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CIVIL ENGINEERING
CONSULTING

Preliminary
HYDROLOGY REPORT

Project: **Chino Valley Fire District FS No. 68**
Soquel Canyon Road, Chino Hills, CA

Owner: **Chino Valley Fire District**
14011 City Center Drive
Chino Hills, CA 91709

Date Prepared: **May 5, 2023**

Prepared By: **civTEC**
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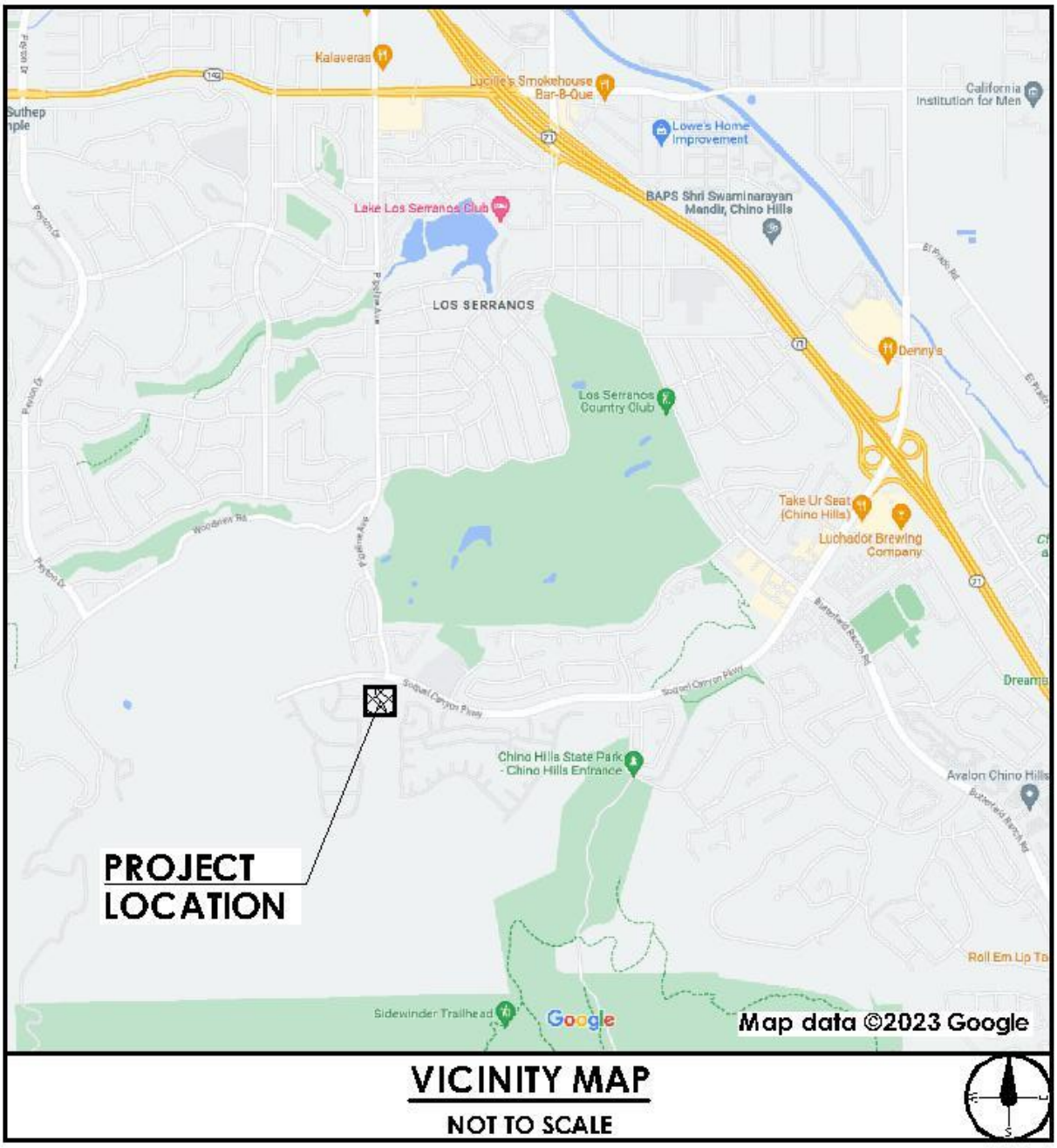
1.0 PROJECT DESCRIPTION and SUMMARY

Location Map



1.0 PROJECT DESCRIPTION and SUMMARY

Purpose

The purpose of this report is to provide a Hydrology study to show if any additional runoff is expected from the proposed improvements and to ensure the proposed buildings are protected from flooding during the 25-yr storm.

Background

The project site is a vacant lot on Soquel Canyon Road at the intersection with Pipeline Ave. The proposed improvements will clear the existing site. The new construction will include a new a new fire station and an apparatus building, landscaping, and parking areas.

Site Description

The existing site is approximately 3.6-acres in size. It is bordered to the north by Soquel Canyon Road, on the east by open space next to a housing tract, on the south by open space and a detention basin below, and on the west by a housing tract.

The existing site slopes from the southwest to the northeast and has no existing inlets or underground storm drain system. The existing site has no trees on it's main pad and is mostly dirt with some rock and light vegetation. The existing site drains through surface sheet flow and has no onsite drainage devices.

The proposed site will drain via sheet flow and gutter flow into proposed catch basins. The catch basins will route the water to two proposed bioinfiltration areas that will treat the water per NPDES requirements. The treated water will then connect to the existing storm drain that outlets into the existing detention basin south of the project site.

Methodology/Design Criteria

The site hydrology for existing and proposed conditions will be calculated for a 25-year storm event.

The 25-year hydrology analyses were completed for the site using The Rational Method. The computations were done using: RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO COUNTY HYDROLOGY CRITERION) (c) Copyright 1983-2015 Advanced Engineering Software (aes) Ver. 22.0 Release Date: 07/01/2015.

References:

1. The proposed grading plans for the subject site as prepared by civTEC.
2. Site plan for the subject site as prepared by PBK
3. "San Bernardino County Hydrology Manual", dated August 1986.

1.0 PROJECT DESCRIPTION and SUMMARY

Hydrology Summary

For the 25-year storm event, the additive runoff total for the existing condition is 10.60 cfs and the additive runoff from the proposed condition is 11.64 cfs. There is an expected increase in runoff due to the proposed improvements of 1.04 cfs or an increase of 9.8%.

The proposed improvements will increase the overall runoff due to the proposed impervious surfaces being constructed. The existing storm drain pipe the project is proposed to connect to shows a flow of 269.90 cfs. Due to the addition of water quality BMPs being proposed (bioinfiltration basins) and the relatively minor increase in flows, any negative impact on downstream structures or capacity will be mitigated from the proposed improvements

2.0 HYDROLOGY CALCULATIONS

Existing 25-year Storm Event Hydrology

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
        (c) Copyright 1983-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1678

                          Analysis prepared by:

                                  civTEC
                          999 Corporate Dr., Suite 100
                             Ladera Ranch, CA 92694
                                ph: 949.463.8822

 ************************* DESCRIPTION OF STUDY *************************
* FIRE STATION NO. 68                                                   *
* EXISTING CONDITION                                                    *
* 25-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 17005E.DAT
  TIME/DATE OF STUDY: 11:34 05/02/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.0385
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *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
```

2.0 HYDROLOGY CALCULATIONS

```
  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      1.01 TO NODE      1.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   575.00
  ELEVATION DATA: UPSTREAM(FEET) =    783.00  DOWNSTREAM(FEET) =    166.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.575
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.913
  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.)
  NATURAL POOR COVER
  "OPEN BRUSH"                B        2.16      0.45     1.000    76    6.58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      6.73
  TOTAL AREA(ACRES) =      2.16   PEAK FLOW RATE(CFS) =      6.73

****************************************************************************
  FLOW PROCESS FROM NODE      2.01 TO NODE      2.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   235.00
  ELEVATION DATA: UPSTREAM(FEET) =    793.00  DOWNSTREAM(FEET) =    769.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.358
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.658
  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.)
  NATURAL POOR COVER
```

2.0 HYDROLOGY CALCULATIONS

```
  "OPEN BRUSH"                B        1.34      0.45     1.000    76    7.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.87
  TOTAL AREA(ACRES) =      1.34   PEAK FLOW RATE(CFS) =      3.87
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

2.0 HYDROLOGY CALCULATIONS

Proposed 25-year Storm Event Hydrology

```
 ************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1678

                              Analysis prepared by:

                                      civTEC
                                999 Corporate Dr., Suite 100
                                   Ladera Ranch, CA 92694
                                      ph: 949.463.8822

  ************************** DESCRIPTION OF STUDY **************************
 * FIRE STATION NO. 68                                                    *
 * PROPOSED CONDITION                                                     *
 * 25-YEAR STORM EVENT                                                    *
  ************************************************************************

   FILE NAME: 17005P.DAT
   TIME/DATE OF STUDY: 16:59 05/04/2023
 ========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ========================================================================
                       --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   25.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.0385
   SLOPE OF INTENSITY DURATION CURVE = 0.6000

   *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
```

2.0 HYDROLOGY CALCULATIONS

```
  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      1.01 TO NODE      1.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  ELEVATION DATA: UPSTREAM(FEET) =    789.00  DOWNSTREAM(FEET) =    776.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.612
  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.)
  CONDOMINIUMS                B        0.05      0.75     0.350    56    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.05   PEAK FLOW RATE(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE      1.02 TO NODE      1.03 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   774.50  DOWNSTREAM(FEET) =   765.50
  FLOW LENGTH(FEET) =   525.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.49
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.20
  PIPE TRAVEL TIME(MIN.) =   2.51    Tc(MIN.) =    7.51
  LONGEST FLOWPATH FROM NODE      1.01 TO NODE      1.03 =     575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.03 TO NODE      1.03 IS CODE =  81
```

2.0 HYDROLOGY CALCULATIONS

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.51
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.613
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        1.51      0.75     0.350    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    4.55
  EFFECTIVE AREA(ACRES) =      1.56   AREA-AVERAGED Fm(INCH/HR) =  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.6       PEAK FLOW RATE(CFS) =       4.71

****************************************************************************
  FLOW PROCESS FROM NODE      2.01 TO NODE      2.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   340.00
  ELEVATION DATA: UPSTREAM(FEET) =    799.00  DOWNSTREAM(FEET) =    774.51

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.645
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.288
  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        1.07      0.75     0.200    56    5.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.99
  TOTAL AREA(ACRES) =      1.07   PEAK FLOW RATE(CFS) =      3.99

****************************************************************************
  FLOW PROCESS FROM NODE      2.02 TO NODE      2.03 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   770.50  DOWNSTREAM(FEET) =   769.00
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.68
```

2.0 HYDROLOGY CALCULATIONS

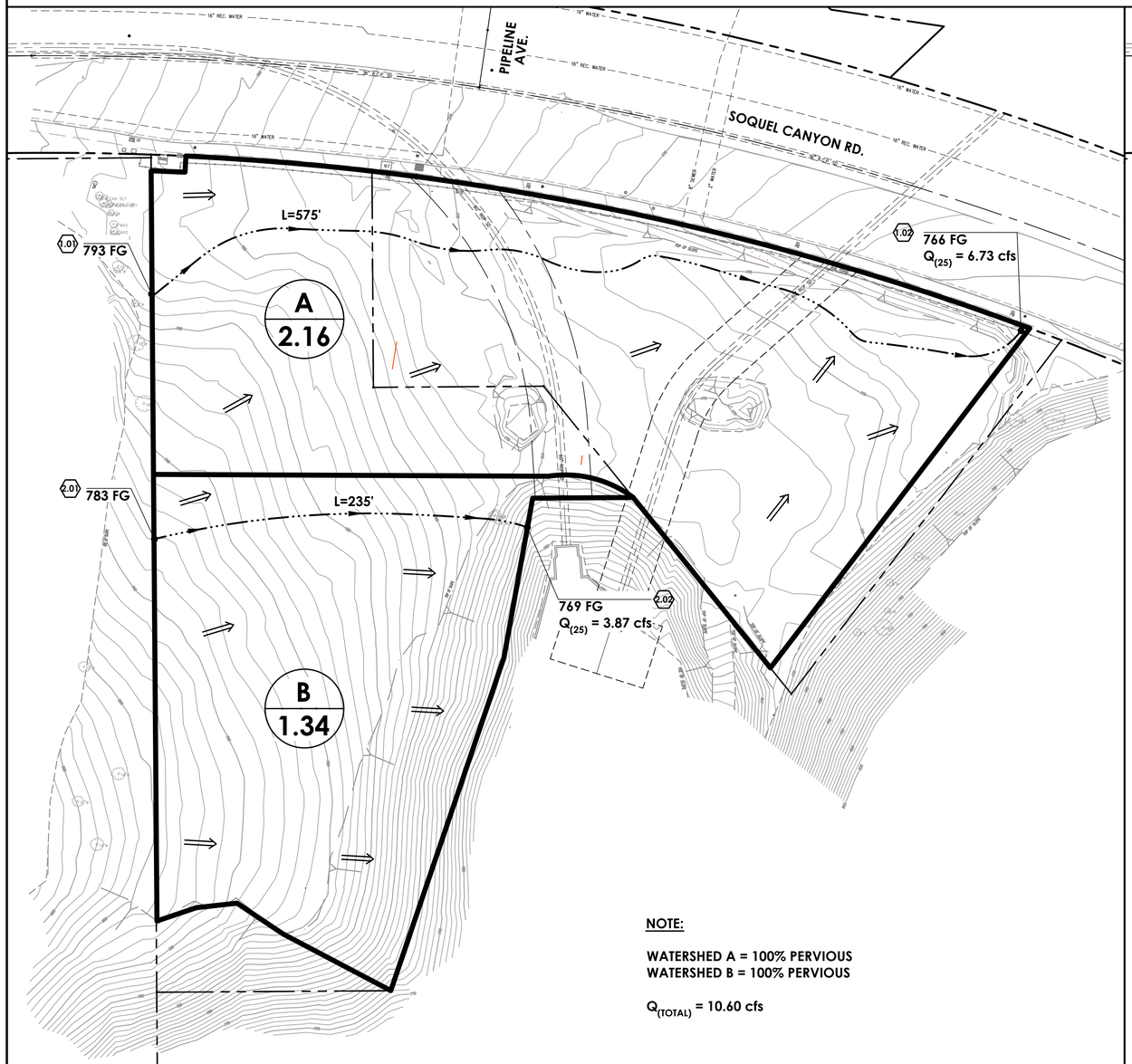
```
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.99
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.76
  LONGEST FLOWPATH FROM NODE      2.01 TO NODE      2.03 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.01 TO NODE      3.02 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   185.00
  ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    762.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.814
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.213
  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.)
  NATURAL POOR COVER
  "OPEN BRUSH"                B        0.87      0.45     1.000    76    5.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.94
  TOTAL AREA(ACRES) =      0.87   PEAK FLOW RATE(CFS) =      2.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

3.0 HYDROLOGY MAP

Hydrology Map

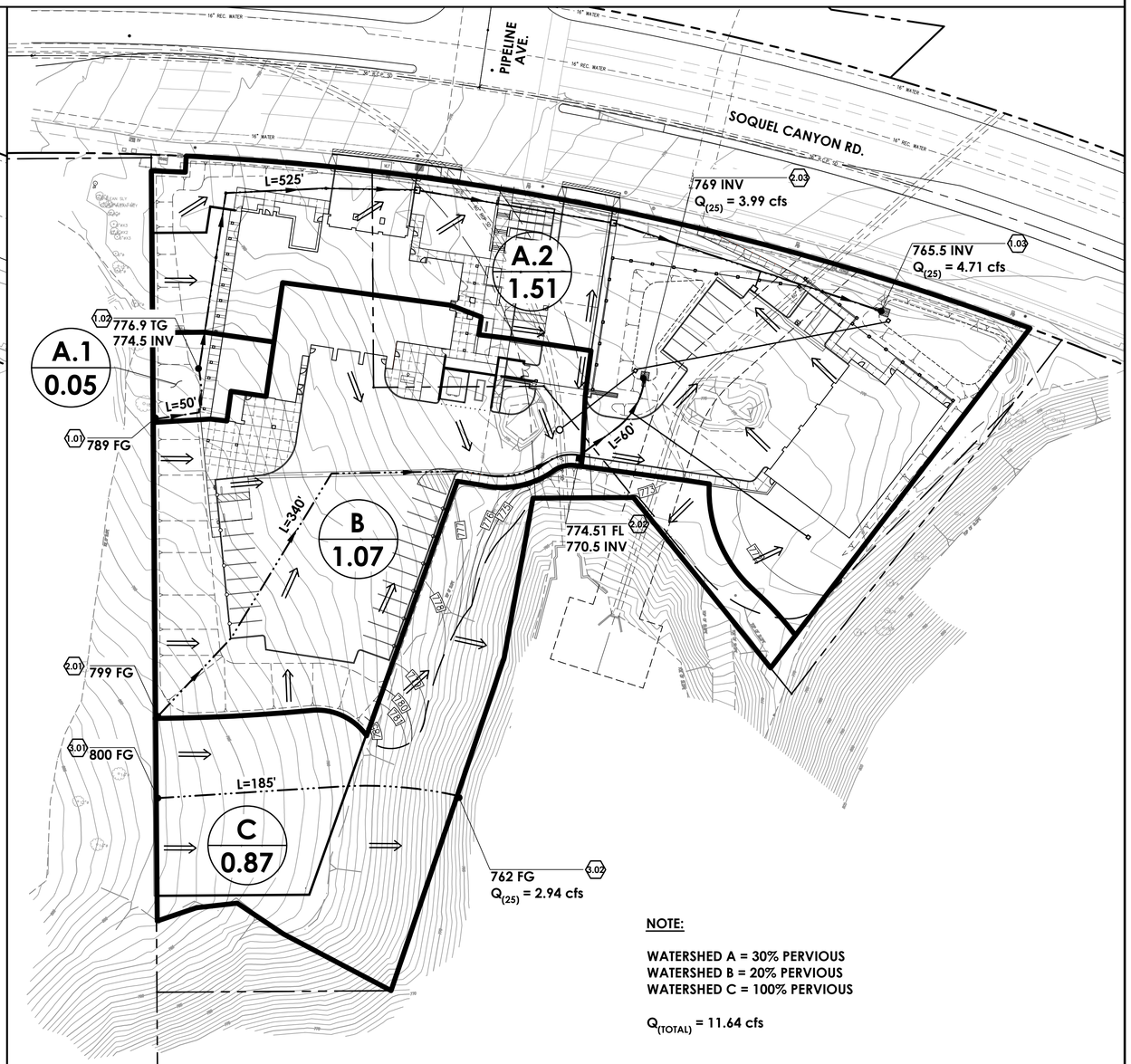


NOTE:

WATERSHED A = 100% PERVIOUS
WATERSHED B = 100% PERVIOUS

$Q_{(TOTAL)}$ = 10.60 cfs

HYDROLOGY MAP - EXISTING



NOTE:

WATERSHED A = 30% PERVIOUS
WATERSHED B = 20% PERVIOUS
WATERSHED C = 100% PERVIOUS

$Q_{(TOTAL)}$ = 11.64 cfs

HYDROLOGY MAP - PROPOSED

NOT FOR CONSTRUCTION

LEGEND

- WATERSHED BORDER
- NODE NUMBER
- SUBAREA DESIGNATION
- ACREAGE
- DRAINAGE FLOW LINE
- DIRECTION OF RUNOFF

NOTE:
ASSUME ALL SOIL GROUP B
10-YEAR 1-HOUR ISOHYETAL = 0.9 INCHES
100-YEAR 1-HOUR ISOHYETAL = 1.3 INCHES
SLOPE OF INTENSITY DURATION CURVE = 0.6

SCALE: 1" = 40'
0 20 40 80

UNDERGROUND SERVICE ALERT
CALL: 811
TWO WORKING DAYS BEFORE YOU DIG

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

REGISTERED PROFESSIONAL ENGINEER
THOMAS E. CARCELLI
C-81640
Exp. 09-30-23
CIVIL
STATE OF CALIFORNIA

PREPARED BY:
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LADERA RANCH, CA 92694
p: 949.463.8822
e: tec@civtec.net
5/4/23
THOMAS E. CARCELLI, R.C.E. #81640

SCALE:	PER PLAN
DATE:	5/4/23
DRAWN BY:	STAFF
CHECKED BY:	TEC
PLOT DATE:	5/4/23

HYDROLOGY MAP
CHINO VALLEY FIRE DISTRICT FS NO. 68
SOQUEL CANYON ROAD
CHINO HILLS, CA

DRAWING NUMBER:
HYD-1
SHEET 1 OF 1
JN 170.05