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DESIGN REPORT
FOR
PINE CREEK
REGIONAL DETENTION FACILITY 'F'

J·R ENGINEERING
A Subsidiary of Westrian

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DESIGN REPORT
FOR
PINE CREEK
REGIONAL DETENTION FACILITY 'F'

November 2002

Prepared For:

LP47, LLC dba
LA PLATA INVESTMENTS
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Colorado Springs, CO 80920
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Job No. 9503.50

DESIGN REPORT FOR PINE CREEK REGIONAL DETENTION FACILITY 'F'

J·R ENGINEERING
A Subsidiary of Westrian

DRAINAGE REPORT STATEMENT

ENGINEER'S STATEMENT:
The attached report was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO REGISTERED VANCEL S FOSSINGER 31972 PROFESSIONAL ENGINEER

Vancel Fossinger — 3-25-03

Vancel S. Fossinger, Colorado P.E. #31972 — Date
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this report.

Business Name: LP47, LLC dba La Plata Investments

By: Thomas Taylor
Thomas Taylor

Title: Director of Development Services

Address: 2315 Briargate Parkway, Suite 100

Colorado Springs, CO 80920

CITY OF COLORADO SPRINGS ONLY:
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

[signature] — 4/3/03

City Engineer — Date

Conditions:

DESIGN REPORT FOR
PINE CREEK REGIONAL DETENTION FACILITY 'F'

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APPENDIX

DESIGN REPORT FOR
PINE CREEK REGIONAL DETENTION FACILITY 'F'

PURPOSE

This document is the Design Report for Pine Creek Regional Detention Facility 'F'. The purpose of this report is to provide information on the function, adequacy, design constraints, and regulatory requirements of the proposed facility.

GENERAL DESCRIPTION

Proposed Pine Creek Regional Detention Facility 'F' is one of several regional detention facilities that were recommended for construction in the draft "Amendment 3 to the Pine Creek Drainage Basin Planning Study (PCDBPS). The proposed facility is located in the northwest quarter of the southwest quarter of Section 26 and eastern half of Section 26, Township 12 South, Range 66 West of the Sixth Principal Meridian, City of Colorado Springs, County of El Paso, State of Colorado, on the North Fork of the Pine Creek Channel.

The proposed facility will be bounded to the north by open space and Pine Creek Subdivision Filing No. 35, to the west by proposed Royal Pine Drive, to the east by open space, and to the south by Royal Pine Drive, open space, and future Pine Creek Filing No. 23. This area is presently undeveloped and is vegetated with native grasses and shrubs.

Proposed Pine Creek Regional Detention Facility 'F' will be located within a Tract within Pine Creek Subdivision Filing No. 35. Tract L (the detention pond tract) will encompass 11.19 acres. In the event that the pond overflows, excess water will be conveyed across adjacent Tract "K" of Pine Creek Subdivision Filing No. 35 to Royal Pine Drive. Tract 'K' will be owned by the Pine Creek Village Association. Restrictions to be recorded on the Pine Creek Filing No. 35 plat will govern the type of landscaping and grading that can be done within Track 'K'.

Detention Facility 'F' will receive storm water runoff from approximately 589 acres of watershed and will release the runoff at a lower peak rate to the natural Pine Creek Channel downstream of Royal Pine Drive in accordance with Amendment No. 3 to the Pine Creek D.B.P.S. The design for the facility has been reviewed informally by a representative of the State Engineer and was determined to be a non-jurisdictional dam per current criteria. Upon completion, the detention facility will be owned and maintained by La Plata Investments until such time it is accepted by the City of Colorado Springs and becomes part of the City of Colorado Springs stormwater system and is publicly maintained.

DESIGN

The storage volume and outlet characteristics for the pond were established in the preparation of Amendment No. 3 to the Pine Creek D.B.P.S. The inflow, outflow, and storage functions of the pond were modeled within the HEC-1 computer model developed for the Amendment No. 3 analysis. The facility is designed to function without overtopping in events up to and including the 100-year design storm with the watershed under full development in accordance with current master land plans and Amendment No. 3 to the D.B.P.S. Additional detention is to occur in the upper portion of the watershed in the full development condition. Section 'D' of the Appendix of this report contains input and output data from the HEC-1 model as well as inflow, outflow, and storage volume graphs. The following summary contains information related to the facility.

DETENTION POND DATA

- Normal Water Surface Elevation = 6913.0 (Empty)
- Lowest Outlet = 54" Vertical Orifice w/ Top 1.4 sf (blocked)
- Lowest Outlet Invert Elevation = 6911.5
- Emergency Spillway = Across Sag Vert. Curve In Royal Pine Dr.
- Crest Elevation = 6930.7 (Low Point In Vert. Curve)
- Storage Volume Below Emergency Spillway = 69.1 ac-ft
- Planned 100-Year Peak Inflow = 1401 cfs
- Planned 5-Year Peak Inflow = 553 cfs
- Planned 100-Year Peak Outflow = 220 cfs
- Planned 5-Year Peak Outflow = 152 cfs
- Planned 100-Year Maximum Water Surface Elevation = 6928.6
- Planned 5-Year Maximum Water Surface Elevation = 6920.6
- Water Surface With Emergency Spillway Passing 1401 cfs = 6933.2

Storage Volume and Grading

The side slopes of the pond have typically been graded at a 4:1 slope, except in areas included within the embankment above the 100-yr water surface elevation and those to the west of Proposed Royal Pine Drive, where slopes are not to exceed 3:1. Side slopes also vary from typical in areas containing service and maintenance roads where slopes are not to exceed 12%. Runoff intercepted by the facility will sheet flow across the floor of the pond at an average slope of 1.1% until reaching the outfall structure located along the southwestern side of the pond. Currently, no low flow channel has been designed for the construction of the facility, however, it is anticipated that the pond bottom will serve as a wetland mitigation area for wetland disturbances in the Pine Creek Neighborhood.

The proposed grading will provide the proposed facility as designed with a storage volume of 69 acre-feet below the overflow elevation of 6930.7. The modeled 100 year maximum water surface elevation in the facility with the outlet functioning as designed is estimated at 6928.6. The storage volume below elevation 6928.6 is planned to be 56.5 acre-feet, thus the facility will have over 2 feet of free board and over 12 acre-feet of storage remaining in the 100 year design event. This freeboard provides a factor of safety for the current design conditions but could also be at least partially utilized if development in the watershed becomes more intense than the current land planning implies. All grading and mitigation within the pond area shall be in accordance with the applicable Corps of Engineers and FEMA regulations. A further discussion of the governmental requirements for this project is included in the Regulatory Aspects section of this report. All areas disturbed by grading for this detention facility shall be revegetated in a timely manner consistent with the "Habitat Conservation Plan for the Briargate Development located along Upper Pine Creek".

Inlet Facilities

Concentrated runoff will enter the proposed pond in three locations. The majority of the inflow (Q_{100} = 1,178 cfs) will enter the northeast side of the proposed pond via the Pine Creek channel, the "Pine Creek Diversion Storm Sewer", and the "Briargate Crossing East Outfall Storm Sewer". Runoff entering the pond via the Pine Creek Channel will first overtop a concrete cutoff wall before combining with flows from the planned 66" and 72" storm sewers. This runoff will combine within a proposed riprap lined stilling basin, which has been designed to dissipate a portion of the energy in the runoff prior to releasing the flow to a proposed rundown channel. The proposed riprap lined rundown channel will convey the flows from the upper to lower stilling basins at an acceptable velocity. The lower stilling basin will dissipate energy from the flow prior to releasing it to the pond bottom.

Runoff collected within adjacent Royal Pine Drive and proposed Pine Creek Subdivision Filing 35 will discharge from a proposed 54" R.C.P. into a riprap lined stilling basin to be located along northwest corner of the pond bottom. Runoff leaving the stilling basin will continue to the proposed outlet structure at an average slope of 1.3%. Both the storm sewer and stilling basin have been previously designed by JR Engineering.

Runoff from future Pine Creek Filing No. 23 will discharge at the southwest corner of the facility into a riprap lined stilling basin. Plans for this proposed 36" R.C.P storm sewer are included in the plan set for the detention facility. Design calculations for the storm sewer are contained in the appendix of this report. The storm sewer was designed to convey up to 113 cfs from future development.

Outlet

The detention facility will have a single stage outlet that is designed to accommodate the major 100-year storm event. The planned outlet will consist of a 13' long by 8' wide (I.D.) 3-sided reinforced concrete structure fitted with a sloped bar grate. A 54" diameter reinforced concrete storm sewer will convey discharge collected in the outlet structure through the Royal Pine Drive embankment to downstream Pine Creek. In the design condition (storms up to and included the 100-year event), control of discharge from the pond will be at the inlet or upstream end of this storm sewer. According to the conditions of the floodplain development permit issued for this facility, the 54" outlet will remain unrestricted until a CLOMR or LOMR is obtained from FEMA to raise the base flood elevation within the detention pond. Prior to significant development occurring in the watershed of the pond, the LOMR or CLOMR should be obtained and a restrictor plate shall be installed to block the top 4.4 square feet of the 54" diameter entrance to the proposed outfall storm sewer. A copy of the stage/discharge calculations for the restricted outlet is contained in Appendix Section 'E' of this report.

Calculations for pipe and bedding class requirements, as well as hydraulic calculations for the outfall storm sewer, are contained in Appendix Section 'H' of this report.

The energy dissipater or stilling basin for the detention facility outfall storm sewer will be located within existing Pine Creek Channel at the west toe of the Royal Pine Drive embankment. Calculations for the sizing of the stilling basin have been included within the Appendix.

Emergency Overflow

If the storage volume of the pond is exceeded, overflow will cross Royal Pine Drive, a minor collector roadway. This event is only expected if the 54" outlet becomes blocked or a storm greater than the design 100-year event occurs. After overflow crosses Royal Pine Drive it will flow overland and back into the historic Pine Creek Channel. To ensure proper function of the overflow section, restrictions on landscaping have been placed across Tract 'K' located adjacent to the detention facility.

The paving and curbs & gutters of Royal Pine Drive will serve as the hardened control section for overflow from the pond. Overflow will occur transverse to a sag vertical curve in the street. Adjacent to the southwest side of the street, the planned sidewalk has been designed to provide protection for the embankment via a thickened outside edge and elevated sections to minimize the length of the embankment that is subject to receiving overflow. Buried rip-rap armoring has been planned to protect the downstream side of the embankment in the event of overtopping. At the request of the developer, the rip-rap will be buried 1.5' deep to facilitate planting and the installation of irrigation lines over the armoring. If overtopping occurs, it is expected that most of the soil over the rip-rap will require replacement. In addition, some erosion will likely occur downstream of the embankment. However, it is believed that the planned armoring will protect the integrity of the Royal Pine Drive embankment in the design overflow event.

Overflow protection was designed assuming an overflow rate of 1,401 cfs (the 100-year pond inflow peak rate). The width and depth of the overflow was estimated through use of a HEC-RAS computer model. Input and output data from the HEC-RAS model is included in Section 'F' of the Appendix of this report. The maximum water surface in the pond associated with the design overflow rate passing over the street is estimated at elevation 6933.2. The maximum depth in the street section is estimated at 3.1 feet with the above described flow condition.

Access Roads and Minor Swales

In addition to the previously mentioned design components, the following design features are to be constructed. A 15' wide v-bottomed swale has been designed along the northwestern side of the facility. The purpose of the swale is to collect and convey runoff from a small portion of the hillside open space and a few rear lots of proposed Pine Creek Subdivision Filing No. 35. The proposed swale is intended to protect the adjacent 4:1 slope located below the swale from erosion that would likely result from the above mentioned runoff. The bottom of the swale is proposed to be lined with North American Green C350 erosion control mat or an approved equal in accordance with the manufacturer's recommendations. The swale will discharge to a graded depression that will contain a Type I manhole fitted with a grated beehive inlet lid. The runoff intercepted by this inlet will be combined with runoff in the proposed Royal Pine Drive storm sewer system and will outfall to the pond in the northwest corner of the pond bottom.

The design of the proposed facility includes access roads to all structures proposed to be located within the pond. The roads are to be 15' wide and possess a cross slope of 3%. The roads to be located along the sides of the pond are intended to intercept minor runoff and convey it to the bottom of the pond or other protected areas.

REGULATORY REQUIREMENTS

City of Colorado Springs

The Pine Creek Regional Detention Facility 'F' is a facility under the direct jurisdiction of the City of Colorado Springs and should be constructed in accordance with the Standard Specifications of the City of Colorado Springs Engineering Division. Construction plans will be reviewed by the City of Colorado Springs for conformance with the Drainage Criteria Manual and the standard specifications.

State Engineer

A representative of the State Engineer has reviewed the preliminary plans informally and concurred that the facility will not be considered jurisdictional under the current criteria. A notification of intent to construct a non-jurisdictional dam should be submitted to the State Engineer along with a copy of the plans upon approval of the plans by the City of Colorado Springs.

Federal Emergency Management Agency (F.E.M.A.)

Proposed Pine Creek Detention Facility 'F' lies within the 100-year floodplain as shown on the F.E.M.A. Flood Insurance Rate Map Community Map Number 08041C0507 F, dated March 17, 1997. A copy of a section of the F.E.M.A. Flood Insurance Rate Map is located in the Appendix.

A floodplain development permit, dated January 24, 2002, was obtained for the construction of this facility. The permitted condition allows for a peak 100-year inflow of 515 cfs, the planned 54" outlet without the planned restriction plate, and a maximum 100-year water surface elevation of 6920.6.

The permitted condition assumed development in the watershed would be limited to Pine Creek Filings 35 and 36, including Royal Pine Drive. A CLOMR or LOMR should be obtained from FEMA prior to exceeding this condition or constructing the outlet restriction plate as required for the future condition.

U.S. Fish and Wildlife Service (U.S.F.W.S.)

The entire site of the proposed facility has been identified as Prebles Meadow Jumping Mouse (P.M.J.M.) habitat. The P.M.J.M. is listed as a "Threatened Species" protected under the Federal Endangered Species Act. Thus, development within the site must be approved by U.S.F.W.S. A Habitat Conservation Plan (H.C.P.) has been prepared and submitted to U.S.F.W.S. for review and approval. Construction of the proposed facility has been addressed in the H.C.P. Approval of the H.C.P. and the issuance of a permit for the construction proposed within the document is expected in the first quarter of 2003.

U.S. Army Corps of Engineers (U.S.A.C.O.E.)

Existing wetlands and other waters of the U.S. are located throughout the portion of Pine Creek that traverses the site of the proposed facility. These "waters" are under the jurisdiction of the U.S.A.C.O.E. A Section 404 permit will be required for the construction of the facility. The application for the permit will be submitted to U.S.F.W.S. upon the approval of the H.C.P. described in the preceding section.

INSPECTIONS AND MAINTENANCE

Pine Creek Regional Detention Facility 'F' will ultimately be a public drainage facility and will therefore be included in a public inspection and maintenance program. It is recommended that inspections of the facility be conducted annually and after significant runoff events. Inspections should include but not be limited to the following:

- Evaluate the structural condition of the inlets and the outlet facilities and check to see that they are free of debris.
- Evaluate the amount of sediment and other debris accumulation in the facility and verify that design capacity is maintained.
- Check for erosion of the pond side slopes and side slopes of the Royal Pine Drive embankment.
- Look for signs of piping or other signs of instability in the Royal Pine Drive embankment.

Deficiencies discovered during inspections should be corrected in a timely manner to assure safety and function is maintained.

PREPARED BY:

JR Engineering, LLC

Vancel S. Fossinger, P.E.
Project Manager

JR Engineering, LLC

Darin L. Moffet, E.I.
Design Engineer II

/kd/950350/designanalysis rev 1118 kad.doc

REFERENCES

1. "City of Colorado Springs/County of El Paso Drainage Criteria Manual," dated November 1991.

2. Soils Survey of El Paso County Area, Colorado Soil Conservation Service.

3. "Amendment No. 2 to Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (Portion Contributing to Pine Creek)" by JR Engineering, October 1998.

4. Draft "Amendment No. 3 to Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (Portion Contributing to Pine Creek)" by JR Engineering, presently in development.

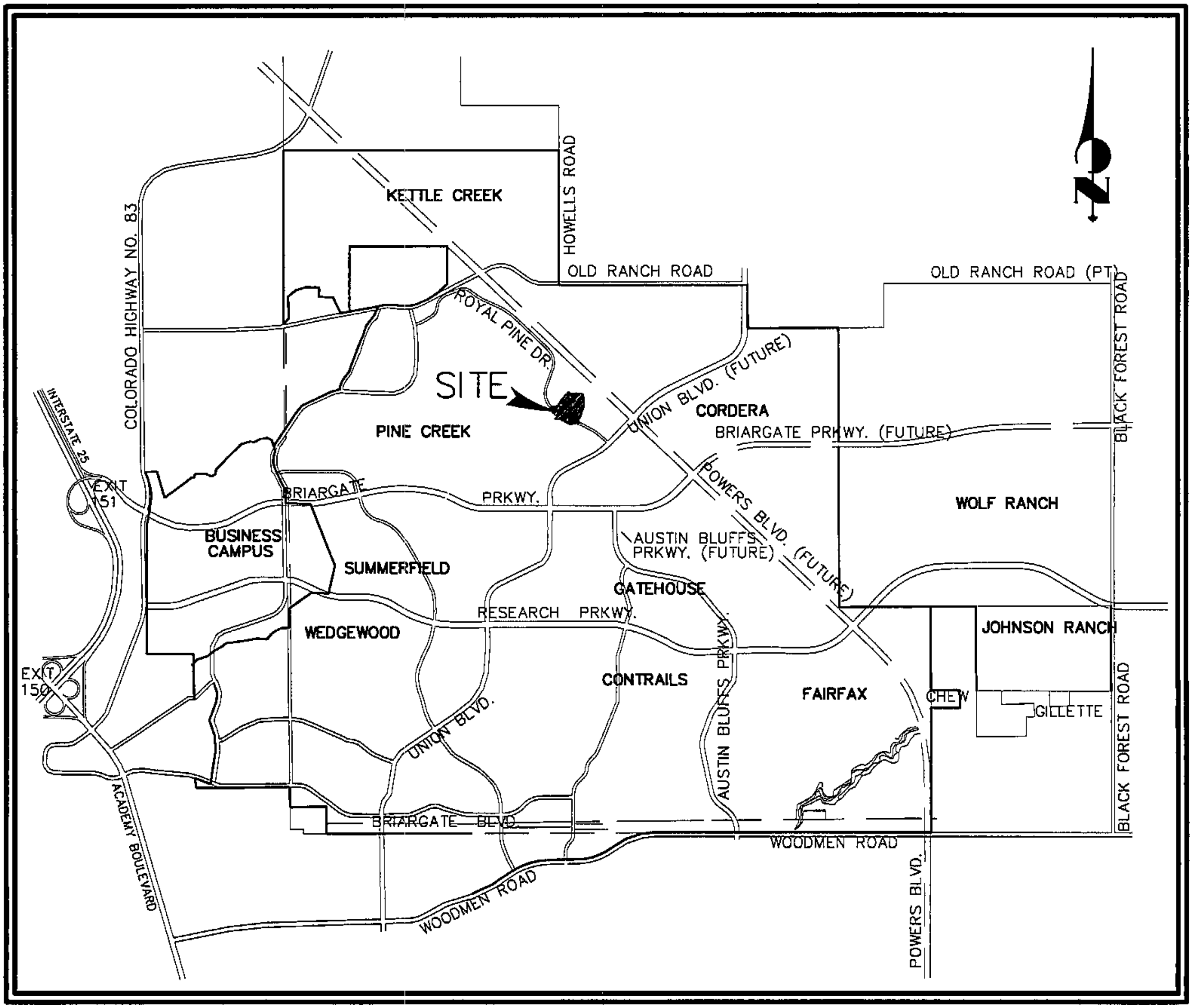
5. "Flood Insurance Rate Map", El Paso County, Colorado and Incorporated Areas, Federal Emergency Management Agency, March 17, 1997.

6. "Final Drainage Report for Pine Creek Subdivision Filing No. 35," by JR Engineering, dated June 2002.

APPENDIX

A.

VICINITY MAP



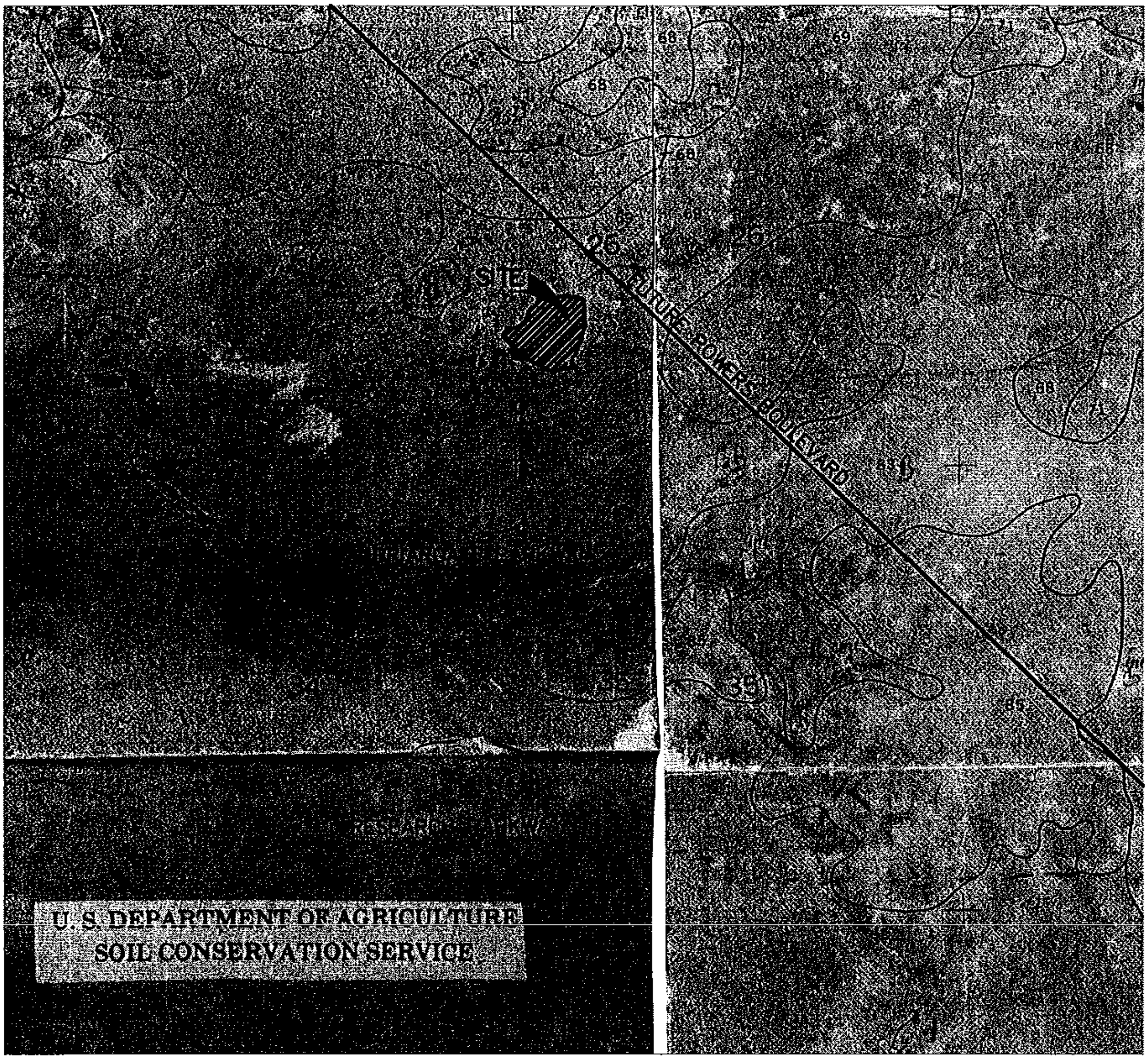
N
KETTLE CREEK
HOWELLS ROAD
OLD RANCH ROAD
OLD RANCH ROAD (PT)
COLORADO HIGHWAY NO. 83
ROYAL PINE DR.
SITE
UNION BLVD. (FUTURE)
CORDERA
BRIARGATE PRKWY. (FUTURE)
BLACK FOREST ROAD
INTERSTATE 25
PINE CREEK
EXIT 151
BRIARGATE
PRKWY.
POWERS BLVD. (FUTURE)
WOLF RANCH
BUSINESS CAMPUS
AUSTIN BLUFFS PRKWY. (FUTURE)
SUMMERFIELD
GATEHOUSE
RESEARCH PRKWY.
WEDGEWOOD
JOHNSON RANCH
EXIT 150
CONTRAILS
FAIRFAX
CHEW
GILLETTE
UNION BLVD.
AUSTIN BLUFFS PRKWY.
BRIARGATE BLVD.
WOODMEN ROAD
ACADEMY BOULEVARD
WOODMEN ROAD
POWERS BLVD.
BLACK FOREST ROAD

B.

S. C. S. SOIL MAP

SHEET NO. 8
EL PASO COUNTY AREA, COLORADO
(PIKEVIEW QUADRANGLE)

SHEET NO. 9
EL PASO COUNTY AREA, COLORADO
(FALCON NW QUADRANGLE)

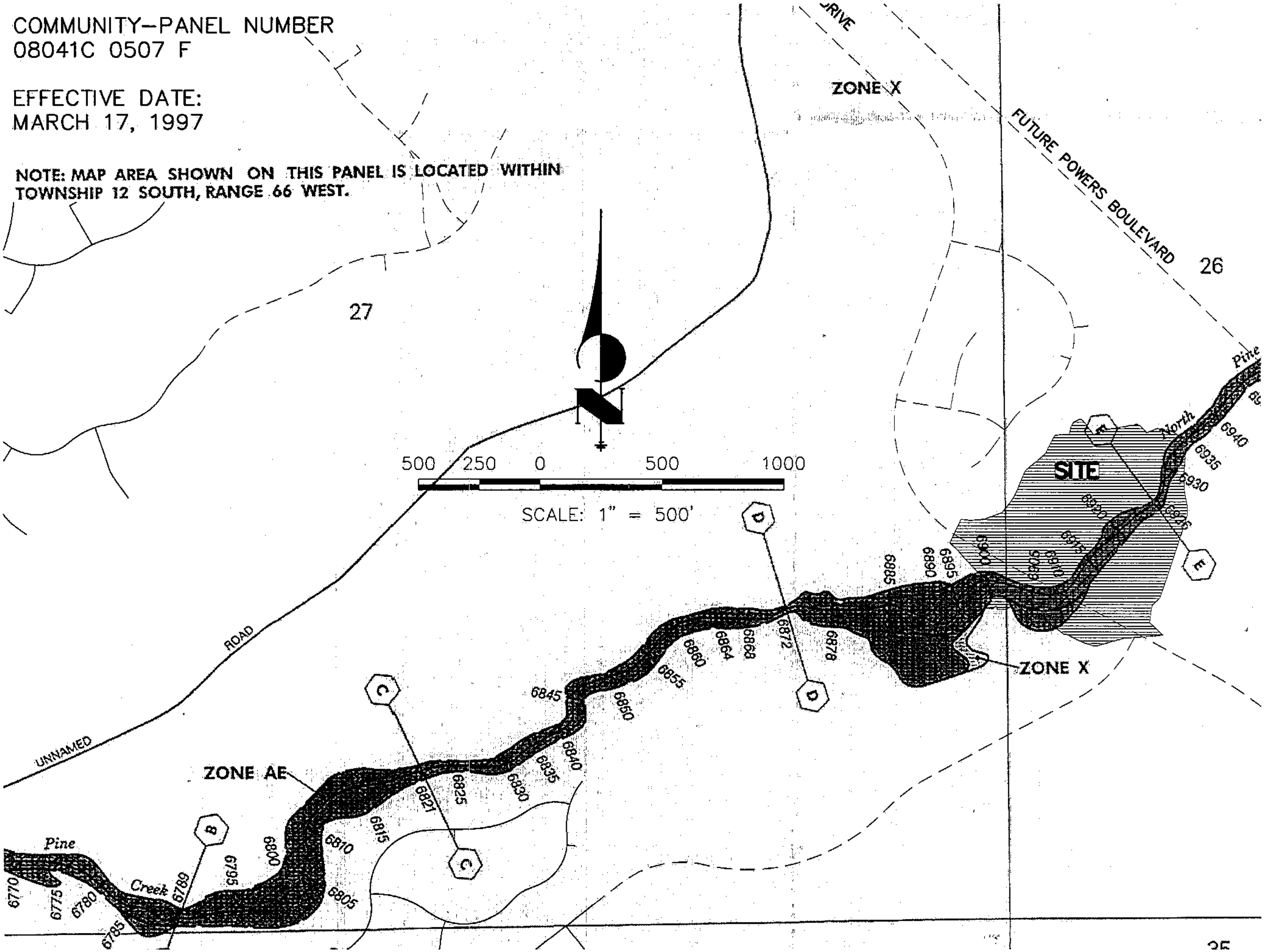


2000 1000 0 2000 4000

SCALE: 1" = 2000'

C.

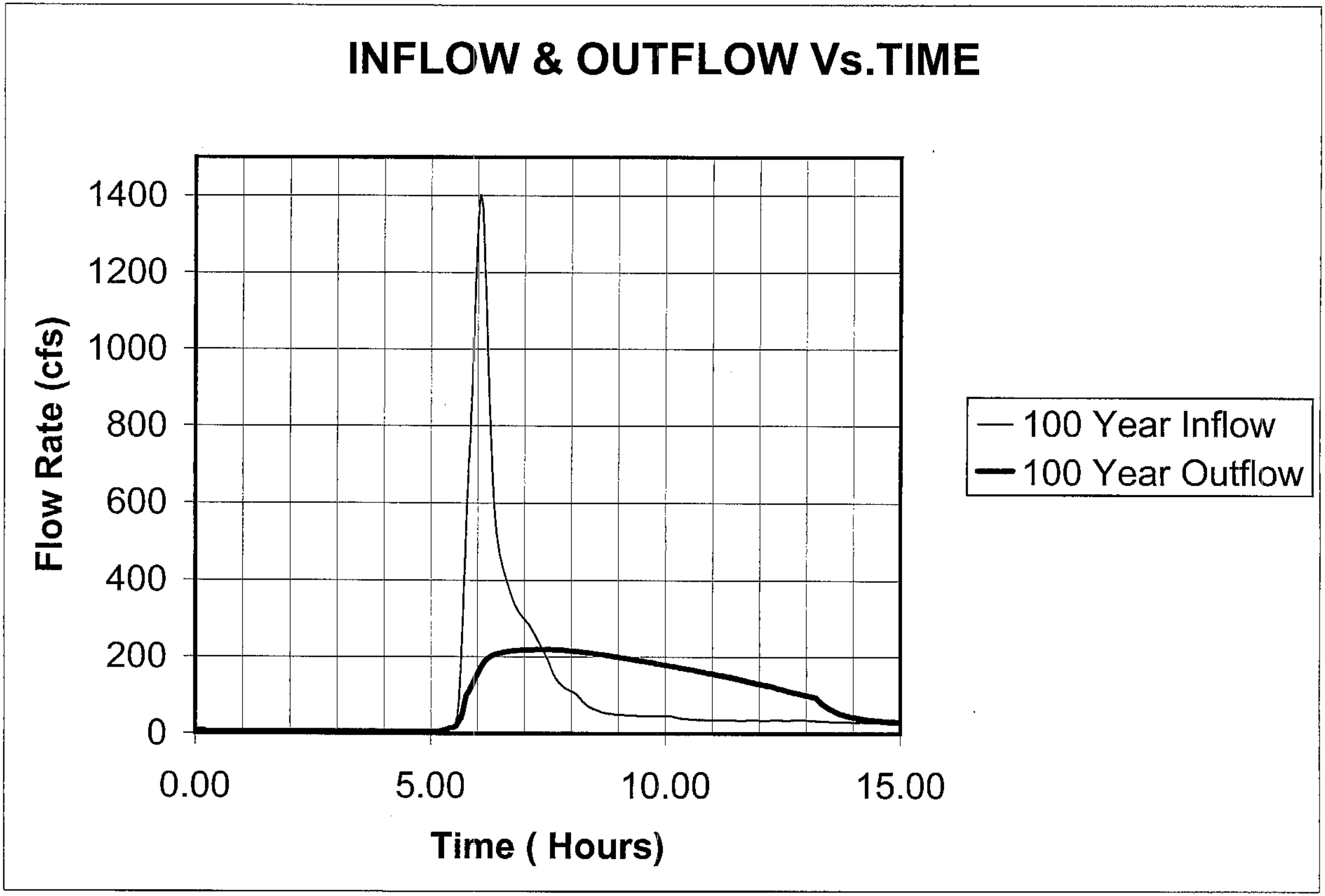
F. E. M. A. FLOODPLAIN MAP

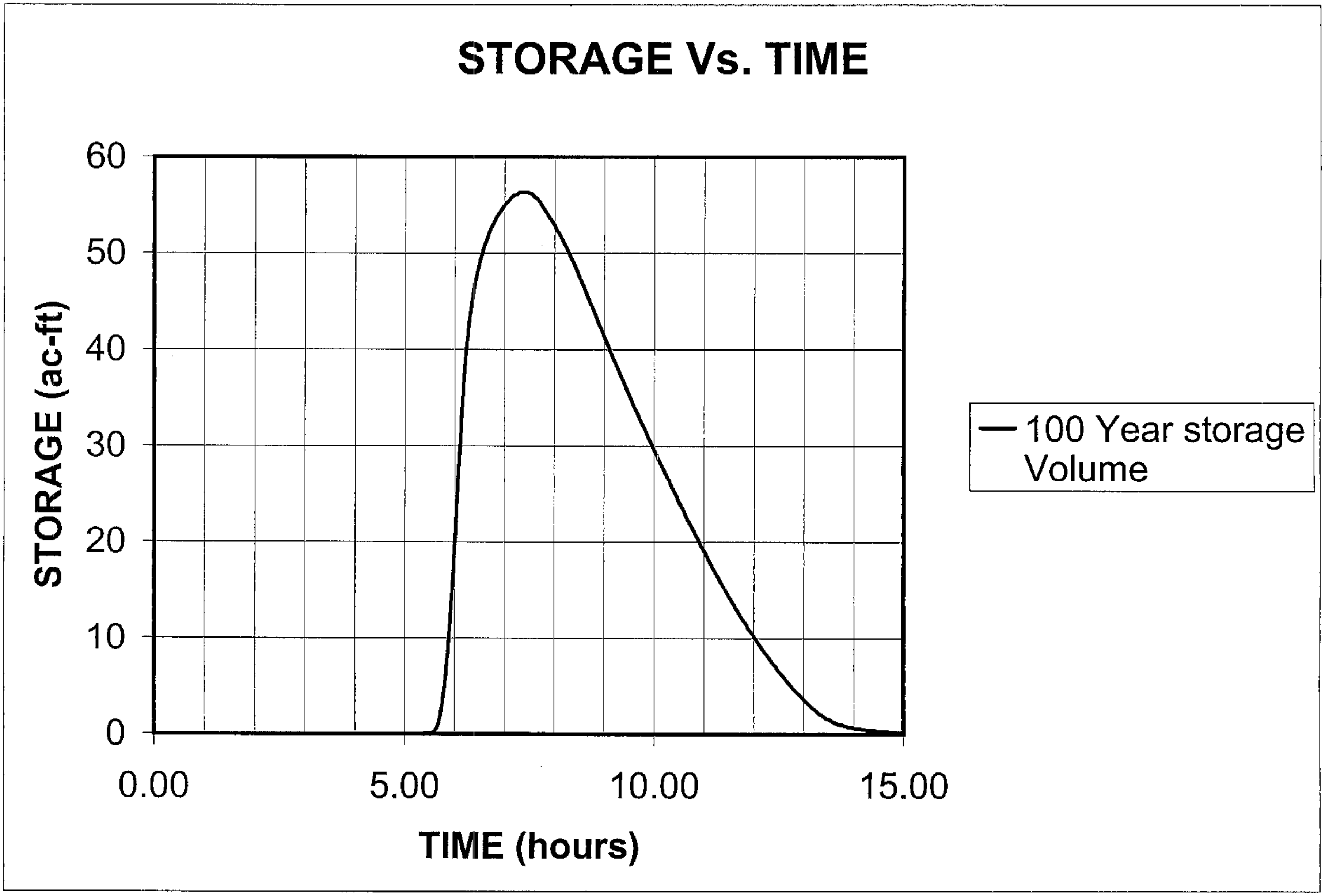

COMMUNITY-PANEL NUMBER
08041C 0507 F
EFFECTIVE DATE:
MARCH 17, 1997
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 66 WEST.
ZONE X
FUTURE POWERS BOULEVARD
26
27
500 250 0 500 1000
SCALE: 1" = 500'
SITE
North
ZONE X
ROAD
UNNAMED
ZONE AE
Pine
Creek

D.

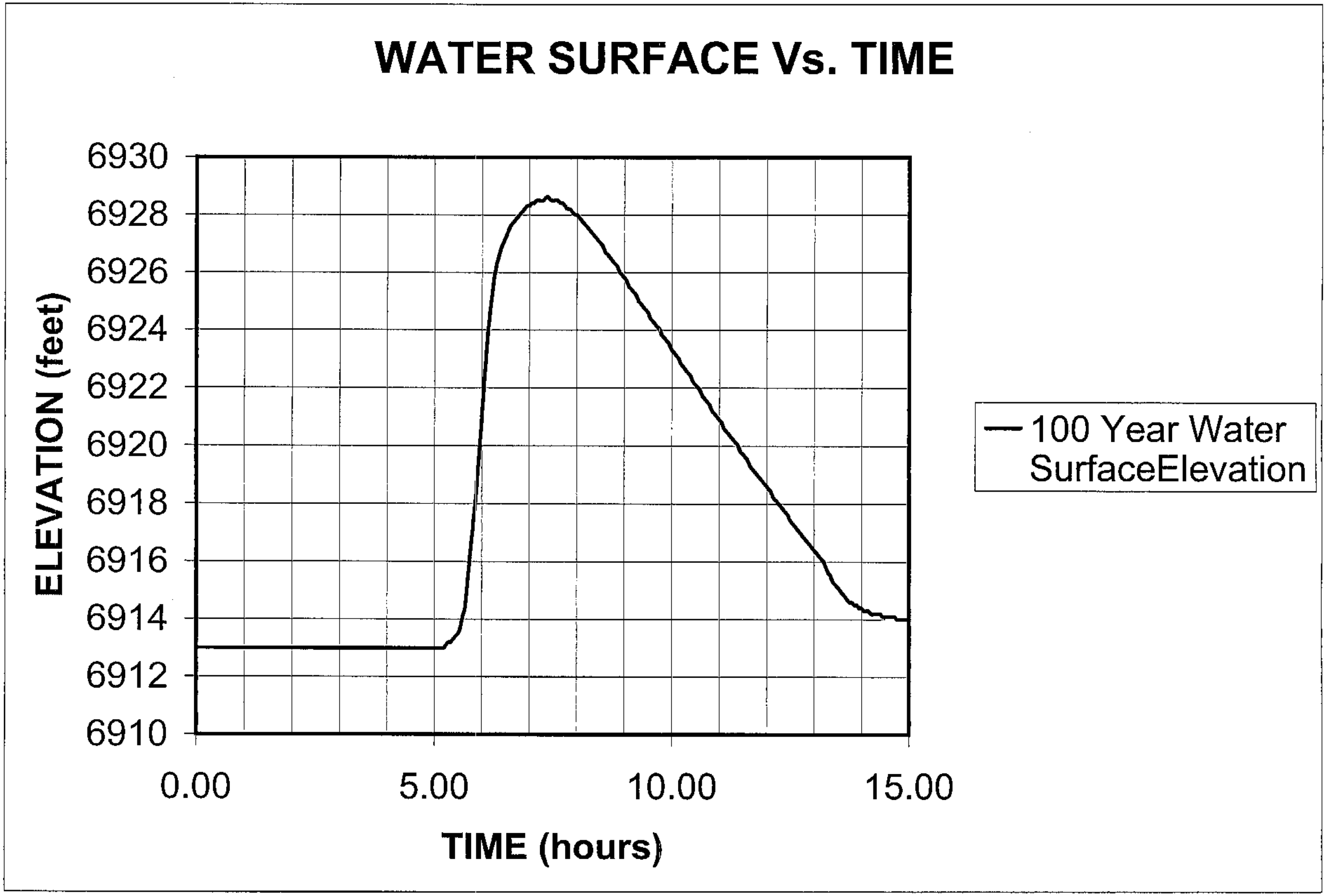
HYDROLOGY: INFLOW, OUTFLOW, AND ROUTING DATA AND GRAPHS

Note: Data was generated with the Amendment No. 3 to Pine Creek D.B.P.S. HEC-1 model


INFLOW & OUTFLOW Vs.TIME
Flow Rate (cfs)
1400
1200
1000
800
600
400
200
0
0.00
5.00
10.00
15.00
Time (Hours)
100 Year Inflow
100 Year Outflow



STORAGE Vs. TIME
STORAGE (ac-ft)
60
50
40
30
20
10
0
0.00
5.00
10.00
15.00
TIME (hours)
100 Year storage Volume


WATER SURFACE Vs. TIME
6930
6928
6926
6924
6922
6920
6918
6916
6914
6912
6910
ELEVATION (feet)
0.00
5.00
10.00
15.00
TIME (hours)
100 Year Water SurfaceElevation

HEC 1 Input and Output
For 100 Year Inflow to Pine Creek Detention Facility F

Model Input Data

```
 261          KK   APDFF
 262          KM   COMBINE THE FLOW FROM BASINS PN7 AND PN8 AND AP3. THIS IS THE TOTAL
 263          KM   INFLOW TO DETENTION FACILITY F
 264          KO      1       0
 265          HC      3
```

*** ***

Model Output

```
          **************
          *            *
261 KK    *    APDFF   *
          *            *
          **************

264 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

265 HC          HYDROGRAPH COMBINATION
                     ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION APDFF
SUM OF 3 HYDROGRAPHS

****
**

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
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1		0130	31	0.	1		0515	106	10.	1		0900	181	49.	1		1245	256	35.
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1		0136	33	0.	1		0521	108	13.	1		0906	183	48.	1		1251	258	35.

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
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1		0145	36	0.	*	1		0530	111	21.	*	1		0915	186	47.	*	1		1300	261	35.
1		0148	37	0.	*	1		0533	112	34.	*	1		0918	187	47.	*	1		1303	262	34.
1		0151	38	0.	*	1		0536	113	87.	*	1		0921	188	47.	*	1		1306	263	34.
1		0154	39	0.	*	1		0539	114	195.	*	1		0924	189	46.	*	1		1309	264	34.
1		0157	40	0.	*	1		0542	115	344.	*	1		0927	190	46.	*	1		1312	265	33.
1		0200	41	0.	*	1		0545	116	513.	*	1		0930	191	46.	*	1		1315	266	33.
1		0203	42	0.	*	1		0548	117	671.	*	1		0933	192	46.	*	1		1318	267	33.
1		0206	43	0.	*	1		0551	118	797.	*	1		0936	193	46.	*	1		1321	268	32.
1		0209	44	0.	*	1		0554	119	963.	*	1		0939	194	46.	*	1		1324	269	32.
1		0212	45	0.	*	1		0557	120	1161.	*	1		0942	195	46.	*	1		1327	270	32.
1		0215	46	0.	*	1		0600	121	1316.	*	1		0945	196	46.	*	1		1330	271	31.
1		0218	47	0.	*	1		0603	122	1401.	*	1		0948	197	46.	*	1		1333	272	31.
1		0221	48	0.	*	1		0606	123	1367.	*	1		0951	198	46.	*	1		1336	273	31.
1		0224	49	0.	*	1		0609	124	1225.	*	1		0954	199	46.	*	1		1339	274	31.
1		0227	50	0.	*	1		0612	125	1057.	*	1		0957	200	46.	*	1		1342	275	31.
1		0230	51	0.	*	1		0615	126	875.	*	1		1000	201	46.	*	1		1345	276	31.
1		0233	52	0.	*	1		0618	127	723.	*	1		1003	202	46.	*	1		1348	277	31.
1		0236	53	0.	*	1		0621	128	611.	*	1		1006	203	45.	*	1		1351	278	31.
1		0239	54	0.	*	1		0624	129	535.	*	1		1009	204	44.	*	1		1354	279	31.
1		0242	55	0.	*	1		0627	130	486.	*	1		1012	205	43.	*	1		1357	280	30.
1		0245	56	0.	*	1		0630	131	452.	*	1		1015	206	41.	*	1		1400	281	30.
1		0248	57	0.	*	1		0633	132	428.	*	1		1018	207	40.	*	1		1403	282	30.
1		0251	58	0.	*	1		0636	133	407.	*	1		1021	208	39.	*	1		1406	283	30.
1		0254	59	0.	*	1		0639	134	387.	*	1		1024	209	39.	*	1		1409	284	30.
1		0257	60	0.	*	1		0642	135	367.	*	1		1027	210	38.	*	1		1412	285	30.
1		0300	61	0.	*	1		0645	136	350.	*	1		1030	211	37.	*	1		1415	286	29.
1		0303	62	0.	*	1		0648	137	335.	*	1		1033	212	37.	*	1		1418	287	29.
1		0306	63	0.	*	1		0651	138	324.	*	1		1036	213	36.	*	1		1421	288	29.
1		0309	64	0.	*	1		0654	139	314.	*	1		1039	214	36.	*	1		1424	289	29.
1		0312	65	0.	*	1		0657	140	306.	*	1		1042	215	36.	*	1		1427	290	29.
1		0315	66	0.	*	1		0700	141	299.	*	1		1045	216	36.	*	1		1430	291	29.
1		0318	67	1.	*	1		0703	142	292.	*	1		1048	217	36.	*	1		1433	292	28.
1		0321	68	1.	*	1		0706	143	284.	*	1		1051	218	35.	*	1		1436	293	28.
1		0324	69	1.	*	1		0709	144	274.	*	1		1054	219	35.	*	1		1439	294	28.
1		0327	70	1.	*	1		0712	145	263.	*	1		1057	220	35.	*	1		1442	295	28.
1		0330	71	1.	*	1		0715	146	252.	*	1		1100	221	35.	*	1		1445	296	28.
1		0333	72	1.	*	1		0718	147	240.	*	1		1103	222	35.	*	1		1448	297	28.
1		0336	73	1.	*	1		0721	148	229.	*	1		1106	223	35.	*	1		1451	298	28.
1		0339	74	1.	*	1		0724	149	217.	*	1		1109	224	35.	*	1		1454	299	28.
1		0342	75	1.	*	1		0727	150	205.	*	1		1112	225	35.	*	1		1457	300	28.
					*						*						*					

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
1401.	6.05		213.	93.	93.	93.
		(INCHES)	2.148	2.354	2.354	2.354
		(AC-FT)	105.	116.	116.	116.

CUMULATIVE AREA = 0.92 SQ MI

HEC 1 Input and Output
For 100 Year Routing and Outflow From Pine Creek Detention Facility F

Model Input Data

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266          KK  RR-DFF
267          KM   ROUTE FLOW THRU A PROPOSED REGIONAL DETENTION FACILITY.
268          KM   VOLUME REFLECTS CURRENT DRAFT DESIGN
269          KM   DISCHARGE ASSUMES THE 54" DIA OUTLET SET AT INVERT ELEV. 11.5 IS RESTRICTED
270          KM   TO A 11.7 SF OPENING BY A STEEL PLATE COVERING THE TOP 1.4' OF THE PIPE.
271          KM   DISCHARGE CALCULATED WITH THE ORIFICE EQUATION WITH HEAD CALCULATED TO
272          KM   THE CENTER OF THE OPENING AREA @ ELEVATION 13.28
273          KO       1       0
274          RS       1     STOR       0
275          SV       0      .18     2.6     8.1    15.4   23.70    32.6    42.4    53.1    64.8
276          SE      13       14      16      18      20      22      24      26      28      30
277          SQ       5       30      93     122     146     166     184     201     216     230
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Model Output

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             **************
             *            *
266 KK       *   RR-DFF   *
             *            *
             **************

273 KO           OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

274 RS           STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       STOR  TYPE OF INITIAL CONDITION
                      RSVRIC       0.00  INITIAL CONDITION
                           X       0.00 WORKING R AND D COEFFICIENT

275 SV             STORAGE        0.0      0.2      2.6      8.1     15.4     23.7     32.6     42.4     53.1     64.8

276 SE           ELEVATION      13.00    14.00    16.00    18.00    20.00    22.00    24.00    26.00    28.00    30.00

277 SQ           DISCHARGE         5.      30.      93.     122.     146.     166.     184.     201.     216.     230.
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HYDROGRAPH AT STATION RR-DFF

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	5.	0.0	13.0	*	1		0500	101	5.	0.0	13.0	*	1		1000	201	178.	29.6	23.3
1		0003	2	7.	0.0	13.1	*	1		0503	102	5.	0.0	13.0	*	1		1003	202	177.	29.1	23.2
1		0006	3	8.	0.0	13.1	*	1		0506	103	5.	0.0	13.0	*	1		1006	203	176.	28.5	23.1
1		0009	4	8.	0.0	13.1	*	1		0509	104	5.	0.0	13.0	*	1		1009	204	175.	28.0	23.0
1		0012	5	7.	0.0	13.1	*	1		0512	105	6.	0.0	13.0	*	1		1012	205	174.	27.5	22.8
1		0015	6	5.	0.0	13.0	*	1		0515	106	8.	0.0	13.1	*	1		1015	206	173.	26.9	22.7
1		0018	7	5.	0.0	13.0	*	1		0518	107	9.	0.0	13.2	*	1		1018	207	171.	26.4	22.6
1		0021	8	5.	0.0	13.0	*	1		0521	108	11.	0.0	13.2	*	1		1021	208	170.	25.8	22.5
1		0024	9	5.	0.0	13.0	*	1		0524	109	13.	0.1	13.3	*	1		1024	209	169.	25.3	22.4
1		0027	10	5.	0.0	13.0	*	1		0527	110	15.	0.1	13.4	*	1		1027	210	168.	24.8	22.2
1		0030	11	5.	0.0	13.0	*	1		0530	111	17.	0.1	13.5	*	1		1030	211	167.	24.2	22.1
1		0033	12	5.	0.0	13.0	*	1		0533	112	22.	0.1	13.7	*	1		1033	212	166.	23.7	22.0
1		0036	13	5.	0.0	13.0	*	1		0536	113	32.	0.3	14.1	*	1		1036	213	165.	23.2	21.9
1		0039	14	5.	0.0	13.0	*	1		0539	114	43.	0.7	14.4	*	1		1039	214	163.	22.6	21.7
1		0042	15	5.	0.0	13.0	*	1		0542	115	66.	1.6	15.2	*	1		1042	215	162.	22.1	21.6
1		0045	16	5.	0.0	13.0	*	1		0545	116	95.	3.0	16.1	*	1		1045	216	161.	21.6	21.5

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0048	17	5.	0.0	13.0	*	1		0548	117	106.	5.0	16.9	*	1		1048	217	160.	21.1	21.4
1		0051	18	5.	0.0	13.0	*	1		0551	118	119.	7.6	17.8	*	1		1051	218	158.	20.6	21.2
1		0054	19	5.	0.0	13.0	*	1		0554	119	131.	10.7	18.7	*	1		1054	219	157.	20.1	21.1
1		0057	20	5.	0.0	13.0	*	1		0557	120	143.	14.6	19.8	*	1		1057	220	156.	19.5	21.0
1		0100	21	5.	0.0	13.0	*	1		0600	121	155.	19.1	20.9	*	1		1100	221	155.	19.1	20.9
1		0103	22	5.	0.0	13.0	*	1		0603	122	167.	24.0	22.1	*	1		1103	222	154.	18.6	20.8
1		0106	23	5.	0.0	13.0	*	1		0606	123	177.	29.0	23.2	*	1		1106	223	152.	18.1	20.6
1		0109	24	5.	0.0	13.0	*	1		0609	124	186.	33.6	24.2	*	1		1109	224	151.	17.6	20.5
1		0112	25	5.	0.0	13.0	*	1		0612	125	193.	37.5	25.0	*	1		1112	225	150.	17.1	20.4
1		0115	26	5.	0.0	13.0	*	1		0615	126	198.	40.7	25.7	*	1		1115	226	149.	16.6	20.3
1		0118	27	5.	0.0	13.0	*	1		0618	127	202.	43.2	26.2	*	1		1118	227	148.	16.2	20.2
1		0121	28	5.	0.0	13.0	*	1		0621	128	205.	45.1	26.5	*	1		1121	228	147.	15.7	20.1
1		0124	29	5.	0.0	13.0	*	1		0624	129	207.	46.6	26.8	*	1		1124	229	145.	15.2	20.0
1		0127	30	5.	0.0	13.0	*	1		0627	130	209.	47.9	27.0	*	1		1127	230	144.	14.8	19.8
1		0130	31	5.	0.0	13.0	*	1		0630	131	210.	49.0	27.2	*	1		1130	231	142.	14.3	19.7
1		0133	32	5.	0.0	13.0	*	1		0633	132	212.	49.9	27.4	*	1		1133	232	141.	13.9	19.6
1		0136	33	5.	0.0	13.0	*	1		0636	133	213.	50.8	27.6	*	1		1136	233	140.	13.5	19.5
1		0139	34	5.	0.0	13.0	*	1		0639	134	214.	51.5	27.7	*	1		1139	234	138.	13.0	19.3
1		0142	35	5.	0.0	13.0	*	1		0642	135	215.	52.2	27.8	*	1		1142	235	137.	12.6	19.2
1		0145	36	5.	0.0	13.0	*	1		0645	136	216.	52.8	27.9	*	1		1145	236	135.	12.2	19.1
1		0148	37	5.	0.0	13.0	*	1		0648	137	216.	53.3	28.0	*	1		1148	237	134.	11.8	19.0
1		0151	38	5.	0.0	13.0	*	1		0651	138	217.	53.8	28.1	*	1		1151	238	133.	11.4	18.9
1		0154	39	5.	0.0	13.0	*	1		0654	139	217.	54.2	28.2	*	1		1154	239	131.	10.9	18.8
1		0157	40	5.	0.0	13.0	*	1		0657	140	218.	54.6	28.3	*	1		1157	240	130.	10.6	18.7
1		0200	41	5.	0.0	13.0	*	1		0700	141	218.	54.9	28.3	*	1		1200	241	129.	10.2	18.6
1		0203	42	5.	0.0	13.0	*	1		0703	142	219.	55.2	28.4	*	1		1203	242	127.	9.8	18.5
1		0206	43	5.	0.0	13.0	*	1		0706	143	219.	55.5	28.4	*	1		1206	243	126.	9.4	18.4
1		0209	44	5.	0.0	13.0	*	1		0709	144	219.	55.8	28.5	*	1		1209	244	125.	9.0	18.2
1		0212	45	5.	0.0	13.0	*	1		0712	145	219.	56.0	28.5	*	1		1212	245	124.	8.6	18.1
1		0215	46	5.	0.0	13.0	*	1		0715	146	220.	56.1	28.5	*	1		1215	246	123.	8.3	18.0
1		0218	47	5.	0.0	13.0	*	1		0718	147	220.	56.3	28.5	*	1		1218	247	121.	7.9	17.9
1		0221	48	5.	0.0	13.0	*	1		0721	148	220.	56.3	28.6	*	1		1221	248	119.	7.6	17.8
1		0224	49	5.	0.0	13.0	*	1		0724	149	220.	56.3	28.6	*	1		1224	249	117.	7.2	17.7
1		0227	50	5.	0.0	13.0	*	1		0727	150	220.	56.3	28.5	*	1		1227	250	116.	6.9	17.6
1		0230	51	5.	0.0	13.0	*	1		0730	151	220.	56.2	28.5	*	1		1230	251	114.	6.5	17.4
1		0233	52	5.	0.0	13.0	*	1		0733	152	220.	56.1	28.5	*	1		1233	252	112.	6.2	17.3
1		0236	53	5.	0.0	13.0	*	1		0736	153	219.	55.8	28.5	*	1		1236	253	110.	5.9	17.2
1		0239	54	5.	0.0	13.0	*	1		0739	154	219.	55.6	28.4	*	1		1239	254	109.	5.6	17.1
1		0242	55	5.	0.0	13.0	*	1		0742	155	219.	55.3	28.4	*	1		1242	255	107.	5.3	17.0
1		0245	56	5.	0.0	13.0	*	1		0745	156	218.	54.9	28.3	*	1		1245	256	106.	5.0	16.9
1		0248	57	5.	0.0	13.0	*	1		0748	157	218.	54.5	28.2	*	1		1248	257	104.	4.7	16.8
1		0251	58	5.	0.0	13.0	*	1		0751	158	217.	54.1	28.2	*	1		1251	258	103.	4.4	16.7
1		0254	59	5.	0.0	13.0	*	1		0754	159	217.	53.7	28.1	*	1		1254	259	101.	4.1	16.6
1		0257	60	5.	0.0	13.0	*	1		0757	160	216.	53.3	28.0	*	1		1257	260	100.	3.9	16.5
1		0300	61	5.	0.0	13.0	*	1		0800	161	216.	52.9	28.0	*	1		1300	261	98.	3.6	16.4
1		0303	62	5.	0.0	13.0	*	1		0803	162	215.	52.4	27.9	*	1		1303	262	97.	3.3	16.3
1		0306	63	5.	0.0	13.0	*	1		0806	163	214.	52.0	27.8	*	1		1306	263	96.	3.1	16.2
1		0309	64	5.	0.0	13.0	*	1		0809	164	214.	51.5	27.7	*	1		1309	264	94.	2.8	16.1
1		0312	65	5.	0.0	13.0	*	1		0812	165	213.	51.0	27.6	*	1		1312	265	93.	2.6	16.0
1		0315	66	5.	0.0	13.0	*	1		0815	166	212.	50.5	27.5	*	1		1315	266	87.	2.4	15.8
1		0318	67	5.	0.0	13.0	*	1		0818	167	212.	49.9	27.4	*	1		1318	267	81.	2.1	15.6
1		0321	68	5.	0.0	13.0	*	1		0821	168	211.	49.4	27.3	*	1		1321	268	76.	2.0	15.5
1		0324	69	5.	0.0	13.0	*	1		0824	169	210.	48.8	27.2	*	1		1324	269	72.	1.8	15.3
1		0327	70	5.	0.0	13.0	*	1		0827	170	209.	48.2	27.1	*	1		1327	270	68.	1.6	15.2
1		0330	71	5.	0.0	13.0	*	1		0830	171	208.	47.6	27.0	*	1		1330	271	64.	1.5	15.1
1		0333	72	5.	0.0	13.0	*	1		0833	172	207.	47.0	26.9	*	1		1333	272	61.	1.4	15.0
1		0336	73	5.	0.0	13.0	*	1		0836	173	207.	46.4	26.7	*	1		1336	273	58.	1.2	14.9
1		0339	74	5.	0.0	13.0	*	1		0839	174	206.	45.8	26.6	*	1		1339	274	55.	1.1	14.8
1		0342	75	5.	0.0	13.0	*	1		0842	175	205.	45.1	26.5	*	1		1342	275	52.	1.0	14.7
1		0345	76	5.	0.0	13.0	*	1		0845	176	204.	44.5	26.4	*	1		1345	276	50.	1.0	14.6
1		0348	77	5.	0.0	13.0	*	1		0848	177	203.	43.9	26.3	*	1		1348	277	48.	0.9	14.6
1		0351	78	5.	0.0	13.0	*	1		0851	178	202.	43.3	26.2	*	1		1351	278	46.	0.8	14.5
1		0354	79	5.	0.0	13.0	*	1		0854	179	201.	42.6	26.0	*	1		1354	279	45.	0.7	14.5
1		0357	80	5.	0.0	13.0	*	1		0857	180	200.	42.0	25.9	*	1		1357	280	43.	0.7	14.4
1		0400	81	5.	0.0	13.0	*	1		0900	181	199.	41.4	25.8	*	1		1400	281	42.	0.6	14.4
1		0403	82	5.	0.0	13.0	*	1		0903	182	198.	40.8	25.7	*	1		1403	282	41.	0.6	14.3
1		0406	83	5.	0.0	13.0	*	1		0906	183	197.	40.1	25.5	*	1		1406	283	40.	0.6	14.3
1		0409	84	5.	0.0	13.0	*	1		0909	184	196.	39.5	25.4	*	1		1409	284	39.	0.5	14.3
1		0412	85	5.	0.0	13.0	*	1		0912	185	195.	38.9	25.3	*	1		1412	285	38.	0.5	14.2
1		0415	86	5.	0.0	13.0	*	1		0915	186	194.	38.3	25.2	*	1		1415	286	37.	0.4	14.2
1		0418	87	5.	0.0	13.0	*	1		0918	187	193.	37.7	25.0	*	1		1418	287	36.	0.4	14.2
1		0421	88	5.	0.0	13.0	*	1		0921	188	192.	37.1	24.9	*	1		1421	288	35.	0.4	14.2
1		0424	89	5.	0.0	13.0	*	1		0924	189	191.	36.5	24.8	*	1		1424	289	35.	0.4	14.2
1		0427	90	5.	0.0	13.0	*	1		0927	190	190.	35.9	24.7	*	1		1427	290	34.	0.3	14.1
1		0430	91	5.	0.0	13.0	*	1		0930	191	189.	35.3	24.6	*	1		1430	291	34.	0.3	14.1
1		0433	92	5.	0.0	13.0	*	1		0933	192	188.	34.7	24.4	*	1		1433	292	33.	0.3	14.1
1		0436	93	5.	0.0	13.0	*	1		0936	193	187.	34.1	24.3	*	1		1436	293	33.	0.3	14.1
1		0439	94	5.	0.0	13.0	*	1		0939	194	186.	33.6	24.2	*	1		1439	294	32.	0.3	14.1
1		0442	95	5.	0.0	13.0	*	1		0942	195	185.	33.0	24.1	*	1		1442	295	32.	0.2	14.1
1		0445	96	5.	0.0	13.0	*	1		0945	196	184.	32.4	24.0	*	1		1445	296	31.	0.2	14.0
1		0448	97	5.	0.0	13.0	*	1		0948	197	182.	31.9	23.8	*	1		1448	297	31.	0.2	14.0
1		0451	98	5.	0.0	13.0	*	1		0951	198	181.	31.3	23.7	*	1		1451	298	31.	0.2	14.0
1		0454	99	5.	0.0	13.0	*	1		0954	199	180.	30.7	23.6	*	1		1454	299	30.	0.2	14.0
1		0457	100	5.	0.0	13.0	*	1		0957	200	179.	30.2	23.5	*	1		1457	300	30.	0.2	14.0
							*								*							

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
220.	7.40		188.	95.	95.	95.
		(INCHES)	1.902	2.383	2.383	2.383
		(AC-FT)	93.	117.	117.	117.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	14.95-HR
(AC-FT)	(HR)				
56.	7.40	37.	16.	16.	16.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	14.95-HR
(FEET)	(HR)				
28.55	7.40	24.72	18.33	18.33	18.33

CUMULATIVE AREA = 0.92 SQ MI

*** ***

HEC 1 Input and Output
For 5 Year Inflow to Pine Creek Detention Facility F

Model Input Data

```
261          KK   APDFF
262          KM   COMBINE THE FLOW FROM BASINS PN7 AND PN8 AND AP3. THIS IS THE TOTAL
263          KM   INFLOW TO DETENTION FACILITY F
264          KO      1         0
265          HC      3
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Model Output Data

```
           **************
           *            *
261 KK     *     APDFF  *
           *            *
           **************

264 KO          OUTPUT CONTROL VARIABLES
                     IPRNT             1  PRINT CONTROL
                     IPLOT             0  PLOT CONTROL
                     QSCAL            0.  HYDROGRAPH PLOT SCALE

265 HC          HYDROGRAPH COMBINATION
                     ICOMP             3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                         ***

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                                              HYDROGRAPH AT STATION    APDFF
                                                  SUM OF  3 HYDROGRAPHS

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DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW
1	0000	1	9.	*	1	0345	76	0.	*	1	0730	151	56.	*	1	1115	226	17.
1	0003	2	9.	*	1	0348	77	0.	*	1	0733	152	54.	*	1	1118	227	17.
1	0006	3	9.	*	1	0351	78	0.	*	1	0736	153	52.	*	1	1121	228	17.
1	0009	4	7.	*	1	0354	79	0.	*	1	0739	154	50.	*	1	1124	229	17.
1	0012	5	4.	*	1	0357	80	0.	*	1	0742	155	49.	*	1	1127	230	17.
1	0015	6	2.	*	1	0400	81	0.	*	1	0745	156	48.	*	1	1130	231	17.
1	0018	7	1.	*	1	0403	82	0.	*	1	0748	157	47.	*	1	1133	232	17.
1	0021	8	0.	*	1	0406	83	0.	*	1	0751	158	47.	*	1	1136	233	17.
1	0024	9	0.	*	1	0409	84	0.	*	1	0754	159	46.	*	1	1139	234	17.
1	0027	10	0.	*	1	0412	85	1.	*	1	0757	160	46.	*	1	1142	235	17.
1	0030	11	0.	*	1	0415	86	1.	*	1	0800	161	45.	*	1	1145	236	17.
1	0033	12	0.	*	1	0418	87	1.	*	1	0803	162	45.	*	1	1148	237	17.
1	0036	13	0.	*	1	0421	88	1.	*	1	0806	163	43.	*	1	1151	238	17.
1	0039	14	0.	*	1	0424	89	1.	*	1	0809	164	41.	*	1	1154	239	17.
1	0042	15	0.	*	1	0427	90	1.	*	1	0812	165	38.	*	1	1157	240	17.
1	0045	16	0.	*	1	0430	91	1.	*	1	0815	166	36.	*	1	1200	241	17.
1	0048	17	0.	*	1	0433	92	1.	*	1	0818	167	33.	*	1	1203	242	17.
1	0051	18	0.	*	1	0436	93	1.	*	1	0821	168	31.	*	1	1206	243	17.
1	0054	19	0.	*	1	0439	94	1.	*	1	0824	169	30.	*	1	1209	244	17.
1	0057	20	0.	*	1	0442	95	1.	*	1	0827	170	29.	*	1	1212	245	17.
1	0100	21	0.	*	1	0445	96	1.	*	1	0830	171	28.	*	1	1215	246	17.
1	0103	22	0.	*	1	0448	97	2.	*	1	0833	172	27.	*	1	1218	247	17.
1	0106	23	0.	*	1	0451	98	2.	*	1	0836	173	26.	*	1	1221	248	17.
1	0109	24	0.	*	1	0454	99	2.	*	1	0839	174	25.	*	1	1224	249	17.
1	0112	25	0.	*	1	0457	100	2.	*	1	0842	175	25.	*	1	1227	250	17.
1	0115	26	0.	*	1	0500	101	2.	*	1	0845	176	24.	*	1	1230	251	17.
1	0118	27	0.	*	1	0503	102	2.	*	1	0848	177	23.	*	1	1233	252	17.
1	0121	28	0.	*	1	0506	103	2.	*	1	0851	178	23.	*	1	1236	253	17.
1	0124	29	0.	*	1	0509	104	3.	*	1	0854	179	22.	*	1	1239	254	17.
1	0127	30	0.	*	1	0512	105	3.	*	1	0857	180	22.	*	1	1242	255	17.
1	0130	31	0.	*	1	0515	106	4.	*	1	0900	181	22.	*	1	1245	256	17.
1	0133	32	0.	*	1	0518	107	4.	*	1	0903	182	22.	*	1	1248	257	17.
1	0136	33	0.	*	1	0521	108	5.	*	1	0906	183	22.	*	1	1251	258	17.

DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW	*	DA MON	HRMN	ORD	FLOW
1	0139	34	0.	*	1	0524	109	6.	*	1	0909	184	22.	*	1	1254	259	17.
1	0142	35	0.	*	1	0527	110	7.	*	1	0912	185	22.	*	1	1257	260	17.
1	0145	36	0.	*	1	0530	111	8.	*	1	0915	186	22.	*	1	1300	261	17.
1	0148	37	0.	*	1	0533	112	13.	*	1	0918	187	22.	*	1	1303	262	17.
1	0151	38	0.	*	1	0536	113	33.	*	1	0921	188	22.	*	1	1306	263	17.
1	0154	39	0.	*	1	0539	114	75.	*	1	0924	189	22.	*	1	1309	264	16.
1	0157	40	0.	*	1	0542	115	127.	*	1	0927	190	22.	*	1	1312	265	16.
1	0200	41	0.	*	1	0545	116	182.	*	1	0930	191	22.	*	1	1315	266	16.
1	0203	42	0.	*	1	0548	117	244.	*	1	0933	192	22.	*	1	1318	267	16.
1	0206	43	0.	*	1	0551	118	314.	*	1	0936	193	22.	*	1	1321	268	15.
1	0209	44	0.	*	1	0554	119	388.	*	1	0939	194	22.	*	1	1324	269	15.
1	0212	45	0.	*	1	0557	120	461.	*	1	0942	195	22.	*	1	1327	270	15.
1	0215	46	0.	*	1	0600	121	524.	*	1	0945	196	22.	*	1	1330	271	15.
1	0218	47	0.	*	1	0603	122	553.	*	1	0948	197	22.	*	1	1333	272	15.
1	0221	48	0.	*	1	0606	123	533.	*	1	0951	198	22.	*	1	1336	273	15.
1	0224	49	0.	*	1	0609	124	541.	*	1	0954	199	22.	*	1	1339	274	15.
1	0227	50	0.	*	1	0612	125	476.	*	1	0957	200	22.	*	1	1342	275	15.
1	0230	51	0.	*	1	0615	126	405.	*	1	1000	201	22.	*	1	1345	276	15.
1	0233	52	0.	*	1	0618	127	345.	*	1	1003	202	22.	*	1	1348	277	15.
1	0236	53	0.	*	1	0621	128	299.	*	1	1006	203	22.	*	1	1351	278	15.
1	0239	54	0.	*	1	0624	129	266.	*	1	1009	204	21.	*	1	1354	279	15.
1	0242	55	0.	*	1	0627	130	242.	*	1	1012	205	20.	*	1	1357	280	15.
1	0245	56	0.	*	1	0630	131	224.	*	1	1015	206	20.	*	1	1400	281	15.
1	0248	57	0.	*	1	0633	132	210.	*	1	1018	207	19.	*	1	1403	282	15.
1	0251	58	0.	*	1	0636	133	195.	*	1	1021	208	18.	*	1	1406	283	15.
1	0254	59	0.	*	1	0639	134	178.	*	1	1024	209	18.	*	1	1409	284	14.
1	0257	60	0.	*	1	0642	135	161.	*	1	1027	210	17.	*	1	1412	285	14.
1	0300	61	0.	*	1	0645	136	145.	*	1	1030	211	17.	*	1	1415	286	14.
1	0303	62	0.	*	1	0648	137	132.	*	1	1033	212	17.	*	1	1418	287	14.
1	0306	63	0.	*	1	0651	138	121.	*	1	1036	213	17.	*	1	1421	288	14.
1	0309	64	0.	*	1	0654	139	113.	*	1	1039	214	17.	*	1	1424	289	14.
1	0312	65	0.	*	1	0657	140	106.	*	1	1042	215	17.	*	1	1427	290	14.
1	0315	66	0.	*	1	0700	141	100.	*	1	1045	216	17.	*	1	1430	291	14.
1	0318	67	0.	*	1	0703	142	95.	*	1	1048	217	17.	*	1	1433	292	14.
1	0321	68	0.	*	1	0706	143	89.	*	1	1051	218	17.	*	1	1436	293	14.
1	0324	69	0.	*	1	0709	144	84.	*	1	1054	219	17.	*	1	1439	294	14.
1	0327	70	0.	*	1	0712	145	78.	*	1	1057	220	17.	*	1	1442	295	14.
1	0330	71	0.	*	1	0715	146	73.	*	1	1100	221	17.	*	1	1445	296	14.
1	0333	72	0.	*	1	0718	147	68.	*	1	1103	222	16.	*	1	1448	297	14.
1	0336	73	0.	*	1	0721	148	64.	*	1	1106	223	16.	*	1	1451	298	14.
1	0339	74	0.	*	1	0724	149	61.	*	1	1109	224	16.	*	1	1454	299	14.
1	0342	75	0.	*	1	0727	150	59.	*	1	1112	225	16.	*	1	1457	300	14.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
553.	6.05		87.	39.	39.	39.
		(INCHES)	0.882	0.980	0.980	0.980
		(AC-FT)	43.	48.	48.	48.

CUMULATIVE AREA = 0.92 SQ MI

HEC 1 Input and Output
For 5 Year Routing and Outflow From Pine Creek Detention Facility F

Model Input Data

```
266     KK  RR-DFF
267     KM   ROUTE FLOW THRU A PROPOSED REGIONAL DETENTION FACILITY.
268     KM   VOLUME REFLECTS CURRENT DRAFT DESIGN
269     KM   DISCHARGE ASSUMES THE 54" DIA OUTLET SET AT INVERT ELEV. 11.5 IS RESTRICTED
270     KM   TO A 11.7 SF OPENING BY A STEEL PLATE COVERING THE TOP 1.4' OF THE PIPE.
271     KM   DISCHARGE CALCULATED WITH THE ORIFICE EQUATION WITH HEAD CALCULATED TO
272     KM   THE CENTER OF THE OPENING AREA @ ELEVATION 13.28
273     KO      1      0
274     RS      1   STOR      0
275     SV      0    .18    2.6    8.1   15.4  23.70   32.6   42.4   53.1   64.8
276     SE     13     14     16     18     20     22     24     26     28     30
277     SQ      5     30     93    122    146    166    184    201    216    230
```

Model Output Data

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*****************************************************************************************************************
          **************
          *            *
266 KK    *    RR-DFF  *
          *            *
          **************

273 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

             HYDROGRAPH ROUTING DATA

274 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC       0.00  INITIAL CONDITION
                          X       0.00 WORKING R AND D COEFFICIENT
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275 SV	STORAGE	0.0	0.2	2.6	8.1	15.4	23.7	32.6	42.4	53.1	64.8
276 SE	ELEVATION	13.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
277 SQ	DISCHARGE	5.	30.	93.	122.	146.	166.	184.	201.	216.	230.

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HYDROGRAPH AT STATION RR-DFF

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	5.	0.0	13.0	*	1		0500	101	5.	0.0	13.0	*	1		1000	201	34.	0.3	14.1
1		0003	2	7.	0.0	13.1	*	1		0503	102	5.	0.0	13.0	*	1		1003	202	32.	0.3	14.1
1		0006	3	8.	0.0	13.1	*	1		0506	103	5.	0.0	13.0	*	1		1006	203	31.	0.2	14.0
1		0009	4	8.	0.0	13.1	*	1		0509	104	5.	0.0	13.0	*	1		1009	204	30.	0.2	14.0
1		0012	5	7.	0.0	13.1	*	1		0512	105	5.	0.0	13.0	*	1		1012	205	27.	0.2	13.9
1		0015	6	5.	0.0	13.0	*	1		0515	106	5.	0.0	13.0	*	1		1015	206	24.	0.1	13.8
1		0018	7	5.	0.0	13.0	*	1		0518	107	5.	0.0	13.0	*	1		1018	207	22.	0.1	13.7
1		0021	8	5.	0.0	13.0	*	1		0521	108	5.	0.0	13.0	*	1		1021	208	21.	0.1	13.6
1		0024	9	5.	0.0	13.0	*	1		0524	109	5.	0.0	13.0	*	1		1024	209	19.	0.1	13.6
1		0027	10	5.	0.0	13.0	*	1		0527	110	5.	0.0	13.0	*	1		1027	210	19.	0.1	13.5
1		0030	11	5.	0.0	13.0	*	1		0530	111	6.	0.0	13.0	*	1		1030	211	18.	0.1	13.5
1		0033	12	5.	0.0	13.0	*	1		0533	112	8.	0.0	13.1	*	1		1033	212	18.	0.1	13.5
1		0036	13	5.	0.0	13.0	*	1		0536	113	15.	0.1	13.4	*	1		1036	213	17.	0.1	13.5

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0039	14	5.	0.0	13.0	*	1		0539	114	31.	0.2	14.0	*	1		1039	214	17.	0.1	13.5
1		0042	15	5.	0.0	13.0	*	1		0542	115	38.	0.5	14.2	*	1		1042	215	17.	0.1	13.5
1		0045	16	5.	0.0	13.0	*	1		0545	116	50.	0.9	14.6	*	1		1045	216	17.	0.1	13.5
1		0048	17	5.	0.0	13.0	*	1		0548	117	66.	1.6	15.2	*	1		1048	217	17.	0.1	13.5
1		0051	18	5.	0.0	13.0	*	1		0551	118	88.	2.4	15.8	*	1		1051	218	17.	0.1	13.5
1		0054	19	5.	0.0	13.0	*	1		0554	119	98.	3.5	16.3	*	1		1054	219	17.	0.1	13.5
1		0057	20	5.	0.0	13.0	*	1		0557	120	105.	4.8	16.8	*	1		1057	220	17.	0.1	13.5
1		0100	21	5.	0.0	13.0	*	1		0600	121	113.	6.4	17.4	*	1		1100	221	17.	0.1	13.5
1		0103	22	5.	0.0	13.0	*	1		0603	122	122.	8.1	18.0	*	1		1103	222	17.	0.1	13.5
1		0106	23	5.	0.0	13.0	*	1		0606	123	128.	9.9	18.5	*	1		1106	223	17.	0.1	13.5
1		0109	24	5.	0.0	13.0	*	1		0609	124	133.	11.5	18.9	*	1		1109	224	16.	0.1	13.5
1		0112	25	5.	0.0	13.0	*	1		0612	125	138.	13.1	19.4	*	1		1112	225	16.	0.1	13.5
1		0115	26	5.	0.0	13.0	*	1		0615	126	142.	14.3	19.7	*	1		1115	226	16.	0.1	13.5
1		0118	27	5.	0.0	13.0	*	1		0618	127	146.	15.3	20.0	*	1		1118	227	17.	0.1	13.5
1		0121	28	5.	0.0	13.0	*	1		0621	128	147.	16.0	20.1	*	1		1121	228	17.	0.1	13.5
1		0124	29	5.	0.0	13.0	*	1		0624	129	149.	16.6	20.3	*	1		1124	229	17.	0.1	13.5
1		0127	30	5.	0.0	13.0	*	1		0627	130	150.	17.0	20.4	*	1		1127	230	17.	0.1	13.5
1		0130	31	5.	0.0	13.0	*	1		0630	131	151.	17.3	20.5	*	1		1130	231	17.	0.1	13.5
1		0133	32	5.	0.0	13.0	*	1		0633	132	151.	17.6	20.5	*	1		1133	232	17.	0.1	13.5
1		0136	33	5.	0.0	13.0	*	1		0636	133	152.	17.8	20.6	*	1		1136	233	17.	0.1	13.5
1		0139	34	5.	0.0	13.0	*	1		0639	134	152.	18.0	20.6	*	1		1139	234	17.	0.1	13.5
1		0142	35	5.	0.0	13.0	*	1		0642	135	152.	18.0	20.6	*	1		1142	235	17.	0.1	13.5
1		0145	36	5.	0.0	13.0	*	1		0645	136	152.	18.0	20.6	*	1		1145	236	17.	0.1	13.5
1		0148	37	5.	0.0	13.0	*	1		0648	137	152.	18.0	20.6	*	1		1148	237	17.	0.1	13.5
1		0151	38	5.	0.0	13.0	*	1		0651	138	152.	17.9	20.6	*	1		1151	238	17.	0.1	13.5
1		0154	39	5.	0.0	13.0	*	1		0654	139	152.	17.7	20.6	*	1		1154	239	17.	0.1	13.5
1		0157	40	5.	0.0	13.0	*	1		0657	140	151.	17.6	20.5	*	1		1157	240	17.	0.1	13.5
1		0200	41	5.	0.0	13.0	*	1		0700	141	151.	17.4	20.5	*	1		1200	241	17.	0.1	13.5
1		0203	42	5.	0.0	13.0	*	1		0703	142	150.	17.1	20.4	*	1		1203	242	17.	0.1	13.5
1		0206	43	5.	0.0	13.0	*	1		0706	143	150.	16.9	20.4	*	1		1206	243	17.	0.1	13.5
1		0209	44	5.	0.0	13.0	*	1		0709	144	149.	16.6	20.3	*	1		1209	244	17.	0.1	13.5
1		0212	45	5.	0.0	13.0	*	1		0712	145	148.	16.4	20.2	*	1		1212	245	17.	0.1	13.5
1		0215	46	5.	0.0	13.0	*	1		0715	146	148.	16.1	20.2	*	1		1215	246	17.	0.1	13.5
1		0218	47	5.	0.0	13.0	*	1		0718	147	147.	15.7	20.1	*	1		1218	247	17.	0.1	13.5
1		0221	48	5.	0.0	13.0	*	1		0721	148	146.	15.4	20.0	*	1		1221	248	17.	0.1	13.5
1		0224	49	5.	0.0	13.0	*	1		0724	149	145.	15.1	19.9	*	1		1224	249	17.	0.1	13.5
1		0227	50	5.	0.0	13.0	*	1		0727	150	144.	14.7	19.8	*	1		1227	250	17.	0.1	13.5
1		0230	51	5.	0.0	13.0	*	1		0730	151	143.	14.4	19.7	*	1		1230	251	17.	0.1	13.5
1		0233	52	5.	0.0	13.0	*	1		0733	152	141.	14.0	19.6	*	1		1233	252	17.	0.1	13.5
1		0236	53	5.	0.0	13.0	*	1		0736	153	140.	13.6	19.5	*	1		1236	253	17.	0.1	13.5
1		0239	54	5.	0.0	13.0	*	1		0739	154	139.	13.3	19.4	*	1		1239	254	17.	0.1	13.5
1		0242	55	5.	0.0	13.0	*	1		0742	155	138.	12.9	19.3	*	1		1242	255	17.	0.1	13.5
1		0245	56	5.	0.0	13.0	*	1		0745	156	137.	12.5	19.2	*	1		1245	256	17.	0.1	13.5
1		0248	57	5.	0.0	13.0	*	1		0748	157	135.	12.2	19.1	*	1		1248	257	17.	0.1	13.5
1		0251	58	5.	0.0	13.0	*	1		0751	158	134.	11.8	19.0	*	1		1251	258	17.	0.1	13.5
1		0254	59	5.	0.0	13.0	*	1		0754	159	133.	11.5	18.9	*	1		1254	259	17.	0.1	13.5
1		0257	60	5.	0.0	13.0	*	1		0757	160	132.	11.1	18.8	*	1		1257	260	17.	0.1	13.5
1		0300	61	5.	0.0	13.0	*	1		0800	161	131.	10.7	18.7	*	1		1300	261	17.	0.1	13.5
1		0303	62	5.	0.0	13.0	*	1		0803	162	130.	10.4	18.6	*	1		1303	262	17.	0.1	13.5
1		0306	63	5.	0.0	13.0	*	1		0806	163	128.	10.0	18.5	*	1		1306	263	17.	0.1	13.5
1		0309	64	5.	0.0	13.0	*	1		0809	164	127.	9.7	18.4	*	1		1309	264	17.	0.1	13.5
1		0312	65	5.	0.0	13.0	*	1		0812	165	126.	9.3	18.3	*	1		1312	265	16.	0.1	13.5
1		0315	66	5.	0.0	13.0	*	1		0815	166	125.	9.0	18.2	*	1		1315	266	16.	0.1	13.5
1		0318	67	5.	0.0	13.0	*	1		0818	167	124.	8.6	18.1	*	1		1318	267	16.	0.1	13.4
1		0321	68	5.	0.0	13.0	*	1		0821	168	122.	8.2	18.0	*	1		1321	268	16.	0.1	13.4
1		0324	69	5.	0.0	13.0	*	1		0824	169	121.	7.8	17.9	*	1		1324	269	16.	0.1	13.4
1		0327	70	5.	0.0	13.0	*	1		0827	170	119.	7.5	17.8	*	1		1327	270	15.	0.1	13.4
1		0330	71	5.	0.0	13.0	*	1		0830	171	117.	7.1	17.6	*	1		1330	271	15.	0.1	13.4
1		0333	72	5.	0.0	13.0	*	1		0833	172	115.	6.7	17.5	*	1		1333	272	15.	0.1	13.4
1		0336	73	5.	0.0	13.0	*	1		0836	173	113.	6.4	17.4	*	1		1336	273	15.	0.1	13.4
1		0339	74	5.	0.0	13.0	*	1		0839	174	111.	6.0	17.2	*	1		1339	274	15.	0.1	13.4
1		0342	75	5.	0.0	13.0	*	1		0842	175	109.	5.7	17.1	*	1		1342	275	15.	0.1	13.4
1		0345	76	5.	0.0	13.0	*	1		0845	176	107.	5.3	17.0	*	1		1345	276	15.	0.1	13.4
1		0348	77	5.	0.0	13.0	*	1		0848	177	105.	5.0	16.9	*	1		1348	277	15.	0.1	13.4
1		0351	78	5.	0.0	13.0	*	1		0851	178	104.	4.6	16.7	*	1		1351	278	15.	0.1	13.4
1		0354	79	5.	0.0	13.0	*	1		0854	179	102.	4.3	16.6	*	1		1354	279	15.	0.1	13.4
1		0357	80	5.	0.0	13.0	*	1		0857	180	100.	4.0	16.5	*	1		1357	280	15.	0.1	13.4
1		0400	81	5.	0.0	13.0	*	1		0900	181	99.	3.7	16.4	*	1		1400	281	15.	0.1	13.4
1		0403	82	5.	0.0	13.0	*	1		0903	182	97.	3.3	16.3	*	1		1403	282	15.	0.1	13.4
1		0406	83	5.	0.0	13.0	*	1		0906	183	95.	3.0	16.2	*	1		1406	283	15.	0.1	13.4
1		0409	84	5.	0.0	13.0	*	1		0909	184	94.	2.7	16.0	*	1		1409	284	15.	0.1	13.4
1		0412	85	5.	0.0	13.0	*	1		0912	185	89.	2.4	15.9	*	1		1412	285	14.	0.1	13.4
1		0415	86	5.	0.0	13.0	*	1		0915	186	82.	2.2	15.6	*	1		1415	286	14.	0.1	13.4
1		0418	87	5.	0.0	13.0	*	1		0918	187	76.	1.9	15.5	*	1		1418	287	14.	0.1	13.4
1		0421	88	5.	0.0	13.0	*	1		0921	188	70.	1.7	15.3	*	1		1421	288	14.	0.1	13.4
1		0424	89	5.	0.0	13.0	*	1		0924	189	65.	1.5	15.1	*	1		1424	289	14.	0.1	13.4

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0427	90	5.	0.0	13.0	*	1		0927	190	61.	1.4	15.0	*	1		1427	290	14.	0.1	13.4
1		0430	91	5.	0.0	13.0	*	1		0930	191	57.	1.2	14.9	*	1		1430	291	14.	0.1	13.4
1		0433	92	5.	0.0	13.0	*	1		0933	192	53.	1.1	14.7	*	1		1433	292	14.	0.1	13.4
1		0436	93	5.	0.0	13.0	*	1		0936	193	50.	0.9	14.6	*	1		1436	293	14.	0.1	13.3
1		0439	94	5.	0.0	13.0	*	1		0939	194	47.	0.8	14.5	*	1		1439	294	14.	0.1	13.3
1		0442	95	5.	0.0	13.0	*	1		0942	195	45.	0.7	14.5	*	1		1442	295	14.	0.1	13.3
1		0445	96	5.	0.0	13.0	*	1		0945	196	42.	0.6	14.4	*	1		1445	296	14.	0.1	13.3
1		0448	97	5.	0.0	13.0	*	1		0948	197	40.	0.6	14.3	*	1		1448	297	14.	0.1	13.3
1		0451	98	5.	0.0	13.0	*	1		0951	198	38.	0.5	14.3	*	1		1451	298	14.	0.1	13.3
1		0454	99	5.	0.0	13.0	*	1		0954	199	37.	0.4	14.2	*	1		1454	299	14.	0.1	13.3
1		0457	100	5.	0.0	13.0	*	1		0957	200	35.	0.4	14.2	*	1		1457	300	14.	0.1	13.3
							*								*							

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
152.	6.75		87.	40.	40.	40.
		(INCHES)	0.881	1.017	1.017	1.017
		(AC-FT)	43.	50.	50.	50.

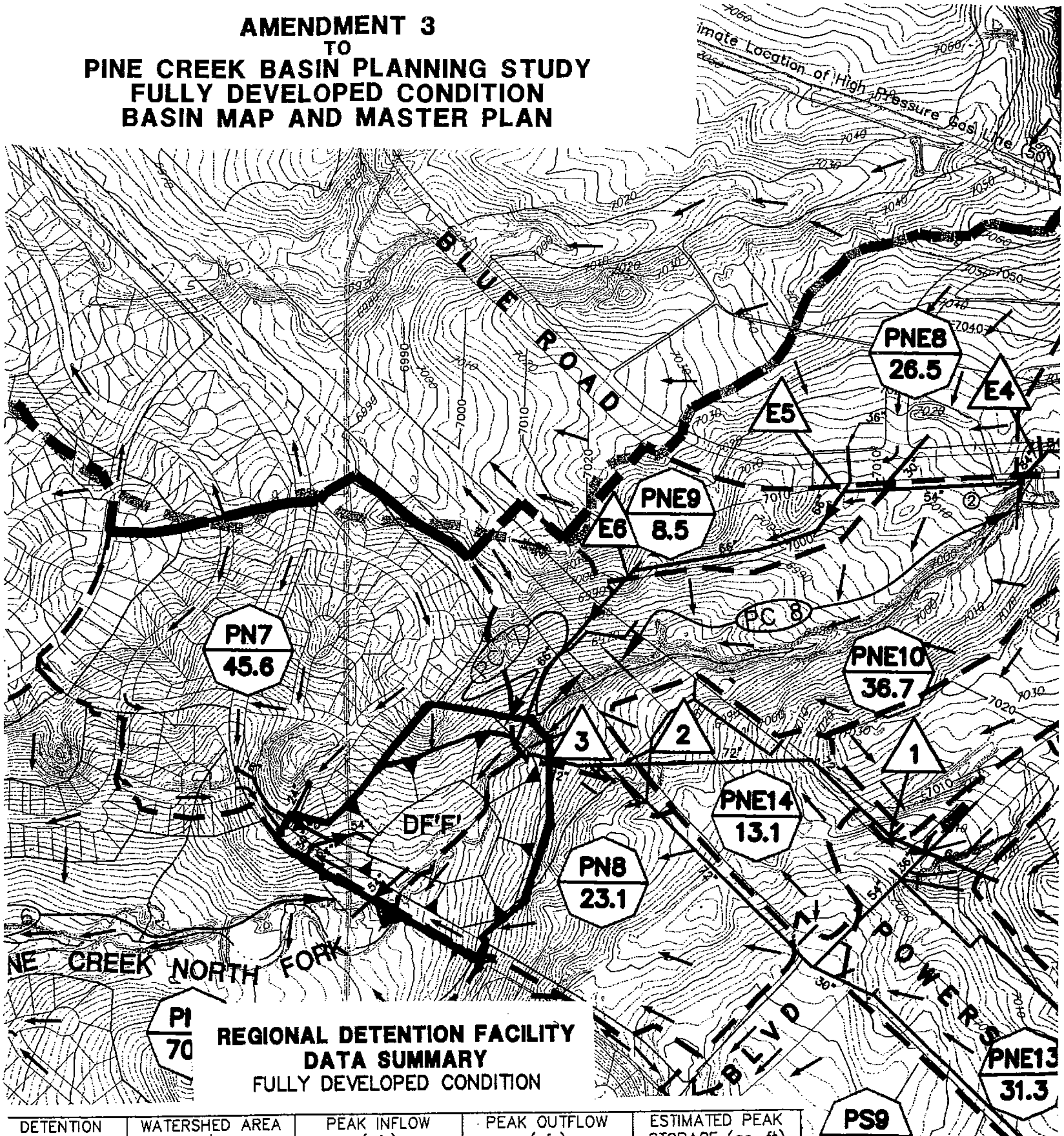
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	14.95-HR
(AC-FT)	(HR)					
18.	6.75		7.	3.	3.	3.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	14.95-HR
(FEET)	(HR)					
20.63	6.75		16.69	14.58	14.58	14.58

CUMULATIVE AREA = 0.92 SQ MI

*** ***

AMENDMENT 3
TO
PINE CREEK BASIN PLANNING STUDY FULLY DEVELOPED CONDITION BASIN MAP AND MASTER PLAN



REGIONAL DETENTION FACILITY DATA SUMMARY
FULLY DEVELOPED CONDITION

DETENTION FACILITY I.D.	WATERSHED AREA (acres)	WATERSHED AREA (sq. miles)	PEAK INFLOW (cfs) Q_5	PEAK INFLOW (cfs) Q_{100}	PEAK OUTFLOW (cfs) Q_5	PEAK OUTFLOW (cfs) Q_{100}	ESTIMATED PEAK STORAGE (ac-ft) V_5	ESTIMATED PEAK STORAGE (ac-ft) V_{100}
A	70.4	0.11	86	222	5	9	3	9
B	793.6	1.24	227	493	153	219	7	21
C	659.2	1.03	929	1825	156	228	33	72
D1	204.8	0.32	229	611	64	89	5	19
D2	64.0	0.10	131	269	45	61	3	8
E	774.4	1.21	254	593	157	224	7	17
F	588.8	0.92	553	1401	152	220	18	56
NE1	89.6	0.14	104	271	59	103	1	6
NE2	108.8	0.17	120	324	67	127	2	7
NE6	12.8	0.02	18	45	8	15	0.3	1
No. 1	2816.0	4.40	1153	2671	463	1156	40	86
SF	102.4	0.16	110	296	92	130	0.1	4

E.

POND STAGE STORAGE AND DISCHARGE CALCULATIONS

PINE CREEK DETENTION FACILITY 'F'

PROPOSED STORAGE VOLUME

ELEVATIONS	SF	CF	AF	SUM
6913	0			
		7495.00	0.17	
6914	14990			0.17
		104617.00	2.40	
6916	89627			2.57
		239610.00	5.50	
6918	149983			8.07
		320389.00	7.36	
6920	170406			15.43
		357019.00	8.20	
6922	186613			23.63
		391118.00	8.98	
6924	204505			32.60
		427877.00	9.82	
6926	223372			42.43
		466585.00	10.71	
6928	243213			53.14
		147334.80	3.38	
6928.6	247903			56.52
		359899.40	8.26	
6930	266239			64.78
		1020362.00	23.42	
6933.5	316825			88.21
		0.00	0.00	
TOTAL		**3842306**	**88.21**	

Calculated by: DLM
Date: 10/9/2002
Checked by: ____________

DETENTION FACILITY "F" STAGE / DISCHARGE CAPACITY

ORIFICE EQUATION Q=CA(2gh)^.5

PROPOSED ORIFICE AREA (SF) = 11.7

ORIFICE "C" = 0.6

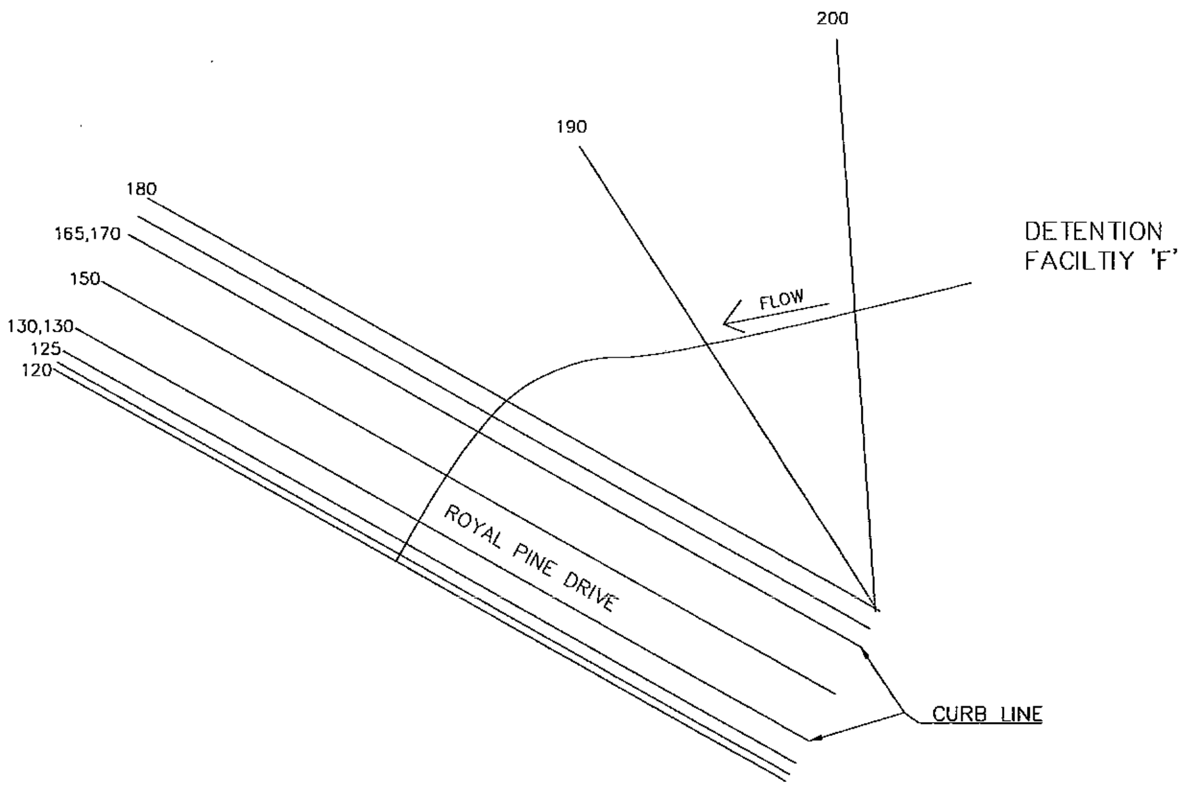
ORIFICE CENTER ELEVATION (Inv + 1.78)= 13.28

INVERT ELEVATION = 11.5

STAGE ELEVATION	HEADWATER DEPTH	"h" (ft)	ORIFICE AREA (sf)	DISCHARGE (cfs)
13	1.5	-0.28	11.700	n.a.
14	2.5	0.72	11.700	48
16	4.5	2.72	11.700	93
18	6.5	4.72	11.700	122
20	8.5	6.72	11.700	146
22	10.5	8.72	11.700	166
24	12.5	10.72	11.700	184
26	14.5	12.72	11.700	201
28	16.5	14.72	11.700	216
30	18.5	16.72	11.700	230
32	20.5	18.72	11.700	244

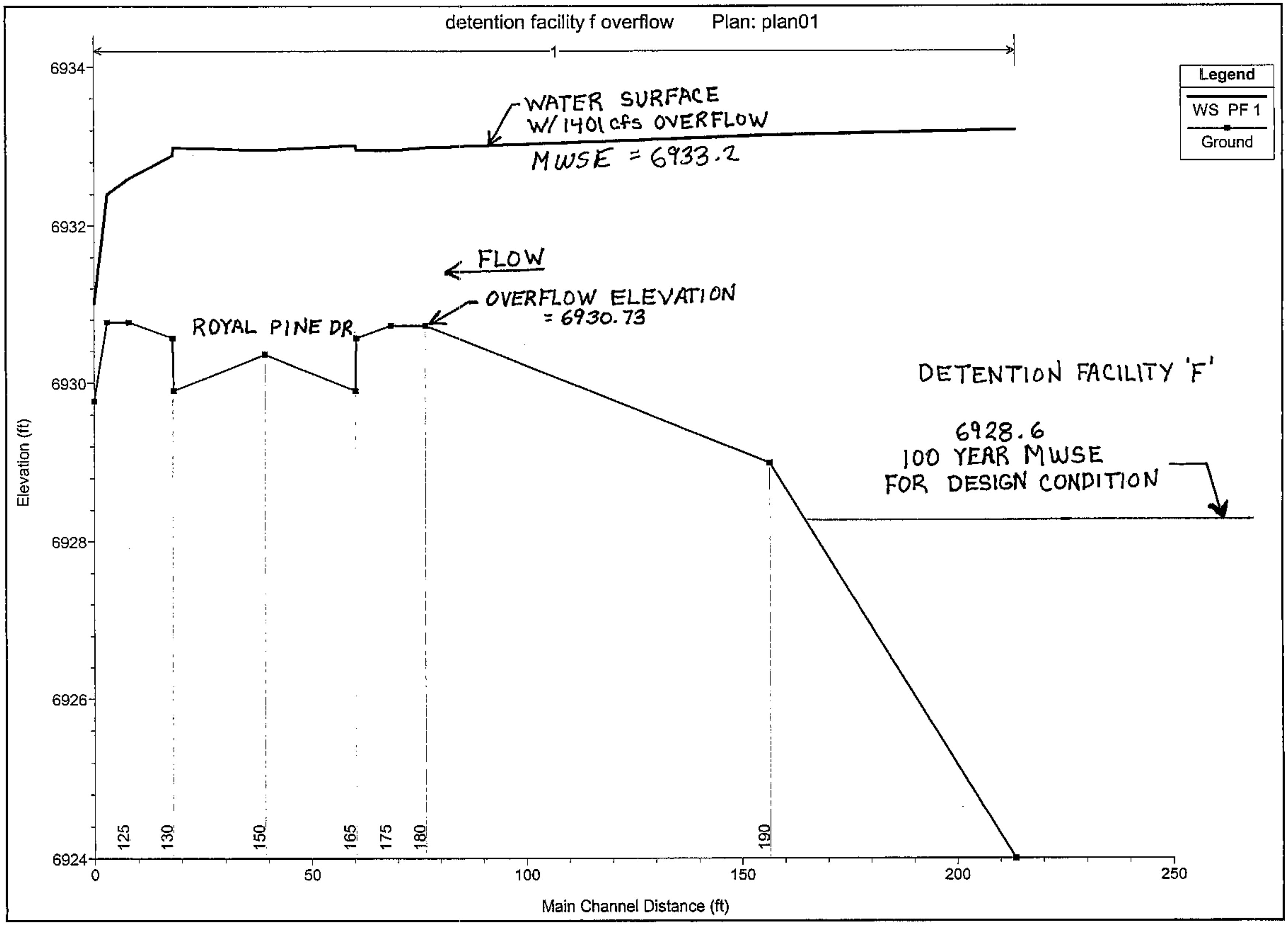
F.

EMERGENCY OVERFLOW CALCULATIONS



HEC-RAS MODEL SCHEMATIC

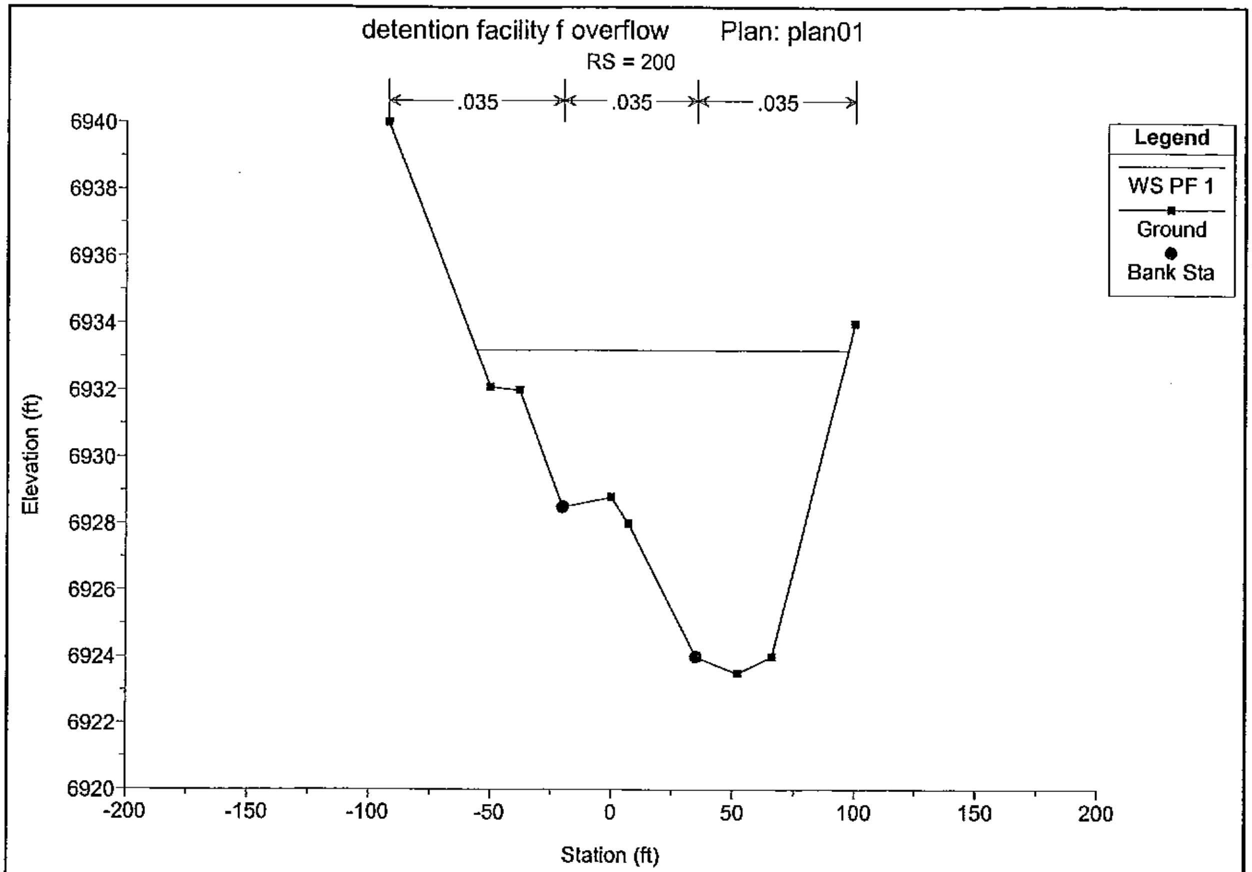
POND OVERFLOW SECTION

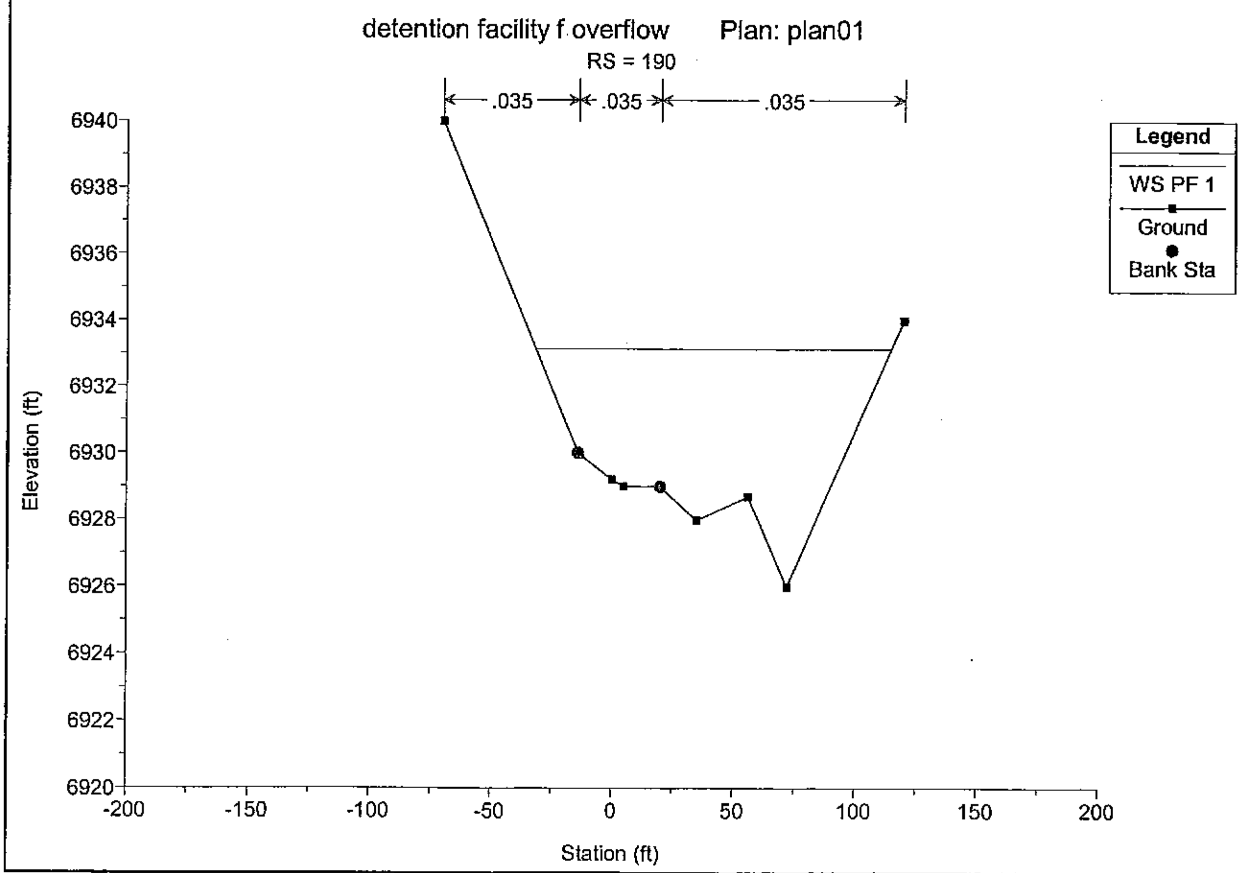


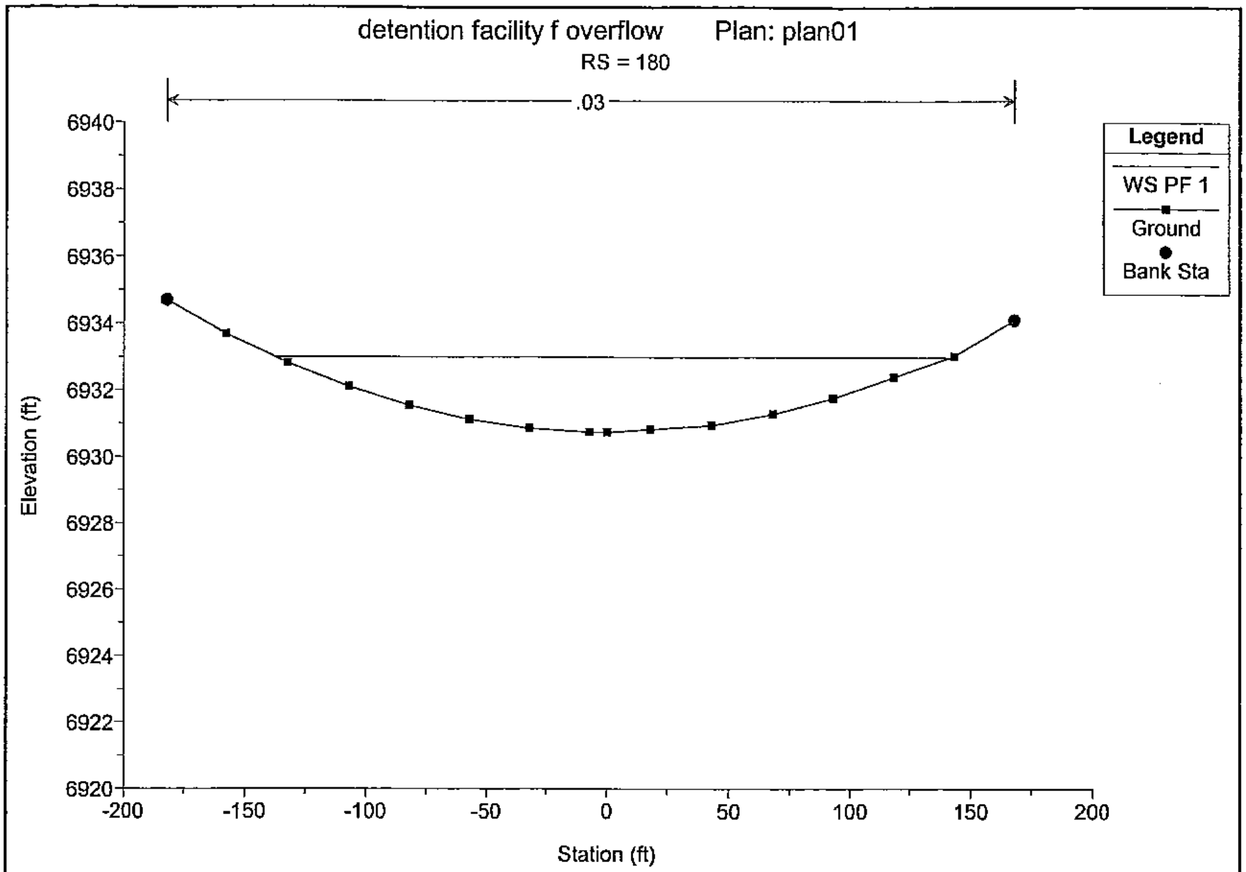
detention facility f overflow Plan: plan01
1
Legend
WS PF 1
Ground
WATER SURFACE
W/ 1401 cfs OVERFLOW
MWSE = 6933.2
FLOW
OVERFLOW ELEVATION
= 6930.73
ROYAL PINE DR.
DETENTION FACILITY 'F'
6928.6
100 YEAR MWSE
FOR DESIGN CONDITION
6934
6932
6930
6928
6926
6924
Elevation (ft)
125
130
150
165
175
180
190
0
50
100
150
200
250
Main Channel Distance (ft)

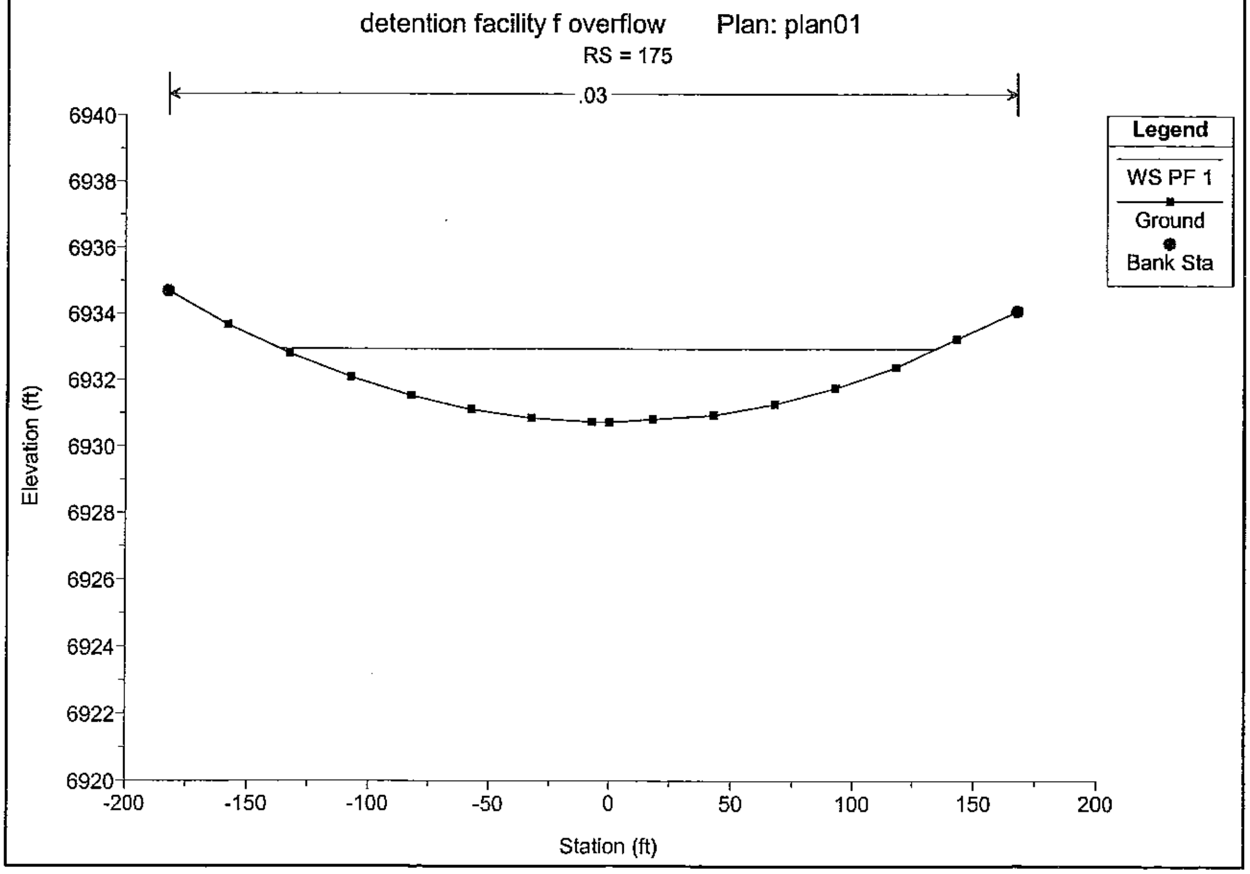
HEC-RAS Plan: 1 River: overflow Reach: 1 Profile: PF 1

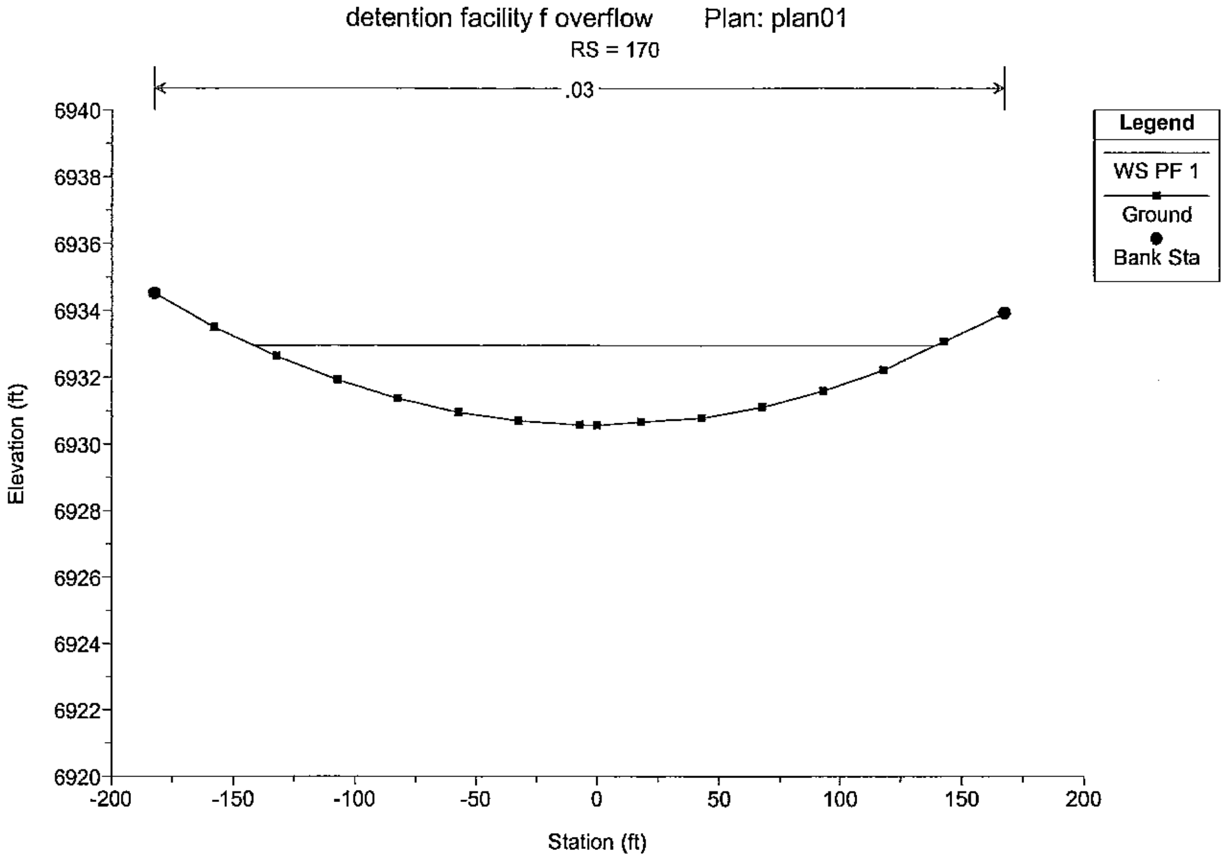
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Vel Left	Vel Right	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(ft/s)	(ft/s)	(sq ft)	(ft)	
1	120	1401.00	6929.77	6931.01	6931.57	6932.78	0.051448	10.68			131.18	141.48	1.95
1	123	1401.00	6930.77	6932.39	6932.39	6932.97	0.012872	6.11			229.30	202.22	1.01
1	125	1401.00	6930.77	6932.59		6933.01	0.001503	5.15			271.86	216.72	0.81
1	130	1401.00	6930.57	6932.88		6933.04	0.000585	3.18			439.91	286.97	0.45
1	135	1401.00	6929.90	6932.98		6933.05	0.000165	2.07			677.81	326.57	0.25
1	150	1401.00	6930.36	6932.95		6933.07	0.000384	2.78			503.13	292.96	0.37
1	165	1401.00	6929.90	6933.01		6933.08	0.000174	2.11			663.28	322.28	0.26
1	170	1401.00	6930.57	6932.95		6933.11	0.002208	3.16			443.41	280.23	0.44
1	175	1401.00	6930.73	6932.95		6933.14	0.003023	3.52			397.68	270.27	0.51
1	180	1401.00	6930.73	6932.98		6933.17	0.002866	3.43			408.84	278.23	0.50
1	190	1401.00	6929.00	6933.13		6933.22	0.000374	2.36	1.28	2.55	573.39	146.28	0.21
1	200	1401.00	6924.00	6933.19	6927.20	6933.24	0.000106	1.66	0.79	1.84	831.24	153.02	0.12

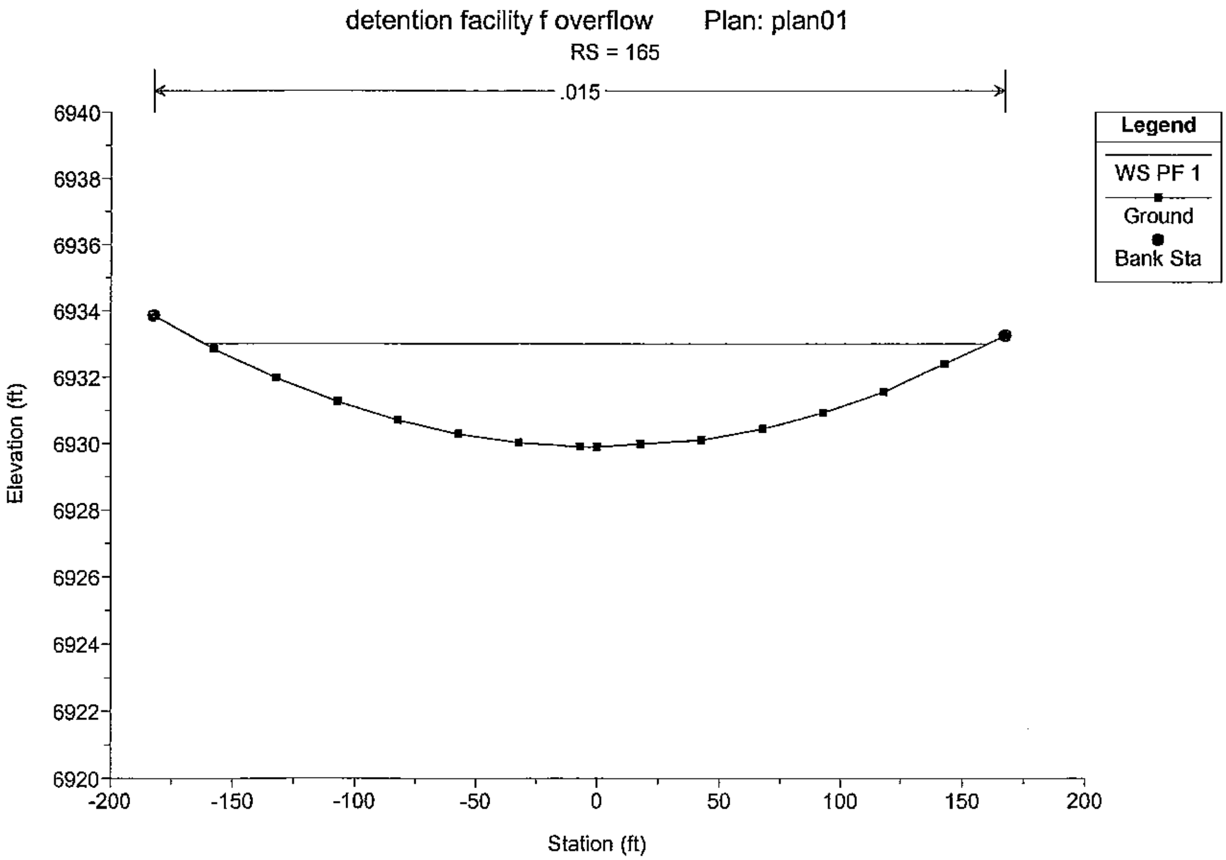

detention facility f overflow Plan: plan01
RS = 200
.035
.035
.035
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)

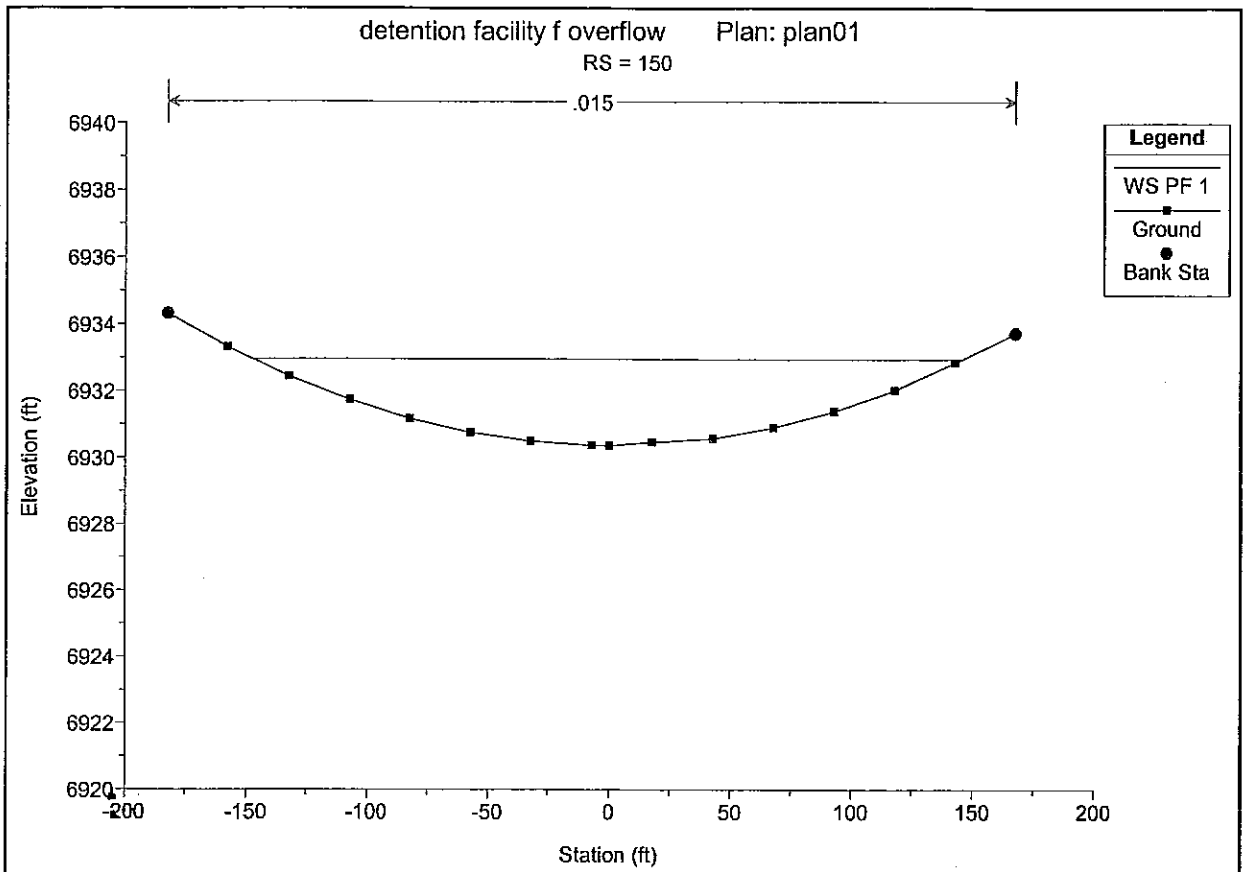

detention facility f overflow Plan: plan01
RS = 190
.035
.035
.035
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)

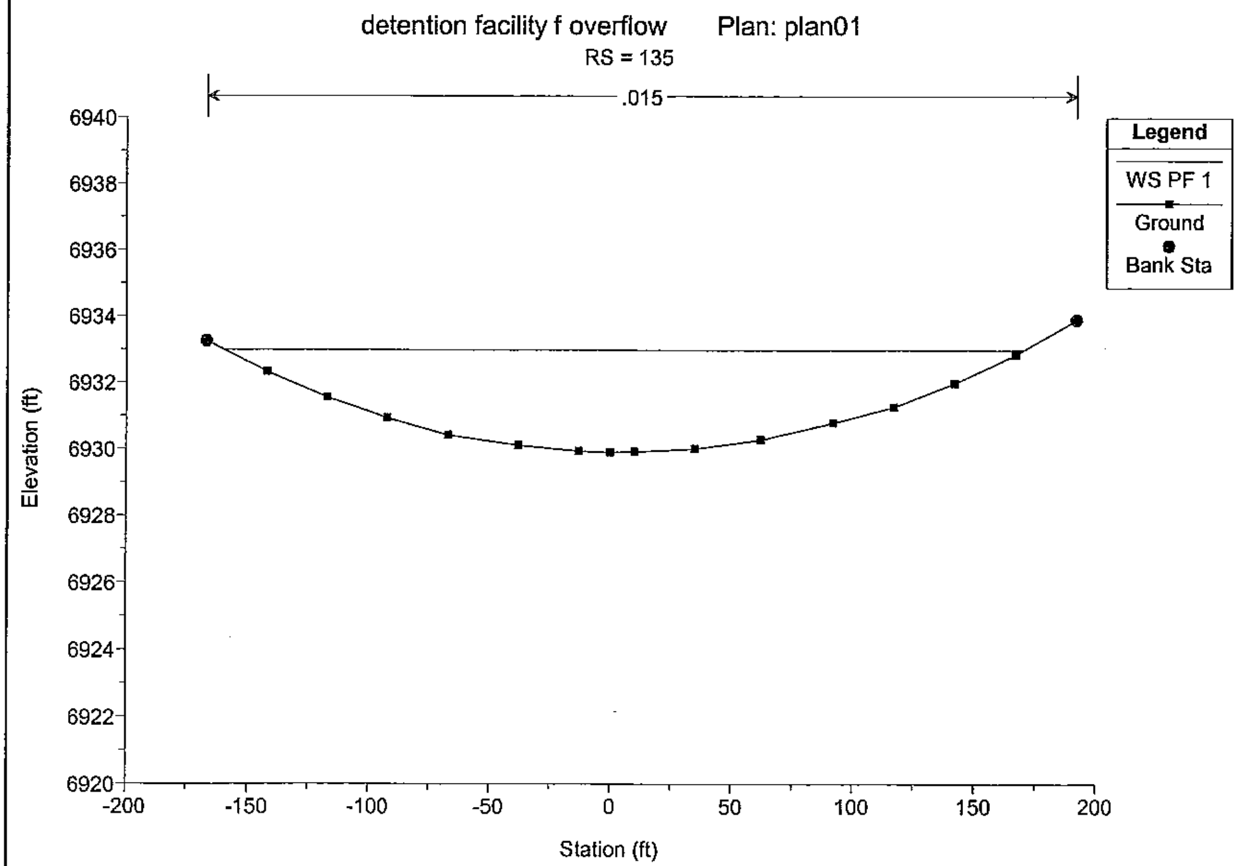

detention facility f overflow Plan: plan01
RS = 180
.03
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200

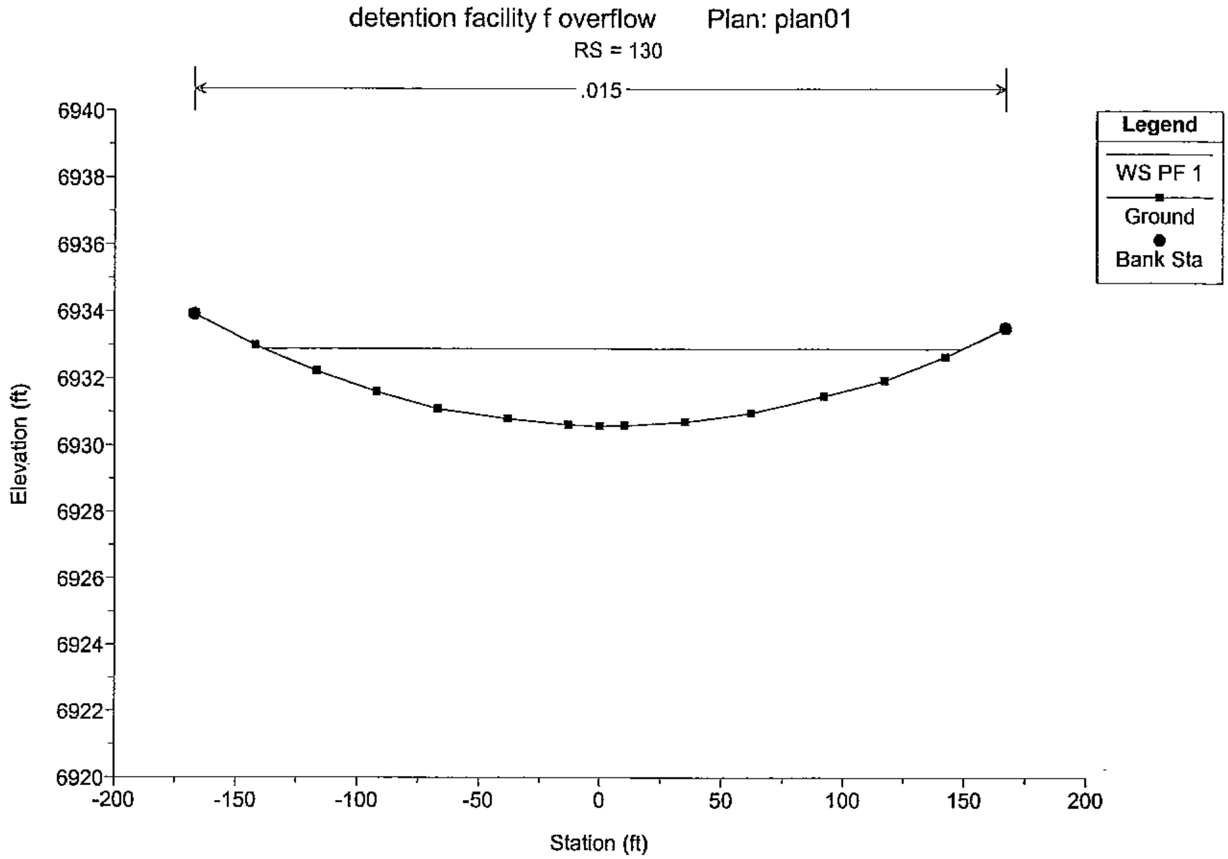

detention facility f overflow Plan: plan01
RS = 175
.03
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200

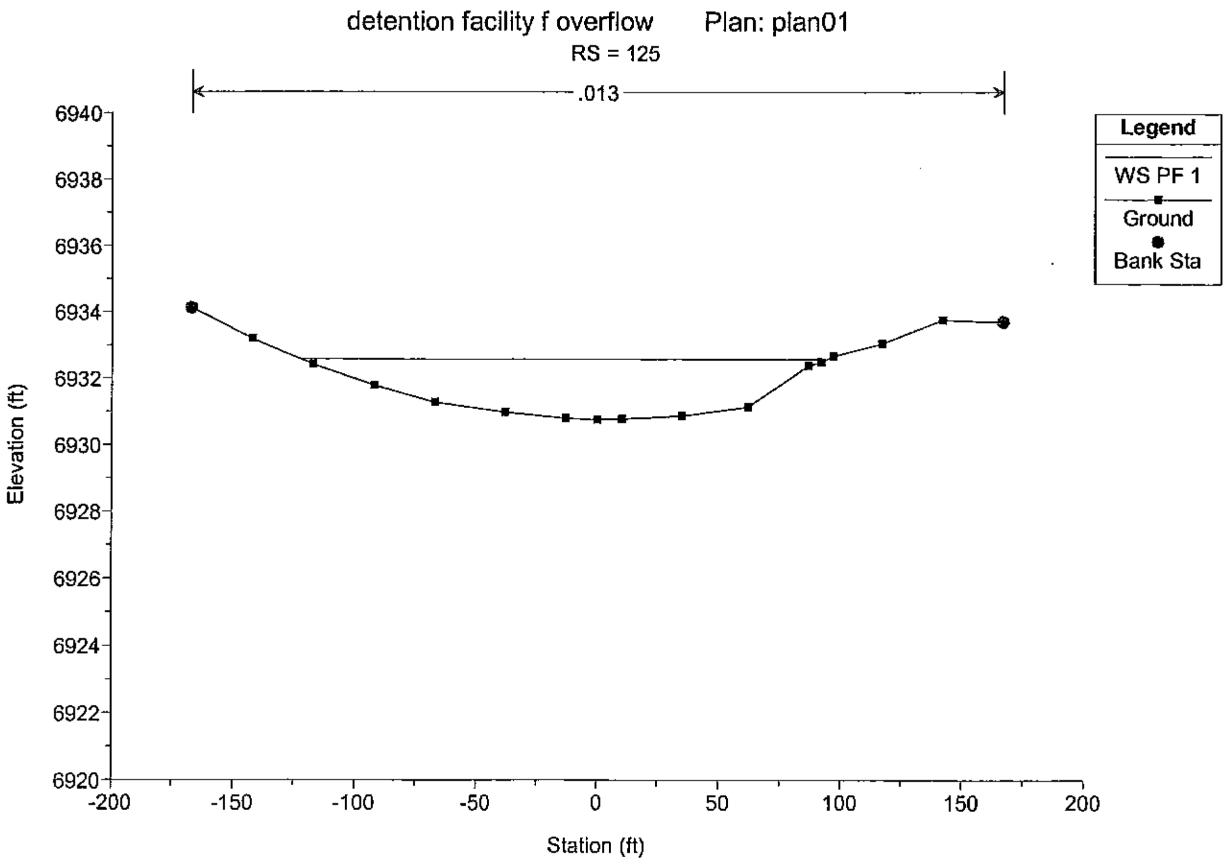

detention facility f overflow Plan: plan01
RS = 170
.03
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)

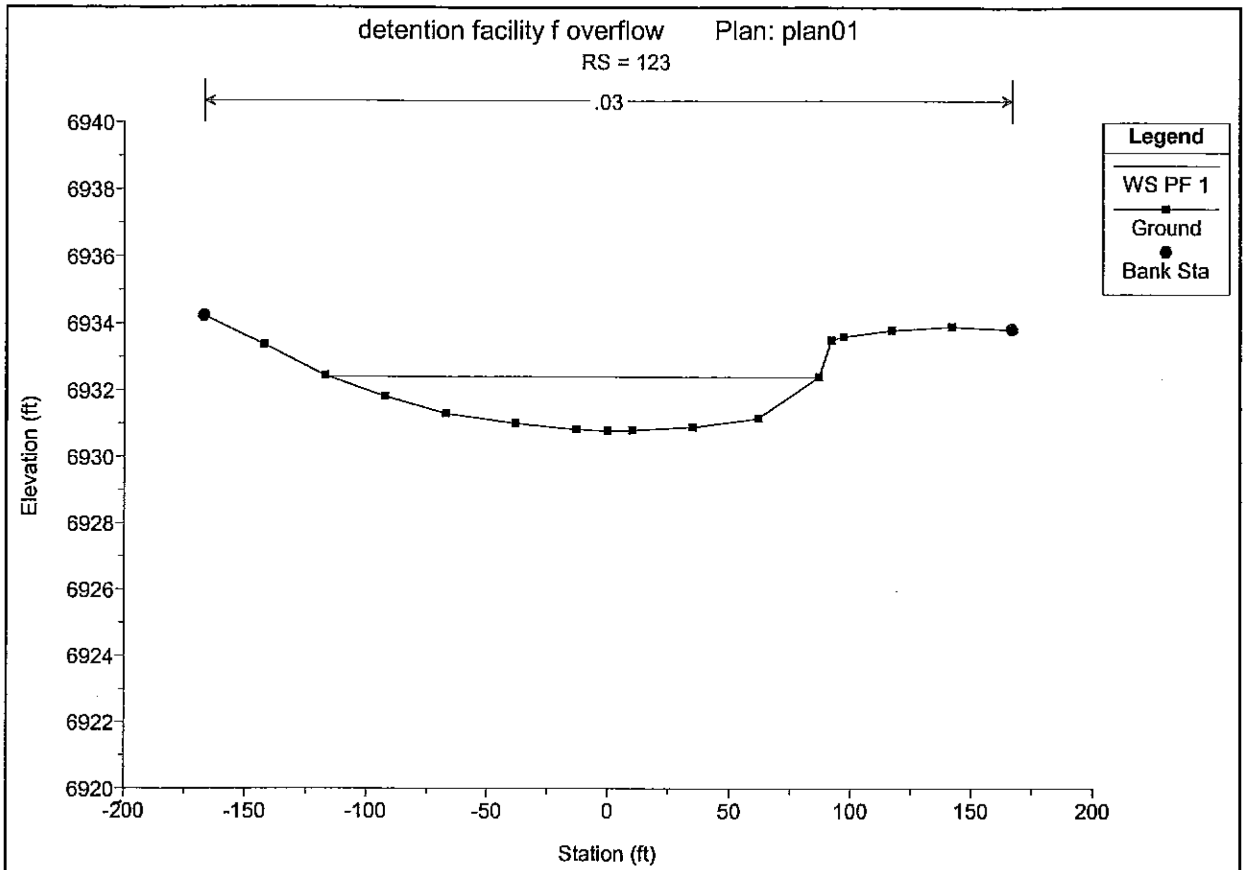

detention facility f overflow Plan: plan01
RS = 165
.015
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)

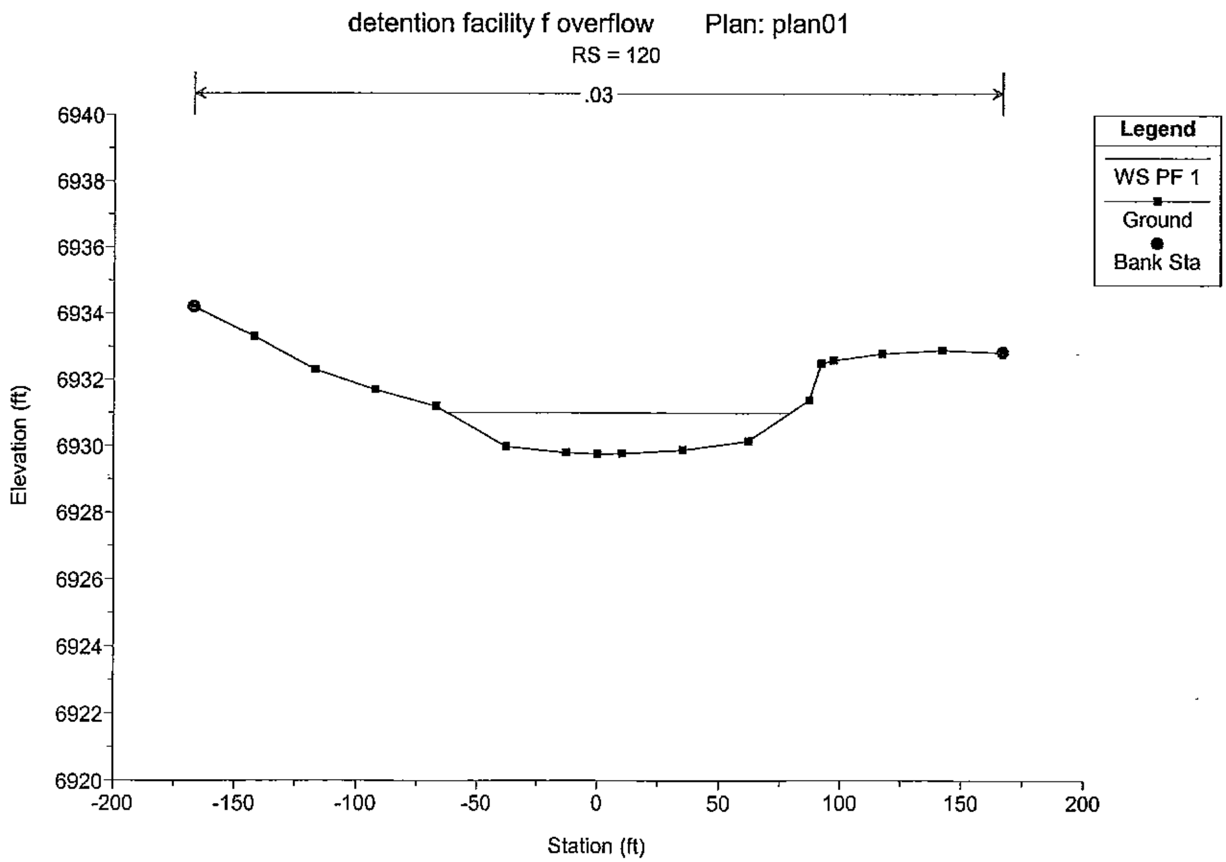

detention facility f overflow Plan: plan01
RS = 150
.015
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)


detention facility f overflow Plan: plan01
RS = 135
.015
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)


detention facility f overflow Plan: plan01
RS = 130
.015
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200


detention facility f overflow Plan: plan01
RS = 125
.013
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200


detention facility f overflow
Plan: plan01
RS = 123
.03
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)


detention facility f overflow
Plan: plan01
RS = 120
.03
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
6940
6938
6936
6934
6932
6930
6928
6926
6924
6922
6920
-200
-150
-100
-50
0
50
100
150
200
Station (ft)

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Hydrologic Engineering Center
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Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX   XXXX        XXXX      XX     XXXX
X     X  X       X    X       X   X    X  X   X
X     X  X       X            X   X   X    X  X
XXXXXXX  XXXX    X       XXX  XXXX    XXXXXX   XXXX
X     X  X       X            X  X    X    X       X
X     X  X       X    X       X   X   X    X       X
X     X  XXXXXX   XXXX        X    X  X    X  XXXXX
```

PROJECT DATA
Project Title: detention facility f overflow
Project File : dffoverflow.prj
Run Date and Time: 10/31/2002 11:08:42 AM

Project in English units

Project Description:
0
UNITS

PLAN DATA

Plan Title: plan01
Plan File : x:\2950000.all\2950350\hec-ras\dffoverflow.p01

Geometry Title: geo01
Geometry File : x:\2950000.all\2950350\hec-ras\dffoverflow.g01

Flow Title : flow01
Flow File : x:\2950000.all\2950350\hec-ras\dffoverflow.f01

Plan Summary Information:

Number of:	Cross Sections	= 12	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculaton tolerance = 0.01
- Maximum number of interations = 20
- Maximum difference tolerance = 0.3
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed only where necessary
- Conveyance Calculation Method: At breaks in n values only
- Friction Slope Method: Average Conveyance
- Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: flow01
Flow File : x:\2950000.all\2950350\hec-ras\dffoverflow.f01

Flow Data (cfs)

River	Reach	RS	PF 1
overflow	1	200	1401

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
overflow	1	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: geo01
Geometry File : x:\2950000.all\2950350\hec-ras\dffoverflow.g01

CROSS SECTION RIVER: overflow
REACH: 1 RS: 200

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-92	6940	-50	6932.1	-38	6932	-20	6928.5	0	6928.8
7	6928	35	6924	52	6923.5	66	6924	100	6934

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-92	.035	-20	.035	35	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-20	35	77	57	27	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 190

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70	6940	-14	6930	0	6929.2	5	6929	20	6929
35	6928	56	6928.7	72	6926	120	6934		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70	.035	-14	.035	20	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-14	20	110	80	30	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 180

INPUT

Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.69	-157.83	6933.68	-132.2	6932.81	-107.2	6932.1	-82.2	6931.54
-57.2	6931.12	-32.2	6930.86	-7.2	6930.74	0	6930.73	17.8	6930.83
42.8	6930.95	67.8	6931.28	92.8	6931.76	117.8	6932.39	142.8	6933.03
167.8	6934.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.04	-182.2	.03	167.8	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 175

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.69	-157.83	6933.68	-132.2	6932.81	-107.2	6932.1	-82.2	6931.54
-57.2	6931.12	-32.2	6930.86	-7.2	6930.74	0	6930.73	17.8	6930.83
42.8	6930.95	67.8	6931.28	92.8	6931.76	117.8	6932.39	142.8	6933.25
167.8	6934.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.04	-182.2	.03	167.8	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 170

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.53	-157.83	6933.52	-132.2	6932.65	-107.2	6931.94	-82.2	6931.38
-57.2	6930.96	-32.2	6930.7	-7.2	6930.58	0	6930.57	17.8	6930.67
42.8	6930.79	67.8	6931.12	92.8	6931.6	117.8	6932.23	142.8	6933.08
167.8	6933.93								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.04	-182.2	.03	167.8	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 165

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6933.86	-157.83	6932.85	-132.2	6931.98	-107.2	6931.27	-82.2	6930.71
-57.2	6930.29	-32.2	6930.03	-7.2	6929.91	0	6929.9	17.8	6930
42.8	6930.12	67.8	6930.45	92.8	6930.93	117.8	6931.56	142.8	6932.41
167.8	6933.26								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.015	-182.2	.015	167.8	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 150

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.32	-157.83	6933.31	-132.2	6932.44	-107.2	6931.73	-82.2	6931.17
-57.2	6930.75	-32.2	6930.49	-7.2	6930.37	0	6930.36	17.8	6930.46
42.8	6930.58	67.8	6930.91	92.8	6931.39	117.8	6932.02	142.8	6932.85
167.8	6933.72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.015	-182.2	.015	167.8	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 135

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6933.26	-142	6932.33	-117	6931.56	-92	6930.93	-67	6930.42
-38	6930.12	-13	6929.94	0	6929.9	10	6929.92	35	6930.02
62	6930.29	92	6930.8	117	6931.27	142	6931.98	167	6932.84
192	6933.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.015	-167	.015	192	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	192	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 130

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6933.93	-142	6933	-117	6932.23	-92	6931.6	-67	6931.09
-38	6930.79	-13	6930.61	0	6930.57	10	6930.59	35	6930.69
62	6930.96	92	6931.47	117	6931.94	142	6932.65	167	6933.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.015	-167	.015	167	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 125

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.13	-142	6933.2	-117	6932.43	-92	6931.8	-67	6931.29
-38	6930.99	-13	6930.81	0	6930.77	10	6930.79	35	6930.89
62	6931.16	87	6932.4	92	6932.5	97	6932.69	117	6933.06
142	6933.78	167	6933.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.013	-167	.013	167	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 123

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.23	-142	6933.36	-117	6932.43	-92	6931.8	-67	6931.29
-38	6930.99	-13	6930.81	0	6930.77	10	6930.79	35	6930.89
62	6931.16	87	6932.4	92	6933.5	97	6933.6	117	6933.8
142	6933.9	167	6933.82						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.03	-167	.03	167	.03

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 120

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.2	-142	6933.3	-117	6932.3	-92	6931.7	-67	6931.2
-38	6929.99	-13	6929.81	0	6929.77	10	6929.79	35	6929.89
62	6930.16	87	6931.4	92	6932.5	97	6932.6	117	6932.8
142	6932.9	167	6932.82						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.03	-167	.03	167	.03

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

SUMMARY OF MANNING'S N VALUES

River:overflow

Reach	River Sta.	n1	n2	n3
1	200	.035	.035	.035
1	190	.035	.035	.035

1	180	.04	.03	.04
1	175	.04	.03	.04
1	170	.04	.03	.04
1	165	.015	.015	.015
1	150	.015	.015	.015
1	135	.015	.015	.015
1	130	.015	.015	.015
1	125	.013	.013	.013
1	123	.03	.03	.03
1	120	.03	.03	.03

SUMMARY OF REACH LENGTHS

River: overflow

Reach	River Sta.	Left	Channel	Right
1	200	77	57	27
1	190	110	80	30
1	180		8	
1	175		8	
1	170		.25	
1	165		21	
1	150		21	
1	135		.25	
1	130		10	
1	125		5	
1	123		3	
1	120		0	

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: overflow

Reach	River Sta.	Contr.	Expan.
1	200	.1	.3
1	190	.1	.3
1	180	.1	.3
1	175	.1	.3
1	170	.1	.3
1	165	.1	.3
1	150	.1	.3
1	135	.1	.3
1	130	.1	.3
1	125	.1	.3
1	123	.1	.3
1	120	.1	.3

```
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U.S. Army Corp of Engineers
Hydrologic Engineering Center
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Davis, California 95616-4687
(916) 756-1104

X      X  XXXXXX    XXXX        XXXX      XX      XXXX
X      X  X        X    X       X   X    X  X    X
X      X  X        X            X   X   X    X   X
XXXXXXX   XXXX     X       XXX  XXXX    XXXXXX    XXXX
X      X  X        X            X  X    X    X        X
X      X  X        X    X       X   X   X    X        X
X      X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: detention facility f overflow
Project File : dffoverflow.prj
Run Date and Time: 10/31/2002 9:34:02 AM

Project in English units

Project Description:
0
UNITS

PLAN DATA

Plan Title: plan01
Plan File : x:\2950000.all\2950350\hec-ras\dffoverflow.p01

Geometry Title: geo01
Geometry File : x:\2950000.all\2950350\hec-ras\dffoverflow.g01

Flow Title : flow01
Flow File : x:\2950000.all\2950350\hec-ras\dffoverflow.f01

Plan Summary Information:

Number of:	Cross Sections =	12	Mulitple Openings =	0
	Culverts =	0	Inline Weirs =	0
	Bridges =	0		

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: flow01
Flow File : x:\2950000.all\2950350\hec-ras\dffoverflow.f01

Flow Data (cfs)

River	Reach	RS	PF 1
overflow	1	200	1401

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
overflow	1	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: geo01
Geometry File : x:\2950000.all\2950350\hec-ras\dffoverflow.g01

CROSS SECTION RIVER: overflow
REACH: 1 RS: 200

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-92	6940	-50	6932.1	-38	6932	-20	6928.5	0	6928.8
7	6928	35	6924	52	6923.5	66	6924	100	6934

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-92	.03	-20	.03	35	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-20	35	77	57	27	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 190

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70	6940	-14	6930	0	6929.2	5	6929	20	6929
35	6928	56	6928.7	72	6926	120	6934		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70	.03	-14	.03	20	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-14	20	110	80	30	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 180

INPUT

Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.69	-157.83	6933.68	-132.2	6932.81	-107.2	6932.1	-82.2	6931.54
-57.2	6931.12	-32.2	6930.86	-7.2	6930.74	0	6930.73	17.8	6930.83
42.8	6930.95	67.8	6931.28	92.8	6931.76	117.8	6932.39	142.8	6933.03
167.8	6934.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2		-182.2	.03	167.8	

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 175

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.69	-157.83	6933.68	-132.2	6932.81	-107.2	6932.1	-82.2	6931.54
-57.2	6931.12	-32.2	6930.86	-7.2	6930.74	0	6930.73	17.8	6930.83
42.8	6930.95	67.8	6931.28	92.8	6931.76	117.8	6932.39	142.8	6933.25
167.8	6934.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.04	-182.2	.03	167.8	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 170

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6934.53	-157.83	6933.52	-132.2	6932.65	-107.2	6931.94	-82.2	6931.38
-57.2	6930.96	-32.2	6930.7	-7.2	6930.58	0	6930.57	17.8	6930.67
42.8	6930.79	67.8	6931.12	92.8	6931.6	117.8	6932.23	142.8	6933.08
167.8	6933.93								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-182.2	.04	-182.2	.03	167.8	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
-182.2	167.8	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 165

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-182.2	6933.86	-157.83	6932.85	-132.2	6931.98	-107.2	6931.27	-82.2	6930.71
-57.2	6930.29	-32.2	6930.03	-7.2	6929.91	0	6929.9	17.8	6930
42.8	6930.12	67.8	6930.45	92.8	6930.93	117.8	6931.56	142.8	6932.41
167.8	6933.26								

```
Manning's n Values         num=        3
     Sta    n Val     Sta    n Val     Sta    n Val
  -182.2     .015  -182.2     .015   167.8     .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -182.2   167.8             .1       .3

CROSS SECTION          RIVER: overflow
REACH: 1                  RS: 150

INPUT
Description:
Station Elevation Data     num=       16
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
  -182.2 6934.32 -157.83 6933.31  -132.2 6932.44  -107.2 6931.73   -82.2 6931.17
   -57.2 6930.75   -32.2 6930.49    -7.2 6930.37       0 6930.36    17.8 6930.46
    42.8 6930.58    67.8 6930.91    92.8 6931.39   117.8 6932.02   142.8 6932.85
   167.8 6933.72

Manning's n Values         num=        3
     Sta    n Val     Sta    n Val     Sta    n Val
  -182.2     .015  -182.2     .015   167.8     .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -182.2   167.8             .1       .3

CROSS SECTION          RIVER: overflow
REACH: 1                  RS: 135

INPUT
Description:
Station Elevation Data     num=       15
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
    -167 6933.26    -142 6932.33    -117 6931.56     -92 6930.93     -67 6930.42
     -38 6930.12     -13 6929.94       0  6929.9      10 6929.92      35 6930.02
      62 6930.29      92  6930.8     117 6931.27     142 6931.98     167 6932.84

Manning's n Values         num=        3
     Sta    n Val     Sta    n Val     Sta    n Val
    -167     .015    -167     .015     167     .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -167     167             .1       .3

CROSS SECTION          RIVER: overflow
REACH: 1                  RS: 130

INPUT
Description:
Station Elevation Data     num=       15
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
    -167 6933.93    -142     6933    -117 6932.23     -92  6931.6     -67 6931.09
     -38 6930.79     -13 6930.61       0 6930.57      10 6930.59      35 6930.69
      62 6930.96      92 6931.47     117 6931.94     142 6932.65     167 6933.51

Manning's n Values         num=        3
     Sta    n Val     Sta    n Val     Sta    n Val
    -167     .015    -167     .015     167     .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -167     167             .1       .3

CROSS SECTION          RIVER: overflow
REACH: 1                  RS: 125
```

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.13	-142	6933.2	-117	6932.43	-92	6931.8	-67	6931.29
-38	6930.99	-13	6930.81	0	6930.77	10	6930.79	35	6930.89
62	6931.16	87	6932.4	92	6932.5	97	6932.69	117	6933.06
142	6933.78	167	6933.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.013	-167	.013	167	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 123

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.23	-142	6933.36	-117	6932.43	-92	6931.8	-67	6931.29
-38	6930.99	-13	6930.81	0	6930.77	10	6930.79	35	6930.89
62	6931.16	87	6932.4	92	6933.5	97	6933.6	117	6933.8
142	6933.9	167	6933.82						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.03	-167	.03	167	.03

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

CROSS SECTION RIVER: overflow
REACH: 1 RS: 120

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-167	6934.2	-142	6933.3	-117	6932.3	-92	6931.7	-67	6931.2
-38	6929.99	-13	6929.81	0	6929.77	10	6929.79	35	6929.89
62	6930.16	87	6931.4	92	6932.5	97	6932.6	117	6932.8
142	6932.9	167	6932.82						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-167	.03	-167	.03	167	.03

Bank Sta: Left	Right	Coeff Contr.	Expan.
-167	167	.1	.3

SUMMARY OF MANNING'S N VALUES

River:overflow

Reach	River Sta.	n1	n2	n3
1	200	.03	.03	.03
1	190	.03	.03	.03
1	180		.03	

1	175	.04	.03	.04
1	170	.04	.03	.04
1	165	.015	.015	.015
1	150	.015	.015	.015
1	135	.015	.015	.015
1	130	.015	.015	.015
1	125	.013	.013	.013
1	123	.03	.03	.03
1	120	.03	.03	.03

SUMMARY OF REACH LENGTHS

River: overflow

Reach	River Sta.	Left	Channel	Right
1	200	77	57	27
1	190	110	80	30
1	180		8	
1	175		8	
1	170		.25	
1	165		21	
1	150		21	
1	135		.25	
1	130		10	
1	125		5	
1	123		3	
1	120		0	

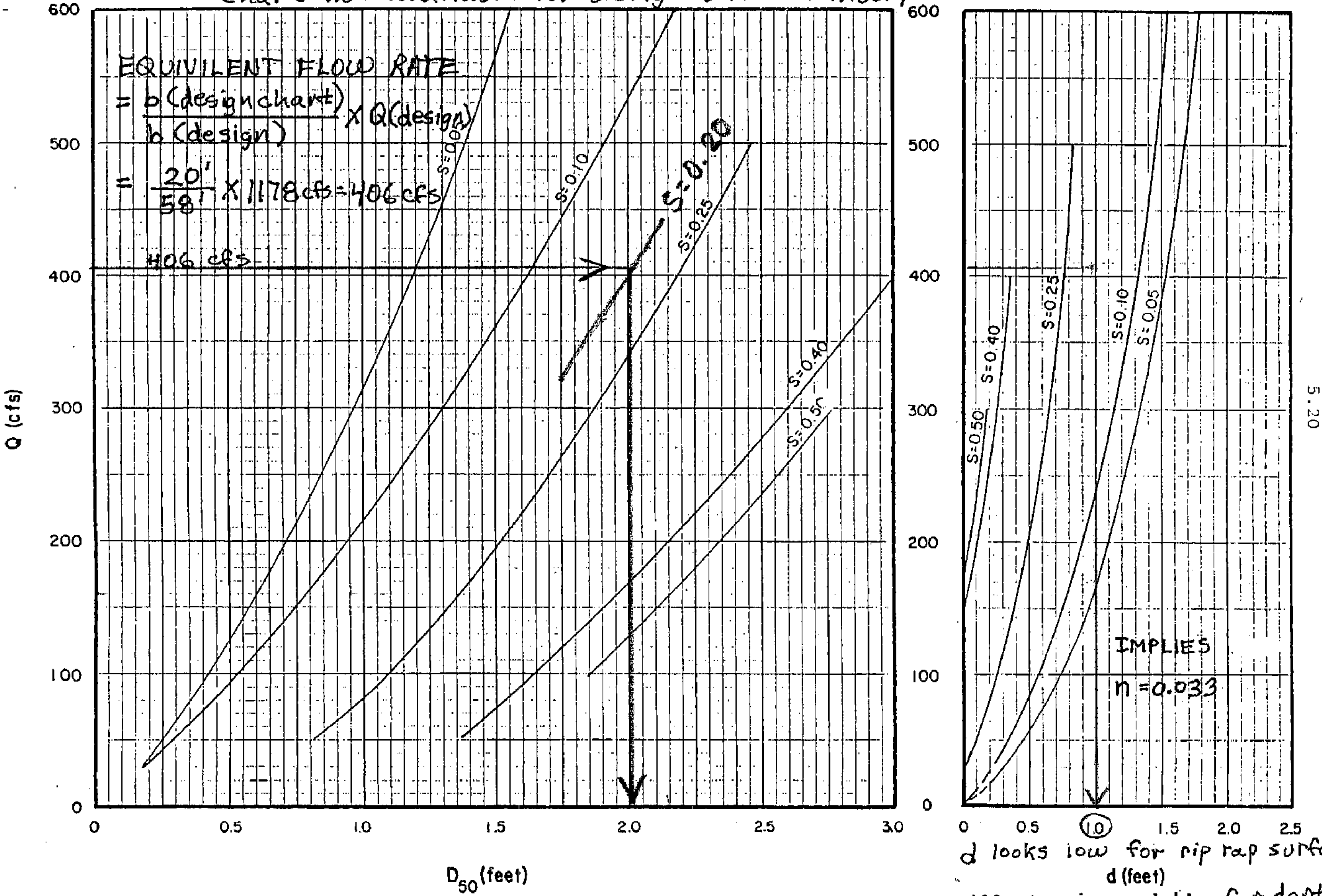
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: overflow

Reach	River Sta.	Contr.	Expan.
1	200	.1	.3
1	190	.1	.3
1	180	.1	.3
1	175	.1	.3
1	170	.1	.3
1	165	.1	.3
1	150	.1	.3
1	135	.1	.3
1	130	.1	.3
1	125	.1	.3
1	123	.1	.3
1	120	.1	.3

G.

RIP-RAP RUNDOWN CHANNEL AND STILLING BASIN CALCULATIONS

Chart not available for design width → interpolate



d looks low for rip rap surface
use mannings solution for depth

Figure 5.7. Steep slope riprap design, trapezoidal channels, 2:1 sideslopes, 20 ft base width.

FROM: Surface Mining Water Diversion Manual, sept 1982, per CS. DCM

DETENTION FACILITY 'F' RUNDOWN
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	RUNDOWN - 1178 CFS
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.078	
Channel Slope	0.200000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	58.00	ft
Discharge	1,178.00	cfs

Results		
Depth	1.66	ft
Flow Area	104.39	ft^2
Wetted Perimeter	68.48	ft
Top Width	67.95	ft
Critical Depth	2.25	ft
Critical Slope	0.070902	ft/ft
Velocity	11.28	ft/s
Velocity Head	1.98	ft
Specific Energy	3.64	ft
Froude Number	1.60	
Flow is supercritical.		

From FHWA HEC No. 15
'Design of Roadside Channels"

Table 3. Manning's Roughness Coefficients.

Lining Category	Lining Type	n - value[1]		
		Depth Ranges		
		0-0.5 ft (0-15 cm)	0.5-2.0 ft (15-60 cm)	>2.0 ft (> 60 cm)
Rigid	Concrete	0.015	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Unlined	Bare Soil	0.023	0.020	0.020
	Rock Cut	0.045	0.035	0.025
Temporary*	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.021	0.019
	Straw with Net	0.065	0.033	0.025
	Curled Wood Mat	0.066	0.035	0.028
	Synthetic Mat	0.036	0.025	0.021
Gravel Riprap	1-inch (2.5-cm) D_{50}	0.044	0.033	0.030
	2-inch (5-cm) D_{50}	0.066	0.041	0.034
Rock Riprap	6-inch (15-cm) D_{50}	0.104	0.069	0.035
	12-inch (30-cm) D_{50}	--	0.078	0.040

[1]Based on data in (5, 8, 13, 14, and 15).

Note: Values listed are representative values for the respective depth ranges. Manning's roughness coefficients, n, vary with the flow depth. See Appendix B.

*Some "temporary" linings become permanent when buried.

Client: LA PLATA INVESTMENTS Job No: 9503.50

Project: DETENTION FAC. 'F' By: DLM Chk. By: ______ Date: 10-19-02

Subject: UPPER STILLING BASIN SIZING Sheet No: 1 of 3

J·R ENGINEERING
A Subsidiary of Westrian

BXE 72" RCP STORM SEWER OUTFALL - 580 CFS.

$Q_{100} = 580$ cfs $A_f = 28.27$'s

$V_f = 580/28.27 = 20.5$ '/s PIPE DIA. = 6'

$f_s = (580/4234)^2 = 0.0187$

ASSUME $T_W = 2.5$'

$y_e = (A/2)^{1/2} = (28.27/2)^{1/2} = 3.76$

$T_W/y_e = (2.5/3.76) = 0.66$

$0.25 < d_{50}/y_e < 0.45$

	L	M	H	VH
d_{50}	0.75	1.0	1.5	2.0
d_{50}/y_e	0.199	0.265	0.398	0.53

Obtain y_o/D from Chart 10-C2 (CCS-DCM)

$T_W/D = 2.5/6.0 = 0.416$

$Q/D^{2.5} = 580/6^{2.5} = 6.58$

$y_o/D = 1.0$

$y_o = 1.0 \times 6.0 = 6.0$ WETTED AREA = A_{FULL}

$V_{AVE} = V_{FULL}$ $F.N = V_F/\sqrt{32.2(y_e)}$

$20.5/\sqrt{32.2(3.76)} = 1.86$

Chart 10.4-C.4 (CCS-DCM)

CONTINUED ON NEXT PAGE

Client: La Plata Investments | Job No: 9503.50
Project: Det Fac 'F' | By: DLM | Chk. By: | Date: 10-19-02
Subject: Upper Stilling Basin Sizing | Sheet No: 2 of 3

J·R ENGINEERING
A Subsidiary of Westrian

Cont. from page 1

Type "H"

$d_{50}/y_e = 0.398$ F.N. = 1.86

h_s/y_e (Chart 10-C4) = 1.46

$h_s/y_e \therefore h_s = 1.46 \cdot y_e = 1.46 \cdot 3.76 = 5.49$

$2 < h_s/d_{50} < 4$ $h_s/d_{50} = 5.49/1.5 = 3.65$

Type 'H' ok

Type "VH"

$d_{50}/y_e = 0.53$ F.N. = 1.86

h_s/y_e (Chart 10-C4) = 1.09

$h_s = 1.09 \cdot y_e = 1.09 \cdot 3.76 = 4.09$

$2 < h_s/d_{50} < 4$ $h_s/d_{50} = 4.09/2.0 = 2.04$

Type "VH" ok

Type 'H' hs = 5.49 Pool Length = 54.9 (10 · hs)

Type 'VH' hs = 4.09 Pool Length = 40.9 (10 · hs)

Use 40' pool length w/ Type "VH" riprap

D_{50} = 24" D_{MAX} = 42" D_1 = 5.3 D_2 = 7.0 D_3 = 7.0

H_s = 4.0 Ld = 40' L_A = 20

W_1 = 14 W_2 = 45 D = 8

WT = 8.75

Client: LA PLATA INVESTMENTS Job No: 950350

Project: DET. FAC. 'F' By: DLM Chk. By: ______ Date: 10-19-02

Subject: UPPER STILLING BASIN SIZING Sheet No: 3 of 3

J·R ENGINEERING
A Subsidiary of Westrian

66" DIVERSION STORM SEWER OUTFALL - 320 CFS

Q_{100} = 320 CFS A_f = 23.758 $'^2$
V_f = 320/23.76 = 13.47 '/s PIPE DIA = 5.5'

f_s = (320/3357)^2 = 0.0091

ASSUME T.W. = 2.5'

$y_c = (A_f/2)^{1/2} = (23.758/2)^{1/2} = 4.05$

$T_w/y_c = (2.5/4.05) = 0.62$

$0.25 < d_{50}/y_c < 0.45$

	L	M	H	VH
d_{50}	0.75	1.0	1.5	2.0
d_{50}/y_c	0.185	0.247	0.370	0.494

Obtain y_o/D from Chart 10-C2 (CCS. D.C.M.)

$T_w/D = 2.5/5.5 = 0.454$

$Q/D^{2.5} = 320/5.5^{2.5} = 4.51$

$y_o/D = 0.77$

$y_o = 0.77 \times 5.5 = 4.24$ WETTED AREA = 19.65 $'^2$

$V_{AVG} = 230/19.65 = 11.70$ '/s

F.N. = $V_{AVG}/\sqrt{(32.2)(y_c)} = 11.70/\sqrt{(32.2 \cdot 4.05)} = 1.02$

F.N. NEARLY @ 1.0 WILL BASE UPPER STILLING BASIN FROM LARGER 72" OUTFALL W/ 580 CFS.

BXE 72" RCP - 580 CFS
Worksheet for Circular Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	BXE 72" RCP PIPE - 580 CFS
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Slope

Input Data		
Mannings Coefficient	0.013	
Diameter	72.00	in
Discharge	580.00	cfs

Results		
Channel Slope	0.018758	ft/ft
Depth	72.0	in
Flow Area	28.27	ft^2
Wetted Perimeter	18.85	ft
Top Width	0.00	ft
Critical Depth	5.81	ft
Percent Full	100.00	
Critical Slope	0.016480	ft/ft
Velocity	20.51	ft/s
Velocity Head	6.54	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	623.91	cfs
Full Flow Capacity	580.00	cfs
Full Flow Slope	0.018758	ft/ft

DIV. 66" RCP - 320 CFS
Worksheet for Circular Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	DIV. 66" RCP PIPE - 320 CFS
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Slope

Input Data		
Mannings Coefficient	0.013	
Diameter	66.00	in
Discharge	320.00	cfs

Results		
Channel Slope	0.009082	ft/ft
Depth	66.0	in
Flow Area	23.76	ft^2
Wetted Perimeter	17.28	ft
Top Width	0.00	ft
Critical Depth	4.88	ft
Percent Full	100.00	
Critical Slope	0.008099	ft/ft
Velocity	13.47	ft/s
Velocity Head	2.82	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	344.23	cfs
Full Flow Capacity	320.00	cfs
Full Flow Slope	0.009082	ft/ft

Q/D^2.5 = 4.51

y₀/D = 0.77

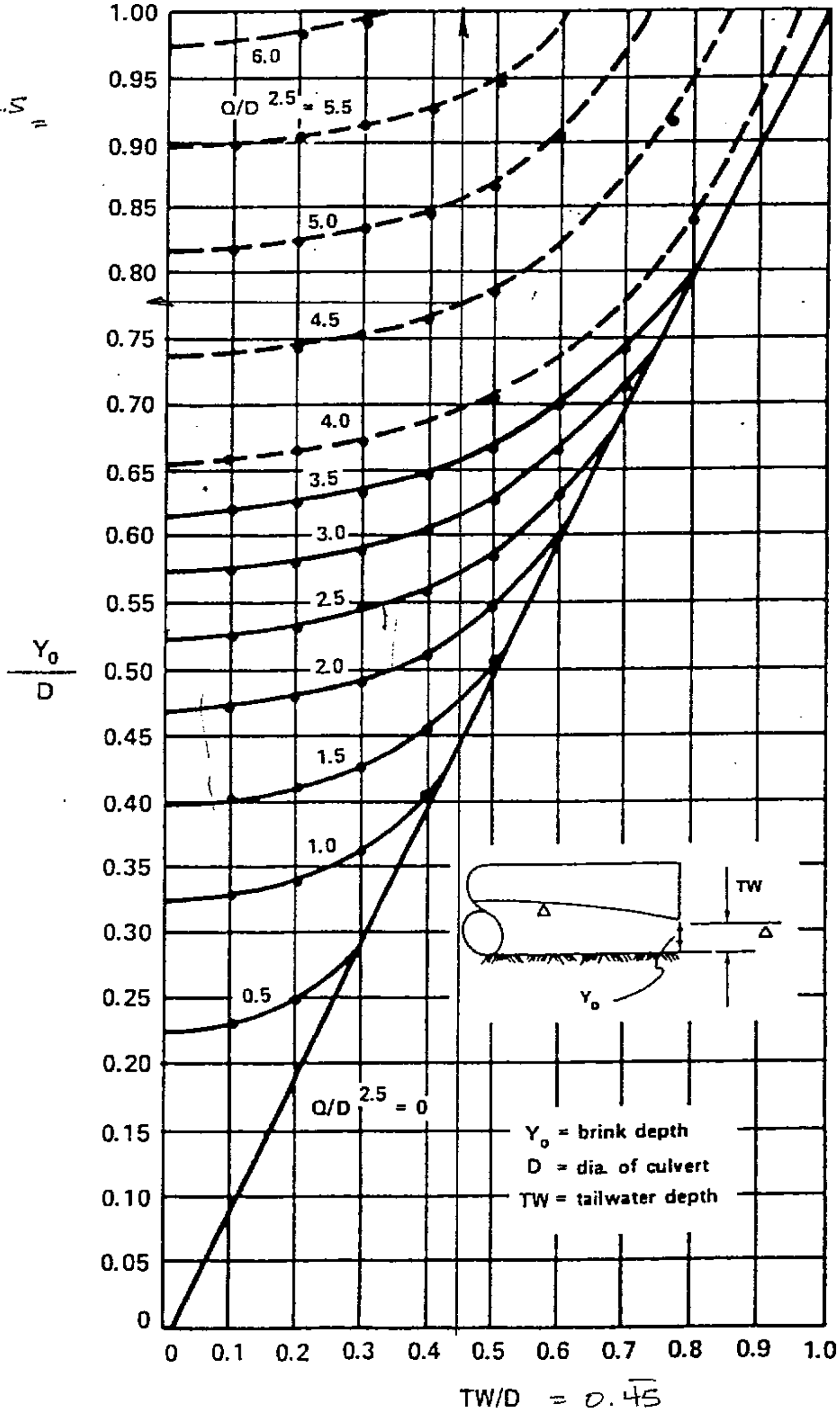


Figure 10-C.2 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes .

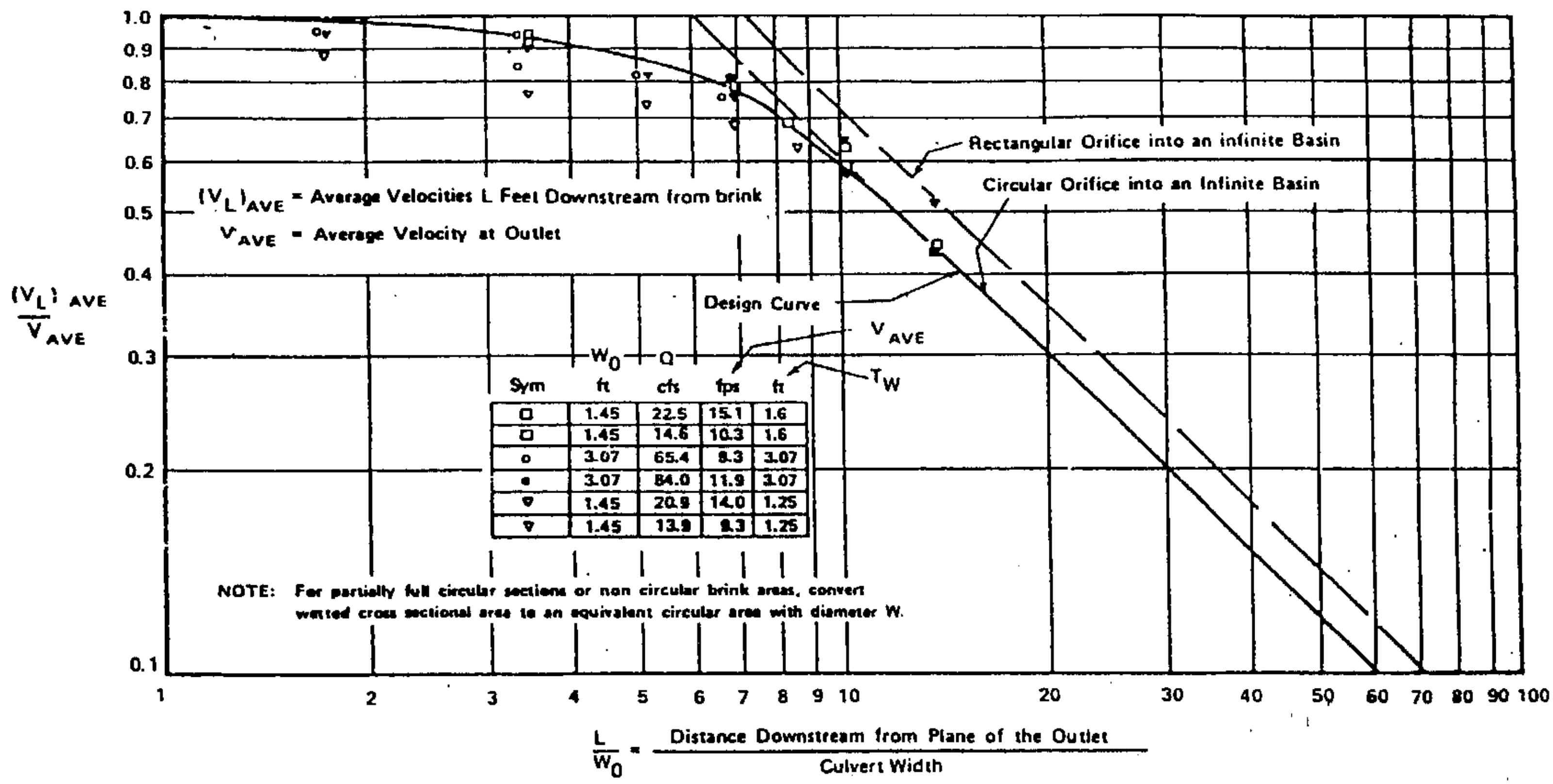
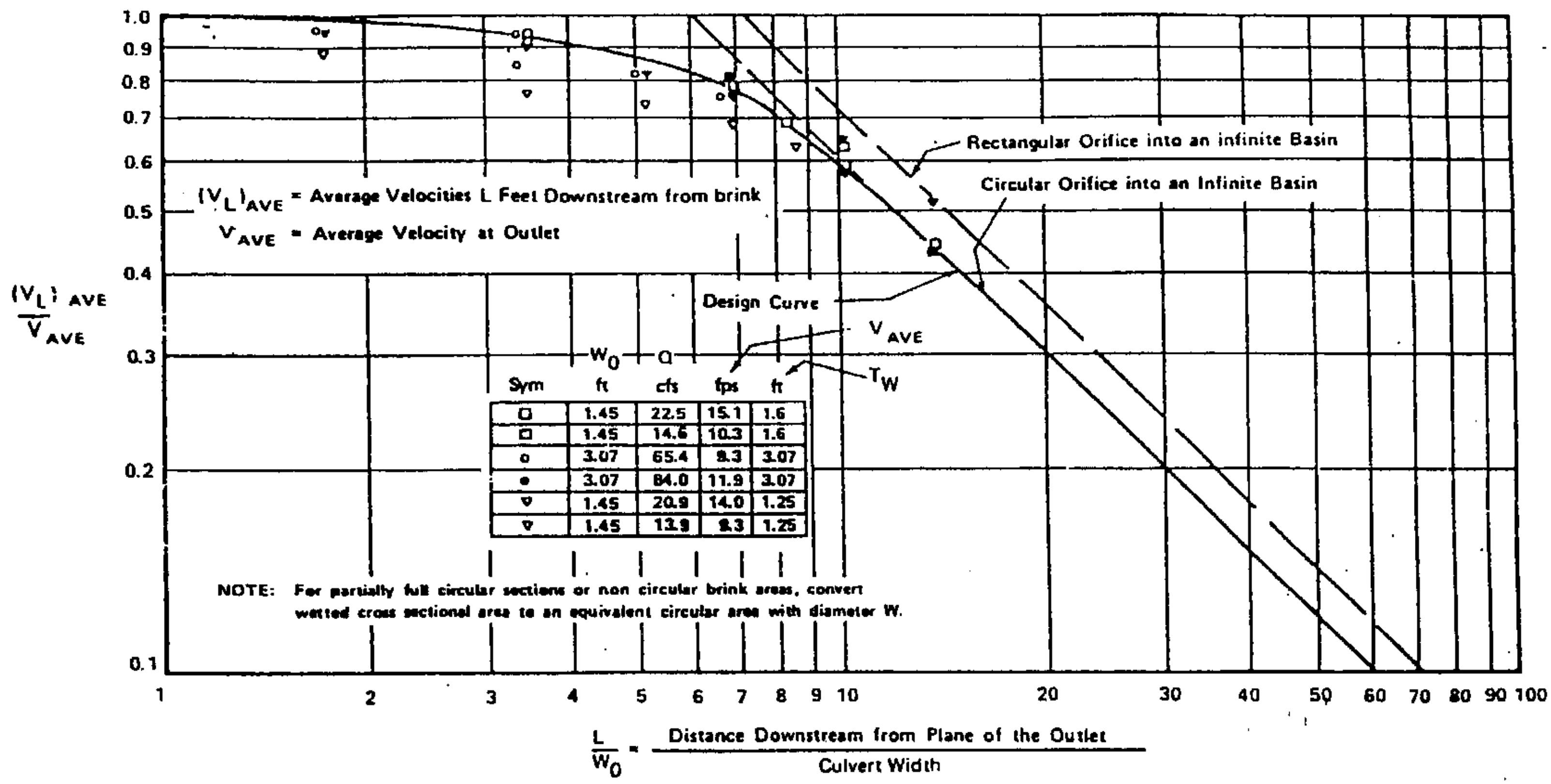


Figure 10-C.3 Distribution of Centerline Velocity for Flow from Submerged Outlets to be used for Predicting Channel Velocities Downstream from Culvert Outlet where High Tailwater prevails. Velocities obtained from the use of this Chart can be used with Figure 2 of HEC No. 11 for sizing riprap (DO NOT use Figure 1 HEC No. 11, use Mean Velocity Values).

The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date 9-30-90
	Figure 10-C.3



Sym	W_0 ft	Q cfs	V_{AVE} fps	T_W ft
□	1.45	22.5	15.1	1.6
□	1.45	14.6	10.3	1.6
o	3.07	65.4	8.3	3.07
•	3.07	84.0	11.9	3.07
▽	1.45	20.9	14.0	1.25
▽	1.45	13.9	9.3	1.25

Figure 10-C.3 Distribution of Centerline Velocity for Flow from Submerged Outlets to be used for Predicting Channel Velocities Downstream from Culvert Outlet where High Tailwater prevails. Velocities obtained from the use of this Chart can be used with Figure 2 of HEC No. 11 for sizing riprap (DO NOT use Figure 1 HEC No. 11, use Mean Velocity Values).

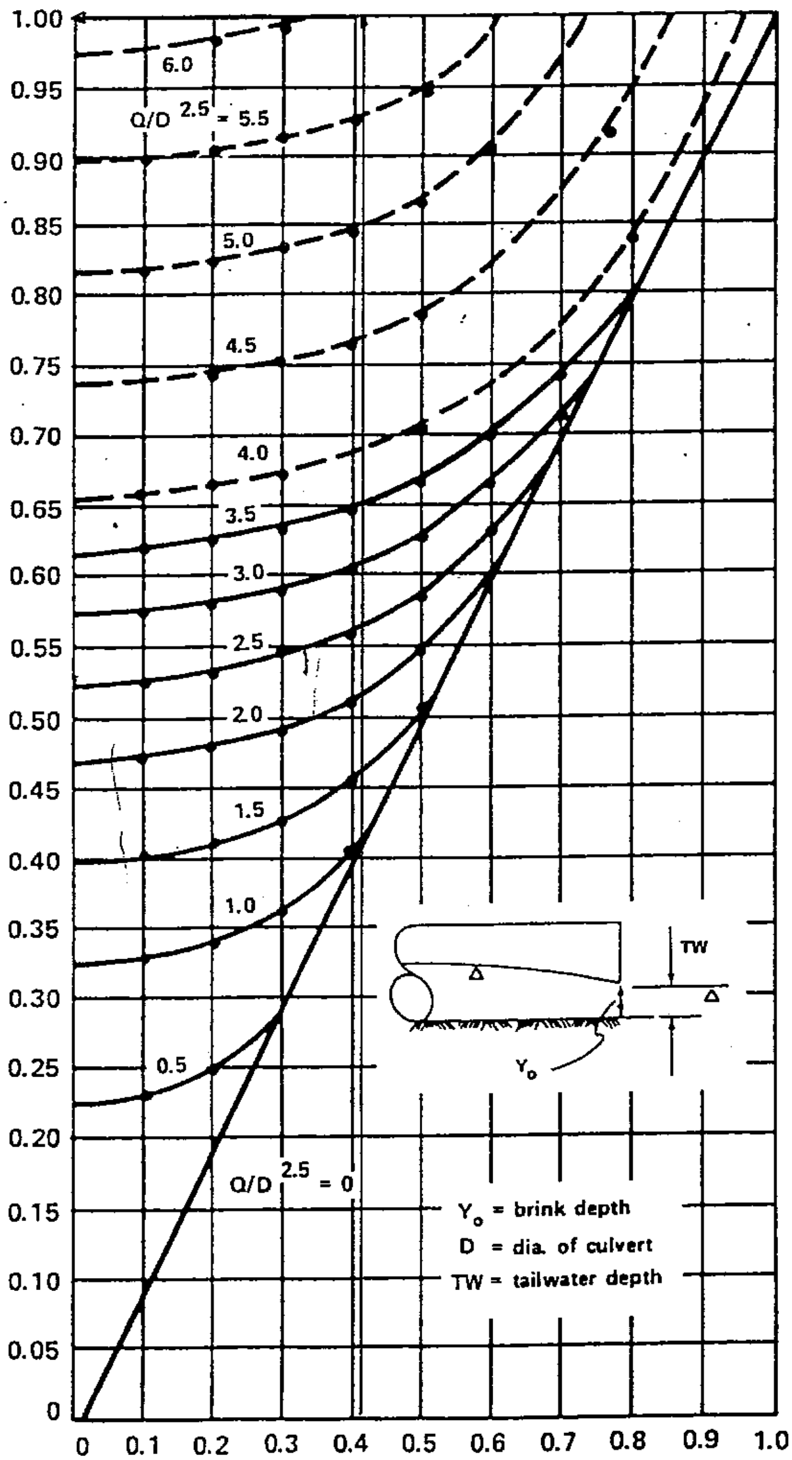
The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date: 9-30-90

Figure: 10-C.3

BXE 72" RCP STORM SEWER OUTFALL - 580CFS

$Q/D^{2.5} = 6.58$



Yo/D

TW/D = .416

Figure 10-C.2 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes.

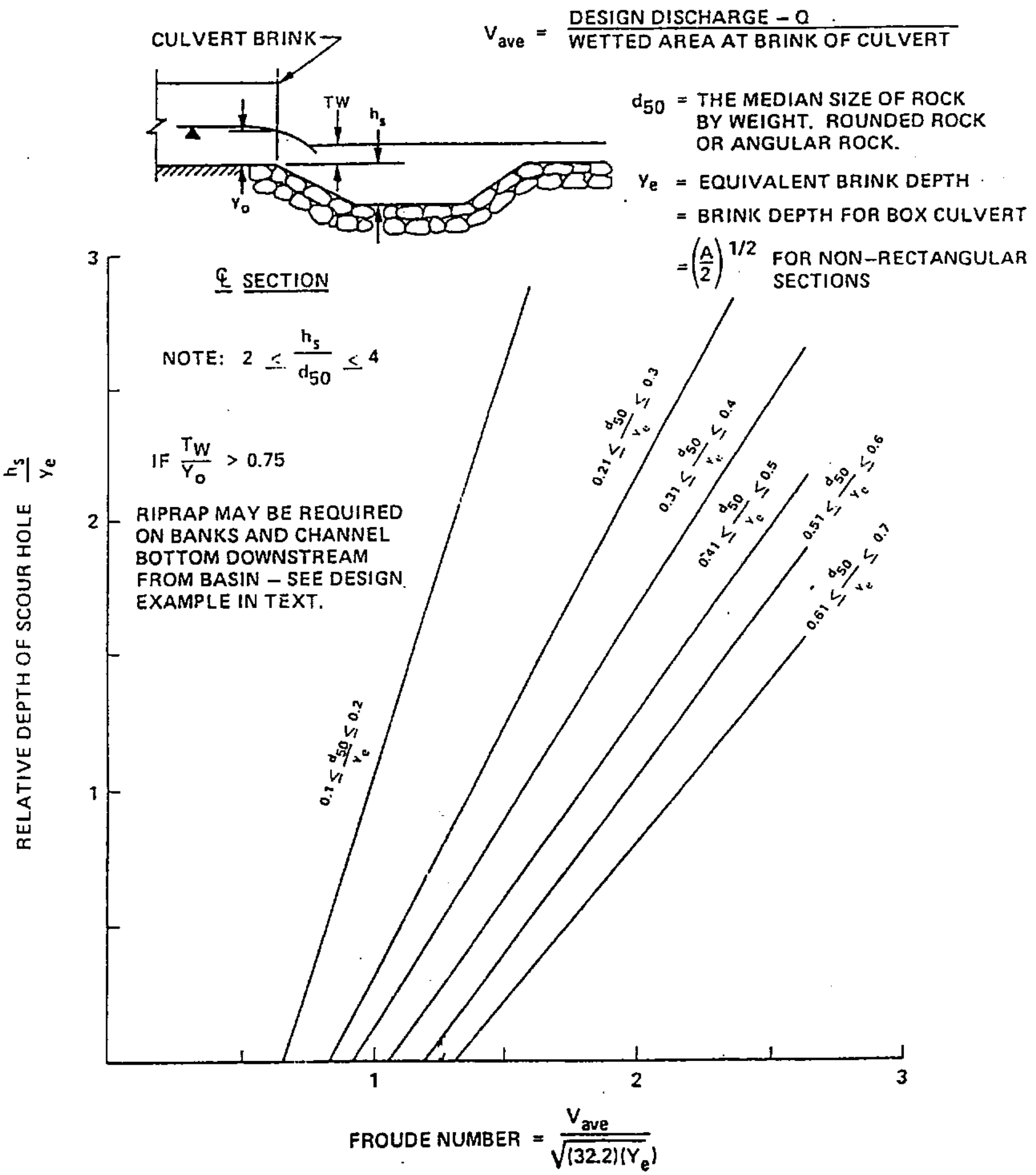
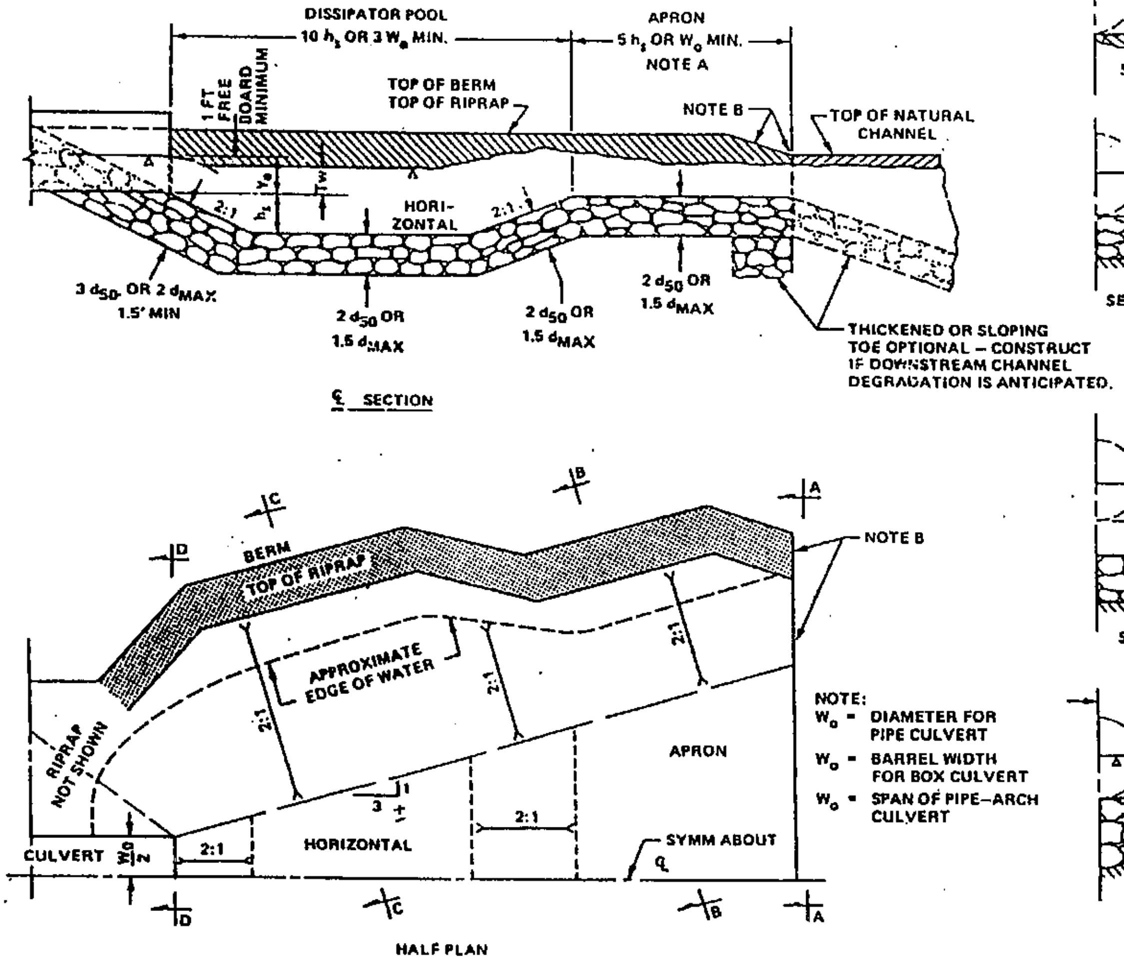


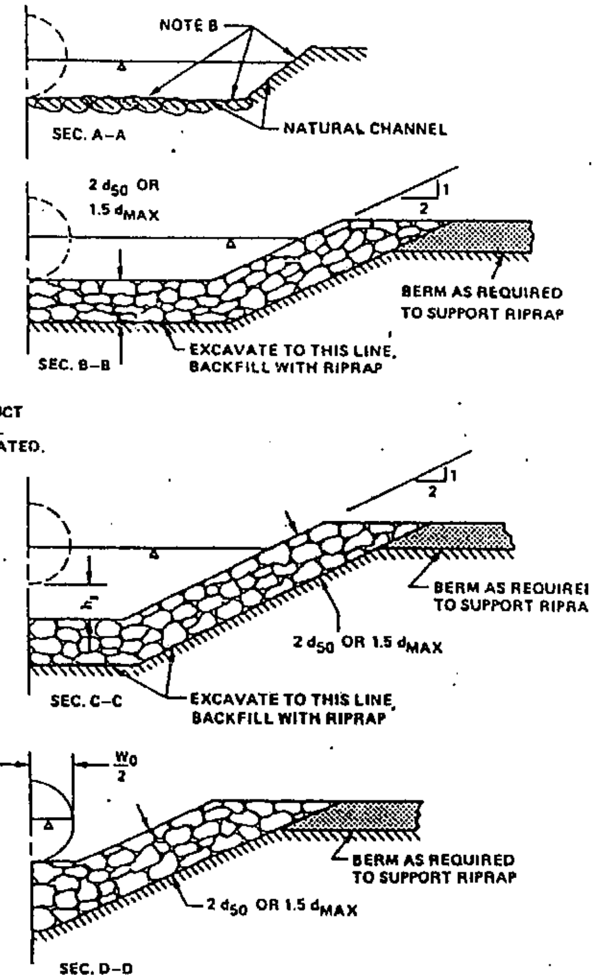
FIGURE 10-C.4 RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

NOTE A – IF EXIT VELOCITY OF BASIN IS SPECIFIED, EXTEND BASIN AS REQUIRED TO OBTAIN SUFFICIENT CROSS-SECTIONAL AREA AT SECTION A–A SUCH THAT Q_{des}/(CROSS SECTION AREA AT SEC. A–A) = SPECIFIED EXIT VELOCITY.

NOTE B – WARP BASIN TO CONFORM TO NATURAL STREAM CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT THE SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM AT SEC. A–A.



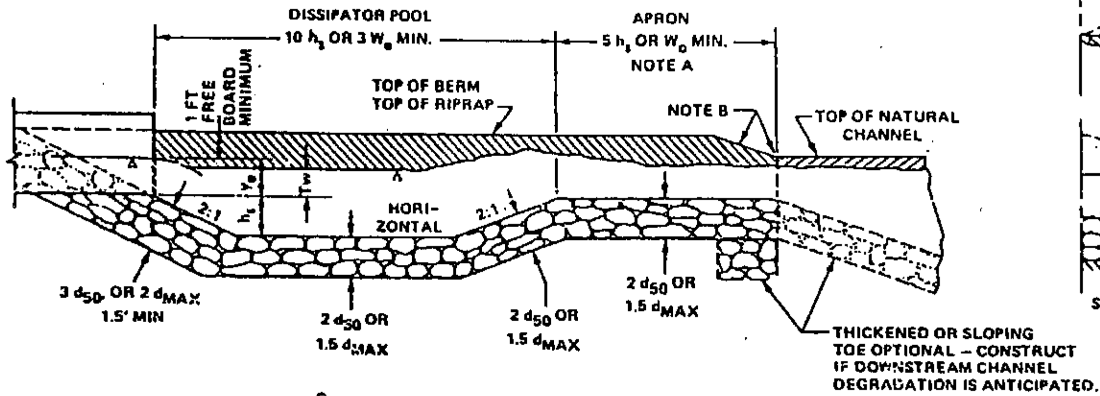
NOTE:
W_o = DIAMETER FOR PIPE CULVERT
W_o = BARREL WIDTH FOR BOX CULVERT
W_o = SPAN OF PIPE–ARCH CULVERT



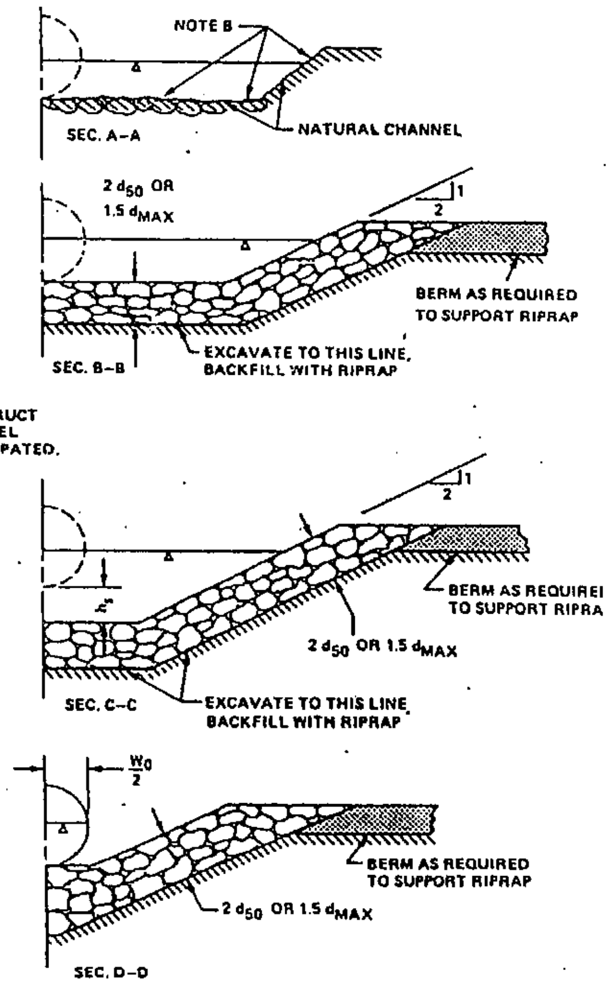
The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date 9-30-90
Details of Riprapped Culvert Energy Basin	Figure 10-C.5

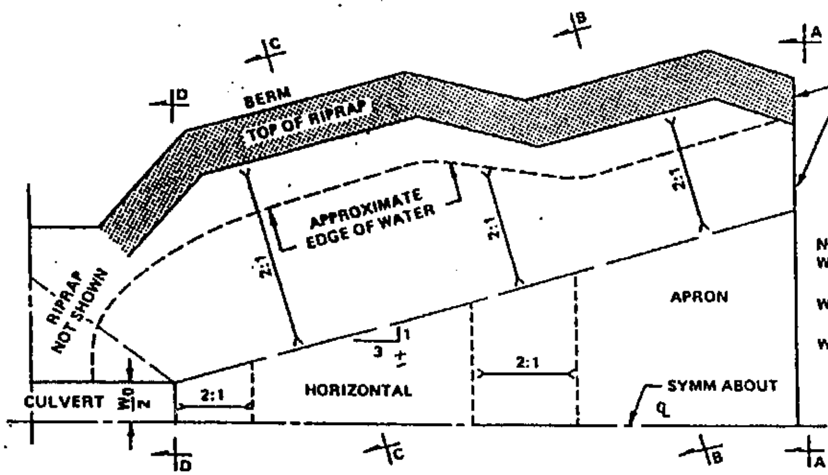
NOTE A – IF EXIT VELOCITY OF BASIN IS SPECIFIED, EXTEND BASIN AS REQUIRED TO OBTAIN SUFFICIENT CROSS-SECTIONAL AREA AT SECTION A–A SUCH THAT Q_{des}/(CROSS SECTION AREA AT SEC. A–A) = SPECIFIED EXIT VELOCITY.

NOTE B – WARP BASIN TO CONFORM TO NATURAL STREAM CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT THE SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM AT SEC. A–A.



℄ SECTION





HALF PLAN

NOTE:
W_o – DIAMETER FOR PIPE CULVERT
W_o – BARREL WIDTH FOR BOX CULVERT
W_o – SPAN OF PIPE-ARCH CULVERT

The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date 9-30-90
Details of Riprapped Culvert Energy Basin	Figure 10-C.5

BX E 72" RCP Storm Sewer Outfall - 580 cfs

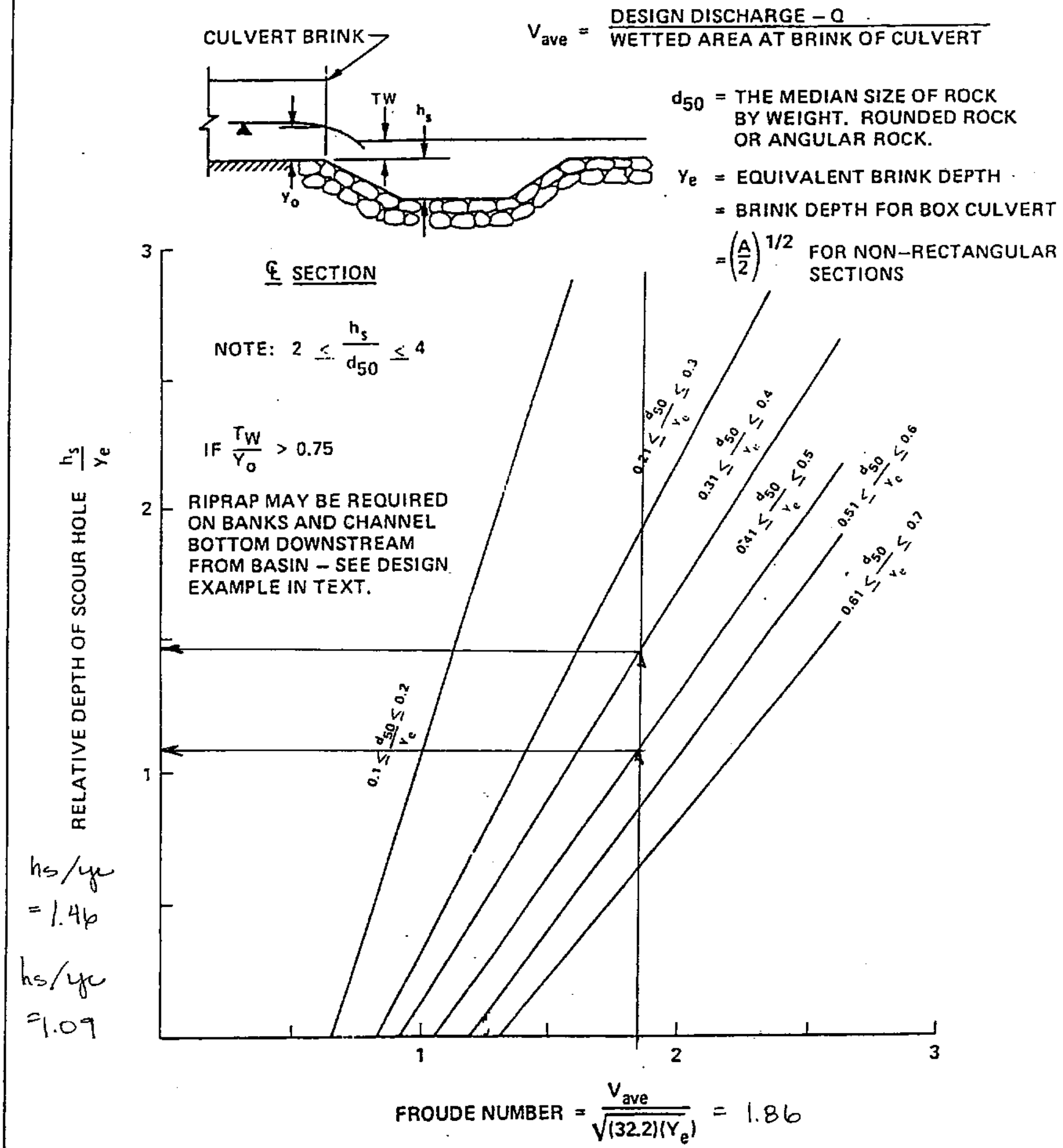


FIGURE 10-C.4 RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

Concrete Cutoff Wall - 437 cfs
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	CONCRETE CUTOFF WALL = 437 cfs
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.033300	ft/ft
Left Side Slope	4.000000	H : V
Right Side Slope	4.000000	H : V
Bottom Width	10.00	ft
Discharge	437.00	cfs

Results		
Depth	2.56	ft
Flow Area	51.67	ft²
Wetted Perimeter	31.07	ft
Top Width	30.44	ft
Critical Depth	2.74	ft
Critical Slope	0.024947	ft/ft
Velocity	8.46	ft/s
Velocity Head	1.11	ft
Specific Energy	3.67	ft
Froude Number	1.14	
Flow is supercritical.		

H.

OUTLET STORM SEWER

54" RCP (outlet) - 230 cfs
Worksheet for Circular Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	OUFALL 54" RCP PIPE - 230 CFS
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Slope

Input Data		
Mannings Coefficient	0.013	
Diameter	54.00	in
Discharge	230.00	cfs

Results		
Channel Slope	0.013681	ft/ft
Depth	54.0	in
Flow Area	15.90	ft²
Wetted Perimeter	14.14	ft
Top Width	0.00	ft
Critical Depth	4.20	ft
Percent Full	100.00	
Critical Slope	0.011827	ft/ft
Velocity	14.46	ft/s
Velocity Head	3.25	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	247.41	cfs
Full Flow Capacity	230.00	cfs
Full Flow Slope	0.013681	ft/ft

Client: LA PLATA INVESTMENTS Job No: 9503.50

Project: DET. FAC. 'F' By: DLM Chk. By: ______ Date: 10-19-02

Subject: 54" OUTFALL STORM SEWER STILLING BASIN SIZING WORKSHEET Sheet No: ___ of ___

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Q_{100} = 230 cfs A_f = 15.904 $'^2$

V_f = 230 / 15.904 = 14.5 '/s   PIPE DIA = 4.5'

f_s = (230/1976)^2 = 0.0135

ASSUME TW = 2.0'

y_e = (A/2)$^{1/2}$ = (15.904/2)$^{1/2}$ = 2.82

TW/y_e = 2.0/2.82 = 0.71

0.25 < d_{50}/y_e < 0.45

~~d50~~	L	M	H	VH
d_{50}	0.75	1.0	1.5	2.0
d_{50}/y_e	0.177	0.26	0.35	0.53

Obtain yo/D from Chart 10-C2 (CCS.-D.C.M.)

TW / D = 2.0 / 4.5 = 0.44   Q

Q / D$^{2.5}$ = 230 / 4.5$^{2.5}$ = 5.35

yo / D = 0.91

yo = 0.91 * 4.5 = 4.1

WETTED AREA @ 4.1 => FLOWMASTER = 15.18 $'^2$

V_{avg} = 230/15.18 = 15.15 '/s

F.N. = V_{avg} / $\sqrt{32.2(Y_e)}$ = 15.15 / $\sqrt{32.2(2.82)}$ = 1.58

Chart 10.~~4~~-C.4 (UCS-DCM)

CONTINUED ON NEXT PAGE

Client: La Plata Investments — Job No: 9503.50

Project: Det. Fac. 'F' — By: DLM — Chk. By: ____ — Date: 10-19-02

Subject: 54" Outfall Stilling Basin Sizing — Sheet No: ____ of ____

J·R ENGINEERING
A Subsidiary of Westrian

Cont. From Page 1

Type 'M'

$d_{50}/y_e = 0.26$ F.N. = 1.58 $h_s/y_e = 1.39$

$h_s = 1.39 * 2.82 = 3.91$ $2 < h_s/d_{50} < 4$

$3.91/1.0 = 3.91$ ok

Type 'H'

$d_{50}/y_e = 0.35$ F.N. = 1.58 $h_s/y_e = 1.03$

$h_s = 1.03 \cdot 2.82 = 2.90$ $2 < h_s/d_{50} < 4$

$2.90/1.5 = 1.93 \cong 2$ ok

Type 'M' $h_s = 3.91$ Pool length = 39.1 ($10 \cdot h_s$)

Type 'H' $h_s = 2.90$ Pool length = 29.0 ($10 \cdot h_s$)

Type 'VH'

$d_{50}/y_e = 0.53$ F.N. = 1.58 $h_s/y_e = 0.5$

$h_s = 0.5 * 2.82 = 1.41$ $2 < h_s/d_{50} < 4$

~~h_s/d_{50}~~ = 1.41 / 2.0 = 0.71 $0.71 \neq 2 < h_{s0}/d_{50} < 4$

Use $D_{50} = 18"$ $D_{MAX} = 30"$ $D_1 = 4'$ $D_2 = 5.0$ $D_3 = 6.0$

$H_s = 2.91$ $L_d = 29'$ $L_a = 15'$

$W_1 = 8.5$ $W_2 = 38'$

54" OUTFALL FROM POND - 230 CFS

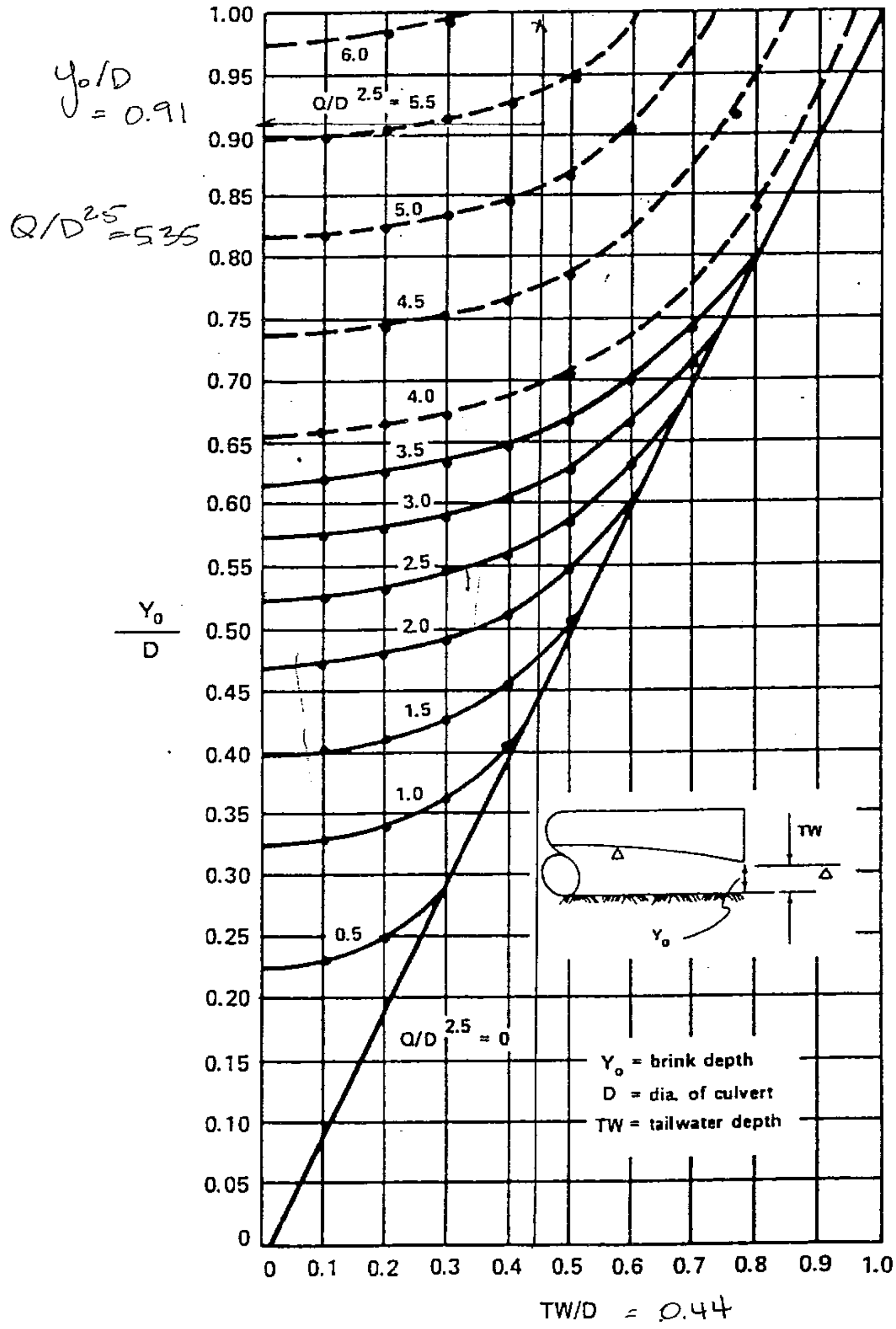
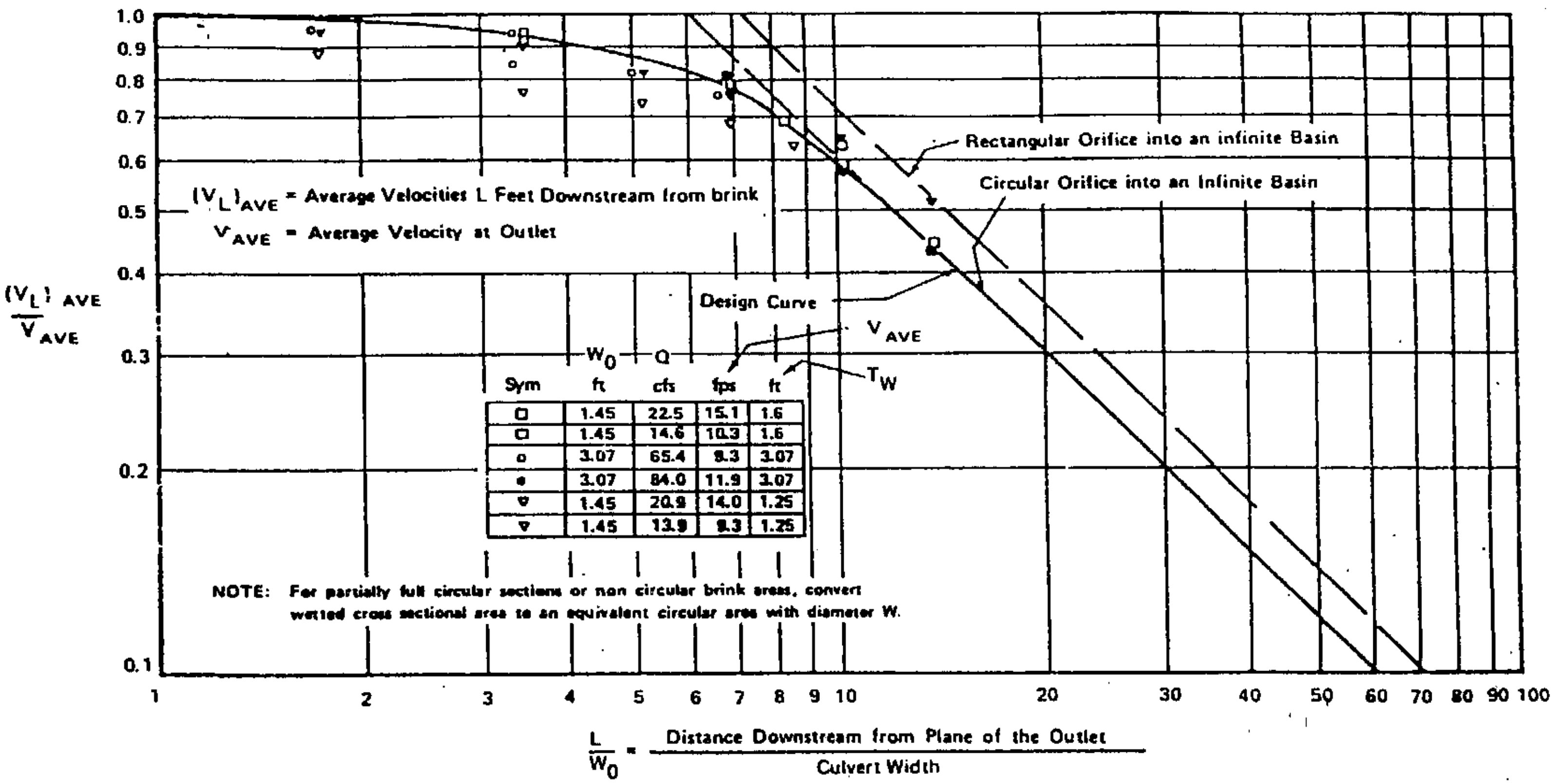


Figure 10-C.2 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes.



Sym	W_0 ft	Q cfs	V_{AVE} fps	T_W ft
□	1.45	22.5	15.1	1.6
□	1.45	14.6	10.3	1.6
o	3.07	65.4	8.3	3.07
•	3.07	84.0	11.9	3.07
▽	1.45	20.9	14.0	1.25
▽	1.45	13.9	8.3	1.25

Figure 10 - C.3 Distribution of Centerline Velocity for Flow from Submerged Outlets to be used for Predicting Channel Velocities Downstream from Culvert Outlet where High Tailwater prevails. Velocities obtained from the use of this Chart can be used with Figure 2 of HEC No. 11 for sizing riprap (DO NOT use Figure 1 HEC No. 11, use Mean Velocity Values).

54" OUTFALL FROM POND - 230 cfs

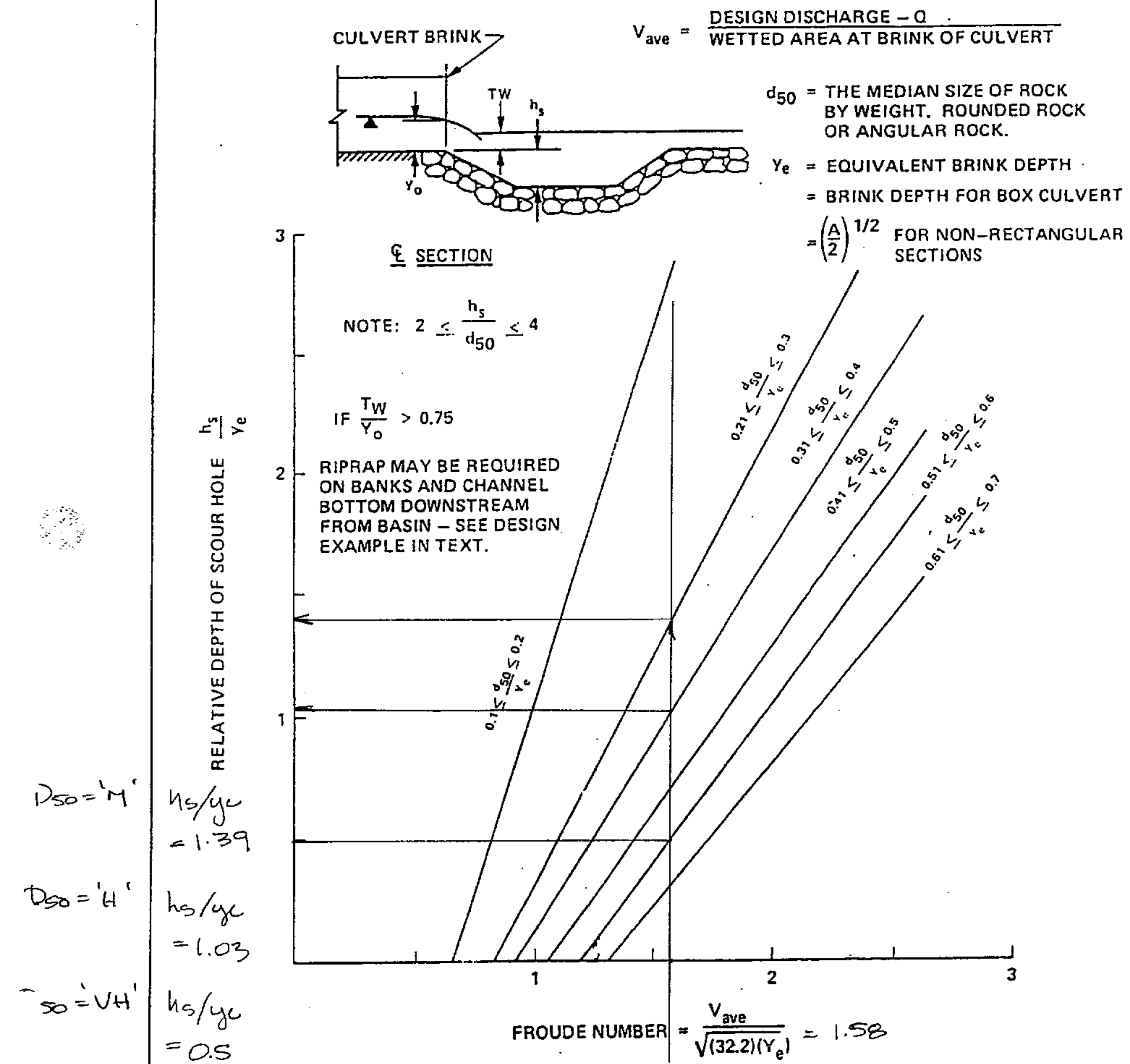
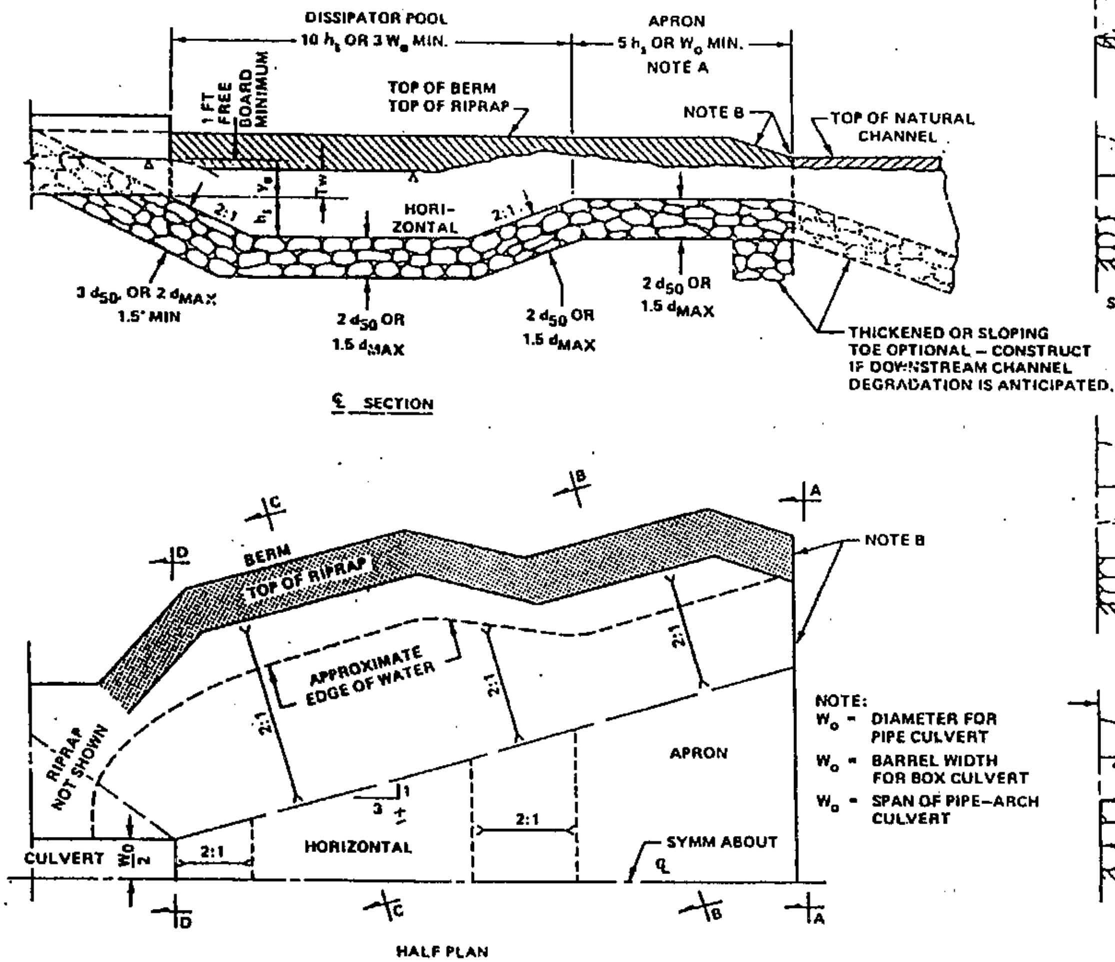
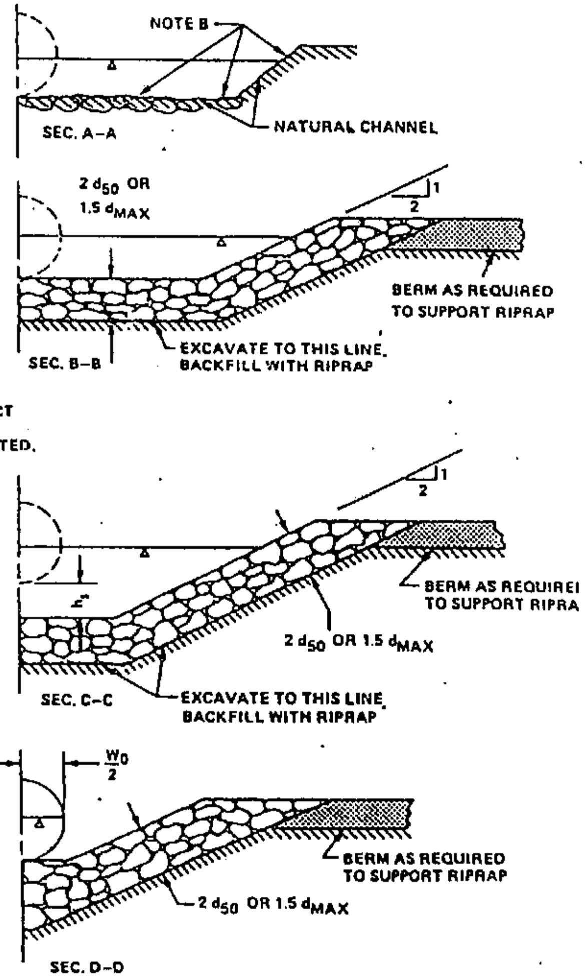


FIGURE 10-C.4 RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

NOTE A – IF EXIT VELOCITY OF BASIN IS SPECIFIED, EXTEND BASIN AS REQUIRED TO OBTAIN SUFFICIENT CROSS-SECTIONAL AREA AT SECTION A–A SUCH THAT Q_{des}/(CROSS SECTION AREA AT SEC. A–A) = SPECIFIED EXIT VELOCITY.

NOTE B – WARP BASIN TO CONFORM TO NATURAL STREAM CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT THE SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM AT SEC. A–A.





The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Details of Riprapped Culvert Energy Basin

Date 9-30-90

Figure 10-C.5

Three Edge Bearing Analysis - Summary

Project Description

Project Title:	Pine Creek Detention Fa	**Consultant:**	La Plata Investments
Project Location:		**Contractor:**	
Contract Number:		**Analyzed By:**	
Country:		**Date:**	23-Aug-02
Units:	English	**Comply To:**	ASTM
Alternative:	Detention Facility 'F' - 54" RCP Outfall		

D-LOAD REQUIREMENTS FOR A 54 in. DIAMETER CIRCULAR PIPE

PIPE DATA

Inner Diameter (in.)	54
Wall 'B' Thickness (in.)	5.500

INSTALLATION CONDITIONS

Minimum Depth of Fill (ft)	1.00
Maximum Depth of Fill (ft)	35.00
Soil Density (lb/cu. ft)	120.0
Installation Type	Positive Projecting Embankment
Positive Projection Ratio	0.50
Soil Lateral Pressure Ratio	0.33
Soil Lateral Pressure/Friction Term (kμ)	0.1500
Soil Lateral Fraction (m)	0.50
Settlement Ratio	0.70

ADDITIONAL LOADS

Live Load	AASHTO HS-20
No Surcharge Load	

FACTOR OF SAFETY

Factor of Safety on 0.01 Inch Crack D-Load (Earth,Live)	1.00 1.00
Factor of Safety on Ultimate Earth and Live Load (ASTM C 76)	
DL.01 Less Than or Equal To 2000 lbs/ft/ft	1.50
DL.01 Greater Than or Equal To 3000 lbs/ft/ft	1.25
DL.01 Between 2000 and 3000 lbs/ft/ft	Interpolated

D-LOAD REQUIREMENTS FOR A 54 in. DIAMETER CIRCULAR PIPE

Comparison of required D-Load Values for Selected Bedding Types

Pipe Depth (ft)	Type B						
1.00	356 (CL-I)						
2.00	349 (CL-I)						
3.00	353 (CL-I)						
4.00	390 (CL-I)						
5.00	449 (CL-I)						
6.00	521 (CL-I)						
7.00	604 (CL-I)						
8.00	696 (CL-I)						
9.00	796 (CL-I)						
10.00	905 (CL-II)						
11.00	994 (CL-II)						
12.00	1082 (CL-III)						
13.00	1172 (CL-III)						
14.00	1261 (CL-III)						
15.00	1351 (CL-IV)						
16.00	1441 (CL-IV)						
17.00	1531 (CL-IV)						
18.00	1621 (CL-IV)						
19.00	1711 (CL-IV)						
20.00	1801 (CL-IV)						
21.00	1892 (CL-IV)						
22.00	1983 (CL-IV)						
23.00	2073 (CL-V)						
24.00	2164 (CL-V)						
25.00	2255 (CL-V)						
26.00	2346 (CL-V)						
27.00	**2437 (CL-V)**						
28.00	2528 (CL-V)						
29.00	2619 (CL-V)						
30.00	2710 (CL-V)						
31.00	2801 (CL-V)						
32.00	2892 (CL-V)						
33.00	2983 (CL-V)						
34.00	3074 (3074)						
35.00	3165 (3165)						

Selected Depth: 27 ft. (closest pipe depth : 27 ft)
Reinforced Pipe Classes for 0.01 in. crack per ASTM C76 (lb/ft/ft):
CL I <= 800; CL II <= 1000; CL III <= 1350; CL IV <= 2000; Class V <= 3000

I.

P.C.F. NO. 23
OUTFALL STORM SEWER

Client: La Plata Investments Job No: 9503.50

Project: Detention Fac. 'F' By: DLM Chk. By: ______ Date: 10-29-02

Subject: 36" Outfall Stilling Basin Sizing Sheet No: 1 of 2

J·R ENGINEERING
A Subsidiary of Westrian

36" RCP Storm Sewer From PC-23 - 113 cfs

$Q_{100} = 113$ $A_f = 7.07$ ⁱ/s

$V_f = 113/7.07 = 15.98$ ⁱ/s Pipe Dia = 3.0

$f_s = (113/666)^2 - 0.29$

Assume Tw = 2.0

$y_e = (A_f/2)^{1/2} = (15.98/2)^{1/2} = 2.83$

$Tw/y_e = 2.0/2.83 = 0.71$

	L	M	H	VH
d_{50}	0.75	1.0	1.5	2.0
d_{50}/y_e	0.265	0.35	0.53	0.71

Obtain Yo/D from Chart 10.C2 (CCC-DCM)

Tw/D = 2.0/3.0 = 0.66

$Q/D = 113/3.0^{2.5}$ 7.25 (off DCM Chart 10-C2)

* NOTE! A FLOW RATE VALUE OF 95 CFS HAS BEEN USED IN PLACE OF THE ESTIMATE OF 113.
*(IMPROVEMENT NOT REQUIRED)

$Q_{100} = 95$ $A_f = 7.07$ ⁱ/s $V_f = 13.43$ ⁱ/s Pipe Dia = 3.0

$f_s = (95/666)^2 = 0.020$

Assume Tw = 2.0 $y_e = (13.43/2)^{1/2} = 2.59$ ⁱ/s

$Tw/y_e = 2.0/2.59 = 0.77$

	L	M	H	VH
d_{50}	0.75	1.0	1.5	2.0
d_{50}/y_e	0.29	0.39	0.58	0.77

Client: La Plata Investments | Job No: 9503.50

Project: Detention Fac. 'F' By: DLM Chk. By: ______ Date: 10-29-02

Subject: 36" Outfall Stilling Basin Sizing Sheet No: 2 of 2

J·R ENGINEERING
A Subsidiary of Westrian

Obtain y_o/D from Chart 10-C2 (C.C.S. DCM)

$T_w/D = 2.0/3.0 = 0.66$

$Q/D^{2.5} = 95/3.0^{2.5} = 6.09$

$y_o/D_o = 1.08 \approx 1.0 \times 3.0$

$F.N. = V_f/\sqrt{32.2(y_c)} = 13.43/\sqrt{32.2(2.59)} = 1.47$

Chart 10.4-C.4 (CCS-DCM)

Type 'M'

$d_{50}/y_c = 0.39$ F.N. = 1.47

h_s/y_c (Chart 10-C4) = 0.85 ∴ h_s = ~~2.59~~ 2.59 · 0.85

h_s = ~~1.25~~ 2.20 2 ≤ h_s ≤ 4 ok

Type 'H' $d_{50}/y_c = 0.58$ $h_s/y_c = 0.38$ ∴ 2.59 · 0.38

$h_s = 0.98$

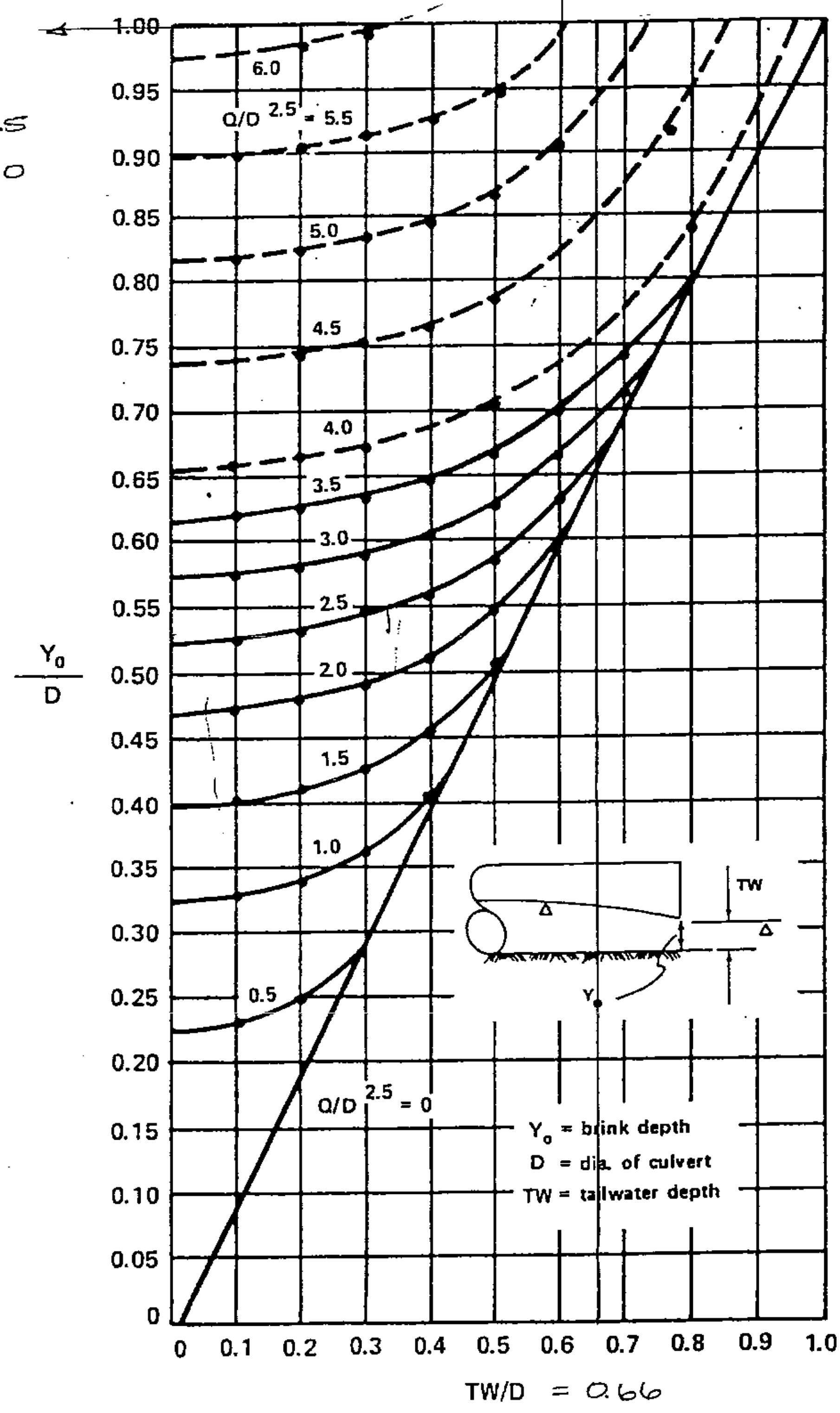
Type 'M' $h_s = 2.20$ Pool length = 22.0 (10 · h_s)

Type → Use 20' w/ Type "H" riprap

D_{50} = 18" D_{MAX} = 2.0

L_d = 20' L_A = 10'

DETENTION FACILITY 'F' - 36" OUTFALL FROM PC-23



DLM 10-29-02

Figure 10-C.2 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes .

The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date 9-30-90
	Figure 10-C.2

DETENTION FACILITY 'F' - 36" OUTFALL FROM PC-23

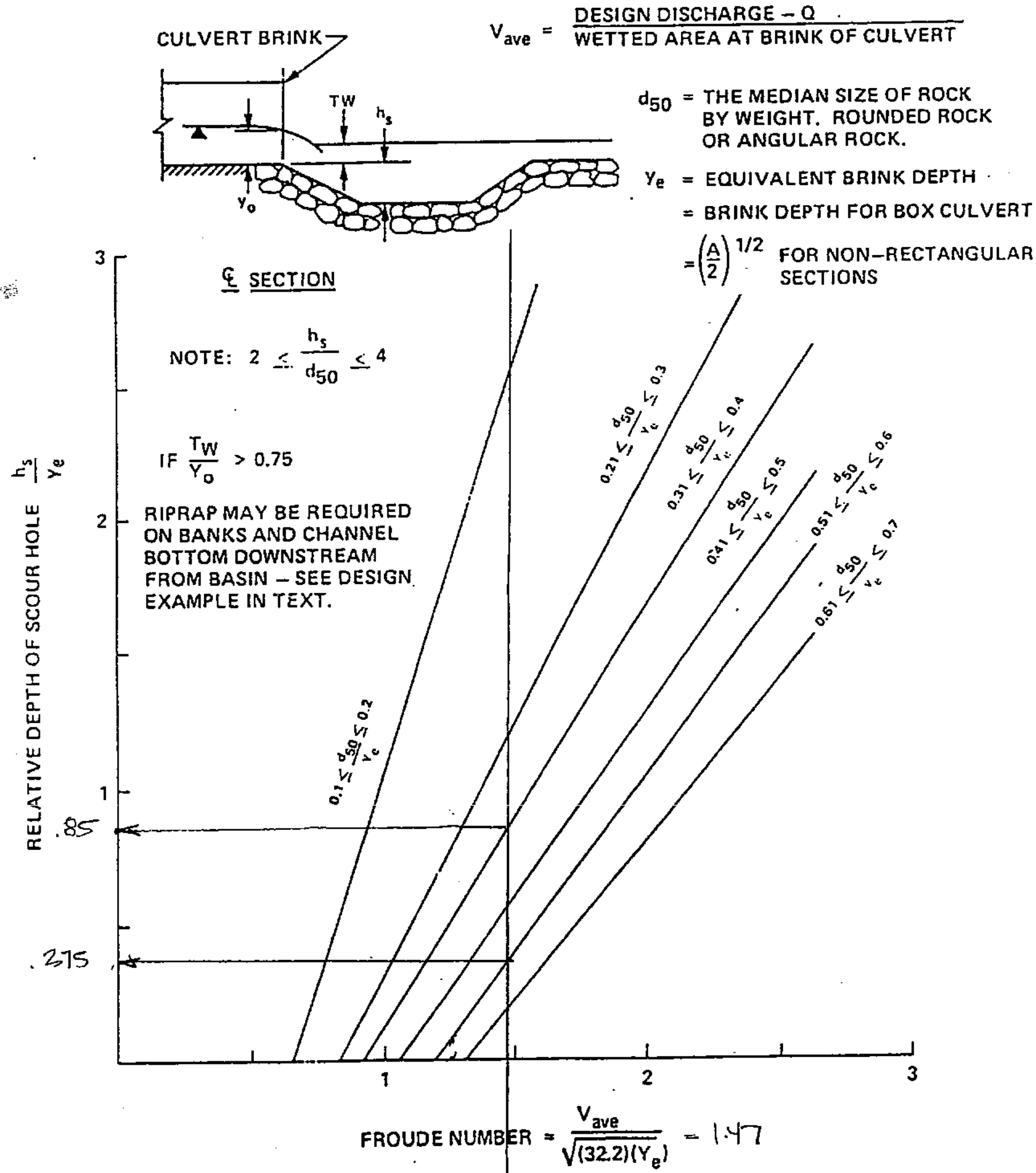


FIGURE 10-C.4 RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

DLM - 10-29-02

Three Edge Bearing Analysis - Summary

Project Description

Project Title:	Pine Creek Detention Fa	**Consultant:**	La Plata Investments
Project Location:		**Contractor:**	
Contract Number:		**Analyzed By:**	
Country:		**Date:**	23-Aug-02
Units:	English	**Comply To:**	ASTM
Alternative:	PC-23 36" RCP STORM SEWER		

D-LOAD REQUIREMENTS FOR A 36 in. DIAMETER CIRCULAR PIPE

PIPE DATA

Inner Diameter (in.)	36
Wall 'B' Thickness (in.)	4.000

INSTALLATION CONDITIONS

Minimum Depth of Fill (ft)	1.00
Maximum Depth of Fill (ft)	20.00
Soil Density (lb/cu. ft)	120.0
Installation Type	Positive Projecting Embankment
Positive Projection Ratio	0.50
Soil Lateral Pressure Ratio	0.33
Soil Lateral Pressure/Friction Term (kμ)	0.1500
Soil Lateral Fraction (m)	0.50
Settlement Ratio	0.70

ADDITIONAL LOADS

Live Load	AASHTO HS-20
No Surcharge Load	

FACTOR OF SAFETY

Factor of Safety on 0.01 Inch Crack D-Load (Earth,Live)	1.00 1.00
Factor of Safety on Ultimate Earth and Live Load (ASTM C 76)	
DL.01 Less Than or Equal To 2000 lbs/ft/ft	1.50
DL.01 Greater Than or Equal To 3000 lbs/ft/ft	1.25
DL.01 Between 2000 and 3000 lbs/ft/ft	Interpolated

D-LOAD REQUIREMENTS FOR A 36 in. DIAMETER CIRCULAR PIPE

Comparison of required D-Load Values for Selected Bedding Types

Pipe Depth (ft)	Type C						
1.00	661 (CL-I)						
2.00	571 (CL-I)						
3.00	482 (CL-I)						
4.00	525 (CL-I)						
5.00	604 (CL-I)						
6.00	**707 (CL-I)**						
7.00	822 (CL-II)						
8.00	922 (CL-II)						
9.00	1025 (CL-III)						
10.00	1129 (CL-III)						
11.00	1235 (CL-III)						
12.00	1342 (CL-III)						
13.00	1450 (CL-IV)						
14.00	1558 (CL-IV)						
15.00	1667 (CL-IV)						
16.00	1776 (CL-IV)						
17.00	1886 (CL-IV)						
18.00	1996 (CL-IV)						
19.00	2106 (CL-V)						
20.00	2216 (CL-V)						

Selected Depth: 6 ft. (closest pipe depth : 6 ft)
Reinforced Pipe Classes for 0.01 in. crack per ASTM C76 (lb/ft/ft):
CL I <= 800; CL II <= 1000; CL III <= 1350; CL IV <= 2000; Class V <= 3000

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J.

MINOR SWALE ALONG NORTH BANK

15' @ 5.0% drainage channel
Worksheet for Irregular Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	diversion swale for pc-35 runoff
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.066000 ft/ft

Elevation range: 102.00 ft to 104.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	104.00	0.00	23.00	0.030
8.00	102.00			
23.00	102.75			

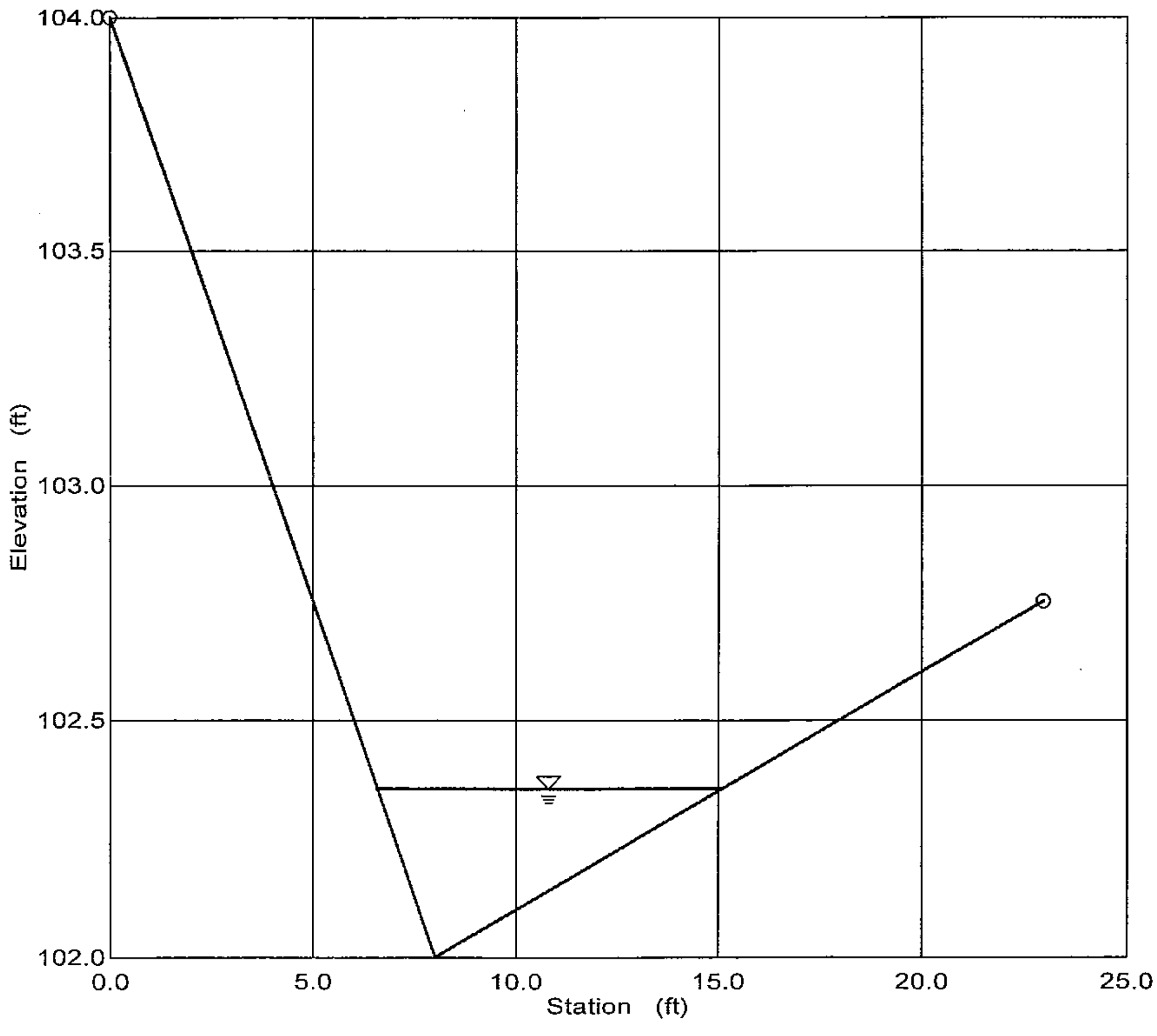
Discharge 6.00 cfs

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	102.35	ft
Flow Area	1.50	ft^2
Wetted Perimeter	8.54	ft
Top Width	8.49	ft
Height	0.35	ft
Critical Depth	102.43	ft
Critical Slope	0.021989	ft/ft
Velocity	3.99	ft/s
Velocity Head	0.25	ft
Specific Energy	102.60	ft
Froude Number	1.67	
Flow is supercritical.		

15' @ 5% cross slope
Cross Section for Irregular Channel

Project Description	
Project File	x:\2950000.all\2950350\flowmaster\detentio.fm2
Worksheet	diversion swale for pc-35 runoff
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.066000	ft/ft
Water Surface Elevation	102.35	ft
Discharge	6.00	cfs



K.

FLOODPLAIN DEVELOPMENT PERMIT

Permit # 02004 FLOOD PLAIN DEVELOPMENT PERMIT Date 24-jan-200

------------------------ Owner Information ------------------------

Name:
LP47, LLC DBA LA PLATA INVSTMT

Address: 2315 BRIARGATE PARKWAY, SUITE 100

City:	St	Zip:	Phone:	Ext:
COLORADO SPRINGS	CO	80920	719-593-2593	

------------------------ Project Location ------------------------

Address: NORTH PINE CRK (SW CRNR NEW PWRS/UNION)

City:	St	Zip:	Phone:	Ext:
COLORADO SPRINGS	CO	80908		

Location/Directions:
NORTH PINE CRK BETWEEN PROPOSED ROYAL PINE DRIVE AND PROPOSED POWERS B OULEVARD

Contractor Name: Phone: Ext:

------------------------ Project Description ------------------------

Single Family Residential:	[ ]	Addition (< 50 Percent):	[ ]
Multi-Family Residential:	[ ]	Rehabilitation:	[ ]
Manuf. (Mobile Home:	[ ]	Watercourse Modification:	[X]
Non-Residential:	[X]	Fill:	[X]
New Construction:	[ ]	Bridge/Culvert:	[X]
Subst.(> 50 Percent) Improve:	[ ]	Levee:	[ ]
Watercourse: PNCRK		Jurisdiction:	

Other: MAP NO. 08041C0507F DATED 3/17/97

------------------------ Flood Hazard Data ------------------------

Proposed Project Location: None
Base (100-Year) Flood Elevation:
Lowest Floor Elevation:
Floodproofing Level:
Source Document:

------------------------ Permit Action ------------------------

Permit Granted (Y/N): Y Variance Granted: (Y/N): N

Action Comments: MEETING PER DAN/SEAN/VANCE

------------------------ Compliance Section ------------------------

FEMA Map Revision (Y/N): N Elevation Certificate (Y/N): Y

Local Certification (Y/N): N Date:

Compliance Comments:

==

Regional Building Official: Date: 24-jan-2002

[signature]

L.

GRADING PLAN