PRELIMINARY HYDROLOGY CALCULATIONS

FOR

FIRST PIONEER LOGISTICS

ALABAMA STREET AND PIONEER AVENUE
SAN BERNARDINO COUNTY, CA 92335

-

PREPARED FOR

FIRST INDUSTRIAL REALTY TRUST, INC.
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EL SEGUNDO, CALIFORNIA 90245
P. (310) 414-5400

MARCH 24, 2020
REVISED: SEPTEMBER 23, 2020
REVISED MARCH 29, 2021
JOB NO. 3849

PREPARED BY

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

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

FIRST PIONEER LOGISTICS

PREPARED UNDER
THE SUPERVISION OF

REINHARD STENZEL , PE
R.C.E. 5615
EXP. 12/31/22

INTRODUCTION

A: PROJECT LOCATION

The project site is located at the southeast corner of Alabama Street and Palmetto Avenue in the City of Redlands. Please see figure 1 for vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the 100-year peak flow rate for the project site that will drain to the existing catch basin in Palmetto Avenue.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
James Wickenhaueser
Eduardo Toledanes

Last Update: 8/20/18
O:\3600-3699\3671\3671VicMap.dwg

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VICINITY MAP

FOR

ALABAMA AND PIONEER BUILDING
COUNTY OF SAN BERNARDINO

DISCUSSION

Project Description

The project site encompasses approximately 22.70 acres. Proposed improvements include one warehouse type building that is approximately 457,037 square feet. There is a truck yard on the west side of the building and vehicle parking along the east property line. The rest of the site is made up of landscaping.

Existing Condition

The site is undeveloped with general slopes to the northwest. The site sheet flows into Alabama Street. Alabama Street drains northerly. There is an existing catch basin on Palmetto which collects the site runoff along with street flows. The 100-year peak flow rate from the existing condition of the project site is approximately 45.6 cfs.

See Appendix "B" for existing condition hydrology calculations and Appendix "E" for existing condition hydrology map.

Proposed Condition

The vehicle parking along the south property line will drain to the proposed catch basin in this area (nodes 100-101). A private storm drain will convey the runoff to the eastern truck yard. The eastern portion of the building and the eastern truck yard will also drain to the eastern truck yard (nodes 102-105). The catch basins in the truck yard will connect to the private storm drain. The storm drain will continue in the northern drive aisle. The runoff for the north drive aisle and the northwest corner of the building and truck yard (node 106) is added. The private storm drain continues westerly towards the private storm drain from the western truck yard. At this point the runoff from the western portion of the building and the western truck yard (nodes 200-321) will be joined. The private storm drain will connect to the back of the existing public catch basin (node 321) along Palmetto Avenue. The two westerly drive aisle and the landscaped areas (node 310-321, 0.95 acres) and the northerly landscaped area (node 320-321, 0.3 acres) will drain at the same location at node 321. The total 100-year peak flow rate from this area (node 321) is approximately 59.4.0 cfs. The remaining southerly (nodes 300-301, 0.65 acres) landscaped area will drain to an existing catch basin at Pioneer Avenue. The total runoff tributary to the site is approximately 60.7 cfs. (59.4 cfs + 1.3 cfs).

See Appendix "B" for proposed condition hydrology calculations and Appendix "E" for proposed condition hydrology map.

Detention

The existing catch basin and lateral was designed with a flow rate of 45.4 cfs. The peak flow from the site will be limited to 45 cfs. The remaining runoff will be detained in the eastern truck yard. The ponding will be limited to approximately maximum depth of 0.88 feet. This will provide approximately 0.58 acre-feet.

See Appendix "C" for detention calculations and Appendix "E" for proposed condition hydrology map.

Methodology

Hydrology calculations were computed using the San Bernardino County Rational Method computer program (by AES Software). Detention analysis was calculated using San Bernardino County's small area unit hydrograph program. The site is soil type is "B" per the San Bernardino County Hydrology Manual. See Appendix "A" for reference materials.

APPENDIX	DESCRIPTION
A	REFERNCE MATERIAL
B	HYDROLOGY CALCULATIONS
C	DETENTION ANALYSIS
D	HYDRAULIC CALCULATIONS
E	HYDROLOGY MAP

APPENDIX A

REFERENCE MATERIALS

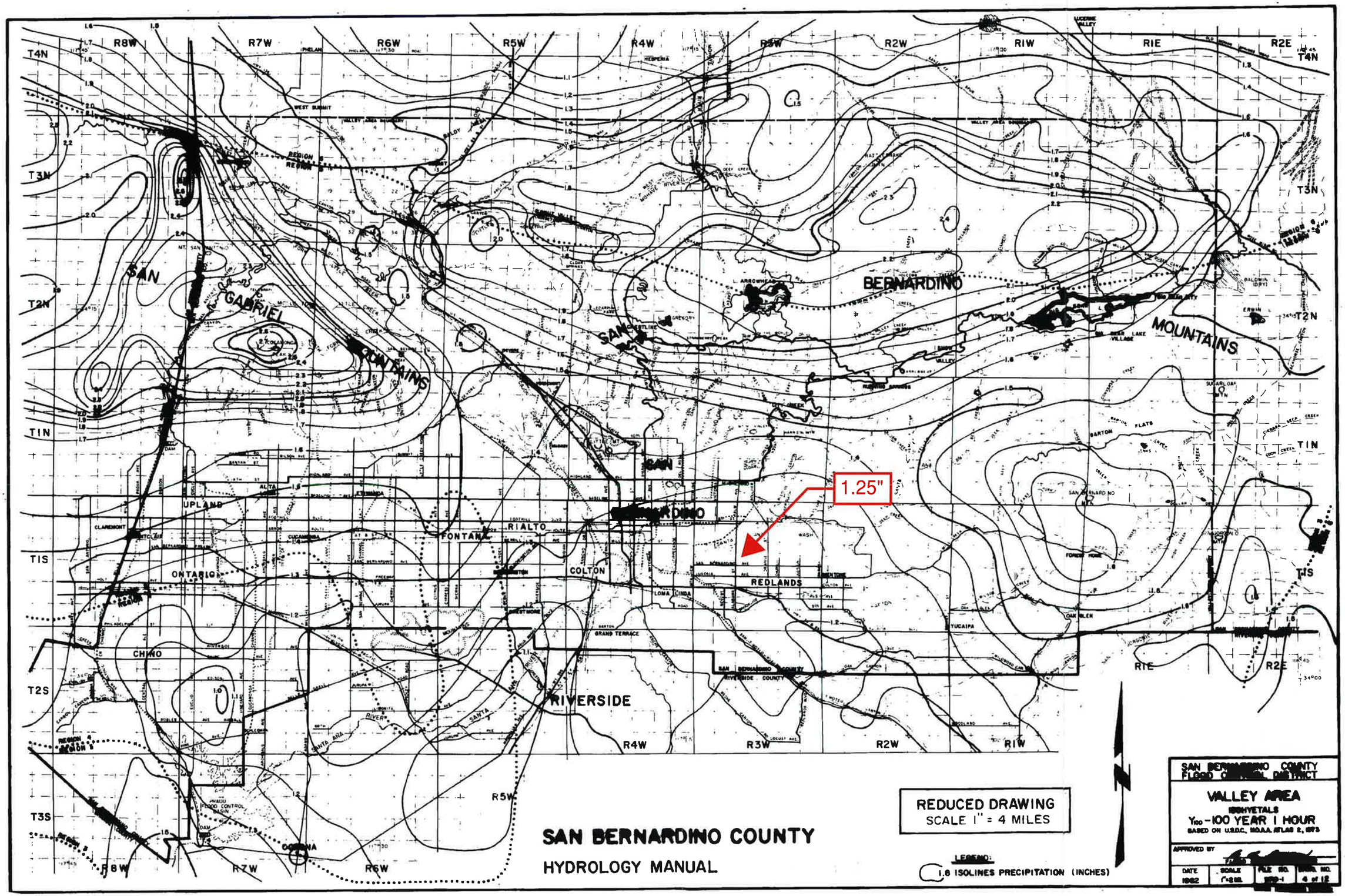

1.25"
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
1.6 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y100 - 100 YEAR 1 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FILE NO. 1970-1
DWG. NO. 4 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
YUCAIPA
CORONA
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-4

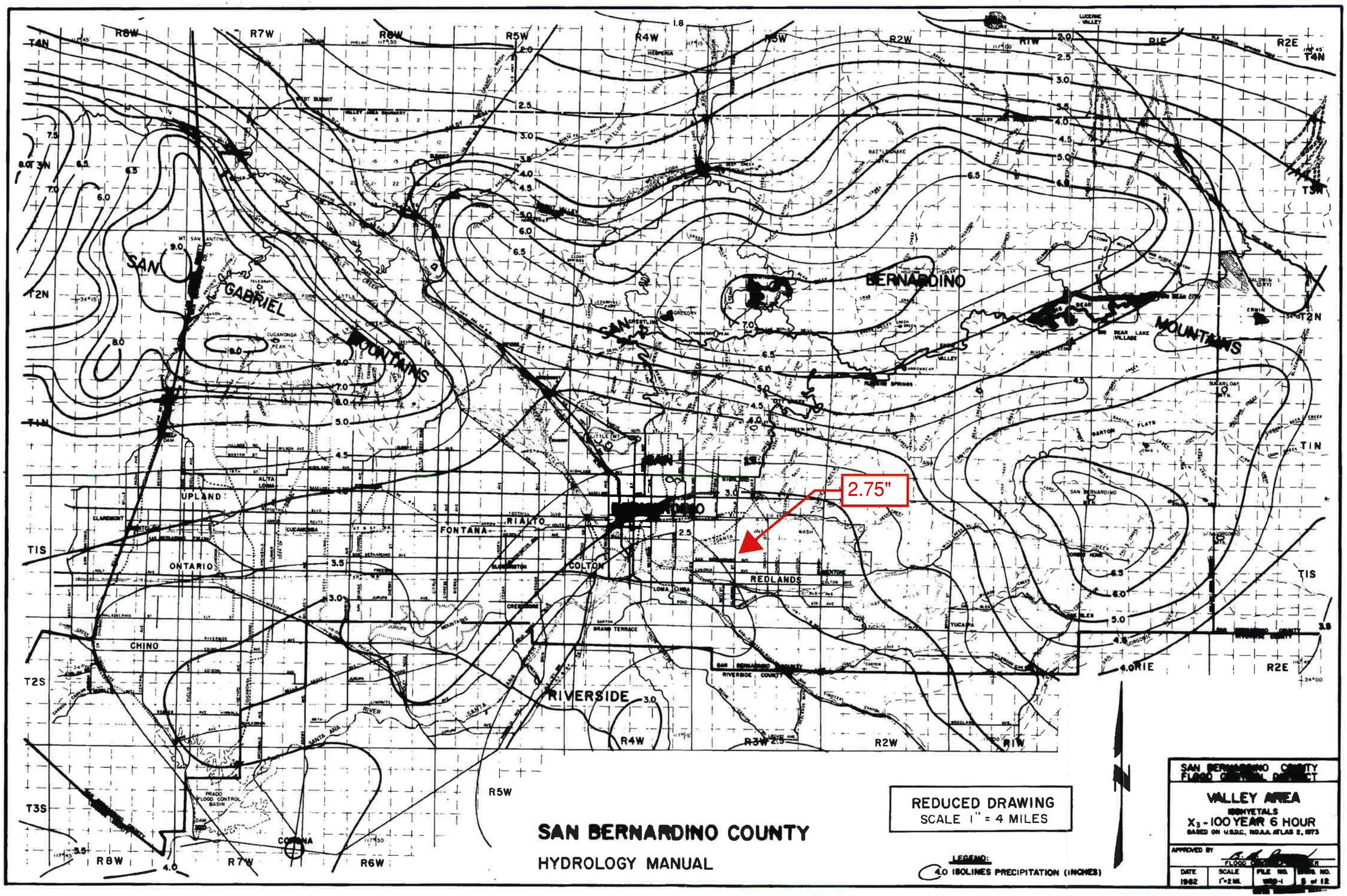

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
2.75"
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
RIVERSIDE
FONTANA
RIALTO
COLTON
REDLANDS
UPLAND
ONTARIO
CHINO
CORONA
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
100YR/TALS
X3 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. V100-1
SHEET NO. 9 of 12

FIGURE B-5

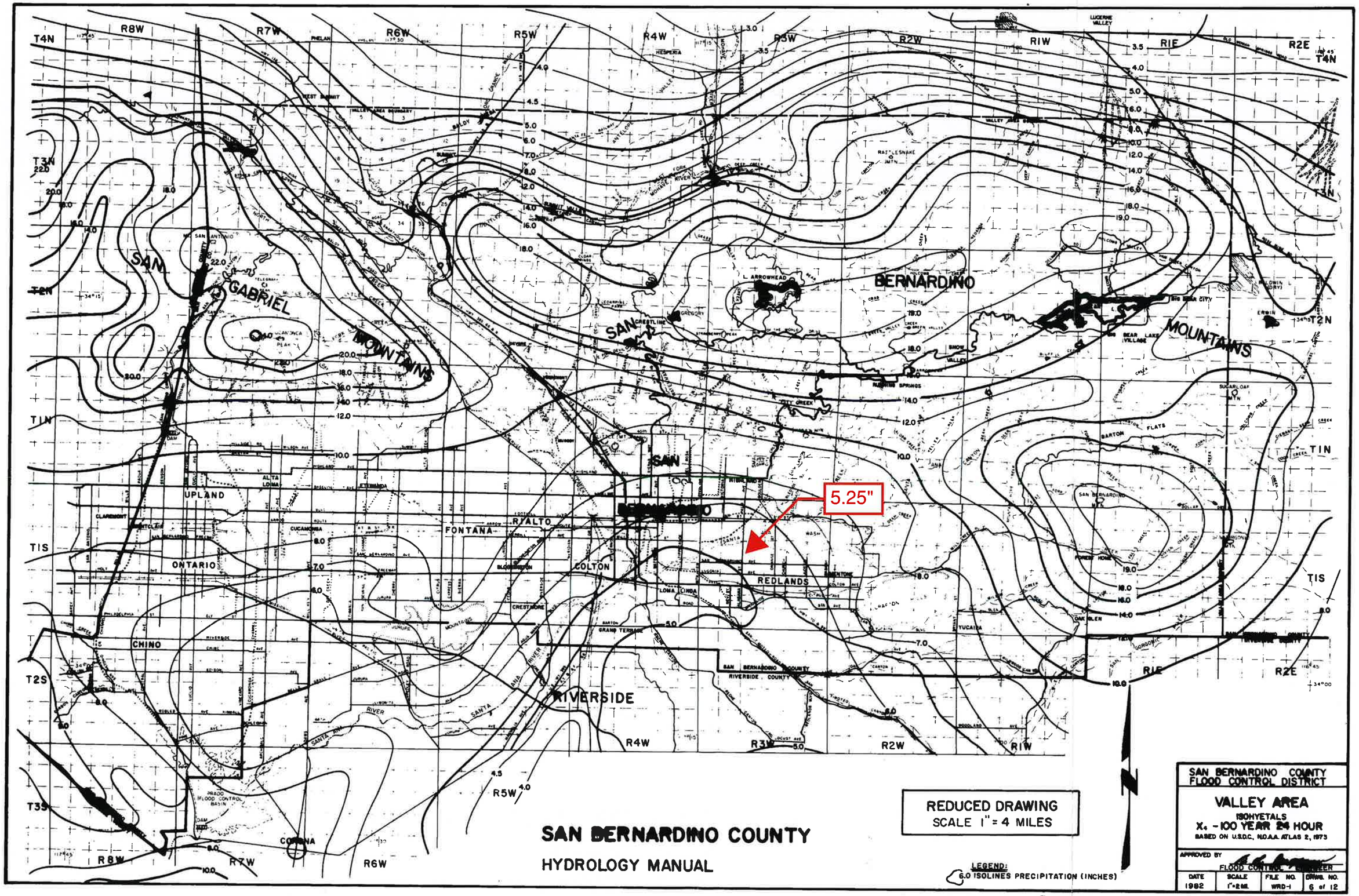
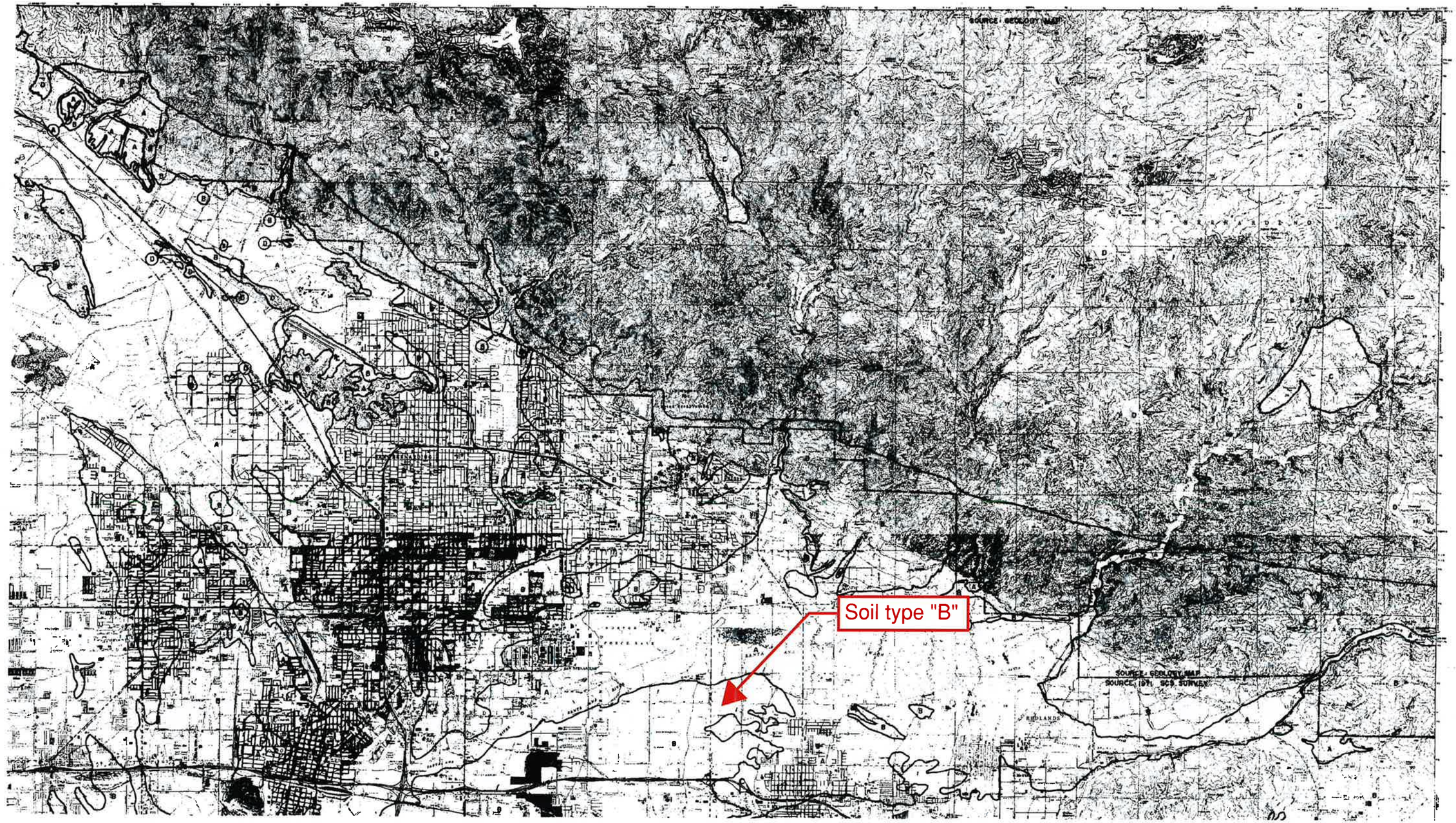
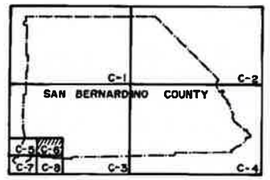

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
5.25"
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X4 - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2MI.
FILE NO. WRD-1
DRWG. NO. 6 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
RIVERSIDE
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
CORONA
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-6





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

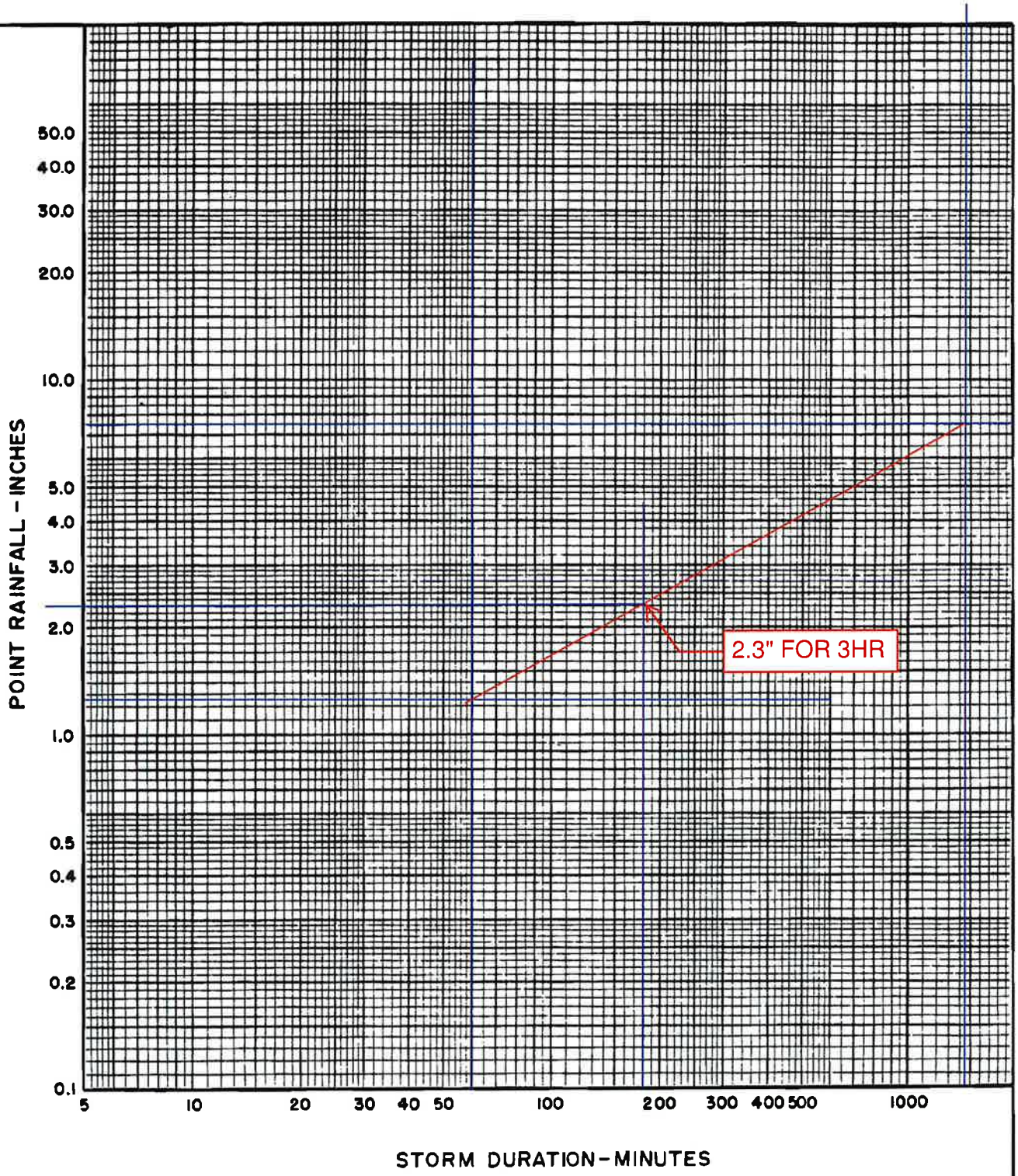
SCALE REDUCED BY 1/2

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-B AREA

FIGURE C-14



PROJECT LOCATION _____

NOTES _____

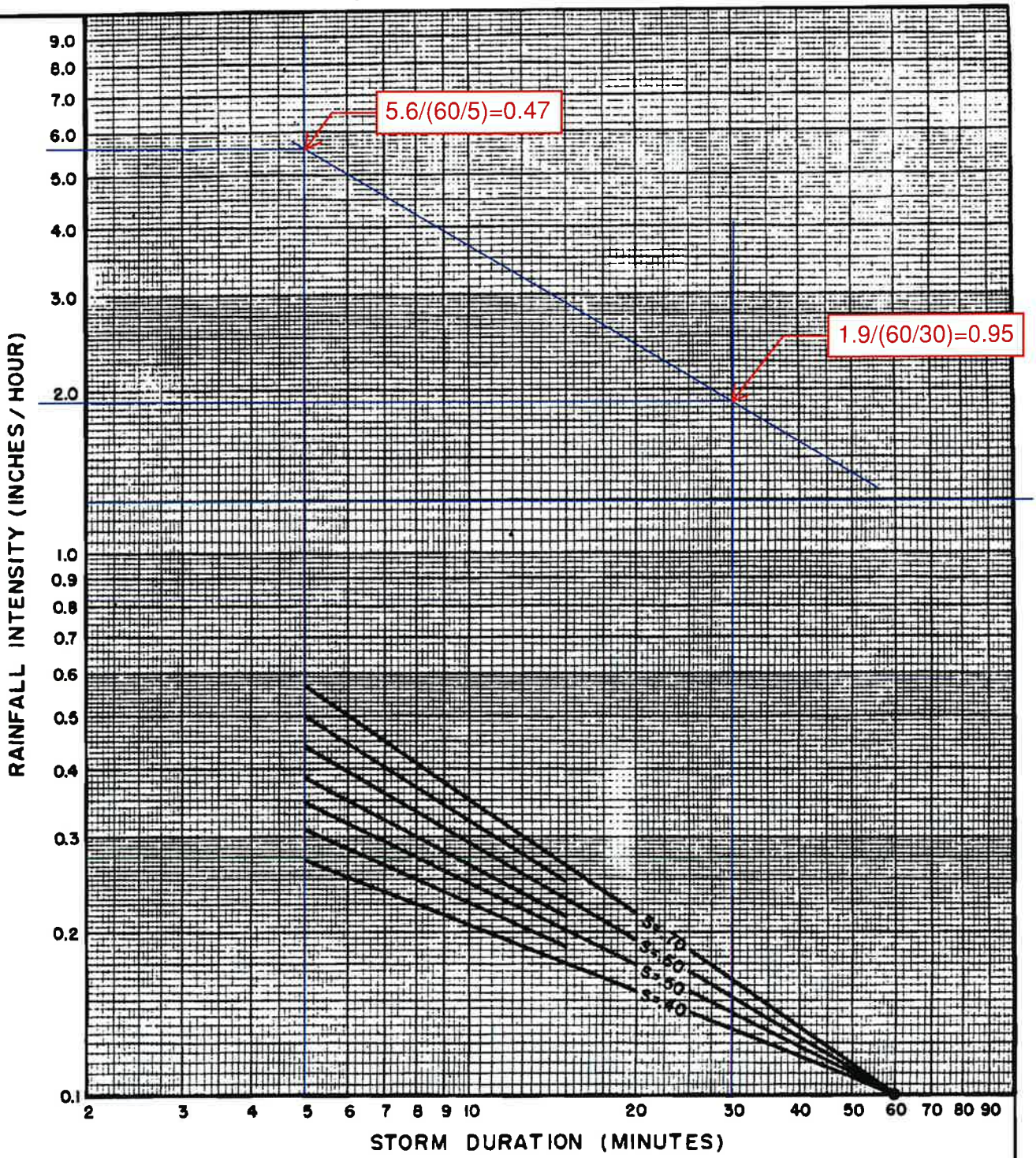
SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

AREA - AVERAGED MASS RAINFALL PLOTTING SHEET

FIGURE E-8

115



DESIGN STORM FREQUENCY = _____ YEARS

ONE HOUR POINT RAINFALL = _____ INCHES

LOG-LOG SLOPE = _____

PROJECT LOCATION = _____

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3

STREET AND STORM DRAIN IMPROVEMENT PLANS FOR REDLANDS PIONEER BUSINESS CTR

COUNTY OF SAN BERNARDINO, CALIFORNIA

STREET IMPROVEMENT GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THIS PLAN AND THE SAN BERNARDINO COUNTY STANDARDS AND SPECIFICATIONS.
2. BENCH MARK DATA: BRASS DISK IN TOP OF CURB @ NE CORNER OF ALABAMA ST. AND SAN BERNARDINO AVE, 15' +/- EAST OF EAST END RETURN
   ELEVATION: 1225.355' (NAVD 88/REDLANDS QUAD)
3. STREET MARKERS PER SAN BERNARDINO COUNTY STANDARD NO. 303, 304A AND 303B SHALL BE CONSTRUCTED AT EACH INTERSECTION.
4. STREET MARKERS SHALL BE CONSTRUCTED AT EACH INTERSECTION IN ACCORDANCE WITH APPLICABLE SAN BERNARDINO COUNTY STANDARDS. ALL SIGNS SHALL BE INSTALLED IN ACCORDANCE WITH COUNTY AND STATE SPECIFICATIONS.
5. A PERMIT WILL BE REQUIRED FROM THE COUNTY OF SAN BERNARDINO DEPARTMENT OF PUBLIC WORKS PRIOR TO ANY ENCROACHMENT OR CONSTRUCTION WITHIN THE COUNTY OF SAN BERNARDINO EASEMENT OR RIGHTS-OF-WAY.
6. LEAVE 8" X 8" BLOCKOUTS IN SIDEWALKS FOR MAILBOXES, ETC. WHEN SIDEWALK IS PLACED ADJACENT TO CURB.
7. IF ASPHALT CONCRETE IS TO BE PLACED DIRECTLY ON SUBGRADE OF ROAD OR DRAINAGE FACILITIES, A SOIL STERILANT REGISTERED BY THE E.P.A. FOR USE UNDER A.C. AND P.C.C. SHALL BE UNIFORMLY APPLIED AT THE MANUFACTURER'S RECOMMENDED RATE FOR THE FULL PAVEMENT WIDTH PRIOR TO PAVING.
8. AT COMPLETION OF ROUGH GRADING, A MATERIALS REPORT AND THE PROPOSED STRUCTURAL SECTIONS SHALL BE SUBMITED BY THE ENGINEER TO THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS, TRANSPORTATION OPERATIONS DIVISION, PERMIT SECTION, FOR REVIEW AND EVALUATION BY THE PAVEMENT MANAGEMENT SECTION. THE SUBMITTAL SHALL INCLUDE A PLAT SHOWING THE LOCATION OF THE SAMPLING, A TABULATION OF SIEVE ANALYSIS AND SAND EQUIVALENT TEST RESULTS, A STATEMENT OF RECOMMENDED STRUCTURAL SECTION AND TEST DATA SHEETS FOR ALL R-VALUE TESTS PERFORMED, INCLUDING EXPANSION PRESSURE READINGS. APPROVAL WILL BE GIVEN WHEN ALL STRUCTURAL SECTION REQUIREMENTS HAVE BEEN MET.
9. COMPACTION TESTS OF EMBANKMENT CONSTRUCTION, TRENCH BACKFILL, COMPACTING ORIGINAL GROUND, ALL SUBGRADES SHALL BE PERFORMED AT NO COST TO SAN BERNARDINO COUNTY. A WRITTEN REPORT WITH THESE COMPACTION TESTS SHALL BE SUBMITTED TO THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS, TRANSPORTATION OPERATIONS DIVISION, PERMIT SECTION FOR APPROVAL PRIOR TO PLACEMENT OF BASE MATERIALS AND/OR SURFACING.
10. AT THE COMPLETION OF PAVING A MATERIALS REPORT SHALL BE SUBMITTED TO THE SAN BERNARDINO COUNTY PUBLIC WORKS DEPARTMENT, TRANSPORTATION OPERATIONS DIVISION, PERMIT SECTION, LISTING ALL TESTS OR DETERMINATIONS COMPLETED TO VERIFY:
    A. R-VALUE, SIEVE ANALYSIS AND SAND EQUIVALENT OF AGGREGATE BASES
    B. STABILITY, OIL CONTENT AND SIEVE ANALYSIS OF ASPHALT SURFACING
11. THE WATER MAINS AND THE GAS MAINS SHALL BE PLACED UNDERGROUND PRIOR TO PAVING CONSTRUCTION. THE SERVICE LATERALS FOR THE WATER SYSTEM SHALL BE INSTALLED AT A LATER DATE. WHERE IT IS NECESSARY TO CROSS PAVEMENT, SERVICE LATERALS SHALL BE BORED IN TO PLACE.
12. FILL AND GRADE TO DRAIN ALL LOW AREAS ABUTTING TRACT ROADS TO A MINIMUM OF 1% GRADES.
13. ALL LATERAL CUTS INTO COUNTY MAINTAINED ROADWAYS SHALL BE TESTED TO VERIFY DENSIFICATION TO 90% RELATIVE COMPACTION (R.C.) AT VARYING DEPTHS TO WITHIN 0.5' OF GRADING PLANE. THE TOP 0.5' SHALL BE DENSIFIED TO 95%.
14. ALL LONGITUDINAL CUTS SHALL BE TESTED IN ACCORDANCE WITH THE SPECIFIED LIMITS AND FREQUENCY AS OUTLINED IN SECTION 6 OF THE SAN BERNARDINO COUNTY STANDARDS AND SPECIFICATIONS.
15. IMMEDIATELY FOLLOWING REMOVAL OF EXISTING PAVEMENT OR DIKE OR CURB AND/OR GUTTER, THE CONTRACTOR SHALL DILIGENTLY PURSUE THIS PORTION OF WORK UNTIL COMPLETION.
16. DEPARTMENT OF PUBLIC WORKS APPROVAL DOES NOT INCLUDE WATER SEWER SYSTEM OR ESTIMATE OF QUANTITIES.
17. A PERMIT SHALL BE OBTAINED FROM THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS PRIOR TO ANY CONSTRUCTION ON THIS PROJECT, THAT FALLS WITHIN SAN BERNARDINO COUNTY, ROAD RIGHT-OF-WAY.
18. EXPANSIVE SOILS: IN EXPANSIVE SOIL AREAS, THE SUBGRADE UNDER CURBS, GUTTERS, SIDEWALK AND DRIVEWAY APPROACHES SHALL BE SCARIFIED TO THE DEPTH OF AT LEAST EIGHT (8) INCHES AND MOISTURE SHALL BE APPLIED TO MAINTAIN FREE WATER ON THE SURFACE FOR AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE AND THE SUBGRADE SHALL THEN BE PREPARED WITHOUT COMPACTION EFFORT.
19. CURB & GUTTER, CROSS GUTTER AND SPANDRELS SHALL BE SO CONSTRUCTED THAT A MINIMUM OF PONDING OCCURS; SECTIONS HAVING GRADIENTS OF 0.5% OR FLATTER SHALL BE WATER TESTED IN THE PRESENCE OF THE INSPECTOR IMMEDIATELY PRIOR TO ACCEPTANCE. SECTIONS WHICH HAVE WATER PONDING MORE THAN 6' WIDE OR MORE THAN 4' LONG SHALL BE SAW-CUT AND REMOVED IN LENGTHS NOT LESS THAN 4' AND REPLACED TO REDUCE PONDING TO THE MAXIMUM SPECIFIED.
20. IF DURING CONSTRUCTION, GROUND WATER IS ENCOUNTERED, A SYSTEM APPROVED BY THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS SHALL BE INSTALLED TO DEWATER SAID AREA AT THE DIRECTION OF THE SOILS ENGINEER.
21. ALL 0.40% OR LESS CURB GRADE LINES SHALL BE STAKED AT 25' INTERVALS AND FORMS CERTIFIED BY THE ENGINEER BEFORE POURING CONCRETE.
22. EXISTING COUNTY ROADS THAT WILL REQUIRE RECONSTRUCTION SHALL REMAIN OPEN FOR TRAFFIC AT ALL TIMES WITH ADEQUATE DETOURS DURING ACTUAL CONSTRUCTION.
23. THE PRIVATE ENGINEER IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF WORK HEREON. IN THE EVENT OF DISCREPANCIES ARISING DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISE THE PLAN FOR APPROVAL BY THE COUNTY OF SAN BERNARDINO.
24. SHOULD ANY EXISTING STOP SIGN BE LOCATED ON A DEVELOPED CORNER OF AN INTERSECTION, IT MUST BE MAINTAINED IN PLACE NEXT TO THE EXISTING PAVEMENT UNTIL SUCH TIME AS THE WIDENED ROADWAY IS OPEN FOR TRAFFIC. AT THAT TIME, IT WILL BE RELOCATED THREE (3) FEET BEHIND THE NEW CURB IN THE VICINITY OF THE BEGINNING OF THE CURB RETURN OR AS OTHERWISE DIRECTED BY THE ENGINEER.

STORM DRAIN CONSTRUCTION NOTES:

- (70) CONSTRUCT JUNCTION STRUCTURE PER A.P.W.A. STD. 331-2, SIZE OF PIPE PER PLAN.
- (71) CONSTRUCT MANHOLE PER A.P.W.A. STD. 320-1, SIZE OF PIPE PER PLAN.
- (72) CONSTRUCT TRANSITION STRUCTURE PER A.P.W.A. STD. PLAN NO. 340-1.
- (73) CONSTRUCT 54" DIA. RCP STORM DRAIN.
- (74) CONSTRUCT 42" DIA. RCP STORM DRAIN.
- (75) CONSTRUCT 36" DIA. RCP STORM DRAIN.
- (76) CONSTRUCT 30" DIA. RCP STORM DRAIN.
- (77) CONSTRUCT 24" DIA. RCP STORM DRAIN.
- (78) CONSTRUCT MONOLITHIC CATCH BASIN CONNECTION PER A.P.W.A. STD. 308-1.
- (79) CONSTRUCT CONCRETE BULKHEAD PER S.B.C.F.C.D. DWG. NO. S.P. 176.
- (80) PROTECT IN PLACE
- (81) CONSTRUCT CURB OPENING CATCH BASIN PER SAN BERNARDINO COUNTY TRANS. DEPT. STD. 206 TYPE "A", X=7.00'.
- (82) CONSTRUCT LOCAL DEPRESSION PER SAN BERNARDINO COUNTY TRANS. DEPT. STD. 203, CF=12"
- (83) CONSTRUCT CMP RISER WITH GRATES SEE DETAIL ON SHEET 9, PIPE SIZE OF CMP RISER AND SIDE OPENINGS PER PLAN.
- (84) CONSTRUCT 36" DIA. CMP STORM DRAIN.
- (85) CONSTRUCT CONCRETE COLLAR PER A.P.W.A. STD. 380-3.
- (86) CONSTRUCT 3" THK. A.C. PAVED CIRCULAR BASIN, 2' MIN. DEEP WITH 4:1 MAX. SIDE SLOPES.
- (87) CONSTRUCT 30" DIA. CMP STORM DRAIN.
- (88) INSTALL PRE-FABRICATED CMP ELBOW, SIZE PER PLAN.
- (89) CONSTRUCT 24" DIA. CMP STORM DRAIN.

STREET CONSTRUCTION NOTES:

* PAVEMENT SECTIONS ARE APPROXIMATE VALUES, SOIL ENGINEER SHALL DETERMINE THE FINAL PAVEMENT SECTIONS ACCORDING TO THE ACTUAL R-VALUE TEST RESULTS.

- (1) REMOVE EXISTING AC PAVEMENT.
- (2) REMOVE EXISTING POWER POLE/GUY ANCHOR BY SCE AND UNDERGROUND OVERHEAD LINES
- (2a) RELOCATE TELEPHONE POLE/POWER POLE & GUY ANCHOR BY OTHER
- (3) PROTECT IN PLACE.
- (4) ADJUST TO GRADE WATER VALVE.
- (5) REMOVE EXISTING GUARD POST
- (6) REMOVE EXISTING IRRIGATION STAND PIPE OR WEIR.
- (7) REMOVE EXISTING AC BERM
- (8) RELOCATE EXISTING SIGN
- (9) ABANDONED EXISTING WATER WELL PER CITY RECOMMENDATION.
- (10) CONSTRUCT 8" CURB & GUTTER PER SAN BERNARDINO COUNTY STANDARD PLAN NO. 115.
- (11) ADJUST TO GRADE EXISTING STORM DRAIN MANHOLE
- (12) CONSTRUCT MODIFIED COMMERCIAL DRIVEWAY WITH CURB RETURNS PER SAN BERNARDINO COUNTY STANDARD PLAN NO. 129B (R=PER PLAN) (W=PER PLAN)
- (13) CONSTRUCT 5' CONCRETE SIDEWALK PER SAN BERNARDINO COUNTY STANDARD PLAN NO. 109 TYPE "B"-MODIFY. PIONEER AVE
- *(14) CONSTRUCT __" AC PAVEMENT OVER __" AB PER SOIL RECOMMENDATION AND GENERAL NOTE NO. 8. (PALMETTO AVE)
- *(15) CONSTRUCT __" AC PAVEMENT OVER __" AB PER SOIL RECOMMENDATION AND GENERAL NOTE NO. 8. (PIONEER AVE)
- (16) COLDPLANE/GRIND AC (2" MIN.) AND PROVIDE MINIMUM 1 1/2" AC OVERLAY TO MATCH PROPOSED AND EXISTING GRADES PER DETAIL ON SHEET 10
- (17) CONSTRUCT REDWOOD HEADER PER DETAIL ON SHEET 10
- (18) CONSTRUCT HANDICAP RAMP PER SAN BERNARDINO STD. PLAN NO. 110-A
- (19) ADJUST TO GRADE EXISTING SEWER MANHOLE
- (20) CONSTRUCT 8" AC DIKE PER SAN BERNARDINO COUNTY STANDARD PLAN 117
- (21) CONSTRUCT 6' CONCRETE SIDEWALK PER SAN BERNARDINO COUNTY STANDARD PLAN NO. 109 TYPE "C". PALMETTO AVE.
- (22) CONSTRUCT 10' WIDE 0.20' AC PAVEMENT CLASS II BIKE TRAIL
- (23) CONSTRUCT FULL DEPTH AC (12") MIN
- (24) RELOCATE EXISTNG FIRE HYDRANT PER CITY OF REDLANDS STD NO. A-20510
- *(25) CONSTRUCT __" AC PAVEMENT OVER __" AB PER SOIL RECOMMENDATION AND GENERAL NOTE NO. 8. (ALABAMA AVE)
- (26) RELOCATE EXISTING TRAFFIC SIGNAL POLE AND PULL BOX PER TRAFFIC SIGNAL PLANS.
- (27) RELOCATE EXISTING TELEPHONE POLE BY VERIZON
- (28) NOT USED.
- (29) RELOCATE EXISTING IRRIGATION TANK
- (30) CONSTRUCT GROUTED RIPRAP PER DETAIL ON SHEET 10
- (31) REMOVE EXISTING CONCRETE IRRIGATION PIPE AND INSTALL NEW PVC PIPE PER CITY OF REDLANDS SPECIFICATION
- (32) CONSTRUCT 3" THICK AC PAVEMENT OVER 6" THICK AB.
- (33) CONSTRUCT 6" THICK PCC CONCRETE DRIVEWAY
- (34) CONSTRUCT CONCRETE ROLLED CURB PER DETAIL ON SHEET 10.
- (35) CONSTRUCT 2 BAGS HIGH GRAVEL BAGS EVERY 200'
- (36) CONSTRUCT 18" WIDE PARKWAY DRAIN PER SAN BERNARDINO COUNTY STD. 218 INLET TYPE 1
- (37) CONSTRUCT 12"x12" CATCH BASIN PER DETAIL ON SHEET 10.
- (38) CONSTRUCT 4" THICK 3/4" GRAVEL.
- (39) CONSTRUCT GRAVITY WALL WITH FENCE ON TOP PER DETAIL ON SHEET 10.
- (40) CONSTRUCT WROUGHT IRON FENCE
- (41) CONSTRUCT METAL GATE
- (42) REMOVE EXISTING CONCRETE CHANNEL
- (43) CONSTRUCT END OF SIDEWALK BARRICADE PER SAN BERNARDINO COUNTY STD. 305B, 1 PANEL (8FT) WITH "SIDEWALK ENDS" SIGN
- (44) INSTALL OBJECT MARKER FOR POWER AND TELELPHONE POLE PER SIGNING PLANS
- (45) CONSTRUCT 4' WIDE AC SWALE PER DETAIL ON SHEET 10.
- (46) CONSTRUCT CATCH BASIN PER STORM DRAIN PLAN. SEE SHEET 8 AND 9 FOR DETAILS OF CATCH BASIN CONSTRUCTION.

PRIVATE ENGINEER'S NOTE TO CONTRACTOR

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES, CONDUITS, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN ON THESE DRAWINGS. THE CONTRACTOR FURTHER ASSUMES ALL LIABILITY AND RESPONSIBILITY FOR THE UTILITY PIPES, CONDUITS OR STRUCTURES SHOWN ON THESE DRAWINGS.

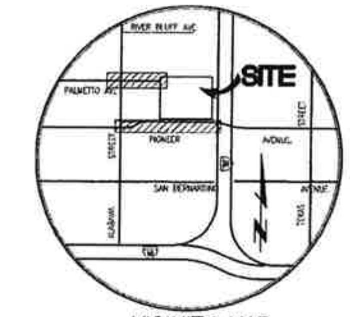
CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE COUNTY OF SAN BERNARDINO, THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

LEGEND

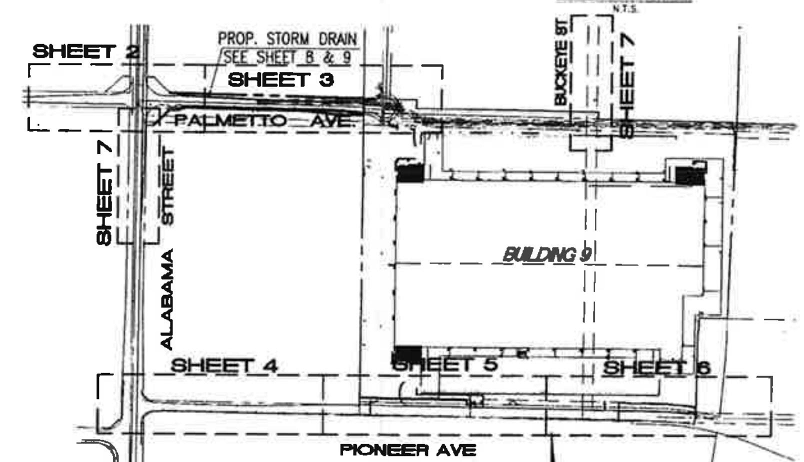
- EXIST. FIRE HYDRANT
- EXIST. WATER METER
- EXIST. WATER VALVE
- EXIST. GAS VALVE
- GUY WIRE/DEADMAN
- EXIST. POWER POLE
- EXIST. STORMDRAIN MANHOLE
- EXIST. SEWER MANHOLE
- EXIST. VAULT
- EXIST. SIGN
- TREE
- EXIST. TRAFFIC SIGNAL BOX
- EXIST. GAS METER
- EXIST. MAIL BOX
- EXIST. TELEPHONE MANHOLE
- X 1834.69 EXIST. GRADE ELEVATION
- NEW AC PAVEMENT
- AC REMOVAL
- COLDPLANE/GRIND AND AC OVERLAY
- NEW EDGE OF A.C. PAVEMENT
- EXIST. CABLE TV CONDUIT
- EXIST. EDGE OF A.C. PAVEMENT
- EXIST. CURB AND GUTTER
- EXIST. SANITARY SEWER
- 24" SD EXIST. STORM DRAIN
- EXIST. GAS LINE
- EXIST. TELEPHONE CONDUIT
- EXIST. WATER LINE
- EXIST. CONTOUR
- NEW PIPE LINE
- PROPERTY LINE
- NEW FIRE HYDRANT
- NEW WATER METER
- NEW WATER VALVE
- NEW THRUST BLOCK
- NEW SEWER MANHOLE
- NEW SEWER CLEAN OUT
- NEW SEWER MANHOLE
- NEW CATCH BASIN
- CONSTRUCTION NOTES BUBBLE
- PROPOSED CONTOUR

ABBREVIATIONS:

A.B.	AGGREGATE BASE	E.C.R.	END OF CURB RETURN	L.S.	LANDSCAPING	S.D.	STORM DRAIN
A.C.	ASPHALT CONCRETE	(0.00)	EXISTING ELEVATION	L.P.	LOW POINT	S.F.	SQUARE FEET
ARCH.	ARCHITECTURAL	E.P.	EDGE OF PAVEMENT	M.H.	MANHOLE	S.W.	SIDEWALK
B.C.R.	BEGIN OF CURB RETURN	EXIST.	EXISTING	N.G.	NATURAL GRADE	T.C.	TOP OF CURB
BLDG	BUILDING	EVC	END VERTICAL CURVE	P.V.C.	POLYVINYLCHLORIDE	T.S.	TOP OF CONCRETE SLAB
B.O.P.	BOTTOM OF PIPE	F.H.	FIRE HYDRANT	P.P.	POWER POLE	T.O.P.	TOP OF PIPE
B.O.W.	BOTTOM OF WALL	F.G.	FINISH GRADE	PL	PROPERTY LINE	T.F.	TOP OF FOOTING
B.W.	BACK OF WALK	F.S.	FINISH SURFACE	R/W	RIGHT OF WAY	T.W.	TOP OF WALL
BVC	BEGIN VERTICAL CURVE	F.F.	FINISH FLOOR	R	RATE OF GRADE	T.R.	TOP OF RAIL
C.L.F.	CHAIN LINK FENCE	F.L.	FLOW LINE	R.D.	ROOF DRAIN	T.G.	TOP OF GRATE
C.I.P.	CAST IRON PIPE	G.B.	GRADE BREAK	R.C.P.	REINFORCED CONCRETE PIPE	TOP	TOP OF SLOPE
C.B.	CATCH BASIN	H.C.	HANDICAP	ST.LT.	STREET LIGHT	TOE	TOE OF SLOPE
C/L	CENTERLINE	H	HEIGHT OF RETAINING	S =	SLOPE	T.B.	TOP OF BERM
C.F.	CURB FACE	H.P.	HIGH POINT			TRANS PAD	TRANSFORMER PAD
C.M.B.	CRUSHED MISC. BASE	INV.	INVERT				
CONC.	CONCRETE						



VICINITY MAP
N.T.S.

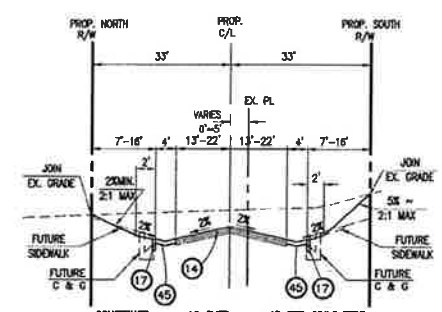


INDEX MAP

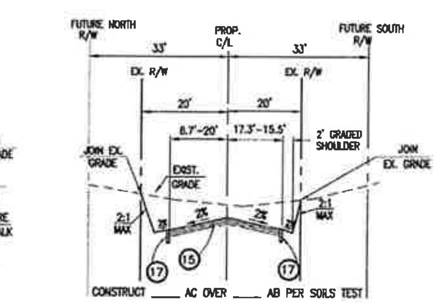
SCALE: 1"=200'

SHEET INDEX

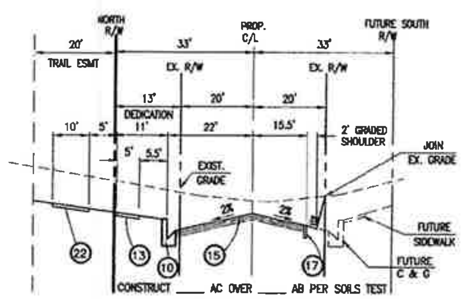
SHT.	TITLE
1	TITLE SHEET
2	PALMETTO AVE-STREET PLAN AND PROFILE
3	PALMETTO AVE-STREET PLAN AND PROFILE
4	PIONEER AVE-STREET PLAN AND PROFILE
5	PIONEER AVE-STREET PLAN AND PROFILE
6	PIONEER AVE-STREET PLAN AND PROFILE
7	ALABAMA ST & BUCKEYE ST -STREET PLAN
8	PALMETTO AVENUE - STORM DRAIN
9	PALMETTO AVE - LATERALS AND DETAILS
10	DETAILS
11	EROSION CONTROL PLAN



STA. 114+43 TO STA. 123+27
PALMETTO AVENUE–EAST
TYPICAL SECTION (COLLECTOR)
N.T.S. T.I.=9.0



STA. 10+30 TO STA. 19+06
PIONEER AVENUE
TYPICAL SECTION (COLLECTOR)
N.T.S. T.I.=9.0



STA. 19+06 TO STA. 32+25
PIONEER AVENUE
TYPICAL SECTION (COLLECTOR)
N.T.S. T.I.=9.0

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

BENCH MARK:

CITY OF REDLANDS BENCH MARK
BRASS DISK IN TOP OF CURB @ NE CORNER OF ALABAMA ST. AND SAN BERNARDINO AVE., 15 FT. +/- EAST OF EAST END RETURN.
(BMR-21 6/96) ELEVATION = 1225.355'
(NAVD '88 / REDLANDS QUAD / 1996ADJ.)

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173
HAIDOOK I. ACHAIAN RCE NO. 43293 8/15/12 DATE
REGISTERED PROFESSIONAL ENGINEER HAIDOOK L. AGHAIAN R.C.E. NO. 43293 Exp. 3-31-14 CIVIL STATE OF CALIFORNIA

MARK	REVISIONS	APPR	DATE

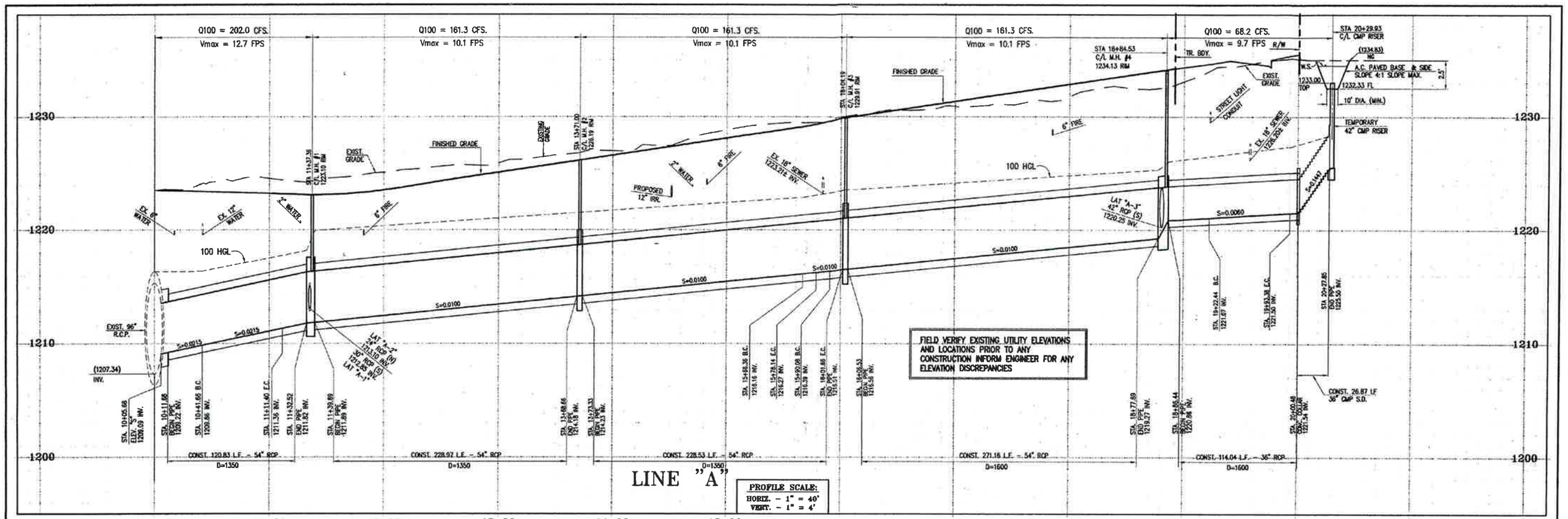
COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

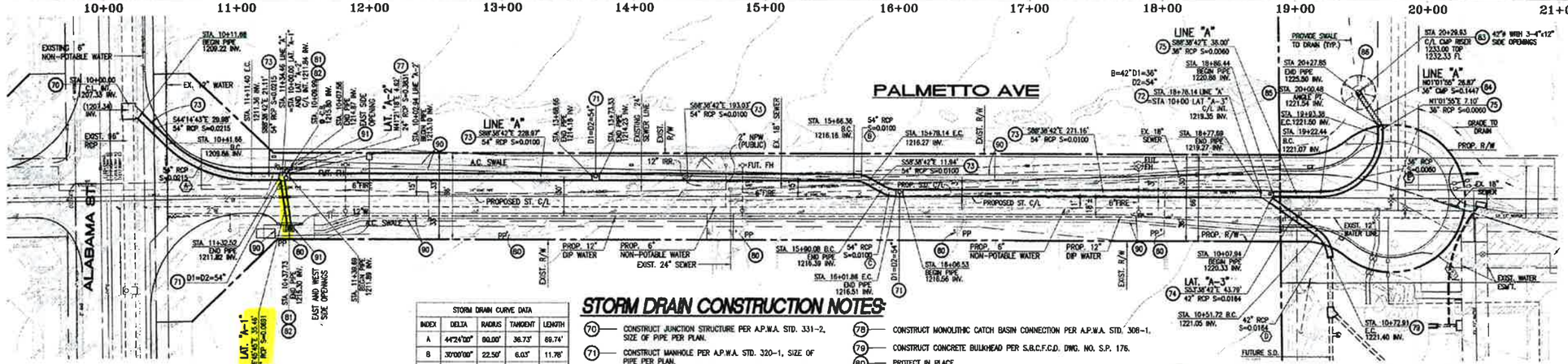
RECOMMENDED BY: AP
TRAFFIC DIVISION DATE
APPROVED BY: CHA KIM, CHIEF, LAND DEVELOPMENT DIVISION 11/15/12 DATE

TITLE SHEET
REDLANDS PIONEER BUSINESS CTR.
PIONEER AVENUE AND PALMETTO AVENUE
P200601233/CUP APN 0292-071-52

ROAD NO.
FILE NO.
SHEET 1 OF 11

Last Update: 8/14/12





STORM DRAIN CURVE DATA				
INDEX	DELTA	RADIUS	TANGENT	LENGTH
A	44°24'00"	90.00'	36.73'	69.74'
B	30°00'00"	22.50'	6.03'	11.78'
C	30°00'00"	22.50'	6.03'	11.78'
D	53°57'56"	22.50'	11.48'	21.19'
E	90°19'23"	45.00'	45.25'	70.94'

STORM DRAIN CONSTRUCTION NOTES

70 — CONSTRUCT JUNCTION STRUCTURE PER A.P.W.A. STD. 331-2, SIZE OF PIPE PER PLAN.

71 — CONSTRUCT MANHOLE PER A.P.W.A. STD. 320-1, SIZE OF PIPE PER PLAN.

72 — CONSTRUCT TRANSITION STRUCTURE PER A.P.W.A. STD. PLAN NO. 340-1.

73 — CONSTRUCT 54" DIA. RCP STORM DRAIN.

74 — CONSTRUCT 42" DIA. RCP STORM DRAIN.

75 — CONSTRUCT 36" DIA. RCP STORM DRAIN.

76 — CONSTRUCT 30" DIA. RCP STORM DRAIN.

77 — CONSTRUCT 24" DIA. RCP STORM DRAIN.

78 — CONSTRUCT MONOLITHIC CATCH BASIN CONNECTION PER A.P.W.A. STD. 308-1.

79 — CONSTRUCT CONCRETE BULKHEAD PER S.B.C.F.C.D. DWG. NO. S.P. 176.

80 — PROTECT IN PLACE

81 — CONSTRUCT CURB OPENING CATCH BASIN PER SAN BERNARDINO COUNTY TRANS. DEPT. STD. 206 TYPE "A", X=7.00'.

82 — CONSTRUCT LOCAL DEPRESSION PER SAN BERNARDINO COUNTY TRANS. DEPT. STD. 203, CF=12"

83 — CONSTRUCT CMP RISER WITH GRATES SEE DETAIL ON SHEET 9, PIPE SIZE OF CMP RISER AND SIDE OPENINGS PER PLAN.

84 — CONSTRUCT 36" DIA. CMP STORM DRAIN.

85 — CONSTRUCT CONCRETE COLLAR PER A.P.W.A. STD. 380-3.

86 — CONSTRUCT 3" THK. A.C. PAVED CIRCULAR BASIN, 2' MIN. DEEP WITH 4:1 MAX. SIDE SLOPES.

87 — CONSTRUCT 30" DIA. CMP STORM DRAIN.

88 — INSTALL PRE-FABRICATED CMP ELBOW, SIZE PER PLAN.

89 — CONSTRUCT 24" DIA. CMP STORM DRAIN.

90 — CONSTRUCT A.C. PAVED SWALE PER STREET PLAN.

91 — CONSTRUCT SIDE OPENING FOR CATCH BASIN, LOCATION OF OPENING PER PLAN.

0 20 40 80 120
SCALE: 1"=40'

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BENCH MARK:

CITY OF REDLANDS BENCH MARK
BRASS DISK IN TOP OF CURB @ NE CORNER OF ALABAMA ST. AND SAN BERNARDINO AVE., 15 FT. +/- EAST OF EAST END RETURN.

(BMR-21 6/96) ELEVATION = 1225.355'
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PREPARED BY:

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PH.(714)521-4811 FAX(714)521-4173

Haidook Aghajan 11/9/12
HAIDOOK I. AGHAJAN RCE NO. 43293 DATE

REGISTERED PROFESSIONAL ENGINEER HAIDOOK I. AGHAJAN R.C.E. NO. 43293 Exp. 3-31-14 CIVIL STATE OF CALIFORNIA

MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY: JACOB HAIDICO, CHIEF, TRAFFIC DIVISION — DATE

APPROVED BY: GIA HUNG, CHIEF, LAND DEVELOPMENT DIVISION — 11/15/12 DATE

STORM DRAIN PLANS

REDLANDS PIONEER BUSINESS CTR.

PALMETTO AVENUE

P200601233/CUP APN 0292-071-18

ROAD NO.

FILE NO.

SHEET 8 OF 11

Last Update: 11/9/12
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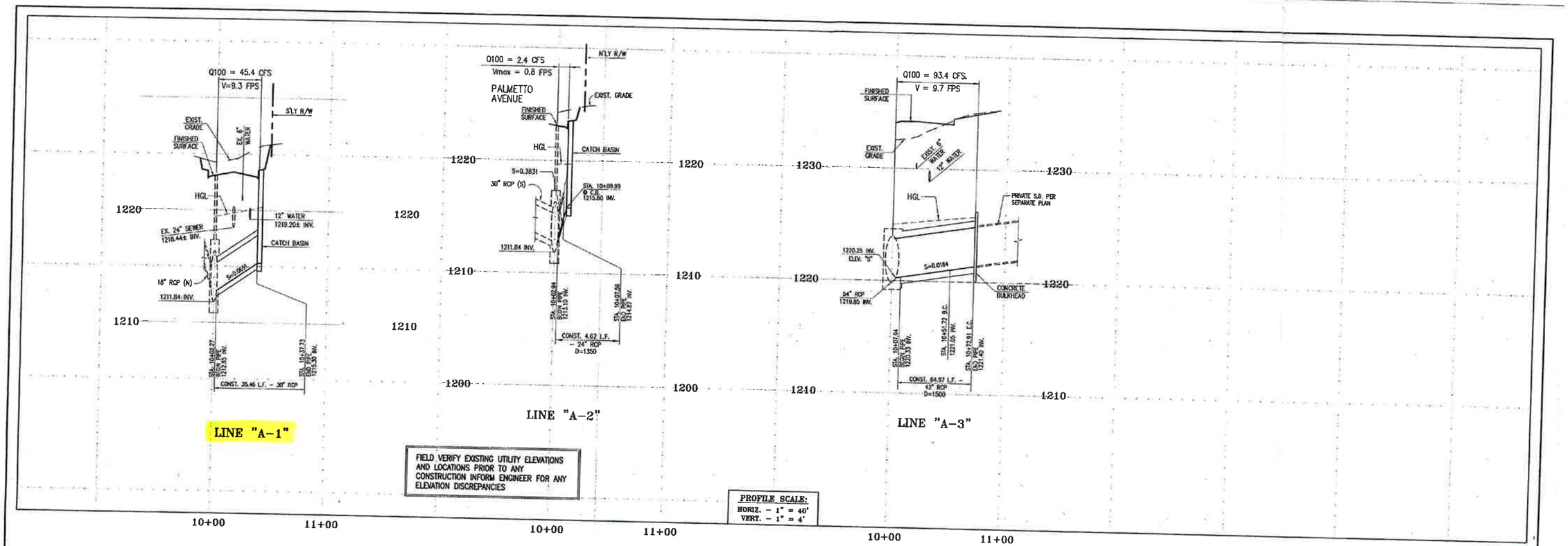
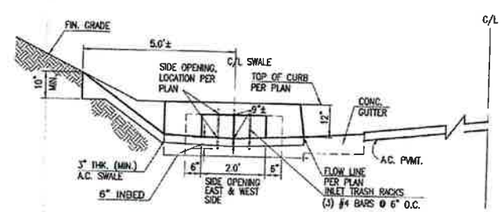


FIELD VERIFY EXISTING UTILITY ELEVATIONS AND LOCATIONS PRIOR TO ANY CONSTRUCTION INFORM ENGINEER FOR ANY ELEVATION DISCREPANCIES

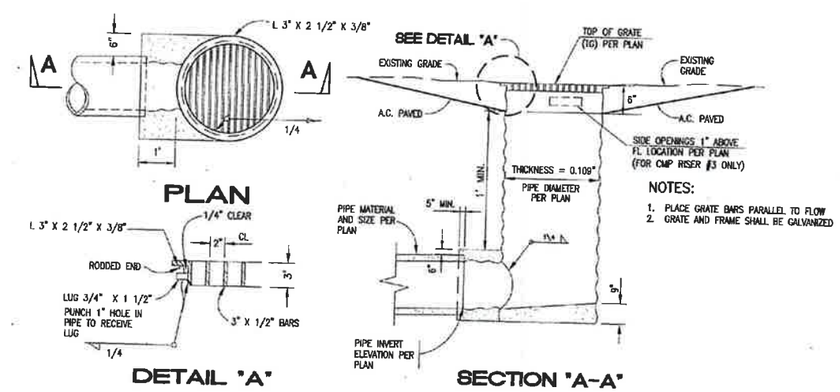
PROFILE SCALE:
HORIZ. – 1" = 40'
VERT. – 1" = 4'



C.B. SIDE OPENING DET.

N.T.S.

91



NOTES:

1. PLACE GRATE BARS PARALLEL TO FLOW
2. GRATE AND FRAME SHALL BE GALVANIZED

CMP INLET DETAIL

N.T.S.

83

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HAIDOOK I. AGHAIAN RCE NO. 43293 — DATE 8/15/12

REGISTERED PROFESSIONAL ENGINEER HAIDOOK I. AGHAIAN R.C.E. NO. 43293 Exp. 3-31-14 CIVIL STATE OF CALIFORNIA

MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY: AP
JACOB BASKOD, CHIEF, TRAFFIC DIVISION — DATE
APPROVED BY: GA KIM, CHIEF, LAND DEVELOPMENT DIVISION — DATE 11/15/12

STORM DRAIN PLANS

REDLANDS PIONEER BUSINESS CTR.
S.D. LATERALS AND DETAILS

P200601233/CUP — APN 0292-071-18

ROAD NO.
FILE NO.
SHEET 9 OF 11

Last Update: 8/15/12

APPENDIX B

HYDROLOGY CALCULATIONS

EXISTING CONDITION

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 8.0  Release Date: 01/01/99  License ID 1435

                          Analysis prepared by:

                           THIENES ENGINEERING
                         16800 VALLEY VIEW AVENUE
                            LA MIRADA CA 90638
                   PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* ALABAMA & PIONEER BLDG, SAN BERNARDINO COUNTY                            *
* 100-YEAR EXISTING CONDITION                                              *
* NODES 100-103                                                            *
 ****************************************************************************

  FILE NAME: C:\XDRIVE\3849\100X.DAT
  TIME/DATE OF STUDY: 10:22 03/24/2020
============================================================================
  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) = 1.1800

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*


****************************************************************************
  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) =   430.00
  ELEVATION DATA: UPSTREAM(FEET) =   1240.50  DOWNSTREAM(FEET) =   1234.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.951
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.831
  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.)
  AGRICULTURAL POOR COVER
  "ORCHARDS"                  B        7.00      0.22       1.00    89   13.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      16.46
  TOTAL AREA(ACRES) =       7.00   PEAK FLOW RATE(CFS) =     16.46

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1234.50  DOWNSTREAM(FEET) =   1230.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =     16.46
  FLOW VELOCITY(FEET/SEC) =   1.83   FLOW DEPTH(FEET) =   0.16
  TRAVEL TIME(MIN.) =   2.00   Tc(MIN.) =  15.95
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =   650.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =  15.95
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.613
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ORCHARDS"                  B        8.30      0.22       1.00    89
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA AREA(ACRES) =     8.30      SUBAREA RUNOFF(CFS) =   17.89
  EFFECTIVE AREA(ACRES) =    15.30   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =    15.30       PEAK FLOW RATE(CFS) =      32.98

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1230.00  DOWNSTREAM(FEET) =   1226.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   240.00   CHANNEL SLOPE =  0.0163
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =     32.98
  FLOW VELOCITY(FEET/SEC) =   2.20   FLOW DEPTH(FEET) =   0.24
  TRAVEL TIME(MIN.) =   1.82   Tc(MIN.) =  17.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =   890.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN) =  17.77
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.449
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ORCHARDS"                  B        7.40      0.22       1.00    89
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA AREA(ACRES) =    7.40      SUBAREA RUNOFF(CFS) =   14.86
  EFFECTIVE AREA(ACRES) =    22.70   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =    22.70       PEAK FLOW RATE(CFS) =      45.58
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)        =     22.70  TC(MIN.) =     17.77
  EFFECTIVE AREA(ACRES) =     22.70  AREA-AVERAGED Fm(INCH/HR)=  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)    =     45.58
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

PROPOSED CONDITION

```
____________________________________________________________________________
****************************************************************************
             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:

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

 ************************* DESCRIPTION OF STUDY *************************
* TEI JOB 3849                                                          *
* 100-YEAR STORM EVENT                                                  *
* PROPOSED CONDITION (NODES 100-321)                                    *
 *************************************************************************

  FILE NAME: W:\3849\100P.DAT
  TIME/DATE OF STUDY: 16:47 09/23/2020
============================================================================
  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) = 1.1800

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *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) =   348.00
  ELEVATION DATA: UPSTREAM(FEET) =   1240.32  DOWNSTREAM(FEET) =   1231.47

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.583
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.443
  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        1.30      0.42     0.100    76    6.58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.15
  TOTAL AREA(ACRES) =      1.30   PEAK FLOW RATE(CFS) =      5.15

****************************************************************************
  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) =  1227.80  DOWNSTREAM(FEET) =  1224.90
  FLOW LENGTH(FEET) =   621.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.15
  PIPE TRAVEL TIME(MIN.) =   2.24    Tc(MIN.) =    8.83
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     969.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.726
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        2.65      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) =    2.65      SUBAREA RUNOFF(CFS) =    8.79
  EFFECTIVE AREA(ACRES) =      3.95   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.0       PEAK FLOW RATE(CFS) =      13.10

****************************************************************************
  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) =  1224.90  DOWNSTREAM(FEET) =  1224.11
  FLOW LENGTH(FEET) =   169.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.78
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.10
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    9.32
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1138.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.32
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.608
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.85      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) =    1.85      SUBAREA RUNOFF(CFS) =    5.94
  EFFECTIVE AREA(ACRES) =      5.80   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =      18.61

****************************************************************************
  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) =  1224.11  DOWNSTREAM(FEET) =  1223.33
  FLOW LENGTH(FEET) =   169.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.26
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.61
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    9.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1307.00 FEET.

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

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.77
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.507
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.85      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) =    1.85      SUBAREA RUNOFF(CFS) =    5.77
  EFFECTIVE AREA(ACRES) =      7.65   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        7.7       PEAK FLOW RATE(CFS) =      23.86

****************************************************************************
  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) =  1223.33  DOWNSTREAM(FEET) =  1222.54
  FLOW LENGTH(FEET) =   169.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.71
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.86
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =   10.19
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1476.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.19
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.420
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        3.25      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) =    3.25      SUBAREA RUNOFF(CFS) =    9.88
  EFFECTIVE AREA(ACRES) =     10.90   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       10.9       PEAK FLOW RATE(CFS) =      33.13

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1222.54  DOWNSTREAM(FEET) =  1218.79
  FLOW LENGTH(FEET) =   803.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.24
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.13
  PIPE TRAVEL TIME(MIN.) =   1.85    Tc(MIN.) =   12.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    2279.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.03
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.094
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        3.40      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) =    3.40      SUBAREA RUNOFF(CFS) =    9.34
  EFFECTIVE AREA(ACRES) =     14.30   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       14.3       PEAK FLOW RATE(CFS) =      39.27

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1218.79  DOWNSTREAM(FEET) =  1217.95
  FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.58
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      39.27
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   12.12
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    204.00 =    2338.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 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.) =   12.12
  RAINFALL INTENSITY(INCH/HR) =   3.08
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      14.30
  TOTAL STREAM AREA(ACRES) =      14.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      39.27

****************************************************************************
  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) =   368.00
  ELEVATION DATA: UPSTREAM(FEET) =   1233.37  DOWNSTREAM(FEET) =   1228.56

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.690
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.048
  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        2.90      0.42     0.100    76    7.69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.45
  TOTAL AREA(ACRES) =      2.90   PEAK FLOW RATE(CFS) =     10.45

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1224.50  DOWNSTREAM(FEET) =  1223.50
  FLOW LENGTH(FEET) =   201.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.54
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.45
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    8.30
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     569.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
  MAINLINE Tc(MIN.) =    8.30
  * 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        1.80      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) =    1.80      SUBAREA RUNOFF(CFS) =    6.20
  EFFECTIVE AREA(ACRES) =      4.70   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =      16.18

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1223.50  DOWNSTREAM(FEET) =  1222.66
  FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.12
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.18
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    8.75
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     737.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.75
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.745
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.80      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) =    1.80      SUBAREA RUNOFF(CFS) =    6.00
  EFFECTIVE AREA(ACRES) =      6.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.5       PEAK FLOW RATE(CFS) =      21.66

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1222.66  DOWNSTREAM(FEET) =  1217.95
  FLOW LENGTH(FEET) =   433.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.93
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.66
  PIPE TRAVEL TIME(MIN.) =   0.81    Tc(MIN.) =    9.56
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =    1170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 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.) =    9.56
  RAINFALL INTENSITY(INCH/HR) =   3.55
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       6.50
  TOTAL STREAM AREA(ACRES) =       6.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.66
```

```
  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       39.27   12.12    3.081  0.42( 0.04) 0.10      14.3     100.00
      2       21.66    9.56    3.552  0.42( 0.04) 0.10       6.5     200.00

  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       57.45    9.56    3.552  0.42( 0.04) 0.10      17.8     200.00
      2       58.03   12.12    3.081  0.42( 0.04) 0.10      20.8     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      58.03    Tc(MIN.) =    12.12
  EFFECTIVE AREA(ACRES) =      20.80   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       20.8
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    204.00 =    2338.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    321.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1217.95  DOWNSTREAM(FEET) =  1215.28
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.46
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      58.03
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   12.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    321.00 =    2391.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    321.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.16
  RAINFALL INTENSITY(INCH/HR) =   3.07
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      20.80
  TOTAL STREAM AREA(ACRES) =      20.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      58.03

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    321.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1122.00
  ELEVATION DATA: UPSTREAM(FEET) =   1229.90  DOWNSTREAM(FEET) =   1222.41

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   31.908
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.724
  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.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.95      0.31     1.000    84   31.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.95   PEAK FLOW RATE(CFS) =      1.21

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

```
  FLOW PROCESS FROM NODE    321.00 TO NODE    321.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   31.91
  RAINFALL INTENSITY(INCH/HR) =   1.72
  AREA-AVERAGED Fm(INCH/HR) =  0.31
  AREA-AVERAGED Fp(INCH/HR) =  0.31
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.95
  TOTAL STREAM AREA(ACRES) =       0.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.21

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   659.00
  ELEVATION DATA: UPSTREAM(FEET) =   1233.78  DOWNSTREAM(FEET) =   1222.41

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   21.330
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.195
  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.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        0.30      0.31     1.000    84   21.33
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    321.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.33
  RAINFALL INTENSITY(INCH/HR) =   2.19
  AREA-AVERAGED Fm(INCH/HR) =  0.31
  AREA-AVERAGED Fp(INCH/HR) =  0.31
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.30
  TOTAL STREAM AREA(ACRES) =       0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       57.45    9.60    3.542  0.42( 0.04) 0.10      17.8     200.00
      1       58.03   12.16    3.074  0.42( 0.04) 0.10      20.8     100.00
      2        1.21   31.91    1.724  0.31( 0.31) 1.00       0.9     310.00
      3        0.51   21.33    2.195  0.31( 0.31) 1.00       0.3     320.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       58.67    9.60    3.542  0.40( 0.05) 0.12      18.2     200.00
      2       59.36   12.16    3.074  0.40( 0.05) 0.12      21.3     100.00
      3       47.58   21.33    2.195  0.39( 0.05) 0.14      21.7     320.00
      4       33.77   31.91    1.724  0.38( 0.06) 0.15      22.0     310.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      59.36    Tc(MIN.) =    12.16
  EFFECTIVE AREA(ACRES) =      21.33   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.12
```

```
                                                                  100P
  TOTAL AREA(ACRES) =       22.0
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    321.00 =    2391.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       22.0  TC(MIN.) =     12.16
  EFFECTIVE AREA(ACRES) =     21.33  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.122
  PEAK FLOW RATE(CFS)   =      59.36

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       58.67    9.60    3.542  0.40( 0.05) 0.12      18.2     200.00
      2       59.36   12.16    3.074  0.40( 0.05) 0.12      21.3     100.00
      3       47.58   21.33    2.195  0.39( 0.05) 0.14      21.7     320.00
      4       33.77   31.91    1.724  0.38( 0.06) 0.15      22.0     310.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 8.0  Release Date: 01/01/99  License ID 1435

                         Analysis prepared by:

                          THIENES ENGINEERING
                        16800 VALLEY VIEW AVENUE
                           LA MIRADA CA 90638
                  PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* ALABAMA & PIONEER BLDG, SAN BERNARDINO COUNTY                            *
* 100-YEAR PROPOSED CONDITION                                              *
* NODES 300-301                                                            *
 ***************************************************************************

  FILE NAME: C:\XDRIVE\3849\100P2.DAT
  TIME/DATE OF STUDY: 10:54 03/20/2020
============================================================================
  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) = 1.1800

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   355.00
  ELEVATION DATA: UPSTREAM(FEET) =   1234.34  DOWNSTREAM(FEET) =   1227.38

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.234
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.585
  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.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.65      0.31       1.00    84   16.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      1.33
  TOTAL AREA(ACRES) =      0.65   PEAK FLOW RATE(CFS) =      1.33
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      0.65  TC(MIN.) =     16.23
  EFFECTIVE AREA(ACRES) =      0.65  AREA-AVERAGED Fm(INCH/HR)=  0.31
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)    =      1.33
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

1
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APPENDIX C

DETENTION CALCULATIONS

****

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

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 5.25 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	9.60	10.00	76.(56.)	0.423	0.912

TOTAL AREA (Acres) = 9.60

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.042

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.088

1

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*****************************************************************************
                        SMALL AREA UNIT HYDROGRAPH MODEL

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                              Analysis prepared by:

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                               LA MIRADA CA 90638
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    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =     9.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.042
    LOW LOSS FRACTION = 0.088
    TIME OF CONCENTRATION(MIN.) = 10.18
    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) =  0.47
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.95
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.25
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.30
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.75
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.25
-----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =      3.48
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =      0.72

*****************************************************************************
  TIME      VOLUME       Q     0.        10.0       20.0       30.0       40.0
 (HOURS)     (AF)      (CFS)
-----------------------------------------------------------------------------
  0.05      0.0000     -0.36  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  0.22      0.0031      0.81  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  0.39      0.0144      0.81  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  0.56      0.0259      0.82  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  0.73      0.0373      0.82  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  0.90      0.0489      0.83  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.07      0.0605      0.83  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.24      0.0721      0.84  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.41      0.0839      0.84  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.58      0.0957      0.85  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.75      0.1076      0.85  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  1.92      0.1196      0.86  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.09      0.1316      0.86  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.26      0.1437      0.87  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.43      0.1559      0.87  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.60      0.1682      0.88  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.77      0.1806      0.88  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  2.94      0.1930      0.89  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.11      0.2055      0.90  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.27      0.2182      0.90  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.44      0.2309      0.91  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.61      0.2437      0.92  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.78      0.2566      0.92  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  3.95      0.2696      0.93  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.12      0.2826      0.94  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.29      0.2958      0.94  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.46      0.3091      0.95  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.63      0.3225      0.96  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.80      0.3360      0.96  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  4.97      0.3496      0.98  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.14      0.3633      0.98  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.31      0.3771      0.99  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.48      0.3911      1.00  QQQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.65      0.4051      1.01  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.82      0.4193      1.01  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  5.99      0.4336      1.03  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  6.16      0.4481      1.03  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  6.33      0.4626      1.05  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  6.50      0.4773      1.05  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  6.67      0.4922      1.07  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  6.84      0.5072      1.07  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.01      0.5223      1.09  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.18      0.5376      1.09  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.35      0.5530      1.11  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.52      0.5686      1.12  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.69      0.5844      1.13  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  7.86      0.6003      1.14  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.03      0.6164      1.16  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.20      0.6327      1.17  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.36      0.6492      1.18  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.53      0.6658      1.19  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.70      0.6827      1.21  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  8.87      0.6998      1.22  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.04      0.7170      1.24  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.21      0.7345      1.25  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.38      0.7523      1.28  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.55      0.7703      1.29  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.72      0.7885      1.31  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
  9.89      0.8070      1.32  .QQQQQQQQQ.QQQQQQQQQ.QQ   Q  Q.QQQQQQQQQ.
```

10.06	0.8257	1.35	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
10.23	0.8448	1.36	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
10.40	0.8641	1.39	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
10.57	0.8837	1.41	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
10.74	0.9037	1.44	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
10.91	0.9240	1.46	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.08	0.9446	1.49	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.25	0.9657	1.51	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.42	0.9871	1.55	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.59	1.0089	1.57	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.76	1.0312	1.61	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
11.93	1.0539	1.63	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.10	1.0752	1.41	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.27	1.0918	0.95	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.44	1.1053	0.99	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.61	1.1194	1.01	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.78	1.1340	1.07	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
12.95	1.1491	1.09	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.12	1.1649	1.15	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.29	1.1813	1.19	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.45	1.1984	1.26	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.62	1.2164	1.30	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.79	1.2353	1.40	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
13.96	1.2553	1.45	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.13	1.2850	2.80	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.30	1.3289	3.46	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.47	1.3788	3.66	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.64	1.4310	3.78	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.81	1.4862	4.09	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
14.98	1.5449	4.27	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
15.15	1.6080	4.73	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
15.32	1.6764	5.02	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
15.49	1.7417	4.28	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
15.66	1.8045	4.68	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
15.83	1.8851	6.81	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.00	1.9997	9.54	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.17	2.2859	31.28	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.34	2.5439	5.51	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.51	2.6203	5.38	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.68	2.6895	4.49	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
16.85	2.7484	3.93	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.02	2.8009	3.56	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.19	2.8364	1.51	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.36	2.8564	1.35	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.53	2.8744	1.22	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.70	2.8909	1.12	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
17.87	2.9060	1.04	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.04	2.9201	0.97	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.21	2.9385	1.66	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.38	2.9613	1.59	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.55	2.9831	1.53	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.71	3.0041	1.47	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
18.88	3.0244	1.42	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.05	3.0441	1.38	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.22	3.0631	1.34	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.39	3.0816	1.30	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.56	3.0996	1.26	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.73	3.1171	1.23	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
19.90	3.1342	1.20	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.07	3.1508	1.17	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.24	3.1671	1.15	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.41	3.1831	1.12	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.58	3.1987	1.10	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.75	3.2139	1.08	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
20.92	3.2289	1.06	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.09	3.2436	1.04	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.26	3.2581	1.02	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.43	3.2723	1.00	.QQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.60	3.2862	0.99	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.77	3.2999	0.97	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
21.94	3.3134	0.95	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.11	3.3267	0.94	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.28	3.3398	0.93	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.45	3.3527	0.91	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.62	3.3654	0.90	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.79	3.3779	0.89	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
22.96	3.3903	0.88	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.13	3.4025	0.86	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.30	3.4145	0.85	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.47	3.4264	0.84	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.64	3.4382	0.83	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.80	3.4498	0.82	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
23.97	3.4612	0.81	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
24.14	3.4726	0.80	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.
24.31	3.4782	0.00	QQQQQQQQQQ.QQQQQQQQQ.QQ	Q	Q.QQQQQQQQQ.

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 10.180
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00

```
                INFLOW
                  |
                  |
                  V                 effective depth
            -------------             (and volume)
            |           |     |
            | detention |     |....V.............
            |   basin   |<-->|           outflow
            |           |     |.........________
            -------------     |          |      \
                  |           | storage  |       basin outlet
                  V           -----------
               OUTFLOW
```

DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 10

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) **	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**	0.180	0.010	3.600*
* 0.480	0.130	5.900**	0.580	0.220	6.500*
* 0.780	0.440	7.500**	0.980	0.720	8.400*
* 1.180	1.030	9.300**	1.380	1.370	10.000*
* 1.580	1.740	10.700**	1.780	2.150	11.400*

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	0.18	-0.01524	0.03524
3	0.48	0.08863	0.17137
4	0.58	0.17443	0.26557
5	0.78	0.38742	0.49258
6	0.98	0.66111	0.77889
7	1.18	0.96480	1.09520
8	1.38	1.29989	1.44011
9	1.58	1.66498	1.81502
10	1.78	2.07007	2.22993

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.

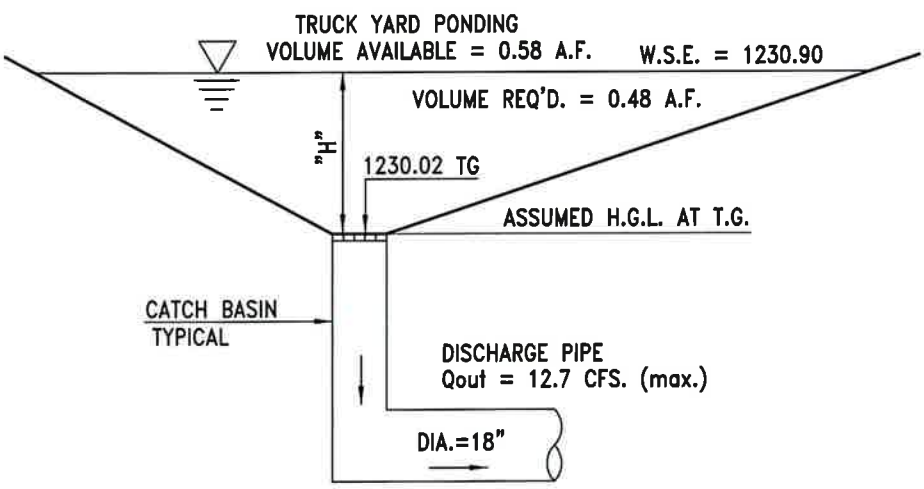
TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.051	0.000	-0.36	-0.03	-0.26	-0.001
0.221	0.000	0.81	0.07	0.43	0.004
0.391	0.000	0.81	0.06	1.27	0.003
0.560	0.000	0.82	0.06	1.16	0.003
0.730	0.000	0.82	0.06	1.17	0.003
0.900	0.000	0.83	0.06	1.18	0.003
1.069	0.000	0.83	0.06	1.19	0.003
1.239	0.000	0.84	0.06	1.19	0.003
1.409	0.000	0.84	0.06	1.20	0.003
1.578	0.000	0.85	0.06	1.21	0.003
1.748	0.000	0.85	0.06	1.21	0.003
1.918	0.000	0.86	0.06	1.22	0.003
2.087	0.000	0.86	0.06	1.23	0.003
2.257	0.000	0.87	0.06	1.24	0.003
2.427	0.000	0.87	0.06	1.25	0.003
2.596	0.000	0.88	0.06	1.25	0.004
2.766	0.000	0.88	0.06	1.26	0.004
2.936	0.000	0.89	0.06	1.27	0.004
3.105	0.000	0.90	0.06	1.28	0.004
3.275	0.000	0.90	0.06	1.29	0.004
3.445	0.000	0.91	0.07	1.30	0.004
3.614	0.000	0.92	0.07	1.31	0.004
3.784	0.000	0.92	0.07	1.32	0.004
3.954	0.000	0.93	0.07	1.33	0.004
4.123	0.000	0.94	0.07	1.34	0.004
4.293	0.000	0.94	0.07	1.35	0.004
4.463	0.000	0.95	0.07	1.36	0.004
4.632	0.000	0.96	0.07	1.37	0.004
4.802	0.000	0.96	0.07	1.38	0.004
4.972	0.000	0.98	0.07	1.39	0.004
5.141	0.000	0.98	0.07	1.40	0.004
5.311	0.000	0.99	0.07	1.41	0.004
5.481	0.000	1.00	0.07	1.42	0.004
5.650	0.000	1.01	0.07	1.44	0.004
5.820	0.000	1.01	0.07	1.45	0.004
5.990	0.000	1.03	0.07	1.46	0.004
6.159	0.000	1.03	0.07	1.47	0.004
6.329	0.000	1.05	0.07	1.49	0.004
6.499	0.000	1.05	0.08	1.50	0.004
6.668	0.000	1.07	0.08	1.52	0.004
6.838	0.000	1.07	0.08	1.53	0.004
7.008	0.000	1.09	0.08	1.55	0.004
7.177	0.000	1.09	0.08	1.56	0.004
7.347	0.000	1.11	0.08	1.58	0.004
7.517	0.000	1.12	0.08	1.59	0.004
7.686	0.000	1.13	0.08	1.61	0.005
7.856	0.000	1.14	0.08	1.63	0.005
8.026	0.000	1.16	0.08	1.65	0.005
8.195	0.000	1.17	0.08	1.66	0.005
8.365	0.000	1.18	0.08	1.68	0.005

8.535	0.000	1.19	0.09	1.70	0.005
8.704	0.000	1.21	0.09	1.72	0.005
8.874	0.000	1.22	0.09	1.74	0.005
9.044	0.000	1.24	0.09	1.77	0.005
9.213	0.000	1.25	0.09	1.79	0.005
9.383	0.000	1.28	0.09	1.81	0.005
9.553	0.000	1.29	0.09	1.84	0.005
9.722	0.000	1.31	0.09	1.86	0.005
9.892	0.000	1.32	0.09	1.89	0.005
10.062	0.000	1.35	0.10	1.92	0.005
10.231	0.000	1.36	0.10	1.94	0.005
10.401	0.000	1.39	0.10	1.97	0.006
10.571	0.000	1.41	0.10	2.01	0.006
10.740	0.000	1.44	0.10	2.04	0.006
10.910	0.000	1.46	0.10	2.07	0.006
11.080	0.000	1.49	0.11	2.11	0.006
11.249	0.000	1.51	0.11	2.15	0.006
11.419	0.000	1.55	0.11	2.19	0.006
11.589	0.000	1.57	0.11	2.23	0.006
11.758	0.000	1.61	0.12	2.28	0.006
11.928	0.000	1.63	0.12	2.32	0.006
12.098	0.000	1.41	0.10	2.18	0.006
12.267	0.000	0.95	0.07	1.69	0.004
12.437	0.000	0.99	0.07	1.39	0.004
12.607	0.000	1.01	0.07	1.44	0.004
12.776	0.000	1.07	0.08	1.49	0.004
12.946	0.000	1.09	0.08	1.55	0.004
13.116	0.000	1.15	0.08	1.61	0.005
13.285	0.000	1.19	0.09	1.68	0.005
13.455	0.000	1.26	0.09	1.75	0.005
13.625	0.000	1.30	0.09	1.84	0.005
13.794	0.000	1.40	0.10	1.93	0.006
13.964	0.000	1.45	0.10	2.04	0.006
14.134	0.000	2.80	0.19	2.87	0.014
14.303	0.000	3.46	0.21	3.75	0.022
14.473	0.000	3.66	0.22	3.85	0.024
14.643	0.000	3.78	0.22	3.89	0.026
14.812	0.000	4.09	0.23	3.94	0.029
14.982	0.000	4.27	0.24	4.01	0.033
15.152	0.000	4.73	0.26	4.13	0.042
15.321	0.000	5.02	0.28	4.30	0.052
15.491	0.000	4.28	0.28	4.39	0.050
15.661	0.000	4.68	0.29	4.41	0.054
15.830	0.000	6.81	0.36	4.73	0.083
16.000	0.000	9.54	0.49	5.49	0.140
16.170	0.000	31.28	0.81	6.80	0.483
16.339	0.000	5.51	0.79	7.59	0.454
16.509	0.000	5.38	0.77	7.49	0.425
16.679	0.000	4.49	0.73	7.34	0.385
16.848	0.000	3.93	0.69	7.15	0.340
17.018	0.000	3.56	0.65	6.94	0.292
17.188	0.000	1.51	0.58	6.66	0.220
17.357	0.000	1.35	0.50	6.27	0.151
17.527	0.000	1.22	0.38	5.58	0.090
17.697	0.000	1.12	0.26	4.65	0.040
17.866	0.000	1.04	0.13	3.39	0.007
18.036	0.000	0.97	0.07	1.99	0.004
18.206	0.000	1.66	0.12	1.88	0.007
18.375	0.000	1.59	0.11	2.32	0.006
18.545	0.000	1.53	0.11	2.23	0.006
18.715	0.000	1.47	0.11	2.15	0.006
18.884	0.000	1.42	0.10	2.07	0.006
19.054	0.000	1.38	0.10	2.01	0.005
19.224	0.000	1.34	0.10	1.95	0.005
19.393	0.000	1.30	0.09	1.89	0.005
19.563	0.000	1.26	0.09	1.84	0.005
19.733	0.000	1.23	0.09	1.79	0.005
19.902	0.000	1.20	0.09	1.74	0.005
20.072	0.000	1.17	0.08	1.70	0.005
20.242	0.000	1.15	0.08	1.66	0.005
20.411	0.000	1.12	0.08	1.63	0.004
20.581	0.000	1.10	0.08	1.59	0.004
20.751	0.000	1.08	0.08	1.56	0.004
20.920	0.000	1.06	0.08	1.53	0.004
21.090	0.000	1.04	0.07	1.50	0.004
21.260	0.000	1.02	0.07	1.47	0.004
21.429	0.000	1.00	0.07	1.45	0.004
21.599	0.000	0.99	0.07	1.42	0.004
21.769	0.000	0.97	0.07	1.40	0.004
21.938	0.000	0.95	0.07	1.38	0.004
22.108	0.000	0.94	0.07	1.36	0.004
22.278	0.000	0.93	0.07	1.34	0.004
22.447	0.000	0.91	0.07	1.32	0.004
22.617	0.000	0.90	0.06	1.30	0.004
22.787	0.000	0.89	0.06	1.28	0.004
22.956	0.000	0.88	0.06	1.26	0.003
23.126	0.000	0.86	0.06	1.25	0.003
23.296	0.000	0.85	0.06	1.23	0.003
23.465	0.000	0.84	0.06	1.21	0.003
23.635	0.000	0.83	0.06	1.20	0.003
23.805	0.000	0.82	0.06	1.19	0.003
23.974	0.000	0.81	0.06	1.17	0.003
24.144	0.000	0.80	0.06	1.16	0.003
24.314	0.000	0.00	0.00	0.58	0.000

1

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs) 18"
1230.02	0.00	51				
			403	403	0.01	3.6
1230.20	0.18	4,426				
			5,344	5,747	0.13	5.9
1230.50	0.48	31,201				
			3,658	9,405	0.22	6.5
1230.60	0.58	41,969				
			9,943	19,348	0.44	7.5
1230.80	0.78	57,458				
			5,904	25,252	0.58	8.0
1230.90	0.88	60,612				
			19,613	44,865	1.03	9.3
1231.20	1.18	70,142				
			14,731	59,596	1.37	10.0
1231.40	1.38	77,169				
			16,211	75,807	1.74	10.7
1231.60	1.58	84,943				
			17,791	93,598	2.15	11.4
1231.80	1.78	92,966				

$Q = 0.6\ (\text{AREA})\ \sqrt{64.4\ (H)}$



A = 1.7671 SF. (18" HDPE PIPE)

$H = 0.18'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (0.18)} = 3.6$ CFS.

$H = 0.48'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (0.48)} = 5.9$ CFS.

$H = 0.58'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (0.58)} = 6.5$ CFS.

$H = 0.78'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (0.78)} = 7.5$ CFS.

$H = 0.88'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (0.88)} = 8.0$ CFS.

$H = 1.18'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (1.18)} = 9.3$ CFS.

$H = 1.38'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (1.38)} = 10.0$ CFS.

$H = 1.58'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (1.58)} = 10.7$ CFS.

$H = 1.78'$
$Q = 0.6\ (1.767)\ \sqrt{64.4\ (1.78)} = 11.4$ CFS.

APPENDIX D

HYDRAULIC CALCULATIONS

```
0
T1 ALABAMA AND PIONEER BUILDING  LNA.DAT
T2 PROPOSED CONDITION 100-YEAR
T3 STORM DRAIN LINE A
SO   1000.001215.28 42                          1220.10
R    1052.541217.95 42      .012
JX   1056.541218.15 36 30   .012    22.0        1218.51        45.00
R    1353.561221.97 36      .012
R    1357.561222.02 30      .012                                                1
R    1485.281222.65 30      .012
JX   1485.281222.66 30 18   .012     5.5        1223.16        45.00
R    1653.211223.50 30      .012
JX   1657.211223.52 24 18   .012     5.7        1224.26        45.00
R    1812.321224.29 24      .012
R    1829.991224.38 24      .012                          22.50 45.00
R    1853.651224.50 24      .012
SH   1853.651224.50 24
CD   6  4              0.50
CD  12  4              1.00
CD  18  4              1.50
CD  24  4              2.00
CD  30  4              2.50
CD  36  4              3.00
CD  42  4              3.50
```

DATE: 3/20/2020
TIME: 16:47

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE 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	6	4			0.50														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ALABAMA AND PIONEER BUILDING LNA.DAT

HEADING LINE NO 2 IS -

PROPOSED CONDITION 100-YEAR

HEADING LINE NO 3 IS -

STORM DRAIN LINE A

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
1000.00 1215.28 42 1220.10

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1052.54 1217.95 42 0.012 0.00 0.00 0.00 0

ELEMENT NO 3 IS A JUNCTION * * * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
1056.54 1218.15 36 30 0 0.012 22.0 0.0 1218.51 0.00 45.00 0.00

ELEMENT NO 4 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1353.56 1221.97 36 0.012 0.00 0.00 0.00 0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 5 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1357.56 1222.02 30 0.012 0.00 0.00 0.00 1

ELEMENT NO 6 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1485.28 1222.65 30 0.012 0.00 0.00 0.00 0

ELEMENT NO 7 IS A JUNCTION * * * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
1485.28 1222.66 30 18 0 0.012 5.5 0.0 1223.16 0.00 45.00 0.00

ELEMENT NO 8 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1653.21 1223.50 30 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
1657.21 1223.52 24 18 0 0.012 5.7 0.0 1224.26 0.00 45.00 0.00

ELEMENT NO 10 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1812.32 1224.29 24 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 11 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1829.99 1224.38 24 0.012 22.50 45.00 0.00 0

ELEMENT NO 12 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1853.65 1224.50 24 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
1853.65 1224.50 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
ALABAMA AND PIONEER BUILDING LNA.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LINE A

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	1215.28	4.820	1220.100	43.7	4.54	0.320	1220.420	0.00	2.060		3.50	0.00	0.00	0	0.00
26.82	0.05082					.001597	0.04			1.000			0.00		
1026.82	1216.64	3.500	1220.143	43.7	4.54	0.320	1220.463	0.00	2.060		3.50	0.00	0.00	0	0.00
5.92	0.05082					.001495	0.01			1.000			0.00		
1032.74	1216.94	3.175	1220.119	43.7	4.76	0.352	1220.471	0.00	2.060		3.50	0.00	0.00	0	0.00
3.10	0.05082					.001455	0.00			1.000			0.00		
1035.84	1217.10	2.987	1220.088	43.7	5.00	0.388	1220.476	0.00	2.060		3.50	0.00	0.00	0	0.00
2.07	0.05082					.001564	0.00			1.000			0.00		
1037.91	1217.21	2.853	1220.059	43.7	5.20	0.421	1220.480	0.00	2.060		3.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1037.91	1217.21	1.459	1218.665	43.7	11.52	2.059	1220.724	0.00	2.060		3.50	0.00	0.00	0	0.00
1.09	0.05082					.012029	0.01			1.000			0.00		
1039.00	1217.26	1.469	1218.731	43.7	11.40	2.018	1220.749	0.00	2.060		3.50	0.00	0.00	0	0.00
3.26	0.05082					.011142	0.04			1.000			0.00		
1042.26	1217.43	1.523	1218.951	43.7	10.87	1.835	1220.786	0.00	2.060		3.50	0.00	0.00	0	0.00
2.67	0.05082					.009791	0.03			1.000			0.00		
1044.93	1217.56	1.580	1219.143	43.7	10.36	1.668	1220.811	0.00	2.060		3.50	0.00	0.00	0	0.00
2.20	0.05082					.008609	0.02			1.000			0.00		
1047.13	1217.67	1.639	1219.314	43.7	9.88	1.516	1220.830	0.00	2.060		3.50	0.00	0.00	0	0.00
1.77	0.05082					.007571	0.01			1.000			0.00		
1048.90	1217.77	1.700	1219.465	43.7	9.42	1.379	1220.844	0.00	2.060		3.50	0.00	0.00	0	0.00
1.37	0.05082					.006663	0.01			1.000			0.00		

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		
1050.27	1217.84	1.765	1219.600	43.7	8.98	1.253	1220.853	0.00	2.060		3.50	0.00	0.00	0	0.00
1.02	0.05082					.005869	0.01			1.000			0.00		
1051.29	1217.89	1.833	1219.720	43.7	8.57	1.139	1220.859	0.00	2.060		3.50	0.00	0.00	0	0.00
0.71	0.05082					.005174	0.00			1.000			0.00		
1052.00	1217.92	1.904	1219.827	43.7	8.17	1.036	1220.863	0.00	2.060		3.50	0.00	0.00	0	0.00
0.42	0.05082					.004565	0.00			1.000			0.00		
1052.42	1217.94	1.979	1219.923	43.7	7.79	0.942	1220.865	0.00	2.060		3.50	0.00	0.00	0	0.00
0.12	0.05082					.004030	0.00			1.000			0.00		
1052.54	1217.95	2.060	1220.010	43.7	7.42	0.855	1220.865	0.00	2.060		3.50	0.00	0.00	0	0.00
JUNCT STR	0.05000					.002286	0.01						0.00		
1056.54	1218.15	2.705	1220.855	21.7	3.23	0.162	1221.017	0.00	1.498		3.00	0.00	0.00	0	0.00
11.77	0.01286					.000822	0.01			1.053			0.00		
1068.31	1218.30	2.547	1220.848	21.7	3.39	0.179	1221.027	0.00	1.498		3.00	0.00	0.00	0	0.00
9.53	0.01286					.000891	0.01			1.053			0.00		
1077.84	1218.42	2.415	1220.839	21.7	3.56	0.197	1221.036	0.00	1.498		3.00	0.00	0.00	0	0.00
8.03	0.01286					.000981	0.01			1.053			0.00		
1085.87	1218.53	2.300	1220.827	21.7	3.73	0.216	1221.043	0.00	1.498		3.00	0.00	0.00	0	0.00
7.00	0.01286					.001090	0.01			1.053			0.00		
1092.87	1218.62	2.196	1220.813	21.7	3.91	0.238	1221.051	0.00	1.498		3.00	0.00	0.00	0	0.00

6.20	0.01286					.001217	0.01			1.053			0.00		
1099.07	1218.70	2.100	1220.797	21.7	4.10	0.262	1221.059	0.00	1.498		3.00	0.00	0.00	0	0.00
1.61	0.01286					.001300	0.00			1.053			0.00		

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		
1100.68	1218.72	2.082	1220.800	21.7	4.14	0.267	1221.067	0.00	1.498		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1100.68	1218.72	1.053	1219.771	21.7	9.81	1.493	1221.264	0.00	1.498		3.00	0.00	0.00	0	0.00
2.98	0.01286					.012906	0.04			1.053			0.00		
1103.66	1218.76	1.053	1219.809	21.7	9.81	1.493	1221.302	0.00	1.498		3.00	0.00	0.00	0	0.00
135.15	0.01286					.012370	1.67			1.053			0.00		
1238.81	1220.49	1.077	1221.571	21.7	9.50	1.402	1222.973	0.00	1.498		3.00	0.00	0.00	0	0.00
50.44	0.01286					.011107	0.56			1.053			0.00		
1289.25	1221.14	1.116	1222.259	21.7	9.06	1.275	1223.534	0.00	1.498		3.00	0.00	0.00	0	0.00
24.32	0.01286					.009742	0.24			1.053			0.00		
1313.57	1221.46	1.156	1222.612	21.7	8.64	1.159	1223.771	0.00	1.498		3.00	0.00	0.00	0	0.00
14.68	0.01286					.008546	0.13			1.053			0.00		
1328.25	1221.64	1.198	1222.843	21.7	8.24	1.053	1223.896	0.00	1.498		3.00	0.00	0.00	0	0.00
9.84	0.01286					.007499	0.07			1.053			0.00		
1338.09	1221.77	1.241	1223.012	21.7	7.85	0.958	1223.970	0.00	1.498		3.00	0.00	0.00	0	0.00
6.55	0.01286					.006584	0.04			1.053			0.00		
1344.64	1221.86	1.287	1223.142	21.7	7.49	0.871	1224.013	0.00	1.498		3.00	0.00	0.00	0	0.00
4.54	0.01286					.005784	0.03			1.053			0.00		
1349.18	1221.91	1.334	1223.248	21.7	7.14	0.791	1224.039	0.00	1.498		3.00	0.00	0.00	0	0.00
2.82	0.01286					.005083	0.01			1.053			0.00		
1352.00	1221.95	1.384	1223.334	21.7	6.81	0.719	1224.053	0.00	1.498		3.00	0.00	0.00	0	0.00
1.56	0.01286					.004471	0.01			1.053			0.00		

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		
1353.56	1221.97	1.436	1223.406	21.7	7.43	0.858	1224.264	0.00	1.584		2.50	0.00	0.00	0	0.00
2.13	0.01250					.005817	0.01			1.154			0.00		
1355.69	1222.00	1.473	1223.470	21.7	7.21	0.808	1224.278	0.00	1.584		2.50	0.00	0.00	0	0.00
1.87	0.01250					.005267	0.01			1.154			0.00		
1357.56	1222.02	1.533	1223.553	21.7	6.88	0.734	1224.287	0.00	1.584		2.50	0.00	0.00	0	0.00
112.25	0.00493					.004946	0.56			1.533			0.00		
1469.81	1222.57	1.533	1224.107	21.7	6.88	0.734	1224.841	0.00	1.584		2.50	0.00	0.00	0	0.00
15.47	0.00493					.004717	0.07			1.533			0.00		
1485.28	1222.65	1.584	1224.234	21.7	6.62	0.680	1224.914	0.00	1.584		2.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002858	0.00						0.00		
1485.28	1222.66	2.153	1224.813	16.2	3.60	0.202	1225.015	0.00	1.360		2.50	0.00	0.00	0	0.00
25.33	0.00500					.001284	0.03			1.271			0.00		

1510.61	1222.79	2.039	1224.826	16.2	3.78	0.222	1225.048	0.00	1.360		2.50	0.00	0.00	0	0.00
21.40	0.00500					.001410	0.03			1.271			0.00		
1532.01	1222.89	1.940	1224.834	16.2	3.96	0.244	1225.078	0.00	1.360		2.50	0.00	0.00	0	0.00
18.79	0.00500					.001563	0.03			1.271			0.00		
1550.80	1222.99	1.851	1224.839	16.2	4.16	0.268	1225.107	0.00	1.360		2.50	0.00	0.00	0	0.00
16.62	0.00500					.001743	0.03			1.271			0.00		
1567.42	1223.07	1.770	1224.841	16.2	4.36	0.295	1225.136	0.00	1.360		2.50	0.00	0.00	0	0.00
14.92	0.00500					.001952	0.03			1.271			0.00		
1582.34	1223.14	1.695	1224.840	16.2	4.57	0.324	1225.164	0.00	1.360		2.50	0.00	0.00	0	0.00
13.36	0.00500					.002192	0.03			1.271			0.00		

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		
1595.70	1223.21	1.625	1224.837	16.2	4.79	0.357	1225.194	0.00	1.360		2.50	0.00	0.00	0	0.00
11.57	0.00500					.002469	0.03			1.271			0.00		
1607.27	1223.27	1.560	1224.830	16.2	5.03	0.393	1225.223	0.00	1.360		2.50	0.00	0.00	0	0.00
10.25	0.00500					.002784	0.03			1.271			0.00		
1617.52	1223.32	1.498	1224.819	16.2	5.27	0.432	1225.251	0.00	1.360		2.50	0.00	0.00	0	0.00
7.97	0.00500					.003146	0.03			1.271			0.00		
1625.49	1223.36	1.440	1224.801	16.2	5.53	0.475	1225.276	0.00	1.360		2.50	0.00	0.00	0	0.00
0.65	0.00500					.003562	0.00			1.271			0.00		
1626.14	1223.36	1.385	1224.749	16.2	5.80	0.523	1225.272	0.00	1.360		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1626.14	1223.36	1.271	1224.635	16.2	6.46	0.648	1225.283	0.00	1.360		2.50	0.00	0.00	0	0.00
21.54	0.00500					.004794	0.10			1.271			0.00		
1647.68	1223.47	1.308	1224.780	16.2	6.23	0.603	1225.383	0.00	1.360		2.50	0.00	0.00	0	0.00
5.53	0.00500					.004289	0.02			1.271			0.00		
1653.21	1223.50	1.360	1224.860	16.2	5.94	0.547	1225.407	0.00	1.360		2.50	0.00	0.00	0	0.00
JUNCT STR	0.00500					.002856	0.01						0.00		
1657.21	1223.52	1.723	1225.243	10.5	3.65	0.207	1225.450	0.00	1.161		2.00	0.00	0.00	0	0.00
22.36	0.00496					.001772	0.04			1.123			0.00		
1679.57	1223.63	1.631	1225.262	10.5	3.83	0.227	1225.489	0.00	1.161		2.00	0.00	0.00	0	0.00
18.65	0.00496					.001946	0.04			1.123			0.00		
1698.22	1223.72	1.552	1225.276	10.5	4.01	0.250	1225.526	0.00	1.161		2.00	0.00	0.00	0	0.00
16.39	0.00496					.002158	0.04			1.123			0.00		

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		
1714.61	1223.81	1.481	1225.286	10.5	4.21	0.275	1225.561	0.00	1.161		2.00	0.00	0.00	0	0.00
14.66	0.00496					.002406	0.04			1.123			0.00		
1729.27	1223.88	1.416	1225.294	10.5	4.41	0.302	1225.596	0.00	1.161		2.00	0.00	0.00	0	0.00
13.11	0.00496					.002694	0.04			1.123			0.00		
1742.38	1223.94	1.356	1225.299	10.5	4.63	0.333	1225.632	0.00	1.161		2.00	0.00	0.00	0	0.00
11.73	0.00496					.003026	0.04			1.123			0.00		

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  1754.11  1224.00    1.300  1225.301      10.5    4.85    0.366  1225.667   0.00    1.161            2.00    0.00  0.00   0   0.00
     9.89  0.00496                                        .003407     0.03                    1.123                  0.00
  1764.00  1224.05    1.248  1225.298      10.5    5.09    0.403  1225.701   0.00    1.161            2.00    0.00  0.00   0   0.00
     8.68  0.00496                                        .003849     0.03                    1.123                  0.00
  1772.68  1224.09    1.198  1225.291      10.5    5.35    0.444  1225.735   0.00    1.161            2.00    0.00  0.00   0   0.00
HYDRAULIC JUMP                                                                                                        0.00
  1772.68  1224.09    1.123  1225.216      10.5    5.78    0.519  1225.735   0.00    1.161            2.00    0.00  0.00   0   0.00
    29.85  0.00496                                        .005006     0.15                    1.123                  0.00
  1802.53  1224.24    1.123  1225.364      10.5    5.78    0.519  1225.883   0.00    1.161            2.00    0.00  0.00   0   0.00
     9.79  0.00496                                        .005045     0.05                    1.123                  0.00
  1812.32  1224.29    1.118  1225.408      10.5    5.82    0.525  1225.933   0.00    1.161            2.00    0.00  0.00   0   0.00
    17.67  0.00509                                        .005067     0.09                    1.115                  0.00
  1829.99  1224.38    1.120  1225.500      10.5    5.80    0.523  1226.023   0.00    1.161            2.00    0.00  0.00   0   0.00
    13.68  0.00507                                        .005049     0.07                    1.120                  0.00
  1843.67  1224.45    1.120  1225.569      10.5    5.80    0.523  1226.092   0.00    1.161            2.00    0.00  0.00   0   0.00
     9.98  0.00507                                        .004777     0.05                    1.120                  0.00
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ALABAMA AND PIONEER BUILDING LNA.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LINE A

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

 L/ELEM     SO                                          SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
  1853.65  1224.50    1.161  1225.661      10.5    5.55    0.479  1226.140   0.00    1.161            2.00    0.00  0.00   0
0.00
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ALABAMA AND PIONEER BUILDING LNA.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LINE A

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                .         .         .         .         .         .         .         .         .         .         .         .
  1000.00      .I              C          H         W  E                                                                      .  R
  1006.42      .                                                                                                               .
  1012.84      .                                                                                                               .
  1019.26      .                                                                                                               .
  1025.67      .                                                                                                               .
  1032.09      .          I              C          X  E                                                                      .  R
  1038.51      .            I               C       W HE                                                                      .  R
  1044.93      .              I              C     W   EH                                                                      .  R
  1051.35      .               I              C    W   E H                                                                     .  R
  1057.77      .               I          W   C         X                                                                      .  R
  1064.18      .               I          W    C        X                                                                      .  R
  1070.60      .                I         W    C        EH                                                                     .  R
  1077.02      .                 I          W   C       E H                                                                    .  R
  1083.44      .                  I          W   C      E  H                                                                   .  R
  1089.86      .                   I           W  C     E   H                                                                  .  R
  1096.28      .                   I            W  C    E    H                                                                 .  R
  1102.69      .                    I            W C    E    H                                                                 .  R
  1109.11      .                    I             WC    E    H                                                                 .  R
  1115.53      .                    I              WC   E    H                                                                 .  R
  1121.95      .                    I               X   E    H                                                                 .  JX
  1128.37      .                      I          C       W EH                                                                  .  R
  1134.79      .                       I          C     W E H                                                                  .  R
  1141.21      .                        I          C    W E  H                                                                 .  R
  1147.62      .                         I          C   W E   H                                                                .  R
  1154.04      .                          I          C  W E    H                                                               .  R
  1160.46      .                           I         C  W E     H                                                              .  R
  1166.88      .                           I         C  W E     H                                                              .  R
  1173.30      .                           I       W  C       E   H                                                            .  R
  1179.72      .                            I      W   C      E   H                                                            .  R
  1186.13      .                                                                                                               .
  1192.55      .                                                                                                               .
  1198.97      .                                                                                                               .
  1205.39      .                                                                                                               .
  1211.81      .                                                                                                               .
  1218.23      .                                                                                                               .
  1224.64      .                                                                                                               .
  1231.06      .                                                                                                               .
  1237.48      .                                                                                                               .
  1243.90      .                                          I         W  C        E    H                                        .  R
  1250.32      .                                                                                                               .
  1256.74      .                                                                                                               .
  1263.16      .                                                                                                               .
  1269.57      .                                                                                                               .
  1275.99      .                                                                                                               .
  1282.41      .                                                                                                               .
```

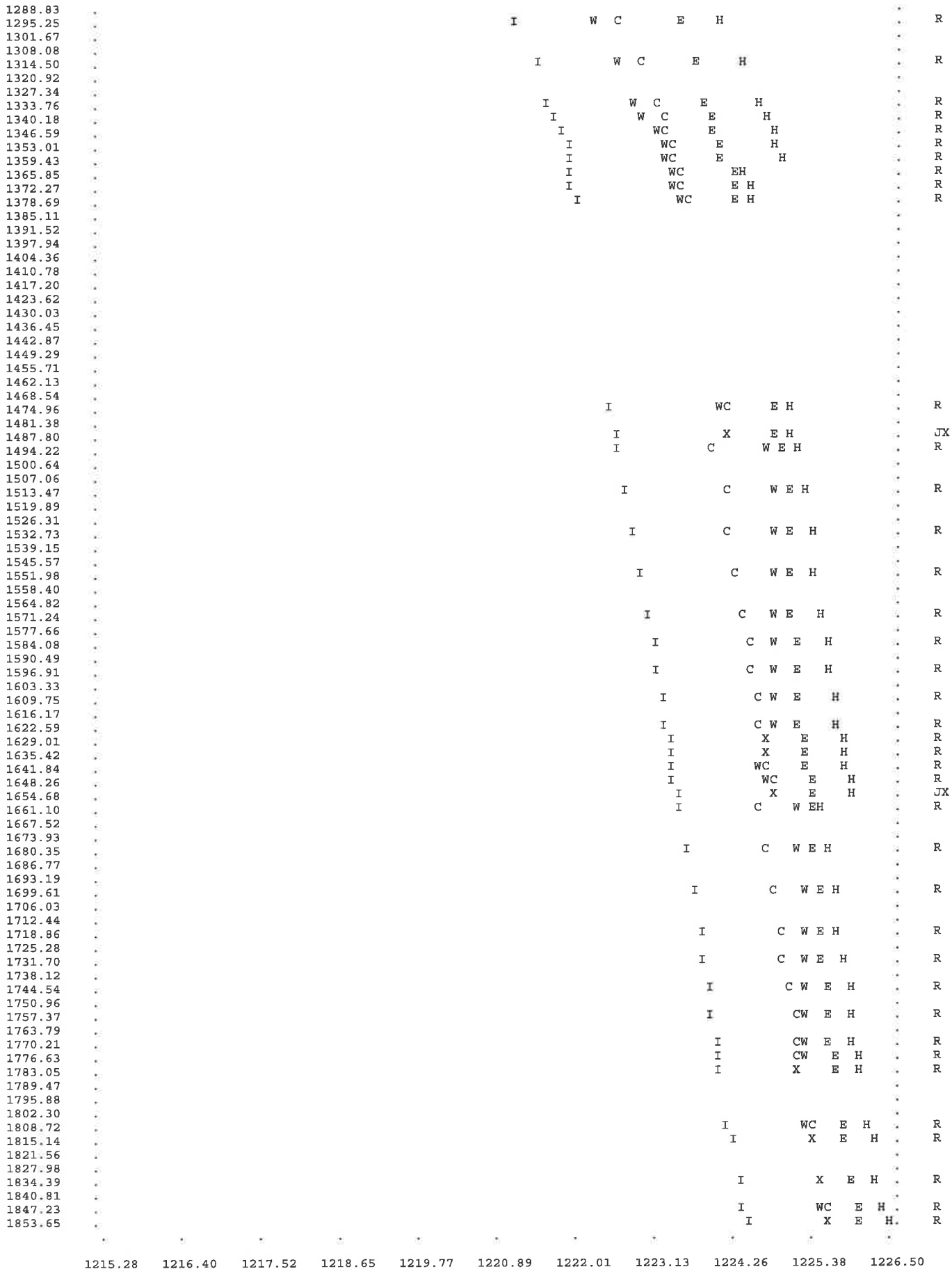

N O T E S

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□

```
0
T1 ALABAMA AND PIONEER BUILDING  LNA.DAT
T2 PROPOSED CONDITION 100-YEAR
T3 STORM DRAIN LINE A
SO   1000.001215.28 42                          1220.10
R    1052.541217.95 42      .012
JX   1056.541218.15 36 30   .012    22.0        1218.51        45.00
R    1353.561221.97 36      .012
R    1357.561222.02 30      .012                                                1
R    1485.281222.65 30      .012
JX   1485.281222.66 30 18   .012     5.5        1223.16        45.00
R    1653.211223.50 30      .012
JX   1657.211223.52 24 18   .012     5.7        1224.26        45.00
R    1812.321224.29 24      .012
R    1829.991224.38 24      .012                         22.50 45.00
R    1853.651224.50 24      .012
SH   1853.651224.50 24
CD   6  4              0.50
CD  12  4              1.00
CD  18  4              1.50
CD  24  4              2.00
CD  30  4              2.50
CD  36  4              3.00
CD  42  4              3.50
```

```
0
T1 ALABAMA AND PIONEER BUILDING  LNB.DAT
T2 PROPOSED CONDITION 100-YEAR
T3 STORM DRAIN LINE B
SO   1001.761218.51 24                          1220.85
R    1014.631218.57 24      .012
R    1032.301218.65 24      .012                          22.50 45.00
R    1061.111218.79 24      .012
JX   1061.111218.79 24 12   .012     9.3        1219.04        45.00
R    1306.311219.93 24      .012
R    1310.311219.95 24      .015                                        1
R    1610.871221.35 24      .012
R    1614.871221.37 24      .015                                        1
R    1650.211221.53 24      .012                          22.50 90.00
R    1864.361222.54 24      .012
JX   1868.361222.55 18 12   .012     2.5        1223.05        45.00
R    2033.351223.33 18      .012
JX   2037.351223.34 18 12   .012     1.5        1223.84        45.00
R    2202.361224.11 18      .012
JX   2206.361224.13 18 12   .012     1.5        1224.63        45.00
R    2371.361224.90 18      .012
JX   2375.361224.92 18 12   .012     2.0        1225.42        45.00
R    2617.441226.05 18      .012
R    2680.721226.35 18      .012                          45.00 80.56
R    2684.721226.37 18      .015                                        1
R    2751.841226.68 18      .012
R    2766.661226.75 18      .012                          90.00  9.43
R    2957.031227.64 18      .012
R    2974.711227.72 18      .012                          45.00 22.50
R    2991.891227.80 18      .012
SH   2991.891227.80 18
CD   6  4              0.50
CD  12  4              1.00
CD  18  4              1.50
CD  24  4              2.00
CD  30  4              2.50
CD  36  4              3.00
CD  42  4              3.50
```

DATE: 3/24/2020
TIME: 11: 9

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE 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	6	4			0.50														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ALABAMA AND PIONEER BUILDING LNB.DAT

HEADING LINE NO 2 IS -

PROPOSED CONDITION 100-YEAR

HEADING LINE NO 3 IS -

STORM DRAIN LINE B

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
ELEMENT NO   1 IS A SYSTEM OUTLET      *          *      *
                   U/S DATA   STATION    INVERT  SECT                                W S ELEV
                                1001.76 1218.51   24                                  1220.85

ELEMENT NO   2 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1014.63 1218.57   24            0.012                            0.00   0.00    0.00      0

ELEMENT NO   3 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1032.30 1218.65   24            0.012                           22.50  45.00    0.00      0

ELEMENT NO   4 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1061.11 1218.79   24            0.012                            0.00   0.00    0.00      0

ELEMENT NO   5 IS A JUNCTION           *          *      *      *                  *                   *                 *
                   U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3      Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                1061.11 1218.79   24    12     0  0.012     9.3     0.0  1219.04     0.00  45.00    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   6 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1306.31 1219.93   24            0.012                            0.00   0.00    0.00      0

ELEMENT NO   7 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1310.31 1219.95   24            0.015                            0.00   0.00    0.00      1

ELEMENT NO   8 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1610.87 1221.35   24            0.012                            0.00   0.00    0.00      0

ELEMENT NO   9 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1614.87 1221.37   24            0.015                            0.00   0.00    0.00      1

ELEMENT NO  10 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1650.21 1221.53   24            0.012                           22.50  90.00    0.00      0

ELEMENT NO  11 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                1864.36 1222.54   24            0.012                            0.00   0.00    0.00      0

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
                                1868.36 1222.55   18    12     0  0.012     2.5     0.0  1223.05     0.00  45.00    0.00
```

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
ELEMENT NO  13 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                2033.35 1223.33   18            0.012                            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
                                2037.35 1223.34   18    12     0  0.012     1.5     0.0  1223.84     0.00  45.00    0.00

ELEMENT NO  15 IS A REACH              *          *      *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
```

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                                 2202.36 1224.11   18                0.012                                  0.00   0.00    0.00     0

ELEMENT NO  16 IS A JUNCTION          *         *     *     *                  *                    *                *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 2206.36 1224.13   18    12     0  0.012      1.5      0.0  1224.63     0.00  45.00    0.00

ELEMENT NO  17 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2371.36 1224.90   18                0.012                                  0.00   0.00    0.00     0

ELEMENT NO  18 IS A JUNCTION          *         *     *     *                  *                    *                *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 2375.36 1224.92   18    12     0  0.012      2.0      0.0  1225.42     0.00  45.00    0.00

ELEMENT NO  19 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2617.44 1226.05   18                0.012                                  0.00   0.00    0.00     0

ELEMENT NO  20 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2680.72 1226.35   18                0.012                                 45.00  80.56    0.00     0

ELEMENT NO  21 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2684.72 1226.37   18                0.015                                  0.00   0.00    0.00     1

ELEMENT NO  22 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2751.84 1226.68   18                0.012                                  0.00   0.00    0.00    0□
                                                       F 0 5 1 5 P                                                     PAGE NO    4

                          WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO  23 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2766.66 1226.75   18                0.012                                 90.00   9.43    0.00     0

ELEMENT NO  24 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2957.03 1227.64   18                0.012                                  0.00   0.00    0.00     0

ELEMENT NO  25 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2974.71 1227.72   18                0.012                                 45.00  22.50    0.00     0

ELEMENT NO  26 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2991.89 1227.80   18                0.012                                  0.00   0.00    0.00     0

ELEMENT NO  27 IS A SYSTEM HEADWORKS                  *                     *
                U/S DATA   STATION    INVERT  SECT                                          W S ELEV
                                 2991.89 1227.80   18                                            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
                         ALABAMA AND PIONEER BUILDING  LNB.DAT
                         PROPOSED CONDITION 100-YEAR
                         STORM DRAIN LINE B

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

 L/ELEM      SO                                            SF AVE     HF                     NORM DEPTH                  ZR
*****************************************************************************************************************************

  1001.76  1218.51    2.340  1220.850      22.0    7.00    0.761  1221.611   0.00    1.675            2.00    0.00   0.00   0   0.00

    12.87  0.00466                                       .008058     0.10                    2.000                  0.00

  1014.63  1218.57    2.384  1220.954      22.0    7.00    0.761  1221.715   0.00    1.675            2.00    0.00   0.00   0   0.00

    17.67  0.00453                                       .008058     0.14                    2.000                  0.00

  1032.30  1218.65    2.554  1221.204      22.0    7.00    0.761  1221.965   0.00    1.675            2.00    0.00   0.00   0   0.00

    28.81  0.00486                                       .008058     0.23                    2.000                  0.00

  1061.11  1218.79    2.646  1221.436      22.0    7.00    0.761  1222.197   0.00    1.675            2.00    0.00   0.00   0   0.00

 JUNCT STR 0.00000                                       .005371     0.00                                           0.00

  1061.11  1218.79    3.154  1221.944      12.7    4.04    0.254  1222.198   0.00    1.282            2.00    0.00   0.00   0   0.00

   245.20  0.00465                                       .002685     0.66                    1.302                  0.00

  1306.31  1219.93    2.672  1222.602      12.7    4.04    0.254  1222.856   0.00    1.282            2.00    0.00   0.00   0   0.00

     4.00  0.00500                                       .004196     0.02                    1.503                  0.00

  1310.31  1219.95    2.682  1222.632      12.7    4.04    0.254  1222.886   0.00    1.282            2.00    0.00   0.00   0   0.00

   300.56  0.00466                                       .002685     0.81                    1.301                  0.00

  1610.87  1221.35    2.089  1223.439      12.7    4.04    0.254  1223.693   0.00    1.282            2.00    0.00   0.00   0   0.00

     4.00  0.00500                                       .004196     0.02                    1.503                  0.00

  1614.87  1221.37    2.098  1223.468      12.7    4.04    0.254  1223.722   0.00    1.282            2.00    0.00   0.00   0   0.00
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35.34	0.00453					.002685	0.09			1.314			0.00		
1650.21	1221.53	2.084	1223.614	12.7	4.04	0.254	1223.868	0.00	1.282		2.00	0.00	0.00	0	0.00
41.29	0.00472					.002660	0.11			1.300			0.00		
1691.50	1221.72	2.000	1223.725	12.7	4.04	0.254	1223.979	0.00	1.282		2.00	0.00	0.00	0	0.00
71.72	0.00472					.002492	0.18			1.300			0.00		

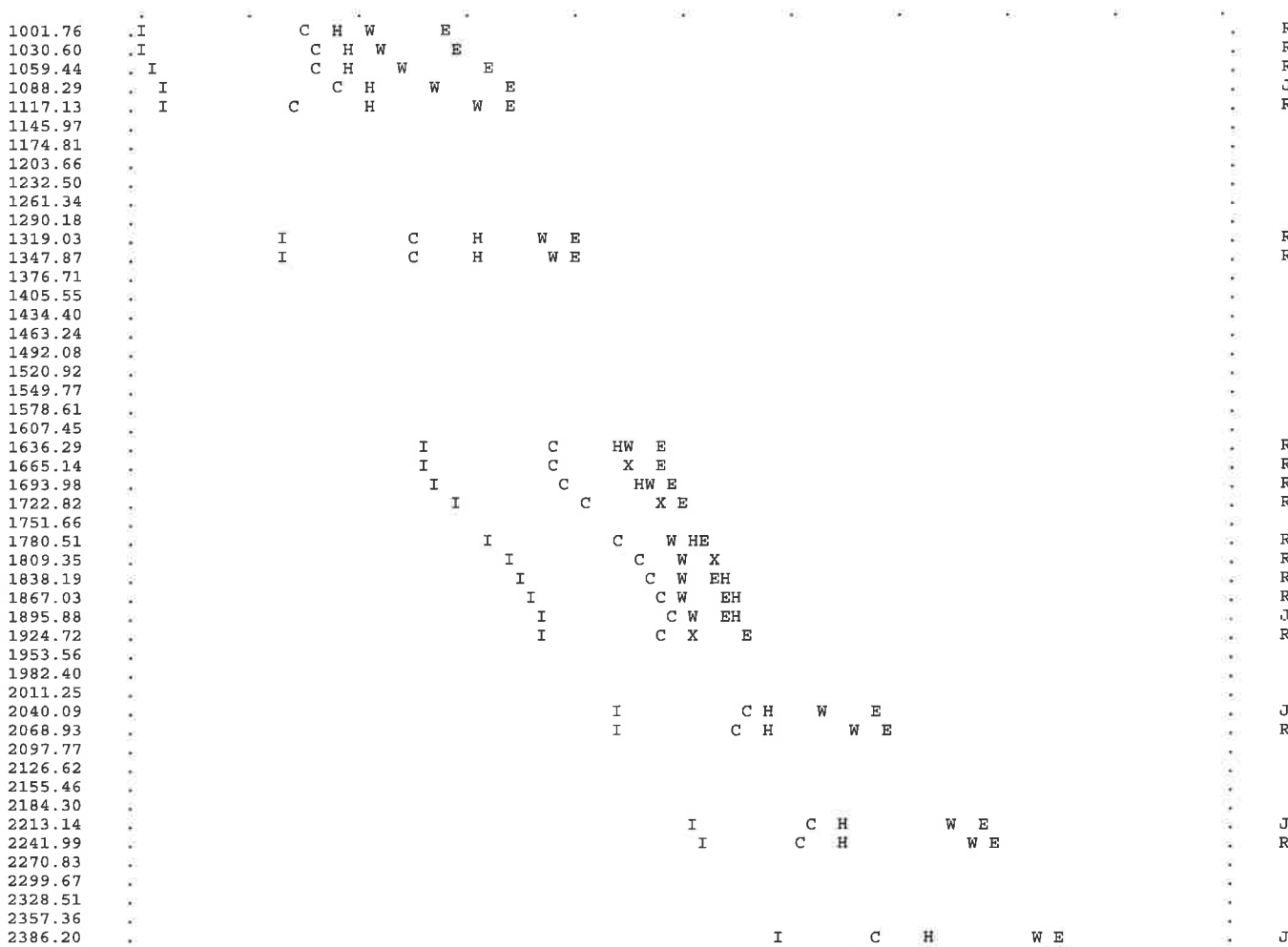
STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
1763.22	1222.06	1.814	1223.877	12.7	4.24	0.279	1224.156	0.00	1.282	2.00	0.00	0.00	0	0.00
35.04	0.00472					.002430	0.09		1.300			0.00		
1798.26	1222.23	1.706	1223.934	12.7	4.45	0.307	1224.241	0.00	1.282	2.00	0.00	0.00	0	0.00
27.48	0.00472					.002631	0.07		1.300			0.00		
1825.74	1222.36	1.618	1223.976	12.7	4.66	0.338	1224.314	0.00	1.282	2.00	0.00	0.00	0	0.00
24.30	0.00472					.002895	0.07		1.300			0.00		
1850.04	1222.47	1.540	1224.012	12.7	4.89	0.372	1224.384	0.00	1.282	2.00	0.00	0.00	0	0.00
14.32	0.00472					.003150	0.05		1.300			0.00		
1864.36	1222.54	1.494	1224.034	12.7	5.05	0.395	1224.429	0.00	1.282	2.00	0.00	0.00	0	0.00
JUNCT STR	0.00250					.005646	0.02					0.00		
1868.36	1222.55	1.501	1224.051	10.2	5.77	0.517	1224.568	0.00	1.230	1.50	0.00	0.00	0	0.00
164.99	0.00473					.008034	1.33		1.500			0.00		
2033.35	1223.33	2.046	1225.376	10.2	5.77	0.517	1225.893	0.00	1.230	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00250					.006939	0.03					0.00		
2037.35	1223.34	2.310	1225.650	8.7	4.92	0.376	1226.026	0.00	1.142	1.50	0.00	0.00	0	0.00
165.01	0.00467					.005845	0.96		1.500			0.00		
2202.36	1224.11	2.505	1226.615	8.7	4.92	0.376	1226.991	0.00	1.142	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00500					.004924	0.02					0.00		
2206.36	1224.13	2.706	1226.836	7.2	4.07	0.258	1227.094	0.00	1.039	1.50	0.00	0.00	0	0.00
165.00	0.00467					.004003	0.66		1.140			0.00		
2371.36	1224.90	2.596	1227.496	7.2	4.07	0.258	1227.754	0.00	1.039	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00500					.003045	0.01					0.00		

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
2375.36	1224.92	2.772	1227.692	5.2	2.94	0.134	1227.826	0.00	0.878	1.50	0.00	0.00	0	0.00
242.08	0.00467					.002088	0.51		0.900			0.00		
2617.44	1226.05	2.147	1228.197	5.2	2.94	0.134	1228.331	0.00	0.878	1.50	0.00	0.00	0	0.00
63.28	0.00474					.002088	0.13		0.890			0.00		
2680.72	1226.35	2.005	1228.355	5.2	2.94	0.134	1228.489	0.00	0.878	1.50	0.00	0.00	0	0.00
4.00	0.00500					.003263	0.01		1.020			0.00		
2684.72	1226.37	2.005	1228.375	5.2	2.94	0.134	1228.509	0.00	0.878	1.50	0.00	0.00	0	0.00
67.12	0.00462					.002088	0.14		0.900			0.00		
2751.84	1226.68	1.835	1228.515	5.2	2.94	0.134	1228.649	0.00	0.878	1.50	0.00	0.00	0	0.00
14.82	0.00472					.002088	0.03		0.890			0.00		

2766.66	1226.75	1.805	1228.555	5.2	2.94	0.134	1228.689	0.00	0.878		1.50	0.00	0.00	0	0.00
117.76	0.00468					.002065	0.24			0.900			0.00		
2884.42	1227.30	1.500	1228.801	5.2	2.94	0.134	1228.935	0.00	0.878		1.50	0.00	0.00	0	0.00
45.77	0.00468					.001933	0.09			0.900			0.00		
2930.19	1227.52	1.360	1228.875	5.2	3.09	0.148	1229.023	0.00	0.878		1.50	0.00	0.00	0	0.00
23.42	0.00468					.001890	0.04			0.900			0.00		
2953.61	1227.62	1.280	1228.904	5.2	3.24	0.163	1229.067	0.00	0.878		1.50	0.00	0.00	0	0.00
3.42	0.00468					.001968	0.01			0.900			0.00		
2957.03	1227.64	1.268	1228.908	5.2	3.26	0.165	1229.073	0.00	0.878		1.50	0.00	0.00	0	0.00
17.68	0.00453					.002066	0.04			0.910			0.00		
2974.71	1227.72	1.210	1228.930	5.2	3.40	0.180	1229.110	0.00	0.878		1.50	0.00	0.00	0	0.00
16.79	0.00466					.002264	0.04			0.900			0.00		

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		
2991.50	1227.80	1.152	1228.950	5.2	3.57	0.198	1229.148	0.00	0.878		1.50	0.00	0.00	0	0.00
0.39	0.00466					.002381	0.00			0.900			0.00		
2991.89	1227.80	1.151	1228.951	5.2	3.57	0.198	1229.149	0.00	0.878		1.50	0.00	0.00	0	
0.00															

ALABAMA AND PIONEER BUILDING LNB.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LINE B



```
2443.88   .                                                                                  .
2472.73   .                                                                                  .
2501.57   .                                                                                  .
2530.41   .                                                                                  .
2559.25   .                                                                                  .
2588.10   .                                                                                  .
2616.94   .                                                                                  .
2645.78   .                                                   I        C    H     W E       .    R
2674.62   .                                                                                  .
2703.47   .                                                      I       C     H    WE      .    R
2732.31   .                                                      I       C     H    WE      .    R
2761.15   .                                                         I       C     H  WE     .    R
2789.99   .                                                          I       C     H  WE    .    R
2818.84   .                                                                                  .
2847.68   .                                                                                  .
2876.52   .                                                                                  .
2905.36   .                                                                 I       C     XE .    R
2934.21   .                                                                   I       C    WX .    R
2963.05   .                                                                     I       C   WEH .    R
2991.89   .                                                                     I       C   WEH .    R
          .         .         .         .         .         .         .         .         .         .         .
        1218.51   1219.59   1220.67   1221.75   1222.83   1223.90   1224.98   1226.06   1227.14   1228.22   1229.30
```

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□

```
0
T1 ALABAMA AND PIONEER BUILDING  LB2.DAT
T2 PROPOSED CONDITION 100-YEAR
T3 STORM DRAIN LATERAL B2
SO    101.751222.96 12                          1224.05
R     143.821227.03 12      .012
SH    143.821227.03 12
CD   6  4              0.50
CD  12  4              1.00
CD  18  4              1.50
CD  24  4              2.00
CD  30  4              2.50
CD  36  4              3.00
CD  42  4              3.50
```

DATE: 3/24/2020
TIME: 12: 7

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE 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	6	4			0.50														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ALABAMA AND PIONEER BUILDING LB2.DAT

HEADING LINE NO 2 IS -

PROPOSED CONDITION 100-YEAR

HEADING LINE NO 3 IS -

STORM DRAIN LATERAL B2

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
101.75 1222.96 12 1224.05

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
143.82 1227.03 12 0.012 0.00 0.00 0.00 0

ELEMENT NO 3 IS A SYSTEM HEADWORKS * *
U/S DATA STATION INVERT SECT W S ELEV
143.82 1227.03 12 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
ALABAMA AND PIONEER BUILDING LB2.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LATERAL B2

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		
101.75	1222.96	0.744	1223.704	9.9	15.81	3.884	1227.588	0.00	0.994	1.00	0.00	0.00	0	0.00
12.66	0.09674					.077693	0.98		0.700			0.00		
114.41	1224.18	0.769	1224.954	9.9	15.28	3.624	1228.578	0.00	0.994	1.00	0.00	0.00	0	0.00
11.30	0.09674					.071073	0.80		0.700			0.00		
125.71	1225.28	0.808	1226.086	9.9	14.56	3.291	1229.377	0.00	0.994	1.00	0.00	0.00	0	0.00
7.93	0.09674					.064580	0.51		0.700			0.00		
133.64	1226.05	0.852	1226.897	9.9	13.88	2.994	1229.891	0.00	0.994	1.00	0.00	0.00	0	0.00
5.88	0.09674					.059642	0.35		0.700			0.00		
139.52	1226.61	0.906	1227.520	9.9	13.24	2.720	1230.240	0.00	0.994	1.00	0.00	0.00	0	0.00
4.30	0.09674					.059643	0.26		0.700			0.00		
143.82	1227.03	0.994	1228.024	9.9	12.61	2.470	1230.494	0.00	0.994	1.00	0.00	0.00	0	0.00

ALABAMA AND PIONEER BUILDING LB2.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LATERAL B2

```
101.75  .I      W   X                                   E                    .   R
102.61  .                                                                    .
103.47  .                                                                    .
104.33  .                                                                    .
105.18  .                                                                    .
106.04  .                                                                    .
106.90  .                                                                    .
107.76  .                                                                    .
108.62  .                                                                    .
```

```
109.48   .                                                                                  .
110.34   .                                                                                  .
111.19   .                                                                                  .
112.05   .                                                                                  .
112.91   .                                                                                  .
113.77   .                                                                                  .
114.63   .                I         W  X                                   E               .    R
115.49   .                                                                                  .
116.35   .                                                                                  .
117.20   .                                                                                  .
118.06   .                                                                                  .
118.92   .                                                                                  .
119.78   .                                                                                  .
120.64   .                                                                                  .
121.50   .                                                                                  .
122.36   .                                                                                  .
123.21   .                                                                                  .
124.07   .                                                                                  .
124.93   .                                                                                  .
125.79   .                           I          W CH                            E           .    R
126.65   .                                                                                  .
127.51   .                                                                                  .
128.37   .                                                                                  .
129.22   .                                                                                  .
130.08   .                                                                                  .
130.94   .                                                                                  .
131.80   .                                                                                  .
132.66   .                                                                                  .
133.52   .                                                                                  .
134.38   .                                   I          W X                            E    .    R
135.23   .                                                                                  .
136.09   .                                                                                  .
136.95   .                                                                                  .
137.81   .                                                                                  .
138.67   .                                                                                  .
139.53   .                                          I           WX                       E  .    R
140.39   .                                                                                  .
141.24   .                                                                                  .
142.10   .                                                                                  .
142.96   .                                                                                  .
143.82   .                                               I           X                    E .    R
         .         .         .         .         .         .         .         .         .         .         .
      1222.96   1223.71   1224.47   1225.22   1225.97   1226.73   1227.48   1228.23   1228.99   1229.74   1230.49
```

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

```
0
T1 ALABAMA AND PIONEER BUILDING  LNB.DAT
T2 PROPOSED CONDITION 100-YEAR
T3 STORM DRAIN LATERAL B5
SO    101.751225.24 12                          1227.69
R     143.821227.03 12      .012
SH    143.821227.03 12
CD   6  4              0.50
CD  12  4              1.00
CD  18  4              1.50
CD  24  4              2.00
CD  30  4              2.50
CD  36  4              3.00
CD  42  4              3.50
```

□
DATE: 3/24/2020
TIME: 12: 2

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE 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	6	4			0.50														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														

□

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ALABAMA AND PIONEER BUILDING LNB.DAT

HEADING LINE NO 2 IS -

PROPOSED CONDITION 100-YEAR

HEADING LINE NO 3 IS -

STORM DRAIN LATERAL B5 □

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	101.75	1225.24	12	1227.69

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	143.82	1227.03	12	0.012	0.00	0.00	0.00	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	143.82	1227.03	12	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

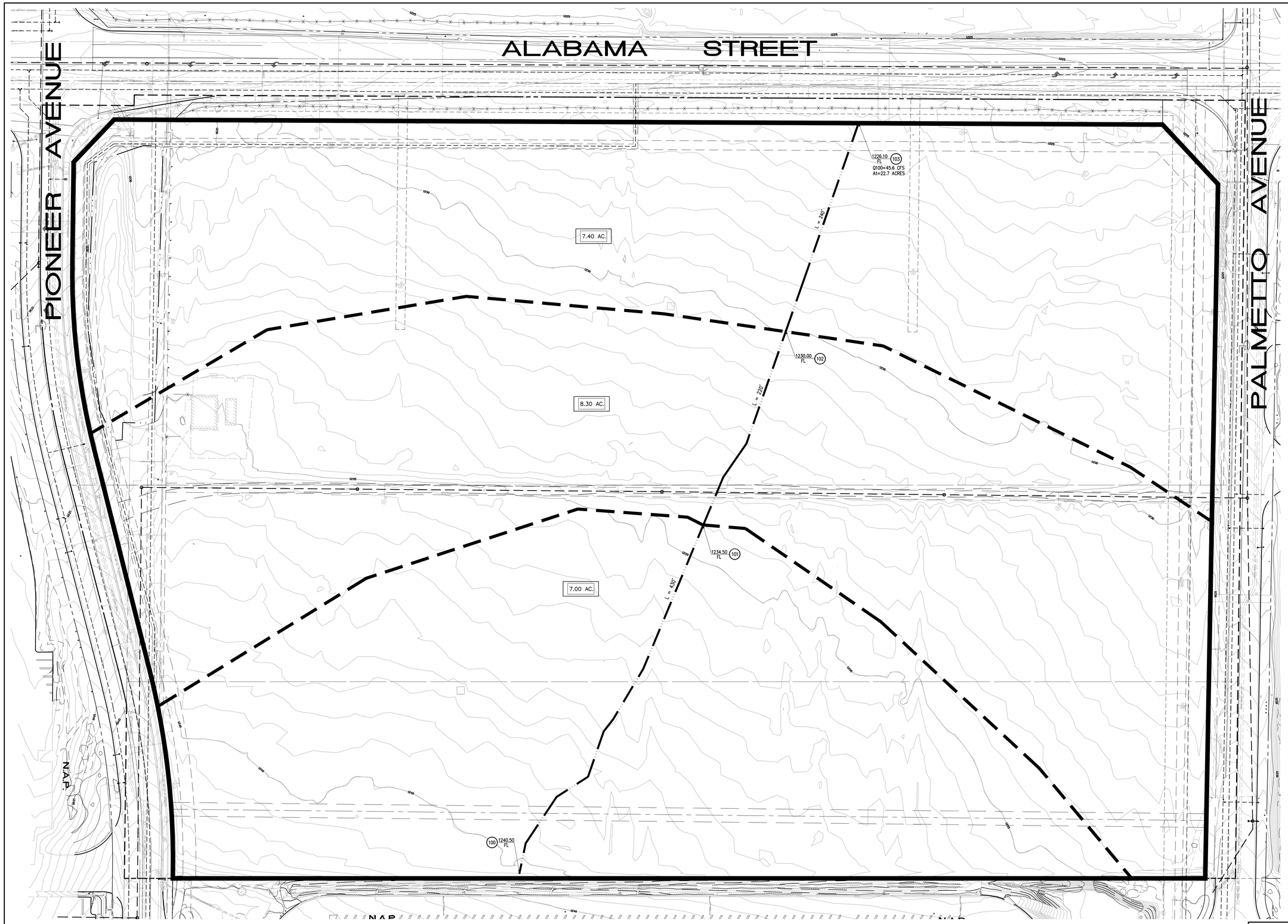
ALABAMA AND PIONEER BUILDING LNB.DAT
PROPOSED CONDITION 100-YEAR
STORM DRAIN LATERAL B5

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		
101.75	1225.24	2.450	1227.690	8.8	11.21	1.951	1229.641	0.00	0.990	1.00	0.00	0.00	0	0.00
42.07	0.04255					.051983	2.19		1.000			0.00		
143.82	1227.03	2.847	1229.877	8.8	11.21	1.951	1231.828	0.00	0.990	1.00	0.00	0.00	0	0.00□

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

APPENDIX E

HYDROLOGY MAP



COUNTY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY
FIRST PIONEER LOGISTICS
ALABAMA ST AND PIONEER AVE
FIRST INDUSTRIAL

JN 3849

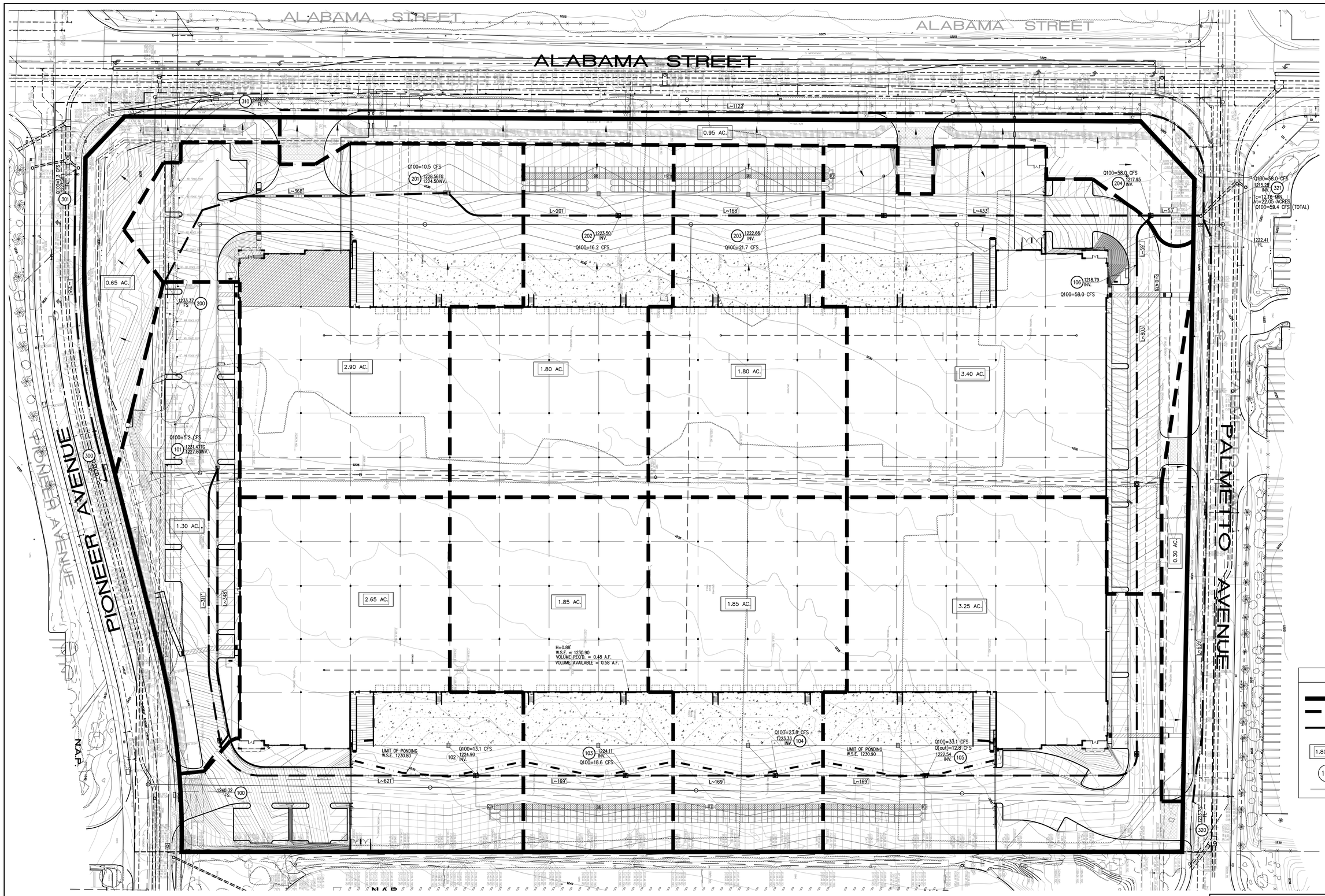
PREPARED FOR:
FIRST INDUSTRIAL REALTY TRUST
898 N. PACFIC COAST HIGHWAY BLVD, SUITE 175
EL SEGUNDO, CA 90245
PHONE: (310) 414-5400

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

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

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

Sheet 1 of 1 Sheets



LEGEND

▬▬	PROJECT BOUNDARY
▬ ▬	SUBAREA BOUNDARY
═══	FLOW PATH
1.80 AC.	SUBAREA AREA
(100)	NODE NUMBER
═══►	FLOW DIRECTION

CITY OF REDLANDS
PUBLIC WORKS DEPARTMENT

PROPOSED CONDITION HYDROLOGY
FIRST PIONEER LOGISTICS
ALABAMA ST AND PIONEER AVE
FIRST INDUSTRIAL

JN 3849

PREPARED FOR:

FIRST INDUSTRIAL REALTY TRUST
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Designed by _____ Date _____
Checked by _____ Date _____
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Checked by _____ Date _____

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

Sheet 1 of 1 Sheets

Last Update: 9/23/20
\TE1\Thienes\2700-up\3800-3899\3849\3849HYD.dwg