runoff coefficient, ratio of rainfall that produces storm water runoff (runoff vs. infiltration/evaporation/absorption/etc)
I = average rainfall intensity for a duration equal to the Tc for the area (in/hr)
A = drainage area contributing to the basin (ac)

The RM equation assumes that the storm event being analyzed delivers precipitation to the entire basin uniformly, and therefore the peak discharge rate will occur when a raindrop that falls at the most remote portion of the basin arrives at the point of analysis. The RM also assumes that the fraction of rainfall that becomes runoff or the runoff coefficient, C, is not affected by the storm intensity, I, or the precipitation zone number.

2.2 City of Encinitas Criteria

The City of Encinitas has additional requirements for hydrology reports which are outlined in the Grading, Erosion and Sediment Control Ordinance. Per City of Encinitas Engineering Design Manual Section 6.203.1 "Area-weighted coefficient of runoff… studies shall calculate the average coefficient of runoff 'C', by assuming a 'C'

value of 0.9 for all roof (i.e. impervious areas) and a 'C' value of 0.45 (sic) for all pervious areas". Please refer to this manual for further details.

2.3 Runoff Coefficient Determination

As stated in section 2.2, the City of Encinitas Engineering Design Manual states 'C' values shall be 0.9 for impervious areas and 0.45 for pervious areas.

Weighted runoff coefficients were calculated based on the existing and proposed impervious areas for each basin per the County Hydrology Manual section 3.1.2 and City of Encinitas EDM section 6.203.1. See sections 3.0 for calculations.

A composite C value can also be calculated for an area based on soil type and impervious percentage using the following formula:

$$C = 0.90 \times (\% \text{ Impervious}) + Cp \times (1 - \% \text{ Pervious})$$

Where: Cp = 0.45 per City of Encinitas EDM

2.4 AES Rational Method Computer Model

The Rational Method computer program developed by Advanced Engineering Software (AES) satisfies the County of San Diego design criteria, therefore it is the computer model used for this study. The AES hydrologic model is capable of creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points to determine peak flow rates. The program utilizes base information input by the user to perform calculations for up to 15 hydrologic processes. These processes are assigned code numbers which are described below. The required base information includes drainage basin area, storm water facility locations and sizes, land uses, flow patterns, and topographic elevations.

Subarea Hydrologic Processes (Codes)

Code 1:	Confluence analysis at node
Code 2:	Initial subarea analysis
Code 3:	Pipe flow travel time (computer-estimate pipe sizes)
Code 4:	Pipe flow travel time (user-specified pipe size)
Code 5:	Trapezoidal channel travel time
Code 6:	Street flow analysis through a subarea
Code 7:	User-specified information at a node
Code 8:	Addition of the subarea runoff to mainline
Code 9:	V-Gutter flow through subarea
Code 10:	Copy mainstream data onto memory bank
Code 11:	Confluence a memory bank with the mainstream memory
Code 12:	Clear a memory bank
Code 13:	Clear the mainstream memory
Code 14:	Copy a memory bank onto the mainstream memory
Code 15:	Hydrologic data bank storage functions

The hydrologic conditions were analyzed in accordance with the 2003 County of San Diego Hydrology Manual criteria as follows:

Design Storm	100-year, 6-hour (with a 24-hour check per Appendix A)	
100-year, 6-hour Precipitation	2.5 inches	
Rainfall Intensity	Based on the 2003 County of San Diego Hydrology Manual criteria	
Runoff Coefficient	Pervious	C = 0.45
	Impervious	C = 0.90
Soil Type	D	

3.0 HYDROLOGIC ANALYSIS

3.1 Existing Condition Hydrologic Model Output (100-Year Event)

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 3376 - 845 SANTA FE                                                    *
* EXISTING CONDITION                                                     *
* 100-YEAR                                                               *
 ************************************************************************

  FILE NAME: 3376E100.DAT
  TIME/DATE OF STUDY: 08:29 06/25/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   173.00
  UPSTREAM ELEVATION(FEET) =    256.40
  DOWNSTREAM ELEVATION(FEET) =    249.60
  ELEVATION DIFFERENCE(FEET) =      6.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.401
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    97.33
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.267
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.74

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```
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    249.60  DOWNSTREAM(FEET) =    225.70
 CHANNEL LENGTH THRU SUBAREA(FEET) =   591.00   CHANNEL SLOPE =  0.0404
 CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  90.000
 MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.956
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .5700
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.38
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.75
 AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   5.62
 Tc(MIN.) =   11.02
 SUBAREA AREA(ACRES) =     4.81       SUBAREA RUNOFF(CFS) =   10.85
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.572
 TOTAL AREA(ACRES) =        5.0         PEAK FLOW RATE(CFS) =      11.31

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   2.14
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     764.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =     11.02
 PEAK FLOW RATE(CFS)   =      11.31
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

3.2 Proposed Undetained Condition Hydrologic Model Output (100-Year Event)

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 3776 - 845 SANTA FE                                                    *
* PROPOSED CONDITION                                                     *
* 100-YEAR                                                               *
 ************************************************************************

  FILE NAME: 3376P100.DAT
  TIME/DATE OF STUDY: 12:29 06/25/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   18.0     13.0    0.020/0.020/0.020   0.42    1.50 0.0100 0.125 0.0180

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

************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   107.00
  UPSTREAM ELEVATION(FEET) =    256.40
  DOWNSTREAM ELEVATION(FEET) =    248.90
  ELEVATION DIFFERENCE(FEET) =      7.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.480
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.19
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  248.90  DOWNSTREAM ELEVATION(FEET) =  237.00
  STREET LENGTH(FEET) =   241.00   CURB HEIGHT(INCHES) =  5.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.54
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.87
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
  STREET FLOW TRAVEL TIME(MIN.) =   1.11   Tc(MIN.) =    4.59
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.854
  SUBAREA AREA(ACRES) =    0.83      SUBAREA RUNOFF(CFS) =    4.70
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.89

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =  10.41
  FLOW VELOCITY(FEET/SEC.) =  4.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   232.40  DOWNSTREAM(FEET) =   228.80
  FLOW LENGTH(FEET) =   359.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.75
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.94 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.89
  PIPE TRAVEL TIME(MIN.) =   1.26    Tc(MIN.) =    5.85
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     707.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7640
  SUBAREA AREA(ACRES) =    3.26   SUBAREA RUNOFF(CFS) =   14.35
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =      18.77
  TC(MIN.) =    5.85
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7447
  SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    1.96
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      20.74
  TC(MIN.) =    5.85

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   225.50  DOWNSTREAM(FEET) =   225.00
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.65
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.94 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.74
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    5.93
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     740.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.903
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7313
  SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    0.71
  TOTAL AREA(ACRES) =        4.9   TOTAL RUNOFF(CFS) =      21.28
  TC(MIN.) =    5.93
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =      5.93
  PEAK FLOW RATE(CFS)   =      21.28
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

3.3 Proposed Detained Condition Hydrologic Model Output (100-Year Event)

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 3776 - 845 SANTA FE                                                    *
* MITIGATED CONDITION                                                    *
* 100-YEAR                                                               *
 ************************************************************************

  FILE NAME: 3376PD00.DAT
  TIME/DATE OF STUDY: 14:59 06/27/2024
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   18.0     13.0    0.020/0.020/0.020   0.42    1.50 0.0100 0.125 0.0180

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

******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   107.00
  UPSTREAM ELEVATION(FEET) =    256.40
  DOWNSTREAM ELEVATION(FEET) =    248.90
  ELEVATION DIFFERENCE(FEET) =      7.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.480
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.19
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  248.90  DOWNSTREAM ELEVATION(FEET) =  237.00
  STREET LENGTH(FEET) =   241.00   CURB HEIGHT(INCHES) =  5.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.54
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.87
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
  STREET FLOW TRAVEL TIME(MIN.) =   1.11   Tc(MIN.) =    4.59
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.854
  SUBAREA AREA(ACRES) =    0.83      SUBAREA RUNOFF(CFS) =    4.70
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.89

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =  10.41
  FLOW VELOCITY(FEET/SEC.) =  4.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   232.40  DOWNSTREAM(FEET) =   228.80
  FLOW LENGTH(FEET) =   359.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.75
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.94 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.89
  PIPE TRAVEL TIME(MIN.) =   1.26    Tc(MIN.) =    5.85
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     707.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7640
  SUBAREA AREA(ACRES) =    3.26   SUBAREA RUNOFF(CFS) =   14.35
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =      18.77
  TC(MIN.) =    5.85
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7447
  SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    1.96
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      20.74
  TC(MIN.) =    5.85

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  10.75   RAIN INTENSITY(INCH/HOUR) =  4.02
  TOTAL AREA(ACRES) =     4.69   TOTAL RUNOFF(CFS) =      6.50

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   225.50  DOWNSTREAM(FEET) =   225.00
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.04
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.50
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   10.83
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     740.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.83
  RAINFALL INTENSITY(INCH/HR) =   4.00
  TOTAL STREAM AREA(ACRES) =     4.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.50

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.93   RAIN INTENSITY(INCH/HOUR) =  5.90
  TOTAL AREA(ACRES) =     0.25   TOTAL RUNOFF(CFS) =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.93
  RAINFALL INTENSITY(INCH/HR) =   5.90
  TOTAL STREAM AREA(ACRES) =     0.25
```

PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.71

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	6.50	10.83	4.002	4.69
2	0.71	5.93	5.901	0.25

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	4.27	5.93	5.901
2	6.98	10.83	4.002

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 6.98 Tc(MIN.) = 10.83
TOTAL AREA(ACRES) = 4.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 740.00 FEET.

==========

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 4.9 TC(MIN.) = 10.83
PEAK FLOW RATE(CFS) = 6.98

==========

END OF RATIONAL METHOD ANALYSIS

3.4 Detention Analysis (100-Year Event)

The HMP Biofiltration basin with the gravel storage system provides pollutant control, hydromodification management flow control and mitigation of the 100-year storm event peak flow rate. The 100-year storm event detention analysis was performed using HydroCAD Stormwater Modeling software. The inflow runoff hydrograph to the basin and storage system was modeled using RatHydro which is a Rational Method Design Storm Hydrograph software that creates a hydrograph using the results of the Rational Method calculations. HydroCAD has the ability to route the 100-year 6-hour storm event inflow hydrograph through the facility considering dynamic tailwater effects. Based on the facility cross sectional geometry, stage storage and outlet structure data, HydroCAD calculates the detained peak flow rate and detained time to peak.

The basin consists of 18" of mid-flow surface ponding, 3" of mulch, 18" of engineered soil, 3" of filter rock, and 12" of gravel with a perforated subdrain. Runoff will be biofiltered through the engineered soil and gravel layers, then collected in a perforated subdrain pipe directed to a catch basin located in the basin where runoff will be mitigated via a small orifice to comply with HMP requirements. In larger storm events, runoff not filtered through the engineered soil and gravel layers will be conveyed via an overflow outlet structure. Runoff conveyed via the outlet structure will bypass the small orifice and be conveyed directly to the proposed storm drain discharge pipe. Refer to the plans for details of the facility.

For the proposed detained hydrologic analysis, the effects of the detention provided by the facility were incorporated into the AES analysis. This was done by inserting the results from the HydroCAD analysis, detained peak flow rate and detained time to peak, into the proposed undetained condition AES model to create the proposed detained condition model. Refer to Section 3.3 for the detained AES output.

Based on the results of the HydroCAD analysis, mitigation for the 100-year storm event peak flow rate is provided, detaining the peak flow rate in the proposed condition to 6.98 cfs which is below the existing condition peak flow rate of 11.31 cfs. Refer to Appendix B for the HydroCAD detention detailed output.

3.5 Hydromodification Management

To satisfy the requirements of the MS4 Permit, a hydromodification management strategy has been developed for the project based on the Final Hydromodification Management Plan dated March 2011, (Final HMP). A continuous simulation model, the Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) version 5.1, was selected to size mitigation measures. The SWMM model is capable of modeling hydromodification management facilities to mitigate the effects of increased runoff from the post-development conditions and use changes that may cause negative impacts (i.e. erosion) to downstream channels. For HMP calculations refer to the Stormwater Quality Management Plan (SWQMP) for the project titled "Stormwater Quality Management Plan for Santa Fe 845 Sub-Division" dated June 2024 prepared by Pasco Laret Suiter & Associates.

3.6 Storm Water Pollutant Control

To meet the requirements of the MS4 Permit, the HMP Biofiltration basin is designed to treat onsite storm water pollutants contained in the volume of runoff from a 24-hour, 85th percentile storm event by slowly infiltrating runoff through an engineered soil layer and gravel layers. Refer to the Stormwater Quality Management Plan (SWQMP) for the project titled "Stormwater Quality Management Plan for Santa Fe 845 Sub-Division" dated June 2024 prepared by Pasco Laret Suiter & Associates for the detailed storm water pollutant control analysis.

APPENDIX A

Hydrology Support Material

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6 = 2.5

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

SITE

OCEANSIDE

VISTA

CARLSBAD

ESCONDIDO

ENCINITAS

SOLANA BEACH

DEL MAR

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

CHULA VISTA

IMPERIAL BEACH

SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

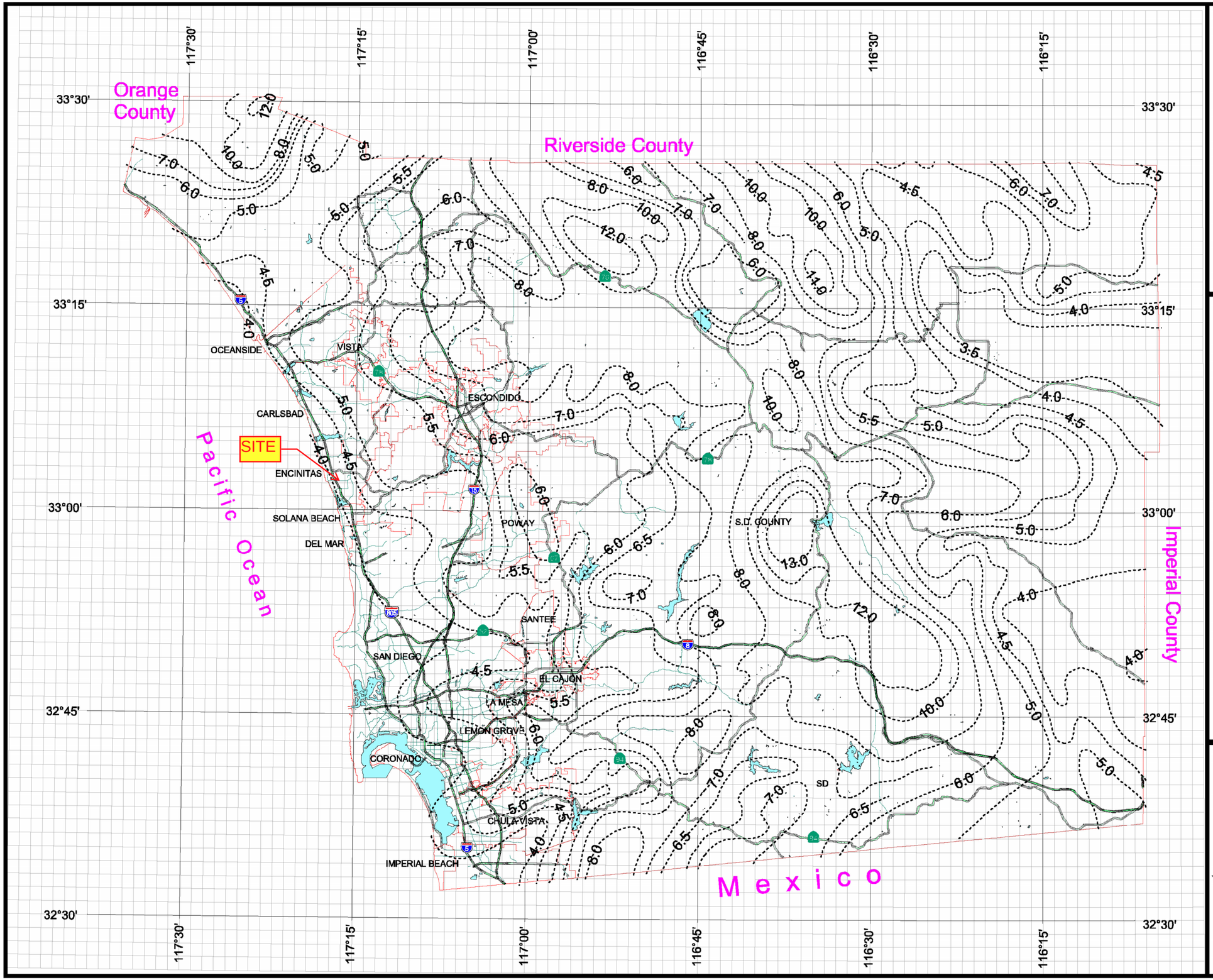
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 4.1

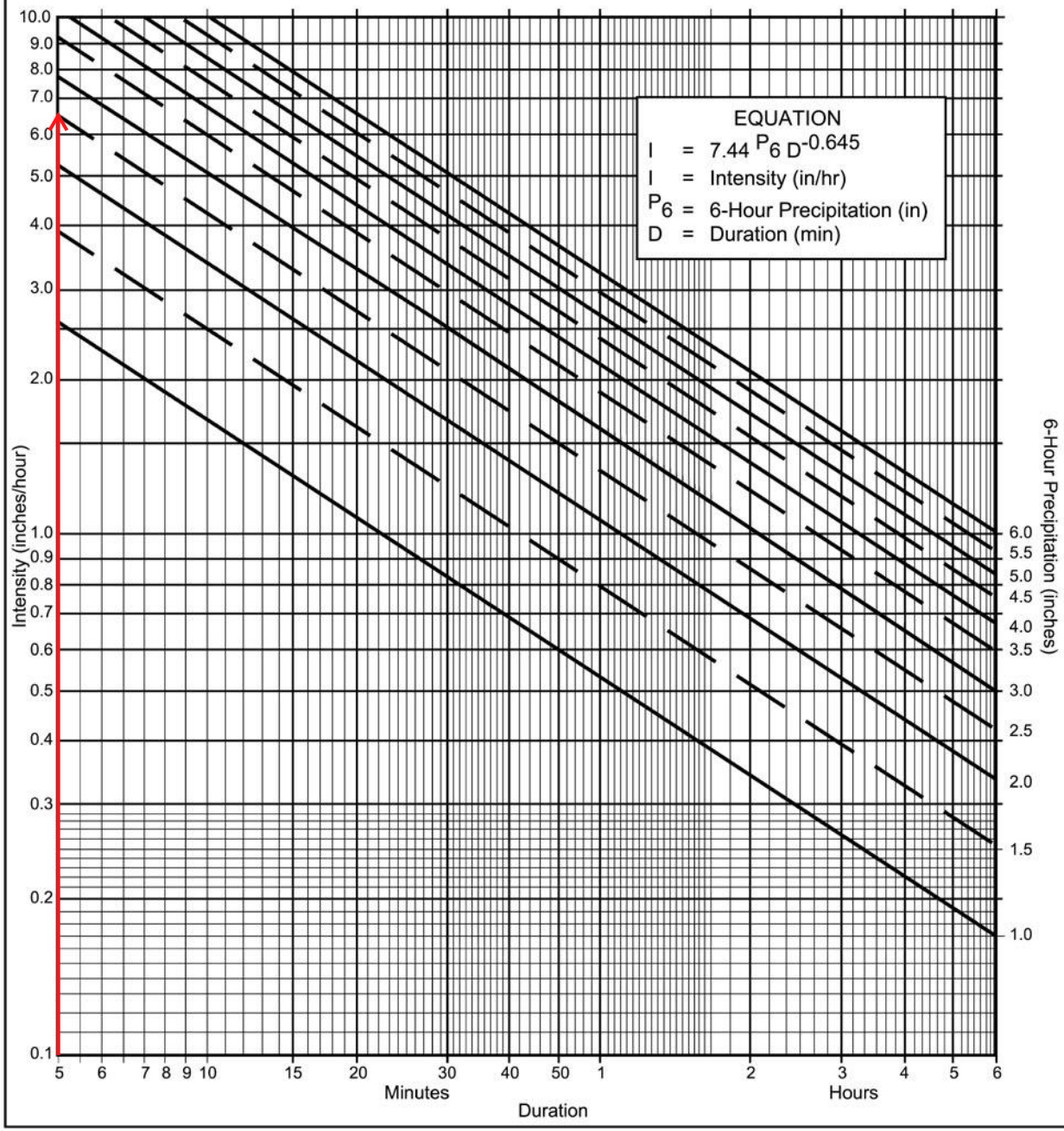


DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



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 = 2.5 in., P_{24} = 4.1, $\frac{P_6}{P_{24}}$ = 61% %(2)

(c) Adjusted $P_6^{(2)}$ = 2.5 in.

(d) t_x = 5 min.

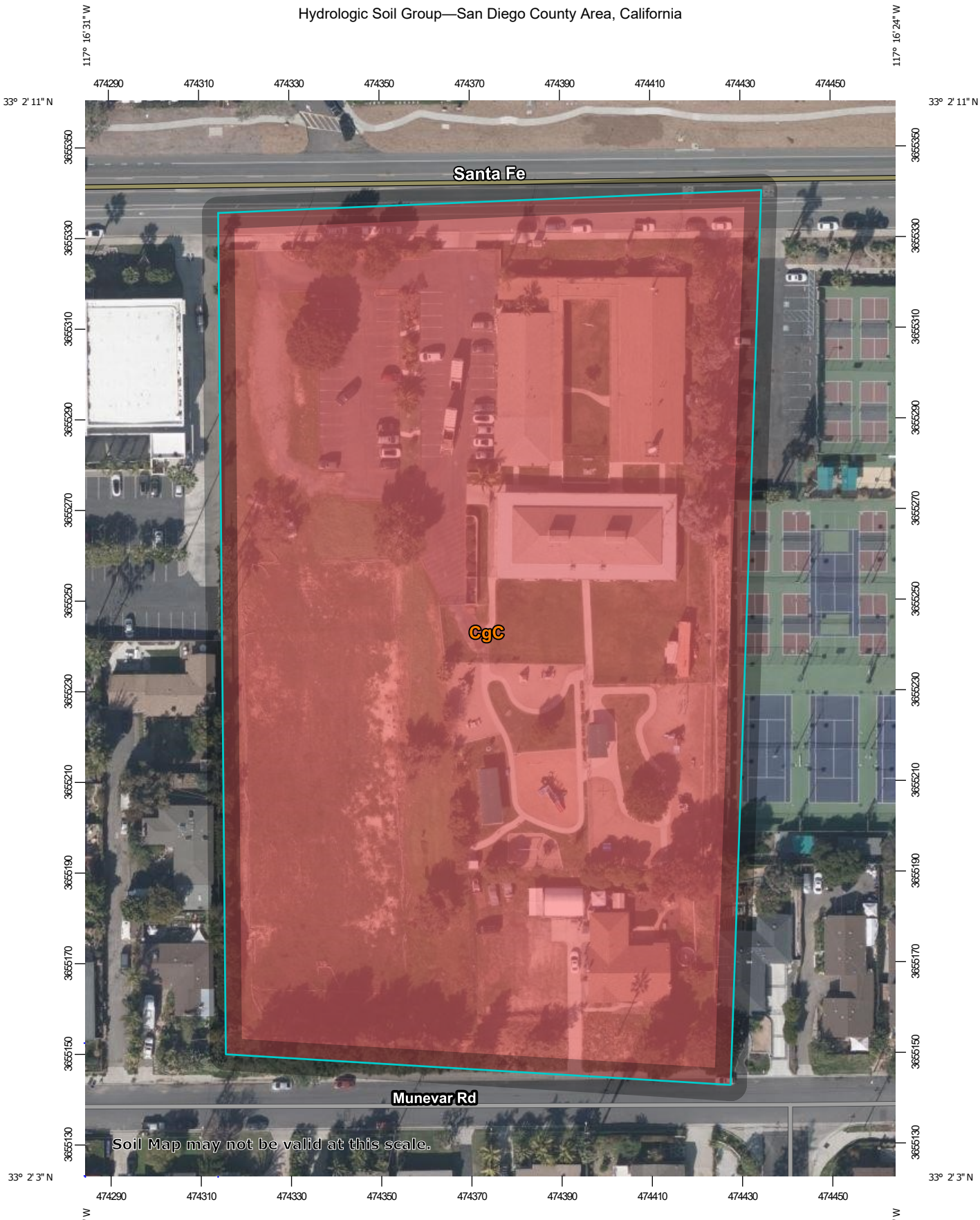
(e) I = 6.59 in./hr.

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



Map Scale: 1:1,160 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

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

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CgC	Chesterton-Urban land complex, 2 to 9 percent slopes	D	5.5	100.0%
Totals for Area of Interest			**5.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

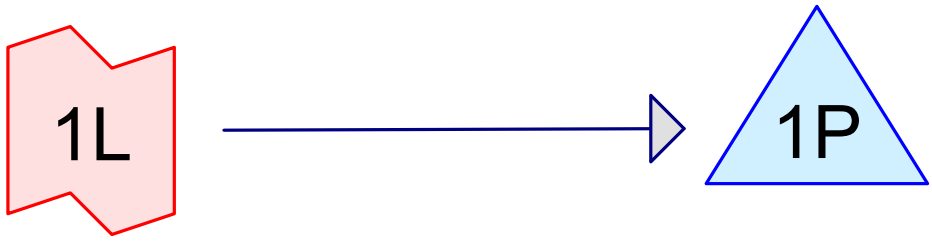
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

Detention Support Material



BMP-A Inflow Opt2

BMP-A 100-YR Opt2

Subcat Reach Pond Link

Routing Diagram for 3376
Prepared by Pasco Laret Suiter & Assoc, Printed 6/27/2024

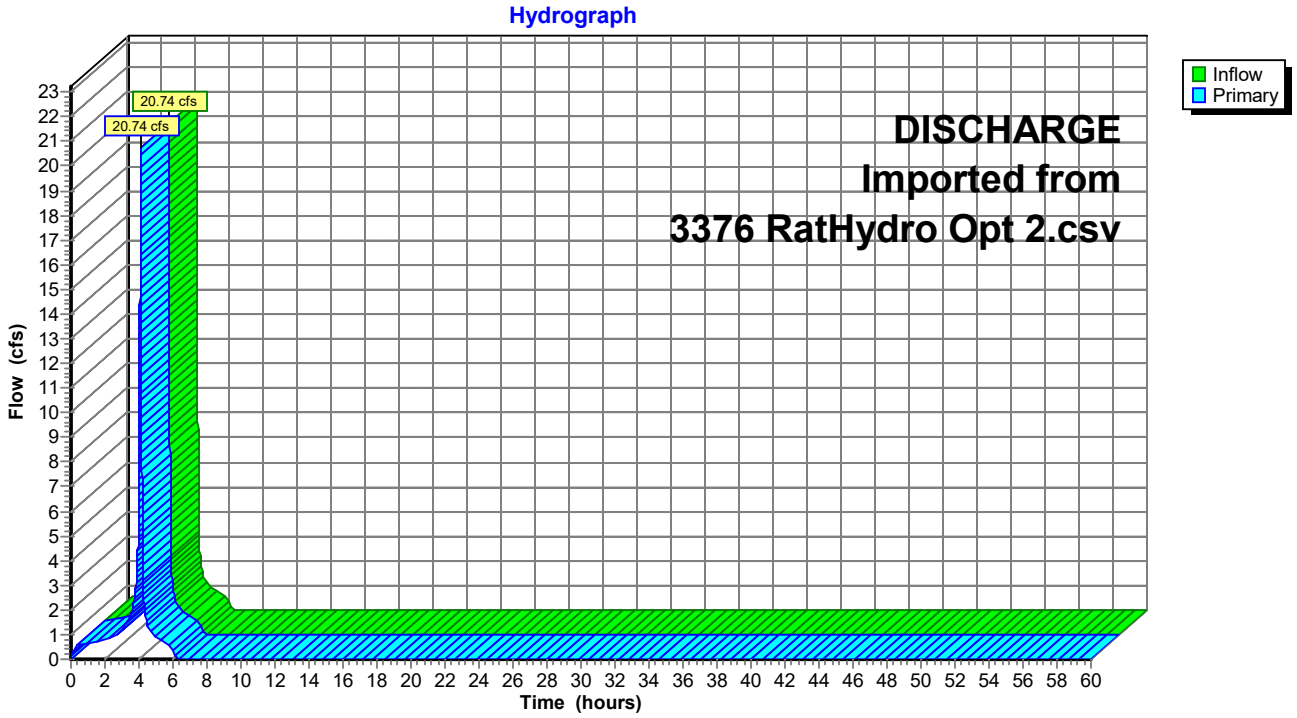
Summary for Link 1L: BMP-A Inflow Opt2

Inflow = 20.74 cfs @ 4.10 hrs, Volume= 0.722 af
Primary = 20.74 cfs @ 4.10 hrs, Volume= 0.722 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : BMP-A 100-YR Opt2

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.001 hrs

DISCHARGE Imported from 3376 RatHydro Opt 2.csv

Link 1L: BMP-A Inflow Opt2



Summary for Pond 1P: BMP-A 100-YR Opt2

Inflow = 20.74 cfs @ 4.10 hrs, Volume= 0.722 af
Outflow = 6.50 cfs @ 4.18 hrs, Volume= 0.716 af, Atten= 69%, Lag= 4.9 min
Primary = 6.50 cfs @ 4.18 hrs, Volume= 0.716 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.001 hrs
Peak Elev= 102.12' @ 4.18 hrs Surf.Area= 7,746 sf Storage= 21,348 cf

Plug-Flow detention time= 494.3 min calculated for 0.716 af (99% of inflow)
Center-of-Mass det. time= 493.0 min (706.2 - 213.2)

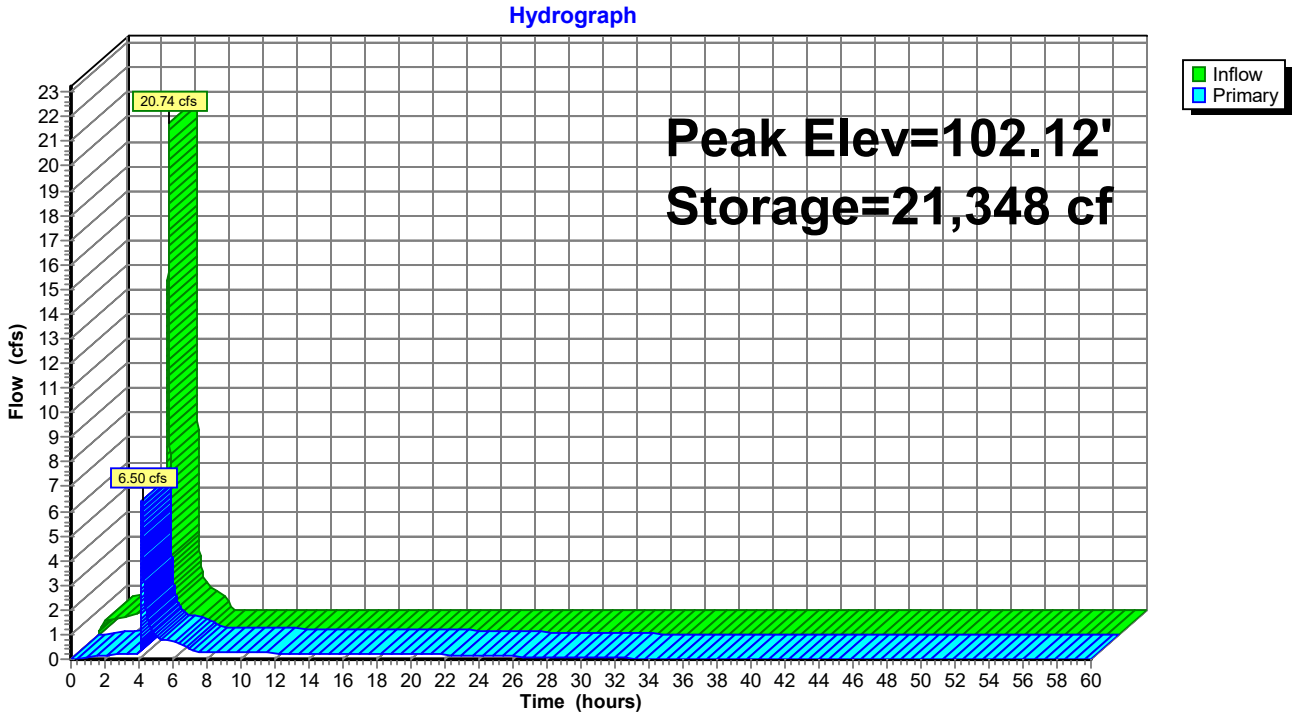
Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,272 cf	**Biofiltration Basin (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
97.00	7,053	0.0	0	0	7,053
98.00	7,053	40.0	2,821	2,821	7,351
100.00	7,053	20.0	2,821	5,642	7,946
100.50	7,217	100.0	3,567	9,210	8,168
100.75	7,298	100.0	1,814	11,024	8,279
101.00	7,380	100.0	1,835	12,859	8,391
101.25	7,461	100.0	1,855	14,714	8,502
101.50	7,543	100.0	1,875	16,590	8,614
102.00	7,706	100.0	3,812	20,402	8,839
102.50	7,868	100.0	3,893	24,295	9,064
102.75	7,949	100.0	1,977	26,272	9,177

Device	Routing	Invert	Outlet Devices
#1	Primary	97.00'	**18.0" Round Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.00' / 96.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	97.08'	**2.2" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 2	97.00'	**5.000 in/hr Infiltration through soil over Surface area below 101.50'**
#4	Device 1	101.50'	**12.0" W x 2.0" H Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#5	Device 1	101.95'	**36.0" x 36.0" Horiz. Grate** C= 0.600 in 36.0" x 36.0" Grate (100% open area) Limited to weir flow at low heads
#6	Device 1	101.95'	**36.0" x 36.0" Horiz. Grate** C= 0.600 in 36.0" x 36.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.50 cfs @ 4.18 hrs HW=102.12' (Free Discharge)
└**1=Outlet** (Passes 6.50 cfs of 17.79 cfs potential flow)
  ├**2=Orifice** (Orifice Controls 0.28 cfs @ 10.71 fps)
  │ └**3=Infiltration through soil** (Passes 0.28 cfs of 0.87 cfs potential flow)
  ├**4=Orifice** (Orifice Controls 0.59 cfs @ 3.53 fps)
  ├**5=Grate** (Weir Controls 2.81 cfs @ 1.36 fps)
  └**6=Grate** (Weir Controls 2.81 cfs @ 1.36 fps)

Pond 1P: BMP-A 100-YR Opt2



APPENDIX C

Hydraulic Outlet Analysis Reports

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 27 2024

ONE SDRSD CURB OUTLET TYPE D-25A

Rectangular

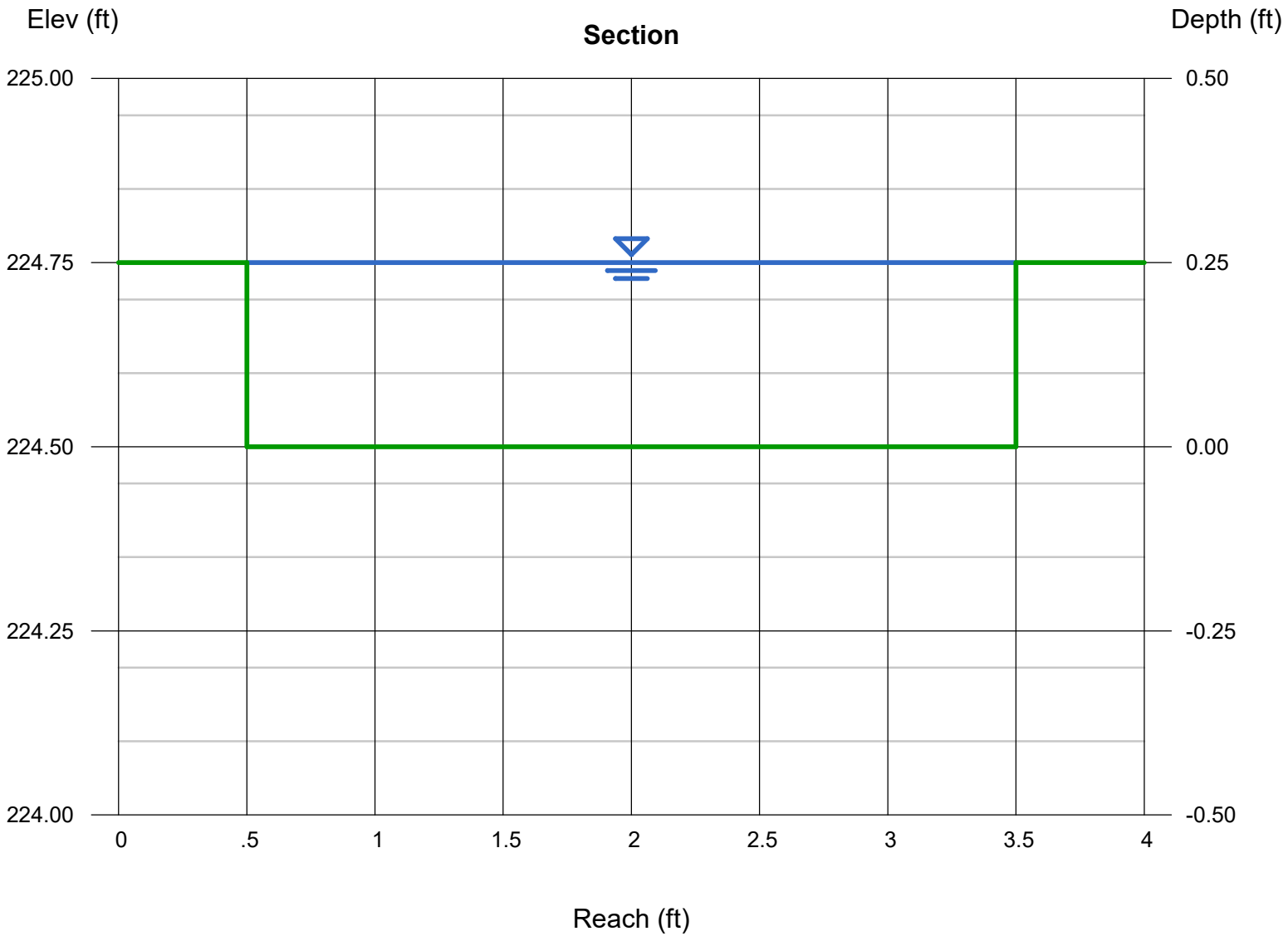
Bottom Width (ft)	= 3.00
Total Depth (ft)	= 0.25
Invert Elev (ft)	= 224.50
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.25

Highlighted

Depth (ft)	= 0.25
Q (cfs)	= 4.339
Area (sqft)	= 0.75
Velocity (ft/s)	= 5.79
Wetted Perim (ft)	= 3.50
Crit Depth, Yc (ft)	= 0.25
Top Width (ft)	= 3.00
EGL (ft)	= 0.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 27 2024

100-YEAR DETAINED GUTTER SPREAD

Gutter

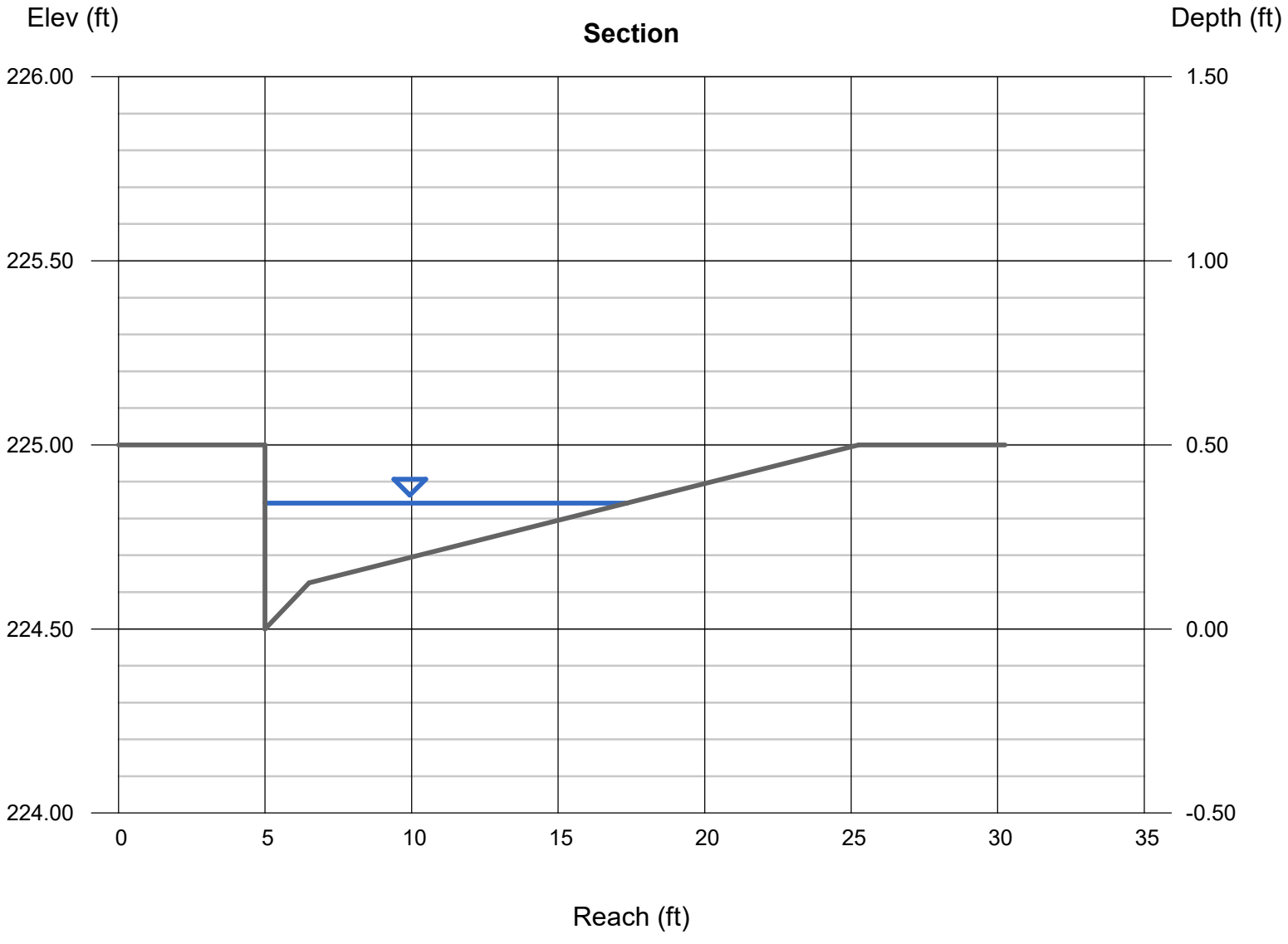
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 1.50
Invert Elev (ft)	= 224.50
Slope (%)	= 1.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.98

Highlighted

Depth (ft)	= 0.34
Q (cfs)	= 6.980
Area (sqft)	= 1.60
Velocity (ft/s)	= 4.37
Wetted Perim (ft)	= 12.70
Crit Depth, Yc (ft)	= 0.44
Spread Width (ft)	= 12.35
EGL (ft)	= 0.64



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 27 2024

100-YEAR UN-DETAINED GUTTER SPREAD CURB OUTLET CONTROLLED

Gutter

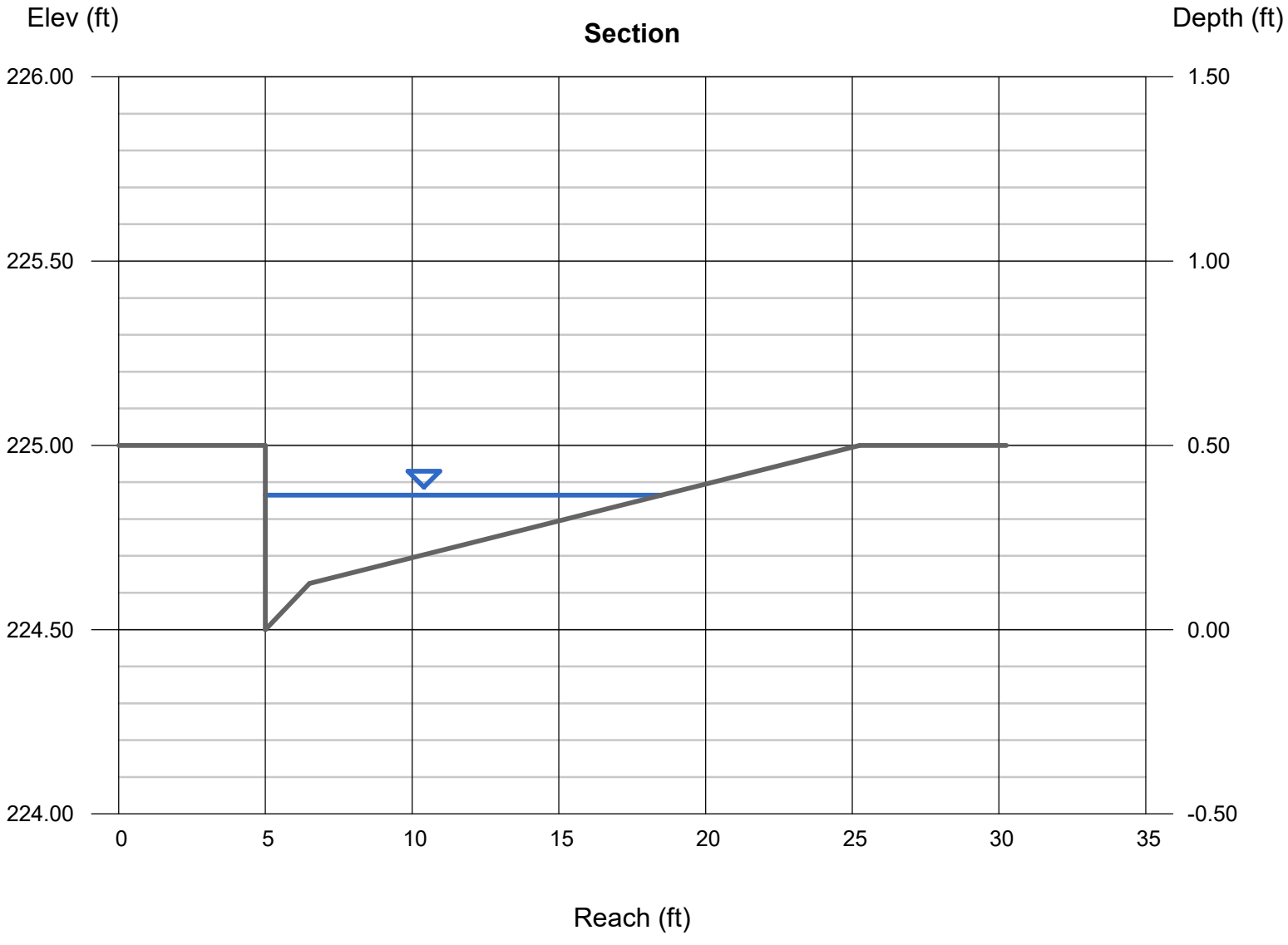
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 1.50
Invert Elev (ft)	= 224.50
Slope (%)	= 1.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.68

Highlighted

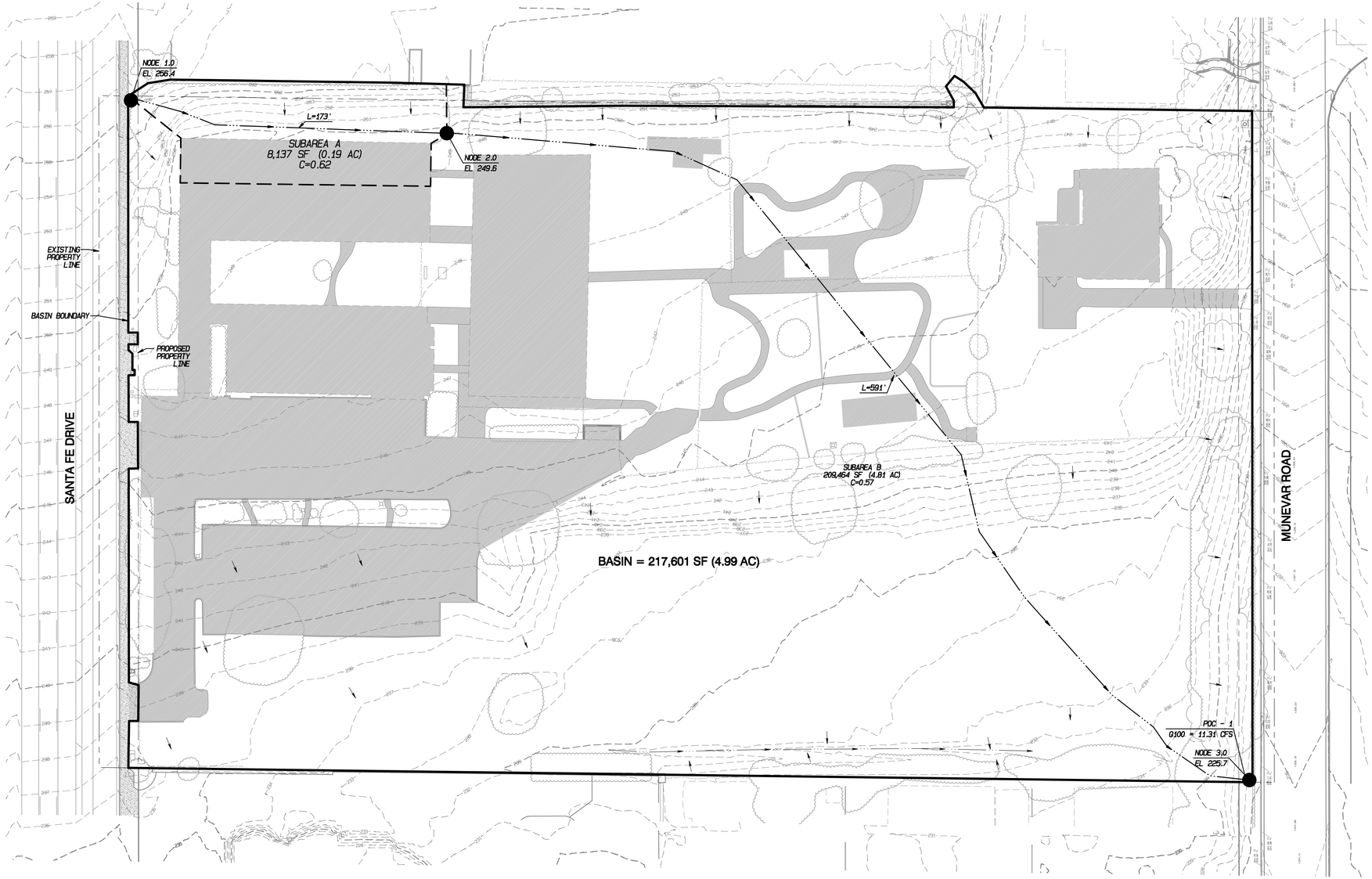
Depth (ft)	= 0.36
Q (cfs)	= 8.680
Area (sqft)	= 1.89
Velocity (ft/s)	= 4.58
Wetted Perim (ft)	= 13.88
Crit Depth, Yc (ft)	= 0.47
Spread Width (ft)	= 13.50
EGL (ft)	= 0.69



APPENDIX D

Existing and Proposed Hydrology Maps

PRE-DEVELOPMENT HYDROLOGIC MAP
845 SANTA FE DRIVE



'C' CALCULATION

PER COUNTY HYDROLOGY MANUAL 3.1.2
C=0.9 X (IMPERVIOUS AREA) + Cp X (PERVIOUS AREA) / TOTAL AREA
Cp = 0.45 PER CITY OF ENCINITAS EDM

SUB AREA 'A'
C= (3,151 * 0.9) + (4,986 * 0.45) / (8,137)
C = 0.62

SUB AREA 'B'
C= (56,080 * 0.9) + (153,384 * 0.45) / (209,464)
C = 0.57

LEGEND

- PROPERTY LINE
- BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOWLINE (LONGEST RUN)
- FLOWLINE (LOCAL)
- IMPERVIOUS AREA — 59,231 SF

GRAPHIC SCALE 1"=30'

0 30 60 90

PREPARED BY:
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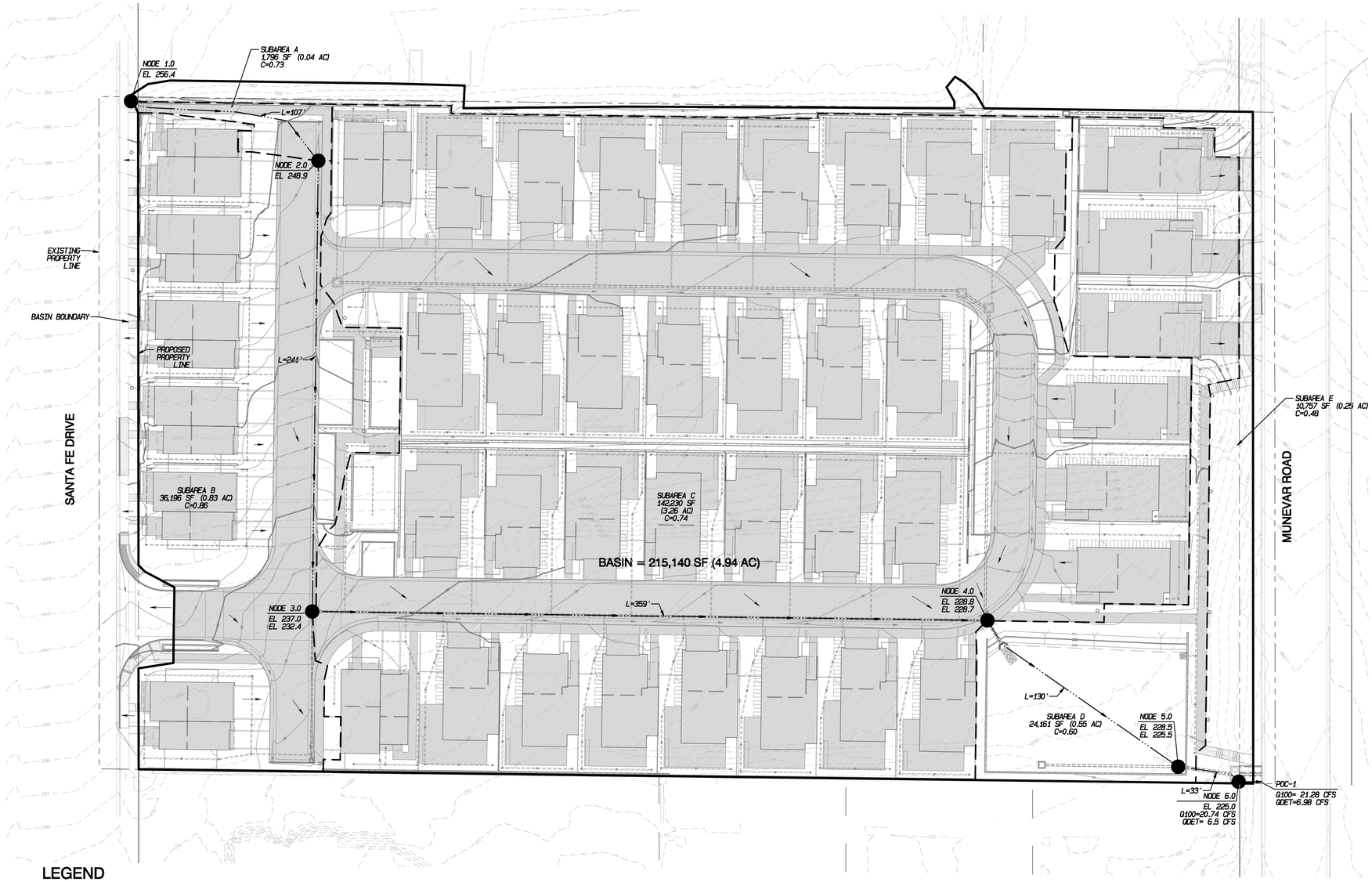
POST-DEVELOPMENT HYDROLOGIC MAP
845 SANTA FE DRIVE



'C' CALCULATION

PER COUNTY HYDROLOGY MANUAL 3.1.2
C=0.9 X (IMPERVIOUS AREA) + Cp X (PERVIOUS AREA) / TOTAL AREA
Cp = 0.45 PER CITY OF ENCINITAS EDM

SUB AREA 'A'
*C= (1,100 * 0.9) + (696 * 0.45) / (1,796)*
C = 0.73

SUB AREA 'B'
*C= (33,197 * 0.9) + (2,999 * 0.45) / (36,196)*
C = 0.86

SUB AREA 'C'
*C= (91,457 * 0.9) + (50,773 * 0.45) / (142,230)*
C = 0.74

SUB AREA 'D'
*C= (8,278 * 0.9) + (15,883 * 0.45) / (24,161)*
C = 0.60

SUB AREA 'E'
*C= (749 * 0.9) + (10,008 * 0.45) / (10,757)*
C = 0.48

LEGEND

PROPERTY LINE	
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE (LONGEST RUN)	
FLOWLINE (LOCAL)	
PROPOSED STORMDRAIN	
IMPERVIOUS AREA DRAINING TO BASIN	*134,032 SF*
IMPERVIOUS AREA DRAINING OFF-SITE	*1,459 SF*

GRAPHIC SCALE 1"=30'

0 30 60 90

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