APPENDIX H

ONSITE HYDROLOGY AND HYDRAULIC REPORT

McDonalds Santa Ana

Onsite Hydrology and Hydraulics Report

2109 E Santa Clara Avenue, Santa Ana, CA 92705

APN: 396-261-26, 396-261-33, 396-261-38

Prepared for:

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CEQA Analysis Submittal: August 2023

INTRODUCTION

The proposed project consists of the construction of a new McDonald's Restaurant in APN 396-261-26, 396-261-33, and 396-261-38 (2109 E Santa Clara Avenue, Santa Ana, CA 92705). The project is located north of E Santa Clara Avenue and is surrounded by commercial developments to the north, east and west side of the property. The site currently has existing residential buildings with three (3) driveway approaches and is surrounded by an existing wall. All existing items will be demolished and replaced with a new McDonald's restaurant, trash enclosure, drive through and associated parking lot.

The proposed project disturbs approximately 0.82 acres and will include improvements to the adjacent shared access aisle, east of the project. The existing drainage patterns shows runoff flowing from the northwest and northeast corner of the property and sheet flowing south (see Appendix B). With no existing stormdrain system within the parcel or any stormdrain lines adjacent to the right-of-way, the existing site's runoff sheet flows from the existing driveway approaches onto the existing curb and gutter on E Santa Clara Ave and flows east to the curb inlet on the intersection of E Santa Clara Ave and Tustin Ave to the public stormwater system.

The proposed development will include the construction of the new restaurant building of approximately 3,975 square feet and a drive-thru west of the building. New landscaped area will be added throughout the project area as shown on the proposed conditions hydrology map (see Appendix B). The site will have one overall drainage area with three sub drainage areas.

Drainage management area 1 (DMA 1) will follow similar existing drainage patterns conditions and flow from the northeast and northwest corners to the south of the site. Roof drains will discharge at the surface and the stormwater will flow through curb and gutters and valley gutters to be captured and convey stormwater runoff towards one of three catch basins strategically placed throughout the site. The proposed catch basins will all be piped to a proposed BMP in the center southern portion of the project area. Stormwater runoff will discharge into a proposed underground detention system and will be pumped and discharged at an attenuated rated onto the curb and gutter off E Santa Clara Ave to match existing conditions. The stormwater will continue to flow east to the curb inlet on the intersection of E Santa Clara Ave and Tustin Ave to the public stormwater system.

DMA 1 has a ridgeline separating the proposed restaurant area and the adjacent shared access. The access aisle will match existing conditions and will sheet flow from the northeast corner of the property to the southeast driveway approach off E Santa Clara Ave. Per the ALTA survey and utility locate, there is no existing public stormwater lines adjacent to the property. There will be driveway improvements on the existing road and public right-of-way will all match existing conditions. All existing drainage patterns will remain the same and runoff will flow from the curb and gutter off E Santa Clara Ave and east to the curb inlet on the intersection of E Santa Clara Ave and Tustin Ave to the public stormwater system.

DMA 1 consists of three (3) inlets that direct stormwater to a single biofiltration BMP. Drainage area 3 (DA 3) consists of discharge coming from the roof drains, parking spaces and drive aisles into the proposed catch basin south of the site. This catch basin will be piped to the proposed biofiltration BMP and eventually into a proposed underground detention system, where the water will be pumped and

attenuated to the curb and gutter off E Santa Clara Ave to match existing conditions. Drainage area 2 (DA 2) contains flows from the northern drive-thru area. From this catch basin, the discharge will be piped into the proposed BMP south of the site. Drainage area 4 (DA 4) consists of flows on the western and southern portions of the drive-thru. Like the other catchment areas, the discharge from these areas will pipe to the proposed biofiltration BMP south of the site, enter the underground detention system and be pumped to the existing curb and gutter on Santa Clara Avenue at an attenuated rate.

HYDROLOGY

The hydrology and hydraulic analysis was prepared in accordance with the Orange County Hydrology Manual (OC Hydrology Manual, 1986) and OC Local Drainage Manual 2020. Per the drainage manuals, minimum recurrence intervals for the design of new local drainage facilities shall be:

- Habitable structures shall have 100-year flood protection
- A 25-year storm event for all open and underground channels and storm drains with drainage areas less than 640 acres, and watershed tributary the Santa Ana River. (Chapter 4, Section II)
- Analysis of all storm events shall be based on "high confidence level"

In the existing condition, storm water runoff from the existing building, driveways, and parking surface flow from the northeast and northwest corners of the site, south towards the E. Santa Clara Ave. All stormwater runoff is being contained within the property limits because of the existing surrounding wall. There is no stormdrain system in existing conditions and no public stormdrain main off E. Santa Clara. All drainage is sheet flowing off site and to the public street.

In the proposed condition, during low flow storm events, a series of curb and gutter and valley gutters will be installed along the north, east and southern ends of the site to capture and convey storm water runoff. The stormwater runoff will be diverted towards one of three (3) new on-site catch basins, which will be located on the southwest of the development. Storm water will then be conveyed to an underground detention system sized to retain the design capture storm. Stormwater will be pumped from the proposed underground retention tank to the existing curb and gutter on Santa Clara Ave. The proposed 2-year flow will be less than the existing 2-year flow.

During large storm events (25 & 100-year storm) storm water runoff will enter the proposed underground retention system and be pumped out and onto the curb and gutter off E Santa Clara Ave and flow east to the curb inlet on the intersection of E Santa Clara Ave and Tustin Ave to the public stormwater system. In storm events larger than the 100-year storm, the water will overflow from the detention basin into a curb cut leading to landscaping, and eventually into the public valley gutter along E. Santa Clara Ave. The stormdrain pipes have also been sized for the 100-year storm. Refer to Appendix C for more information on proposed large storm event hydrology conditions.

The goal of the project is to keep flowrates for the proposed project conditions from exceeding existing conditions peak flows discharging directly to the on-site storm drain system for 100-year and 25-year storm events. A rational method analysis in accordance with the Orange County Hydrology Manual was completed to calculate the peak discharges for existing conditions and proposed project conditions

(Refer to Appendices D-E for calculations). A review of soil maps from the Hydrology Manual showed that the existing soils consisted of hydrologic group B as shown in the Soils Map in Appendix A. Soil group B is defined as soils having moderate infiltration rates and was used to calculate the soil loss rates. In addition, antecedent moisture condition (AMC) of 2 was used to calculate the 25-year peak flows and 100-year storm event. The land use for each subarea was selected based on the percent pervious for existing and proposed project conditions.

The Orange County Hydrology Manual was used to complete the rational method analysis. In accordance with the Orange County WQMP TGD the project is not hydromod exempt and must also detain the difference in volume and attenuate the discharge created during the 2-year, 24-hour storm event. The additional peak flow from existing to proposed conditions, as well as the 2-year, 24-hour storm event, will be accounted for in the underground detention system and will pump onto the right-of-way to match existing conditions and attenuate the peak flow. The underground detention area will capture the additional storage required to attenuate peak flows. Please refer to Appendices for more information and calculation outputs.

Hydrology results for existing and proposed conditions are included in Appendix B and Appendix C, respectively, and shown in Tables 1 -3 below.

Table 1: Existing Conditions Rational Method Results

Drainage Area	Area (acres)	Time of Concentration (min)	25-year Peak Flow (cfs)	100-year Peak Flow (cfs)
1	0.82	10.63	2.39	3.11

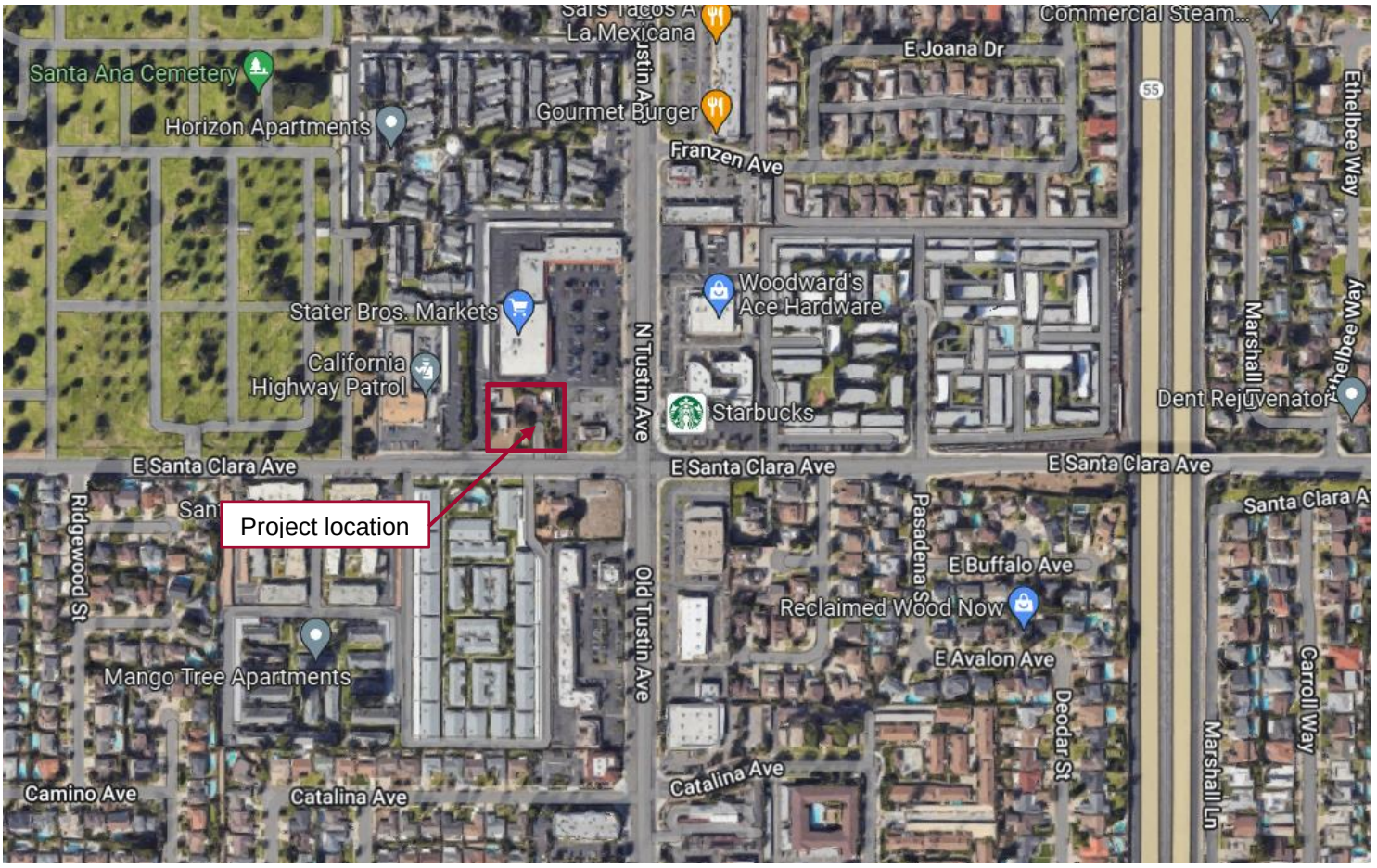
Table 2: Proposed Conditions Rational Method Results

Drainage Area	Area (acres)	Time of Concentration (min)	25-year Peak Flow (cfs)	100-year Peak Flow (cfs)
1	0.82	5.2	3.00	3.90

Table 3: Summary of Results

Drainage Area	Area (acres)	50-year Required Detention Volume (CF)	Proposed Detention Volume (CF)	25-year & 100-year Peak pump discharge rate	25-year Peak Flow Reduction (cfs)	100-year Peak Flow Reduction (cfs)
1	0.82	1638	3845	0.87 cfs	**-0.61 cfs**	**-0.79 cfs**

Figure 1: McDonald's Santa Ana Project Location Map

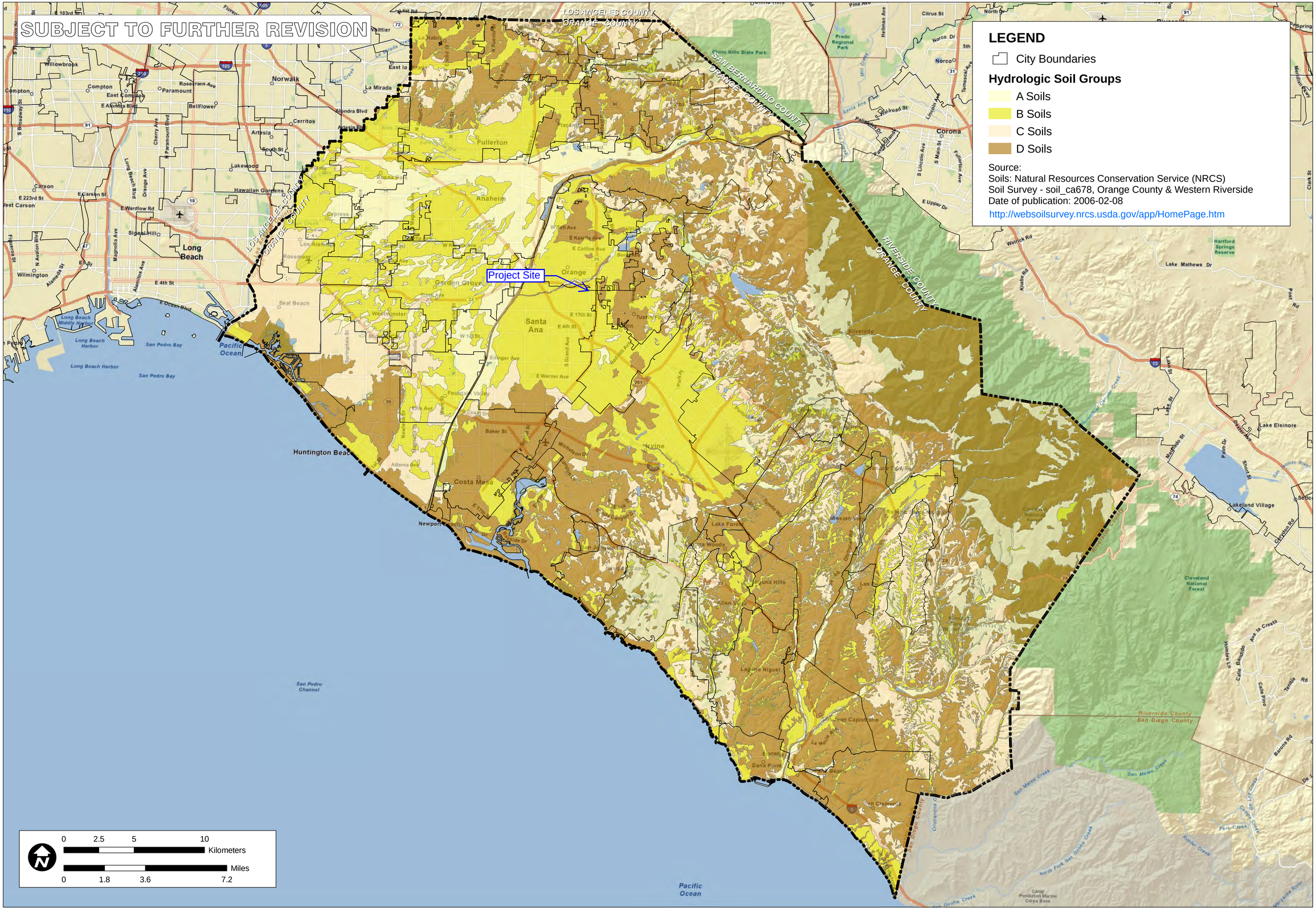


NORTH

N.T.S

APPENDIX A: SOILS MAP

SUBJECT TO FURTHER REVISION



TITLE

NRCS HYDROLOGIC SOILS GROUPS

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

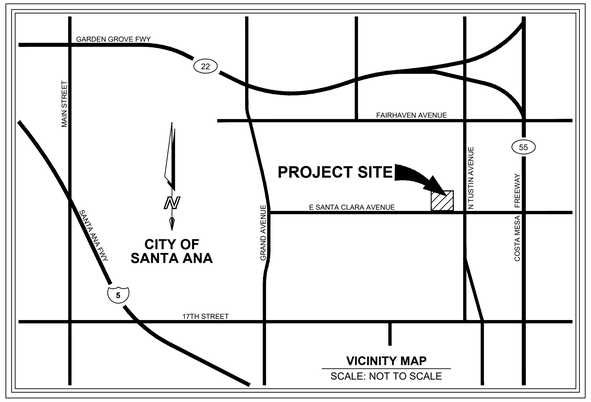
PACE
Advanced Water Engineering

FIGURE

XVI-2a

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2a_HydroSoils_20110215.mxd

APPENDIX B: EXISTING CONDITIONS HYDROLOGY MAP



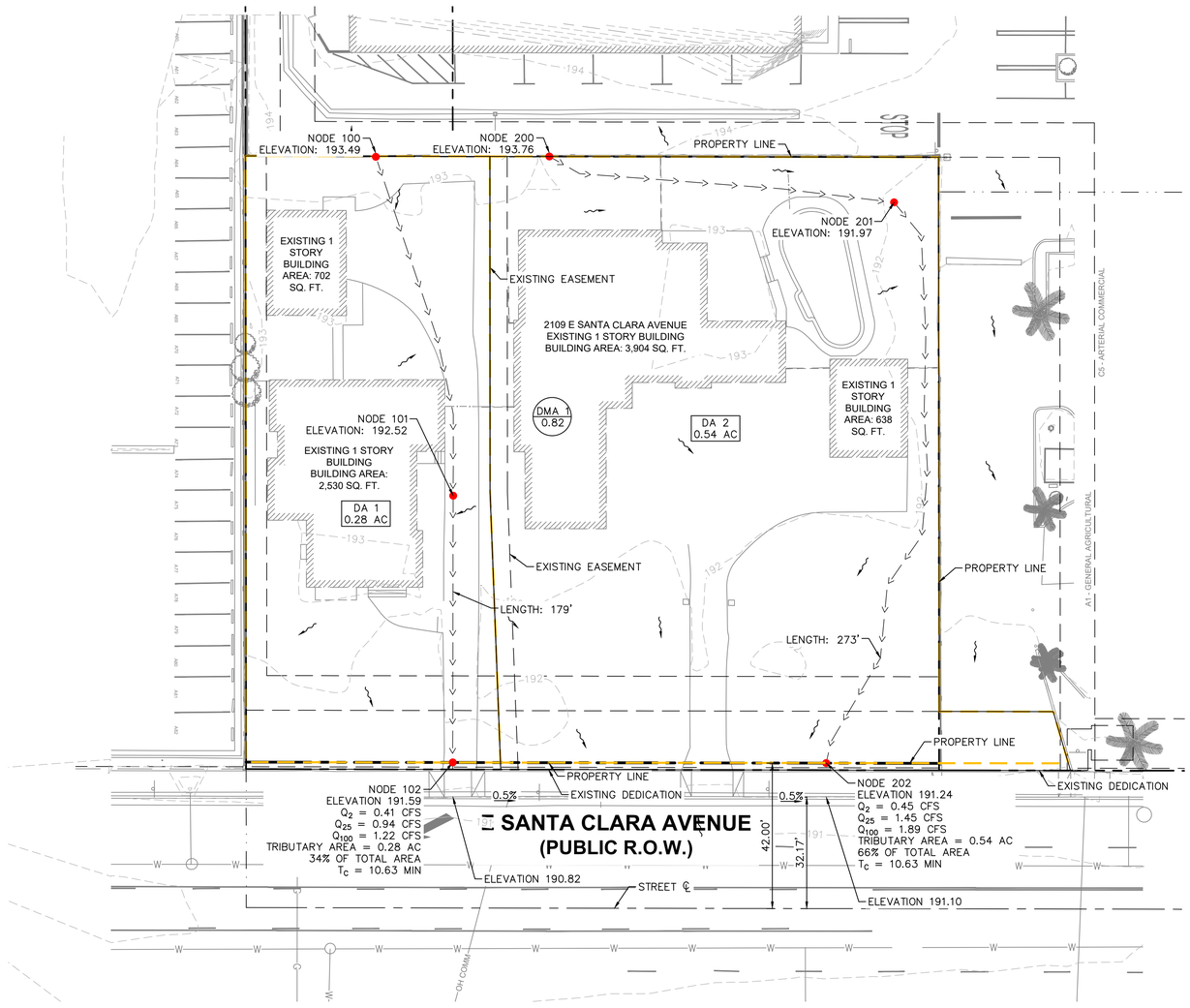
LEGEND

- CENTER LINE
- PROPERTY LINE
- DEDICATION LINE
- EASEMENT LINE
- DRAINAGE MAP AREA (DMA) BOUNDARY
- PROPOSED FLOW LINE
- PROPOSED STORM DRAIN LINE (SD)
- EXISTING FLOW DIRECTION
- LONGEST HYDROLOGIC PATH
- NODE

EXISTING CONDITIONS (DMA 1)	
TOTAL AREA, SF (ACRES)	35531 (0.82)
IMPERVIOUS AREA, SF (ACRES)	16275 (0.38)
PERVIOUS AREA, SF (ACRES)	19256 (0.44)
IMPERVIOUS FRACTION (IMP)	0.46
C	0.50
2-YEAR DEPTH, INCHES	2.05

EXISTING CONDITIONS (DA 1)	
TOTAL AREA, SF (ACRES)	23078 (0.54)
IMPERVIOUS AREA, SF (ACRES)	9724 (0.22)
PERVIOUS AREA, SF (ACRES)	13354 (0.31)
IMPERVIOUS FRACTION (IMP)	0.42
C	0.50
2-YEAR DEPTH, INCHES	2.05

EXISTING CONDITIONS (DA 2)	
TOTAL AREA, SF (ACRES)	12453 (0.29)
IMPERVIOUS AREA, SF (ACRES)	6936 (0.16)
PERVIOUS AREA, SF (ACRES)	5517 (0.13)
IMPERVIOUS FRACTION (IMP)	0.56
C	0.50
2-YEAR DEPTH, INCHES	2.05



NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

SCALE
1" = 20'
WHEN PRINTED AT FULL SIZE
(24"X36")

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of Southern California
CALL: TOLL FREE 1-800-422-4133
TWO WORKING DAYS
BEFORE YOU DIG

NOTICE TO CONTRACTOR

PURSUANT TO ASSEMBLY BILL 3019 NO EXCAVATION PERMIT IS VALID UNLESS THE CONTRACTOR CONTACTS AND OBTAINS AN INQUIRY I.D. NUMBER FROM "UNDERGROUND SERVICE ALERT" (1-800-422-4133) AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING EXCAVATION.

PROJECT NO. YY-NNNN: PROJECT TITLE PROJECT LIMITS

FILE NO.:

R-

REVISIONS

NUMBER	DATE	INITIALS	DESCRIPTION	APPROVED	INSTALLED

REFERENCES

BENCHMARK NO.: 3C-26-06 ELEV.: 173.744' NAVD88

THE ON-SITE BENCHMARK IS BASED ON NAVD 1988 DATUM, AND IS A SET MAG NAIL AND SHINER AT THE NORTHEAST CORNER OF PARCEL 2. ELEVATION = 193.65 FEET.

THE BASIS OF BEARING IS THE CENTERLINE OF SANTA CLARA AVENUE PER TRACT MAP NO. 14568, BOOK 695, PAGE 47, COUNTY OF ORANGE, A BEARING OF N89°59'50"E.

CONSTRUCTION COMPLETED:

REGISTERED PROFESSIONAL ENGINEER HANNAH M. LUEVANO RCE NO. 90371 CIVIL STATE OF CALIFORNIA — NOT FOR CONSTRUCTION

PREPARED UNDER THE SUPERVISION OF:
HANNAH LUEVANO, P.E.
KIMLEY-HORN
3100 TOWN & COUNTRY RD
SUITE 700
(213) 261-4040

REVIEWED FOR CONSTRUCTABILITY AND RECOMMENDED FOR CONSTRUCTION:

JASON GABRIEL
SENIOR CIVIL ENGINEER RCE NO.: 90371
DESIGNED: HL DRAWN: MH CHECKED: HL
PRINCIPAL CIVIL ENGINEER RCE NO.: 62968

DATE 7/11/2023
DATE XX/YYYY

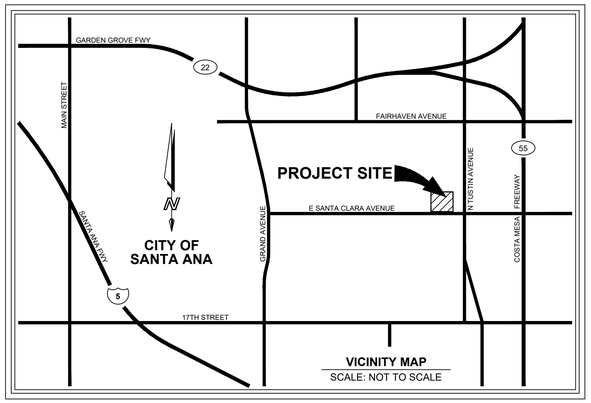
PROPOSED DRIVE-THRU RESTAURANT
2109 E SANTA CLARA AVENUE
SANTA ANA, CA 92705

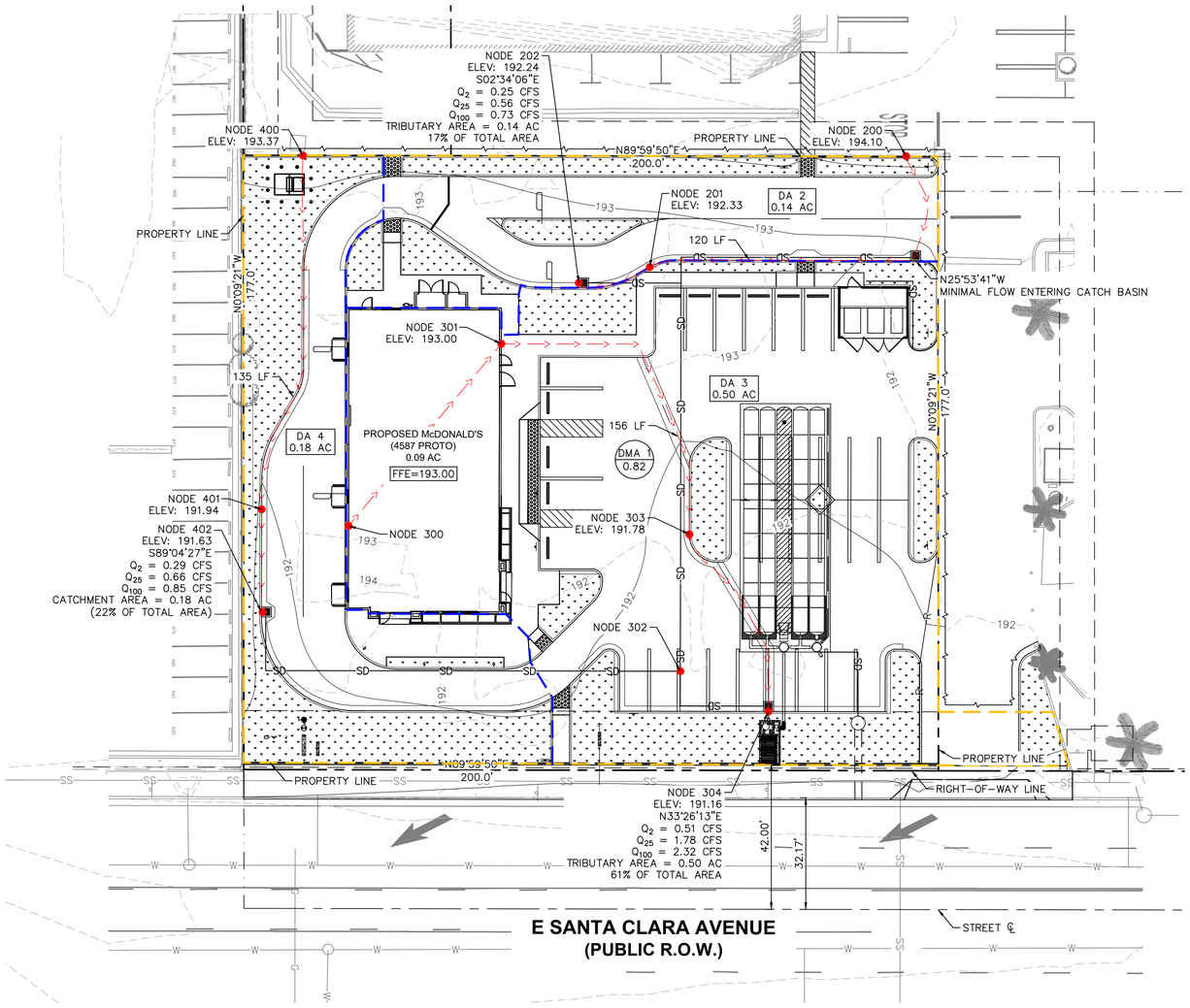
PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET NO.

EXISTING HYDROLOGY MAP

APPENDIX C: PROPOSED CONDITIONS HYDROLOGY MAP





LEGEND

- CENTER LINE
- PROPERTY LINE
- DEDICATION LINE
- EASEMENT LINE
- DRAINAGE AREA BOUNDARY
- CATCHMENT AREA BOUNDARY
- PROPOSED FLOW LINE
- PROPOSED STORM DRAIN LINE (SD)
- LONGEST HYDROLOGIC PATH
- CONFLUENCE POINT (CP)
- LANDSCAPE/PLANTER AREA

PROPOSED CONDITIONS (DMA 1)	
TOTAL AREA, SF (ACRES)	35531 (0.82)
IMPERVIOUS AREA, SF (ACRES)	26973 (0.63)
PERVIOUS AREA, SF (ACRES)	8558 (0.18)
IMPERVIOUS FRACTION (IMP)	0.78
C	0.72
2-YEAR DEPTH, INCHES	2.05
2-YEAR FLOW	1.62

PROPOSED CONDITIONS (DA 2)	
TOTAL AREA, SF (ACRES)	5879 (0.14)
IMPERVIOUS AREA, SF (ACRES)	4229 (0.10)
PERVIOUS AREA, SF (ACRES)	1650 (0.04)
IMPERVIOUS FRACTION (IMP)	0.72
C	0.72
2-YEAR DEPTH, INCHES	2.05
2-YEAR FLOW	0.28

PROPOSED CONDITIONS (DA 3)	
TOTAL AREA, SF (ACRES)	21784 (0.50)
IMPERVIOUS AREA, SF (ACRES)	18513 (0.43)
PERVIOUS AREA, SF (ACRES)	3271 (0.08)
IMPERVIOUS FRACTION (IMP)	0.85
C	0.72
2-YEAR DEPTH, INCHES	2.05
2-YEAR FLOW	0.99

PROPOSED CONDITIONS (DA 4)	
TOTAL AREA, SF (ACRES)	7868 (0.18)
IMPERVIOUS AREA, SF (ACRES)	4231 (0.10)
PERVIOUS AREA, SF (ACRES)	3637 (0.08)
IMPERVIOUS FRACTION (IMP)	0.54
C	0.72
2-YEAR DEPTH, INCHES	2.05
2-YEAR FLOW	0.36

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

SCALE
1" = 20'
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SENIOR CIVIL ENGINEER RCE NO.: 90371
DESIGNED: HL DRAWN: MH CHECKED: HL

DATE
7/11/2023
XX/YYYY

PROPOSED DRIVE-THRU RESTAURANT

2109 E SANTA CLARA AVENUE
SANTA ANA, CA 92705

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

PROPOSED HYDROLOGY MAP

SHEET NO.

APPENDIX D: 25-YEAR STORM ANALYSIS FOR EXISTING CONDITIONS AND PROPOSED CONDITIONS

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**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2011 Advanced Engineering Software (aes)
             Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```



```
  FILE NAME: MCD100E.DAT
  TIME/DATE OF STUDY: 11:25 06/27/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *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 =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 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) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.49  DOWNSTREAM(FEET) =    192.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.203
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.270
  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
  "5-7 DWELLINGS/ACRE"       B        0.16      0.30     0.500    56    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.59
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.59

********************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.52  DOWNSTREAM(FEET) =    191.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =    79.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.916
  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        0.06      0.30     0.700    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.29
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.02
  Tc(MIN.) =    7.23
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.20
  EFFECTIVE AREA(ACRES) =      0.22     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     179.00 FEET.

********************************************************************************
```

```
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.23
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.916
 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        0.06      0.30     0.700    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.20
 EFFECTIVE AREA(ACRES) =      0.28   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.94

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 ELEVATION DATA: UPSTREAM(FEET) =    193.76  DOWNSTREAM(FEET) =    191.97

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.814
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.049
 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.)
 PUBLIC PARK                B        0.04      0.30     0.850    56    6.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.14
 TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.14

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    191.97  DOWNSTREAM(FEET) =    191.24
 CHANNEL LENGTH THRU SUBAREA(FEET) =   173.00   CHANNEL SLOPE =  0.0042
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.147
 SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.76
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   3.82
  Tc(MIN.) =   10.63
  SUBAREA AREA(ACRES) =     0.25       SUBAREA RUNOFF(CFS) =    0.67
  EFFECTIVE AREA(ACRES) =      0.29     AREA-AVERAGED Fm(INCH/HR) =   0.16
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.84
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     273.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.63
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.147
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.67
  EFFECTIVE AREA(ACRES) =      0.54   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.53
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.45
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     10.63
  EFFECTIVE AREA(ACRES) =      0.54  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.526
  PEAK FLOW RATE(CFS)   =       1.45
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2011 Advanced Engineering Software (aes)
             Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```

```
 ************************** DESCRIPTION OF STUDY **************************
* MCDONALD'S SANTA ANA                                                   *
* PROPOSED 25 YEAR                                                       *
* KIMLEY-HORN & ASSOCIATES                                               *
 ************************************************************************

  FILE NAME: MCD25PR.DAT
  TIME/DATE OF STUDY: 11:33 06/29/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *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 =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.5 (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    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    194.10  DOWNSTREAM(FEET) =    192.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.090
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.775
  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        0.09      0.30     0.350    56    5.09
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.38

********************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.33  DOWNSTREAM(FEET) =    192.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.566
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.79
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.42
  Tc(MIN.) =    5.51
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.10
  EFFECTIVE AREA(ACRES) =      0.12     AREA-AVERAGED Fm(INCH/HR) =   0.11
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.74
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     120.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    5.51
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.566
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.03      SUBAREA RUNOFF(CFS) =    0.10
  EFFECTIVE AREA(ACRES) =      0.14   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        0.1       PEAK FLOW RATE(CFS) =       0.56

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    302.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.46  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.44
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.56
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    6.17
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    302.00 =     257.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.17
  RAINFALL INTENSITY(INCH/HR) =   4.28
  AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       0.14
  TOTAL STREAM AREA(ACRES) =       0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.56

********************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.37  DOWNSTREAM(FEET) =    191.94

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.740
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.461
  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
  "5-7 DWELLINGS/ACRE"       B        0.08      0.30     0.500    56    5.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    191.94  DOWNSTREAM(FEET) =    191.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =    35.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.207
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.93
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.63
  Tc(MIN.) =    6.37
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.18
  EFFECTIVE AREA(ACRES) =      0.13     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.50
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.47

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.37
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.207
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.18
  EFFECTIVE AREA(ACRES) =      0.18   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.66

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    302.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.32  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   134.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.46
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.66
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =    7.01
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.01
  RAINFALL INTENSITY(INCH/HR) =   3.98
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.66

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        0.56    6.17    4.281  0.30( 0.11) 0.35       0.1     200.00
    2        0.66    7.01    3.983  0.30( 0.15) 0.50       0.2     400.00

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

  ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        1.19    6.17    4.281  0.30( 0.13) 0.43       0.3     200.00
    2        1.18    7.01    3.983  0.30( 0.13) 0.43       0.3     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.19    Tc(MIN.) =     6.17
  EFFECTIVE AREA(ACRES) =       0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.43
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.98  DOWNSTREAM(FEET) =   187.64
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.04
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.19
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    6.31
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.31
  RAINFALL INTENSITY(INCH/HR) =   4.23
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.43
  EFFECTIVE STREAM AREA(ACRES) =       0.30
  TOTAL STREAM AREA(ACRES) =       0.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.19
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
  USER SPECIFIED Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.09      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    193.00  DOWNSTREAM(FEET) =    191.16
  CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.940
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 B        0.21      0.30     0.200    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.21
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   2.15
  Tc(MIN.) =    7.15
  SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.73
  EFFECTIVE AREA(ACRES) =      0.30     AREA-AVERAGED Fm(INCH/HR) =   0.05
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.17
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.05

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.34
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     189.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    7.15
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.940
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 B        0.21      0.30     0.200    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.73
  EFFECTIVE AREA(ACRES) =      0.51   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.78

********************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.15
  RAINFALL INTENSITY(INCH/HR) =   3.94
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =       0.51
  TOTAL STREAM AREA(ACRES) =       0.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.78

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.19    6.31    4.228  0.30( 0.13) 0.43       0.3     200.00
      1        1.18    7.15    3.940  0.30( 0.13) 0.43       0.3     400.00
      2        1.78    7.15    3.940  0.30( 0.05) 0.18       0.5     300.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.88    6.31    4.228  0.30( 0.08) 0.28       0.7     200.00
      2        2.96    7.15    3.940  0.30( 0.08) 0.28       0.8     300.00
      3        2.96    7.15    3.940  0.30( 0.08) 0.28       0.8     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.96    Tc(MIN.) =     7.15
```

```
  EFFECTIVE AREA(ACRES) =       0.83   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.28
  TOTAL AREA(ACRES) =        0.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      7.15
  EFFECTIVE AREA(ACRES) =      0.83  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.280
  PEAK FLOW RATE(CFS)   =       2.96

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.88    6.31    4.228  0.30( 0.08) 0.28       0.7     200.00
      2        2.96    7.15    3.940  0.30( 0.08) 0.28       0.8     300.00
      3        2.96    7.15    3.940  0.30( 0.08) 0.28       0.8     400.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX E: 100-YEAR STORM ANALYSIS FOR EXISTING CONDITIONS AND PROPOSED CONDITIONS

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




 ************************** DESCRIPTION OF STUDY **************************
* MCDONALDS SANTA ANA                                                    *
* 100-YEAR EXISTING                                                      *
* KIMLEY-HORN                                                            *
 ************************************************************************

  FILE NAME: MCD100E.DAT
  TIME/DATE OF STUDY: 13:51 06/27/2023
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *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 =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.49  DOWNSTREAM(FEET) =    192.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.203
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.468
  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
  "5-7 DWELLINGS/ACRE"       B        0.16      0.30     0.500    56    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.77

********************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.52  DOWNSTREAM(FEET) =    191.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =    79.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.033
  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        0.06      0.30     0.700    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.97
  Tc(MIN.) =    7.17
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.26
  EFFECTIVE AREA(ACRES) =      0.22     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     179.00 FEET.

********************************************************************************
```

```
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.17
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.033
 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        0.06      0.30     0.700    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.26
 EFFECTIVE AREA(ACRES) =      0.28   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       1.22

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 ELEVATION DATA: UPSTREAM(FEET) =    193.76  DOWNSTREAM(FEET) =    191.97

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.814
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.182
 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.)
 PUBLIC PARK                B        0.04      0.30     0.850    56    6.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.18
 TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.18

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    191.97  DOWNSTREAM(FEET) =    191.24
 CHANNEL LENGTH THRU SUBAREA(FEET) =   173.00   CHANNEL SLOPE =  0.0042
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.051
 SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.79
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   3.66
  Tc(MIN.) =   10.47
  SUBAREA AREA(ACRES) =     0.25       SUBAREA RUNOFF(CFS) =    0.88
  EFFECTIVE AREA(ACRES) =      0.29     AREA-AVERAGED Fm(INCH/HR) =   0.16
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     273.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.47
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.051
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.88
  EFFECTIVE AREA(ACRES) =      0.54   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.53
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.89
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     10.47
  EFFECTIVE AREA(ACRES) =      0.54  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.526
  PEAK FLOW RATE(CFS)   =       1.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

```
 ************************** DESCRIPTION OF STUDY **************************
* MCDONALD'S SANTA ANA                                                   *
* PROPOSED 100 YEAR                                                      *
* KIMLEY-HORN & ASSOCIATES                                               *
 ************************************************************************

  FILE NAME: MCD100PR.DAT
  TIME/DATE OF STUDY: 11:42 06/29/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.5 (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    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    194.10  DOWNSTREAM(FEET) =    192.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.090
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.124
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               B        0.09      0.30     0.350    76    5.09
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.49
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.49

********************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.33  DOWNSTREAM(FEET) =    192.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.867
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.40
  Tc(MIN.) =    5.49
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.13
  EFFECTIVE AREA(ACRES) =      0.12     AREA-AVERAGED Fm(INCH/HR) =   0.11
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   0.79
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     120.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    5.49
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.867
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.03      SUBAREA RUNOFF(CFS) =    0.13
  EFFECTIVE AREA(ACRES) =      0.14   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        0.1       PEAK FLOW RATE(CFS) =       0.73

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    302.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.46  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.66
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.73
  PIPE TRAVEL TIME(MIN.) =   0.62    Tc(MIN.) =    6.11
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    302.00 =     257.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.11
  RAINFALL INTENSITY(INCH/HR) =   5.52
  AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       0.14
  TOTAL STREAM AREA(ACRES) =       0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.73

********************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.37  DOWNSTREAM(FEET) =    191.94

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.740
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.717
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.08      0.30     0.500    76    5.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.40

**************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    191.94  DOWNSTREAM(FEET) =    191.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =    35.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.413
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.57
  Tc(MIN.) =    6.31
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.24
  EFFECTIVE AREA(ACRES) =      0.13     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.50
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.98
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     135.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
--------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    6.31
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.413
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.24
  EFFECTIVE AREA(ACRES) =      0.18   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.85

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    302.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.32  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   134.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.85
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    6.92
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.92
  RAINFALL INTENSITY(INCH/HR) =   5.14
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.85

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1        0.73    6.11    5.516  0.30( 0.11) 0.35       0.1     200.00
     2        0.85    6.92    5.138  0.30( 0.15) 0.50       0.2     400.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        1.54    6.11    5.516  0.30( 0.13) 0.43       0.3     200.00
     2        1.53    6.92    5.138  0.30( 0.13) 0.43       0.3     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.54    Tc(MIN.) =     6.11
  EFFECTIVE AREA(ACRES) =       0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.43
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.98  DOWNSTREAM(FEET) =   187.64
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.21
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.54
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    6.24
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.24
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.43
  EFFECTIVE STREAM AREA(ACRES) =       0.30
  TOTAL STREAM AREA(ACRES) =       0.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.54

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
 USER SPECIFIED Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.187
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.09      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.50
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.50

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    193.00  DOWNSTREAM(FEET) =    191.16
 CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00   CHANNEL SLOPE =  0.0118
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.103
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 APARTMENTS                 B        0.21      0.30     0.200    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.98
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.30
 AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.00
 Tc(MIN.) =    7.00
 SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.95
 EFFECTIVE AREA(ACRES) =      0.30     AREA-AVERAGED Fm(INCH/HR) =   0.05
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.17
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.36

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.47
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     189.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==========================================================================
  MAINLINE Tc(MIN.) =    7.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.103
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 B        0.21      0.30     0.200    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.95
  EFFECTIVE AREA(ACRES) =      0.51   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       2.32

**************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.00
  RAINFALL INTENSITY(INCH/HR) =   5.10
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =       0.51
  TOTAL STREAM AREA(ACRES) =       0.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.32

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.54    6.24    5.449  0.30( 0.13) 0.43       0.3     200.00
      1        1.53    7.05    5.083  0.30( 0.13) 0.43       0.3     400.00
      2        2.32    7.00    5.103  0.30( 0.05) 0.18       0.5     300.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.74    6.24    5.449  0.30( 0.08) 0.28       0.8     200.00
      2        3.85    7.00    5.103  0.30( 0.08) 0.28       0.8     300.00
      3        3.84    7.05    5.083  0.30( 0.08) 0.28       0.8     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.85    Tc(MIN.) =     7.00
  EFFECTIVE AREA(ACRES) =       0.83   AREA-AVERAGED Fm(INCH/HR) =  0.08
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.28
  TOTAL AREA(ACRES) =        0.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      7.00
  EFFECTIVE AREA(ACRES) =      0.83  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.279
  PEAK FLOW RATE(CFS)   =       3.85

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.74    6.24    5.449  0.30( 0.08) 0.28       0.8     200.00
      2        3.85    7.00    5.103  0.30( 0.08) 0.28       0.8     300.00
      3        3.84    7.05    5.083  0.30( 0.08) 0.28       0.8     400.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX F: 2-YEAR 24-HOUR

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2011 Advanced Engineering Software (aes)
             Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```



```
  FILE NAME: MCD2E.DAT
  TIME/DATE OF STUDY: 11:50 06/29/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.49  DOWNSTREAM(FEET) =    192.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.203
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.000
  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
  "5-7 DWELLINGS/ACRE"       B        0.16      0.30     0.500    36    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.52  DOWNSTREAM(FEET) =    191.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =    79.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.787
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         B        0.06      0.30     0.700    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.98
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.35
  Tc(MIN.) =    7.55
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.09
  EFFECTIVE AREA(ACRES) =      0.22     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.01
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     179.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.55
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.787
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         B        0.06      0.30     0.700    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.09
 EFFECTIVE AREA(ACRES) =      0.28   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.41

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 ELEVATION DATA: UPSTREAM(FEET) =    193.76  DOWNSTREAM(FEET) =    191.97

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.814
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.895
 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.)
 PUBLIC PARK                B        0.04      0.30     0.850    36    6.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.06
 TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.06

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 ** WARNING: Computed Flowrate is less than 0.1 cfs,
              Routing Algorithm is UNAVAILABLE.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.81
```

```
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.895
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.39
  EFFECTIVE AREA(ACRES) =      0.29   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.55
  TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.45
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.81
  EFFECTIVE AREA(ACRES) =      0.29  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.548
  PEAK FLOW RATE(CFS)   =       0.45
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2011 Advanced Engineering Software (aes)
             Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```

```
 ************************** DESCRIPTION OF STUDY **************************
* MCDONALD'S SANTA ANA                                                   *
* PROPOSED 2 YEAR                                                        *
* KIMLEY-HORN & ASSOCIATES                                               *
 ************************************************************************

  FILE NAME: MCD2PR.DAT
  TIME/DATE OF STUDY: 11:38 06/29/2023
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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 =  0.5 (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    200.00 TO NODE    201.00 IS CODE =  21
------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    194.10  DOWNSTREAM(FEET) =    192.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.090
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.241
  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.)
  CONDOMINIUMS               B        0.09      0.30     0.350    36    5.09
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.17

********************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.33  DOWNSTREAM(FEET) =    192.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.115
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.62
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.54
  Tc(MIN.) =    5.63
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.05
  EFFECTIVE AREA(ACRES) =      0.12     AREA-AVERAGED Fm(INCH/HR) =   0.11
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.21

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.61
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     120.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    5.63
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.115
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.03      SUBAREA RUNOFF(CFS) =    0.05
  EFFECTIVE AREA(ACRES) =      0.14   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        0.1       PEAK FLOW RATE(CFS) =       0.25

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    302.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.46  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.77
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.25
  PIPE TRAVEL TIME(MIN.) =   0.82    Tc(MIN.) =    6.45
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    302.00 =     257.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.45
  RAINFALL INTENSITY(INCH/HR) =   1.96
  AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       0.14
  TOTAL STREAM AREA(ACRES) =       0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.25

********************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.37  DOWNSTREAM(FEET) =    191.94

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.740
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.091
  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
  "5-7 DWELLINGS/ACRE"       B        0.08      0.30     0.500    36    5.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.14

********************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    191.94  DOWNSTREAM(FEET) =    191.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =    35.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.946
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.76
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    6.51
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.08
  EFFECTIVE AREA(ACRES) =      0.13     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.50
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.21

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     135.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
```

```
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
  MAINLINE Tc(MIN.) =    6.51
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.946
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.08
  EFFECTIVE AREA(ACRES) =      0.18   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.29

************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    302.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.32  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   134.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.82
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.29
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    7.30
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.30
  RAINFALL INTENSITY(INCH/HR) =   1.82
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.29

  ** CONFLUENCE DATA **
```

```
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        0.25    6.45    1.955  0.30( 0.11) 0.35       0.1     200.00
    2        0.29    7.30    1.822  0.30( 0.15) 0.50       0.2     400.00

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

  ** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        0.53    6.45    1.955  0.30( 0.13) 0.43       0.3     200.00
    2        0.53    7.30    1.822  0.30( 0.13) 0.43       0.3     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.53    Tc(MIN.) =     6.45
  EFFECTIVE AREA(ACRES) =       0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.43
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.98  DOWNSTREAM(FEET) =   187.64
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.33
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.53
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    6.62
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.62
  RAINFALL INTENSITY(INCH/HR) =   1.93
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.43
  EFFECTIVE STREAM AREA(ACRES) =       0.30
  TOTAL STREAM AREA(ACRES) =       0.32
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.53

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.09      0.30     0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    193.00  DOWNSTREAM(FEET) =    191.16
  CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.784
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 B        0.21      0.30     0.200    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.01
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   2.57
  Tc(MIN.) =    7.57
  SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.33
  EFFECTIVE AREA(ACRES) =      0.30     AREA-AVERAGED Fm(INCH/HR) =   0.05
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.17
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.47

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     189.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.57
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.784
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 APARTMENTS                 B        0.21      0.30     0.200    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.33
 EFFECTIVE AREA(ACRES) =      0.51   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       0.79

****************************************************************************
 FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.57
 RAINFALL INTENSITY(INCH/HR) =   1.78
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.30
 AREA-AVERAGED Ap =  0.18
 EFFECTIVE STREAM AREA(ACRES) =       0.51
 TOTAL STREAM AREA(ACRES) =       0.51
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.79

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        0.53    6.62    1.927  0.30( 0.13) 0.43       0.3     200.00
     1        0.53    7.46    1.798  0.30( 0.13) 0.43       0.3     400.00
     2        0.79    7.57    1.784  0.30( 0.05) 0.18       0.5     300.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        1.28    6.62    1.927  0.30( 0.08) 0.28       0.7     200.00
     2        1.32    7.46    1.798  0.30( 0.08) 0.28       0.8     400.00
     3        1.32    7.57    1.784  0.30( 0.08) 0.28       0.8     300.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.32    Tc(MIN.) =     7.46
  EFFECTIVE AREA(ACRES) =       0.82   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.28
  TOTAL AREA(ACRES) =        0.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      7.46
  EFFECTIVE AREA(ACRES) =      0.82  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.280
  PEAK FLOW RATE(CFS)   =       1.32

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.28    6.62    1.927  0.30( 0.08) 0.28       0.7     200.00
      2        1.32    7.46    1.798  0.30( 0.08) 0.28       0.8     400.00
      3        1.32    7.57    1.784  0.30( 0.08) 0.28       0.8     300.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX G: DETENTION ROUTING CALUCULATIONS (100 YR)

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




 ************************** DESCRIPTION OF STUDY **************************
* MCDONALDS SANTA ANA                                                    *
* 100-YEAR EXISTING                                                      *
* KIMLEY-HORN                                                            *
 ************************************************************************

  FILE NAME: MCD100E.DAT
  TIME/DATE OF STUDY: 13:51 06/27/2023
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *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 =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.49  DOWNSTREAM(FEET) =    192.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.203
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.468
  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
  "5-7 DWELLINGS/ACRE"       B        0.16      0.30     0.500    56    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.77

********************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.52  DOWNSTREAM(FEET) =    191.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =    79.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.033
  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        0.06      0.30     0.700    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.97
  Tc(MIN.) =    7.17
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.26
  EFFECTIVE AREA(ACRES) =      0.22     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     179.00 FEET.

********************************************************************************
```

```
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.17
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.033
 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        0.06      0.30     0.700    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.26
 EFFECTIVE AREA(ACRES) =      0.28   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       1.22

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 ELEVATION DATA: UPSTREAM(FEET) =    193.76  DOWNSTREAM(FEET) =    191.97

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.814
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.182
 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.)
 PUBLIC PARK                B        0.04      0.30     0.850    56    6.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.18
 TOTAL AREA(ACRES) =      0.04   PEAK FLOW RATE(CFS) =      0.18

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    191.97  DOWNSTREAM(FEET) =    191.24
 CHANNEL LENGTH THRU SUBAREA(FEET) =   173.00   CHANNEL SLOPE =  0.0042
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.051
 SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.79
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   3.66
  Tc(MIN.) =   10.47
  SUBAREA AREA(ACRES) =     0.25       SUBAREA RUNOFF(CFS) =    0.88
  EFFECTIVE AREA(ACRES) =      0.29     AREA-AVERAGED Fm(INCH/HR) =   0.16
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.55
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     273.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.47
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.051
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.25      0.30     0.500    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.88
  EFFECTIVE AREA(ACRES) =      0.54   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.53
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.89
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     10.47
  EFFECTIVE AREA(ACRES) =      0.54  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.526
  PEAK FLOW RATE(CFS)   =       1.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

```
 ************************** DESCRIPTION OF STUDY **************************
* MCDONALD'S SANTA ANA                                                   *
* PROPOSED 100 YEAR                                                      *
* KIMLEY-HORN & ASSOCIATES                                               *
 ************************************************************************

  FILE NAME: MCD100PR.DAT
  TIME/DATE OF STUDY: 11:42 06/29/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.5 (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    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    194.10  DOWNSTREAM(FEET) =    192.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.090
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.124
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               B        0.09      0.30     0.350    76    5.09
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.49
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.49

********************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    192.33  DOWNSTREAM(FEET) =    192.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.867
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.40
  Tc(MIN.) =    5.49
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.13
  EFFECTIVE AREA(ACRES) =      0.12     AREA-AVERAGED Fm(INCH/HR) =   0.11
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   0.79
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     120.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    5.49
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.867
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.03      0.30     0.350    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.03      SUBAREA RUNOFF(CFS) =    0.13
  EFFECTIVE AREA(ACRES) =      0.14   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        0.1       PEAK FLOW RATE(CFS) =       0.73

********************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    302.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.46  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.66
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.73
  PIPE TRAVEL TIME(MIN.) =   0.62    Tc(MIN.) =    6.11
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    302.00 =     257.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.11
  RAINFALL INTENSITY(INCH/HR) =   5.52
  AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       0.14
  TOTAL STREAM AREA(ACRES) =       0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.73

********************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    193.37  DOWNSTREAM(FEET) =    191.94

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.740
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.717
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.08      0.30     0.500    76    5.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.40

**************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    191.94  DOWNSTREAM(FEET) =    191.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =    35.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.413
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.57
  Tc(MIN.) =    6.31
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.24
  EFFECTIVE AREA(ACRES) =      0.13     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.50
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.98
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     135.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
--------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    6.31
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.413
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       B        0.05      0.30     0.500    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.24
  EFFECTIVE AREA(ACRES) =      0.18   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        0.2       PEAK FLOW RATE(CFS) =       0.85

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    302.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.32  DOWNSTREAM(FEET) =   187.98
  FLOW LENGTH(FEET) =   134.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.85
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    6.92
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.92
  RAINFALL INTENSITY(INCH/HR) =   5.14
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.85

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1        0.73    6.11    5.516  0.30( 0.11) 0.35       0.1     200.00
     2        0.85    6.92    5.138  0.30( 0.15) 0.50       0.2     400.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        1.54    6.11    5.516  0.30( 0.13) 0.43       0.3     200.00
     2        1.53    6.92    5.138  0.30( 0.13) 0.43       0.3     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.54    Tc(MIN.) =     6.11
  EFFECTIVE AREA(ACRES) =       0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.43
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    302.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.98  DOWNSTREAM(FEET) =   187.64
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.21
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.54
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    6.24
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.24
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.43
  EFFECTIVE STREAM AREA(ACRES) =       0.30
  TOTAL STREAM AREA(ACRES) =       0.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.54

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
 USER SPECIFIED Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.187
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.09      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.50
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.50

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    193.00  DOWNSTREAM(FEET) =    191.16
 CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00   CHANNEL SLOPE =  0.0118
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.103
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 APARTMENTS                 B        0.21      0.30     0.200    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.98
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.30
 AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.00
 Tc(MIN.) =    7.00
 SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.95
 EFFECTIVE AREA(ACRES) =      0.30     AREA-AVERAGED Fm(INCH/HR) =   0.05
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.17
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.36

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.47
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     189.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==========================================================================
  MAINLINE Tc(MIN.) =    7.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.103
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 B        0.21      0.30     0.200    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.95
  EFFECTIVE AREA(ACRES) =      0.51   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       2.32

**************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.00
  RAINFALL INTENSITY(INCH/HR) =   5.10
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =       0.51
  TOTAL STREAM AREA(ACRES) =       0.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.32

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.54    6.24    5.449  0.30( 0.13) 0.43       0.3     200.00
      1        1.53    7.05    5.083  0.30( 0.13) 0.43       0.3     400.00
      2        2.32    7.00    5.103  0.30( 0.05) 0.18       0.5     300.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.74    6.24    5.449  0.30( 0.08) 0.28       0.8     200.00
      2        3.85    7.00    5.103  0.30( 0.08) 0.28       0.8     300.00
      3        3.84    7.05    5.083  0.30( 0.08) 0.28       0.8     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.85    Tc(MIN.) =     7.00
  EFFECTIVE AREA(ACRES) =       0.83   AREA-AVERAGED Fm(INCH/HR) =  0.08
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.28
  TOTAL AREA(ACRES) =        0.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    304.00 =     302.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      7.00
  EFFECTIVE AREA(ACRES) =      0.83  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.279
  PEAK FLOW RATE(CFS)   =       3.85

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.74    6.24    5.449  0.30( 0.08) 0.28       0.8     200.00
      2        3.85    7.00    5.103  0.30( 0.08) 0.28       0.8     300.00
      3        3.84    7.05    5.083  0.30( 0.08) 0.28       0.8     400.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX I: STORMWATER DESIGN SPECIFICATION SHEETS

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	TRAVIS ANTONISSEN 949-237-8866 TRAVIS.ANTONISSEN@ADSPIPE.COM
ADS SALES REP:	MATT NOBLE 951-603-6551 MATT.NOBLE@ADSPIPE.COM
PROJECT NO:	S349547

Advanced Drainage Systems, Inc.

APPROVED BY:

SIGNED:_____

DATE:_____

COMPANY:_____

PHONE / EMAIL:_____

MCDONALD'S 4-5088 PROPOSED DRIVE-THRU RESTAURANT

SANTA ANA - CA

CONTRACTOR PROVIDED DELIVERY SCHEDULE & SITE INFORMATION:

SYSTEM DESIGNATION / SIZE									
SYSTEM DELIVERY DATE									

***ACTUAL DATE REQUIRED, ASAP IS NOT ACCEPTABLE AND A MINIMUM OF 4 WEEKS MUST BE PROVIDED UNLESS OTHERWISE DISCUSSED WITH A SALES REPRESENTATIVE.**

DELIVERY INFORMATION			
JOB SITE STREET ADDRESS		CITY	
CONTACT		CONTACT PHONE	
ALTERNATE CONTACT		ALTERNATE PHONE	

DIRECTIONS TO JOB SITE FROM NEAREST INTERSTATE:
(PLEASE NO MAPS)

ADS ECOPURE SPECIFICATIONS

PRODUCTS

A. INTERNAL COMPONENTS: SHALL BE SUBSTANTIALLY CONSTRUCTED OF STAINLESS STEEL, RECYCLED POLYETHYLENE OR OTHER THERMOPLASTIC MATERIAL APPROVED BY THE MANUFACTURER

B. FILTER MEDIA/VEGETATION: FILTER MEDIA SHALL BE BY ADS AND SHALL CONSIST OF A PROPRIETARY BLEND OF FILTER MEDIA. VEGETATION IS VARIABLE DEPENDENT ON REGION. ITEMS CHOSEN SHOULD ALIGN WITH CONTROLLING MUNICIPAL, COUNTY, OR STATE REQUIREMENTS.

C. PRECAST CONCRETE VAULT: DESIGNED FOR H-20 TRAFFIC LOADING AND APPLICABLE SOIL LOADS OR AS OTHERWISE DETERMINED BY A LICENSED PROFESSIONAL ENGINEER. THE MATERIALS AND STRUCTURAL DESIGN OF THE DEVICES SHALL BE PER ASTM C478, ASTM C857 AND ASTM C858.

PERFORMANCE

A. THE STORMWATER FILTER SYSTEM SHALL BE AN OFFLINE DESIGN CAPABLE OF TREATING 100% OF THE REQUIRED TREATMENT FLOW AT FULL SEDIMENT LOAD CONDITIONS.
B. THE STORMWATER FILTER SYSTEM SHALL HAVE NO MOVING PARTS.
C. THE STORMWATER TREATMENT UNIT SHALL BE DESIGNED TO REMOVE AT LEAST 85% OF SUSPENDED SOLIDS AND 70% OF TOTAL PHOSPHORUS.

ECOPURE MAINTENANCE

THE ECOPURE SYSTEM REQUIRES PERIODIC MAINTENANCE TO CONTINUE OPERATING AT ITS PEAK EFFICIENCY DESIGN. THE MAINTENANCE PROCESS COMPRISES THE REMOVAL AND REPLACEMENT OF FILTER MEDIA AND VEGETATION AND THE CLEANING OF THE VAULT WITH A VACUUM TRUCK. FOR BEST RESULTS, ECOPURE MAINTENANCE SHOULD BE PERFORMED BY A CERTIFIED MAINTENANCE CONTRACTOR. A QUICK CALL TO AN ADS ENGINEER OR CUSTOMER SERVICE REPRESENTATIVE WILL PROVIDE YOU WITH A LIST OF RELIABLE CONTRACTORS IN YOUR AREA.

WHEN ECOPURE IS INITIALLY INSTALLED, WE RECOMMEND THAT AN INSPECTION BE PERFORMED ON THE SYSTEM IN THE FIRST SIX (6) MONTHS. AFTER THAT, THE INSPECTION CYCLE TYPICALLY FALLS INTO A BIANNUAL PATTERN GIVEN NORMAL STORM OCCURRENCE AND ACTUAL SOLIDS LOADS.

WHEN ECOPURE EXHIBITS FLOWS BELOW DESIGN LEVELS, THE SYSTEM SHOULD BE INSPECTED AND MAINTAINED AS SOON AS PRACTICAL.

MAINTENANCE OF THE STORMWATER TREATMENT UNIT(S) SHALL BE PERFORMED PER MANUFACTURER'S MAINTENANCE INSTRUCTIONS. SUCH INSTRUCTIONS CAN BE OBTAINED BY CALLING ADVANCED DRAINAGE SYSTEMS AT (800) 821-6710 OR BY LOGGING ON TO WWW.ADS-PIPE.COM.

ECOPURE INSTALLATION NOTES

INSTALLATION OF THE STORMWATER TREATMENT UNIT(S) SHALL BE PERFORMED PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. SUCH INSTRUCTIONS CAN BE OBTAINED BY CALLING ADVANCED DRAINAGE SYSTEMS AT (800) 821-6710 OR BY LOGGING ON TO WWW.ADS-PIPE.COM.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

MCDONALD'S 4-5088 PROPOSED DRIVE-THRU RESTAURANT

SANTA ANA - CA

SC-740 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-740 SYSTEM

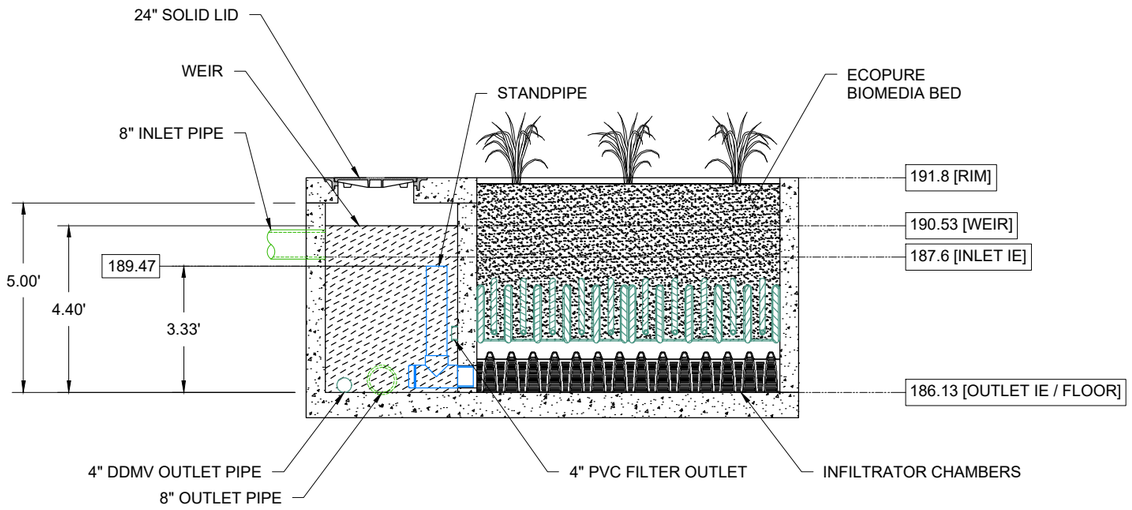
1. STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

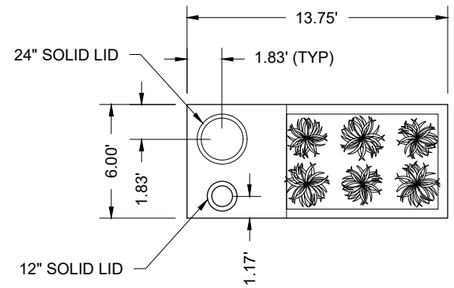
1. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

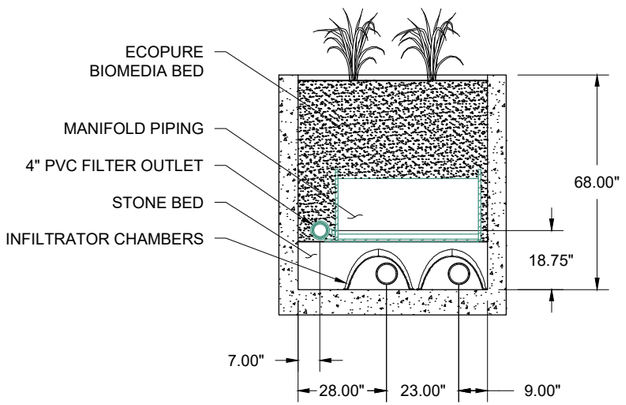
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



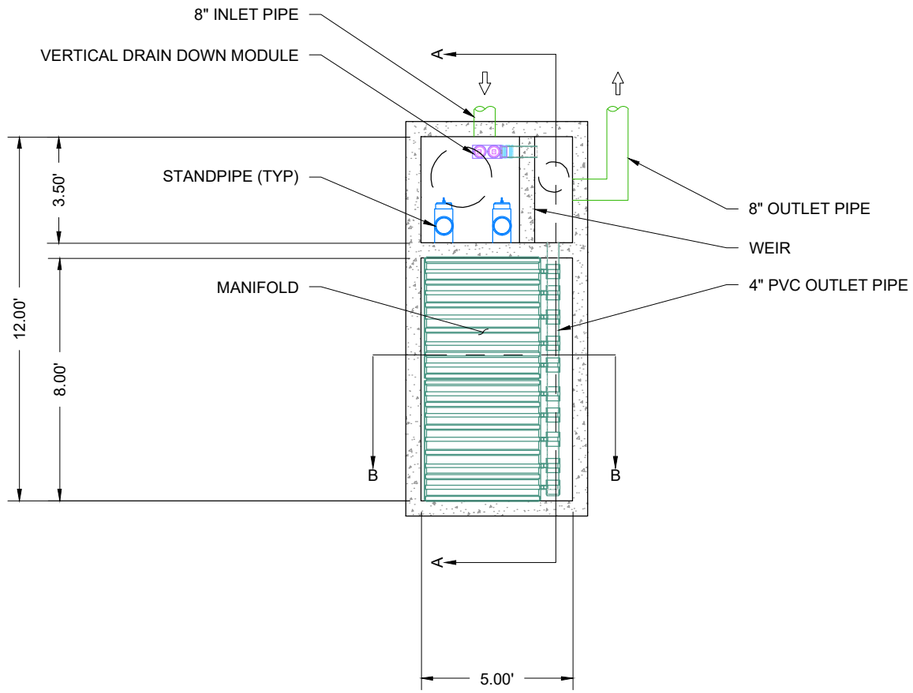
SECTION A-A
NTS



TOP SLAB PLAN VIEW
NTS / PIPE CONNECTIONS NOT SHOWN



SECTION B-B
NTS



PLAN VIEW
NTS

ECOPURE BIOFILTER 120	
WATER QUALITY FLOW RATE	0.27 CFS
EFFECTIVE LOADING RATE	1 GPM/SF
DRAINAGE AREA	
TREATED SEDIMENT CAPACITY	

THE ECOPURE BIOFILTER™ IS A BIOFILTRATION STORMWATER TREATMENT TECHONOLOGY RELIES ON PHYSICAL, CHEMICAL AND BIOLOGICAL MECHANISMS TO REMOVE TOTAL SUSPENDED SOLIDS, TOTAL PHOSPHORUS, TOTAL NITROGEN, HEAVY METALS, OIL and GREASE, TRASH AND BACTERIA. THE ECOPURE SYSTEM PROVIDES LINEAR TREATMENT DESIGN WITH AN UPFRONT PRETREATMENT CHAMBER.

MCDONALD'S 4-5088 PROPOSED
DRIVE-THRU RESTAURANT
SANTA ANA - CA

DATE: 04/17/23 | DRAWN: JLM | PROJECT #: S349547 | CHECKED: KLJ/PR

DATE	DRWN	CHKD	DESCRIPTION

EcoPure™ Biofilter
Stormwater Media Filters

4640 TRUEMAN BLVD
HILLIARD, OH 43026

NOT TO SCALE

PROPOSED LAYOUT

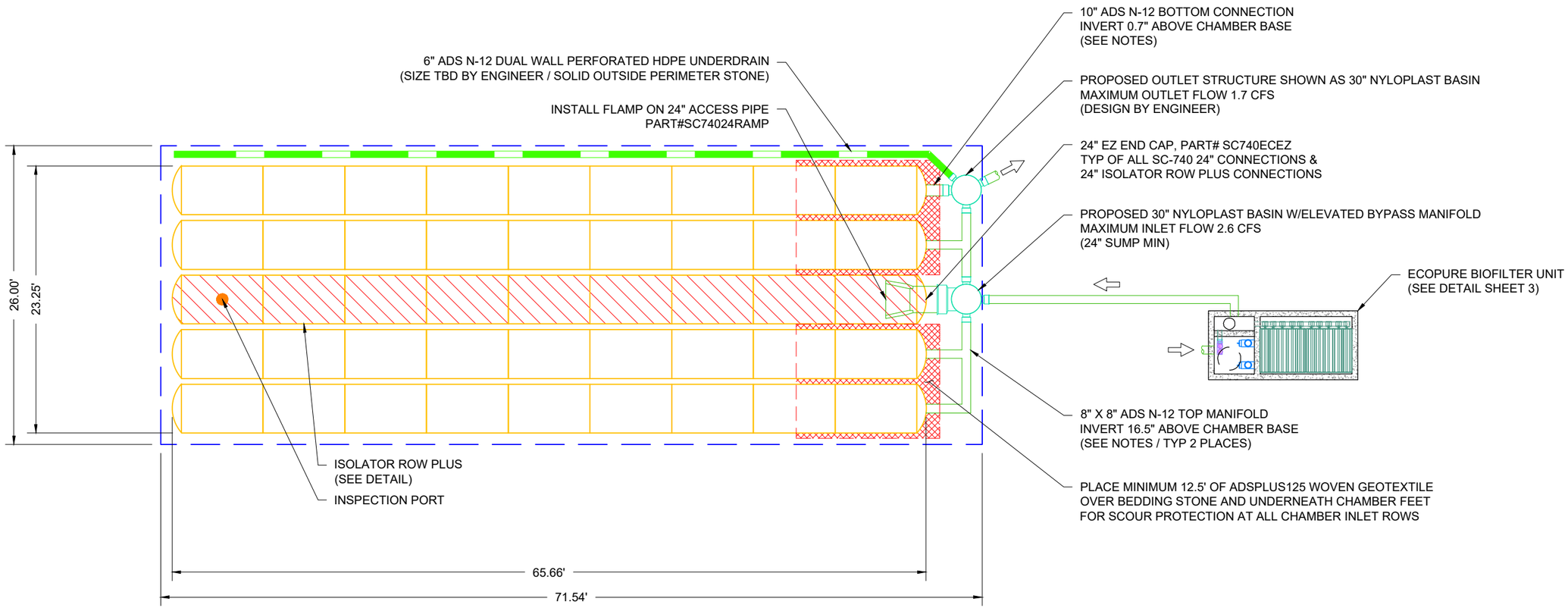
45	STORMTECH SC-740 CHAMBERS
10	STORMTECH SC-740 END CAPS
6	STONE ABOVE (in)
6	STONE BELOW (in)
40	% STONE VOID
3,845	**INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)**
1860	SYSTEM AREA (ft²)
195	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS

196.57	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)
190.57	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)
190.07	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)
190.07	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)
190.07	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)
189.07	TOP OF STONE
188.57	TOP OF SC-740 CHAMBER
187.45	8" TOP MANIFOLD INVERT
186.13	10" BOTTOM MANIFOLD INVERT
186.08	24" ISOLATOR ROW PLUS CONNECTION INVERT
186.07	BOTTOM OF SC-740 CHAMBER
185.57	UNDERDRAIN INVERT
185.57	BOTTOM OF STONE

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.



MCDONALD'S 4-5088 PROPOSED
DRIVE-THRU RESTAURANT
SANTA ANA - CA

DATE: 04/17/23 | DRAWN: JLM
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StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

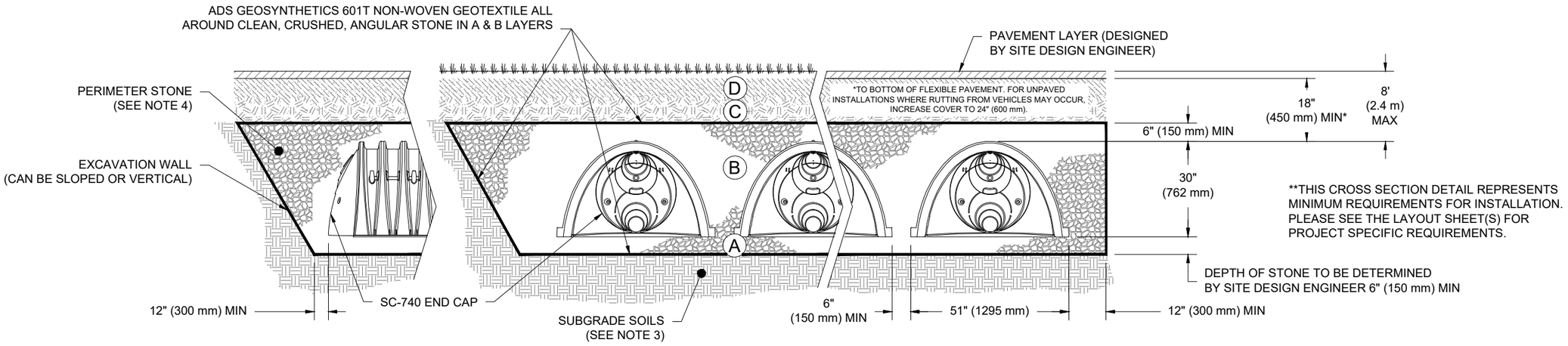
4640 TRUEMAN BLVD
HILLIARD, OH 43026

0 10' 20'

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

MCDONALD'S 4-5088 PROPOSED
DRIVE-THRU RESTAURANT
SANTA ANA - CA
DATE: 04/17/23 DRAWN: JLM
PROJECT #: S349547 CHECKED: KLJ/PR

DATE	DESCRIPTION	DRWN	CHKD

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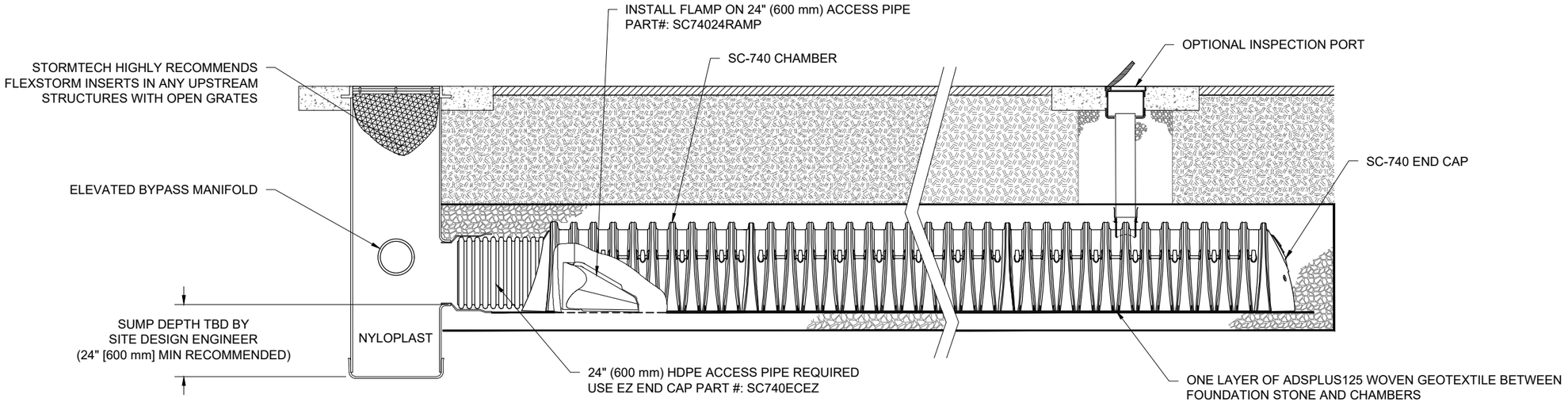
4640 TRUEMAN BLVD
HILLIARD, OH 43026



SC-740 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

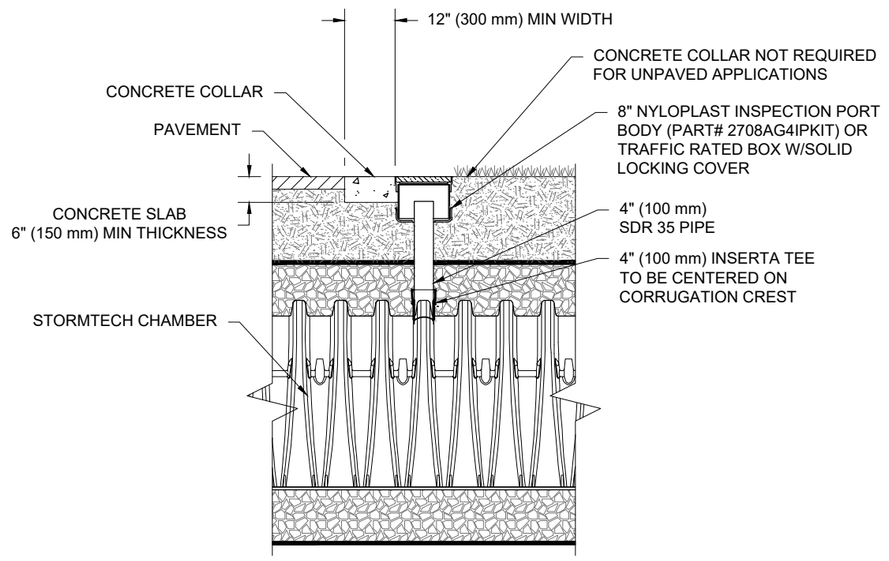
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL
(SC SERIES CHAMBER)
NTS

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DRIVE-THRU RESTAURANT
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PROJECT #: S349547 | CHECKED: KLJ/PR

DATE	DRWN	CHKD	DESCRIPTION

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

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ADS
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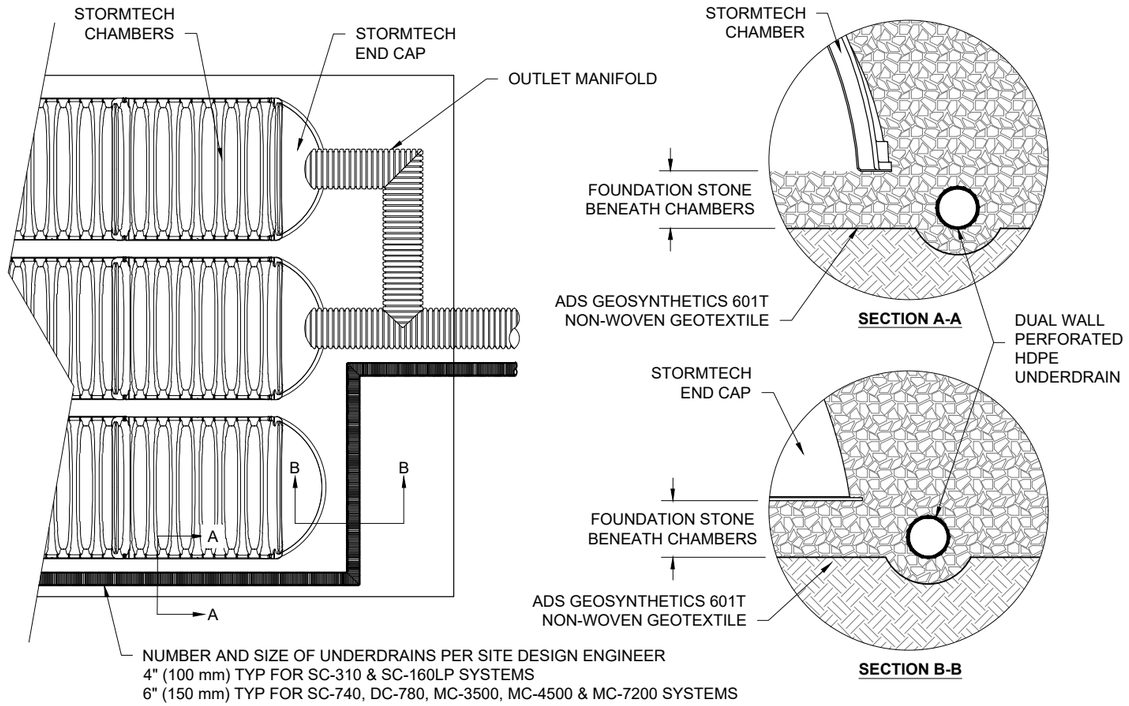
HILLIARD, OH 43026

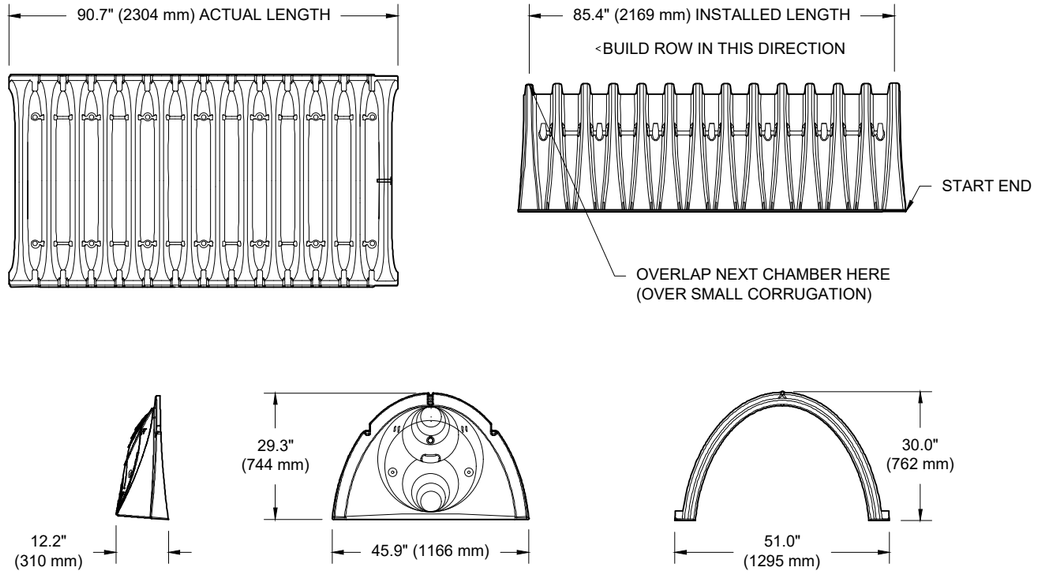
UNDERDRAIN DETAIL

NTS



SC-740 TECHNICAL SPECIFICATION

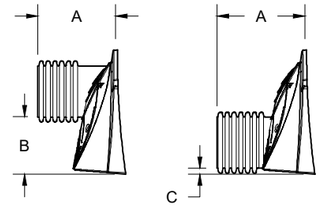
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740ECEZ*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740ECEZ THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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