Appendix H: Hydrology

H.1 - Warm Creek Bypass Analysis Relocation, August 25, 2011

WARM CREEK BYPASS RELOCATION ANALYSIS

FOR

NATIONAL ORANGE SHOW
NE CORNER OF ARROWHEAD AVENUE/CENTRAL AVENUE
SAN BERNARDINO, CALIFORNIA

Prepared For:

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Prepared By:

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Reviewed by: _____
Gregory R. Cooke RCE 39478 Exp. 12-31-11

Prepared on: August 25, 2011

DRC Project No. 11-420

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Purpose of Report

This report has been prepared for the National Orange Show project in the City of San Bernardino, County of San Bernardino, California. The Project Site is an existing developed site encompasses approximately 37.4 acres of land. It is located on the east side of Arrowhead Avenue between Mill Street and Central Avenue with a portion located south of Central Avenue. The purpose of this report is to evaluate the relocation of the Warm Creek bypass within the Project Site.

Project Description

The Project Site is currently an unpaved parking lot with parking lot lights. Warm Creek Channel is located along the easterly boundary of the site. An existing 78" RCP storm drain pipe serving as the Warm Creek bypass runs diagonally across the site in the northeast/southwest direction carrying the low flow from the channel and discharges into a recharge basin at an outlet structure approximately 340' downstream of the project site on the west side of Arrowhead Avenue. Refer to Appendix B for the surface water system in the vicinity of the project site.

The proposed project includes the construction of four buildings, paved parking areas and drive aisles, landscape areas, underground utilities and site related improvements. The site plan is included as Appendix C of this report.

The relocation of the existing 78" storm drain pipe becomes necessary as a result of the proposed development. A 48" RCP storm drain is proposed to join the existing 78" storm drain approximately 120' upstream of the site, align with the easterly boundary and turns westerly along Central Avenue and connect back to the existing 78" line about 330' upstream of the existing outlet structure. Refer to the Bypass Relocation Exhibit in Appendix D for the proposed storm drain alignment.

Methodology

In the "Design Memorandum No. 3, General Design for East Twin & Warm Creeks Channel, Channel Improvements from Marshall Boulevard Downstream to Santa Ana River" prepared by U.S. Army engineer District, Los Angeles, Corps of engineers, in April 1958, it states that "the bypass conduit would be designed to carry flows up to 200 cubic feet per second". With the record plans prepared by Corps of Engineers and assuming 200 cfs of flow in the existing 78" bypass storm drain, the bypass pipe was modeled in the Water Surface and Pressure Gradient (WSPG) software program to analyze the hydraulic grade line in the existing system. There is a discrepancy between the invert elevations of the existing 78" storm drain pipe at Station 14+00 on Sheet 12 and Sheet 13 of the record plans. It shows 987.66' on Sheet 12 but 988.24' on Sheet 13. The invert elevation of 988.24' was used for the model because it was the elevation from a delta revision. The station of the pipe on the record plans started from the upstream end of the pipe and increased as it went downstream. To model the system properly, the bypass pipe was re-

stationed from downstream up. The conversion of stations between the record plans and the WSPG model for the existing system is tabulated below. All referenced documents can be found in Appendix E.

Record Plans STA	Exist SD WSPG STA	Invert Elevation
39+00	10+00	981.00
36+05	12+95	983.95
21+92.54	27+07.46	986.70
19+16.57	29+83.43	987.23
18+50.40	30+49.60	987.36
15+69.08	33+30.92	987.91
12+20.36	36+79.64	988.63
11+32.69	37+67.31	988.83
10+94.76	38+05.24	988.91
10+00.88	38+99.12	989.12
5+30.16	39+69.84	989.27
4+15.37	44+84.63	990.40
1+56.88	47+43.12	990.97
1+45.10	47+54.90	990.99
1+42.72	47+57.28	991.00

A similar model was inputted in WSPG for the proposed storm drain alignment assuming pipe flowing full at the outlet structure. The face of the existing inlet structure is 15' but the maximum depth of water allowed for the design is 13.5' with 1.5' of freeboard provided. The allowable flow in the proposed storm drain was adjusted until the water surface elevation at the most upstream is 13.5' or less.

The hydraulic calculations for the storm drain capacities are included in Appendix F.

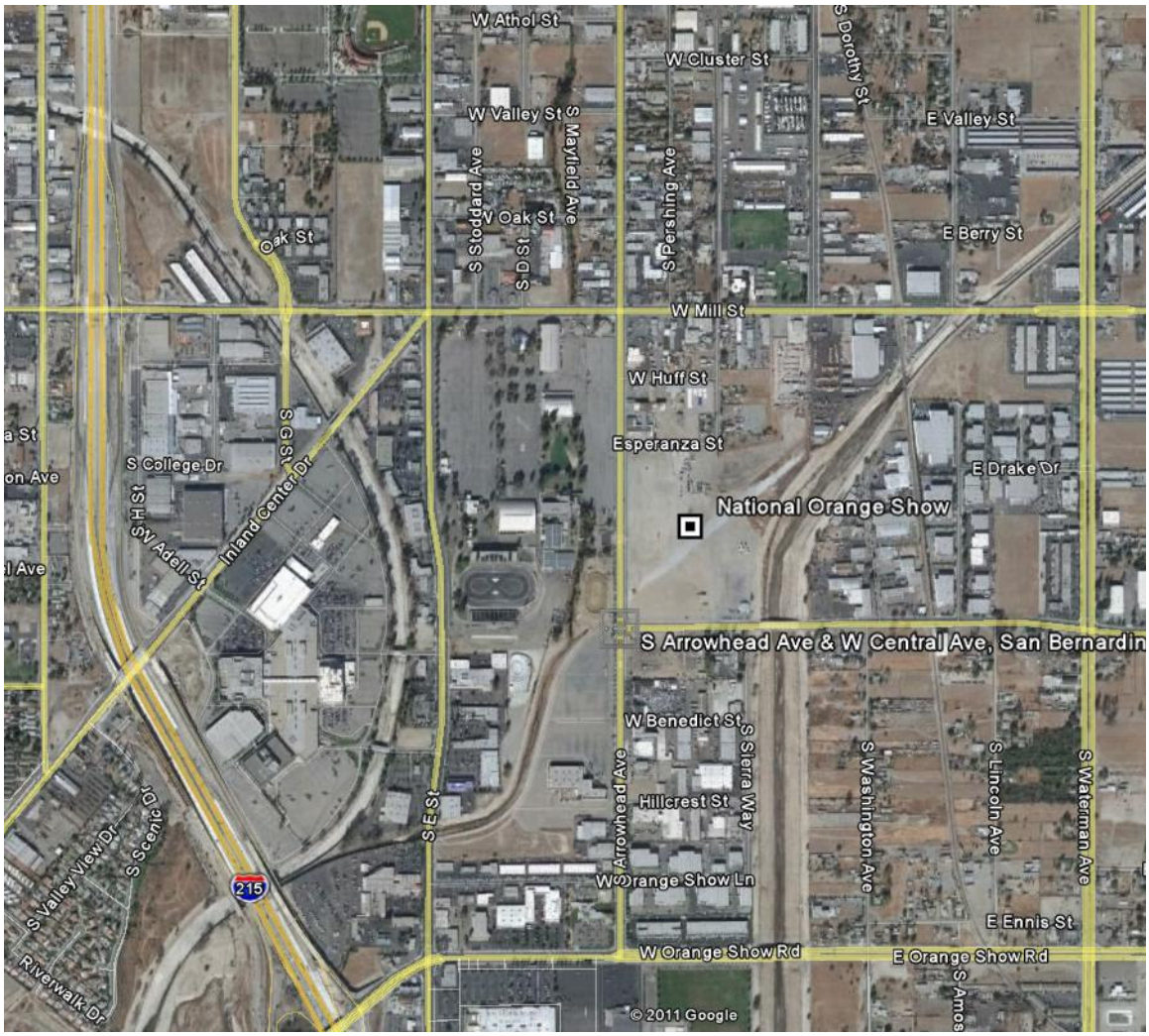
Summary

It is our understanding that the downstream recharging basin that the Warm Creek bypass was designed to recharge is to be concrete lined and no longer used for infiltration. Since the Warm Creek bypass is no longer being used for recharge, the bypass pipe can be downsized.

Based on the assumption of 200 cfs flow in the existing 78" storm drain, the result of WSPG yields a depth of 5.1' of water at the inlet structure. The proposed 48" storm drain pipe is capable of diverting approximately 117.2 cfs of flow without impacting the natural creeks upstream of the inlet structure.

Appendix A

Vicinity Map


W Athol St
W Cluster St
S Dorothy St
W Valley St
S Maxfield Ave
E Valley St
S Stoddard Ave
W Oak St
S Pershing Ave
E Berry St
Oak St
S D St
W Mill St
W Huff St
Esperanza St
S College Dr
S G St
E Drake Dr
S H St
Inland Center Dr
National Orange Show
W Adell St
S Arrowhead Ave & W Central Ave, San Bernardin
W Benedict St
S Sierra Way
S Washington Ave
S Lincoln Ave
S Waterman Ave
Hillcrest St
S E St
S Arrowhead Ave
S Valley View Dr
S Scenic Dr
215
W Orange Show Ln
E Ennis St
W Orange Show Rd
E Orange Show Rd
Riverwalk Dr
© 2011 Google

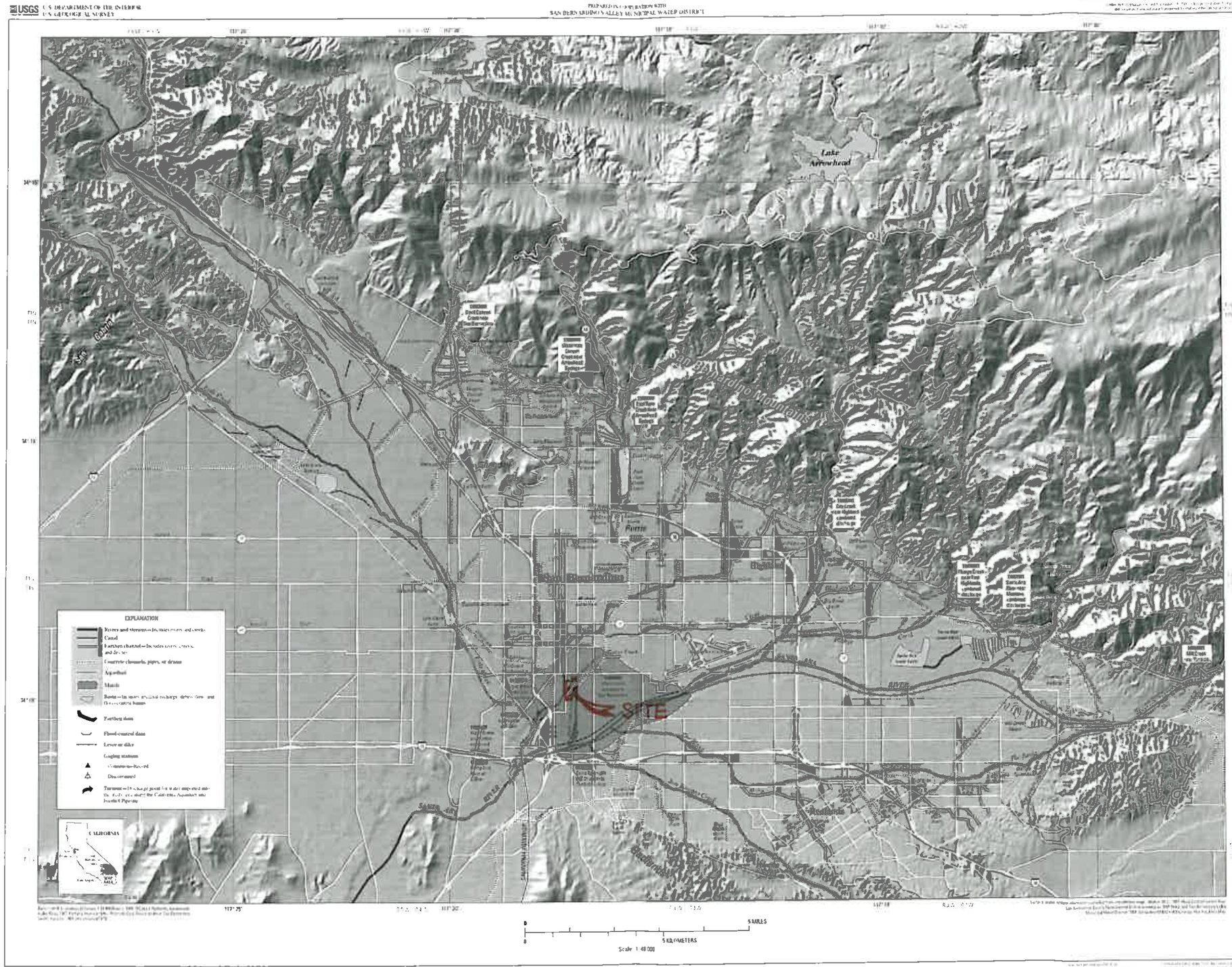
Appendix B

Major Components of the Surface-Water System in the San Bernardino area, California, 1998

USGS U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

OPEN-FILE REPORT 2005-1178

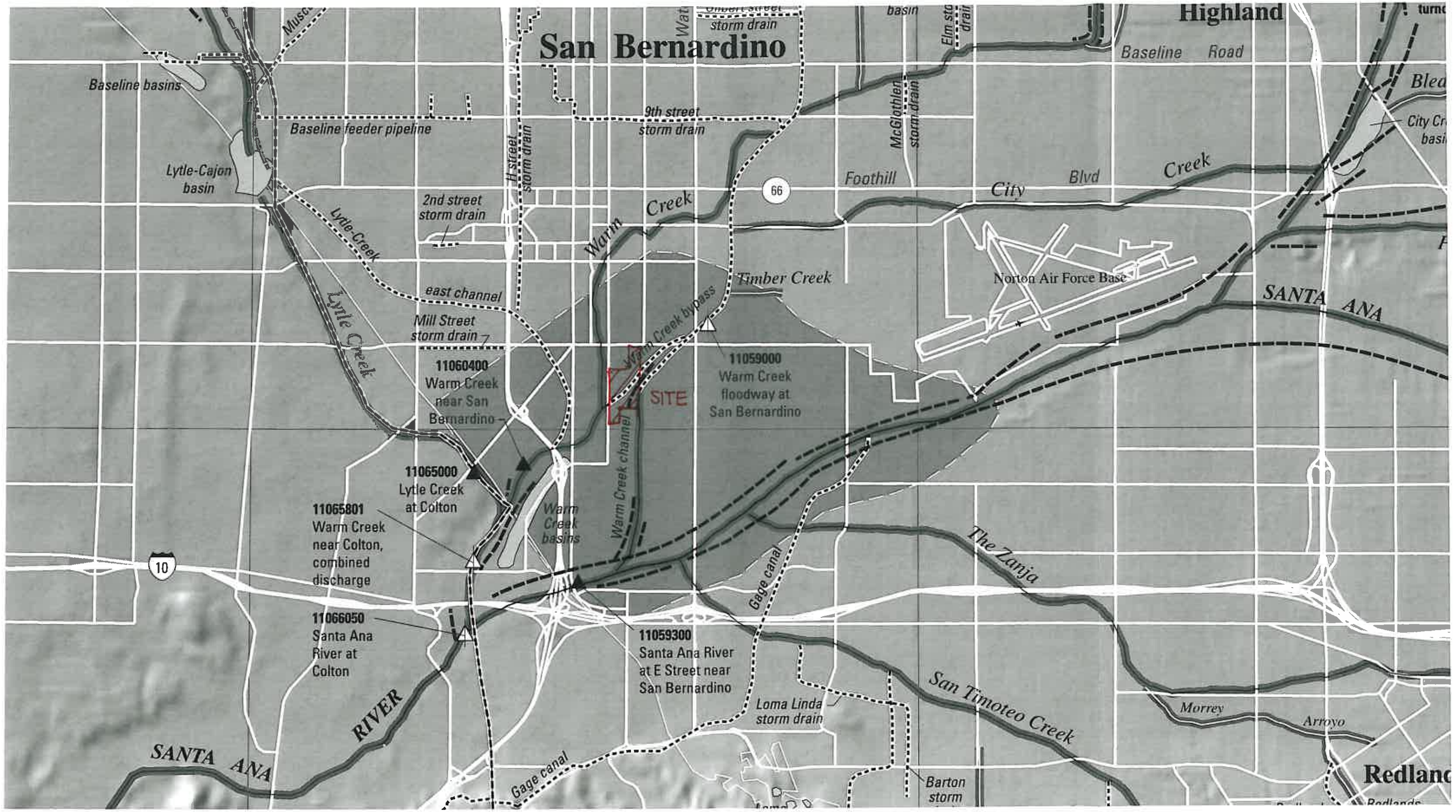


Major Components of the Surface-Water System in the San Bernardino area, California, 1998

By

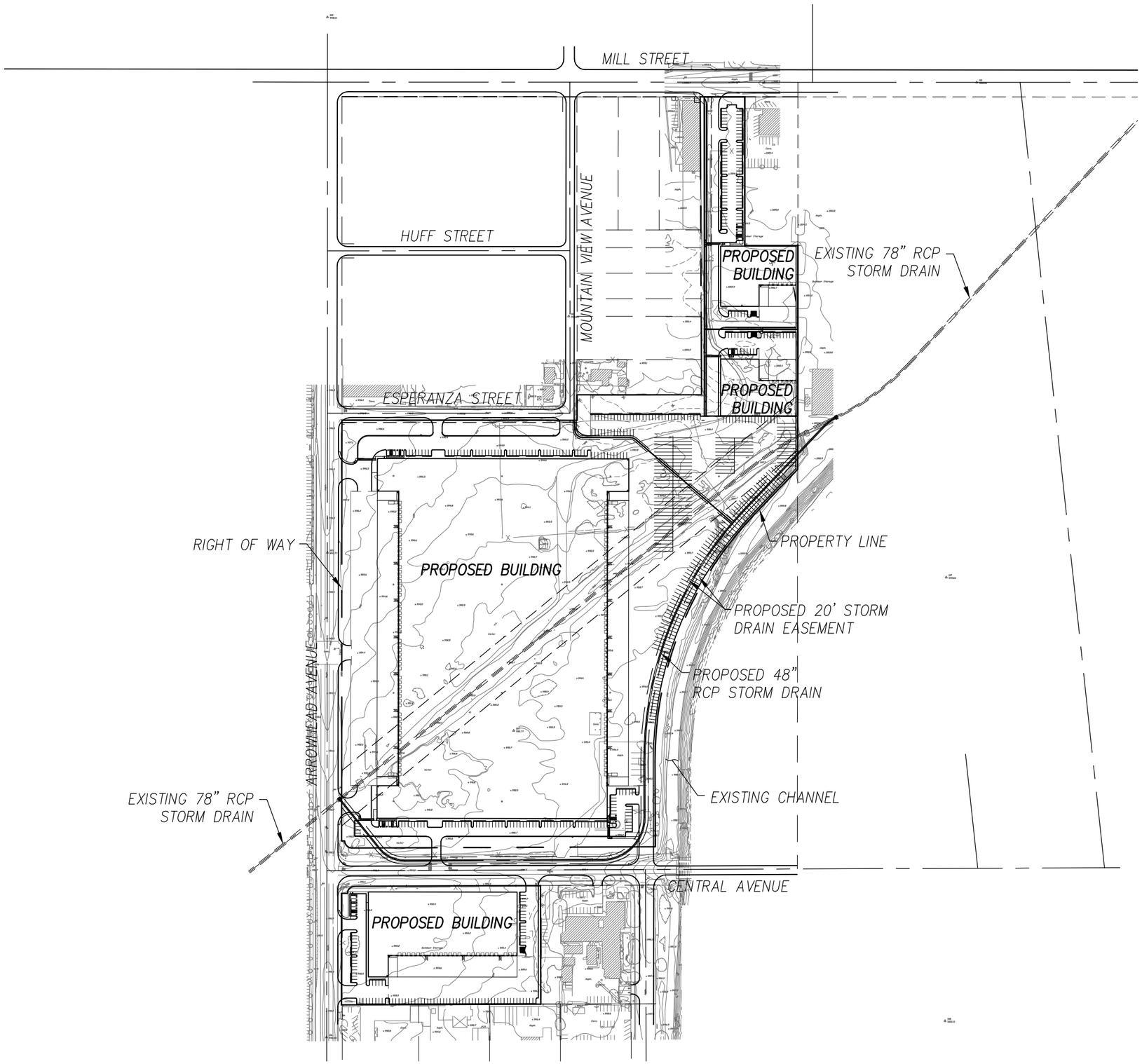
Wesley R. Danskin, Kelly R. McPherson, and Linda R. Woolfenden

2006


San Bernardino
Highland
Baseline Road
Baseline basins
Baseline feeder pipeline
Lytle-Cajon basin
Lytle Creek
2nd street storm drain
H street storm drain
9th street storm drain
Gilbert street storm drain
McGlothlen storm drain
Elm st drain
basin
Foothill Blvd
City Creek
Warm Creek
Timber Creek
Norton Air Force Base
SANTA ANA
east channel
Mill Street storm drain
Warm Creek bypass
11060400
Warm Creek near San Bernardino
11059000
Warm Creek floodway at San Bernardino
SITE
Warm Creek channel
11065000
Lytle Creek at Colton
11065801
Warm Creek near Colton, combined discharge
Warm Creek basins
The Zanja
Gage canal
11066050
Santa Ana River at Colton
11059300
Santa Ana River at E Street near San Bernardino
Loma Linda storm drain
San Timoteo Creek
Morrey Arroyo
SANTA ANA RIVER
Barton storm
Redland
66
10

Appendix C

Site Plan



SCALE: 1"=300'

NATIONAL ORANGE SHOW

SITE PLAN

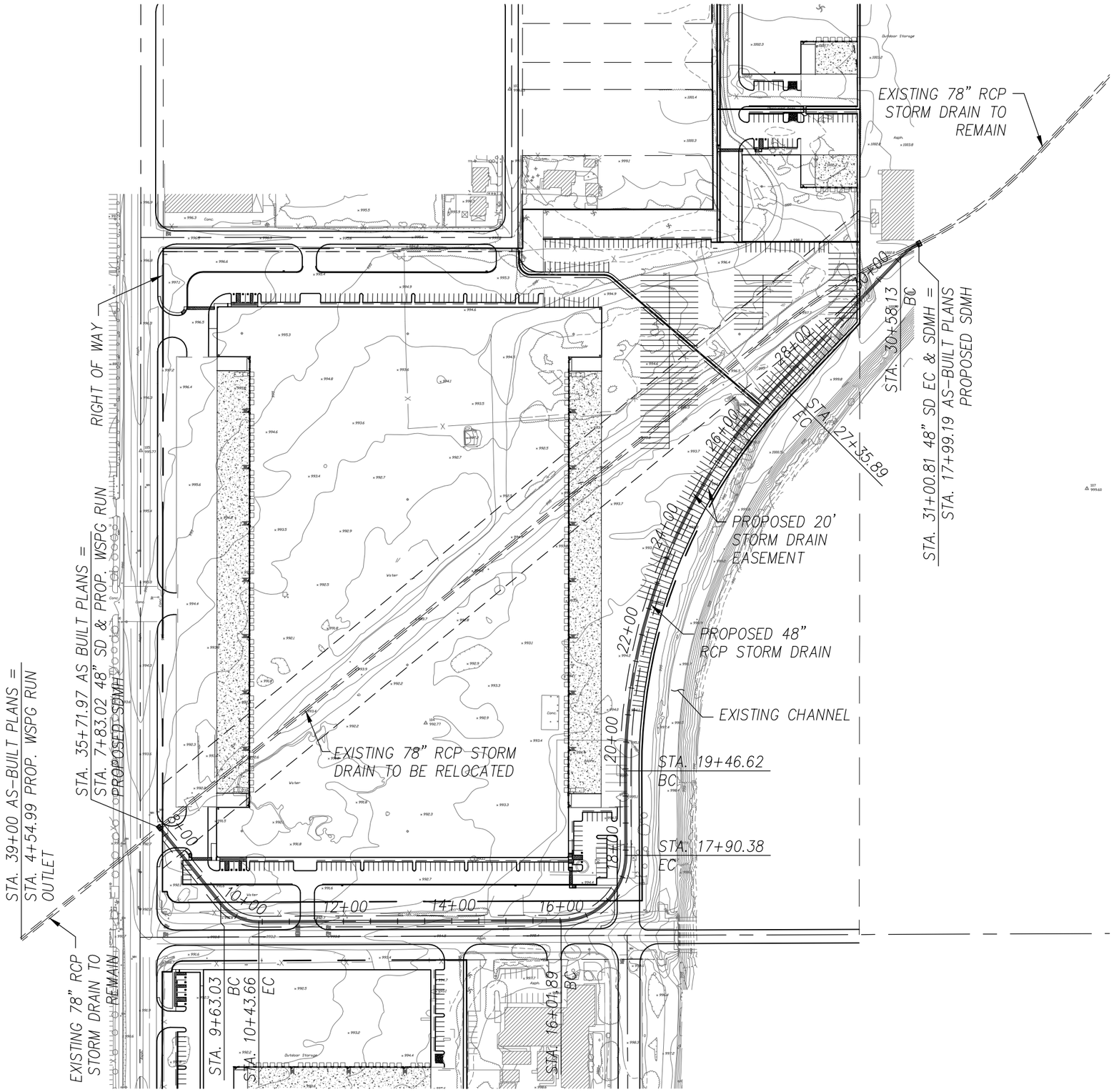
SAN BERNARDINO, CALIFORNIA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

EXTERNAL REFERENCES: 11420ct01 11-420 BT01 11-420bndy01 11420 MA
FILENAME: M:\2011\11-420 Lewis National Orange Show SB\hydraulic\78-inch SD Relocation\11420 Site Plan.dwg, LAST SAVED ON: Aug 24 2011 4:51pm PLOTTED BY: JULIE, ON: Aug 25 201

Appendix D

Bypass Relocation Exhibit



SCALE: 1"=200'

NATIONAL ORANGE SHOW

BYPASS RELOCATION EXHIBIT

SAN BERNARDINO, CALIFORNIA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

EXTERNAL REFERENCES: 11420Ct01 11-420 BT01 11-420bndy01 11420 MA
FILENAME: M:\2011\11-420 Lewis National Orange Show SB\hydraulic\78-inch SD Relocation\11420 Prop Exhibit.dwg, LAST SAVED ON: Aug 24 2011 4:41pm PLOTTED BY: JULIE, ON: Aug 25 .

Appendix E

Reference Documents:

Excerpts from "Design Memorandum No. 3, General Design for East Twin & Warm Creeks Channel, Channel Improvements from Marshall Boulevard Downstream to Santa Ana River – Devil, East Twin, Warm, and Lytle Creeks, Calif." by U.S. Army Engineer District, Los Angeles, Corps of Engineers, dated April 1958

Record Plans

McNown

COPY 55 OF 65 COPIES

SANTA ANA RIVER BASIN, CALIF.
FLOOD CONTROL

DESIGN MEMORANDUM NO. 3

GENERAL DESIGN

FOR

EAST TWIN & WARM CREEKS CHANNEL

CHANNEL IMPROVEMENTS FROM MARSHALL BOULEVARD DOWNSTREAM TO SANTA ANA RIVER

DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS, CALIF.

5

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
CORPS OF ENGINEERS
APRIL 1958

32. Bypass structure.--A bypass structure would be provided for the diversion of flows from the proposed channel. The bypass structure would include a gated inlet structure extending through the right wall at station 180+00 and a reinforced-concrete bypass conduit, 84 inches in diameter and 3,500 feet long, extending from the main channel to Timber Creek - just downstream from Arrowhead Avenue - near its confluence with Warm Creek.

33. The gate, which would be 84 by 84 inches, would be similar to "Hardesty model No. 35-05" gate. The bypass conduit would be designed to carry flows up to 200 cubic feet per second. Manholes for inspection would be provided along the conduit at 500-foot intervals. The gradient of the conduit would be 0.001690. Rock protection would be provided at the downstream end of the conduit to prevent excessive scour. The existing channel just downstream from the conduit would be graded to connect the invert at the end of the conduit with the existing invert at the confluence of Timber and Warm Creeks. Additional information on the bypass structure is given in a subsequent paragraph titled "Bypass Structures and Subdrainage System" under the heading titled "Departures From Project-Document Plan."

34. Subdrainage system.--A subdrainage system would be required along parts of the proposed rectangular and trapezoidal channels. Detailed information on the subdrainage system is given in Appendix 1: Geology and Soils.

35. Side-drainage inlet structures.--The side-drainage inlet structures would consist of corrugated-metal or reinforced-concrete pipes and paved spillways. Side-drainage structures would include inlets for existing storm drains and for storm drains constucted concurrently with channel construction. The pipes would extend through the channel walls or banks and would connect to existing drains and to drains to be provided by local interests. Automatic drainage gates would be provided where the inlet elevation of the pipe is below the tops of the walls or banks. Paved spillways over the tops of the banks would be provided at drainage concentration points. Where drainage enters that part of the proposed trapezoidal channel with side slopes protected by an ungrouted stone revetment (downstream from station 159+13), the dumped stone would be grouted to prevent erosion. Pertinent information on side-drainage inlet structures is given in the following table:

Pertinent information on side-drainage inlet structures - East Twin and Warm Creeks channel improvements from Marshall Boulevard downstream to Santa Ana River

EAST TWIN AND WARM CREEKS CHANNEL

Right bank

Drain No.	Subarea*			Side-drainage structures				Remarks	Disposition of excess flow
	Name	Size	Discharge peak	Total Q	Individual Q	Description	Station		
		Sq. mi.	C. f. s.	C. f. s.	C. f. s.				
3....					24	24-inch corrugated-metal pipe.	398+04	Provide inlet for proposed drain at upstream side of Lynwood Dr.	
5....					24	...do.....	397+56	Provide inlet for proposed drain at downstream side of Lynwood Dr.	Probably no excess flow. Discharges from drains Nos. 6 and 9 would be infrequent.
	(**)..	(**)	(**)	(***)					
6....					(***)	12-inch corrugated-metal pipe.	395+70	Join existing drain from pumping plant.	
9....					(***)	24-inch corrugated-metal pipe with gate.	387+00	Provide inlet for proposed drain from spreading basins.	
10...	(**)..	(**)	650	180	180	40- by 2-foot paved overflow spillway.	387+00	Structure will carry those excess flows from spreading basin that are discharged by 30th St. storm drain.	Excess flow will enter channel over tops of walls, over an additional overflow spillway, or by enlargement of the spillway of drain No. 10; the disposition of excess flow will be determined before completion of plans and specifications.
11...					25	24-inch corrugated-metal pipe.	361+60	Provide inlet for proposed drain at end of 23d St.	
12...	D.....	0.10	130	135	50	36-inch corrugated-metal pipe.	358+40	Join existing drain at upstream edge of Highland Ave.	
13...					60	42-inch reinforced-concrete pipe.	357+60	Join existing 24-inch corrugated-metal-pipe and 27-inch reinforced-concrete-pipe storm drains downstream from Highland Ave.	No excess flow.
15...					25	24-inch reinforced-concrete pipe.	354+50	Join existing drain.....	
19...					8	11-inch reinforced-concrete pipe.	337+00	...do.....	
23...	C.....	.46	420	148	25	24-inch corrugated-metal pipe.	322+98	Provide inlet for proposed drain upstream from Gilbert St.	Excess flow will (a) enter channel over tops of walls and (b) flow in streets and thence into existing Warm Creek.
24...					40	42-inch reinforced-concrete pipe.	320+70	Join existing storm drain downstream from Gilbert St.	
25...					25	24-inch corrugated-metal pipe.	302+44	Provide inlet for proposed drain upstream from Base Line St.	
27...					25	...do.....	301+67	Provide inlet for proposed drain downstream from Base Line St.	

See footnotes at end of table.

Pertinent information on side-drainage inlet structures - East Twin and Warm Creeks channel improvements from Marshall Boulevard downstream to Santa Ana River

EAST TWIN AND WARM CREEKS CHANNEL--Continued

Left-bank--Continued

Drain No.	Suboroa* Name	Suboroa* Size	Suboroa* Discharge peak	Side-drainage structures Total Q	Side-drainage structures Individual Q	Side-drainage structures Description	Side-drainage structures Station	Remarks	Disposition of excess flow
		Sq. mi.	C. f. s.	C. f. s.	C. f. s.				
7	F	0.38	400	(***)	(***)	24-inch corrugated-metal pipe.	387+00	Provide inlet for proposed drain from future spreading basin.	Excess flow (about 125 c. f. s.) will enter channel over tops of walls. Discharges from drains Nos. 7 and 18 would be infrequent.
8					180	40- by 2-foot paved overflow spillway.	387+00	Structure will carry excess flows from spreading basins.	
14					35	24-inch corrugated-metal pipe.	357+54	Provide inlet for proposed drain downstream from Highland Ave.	
16					20	18-inch corrugated-metal pipe.	352+70	Join existing 12-inch drain and 6-inch drain.	
17					40	24-inch corrugated-metal pipe.	350+80	Provide inlet for proposed drain.	
18					(***)	6-inch metal pipe.....	346+60	Join existing overflow pipe.....	
20	(**)	(**)	(**)	109	5	12-inch corrugated-metal pipe.	336+80	Join existing 12-inch iron-pipe drain extended from 21st St.	Excess flow, if any, will (a) enter channel over tops of walls or (b) flow into Warm Creek.
21					10	24-inch corrugated-metal pipe.	328+40	Join existing drain from Perris Hill Park Rd.	
22					30	...do.....	323+48	Provide inlet for proposed drain from intersection of Perris Hill Park Rd. and Gilbert St.	
26					30	...do.....	302+44	Provide inlet for proposed drain upstream from Base Line St.	
28					30	...do.....	301+67	Provide inlet for proposed drain downstream from Perris Hill Park Rd. and intersection of Gilbert St.	
31					4	8-inch pipe.....	292+00	Provide inlet for proposed drain from County yard.	
35	G	.29	290	(***)	(***)	12-inch corrugated-metal pipe.	260+00	Provide inlet for proposed drain from Antil Pumping Plant.	Excess flow (about 75 c. f. s.) will (a) enter channel over tops of walls or (b) flow into City Creek. Discharges from drain No. 35 would be infrequent.
36					140	60-inch reinforced-concrete pipe.	253+59	Provide inlet for proposed storm drain just upstream from 6th St.	
37					25	24-inch corrugated-metal pipe.	253+00	Provide inlet for proposed drain.	
38					25	...do.....	246+16	Provide inlet for proposed drain at upstream edge of 5th St.	
39					25	...do.....	245+36	Provide inlet for proposed drain at downstream edge of 5th St.	

See footnotes at end of table.

Pertinent information on side-drainage inlet structures - East Twin and Warm Creeks channel improvements from Marshall Boulevard downstream to Santa Ana River

EAST TWIN AND WARM CREEKS CHANNEL--Continued

Left bank--Continued

Drain No.	Subarea*			Side-drainage structures				Remarks	Disposition of excess flow
	Name	Size	Discharge peak	Total Q	Individual Q	Description	Station		
		Sq. mi.	C. f. s.	C. f. s.	C. f. s.				
40...	(**)..	(**)	(**)	50	25	24-inch corrugated-metal pipe.	238+99	Provide inlet for proposed drain just upstream from 4th St.	Excess flow, if any, will (a) enter channel over tops of walls or (b) flow into City Creek.
41...					25	...do.....	238+50	Provide inlet for proposed drain at downstream edge of 4th St.	
44...	H.....	3.50	1,700	2,070	35	...do.....	231+39	Provide inlet for proposed drain upstream from 3d St.	No excess flow.
45...					40	...do.....	225+40	Provide inlet for proposed drain on downstream side of 2d St.	
46...					50	Overflow section with 18- by 2-foot spillway.	221+60	None.....	
47...					35	24-inch corrugated-metal pipe.	220+93	Provide inlet for proposed drain just upstream from Cardiff St.	
48...					35	...do.....	220+25	Provide inlet for proposed drain just downstream from Cardiff St.	
49...					1,700	Inlet structure with side spillway.	205+00	Inlet, about 375 feet long, proposed by CE for flows from Timber Creek.	
54...					95	42-inch reinforced-concrete pipe.	187+58	Provide inlet for proposed drain on downstream side of Waterman Ave.	
56...					80	36-inch corrugated-metal pipe.	178+71	Provide inlet for proposed drain on upstream side of Mill St.	
60...	(**)..	(**)	(**)	(***)	(***)	24-inch corrugated-metal pipe with gate.	151+04	Provide inlet for proposed drain on upstream side of Central Ave.	Excess flow, if any, will enter streets and thence discharge into Santa Ana River.
61...					(***)	...do.....	150+32	Provide inlet for proposed drain on downstream side of Central Ave.	

See footnotes at end of table.

Pertinent information on side-drainage inlet structures - East Twin and Warm Creeks channel improvements from Marshall Boulevard downstream to Santa Ana River

WARM CREEK INLET CHANNEL

Drain No.	Subarea*			Side-drainage structures				Remarks	Disposition of excess flow
	Name	Size	Discharge peak	Total Q	Individual Q	Description	Station		
		Sq. mi.	C. f. s.	C. f. s.	C. f. s.				
33...	(**)..	(**)	(**)	50	25	24-inch corrugated-metal pipe.	11+81	Provide inlet for proposed drain upstream from 9th St.	Excess flow, if any, will enter inlet channel or main channel over tops of walls.
34...					25	...do.....	10+86	Provide inlet for proposed drain downstream from 9th St.	

BYPASS CONDUIT

58...	(**)..	(**)	(**)	40	20	24-inch corrugated-metal pipe.	(#)	Proposed by CE; provide inlet for proposed drain to be extended from Allen St.	Probably no excess flow.
59...					20	...do.....	(#)	...do.....	

* See pl. 3; except as noted, discharge peak is based on 50-year-frequency rainfall.
** Drains carrying flow diverted from another drainage area or from those parts of project drainage area that are outside boundaries of drainage subareas; includes drains that are part of storm-drainage system constructed by local interests.
*** Information not available.
\# Not applicable.

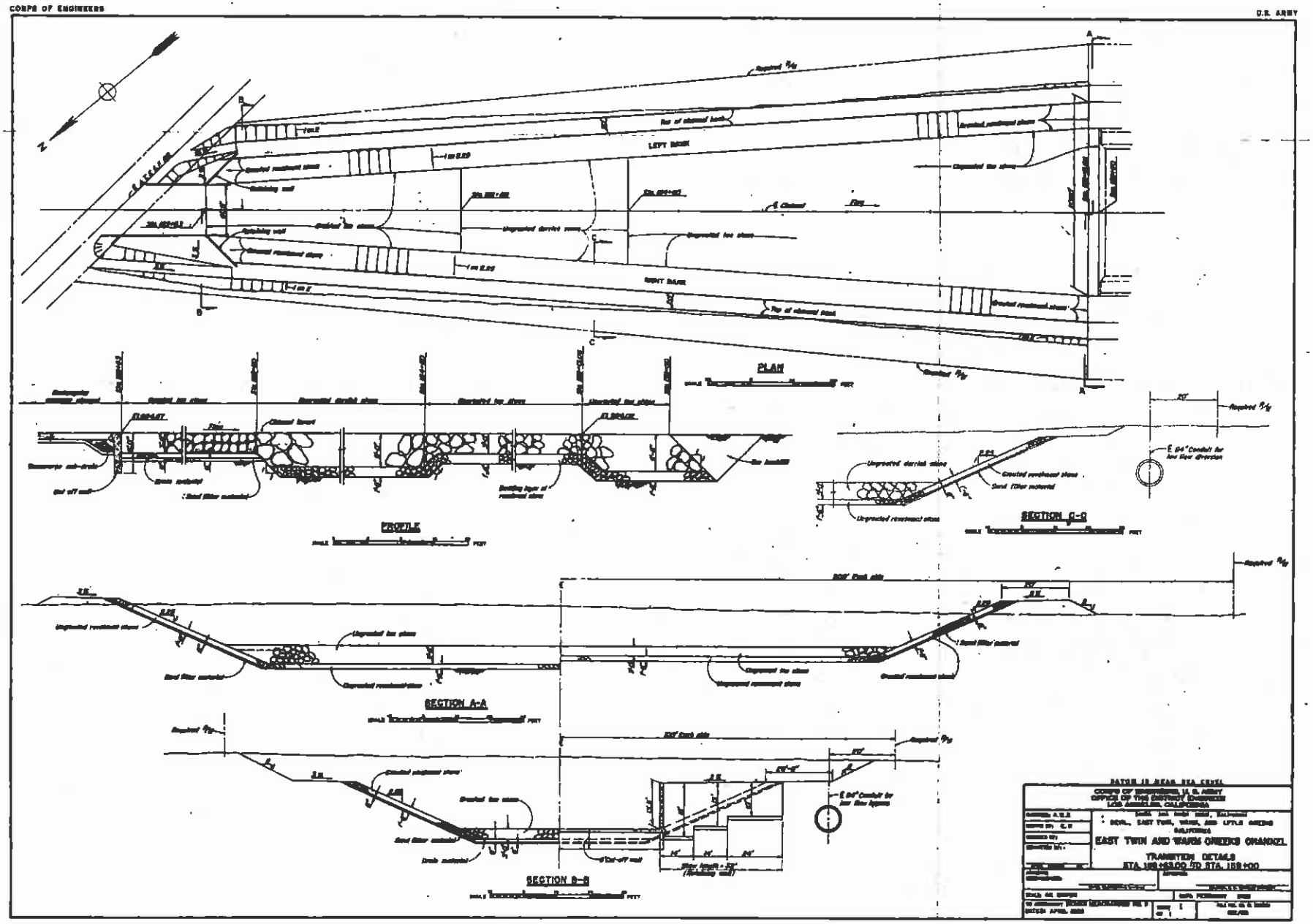
Note.--Except as otherwise noted, all drains are proposed by the San Bernardino County Flood Control District; CE refers to Corps of Engineers.

89. As a result of field-reconnaissance surveys by the Los Angeles District and conferences between representatives of the District and of local interests regarding extension of the downstream terminus of the proposed channel, a decision was made that extending the proposed improvement downstream was justified. It was agreed that the district engineer would (a) include the extension as part of the recommended plan in the general-design memorandum and (b) recommend construction of the proposed extension at Government expense.

90. Bypass structures and subdrainage system.--Under the project-document plan, three bypass or diversion structures would be provided to protect water rights and to divert flows for water conservation. These structures, which would be at the confluences of Warm Creek, City Creek, and Timber Creek, would each have a capacity of 250 cubic feet per second. Under the project-document plan, a subdrainage system for the channel would not be provided because of possible drawdown of ground water. Local interests agreed to the deletion of the bypass structures and withdrew their objections to a subdrainage system provided that provisions were made for the replenishment of ground water. As a result, the recommended plan provides for the construction of one bypass structure, with a capacity of 200 cubic feet per second. This capacity was requested by representatives of the San Bernardino County Flood Control District in a conference held on 25 October 1957. The bypass structure, which would include an 84-inch reinforced-concrete conduit, would divert flows into the existing Warm Creek channel.

91. Inlet channels.--Under the project-document plan, an inlet structure would be provided at the confluence of the proposed project channel and Warm Creek. Under the recommended plan, short reaches of inlet channel would be provided at the confluences of the proposed project channel and Warm and City Creeks. These inlet structures are designed to the minimum widths and lengths necessary to safeguard the project channel. The detailed studies made in connection with the preparation of this design memorandum indicated that an inlet structure on City Creek is necessary.

92. Summary of departures of recommended plan from project-document plan.--A summary of the departures of the principal features of the recommended plan from the project-document plan is given in the following table:


PLAN
LEFT BANK
RIGHT BANK
PROFILE
SECTION C-C
SECTION A-A
SECTION B-B
EAST TWIN AND WARM CREEKS CHANNEL
TRANSITION DETAILS
STA. 188+00.00 TO STA. 189+00

SANTA ANA RIVER BASIN, CALIFORNIA

DEVIL, EAST TWIN, WARM AND LYTLE CREEKS

EAST TWIN, AND WARM CREEKS CHANNEL

PLANS OF CHANNEL CONSTRUCTION FOR

P. E. RY. BRIDGE TO CENTRAL AVE.

STA. 207+50 TO STA. 159+16.05 MILE 2.42 TO MILE 1.50

LOS ANGELES DISTRICT CORPS OF ENGINEERS

"AS CONSTRUCTED"

TO ACCOMPANY SPECIFICATIONS
CIVENG. 04-353-59-26
CONT. 59-129

DRAWINGS IN THIS FOLIO HAVE
BEEN REDUCED TO ONE HALF
THE ORIGINAL SCALE

File #2-409-17

SANTA ANA RIVER BASIN, CALIFORNIA

DEVIL, EAST TWIN, WARM AND LYTLE CREEKS

EAST TWIN, AND WARM CREEKS CHANNEL

P. E. RY. BRIDGE TO CENTRAL AVE.

STA. 207+50 TO STA. 159+16.05 MILE 2.42 TO MILE 1.50

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DATUM IS MEAN SEA LEVEL

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58	FOUNDATION INVESTIGATION-STA. 207+50 TO STA. 159+16.05	4
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60	PLAN AND PROFILE NO. 2-STA. 195+77.42 TO STA. 182+00	6
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67	78" CONDUIT-PLAN AND PROFILE NO. 2-STA. 14+00 TO STA. 28+00	13
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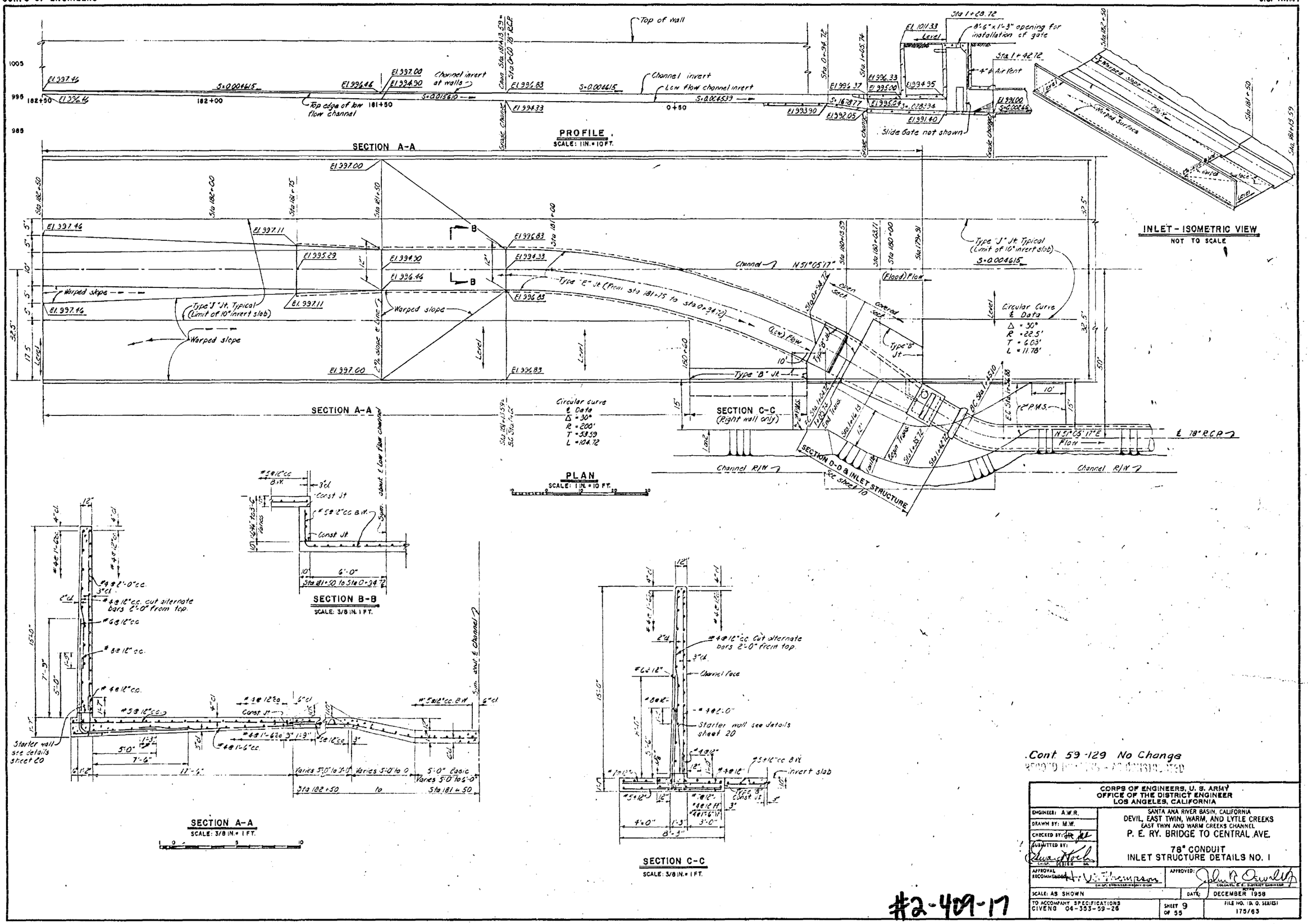
#2-409-17

TO ACCOMPANY SPECIFICATIONS
CIVENG 04-353-59-66
IN 55 SHEETS SHEET 1
FILE NO. 175/55



.Cont. 59-129 No Change

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: A.W.R.
DRAWN BY: M.W.
CHECKED BY:
SUBMITTED BY:
CHIEF, DESIGN SEC.

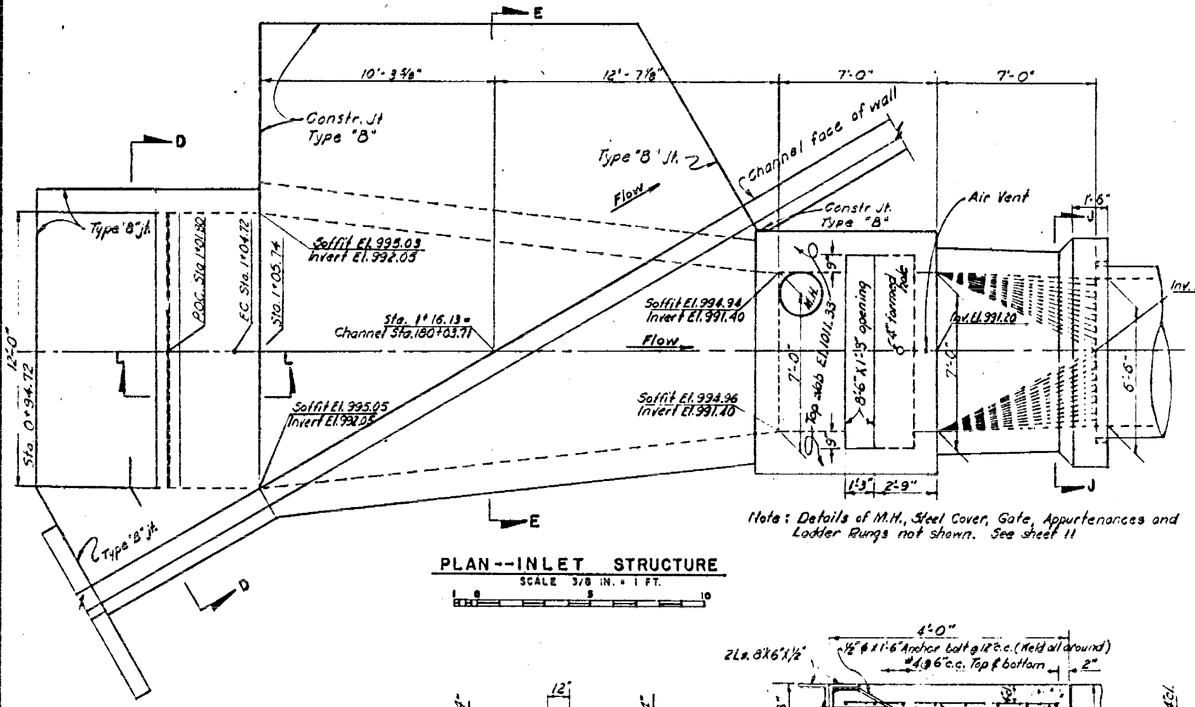
SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.

78" CONDUIT
INLET STRUCTURE DETAILS NO. 1

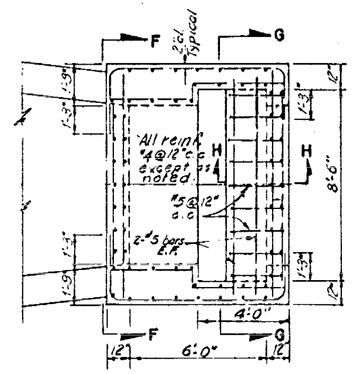
APPROVAL RECOMMENDED: H. W. Thompson, CHIEF, ENGINEERING DIVISION
APPROVED: John R. Crawford, COLONEL, C.E., DISTRICT ENGINEER

SCALE: AS SHOWN
DATE: DECEMBER 1958

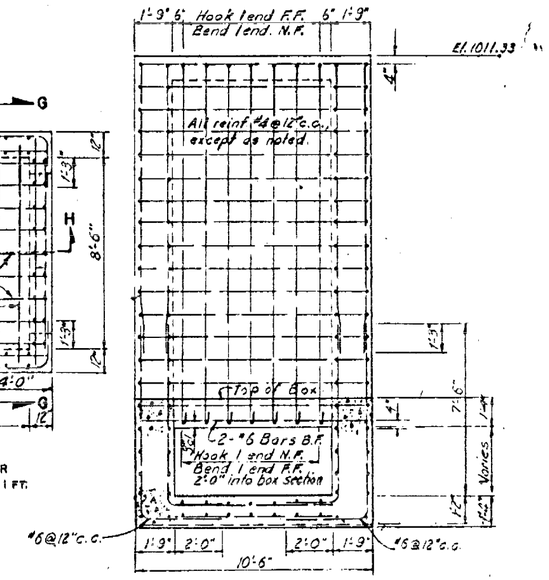
TO ACCOMPANY SPECIFICATIONS CIVENG 04-353-59-26
SHEET 9 OF 55
FILE NO. (D. O. SERIES) 175/63



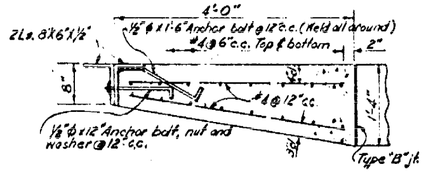
PLAN--INLET STRUCTURE
SCALE 3/8 IN. = 1 FT.



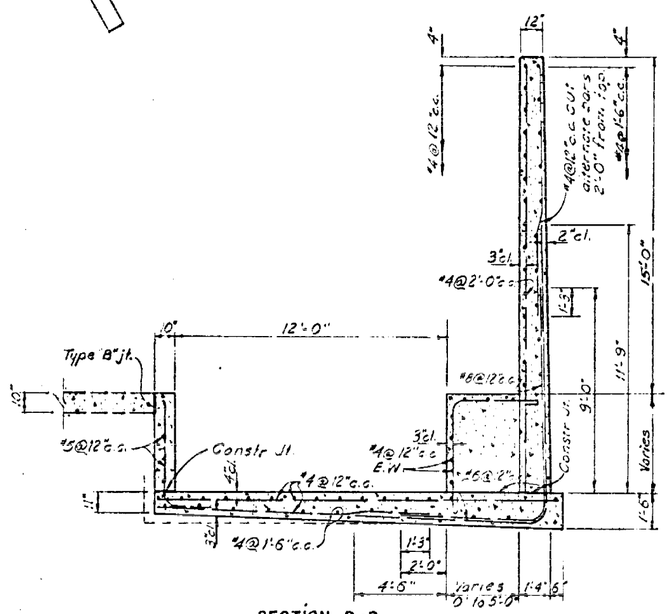
PLAN
INLET TOWER
SCALE: 3/8 IN. = 1 FT.



SECTION F-F



SECTION L-L
SCALE: 1 IN. = 1 FT.



SECTION D-D
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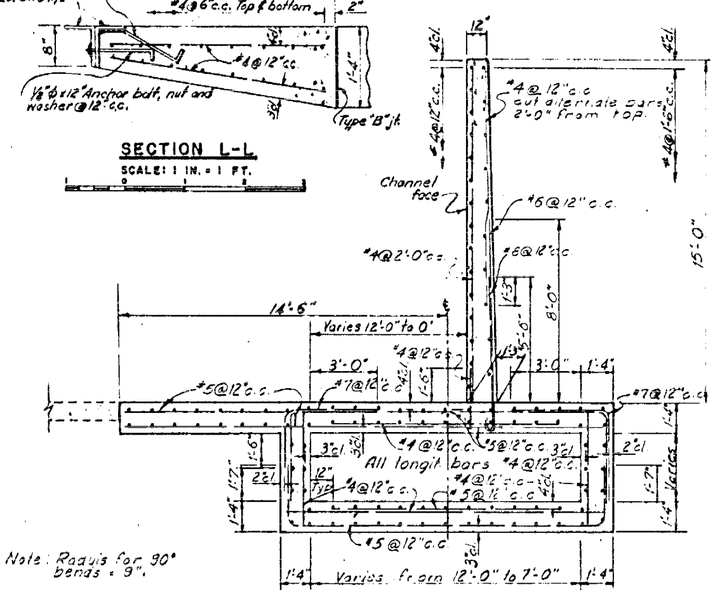
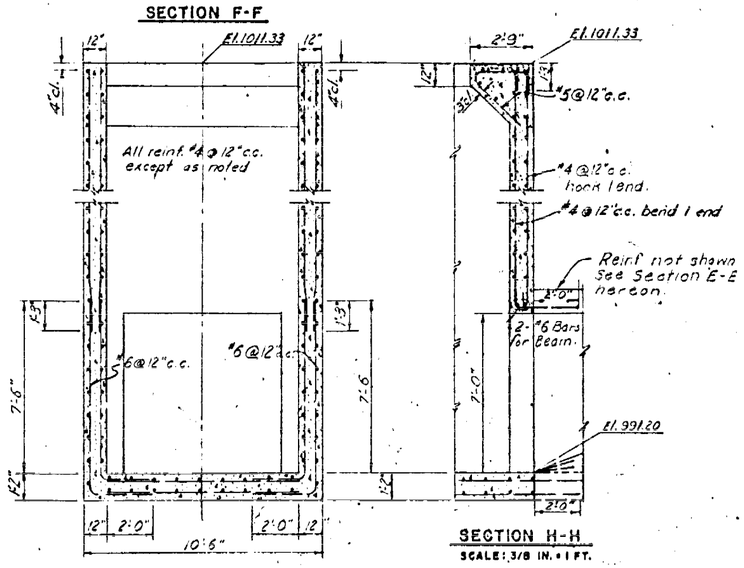


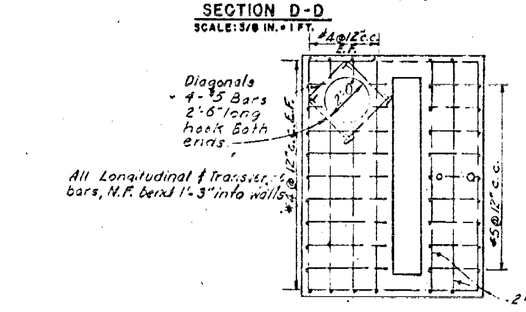
SECTION E-E
SCALE: 3/8 IN. = 1 FT.



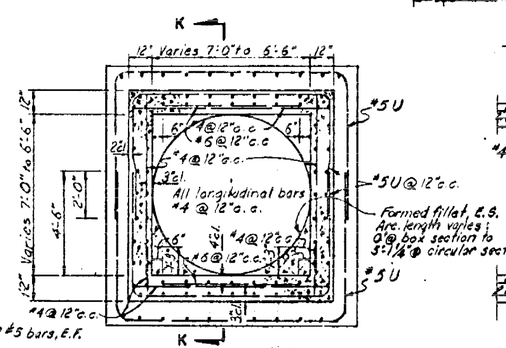
SECTION G-G
SCALE: 3/8 IN. = 1 FT.

SECTION H-H
SCALE: 3/8 IN. = 1 FT.

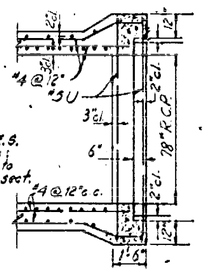
Note: Radius for 90° bends = 9".



PLAN ROOF SLAB
SCALE: 3/8 IN. = 1 FT.



SECTION J-J
SCALE: 3/8 IN. = 1 FT.

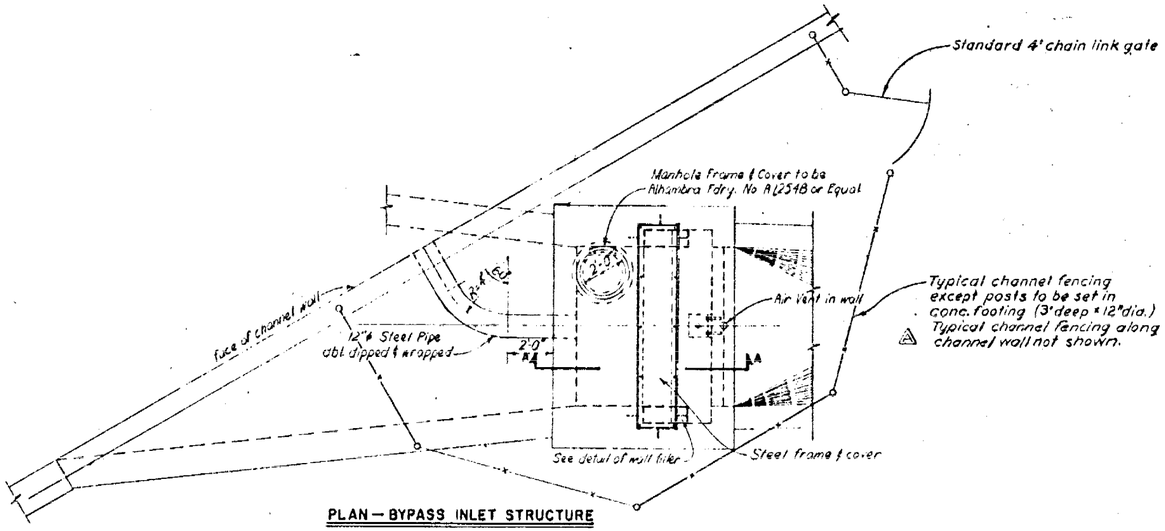


SECTION K-K
SCALE: 3/8 IN. = 1 FT.

Cont. 59-129 No Change
AS CONSTRUCTED

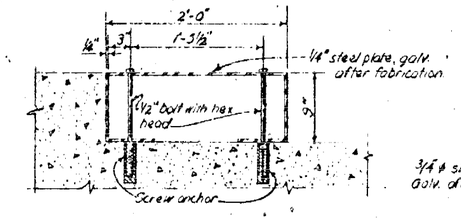
#2-409-17

CORPS OF ENGINEERS, U. S. ARMY OFFICE OF THE DISTRICT ENGINEER LOS ANGELES, CALIFORNIA	
ENGINEER: A.W.R. DRAWN BY: J.S.L., J.J.B. CHECKED BY: [illegible] SUBMITTED BY: [illegible] CHIEF, DESIGN BR.	SANTA ANA RIVER BASIN, CALIFORNIA DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS EAST TWIN AND WARM CREEKS CHANNEL P. E. RY. BRIDGE TO CENTRAL AVE. 78" CONDUIT INLET STRUCTURE DETAILS NO. 2
APPROVAL RECOMMENDED: [illegible] CHIEF, ENGINEERING DIVISION	APPROVED: [illegible] COLONEL, C. E. DISTRICT ENGINEER
SCALE: AS SHOWN	DATE: DECEMBER 1958
TO ACCOMPANY SPECIFICATIONS CIVENG 04-353-59-26	SHEET 10 OF 56 — FILE NO. (B. D. SERIES) 175/64



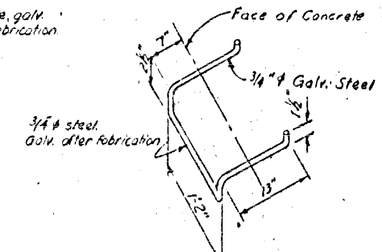
PLAN — BYPASS INLET STRUCTURE

SCALE: 3/8 IN. = 1 FT.



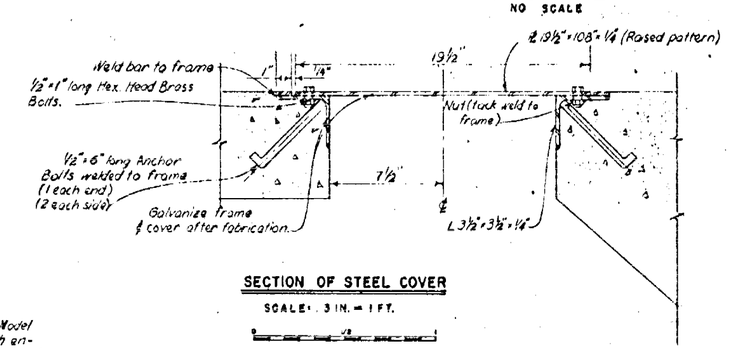
SECTION OF WALL FILLER

SCALE: 1 1/2 IN. = 1 FT.



LADDER RUNGS

NO SCALE



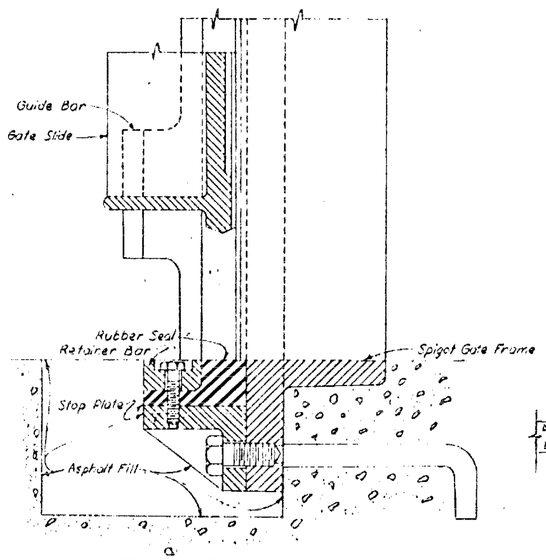
SECTION OF STEEL COVER

SCALE: 3 IN. = 1 FT.

GENERAL NOTES

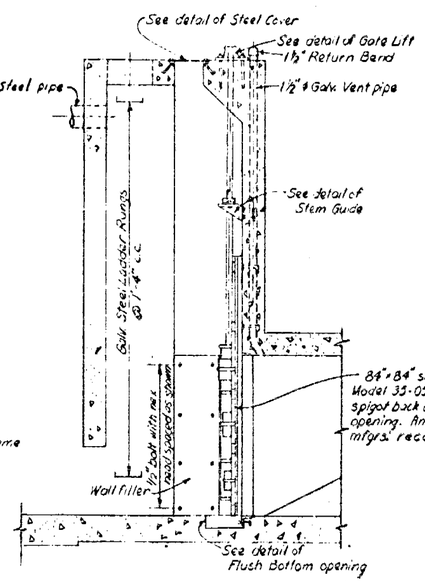
All steel items on this drawing except slide gate and appurtenances shall be galvanized after fabrication unless otherwise indicated.

All anchor bolts shall be either galvanized or of corrosion resistant metal.



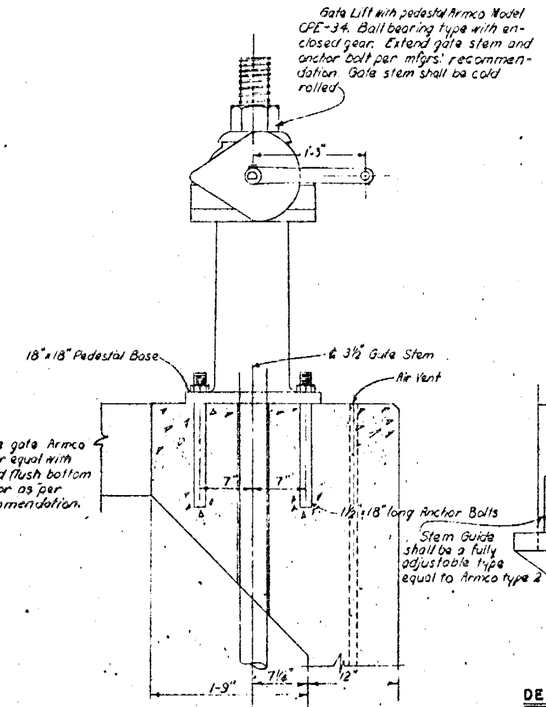
DETAIL — FLUSH BOTTOM OPENING

NO SCALE



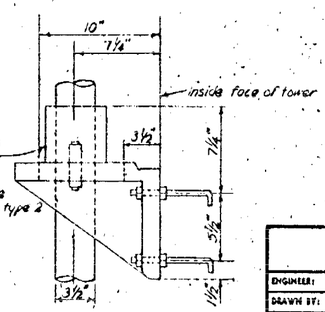
SECTION A—A

SCALE: 3/8 IN. = 1 FT.



DETAIL — GATE LIFT

SCALE: 1 1/2 IN. = 1 FT.



DETAIL — STEM GUIDE

NO SCALE

RECORD DRAWING-AS CONSTRUCTED

CONT. NO. 53-129 REV. A DATE 17 Feb 60 BY S.C.

CONT. NO. ---- REV. ---- DATE ---- BY ----

JOINT NO. ---- REV. ---- DATE ---- BY ----

REV NO	DATE	REVISION	REV	CHK	APP
A	2-17-60	Added Hole Frame not shown	S.C.	RAN	

#2-404-M

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: A.W.R.
DRAWN BY: J.R.W.
CHECKED BY: [illegible]
SUBMITTED BY: [illegible] CHIEF, DESIGN SEC.

SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.
78" CONDUIT — INLET STRUCTURE
DETAILS NO. 3

APPROVAL RECOMMENDED: [illegible] CHIEF, ENGINEERING DIVISION

APPROVED: John R. Oswald Jr. COLONEL, C. E. DISTRICT ENGINEER

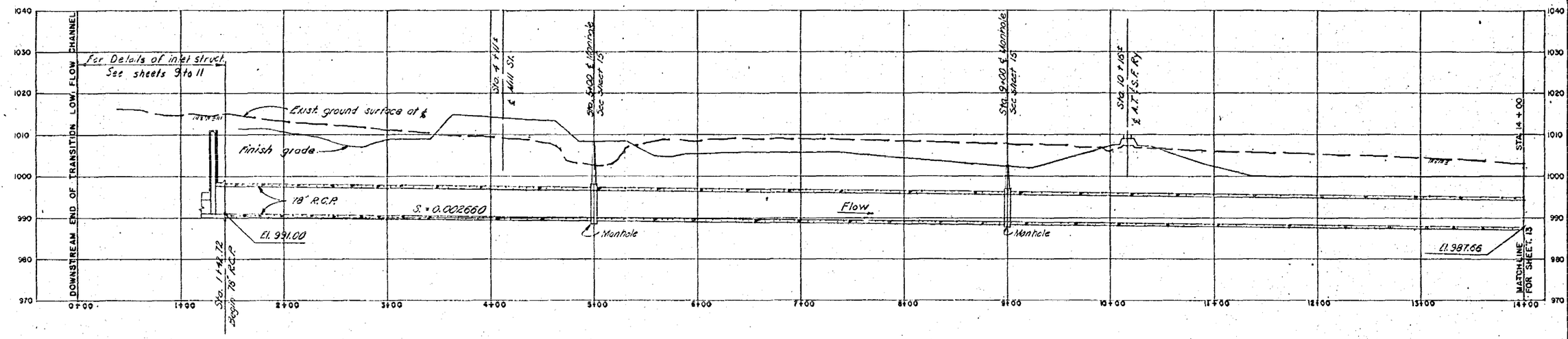
SCALE: AS SHOWN

DATE: DECEMBER 1958

TO ACCOMPANY SPECIFICATIONS DIVENG 04-353-59-26

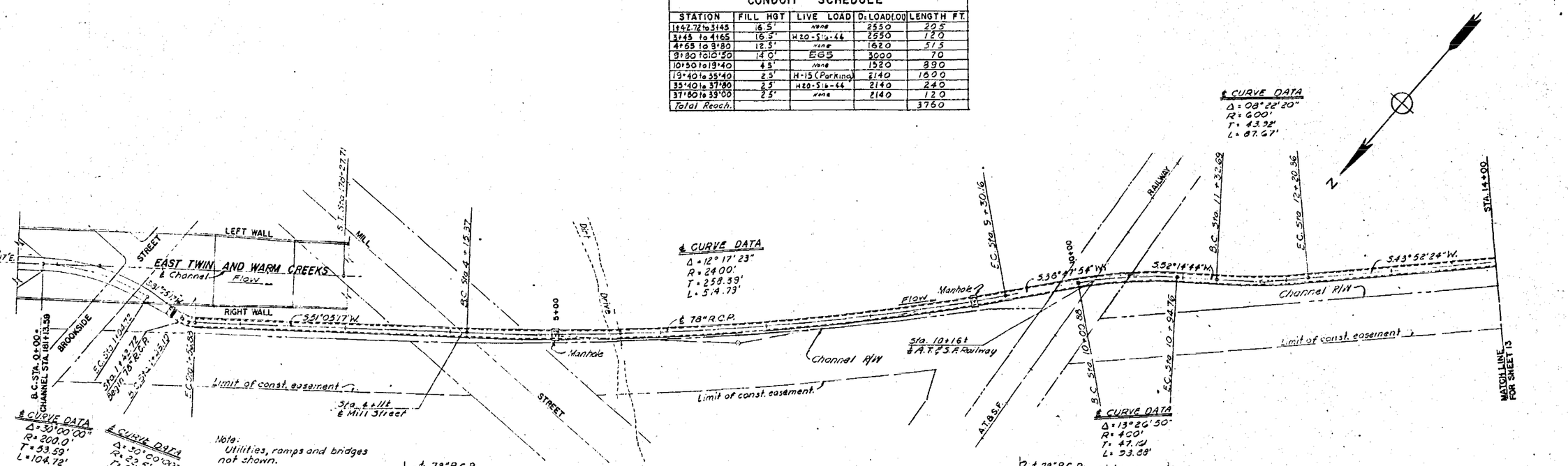
SHEET 11 OF 53

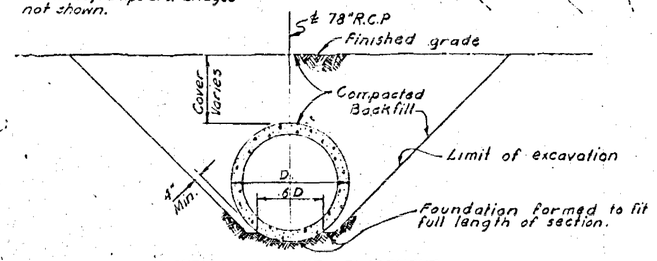
FILE NO. (R. O. SERIES) 175/65 REV'A"



PROFILE
SCALE: HOR. 1 IN = 40 FT.
VERT. 1 IN = 10 FT.

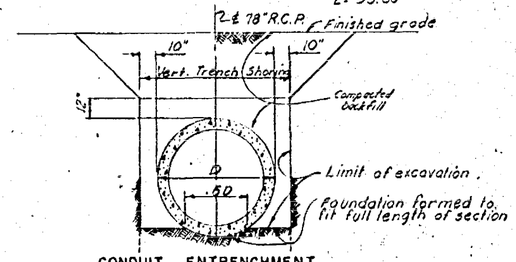
CONDUIT SCHEDULE				
STATION	FILL HGT	LIVE LOAD	D: LOAD (OD)	LENGTH FT.
1+42.72 to 3+45	16.5'	none	2550	205
3+45 to 4+65	16.5'	H20-S16-44	2550	120
4+65 to 9+80	12.5'	none	1620	515
9+80 to 10+50	14.0'	E65	3000	70
10+50 to 19+40	4.5'	none	1520	890
19+40 to 35+40	2.5'	H-15 (Parking)	2140	1600
35+40 to 37+80	2.5'	H20-S16-44	2140	240
37+80 to 39+00	2.5'	none	2140	120
Total Reach.				3760





TYPICAL CONDUIT PLACEMENT
(EXCEPT WITHIN A.T. & S.F. RY. R/W)
NOT TO SCALE

PLAN
SCALE: 1 IN. = 40 FT.



CONDUIT ENTRENCHMENT
(WITHIN A.T. & S.F. RY. R/W)
NOT TO SCALE

Cont. 59-129 No Change
RECORD DRAWING - AS CONSTRUCTED

#2-409-17

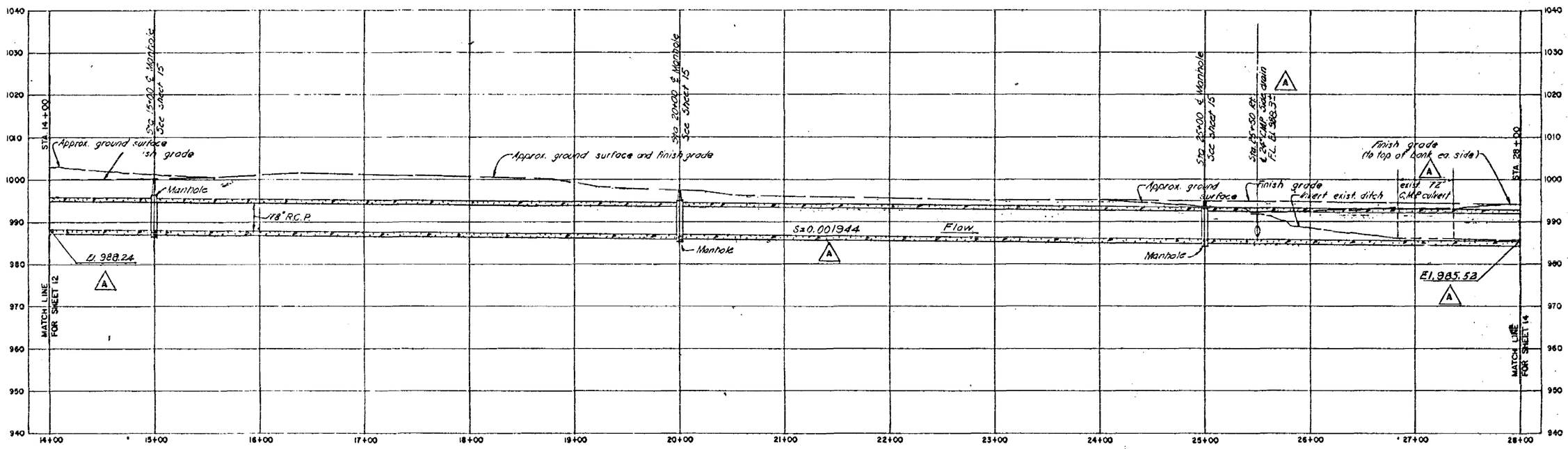
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: A.W.R.
DRAWN BY: MMO
CHECKED BY:
SUBMITTED BY:
CHIEF, DESIGN BR.

SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.
78" CONDUIT-PLAN AND PROFILE NO. 1
STA. 1+42.72 TO STA. 14+00

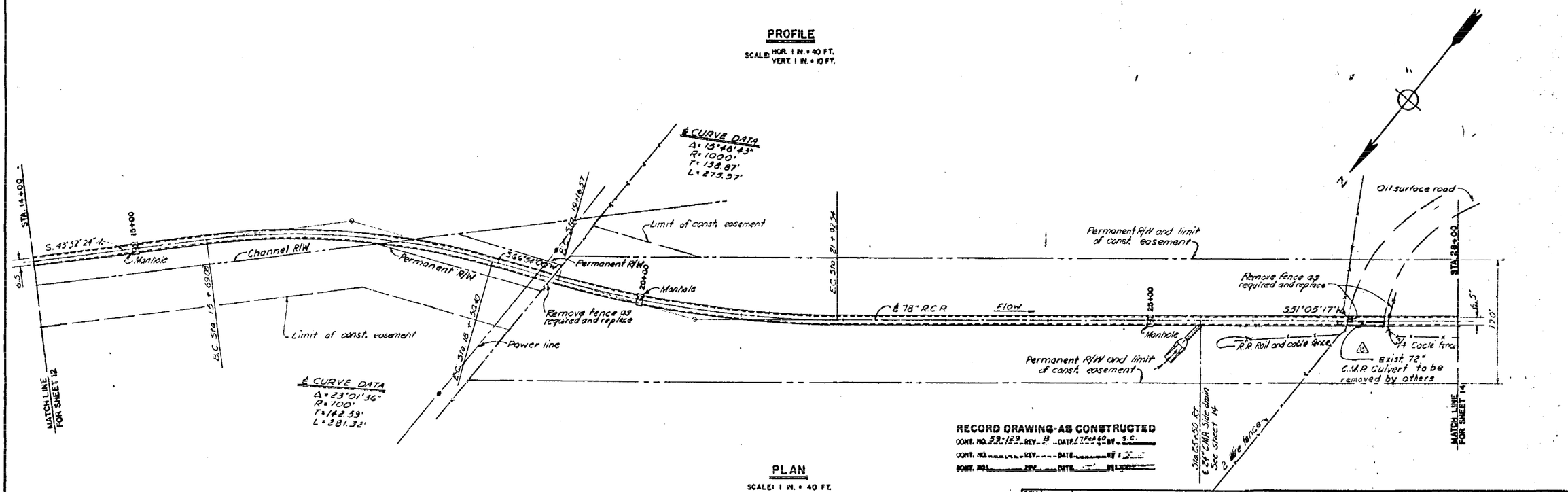
APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION
APPROVED: COLONEL, C.E. DISTRICT ENGINEER

SCALE: AS SHOWN
DATE: DECEMBER 1959
TO ACCOMPANY SPECIFICATIONS CIVENG 04-353-59-26
SHEET 12 OF 53
FILE NO. (D. O. SERIES) 175/66



PROFILE

SCALE: HOR. 1 IN. = 40 FT. VERT. 1 IN. = 10 FT.



PLAN

SCALE: 1 IN. = 40 FT.

RECORD DRAWING-AS CONSTRUCTED

CONT. NO. 59-129 REV. B DATE 17 Feb 60 BY S.C.

CONT. NO. ____ REV. ____ DATE ____ BY ____

CONT. NO. ____ REV. ____ DATE ____ BY ____

REV. NO.	DATE	REVISION	REV.	CHK.	APP.
A	4-7-59	Revised invert grade of 78" R.C.P.	S.C.	PAN	
B	2-17-60	Culvert to be Removed by others	S.C.	PAN	

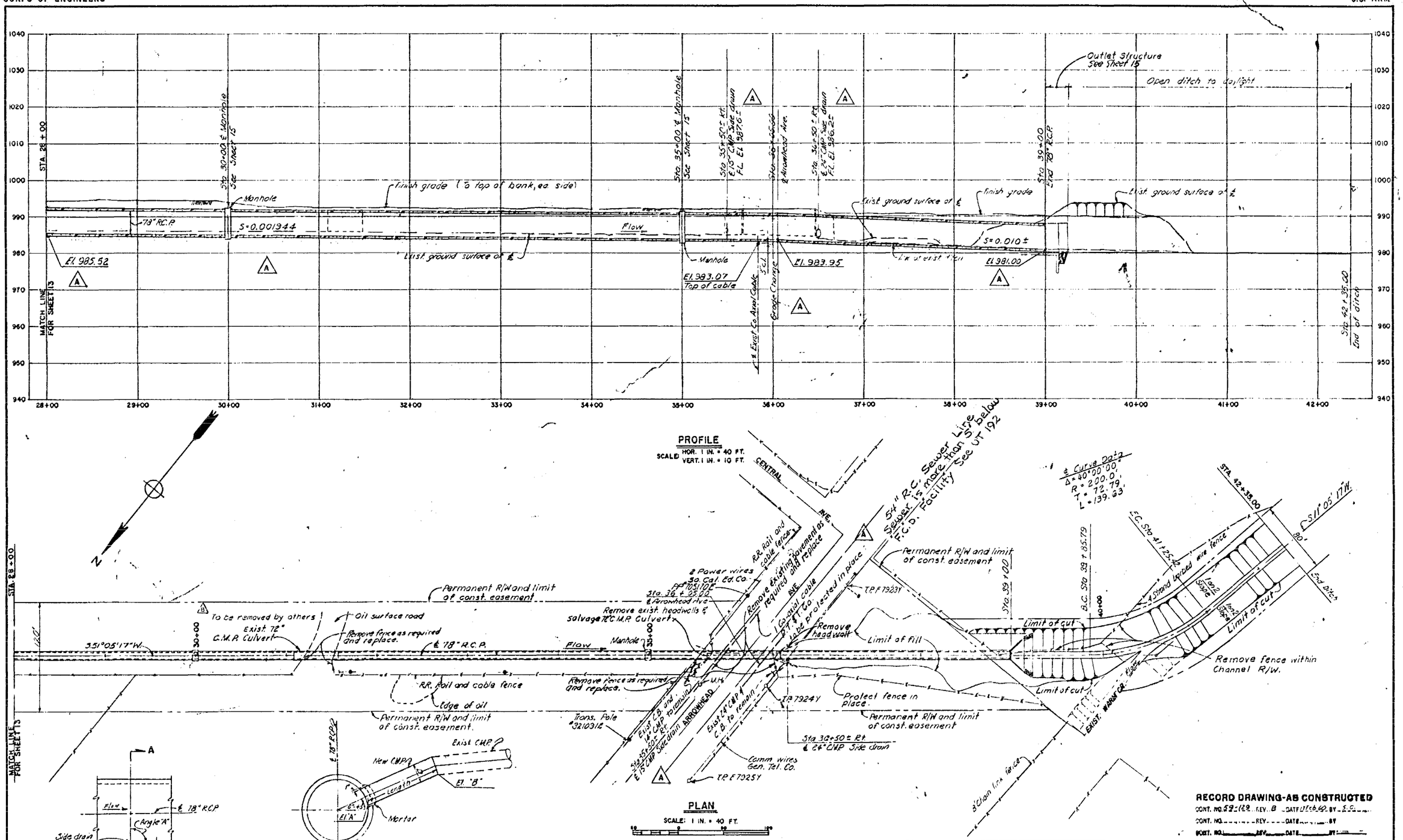
#2-409-17

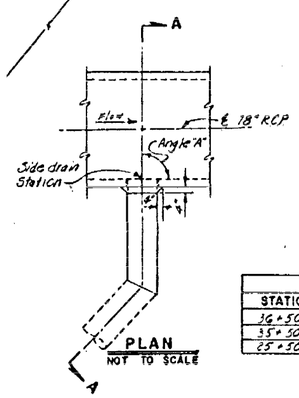
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

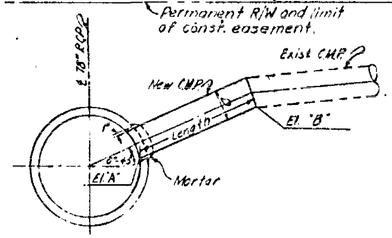
ENGINEER: A.W.R.
DRAWN BY: MMD
CHECKED BY: HR
SUBMITTED BY: Oliver P. Koch, CHIEF, DESIGN BR.
APPROVAL RECOMMENDED: H. W. Thompson, CHIEF, ENGINEERING DIVISION
APPROVED: John R. Oswald Jr., COLONEL, C.E., DISTRICT ENGINEER

SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.
78" CONDUIT-PLAN AND PROFILE NO. 2
STA 14+00 TO STA. 28+00

SCALE: AS SHOWN
DATE: DECEMBER 1958
TO ACCOMPANY SPECIFICATIONS OCI-CIV-59-26
SHEET 13 OF 55
FILE NO. (D. O. SERIES) 175/67 REV. "B"







SECTION A-A
NOT TO SCALE

TABULATION OF SIDE DRAINS

STATION	ANGLE "A"	ELEV. "A"	ELEV. "B"	PIPE SIZE	GAGE	LENGTH	REMARKS
36+50 Rt	90°	986.2±	987.4±	24" CMP	14	10'±	Revised to VPC flow line and pipe characteristics and length
35+50 Rt	90°	987.6±	990.5±	15" CMP	16	10'±	Connecting pipe & bend to match old flow line
25+50 Rt	45°	988.3±	989.7±	24" CMP	14	20'±	Provide metal inlet and ditch

TYPICAL SIDE DRAIN DETAILS

RECORD DRAWING-AS CONSTRUCTED
CONT. NO. 59-129 REV. B DATE 1 Feb 60 BY S.C.
CONT. NO. ____ REV. ____ DATE ____ BY ____
POST. NO. ____ REV. ____ DATE ____ BY ____

REV. NO.	DATE	REVISION	REV.	CHK.	APP.
A	4-8-59	Revised invert grade of 78" R.C.P. and side drain tabulation.			
B	2-17-60	Note CMP culvert to be removed by others	SC	TAK	

#2-409-17

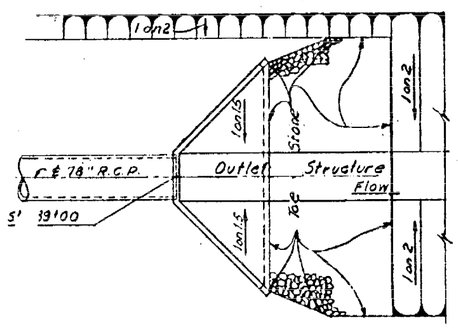
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: A. W. R.
DRAWN BY: MMD
CHECKED BY: JHP JAK
SUBMITTED BY: CHIEF DESIGNER

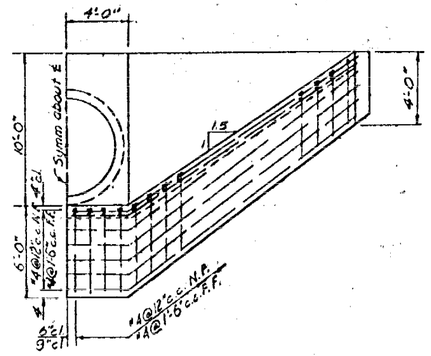
SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.
78" CONDUIT-PLAN AND PROFILE NO. 3
STA. 28+00 TO STA. 42+35

APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION
APPROVED: COLONEL, C.E. DISTRICT ENGINEER

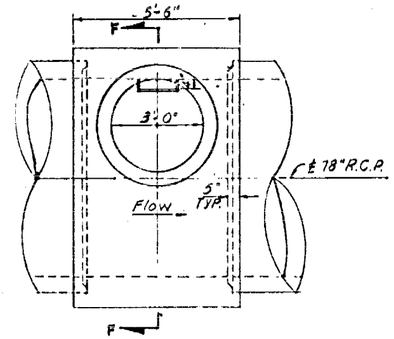
SCALE: AS SHOWN
DATE: DECEMBER 1958
TO ACCOMPANY SPECIFICATIONS DCI-CIV-59-26
SHEET 14 OF 55
FILE NO. (D. O. SERIES) 175/68 REV. "B"



PLAN
OUTLET STRUCTURE
SCALE: 1 IN. = 10 FT.



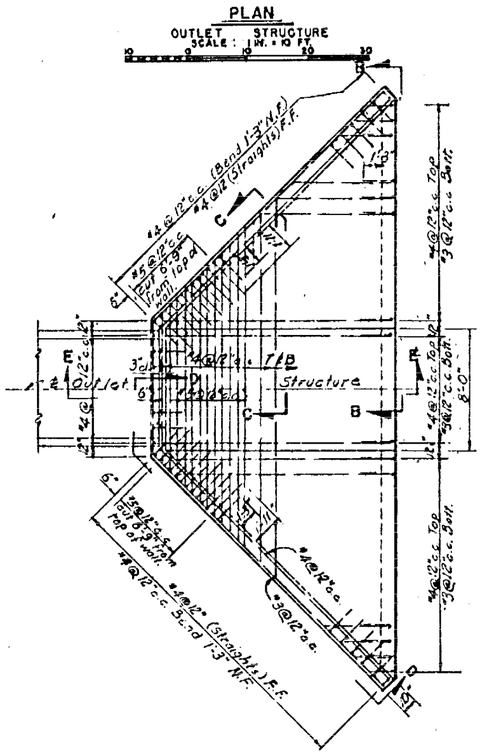
SECTION B-B



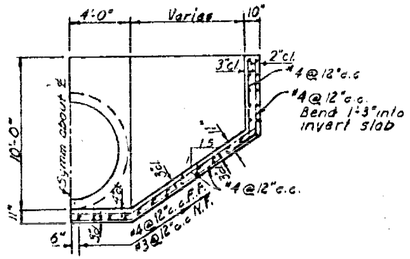
PLAN - MANHOLE
SCALE: 1/2 IN. = 1 FT.

MANHOLE TABULATION			
STATION	HEIGHT APPROX	INVERT ELEV	TOP ELEV.
5 + 00	10.8'	989.99	1000.0 ±
9 + 00	5.6'	989.27	1002.0 ±
15 + 00	4.8'	988.04	1000.0 ±
20 + 00	3.3'	987.07	997.5 ±
25 + 00	1.5'	986.10	994.8 ±
30 + 00	1.2'	985.13	993.5 ±
35 + 00	1.0'	984.16	992.3 ±

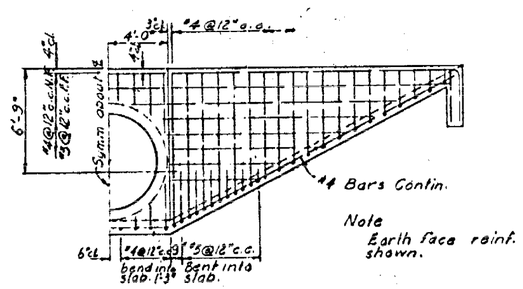
A



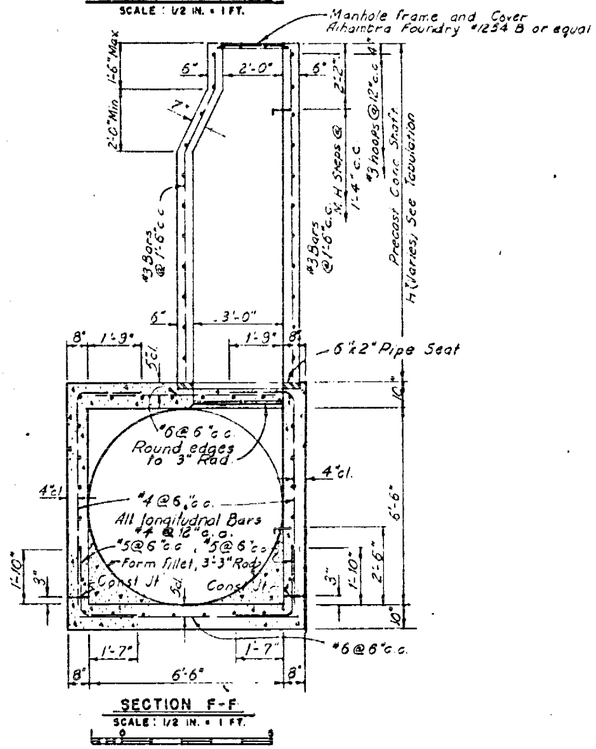
PLAN A-A
SCALE: 1/4 IN. = 1 FT.



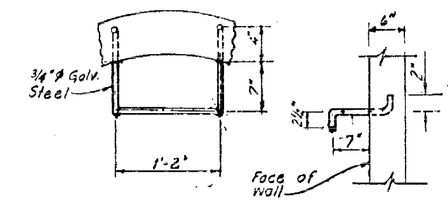
SECTION C-C



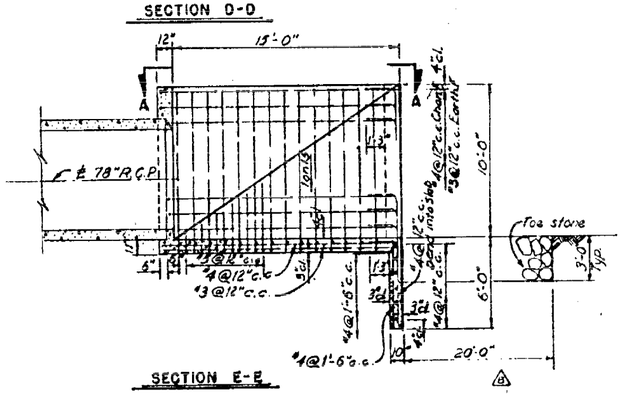
SECTION D-D



SECTION F-F
SCALE: 1/2 IN. = 1 FT.



LADDER STEP DETAILS
NOT TO SCALE



SECTION E-E

RECORD DRAWING-AS CONSTRUCTED
CONT. NO. 59-129 REV. B DATE 2-17-60 BY E.C.
CONT. NO. ---- REV. ---- DATE ---- BY ----
CONT. NO. ---- REV. ---- DATE ---- BY ----

REV. NO.	DATE	REVISION	REV.	CHK.	APP.
A	4-8-59	Revised Manhole Tabulation			
B	2-11-60	Revised Plan-Outlet Struct. Chg'd Dim. 18" to 20" Section E-E	E.C.	R.A.K.	

#2-409-17

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: L. F.
DRAWN BY: J.S.L.
CHECKED BY: JR
SUBMITTED BY: Chas. O. Koch, CHIEF, DESIGN BR.

SANTA ANA RIVER BASIN, CALIFORNIA
DEVIL, EAST TWIN, WARM, AND LYTLE CREEKS
EAST TWIN AND WARM CREEKS CHANNEL
P. E. RY. BRIDGE TO CENTRAL AVE.

78" CONDUIT — OUTLET STRUCTURE AND MANHOLE DETAILS

APPROVAL RECOMMENDED: H. W. Thompson, CHIEF, ENGINEERING DIVISION
APPROVED: John R. Burdell, COLONEL, C. E., DISTRICT ENGINEER

SCALE: AS SHOWN
DATE: DECEMBER 1958
TO ACCOMPANY SPECIFICATIONS OCI-CIV-59-26
SHEET 15 OF 55
FILE NO. (D. O. SERIES) 175/69 REV. "F"

Appendix F

Hydraulic Calculations:

Existing System

Proposed System

```
FILE: 11420ex.WSW                          W S P G W  - EDIT LISTING - Version 14.06              Date: 8-24-2011  Time: 4:28:18
                                     WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
  CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH             DROP

  CD      1    4      1             6.600
  CD      2    4      1             6.600
  CD      3    2      0     .000    7.000    7.000                  .00
  CD      4    2      0     .000   15.000    7.000                  .00
  CD      6    3      0     .000    3.500    7.000    .000   .000    .00
  CD      7    3      0     .000    3.000    7.000    .000   .000    .00
  CD      8    5      0        .000
 FILE:                                W S P G W  - EDIT LISTING - Version 14.06              Date: 8-24-2011  Time: 4:28:18
                                     WATER SURFACE PROFILE - CROSS SECTION POINT LISTING                               PAGE    2
    CARD  SECT  NO OF    X(1) , Y(1)    X(2) , Y(2)    X(3) , Y(3)    X(4) , Y(4)    X(5) , Y(5)    X(6) , Y(6)    X(7) , Y(7)
    CODE   NO   POINTS   X(8) , Y(8)    X(9) , Y(9)   X(10) ,Y(10)   X(11) ,Y(11)    X(N) , Y(N)   X(N+1),Y(N+1)  X(35) ,Y(35)

    PTS     8     8        .000  17.500     .000   2.500   17.500   2.500   17.500    .000   27.500    .000   27.500   2.500   65.000
2.500
    PTS                 65.000  17.500
                                                W S P G W                                                                PAGE NO   1
                            WATER SURFACE PROFILE - TITLE CARD LISTING
 HEADING LINE NO 1 IS -
                              11-420
 HEADING LINE NO 2 IS -
                              san bernardino
 HEADING LINE NO 3 IS -
                              existing condition
                                                W S P G W                                                                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
                                1000.000  981.000    1                                       987.500
  ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                1295.000  983.950    1              .013                          .000     .000      .000     0
  ELEMENT NO   3 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                2707.460  986.700    1              .013                      5118.138   15.812      .000     0
  ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                3049.600  987.366    1              .013                       851.202  -23.030      .000     0
  ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                3500.000  988.243    1              .013                          .000     .000      .000     0
  ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                3679.640  988.630    1              .013                      1229.409    8.372      .000     0
  ELEMENT NO   7 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                                3805.240  988.910    1              .013                       535.164  -13.447      .000     0
```

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
 ELEMENT NO   8 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3969.840  989.277    1              .013                        767.363   12.290      .000     0
 ELEMENT NO   9 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4743.120  990.970    1              .013                       1476.856   30.000      .000     0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
 ELEMENT NO  10 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4757.280  991.000    2              .013                          .000     .000      .000     0
 ELEMENT NO  11 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               4757.280  991.000    3              .500
 ELEMENT NO  12 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4764.280  991.200    3              .014                          .000     .000      .000     0
 ELEMENT NO  13 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4765.280  991.230    3              .014                          .000     .000      .000     0
 ELEMENT NO  14 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               4765.280  991.230    4              .500
 ELEMENT NO  15 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4771.280  991.410    4              .014                          .000     .000      .000     0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
 ELEMENT NO  16 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4772.280  991.430    6              .013                          .000     .000      .000     0
 ELEMENT NO  17 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               4772.280  991.430    7              .500
 ELEMENT NO  18 IS A TRANSITION       *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS   ANGLE
                               4794.260  992.050    8              .013                          .000     .000
 ELEMENT NO  19 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4798.200  992.710    8              .030                          .000     .000      .000     0
 ELEMENT NO  20 IS A SYSTEM HEADWORKS                 *                     *
                    U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                               4798.200  992.710    8                                    992.710
```

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 4:28:20

11-420
san bernardino
existing condition

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	981.000	6.500	987.500	200.00	5.86	.53	988.03	.00	3.76	1.61	6.600	.000	.00	1 .0
55.147	.0100					.0012	.07	6.50	.22	2.76	.013	.00	.00	PIPE
1055.147	981.551	5.961	987.513	200.00	6.15	.59	988.10	.00	3.76	3.90	6.600	.000	.00	1 .0
33.059	.0100					.0012	.04	5.96	.38	2.76	.013	.00	.00	PIPE
1088.206	981.882	5.612	987.494	200.00	6.45	.65	988.14	.00	3.76	4.71	6.600	.000	.00	1 .0
26.089	.0100					.0013	.03	5.61	.44	2.76	.013	.00	.00	PIPE
1114.295	982.143	5.321	987.464	200.00	6.77	.71	988.17	.00	3.76	5.22	6.600	.000	.00	1 .0
21.410	.0100					.0015	.03	5.32	.50	2.76	.013	.00	.00	PIPE
1135.704	982.357	5.067	987.424	200.00	7.10	.78	988.21	.00	3.76	5.57	6.600	.000	.00	1 .0
18.109	.0100					.0016	.03	5.07	.56	2.76	.013	.00	.00	PIPE
1153.814	982.538	4.837	987.375	200.00	7.44	.86	988.24	.00	3.76	5.84	6.600	.000	.00	1 .0
10.300	.0100					.0018	.02	4.84	.61	2.76	.013	.00	.00	PIPE
1164.113	982.641	4.697	987.338	200.00	7.68	.92	988.25	.00	3.76	5.98	6.600	.000	.00	1 .0
HYDRAULIC JUMP														
1164.113	982.641	2.967	985.608	200.00	13.41	2.79	988.40	.00	3.76	6.57	6.600	.000	.00	1 .0
19.857	.0100					.0076	.15	2.97	1.57	2.76	.013	.00	.00	PIPE
1183.970	982.840	2.995	985.835	200.00	13.25	2.72	988.56	.00	3.76	6.57	6.600	.000	.00	1 .0
45.986	.0100					.0070	.32	3.00	1.54	2.76	.013	.00	.00	PIPE

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 4:28:20

11-420
san bernardino
existing condition

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1229.957	983.300	3.107	986.407	200.00	12.63	2.48	988.88	.00	3.76	6.59	6.600	.000	.00	1 .0
28.473	.0100					.0062	.18	3.11	1.44	2.76	.013	.00	.00	PIPE
1258.430	983.584	3.224	986.808	200.00	12.04	2.25	989.06	.00	3.76	6.60	6.600	.000	.00	1 .0
17.989	.0100					.0055	.10	3.22	1.34	2.76	.013	.00	.00	PIPE
1276.419	983.764	3.347	987.111	200.00	11.48	2.05	989.16	.00	3.76	6.60	6.600	.000	.00	1 .0
10.997	.0100					.0048	.05	3.35	1.25	2.76	.013	.00	.00	PIPE
1287.416	983.874	3.476	987.350	200.00	10.95	1.86	989.21	.00	3.76	6.59	6.600	.000	.00	1 .0
5.932	.0100					.0042	.03	3.48	1.16	2.76	.013	.00	.00	PIPE
1293.347	983.933	3.611	987.545	200.00	10.44	1.69	989.24	.00	3.76	6.57	6.600	.000	.00	1 .0
1.653	.0100					.0037	.01	3.61	1.08	2.76	.013	.00	.00	PIPE
1295.000	983.950	3.756	987.706	200.00	9.95	1.54	989.24	.00	3.76	6.54	6.600	.000	.00	1 .0
7.987	.0019					.0033	.03	3.76	1.00	4.59	.013	.00	.00	PIPE
1302.987	983.966	3.906	987.872	200.00	9.49	1.40	989.27	.00	3.76	6.49	6.600	.000	.00	1 .0
32.811	.0019					.0029	.10	3.91	.93	4.59	.013	.00	.00	PIPE
1335.798	984.029	4.065	988.095	200.00	9.04	1.27	989.36	.00	3.76	6.42	6.600	.000	.00	1 .0
83.456	.0019					.0026	.22	4.07	.86	4.59	.013	.00	.00	PIPE
1419.254	984.192	4.234	988.426	200.00	8.62	1.15	989.58	.00	3.76	6.33	6.600	.000	.00	1 .0
216.916	.0019					.0023	.50	4.24	.79	4.59	.013	.00	.00	PIPE

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 4:28:20

11-420
san bernardino
existing condition

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1636.169	984.614	4.415	989.029	200.00	8.22	1.05	990.08	.00	3.76	6.21	6.600	.000	.00	1 .0
834.179	.0019					.0021	1.71	4.42	.73	4.59	.013	.00	.00	PIPE
2470.348	986.238	4.590	990.828	200.00	7.88	.96	991.79	.00	3.76	6.08	6.600	.000	.00	1 .0
237.112	.0019					.0019	.46	4.59	.68	4.59	.013	.00	.00	PIPE
2707.460	986.700	4.590	991.290	200.00	7.88	.96	992.25	.01	3.76	6.08	6.600	.000	.00	1 .0
84.678	.0019					.0019	.16	4.60	.68	4.59	.013	.00	.00	PIPE
2792.138	986.865	4.590	991.455	200.00	7.87	.96	992.42	.01	3.76	6.07	6.600	.000	.00	1 .0
257.462	.0019					.0019	.50	4.60	.68	4.59	.013	.00	.00	PIPE
3049.600	987.366	4.590	991.956	200.00	7.87	.96	992.92	.00	3.76	6.07	6.600	.000	.00	1 .0
71.281	.0019					.0019	.14	4.59	.68	4.59	.013	.00	.00	PIPE
3120.881	987.505	4.590	992.095	200.00	7.88	.96	993.06	.00	3.76	6.08	6.600	.000	.00	1 .0
379.119	.0019					.0019	.74	4.59	.68	4.59	.013	.00	.00	PIPE
3500.000	988.243	4.590	992.833	200.00	7.88	.96	993.80	.00	3.76	6.08	6.600	.000	.00	1 .0
179.640	.0022					.0020	.36	4.59	.68	4.42	.013	.00	.00	PIPE
3679.640	988.630	4.531	993.161	200.00	7.99	.99	994.15	.01	3.76	6.12	6.600	.000	.00	1 .0
125.600	.0022					.0020	.26	4.54	.70	4.37	.013	.00	.00	PIPE
3805.240	988.910	4.485	993.395	200.00	8.08	1.01	994.41	.01	3.76	6.16	6.600	.000	.00	1 .0
164.600	.0022					.0021	.35	4.49	.71	4.37	.013	.00	.00	PIPE

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 4:28:20

11-420
san bernardino
existing condition

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3969.840	989.277	4.441	993.718	200.00	8.17	1.04	994.75	.00	3.76	6.19	6.600	.000	.00	1 .0
638.094	.0022					.0022	1.38	4.45	.72	4.40	.013	.00	.00	PIPE
4607.934	990.674	4.395	995.069	200.00	8.26	1.06	996.13	.00	3.76	6.23	6.600	.000	.00	1 .0
135.186	.0022					.0022	.30	4.40	.74	4.40	.013	.00	.00	PIPE
4743.120	990.970	4.395	995.365	200.00	8.26	1.06	996.43	.00	3.76	6.23	6.600	.000	.00	1 .0
14.160	.0021					.0022	.03	4.40	.74	4.45	.013	.00	.00	PIPE
4757.280	991.000	4.398	995.398	200.00	8.26	1.06	996.46	.00	3.76	6.22	6.600	.000	.00	1 .0
WALL ENTRANCE														
4757.280	991.000	5.319	996.319	200.00	5.37	.45	996.77	.00	2.94	7.00	7.000	7.000	.00	0 .0
7.000	.0286					.0010	.01	5.32	.41	1.53	.014	.00	.00	RECTANG
4764.280	991.200	5.084	996.284	200.00	5.62	.49	996.77	.00	2.94	7.00	7.000	7.000	.00	0 .0
1.000	.0300					.0011	.00	5.08	.44	1.50	.014	.00	.00	RECTANG
4765.280	991.230	5.048	996.278	200.00	5.66	.50	996.78	.00	2.94	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
4765.280	991.230	2.448	993.678	200.00	11.67	2.12	995.79	.00	2.94	7.00	15.000	7.000	.00	0 .0
HYDRAULIC DROP														
4765.280	991.230	5.049	996.279	200.00	5.66	.50	996.78	.00	2.94	7.00	15.000	7.000	.00	0 .0
6.000	.0300					.0011	.01	5.05	.44	1.50	.014	.00	.00	RECTANG

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 4:28:20

11-420
san bernardino
existing condition

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
4771.280	991.410	4.830	996.240	200.00	8.16	1.03	997.27	.00	2.94	7.00	3.500	7.000	.00	0 .0
1.000	.0200					.0042	.00	4.83	.77	1.64	.013	.00	.00	BOX
4772.280	991.430	4.814	996.244	200.00	8.16	1.03	997.28	.00	2.94	7.00	3.500	7.000	.00	0 .0
WALL ENTRANCE														
4772.280	991.430	4.627	996.057	200.00	9.52	1.41	997.47	.00	2.94	7.00	3.000	7.000	.00	0 .0
TRANS STR	.0282					.0033	.07	4.63	.97		.013	.00	.00	BOX
4794.260	992.050	5.736	997.786	200.00	.85	.01	997.80	.00	3.00	65.00		8		0 .0
1.002	.1675					.0001	.00	5.74	.08	1.072	.030			IR-OPEN
4795.262	992.218	5.567	997.785	200.00	.89	.01	997.80	.00	3.00	65.00		8		0 .0
.954	.1675					.0001	.00	5.57	.08	1.072	.030			IR-OPEN
4796.216	992.378	5.406	997.784	200.00	.93	.01	997.80	.00	3.00	65.00		8		0 .0
.906	.1675					.0001	.00	5.41	.09	1.072	.030			IR-OPEN
4797.122	992.529	5.253	997.783	200.00	.98	.01	997.80	.00	3.00	65.00		8		0 .0
.863	.1675					.0001	.00	5.25	.10	1.072	.030			IR-OPEN
4797.985	992.674	5.107	997.781	200.00	1.03	.02	997.80	.00	3.00	65.00		8		0 .0
.215	.1675					.0001	.00	5.11	.10	1.072	.030			IR-OPEN
4798.200	992.710	5.071	997.781	200.00	1.04	.02	997.80	.00	3.00	65.00		8		0 .0

```
FILE: 11420pr.WSW                          W S P G W  - EDIT LISTING - Version 14.06              Date: 8-24-2011  Time: 3:39:29
                                     WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
  CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH             DROP

  CD      1    4      1             6.600
  CD      2    4      1             4.000
  CD      3    2      0     .000    6.600    7.000                  .00
  CD      4    2      0     .000    7.000    7.000                  .00
  CD      5    2      0     .000   15.000    7.000                  .00
  CD      6    3      0     .000    3.500    7.000    .000   .000    .00
  CD      7    3      0     .000    3.000    7.000    .000   .000    .00
  CD      8    5      0        .000
 FILE:                                     W S P G W  - EDIT LISTING - Version 14.06              Date: 8-24-2011  Time: 3:39:29
                                     WATER SURFACE PROFILE - CROSS SECTION POINT LISTING                               PAGE    2
    CARD  SECT  NO OF    X(1) , Y(1)    X(2) , Y(2)    X(3) , Y(3)    X(4) , Y(4)    X(5) , Y(5)    X(6) , Y(6)    X(7) , Y(7)
    CODE   NO   POINTS   X(8) , Y(8)    X(9) , Y(9)   X(10) ,Y(10)   X(11) ,Y(11)    X(N) , Y(N)   X(N+1),Y(N+1)  X(35) ,Y(35)

    PTS     8     8        .000  17.500     .000   2.500   17.500   2.500   17.500    .000   27.500    .000   27.500   2.500   65.000
2.500
    PTS                 65.000  17.500
                                                W S P G W                                                              PAGE NO   1
                            WATER SURFACE PROFILE - TITLE CARD LISTING
 HEADING LINE NO 1 IS -
                              11-420 NATIONAL ORANGE SHOW
 HEADING LINE NO 2 IS -
                              PROPOSED 48" STORM DRAIN BYPASS
 HEADING LINE NO 3 IS -

                                                W S P G W                                                              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
                                 454.990  981.000    1                                       987.500
 WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
  ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                 783.020  984.110    2              .013                           .000     .000    90.000     1
  ELEMENT NO   3 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                 963.030  984.370    2              .013                         90.000 -114.598      .000     0
  ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                1043.660  984.486    2              .013                           .000     .000      .000     0
  ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                1601.890  985.260    2              .013                        120.000 -266.535      .000     0
  ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                1790.380  985.521    2              .013                           .000     .000      .000     0
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WATER SURFACE PROFILE - ELEMENT CARD LISTING

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 ELEMENT NO   7 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1946.620  985.740    2              .013                       1030.019    8.691      .000     0
 ELEMENT NO   8 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               2735.890  986.850    2              .013                          .000     .000      .000     0
 ELEMENT NO   9 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3058.130  987.303    2              .013                        120.000  153.858      .000     0
 ELEMENT NO  10 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3100.810  987.363    2              .013                          .000     .000      .000     0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
 ELEMENT NO  11 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3500.000  988.243    1              .013                          .000     .000      .000     1
 ELEMENT NO  12 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3679.640  988.630    1              .013                       1229.409    8.372      .000     0
 ELEMENT NO  13 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3805.240  988.910    1              .013                        535.164  -13.447      .000     0
 ELEMENT NO  14 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               3969.840  989.277    1              .013                        767.363   12.290      .000     0
 ELEMENT NO  15 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4743.120  990.970    1              .013                       1476.856   30.000      .000     0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
 ELEMENT NO  16 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4757.280  991.001    3              .013                          .000     .000      .000     0
 ELEMENT NO  17 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               4757.280  991.001    4              .500
 ELEMENT NO  18 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4764.280  991.200    4              .014                          .000     .000      .000     0
 ELEMENT NO  19 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4765.280  991.230    4              .014                          .000     .000      .000     0
 ELEMENT NO  20 IS A  WALL  ENTRANCE                  *
                    U/S DATA   STATION    INVERT  SECT             FP
                               4765.280  991.230    5              .500
 ELEMENT NO  21 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               4771.280  991.410    5              .014                          .000     .000      .000     0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
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WATER SURFACE PROFILE - ELEMENT CARD LISTING

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ELEMENT NO  22 IS A REACH            *         *     *
                  U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             4772.280  991.430    6              .014                           .000     .000      .000     0
ELEMENT NO  23 IS A  WALL  ENTRANCE                *
                  U/S DATA   STATION    INVERT  SECT             FP
                             4772.280  991.430    7              .500
ELEMENT NO  24 IS A TRANSITION       *         *     *
                  U/S DATA   STATION    INVERT  SECT              N                          RADIUS   ANGLE
                             4794.260  992.050    8              .030                           .000     .000
ELEMENT NO  25 IS A REACH            *         *     *
                  U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             4798.200  992.710    8              .030                           .000     .000      .000     0
ELEMENT NO  26 IS A SYSTEM HEADWORKS                *                       *
                  U/S DATA   STATION    INVERT  SECT                                W S ELEV
                             4798.200  992.710    8                                 992.710
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Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 3:39:31

11-420 NATIONAL ORANGE SHOW
PROPOSED 48" STORM DRAIN BYPASS

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
454.990	981.000	6.500	987.500	111.27	8.85	1.22	988.72	.00	3.19	.00	4.000	.000	.00	1 .0
328.030	.0095					.0060	1.97	6.50	.00	2.70	.013	.00	.00	PIPE
783.020	984.110	5.781	989.891	111.27	8.85	1.22	991.11	.00	3.19	.00	4.000	.000	.00	1 .0
180.010	.0014					.0060	1.08	.00	.00	4.00	.013	.00	.00	PIPE
963.030	984.370	6.876	991.246	111.27	8.85	1.22	992.46	.00	3.19	.00	4.000	.000	.00	1 .0
80.630	.0014					.0060	.48	6.88	.00	4.00	.013	.00	.00	PIPE
1043.660	984.486	7.244	991.730	111.27	8.85	1.22	992.95	.00	3.19	.00	4.000	.000	.00	1 .0
558.230	.0014					.0060	3.35	.00	.00	4.00	.013	.00	.00	PIPE
1601.890	985.260	10.238	995.498	111.27	8.85	1.22	996.72	.00	3.19	.00	4.000	.000	.00	1 .0
188.490	.0014					.0060	1.13	10.24	.00	4.00	.013	.00	.00	PIPE
1790.380	985.521	11.108	996.629	111.27	8.85	1.22	997.85	.00	3.19	.00	4.000	.000	.00	1 .0
156.240	.0014					.0060	.94	.00	.00	4.00	.013	.00	.00	PIPE
1946.620	985.740	11.902	997.642	111.27	8.85	1.22	998.86	.00	3.19	.00	4.000	.000	.00	1 .0
789.270	.0014					.0060	4.74	11.90	.00	4.00	.013	.00	.00	PIPE
2735.890	986.850	15.528	1002.378	111.27	8.85	1.22	1003.60	.00	3.19	.00	4.000	.000	.00	1 .0
322.240	.0014					.0060	1.93	.00	.00	4.00	.013	.00	.00	PIPE
3058.130	987.303	17.327	1004.630	111.27	8.85	1.22	1005.85	.00	3.19	.00	4.000	.000	.00	1 .0
42.680	.0014					.0060	.26	17.33	.00	4.00	.013	.00	.00	PIPE

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 3:39:31

11-420 NATIONAL ORANGE SHOW
PROPOSED 48" STORM DRAIN BYPASS

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3100.810	987.363	17.523	1004.886	111.27	3.25	.16	1005.05	.00	2.76	.00	6.600	.000	.00	1 .0
399.190	.0022					.0004	.17	17.52	.00	3.04	.013	.00	.00	PIPE
3500.000	988.243	16.817	1005.060	111.27	3.25	.16	1005.22	.00	2.76	.00	6.600	.000	.00	1 .0
179.640	.0022					.0004	.07	.00	.00	3.06	.013	.00	.00	PIPE
3679.640	988.630	16.515	1005.145	111.27	3.25	.16	1005.31	.00	2.76	.00	6.600	.000	.00	1 .0
125.600	.0022					.0004	.05	.00	.00	3.03	.013	.00	.00	PIPE
3805.240	988.910	16.300	1005.210	111.27	3.25	.16	1005.37	.00	2.76	.00	6.600	.000	.00	1 .0
164.600	.0022					.0004	.07	.00	.00	3.03	.013	.00	.00	PIPE
3969.840	989.277	16.013	1005.290	111.27	3.25	.16	1005.45	.00	2.76	.00	6.600	.000	.00	1 .0
773.280	.0022					.0004	.32	.00	.00	3.05	.013	.00	.00	PIPE
4743.120	990.970	14.660	1005.630	111.27	1.08	.02	1005.65	.00	1.99	7.00	6.600	7.000	.00	0 .0
14.160	.0022					.0000	.00	14.66	.05	2.36	.013	.00	.00	RECTANG
WALL ENTRANCE														
4757.280	991.001	14.629	1005.630	111.27	1.09	.02	1005.65	.00	1.99	7.00	7.000	7.000	.00	0 .0
7.000	.0284					.0000	.00	14.63	.05	1.03	.014	.00	.00	RECTANG
4764.280	991.200	14.430	1005.630	111.27	1.10	.02	1005.65	.00	1.99	7.00	7.000	7.000	.00	0 .0
1.000	.0300					.0000	.00	14.43	.05	1.02	.014	.00	.00	RECTANG

Program Package License Serial Number: 1232

WATER SURFACE PROFILE LISTING Date: 8-24-2011 Time: 3:39:31

11-420 NATIONAL ORANGE SHOW
PROPOSED 48" STORM DRAIN BYPASS

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
4765.280	991.230	14.400	1005.630	111.27	1.10	.02	1005.65	.00	1.99	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
4765.280	991.230	1.596	992.826	111.27	9.96	1.54	994.37	.00	1.99	7.00	15.000	7.000	.00	0 .0
HYDRAULIC DROP														
4765.280	991.230	14.399	1005.629	111.27	1.10	.02	1005.65	.00	1.99	7.00	15.000	7.000	.00	0 .0
6.000	.0300					.0000	.00	14.40	.05	1.01	.014	.00	.00	RECTANG
4771.280	991.410	14.219	1005.629	111.27	4.54	.32	1005.95	.00	1.99	7.00	3.500	7.000	.00	0 .0
1.000	.0200					.0015	.00	14.22	.43	1.16	.014	.00	.00	BOX
4772.280	991.430	14.201	1005.631	111.27	4.54	.32	1005.95	.00	1.99	7.00	3.500	7.000	.00	0 .0
WALL ENTRANCE														
4772.280	991.430	14.143	1005.573	111.27	5.30	.44	1006.01	.00	1.99	7.00	3.000	7.000	.00	0 .0
TRANS STR	.0282					.0054	.12	14.14	.54		.030	.00	.00	BOX
4794.260	992.050	14.158	1006.208	111.27	.14	.00	1006.21	.00	1.57	65.00		8		0 .0
3.347	.1675					.0000	.00	14.16	.01	.737	.030			IR-OPEN
4797.607	992.611	13.597	1006.208	111.27	.15	.00	1006.21	.00	1.57	65.00		8		0 .0
.593	.1675					.0000	.00	13.60	.01	.737	.030			IR-OPEN
4798.200	992.710	13.498	1006.208	111.27	.15	.00	1006.21	.00	1.57	65.00		8		0 .0

H.2 - Water Usage Calculations, May 12, 2011

Raymond K. Phua, P.E., Principal
Maurice Yee, P.E., Senior Associates
Lan V Nguyen, P.E., Senior Associates

RPM *ENGINEERS, INC.*

May 12, 2011

ARON LIANG
SENIOR PLANNER, COMMUNITY DEVELOPMENT DEPT.
CITY OF SAN BERNARDINO
300 N. D ST.
SAN BERNARDINO, CA 92418

Dear Mr. Liang,

This letter is to verify the estimated water usage for the proposed future office space for the Lewis Operation Corporation project along Arrowhead Ave in San Bernardino, CA.

The estimated water use is as follows:

- Building A: 192,400 gal/yr
- Building B: 72,540 gal/yr
- Building C: 38,480 gal/yr
- Building D: 38,480 gal/yr

Please refer to the attached calculations for more details.

Sincerely,

Maurice E Yee, P.E.

102 Discovery, Irvine, CA, 92618 • Tel: 949-450-1229 Fax: 949-450-1454

PROJECT: **NATIONAL ORANGE SHOW, ARROWHEAD AVE., SAN BERNANDINO CA**

BUILDING A

OCCUPANCY USE TYPE: **BUSINESS AREAS**

OCCUPANT LOAD FACTOR 100 SQ.FT. /PERSON (CBC 2010 Table 1004.1.1)

OFFICE AREA: **15,000 SQ. FT.**

OCCUPANT LOAD : 150

WATER USAGE CALCULATION

FIXTURE TYPE	FLOW RATE (GPM)	DURATION		DAILY USES		OCCUPANTS	GALLONS/ DAY
LAVATORY	0.5	0.25	min	3		150	56.25
KITCHEN SINK	0.5	4	min	1		150	300
WATER CLOSET (FLUSH VALVE)	1.28	1	flush	1	Male	75	96
				3	Female	75	288
URINAL (WATERLESS)	0	0	flush	2	Male	75	0
TOTAL							**740.25**

(740 gal/ day) x (5 days) x (52weeks) = 192,400 gal/ year **GALLONS/ YEAR = 192,400**

PROJECT: **NATIONAL ORANGE SHOW, ARROWHEAD AVE., SAN BERNANDINO CA**
BUILDING B
OCCUPANCY USE TYPE: **BUSINESS AREAS**
OCCUPANT LOAD FACTOR 100 SQ.FT. /PERSON (CBC 2010 Table 1004.1.1)
OFFICE AREA: 5,**000 SQ. FT.**
OCCUPANT LOAD : 50

WATER USAGE CALCULATION

FIXTURE TYPE	**FLOW RATE (GPM)**	**DURATION**		**DAILY USES**		**OCCUPANTS**	**GALLONS/ DAY**
LAVATORY	0.5	0.25	min	3		50	18.75
KITCHEN SINK	0.5	4	min	1		50	100
WATER CLOSET (FLUSH VALVE)	1.28	1	flush	1	Male	50	64
				3	Female	25	96
URINAL (WATERLESS)	0	0	flush	2	Male	25	0
TOTAL							**278.75**

(279 gal/ day) x (5 days) x (52weeks) = 72,540 gal/ year **GALLONS/ YEAR = 72,540**

PROJECT: **NATIONAL ORANGE SHOW, ARROWHEAD AVE., SAN BERNANDINO CA**
BUILDING C
OCCUPANCY USE TYPE: **BUSINESS AREAS**
OCCUPANT LOAD FACTOR 100 SQ.FT. /PERSON (CBC 2010 Table 1004.1.1)
OFFICE AREA: **3,000 SQ. FT.**
OCCUPANT LOAD : **30**

WATER USAGE CALCULATION

FIXTURE TYPE	**FLOW RATE (GPM)**	**DURATION**		**DAILY USES**		**OCCUPANTS**	**GALLONS/ DAY**
LAVATORY	0.5	0.25	min	3		30	11.25
KITCHEN SINK	0.5	4	min	1		30	60
WATER CLOSET (FLUSH VALVE)	1.28	1	flush	1	Male	15	19.2
				3	Female	15	57.6
URINAL (WATERLESS)	0	0	flush	2	Male	15	0
TOTAL							**148.05**

(148 gal/ day) x (5 days) x (52weeks) = 38,480 gal/ year **GALLONS/ YEAR = 38,480**

PROJECT: **NATIONAL ORANGE SHOW, ARROWHEAD AVE., SAN BERNANDINO CA**
BUILDING D
OCCUPANCY USE TYPE: **BUSINESS AREAS**
OCCUPANT LOAD FACTOR 100 SQ.FT. /PERSON (CBC 2010 Table 1004.1.1)
OFFICE AREA: **3,000 SQ. FT.**
OCCUPANT LOAD : **30**

WATER USAGE CALCULATION

FIXTURE TYPE	FLOW RATE (GPM)	DURATION		DAILY USES		OCCUPANTS	GALLONS/ DAY
LAVATORY	0.5	0.25	min	3		30	11.25
KITCHEN SINK	0.5	4	min	1		30	60
WATER CLOSET (FLUSH VALVE)	1.28	1	flush	1	Male	15	19.2
				3	Female	15	57.6
URINAL (WATERLESS)	0	0	flush	2	Male	15	0
TOTAL							**148.05**

(148 gal/ day) x (5 days) x (52weeks) = 38,480 gal/ year **GALLONS/ YEAR = 38,480**

H.3 - Water Usage Statement - Landscaping, May 10, 2011

conceptual design & planning company

May 10, 2011

Aron Liang
Senior Planner, Community Development Department
City of San Bernardino
300 N. D St.
San Bernardino, CA 92418

Dear Mr. Liang,

This letter is to verify the estimated water usage for landscape irrigation for the Lewis Operation Corp. project along Arrowhead Ave in San Bernardino, CA. The estimated water use is 1,693,323 gallons per year. All calculations used are based on the standards set by the Water Efficient Landscape Ordinance AB 1881. The aforementioned calculations are based on the attached site plan.

Sincerely,

Jim Baldovin
Landscape Architect
Principal

9950 Research Drive ▪ Irvine, CA 92618 ▪ T: 949.399.0870 ▪ F: 949.399.0882 ▪ www.cdpcinc.com
6659 Morro Road ▪ Atascadero, CA 93422 ▪ T: 805.466.3385 ▪ F: 805.466.3204

ESTIMATED TOTAL WATER USE

ETWU = (Eto x 0.62 x KIx LA / IE) + (Eto x 0.62 x 1.0 x SLA / IE)

ETWU =	Estimted water use per year (gallon per year)
Eto =	Reference Evapotranspiration (inches per year)
0.62 =	Conversion Facctor (to gallon per square foot)
KI =	Landscape Coefficient
LA =	Hydrozone Area (High, medium and low water use are in square feet)
IE =	Irrigation Efficiency
1.0 =	Landscape Coefficient for Special Landscape Area
SLA =	Special Landscape Area (square feet)

There is no special landscape area.

HYDROZONE	ETWU	=	Eto	x	Conversion Factor	x	KI	x	LA	/	IE	Distribution type	
HZ 1	***1,693,323***	**=**	***56.37***	***x***	***0.62***	***x***	***0.16***	***x***	***215,000***	***/***	***0.710***	***LVS***	shade
Total	***1,693,323***		***gallon per year***										

Irrigation Efficiency

Subsurface Irrigation	***T***	90%
Drip Emitters	***D***	85%
Bubbler	***B***	80%
Microspray	***MS***	75%
Rotor, Stream Rotor, Impact Rotor	***R***	75%
Conventional Spray	***S***	62%

Hydrozone Information Table

Landscape Coefficent (Kl)

Kl = Ks x Kd x Kmc

Ks Species factor

Kd Density factor

Kmc Microclimate factor

Hydrozone	Controller Valve #	Plant Water Use*	Species Factor(Ks)	Density Factor (Kd)	Microclimate Factor (Kmc)	Landscape Coefficient (Kl)	Irrigation Method**	Landscape Area w/ slope factor (LA) square feet	% of total landscape area	Kl x LA (Sq. Ft.)
HZ 1		*L*	*0.2*	*1.0*	*0.8*	***0.16***	*LVS*	***215,000***	***100.0%***	***34400***
								215,000	100.0%	

Ground Plane Gradient	Gradient Mulpiplier	Landscape Area in plan (sq.ft.)
Flat	*1*	*215,000*

* Plant Water Use

H = High Water Use Plants

M = Moderate Water Use Plants

L = Low Water Use Plants

**Irrigation Method

LVS Low Volume Spray

B = Bubbler

S = Conventional S

R = Rotor

RN = Rotator Nozzle

Maxinum Applied Water Allowance (MAWA)

MAWA = (Eto x 0.62 x 0.7 x LA) + (Eto x 0.62 x 0.3 x SLA)

MAWA =	Maximum Applied Water Allowance (gallon per year)		
Eto =	Reference Evapotranspiration (inches per year)	=	56.37
0.62 =	Conversion factor (to gallon per square foot)	=	0.62
0.7 =	ET Adjustment Factor (ETAF)	=	0.7
LA =	Landscape Area (square foot)	=	215,000
0.3 =	The additional ET Adjustment Factor for Special Landscape Area (1.0 - 0.7 = 0.3)	=	0.3
SLA =	Portion of the landscape area identified as Special Landscape Area (square foot)	=	0

MAWA = **(56.37 x 0.62 x 0.7 x 215,000) + (56.37 x 0.62 x 0.3 x 0) = 5,259,885** ***gallon per year***

Note:
Effective Precipitaioin was not considered in this calculation
There is no special Landscape Area in this project

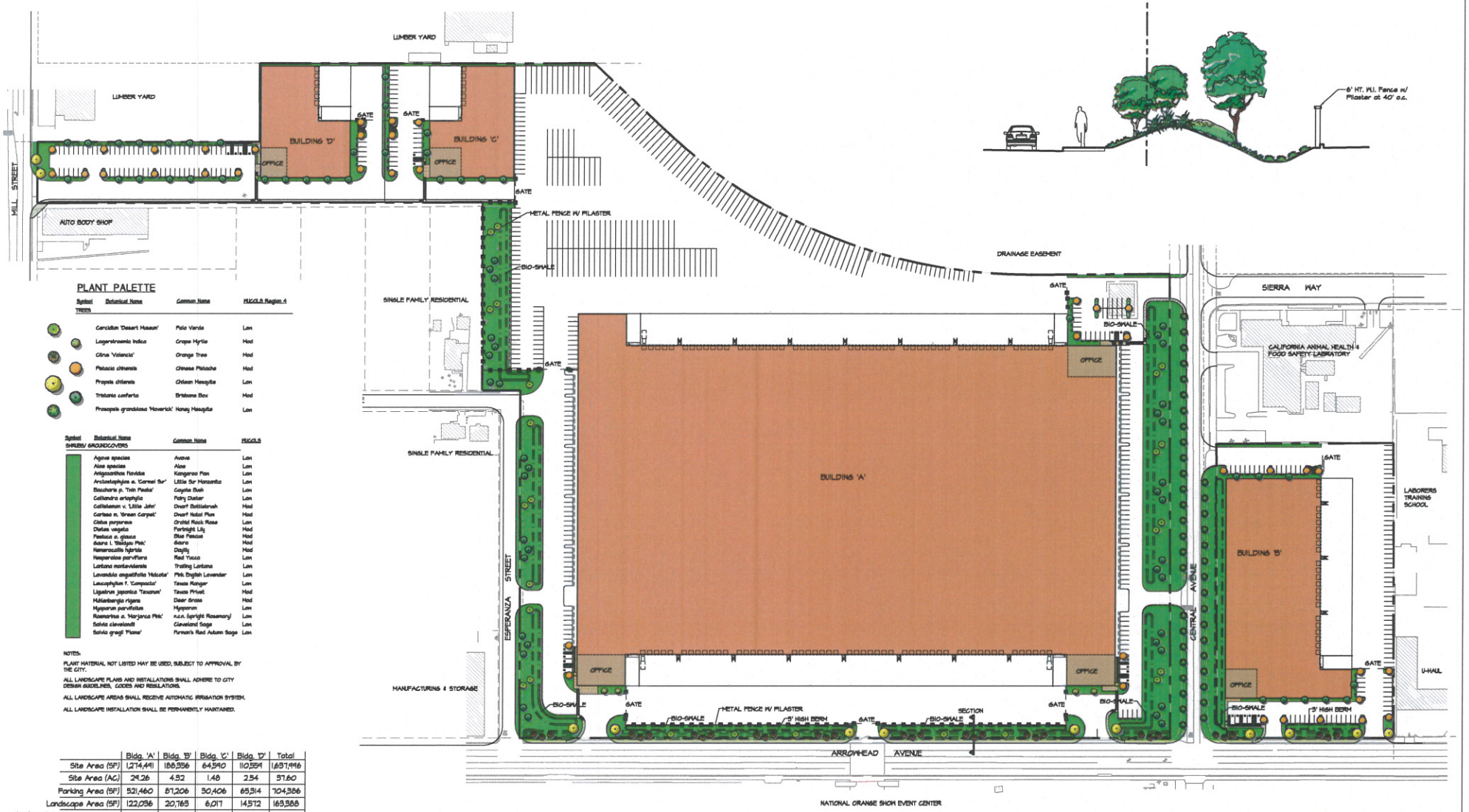
Local Eto - CIMIS Station #44 U.C. Riverside

Month Year	Tot ETo (in)
Jan	2.49
Feb	2.91
Mar	4.16
Apr	5.27
May	5.94
Jun	6.56
Jul	7.22
Aug	6.92
Sep	5.35
Oct	4.05
Nov	2.94
Dec	2.56
Annual Total	56.37

LANDSCAPE WATER CONSERVATION STATEMENT

Water conservation is achieved in this landscape construction document as described below.

1. All plant materials selected for this site were appropriate for the geographical location and local climate, their adaptability to drought. Data from WULCOLS III has been used for determining species' plant factor for the water use calculations.
2. Plants with similar water use requirements were grouped together.
3. More than 90% of landscape areas are planted with low water use plants, the balance with moderate use plants. No high water use plants are used.
4. Irrigation sections/hydrozones are separated by considering plant species factor, plant density and microclimate. If low water use plants are mixed with moderate water use plants in the same hydrozone, the moderate water use factor is used for water use calculations. See Hydrozone exhibit and table.
5. The irrigation system utilizes low-volume distribution system with a master valve, flow sensor, check valves, ET based automatic controllers with Cycle+Soak and water budgeting capability, weather station, rain shut-off.
6. The use of turf is elimiated. All tree, shrub and groundcover areas will be dressed with 2" layer of mulch moisture retention and to discourage weeds.
7. There is no Special Landscape Area in this project.



PLANT PALETTE

Symbol	Botanical Name	Common Name	HUCOLS Region 4
TREES			
	Cercidium 'Desert Museum'	Palo Verde	Low
	Lagerstroemia indica	Crape Myrtle	Mod
	Citrus 'Valencia'	Orange Tree	Mod
	Pistacia chinensis	Chinese Pistache	Mod
	Prosopis chilensis	Chilean Mesquite	Low
	Tristania conferta	Brisbane Box	Mod
	Prosopsis grandulosa 'Maverick'	Honey Mesquite	Low

Symbol	Botanical Name	Common Name	HUCOLS
SHRUBS/ GROUNDCOVERS			
	Agave species	Agave	Low
	Aloe species	Aloe	Low
	Anigozanthos flavidus	Kangaroo Paw	Low
	Arctostaphylos e. 'Carmel Sur'	Little Sur Manzanita	Low
	Baccharis p. 'Twin Peaks'	Coyote Bush	Low
	Calliandra eriophylla	Fairy Duster	Low
	Callistemon v. 'Little John'	Dwarf Bottlebrush	Mod
	Carissa m. 'Green Carpet'	Dwarf Natal Plum	Mod
	Cistus purpureus	Orchid Rock Rose	Low
	Dietes vegeta	Fortnight Lily	Mod
	Festuca o. glauca	Blue Fescue	Mod
	Gaura l. 'Siskiyou Pink'	Gaura	Mod
	Hemerocallis hybrids	Daylily	Mod
	Hesperaloe parviflora	Red Yucca	Low
	Lantana montevidensis	Trailing Lantana	Low
	Lavandula angustifolia 'Hidcote'	Pink English Lavender	Low
	Leucophyllum f. 'Compacta'	Texas Ranger	Low
	Ligustrum japonicus 'Texanum'	Texas Privet	Mod
	Muhlenbergia rigens	Deer Grass	Mod
	Myoporum parvifolium	Myoporum	Low
	Rosmarinus o. 'Marjorca Pink'	n.c.n. (upright Rosemary)	Low
	Salvia clevelandii	Cleveland Sage	Low
	Salvia greggi 'Flame'	Furman's Red Autumn Sage	Low

NOTES:

PLANT MATERIAL NOT LISTED MAY BE USED, SUBJECT TO APPROVAL BY THE CITY.

ALL LANDSCAPE PLANS AND INSTALLATIONS SHALL ADHERE TO CITY DESIGN GUIDELINES, CODES AND REGULATIONS.

ALL LANDSCAPE AREAS SHALL RECEIVE AUTOMATIC IRRIGATION SYSTEM.

ALL LANDSCAPE INSTALLATION SHALL BE PERMANENTLY MAINTAINED.

	Bldg. 'A'	Bldg. 'B'	Bldg. 'C'	Bldg. 'D'	Total
Site Area (SF)	1,274,441	188,356	64,540	110,554	1,637,996
Site Area (AC)	29.26	4.32	1.48	2.54	37.60
Parking Area (SF)	521,460	87,206	30,406	65,314	704,386
Landscape Area (SF)	122,036	20,165	6,017	14,572	163,388
% of Parking Area Landscape 15% Required	22%	24%	20%	22%	23%

CONCEPTUAL LANDSCAPE PLAN

NATIONAL ORANGE SHOW

SAN BERNARDINO, CA

SHEET 1 OF 1

DATE: 05-10-11

SCALE: 1" = 80'-0"

north

conceptual design & planning company

9980 Research Drive, Irvine, CA 92618
T: 949.399.0870 F: 949.399.0892 www.cdpcinc.com

4689 Mono Road, Atascadero, CA 93422
T: 805.466.3386 F: 805.466.3204

cdpc

H.4 - Water Quality Management Plan, June 6, 2011

WATER QUALITY MANAGEMENT PLAN (WQMP)

For compliance with Santa Ana Regional Water Quality Control Board

Order Number R8-2010-0036 (NPDES Permit No. CAS618036)

for

National Orange Show Industrial Development

Prepared for:
Lewis Retail Centers
Arrowhead Ave and Central Ave
San Bernardino, CA 92408
(909) 579-1294
APN: 136-283-01, 136-291-04, 136-472-01, 136-472-06, 136-472-07 AND 136-492-03

Prepared By:
Warren Williams, P.E.
DRC Engineering, Inc.
160 S. Old Springs Rd, Suite 210
Anaheim Hills, CA 92808
(714) 685-6860

WQMP Preparation Date
June 6, 2011

WATER QUALITY MANAGEMENT PLAN (WQMP)

PROJECT SITE INFORMATION

Name of Project: National Orange Show Industrial Development

Project Location: Arrowhead Avenue and Central Avenue, San Bernardino

Size of Significant Re-Development on an Already Developed Site (in feet^2): N/A

Size of New Development: 37.2 Acres

Number of Home Subdivisions: N/A

SIC Codes: _____

Erosive Site Conditions?: No

Natural Slope More Than 25%?: No

WATER QUALITY MANAGEMENT PLAN (WQMP)

Check the appropriate project category below:

Check below	**Project Categories**
	1. All significant re-development projects. Significant re-development is defined as the addition or creation of 5,000 or more square feet of impervious surface on an already developed site. This includes, but is not limited to, additional buildings and/or structures, extension of existing footprint of a building, construction of parking lots, etc. Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing development, and the existing development was not subject to SUSMPs, the design standards apply only to the addition, and not the entire development. When the redevelopment results in an increase of more than fifty percent of the impervious surfaces, then a WQMP is required for the entire development (new and existing).
	2. Home subdivisions of 10 units or more. This includes single family residences, multi-family residence, condominiums, apartments, etc.
X	3. Industrial/commercial developments of 100,000 square feet or more. Commercial developments include non-residential developments such as hospitals, educational institutions, recreational facilities, mini-malls, hotels, office buildings, warehouses, and light industrial facilities.
	4. Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532- 7534, 7536-7539).
	5. Restaurants where the land area of development is 5,000 square feet or more.
	6. Hillside developments of 10,000 square feet or more which are located on areas with known erosive soil conditions or where the natural slope is twenty-five percent or more.
	7. Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas such as areas designated in the Ocean Plan as areas of special biological significance or waterbodies listed on the CWA Section 303(d) list of impaired waters.
	8. Parking lots of 5,000 square feet or more exposed to storm water. Parking lot is defined as land area or facility for the temporary storage of motor vehicles.
	The project does not fall into any of the categories described above. (If the project requires a precise plan of development [e.g. all commercial or industrial projects, residential projects of less than 10 dwelling units, and all other land development projects with potential for significant adverse water quality impacts] or subdivision of land, it is defined as a Non-Category Project.)

Section 1
Introduction And Project Description

1.1 Project Information

- Owner Information:
  Lewis Retail Centers
  1156 N. Mountain Avenue
  Upland, CA 91786
  (909) 579-1294

- Location:
  Arrowhead Avenue and Central Avenue, San Bernardino

1.2 Permits

- Will be provided with Final WQMP

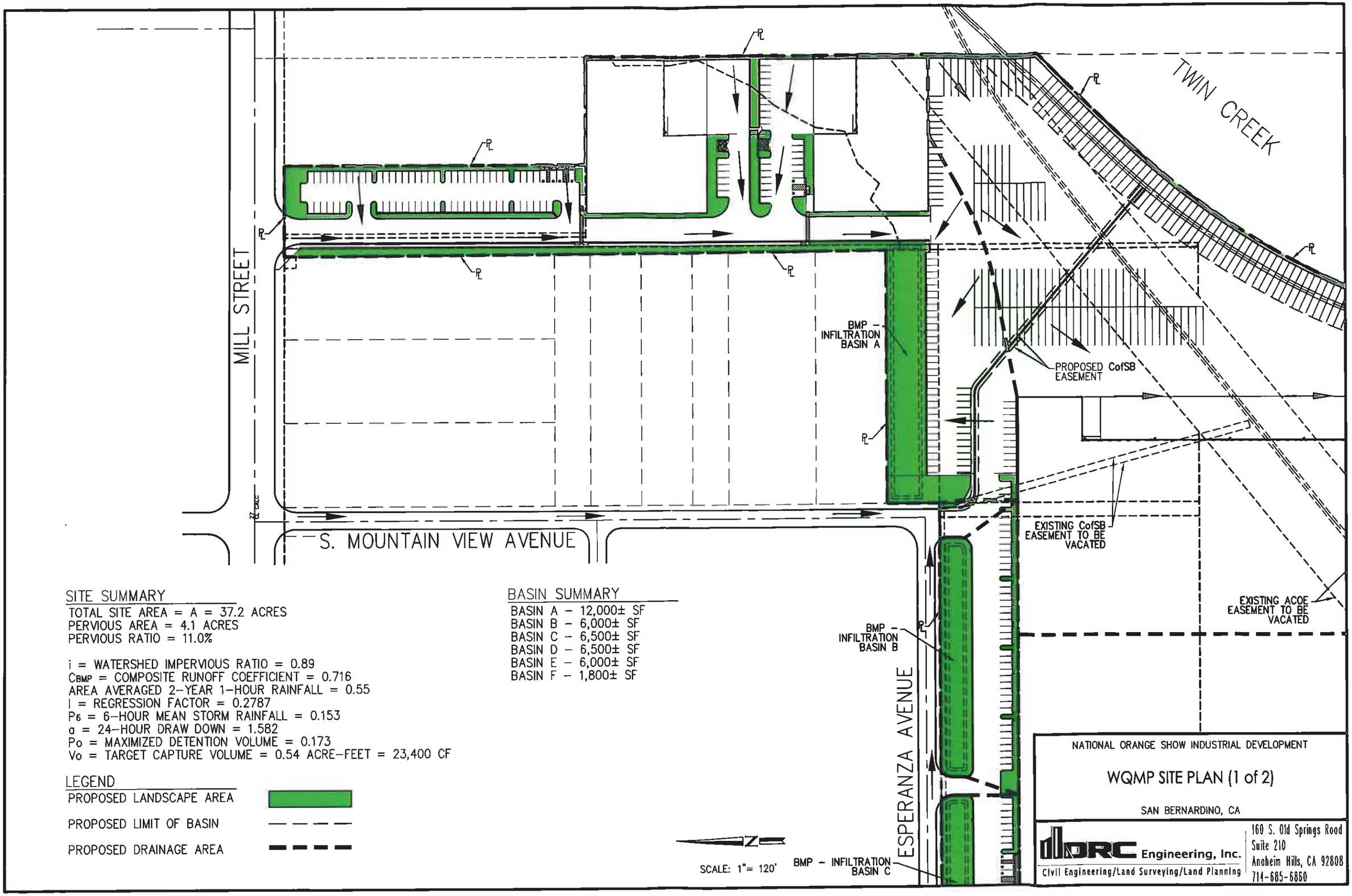
1.3 Project Description

The proposed project is located in the City of San Bernardino within the County of San Bernardino. The project is bound by Arrowhead Avenue to the west, Mill Street to the north, existing commercial buildings to the south, and Twin Creek to the east. The existing site is 37.2 acres of undeveloped land except for minor utility improvements and public drainage infrastructure. The proposed project will be Industrial/Commercial Development (>100,000 SF) land use.

The majority (36.6 acres) of the existing site surface drains to the southwest at an average of 1% slope. The site runoff discharges into the public right-of-way of Arrowhead Avenue where it drains into catch basins located along the curb line of the street. Runoff collected in the catch basins connect to the Army Corp of Engineers Warm Creek bypass drain that runs through the site and discharges into an earthen channel (Warm Creek) southwest of the project. Warm Creek transitions into a concrete lined channel as it moves south and discharges into the Santa Ana River. The Santa Ana River discharges into the Pacific Ocean.

The remaining 0.6 acres of the site drains via overland flow to the north to Mill Street. Mill Street drains west towards Arrowhead Avenue by means of City of San Bernardino underground storm drain line.

The project will include the construction of industrial buildings, drive aisles, parking, loading bays, sidewalks, landscape and utilities. Runoff from the improved areas will be directed towards above ground landscaped retention/infiltration basins located along the perimeter of the site. Flows in excess of the site retention requirements will be discharged directly into the Warm Creek Bypass line.



SITE SUMMARY

TOTAL SITE AREA = A = 37.2 ACRES
PERVIOUS AREA = 4.1 ACRES
PERVIOUS RATIO = 11.0%

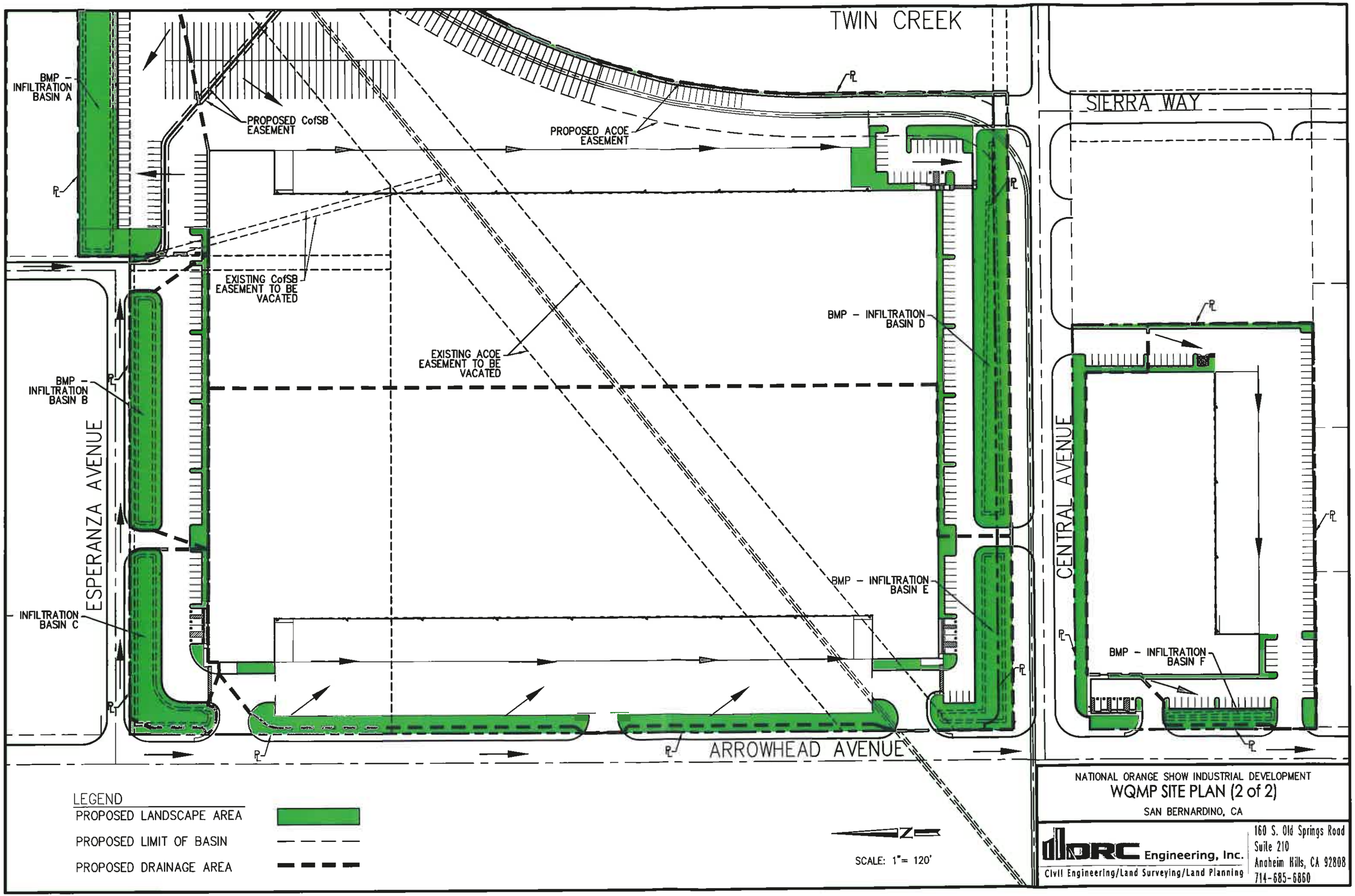
i = WATERSHED IMPERVIOUS RATIO = 0.89
C_{BMP} = COMPOSITE RUNOFF COEFFICIENT = 0.716
AREA AVERAGED 2–YEAR 1–HOUR RAINFALL = 0.55
I = REGRESSION FACTOR = 0.2787
P_6 = 6–HOUR MEAN STORM RAINFALL = 0.153
a = 24–HOUR DRAW DOWN = 1.582
Po = MAXIMIZED DETENTION VOLUME = 0.173
Vo = TARGET CAPTURE VOLUME = 0.54 ACRE–FEET = 23,400 CF

BASIN SUMMARY

BASIN A – 12,000± SF
BASIN B – 6,000± SF
BASIN C – 6,500± SF
BASIN D – 6,500± SF
BASIN E – 6,000± SF
BASIN F – 1,800± SF

LEGEND

PROPOSED LANDSCAPE AREA
PROPOSED LIMIT OF BASIN
PROPOSED DRAINAGE AREA


TWIN CREEK
SIERRA WAY
BMP - INFILTRATION BASIN A
PROPOSED CofSB EASEMENT
PROPOSED ACOE EASEMENT
EXISTING CofSB EASEMENT TO BE VACATED
EXISTING ACOE EASEMENT TO BE VACATED
BMP - INFILTRATION BASIN D
BMP - INFILTRATION BASIN B
ESPERANZA AVENUE
CENTRAL AVENUE
BMP - INFILTRATION BASIN E
INFILTRATION BASIN C
BMP - INFILTRATION BASIN F
ARROWHEAD AVENUE
LEGEND
PROPOSED LANDSCAPE AREA
PROPOSED LIMIT OF BASIN
PROPOSED DRAINAGE AREA
SCALE: 1"= 120'
NATIONAL ORANGE SHOW INDUSTRIAL DEVELOPMENT
WQMP SITE PLAN (2 of 2)
SAN BERNARDINO, CA
ORC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

As part of this project, underground public storm drain facilities (ACOE and CofSB) will be relocated around the proposed building. These facilities include the Warm Creek Bypass line that conveys runoff from Twin Creek to Warm Creek (ACOE facility) and a CofSB storm drain line that conveys runoff from Mountain View Avenue and Esparanza Street underground into the Warm Creek Bypass line. The existing drainage easements will be vacated and new easements formed.

1.4 Site Description

- The project site is located in the Santa Ana River Watershed, Upper Santa Ana River Hydraulic Area, Bunker Hill Hydraulic Sub Area (801.52) per the Santa Ana Regional Board Hydrologic Areas Map. No pre-existing water quality problems have been identified for this project.

Section 2
Pollutants of concern and hydrologic conditions of concern

2.1 Pollutants of Concern (NOT REQUIRED FOR NON-CATEGORY PROJECTS)

Use Table 2-1 in the WQMP Guidance to identify the potential pollutants expected to be generated by the development. List all expected pollutants of concern for the project site as directed below:

- List all expected and potential pollutants using Table 2-1.
  - For Industrial/Commercial the expected and potential pollutants are:
    - Heavy Metals
    - Nutrients
    - Pesticides
    - Organic Compounds
    - Sediments
    - Trash & Debris
    - Oxygen Demanding Substances
    - Oil & Grease

- List any other pollutants of concern from the project site not listed in Tables 2-1 and B-1.
  - No other pollutants of concern are expected from the project site.

- Identify pollutants of concern in the receiving waters as follows:
  1. The project site is located in the Santa Ana River Watershed, Upper Santa Ana River Hydraulic Area, Bunker Hill Hydraulic Sub Area (801.52) per the Santa Ana Regional Board Hydrologic Areas Map. The site discharges into public storm drain facilities that convey the runoff into Warm Creek. Warm Creek discharges into the Upper Santa Ana River which drains to the Pacific Ocean.

2. Of the downstream receiving waters of the project, only the Santa Ana River is listed on the 303(d) list as an impaired waterbody (Santa Ana River Reach 4). The pollutant of concern for this waterbody is Pathogens.

3. There are no pollutants expected to be generated by the site that match the impairment of downstream waterbodies. Since the site is not going to involve animal waste Pathogens are not considered a potential or expected pollutant per Table 2-1.

4. Summarize identified pollutants of concern by checking the applicable boxes in the following table. (For identified pollutants of concern that are causing an impairment in receiving waters, the project WQMP shall incorporate one or more Treatment Control BMPs of medium or high effectiveness in reducing those pollutants.)

Pollutant of Concern Summary Table

Pollutant Type	Expected	Potential	Listed for Receiving Water
Bacteria/Virus			X
Heavy Metals		X	
Nutrients		X	
Pesticides		X	
Organic Compounds		X	
Sediments		X	
Trash & Debris	X		
Oxygen Demanding Substances		X	
Oil & Grease	X		
Other—specify pollutant(s):			

2.2 HYDROLOGIC CONDITIONS OF CONCERN (NOT REQUIRED FOR NON-CATEGORY PROJECTS)

All Category projects must identify any hydrologic condition of concern (HCOC) that will be caused by the project, and implement Site Design, Source Control, and/or Treatment Control BMPs to address identified impacts. Project proponents must follow the procedure for identifying HCOCs specified in Section 2.3 of the Model WQMP. Use the following Table and instructions as a guide.

1. (from Section 2.3, Part 2): Determine if the project will create a Hydrologic Condition of Concern. Check "yes" or "no" as applicable and proceed to the appropriate section as outlined below.	**Yes**	**No**
A. All downstream conveyance channels, that will receive runoff from the project, are engineered, hardened (concrete, riprap or other), and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. Engineered, hardened, and maintained channels include channel reaches that have been fully and properly approved (including CEQA review, and permitting by USACOE, RWQCB and California Dept. of Fish & Game) by June 1, 2004 for construction and hardening to achieve design capacity, whether construction of the channels is complete. Discharge from the project will be in full compliance with Agency requirements for connections and discharges to the MS4, including both quality and quantity requirements, and the project will be permitted by the Agency for the connection or discharge to the MS4.	x	
B. Project runoff rates, volumes, velocities, and flow duration for the post-development condition will not exceed those of the pre-development condition for 1-year, 2-year and 5-year frequency storm events. This condition will be substantiated with hydrologic modeling methods that are acceptable to the Agency, to the U.S. Army Corps of Engineers (USACOE), and to local watershed authorities. See method described below in Parts B1- B3.	x	
C. Can the conditions in part A or B above be demonstrated for the project?	x	
▪ If the answer for A, B, and/or C above is yes, then the project does not create a HCOC—in this case go to Section 3 (page A-12). ▪ If the answer for C above is no, the go to section 2.3. Part 3, below.		

SECTION 3
BEST MANAGEMENT PRACTICE SELECTION PROCESS

3.1 SITE DESIGN BMPS

For listed Site Design BMPs, indicate in the following table whether it will be used (yes/no) and describe how used, or, if not used, provide justification/alternative. Provide detailed descriptions of planned Site Design BMPs, if applicable.

1. Minimize Stormwater Runoff, Minimize Project's Impervious Footprint, and Conserve Natural Areas		
Maximize the permeable area. This can be achieved in various ways, including but not limited to, increasing building density (number of stories above or below ground) and developing land use regulations seeking to limit impervious surfaces.		
Yes x	No	
Describe actions taken or justification/alternative: Drive aisles and parking stalls have been minimized while still providing the necessary use of the project and fire access. Landscape planters/retention basins have been created wherever practical.		
Runoff from developed areas may be reduced by using alternative materials or surfaces with a lower Coefficient of Runoff, or "C-Factor".		
Yes	No x	
Describe actions taken or justification/alternative: Due to heavy vehicle loading and the impact of maintenance of pervious pavements on the building, the use alternative surface materials are not feasible. In lieu of pervious pavements the pavement areas will drain to landscape areas for infiltration and to create a disconnect from impervious surface and storm drain facilities.		
Conserve natural areas. This can be achieved by concentrating or clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition.		
Yes	No x	
Describe actions taken or justification/alternative: The existing site is currently used as a parking field with very sparse vegetation and no land that was left in a natural, undisturbed condition.		

Construct walkways, trails, patios, overflow parking lots, alleys, driveways, low-traffic streets, and other low-traffic areas with open-jointed paving materials or permeable surfaces, such as pervious concrete, porous asphalt, unit pavers, and granular materials.		
Yes	No x	
Describe actions taken or justification/alternative: All parking areas and driveways are subject to heavy truck loads and are required to remain accessible for building operations. Permeable surfaces are not practical for this industrial use. Sidewalks are adjacent to the building foundations and infiltration of stormwater directly adjacent to structural foundations is not recommended for building stability. In lieu of these options, pavement areas will drain to landscape areas for infiltration and to create a disconnect from impervious surface and storm drain facilities.		
Construct streets, sidewalks, and parking lot aisles to the minimum widths necessary, provided that public safety and a pedestrian friendly environment are not compromised[1]. Incorporate landscaped buffer areas between sidewalks and streets.		
Yes x	No	
Describe actions taken or justification/alternative: Sidewalks have been minimized while still meeting the accessibility requirements. Parking stall sizes and drive aisles have been minimized while still providing the necessary access for trucks and the fire department.		
Reduce widths of street where off-street parking is available[2].		
Yes	No x	
Describe actions taken or justification/alternative: Off-Site parking is not included in this project and the width of public streets are required to be sized in conformance with city requirements.		
Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought tolerant trees and large shrubs.		
Yes x	No	
Describe actions taken or justification/alternative: Existing trees are sparse and will not be at the correct grade to remain. Additional trees will be planted per the requirements of the city and existing trees will be transplanted where practical.		

[1] Sidewalk widths must still comply with Americans with Disabilities Act regulations and other life safety requirements.

[2] However, street widths must still comply with life safety requirements for fire and emergency vehicle access.

Minimize the use of impervious surfaces, such as decorative concrete, in the landscape design.		
Yes x	No	
Describe actions taken or justification/alternative: Impervious surfaces in the landscape design will be limited to necessary sidewalks or utility pads.		
Use natural drainage systems.		
Yes x	No	
Describe actions taken or justification/alternative: Landscape swales/retention basins will be used to collect stormwater prior to any discharge to the public storm drain system in lieu of concrete catch basins, concrete swales or underground chambers.		
Where soils conditions are suitable, use perforated pipe or gravel filtration pits for low flow infiltration[3].		
Yes	No x	
Describe actions taken or justification/alternative: The site will use above ground infiltration basins for collecting surface runoff from parking fields instead of collecting in catch basins and conduit.		
Construct onsite ponding areas, rain gardens, or retention facilities to increase opportunities for infiltration, while being cognizant of the need to prevent the development of vector breeding areas.		
Yes x	No	
Describe actions taken or justification/alternative: The site will utilize above ground infiltration basins that will be sized to infiltrate/empty within 24 hours of the completion of a storm event.		

[3]However, projects must still comply with hillside grading ordinances that limit or restrict infiltration of runoff. Infiltration areas may be subject to regulation as Class V injection wells and may require a report to the USEPA. Consult the Agency for more information on use of this type of facility.

2. Minimize Directly Connected Impervious Areas

Where landscaping is proposed, drain rooftops into adjacent landscaping prior to discharging to the storm drain.

Yes	No	
x		

Describe actions taken or justification/alternative:
Roof drains will discharge to adjacent pavement which will drain to landscape areas/infiltration areas prior to entering the storm drain system.

Where landscaping is proposed, drain impervious sidewalks, walkways, trails, and patios into adjacent landscaping.

Yes	No	
x		

Describe actions taken or justification/alternative:
Sidewalks to drain to adjacent landscape areas where available and when not prohibited by building code.

Increase the use of vegetated drainage swales in lieu of underground piping or imperviously lined swales.

Yes	No	
x		

Describe actions taken or justification/alternative:
The site will use landscape basins to collect, store, and convey stormwater in lieu of impervious storm drain infrastructure.

Use one or more of the following:

Yes	No	Design Feature
	x	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings
	x	Urban curb/swale system; street slopes to curb; periodic swale inlets drain to vegetated swale/biofilter.
	x	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to municipal storm drain systems.
	x	Other comparable design concepts that are equally effective.

Describe actions taken or justification/alternative:
The public right-of-way has minimal space beyond the designated roadway and must meet the city design criteria/cross sections.

Use one or more of the following features for design of driveways and private residential parking areas:

Yes	No	Design Feature
	x	▪ Design driveways with shared access, flared (single lane at street) or wheel strips (paving only under tires); or, drain into landscaping prior to discharging to the municipal storm drain system.
x		▪ Uncovered temporary or guest parking on private residential lots may be paved with a permeable surface; or designed to drain into landscaping prior to discharging to the municipal storm drain system.
	x	▪ Other comparable design concepts that are equally effective.

Describe actions taken_or justification/alternative:

Driveways to be designed to city code to accommodate heavy traffic loads. Site pavement/parking areas to drain to landscape retention basins prior to discharge into storm drain system.

Use one or more of the following design concepts for the design of parking areas:

Yes	No	Design Feature
x		Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.
	x	Overflow parking (parking stalls provided in excess of the Agency's minimum parking requirements) may be constructed with permeable paving.
	x	Other comparable design concepts that are equally effective.

Describe actions taken_or justification/alternative:
Impermeable parking areas are to drain/sheet flow to landscape basins prior to entering storm drain system.

3.2 SOURCE CONTROL BMPS

Complete the following selection table for Source Control BMPs, by checking boxes that are applicable. All listed BMPs shall be implemented for the project. Where a required Source Control BMP is not applicable to the project due to project characteristics, justification and/or alternative practices for preventing pollutants must be provided. In addition to completing the following tables, provide detailed descriptions on the implementation of planned Source Control BMPs.

Source Control BMP Selection Matrix*

Project Category	Source Control BMPs																								
	Education of Property Owners	*Activity Restrictions*	*Spill Contingency Plan*	*Employee Training/Education Program*	*Street Sweeping Private Street and Parking Lots*	*Common Areas Catch Basin Inspection*	*Landscape Planning (SD-10)*	*Hillside Landscaping*	*Roof Runoff Controls (SD-11)*	*Efficient Irrigation (SD-12)*	*Protect Slopes and Channels*	*Storm Drain Signage (SD-13)*	*Inlet Trash Racks*	*Energy Dissipaters*	*Trash Storage Areas (SD-32) and Litter Control*	*Fueling Areas (SD-30)*	*Air/Water Supply Area Drainage*	*Maintenance Bays and Docks (SD-31)*	*Vehicle Washing Areas (SD-33)*	*Outdoor Material Storage Areas (SD-34)*	*Outdoor Work Areas (SD-35)*	*Outdoor Processing Areas (SD-36)*	*Wash Water Controls for Food Preparation Areas*	*Pervious Pavement (SD-20)*	*Alternative Building Materials (SD-21)*
Significant Re-development																									
Home subdivisions of 10 or more units																									
Commercial/ Industrial Development >100,000 ft^2	x	x	x	x	x	x	x		x	x	x	x	x		x			x		x	x				x
Automotive Repair Shop																									
Restaurants																									
Hillside Development >10,000 ft^2																									
Development of impervious surface >2,500 ft^2																									
Parking Lots >5,000 ft^2 of exposed storm water																									

* Provide justification of each Source Control BMP that will not be incorporated in the project WQMP, or explanation of proposed equally effective alternatives in the following table.

Justification for Source Control BMPs not incorporated into the project WQMP			
Source Control BMP	Used in Project (yes/no)?	Justification/Alternative*	Implementation Description
Education of Property Owners	Yes		
Activity Restrictions	Yes		
Spill Contingency Plan	Yes		
Employee Training/Education Program	Yes		
Street Sweeping Private Street and Parking Lots	Yes		
Common Areas Catch Basin Inspection	Yes		
Landscape Planning (SD-10)	Yes		
Hillside Landscaping	No	No Hillside Landscaping is proposed on this project.	
Roof Runoff Controls (SD-11)	Yes		
Efficient Irrigation (SD-12)	Yes		
Protect Slopes and Channels	Yes		
Storm Drain Signage (SD-13)	Yes		
Inlet Trash Racks	Yes		
Energy Dissipaters	No	Conentrated flows will not be discharged to adjacent, unimproved areas.	
Trash Storage Areas (SD-32) and Litter Control	Yes		
Fueling Areas (SD-30)	No	No fueling areas proposed on-site.	
Air/Water Supply Area Drainage	No	No air/water supply areas proposed on-site.	
Maintenance Bays and Docks (SD-31)	Yes		
Vehicle Washing Areas (SD-33)	No	No vehicle washing areas proposed on-site.	
Outdoor Material Storage Areas (SD-34)	Yes		
Outdoor Work Areas (SD-35)	Yes		
Outdoor Processing Areas (SD-36)	No	No processing of wet materials is proposed in outdoor areas.	
Wash Water Controls for Food Preparation Areas	No	No food preparation is proposed on-site.	
Pervious Pavement (SD-20)	No	More effective means of infiltration proposed on-site.	
Alternative Building Materials (SD-21)	Yes		
*Attach additional sheets if necessary for justification.			

Education of Property Owners and Occupants
The owner is to provide environmental awareness education materials to employees who work in the operational areas that impact stormwater quality. These materials must contain general good housekeeping practices that contribute to protection of stormwater quality, BMPs that eliminate or reduce pollution during property improvements (concrete work, etc) plus describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins, and storm drains. These materials will be made available by the owner and may be attached to the WQMP template.

Activity Restrictions
Pesticide application in common areas must be performed by an applicator certified by the California Department of Pesticide Regulation.

Spill Contingency Plan
A "Spill Contingency Plan" (Business Emergency/Contingency Plan Guidelines and Forms) shall be provided in accordance with Section 6.95 of the California Health and Safety Code.

Employee Training/Education Program
For developments where people will be employed to perform activities that may impact water quality, BMP training and education programs must be provided. Materials based upon information provided through the Area-wide Stormwater Program Public Education Program may be used. Training and education program commitments may be conveyed to a POA or development purchaser.

Street Sweeping Private Streets and Parking Lots
For privately owned streets and parking lots, the streets and parking lots must be swept at least twice annually, prior to the storm season in the late summer or early fall, to reduce the amount of sediment, garden waste, and trash entering the storm drain systems. Privately owned streets and parking lots in commercial, industrial, and institutional zones, and along designated truck routes, must be swept at least once each quarter. Street sweeping requirements apply to streets where there is sufficient curb and gutter to justify street sweeping.

Common Area Catch Basin Inspection
Drainage facilities (inlets, open channels and basins) must be inspected annually, in the late summer or early fall, and cleaned as needed, or if accumulated sediment/ debris fills 25% or more of the sediment/debris storage capacity of the facility. The party responsible for post-construction operation and maintenance of drainage facilities shall evaluate all portions of the drainage facilities annually to determine the adequacy of the inspection and maintenance frequency, and report the evaluation findings to the Agency.

Landscape Planning
Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels. Plants should be grouped with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Landscaping shall correlate to the climate, soil, related natural resources and existing vegetation of the site, as well as the type of development proposed. Ongoing maintenance consistent with County Administrative Design Guidelines (available at: http://www.co.san-bernardino.ca.us/landuseservices/Informational%20Handouts/Administative%20Design%20Guidelines-Jan%202002.pdf) or local equivalent, plus fertilizer and pesticide usage consistent with the instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation shall be implemented.

Roof Runoff Controls
Residential and commercial sites must be designed to contain and infiltrate roof runoff, or direct roof runoff to vegetative swales or buffer areas.

Efficient Irrigation
Irrigation methods should be utilized to minimize runoff of excess irrigation water across impervious surfaces and into the stormwater conveyance system. Such measures include employing rain-triggered shutoff devices to eliminate or reduce irrigation during and immediately after precipitation, using mulches (such as wood chips) to minimize sediment in runoff and to maintain soil infiltration capacity, and coordinating design of the irrigation system and landscape to minimize overspray and runoff. Irrigation systems should consider the use of flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or water supply lines.

Water conservation devices such as programmable irrigation timers and soil moisture sensors should also be considered.

Protect Slopes and Channels (OC 2003)
Project plans shall include Source-Control BMPs to decrease the potential for erosion of slopes and/or channels, consistent with local codes and ordinances, and with approval of all agencies with jurisdiction (e.g., USACOE, RWQCB, and CDFG). The following design principles shall be considered, and implemented where determined to be applicable and feasible by the Agency:

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Install permanent stabilization BMPs on disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought-tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching natural drainage systems.

Storm Drain Signage
Signage such as notices regarding discharge prohibitions at storm drain inlets to eliminate or reduce dumping and littering are required. The phrase "No Dumping – Flows to Creek," or an equally effective phrase as approved by the NPDES General Committee, must be stenciled on catch basins (inlets) to alert the public as to the destination of pollutants discharged into storm drains. This signage must be maintained and a party responsible for maintenance should be identified in the WQMP.

Inlet Trash Racks
Where appropriate to reduce intake and transport through the storm drain system of large floatable debris, trash racks shall be provided where drainage from open areas enters storm drains.

Trash Storage Areas and Litter Control
Trash container (dumpster) areas shall have drainage from adjoining roofs and pavements diverted around the area(s). Dumpsters shall be leak proof and have attached workable covers. Trash area drains, if any, must not be allowed to discharge offsite, or be connected to the municipal storm drain system. For trash container areas associated with fuel dispensing, vehicle repair/maintenance, and industry, grade and pave the area to eliminate or reduce run-on of storm water to the maximum extent practicable. Trash compactors shall be roofed and set on a concrete pad. The pad shall be a minimum of one foot larger all around than the trash compactor and sloped to drain to a sanitary sewer line.

Maintenance Bays and Docks
Loading docks must be kept in a clean and orderly condition through a regular program of sweeping, litter control, and immediate cleanup of spills and broken containers. Polluted material or wash waters shall not be allowed to discharge into a storm drain.
Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff. Direct connections into storm drains from depressed loading docks (truck wells) are prohibited. Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative reviewed and approved by the Agency.

Outdoor Material Storage Areas
Where plans propose outdoor storage containers for oils, fuels, solvents, coolants, wastes, and other chemicals, the areas where these materials are to be used or stored must be protected by secondary containment structures such as a low containment berm, dike, or curb, designed to the satisfaction of the approving Agency. For commercial outdoor vehicle and equipment salvage yards, and commercial outdoor recycling facilities, the entire facility must comply with the NPDES General Industrial Activities Storm Water Permit. Piles of materials or products that are stored outside and that have the potential to cause pollutant discharges shall be protected from rainfall, runoff, run-on, and wind erosion.

Alternative Building Materials
Materials used to reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff and reducing the need for pesticides, paints, and other materials are encouraged to be used.

3.3 TREATMENT CONTROL BMPS (Not required for Non-Category projects)

- Complete the following Treatment Control BMPs Selection Matrix. For each pollutant of concern enter "yes" if identified in Section 2.1, above, or "no" if not identified for the project. Check the boxes of selected BMPs that will be implemented for the project to address each pollutant of concern from the project as listed above in section 2.1. Treatment Control BMPs must be selected and installed with respect to identified pollutant characteristics and concentrations that will be discharged from the site. For any identified pollutants of concern not listed in the Treatment Control BMP Selection Matrix, provide an explanation of how they will be addressed by Treatment Control BMPs. For identified pollutants of concern that are causing an impairment in receiving waters (as identified in Section 2.1, above), the project WQMP shall incorporate one or more Treatment Control BMPs of medium or high effectiveness in reducing those pollutants. It is the responsibility of the project proponent to demonstrate, and document in the project WQMP, that all pollutants of concern will be fully addressed. The Agency may require information beyond the minimum requirements of this WQMP to demonstrate that adequate pollutant treatment is being accomplished.

- In addition to completing the Selection Matrix, provide detailed descriptions on the location, implementation, installation, and long-term O&M of planned Treatment Control BMPs.

Treatment Control BMP Selection Matrix

Pollutant of Concern	Treatment Control BMP Categories							
	Biofilters	Detention Basins[2]	Infiltration Basins[3]	Wet Ponds or Wetlands	Filtration	Water Quality Inlets	Hydrodynamic Separator Systems [4]	Manufactured/ Proprietary Devices
Sediment/Turbidity	H/M	M	H/M	H/M	H/M	L	H/M (L for turbidity)	U
Yes/No? Yes			x					
Nutrients	L	M	H/M	H/M	L/M	L	L	U
Yes/No? Yes			x					
Organic Compounds	U	U	U	U	H/M	L	L	U
Yes/No? Yes			x					
Trash & Debris	L	M	U	U	H/M	M	H/M	U
Yes/No? Yes			x					
Oxygen Demanding Substances	L	M	H/M	H/M	H/M	L	L	U
Yes/No? Yes			x					
Bacteria & Viruses	U	U	H/M	U	H/M	L	L	U
Yes/No? Yes			x					
Oils & Grease	H/M	M	U	U	H/M	M	L/M	U
Yes/No? Yes			x					
Pesticides (non-soil bound)	U	U	U	U	U	L	L	U
Yes/No? Yes			x					
Metals	H/M	M	H	H	H	L	L	U
Yes/No? Yes			x					

3.4 BMP DESIGN CRITERIA

- The following Treatment Control BMP(s) (Flow Based or Volume Based) will be implemented for this project (***check "Implemented" box, if used***):

Design Basis of Treatment Control BMPs

Implemented	Treatment Control BMP	Design Basis
	Vegetated Buffer Strips	Flow Based
	Vegetated Swale	
	Multiple Systems	
	Manufactured/Proprietary	
	Bioretention	Volume Based
	Wet Pond	
	Constructed Wetland	
	Extended Detention Basin	
	Water Quality Inlet	
	Retention/Irrigation	
x	Infiltration Basin	
	Infiltration Trench	
	Media Filter	
	Manufactured/Proprietary	

3.4.1 Flow Based Design Criteria

- Project is utilizing Volume-Based treatment BMPs only.

3.4.2 Volume-Based Design Criteria

- See Volume Based design calculations in Appendix D.

Section 4
Operation and Maintenance

4.1 Operations and Maintenance

Operation and maintenance (O&M) requirements for all Source Control, Site Design, and Treatment Control BMPs shall be identified within the WQMP. The WQMP shall include the following:

4.1.1 O&M DESCRIPTION AND SCHEDULE

BMP that Requires O&M	Operation & Maintenance Activities	Maintenance Frequency
Spill Contingency Plan	Inspect spill kit for completeness. Keep a log of spill kip maintenance activity on-site. In the event of spill, dispose of used materials with licensed waste disposal company.	Inspect after each use and a minimum of once a year. Replace materials as needed.
Storm Drain Signage	Apply "NO DUMPING – DRAINS TO OCEAN" stenciling on all drain inlets. Inspect for fading of stenciling and re-stencil when necessary.	Apply stencil prior to occupancy of building. Inspect for fading on an annual basis.
Inlet Trash Racks	Remove collected trash at inlets and replace broken/damaged grate inlets.	Install grates on inlets at time of inlet installation. Inspect grates for trash accumulation and damage on a weekly basis.
Infiltration Basins	Remove collected trash in basin and at overflow drains. In the event that the basin is not infiltrating runoff within 72 hours after completion of rain event basin shall be raked and, if necessary, soil shall be excavated and cleaned or replaced.	Inspect basin weekly for trash accumulation. Inspect basin 72 hours after rain event for infiltration.

4.1.2 INSPECTION & MONITORING REQUIREMENTS

- No self inspection or monitoring is required for this project.

4.1.3 IDENTIFICATION OF RESPONSIBLE PARTIES

- The property owner will be responsible for the maintenance and operation of each project BMP.

  Lewis Retail Centers
  1156 N. Mountain Avenue
  Upland, CA 91786
  Timothy Reeves
  (909) 579-1294

SECTION 5
FUNDING

5.1 Funding

- The property owner will be responsible for the funding of each project BMP.

  Lewis Retail Centers
  1156 N. Mountain Avenue
  Upland, CA 91786
  Timothy Reeves
  (909) 579-1294

SECTION 6
WQMP Certification

6.1 Certification

"This Water Quality Management Plan has been prepared for (Owner/Developer Name) by (Consulting /Engineering Firm Name). It is intended to comply with the requirements of the City of (name city or county) for Tract/Parcel Map No. _____, Condition Number(s) _____ requiring the preparation of a Water Quality Management Plan (WQMP). The undersigned is aware that Best Management Practices (BMPs) are enforceable pursuant to the City's/County's Water Quality Ordinance No. _____. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Stormwater Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity. "

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

_____	_____
Applicant's Signature	Date
_____	_____
Applicant's Name	Applicant's Telephone Number

Attachment A-1

Maintenance Mechanisms

A-1.1 The Agency shall not accept stormwater structural BMPs as meeting the WQMP requirements standard, unless an O&M Plan is prepared (see WQMP Section 2.6) and a mechanism is in place that will ensure ongoing long-term maintenance of all structural and non-structural BMPs. This mechanism can be provided by the Agency or by the project proponent. As part of project review, if a project proponent is required to include interim or permanent structural and non-structural BMPs in project plans, and if the Agency does not provide a mechanism for BMP maintenance, the Agency shall require that the applicant provide verification of maintenance requirements through such means as may be appropriate, at the discretion of the Agency, including, but not limited to covenants, legal agreements, maintenance agreements, conditional use permits and/or funding arrangements (OC 2003)

A-1.2 Maintenance Mechanisms

1. **Public entity maintenance**: The Agency may approve a public or acceptable quasi-public entity (e.g., the County Flood Control District, or annex to an existing assessment district, an existing utility district, a state or federal resource agency, or a conservation conservancy) to assume responsibility for operation, maintenance, repair and replacement of the BMP. Unless otherwise acceptable to individual Agencies, public entity maintenance agreements shall ensure estimated costs are front-funded or reliably guaranteed, (e.g., through a trust fund, assessment district fees, bond, letter of credit or similar means). In addition, the Permittees may seek protection from liability by appropriate releases and indemnities.

   The Agency shall have the authority to approve stormwater BMPs proposed for transfer to any other public entity within its jurisdiction before installation. The Permittee shall be involved in the negotiation of maintenance requirements with any other public entities accepting maintenance responsibilities within their respective jurisdictions; and in negotiations with the resource agencies responsible for issuing permits for the construction and/or maintenance of the facilities. The Agency must be identified as a third party beneficiary empowered to enforce any such maintenance agreement within their respective jurisdictions.

2. **Project proponent agreement to maintain stormwater BMPs:** The Agency may enter into a contract with the project proponent obliging the project proponent to maintain, repair and replace the stormwater BMP as necessary into perpetuity. Security or a funding mechanism with a "no sunset" clause may be required.

3. **Assessment districts:** The Agency may approve an Assessment District or other funding mechanism created by the project proponent to provide funds for stormwater

BMP maintenance, repair and replacement on an ongoing basis. Any agreement with such a District shall be subject to the Public Entity Maintenance Provisions above.

4. **Lease provisions:** In those cases where the Agency holds title to the land in question, and the land is being leased to another party for private or public use, the Agency may assure stormwater BMP maintenance, repair and replacement through conditions in the lease.

5. **Conditional use permits:** For discretionary projects only, the Agency may assure maintenance of stormwater BMPs through the inclusion of maintenance conditions in the conditional use permit. Security may be required.

6. **Alternative mechanisms:** The Agency may accept alternative maintenance mechanisms if such mechanisms are as protective as those listed above.

Attachment A-2

Water Quality Management Plan and Stormwater BMP Transfer, Access and Maintenance Agreement (adapted from documents from the Ventura County Stormwater Management Program)

Recorded at the request of:

City of _____

After recording, return to:

City of _____

City Clerk _____

Water Quality Management Plan and Stormwater BMP Transfer, Access and Maintenance Agreement

OWNER: _____

PROPERTY ADDRESS: _____

_____

APN: _____

THIS AGREEMENT is made and entered into in

_____, California, this _____ day of

_____ , by and between

_____, herein after

referred to as "Owner" and the CITY OF _____, a municipal corporation, located in the County of San Bernardino, State of California hereinafter referred to as "CITY";

WHEREAS, the Owner owns real property ("Property") in the City of

_____, County of San Bernardino, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference;

WHEREAS, at the time of initial approval of development project known as

_____ within the Property described herein, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff;

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the City;

WHEREAS, said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement;

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs;

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner hereby provides the City of City's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by City's Director of Public Works no advance notice, for the purpose of inspection, sampling, testing of the Device, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the Civil Code from the date of the notice of expense until paid in full.

4. The City may require the owner to post security in form and for a time period satisfactory to the city to guarantee the performance of the obligations state herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement. As an additional remedy, the Director may withdraw any previous stormwater-related approval with respect to the property on which BMPs have been installed and/or implemented until such time as Owner repays to City its reasonable costs incurred in accordance with paragraph 3 above.

5. This agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

6. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

7. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

8. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

9. Time is of the essence in the performance of this Agreement.

10. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY:

_____

_____

_____

_____

IF TO OWNER:

_____

_____

_____

_____

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

APPROVED AS TO FORM:

_____
City Attorney

_____
CITY OF

_____
Name

_____
Title

ATTEST:

_____
City Clerk Date

OWNER:

_____
Name

_____
Title

OWNER:

_____
Name

_____
Title

NOTARIES ON FOLLOWING PAGE

EXHIBIT A
(Legal Description)

EXHIBIT B
(Map/Ilustration)

Attachment B
Tables

Table B-1
303(d) List of Impaired Water Bodies

Waterbody	Pollutant					
	Bacteria Indicators/ Pathogens	Metals	Nutrients	Organic Enrichment	Sedimentation/Siltation	Suspended Solids
Big Bear Lake		X	X	X	X	
Canyon Lake (Railroad Canyon Reservoir)	X		X			
Chino Creek Reach 1	X		X			
Chino Creek Reach 2	X					
Cucamonga Creek, Valley Reach	X					
Grout Creek		X	X			
Knickerbocker Creek	X	X				
Lytle Creek	X					
Mill Creek (Prado Area)	X		X			X
Mill Creek Reach 1	X					
Mill Creek Reach 2	X					
Mountain Home Creek	X					
Mountain Home Creek, East Fork	X					
Prado Park Lake	X		X			
Rathbone (Rathbun Creek)			X		X	
Santa Ana River, Reach 3	X					
Santa Ana River, Reach 4	X					
Summit Creek			X			

NOTES:

1) Summary of the 2006 303(d) Listed Water Bodies and Associated Pollutants of Concern from RWQCB Region 8. Check for updated lists from the RWQCB.

2) Chlorides, pesticides, salinity, total dissolved solids (TDS), toxicity, and trash are listed impairments within the 303(d) table, however, they are not impairments in the above waterbodies.

Table B-2
C Values Based on Impervious/Pervious Area Ratios

% Impervious	% Pervious	C
0	100	0.15
5	95	0.19
10	90	0.23
15	85	0.26
20	80	0.30
25	75	0.34
30	70	0.38
35	65	0.41
40	60	0.45
45	55	0.49
50	50	0.53
55	45	0.56
60	40	0.60
65	35	0.64
70	30	0.68
75	25	0.71
80	20	0.75
85	15	0.79
90	10	0.83
95	5	0.86
100	0	0.90

NOTE:

Obtain individual runoff coefficient C-Factors from the local agency or from the local flood control district.

If C-Factors are not available locally, obtain factors from hydrology text books or estimate using this table.

Composite the individual C-Factors using area-weighted averages to calculate the Composite C Factor for the area draining to a treatment control BMP.

Do not use the C-Factors in this table for flood control design or related work.

Attachment C
Pollutants of Concern

Pollutants of Concern

- *Bacteria and Viruses* – Bacteria and Viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically cause by the transport of animal or human fecal wastes from the watershed. Water, containing excessive bacteria and viruses, can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

- *Metals* – The primary source of metal pollution in stormwater is typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. Metals are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. At low concentrations naturally occurring in soil, metals may not be toxic. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications (OC 2003).

- *Nutrients* – Nutrients are inorganic substances, such as nitrogen and phosphorus. Excessive discharge of nutrients to water bodies and streams causes eutrophication, where aquatic plants and algae growth can lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms. Primary sources of nutrients in urban runoff are fertilizers and eroded soils.

- *Pesticides* -- Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Relatively low levels of the active component of pesticides can result in conditions of aquatic toxicity. Excessive or improper application of a pesticide may result in runoff containing toxic levels of its active ingredient (OC 2003).

- *Organic Compounds* – Organic compounds are carbon-based. Commercially available or naturally occurring organic compounds are found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life (OC 2003).

- *Sediments* – Sediments are solid materials that are eroded from the land surface. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth.

- *Trash and Debris* – Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may

have a significant impact on the recreational value of a water body and aquatic habitat. Trash impacts water quality by increasing biochemical oxygen demand.

- *Oxygen-Demanding Substances* – This category includes biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions. A reduction of dissolved oxygen is detrimental to aquatic life and can generate hazardous compounds such as hydrogen sulfides.

- *Oil and Grease* – Oil and grease in water bodies decreases the aesthetic value of the water body, as well as the water quality. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

Attachment D
Flow- and Volume-Based BMP Design Calculations

Volume-Based BMP Design

1) Calculate the "Watershed Imperviousness Ratio", i, which is equal to the percent of impervious area in the BMP Drainage Area divided by 100.

- i = 0.89

2) Calculate the composite runoff coefficient C_{BMP} for the Drainage Area above using the following equation:

$$C_{BMP} = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$$

- CBMP = 0.716

where: C_{BMP} = composite runoff coefficient; and,

i = watershed imperviousness ratio.

3) The Drainage Area is located in the Valley region.

- I = 0.2787

4) Determine the area-averaged "6-hour Mean Storm Rainfall", P_6, for the Drainage Area. This is calculated by multiplying the area averaged 2-year 1-hour value by the appropriate regression coefficient from Table 1.

- P6 = 0.55 (From NOAA Map below) x I = 0.153

5) Determine the appropriate drawdown time. Use the regression constant a = 1.582 for 24 hours and a = 1.963 for 48 hours.

6) Calculate the "Maximized Detention Volume", P_0, using the following equation:

$$P_0 = a \cdot C_{BMP} \cdot P_6$$

- P0 = 1.582 x 0.716 x 0.153 = 0.173

7) Calculate the "Target Capture Volume", V_0, using the following equation:

$$V_0 = (P_0 \cdot A) / 12$$

- V0 = (0.173 x 37.2) / 12 = 0.54 acre-feet = 23,400CF

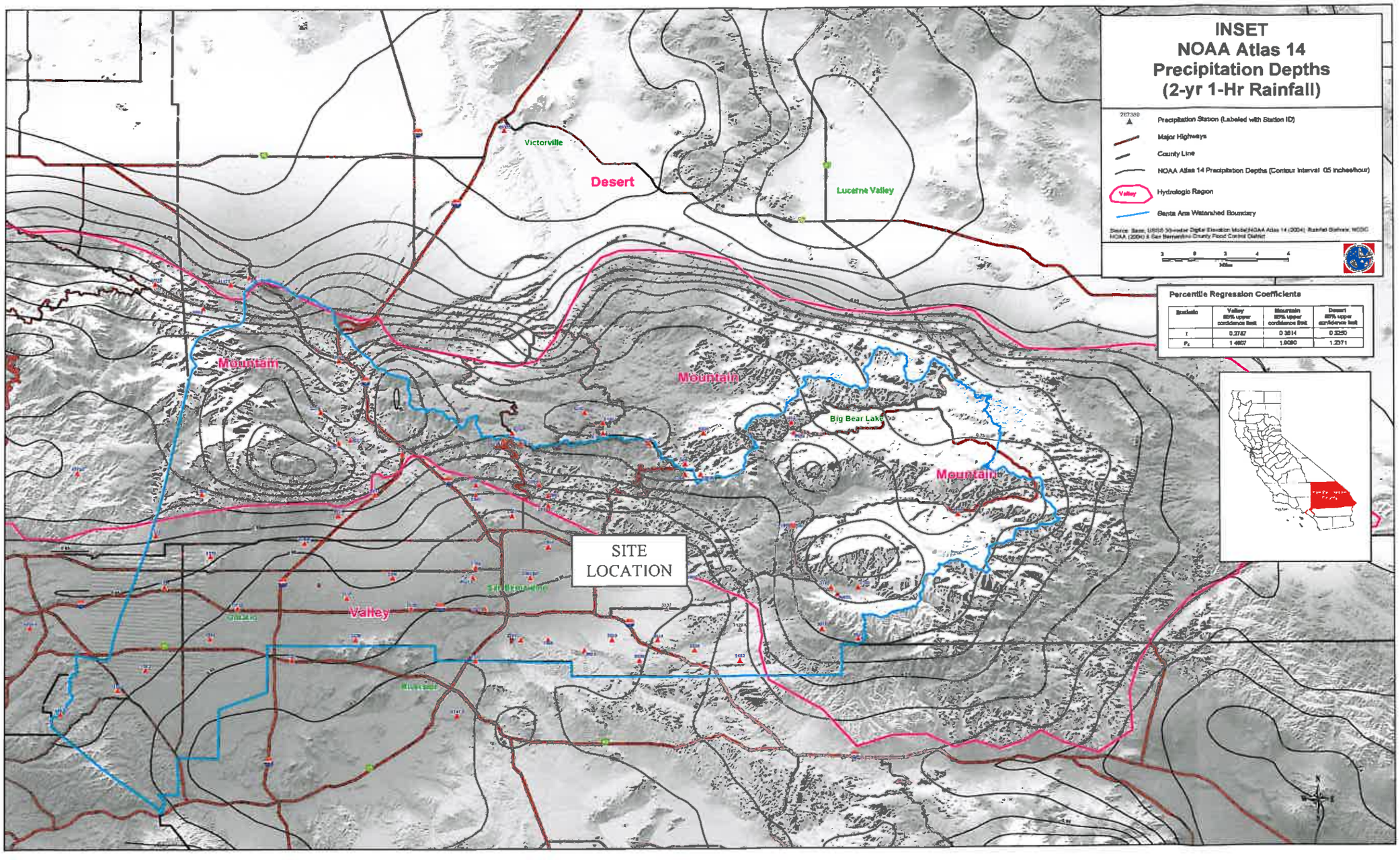
where:

V_0 = Target Capture Volume, in acre-feet

P_0 = Maximized Detention Volume, in inches; and,

A = BMP Drainage Area, in acres

Figure D-1: NOAA Atlas 14 Inset Map.



H.5 - Preliminary Hydrology and Hydraulics Report, June 9, 2011

PRELIMINARY HYDROLOGY AND HYDRAULICS REPORT

For:

NATIONAL ORANGE SHOW INDUSTRIAL DEVELOPMENT

TPM 19330
Arrowhead Ave & Central Ave
San Bernardino, CA 92408

Prepared for:

Lewis Retail Centers
1156 N. Mountain Avenue
Upland, CA 91786
(909) 579-1294

Prepared by:

DRC Engineering, Inc.
160 S. Old Springs Rd, Suite 210
Anaheim Hills, CA 92808
(714) 685-6860
Larry Gates, P.E.

June 9, 2011

DRC Project No. 11+420

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- Reference Documentation

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- Existing On-Site Hydrology Map
- AES 10-Year, 25-Year and 100-Year Calculations

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- Proposed On-Site Hydrology Map
- AES 10-Year, 25-Year and 100-Year Calculations
- Basin Detention Analysis

SECTION 1.0

NARRATIVE

Introduction
Project Description
Hydrology Analysis
Conclusions/Recommendations

Introduction

The proposed project is located on approximately 37.4 acres of undeveloped land at the National Orange Show Fairgrounds near the intersection of Arrowhead Avenue and Central Avenue in the City of San Bernardino, San Bernardino County, California. The project will include the demolition of existing improvements as well as the grading and construction of 4 new buildings, pavement and other improvements associated with industrial developments. This report has been prepared to calculate the pre and post-construction hydrologic conditions for peak storm water runoff rates.

Project Description

Existing Site Conditions: The existing site consists of 37.4 acres of undeveloped land that generally drains to the south and west at an average grade of 1.0%. The site is 4% impervious with minor improvements on-site. There is no off-site run-on to the project, however public storm drain infrastructure (Army Corps of Engineers Warm Creek Bypass Line and City of San Bernardino catch basin lateral) due cross the site in drainage easements The existing site is currently used as a parking field and is mostly barren with scattered trees and brush. Site runoff travels by overland flow to the public right-of-way of Arrowhead Avenue and Mill Street. See Existing Hydrology Map in Section 3.0 for illustration of existing site conditions. Through catch basins in the public right-of-way, all site runoff enters existing public storm drain facilities in Mill Street and Arrowhead Avenue. The public storm drain system flows west and ultimately discharges into the Santa Ana River.

Proposed Site Development: The proposed site consists of the removal of the existing improvements, relocation of public drainage facilities on-site, and the construction of industrial center. The proposed site will be 89% impervious. The site will also contain on-site above ground infiltration basins as part of the Water Quality Management Plan and for stormwater detention/retention of peak runoff events. The proposed site will maintain the existing drainage discharge pattern of the site. See Proposed Hydrology Map in Section 4.0 for illustration of proposed site conditions.

Hydrologic Analysis

The hydrology calculations for the project are based on the San Bernardino County Hydrology Manual (August 1986 edition). Location maps, precipitation values, and soil values have all been interpolated from the SBC Manual and can be found in Section 2.0 of this report. Existing and proposed site conditions are analyzed using Advanced Engineering Solutions (AES) HydroWin software to calculate pre and post-construction flow rates and storm volumes for the 10-Year, 25-Year and 100-Year storm events. See Section 3.0 for pre development calculations and Section 4.0 for post development calculations. The 10-Year, 25-Year and 100-Year storm events are being analyzed as the design storm in accordance with City of San Bernardino requirements.

The City of San Bernardino requires that the proposed development not exceed the peak discharge rates of the existing condition.

Proposed basin infiltration rates are based upon infiltration rates contained in the site geotechnical report (LOR Geotechnical Group, Inc., Project No. 12798.1) of 350 gallons per square foot per day. This rate was decreased by a factor of safety of 1.25. The infiltration was calculated over the entire limits of the proposed basins.

Existing Conditions: The existing site was analyzed by treating the 3 drainage areas as a single watershed that discharges into the public system. See the Existing Hydrology Map in Section 3.0.

The results of the drainage area calculations are located in Section 3.0 and are summarized in the table below.

EXISTING DRAINAGE SUMMARY TABLE

Drainage Area	10-Year Storm	25-Year Storm	100-Year Storm
TOTAL SITE	31.9 CFS	39.7 CFS	60.3 CFS

Proposed Conditions: The hydrologic analysis for the proposed site was performed by analyzing six drainage areas. The drainage areas were divided by tributary area to each proposed infiltration/detention basin. See the Proposed Hydrology Map in Section 4.0. The results of the drainage area calculations and basin analysis are located in Section 4.0 and are summarized in the table below.

PROPOSED DRAINAGE SUMMARY TABLE – POST RETENTION

Drainage Area	10-Year Storm	25-Year Storm	100-Year Storm
A	0 CFS	0 CFS	0 CFS
B	0 CFS	18.0 CFS	30.6 CFS
C	17.9 CFS	22.1 CFS	30.0 CFS
D	0 CFS	0 CFS	0 CFS
E	0 CFS	0 CFS	0 CFS
F	6.5 CFS	8.1 CFS	11.0 CFS
TOTAL	24.4 CFS	48.2 CFS	71.6 CFS

The proposed basin analysis assumes no discharge prior to basin exceeding capacity. The basins very in depth from 1' to 2.5' deep with side slopes that vary from 2:1 (Horizontal:Vertical) to 4:1. Preliminary basin volumes are shown on the Proposed Hydrology Map in Section 4.0.

Hydrology Analysis

Based upon the preliminary basin sizing and design, the site is expected to increase the peak site runoff in the 25-Year (21.4%) and 100-Year storm events (18.7%). In final design the proposed basins B, C and F will be designed with multi-stage risers that will allow site discharge below the existing discharge rates prior to the basin capacity being reached. By discharging stormwater prior to the peak event, additional basin capacity will be available to capture and detain the peak runoff. The basin risers will discharge directly into the Warm Creek Bypass line that will be relocated into Central Avenue.

Drainage Basins A, D and E are designed as complete retention basins with zero site discharge in the 100-Year event. In the event of a storm event larger than the capacity of these basins, the overflow path of the basins is to drain into the public right-of-way in Esperanza Street. Esperanza Street has drainage facilities that discharge into the Warm Creek Bypass line.

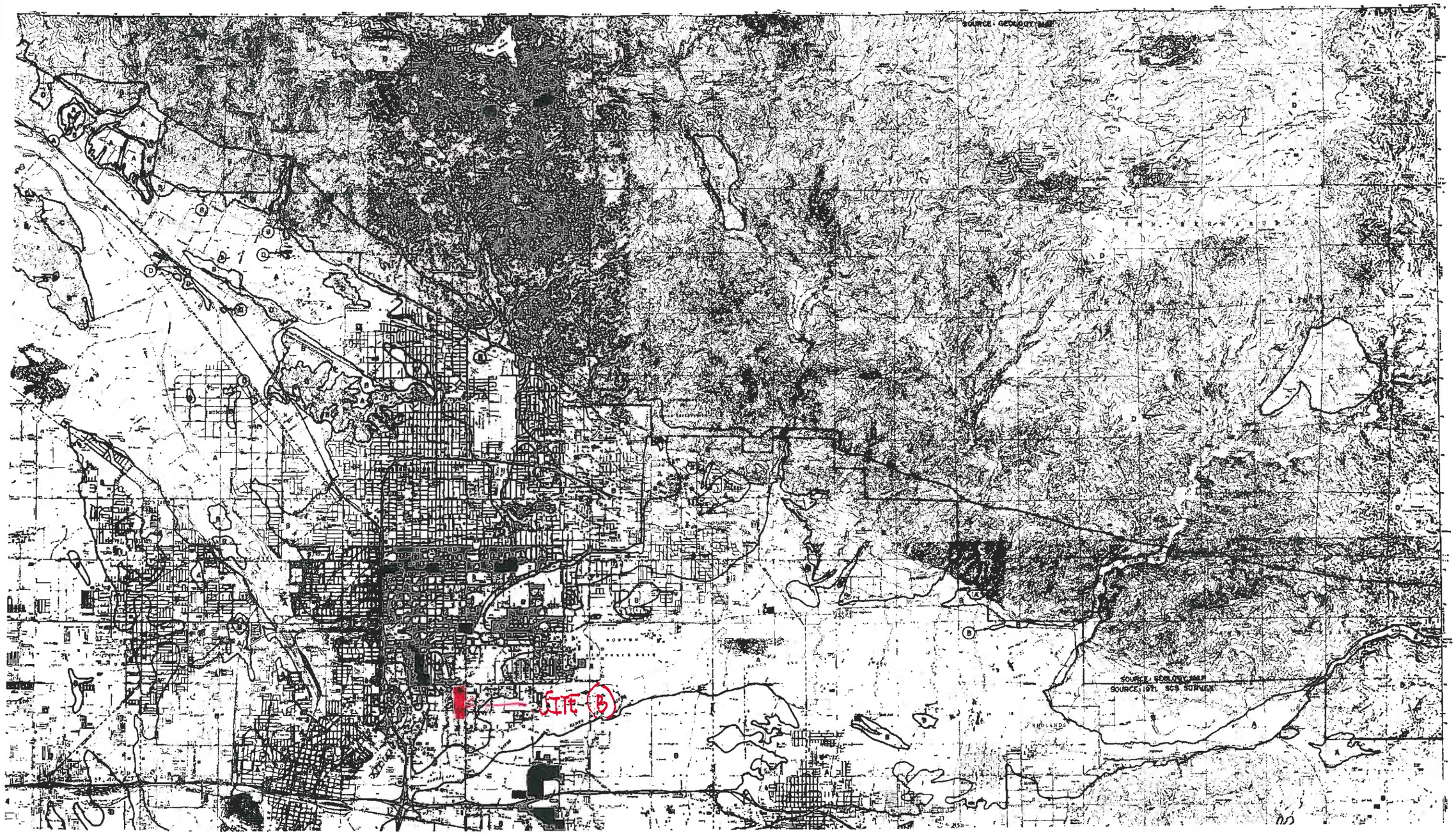
Conclusions

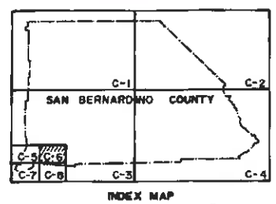
With minor modifications made in final design, the proposed project will not increase the peak discharge flow rate from the existing condition in the 10-Year, 25-Year or 100-Year storm events.

SECTION 2.0

SITE INFORMATION

SBC Soils and Rainfall Maps
SBC Curve Number Tables





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

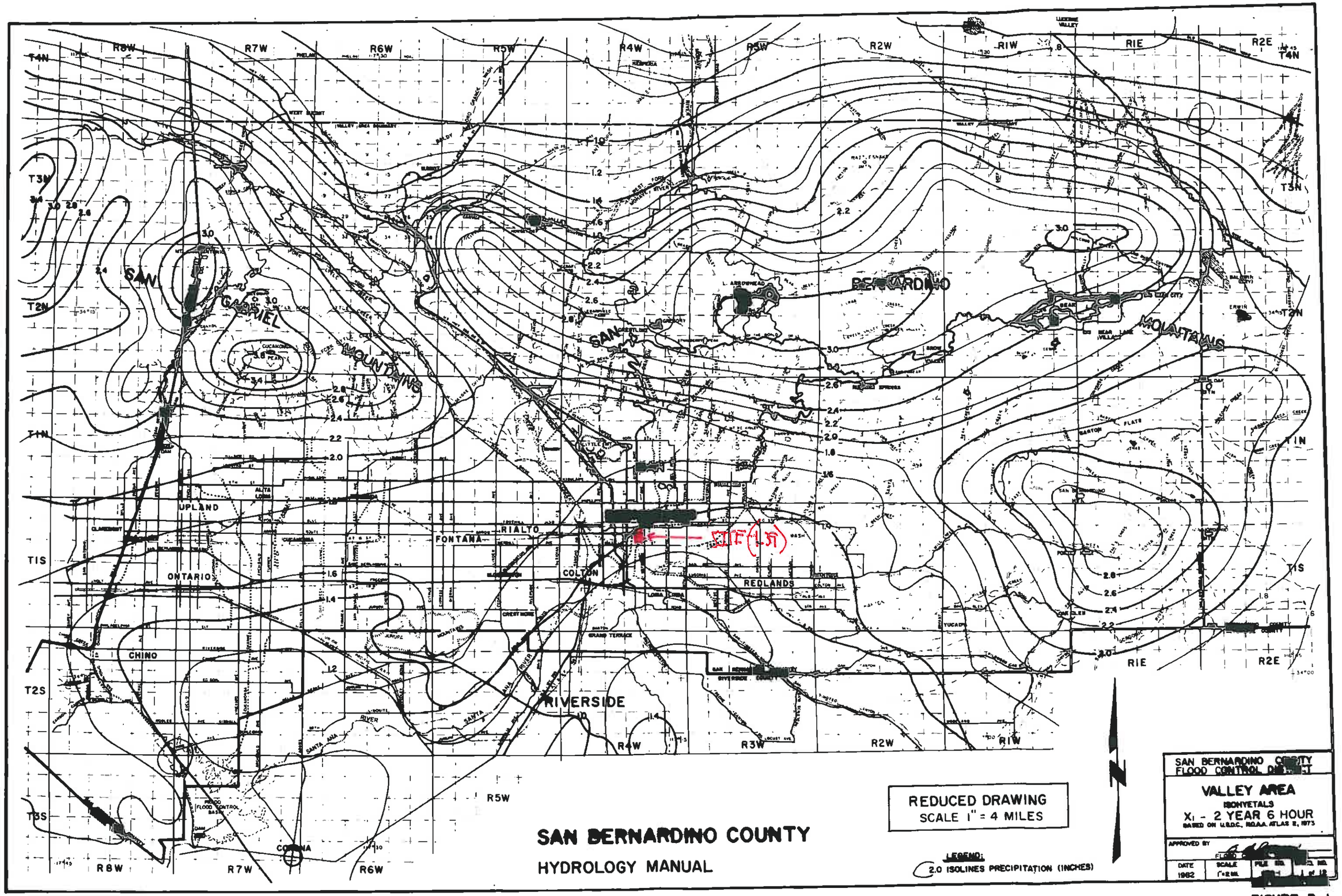
SCALE REDUCED BY 1/2

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-B AREA

FIGURE C-14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HYDROLOGY MANUAL
REDUCED DRAWING
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LEGEND:
2.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X1 - 2 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FIGURE B-1
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
CORONA
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S

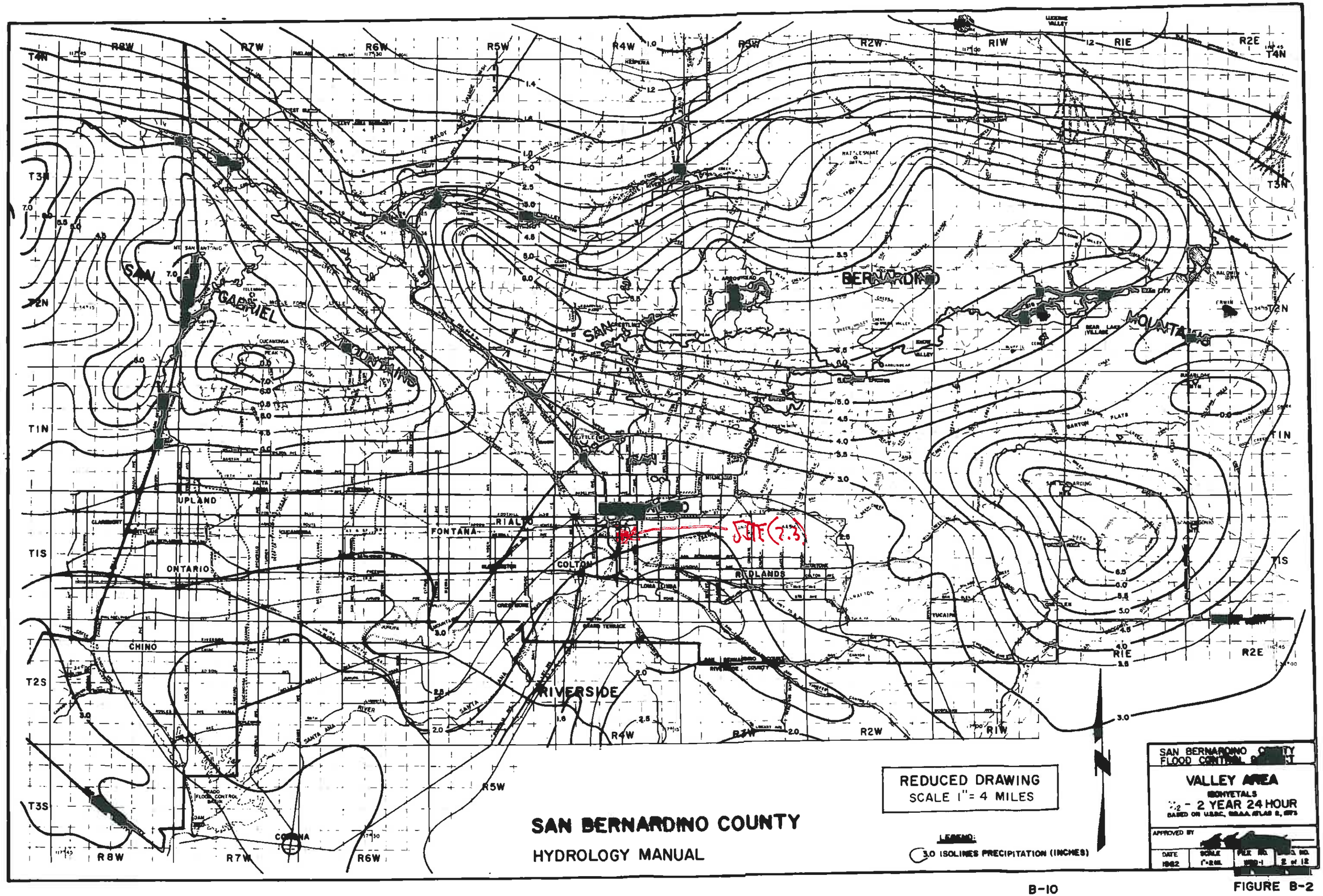

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
3.0 ISOLINES PRECIPITATION (INCHES)
VALLEY AREA
ISOHYETALS
½ - 2 YEAR 24 HOUR
BASED ON U.S.B.C., S.B.A. ATLAS 2, 1973
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FILE NO. HYD-1
SHEET NO. 2 of 12
SAN BERNARDINO
RIVERSIDE
FONTANA
RIALTO
COLTON
REDLANDS
UPLAND
ONTARIO
CHINO
CORONA
BERNARDINO
MOUNTAINS
GABRIEL
MOUNTAINS
SAN
JETE (7.3)
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-2

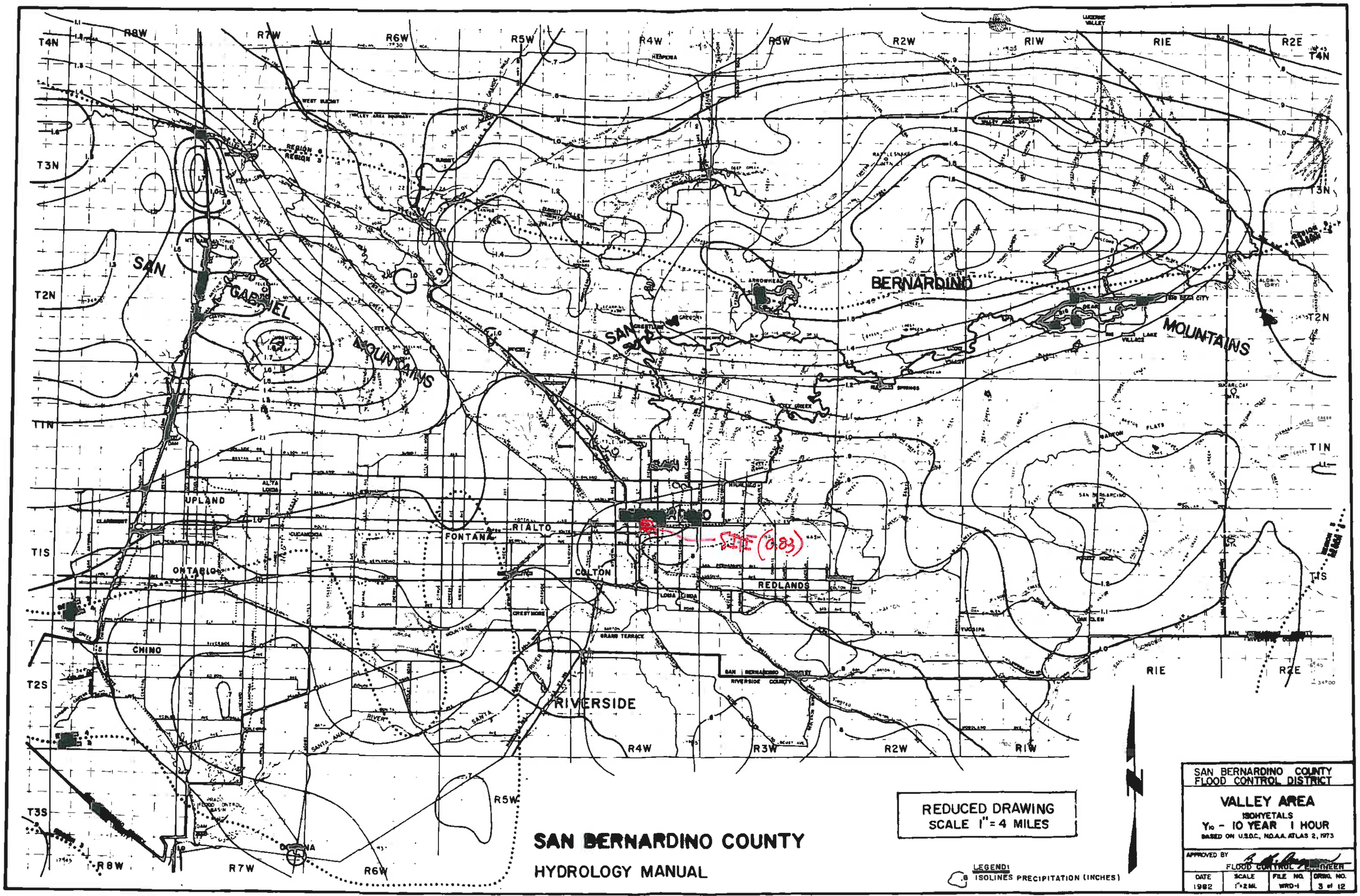
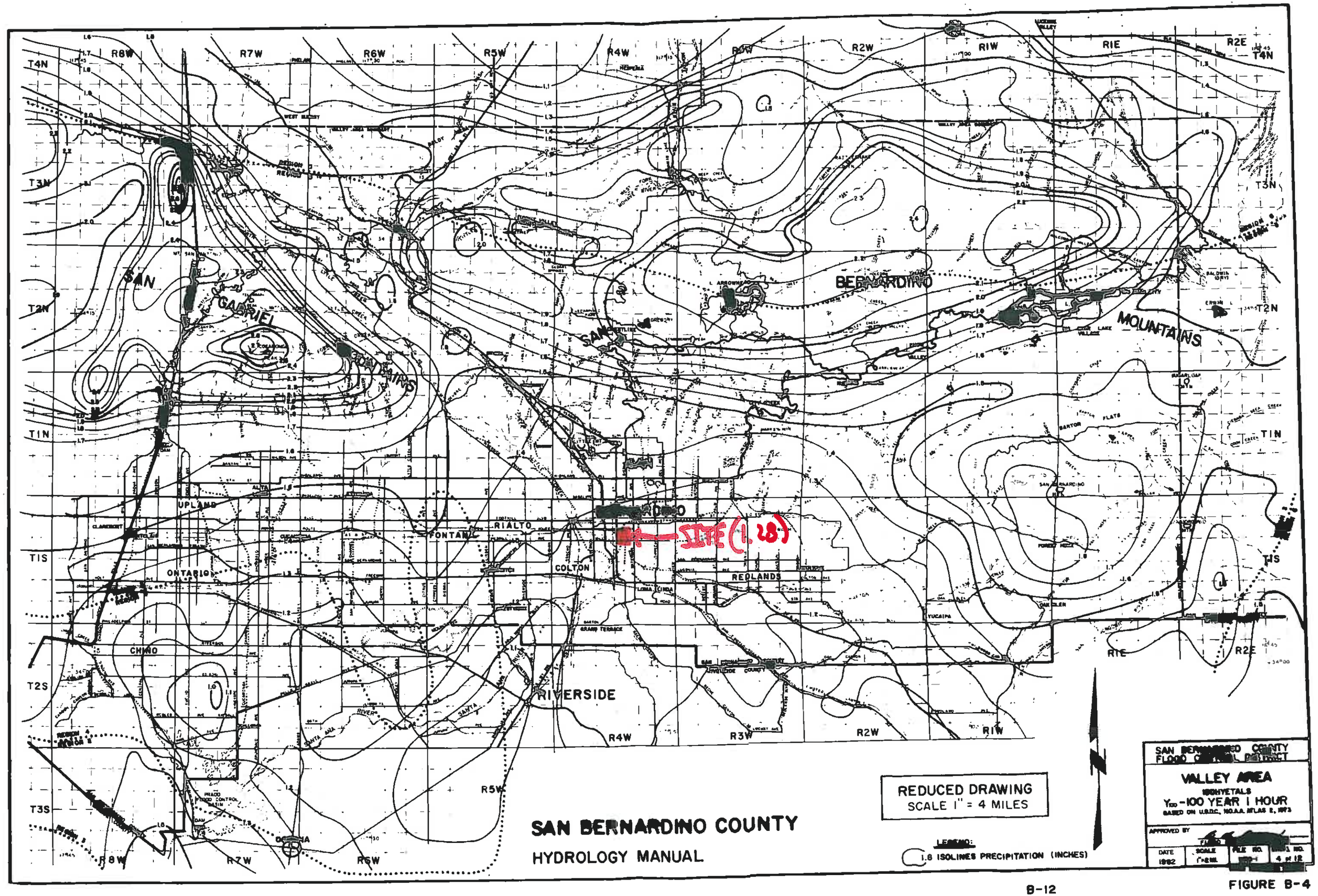

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y10 - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
DRWG. NO. 3 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
SAN BERNARDINO
L. ARROWHEAD
BIG BEAR CITY
SITE (0.83)
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-3


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
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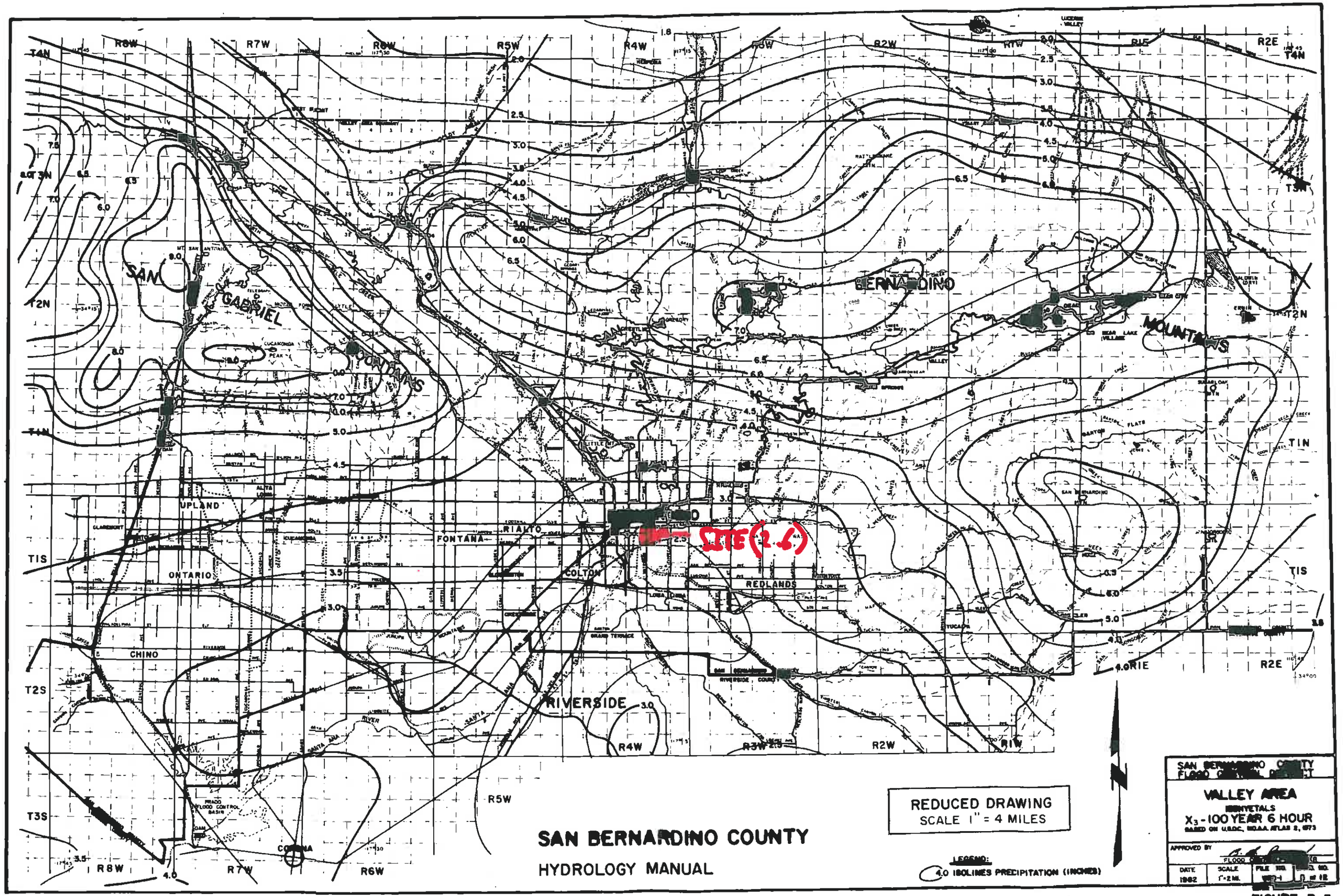
1.8 ISOLINES PRECIPITATION (INCHES)
SITE (1.28)
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
YUCAIPA
VALLEY AREA
ISOHYETALS
Y100 -100 YEAR 1 HOUR
BASED ON U.B.C., NOAA ATLAS 2, 1973
DATE 1982
SCALE 1"=2MI.
FILE NO.
4 of 12

FIGURE B-4


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
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LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
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SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
CORONA
SITE (2.6)
VALLEY AREA
X3 - 100 YEAR 6 HOUR
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-5

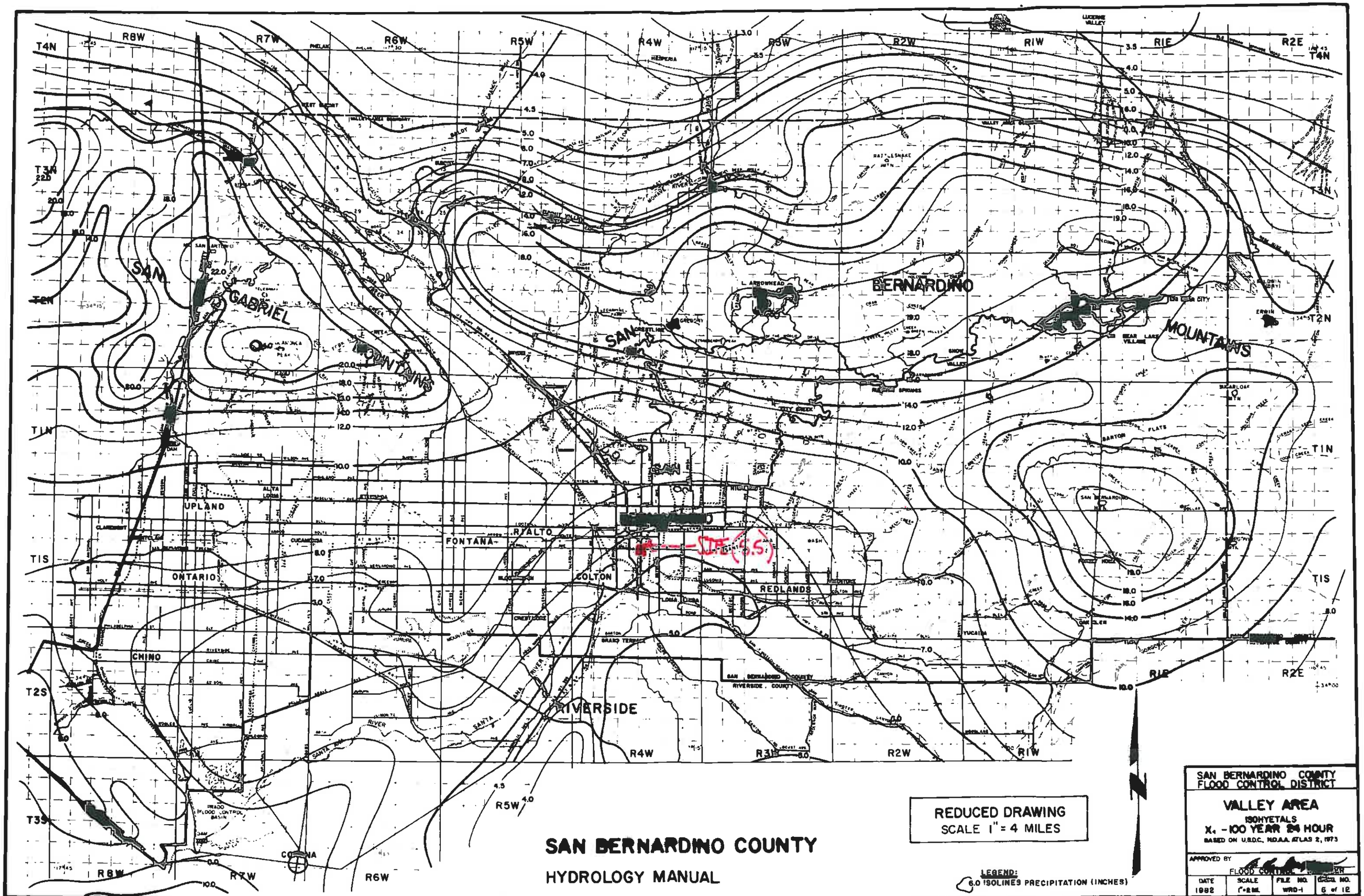
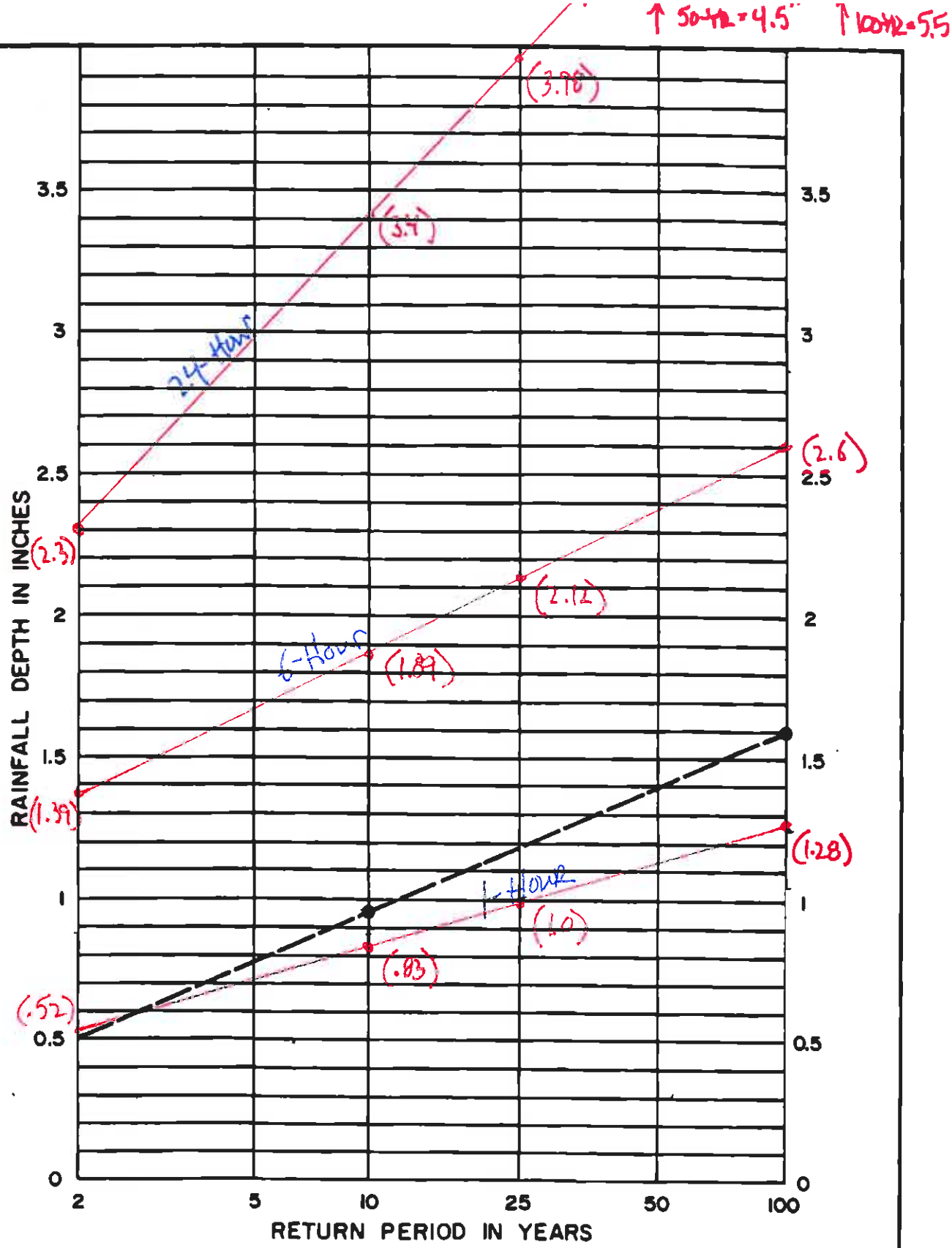

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X, - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE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

FIGURE B-6



NOTE:

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

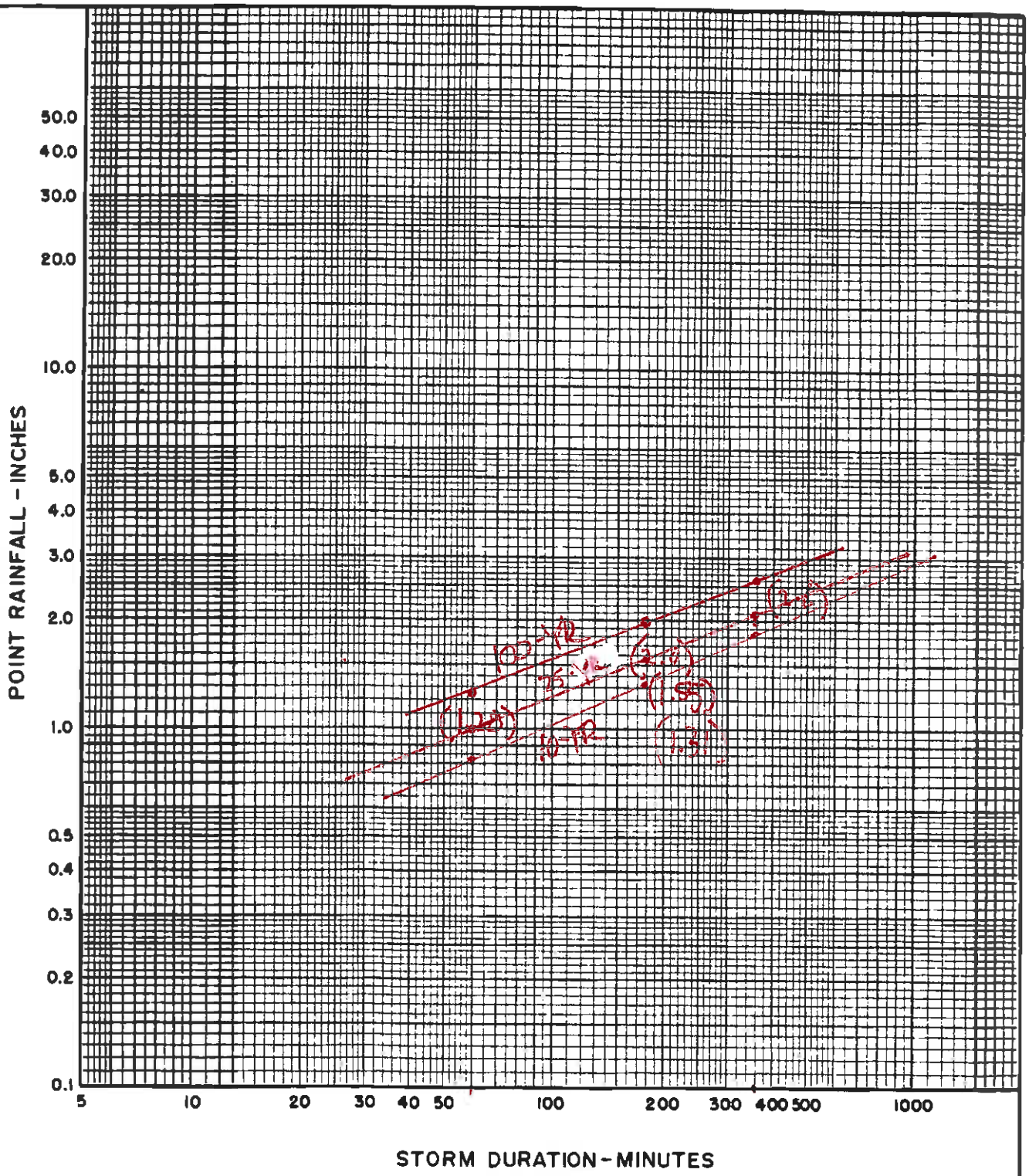
REFERENCE: NOAA ATLAS 2, VOLUME XI - CAL., 1973

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

FIGURE D-2

70



PROJECT LOCATION _____

NOTES _____

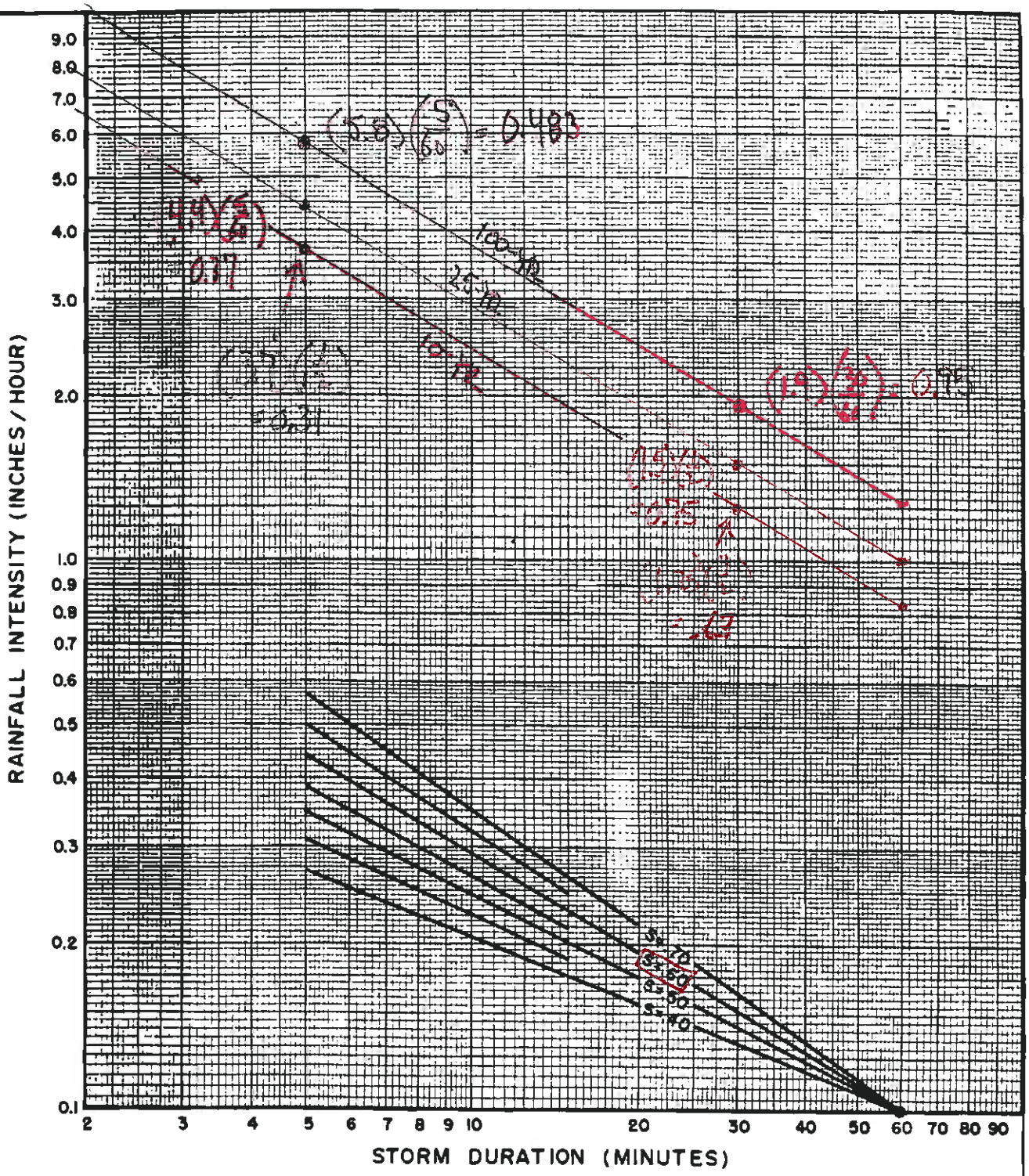
_____

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

AREA - AVERAGED
MASS RAINFALL
PLOTTING SHEET

FIGURE E-8



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

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Clenegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

   Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (2 of 2)

27

TABLE C.1. CURVE NUMBER RELATIONSHIPS

CN for AMC Condition II	Corresponding CN for AMC Condition I	III
100	100	100
95	87	99
90	78	98
85	70	97
80	63	94
75	57	91
70	51	87
65	45	83
60	40	79
55	35	75
50	31	70
45	27	65
40	23	60
35	19	55
30	15	50
25	12	45
20	9	39
15	7	33
10	4	26
5	2	17
0	0	0

C.6. ESTIMATION OF LOSS RATES

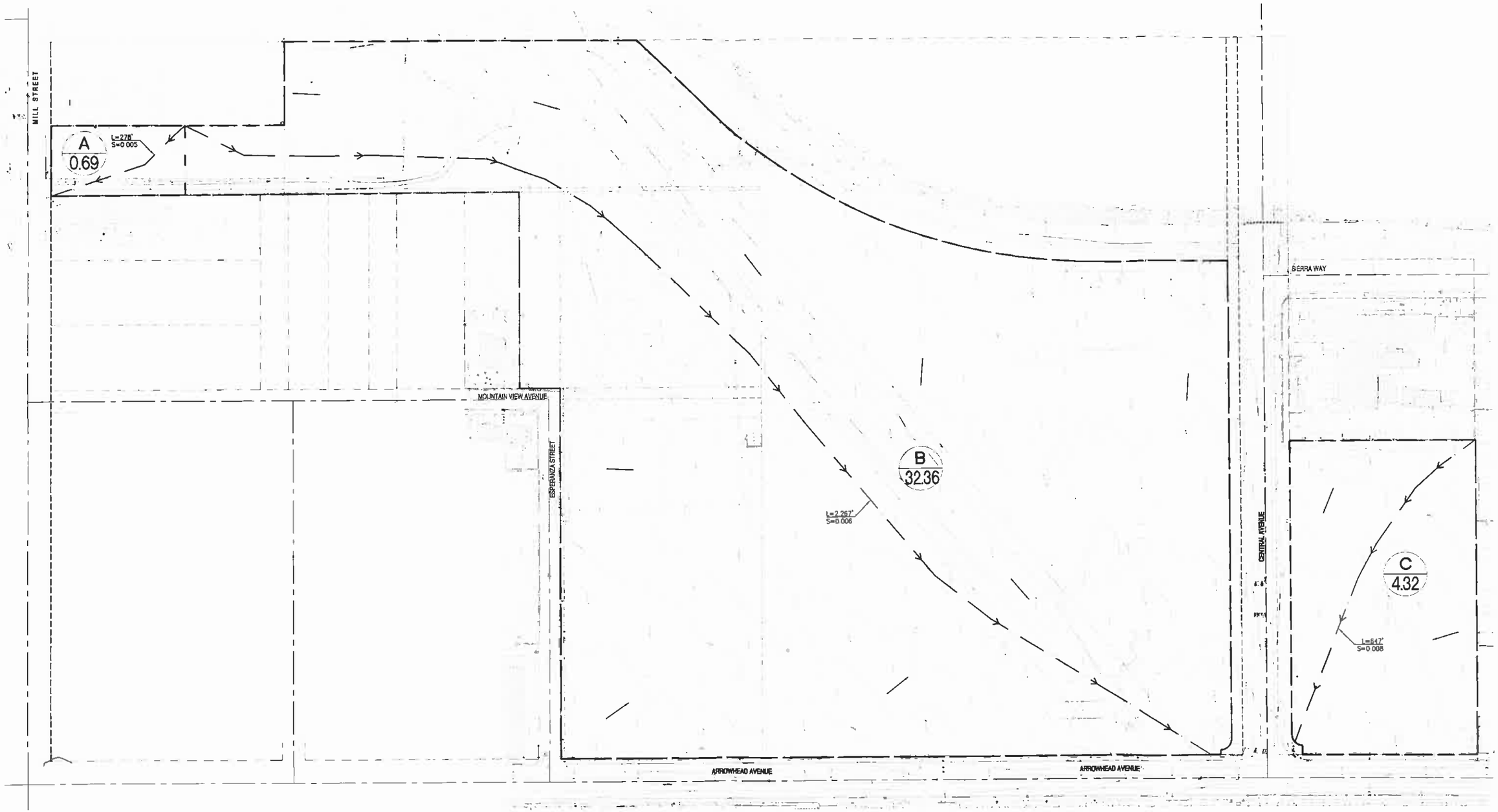
In estimating loss rates for design hydrology, a watershed curve number (CN) is determined for each soil-cover complex within the watershed using Figure C-3. The working range of CN values is between 0 and 98, where a low CN indicates low runoff potential (high infiltration), and a high CN indicates high runoff potential (low infiltration). Selection of a CN takes into account the major factors affecting loss rates on pervious surfaces including the hydrologic soil group, cover type and quality, and antecedent moisture condition (AMC).

Also included in the CN selection are the effects of "initial abstraction" (Ia) which represents the combined effects of other effective rainfall losses including depression storage, vegetation interception, evaporation, and transpiration, among other factors.

SECTION 3.0

EXISTING SITE HYDROLOGIC ANALYSIS

Existing On-Site Hydrology Map
AES 10-Year, 25-Year and 100-Year Calculations



LEGEND:

- DRAINAGE BOUNDARY
- DRAINAGE FLOW PATH
- DIRECTION OF FLOW
- A / 1.00 — DRAINAGE SUBAREA DESIGNATION / DRAINAGE SUBAREA IN ACRES

IMPERVIOUS AREA = 4.1%

GRAPHIC SCALE

(IN FEET)
1 inch = 80 ft.

NATIONAL ORANGE SHOW

EXISTING HYDROLOGY MAP

SAN BERNARDINO, CA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
760 S Old Springs Road, Ste 210
Anaheim Hills, California 92808
(714) 685-6860

10-YEAR ANALYSIS

10-Year Existing Site Analysis

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 37.37
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.261
LOW LOSS FRACTION = 0.395
TIME OF CONCENTRATION(MIN.) = 32.12
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 6.05
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 4.54

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
0.48	0.0241	1.23	.Q	.	.	.	.
1.01	0.0788	1.24	.Q	.	.	.	.
1.55	0.1345	1.28	.Q	.	.	.	.
2.08	0.1914	1.29	.Q	.	.	.	.
2.62	0.2495	1.33	.Q	.	.	.	.
3.15	0.3089	1.35	.Q	.	.	.	.
3.69	0.3698	1.40	Q	.	.	.	.
4.22	0.4321	1.42	.Q	.	.	.	.
4.76	0.4960	1.47	.Q	.	.	.	.
5.29	0.5616	1.50	.Q	.	.	.	.
5.83	0.6291	1.55	.Q	.	.	.	.
6.36	0.6986	1.59	.Q	.	.	.	.
6.90	0.7702	1.65	.Q	.	.	.	.
7.43	0.8442	1.69	.Q	.	.	.	.
7.97	0.9208	1.77	.Q	.	.	.	.
8.51	1.0001	1.82	.Q	.	.	.	.
9.04	1.0827	1.92	.Q	.	.	.	.
9.58	1.1688	1.97	.Q	.	.	.	.
10.11	1.2589	2.10	Q	.	.	.	.
10.65	1.3534	2.17	. Q	.	.	.	.
11.18	1.4533	2.34	. Q	.	.	.	.
11.72	1.5590	2.44	. Q	.	.	.	.
12.25	1.6753	2.82	. Q	.	.	.	.
12.79	1.8149	3.50	. Q	.	.	.	.
13.32	1.9777	3.86	. Q	.	.	.	.
13.86	2.1538	4.10	. Q	.	.	.	.
14.39	2.3359	4.13	. Q	.	.	.	.
14.93	2.5204	4.20	. Q	.	.	.	.
15.46	2.7451	5.95	. Q	.	.	.	.
16.00	3.0505	7.85	. Q	.	.	.	.
16.54	3.9296	31.89	.	.	.	.Q	.
17.07	4.7430	4.88	. Q	.	.	.	.
17.61	4.9478	4.38	. Q	.	.	.	.
18.14	5.1259	3.67	. Q	.	.	.	.
18.68	5.2634	2.55	. Q	.	.	.	.
19.21	5.3696	2.25	. Q	.	.	.	.
19.75	5.4644	2.03	. Q	.	.	.	.
20.28	5.5507	1.87	.Q	.	.	.	.
20.82	5.6302	1.73	.Q	.	.	.	.
21.35	5.7043	1.62	.Q	.	.	.	.
21.89	5.7738	1.52	.Q	.	.	.	.
22.42	5.8395	1.44	.Q	.	.	.	.
22.96	5.9018	1.37	.Q	.	.	.	.
23.49	5.9613	1.31	.Q	.	.	.	.
24.03	6.0182	1.26	.Q	.	.	.	.
24.57	6.0461	0.00	Q	.	.	.	.

PROJECT: 1H420 Existing **DATE:** 6/09/11

ENGINEER:

1. Enter the design storm return frequency **(years)** 10
2. Enter catchment lag **(hours)**
3. Enter the catchment area **(acres)** 37.37
4. Enter baseflow **(cfs/square mile)** 6
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.261
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.395
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.31

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.63

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 0.83

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 1.31

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 1.89

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 3.4
9. Enter 24-hour storm unit interval **(minutes)**

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

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10-Year Existing Site Analysis

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.40 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.69	96.00	86.	0.272	0.605
2	32.36	96.00	86.	0.272	0.605
3	4.32	96.00	86.	0.272	0.605

TOTAL AREA (Acres) = 37.37

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.261

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.395

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2006 Advanced Engineering Software (aes)
              Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 *************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                            *
* 10-Yr Existing 1-Hour Rational                                           *
*                                                                          *
 ****************************************************************************

  FILE NAME: 11420EX.DAT
  TIME/DATE OF STUDY: 09:54 06/09/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) = 0.8080
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =  2267.00
ELEVATION DATA: UPSTREAM(FEET) =     14.60  DOWNSTREAM(FEET) =      1.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   32.116
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.176
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL POOR COVER
"BARREN"                    B       37.37      0.27      1.000    86   32.12
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =     30.39
TOTAL AREA(ACRES) =     37.37   PEAK FLOW RATE(CFS) =     30.39
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =     37.37  TC(MIN.) =     32.12
EFFECTIVE AREA(ACRES) =     37.37  AREA-AVERAGED Fm(INCH/HR)=  0.27
AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS)    =     30.39
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

25-YEAR ANALYSIS

25-Year Existing Site Analysis

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 37.37
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.261
LOW LOSS FRACTION = 0.353
TIME OF CONCENTRATION(MIN.) = 32.12
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 7.53
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 4.86

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0. 10.0 20.0 30.0 40.0
0.48	0.0324	1.65	.Q . . . .
1.01	0.1057	1.67	.Q . . . .
1.55	0.1804	1.71	.Q . . . .
2.08	0.2566	1.73	.Q . . . .
2.62	0.3343	1.78	.Q . . . .
3.15	0.4137	1.81	.Q . . . .
3.69	0.4949	1.86	.Q . . . .
4.22	0.5779	1.89	.Q . . . .
4.76	0.6630	1.95	.Q . . . .
5.29	0.7502	1.99	.Q . . . .
5.83	0.8398	2.06	.Q . . . .
6.36	0.9318	2.10	.Q . . . .
6.90	1.0265	2.18	.Q . . . .
7.43	1.1242	2.23	.Q . . . .
7.97	1.2252	2.33	.Q . . . .
8.51	1.3296	2.39	.Q . . . .
9.04	1.4380	2.51	.Q . . . .
9.58	1.5508	2.58	.Q . . . .
10.11	1.6685	2.74	.Q . . . .
10.65	1.7917	2.83	.Q . . . .
11.18	1.9214	3.04	.Q . . . .
11.72	2.0584	3.16	.Q . . . .
12.25	2.2044	3.44	.Q . . . .
12.79	2.3602	3.60	.Q . . . .
13.32	2.5293	4.04	.Q . . . .
13.86	2.7146	4.33	.Q . . . .
14.39	2.9161	4.78	.Q . . . .
14.93	3.1352	5.13	.Q . . . .
15.46	3.4108	7.33	.Q . . . .
16.00	3.8033	10.41	.Q . . . .
16.54	4.9116	39.70	. . . . Q.
17.07	5.9219	5.97	.Q . . . .
17.61	6.1576	4.69	.Q . . . .
18.14	6.3455	3.80	.Q . . . .
18.68	6.5025	3.29	.Q . . . .
19.21	6.6401	2.93	.Q . . . .
19.75	6.7636	2.66	.Q . . . .
20.28	6.8766	2.45	.Q . . . .
20.82	6.9812	2.28	.Q . . . .
21.35	7.0790	2.14	.Q . . . .
21.89	7.1711	2.02	.Q . . . .
22.42	7.2584	1.92	.Q . . . .
22.96	7.3415	1.83	.Q . . . .
23.49	7.4209	1.76	.Q . . . .
24.03	7.4971	1.69	.Q . . . .
24.57	7.5345	0.00	Q . . . .

PROJECT: 11-420 Existing **DATE:** 6/8/11

ENGINEER:

1. Enter the design storm return frequency **(years)** 25
2. Enter catchment lag **(hours)** 32.12 min
3. Enter the catchment area **(acres)** 37.37
4. Enter baseflow **(cfs/square mile)** Ø
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.261
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.353
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.37

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.75

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 1.0

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 1.55

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 2.12

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 3.98
9. Enter 24-hour storm unit interval **(minutes)**

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

114

25-Year Existing Site Analysis

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

   TOTAL 24-HOUR DURATION RAINFALL DEPTH =    3.98 (inches)

   SOIL-COVER    AREA     PERCENT OF   SCS CURVE   LOSS RATE
     TYPE     (Acres)  PERVIOUS AREA    NUMBER   Fp(in./hr.)   YIELD
      1        0.69      96.00          86.      0.272      0.647
      2       32.36      96.00          86.      0.272      0.647
      3        4.32      96.00          86.      0.272      0.647

   TOTAL AREA (Acres) =    37.37

   AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.261

   AREA-AVERAGED LOW LOSS FRACTION, Y = 0.353
==========================================================================
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2006 Advanced Engineering Software (aes)
              Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                            *
* 25-Yr Existing 1-Hour Rational                                           *
*                                                                          *
 ****************************************************************************

  FILE NAME: 11420EX.DAT
  TIME/DATE OF STUDY: 09:35 06/09/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 0.9716
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =  2267.00
ELEVATION DATA: UPSTREAM(FEET) =     14.60  DOWNSTREAM(FEET) =      1.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   32.116
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.414
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL POOR COVER
"BARREN"                    B       37.37      0.27     1.000    86   32.12
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =     38.40
TOTAL AREA(ACRES) =     37.37   PEAK FLOW RATE(CFS) =     38.40
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =     37.37  TC(MIN.) =     32.12
EFFECTIVE AREA(ACRES) =     37.37  AREA-AVERAGED Fm(INCH/HR)=  0.27
AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS)    =     38.40
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

100-YEAR ANALYSIS

100-Year Existing Site Analysis

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 37.37
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.035
LOW LOSS FRACTION = 0.064
TIME OF CONCENTRATION(MIN.) = 32.12
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 14.46
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 2.67

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	17.5	35.0	52.5	70.0
0.48	0.0769	3.92	.Q	.	.	.	.
1.01	0.2510	3.95	.Q	.	.	.	.
1.55	0.4278	4.04	.Q	.	.	.	.
2.08	0.6076	4.09	.Q	.	.	.	.
2.62	0.7904	4.18	.Q	.	.	.	.
3.15	0.9766	4.23	.Q	.	.	.	.
3.69	1.1662	4.34	.Q	.	.	.	.
4.22	1.3595	4.40	.Q	.	.	.	.
4.76	1.5568	4.52	.Q	.	.	.	.
5.29	1.7582	4.59	.Q	.	.	.	.
5.83	1.9642	4.73	.Q	.	.	.	.
6.36	2.1750	4.80	.Q	.	.	.	.
6.90	2.3910	4.96	.Q	.	.	.	.
7.43	2.6127	5.05	.Q	.	.	.	.
7.97	2.8405	5.25	.Q	.	.	.	.
8.51	3.0750	5.35	.Q	.	.	.	.
9.04	3.3170	5.59	.Q	.	.	.	.
9.58	3.5670	5.72	.Q	.	.	.	.
10.11	3.8264	6.01	.Q	.	.	.	.
10.65	4.0958	6.17	.Q	.	.	.	.
11.18	4.3773	6.55	.Q	.	.	.	.
11.72	4.6720	6.77	.Q	.	.	.	.
12.25	4.9727	6.83	.Q	.	.	.	.
12.79	5.2428	5.38	.Q	.	.	.	.
13.32	5.4975	6.14	.Q	.	.	.	.
13.86	5.7799	6.63	.Q	.	.	.	.
14.39	6.1126	8.40	.Q	.	.	.	.
14.93	6.5137	9.73	.Q	.	.	.	.
15.46	7.0355	13.86	.Q	.	.	.	.
16.00	7.7853	20.04	.Q	.	.	.	.
16.54	9.5622	60.29	.	.	.	Q	.
17.07	11.1460	11.31	.Q	.	.	.	.
17.61	11.5566	7.25	.Q	.	.	.	.
18.14	11.8437	5.72	.Q	.	.	.	.
18.68	12.1255	7.01	.Q	.	.	.	.
19.21	12.4212	6.35	.Q	.	.	.	.
19.75	12.6913	5.86	.Q	.	.	.	.
20.28	12.9417	5.47	.Q	.	.	.	.
20.82	13.1765	5.15	.Q	.	.	.	.
21.35	13.3983	4.88	.Q	.	.	.	.
21.89	13.6093	4.65	.Q	.	.	.	.
22.42	13.8108	4.46	.Q	.	.	.	.
22.96	14.0042	4.29	.Q	.	.	.	.
23.49	14.1905	4.13	.Q	.	.	.	.
24.03	14.3703	4.00	.Q	.	.	.	.
24.57	14.4587	0.00	Q	.	.	.	.

PROJECT: 11-120 Existing **DATE:** 6/09/11

ENGINEER: J

1. Enter the design storm return frequency **(years)** 100
2. Enter catchment lag **(hours)** 32.12 min
3. Enter the catchment area **(acres)** 37.37
4. Enter baseflow **(cfs/square mile)** Ø
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.035
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.064
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.48

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.95

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 1.28

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 2.0

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 2.6

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 5.5
9. Enter 24-hour storm unit interval **(minutes)** 0.48 hrs

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

100-Year Existing Site Analysis

==========

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 5.50 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.69	96.00	97.(86.)	0.036	0.936
2	32.36	96.00	97.(86.)	0.036	0.936
3	4.32	96.00	97.(86.)	0.036	0.936

TOTAL AREA (Acres) = 37.37

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.035

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.064

==========

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2006 Advanced Engineering Software (aes)
              Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 *************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                             *
* 100-Yr Existing 1-Hour Rational                                           *
*                                                                           *
 ***************************************************************************

  FILE NAME: 11420EX.DAT
  TIME/DATE OF STUDY: 17:24 06/08/2011
============================================================================
  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 = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.2800
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
```

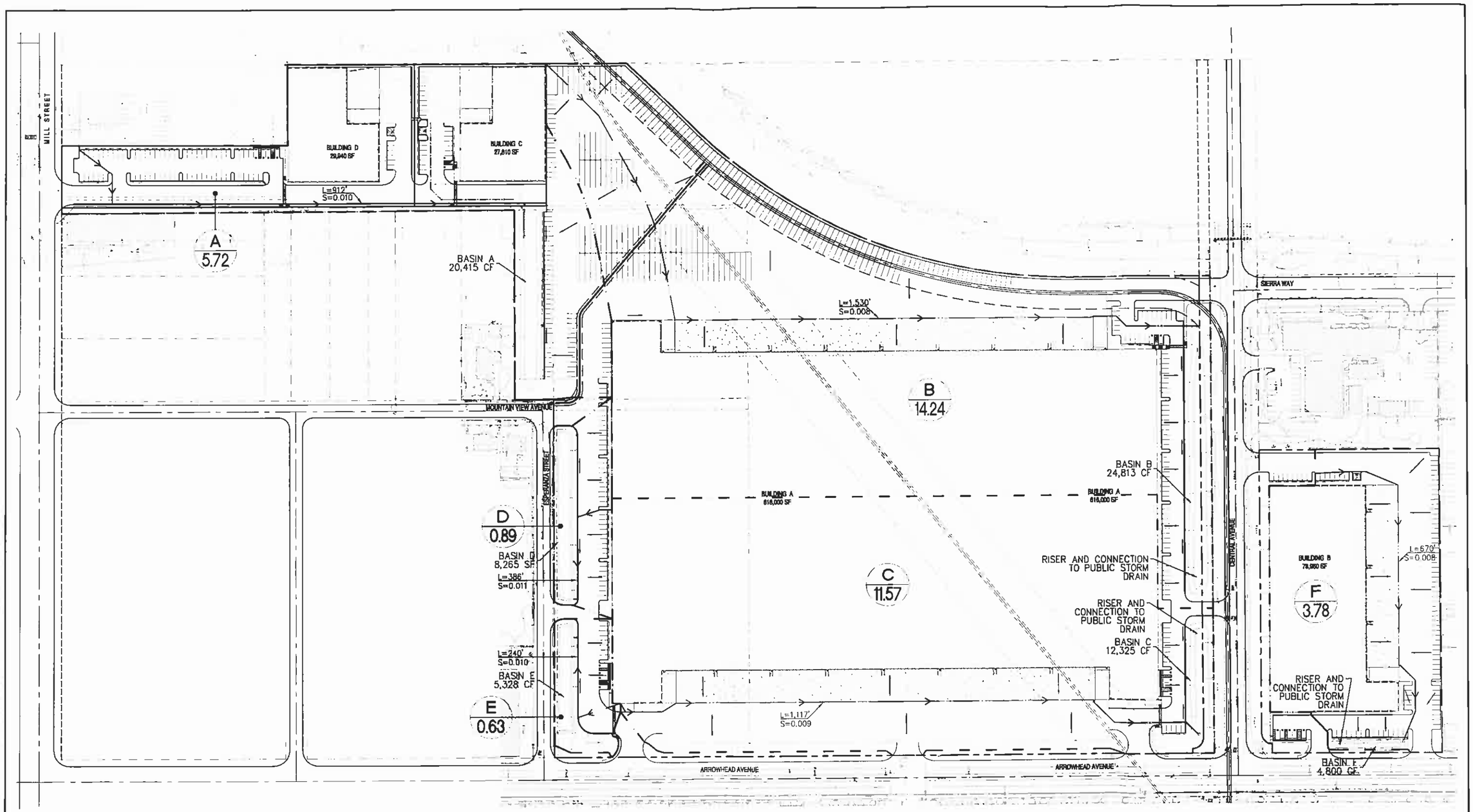
```
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =  2267.00
ELEVATION DATA: UPSTREAM(FEET) =     14.60  DOWNSTREAM(FEET) =      1.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   32.116
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.862
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 POOR COVER
"BARREN"                    B       37.37      0.03     1.000    97   32.12
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.03
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =     61.52
TOTAL AREA(ACRES) =     37.37   PEAK FLOW RATE(CFS) =     61.52
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =     37.37  TC(MIN.) =     32.12
EFFECTIVE AREA(ACRES) =     37.37  AREA-AVERAGED Fm(INCH/HR)=  0.03
AREA-AVERAGED Fp(INCH/HR) =  0.03  AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS)    =     61.52
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

SECTION 4.0

PROPOSED SITE HYDROLOGIC ANALYSIS

Proposed On-Site Hydrology Map
AES 10-Year, 25-Year and 100-Year Calculations
Basin Detention Analysis



LEGEND:

DRAINAGE BOUNDARY

DRAINAGE FLOW PATH

DIRECTION OF FLOW

A / 1.00 — DRAINAGE SUBAREA DESIGNATION / DRAINAGE SUBAREA IN ACRES

GRAPHIC SCALE

(IN FEET)
1 inch = 80 ft.

NATIONAL ORANGE SHOW

PROPOSED HYDROLOGY MAP

SAN BERNARDINO, CA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
162 S. Old Springs Road, Ste. 210
Anaheim Hills, California 92808
(714) 685-6860

10-YEAR ANALYSIS

Area A Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 5.72
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 11.66
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.24
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.38

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.06	0.0000	0.00 Q	.	.	.	.	
0.26	0.0021	0.26 Q	.	.	.	.	
0.45	0.0063	0.26 Q	.	.	.	.	
0.65	0.0105	0.26 Q	.	.	.	.	
0.84	0.0148	0.27 Q	.	.	.	.	
1.04	0.0191	0.27 Q	.	.	.	.	
1.23	0.0234	0.27 Q	.	.	.	.	
1.43	0.0277	0.27 Q	.	.	.	.	
1.62	0.0321	0.27 Q	.	.	.	.	
1.81	0.0365	0.28 Q	.	.	.	.	
2.01	0.0410	0.28 Q	.	.	.	.	
2.20	0.0455	0.28 Q	.	.	.	.	
2.40	0.0500	0.28 Q	.	.	.	.	
2.59	0.0546	0.29 Q	.	.	.	.	
2.79	0.0592	0.29 Q	.	.	.	.	
2.98	0.0638	0.29 Q	.	.	.	.	
3.17	0.0685	0.29 Q	.	.	.	.	
3.37	0.0732	0.30 Q	.	.	.	.	
3.56	0.0780	0.30 Q	.	.	.	.	
3.76	0.0828	0.30 Q	.	.	.	.	
3.95	0.0876	0.30 Q	.	.	.	.	
4.15	0.0925	0.31 Q	.	.	.	.	
4.34	0.0975	0.31 Q	.	.	.	.	
4.53	0.1025	0.31 Q	.	.	.	.	
4.73	0.1075	0.31 Q	.	.	.	.	
4.92	0.1126	0.32 Q	.	.	.	.	
5.12	0.1177	0.32 Q	.	.	.	.	
5.31	0.1229	0.33 Q	.	.	.	.	
5.51	0.1281	0.33 Q	.	.	.	.	
5.70	0.1334	0.33 Q	.	.	.	.	
5.89	0.1388	0.33 Q	.	.	.	.	
6.09	0.1442	0.34 Q	.	.	.	.	
6.28	0.1497	0.34 Q	.	.	.	.	
6.48	0.1552	0.35 Q	.	.	.	.	
6.67	0.1608	0.35 Q	.	.	.	.	
6.87	0.1665	0.36 Q	.	.	.	.	
7.06	0.1722	0.36 Q	.	.	.	.	
7.26	0.1780	0.36 Q	.	.	.	.	
7.45	0.1839	0.37 Q	.	.	.	.	
7.64	0.1898	0.37 Q	.	.	.	.	
7.84	0.1959	0.38 Q	.	.	.	.	
8.03	0.2020	0.38 Q	.	.	.	.	
8.23	0.2082	0.39 Q	.	.	.	.	
8.42	0.2145	0.40 Q	.	.	.	.	
8.62	0.2209	0.40 Q	.	.	.	.	
8.81	0.2273	0.41 Q	.	.	.	.	
9.00	0.2339	0.41 Q	.	.	.	.	

9.20	0.2406	0.42	Q	.	.	.	.	.
9.39	0.2474	0.42	Q	.	.	.	.	.
9.59	0.2543	0.43	Q	.	.	.	.	.
9.78	0.2613	0.44	Q	.	.	.	.	.
9.98	0.2684	0.45	Q	.	.	.	.	.
10.17	0.2757	0.46	Q	.	.	.	.	.
10.36	0.2831	0.47	Q	.	.	.	.	.
10.56	0.2907	0.47	Q	.	.	.	.	.
10.75	0.2984	0.49	Q	.	.	.	.	.
10.95	0.3063	0.49	Q	.	.	.	.	.
11.14	0.3143	0.51	.Q	.	.	.	.	.
11.34	0.3225	0.52	.Q	.	.	.	.	.
11.53	0.3309	0.53	.Q	.	.	.	.	.
11.72	0.3396	0.54	.Q	.	.	.	.	.
11.92	0.3484	0.56	.Q	.	.	.	.	.
12.11	0.3575	0.57	.Q	.	.	.	.	.
12.31	0.3680	0.74	.Q	.	.	.	.	.
12.50	0.3799	0.75	.Q	.	.	.	.	.
12.70	0.3921	0.77	.Q	.	.	.	.	.
12.89	0.4047	0.79	.Q	.	.	.	.	.
13.09	0.4176	0.82	.Q	.	.	.	.	.
13.28	0.4309	0.84	.Q	.	.	.	.	.
13.47	0.4446	0.87	.Q	.	.	.	.	.
13.67	0.4588	0.89	.Q	.	.	.	.	.
13.86	0.4735	0.94	.Q	.	.	.	.	.
14.06	0.4889	0.97	.Q	.	.	.	.	.
14.25	0.5032	0.81	.Q	.	.	.	.	.
14.45	0.5165	0.85	.Q	.	.	.	.	.
14.64	0.5308	0.93	.Q	.	.	.	.	.
14.83	0.5462	0.98	.Q	.	.	.	.	.
15.03	0.5630	1.11	. Q	.	.	.	.	.
15.22	0.5816	1.20	. Q	.	.	.	.	.
15.42	0.6026	1.43	. Q	.	.	.	.	.
15.61	0.6266	1.55	. Q	.	.	.	.	.
15.81	0.6568	2.21	Q	.	.	.	.	.
16.00	0.7003	3.20	. Q	.	.	.	.	.
16.19	0.8148	11.06	.	.	.	. Q	.	.
16.39	0.9181	1.81	. Q	.	.	.	.	.
16.58	0.9431	1.30	. Q	.	.	.	.	.
16.78	0.9619	1.04	. Q	.	.	.	.	.
16.97	0.9774	0.89	.Q	.	.	.	.	.
17.17	0.9918	0.90	.Q	.	.	.	.	.
17.36	1.0064	0.92	.Q	.	.	.	.	.
17.55	1.0206	0.85	.Q	.	.	.	.	.
17.75	1.0339	0.80	.Q	.	.	.	.	.
17.94	1.0465	0.76	.Q	.	.	.	.	.
18.14	1.0583	0.71	.Q	.	.	.	.	.
18.33	1.0684	0.55	.Q	.	.	.	.	.
18.53	1.0770	0.52	.Q	.	.	.	.	.
18.72	1.0852	0.50	.Q	.	.	.	.	.
18.92	1.0931	0.48	Q	.	.	.	.	.
19.11	1.1006	0.46	Q	.	.	.	.	.
19.30	1.1079	0.44	Q	.	.	.	.	.
19.50	1.1149	0.43	Q	.	.	.	.	.
19.69	1.1217	0.42	Q	.	.	.	.	.
19.89	1.1283	0.40	Q	.	.	.	.	.
20.08	1.1347	0.39	Q	.	.	.	.	.
20.28	1.1409	0.38	Q	.	.	.	.	.
20.47	1.1469	0.37	Q	.	.	.	.	.
20.66	1.1528	0.36	Q	.	.	.	.	.
20.86	1.1585	0.35	Q	.	.	.	.	.
21.05	1.1641	0.34	Q	.	.	.	.	.
21.25	1.1696	0.34	Q	.	.	.	.	.
21.44	1.1750	0.33	Q	.	.	.	.	.
21.64	1.1802	0.32	Q	.	.	.	.	.
21.83	1.1853	0.32	Q	.	.	.	.	.
22.02	1.1904	0.31	Q	.	.	.	.	.
22.22	1.1953	0.30	Q	.	.	.	.	.
22.41	1.2002	0.30	Q	.	.	.	.	.
22.61	1.2049	0.29	Q	.	.	.	.	.

22.80	1.2096	0.29	Q	.	.	.	.
23.00	1.2142	0.28	Q	.	.	.	.
23.19	1.2187	0.28	Q	.	.	.	.
23.38	1.2232	0.28	Q	.	.	.	.
23.58	1.2276	0.27	Q	.	.	.	.
23.77	1.2319	0.27	Q	.	.	.	.
23.97	1.2362	0.26	Q	.	.	.	.
24.16	1.2404	0.26	Q	.	.	.	.
24.36	1.2424	0.00	Q	.	.	.	.

Area B Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 14.24
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 15.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 3.09
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.95

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.25	0.0067	0.65	Q				
0.50	0.0201	0.65	Q				
0.75	0.0337	0.66	Q				
1.00	0.0474	0.66	Q				
1.25	0.0612	0.67	Q				
1.50	0.0751	0.68	Q				
1.75	0.0892	0.69	Q				
2.00	0.1034	0.69	Q				
2.25	0.1178	0.70	Q				
2.50	0.1323	0.70	Q				
2.75	0.1470	0.72	Q				
3.00	0.1618	0.72	Q				
3.25	0.1768	0.73	Q				
3.50	0.1919	0.74	Q				
3.75	0.2073	0.75	Q				
4.00	0.2228	0.75	.Q				
4.25	0.2385	0.77	.Q				
4.50	0.2543	0.77	.Q				
4.75	0.2704	0.78	.Q				
5.00	0.2867	0.79	.Q				
5.25	0.3032	0.81	.Q				
5.50	0.3199	0.81	.Q				
5.75	0.3369	0.83	.Q				
6.00	0.3540	0.84	.Q				
6.25	0.3714	0.85	.Q				
6.50	0.3891	0.86	.Q				
6.75	0.4071	0.88	.Q				
7.00	0.4253	0.89	.Q				
7.25	0.4438	0.90	.Q				
7.50	0.4626	0.91	.Q				
7.75	0.4817	0.94	.Q				
8.00	0.5011	0.95	.Q				
8.25	0.5209	0.97	.Q				
8.50	0.5411	0.98	.Q				
8.75	0.5616	1.01	.Q				
9.00	0.5825	1.02	.Q				
9.25	0.6039	1.05	.Q				
9.50	0.6257	1.06	.Q				
9.75	0.6479	1.09	.Q				
10.00	0.6707	1.11	.Q				
10.25	0.6940	1.15	.Q				
10.50	0.7179	1.17	.Q				
10.75	0.7424	1.21	.Q				
11.00	0.7676	1.23	.Q				
11.25	0.7934	1.28	.Q				
11.50	0.8200	1.30	.Q				
11.75	0.8475	1.36	.Q				

12.00	0.8758	1.39	.Q . . . .
12.25	0.9089	1.81	. Q . . . .
12.50	0.9467	1.85	. Q . . . .
12.75	0.9857	1.93	. Q . . . .
13.00	1.0261	1.98	. Q . . . .
13.25	1.0681	2.08	. Q . . . .
13.50	1.1117	2.14	. Q . . . .
13.75	1.1573	2.27	. Q . . . .
14.00	1.2051	2.35	. Q . . . .
14.25	1.2500	2.00	. Q . . . .
14.50	1.2925	2.11	. Q . . . .
14.75	1.3391	2.39	. Q . . . .
15.00	1.3903	2.57	. Q . . . .
15.25	1.4488	3.09	. Q . . . .
15.50	1.5165	3.47	. Q . . . .
15.75	1.6014	4.75	. Q . . . .
16.00	1.7196	6.70	. Q . . .
16.25	2.0316	23.50	. . . .Q .
16.50	2.3142	3.86	. Q . . . .
16.75	2.3830	2.80	. Q . . . .
17.00	2.4351	2.24	. Q . . . .
17.25	2.4834	2.44	. Q . . . .
17.50	2.5314	2.20	. Q . . . .
17.75	2.5751	2.03	. Q . . . .
18.00	2.6155	1.89	. Q . . . .
18.25	2.6497	1.42	.Q . . . .
18.50	2.6781	1.33	.Q . . . .
18.75	2.7047	1.25	.Q . . . .
19.00	2.7299	1.19	.Q . . . .
19.25	2.7538	1.13	.Q . . . .
19.50	2.7766	1.08	.Q . . . .
19.75	2.7984	1.03	.Q . . . .
20.00	2.8193	0.99	.Q . . . .
20.25	2.8395	0.96	Q . . . .
20.50	2.8589	0.92	.Q . . . .
20.75	2.8777	0.90	.Q . . . .
21.00	2.8960	0.87	.Q . . . .
21.25	2.9136	0.84	.Q . . . .
21.50	2.9308	0.82	.Q . . . .
21.75	2.9475	0.80	.Q . . . .
22.00	2.9638	0.78	.Q . . . .
22.25	2.9797	0.76	.Q . . . .
22.50	2.9952	0.74	Q . . . .
22.75	3.0104	0.73	Q . . . .
23.00	3.0252	0.71	Q . . . .
23.25	3.0397	0.70	Q . . . .
23.50	3.0539	0.68	Q . . . .
23.75	3.0679	0.67	Q . . . .
24.00	3.0816	0.66	Q . . . .
24.25	3.0883	0.00	Q . . . .

Area C Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 11.57
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 12.92
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.51
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.76

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.07	0.0000	0.00	Q	.	.	.	.
0.28	0.0047	0.53	Q	.	.	.	.
0.50	0.0141	0.53	Q	.	.	.	.
0.71	0.0236	0.54	Q	.	.	.	.
0.93	0.0332	0.54	Q	.	.	.	.
1.14	0.0428	0.54	Q	.	.	.	.
1.36	0.0525	0.55	Q	.	.	.	.
1.57	0.0623	0.55	Q	.	.	.	.
1.79	0.0722	0.56	Q	.	.	.	.
2.00	0.0822	0.56	Q	.	.	.	.
2.22	0.0922	0.57	Q	.	.	.	.
2.43	0.1024	0.57	Q	.	.	.	.
2.65	0.1126	0.58	Q	.	.	.	.
2.86	0.1230	0.58	Q	.	.	.	.
3.08	0.1334	0.59	Q	.	.	.	.
3.30	0.1439	0.60	Q	.	.	.	.
3.51	0.1546	0.60	Q	.	.	.	.
3.73	0.1653	0.61	Q	.	.	.	.
3.94	0.1762	0.61	Q	.	.	.	.
4.16	0.1871	0.62	Q	.	.	.	.
4.37	0.1982	0.62	Q	.	.	.	.
4.59	0.2094	0.63	Q	.	.	.	.
4.80	0.2207	0.64	Q	.	.	.	.
5.02	0.2321	0.65	Q	.	.	.	.
5.23	0.2437	0.65	Q	.	.	.	.
5.45	0.2554	0.66	Q	.	.	.	.
5.66	0.2672	0.67	Q	.	.	.	.
5.88	0.2792	0.68	Q	.	.	.	.
6.09	0.2913	0.68	Q	.	.	.	.
6.31	0.3035	0.69	Q	.	.	.	.
6.53	0.3160	0.70	Q	.	.	.	.
6.74	0.3285	0.71	Q	.	.	.	.
6.96	0.3413	0.72	Q	.	.	.	.
7.17	0.3542	0.73	Q	.	.	.	.
7.39	0.3673	0.74	Q	.	.	.	.
7.60	0.3806	0.75	.Q	.	.	.	.
7.82	0.3941	0.76	.Q	.	.	.	.
8.03	0.4078	0.78	.Q	.	.	.	.
8.25	0.4216	0.78	.Q	.	.	.	.
8.46	0.4358	0.80	.Q	.	.	.	.
8.68	0.4501	0.81	.Q	.	.	.	.
8.89	0.4647	0.83	.Q	.	.	.	.
9.11	0.4795	0.84	.Q	.	.	.	.
9.32	0.4946	0.86	.Q	.	.	.	.
9.54	0.5100	0.87	.Q	.	.	.	.
9.76	0.5256	0.89	.Q	.	.	.	.
9.97	0.5416	0.90	.Q	.	.	.	.

10.19	0.5579	0.93	.Q . . .
10.40	0.5745	0.94	.Q . . .
10.62	0.5915	0.97	.Q . . .
10.83	0.6089	0.98	.Q . . .
11.05	0.6266	1.02	.Q . . .
11.26	0.6448	1.03	.Q . . .
11.48	0.6635	1.07	.Q . . .
11.69	0.6827	1.09	.Q . . .
11.91	0.7024	1.13	.Q . . .
12.12	0.7227	1.15	.Q . . .
12.34	0.7463	1.49	.Q . . .
12.55	0.7731	1.52	Q . . .
12.77	0.8006	1.58	.Q . . .
12.99	0.8290	1.61	.Q . . .
13.20	0.8583	1.68	.Q . . .
13.42	0.8887	1.72	.Q . . .
13.63	0.9201	1.81	.Q . . .
13.85	0.9529	1.87	.Q . . .
14.06	0.9871	1.98	.Q . . .
14.28	1.0194	1.65	.Q . . .
14.49	1.0498	1.78	.Q . . .
14.71	1.0823	1.87	.Q . . .
14.92	1.1178	2.12	.Q . . .
15.14	1.1570	2.28	. Q . . .
15.35	1.2016	2.74	. Q . . .
15.57	1.2526	2.99	. Q . . .
15.78	1.3167	4.21	Q . . . .
16.00	1.4079	6.04	. Q . . .
16.22	1.6483	20.97	. . . Q .
16.43	1.8654	3.44	. Q . . .
16.65	1.9181	2.48	. Q . . .
16.86	1.9578	1.99	.Q . . .
17.08	1.9905	1.69	.Q . . .
17.29	2.0227	1.92	.Q . . .
17.51	2.0555	1.77	.Q . . .
17.72	2.0859	1.65	.Q . . .
17.94	2.1143	1.55	.Q . . .
18.15	2.1408	1.43	.Q . . .
18.37	2.1633	1.11	.Q . . .
18.58	2.1825	1.05	.Q . . .
18.80	2.2007	1.00	.Q . . .
19.01	2.2181	0.95	.Q . . .
19.23	2.2347	0.91	.Q . . .
19.45	2.2507	0.88	.Q . . .
19.66	2.2661	0.85	.Q . . .
19.88	2.2809	0.82	.Q . . .
20.09	2.2953	0.79	.Q . . .
20.31	2.3092	0.77	.Q . . .
20.52	2.3226	0.75	Q . . .
20.74	2.3357	0.73	Q . . .
20.95	2.3485	0.71	Q . . .
21.17	2.3609	0.69	Q . . .
21.38	2.3730	0.67	Q . . .
21.60	2.3849	0.66	Q . . .
21.81	2.3964	0.64	Q . . .
22.03	2.4077	0.63	Q . . .
22.24	2.4188	0.62	Q . . .
22.46	2.4296	0.60	Q . . .
22.68	2.4403	0.59	Q . . .
22.89	2.4507	0.58	Q . . .
23.11	2.4610	0.57	Q . . .
23.32	2.4710	0.56	Q . . .
23.54	2.4809	0.55	Q . . .
23.75	2.4906	0.54	Q . . .
23.97	2.5002	0.53	Q . . .
24.18	2.5096	0.53	Q . . .
24.40	2.5143	0.00	Q . . .

Area D Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.89
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 8.11
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.19
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.06

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.05	0.0000	0.00 Q	.	.	.	.	
0.19	0.0002	0.04 Q	.	.	.	.	
0.32	0.0007	0.04 Q	.	.	.	.	
0.46	0.0011	0.04 Q	.	.	.	.	
0.59	0.0016	0.04 Q	.	.	.	.	
0.73	0.0021	0.04 Q	.	.	.	.	
0.86	0.0025	0.04 Q	.	.	.	.	
1.00	0.0030	0.04 Q	.	.	.	.	
1.13	0.0034	0.04 Q	.	.	.	.	
1.27	0.0039	0.04 Q	.	.	.	.	
1.40	0.0044	0.04 Q	.	.	.	.	
1.54	0.0049	0.04 Q	.	.	.	.	
1.67	0.0053	0.04 Q	.	.	.	.	
1.81	0.0058	0.04 Q	.	.	.	.	
1.94	0.0063	0.04 Q	.	.	.	.	
2.08	0.0068	0.04 Q	.	.	.	.	
2.21	0.0073	0.04 Q	.	.	.	.	
2.35	0.0078	0.04 Q	.	.	.	.	
2.48	0.0083	0.04 Q	.	.	.	.	
2.62	0.0088	0.04 Q	.	.	.	.	
2.75	0.0093	0.04 Q	.	.	.	.	
2.89	0.0098	0.05 Q	.	.	.	.	
3.02	0.0103	0.05 Q	.	.	.	.	
3.16	0.0108	0.05 Q	.	.	.	.	
3.29	0.0113	0.05 Q	.	.	.	.	
3.43	0.0118	0.05 Q	.	.	.	.	
3.56	0.0123	0.05 Q	.	.	.	.	
3.70	0.0128	0.05 Q	.	.	.	.	
3.84	0.0134	0.05 Q	.	.	.	.	
3.97	0.0139	0.05 Q	.	.	.	.	
4.11	0.0144	0.05 Q	.	.	.	.	
4.24	0.0149	0.05 Q	.	.	.	.	
4.38	0.0155	0.05 Q	.	.	.	.	
4.51	0.0160	0.05 Q	.	.	.	.	
4.65	0.0166	0.05 Q	.	.	.	.	
4.78	0.0171	0.05 Q	.	.	.	.	
4.92	0.0177	0.05 Q	.	.	.	.	
5.05	0.0182	0.05 Q	.	.	.	.	
5.19	0.0188	0.05 Q	.	.	.	.	
5.32	0.0194	0.05 Q	.	.	.	.	
5.46	0.0199	0.05 Q	.	.	.	.	
5.59	0.0205	0.05 Q	.	.	.	.	
5.73	0.0211	0.05 Q	.	.	.	.	
5.86	0.0216	0.05 Q	.	.	.	.	
6.00	0.0222	0.05 Q	.	.	.	.	
6.13	0.0228	0.05 Q	.	.	.	.	
6.27	0.0234	0.05 Q	.	.	.	.	

6.40	0.0240	0.05	Q	.	.	.	.
6.54	0.0246	0.05	Q	.	.	.	.
6.67	0.0252	0.05	Q	.	.	.	.
6.81	0.0258	0.06	Q	.	.	.	.
6.94	0.0265	0.06	Q	.	.	.	.
7.08	0.0271	0.06	Q	.	.	.	.
7.21	0.0277	0.06	Q	.	.	.	.
7.35	0.0284	0.06	Q	.	.	.	.
7.48	0.0290	0.06	Q	.	.	.	.
7.62	0.0296	0.06	Q	.	.	.	.
7.75	0.0303	0.06	Q	.	.	.	.
7.89	0.0310	0.06	Q	.	.	.	.
8.03	0.0316	0.06	Q	.	.	.	.
8.16	0.0323	0.06	Q	.	.	.	.
8.30	0.0330	0.06	Q	.	.	.	.
8.43	0.0337	0.06	Q	.	.	.	.
8.57	0.0343	0.06	Q	.	.	.	.
8.70	0.0350	0.06	Q	.	.	.	.
8.84	0.0358	0.06	Q	.	.	.	.
8.97	0.0365	0.06	Q	.	.	.	.
9.11	0.0372	0.07	Q	.	.	.	.
9.24	0.0379	0.07	Q	.	.	.	.
9.38	0.0387	0.07	Q	.	.	.	.
9.51	0.0394	0.07	Q	.	.	.	.
9.65	0.0402	0.07	Q	.	.	.	.
9.78	0.0409	0.07	Q	.	.	.	.
9.92	0.0417	0.07	Q	.	.	.	.
10.05	0.0425	0.07	Q	.	.	.	.
10.19	0.0433	0.07	Q	.	.	.	.
10.32	0.0441	0.07	Q	.	.	.	.
10.46	0.0449	0.07	Q	.	.	.	.
10.59	0.0457	0.07	Q	.	.	.	.
10.73	0.0466	0.08	Q	.	.	.	.
10.86	0.0474	0.08	Q	.	.	.	.
11.00	0.0483	0.08	Q	.	.	.	.
11.13	0.0492	0.08	Q	.	.	.	.
11.27	0.0500	0.08	Q	.	.	.	.
11.40	0.0510	0.08	Q	.	.	.	.
11.54	0.0519	0.08	Q	.	.	.	.
11.67	0.0528	0.08	Q	.	.	.	.
11.81	0.0538	0.09	Q	.	.	.	.
11.95	0.0547	0.09	Q	.	.	.	.
12.08	0.0558	0.10	Q	.	.	.	.
12.22	0.0570	0.11	Q	.	.	.	.
12.35	0.0582	0.12	Q	.	.	.	.
12.49	0.0595	0.12	Q	.	.	.	.
12.62	0.0609	0.12	Q	.	.	.	.
12.76	0.0622	0.12	Q	.	.	.	.
12.89	0.0636	0.12	Q	.	.	.	.
13.03	0.0650	0.13	Q	.	.	.	.
13.16	0.0664	0.13	Q	.	.	.	.
13.30	0.0679	0.13	Q	.	.	.	.
13.43	0.0694	0.14	Q	.	.	.	.
13.57	0.0709	0.14	Q	.	.	.	.
13.70	0.0725	0.14	Q	.	.	.	.
13.84	0.0741	0.15	Q	.	.	.	.
13.97	0.0757	0.15	Q	.	.	.	.
14.11	0.0774	0.15	Q	.	.	.	.
14.24	0.0789	0.13	Q	.	.	.	.
14.38	0.0804	0.13	Q	.	.	.	.
14.51	0.0819	0.14	Q	.	.	.	.
14.65	0.0835	0.15	Q	.	.	.	.
14.78	0.0852	0.16	Q	.	.	.	.
14.92	0.0870	0.16	Q	.	.	.	.
15.05	0.0889	0.18	Q	.	.	.	.
15.19	0.0909	0.19	Q	.	.	.	.
15.32	0.0932	0.21	Q	.	.	.	.
15.46	0.0957	0.23	Q	.	.	.	.
15.59	0.0984	0.27	.Q	.	.	.	.
15.73	0.1016	0.30	.Q	.	.	.	.

15.86	0.1057	0.44	.Q			.	.	.
16.00	0.1118	0.64	. Q	.		.		
16.14	0.1274	2.16	.		Q .		.	.
16.27	0.1414	0.35	.Q		.		.	.
16.41	0.1447	0.24	Q		.	.	.	.
16.54	0.1471	0.20	Q		.	.	.	.
16.68	0.1492	0.17	Q		.		.	
16.81	0.1510	0.15	Q					.
16.95	0.1526	0.14	Q			.	.	
17.08	0.1541	0.12	Q		.	.	.	.
17.22	0.1556	0.15	Q		.	.		
17.35	0.1572	0.14	Q			.	.	
17.49	0.1587	0.13	Q			.		.
17.62	0.1602	0.13	Q			.		.
17.76	0.1616	0.12	Q		.	.		.
17.89	0.1629	0.12	Q		.			.
18.03	0.1642	0.11	Q			.	.	.
18.16	0.1654	0.09	Q		.	.		.
18.30	0.1663	0.09	Q			.	.	.
18.43	0.1673	0.08	Q			.	.	.
18.57	0.1682	0.08	Q		.	.	.	
18.70	0.1691	0.08	Q			.	.	
18.84	0.1699	0.08	Q			.		.
18.97	0.1707	0.07	Q		.		.	
19.11	0.1715	0.07	Q		.			
19.24	0.1723	0.07	Q		.	.	.	.
19.38	0.1731	0.07	Q		.			
19.51	0.1738	0.07	Q		.	.	.	.
19.65	0.1746	0.06	Q		.	.	.	.
19.78	0.1753	0.06	Q					.
19.92	0.1760	0.06	Q					.
20.06	0.1767	0.06	Q		.	.	.	.
20.19	0.1773	0.06	Q		.	.		.
20.33	0.1780	0.06	Q					.
20.46	0.1786	0.06	Q		.	.	.	
20.60	0.1793	0.06	Q		.	.	.	
20.73	0.1799	0.06	Q		.			.
20.87	0.1805	0.05	Q			.	.	
21.00	0.1811	0.05	Q				.	.
21.14	0.1817	0.05	Q		.		.	.
21.27	0.1823	0.05	Q		.	.	.	
21.41	0.1829	0.05	Q		.	.		.
21.54	0.1834	0.05	Q			.		.
21.68	0.1840	0.05	Q		.	.	.	
21.81	0.1846	0.05	Q			.	.	.
21.95	0.1851	0.05	Q			.	.	
22.08	0.1856	0.05	Q		.	.	.	.
22.22	0.1862	0.05	Q		.		.	.
22.35	0.1867	0.05	Q		.	.	.	
22.49	0.1872	0.05	Q			.	.	.
22.62	0.1877	0.05	Q			.	.	.
22.76	0.1882	0.04	Q		.	.		
22.89	0.1887	0.04	Q			.	.	.
23.03	0.1892	0.04	Q		.	.		.
23.16	0.1897	0.04	Q		.	.	.	
23.30	0.1902	0.04	Q		.	.		.
23.43	0.1907	0.04	Q		.		.	
23.57	0.1911	0.04	Q		.	.	.	
23.70	0.1916	0.04	Q		.	.	.	
23.84	0.1921	0.04	Q		.	.	.	
23.97	0.1925	0.04	Q			.	.	
24.11	0.1930	0.04	Q		.	.	.	.
24.25	0.1932	0.00	Q		.	.	.	.

Area E Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.63
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 6.84
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.14
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.04

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.04	0.0000	0.00 Q	.	.	.	.	
0.15	0.0001	0.03 Q	.	.		.	
0.27	0.0004	0.03 Q	.			.	
0.38	0.0007	0.03 Q	.	.	.		
0.50	0.0009	0.03 Q			.	.	
0.61	0.0012	0.03 Q	.		.	.	
0.72	0.0015	0.03 Q		.	.	.	
0.84	0.0018	0.03 Q	.				
0.95	0.0021	0.03 Q	.	.	.	.	
1.07	0.0023	0.03 Q			.		
1.18	0.0026	0.03 Q	.	.			
1.29	0.0029	0.03 Q			.	.	
1.41	0.0032	0.03 Q	.	.	.	.	
1.52	0.0035	0.03 Q		.		.	
1.64	0.0037	0.03 Q	.	.	.		
1.75	0.0040	0.03 Q	.	.	.	.	
1.86	0.0043	0.03 Q	.		.	.	
1.98	0.0046	0.03 Q	.	.	.	.	
2.09	0.0049	0.03 Q	.			.	
2.21	0.0052	0.03 Q	.	.	.		
2.32	0.0055	0.03 Q	.	.		.	
2.43	0.0058	0.03 Q			.	.	
2.55	0.0061	0.03 Q	.			.	
2.66	0.0064	0.03 Q	.	.		.	
2.78	0.0067	0.03 Q	.		.		
2.89	0.0070	0.03 Q	.	.	.		
3.00	0.0073	0.03 Q	.	.	.	.	
3.12	0.0076	0.03 Q	.	.	.		
3.23	0.0079	0.03 Q	.	.	.		
3.35	0.0082	0.03 Q	.	.		.	
3.46	0.0085	0.03 Q	.	.	.	.	
3.57	0.0088	0.03 Q	.	.		.	
3.69	0.0091	0.03 Q			.		
3.80	0.0094	0.03 Q		.	.	.	
3.92	0.0097	0.03 Q	.	.	.		
4.03	0.0101	0.03 Q			.	.	
4.14	0.0104	0.03 Q	.			.	
4.26	0.0107	0.03 Q	.	.		.	
4.37	0.0110	0.03 Q	.	.		.	
4.49	0.0113	0.03 Q		.		.	
4.60	0.0117	0.03 Q		.	.	.	
4.71	0.0120	0.03 Q	.	.	.		
4.83	0.0123	0.03 Q	.				
4.94	0.0126	0.04 Q	.	.	.	.	
5.06	0.0130	0.04 Q		.	.	.	
5.17	0.0133	0.04 Q	.	.	.	.	
5.28	0.0136	0.04 Q		.	.	.	

5.40	0.0140	0.04	Q	.	.	.	.
5.51	0.0143	0.04	Q	.	.	.	.
5.63	0.0147	0.04	Q	.	.	.	.
5.74	0.0150	0.04	Q	.	.	.	.
5.85	0.0154	0.04	Q	.	.	.	.
5.97	0.0157	0.04	Q	.	.	.	.
6.08	0.0161	0.04	Q	.	.	.	.
6.20	0.0164	0.04	Q	.	.	.	.
6.31	0.0168	0.04	Q	.	.	.	.
6.42	0.0171	0.04	Q	.	.	.	.
6.54	0.0175	0.04	Q	.	.	.	.
6.65	0.0179	0.04	Q	.	.	.	.
6.77	0.0182	0.04	Q	.	.	.	.
6.88	0.0186	0.04	Q	.	.	.	.
6.99	0.0190	0.04	Q	.	.	.	.
7.11	0.0193	0.04	Q	.	.	.	.
7.22	0.0197	0.04	Q	.	.	.	.
7.34	0.0201	0.04	Q	.	.	.	.
7.45	0.0205	0.04	Q	.	.	.	.
7.56	0.0209	0.04	Q	.	.	.	.
7.68	0.0212	0.04	Q	.	.	.	.
7.79	0.0216	0.04	Q	.	.	.	.
7.91	0.0220	0.04	Q	.	.	.	.
8.02	0.0224	0.04	Q	.	.	.	.
8.13	0.0228	0.04	Q	.	.	.	.
8.25	0.0232	0.04	Q	.	.	.	.
8.36	0.0236	0.04	Q	.	.	.	.
8.48	0.0241	0.04	Q	.	.	.	.
8.59	0.0245	0.04	Q	.	.	.	.
8.70	0.0249	0.04	Q	.	.	.	.
8.82	0.0253	0.05	Q	.	.	.	.
8.93	0.0257	0.05	Q	.	.	.	.
9.05	0.0262	0.05	Q	.	.	.	.
9.16	0.0266	0.05	Q	.	.	.	.
9.27	0.0270	0.05	Q	.	.	.	.
9.39	0.0275	0.05	Q	.	.	.	.
9.50	0.0279	0.05	Q	.	.	.	.
9.62	0.0284	0.05	Q	.	.	.	.
9.73	0.0288	0.05	Q	.	.	.	.
9.84	0.0293	0.05	Q	.	.	.	.
9.96	0.0298	0.05	Q	.	.	.	.
10.07	0.0302	0.05	Q	.	.	.	.
10.19	0.0307	0.05	Q	.	.	.	.
10.30	0.0312	0.05	Q	.	.	.	.
10.41	0.0317	0.05	Q	.	.	.	.
10.53	0.0322	0.05	Q	.	.	.	.
10.64	0.0327	0.05	Q	.	.	.	.
10.76	0.0332	0.05	Q	.	.	.	.
10.87	0.0337	0.05	Q	.	.	.	.
10.98	0.0342	0.06	Q	.	.	.	.
11.10	0.0347	0.06	Q	.	.	.	.
11.21	0.0352	0.06	Q	.	.	.	.
11.33	0.0358	0.06	Q	.	.	.	.
11.44	0.0363	0.06	Q	.	.	.	.
11.55	0.0369	0.06	Q	.	.	.	.
11.67	0.0374	0.06	Q	.	.	.	.
11.78	0.0380	0.06	Q	.	.	.	.
11.90	0.0386	0.06	Q	.	.	.	.
12.01	0.0392	0.06	Q	.	.	.	.
12.12	0.0398	0.07	Q	.	.	.	.
12.24	0.0405	0.08	Q	.	.	.	.
12.35	0.0413	0.08	Q	.	.	.	.
12.47	0.0421	0.08	Q	.	.	.	.
12.58	0.0429	0.08	Q	.	.	.	.
12.69	0.0437	0.09	Q	.	.	.	.
12.81	0.0445	0.09	Q	.	.	.	.
12.92	0.0453	0.09	Q	.	.	.	.
13.04	0.0462	0.09	Q	.	.	.	.
13.15	0.0470	0.09	Q	.	.	.	.
13.26	0.0479	0.09	Q	.	.	.	.

13.38	0.0488	0.10	Q		.	.	.	.
13.49	0.0497	0.10	Q		.	.	.	.
13.61	0.0506	0.10	Q		.	.	.	.
13.72	0.0516	0.10	Q		.	.	.	.
13.83	0.0525	0.10	Q		.	.	.	.
13.95	0.0535	0.11	Q		.	.	.	.
14.06	0.0545	0.10	Q		.	.	.	.
14.18	0.0554	0.09	Q		.	.	.	.
14.29	0.0562	0.09	Q		.	.	.	.
14.40	0.0571	0.09	Q		.	.	.	.
14.52	0.0580	0.10	Q		.	.	.	.
14.63	0.0590	0.10	Q		.	.	.	.
14.75	0.0600	0.11	Q		.	.	.	.
14.86	0.0610	0.11	Q		.	.	.	.
14.97	0.0622	0.12	Q		.	.	.	.
15.09	0.0633	0.13	Q		.	.	.	.
15.20	0.0646	0.14	Q		.	.	.	.
15.32	0.0660	0.15	Q		.	.	.	.
15.43	0.0674	0.16	Q		.	.	.	.
15.54	0.0690	0.17	Q		.	.	.	.
15.66	0.0708	0.21	Q		.	.	.	.
15.77	0.0729	0.24	Q		.	.	.	.
15.89	0.0756	0.35	.Q		.	.	.	.
16.00	0.0797	0.50	Q		.	.	.	.
16.11	0.0901	1.70	.	Q	.	.	.	.
16.23	0.0994	0.28	.Q		.	.	.	.
16.34	0.1016	0.19	Q		.	.	.	.
16.46	0.1032	0.16	Q		.	.	.	.
16.57	0.1046	0.13	Q		.	.	.	.
16.68	0.1058	0.12	Q		.	.	.	.
16.80	0.1068	0.11	Q		.	.	.	.
16.91	0.1078	0.10	Q		.	.	.	.
17.03	0.1087	0.09	Q		.	.	.	.
17.14	0.1096	0.11	Q		.	.	.	.
17.25	0.1106	0.10	Q		.	.	.	.
17.37	0.1115	0.10	Q		.	.	.	.
17.48	0.1124	0.09	Q		.	.	.	.
17.60	0.1133	0.09	Q		.	.	.	.
17.71	0.1141	0.09	Q		.	.	.	.
17.82	0.1150	0.08	Q		.	.	.	.
17.94	0.1157	0.08	Q		.	.	.	.
18.05	0.1165	0.08	Q		.	.	.	.
18.17	0.1172	0.06	Q		.	.	.	.
18.28	0.1178	0.06	Q		.	.	.	.
18.39	0.1183	0.06	Q		.	.	.	.
18.51	0.1189	0.06	Q		.	.	.	.
18.62	0.1194	0.06	Q		.	.	.	.
18.74	0.1199	0.05	Q		.	.	.	.
18.85	0.1204	0.05	Q		.	.	.	.
18.96	0.1209	0.05	Q		.	.	.	.
19.08	0.1214	0.05	Q		.	.	.	.
19.19	0.1219	0.05	Q		.	.	.	.
19.31	0.1223	0.05	Q		.	.	.	.
19.42	0.1228	0.05	Q		.	.	.	.
19.53	0.1232	0.05	Q		.	.	.	.
19.65	0.1236	0.05	Q		.	.	.	.
19.76	0.1241	0.04	Q		.	.	.	.
19.88	0.1245	0.04	Q		.	.	.	.
19.99	0.1249	0.04	Q		.	.	.	.
20.10	0.1253	0.04	Q		.	.	.	.
20.22	0.1257	0.04	Q		.	.	.	.
20.33	0.1261	0.04	Q		.	.	.	.
20.45	0.1265	0.04	Q		.	.	.	.
20.56	0.1269	0.04	Q		.	.	.	.
20.67	0.1272	0.04	Q		.	.	.	.
20.79	0.1276	0.04	Q		.	.	.	.
20.90	0.1280	0.04	Q		.	.	.	.
21.02	0.1283	0.04	Q		.	.	.	.
21.13	0.1287	0.04	Q		.	.	.	.
21.24	0.1290	0.04	Q		.	.	.	.

21.36	0.1294	0.04	Q	.	.	.	.
21.47	0.1297	0.04	Q	.	.	.	.
21.59	0.1301	0.04	Q	.	.	.	.
21.70	0.1304	0.04	Q	.	.	.	.
21.81	0.1307	0.03	Q	.	.	.	.
21.93	0.1310	0.03	Q	.	.	.	.
22.04	0.1314	0.03	Q	.	.	.	.
22.16	0.1317	0.03	Q	.	.	.	.
22.27	0.1320	0.03	Q	.	.	.	.
22.38	0.1323	0.03	Q	.	.	.	.
22.50	0.1326	0.03	Q	.	.	.	.
22.61	0.1329	0.03	Q	.	.	.	.
22.73	0.1332	0.03	Q	.	.	.	.
22.84	0.1335	0.03	Q	.	.	.	.
22.95	0.1338	0.03	Q	.	.	.	.
23.07	0.1341	0.03	Q	.	.	.	.
23.18	0.1344	0.03	Q	.	.	.	.
23.30	0.1347	0.03	Q	.	.	.	.
23.41	0.1350	0.03	Q	.	.	.	.
23.52	0.1353	0.03	Q	.	.	.	.
23.64	0.1355	0.03	Q	.	.	.	.
23.75	0.1358	0.03	Q	.	.	.	.
23.87	0.1361	0.03	Q	.	.	.	.
23.98	0.1364	0.03	Q	.	.	.	.
24.09	0.1366	0.03	Q	.	.	.	.
24.21	0.1368	0.00	Q	.	.	.	.

Area F Proposed 10-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 3.78
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.160
TIME OF CONCENTRATION(MIN.) = 10.78
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.63
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.83
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.40

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.82
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.25

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.01	0.0000	0.00 Q	.	.	.	.	
0.19	0.0013	0.17 Q	.	.	.	.	
0.37	0.0038	0.17 Q	.	.	.	.	
0.55	0.0064	0.17 Q	.	.	.	.	
0.73	0.0090	0.18 Q	.	.	.	.	
0.91	0.0116	0.18 Q	.	.	.	.	
1.09	0.0142	0.18 Q	.	.	.	.	
1.27	0.0169	0.18 Q	.	.	.	.	
1.45	0.0195	0.18 Q	.	.	.	.	
1.63	0.0222	0.18 Q	.	.	.	.	
1.81	0.0249	0.18 Q	.	.	.	.	
1.99	0.0277	0.18 Q	.	.	.	.	
2.17	0.0304	0.19 Q	.	.	.	.	
2.35	0.0332	0.19 Q	.	.	.	.	
2.53	0.0359	0.19 Q	.	.	.	.	
2.70	0.0387	0.19 Q	.	.	.	.	
2.88	0.0416	0.19 Q	.	.	.	.	
3.06	0.0444	0.19 Q	.	.	.	.	
3.24	0.0473	0.19 Q	.	.	.	.	
3.42	0.0502	0.20 Q	.	.	.	.	
3.60	0.0531	0.20 Q	.	.	.	.	
3.78	0.0560	0.20 Q	.	.	.	.	
3.96	0.0590	0.20 Q	.	.	.	.	
4.14	0.0620	0.20 Q	.	.	.	.	
4.32	0.0650	0.20 Q	.	.	.	.	
4.50	0.0681	0.21 Q	.	.	.	.	
4.68	0.0711	0.21 Q	.	.	.	.	
4.86	0.0742	0.21 Q	.	.	.	.	
5.04	0.0774	0.21 Q	.	.	.	.	
5.22	0.0805	0.21 Q	.	.	.	.	
5.40	0.0837	0.22 Q	.	.	.	.	
5.58	0.0869	0.22 Q	.	.	.	.	
5.76	0.0902	0.22 Q	.	.	.	.	
5.94	0.0935	0.22 Q	.	.	.	.	
6.12	0.0968	0.22 Q	.	.	.	.	
6.30	0.1001	0.23 Q	.	.	.	.	
6.48	0.1035	0.23 Q	.	.	.	.	
6.66	0.1069	0.23 Q	.	.	.	.	
6.84	0.1104	0.23 Q	.	.	.	.	
7.02	0.1139	0.24 Q	.	.	.	.	
7.20	0.1174	0.24 Q	.	.	.	.	
7.38	0.1210	0.24 Q	.	.	.	.	
7.56	0.1246	0.25 Q	.	.	.	.	
7.74	0.1283	0.25 Q	.	.	.	.	
7.92	0.1320	0.25 .Q	.	.	.	.	
8.09	0.1358	0.25 .Q	.	.	.	.	
8.27	0.1396	0.26 .Q	.	.	.	.	

8.45	0.1434	0.26	.Q . . .
8.63	0.1473	0.27	.Q . . .
8.81	0.1513	0.27	.Q . . .
8.99	0.1553	0.27	.Q . . .
9.17	0.1594	0.28	.Q . . .
9.35	0.1635	0.28	.Q . . .
9.53	0.1677	0.28	.Q . . .
9.71	0.1720	0.29	.Q . . .
9.89	0.1763	0.29	.Q . . .
10.07	0.1808	0.30	.Q . . .
10.25	0.1852	0.30	.Q . . .
10.43	0.1898	0.31	.Q . . .
10.61	0.1945	0.32	.Q . . .
10.79	0.1992	0.32	Q . . .
10.97	0.2040	0.33	.Q . . .
11.15	0.2090	0.34	.Q . . .
11.33	0.2140	0.34	.Q . . .
11.51	0.2191	0.35	.Q . . .
11.69	0.2244	0.36	.Q . . .
11.87	0.2298	0.37	.Q . . .
12.05	0.2353	0.37	.Q . . .
12.23	0.2416	0.48	.Q . . .
12.41	0.2488	0.49	.Q . . .
12.59	0.2562	0.50	. Q . . .
12.77	0.2638	0.51	. Q . . .
12.95	0.2715	0.53	. Q . . .
13.13	0.2795	0.54	. Q . . .
13.30	0.2877	0.56	. Q . . .
13.48	0.2961	0.57	. Q . . .
13.66	0.3048	0.60	. Q . . .
13.84	0.3138	0.61	. Q . . .
14.02	0.3231	0.65	. Q . . .
14.20	0.3321	0.56	. Q . . .
14.38	0.3405	0.56	. Q . . .
14.56	0.3490	0.59	. Q . . .
14.74	0.3582	0.64	. Q . . .
14.92	0.3680	0.68	. Q . . .
15.10	0.3788	0.77	. Q . . .
15.28	0.3907	0.83	. Q . . .
15.46	0.4040	0.97	. Q . . .
15.64	0.4192	1.07	. Q . . .
15.82	0.4386	1.54	. Q . . .
16.00	0.4667	2.23	. Q . . .
16.18	0.5402	7.68	. . Q .
16.36	0.6065	1.25	. Q . . .
16.54	0.6225	0.90	. Q . . .
16.72	0.6345	0.72	. Q . . .
16.90	0.6445	0.61	. Q . . .
17.08	0.6530	0.54	. Q . . .
17.26	0.6617	0.63	. Q . . .
17.44	0.6707	0.59	. Q . . .
17.62	0.6792	0.55	. Q . . .
17.80	0.6871	0.52	. Q . . .
17.98	0.6947	0.50	.Q . . .
18.16	0.7015	0.42	.Q . . .
18.34	0.7073	0.36	.Q . . .
18.52	0.7125	0.35	.Q . . .
18.69	0.7176	0.33	.Q . . .
18.87	0.7224	0.32	.Q . . .
19.05	0.7271	0.31	.Q . . .
19.23	0.7315	0.30	.Q . . .
19.41	0.7359	0.29	.Q . . .
19.59	0.7401	0.28	.Q . . .
19.77	0.7442	0.27	.Q . . .
19.95	0.7481	0.26	.Q . . .
20.13	0.7520	0.26	.Q . . .
20.31	0.7558	0.25	Q . . .
20.49	0.7594	0.24	Q . . .
20.67	0.7630	0.24	Q . . .
20.85	0.7665	0.23	Q . . .

21.03	0.7699	0.23	Q	.	.	.	.
21.21	0.7733	0.22	Q	.	.	.	.
21.39	0.7766	0.22	Q	.	.	.	.
21.57	0.7798	0.21	Q	.	.	.	.
21.75	0.7829	0.21	Q	.	.	.	.
21.93	0.7860	0.21	Q	.	.	.	.
22.11	0.7891	0.20	Q	.	.	.	.
22.29	0.7921	0.20	Q	.	.	.	.
22.47	0.7950	0.20	Q	.	.	.	.
22.65	0.7979	0.19	Q	.	.	.	.
22.83	0.8007	0.19	Q	.	.	.	.
23.01	0.8036	0.19	Q	.	.	.	.
23.19	0.8063	0.18	Q	.	.	.	.
23.37	0.8090	0.18	Q	.	.	.	.
23.55	0.8117	0.18	Q	.	.	.	.
23.73	0.8144	0.18	Q	.	.	.	.
23.91	0.8170	0.17	Q	.	.	.	.
24.08	0.8195	0.17	Q	.	.	.	.
24.26	0.8208	0.00	Q	.	.	.	.

PROJECT: 11-420 Proposed **DATE:**

ENGINEER:

1. Enter the design storm return frequency **(years)** 10
2. Enter catchment lag **(hours)** _____
3. Enter the catchment area **(acres)** 3737
4. Enter baseflow **(cfs/square mile)** Ø
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.082
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.160
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.31

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.63

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 0.83

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 1.31

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 1.89

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 3.4
9. Enter 24-hour storm unit interval **(minutes)** _____

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

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10-Year Proposed Site Analysis

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.40 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.72	11.00	56.	0.748	0.840
2	14.24	11.00	56.	0.748	0.840
3	11.57	11.00	56.	0.748	0.840
4	0.89	11.00	56	0.748	0.840
5	0.63	11.00	56.	0.748	0.840
6	3.78	11.00	56.	0.748	0.840

TOTAL AREA (Acres) = 36.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.082

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.160

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
        (c) Copyright 1983-2006 Advanced Engineering Software (aes)
            Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                            *
* 10-Yr Proposed 1-Hour Rational                                           *
*                                                                          *
 ****************************************************************************

  FILE NAME: 11420PR.DAT
  TIME/DATE OF STUDY: 10:03 06/09/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) = 0.8080
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

+---------------------------------------------------------------------------+
| PROPOSED AREA A                                                           |
|                                                                           |
```

```
|                                                                                |
+--------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       1.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   912.00
  ELEVATION DATA: UPSTREAM(FEET) =      10.12  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.665
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.159
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        5.72      0.75      0.100    56   11.66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      10.73
  TOTAL AREA(ACRES) =       5.72   PEAK FLOW RATE(CFS) =      10.73

+--------------------------------------------------------------------------------+
| PROPOSED AREA B                                                                |
|                                                                                |
|                                                                                |
+--------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1530.00
  ELEVATION DATA: UPSTREAM(FEET) =      13.24  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.001
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.856
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B       14.24      0.75      0.100    56   15.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      22.83
  TOTAL AREA(ACRES) =      14.24   PEAK FLOW RATE(CFS) =      22.83

+--------------------------------------------------------------------------------+
| PROPOSED AREA C                                                                |
|                                                                                |
|                                                                                |
+--------------------------------------------------------------------------------+
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1117.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.05  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.920
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.030
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B       11.57      0.75     0.100    56   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     20.36
  TOTAL AREA(ACRES) =     11.57   PEAK FLOW RATE(CFS) =     20.36

+--------------------------------------------------------------------------+
| PROPOSED AREA D                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   386.00
  ELEVATION DATA: UPSTREAM(FEET) =      5.25  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.112
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.684
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.89      0.75     0.100    56    8.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.09
  TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      2.09

+--------------------------------------------------------------------------+
| PROPOSED AREA E                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =      3.40  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.838
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.974
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.63      0.75     0.100    56   6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.64
  TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      1.64

+----------------------------------------------------------------------------+
| PROPOSED AREA F                                                            |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   670.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.36  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.782
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.263
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        3.78      0.75     0.100    56  10.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.44
  TOTAL AREA(ACRES) =      3.78   PEAK FLOW RATE(CFS) =      7.44
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      3.78  TC(MIN.) =     10.78
  EFFECTIVE AREA(ACRES) =      3.78  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =      7.44
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

25-YEAR ANALYSIS

Area A Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 5.72
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 11.66
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.48
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.42

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.06	0.0000	0.00	Q	.	.	.	.
0.26	0.0027	0.33	Q	.	.	.	.
0.45	0.0080	0.33	Q	.	.	.	.
0.65	0.0134	0.34	Q	.	.	.	.
0.84	0.0188	0.34	Q	.	.	.	.
1.04	0.0243	0.34	Q	.	.	.	.
1.23	0.0298	0.34	Q	.	.	.	.
1.43	0.0353	0.35	Q	.	.	.	.
1.62	0.0409	0.35	Q	.	.	.	.
1.81	0.0465	0.35	Q	.	.	.	.
2.01	0.0522	0.35	Q	.	.	.	.
2.20	0.0579	0.36	Q	.	.	.	.
2.40	0.0636	0.36	Q	.	.	.	.
2.59	0.0694	0.36	Q	.	.	.	.
2.79	0.0753	0.36	Q	.	.	.	.
2.98	0.0811	0.37	Q	.	.	.	.
3.17	0.0871	0.37	Q	.	.	.	.
3.37	0.0931	0.37	Q	.	.	.	.
3.56	0.0991	0.38	Q	.	.	.	.
3.76	0.1052	0.38	Q	.	.	.	.
3.95	0.1113	0.38	Q	.	.	.	.
4.15	0.1175	0.39	Q	.	.	.	.
4.34	0.1237	0.39	Q	.	.	.	.
4.53	0.1300	0.39	Q	.	.	.	.
4.73	0.1364	0.40	Q	.	.	.	.
4.92	0.1428	0.40	Q	.	.	.	.
5.12	0.1493	0.40	Q	.	.	.	.
5.31	0.1558	0.41	Q	.	.	.	.
5.51	0.1624	0.41	Q	.	.	.	.
5.70	0.1691	0.42	Q	.	.	.	.
5.89	0.1758	0.42	Q	.	.	.	.
6.09	0.1826	0.43	Q	.	.	.	.
6.28	0.1895	0.43	Q	.	.	.	.
6.48	0.1964	0.44	Q	.	.	.	.
6.67	0.2035	0.44	Q	.	.	.	.
6.87	0.2106	0.45	Q	.	.	.	.
7.06	0.2177	0.45	Q	.	.	.	.
7.26	0.2250	0.46	Q	.	.	.	.
7.45	0.2324	0.46	Q	.	.	.	.
7.64	0.2398	0.47	Q	.	.	.	.
7.84	0.2474	0.47	Q	.	.	.	.
8.03	0.2550	0.48	Q	.	.	.	.
8.23	0.2628	0.48	Q	.	.	.	.
8.42	0.2706	0.49	Q	.	.	.	.
8.62	0.2786	0.50	Q	.	.	.	.
8.81	0.2866	0.51	.Q	.	.	.	.
9.00	0.2948	0.51	.Q	.	.	.	.

9.20	0.3031	0.52	.Q . . .
9.39	0.3115	0.53	.Q . . .
9.59	0.3201	0.54	.Q . . .
9.78	0.3288	0.54	.Q . . .
9.98	0.3377	0.56	.Q . . .
10.17	0.3467	0.56	.Q . . .
10.36	0.3558	0.58	.Q . . .
10.56	0.3652	0.58	.Q . . .
10.75	0.3747	0.60	.Q . . .
10.95	0.3844	0.61	.Q . . .
11.14	0.3943	0.62	.Q . . .
11.34	0.4044	0.63	.Q . . .
11.53	0.4147	0.65	.Q . . .
11.72	0.4253	0.66	.Q . . .
11.92	0.4361	0.69	.Q . . .
12.11	0.4472	0.70	.Q . . .
12.31	0.4586	0.72	.Q . . .
12.50	0.4703	0.73	.Q . . .
12.70	0.4823	0.76	.Q . . .
12.89	0.4946	0.78	.Q . . .
13.09	0.5074	0.81	.Q . . .
13.28	0.5207	0.83	.Q . . .
13.47	0.5344	0.88	.Q . . .
13.67	0.5487	0.90	.Q . . .
13.86	0.5636	0.96	.Q . . .
14.06	0.5792	0.99	.Q . . .
14.25	0.5947	0.94	.Q . . .
14.45	0.6102	0.98	.Q . . .
14.64	0.6267	1.08	. Q . . .
14.83	0.6446	1.14	. Q . . .
15.03	0.6641	1.30	. Q . . .
15.22	0.6858	1.40	. Q . . .
15.42	0.7106	1.70	. Q . . .
15.61	0.7401	1.98	. Q . . .
15.81	0.7781	2.76	. Q . . .
16.00	0.8315	3.88	. Q . . .
16.19	0.9692	13.26	. . . Q .
16.39	1.0941	2.29	. Q . . .
16.58	1.1247	1.52	. Q . . .
16.78	1.1467	1.21	. Q . . .
16.97	1.1647	1.03	. Q . . .
17.17	1.1807	0.97	.Q . . .
17.36	1.1960	0.93	.Q . . .
17.55	1.2103	0.85	.Q . . .
17.75	1.2235	0.80	.Q . . .
17.94	1.2359	0.75	.Q . . .
18.14	1.2476	0.71	.Q . . .
18.33	1.2587	0.67	.Q . . .
18.53	1.2693	0.64	.Q . . .
18.72	1.2794	0.62	.Q . . .
18.92	1.2891	0.59	.Q . . .
19.11	1.2984	0.57	.Q . . .
19.30	1.3074	0.55	.Q . . .
19.50	1.3161	0.53	.Q . . .
19.69	1.3246	0.52	.Q . . .
19.89	1.3328	0.50	.Q . . .
20.08	1.3407	0.49	Q . . .
20.28	1.3485	0.48	Q . . .
20.47	1.3560	0.46	Q . . .
20.66	1.3634	0.45	Q . . .
20.86	1.3705	0.44	Q . . .
21.05	1.3776	0.43	Q . . .
21.25	1.3845	0.42	Q . . .
21.44	1.3912	0.42	Q . . .
21.64	1.3978	0.41	Q . . .
21.83	1.4043	0.40	Q . . .
22.02	1.4106	0.39	Q . . .
22.22	1.4169	0.39	Q . . .
22.41	1.4230	0.38	Q . . .
22.61	1.4290	0.37	Q . . .

22.80	1.4350	0.37	Q	.	.	.	.
23.00	1.4408	0.36	Q	.	.	.	.
23.19	1.4465	0.36	Q	.	.	.	.
23.38	1.4522	0.35	Q	.	.	.	.
23.58	1.4578	0.34	Q	.	.	.	.
23.77	1.4633	0.34	Q	.	.	.	.
23.97	1.4687	0.34	Q	.	.	.	.
24.16	1.4741	0.33	Q	.	.	.	.
24.36	1.4767	0.00	Q	.	.	.	.

Area B Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 14.24
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 15.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 3.67
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.05

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.25	0.0085	0.83	.Q	.	.	.	.
0.50	0.0256	0.83	.Q	.	.	.	.
0.75	0.0429	0.84	.Q	.	.	.	.
1.00	0.0603	0.85	.Q	.	.	.	.
1.25	0.0779	0.86	.Q	.	.	.	.
1.50	0.0956	0.86	.Q	.	.	.	.
1.75	0.1135	0.87	.Q	.	.	.	.
2.00	0.1316	0.88	.Q	.	.	.	.
2.25	0.1499	0.89	.Q	.	.	.	.
2.50	0.1683	0.89	.Q	.	.	.	.
2.75	0.1869	0.91	.Q	.	.	.	.
3.00	0.2057	0.91	.Q	.	.	.	.
3.25	0.2247	0.93	.Q	.	.	.	.
3.50	0.2439	0.93	.Q	.	.	.	.
3.75	0.2633	0.95	.Q	.	.	.	.
4.00	0.2829	0.95	.Q	.	.	.	.
4.25	0.3028	0.97	.Q	.	.	.	.
4.50	0.3228	0.97	.Q	.	.	.	.
4.75	0.3431	0.99	.Q	.	.	.	.
5.00	0.3637	1.00	.Q	.	.	.	.
5.25	0.3845	1.01	.Q	.	.	.	.
5.50	0.4055	1.02	.Q	.	.	.	.
5.75	0.4268	1.04	.Q	.	.	.	.
6.00	0.4484	1.05	.Q	.	.	.	.
6.25	0.4703	1.07	.Q	.	.	.	.
6.50	0.4925	1.08	.Q	.	.	.	.
6.75	0.5150	1.10	.Q	.	.	.	.
7.00	0.5379	1.11	.Q	.	.	.	.
7.25	0.5611	1.13	.Q	.	.	.	.
7.50	0.5846	1.14	.Q	.	.	.	.
7.75	0.6085	1.17	.Q	.	.	.	.
8.00	0.6328	1.18	.Q	.	.	.	.
8.25	0.6575	1.21	.Q	.	.	.	.
8.50	0.6826	1.22	.Q	.	.	.	.
8.75	0.7082	1.25	.Q	.	.	.	.
9.00	0.7343	1.27	.Q	.	.	.	.
9.25	0.7608	1.30	.Q	.	.	.	.
9.50	0.7879	1.32	.Q	.	.	.	.
9.75	0.8155	1.36	.Q	.	.	.	.
10.00	0.8438	1.38	.Q	.	.	.	.
10.25	0.8726	1.42	.Q	.	.	.	.
10.50	0.9021	1.44	.Q	.	.	.	.
10.75	0.9324	1.49	.Q	.	.	.	.
11.00	0.9634	1.51	. Q	.	.	.	.
11.25	0.9952	1.57	. Q	.	.	.	.
11.50	1.0279	1.60	. Q	.	.	.	.
11.75	1.0616	1.66	. Q	.	.	.	.

12.00	1.0963	1.70	. Q . . . .
12.25	1.1321	1.77	. Q . . . .
12.50	1.1690	1.81	. Q . . . .
12.75	1.2074	1.90	. Q . . . .
13.00	1.2472	1.96	. Q . . . .
13.25	1.2889	2.08	. Q . . . .
13.50	1.3324	2.14	. Q . . . .
13.75	1.3783	2.30	. Q . . . .
14.00	1.4268	2.39	. Q . . . .
14.25	1.4754	2.31	. Q . . . .
14.50	1.5246	2.44	. Q . . . .
14.75	1.5784	2.77	. Q . . . .
15.00	1.6380	2.99	. Q . . . .
15.25	1.7061	3.61	Q . . . .
15.50	1.7854	4.07	. Q . . . .
15.75	1.8896	6.01	. Q . . . .
16.00	2.0358	8.14	. Q . . . .
16.25	2.4113	28.20	. . . Q .
16.50	2.7535	4.92	. Q . . . .
16.75	2.8380	3.26	. Q . . . .
17.00	2.8985	2.59	. Q . . . .
17.25	2.9511	2.50	. Q . . . .
17.50	2.9998	2.22	. Q . . . .
17.75	3.0435	2.01	. Q . . . .
18.00	3.0834	1.85	. Q . . . .
18.25	3.1205	1.74	Q . . . .
18.50	3.1553	1.63	. Q . . . .
18.75	3.1880	1.54	. Q . . . .
19.00	3.2190	1.46	.Q . . . .
19.25	3.2486	1.40	.Q . . . .
19.50	3.2768	1.34	.Q . . . .
19.75	3.3039	1.28	.Q . . . .
20.00	3.3300	1.24	.Q . . . .
20.25	3.3551	1.20	.Q . . . .
20.50	3.3794	1.16	.Q . . . .
20.75	3.4029	1.12	.Q . . . .
21.00	3.4258	1.09	.Q . . . .
21.25	3.4480	1.06	.Q . . . .
21.50	3.4696	1.03	.Q . . . .
21.75	3.4907	1.01	.Q . . . .
22.00	3.5112	0.98	.Q . . . .
22.25	3.5313	0.96	.Q . . . .
22.50	3.5509	0.94	.Q . . . .
22.75	3.5701	0.92	.Q . . . .
23.00	3.5889	0.90	.Q . . . .
23.25	3.6073	0.88	.Q . . . .
23.50	3.6254	0.87	.Q . . . .
23.75	3.6431	0.85	.Q . . . .
24.00	3.6605	0.84	.Q . . . .
24.25	3.6692	0.00	Q . . . .

Area C Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 11.57
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 12.92
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.99
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.85

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TIME (HOURS)	VOLUME (AF)	Q (CFS)		0.	7.5	15.0	22.5	30.0
0.07	0.0000	0.00	Q		.	.	.	
0.28	0.0060	0.67	Q	.		.	.	
0.50	0.0180	0.68	Q	.	.	.		
0.71	0.0301	0.68	Q	.	.		.	
0.93	0.0422	0.69	Q	.				
1.14	0.0545	0.69	Q	.		.	.	
1.36	0.0669	0.70	Q	.	.	.		
1.57	0.0794	0.70	Q		.	.	.	
1.79	0.0919	0.71	Q		.			
2.00	0.1046	0.72	Q	.	.	.		
2.22	0.1174	0.72	Q	.		.	.	
2.43	0.1303	0.73	Q	.	.	.	.	
2.65	0.1432	0.73	Q	.	.	.	.	
2.86	0.1564	0.74	Q		.	.	.	
3.08	0.1696	0.75	Q	.	.		.	
3.30	0.1829	0.75	.Q	.	.	.	.	
3.51	0.1964	0.76	.Q	.		.	.	
3.73	0.2100	0.77	.Q	.			.	
3.94	0.2237	0.77	.Q	.		.	.	
4.16	0.2376	0.78	.Q		.	.		
4.37	0.2515	0.79	.Q	.	.	.	.	
4.59	0.2657	0.80	.Q	.		.	.	
4.80	0.2799	0.80	.Q	.	.	.		
5.02	0.2944	0.82	.Q		.	.	.	
5.23	0.3089	0.82	.Q		.	.	.	
5.45	0.3237	0.83	.Q	.	.	.		
5.66	0.3386	0.84	.Q			.	.	
5.88	0.3536	0.85	.Q	.	.	.	.	
6.09	0.3689	0.86	.Q		.	.		
6.31	0.3843	0.87	.Q	.	.	.	.	
6.53	0.3999	0.88	.Q	.	.	.	.	
6.74	0.4157	0.89	.Q	.	.	.	.	
6.96	0.4316	0.90	.Q	.	.	.	.	
7.17	0.4478	0.92	.Q	.	.	.	.	
7.39	0.4642	0.93	.Q		.	.	.	
7.60	0.4809	0.94	.Q	.		.		
7.82	0.4977	0.95	.Q	.		.		
8.03	0.5148	0.97	.Q	.	.	.		
8.25	0.5321	0.98	.Q	.	.	.		
8.46	0.5497	1.00	.Q	.	.	.	.	
8.68	0.5676	1.01	.Q	.		.	.	
8.89	0.5858	1.03	.Q		.			
9.11	0.6042	1.04	.Q	.	.	.		
9.32	0.6230	1.07	.Q					
9.54	0.6421	1.08	.Q	.	.		.	
9.76	0.6615	1.10	.Q	.	.	.	.	
9.97	0.6813	1.12	.Q	.	.	.	.	

10.19	0.7014	1.15	.Q . . . .
10.40	0.7220	1.16	.Q . . . .
10.62	0.7430	1.20	.Q . . . .
10.83	0.7644	1.21	.Q . . . .
11.05	0.7863	1.25	.Q . . . .
11.26	0.8087	1.27	.Q . . . .
11.48	0.8317	1.31	.Q . . . .
11.69	0.8552	1.33	.Q . . . .
11.91	0.8794	1.38	.Q . . . .
12.12	0.9042	1.41	.Q . . . .
12.34	0.9297	1.46	.Q . . . .
12.55	0.9559	1.49	.Q . . . .
12.77	0.9830	1.56	Q . . . .
12.99	1.0110	1.59	.Q . . . .
13.20	1.0402	1.68	.Q . . . .
13.42	1.0704	1.72	.Q . . . .
13.63	1.1021	1.83	.Q . . . .
13.85	1.1352	1.89	.Q . . . .
14.06	1.1700	2.03	.Q . . . .
14.28	1.2048	1.88	.Q . . . .
14.49	1.2399	2.06	.Q . . . .
14.71	1.2775	2.17	.Q . . . .
14.92	1.3187	2.47	. Q . . . .
15.14	1.3643	2.66	. Q . . . .
15.35	1.4165	3.20	. Q . . . .
15.57	1.4780	3.71	. Q . . . .
15.78	1.5581	5.29	. Q . . . .
16.00	1.6703	7.32	. Q. . . .
16.22	1.9594	25.16	. . . . Q
16.43	2.2221	4.36	. Q . . . .
16.65	2.2867	2.90	. Q . . . .
16.86	2.3330	2.31	. Q . . . .
17.08	2.3710	1.95	.Q . . . .
17.29	2.4057	1.96	.Q . . . .
17.51	2.4389	1.78	.Q . . . .
17.72	2.4693	1.63	.Q . . . .
17.94	2.4974	1.52	.Q . . . .
18.15	2.5236	1.43	.Q . . . .
18.37	2.5484	1.36	.Q . . . .
18.58	2.5720	1.29	.Q . . . .
18.80	2.5944	1.23	.Q . . . .
19.01	2.6158	1.18	.Q . . . .
19.23	2.6364	1.13	.Q . . . .
19.45	2.6562	1.09	.Q . . . .
19.66	2.6753	1.05	.Q . . . .
19.88	2.6937	1.02	.Q . . . .
20.09	2.7116	0.99	.Q . . . .
20.31	2.7290	0.96	.Q . . . .
20.52	2.7458	0.93	.Q . . . .
20.74	2.7622	0.91	.Q . . . .
20.95	2.7782	0.89	.Q . . . .
21.17	2.7938	0.87	.Q . . . .
21.38	2.8090	0.85	.Q . . . .
21.60	2.8239	0.83	.Q . . . .
21.81	2.8385	0.81	.Q . . . .
22.03	2.8528	0.79	.Q . . . .
22.24	2.8668	0.78	.Q . . . .
22.46	2.8805	0.76	.Q . . . .
22.68	2.8940	0.75	Q . . . .
22.89	2.9072	0.74	Q . . . .
23.11	2.9202	0.72	Q . . . .
23.32	2.9330	0.71	Q . . . .
23.54	2.9455	0.70	Q . . . .
23.75	2.9579	0.69	Q . . . .
23.97	2.9701	0.68	Q . . . .
24.18	2.9821	0.67	Q . . . .
24.40	2.9880	0.00	Q . . . .

Area D Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.89
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 8.11
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.23
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.07

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.05	0.0000	0.00 Q	.	.	.	.	
0.19	0.0003	0.05 Q	.	.	.	.	
0.32	0.0009	0.05 Q	.	.	.	.	
0.46	0.0014	0.05 Q	.	.	.	.	
0.59	0.0020	0.05 Q	.	.	.	.	
0.73	0.0026	0.05 Q	.	.	.	.	
0.86	0.0032	0.05 Q	.	.	.	.	
1.00	0.0038	0.05 Q	.	.	.	.	
1.13	0.0044	0.05 Q	.	.	.	.	
1.27	0.0050	0.05 Q	.	.	.	.	
1.40	0.0056	0.05 Q	.	.	.	.	
1.54	0.0062	0.05 Q	.	.	.	.	
1.67	0.0068	0.05 Q	.	.	.	.	
1.81	0.0074	0.05 Q	.	.	.	.	
1.94	0.0080	0.05 Q	.	.	.	.	
2.08	0.0086	0.06 Q	.	.	.	.	
2.21	0.0093	0.06 Q	.	.	.	.	
2.35	0.0099	0.06 Q	.	.	.	.	
2.48	0.0105	0.06 Q	.	.	.	.	
2.62	0.0111	0.06 Q	.	.	.	.	
2.75	0.0118	0.06 Q	.	.	.	.	
2.89	0.0124	0.06 Q	.	.	.	.	
3.02	0.0130	0.06 Q	.	.	.	.	
3.16	0.0137	0.06 Q	.	.	.	.	
3.29	0.0143	0.06 Q	.	.	.	.	
3.43	0.0150	0.06 Q	.	.	.	.	
3.56	0.0156	0.06 Q	.	.	.	.	
3.70	0.0163	0.06 Q	.	.	.	.	
3.84	0.0170	0.06 Q	.	.	.	.	
3.97	0.0176	0.06 Q	.	.	.	.	
4.11	0.0183	0.06 Q	.	.	.	.	
4.24	0.0190	0.06 Q	.	.	.	.	
4.38	0.0197	0.06 Q	.	.	.	.	
4.51	0.0203	0.06 Q	.	.	.	.	
4.65	0.0210	0.06 Q	.	.	.	.	
4.78	0.0217	0.06 Q	.	.	.	.	
4.92	0.0224	0.06 Q	.	.	.	.	
5.05	0.0231	0.06 Q	.	.	.	.	
5.19	0.0238	0.06 Q	.	.	.	.	
5.32	0.0245	0.06 Q	.	.	.	.	
5.46	0.0252	0.06 Q	.	.	.	.	
5.59	0.0260	0.06 Q	.	.	.	.	
5.73	0.0267	0.07 Q	.	.	.	.	
5.86	0.0274	0.07 Q	.	.	.	.	
6.00	0.0282	0.07 Q	.	.	.	.	
6.13	0.0289	0.07 Q	.	.	.	.	
6.27	0.0296	0.07 Q	.	.	.	.	

6.40	0.0304	0.07	Q	.	.	.	.
6.54	0.0312	0.07	Q	.	.	.	.
6.67	0.0319	0.07	Q	.	.	.	.
6.81	0.0327	0.07	Q	.	.	.	.
6.94	0.0335	0.07	Q	.	.	.	.
7.08	0.0342	0.07	Q	.	.	.	.
7.21	0.0350	0.07	Q	.	.	.	.
7.35	0.0358	0.07	Q	.	.	.	.
7.48	0.0366	0.07	Q	.	.	.	.
7.62	0.0374	0.07	Q	.	.	.	.
7.75	0.0383	0.07	Q	.	.	.	.
7.89	0.0391	0.07	Q	.	.	.	.
8.03	0.0399	0.07	Q	.	.	.	.
8.16	0.0408	0.08	Q	.	.	.	.
8.30	0.0416	0.08	Q	.	.	.	.
8.43	0.0425	0.08	Q	.	.	.	.
8.57	0.0433	0.08	Q	.	.	.	.
8.70	0.0442	0.08	Q	.	.	.	.
8.84	0.0451	0.08	Q	.	.	.	.
8.97	0.0460	0.08	Q	.	.	.	.
9.11	0.0469	0.08	Q	.	.	.	.
9.24	0.0478	0.08	Q	.	.	.	.
9.38	0.0487	0.08	Q	.	.	.	.
9.51	0.0496	0.08	Q	.	.	.	.
9.65	0.0505	0.08	Q	.	.	.	.
9.78	0.0515	0.09	Q	.	.	.	.
9.92	0.0524	0.09	Q	.	.	.	.
10.05	0.0534	0.09	Q	.	.	.	.
10.19	0.0544	0.09	Q	.	.	.	.
10.32	0.0554	0.09	Q	.	.	.	.
10.46	0.0564	0.09	Q	.	.	.	.
10.59	0.0574	0.09	Q	.	.	.	.
10.73	0.0585	0.09	Q	.	.	.	.
10.86	0.0595	0.09	Q	.	.	.	.
11.00	0.0606	0.10	Q	.	.	.	.
11.13	0.0617	0.10	Q	.	.	.	.
11.27	0.0628	0.10	Q	.	.	.	.
11.40	0.0639	0.10	Q	.	.	.	.
11.54	0.0650	0.10	Q	.	.	.	.
11.67	0.0661	0.10	Q	.	.	.	.
11.81	0.0673	0.11	Q	.	.	.	.
11.95	0.0685	0.11	Q	.	.	.	.
12.08	0.0697	0.11	Q	.	.	.	.
12.22	0.0709	0.11	Q	.	.	.	.
12.35	0.0722	0.11	Q	.	.	.	.
12.49	0.0735	0.11	Q	.	.	.	.
12.62	0.0748	0.12	Q	.	.	.	.
12.76	0.0761	0.12	Q	.	.	.	.
12.89	0.0774	0.12	Q	.	.	.	.
13.03	0.0788	0.13	Q	.	.	.	.
13.16	0.0802	0.13	Q	.	.	.	.
13.30	0.0817	0.13	Q	.	.	.	.
13.43	0.0832	0.14	Q	.	.	.	.
13.57	0.0847	0.14	Q	.	.	.	.
13.70	0.0863	0.14	Q	.	.	.	.
13.84	0.0880	0.15	Q	.	.	.	.
13.97	0.0896	0.15	Q	.	.	.	.
14.11	0.0914	0.15	Q	.	.	.	.
14.24	0.0931	0.15	Q	.	.	.	.
14.38	0.0947	0.15	Q	.	.	.	.
14.51	0.0965	0.16	Q	.	.	.	.
14.65	0.0983	0.17	Q	.	.	.	.
14.78	0.1003	0.18	Q	.	.	.	.
14.92	0.1024	0.19	Q	.	.	.	.
15.05	0.1046	0.21	Q	.	.	.	.
15.19	0.1070	0.22	Q	.	.	.	.
15.32	0.1096	0.25	.Q	.	.	.	.
15.46	0.1126	0.27	.Q	.	.	.	.
15.59	0.1160	0.34	.Q	.	.	.	.
15.73	0.1200	0.38	.Q	.	.	.	.

15.86	0.1251	0.54	.	Q	.	.	.	.
16.00	0.1324	0.77	.	Q	.	.	.	.
16.14	0.1512	2.59	.		Q	.	.	.
16.27	0.1681	0.43		Q	.	.	.	.
16.41	0.1722	0.31	.	Q	.	.	.	.
16.54	0.1752	0.23		Q	.	.	.	.
16.68	0.1776	0.20		Q	.	.	.	.
16.81	0.1797	0.17		Q	.	.	.	.
16.95	0.1816	0.16		Q	.	.	.	.
17.08	0.1833	0.14		Q	.	.	.	.
17.22	0.1849	0.15		Q	.	.	.	.
17.35	0.1865	0.14		Q	.	.	.	.
17.49	0.1881	0.13		Q	.	.	.	.
17.62	0.1895	0.13		Q	.	.	.	.
17.76	0.1909	0.12		Q	.	.	.	.
17.89	0.1923	0.12		Q	.	.	.	.
18.03	0.1935	0.11		Q	.	.	.	.
18.16	0.1948	0.11		Q	.	.	.	.
18.30	0.1959	0.10		Q	.	.	.	.
18.43	0.1971	0.10		Q	.	.	.	.
18.57	0.1982	0.10		Q	.	.	.	.
18.70	0.1993	0.10		Q	.	.	.	.
18.84	0.2003	0.09		Q	.	.	.	.
18.97	0.2014	0.09		Q	.	.	.	.
19.11	0.2024	0.09		Q	.	.	.	.
19.24	0.2033	0.09		Q	.	.	.	.
19.38	0.2043	0.08		Q	.	.	.	.
19.51	0.2052	0.08		Q	.	.	.	.
19.65	0.2061	0.08		Q	.	.	.	.
19.78	0.2070	0.08		Q	.	.	.	.
19.92	0.2079	0.08		Q	.	.	.	.
20.06	0.2087	0.08		Q	.	.	.	.
20.19	0.2096	0.07		Q	.	.	.	.
20.33	0.2104	0.07		Q	.	.	.	.
20.46	0.2112	0.07		Q	.	.	.	.
20.60	0.2120	0.07		Q	.	.	.	.
20.73	0.2128	0.07		Q	.	.	.	.
20.87	0.2135	0.07		Q	.	.	.	.
21.00	0.2143	0.07		Q	.	.	.	.
21.14	0.2150	0.07		Q	.	.	.	.
21.27	0.2158	0.07		Q	.	.	.	.
21.41	0.2165	0.06		Q	.	.	.	.
21.54	0.2172	0.06		Q	.	.	.	.
21.68	0.2179	0.06		Q	.	.	.	.
21.81	0.2186	0.06		Q	.	.	.	.
21.95	0.2193	0.06		Q	.	.	.	.
22.08	0.2200	0.06		Q	.	.	.	.
22.22	0.2207	0.06		Q	.	.	.	.
22.35	0.2213	0.06		Q	.	.	.	.
22.49	0.2220	0.06		Q	.	.	.	.
22.62	0.2226	0.06		Q	.	.	.	.
22.76	0.2233	0.06		Q	.	.	.	.
22.89	0.2239	0.06		Q	.	.	.	.
23.03	0.2245	0.06		Q	.	.	.	.
23.16	0.2251	0.06		Q	.	.	.	.
23.30	0.2258	0.05		Q	.	.	.	.
23.43	0.2264	0.05		Q	.	.	.	.
23.57	0.2270	0.05		Q	.	.	.	.
23.70	0.2276	0.05		Q	.	.	.	.
23.84	0.2281	0.05		Q	.	.	.	.
23.97	0.2287	0.05		Q	.	.	.	.
24.11	0.2293	0.05		Q	.	.	.	.
24.25	0.2296	0.00		Q	.	.	.	.

Area E Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.63
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 6.84
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.16
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.05

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)		0.	2.5	5.0	7.5	10.0
0.04	0.0000	0.00	Q	.	.	.	.	
0.15	0.0002	0.04	Q	.	.	.	.	
0.27	0.0005	0.04	Q	.	.	.	.	
0.38	0.0009	0.04	Q	.	.	.	.	
0.50	0.0012	0.04	Q	.	.	.	.	
0.61	0.0016	0.04	Q	.	.	.	.	
0.72	0.0019	0.04	Q	.	.	.	.	
0.84	0.0023	0.04	Q	.	.	.	.	
0.95	0.0026	0.04	Q	.	.	.	.	
1.07	0.0030	0.04	Q	.	.	.	.	
1.18	0.0033	0.04	Q	.	.	.	.	
1.29	0.0037	0.04	Q	.	.	.	.	
1.41	0.0040	0.04	Q	.	.	.	.	
1.52	0.0044	0.04	Q	.	.	.	.	
1.64	0.0048	0.04	Q	.	.	.	.	
1.75	0.0051	0.04	Q	.	.	.	.	
1.86	0.0055	0.04	Q	.	.	.	.	
1.98	0.0059	0.04	Q	.	.	.	.	
2.09	0.0062	0.04	Q	.	.	.	.	
2.21	0.0066	0.04	Q	.	.	.	.	
2.32	0.0070	0.04	Q	.	.	.	.	
2.43	0.0073	0.04	Q	.	.	.	.	
2.55	0.0077	0.04	Q	.	.	.	.	
2.66	0.0081	0.04	Q	.	.	.	.	
2.78	0.0085	0.04	Q	.	.	.	.	
2.89	0.0089	0.04	Q	.	.	.	.	
3.00	0.0092	0.04	Q	.	.	.	.	
3.12	0.0096	0.04	Q	.	.	.	.	
3.23	0.0100	0.04	Q	.	.	.	.	
3.35	0.0104	0.04	Q	.	.	.	.	
3.46	0.0108	0.04	Q	.	.	.	.	
3.57	0.0112	0.04	Q	.	.	.	.	
3.69	0.0116	0.04	Q	.	.	.	.	
3.80	0.0120	0.04	Q	.	.	.	.	
3.92	0.0124	0.04	Q	.	.	.	.	
4.03	0.0128	0.04	Q	.	.	.	.	
4.14	0.0132	0.04	Q	.	.	.	.	
4.26	0.0136	0.04	Q	.	.	.	.	
4.37	0.0140	0.04	Q	.	.	.	.	
4.49	0.0144	0.04	Q	.	.	.	.	
4.60	0.0148	0.04	Q	.	.	.	.	
4.71	0.0152	0.04	Q	.	.	.	.	
4.83	0.0156	0.04	Q	.	.	.	.	
4.94	0.0160	0.04	Q	.	.	.	.	
5.06	0.0165	0.04	Q	.	.	.	.	
5.17	0.0169	0.04	Q	.	.	.	.	
5.28	0.0173	0.05	Q	.	.	.	.	

5.40	0.0177	0.05	Q	.	.	.	.
5.51	0.0182	0.05	Q	.	.	.	.
5.63	0.0186	0.05	Q	.	.	.	.
5.74	0.0190	0.05	Q	.	.	.	.
5.85	0.0195	0.05	Q	.	.	.	.
5.97	0.0199	0.05	Q	.	.	.	.
6.08	0.0203	0.05	Q	.	.	.	.
6.20	0.0208	0.05	Q	.	.	.	.
6.31	0.0212	0.05	Q	.	.	.	.
6.42	0.0217	0.05	Q	.	.	.	.
6.54	0.0221	0.05	Q	.	.	.	.
6.65	0.0226	0.05	Q	.	.	.	.
6.77	0.0230	0.05	Q	.	.	.	.
6.88	0.0235	0.05	Q	.	.	.	.
6.99	0.0240	0.05	Q	.	.	.	.
7.11	0.0244	0.05	Q	.	.	.	.
7.22	0.0249	0.05	Q	.	.	.	.
7.34	0.0254	0.05	Q	.	.	.	.
7.45	0.0259	0.05	Q	.	.	.	.
7.56	0.0264	0.05	Q	.	.	.	.
7.68	0.0268	0.05	Q	.	.	.	.
7.79	0.0273	0.05	Q	.	.	.	.
7.91	0.0278	0.05	Q	.	.	.	.
8.02	0.0283	0.05	Q	.	.	.	.
8.13	0.0288	0.05	Q	.	.	.	.
8.25	0.0293	0.05	Q	.	.	.	.
8.36	0.0298	0.05	Q	.	.	.	.
8.48	0.0303	0.05	Q	.	.	.	.
8.59	0.0309	0.06	Q	.	.	.	.
8.70	0.0314	0.06	Q	.	.	.	.
8.82	0.0319	0.06	Q	.	.	.	.
8.93	0.0324	0.06	Q	.	.	.	.
9.05	0.0330	0.06	Q	.	.	.	.
9.16	0.0335	0.06	Q	.	.	.	.
9.27	0.0341	0.06	Q	.	.	.	.
9.39	0.0346	0.06	Q	.	.	.	.
9.50	0.0352	0.06	Q	.	.	.	.
9.62	0.0357	0.06	Q	.	.	.	.
9.73	0.0363	0.06	Q	.	.	.	.
9.84	0.0369	0.06	Q	.	.	.	.
9.96	0.0374	0.06	Q	.	.	.	.
10.07	0.0380	0.06	Q	.	.	.	.
10.19	0.0386	0.06	Q	.	.	.	.
10.30	0.0392	0.06	Q	.	.	.	.
10.41	0.0398	0.06	Q	.	.	.	.
10.53	0.0404	0.06	Q	.	.	.	.
10.64	0.0410	0.07	Q	.	.	.	.
10.76	0.0416	0.07	Q	.	.	.	.
10.87	0.0423	0.07	Q	.	.	.	.
10.98	0.0429	0.07	Q	.	.	.	.
11.10	0.0435	0.07	Q	.	.	.	.
11.21	0.0442	0.07	Q	.	.	.	.
11.33	0.0449	0.07	Q	.	.	.	.
11.44	0.0455	0.07	Q	.	.	.	.
11.55	0.0462	0.07	Q	.	.	.	.
11.67	0.0469	0.07	Q	.	.	.	.
11.78	0.0476	0.07	Q	.	.	.	.
11.90	0.0483	0.08	Q	.	.	.	.
12.01	0.0490	0.08	Q	.	.	.	.
12.12	0.0497	0.08	Q	.	.	.	.
12.24	0.0505	0.08	Q	.	.	.	.
12.35	0.0512	0.08	Q	.	.	.	.
12.47	0.0520	0.08	Q	.	.	.	.
12.58	0.0528	0.08	Q	.	.	.	.
12.69	0.0536	0.08	Q	.	.	.	.
12.81	0.0544	0.09	Q	.	.	.	.
12.92	0.0552	0.09	Q	.	.	.	.
13.04	0.0560	0.09	Q	.	.	.	.
13.15	0.0569	0.09	Q	.	.	.	.
13.26	0.0577	0.09	Q	.	.	.	.

13.38	0.0586	0.10	Q		.	.	.	.
13.49	0.0595	0.10	Q		.	.	.	.
13.61	0.0605	0.10	Q		.	.	.	.
13.72	0.0614	0.10	Q		.	.	.	.
13.83	0.0624	0.11	Q		.	.	.	.
13.95	0.0634	0.11	Q		.	.	.	.
14.06	0.0644	0.11	Q		.	.	.	.
14.18	0.0654	0.10	Q		.	.	.	.
14.29	0.0664	0.11	Q		.	.	.	.
14.40	0.0674	0.11	Q		.	.	.	.
14.52	0.0685	0.12	Q		.	.	.	.
14.63	0.0696	0.12	Q		.	.	.	.
14.75	0.0707	0.13	Q		.	.	.	.
14.86	0.0720	0.13	Q		.	.	.	.
14.97	0.0733	0.14	Q		.	.	.	.
15.09	0.0746	0.15	Q		.	.	.	.
15.20	0.0761	0.16	Q		.	.	.	.
15.32	0.0777	0.17	Q		.	.	.	.
15.43	0.0795	0.20	Q		.	.	.	.
15.54	0.0815	0.22	Q		.	.	.	.
15.66	0.0837	0.26	.Q		.	.	.	.
15.77	0.0864	0.30	.Q		.	.	.	.
15.89	0.0898	0.43	.Q		.	.	.	.
16.00	0.0947	0.61	. Q		.	.	.	.
16.11	0.1071	2.04	.	Q	.	.	.	.
16.23	0.1183	0.34	.Q		.	.	.	.
16.34	0.1210	0.24	Q		.	.	.	.
16.46	0.1230	0.18	Q		.	.	.	.
16.57	0.1246	0.16	Q		.	.	.	.
16.68	0.1260	0.14	Q		.	.	.	.
16.80	0.1272	0.12	Q		.	.	.	.
16.91	0.1283	0.11	Q		.	.	.	.
17.03	0.1294	0.10	Q		.	.	.	.
17.14	0.1304	0.11	Q		.	.	.	.
17.25	0.1314	0.10	Q		.	.	.	.
17.37	0.1323	0.10	Q		.	.	.	.
17.48	0.1333	0.09	Q		.	.	.	.
17.60	0.1341	0.09	Q		.	.	.	.
17.71	0.1350	0.09	Q		.	.	.	.
17.82	0.1358	0.08	Q		.	.	.	.
17.94	0.1365	0.08	Q		.	.	.	.
18.05	0.1373	0.08	Q		.	.	.	.
18.17	0.1380	0.08	Q		.	.	.	.
18.28	0.1387	0.07	Q		.	.	.	.
18.39	0.1394	0.07	Q		.	.	.	.
18.51	0.1401	0.07	Q		.	.	.	.
18.62	0.1407	0.07	Q		.	.	.	.
18.74	0.1414	0.07	Q		.	.	.	.
18.85	0.1420	0.07	Q		.	.	.	.
18.96	0.1426	0.06	Q		.	.	.	.
19.08	0.1432	0.06	Q		.	.	.	.
19.19	0.1438	0.06	Q		.	.	.	.
19.31	0.1443	0.06	Q		.	.	.	.
19.42	0.1449	0.06	Q		.	.	.	.
19.53	0.1454	0.06	Q		.	.	.	.
19.65	0.1460	0.06	Q		.	.	.	.
19.76	0.1465	0.06	Q		.	.	.	.
19.88	0.1470	0.05	Q		.	.	.	.
19.99	0.1476	0.05	Q		.	.	.	.
20.10	0.1481	0.05	Q		.	.	.	.
20.22	0.1486	0.05	Q		.	.	.	.
20.33	0.1490	0.05	Q		.	.	.	.
20.45	0.1495	0.05	Q		.	.	.	.
20.56	0.1500	0.05	Q		.	.	.	.
20.67	0.1505	0.05	Q		.	.	.	.
20.79	0.1509	0.05	Q		.	.	.	.
20.90	0.1514	0.05	Q		.	.	.	.
21.02	0.1518	0.05	Q		.	.	.	.
21.13	0.1523	0.05	Q		.	.	.	.
21.24	0.1527	0.05	Q		.	.	.	.

21.36	0.1532	0.05	Q	.	.	.	.
21.47	0.1536	0.05	Q	.	.	.	.
21.59	0.1540	0.04	Q	.	.	.	.
21.70	0.1544	0.04	Q	.	.	.	.
21.81	0.1548	0.04	Q	.	.	.	.
21.93	0.1553	0.04	Q	.	.	.	.
22.04	0.1557	0.04	Q	.	.	.	.
22.16	0.1561	0.04	Q	.	.	.	.
22.27	0.1565	0.04	Q	.	.	.	.
22.38	0.1569	0.04	Q	.	.	.	.
22.50	0.1572	0.04	Q	.	.	.	.
22.61	0.1576	0.04	Q	.	.	.	.
22.73	0.1580	0.04	Q	.	.	.	.
22.84	0.1584	0.04	Q	.	.	.	.
22.95	0.1588	0.04	Q	.	.	.	.
23.07	0.1591	0.04	Q	.	.	.	.
23.18	0.1595	0.04	Q	.	.	.	.
23.30	0.1599	0.04	Q	.	.	.	.
23.41	0.1602	0.04	Q	.	.	.	.
23.52	0.1606	0.04	Q	.	.	.	.
23.64	0.1609	0.04	Q	.	.	.	.
23.75	0.1613	0.04	Q	.	.	.	.
23.87	0.1616	0.04	Q	.	.	.	.
23.98	0.1620	0.04	Q	.	.	.	.
24.09	0.1623	0.04	Q	.	.	.	.
24.21	0.1625	0.00	Q	.	.	.	.

AreaF Proposed 25-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 3.78
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.082
LOW LOSS FRACTION = 0.147
TIME OF CONCENTRATION(MIN.) = 10.78
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.37
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.75
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.00
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.55
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.12
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.98

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.98
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.28

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.01	0.0000	0.00	Q	.	.	.	.
0.19	0.0016	0.22	Q	.	.	.	.
0.37	0.0049	0.22	Q	.	.	.	.
0.55	0.0082	0.22	Q	.	.	.	.
0.73	0.0115	0.22	Q	.	.	.	.
0.91	0.0148	0.22	Q	.	.	.	.
1.09	0.0181	0.23	Q	.	.	.	.
1.27	0.0215	0.23	Q	.	.	.	.
1.45	0.0249	0.23	Q	.	.	.	.
1.63	0.0283	0.23	Q	.	.	.	.
1.81	0.0317	0.23	Q	.	.	.	.
1.99	0.0352	0.23	Q	.	.	.	.
2.17	0.0387	0.24	Q	.	.	.	.
2.35	0.0422	0.24	Q	.	.	.	.
2.53	0.0457	0.24	Q	.	.	.	.
2.70	0.0493	0.24	Q	.	.	.	.
2.88	0.0529	0.24	Q	.	.	.	.
3.06	0.0565	0.24	Q	.	.	.	.
3.24	0.0601	0.25	Q	.	.	.	.
3.42	0.0638	0.25	Q	.	.	.	.
3.60	0.0675	0.25	.Q	.	.	.	.
3.78	0.0712	0.25	.Q	.	.	.	.
3.96	0.0749	0.25	.Q	.	.	.	.
4.14	0.0787	0.26	.Q	.	.	.	.
4.32	0.0825	0.26	.Q	.	.	.	.
4.50	0.0864	0.26	.Q	.	.	.	.
4.68	0.0903	0.26	.Q	.	.	.	.
4.86	0.0942	0.26	.Q	.	.	.	.
5.04	0.0981	0.27	.Q	.	.	.	.
5.22	0.1021	0.27	.Q	.	.	.	.
5.40	0.1061	0.27	.Q	.	.	.	.
5.58	0.1102	0.27	.Q	.	.	.	.
5.76	0.1142	0.28	.Q	.	.	.	.
5.94	0.1184	0.28	.Q	.	.	.	.
6.12	0.1225	0.28	.Q	.	.	.	.
6.30	0.1267	0.28	.Q	.	.	.	.
6.48	0.1310	0.29	.Q	.	.	.	.
6.66	0.1353	0.29	.Q	.	.	.	.
6.84	0.1396	0.29	.Q	.	.	.	.
7.02	0.1440	0.30	.Q	.	.	.	.
7.20	0.1485	0.30	.Q	.	.	.	.
7.38	0.1529	0.30	.Q	.	.	.	.
7.56	0.1575	0.31	.Q	.	.	.	.
7.74	0.1621	0.31	.Q	.	.	.	.
7.92	0.1667	0.31	.Q	.	.	.	.
8.09	0.1714	0.32	.Q	.	.	.	.
8.27	0.1761	0.32	.Q	.	.	.	.

8.45	0.1809	0.33	.Q
8.63	0.1858	0.33	.Q
8.81	0.1907	0.33	Q
8.99	0.1958	0.34	.Q
9.17	0.2008	0.34	.Q
9.35	0.2060	0.35	.Q
9.53	0.2112	0.35	.Q
9.71	0.2165	0.36	.Q
9.89	0.2219	0.36	.Q
10.07	0.2273	0.37	.Q
10.25	0.2329	0.38	.Q
10.43	0.2385	0.38	.Q
10.61	0.2443	0.39	.Q
10.79	0.2501	0.40	.Q
10.97	0.2561	0.40	.Q
11.15	0.2621	0.41	.Q
11.33	0.2683	0.42	.Q
11.51	0.2746	0.43	.Q
11.69	0.2811	0.44	.Q
11.87	0.2877	0.45	.Q
12.05	0.2944	0.46	.Q
12.23	0.3013	0.47	.Q
12.41	0.3083	0.48	Q
12.59	0.3156	0.50	.Q
12.77	0.3230	0.51	Q
12.95	0.3307	0.53	.Q
13.13	0.3385	0.54	.Q
13.30	0.3467	0.56	.Q
13.48	0.3551	0.58	.Q
13.66	0.3639	0.61	.Q
13.84	0.3730	0.62	.Q
14.02	0.3825	0.66	Q
14.20	0.3921	0.63	.Q
14.38	0.4016	0.65	.Q
14.56	0.4115	0.68	.Q
14.74	0.4221	0.75	.Q
14.92	0.4335	0.79	.Q
15.10	0.4460	0.90	.Q
15.28	0.4599	0.97	.Q
15.46	0.4759	1.19	.Q
15.64	0.4950	1.37	Q
15.82	0.5192	1.91	.Q
16.00	0.5535	2.70	.Q
16.18	0.6419	9.21	Q
16.36	0.7220	1.58	.Q
16.54	0.7416	1.06	Q
16.72	0.7557	0.84	.Q
16.90	0.7672	0.71	.Q
17.08	0.7771	0.63	.Q
17.26	0.7865	0.64	.Q
17.44	0.7956	0.59	.Q
17.62	0.8041	0.55	.Q
17.80	0.8120	0.52	.Q
17.98	0.8194	0.49	.Q
18.16	0.8265	0.46	.Q
18.34	0.8332	0.44	Q
18.52	0.8397	0.43	.Q
18.69	0.8459	0.41	.Q
18.87	0.8518	0.39	.Q
19.05	0.8576	0.38	.Q
19.23	0.8631	0.37	.Q
19.41	0.8685	0.36	.Q
19.59	0.8737	0.35	.Q
19.77	0.8788	0.34	.Q
19.95	0.8837	0.33	.Q
20.13	0.8885	0.32	.Q
20.31	0.8932	0.31	.Q
20.49	0.8978	0.31	.Q
20.67	0.9023	0.30	.Q
20.85	0.9067	0.29	.Q

21.03	0.9110	0.29	.Q	.	.	.	.
21.21	0.9152	0.28	.Q	.	.	.	.
21.39	0.9193	0.28	.Q	.	.	.	.
21.57	0.9234	0.27	.Q	.	.	.	.
21.75	0.9274	0.27	.Q	.	.	.	.
21.93	0.9313	0.26	.Q	.	.	.	.
22.11	0.9351	0.26	.Q	.	.	.	.
22.29	0.9389	0.25	.Q	.	.	.	.
22.47	0.9426	0.25	Q	.	.	.	.
22.65	0.9463	0.24	Q	.	.	.	.
22.83	0.9499	0.24	Q	.	.	.	.
23.01	0.9534	0.24	Q	.	.	.	.
23.19	0.9570	0.23	Q	.	.	.	.
23.37	0.9604	0.23	Q	.	.	.	.
23.55	0.9638	0.23	Q	.	.	.	.
23.73	0.9672	0.23	Q	.	.	.	.
23.91	0.9705	0.22	Q	.	.	.	.
24.08	0.9738	0.22	Q	.	.	.	.
24.26	0.9754	0.00	Q	.	.	.	.

PROJECT: 11-420 Proposed **DATE:**

ENGINEER:

1. Enter the design storm return frequency **(years)** 25
2. Enter catchment lag **(hours)** _____
3. Enter the catchment area **(acres)** 37.37
4. Enter baseflow **(cfs/square mile)** Ø
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.082
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.147
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.37

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.75

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 1.0

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 1.55

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 2.12

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 3.98
9. Enter 24-hour storm unit interval **(minutes)** _____

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

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25-Year Proposed Site Analysis

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.98 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.72	11.00	56.	0.748	0.853
2	14.24	11.00	56.	0.748	0.853
3	11.57	11.00	56.	0.748	0.853
4	0.89	11.00	56.	0.748	0.853
5	0.63	11.00	56.	0.748	0.853
6	3.78	11.00	56.	0.748	0.853

TOTAL AREA (Acres) = 36.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.082

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.147

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2006 Advanced Engineering Software (aes)
              Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                            *
* 25-Yr Proposed 1-Hour Rational                                           *
*                                                                          *
 ****************************************************************************

  FILE NAME: 11420PR.DAT
  TIME/DATE OF STUDY: 10:08 06/09/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 0.9716
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

+---------------------------------------------------------------------------+
| PROPOSED AREA A                                                           |
|                                                                           |
```

```
|                                                                                |
+--------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       1.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   912.00
  ELEVATION DATA: UPSTREAM(FEET) =      10.12  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.665
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.596
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        5.72      0.75      0.100    56  11.66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      12.98
  TOTAL AREA(ACRES) =       5.72   PEAK FLOW RATE(CFS) =     12.98

+--------------------------------------------------------------------------------+
| PROPOSED AREA B                                                                |
|                                                                                |
|                                                                                |
+--------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1530.00
  ELEVATION DATA: UPSTREAM(FEET) =      13.24  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.001
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.232
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B       14.24      0.75      0.100    56  15.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      27.65
  TOTAL AREA(ACRES) =      14.24   PEAK FLOW RATE(CFS) =     27.65

+--------------------------------------------------------------------------------+
| PROPOSED AREA C                                                                |
|                                                                                |
|                                                                                |
+--------------------------------------------------------------------------------+
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1117.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.05  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.920
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.441
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B       11.57      0.75      0.100    56   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      24.64
  TOTAL AREA(ACRES) =      11.57   PEAK FLOW RATE(CFS) =     24.64

+--------------------------------------------------------------------------+
| PROPOSED AREA D                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   386.00
  ELEVATION DATA: UPSTREAM(FEET) =       5.25  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.112
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.228
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.89      0.75      0.100    56    8.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       2.53
  TOTAL AREA(ACRES) =       0.89   PEAK FLOW RATE(CFS) =      2.53

+--------------------------------------------------------------------------+
| PROPOSED AREA E                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =      3.40  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.838
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.576
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.63      0.75     0.100    56   6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.99
  TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      1.99

+-----------------------------------------------------------------------------+
| PROPOSED AREA F                                                             |
|                                                                             |
|                                                                             |
+-----------------------------------------------------------------------------+

******************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   670.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.36  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.782
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.721
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        3.78      0.75     0.100    56  10.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.00
  TOTAL AREA(ACRES) =      3.78   PEAK FLOW RATE(CFS) =      9.00
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      3.78  TC(MIN.) =     10.78
  EFFECTIVE AREA(ACRES) =      3.78  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =      9.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

100-YEAR ANALYSIS

Area A Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 5.72
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 11.66
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.23
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.39

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.06	0.0000	0.00	Q	.	.	.	.
0.26	0.0048	0.60	.Q	.	.	.	.
0.45	0.0145	0.60	.Q	.	.	.	.
0.65	0.0243	0.61	.Q	.	.	.	.
0.84	0.0341	0.61	.Q	.	.	.	.
1.04	0.0439	0.62	.Q	.	.	.	.
1.23	0.0539	0.62	.Q	.	.	.	.
1.43	0.0638	0.62	.Q	.	.	.	.
1.62	0.0739	0.63	.Q	.	.	.	.
1.81	0.0840	0.63	.Q	.	.	.	.
2.01	0.0941	0.63	.Q	.	.	.	.
2.20	0.1044	0.64	.Q	.	.	.	.
2.40	0.1146	0.64	.Q	.	.	.	.
2.59	0.1250	0.65	.Q	.	.	.	.
2.79	0.1354	0.65	.Q	.	.	.	.
2.98	0.1459	0.66	.Q	.	.	.	.
3.17	0.1565	0.66	.Q	.	.	.	.
3.37	0.1671	0.67	.Q	.	.	.	.
3.56	0.1779	0.67	.Q	.	.	.	.
3.76	0.1887	0.68	.Q	.	.	.	.
3.95	0.1995	0.68	.Q	.	.	.	.
4.15	0.2105	0.69	.Q	.	.	.	.
4.34	0.2215	0.69	.Q	.	.	.	.
4.53	0.2326	0.70	.Q	.	.	.	.
4.73	0.2438	0.70	.Q	.	.	.	.
4.92	0.2551	0.71	.Q	.	.	.	.
5.12	0.2665	0.71	.Q	.	.	.	.
5.31	0.2780	0.72	.Q	.	.	.	.
5.51	0.2895	0.72	.Q	.	.	.	.
5.70	0.3012	0.73	.Q	.	.	.	.
5.89	0.3130	0.73	.Q	.	.	.	.
6.09	0.3248	0.74	.Q	.	.	.	.
6.28	0.3368	0.75	.Q	.	.	.	.
6.48	0.3489	0.76	.Q	.	.	.	.
6.67	0.3611	0.76	.Q	.	.	.	.
6.87	0.3734	0.77	.Q	.	.	.	.
7.06	0.3858	0.78	.Q	.	.	.	.
7.26	0.3984	0.79	.Q	.	.	.	.
7.45	0.4111	0.79	.Q	.	.	.	.
7.64	0.4239	0.80	.Q	.	.	.	.
7.84	0.4368	0.81	.Q	.	.	.	.
8.03	0.4499	0.82	.Q	.	.	.	.
8.23	0.4631	0.83	.Q	.	.	.	.
8.42	0.4765	0.84	.Q	.	.	.	.
8.62	0.4900	0.85	.Q	.	.	.	.
8.81	0.5037	0.86	.Q	.	.	.	.
9.00	0.5176	0.87	.Q	.	.	.	.

9.20	0.5316	0.88	.Q . . . .
9.39	0.5458	0.89	.Q . . . .
9.59	0.5602	0.90	.Q . . . .
9.78	0.5748	0.91	.Q . . . .
9.98	0.5896	0.93	.Q . . . .
10.17	0.6047	0.94	.Q . . . .
10.36	0.6199	0.96	.Q . . . .
10.56	0.6354	0.97	.Q . . . .
10.75	0.6511	0.99	.Q . . . .
10.95	0.6671	1.00	. Q . . . .
11.14	0.6834	1.03	. Q . . . .
11.34	0.7000	1.04	. Q . . . .
11.53	0.7168	1.06	. Q . . . .
11.72	0.7340	1.08	. Q . . . .
11.92	0.7516	1.11	. Q . . . .
12.11	0.7695	1.12	. Q . . . .
12.31	0.7851	0.82	.Q . . . .
12.50	0.7984	0.84	.Q . . . .
12.70	0.8121	0.87	.Q . . . .
12.89	0.8263	0.89	.Q . . . .
13.09	0.8411	0.94	.Q . . . .
13.28	0.8564	0.97	.Q . . . .
13.47	0.8724	1.02	. Q . . . .
13.67	0.8891	1.06	. Q . . . .
13.86	0.9067	1.13	. Q . . . .
14.06	0.9252	1.17	Q . . . .
14.25	0.9455	1.36	. Q . . . .
14.45	0.9679	1.42	. Q . . . .
14.64	0.9918	1.56	. Q . . . .
14.83	1.0177	1.65	. Q . . . .
15.03	1.0460	1.89	. Q . . . .
15.22	1.0776	2.04	. Q . . . .
15.42	1.1140	2.50	. Q . . . .
15.61	1.1578	2.96	. Q . . . .
15.81	1.2131	3.92	. Q . . . .
16.00	1.2863	5.20	. Q . . .
16.19	1.4683	17.45	. . . . Q .
16.39	1.6360	3.44	. Q . . . . .
16.58	1.6815	2.23	. Q . . . . .
16.78	1.7136	1.76	. Q . . . . .
16.97	1.7396	1.49	. Q . . . . .
17.17	1.7617	1.26	Q . . . . .
17.36	1.7806	1.09	. Q . . . . .
17.55	1.7973	1.00	.Q . . . . .
17.75	1.8127	0.92	.Q . . . . .
17.94	1.8269	0.85	.Q . . . . .
18.14	1.8405	0.84	.Q . . . . .
18.33	1.8561	1.09	. Q . . . . .
18.53	1.8733	1.05	. Q . . . . .
18.72	1.8899	1.01	. Q . . . . .
18.92	1.9059	0.98	.Q . . . . .
19.11	1.9214	0.95	.Q . . . . .
19.30	1.9364	0.92	.Q . . . . .
19.50	1.9510	0.90	.Q . . . . .
19.69	1.9652	0.87	.Q . . . . .
19.89	1.9791	0.85	.Q . . . . .
20.08	1.9926	0.83	.Q . . . . .
20.28	2.0058	0.81	.Q . . . . .
20.47	2.0188	0.80	.Q . . . . .
20.66	2.0315	0.78	.Q . . . . .
20.86	2.0439	0.77	.Q . . . . .
21.05	2.0561	0.75	.Q . . . . .
21.25	2.0681	0.74	.Q . . . . .
21.44	2.0798	0.73	.Q . . . . .
21.64	2.0914	0.71	.Q . . . . .
21.83	2.1028	0.70	.Q . . . . .
22.02	2.1140	0.69	.Q . . . . .
22.22	2.1250	0.68	.Q . . . . .
22.41	2.1359	0.67	.Q . . . . .
22.61	2.1466	0.66	.Q . . . . .

22.80	2.1572	0.65	.Q	.	.	.	.
23.00	2.1676	0.65	.Q	.	.	.	.
23.19	2.1779	0.64	.Q	.	.	.	.
23.38	2.1881	0.63	.Q	.	.	.	.
23.58	2.1981	0.62	.Q	.	.	.	.
23.77	2.2080	0.61	.Q	.	.	.	.
23.97	2.2178	0.61	.Q	.	.	.	.
24.16	2.2275	0.60	.Q	.	.	.	.
24.36	2.2323	0.00	Q	.	.	.	.

Area B Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 14.24
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 15.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 5.55
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.98

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TIME (HOURS)	VOLUME (AF)	Q (CFS)	0. 10.0 20.0 30.0 40.0
0.25	0.0155	1.50	.Q
0.50	0.0465	1.50	.Q
0.75	0.0777	1.52	.Q
1.00	0.1092	1.53	.Q
1.25	0.1409	1.54	.Q
1.50	0.1729	1.55	.Q
1.75	0.2051	1.57	.Q
2.00	0.2375	1.58	.Q
2.25	0.2702	1.59	.Q
2.50	0.3032	1.60	.Q
2.75	0.3365	1.62	Q
3.00	0.3701	1.63	.Q
3.25	0.4039	1.65	.Q
3.50	0.4381	1.66	.Q
3.75	0.4725	1.68	.Q
4.00	0.5073	1.69	.Q
4.25	0.5424	1.71	.Q
4.50	0.5779	1.72	.Q
4.75	0.6137	1.74	.Q
5.00	0.6499	1.76	.Q
5.25	0.6864	1.78	.Q
5.50	0.7233	1.79	.Q
5.75	0.7606	1.82	Q
6.00	0.7984	1.83	.Q
6.25	0.8365	1.86	.Q
6.50	0.8751	1.88	.Q
6.75	0.9142	1.91	.Q
7.00	0.9537	1.92	.Q
7.25	0.9938	1.95	.Q
7.50	1.0343	1.97	.Q
7.75	1.0754	2.01	.Q
8.00	1.1171	2.03	.Q
8.25	1.1593	2.06	.Q
8.50	1.2021	2.08	.Q
8.75	1.2456	2.13	.Q
9.00	1.2898	2.15	.Q
9.25	1.3347	2.20	.Q
9.50	1.3803	2.22	.Q
9.75	1.4268	2.27	.Q
10.00	1.4740	2.30	.Q
10.25	1.5221	2.36	.Q
10.50	1.5712	2.39	.Q
10.75	1.6213	2.46	.Q
11.00	1.6724	2.49	.Q
11.25	1.7247	2.57	.Q
11.50	1.7782	2.61	.Q
11.75	1.8331	2.70	.Q

12.00	1.8893	2.75	. Q . . . .
12.25	1.9384	2.00	. Q . . . .
12.50	1.9804	2.06	. Q . . . .
12.75	2.0242	2.18	. Q . . . .
13.00	2.0700	2.25	. Q . . . .
13.25	2.1181	2.41	. Q . . . .
13.50	2.1688	2.50	. Q . . . .
13.75	2.2225	2.71	. Q . . . .
14.00	2.2797	2.83	. Q . . . .
14.25	2.3436	3.35	. Q . . . .
14.50	2.4147	3.54	. Q . . . .
14.75	2.4927	4.01	. Q . . . .
15.00	2.5789	4.33	. Q . . . .
15.25	2.6781	5.27	. Q . . . .
15.50	2.7942	5.97	. Q . . . .
15.75	2.9490	9.02	. Q. . .
16.00	3.1564	11.05	. .Q . . .
16.25	3.6542	37.14	. . . . Q .
16.50	4.1141	7.38	. Q . . . .
16.75	4.2394	4.74	. Q . . . .
17.00	4.3272	3.75	. Q . . . .
17.25	4.3966	2.97	. Q . . . .
17.50	4.4541	2.60	. Q . . . .
17.75	4.5049	2.33	. Q . . . .
18.00	4.5508	2.12	. Q . . . .
18.25	4.6016	2.80	. Q . . . .
18.50	4.6579	2.65	. Q . . . .
18.75	4.7115	2.53	. Q . . . .
19.00	4.7626	2.42	. Q . . . .
19.25	4.8117	2.33	. Q . . . .
19.50	4.8590	2.25	. Q . . . .
19.75	4.9047	2.17	. Q . . . .
20.00	4.9488	2.11	. Q . . . .
20.25	4.9917	2.04	. Q . . . .
20.50	5.0334	1.99	.Q . . . .
20.75	5.0739	1.94	.Q . . . .
21.00	5.1135	1.89	.Q . . . .
21.25	5.1521	1.85	.Q . . . .
21.50	5.1898	1.81	.Q . . . .
21.75	5.2267	1.77	.Q . . . .
22.00	5.2629	1.73	.Q . . . .
22.25	5.2984	1.70	.Q . . . .
22.50	5.3332	1.67	.Q . . . .
22.75	5.3673	1.64	.Q . . . .
23.00	5.4009	1.61	.Q . . . .
23.25	5.4339	1.58	.Q . . . .
23.50	5.4663	1.56	.Q . . . .
23.75	5.4983	1.53	.Q . . . .
24.00	5.5298	1.51	.Q . . . .
24.25	5.5454	0.00	Q . . . .

Area C Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 11.57
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 12.92
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 4.52
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.79

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TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
0.07	0.0000	0.00	Q	.	.	.	.
0.28	0.0108	1.22	.Q	.	.	.	.
0.50	0.0326	1.22	.Q	.	.	.	.
0.71	0.0544	1.23	.Q	.	.	.	.
0.93	0.0764	1.24	.Q	.	.	.	.
1.14	0.0986	1.25	.Q	.	.	.	.
1.36	0.1209	1.26	.Q	.	.	.	.
1.57	0.1433	1.27	.Q	.	.	.	.
1.79	0.1659	1.27	.Q	.	.	.	.
2.00	0.1887	1.28	.Q	.	.	.	.
2.22	0.2116	1.29	.Q	.	.	.	.
2.43	0.2347	1.30	.Q	.	.	.	.
2.65	0.2579	1.31	.Q	.	.	.	.
2.86	0.2813	1.32	.Q	.	.	.	.
3.08	0.3049	1.33	.Q	.	.	.	.
3.30	0.3287	1.34	.Q	.	.	.	.
3.51	0.3526	1.35	.Q	.	.	.	.
3.73	0.3768	1.36	.Q	.	.	.	.
3.94	0.4011	1.37	.Q	.	.	.	.
4.16	0.4256	1.39	.Q	.	.	.	.
4.37	0.4504	1.39	.Q	.	.	.	.
4.59	0.4753	1.41	.Q	.	.	.	.
4.80	0.5005	1.42	.Q	.	.	.	.
5.02	0.5258	1.43	.Q	.	.	.	.
5.23	0.5514	1.44	Q	.	.	.	.
5.45	0.5773	1.46	.Q	.	.	.	.
5.66	0.6033	1.47	.Q	.	.	.	.
5.88	0.6297	1.49	.Q	.	.	.	.
6.09	0.6562	1.50	.Q	.	.	.	.
6.31	0.6831	1.52	.Q	.	.	.	.
6.53	0.7102	1.53	.Q	.	.	.	.
6.74	0.7376	1.55	.Q	.	.	.	.
6.96	0.7652	1.56	.Q	.	.	.	.
7.17	0.7932	1.58	.Q	.	.	.	.
7.39	0.8215	1.59	.Q	.	.	.	.
7.60	0.8501	1.62	.Q	.	.	.	.
7.82	0.8790	1.63	.Q	.	.	.	.
8.03	0.9083	1.66	.Q	.	.	.	.
8.25	0.9379	1.67	.Q	.	.	.	.
8.46	0.9679	1.70	.Q	.	.	.	.
8.68	0.9983	1.72	.Q	.	.	.	.
8.89	1.0291	1.75	.Q	.	.	.	.
9.11	1.0603	1.76	.Q	.	.	.	.
9.32	1.0920	1.80	.Q	.	.	.	.
9.54	1.1241	1.81	.Q	.	.	.	.
9.76	1.1567	1.85	.Q	.	.	.	.
9.97	1.1898	1.87	.Q	.	.	.	.

10.19	1.2235	1.91	.Q . . . .
10.40	1.2577	1.93	.Q . . . .
10.62	1.2925	1.98	.Q . . . .
10.83	1.3279	2.00	. Q . . . .
11.05	1.3640	2.05	. Q . . . .
11.26	1.4008	2.08	. Q . . . .
11.48	1.4383	2.14	. Q . . . .
11.69	1.4766	2.17	. Q . . . .
11.91	1.5158	2.24	. Q . . . .
12.12	1.5559	2.27	. Q . . . .
12.34	1.5909	1.66	.Q . . . .
12.55	1.6207	1.70	.Q . . . .
12.77	1.6518	1.79	.Q . . . .
12.99	1.6840	1.84	.Q . . . .
13.20	1.7176	1.95	.Q . . . .
13.42	1.7528	2.01	. Q . . . .
13.63	1.7897	2.15	Q . . . .
13.85	1.8287	2.23	. Q . . . .
14.06	1.8699	2.41	. Q . . . .
14.28	1.9153	2.69	. Q . . . .
14.49	1.9658	2.97	. Q . . . .
14.71	2.0202	3.14	. Q . . . .
14.92	2.0799	3.58	. Q . . . .
15.14	2.1462	3.87	. Q . . . .
15.35	2.2224	4.70	. Q . . . .
15.57	2.3133	5.53	Q . . . .
15.78	2.4309	7.68	. Q . . . .
16.00	2.5870	9.86	. Q. . . .
16.22	2.9695	33.12	. . . Q .
16.43	3.3224	6.55	Q . . . .
16.65	3.4183	4.23	Q . . . .
16.86	3.4856	3.33	. Q . . . .
17.08	3.5405	2.83	. Q . . . .
17.29	3.5863	2.31	. Q . . . .
17.51	3.6253	2.07	Q . . . .
17.72	3.6606	1.89	.Q . . . .
17.94	3.6929	1.74	.Q . . . .
18.15	3.7236	1.71	.Q . . . .
18.37	3.7584	2.20	. Q . . . .
18.58	3.7968	2.11	. Q . . . .
18.80	3.8336	2.03	. Q . . . .
19.01	3.8690	1.95	.Q . . . .
19.23	3.9032	1.89	.Q . . . .
19.45	3.9364	1.83	.Q . . . .
19.66	3.9685	1.78	.Q . . . .
19.88	3.9997	1.73	.Q . . . .
20.09	4.0301	1.69	.Q . . . .
20.31	4.0598	1.65	.Q . . . .
20.52	4.0887	1.61	.Q . . . .
20.74	4.1170	1.57	.Q . . . .
20.95	4.1447	1.54	.Q . . . .
21.17	4.1718	1.51	.Q . . . .
21.38	4.1983	1.48	.Q . . . .
21.60	4.2244	1.45	.Q . . . .
21.81	4.2500	1.43	.Q . . . .
22.03	4.2752	1.40	.Q . . . .
22.24	4.2999	1.38	.Q . . . .
22.46	4.3242	1.36	.Q . . . .
22.68	4.3482	1.34	.Q . . . .
22.89	4.3718	1.32	.Q . . . .
23.11	4.3950	1.30	.Q . . . .
23.32	4.4179	1.28	.Q . . . .
23.54	4.4405	1.26	.Q . . . .
23.75	4.4628	1.24	.Q . . . .
23.97	4.4848	1.23	.Q . . . .
24.18	4.5066	1.21	.Q . . . .
24.40	4.5174	0.00	Q . . . .

Area D Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.89
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 8.11
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.35
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.06

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TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.05	0.0000	0.00 Q	.	.	.	.	
0.19	0.0005	0.09 Q	.	.	.	.	
0.32	0.0016	0.09 Q	.	.	.	.	
0.46	0.0026	0.09 Q	.	.	.	.	
0.59	0.0037	0.09 Q	.	.	.	.	
0.73	0.0047	0.10 Q	.	.	.	.	
0.86	0.0058	0.10 Q	.	.	.	.	
1.00	0.0069	0.10 Q	.	.	.	.	
1.13	0.0079	0.10 Q	.	.	.	.	
1.27	0.0090	0.10 Q	.	.	.	.	
1.40	0.0101	0.10 Q	.	.	.	.	
1.54	0.0112	0.10 Q	.	.	.	.	
1.67	0.0123	0.10 Q	.	.	.	.	
1.81	0.0134	0.10 Q	.	.	.	.	
1.94	0.0145	0.10 Q	.	.	.	.	
2.08	0.0156	0.10 Q	.	.	.	.	
2.21	0.0167	0.10 Q	.	.	.	.	
2.35	0.0178	0.10 Q	.	.	.	.	
2.48	0.0189	0.10 Q	.	.	.	.	
2.62	0.0200	0.10 Q	.	.	.	.	
2.75	0.0212	0.10 Q	.	.	.	.	
2.89	0.0223	0.10 Q	.	.	.	.	
3.02	0.0235	0.10 Q	.	.	.	.	
3.16	0.0246	0.10 Q	.	.	.	.	
3.29	0.0258	0.10 Q	.	.	.	.	
3.43	0.0269	0.10 Q	.	.	.	.	
3.56	0.0281	0.10 Q	.	.	.	.	
3.70	0.0292	0.10 Q	.	.	.	.	
3.84	0.0304	0.11 Q	.	.	.	.	
3.97	0.0316	0.11 Q	.	.	.	.	
4.11	0.0328	0.11 Q	.	.	.	.	
4.24	0.0340	0.11 Q	.	.	.	.	
4.38	0.0352	0.11 Q	.	.	.	.	
4.51	0.0364	0.11 Q	.	.	.	.	
4.65	0.0376	0.11 Q	.	.	.	.	
4.78	0.0388	0.11 Q	.	.	.	.	
4.92	0.0400	0.11 Q	.	.	.	.	
5.05	0.0413	0.11 Q	.	.	.	.	
5.19	0.0425	0.11 Q	.	.	.	.	
5.32	0.0438	0.11 Q	.	.	.	.	
5.46	0.0450	0.11 Q	.	.	.	.	
5.59	0.0463	0.11 Q	.	.	.	.	
5.73	0.0475	0.11 Q	.	.	.	.	
5.86	0.0488	0.11 Q	.	.	.	.	
6.00	0.0501	0.12 Q	.	.	.	.	
6.13	0.0514	0.12 Q	.	.	.	.	
6.27	0.0527	0.12 Q	.	.	.	.	

6.40	0.0540	0.12	Q	.	.	.	.
6.54	0.0553	0.12	Q	.	.	.	.
6.67	0.0566	0.12	Q	.	.	.	.
6.81	0.0580	0.12	Q	.	.	.	.
6.94	0.0593	0.12	Q	.	.	.	.
7.08	0.0607	0.12	Q	.	.	.	.
7.21	0.0620	0.12	Q	.	.	.	.
7.35	0.0634	0.12	Q	.	.	.	.
7.48	0.0648	0.12	Q	.	.	.	.
7.62	0.0662	0.12	Q	.	.	.	.
7.75	0.0676	0.13	Q	.	.	.	.
7.89	0.0690	0.13	Q	.	.	.	.
8.03	0.0704	0.13	Q	.	.	.	.
8.16	0.0718	0.13	Q	.	.	.	.
8.30	0.0733	0.13	Q	.	.	.	.
8.43	0.0747	0.13	Q	.	.	.	.
8.57	0.0762	0.13	Q	.	.	.	.
8.70	0.0777	0.13	Q	.	.	.	.
8.84	0.0792	0.13	Q	.	.	.	.
8.97	0.0807	0.14	Q	.	.	.	.
9.11	0.0822	0.14	Q	.	.	.	.
9.24	0.0837	0.14	Q	.	.	.	.
9.38	0.0853	0.14	Q	.	.	.	.
9.51	0.0868	0.14	Q	.	.	.	.
9.65	0.0884	0.14	Q	.	.	.	.
9.78	0.0900	0.14	Q	.	.	.	.
9.92	0.0916	0.14	Q	.	.	.	.
10.05	0.0932	0.15	Q	.	.	.	.
10.19	0.0949	0.15	Q	.	.	.	.
10.32	0.0965	0.15	Q	.	.	.	.
10.46	0.0982	0.15	Q	.	.	.	.
10.59	0.0999	0.15	Q	.	.	.	.
10.73	0.1016	0.15	Q	.	.	.	.
10.86	0.1033	0.16	Q	.	.	.	.
11.00	0.1051	0.16	Q	.	.	.	.
11.13	0.1068	0.16	Q	.	.	.	.
11.27	0.1086	0.16	Q	.	.	.	.
11.40	0.1104	0.16	Q	.	.	.	.
11.54	0.1123	0.17	Q	.	.	.	.
11.67	0.1142	0.17	Q	.	.	.	.
11.81	0.1161	0.17	Q	.	.	.	.
11.95	0.1180	0.17	Q	.	.	.	.
12.08	0.1198	0.16	Q	.	.	.	.
12.22	0.1214	0.13	Q	.	.	.	.
12.35	0.1228	0.13	Q	.	.	.	.
12.49	0.1242	0.13	Q	.	.	.	.
12.62	0.1257	0.14	Q	.	.	.	.
12.76	0.1273	0.14	Q	.	.	.	.
12.89	0.1288	0.14	Q	.	.	.	.
13.03	0.1304	0.14	Q	.	.	.	.
13.16	0.1321	0.15	Q	.	.	.	.
13.30	0.1338	0.15	Q	.	.	.	.
13.43	0.1355	0.16	Q	.	.	.	.
13.57	0.1373	0.16	Q	.	.	.	.
13.70	0.1392	0.17	Q	.	.	.	.
13.84	0.1411	0.17	Q	.	.	.	.
13.97	0.1431	0.18	Q	.	.	.	.
14.11	0.1452	0.19	Q	.	.	.	.
14.24	0.1474	0.21	Q	.	.	.	.
14.38	0.1499	0.22	Q	.	.	.	.
14.51	0.1524	0.24	Q	.	.	.	.
14.65	0.1551	0.24	Q	.	.	.	.
14.78	0.1579	0.26	.Q	.	.	.	.
14.92	0.1609	0.28	.Q	.	.	.	.
15.05	0.1642	0.30	.Q	.	.	.	.
15.19	0.1677	0.32	Q	.	.	.	.
15.32	0.1715	0.37	.Q	.	.	.	.
15.46	0.1759	0.41	.Q	.	.	.	.
15.59	0.1810	0.51	. Q	.	.	.	.
15.73	0.1870	0.57	. Q	.	.	.	.

15.86	0.1942	0.73	. Q . . . .
16.00	0.2040	1.02	. Q . . . .
16.14	0.2287	3.40	. . Q . . .
16.27	0.2511	0.61	. Q . . . .
16.41	0.2571	0.46	.Q . . . .
16.54	0.2615	0.34	.Q . . . .
16.68	0.2651	0.29	.Q . . . .
16.81	0.2681	0.25	.Q . . . .
16.95	0.2708	0.23	Q . . . .
17.08	0.2732	0.21	Q . . . .
17.22	0.2754	0.18	Q . . . .
17.35	0.2773	0.17	Q . . . .
17.49	0.2791	0.16	Q . . . .
17.62	0.2808	0.15	Q . . . .
17.76	0.2824	0.14	Q . . . .
17.89	0.2839	0.13	Q . . . .
18.03	0.2854	0.13	Q . . . .
18.16	0.2871	0.17	Q . . . .
18.30	0.2890	0.17	Q . . . .
18.43	0.2908	0.16	Q . . . .
18.57	0.2927	0.16	Q . . . .
18.70	0.2944	0.16	Q . . . .
18.84	0.2962	0.15	Q . . . .
18.97	0.2979	0.15	Q . . . .
19.11	0.2995	0.15	Q . . . .
19.24	0.3011	0.14	Q . . . .
19.38	0.3027	0.14	Q . . . .
19.51	0.3043	0.14	Q . . . .
19.65	0.3058	0.14	Q . . . .
19.78	0.3073	0.13	Q . . . .
19.92	0.3088	0.13	Q . . . .
20.06	0.3102	0.13	Q . . . .
20.19	0.3117	0.13	Q . . . .
20.33	0.3131	0.13	Q . . . .
20.46	0.3145	0.12	Q . . . .
20.60	0.3159	0.12	Q . . . .
20.73	0.3172	0.12	Q . . . .
20.87	0.3185	0.12	Q . . . .
21.00	0.3199	0.12	Q . . . .
21.14	0.3212	0.12	Q . . . .
21.27	0.3224	0.11	Q . . . .
21.41	0.3237	0.11	Q . . . .
21.54	0.3250	0.11	Q . . . .
21.68	0.3262	0.11	Q . . . .
21.81	0.3274	0.11	Q . . . .
21.95	0.3286	0.11	Q . . . .
22.08	0.3298	0.11	Q . . . .
22.22	0.3310	0.11	Q . . . .
22.35	0.3322	0.10	Q . . . .
22.49	0.3334	0.10	Q . . . .
22.62	0.3345	0.10	Q . . . .
22.76	0.3357	0.10	Q . . . .
22.89	0.3368	0.10	Q . . . .
23.03	0.3379	0.10	Q . . . .
23.16	0.3390	0.10	Q . . . .
23.30	0.3401	0.10	Q . . . .
23.43	0.3412	0.10	Q . . . .
23.57	0.3423	0.10	Q . . . .
23.70	0.3434	0.10	Q . . . .
23.84	0.3444	0.09	Q . . . .
23.97	0.3455	0.09	Q . . . .
24.11	0.3465	0.09	Q . . . .
24.25	0.3470	0.00	Q . . . .

Area E Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 0.63
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 6.84
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.25
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.04

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)		0.	2.5	5.0	7.5	10.0
0.04	0.0000	0.00	Q	.	.	.	.	
0.15	0.0003	0.07	Q	.	.	.	.	
0.27	0.0009	0.07	Q	.	.	.	.	
0.38	0.0016	0.07	Q	.	.	.	.	
0.50	0.0022	0.07	Q	.	.	.	.	
0.61	0.0028	0.07	Q	.	.	.	.	
0.72	0.0035	0.07	Q	.	.	.	.	
0.84	0.0041	0.07	Q	.	.	.	.	
0.95	0.0047	0.07	Q	.	.	.	.	
1.07	0.0054	0.07	Q	.	.	.	.	
1.18	0.0060	0.07	Q	.	.	.	.	
1.29	0.0067	0.07	Q	.	.	.	.	
1.41	0.0073	0.07	Q	.	.	.	.	
1.52	0.0079	0.07	Q	.	.	.	.	
1.64	0.0086	0.07	Q	.	.	.	.	
1.75	0.0093	0.07	Q	.	.	.	.	
1.86	0.0099	0.07	Q	.	.	.	.	
1.98	0.0106	0.07	Q	.	.	.	.	
2.09	0.0112	0.07	Q	.	.	.	.	
2.21	0.0119	0.07	Q	.	.	.	.	
2.32	0.0126	0.07	Q	.	.	.	.	
2.43	0.0132	0.07	Q	.	.	.	.	
2.55	0.0139	0.07	Q	.	.	.	.	
2.66	0.0146	0.07	Q	.	.	.	.	
2.78	0.0152	0.07	Q	.	.	.	.	
2.89	0.0159	0.07	Q	.	.	.	.	
3.00	0.0166	0.07	Q	.	.	.	.	
3.12	0.0173	0.07	Q	.	.	.	.	
3.23	0.0180	0.07	Q	.	.	.	.	
3.35	0.0187	0.07	Q	.	.	.	.	
3.46	0.0194	0.07	Q	.	.	.	.	
3.57	0.0201	0.07	Q	.	.	.	.	
3.69	0.0208	0.07	Q	.	.	.	.	
3.80	0.0215	0.07	Q	.	.	.	.	
3.92	0.0222	0.07	Q	.	.	.	.	
4.03	0.0229	0.08	Q	.	.	.	.	
4.14	0.0236	0.08	Q	.	.	.	.	
4.26	0.0243	0.08	Q	.	.	.	.	
4.37	0.0250	0.08	Q	.	.	.	.	
4.49	0.0257	0.08	Q	.	.	.	.	
4.60	0.0264	0.08	Q	.	.	.	.	
4.71	0.0272	0.08	Q	.	.	.	.	
4.83	0.0279	0.08	Q	.	.	.	.	
4.94	0.0286	0.08	Q	.	.	.	.	
5.06	0.0294	0.08	Q	.	.	.	.	
5.17	0.0301	0.08	Q	.	.	.	.	
5.28	0.0309	0.08	Q	.	.	.	.	

5.40	0.0316	0.08	Q	.	.	.	.
5.51	0.0324	0.08	Q	.	.	.	.
5.63	0.0331	0.08	Q	.	.	.	.
5.74	0.0339	0.08	Q	.	.	.	.
5.85	0.0346	0.08	Q	.	.	.	.
5.97	0.0354	0.08	Q	.	.	.	.
6.08	0.0362	0.08	Q	.	.	.	.
6.20	0.0369	0.08	Q	.	.	.	.
6.31	0.0377	0.08	Q	.	.	.	.
6.42	0.0385	0.08	Q	.	.	.	.
6.54	0.0393	0.08	Q	.	.	.	.
6.65	0.0401	0.08	Q	.	.	.	.
6.77	0.0409	0.08	Q	.	.	.	.
6.88	0.0417	0.09	Q	.	.	.	.
6.99	0.0425	0.09	Q	.	.	.	.
7.11	0.0433	0.09	Q	.	.	.	.
7.22	0.0441	0.09	Q	.	.	.	.
7.34	0.0449	0.09	Q	.	.	.	.
7.45	0.0457	0.09	Q	.	.	.	.
7.56	0.0466	0.09	Q	.	.	.	.
7.68	0.0474	0.09	Q	.	.	.	.
7.79	0.0483	0.09	Q	.	.	.	.
7.91	0.0491	0.09	Q	.	.	.	.
8.02	0.0499	0.09	Q	.	.	.	.
8.13	0.0508	0.09	Q	.	.	.	.
8.25	0.0517	0.09	Q	.	.	.	.
8.36	0.0525	0.09	Q	.	.	.	.
8.48	0.0534	0.09	Q	.	.	.	.
8.59	0.0543	0.09	Q	.	.	.	.
8.70	0.0552	0.09	Q	.	.	.	.
8.82	0.0561	0.10	Q	.	.	.	.
8.93	0.0570	0.10	Q	.	.	.	.
9.05	0.0579	0.10	Q	.	.	.	.
9.16	0.0588	0.10	Q	.	.	.	.
9.27	0.0597	0.10	Q	.	.	.	.
9.39	0.0606	0.10	Q	.	.	.	.
9.50	0.0615	0.10	Q	.	.	.	.
9.62	0.0625	0.10	Q	.	.	.	.
9.73	0.0634	0.10	Q	.	.	.	.
9.84	0.0644	0.10	Q	.	.	.	.
9.96	0.0653	0.10	Q	.	.	.	.
10.07	0.0663	0.10	Q	.	.	.	.
10.19	0.0673	0.10	Q	.	.	.	.
10.30	0.0683	0.11	Q	.	.	.	.
10.41	0.0693	0.11	Q	.	.	.	.
10.53	0.0703	0.11	Q	.	.	.	.
10.64	0.0713	0.11	Q	.	.	.	.
10.76	0.0723	0.11	Q	.	.	.	.
10.87	0.0734	0.11	Q	.	.	.	.
10.98	0.0744	0.11	Q	.	.	.	.
11.10	0.0755	0.11	Q	.	.	.	.
11.21	0.0765	0.11	Q	.	.	.	.
11.33	0.0776	0.12	Q	.	.	.	.
11.44	0.0787	0.12	Q	.	.	.	.
11.55	0.0798	0.12	Q	.	.	.	.
11.67	0.0809	0.12	Q	.	.	.	.
11.78	0.0821	0.12	Q	.	.	.	.
11.90	0.0832	0.12	Q	.	.	.	.
12.01	0.0844	0.12	Q	.	.	.	.
12.12	0.0854	0.10	Q	.	.	.	.
12.24	0.0863	0.09	Q	.	.	.	.
12.35	0.0872	0.09	Q	.	.	.	.
12.47	0.0880	0.09	Q	.	.	.	.
12.58	0.0889	0.09	Q	.	.	.	.
12.69	0.0898	0.10	Q	.	.	.	.
12.81	0.0908	0.10	Q	.	.	.	.
12.92	0.0917	0.10	Q	.	.	.	.
13.04	0.0927	0.10	Q	.	.	.	.
13.15	0.0936	0.11	Q	.	.	.	.
13.26	0.0947	0.11	Q	.	.	.	.

13.38	0.0957	0.11	Q	.	.	.	.
13.49	0.0968	0.11	Q	.	.	.	.
13.61	0.0978	0.12	Q	.	.	.	.
13.72	0.0990	0.12	Q	.	.	.	.
13.83	0.1001	0.13	Q	.	.	.	.
13.95	0.1013	0.13	Q	.	.	.	.
14.06	0.1026	0.14	Q	.	.	.	.
14.18	0.1039	0.15	Q	.	.	.	.
14.29	0.1053	0.15	Q	.	.	.	.
14.40	0.1068	0.16	Q	.	.	.	.
14.52	0.1083	0.17	Q	.	.	.	.
14.63	0.1100	0.17	Q	.	.	.	.
14.75	0.1116	0.18	Q	.	.	.	.
14.86	0.1134	0.19	Q	.	.	.	.
14.97	0.1153	0.21	Q	.	.	.	.
15.09	0.1173	0.22	Q	.	.	.	.
15.20	0.1194	0.24	Q	.	.	.	.
15.32	0.1218	0.25	.Q	.	.	.	.
15.43	0.1244	0.30	.Q	.	.	.	.
15.54	0.1274	0.33	Q	.	.	.	.
15.66	0.1308	0.40	.Q	.	.	.	.
15.77	0.1347	0.43	.Q	.	.	.	.
15.89	0.1394	0.57	. Q	.	.	.	.
16.00	0.1458	0.80	. Q	.	.	.	.
16.11	0.1622	2.68	.	Q	.	.	.
16.23	0.1770	0.46	.Q	.	.	.	.
16.34	0.1809	0.36	.Q	.	.	.	.
16.46	0.1839	0.27	.Q	.	.	.	.
16.57	0.1862	0.23	Q	.	.	.	.
16.68	0.1882	0.20	Q	.	.	.	.
16.80	0.1900	0.18	Q	.	.	.	.
16.91	0.1916	0.16	Q	.	.	.	.
17.03	0.1931	0.15	Q	.	.	.	.
17.14	0.1944	0.13	Q	.	.	.	.
17.25	0.1956	0.12	Q	.	.	.	.
17.37	0.1967	0.12	Q	.	.	.	.
17.48	0.1978	0.11	Q	.	.	.	.
17.60	0.1988	0.10	Q	.	.	.	.
17.71	0.1998	0.10	Q	.	.	.	.
17.82	0.2007	0.10	Q	.	.	.	.
17.94	0.2016	0.09	Q	.	.	.	.
18.05	0.2024	0.09	Q	.	.	.	.
18.17	0.2034	0.12	Q	.	.	.	.
18.28	0.2046	0.12	Q	.	.	.	.
18.39	0.2057	0.12	Q	.	.	.	.
18.51	0.2068	0.11	Q	.	.	.	.
18.62	0.2078	0.11	Q	.	.	.	.
18.74	0.2089	0.11	Q	.	.	.	.
18.85	0.2099	0.11	Q	.	.	.	.
18.96	0.2109	0.11	Q	.	.	.	.
19.08	0.2119	0.10	Q	.	.	.	.
19.19	0.2129	0.10	Q	.	.	.	.
19.31	0.2138	0.10	Q	.	.	.	.
19.42	0.2148	0.10	Q	.	.	.	.
19.53	0.2157	0.10	Q	.	.	.	.
19.65	0.2166	0.10	Q	.	.	.	.
19.76	0.2175	0.09	Q	.	.	.	.
19.88	0.2184	0.09	Q	.	.	.	.
19.99	0.2193	0.09	Q	.	.	.	.
20.10	0.2201	0.09	Q	.	.	.	.
20.22	0.2210	0.09	Q	.	.	.	.
20.33	0.2218	0.09	Q	.	.	.	.
20.45	0.2227	0.09	Q	.	.	.	.
20.56	0.2235	0.09	Q	.	.	.	.
20.67	0.2243	0.09	Q	.	.	.	.
20.79	0.2251	0.08	Q	.	.	.	.
20.90	0.2259	0.08	Q	.	.	.	.
21.02	0.2267	0.08	Q	.	.	.	.
21.13	0.2274	0.08	Q	.	.	.	.
21.24	0.2282	0.08	Q	.	.	.	.

21.36	0.2290	0.08	Q	.	.	.	.
21.47	0.2297	0.08	Q	.	.	.	.
21.59	0.2304	0.08	Q	.	.	.	.
21.70	0.2312	0.08	Q	.	.	.	.
21.81	0.2319	0.08	Q	.	.	.	.
21.93	0.2326	0.08	Q	.	.	.	.
22.04	0.2334	0.08	Q	.	.	.	.
22.16	0.2341	0.08	Q	.	.	.	.
22.27	0.2348	0.07	Q	.	.	.	.
22.38	0.2355	0.07	Q	.	.	.	.
22.50	0.2362	0.07	Q	.	.	.	.
22.61	0.2368	0.07	Q	.	.	.	.
22.73	0.2375	0.07	Q	.	.	.	.
22.84	0.2382	0.07	Q	.	.	.	.
22.95	0.2389	0.07	Q	.	.	.	.
23.07	0.2395	0.07	Q	.	.	.	.
23.18	0.2402	0.07	Q	.	.	.	.
23.30	0.2409	0.07	Q	.	.	.	.
23.41	0.2415	0.07	Q	.	.	.	.
23.52	0.2422	0.07	Q	.	.	.	.
23.64	0.2428	0.07	Q	.	.	.	.
23.75	0.2434	0.07	Q	.	.	.	.
23.87	0.2441	0.07	Q	.	.	.	.
23.98	0.2447	0.07	Q	.	.	.	.
24.09	0.2453	0.07	Q	.	.	.	.
24.21	0.2456	0.00	Q	.	.	.	.

Area F Proposed 100-Year Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 3.78
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.059
TIME OF CONCENTRATION(MIN.) = 10.78
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.95
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.28
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.00
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.60
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.50

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.47
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.26

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.01	0.0000	0.00 Q	.	.	.	.	
0.19	0.0029	0.40 Q	.	.		.	
0.37	0.0089	0.40 Q	.	.	.	.	
0.55	0.0148	0.40 Q	.		.	.	
0.73	0.0208	0.40 Q	.	.	.		
0.91	0.0268	0.41 Q	.			.	
1.09	0.0328	0.41 Q	.	.	.		
1.27	0.0389	0.41 Q			.	.	
1.45	0.0450	0.41 Q	.	.	.		
1.63	0.0511	0.41 Q		.	.	.	
1.81	0.0573	0.42 Q	.	.	.		
1.99	0.0635	0.42 Q	.		.	.	
2.17	0.0697	0.42 Q	.		.		
2.35	0.0760	0.42 Q		.			
2.53	0.0824	0.43 Q			.	.	
2.70	0.0887	0.43 Q	.	.	.	.	
2.88	0.0951	0.43 Q	.			.	
3.06	0.1015	0.43 Q	.	.	.	.	
3.24	0.1080	0.44 Q	.	.		.	
3.42	0.1145	0.44 Q		.		.	
3.60	0.1211	0.44 Q	.	.			
3.78	0.1277	0.45 Q		.	.		
3.96	0.1344	0.45 Q			.	.	
4.14	0.1411	0.45 Q	.	.	.	.	
4.32	0.1478	0.46 Q	.	.	.	.	
4.50	0.1546	0.46 Q		.	.		
4.68	0.1614	0.46 Q	.	.			
4.86	0.1683	0.46 Q	.	.		.	
5.04	0.1752	0.47 Q	.	.	.		
5.22	0.1822	0.47 Q	.			.	
5.40	0.1893	0.48 Q	.		.	.	
5.58	0.1964	0.48 Q		.	.	.	
5.76	0.2035	0.48 Q	.	.	.		
5.94	0.2107	0.49 Q		.	.		
6.12	0.2180	0.49 Q	.		.	.	
6.30	0.2253	0.49 Q					
6.48	0.2327	0.50 .Q		.	.	.	
6.66	0.2402	0.50 .Q	.	.	.		
6.84	0.2477	0.51 .Q		.		.	
7.02	0.2553	0.51 .Q	.	.	.		
7.20	0.2629	0.52 .Q	.	.			
7.38	0.2706	0.52 .Q	.	.			
7.56	0.2784	0.53 .Q	.	.			
7.74	0.2863	0.53 .Q		.		.	
7.92	0.2943	0.54 .Q	.	.		.	
8.09	0.3023	0.54 .Q	.	.	.	.	
8.27	0.3104	0.55 .Q	.	.	.		

8.45	0.3186	0.55	.Q . . .
8.63	0.3269	0.56	.Q . . .
8.81	0.3353	0.57	.Q . . .
8.99	0.3437	0.57	.Q . . .
9.17	0.3523	0.58	.Q . . .
9.35	0.3610	0.59	.Q . . .
9.53	0.3698	0.59	.Q . . .
9.71	0.3786	0.60	.Q . . .
9.89	0.3876	0.61	.Q . . .
10.07	0.3968	0.62	.Q . . .
10.25	0.4060	0.63	Q . . .
10.43	0.4154	0.64	.Q . . .
10.61	0.4249	0.64	.Q . . .
10.79	0.4346	0.66	.Q . . .
10.97	0.4444	0.66	.Q . . .
11.15	0.4543	0.68	.Q . . .
11.33	0.4645	0.69	.Q . . .
11.51	0.4748	0.70	.Q . . .
11.69	0.4853	0.71	.Q . . .
11.87	0.4960	0.73	.Q . . .
12.05	0.5069	0.74	.Q . . .
12.23	0.5163	0.53	.Q . . .
12.41	0.5243	0.54	.Q . . .
12.59	0.5326	0.57	.Q . . .
12.77	0.5411	0.58	.Q . . .
12.95	0.5499	0.61	.Q . . .
13.13	0.5590	0.62	.Q . . .
13.30	0.5685	0.65	.Q . . .
13.48	0.5783	0.67	.Q . . .
13.66	0.5886	0.71	.Q . . .
13.84	0.5993	0.73	.Q . . .
14.02	0.6106	0.78	.Q . . .
14.20	0.6227	0.86	.Q . . .
14.38	0.6361	0.94	.Q . . .
14.56	0.6504	0.98	.Q . . .
14.74	0.6657	1.08	. Q . . .
14.92	0.6823	1.15	. Q . . .
15.10	0.7005	1.31	. Q . . .
15.28	0.7207	1.41	. Q . . .
15.46	0.7444	1.78	. Q . . .
15.64	0.7728	2.05	. Q . . .
15.82	0.8077	2.65	Q . . .
16.00	0.8542	3.61	. Q . . .
16.18	0.9709	12.11	. . Q .
16.36	1.0785	2.38	. Q . . .
16.54	1.1077	1.55	. Q . . .
16.72	1.1282	1.22	. Q . . .
16.90	1.1449	1.03	. Q . . .
17.08	1.1593	0.91	.Q . . .
17.26	1.1716	0.76	.Q . . .
17.44	1.1824	0.69	.Q . . .
17.62	1.1923	0.64	.Q . . .
17.80	1.2014	0.59	.Q . . .
17.98	1.2099	0.56	.Q . . .
18.16	1.2189	0.66	.Q . . .
18.34	1.2292	0.72	.Q . . .
18.52	1.2397	0.69	.Q . . .
18.69	1.2498	0.67	.Q . . .
18.87	1.2596	0.65	.Q . . .
19.05	1.2691	0.63	.Q . . .
19.23	1.2784	0.61	.Q . . .
19.41	1.2874	0.60	.Q . . .
19.59	1.2962	0.58	.Q . . .
19.77	1.3047	0.57	.Q . . .
19.95	1.3131	0.56	.Q . . .
20.13	1.3213	0.55	.Q . . .
20.31	1.3293	0.54	.Q . . .
20.49	1.3372	0.53	.Q . . .
20.67	1.3449	0.52	.Q . . .
20.85	1.3525	0.51	.Q . . .

21.03	1.3600	0.50	Q	.	.	.	.
21.21	1.3673	0.49	Q	.	.	.	.
21.39	1.3745	0.48	Q	.	.	.	.
21.57	1.3816	0.47	Q	.	.	.	.
21.75	1.3886	0.47	Q	.	.	.	.
21.93	1.3955	0.46	Q	.	.	.	.
22.11	1.4023	0.45	Q	.	.	.	.
22.29	1.4090	0.45	Q	.	.	.	.
22.47	1.4156	0.44	Q	.	.	.	.
22.65	1.4221	0.44	Q	.	.	.	.
22.83	1.4285	0.43	Q	.	.	.	.
23.01	1.4349	0.43	Q	.	.	.	.
23.19	1.4412	0.42	Q	.	.	.	.
23.37	1.4474	0.42	Q	.	.	.	.
23.55	1.4535	0.41	Q	.	.	.	.
23.73	1.4596	0.41	Q	.	.	.	.
23.91	1.4656	0.40	Q	.	.	.	.
24.08	1.4715	0.40	Q	.	.	.	.
24.26	1.4745	0.00	Q	.	.	.	.

PROJECT: 11-420 Proposed **DATE:**

ENGINEER:

1. Enter the design storm return frequency **(years)** 100
2. Enter catchment lag **(hours)**
3. Enter the catchment area **(acres)** 37.37
4. Enter baseflow **(cfs/square mile)** Ø
5. Enter S-Graph proportions **(decimal)**

Valley: Developed	1
Foothill	
Mountain	
Valley: Undeveloped	
Desert	

6. Enter maximum loss rate, F_m **(inch/hour)** 0.020
7. Enter low loss fraction, $\bar{Y}$ **(decimal)** 0.059
8. Enter watershed area-averaged 5-minute point rainfall **(inches)*** 0.48

   Enter watershed area-averaged 30-minute point rainfall **(inches)*** 0.95

   Enter watershed area-averaged 1-hour point rainfall **(inches)*** 1.28

   Enter watershed area-averaged 3-hour point rainfall **(inches)*** 2.0

   Enter watershed area-averaged 6-hour point rainfall **(inches)*** 2.6

   Enter watershed area-averaged 24-hour point rainfall **(inches)*** 5.5
9. Enter 24-hour storm unit interval **(minutes)**

*Note: enter values unadjusted by depth-area factors

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

WATERSHED INFORMATION FORM

Figure E-7

100-Year Proposed Site Analysis

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 5.50 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.72	11.00	91.(75.)	0.180	0.941
2	14.24	11.00	91.(75.)	0.180	0.941
3	11.57	11.00	91.(75.)	0.180	0.941
4	0.89	11.00	91.(75.)	0.180	0.941
5	0.63	11.00	91.(75.)	0.180	0.941
6	3.78	11.00	91.(75.)	0.180	0.941

TOTAL AREA (Acres) = 36.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.020

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.059

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****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2006 Advanced Engineering Software (aes)
              Ver. 13.0  Release Date: 06/01/2006  License ID 1510

                          Analysis prepared by:

                     Development Resource Consultants
                           8175 E. Kaiser Blvd.
                         Anaheim Hills, CA  92808
                              (714) 685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 11-420 Orange Show Industrial                                            *
* 100-Yr Proposed 1-Hour Rational                                          *
*                                                                          *
 ****************************************************************************

  FILE NAME: 11420PR.DAT
  TIME/DATE OF STUDY: 10:10 06/09/2011
============================================================================
  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 = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.2800
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

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

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

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

+---------------------------------------------------------------------------+
| PROPOSED AREA A                                                           |
|                                                                           |
```

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|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   912.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.12  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.665
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.420
  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        5.72      0.45      0.100    76   11.66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     17.37
  TOTAL AREA(ACRES) =      5.72   PEAK FLOW RATE(CFS) =     17.37

+--------------------------------------------------------------------------+
| PROPOSED AREA B                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1530.00
  ELEVATION DATA: UPSTREAM(FEET) =     13.24  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.001
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.941
  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       14.24      0.45      0.100    76   15.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     37.11
  TOTAL AREA(ACRES) =     14.24   PEAK FLOW RATE(CFS) =     37.11

+--------------------------------------------------------------------------+
| PROPOSED AREA C                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
```

```
****************************************************************************
  FLOW PROCESS FROM NODE       5.00 TO NODE       6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1117.00
  ELEVATION DATA: UPSTREAM(FEET) =      11.05  DOWNSTREAM(FEET) =       1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.920
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.216
  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       11.57      0.45      0.100    76   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      33.02
  TOTAL AREA(ACRES) =      11.57   PEAK FLOW RATE(CFS) =      33.02

+--------------------------------------------------------------------------+
| PROPOSED AREA D                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       7.00 TO NODE       8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   386.00
  ELEVATION DATA: UPSTREAM(FEET) =       5.25  DOWNSTREAM(FEET) =       1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.112
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.252
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.89      0.45      0.100    76    8.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       3.37
  TOTAL AREA(ACRES) =       0.89   PEAK FLOW RATE(CFS) =       3.37

+--------------------------------------------------------------------------+
| PROPOSED AREA E                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE       9.00 TO NODE      10.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =      3.40  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.838
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.711
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        0.63      0.45     0.100    76   6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       2.65
  TOTAL AREA(ACRES) =       0.63   PEAK FLOW RATE(CFS) =      2.65

+----------------------------------------------------------------------------+
| PROPOSED AREA F                                                            |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   670.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.36  DOWNSTREAM(FEET) =      1.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.782
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.585
  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.)
  COMMERCIAL                  B        3.78      0.45     0.100    76  10.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      12.04
  TOTAL AREA(ACRES) =       3.78   PEAK FLOW RATE(CFS) =     12.04
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      3.78  TC(MIN.) =     10.78
  EFFECTIVE AREA(ACRES) =       3.78  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =     12.04
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

BASIN ANALYSIS

Basin A

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	13,000	SF	(Per Grading Plan)
Bottom Perimater =	7,415	SF	(Per Grading Plan)
Depth =	2	FT	(Per Grading Plan)
Basin Storage =	20,415	CF	(Averaage End Area Method)
	0.469	AC-FT	

Basin Infiltration Rate

Infiltration Area =	13,000	SF
IR = Infiltration Rate =	5.63	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	11.06	CFS
TP = Time at Peak Run-On Rate =	16.19	HRS
Run-On Volume =	1.24	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	16	HRS	
Q1 = Flow Rate at T1 =	3.2	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.39	HRS	
Q2 = Flow Rate at T2 =	1.81	CFS	
T1a = Time at Infiltration Rate Exceeded =	16.059	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	5.63	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.307	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	5.63	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 2,429 CF

0.056 AC-FT

Basin Not Exceeded - Storm Event Does not Discharge

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	13.26	CFS
TP = Time at Peak Run-On Rate =	16.19	HRS
Run-On Volume =	1.48	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	16	HRS	
Q1 = Flow Rate at T1 =	3.88	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.39	HRS	
Q2 = Flow Rate at T2 =	2.29	CFS	
T1a = Time at Infiltration Rate Exceeded =	16.035	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	5.63	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.329	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	5.63	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 9,984 CF

0.229 AC-FT

Basin Not Exceeded - Storm Event Does not Discharge

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	17.45	CFS
TP = Time at Peak Run-On Rate =	16.19	HRS
Run-On Volume =	2.23	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	16	HRS	
Q1 = Flow Rate at T1 =	5.2	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.39	HRS	
Q2 = Flow Rate at T2 =	3.44	CFS	
T1a = Time at Infiltration Rate Exceeded =	16.007	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	5.63	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.359	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	5.63	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 14,625 CF

0.336 AC-FT

Basin Not Exceeded - Storm Event Does not Discharge

Basin B

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	15,000	SF	(Per Grading Plan)
Bottom Perimater =	4,850	SF	(Per Grading Plan)
Depth =	2.5	FT	(Per Grading Plan)
Basin Storage =	24,813	CF	(Averaage End Area Method)
	0.570	AC-FT	

Basin Infiltration Rate

Infiltration Area =	15,000	SF
IR = Infiltration Rate =	6.50	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	23.5	CFS
TP = Time at Peak Run-On Rate =	16.25	HRS
Run-On Volume =	3.09	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.75	HRS	
Q1 = Flow Rate at T1 =	4.75	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.5	HRS	
Q2 = Flow Rate at T2 =	3.86	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.797	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	6.50	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.466	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	6.50	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 20,499 CF

0.471 AC-FT

Basin Not Exceeded - Storm Event Does not Discharge

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	28.2	CFS
TP = Time at Peak Run-On Rate =	16.25	HRS
Run-On Volume =	3.67	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.75	HRS	
Q1 = Flow Rate at T1 =	6.01	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.5	HRS	
Q2 = Flow Rate at T2 =	4.92	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.761	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	6.50	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.483	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	6.50	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 28,206 CF

0.648 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	1.896	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.570	AC-FT	
Storm Runoff at Basin Capacity =	2.466	AC-FT	
Time at Basin Capacity =	16.29	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	24.48	CFS	

Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate = **17.98** CFS

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	37.14	CFS
TP = Time at Peak Run-On Rate =	16.25	HRS
Run-On Volume =	5.55	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.5	HRS	
Q1 = Flow Rate at T1 =	5.97	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.75	HRS	
Q2 = Flow Rate at T2 =	4.74	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.513	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	6.50	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.723	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	6.50	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 66,748 CF
1.532 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	2.802	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.570	AC-FT	
Storm Runoff at Basin Capacity =	3.372	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	37.14	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =			30.64 CFS

Basin C

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	7,160	SF	(Per Grading Plan)
Bottom Perimater =	2,700	SF	(Per Grading Plan)
Depth =	2.5	FT	(Per Grading Plan)
Basin Storage =	12,325	CF	(Averaage End Area Method)
	0.283	AC-FT	

Basin Infiltration Rate

Infiltration Area =	7,160	SF
IR = Infiltration Rate =	3.10	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	20.97	CFS
TP = Time at Peak Run-On Rate =	16.22	HRS
Run-On Volume =	2.51	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.57	HRS	
Q1 = Flow Rate at T1 =	2.99	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.65	HRS	
Q2 = Flow Rate at T2 =	2.48	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.574	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	3.10	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.636	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	3.10	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 34,141 CF

0.784 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	1.254	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.283	AC-FT	
Storm Runoff at Basin Capacity =	1.537	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	20.97	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =	17.87	CFS	

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	25.16	CFS
TP = Time at Peak Run-On Rate =	16.22	HRS
Run-On Volume =	2.99	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.14	HRS	
Q1 = Flow Rate at T1 =	2.66	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.65	HRS	
Q2 = Flow Rate at T2 =	2.9	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.161	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	3.10	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.646	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	3.10	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 58,958 CF

1.353 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	1.37	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.283	AC-FT	
Storm Runoff at Basin Capacity =	1.653	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	25.16	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =	22.06	CFS	

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	33.12	CFS
TP = Time at Peak Run-On Rate =	16.22	HRS
Run-On Volume =	4.52	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	14.49	HRS	
Q1 = Flow Rate at T1 =	2.97	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	17.08	HRS	
Q2 = Flow Rate at T2 =	2.83	CFS	
T1a = Time at Infiltration Rate Exceeded =	14.498	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	3.10	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	17.072	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	3.10	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 139,120 CF

3.194 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	1.97	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.283	AC-FT	
Storm Runoff at Basin Capacity =	2.253	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	33.12	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =			30.02 CFS

Basin D

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	9,600	SF	(Per Grading Plan)
Bottom Perimater =	6,930	SF	(Per Grading Plan)
Depth =	1	FT	(Per Grading Plan)
Basin Storage =	8,265	CF	(Averaage End Area Method)
	0.190	AC-FT	

Basin Infiltration Rate

Infiltration Area =	9,600	SF
IR = Infiltration Rate =	4.16	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	2.16	CFS
TP = Time at Peak Run-On Rate =	16.14	HRS
Run-On Volume =	0.19	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	2.59	CFS
TP = Time at Peak Run-On Rate =	16.14	HRS
Run-On Volume =	0.23	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	3.4	CFS
TP = Time at Peak Run-On Rate =	16.14	HRS
Run-On Volume =	0.35	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Basin E

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	6,230	SF	(Per Grading Plan)
Bottom Perimater =	4,425	SF	(Per Grading Plan)
Depth =	1	FT	(Per Grading Plan)
Basin Storage =	5,328	CF	(Averaage End Area Method)
	0.122	AC-FT	

Basin Infiltration Rate

Infiltration Area =	6,230	SF
IR = Infiltration Rate =	2.70	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	1.7	CFS
TP = Time at Peak Run-On Rate =	16.11	HRS
Run-On Volume =	0.14	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	2.04	CFS
TP = Time at Peak Run-On Rate =	16.11	HRS
Run-On Volume =	0.16	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	2.68	CFS
TP = Time at Peak Run-On Rate =	16.11	HRS
Run-On Volume =	0.25	AC-FT

Basin Infiltration Rate Exceeds Storm Event Peak Discharge therefore No Storage Required and No Discharge Necessary

Basin F

Soil Information

Infiltration Rate =	350	Gal/(SFxDay)	(Per Geotechnical Report)
Safety Factor =	1.25		

Infiltration Rate in CFS/100SF = 0.043 CFS/100SF

Basin Size

Top Perimeter =	2,670	SF	(Per Grading Plan)
Bottom Perimater =	1,170	SF	(Per Grading Plan)
Depth =	2.5	FT	(Per Grading Plan)
Basin Storage =	4,800	CF	(Averaage End Area Method)
	0.110	AC-FT	

Basin Infiltration Rate

Infiltration Area =	2,670	SF
IR = Infiltration Rate =	1.16	CFS

Design Storage

10-Year Storm Event

QP = Peak Run-On Rate =	7.68	CFS
TP = Time at Peak Run-On Rate =	16.18	HRS
Run-On Volume =	0.82	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.64	HRS	
Q1 = Flow Rate at T1 =	1.07	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.54	HRS	
Q2 = Flow Rate at T2 =	0.9	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.647	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	1.16	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.526	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	1.16	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 10,325 CF

0.237 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	0.42	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.110	AC-FT	
Storm Runoff at Basin Capacity =	0.530	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	7.68	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =	6.52	CFS	

Design Storage

25-Year Storm Event

QP = Peak Run-On Rate =	9.21	CFS
TP = Time at Peak Run-On Rate =	16.18	HRS
Run-On Volume =	0.98	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	15.28	HRS	
Q1 = Flow Rate at T1 =	0.97	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.54	HRS	
Q2 = Flow Rate at T2 =	1.06	CFS	
T1a = Time at Infiltration Rate Exceeded =	15.300	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	1.16	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.536	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	1.16	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 17,908 CF

0.411 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	0.461	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.110	AC-FT	
Storm Runoff at Basin Capacity =	0.571	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	9.21	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =	8.05	CFS	

Design Storage

100-Year Storm Event

QP = Peak Run-On Rate =	12.11	CFS
TP = Time at Peak Run-On Rate =	16.18	HRS
Run-On Volume =	1.47	AC-FT

T1 = Hyd. Point prior to infiltration rate excceding =	14.92	HRS	
Q1 = Flow Rate at T1 =	1.15	CFS	
T2 = Hyd. Point after to infiltration rate exceeding =	16.9	HRS	
Q2 = Flow Rate at T2 =	1.03	CFS	
T1a = Time at Infiltration Rate Exceeded =	14.921	HRS	(Linear Interpolation of Hydrograph)
Q1a = Flow Rate at time T1a =	1.16	CFS	
T2a = Time at Infiltration Rate No Longer Exceeded =	16.892	HRS	(Linear Interpolation of Hydrograph)
Q2a = Flow Rate at time T2a =	1.16	CFS	

Stored Volume = [(TP-T1a) x ((QP + Q1a)-(2 x IR))/2] + [(T2a-TP) x ((Q2a + QP)-(2 x IR))/2] x 3,600 = 38,861 CF

0.892 AC-FT

Basin Exceeded - Will Discharge

Storm Runoff at T1a =	0.683	AC-FT	(Linear Interpolation of Hydrograph)
Volume at Basin Capacity =	0.110	AC-FT	
Storm Runoff at Basin Capacity =	0.793	AC-FT	
Time at Basin Capacity =	NA	HRS	(Linear Interpolation of Hydrograph)
Flow Rate at Basin Capacity =	12.11	CFS	(Basin Full prior to Peak Runoff, Therefore no Detention)
Basin Disharge = Flow Rate at Basin Capacity - Infiltration Rate =			10.95 CFS