PRELIMINARY
HYDROLOGY & HYDRAULICS STUDY

FOR

TENTATIVE TRACT 18186
10460 SLATER AVENUE
FOUNTAIN VALLEY, CALIFORNIA

Prepared For:

Coastal Community Fellowship
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Fountain Valley, California 92708
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January 17, 2019

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CIVIL ENGINEERS

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INTRODUCTION AND SUMMARY

Site Description

The proposed Tentative Tract No. 18186 is located at 10460 Slater Avenue and encompasses 2.43 acres in the City of Fountain Valley. The project consists of 12 single family homes varying in size from 4,760 SF to 5,770 SF, and improvements for additional parking spaces for Coastal Community Church. The site is bounded by single family homes to the south and west.

Existing Conditions

The proposed project is located at the southwest corner of Slater Avenue and Ward Street. The overall site is "L" shaped in configuration and relatively flat. The approximate elevations of the site vary from 33.00 to 31.00 feet above mean sea level (msl). Currently the site is occupied by Church buildings and a parking lot.

The project also consists of relocation of existing parking spaces located southerly of the Coastal Community Fellowship (CCF) building to the northerly and westerly side of the CCF building with a new additional access from Slater Avenue. The existing access to CCF facilities from Ward Street will stay in place.

Proposed Conditions

AREA A & B: Residential Portion – Lots 2 to 13 and Lot A (Private Drive)

To capture, store and infiltrate storm water (low flow) runoff will be directed to Eco-Stone permeable pavers underlaid with open graded gravel in Private Drive (Lot A). The flow from permeable pavers will be directed to a bottomless trench drain.

Overflow (high flow) from the area will be directed to Ward Street via a parkway drain.

AREA C: Coastal Community Fellowship Portion – Portion of Lot 1

To capture, store and infiltrate storm water (low flow) runoff will be directed to Eco-Stone permeable pavers underlaid with open graded gravel in drive areas. The flow from permeable pavers will be directed to a bottomless trench drain.

Overflow (high flow) from the area will be directed to Talbert Avenue via a parkway drain.

Purpose

The purpose of this study is to determine the runoff generated by a storm of 25-year and 100-year frequency for both existing and proposed conditions. The site drainage will be designed for a 25-year storm.

Methodology

The hydrology calculations have been prepared using the A.E.S. Program based on the 1986 Orange County Hydrology Manual.

Soil Type

The soil type is Type "B" as determined from Plate A of the Hydrology Manual.

Land Use

For existing conditions, the entire watershed was taken as a church/school. For proposed conditions Area A and Area B were taken as a single family development and Area C was taken as a church/single family development.

Conclusion

The table below summarizes the total runoff from the site for a storm of 25-year and 100-year frequency.

	Existing Conditions	Proposed Conditions
25-Year Storm Event	9.47 cfs	11.22 cfs
100-Year Storm Event	12.31 cfs	14.51 cfs

RATIONAL METHOD HYDROLOGY

Existing Conditions

25-Year Storm Event

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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  FILE NAME: 18186EX.DAT
  TIME/DATE OF STUDY: 10:16 01/17/2019
==========================================================================
  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
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I 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    101.00 TO NODE    102.00 IS CODE =  21
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  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   380.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.75  DOWNSTREAM(FEET) =     30.43

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.293
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.899
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  SCHOOL                     A        1.93      0.40      0.600    17   12.29
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      4.62
 TOTAL AREA(ACRES) =      1.93   PEAK FLOW RATE(CFS) =      4.62

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
 ELEVATION DATA: UPSTREAM(FEET) =     32.70  DOWNSTREAM(FEET) =     31.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.491
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.759
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 SCHOOL                     A        2.14      0.40      0.600    17   13.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      4.85
 TOTAL AREA(ACRES) =      2.14   PEAK FLOW RATE(CFS) =      4.85
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      2.14  TC(MIN.) =     13.49
 EFFECTIVE AREA(ACRES) =      2.14  AREA-AVERAGED Fm(INCH/HR)=  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.600
 PEAK FLOW RATE(CFS)    =      4.85
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY

Existing Conditions

100-Year Storm Event

RATIONAL METHOD HYDROLOGY

Proposed Conditions

25-Year Storm Event

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**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I 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    101.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   380.00
  ELEVATION DATA: UPSTREAM(FEET) =     32.75  DOWNSTREAM(FEET) =     30.43

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.293
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.695
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  SCHOOL                     A        1.93      0.40      0.600    17   12.29
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      6.00
 TOTAL AREA(ACRES) =      1.93   PEAK FLOW RATE(CFS) =      6.00

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
 ELEVATION DATA: UPSTREAM(FEET) =     32.70  DOWNSTREAM(FEET) =     31.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.491
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.517
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 SCHOOL                     A        2.14      0.40      0.600    17   13.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      6.31
 TOTAL AREA(ACRES) =      2.14   PEAK FLOW RATE(CFS) =      6.31
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      2.14  TC(MIN.) =     13.49
 EFFECTIVE AREA(ACRES) =      2.14  AREA-AVERAGED Fm(INCH/HR)=  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.600
 PEAK FLOW RATE(CFS)    =      6.31
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY

Proposed Conditions

100-Year Storm Event

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  FILE NAME: 18186PR.DAT
  TIME/DATE OF STUDY: 10:36 01/17/2019
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  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
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I 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    101.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.50  DOWNSTREAM(FEET) =     30.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.199
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.416
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
```

```
"8-10 DWELLINGS/ACRE"      A        1.64      0.40      0.400     17     9.20
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =      4.81
TOTAL AREA(ACRES) =      1.64   PEAK FLOW RATE(CFS) =      4.81

****************************************************************************
FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     33.50  DOWNSTREAM(FEET) =     30.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.199
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.443
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
RESIDENTIAL
"8-10 DWELLINGS/ACRE"      A        0.30      0.40      0.400     17     9.20
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =      0.89
TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.89

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     33.20  DOWNSTREAM(FEET) =     30.70

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.509
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.181
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
SCHOOL                     A        1.14      0.40      0.600     17    10.51
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
SUBAREA RUNOFF(CFS) =      3.02
TOTAL AREA(ACRES) =      1.14   PEAK FLOW RATE(CFS) =      3.02

****************************************************************************
FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
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>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     32.70  DOWNSTREAM(FEET) =     31.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.352
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.049
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 SCHOOL                      A        0.99      0.40      0.600    17   11.35
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      2.50
 TOTAL AREA(ACRES) =      0.99   PEAK FLOW RATE(CFS) =      2.50
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      0.99  TC(MIN.) =     11.35
 EFFECTIVE AREA(ACRES) =      0.99  AREA-AVERAGED Fm(INCH/HR)=  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.600
 PEAK FLOW RATE(CFS)    =      2.50
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
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==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I 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    101.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     33.50  DOWNSTREAM(FEET) =     30.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.199
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.363
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
```

```
"8-10 DWELLINGS/ACRE"      A        1.64      0.40      0.400    17    9.20
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =      6.20
TOTAL AREA(ACRES) =      1.64   PEAK FLOW RATE(CFS) =      6.20

****************************************************************************
FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     33.50  DOWNSTREAM(FEET) =     30.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.199
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.397
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
RESIDENTIAL
"8-10 DWELLINGS/ACRE"      A        0.30      0.40      0.400    17    9.20
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =      1.14
TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      1.14

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     33.20  DOWNSTREAM(FEET) =     30.70

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.509
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.058
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
SCHOOL                     A        1.14      0.40      0.600    17   10.51
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
SUBAREA RUNOFF(CFS) =      3.92
TOTAL AREA(ACRES) =      1.14   PEAK FLOW RATE(CFS) =      3.92

****************************************************************************
FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     32.70  DOWNSTREAM(FEET) =     31.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.352
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.890
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 SCHOOL                      A        0.99      0.40      0.600     17   11.35
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      3.25
 TOTAL AREA(ACRES) =      0.99   PEAK FLOW RATE(CFS) =      3.25
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      0.99  TC(MIN.) =     11.35
 EFFECTIVE AREA(ACRES) =       0.99  AREA-AVERAGED Fm(INCH/HR)=  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.600
 PEAK FLOW RATE(CFS)    =      3.25
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

HYDRAULICS

Parkway Culverts Capacity Calculations

```
**************************************************************************
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            Ver. 10.2  Release Date: 01/01/2005  License ID 1570

                        Analysis prepared by:


                        DMS Consultants, Inc.



--------------------------------------------------------------------------
  TIME/DATE OF STUDY: 14:45 01/17/2019
==========================================================================
 Problem Descriptions:
  Parkway Culvert Calculation


**************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
--------------------------------------------------------------------------
    NORMAL DEPTH(FEET) =   0.33
    CHANNEL Z1(HORIZONTAL/VERTICAL) =    0.00
            Z2(HORIZONTAL/VERTICAL) =    0.00
    BASEWIDTH(FEET) =     2.00
    CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.020000
    MANNINGS FRICTION FACTOR = 0.0150
==========================================================================
    NORMAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    >>>>> NORMAL DEPTH FLOW(CFS) =      3.65
    FLOW TOP-WIDTH(FEET) =         2.00
    FLOW AREA(SQUARE FEET) =           0.66
    HYDRAULIC DEPTH(FEET) =     0.33
    FLOW AVERAGE VELOCITY(FEET/SEC.) =     5.53
    UNIFORM FROUDE NUMBER =    1.697
    PRESSURE + MOMENTUM(POUNDS) =           45.94
    AVERAGED VELOCITY HEAD(FEET) =      0.475
    SPECIFIC ENERGY(FEET) =      0.805
==========================================================================
    CRITICAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    CRITICAL FLOW TOP-WIDTH(FEET) =         2.00
    CRITICAL FLOW AREA(SQUARE FEET) =           0.94
    CRITICAL FLOW HYDRAULIC DEPTH(FEET) =     0.47
    CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =     3.90
    CRITICAL DEPTH(FEET) =     0.47
    CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =           41.27
    AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =      0.236
    CRITICAL FLOW SPECIFIC ENERGY(FEET) =      0.704
==========================================================================
```

```
**************************************************************************
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                          Analysis prepared by:


                          DMS Consultants,Inc.



--------------------------------------------------------------------------
  TIME/DATE OF STUDY: 14:48 01/17/2019
==========================================================================
 Problem Descriptions:
  Parkway Calculation


**************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
--------------------------------------------------------------------------
    NORMAL DEPTH(FEET) =   0.33
    CHANNEL Z1(HORIZONTAL/VERTICAL) =    0.00
            Z2(HORIZONTAL/VERTICAL) =    0.00
    BASEWIDTH(FEET) =     3.00
    CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.020000
    MANNINGS FRICTION FACTOR = 0.0150
==========================================================================
    NORMAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    >>>>> NORMAL DEPTH FLOW(CFS) =      5.80
    FLOW TOP-WIDTH(FEET) =         3.00
    FLOW AREA(SQUARE FEET) =            0.99
    HYDRAULIC DEPTH(FEET) =     0.33
    FLOW AVERAGE VELOCITY(FEET/SEC.) =     5.86
    UNIFORM FROUDE NUMBER =    1.798
    PRESSURE + MOMENTUM(POUNDS) =           76.07
    AVERAGED VELOCITY HEAD(FEET) =      0.533
    SPECIFIC ENERGY(FEET) =      0.863
==========================================================================
    CRITICAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    CRITICAL FLOW TOP-WIDTH(FEET) =         3.00
    CRITICAL FLOW AREA(SQUARE FEET) =           1.46
    CRITICAL FLOW HYDRAULIC DEPTH(FEET) =     0.49
    CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =     3.97
    CRITICAL DEPTH(FEET) =     0.49
    CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =           66.84
    AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =      0.244
    CRITICAL FLOW SPECIFIC ENERGY(FEET) =      0.732
==========================================================================
```

```
**************************************************************************
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                        Analysis prepared by:



--------------------------------------------------------------------------
  TIME/DATE OF STUDY: 14:51 01/17/2019
==========================================================================
 Problem Descriptions:
  Parkway Calculation


**************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
--------------------------------------------------------------------------
    NORMAL DEPTH(FEET) =   0.33
    CHANNEL Z1(HORIZONTAL/VERTICAL) =    0.00
            Z2(HORIZONTAL/VERTICAL) =    0.00
    BASEWIDTH(FEET) =     1.00
    CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.020000
    MANNINGS FRICTION FACTOR = 0.0150
==========================================================================
    NORMAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    >>>>> NORMAL DEPTH FLOW(CFS) =      1.57
    FLOW TOP-WIDTH(FEET) =         1.00
    FLOW AREA(SQUARE FEET) =           0.33
    HYDRAULIC DEPTH(FEET) =     0.33
    FLOW AVERAGE VELOCITY(FEET/SEC.) =     4.77
    UNIFORM FROUDE NUMBER =    1.464
    PRESSURE + MOMENTUM(POUNDS) =           17.96
    AVERAGED VELOCITY HEAD(FEET) =      0.354
    SPECIFIC ENERGY(FEET) =      0.684
==========================================================================
    CRITICAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
    CRITICAL FLOW TOP-WIDTH(FEET) =         1.00
    CRITICAL FLOW AREA(SQUARE FEET) =           0.43
    CRITICAL FLOW HYDRAULIC DEPTH(FEET) =     0.43
    CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =     3.70
    CRITICAL DEPTH(FEET) =     0.43
    CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =           16.94
    AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =      0.213
    CRITICAL FLOW SPECIFIC ENERGY(FEET) =      0.638
==========================================================================
```

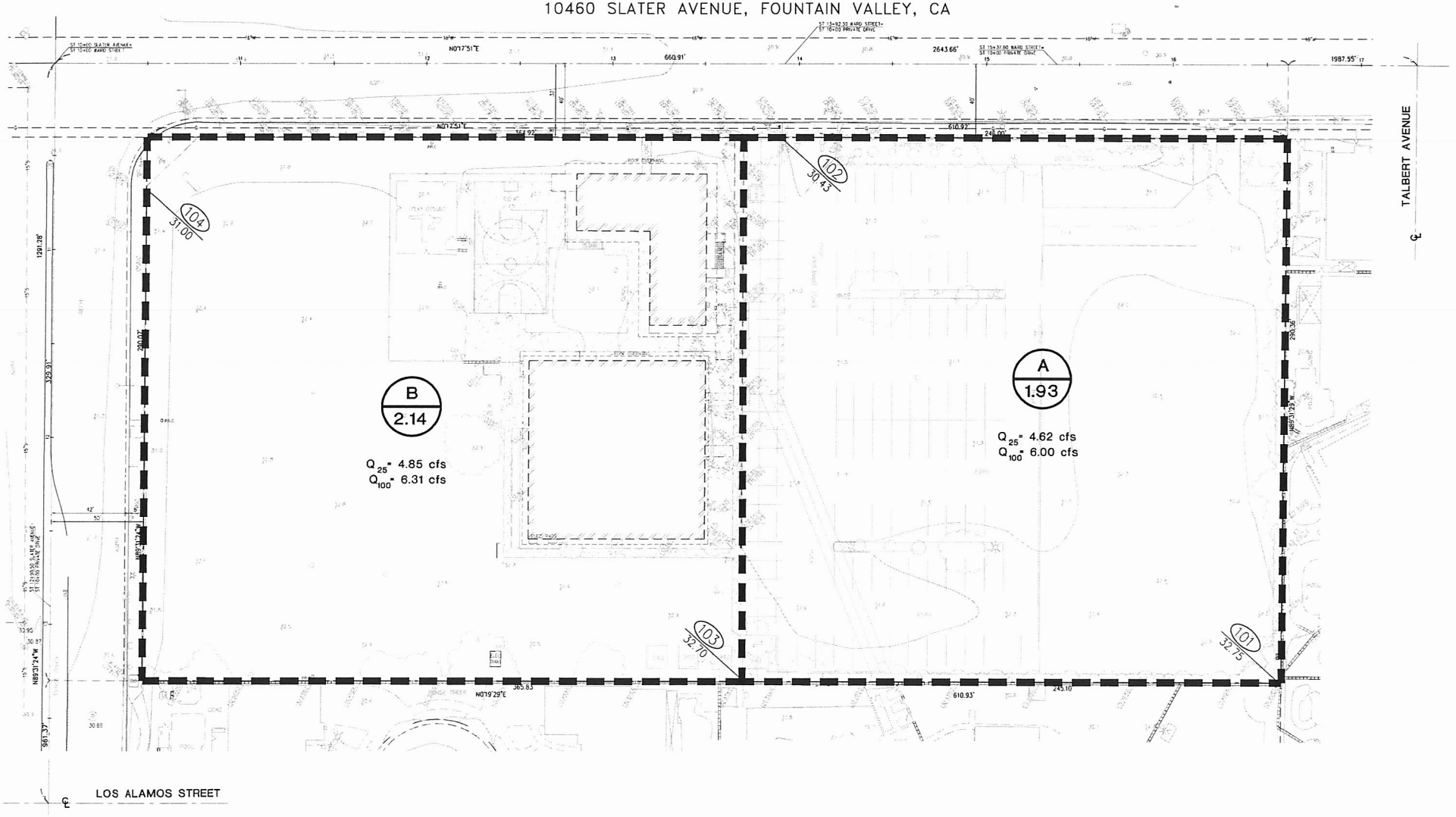
APPENDIX

Hydrology Maps
Existing and Proposed Conditions

HYDROLOGY MAP

IN THE CITY OF FOUNTAIN VALLEY, COUNTY OF ORANGE, STATE OF CALIFORNIA

10460 SLATER AVENUE, FOUNTAIN VALLEY, CA



LEGEND

- A / 0.00 — AREA DESIGNATION / AREA IN ACRES
- XXX — NODE DESIGNATION
- 45.00 — ELEVATION
- DIRECTION OF FLOW

GRAPHIC SCALE

(IN FEET)

1 inch = 20 ft.

SOILS ENGINEER:

GLOBUSDEN INC.
GEOTECHNICAL CONSULTANTS
5 HODGONVILLE, IRVINE, CA 92620
TEL: 949-872-9565

PREPARED FOR:

KENG TARAS, LEAD PASTOR
COASTAL COMMUNITY FELLOWSHIP
10460 SLATER AVENUE
FOUNTAIN VALLEY, CA 92708
TEL: 714-756-1314

APN: 169-141-04

HYDROLOGY MAP - EXISTING CONDITIONS

PREPARED BY:

DMS CONSULTANTS, INC.
CIVIL ENGINEERS

TENTATIVE TRACT NO. 18186
COASTAL COMMUNITY FELLOWSHIP
10460 SLATER AVENUE
FOUNTAIN VALLEY, CA 92708

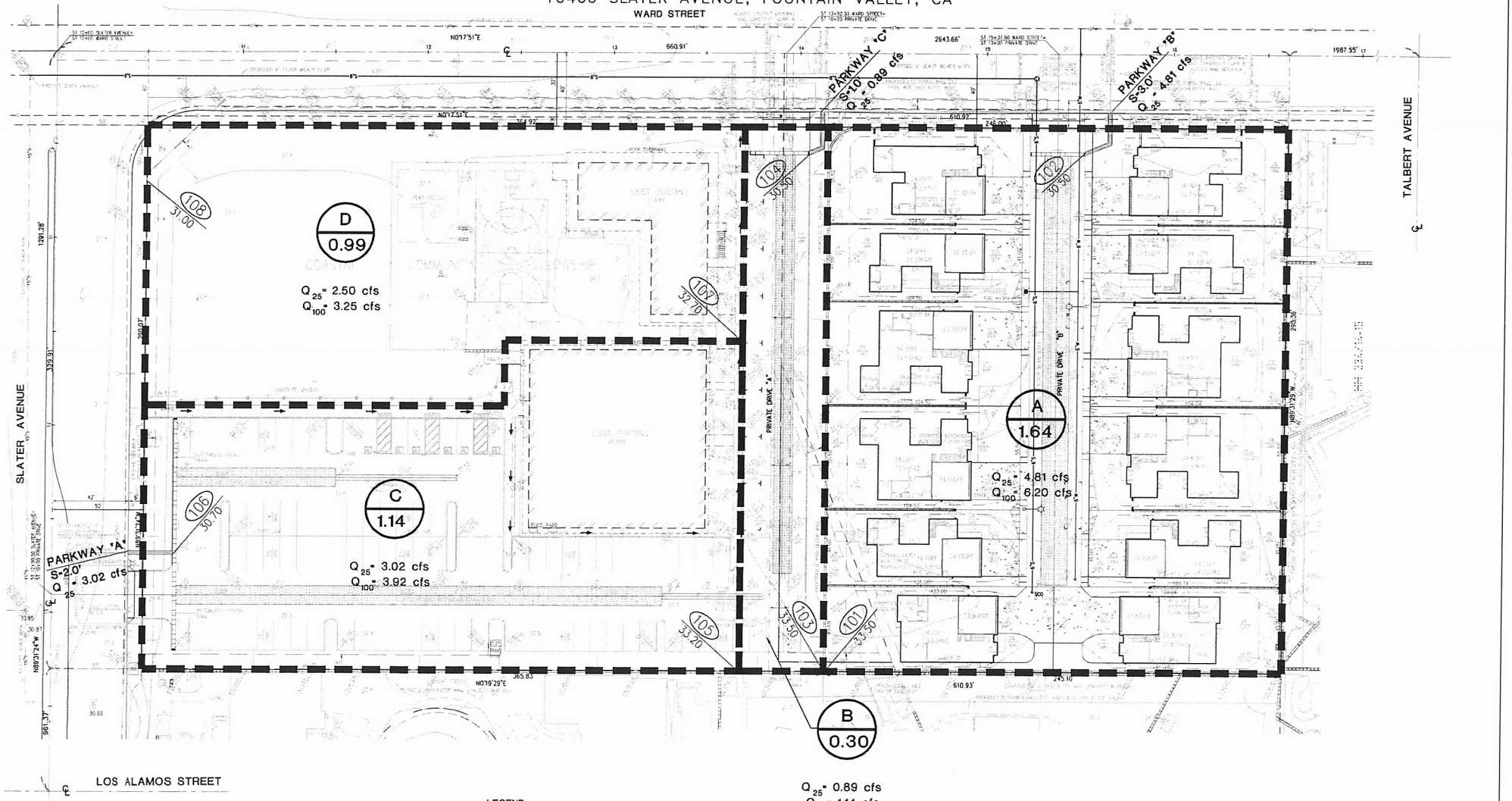
DATE: 01/17/19

SHEET 1 OF 1

HYDROLOGY MAP

IN THE CITY OF FOUNTAIN VALLEY, COUNTY OF ORANGE, STATE OF CALIFORNIA

10460 SLATER AVENUE, FOUNTAIN VALLEY, CA



LEGEND

- A / 0.00 — AREA DESIGNATION / AREA IN ACRES
- XXX — NODE DESIGNATION
- 45.00 — ELEVATION
- DIRECTION OF FLOW

GRAPHIC SCALE

(IN FEET)

1 inch = 20 ft.

SOILS ENGINEER:

GLOBUDEN INC.
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5 MOBONVILLE, IRVINE, CA 92620
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COASTAL COMMUNITY FELLOWSHIP
10460 SLATER AVENUE
FOUNTAIN VALLEY, CA 92708
TEL: 714-756-311

APN: 169-141-04

HYDROLOGY MAP - PROPOSED CONDITIONS

PREPARED BY:

DMS CONSULTANTS, INC.
CIVIL ENGINEERS

TENTATIVE TRACT NO. 18186
COASTAL COMMUNITY FELLOWSHIP
10460 SLATER AVENUE
FOUNTAIN VALLEY, CA 92708

DATE: 12/11/18

SHEET 1 OF 1