HYDROLOGY & HYDRAULICS STUDY

FOR

STARFISH
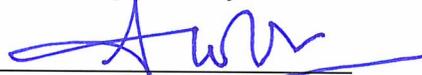## LOTS 1 TO 7 AND LOT A - TRACT 19115
9779 STARFISH AVENUE
FOUNTAIN VALLEY, CALIFORNIA

Prepared For:

Starfish FV Venture, LLC
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February 22, 2021

DMS
CONSULTANTS, INC.
C I V I L   E N G I N E E R S

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INTRODUCTION AND SUMMARY

Site Description

The proposed project is located at 9779 Starfish Avenue and encompasses 1.02 acres in the City of Fountain Valley. The project consists of construction of 7 single family homes. The site is bounded by existing residential properties to the north and west, vacant land to the east and Starfish Avenue to the south.

Existing Conditions

The proposed project is located along the northerly curb of Starfish Avenue, west of Mt. Henry Street. The overall site is relatively flat. The approximate elevations of the site vary from 28.0 to 32.0 feet above mean sea level (msl). Currently the site is fenced off landscape area with a basketball court. The site was initially owned by Huntington Valley Baptist church but has since been fenced off. Under existing conditions, the project drains to Starfish Avenue.

Proposed Conditions

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 via a parkway drain to Starfish Avenue.

Purpose

The purpose of this study is to determine the runoff generated by a storm of 10-year, 25-year and 100-year frequency for both existing and proposed conditions. The site drainage will be designed for a 25-year storm. The attached parkway culvert calculations show that the culverts have the capacity for a storm event of 10-year frequency.

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 "D" as determined from Plate A of the Hydrology Manual.

Land Use

For existing conditions the watershed was taken as a church/school. For proposed conditions the watershed was taken as a single-family residential development.

Starfish FV Venture, LLC

Starfish Avenue - Tract 19115

Conclusion

The table below summarizes the total runoff from the site for a storm of 10-year, 25-year and 100-year frequency.

	Existing Conditions	Proposed Conditions
10-Year Storm Event	2.04 cfs	2.22 cfs
25-Year Storm Event	2.47 cfs	2.68 cfs
100-Year Storm Event	3.19 cfs	3.44 cfs

The run-off indicated in the table above is the raw number and does not account from infiltration to permeable pavers.

Under proposed condition, the run-off from the site is directed to permeable pavers over open graded gravel for infiltration as required by Orange County drainage area Management plan (DAMP). Only the overflow from the site after infiltration outlets via parkway drain to existing curb & gutter on Starfish Avenue.

RATIONAL METHOD HYDROLOGY

Existing Conditions
10-Year Storm Event

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       FILE NAME: STAR10.DAT
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       USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
     =====================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

       USER SPECIFIED STORM EVENT(YEAR) =   10.00
       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) =   375.00
       ELEVATION DATA: UPSTREAM(FEET) =     31.90  DOWNSTREAM(FEET) =    28.25

       Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
       SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.680
       *  10 YEAR RAINFALL INTENSITY(INCH/HR) =   2.382
       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
       "1 DWELLING/ACRE"          D       1.02     0.20     0.800    57  12.68
       SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
       SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
       SUBAREA RUNOFF(CFS) =     2.04
       TOTAL AREA(ACRES) =       1.02   PEAK FLOW RATE(CFS) =     2.04
     =====================================================================
```

1

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES)        =       1.02  TC(MIN.) =      12.68
EFFECTIVE AREA(ACRES) =          1.02  AREA-AVERAGED Fm(INCH/HR)=  0.16
AREA-AVERAGED Fp(INCH/HR) =      0.20  AREA-AVERAGED Ap = 0.800
PEAK FLOW RATE(CFS)      =       2.04
=============================================================================
=============================================================================
END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY

Existing Conditions

25-Year Storm Event

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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) =   375.00
      ELEVATION DATA: UPSTREAM(FEET) =     31.90  DOWNSTREAM(FEET) =     28.25

      Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
      SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.680
      *  25 YEAR RAINFALL INTENSITY(INCH/HR) =   2.849
      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
      "1 DWELLING/ACRE"           D        1.02      0.20     0.800    57  12.68
      SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
      SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
      SUBAREA RUNOFF(CFS) =      2.47
      TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      2.47
     ==================================================================
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1

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =      1.02  TC(MIN.) =       12.68
EFFECTIVE AREA(ACRES) =      1.02  AREA-AVERAGED Fm(INCH/HR)=  0.16
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.800
PEAK FLOW RATE(CFS)    =      2.47
===============================================================================
===============================================================================
END OF RATIONAL METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY

Existing Conditions

100-Year Storm Event

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     FILE NAME: STAR10.DAT
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     USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
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                    --*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) =   375.00
     ELEVATION DATA: UPSTREAM(FEET) =    31.90  DOWNSTREAM(FEET) =    28.25

     Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
     SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.680
     * 100 YEAR RAINFALL INTENSITY(INCH/HR) =   3.630
     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
     "1 DWELLING/ACRE"        D        1.02     0.20     0.800    57  12.68
     SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
     SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
     SUBAREA RUNOFF(CFS) =      3.19
     TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      3.19
    =================================================================
```

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES)        =      1.02  TC(MIN.) =      12.68
EFFECTIVE AREA(ACRES) =         1.02  AREA-AVERAGED Fm(INCH/HR)=  0.16
AREA-AVERAGED Fp(INCH/HR) =     0.20  AREA-AVERAGED Ap = 0.800
PEAK FLOW RATE(CFS)      =       3.19
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========================================================================
END OF RATIONAL METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY

Proposed Conditions

10-Year Storm Event

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                      --*TIME-OF-CONCENTRATION MODEL*--

      USER SPECIFIED STORM EVENT(YEAR) =   10.00
      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) =   365.00
      ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =    29.75

      Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
      SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.150
      *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.564
      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
      "3-4 DWELLINGS/ACRE"      D       1.01      0.20      0.600     57   11.15
      SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
      SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
      SUBAREA RUNOFF(CFS) =       2.22
      TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =       2.22
     ==================================================================
```

1

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES)        =      1.01  TC(MIN.) =      11.15
EFFECTIVE AREA(ACRES) =         1.01  AREA-AVERAGED Fm(INCH/HR)=  0.12
AREA-AVERAGED Fp(INCH/HR) =     0.20  AREA-AVERAGED Ap = 0.600
PEAK FLOW RATE(CFS)      =      2.22
=====================================================================
=====================================================================
END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY

Proposed Conditions
25-Year Storm Event

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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) =   365.00
     ELEVATION DATA: UPSTREAM(FEET) =     33.10  DOWNSTREAM(FEET) =    29.75

     Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
     SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.150
     *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.064
     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
     "3-4 DWELLINGS/ACRE"      D        1.01     0.20     0.600    57   11.15
     SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
     SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
     SUBAREA RUNOFF(CFS) =      2.68
     TOTAL AREA(ACRES) =     1.01   PEAK FLOW RATE(CFS) =      2.68
    ========================================================================
```

1

```
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)       =      1.01  TC(MIN.) =      11.15
EFFECTIVE AREA(ACRES) =        1.01  AREA-AVERAGED Fm(INCH/HR)=  0.12
AREA-AVERAGED Fp(INCH/HR) =    0.20  AREA-AVERAGED Ap = 0.600
PEAK FLOW RATE(CFS)     =      2.68
================================================================================
================================================================================
END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY

Proposed Conditions
100-Year Storm Event

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*****************************************************************************
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     -----------------------------------------------------------------------
       FILE NAME: STARP.DAT
       TIME/DATE OF STUDY: 15:33 02/19/2021
     ========================================================================
       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) =   365.00
       ELEVATION DATA: UPSTREAM(FEET) =      33.10  DOWNSTREAM(FEET) =    29.75

       Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
       SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.150
       * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.908
       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
       "3-4 DWELLINGS/ACRE"       D       1.01     0.20     0.600     57   11.15
       SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
       SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
       SUBAREA RUNOFF(CFS) =      3.44
       TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      3.44
     ========================================================================
```

```
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)       =       1.01  TC(MIN.) =       11.15
EFFECTIVE AREA(ACRES) =         1.01  AREA-AVERAGED Fm(INCH/HR)=  0.12
AREA-AVERAGED Fp(INCH/HR) =     0.20  AREA-AVERAGED Ap = 0.600
PEAK FLOW RATE(CFS)     =       3.44
===============================================================================
===============================================================================
END OF RATIONAL METHOD ANALYSIS
```

HYDRAULICS

Parkway Culverts Capacity Calculations

```
-------------------------------------------------------------------------------
  ********************************************************************************
                  HYDRAULIC ELEMENTS - I   PROGRAM PACKAGE
            (C) Copyright 1982-2005 Advanced Engineering Software (aes)
              Ver. 10.2   Release Date: 01/01/2005   License ID 1570

                          Analysis prepared by:

                          DMS Consultants, Inc.




-------------------------------------------------------------------------------
   TIME/DATE OF STUDY: 15:42 03/02/2021
===============================================================================
 Problem Descriptions:
  Parkway Drain Calcs


 ********************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
-------------------------------------------------------------------------------
    NORMAL DEPTH(FEET) =   0.33
    CHANNEL Z1(HORIZONTAL/VERTICAL) =    0.00
           Z2(HORIZONTAL/VERTICAL) =    0.00
    CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.009000
    UNIFORM FLOW(CFS) =       2.68
    MANNINGS FRICTION FACTOR = 0.0130
===============================================================================
    NORMAL-DEPTH FLOW INFORMATION:
-------------------------------------------------------------------------------
    >>>>> BASEWIDTH(FEET) =     1.91              ------> OK (Provided 2.0')
    FLOW TOP-WIDTH(FEET) =          1.91
    FLOW AREA(SQUARE FEET) =           0.63
    HYDRAULIC DEPTH(FEET) =      0.33
    FLOW AVERAGE VELOCITY(FEET/SEC.) =     4.25
    UNIFORM FROUDE NUMBER =   1.304
    PRESSURE + MOMENTUM(POUNDS) =          28.56
    AVERAGED VELOCITY HEAD(FEET) =       0.280
    SPECIFIC ENERGY(FEET) =       0.610
===============================================================================
    CRITICAL-DEPTH FLOW INFORMATION:
-------------------------------------------------------------------------------
    CRITICAL FLOW TOP-WIDTH(FEET) =          1.91
    CRITICAL FLOW AREA(SQUARE FEET) =            0.75
    CRITICAL FLOW HYDRAULIC DEPTH(FEET) =      0.39
    CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =      3.55
    CRITICAL DEPTH(FEET) =      0.39
    CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =          27.74
    AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =       0.196
    CRITICAL FLOW SPECIFIC ENERGY(FEET) =       0.591
===============================================================================
```
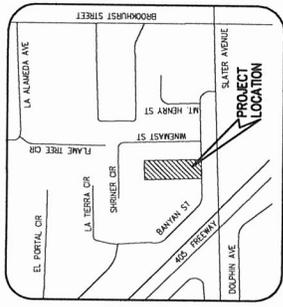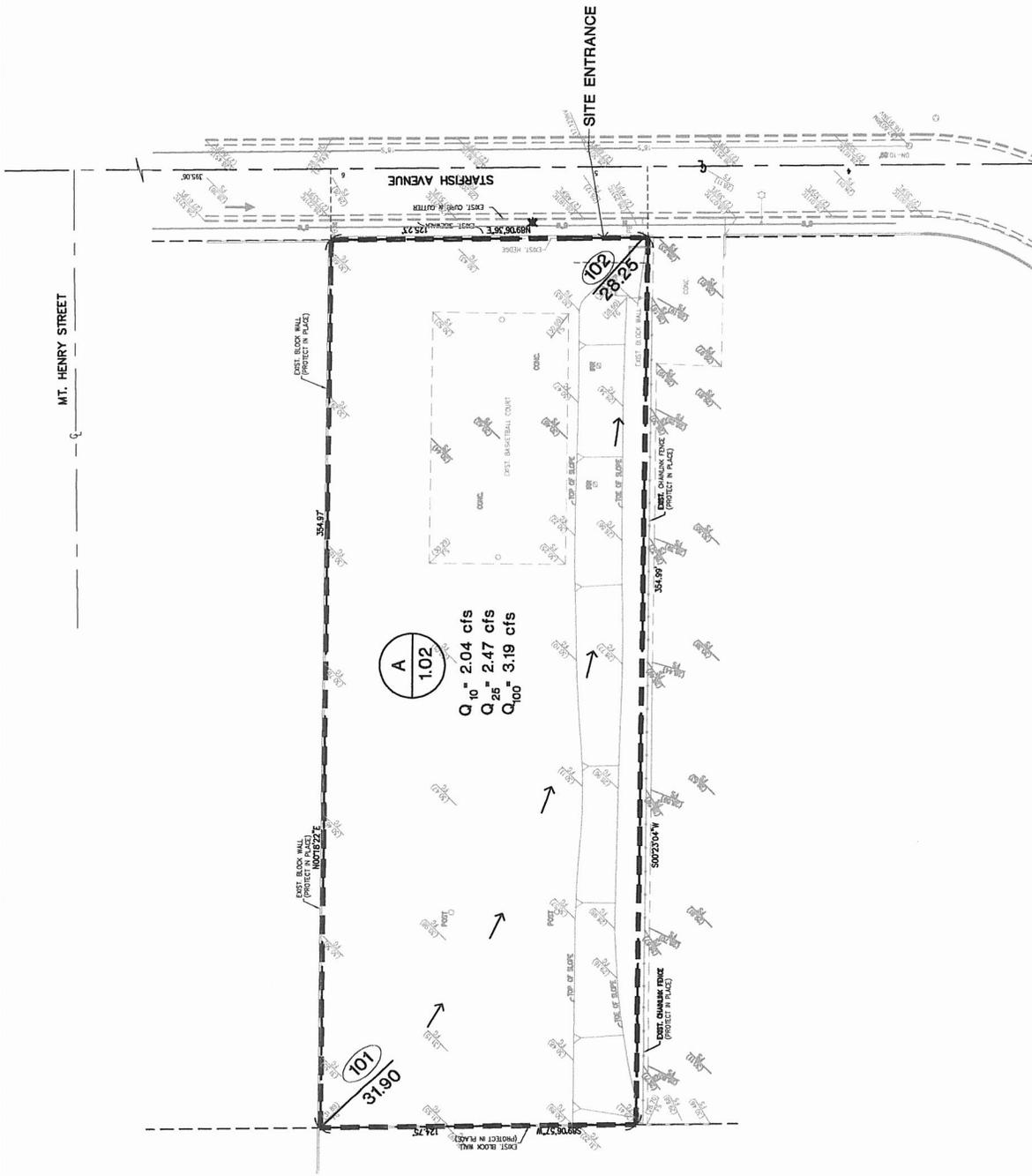
APPENDIX

Hydrology Maps
Existing and Proposed Conditions

VICINITY MAP
NOT TO SCALE

Vicinity map streets: BROOKHURST STREET, LA ALMEDA AVE, SLATER AVENUE, FLAME TREE CR, MT HENRY ST, WINEMA ST, EL PORTAL CR, LA TERRA CR, SHRINER CR, BANYAN ST, 405 FREEWAY, DOLPHIN AVE
PROJECT LOCATION

LEGEND

A	AREA DESIGNATION
0.00	AREA IN ACRES
XXX	NODE DESIGNATION
45.00	ELEVATION
→	DIRECTION OF FLOW

MT. HENRY STREET

STARFISH AVENUE

SITE ENTRANCE

EXIST. CURB & GUTTER
EXIST. SIDEWALK 125.3'
N89°06'06"E
EXIST. HEDGE
EXIST. BLOCK WALL
EXIST BLOCK WALL (PROTECT IN PLACE)
EXIST. CHAINLINK FENCE (PROTECT IN PLACE)
EXIST. BASKETBALL COURT
CONC
TOP OF SLOPE
TOE OF SLOPE

102
28.25

354.99'
S00°23'04"W

A
1.02

Q₁₀ = 2.04 cfs
Q₂₅ = 2.47 cfs
Q₁₀₀ = 3.19 cfs

$Q_{10} = 2.04$ cfs
$Q_{25} = 2.47$ cfs
$Q_{100} = 3.19$ cfs

354.97'
N00°16'22"E

POST
POST

101
31.90

S89°06'52"W 124.75
EXIST BLOCK WALL (PROTECT IN PLACE)

SCALE: 1"=20'

PREPARED UNDER THE SUPERVISION OF
SURINDER M. DEWAN

ENGINEER
DMS
CONSULTANTS, INC.
CIVIL ENGINEERS

OWNER/DEVELOPER:
STARFISH FV VENTURE, LLC
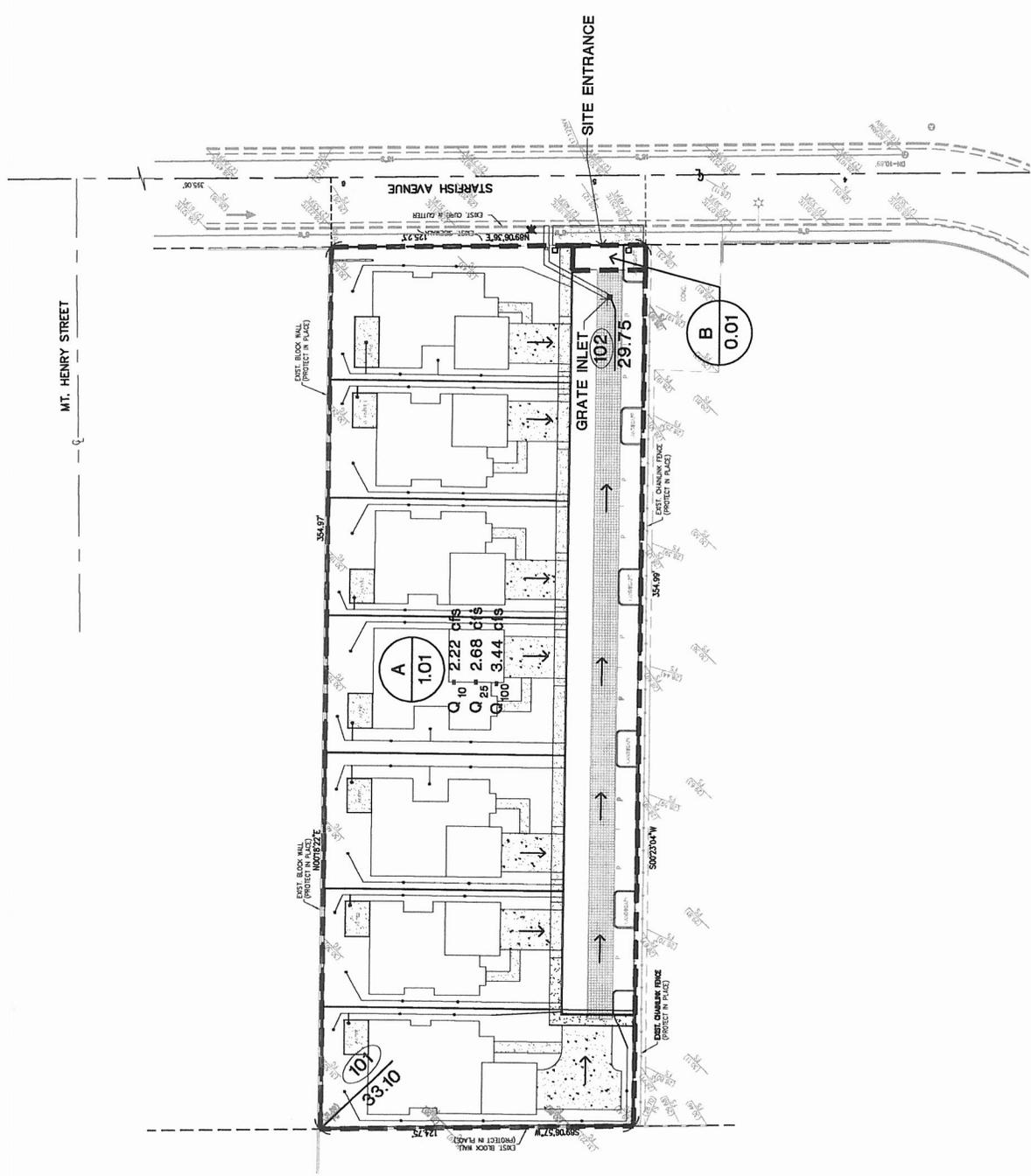
CITY OF FOUNTAIN VALLEY
HYDROLOGY PLAN – EXISTING CONDITIONS
TENTATIVE TRACT NO. 19115
9779 STARFISH AVENUE, FOUNTAIN VALLEY, CA 92708
SHEET 1 OF 1
DATE : 02/19/2021

VICINITY MAP
NOT TO SCALE

LEGEND

(A)	AREA DESIGNATION
0.00	AREA IN ACRES
XXX	NODE DESIGNATION
45.00	ELEVATION
→	DIRECTION OF FLOW

SITE ENTRANCE

STARFISH AVENUE

GRATE INLET

102
29.75

B
0.01

A
1.01

Q10 = 2.22 cfs
Q25 = 2.68 cfs
Q100 = 3.44 cfs

101
33.10

MT. HENRY STREET

SCALE: 1"=20'

PREPARED UNDER THE
SUPERVISION OF

SURENDER M. DEWAN

ENGINEER

DMS
CONSULTANTS, INC.
CIVIL ENGINEERS

OWNER/DEVELOPER:

STARFISH FV VENTURE, LLC

CITY OF FOUNTAIN VALLEY
HYDROLOGY PLAN –PROPOSED CONDITIONS
TENTATIVE TRACT NO. 19115
9779 STARFISH AVENUE, FOUNTAIN VALLEY, CA 92708

DATE : 02/19/2021

SHEET 1 OF 1