APPENDIX E

HYDROLOGY AND DRAINAGE STUDY

PRELIMINARY DRAINAGE STUDY

PREPARED FOR:

ISO SELF-STORAGE

7886 SHAFTER AVENUE

A.P.N. 0585-273-04

CITY YUCCA VALLEY
UNINCORPORATED AREA OF
COUNTY OF SAN BERNARDINO

PREPARED BY:

SITETECH, INC.
8061 CHURCH STREET
HIGHLAND CA 92346
PO BOX 592
PH. (909) 864-3180

BERNHARD K. MAYER R.C.E. 36866

07/27/2023
DATE

SUMMARY

INTRODUCTION

The project is a new commercial development on a vacant 5.74 acre site located on a in the City of Yucca Valley, being in an unincorporated area of the County of San Bernardino. A self-storage facility is proposed which includes concrete drive aisles, planters and a trash enclosure. The purpose of this study is to determine the rate of storm water runoff which will flow through the property during a 100-Year storm event and determine any mitigations which are necessary to protect the proposed development during a 100-Year Storm.

WATERSHED DESCRIPTION

In its existing condition there is a hill near the center of the lot. Runoff sheet flows in every direction from the top of the hill. This study will focus on the runoff that sheet flows north and north westerly. There are no defined drainage courses on-site or off-site.

The proposed condition will have the storage facility at the base of the hill on the northerly side of the hill. Runoff from the storage facility will be conveyed to a series of concrete gutters which will convey the runoff west then southerly to a retention basin. The proposed basin will mitigate the difference in runoff before it outlets in the same location as the existing condition.

METHODOLOGY - Rational Method

The following scenario was modeled: 100-year storm Existing Condition
100-year storm Proposed Condition

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.

The curve number used in this analysis was based on the software input of the soil type, land cover and AMC value. We used soil type B found in the hydrology manual figure C-11, a land cover of desert brush with 10% coverage, and an AMC value III, based on the 100 year storm saturation. The AES software came up with a curve number of 96.

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:

EXISTING RUNOFF:

Q100 = 34.52 C.F.S.

PROPOSED RUNOFF:

Q100 = 35.74 C.F.S.

RUNOFF MITIGATION:

35.78 C.F.S. - 34.52 C.F.S. = 1.26 C.F.S

RETENTION BASIN SIZE = 4,841

DIFFERENCE OF 1.22 C.F.S. OVER A 1 HR STORM=

1.22X60 SEC.X60 MIN. = 4,392 FT3 < 4,841 = OK

DRAINAGE MAP

IN THE COUNTY OF SAN BERNARDINIO

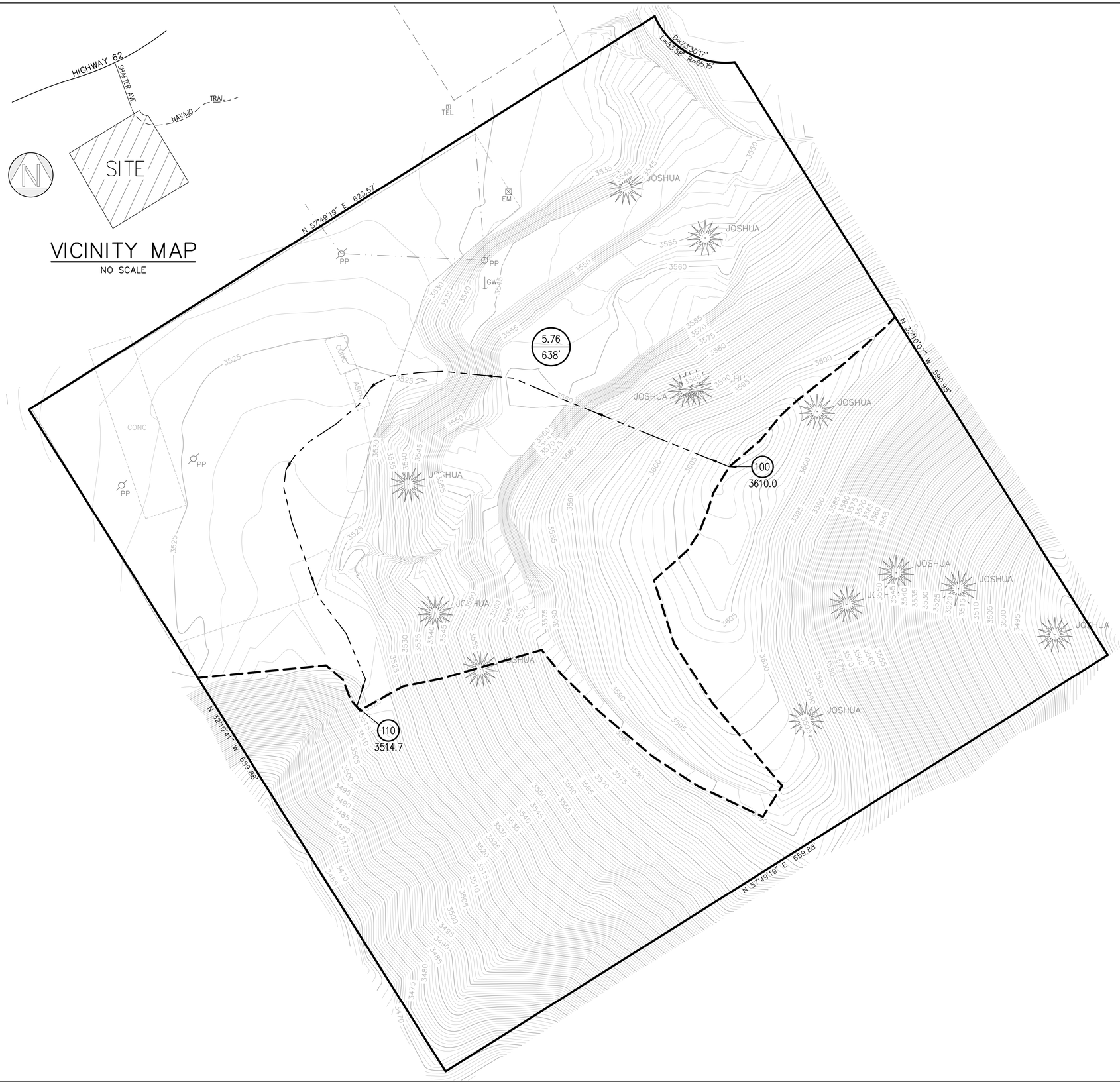
DRAINAGE MAP
EXISTING CONDITION
ISO SELF-STORAGE

PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 5 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

SITETECH, INC.

JULY, 2023

VICINITY MAP
NO SCALE



N

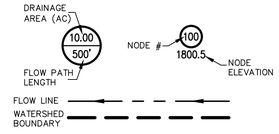
SCALE: 1"=40'

40 0 40 80

OWNER:
JAY LOCH
PO BOX 3398
LANDERS, CA 92285
PH: 208-800-2058

APPLICANT:
ETHAN RAMBERG
RAMBERGWEST, INC.
53 SANSOVINO
LADERA RANCH, CA 92694
PH: 253-640-6222
EMAIL: ETHAN.RAMBERG@GMAIL.COM

DRAINAGE LEGEND:



FLOW PROCESS CHART:

FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 100 YR/1 HR
100	110	3610.0	3514.7	34.52

A.P.N.: 0585-273-04

REGISTERED PROFESSIONAL ENGINEER
BERNHARD K. MAYER
NO. 36866
Exp. 6-30-24
CIVIL
STATE OF CALIFORNIA

SITETECH INC.
8061 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909)864-3180, FAX: (909)864-0850

07/27/2023

BERNHARD K. MAYER R.C.E. 36866 L.S. 7319 DATE

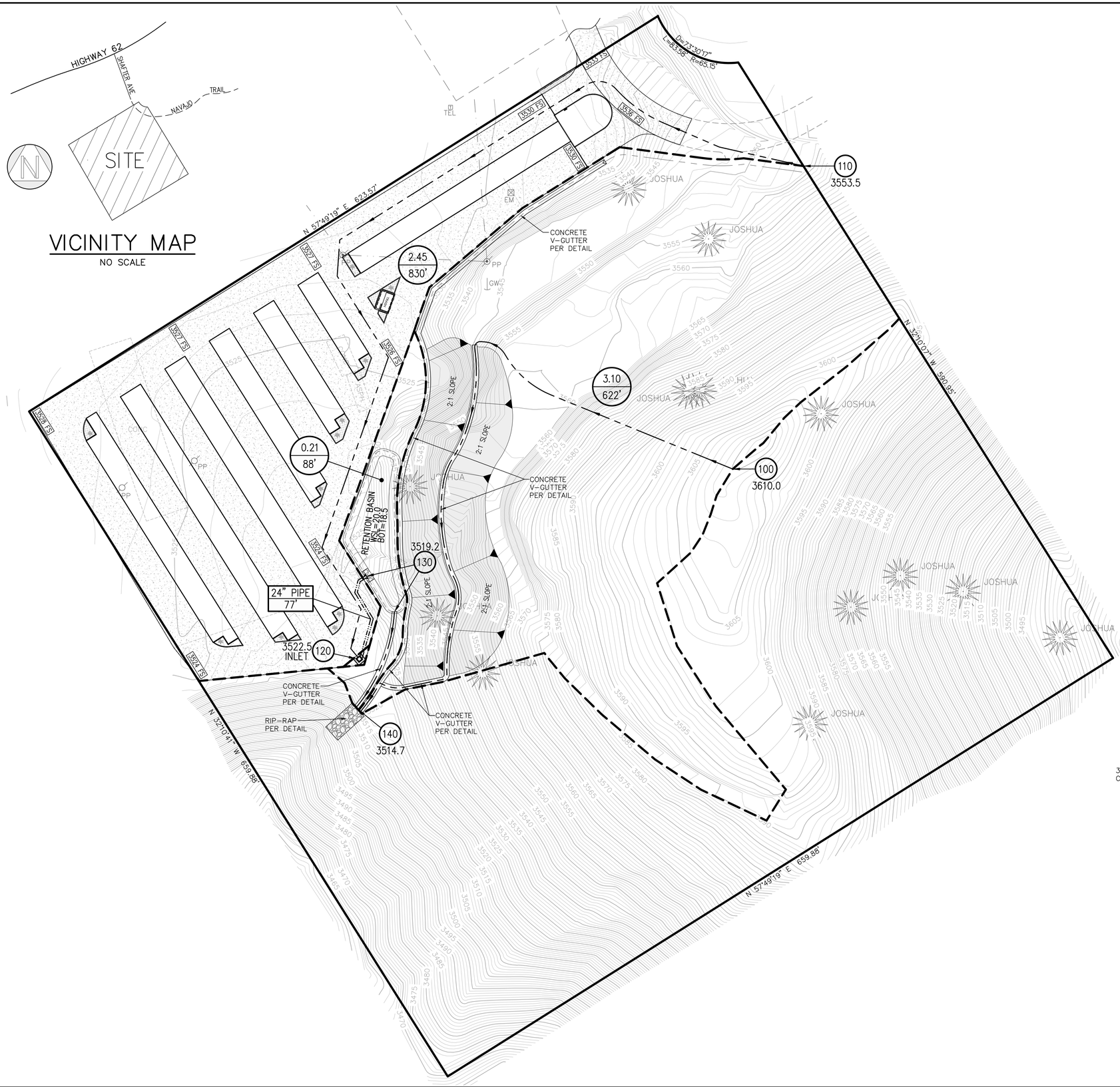
IN THE COUNTY OF SAN BERNARDINIO

DRAINAGE MAP
PROPOSED CONDITION
ISO SELF-STORAGE

PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 5 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

SITETECH, INC.

JULY, 2023



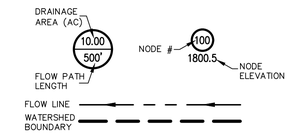
OWNER:
JAY LOCH
PO BOX 3398
LANDERS, CA 92285
PH: 208-800-2058

APPLICANT:
ETHAN RAMBERG
RAMBERGWEST, INC.
53 SANSOVINO
LADERA RANCH, CA 92694
PH: 253-640-6222
EMAIL: ETHAN.RAMBERG@GMAIL.COM

SCALE: 1"=40'

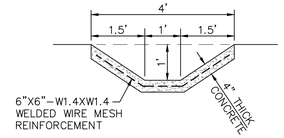
40 0 40 80

DRAINAGE LEGEND:

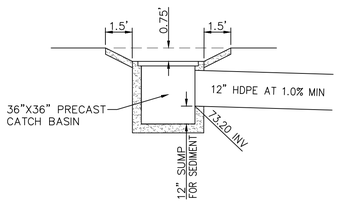


FLOW PROCESS CHART:

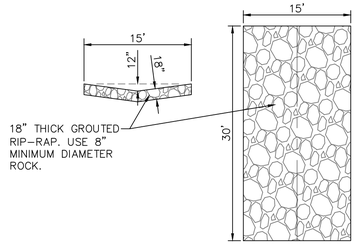
FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 100 YR/1 HR
100	140	3610.0	3514.7	18.78
110	120	3553.5	3522.5	16.58
120	130	3520.0	3519.2	16.58
130	140	3519.2	3514.7	17.59
140	140	3514.7	3514.7	35.74



V-GUTTER DETAIL
SCALE: 1"=2'



CATCH BASIN INLET DETAIL
SCALE: 1"=4'



RIP-RAP DETAIL
SCALE: 1"=10'

A.P.N.: 0585-273-04

REGISTERED PROFESSIONAL ENGINEER
BERNHARD K. MAYER
NO. 36866
Exp. 6-30-24
CIVIL
STATE OF CALIFORNIA

SITETECH INC.
8061 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909)864-3180, FAX: (909)864-0850

07/27/2023

BERNHARD K. MAYER R.C.E. 36866 L.S. 7319 DATE

HYDROLOGY

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
        (c) Copyright 1983-2016 Advanced Engineering Software (aes)
            Ver. 23.0  Release Date: 07/01/2016  License ID 1524

                          Analysis prepared by:

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

 ************************** DESCRIPTION OF STUDY **************************
* 100 YEAR - 1 HOUR DESIGN STORM                                          *
* ISO SELF-STORAGE                                                        *
* EXISTING CONDITION                                                      *
 ************************************************************************

  FILE NAME: RAM100E.DAT
  TIME/DATE OF STUDY: 10:44 07/25/2023
========================================================================
  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 = 0.96
  *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) = 1.9400

  *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) =   638.00
  ELEVATION DATA: UPSTREAM(FEET) =   3610.00  DOWNSTREAM(FEET) =   3514.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.168
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.721
  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.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (25.0%)   D        5.76      0.06     1.000    98   10.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.06
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     34.52
  TOTAL AREA(ACRES) =      5.76   PEAK FLOW RATE(CFS) =     34.52
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.8  TC(MIN.) =     10.17
  EFFECTIVE AREA(ACRES) =      5.76  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.06  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      34.52
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1524

                              Analysis prepared by:

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

  ************************** DESCRIPTION OF STUDY **************************
 * 100 YEAR - 1 HOUR DESIGN STORM                                         *
 * ISO SELF STORAGE                                                       *
 * PROPOSED CONDITION                                                     *
  ************************************************************************

   FILE NAME: RAM100P.DAT
   TIME/DATE OF STUDY: 09:37 07/27/2023
 ========================================================================
   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) = 1.9400

   *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    140.00 IS CODE =  21
 ------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  ELEVATION DATA: UPSTREAM(FEET) =   3610.00  DOWNSTREAM(FEET) =   3514.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.014
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.793
  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.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (25.0%)   D        3.10      0.06     1.000    98   10.01
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.06
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     18.78
  TOTAL AREA(ACRES) =      3.10   PEAK FLOW RATE(CFS) =     18.78

********************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 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.) =   10.01
  RAINFALL INTENSITY(INCH/HR) =   6.79
  AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.06
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       3.10
  TOTAL STREAM AREA(ACRES) =       3.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.78

********************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   830.00
  ELEVATION DATA: UPSTREAM(FEET) =   3553.50  DOWNSTREAM(FEET) =   3522.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.631
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.538
  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.)
  COMMERCIAL                 D        2.45      0.21     0.100    91    8.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     16.58
  TOTAL AREA(ACRES) =      2.45   PEAK FLOW RATE(CFS) =     16.58

********************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3520.00  DOWNSTREAM(FEET) =  3519.20
  FLOW LENGTH(FEET) =    77.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.82
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.58
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    8.79
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =     907.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3519.20  DOWNSTREAM(FEET) =   3514.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    88.00   CHANNEL SLOPE =  0.0511
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.370
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    D        0.21      0.05     1.000    98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.05
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.26
  AVERAGE FLOW DEPTH(FEET) =   0.69   TRAVEL TIME(MIN.) =   0.12
  Tc(MIN.) =    8.91
  SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    1.38
  EFFECTIVE AREA(ACRES) =      2.66     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.13  AREA-AVERAGED Ap =   0.17
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =      17.59

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.70   FLOW VELOCITY(FEET/SEC.) =  12.28
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    140.00 =     995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 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.) =    8.91
  RAINFALL INTENSITY(INCH/HR) =   7.37
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.13
  AREA-AVERAGED Ap =  0.17
```

```
 EFFECTIVE STREAM AREA(ACRES) =       2.66
 TOTAL STREAM AREA(ACRES) =       2.66
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.59

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       18.78   10.01    6.793  0.06( 0.06) 1.00       3.1     100.00
     2       17.59    8.91    7.370  0.13( 0.02) 0.17       2.7     110.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       35.74    8.91    7.370  0.07( 0.04) 0.59       5.4     110.00
     2       34.99   10.01    6.793  0.07( 0.04) 0.62       5.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      35.74    Tc(MIN.) =     8.91
 EFFECTIVE AREA(ACRES) =       5.42   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.07  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        5.8
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    140.00 =     995.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        5.8  TC(MIN.) =      8.91
 EFFECTIVE AREA(ACRES) =      5.42  AREA-AVERAGED Fm(INCH/HR)=  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.07  AREA-AVERAGED Ap = 0.593
 PEAK FLOW RATE(CFS)   =      35.74

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       35.74    8.91    7.370  0.07( 0.04) 0.59       5.4     110.00
     2       34.99   10.01    6.793  0.07( 0.04) 0.62       5.8     100.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

HYDRAULIC CALCULATIONS

Inlet Report

36IN X 36IN CATCH BASIN WITH 0.6FT SAG (NODE 120)

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 9.00
Grate Width (ft)	= 3.00
Grate Length (ft)	= 3.00

Gutter

Slope, Sw (ft/ft)	= 0.500
Slope, Sx (ft/ft)	= 0.500
Local Depr (in)	= -0-
Gutter Width (ft)	= 3.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

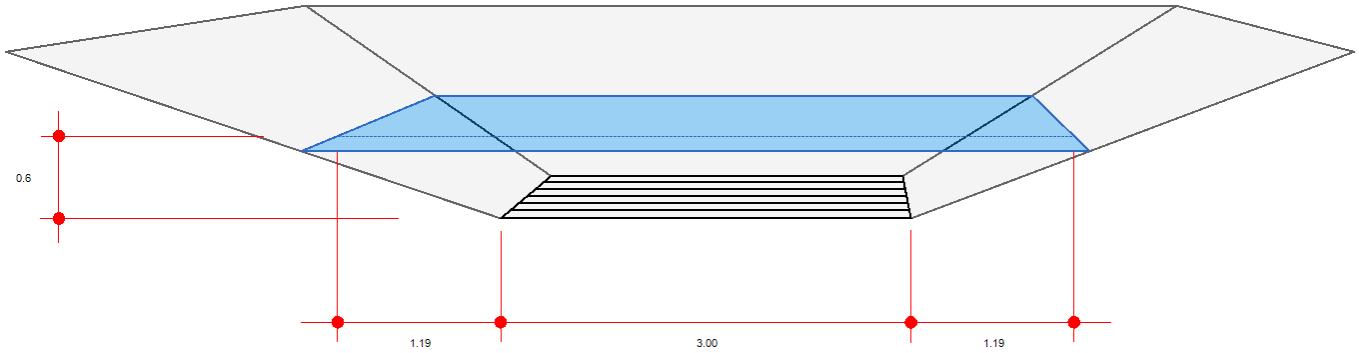
Calculations

Compute by:	Known Q
Q (cfs)	= 16.58

Highlighted

Q Total (cfs)	= 16.58
Q Capt (cfs)	= 16.58
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.15
Efficiency (%)	= 100
Gutter Spread (ft)	= 5.38
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jul 27 2023

24IN HDPE @ 1.0% (NODE 120-130)

Circular

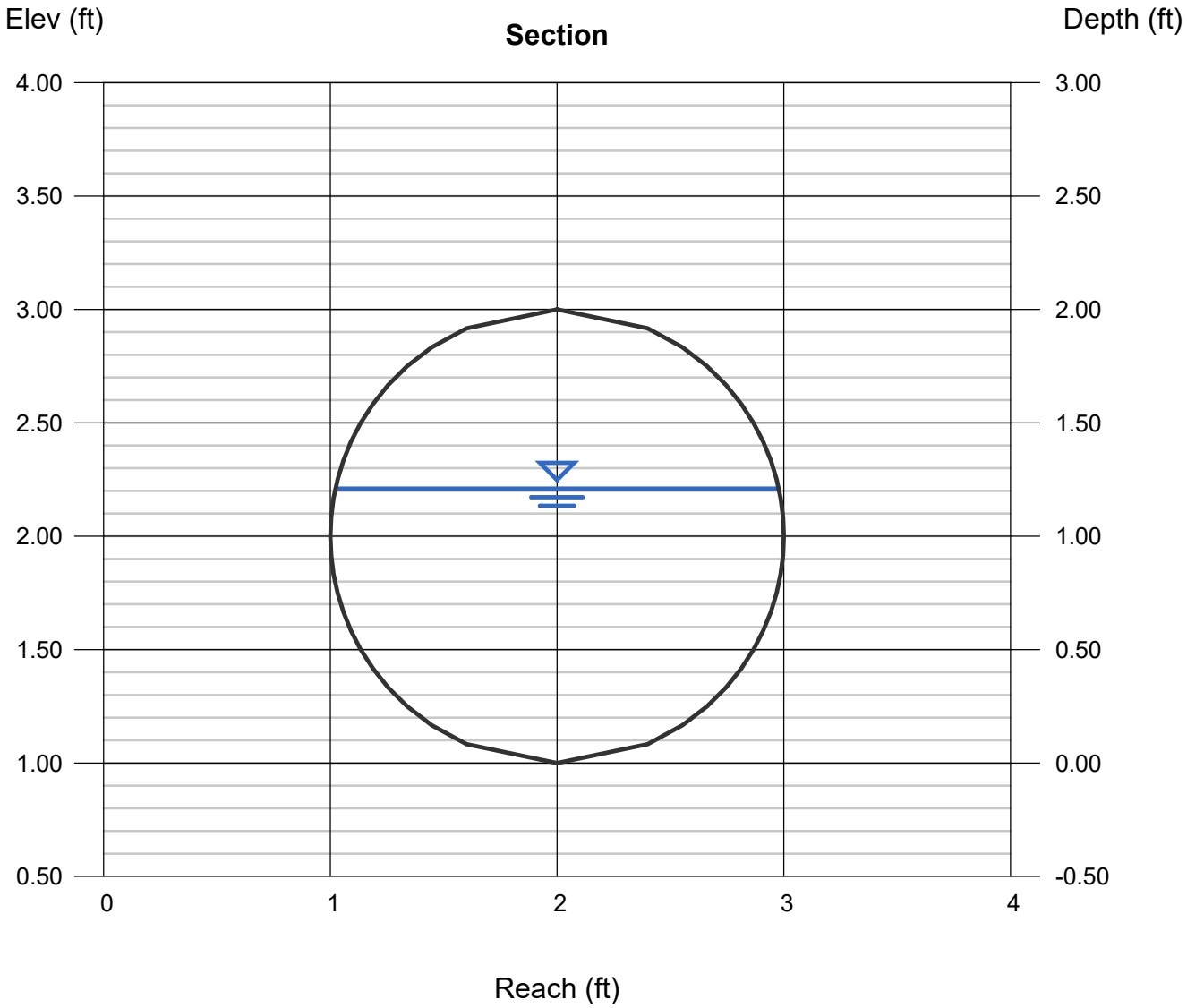
Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 16.58

Highlighted

Depth (ft)	= 1.21
Q (cfs)	= 16.58
Area (sqft)	= 1.99
Velocity (ft/s)	= 8.32
Wetted Perim (ft)	= 3.57
Crit Depth, Yc (ft)	= 1.47
Top Width (ft)	= 1.95
EGL (ft)	= 2.29



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 18 2023

4FT WIDE X 12IN DEEP CONCRETE V-GUTTER AT 1.5% MIN. GRADE (NODE 100-130)

Trapezoidal

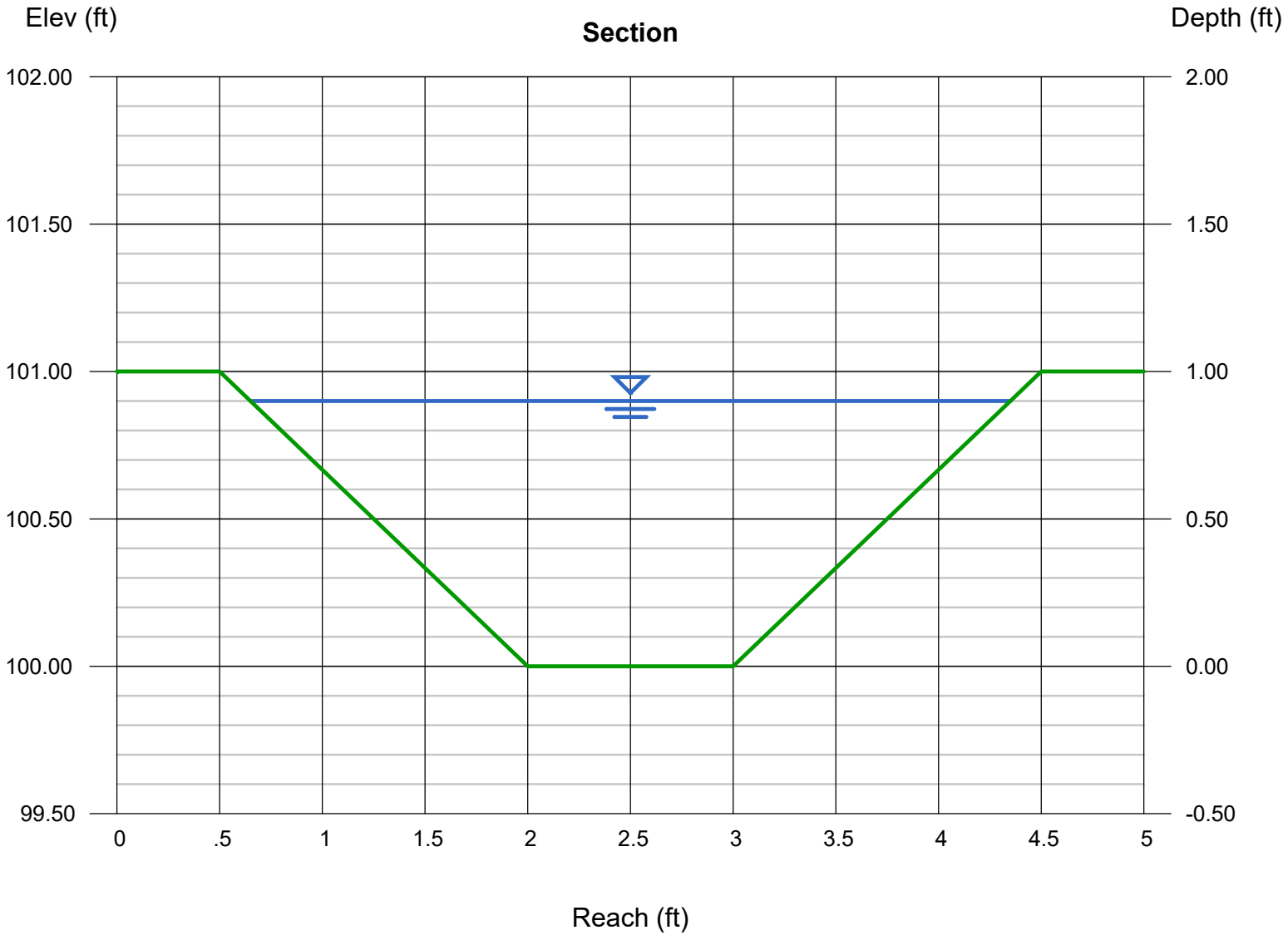
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 1.50, 1.50
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.90

Highlighted

Depth (ft)	= 0.90
Q (cfs)	= 18.60
Area (sqft)	= 2.12
Velocity (ft/s)	= 8.80
Wetted Perim (ft)	= 4.24
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 3.70
EGL (ft)	= 2.10



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jul 27 2023

4FT WIDE X 12IN DEEP CONCRETE V-GUTTER AT 2.0% MIN. GRADE (NODE 130-140)

Trapezoidal

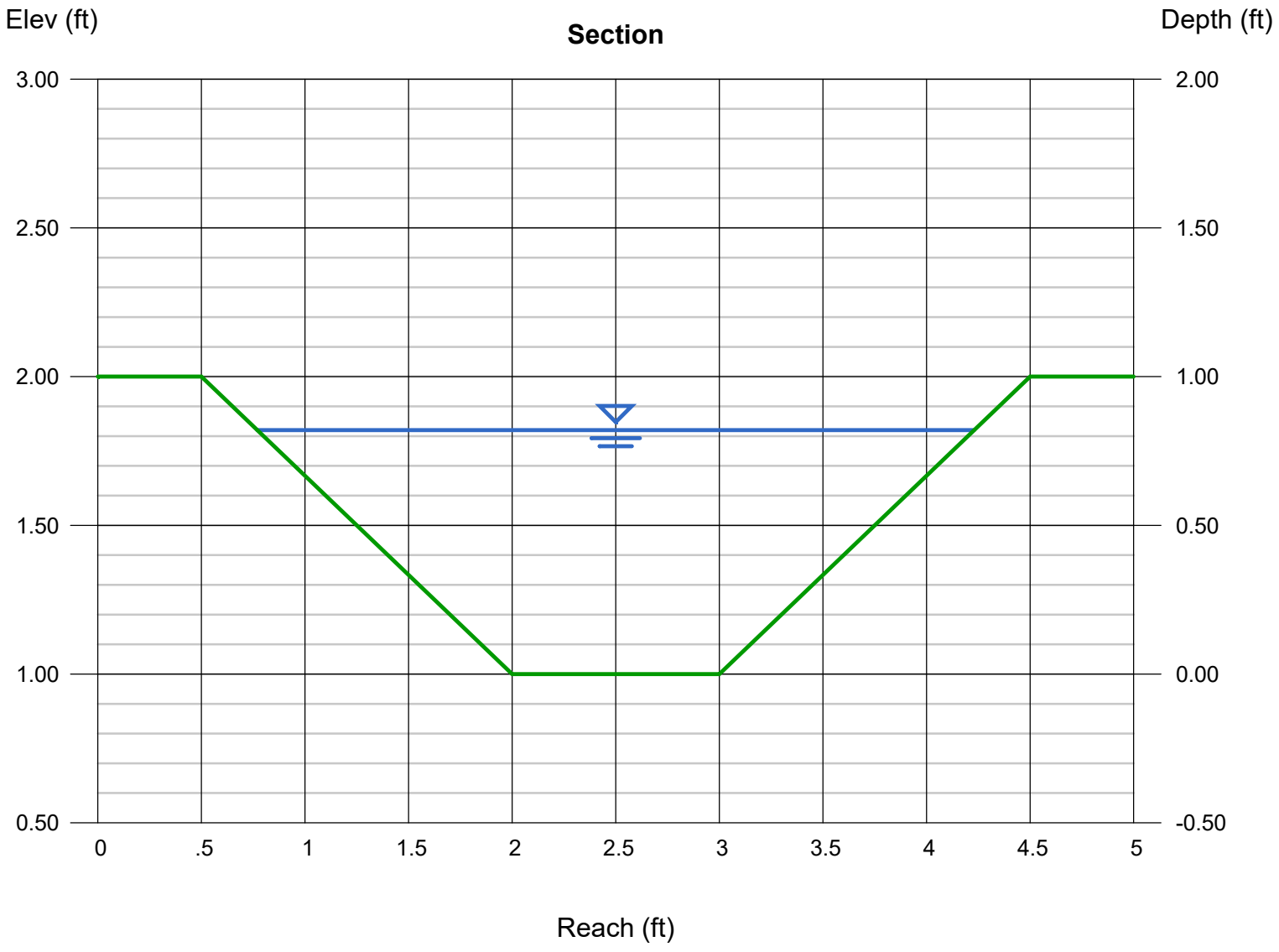
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 1.50, 1.50
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 17.59

Highlighted

Depth (ft)	= 0.82
Q (cfs)	= 17.59
Area (sqft)	= 1.83
Velocity (ft/s)	= 9.62
Wetted Perim (ft)	= 3.96
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 3.46
EGL (ft)	= 2.26



REFERENCE MAPS

NOAA Atlas 14, Volume 6, Version 2
Location name: Yucca Valley, California, USA*
Latitude: 34.108°, Longitude: -116.4775°
Elevation: m/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	**0.100** (0.083-0.122)	**0.145** (0.120-0.177)	**0.211** (0.174-0.258)	**0.270** (0.221-0.333)	**0.359** (0.285-0.458)	**0.436** (0.338-0.568)	**0.523** (0.396-0.698)	**0.621** (0.457-0.852)	**0.771** (0.545-1.10)	**0.907** (0.619-1.34)
10-min	**0.143** (0.119-0.175)	**0.208** (0.172-0.254)	**0.302** (0.250-0.370)	**0.387** (0.317-0.477)	**0.515** (0.408-0.657)	**0.626** (0.485-0.815)	**0.749** (0.567-1.00)	**0.890** (0.655-1.22)	**1.11** (0.781-1.58)	**1.30** (0.887-1.92)
15-min	**0.173** (0.144-0.211)	**0.252** (0.208-0.307)	**0.366** (0.302-0.447)	**0.468** (0.383-0.577)	**0.623** (0.493-0.795)	**0.756** (0.587-0.985)	**0.906** (0.686-1.21)	**1.08** (0.792-1.48)	**1.34** (0.944-1.91)	**1.57** (1.07-2.33)
30-min	**0.263** (0.218-0.320)	**0.381** (0.316-0.466)	**0.554** (0.457-0.678)	**0.709** (0.580-0.875)	**0.944** (0.748-1.20)	**1.15** (0.889-1.49)	**1.37** (1.04-1.83)	**1.63** (1.20-2.24)	**2.03** (1.43-2.90)	**2.38** (1.63-3.53)
60-min	**0.372** (0.308-0.453)	**0.540** (0.447-0.659)	**0.784** (0.647-0.959)	**1.00** (0.821-1.24)	**1.34** (1.06-1.70)	**1.62** (1.26-2.11)	**1.94** (1.47-2.59)	**2.31** (1.70-3.17)	**2.87** (2.02-4.10)	**3.37** (2.30-4.99)
2-hr	**0.514** (0.426-0.627)	**0.722** (0.598-0.881)	**1.02** (0.842-1.25)	**1.29** (1.05-1.59)	**1.68** (1.33-2.14)	**2.01** (1.56-2.62)	**2.38** (1.80-3.17)	**2.79** (2.05-3.83)	**3.40** (2.40-4.86)	**3.93** (2.68-5.82)
3-hr	**0.616** (0.510-0.751)	**0.856** (0.708-1.05)	**1.20** (0.989-1.47)	**1.50** (1.23-1.85)	**1.95** (1.54-2.48)	**2.32** (1.80-3.02)	**2.73** (2.07-3.64)	**3.19** (2.35-4.37)	**3.86** (2.73-5.53)	**4.44** (3.03-6.57)
6-hr	**0.823** (0.682-1.00)	**1.14** (0.940-1.39)	**1.58** (1.30-1.93)	**1.96** (1.60-2.42)	**2.52** (2.00-3.22)	**2.99** (2.32-3.89)	**3.50** (2.65-4.67)	**4.06** (2.99-5.57)	**4.88** (3.44-6.97)	**5.57** (3.80-8.24)
12-hr	**1.05** (0.871-1.28)	**1.46** (1.21-1.78)	**2.03** (1.67-2.48)	**2.52** (2.06-3.11)	**3.24** (2.57-4.13)	**3.83** (2.97-4.99)	**4.48** (3.39-5.97)	**5.18** (3.81-7.11)	**6.21** (4.39-8.89)	**7.08** (4.83-10.5)
24-hr	**1.34** (1.19-1.54)	**1.88** (1.67-2.17)	**2.64** (2.33-3.05)	**3.30** (2.89-3.85)	**4.27** (3.62-5.15)	**5.08** (4.22-6.24)	**5.95** (4.83-7.49)	**6.92** (5.46-8.94)	**8.33** (6.31-11.2)	**9.52** (6.97-13.3)
2-day	**1.53** (1.35-1.76)	**2.18** (1.93-2.52)	**3.11** (2.75-3.60)	**3.93** (3.44-4.58)	**5.15** (4.37-6.20)	**6.17** (5.13-7.59)	**7.29** (5.91-9.18)	**8.53** (6.73-11.0)	**10.4** (7.86-14.0)	**11.9** (8.75-16.6)
3-day	**1.65** (1.46-1.90)	**2.39** (2.11-2.75)	**3.44** (3.03-3.98)	**4.38** (3.83-5.10)	**5.78** (4.90-6.96)	**6.97** (5.79-8.57)	**8.29** (6.72-10.4)	**9.75** (7.70-12.6)	**11.9** (9.05-16.1)	**13.8** (10.1-19.3)
4-day	**1.73** (1.53-1.99)	**2.51** (2.22-2.90)	**3.64** (3.21-4.21)	**4.65** (4.07-5.42)	**6.17** (5.23-7.43)	**7.47** (6.20-9.18)	**8.90** (7.21-11.2)	**10.5** (8.29-13.6)	**12.9** (9.78-17.4)	**15.0** (11.0-20.9)
7-day	**1.92** (1.71-2.22)	**2.83** (2.51-3.27)	**4.14** (3.66-4.79)	**5.31** (4.65-6.19)	**7.07** (6.00-8.52)	**8.58** (7.12-10.5)	**10.2** (8.31-12.9)	**12.1** (9.56-15.7)	**14.9** (11.3-20.1)	**17.4** (12.7-24.2)
10-day	**2.07** (1.83-2.38)	**3.06** (2.71-3.53)	**4.48** (3.96-5.18)	**5.75** (5.04-6.71)	**7.66** (6.50-9.23)	**9.29** (7.72-11.4)	**11.1** (9.00-14.0)	**13.1** (10.4-17.0)	**16.2** (12.3-21.8)	**18.8** (13.8-26.2)
20-day	**2.36** (2.09-2.72)	**3.50** (3.10-4.04)	**5.12** (4.52-5.92)	**6.56** (5.74-7.64)	**8.70** (7.37-10.5)	**10.5** (8.73-12.9)	**12.5** (10.2-15.8)	**14.8** (11.7-19.1)	**18.2** (13.8-24.5)	**21.2** (15.5-29.5)
30-day	**2.68** (2.37-3.09)	**3.97** (3.51-4.58)	**5.78** (5.10-6.68)	**7.38** (6.46-8.60)	**9.74** (8.26-11.7)	**11.7** (9.75-14.4)	**14.0** (11.3-17.6)	**16.4** (13.0-21.3)	**20.2** (15.3-27.2)	**23.4** (17.1-32.6)
45-day	**3.14** (2.78-3.61)	**4.60** (4.07-5.31)	**6.65** (5.87-7.69)	**8.43** (7.38-9.82)	**11.0** (9.36-13.3)	**13.2** (11.0-16.3)	**15.6** (12.7-19.7)	**18.4** (14.5-23.7)	**22.4** (17.0-30.2)	**25.9** (19.0-36.1)
60-day	**3.59** (3.18-4.13)	**5.21** (4.61-6.01)	**7.46** (6.58-8.62)	**9.40** (8.23-11.0)	**12.2** (10.4-14.7)	**14.6** (12.1-17.9)	**17.2** (13.9-21.6)	**20.1** (15.8-26.0)	**24.4** (18.5-32.9)	**28.2** (20.6-39.2)

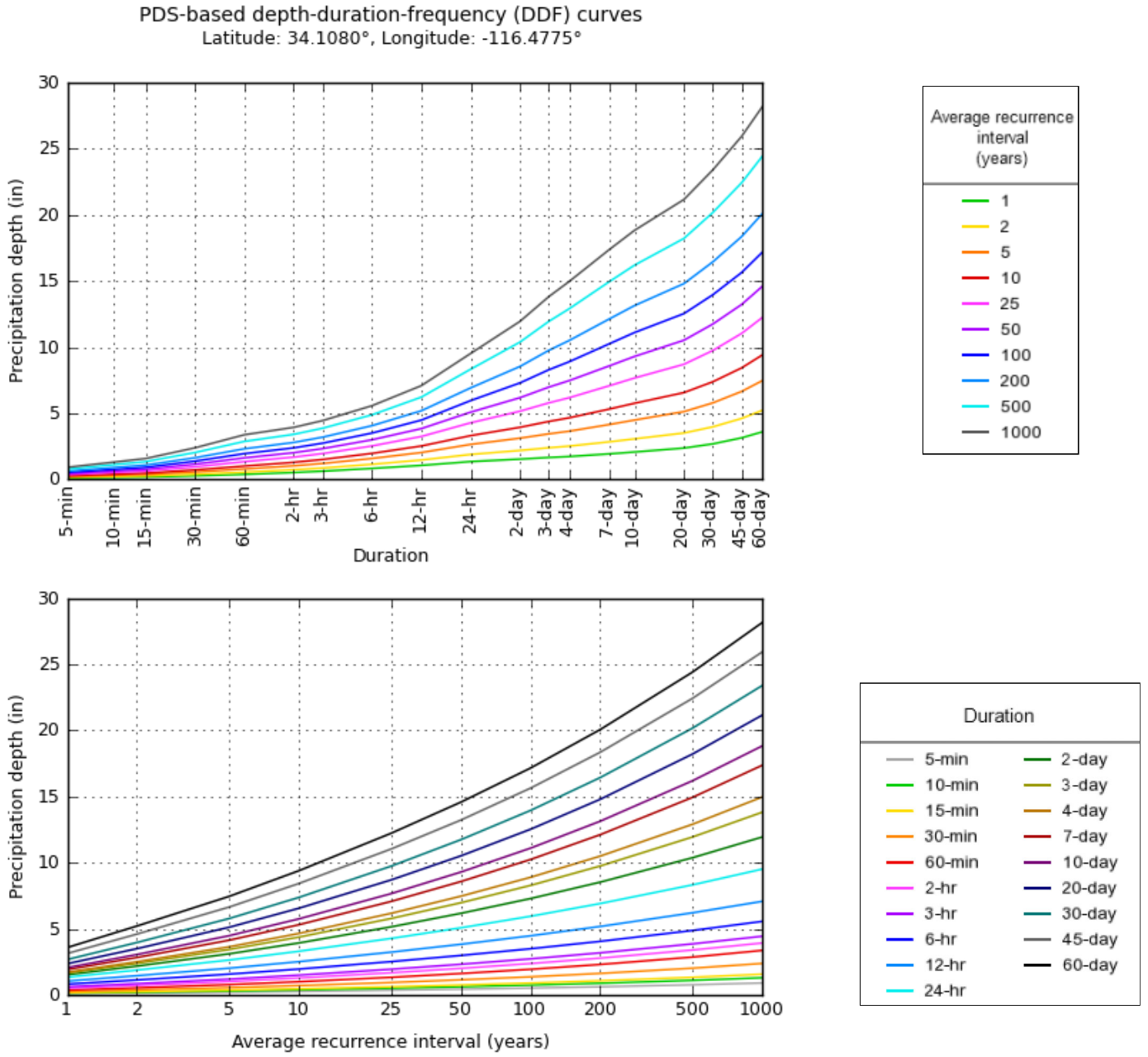
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



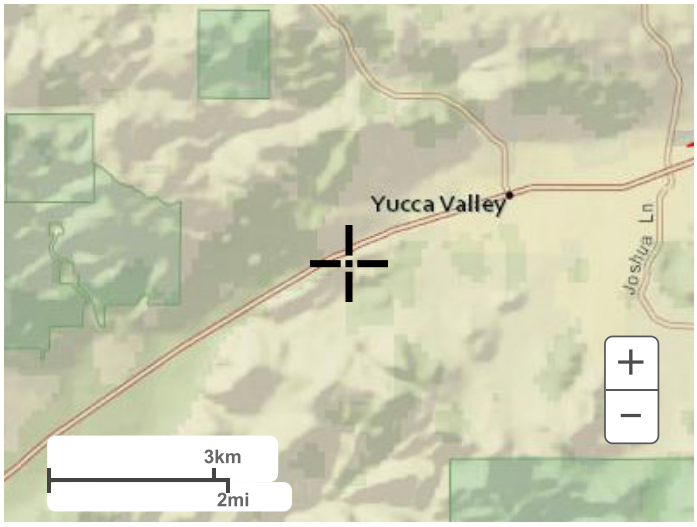
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu May 18 21:51:19 2023

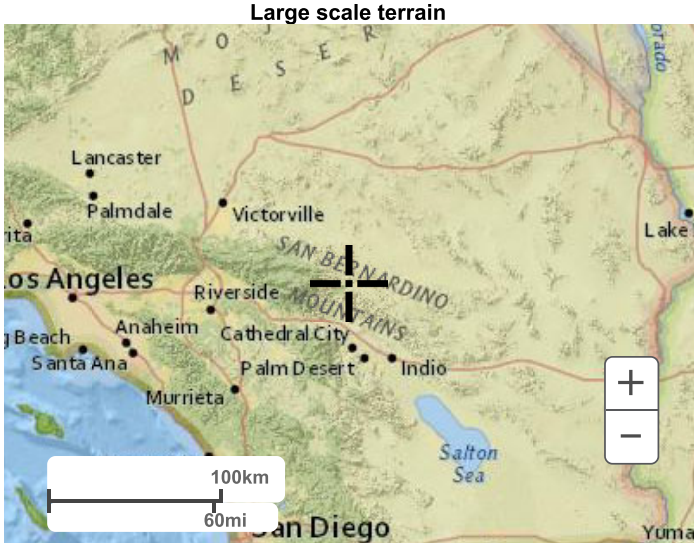
Back to Top

Maps & aerials

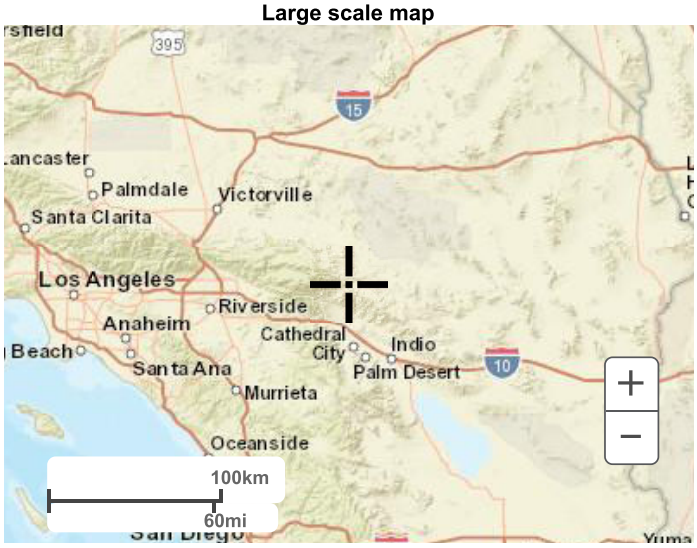
Small scale terrain



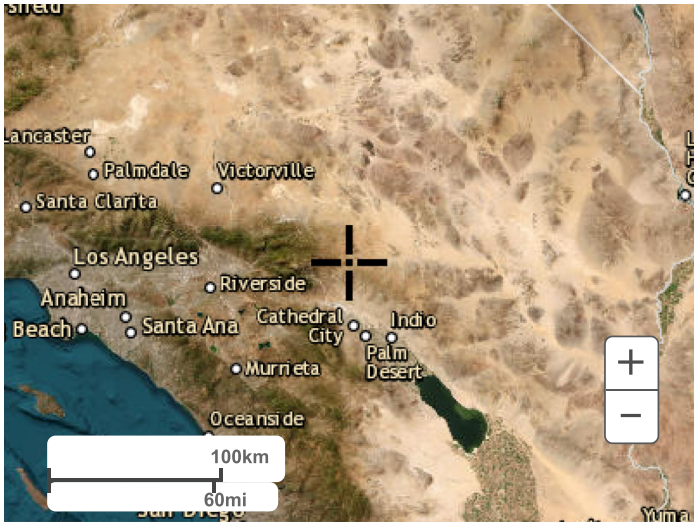
Large scale terrain



Large scale map



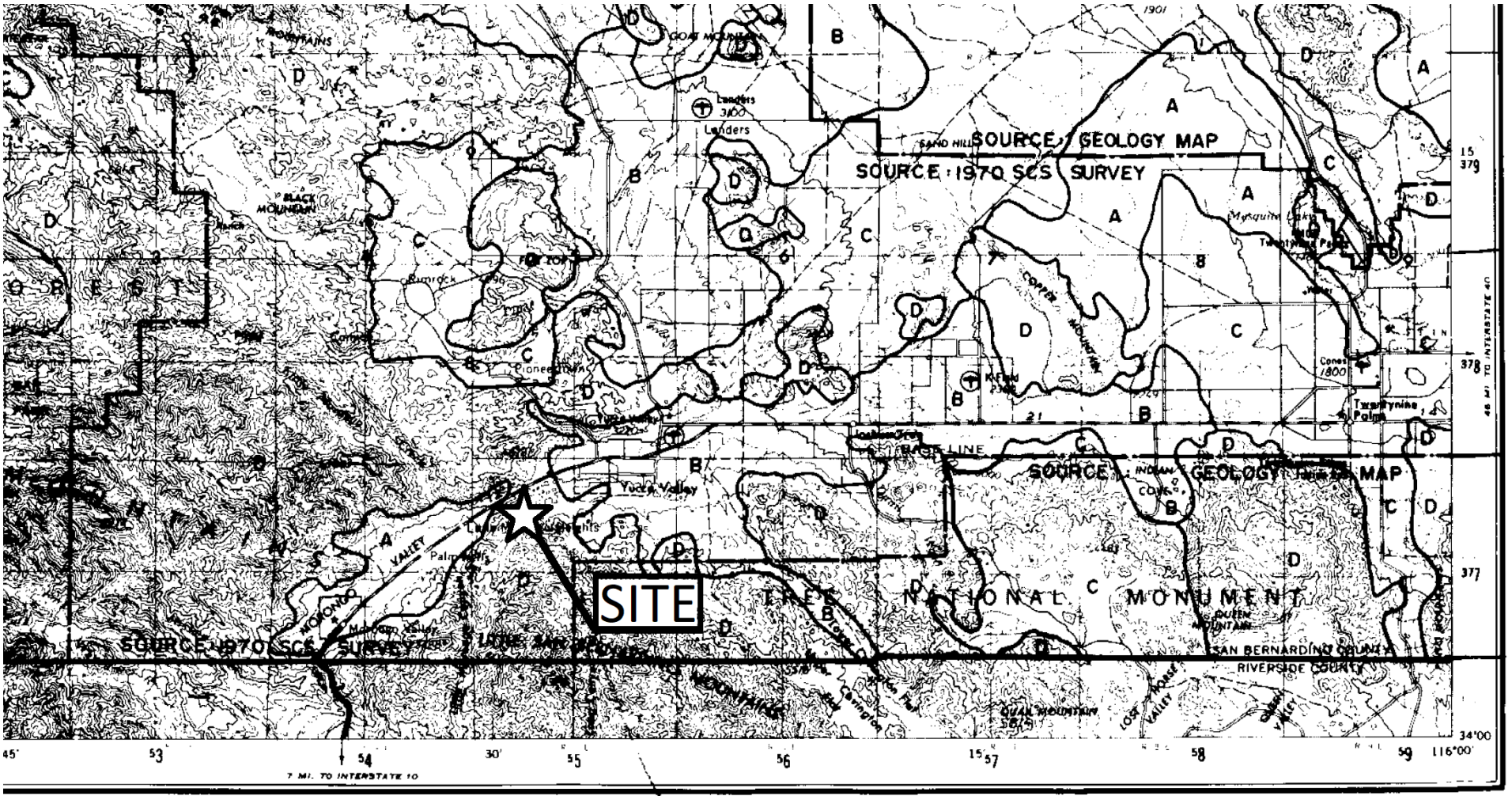
Large scale aerial



Back to Top

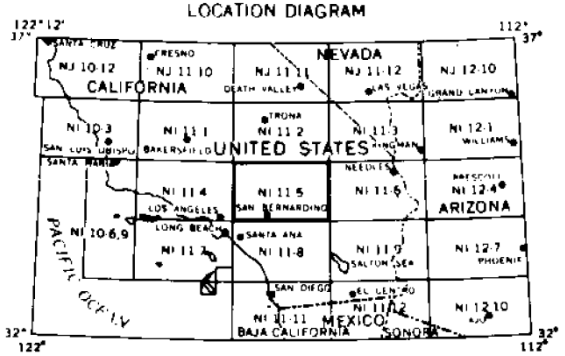
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer



Miles

LOCATION DIAGRAM



HYDROLOGIC SOILS GROUP MAP FOR SOUTHCENTRAL AREA

FIGURE C-11