Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

CENTURION PLAZA
15661 RED HILL AVENUE
TUSTIN, CA

PREPARED FOR

CENTURIAN PLAZA, LLC
35 DEEP SEA
NEWPORT BEACH, CA 92657

FEBRUARY 6, 2023

JOB NO. 4136

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
P. (714) 521-4811
FAX (714) 521-4173

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

CENTURION PLAZA
15661 RED HILL AVENUE

PREPARED UNDER
THE SUPERVISION OF:

REINHARD STENZEL DATE
R.C.E. 56155
EXP. 12/31/2024

INTRODUCTION

A: PROJECT LOCATION

The project site is located on the northernly side of the intersection of Bell Avenue and Red Hill Avenue in the City of Tustin. See following page for vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the 25- and 100-year peak flow rates for the project site that drain to an existing storm drain system located in Bell Avenue.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Kristie Ferronato

Last Update: 2/22/23
O:\4100-4199\4136\4136VicMap.dwg

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

VICINITY MAP

FOR

15661 RED HILL AVENUE
TUSTIN, CA 92780

N

NTS

DISCUSSION

Project Description

The project site encompasses approximately 6.16 acres. Proposed improvements to the site include the construction of two commercial/industrial building with approximately 49,577 and 93,158 square feet. Each building will have a truck yard in the north. Vehicle parking is located along the north side of building 1 and along the north, west, and south sides of building 2. There will be landscaping adjacent to Bell Avenue and Red Hill Avenue and smaller areas throughout the site.

Existing storm drains

There is an existing storm drain system in Bell Avenue. The Bell Avenue storm drain plans show an HGL however no flow rate or storm event is labeled. There is also an existing storm drain that divides the site in 2, this storm drain serves area north of the project site and no change will be made to this existing storm drain.

See Appendix "A" for reference storm drain plans.

Existing Condition Hydrology

Under existing conditions, the majority of the site drains southerly toward the intersection of Bell Avenue and Red Hill Avenue. Here, on the project site there is a pair of catch basins that collect the runoff and convey it to the existing storm drain in Bell Avenue. The 25-year and 100-year peak flow rates for this area is approximately 12.1 cfs and 15.6 cfs respectively.

A small portion of the site in the northwest side drains out to Bell Avenue via a v-gutter system on site. The 25-year and 100-year peak flow rates for this area is approximately 2.0 cfs and 2.6 cfs respectively.

The northwest of the project drains out a shared use gutter and discharges into an existing catch basin which connects to the existing storm drain in Red Hill Avenue. The 25-year and 100-year peak flow rates for this area is approximately 1.9 cfs and 2.4 cfs respectively.

Total site discharge for the 25-year peak flow rates is 16.0 cfs, and 20.6 cfs for the 100-year storm event.

See Appendix “B” for Hydrology Calculations and Appendix “F” for the existing condition hydrology map.

Proposed Condition Hydrology

Drainage from building 1 and the associate vehicle parking will all be directed to a low spot in the truck yard. Here a proposed catch basin will be installed. The private storm drain will convey the runoff southeasterly towards the existing 48" storm drain in Bell Avenue. A new connection will be proposed to allow for this discharge. The 25-year and 100-year peak flow rates for this building 1 is approximately 8.0 cfs and 9.1 cfs respectively.

Drainage from Building 2 and the vehicle parking along the north side will be directed to a pair of catch basins in the truck yard. The proposed storm drain will continue westerly collecting runoff from the west vehicle parking and drive aisle. The storm drain will continue to the southern corner of the site. The existing public catch basin on Bell Avenue will be reconstructed to allow for this proposed connection. The 25-year and 100-year peak flow rates for this building 1 is approximately 13.4 cfs and 17.3 cfs respectively.

The northern drive aisle will continue to drain as in the existing condition, along an existing v-gutter which is utilized by the neighboring property. The existing catch basin at the downstream end of this gutter will be reconstructed in a slightly new location to allow for the parking improvements. The existing storm drain lateral will continue to be utilized. The 25-year and 100-year peak flow rates for this building 1 is approximately 0.95 cfs and 1.2 cfs respectively.

Methodology

Hydrology calculations were computed using Orange County Rational Method program (by AES Software). Orange County preset rainfall values were used in the 25- and 100-year calculations. The soil type is "C" per the Orange County Hydrology Manual. See Appendix "A" for reference materials. Small area unit hydrograph program, also by AES Software, was used for the basin routing and detention calculations.

Summary

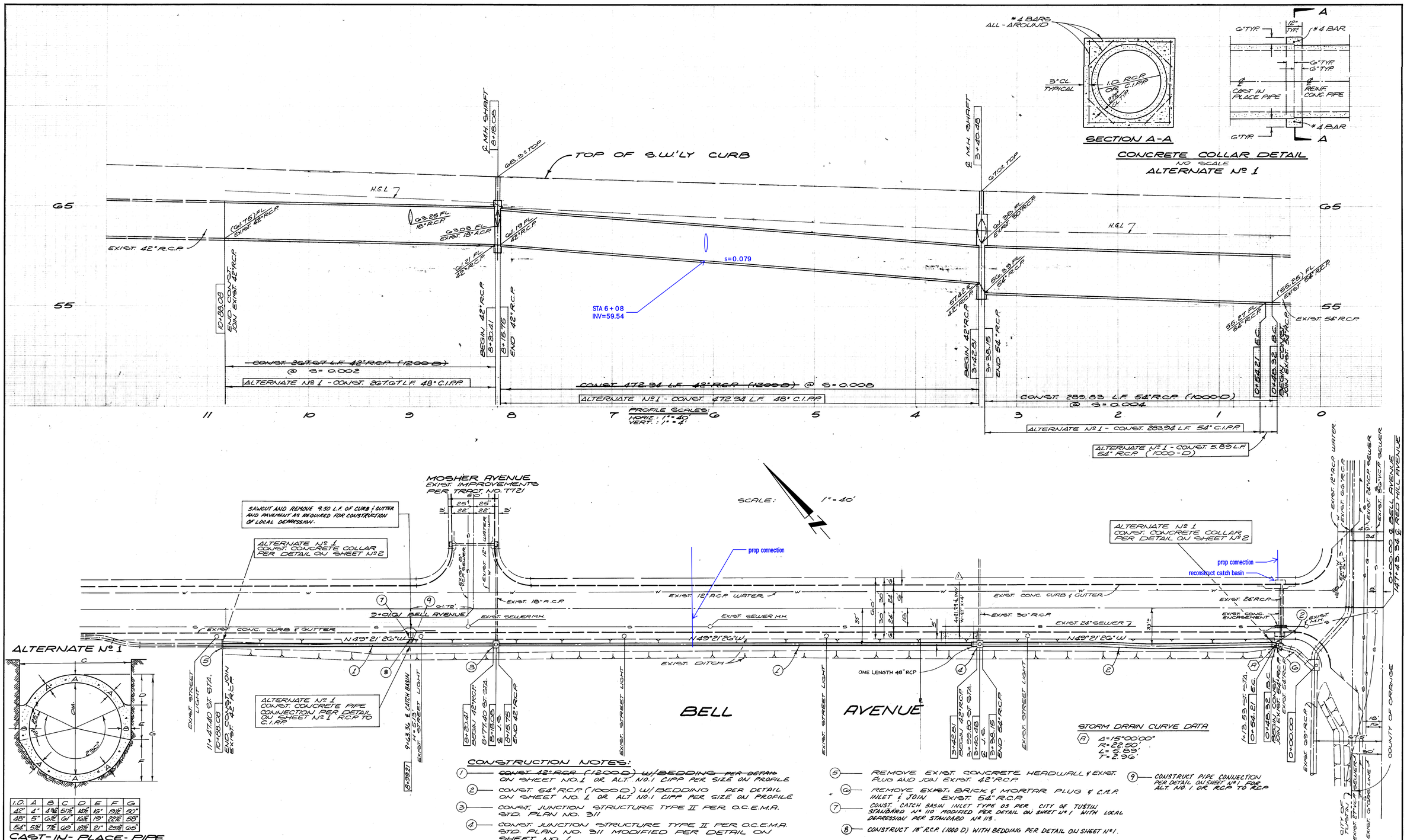
The site was fully developed as an office park with drainage systems in place at downstream locations. With the development of the project as 2 buildings and an on-site storm drain system, this will yield a higher flow rates however the land use will remain the same. The following table summarizes the existing and proposed flow rates for the project site.

	25-year cfs	100-year cfs
Existing	16.0	20.6
Proposed	22.4	27.6

APPENDIX	DESCRIPTION
A	REFERENCE MATERIALS
B	HYDROLOGY CALCULATIONS
C	HYDROLOGY MAPS

APPENDIX A

REFERENCE MATERIALS



REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP.
1	12-22-79	RJB	ADDED DRIVEWAY @ STA. 4+21.29	R.S.L.

DRESCO

REFERENCES

WILLIAMSON & SCHMID — DATE.
PREPARED UNDER THE SUPERVISION OF: Andrew D. Hall Jr. R.C.E. NO. 26759 — 11-3-77
CHECKED BY
RECMD. BY
APPROVED: Robert S. Schumacher CITY ENGINEER — 1-27-78

STORM DRAIN IMPROVEMENT PLAN
BELL AVENUE
CITY OF TUSTIN
DEPARTMENT OF PUBLIC WORKS
SHEET 2 OF 2

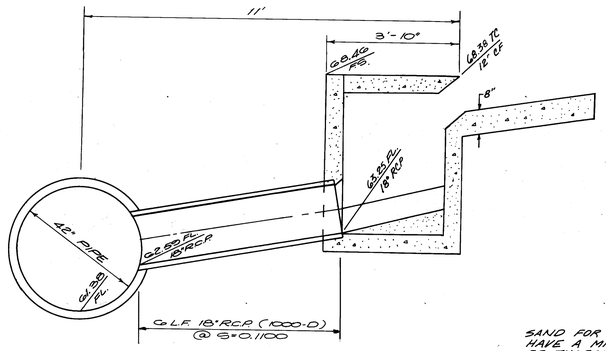
"AS BUILT" D-244 B J.N. 77340

D244 002

D - 244B
SHEET 2 OF 2

GENERAL NOTES

1. ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STD. SPECIFICATIONS OF THE STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEP. OF TRANSPORTATION, DATED JAN. 1975 AND IN ACCORDANCE WITH THE CITY OF TUSTIN MIN. DESIGN STD. FOR PUBLIC WORKS IMPROVEMENTS & STREET IMPROVEMENT STDS. & ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY STD. DATED 1977.
2. IN ACCORDANCE WITH CHAPTER 8A OF "THE CODE OF THE CITY OF TUSTIN, CALIFORNIA", ALL CONSTRUCTION IN STREET RIGHTS OF WAY, DONE IN CONJUNCTION WITH THIS PROJECT, WILL REQUIRE A CITY OF TUSTIN CONSTRUCTION PERMIT TO BE OBTAINED PRIOR TO START OF WORK.
3. THE ORANGE COUNTY FLOOD CONTROL DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO ANY CONNECTION TO THEIR FACILITIES. INSTALLATION SHALL BE DONE TO THE SATISFACTION OF THE O.C.F.C.D. INSPECTOR.
4. STATIONS SHOWN THUS ▭ ARE STORM DRAIN STATIONS AND ARE INDEPENDENT OF CENTERLINE STREET STATIONS.
5. THE CONTRACTOR SHALL HAVE COPIES ON THE PROJECT SITE AND BE FAMILIAR WITH ALL APPLICABLE STANDARDS AND SPECIFICATIONS.
6. ADVERTISING SIGNS WILL NOT BE ALLOWED IN STREET RIGHTS OF WAY.
7. THE CITY ENGINEER'S OFFICE SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO ANY INSPECTION.
8. SPECIFIED RELATIVE COMPACTION FOR TRENCH BACKFILL, SUBGRADE AND AGGREGATE BASE SHALL BE DETERMINED BY CALIF. TEST METHOD NO. 231. THE CITY WILL FURNISH FIRST TESTS WHEN REQUESTED BY THE CONTRACTOR. ANY RE-TESTING REQUIRED DUE TO FIRST TEST FAILURES SHALL BE MADE, AS ORDERED BY THE CITY PUBLIC WORKS INSPECTOR, AT THE CONTRACTOR'S EXPENSE. SAID COMPACTION TEST SHALL BE PERFORMED BY THE ORANGE COUNTY MATERIALS LAB.



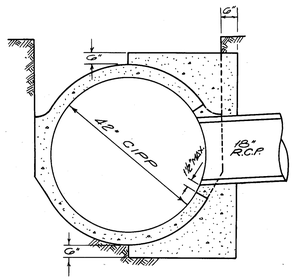
CATCH BASIN INLET TYPE 0S MODIFIED
NO SCALE

ESTIMATE OF QUANTITIES NOTE:

QUANTITIES SHOWN ARE TO BE SOLELY FOR THE PURPOSE OF COMPARISON OF BIDS. THE CONTRACTOR'S COMPENSATION WILL BE COMPUTED UPON ACTUAL QUANTITIES IN THE COMPLETED WORK, WHETHER THEY BE MORE OR LESS THAN THOSE SHOWN HEREON. THE FINAL QUANTITIES SHALL BE DETERMINED BY THE ENGINEER.

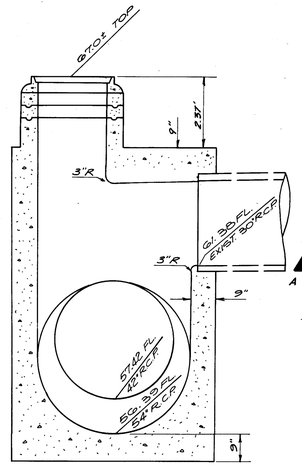
CONSTRUCTION NOTES & ESTIMATED QUANTITIES

1. CONST. 42" R.C.P. (1200 D) W/ BEDDING PER DETAIL ON SHEET NO. 1 — 741 L.F.
2. CONST. 54" R.C.P. (1000 D) W/ BEDDING PER DETAIL ON SHEET NO. 1 — 285 L.F.
3. CONST. JUNCTION STRUCTURE TYPE II PER O.C.E.M.A. STD. PLAN NO. 311. — 1 EA.
4. CONST. JUNCTION STRUCTURE TYPE II PER O.C.E.M.A. STD. PLAN NO. 311 MODIFIED PER DETAIL ON SHEET NO. 1 — 1 EA.
5. REMOVE EXIST. CONCRETE HEADWALL & EXIST. PLUG & JOIN EXIST. 42" R.C.P. — 1 EA.
6. REMOVE EXIST. BRICK & MORTAR PLUG & CMP INLET & JOIN EXIST. 54" R.C.P. — 1 EA.
7. CONST. CATCH BASIN INLET TYPE 0S PER CITY OF TUSTIN STANDARD Nº 110 MODIFIED PER DETAIL ON SHEET Nº 1 WITH LOCAL DEPRESSIONS PER STANDARD Nº 113 — 1 EA.
8. CONST. 18" R.C.P. (1000 D) WITH BEDDING PER DETAIL ON SHEET Nº 1 — 6 L.F.
9. CONST. PIPE CONNECTION PER DETAIL ON SHEET NO. 1 — 1 EA.

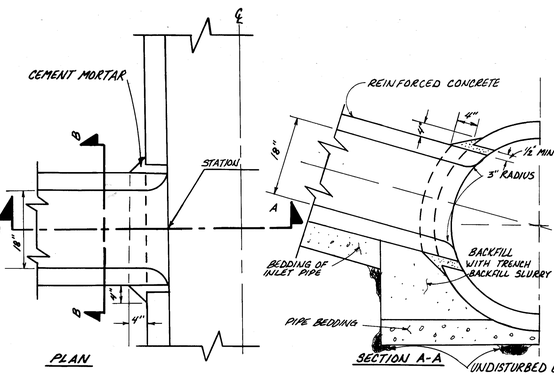


PIPE CONNECTION DETAIL R.C.P. TO CIPP - LENGTH=3', ALTERNATE Nº 1
NO SCALE

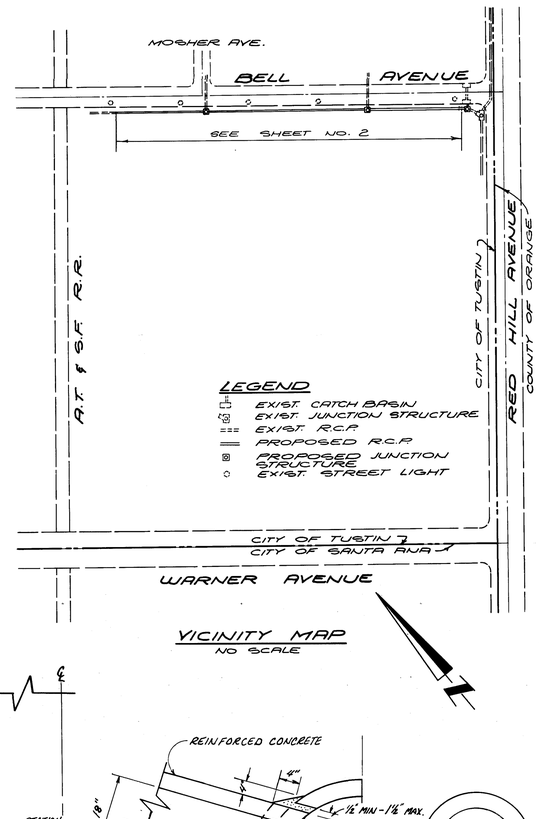
SAND FOR BEDDING SHALL HAVE A MIN. S.E. OF 25 AND SHALL BE THOROUGHLY TAMPED AND CONSOLIDATED TO 90% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE AS DETERMINED BY CALIF. TEST METHOD NO. 231.



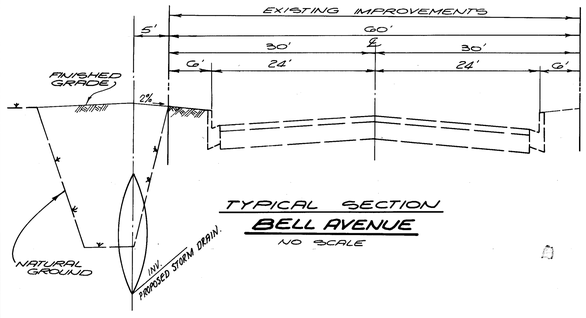
MODIFIED JUNCTION STRUCTURE
NO SCALE



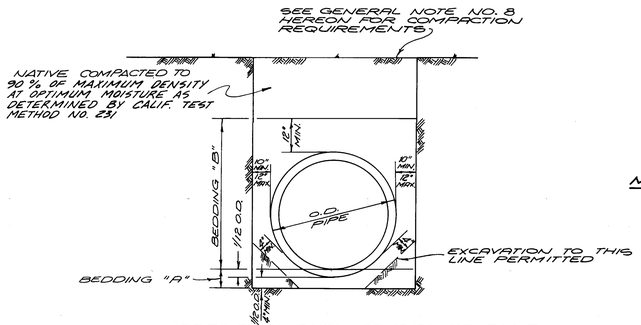
PIPE CONNECTION DETAIL - RCP TO RCP
SCALE 3/4"=1'



VICINITY MAP
NO SCALE



TYPICAL SECTION BELL AVENUE
NO SCALE



1. BEDDING "A" SHALL CONSIST OF SAND OR #4 (MAX.) CRUSHED ROCK OR GRAVEL (IF REQUIRED BY INSPECTOR.
2. BEDDING "B" SHALL CONSIST OF SAND OR OTHER GRANULAR MATERIAL

TYPICAL R.C.P. BEDDING DETAIL
NO SCALE

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS.

NOTICE TO CONTRACTOR

BASIS OF BEARINGS

THE BEARINGS HEREON ARE BASED ON THE CENTER-LINE OF BELL AVENUE BEING N45°21'26"W PER MAP FILED IN BOOK 52, PAGES 38 OF PARCEL MAPS, RECORDS OF ORANGE COUNTY, CALIFORNIA.

WILLIAMSON & SCHMID
17782 SKY PARK BOULEVARD • IRVINE, CALIFORNIA 92714 • (714) 549-2222

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP.

REFERENCES

BENCH MARK:
CITY OF SANTA ANA B.M. # 521. STD. O.C.S. MON. W/3" ALUM. DISC @ ℄ INT. WARNER & REDHILL CITY ELEV.=59.98 (1958 ADJ) − 0.09 O.C.S. ELEV. = 59.89 (1970 ADJ)

PLANS FOR THESE IMPROVEMENTS
STREET: BELL AVENUE R.G.S.
SEWER:
STORM DRAIN: BARRANCA STORM DRAIN F.C.S. P15
APPROVED:
DIRECTOR OF PUBLIC UTILITIES — DATE

	DATE
PREPARED UNDER THE SUPERVISION OF R.C.E. NO. 20759	11-2-77
CHECKED BY	
RECMD. BY	
APPROVED Robert S. Fredericksen CITY ENGINEER	1-27-78

STORM DRAIN IMPROVEMENT PLAN
BELL AVENUE
CITY OF TUSTIN
DEPARTMENT OF PUBLIC WORKS

SHEET 1 OF 2

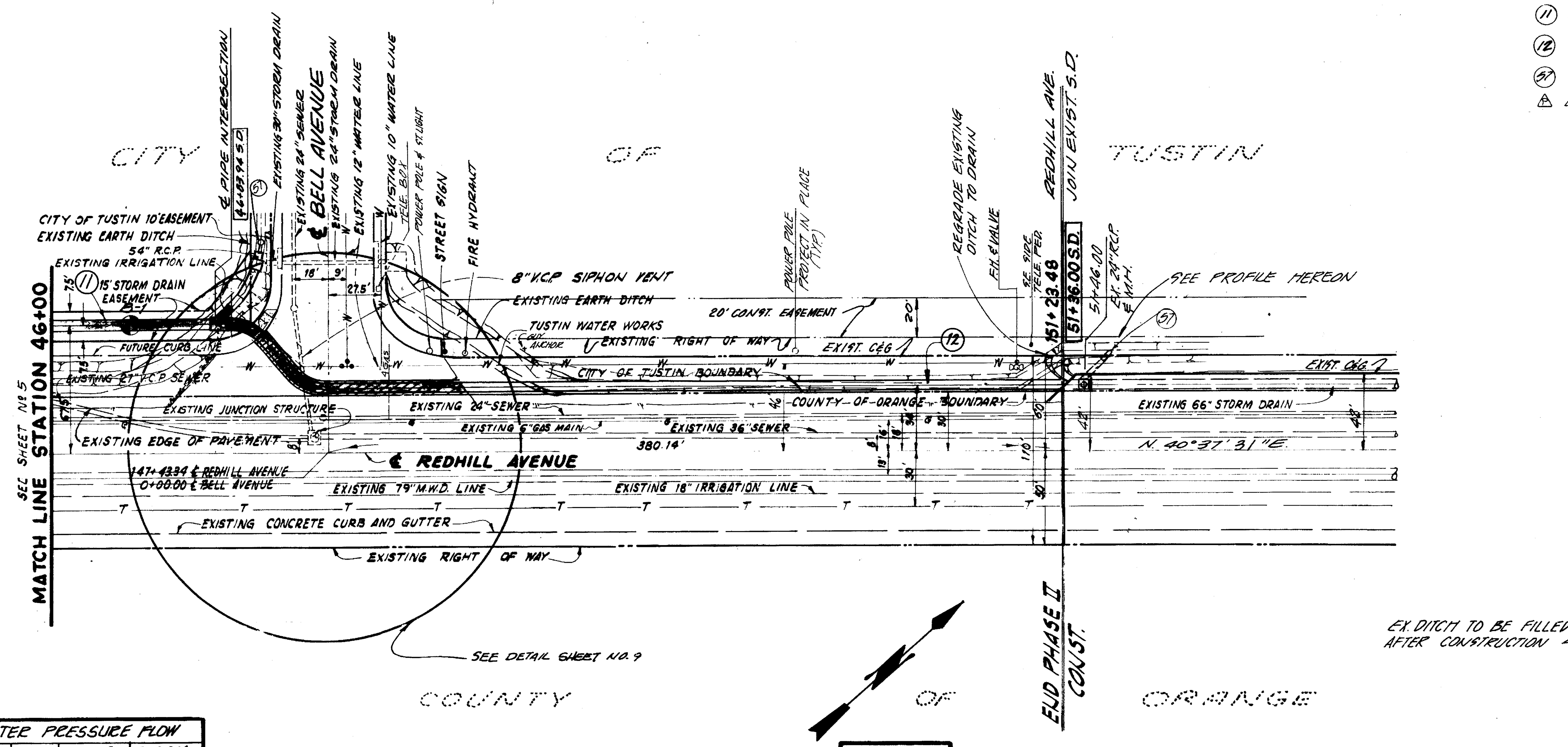
D-244A J.N. 77346

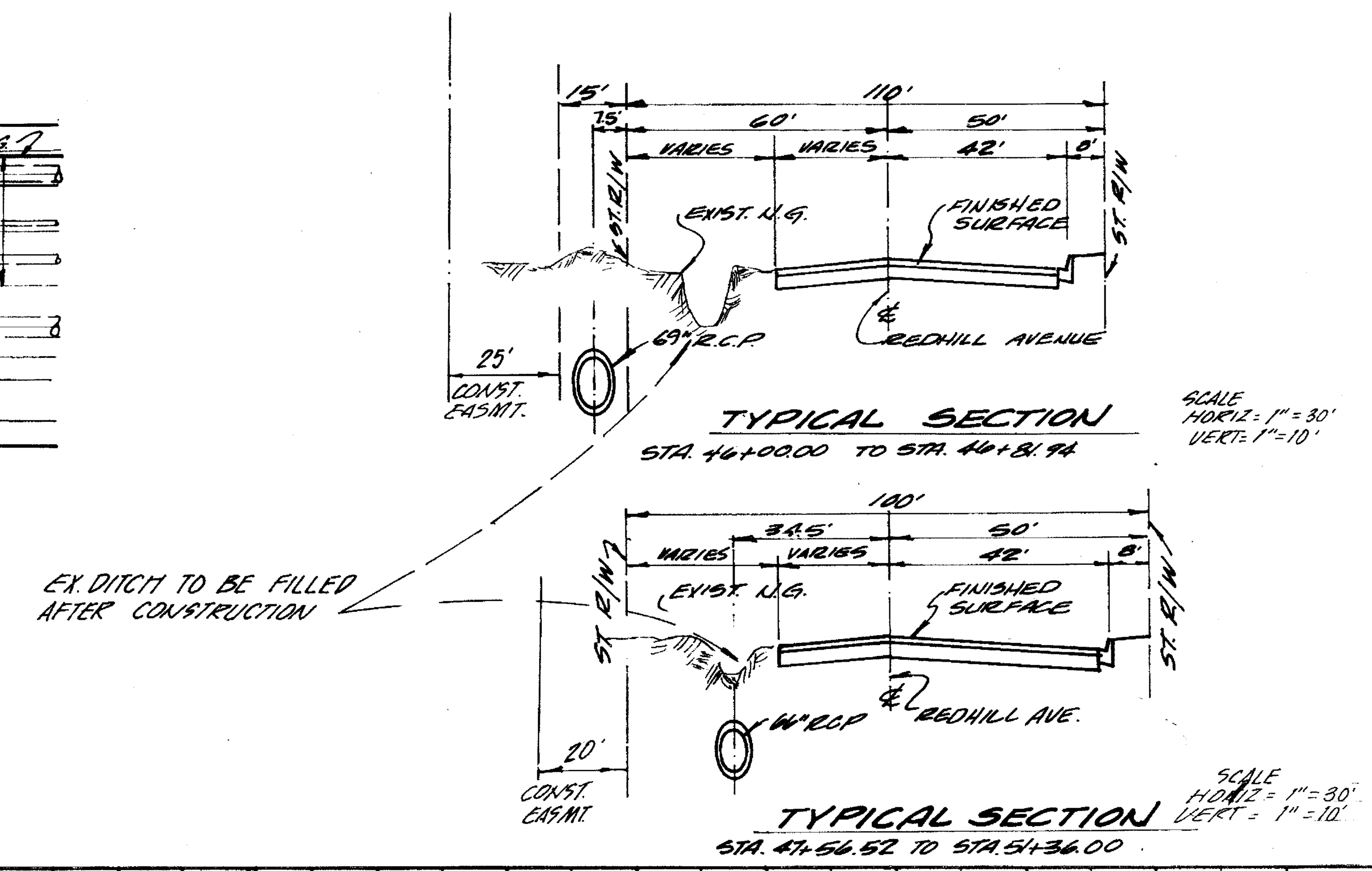
D244 001

D - 244A
SHEET 1 OF 2

CONSTRUCTION NOTES

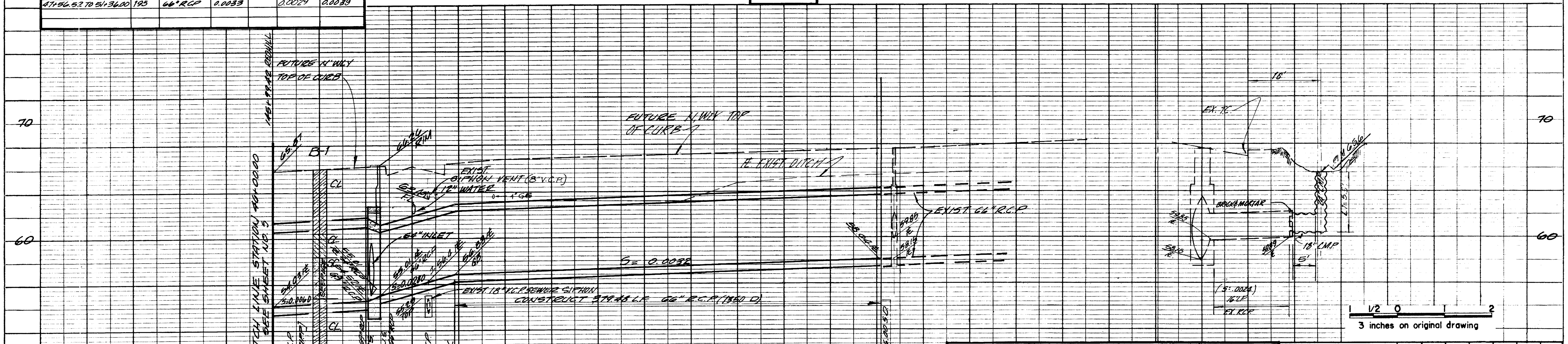
(11) CONST. 69" R.C.P. "D" LOAD AS SHOWN PER PLAN.
(12) CONST. 66" R.C.P. "D" LOAD AS SHOWN PER PLAN.
(51) CONST. TEMPORARY CSP DROP INLET PER O.C.F.C.D. STD.-D11-1
(A) EXISTING INLET EXTENDED PER PERMIT Nº 7700594FE





HYDRAULIC DATA BACKWATER PRESSURE FLOW

Station to Station	Q10	Size	So	Dc	n=0.012 Sf	n=0.014 Sf
46+00.00 TO 46+81.94	279	69" RCP	0.0060		0.0045	0.0063
47+56.52 TO 51+36.00	195	66" RCP	0.0033		0.0029	0.0039



BASIS OF BEARINGS

BEARINGS HEREON ARE BASED ON THE CENTERLINE OF RED HILL AVENUE BEING N 40° 37' 54" E PER TRACT NO. 5771, M.M. 210/39.41, RECORDS OF ORANGE COUNTY, CALIFORNIA

BENCH MARK: 3A-77-69 ELEV: 61.616'
DATUM: OCFCD=OCS=PLAN ELEV: -0.10
ALUMINUM CAP IN THE NORTHWEST PART OF THE INTERSECTION OF RED HILL AVE. AND WARNER AVE. 139 FEET NORTHWEST OF THE CENTERLINE OF RED HILL AVE., 38 FEET NORTHEAST OF THE CENTER OF THE TRAFFIC MEDIAN OF WARNER AVE., SET IN THE TOP OF THE SOUTHEAST CORNER OF A 3 x 7 FOOT CONCRETE BASE OF AMWD METERING STATION ABOUT LEVEL WITH THE CENTER OF WARNER AVE.

PRELIMINARY REVISION CODE
Disregard Prints Bearing Earlier Codes

REVISIONS

MARK	DATE	DESCRIPTION
(A)	10-78	PER. #7700594FE

DESIGNED FJK
DRAWN WC CHECKED MAC
SUBMITTED JRC DESIGN ENGINEER

ORANGE COUNTY FLOOD CONTROL DISTRICT

BARRANCA STORM DRAIN
PLAN AND PROFILE
STA. 46+00.00 TO STA. 51+36.00

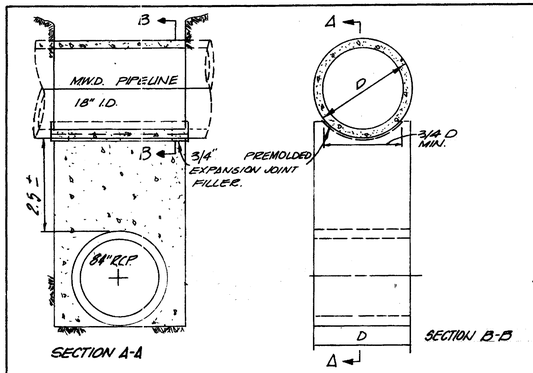
RECOMMENDED J. W. Williams DESIGN DIVISION ENGINEER

SCALE AS SHOWN | DATE OCT 74 | DWG. NO. F09P15-713-1 A

EDA PROJECT NO. 07-01-01391

SHEET 6 OF 14

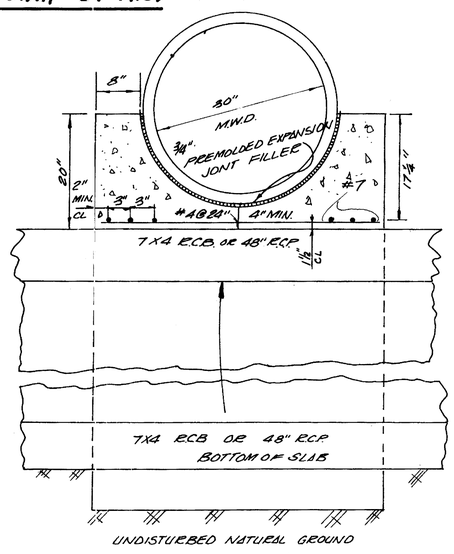
D-231-F
SHEET 6 OF 14
D231 006
DRAWING NUMBER

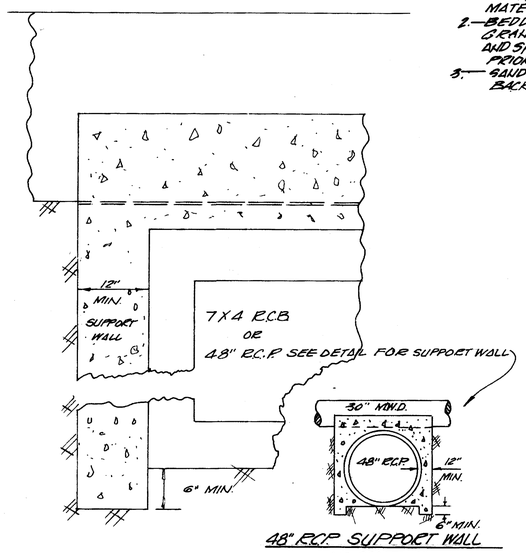


PERMANENT 18" M.W.D. SUPPORT DETAIL "N"

NO SCALE

@ STA. (± 34+11.5)





48" R.C.P. SUPPORT WALL

NO SCALE

PERMANENT 30" M.W.D. SUPPORT DETAIL "M"

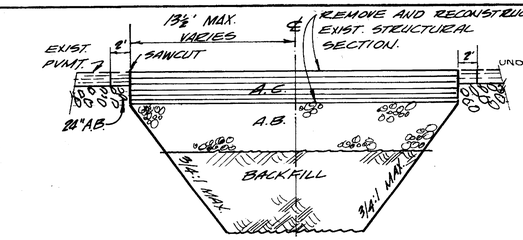
@ STA. (±34+79.5)

SCALE 1" = 1'

NOTIFY MR. THOMAS LOVIL OF THE METROPOLITAN WATER DISTRIBUTION BRANCH 48 HRS. PRIOR TO ANY WORK IN THE VICINITY OF METROPOLITAN'S FACILITIES.

213-626-4282

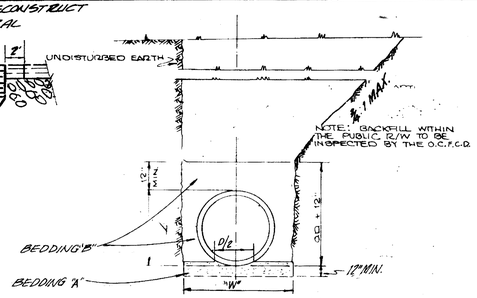
NOTE: THE SUPPORT BEAM SHALL BE CONSTRUCTED WITH THE GENERAL STRUCTURAL NOTES APPLYING TO BOX STRUCTURES.



DETAIL "G" PAVEMENT REMOVAL AND RECONSTRUCTION

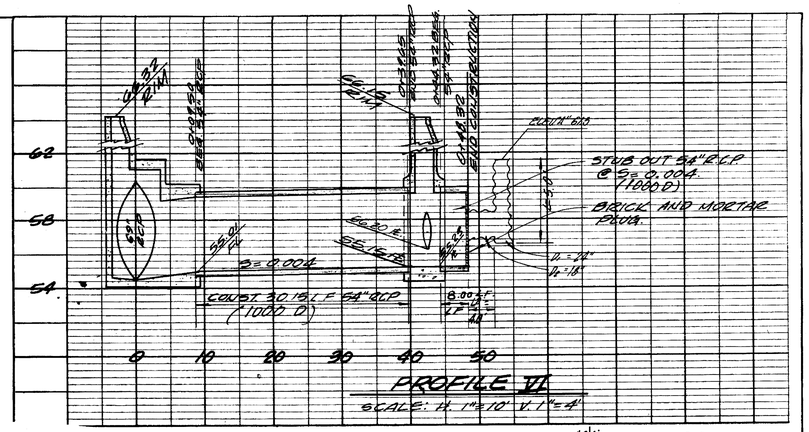
STRUCTUAL SECTION

CARNEGIE, WARNER, BELL, | 11' AC / N.S. WITH SEAL COAT



"W" SHALL BE O.D. + 12" MIN. FOR PIPES 60" OR SMALLER & O.D. + 20" MIN FOR LARGER PIPES.

R.C.P. BEDDING DETAIL



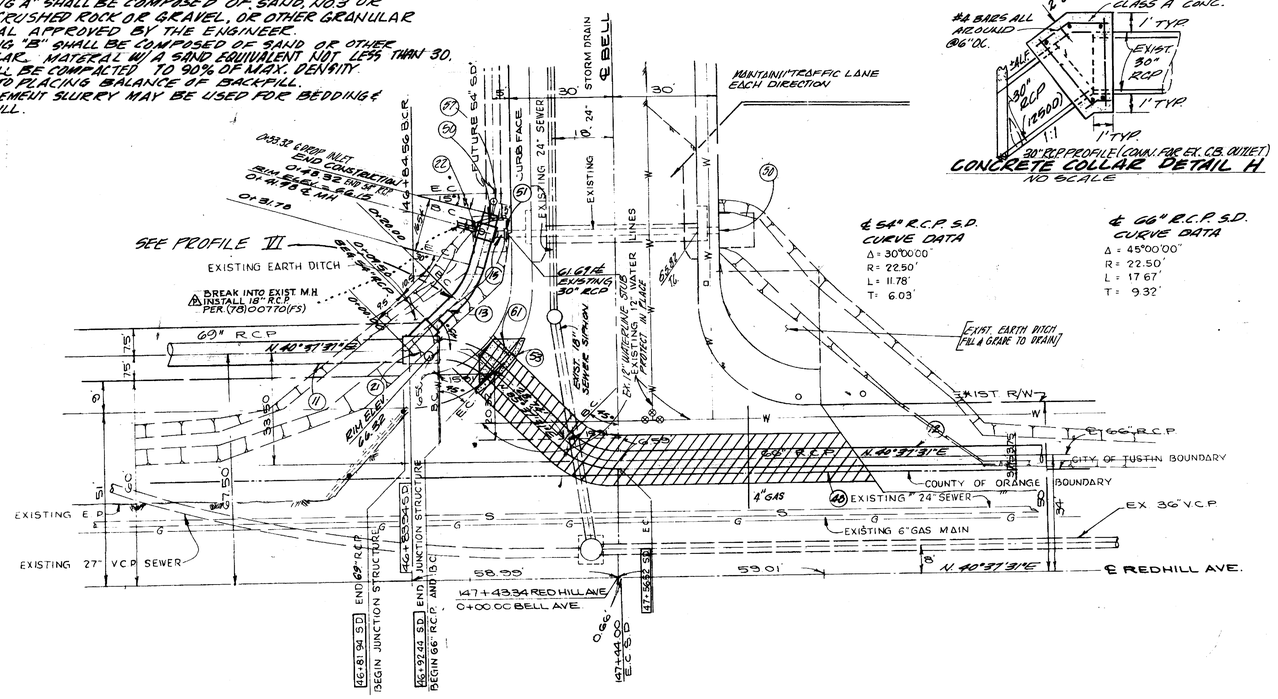
PROFILE VI

SCALE: H. 1"=10' V. 1"=4'

1. BEDDING "A" SHALL BE COMPOSED OF SAND, NO. 3 OR NO. 4, CRUSHED ROCK OR GRAVEL, OR OTHER GRANULAR MATERIAL APPROVED BY THE ENGINEER.
2. BEDDING "B" SHALL BE COMPOSED OF SAND OR OTHER GRANULAR MATERIAL W/ A SAND EQUIVALENT NOT LESS THAN 30, AND SHALL BE COMPACTED TO 90% OF MAX. DENSITY PRIOR TO PLACING BALANCE OF BACKFILL.
3. SAND-CEMENT SLURRY MAY BE USED FOR BEDDING & BACKFILL.

CONCRETE COLLAR DETAIL H

NO SCALE



℄ 54" R.C.P. S.D. CURVE DATA
Δ = 30°00'00"
R = 22.50'
L = 11.78'
T = 6.03'

℄ 66" R.C.P. S.D. CURVE DATA
Δ = 45°00'00"
R = 22.50'
L = 17.67'
T = 9.32'

INT. REDHILL AVE. & BELL AVE. DETAIL

SCALE: 1"=20'

CONSTRUCTION NOTES

(11) CONST. 60" R.C.P. (D LOAD AS SHOWN PER PLAN.)
(12) CONST. 66" R.C.P. (D LOAD AS SHOWN PER PLAN.)
(13) CONST. 54" R.C.P. (D LOAD AS SHOWN PER PLAN.)
(15) CONST. 30" R.C.P. (D LOAD AS SHOWN PER PLAN.) SEE DETAIL "H" HEREON.
(21) CONST. MANHOLE #4 (JUNCTION STRUCTURE) PER O.C.F.C.D. STD. DRWG. NO. "STD-MH4-1"
(22) CONST. MANHOLE #2 PER O.C.F.C.D. STD. DRAWING NO. "STD-MH2-1"
(48) SAWCUT, REMOVE AND RECONSTRUCT A.C. PAVEMENT PER DETAIL "G" HEREON.
(61) CONST. CONCRETE COLLAR PER DETAIL "H" HEREON
(62) REMOVE & RECONSTRUCT CURB & GUTTER.
(50) PLUG W/ ONE LAYER BRICK & MORTAR.
(57) CONST. DROP INLET PER O.C.R.D. STD. DRAWING NO. "STD-D11-1".
(41) CONST WHEEL CHAIR RAMP PER O.C.R.D. STD. PLAN 105A.

1 1/2 0 1 2

3 inches on original drawing

PRELIMINARY REVISION CODE Disregard Prints Bearing Earlier Codes			ORANGE COUNTY FLOOD CONTROL DISTRICT
REVISIONS			BARRANCA STORM DRAIN
MARK	DATE	DESCRIPTION	REDHILL & BELL PAVMT. & BEDDING DETAILS
1	11-79	PER (78)00770(FS)	
DESIGNED E.J.K.			RECOMMENDED
DRAWN W.C.	CHECKED M.A.C.		DESIGN DIVISION ENGINEER
SUBMITTED J.R.C. DESIGN ENGINEER			SCALE AS SHOWN / DATE OCT 74 / DWG. NO. FDA PIB-178-7 A

EDA PROJECT NO. 07-01-01391

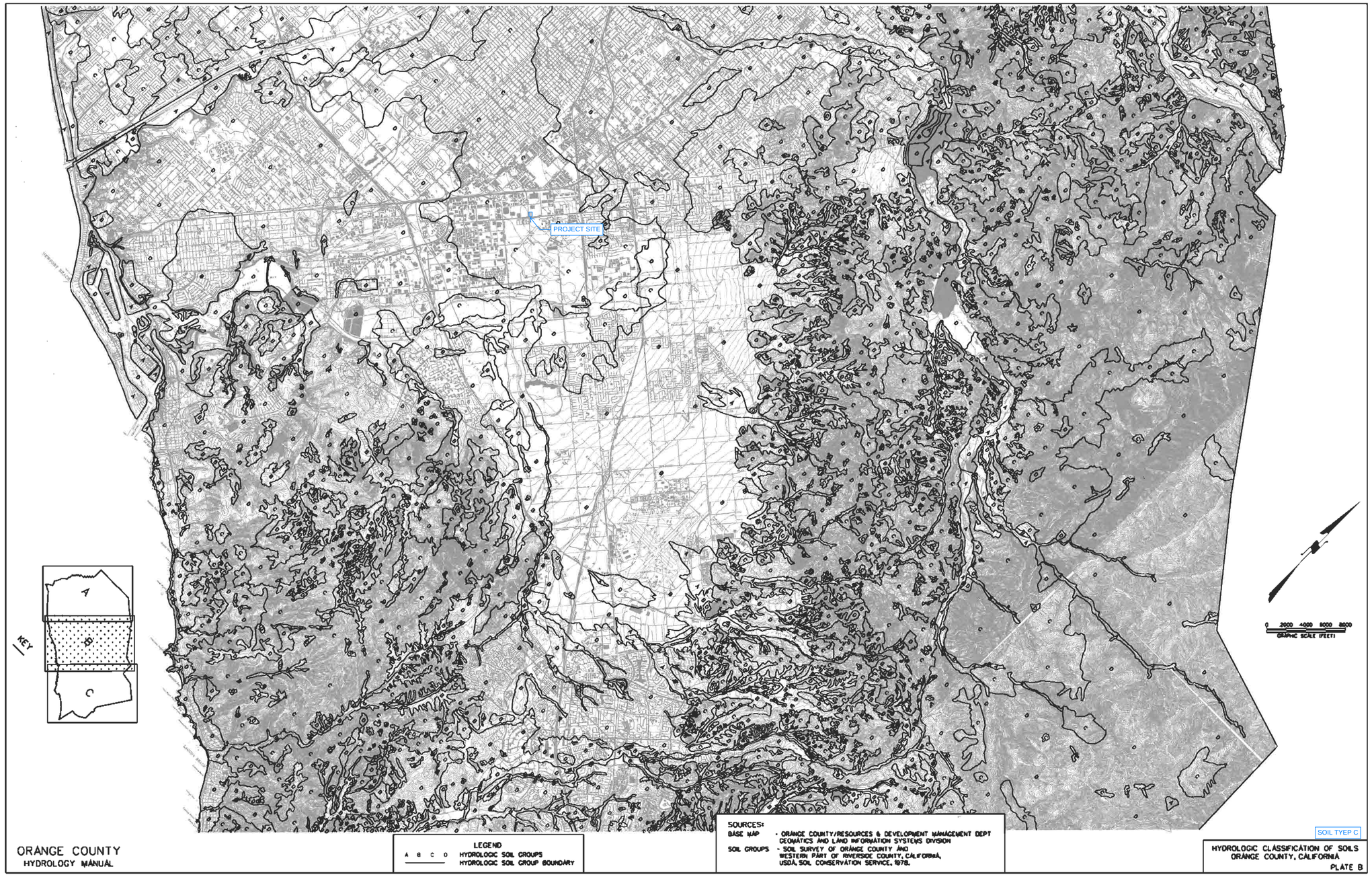
SHEET 9 OF 14

DRAWING NUMBER

D231 009

D - 231-1

SHEET 9 OF 14



ORANGE COUNTY
HYDROLOGY MANUAL

LEGEND
A B C D HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY

SOURCES:
BASE MAP - ORANGE COUNTY/RESOURCES & DEVELOPMENT MANAGEMENT DEPT GEOMATICS AND LAND INFORMATION SYSTEMS DIVISION
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA, USDA, SOIL CONSERVATION SERVICE, 1978.

HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
PLATE B

APPENDIX B

HYDROLOGY CALCULATIONS

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                            Analysis prepared by:

                          THIENES ENGINEERING, INC.
                             14349 FIRESTONE BLVD
                             LA MIRADA, CA 90638
                                 714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                      *
* EXISTING CONDITION                                                   *
* 25 YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: W:\4136\X100-25.DAT
  TIME/DATE OF STUDY: 11:03 02/06/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     70.53  DOWNSTREAM(FEET) =     69.55

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.352
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.384
  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                 C        0.62      0.25     0.100    69    9.35
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.87
  TOTAL AREA(ACRES) =      0.62   PEAK FLOW RATE(CFS) =      1.87
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      9.35
  EFFECTIVE AREA(ACRES) =      0.62  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.87
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                           Analysis prepared by:

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                      *
* EXISTING CONDITION                                                   *
* 25 YEAR STORM EVENT                                                  *
 **************************************************************************

  FILE NAME: W:\4136\X110-25.DAT
  TIME/DATE OF STUDY: 08:36 02/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   316.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.47  DOWNSTREAM(FEET) =     69.75

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.621
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.544
  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                 C        0.71      0.25     0.100    69    8.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.25
  TOTAL AREA(ACRES) =      0.71   PEAK FLOW RATE(CFS) =      2.25

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  91
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =     69.75
  DOWNSTREAM NODE ELEVATION(FEET) =     69.12
  CHANNEL LENGTH THRU SUBAREA(FEET) =   255.00
  "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
```

```
  PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.988
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        1.57      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.40
  AVERAGE FLOW DEPTH(FEET) =   0.40   FLOOD WIDTH(FEET) =   23.98
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.04   Tc(MIN.) =   11.66
  SUBAREA AREA(ACRES) =    1.57       SUBAREA RUNOFF(CFS) =    4.19
  EFFECTIVE AREA(ACRES) =    2.28     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       6.08

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.44   FLOOD WIDTH(FEET) =   27.82
  FLOW VELOCITY(FEET/SEC.) =   1.49   DEPTH*VELOCITY(FT*FT/SEC) =   0.65
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     571.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     69.12
  DOWNSTREAM NODE ELEVATION(FEET) =     67.66
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
  PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.738
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.46      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.15
  AVERAGE FLOW DEPTH(FEET) =   0.40   FLOOD WIDTH(FEET) =   23.98
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.94   Tc(MIN.) =   13.59
  SUBAREA AREA(ACRES) =    0.46       SUBAREA RUNOFF(CFS) =    1.12
  EFFECTIVE AREA(ACRES) =    2.74     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =       6.69

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOOD WIDTH(FEET) =   24.11
  FLOW VELOCITY(FEET/SEC.) =   2.14   DEPTH*VELOCITY(FT*FT/SEC) =   0.86
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     821.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.10  DOWNSTREAM(FEET) =    65.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.69
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   13.66
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =     841.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
```

```
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.66
 RAINFALL INTENSITY(INCH/HR) =   2.73
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.74
 TOTAL STREAM AREA(ACRES) =       2.74
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.69

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
 ELEVATION DATA: UPSTREAM(FEET) =     71.06  DOWNSTREAM(FEET) =     69.29

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.713
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.523
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 C        1.16      0.25     0.200    69    8.71
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      3.63
 TOTAL AREA(ACRES) =      1.16   PEAK FLOW RATE(CFS) =      3.63

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     69.29
 DOWNSTREAM NODE ELEVATION(FEET) =     67.58
 CHANNEL LENGTH THRU SUBAREA(FEET) =   248.00
 "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.50
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.148
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.71      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.63
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.16
 AVERAGE FLOW DEPTH(FEET) =   0.35   FLOOD WIDTH(FEET) =   19.65
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.92   Tc(MIN.) =   10.63
 SUBAREA AREA(ACRES) =    0.71       SUBAREA RUNOFF(CFS) =    2.00
 EFFECTIVE AREA(ACRES) =    1.87     AREA-AVERAGED Fm(INCH/HR) =   0.04
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.16
 TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       5.23

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.37   FLOOD WIDTH(FEET) =   20.76
 FLOW VELOCITY(FEET/SEC.) =   2.21   DEPTH*VELOCITY(FT*FT/SEC) =   0.81
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     540.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    65.20  DOWNSTREAM(FEET) =    65.00
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.13
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.23
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   10.68
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =     560.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.68
  RAINFALL INTENSITY(INCH/HR) =   3.14
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.87
  TOTAL STREAM AREA(ACRES) =       1.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.23

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.69   13.66    2.731  0.25( 0.03) 0.10       2.7     110.00
      2        5.23   10.68    3.139  0.25( 0.04) 0.16       1.9     120.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       11.25   10.68    3.139  0.25( 0.03) 0.13       4.0     120.00
      2       11.23   13.66    2.731  0.25( 0.03) 0.13       4.6     110.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.25    Tc(MIN.) =    10.68
  EFFECTIVE AREA(ACRES) =       4.01   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.13
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =     841.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.68
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.139
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        0.33      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.33      SUBAREA RUNOFF(CFS) =    0.86
  EFFECTIVE AREA(ACRES) =      4.34   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.9       PEAK FLOW RATE(CFS) =      12.08
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     10.68
  EFFECTIVE AREA(ACRES) =      4.34  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.195
  PEAK FLOW RATE(CFS)   =      12.08

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.08   10.68    3.139  0.25( 0.05) 0.20       4.3     120.00
      2       11.94   13.66    2.731  0.25( 0.05) 0.18       4.9     110.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                            Analysis prepared by:

                          THIENES ENGINEERING, INC.
                             14349 FIRESTONE BLVD
                             LA MIRADA, CA 90638
                                 714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB 4136                                                           *
* EXISTING CONDITION                                                     *
* 25 YEAR CONDITION                                                      *
 **************************************************************************

  FILE NAME: W:\4136\X130-25.DAT
  TIME/DATE OF STUDY: 08:34 02/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   236.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.25  DOWNSTREAM(FEET) =     69.39

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.124
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.948
  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                 C        0.57      0.25     0.100    69    7.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.01
  TOTAL AREA(ACRES) =      0.57   PEAK FLOW RATE(CFS) =      2.01
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      7.12
  EFFECTIVE AREA(ACRES) =      0.57  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.01
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NUMBER 4136                                                   *
* EXISTING CONDITIONS                                                   *
* 100-YEAR STORM EVENT                                                  *
 *************************************************************************

  FILE NAME: W:\4136\X100.DAT
  TIME/DATE OF STUDY: 11:00 02/06/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     70.53  DOWNSTREAM(FEET) =     69.55

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.352
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.322
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.62      0.25     0.100    86    9.35
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.40
  TOTAL AREA(ACRES) =      0.62   PEAK FLOW RATE(CFS) =      2.40
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      9.35
  EFFECTIVE AREA(ACRES) =      0.62  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.40
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NUMBER 4136                                                    *
* EXISTING CONDITIONS                                                    *
* 100-YEAR STORM EVENT                                                   *
 **************************************************************************

  FILE NAME: W:\4136\X110.DAT
  TIME/DATE OF STUDY: 08:36 02/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   316.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.47  DOWNSTREAM(FEET) =     69.75

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.621
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.528
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.71      0.25     0.100    86    8.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.88
  TOTAL AREA(ACRES) =      0.71   PEAK FLOW RATE(CFS) =      2.88

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  91
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =     69.75
  DOWNSTREAM NODE ELEVATION(FEET) =     69.12
  CHANNEL LENGTH THRU SUBAREA(FEET) =   255.00
  "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
```

```
  PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.836
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.57      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.47
  AVERAGE FLOW DEPTH(FEET) =   0.43   FLOOD WIDTH(FEET) =   26.71
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.89   Tc(MIN.) =   11.52
  SUBAREA AREA(ACRES) =    1.57       SUBAREA RUNOFF(CFS) =    5.38
  EFFECTIVE AREA(ACRES) =    2.28     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       7.82

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.47   FLOOD WIDTH(FEET) =   30.79
  FLOW VELOCITY(FEET/SEC.) =   1.58   DEPTH*VELOCITY(FT*FT/SEC) =   0.74
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     571.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     69.12
  DOWNSTREAM NODE ELEVATION(FEET) =     67.66
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
  PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.523
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.46      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      8.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.26
  AVERAGE FLOW DEPTH(FEET) =   0.43   FLOOD WIDTH(FEET) =   26.71
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.84   Tc(MIN.) =   13.36
  SUBAREA AREA(ACRES) =    0.46       SUBAREA RUNOFF(CFS) =    1.45
  EFFECTIVE AREA(ACRES) =    2.74     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =       8.63

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.43   FLOOD WIDTH(FEET) =   26.83
  FLOW VELOCITY(FEET/SEC.) =   2.26   DEPTH*VELOCITY(FT*FT/SEC) =   0.96
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     821.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.10  DOWNSTREAM(FEET) =    65.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.37
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.63
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   13.42
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =     841.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
```

```
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.42
 RAINFALL INTENSITY(INCH/HR) =   3.51
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.74
 TOTAL STREAM AREA(ACRES) =       2.74
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.63

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
 ELEVATION DATA: UPSTREAM(FEET) =     71.06  DOWNSTREAM(FEET) =     69.29

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.713
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.501
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                  C        1.16      0.25     0.200    86    8.71
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      4.65
 TOTAL AREA(ACRES) =      1.16   PEAK FLOW RATE(CFS) =      4.65

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     69.29
 DOWNSTREAM NODE ELEVATION(FEET) =     67.58
 CHANNEL LENGTH THRU SUBAREA(FEET) =   248.00
 "V" GUTTER WIDTH(FEET) =   2.50   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.034
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  C        0.71      0.25     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.93
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.25
 AVERAGE FLOW DEPTH(FEET) =   0.38   FLOOD WIDTH(FEET) =   22.00
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.84   Tc(MIN.) =   10.55
 SUBAREA AREA(ACRES) =    0.71       SUBAREA RUNOFF(CFS) =    2.56
 EFFECTIVE AREA(ACRES) =    1.87     AREA-AVERAGED Fm(INCH/HR) =   0.04
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.16
 TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       6.72

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.39   FLOOD WIDTH(FEET) =   23.24
 FLOW VELOCITY(FEET/SEC.) =   2.31   DEPTH*VELOCITY(FT*FT/SEC) =   0.90
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     540.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    65.20  DOWNSTREAM(FEET) =    65.00
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.72
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   10.60
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =     560.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.60
  RAINFALL INTENSITY(INCH/HR) =   4.02
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.87
  TOTAL STREAM AREA(ACRES) =       1.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.72

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        8.63   13.42    3.514  0.25( 0.03) 0.10       2.7     110.00
      2        6.72   10.60    4.022  0.25( 0.04) 0.16       1.9     120.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       14.53   10.60    4.022  0.25( 0.03) 0.13       4.0     120.00
      2       14.49   13.42    3.514  0.25( 0.03) 0.13       4.6     110.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.53    Tc(MIN.) =    10.60
  EFFECTIVE AREA(ACRES) =       4.03   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.13
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    122.00 =     841.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.60
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.022
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        0.33      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.33      SUBAREA RUNOFF(CFS) =    1.12
  EFFECTIVE AREA(ACRES) =      4.36   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =        4.9       PEAK FLOW RATE(CFS) =      15.61
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     10.60
  EFFECTIVE AREA(ACRES) =      4.36  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.195
  PEAK FLOW RATE(CFS)   =      15.61

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.61   10.60    4.022  0.25( 0.05) 0.19       4.4     120.00
      2       15.42   13.42    3.514  0.25( 0.05) 0.18       4.9     110.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NUMBER 4136                                                   *
* EXISTING CONDITIONS                                                   *
* 100-YEAR STORM EVENT                                                  *
 **************************************************************************

  FILE NAME: W:\4136\X130.DAT
  TIME/DATE OF STUDY: 08:34 02/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  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    130.00 TO NODE    131.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   236.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.25  DOWNSTREAM(FEET) =     69.39

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.124
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.051
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.57      0.25     0.100    86    7.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.58
  TOTAL AREA(ACRES) =      0.57   PEAK FLOW RATE(CFS) =      2.58
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      7.12
  EFFECTIVE AREA(ACRES) =      0.57  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.58
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                        *
* PROPOSED CONDITION                                                     *
* 25 YEAR STORM EVENT                                                    *
 **************************************************************************

  FILE NAME: W:\4136\P100-25.DAT
  TIME/DATE OF STUDY: 11:11 02/06/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  ELEVATION DATA: UPSTREAM(FEET) =     70.67  DOWNSTREAM(FEET) =     69.61

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.407
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.373
  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                 C        0.30      0.25     0.100    69    9.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.90
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.90

**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.38  DOWNSTREAM(FEET) =     69.16
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.282
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.239
  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                  C        1.37      0.25     0.100    69    6.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.20
  TOTAL AREA(ACRES) =      1.37   PEAK FLOW RATE(CFS) =      5.20

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   155.00
  ELEVATION DATA: UPSTREAM(FEET) =     70.89  DOWNSTREAM(FEET) =     69.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.616
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.517
  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                  C        1.53      0.25     0.100    69    5.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.18
  TOTAL AREA(ACRES) =      1.53   PEAK FLOW RATE(CFS) =      6.18

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   290.00
  ELEVATION DATA: UPSTREAM(FEET) =     72.53  DOWNSTREAM(FEET) =     68.28

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.833
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.042
  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                  C        0.47      0.25     0.100    69    6.83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.70
  TOTAL AREA(ACRES) =      0.47   PEAK FLOW RATE(CFS) =      1.70

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   145.00
  ELEVATION DATA: UPSTREAM(FEET) =     72.34  DOWNSTREAM(FEET) =     67.78

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
  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                  C        1.86      0.25     0.100    69    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.03
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      8.03
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.9  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      1.86  AREA-AVERAGED Fm(INCH/HR)=  0.03
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       8.03
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                        *
* PROPOSED CONDITION                                                     *
* 25 YEAR STORM EVENT                                                    *
 **************************************************************************

  FILE NAME: W:\4136\P110-25.DAT
  TIME/DATE OF STUDY: 12:10 02/22/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.38  DOWNSTREAM(FEET) =     69.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.226
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.261
  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                 C        1.37      0.25     0.100    69    6.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.22
  TOTAL AREA(ACRES) =      1.37   PEAK FLOW RATE(CFS) =      5.22

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    66.16  DOWNSTREAM(FEET) =    35.99
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.35
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.22
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.28
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.241
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        1.53      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.53      SUBAREA RUNOFF(CFS) =    5.81
  EFFECTIVE AREA(ACRES) =      2.90   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =      11.00

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.99  DOWNSTREAM(FEET) =    65.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.56
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.00
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    6.72
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.72
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.082
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        0.47      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.72
  EFFECTIVE AREA(ACRES) =      3.37   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =      12.30

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.65  DOWNSTREAM(FEET) =    65.04
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.47
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.30
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    7.65
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     645.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
  MAINLINE Tc(MIN.) =    7.65
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.792
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                     C        0.30      0.25     1.000    74
  NATURAL GOOD COVER
  "GRASS"                     C        0.33      0.25     1.000    74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    2.01
  EFFECTIVE AREA(ACRES) =      4.00   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        4.0       PEAK FLOW RATE(CFS) =      13.44
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.0  TC(MIN.) =      7.65
  EFFECTIVE AREA(ACRES) =      4.00  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.242
  PEAK FLOW RATE(CFS)   =      13.44
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638
                               714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                        *
* 25 YEAR STORM EVENT                                                    *
* PROPOSED CONDITION                                                     *
 **************************************************************************

  FILE NAME: W:\4136\P120-25.DAT
  TIME/DATE OF STUDY: 12:15 02/22/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   324.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.38  DOWNSTREAM(FEET) =     69.45

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.552
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.560
  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                 C        0.30      0.25     0.100    69    8.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.95
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.95
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      8.55
  EFFECTIVE AREA(ACRES) =      0.30  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       0.95
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638
                               714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NUMBER 4136                                                   *
* PROPOSED CONDITION                                                    *
* 100-YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: W:\4136\P100.DAT
  TIME/DATE OF STUDY: 12:46 02/06/2023
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  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) =   199.00
  ELEVATION DATA: UPSTREAM(FEET) =     70.06  DOWNSTREAM(FEET) =     67.91

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.247
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.446
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.86      0.25     0.100    86    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.07
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      9.07
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.9  TC(MIN.) =      6.25
  EFFECTIVE AREA(ACRES) =      1.86  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       9.07
========================================================================
========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                           Analysis prepared by:

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                        *
* PROPOSED CONDITION                                                     *
* 100 YEAR STORM EVENT                                                   *
 **************************************************************************

  FILE NAME: W:\4136\P110.DAT
  TIME/DATE OF STUDY: 10:54 02/22/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  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    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.38  DOWNSTREAM(FEET) =     69.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.226
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.457
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.37      0.25     0.100    86    6.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.70
  TOTAL AREA(ACRES) =      1.37   PEAK FLOW RATE(CFS) =      6.70

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    66.16  DOWNSTREAM(FEET) =    35.99
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  26.08
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.70
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.27
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.433
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        1.53      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.53      SUBAREA RUNOFF(CFS) =    7.45
  EFFECTIVE AREA(ACRES) =      2.90   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =      14.11

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.99  DOWNSTREAM(FEET) =    65.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.11
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    6.68
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.68
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.239
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        0.47      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    2.21
  EFFECTIVE AREA(ACRES) =      3.37   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =      15.81

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.65  DOWNSTREAM(FEET) =    65.04
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.63
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.81
  PIPE TRAVEL TIME(MIN.) =   0.90    Tc(MIN.) =    7.58
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     645.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
  MAINLINE Tc(MIN.) =    7.58
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.873
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                     C        0.30      0.25     1.000    90
  NATURAL GOOD COVER
  "GRASS"                     C        0.33      0.25     1.000    90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    2.62
  EFFECTIVE AREA(ACRES) =      4.00   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        4.0       PEAK FLOW RATE(CFS) =      17.33
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.0  TC(MIN.) =      7.58
  EFFECTIVE AREA(ACRES) =      4.00  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.242
  PEAK FLOW RATE(CFS)   =      17.33
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                           Analysis prepared by:

                         THIENES ENGINEERING, INC.
                            14349 FIRESTONE BLVD
                            LA MIRADA, CA 90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB NO 4136                                                       *
* PROPOSED CONDITION                                                    *
* 100 YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: W:\4136\P120.DAT
  TIME/DATE OF STUDY: 12:52 02/06/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   324.00
  ELEVATION DATA: UPSTREAM(FEET) =     71.38  DOWNSTREAM(FEET) =     69.45

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.552
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.549
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.30      0.25     0.100    86    8.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.22
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      1.22
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      8.55
  EFFECTIVE AREA(ACRES) =      0.30  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.22
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```
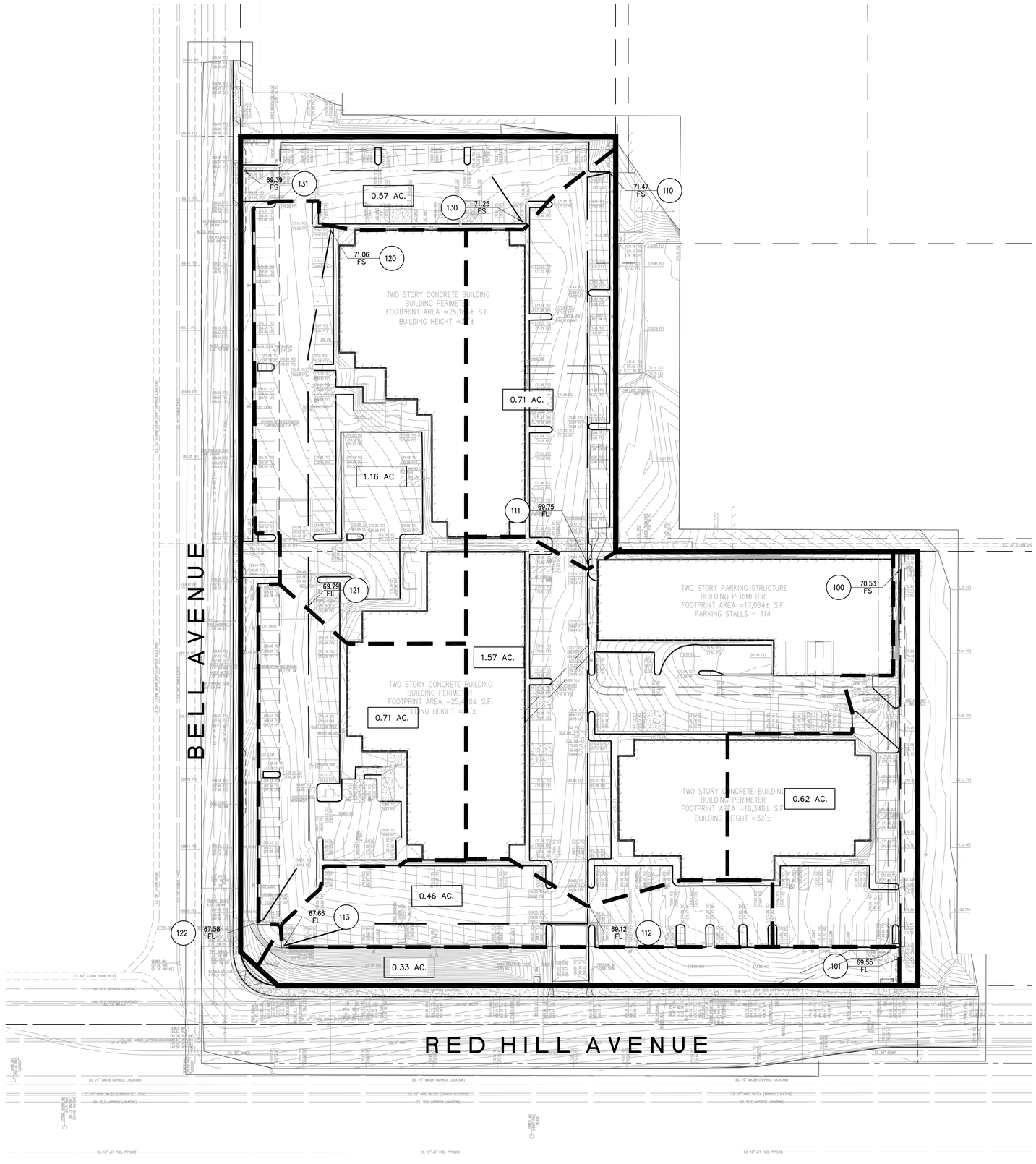
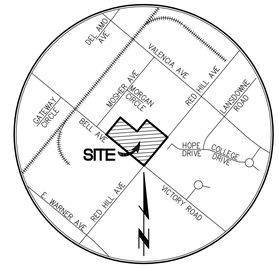

APPENDIX C

HYDROLOGY MAPS





VICINITY MAP

N.T.S.

LEGEND

———	PROJECT BOUNDARY
– – –	SUBAREA BOUNDARY
———	FLOW PATH
4.10 AC.	SUBAREA AREA
100	NODE NUMBER
———	FLOW DIRECTION

0 20 40 80 120

SCALE 1"=40'

PREPARED FOR:

Centurion Plaza LLC
36 Deep Sea
Newport Coast, CA 92657

CITY OF TUSTIN
PUBLIC WORKS DEPARTMENT

EXISTING HYDROLOGY MAP

CENTURION PLAZA
15661 RED HILL AVENUE, TUSTIN, CA

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 1 of 1 Sheets

JN: 4136

Last Update: 2/22/23
O:\4100-4199\4136\4136HYD-EX.dwg

Last Update:2/23/23
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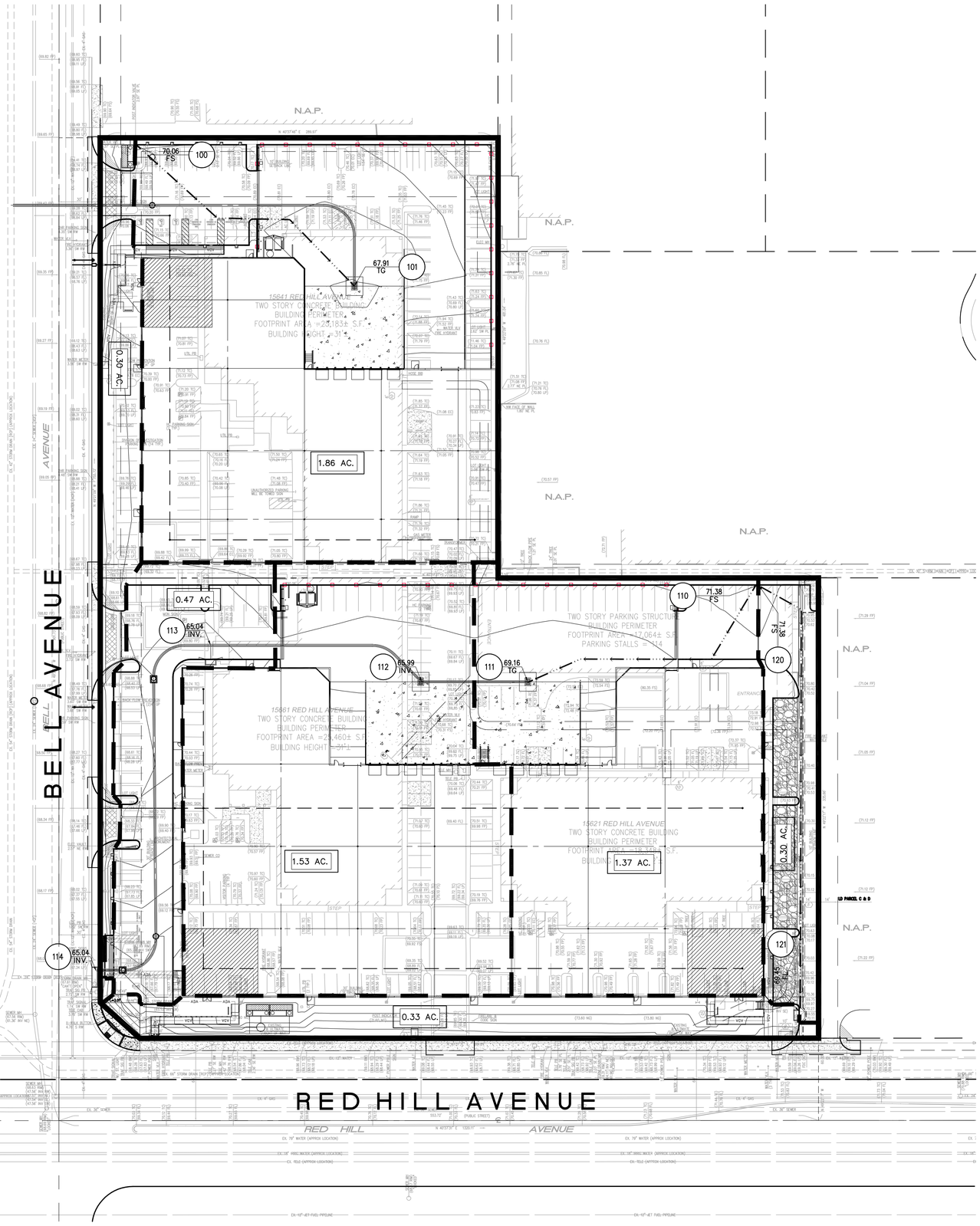

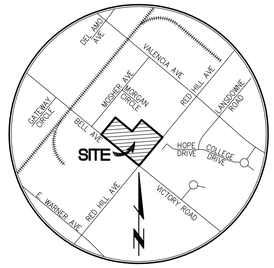

VICINITY MAP

N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 4.10 AC. — SUBAREA AREA
- 100 — NODE NUMBER
- FLOW DIRECTION

0 20 40 80 120

SCALE 1"=40'

PREPARED FOR:

Centurion Plaza LLC
36 Deep Sea
Newport Coast, CA 92657

CITY OF TUSTIN
PUBLIC WORKS DEPARTMENT

PRELIMINARY HYDROLOGY MAP
CONCEPTUAL STORM DRAIN

CENTURION PLAZA
15661 RED HILL AVENUE, TUSTIN, CA

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Last Update: 2/7/23
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Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 1 of 1 Sheets

JN: 4136