PRELIMINARY DRAINAGE STUDY

8561 C AVENUE
HESPERIA, CA 92345
A.P.N. 0410-242-03 & 04

PREPARED FOR:

TAYLOR PROPERTY DEVELOPMENT, LLC
21496 MAIN STREET
10770 I AVENUE
HESPERIA, CA 92345
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CONTACT: ANDREW TAYLOR

PREPARED BY:

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8061 CHURCH STREET, P.O. BOX 592
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BERNHARD K. MAYER R.C.E. 36866 — **DATE** 01/02/24

PROJECT INTRODUCTION

This project consists of the development of an existing 4.71-acre parcel in the City of Hesperia, County of San Bernardino. The parcel is located north of Lime Street on the east side of C Avenue, having A.P.N.s of 0410-242-03 & 04. The pre-developed land cover is partially developed with single family residences on each lot. The easterly half of the property undeveloped and classified as “Barren (rock land, eroded and graded land)”. The proposed demolition to this parcel includes the removal of the existing residences and some fencing. The proposed improvements include 11 apartment buildings with a total of 70 units, a recreation building, 2 garage buildings, parking and drive aisles, 2 trash enclosures, street improvements, a variety of stormwater feature structures including curbs, gutters, Infiltration Basins, and rip rap. The post-developed condition will mimic the same flow pattern as the pre-developed condition. Stormwater will begin to be generated at the westerly property line and will be conveyed to concrete curb & gutters and v-gutters which will convey the runoff easterly to 2 infiltration basins. The Infiltration Basin will treat the runoff and outlet at the east property line like the existing drainage pattern.

Existing impervious area (all being removed) = 5,613 square-feet
Proposed Impervious = 156,775 square-feet.

PROJECT INFORMATION

EXISTING WATERSHED DESCRIPTION

In pre-developed condition the site drains via sheet flow from the west property line to the east property line. There are no existing drainage courses on site.

PROPOSED WATERSHED DESCRIPTION

Stormwater runoff from the southerly portion begins at a high point in the driveway at the west property line and will be conveyed to a series of curb & gutter and v-gutters. These gutters will convey the runoff east to a parkway drain which will convey the runoff into the infiltration basin located at the southeast corner of the lot. Basin overflow will be conveyed to a drainage channel which will outlet the runoff at the existing low point along the east property line.
Stormwater runoff from the northerly portion begins at a high point in the driveway at the west property line and will be conveyed to a series of curb & gutter and v-gutters. These gutters will convey the runoff east to a parkway drain which will convey the runoff into the infiltration basin located at the northeast corner of the lot. Basin overflow will outlet at the existing low point along the east property line.

METHODOLOGY – RATIONAL METHOD

The following scenario was modeled:

Existing Condition: 2-year Storm Event
Pre-Developed Condition: 100-year Storm Event

Developed Condition: 2-year Storm Event
Developed Condition: 100-year Storm Event

Rainfall depth was derived from the San Bernardino County Flood Control & Water Conservation District Hydrology Manual's isohyetal maps and precipitation frequency Atlas, NOAA Atlas 14.

Rational Method computations were performed using Advanced Engineering Software (aes), ver. 23.0, based on the Hydrology Manual. Discharge was calculated by the software, based on user input of rainfall, soil type, acreage, and land use parameters.

Printouts of the rational method calculations, as well as applicable plates from the Manual, are included in this report.

CONCLUSIONS

This drainage study and the calculations presented herein demonstrate the following:

The proposed and existing drainage facilities are adequate to carry the runoff produced by 2-year and 100-year storm events

TOTAL RUNOFF LEAVING THE SITE

Existing Condition:

Q_2	=	3.34 cfs	Tc = 16.02 min.
Q_{100}	=	11.10 cfs	Tc = 16.02 min.

Proposed Condition:

Q_2 (100-110)	=	3.12 cfs	Tc = 11.06 min.
Q_{100} (100-110)	=	6.81 cfs	Tc = 11.06 min.
Q_2 (200-210)	=	4.74 cfs	Tc = 9.65 min.
Q_{100} (200-210)	=	10.26 cfs	Tc = 9.65 min.
TOTAL Q_2	=	7.86 cfs	Tc = 11.06 min.
TOTAL Q_{100}	=	17.07 cfs	Tc = 9.65 min.

Q_2 7.86 – 3.34 = 4.52 cfs Increase
Q_{100} 17.07 – 11.10 = 5.97 cfs Increase

VOLUME MITIGATION

Existing (Q100) = 18,556 ft^3
Proposed (Q100) = 26,204 ft^3 26,204 - 18,556 = 7,648 ft^3 < 9,159 ft^3 (basin volume)

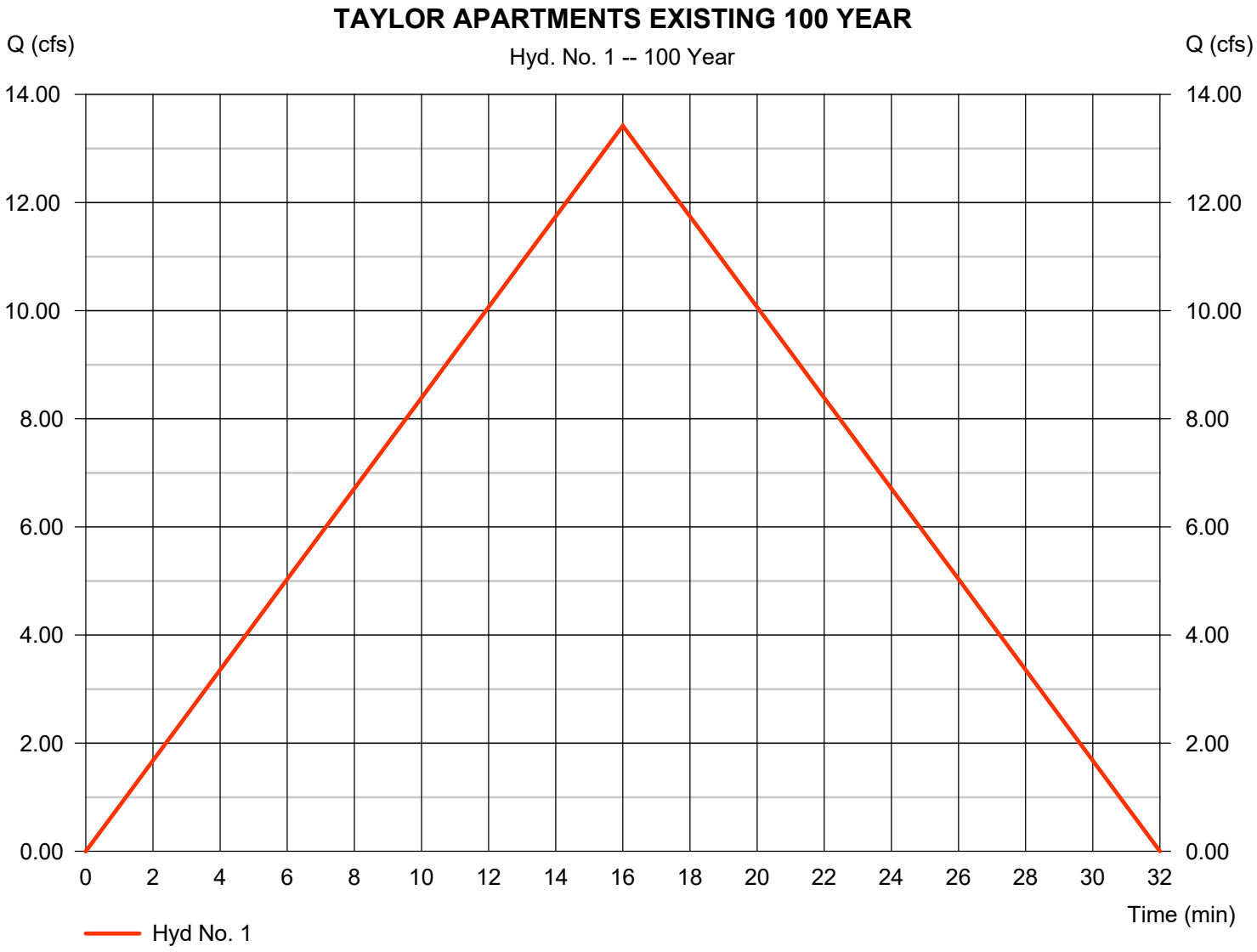
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Tuesday, 01 / 2 / 2024

Hyd. No. 1

TAYLOR APARTMENTS EXISTING 100 YEAR

Hydrograph type	= Rational	Peak discharge	= 13.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 12,884 cuft
Drainage area	= 4.710 ac	Runoff coeff.	= 0.4
Intensity	= 7.124 in/hr	Tc by User	= 16.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1



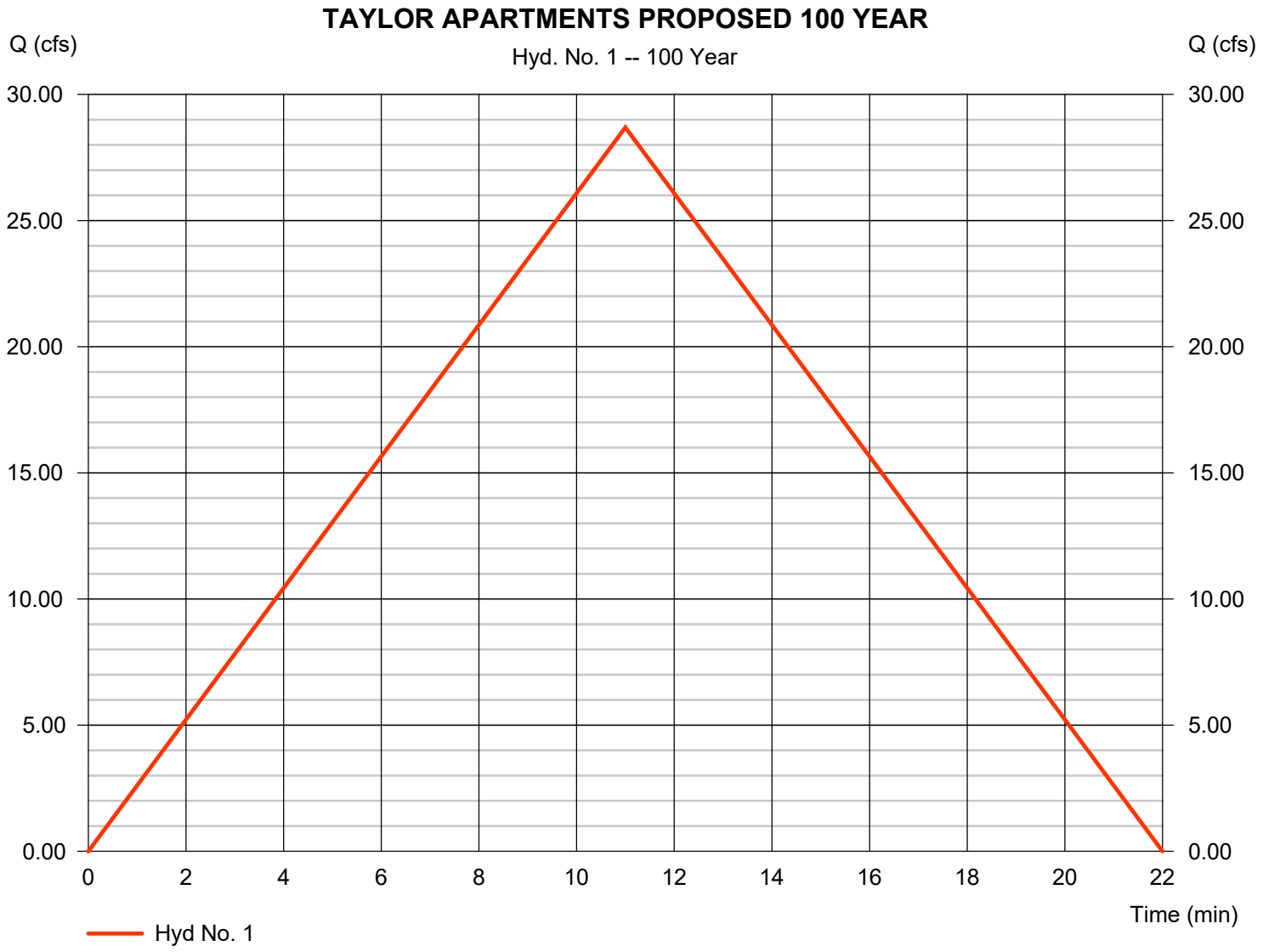
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Tuesday, 01 / 2 / 2024

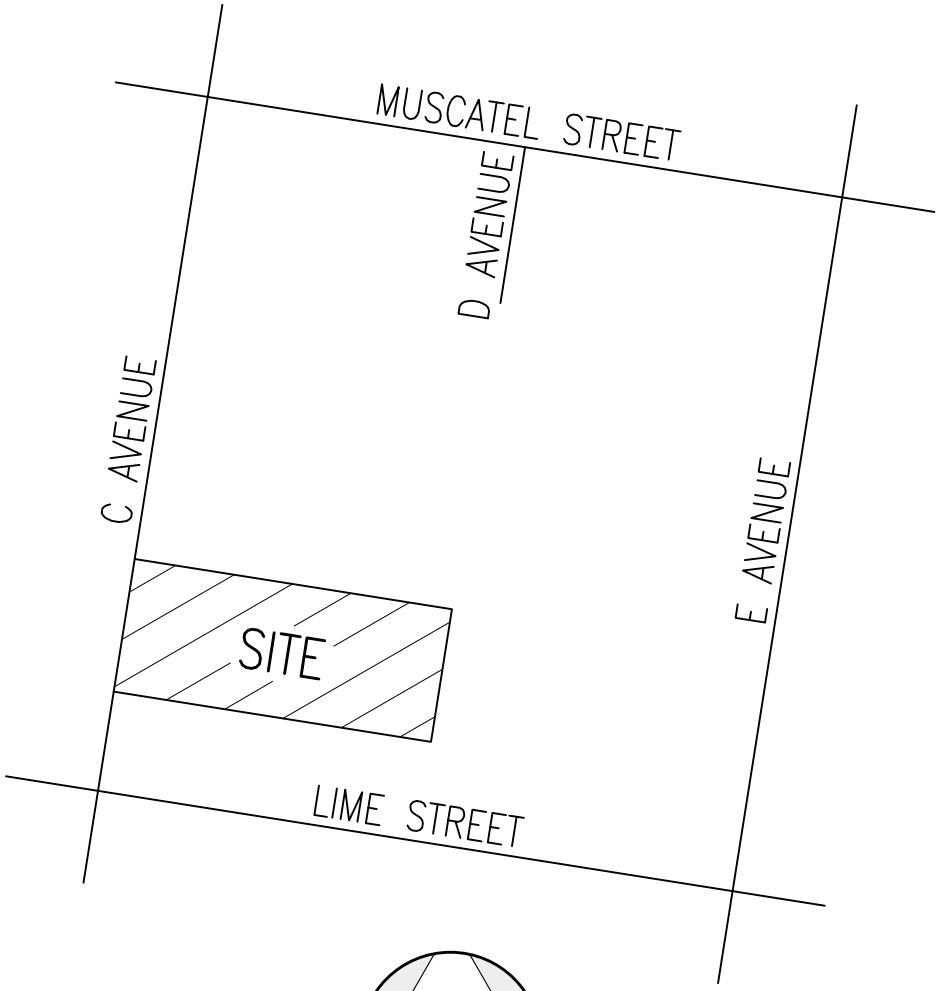
Hyd. No. 1

TAYLOR APARTMENTS PROPOSED 100 YEAR

Hydrograph type	= Rational	Peak discharge	= 28.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 11 min
Time interval	= 1 min	Hyd. volume	= 18,934 cuft
Drainage area	= 4.710 ac	Runoff coeff.	= 0.75
Intensity	= 8.121 in/hr	Tc by User	= 11.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1



DRAINAGE MAPS



VICINITY MAP

NOT TO SCALE

DRAINAGE MAP – EXISTING

SCALE: 1"=80'

FLOW PROCESS CHART PROPOSED:

FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 2 YR/1 HR	Q (CFS) 100 YR/1 HR
100	110	3265.0	3252.1	3.34	11.10

DRAINAGE LEGEND:

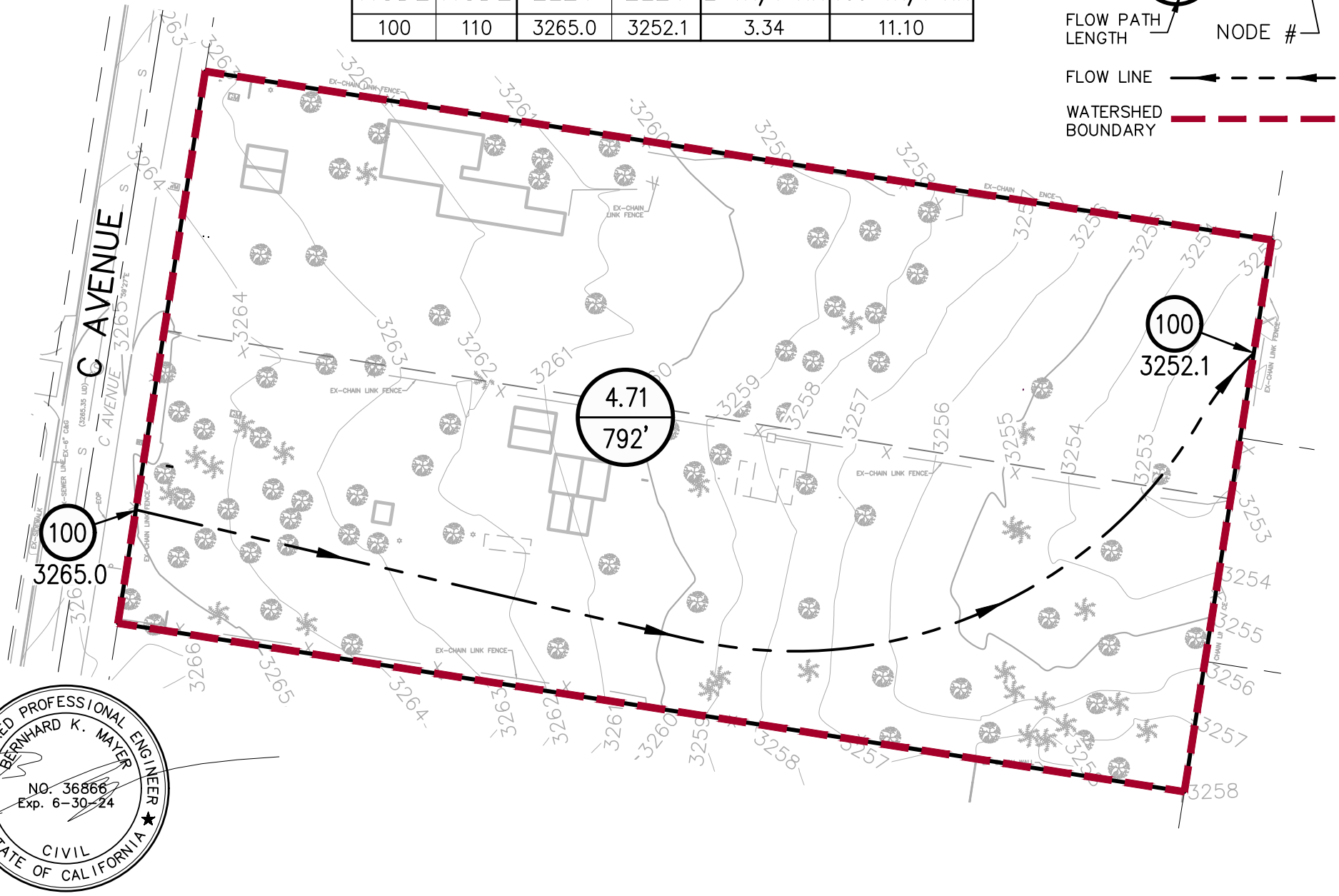
DRAINAGE AREA (AC) — NODE ELEV. 3252.1

10.00 / 500' — 100

FLOW PATH LENGTH — NODE #

FLOW LINE

WATERSHED BOUNDARY



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STATE OF CALIFORNIA

DRAINAGE MAP – PROPOSED

SCALE: 1"=80'

FLOW PROCESS CHART PROPOSED:

FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 2 YR/1 HR	Q (CFS) 100 YR/1 HR
100	110	3264.8	3252.1	3.12	6.81
200	210	3265.9	3252.1	4.74	10.26

DRAINAGE LEGEND:

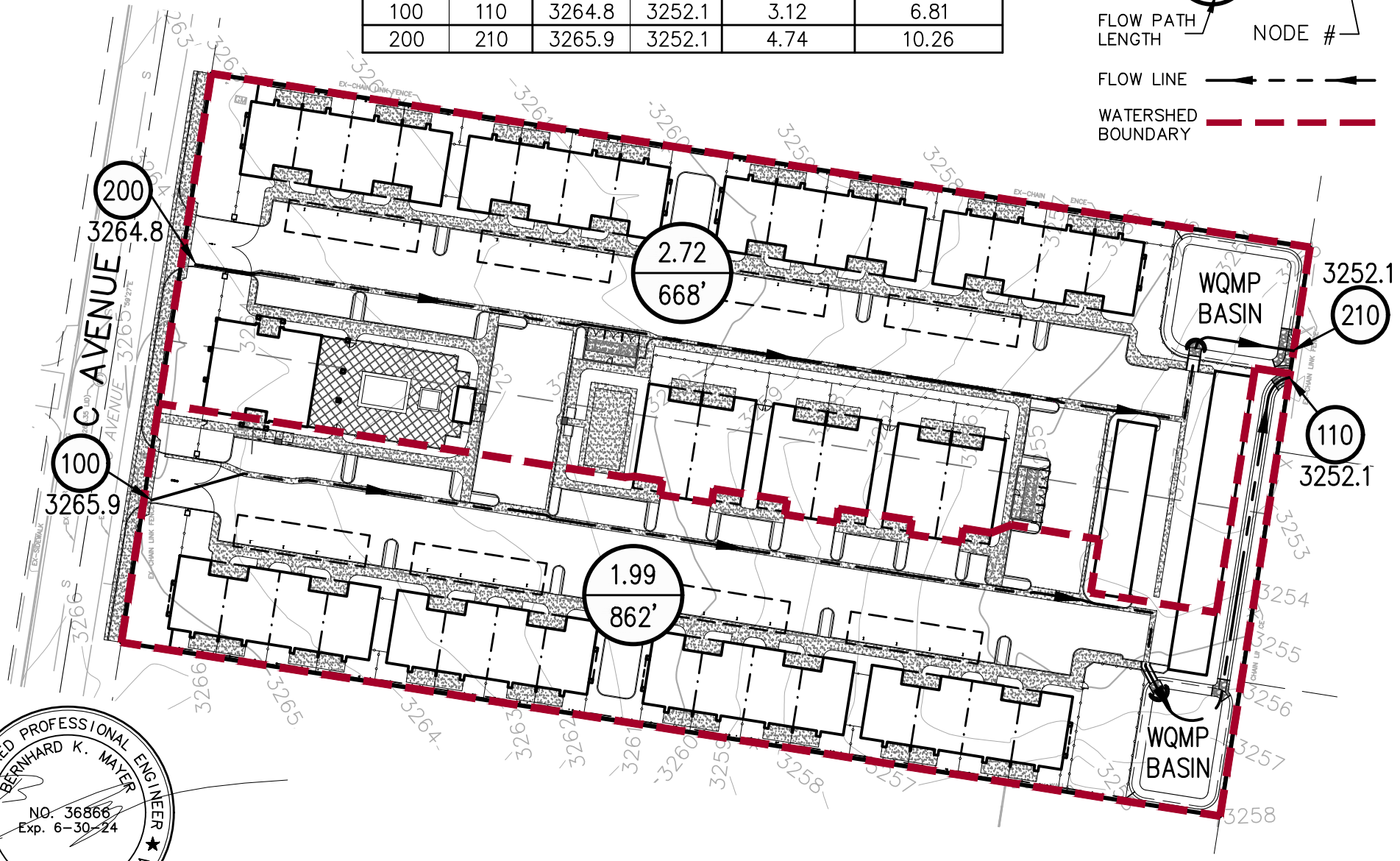
DRAINAGE AREA (AC) / FLOW PATH LENGTH: 10.00 / 500'

NODE ELEV. 3252.1

NODE # 100

FLOW LINE

WATERSHED BOUNDARY



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HYDROLOGY

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                          Analysis prepared by:

                              SITETECH, INC.
                         8061 CHURCH STREET, P.O. 592
                              HIGHLAND, CA 92346
                              PH: (909) 864-3180

 ************************** DESCRIPTION OF STUDY **************************
* TAYLOR APARTMENTS - 8561 C AVENUE                                      *
* 2 YEAR - 1 HOUR DESIGN STORM                                           *
* EXISTING CONDITION                                                     *
 **************************************************************************

  FILE NAME: TAY2E.DAT
  TIME/DATE OF STUDY: 10:17 01/02/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.5800

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   792.00
  ELEVATION DATA: UPSTREAM(FEET) =   3265.00  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.019
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.462
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"         B        4.71      0.75     0.900    56   16.02
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      3.34
  TOTAL AREA(ACRES) =      4.71   PEAK FLOW RATE(CFS) =      3.34
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.7  TC(MIN.) =     16.02
  EFFECTIVE AREA(ACRES) =      4.71  AREA-AVERAGED Fm(INCH/HR)=  0.67
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.900
  PEAK FLOW RATE(CFS)   =       3.34
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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                              SITETECH, INC.
                         8061 CHURCH STREET, P.O. 592
                              HIGHLAND, CA 92346
                              PH: (909) 864-3180

 ************************** DESCRIPTION OF STUDY **************************
* TAYLOR APARTMENTS - 8561 C AVENUE                                      *
* 100 YEAR - 1 HOUR DESIGN STORM                                         *
* EXISTING CONDITION                                                     *
 ************************************************************************

  FILE NAME: TAY100E.DAT
  TIME/DATE OF STUDY: 10:11 01/02/2024
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1900

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
 ------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   792.00
  ELEVATION DATA: UPSTREAM(FEET) =   3265.00  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.019
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.999
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"         B        4.71      0.42     0.900    76   16.02
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =     11.10
  TOTAL AREA(ACRES) =      4.71   PEAK FLOW RATE(CFS) =     11.10
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.7  TC(MIN.) =     16.02
  EFFECTIVE AREA(ACRES) =      4.71  AREA-AVERAGED Fm(INCH/HR)=  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.900
  PEAK FLOW RATE(CFS)   =      11.10
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                         8061 CHURCH STREET, P.O. 592
                              HIGHLAND, CA 92346
                              PH: (909) 864-3180

 ************************** DESCRIPTION OF STUDY **************************
* TAYLOR APARTMENTS - 8561 C AVENUE                                      *
* 2 YEAR - 1 HOUR DESIGN STORM                                           *
* PROPOSED CONDITION                                                     *
 **************************************************************************

  FILE NAME: TAY2P.DAT
  TIME/DATE OF STUDY: 10:15 01/02/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.5800

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   862.00
  ELEVATION DATA: UPSTREAM(FEET) =   3265.90  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.063
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.894
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        1.99      0.75     0.200    56   11.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.12
  TOTAL AREA(ACRES) =      1.99   PEAK FLOW RATE(CFS) =      3.12

******************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   668.00
  ELEVATION DATA: UPSTREAM(FEET) =   3264.80  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.653
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.084
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        2.72      0.75     0.200    56    9.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      4.74
  TOTAL AREA(ACRES) =      2.72   PEAK FLOW RATE(CFS) =      4.74
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =      9.65
  EFFECTIVE AREA(ACRES) =      2.72  AREA-AVERAGED Fm(INCH/HR)=  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       4.74
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                          Analysis prepared by:

                              SITETECH, INC.
                         8061 CHURCH STREET, P.O. 592
                              HIGHLAND, CA 92346
                              PH: (909) 864-3180

 ************************** DESCRIPTION OF STUDY **************************
* TAYLOR APARTMENTS - 8561 C AVENUE                                      *
* 100 YEAR - 1 HOUR DESIGN STORM                                         *
* PROPOSED CONDITION                                                     *
 ************************************************************************

  FILE NAME: TAY100P.DAT
  TIME/DATE OF STUDY: 10:06 01/02/2024
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1900

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
 ------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   862.00
  ELEVATION DATA: UPSTREAM(FEET) =   3265.90  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.063
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.886
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        1.99      0.42     0.200    76   11.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      6.81
  TOTAL AREA(ACRES) =      1.99   PEAK FLOW RATE(CFS) =      6.81

********************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   668.00
  ELEVATION DATA: UPSTREAM(FEET) =   3264.80  DOWNSTREAM(FEET) =   3252.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.653
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.276
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        2.72      0.42     0.200    76    9.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =     10.26
  TOTAL AREA(ACRES) =      2.72   PEAK FLOW RATE(CFS) =     10.26
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =      9.65
  EFFECTIVE AREA(ACRES) =      2.72  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =      10.26
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED INFILTRATION BASIN VOLUME & DRAWDOWN

SOUTH INFILTRATION BASIN

Depth of Basin (ft)	1.5		Above Ground Storage (ft^3)	4088
Bottom Footprint (ft^2)	2270		Gravel Storage (ft^3)	0
Area of Side Slope (ft^2)	911		Total System Storage (ft^3)	4088
Volume of Basin (ft^3)	4088.25		Proposed DCV (ft^3)	4003
Infiltration Footprint (ft^2)	3181		% of Total DCV Retention	102%
Gravel Footprint (ft^2)			Measured Infil. Rate (in/hr)	0.76
Gravel Depth (ft)			Factor of Safety	2
Gravel Volume (ft^2)	0		Design Infil. Rate (in/hr)	0.38
Gravel Porosity	40%		BMP Drawdown (hr)	40.6

Results

Total System Retention (ft^3)	=	4088
$V_{BMP} > V_{DCV}$???	=	YES
BMP Drawdown < 48 hours ???	=	YES
	=	INPUT DATA
	=	CALCULATED DATA

NORTH INFILTRATION BASIN

Depth of Basin (ft)	1.5		Above Ground Storage (ft^3)	6074
Bottom Footprint (ft^2)	3503		Gravel Storage (ft^3)	0
Area of Side Slope (ft^2)	1092		Total System Storage (ft^3)	6074
Volume of Basin (ft^3)	6073.50		Proposed DCV (ft^3)	5,700
Infiltration Footprint (ft^2)	4595		% of Total DCV Retention	107%
Gravel Footprint (ft^2)			Measured Infil. Rate (in/hr)	0.76
Gravel Depth (ft)			Factor of Safety	2
Gravel Volume (ft^2)	0		Design Infil. Rate (in/hr)	0.38
Gravel Porosity	40%		BMP Drawdown (hr)	41.7

Results

Total System Retention (ft^3)	=	6074
$V_{BMP} > V_{DCV}$???	=	YES
BMP Drawdown < 48 hours ???	=	YES
	=	INPUT DATA
	=	CALCULATED DATA

* Infiltration Basin Volume = (Bottom Footprint x Depth) + (Area of Side Slope x Depth)/2
* Total Gravel Storage = (Gravel Volume) x Gravel Porosity
* Total System Storage = Above Ground Storage + Gravel Storage
* BMP Drawdown = [(Total Storage / Infiltration Footprint) x 12 in/ft] / Design Infil. Rate

HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 2 2024

SOUTH BASIN INLET - 36IN PARKWAY DRAIN

Rectangular

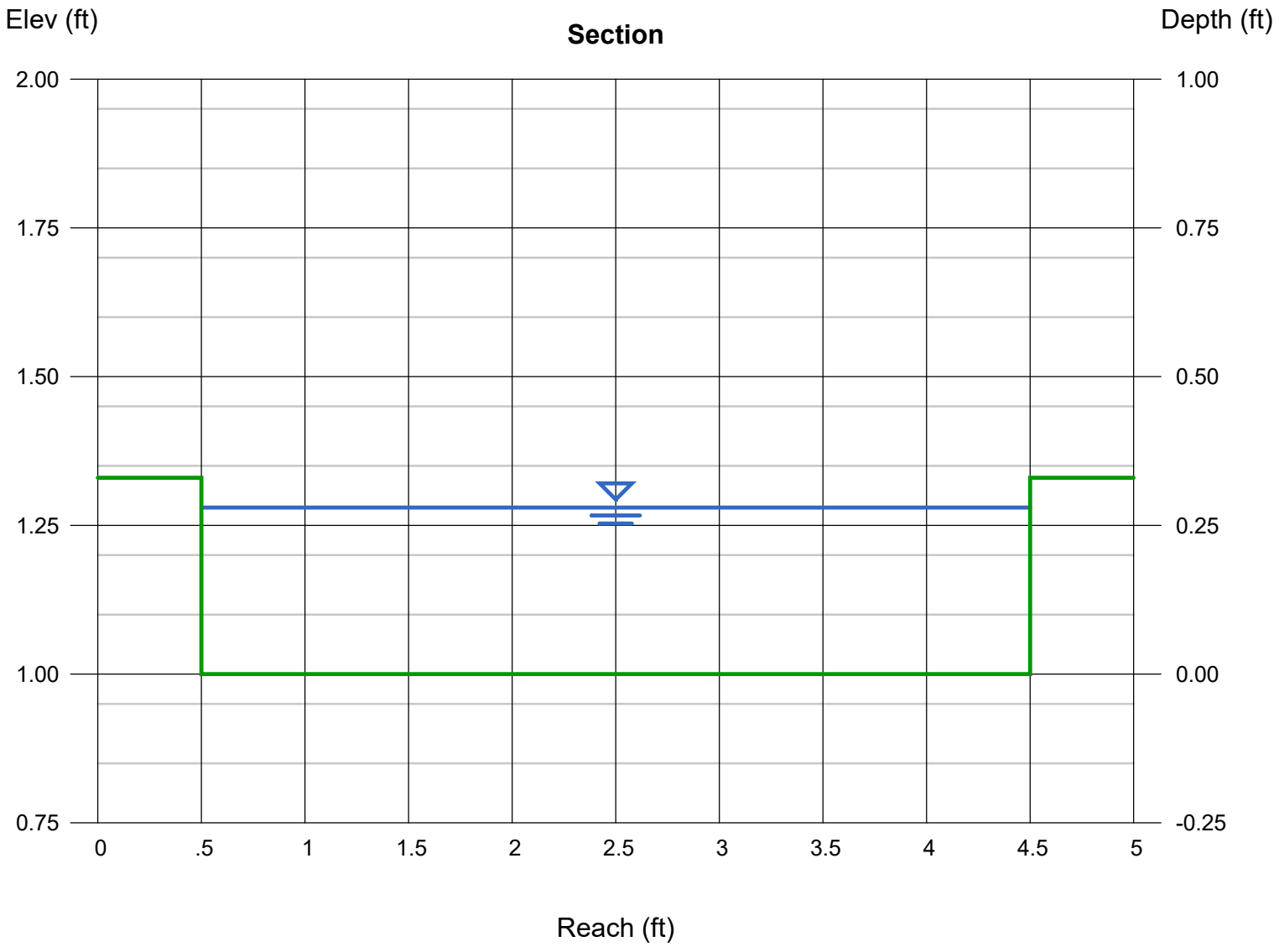
Bottom Width (ft)	= 4.00
Total Depth (ft)	= 0.33
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.81

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 6.810
Area (sqft)	= 1.12
Velocity (ft/s)	= 6.08
Wetted Perim (ft)	= 4.56
Crit Depth, Yc (ft)	= 0.33
Top Width (ft)	= 4.00
EGL (ft)	= 0.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 2 2024

SOUTH BASIN OUTLET - 4FT WIDE GRADED DRAINAGE CHANNEL

Trapezoidal

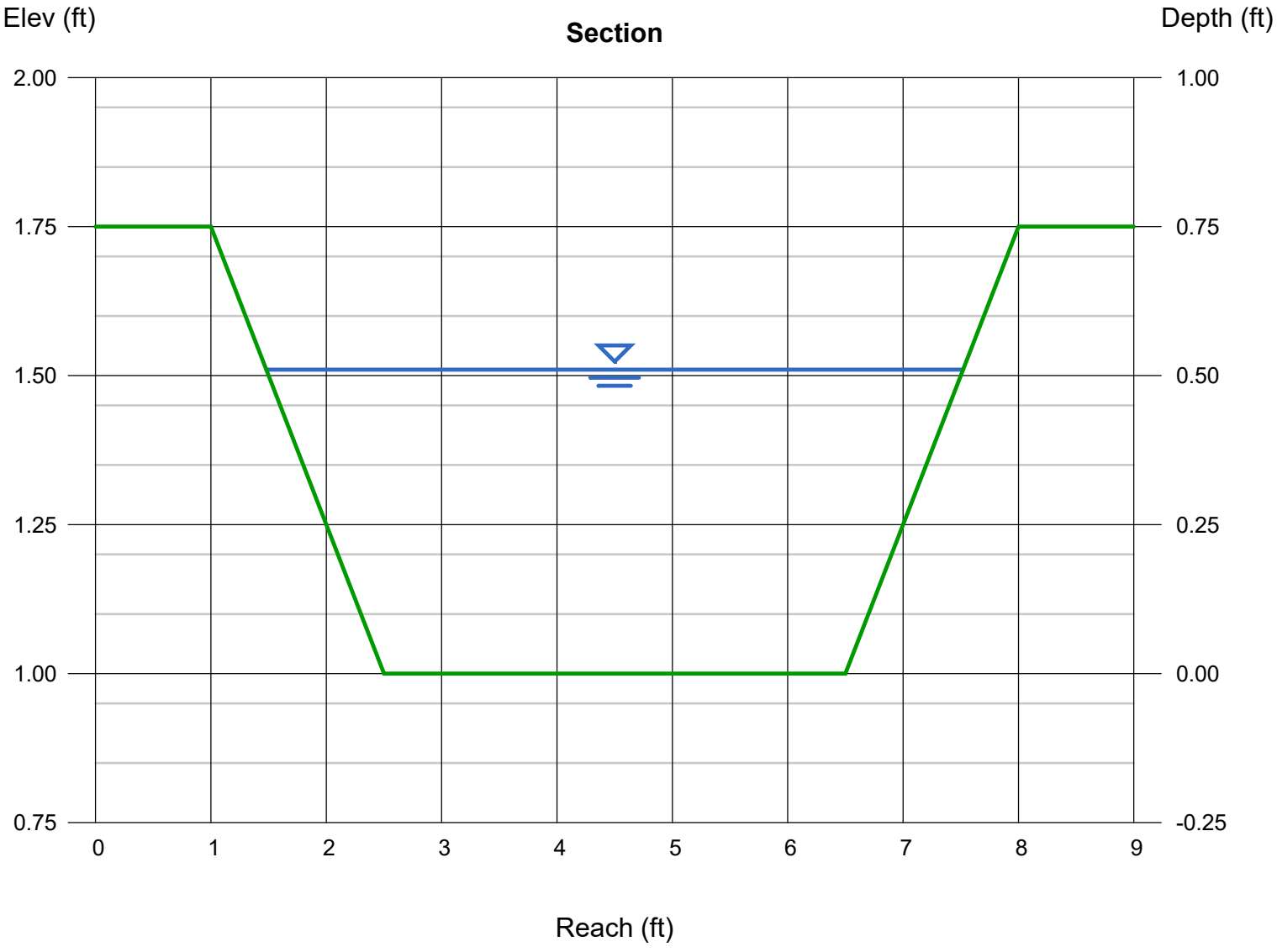
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 0.75
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.81

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 6.810
Area (sqft)	= 2.56
Velocity (ft/s)	= 2.66
Wetted Perim (ft)	= 6.28
Crit Depth, Yc (ft)	= 0.42
Top Width (ft)	= 6.04
EGL (ft)	= 0.62



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 2 2024

NORTH BASIN INLET - 72IN PARKWAY DRAIN

Rectangular

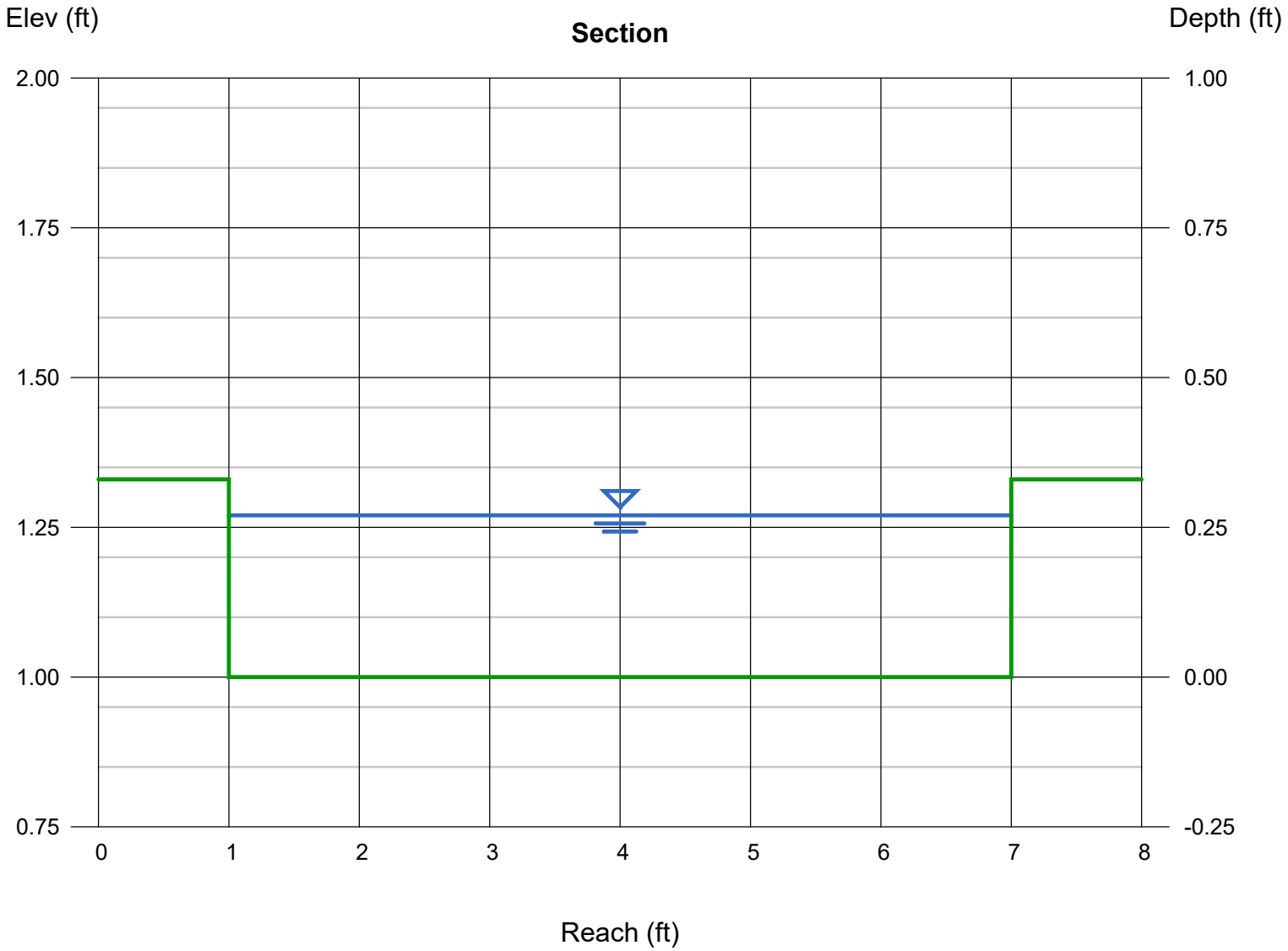
Bottom Width (ft)	= 6.00
Total Depth (ft)	= 0.33
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.26

Highlighted

Depth (ft)	= 0.27
Q (cfs)	= 10.26
Area (sqft)	= 1.62
Velocity (ft/s)	= 6.33
Wetted Perim (ft)	= 6.54
Crit Depth, Yc (ft)	= 0.33
Top Width (ft)	= 6.00
EGL (ft)	= 0.89



REFERENCE MAPS

NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4068°, Longitude: -117.2986°
Elevation: 3255 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.089 (0.073-0.108)	0.123 (0.101-0.150)	0.169 (0.139-0.207)	0.207 (0.169-0.256)	0.261 (0.206-0.334)	0.304 (0.235-0.396)	0.348 (0.263-0.466)	0.395 (0.290-0.543)	0.460 (0.324-0.659)	0.511 (0.348-0.759)
10-min	0.127 (0.105-0.155)	0.176 (0.145-0.215)	0.242 (0.199-0.297)	0.297 (0.243-0.367)	0.374 (0.296-0.478)	0.435 (0.337-0.568)	0.499 (0.377-0.667)	0.566 (0.416-0.779)	0.659 (0.465-0.945)	0.733 (0.499-1.09)
15-min	0.154 (0.127-0.188)	0.213 (0.176-0.260)	0.293 (0.241-0.359)	0.359 (0.293-0.444)	0.452 (0.358-0.578)	0.526 (0.408-0.687)	0.604 (0.456-0.807)	0.685 (0.503-0.942)	0.797 (0.562-1.14)	0.886 (0.603-1.32)
30-min	0.223 (0.185-0.273)	0.309 (0.255-0.378)	0.425 (0.350-0.521)	0.522 (0.427-0.645)	0.658 (0.520-0.840)	0.765 (0.592-0.999)	0.877 (0.663-1.17)	0.995 (0.731-1.37)	1.16 (0.817-1.66)	1.29 (0.877-1.91)
60-min	0.303 (0.251-0.370)	0.419 (0.347-0.513)	0.577 (0.475-0.707)	0.708 (0.579-0.875)	0.892 (0.705-1.14)	1.04 (0.803-1.35)	1.19 (0.899-1.59)	1.35 (0.992-1.86)	1.57 (1.11-2.25)	1.75 (1.19-2.59)
2-hr	0.435 (0.360-0.531)	0.580 (0.480-0.709)	0.779 (0.642-0.954)	0.945 (0.773-1.17)	1.18 (0.934-1.51)	1.37 (1.06-1.79)	1.57 (1.18-2.09)	1.77 (1.30-2.44)	2.06 (1.45-2.96)	2.29 (1.56-3.40)
3-hr	0.540 (0.446-0.659)	0.711 (0.588-0.870)	0.946 (0.779-1.16)	1.14 (0.935-1.41)	1.42 (1.13-1.82)	1.65 (1.28-2.15)	1.88 (1.42-2.52)	2.13 (1.57-2.94)	2.48 (1.75-3.56)	2.76 (1.88-4.10)
6-hr	0.753 (0.623-0.919)	0.984 (0.813-1.20)	1.30 (1.07-1.59)	1.57 (1.28-1.94)	1.95 (1.54-2.49)	2.25 (1.74-2.94)	2.57 (1.94-3.44)	2.92 (2.14-4.01)	3.40 (2.39-4.87)	3.78 (2.58-5.62)
12-hr	0.975 (0.807-1.19)	1.30 (1.08-1.59)	1.75 (1.44-2.14)	2.12 (1.74-2.62)	2.65 (2.10-3.39)	3.08 (2.38-4.01)	3.52 (2.66-4.70)	3.99 (2.93-5.48)	4.64 (3.27-6.66)	5.17 (3.52-7.68)
24-hr	1.30 (1.16-1.50)	1.80 (1.59-2.07)	2.46 (2.17-2.84)	3.01 (2.64-3.51)	3.79 (3.21-4.57)	4.41 (3.66-5.42)	5.06 (4.10-6.37)	5.74 (4.53-7.44)	6.71 (5.07-9.05)	7.48 (5.46-10.4)
2-day	1.51 (1.34-1.74)	2.10 (1.86-2.42)	2.90 (2.56-3.35)	3.58 (3.14-4.17)	4.54 (3.85-5.47)	5.31 (4.41-6.53)	6.12 (4.96-7.71)	6.99 (5.51-9.05)	8.22 (6.21-11.1)	9.21 (6.73-12.9)
3-day	1.62 (1.44-1.86)	2.26 (2.00-2.61)	3.15 (2.78-3.64)	3.91 (3.42-4.55)	4.98 (4.22-6.00)	5.84 (4.85-7.18)	6.76 (5.47-8.51)	7.74 (6.10-10.0)	9.14 (6.91-12.3)	10.3 (7.52-14.4)
4-day	1.74 (1.54-2.00)	2.43 (2.15-2.80)	3.40 (3.00-3.93)	4.22 (3.70-4.92)	5.38 (4.56-6.48)	6.33 (5.25-7.78)	7.33 (5.93-9.23)	8.40 (6.62-10.9)	9.94 (7.52-13.4)	11.2 (8.18-15.6)
7-day	1.93 (1.71-2.22)	2.70 (2.39-3.11)	3.76 (3.32-4.35)	4.67 (4.09-5.44)	5.97 (5.06-7.19)	7.01 (5.82-8.62)	8.12 (6.58-10.2)	9.30 (7.33-12.0)	11.0 (8.32-14.8)	12.4 (9.04-17.3)
10-day	2.06 (1.82-2.37)	2.88 (2.55-3.32)	4.02 (3.54-4.64)	4.98 (4.36-5.81)	6.37 (5.40-7.67)	7.48 (6.21-9.20)	8.66 (7.02-10.9)	9.93 (7.82-12.9)	11.7 (8.88-15.8)	13.2 (9.65-18.4)
20-day	2.44 (2.16-2.81)	3.43 (3.04-3.96)	4.82 (4.25-5.57)	6.00 (5.25-6.99)	7.70 (6.52-9.27)	9.07 (7.53-11.2)	10.5 (8.52-13.3)	12.1 (9.52-15.6)	14.3 (10.8-19.3)	16.1 (11.8-22.5)
30-day	2.84 (2.52-3.27)	3.99 (3.54-4.60)	5.61 (4.95-6.48)	6.99 (6.12-8.15)	8.99 (7.62-10.8)	10.6 (8.81-13.0)	12.3 (9.99-15.5)	14.2 (11.2-18.4)	16.8 (12.7-22.7)	18.9 (13.8-26.4)
45-day	3.36 (2.98-3.87)	4.70 (4.16-5.42)	6.59 (5.82-7.61)	8.22 (7.20-9.57)	10.6 (8.96-12.7)	12.5 (10.4-15.4)	14.6 (11.8-18.3)	16.8 (13.2-21.7)	19.9 (15.1-26.9)	22.5 (16.4-31.4)
60-day	3.81 (3.38-4.38)	5.27 (4.66-6.07)	7.33 (6.47-8.47)	9.12 (7.99-10.6)	11.7 (9.93-14.1)	13.9 (11.5-17.0)	16.1 (13.1-20.3)	18.6 (14.7-24.1)	22.1 (16.7-29.9)	25.0 (18.3-35.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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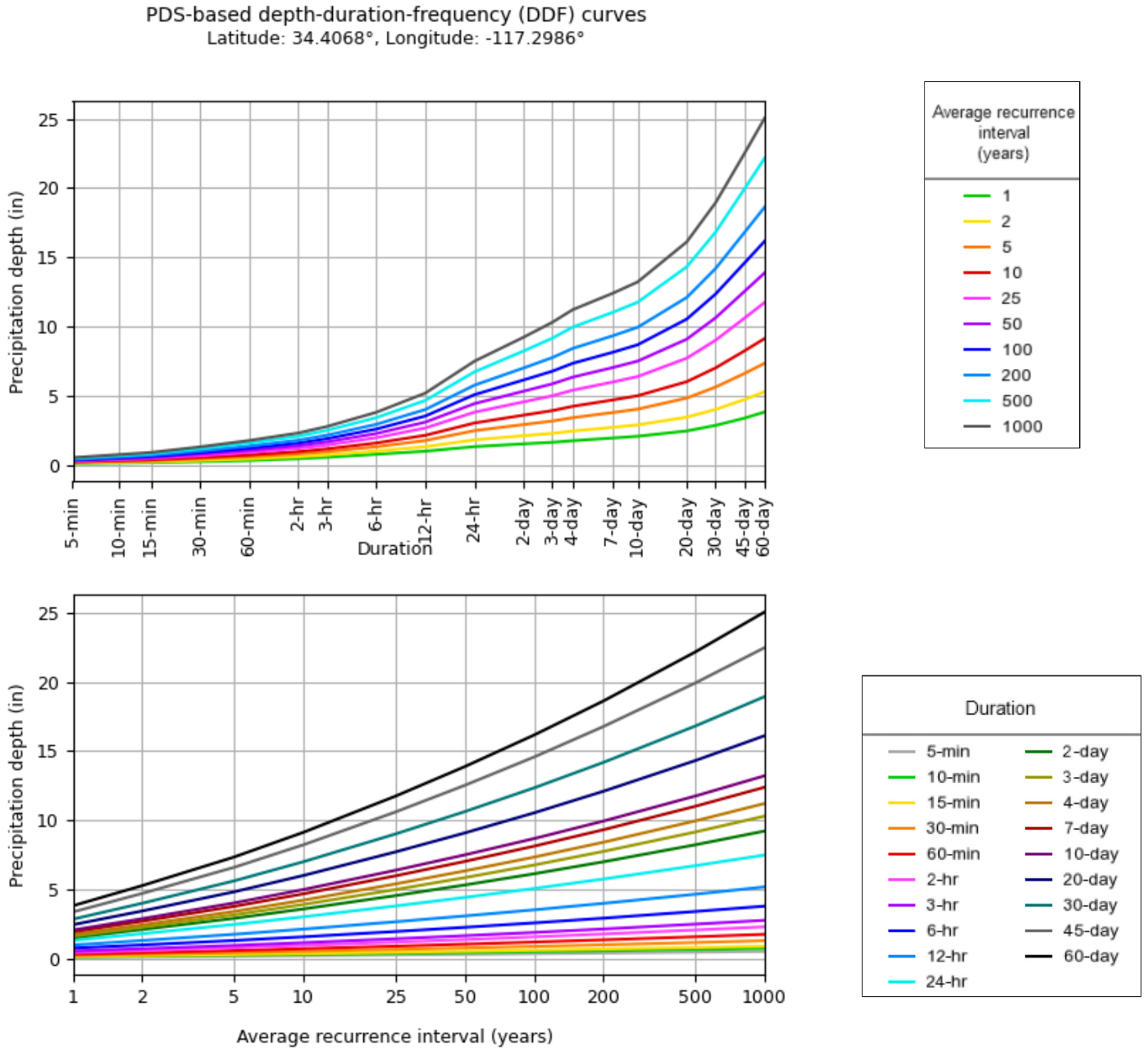
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Mon Dec 11 21:16:25 2023

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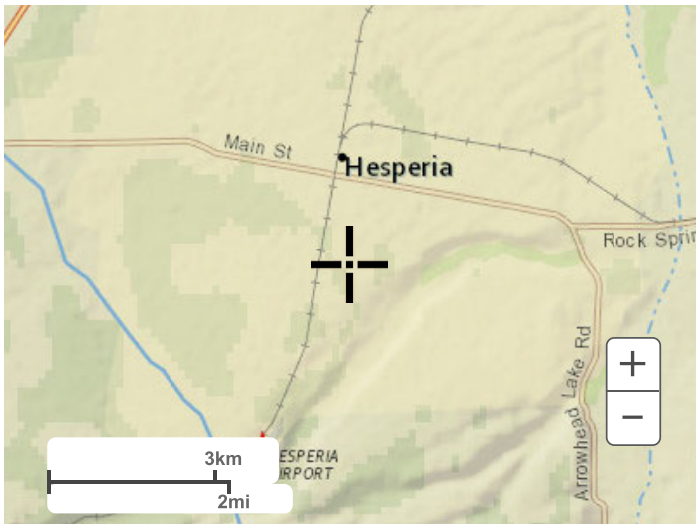
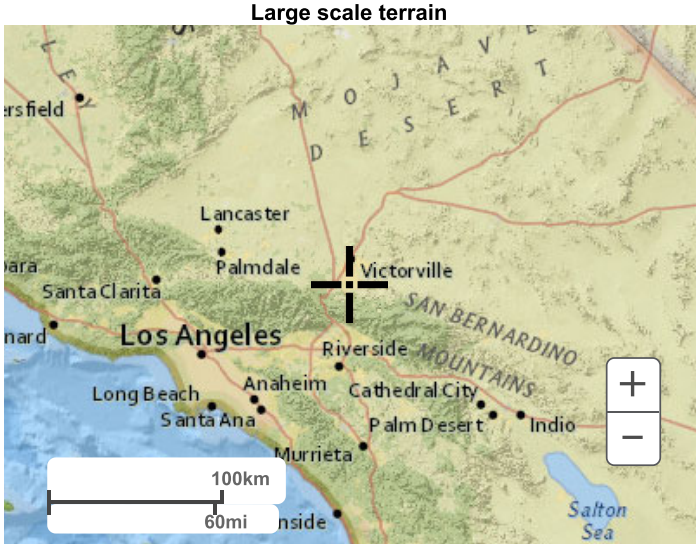
Maps & aerials

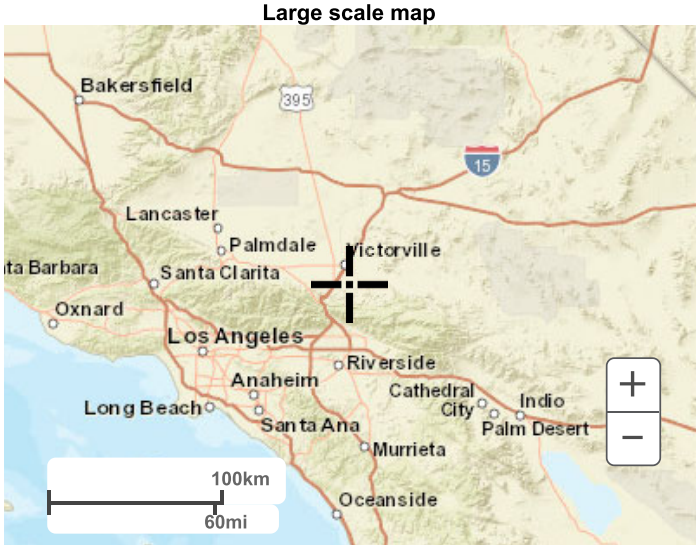
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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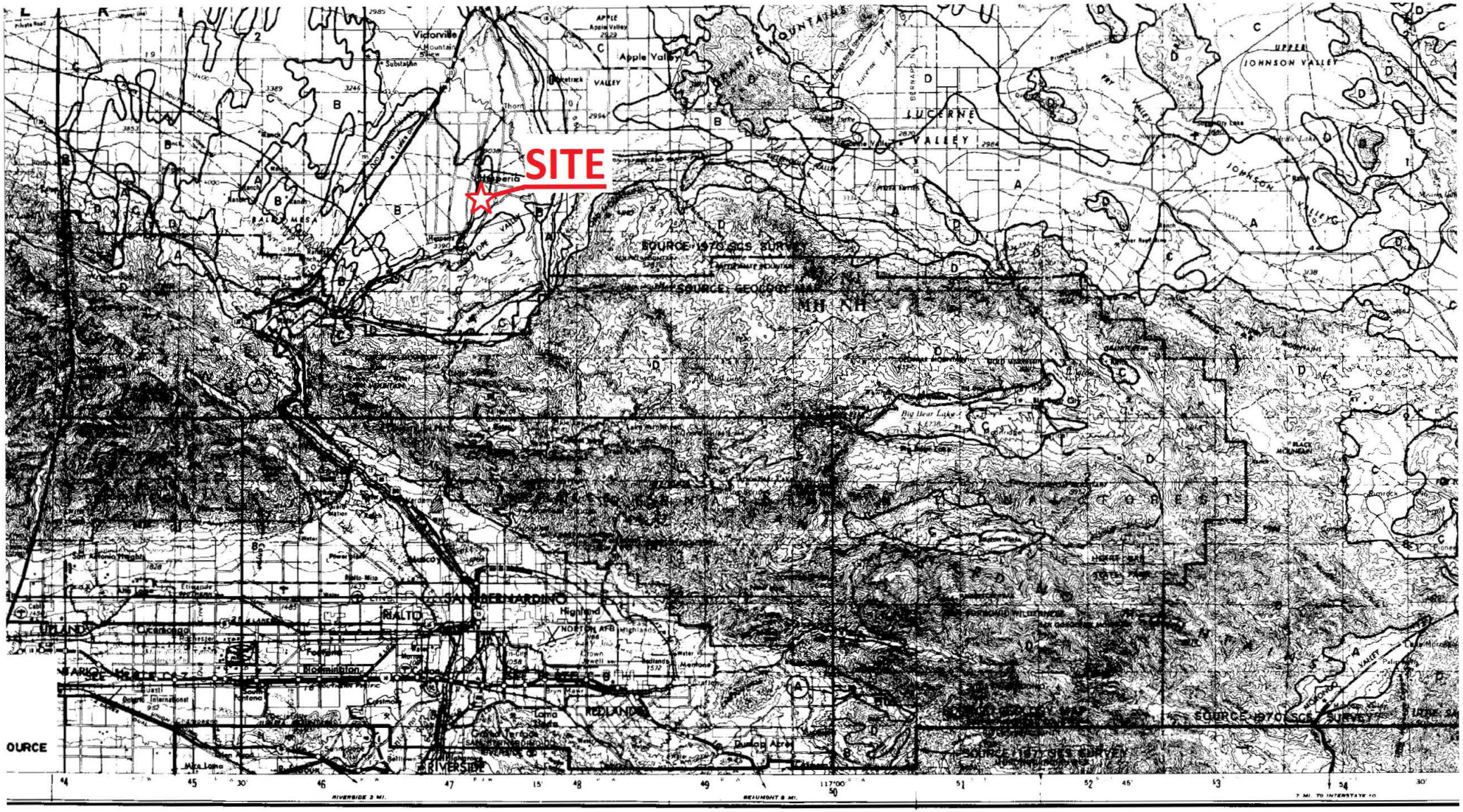
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer



Scale 1:250,000

5 0 5 10 15 20 Statute Miles

5 0 5 10 15 20 25 30 Kilometers

5 0 5 10 15 Nautical Miles

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

TRANSVERSE MERCATOR PROJECTION

BLACK NUMBERED LINES INDICATE THE 10,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 11

1985 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 15½° (280 MILS) EASTERLY FOR THE CENTER OF THE WEST EDGE TO 15° (270 MILS) EASTERLY FOR THE CENTER OF THE EAST EDGE

BASE MAP REPRODUCED FROM U.S.G.S. "SAN BERNARDINO" TOPOGRAPHIC MAP

SCALE REDUCED BY 1/2

LOCATION DIAGRAM

HYDROLOGIC SOILS GROUP MAP FOR SOUTHCENTRAL AREA

FIGURE C-11