Preliminary Hydrology Report

BIG BEAR RV PARK
A.P.N. 304-412-06
42144 N. SHORE DR., BIG BEAR CITY, CA

Prepared for:

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Discussion

Introduction

The project is located at 42144 N. Shore Drive, Big Bear, California. A.P.N. 0304-112-06 is a 4.6-acre lot. Currently, there is an RV and Mobil Park. that includes 25 RV sites. The site lies north of North Shore Dr., east of Lake View Trail, west of Lake View Lane and south of Lake View Trial on the City of Big Bear, County of San Bernardino.

The project proposes the construction of 32 new RV parking spaces including all the roadway necessary to access the new RV parking.

One of the new roads will cross and existing gully that runs from the north-west corner of the lot and runs along the west boundary of the property up to North Shore Drive.

A pipe will be design to carry the existing flows underneath the proposed road.

Purpose

The purpose of this drainage report is to determine the storm water runoff for the 10 year one hour and 100-year one hour storm. Detailed hydraulic calculations for the site will be shown on the Final Hydrology Report, but this Preliminary Hydrology Report includes the design of a 24" RCP that will be installed on the new area of the project. The predeveloped condition shows the current runoff pattern Nodes 10, 20, 30 and 40 receives the storm water runoff from off-site and on-site into the Gully.

Nodes 15, 25 and 35 receives the storm water runoff from off-site and on-site and it will run through the site and into North Shore Drive.

Criteria

The criteria utilized for hydrologic analysis is the San Bernardino County Hydrology Manual. CIVIL CAD and Civild and AES computer software were utilized to perform computations in accordance with San Bernardino County Flood Control policy.

Intensity Values

The rain intensity values for the site were obtained from the NOAA website using the values for the Big Bear Area.

Hydrologic Soil Group B was used for the Rational Method calculations.

Findings

The proposed 24" RCP was designed with the 100 year storm intensity (2.25") for the developed condition and the Bulk factor of 1.5 to the flow rate at the entrance of the pipe.

Results

The 10 & 100 year storm hydrologic calculation yielded the following results:

NODE	STORM	FLOW RATE		DIFFERENCE
		PRE-DEVELOPED	DEVELOPED	DEVELOPED - PREDEVELOPED
-	years	cfs	cfs	cfs
10	10	0	0	0
20	10	6.4	6.4	0
30	10	7.1	7.2	0.1
40	10	9.7	10	0.3
15	10	0	0	0
25	10	6.8	6.8	0
35	10	13.9	14.1	0.2

The biggest difference for the 10 year storm event will be 0.3 cfs at node 40

NODE	STORM	FLOW RATE		DIFFERENCE
		PRE-DEVELOPED	DEVELOPED	DEVELOPED - PREDEVELOPED
-	years	cfs	cfs	cfs
10	100	0	0	0
20	100	13.4	13.4	0
30	100	15.1	15.2	0.1
40	100	21	21.2	0.2
15	100	0	0	0
25	100	14.3	14.3	0
35	100	30.8	31.1	0.3

The biggest difference for the 100 year storm event will be 0.3 cfs at node 35
No significant increase of the flow rate for the project will occur after the new proposed RV parking are built.

RCP PIPE		
Length	ft	56.5
Diameter	ft	2
Q100	cfs	15.7
Bulk factor		1.5
Q design	cfs	23.58
Wall entrance		
length	ft	4
height	ft	4
Max water elevation	ft	3.56
Max. velocity (*)	fps	18.6

(*) Rip rap at the outlet of the pipe will be design on the Final Hydrology

Reference Material

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

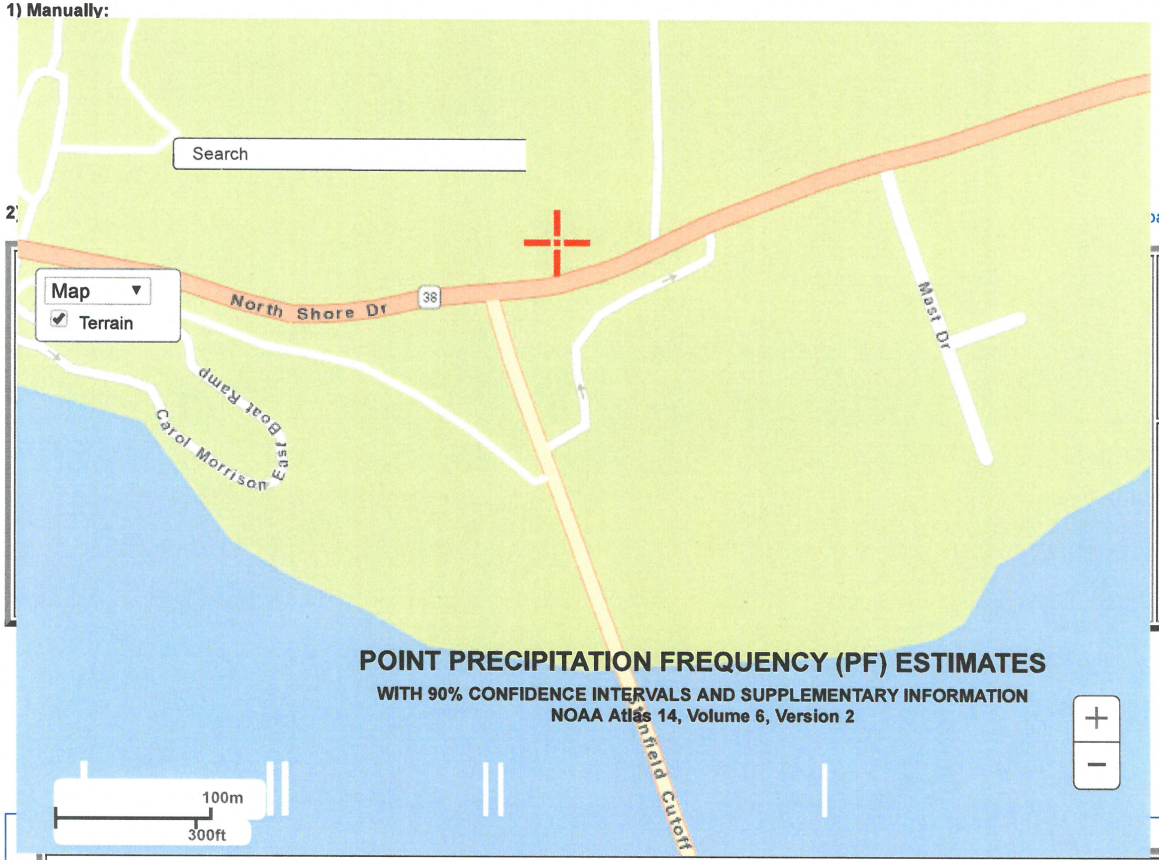
NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

1) Manually:



POINT PRECIPITATION FREQUENCY (PF) ESTIMATES
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

2) aa.gov):

a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Big Bear City, California, USA*
Latitude: 34.2627°
Longitude: -116.8850°
Elevation: 6805.72 ft **
* Source: ESRI Maps
** Source: USGS

Print page

PDS-based 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	0.127 (0.105-0.155)	0.180 (0.149-0.220)	0.257 (0.212-0.315)	0.328 (0.268-0.405)	0.435 (0.344-0.555)	0.527 (0.408-0.687)	0.631 (0.477-0.842)	0.748 (0.550-1.03)	1.01 (0.716-1.45)	1.44 (0.979-2.13)

10-min	0.182 (0.151-0.222)	0.258 (0.213-0.315)	0.369 (0.304-0.452)	0.470 (0.384-0.580)	0.623 (0.493-0.796)	0.755 (0.585-0.985)	0.904 (0.683-1.21)	1.07 (0.788-1.47)	1.46 (1.03-2.08)	2.06 (1.40-3.05)
15-min	0.220 (0.182-0.269)	0.312 (0.258-0.381)	0.446 (0.368-0.547)	0.568 (0.464-0.702)	0.753 (0.596-0.962)	0.914 (0.708-1.19)	1.09 (0.826-1.46)	1.30 (0.954-1.78)	1.76 (1.24-2.52)	2.49 (1.70-3.69)
30-min	0.318 (0.264-0.389)	0.450 (0.372-0.550)	0.645 (0.532-0.790)	0.821 (0.671-1.01)	1.09 (0.861-1.39)	1.32 (1.02-1.72)	1.58 (1.19-2.11)	1.87 (1.38-2.58)	2.54 (1.79-3.64)	3.60 (2.45-5.33)
60-min	0.453 (0.375-0.553)	0.640 (0.529-0.782)	0.917 (0.756-1.12)	1.17 (0.954-1.44)	1.55 (1.22-1.98)	1.88 (1.45-2.45)	2.25 (1.70-3.00)	2.67 (1.96-3.66)	3.62 (2.55-5.18)	5.12 (3.49-7.58)
2-hr	0.668 (0.553-0.815)	0.934 (0.772-1.14)	1.31 (1.08-1.61)	1.64 (1.34-2.03)	2.12 (1.68-2.71)	2.52 (1.95-3.29)	2.95 (2.23-3.94)	3.42 (2.52-4.71)	4.11 (2.90-5.89)	5.17 (3.52-7.66)
3-hr	0.840 (0.695-1.02)	1.17 (0.967-1.43)	1.63 (1.34-2.00)	2.03 (1.66-2.50)	2.60 (2.06-3.32)	3.07 (2.38-4.00)	3.57 (2.70-4.78)	4.12 (3.03-5.66)	4.91 (3.46-7.03)	5.56 (3.79-8.24)
6-hr	1.24 (1.02-1.51)	1.71 (1.42-2.09)	2.37 (1.96-2.91)	2.94 (2.40-3.63)	3.75 (2.97-4.79)	4.42 (3.42-5.76)	5.12 (3.87-6.84)	5.88 (4.32-8.08)	6.97 (4.92-9.99)	7.87 (5.36-11.7)
12-hr	1.71 (1.42-2.09)	2.39 (1.97-2.92)	3.34 (2.75-4.09)	4.17 (3.41-5.16)	5.40 (4.27-6.90)	6.42 (4.98-8.38)	7.53 (5.70-10.1)	8.76 (6.44-12.0)	10.5 (7.44-15.1)	12.1 (8.21-17.9)
24-hr	2.44 (2.16-2.80)	3.40 (3.01-3.92)	4.83 (4.26-5.58)	6.11 (5.35-7.13)	8.07 (6.84-9.72)	9.77 (8.11-12.0)	11.7 (9.45-14.7)	13.8 (10.9-17.9)	17.1 (12.9-23.1)	20.0 (14.6-27.8)
2-day	3.13 (2.77-3.60)	4.34 (3.85-5.01)	6.17 (5.45-7.14)	7.86 (6.89-9.16)	10.5 (8.90-12.6)	12.8 (10.7-15.8)	15.5 (12.6-19.5)	18.6 (14.7-24.1)	23.4 (17.7-31.6)	27.7 (20.3-38.7)
3-day	3.48 (3.08-4.01)	4.82 (4.26-5.55)	6.85 (6.05-7.92)	8.75 (7.66-10.2)	11.7 (9.95-14.1)	14.4 (12.0-17.7)	17.5 (14.2-22.0)	21.1 (16.6-27.3)	26.8 (20.3-36.1)	31.9 (23.3-44.5)
4-day	3.73 (3.31-4.30)	5.18 (4.58-5.97)	7.38 (6.52-8.53)	9.44 (8.26-11.0)	12.7 (10.8-15.3)	15.6 (12.9-19.2)	19.0 (15.4-23.9)	22.9 (18.1-29.6)	29.1 (22.0-39.3)	34.7 (25.4-48.5)
7-day	4.25 (3.76-4.89)	5.97 (5.29-6.89)	8.59 (7.59-9.94)	11.0 (9.65-12.8)	14.8 (12.6-17.9)	18.2 (15.1-22.4)	22.1 (17.9-27.8)	26.6 (21.0-34.4)	33.6 (25.4-45.3)	39.9 (29.2-55.7)
10-day	4.56 (4.04-5.25)	6.47 (5.73-7.46)	9.35 (8.25-10.8)	12.0 (10.5-14.0)	16.1 (13.7-19.4)	19.8 (16.4-24.3)	23.9 (19.4-30.1)	28.7 (22.6-37.2)	36.1 (27.4-48.7)	42.8 (31.3-59.6)
20-day	5.45 (4.83-6.27)	7.80 (6.90-8.99)	11.3 (9.98-13.1)	14.5 (12.7-16.9)	19.4 (16.5-23.4)	23.7 (19.7-29.1)	28.5 (23.1-35.9)	34.1 (26.9-44.1)	42.6 (32.2-57.4)	50.0 (36.6-69.7)
30-day	6.45 (5.72-7.43)	9.23 (8.17-10.6)	13.3 (11.8-15.4)	17.1 (15.0-19.9)	22.8 (19.3-27.5)	27.8 (23.0-34.1)	33.3 (27.0-41.9)	39.6 (31.2-51.3)	49.2 (37.3-66.4)	57.6 (42.1-80.4)
45-day	7.74 (6.86-8.91)	11.0 (9.75-12.7)	15.9 (14.0-18.3)	20.2 (17.7-23.6)	26.9 (22.8-32.3)	32.6 (27.0-40.0)	38.9 (31.6-49.0)	46.1 (36.4-59.7)	57.0 (43.1-76.9)	66.4 (48.6-92.7)
60-day	8.99 (7.97-10.4)	12.7 (11.3-14.7)	18.2 (16.1-21.0)	23.1 (20.3-27.0)	30.6 (25.9-36.9)	37.0 (30.7-45.5)	44.1 (35.7-55.5)	52.1 (41.1-67.4)	64.1 (48.5-86.4)	74.5 (54.5-104)

[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.

Estimates from the table in CSV format: Precipitation frequency estimates ▼ Submit

Main Link Categories:
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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

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Rational Method

10-year storm pre-developed condition

100-year storm pre-developed condition

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              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 1573

                           Analysis prepared by:


 ************************** DESCRIPTION OF STUDY **************************
* RV Parking                                                               *
* 42144 N Shore Dr. Big Bear                                               *
* 10 year storm pre-developed condition nodes 15 to 35                     *
 ***************************************************************************

  FILE NAME: RVPSRKHP.DAT
  TIME/DATE OF STUDY: 11:36 10/25/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  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)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1700

  *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 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.01 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     15.00 TO NODE     25.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
  ELEVATION DATA: UPSTREAM(FEET) =   6904.97  DOWNSTREAM(FEET) =   6835.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.851
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.689
  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
  "1 DWELLING/ACRE"          B        2.44      0.75     0.800    56    8.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      6.79
  TOTAL AREA(ACRES) =      2.44   PEAK FLOW RATE(CFS) =      6.79

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     35.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   6835.48  DOWNSTREAM(FEET) =   6798.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   509.00   CHANNEL SLOPE =  0.0728
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.79
  FLOW VELOCITY(FEET/SEC) =   2.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =   11.82
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     35.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.82
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.101
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          B        3.71      0.75     0.800    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    3.71      SUBAREA RUNOFF(CFS) =    8.36
  EFFECTIVE AREA(ACRES) =      6.15   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        6.2       PEAK FLOW RATE(CFS) =      13.85
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.2  TC(MIN.) =     11.82
  EFFECTIVE AREA(ACRES) =      6.15  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.800
  PEAK FLOW RATE(CFS)   =      13.85
============================================================================
```

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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 1573

                              Analysis prepared by:

                                allen engineering
                                   123 A street
                                    suite 220
                                    riverside

 ************************** DESCRIPTION OF STUDY **************************
* RV Parking                                                               *
* 42144 N Shore Dr. Big Bear                                               *
* 100 year storm pre-developed condition node 15 to 35                     *
 ***************************************************************************

  FILE NAME: RVPSRKHP.DAT
  TIME/DATE OF STUDY: 12:28 10/25/2019
============================================================================
  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)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2500

  *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 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.01 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     15.00 TO NODE     25.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
  ELEVATION DATA: UPSTREAM(FEET) =   6904.97  DOWNSTREAM(FEET) =   6835.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.851
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.094
  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
  "1 DWELLING/ACRE"          B        2.44      0.75     0.800    56    8.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =     14.26
  TOTAL AREA(ACRES) =      2.44   PEAK FLOW RATE(CFS) =     14.26

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     35.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   6835.48  DOWNSTREAM(FEET) =   6798.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   509.00   CHANNEL SLOPE =  0.0728
  CHANNEL FLOW THRU SUBAREA(CFS) =      14.26
  FLOW VELOCITY(FEET/SEC) =   3.66 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.32   Tc(MIN.) =   11.17
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     35.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.17
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.170
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          B        3.71      0.75     0.800    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    3.71      SUBAREA RUNOFF(CFS) =   18.60
  EFFECTIVE AREA(ACRES) =      6.15   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        6.2       PEAK FLOW RATE(CFS) =      30.84
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.2  TC(MIN.) =     11.17
```

```
  EFFECTIVE AREA(ACRES) =       6.15  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =   0.75  AREA-AVERAGED Ap = 0.800
  PEAK FLOW RATE(CFS)   =       30.84
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Rational Method

10-year storm developed condition

100-year storm developed condition

```
****************************************************************************
              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 1573

                              Analysis prepared by:

                                allen engineering
                                   123 A street
                                    suite 220
                                    riverside

 ************************** DESCRIPTION OF STUDY **************************
* RV Parking                                                               *
* 42144 N Shore Dr. Big Bear                                               *
* 10 year storm developed condition nodes 15 to 35                        *
 ****************************************************************************

  FILE NAME: RVPSRKHP.DAT
  TIME/DATE OF STUDY: 11:42 10/25/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  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)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1700

  *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 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.01 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     15.00 TO NODE     25.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
  ELEVATION DATA: UPSTREAM(FEET) =   6904.97  DOWNSTREAM(FEET) =   6835.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.851
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.689
  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
  "1 DWELLING/ACRE"          B        2.44      0.75     0.800    56    8.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      6.79
  TOTAL AREA(ACRES) =      2.44   PEAK FLOW RATE(CFS) =      6.79

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     35.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   6835.48  DOWNSTREAM(FEET) =   6798.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   509.00   CHANNEL SLOPE =  0.0728
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.79
  FLOW VELOCITY(FEET/SEC) =   2.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =   11.82
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     35.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.82
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.101
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         B        3.71      0.75     0.700    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA AREA(ACRES) =    3.71      SUBAREA RUNOFF(CFS) =    8.61
  EFFECTIVE AREA(ACRES) =      6.15   AREA-AVERAGED Fm(INCH/HR) =  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =        6.2       PEAK FLOW RATE(CFS) =      14.10
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.2  TC(MIN.) =     11.82
```

```
  EFFECTIVE AREA(ACRES) =       6.15  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.740
  PEAK FLOW RATE(CFS)   =      14.10
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1573

                          Analysis prepared by:

                            allen engineering
                               123 A street
                                suite 220
                                riverside

 ************************** DESCRIPTION OF STUDY **************************
* RV Parking                                                               *
* 42144 N Shore Dr. Big Bear                                               *
* 100 year storm developed condition nodes 15 to 35                        *
 ***************************************************************************

  FILE NAME: RVPSRKHP.DAT
  TIME/DATE OF STUDY: 12:20 10/25/2019
===========================================================================
  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)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2500

  *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 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.01 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     15.00 TO NODE     25.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
  ELEVATION DATA: UPSTREAM(FEET) =   6904.97  DOWNSTREAM(FEET) =   6835.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.851
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.094
  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
  "1 DWELLING/ACRE"          B        2.44      0.75     0.800    56    8.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =     14.26
  TOTAL AREA(ACRES) =      2.44   PEAK FLOW RATE(CFS) =     14.26

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     35.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   6835.48  DOWNSTREAM(FEET) =   6798.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   509.00   CHANNEL SLOPE =  0.0728
  CHANNEL FLOW THRU SUBAREA(CFS) =      14.26
  FLOW VELOCITY(FEET/SEC) =   3.66 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.32   Tc(MIN.) =   11.17
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     35.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.17
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.170
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         B        3.71      0.75     0.700    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA AREA(ACRES) =    3.71      SUBAREA RUNOFF(CFS) =   18.85
  EFFECTIVE AREA(ACRES) =      6.15   AREA-AVERAGED Fm(INCH/HR) =  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =        6.2       PEAK FLOW RATE(CFS) =      31.09
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.2  TC(MIN.) =     11.17
```

```
  EFFECTIVE AREA(ACRES) =       6.15  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.740
  PEAK FLOW RATE(CFS)   =      31.09
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

WSPG calculation for 24" RCP

```
T1 24" rcp                                        0
T2 Developed condition
T3 100 year storm  Bulking factor = 1.5
SO      .0006817.500  1                   6818.500
R     56.6006823.800  1     .013                        .000    .000 0
WE    56.6006823.800  2     .500
SH    56.6006823.800  2                   6823.800
CD   1  4   1    .000   2.000    .000  .000  .000   .00
CD   2  2   0    .000   4.000    4.000  .000  .000   .00
Q          23.580   .0
```

Program Package Serial Number: 7188

WATER SURFACE PROFILE LISTING Date:10-24-2019 Time: 7:28:20

24" rcp
Developed condition
100 year storm Bulking factor = 1.5

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
.000	6817.499	.847	6818.346	23.58	18.62	5.39	6823.73	.00	1.72	1.98	2.000	.000	.00	1 .0
3.447	.1113					.0766	.26	.85	4.10	.77	.013	.00	.00	PIPE
3.447	6817.883	.854	6818.737	23.58	18.42	5.27	6824.01	.00	1.72	1.98	2.000	.000	.00	1 .0
11.084	.1113					.0709	.79	.85	4.04	.77	.013	.00	.00	PIPE
14.531	6819.117	.886	6820.002	23.58	17.57	4.79	6824.79	.00	1.72	1.99	2.000	.000	.00	1 .0
8.221	.1113					.0623	.51	.89	3.77	.77	.013	.00	.00	PIPE
22.752	6820.032	.918	6820.950	23.58	16.75	4.36	6825.31	.00	1.72	1.99	2.000	.000	.00	1 .0
6.399	.1113					.0548	.35	.92	3.51	.77	.013	.00	.00	PIPE
29.152	6820.744	.953	6821.697	23.58	15.97	3.96	6825.66	.00	1.72	2.00	2.000	.000	.00	1 .0
5.134	.1113					.0482	.25	.95	3.27	.77	.013	.00	.00	PIPE
34.286	6821.315	.989	6822.304	23.58	15.23	3.60	6825.90	.00	1.72	2.00	2.000	.000	.00	1 .0
4.206	.1113					.0424	.18	.99	3.05	.77	.013	.00	.00	PIPE
38.491	6821.784	1.027	6822.810	23.58	14.52	3.27	6826.08	.00	1.72	2.00	2.000	.000	.00	1 .0
3.489	.1113					.0374	.13	1.03	2.84	.77	.013	.00	.00	PIPE
41.980	6822.172	1.066	6823.238	23.58	13.84	2.98	6826.21	.00	1.72	2.00	2.000	.000	.00	1 .0
2.920	.1113					.0330	.10	1.07	2.64	.77	.013	.00	.00	PIPE
44.900	6822.497	1.108	6823.605	23.58	13.20	2.70	6826.31	.00	1.72	1.99	2.000	.000	.00	1 .0
2.458	.1113					.0291	.07	1.11	2.45	.77	.013	.00	.00	PIPE

24" rcp
Developed condition
100 year storm Bulking factor = 1.5

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
47.358	6822.771	1.152	6823.922	23.58	12.58	2.46	6826.38	.00	1.72	1.98	2.000	.000	.00	1 .0
2.069	.1113					.0257	.05	1.15	2.28	.77	.013	.00	.00	PIPE
49.427	6823.001	1.199	6824.200	23.58	12.00	2.24	6826.44	.00	1.72	1.96	2.000	.000	.00	1 .0
1.740	.1113					.0228	.04	1.20	2.11	.77	.013	.00	.00	PIPE
51.167	6823.195	1.248	6824.442	23.58	11.44	2.03	6826.47	.00	1.72	1.94	2.000	.000	.00	1 .0
1.454	.1113					.0202	.03	1.25	1.95	.77	.013	.00	.00	PIPE
52.621	6823.356	1.300	6824.656	23.58	10.91	1.85	6826.50	.00	1.72	1.91	2.000	.000	.00	1 .0
1.200	.1113					.0179	.02	1.30	1.81	.77	.013	.00	.00	PIPE
53.821	6823.490	1.356	6824.846	23.58	10.40	1.68	6826.53	.00	1.72	1.87	2.000	.000	.00	1 .0
.972	.1113					.0160	.02	1.36	1.66	.77	.013	.00	.00	PIPE
54.793	6823.599	1.416	6825.015	23.58	9.92	1.53	6826.54	.00	1.72	1.82	2.000	.000	.00	1 .0
.762	.1113					.0143	.01	1.42	1.53	.77	.013	.00	.00	PIPE
55.554	6823.684	1.481	6825.165	23.58	9.45	1.39	6826.55	.00	1.72	1.75	2.000	.000	.00	1 .0
.559	.1113					.0128	.01	1.48	1.40	.77	.013	.00	.00	PIPE
56.113	6823.746	1.552	6825.297	23.58	9.01	1.26	6826.56	.00	1.72	1.67	2.000	.000	.00	1 .0
.356	.1113					.0115	.00	1.55	1.27	.77	.013	.00	.00	PIPE
56.469	6823.785	1.631	6825.417	23.58	8.60	1.15	6826.56	.00	1.72	1.55	2.000	.000	.00	1 .0
.131	.1113					.0105	.00	1.63	1.14	.77	.013	.00	.00	PIPE

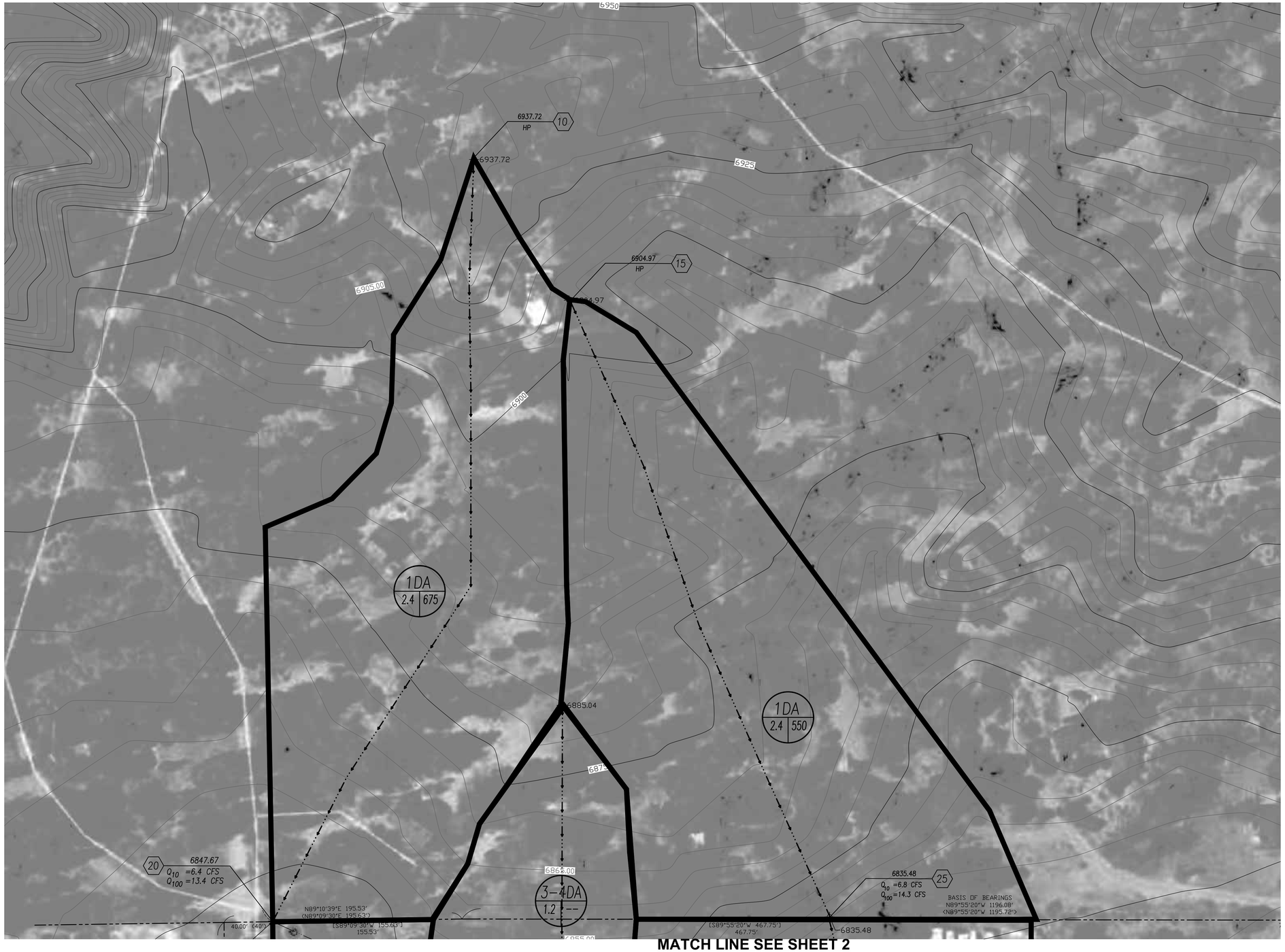
Program Package Serial Number: 7188

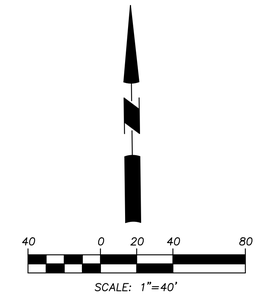
WATER SURFACE PROFILE LISTING Date:10-24-2019 Time: 7:28:20

24" rcp
Developed condition
100 year storm Bulking factor = 1.5

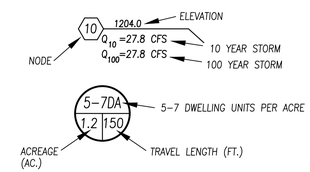
Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE	Super Elev / Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
56.600	6823.800	1.723	6825.523	23.58	8.19	1.04	6826.56	.00	1.72	1.38	2.000	.000	.00	1 .0
WALL	ENTRANCE													
56.600	6823.800	3.557	6827.357	23.58	1.66	.04	6827.40	.00	1.03	4.00	4.000	4.000	.00	0 .0

Hydrology Exhibits





LEGEND



INDICATES SUBAREA BOUNDARY

FLOW DIRECTION

BAR	BARREN LAND COVERAGE
COM	COMMERCIAL LAND COVERAGE
1DA	1 DWELLING UNITS PER ACRE
2DA	2 DWELLING UNITS PER ACRE
3-4DA	3-4 DWELLING UNITS PER ACRE
5-7DA	5-7 DWELLING UNITS PER ACRE

SOIL TYPE "B"

MATCH LINE SEE SHEET 2

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER MANIJEH NADERI NO. 46015 Exp. 12/31/2020 CIVIL STATE OF CALIFORNIA

NADERI CONSULTING ENGINEERS
P.O. BOX 7553
LA VERNE, CA 91750
909-374-0453
nec_dev@yahoo.com

PREPARED UNDERTHE DIRECT SUPERVISION OF:

MANIJEH NADERI RCE #46015 DATE: EXP. 12/31/2018

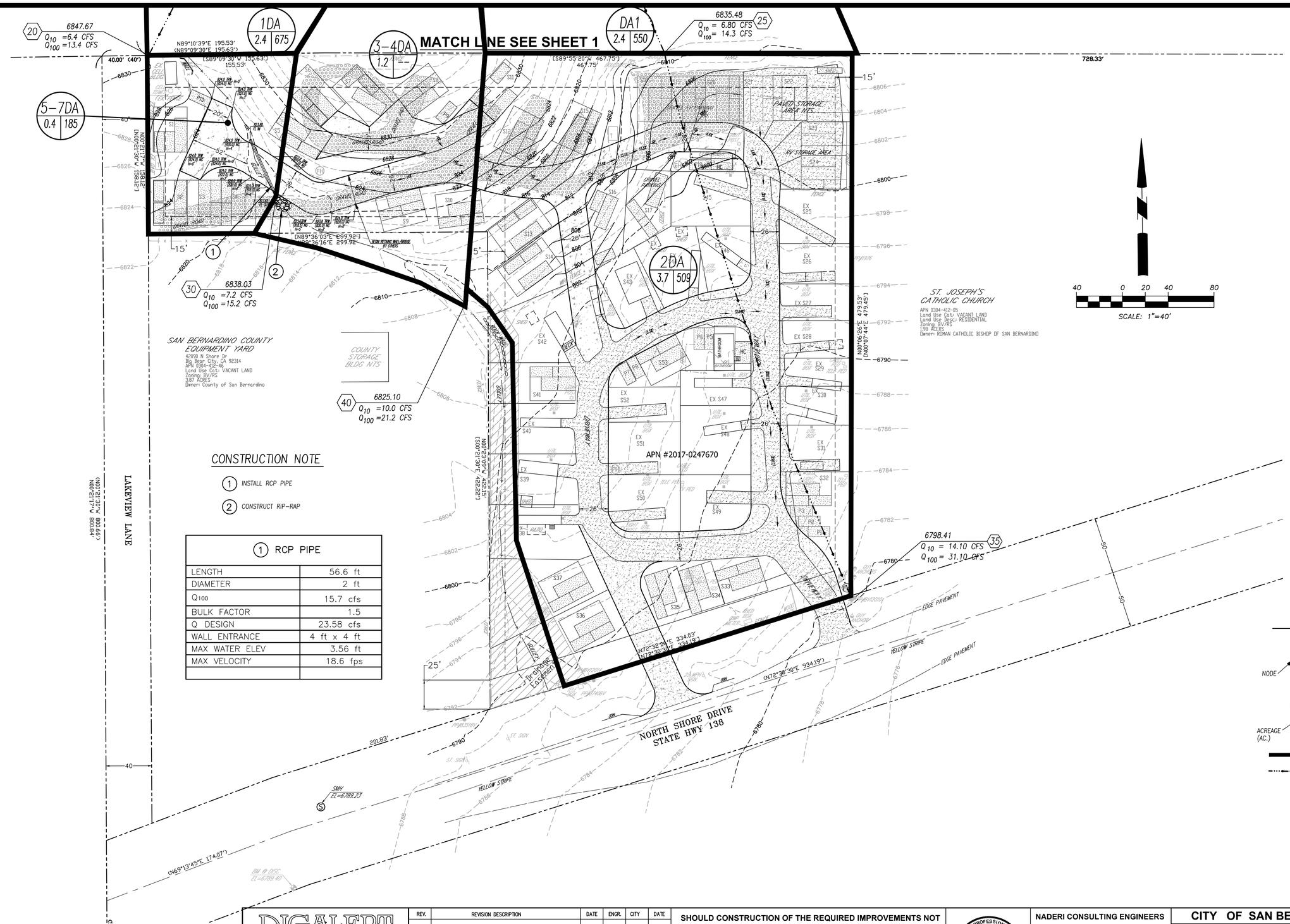
CITY OF SAN BERNARDINO, CALIFORNIA

HYDROLOGY DEVELOPED CONDTION

BIG BEAR RV PARK
42144 N. SHORE DRIVE BIG BEAR CITY, CA
APN 304-412-06

DRAWN BY: W.F.
DESIGNED BY: E.i.
CHECKED BY: M.N.
APPROVED BY: CITY ENGINEER R.C.E. ..... DATE:
SCALE: 1"=40'
DATE: 10-25-2019
DRAWING NO.: G 1/2

F:\october 1, 2019\work\ehe big bear\Hydrology\Hydrology Developed Conditions.dwg Oct 25, 2019 - 6:18pm



CONSTRUCTION NOTE

1. INSTALL RCP PIPE
2. CONSTRUCT RIP-RAP

1 RCP PIPE	
LENGTH	56.6 ft
DIAMETER	2 ft
Q_{100}	15.7 cfs
BULK FACTOR	1.5
Q DESIGN	23.58 cfs
WALL ENTRANCE	4 ft x 4 ft
MAX WATER ELEV	3.56 ft
MAX VELOCITY	18.6 fps

LEGEND

- NODE: 10 — 1204.0 ELEVATION; Q_{10} =27.8 CFS 10 YEAR STORM; Q_{100}=27.8 CFS 100 YEAR STORM
- 5-7DA — 5-7 DWELLING UNITS PER ACRE
- 1.2 (ACREAGE (AC.)) 150 (TRAVEL LENGTH (FT.))
- INDICATES SUBAREA BOUNDARY
- FLOW DIRECTION

BAR	BARREN LAND COVERAGE
COM	COMMERCIAL LAND COVERAGE
1DA	1 DWELLING UNITS PER ACRE
2DA	2 DWELLING UNITS PER ACRE
3-4DA	3-4 DWELLING UNITS PER ACRE
5-7DA	5-7 DWELLING UNITS PER ACRE

SOIL TYPE "B"

DIGALERT — DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG — TOLL FREE 1-800-227-2600 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER — MANIJEH NADERI — NO. 46015 — Exp. 12/31/2020 — CIVIL — STATE OF CALIFORNIA

NADERI CONSULTING ENGINEERS
P.O. BOX 7553
LA VERNE, CA 91750
909-374-0453
nec_dev@yahoo.com

PREPARED UNDERTHE DIRECT SUPERVISION OF:
MANIJEH NADERI RCE #46015 — DATE: EXP. 12/31/2018

CITY OF SAN BERNARDINO, CALIFORNIA
HYDROLOGY DEVELOPED CONDITION

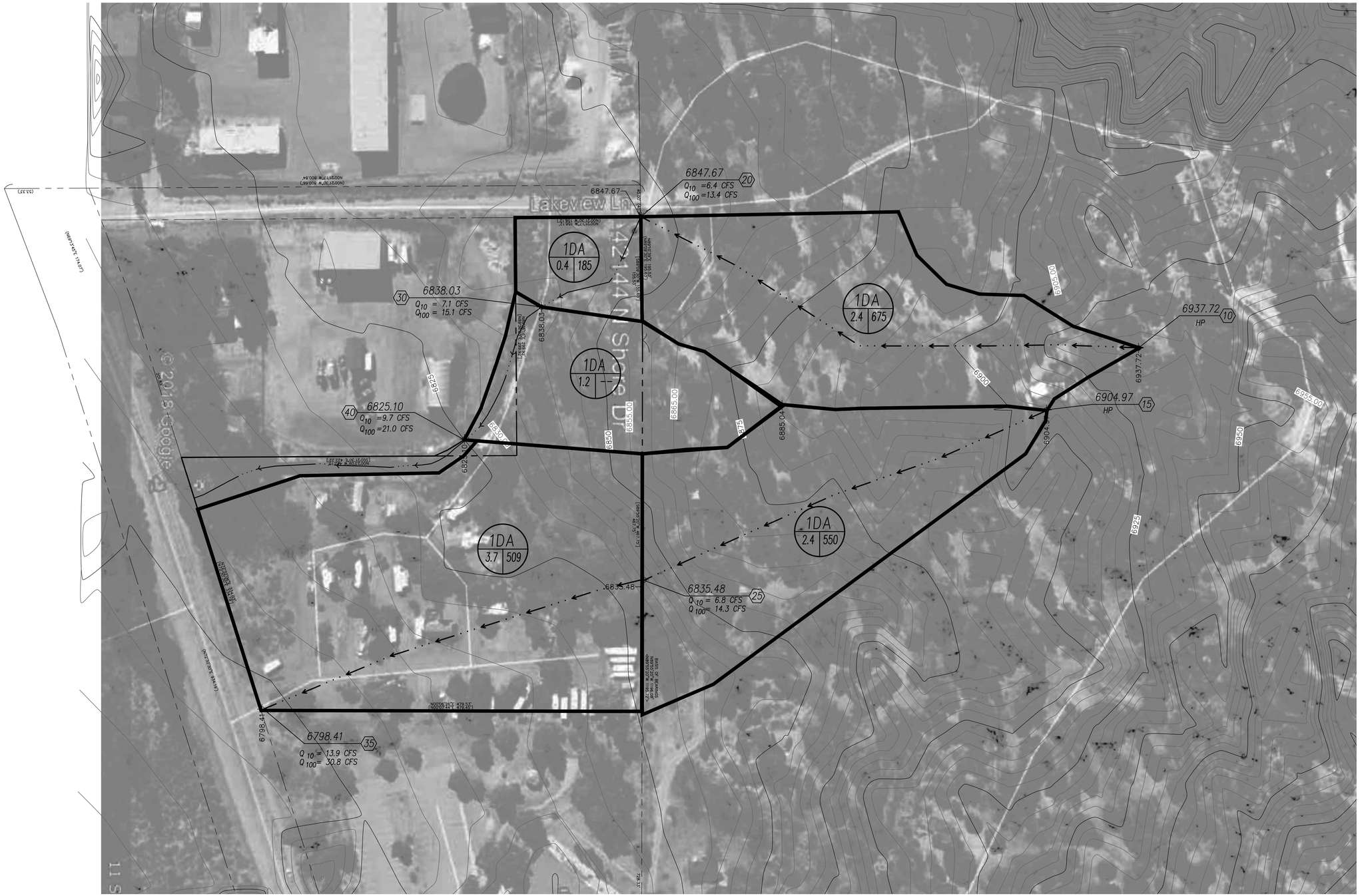
DRAWN BY: W.F. — DESIGNED BY: E.i. — CHECKED BY: M.N.

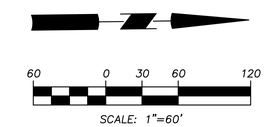
BIG BEAR RV PARK
42144 N. SHORE DRIVE BIG BEAR CITY, CA
APN 304-412-06

SCALE: 1"=40'
DATE: 10-25-2018
DRAWING NO.: G 2/2

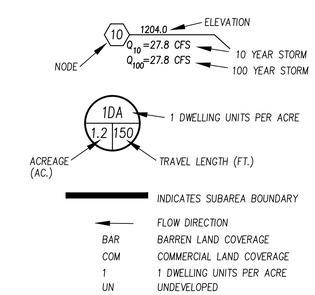
APPROVED BY: CITY ENGINEER R.C.E. ..... DATE:

F:\october 1, 2019\work\ehe big bear\Hydrology\Hydrology Developed Conditions.dwg Oct 25, 2019 - 6:17pm





LEGEND



SOIL TYPE "B"

DIGALERT
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REGISTERED PROFESSIONAL ENGINEER MANIJEH NADERI NO. 46015 Exp. 12/31/2020 CIVIL STATE OF CALIFORNIA

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P.O. BOX 7553
LA VERNE, CA 91750
909-374-0453
nec_dev@yahoo.com

PREPARED UNDERTHE DIRECT SUPERVISION OF:

MANIJEH NADERI RCE #46015 DATE: EXP. 12/31/2018

CITY OF FONTANA CALIFORNIA

HYDROLOGY PREDEVELOPED CONDTION

BIG BEAR RV PARK
42144 N. SHORE DRIVE BIG BEAR CITY, CA
APN 304-412-06

DRAWN BY: W.F.
DESIGNED BY: E.I.
CHECKED BY: _
APPROVED BY:
CITY ENGINEER R.C.E. ..... DATE:
SCALE: 1"=60'
DATE: 10-25-2019
DRAWING NO.: G 1/1