Appendix F

Conceptual Drainage and Water Quality Technical Memoradum

Michael Baker INTERNATIONAL

We Make a Difference

MEMORANDUM

To: **Ms. Lindsey Hashimoto** **JN:** 172570
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From: David Jaffe, PhD, P.E., D.WRE
Rebecca Kinney, P.E.
Rianne Okamoto, EIT

Date: February 20, 2020

Subject: Irvine Campus Medical Complex Project Concept Drainage and Water Quality Technical Memorandum

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This memorandum provides recommendations for Low Impact Development (LID) for the proposed Irvine Campus Medical Complex.

Introduction:

University of California, Irvine (UCI) contracted Michael Baker International (Michael Baker) to complete professional environmental services for the proposed Irvine Campus Medical Complex. This proposal request included biological, jurisdictional, cultural resources compliance services and a preliminary drainage study. The preliminary drainage study includes an analysis of the site drainage and recommends Best Management Practices (BMP) configurations that meet City and County drainage requirements and UCI water quality requirements. The memorandum also recommends site changes to avoid impacts to the 100-yr Federal Emergency Management Agency (FEMA) Floodplain.

Existing Condition:

The existing drainage patterns are shown as Figure 1. Most of the area drains south to San Juaquin Marsh and a small portion drains north and east to adjacent streets before ultimately discharging to the Marsh. There are existing buildings and an arboretum in the current site location.

Land Use and Soils:

The existing condition land use is commercial with a large undeveloped portion, see Figure 2. The soil type is D and consists of a relatively high percent of clay. The soil has a very low infiltration rate which means it has a high runoff potential. Appendix A contains the soil survey from United States Geological Survey (USGS).

Proposed Condition:

There are no existing storm drain pipes to tie into so, for the purposes of this study, it was assumed the site retained similar drainage patterns. Proposed conditions grading was not provided to Michael Baker, but flow patterns were assumed based on changes in land use. See Figure 3 for proposed drainage

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assumed for the purpose of this memorandum. The proposed site plan includes a medical center south of the existing buildings at the intersection of Campus Drive and Jamboree. The proposed project would alter the undeveloped area of the site.

Land Use and Soils:
The proposed condition contains a campus medical complex. The land use and site configuration were determined based on a site plan that was provided by UCI. Figure 4 shows the land uses for the proposed project site. Grading was assumed to drain the site towards San Juaquin Marsh. Flows entering the proposed site were assumed to be picked up by a storm drain system and routed through the development. The soil type is D for the project site per USGS soil survey.

Drainage:
The County requires that the proposed condition peak discharge values not exceed the existing condition values. Expected value (50% confidence interval) discharges are used for calculating the incremental increase in peak discharges for purposes of implementing development mitigation requirements. A hydrology study would be required to evaluate the discharges of the 100-, 50-, 25-, 10-, 5-, and 2-year expected value storm events to determine the increase from the proposed site. Detention basins should be implemented to detain the storm flows and to meet the existing discharge values. Because there are no existing storm drains to tie into on streets around the site it is recommended direct flows to a basin and discharge to the marsh.

Modeling Approach:
The hydrology models were run with Rational Method using the AES software RATSCx 2013 for Orange County. The Rational Method is an empirical computation procedure for developing a peak discharge for watersheds less than 640 acres and storms of a given recurrence interval. The Rational Method assumes that the rainfall intensity is uniformly distributed over the drainage area at a uniform rate throughout the duration of the storm. This assumption generally applies for areas less than 640 acres. The Rational Method equation assumes that the peak flowrate is directly proportional to the drainage area, rainfall intensity, and a loss coefficient related to land use and soil type. The hydrology parameters required for the analysis include rainfall, topography, hydrologic soil types, and land use. The hydrology was performed for the 2-yr expected value storm event.

Hydrology Results:
The results of the hydrology analysis are shown In Table 1, below, and the detailed outputs are included in Appendix B. Subwatershed A increases in area with the proposed grading because only one discharge point was assumed. Both subwatershed B and C are combined into the proposed A area. Overall there is an increase in runoff in the proposed condition for Subwatershed A. There was a slight decrease in runoff from Subwatershed B because part of the area has been regarded to drain into the proposed Medical Complex.

Table 1: Rational Method Results for 2-Year Storm Event

Subwatershed	Existing Area (acres)	Existing 2-yr Peak Discharge (cfs)	Proposed Area (acres)	Proposed Peak Discharge (cfs)
A	20.6	3.00	21.3	7.87
B	7.2	4.16	6.7	3.74
C	6.6	3.12	6.6	3.12
D	5.0	3.94	5.0	3.94

Water Quality Considerations:

This project is within the Santa Ana Region (NOC) jurisdiction and is considered a priority project because the new development will create more than 10,000 square feet of impervious surface. The site is tributary to San Juaquin Marsh which drains to Lower San Diego Creek. San Diego Creek then drains to Newport Bay before reaching the Pacific Ocean.

LID BMPs:

The project site is composed of new development in area that is currently barren. Design runoff volume was computed using the Equation III.1 from the Orange County Technical Guidance Document (OCTGD) shown below.

$$V = C \times d \times A \times 43560\ sf/ac \times 1/12\ in/ft$$

Where:

V = runoff volume during the design storm event, cu-ft
C = runoff coefficient = (0.75 × imp + 0.15)
imp = impervious fraction of drainage area (ranges from 0 to 1)
d = storm depth (inches)
A = tributary area (acres)

Based on Figure XVI-1 of the Technical Guidance Document the design rainfall depth is 0.75 inches. The percent impervious for the proposed conditions are in Table 2.

Table 2: Proposed Project Site Percent Impervious

Land Use	Approximate Area (ac)	Percent Impervious
Commercial	10.9	90%
Open Brush, Fair	1.2	0%
Open Brush, Poor	2.6	0%
Public Park	0.1	15%
Woodland, Fair	0.8	0%
Total Area and Area-Weighted Percent Impervious	**15.6**	**63%**

The design capture volume for the proposed condition is approximately 35,110 cu-ft based on Equation III.1. Because of the soil type, infiltration methods cannot be considered to manage runoff so BMPs must be designed to achieve the maximum feasible evapotranspiration, which is the next-best tiered BMP per the OCTGD. BMP tiers can be found in the TGD. Green, brown or blue roofs are recommended to increase evapotranspiration and evaporation. Bioretention basins with underdrains and stormwater planter boxes with underdrains in a distributed system are recommended as biofiltration BMPs if the roof BMP options cannot treat 100% of the design capture volume. Pictures 1 and 2 are examples of potential BMPs.

Picture 1: Dry extended detention basin

Picture 2: Bioretention planters

Hydromodification:

Lower San Diego Creek is an partially lined earthen channel and the proposed facility increases the site's 2-yr runoff discharge by more than 5 percent. Onsite hydromodification controls will need to be implemented to reduce the post development runoff for the two-year storm volume to less than the predevelopment condition and increase the time of concentration of post-development runoff for the two-year storm so it exceeds the predevelopment condition. The design runoff discharge was determined by calculating the 2-yr expected value (EV) using the modified rational method described in the Orange County Hydrology Manual. As seen in Table 1, above, the watershed does have an increase in runoff in the proposed condition. The proposed condition excess discharge will need to be detained onsite and discharged incrementally to meet the hydromodification requirement through an above- or below-ground detention system. A distributed BMP system is recommended for the LID BMPs may also provide some or all the hydromodification mitigation required.

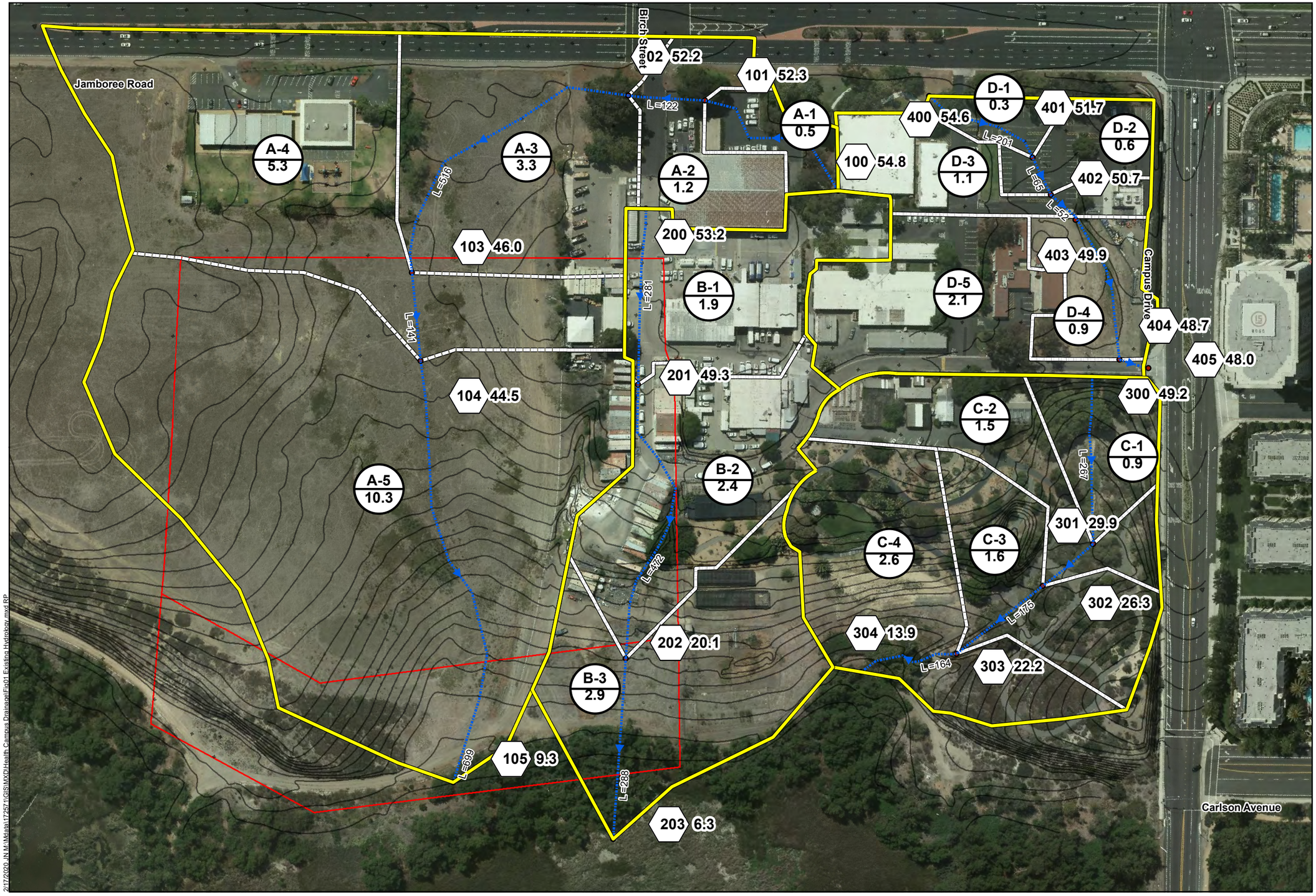
Floodplain Mapping:

The 100-yr FEMA Floodplain was reviewed to ensure the proposed project does not impact it. The proposed improvements is expected to require a Conditional Letter of Map Revision (CLMOR) as the proposed parking structure falls within the regulatory floodplain. After the BMPs have been implemented the site will discharge no more than the existing condition so the floodplain limits will be otherwise unaffected. The current site plan has a 150-foot development buffer, which is required in the 2007 UCI LRDP EIR. This buffer area will not be impacted during development but has been included in the report. Figure 5 shows the project boundary and floodplain.

Design Recommendations:

The proposed project should include the following:

1. Maximize feasible evapotranspiration with green, brown or blue roofs, and planter boxes.
2. Incorporate LID biofiltration BMPs like stormwater planter boxes with underdrains throughout the project site and a dry extended detention basin to treat and retain water to meet OCTGD's LID and hydromodification requirements.
3. Reserve space for flood control basins.
4. Ensure proposed development, including grading, does not fall within the FEMA 100-yr floodplain to avoid impacts to FEMA flood elevations. A CLMOR will be required if the development alters the effective regulatory flood plain.



Legend

- Topography
- Existing Flowpath
- Subwatersheds
- Existing Subarea
- Project Site
- 103 46.0 Node/Elevation
- B-1 1.9 Subarea/Area

0 100 200 Feet

2/17/2020 JN:M:\data\172572\GIS\MXD\Health Campus Drainage\Fig01 Existing Hydrology.mxd RP

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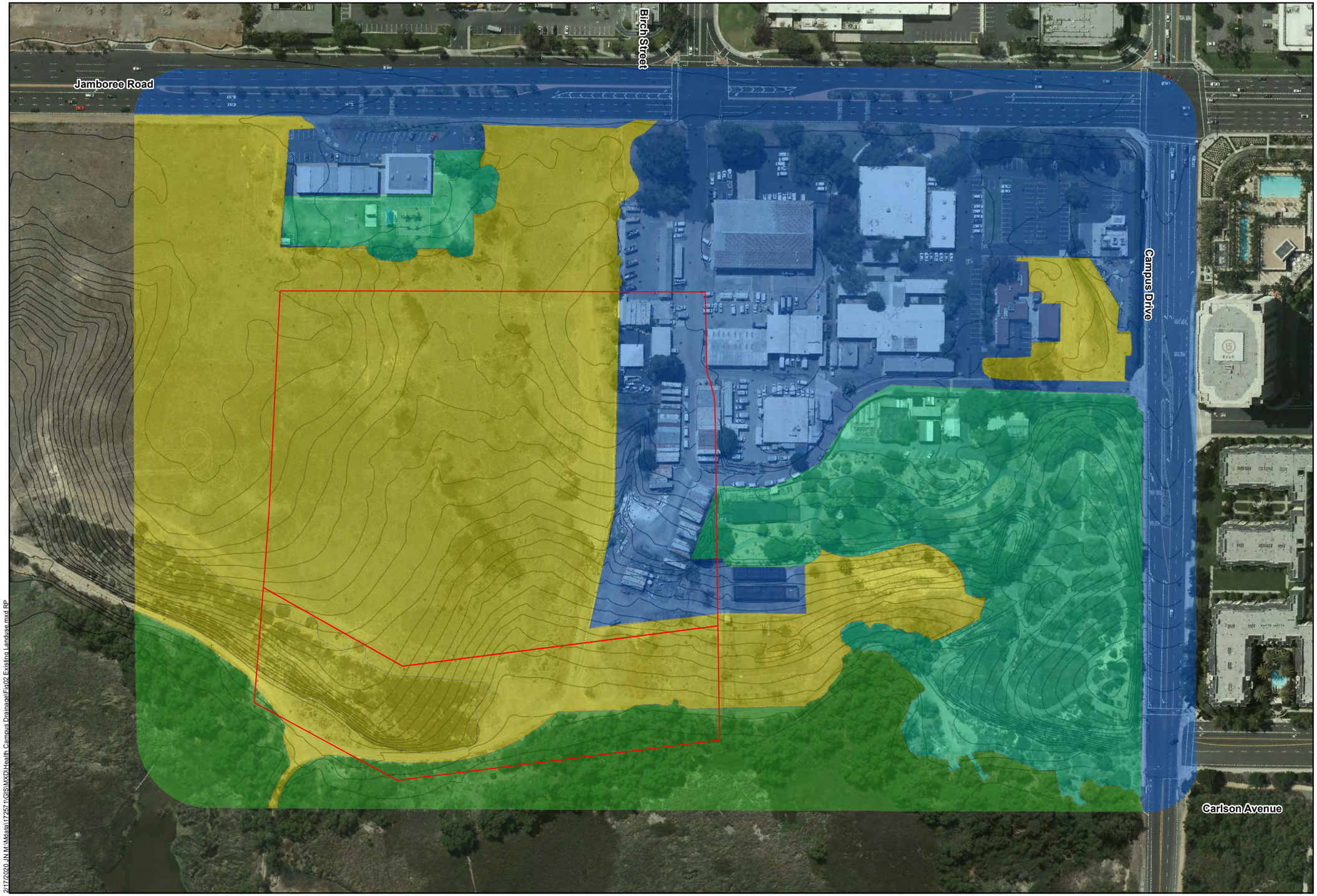
Source: Eagle Aerial, 2014

IRVINE CAMPUS MEDICAL COMPLEX PROJECT
DRAINAGE AND WATER STUDY REPORT

Existing Condition Hydrology Map

Figure 1



Legend

- Topography
- Commercial
- Open Brush
- Public Park
- Woodland, Fair
- Project Site

0 100 200 Feet

2/17/2020 JN:M:\Maria\172571\GIS\MXD\Health Campus Drainage\Fig02 Existing Landuse.mxd RP

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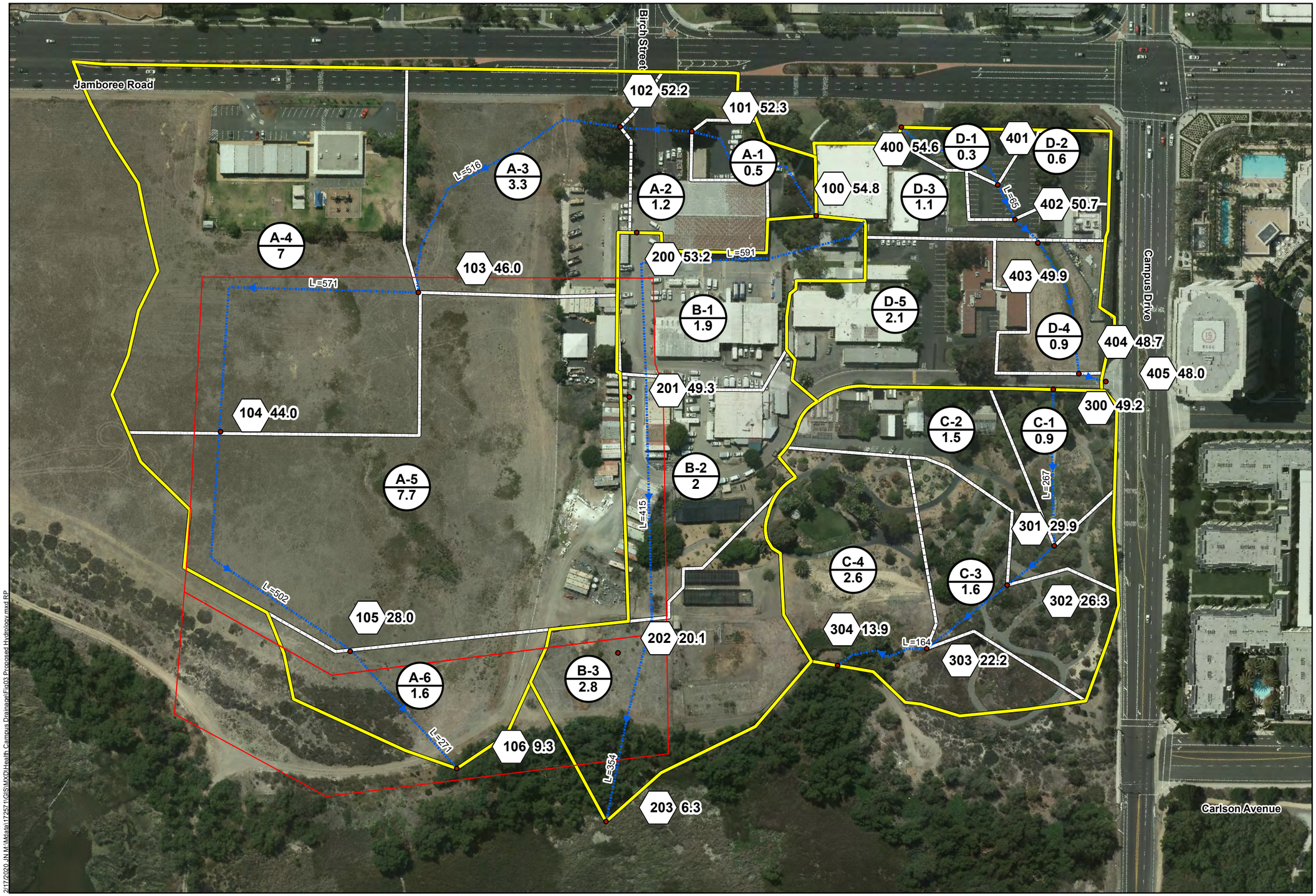
Source: Eagle Aerial, 2014

IRVINE CAMPUS MEDICAL COMPLEX PROJECT
DRAINAGE AND WATER STUDY REPORT

Existing Condition Land Use

Figure 2



Legend

- Proposed Flowpath
- Proposed Subwatershed
- Proposed Subarea
- Project Site
- 103 46.0 Node/Elevation
- B-1 1.9 Subarea/Area

0 100 200 Feet

2/17/2020 J:\MA\Irvine\172571\GIS\MXD\Health Campus Drainage\Fig03 Proposed Hydrology.mxd RP

Source: Eagle Aerial, 2014

IRVINE CAMPUS MEDICAL COMPLEX PROJECT
DRAINAGE AND WATER STUDY REPORT

Proposed Condition Hydrology Map

Figure 3

2/17/2020 J:\NA\Akhala\172571\GIS\MXD\Health Campus Drainage\Fig04 Proposed Landuse.mxd RP

Source: Eagle Aerial, 2014

IRVINE CAMPUS MEDICAL COMPLEX PROJECT
DRAINAGE AND WATER STUDY REPORT

Proposed Condition Land Use

Figure 4

Legend

- Project Site
- San Juaquin 100-Year FEMA Floodplain

0 100 200 Feet

2/17/2020 J:\N M\Irvine\172571\GIS\MXD\Health Campus Drainage\Fig 05 San Juaquin FEMA Floodplain.mxd RP

Source: Eagle Aerial, 2014

IRVINE CAMPUS MEDICAL COMPLEX PROJECT
DRAINAGE AND WATER STUDY REPORT

FEMA 100-yr Floodplain

Figure 5

IRVINE CAMPUS MEDICAL COMPLEX

DRAINAGE AND WATER STUDY REPORT

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TECHNICAL APPENDIX A

USGS Web Soil Survey

Map Scale: 1:3,810 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 12, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 3, 2015—Jan 17, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	Alo clay, 9 to 15 percent slopes	D	33.3	100.0%
Totals for Area of Interest			**33.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

IRVINE CAMPUS MEDICAL COMPLEX

DRAINAGE AND WATER STUDY REPORT

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TECHNICAL APPENDIX B

Hydrology Models

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 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2013 Advanced Engineering Software (aes)
            Ver. 20.0  Release Date: 06/01/2013  License ID 1264

                        Analysis prepared by:

                      MICHAEL BAKER INTERNATIONAL
                    5 HUTTON CENTRE DRIVE, SUITE 500
                            SANTA  ANA, CA
                                92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED A                                *
* RATIONAL METHOD HYDROLOGY MODEL                                       *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: EHCA02EV.DAT
  TIME/DATE OF STUDY: 07:31 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.80  DOWNSTREAM(FEET) =     52.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.614
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.318
  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.)
  COMMERCIAL                 -        0.50      0.60     0.100     0    7.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   52.30  DOWNSTREAM ELEVATION(FEET) =   52.20
  STREET LENGTH(FEET) =   122.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    0.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.19
  STREET FLOW TRAVEL TIME(MIN.) =   3.43   Tc(MIN.) =   11.04
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.014
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.20      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.20      SUBAREA RUNOFF(CFS) =    1.03
  EFFECTIVE AREA(ACRES) =      1.70    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       1.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.33
  FLOW VELOCITY(FEET/SEC.) =  0.63   DEPTH*VELOCITY(FT*FT/SEC.) =   0.22
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     413.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.20  DOWNSTREAM(FEET) =     46.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   516.00   CHANNEL SLOPE =  0.0120
  CHANNEL BASE(FEET) =   85.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.708
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        2.00      0.60     1.000     -
  USER-DEFINED               -        1.20      0.60     0.100     -
  USER-DEFINED               -        0.10      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.668
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.95
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.89
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   9.65
  Tc(MIN.) =   20.69
  SUBAREA AREA(ACRES) =     3.30       SUBAREA RUNOFF(CFS) =    0.91
  EFFECTIVE AREA(ACRES) =      5.00     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.48
  TOTAL AREA(ACRES) =        5.0         PEAK FLOW RATE(CFS) =       1.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     46.00  DOWNSTREAM(FEET) =     44.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   141.00   CHANNEL SLOPE =  0.0106
  CHANNEL BASE(FEET) =   85.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.668
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        2.60      0.60     1.000     -
```



```
  USER-DEFINED               -        1.80      0.60     0.100     -
  USER-DEFINED               -        0.90      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.669
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.08
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.18
  Tc(MIN.) =   22.87
  SUBAREA AREA(ACRES) =     5.30       SUBAREA RUNOFF(CFS) =    1.27
  EFFECTIVE AREA(ACRES) =     10.30     AREA-AVERAGED Fm(INCH/HR) =   0.34
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.57
  TOTAL AREA(ACRES) =       10.3         PEAK FLOW RATE(CFS) =       3.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1070.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     44.50  DOWNSTREAM(FEET) =      9.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   699.00   CHANNEL SLOPE =  0.0504
  CHANNEL BASE(FEET) =   85.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        9.10      0.60     1.000     -
  USER-DEFINED               -        0.70      0.60     0.100     -
  USER-DEFINED               -        0.10      0.60     1.000     -
  USER-DEFINED               -        0.40      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.939
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.16
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.86
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =   6.27
  Tc(MIN.) =   29.14
  SUBAREA AREA(ACRES) =    10.30       SUBAREA RUNOFF(CFS) =    0.32
  EFFECTIVE AREA(ACRES) =     20.60     AREA-AVERAGED Fm(INCH/HR) =   0.45
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.76
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =       20.6         PEAK FLOW RATE(CFS) =       3.00
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1769.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       20.6  TC(MIN.) =     29.14
  EFFECTIVE AREA(ACRES) =     20.60  AREA-AVERAGED Fm(INCH/HR)=  0.45
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.757
  PEAK FLOW RATE(CFS)   =       3.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 20.0  Release Date: 06/01/2013  License ID 1264

                        Analysis prepared by:

                     MICHAEL BAKER INTERNATIONAL
                   5 HUTTON CENTRE DRIVE, SUITE 500
                            SANTA  ANA, CA
                               92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED B                                *
* RATIONAL METHOD HYDROLOGY MODEL                                       *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: EHCB02EV.DAT
  TIME/DATE OF STUDY: 07:34 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    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) =   281.00
  ELEVATION DATA: UPSTREAM(FEET) =     53.20  DOWNSTREAM(FEET) =     49.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.822
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.403
  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.)
  COMMERCIAL                 -        1.90      0.60     0.100     0    6.82
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.30
  TOTAL AREA(ACRES) =      1.90   PEAK FLOW RATE(CFS) =      2.30

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   49.30  DOWNSTREAM ELEVATION(FEET) =   20.10
  STREET LENGTH(FEET) =   472.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.73
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.13
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
  STREET FLOW TRAVEL TIME(MIN.) =   1.90   Tc(MIN.) =    8.73
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.198
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.80      0.60     0.100     -
  USER-DEFINED               -        0.60      0.60     0.850     -
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.288
  SUBAREA AREA(ACRES) =    2.40      SUBAREA RUNOFF(CFS) =    2.21
  EFFECTIVE AREA(ACRES) =      4.30    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.3        PEAK FLOW RATE(CFS) =       4.16

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.30
  FLOW VELOCITY(FEET/SEC.) =  4.33   DEPTH*VELOCITY(FT*FT/SEC.) =   1.14
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     753.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     20.10  DOWNSTREAM(FEET) =      6.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   288.00   CHANNEL SLOPE =  0.0479
  CHANNEL BASE(FEET) =  230.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.150   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.659
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.60      0.60     1.000     -
  USER-DEFINED               -        0.40      0.60     0.100     -
  USER-DEFINED               -        0.20      0.60     0.850     -
  USER-DEFINED               -        0.70      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.866
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.33
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =  14.66
  Tc(MIN.) =   23.39
  SUBAREA AREA(ACRES) =     2.90       SUBAREA RUNOFF(CFS) =    0.36
  EFFECTIVE AREA(ACRES) =      7.20     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.47
  TOTAL AREA(ACRES) =        7.2         PEAK FLOW RATE(CFS) =       4.16
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.32
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =    1041.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        7.2  TC(MIN.) =     23.39
  EFFECTIVE AREA(ACRES) =      7.20  AREA-AVERAGED Fm(INCH/HR)=  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.471
  PEAK FLOW RATE(CFS)   =       4.16
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                        Analysis prepared by:

                      MICHAEL BAKER INTERNATIONAL
                    5 HUTTON CENTRE DRIVE, SUITE 500
                            SANTA  ANA, CA
                                92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED C                                *
* RATIONAL METHOD HYDROLOGY MODEL                                       *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: EHCC02EV.DAT
  TIME/DATE OF STUDY: 07:40 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    300.00 TO NODE    301.00 IS CODE =  21
 ------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   267.00
  ELEVATION DATA: UPSTREAM(FEET) =     49.20  DOWNSTREAM(FEET) =     29.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.634
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.316
  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                -        0.90      0.60     0.850     0    7.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      0.65

 ************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
 ------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
 ========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     29.90  DOWNSTREAM(FEET) =     26.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.0343
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.231
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.50      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.24
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.78
  Tc(MIN.) =    8.42
  SUBAREA AREA(ACRES) =     1.50       SUBAREA RUNOFF(CFS) =    0.97
  EFFECTIVE AREA(ACRES) =      2.40     AREA-AVERAGED Fm(INCH/HR) =   0.51
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =        2.4         PEAK FLOW RATE(CFS) =       1.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.62
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     372.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     26.30  DOWNSTREAM(FEET) =     22.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   175.00   CHANNEL SLOPE =  0.0234
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.106
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.60      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.53
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =    9.57
  SUBAREA AREA(ACRES) =     1.60       SUBAREA RUNOFF(CFS) =    0.86
  EFFECTIVE AREA(ACRES) =      4.00     AREA-AVERAGED Fm(INCH/HR) =   0.51
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =        4.0         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.51
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     547.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     22.20  DOWNSTREAM(FEET) =     13.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   164.00   CHANNEL SLOPE =  0.0506
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.045
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.80      0.60     1.000     -
  USER-DEFINED               -        1.80      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.896
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.74
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.58
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =   10.33
  SUBAREA AREA(ACRES) =     2.60       SUBAREA RUNOFF(CFS) =    1.19
  EFFECTIVE AREA(ACRES) =      6.60     AREA-AVERAGED Fm(INCH/HR) =   0.52
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.87
  TOTAL AREA(ACRES) =        6.6         PEAK FLOW RATE(CFS) =       3.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```



```
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.95
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     711.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =     10.33
  EFFECTIVE AREA(ACRES) =      6.60  AREA-AVERAGED Fm(INCH/HR)=  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.868
  PEAK FLOW RATE(CFS)   =       3.12
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                        Analysis prepared by:

                     MICHAEL BAKER INTERNATIONAL
                   5 HUTTON CENTRE DRIVE, SUITE 500
                           SANTA  ANA, CA
                               92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED D                                *
* RATIONAL METHOD HYDROLOGY MODEL                                       *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: EHCD02EV.DAT
  TIME/DATE OF STUDY: 07:44 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    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) =   201.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.60  DOWNSTREAM(FEET) =     51.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.920
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.501
  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.)
  COMMERCIAL                 -        0.30      0.60     0.100     0    5.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.39

 ****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
 ============================================================================
  UPSTREAM ELEVATION(FEET) =   51.70  DOWNSTREAM ELEVATION(FEET) =   50.70
  STREET LENGTH(FEET) =    65.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    3.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.37
  STREET FLOW TRAVEL TIME(MIN.) =   0.60   Tc(MIN.) =    6.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.435
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.60      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.74
  EFFECTIVE AREA(ACRES) =      0.90    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       1.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   4.61
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   0.43
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     266.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   51.70  DOWNSTREAM ELEVATION(FEET) =   50.70
  STREET LENGTH(FEET) =    52.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    6.72
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.81
  STREET FLOW TRAVEL TIME(MIN.) =   0.31   Tc(MIN.) =    6.84
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.402
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.10      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      2.00    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       2.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   7.95
  FLOW VELOCITY(FEET/SEC.) =  2.94   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     318.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```



```
  ELEVATION DATA: UPSTREAM(FEET) =     49.90  DOWNSTREAM(FEET) =     48.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   244.00   CHANNEL SLOPE =  0.0049
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.043
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.20      0.60     0.100     -
  USER-DEFINED               -        0.70      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.15
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   3.55
  Tc(MIN.) =   10.38
  SUBAREA AREA(ACRES) =     0.90       SUBAREA RUNOFF(CFS) =    0.46
  EFFECTIVE AREA(ACRES) =      2.90     AREA-AVERAGED Fm(INCH/HR) =   0.19
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.32
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       2.42
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.13
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =     562.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   48.70  DOWNSTREAM ELEVATION(FEET) =   48.00
  STREET LENGTH(FEET) =    40.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =   10.64
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.032
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.90      0.60     0.100     -
  USER-DEFINED               -        0.10      0.60     1.000     -
```

```
  USER-DEFINED               -        0.10      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.179
  SUBAREA AREA(ACRES) =    2.10      SUBAREA RUNOFF(CFS) =    1.75
  EFFECTIVE AREA(ACRES) =      5.00    AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =        5.0        PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.84
  FLOW VELOCITY(FEET/SEC.) =  2.65   DEPTH*VELOCITY(FT*FT/SEC.) =   0.80
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =     602.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =     10.64
  EFFECTIVE AREA(ACRES) =      5.00  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.259
  PEAK FLOW RATE(CFS)   =       3.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                        Analysis prepared by:

                     MICHAEL BAKER INTERNATIONAL
                   5 HUTTON CENTRE DRIVE, SUITE 500
                           SANTA  ANA, CA
                               92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED A                                *
* RATIONAL METHOD HYDROLOGY MODEL - PROPOSED                            *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: PHCA02EV.DAT
  TIME/DATE OF STUDY: 07:57 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.80  DOWNSTREAM(FEET) =     52.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.614
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.318
  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.)
  COMMERCIAL                 -        0.50      0.60     0.100     0    7.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   52.30  DOWNSTREAM ELEVATION(FEET) =   52.20
  STREET LENGTH(FEET) =   122.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    0.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.19
  STREET FLOW TRAVEL TIME(MIN.) =   3.43   Tc(MIN.) =   11.04
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.014
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.20      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.20      SUBAREA RUNOFF(CFS) =    1.03
  EFFECTIVE AREA(ACRES) =      1.70    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       1.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.33
  FLOW VELOCITY(FEET/SEC.) =  0.63   DEPTH*VELOCITY(FT*FT/SEC.) =   0.22
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     413.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.20  DOWNSTREAM(FEET) =     46.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   516.00   CHANNEL SLOPE =  0.0120
  CHANNEL BASE(FEET) =   85.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.714
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.70      0.60      1.000     -
  USER-DEFINED               -        1.50      0.60      0.100     -
  USER-DEFINED               -        0.10      0.60      0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.586
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.92
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   9.30
  Tc(MIN.) =   20.34
  SUBAREA AREA(ACRES) =     3.30       SUBAREA RUNOFF(CFS) =    1.08
  EFFECTIVE AREA(ACRES) =      5.00     AREA-AVERAGED Fm(INCH/HR) =   0.25
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.42
  TOTAL AREA(ACRES) =        5.0         PEAK FLOW RATE(CFS) =       2.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    46.00  DOWNSTREAM(FEET) =    44.00
  FLOW LENGTH(FEET) =   571.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.05
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.08
  PIPE TRAVEL TIME(MIN.) =   3.12    Tc(MIN.) =   23.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1500.00 FEET.
```



```
****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.47
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.658
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        3.90      0.60      0.100     -
  USER-DEFINED               -        2.20      0.60      1.000     -
  USER-DEFINED               -        0.90      0.60      0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.479
  SUBAREA AREA(ACRES) =    7.00      SUBAREA RUNOFF(CFS) =    2.33
  EFFECTIVE AREA(ACRES) =     12.00   AREA-AVERAGED Fm(INCH/HR) =  0.27
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.46
  TOTAL AREA(ACRES) =       12.0       PEAK FLOW RATE(CFS) =       4.15

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.00  DOWNSTREAM(FEET) =    28.00
  FLOW LENGTH(FEET) =   502.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.15
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =   24.48
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    2002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   24.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.639
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        7.50      0.60      0.100     -
  USER-DEFINED               -        0.20      0.60      1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.123
  SUBAREA AREA(ACRES) =    7.70      SUBAREA RUNOFF(CFS) =    3.92
  EFFECTIVE AREA(ACRES) =     19.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =       19.7       PEAK FLOW RATE(CFS) =       7.87

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  52
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     28.00  DOWNSTREAM(FEET) =      9.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   271.00   CHANNEL SLOPE =  0.0690
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.87
  FLOW VELOCITY(FEET/SEC) =   6.18 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.73   Tc(MIN.) =   25.22
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    2273.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =   25.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.627
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.10      0.60     0.100     -
  USER-DEFINED               -        0.40      0.60     1.000     -
  USER-DEFINED               -        1.00      0.60     1.000     -
  USER-DEFINED               -        0.10      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
  SUBAREA AREA(ACRES) =    1.60      SUBAREA RUNOFF(CFS) =    0.09
  EFFECTIVE AREA(ACRES) =     21.30   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.37
  TOTAL AREA(ACRES) =       21.3       PEAK FLOW RATE(CFS) =       7.87
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       21.3  TC(MIN.) =     25.22
  EFFECTIVE AREA(ACRES) =     21.30  AREA-AVERAGED Fm(INCH/HR)=  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.372
  PEAK FLOW RATE(CFS)   =       7.87
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 20.0  Release Date: 06/01/2013  License ID 1264

                        Analysis prepared by:

                      MICHAEL BAKER INTERNATIONAL
                    5 HUTTON CENTRE DRIVE, SUITE 500
                            SANTA  ANA, CA
                                92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED B                                *
* RATIONAL METHOD HYDROLOGY MODEL - PROPOSED                            *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: PHCB02EV.DAT
  TIME/DATE OF STUDY: 07:59 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    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) =   281.00
  ELEVATION DATA: UPSTREAM(FEET) =     53.20  DOWNSTREAM(FEET) =     49.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.822
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.403
  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.)
  COMMERCIAL                 -        1.90      0.60     0.100     0    6.82
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.30
  TOTAL AREA(ACRES) =      1.90   PEAK FLOW RATE(CFS) =      2.30

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   49.30  DOWNSTREAM ELEVATION(FEET) =   20.10
  STREET LENGTH(FEET) =   472.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.20
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.55
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   1.92   Tc(MIN.) =    8.75
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.40      0.60     0.100     -
  USER-DEFINED               -        0.60      0.60     0.850     -
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.325
  SUBAREA AREA(ACRES) =    2.00      SUBAREA RUNOFF(CFS) =    1.80
  EFFECTIVE AREA(ACRES) =      3.90    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.22
  TOTAL AREA(ACRES) =        3.9        PEAK FLOW RATE(CFS) =       3.74

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.02
  FLOW VELOCITY(FEET/SEC.) =  4.20   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     753.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     20.10  DOWNSTREAM(FEET) =      6.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   288.00   CHANNEL SLOPE =  0.0479
  CHANNEL BASE(FEET) =  230.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.150   MAXIMUM DEPTH(FEET) =   0.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.637
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.60      0.60     1.000     -
  USER-DEFINED               -        0.30      0.60     0.100     -
  USER-DEFINED               -        0.20      0.60     0.850     -
  USER-DEFINED               -        0.70      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.893
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.30
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =  15.86
  Tc(MIN.) =   24.61
  SUBAREA AREA(ACRES) =     2.80       SUBAREA RUNOFF(CFS) =    0.26
  EFFECTIVE AREA(ACRES) =      6.70     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.50
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       3.74
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   0.32
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =    1041.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     24.61
  EFFECTIVE AREA(ACRES) =      6.70  AREA-AVERAGED Fm(INCH/HR)=  0.30
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.499
  PEAK FLOW RATE(CFS)   =       3.74
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 20.0  Release Date: 06/01/2013  License ID 1264

                        Analysis prepared by:

                     MICHAEL BAKER INTERNATIONAL
                   5 HUTTON CENTRE DRIVE, SUITE 500
                            SANTA  ANA, CA
                               92707

 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED C                                *
* RATIONAL METHOD HYDROLOGY MODEL - PROPOSED                            *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: PHCC02EV.DAT
  TIME/DATE OF STUDY: 08:01 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   267.00
  ELEVATION DATA: UPSTREAM(FEET) =     49.20  DOWNSTREAM(FEET) =     29.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.634
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.316
  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                -        0.90      0.60     0.850     0    7.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     29.90  DOWNSTREAM(FEET) =     26.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.0343
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.231
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.50      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.24
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.78
  Tc(MIN.) =    8.42
  SUBAREA AREA(ACRES) =     1.50       SUBAREA RUNOFF(CFS) =    0.97
  EFFECTIVE AREA(ACRES) =      2.40     AREA-AVERAGED Fm(INCH/HR) =   0.51
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =        2.4         PEAK FLOW RATE(CFS) =       1.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.62
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     372.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     26.30  DOWNSTREAM(FEET) =     22.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   175.00   CHANNEL SLOPE =  0.0234
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.106
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.60      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.53
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =    9.57
  SUBAREA AREA(ACRES) =     1.60       SUBAREA RUNOFF(CFS) =    0.86
  EFFECTIVE AREA(ACRES) =      4.00     AREA-AVERAGED Fm(INCH/HR) =   0.51
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =        4.0         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.51
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     547.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     22.20  DOWNSTREAM(FEET) =     13.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   164.00   CHANNEL SLOPE =  0.0506
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.045
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.80      0.60     1.000     -
  USER-DEFINED               -        1.80      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.896
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.74
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.58
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =   10.33
  SUBAREA AREA(ACRES) =     2.60       SUBAREA RUNOFF(CFS) =    1.19
  EFFECTIVE AREA(ACRES) =      6.60     AREA-AVERAGED Fm(INCH/HR) =   0.52
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.87
  TOTAL AREA(ACRES) =        6.6         PEAK FLOW RATE(CFS) =       3.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```



```
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.95
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     711.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =     10.33
  EFFECTIVE AREA(ACRES) =      6.60  AREA-AVERAGED Fm(INCH/HR)=  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.868
  PEAK FLOW RATE(CFS)   =       3.12
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                        Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* UCI HEALTH CENTER STUDY SUBWATERSHED D                                *
* RATIONAL METHOD HYDROLOGY MODEL - PROPOSED                            *
* 2-YR EV FEBRUARY 2020 ROKAMOTO                                        *
 ************************************************************************

  FILE NAME: PHCD02EV.DAT
  TIME/DATE OF STUDY: 08:01 02/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 14
   1)    5.00;  1.600
   2)   10.00;  1.060
   3)   15.00;  0.840
   4)   20.00;  0.720
   5)   25.00;  0.630
   6)   30.00;  0.560
   7)   40.00;  0.480
   8)   50.00;  0.420
   9)   60.00;  0.366
  10)   90.00;  0.300
  11)  120.00;  0.246
  12)  180.00;  0.190
  13)  360.00;  0.136
  14) 1200.00;  0.080
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   32.0     27.0    0.020/0.020/ ---    0.67    2.00 0.0312 0.167 0.0150
  3   13.0      8.0    0.020/0.020/ ---    0.33    1.00 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```



```
    1. Relative Flow-Depth =  1.00 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    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) =   201.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.60  DOWNSTREAM(FEET) =     51.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.920
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.501
  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.)
  COMMERCIAL                 -        0.30      0.60     0.100     0    5.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   51.70  DOWNSTREAM ELEVATION(FEET) =   50.70
  STREET LENGTH(FEET) =    65.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    3.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.37
  STREET FLOW TRAVEL TIME(MIN.) =   0.60   Tc(MIN.) =    6.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.435
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.60      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.74
  EFFECTIVE AREA(ACRES) =      0.90    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       1.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   4.61
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   0.43
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     266.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   51.70  DOWNSTREAM ELEVATION(FEET) =   50.70
  STREET LENGTH(FEET) =    52.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    6.72
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.81
  STREET FLOW TRAVEL TIME(MIN.) =   0.31   Tc(MIN.) =    6.84
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.402
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.10      0.60     0.100     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      2.00    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       2.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   7.95
  FLOW VELOCITY(FEET/SEC.) =  2.94   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     318.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```



```
  ELEVATION DATA: UPSTREAM(FEET) =     49.90  DOWNSTREAM(FEET) =     48.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   244.00   CHANNEL SLOPE =  0.0049
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.043
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        0.20      0.60     0.100     -
  USER-DEFINED               -        0.70      0.60     1.000     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.15
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   3.55
  Tc(MIN.) =   10.38
  SUBAREA AREA(ACRES) =     0.90       SUBAREA RUNOFF(CFS) =    0.46
  EFFECTIVE AREA(ACRES) =      2.90     AREA-AVERAGED Fm(INCH/HR) =   0.19
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   0.32
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       2.42
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.13
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =     562.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   48.70  DOWNSTREAM ELEVATION(FEET) =   48.00
  STREET LENGTH(FEET) =    40.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =   10.64
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.032
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  USER-DEFINED               -        1.90      0.60     0.100     -
  USER-DEFINED               -        0.10      0.60     1.000     -
```

```
  USER-DEFINED               -        0.10      0.60     0.850     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.179
  SUBAREA AREA(ACRES) =    2.10      SUBAREA RUNOFF(CFS) =    1.75
  EFFECTIVE AREA(ACRES) =      5.00    AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =        5.0        PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.84
  FLOW VELOCITY(FEET/SEC.) =  2.65   DEPTH*VELOCITY(FT*FT/SEC.) =   0.80
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =     602.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =     10.64
  EFFECTIVE AREA(ACRES) =      5.00  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 0.259
  PEAK FLOW RATE(CFS)   =       3.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```