



Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

**PRELIMINARY HYDROLOGY
CALCULATIONS**

FOR

YORBA AVENUE INDUSTRIAL DEVELOPMENT

13610 YORBA AVENUE
CHINO, CA 91710

PREPARED FOR

LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

JULY 24, 2023
REVISED SEPTEMBER 8, 2023
REVISED APRIL 23, 2024

JOB NO. 4163

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
P. (714) 521-4811
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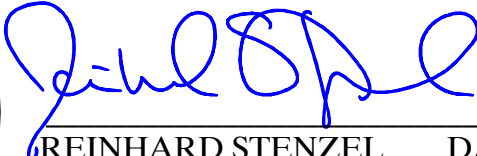
**PRELIMINARY HYDROLOGY
CALCULATIONS**

FOR

YORBA AVENUE INDUSTRIAL DEVELOPMENT

PREPARED UNDER THE
SUPERVISION OF



 4/18/24
REINHARD STENZEL DATE:
R.C.E. 56155
EXP. 12/31/24

INTRODUCTION

A: PROJECT LOCATION

The project site is located at the northwest corner of Yorba Avenue and Schaefer Avenue in the City of Chino, California. Please see following page for vicinity map.

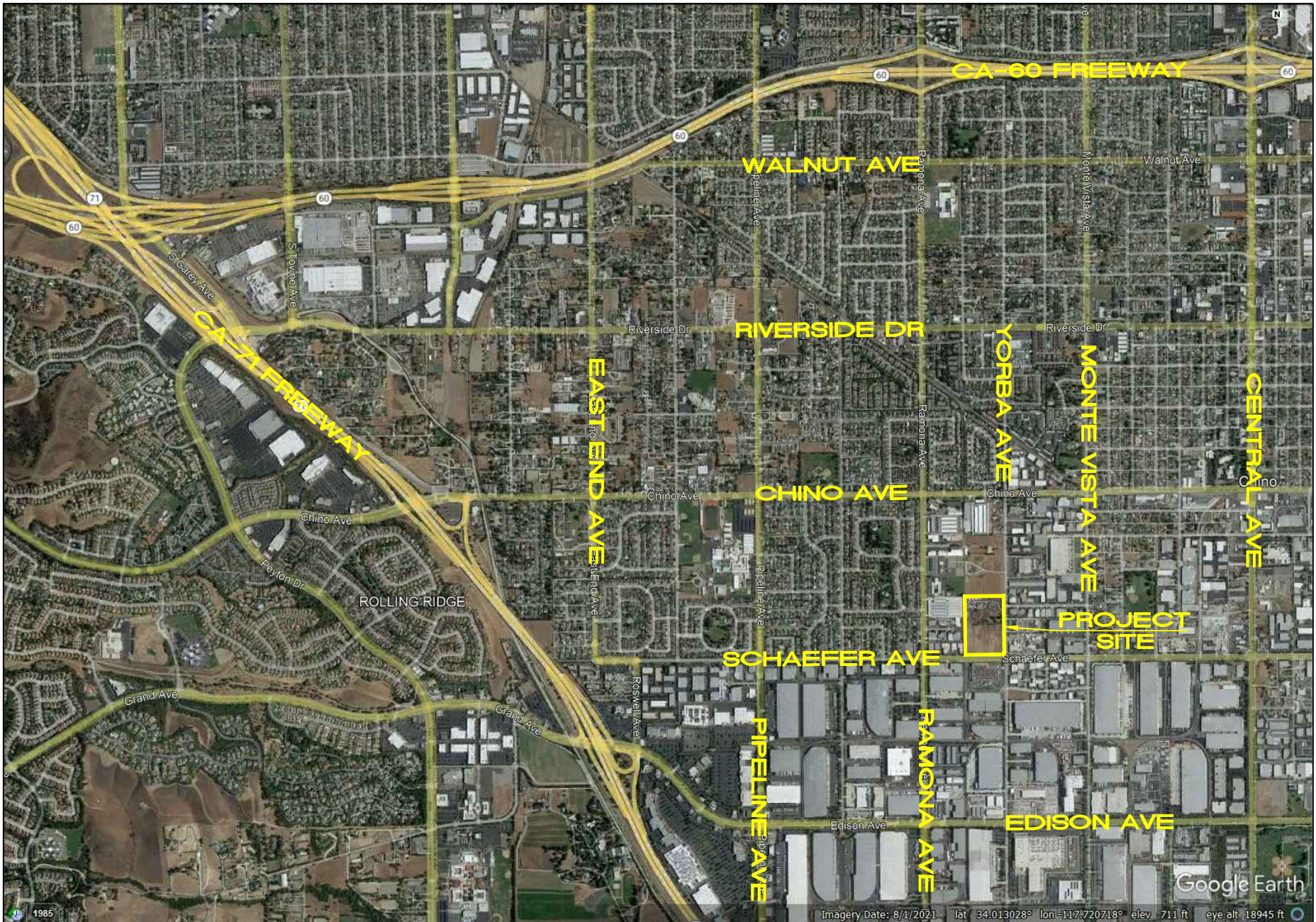
B: STUDY PURPOSE

The purpose of this study is to determine 100-year existing and proposed condition hydrology for the project site.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Kristie Ferronato



Last Update: 3/8/23
 O:\4100-4199\4163\4163VicMap.dwg

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VICINITY MAP
 FOR
YORBA AVENUE INDUSTRIAL DEVELOPMENT
CHINO, CALIFORNIA



DISCUSSION

Project Description

The project site encompasses approximately 13.51 acres. Proposed improvements to the site consist of the construction of one warehouse type building approximately 298,839 square feet. A truck yard will be located to the west of the building with vehicle parking lots located throughout the site. Landscaping will also be located throughout the site.

Existing Conditions

The northern portion of the site is used as a truck trailer storage yard. South of this trailer storage yard, a single-family home exists with some associated out buildings. The remaining portion of the site is vacant undeveloped land. Runoff from the site generally drains north to south towards Schaefer Avenue. The total 100-year peak flow rate from the project site is approximately 27.6 cfs. There is an existing AC ditch along the north side of Schaefer Avenue which conveys this run-off westerly towards the existing catch basin at the northeast corner of Schaefer Avenue and Yorba Avenue. This catch basin connects to the existing storm drain system in Yorba Avenue.

Please see Appendix “B” for the existing condition hydrology calculations and Appendix “F” for the existing condition hydrology map.

Public Storm Drain Improvements

The project site is part of the Master Plan of Drainage System 45. The Master Plan of Drainage shows a proposed 45” storm drain in Schaefer Avenue which would convey flow from the project site and other tributary areas. A 48” storm drain is proposed in Schaefer Avenue. This will convey the discharge from the project site along the area north of the project which discharges to the project site. A public catch basin will also be proposed east of the project driveway to collect street flow.

A public catch basin will also be proposed along Yorba Avenue north of Schaefer where there are records of an existing inlet, however our field survey did not locate this inlet. A proposed 24” lateral will connect to the existing storm drain in Yorba Avenue.

Please see Appendix “A” for references.

Off Site Run-On

The area north of the project site is currently under development. The Yorba Avenue Industrial Building Hydrology and Hydraulic Report prepared by CA Engineering date April 22, 2022 shows 100-year peak flow discharge of 38.7 cfs through a burb out catch basin and energy dissipating system which will then run-on to the project site in the

northwest corner (see Appendix A for the CA Engineering proposed Hydrology Map). A storm drain will be proposed in the west drive aisle of the proposed project and collect this runoff and ultimately conveying it southerly towards the proposed public storm drain in Schaefer Avenue.

Additional it appears that a small portion of the development located at 4575 Carter Court drains south easterly and runs onto the project site. This will be collected and conveyed in the proposed storm drain in the project's west drive aisle.

Please see Appendix "A" for references.

Proposed Conditions

The northern vehicle parking area (nodes 100-103) will drain to three catch basins located at low spots along the east side of the proposed building. The piping system then conveys to the north through 30" storm drain pipe which turns westerly along the north of the building where the runoff from two sections of drive aisle (nodes 104-105) adds to the pipe flow. The storm drains flow then turns south to collect runoff through truck yard (nodes 110-114) and continue towards a piping confluence with offsite run-on flows (node 121) where the flow totals 76.4 cfs undetained. The storm system then continues southerly to join the storm drain conveying flow from the southern drive aisle and driveway that is captured by a trench drain (node 133).

The pipe flow in the 42" storm drain then totals 81.4 cfs undetained as it passes into the public right-of-way and confluences with the proposed catch basin along Schaefer (node 210). The run-off from this portion of the street captured by the catch basin (nodes 200-201) under the 100-year condition is approximately 2.0 cfs. At this point where the sites flow confluences into the public system the total 100-year peak flow rate is 81.1 cfs (rational method calculations). The total 100-year peak flow discharge from the site only is approximately 43.8 cfs.

Please see Appendix "B" for proposed condition hydrology calculations and Appendix "F" for proposed condition hydrology map.

Detention

The majority of the site is undeveloped or barren, with a small portion developed as a single-family home. The flow from the project site will be limited to the existing 100-year peak flow discharge (27.6 cfs). This will be achieved by limiting the flow from the truck yard. The off-site run-on will continue to flow without any detention. The flow from the westerly drive aisle and the south drive aisle will also not be detained.

A small area hydrograph was used to determine the discharge from the truck yard given the developed rating curve. Discharge from the truck yard area is dependent upon capacity of the storm drain system which is based on pipe length, pipe size and other

hydraulic losses. The orifice equation was used to calculation the discharge from the downstream 15” pipe to limit the flow from the truckyard. The peak flow rates and corresponding water surface elevation were used to determine the outflow rates from the truck yard area used in the detention calculations. Incremental volumes in the truck yard were calculated simply by taking the average of cross-sectional areas and multiplying the depth interval (0.10’). These volumes were then summed up to achieve a total volume at each desired elevation.

From the flood routing, the storage volume in the truck yard (node 111-114) will be approximately 0.255 acre-ft with a depth of 0.46 ft., so the water surface elevation in the truck yard will be approximately 678.07. With detention, the discharge from the truck yard will be 16.2 cfs.

This will allow for a total 100-year peak flow site discharge of 19.2 cfs, this does not account for off-site run-on.

In all, the 100-year detained peak flow rate from the site via the proposed storm drain system will be 58.9 cfs, which is less than the master plan flow rate and below the existing condition peak flow rate of 69.3 cfs.

Please see Appendix “C” for detention calculations.

Summary

The city’s master plan proposed a 45” storm drain in Schaefer with 65.0 cfs from the tributary area. The site will detain to existing flow rates, while accepting the run-on from historic and proposed conditions and convey this along with a proposed discharge of 19.2 cfs. This will limit the peak flow from the site, including run-on, to 60.9 cfs which is comparable to the master plan flow rate.

	100-YR Q (CFS)	Tc Min	Area (AC)
Exist. Nodes 100-103	11.0	20.5	5.43
Exist. Nodes 110-111	8.6	19.6	4.07
Exist. Nodes 120-121	8.0	20.95	4.03
Pre-Development Total	27.6	-	13.53
Prop. Nodes 100-105	12.5	12.85	4.06
Prop. Nodes 110-115	28.3	7.38	8.15
Prop. Nodes 130-133	3.2	9.01	0.89
Post-Development	44.0	-	13.10
Post-Development w/ Detention	19.2	-	13.10
Offsite (north Adjacent site)	38.7	8.4	8.36
Offsite (parking lot/street)	3.0	-	0.96
Post-Development w/ Detention	60.9 cfs	-	22.42

Methodology

Rational method and flood routing hydrology was calculated using the Advanced Engineering Software Rational Method program. The site is composed of soil type “B” per the San Bernardino County Hydrology Manual.

Water Quality Management Plan (WQMP)

Roof and surface runoff will sheet flow into inlets where stormwater will be intercepted and diverted into the StormTech chambers for water quality treatment. The system utilizes infiltration as the primary form of treatment. The system stores stormwater runoff until it gradually exfiltrates into the underlying soil. Pollutant removal occurs through the infiltration of runoff and the adsorption of pollutants into the soil. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems.

Infiltration type BMPs were deemed feasible in the truck yard area where infiltration rates ranged between 5.7 to 6.8 inches per hour. Before runoff is discharged offsite, the Design Capture Volume (DCV) will be diverted to the proposed underground infiltration chambers. Once the DCV is met, “high flows” will continue to drain offsite as mentioned above. A hydrodynamic separator will be utilized for pretreatment.

See Appendix G of this report for calculations.

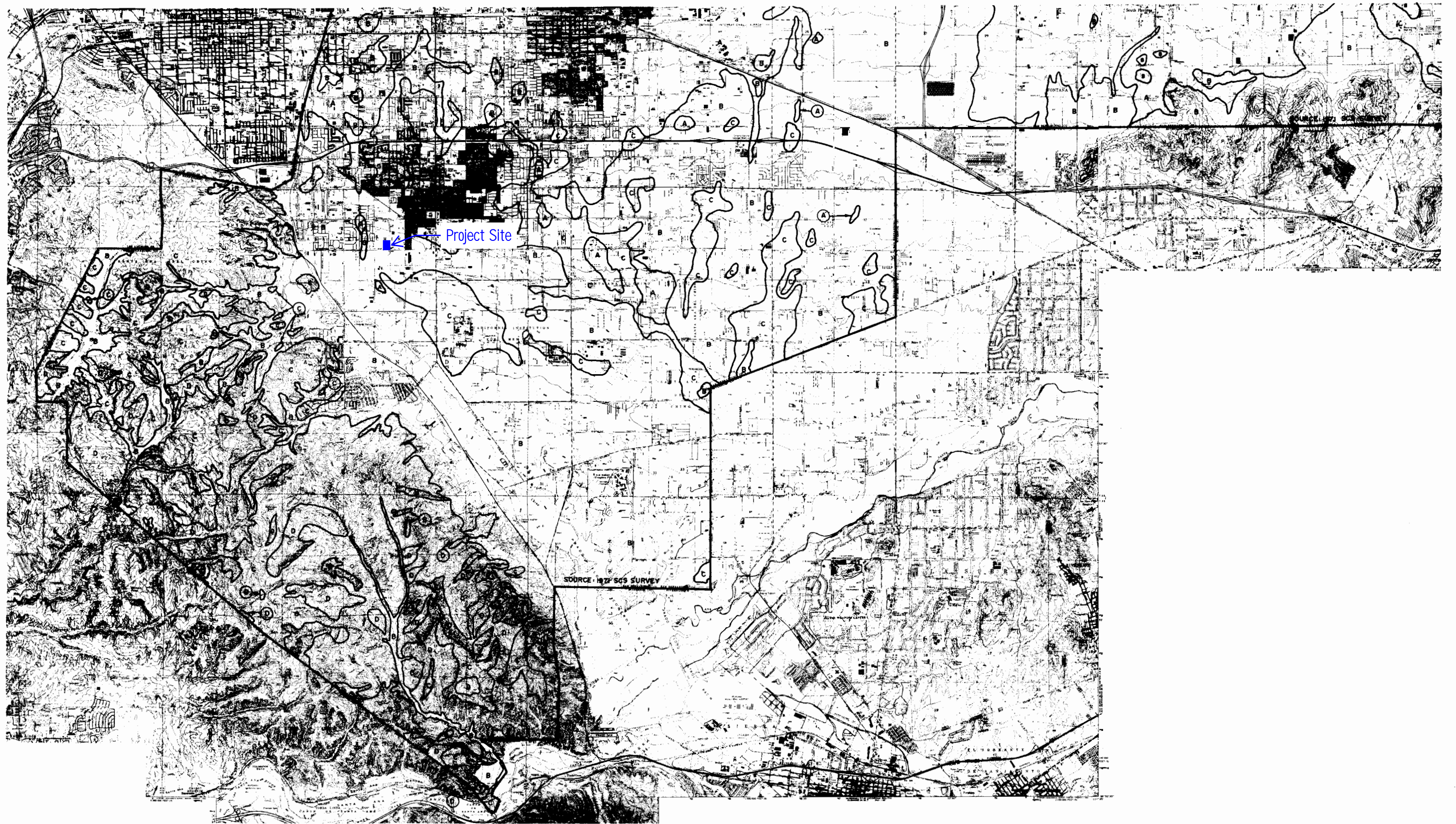
APPENDIX

DESCRIPTION

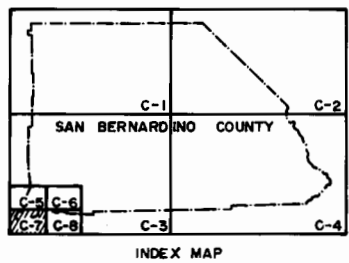
A	REFERENCE MATERIALS
B	HYDROLOGY CALCULATIONS
C	DETENTION CALCULATIONS
D	HYDRAULIC CALCULATIONS
E	CATCH BASIN CALCULATIONS
F	HYDROLOGY MAP
G	WQMP CALCULATIONS

APPENDIX A

REFERENCE MATERIALS



SOURCE: 1927 SCS SURVEY

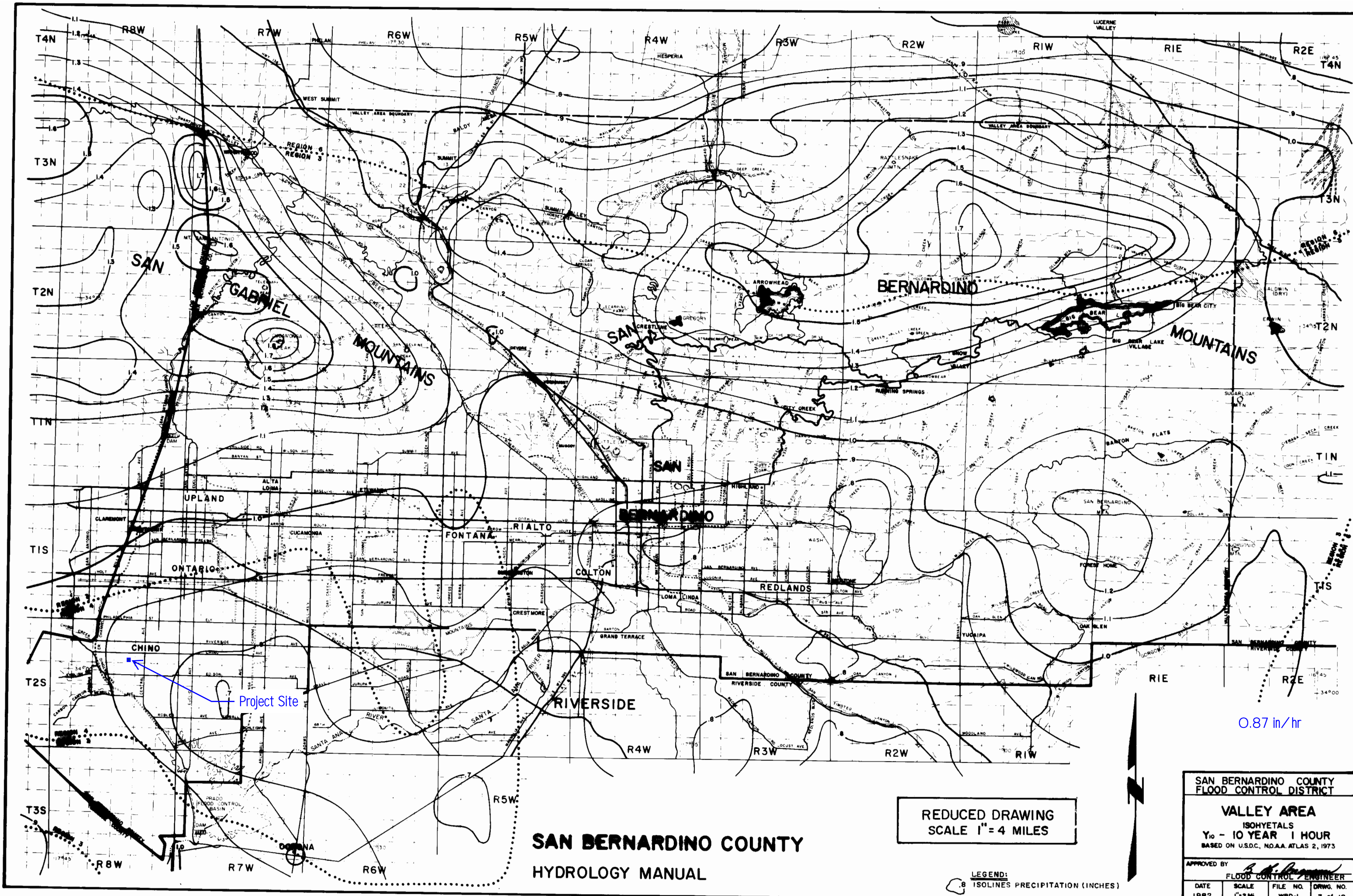


- LEGEND
- SOIL GROUP BOUNDARY
 - A SOIL GROUP DESIGNATION
 - - - BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000
SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-C AREA

SOIL TYPE B

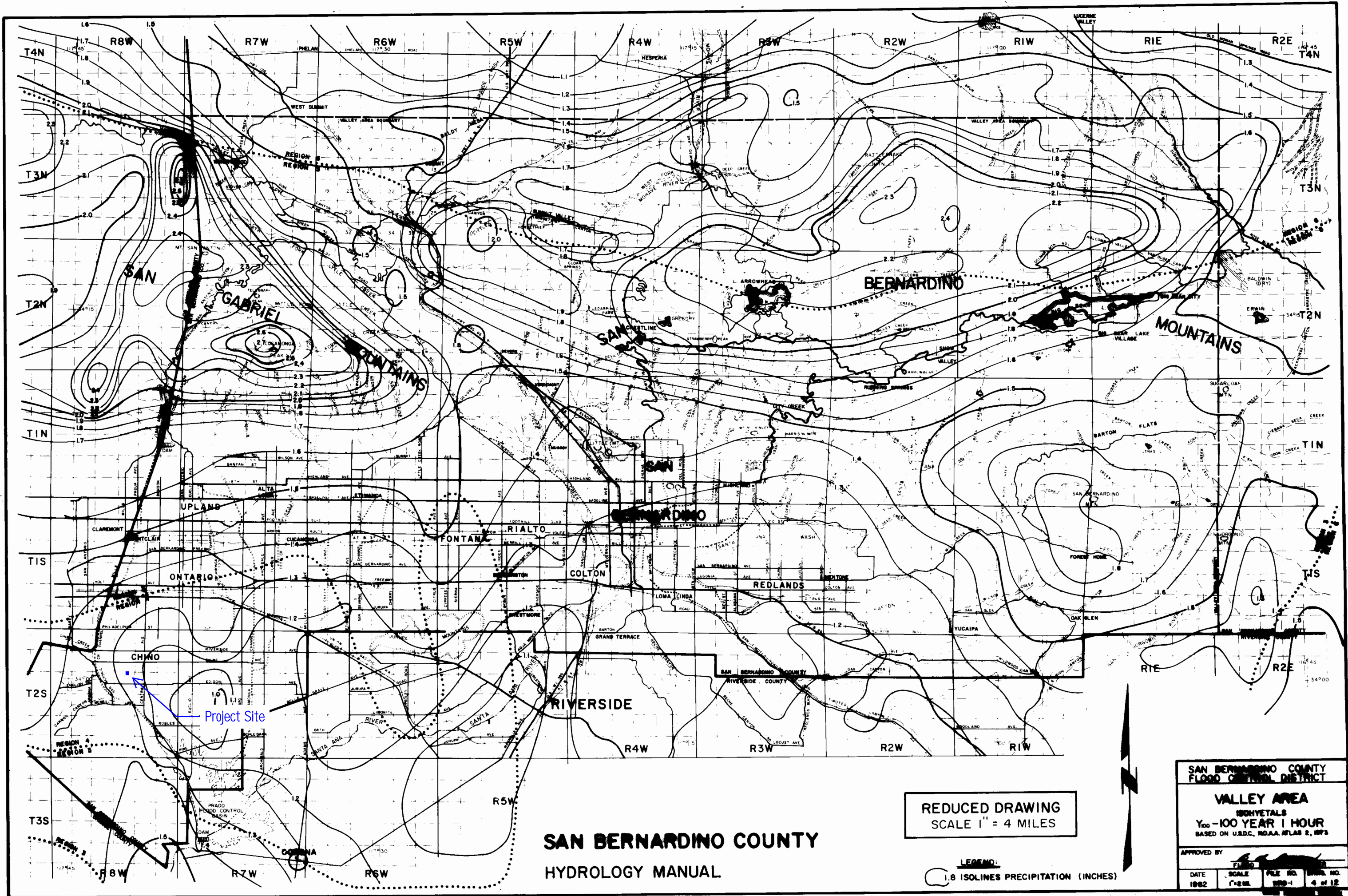


**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

LEGEND:
0.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT			
VALLEY AREA			
ISOHYETALS			
Y ₁₀ - 10 YEAR 1 HOUR			
BASED ON U.S.D.C. NO.AA. ATLAS 2, 1973			
APPROVED BY <i>[Signature]</i>			
FLOOD CONTROL ENGINEER			
DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2MI.	WRD-1	3 of 12

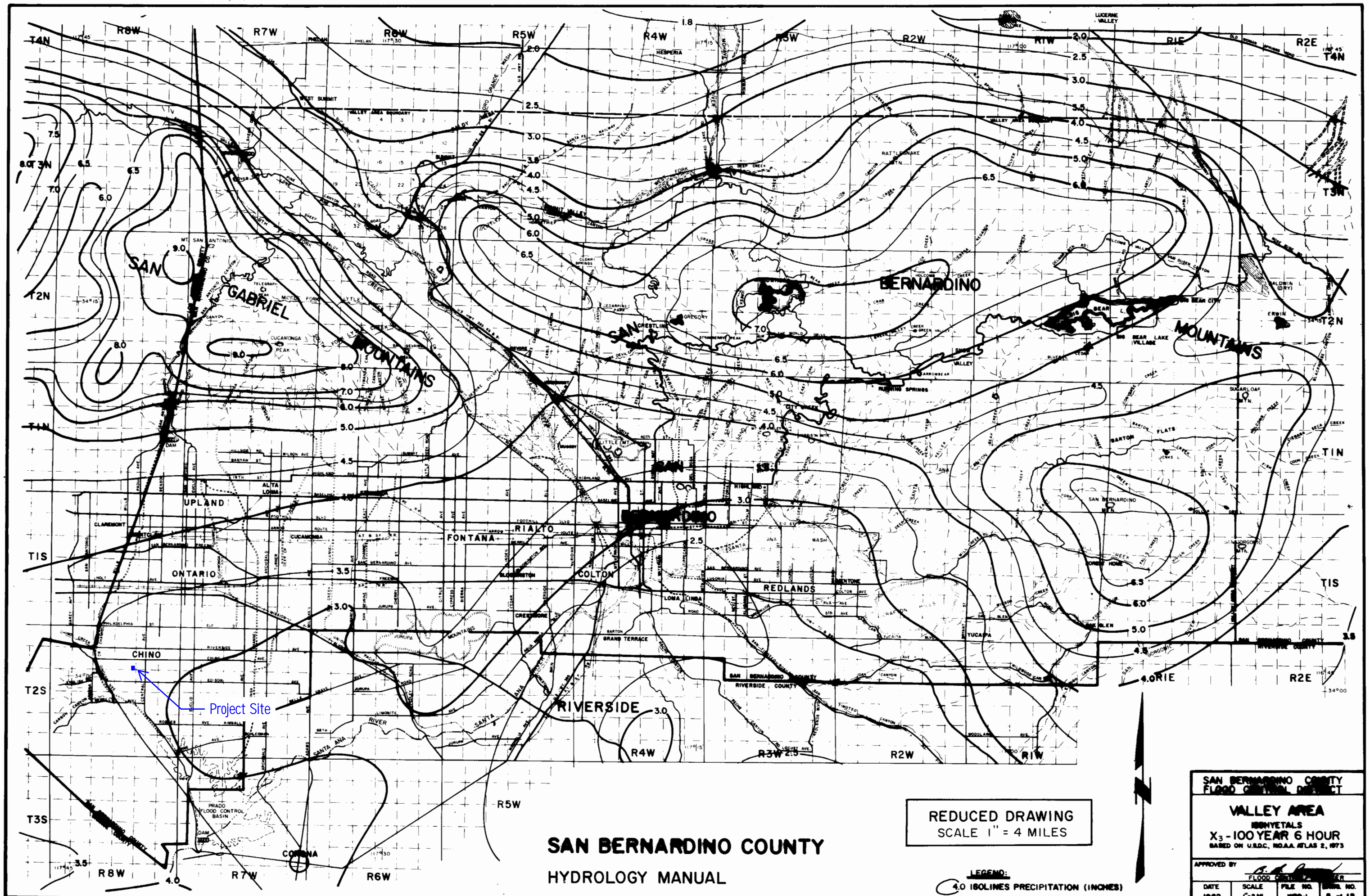


**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT			
VALLEY AREA			
100-YEAR 1 HOUR			
BASED ON U.S.D.C. NOAA ATLAS 2, 1973			
APPROVED BY _____			
DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=2 MI.	WB-1	4 of 12



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
 SCALE 1" = 4 MILES

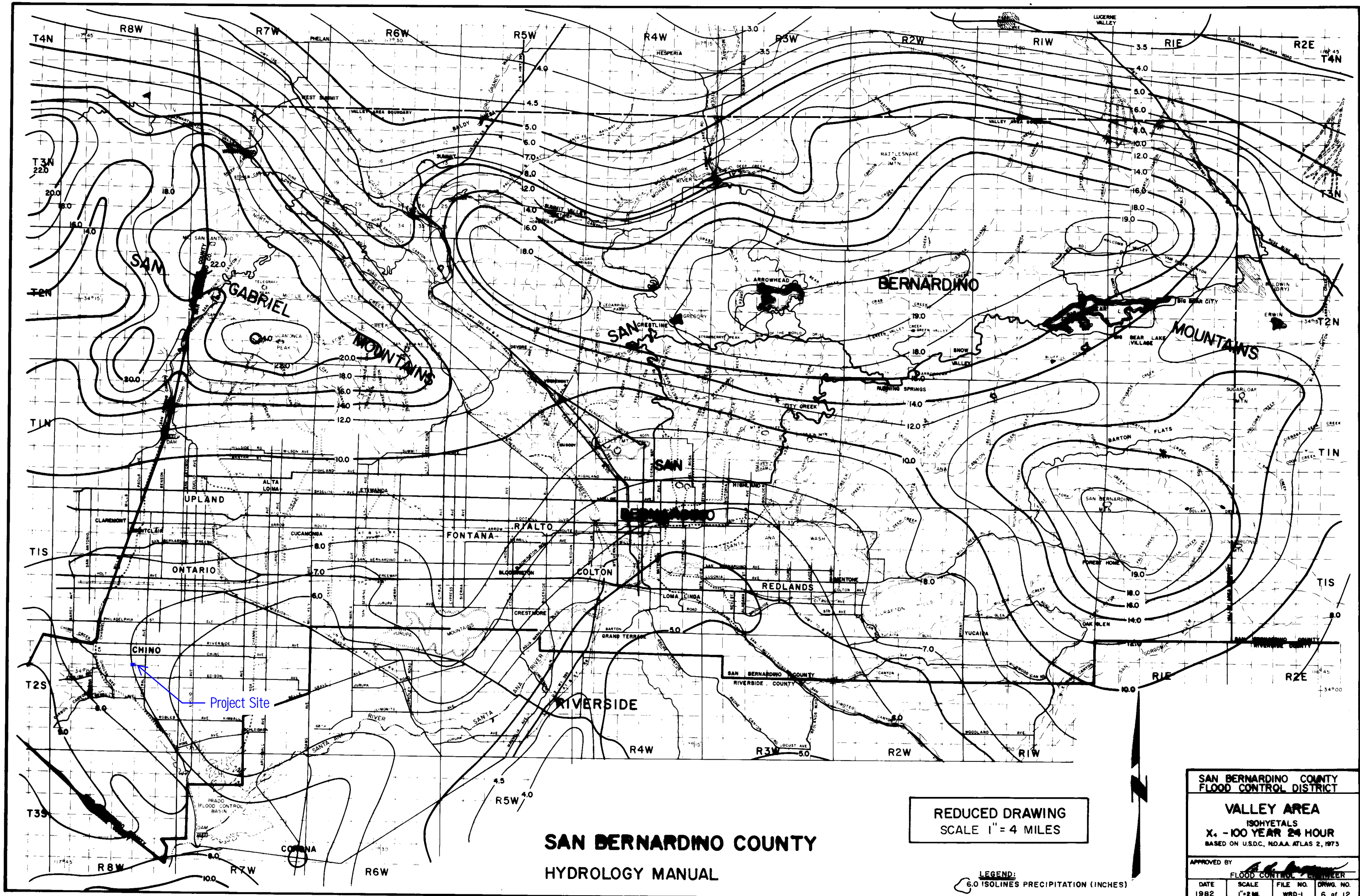
LEGEND:
 4.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
 FLOOD CONTROL DISTRICT

VALLEY AREA
 ISOHYETALS
 X₃ - 100 YEAR 6 HOUR
 BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY: *[Signature]*

DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=2 M.	WB-1	5 of 12

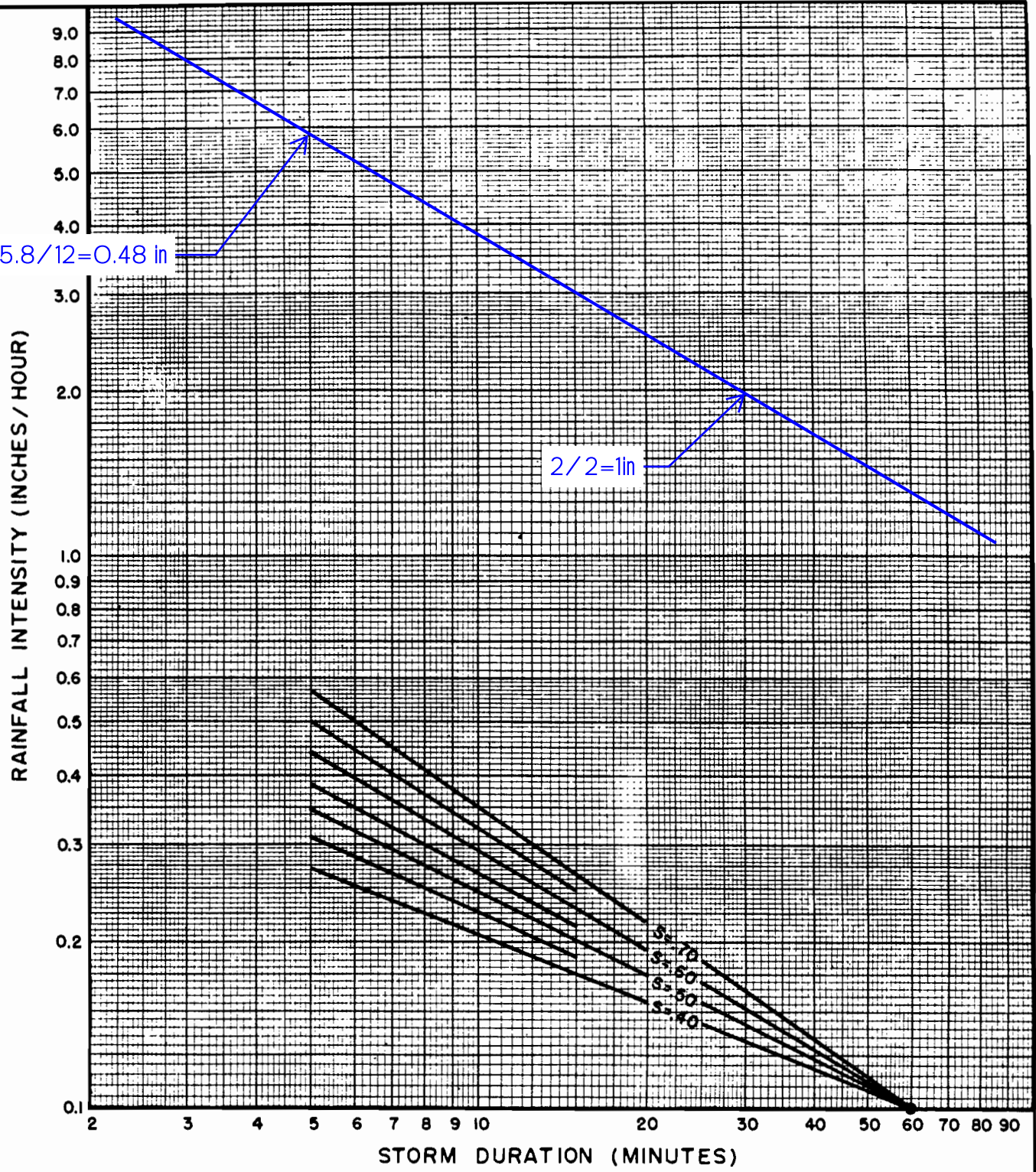


**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT			
VALLEY AREA			
ISOHYETALS			
X ₄ - 100 YEAR 24 HOUR			
BASED ON U.S.D.C. NOAA ATLAS 2, 1973			
APPROVED BY _____			
FLOOD CONTROL ENGINEER			
DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 2 MI.	WRD-1	6 of 12



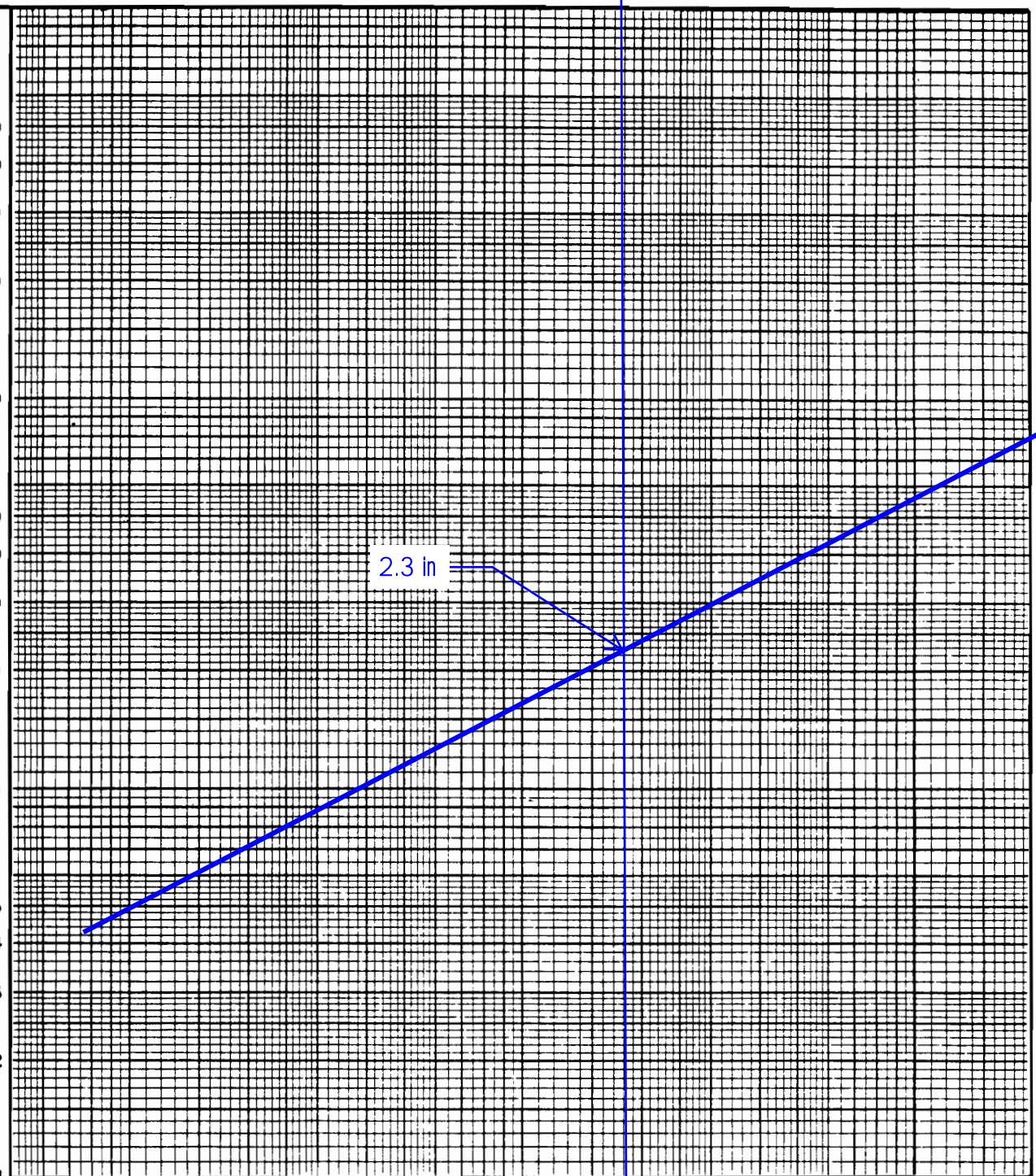
DESIGN STORM FREQUENCY = _____ YEARS
 ONE HOUR POINT RAINFALL = _____ INCHES
 LOG-LOG SLOPE = _____
 PROJECT LOCATION = _____

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL

**INTENSITY - DURATION
 CURVES
 CALCULATION SHEET**

POINT RAINFALL - INCHES

50.0
40.0
30.0
20.0
10.0
5.0
4.0
3.0
2.0
1.0
0.5
0.4
0.3
0.2
0.1



STORM DURATION - MINUTES

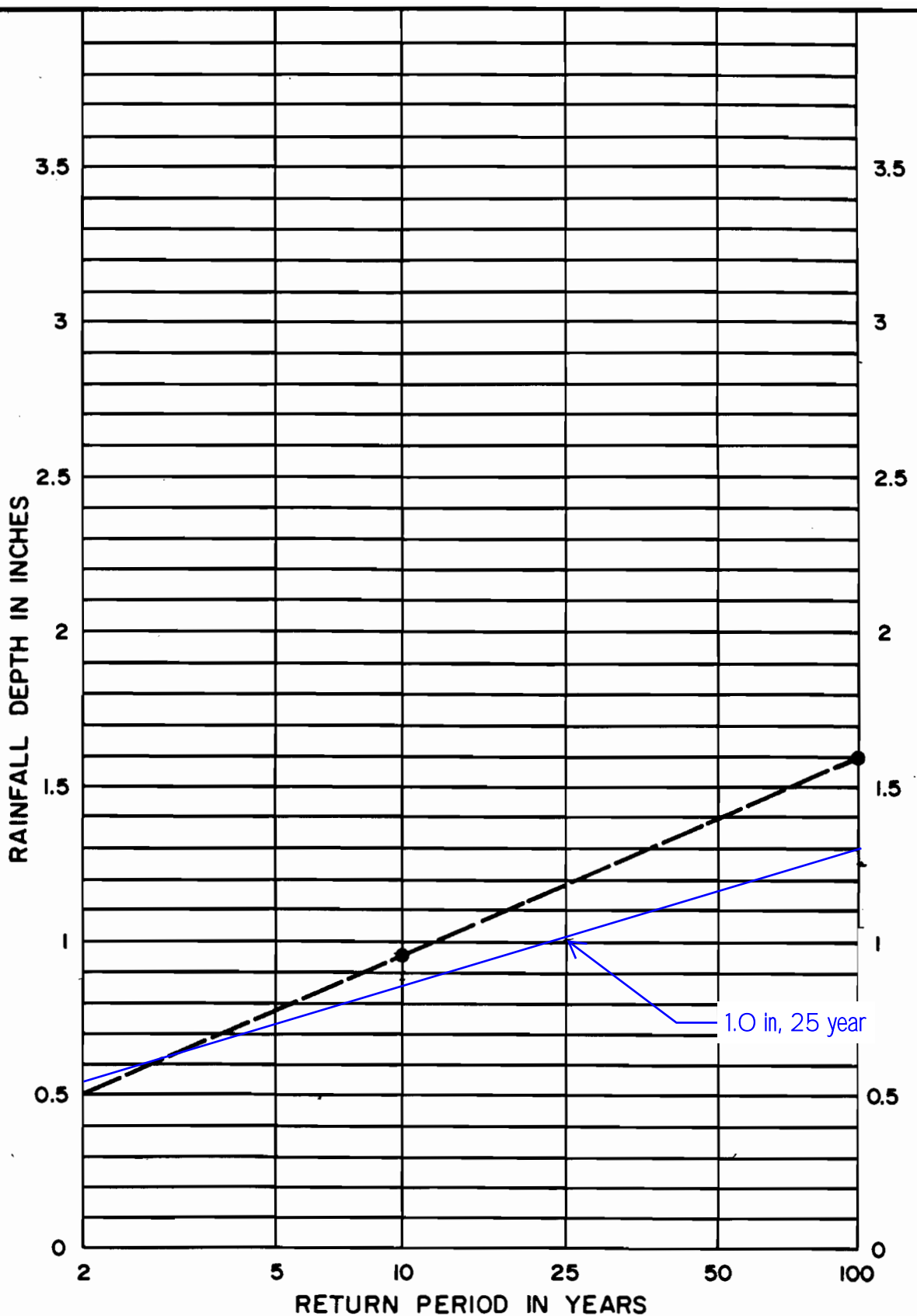
PROJECT LOCATION _____

NOTES _____

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

AREA - AVERAGED
MASS RAINFALL
PLOTING SHEET

115

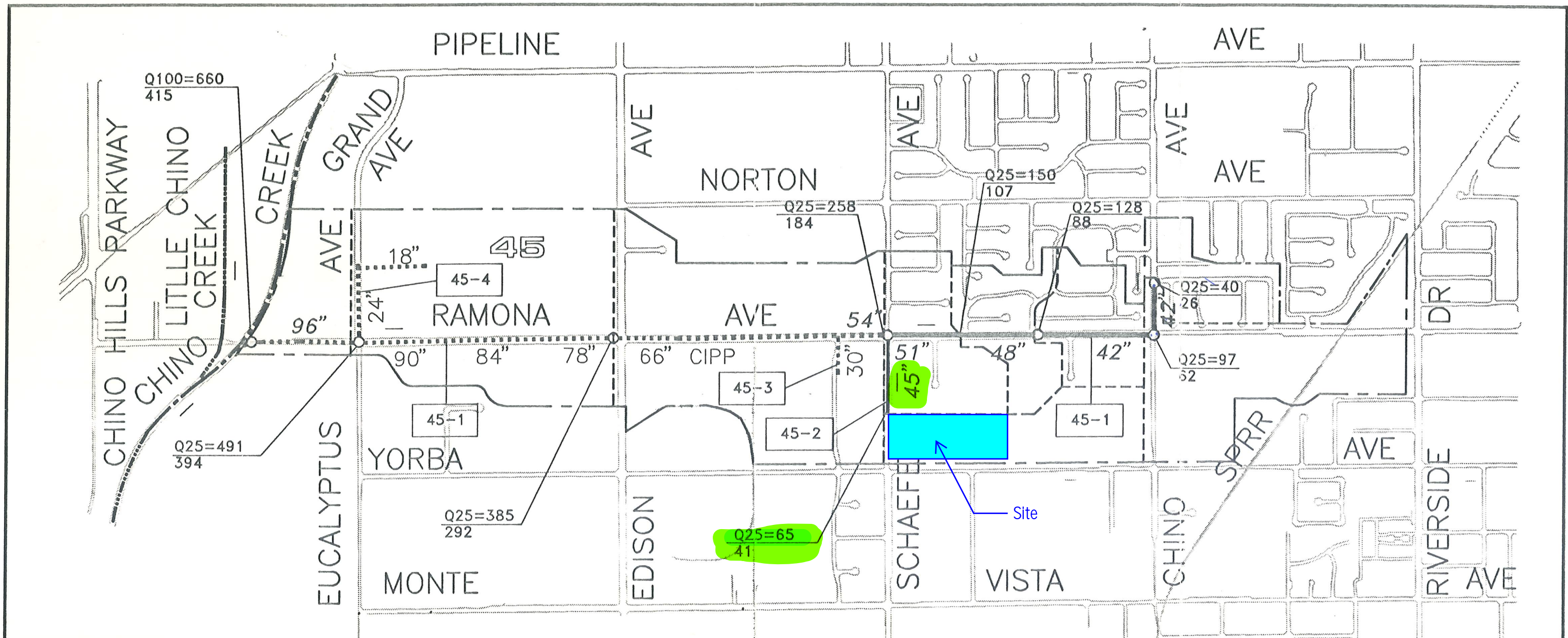


NOTE:
 1. FOR INTERMEDIATE RETURN PERIODS PLOT 10-YEAR AND 100-YEAR ONE HOUR VALUES FROM MAPS, THEN CONNECT POINTS AND READ VALUE FOR DESIRED RETURN PERIOD. FOR EXAMPLE GIVEN 10-YEAR ONE HOUR = 0.95" AND 100-YEAR ONE HOUR = 1.60", 25-YEAR ONE HOUR = 1.18".

REFERENCE: NOAA ATLAS 2, VOLUME XI - CAL., 1973

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL

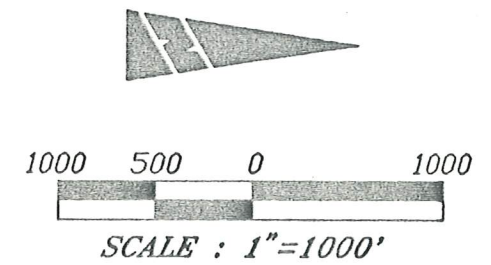
RAINFALL DEPTH VERSUS
RETURN PERIOD FOR
PARTIAL DURATION SERIES



LEGEND

- SYSTEM AREA NUMBER
- SYSTEM AREA BOUNDARY
- SUBAREA BOUNDARY
- PROPOSED STORM DRAIN-ADJOINING SYSTEM
- PROPOSED STORM DRAIN-THIS SYSTEM
- EXISTING CLOSED CONDUIT
- EXISTING CONCRETE CHANNEL
- EXISTING EARTHEN CHANNEL
- TOTAL FLOW FOR YEAR STORM (25) IN CUBIC FEET PER SECOND
- TOTAL AREA TRIBUTARY TO NODE IN ACRES

- LINE NUMBER
- VACATED STREET
- REINFORCED CONCRETE PIPE SIZE
- CAST-IN-PLACE PIPE
- CORRUGATED METAL PIPE
- REINFORCED CONCRETE BOX
- TRAPEZOIDAL CONCRETE CHANNEL
- RECTANGULAR CONCRETE CHANNEL
- EXISTING LIFT STATION



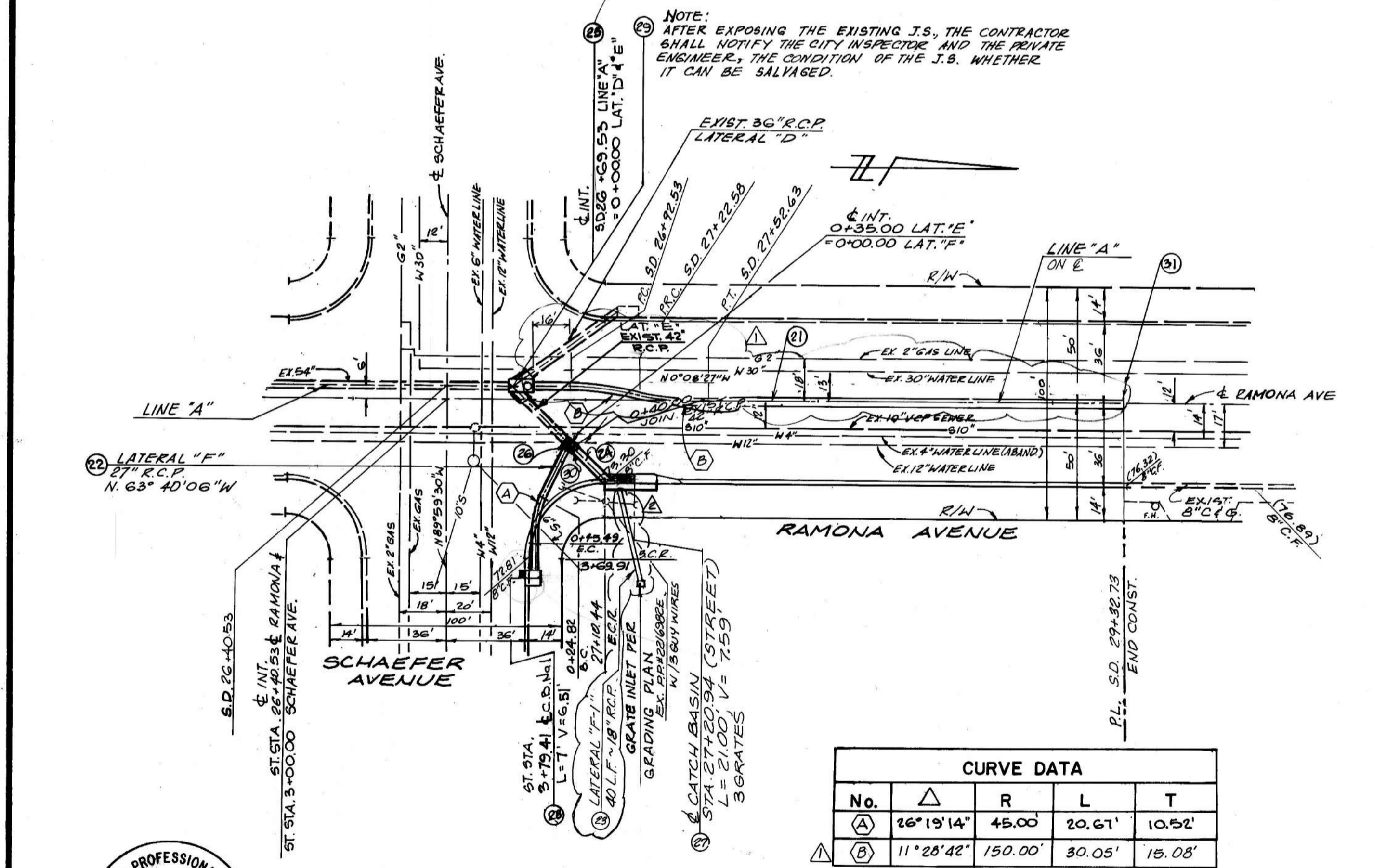
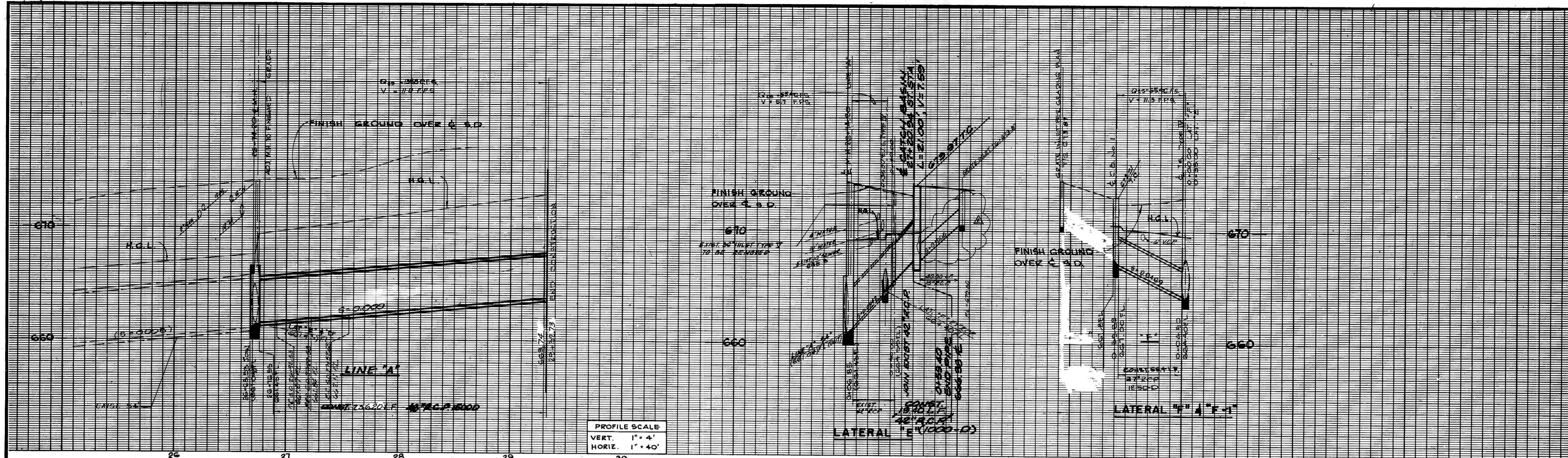
REVISIONS

CITY OF CHINO
MASTER PLAN OF DRAINAGE

SYSTEM 45

FIGURE VI-38

BSI BSI Consultants, Inc.
 2001 E. First Street
 Santa Ana CA 92705
 (714) 868-7300



GENERAL NOTES

- FOR STORM DRAIN**
- No work shall be undertaken without obtaining necessary permits from the City of Chino.
 - Contractor shall satisfy himself that estimated quantities shown are correct before bidding on any item.
 - No concrete shall be placed until the forms and reinforcing steel has been placed, inspected and approved.
 - All concrete shall be Portland Cement concrete with an ultimate 28 days compressive strength of 3250 p.s.i.
 - All exposed edges shall be finished with a 3/4" chamfer.
 - All steel adjacent to face of concrete shall have 2 1/2" clearance unless otherwise specified.
 - Reinforcement shall be deformed bars of intermediate grade steel as per A.S.T.M. A-615.
 - All bar bends and hooks shall conform to the American Concrete Institute "Manual of Standard Practices".
 - Dimensions from face of concrete to steel are to centerline of steel unless otherwise noted.
 - All steel that is to be continuous shall have a minimum lap of 30 bar diameters or 18", whichever is greater.
 - Pipe shall be embedded 5 inches into all structures including inlet and headwalls, unless otherwise specified.
 - All reinforced concrete pipe shall be bedded in accordance with Los Angeles County Flood Control District Case I bedding per Standard Drawing 2-D177 unless otherwise noted.
 - No trench backfill shall take place without prior approval of the City's inspector.
 - Trench compaction shall be in accordance with City of Chino Special Provisions for Trench Compaction (Special Section 114).
 - All manhole frame and covers are to be temporarily set 4 inches below the finished grade elevation shown on plans unless otherwise noted.
 - Contractor shall maintain dust control at all times.
 - Contractor is responsible for locating and identifying all underground lines and substructures, of every nature, and to protect them from damage.
 - Contractor shall furnish the City Engineer with 'As-Built' of all construction plans.

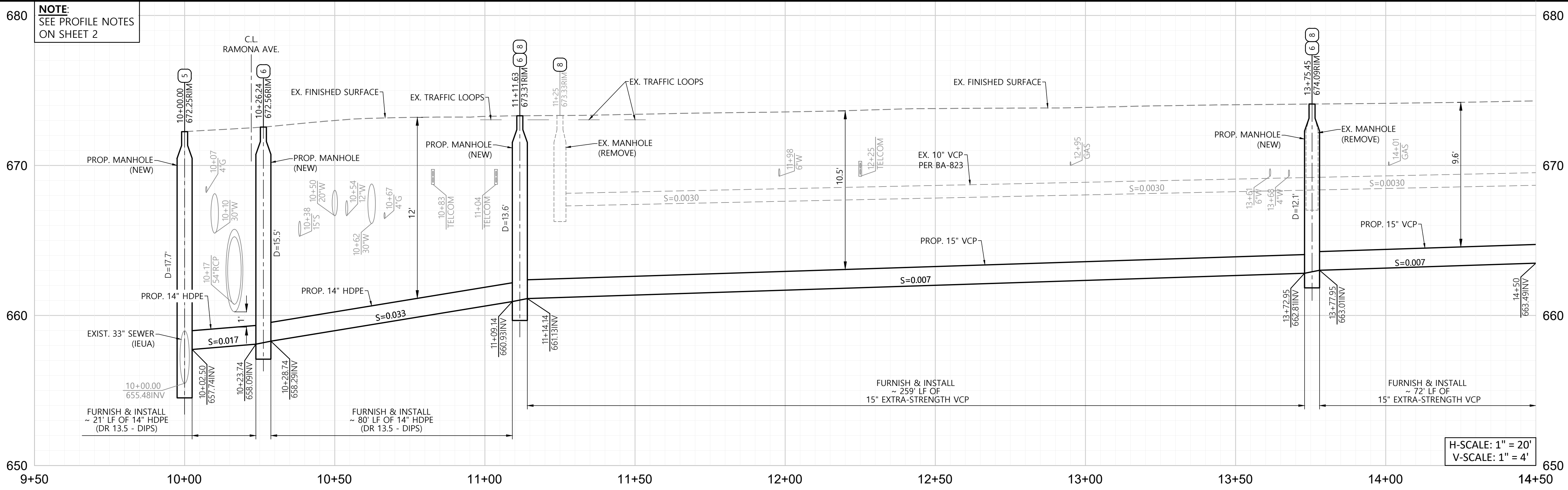
CONSTRUCTION NOTES

- (22) - INSTALL 48" R.C.P. 256 LF.
- (23) - INSTALL 27" R.C.P. 56 LF.
- (23) - INSTALL 18" R.C.P. 40 LF.
- (24) - INSTALL 42" R.C.P. 19.40 LF.
- (25) - CONSTRUCT JUNCTION STRUCTURE TYPE I PER LAFCD STD. PLAN NO. 2-D113 1EA.
- (26) - CONSTRUCT JUNCTION STRUCTURE TYPE II PER LAFCD STD. PLAN NO. 2-D112. 1EA.
- (27) - CONSTRUCT CATCH BASIN PER CITY OF CHINO STD. DWG. NO. 114A, L=21' 1EA.
- (28) - CONSTRUCT CATCH BASIN PER CITY OF CHINO STD. DRAWING NO. 114A (MODIFIED) 7" WITH ONE GRATE INLET 1EA.
- (29) - REMOVE EXISTING JUNCTION STRUCTURE 1EA.
- (30) - REMOVE EXISTING INLET TYPE V 1EA.
- (31) - CONSTRUCT BRICK & MORTAR SEAL 1EA.

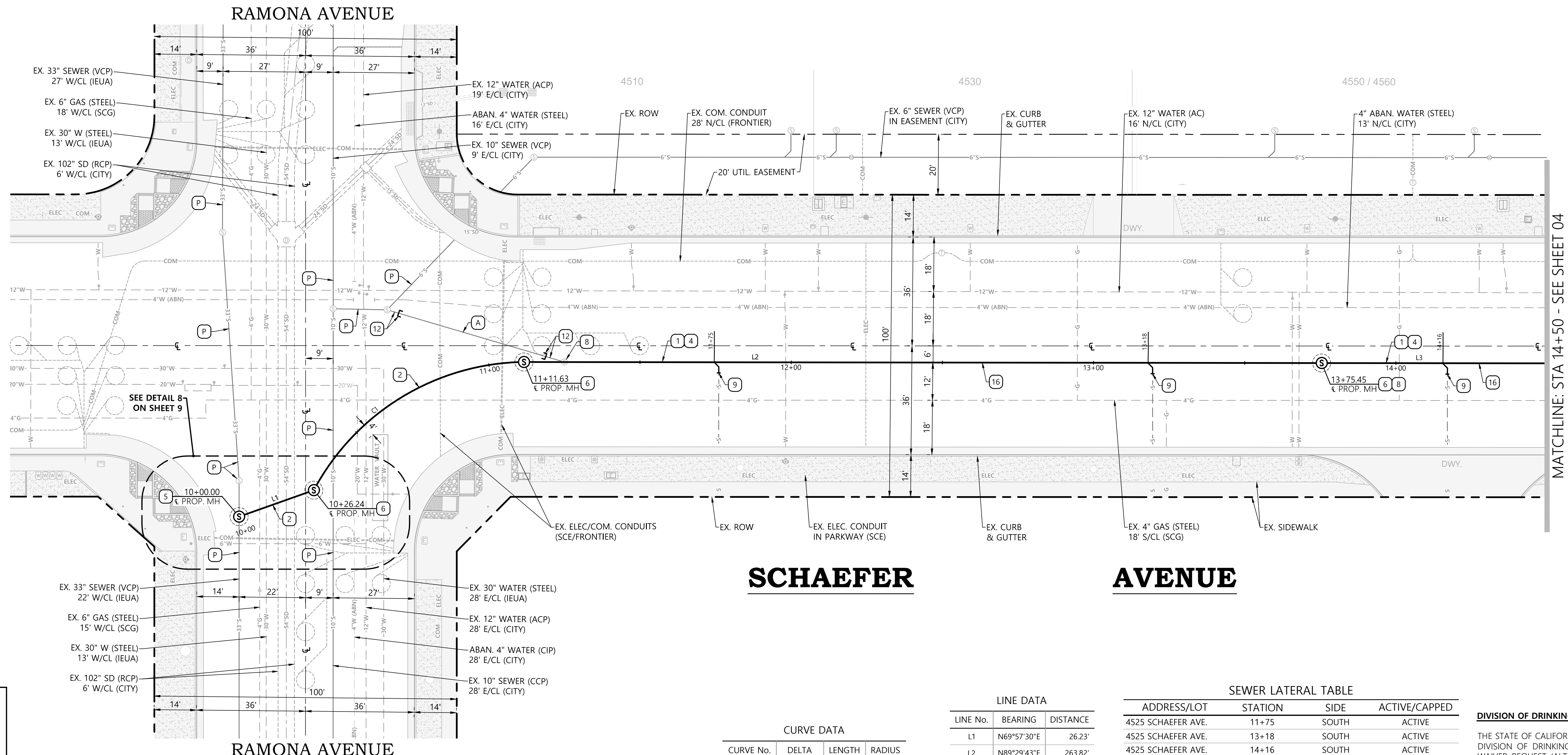
"AS BUILT"



RMG ENGINEERING, INC. Civil Engineers, Planners & Land Surveyors 17961-A COWAN • IRVINE, CALIFORNIA 92714 • PHONE: (714) 863-9390 James Bolton 2-24-87 JAMES BOLTON R.C.E. 30236	DATE BY REVISION 12-87 J.B. Moved Storm Drain & East Add "S" Curve 2-88 J.B. Changed location of lateral "F-1" 5/85/88 J.B. "AS BUILT"	APP'D 12/11/87 1/3/2/91	BENCH MARK NO. 164 ELEV. 690.715 LOCATION: L & T ON EAST CURB RAMONA AVE. 1100' ± SOUTH OF CHINO AVE. CORRECTED 12/14/78	APPROVED BY TRAFFIC WATER SEWER	DATE CITY ENGINEER'S STAFF DATE DRAWN BY DESIGNED BY CHECKED BY J.M. J.M.A. 5/8/87 RECOMMENDED BY	APPROVED BY CITY ENGINEER DATE 6-2-87	City of Chino Engineering Department PARCEL MAP No. 10100 RAMONA AVE. FROM SCHAEFER AVE. TO 292' NORTH STORM DRAIN IMPROVEMENT PLAN & PROFILE	JOB NO. 86-0066 Sht. 1 of 1 DWG. NO. AA-1497
	(STORM DRAIN)							



- ### SEWER CONSTRUCTION NOTES
- 1 FURNISH & INSTALL 15" EXTRA STRENGTH VCP SEWER MAIN WITH TRENCHING & BACKFILL PER CITY STD. DWG. NO. 109
 - 2 FURNISH & INSTALL 14" HDPE (DR 13.5 - DIPS) SEWER MAIN WITH TRENCHING & BACKFILL PER CITY STD. DWG. NO. 109
 - 4 REMOVE AND DISPOSE OF EXISTING 10" VCP SEWER MAIN
 - 5 FURNISH & INSTALL 60" DIA. IEUA CONNECTION MANHOLE PER DETAILS ON SHEET 9 WITH 30" CLEAR OPENING
 - 6 FURNISH & INSTALL 60" DIA. SEWER MANHOLE PER CITY STD. DWG. 515 WITH 24" CLEAR OPENING AND MANHOLE FRAME & COVER PER CITY STD. DWG. 540
 - 8 REMOVE EXISTING SEWER MANHOLE PER PROJECT SPECIFICATIONS
 - 9 FURNISH & INSTALL WYE BRANCH PER SEWER LATERAL TABLE HEREON. RECONNECT SEWER LATERAL PER CITY STD. 500 AND DETAIL 5 ON SHEET 8
 - 12 CUT AND REMOVE PORTION OF EXISTING SEWER, AND CONSTRUCT CONCRETE PLUG ON UPSTREAM END
 - 16 PROVIDE ABOVE-GROUND FLOW BYPASS PER DETAIL 7 ON SHEET 8
 - A ABANDON IN PLACE EXISTING UTILITY
 - P PROTECT IN PLACE EXISTING UTILITY



- ### ENGINEER'S NOTES
- 1 UNLESS OTHERWISE NOTED, ALL PROPOSED SEWER PIPING INSTALLED ON THIS PROJECT SHALL BE EITHER HIGH-DENSITY POLYETHYLENE PIPE (HDPE) OR EXTRA-STRENGTH VITRIFIED CLAY PIPE (VCP) WITH COMPRESSION JOINTS.
 - 1.1 HDPE SHALL BE DUCTILE-IRON PIPE SIZE (DIPS), WITH A DIMENSION RATIO OF 13.5 (DR 13.5).
 - 1.2 VCP PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C700 AND TESTED IN ACCORDANCE WITH ASTM C301.
 - 1.3 VCP COMPRESSION JOINTS SHALL BE BELL AND SPIGOT TYPE PER ASTM C425.
 - 2 FOR INSPECTION AND ACCEPTANCE BY THE CITY, CONTRACTOR SHALL ENSURE THAT THE PIPE SECTIONS ON-SITE ARE MARKED WITH THE FOLLOWING INFORMATION:
 - 2.1 MANUFACTURER'S NAME, ADDRESS, AND DATE OF MANUFACTURE.
 - 2.2 NOMINAL PIPE SIZE (DIAMETER).
 - 3 EXISTING UTILITIES THAT CROSS WITHIN ONE (1) FOOT OR LESS FROM THE PROPOSED SEWER SHALL BE MONITORED AND PROTECTED UNTIL INSTALLATION OF PROPOSED PIPE IS COMPLETE.
 - 3.1 ADJUSTMENTS TO THE DEPTH OF EXISTING UTILITIES SHALL BE MADE ONLY AS NECESSARY. ADJUSTMENTS SHALL BE MADE IN ACCORDANCE WITH THE UTILITY OWNER'S SPECIFICATIONS.
 - 3.2 CONCRETE PIPE SUPPORTS OR BLANKETS SHALL BE INSTALLED IF/AS INDICATED ON THE PROFILE OR AS DIRECTED BY THE CITY DURING CONSTRUCTION.
 - 4 RUBBER REPAIR COUPLINGS MAY BE USED FOR FIELD-CUT SEGMENTS OF PIPE. COUPLINGS SHALL BE AS FOLLOWS:
 - 4.1 REPAIR COUPLINGS FOR MAINLINE SEWER PIPE SHALL CONSIST OF FLEXIBLE RUBBER COLLAR WITH 316 STAINLESS STEEL RINGS.
 - 4.2 REPAIR COUPLINGS FOR SEWER LATERALS SHALL CONSIST OF A HEAVY-DUTY RUBBER COLLAR WITH 316 STAINLESS STEEL RINGS.
 - 5 FLOW BYPASSING MUST BE OPERATIONAL PRIOR TO REMOVAL OF EXISTING PIPE.
 - 5.1 FLOW BYPASSING SHALL CONFORM TO DETAIL 5 ON SHEET 18.
 - 5.2 CONTRACTOR SHALL SUBMIT A BYPASSING PLAN FOR APPROVAL.
 - 6 WHEREVER TRENCH EXCAVATIONS CONFIRM THAT THE PROPOSED EXTRA-STRENGTH VCP WILL HAVE LESS THAN 4 FEET OF COVER, CONTRACTOR SHALL FURNISH & INSTALL:
 - 6.1 CONTROLLED LOW-STRENGTH MATERIAL (CLSM) "FLOWABLE FILL" IN THE TRENCH (BACKFILL) ZONE.
 - 6.2 1/2" CRUSHED ROCK IN THE BEDDING ZONE (UP TO 12" ABOVE PIPE).
 - 6.3 ALTERNATIVELY, THE CITY MAY REQUIRE DUCTILE IRON PIPE IN-LEU OF EXTRA-STRENGTH VCP.
 - 6.4 THE CITY MAY ALSO REQUIRE A COMBINATION OF THE ABOVE.

CURVE DATA

CURVE No.	DELTA	LENGTH	RADIUS
C1	61°05'28"	85.41'	80.10'

LINE DATA

LINE No.	BEARING	DISTANCE
L1	N69°57'30"E	26.23'
L2	N89°29'43"E	263.82'
L3	N89°29'57"E	323.42'

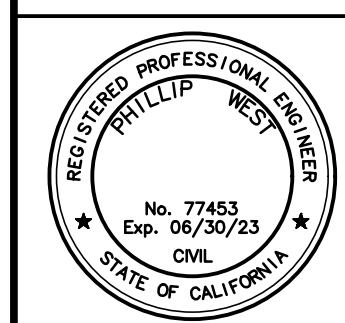
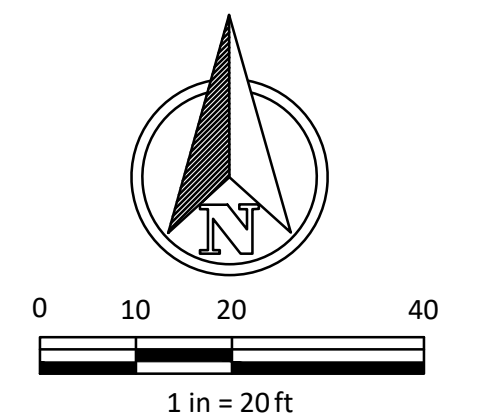
SEWER LATERAL TABLE

ADDRESS/LOT	STATION	SIDE	ACTIVE/CAPPED
4525 SCHAEFER AVE.	11+75	SOUTH	ACTIVE
4525 SCHAEFER AVE.	13+18	SOUTH	ACTIVE
4525 SCHAEFER AVE.	14+16	SOUTH	ACTIVE

NOTE: STATIONS FOR SEWER LATERALS ARE BASED ON CITY AS-BUILTS AND ARE PROVIDED AS A REFERENCE. EXACT STATION MAY BE SUBJECT TO CHANGE IN THE FIELD.

DIVISION OF DRINKING WATER NOTE:

THE STATE OF CALIFORNIA WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER, HAS ISSUED AN APPROVAL OF WAIVER REQUEST (ALTERNATIVE TO WATERWORKS STANDARDS) IN A LETTER TO THE CITY DATED 12/06/2021 (FOR SYSTEM NO. 3610012 - CITY OF CHINO).



CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT A MINIMUM OF 48 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION WORK.

811 Know what's below. Call before you dig.

PREPARED BY	REVISIONS	MADE BY	APPROVED BY
PHILLIP WEST, P.E. RCE 77453			

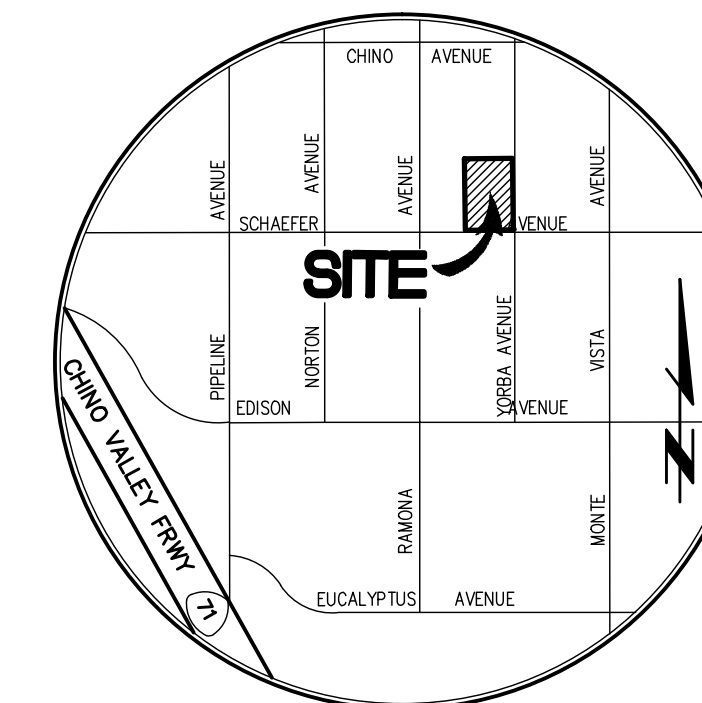
BENCHMARK DATA	REFERENCE DRAWINGS / ATLAS MAPS
BENCHMARK: CITY OF CHINO BM 137-49 A 2- 1/2" BRASS DISC STAMPED "137/49" LOCATED IN TOP OF CURB, 5' E/O THE ECR OF THE SW CURB RETURN, & BEING 4.5' E/O BRASS DISK STAMPED "SAN BERNARDINO COUNTY SURVEYORS 1980 74 - 1-7" & BEING 58.5' WEST & 36.5' SOUTH OF THE C.L. INTERSECTION OF MONTE VISTA AVE & SCHAEFER AVE. ELEVATION = 6811470 FT DATE 08/2021	BA-4 BA-10 BA-575 BA-823 D4587 (IEUA) CHINO WASTEWATER ATLAS (2009): Q-6

RECOMMENDED BY:
CITY ENGINEER
DATE: _____

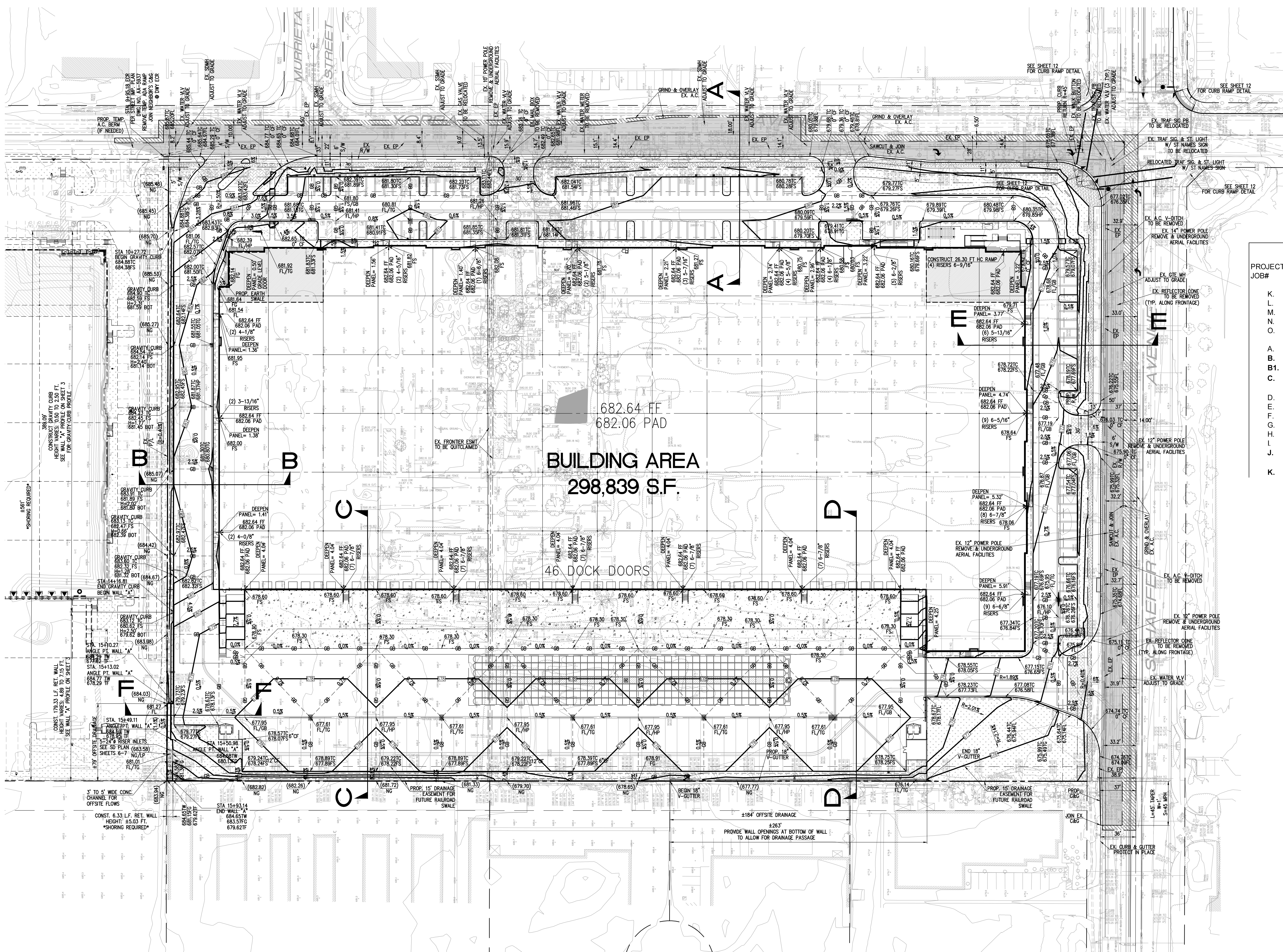
CITY OF CHINO ENGINEERING DIVISION
SCHAEFER AVENUE AND YORBA AVENUE
SEWER MAIN REPLACEMENT
SCHAEFER AVENUE STATION: 10+00 TO 14+50

PROJECT NO.
SW 211
SHEET 3 OF 9
DRAWING NO. BA-2321

60% SUBMITTAL (NOT FOR CONSTRUCTION) - 09.06.2022



VICINITY MAP
N.T.S.



7/24/2023

EARTHWORK BALANCE CALCULATIONS

PROJECT: YORBA AVENUE INDUSTRIAL DEVELOPMENT
JOB#: 4163

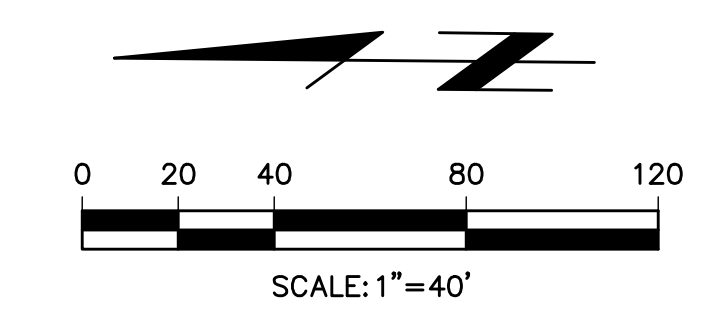
K. SITE AREA:	589,196 SF
L. SUBSIDENCE FACTOR:	0.113
M. SHRINKAGE FACTOR:	9.0 %
N. SITE STRIPPING FACTOR:	0.1
O. OVEREXCAVATION:	46,010 CY
A. CALCULATED CUT:	25,038 CY
B. FOOTING AND UTILITY SPOILS:	7,927 CY
B1. OFFSITE UTILITY:	-
C. TOTAL CUT: (A+B)	32,965 CY
D. CALCULATED FILL:	21,220 CY
E. LIGHT PAVING FILL: STREET FILL:	- CY
F. SUBSIDENCE: (LxK)/27=	2,455 CY
G. SHRINKAGE: (M/100)C=	2,967 CY
H. SITE STRIPPING:	2,182
I. OVEREXCAVATION SHRINKAGE:	4,141 CY
J. TOTAL FILL: (D+E+F+G+H)=	32,965 CY
K. TOTAL (IMPORT) OR EXPORT:	(0) CY

SEE SHEET 12 FOR CURB RAMP DETAILS

SEE SHEET 3 FOR CROSS SECTIONS

SEE SHEET 3 FOR WALL PROFILES

SEE SHEET 4 FOR STREET PROFILES



CITY OF CHINO
PUBLIC WORKS DEPARTMENT

CONCEPTUAL GRADING PLAN
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Date _____		
Checked by _____		
Date _____		

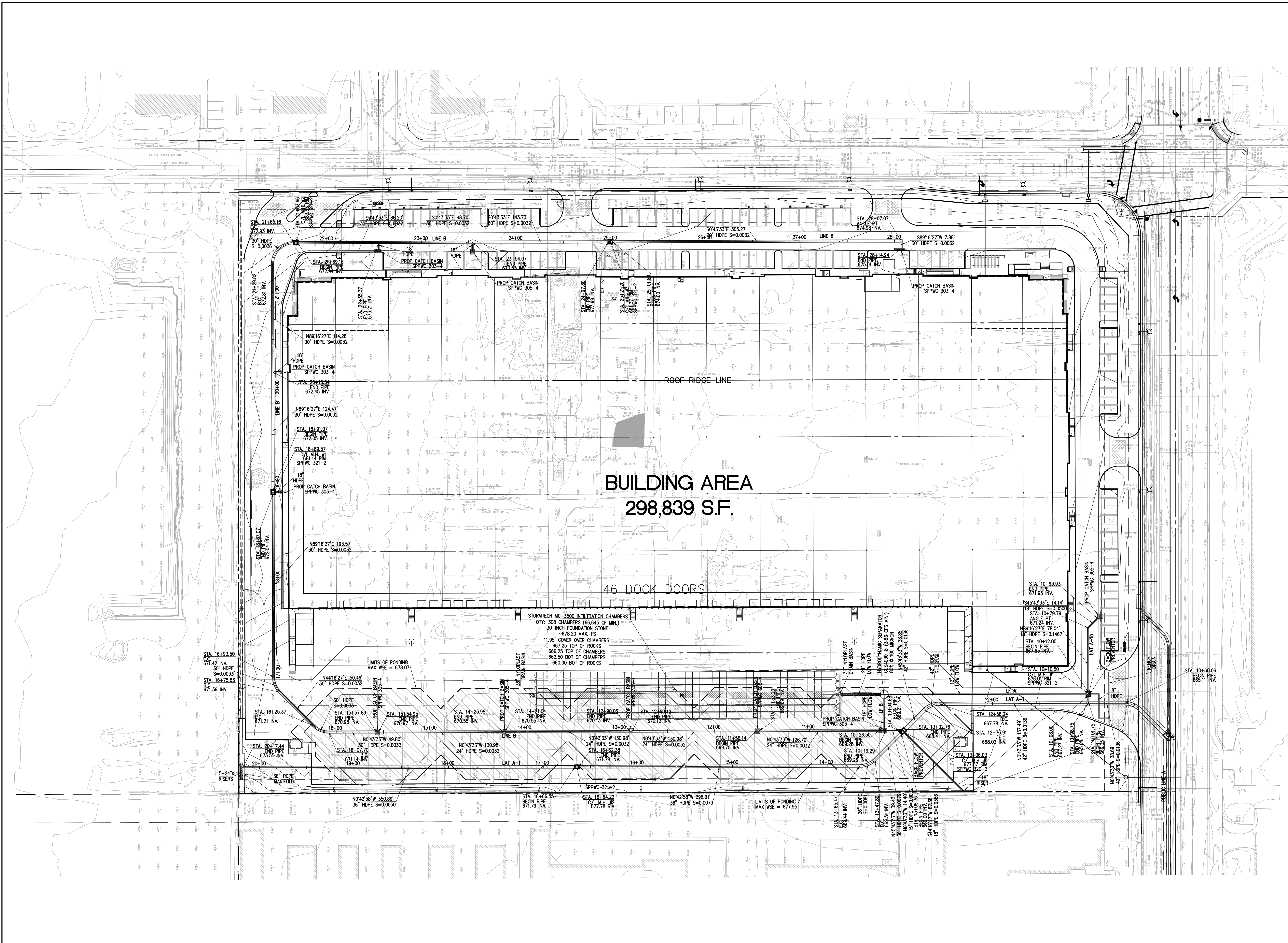
Sheet **1** of **12** Sheets

4163 / 1 OF 12 SHEET

PREPARED FOR:
LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

PREPARED BY:
Tai Thienes Engineering, Inc.
CIVIL ENGINEERING - LAND SURVEYING
14140 FIRESTONE BOULEVARD
LA BARRA, CALIFORNIA 90630
PH: (714) 321-4111 FAX: (714) 321-4173

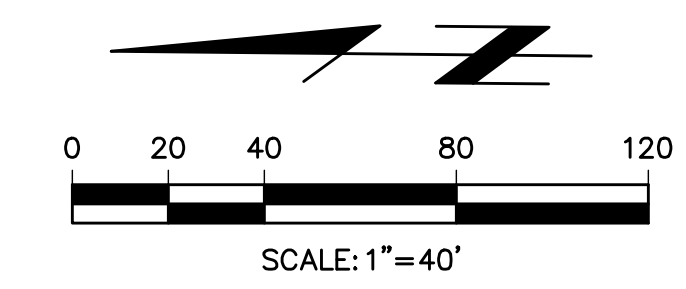
Lot 1 Update: 4/23/24
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BUILDING AREA
298,839 S.F.

46 DOCK DOORS

STORMTECH MC-3500 INFILTRATION CHAMBERS
QTY: 308 CHAMBERS (66,645 OF MIN.)
30" x 104" FOUNDATION STONE
-678.20 MAX. FS
11.95' COVER OVER CHAMBERS
667.25 TOP OF ROCKS
666.25 TOP OF CHAMBERS
662.50 BOT OF CHAMBERS
660.00 BOT OF ROCKS



Last Update: 4/23/24
© 14100-4199 v1631-11630SP07-SDC PLAN.dwg

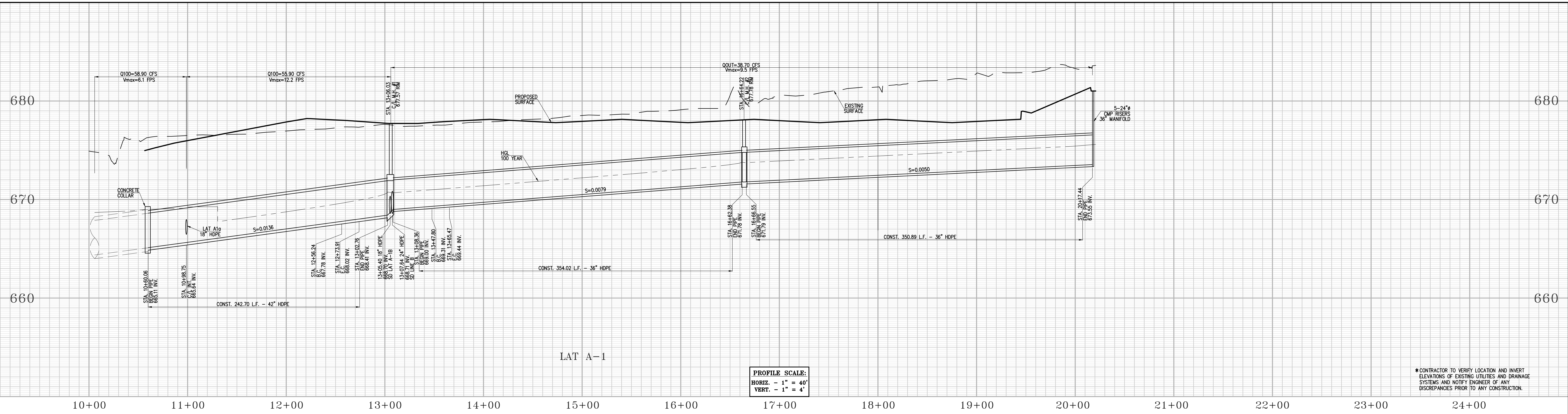
CITY OF CHINO
PUBLIC WORKS DEPARTMENT
CONCEPTUAL STORM DRAIN PLAN
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

PREPARED FOR:
LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

PREPARED BY:
T.E.I. Thienes Engineering, Inc.
CIVIL ENGINEERING - LAND SURVEYING
14140 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH: (714) 521-4011 FAX: (714) 521-4173

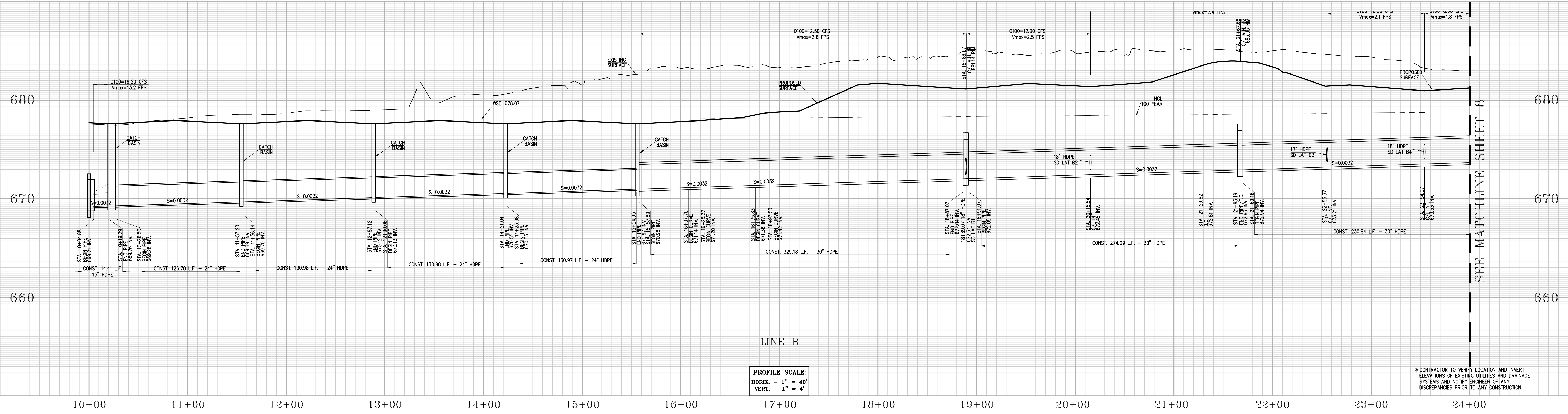
Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Checked by _____		
Date _____	Sheet 7 of 12	Sheets

4163 / 7 OF 12 SHEET



PROFILE SCALE:
 HORIZ. - 1" = 40'
 VERT. - 1" = 4'

* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.



PROFILE SCALE:
 HORIZ. - 1" = 40'
 VERT. - 1" = 4'

* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

SEE MATCHLINE SHEET 8

Last Update: 4/23/24
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CITY OF CHINO
 PUBLIC WORKS DEPARTMENT
CONCEPTUAL STORM DRAIN PROFILES
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

PREPARED FOR:
 LOVETT INDUSTRIAL
 610 NEWPORT CENTER DRIVE, SUITE 340
 NEWPORT BEACH, CA 92660
 PHONE: (949) 402-2760

PREPARED BY:
T*e*i Thienes Engineering, Inc.
 CIVIL ENGINEERING • LAND SURVEYING
 14349 FIRESTONE BOULEVARD
 LA HABRA, CALIFORNIA 90638
 PH: (714) 521-4811 FAX: (714) 521-4733

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Date _____		
Checked by _____		
Date _____		
Sheet 8 of 12 Sheets		

4163 / 8 OF 12 SHEET



SEE MATCHLINE SHEET 7

LINE B

PROFILE SCALE:
 HORIZ. - 1" = 40'
 VERT. - 1" = 4'


* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

24+00 25+00 26+00 27+00 28+00 29+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00

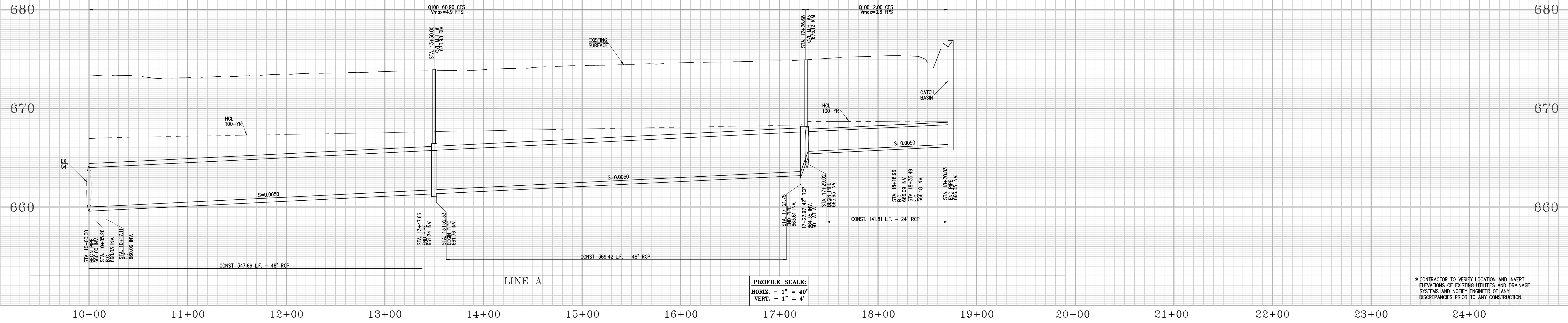
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CITY OF CHINO PUBLIC WORKS DEPARTMENT	
CONCEPTUAL STORM DRAIN PROFILES YORBA AVENUE INDUSTRIAL DEVELOPMENT 13610 YORBA AVENUE	
Designed by _____ Date _____ Checked by _____ Date _____ Designed by _____ Date _____ Checked by _____ Date _____	Approved by _____ Date _____ Public Works Director R.C.E. XXXXX
Sheet 9 of 12 Sheets	

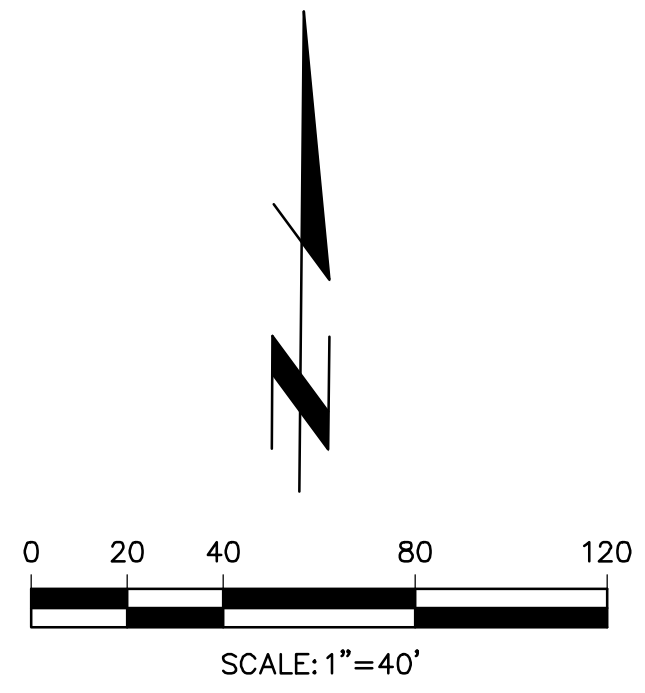
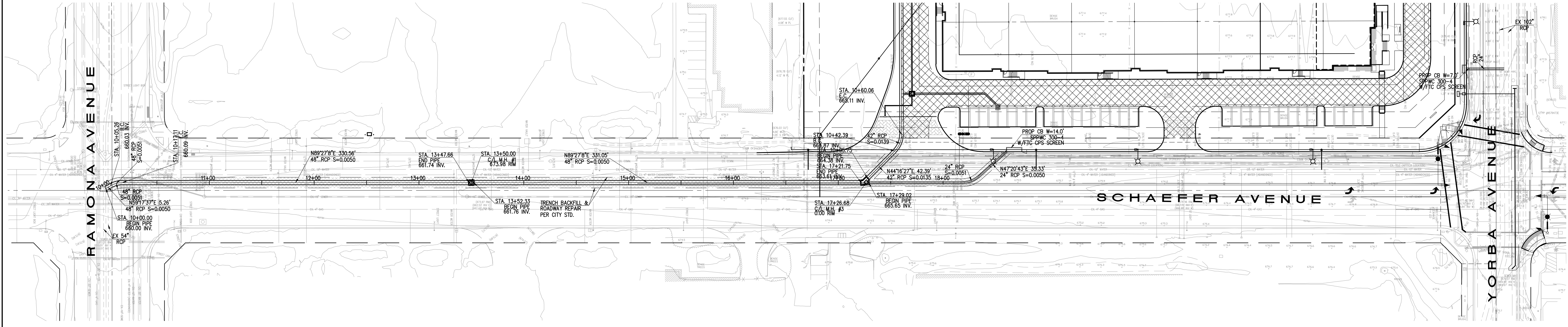
PREPARED FOR:
 LOVETT INDUSTRIAL
 610 NEWPORT CENTER DRIVE, SUITE 340
 NEWPORT BEACH, CA 92660
 PHONE: (949) 402-2760

PREPARED BY:

 CIVIL ENGINEERING - LAND SURVEYING
 14340 FIRESTONE BOULEVARD
 LA BREA, CALIFORNIA 90639
 PH: (714) 521-4811 FAX: (714) 521-4773

4163/9 OF 12 SHEET



* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.



CITY OF CHINO
PUBLIC WORKS DEPARTMENT
CONCEPTUAL STORM DRAIN PLAN
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

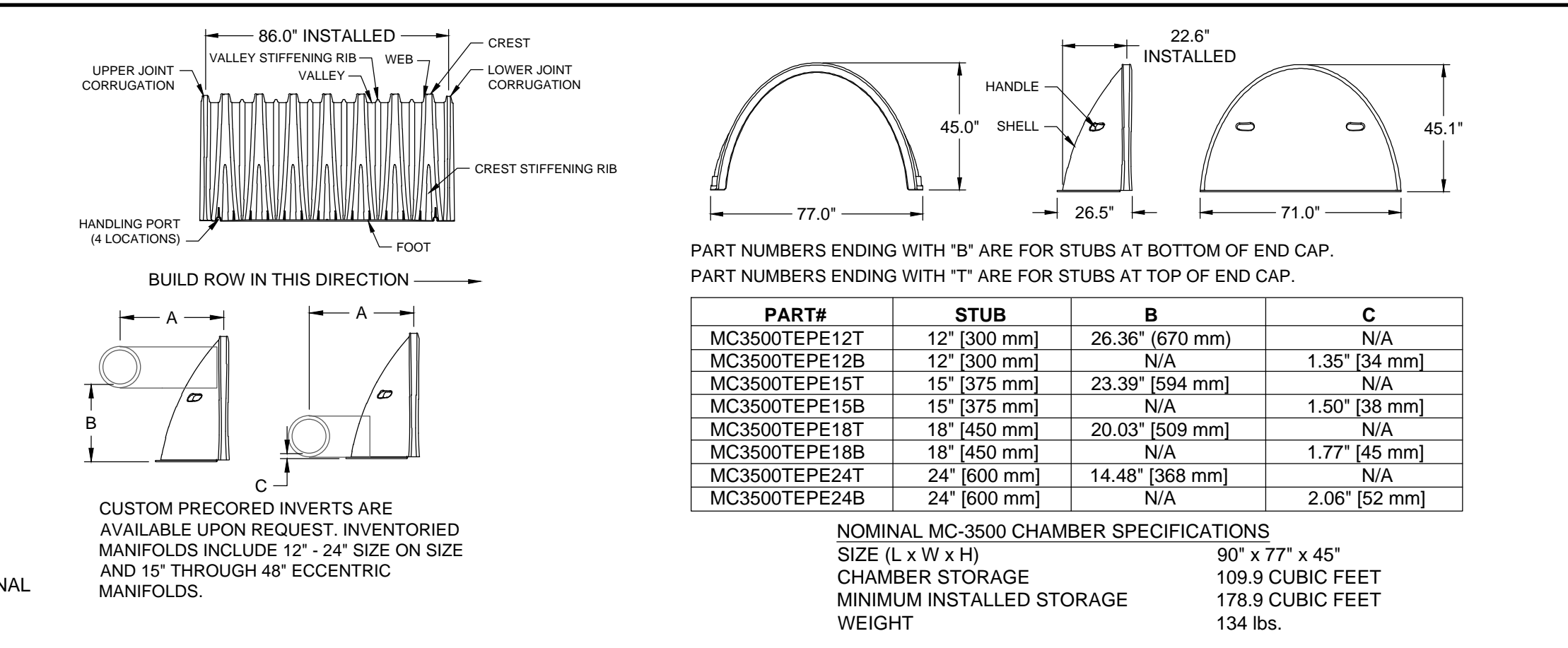
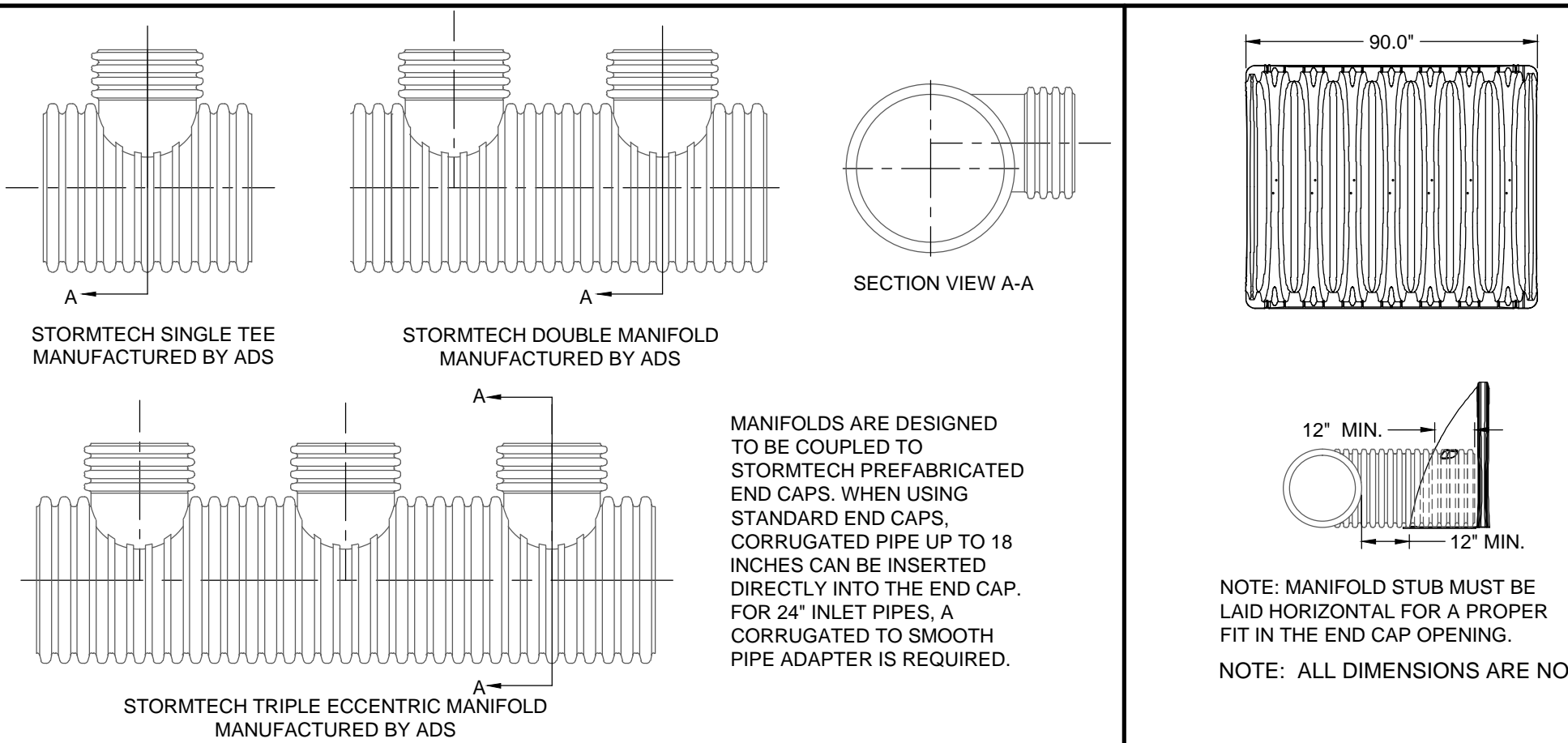
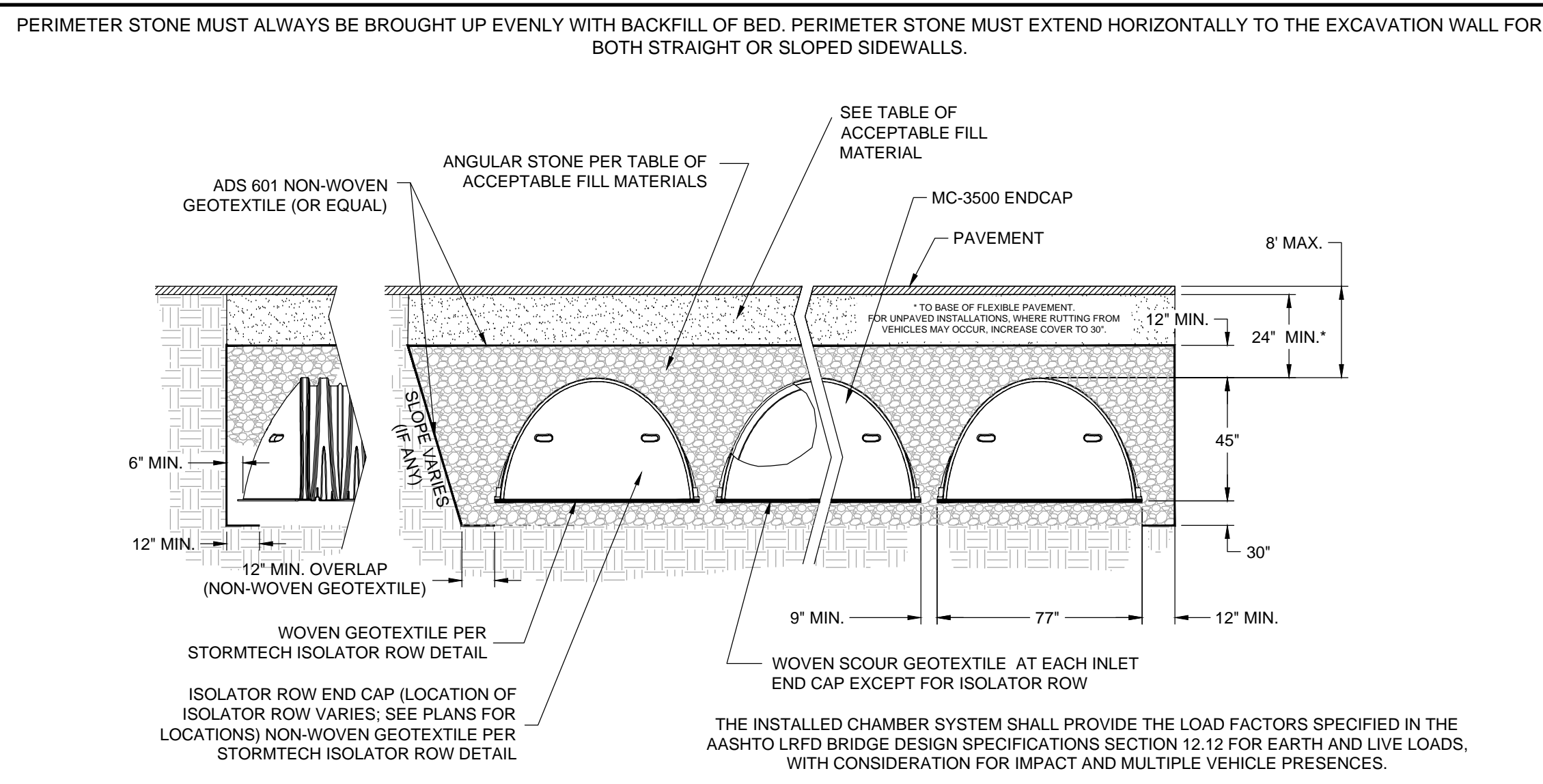
PREPARED FOR:
LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

PREPARED BY:
T*e*i Thienes Engineering, Inc.
CIVIL ENGINEERING - LAND SURVEYING
14140 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH: (714) 521-4811 FAX: (714) 521-4733

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Date _____		
Checked by _____		
Date _____		
Sheet 10 of 12 Sheets		

4163/10 OF 12 SHEET

Last Update: 4/23/24
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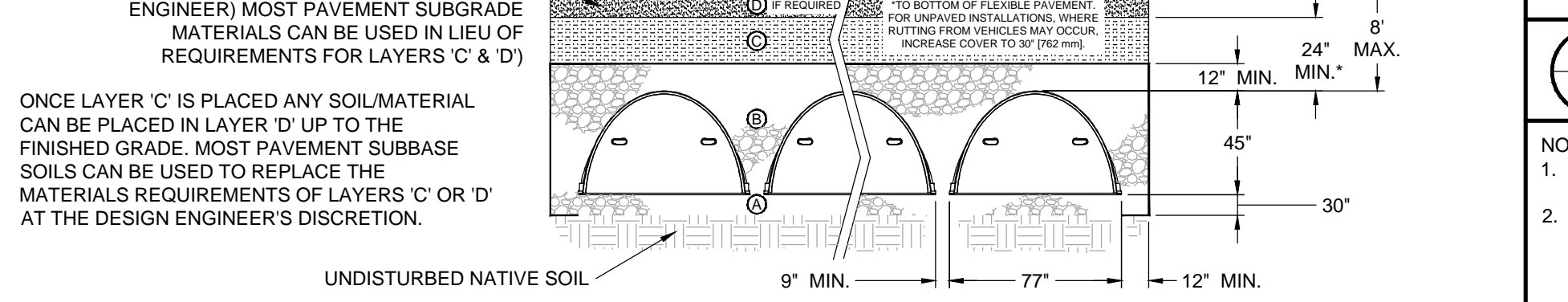
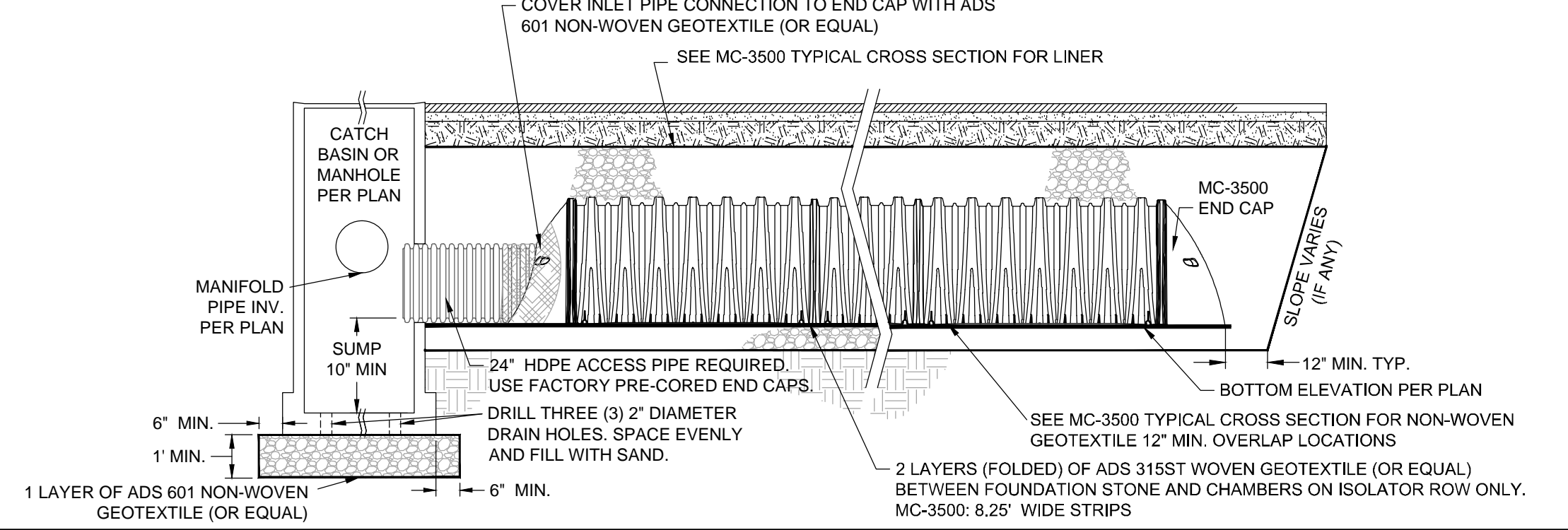
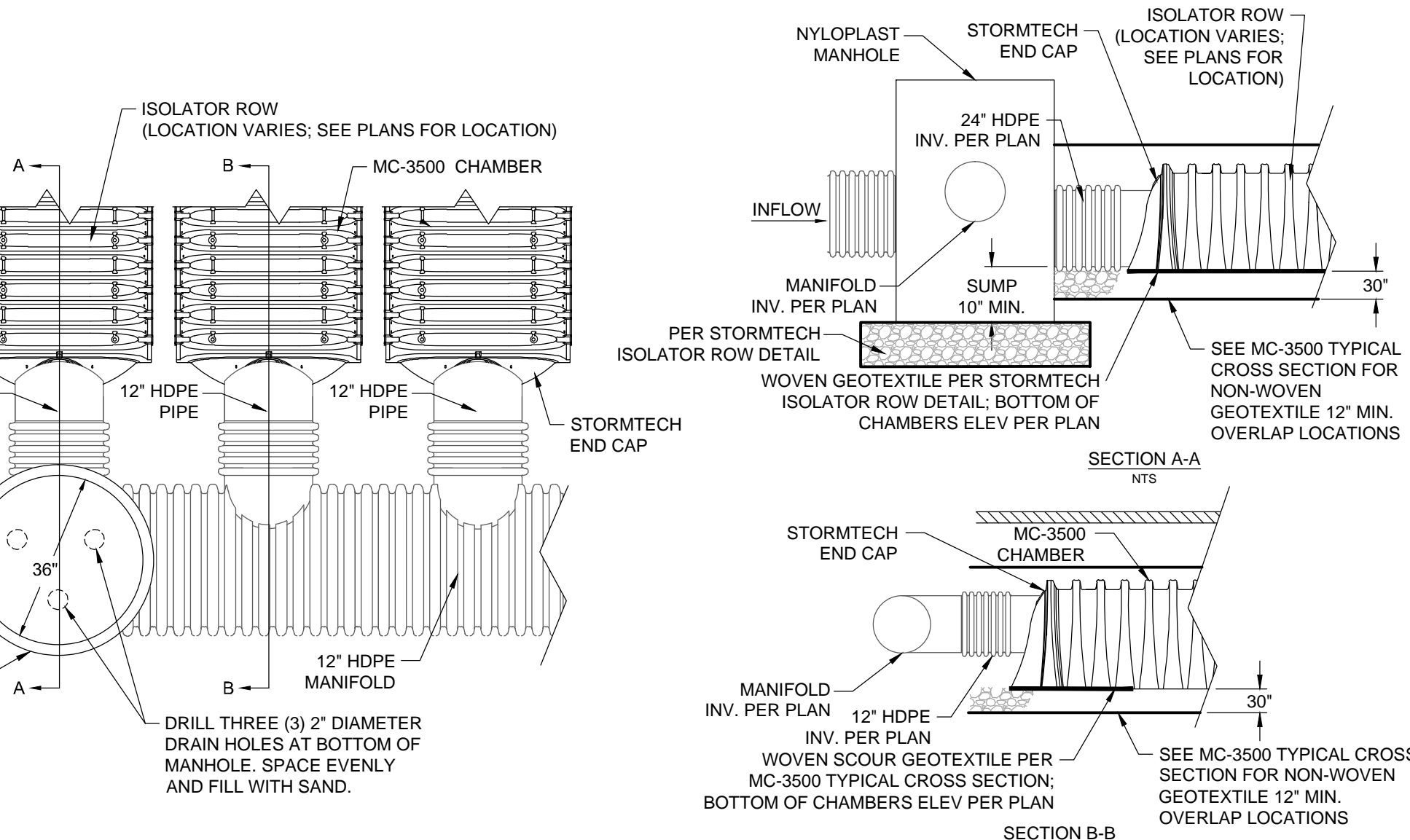


MC-3500 TYPICAL CROSS SECTION

ADS MANIFOLD DETAILS

TECHNICAL DETAILS

MATERIAL LOCATION	DESCRIPTION	AASHTO M43 (DESIGNATION)	COMPACTION/DENSITY REQUIREMENT
1	FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR BEDDED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THIS LAYER.	N/A	PREPARE PER ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
2	FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B LAYER) TO 2' (610 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THIS LAYER.	3, 307, 4, 467, 5, 56, 57, 67, 68, 7, 75, 8, 89, 9, 10	BEGIN COMPACTION AFTER 2" (51 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 2" (51 mm) MAX LIFTS TO A MIN. 95% STANDARD PROCTOR DENSITY.
3	EMBEDMENT STONE SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE TO THE 'C' LAYER ABOVE.	3, 4	NO COMPACTION REQUIRED.
4	FOUNDATION STONE BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	3, 4	FLATE COMPACT OR ROLL TO ACHIEVE A 95% STANDARD PROCTOR DENSITY.



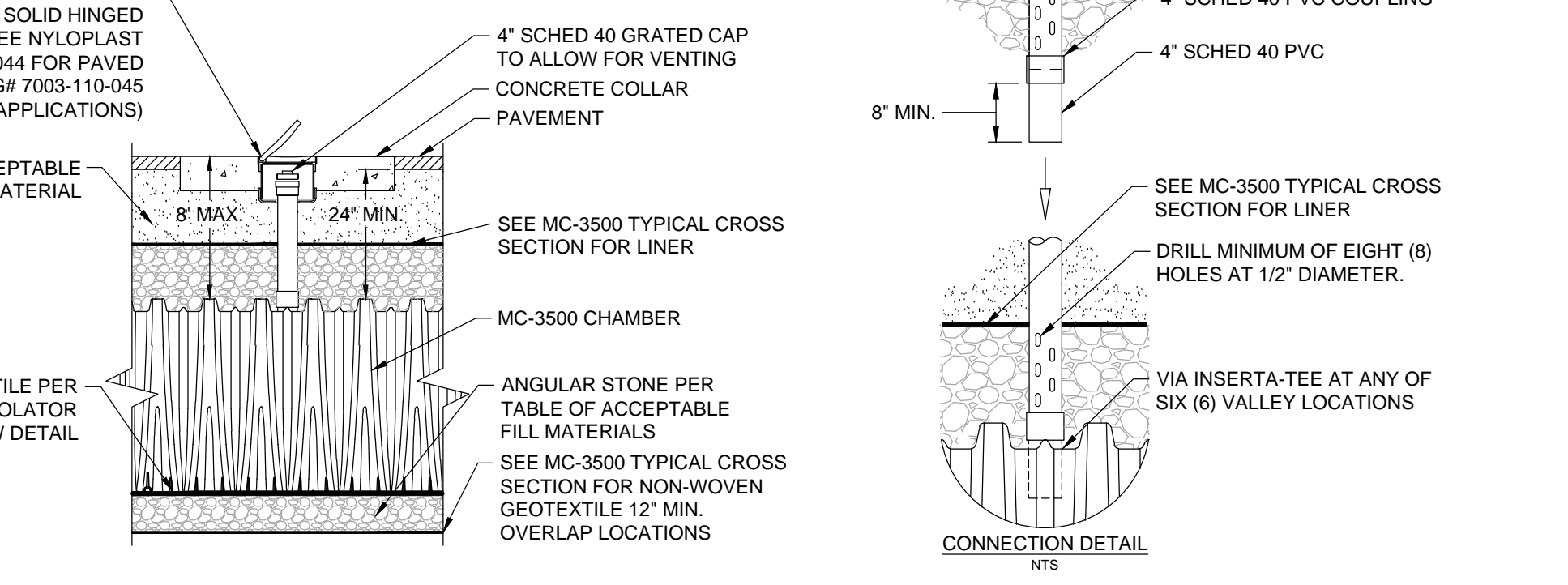
STORMTECH ELEVATIONS

STORMTECH ISOLATOR ROW DETAIL

ACCEPTABLE FILL MATERIALS

NOTES:
 1. INSPECTION PORTS MAY BE CONNECTED VIA INSERTA-TEE AT ANY OF THE TWO CORRUGATION VALLEYS LOCATED AT THE CENTER OF THE CHAMBER. AVOID INSTALLING INSPECTION PORT ON CHAMBER JOINT CORRUGATION.
 2. ALL SCHEDULE 40 FITTINGS TO BE SOLVENT GEMED.

GENERAL NOTES:
 1. ALL DESIGN SPECIFICATIONS FOR STORMTECH CHAMBERS SHALL BE IN ACCORDANCE WITH THE STORMTECH DESIGN MANUAL.
 2. THE INSTALLATION OF STORMTECH CHAMBERS SHALL BE IN ACCORDANCE WITH THE LATEST STORMTECH INSTALLATION INSTRUCTIONS.
 3. THE CONTRACTOR IS ADVISED TO REVIEW AND UNDERSTAND THE INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING SYSTEM INSTALLATION. CALL 1 (888) 892-2694 OR VISIT WWW.STORMTECH.COM TO RECEIVE A COPY OF THE LATEST STORMTECH INSTALLATION INSTRUCTIONS.
 4. THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCE.
 5. THE CONTRACTOR IS REQUIRED TO CALL THE CIVIL ENGINEER AT (714) 521-4811 TO SCHEDULE A FREE PRE-CONSTRUCTION MEETING WITH THE MANUFACTURER.



STORMTECH NOTES

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(\text{imp})^3 - 0.78(\text{imp})^2 + 0.774(\text{imp}) + 0.04$
 $P6 = (0.594)(1.4807) = 0.880$ inches
 $P0 = (1.963)(C_{BMP})(0.880)$
 $DCV = (P0 * \text{Area}) / 12$

Region	Valley	Drainage Area (acres)	Drainage Area (sq-ft)	Impervious Coeff	Runoff Coeff	1-hr 2-yr from NOAA	P6 Coeff	Mean 6-hr (P6)	Drawdown Rate (a)	DCV	DCV
		13.17	573,685	0.95	0.807	0.594	1.4807	0.880	1.963	66,645	1,530

COMPACTION NOTE

Stormtech Project Information: Project Name: Yorba Ave, Chino (TE 4163), Location: Chino, CA, Date: 8/24/2011, Engineer: Thomas Engineering, StormTech RPA.

MC-3500 Site Calculator

System Requirements	System Sizing
Units	CF
Required Storage Volume	Number of Chambers Required
Stone Porosity (Industry Standard = 40%)	Bed Size (including perimeter stone)
Stone Above Chambers (12 inch min.)	Bed Size (including perimeter stone)
Stone Foundation Depth (6 inch min.)	Volume of Excavation
Average Cover over Chambers (24 inch min.)	Non-woven Filter Fabric Required (20% Safety Factor)
Bed size controlled by WEPH or LENOIR?	Length of Isolator Row
Limiting WEPH or LENOIR dimensions	Non-woven Isolator Row Fabric (20% Safety Factor)
Storage Volume per Chamber	Woven Isolator Row Fabric (20% Safety Factor)
Storage Volume per End Cap	Installed Storage Volume

Controlled by Width (Rows): Maximum Width = 55 feet, 6 rows of 44 chambers, 1 row of 43 chambers. Maximum Length = 305.11 feet, Maximum Width = 23.42 feet.

Design infiltration rate = 2.85 in/hr
 $d_{max} = 136.8$ inches = Design infiltration rate x 48 hours = 2.85 in/hr x 48 hrs
 $d_{BMP} = 61.8$ inches = (12 inches + 30 inches) x 0.40 + 45 inches
 $d_{max} > d_{BMP}$

INSPECTION PORT DETAIL

WQMP CALCULATIONS

PREPARED FOR: LOVETT INDUSTRIAL, 610 NEWPORT CENTER DRIVE, SUITE 340, NEWPORT BEACH, CA 92660, PHONE: (949) 402-2760

PREPARED BY: **Tai** Thienes Engineering, Inc., CIVIL ENGINEERING - LAND SURVEYING, 14140 FIRESTONE BOULEVARD, LA HABRA, CALIFORNIA 90630, PH: (714) 521-4811, FAX: (714) 521-4773

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

Approved by: _____ Date: _____
 Public Works Director: R.C.E. XXXXX

Sheet **11** of **12** Sheets

4163/11 OF 12 SHEET

City of Chino Public Works Department
MC-3500 INFILTRATION CHAMBERS
 YORBA AVENUE INDUSTRIAL DEVELOPMENT
 13610 YORBA AVENUE

City of Chino
 PUBLIC WORKS DEPARTMENT
MC-3500 INFILTRATION CHAMBERS
 YORBA AVENUE INDUSTRIAL DEVELOPMENT
 13610 YORBA AVENUE

APPENDIX B

HYDROLOGY CALCULATIONS

EXISTING ONSITE

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

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* TEI JOB NO 4163 *
* EXISTING CONDITION *
* 100 YEAR STORM EVENT *

FILE NAME: W:\4163\X100.DAT
TIME/DATE OF STUDY: 18:07 05/16/2023

=====

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
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK- SIDE / SIDE/ WAY	HEIGHT (FT)	GUTTER GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (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) = 388.00
ELEVATION DATA: UPSTREAM(FEET) = 685.50 DOWNSTREAM(FEET) = 682.20

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 14.783

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.013

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL POOR COVER "BARREN"	B	1.60	0.11	1.000	97	14.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.11

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 1.000

SUBAREA RUNOFF(CFS) = 4.19

TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 4.19

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 682.20 DOWNSTREAM(FEET) = 679.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 247.00 CHANNEL SLOPE = 0.0109
CHANNEL FLOW THRU SUBAREA(CFS) = 4.19
FLOW VELOCITY(FEET/SEC) = 2.12 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 1.95 Tc(MIN.) = 16.73
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 635.00 FEET.

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*****
FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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```

=====
MAINLINE Tc(MIN.) = 16.73
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.797
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
RESIDENTIAL
"1 DWELLING/ACRE"      B        0.73    0.42    0.800   76
NATURAL POOR COVER
"BARREN"               B        0.49    0.11    1.000   97
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.28
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.880
SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 2.80
EFFECTIVE AREA(ACRES) = 2.82 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.18 AREA-AVERAGED Ap = 0.95
TOTAL AREA(ACRES) = 2.8 PEAK FLOW RATE(CFS) = 6.68

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*****
FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 52

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>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

```

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=====
ELEVATION DATA: UPSTREAM(FEET) = 679.50 DOWNSTREAM(FEET) = 677.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 371.00 CHANNEL SLOPE = 0.0054
CHANNEL FLOW THRU SUBAREA(CFS) = 6.68
FLOW VELOCITY(FEET/SEC) = 1.66 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 3.72 Tc(MIN.) = 20.45
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 1006.00 FEET.

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*****
FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

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```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc(MIN.) = 20.45
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.480
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"OPEN BRUSH"          B        2.60    0.31    1.000   84
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.31
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 2.60 SUBAREA RUNOFF(CFS) = 5.08
EFFECTIVE AREA(ACRES) = 5.42 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.24 AREA-AVERAGED Ap = 0.97
TOTAL AREA(ACRES) = 5.4 PEAK FLOW RATE(CFS) = 10.95

```

```

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 5.4 TC(MIN.) = 20.45
EFFECTIVE AREA(ACRES) = 5.42 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.24 AREA-AVERAGED Ap = 0.973
PEAK FLOW RATE(CFS) = 10.95

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END OF RATIONAL METHOD ANALYSIS

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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 4163 *
 * EXISTING CONDITION *
 * 100 YEAR STORM EVENT *

FILE NAME: W:\4163\X110.DAT
 TIME/DATE OF STUDY: 11:36 03/09/2023

=====

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
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GUTTER LIP (FT)	GUTTER GEOMETRIES HIKE (FT)	MANNING FACTOR (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) = 944.00
 ELEVATION DATA: UPSTREAM(FEET) = 688.00 DOWNSTREAM(FEET) = 676.40

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

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 19.600

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.544

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL POOR COVER "BARREN"	B	2.09	0.11	1.000	97	19.60
NATURAL FAIR COVER "OPEN BRUSH"	B	1.98	0.31	1.000	84	26.36

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 8.57

TOTAL AREA(ACRES) = 4.07 PEAK FLOW RATE(CFS) = 8.57

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 4.1 TC(MIN.) = 19.60

EFFECTIVE AREA(ACRES) = 4.07 AREA-AVERAGED Fm(INCH/HR)= 0.20

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 8.57
=====

=====
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 4163 *
* EXISTING CONDITION *
* 100 YEAR STORM EVENT *

FILE NAME: W:\4163\X120.DAT
TIME/DATE OF STUDY: 11:39 03/09/2023

=====
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
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE / PARK-SIDE / WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GUTTER LIP (FT), GUTTER HIKE (FT), GUTTER GEOMETRIES (n), MANNING FACTOR. Row 1: 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) = 966.00
ELEVATION DATA: UPSTREAM(FEET) = 684.30 DOWNSTREAM(FEET) = 675.40

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

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 20.954

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.444

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL POOR COVER "BARREN"	B	1.57	0.11	1.000	97	20.95
NATURAL FAIR COVER "OPEN BRUSH"	B	2.46	0.31	1.000	84	28.18

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.23

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 8.03

TOTAL AREA(ACRES) = 4.03 PEAK FLOW RATE(CFS) = 8.03

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 4.0 TC(MIN.) = 20.95

EFFECTIVE AREA(ACRES) = 4.03 AREA-AVERAGED Fm(INCH/HR)= 0.23

AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 8.03

=====

=====

END OF RATIONAL METHOD ANALYSIS



PROPOSED ONSITE ONLY

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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* TEI JOB NO 4163 SITE ONLY *
* PROPOSED CONDITION (ONSITE ONLY) *
* 100 YEAR STORM EVENT *

FILE NAME: W:\4163\P100S.DAT
TIME/DATE OF STUDY: 15:24 04/17/2024

=====
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
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), SIDE / SIDE/ WAY, HEIGHT (FT), CURB GUTTER-GEOMETRIES: MANNING (FT) (FT) (FT) (FT) (n), and FACTOR. Row 1: 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) = 394.00
ELEVATION DATA: UPSTREAM(FEET) = 682.75 DOWNSTREAM(FEET) = 678.92

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.386
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.234
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 B 2.37 0.42 0.100 76 8.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.94
TOTAL AREA(ACRES) = 2.37 PEAK FLOW RATE(CFS) = 8.94

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 675.13 DOWNSTREAM(FEET) = 673.56
FLOW LENGTH(FEET) = 460.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.61
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.94
PIPE TRAVEL TIME(MIN.) = 1.66 Tc(MIN.) = 10.05
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 854.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 10.05
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.798
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.73 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.73 SUBAREA RUNOFF(CFS) = 2.47
EFFECTIVE AREA(ACRES) = 3.10 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.1 PEAK FLOW RATE(CFS) = 10.48

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 673.60 DOWNSTREAM(FEET) = 673.28
FLOW LENGTH(FEET) = 99.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.77
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.48
PIPE TRAVEL TIME(MIN.) = 0.35 Tc(MIN.) = 10.39
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 953.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 10.39
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.722
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.49 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 1.62
EFFECTIVE AREA(ACRES) = 3.59 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.6 PEAK FLOW RATE(CFS) = 11.89

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 673.28 DOWNSTREAM(FEET) = 672.49
FLOW LENGTH(FEET) = 240.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.92
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.89
PIPE TRAVEL TIME(MIN.) = 0.81 Tc(MIN.) = 11.21
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 1193.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

```

=====
MAINLINE Tc(MIN.) = 11.21
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.557
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              B        0.29      0.42      0.100    76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.29      SUBAREA RUNOFF(CFS) = 0.92
EFFECTIVE AREA(ACRES) = 3.88      AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42  AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.9      PEAK FLOW RATE(CFS) = 12.27

```

```

*****
FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
-----

```

```

ELEVATION DATA: UPSTREAM(FEET) = 672.49  DOWNSTREAM(FEET) = 672.13
FLOW LENGTH(FEET) = 126.00  MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.63
ESTIMATED PIPE DIAMETER(INCH) = 24.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.27
PIPE TRAVEL TIME(MIN.) = 0.45  Tc(MIN.) = 11.66
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 1319.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81
-----

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```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
-----

```

```

MAINLINE Tc(MIN.) = 11.66
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.474
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              B        0.18      0.42      0.100    76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.18      SUBAREA RUNOFF(CFS) = 0.56
EFFECTIVE AREA(ACRES) = 4.06      AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42  AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 4.1      PEAK FLOW RATE(CFS) = 12.54

```

```

*****
FLOW PROCESS FROM NODE 105.00 TO NODE 111.00 IS CODE = 31
-----

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```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
-----

```

```

ELEVATION DATA: UPSTREAM(FEET) = 672.13  DOWNSTREAM(FEET) = 670.97
FLOW LENGTH(FEET) = 352.00  MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.95
ESTIMATED PIPE DIAMETER(INCH) = 24.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.54
PIPE TRAVEL TIME(MIN.) = 1.18  Tc(MIN.) = 12.85
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 1671.00 FEET.

```

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*****
FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 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.) = 12.85
RAINFALL INTENSITY(INCH/HR) = 3.28
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 4.06
TOTAL STREAM AREA(ACRES) = 4.06
PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.54

```

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*****

```

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) = 231.00
ELEVATION DATA: UPSTREAM(FEET) = 682.52 DOWNSTREAM(FEET) = 677.61

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.792
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.286
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 B 1.89 0.42 0.100 76 5.79
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.92
TOTAL AREA(ACRES) = 1.89 PEAK FLOW RATE(CFS) = 8.92

FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 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.) = 5.79
RAINFALL INTENSITY(INCH/HR) = 5.29
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.89
TOTAL STREAM AREA(ACRES) = 1.89
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.92

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 12.54 12.85 3.278 0.42(0.04) 0.10 4.1 100.00
2 8.92 5.79 5.286 0.42(0.04) 0.10 1.9 110.00

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 18.08 5.79 5.286 0.42(0.04) 0.10 3.7 110.00
2 18.04 12.85 3.278 0.42(0.04) 0.10 5.9 100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 18.08 Tc(MIN.) = 5.79
EFFECTIVE AREA(ACRES) = 3.72 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 5.9
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 1671.00 FEET.

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) = 670.97 DOWNSTREAM(FEET) = 670.55
FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.25
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 18.08
PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 6.22
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 1805.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 6.22
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.066
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.22 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 5.52
 EFFECTIVE AREA(ACRES) = 4.94 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 7.2 PEAK FLOW RATE(CFS) = 22.34

 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) = 670.55 DOWNSTREAM(FEET) = 670.12
 FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.67
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 22.34
 PIPE TRAVEL TIME(MIN.) = 0.39 Tc(MIN.) = 6.61
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 113.00 = 1939.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE Tc(MIN.) = 6.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.883
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.53 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.53 SUBAREA RUNOFF(CFS) = 6.67
 EFFECTIVE AREA(ACRES) = 6.47 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 28.19

 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) = 670.12 DOWNSTREAM(FEET) = 669.69
 FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.02
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 28.19
 PIPE TRAVEL TIME(MIN.) = 0.37 Tc(MIN.) = 6.98
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 114.00 = 2073.00 FEET.

 FLOW PROCESS FROM NODE 114.00 TO NODE 114.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE Tc(MIN.) = 6.98
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.725
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.20 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.20 SUBAREA RUNOFF(CFS) = 5.06
 EFFECTIVE AREA(ACRES) = 7.67 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 9.9 PEAK FLOW RATE(CFS) = 32.33

FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 669.69 DOWNSTREAM(FEET) = 669.26
FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.29
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 32.33
PIPE TRAVEL TIME(MIN.) = 0.36 Tc(MIN.) = 7.34
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 115.00 = 2207.00 FEET.

FLOW PROCESS FROM NODE 115.00 TO NODE 115.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 7.34
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.587
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 2.31 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 2.31 SUBAREA RUNOFF(CFS) = 9.45
EFFECTIVE AREA(ACRES) = 9.98 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 12.2 PEAK FLOW RATE(CFS) = 40.82

FLOW PROCESS FROM NODE 115.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 669.26 DOWNSTREAM(FEET) = 668.41
FLOW LENGTH(FEET) = 39.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.63
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 40.82
PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 7.38
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 2246.00 FEET.

FLOW PROCESS FROM NODE 121.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 668.41 DOWNSTREAM(FEET) = 665.64
FLOW LENGTH(FEET) = 204.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.45
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 40.82
PIPE TRAVEL TIME(MIN.) = 0.30 Tc(MIN.) = 7.68
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 133.00 = 2450.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 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.) = 7.68
RAINFALL INTENSITY(INCH/HR) = 4.46
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 9.98
TOTAL STREAM AREA(ACRES) = 12.21
PEAK FLOW RATE(CFS) AT CONFLUENCE = 40.82

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) = 437.00
ELEVATION DATA: UPSTREAM(FEET) = 679.98 DOWNSTREAM(FEET) = 675.97

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 8.842
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.101
SUBAREA T_c AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS T_c
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL B 0.68 0.42 0.100 76 8.84
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA RUNOFF(CFS) = 2.48
TOTAL AREA(ACRES) = 0.68 PEAK FLOW RATE(CFS) = 2.48

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 671.95 DOWNSTREAM(FEET) = 667.85
FLOW LENGTH(FEET) = 87.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.13
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.48
PIPE TRAVEL TIME(MIN.) = 0.16 T_c (MIN.) = 9.00
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 524.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE T_c (MIN.) = 9.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.058
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.21 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA AREA(ACRES) = 0.21 SUBAREA RUNOFF(CFS) = 0.76
EFFECTIVE AREA(ACRES) = 0.89 AREA-AVERAGED F_m (INCH/HR) = 0.04
AREA-AVERAGED F_p (INCH/HR) = 0.42 AREA-AVERAGED A_p = 0.10
TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 3.22

FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 667.85 DOWNSTREAM(FEET) = 665.64
FLOW LENGTH(FEET) = 12.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 3.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.02
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.22
PIPE TRAVEL TIME(MIN.) = 0.01 T_c (MIN.) = 9.01
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 536.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 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.) = 9.01
 RAINFALL INTENSITY(INCH/HR) = 4.05
 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 0.89
 TOTAL STREAM AREA(ACRES) = 0.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.22

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	40.82	7.68	4.462	0.42(0.04)	0.10	10.0	110.00
1	33.12	14.80	3.011	0.42(0.04)	0.10	12.2	100.00
2	3.22	9.01	4.054	0.42(0.04)	0.10	0.9	130.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	43.84	7.68	4.462	0.42(0.04)	0.10	10.7	110.00
2	42.60	9.01	4.054	0.42(0.04)	0.10	11.3	130.00
3	35.50	14.80	3.011	0.42(0.04)	0.10	13.1	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 43.84 Tc(MIN.) = 7.68
 EFFECTIVE AREA(ACRES) = 10.74 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 13.1
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 133.00 = 2450.00 FEET.

 FLOW PROCESS FROM NODE 133.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 665.64 DOWNSTREAM(FEET) = 663.62
 FLOW LENGTH(FEET) = 99.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.36
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 43.84
 PIPE TRAVEL TIME(MIN.) = 0.12 Tc(MIN.) = 7.81
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 210.00 = 2549.00 FEET.

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 13.1 TC(MIN.) = 7.81
 EFFECTIVE AREA(ACRES) = 10.74 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 PEAK FLOW RATE(CFS) = 43.84

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	43.84	7.81	4.420	0.42(0.04)	0.10	10.7	110.00
2	42.60	9.14	4.021	0.42(0.04)	0.10	11.3	130.00
3	35.50	14.93	2.995	0.42(0.04)	0.10	13.1	100.00

END OF RATIONAL METHOD ANALYSIS



PROPOSED ONSITE & OFFSITE COMBINED

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* TEI JOB NO 4163 *
* PROPOSED CONDITION (ONSITE & OFFSITE) *
* 100 YEAR STORM EVENT *
*****

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FILE NAME: W:\4163\P100.DAT
TIME/DATE OF STUDY: 08:36 04/17/2024

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

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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
*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

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SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

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ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (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

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

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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 394.00
ELEVATION DATA: UPSTREAM(FEET) = 682.75 DOWNSTREAM(FEET) = 678.92

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.386
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.234
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            B        2.37      0.42      0.100   76    8.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.94
TOTAL AREA(ACRES) = 2.37 PEAK FLOW RATE(CFS) = 8.94

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*****
FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

ELEVATION DATA: UPSTREAM(FEET) = 675.13 DOWNSTREAM(FEET) = 673.56
FLOW LENGTH(FEET) = 460.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.61
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.94
PIPE TRAVEL TIME(MIN.) = 1.66 Tc(MIN.) = 10.05
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 854.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 10.05
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.798
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.73 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.73 SUBAREA RUNOFF(CFS) = 2.47
EFFECTIVE AREA(ACRES) = 3.10 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.1 PEAK FLOW RATE(CFS) = 10.48

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 673.60 DOWNSTREAM(FEET) = 673.28
FLOW LENGTH(FEET) = 99.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.77
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.48
PIPE TRAVEL TIME(MIN.) = 0.35 Tc(MIN.) = 10.39
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 953.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 10.39
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.722
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.49 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 1.62
EFFECTIVE AREA(ACRES) = 3.59 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.6 PEAK FLOW RATE(CFS) = 11.89

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 673.28 DOWNSTREAM(FEET) = 672.49
FLOW LENGTH(FEET) = 240.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.92
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.89
PIPE TRAVEL TIME(MIN.) = 0.81 Tc(MIN.) = 11.21
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 1193.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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=====
MAINLINE Tc(MIN.) = 11.21
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.557
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL                B      0.29      0.42      0.100    76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.29      SUBAREA RUNOFF(CFS) = 0.92
EFFECTIVE AREA(ACRES) = 3.88      AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42  AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.9      PEAK FLOW RATE(CFS) = 12.27

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FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 672.49  DOWNSTREAM(FEET) = 672.13
FLOW LENGTH(FEET) = 126.00  MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.63
ESTIMATED PIPE DIAMETER(INCH) = 24.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.27
PIPE TRAVEL TIME(MIN.) = 0.45  Tc(MIN.) = 11.66
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 1319.00 FEET.

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FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 11.66
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.474
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL                B      0.18      0.42      0.100    76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.18      SUBAREA RUNOFF(CFS) = 0.56
EFFECTIVE AREA(ACRES) = 4.06      AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42  AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 4.1      PEAK FLOW RATE(CFS) = 12.54

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*****
FLOW PROCESS FROM NODE 105.00 TO NODE 111.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 672.13  DOWNSTREAM(FEET) = 670.97
FLOW LENGTH(FEET) = 352.00  MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.95
ESTIMATED PIPE DIAMETER(INCH) = 24.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.54
PIPE TRAVEL TIME(MIN.) = 1.18  Tc(MIN.) = 12.85
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 1671.00 FEET.

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*****
FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 12.85
RAINFALL INTENSITY(INCH/HR) = 3.28
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 4.06
TOTAL STREAM AREA(ACRES) = 4.06
PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.54

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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) = 231.00
ELEVATION DATA: UPSTREAM(FEET) = 682.52 DOWNSTREAM(FEET) = 677.61

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.792
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.286
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 B 1.89 0.42 0.100 76 5.79
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.92
TOTAL AREA(ACRES) = 1.89 PEAK FLOW RATE(CFS) = 8.92

FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 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.) = 5.79
RAINFALL INTENSITY(INCH/HR) = 5.29
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.89
TOTAL STREAM AREA(ACRES) = 1.89
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.92

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.54	12.85	3.278	0.42(0.04)	0.10	4.1	100.00
2	8.92	5.79	5.286	0.42(0.04)	0.10	1.9	110.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.08	5.79	5.286	0.42(0.04)	0.10	3.7	110.00
2	18.04	12.85	3.278	0.42(0.04)	0.10	5.9	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 18.08 Tc(MIN.) = 5.79
EFFECTIVE AREA(ACRES) = 3.72 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 5.9
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 1671.00 FEET.

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) = 670.97 DOWNSTREAM(FEET) = 670.55
FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.25
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 18.08
PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 6.22
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 1805.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 6.22
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.066
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.22 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 5.52
 EFFECTIVE AREA(ACRES) = 4.94 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 7.2 PEAK FLOW RATE(CFS) = 22.34

 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) = 670.55 DOWNSTREAM(FEET) = 670.12
 FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.67
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 22.34
 PIPE TRAVEL TIME(MIN.) = 0.39 Tc(MIN.) = 6.61
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 113.00 = 1939.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE Tc(MIN.) = 6.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.883
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.53 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.53 SUBAREA RUNOFF(CFS) = 6.67
 EFFECTIVE AREA(ACRES) = 6.47 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 28.19

 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) = 670.12 DOWNSTREAM(FEET) = 669.69
 FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.02
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 28.19
 PIPE TRAVEL TIME(MIN.) = 0.37 Tc(MIN.) = 6.98
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 114.00 = 2073.00 FEET.

 FLOW PROCESS FROM NODE 114.00 TO NODE 114.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE Tc(MIN.) = 6.98
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.725
 SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL B 1.20 0.42 0.100 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.20 SUBAREA RUNOFF(CFS) = 5.06
 EFFECTIVE AREA(ACRES) = 7.67 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 9.9 PEAK FLOW RATE(CFS) = 32.33

FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 669.69 DOWNSTREAM(FEET) = 669.26
FLOW LENGTH(FEET) = 134.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.29
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 32.33
PIPE TRAVEL TIME(MIN.) = 0.36 Tc(MIN.) = 7.34
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 115.00 = 2207.00 FEET.

FLOW PROCESS FROM NODE 115.00 TO NODE 115.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 7.34
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.587
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 2.31 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 2.31 SUBAREA RUNOFF(CFS) = 9.45
EFFECTIVE AREA(ACRES) = 9.98 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 12.2 PEAK FLOW RATE(CFS) = 40.82

FLOW PROCESS FROM NODE 115.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 669.26 DOWNSTREAM(FEET) = 668.41
FLOW LENGTH(FEET) = 39.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.63
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 40.82
PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 7.38
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 2246.00 FEET.

FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 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.) = 7.38
RAINFALL INTENSITY(INCH/HR) = 4.57
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 9.98
TOTAL STREAM AREA(ACRES) = 12.21
PEAK FLOW RATE(CFS) AT CONFLUENCE = 40.82

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN.) = 8.40 RAINFALL INTENSITY(INCH/HR) = 4.23
EFFECTIVE AREA(ACRES) = 8.36
TOTAL AREA(ACRES) = 8.36 PEAK FLOW RATE(CFS) = 38.65
AREA-AVERAGED Fm(INCH/HR) = 0.04 AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
CONFLUENCE ANALYSES.

FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 673.57 DOWNSTREAM(FEET) = 668.41
FLOW LENGTH(FEET) = 718.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.89
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 38.65
PIPE TRAVEL TIME(MIN.) = 1.35 Tc(MIN.) = 9.75
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 121.00 = 949.00 FEET.

FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE Tc(MIN.) = 9.75
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.868
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.30 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.03
EFFECTIVE AREA(ACRES) = 8.66 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 38.65
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 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.) = 9.75
RAINFALL INTENSITY(INCH/HR) = 3.87
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 8.66
TOTAL STREAM AREA(ACRES) = 8.66
PEAK FLOW RATE(CFS) AT CONFLUENCE = 38.65

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	40.82	7.38	4.569	0.42(0.04)	0.10	10.0	110.00
1	33.12	14.49	3.050	0.42(0.04)	0.10	12.2	100.00
2	38.65	9.75	3.868	0.42(0.04)	0.10	8.7	120.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	75.47	7.38	4.569	0.42(0.04)	0.10	16.5	110.00
2	76.91	9.75	3.868	0.42(0.04)	0.10	19.4	120.00
3	63.50	14.49	3.050	0.42(0.04)	0.10	20.9	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 76.91 Tc(MIN.) = 9.75
EFFECTIVE AREA(ACRES) = 19.38 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 20.9
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 2246.00 FEET.

FLOW PROCESS FROM NODE 121.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

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=====
ELEVATION DATA: UPSTREAM(FEET) = 668.41 DOWNSTREAM(FEET) = 665.64
FLOW LENGTH(FEET) = 204.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.20
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 76.91
PIPE TRAVEL TIME(MIN.) = 0.26 Tc(MIN.) = 10.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 133.00 = 2450.00 FEET.

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FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 IS CODE = 1

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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 10.00
RAINFALL INTENSITY(INCH/HR) = 3.81
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 19.38
TOTAL STREAM AREA(ACRES) = 20.87
PEAK FLOW RATE(CFS) AT CONFLUENCE = 76.91

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*****
FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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INITIAL SUBAREA FLOW-LENGTH(FEET) = 437.00
ELEVATION DATA: UPSTREAM(FEET) = 679.98 DOWNSTREAM(FEET) = 675.97

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.842
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.101
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          B      0.68     0.42     0.100    76   8.84
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.48
TOTAL AREA(ACRES) = 0.68 PEAK FLOW RATE(CFS) = 2.48

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*****
FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 31

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-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 671.95 DOWNSTREAM(FEET) = 667.85
FLOW LENGTH(FEET) = 87.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.13
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.48
PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 9.00
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 524.00 FEET.

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*****
FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 9.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.058
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/   SCS SOIL  AREA      Fp          Ap      SCS
LAND USE            GROUP  (ACRES)  (INCH/HR)  (DECIMAL) CN
COMMERCIAL          B      0.21     0.42     0.100    76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.21 SUBAREA RUNOFF(CFS) = 0.76
EFFECTIVE AREA(ACRES) = 0.89 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10

```

TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 3.22

FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 667.85 DOWNSTREAM(FEET) = 665.64
FLOW LENGTH(FEET) = 12.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 3.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.02
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.22
PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 9.01
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 536.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 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.) = 9.01
RAINFALL INTENSITY(INCH/HR) = 4.05
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.89
TOTAL STREAM AREA(ACRES) = 0.89
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.22

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	75.47	7.64	4.476	0.42(0.04)	0.10	16.5	110.00
1	76.91	10.00	3.808	0.42(0.04)	0.10	19.4	120.00
1	63.50	14.76	3.016	0.42(0.04)	0.10	20.9	100.00
2	3.22	9.01	4.054	0.42(0.04)	0.10	0.9	130.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	78.48	7.64	4.476	0.42(0.04)	0.10	17.3	110.00
2	79.52	9.01	4.054	0.42(0.04)	0.10	19.1	130.00
3	79.93	10.00	3.808	0.42(0.04)	0.10	20.3	120.00
4	65.88	14.76	3.016	0.42(0.04)	0.10	21.8	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 79.93 Tc(MIN.) = 10.00
EFFECTIVE AREA(ACRES) = 20.27 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 21.8
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 133.00 = 2450.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 665.64 DOWNSTREAM(FEET) = 663.62
FLOW LENGTH(FEET) = 99.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.80
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 79.93
PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 10.11
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 210.00 = 2549.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 10.11
RAINFALL INTENSITY(INCH/HR) = 3.78
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 20.27
TOTAL STREAM AREA(ACRES) = 21.76
PEAK FLOW RATE(CFS) AT CONFLUENCE = 79.93

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 480.00
ELEVATION DATA: UPSTREAM(FEET) = 677.63 DOWNSTREAM(FEET) = 676.40
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.848
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.441
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 B 0.66 0.42 0.100 76 11.85
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.02
TOTAL AREA(ACRES) = 0.66 PEAK FLOW RATE(CFS) = 2.02

FLOW PROCESS FROM NODE 201.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 667.63 DOWNSTREAM(FEET) = 663.62
FLOW LENGTH(FEET) = 110.00 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.) = 7.87
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.02
PIPE TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 12.08
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 590.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 12.08
RAINFALL INTENSITY(INCH/HR) = 3.40
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.66
TOTAL STREAM AREA(ACRES) = 0.66
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.02

** CONFLUENCE DATA **
Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 5 rows of data for different stream numbers and flow rates.

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	80.18	7.75	4.438	0.42(0.04)	0.10	17.7	110.00
2	81.33	9.12	4.025	0.42(0.04)	0.10	19.6	130.00
3	81.81	10.11	3.785	0.42(0.04)	0.10	20.8	120.00
4	76.13	12.08	3.401	0.42(0.04)	0.10	21.5	200.00
5	67.66	14.87	3.002	0.42(0.04)	0.10	22.4	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 81.81 Tc(MIN.) = 10.11
 EFFECTIVE AREA(ACRES) = 20.82 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 22.4
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 210.00 = 2549.00 FEET.

FLOW PROCESS FROM NODE 220.00 TO NODE 220.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 10.11

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.785

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
NATURAL GOOD COVER "WOODLAND,GRASS"	B	0.34	0.40	1.000	77

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.40

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 0.34 SUBAREA RUNOFF(CFS) = 1.04

EFFECTIVE AREA(ACRES) = 21.16 AREA-AVERAGED Fm(INCH/HR) = 0.05

AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.11

TOTAL AREA(ACRES) = 22.8 PEAK FLOW RATE(CFS) = 81.81

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 22.8 TC(MIN.) = 10.11

EFFECTIVE AREA(ACRES) = 21.16 AREA-AVERAGED Fm(INCH/HR) = 0.05

AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.114

PEAK FLOW RATE(CFS) = 81.81

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	80.18	7.75	4.438	0.42(0.05)	0.12	18.1	110.00
2	81.33	9.12	4.025	0.42(0.05)	0.12	19.9	130.00
3	81.81	10.11	3.785	0.42(0.05)	0.11	21.2	120.00
4	76.13	12.08	3.401	0.42(0.05)	0.11	21.9	200.00
5	67.66	14.87	3.002	0.42(0.05)	0.11	22.8	100.00

=====

END OF RATIONAL METHOD ANALYSIS

▲

APPENDIX C

DETENTION CALCULATIONS

 NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
 AND LOW LOSS FRACTION ESTIMATIONS
 =====

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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

Problem Descriptions:
 TEI JOB NO 4163
 PROPOSED CONDITION
 LOSS RATES

 *** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
 AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:
 =====

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 7.00 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp (in./hr.)	YIELD
1	5.62	10.00	56.(AMC II)	0.423	0.930

TOTAL AREA (Acres) = 5.62

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.042

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.070

=====

JOB #4163 BLDG 1
TRUCK YARD DETENTION VOLUME

Elevation	Depth	Area	Volume	Σ Volume	Σ Volume	Discharge
	(feet)	(sq. ft.)	(c.f.)	(c.f.)	(ac-ft)	(cfs) 15" downstream section
677.61	0.00	0				
			118	118	0.00	15.9
677.70	0.09	2,615				
			741	859	0.02	16.0
677.80	0.19	12,210				
			2,052	2,911	0.07	16.1
677.90	0.29	28,835				
			3,904	6,815	0.16	16.2
678.00	0.39	49,250				
			5,811	12,626	0.29	16.3
678.10	0.49	66,967				
			5,082	17,708	0.41	16.3
678.17	0.56	78,221				

SMALL AREA UNIT HYDROGRAPH MODEL

=====

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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

Problem Descriptions:

TEI JOB NO. 4163
PROPOSED CONDITION
TRUCK YARD DETENTION HYDROGRAPH

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA (ACRES) = 8.15
SOIL-LOSS RATE, Fm, (INCH/HR) = 0.042
LOW LOSS FRACTION = 0.070
TIME OF CONCENTRATION (MIN.) = 7.38
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 100
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE (INCHES) = 1.00
1-HOUR POINT RAINFALL VALUE (INCHES) = 1.30
3-HOUR POINT RAINFALL VALUE (INCHES) = 2.30
6-HOUR POINT RAINFALL VALUE (INCHES) = 3.20
24-HOUR POINT RAINFALL VALUE (INCHES) = 7.00

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 3.99
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.77

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
0.01	0.0000	0.00	Q	.	.	.	.
0.13	0.0057	1.12	.Q	.	.	.	.
0.26	0.0172	1.13	.Q	.	.	.	.
0.38	0.0287	1.13	.Q	.	.	.	.
0.50	0.0402	1.14	.Q	.	.	.	.
0.62	0.0517	1.14	.Q	.	.	.	.
0.75	0.0634	1.14	.Q	.	.	.	.
0.87	0.0750	1.15	.Q	.	.	.	.
0.99	0.0867	1.15	.Q	.	.	.	.
1.12	0.0984	1.16	.Q	.	.	.	.
1.24	0.1102	1.16	.Q	.	.	.	.
1.36	0.1220	1.16	.Q	.	.	.	.
1.49	0.1339	1.17	.Q	.	.	.	.
1.61	0.1458	1.17	.Q	.	.	.	.
1.73	0.1577	1.18	.Q	.	.	.	.
1.85	0.1697	1.18	.Q	.	.	.	.
1.98	0.1817	1.19	.Q	.	.	.	.

2.10	0.1938	1.19	.Q	.	.	.	.
2.22	0.2059	1.19	.Q	.	.	.	.
2.35	0.2181	1.20	.Q	.	.	.	.
2.47	0.2303	1.20	.Q	.	.	.	.
2.59	0.2426	1.21	.Q	.	.	.	.
2.72	0.2549	1.21	.Q	.	.	.	.
2.84	0.2673	1.22	.Q	.	.	.	.
2.96	0.2797	1.22	.Q	.	.	.	.
3.08	0.2922	1.23	.Q	.	.	.	.
3.21	0.3047	1.23	.Q	.	.	.	.
3.33	0.3173	1.24	.Q	.	.	.	.
3.45	0.3299	1.24	.Q	.	.	.	.
3.58	0.3426	1.25	.Q	.	.	.	.
3.70	0.3553	1.25	.Q	.	.	.	.
3.82	0.3681	1.26	.Q	.	.	.	.
3.95	0.3809	1.27	.Q	.	.	.	.
4.07	0.3938	1.27	.Q	.	.	.	.
4.19	0.4068	1.28	.Q	.	.	.	.
4.32	0.4198	1.28	.Q	.	.	.	.
4.44	0.4329	1.29	.Q	.	.	.	.
4.56	0.4460	1.30	.Q	.	.	.	.
4.68	0.4592	1.30	.Q	.	.	.	.
4.81	0.4724	1.31	.Q	.	.	.	.
4.93	0.4858	1.31	.Q	.	.	.	.
5.05	0.4992	1.32	.Q	.	.	.	.
5.18	0.5126	1.33	.Q	.	.	.	.
5.30	0.5261	1.33	.Q	.	.	.	.
5.42	0.5397	1.34	.Q	.	.	.	.
5.54	0.5534	1.35	.Q	.	.	.	.
5.67	0.5671	1.35	.Q	.	.	.	.
5.79	0.5809	1.36	.Q	.	.	.	.
5.91	0.5947	1.37	.Q	.	.	.	.
6.04	0.6087	1.38	.Q	.	.	.	.
6.16	0.6227	1.38	.Q	.	.	.	.
6.28	0.6368	1.39	.Q	.	.	.	.
6.41	0.6509	1.40	.Q	.	.	.	.
6.53	0.6652	1.41	.Q	.	.	.	.
6.65	0.6795	1.41	.Q	.	.	.	.
6.78	0.6939	1.42	.Q	.	.	.	.
6.90	0.7084	1.43	.Q	.	.	.	.
7.02	0.7230	1.44	.Q	.	.	.	.
7.14	0.7376	1.44	.Q	.	.	.	.
7.27	0.7524	1.46	.Q	.	.	.	.
7.39	0.7672	1.46	.Q	.	.	.	.
7.51	0.7821	1.47	.Q	.	.	.	.
7.64	0.7971	1.48	.Q	.	.	.	.
7.76	0.8122	1.49	.Q	.	.	.	.
7.88	0.8275	1.50	.Q	.	.	.	.
8.01	0.8428	1.51	.Q	.	.	.	.
8.13	0.8582	1.52	.Q	.	.	.	.
8.25	0.8737	1.53	.Q	.	.	.	.
8.37	0.8893	1.54	.Q	.	.	.	.
8.50	0.9051	1.55	.Q	.	.	.	.
8.62	0.9209	1.56	.Q	.	.	.	.
8.74	0.9369	1.58	.Q	.	.	.	.
8.87	0.9529	1.58	.Q	.	.	.	.
8.99	0.9691	1.60	.Q	.	.	.	.
9.11	0.9854	1.61	.Q	.	.	.	.
9.23	1.0019	1.63	.Q	.	.	.	.
9.36	1.0184	1.63	.Q	.	.	.	.
9.48	1.0351	1.65	.Q	.	.	.	.
9.60	1.0520	1.66	.Q	.	.	.	.
9.73	1.0690	1.68	.Q	.	.	.	.
9.85	1.0861	1.69	.Q	.	.	.	.
9.97	1.1033	1.71	.Q	.	.	.	.

10.10	1.1208	1.72	.Q	.	.	.	.
10.22	1.1383	1.74	.Q	.	.	.	.
10.34	1.1561	1.75	.Q	.	.	.	.
10.47	1.1740	1.77	.Q	.	.	.	.
10.59	1.1920	1.78	.Q	.	.	.	.
10.71	1.2103	1.81	.Q	.	.	.	.
10.83	1.2287	1.82	.Q	.	.	.	.
10.96	1.2473	1.84	.Q	.	.	.	.
11.08	1.2661	1.86	.Q	.	.	.	.
11.20	1.2852	1.88	.Q	.	.	.	.
11.33	1.3044	1.90	.Q	.	.	.	.
11.45	1.3238	1.93	.Q	.	.	.	.
11.57	1.3435	1.94	.Q	.	.	.	.
11.70	1.3634	1.97	.Q	.	.	.	.
11.82	1.3835	1.99	.Q	.	.	.	.
11.94	1.4039	2.02	. Q	.	.	.	.
12.06	1.4246	2.04	. Q	.	.	.	.
12.19	1.4439	1.76	.Q	.	.	.	.
12.31	1.4619	1.78	.Q	.	.	.	.
12.43	1.4801	1.82	.Q	.	.	.	.
12.56	1.4987	1.84	.Q	.	.	.	.
12.68	1.5177	1.89	.Q	.	.	.	.
12.80	1.5370	1.91	.Q	.	.	.	.
12.93	1.5567	1.96	.Q	.	.	.	.
13.05	1.5768	1.99	.Q	.	.	.	.
13.17	1.5973	2.05	. Q	.	.	.	.
13.29	1.6182	2.08	. Q	.	.	.	.
13.42	1.6397	2.14	. Q	.	.	.	.
13.54	1.6617	2.18	. Q	.	.	.	.
13.66	1.6842	2.26	. Q	.	.	.	.
13.79	1.7074	2.30	. Q	.	.	.	.
13.91	1.7312	2.39	. Q	.	.	.	.
14.03	1.7557	2.43	. Q	.	.	.	.
14.15	1.7821	2.77	. Q	.	.	.	.
14.28	1.8105	2.82	. Q	.	.	.	.
14.40	1.8398	2.95	. Q	.	.	.	.
14.52	1.8702	3.02	. Q	.	.	.	.
14.65	1.9018	3.19	. Q	.	.	.	.
14.77	1.9346	3.28	. Q	.	.	.	.
14.89	1.9690	3.49	. Q	.	.	.	.
15.02	2.0051	3.61	. Q	.	.	.	.
15.14	2.0433	3.90	. Q	.	.	.	.
15.26	2.0838	4.07	. Q	.	.	.	.
15.38	2.1267	4.37	. Q	.	.	.	.
15.51	2.1668	3.53	. Q	.	.	.	.
15.63	2.2066	4.30	. Q	.	.	.	.
15.75	2.2536	4.95	. Q	.	.	.	.
15.88	2.3182	7.75	.	Q	.	.	.
16.00	2.4120	10.72	.	.	Q	.	.
16.12	2.6356	33.27	.	.	.	Q	.
16.25	2.8365	6.28	.	Q	.	.	.
16.37	2.8881	3.86	. Q	.	.	.	.
16.49	2.9295	4.29	. Q	.	.	.	.
16.61	2.9703	3.75	. Q	.	.	.	.
16.74	3.0065	3.38	. Q	.	.	.	.
16.86	3.0395	3.10	. Q	.	.	.	.
16.98	3.0699	2.89	. Q	.	.	.	.
17.11	3.0977	2.57	. Q	.	.	.	.
17.23	3.1226	2.34	. Q	.	.	.	.
17.35	3.1458	2.22	. Q	.	.	.	.
17.48	3.1678	2.11	. Q	.	.	.	.
17.60	3.1888	2.02	. Q	.	.	.	.
17.72	3.2089	1.94	.Q	.	.	.	.
17.84	3.2282	1.86	.Q	.	.	.	.
17.97	3.2468	1.80	.Q	.	.	.	.

18.09	3.2651	1.81	.Q	.	.	.	.
18.21	3.2845	2.01	. Q	.	.	.	.
18.34	3.3047	1.96	.Q	.	.	.	.
18.46	3.3243	1.91	.Q	.	.	.	.
18.58	3.3435	1.87	.Q	.	.	.	.
18.71	3.3624	1.83	.Q	.	.	.	.
18.83	3.3808	1.80	.Q	.	.	.	.
18.95	3.3989	1.76	.Q	.	.	.	.
19.08	3.4166	1.73	.Q	.	.	.	.
19.20	3.4340	1.70	.Q	.	.	.	.
19.32	3.4511	1.67	.Q	.	.	.	.
19.44	3.4680	1.64	.Q	.	.	.	.
19.57	3.4846	1.62	.Q	.	.	.	.
19.69	3.5009	1.59	.Q	.	.	.	.
19.81	3.5169	1.57	.Q	.	.	.	.
19.94	3.5328	1.55	.Q	.	.	.	.
20.06	3.5484	1.53	.Q	.	.	.	.
20.18	3.5638	1.51	.Q	.	.	.	.
20.31	3.5790	1.49	.Q	.	.	.	.
20.43	3.5941	1.47	.Q	.	.	.	.
20.55	3.6089	1.45	.Q	.	.	.	.
20.67	3.6235	1.43	.Q	.	.	.	.
20.80	3.6380	1.42	.Q	.	.	.	.
20.92	3.6524	1.40	.Q	.	.	.	.
21.04	3.6665	1.39	.Q	.	.	.	.
21.17	3.6805	1.37	.Q	.	.	.	.
21.29	3.6944	1.36	.Q	.	.	.	.
21.41	3.7081	1.34	.Q	.	.	.	.
21.53	3.7217	1.33	.Q	.	.	.	.
21.66	3.7352	1.32	.Q	.	.	.	.
21.78	3.7485	1.30	.Q	.	.	.	.
21.90	3.7617	1.29	.Q	.	.	.	.
22.03	3.7747	1.28	.Q	.	.	.	.
22.15	3.7877	1.27	.Q	.	.	.	.
22.27	3.8005	1.26	.Q	.	.	.	.
22.40	3.8133	1.25	.Q	.	.	.	.
22.52	3.8259	1.24	.Q	.	.	.	.
22.64	3.8384	1.23	.Q	.	.	.	.
22.77	3.8508	1.22	.Q	.	.	.	.
22.89	3.8632	1.21	.Q	.	.	.	.
23.01	3.8754	1.20	.Q	.	.	.	.
23.13	3.8875	1.19	.Q	.	.	.	.
23.26	3.8995	1.18	.Q	.	.	.	.
23.38	3.9115	1.17	.Q	.	.	.	.
23.50	3.9233	1.16	.Q	.	.	.	.
23.63	3.9351	1.15	.Q	.	.	.	.
23.75	3.9468	1.15	.Q	.	.	.	.
23.87	3.9584	1.14	.Q	.	.	.	.
23.99	3.9699	1.13	.Q	.	.	.	.
24.12	3.9814	1.12	.Q	.	.	.	.
24.24	3.9871	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1446.5
10%	118.1
20%	22.1
30%	14.8
40%	7.4

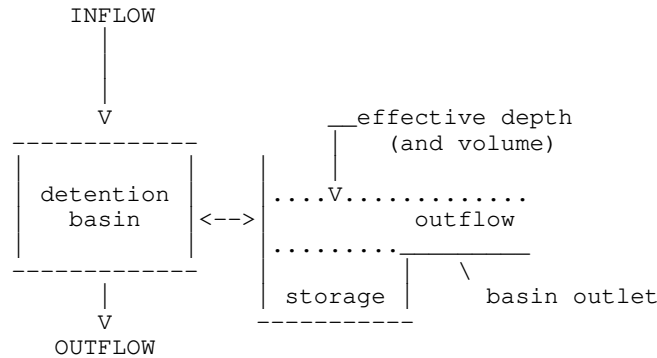
50%	7.4
60%	7.4
70%	7.4
80%	7.4
90%	7.4

Problem Descriptions:
 TEI JOB NO. 4163
 PROPOSED CONDITION
 TRUCK YARD DETENTION HYDROGRAPH

=====

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 7.380
 DEAD STORAGE(AF) = 0.00
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
 ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:

TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 7

* BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	** BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)
* 0.000	0.000	0.000**	0.090	0.001	15.900*
* 0.190	0.020	16.000**	0.290	0.070	16.100*
* 0.390	0.160	16.200**	0.490	0.290	16.300*
* 0.560	0.410	16.300**			

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.09	-0.07981	0.08181
3	0.19	-0.06132	0.10132
4	0.29	-0.01183	0.15183
5	0.39	0.07766	0.24234
6	0.49	0.20715	0.37285
7	0.56	0.32715	0.49285

WHERE S=STORAGE (AF); O=OUTFLOW (AF/MIN.); DT=UNIT INTERVAL (MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED (AF)	INFLOW (CFS)	EFFECTIVE DEPTH (FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME (AF)
0.010	0.000	0.00	0.00	0.00	0.000
0.133	0.000	1.12	0.01	1.11	0.000
0.256	0.000	1.13	0.01	2.22	0.000
0.379	0.000	1.13	0.01	2.23	0.000
0.502	0.000	1.14	0.01	2.24	0.000
0.625	0.000	1.14	0.01	2.25	0.000
0.748	0.000	1.14	0.01	2.26	0.000
0.871	0.000	1.15	0.01	2.26	0.000
0.994	0.000	1.15	0.01	2.27	0.000
1.117	0.000	1.16	0.01	2.28	0.000
1.240	0.000	1.16	0.01	2.29	0.000
1.363	0.000	1.16	0.01	2.30	0.000
1.486	0.000	1.17	0.01	2.30	0.000
1.609	0.000	1.17	0.01	2.31	0.000
1.732	0.000	1.18	0.01	2.32	0.000
1.855	0.000	1.18	0.01	2.33	0.000
1.978	0.000	1.19	0.01	2.34	0.000
2.101	0.000	1.19	0.01	2.35	0.000
2.224	0.000	1.19	0.01	2.36	0.000
2.347	0.000	1.20	0.01	2.37	0.000
2.470	0.000	1.20	0.01	2.37	0.000
2.593	0.000	1.21	0.01	2.38	0.000
2.716	0.000	1.21	0.01	2.39	0.000
2.839	0.000	1.22	0.01	2.40	0.000
2.962	0.000	1.22	0.01	2.41	0.000
3.085	0.000	1.23	0.01	2.42	0.000
3.208	0.000	1.23	0.01	2.43	0.000
3.331	0.000	1.24	0.01	2.44	0.000
3.454	0.000	1.24	0.01	2.45	0.000
3.577	0.000	1.25	0.01	2.46	0.000
3.700	0.000	1.25	0.01	2.47	0.000
3.823	0.000	1.26	0.01	2.48	0.000
3.946	0.000	1.27	0.01	2.50	0.000
4.069	0.000	1.27	0.01	2.51	0.000
4.192	0.000	1.28	0.01	2.52	0.000
4.315	0.000	1.28	0.01	2.53	0.000
4.438	0.000	1.29	0.01	2.54	0.000
4.561	0.000	1.30	0.01	2.55	0.000
4.684	0.000	1.30	0.01	2.56	0.000
4.807	0.000	1.31	0.01	2.58	0.000
4.930	0.000	1.31	0.01	2.59	0.000
5.053	0.000	1.32	0.01	2.60	0.000
5.176	0.000	1.33	0.01	2.61	0.000
5.299	0.000	1.33	0.01	2.63	0.000
5.422	0.000	1.34	0.01	2.64	0.000
5.545	0.000	1.35	0.02	2.65	0.000
5.668	0.000	1.35	0.02	2.67	0.000
5.791	0.000	1.36	0.02	2.68	0.000
5.914	0.000	1.37	0.02	2.69	0.000
6.037	0.000	1.38	0.02	2.71	0.000
6.160	0.000	1.38	0.02	2.72	0.000
6.283	0.000	1.39	0.02	2.74	0.000
6.406	0.000	1.40	0.02	2.75	0.000
6.529	0.000	1.41	0.02	2.77	0.000
6.652	0.000	1.41	0.02	2.78	0.000
6.775	0.000	1.42	0.02	2.80	0.000
6.898	0.000	1.43	0.02	2.82	0.000
7.021	0.000	1.44	0.02	2.83	0.000
7.144	0.000	1.44	0.02	2.85	0.000
7.267	0.000	1.46	0.02	2.87	0.000
7.390	0.000	1.46	0.02	2.88	0.000
7.513	0.000	1.47	0.02	2.90	0.000

7.636	0.000	1.48	0.02	2.92	0.000
7.759	0.000	1.49	0.02	2.94	0.000
7.882	0.000	1.50	0.02	2.96	0.000
8.005	0.000	1.51	0.02	2.98	0.000
8.128	0.000	1.52	0.02	3.00	0.000
8.251	0.000	1.53	0.02	3.02	0.000
8.374	0.000	1.54	0.02	3.04	0.000
8.497	0.000	1.55	0.02	3.06	0.000
8.620	0.000	1.56	0.02	3.08	0.000
8.743	0.000	1.58	0.02	3.10	0.000
8.866	0.000	1.58	0.02	3.12	0.000
8.989	0.000	1.60	0.02	3.15	0.000
9.112	0.000	1.61	0.02	3.17	0.000
9.235	0.000	1.63	0.02	3.20	0.000
9.358	0.000	1.63	0.02	3.22	0.000
9.481	0.000	1.65	0.02	3.25	0.000
9.604	0.000	1.66	0.02	3.27	0.000
9.727	0.000	1.68	0.02	3.30	0.000
9.850	0.000	1.69	0.02	3.33	0.000
9.973	0.000	1.71	0.02	3.36	0.000
10.096	0.000	1.72	0.02	3.38	0.000
10.219	0.000	1.74	0.02	3.42	0.000
10.342	0.000	1.75	0.02	3.45	0.000
10.465	0.000	1.77	0.02	3.48	0.000
10.588	0.000	1.78	0.02	3.51	0.000
10.711	0.000	1.81	0.02	3.55	0.000
10.834	0.000	1.82	0.02	3.58	0.000
10.957	0.000	1.84	0.02	3.62	0.000
11.080	0.000	1.86	0.02	3.66	0.000
11.203	0.000	1.88	0.02	3.70	0.000
11.326	0.000	1.90	0.02	3.74	0.000
11.449	0.000	1.93	0.02	3.78	0.000
11.572	0.000	1.94	0.02	3.82	0.000
11.695	0.000	1.97	0.02	3.87	0.000
11.818	0.000	1.99	0.02	3.91	0.000
11.941	0.000	2.02	0.02	3.96	0.000
12.064	0.000	2.04	0.02	4.02	0.000
12.187	0.000	1.76	0.02	3.75	0.000
12.310	0.000	1.78	0.02	3.49	0.000
12.433	0.000	1.82	0.02	3.55	0.000
12.556	0.000	1.84	0.02	3.61	0.000
12.679	0.000	1.89	0.02	3.68	0.000
12.802	0.000	1.91	0.02	3.75	0.000
12.925	0.000	1.96	0.02	3.83	0.000
13.048	0.000	1.99	0.02	3.90	0.000
13.171	0.000	2.05	0.02	3.99	0.000
13.294	0.000	2.08	0.02	4.07	0.000
13.417	0.000	2.14	0.02	4.17	0.000
13.540	0.000	2.18	0.02	4.27	0.000
13.663	0.000	2.26	0.03	4.38	0.000
13.786	0.000	2.30	0.03	4.50	0.000
13.909	0.000	2.39	0.03	4.63	0.000
14.032	0.000	2.43	0.03	4.76	0.000
14.155	0.000	2.77	0.03	5.14	0.000
14.278	0.000	2.82	0.03	5.52	0.000
14.401	0.000	2.95	0.03	5.71	0.000
14.524	0.000	3.02	0.03	5.90	0.000
14.647	0.000	3.19	0.04	6.14	0.000
14.770	0.000	3.28	0.04	6.38	0.000
14.893	0.000	3.49	0.04	6.68	0.000
15.016	0.000	3.61	0.04	7.01	0.000
15.139	0.000	3.90	0.04	7.42	0.000
15.262	0.000	4.07	0.05	7.88	0.001
15.385	0.000	4.37	0.05	8.34	0.001
15.508	0.000	3.53	0.04	7.80	0.000

15.631	0.000	4.30	0.05	7.74	0.001
15.754	0.000	4.95	0.06	9.13	0.001
15.877	0.000	7.75	0.09	12.54	0.001
16.000	0.000	10.72	0.21	15.66	0.028
16.123	0.000	33.27	0.46	16.14	0.255
16.246	0.000	6.28	0.38	16.23	0.154
16.369	0.000	3.86	0.21	16.11	0.030
16.492	0.000	4.29	0.05	12.25	0.001
16.615	0.000	3.75	0.04	7.94	0.000
16.738	0.000	3.38	0.04	7.04	0.000
16.861	0.000	3.10	0.03	6.40	0.000
16.984	0.000	2.89	0.03	5.92	0.000
17.107	0.000	2.57	0.03	5.39	0.000
17.230	0.000	2.34	0.03	4.85	0.000
17.353	0.000	2.22	0.02	4.50	0.000
17.476	0.000	2.11	0.02	4.27	0.000
17.599	0.000	2.02	0.02	4.08	0.000
17.722	0.000	1.94	0.02	3.91	0.000
17.845	0.000	1.86	0.02	3.75	0.000
17.968	0.000	1.80	0.02	3.62	0.000
18.091	0.000	1.81	0.02	3.56	0.000
18.214	0.000	2.01	0.02	3.77	0.000
18.337	0.000	1.96	0.02	3.92	0.000
18.460	0.000	1.91	0.02	3.82	0.000
18.583	0.000	1.87	0.02	3.74	0.000
18.706	0.000	1.83	0.02	3.66	0.000
18.829	0.000	1.80	0.02	3.58	0.000
18.952	0.000	1.76	0.02	3.51	0.000
19.075	0.000	1.73	0.02	3.45	0.000
19.198	0.000	1.70	0.02	3.39	0.000
19.321	0.000	1.67	0.02	3.33	0.000
19.444	0.000	1.64	0.02	3.27	0.000
19.567	0.000	1.62	0.02	3.22	0.000
19.690	0.000	1.59	0.02	3.17	0.000
19.813	0.000	1.57	0.02	3.12	0.000
19.936	0.000	1.55	0.02	3.08	0.000
20.059	0.000	1.53	0.02	3.04	0.000
20.182	0.000	1.51	0.02	3.00	0.000
20.305	0.000	1.49	0.02	2.96	0.000
20.428	0.000	1.47	0.02	2.92	0.000
20.551	0.000	1.45	0.02	2.88	0.000
20.674	0.000	1.43	0.02	2.85	0.000
20.797	0.000	1.42	0.02	2.82	0.000
20.920	0.000	1.40	0.02	2.78	0.000
21.043	0.000	1.39	0.02	2.75	0.000
21.166	0.000	1.37	0.02	2.72	0.000
21.289	0.000	1.36	0.02	2.69	0.000
21.412	0.000	1.34	0.02	2.67	0.000
21.535	0.000	1.33	0.01	2.64	0.000
21.658	0.000	1.32	0.01	2.61	0.000
21.781	0.000	1.30	0.01	2.59	0.000
21.904	0.000	1.29	0.01	2.56	0.000
22.027	0.000	1.28	0.01	2.54	0.000
22.150	0.000	1.27	0.01	2.52	0.000
22.273	0.000	1.26	0.01	2.50	0.000
22.396	0.000	1.25	0.01	2.47	0.000
22.519	0.000	1.24	0.01	2.45	0.000
22.642	0.000	1.23	0.01	2.43	0.000
22.765	0.000	1.22	0.01	2.41	0.000
22.888	0.000	1.21	0.01	2.39	0.000
23.011	0.000	1.20	0.01	2.38	0.000
23.134	0.000	1.19	0.01	2.36	0.000
23.257	0.000	1.18	0.01	2.34	0.000
23.380	0.000	1.17	0.01	2.32	0.000
23.503	0.000	1.16	0.01	2.30	0.000

PEAK DISCHARGE

23.626	0.000	1.15	0.01	2.29	0.000
23.749	0.000	1.15	0.01	2.27	0.000
23.872	0.000	1.14	0.01	2.26	0.000
23.995	0.000	1.13	0.01	2.24	0.000
24.118	0.000	1.12	0.01	2.23	0.000
24.241	0.000	0.00	0.00	1.11	0.000
24.364	0.000	0.00	0.00	0.00	0.000

APPENDIX D

HYDRAULIC CALCULATIONS

1818.96 666.09 24 0.013 0.00 0.00 0.00 0

ELEMENT NO 9 IS A REACH * * *
 U/S DATA STATION INVERT SECT N
 1835.49 666.18 24 0.013 RADIUS ANGLE ANG PT MAN H
 22.50 45.00 0.00 0

ELEMENT NO 10 IS A REACH * * *
 U/S DATA STATION INVERT SECT N
 1870.83 666.35 24 0.013 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 11 IS A SYSTEM HEADWORKS * *
 U/S DATA STATION INVERT SECT W S ELEV
 1870.83 666.35 24 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: THIENES ENGINEERING

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NO. 4163
 SD PUB LINE A
 100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF	NORM DEPTH		ZR				
1000.00	660.00	6.950	666.950	60.9	4.85	0.365	667.315	0.00	2.352	4.00	0.00	0.00	0	0.00
5.26	0.00570					.001797	0.01	2.143		0.00				
1005.26	660.03	6.929	666.959	60.9	4.85	0.365	667.324	0.00	2.352	4.00	0.00	0.00	0	0.00
11.85	0.00506					.001797	0.02	2.223		0.00				
1017.11	660.09	6.942	667.032	60.9	4.85	0.365	667.397	0.00	2.352	4.00	0.00	0.00	0	0.00
330.55	0.00499					.001797	0.59	2.233		0.00				
1347.66	661.74	5.886	667.626	60.9	4.85	0.365	667.991	0.00	2.352	4.00	0.00	0.00	0	0.00
4.67	0.00428					.001797	0.01	2.344		0.00				
1352.33	661.76	5.893	667.653	60.9	4.85	0.365	668.018	0.00	2.352	4.00	0.00	0.00	0	0.00
369.42	0.00501					.001797	0.66	2.231		0.00				
1721.75	663.61	4.707	668.317	60.9	4.85	0.365	668.682	0.00	2.352	4.00	0.00	0.00	0	0.00
JUNCT STR	0.28060					.000937	0.01			0.00				
1729.02	665.65	3.032	668.682	2.0	0.64	0.006	668.688	0.00	0.491	2.00	0.00	0.00	0	0.00
89.94	0.00489					.000078	0.01	0.480		0.00				
1818.96	666.09	2.599	668.689	2.0	0.64	0.006	668.695	0.00	0.491	2.00	0.00	0.00	0	0.00
16.53	0.00545					.000078	0.00	0.470		0.00				
1835.49	666.18	2.512	668.692	2.0	0.64	0.006	668.698	0.00	0.491	2.00	0.00	0.00	0	0.00

35.34	0.00481					.000078	0.00			0.480		0.00		
1870.83	666.35	2.344	668.694	2.0	0.64	0.006	668.700	0.00	0.491		2.00	0.00	0.00	0 0.00

TEI JOB NO. 4163
SD PUB LINE A
100

1000.00	.I			C			H				W	E		R
1017.77	.I			C			H				W	E		R
1035.54	.I			C			H				W	E		R
1053.32	.													
1071.09	.													
1088.86	.													
1106.63	.													
1124.40	.													
1142.18	.													
1159.95	.													
1177.72	.													
1195.49	.													
1213.26	.													
1231.04	.													
1248.81	.													
1266.58	.													
1284.35	.													
1302.12	.													
1319.90	.													
1337.67	.													
1355.44	.			I			C		H		W	E		R
1373.21	.			I			C		H		W	E		R
1390.98	.													
1408.76	.													
1426.53	.													
1444.30	.													
1462.07	.													
1479.85	.													
1497.62	.													
1515.39	.													
1533.16	.													
1550.93	.													
1568.71	.													
1586.48	.													
1604.25	.													
1622.02	.													
1639.79	.													
1657.57	.													
1675.34	.													
1693.11	.													
1710.88	.													
1728.65	.					I			C		H	W	E	JX
1746.43	.							I	C		H		X	R
1764.20	.													
1781.97	.													
1799.74	.													
1817.51	.													
1835.29	.								I	C		H	X	R
1853.06	.								I	C		H	X	R
1870.83	.								I	C		H	WE	R

660.00 660.87 661.74 662.61 663.48 664.35 665.22 666.09 666.96 667.83 668.70

N O T E S

1. GLOSSARY

I = INVERT ELEVATION

C = CRITICAL DEPTH

W = WATER SURFACE ELEVATION

H = HEIGHT OF CHANNEL

E = ENERGY GRADE LINE

X = CURVES CROSSING OVER

B = BRIDGE ENTRANCE OR EXIT

Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

	U/S DATA	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN H
		1273.91	668.02	42		0.012				0.00	0.00	0.00	0
ELEMENT NO	8 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN H
		1302.76	668.41	42		0.012				0.00	0.00	0.00	0
ELEMENT NO	9 IS A JUNCTION	*	*	*	*	*							
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		1308.36	669.00	36	18	15	0.012	1.0	16.2	668.70	668.70	45.00	45.00
ELEMENT NO	10 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN H
		1662.36	671.78	36			0.012			0.00	0.00	0.00	0
ELEMENT NO	11 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN H
		1665.55	671.79	36			0.012			0.00	0.00	0.00	0
					F 0 5 1 5 P							PAGE NO	3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	12 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN H
		2020.79	673.57	36			0.012			0.00	0.00	0.00	0
ELEMENT NO	13 IS A SYSTEM HEADWORKS			*				*					
	U/S DATA	STATION	INVERT	SECT					W S ELEV				
		2020.79	673.57	36					0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
 LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NO 4163
 LAT A1
 100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1005.75	664.38	4.300	668.680	58.9	6.12	0.582	669.262	0.00	2.405	3.50	0.00	0.00	0	0.00
36.64	0.01337					.004563	0.17		1.921			0.00		
1042.39	664.87	3.977	668.847	58.9	6.12	0.582	669.429	0.00	2.405	3.50	0.00	0.00	0	0.00
17.67	0.01358					.004563	0.08		1.912			0.00		
1060.06	665.11	3.900	669.010	58.9	6.12	0.582	669.592	0.00	2.405	3.50	0.00	0.00	0	0.00
37.12	0.01370					.002899	0.11		1.670			0.00		
1097.18	665.62	3.500	669.119	58.9	6.12	0.582	669.701	0.00	2.405	3.50	0.00	0.00	0	0.00
1.57	0.01370					.002812	0.00		1.670			0.00		
1098.75	665.64	3.481	669.121	58.9	6.13	0.583	669.704	0.00	2.405	3.50	0.00	0.00	0	0.00

JUNCT STR	0.00000					.002688	0.00					0.00			
1098.75	665.64	3.598	669.238	55.9	5.81	0.524	669.762	0.00	2.341		3.50	0.00	0.00	0	0.00
8.90	0.01359					.002612	0.02			1.624			0.00		
1107.65	665.76	3.500	669.261	55.9	5.81	0.524	669.785	0.00	2.341		3.50	0.00	0.00	0	0.00
22.83	0.01359					.002442	0.06			1.624			0.00		
1130.48	666.07	3.201	669.272	55.9	6.06	0.570	669.842	0.00	2.341		3.50	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00			
1130.48	666.07	1.681	667.752	55.9	12.23	2.323	670.075	0.00	2.341		3.50	0.00	0.00	0	0.00
53.03	0.01359					.011685	0.62			1.624			0.00		
1183.51	666.79	1.713	668.505	55.9	11.94	2.213	670.718	0.00	2.341		3.50	0.00	0.00	0	0.00
45.91	0.01359					.010624	0.49			1.624			0.00		
1229.42	667.42	1.778	669.194	55.9	11.38	2.011	671.205	0.00	2.341		3.50	0.00	0.00	0	0.00
26.82	0.01359					.009360	0.25			1.624			0.00		↑

LICENSEE: THIENES ENGINEERING

F0515P
WATER SURFACE PROFILE LISTING

TEI JOB NO 4163
LAT A1
100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR	
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR			
1256.24	667.78	1.848	669.628	55.9	10.85	1.828	671.456	0.00	2.341		3.50	0.00	0.00	0	0.00
17.67	0.01358					.008257	0.15		1.624				0.00		
1273.91	668.02	1.919	669.939	55.9	10.35	1.663	671.602	0.00	2.341		3.50	0.00	0.00	0	0.00
11.46	0.01352					.007314	0.08		1.627				0.00		
1285.37	668.17	1.990	670.165	55.9	9.90	1.521	671.686	0.00	2.341		3.50	0.00	0.00	0	0.00
8.28	0.01352					.006488	0.05		1.627				0.00		
1293.65	668.29	2.070	670.357	55.9	9.43	1.382	671.739	0.00	2.341		3.50	0.00	0.00	0	0.00
5.36	0.01352					.005739	0.03		1.627				0.00		
1299.01	668.36	2.154	670.513	55.9	9.00	1.257	671.770	0.00	2.341		3.50	0.00	0.00	0	0.00
2.87	0.01352					.005084	0.01		1.627				0.00		
1301.88	668.40	2.244	670.642	55.9	8.58	1.142	671.784	0.00	2.341		3.50	0.00	0.00	0	0.00
0.88	0.01352					.004511	0.00		1.627				0.00		

1302.76	668.41	2.341	670.751	55.9	8.17	1.037	671.788	0.00	2.341		3.50	0.00	0.00	0	0.00
JUNCT STR	0.10536												0.00		
1308.36	669.00	1.681	670.681	38.7	9.49	1.400	672.081	0.00	2.025		3.00	0.00	0.00	0	0.00
92.70	0.00785					.007875	0.73			1.681			0.00		
1401.06	669.73	1.681	671.409	38.7	9.49	1.400	672.809	0.00	2.025		3.00	0.00	0.00	0	0.00
154.38	0.00785					.007687	1.19			1.681			0.00		
1555.44	670.94	1.707	672.647	38.7	9.32	1.348	673.995	0.00	2.025		3.00	0.00	0.00	0	0.00
68.98	0.00785					.007063	0.49			1.681			0.00		
1624.42	671.48	1.775	673.257	38.7	8.88	1.226	674.483	0.00	2.025		3.00	0.00	0.00	0	0.00

23.92 0.00785
 LICENSEE: THIENES ENGINEERING

.006247 0.15
 F0515P
 WATER SURFACE PROFILE LISTING

TEI JOB NO 4163
 LAT A1
 100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR	
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR			
1648.34	671.67	1.848	673.518	38.7	8.47	1.114	674.632	0.00	2.025		3.00	0.00	0.00	0	0.00
10.90	0.00785					.005534	0.06			1.681		0.00			
1659.24	671.76	1.924	673.680	38.7	8.08	1.013	674.693	0.00	2.025		3.00	0.00	0.00	0	0.00
3.12	0.00785					.004912	0.02			1.681		0.00			
1662.36	671.78	2.007	673.787	38.7	7.70	0.921	674.708	0.00	2.025		3.00	0.00	0.00	0	0.00
3.19	0.00314					.004818	0.02			2.350		0.00			
1665.55	671.79	1.950	673.740	38.7	7.96	0.983	674.723	0.00	2.025		3.00	0.00	0.00	0	0.00
332.13	0.00501					.005014	1.67			1.950		0.00			
1997.68	673.45	1.950	675.404	38.7	7.96	0.983	676.387	0.00	2.025		3.00	0.00	0.00	0	0.00
23.11	0.00501					.004763	0.11			1.950		0.00			
2020.79	673.57	2.025	675.595	38.7	7.62	0.902	676.497	0.00	2.025		3.00	0.00	0.00	0	0.00

TEI JOB NO 4163
 LAT A1
 100

1005.75 .I C H W E . R
 1024.21 .

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

SD LINE B (DOWNSTREAM)

DATE: 4/18/2024
TIME: 7:44

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
-----------	---------	----------	-------------	-----------	------------	-------------------	------------	----	----	----------	------	------	------	------	------	------	------	------	------	-------

CD	15	4				1.25															
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F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NO. 4163

HEADING LINE NO 2 IS -

SD LINE B

HEADING LINE NO 3 IS -

100

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	DESCRIPTION	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A SYSTEM OUTLET		1004.57	669.21	15	670.68				
2	IS A REACH		1019.29	669.26	15		0.00	0.00	0.00	0
3	IS A SYSTEM HEADWORKS		1019.29	669.26	15	0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NO. 4163
SD LINE B
100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1004.57	669.21	1.470	670.680	16.2	13.20	2.707	673.387	0.00	1.240	1.25	0.00	0.00	0	0.00
14.72	0.00340					.053588	0.79		1.250			0.00		
1019.29	669.26	2.209	671.469	16.2	13.20	2.707	674.176	0.00	1.240	1.25	0.00	0.00	0	0.00

** WARNING NO. 22 ** - NO PLOT GENERATED, BAD DATA OR NOT ENOUGH POINTS, 3 OR LESS

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO	8 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2129.82	672.81	30		N				RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	9 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2165.16	672.93	30		N				RADIUS	ANGLE	ANG PT	MAN H	
										22.50	90.00	0.00	0	

ELEMENT NO	10 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2169.16	672.94	30		N				RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	11 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2255.37	673.21	30		N				RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	12 IS A JUNCTION	*	*	*	*	*	*	*	*	*	*	*	*	
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	
		2255.37	673.21	30	18	0	0.012	1.4	0.0	673.71	0.00	90.00	0.00	

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO	13 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2354.07	673.53	30			N			RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	14 IS A JUNCTION	*	*	*	*	*	*	*	*	*	*	*	*	
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	
		2354.07	673.53	30	18	0	0.012	1.6	0.0	674.03	0.00	90.00	0.00	

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO	15 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2497.80	673.99	30			N			RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	16 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2501.80	674.00	30			N			RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	17 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2807.07	674.98	30			N			RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	90.00	0	

ELEMENT NO	18 IS A REACH	*	*	*										
	U/S DATA	STATION	INVERT	SECT										
		2814.94	675.01	30			N			RADIUS	ANGLE	ANG PT	MAN H	
										0.00	0.00	0.00	0	

ELEMENT NO	19 IS A SYSTEM HEADWORKS	*												
	U/S DATA	STATION	INVERT	SECT						W S ELEV				
		2814.94	675.01	30						0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: THIENES ENGINEERING

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NO 4163

LINE B UPSTREAM OF TRUCK YARD
100

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1557.89	670.98	7.090	678.070	12.5	2.55	0.101	678.171	0.00	1.187	2.50	0.00	0.00	0	0.00
85.49	0.00328					.000791	0.07		1.236			0.00		
1643.38	671.26	6.878	678.138	12.5	2.55	0.101	678.239	0.00	1.187	2.50	0.00	0.00	0	0.00
35.34	0.00311					.000791	0.03		1.255			0.00		
1678.72	671.37	6.816	678.186	12.5	2.55	0.101	678.287	0.00	1.187	2.50	0.00	0.00	0	0.00
208.35	0.00322					.000791	0.16		1.243			0.00		
1887.07	672.04	6.311	678.351	12.5	2.55	0.101	678.452	0.00	1.187	2.50	0.00	0.00	0	0.00
JUNCT STR	0.00250					.000779	0.00					0.00		
1891.07	672.05	6.310	678.360	12.3	2.51	0.097	678.457	0.00	1.177	2.50	0.00	0.00	0	0.00
124.47	0.00321					.000766	0.10		1.231			0.00		
2015.54	672.45	6.006	678.456	12.3	2.51	0.097	678.553	0.00	1.177	2.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000741	0.00					0.00		
2015.54	672.45	6.018	678.468	11.9	2.42	0.091	678.559	0.00	1.157	2.50	0.00	0.00	0	0.00
114.28	0.00315					.000717	0.08		1.215			0.00		
2129.82	672.81	5.740	678.550	11.9	2.42	0.091	678.641	0.00	1.157	2.50	0.00	0.00	0	0.00
35.34	0.00340					.000717	0.03		1.190			0.00		
2165.16	672.93	5.664	678.594	11.9	2.42	0.091	678.685	0.00	1.157	2.50	0.00	0.00	0	0.00
4.00	0.00250					.000717	0.00		1.301			0.00		
2169.16	672.94	5.656	678.596	11.9	2.42	0.091	678.687	0.00	1.157	2.50	0.00	0.00	0	0.00
86.21	0.00313					.000717	0.06		1.220			0.00		
2255.37	673.21	5.448	678.658	11.9	2.42	0.091	678.749	0.00	1.157	2.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000638	0.00					0.00		

LICENSEE: THIENES ENGINEERING

F0515P
WATER SURFACE PROFILE LISTING

TEI JOB NO 4163
LINE B UPSTREAM OF TRUCK YARD
100

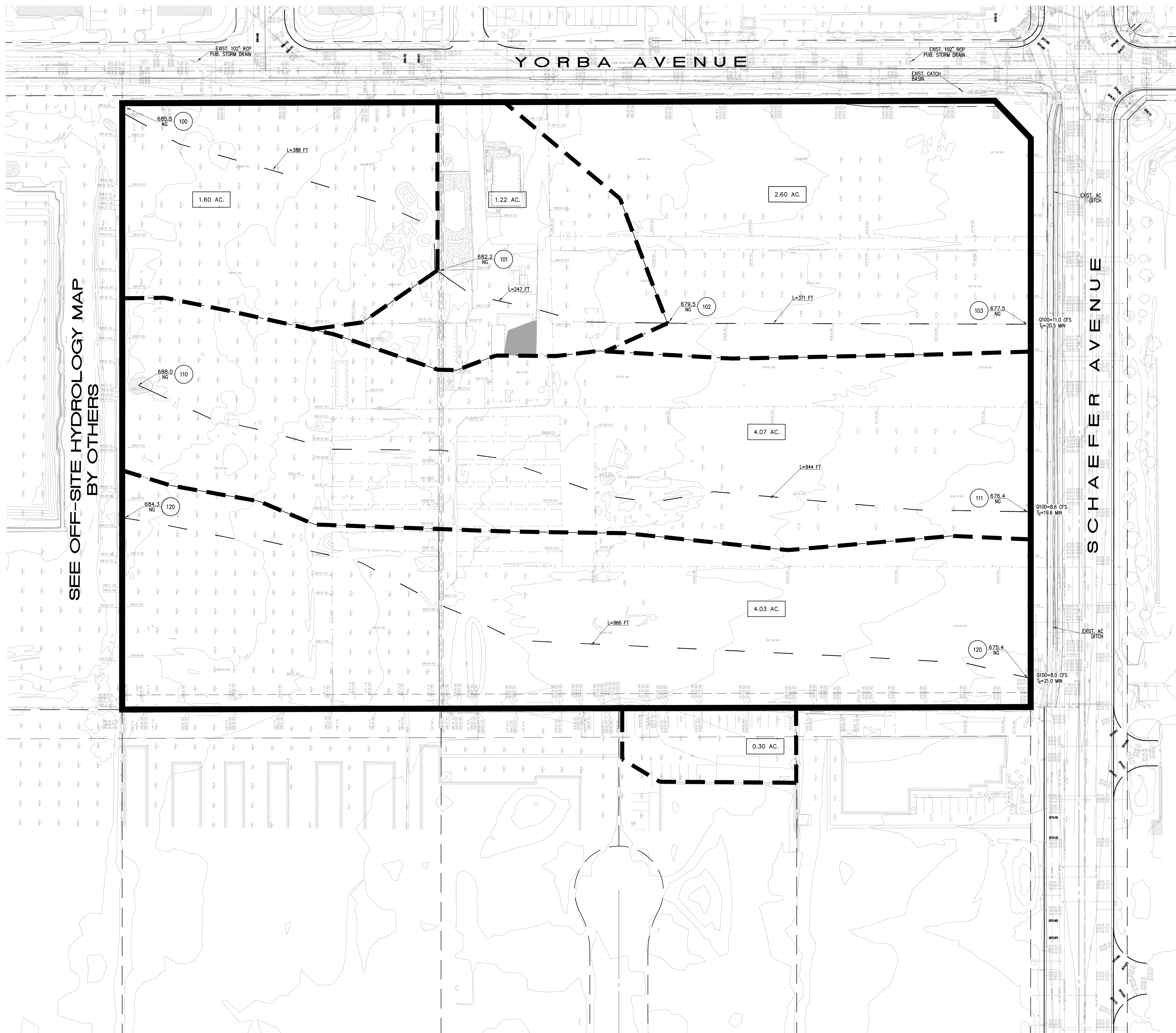
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
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APPENDIX E

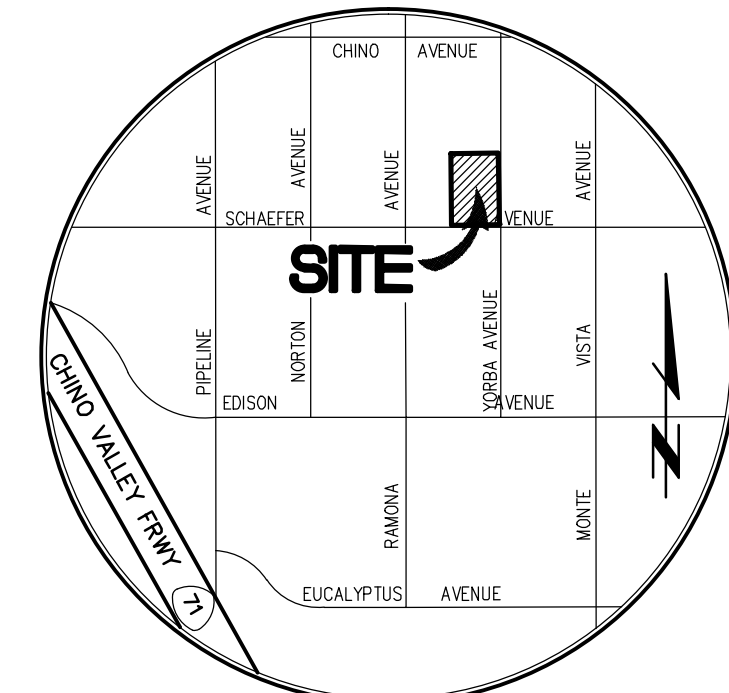
CATCH BASIN CALCULATIONS

APPENDIX F

HYDROLOGY MAPS



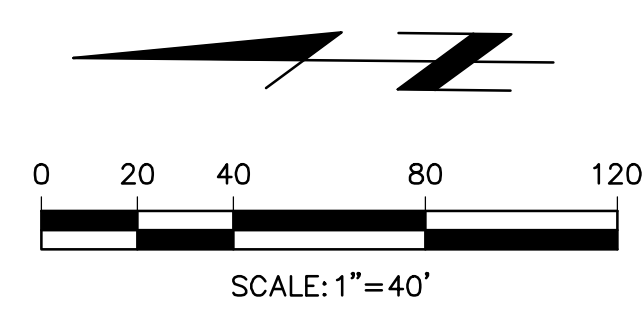
SEE OFF-SITE HYDROLOGY MAP
BY OTHERS



VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- SUBAREA AREA
- NODE NUMBER
- FLOW DIRECTION
- PONDING LIMITS



Last Update: 4/23/24
D:\4100-4199\4163\4163HYD-EX.dwg

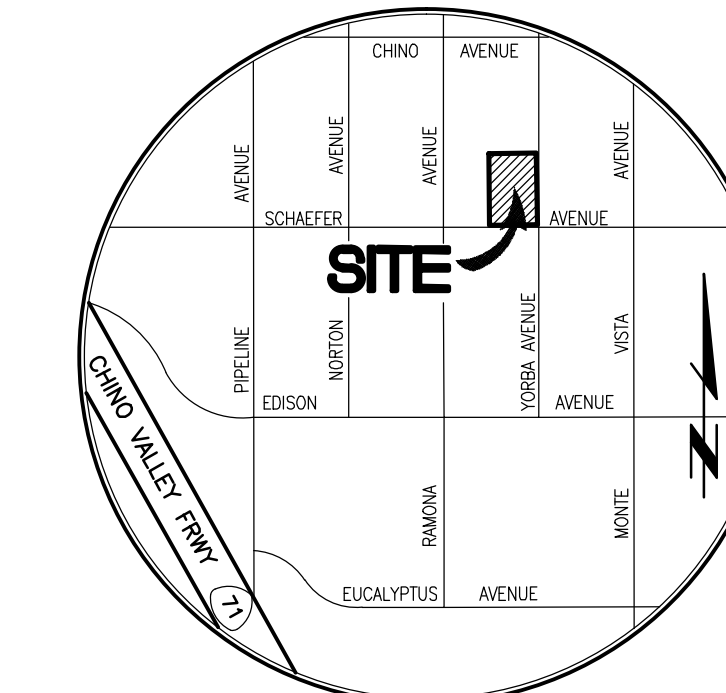
CITY OF CHINO
PUBLIC WORKS DEPARTMENT
EXISTING HYDROLOGY MAP
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

PREPARED FOR:
LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

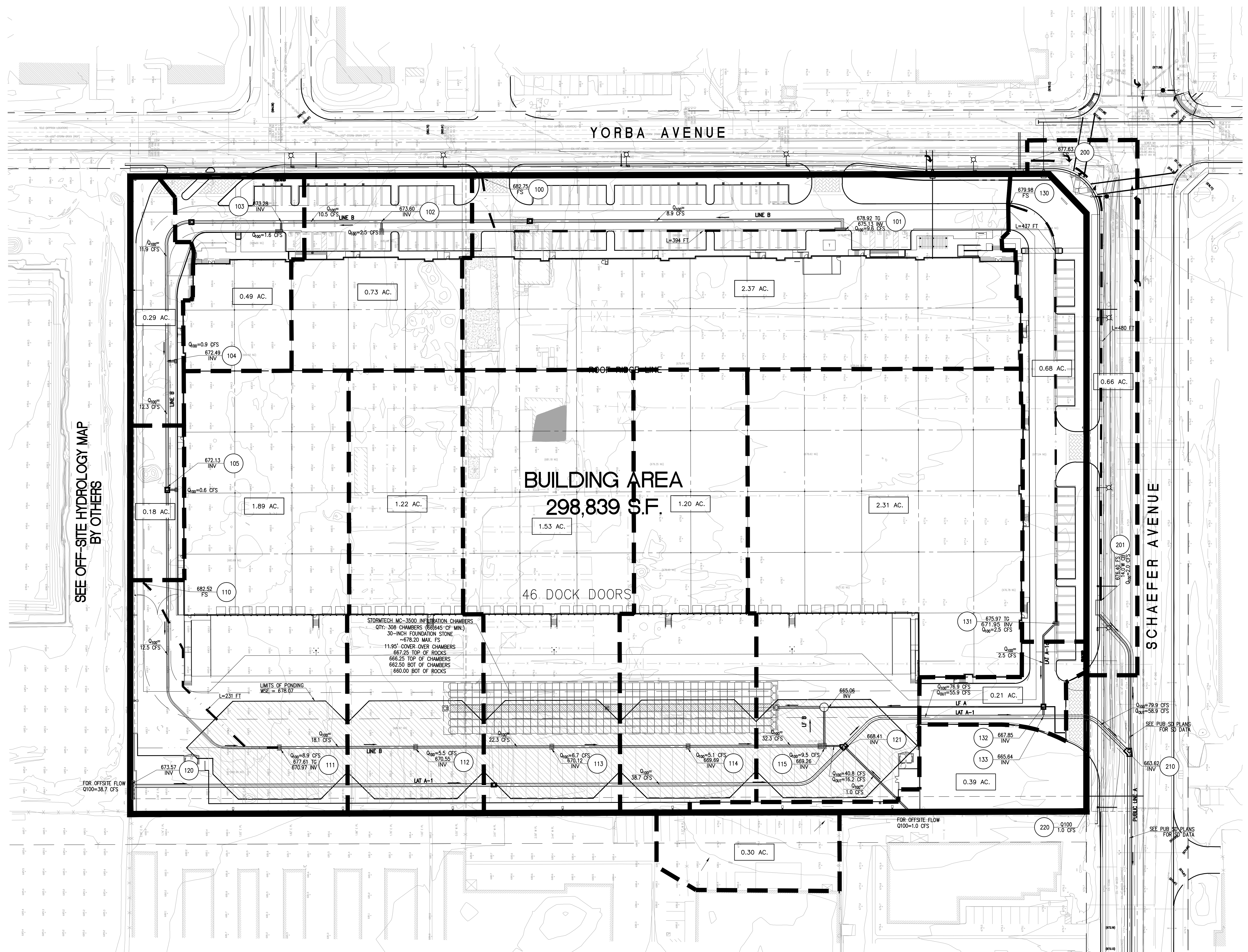
Tai Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14340 FIRESTONE BOULEVARD
LA BURE, CALIFORNIA 90639
PH: (714) 521-4811 FAX: (714) 521-4753

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Checked by _____		
Date _____	Sheet 1 of 1	Sheets

4163 / 1 OF 1 SHEET



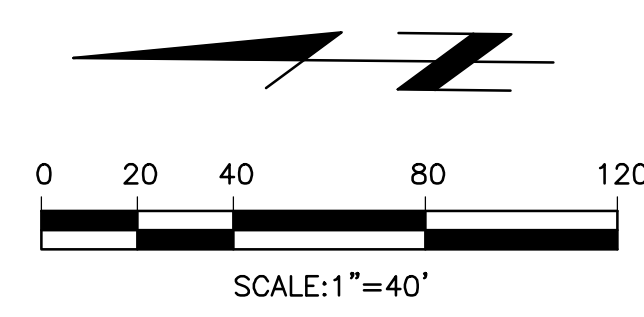
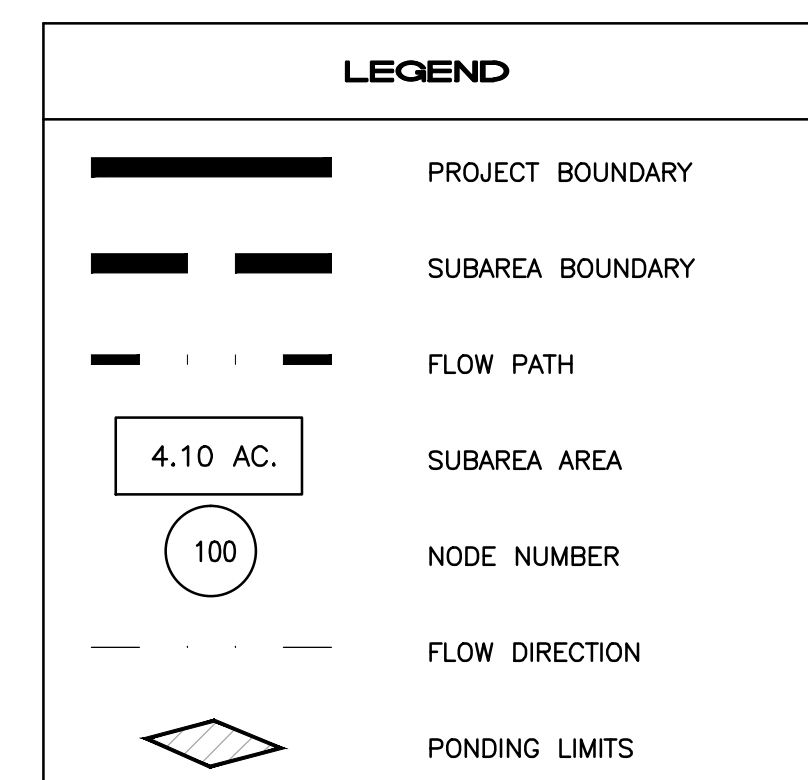
VICINITY MAP
N.T.S.



SEE OFF-SITE HYDROLOGY MAP
BY OTHERS

SUBAREA DATA SUMMARY

NODES	AREA (ACRES)	SOIL TYPE	Tc (MINUTES)	Q100 (CFS)
100-101	2.37	B	8.39	8.9
102	0.73	B	10.05	2.5
103	0.49	B	10.39	1.6
104	0.29	B	11.21	0.9
105	0.18	B	11.66	0.6
110-111	1.89	B	5.79	8.9
112	1.22	B	6.22	5.5
113	1.53	B	6.61	6.7
114	1.20	B	6.98	5.1
115	2.31	B	7.34	9.5
120-121(O)	8.66	B	9.75	39.7
130-133	0.93	B	9.08	3.4
200-201	0.66	B	9.05	1.9
220	0.34	B	10.11	1.0



Last Update: 4/23/24
0:\1100-4199\4163\4163HYD.dwg

CITY OF CHINO
PUBLIC WORKS DEPARTMENT
PROPOSED HYDROLOGY MAP
YORBA AVENUE INDUSTRIAL DEVELOPMENT
13610 YORBA AVENUE

PREPARED FOR:
LOVETT INDUSTRIAL
610 NEWPORT CENTER DRIVE, SUITE 340
NEWPORT BEACH, CA 92660
PHONE: (949) 402-2760

Tai Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14140 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH: (714) 521-4811 FAX: (714) 521-4123

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. XXXXX
Designed by _____		
Checked by _____		
Date _____		

Sheet **1** of **1** Sheets

4163 / 1 OF 1 SHEET

APPENDIX G

WQMP CALCULATIONS

VOLUME-BASED BMP DESIGN

$$C_{BMP} = 0.858(\text{imp})^3 - 0.78(\text{imp})^2 + 0.774(\text{imp}) + 0.04$$


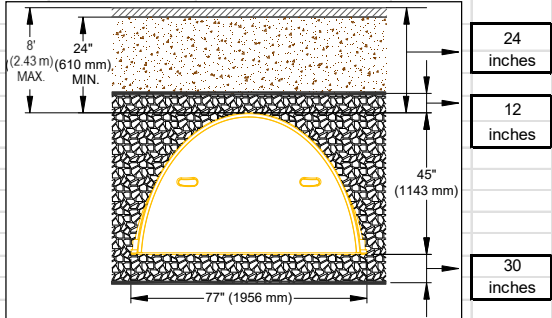
$$P6 = (0.594)(1.4807) = 0.880 \text{ inches}$$

$$P0 = (1.963)(C_{BMP})(0.880)$$

$$DCV = (P0 * \text{Area}) / 12$$

DMA 1 – STORMTECH MC-3500 INFILTRATION CHAMBERS

Region	Valley	
Drainage Area (acres)	13.17	acres
Drainage Area (sq-ft)	573,685	sq-ft
Impervious Coeff	i = 0.95	< 1.0
Runoff Coeff	C = 0.807	
	1-hr 2-yr from NOAA	0.594
P6 Coeff	1.4807	
Mean 6-hr (P6)	0.880	
Drawdown Rate (a)	1.963	
DCV	66,645	cu-ft
DCV	1.530	acre-ft

		Project Information: Project Name: Yorba Ave, Chino (TEI 4163) Location: Chino, CA Date: 9-Aug Engineer: Thienes Engineering StormTech RPM:	
MC-3500 Site Calculator			
System Requirements		System Sizing	
Units	Imperial	Number of Chambers Required	307 each
Required Storage Volume	66645 CF	Number of End Caps Required	14 each
Stone Porosity (Industry Standard = 40%)	40 %	Bed Size (including perimeter stone)	16,409 square feet
Stone Above Chambers (12 inch min.)	12 inches	Stone Required (including perimeter stone)	4413 tons
Stone Foundation Depth (9 inch min.)	30 inches	Volume of Excavation	4406 cubic yards
Average Cover over Chambers (24 inch min.)	24 inches	Non-woven Filter Fabric Required (20% Safety Factor)	5094 square yards
Bed size controlled by WIDTH or LENGTH?	WIDTH	Length of Isolator Row	320.1 feet
Limiting WIDTH or LENGTH dimension	55 feet	Non-woven Isolator Row Fabric (20% Safety Factor)	555 square yards
		Woven Isolator Row Fabric (20% Safety Factor)	704 square yards
Storage Volume per Chamber	214.9 CF	Installed Storage Volume	66,799 cubic feet
Storage Volume per End Cap	58.9 CF		
Controlled by Width (Rows)			
Maximum Width =	55 feet		
6 rows of	44 chambers		
1 row of	43 chambers		
Maximum Length =	320.11 feet		
Maximum Width =	51.42 feet		
*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.			

Design infiltration rate = 2.85 in/hr

$$d_{\text{max}} = 136.8 \text{ inches} = \text{Design infiltration rate} \times 48 \text{ hours} = 2.85 \text{ in/hr} \times 48 \text{ hrs}$$

$$d_{BMP} = 61.8 \text{ inches} = [(12 \text{ inches} + 30 \text{ inches}) \times 0.40] + 45 \text{ inches}$$

$$d_{\text{max}} > d_{BMP}$$