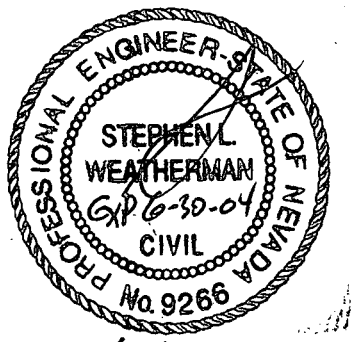
RESPONSE TO COMMENTS
ON THE
REQUEST FOR LETTER OF MAP REVISION
SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

CASE No. 03-09-0153P

550.040

December 2002



14/2/02

Prepared for:

Clark County Regional Flood Control District
600 South Grand Central Parkway; Suite 300
Las Vegas Nevada, 89106-4511
Phone: (702) 455-3139
Fax: (702) 455-3870

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CHURAIRAT (ANN) TANAKAL, PE
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STEPHEN L. WEATHERMAN, PE
MANSON W. WONG, PE, PTOE
KENNETH T. YAMADA, PE
CHRISTOPHER R. ZRINYI, PE

AFFILIATE OFFICE IN
SACRAMENTO, CA

550.040

December 12, 2002

RFCD
2002 DEC 13 PM 3:19

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.
FEMA Map Coordination Contractor
3601 Eisenhower Avenue
Alexandria, VA 22304-6425

Subject: Response to Comments on the Request for FIRM Revision
Southern Vista Estates Diversion Channel and Berm
FIRM Panel 32003C 2535 E - Case No. 03-09-0153P

Dear Ms. Ryon:

The purpose of this letter is to address the comments in your letter, dated December 5, 2002, regarding the above-referenced project. The comments are individually addressed as follows:

Comment: "1. Application/Certification Form 6, entitled "*Alluvial Fan Flooding Form*" (copy enclosed), which was omitted from your previous submittal, must be provided."

Response: The Alluvial Fan Flooding Form has been provided.

Comment: "2. Our preliminary review revealed that the area of the proposed revision is subject to alluvial fan flooding from an unnamed branch of the Flamingo Alluvial Fan, as shown on the effective FIRM panel. Information must be submitted to demonstrate that the area is not subject to alluvial fan flooding. Therefore, an alluvial fan flood hazard assessment must be completed in accordance with the guidelines in the FEMA publication entitled "*Guidelines for Determining Flood Hazards on Alluvial Fans*," dated February 23, 2000, which have been republished in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners,* dated February 2002. Please submit all documentation and the appropriate method of analysis necessary, as outlined in the above-referenced publications."

Response: We have reviewed the regulations noted above. Based on current conditions the unnamed branch of the Flamingo Alluvial Fan is not an active alluvial fan. The historical flows

that contributed to the unnamed branch of the Flamingo Alluvial Fan are collected and conveyed to the Upper Flamingo Detention Basin without reaching the fan area. The most upstream facility that collects these flows is the drainage facilities associated with US-215 - the Las Vegas Southern Beltway. As-built plans and a portion of the drainage study for these facilities were included in the submission package and were part of the USACOE Tropicana and Flamingo Wash project. The effects of these facilities are documented by Case 02-09-716R for the Tropicana Wash LOMR request.

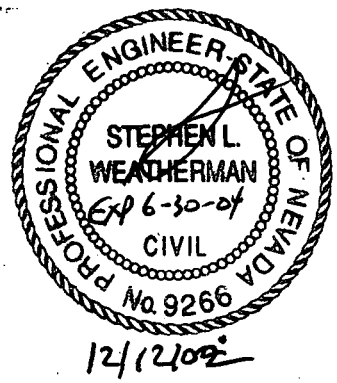
The second facility that collects flows is the Southern Vista Estates Diversion Berm and Channel (SVE Diversion Channel). Our calculations clearly show that all flow between the Beltway and the SVE Diversion Channel are collected by the SVE Diversion Channel and conveyed into the Upper Flamingo Detention Basin. The area that contributes flow to the unnamed branch of the Flamingo Alluvial Fan is now less than two acres. For these reasons we believe the unnamed branch of the Flamingo Alluvial Fan is no longer active and should be revised as shaded Zone X as shown on our work map.

To support this belief we are submitting two additional exhibits: Figure 3B, which shows the 9/27/02 FIRM overlaid on the ESI basin map, the Clark County Public Works Topography, the parcel map layer, and the Clark County Aerial Photography. The second additional exhibit is Figure 5C, which shows the ESI basin map, the Clark County Public Works Topography, the parcel map layer, and the Clark County Aerial Photography. These exhibits clearly show the Beltway and other exiting developments upstream from the unnamed branch of the Flamingo Alluvial Fan which block the flows that historically contributed to the Flood Zone A.

Comment: "3. The submitted topographic plans entitled *"FIG-A and FIG-B,"* dated September 20, 2002, and "*PRO-1*," dated October 8, 2002, all prepared by G. C. Wallace, Inc., are not certified as-built. Please submit as-built plans or a letter stating that the above-mentioned plans represent as-built conditions. The plans or letter must be certified by a registered professional engineer. In addition, please provide detailed plans showing the location, layout, size, and shape of the berm/dike."

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

Response: I, Stephen L. Weatherman, P.E., certify that "FIG-A and FIG-B," dated September 20, 2002, and "PRO-1," dated October 8, 2002, are as-built plans of the Southern Vista Estates Diversion Berm and Channel.



The submission included plans by ESI for the construction of the SVE diversion channel. The as-built survey verifies that the facilities were constructed according to the ESI plans. The ground survey establishes the channel's existence, characteristics, and other modifications to the channel by others.

If you have any questions or require additional information, please contact us at 804-2000.

Very truly yours,

G. C. WALLACE, INC.

Stephen L. Weatherman, P.E.
Project Manager
Flood Control Division

SLW:jj

Encl.

pc: Pernille Buch-Pedersen, Michael Baker Jr., Inc.
Kevin L. Eubanks, CCRFCD
Calvin L. Black, GCW
Jerry E. Pruitt, GCW

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLUVIAL FAN FLOODING FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Unnamed branch of the Flamingo Alluvial Fan
Note: Fill out one form for each flooding source studied

A. THREE-STAGE ANALYSIS (Based on FEMA Guidelines dated February 23, 2000)

1. Stage 1 Analysis

   a. The landform is composed of (check one) ☒ alluvial ☐ debris flow deposits.

   b. Source of data used to determine composition, morphology, and location of the landform:

   Clark County Public Works Topograpy and Aerial Photography

   c. Is there an NRCS soils survey and soil survey map available? ☒ Yes ☐ No
   If Yes, please include a copy of the map and any pertinent sections of the soil survey

2. Stage 2 Analysis

   a. The alluvial fan exhibits ☐ active ☒ inactive ☐ a combination of active and inactive alluvial fan flooding.

   b. Approximate age of inactive fan surfaces (thousands of years): 5-10 yrs.

   c. Is there an opportunity for avulsions that could lead channels or sheetfloods across the older fan surfaces?
   ☐ Yes ☒ No

   d. Is there evidence of headcutting that could lead to stream piracy? ☐ Yes ☒ No

   e. Is there geomorphic evidence of past avulsions during the Holocene epoch? ☒ Yes ☐ No

   f. The fan exhibits the following types of flooding (check one):

   ☒ Flooding along stable channels
   ☐ Sheetflow
   ☐ Debris flow
   ☐ Unstable flow path flooding

3. Stage 3 Analysis

   The boundaries of the 1%-annual-chance floodplain have been determined using (check one):

   ☐ Risk-Based Analysis
   ☐ FEMA FAN program (if discharge at the apex is different than that given in the effective FIS, then attach MT-2, Form 2 along with a plot of the flood frequency curve on log-normal probability paper and include the drainage area above the hydrographic apex, and the mean, standard deviation, and skew coefficient of the curve)
   ☐ Sheetflow Methods
   ☒ Hydraulic Analytical Methods
   ☐ Geomorphic Data, Post-Flood Hazard Verification, and Historical Information
   ☐ Composite Methods

B. STRUCTURAL FLOOD CONTROL MEASURES

1. The following structural flood control measures are proposed or built (check one):

   ☒ Channelization ☒ Levee/Floodwall ☐ Dam ☐ Sedimentation Basin

2. Do the constructed or proposed structural measures affect flood hazards (including velocity, scour, and sediment deposition) on other areas of the fan? ☐ Yes ☒ No

3. Attach completed Form 3 (Riverine Structures Form).

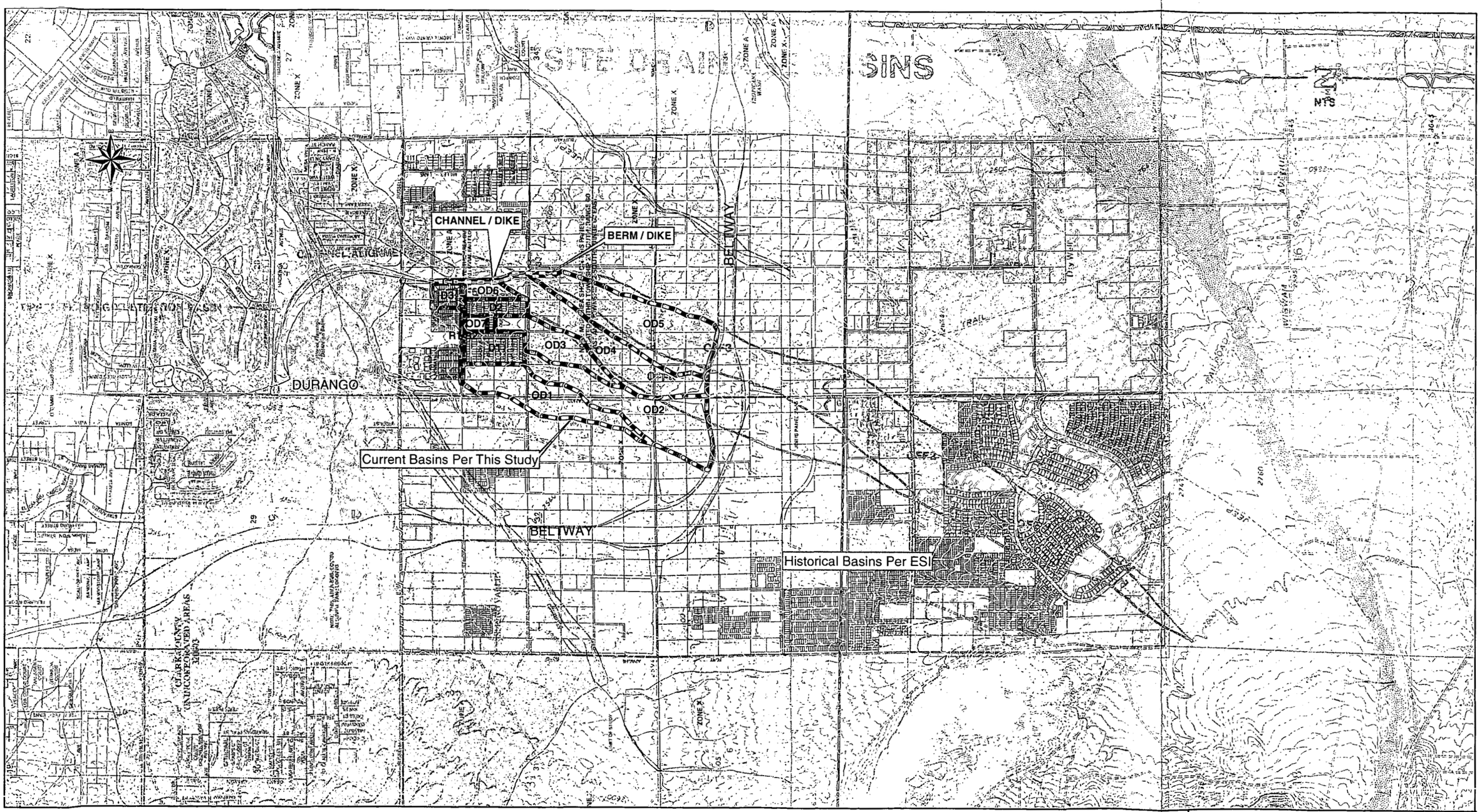
4. Sediment Transport Considerations:
   Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Form 3, Section F (Sediment Transport).
   If No, then attach your explanation for why sediment transport was not considered.

5. Please attach a copy of the formal Operations and Maintenance Plan.

C. MAPPING REQUIREMENTS

Attach a certified topographic work map showing the following:

- The boundaries of the alluvial fan including: toe, topographic and hydrologic apexes, and lateral boundaries
- The delineation of the active and inactive portions of the fan as determined by the Stage 2 analysis
- The revised 1%-annual-chance floodplain boundaries, as determined by the Stage 3 Analysis, that tie into the effective floodplain boundaries
- The correct alignment of all structural features
- The map scale



0 1,000 2,000 3,000 Feet

(IN FEET)
1 INCH = 2000 ft.

SEPTEMBER 17, 2002 32003C2535 E FIRM OVERLAY
RECTIFIED TO CURRENT AERIAL PHOTOGRAPHY,
CLARK COUNTY PUBLIC WORKS TOPOGRAPHY
AND CURRENT BASINS

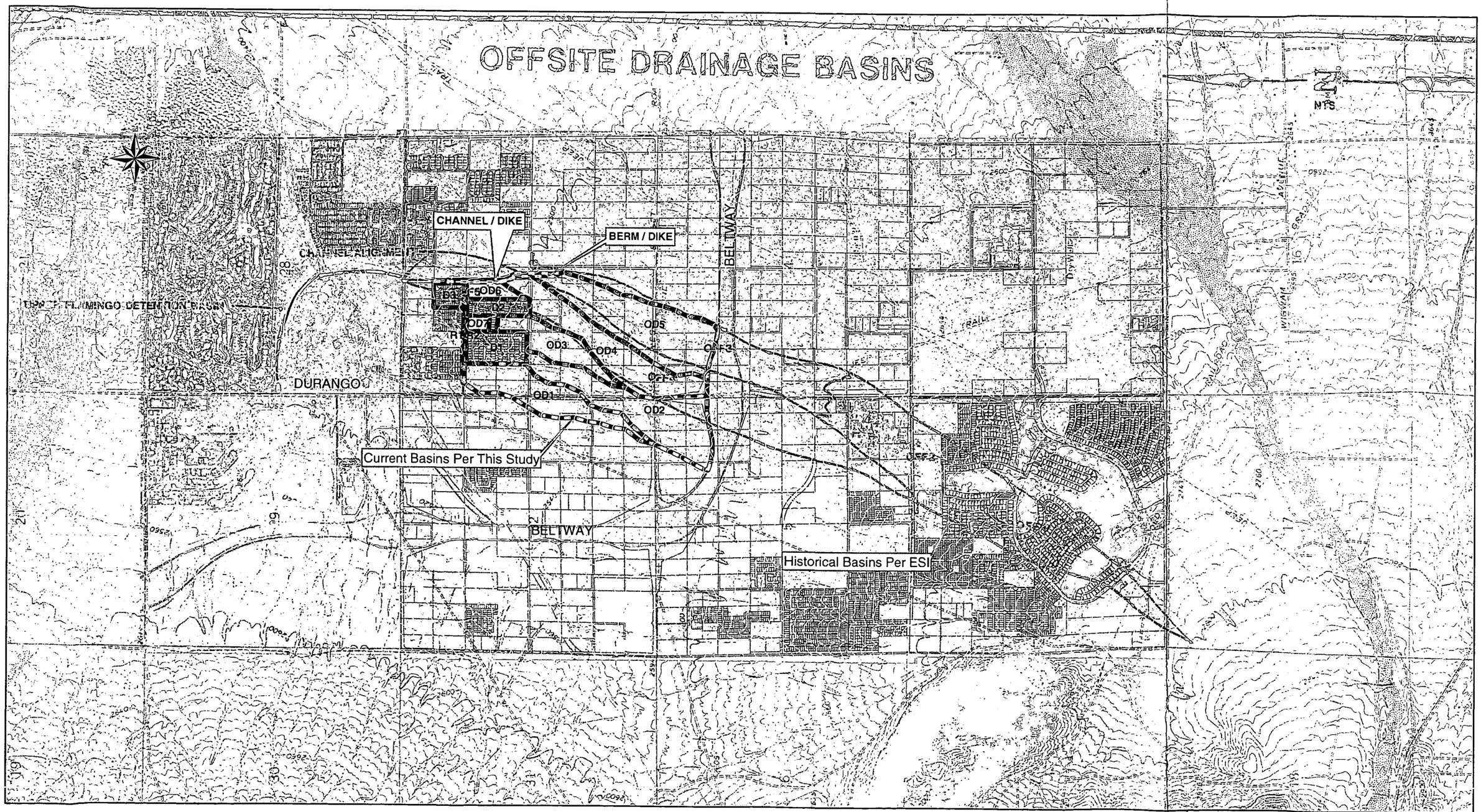
SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 3B
FIRM BASIN MAP

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
(702) 804-2000 Fax (702) 804-2288
www.gcwallace.com

F:\550-040\GIS\FIG-3b-4.MXD

OFFSITE DRAINAGE BASINS



0 1,000 2,000 3,000 Feet

(IN FEET)
1 INCH = 2000 ft.

ESI OFFSITE DRAINAGE BASINS OVERLAY
RECTIFIED TO CURRENT AERIAL PHOTOGRAPHY,
CLARK COUNTY PUBLIC WORKS TOPOGRAPHY
AND CURRENT BASINS

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 5c
ESI BASIN MAP

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F:\550-040\GIS\FIG-5b3-WTOPO.MXD

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

550.040

Name of Development: Southern Vista Estates Channel and Berm Date: October 2002

Location of Development: a) Descriptive (Cross Streets): North/South: Sobb /West Quail East/West: Cimarron/Tomsik

b) Sect. 33 Twn. 21 S Rng. 60 E

Name of Owner: Clark County Assessors Parcel No:

Telephone: Facsimile No:

Address:

Contact Person - Name Stephen L. Weatherman P.E. Telephone No: (702) 804-2060

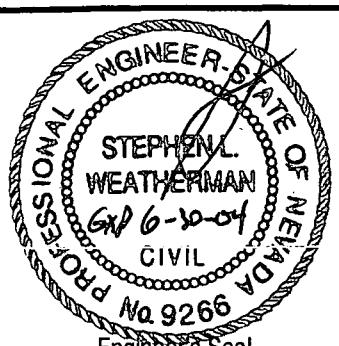
Firm: G. C. Wallace, Inc.

Address: 1555 South Rainbow Boulevard; Las Vegas, NV 89146

Type of Land Development / Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development	X	Other (Please specify below)
	Large Parcel Map		Building Permit	LOMR	

1. Total Owned Land Area: At Site: N/A Being Developed / Disturbed: none
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? Yes* No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? Yes* No
4. Proposed type of development: (Residential, Commercial, etc.)? LOMR
5. Approximate upstream land area which drains to the subject site? 355 a.c.
6. Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation:
   Upper Flamingo Wash Detention Basin LOMR & Southern Vista Estates Temporary Channel
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Upper Flamingo Wash Detention Basin
8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

11/4/02

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*Review and concurrence of the Clark County Regional Flood Control District is required.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

LETTER OF MAP REVISION
FOR
SOUTHERN VISTA ESTATES DIVERSION BERM
And CHANNEL
(FLAMINGO – CIMARRON BRANCH)

550.040

November 2002

Prepared for:

Clark County Regional Flood Control District
600 South Grand Central Parkway; Suite 300
Las Vegas Nevada, 89106-4511
Phone: (702) 455-3139
Fax: (702) 455-3870

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APPENDIX A – HYDROLOGIC CALCULATIONS

APPENDIX B – HYDRAULIC CALCULATIONS

APPENDIX C – REFERENCE INFORMATION

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I. INTRODUCTION

The purpose of this report is to evaluate the current conditions impacting the existing Southern Vista Estates Diversion Channel and Berm now known as the Flamingo – Cimarron Branch. The facility was originally designed by Engineers Surveyors, Incorporated in 1993 and constructed by Southern Vistas Estates soon after. This report includes the following:

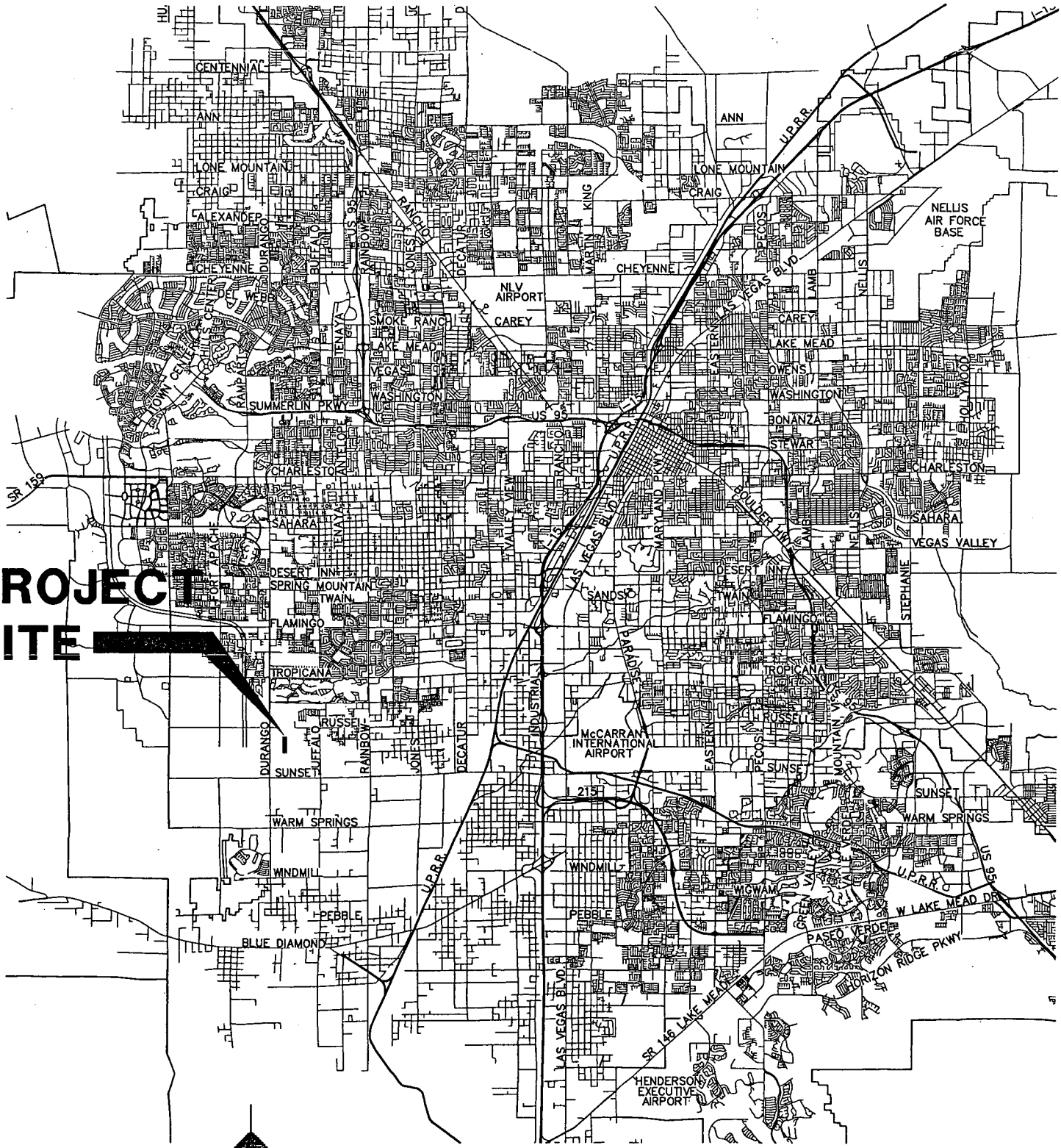
- Identifies previous drainage studies for the channel
- Determines the FEMA floodplain designation for the project area
- Identifies existing and proposed drainage areas and local and regional facilities that affect the site
- Determines existing runoff generated within the project area and runoff, which affects the channel for 100-year return period storm event.
- Revises the effective FIS flows to the Channel Berm/Dike
- Evaluates the Channel and Berm
- Prepares LOMR Application Forms and Technical Support Data Notebook

II. LOCATION AND DESCRIPTION

The Channel Berm/Dike is located approximately 300 feet west of the Cimarron Road alignment between the Cimarron Road and Tomsik Street right-of-way (ROW) (See Figure 1 and Figure 2). The Channel Berm/Dike runs south to north from the Sobb Avenue ROW and north to the West Quail Avenue ROW where the channel outfalls into the Upper Flamingo Detention Basin at the south arm of the Upper Flamingo Detention Basin embankment.

III. FEDERAL EMERGENCY MANAGEMENT AGENCY

The Special Flood Hazard Areas for Clark County, Nevada, are outlined in the Federal Emergency Agency (FEMA) Flood Insurance Rate Maps (FIRM), dated September 27, 2002. The Channel Berm/Dike was designed and constructed to remove the 100-year runoff to the FEMA-designated Special Flood Hazard Area (Zone A) shown to exist just southeast of the south arm of the Upper Flamingo Detention Basin embankment. Figure 3 shows the project site located on a portion of the above-mentioned revised FIRM.



NORTH

GRAPHIC SCALE

15000 0 7000 15000

(IN FEET)

1 inch =15000 ft.

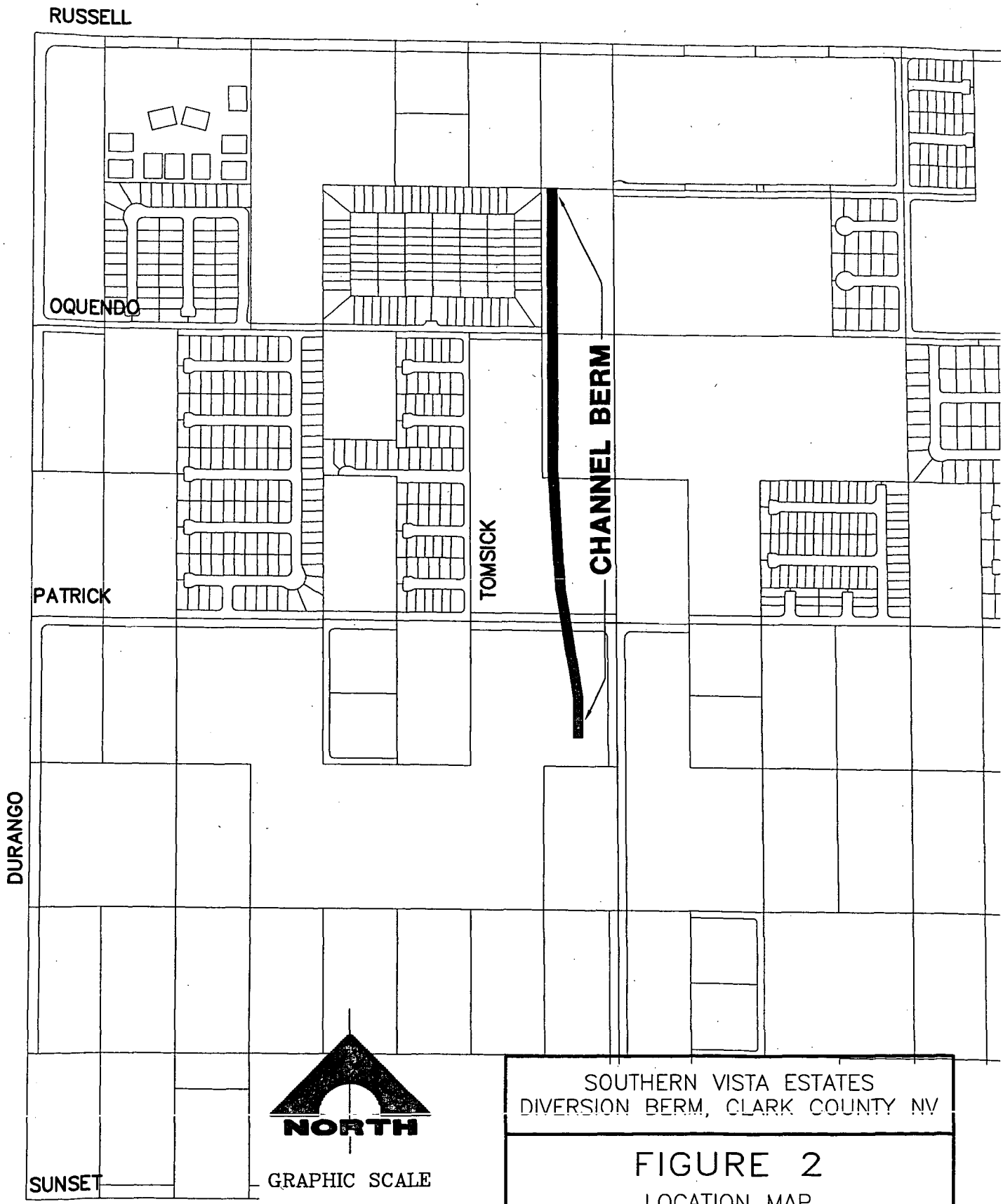
SOUTHERN VISTA ESTATES
DIVERSION BERM, CLARK COUNTY NV

FIGURE 1

VICINITY MAP

G.C. WALLACE, INC.
Engineers/Planners/Surveyors 1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

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04-02-02 09:19:57
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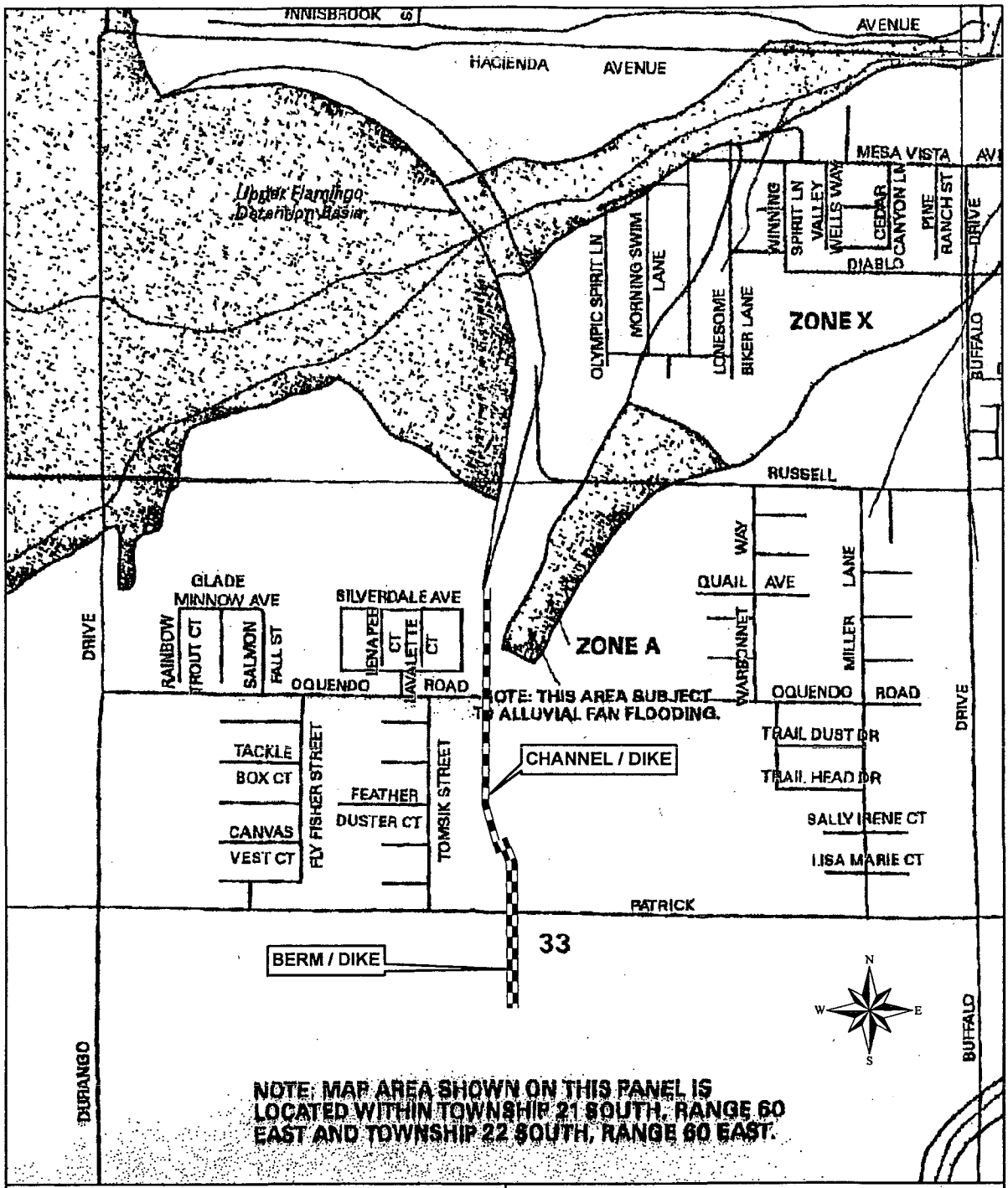


SOUTHERN VISTA ESTATES
DIVERSION BERM, CLARK COUNTY NV

FIGURE 2
LOCATION MAP

G.C. WALLACE, INC.
Engineers/Planners/Surveyors 1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

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A PORTION OF FIRM 32003C2535 E MAP
REVISED SEPTEMBER 27, 2002

0 1,000 2,000
Feet

(IN FEET)
1 INCH = 1000 ft.

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 3
FIRM

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
(702) 804-2000 Fax (702) 804-2288
www.gcwallace.com

IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) FACILITIES

A copy of Figure F-18 from the *1996 Flood Control Master Plan Update* (Reference 1) is included as Figure 4a. Currently the only existing CCRFCD facility near the Channel Berm/Dike is the Upper Flamingo Detention Basin (FLWA 1443). In the future the Flamingo – Cimarron Branch (FLCM 0000 & 0040), a 96-inch RCP and 72-inch RCP are planned to be constructed within the existing Channel Berm/Dike alignment from the south embankment of the Upper Flamingo Detention Basin south to Sunset Avenue. Figure 4b shows the preliminary 2002 Clark County Regional Flood Control District Master Plan update. The pending 2002 Master Plan does not change the proposed facility.

V. HYDROLOGY

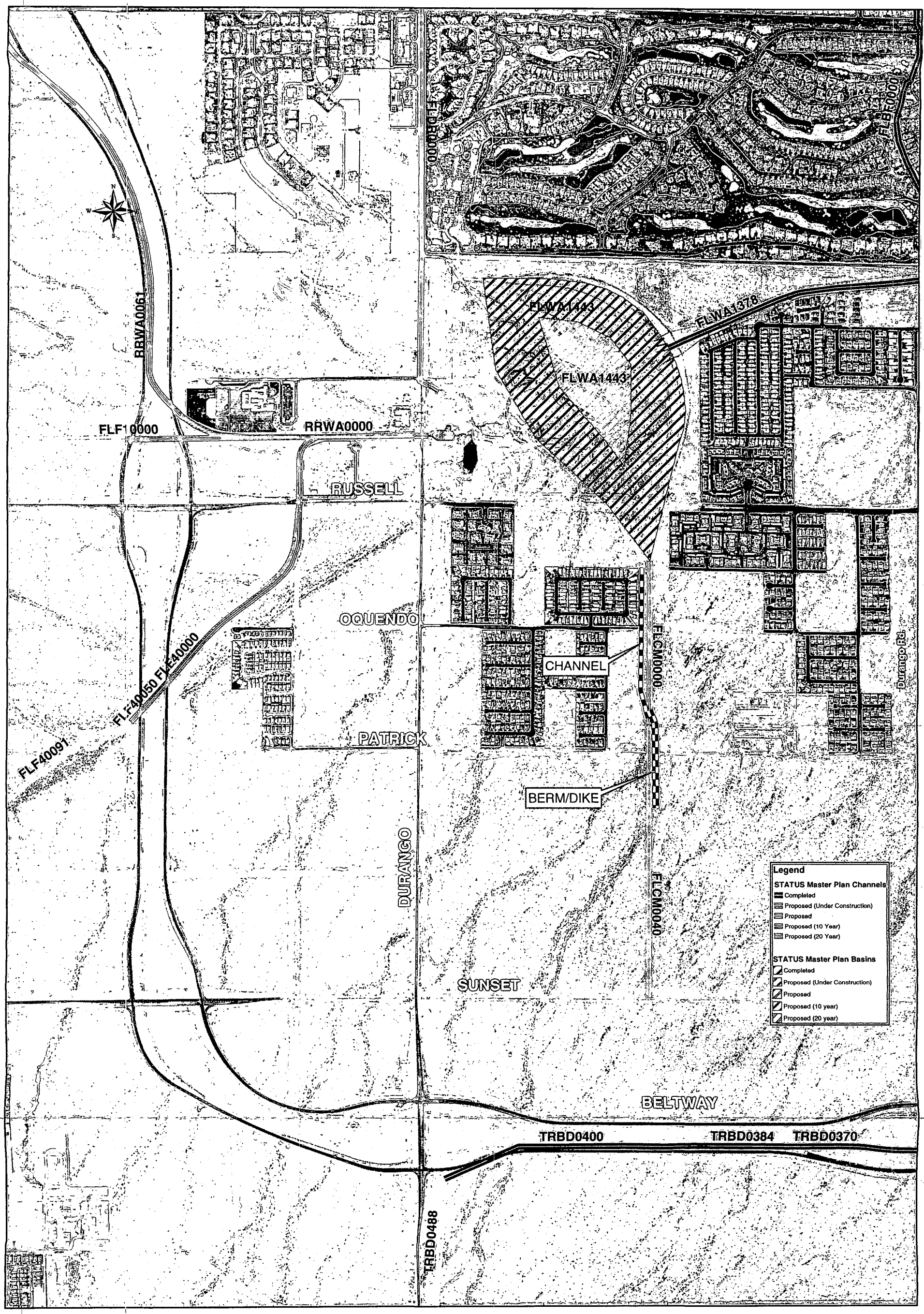
Methodology

The methodology contained in this study is in compliance with the CCRFCD Manual, hereinafter referred to as the Manual (Reference 2). The following is a brief description of the parameters employed in calculating hydrologic characteristics for the subject parcel.

Model Description – The offsite and onsite drainage basins were modeled using the SCS Unit Hydrograph method within the U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package (Reference 3).

Precipitation – The subject parcel and offsite tributary drainage areas lie outside of the McCarran Rainfall Area as identified in the Manual. The 100-year rainfall depths for the project site were calculated utilizing GIS data distributed by the Clark County GISMO (Geographic Information Systems Management Office). The GIS rainfall depths were extracted from the NOAA Rainfall Atlas and have been adjusted according to the approach outlined in Section 500 of the Manual. The adjusted 100-year point precipitation values for the offsite subbasins is 2.8 inches for a 100-year storm event.

The Manual also identifies a methodology to determine which storm distribution to employ. Drainage areas that are less than 8 square miles use an SDN 3 design storm model. An SDN 3 design storm was used in modeling the subject site.



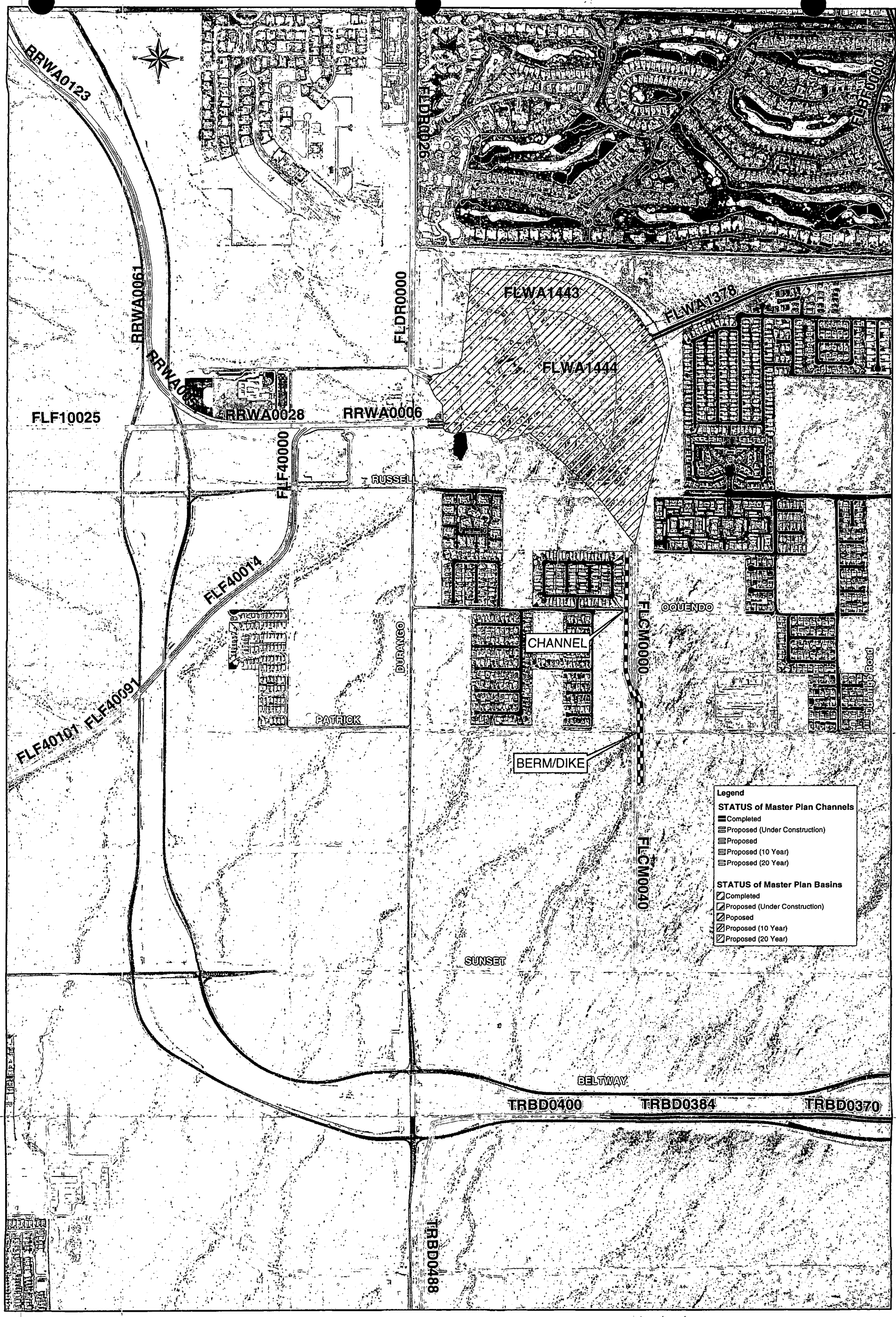
Flood Control Master Plan Update 1996
A Portion of
Figure F-18

SOUTHERN VISTA ESTATES
DIVERSION BERM AND CHANNEL

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Boulevard, Las Vegas, NV 89146
Phone (702) 804-2060 * Fax (702) 804-2288
www.gcwallace.com

Figure 4a

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Preliminary Flood Control Master Plan Update 2002
A Portion of
Figure F-18

SOUTHERN VISTA ESTATES
DIVERSION BERM
AND CHANNEL

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
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Figure 4b
550.040
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Curve Number – The runoff curve number (CN) is an empirical measurement of the soils capacity for runoff. The soil type coverage along with the type of development greatly influences the CN value. The CN value is inversely proportional to the infiltration rate. The higher the CN value the lower the infiltration rate which, in turn, results in the higher potential for runoff.

Soil information was obtained from Figure H-18 of the *1996 Flood Control Master Plan Update* (Reference 1). The data extracted is consistent with the values and the delineation outlined in the *Soil Survey of Las Vegas Valley Area Nevada* (Reference 4). To comply with Clark County's drainage guidelines, Figure H-18 has been superimposed on the subject site and is presented in the Appendix.

As presented on Figure H -18, the soil unit type that encompasses the subject berm and upstream drainage area is hydrologic soil group (HSG) type "D". Curve numbers were determined from Tables 602 and 602A of the Manual. The offsite subbasins were modeled using desert shrub in fair condition, which has a CN value of 86. Existing residential offsite basins were evaluated using a CN of 91 (7000 square foot lots) for the fully improved portions of the offsite area. A CN of 98 was used for the road subbasin and CN of 90 for the channel subbasin.

Drainage Area and Flow Patterns – AutoCad was used in the delineation of all the offsite hydrologic subbasins. The program was also used to determine routing lengths and travel time length in approximating the lag time.

Lag Time – The Lag Time (Ti) is described as the time between the center of mass of rainfall excess and the time of peak discharge for a basin. Lag time can be related to time of concentration (Tc) by the following relationship: Ti = 0.6 (Tc). The time of concentration (Tc) is defined as the time required for runoff to flow from the most remote areas of the basin to the outlet of the basin or a design point. The procedure for calculating Tc is outlined in Section 602 of the Manual. Lag time calculations for this site are in the form of Standard Form 4 and are included in the Appendix. Time of concentration calculated to be less than 5 minutes were adjusted upward to 5 minutes minimum.

VI. HISTORICAL OFFSITE CONDITIONS

The historical offsite conditions were originally evaluated by Engineers and Surveyors, Inc. (November 1992) in their *Technical Drainage Study for the Southern Vista*

Temporary Drainage Channel (see Appendix for referenced study). The study's purpose was to identify the flows impacting the proposed channel at that time. The five offsite basins included three basins flowing in sequence from OFF 1 through OFF 2 and combining to flow through OFF 3 and then combining at the upstream end of the berm/dike. OFF 4 flowed parallel to OFF 1 - OFF 3 and joined these flows along the dike at the upstream end of the channel. OFF 5 contributed flow to the channel. OFF 1 – OFF3 had an area of 371 acres or 0.579 square miles, a total flow length of 16,090 feet (3.05 miles) and generated 491 cfs. OFF- 4 had an area of 125 acres or 0.1953 square miles, a total flow length of 8725 feet (1.65 miles) and generated 164 cfs. OFF 5 was 24 acres or 0.0375 square miles and generated 39 cfs.

The design was based on providing 1 foot of freeboard to meet Clark County Regional Flood Control District design criteria. The facility was reviewed, approved, and constructed in 1993 – 94.

The channel was revisited in January 1996 by Black & Veatch when preparing the LOMR for the Upper Flamingo Detention Basin, Case # 97-09-138P. The channel and berm/dike were re-evaluated and included in the LOMR request. The channel and berm/dike could not meet the freeboard requirements and were rejected by FEMA.

Table 1 summarizes the historical offsite hydrologic analysis.

TABLE 1
SUMMARY OF HISTORICAL CONDITIONS HEC-1 MODEL

Subbasin*	Area (ac)	Q_{100} (cfs)
OFF1	124	182
OFF2	136	193
COM1	-	370
OFF3	111	171
COM2	-	491
OFF4	125	90
OFF5	24	119
COM3	-	688

*See Figure 5b.

VII. CURRENT OFFSITE CONDITIONS

The current offsite conditions are shown on Figure 5a. The current offsite drainage pattern affecting the channel berm/dike is generally that area south and west of the

channel berm/dike. The offsite basins include areas to the southwest up to the new Beltway Frontage Road and drainage facilities. The Beltway Frontage Road is the upstream basin limit. As-built plans for the Beltway Frontage Road were submitted with Case No. 02-09-716R for the Tropicana Wash.

Offsite Basin OD 5 flows to the upstream end of the berm/dike. OD 4 joins this flow just above the beginning of the channel at CP1. OD 6 joins the flow in the channel at Oquendo. OD 2 flows to Oquendo and is turned east toward the channel by the existing subdivision just east of Durango. OD 2 flows to the subdivision noted as D1 and passes through the subdivision to be joined with D1 at CP2 and outfalls into Oquendo to flow east toward the channel. Oquendo is not a full ROW road east of CP 2 and any flow in excess of the road centerline outfalls north toward the Upper Flamingo Detention Basin and out of the Southern Vista Estates Diversion Channel and Berm system. Up to 15.5 cfs continues in Oquendo to flow east toward the channel.

OD 7 flows to Oquendo and flows east toward the channel and is joined by the flow from CP2 at CP3. OD 3 flows to and through D2 to Oquendo where the flows join with the flows from CP3 at CP4. The flow generated by the east end of Oquendo road, OD 6, CP2, CP3, CP 4, OD 5, and OD6 join in the channel at Oquendo (CP5). The flow in the channel continues north to the south arm of the Upper Flamingo Detention Basin embankment where the flows are joined by flows from D3 and the area adjacent to the channel.

Table 2 summarizes the current offsite hydrologic analysis.

TABLE 2
SUMMARY OF CURRENT CONDITIONS HEC-1 MODEL

Subbasin*	Area (ac)	Q_{100} (cfs)
OD 1	47.66	68
OD 2	71.47	102
OD 3	29.69	46
OD 4	65.69	89
OD 5	81.83	117
OD 6	8.95	16
OD 7	3.72	8
D1	19.75	47
D2	11.75	29
D3	7.50	18
R1	3.15	8

TABLE 2 SUMMARY OF CURRENT CONDITIONS HEC-1 MODEL		
Subbasin*	Area (ac)	Q_{100} (cfs)
R2	3.15	8
C1	0.95	2
CP1	-	204
CP2	-	203
CP3	-	23
CP4	-	88
CP5	-	301
CP6	-	309

*See Figure 5a.

VIII. COMPARISION OF HISTORICAL CONDITIONS AND CURRENT CONDITONS

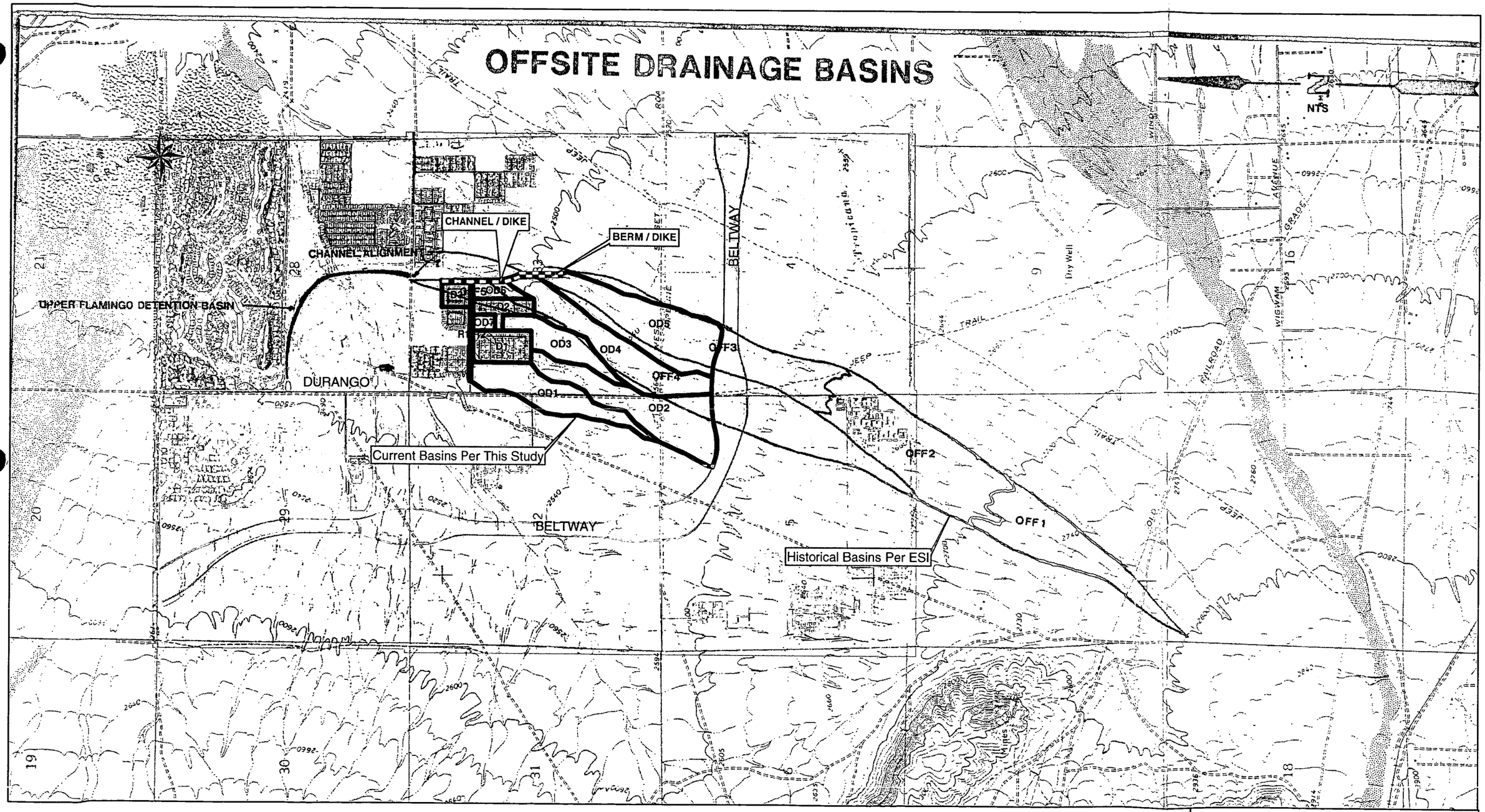
Current conditions offsite Basin OD5 corresponds to historical offsite Basins OFF1, OFF2, and OFF3. Offsite Basin OD5 is less than one-fourth the size of historical offsite Basins OFF1 - OFF3, (81.83 acres current to 371 acres historical). Current conditions offsite Basin OD4 corresponds to historical offsite Basis OFF4 and is approximately one-half the size of historical offsite Basins OFF4, (65.69 acres current to 125 acres historical). A historical offsite Basin OFF5 does match any current conditions offsite basin because of the new residential subdivisions and Oquendo Road.

The flow to the upstream end of the berm/dike has been reduced from 491 cfs to 119 cfs and the flow at the upstream end of the channel has been reduced from 655 cfs to 208 cfs. The channel flow from Oquendo north has been reduced from 688 cfs to 306 cfs. The total area contributing to the channel has been reduced from 520 acres to 355.26 acres.

IX. SEDIMENT LOAD

The sediment load for the current conditions was developed by using the Modified Universal Soil Loss Equation (1307) from the Manual (Reference 2). Variables noted in the equations were obtained from or modified based on the Upper Flamingo Wash Detention Basin Letter of Map Revision (Reference 7). The sediment volumes were used to bulk the flows from the offsite basins. See Appendix A for the calculations. The volumes were small and only increased the flows by 1 or 2 cfs depending on the

OFFSITE DRAINAGE BASINS



0 1,000 2,000 3,000 4,000 Feet

(IN FEET)
1 INCH = 2000 ft.

ESI OFFSITE DRAINAGE BASINS OVERLAY
RECTIFIED TO CURRENT AERIAL PHOTOGRAPHY
AND CURRENT BASINS

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 5b
ESI BASIN MAP

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
(702) 804-2000 Fax (702) 804-2288
www.gcwallace.com

F:\550-040\GIS\FIG-5B.MXD

size and flow rate of the basin evaluated. The bulked flows are shown below in Table 3.

TABLE 3
SUMMARY OF BULKED CURRENT CONDITIONS HEC-1 MODEL

Subbasin*	Area (ac)	Q_{100} (cfs)
OD 1	47.66	67
OD 2	71.47	101
OD 3	29.69	46
OD 4	65.69	90
OD 5	81.83	116
OD 6	8.95	16
OD 7	3.72	8
D1	19.75	47
D2	11.75	29
D3	7.5	18
R1	0.93	8
R2	0.93	8
C1	0.95	2
CP1	-	206
CP2	-	205
CP3	-	23
CP4	-	88
CP5	-	303
CP6	-	311

*See Figure 5a.

X. HEC-RAS EVALUATION

The HEC-RAS evaluation includes three runs. The first uses the January 1996 Black & Veatch sections (Reference 7) and the ESI sections (Reference 8) with the historical evaluation flows. The second run uses the January 1996 Black & Veatch sections (Reference 7) and the ESI sections (Reference 8) with the current evaluation flows. The final run using the current condition HEC-RAS evaluation is based on new March 2002 topography and includes three branches. One branch evaluates the flow from OD5. The second branch evaluates the flows from OD4, and the third branch evaluates the flows from the junction of OD5 and OD4 to discharge at the north end of the channel at Upper Flamingo Detention Basin. The stationing has been set to match the January 1996 Black & Veatch (Reference 7) but the sections are not set at the same locations. The historical evaluation and the historical section with the current flows are presented in table 4. The current flows with the current topography-based HEC-RAS are presented in Table 5 and are the basins of this LOMR request.

TABLE 4
Station Comparison ESI Channel HEC-2 and Black and Veatch Calculations

	Historical Section No. *	Historical Station	Current Profile Station	Historical WSE	Current WSE	Elevation Channel Bottom	Elevation Channel Dike	Historical Channel Freeboard	Current Channel Freeboard
	65	1+70.00	102+10.00	2512.96	2512.08	2510.90	2514.50	1.54	2.42
	64	2+00.00	102+40.00	2512.04	2511.18	2510.10	2514.00	1.96	2.82
	63	2+50.00	102+90.00	2511.50	2510.57	2509.40	2513.50	2.00	2.93
	62	3+00.00	103+40.00	2510.63	2509.82	2508.70	2512.30	1.67	2.48
Begin Berm/Dike	61	3+50.00	103+90.00	2509.78	2508.78	2507.70	2511.80	2.02	3.02
	60	4+00.00	104+40.00	2509.18	2508.12	2506.80	2511.20	2.02	3.08
	59	4+50.00	104+90.00	2508.58	2507.67	2506.30	2510.50	1.92	2.83
	58	5+00.00	105+40.00	2507.67	2506.88	2505.80	2509.50	1.83	2.62
	57	5+50.00	105+90.00	2506.79	2505.85	2504.60	2509.00	2.21	3.15
	56	6+00.00	106+40.00	2505.71	2504.82	2503.60	2508.50	2.79	3.68
	55	6+50.00	106+90.00	2503.88	2503.19	2502.20	2507.70	3.82	4.51
	54	7+00.00	107+40.00	2503.14	2502.06	2500.50	2507.20	4.06	5.14
	53	7+50.00	107+90.00	2502.74	2501.72	2499.90	2506.50	3.76	4.78
	51	8+00.00	108+40.00	2502.50	2501.53	2499.70	2505.70	3.20	4.17
	50	8+50.00	108+90.00	2502.27	2501.37	2499.50	2505.00	2.73	3.63
	48	9+00.00	109+40.00	2501.64	2501.01	2499.40	2504.20	2.56	3.19
	47	9+50.00	109+90.00	2500.83	2500.18	2499.25	2503.50	2.67	3.32
	45	10+00.00	110+40.00	2500.40	2499.74	2498.90	2502.60	2.20	2.86
	42	10+50.00	110+90.00	2499.61	2499.05	2498.20	2501.80	2.19	2.75
	40	11+00.00	111+40.00	2498.99	2498.30	2497.30	2501.00	2.01	2.70
	39	11+50.00	111+90.00	2498.17	2497.44	2496.70	2500.50	2.33	3.06
	38	12+00.00	112+40.00	2498.02	2496.62	2495.20	2500.00	1.98	3.38
	36	12+50.00	112+90.00	2497.02	2495.67	2493.50	2499.50	2.48	3.83
Begin Channel	33	13+00.00	113+40.00	2495.79	2493.40	2490.24	2499.00	3.21	5.60
	31	14+00.00	114+40.00	2495.48	2493.18	2490.00	2498.00	2.52	4.82
	30	15+00.00	115+40.00	2494.66	2492.67	2490.20	2497.20	2.54	4.53
	29	15+40.00	115+80.00	2494.58	2492.49	2490.20	2497.04	2.46	4.55
	28	15+50.00	115+90.00	2494.20	2492.06	2490.00	2498.00	3.80	5.94
	27	15+70.00	116+10.00	2491.66	2489.87	2488.52	2495.52	3.86	5.65
	26	15+90.00	116+30.00	2489.98	2489.41	2487.04	2494.04	4.06	4.63
	25	16+00.00	116+40.00	2492.11	2489.76	2487.00	2494.10	1.99	4.34
	24	16+15.00	116+55.00	2492.05	2489.68	2486.94	2493.94	1.89	4.26
	23	17+00.00	117+40.00	2491.64	2489.30	2486.60	2493.60	1.96	4.30
	22	18+00.00	118+40.00	2491.43	2489.07	2486.20	2493.30	1.87	4.23
	21	19+00.00	119+40.00	2491.27	2488.92	2485.80	2492.80	1.53	3.88
	20	20+00.00	120+40.00	2490.01	2487.95	2485.40	2492.50	2.49	4.55
	19	21+00.00	121+40.00	2488.69	2487.29	2485.00	2492.10	3.41	4.81
	18	21+10.00	121+50.00	2488.02	2487.40	2484.96	2491.56	3.54	4.16
	17	21+25.00	121+65.00	2487.60	2487.42	2484.90	2490.90	3.30	3.48
	16	21+40.00	121+80.00	2487.20	2487.44	2484.84	2490.24	3.04	2.80
	15	21+50.00	121+90.00	2487.01	2487.01	2484.80	2489.80	2.79	2.79
	14	22+00.00	122+40.00	2488.26	2486.79	2484.60	2489.60	1.34	2.81
	13	22+90.00	123+30.00	2488.28	2486.36	2484.24	2489.24	0.96	2.88

TABLE 4
Station Comparison ESI Channel HEC-2 and Black and Veatch Calculations

	Historical Section No.*	Historical Station	Current Profile Station	Historical WSE	Current WSE	Elevation Channel Bottom	Elevation Channel Dike	Historical Channel Freeboard	Current Channel Freeboard
	12	23+00.00	123+40.00	2487.19	2486.00	2484.20	2489.20	2.01	3.20
	11	23+20.00	123+60.00	2485.64	2484.66	2483.32	2488.32	2.68	3.66
	10	23+40.00	123+80.00	2484.73	2484.83	2482.44	2487.44	2.71	2.61
	9	23+50.00	123+90.00	2486.13	2484.78	2482.40	2487.40	1.27	2.62
	8	23+65.00	124+05.00	2485.99	2484.65	2482.34	2487.00	1.01	2.35
	7	24+00.00	124+40.00	2485.74	2484.43	2482.20	2487.20	1.46	2.77
	6	25+00.00	125+40.00	2485.37	2484.04	2481.80	2486.80	1.43	2.76
	5	26+00.00	126+40.00	2484.99	2483.66	2481.40	2486.42	1.43	2.76
	4	27+00.00	127+40.00	2484.66	2483.32	2481.00	2486.00	1.34	2.68
	3	28+00.00	128+40.00	2483.61	2482.41	2480.00	2486.60	2.99	4.19
	2	28+50.00	128+90.00	2481.61	2480.88	2479.86	2485.60	3.99	4.72
	1	28+75.00	129+15.00	2480.87	2480.44	2479.60	2482.80	1.93	2.36

*See Appendix C Southern Vista Channel and Berm

TABLE 5
CURRENT BERM/DIKE AND CHANNEL EVALUATION

channel bank n = 0.035 for riprap
channel n = 0.025 for caliche bottom
channel n = 0.032 for natural channel
Spoil piles removed

	Historical Station	Current Station	Section*	Flow cfs	East Bank or Levee Station	East Bank or Levee Elevation	Subcritical Water Surface Elevation	Freeboard	Channel Velocity
	-1+61.00	98+73.31	4280	116	1210.68	2522.00	2517.90	4.1	2.73
	0+15.00	100+52.52	4270	116	1237.68	2518.20	2515.95	2.3	4.16
Begin berm	1+30.00	101+70.00	4260	116	1221.53	2517.00	2514.55	2.4	2.71
	2+00.00	102+39.78	4250	116	1241.81	2516.00	2513.52	2.5	3.71
	3+00.00	103+39.71	4240	116	1154.89	2514.00	2511.92	2.1	3.94
	3+70.00	104+05.61	4230	116	1218.70	2513.00	2510.90	2.1	4.15
	4+86.00	105+28.78	4220	116	1258.70	2511.00	2508.80	2.2	4.34
	5+56.00	106+04.41	4210	116	1100.55	2511.00	2507.56	3.4	5.09
	6+61.00	107+14.06	4200	206	1322.33	2508.00	2505.42	2.6	6.01
	7+83.00	108+50.15	4100	206	1284.18	2508.00	2503.76	4.2	3.51
	8+48.00	109+29.54	4000	206	1202.48	2507.00	2503.63	3.4	2.16
	9+35.00	110+16.27	3900	206	1204.80	2505.47	2503.17	2.3	3.65
	10+48.00	111+19.95	3800	206	1223.72	2504.00	2501.82	2.2	4.04
	11+36.00	112+07.46	3700	206	1262.04	2502.65	2500.20	2.5	4.96
Begin channel	12+26.00	112+97.00	3600	206	1162.72	2501.00	2498.52	2.5	6.35
	13+43.00	114+14.00	3500	206	1169.15	2500.00	2496.38	3.6	4.95
	14+50.00	115+21.00	3400	206	1071.84	2498.00	2495.43	2.6	6.40
	15+00.00	115+71.00	3300	206	1126.26	2497.00	2493.22	3.8	4.92

TABLE 5
CURRENT BERM/DIKE AND CHANNEL EVALUATION

channel bank n = 0.035 for riprap
channel n = 0.025 for caliche bottom
channel n = 0.032 for natural channel
Spoil piles removed

	Historical Station	Current Station	Section*	Flow cfs	East Bank or Levee Station	East Bank or Levee Elevation	Subcritical Water Surface Elevation	Freeboard	Channel Velocity
	15+90.00	116+61.00	3200	206	1107.44	2496.00	2492.87	3.1	4.47
	17+00.00	117+71.00	3100	206	1088.93	2496.00	2492.52	3.5	4.44
	17+83.00	118+54.00	3000	206	1092.32	2495.00	2491.70	3.3	6.50
	19+00.00	119+71.00	2900	206	1055.87	2494.00	2491.16	2.8	5.41
	20+00.00	120+71.00	2800	206	1057.94	2493.00	2490.06	2.9	7.13
	21+00.00	121+71.00	2700	206	1091.34	2493.00	2488.78	4.2	6.78
	21+95.00	122+66.00	2600	303	1069.73	2490.00	2487.47	2.5	4.63
	22+95.00	123+66.00	2500	303	1087.02	2489.00	2486.83	2.2	5.40
	23+95.00	124+66.00	2400	303	1046.16	2488.53	2485.78	2.8	6.76
	24+95.00	125+66.00	2300	303	1047.73	2488.39	2485.86	2.5	3.31
	25+95.00	126+66.00	2200	303	1048.50	2488.00	2485.73	2.3	3.20
	26+95.00	127+66.00	2100	303	1041.91	2487.87	2485.48	2.4	3.85
End channel	28+10.00	128+81.00	2000	303	1054.28	2487.00	2484.56	2.4	6.51
	28+32.00	129+03.00	1900	311	1060.00	2486.80	2484.37	2.4	6.01
	28+70.00	129+41.00	1800	311	1050.00	2485.70	2483.69	2.0	4.68
	29+25.00	129+96.00	1700	311	1062.00	2484.30	2482.00	2.3	4.06

*See Figures A, B and Pro-1

XI. ANSWERS TO JUNE 14, 1996 REQUEST FOR ADDITIONAL DATA REQIRED TO SUPPORT A REVISION TO FLOOD INSURANCE RATE MAP (FIRM) FEMA CASE No. 97-09-138P (for complete text of the letter see Appendix)

"FEMA COMMENT"

2. Regarding the information submitted for the SVE diversion channel, we have reviewed the submitted data that included plans certified by Mr. Byron J. Glenn, P.E., Manager, Stormwater Management Division, Engineers & Surveyors, Inc., as representing "as-built" conditions and have noted that the available freeboard for the SVE facilities is less than that required in Section 65.10 of the National Flood Insurance Program (NFIP) regulations. Before we revise the FIRM to recognize this channel and berm as providing protection from the base flood, we must receive the following information:

- An engineering analysis and operation and maintenance plan that demonstrate the berms along the SVE diversion channel meet the requirements of Section 65.10 of the NFIP regulations; and

- An engineering analysis that evaluates the effect of the sediment load associated with the base flood on the SVE diversion channel.

Response: The berms along the SVE diversion channel have been accepted for maintenance by CCRFCD and are maintained by Clark County Public Works per the CCRFCD Operations and Maintenance Manual (Maintenance Manual). The Maintenance Manual sets forth both policies and procedures by which the maintenance of the drainage and flood control facilities will be achieved to assure their proper working order at the time of need. In general, the maintenance program includes routine and / or preventive maintenance and restoration or repair of existing facilities after a storm event.

The SVE diversion channel is impacted by a basin that is clearly defined and limited in size, less then one square mile. The regulatory flow rates are predictable and relatively small. The basin is protected from upstream impacts by the new Las Vegas Beltway facilities. The sediment bulking is very limited as shown by the calculations. The berm portion of the SVE diversion channel is a minimum of 12-foot wide at the top and is compacted to 95 percent to 100 percent maximum density. The berm has shown negligible variation in elevation from the time that it was constructed in 1994 and the current conditions field surveyed in 2002. The velocities in the channel are generally under 5 fps except at the drop structures. The riprap lining on the channel extends up to the top of the dike from Station 21+00 to 28+32.

For these reasons freeboard less then 2 feet is acceptable in accordance with 65.10 fo the NIFP regulations as stated in paragraph (b)(ii).

"FEMA COMMENT"

3. Regarding the SVE berm, the following information must be received before we can consider this berm as providing protection from the base flood:

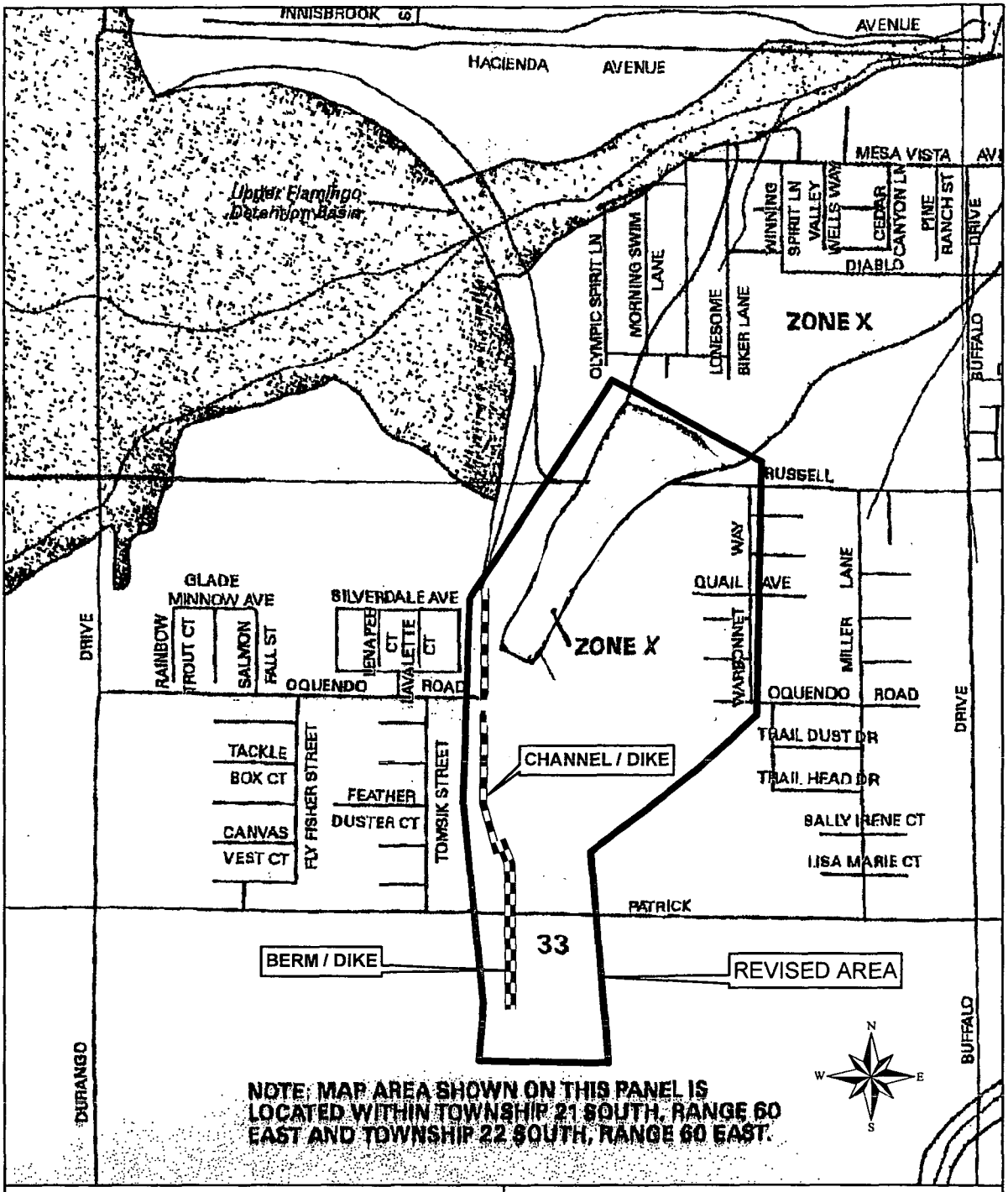
   - As-built plans of the SVE berm, certified by registered professional engineer or land surveyor;
   - An engineering analysis and operation and maintenance plan that demonstrate that the SVE berm meets the requirements of Section 65.10 of the NFIP regulations, and
   - An engineering analysis that evaluates the effect of the sediment load associated with the base flood on the SVE berm.

Response: Please find Figure A, Figure B, and Pro-1, which provide the as-built survey of the SVE Berm. The berms along the SVE diversion channel have been accepted for maintenance by CCRFCD and are maintained by Clark County Public Works per the *CCRFCD Operations and Maintenance Manual* (Maintenance Manual). The Maintenance Manual sets forth both policies and procedures by which the maintenance of the drainage and flood control facilities will be achieved to assure their proper working order at the time of need. In general, the maintenance program includes routine and / or preventive maintenance and restoration or repair of existing facilities after a storm event.

The SVE diversion channel is impacted by a basin that is clearly defined and limited in size. The basin is protected from upstream impacts by the new Las Vegas Beltway facilities. The Las Vegas Beltway Facilities were constructed as part of the USACOE Tropicana Flamingo Wash Project. The effects are documented by Case No. 02-09-712R for the Tropicana Wash LOMR request. The sediment bulking is very limited as shown by the calculations. The berm portion of the SVE diversion channel is a minimum of 12-foot wide at the top and is compacted to 95 percent to 100 percent maximum density. The berm has shown negligible variation in

elevation from the time that it was constructed in 1994 and the current conditions field surveyed in 2002. The velocities in the channel are generally under 5 fps except at the drop structures. The riprap lining on the channel extends up to the top of the dike from Station 21+00 to 28+32.

For these reasons freeboard less then 2 feet is acceptable in accordance with 65.10 fo the NIFP regulations as stated in paragraph (b)(ii).



A PORTION OF FIRM 32003C2535 E MAP
REVISED SEPTEMBER 27, 2002

0 1,000 2,000 Feet

(IN FEET)
1 INCH = 1000 ft.

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 6
REVISED FIRM

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(702) 804-2000 Fax (702) 804-2288
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XII. CONCLUSIONS AND RECOMMENDATIONS

1. The upstream area contributing to the berm / channel upstream of the Flood Zone A has been reduced from 0.813 square miles to 0.555 square miles by the drainage facilities associated with the Las Vegas Beltway Frontage Road Drainage Facilities Section 7B - DR Durango Drive to Rainbow Boulevard, *Guidelines and Specifications for Study Contractors FEMA 37* Chapter 5. Section A. General Requirements Paragraph 2 states: "*The SC should not study areas having a drainage area less than one square mile unless Regional PO approval has been obtained.*" Although this technical data was not prepared under a FEMA study contract, the guidelines suggest that the subject watershed is minor.

2. The berm/dike portion of the drainage facility provides a minimum of 2 feet of freeboard based on the sediment bulked flow for the full length of the dike, Station 1+70 to Station 12+26. In a small predictable watershed such as this the berm meets the requirements of 65.10(b)(ii) of the NFIP regulations.

3. The channel portion of the drainage facility provides a minimum of 2 feet of freeboard based on the sediment-bulked flow from Station 12+26 to Station 29+25. The facility meets the Clark County Regional Flood Control District criteria for 1 foot of free board minimum for the full length of the channel.

4. The method used to calculate storm runoff and various hydraulic characteristics for this project is in compliance with the Manual.

5. Since the existing berm and channel intercepts and routes the entire upstream 100-year runoff into the existing detention basin, the flow in the existing Zone A is reduced to negligible levels and the Special Flood Hazard Area can be removed.

XIII. REFERENCES

1. PBS&J. CCRFCD: *The Master Plan Update of the Las Vegas Valley,* dated 1996.

2. Clark County Regional Flood Control District. *Hydrologic Criteria and Drainage Design Manual*, dated 1999.

3. U.S. Army Corps of Engineers. *HEC-1 Flood Hydrograph Package,* revised September 1990.

4. U.S. Department of Agriculture, Soil Conservation Service. *Soil Survey of Las Vegas Valley Area, Nevada*, dated July 1985.

5. HEC-RAS River Analysis System. *Hydraulic Reference Manual, Version 2.2.* August 1998.

6. BOSS International. *BOSS RMS 2000 for AUTOCAD.* 2001.

7. Black & Veatch. *Upper Flamingo Wash Detention Basin Letter of Map Revision* , January 1996

CCRFCD
20 JUN 96 1:17

Federal Emergency Management Agency

Washington, D.C. 20472

Summary of Additional Data Required to Support a
Revision to Flood Insurance Rate Map (FIRM)

Case No.: 96-09-380P Date: JUN 14 1996

Requester: Mr. Kevin L. Eubanks, P.E. Community No.: 320003

Community: Clark County, Nevada

The issues listed below must be addressed before we can continue the review of your request.

Your request for a Letter of Map Revision (LOMR) follows a Conditional Letter of Map Revision (CLOMR) dated August 27, 1993 (Case No. 93-09-407R), for the unincorporated areas of Clark County, Nevada. In the CLOMR we identified the additional information we would require to show that the Upper Flamingo Wash Detention Basin (UFWDB) and the Southern Vista Estates (SVE) diversion channel (which includes a parallel berm on the east side of the channel) would provide protection from the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood). The information submitted with this LOMR request identifies a diversion berm called "the SVE berm" that extends from just upstream of the SVE diversion channel south approximately 1,000 feet. The SVE berm was not reviewed as part of the CLOMR.

1. With your LOMR request we received an annotated FIRM that shows an area south of the outfall channel and between the UFWDB and South Buffalo Drive to be removed from the Special Flood Hazard Area designated Zone A, an area inundated by the base flood with no base flood elevations determined. We also received an undated aerial photographic map, entitled "LOMR, Upper Flamingo Wash Detention Basin Discharge Channel, Revised Floodplain Map," prepared by Black & Veatch, that shows revised base floodplain boundaries along the outfall channel downstream of the UFWDB to Hacienda Avenue. The submittal for the LOMR request also included a hydrologic analysis that established a new base flood event to evaluate the performance of the UFWDB, an engineering analysis that evaluated the effect of the sediment load associated with the base flood on the UFWDB, and geotechnical and structural analyses for the embankment and outlet structure of the UFWDB. We have reviewed the data submitted and can revise the FIRM to reflect that the UFWDB provides protection from the base flood to the areas downstream of the UFWDB provided that we receive the following items:

   - Topographic and contour information to support the floodplain boundary delineations shown on the submitted aerial photographic map. The delineations must agree with the results of the HEC-2 model submitted for the outfall channel between the outlet of the UFWDB and Hacienda Avenue.

With this information we can revise the FIRM to show the effects of the UFWDB on areas downstream. However, the SVE subdivision would still be subject to flooding from the unnamed wash that crosses the subdivision property until data sufficient to satisfy the requirements listed in Items 2 and 3 below have been submitted.

2. Regarding the information submitted for the SVE diversion channel, we have reviewed the submitted data that included plans certified by Mr. Byron J. Glenn, P.E., Manager, Stormwater Management Division, Engineers & Surveyors, Inc., as representing "as-built" conditions and have noted that the available freeboard for the SVE facilities is less than that required in Section 65.10 of the National Flood Insurance Program (NFIP) regulations. Before we revise the FIRM to recognize this channel and berm as providing protection from the base flood, we must receive the following information:

   - An engineering analysis and operation and maintenance plan that demonstrate the berms along the SVE diversion channel meet the requirements of Section 65.10 of the NFIP regulations

   - An engineering analysis that evaluates the effect of the sediment load associated with the base flood on the SVE diversion channel

3. Regarding the SVE berm, the following information must be received before we can consider this berm as providing protection from the base flood:

   - As-built plans of the SVE berm, certified by registered professional engineer or land surveyor

   - An engineering analysis and operation and maintenance plan that demonstrate that the SVE berm meets the requirements of Section 65.10 of the NFIP regulations

   - An engineering analysis that evaluates the effect of the sediment load associated with the base flood on the SVE berm

Please send the required data directly to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

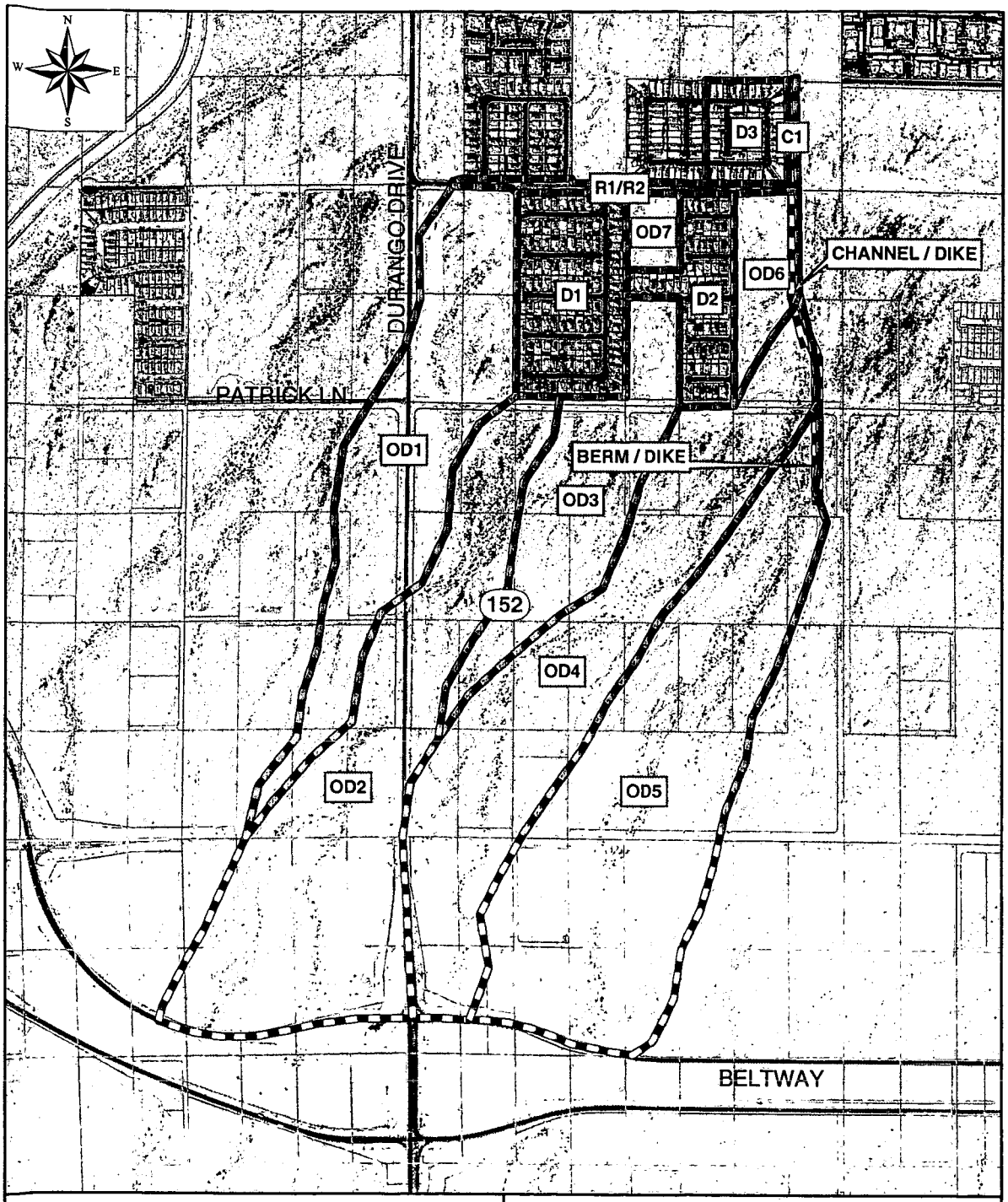
Attention: Mr. Thomas W. Smith, P.E.
(703) 317-6267

For identification purposes, you must include the case number referenced above on all correspondence.

APPENDIX

APPENDIX A
Hydrologic Calculations

Soils Map
Precipitation Data
Lag Time Calculations
HEC-1 Model – Current Conditions
Diskette Containing HEC-1 Input and Output Files



Legend

SOILS

BASINS

0 500 1,000 Feet

(IN FEET)
1 INCH = 1000 ft.
F:\550-040\GIS\FIG-6 SOILS.MXD

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 6
SOIL MAP

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This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 6.

152—Cave gravelly fine sandy loam, 0 to 4 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 80 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pale brown gravelly fine sandy loam about 12 inches thick. The next layer to a depth of 36 inches is an indurated, lime-cemented hardpan. The underlying material to a depth of 60 inches or more is light brown very gravelly sandy loam. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels, 5 percent Canutio soils on inset fans, and 5 percent Grapevine soils on side slopes of erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used mainly for urban development. It is also used as habitat for desert wildlife and for recreation.

This unit is poorly suited to urban development. The main limitation is the shallow depth to the hardpan. Excavation for building sites is limited by the hardpan, and heavy equipment is needed. Special design of septic tank absorption fields is needed.

Roads should be designed to minimize cuts because of the limited depth to the hardpan.

It is difficult to establish plants in areas where the pan is exposed. Mulching and fertilizing cut areas help to establish plants. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 6.

155—Cave gravelly fine sandy loam, 4 to 15 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 70 percent of the surface is covered with a desert pavement of rock fragments and pan fragments. The surface layer is light brown gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 15 inches is light brown gravelly fine sandy loam. The next layer to a depth of 60 inches or more is an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels and 5 percent Caliza soils on side slopes of erosional fan remnants. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is moderate, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts. Cutting and filling can be reduced by building roads in the less sloping areas.

This map unit is in capability subclass VIIs, nonirrigated and in horticultural group 6.

160—Destazo cobbly fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on relict alluvial flats. It formed in alluvium derived dominantly from limestone and dolomite.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pink cobbly fine sandy loam about 11 inches thick. The upper 29 inches of the underlying material is light brown very gravelly sandy clay loam, and the lower part to a depth of 60 inches or more is pinkish white gravelly sandy loam containing some crystalline gypsum.

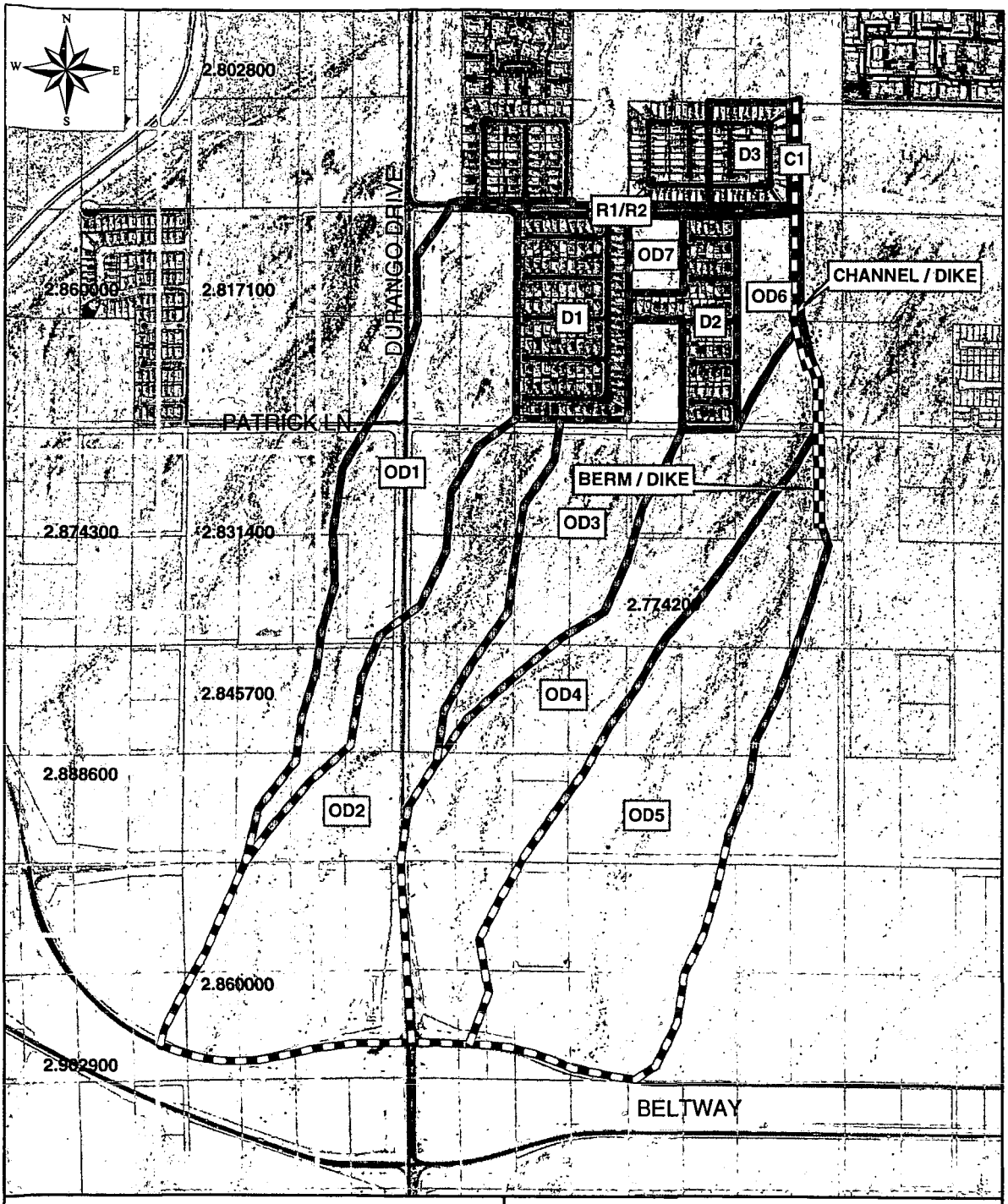
Included in this unit are about 5 percent Bracken very cobbly fine sandy loam, 2 to 8 percent slopes, on side slopes of slightly higher remnants of relict alluvial flats and 10 percent Las Vegas soils on summits of slightly higher remnants of alluvial flats. Included areas make about 15 percent of the total acreage.

Permeability of this Destazo soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban developme

This unit is well suited to the construction of dwellin

The main limitation for septic tank absorption fields restricted permeability. The operation of septic tank



Legend

BASINS

NOAA RAIN

0 500 1,000 1,500 Feet

(IN FEET)
1 INCH = 1000 ft.

F:\550-040\GIS\FIG-7 RAINFALL.MXD

SOUTHERN VISTA ESTATES
DIVERSION CHANNEL AND BERM

FIGURE 7
RAINFALL MAP

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HISTORY OF DESIGN RAINFALL

A brief history of design rainfall depths used in Clark County may be summarized by a discussion of the following studies:

National Oceanic and Atmospheric Administration
Atlas 2 Volume VII-Nevada
NOAA (1973)
Period of Record for Las Vegas data: 1948-68

NOAA conducted this study in order to depict more accurately variations in the precipitation frequency regime in mountainous regions of the West. The frequency distribution used was the Fischer-Tippet Type I distribution; the fitting procedure was that developed by Gumbel (Method of Moments). This procedure was consistent with similar previous studies conducted by NOAA in other areas of the country. In addition to determining precipitation frequency values, relationships between meteorologic and topographic factors were also determined. These factors included 2-year 24-hour precipitation, normal annual precipitation, elevation, distance to moisture, location, and barriers to airflow. Multiple linear regression equations were developed to describe the relationships between these variables. The final isopluvial maps were drawn with consideration to the results of both the frequency analysis of each of the stations included in the study, as well as the rainfall values resulting from the multiple linear regression equations. The 6-hr 100 year point rainfall value for Las Vegas resulting from this work is 1.94".

Precipitation Analysis in Clark County, Nevada
Black & Veatch (B&V) (1985)
Period of Record for Las Vegas data: 1948-83

Considering the increased period of record available since the completion of NOAA Atlas 2, as well as the number of significant rainfall events which had occurred in the Clark County area in the time, engineers with B&V suggested that the rainfall frequency distribution for Las Vegas was in need of re-evaluation. As part of their flood control facilities study of the flamingo Wash drainage area, B&V conducted this analysis. Hourly and daily rainfall data were obtained for Las Vegas, Searchlight and Boulder City. The precipitation frequency distributions for the 1-,2-,3-, and 24-hour duration storms were determined. These points were plotted "on Gumbel probability graph paper according to the Weibull plotting position. Lines of best fit were determined visually". Values read from this precipitation frequency plot were then adjusted by a multiplier to transform them from x-hour values to n-minute values. The 3-hr 100-year point rainfall value for Las Vegas resulting from this analysis was 2.48", a 43% increase over NOAA Atlas 2.

Clark County Regional Flood Control District Master Plan
James M. Montgomery (JMM) (1986)

As consultants for the preparation of the Flood Control Master Plan, JMM reviewed the Black & Veatch analysis to determine the accuracy of the plotting positions of the data points and the reasonableness of the "best-fit" line. They determined that the results of the B&V analysis were

reasonable. The results of the B&V study were also discussed with representatives of the National Weather Service (NWS), COE, and an independent meteorological consultant who all believed that NOAA Atlas 2 under-estimated the low frequency short duration rainfall depths and suggested that an adjustment factor would be appropriate. For the preparation of the Master Plan, JMM used a 3-hour 100-year storm; point depths were determined from NOAA Atlas 2 and adjusted by a multiplier of 1.44.

Hydrologic Documentation for Feasibility Study, Las Vegas Wash and Tributaries U.S. Army Corps of Engineers (1988)

"The analytical analysis conducted by the COE used the same approach as that used by NOAA Atlas 2 to generate point rainfall depths, the Gumbel Distribution". The COE evaluated the 1-, 2-, 3-, 6-, and 24-hour precipitation depths for Las Vegas, Searchlight, Overton-Logandale, Baker, and Needles. The period of record for the Las Vegas data was 1949-86. The fixed-interval vs true-interval correction factor used for the 6-hour data was 1.02. The results of the COE' analysis were 35% and 28% higher than the rainfall depths presented in NOAA Atlas 2 for the 3-hour and 6-hour storms, respectively. Based on this and previous analysis, the COE adopted the use of a 1.43 multiplier to determine point rainfall depths for the 6-hour 100 year storm.

The COE's documentation indicates that the original analytical analysis prepared by NOAA (1973) resulted in a 6-hour 100 year point rainfall depth of 2.91" for the Las Vegas gage. The COE suggests that the regional smoothing done in developing the NOAA Atlas 2 isopluvial maps resulted in a lower point rainfall depth being presented on the isopiuvial maps.

Collection and Analysis of Historic Rainfall Data and Patterns to support continued use or changes to the Adopted Clark County Regional Flood Control District's Design Rainfall for Drainage Facility Design and Analysis
WRC Engineering (1989)

As part of their contract for the preparation of the District's Hydrologic Criteria and Drainage Design Manual (Criteria Manual), WRC sub-contracted with Loren Crow. The study did not include a new statistical analysis of the rainfall data for any stations in or near Clark County. The report included the following recommendations, a) the overwhelming consensus is that NOAA Atlas 2 does not accurately reflect the expected rainfall depth values as obtained using the much greater length of rainfall records available since the preparation of the Atlas. Therefore some sort of adjustment values are necessary; b) "the results of this study have not found sufficient additional data to suggest or support changes to the listed factors for the 3-hour duration storm"; c) additional data obtained in this study was not sufficient to prepare an additional statistical analysis for the 6-hour storm. However, the application of an adjustment factor similar to that used for the 3-hour 100-year rainfall value was recommended for the 6-hour 100-year rainfall values. "In fact, until sufficient additional data is available to more accurately determine this factor, the 1.43 factor should be used for the 6-hour storm".

NOAA Atlas 3
NOAA (unpublished; study in progress)
Period of Record: 1949-92

For the past four years, NOAA has been conducting a re-analysis of the precipitation frequency values for the southwestern United States. This study makes use of current statistical theory for the determination of the appropriate probability distribution for the data. Using L-moment statistics, the Generalized Pareto Distribution was selected as being appropriate. This statistical theory was also used to determine which rainfall stations should be grouped together as a "region" for the development of "regionalized growth factors" (RGF's). Las Vegas was grouped with other stations in southern Nevada and the desert regions of San Bernardino, California in Region 7. RGFs for a given region are calculated for each duration and frequency of interest. The mean rainfall value for a given duration event at a station is multiplied by the appropriate RGF to determine the point rainfall depth for that duration and frequency. Preliminary results indicate that the 6-hour 100-year rainfall depth for Las Vegas is 2.09". This value is 7.7% higher then the value read from the NOAA Atlas 2 isopluvial maps; it is 75% of the rainfall value currently used for the design of drainage facilities in Clark County.

1996 Master Plan Update

The CCRFCD and each governmental entity agreed the rainfall used for the 1996 MPU should be in accordance with the Criteria Manual. The Criteria Manual applies a 1.43 factor to the 100-year rainfall depths of the 1973 NOAA Atlas Area 2 (1973 Atlas).

As previously discussed, the National Weather Service is in the process of preparing a Precipitation Frequency Atlas for the Semi-Arid Region (NOAA Atlas 3). This document will supplant the 1973 Atlas. The new publication will utilize 20 years of additional record and data from approximately 50 new rain gauges in the semi-arid region. Preliminary maps for the NOAA Atlas 3 indicate little change from the 1973 Atlas for the rainfall depths in the Las Vegas Valley. This would indicate that the additional rainfall data does not support the application of the 1.43 factor as an adjustment to account for more years of record.

The NOAA Atlas 3 document would not be published within the time frame of the MPU contract. The NOAA Atlas maps have met with opposition from agencies performing reviews and are subject to revision. It was determined that the MPU proceed based on the present Criteria Manual.

When the NOAA Atlas 3 is published, CCRFCD and the entities agree that an adjustment factor continue to be applied to the rainfall depths. The depth adjustment would be based on producing design discharges consistent with presently accepted hydrologic methods in Clark County. The point precipitation storm depths would be taken from the NOAA Atlas 3 maps for Warm Season, 100-Year, 6-Hour Duration Rainfall, with an adjustment to account for local rainfall experience. Since an adjustment factor would be applied, the hydrologic results would be similar to using the current methodology.

The reasons for using the present Criteria Manual rainfall, with its adjustment factor, or for applying an adjustment to rainfall from NOAA Atlas 3, are further summarized below:

The discharges based on adjusted rainfall depths are consistent with adopted regulatory discharges as included in the "Las Vegas Valley Flood Insurance Study Hydrology Report," prepared by JMM, August 1991, and with the calibrated flows based on the COE regional analysis of stream gage data as reported in "Hydrologic Documentation for Feasibility Study Las Vegas Wash and Tributaries, Clark County, Nevada, April 1988."

- The present Manual applies a 1.43 factor to the 100-year rainfall depths of the 1973 NOAA Atlas Area 2 (1973 Atlas). This adjustment was adopted based on rainfall studies performed by B&V and the COE. It has become the accepted design standard by the community, the CCRFCD Flood, and the city and county entities.

- The CCRFCD Flood Warning System precipitation gage network supports that several severe rainfall events have been recorded in Clark County within the short history of the network. See Table 1-1, which indicates several events have occurred in Clark County which exceed the preliminary 100-year rainfall of the NOAA Atlas 3 for the McCarran Rainfall Area.

- The high sediment loads and debris, associated with flood events in the desert environment, bulks flows, and creates debris blockages and unpredictable flow patterns. This supports a conservative approach to the design of flood control facilities.

- The limited years of record and number of rainfall gages do not support tight confidence limits on estimated 100-year rainfall values. The nature of the desert and its tendency to severe impacts from extreme events warrant a conservative upward adjustment to the statistically derived 100-year rainfall depth.

- Numerous flood control facilities have been designed in accordance with the Criteria Manual which applies a rainfall adjustment factor, and it is important to maintain equal levels of protection to the entire community.

- The adjustment to rainfall is more compatible with the COE hydrologic methods. COE hydrology will control for the federally funded projects of the Flamingo/Tropicana Wash System.

Table 1-1
Rainfall Extremes for Events in Clark County
Exceeding Mccarran 5-year Return Frequency
5 Year Period (1990-1995)

DATE OF EVENT	DEPTH	DURATION	LOCATION
6/10/90	1.06 1.54	15 min. 1 hour	Las Vegas Creek at Lamb
7/8/90	1.09 1.02	3 hours 3 hours	Valley of Fire State Park West of Logandale
7/12/90	1.61	1 hour	Cal-Nev-Ari
7/13/90	1.40	3 hours	Laughlin
7/13/90	1.82	24 hours	Overton Beach
7/14/90	.91 1.66	15 min 3 hours	Jean
7/14/90	1.47	1 hour	Beatty
7/14/90	1.35	2 hours	Upper Flamingo 1
7/14/90	2.23	24 hours	Mount Charleston
7/15/90	2.17	3 hours	Lone Mountain/Hualapai
8/14/90	1.81	45 min	Cal-Nev-Ari
8/15/90	2.20 2.48	45 min 1.5 hours	Logandale
8/15/90	.91	30 min	Lone Mountain/Hualapai
9/18/90	1.97	1 hour	California Wash - Glendale
7/8/91	1.30	1 hour	The Lakes
8/10/91	1.25 1.65	1 hour 3 hours	Cal-Nev-Ari
9/6/91	1.02 1.61 1.77	30 min 4 hours 24 hours	Jean
2/12/92	1.44 1.77	6 hours 11 hours	Nellis AFB
3/27/92	2.56	16 hours	Blue Diamond North
3/30/92	.63 1.28 2.13	5 min 45 min 15 hours	Cal-Nev-Ari
2/8/93	1.57 2.40	6 hours 16 hours	TIMET Facility - Henderson
2/22/93	2.3	6 hours	Katherine's Landing
2/27/93	1.68	6 hours	Laughlin 2
8/8/93	.34 1.2	5 min 30 min	Tortoise Center The Lakes
8/8/94	1.57	1 hour	Smoke Ranch & Buffalo
8/22/95	.71	15 min	Oakey Detention Basin

NOTE: Preliminary NOAA Atlas 3 Map for 100-Year, 1-Hour Rainfall is 1.42 inches for the McCarran Rainfall Area.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C. Wallace, Inc. — **Southern Vista Estates Channel and Berm**

File: 550.040_SF4E.wb2 — **BY: SLW**

Project No.: 550.040 — **Current Conditions** — **DATE: 10/01/02**

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	CN	K (2)	AREA Ac (3)	AREA MI^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	TOTAL LENGTH Ft (11)	Tc = (L/180)+10 Min (12)	Min (13)	Tlag= 0.6Tc/60 Hours	RAINFALL 100-YR Inches
Existing Conditions																		
OD1	E	86.0	0.7452	47.66	0.07447	500	1.53	12.4	3950	1.53	1.8	3.6	20.4	4450	34.7	32.8	0.328	2.8
OD2	E	86.0	0.7452	71.47	0.11167	500	1.67	12.0	4120	1.67	1.9	3.8	20.2	4620	35.7	32.3	0.323	2.8
OD3	E	86.0	0.7452	29.69	0.04639	500	1.60	12.2	2680	1.60	1.9	3.7	14.2	3180	27.7	26.4	0.264	2.8
OD4	E	86.0	0.7452	65.69	0.10264	500	1.71	11.9	4920	1.71	1.9	3.8	23.5	5420	40.1	35.4	0.354	2.8
OD5	E	86.0	0.7452	81.83	0.12786	500	1.57	12.3	3850	1.57	1.9	3.7	19.7	4350	34.2	31.9	0.319	2.8
OD6	E	86.0	0.7452	8.95	0.01398	500	1.43	12.7	847	1.43	1.8	3.5	6.4	1347	17.5	19.0	0.175	2.8
OD7	E	86.0	0.7452	3.72	0.00581	300	1.67	9.3	275	1.67	1.9	3.8	2.4	575	13.2	11.7	0.117	2.8
D-1	D	91.0	0.8112	19.75	0.03086	100	1.00	5.2	1670	1.13	2.1	3.3	9.9	1770	19.8	15.1	0.151	2.8
D-2	D	91.0	0.8112	11.75	0.01836	100	1.00	5.2	1440	1.48	2.5	3.7	7.6	1540	18.6	12.8	0.128	2.8
D-3	D	91.0	0.8112	7.50	0.01172	100	1.00	5.2	910	0.99	2.0	3.0	6.4	1010	15.6	11.6	0.116	2.8
R-1	D	98.0	0.9036	3.15	0.00492	30	2.00	1.5	1000	0.50	1.4	2.2	9.7	1030	15.7	11.2	0.112	2.8
R-2	D	98.0	0.9036	3.15	0.00492	30	2.00	1.5	1000	0.50	1.4	2.2	9.7	1030	15.7	11.2	0.112	2.8
C-1	E	90.0	0.7980	0.95	0.00148	50	0.74	4.2	630	0.74	1.3	2.5	7.4	680	13.8	11.7	0.117	2.8

Tc = Ti + Tt Tlag = 0.6 Tc

Ti = 1.8 (1.1 - K) L^1/2 / S^1/3

K = 0.0132 (CN) - 0.39

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2

Existing V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : **STANDARD FORM 4**

```
1****************************************
****************************************
 *                                      *
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *                                      *
 *              JUN   1998              *
 *                                      *
 *            VERSION 4.1               *
 *                                      *
 *                                      *
 *                                      *
 *  RUN DATE   27MAR02  TIME  09:17:31  *
 *                                      *
 *                                      *
 *                                      *
 ****************************************
****************************************
```


U.S. ARMY CORPS OF ENGINEERS

HYDROLOGIC ENGINEERING CENTER

609 SECOND STREET

DAVIS, CALIFORNIA 95616

(916) 756-1104


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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

              *DIAGRAM
    1         ID   ************************************************************
    2         ID   * ..........................................................  *
    3         ID   * :                                                        :  *
    4         ID   * :                                                        :  *
    5         ID   * :                                                        :  *
    6         ID   * :      UPPER FLAMINGO WASH DETENTION BASIN               :  *
    7         ID   * :      SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM  :  *
    8         ID   * :      EXISTING CONDITION                                :  *
    9         ID   * :........................................................:  *
   10         ID   * :              RETURN PERIOD_ _ _ _100-YR                :  *
   11         ID   * :              DISTRIBUTION_ _ _ _ 6-HOUR SDN3           :  *
   12         ID   * :              PROJECT NO_ _ _ _ _  550.040              :  *
   13         ID   * :              FILENAME_ _ _ _ _ CHANN.H1                :  *
   14         ID   * :              DATE MODELED_ _ _ _  03/25/02             :  *
   15         ID   * :              MODELED BY_ _ _ _ _      SLW              :  *
   16         ID   * :........................................................:  *
   17         ID   ************************************************************
   18         ID
   19         IT      5       0       0     300
   20         IO      5
   21         IN      5       0       0
   22         JR    PREC      1
              *
   23         KK     OD5
   24         KM   OPEN DESERT SUBBASIN OD5
   25         KM            AREA   81.83  AC
   26         KM         CURVE NO   86.0
   27         KM             LAG   0.319  HR
   28         BA  .12786
   29         PB     2.8
   30         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
   31         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
   32         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
   33         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
   34         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
   35         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
   36         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
   37         PC    .998    .999   1.00
```

```
 38          LS       0    86.0
 39          UD    .319
             *

 40          KK     RT1
 41          KM    ROUTE FLOWS NORTH IN CHANNEL
 42          RK     700   .0074    .035            TRAP      30       2
             *

 43          KK     OD4
 44          KM    OPEN DESERT SUBBASIN OD4
 45          KM             AREA   65.69  AC
 46          KM         CURVE NO    86.0
 47          KM              LAG   0.354  HR
 48          BA  .10265
1                                    HEC-1 INPUT                                                    PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 49          PB     2.8
 50          LS       0    86.0
 51          UD    .354
             *

 52          KK     CP1
 53          KM    JOIN OD5 AND OD4 IF CHANNEL
 54          HC       2
             *

 55          KK     RT2
 56          KM    ROUTE FLOWS NORTH IN CHANNEL TO OQUINDO
 57          RK     700   .0074    .035            TRAP      30       2
             *

 58          KK     OD1
 59          KM    OPEN DESERT SUBBASIN OD1
 60          KM             AREA    47.66 AC
 61          KM         CURVE NO    86.0
 62          KM              LAG    .328  HR
 63          BA  .07447
 64          PB     2.8
 65          LS       0    86.0
 66          UD    .328
             *

 67          KK     RT3
 68          KM    ROUTE FLOWS EAST IN OQUINDO TO D-1
 69          RK     600   .0050    .017            TRAP      80       1
             *

 70          KK     OD2
 71          KM    OPEN DESERT SUBBASIN OD2
 72          KM             AREA   71.47  AC
 73          KM         CURVE NO    86.0
 74          KM              LAG    .323  HR
 75          BA  .11168
 76          PB     2.8
 77          LS       0    86.0
 78          UD    .323
             *

 79          KK     RT4
 80          KM    ROUTE FLOWS THROUGH D-1 TO OQUINDO
 81          RK    1400   .0113    .017            TRAP      60       1
             *

 82          KK     D-1
 83          KM    DEVELOPED SUBDIVISION D-1
 84          KM             AREA   19.75  AC
 85          KM         CURVE NO    91.0
 86          KM              LAG    .151  HR
 87          BA  .03086
 88          PB     2.8
 89          LS       0    91.0
1                                    HEC-1 INPUT                                                    PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 90          UD    .151
             *

 91          KK     R-1
 92          KM    ROADWAY SUBBASIN R-1
 93          KM             AREA    0.93  AC
 94          KM         CURVE NO    98.0
 95          KM              LAG   0.214  HR
 96          BA  .00492
```

```
 97          PB     2.8
 98          LS       0    98.0
 99          UD    .214
             *

100          KK     CP2
101          KM   JOIN OD1, OD2 R1 AND D-1 AT OQUINDO
102          HC       4
             *

103          KK     DV1
104          KM   DIVERSION AT 1/2 ROW ROAD
105          DT      DD
106          DI       2    16.5      50     100      200      300
107          DQ       1       1    34.5    84.5   184.5   284.5
             *

108          KK     RT5
109          KM    ROUTE FLOWS EAST IN OQUINDO
110          RK     300   .005     .017            TRAP      60       1
             *

111          KK     OD7
112          KM   OPEN DESERT SUBBASIN OD7
113          KM            AREA    3.72 AC
114          KM        CURVE NO    86.0
115          KM             LAG    .112 HR
116          BA  .00581
117          PB     2.8
118          LS       0    86.0
119          UD    .112
             *

120          KK     CP3
121          KM   JOIN DV1 AND OND7 AT OQUINDO
122          HC       2
             •

123          KK     RT5
124          KM    ROUTE FLOWS EAST IN OQUINDO
125          RK     300   .005     .017            TRAP      60       1
             •
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

126          KK     OD3
127          KM   OPEN DESERT SUBBASIN OD3
128          KM            AREA   29.69  AC
129          KM        CURVE NO    86.0
130          KM             LAG    .264  HR
131          BA  .04639
132          PB     2.8
133          LS       0    86.0
134          UD    .264
             *

135          KK     RT5
136          KM    ROUTE FLOWS THROUGH D-2
137          RK     900   .0148    .017            TRAP      60       1
             *

138          KK     D-2
139          KM   DEVELOPED SUBDIVISION D-2
140          KM            AREA   11.75  AC
141          KM        CURVE NO    91.0
142          KM             LAG    .128  HR
143          BA  .01836
144          PB     2.8
145          LS       0    91.0
146          UD    .128
             *

147          KK     CP4
148          KM   JOIN OD1, OD2 , OND7, OND3, D-2 AND D-1 AT OQUINDO
149          HC       3
             *

150          KK     RT6
151          KM    ROUTE FLOWS EAST IN OQUINDO
152          RK     300   .005     .017            TRAP      60       1
             *

153          KK     OD6
154          KM   OPEN DESERT SUBBASIN OD6
155          KM            AREA    8.95 AC
```

```
156          KM         CURVE NO    86.0
157          KM              LAG   0.175 HR
158          BA  .01398
159          PB     2.8
160          LS       0    86.0
161          UD   0.175
                  •

162          KK     R-2
163          KM   ROADWAY SUBBASIN R-1
164          KM              AREA    0.93  AC
165          KM         CURVE NO    98.0
166          KM              LAG   0.214  HR
167          BA  .00492
1                                        HEC-1 INPUT                                                    PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

168          PB     2.8
169          LS       0    98.0
170          UD    .214
171
                  *

172          KK     CP5
173          KM   JOIN OD1, OD2, OND3, OND4, OND5, OND6, OND7, D,1, D-2 AND R-1 AT CHANNEL
174          HC       4
                  *

175          KK     RT7
176          KM    ROUTE FLOWS NORTH IN CHANNEL
177          RK     700   .0074    .035            TRAP      30       2
                  *

178          KK     D-3
179          KM   DEVELOPED SUBDIVISION D-3
180          KM              AREA     7.5  AC
181          KM         CURVE NO    91.0
182          KM              LAG    .116  HR
183          BA  .01172
184          PB     2.8
185          LS       0    91.0
186          UD    .116
                  *

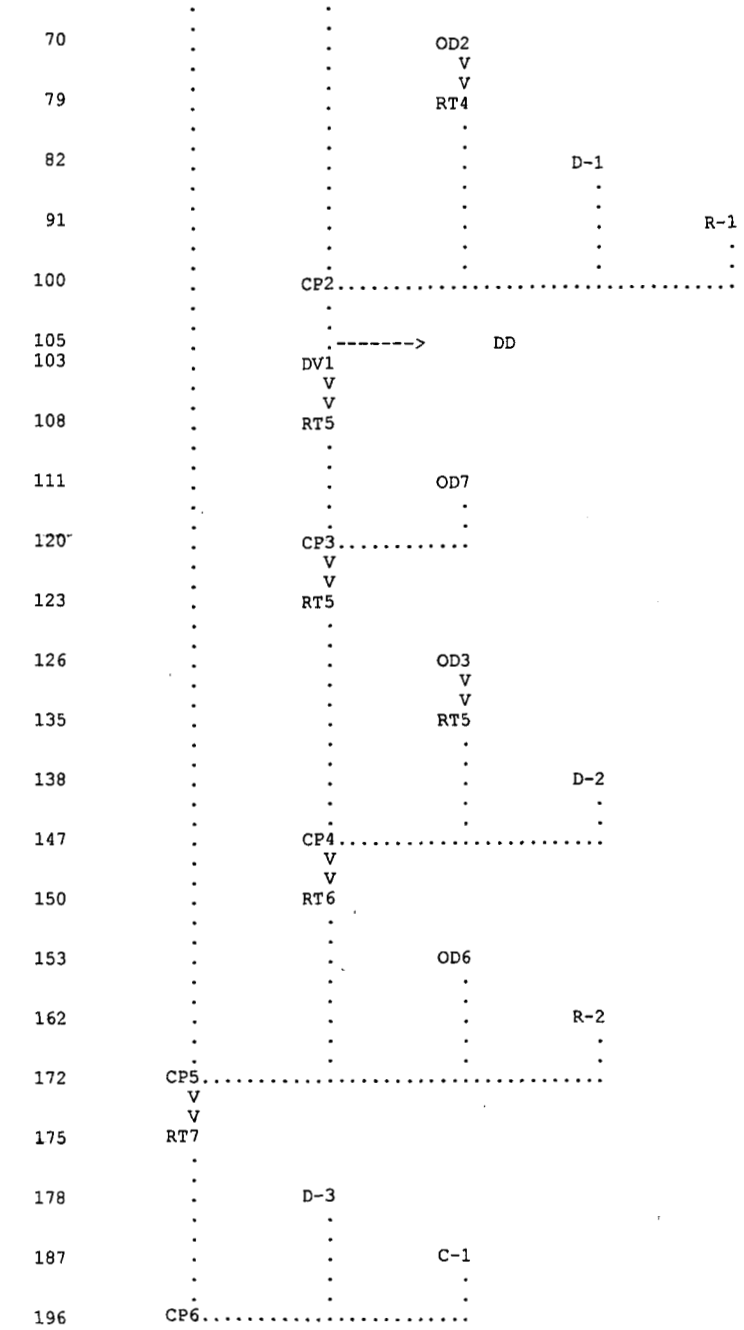
187          KK     C-1
188          KM   CHANNEL SUBBASIN C-1
189          KM              AREA    0.95  AC
190          KM         CURVE NO    90.0
191          KM              LAG   0.117  HR
192          BA  .00148
193          PB     2.8
194          LS       0    90.0
195          UD    .117
                  *

196          KK     CP6
197          KM   JOIN OD1, OD2, OND3, OND4, OND5, OND6, OND7, D,1, D-2, D-3, C-1 AND R-1 AT CH
198          HC       3
                  •
199          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
 LINE     (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

   23        OD5
               V
               V
   40        RT1
               .
               .
   43          .          OD4
               .            .
               .            .
   52        CP1.............
               V
               V
   55        RT2
               .
               .
   58          .          OD1
               .            V
               .            V
   67          .          RT3
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********

****

*

*

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *

*

* JUN 1998 *

*

* VERSION 4.1 *

*

*

*

* RUN DATE 27MAR02 TIME 09:17:31 *

*

*

*

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*

*

* U.S. ARMY CORPS OF ENGINEERS

* HYDROLOGIC ENGINEERING CENTER

* 609 SECOND STREET

* DAVIS, CALIFORNIA 95616

* (916) 756-1104

*

```
UPPER FLAMINGO WASH DETENTION BASIN
SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM
EXISTING CONDITION

RETURN PERIOD_ _ _ _100-YR
DISTRIBUTION_ _ _ _ 6-HOUR SDN3
PROJECT NO_ _ _ _ _ 550.040
FILENAME_ _ _ _ _ _ CHANN.H1
DATE MODELED_ _ _ _ 03/25/02
MODELED BY_ _ _ _ _ SLW
```

```
 20 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2   0  ENDING DATE
                     NDTIME       0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL      .08 HOURS
                        TOTAL TIME BASE    24.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

    JP          MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00

        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT


        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT


 *** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
     CARD NO.  171
1

              PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                              TIME TO PEAK IN HOURS


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA     PLAN                 RATIO 1
                                                             1.00

 HYDROGRAPH AT
+                 OD5        .13      1    FLOW             119.
                                            TIME             3.75

 ROUTED TO
+                 RT1        .13      1    FLOW             117.
                                            TIME             3.75

 HYDROGRAPH AT
```

+	OD4	.10	1	FLOW	90.
				TIME	3.75
2 COMBINED AT					
+	CP1	.23	1	FLOW	208.
				TIME	3.75
ROUTED TO					
+	RT2	.23	1	FLOW	206.
				TIME	3.83
HYDROGRAPH AT					
+	OD1	.07	1	FLOW	69.
				TIME	3.75
ROUTED TO					
+	RT3	.07	1	FLOW	67.
				TIME	3.75
HYDROGRAPH AT					
+	OD2	.11	1	FLOW	104.
				TIME	3.75
ROUTED TO					
+	RT4	.11	1	FLOW	101.
				TIME	3.83
HYDROGRAPH AT					
+	D-1	.03	1	FLOW	47.
				TIME	3.58
HYDROGRAPH AT					
+	R-1	.00	1	FLOW	8.
				TIME	3.58
4 COMBINED AT					
+	CP2	.22	1	FLOW	205.
				TIME	3.75
DIVERSION TO					
+	DD	.22	1	FLOW	190.
				TIME	3.75
HYDROGRAPH AT					
+	DV1	.22	1	FLOW	16.
				TIME	3.17
ROUTED TO					
+	RT5	.22	1	FLOW	16.
				TIME	3.25
HYDROGRAPH AT					
+	OD7	.01	1	FLOW	8.
				TIME	3.58
2 COMBINED AT					
+	CP3	.23	1	FLOW	23.
				TIME	3.58
ROUTED TO					
+	RT5	.23	1	FLOW	23.
				TIME	3.58
HYDROGRAPH AT					
+	OD3	.05	1	FLOW	47.
				TIME	3.67
ROUTED TO					
+	RT5	.05	1	FLOW	46.
				TIME	3.75
HYDROGRAPH AT					
+	D-2	.02	1	FLOW	29.
				TIME	3.58
3 COMBINED AT					
+	CP4	.29	1	FLOW	90.
				TIME	3.58
ROUTED TO					
+	RT6	.29	1	FLOW	89.
				TIME	3.67
HYDROGRAPH AT					
+	OD6	.01	1	FLOW	17.
				TIME	3.58

```
 HYDROGRAPH AT
+                    R-2        .00     1   FLOW          8.
                                            TIME        3.58

  4 COMBINED AT
+                    CP5        .54     1   FLOW        306.
                                            TIME        3.75

 ROUTED TO
+                    RT7        .54     1   FLOW        302.
                                            TIME        3.75

 HYDROGRAPH AT
+                    D-3        .01     1   FLOW         19.
                                            TIME        3.58

 HYDROGRAPH AT
+                    C-1        .00     1   FLOW          2.
                                            TIME        3.58

  3 COMBINED AT
+                    CP6        .56     1   FLOW        314.
                                            TIME        3.75
1
                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                    INTERPOLATED TO
                                                                    COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                    PEAK

                                (MIN)     (CFS)     (MIN)      (IN)     (MIN)     (CFS)     (MIN)      (IN)

          FOR PLAN = 1  RATIO= 1.00
               RT1  MANE          .83    119.13    226.58      1.49      5.00    117.38    225.00      1.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1018E+02 EXCESS= .0000E+00 OUTFLOW= .1019E+02 BASIN STORAGE= .3146E-05 PERCENT ERROR=
-.1

          FOR PLAN = 1  RATIO= 1.00
               RT2  MANE          .62    207.45    226.45      1.49      5.00    206.11    230.00      1.50

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1836E+02 EXCESS= .0000E+00 OUTFLOW= .1837E+02 BASIN STORAGE= .1063E-04 PERCENT ERROR=
.0

          FOR PLAN = 1  RATIO= 1.00
               RT3  MANE          .76     68.47    226.34      1.49      5.00     67.25    225.00      1.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5928E+01 EXCESS= .0000E+00 OUTFLOW= .5933E+01 BASIN STORAGE= .9646E-05 PERCENT ERROR=
-.1

          FOR PLAN = 1  RATIO= 1.00
               RT4  MANE         1.15    103.14    227.71      1.49      5.00    101.24    230.00      1.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8890E+01 EXCESS= .0000E+00 OUTFLOW= .8899E+01 BASIN STORAGE= .2463E-04 PERCENT ERROR=
-.1

          FOR PLAN = 1  RATIO= 1.00
               RT5  MANE          .62     15.50    191.79       .40      5.00     15.50    195.00       .40

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4747E+01 EXCESS= .0000E+00 OUTFLOW= .4748E+01 BASIN STORAGE= .1003E-05 PERCENT ERROR=
.0

          FOR PLAN = 1  RATIO= 1.00
               RT5  MANE          .55     23.13    215.53       .43      5.00     23.12    215.00       .43

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5211E+01 EXCESS= .0000E+00 OUTFLOW= .5212E+01 BASIN STORAGE= .2544E-05 PERCENT ERROR=
.0

          FOR PLAN = 1  RATIO= 1.00
               RT5  MANE          .88     46.91    222.08      1.49      5.00     46.23    225.00      1.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3693E+01 EXCESS= .0000E+00 OUTFLOW= .3697E+01 BASIN STORAGE= .8743E-05 PERCENT ERROR=
-.1
```

FOR PLAN = 1 RATIO= 1.00

RT6	MANE	.45	89.50	216.16	.69	5.00	89.05	220.00	.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1076E+02 EXCESS= .0000E+00 OUTFLOW= .1076E+02 BASIN STORAGE= .7953E-05 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RT7	MANE	.63	304.99	226.03	1.07	5.00	302.40	225.00	1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3093E+02 EXCESS= .0000E+00 OUTFLOW= .3094E+02 BASIN STORAGE= .2893E-04 PERCENT ERROR= .0

*** 1 ERROR(S) DETECTED BY HEC-1 ***

	Q	Acre Ft	K		LENGTH	SLOPE	LS	CP		TONS Y	CF	Acre Ft	sediment to flow
OD1		68	6	0.17	4450	0.0153	0.514415		0.45	108.31	2548.471	0.058505	0.009751
OD2		102	9	0.17	4620	0.0167	0.552438		0.45	183.1727	4309.946	0.098943	0.010994
OD3		46	4	0.17	3180	0.0160	0.479383		0.45	64.61984	1520.467	0.034905	0.008726
OD4		89	8	0.17	5420	0.0171	0.589374		0.45	169.498	3988.189	0.091556	0.011445
OD5		117	10	0.17	4350	0.0157	0.519868		0.45	197.4521	4645.933	0.106656	0.010666
OD6		16	1	0.17	1347	0.0143	0.343913		0.45	11.80704	277.8128	0.006378	0.006378
OD7		8	0.4	0.17	575	0.0167	0.295659		0.45	4.121551	96.97766	0.002226	0.005566
D1		47	3		1770	0.0113							
D2		29	2		1540	0.0148							
D3		18	1		1010	0.0099							

APPENDIX B
Hydraulic Calculations

Sedimentation Analysis
Comparison Table of HEC-RAS Model Results
HEC-RAS Model – Current Conditions
- Output Tables
- Profiles
- Cross Sections
- Printout of Output File (Showing input, output, and summary of errors)

HEC-RAS Models – Historic Topography With Historic/Current Flows
- Output Tables
- Profiles
- Cross Sections
- Printout of Output File (Showing input, output, and summary of errors)

Diskette Containing HEC-RAS Files

Southern Vistas Estates Channel and Berm

Sediment evaluation using Modified Universal Soil Loss Equation (1307)

$Y_s = \alpha (VQ_p)^{\beta} KLSCP$

Ys = Storm event yield in tons

Qp = Storm event peak flow in cfs

V = Storm event runoff volume in Acre Ft

K = Soil erodibility factor

LS = Topographic factor = $(LENGTH / 72.6)^{0.3}$ X { ([430 X $SLOPE^2$] +[30 X SLOPE] + 0.43) / 6.613 }

Formula from reference Upper Flamingo Detention Basin LOMR by Black & Veatch

C = Cropping Factor 0.45 for desert and 0.20 for residential

P = Conservative practices factor 1 or desert and 0.30 for residential

Basin	Routed 100 year Q	Total Flow Acre Ft	K	Flow LENGTH	Basin SLOPE	LS	CP	Sediment TONS Y	CF	Acre Ft	Sediment Volume to Flow Volume Percent	Bulking Factor	Bulked Flow cfs	Rounded Bulked Flow cfs
OD1 RT3	66	6	0.17	4450	0.0153	0.5144	0.45	106.5	2506.22	0.057535	0.009589	1.009589	66.63288	67
OD2 RT4	100	9	0.17	4620	0.0167	0.5524	0.45	181.2	4262.42	0.097852	0.010872	1.010872	101.0872	101
OD3	46	4	0.17	3180	0.0160	0.4794	0.45	64.6	1520.47	0.034905	0.008726	1.008726	46.40141	46
OD4	89	8	0.17	5420	0.0171	0.5894	0.45	169.5	3988.19	0.091556	0.011445	1.011445	90.01856	90
OD5 RT1	115	10	0.17	4350	0.0157	0.5199	0.45	195.6	4601.29	0.105631	0.010563	1.010563	116.2148	116
OD6	16	1	0.17	1347	0.0143	0.3439	0.45	11.8	277.81	0.006378	0.006378	1.006378	16.10204	16
OD7	8	0.4	0.17	575	0.0167	0.2957	0.45	4.1	96.98	0.002226	0.005566	1.005566	8.044526	8
D1	47	3	0.17	1770	0.0113	0.3248	0.06	5.0	118.33	0.002716	0.000905	1.000905	47.04256	47
D2	29	2	0.17	1540	0.0148	0.3660	0.06	3.4	81.09	0.001862	0.000931	1.000931	29.02699	29
D3	18	1	0.17	1010	0.0099	0.2562	0.06	1.3	29.48	0.000677	0.000677	1.000677	18.01218	18
R1														8
Routed flows														
CP1														206
CP2														205
DV1														16
CP3														23
CP4														88
CP5														303
CP6														311

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Station Comparison ESI channel HEC-2 and Black and Veatch Calculations

	Historical Section No.	Historical Station	Curremt Profile Station	Historical WSE	Curremt WSE	Elevation Channel Bottom	Elevation Channel Dike	Historical Channel Freeboard	Curremt Channel Freeboard
Begin Berm/Dike	65	1+70.00	102+10.00	2512.96	2512.08	2510.90	2514.50	1.54	2.42
	64	2+00.00	102+40.00	2512.04	2511.18	2510.10	2514.00	1.96	2.82
	63	2+50.00	102+90.00	2511.50	2510.57	2509.40	2513.50	2.00	2.93
	62	3+00.00	103+40.00	2510.63	2509.82	2508.70	2512.30	1.67	2.48
	61	3+50.00	103+90.00	2509.78	2508.78	2507.70	2511.80	2.02	3.02
	60	4+00.00	104+40.00	2509.18	2508.12	2506.80	2511.20	2.02	3.08
	59	4+50.00	104+90.00	2508.58	2507.67	2506.30	2510.50	1.92	2.83
	58	5+00.00	105+40.00	2507.67	2506.88	2505.80	2509.50	1.83	2.62
	57	5+50.00	105+90.00	2506.79	2505.85	2504.60	2509.00	2.21	3.15
	56	6+00.00	106+40.00	2505.71	2504.82	2503.60	2508.50	2.79	3.68
	55	6+50.00	106+90.00	2503.88	2503.19	2502.20	2507.70	3.82	4.51
	54	7+00.00	107+40.00	2503.14	2502.06	2500.50	2507.20	4.06	5.14
	53	7+50.00	107+90.00	2502.74	2501.72	2499.90	2506.50	3.76	4.78
	51	8+00.00	108+40.00	2502.50	2501.53	2499.70	2505.70	3.20	4.17
	50	8+50.00	108+90.00	2502.27	2501.37	2499.50	2505.00	2.73	3.63
	48	9+00.00	109+40.00	2501.64	2501.01	2499.40	2504.20	2.56	3.19
	47	9+50.00	109+90.00	2500.83	2500.18	2499.25	2503.50	2.67	3.32
	45	10+00.00	110+40.00	2500.40	2499.74	2498.90	2502.60	2.20	2.86
	42	10+50.00	110+90.00	2499.61	2499.05	2498.20	2501.80	2.19	2.75
	40	11+00.00	111+40.00	2498.99	2498.30	2497.30	2501.00	2.01	2.70
	39	11+50.00	111+90.00	2498.17	2497.44	2496.70	2500.50	2.33	3.06
	38	12+00.00	112+40.00	2498.02	2496.62	2495.20	2500.00	1.98	3.38
Begin Channel	36	12+50.00	112+90.00	2497.02	2495.67	2493.50	2499.50	2.48	3.83
	33	13+00.00	113+40.00	2495.79	2493.40	2490.24	2499.00	3.21	5.60
	31	14+00.00	114+40.00	2495.48	2493.18	2490.00	2498.00	2.52	4.82
	30	15+00.00	115+40.00	2494.66	2492.67	2490.20	2497.20	2.54	4.53
	29	15+40.00	115+80.00	2494.58	2492.49	2490.20	2497.04	2.46	4.55
	28	15+50.00	115+90.00	2494.20	2492.06	2490.00	2498.00	3.80	5.94
	27	15+70.00	116+10.00	2491.66	2489.87	2488.52	2495.52	3.86	5.65
	26	15+90.00	116+30.00	2489.98	2489.41	2487.04	2494.04	4.06	4.63
	25	16+00.00	116+40.00	2492.11	2489.76	2487.00	2494.10	1.99	4.34
	24	16+15.00	116+55.00	2492.05	2489.68	2486.94	2493.94	1.89	4.26
	23	17+00.00	117+40.00	2491.64	2489.30	2486.60	2493.60	1.96	4.30
	22	18+00.00	118+40.00	2491.43	2489.07	2486.20	2493.30	1.87	4.23
	21	19+00.00	119+40.00	2491.27	2488.92	2485.80	2492.80	1.53	3.88
	20	20+00.00	120+40.00	2490.01	2487.95	2485.40	2492.50	2.49	4.55
	19	21+00.00	121+40.00	2488.69	2487.29	2485.00	2492.10	3.41	4.81
	18	21+10.00	121+50.00	2488.02	2487.40	2484.96	2491.56	3.54	4.16
	17	21+25.00	121+65.00	2487.60	2487.42	2484.90	2490.90	3.30	3.48
	16	21+40.00	121+80.00	2487.20	2487.44	2484.84	2490.24	3.04	2.80
	15	21+50.00	121+90.00	2487.01	2487.01	2484.80	2489.80	2.79	2.79
	14	22+00.00	122+40.00	2488.26	2486.79	2484.60	2489.60	1.34	2.81
	13	22+90.00	123+30.00	2488.28	2486.36	2484.24	2489.24	0.96	2.88
	12	23+00.00	123+40.00	2487.19	2486.00	2484.20	2489.20	2.01	3.20
	11	23+20.00	123+60.00	2485.64	2484.66	2483.32	2488.32	2.68	3.66
	10	23+40.00	123+80.00	2484.73	2484.83	2482.44	2487.44	2.71	2.61
	9	23+50.00	123+90.00	2486.13	2484.78	2482.40	2487.40	1.27	2.62
	8	23+65.00	124+05.00	2485.99	2484.65	2482.34	2487.00	1.01	2.35
	7	24+00.00	124+40.00	2485.74	2484.43	2482.20	2487.20	1.46	2.77
	6	25+00.00	125+40.00	2485.37	2484.04	2481.80	2486.80	1.43	2.76
	5	26+00.00	126+40.00	2484.99	2483.66	2481.40	2486.42	1.43	2.76

4	27+00.00	127+40.00	2484.66	2483.32	2481.00	2486.00	1.34	2.68
3	28+00.00	128+40.00	2483.61	2482.41	2480.00	2486.60	2.99	4.19
2	28+50.00	128+90.00	2481.61	2480.88	2479.86	2485.60	3.99	4.72
1	28+75.00	129+15.00	2480.87	2480.44	2479.60	2482.80	1.93	2.36

HEC-RAS Model
Current Conditions

channel bank n = 0.035 for riprap
channel n = 0.025 for caliche bottom
channel n = 0.032 for natural channel
Spoil piles removed

	Section	Flow cfs	East Bank or Levee station	East Bank or Levee elevation	subcritical water surface elevation	Freeboard	Freeboard	Channel Velocity
	4280	116	1210.68	2522.00	2517.90	4.10	4.1	2.73
	4270	116	1237.68	2518.20	2515.95	2.25	2.3	4.16
Begin berm	4260	116	1221.53	2517.00	2514.55	2.45	2.4	2.71
	4250	116	1241.81	2516.00	2513.52	2.48	2.5	3.71
	4240	116	1154.89	2514.00	2511.92	2.08	2.1	3.94
	4230	116	1218.70	2513.00	2510.90	2.10	2.1	4.15
	4220	116	1258.70	2511.00	2508.80	2.20	2.2	4.34
	4210	116	1100.55	2511.00	2507.56	3.44	3.4	5.09
	4200	206	1322.33	2508.00	2505.42	2.58	2.6	6.01
	4100	206	1284.18	2508.00	2503.76	4.24	4.2	3.51
	4000	206	1202.48	2507.00	2503.63	3.37	3.4	2.16
	3900	206	1204.80	2505.47	2503.17	2.30	2.3	3.65
	3800	206	1223.72	2504.00	2501.82	2.18	2.2	4.04
	3700	206	1262.04	2502.65	2500.20	2.45	2.5	4.96
Begin channel	3600	206	1162.72	2501.00	2498.52	2.48	2.5	6.35
	3500	206	1169.15	2500.00	2496.38	3.62	3.6	4.95
	3400	206	1071.84	2498.00	2495.43	2.57	2.6	6.40
	3300	206	1126.26	2497.00	2493.22	3.78	3.8	4.92
	3200	206	1107.44	2496.00	2492.87	3.13	3.1	4.47
	3100	206	1088.93	2496.00	2492.52	3.48	3.5	4.44
	3000	206	1092.32	2495.00	2491.70	3.30	3.3	6.50
	2900	206	1055.87	2494.00	2491.16	2.84	2.8	5.41
	2800	206	1057.94	2493.00	2490.06	2.94	2.9	7.13
	2700	206	1091.34	2493.00	2488.78	4.22	4.2	6.78
	2600	303	1069.73	2490.00	2487.47	2.53	2.5	4.63
	2500	303	1087.02	2489.00	2486.83	2.17	2.2	5.40
	2400	303	1046.16	2488.53	2485.78	2.75	2.8	6.76
	2300	303	1047.73	2488.39	2485.86	2.53	2.5	3.31
	2200	303	1048.50	2488.00	2485.73	2.27	2.3	3.20
	2100	303	1041.91	2487.87	2485.48	2.39	2.4	3.85
End channel	2000	303	1054.28	2487.00	2484.56	2.44	2.4	6.51
	1900	311	1060.00	2486.80	2484.37	2.43	2.4	6.01
	1800	311	1050.00	2485.70	2483.69	2.01	2.0	4.68
	1700	311	1062.00	2484.30	2482.00	2.30	2.3	4.06

HEC-RAS Plan: FW3PR River: West Branch Reach: Reach #1 Profile: PF 1

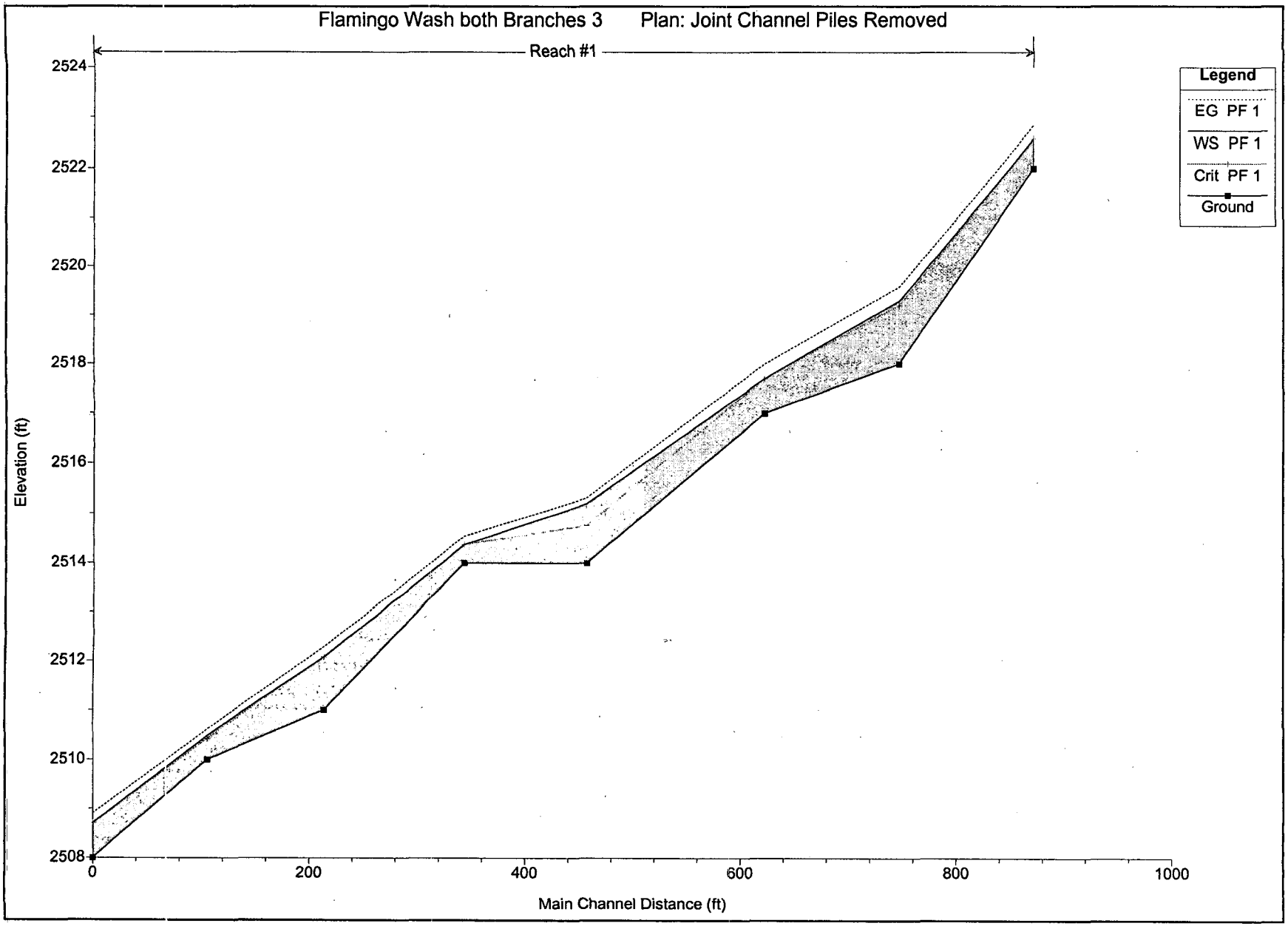
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #1	5000	90.00	2522.00	2522.58	2522.58	2522.84	0.018949	4.06	22.16	43.69	1.00
Reach #1	4900	90.00	2518.00	2519.30	2519.21	2519.59	0.009390	4.37	21.84	33.23	0.78
Reach #1	4800	90.00	2517.00	2517.70	2517.70	2517.99	0.018369	4.34	20.72	36.03	1.01
Reach #1	4700	90.00	2514.00	2515.20	2514.76	2515.31	0.003259	2.69	33.92	38.53	0.47
Reach #1	4600	90.00	2514.00	2514.37	2514.37	2514.54	0.021487	3.29	27.34	81.29	1.00
Reach #1	4500	90.00	2511.00	2512.08	2512.08	2512.29	0.010139	3.70	26.98	77.59	0.78
Reach #1	4400	90.00	2510.00	2510.49	2510.42	2510.61	0.012802	2.82	31.94	81.29	0.79
Reach #1	4300	90.00	2508.00	2508.70	2508.70	2508.90	0.020859	3.59	25.08	64.07	1.01

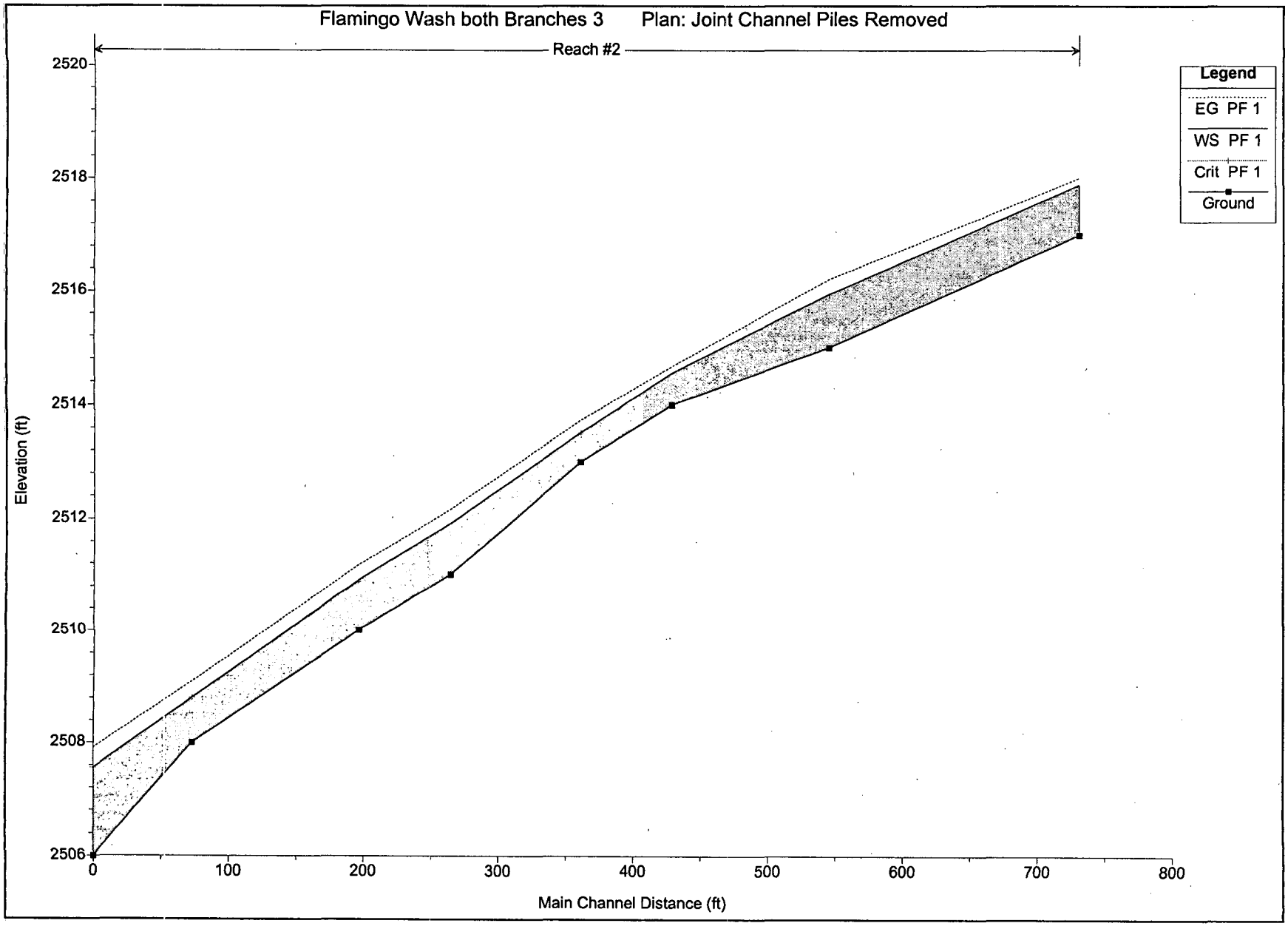
HEC-RAS Plan: FW3PR River: East Branch Reach: Reach #2 Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #2	4280	116.00	2517.00	2517.90		2518.01	0.005934	2.73	42.46	63.52	0.59
Reach #2	4270	116.00	2515.00	2515.95	2515.93	2516.22	0.017993	4.16	27.87	50.99	0.99
Reach #2	4260	116.00	2514.00	2514.55		2514.66	0.009693	2.71	42.85	94.03	0.71
Reach #2	4250	116.00	2513.00	2513.52	2513.51	2513.73	0.019973	3.71	31.28	73.64	1.00
Reach #2	4240	116.00	2511.00	2511.92		2512.17	0.013444	3.94	29.45	47.01	0.88
Reach #2	4230	116.00	2510.00	2510.90	2510.87	2511.17	0.015737	4.15	27.98	46.54	0.94
Reach #2	4220	116.00	2508.00	2508.80	2508.80	2509.09	0.017953	4.34	26.74	45.85	1.00
Reach #2	4210	116.00	2506.00	2507.56	2507.56	2507.91	0.011209	5.09	26.04	38.62	0.87

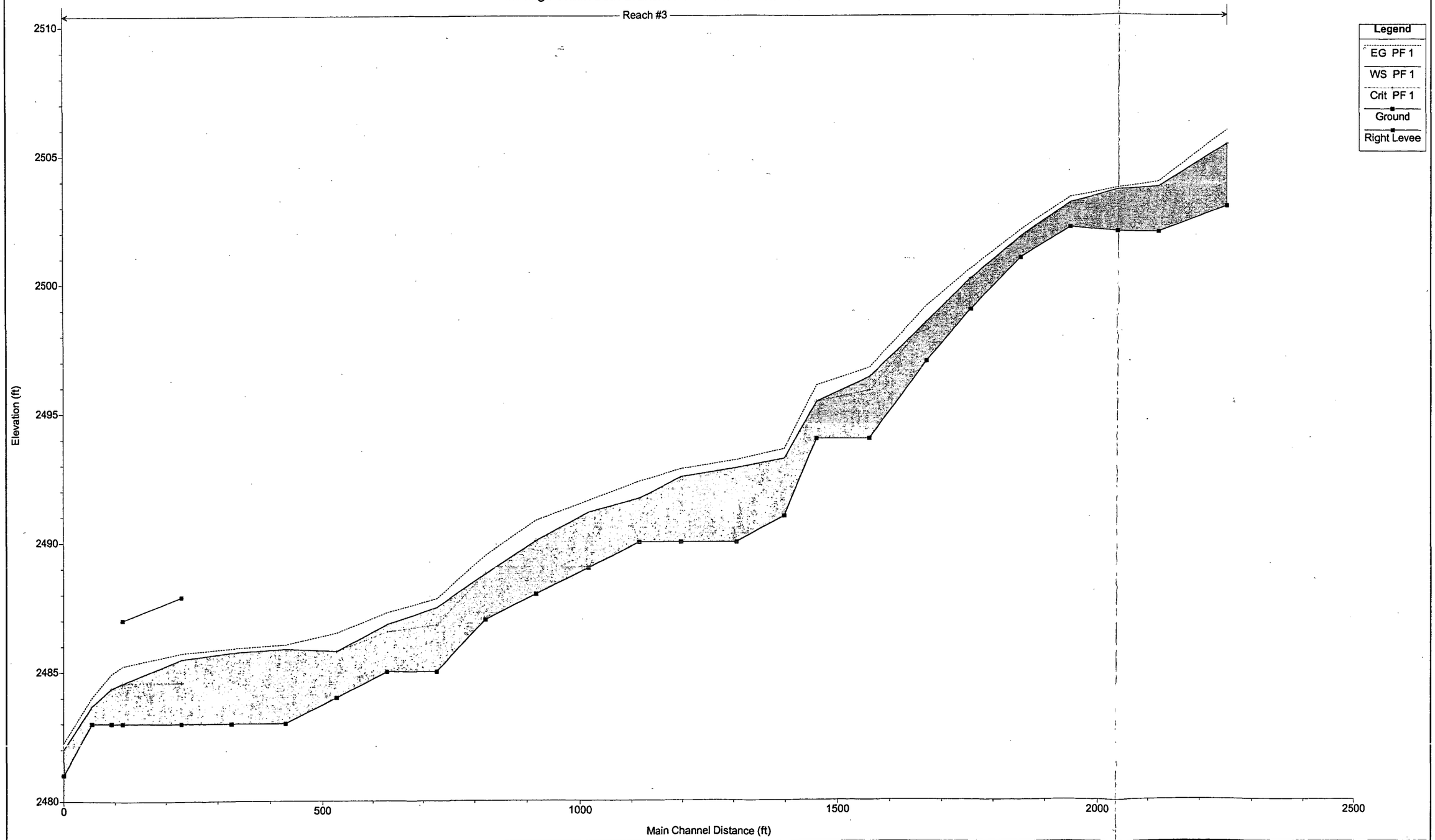
HEC-RAS Plan: FW3PR River: Joint Branch Reach: Reach #3 Profile: PF 1

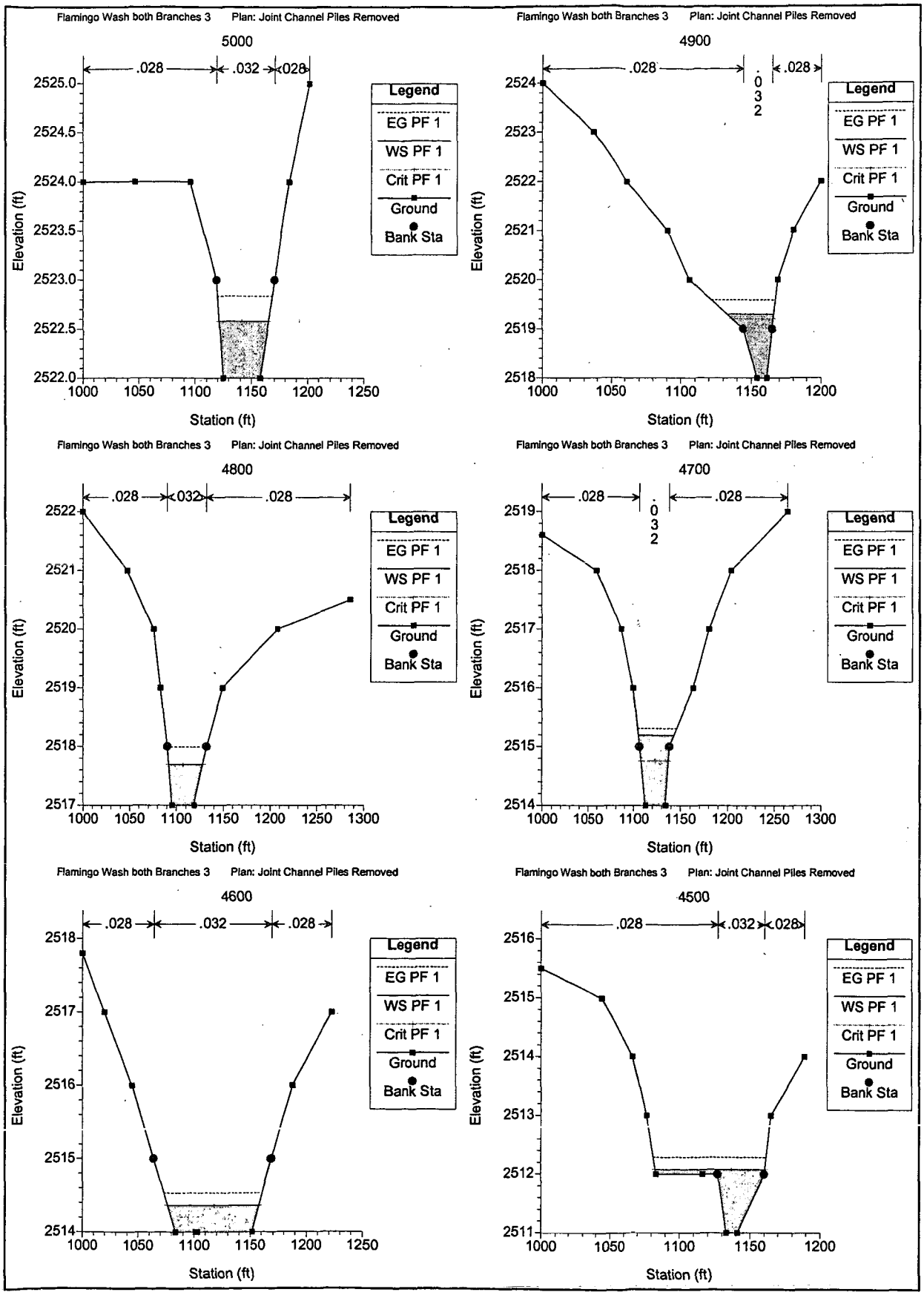
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #3	4200	206.00	2503.00	2505.42	2505.42	2505.96	0.011963	6.01	35.90	37.02	0.92
Reach #3	4100	206.00	2502.00	2503.76		2503.95	0.005768	3.51	58.77	59.14	0.62
Reach #3	4000	206.00	2502.00	2503.63	2503.05	2503.70	0.001532	2.16	102.73	102.90	0.33
Reach #3	3900	206.00	2502.20	2503.17	2503.10	2503.37	0.012757	3.66	56.64	101.69	0.84
Reach #3	3800	206.00	2501.00	2501.82	2501.77	2502.08	0.014433	4.04	50.95	82.43	0.91
Reach #3	3700	206.00	2499.00	2500.20	2500.20	2500.58	0.016049	4.96	41.86	58.55	0.99
Reach #3	3600	206.00	2497.00	2498.52	2498.52	2499.13	0.012586	6.35	33.28	28.53	0.96
Reach #3	3500	206.00	2494.00	2496.38	2495.86	2496.75	0.004467	4.95	43.35	24.67	0.61
Reach #3	3400	206.00	2494.00	2495.43	2495.43	2496.07	0.010020	6.41	32.15	25.49	1.01
Reach #3	3300	206.00	2491.00	2493.22		2493.60	0.006472	4.92	41.88	23.14	0.64
Reach #3	3200	206.00	2490.00	2492.87		2493.18	0.003207	4.47	47.25	23.99	0.52
Reach #3	3100	206.00	2490.00	2492.52		2492.83	0.003229	4.44	46.42	23.63	0.56
Reach #3	3000	206.00	2490.00	2491.70	2491.66	2492.36	0.009849	6.50	31.70	22.71	0.97
Reach #3	2900	206.00	2489.00	2491.15		2491.61	0.005209	5.41	38.05	22.32	0.73
Reach #3	2800	206.00	2488.00	2490.06	2490.06	2490.85	0.011149	7.12	28.95	18.60	1.01
Reach #3	2700	206.00	2487.00	2488.77	2488.77	2489.49	0.016745	6.79	30.34	21.38	1.00
Reach #3	2600	306.00	2485.00	2487.48	2486.81	2487.82	0.005084	4.65	65.79	33.72	0.59
Reach #3	2500	306.00	2485.00	2486.84	2486.55	2487.29	0.005599	5.42	56.41	35.78	0.76
Reach #3	2400	306.00	2484.00	2485.79	2485.79	2486.50	0.011068	6.75	45.34	31.95	1.00
Reach #3	2300	306.00	2483.00	2485.88		2486.05	0.001332	3.32	92.22	39.30	0.38
Reach #3	2200	306.00	2483.00	2485.74		2485.90	0.001422	3.21	95.42	44.22	0.38
Reach #3	2100	306.00	2483.00	2485.50	2484.59	2485.73	0.002039	3.86	79.48	38.09	0.46
Reach #3	2000	306.00	2483.00	2484.57	2484.57	2485.24	0.010453	6.55	46.75	35.15	1.00
Reach #3	1900	311.00	2483.00	2484.37	2484.37	2484.93	0.009162	6.01	51.77	46.57	1.00
Reach #3	1800	311.00	2483.00	2483.69	2483.69	2484.03	0.010698	4.68	66.40	97.42	1.00
Reach #3	1700	311.00	2481.00	2482.00	2482.00	2482.25	0.016978	4.06	76.62	153.62	1.01

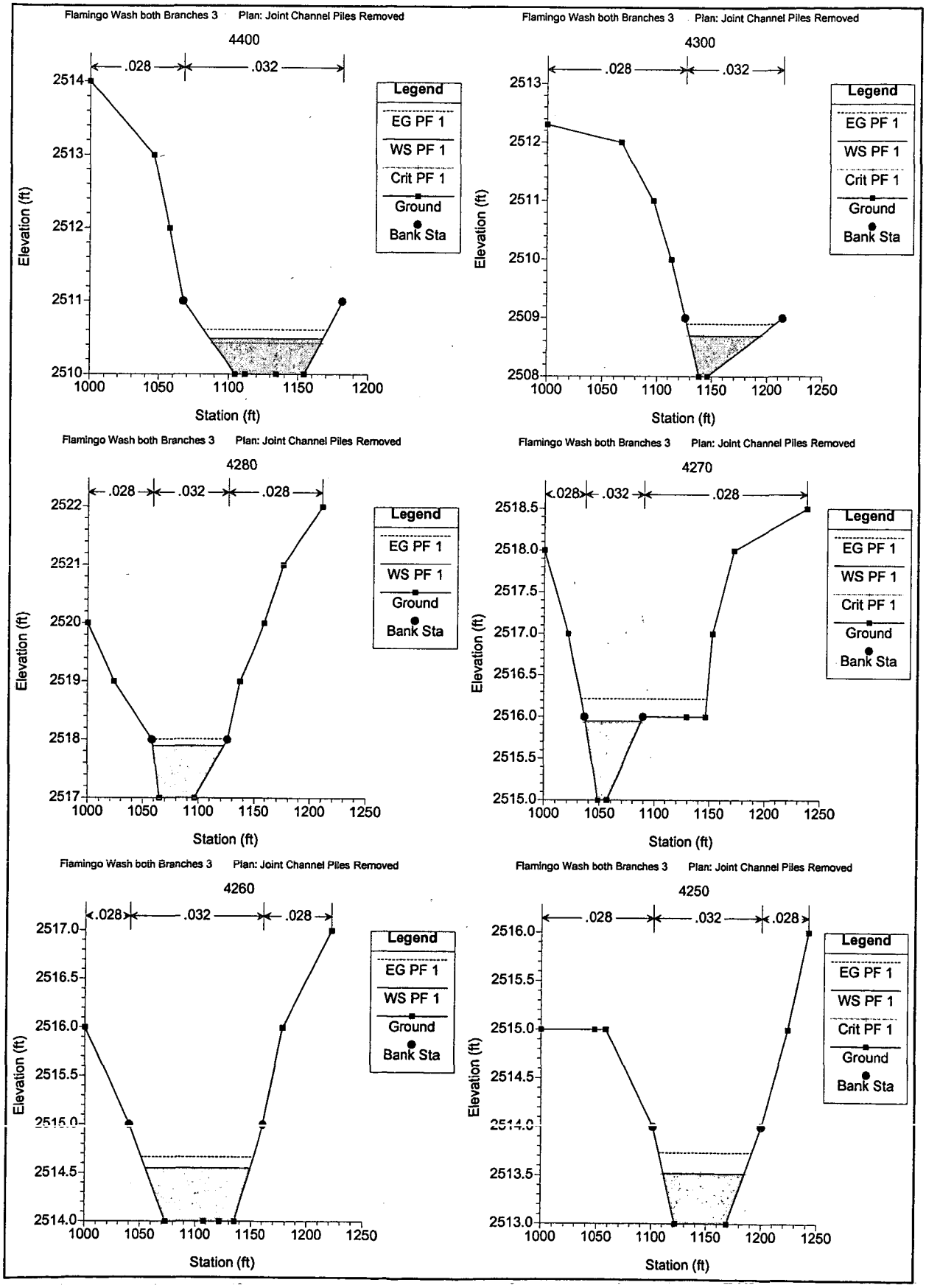

Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
Reach #1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2524
2522
2520
2518
2516
2514
2512
2510
2508
0
200
400
600
800
1000
Main Channel Distance (ft)

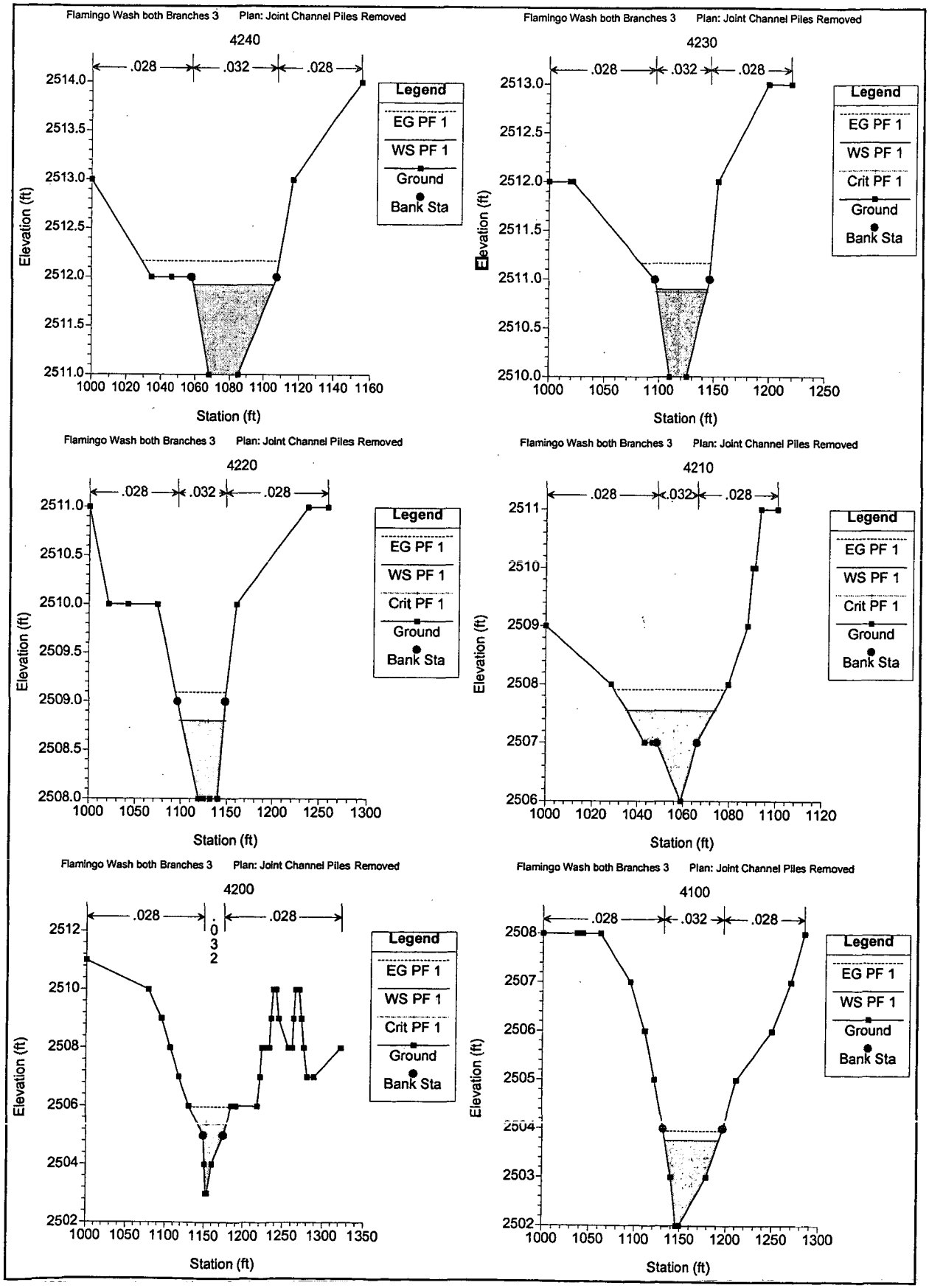

Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
Reach #2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2520
2518
2516
2514
2512
2510
2508
2506
0
100
200
300
400
500
600
700
800
Main Channel Distance (ft)

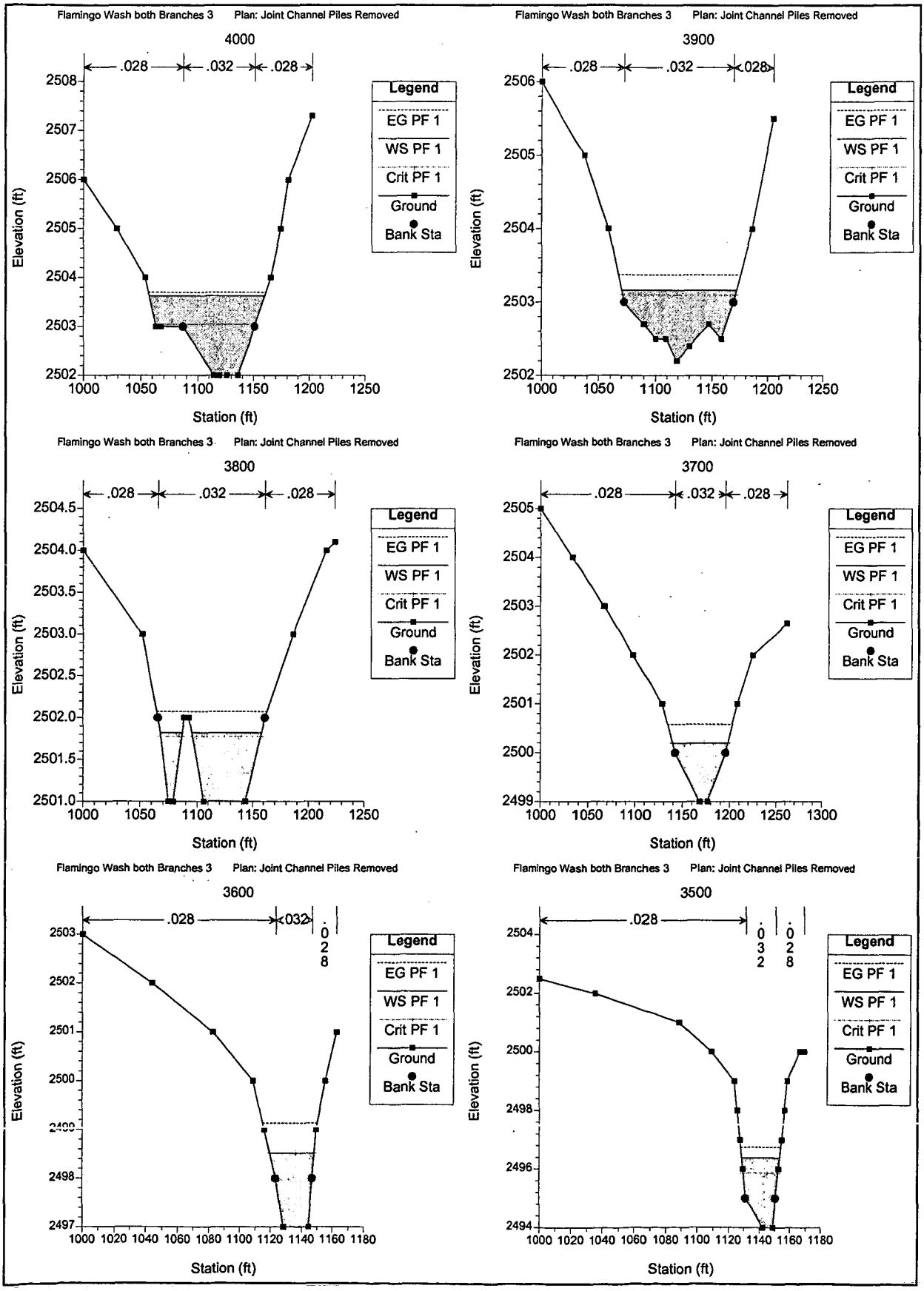
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed

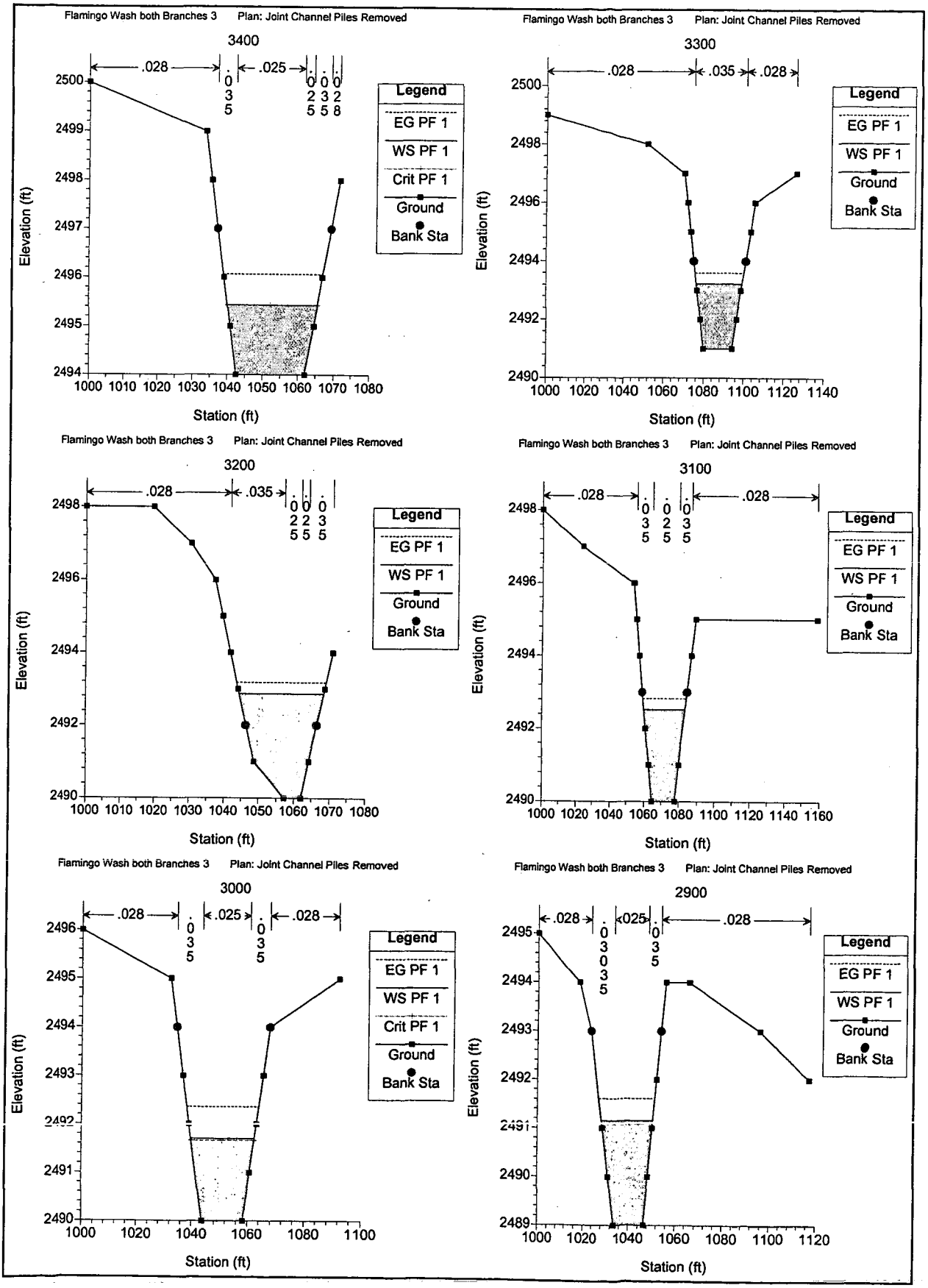


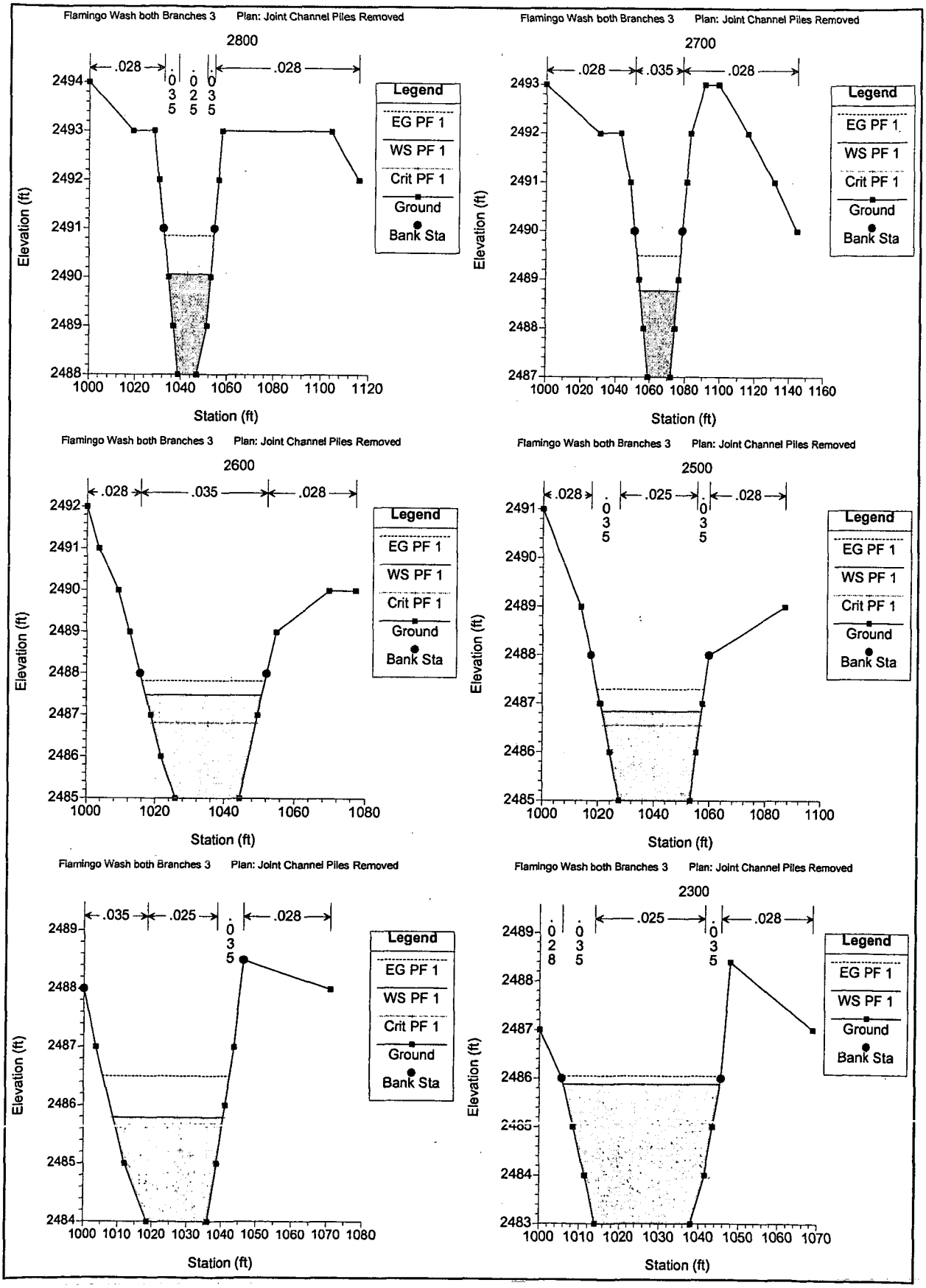

Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
5000
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4900
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4800
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4700
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4600
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4500
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

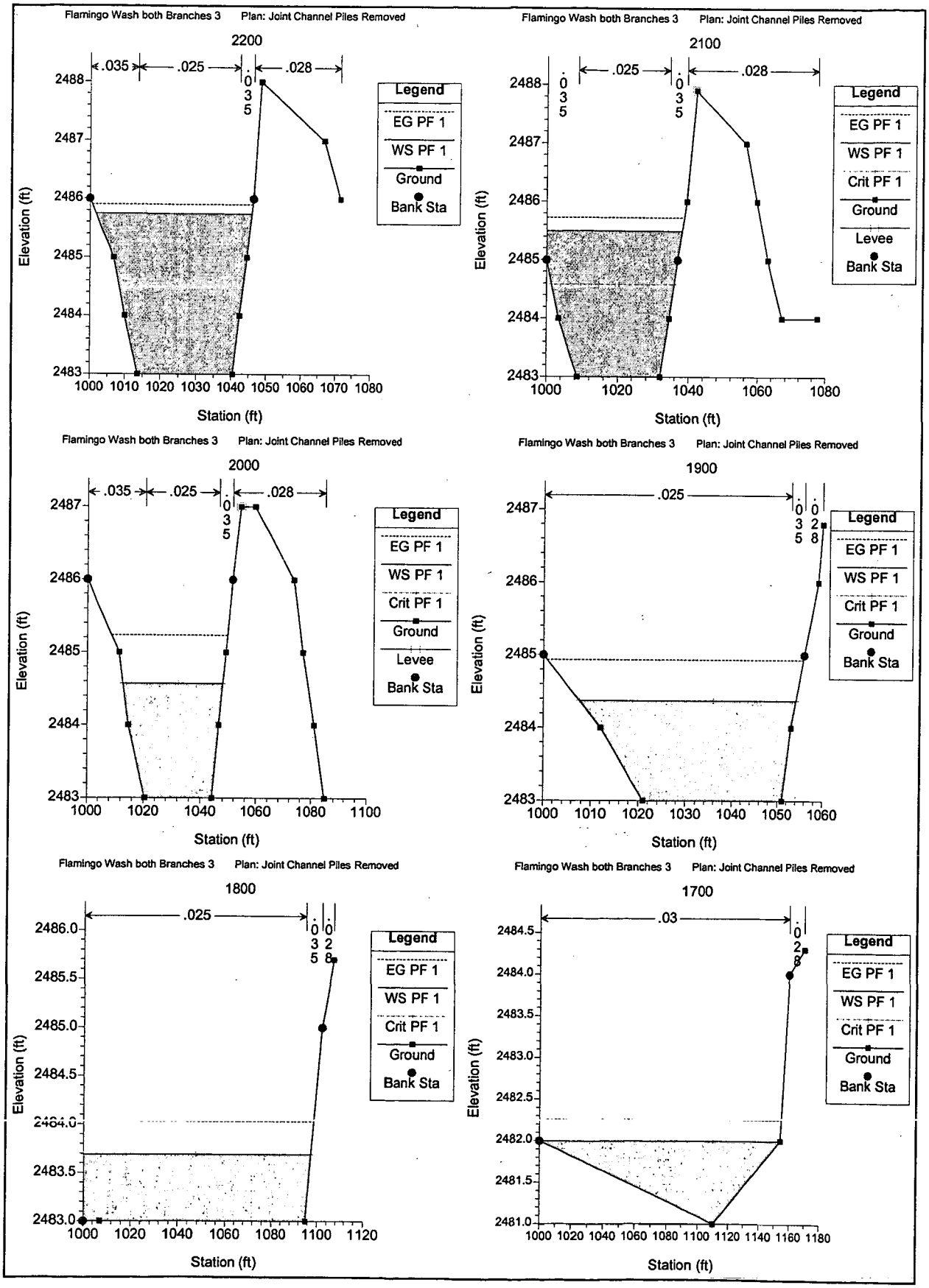

Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4400
.028
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4300
.028
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4280
.028
.032
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4270
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4260
.028
.032
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4250
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4240
.028
.032
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4230
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4220
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4210
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4200
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4100
.028
.032
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
4000
.028
.032
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3900
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3800
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3700
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3600
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3500


Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3400
.028
.025
.035
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3300
.028
.035
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3200
.028
.035
.035
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3100
.028
.035
.035
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
3000
.028
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2900
.028
.025
.035
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2800
.028
.035
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2700
.028
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2600
.028
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2500
.028
.025
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
.035
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2300
.028
.035
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2200
.035
.025
.028
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2100
.025
.028
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
2000
.035
.025
.028
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
1900
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
1800
.025
.035
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Flamingo Wash both Branches 3 Plan: Joint Channel Piles Removed
1700
.03
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
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
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X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
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PROJECT DATA
Project Title: Flamingo Wash both Branches 3
Project File : FW3.prj
Run Date and Time: 9/18/2002 2:07:12 PM

Project in English units

PLAN DATA

Plan Title: Joint Channel Piles Removed
Plan File : f:\550-040\HEC-RAS\FW3.p07

Geometry Title: Joint Channel Piles removed
Geometry File : f:\550-040\HEC-RAS\FW3.g07

Flow Title : Q100 Joint Flow
Flow File : f:\550-040\HEC-RAS\fw2.f04

Plan Summary Information:
Number of: Cross Sections = 42 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: Subcritical Flow

FLOW DATA

Flow Title: Q100 Joint Flow
Flow File : f:\550-040\HEC-RAS\fw2.f04

Flow Data (cfs)

River	Reach	RS	PF 1
West Branch	Reach #1	5000	90
West Branch	Reach #1	4900	90
East Branch	Reach #2	4280	116
Joint Branch	Reach #3	4200	206
Joint Branch	Reach #3	4100	206
Joint Branch	Reach #3	2600	306
Joint Branch	Reach #3	2000	306
Joint Branch	Reach #3	1900	311
Joint Branch	Reach #3	1700	311

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
West Branch	Reach #1	PF 1	Normal S = .0323	
East Branch	Reach #2	PF 1	Normal S = .0108	
Joint Branch	Reach #3	PF 1		Normal S = .0182

GEOMETRY DATA

Geometry Title: Joint Channel Piles removed
Geometry File : f:\550-040\HEC-RAS\FW3.g07

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
West Branch	Reach #1		Junction 1
East Branch	Reach #2		Junction 1
Joint Branch	Reach #3	Junction 1	

JUNCTION INFORMATION

Name: Junction 1
Description: Junction of East and West Branch
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
West Branch	Reach #1	to Joint Branch	Reach #3	127.81	
East Branch	Reach #2	to Joint Branch	Reach #3	108.64	

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 5000

INPUT
Description: 5000
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2524	1046.47	2524	1095.7	2524	1118.9	2523	1125.03	2522
1157.91	2522	1170.45	2523	1183.34	2524	1201.43	2525		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1118.9	.032	1170.45	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1118.9	1170.45	89.58	124.41	140.38	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4900

INPUT
Description: 4900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2524	1037.32	2523	1061.23	2522	1090.54	2521	1106.05	2520
1144.35	2519	1154.16	2518	1161.07	2518	1165.03	2519	1168.77	2520
1180.25	2521	1199.88	2522						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1144.35	.032	1165.03	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1144.35	1165.03	138.21	124.96	118.21	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4800

INPUT
Description: 4800
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2522	1047.67	2521	1075.97	2520	1083.52	2519	1090.72	2518
1095.63	2517	1119.11	2517	1132.22	2518	1149.57	2519	1207.81	2520
1286.54	2520.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1090.72	.032	1132.22	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1090.72	1132.22	190.89	165.05	143.15	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4700

INPUT
Description: 4700
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2518.6	1059.49	2518	1086.16	2517	1099.82	2516	1105.92	2515
1112.64	2514	1134.19	2514	1138.34	2515	1163.49	2516	1180.32	2517
1204.22	2518	1264.28	2519						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1105.92	.032	1138.34	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1105.92	1138.34	114.06	113.59	117.01	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4600

INPUT
Description: 4600

Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2517.8	1019.58	2517	1044.57	2516	1064.08	2515	1083.56	2514
1101.31	2514	1102.91	2514	1151.5	2514	1168.45	2515	1187.62	2516
1222.18	2517								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1064.08	.032	1168.45	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1064.08	1168.45	118.31	130.08	131.97	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4500

INPUT
Description: 4500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2515.5	1043.88	2515	1066.74	2514	1076.59	2513	1083.57	2512
1116.28	2512	1127.1	2512	1132.95	2511	1141.11	2511	1160.21	2512
1164.78	2513	1188.96	2514						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1127.1	.032	1160.21	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1127.1	1160.21	104.31	107.98	105.49	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4400

INPUT
Description: 4400
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2514	1046.45	2513	1057.48	2512	1067.44	2511	1104.87	2510
1111.75	2510	1134.19	2510	1154.46	2510	1181.99	2511		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1067.44	.032	1181.99	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1067.44	1181.99	108.98	105.87	101.81	.1 .3

CROSS SECTION RIVER: West Branch
REACH: Reach #1 RS: 4300

INPUT
Description: 4300
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2512.3	1066.29	2512	1096.07	2511	1112.96	2510	1125.84	2509
1138.31	2508	1145.94	2508	1214.13	2509				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1125.84	.032	1214.13	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1125.84	1214.13	0	0	0	.1 .3

CROSS SECTION RIVER: East Branch
REACH: Reach #2 RS: 4280

INPUT
Description: 4280
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2520	1023.61	2519	1058.94	2518	1065.08	2517	1096.44	2517
1126.23	2518	1137.33	2519	1159.14	2520	1175.55	2521	1210.68	2522

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1058.94	.032	1126.23	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1058.94	1126.23	134.27	185.17	210.05	.1 .3

CROSS SECTION RIVER: East Branch
REACH: Reach #2 RS: 4270

INPUT
Description: 4270
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2518	1021.42	2517	1036.38	2516	1048.64	2515	1056.55	2515
1089.8	2516	1129.45	2516	1146.5	2516	1152.83	2517	1171.89	2518
1237.68	2518.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1036.38	.032	1089.8	.028

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1036.38  1089.8           114.97  116.72  116.36            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4260

INPUT
Description: 4260
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2516 1040.21    2515 1072.99    2514 1107.66    2514 1121.32    2514
 1134.98    2514 1160.52    2515 1177.51    2516 1221.53    2517

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1040.21    .032 1160.52    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1040.21 1160.52           65.77    67.7   65.52            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4250

INPUT
Description: 4250
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2515 1047.99    2515 1058.05    2515 1101.28    2514 1121.62    2513
 1168.47    2513 1199.72    2514 1223.87    2515 1241.81    2516

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1101.28    .032 1199.72    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1101.28 1199.72           112.53   96.47    96.4            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4240

INPUT
Description: 4240
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2513 1034.75    2512 1046.05    2512 1058.07    2512 1068.38    2511
 1085.15    2511 1107.58    2512  1116.6    2513 1154.89    2514

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1058.07    .032 1107.58    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1058.07 1107.58           58.37    68.5    73.1            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4230

INPUT
Description: 4230
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2512 1019.06    2512 1021.28    2512 1096.21    2511 1109.69    2510
 1125.33    2510 1146.19    2511 1153.34    2512 1198.75    2513  1218.7    2513

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1096.21    .032 1146.19    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1096.21 1146.19           104.45  123.27  147.64            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4220

INPUT
Description: 4220
4220
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2511 1021.21    2510 1041.92    2510 1073.85    2510  1095.9    2509
  1119.5    2508 1124.91    2508 1132.52    2508 1140.37    2508 1147.93    2509
 1160.36    2510  1237.3    2511  1258.7    2511

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028  1095.9    .032 1147.93    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1095.9 1147.93           71.16   73.23    75.6            .1       .3

CROSS SECTION          RIVER: East Branch
REACH: Reach #2          RS: 4210

INPUT
Description: 4210
```

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2509	1028.49	2508	1043.24	2507	1046.43	2507	1048.46	2507
1058.86	2506	1059.05	2506	1066.18	2507	1079.67	2508	1087.89	2509
1090.11	2510	1091.06	2510	1093.61	2511	1100.55	2511		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1048.46	.032	1066.18	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1048.46	1066.18	0	0	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 4200

INPUT
Description: 4200
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2511	1078.25	2510	1094.99	2509	1106.09	2508	1117.84	2507
1130.87	2506	1148.81	2505	1150.39	2504	1152.26	2503	1153.71	2503
1159.93	2504	1174.19	2505	1184.31	2506	1190.69	2506	1217.75	2506
1221.34	2507	1223.4	2508	1229.34	2508	1233.23	2508	1235.52	2509
1237.88	2510	1241.48	2510	1244.89	2509	1257.2	2508	1261.4	2508
1263.33	2509	1265.51	2510	1270.35	2510	1273.27	2509	1276.16	2508
1280.57	2507	1289.41	2507	1322.33	2508				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1148.81	.032	1174.19	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1148.81	1174.19	128.56	131.99	99.11	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 4100

INPUT
Description: 4100
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2508	1036.95	2508	1042.8	2508	1062.07	2508	1094.63	2507
1111.35	2506	1121.68	2505	1131.05	2504	1139.72	2503	1145.56	2502
1149.29	2502	1178.86	2503	1196.52	2504	1211.23	2505	1249.8	2506
1269.68	2507	1284.18	2508						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1131.05	.032	1196.52	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1131.05	1196.52	76.22	79.8	74.78	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 4000

INPUT
Description: 4000
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2506	1029.05	2505	1053.82	2504	1063.5	2503	1067.57	2503
1087.2	2503	1114.35	2502	1119.3	2502	1125.82	2502	1135.97	2502
1151.29	2503	1165.68	2504	1174.42	2505	1180.91	2506	1202.48	2507.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1087.2	.032	1151.29	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1087.2	1151.29	47.52	92.14	101.82	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3900

INPUT
Description: 3900
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2506	1037.33	2505	1058.54	2504	1072.42	2503	1090	2502.7
1100	2502.5	1109	2502.5	1119	2502.2	1130	2502.4	1147	2502.7
1158	2502.5	1168.98	2503	1185.9	2504	1204.8	2505.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1072.42	.032	1168.98	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1072.42	1168.98	84	95	101	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3800

INPUT
Description: 3800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2504	1051.77	2503	1065.48	2502	1074.55	2501	1078.96	2501
1088.37	2502	1092.85	2502	1105.89	2501	1143.16	2501	1161.27	2502
1185.97	2503	1215.78	2504	1223.72	2504.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1065.48	.032	1161.27	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1065.48	1161.27	93.56	97.03	94.82	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3700

INPUT
Description: 3700
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2505	1033.59	2504	1067.04	2503	1097.71	2502	1128.19	2501
1141.93	2500	1168.04	2499	1176.4	2499	1195.21	2500	1208.16	2501
1224.66	2502	1262.04	2502.65						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1141.93	.032	1195.21	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1141.93	1195.21	90.04	86.51	83.47	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3600

INPUT
Description: 3600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2503	1044	2502	1082.56	2501	1108.71	2500	1116.13	2499
1123.48	2498	1128.28	2497	1144.51	2497	1146.96	2498	1149.4	2499
1155.41	2500	1162.72	2501						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1123.48	.032	1146.96	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1123.48	1146.96	98.81	109.92	110.94	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3500

INPUT
Description: 3500
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2502.5	1035.37	2502	1088.41	2501	1109.07	2500	1123.7	2499
1125.59	2498	1127.45	2497	1129.34	2496	1131.2	2495	1142.38	2494
1148.73	2494	1150.64	2495	1152.55	2496	1154.48	2497	1156.35	2498
1158.32	2499	1166.23	2500	1169.15	2500				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1131.2	.032	1150.64	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1131.2	1150.64	98	102	105	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3400

INPUT
Description: 3400
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2500	1033.79	2499	1035.49	2498	1037.27	2497	1039.03	2496
1040.81	2495	1042.53	2494	1062.01	2494	1064.51	2495	1066.89	2496
1069.36	2497	1071.84	2498						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1037.27	.035	1042.53	.025	1062.01	.025	1064.51	.035
1069.36	.028								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1037.27	1069.36	78.81	60.99	54	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3300

INPUT
Description: 3300
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2499	1051.57	2498	1070.23	2497	1071.89	2496	1073.38	2495
1074.91	2494	1076.45	2493	1078.06	2492	1079.78	2491	1094.27	2491
1096.54	2492	1098.75	2493	1101.04	2494	1103.28	2495	1105.35	2496

1126.26 2497

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1074.91	.035	1101.04	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1074.91	1101.04	90.22	92.05	88.97	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3200

INPUT
Description: 3200
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2498	1019.79	2498	1030.48	2497	1037.36	2496	1039.65	2495
1041.91	2494	1044.13	2493	1046.36	2492	1048.64	2491	1057.21	2490
1062	2490	1064.22	2491	1066.49	2492	1068.69	2493	1070.87	2494

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1041.91	.035	1057.21	.025	1062	.025	1064.22	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1046.36	1066.49	107.99	107.98	108.01	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3100

INPUT
Description: 3100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2498	1023.82	2497	1053.42	2496	1055.15	2495	1056.98	2494
1058.8	2493	1060.65	2492	1062.58	2491	1064.52	2490	1077.71	2490
1079.9	2491	1084.39	2493	1086.62	2494	1088.93	2495	1158.41	2495

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1055.15	.035	1064.52	.025	1079.9	.035	1086.62	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1058.8	1084.39	83	83	83	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 3000

INPUT
Description: 3000
3000
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2496	1032.24	2495	1034.58	2494	1036.81	2493	1039.14	2492
1043.76	2490	1058.29	2490	1060.82	2491	1063.27	2492	1065.57	2493
1067.78	2494	1092.32	2495						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1034.58	.035	1043.76	.025	1060.82	.035	1067.78	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1034.58	1067.78	99	99	99	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 2900

INPUT
Description: 2900
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2495	1018.24	2494	1023.78	2493	1028.61	2491	1031.06	2490
1033.61	2489	1046.54	2489	1048.42	2490	1050.27	2491	1052.16	2492
1053.99	2493	1055.87	2494	1065.7	2494	1096.06	2493	1117.32	2492

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1023.78	.03035	1033.61	.025	1048.42	.035	1053.99	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1023.78	1053.99	99	99	99	.1 .3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 2800

INPUT
Description: 2800
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2494	1019.02	2493	1028.31	2493	1030.43	2492	1032.52	2491
1034.65	2490	1036.7	2489	1038.8	2488	1046.87	2488	1051.29	2489
1053.01	2490	1054.71	2491	1056.36	2492	1057.94	2493	1104.48	2493
1116	2492								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

```
    1000    .028 1032.52    .035  1038.8    .025 1051.29    .035 1054.71    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1032.52 1054.71               97      97      97             .1      .3

CROSS SECTION          RIVER: Joint Branch
REACH: Reach #3           RS: 2700

INPUT
Description: 2700
2700
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2493 1030.82    2492 1043.01    2492 1048.69    2491 1051.32    2490
 1053.84    2489 1056.43    2488 1059.16    2487 1071.93    2487 1074.13    2488
  1076.3    2489 1078.53    2490 1080.77    2491 1083.04    2492 1091.34    2493
  1099.1    2493 1116.03    2492 1131.41    2491  1144.6    2490

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1051.32    .035 1078.53    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1051.32 1078.53               94      94      94             .1      .3

CROSS SECTION          RIVER: Joint Branch
REACH: Reach #3           RS: 2600

INPUT
Description: 2600
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2492 1003.59    2491 1009.11    2490 1012.47    2489 1015.59    2488
 1018.63    2487 1021.75    2486 1025.84    2485 1044.46    2485 1049.65    2487
  1052.2    2488 1054.78    2489 1069.73    2490 1077.21    2490

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1015.59    .035  1052.2    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1015.59  1052.2               98      98      98             .1      .3

CROSS SECTION          RIVER: Joint Branch
REACH: Reach #3           RS: 2500

INPUT
Description: 2500
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2491 1013.54    2489 1017.36    2488 1020.72    2487 1023.99    2486
 1027.19    2485 1052.93    2485 1055.15    2486 1057.41    2487 1059.74    2488
 1087.02    2489

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1017.36    .035 1027.19    .025 1055.15    .035 1059.74    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1017.36 1059.74               100     100     100             .1      .3

CROSS SECTION          RIVER: Joint Branch
REACH: Reach #3           RS: 2400

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2488 1003.58    2487 1011.92    2485 1018.45    2484 1035.98    2484
 1038.56    2485 1041.08    2486 1043.59    2487 1046.16  2488.5 1070.94    2488

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .035 1018.45    .025 1038.56    .035 1046.16    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1000 1046.16               99      99      99             .1      .3

CROSS SECTION          RIVER: Joint Branch
REACH: Reach #3           RS: 2300

INPUT
Description: 2300
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    1000    2487 1005.65    2486 1008.47    2485 1011.25    2484 1013.93    2483
 1037.91    2483 1041.44    2484 1043.42    2485 1045.56    2486 1047.73  2488.4
 1068.74    2487

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
    1000    .028 1005.65    .035 1013.93    .025 1041.44    .035 1045.56    .028

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1005.65 1045.56               103     103     103             .1      .3
```

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 2200

INPUT
Description: 2200
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2486	1006.74	2485	1009.9	2484	1013.56	2483	1040.49	2483
1042.5	2484	1044.46	2485	1046.45	2486	1048.5	2488	1066.82	2487
1071.53	2486								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.035	1013.56	.025	1042.5	.035	1046.45	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1000	1046.45	96	96	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 2100

INPUT
Description: 2100
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2485	1003.43	2484	1008.64	2483	1031.8	2483	1034.37	2484
1036.84	2485	1039.36	2486	1041.91	2487.9	1056.36	2487	1059.65	2486
1062.89	2485	1067.02	2484	1077.59	2484				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.035	1008.64	.025	1034.37	.035	1039.36	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1000	1036.84	115	115	.1	.3

Right Levee Station= 1041.91 Elevation= 2487.9

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 2000

INPUT
Description: 2000
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2486	1011.29	2485	1014.68	2484	1020.47	2483	1044.02	2483
1046.46	2484	1048.98	2485	1051.42	2486	1054.28	2487	1059.4	2487
1073.49	2486	1076.92	2485	1081.1	2484	1084.83	2483		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
1000	.035	1020.47	.025	1046.46	.035	1051.42	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1000	1051.42	22	22	.1	.3

Right Levee Station= 1054.28 Elevation= 2487

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 1900

INPUT
Description: 1900
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2485	1012	2484	1021	2483	1051	2483	1053	2484
1056	2485	1059	2486	1060	2486.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.025	1053	.035	1056	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1000	1056	38	38	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 1800

INPUT
Description: 1800
1800
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2485	1007	2483	1095	2483	1102	2485	1107	2485.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.025	1095	.035	1102	.028

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1000	1102	55	55	.1	.3

CROSS SECTION RIVER: Joint Branch
REACH: Reach #3 RS: 1700

INPUT
Description: 1700
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	2482	1110	2481	1154	2482	1160	2484	1170	2484.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.028	1000	.03	1160	.028

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1000	1160	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:West Branch

Reach	River Sta.	n1	n2	n3
Reach #1	5000	.028	.032	.028
Reach #1	4900	.028	.032	.028
Reach #1	4800	.028	.032	.028
Reach #1	4700	.028	.032	.028
Reach #1	4600	.028	.032	.028
Reach #1	4500	.028	.032	.028
Reach #1	4400	.028	.032	.028
Reach #1	4300	.028	.032	.028

River:East Branch

Reach	River Sta.	n1	n2	n3
Reach #2	4280	.028	.032	.028
Reach #2	4270	.028	.032	.028
Reach #2	4260	.028	.032	.028
Reach #2	4250	.028	.032	.028
Reach #2	4240	.028	.032	.028
Reach #2	4230	.028	.032	.028
Reach #2	4220	.028	.032	.028
Reach #2	4210	.028	.032	.028

River:Joint Branch

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Reach #3	4200	.028	.032	.028			
Reach #3	4100	.028	.032	.028			
Reach #3	4000	.028	.032	.028			
Reach #3	3900	.028	.032	.028			
Reach #3	3800	.028	.032	.028			
Reach #3	3700	.028	.032	.028			
Reach #3	3600	.028	.032	.028			
Reach #3	3500	.028	.032	.028			
Reach #3	3400	.028	.035	.025	.025	.035	.028
Reach #3	3300	.028	.035	.028			
Reach #3	3200	.028	.035	.025	.025	.035	
Reach #3	3100	.028	.035	.025	.035	.028	
Reach #3	3000	.028	.035	.025	.035	.028	
Reach #3	2900	.028	.03035	.025	.035	.028	
Reach #3	2800	.028	.035	.025	.035	.028	
Reach #3	2700	.028	.035	.028			
Reach #3	2600	.028	.035	.028			
Reach #3	2500	.028	.035	.025	.035	.028	
Reach #3	2400	.035	.025	.035	.028		
Reach #3	2300	.028	.035	.025	.035	.028	
Reach #3	2200	.035	.025	.035	.028		
Reach #3	2100	.035	.025	.035	.028		
Reach #3	2000	.035	.025	.035	.028		
Reach #3	1900	.025	.035	.028			
Reach #3	1800	.025	.035	.028			
Reach #3	1700	.028	.03	.028			

SUMMARY OF REACH LENGTHS

River: West Branch

Reach	River Sta.	Left	Channel	Right
Reach #1	5000	89.58	124.41	140.38
Reach #1	4900	138.21	124.96	118.21
Reach #1	4800	190.89	165.05	143.15
Reach #1	4700	114.06	113.59	117.01
Reach #1	4600	118.31	130.08	131.97
Reach #1	4500	104.31	107.98	105.49
Reach #1	4400	108.98	105.87	101.81
Reach #1	4300	0	0	0

River: East Branch

Reach	River Sta.	Left	Channel	Right

Reach	River Sta.	Left	Channel	Right
Reach #2	4280	134.27	185.17	210.05
Reach #2	4270	114.97	116.72	116.36
Reach #2	4260	65.77	67.7	65.52
Reach #2	4250	112.53	96.47	96.4
Reach #2	4240	58.37	68.5	73.1
Reach #2	4230	104.45	123.27	147.64
Reach #2	4220	71.16	73.23	75.6
Reach #2	4210	0	0	0

River: Joint Branch

Reach	River Sta.	Left	Channel	Right
Reach #3	4200	128.56	131.99	99.11
Reach #3	4100	76.22	79.8	74.78
Reach #3	4000	47.52	92.14	101.82
Reach #3	3900	84	95	101
Reach #3	3800	93.56	97.03	94.82
Reach #3	3700	90.04	86.51	83.47
Reach #3	3600	98.81	109.92	110.94
Reach #3	3500	98	102	105
Reach #3	3400	78.81	60.99	54
Reach #3	3300	90.22	92.05	88.97
Reach #3	3200	107.99	107.98	108.01
Reach #3	3100	83	83	83
Reach #3	3000	99	99	99
Reach #3	2900	99	99	99
Reach #3	2800	97	97	97
Reach #3	2700	94	94	94
Reach #3	2600	98	98	98
Reach #3	2500	100	100	100
Reach #3	2400	99	99	99
Reach #3	2300	103	103	103
Reach #3	2200	96	96	96
Reach #3	2100	115	115	115
Reach #3	2000	22	22	22
Reach #3	1900	38	38	38
Reach #3	1800	55	55	55
Reach #3	1700	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: West Branch

Reach	River Sta.	Contr.	Expan.
Reach #1	5000	.1	.3
Reach #1	4900	.1	.3
Reach #1	4800	.1	.3
Reach #1	4700	.1	.3
Reach #1	4600	.1	.3
Reach #1	4500	.1	.3
Reach #1	4400	.1	.3
Reach #1	4300	.1	.3

River: East Branch

Reach	River Sta.	Contr.	Expan.
Reach #2	4280	.1	.3
Reach #2	4270	.1	.3
Reach #2	4260	.1	.3
Reach #2	4250	.1	.3
Reach #2	4240	.1	.3
Reach #2	4230	.1	.3
Reach #2	4220	.1	.3
Reach #2	4210	.1	.3

River: Joint Branch

Reach	River Sta.	Contr.	Expan.
Reach #3	4200	.1	.3
Reach #3	4100	.1	.3
Reach #3	4000	.1	.3
Reach #3	3900	.1	.3
Reach #3	3800	.1	.3
Reach #3	3700	.1	.3
Reach #3	3600	.1	.3
Reach #3	3500	.1	.3
Reach #3	3400	.1	.3
Reach #3	3300	.1	.3
Reach #3	3200	.1	.3
Reach #3	3100	.1	.3
Reach #3	3000	.1	.3
Reach #3	2900	.1	.3
Reach #3	2800	.1	.3
Reach #3	2700	.1	.3
Reach #3	2600	.1	.3
Reach #3	2500	.1	.3

Reach #3	2400	.1	.3
Reach #3	2300	.1	.3
Reach #3	2200	.1	.3
Reach #3	2100	.1	.3
Reach #3	2000	.1	.3
Reach #3	1900	.1	.3
Reach #3	1800	.1	.3
Reach #3	1700	.1	.3

Profile Output Table - GeneralScour

River	Reach	River Sta	Min Ch El (ft)	W.S. Elev (ft)	Max Chl Dpth (ft)	Hydr Depth (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)
Joint Branch	Reach #3	4200	2503.00	2505.42	2.41	0.97	0.011963	6.01
Joint Branch	Reach #3	4100	2502.00	2503.76	1.76	0.99	0.005768	3.51
Joint Branch	Reach #3	4000	2502.00	2503.63	1.63	1.00	0.001532	2.16
Joint Branch	Reach #3	3900	2502.20	2503.17	0.97	0.56	0.012757	3.66
Joint Branch	Reach #3	3800	2501.00	2501.82	0.82	0.62	0.014433	4.04
Joint Branch	Reach #3	3700	2499.00	2500.20	1.20	0.71	0.016049	4.96
Joint Branch	Reach #3	3600	2497.00	2498.52	1.52	1.17	0.012586	6.35
Joint Branch	Reach #3	3500	2494.00	2496.38	2.38	1.76	0.004467	4.95
Joint Branch	Reach #3	3400	2494.00	2495.43	1.43	1.26	0.010020	6.41
Joint Branch	Reach #3	3300	2491.00	2493.22	2.22	1.81	0.006472	4.92
Joint Branch	Reach #3	3200	2490.00	2492.87	2.87	1.97	0.003207	4.47
Joint Branch	Reach #3	3100	2490.00	2492.52	2.52	1.96	0.003229	4.44
Joint Branch	Reach #3	3000	2490.00	2491.70	1.70	1.40	0.009849	6.50
Joint Branch	Reach #3	2900	2489.00	2491.15	2.15	1.70	0.005209	5.41
Joint Branch	Reach #3	2800	2488.00	2490.06	2.06	1.56	0.011149	7.12
Joint Branch	Reach #3	2700	2487.00	2488.77	1.77	1.42	0.016745	6.79
Joint Branch	Reach #3	2600	2485.00	2487.48	2.48	1.95	0.005084	4.65
Joint Branch	Reach #3	2500	2485.00	2486.84	1.84	1.58	0.005599	5.42
Joint Branch	Reach #3	2400	2484.00	2485.79	1.79	1.42	0.011068	6.75
Joint Branch	Reach #3	2300	2483.00	2485.88	2.88	2.35	0.001332	3.32
Joint Branch	Reach #3	2200	2483.00	2485.74	2.74	2.16	0.001422	3.21
Joint Branch	Reach #3	2100	2483.00	2485.50	2.49	2.09	0.002039	3.86
Joint Branch	Reach #3	2000	2483.00	2484.57	1.57	1.33	0.010453	6.55
Joint Branch	Reach #3	1900	2483.00	2484.37	1.37	1.11	0.009162	6.01
Joint Branch	Reach #3	1800	2483.00	2483.69	0.69	0.68	0.010698	4.68
Joint Branch	Reach #3	1700	2481.00	2482.00	1.00	0.50	0.016978	4.06
East Branch	Reach #2	4280	2517.00	2517.90	0.90	0.67	0.005934	2.73
East Branch	Reach #2	4270	2515.00	2515.95	0.95	0.55	0.017993	4.16
East Branch	Reach #2	4260	2514.00	2514.55	0.55	0.46	0.009693	2.71
East Branch	Reach #2	4250	2513.00	2513.52	0.52	0.42	0.019973	3.71
East Branch	Reach #2	4240	2511.00	2511.92	0.92	0.63	0.013444	3.94
East Branch	Reach #2	4230	2510.00	2510.90	0.90	0.60	0.015737	4.15
East Branch	Reach #2	4220	2508.00	2508.80	0.80	0.58	0.017953	4.34
East Branch	Reach #2	4210	2506.00	2507.56	1.56	0.67	0.011209	5.09
West Branch	Reach #1	5000	2522.00	2522.58	0.58	0.51	0.018949	4.06
West Branch	Reach #1	4900	2518.00	2519.30	1.30	0.66	0.009390	4.37
West Branch	Reach #1	4800	2517.00	2517.70	0.70	0.58	0.018369	4.34
West Branch	Reach #1	4700	2514.00	2515.20	1.20	0.88	0.003259	2.69
West Branch	Reach #1	4600	2514.00	2514.37	0.37	0.34	0.021487	3.29
West Branch	Reach #1	4500	2511.00	2512.08	1.08	0.35	0.010139	3.70
West Branch	Reach #1	4400	2510.00	2510.49	0.49	0.39	0.012802	2.82
West Branch	Reach #1	4300	2508.00	2508.70	0.70	0.39	0.020859	3.59

Profile Output Table - Standard Table 1

River	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Joint Branch	Reach #3	4200	206.00	2503.00	2505.42	2505.42	2505.96	0.011963	6.01	35.90	37.02	0.92
Joint Branch	Reach #3	4100	206.00	2502.00	2503.76		2503.95	0.005768	3.51	58.77	59.14	0.62
Joint Branch	Reach #3	4000	206.00	2502.00	2503.63	2503.05	2503.70	0.001532	2.16	102.73	102.90	0.33
Joint Branch	Reach #3	3900	206.00	2502.20	2503.17	2503.10	2503.37	0.012757	3.66	56.64	101.69	0.84
Joint Branch	Reach #3	3800	206.00	2501.00	2501.82	2501.77	2502.08	0.014433	4.04	50.95	82.43	0.91
Joint Branch	Reach #3	3700	206.00	2499.00	2500.20	2500.20	2500.58	0.016049	4.96	41.86	58.55	0.99
Joint Branch	Reach #3	3600	206.00	2497.00	2498.52	2498.52	2499.13	0.012586	6.35	33.28	28.53	0.96
Joint Branch	Reach #3	3500	206.00	2494.00	2496.38	2495.86	2496.75	0.004467	4.95	43.35	24.67	0.61
Joint Branch	Reach #3	3400	206.00	2494.00	2495.43	2495.43	2496.07	0.010020	6.41	32.15	25.49	1.01
Joint Branch	Reach #3	3300	206.00	2491.00	2493.22		2493.60	0.006472	4.92	41.88	23.14	0.64
Joint Branch	Reach #3	3200	206.00	2490.00	2492.87		2493.18	0.003207	4.47	47.25	23.99	0.52
Joint Branch	Reach #3	3100	206.00	2490.00	2492.52		2492.83	0.003229	4.44	46.42	23.63	0.56
Joint Branch	Reach #3	3000	206.00	2490.00	2491.70	2491.66	2492.36	0.009849	6.50	31.70	22.71	0.97
Joint Branch	Reach #3	2900	206.00	2489.00	2491.15		2491.61	0.005209	5.41	38.05	22.32	0.73
Joint Branch	Reach #3	2800	206.00	2488.00	2490.06	2490.06	2490.85	0.011149	7.12	28.95	18.60	1.01

Joint Branch Reach #3	2700	206.00	2487.00	2488.77	2488.77	2489.49	0.016745	6.79	30.34
21.38	1.00								
Joint Branch Reach #3	2600	306.00	2485.00	2487.48	2486.81	2487.82	0.005084	4.65	65.79
33.72	0.59								
Joint Branch Reach #3	2500	306.00	2485.00	2486.84	2486.55	2487.29	0.005599	5.42	56.41
35.78	0.76								
Joint Branch Reach #3	2400	306.00	2484.00	2485.79	2485.79	2486.50	0.011068	6.75	45.34
31.95	1.00								
Joint Branch Reach #3	2300	306.00	2483.00	2485.88		2486.05	0.001332	3.32	92.22
39.30	0.38								
Joint Branch Reach #3	2200	306.00	2483.00	2485.74		2485.90	0.001422	3.21	95.42
44.22	0.38								
Joint Branch Reach #3	2100	306.00	2483.00	2485.50	2484.59	2485.73	0.002039	3.86	79.48
38.09	0.46								
Joint Branch Reach #3	2000	306.00	2483.00	2484.57	2484.57	2485.24	0.010453	6.55	46.75
35.15	1.00								
Joint Branch Reach #3	1900	311.00	2483.00	2484.37	2484.37	2484.93	0.009162	6.01	51.77
46.57	1.00								
Joint Branch Reach #3	1800	311.00	2483.00	2483.69	2483.69	2484.03	0.010698	4.68	66.40
97.42	1.00								
Joint Branch Reach #3	1700	311.00	2481.00	2482.00	2482.00	2482.25	0.016978	4.06	76.62
153.62	1.01								
East Branch Reach #2	4280	116.00	2517.00	2517.90		2518.01	0.005934	2.73	42.46
63.52	0.59								
East Branch Reach #2	4270	116.00	2515.00	2515.95	2515.93	2516.22	0.017993	4.16	27.87
50.99	0.99								
East Branch Reach #2	4260	116.00	2514.00	2514.55		2514.66	0.009693	2.71	42.85
94.03	0.71								
East Branch Reach #2	4250	116.00	2513.00	2513.52	2513.51	2513.73	0.019973	3.71	31.28
73.64	1.00								
East Branch Reach #2	4240	116.00	2511.00	2511.92		2512.17	0.013444	3.94	29.45
47.01	0.88								
East Branch Reach #2	4230	116.00	2510.00	2510.90	2510.87	2511.17	0.015737	4.15	27.98
46.54	0.94								
East Branch Reach #2	4220	116.00	2508.00	2508.80	2508.80	2509.09	0.017953	4.34	26.74
45.85	1.00								
East Branch Reach #2	4210	116.00	2506.00	2507.56	2507.56	2507.91	0.011209	5.09	26.04
38.62	0.87								
West Branch Reach #1	5000	90.00	2522.00	2522.58	2522.58	2522.84	0.018949	4.06	22.16
43.69	1.00								
West Branch Reach #1	4900	90.00	2518.00	2519.30	2519.21	2519.59	0.009390	4.37	21.84
33.23	0.78								
West Branch Reach #1	4800	90.00	2517.00	2517.70	2517.70	2517.99	0.018369	4.34	20.72
36.03	1.01								
West Branch Reach #1	4700	90.00	2514.00	2515.20	2514.76	2515.31	0.003259	2.69	33.92
38.53	0.47								
West Branch Reach #1	4600	90.00	2514.00	2514.37	2514.37	2514.54	0.021487	3.29	27.34
81.29	1.00								
West Branch Reach #1	4500	90.00	2511.00	2512.08	2512.08	2512.29	0.010139	3.70	26.98
77.59	0.78								
West Branch Reach #1	4400	90.00	2510.00	2510.49	2510.42	2510.61	0.012802	2.82	31.94
81.29	0.79								
West Branch Reach #1	4300	90.00	2508.00	2508.70	2508.70	2508.90	0.020859	3.59	25.08
64.07	1.01								

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : FW3PR

River: West Branch Reach: Reach #1 RS: 5000 Profile: PF 1
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: West Branch Reach: Reach #1 RS: 4900 Profile: PF 1
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: West Branch Reach: Reach #1 RS: 4800 Profile: PF 1
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: West Branch Reach: Reach #1 RS: 4700 Profile: PF 1
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: West Branch Reach: Reach #1 RS: 4600 Profile: PF 1
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: West Branch Reach: Reach #1 RS: 4500 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: West Branch Reach: Reach #1 RS: 4400 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: West Branch Reach: Reach #1 RS: 4300 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: East Branch Reach: Reach #2 RS: 4280 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: East Branch Reach: Reach #2 RS: 4270 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: East Branch Reach: Reach #2 RS: 4260 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: East Branch Reach: Reach #2 RS: 4250 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: East Branch Reach: Reach #2 RS: 4230 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: East Branch Reach: Reach #2 RS: 4220 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water
surface that had the least amount of error between computed and assumed values.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: East Branch Reach: Reach #2 RS: 4210 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Joint Branch Reach: Reach #3 RS: 4200 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Joint Branch Reach: Reach #3 RS: 4100 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Joint Branch Reach: Reach #3 RS: 4000 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Joint Branch Reach: Reach #3 RS: 3900 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Joint Branch Reach: Reach #3 RS: 3800 Profile: PF 1
Warning:Divided flow computed for this cross-section.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Joint Branch Reach: Reach #3 RS: 3700 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water
surface that had the least amount of error between computed and assumed values.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Joint Branch Reach: Reach #3 RS: 3600 Profile: PF 1

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Joint Branch Reach: Reach #3 RS: 3500 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Joint Branch Reach: Reach #3 RS: 3400 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 3200 Profile: PF 1
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 3100 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 3000 Profile: PF 1
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2900 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2800 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water
surface that had the least amount of error between computed and assumed values.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2700 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Joint Branch Reach: Reach #3 RS: 2500 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2400 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2300 Profile: PF 1
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2200 Profile: PF 1
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2100 Profile: PF 1
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 2000 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water
surface that had the least amount of error between computed and assumed values.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Joint Branch Reach: Reach #3 RS: 1900 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 1800 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
River: Joint Branch Reach: Reach #3 RS: 1700 Profile: PF 1
Warning:Slope too steep for slope area to converge during supercritical flow calculations (normal depth is below critical depth). Water surface set to critical depth.

HEC-RAS Models
Historic Topography With Historic/Current Flows

HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	65	491.00	2510.90	2512.96	2512.58	2513.18	0.006837	3.78	129.78	115.92	0.63
Reach 1	65	116.00	2510.90	2512.08	2511.83	2512.18	0.006645	2.51	46.20	74.71	0.56
Reach 1	64	491.00	2510.10	2512.04		2512.41	0.013673	4.92	99.84	101.19	0.87
Reach 1	64	116.00	2510.10	2511.18		2511.38	0.015967	3.60	32.18	58.40	0.86
Reach 1	63	491.00	2509.40	2511.50		2511.78	0.010844	4.26	115.30	121.89	0.77
Reach 1	63	116.00	2509.40	2510.57		2510.73	0.010535	3.18	36.47	58.44	0.71
Reach 1	62	491.00	2508.70	2510.63	2510.63	2511.06	0.019352	5.26	93.42	111.20	1.01
Reach 1	62	116.00	2508.70	2509.82	2509.76	2510.05	0.017294	3.89	29.79	51.11	0.90
Reach 1	61	491.00	2507.70	2509.78	2509.69	2510.16	0.014423	4.91	100.01	105.74	0.89
Reach 1	61	116.00	2507.70	2508.78	2508.78	2509.08	0.021897	4.37	26.55	45.73	1.01
Reach 1	60	491.00	2506.80	2509.18		2509.52	0.010975	4.64	105.89	99.32	0.79
Reach 1	60	116.00	2506.80	2508.12	2507.90	2508.29	0.009068	3.29	35.21	47.77	0.68
Reach 1	59	491.00	2506.30	2508.58		2508.88	0.014299	4.40	111.59	138.16	0.86
Reach 1	59	116.00	2506.30	2507.67	2507.46	2507.83	0.009155	3.26	35.56	49.32	0.68
Reach 1	58	491.00	2505.80	2507.67	2507.67	2508.03	0.020199	4.86	101.00	139.56	1.01
Reach 1	58	116.00	2505.80	2506.88	2506.88	2507.14	0.022136	4.14	28.04	52.87	1.00
Reach 1	57	491.00	2504.60	2506.79	2506.69	2507.02	0.014829	3.86	127.09	196.63	0.85
Reach 1	57	116.00	2504.60	2505.85	2505.81	2506.15	0.017555	4.36	26.63	39.01	0.93
Reach 1	56	688.00	2503.60	2505.71	2505.71	2506.15	0.018951	5.31	129.53	149.40	1.01
Reach 1	56	206.00	2503.60	2504.82	2504.82	2505.19	0.019984	4.84	42.60	58.84	1.00
Reach 1	55	688.00	2502.20	2503.88	2504.15	2504.84	0.034840	7.88	87.27	87.87	1.39
Reach 1	55	206.00	2502.20	2503.19	2503.34	2503.73	0.044180	5.92	34.82	64.45	1.42
Reach 1	54	688.00	2500.50	2503.14	2503.00	2503.71	0.012524	6.10	112.75	77.25	0.89
Reach 1	54	206.00	2500.50	2502.06	2501.97	2502.40	0.014921	4.71	43.72	50.37	0.89

HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	53	688.00	2499.90	2502.74		2503.17	0.008225	5.22	131.83	83.30	0.73
Reach 1	53	206.00	2499.90	2501.72		2501.90	0.006077	3.43	59.99	56.60	0.59
Reach 1	51	688.00	2499.70	2502.50		2502.79	0.005613	4.33	159.00	99.99	0.60
Reach 1	51	206.00	2499.70	2501.53		2501.64	0.003782	2.72	75.81	71.27	0.46
Reach 1	50	688.00	2499.50	2502.27		2502.51	0.005029	3.98	172.74	113.37	0.57
Reach 1	50	206.00	2499.50	2501.37		2501.46	0.003152	2.44	84.35	81.23	0.42
Reach 1	48	688.00	2499.40	2501.64	2501.54	2502.10	0.013476	5.46	126.00	107.87	0.89
Reach 1	48	206.00	2499.40	2501.01	2500.87	2501.18	0.011644	3.37	61.21	97.12	0.75
Reach 1	47	688.00	2499.25	2500.83	2500.81	2501.35	0.016711	5.77	119.20	110.41	0.98
Reach 1	47	206.00	2499.25	2500.18	2500.16	2500.42	0.020153	3.97	51.83	96.75	0.96
Reach 1	45	688.00	2498.90	2500.40		2500.70	0.008556	4.34	158.44	136.14	0.71
Reach 1	45	206.00	2498.90	2499.74		2499.85	0.006609	2.69	76.47	110.81	0.57
Reach 1	42	688.00	2498.20	2499.61	2499.61	2500.07	0.018516	5.48	125.52	135.76	1.00
Reach 1	42	206.00	2498.20	2499.05	2499.05	2499.28	0.023367	3.80	54.28	121.35	1.00
Reach 1	40	688.00	2497.30	2498.99	2498.75	2499.31	0.009339	4.56	150.95	128.78	0.74
Reach 1	40	206.00	2497.30	2498.30	2498.15	2498.44	0.009807	3.03	67.91	110.75	0.68
Reach 1	39	688.00	2496.70	2498.17	2498.13	2498.70	0.015717	5.81	118.33	103.49	0.96
Reach 1	39	206.00	2496.70	2497.44	2497.44	2497.72	0.022191	4.25	48.44	87.77	1.01
Reach 1	38	688.00	2495.20	2498.02		2498.27	0.003877	3.98	173.03	93.52	0.52
Reach 1	38	206.00	2495.20	2496.62	2496.36	2496.80	0.007633	3.43	60.05	67.43	0.64
Reach 1	36	688.00	2493.50	2497.02	2497.02	2497.86	0.015331	7.39	93.06	55.34	1.00
Reach 1	36	206.00	2493.50	2495.67	2495.67	2496.21	0.017638	5.92	34.82	32.10	1.00
Reach 1	33	688.00	2490.24	2495.79	2494.23	2496.31	0.003667	5.77	119.33	32.99	0.53
Reach 1	33	206.00	2490.24	2493.40	2492.27	2493.64	0.003133	3.94	52.33	23.10	0.46

HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	31	688.00	2490.00	2495.48		2496.04	0.002049	6.00	114.75	31.91	0.56
Reach 1	31	206.00	2490.00	2493.18		2493.42	0.001606	3.96	51.97	22.71	0.46
Reach 1	30	688.00	2490.20	2494.66		2495.69	0.004748	8.17	84.25	27.82	0.83
Reach 1	30	206.00	2490.20	2492.67		2493.15	0.004191	5.59	36.84	19.87	0.72
Reach 1	29	688.00	2490.04	2494.58	2494.58	2495.37	0.008178	7.17	95.99	60.34	1.00
Reach 1	29	206.00	2490.04	2492.49	2492.08	2492.98	0.004322	5.65	36.47	19.83	0.73
Reach 1	28	688.00	2490.00	2494.20	2494.42	2495.22	0.023646	8.11	84.83	59.24	1.19
Reach 1	28	206.00	2490.00	2492.06	2492.06	2492.88	0.016689	7.26	28.38	17.60	1.01
Reach 1	27	688.00	2488.52	2491.66	2492.54	2494.46	0.036551	13.43	51.24	22.60	1.57
Reach 1	27	206.00	2488.52	2489.87	2490.56	2492.12	0.073727	12.04	17.11	15.40	2.01
Reach 1	26	688.00	2487.04	2489.98	2491.11	2493.54	0.049509	15.14	45.44	20.90	1.81
Reach 1	26	206.00	2487.04	2488.41	2489.10	2490.66	0.072213	12.05	17.10	15.06	1.99
Reach 1	25	688.00	2487.00	2492.11	2491.05	2492.83	0.005568	6.81	101.01	29.53	0.65
Reach 1	25	206.00	2487.00	2489.76	2489.05	2490.13	0.005569	4.90	42.06	20.53	0.60
Reach 1	24	688.00	2486.94	2492.05		2492.74	0.005350	6.67	103.17	30.36	0.64
Reach 1	24	206.00	2486.94	2489.68		2490.04	0.005588	4.88	42.25	20.89	0.60
Reach 1	23	688.00	2486.60	2491.64		2492.40	0.003049	7.00	98.23	29.00	0.67
Reach 1	23	206.00	2486.60	2489.30		2489.70	0.003107	5.07	40.67	20.17	0.63
Reach 1	22	688.00	2486.20	2491.43		2492.09	0.002551	6.53	105.35	30.30	0.62
Reach 1	22	206.00	2486.20	2489.07		2489.40	0.002408	4.61	44.73	21.15	0.56
Reach 1	21	688.00	2485.80	2491.27		2491.83	0.002060	6.01	114.52	31.88	0.56
Reach 1	21	206.00	2485.80	2488.92		2489.18	0.001722	4.06	50.68	22.48	0.48
Reach 1	20	688.00	2485.40	2490.01	2490.01	2491.40	0.007203	9.43	72.96	26.62	1.00
Reach 1	20	206.00	2485.40	2487.95	2487.95	2488.79	0.008473	7.34	28.05	16.97	1.01

HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1 (Continued)

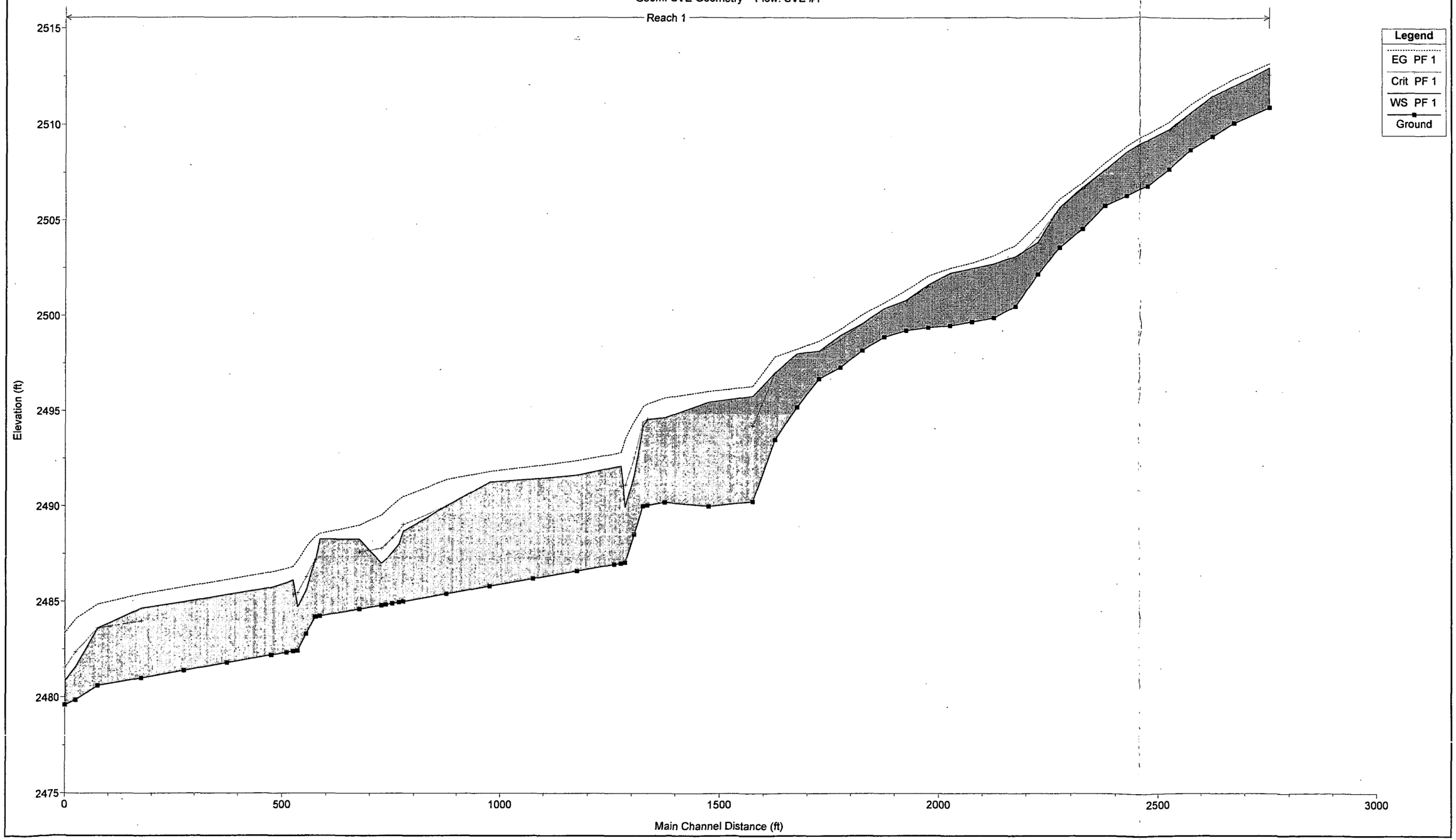
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	19	688.00	2485.00	2488.69	2489.03	2490.50	0.010147	10.80	63.69	24.50	1.18
Reach 1	19	206.00	2485.00	2487.29	2487.04	2487.89	0.005598	6.21	33.16	18.99	0.83
Reach 1	18	688.00	2484.96	2488.02	2488.69	2490.33	0.015182	12.20	56.40	24.85	1.43
Reach 1	18	206.00	2484.96	2487.40		2487.78	0.003167	4.93	41.79	22.24	0.63
Reach 1	17	688.00	2484.90	2487.60	2488.33	2490.05	0.017308	12.56	54.78	25.60	1.51
Reach 1	17	206.00	2484.90	2487.42		2487.68	0.001986	4.10	50.27	24.90	0.51
Reach 1	16	688.00	2484.84	2487.20	2487.99	2489.74	0.020019	12.79	53.78	27.56	1.61
Reach 1	16	206.00	2484.84	2487.44		2487.62	0.001284	3.41	60.34	28.51	0.41
Reach 1	15	688.00	2484.80	2487.01	2487.79	2489.53	0.020935	12.75	53.95	28.84	1.64
Reach 1	15	303.00	2484.80	2487.01		2487.50	0.004043	5.61	54.03	28.85	0.72
Reach 1	14	688.00	2484.60	2488.26	2487.59	2488.99	0.003497	6.89	99.81	34.62	0.72
Reach 1	14	303.00	2484.60	2486.79		2487.29	0.004167	5.67	53.48	28.77	0.73
Reach 1	13	688.00	2484.24	2488.28		2488.56	0.003085	4.21	163.32	111.09	0.61
Reach 1	13	303.00	2484.24	2486.36		2486.89	0.004638	5.86	51.75	28.77	0.77
Reach 1	12	688.00	2484.20	2487.19	2487.19	2488.41	0.014182	8.87	77.54	31.94	1.00
Reach 1	12	303.00	2484.20	2486.00	2486.00	2486.79	0.016183	7.13	42.52	27.21	1.00
Reach 1	11	688.00	2483.32	2485.64	2486.30	2487.88	0.034674	12.03	57.20	29.41	1.52
Reach 1	11	303.00	2483.32	2484.66	2485.13	2486.21	0.045278	10.00	30.31	25.42	1.61
Reach 1	10	688.00	2482.44	2484.73	2485.46	2487.15	0.037269	12.47	55.16	28.17	1.57
Reach 1	10	303.00	2482.44	2484.83	2484.25	2485.26	0.006199	5.22	58.10	28.54	0.64
Reach 1	9	688.00	2482.40	2486.13	2485.38	2486.83	0.006357	6.71	102.48	34.93	0.69
Reach 1	9	303.00	2482.40	2484.78		2485.19	0.006133	5.14	58.93	29.52	0.64
Reach 1	8	688.00	2482.34	2485.99		2486.73	0.006889	6.90	99.72	34.68	0.72
Reach 1	8	303.00	2482.34	2484.65		2485.09	0.006811	5.32	56.91	29.29	0.67

HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7	688.00	2482.20	2485.74		2486.54	0.003924	7.18	95.88	34.16	0.75
Reach 1	7	303.00	2482.20	2484.43		2484.91	0.003963	5.57	54.40	28.90	0.72
Reach 1	6	688.00	2481.80	2485.37		2486.15	0.003829	7.11	96.70	34.26	0.75
Reach 1	6	303.00	2481.80	2484.04		2484.51	0.003878	5.53	54.80	28.96	0.71
Reach 1	5	688.00	2481.40	2484.99		2485.77	0.003761	7.07	97.32	34.34	0.74
Reach 1	5	303.00	2481.40	2483.66		2484.13	0.003838	5.51	55.00	28.99	0.70
Reach 1	4	688.00	2481.00	2484.66	2483.98	2485.39	0.003488	6.89	99.90	34.63	0.71
Reach 1	4	303.00	2481.00	2483.32	2482.80	2483.75	0.003440	5.31	57.07	29.27	0.67
Reach 1	3	688.00	2480.60	2483.61	2483.61	2484.86	0.007273	8.97	76.68	31.02	1.01
Reach 1	3	303.00	2480.60	2482.41	2482.41	2483.21	0.008270	7.18	42.20	26.64	1.01
Reach 1	2	688.00	2479.86	2481.61	2482.37	2484.11	0.025553	12.71	54.14	34.07	1.78
Reach 1	2	303.00	2479.86	2480.88	2481.35	2482.42	0.030210	9.96	30.41	31.55	1.79
Reach 1	1	688.00	2479.60	2480.87	2481.55	2483.35	0.035899	12.66	54.36	44.79	2.02
Reach 1	1	303.00	2479.60	2480.44	2480.77	2481.58	0.027893	8.57	35.35	43.50	1.68

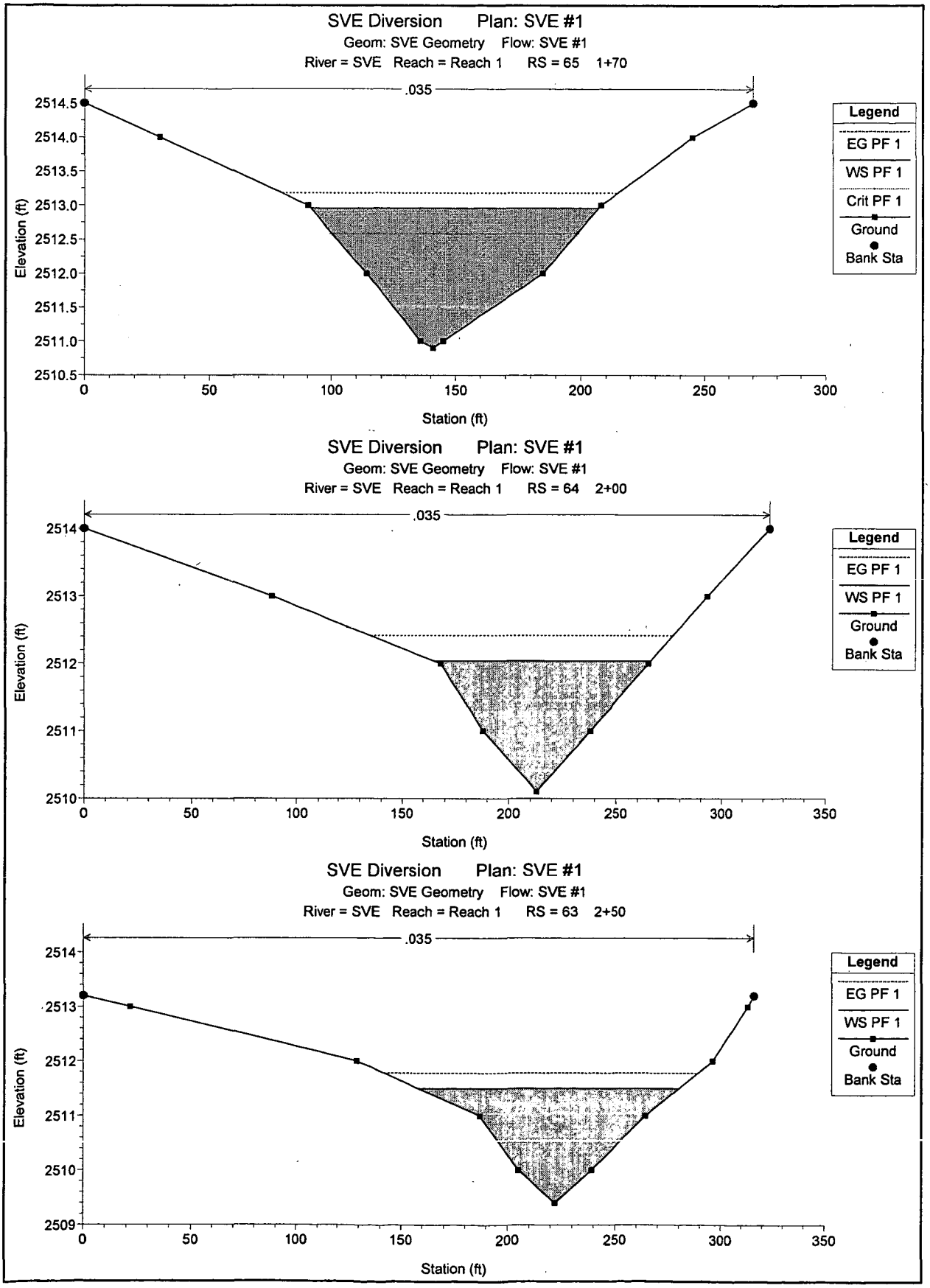
SVE Diversion Plan: SVE #1

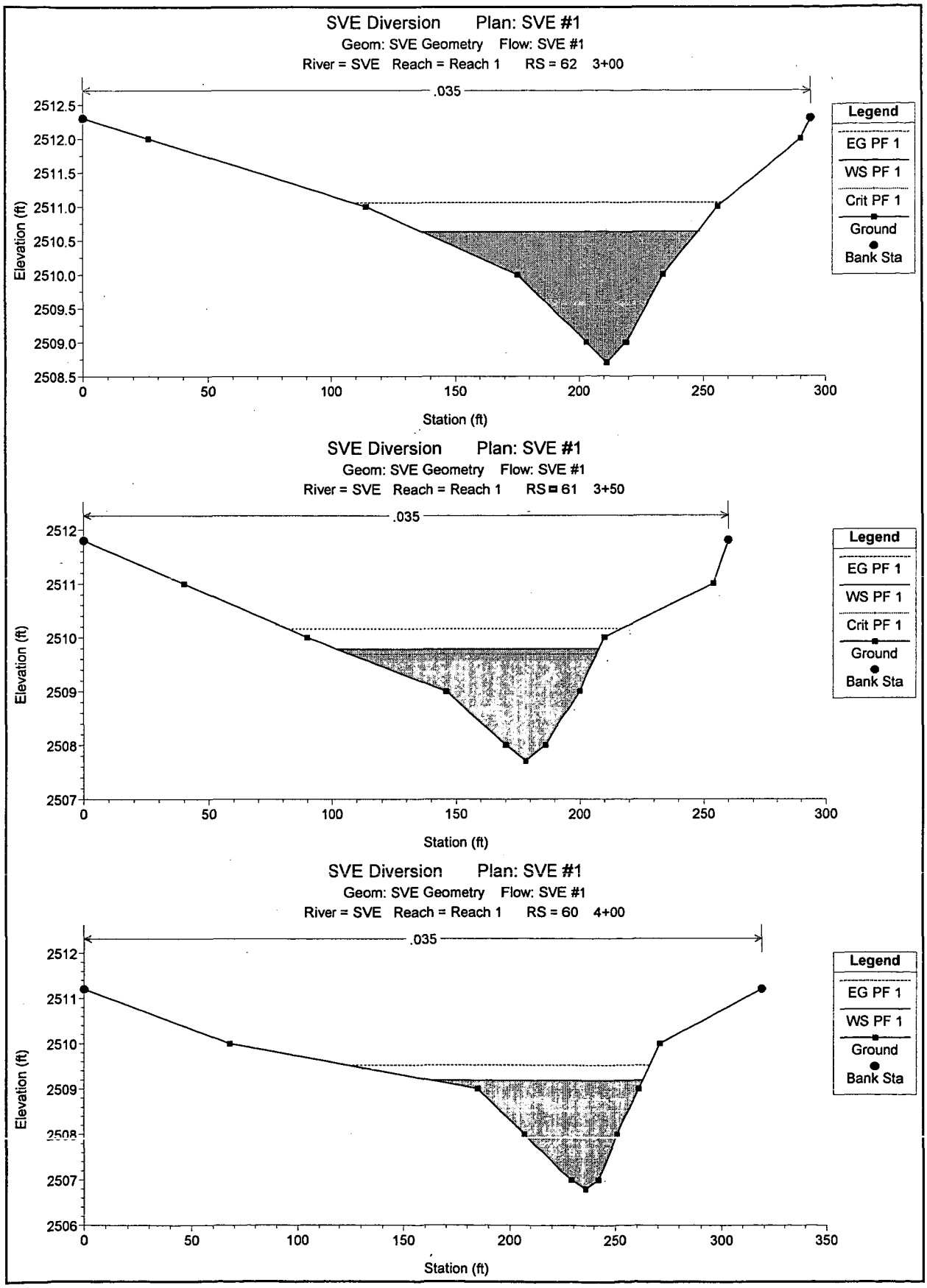
Geom: SVE Geometry Flow: SVE #1



HEC-RAS Plan: SVE1 River: SVE Reach: 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	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	65	491.00	2510.90	2512.96	2512.58	2513.18	0.006837	3.78	129.78	115.92	0.63
Reach 1	64	491.00	2510.10	2512.04		2512.41	0.013673	4.92	99.84	101.19	0.87
Reach 1	63	491.00	2509.40	2511.50		2511.78	0.010844	4.26	115.30	121.89	0.77
Reach 1	62	491.00	2508.70	2510.63	2510.63	2511.06	0.019352	5.26	93.42	111.20	1.01
Reach 1	61	491.00	2507.70	2509.78	2509.69	2510.16	0.014423	4.91	100.01	105.74	0.89
Reach 1	60	491.00	2506.80	2509.18		2509.52	0.010975	4.64	105.89	99.32	0.79
Reach 1	59	491.00	2506.30	2508.58		2508.88	0.014299	4.40	111.59	138.16	0.86
Reach 1	58	491.00	2505.80	2507.67	2507.67	2508.03	0.020199	4.86	101.00	139.56	1.01
Reach 1	57	491.00	2504.60	2506.79	2506.69	2507.02	0.014829	3.86	127.09	196.63	0.85
Reach 1	56	688.00	2503.60	2505.71	2505.71	2506.15	0.018951	5.31	129.53	149.40	1.01
Reach 1	55	688.00	2502.20	2503.88	2504.15	2504.84	0.034840	7.88	87.27	87.87	1.39
Reach 1	54	688.00	2500.50	2503.14	2503.00	2503.71	0.012524	6.10	112.75	77.25	0.89
Reach 1	53	688.00	2499.90	2502.74		2503.17	0.008225	5.22	131.83	83.30	0.73
Reach 1	51	688.00	2499.70	2502.50		2502.79	0.005613	4.33	159.00	99.99	0.60
Reach 1	50	688.00	2499.50	2502.27		2502.51	0.005029	3.98	172.74	113.37	0.57
Reach 1	48	688.00	2499.40	2501.64	2501.54	2502.10	0.013476	5.46	126.00	107.87	0.89
Reach 1	47	688.00	2499.25	2500.83	2500.81	2501.35	0.016711	5.77	119.20	110.41	0.98
Reach 1	45	688.00	2498.90	2500.40		2500.70	0.008556	4.34	158.44	136.14	0.71
Reach 1	42	688.00	2498.20	2499.61	2499.61	2500.07	0.018516	5.48	125.52	135.76	1.00
Reach 1	40	688.00	2497.30	2498.99	2498.75	2499.31	0.009339	4.56	150.95	128.78	0.74
Reach 1	39	688.00	2496.70	2498.17	2498.13	2498.70	0.015717	5.81	118.33	103.49	0.96
Reach 1	38	688.00	2495.20	2498.02		2498.27	0.003877	3.98	173.03	93.52	0.52
Reach 1	36	688.00	2493.50	2497.02	2497.02	2497.86	0.015331	7.39	93.06	55.34	1.00
Reach 1	33	688.00	2490.24	2495.79	2494.23	2496.31	0.003667	5.77	119.33	32.99	0.53
Reach 1	31	688.00	2490.00	2495.48		2496.04	0.002049	6.00	114.75	31.91	0.56
Reach 1	30	688.00	2490.20	2494.66		2495.69	0.004748	8.17	84.25	27.82	0.83
Reach 1	29	688.00	2490.04	2494.58	2494.58	2495.37	0.008178	7.17	95.99	60.34	1.00
Reach 1	28	688.00	2490.00	2494.20	2494.42	2495.22	0.023646	8.11	84.83	59.24	1.19
Reach 1	27	688.00	2488.52	2491.66	2492.54	2494.46	0.036551	13.43	51.24	22.60	1.57
Reach 1	26	688.00	2487.04	2489.98	2491.11	2493.54	0.049509	15.14	45.44	20.90	1.81
Reach 1	25	688.00	2487.00	2492.11	2491.05	2492.83	0.005568	6.81	101.01	29.53	0.65
Reach 1	24	688.00	2486.94	2492.05		2492.74	0.005350	6.67	103.17	30.36	0.64
Reach 1	23	688.00	2486.60	2491.64		2492.40	0.003049	7.00	98.23	29.00	0.67
Reach 1	22	688.00	2486.20	2491.43		2492.09	0.002551	6.53	105.35	30.30	0.62
Reach 1	21	688.00	2485.80	2491.27		2491.83	0.002060	6.01	114.52	31.88	0.56
Reach 1	20	688.00	2485.40	2490.01	2490.01	2491.40	0.007203	9.43	72.96	26.62	1.00
Reach 1	19	688.00	2485.00	2488.69	2489.03	2490.50	0.010147	10.80	63.69	24.50	1.18
Reach 1	18	688.00	2484.96	2488.02	2488.69	2490.33	0.015182	12.20	56.40	24.85	1.43
Reach 1	17	688.00	2484.90	2487.60	2488.33	2490.05	0.017308	12.56	54.78	25.60	1.51
Reach 1	16	688.00	2484.84	2487.20	2487.99	2489.74	0.020019	12.79	53.78	27.56	1.61
Reach 1	15	688.00	2484.80	2487.01	2487.79	2489.53	0.020935	12.75	53.95	28.84	1.64
Reach 1	14	688.00	2484.60	2488.26	2487.59	2488.99	0.003497	6.89	99.81	34.62	0.72
Reach 1	13	688.00	2484.24	2488.28		2488.56	0.003085	4.21	163.32	111.09	0.61
Reach 1	12	688.00	2484.20	2487.19	2487.19	2488.41	0.014182	8.87	77.54	31.94	1.00
Reach 1	11	688.00	2483.32	2485.64	2486.30	2487.88	0.034674	12.03	57.20	29.41	1.52
Reach 1	10	688.00	2482.44	2484.73	2485.46	2487.15	0.037269	12.47	55.16	28.17	1.57
Reach 1	9	688.00	2482.40	2486.13	2485.38	2486.83	0.006357	6.71	102.48	34.93	0.69
Reach 1	8	688.00	2482.34	2485.99		2486.73	0.006889	6.90	99.72	34.68	0.72
Reach 1	7	688.00	2482.20	2485.74		2486.54	0.003924	7.18	95.88	34.16	0.75
Reach 1	6	688.00	2481.80	2485.37		2486.15	0.003829	7.11	96.70	34.26	0.75
Reach 1	5	688.00	2481.40	2484.99		2485.77	0.003761	7.07	97.32	34.34	0.74
Reach 1	4	688.00	2481.00	2484.66	2483.98	2485.39	0.003488	6.89	99.90	34.63	0.71
Reach 1	3	688.00	2480.60	2483.61	2483.61	2484.86	0.007273	8.97	76.68	31.02	1.01
Reach 1	2	688.00	2479.86	2481.61	2482.37	2484.11	0.025553	12.71	54.14	34.07	1.78
Reach 1	1	688.00	2479.60	2480.87	2481.55	2483.35	0.035899	12.66	54.36	44.79	2.02

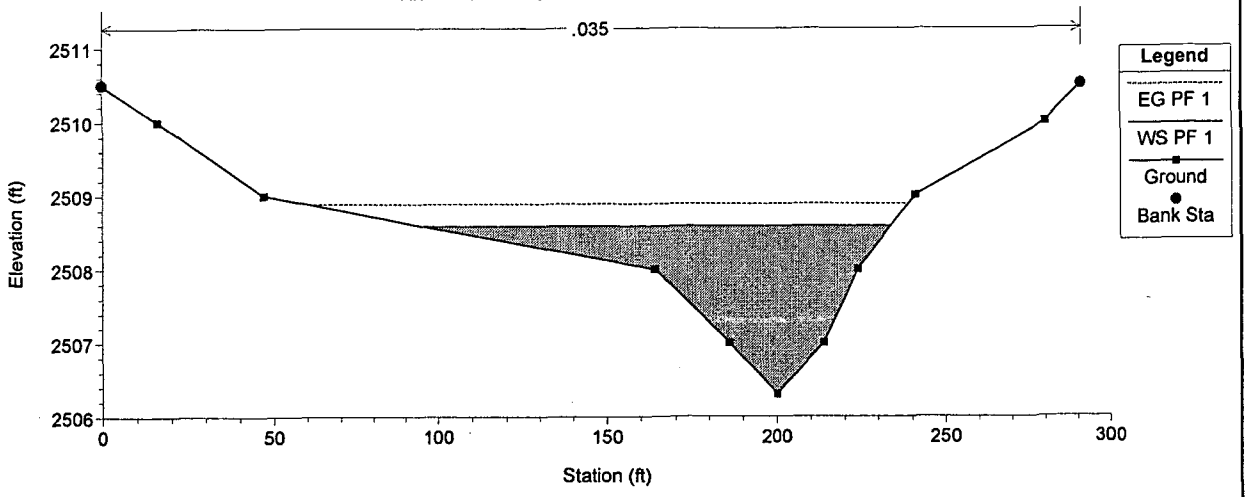

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 65 1+70
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 64 2+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 63 2+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 62 3+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 61 3+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 60 4+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

SVE Diversion Plan: SVE #1

Geom: SVE Geometry Flow: SVE #1

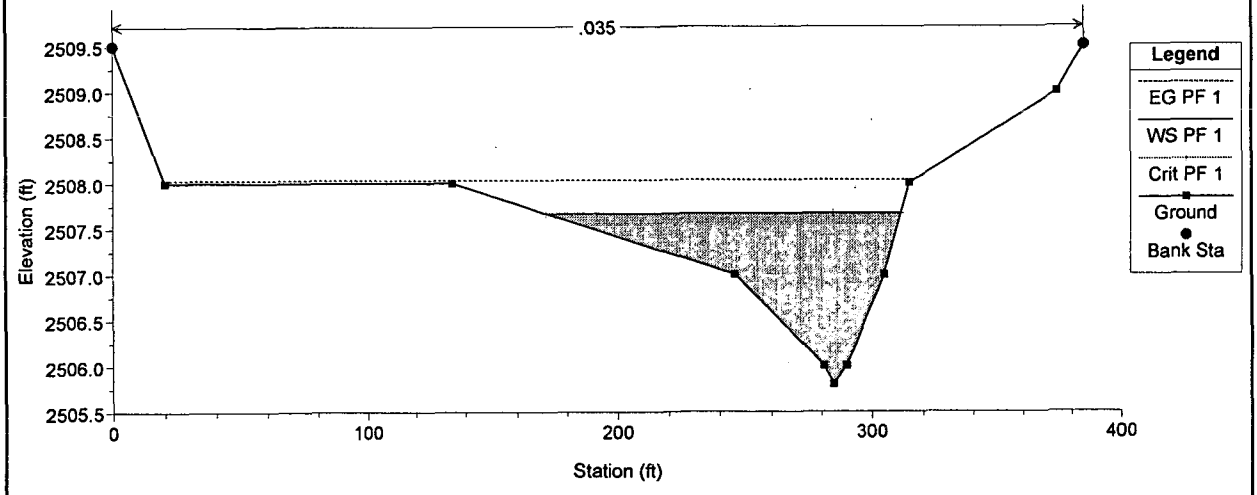
River = SVE Reach = Reach 1 RS = 59 4+50



SVE Diversion Plan: SVE #1

Geom: SVE Geometry Flow: SVE #1

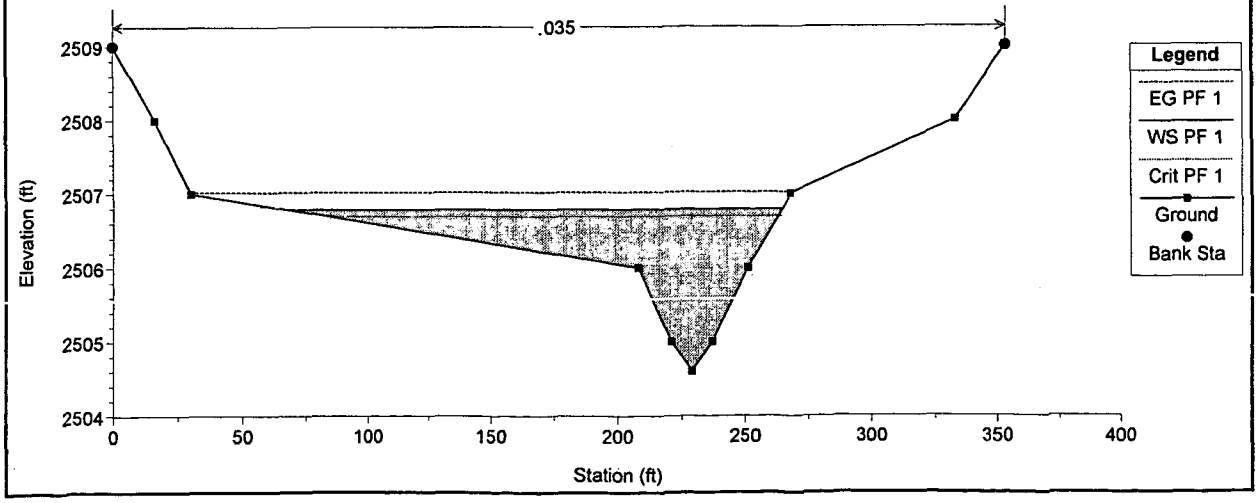
River = SVE Reach = Reach 1 RS = 58 5+00

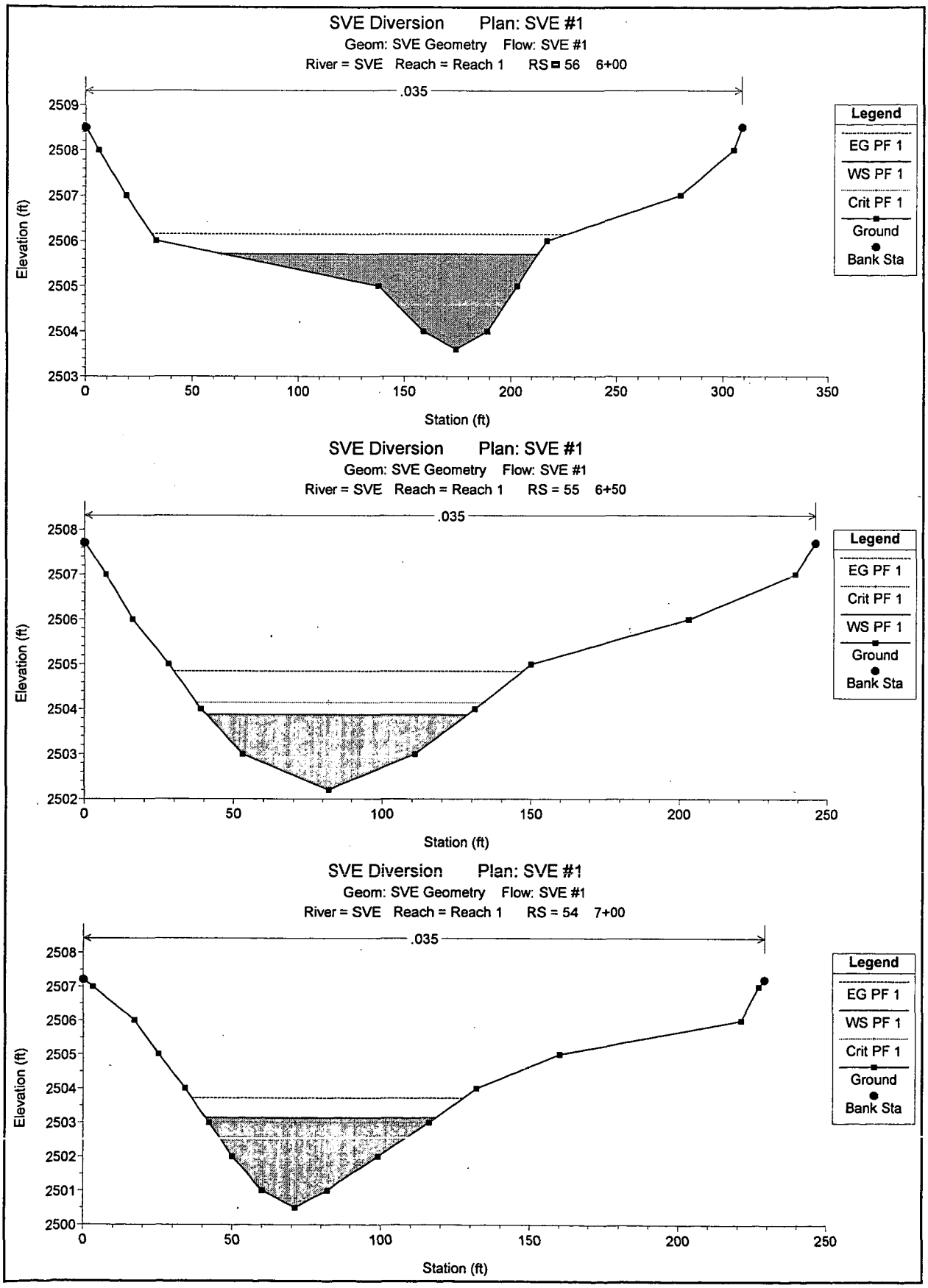


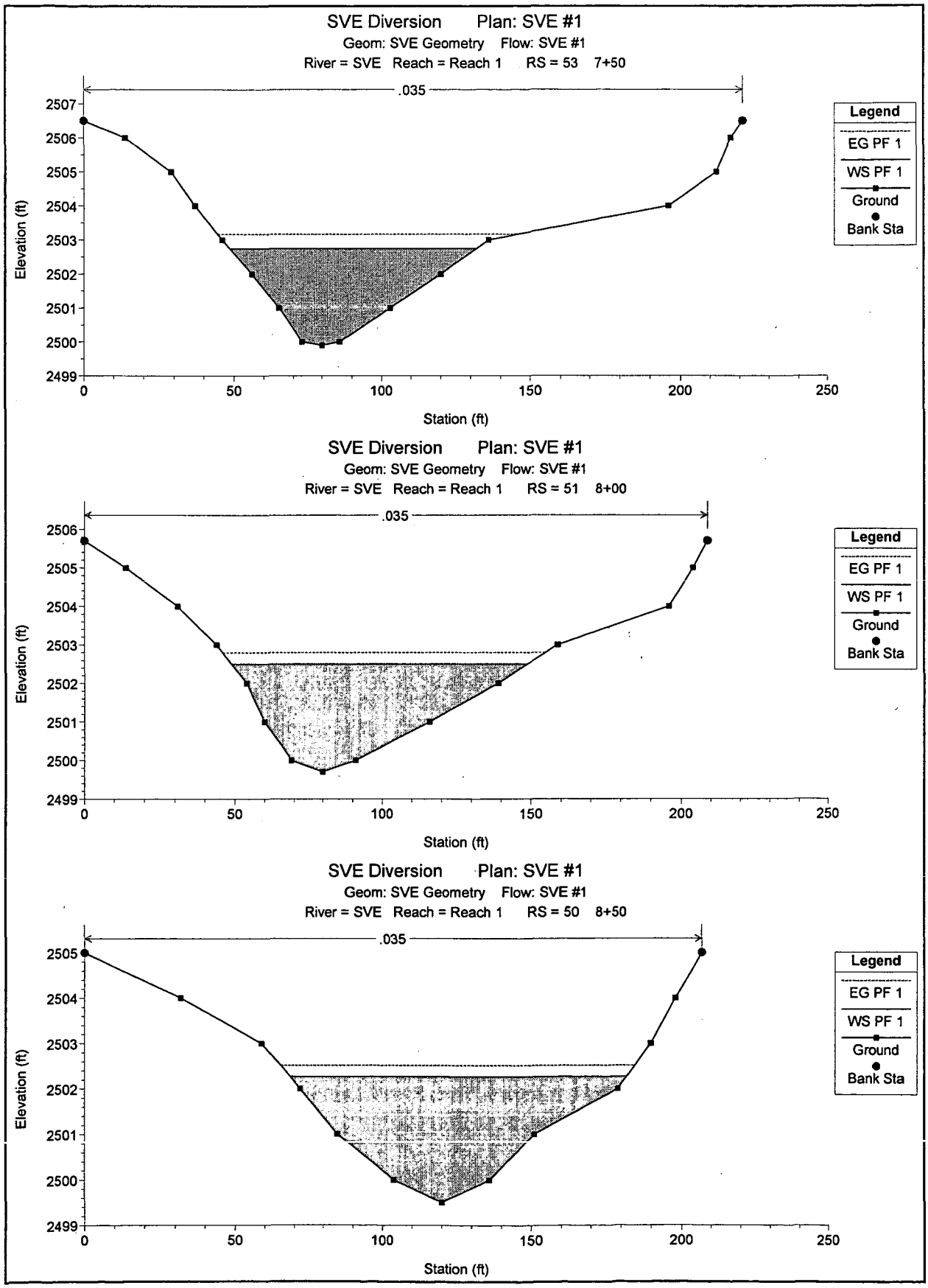
SVE Diversion Plan: SVE #1

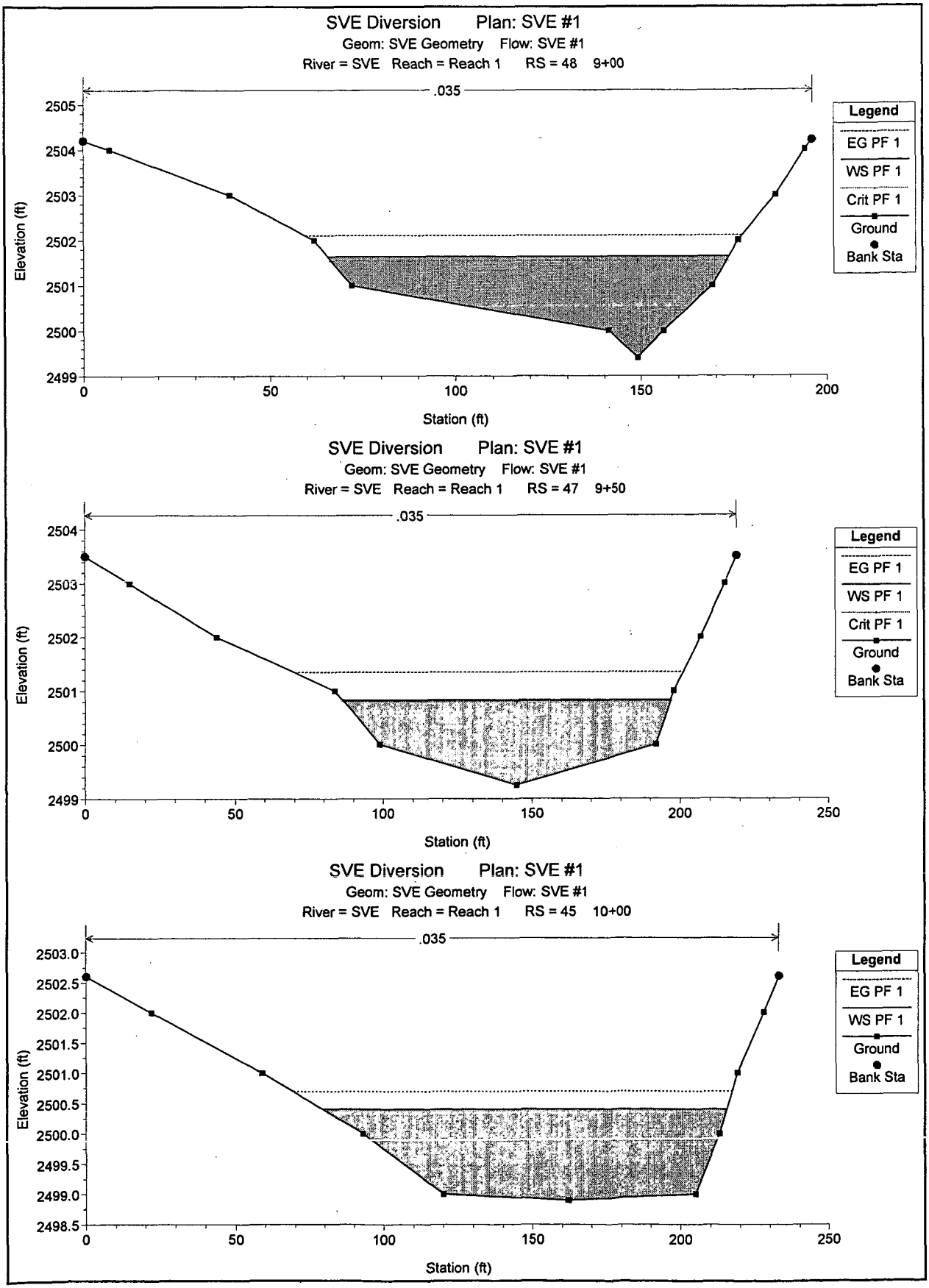
Geom: SVE Geometry Flow: SVE #1

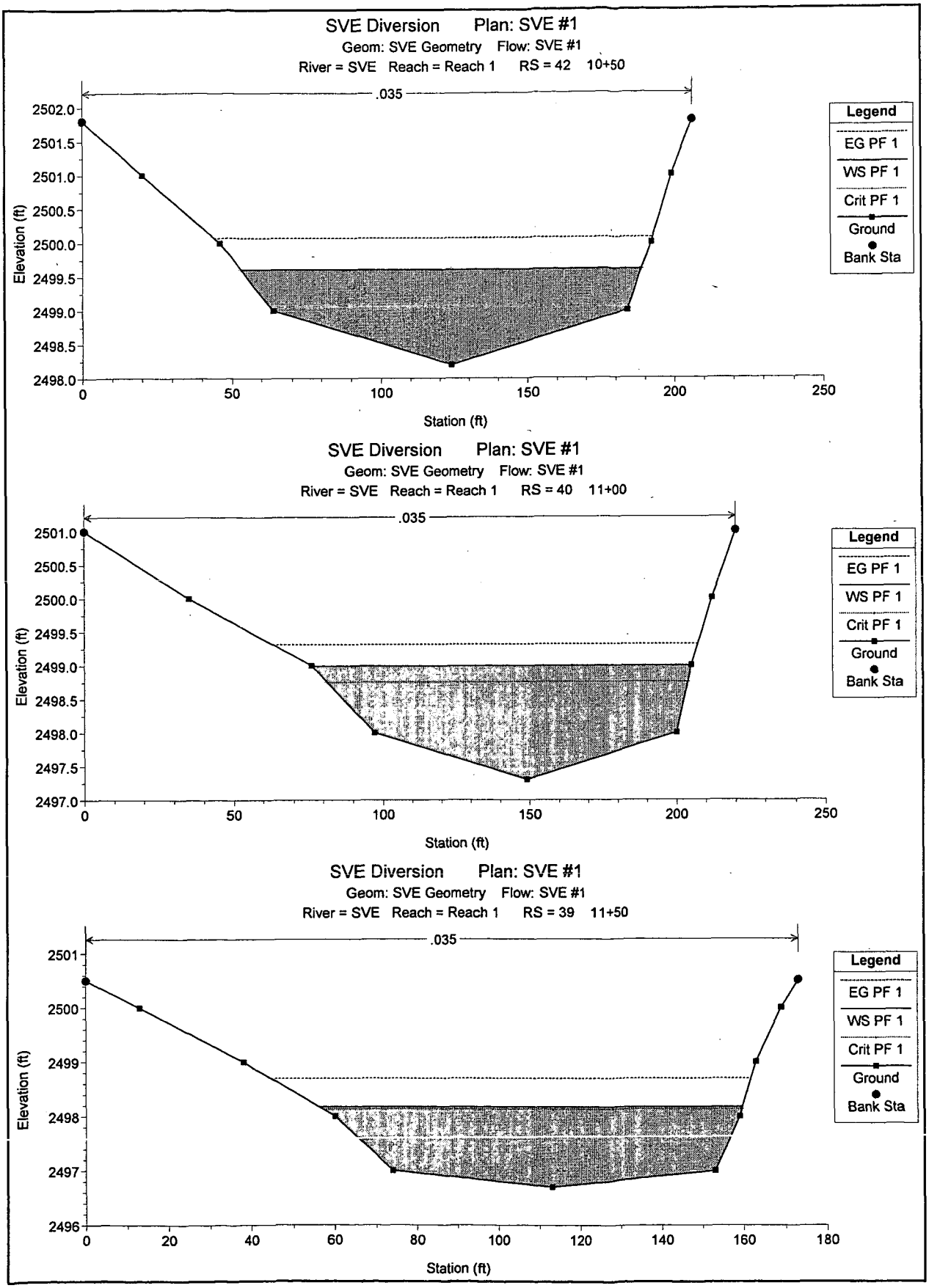
River = SVE Reach = Reach 1 RS = 57 5+50

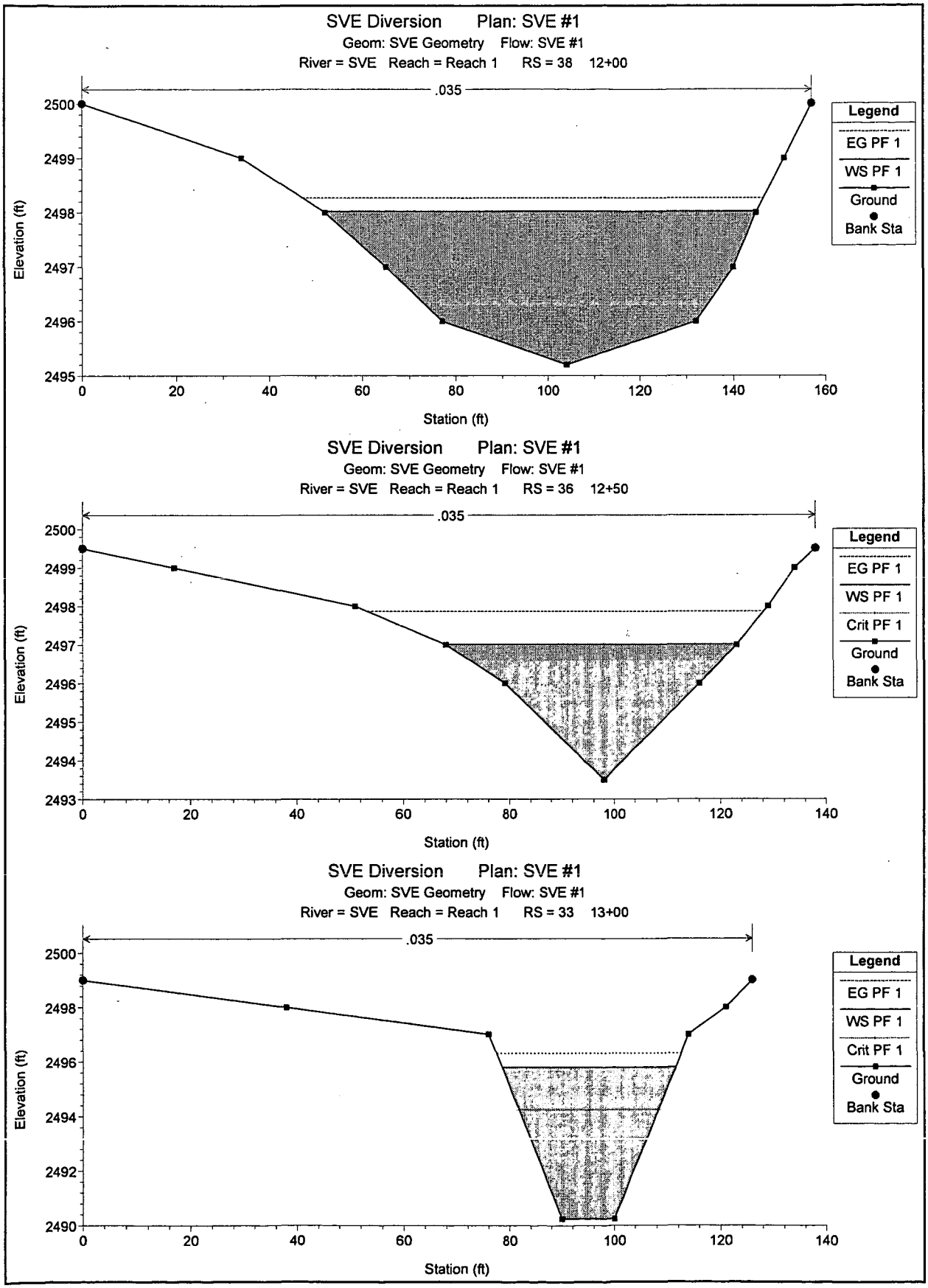


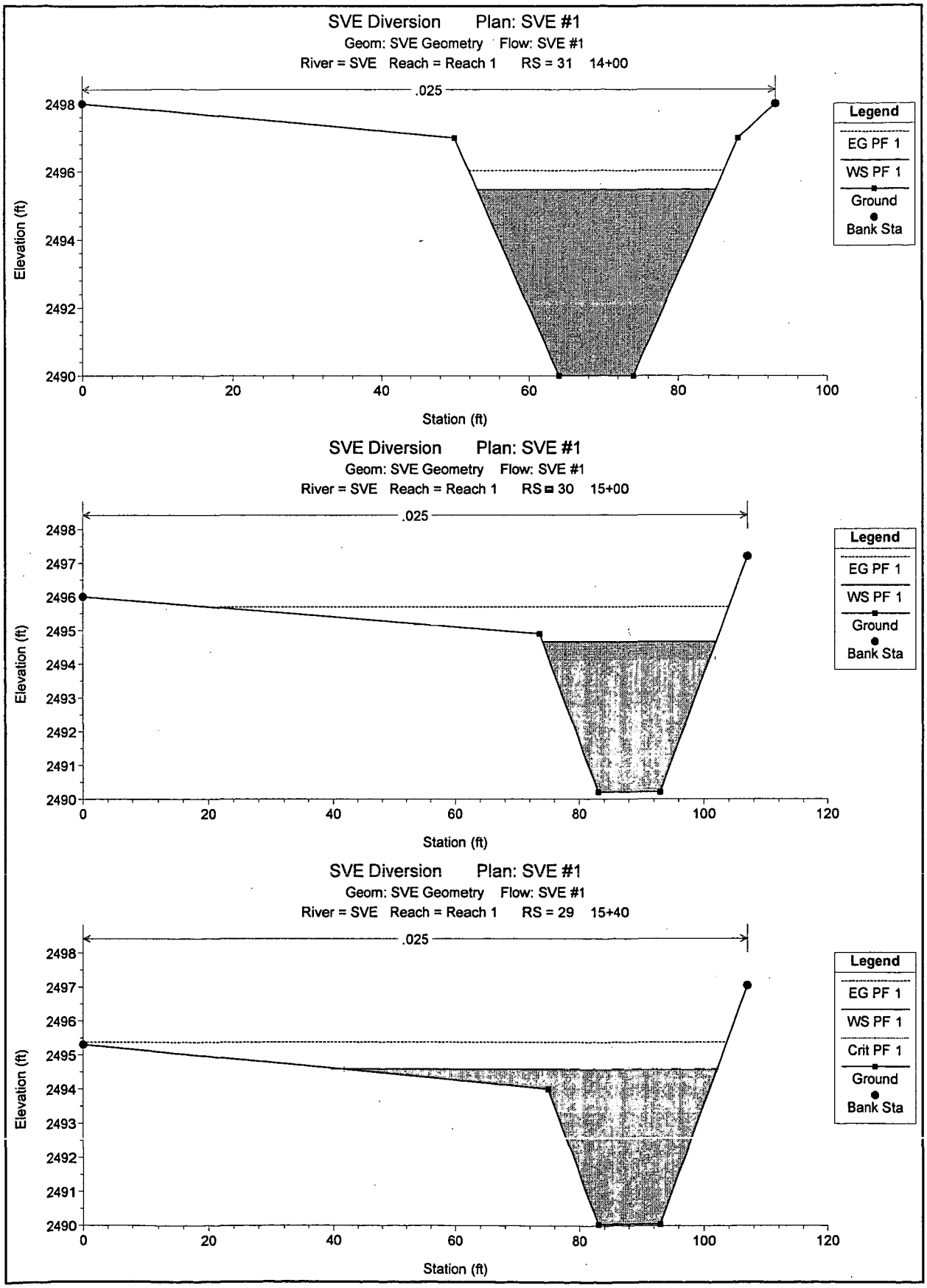

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 56 6+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 55 6+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 54 7+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

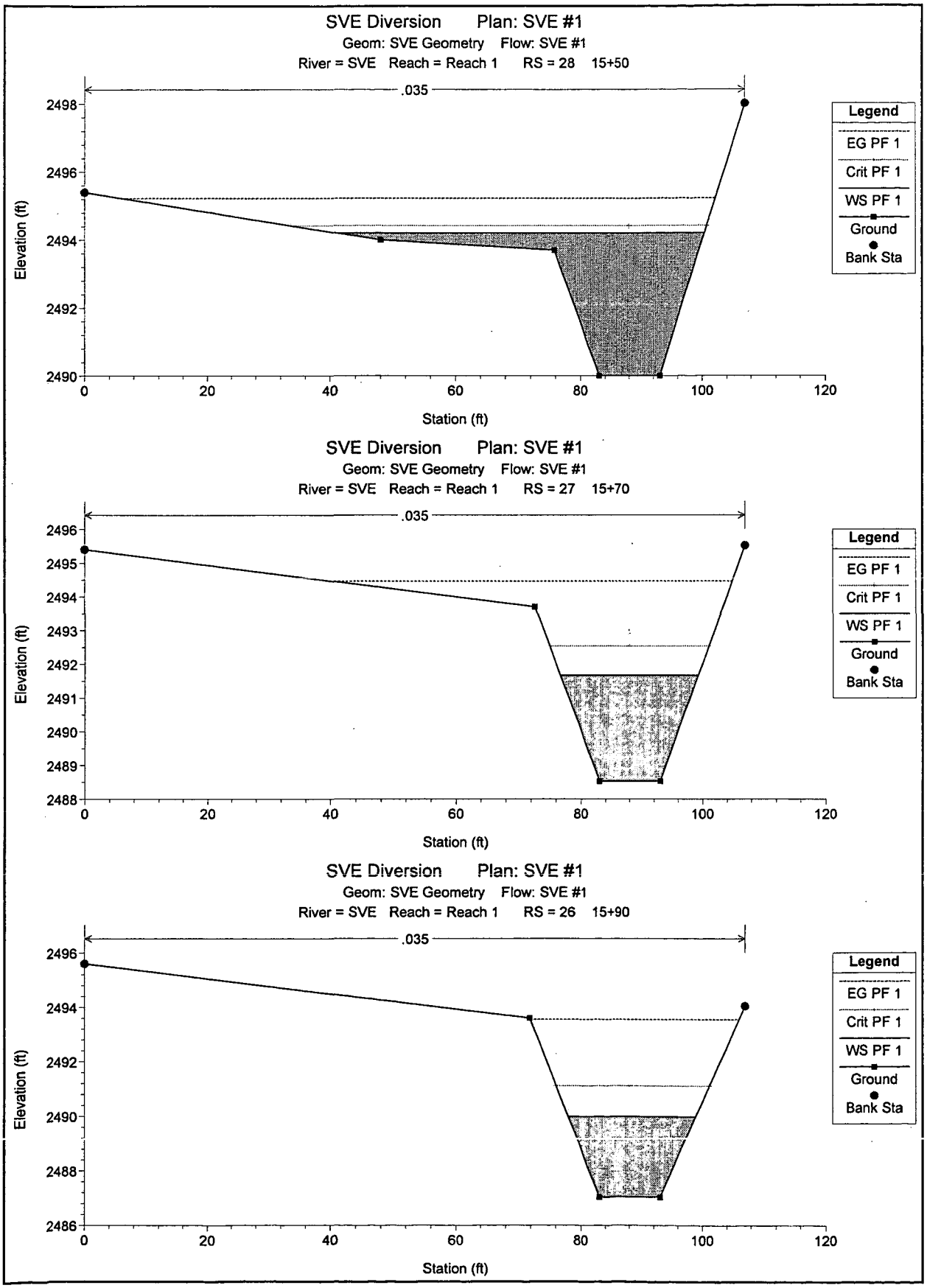

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 53 7+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 51 8+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 50 8+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

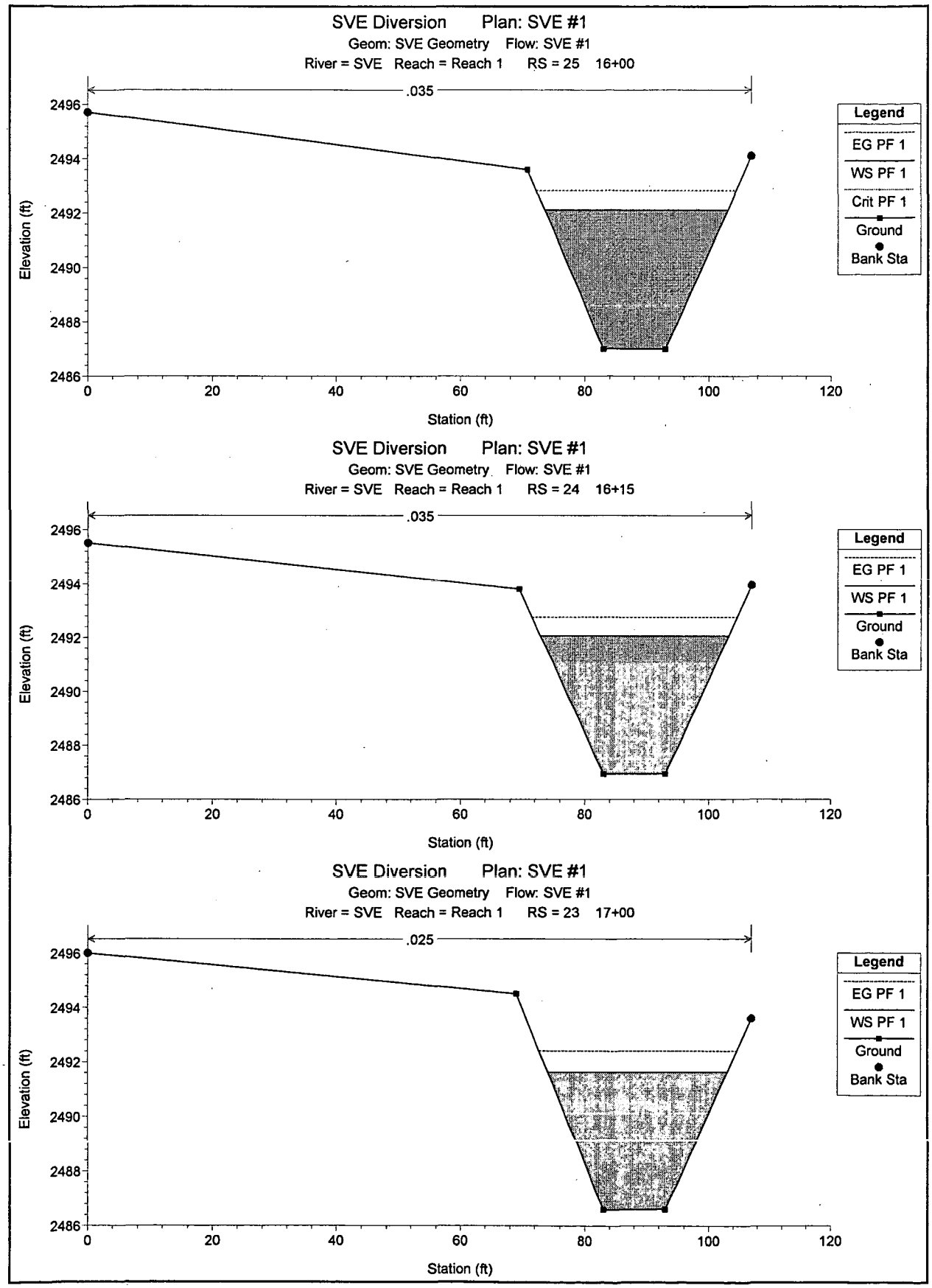

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 48 9+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 47 9+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 45 10+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

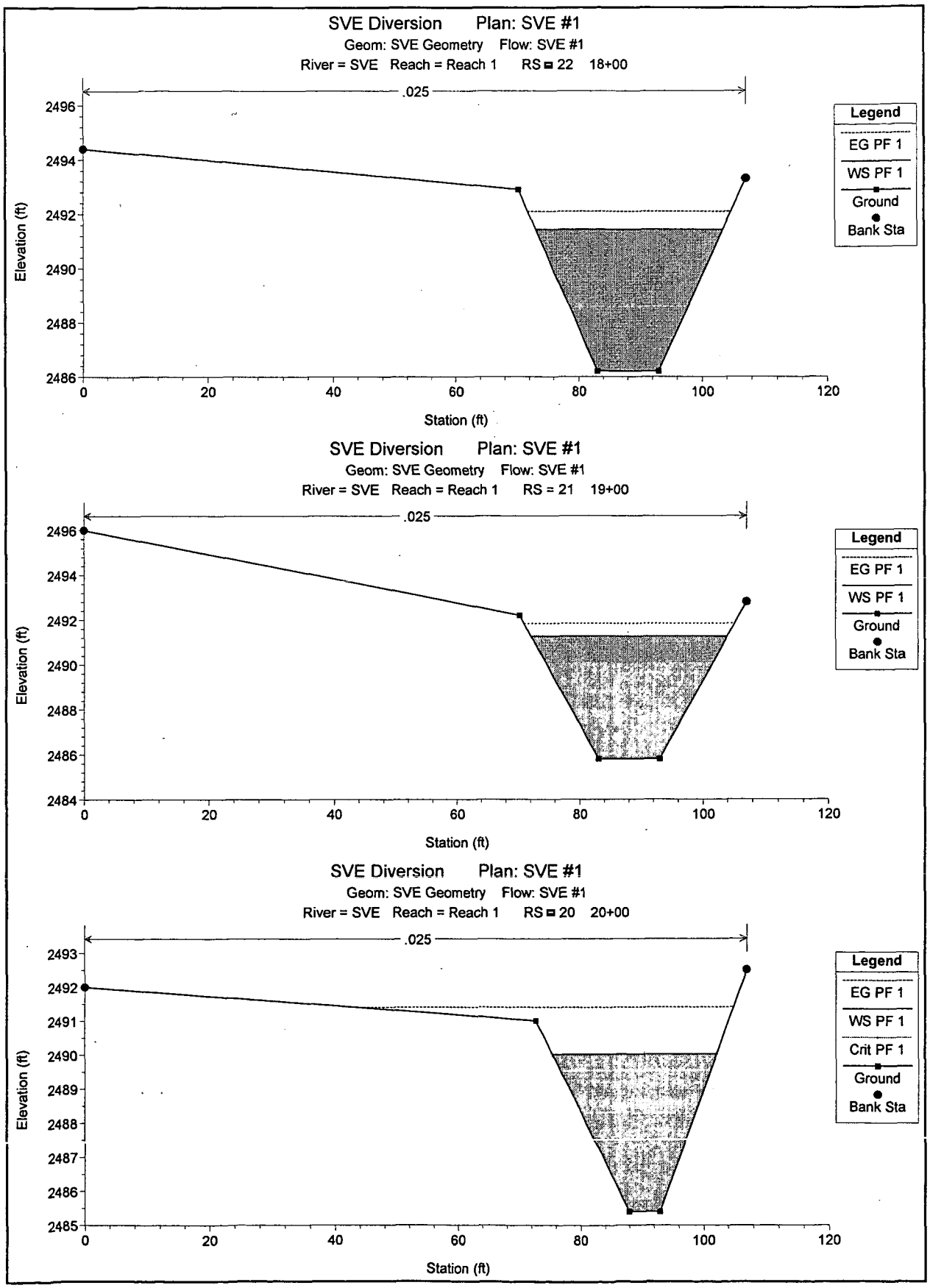

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 42 10+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 40 11+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 39 11+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

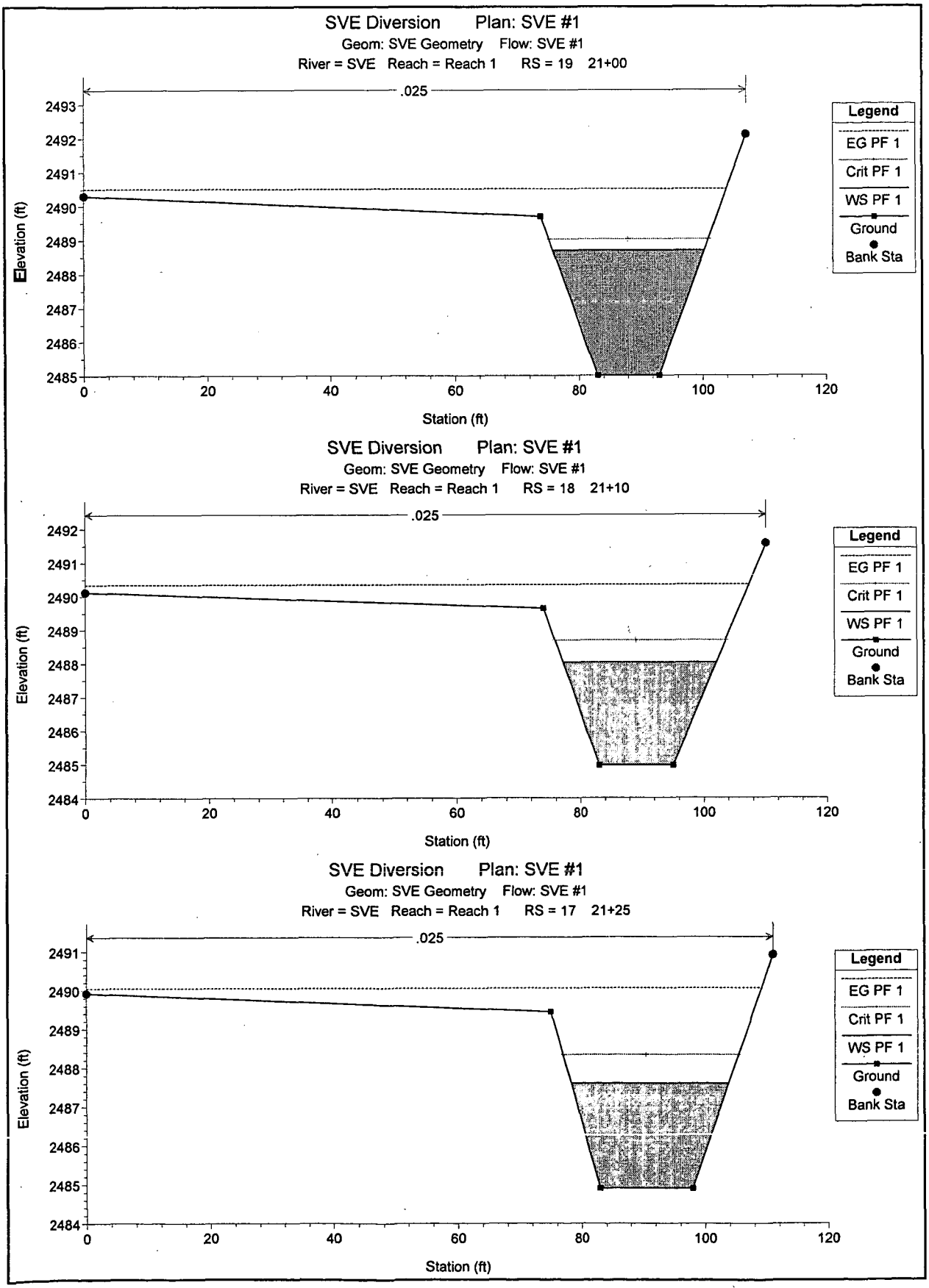

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 38 12+00
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 36 12+50
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 33 13+00
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

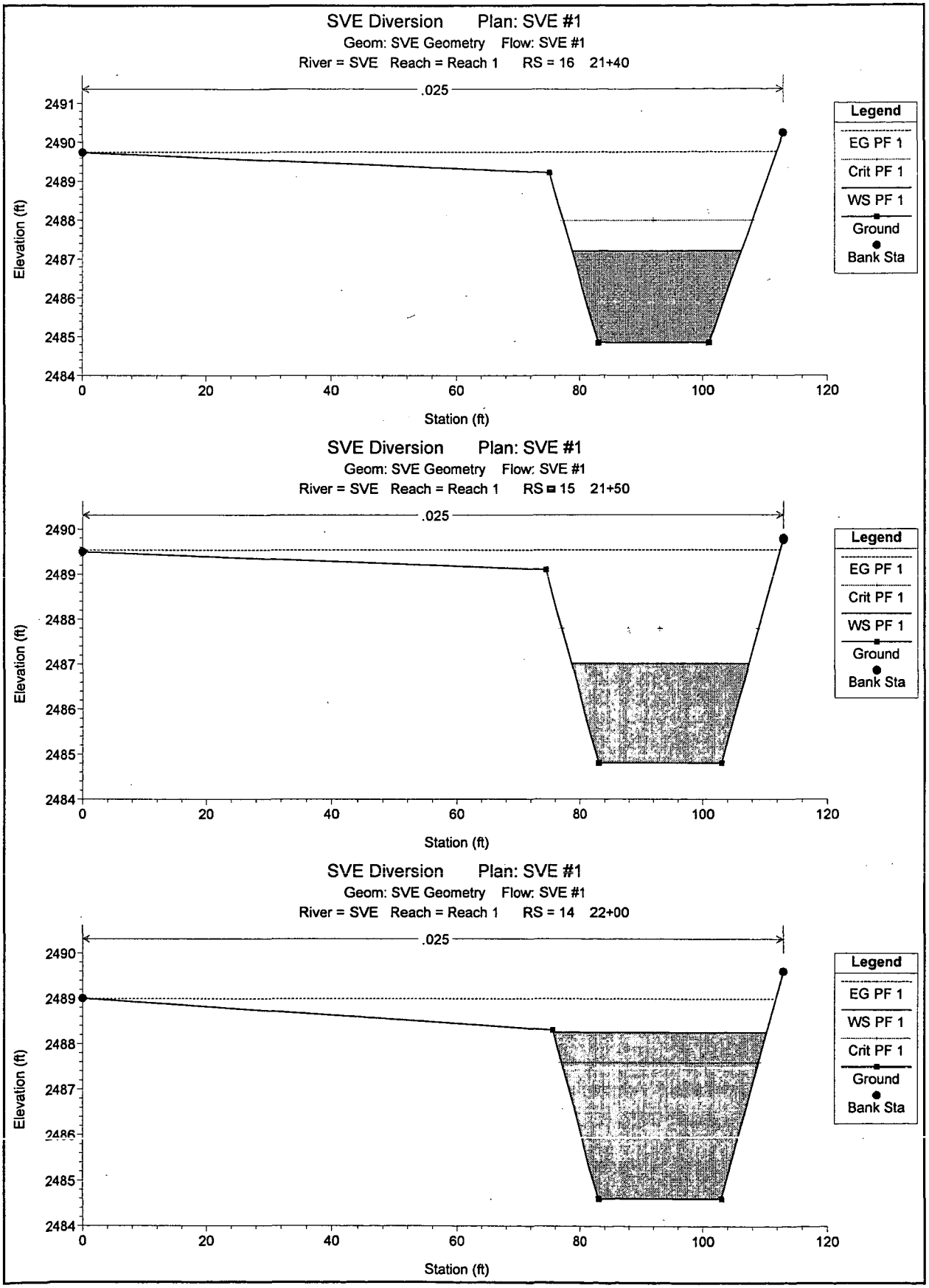

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 31 14+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 30 15+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 29 15+40
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

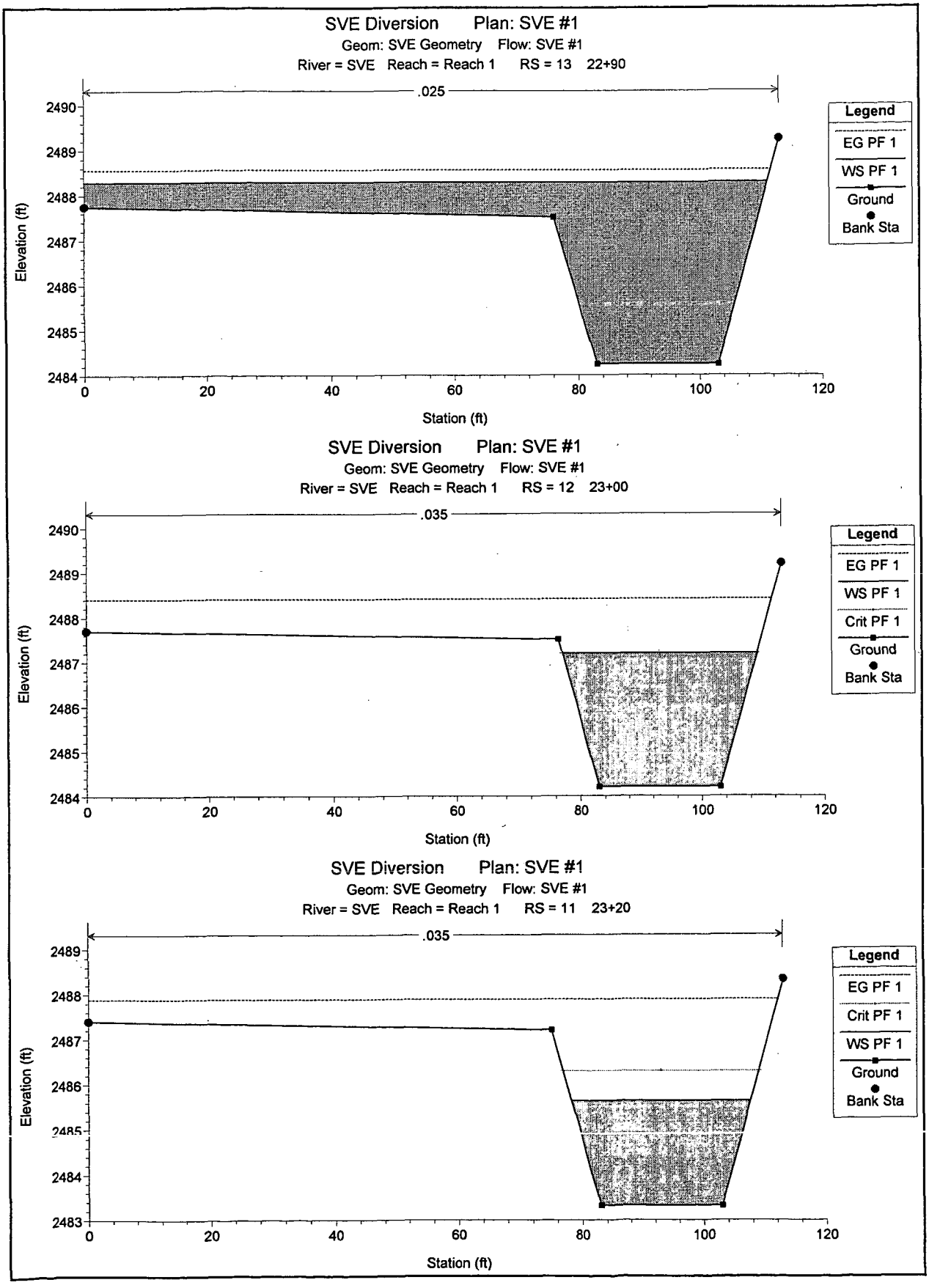

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 28 15+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 27 15+70
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 26 15+90
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

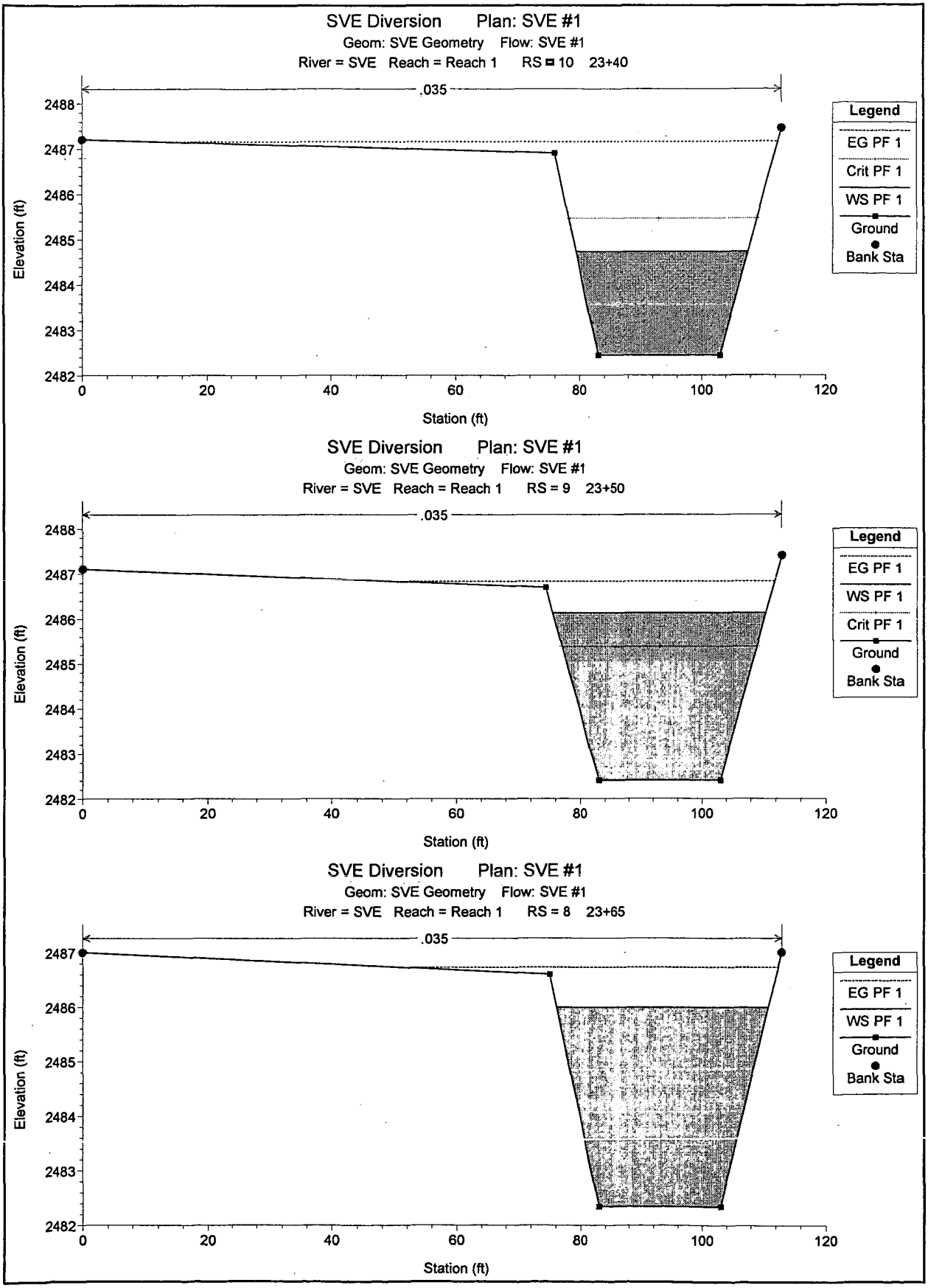

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 25 16+00
.035
Elevation (ft)
2496
2494
2492
2490
2488
2486
0
20
40
60
80
100
120
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 24 16+15
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 23 17+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

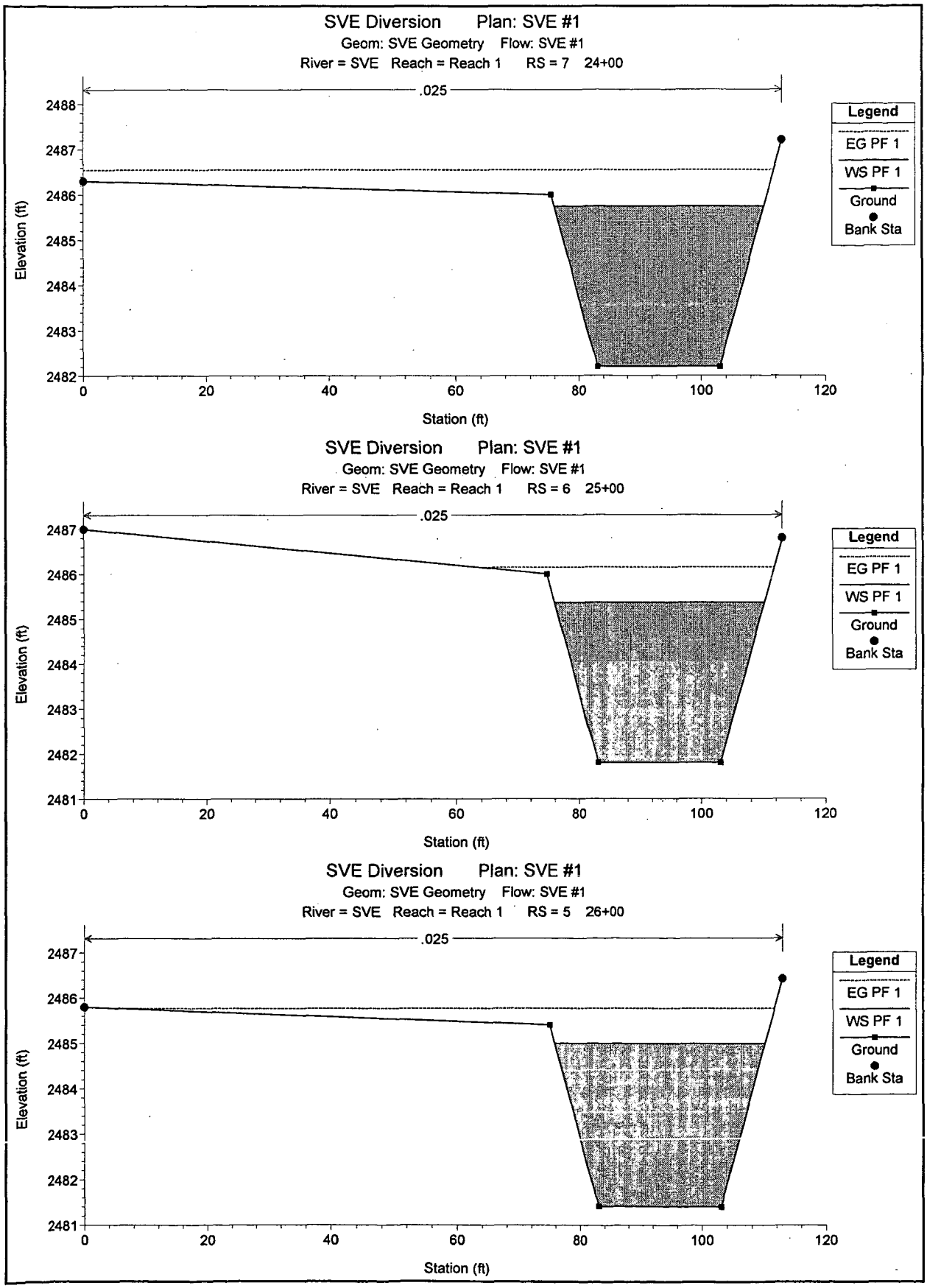

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 22 18+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 21 19+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 20 20+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

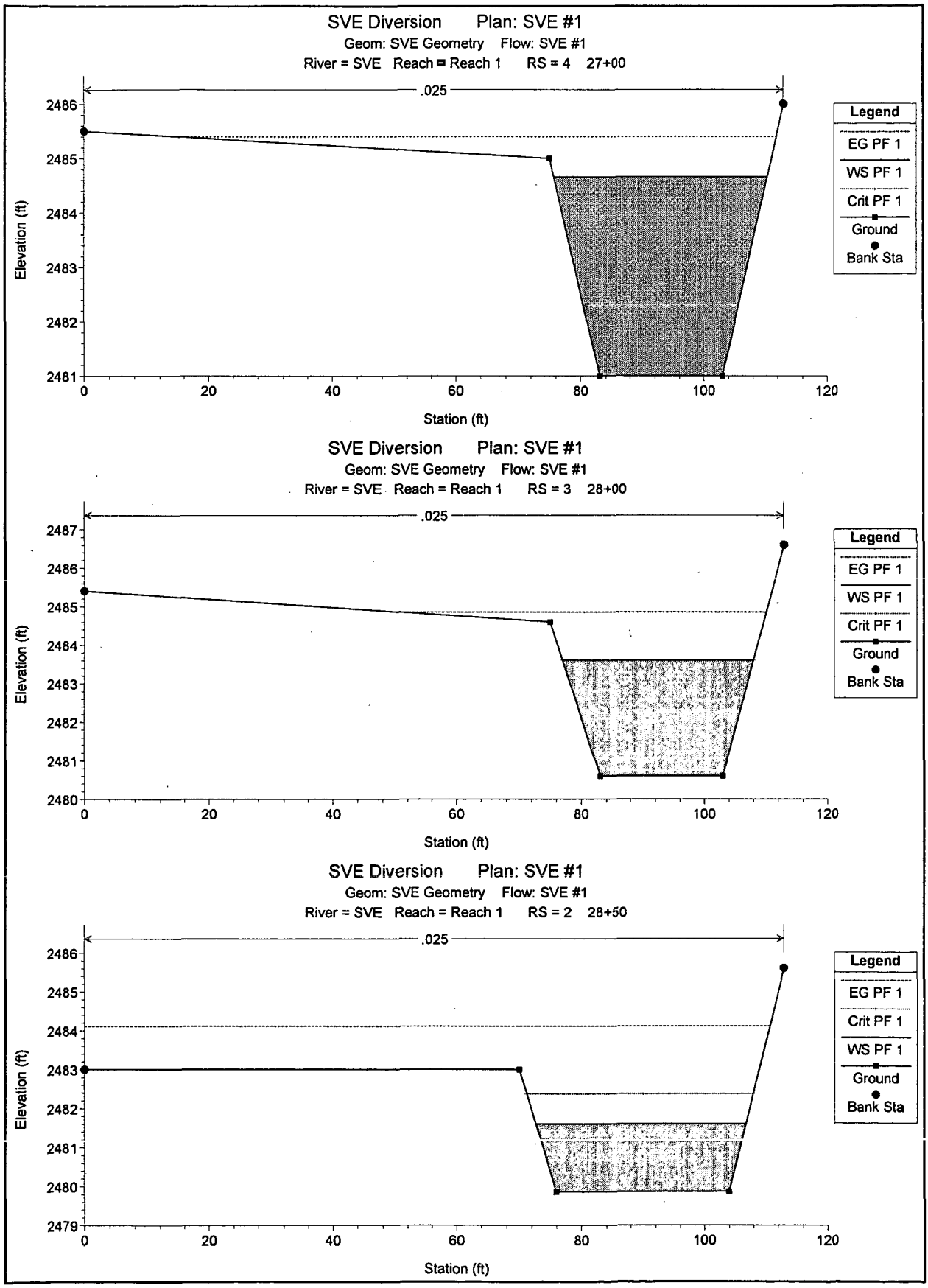

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 19 21+00
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 18 21+10
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 17 21+25
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

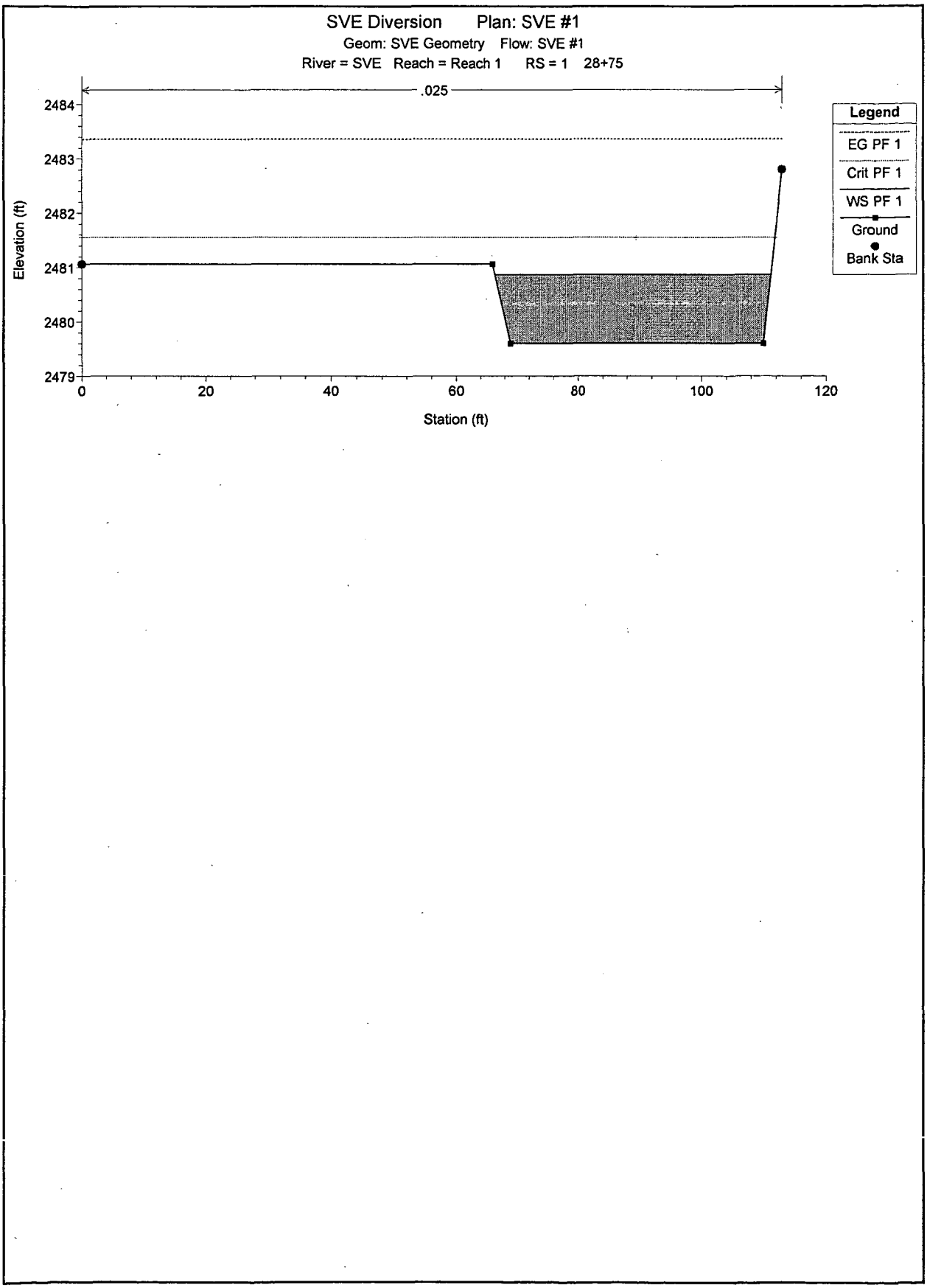

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 16 21+40
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 15 21+50
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 14 22+00
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 13 22+90
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 12 23+00
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 11 23+20
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 10 23+40
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 9 23+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 8 23+65
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

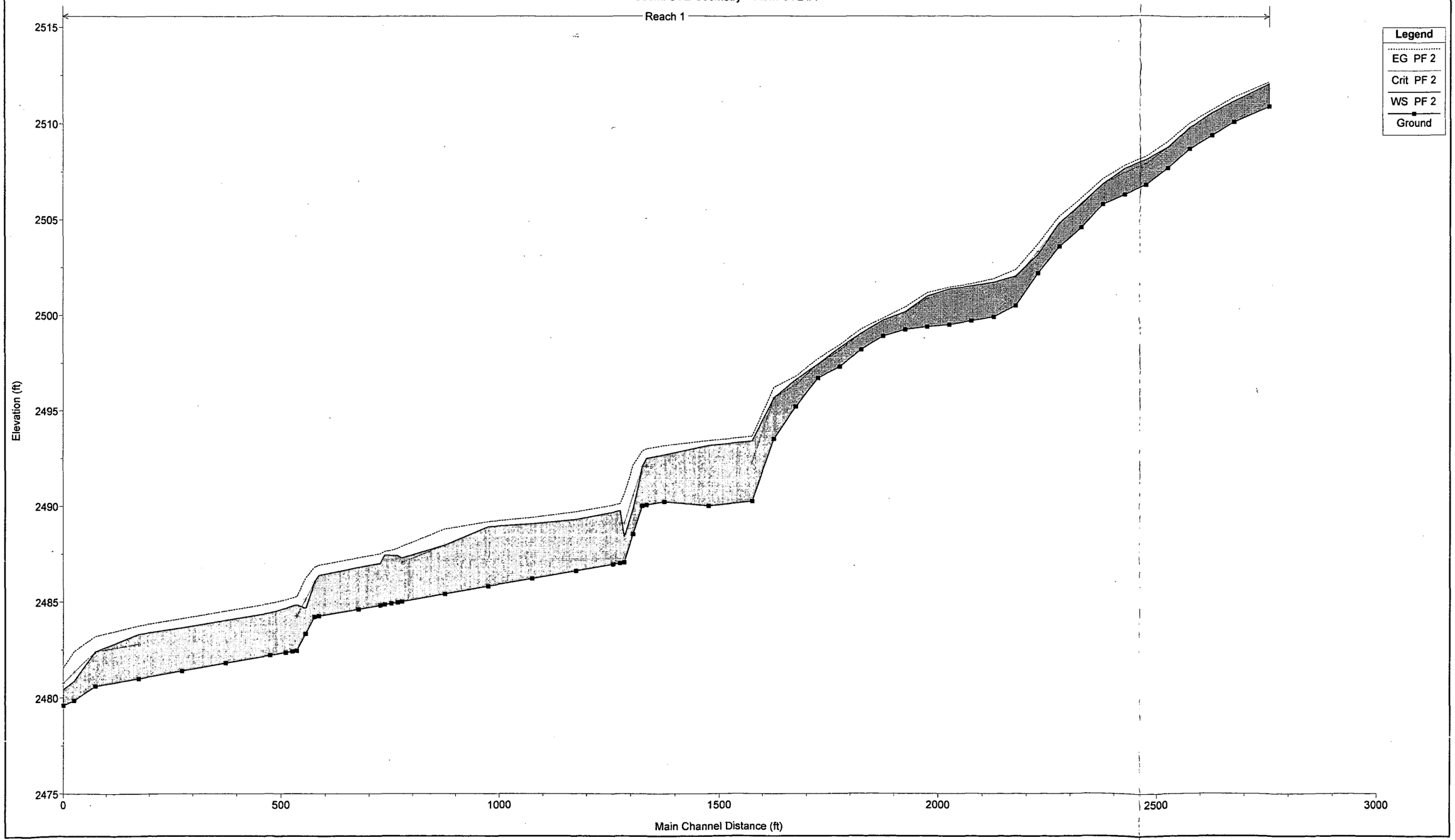

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 7 24+00
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 6 25+00
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 5 26+00
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 4 27+00
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 3 28+00
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 2 28+50
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 1 28+75
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2484
2483
2482
2481
2480
2479
0
20
40
60
80
100
120
Station (ft)

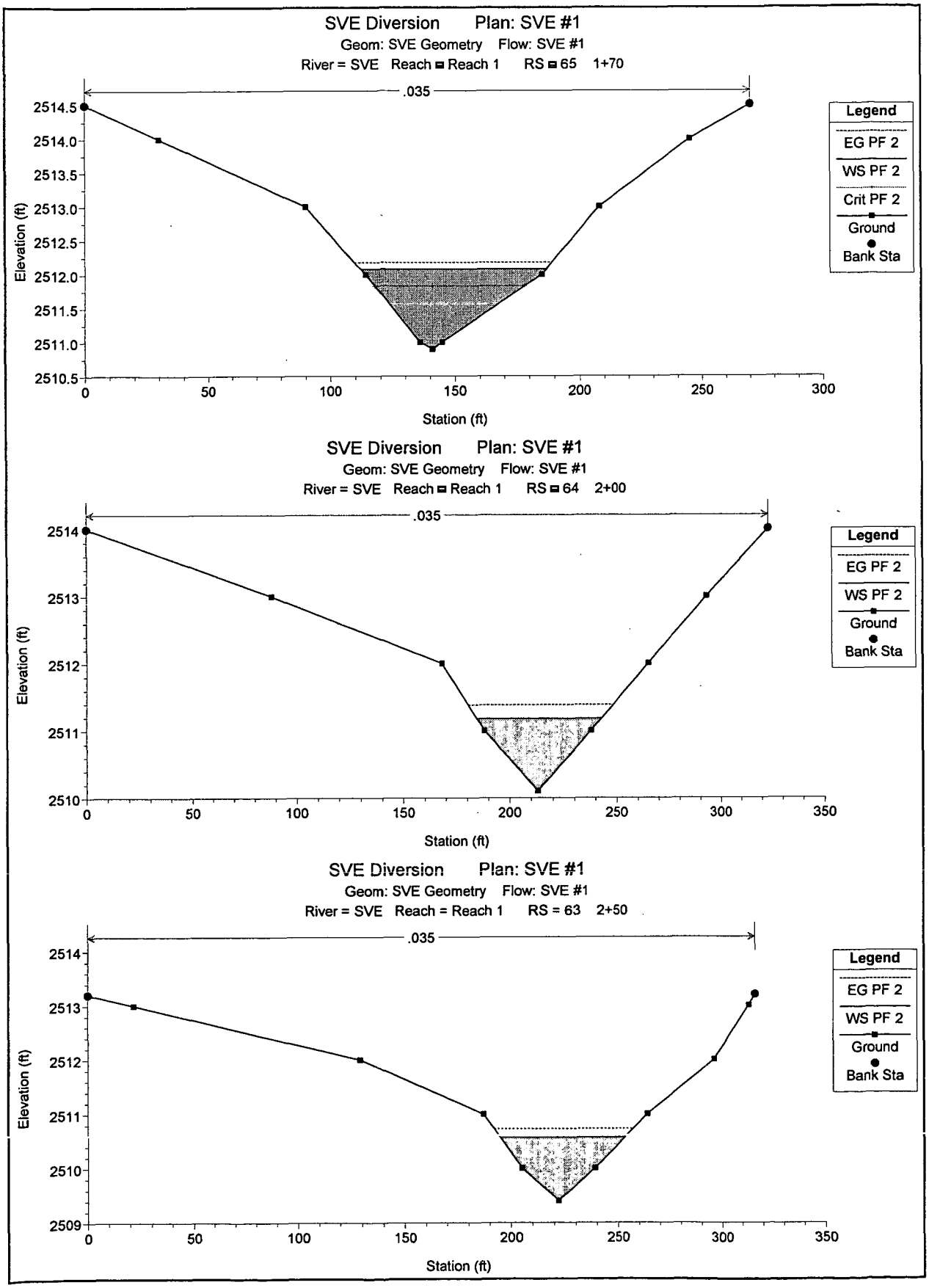
SVE Diversion Plan: SVE #1

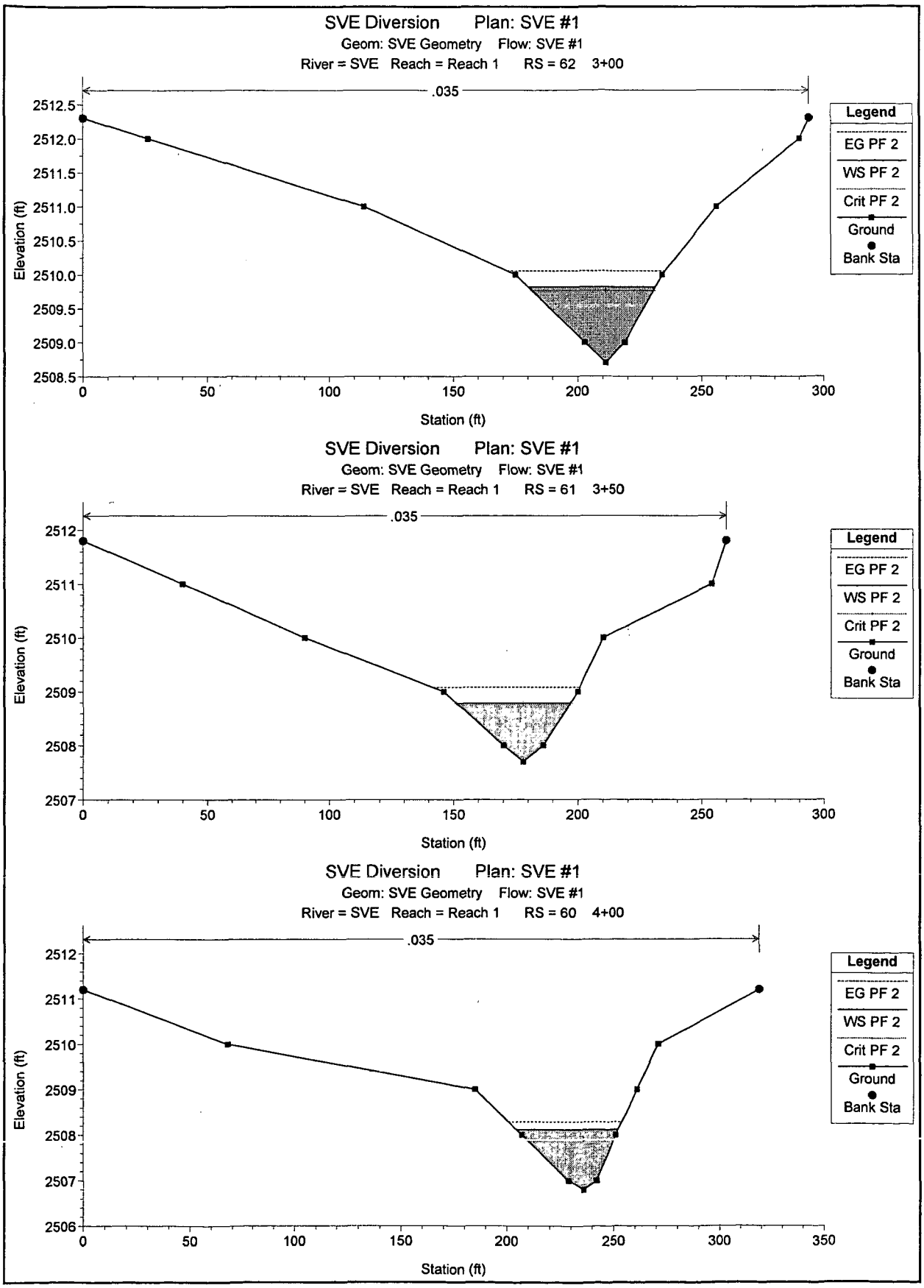
Geom: SVE Geometry Flow: SVE #1

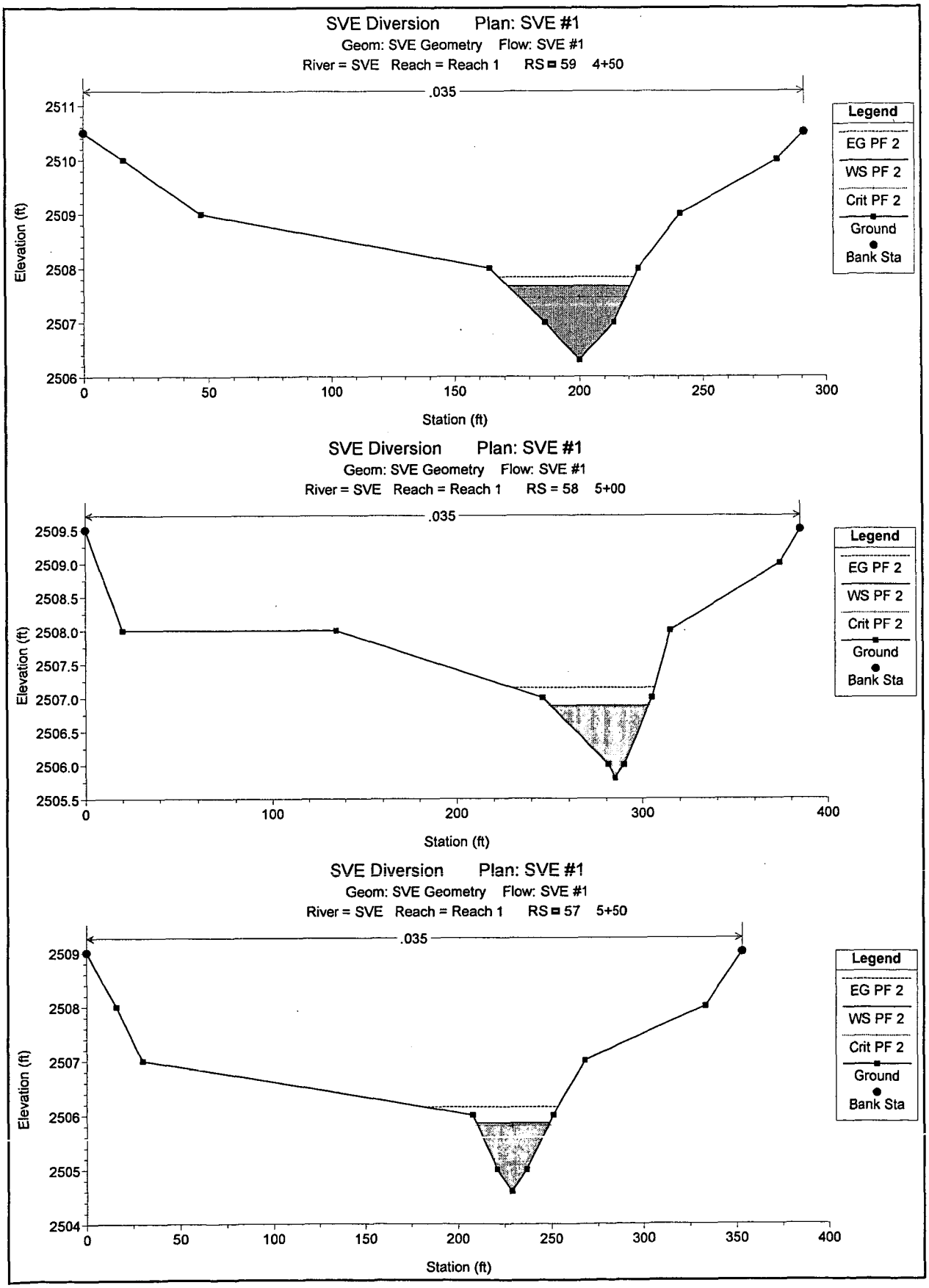


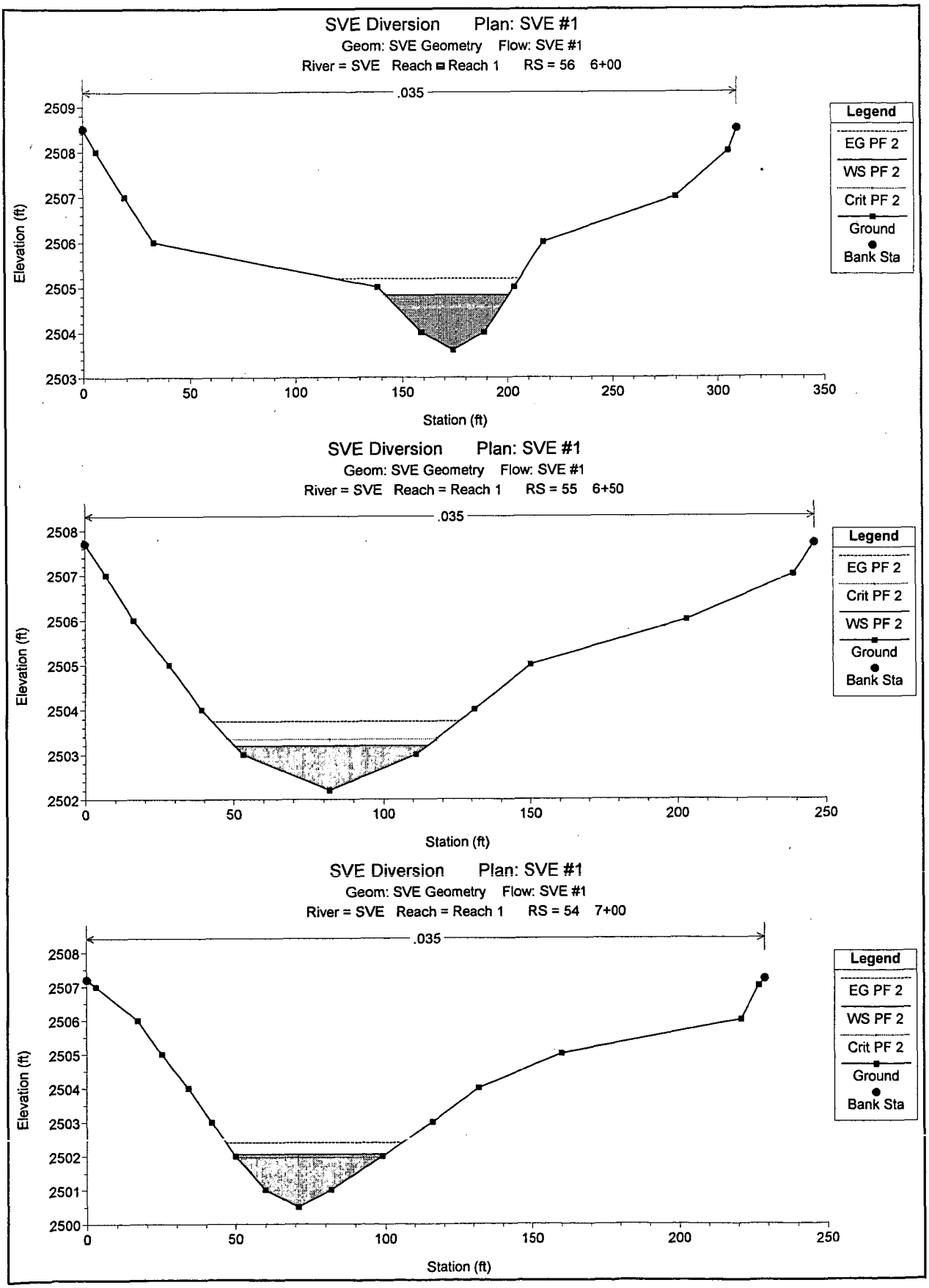
HEC-RAS Plan: SVE1 River: SVE Reach: Reach 1 Profile: PF 2

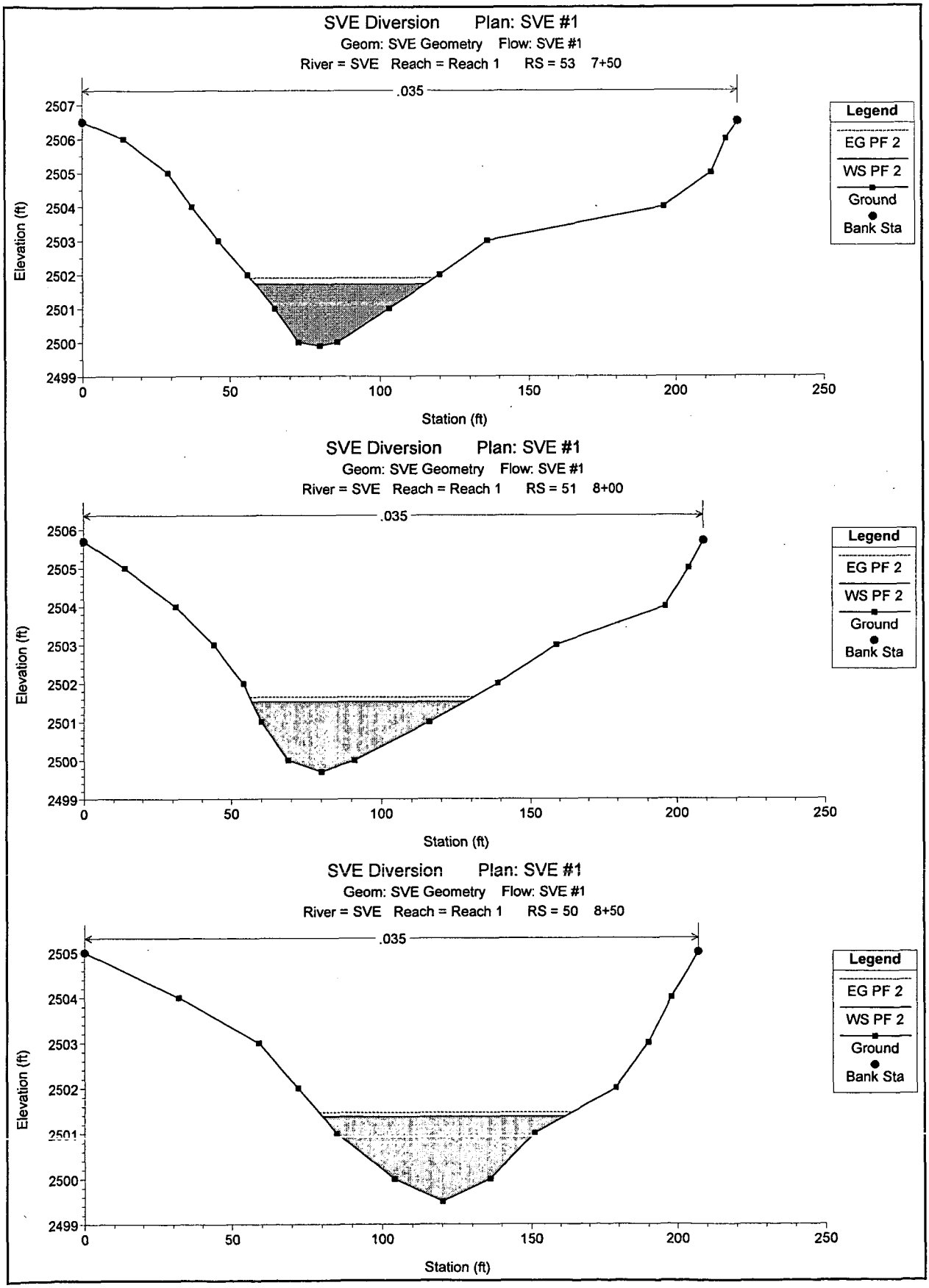
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	65	116.00	2510.90	2512.08	2511.83	2512.18	0.006645	2.51	46.20	74.71	0.56
Reach 1	64	116.00	2510.10	2511.18		2511.38	0.015967	3.60	32.18	58.40	0.86
Reach 1	63	116.00	2509.40	2510.57		2510.73	0.010535	3.18	36.47	58.44	0.71
Reach 1	62	116.00	2508.70	2509.82	2509.76	2510.05	0.017294	3.89	29.79	51.11	0.90
Reach 1	61	116.00	2507.70	2508.78	2508.78	2509.08	0.021897	4.37	26.55	45.73	1.01
Reach 1	60	116.00	2506.80	2508.12	2507.90	2508.29	0.009068	3.29	35.21	47.77	0.68
Reach 1	59	116.00	2506.30	2507.67	2507.46	2507.83	0.009155	3.26	35.56	49.32	0.68
Reach 1	58	116.00	2505.80	2506.88	2506.88	2507.14	0.022136	4.14	28.04	52.87	1.00
Reach 1	57	116.00	2504.60	2505.85	2505.81	2506.15	0.017555	4.36	26.63	39.01	0.93
Reach 1	56	206.00	2503.60	2504.82	2504.82	2505.19	0.019984	4.84	42.60	58.84	1.00
Reach 1	55	206.00	2502.20	2503.19	2503.34	2503.73	0.044180	5.92	34.82	64.45	1.42
Reach 1	54	206.00	2500.50	2502.06	2501.97	2502.40	0.014921	4.71	43.72	50.37	0.89
Reach 1	53	206.00	2499.90	2501.72		2501.90	0.006077	3.43	59.99	56.60	0.59
Reach 1	51	206.00	2499.70	2501.53		2501.64	0.003782	2.72	75.81	71.27	0.46
Reach 1	50	206.00	2499.50	2501.37		2501.46	0.003152	2.44	84.35	81.23	0.42
Reach 1	48	206.00	2499.40	2501.01	2500.87	2501.18	0.011644	3.37	61.21	97.12	0.75
Reach 1	47	206.00	2499.25	2500.18	2500.16	2500.42	0.020153	3.97	51.83	96.75	0.96
Reach 1	45	206.00	2498.90	2499.74		2499.85	0.006609	2.69	76.47	110.81	0.57
Reach 1	42	206.00	2498.20	2499.05	2499.05	2499.28	0.023367	3.80	54.28	121.35	1.00
Reach 1	40	206.00	2497.30	2498.30	2498.15	2498.44	0.009807	3.03	67.91	110.75	0.68
Reach 1	39	206.00	2496.70	2497.44	2497.44	2497.72	0.022191	4.25	48.44	87.77	1.01
Reach 1	38	206.00	2495.20	2496.62	2496.36	2496.80	0.007633	3.43	60.05	67.43	0.64
Reach 1	36	206.00	2493.50	2495.67	2495.67	2496.21	0.017638	5.92	34.82	32.10	1.00
Reach 1	33	206.00	2490.24	2493.40	2492.27	2493.64	0.003133	3.94	52.33	23.10	0.46
Reach 1	31	206.00	2490.00	2493.18		2493.42	0.001606	3.96	51.97	22.71	0.46
Reach 1	30	206.00	2490.20	2492.67		2493.15	0.004191	5.59	36.84	19.87	0.72
Reach 1	29	206.00	2490.04	2492.49	2492.08	2492.98	0.004322	5.65	36.47	19.83	0.73
Reach 1	28	206.00	2490.00	2492.06	2492.06	2492.88	0.016689	7.26	28.38	17.60	1.01
Reach 1	27	206.00	2488.52	2489.87	2490.56	2492.12	0.073727	12.04	17.11	15.40	2.01
Reach 1	26	206.00	2487.04	2488.41	2489.10	2490.66	0.072213	12.05	17.10	15.06	1.99
Reach 1	25	206.00	2487.00	2489.76	2489.05	2490.13	0.005569	4.90	42.06	20.53	0.60
Reach 1	24	206.00	2486.94	2489.68		2490.04	0.005588	4.88	42.25	20.89	0.60
Reach 1	23	206.00	2486.60	2489.30		2489.70	0.003106	5.06	40.67	20.17	0.63
Reach 1	22	206.00	2486.20	2489.07		2489.40	0.002407	4.61	44.73	21.15	0.56
Reach 1	21	206.00	2485.80	2488.92		2489.18	0.001721	4.06	50.69	22.48	0.48
Reach 1	20	206.00	2485.40	2487.95	2487.95	2488.79	0.008469	7.34	28.05	16.97	1.01
Reach 1	19	206.00	2485.00	2487.31	2487.04	2487.90	0.005364	6.12	33.67	19.09	0.81
Reach 1	18	206.00	2484.96	2487.42		2487.79	0.003068	4.88	42.25	22.33	0.62
Reach 1	17	206.00	2484.90	2487.44		2487.70	0.001928	4.06	50.79	24.98	0.50
Reach 1	16	206.00	2484.84	2487.46		2487.63	0.001247	3.38	60.94	28.59	0.41
Reach 1	15	306.00	2484.80	2487.03		2487.52	0.004042	5.63	54.40	28.90	0.72
Reach 1	14	306.00	2484.60	2486.81		2487.31	0.004167	5.68	53.84	28.82	0.73
Reach 1	13	306.00	2484.24	2486.38		2486.91	0.004633	5.87	52.12	28.83	0.77
Reach 1	12	306.00	2484.20	2486.01	2486.01	2486.81	0.016139	7.14	42.84	27.25	1.00
Reach 1	11	306.00	2483.32	2484.66	2485.13	2486.22	0.045125	10.02	30.54	25.46	1.61
Reach 1	10	306.00	2482.44	2484.85	2484.27	2485.27	0.006209	5.24	58.45	28.59	0.65
Reach 1	9	306.00	2482.40	2484.79		2485.21	0.006141	5.16	59.30	29.57	0.64
Reach 1	8	306.00	2482.34	2484.66		2485.11	0.006812	5.34	57.29	29.34	0.67
Reach 1	7	306.00	2482.20	2484.44		2484.92	0.003962	5.59	54.76	28.95	0.72
Reach 1	6	306.00	2481.80	2484.05		2484.53	0.003877	5.55	55.17	29.01	0.71
Reach 1	5	306.00	2481.40	2483.67		2484.14	0.003837	5.53	55.36	29.04	0.71
Reach 1	4	306.00	2481.00	2483.33	2482.81	2483.77	0.003446	5.33	57.42	29.31	0.67
Reach 1	3	306.00	2480.60	2482.42	2482.42	2483.23	0.008234	7.19	42.54	26.68	1.00
Reach 1	2	306.00	2479.86	2480.89	2481.35	2482.44	0.030176	10.00	30.61	31.57	1.79
Reach 1	1	306.00	2479.60	2480.44	2480.78	2481.59	0.027927	8.61	35.55	43.52	1.68

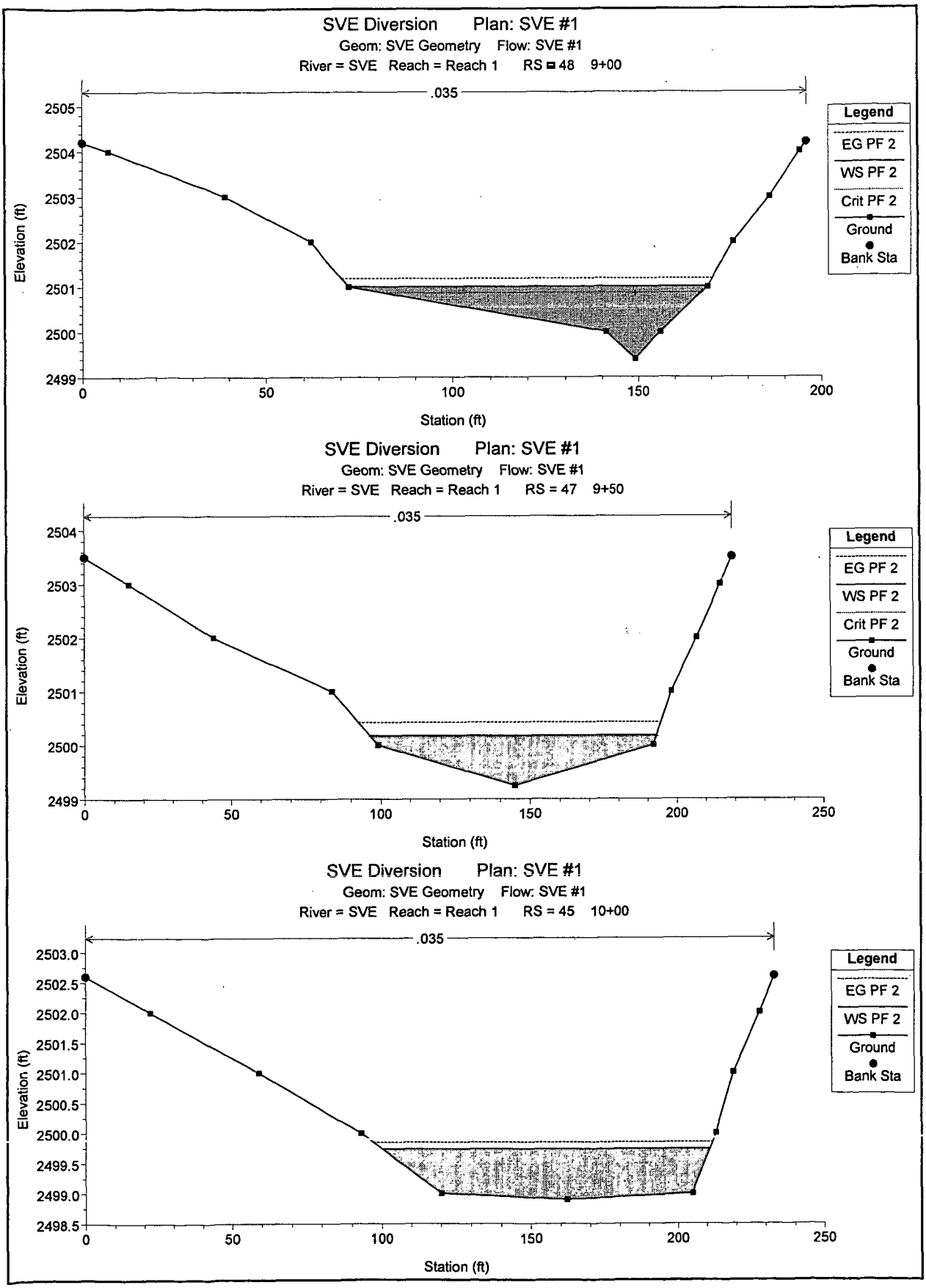

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 65 1+70
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 64 2+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 63 2+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Ground
Bank Sta

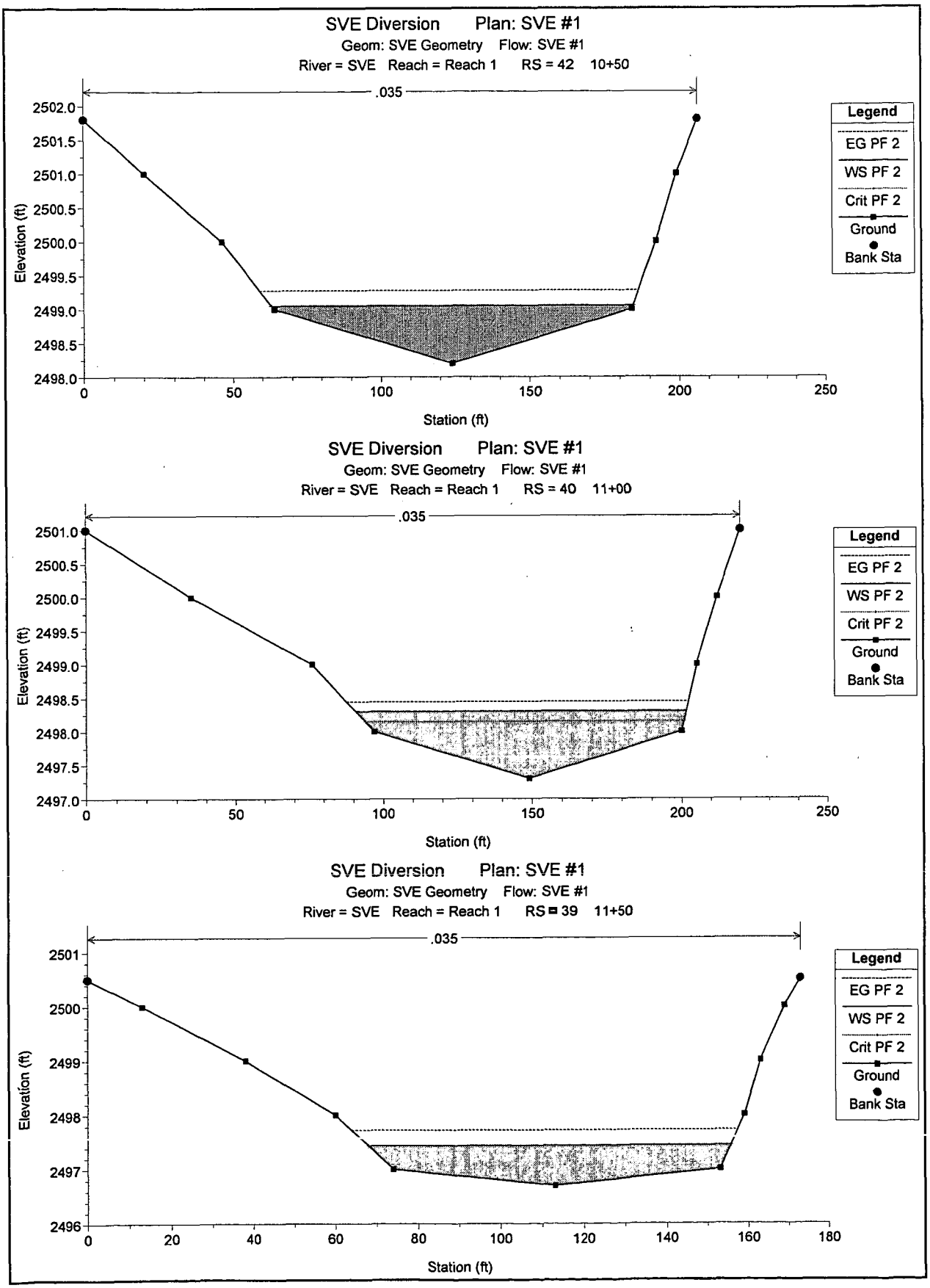

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 62 3+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 61 3+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 60 4+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta

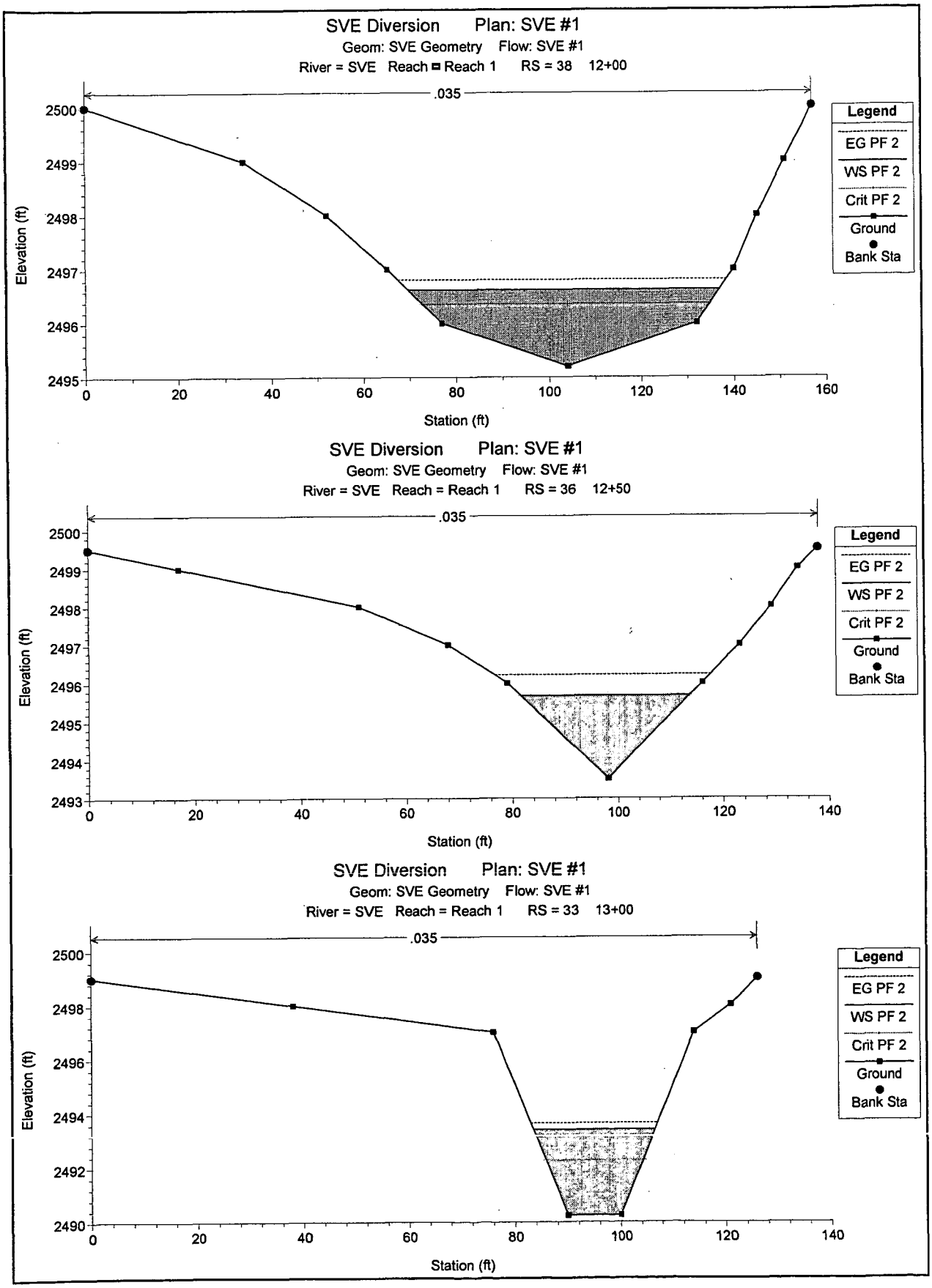

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 59 4+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 58 5+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 57 5+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta

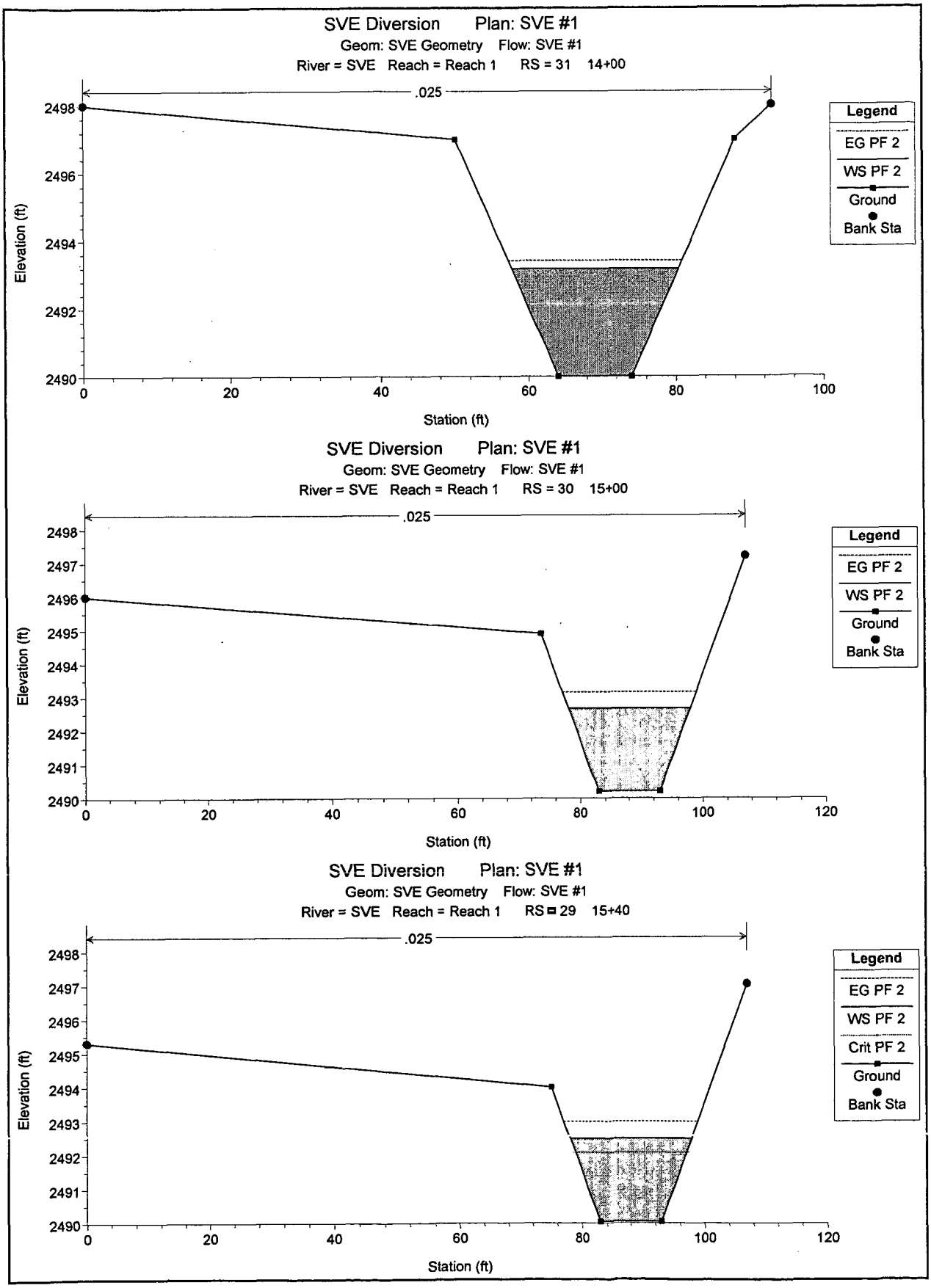

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 56 6+00
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 55 6+50
.035
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 54 7+00
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

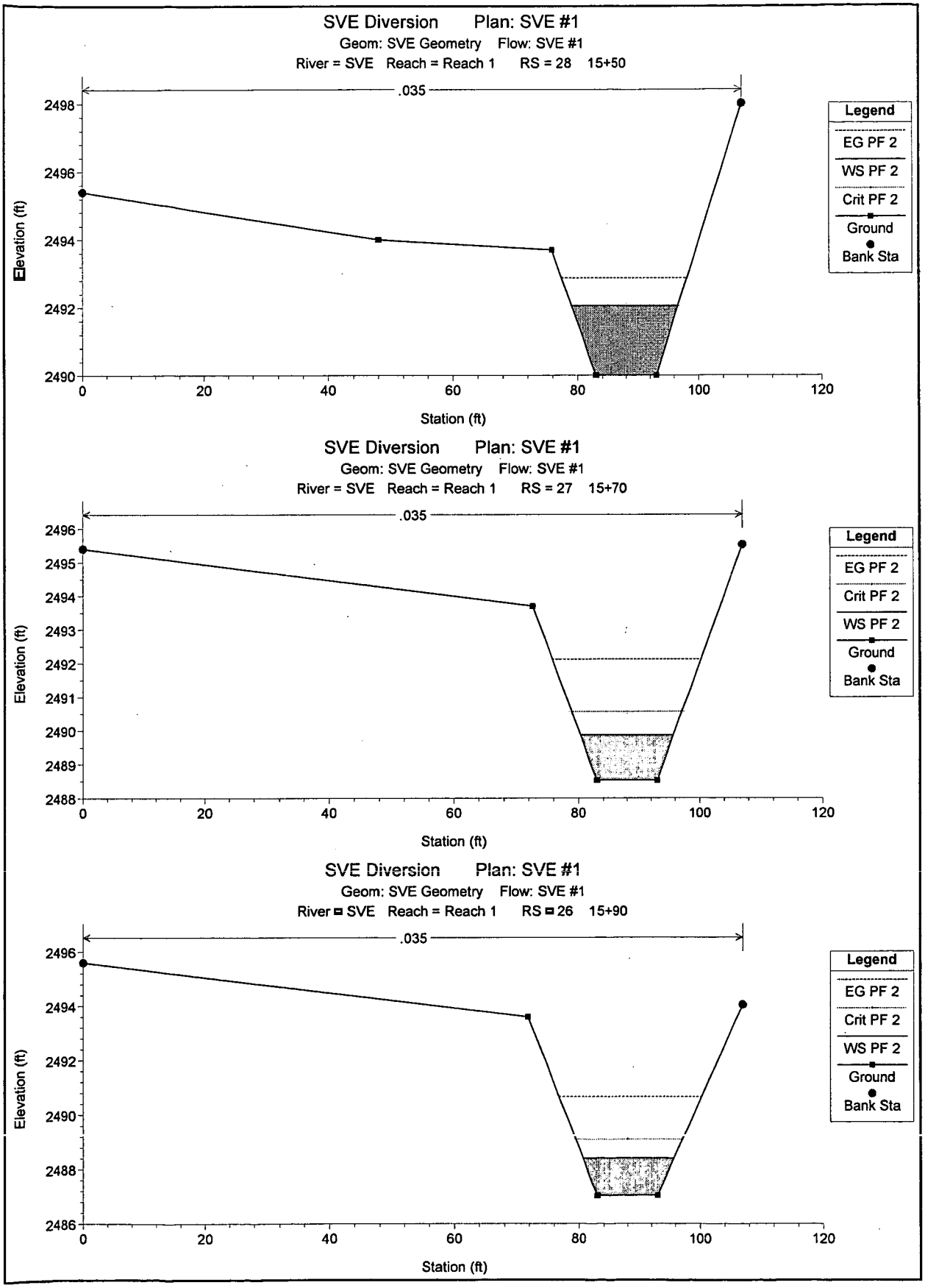

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 53 7+50
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 51 8+00
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 50 8+50
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

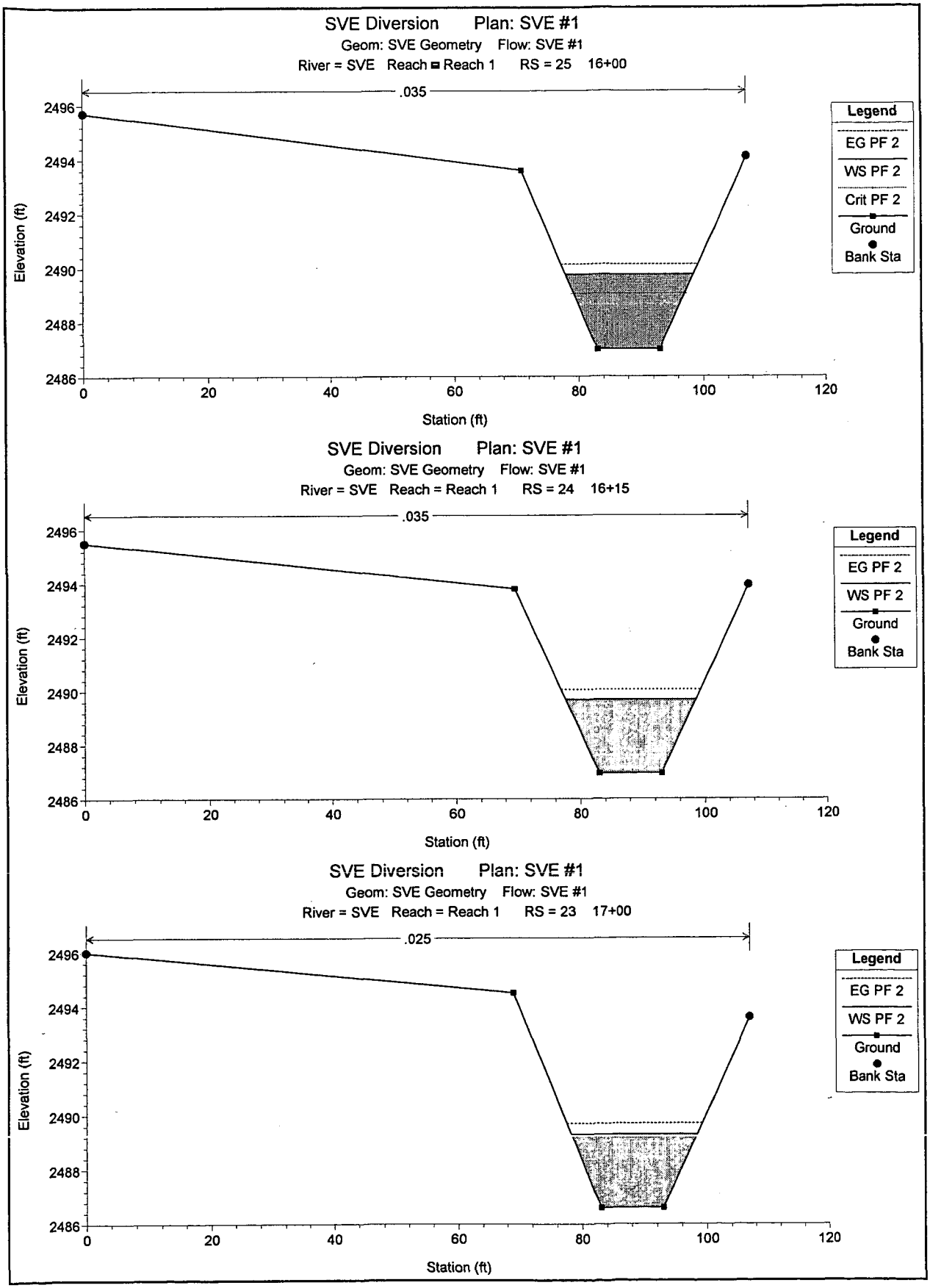

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 48 9+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 47 9+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 45 10+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Ground
Bank Sta

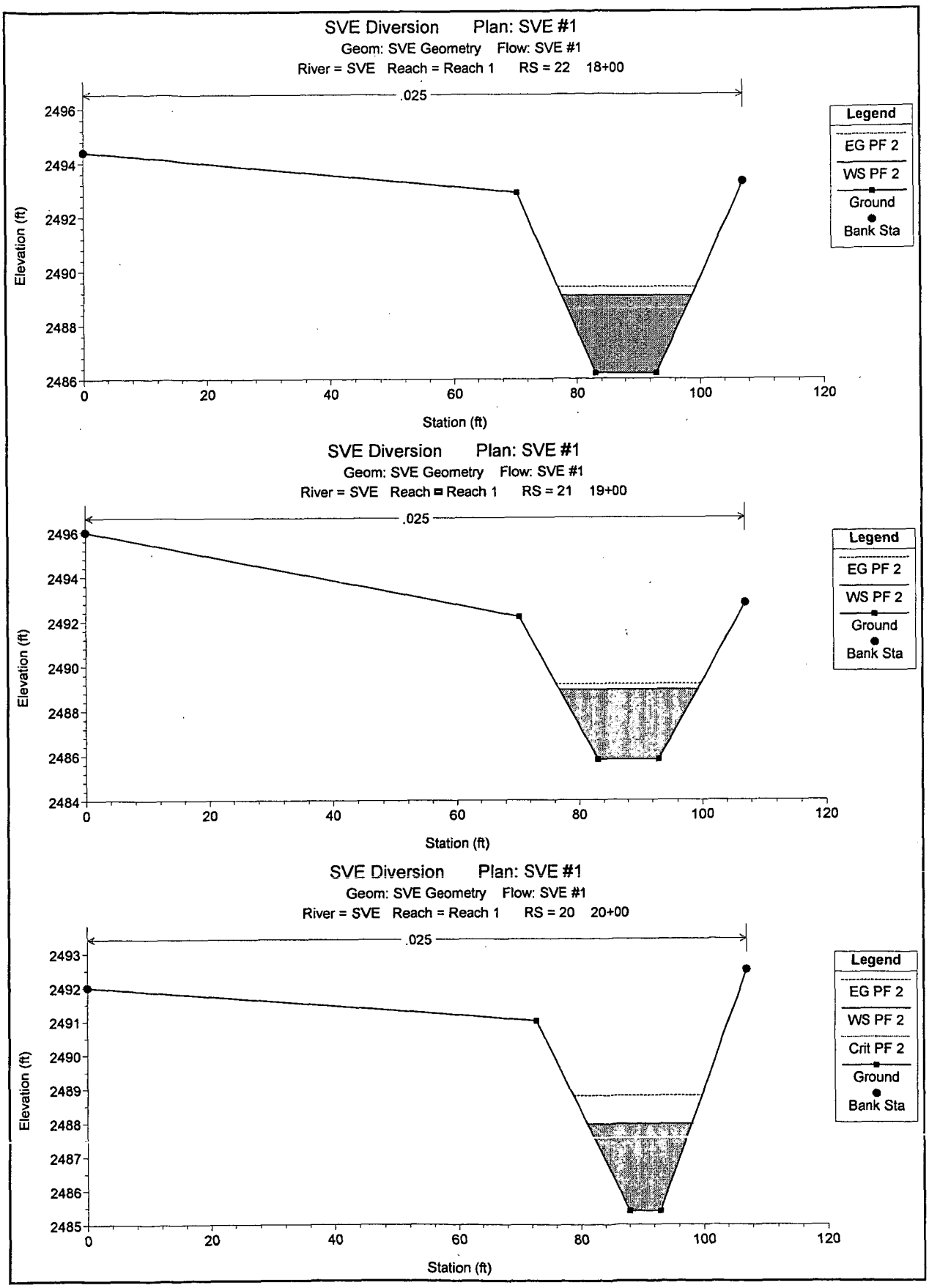

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 42 10+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 40 11+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 39 11+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta

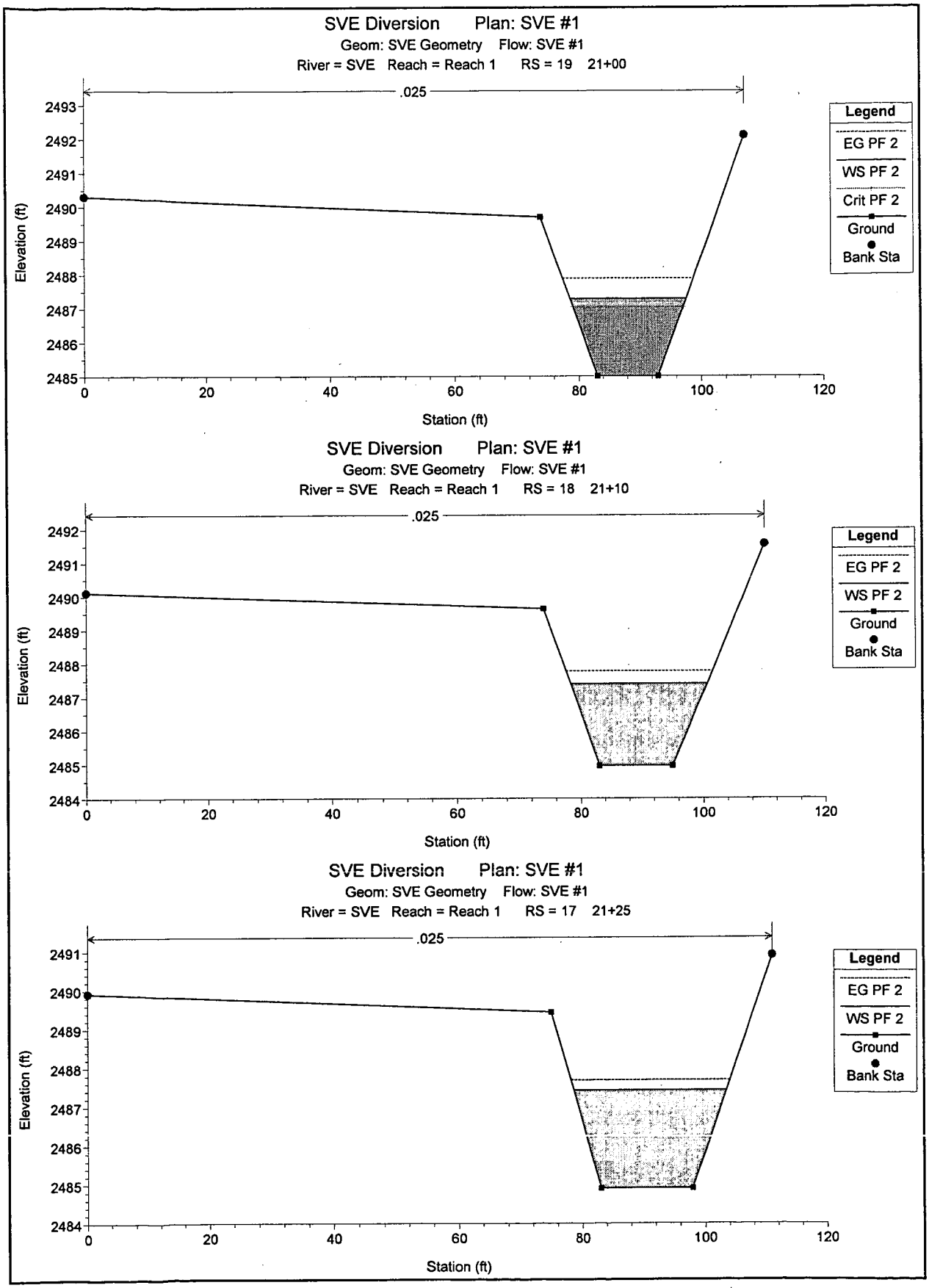

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 38 12+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 36 12+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 33 13+00
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta

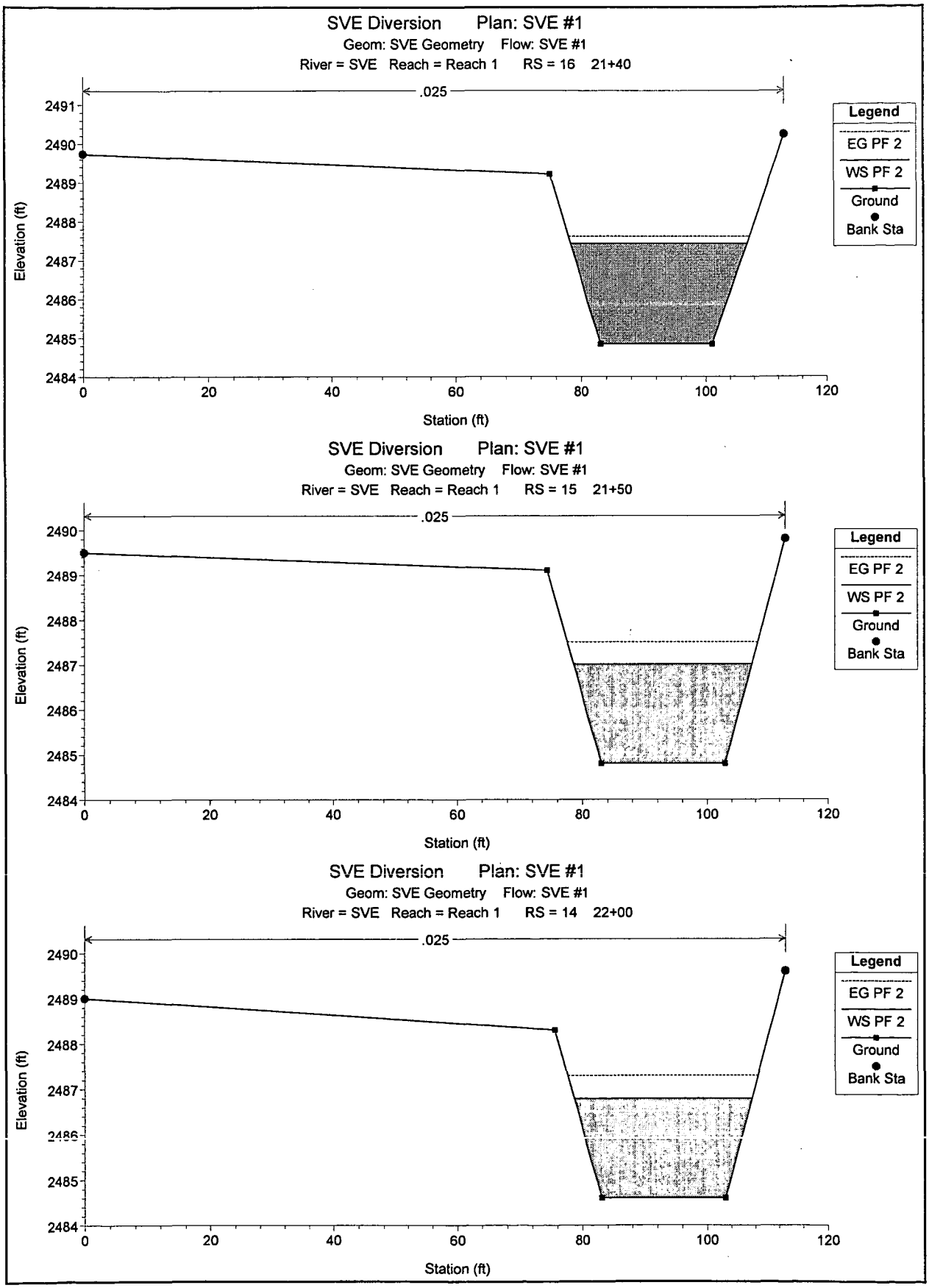

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 31 14+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 30 15+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 29 15+40
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

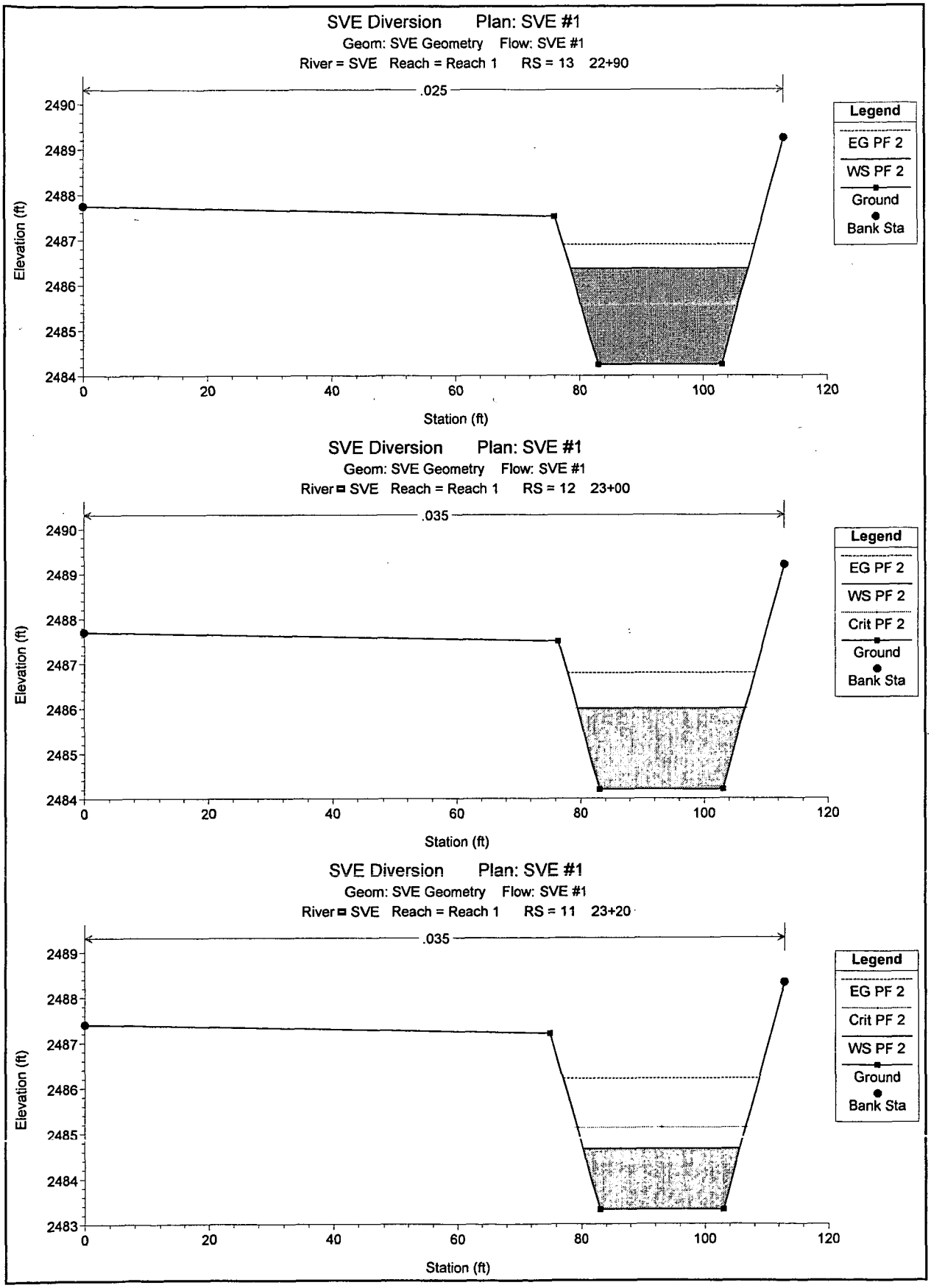

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 28 15+50
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 27 15+70
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 26 15+90
.035
Elevation (ft)
Station (ft)
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta

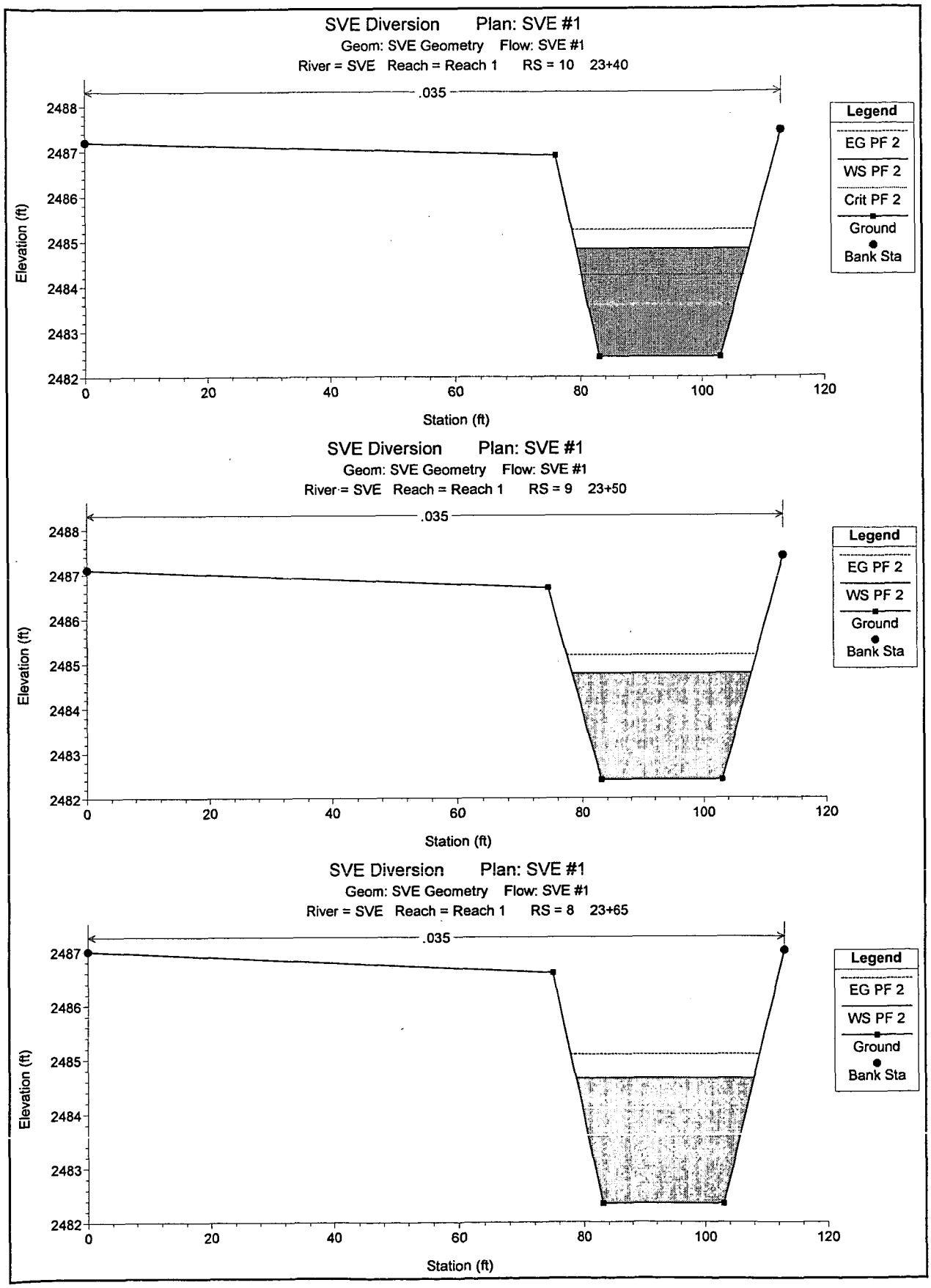

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 25 16+00
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 24 16+15
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 23 17+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

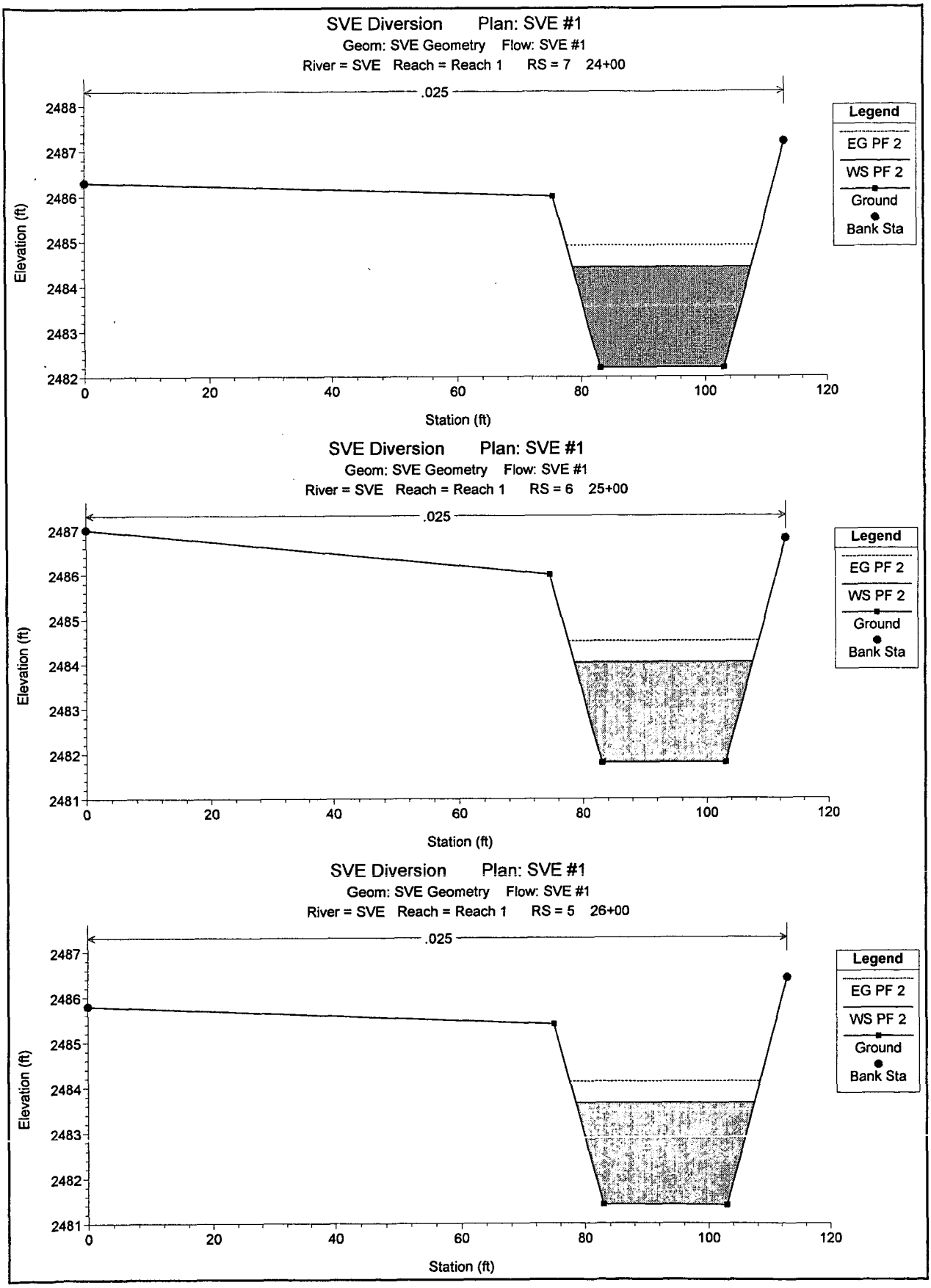

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 22 18+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 21 19+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 20 20+00
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

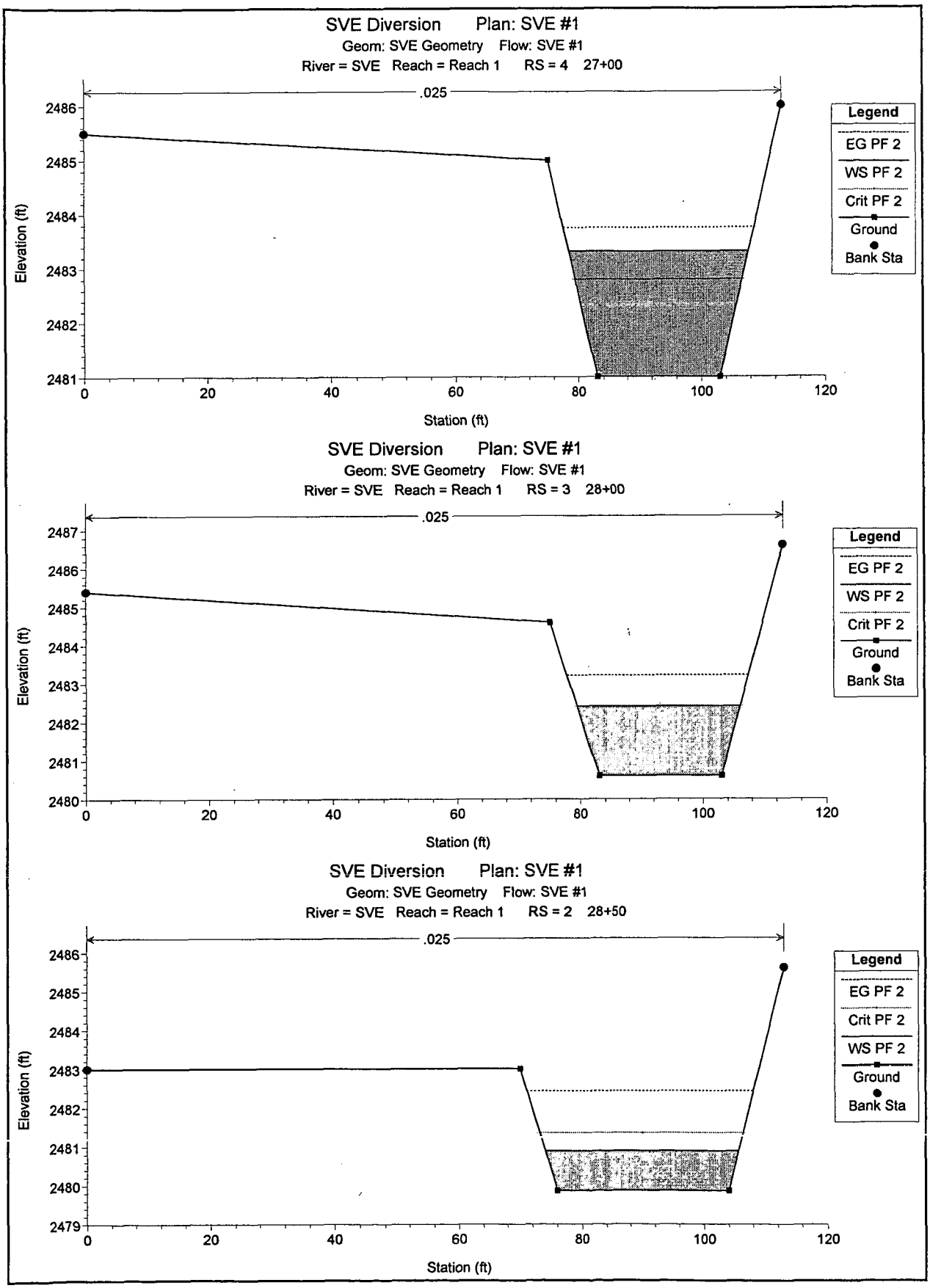

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 19 21+00
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 18 21+10
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 17 21+25
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Ground
Bank Sta

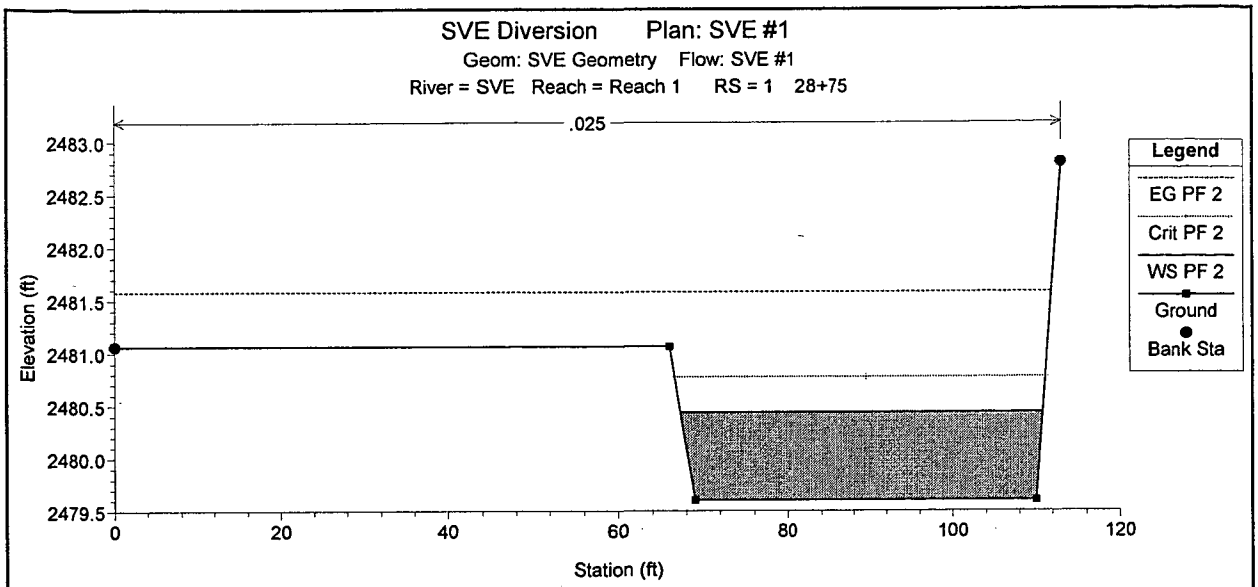

SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 16 21+40
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 15 21+50
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 14 22+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 13 22+90
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 12 23+00
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 11 23+20
.035
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 10 23+40
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 9 23+50
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 8 23+65
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 7 24+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 6 25+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 5 26+00
.025
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 4 27+00
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 3 28+00
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 2 28+50
.025
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


SVE Diversion Plan: SVE #1
Geom: SVE Geometry Flow: SVE #1
River = SVE Reach = Reach 1 RS = 1 28+75
.025
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2483.0
2482.5
2482.0
2481.5
2481.0
2480.5
2480.0
2479.5
0
20
40
60
80
100
120
Station (ft)

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
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
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PROJECT DATA
Project Title: SVE Diversion
Project File : SVE_3.prj
Run Date and Time: 10/2/2002 10:25:35 AM

Project in English units

PLAN DATA

Plan Title: SVE #1
Plan File : f:\550-040\HEC-RAS\SVE_3.p01

Geometry Title: SVE Geometry
Geometry File : f:\550-040\HEC-RAS\SVE_3.g01

Flow Title : SVE #1
Flow File : f:\550-040\HEC-RAS\SVE_3.f01

Plan Summary Information:
Number of: Cross Sections = 55 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
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: SVE #1
Flow File : f:\550-040\HEC-RAS\SVE_3.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2
SVE	Reach 1	65	491	116

SVE	Reach 1	56	688	206
SVE	Reach 1	15	688	303

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
SVE	Reach 1	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: SVE Geometry
Geometry File : f:\550-040\HEC-RAS\SVE_3.g01

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 65

INPUT
Description: 1+70
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2514.5	30	2514	90	2513	114	2512	136	2511
141	2510.9	145	2511	185	2512	208	2513	245	2514
270	2514.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	270	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	270	80	80	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2512.18	Element			
Vel Head (ft)	0.10	Wt. n-Val.		0.035	
W.S. Elev (ft)	2512.08	Reach Len. (ft)	80.00	80.00	80.00
Crit W.S. (ft)	2511.83	Flow Area (sq ft)		46.20	
E.G. Slope (ft/ft)	0.006645	Area (sq ft)		46.20	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	74.71	Top Width (ft)		74.71	
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)		2.51	
Max Chl Dpth (ft)	1.18	Hydr. Depth (ft)		0.62	
Conv. Total (cfs)	1423.0	Conv. (cfs)		1423.0	
Length Wtd. (ft)	80.00	Wetted Per. (ft)		74.75	
Min Ch El (ft)	2510.90	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		0.64	
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)		2.94	
C & E Loss (ft)	0.01	Cum SA (acres)		2.72	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 64

INPUT
Description: 2+00
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2514	88	2513	168	2512	188	2511	213	2510.1
238	2511	265	2512	293	2513	323	2514		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.035	0	.035	323	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	323	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2511.38	Element			
Vel Head (ft)	0.20	Wt. n-Val.		0.035	
W.S. Elev (ft)	2511.18	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		32.18	
E.G. Slope (ft/ft)	0.015967	Area (sq ft)		32.18	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	58.40	Top Width (ft)		58.40	
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)		3.60	
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)		0.55	
Conv. Total (cfs)	918.0	Conv. (cfs)		918.0	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		58.44	
Min Ch El (ft)	2510.10	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		1.98	
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)		2.87	
C & E Loss (ft)	0.01	Cum SA (acres)		2.60	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 63

INPUT
Description: 2+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2513.2	21.5	2513	129	2512	187	2511	205	2510
222	2509.4	239	2510	264	2511	296	2512	313	2513
316	2513.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	316	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	316	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2510.73	Element			
Vel Head (ft)	0.16	Wt. n-Val.		0.035	
W.S. Elev (ft)	2510.57	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		36.47	
E.G. Slope (ft/ft)	0.010535	Area (sq ft)		36.47	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	58.44	Top Width (ft)		58.44	
Vel Total (ft/s)	3.18	Avg. Vel. (ft/s)		3.18	
Max Chl Dpth (ft)	1.17	Hydr. Depth (ft)		0.62	
Conv. Total (cfs)	1130.1	Conv. (cfs)		1130.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		58.49	
Min Ch El (ft)	2509.40	Shear (lb/sq ft)		0.41	
Alpha	1.00	Stream Power (lb/ft s)		1.30	
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		2.83	
C & E Loss (ft)	0.01	Cum SA (acres)		2.53	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 62

INPUT
Description: 3+00
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2512.3	26	2512	114	2511	175	2510	203	2509
211	2508.7	219	2509	234	2510	256	2511	290	2512

294 2512.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	294	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	294	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2510.05	Element			
Vel Head (ft)	0.24	Wt. n-Val.		0.035	
W.S. Elev (ft)	2509.82	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2509.76	Flow Area (sq ft)		29.79	
E.G. Slope (ft/ft)	0.017294	Area (sq ft)		29.79	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	51.11	Top Width (ft)		51.11	
Vel Total (ft/s)	3.89	Avg. Vel. (ft/s)		3.89	
Max Chl Dpth (ft)	1.12	Hydr. Depth (ft)		0.58	
Conv. Total (cfs)	882.1	Conv. (cfs)		882.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		51.16	
Min Ch El (ft)	2508.70	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		2.45	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)		2.79	
C & E Loss (ft)	0.01	Cum SA (acres)		2.47	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 61

INPUT
Description: 3+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2511.8	40	2511	90	2510	146	2509	170	2508
178	2507.7	186	2508	200	2509	210	2510	254	2511
260	2511.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	260	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	260	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2509.08	Element			
Vel Head (ft)	0.30	Wt. n-Val.		0.035	
W.S. Elev (ft)	2508.78	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2508.78	Flow Area (sq ft)		26.55	
E.G. Slope (ft/ft)	0.021897	Area (sq ft)		26.55	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	45.73	Top Width (ft)		45.73	
Vel Total (ft/s)	4.37	Avg. Vel. (ft/s)		4.37	
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)		0.58	
Conv. Total (cfs)	783.9	Conv. (cfs)		783.9	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		45.79	
Min Ch El (ft)	2507.70	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		3.46	
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)		2.76	
C & E Loss (ft)	0.04	Cum SA (acres)		2.41	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 60

INPUT
Description: 4+00
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2511.2	68	2510	185	2509	207	2508	229	2507
236	2506.8	242	2507	251	2508	261	2509	271	2510
319	2511.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	319	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	319	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2508.29	Element			
Vel Head (ft)	0.17	Wt. n-Val.		0.035	
W.S. Elev (ft)	2508.12	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2507.90	Flow Area (sq ft)		35.21	
E.G. Slope (ft/ft)	0.009068	Area (sq ft)		35.21	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	47.77	Top Width (ft)		47.77	
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.29	
Max Chl Dpth (ft)	1.32	Hydr. Depth (ft)		0.74	
Conv. Total (cfs)	1218.1	Conv. (cfs)		1218.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		47.87	
Min Ch El (ft)	2506.80	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		1.37	
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)		2.73	
C & E Loss (ft)	0.00	Cum SA (acres)		2.36	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 59

INPUT
Description: 4+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2510.5	16	2510	47	2509	164	2508	186	2507
200	2506.3	214	2507	224	2508	241	2509	280	2510
291	2510.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	291	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	291	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2507.83	Element			
Vel Head (ft)	0.17	Wt. n-Val.		0.035	
W.S. Elev (ft)	2507.67	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2507.46	Flow Area (sq ft)		35.56	
E.G. Slope (ft/ft)	0.009155	Area (sq ft)		35.56	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	49.32	Top Width (ft)		49.32	
Vel Total (ft/s)	3.26	Avg. Vel. (ft/s)		3.26	
Max Chl Dpth (ft)	1.37	Hydr. Depth (ft)		0.72	

Conv. Total (cfs)	1212.4	Conv. (cfs)	1212.4
Length Wtd. (ft)	50.00	Wetted Per. (ft)	49.40
Min Ch El (ft)	2506.30	Shear (lb/sq ft)	0.41
Alpha	1.00	Stream Power (lb/ft s)	1.34
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	2.69
C & E Loss (ft)	0.01	Cum SA (acres)	2.30

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 58

INPUT
Description: 5+00
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2509.5	20	2508	135	2508	246	2507	281	2506
285	2505.8	290	2506	305	2507	315	2508	374	2509
385	2509.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	385	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	385	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2507.14	Element			
Vel Head (ft)	0.27	Wt. n-Val.		0.035	
W.S. Elev (ft)	2506.88	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2506.88	Flow Area (sq ft)		28.04	
E.G. Slope (ft/ft)	0.022136	Area (sq ft)		28.04	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	52.87	Top Width (ft)		52.87	
Vel Total (ft/s)	4.14	Avg. Vel. (ft/s)		4.14	
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)		0.53	
Conv. Total (cfs)	779.7	Conv. (cfs)		779.7	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		52.92	
Min Ch El (ft)	2505.80	Shear (lb/sq ft)		0.73	
Alpha	1.00	Stream Power (lb/ft s)		3.03	
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)		2.65	
C & E Loss (ft)	0.00	Cum SA (acres)		2.24	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 57

INPUT
Description: 5+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2509	16	2508	30	2507	208	2506	221	2505
229	2504.6	237	2505	251	2506	268	2507	333	2508
353	2509								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	353	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	353	50 50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2506.15	Element			
Vel Head (ft)	0.29	Wt. n-Val.		0.035	
W.S. Elev (ft)	2505.85	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2505.81	Flow Area (sq ft)		26.63	
E.G. Slope (ft/ft)	0.017555	Area (sq ft)		26.63	
Q Total (cfs)	116.00	Flow (cfs)		116.00	
Top Width (ft)	39.01	Top Width (ft)		39.01	
Vel Total (ft/s)	4.36	Avg. Vel. (ft/s)		4.36	
Max Chl Dpth (ft)	1.25	Hydr. Depth (ft)		0.68	
Conv. Total (cfs)	875.5	Conv. (cfs)		875.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		39.09	
Min Ch El (ft)	2504.60	Shear (lb/sq ft)		0.75	
Alpha	1.00	Stream Power (lb/ft s)		3.25	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		2.62	
C & E Loss (ft)	0.01	Cum SA (acres)		2.19	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 56

INPUT
Description: 6+00
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2508.5	6	2508	19	2507	33	2506	138	2505
159	2504	174	2503.6	189	2504	203	2505	217	2506
280	2507	305	2508	309	2508.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	309	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	309	50 50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2505.19	Element			
Vel Head (ft)	0.36	Wt. n-Val.		0.035	
W.S. Elev (ft)	2504.82	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2504.82	Flow Area (sq ft)		42.60	
E.G. Slope (ft/ft)	0.019984	Area (sq ft)		42.60	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	58.84	Top Width (ft)		58.84	
Vel Total (ft/s)	4.84	Avg. Vel. (ft/s)		4.84	
Max Chl Dpth (ft)	1.22	Hydr. Depth (ft)		0.72	
Conv. Total (cfs)	1457.2	Conv. (cfs)		1457.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		58.90	
Min Ch El (ft)	2503.60	Shear (lb/sq ft)		0.90	
Alpha	1.00	Stream Power (lb/ft s)		4.36	
Frctn Loss (ft)	1.03	Cum Volume (acre-ft)		2.58	
C & E Loss (ft)	0.01	Cum SA (acres)		2.13	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 55

INPUT
Description: 6+50
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2507.7	7	2507	16	2506	28	2505	39	2504
53	2503	82	2502.2	111	2503	131	2504	150	2505
203	2506	239	2507	246	2507.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	246	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	246	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2503.73	Element			
Vel Head (ft)	0.54	Wt. n-Val.		0.035	
W.S. Elev (ft)	2503.19	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2503.34	Flow Area (sq ft)		34.82	
E.G. Slope (ft/ft)	0.044180	Area (sq ft)		34.82	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	64.45	Top Width (ft)		64.45	
Vel Total (ft/s)	5.92	Avg. Vel. (ft/s)		5.92	
Max Chl Dpth (ft)	0.99	Hydr. Depth (ft)		0.54	
Conv. Total (cfs)	980.1	Conv. (cfs)		980.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		64.48	
Min Ch El (ft)	2502.20	Shear (lb/sq ft)		1.49	
Alpha	1.00	Stream Power (lb/ft s)		8.81	
Frctn Loss (ft)	1.44	Cum Volume (acre-ft)		2.53	
C & E Loss (ft)	0.02	Cum SA (acres)		2.06	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 54

INPUT
Description: 7+00
7+00
7+00
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2507.2	3	2507	17	2506	25	2505	34	2504
42	2503	50	2502	60	2501	71	2500.5	82	2501
99	2502	116	2503	132	2504	160	2505	221	2506
227	2507	229	2507.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	229	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	229	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2502.40	Element			
Vel Head (ft)	0.34	Wt. n-Val.		0.035	
W.S. Elev (ft)	2502.06	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2501.97	Flow Area (sq ft)		43.72	

E.G. Slope (ft/ft)	0.014921	Area (sq ft)	43.72
Q Total (cfs)	206.00	Flow (cfs)	206.00
Top Width (ft)	50.37	Top Width (ft)	50.37
Vel Total (ft/s)	4.71	Avg. Vel. (ft/s)	4.71
Max Chl Dpth (ft)	1.55	Hydr. Depth (ft)	0.87
Conv. Total (cfs)	1686.4	Conv. (cfs)	1686.4
Length Wtd. (ft)	50.00	Wetted Per. (ft)	50.47
Min Ch El (ft)	2500.50	Shear (lb/sq ft)	0.81
Alpha	1.00	Stream Power (lb/ft s)	3.80
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	2.49
C & E Loss (ft)	0.05	Cum SA (acres)	2.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 53

INPUT
Description: 7+50
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2506.5	14	2506	29	2505	37	2504	46	2503
56	2502	65	2501	73	2500	80	2499.9	86	2500
103	2501	120	2502	136	2503	196	2504	212	2505
217	2506	221	2506.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	221	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	221	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2501.90	Element			
Vel Head (ft)	0.18	Wt. n-Val.		0.035	
W.S. Elev (ft)	2501.72	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		59.99	
E.G. Slope (ft/ft)	0.006077	Area (sq ft)		59.99	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	56.60	Top Width (ft)		56.60	
Vel Total (ft/s)	3.43	Avg. Vel. (ft/s)		3.43	
Max Chl Dpth (ft)	1.82	Hydr. Depth (ft)		1.06	
Conv. Total (cfs)	2642.5	Conv. (cfs)		2642.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		56.75	
Min Ch El (ft)	2499.90	Shear (lb/sq ft)		0.40	
Alpha	1.00	Stream Power (lb/ft s)		1.38	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		2.43	
C & E Loss (ft)	0.02	Cum SA (acres)		1.94	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 51

INPUT
Description: 8+00
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2505.7	14	2505	31	2504	44	2503	54	2502
60	2501	69	2500	80	2499.7	91	2500	116	2501
139	2502	159	2503	196	2504	204	2505	209	2505.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	209	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	209	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2501.64	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	2501.53	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		75.81	
E.G. Slope (ft/ft)	0.003782	Area (sq ft)		75.81	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	71.27	Top Width (ft)		71.27	
Vel Total (ft/s)	2.72	Avg. Vel. (ft/s)		2.72	
Max Chl Dpth (ft)	1.83	Hydr. Depth (ft)		1.06	
Conv. Total (cfs)	3349.5	Conv. (cfs)		3349.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		71.41	
Min Ch El (ft)	2499.70	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		0.68	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)		2.35	
C & E Loss (ft)	0.01	Cum SA (acres)		1.86	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 50

INPUT
Description: 8+50
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2505	32	2504	59	2503	72	2502	85	2501
104	2500	120	2499.5	136	2500	151	2501	179	2502
190	2503	198	2504	207	2505				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	207	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	207	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2501.46	Element			
Vel Head (ft)	0.09	Wt. n-Val.		0.035	
W.S. Elev (ft)	2501.37	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		84.35	
E.G. Slope (ft/ft)	0.003152	Area (sq ft)		84.35	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	81.23	Top Width (ft)		81.23	
Vel Total (ft/s)	2.44	Avg. Vel. (ft/s)		2.44	
Max Chl Dpth (ft)	1.87	Hydr. Depth (ft)		1.04	
Conv. Total (cfs)	3669.5	Conv. (cfs)		3669.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		81.33	
Min Ch El (ft)	2499.50	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.50	
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)		2.26	
C & E Loss (ft)	0.01	Cum SA (acres)		1.78	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 48

INPUT
Description: 9+00
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2504.2	7	2504	39	2503	62	2502	72	2501

141	2500	149	2499.4	156	2500	169	2501	176	2502
186	2503	194	2504	196	2504.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	196	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	196	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2501.18	Element			
Vel Head (ft)	0.18	Wt. n-Val.		0.035	
W.S. Elev (ft)	2501.01	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2500.87	Flow Area (sq ft)		61.21	
E.G. Slope (ft/ft)	0.011644	Area (sq ft)		61.21	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	97.12	Top Width (ft)		97.12	
Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)		3.37	
Max Chl Dpth (ft)	1.61	Hydr. Depth (ft)		0.63	
Conv. Total (cfs)	1909.0	Conv. (cfs)		1909.0	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		97.22	
Min Ch El (ft)	2499.40	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		1.54	
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)		2.18	
C & E Loss (ft)	0.01	Cum SA (acres)		1.67	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 47

INPUT
Description: 9+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2503.5	15	2503	44	2502	84	2501	99	2500
145	2499.25	192	2500	198	2501	207	2502	215	2503
219	2503.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	219	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	219	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2500.42	Element			
Vel Head (ft)	0.25	Wt. n-Val.		0.035	
W.S. Elev (ft)	2500.18	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2500.16	Flow Area (sq ft)		51.83	
E.G. Slope (ft/ft)	0.020153	Area (sq ft)		51.83	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	96.75	Top Width (ft)		96.75	
Vel Total (ft/s)	3.97	Avg. Vel. (ft/s)		3.97	
Max Chl Dpth (ft)	0.93	Hydr. Depth (ft)		0.54	
Conv. Total (cfs)	1451.1	Conv. (cfs)		1451.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		96.79	
Min Ch El (ft)	2499.25	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		2.68	
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)		2.11	
C & E Loss (ft)	0.04	Cum SA (acres)		1.56	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE

REACH: Reach 1 RS: 45

INPUT
Description: 10+00
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2502.6	22	2502	59	2501	93	2500	120	2499
162	2498.9	205	2499	213	2500	219	2501	228	2502
233	2502.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	233	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	233	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2499.85	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	2499.74	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		76.47	
E.G. Slope (ft/ft)	0.006609	Area (sq ft)		76.47	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	110.81	Top Width (ft)		110.81	
Vel Total (ft/s)	2.69	Avg. Vel. (ft/s)		2.69	
Max Chl Dpth (ft)	0.84	Hydr. Depth (ft)		0.69	
Conv. Total (cfs)	2534.1	Conv. (cfs)		2534.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		110.87	
Min Ch El (ft)	2498.90	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		0.77	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)		2.04	
C & E Loss (ft)	0.01	Cum SA (acres)		1.44	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 42

INPUT
Description: 10+50
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2501.8	20	2501	46	2500	64	2499	124	2498.2
184	2499	192	2500	199	2501	206	2501.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	206	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	206	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2499.28	Element			
Vel Head (ft)	0.22	Wt. n-Val.		0.035	
W.S. Elev (ft)	2499.05	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2499.05	Flow Area (sq ft)		54.28	
E.G. Slope (ft/ft)	0.023367	Area (sq ft)		54.28	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	121.35	Top Width (ft)		121.35	
Vel Total (ft/s)	3.80	Avg. Vel. (ft/s)		3.80	
Max Chl Dpth (ft)	0.85	Hydr. Depth (ft)		0.45	
Conv. Total (cfs)	1347.6	Conv. (cfs)		1347.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		121.37	
Min Ch El (ft)	2498.20	Shear (lb/sq ft)		0.65	

Alpha	1.00	Stream Power (lb/ft s)	2.48
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)	1.96
C & E Loss (ft)	0.02	Cum SA (acres)	1.31

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 40

INPUT
Description: 11+00
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2501	35	2500	76	2499	97	2498	149	2497.3
200	2498	205	2499	212	2500	220	2501		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	220	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	220	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2498.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.035	
W.S. Elev (ft)	2498.30	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2498.15	Flow Area (sq ft)		67.91	
E.G. Slope (ft/ft)	0.009807	Area (sq ft)		67.91	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	110.75	Top Width (ft)		110.75	
Vel Total (ft/s)	3.03	Avg. Vel. (ft/s)		3.03	
Max Chl Dpth (ft)	1.00	Hydr. Depth (ft)		0.61	
Conv. Total (cfs)	2080.2	Conv. (cfs)		2080.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		110.80	
Min Ch El (ft)	2497.30	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.14	
Frctn Loss (ft)	0.71	Cum Volume (acre-ft)		1.89	
C & E Loss (ft)	0.01	Cum SA (acres)		1.18	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 39

INPUT
Description: 11+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2500.5	13	2500	38	2499	60	2498	74	2497
113	2496.7	153	2497	159	2498	163	2499	169	2500
173	2500.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	173	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	173	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2497.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.		0.035	
W.S. Elev (ft)	2497.44	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2497.44	Flow Area (sq ft)		48.44	
E.G. Slope (ft/ft)	0.022191	Area (sq ft)		48.44	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	87.77	Top Width (ft)		87.77	
Vel Total (ft/s)	4.25	Avg. Vel. (ft/s)		4.25	
Max Chl Dpth (ft)	0.74	Hydr. Depth (ft)		0.55	
Conv. Total (cfs)	1382.9	Conv. (cfs)		1382.9	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		87.83	
Min Ch El (ft)	2496.70	Shear (lb/sq ft)		0.76	
Alpha	1.00	Stream Power (lb/ft s)		3.25	
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)		1.83	
C & E Loss (ft)	0.03	Cum SA (acres)		1.06	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 38

INPUT
Description: 12+00
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2500	34	2499	52	2498	65	2497	77	2496
104	2495.2	132	2496	140	2497	145	2498	151	2499
157	2500								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	157	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	157	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2496.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.035	
W.S. Elev (ft)	2496.62	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2496.36	Flow Area (sq ft)		60.05	
E.G. Slope (ft/ft)	0.007633	Area (sq ft)		60.05	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	67.43	Top Width (ft)		67.43	
Vel Total (ft/s)	3.43	Avg. Vel. (ft/s)		3.43	
Max Chl Dpth (ft)	1.42	Hydr. Depth (ft)		0.89	
Conv. Total (cfs)	2357.9	Conv. (cfs)		2357.9	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		67.52	
Min Ch El (ft)	2495.20	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		1.45	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)		1.76	
C & E Loss (ft)	0.04	Cum SA (acres)		0.97	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE

REACH: Reach 1 RS: 36

INPUT
Description: 12+50
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2499.5	17	2499	51	2498	68	2497	79	2496
98	2493.5	116	2496	123	2497	129	2498	134	2499
138	2499.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	138	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	138	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2496.21	Element			
Vel Head (ft)	0.54	Wt. n-Val.		0.035	
W.S. Elev (ft)	2495.67	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2495.67	Flow Area (sq ft)		34.82	
E.G. Slope (ft/ft)	0.017638	Area (sq ft)		34.82	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	32.10	Top Width (ft)		32.10	
Vel Total (ft/s)	5.92	Avg. Vel. (ft/s)		5.92	
Max Chl Dpth (ft)	2.17	Hydr. Depth (ft)		1.08	
Conv. Total (cfs)	1551.1	Conv. (cfs)		1551.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		32.40	
Min Ch El (ft)	2493.50	Shear (lb/sq ft)		1.18	
Alpha	1.00	Stream Power (lb/ft s)		7.00	
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)		1.71	
C & E Loss (ft)	0.09	Cum SA (acres)		0.92	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 33

INPUT
Description: 13+00
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2499	38	2498	76	2497	90	2490.24	100	2490.24
114	2497	121	2498	126	2499				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	126	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	126	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2493.64	Element			
Vel Head (ft)	0.24	Wt. n-Val.		0.035	
W.S. Elev (ft)	2493.40	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2492.27	Flow Area (sq ft)		52.33	
E.G. Slope (ft/ft)	0.003133	Area (sq ft)		52.33	

Q Total (cfs)	206.00	Flow (cfs)	206.00
Top Width (ft)	23.10	Top Width (ft)	23.10
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	3.94
Max Chl Dpth (ft)	3.16	Hydr. Depth (ft)	2.27
Conv. Total (cfs)	3680.1	Conv. (cfs)	3680.1
Length Wtd. (ft)	100.00	Wetted Per. (ft)	24.54
Min Ch El (ft)	2490.24	Shear (lb/sq ft)	0.42
Alpha	1.00	Stream Power (lb/ft s)	1.64
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	1.66
C & E Loss (ft)	0.00	Cum SA (acres)	0.88

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 31

INPUT
Description: 14+00
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2498	50	2497	64	2490	74	2490	88	2497
93	2498								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	93	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	93	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2493.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.025	
W.S. Elev (ft)	2493.18	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		51.97	
E.G. Slope (ft/ft)	0.001606	Area (sq ft)		51.97	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	22.71	Top Width (ft)		22.71	
Vel Total (ft/s)	3.96	Avg. Vel. (ft/s)		3.96	
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)		2.29	
Conv. Total (cfs)	5140.6	Conv. (cfs)		5140.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		24.21	
Min Ch El (ft)	2490.00	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.85	
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)		1.54	
C & E Loss (ft)	0.02	Cum SA (acres)		0.83	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 30

INPUT
Description: 15+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2496	73.6	2494.9	83	2490.2	93	2490.2	107	2497.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	40	40	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2493.15	Element	Left OB	Channel	Right OB

Vel Head (ft)	0.49	Wt. n-Val.		0.025	
W.S. Elev (ft)	2492.67	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)		Flow Area (sq ft)		36.84	
E.G. Slope (ft/ft)	0.004191	Area (sq ft)		36.84	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	19.87	Top Width (ft)		19.87	
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)		5.59	
Max Chl Dpth (ft)	2.47	Hydr. Depth (ft)		1.85	
Conv. Total (cfs)	3182.1	Conv. (cfs)		3182.1	
Length Wtd. (ft)	40.00	Wetted Per. (ft)		21.03	
Min Ch El (ft)	2490.20	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		2.56	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)		1.44	
C & E Loss (ft)	0.00	Cum SA (acres)		0.78	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 29

INPUT
Description: 15+40
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.3	75	2494	83	2490.04	93	2490.04	107	2497.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2492.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.025	
W.S. Elev (ft)	2492.49	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	2492.08	Flow Area (sq ft)		36.47	
E.G. Slope (ft/ft)	0.004322	Area (sq ft)		36.47	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	19.83	Top Width (ft)		19.83	
Vel Total (ft/s)	5.65	Avg. Vel. (ft/s)		5.65	
Max Chl Dpth (ft)	2.45	Hydr. Depth (ft)		1.84	
Conv. Total (cfs)	3133.6	Conv. (cfs)		3133.6	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		20.98	
Min Ch El (ft)	2490.04	Shear (lb/sq ft)		0.47	
Alpha	1.00	Stream Power (lb/ft s)		2.65	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)		1.40	
C & E Loss (ft)	0.03	Cum SA (acres)		0.77	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 28

INPUT
Description: 15+50
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.4	48	2494	75.8	2493.7	83	2490	93	2490
107	2498								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	107	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2492.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.82	Wt. n-Val.		0.035	
W.S. Elev (ft)	2492.06	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	2492.06	Flow Area (sq ft)		28.38	
E.G. Slope (ft/ft)	0.016689	Area (sq ft)		28.38	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	17.60	Top Width (ft)		17.60	
Vel Total (ft/s)	7.26	Avg. Vel. (ft/s)		7.26	
Max Chl Dpth (ft)	2.06	Hydr. Depth (ft)		1.61	
Conv. Total (cfs)	1594.6	Conv. (cfs)		1594.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		18.64	
Min Ch El (ft)	2490.00	Shear (lb/sq ft)		1.59	
Alpha	1.00	Stream Power (lb/ft s)		11.51	
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)		1.40	
C & E Loss (ft)	0.01	Cum SA (acres)		0.76	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 27

INPUT
Description: 15+70
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.4	72.6	2493.7	83	2488.52	93	2488.52	107	2495.52

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	107	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2492.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.035	
W.S. Elev (ft)	2489.87	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	2490.56	Flow Area (sq ft)		17.11	
E.G. Slope (ft/ft)	0.073727	Area (sq ft)		17.11	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	15.40	Top Width (ft)		15.40	
Vel Total (ft/s)	12.04	Avg. Vel. (ft/s)		12.04	
Max Chl Dpth (ft)	1.35	Hydr. Depth (ft)		1.11	
Conv. Total (cfs)	758.7	Conv. (cfs)		758.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		16.04	
Min Ch El (ft)	2488.52	Shear (lb/sq ft)		4.91	
Alpha	1.00	Stream Power (lb/ft s)		59.13	
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)		1.39	
C & E Loss (ft)	0.14	Cum SA (acres)		0.75	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

CROSS SECTION RIVER: SVE

REACH: Reach 1 RS: 26

INPUT
Description: 15+90
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.6	71.8	2493.6	83	2487.04	93	2487.04	107	2494.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	107	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2490.66	Element			
Vel Head (ft)	2.25	Wt. n-Val.		0.035	
W.S. Elev (ft)	2488.41	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	2489.10	Flow Area (sq ft)		17.10	
E.G. Slope (ft/ft)	0.072213	Area (sq ft)		17.10	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	15.06	Top Width (ft)		15.06	
Vel Total (ft/s)	12.05	Avg. Vel. (ft/s)		12.05	
Max Chl Dpth (ft)	1.36	Hydr. Depth (ft)		1.14	
Conv. Total (cfs)	766.6	Conv. (cfs)		766.6	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		15.75	
Min Ch El (ft)	2487.04	Shear (lb/sq ft)		4.89	
Alpha	1.00	Stream Power (lb/ft s)		58.96	
Frctn Loss (ft)	1.46	Cum Volume (acre-ft)		1.38	
C & E Loss (ft)	0.00	Cum SA (acres)		0.75	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 25

INPUT
Description: 16+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.7	70.8	2493.6	83	2487	93	2487	107	2494.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	107	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	15	15	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2490.13	Element			
Vel Head (ft)	0.37	Wt. n-Val.		0.035	
W.S. Elev (ft)	2489.76	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	2489.05	Flow Area (sq ft)		42.06	
E.G. Slope (ft/ft)	0.005569	Area (sq ft)		42.06	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	20.53	Top Width (ft)		20.53	
Vel Total (ft/s)	4.90	Avg. Vel. (ft/s)		4.90	
Max Chl Dpth (ft)	2.76	Hydr. Depth (ft)		2.05	
Conv. Total (cfs)	2760.4	Conv. (cfs)		2760.4	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		21.88	
Min Ch El (ft)	2487.00	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		3.27	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)		1.37	
C & E Loss (ft)	0.00	Cum SA (acres)		0.74	

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 24

INPUT
Description: 16+15
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2495.5	69.4	2493.8	83	2486.94	93	2486.94	107	2493.94

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	107	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	85	85	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2490.04	Element			
Vel Head (ft)	0.37	Wt. n-Val.		0.035	
W.S. Elev (ft)	2489.68	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)		42.25	
E.G. Slope (ft/ft)	0.005588	Area (sq ft)		42.25	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	20.89	Top Width (ft)		20.89	
Vel Total (ft/s)	4.88	Avg. Vel. (ft/s)		4.88	
Max Chl Dpth (ft)	2.74	Hydr. Depth (ft)		2.02	
Conv. Total (cfs)	2755.7	Conv. (cfs)		2755.7	
Length Wtd. (ft)	85.00	Wetted Per. (ft)		22.19	
Min Ch El (ft)	2486.94	Shear (lb/sq ft)		0.66	
Alpha	1.00	Stream Power (lb/ft s)		3.24	
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)		1.36	
C & E Loss (ft)	0.00	Cum SA (acres)		0.74	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 23

INPUT
Description: 17+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2496	69	2494.5	83	2486.6	93	2486.6	107	2493.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2489.70	Element			
Vel Head (ft)	0.40	Wt. n-Val.		0.025	
W.S. Elev (ft)	2489.30	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		40.67	
E.G. Slope (ft/ft)	0.003107	Area (sq ft)		40.67	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	20.17	Top Width (ft)		20.17	
Vel Total (ft/s)	5.07	Avg. Vel. (ft/s)		5.07	
Max Chl Dpth (ft)	2.70	Hydr. Depth (ft)		2.02	
Conv. Total (cfs)	3695.6	Conv. (cfs)		3695.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		21.51	
Min Ch El (ft)	2486.60	Shear (lb/sq ft)		0.37	
Alpha	1.00	Stream Power (lb/ft s)		1.86	

Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	1.28
C & E Loss (ft)	0.02	Cum SA (acres)	0.70

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 22

INPUT
Description: 18+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2494.4	70.2	2492.9	83	2486.2	93	2486.2	107	2493.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2489.40	Element			
Vel Head (ft)	0.33	Wt. n-Val.		0.025	
W.S. Elev (ft)	2489.07	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		44.73	
E.G. Slope (ft/ft)	0.002408	Area (sq ft)		44.73	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	21.15	Top Width (ft)		21.15	
Vel Total (ft/s)	4.61	Avg. Vel. (ft/s)		4.61	
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.11	
Conv. Total (cfs)	4197.8	Conv. (cfs)		4197.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		22.54	
Min Ch El (ft)	2486.20	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		1.37	
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)		1.18	
C & E Loss (ft)	0.02	Cum SA (acres)		0.65	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 21

INPUT
Description: 19+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2496	70.2	2492.2	83	2485.8	93	2485.8	107	2492.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2489.18	Element			
Vel Head (ft)	0.26	Wt. n-Val.		0.025	
W.S. Elev (ft)	2488.92	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		50.68	
E.G. Slope (ft/ft)	0.001722	Area (sq ft)		50.68	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	22.48	Top Width (ft)		22.48	
Vel Total (ft/s)	4.06	Avg. Vel. (ft/s)		4.06	
Max Chl Dpth (ft)	3.12	Hydr. Depth (ft)		2.25	
Conv. Total (cfs)	4964.5	Conv. (cfs)		4964.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		23.96	
Min Ch El (ft)	2485.80	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.92	

Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	1.07
C & E Loss (ft)	0.06	Cum SA (acres)	0.60

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 20

INPUT
Description: 20+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2492	72.8	2491	88	2485.4	93	2485.4	107	2492.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2488.79	Element			
Vel Head (ft)	0.84	Wt. n-Val.		0.025	
W.S. Elev (ft)	2487.95	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2487.95	Flow Area (sq ft)		28.05	
E.G. Slope (ft/ft)	0.008473	Area (sq ft)		28.05	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	16.97	Top Width (ft)		16.97	
Vel Total (ft/s)	7.34	Avg. Vel. (ft/s)		7.34	
Max Chl Dpth (ft)	2.55	Hydr. Depth (ft)		1.65	
Conv. Total (cfs)	2238.0	Conv. (cfs)		2238.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		18.03	
Min Ch El (ft)	2485.40	Shear (lb/sq ft)		0.82	
Alpha	1.00	Stream Power (lb/ft s)		6.04	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)		0.98	
C & E Loss (ft)	0.07	Cum SA (acres)		0.55	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 19

INPUT
Description: 21+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2490.3	73.8	2489.7	83	2485	93	2485	107	2492.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	107	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	107	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2487.89	Element			
Vel Head (ft)	0.60	Wt. n-Val.		0.025	

W.S. Elev (ft)	2487.29	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	2487.04	Flow Area (sq ft)		33.16	
E.G. Slope (ft/ft)	0.005598	Area (sq ft)		33.16	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	18.99	Top Width (ft)		18.99	
Vel Total (ft/s)	6.21	Avg. Vel. (ft/s)		6.21	
Max Chl Dpth (ft)	2.29	Hydr. Depth (ft)		1.75	
Conv. Total (cfs)	2753.2	Conv. (cfs)		2753.2	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		20.09	
Min Ch El (ft)	2485.00	Shear (lb/sq ft)		0.58	
Alpha	1.00	Stream Power (lb/ft s)		3.58	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)		0.91	
C & E Loss (ft)	0.07	Cum SA (acres)		0.51	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 18

INPUT
Description: 21+10
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2490.12	74	2489.64	83	2484.96	95	2484.96	110	2491.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	110	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	110	15	15	.3	.5

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2487.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.025	
W.S. Elev (ft)	2487.40	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)		41.79	
E.G. Slope (ft/ft)	0.003167	Area (sq ft)		41.79	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	22.24	Top Width (ft)		22.24	
Vel Total (ft/s)	4.93	Avg. Vel. (ft/s)		4.93	
Max Chl Dpth (ft)	2.44	Hydr. Depth (ft)		1.88	
Conv. Total (cfs)	3660.7	Conv. (cfs)		3660.7	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		23.35	
Min Ch El (ft)	2484.96	Shear (lb/sq ft)		0.35	
Alpha	1.00	Stream Power (lb/ft s)		1.74	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)		0.90	
C & E Loss (ft)	0.06	Cum SA (acres)		0.51	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 17

INPUT
Description: 21+25
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2489.92	75	2489.44	83	2484.9	98	2484.9	111	2490.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	111	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	111	15	15	.3	.5

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2487.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.		0.025	

W.S. Elev (ft)	2487.42	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)		50.27	
E.G. Slope (ft/ft)	0.001986	Area (sq ft)		50.27	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	24.90	Top Width (ft)		24.90	
Vel Total (ft/s)	4.10	Avg. Vel. (ft/s)		4.10	
Max Chl Dpth (ft)	2.52	Hydr. Depth (ft)		2.02	
Conv. Total (cfs)	4623.0	Conv. (cfs)		4623.0	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		26.12	
Min Ch El (ft)	2484.90	Shear (lb/sq ft)		0.24	
Alpha	1.00	Stream Power (lb/ft s)		0.98	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.88	
C & E Loss (ft)	0.04	Cum SA (acres)		0.50	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 16

INPUT
Description: 21+40
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2489.74	75	2489.22	83	2484.84	101	2484.84	113	2490.24

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	10	10	.3	.5

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2487.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.025	
W.S. Elev (ft)	2487.44	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)		60.34	
E.G. Slope (ft/ft)	0.001284	Area (sq ft)		60.34	
Q Total (cfs)	206.00	Flow (cfs)		206.00	
Top Width (ft)	28.51	Top Width (ft)		28.51	
Vel Total (ft/s)	3.41	Avg. Vel. (ft/s)		3.41	
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)		2.12	
Conv. Total (cfs)	5749.7	Conv. (cfs)		5749.7	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		29.73	
Min Ch El (ft)	2484.84	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.56	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.86	
C & E Loss (ft)	0.09	Cum SA (acres)		0.49	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 15

INPUT
Description: 21+50
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2489.5	74.4	2489.1	83	2484.8	103	2484.8	113	2489.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	50	50	.3	.5

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2487.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.		0.025	

W.S. Elev (ft)	2487.01	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		54.03	
E.G. Slope (ft/ft)	0.004043	Area (sq ft)		54.03	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.85	Top Width (ft)		28.85	
Vel Total (ft/s)	5.61	Avg. Vel. (ft/s)		5.61	
Max Chl Dpth (ft)	2.21	Hydr. Depth (ft)		1.87	
Conv. Total (cfs)	4765.1	Conv. (cfs)		4765.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		29.89	
Min Ch El (ft)	2484.80	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		2.56	
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)		0.85	
C & E Loss (ft)	0.00	Cum SA (acres)		0.48	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 14

INPUT
Description: 22+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2489	75.6	2488.3	83	2484.6	103	2484.6	113	2489.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	90	90	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2487.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.025	
W.S. Elev (ft)	2486.79	Reach Len. (ft)	90.00	90.00	90.00
Crit W.S. (ft)		Flow Area (sq ft)		53.48	
E.G. Slope (ft/ft)	0.004167	Area (sq ft)		53.48	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.77	Top Width (ft)		28.77	
Vel Total (ft/s)	5.67	Avg. Vel. (ft/s)		5.67	
Max Chl Dpth (ft)	2.19	Hydr. Depth (ft)		1.86	
Conv. Total (cfs)	4693.7	Conv. (cfs)		4693.7	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		29.81	
Min Ch El (ft)	2484.60	Shear (lb/sq ft)		0.47	
Alpha	1.00	Stream Power (lb/ft s)		2.64	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)		0.79	
C & E Loss (ft)	0.00	Cum SA (acres)		0.45	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 13

INPUT
Description: 22+90
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487.75	76	2487.52	83	2484.24	103	2484.24	113	2489.24

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2486.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.		0.025	

W.S. Elev (ft)	2486.36	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)		51.75	
E.G. Slope (ft/ft)	0.004638	Area (sq ft)		51.75	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.77	Top Width (ft)		28.77	
Vel Total (ft/s)	5.86	Avg. Vel. (ft/s)		5.86	
Max Chl Dpth (ft)	2.12	Hydr. Depth (ft)		1.80	
Conv. Total (cfs)	4449.2	Conv. (cfs)		4449.2	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		29.75	
Min Ch El (ft)	2484.24	Shear (lb/sq ft)		0.50	
Alpha	1.00	Stream Power (lb/ft s)		2.95	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)		0.68	
C & E Loss (ft)	0.03	Cum SA (acres)		0.39	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 12

INPUT
Description: 23+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487.7	76.4	2487.5	83	2484.2	103	2484.2	113	2489.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	113	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	2486.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.		0.035	
W.S. Elev (ft)	2486.00	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	2486.00	Flow Area (sq ft)		42.52	
E.G. Slope (ft/ft)	0.016183	Area (sq ft)		42.52	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	27.21	Top Width (ft)		27.21	
Vel Total (ft/s)	7.13	Avg. Vel. (ft/s)		7.13	
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.56	
Conv. Total (cfs)	2381.8	Conv. (cfs)		2381.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		28.06	
Min Ch El (ft)	2484.20	Shear (lb/sq ft)		1.53	
Alpha	1.00	Stream Power (lb/ft s)		10.91	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)		0.67	
C & E Loss (ft)	0.00	Cum SA (acres)		0.38	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 11

INPUT
Description: 23+20
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487.4	75	2487.2	83	2483.32	103	2483.32	113	2488.32

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
      0    .035       0    .035     113    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0     113               20      20      20            .1       .3

CROSS SECTION OUTPUT    Profile #PF 2

  E.G. Elev (ft)           2486.21    Element                 Left OB    Channel   Right OB
  Vel Head (ft)               1.55    Wt. n-Val.                         0.035
  W.S. Elev (ft)           2484.66    Reach Len. (ft)          20.00     20.00      20.00
  Crit W.S. (ft)           2485.13    Flow Area (sq ft)                  30.31
  E.G. Slope (ft/ft)      0.045278    Area (sq ft)                       30.31
  Q Total (cfs)             303.00    Flow (cfs)                        303.00
  Top Width (ft)             25.42    Top Width (ft)                     25.42
  Vel Total (ft/s)           10.00    Avg. Vel. (ft/s)                   10.00
  Max Chl Dpth (ft)           1.33    Hydr. Depth (ft)                    1.19
  Conv. Total (cfs)         1424.0    Conv. (cfs)                       1424.0
  Length Wtd. (ft)           20.00    Wetted Per. (ft)                   26.04
  Min Ch El (ft)           2483.32    Shear (lb/sq ft)                    3.29
  Alpha                       1.00    Stream Power (lb/ft s)             32.89
  Frctn Loss (ft)             0.51    Cum Volume (acre-ft)                0.65
  C & E Loss (ft)             0.08    Cum SA (acres)                      0.37

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less
         than 0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Program found supercritical flow starting at this cross section.

CROSS SECTION           RIVER: SVE
REACH: Reach 1             RS: 10

INPUT
Description: 23+40
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0  2487.2        76  2486.9        83 2482.44       103 2482.44       113 2487.44

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .035        0    .035      113    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0     113               10      10      10            .1       .3

CROSS SECTION OUTPUT    Profile #PF 2

  E.G. Elev (ft)           2485.26    Element                 Left OB    Channel   Right OB
  Vel Head (ft)               0.42    Wt. n-Val.                         0.035
  W.S. Elev (ft)           2484.83    Reach Len. (ft)          10.00     10.00      10.00
  Crit W.S. (ft)           2484.25    Flow Area (sq ft)                  58.10
  E.G. Slope (ft/ft)      0.006199    Area (sq ft)                       58.10
  Q Total (cfs)             303.00    Flow (cfs)                        303.00
  Top Width (ft)             28.54    Top Width (ft)                     28.54
  Vel Total (ft/s)            5.22    Avg. Vel. (ft/s)                    5.22
  Max Chl Dpth (ft)           2.39    Hydr. Depth (ft)                    2.04
  Conv. Total (cfs)         3848.6    Conv. (cfs)                       3848.6
  Length Wtd. (ft)           10.00    Wetted Per. (ft)                   29.81
  Min Ch El (ft)           2482.44    Shear (lb/sq ft)                    0.75
  Alpha                       1.00    Stream Power (lb/ft s)              3.93
  Frctn Loss (ft)             0.06    Cum Volume (acre-ft)                0.63
  C & E Loss (ft)             0.00    Cum SA (acres)                      0.36

Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION           RIVER: SVE
REACH: Reach 1             RS: 9
```

INPUT
Description: 23+50
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487.1	74.4	2486.7	83	2482.4	103	2482.4	113	2487.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	113	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	15	15	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2485.19	Element			
Vel Head (ft)	0.41	Wt. n-Val.		0.035	
W.S. Elev (ft)	2484.78	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)		58.93	
E.G. Slope (ft/ft)	0.006133	Area (sq ft)		58.93	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	29.52	Top Width (ft)		29.52	
Vel Total (ft/s)	5.14	Avg. Vel. (ft/s)		5.14	
Max Chl Dpth (ft)	2.38	Hydr. Depth (ft)		2.00	
Conv. Total (cfs)	3869.2	Conv. (cfs)		3869.2	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		30.64	
Min Ch El (ft)	2482.40	Shear (lb/sq ft)		0.74	
Alpha	1.00	Stream Power (lb/ft s)		3.79	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)		0.62	
C & E Loss (ft)	0.00	Cum SA (acres)		0.35	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 8

INPUT
Description: 23+65
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487	75	2486.6	83	2482.34	103	2482.34	113	2487

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	113	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	35	35	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2485.09	Element			
Vel Head (ft)	0.44	Wt. n-Val.		0.035	
W.S. Elev (ft)	2484.65	Reach Len. (ft)	35.00	35.00	35.00
Crit W.S. (ft)		Flow Area (sq ft)		56.91	
E.G. Slope (ft/ft)	0.006811	Area (sq ft)		56.91	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	29.29	Top Width (ft)		29.29	
Vel Total (ft/s)	5.32	Avg. Vel. (ft/s)		5.32	
Max Chl Dpth (ft)	2.31	Hydr. Depth (ft)		1.94	
Conv. Total (cfs)	3671.5	Conv. (cfs)		3671.5	
Length Wtd. (ft)	35.00	Wetted Per. (ft)		30.38	
Min Ch El (ft)	2482.34	Shear (lb/sq ft)		0.80	
Alpha	1.00	Stream Power (lb/ft s)		4.24	
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)		0.60	
C & E Loss (ft)	0.00	Cum SA (acres)		0.34	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 7

INPUT
Description: 24+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2486.3	75.4	2486	83	2482.2	103	2482.2	113	2487.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2484.91	Element			
Vel Head (ft)	0.48	Wt. n-Val.		0.025	
W.S. Elev (ft)	2484.43	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		54.40	
E.G. Slope (ft/ft)	0.003963	Area (sq ft)		54.40	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.90	Top Width (ft)		28.90	
Vel Total (ft/s)	5.57	Avg. Vel. (ft/s)		5.57	
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)		1.88	
Conv. Total (cfs)	4813.0	Conv. (cfs)		4813.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		29.95	
Min Ch El (ft)	2482.20	Shear (lb/sq ft)		0.45	
Alpha	1.00	Stream Power (lb/ft s)		2.50	
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.55	
C & E Loss (ft)	0.00	Cum SA (acres)		0.32	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 6

INPUT
Description: 25+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2487	74.6	2486	83	2481.8	103	2481.8	113	2486.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2484.51	Element			
Vel Head (ft)	0.47	Wt. n-Val.		0.025	
W.S. Elev (ft)	2484.04	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		54.80	
E.G. Slope (ft/ft)	0.003878	Area (sq ft)		54.80	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.96	Top Width (ft)		28.96	
Vel Total (ft/s)	5.53	Avg. Vel. (ft/s)		5.53	
Max Chl Dpth (ft)	2.24	Hydr. Depth (ft)		1.89	
Conv. Total (cfs)	4865.8	Conv. (cfs)		4865.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		30.01	
Min Ch El (ft)	2481.80	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		2.44	
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.43	
C & E Loss (ft)	0.00	Cum SA (acres)		0.25	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 5

INPUT
Description: 26+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2485.8	75	2485.4	83	2481.42	103	2481.4	113	2486.42

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2484.13	Element			
Vel Head (ft)	0.47	Wt. n-Val.		0.025	
W.S. Elev (ft)	2483.66	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		55.00	
E.G. Slope (ft/ft)	0.003838	Area (sq ft)		55.00	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	28.99	Top Width (ft)		28.99	
Vel Total (ft/s)	5.51	Avg. Vel. (ft/s)		5.51	
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)		1.90	
Conv. Total (cfs)	4891.2	Conv. (cfs)		4891.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		30.05	
Min Ch El (ft)	2481.40	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		2.42	
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)		0.30	
C & E Loss (ft)	0.01	Cum SA (acres)		0.19	

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 4

INPUT
Description: 27+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2485.5	75	2485	83	2481	103	2481	113	2486

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2483.75	Element			
Vel Head (ft)	0.44	Wt. n-Val.		0.025	
W.S. Elev (ft)	2483.32	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2482.80	Flow Area (sq ft)		57.07	
E.G. Slope (ft/ft)	0.003440	Area (sq ft)		57.07	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	29.27	Top Width (ft)		29.27	
Vel Total (ft/s)	5.31	Avg. Vel. (ft/s)		5.31	
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)		1.95	
Conv. Total (cfs)	5166.0	Conv. (cfs)		5166.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		30.36	
Min Ch El (ft)	2481.00	Shear (lb/sq ft)		0.40	
Alpha	1.00	Stream Power (lb/ft s)		2.14	
Frctn Loss (ft)	0.51	Cum Volume (acre-ft)		0.17	
C & E Loss (ft)	0.04	Cum SA (acres)		0.12	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 3

INPUT
Description: 28+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2485.4	75	2484.6	83	2480.6	103	2480.6	113	2486.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2483.21	Element			
Vel Head (ft)	0.80	Wt. n-Val.		0.025	
W.S. Elev (ft)	2482.41	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	2482.41	Flow Area (sq ft)		42.20	
E.G. Slope (ft/ft)	0.008270	Area (sq ft)		42.20	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	26.64	Top Width (ft)		26.64	
Vel Total (ft/s)	7.18	Avg. Vel. (ft/s)		7.18	
Max Chl Dpth (ft)	1.81	Hydr. Depth (ft)		1.58	
Conv. Total (cfs)	3331.9	Conv. (cfs)		3331.9	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		27.56	
Min Ch El (ft)	2480.60	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		5.68	
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)		0.06	
C & E Loss (ft)	0.03	Cum SA (acres)		0.05	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 2

INPUT
Description: 28+50
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2483	70	2483	76	2479.86	104	2479.86	113	2485.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	113	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2482.42	Element			
Vel Head (ft)	1.54	Wt. n-Val.		0.025	
W.S. Elev (ft)	2480.88	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)	2481.35	Flow Area (sq ft)		30.41	
E.G. Slope (ft/ft)	0.030210	Area (sq ft)		30.41	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	31.55	Top Width (ft)		31.55	
Vel Total (ft/s)	9.96	Avg. Vel. (ft/s)		9.96	
Max Chl Dpth (ft)	1.02	Hydr. Depth (ft)		0.96	

Conv. Total (cfs)	1743.3	Conv. (cfs)	1743.3
Length Wtd. (ft)	25.00	Wetted Per. (ft)	32.10
Min Ch El (ft)	2479.86	Shear (lb/sq ft)	1.79
Alpha	1.00	Stream Power (lb/ft s)	17.80
Frctn Loss (ft)	0.71	Cum Volume (acre-ft)	0.02
C & E Loss (ft)	0.07	Cum SA (acres)	0.02

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

CROSS SECTION RIVER: SVE
REACH: Reach 1 RS: 1

INPUT
Description: 28+75
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2481.06	66	2481.06	69	2479.6	110	2479.6	113	2482.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	0	.025	113	.025

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	113	.1	.3

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	2481.58	Element			
Vel Head (ft)	1.14	Wt. n-Val.		0.025	
W.S. Elev (ft)	2480.44	Reach Len. (ft)			
Crit W.S. (ft)	2480.77	Flow Area (sq ft)		35.35	
E.G. Slope (ft/ft)	0.027893	Area (sq ft)		35.35	
Q Total (cfs)	303.00	Flow (cfs)		303.00	
Top Width (ft)	43.50	Top Width (ft)		43.50	
Vel Total (ft/s)	8.57	Avg. Vel. (ft/s)		8.57	
Max Chl Dpth (ft)	0.84	Hydr. Depth (ft)		0.81	
Conv. Total (cfs)	1814.3	Conv. (cfs)		1814.3	
Length Wtd. (ft)		Wetted Per. (ft)		44.06	
Min Ch El (ft)	2479.60	Shear (lb/sq ft)		1.40	
Alpha	1.00	Stream Power (lb/ft s)		11.98	
Frctn Loss (ft)	0.73	Cum Volume (acre-ft)			
C & E Loss (ft)	0.12	Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:SVE

Reach	River Sta.	n1	n2	n3
Reach 1	65	.035	.035	.035
Reach 1	64	.035	.035	.035
Reach 1	63	.035	.035	.035
Reach 1	62	.035	.035	.035
Reach 1	61	.035	.035	.035
Reach 1	60	.035	.035	.035
Reach 1	59	.035	.035	.035
Reach 1	58	.035	.035	.035
Reach 1	57	.035	.035	.035
Reach 1	56	.035	.035	.035
Reach 1	55	.035	.035	.035
Reach 1	54	.035	.035	.035
Reach 1	53	.035	.035	.035

Reach 1	51	.035	.035	.035
Reach 1	50	.035	.035	.035
Reach 1	48	.035	.035	.035
Reach 1	47	.035	.035	.035
Reach 1	45	.035	.035	.035
Reach 1	42	.035	.035	.035
Reach 1	40	.035	.035	.035
Reach 1	39	.035	.035	.035
Reach 1	38	.035	.035	.035
Reach 1	36	.035	.035	.035
Reach 1	33	.035	.035	.035
Reach 1	31	.025	.025	.025
Reach 1	30	.025	.025	.025
Reach 1	29	.025	.025	.025
Reach 1	28	.035	.035	.035
Reach 1	27	.035	.035	.035
Reach 1	26	.035	.035	.035
Reach 1	25	.035	.035	.035
Reach 1	24	.035	.035	.035
Reach 1	23	.025	.025	.025
Reach 1	22	.025	.025	.025
Reach 1	21	.025	.025	.025
Reach 1	20	.025	.025	.025
Reach 1	19	.025	.025	.025
Reach 1	18	.025	.025	.025
Reach 1	17	.025	.025	.025
Reach 1	16	.025	.025	.025
Reach 1	15	.025	.025	.025
Reach 1	14	.025	.025	.025
Reach 1	13	.025	.025	.025
Reach 1	12	.035	.035	.035
Reach 1	11	.035	.035	.035
Reach 1	10	.035	.035	.035
Reach 1	9	.035	.035	.035
Reach 1	8	.035	.035	.035
Reach 1	7	.025	.025	.025
Reach 1	6	.025	.025	.025
Reach 1	5	.025	.025	.025
Reach 1	4	.025	.025	.025
Reach 1	3	.025	.025	.025
Reach 1	2	.025	.025	.025
Reach 1	1	.025	.025	.025

SUMMARY OF REACH LENGTHS

River: SVE

Reach	River Sta.	Left	Channel	Right
Reach 1	65	80	80	80
Reach 1	64	50	50	50
Reach 1	63	50	50	50
Reach 1	62	50	50	50
Reach 1	61	50	50	50
Reach 1	60	50	50	50
Reach 1	59	50	50	50
Reach 1	58	50	50	50
Reach 1	57	50	50	50
Reach 1	56	50	50	50
Reach 1	55	50	50	50
Reach 1	54	50	50	50
Reach 1	53	50	50	50
Reach 1	51	50	50	50
Reach 1	50	50	50	50
Reach 1	48	50	50	50
Reach 1	47	50	50	50
Reach 1	45	50	50	50

Reach 1	42	50	50	50
Reach 1	40	50	50	50
Reach 1	39	50	50	50
Reach 1	38	50	50	50
Reach 1	36	50	50	50
Reach 1	33	100	100	100
Reach 1	31	100	100	100
Reach 1	30	40	40	40
Reach 1	29	10	10	10
Reach 1	28	20	20	20
Reach 1	27	20	20	20
Reach 1	26	10	10	10
Reach 1	25	15	15	15
Reach 1	24	85	85	85
Reach 1	23	100	100	100
Reach 1	22	100	100	100
Reach 1	21	100	100	100
Reach 1	20	100	100	100
Reach 1	19	10	10	10
Reach 1	18	15	15	15
Reach 1	17	15	15	15
Reach 1	16	10	10	10
Reach 1	15	50	50	50
Reach 1	14	90	90	90
Reach 1	13	10	10	10
Reach 1	12	20	20	20
Reach 1	11	20	20	20
Reach 1	10	10	10	10
Reach 1	9	15	15	15
Reach 1	8	35	35	35
Reach 1	7	100	100	100
Reach 1	6	100	100	100
Reach 1	5	100	100	100
Reach 1	4	100	100	100
Reach 1	3	50	50	50
Reach 1	2	25	25	25
Reach 1	1			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: SVE

Reach	River Sta.	Contr.	Expan.
Reach 1	65	.1	.3
Reach 1	64	.1	.3
Reach 1	63	.1	.3
Reach 1	62	.1	.3
Reach 1	61	.1	.3
Reach 1	60	.1	.3
Reach 1	59	.1	.3
Reach 1	58	.1	.3
Reach 1	57	.1	.3
Reach 1	56	.1	.3
Reach 1	55	.1	.3
Reach 1	54	.1	.3
Reach 1	53	.1	.3
Reach 1	51	.1	.3
Reach 1	50	.1	.3
Reach 1	48	.1	.3
Reach 1	47	.1	.3
Reach 1	45	.1	.3
Reach 1	42	.1	.3
Reach 1	40	.1	.3
Reach 1	39	.1	.3
Reach 1	38	.1	.3
Reach 1	36	.1	.3

Reach 1	33	.1	.3
Reach 1	31	.1	.3
Reach 1	30	.1	.3
Reach 1	29	.1	.3
Reach 1	28	.1	.3
Reach 1	27	.1	.3
Reach 1	26	.1	.3
Reach 1	25	.1	.3
Reach 1	24	.1	.3
Reach 1	23	.1	.3
Reach 1	22	.1	.3
Reach 1	21	.1	.3
Reach 1	20	.1	.3
Reach 1	19	.1	.3
Reach 1	18	.3	.5
Reach 1	17	.3	.5
Reach 1	16	.3	.5
Reach 1	15	.3	.5
Reach 1	14	.1	.3
Reach 1	13	.1	.3
Reach 1	12	.1	.3
Reach 1	11	.1	.3
Reach 1	10	.1	.3
Reach 1	9	.1	.3
Reach 1	8	.1	.3
Reach 1	7	.1	.3
Reach 1	6	.1	.3
Reach 1	5	.1	.3
Reach 1	4	.1	.3
Reach 1	3	.1	.3
Reach 1	2	.1	.3
Reach 1	1	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	65	116.00	2510.90	2512.08	2511.83	2512.18	0.006645	2.51	46.20	74.71	0.56
Reach 1	64	116.00	2510.10	2511.18		2511.38	0.015967	3.60	32.18	58.40	0.86
Reach 1	63	116.00	2509.40	2510.57		2510.73	0.010535	3.18	36.47	58.44	0.71
Reach 1	62	116.00	2508.70	2509.82	2509.76	2510.05	0.017294	3.89	29.79	51.11	0.90
Reach 1	61	116.00	2507.70	2508.78	2508.78	2509.08	0.021897	4.37	26.55	45.73	1.01
Reach 1	60	116.00	2506.80	2508.12	2507.90	2508.29	0.009068	3.29	35.21	47.77	0.68
Reach 1	59	116.00	2506.30	2507.67	2507.46	2507.83	0.009155	3.26	35.56	49.32	0.68
Reach 1	58	116.00	2505.80	2506.88	2506.88	2507.14	0.022136	4.14	28.04	52.87	1.00
Reach 1	57	116.00	2504.60	2505.85	2505.81	2506.15	0.017555	4.36	26.63	39.01	0.93
Reach 1	56	206.00	2503.60	2504.82	2504.82	2505.19	0.019984	4.84	42.60	58.84	1.00
Reach 1	55	206.00	2502.20	2503.19	2503.34	2503.73	0.044180	5.92	34.82	64.45	1.42
Reach 1	54	206.00	2500.50	2502.06	2501.97	2502.40	0.014921	4.71	43.72	50.37	0.89
Reach 1	53	206.00	2499.90	2501.72		2501.90	0.006077	3.43	59.99	56.60	0.59
Reach 1	51	206.00	2499.70	2501.53		2501.64	0.003782	2.72	75.81	71.27	0.46
Reach 1	50	206.00	2499.50	2501.37		2501.46	0.003152	2.44	84.35	81.23	0.42
Reach 1	48	206.00	2499.40	2501.01	2500.87	2501.18	0.011644	3.37	61.21	97.12	0.75
Reach 1	47	206.00	2499.25	2500.18	2500.16	2500.42	0.020153	3.97	51.83	96.75	0.96
Reach 1	45	206.00	2498.90	2499.74		2499.85	0.006609	2.69	76.47	110.81	0.57
Reach 1	42	206.00	2498.20	2499.05	2499.05	2499.28	0.023367	3.80	54.28	121.35	1.00
Reach 1	40	206.00	2497.30	2498.30	2498.15	2498.44	0.009807	3.03	67.91	110.75	0.68
Reach 1	39	206.00	2496.70	2497.44	2497.44	2497.72	0.022191	4.25	48.44	87.77	1.01
Reach 1	38	206.00	2495.20	2496.62	2496.36	2496.80	0.007633	3.43	60.05	67.43	0.64
Reach 1	36	206.00	2493.50	2495.67	2495.67	2496.21	0.017638	5.92	34.82	32.10	1.00
Reach 1	33	206.00	2490.24	2493.40	2492.27	2493.64	0.003133	3.94	52.33	23.10	0.46
Reach 1	31	206.00	2490.00	2493.18		2493.42	0.001606	3.96	51.97	22.71	0.46
Reach 1	30	206.00	2490.20	2492.67		2493.15	0.004191	5.59	36.84	19.87	0.72
Reach 1	29	206.00	2490.04	2492.49	2492.08	2492.98	0.004322	5.65	36.47	19.83	0.73
Reach 1	28	206.00	2490.00	2492.06	2492.06	2492.88	0.016689	7.26	28.38	17.60	1.01
Reach 1	27	206.00	2488.52	2489.87	2490.56	2492.12	0.073727	12.04	17.11	15.40	2.01
Reach 1	26	206.00	2487.04	2488.41	2489.10	2490.66	0.072213	12.05	17.10	15.06	1.99
Reach 1	25	206.00	2487.00	2489.76	2489.05	2490.13	0.005569	4.90	42.06	20.53	0.60

Reach 1	24	206.00	2486.94	2489.68		2490.04	0.005588	4.88	42.25	20.89	0.60
Reach 1	23	206.00	2486.60	2489.30		2489.70	0.003107	5.07	40.67	20.17	0.63
Reach 1	22	206.00	2486.20	2489.07		2489.40	0.002408	4.61	44.73	21.15	0.56
Reach 1	21	206.00	2485.80	2488.92		2489.18	0.001722	4.06	50.68	22.48	0.48
Reach 1	20	206.00	2485.40	2487.95	2487.95	2488.79	0.008473	7.34	28.05	16.97	1.01
Reach 1	19	206.00	2485.00	2487.29	2487.04	2487.89	0.005598	6.21	33.16	18.99	0.83
Reach 1	18	206.00	2484.96	2487.40		2487.78	0.003167	4.93	41.79	22.24	0.63
Reach 1	17	206.00	2484.90	2487.42		2487.68	0.001986	4.10	50.27	24.90	0.51
Reach 1	16	206.00	2484.84	2487.44		2487.62	0.001284	3.41	60.34	28.51	0.41
Reach 1	15	303.00	2484.80	2487.01		2487.50	0.004043	5.61	54.03	28.85	0.72
Reach 1	14	303.00	2484.60	2486.79		2487.29	0.004167	5.67	53.48	28.77	0.73
Reach 1	13	303.00	2484.24	2486.36		2486.89	0.004638	5.86	51.75	28.77	0.77
Reach 1	12	303.00	2484.20	2486.00	2486.00	2486.79	0.016183	7.13	42.52	27.21	1.00
Reach 1	11	303.00	2483.32	2484.66	2485.13	2486.21	0.045278	10.00	30.31	25.42	1.61
Reach 1	10	303.00	2482.44	2484.83	2484.25	2485.26	0.006199	5.22	58.10	28.54	0.64
Reach 1	9	303.00	2482.40	2484.78		2485.19	0.006133	5.14	58.93	29.52	0.64
Reach 1	8	303.00	2482.34	2484.65		2485.09	0.006811	5.32	56.91	29.29	0.67
Reach 1	7	303.00	2482.20	2484.43		2484.91	0.003963	5.57	54.40	28.90	0.72
Reach 1	6	303.00	2481.80	2484.04		2484.51	0.003878	5.53	54.80	28.96	0.71
Reach 1	5	303.00	2481.40	2483.66		2484.13	0.003838	5.51	55.00	28.99	0.70
Reach 1	4	303.00	2481.00	2483.32	2482.80	2483.75	0.003440	5.31	57.07	29.27	0.67
Reach 1	3	303.00	2480.60	2482.41	2482.41	2483.21	0.008270	7.18	42.20	26.64	1.01
Reach 1	2	303.00	2479.86	2480.88	2481.35	2482.42	0.030210	9.96	30.41	31.55	1.79
Reach 1	1	303.00	2479.60	2480.44	2480.77	2481.58	0.027893	8.57	35.35	43.50	1.68

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : SVE1

River: SVE Reach: Reach 1 RS: 65 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 61 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 59 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 58 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 57 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 56 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 55 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
River: SVE Reach: Reach 1 RS: 54 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
River: SVE Reach: Reach 1 RS: 50 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 47 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 45 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 42 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 40 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 39 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 38 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 36 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 31 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 29 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 28 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 27 Profile: PF 2
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
River: SVE Reach: Reach 1 RS: 26 Profile: PF 2
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 25 Profile: PF 2
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
River: SVE Reach: Reach 1 RS: 21 Profile: PF 2
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 20 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 13 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 12 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 11 Profile: PF 2
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
River: SVE Reach: Reach 1 RS: 10 Profile: PF 2
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
River: SVE Reach: Reach 1 RS: 4 Profile: PF 2
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: SVE Reach: Reach 1 RS: 3 Profile: PF 2
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: SVE Reach: Reach 1 RS: 2 Profile: PF 2
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

APPENDIX C
Reference Materials

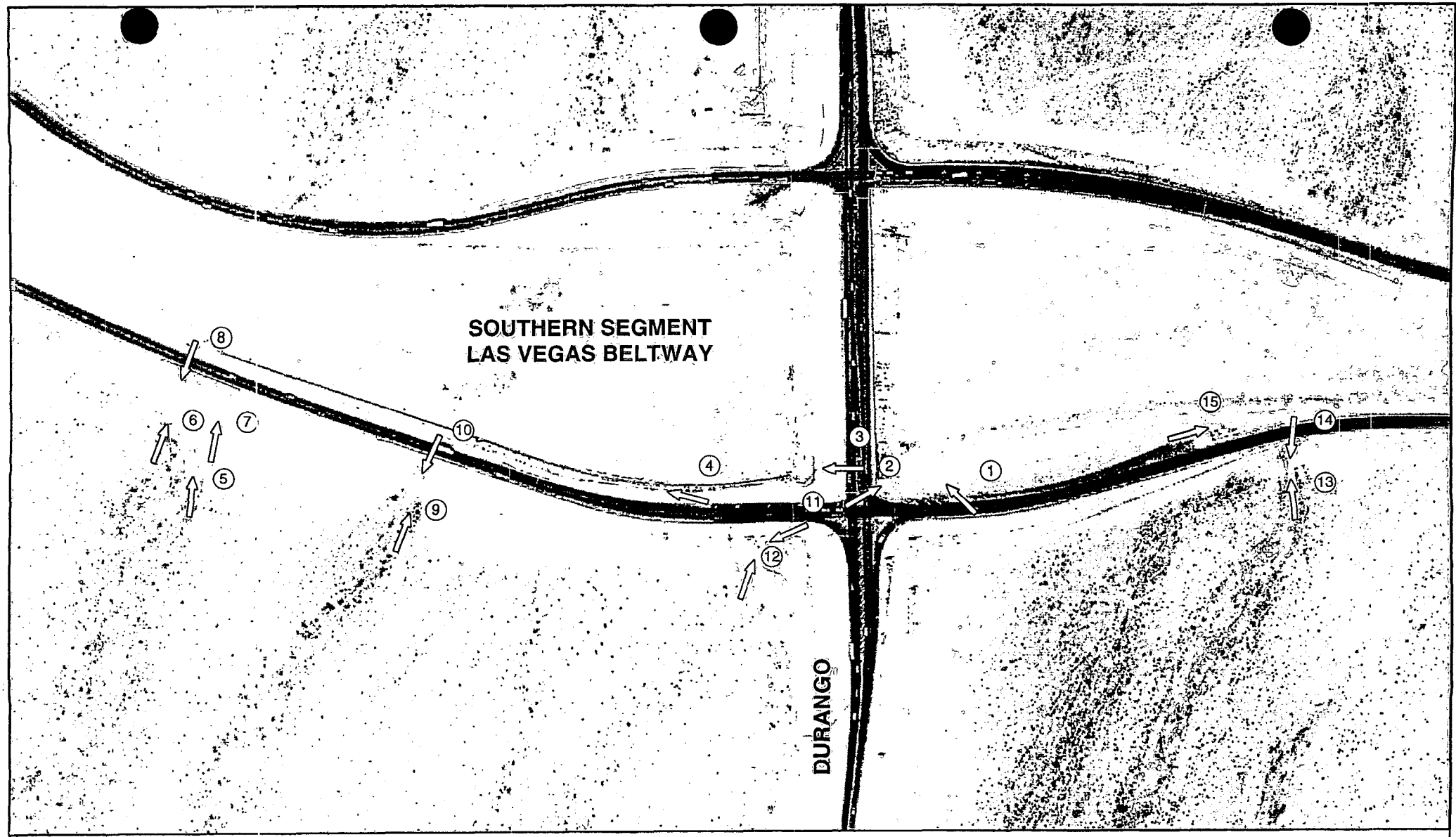
Photographs of Existing Facilities
- **Offsite (Southern Beltway Facilities)**
- **Onsite**

Clark County Regional Flood Control District Operations and Maintenance Manual

Upper Flamingo Wash Detention Basin LOMR

Final Design Memorandum for the Southern Beltway Improvements

Beltway Improvement Plans



N

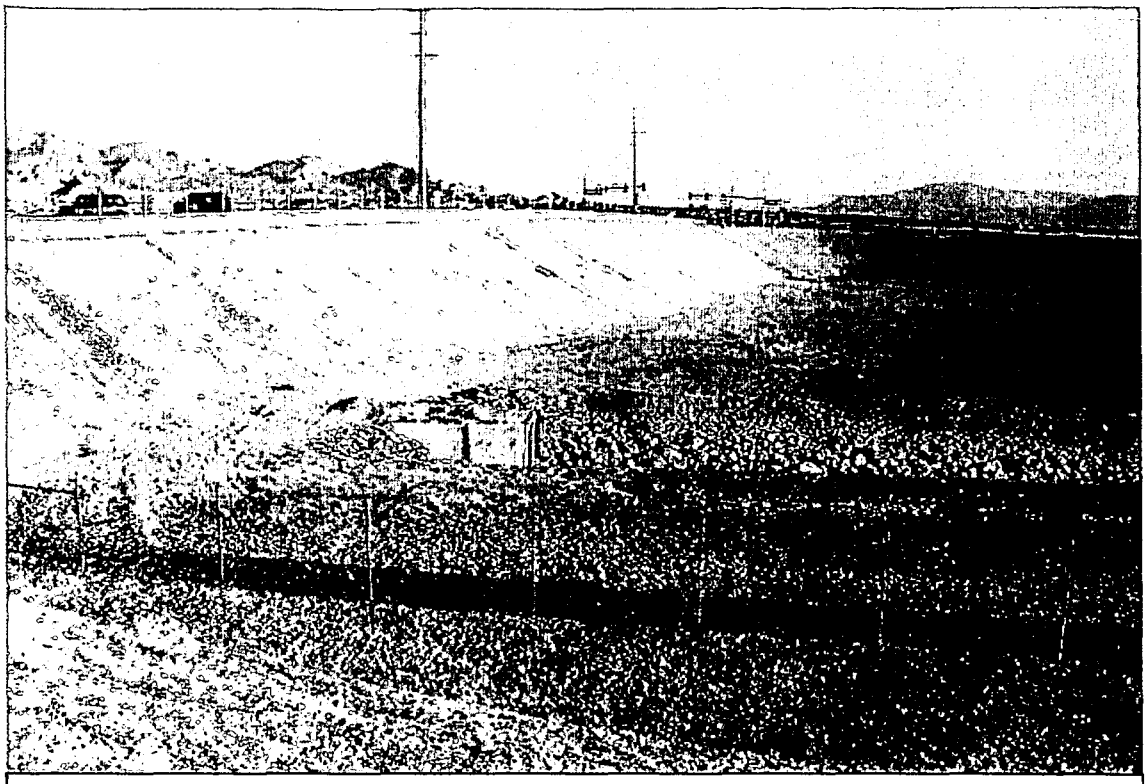
0 150 300 600 Feet

SOUTHERN VISTA ESTATES
DIVERSION BERM AND CHANNEL

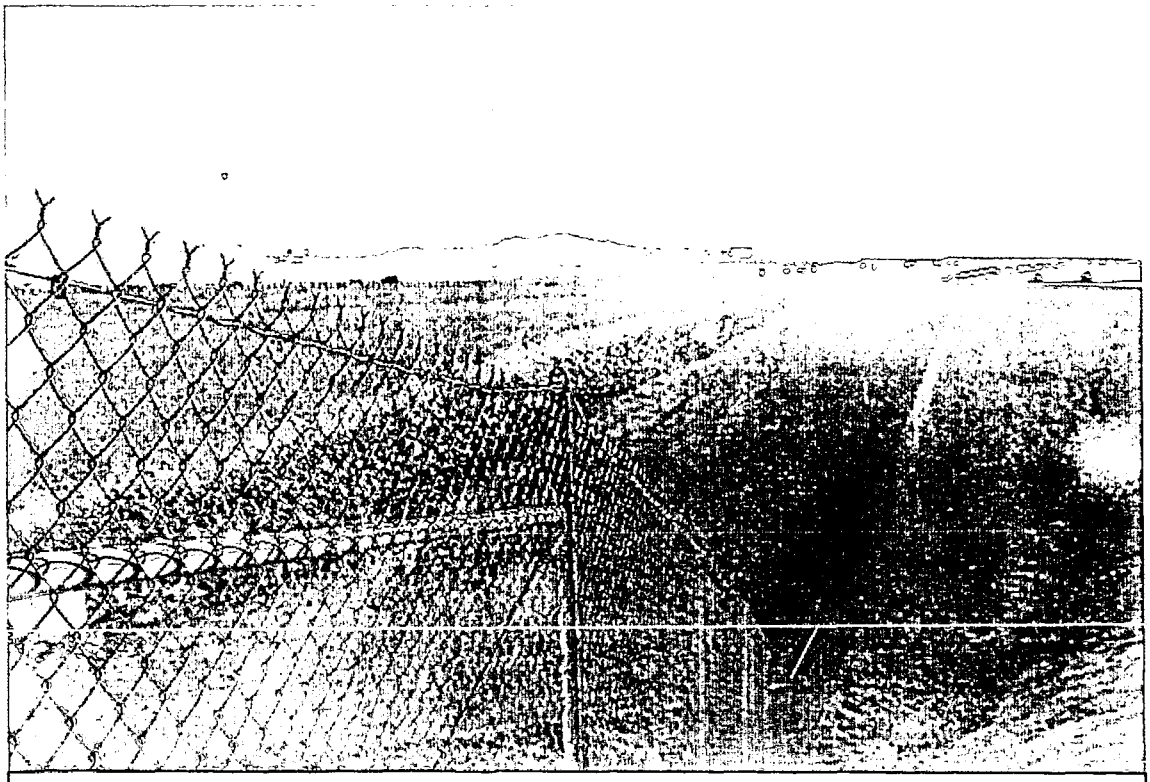
EXHIBIT

BELTWAY FACILITY PICTURES KEY MAP

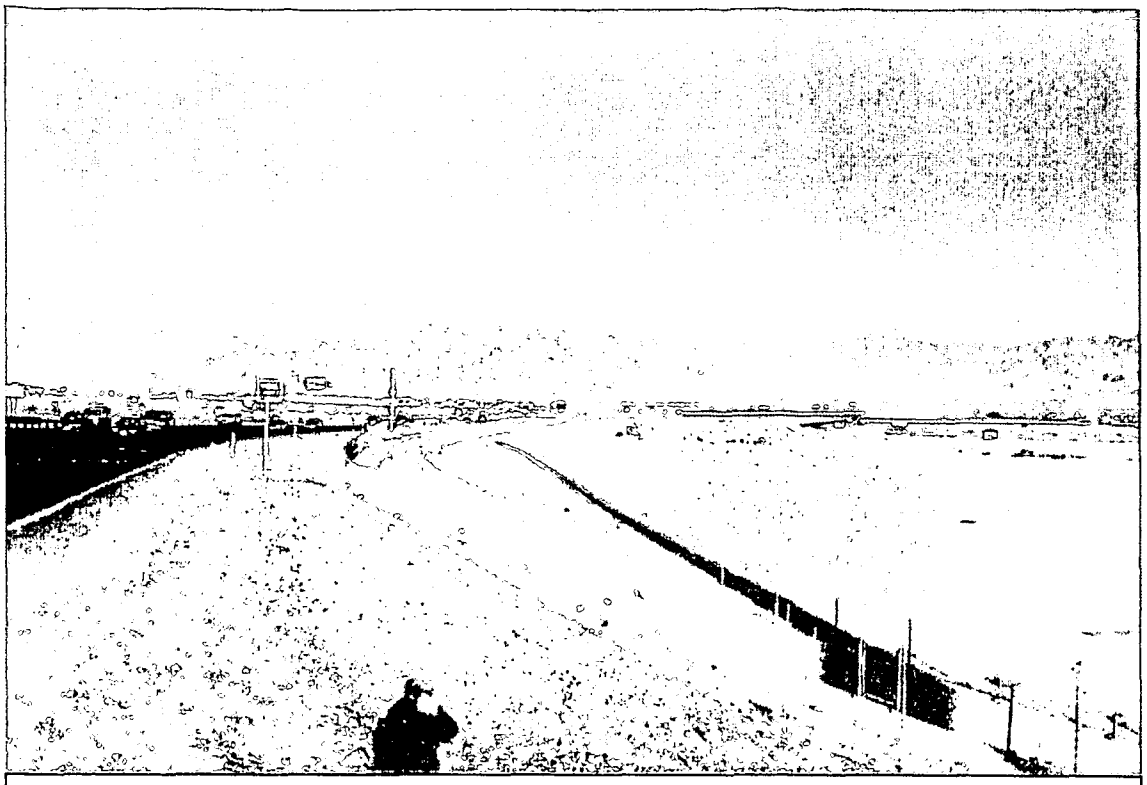
G.C. WALLACE, INC.
Engineers/Planners/Surveyors 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146



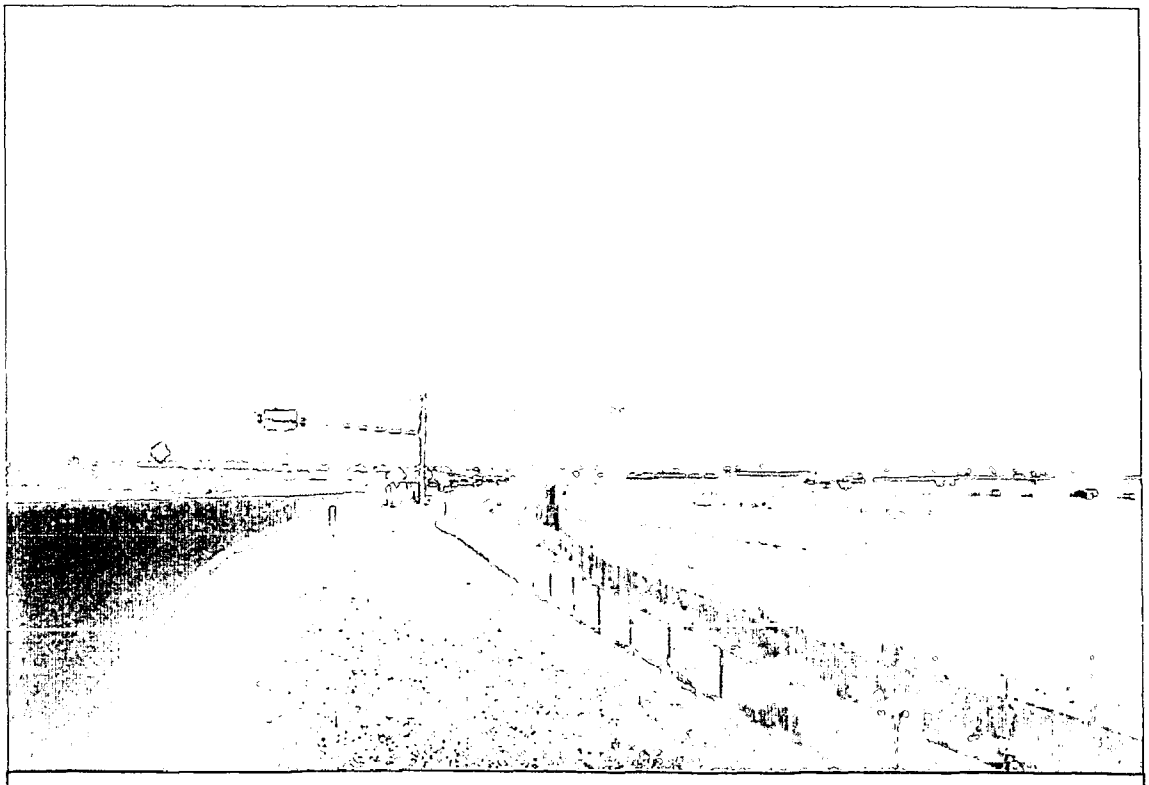
PICTURE 1



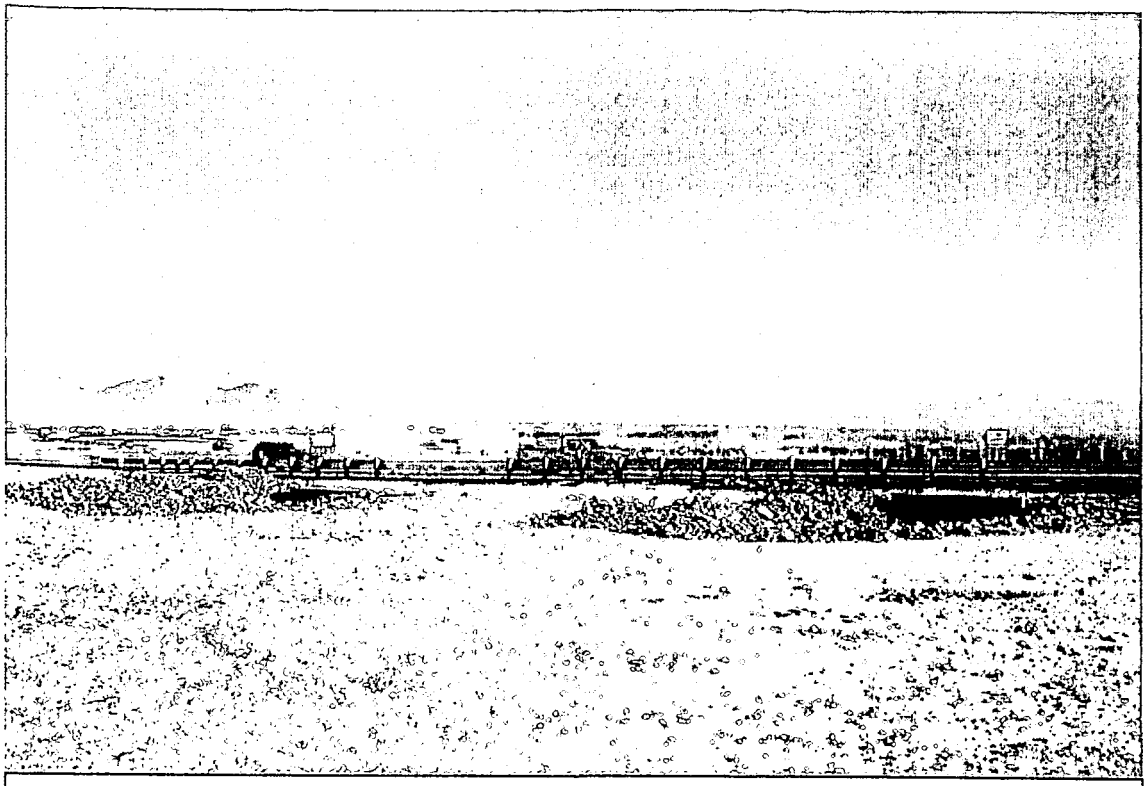
PICTURE 2



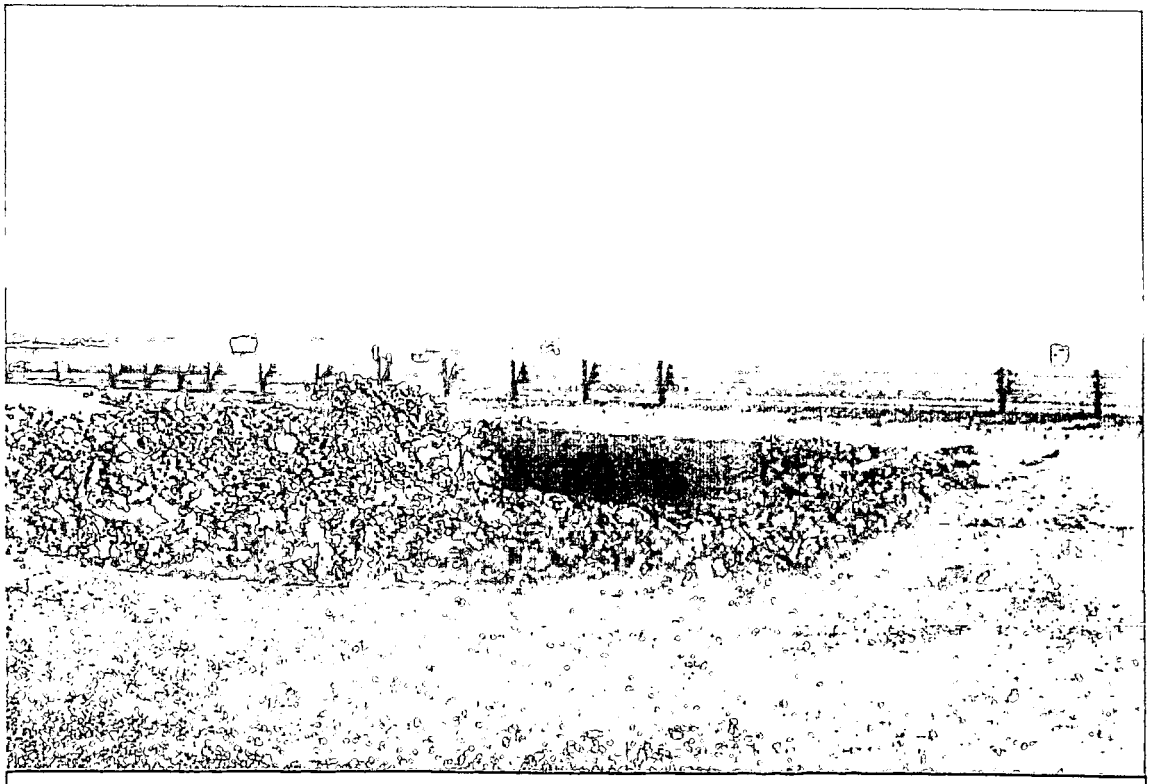
PICTURE 3



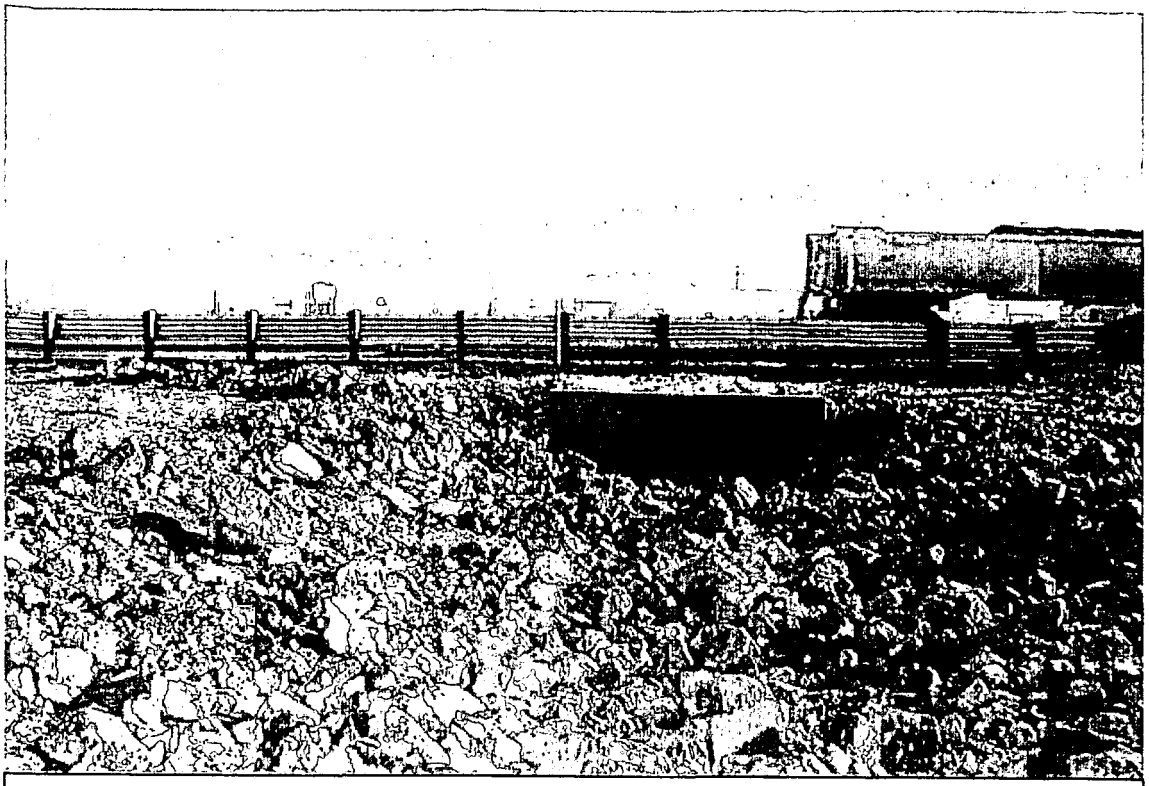
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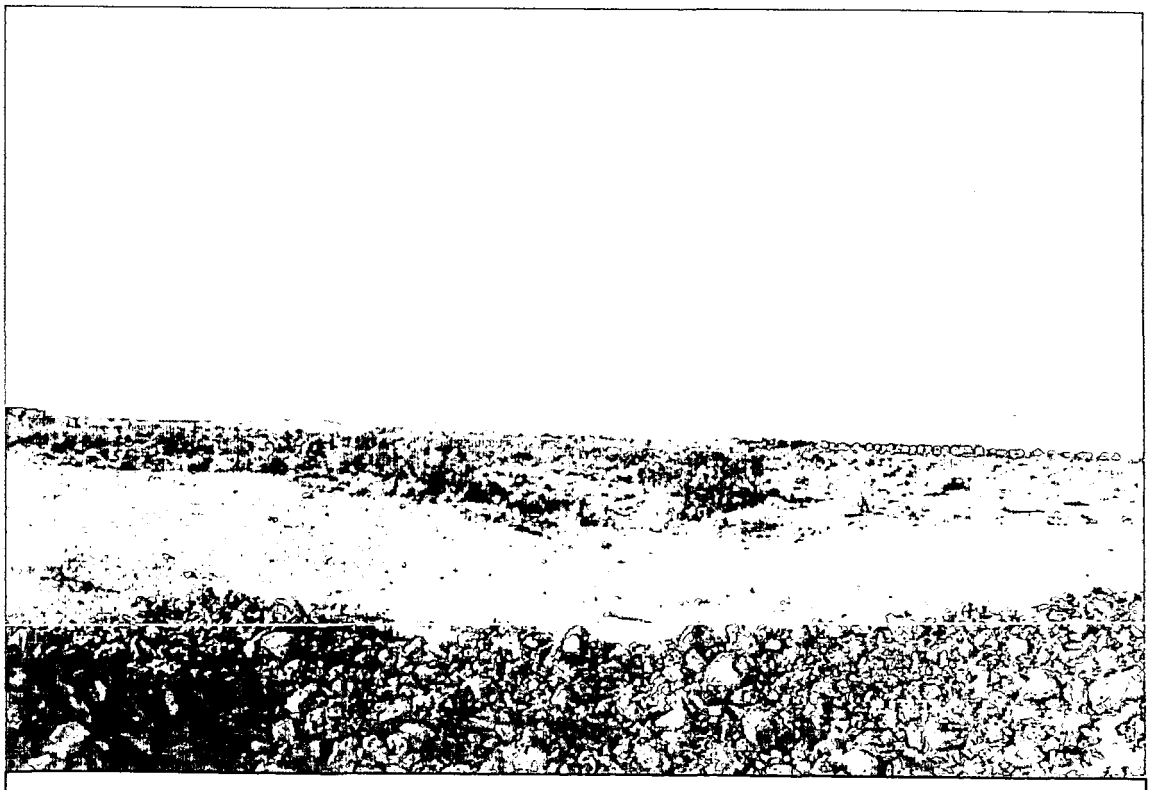
PICTURE 5



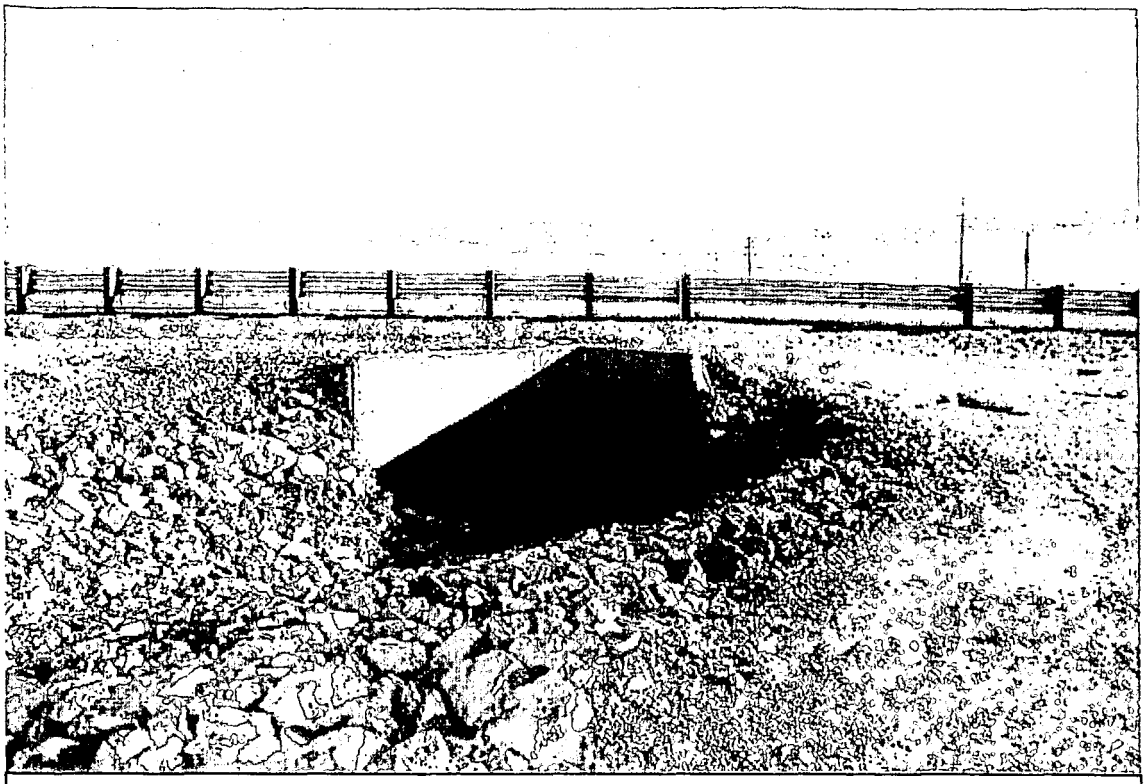
PICTURE 6



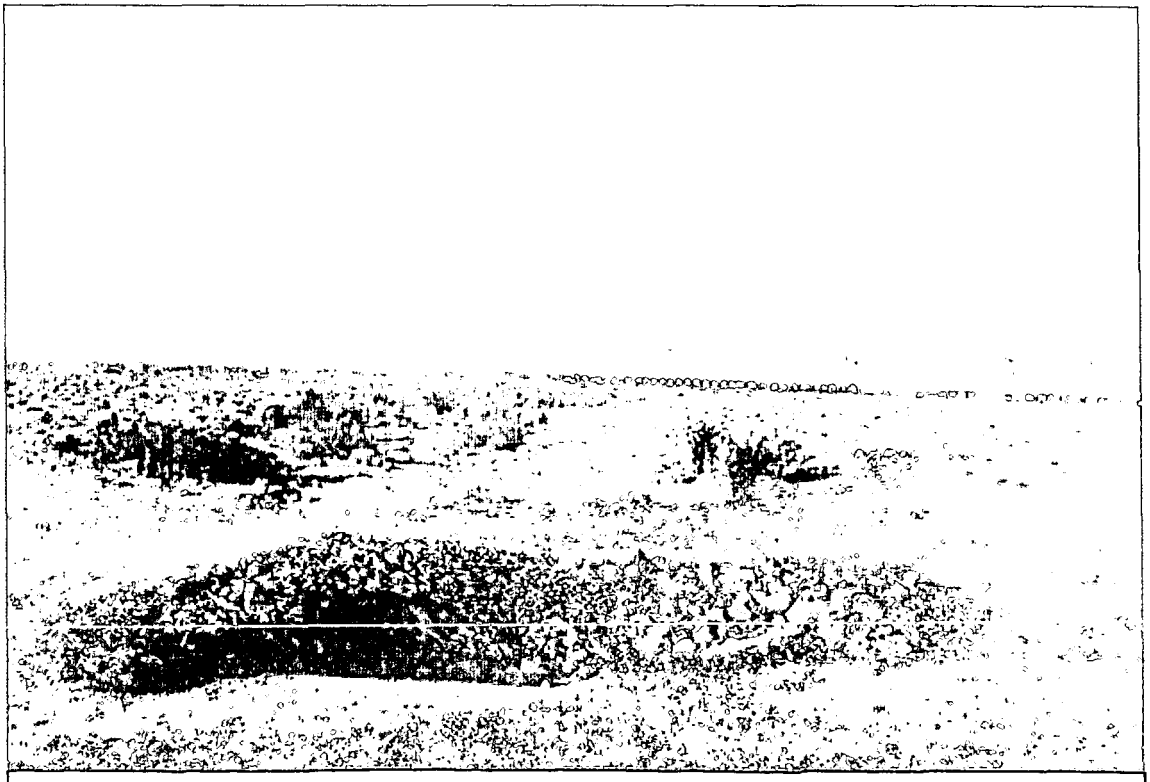
PICTURE 7



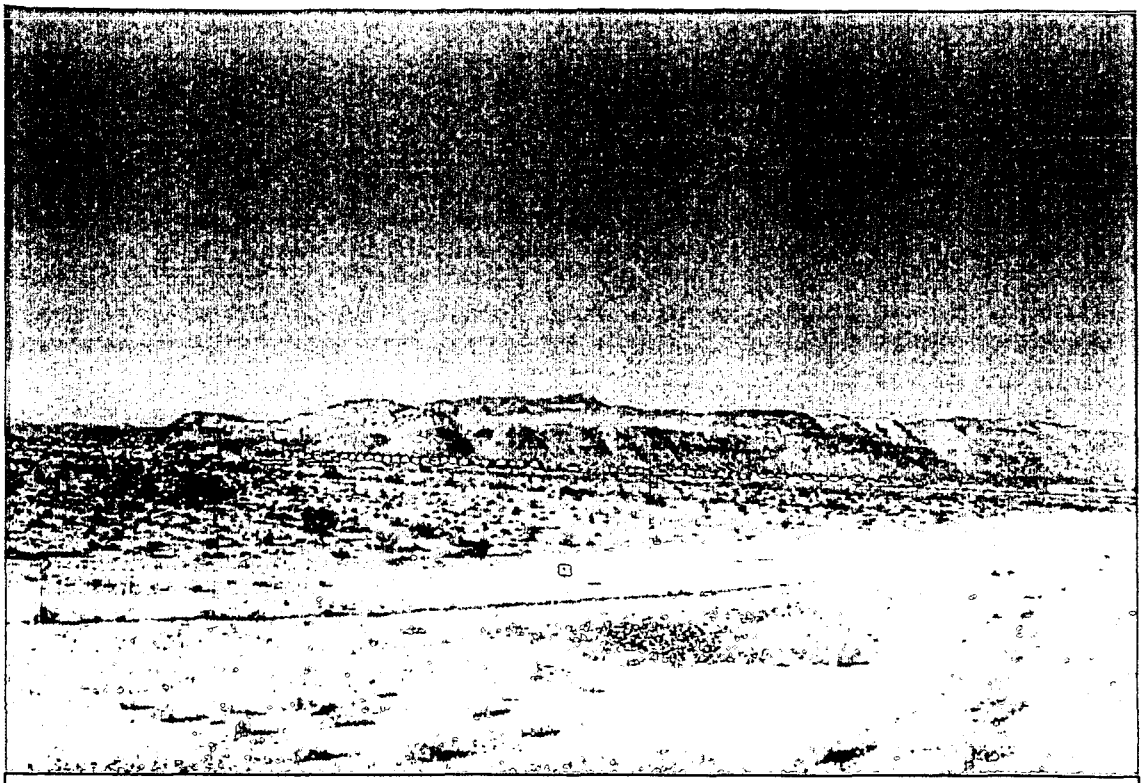
PICTURE 8



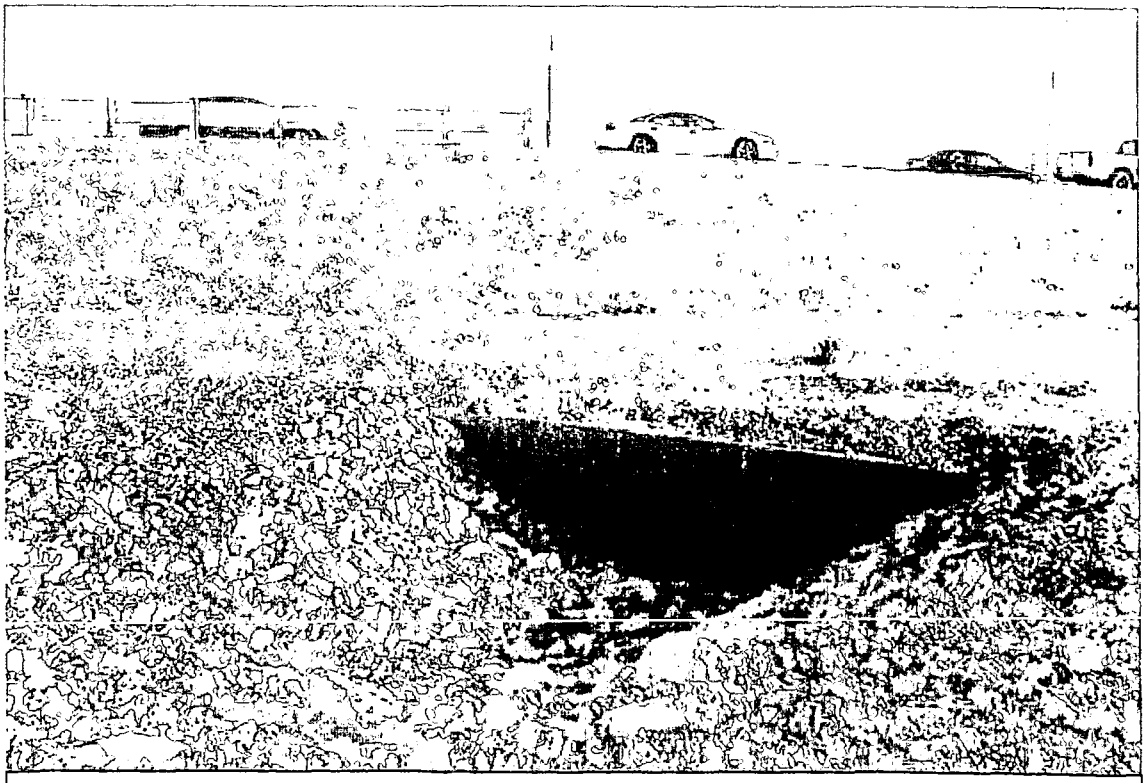
PICTURE 9



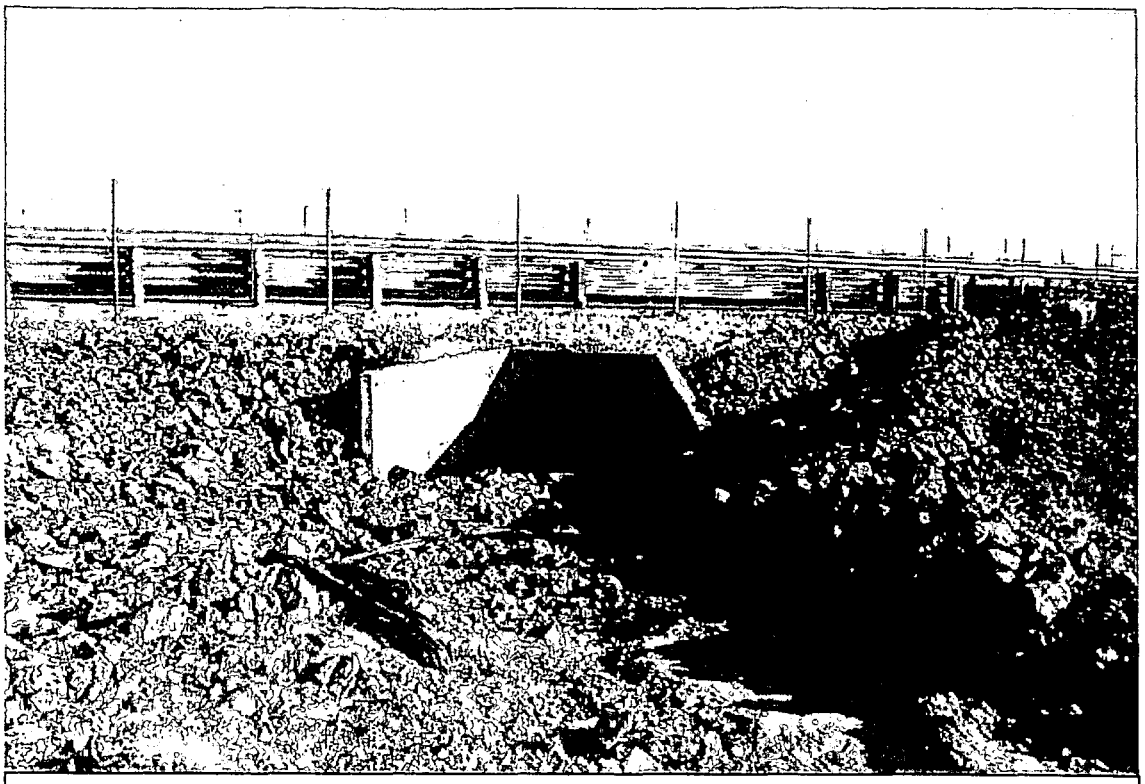
PICTURE 10



PICTURE 11



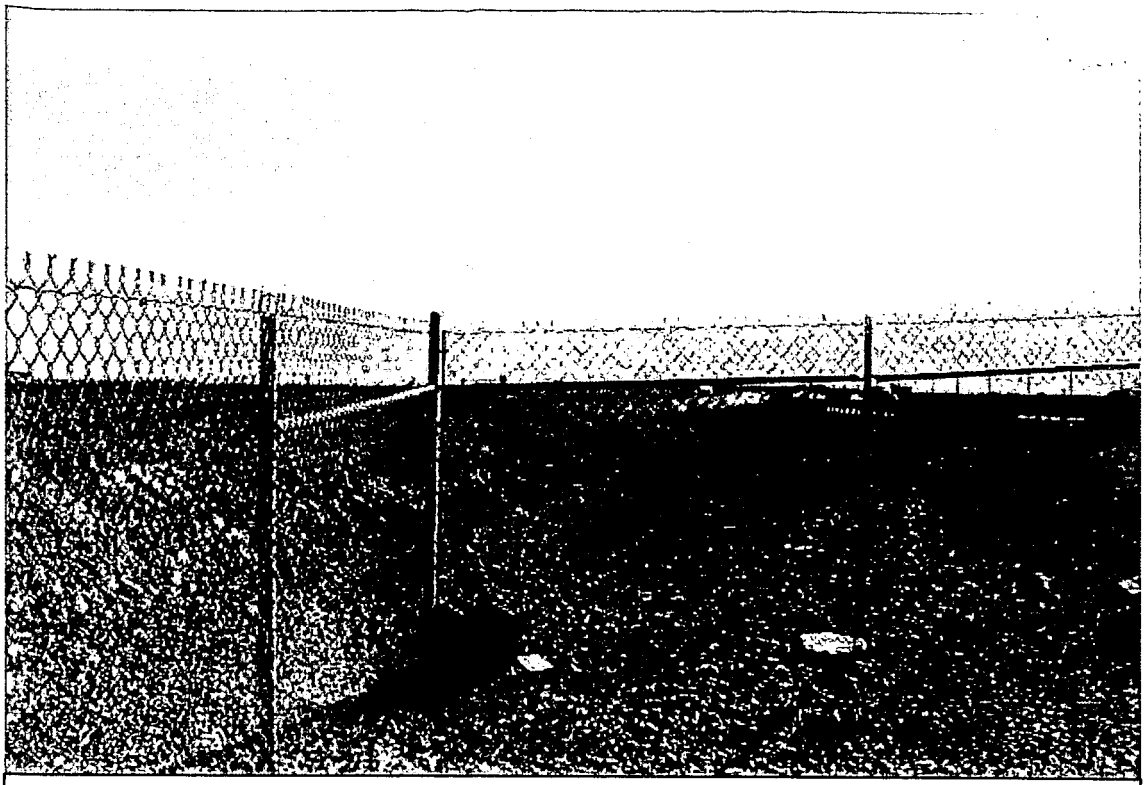
PICTURE 12



PICTURE 13

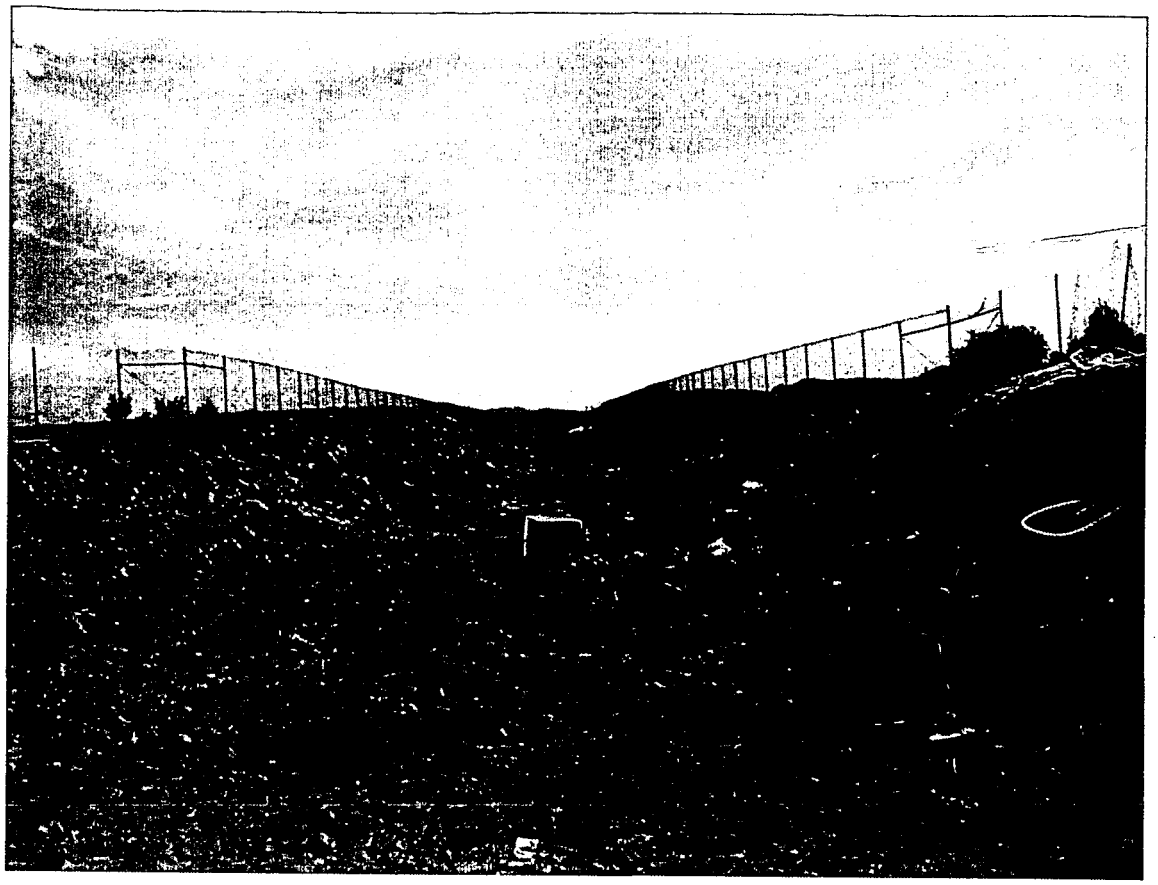


PICTURE 14

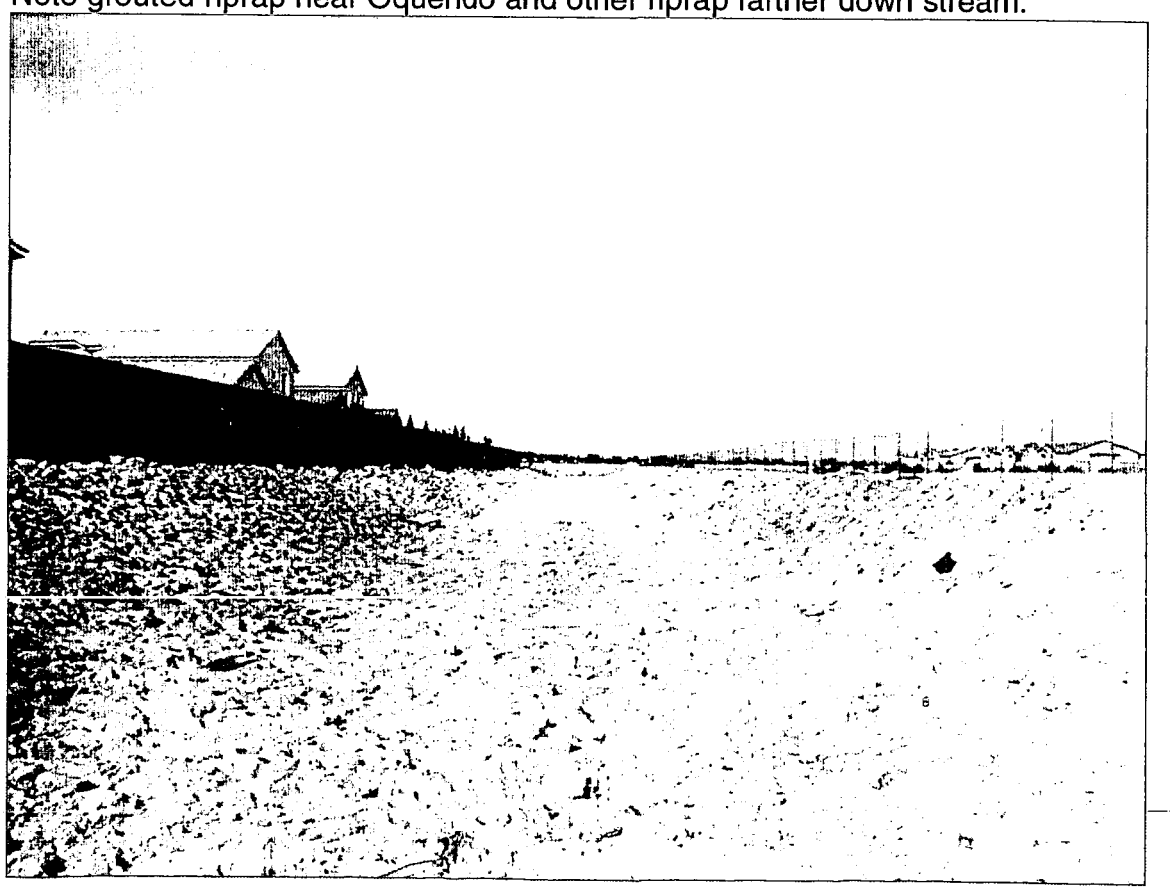


PICTURE 15

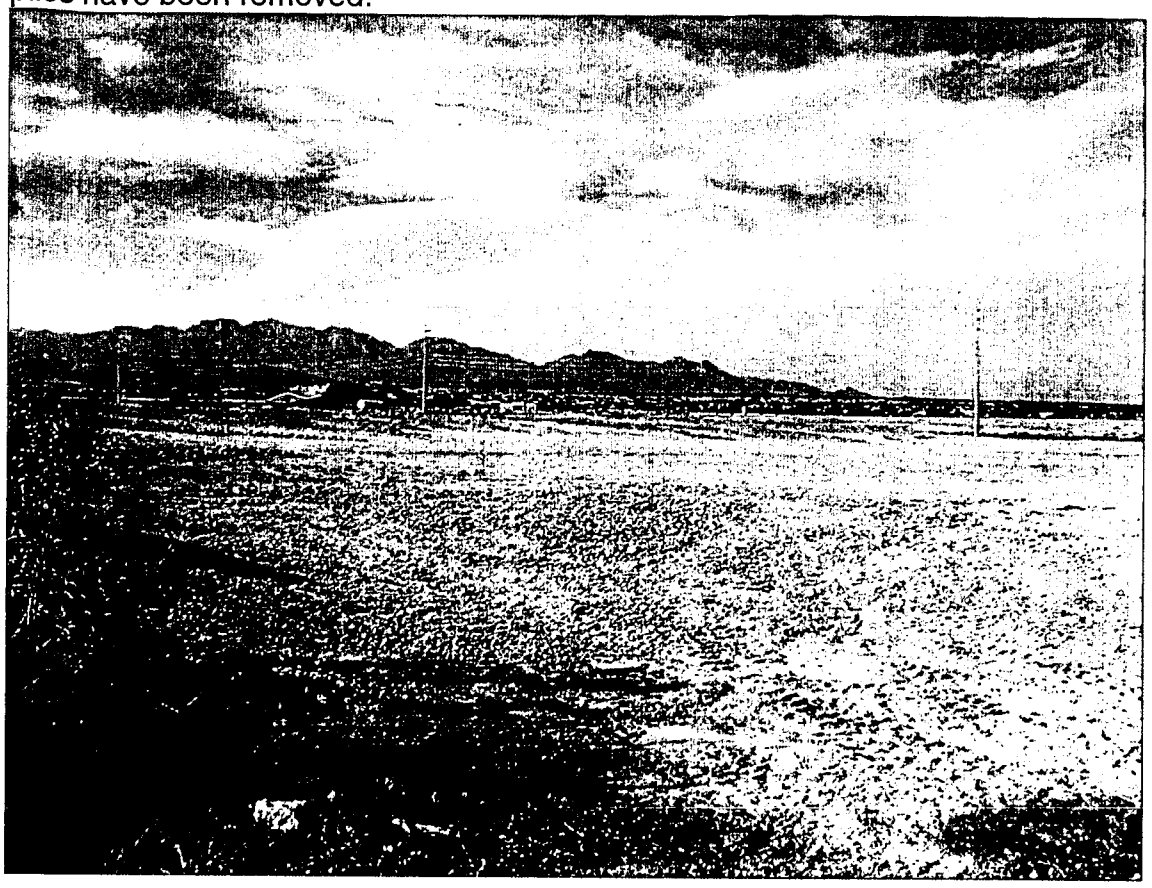
At Oquendo looking upstream, note grouted riprap on sides.



At Oquendo looking north at entrance to Upper Flamingo Wash Detention Basin. Note grouted riprap near Oquendo and other riprap farther down stream.



At end of channel looking south into Upper Flamingo Wash Detention Basin. Note spoil piles have been removed.



At end of subdivision drainage channel outlet looking northeast at Upper Flamingo Detention Basin outlet structure. Note debris piles have been removed.



At channel north end looking south toward Oquendo note riprap and grouted riprap on channel walls.



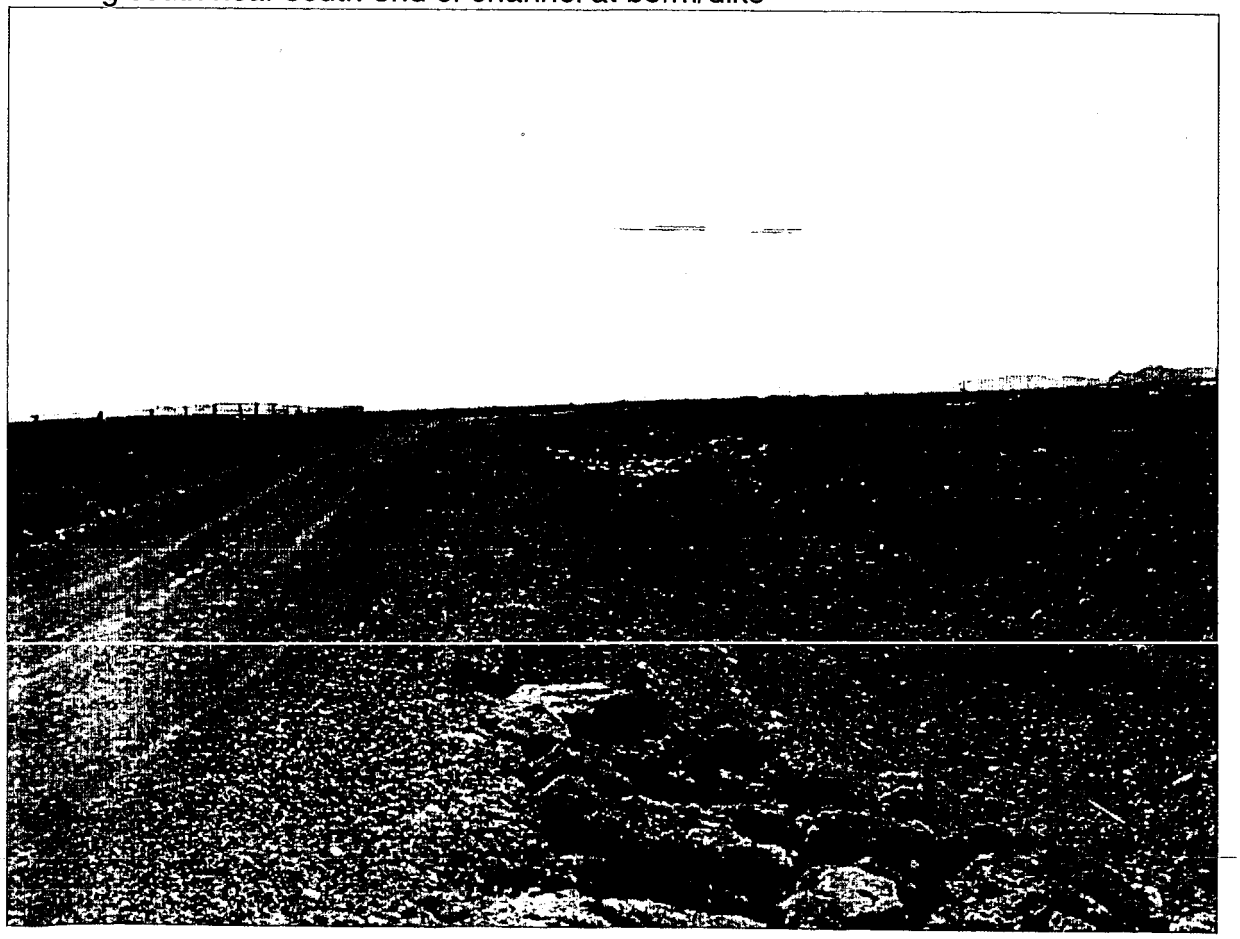
On top of Oquendo embankment looking south toward Upper Flamingo Wash Detention Basin.



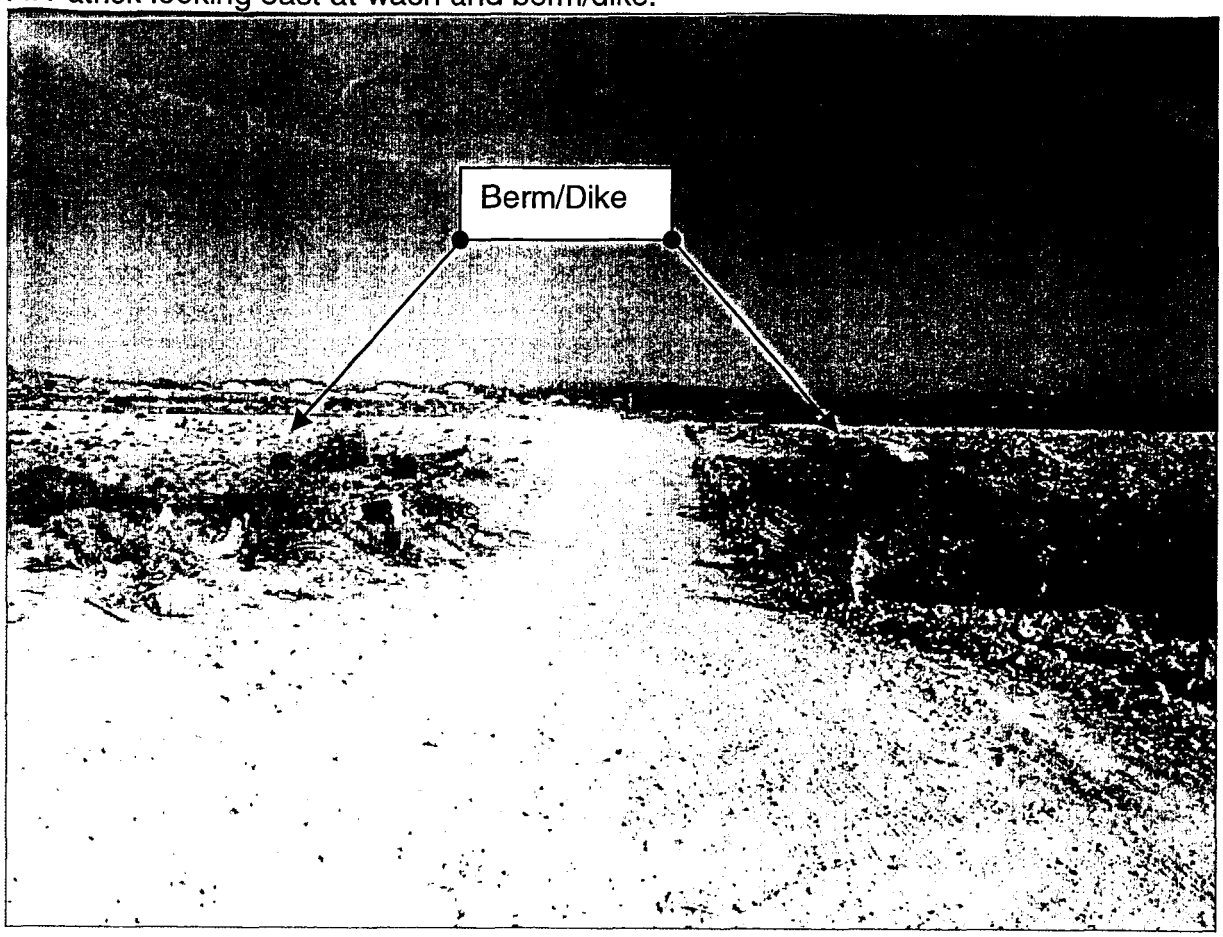
Looking north from the beginning of the channel toward Oquendo.



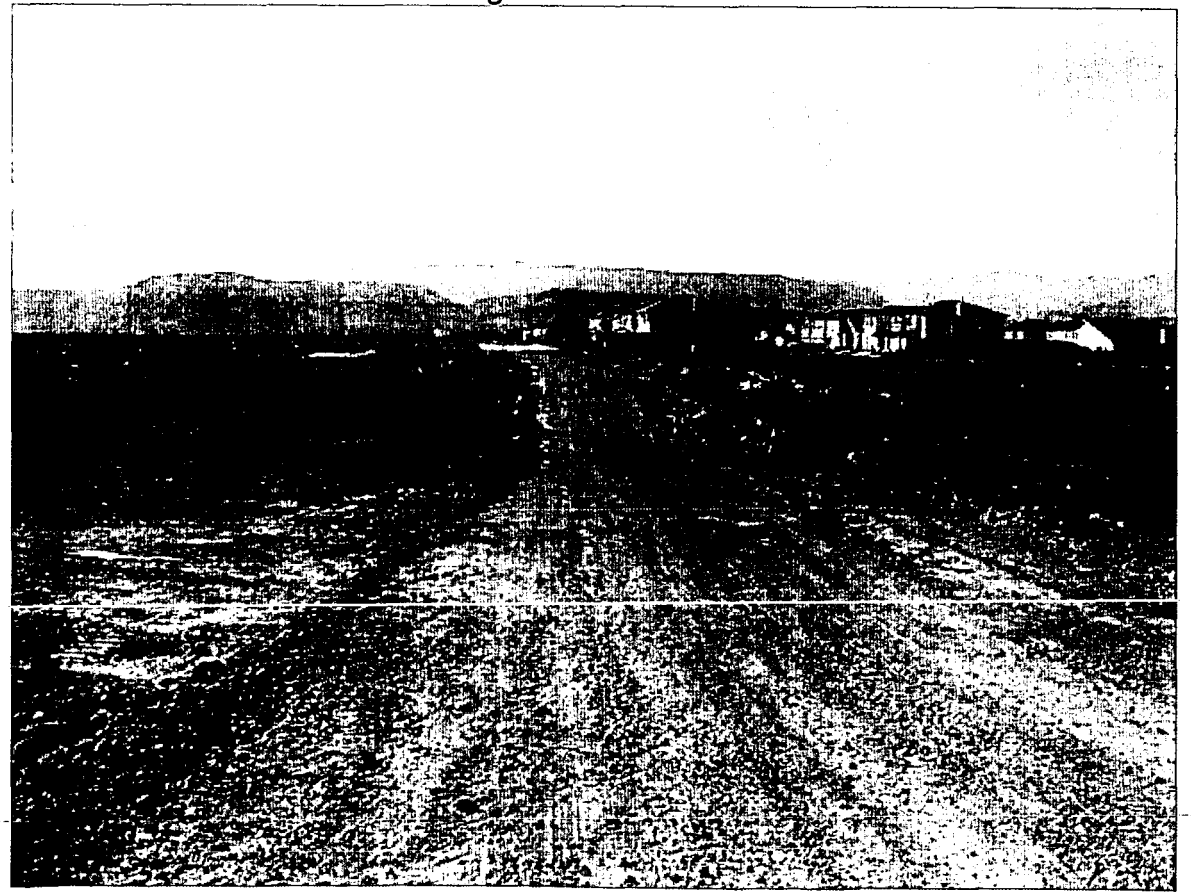
Looking south near south end of channel at berm/dike



At Patrick looking east at wash and berm/dike.



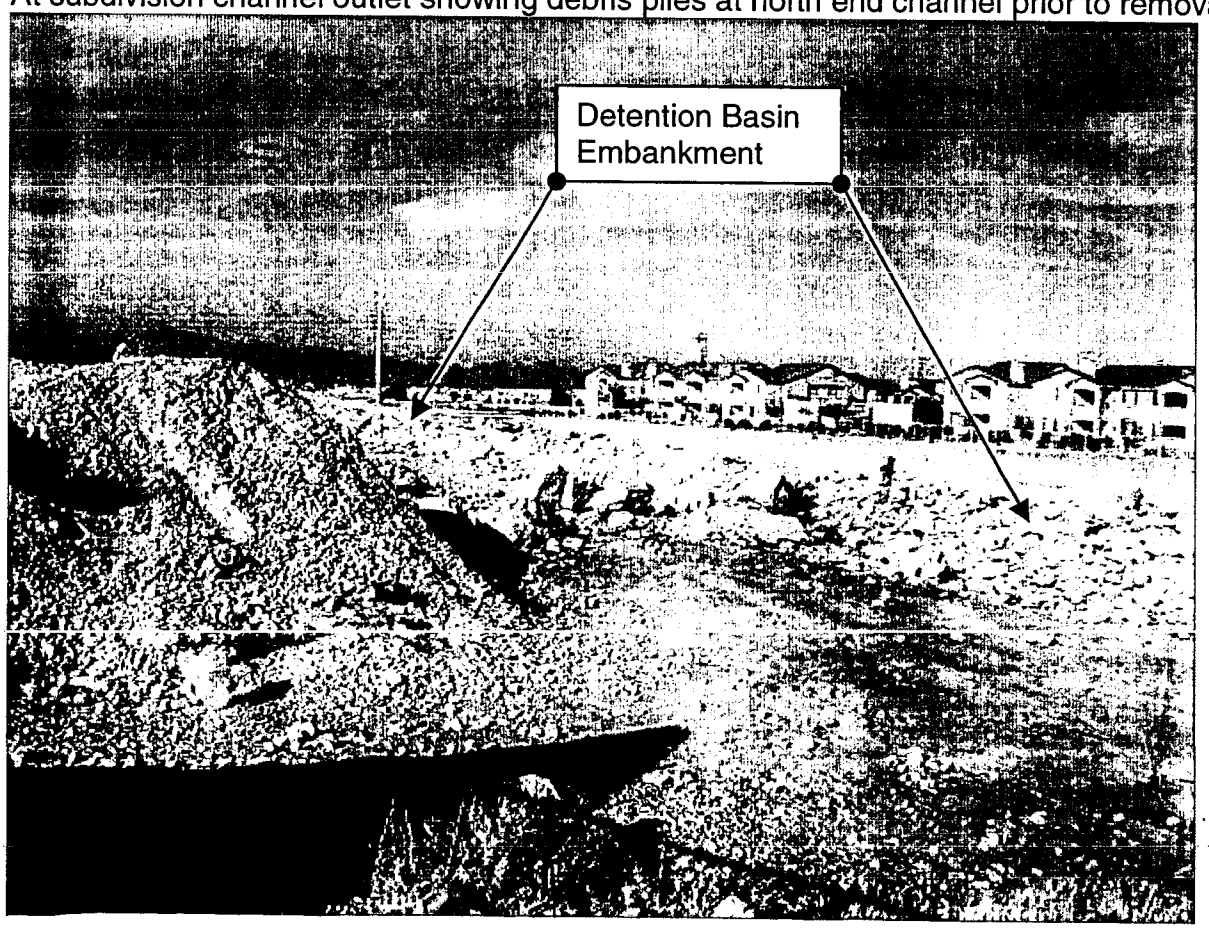
At Patrick on the berm/dike looking west.



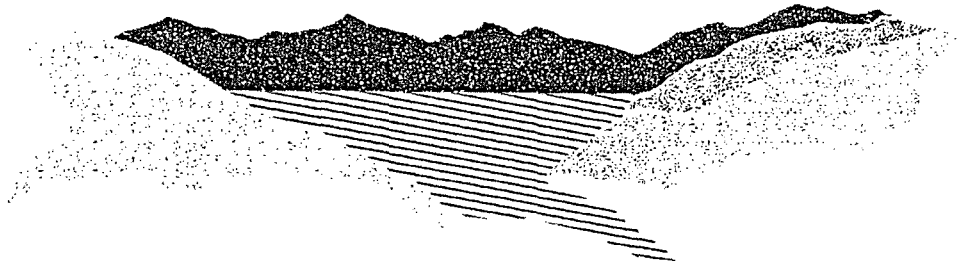
On dike/berm looking south from Patrick.



At subdivision channel outlet showing debris piles at north end channel prior to removal.



CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT



OPERATIONS AND MAINTENANCE MANUAL

PRINTED
JANUARY 2000

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

OPERATIONS AND MAINTENANCE MANUAL

GALE WM. FRASER, II, P.E.
GENERAL MANAGER / CHIEF ENGINEER

The Operations and Maintenance Manual has been updated in accordance with Regional Flood Control District Board action on December 9, 1999. The Board adopted amendments to Sections 2.50, 3.20, 4.11, 4.22, 4.25, 4.34, added Chapter 5, updated forms and charts, and added sample forms.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

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CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

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CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

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CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 1
EXECUTIVE SUMMARY

1.10 EXECUTIVE SUMMARY

The Clark County Regional Flood Control District (District) was created under NRS 543 with responsibility to plan, construct and maintain drainage and flood control facilities throughout Clark County. In order to comply with NRS 543.340(4), this Operations and Maintenance Manual has been prepared through the cooperation and support of all of the affected Entities in the County. The document sets forth both policies and procedures by which the maintenance of the drainage and flood control facilities will be achieved to assure their proper working order at the time of need. The overall goal of the maintenance program as adopted by the District Board is as follows:

> COMPLY WITH THE PROVISIONS OF NRS 543.340(4) AND ASSURE THAT FACILITIES IN THE MASTER PLAN ARE MAINTAINED IN A MANNER THAT MAXIMIZES THEIR USEFUL LIFE AND ENSURES THEIR OPERATION AT DESIGN CAPACITY DURING A STORM EVENT.

Ten policy statements were also adopted supporting the above goal.

In order to achieve the goal, and to comply with the adopted policies, the following procedures have been developed in an open and very participatory manner.

Funding Procedure - Provides for a means by which the Entities can be reimbursed for activities associated with maintenance of drainage and flood control facilities on the Master Plan provided they meet criteria as set forth in the manual.

Administrative Procedure - Provides for establishing standards and levels of service by which maintenance will be achieved. This procedure includes the steps and schedule by which an annual work plan is established and adopted by the District Board. It also provides for the certification of performance by each Entity in accordance with the annual interlocal contract. The ability for the Entity to contract maintenance activities to private contractors is also authorized under this procedure.

Maintenance Procedures - This procedure provides the specific activities under which the maintenance program is to be carried out as listed below:

ACTIVITY NUMBER	ACTIVITY NAME	WORK MEASURE UNIT
05	Inspect Channels	Miles
10	Clean and Reshape Channels	Cubic Yards
15	Repair Lined Channel	Each
20	Provide/Maintain Erosion Control	Square Feet
25	Clean and Inspect Detention/Debris Basins	Cubic Yards
30	Erosion Repair	Cubic Yards
35	Fence Repair	Linear Feet
40	Vegetation Control - Chemical	Acres
45	Vegetation Control - Mechanical	Acres
50	Maintain Access Road	Miles
55	Clean and Inspect Inlet/Outlet Structures	Each
60	Repair Inlet/Outlet Structures	Each
65	Clean Storm Sewer Lines	Linear Feet
70	Storm Sewer Repair	Repairs
75	Clean/Flush Culverts & Bridges	Each
80	Miscellaneous Work Activities	Labor Hours
85	Engineering	Labor Hours

A specific performance standard has been developed for each activity setting forth the following elements:

- The most effective crew size.
- The kinds and number of equipment required.
- The major types of material that should be used.
- Recommended procedures for performing the work.
- An estimate of expected average daily accomplishment with standard crew size, equipment, and procedures.
- Authorization and scheduling criteria.

Inventory Procedures - A critical element of any maintenance program is the identification and condition of the overall drainage and flood control system. In the case of this program, the inventory also identifies those facilities that are "eligible" for reimbursement of maintenance activities, provided the work is a part of the annual plan. Facilities eligible are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan facilities, or exist in the same alignment as a proposed Master Plan facility and appurtenant facilities are eligible.

Maintenance is an ongoing and very dynamic function of a successful drainage and flood control program. This Operations and Maintenance Manual sets forth an initial set of policies and procedures, including the various actions required to achieve the maintenance goal. The manual will need to be updated on a regular basis to reflect fiscal implications and the experience gained as the District continuous to grow and to serve the citizens and taxpayers of Clark County.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 2
INTRODUCTION

2.10 BACKGROUND

The Clark County Regional Flood Control District (District) was established in 1986 to plan, construct, and maintain drainage and flood control facilities. These responsibilities focused on alleviating the potential for flooding and protecting the lives and property of District residents. The initial phases of the District's program succeeded in preparing a Master Plan, uniform design criteria, regulatory standards, and constructing facilities. As these areas have progressed, the District, along with other agencies and Entities in the County, has oriented its efforts towards assuring adequate maintenance of flood control facilities and conveyance systems. This orientation is consistent with the vital role maintenance plays in all comprehensive flood control programs. This Operations and Maintenance Manual has been prepared through the District with the support and cooperation of each affected Entity. It represents a commitment to uniform flood control system standards and establishes a blueprint for a cost effective and consistent maintenance program throughout the District.

2.20 AUTHORITY

Nevada Revised Statute (NRS) 543 mandates that the District shall undertake programs for both construction and maintenance of flood control facilities. A commitment to building and maintaining flood control facilities within Clark County is reiterated in the District's Uniform Regulations for the Control of Drainage which states that capital improvements, operation, and maintenance are all interrelated parts of the District's overall flood control program. In accordance with NRS 543.340(4) and the Uniform Regulations, the District authorized URS Consultants to prepare a specific Operations and Maintenance Manual, which was adopted by the District Board on November 8, 1990. To reflect fiscal implications and experience gained, the manual was updated in 1995 and 1999.

2.30 RESPONSIBILITY

The District was formed, in part, to fund and coordinate the construction and maintenance of facilities to alleviate flooding and protect the life and property of citizens within the boundaries of the District. It is the responsibility of the District to prepare and update the Master Plan for the control of floods, and manage the Regional Fund for the Control of Floods in a manner consistent with NRS 543.

2.40 APPROACH

The maintenance program must assure that the flood control projects funded by the District are maintained at a level which maximizes their useful life and assures that facilities operate to design capacity. As an interconnected network of conveyances and structures, failure of any flood control facility to operate properly may affect the performance of the overall system within a specific watershed.

Flood control facilities require regular maintenance if they are to be functional, visually attractive, and last through their design life. Accordingly, the development of a maintenance program is just as critical to the overall success of a comprehensive flood control effort as basin planning and regulation enforcement. As stormwater and flood control programs begin to address nonpoint pollution/water quality issues, the maintenance program will play an even greater role by enabling cost effective reductions in pollutant loadings to receiving waters. Finally, visibility of the program to the public, which a comprehensive maintenance program affords, is an important factor in demonstrating that flood control management is truly a full-time commitment and not simply a priority only after a storm event. The primary objectives of the District's maintenance program are:

- To develop a complete physical feature inventory for the system.
- To establish overall policies and levels of service.
- To develop operating procedures.

It is also critical that ongoing inspection and reporting procedures continue to assure all systems are ready when needed.

Due to the multiple jurisdictions involved with maintenance of the flood control system, a commitment to this program from all Entities within the Flood Control District was essential. This commitment was made through the Maintenance Technical Committee during the development of the manual in 1990. It was also recognized that coordination of this maintenance program with state transportation programs was critical. The level and consistency of the long range commitment has a direct impact on how effective the resulting maintenance system becomes. This commitment begins with a credible Operations and Maintenance Manual.

An essential building block for a successful flood control maintenance program in Clark County is a complete physical feature inventory of the system. It is also important to note that no maintenance program is ever truly "complete". Rather, these programs are constantly evolving as inventories are defined and standards/costs are further refined. A similar evolution is anticipated for this program. The flexibility to adjust to this evolutionary process has been built into this manual.

2.50 DEFINITIONS

In addition to the definitions of terms and phrases set forth in other District documents, the following apply to operation and maintenance:

Acceptance for Maintenance: "Acceptance for Maintenance" means that a project funded by the District, Entity, or other public/private funds is a part of the Master Plan and has been constructed in accordance with District standards and therefore eligible for maintenance funding by the District.

Annual Budget: "Annual Budget" means the anticipated costs associated with completion of each activity outlined within the annual work plan submitted by each of the Entities, and ultimately approved by the District Board of Directors prior to the start of each fiscal year.

Annual Work Plan: "Annual Work Plan" means a plan submitted by each of the Entities setting forth the type and quantity of maintenance to be performed during the ensuing budget year in a form prescribed by the District specifically requesting funds for budgeting purposes.

Certification: "Certification" means the documentation which evidences that required maintenance by an Entity has been completed in accordance with established standards.

Maintenance Program: The "Maintenance Program" has been established by the Board to provide funding of, and establish performance standards and guidelines for, the maintenance of flood control facilities located throughout Clark County and the incorporated areas. The Program provides funding to entities to perform maintenance of eligible flood control facilities. Projects eligible for District maintenance funding are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan Facilities or exist in the same alignment as a proposed Master Plan facility, and appurtenant facilities are eligible. Subsequently, the District works with the entities annually to develop Maintenance Work Plans. The work plans undertaken through the Maintenance Program and budgets are funded through the annual interlocal contracts between each Entity and the District. No matching funds are required, except in those cases where an arrangement has been made to cooperatively fund a particular field activity. Work is performed using a combination of private contractors and entity maintenance staff. The Maintenance Program contains three broad categories of work:

1. Routine and/or Preventive Maintenance: "Routine and/or Preventive Maintenance" means work on existing facilities to keep them in proper working condition, including but not limited to, debris/sedimentation removal, vegetative control, and reshaping.

2. Restoration: "Restoration" means the repair to existing facilities after a storm event including erosion repair, fence replacement, repairing/replacing trash racks, inlets, storm sewer systems, major debris removal and similar "one time" work activity.

3. Rehabilitation: "Rehabilitation" means rebuilding a facility and/or conveyance system after it is destroyed by an event or it has been determined that it is not operating according to the intent of the design documents on file at the District causing a safety or maintenance problem or it has deteriorated to the extent that it must be replaced "in kind" including replacing or modifying drop structures, reshaping channels, bank protection restoration, inlets etc. In general, the rehabilitative projects are designed by consultants and the construction contracts are awarded through a bid process.

Maintenance Program Exclusions: "Exclusions" typically include local drainageway maintenance such as curb and gutter work, inlet maintenance, and repairs to small piped storm sewer systems, unless otherwise constructed as part of a regional facility. Maintenance work exclusions also include repair or replacement of existing flood control Master Plan facilities which undergo catastrophic damage of more than one-half (½) mile. These types of catastrophic damages will generally be classified as capital improvements, and requests for capital improvement funds must be reprogrammed as a capital improvement project in accordance with District Policies and Procedures.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 3
POLICY STATEMENT

It is important that a maintenance policy statement be adopted which reflects the objectives of both the elected officials and the operations staff charged with its implementation. The initial policy document was prepared and reviewed by District staff and the Maintenance Committee. Following input from the group, it was reviewed by the respective Public Works Directors of all Entities and further revised to reflect their input. The document was then reviewed by the Technical Advisory Committee (TAC) and the Citizens Advisory Committee (CAC) before final adoption by the Board on November 8, 1990. The final adopted policy statement is as follows:

3.10 GOAL

Comply with the provisions of **NRS 543.340 (4)** and assure that facilities in the Master Plan are maintained in a manner that maximizes their useful life and ensures their operation at design capacity during a storm event.

3.20 POLICIES

1. Flood control facilities identified in the Master Plan are eligible for District maintenance funding.

2. As specified in the Uniform Regulations for the Control of Drainage **Section 12.050**, facilities funded through the District shall be inspected on an annual basis to assure proper maintenance has been provided.

3. In cases where funded maintenance by the lead Entity is not performed to the standards specified, the District shall perform or cause to be performed the maintenance necessary to assure proper operations of the facility. Costs incurred by the District shall be deducted from the amount authorized in the maintenance agreement between the lead Entity and the District.

4. Flood control facilities improved or constructed after adoption of this policy, must be designed in accordance with District criteria and standards to be eligible for maintenance funding.

5. Access to the facility must be guaranteed to the lead Entity and the District in order to be eligible for maintenance funding.

6. The maintenance requirements applied to these facilities shall be based on the standards contained in the District's Operations and Maintenance Manual.

7. The lead Entity must develop an annual work plan to be eligible for maintenance funds. Upon completion of the work, the Entity must certify that the work was completed in accordance with the standards contained in the District's Operations and Maintenance Manual.

8. Maintenance funding is available only for repair, restoration, rehabilitation, or maintenance of existing facilities and is not intended to supplement the District's capital improvement program. For example, if the intent of the field activity is to increase the designed capacity of a facility or conveyance, then that function is capital in nature.

9. Expenditures for repair and replacement of existing flood control Master Plan facilities which undergo catastrophic damage of one-half (½) mile or less will be classified as maintenance. These expenditures will be made from funds budgeted in the Facilities Maintenance Fund.

10. Expenditures for repair and replacement of existing flood control Master Plan facilities which undergo catastrophic damage of more than one-half (½) mile will generally be classified as capital improvements. Requests for capital improvement funds must be reprogrammed as a capital improvement project in accordance with District Policies and Procedures.

11. Expenditures for removal of debris and sediment captured or deposited in a debris basin, detention basin or a linear flood control facility will be classified as maintenance. Necessary repairs to a debris or detention basin will also be classified as maintenance. These expenditures will be made from funds budgeted in the Facilities Maintenance Fund.

12. Expenditures for repair and replacement of non-improved or "earth lined" flood control facilities and features will be classified as maintenance. These expenditures will be made from funds budgeted in the Facilities Maintenance Fund.

13. An entity may consider another option in lieu of repairing or rehabilitating facilities that have not been improved to Master Plan design specifications. This option is to build/implement the long-term solution for the damaged facility. Expediting the implementation of the Master Plan may be a viable alternative that maximizes the use of available resources. This should be considered as an alternative if the long-term solution

can be implemented in a timely manner. Requests for capital improvement funds to implement a Master Plan project must be reprogrammed as a capital improvement project in accordance with District Policies and Procedures.

14. All facilities eligible for maintenance funding must be publicly owned.

15. Funds may be provided by the District for maintenance of Master Plan facilities by outside contractors under conditions when the use of such an approach is deemed the most efficient and cost effective by the lead Entity.

16. Bridge structures, generally speaking, are not eligible for District funding unless it can be shown that the flood carrying aspects of the regional facility causes a safety or maintenance problem.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 4
PROCEDURES

4.10 FUNDING PROCEDURES

4.11 Purpose

This element of the Operations and Maintenance Manual provides the Entities with procedures for the appropriation, expenditure and reimbursement of funds to perform maintenance activities. A principle role of the District shall be to manage and disburse payments to the Entities for maintenance that is performed in compliance with the approved plans. A diagram of the funding flow is shown on **Figure 4-1**.

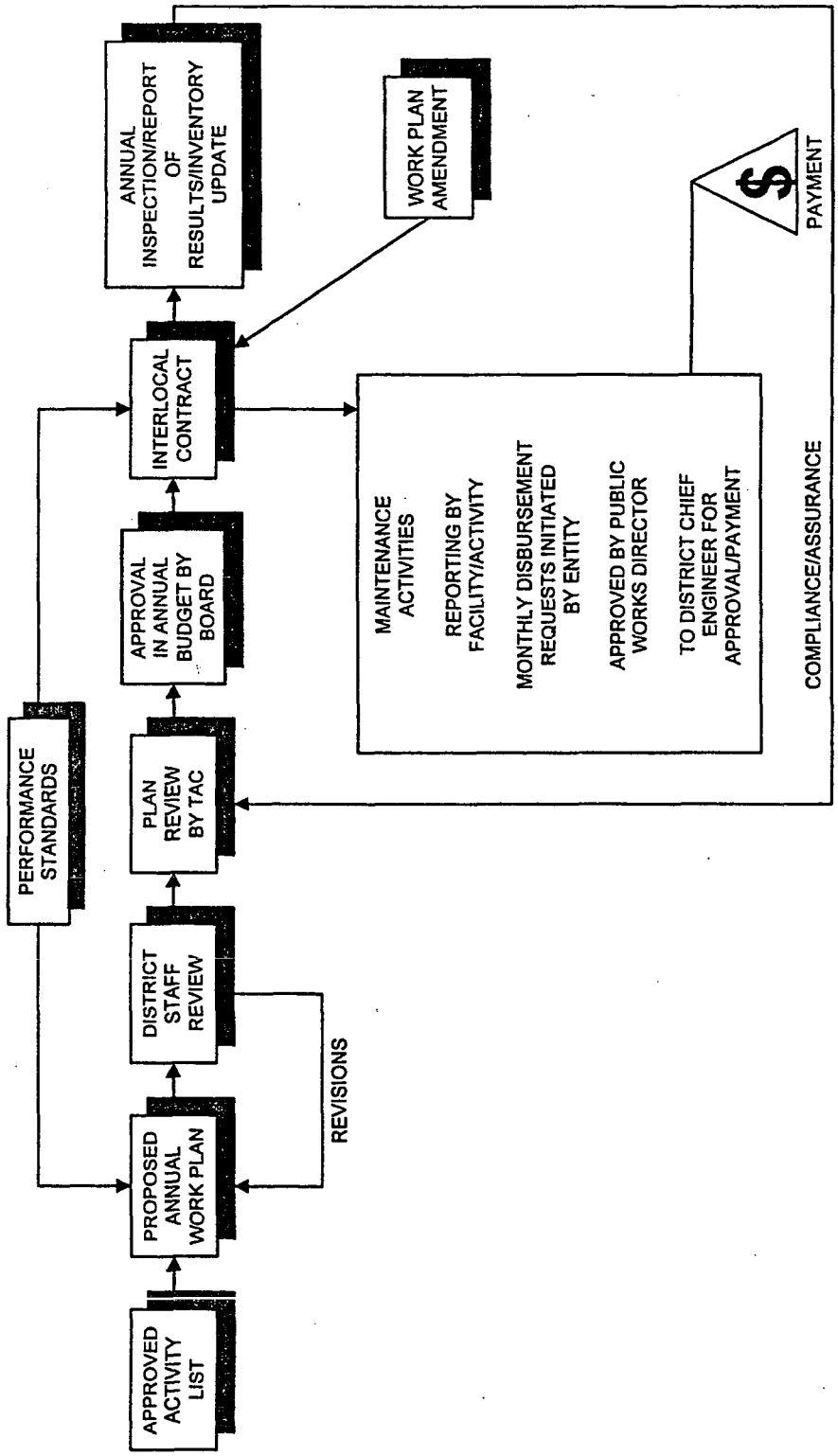
The District has authorized funding to assist the Entities with major drainageway maintenance in accordance with the priorities listed below:

- First priority: District owned facilities.
- Second priority: Facilities owned by other public agencies, but totally or partly financed by District funds. (Capital Improvement and Maintenance Project)
- Third priority: Facilities owned by others and constructed by others without District assistance.
- Fourth priority: Unimproved drainageways.

4.12 Payment Procedures

Payment for work performed will be made in accordance with the annual interlocal contract executed as part of the approved work plan and the payment procedures outlined herein. The primary mechanism for reimbursements shall occur through a purchase order established between the District and each Entity. In cases where the Entity directs the District to make payments to a contractor or supplier directly, the purchase orders will be established between the District and the contractor, consultant, or supplier, at the Entity's request. Unless otherwise contained within this manual, all District Policies and Procedures relating to disbursement of funds and reimbursement to Entities apply.

Figure 4-1 Funding Flow Diagram



Schedule

Disbursement requests (invoices) from each Entity may only be submitted for completed work activity and may not be submitted more than once in a 30-day period. Disbursement requests must be accompanied by a verification statement from the Entity that the work for which payment is due has been completed in accordance with the standards contained in this manual. The disbursement request must identify the Master Plan facility maintained, specific plan activity or activities for which reimbursement is sought, and separately identify personnel, equipment, and other related costs. (**Figure 4-2** represents a sample of the reporting required, and can be obtained on diskette from the District.) Administrative costs incurred by the Entity in the management of the interlocal contract are not reimbursable. Examples include cost accounting work, secretarial/clerical work, the preparation of requests for payment, and certification statements for work performed under the contract.

All invoices from the Entities requesting reimbursement to the Entity or direct payment to the Entity contractor or vendor must first be submitted to and approved by the Entity's Public Works Director or other designated responsible person in charge of the project. The Chief Engineer or designated District staff will process and approve such payments within 30 days providing the required approval has been obtained and terms of the interlocal contract have been satisfied.

Direct payments to contractors must originate from the Entity and include the following:

1. Invoice to the Entity from the contractor.
2. Certification of work performed by the contractor signed by the Entity, if applicable.
3. Disbursement Request Form (**Figure 4-2**).

Reporting

Monthly and annual summaries of purchase order balances, budget status, and facility expenditures shall be prepared by the District as a part of the routine financial reporting procedures to the Board.

REGIONAL FLOOD CONTROL DISTRICT

ENTITY: _____

MAINTENANCE WORK PROGRAM - FISCAL YEAR 20XX-XX

[ ] Disbursement Request	
Vendor Name:	
Invoice Number:	
Amount Requested:	
RFCD Purchase Order #:	

[ ] Amended Annual Budget Request	
Approved:	
General Manager/Chief Engineer	Date
Clark County Regional Flood Control District	

MWP Facility #:											
Facility Name:											
Master Plan Facility ID:											ACTIVITY TOTAL
05-Chnl Insp											0.00
10-Reshape Chnl											0.00
15-Chnl Repair											0.00
20-Erosion Control											0.00
25-Clean DB											0.00
30-Erosion Repair											0.00
35-Fence Repair											0.00
40-Vege Control - C											0.00
45-Vege Control - M											0.00
50-Access Rd											0.00
55-Clean In/Outlet											0.00
60-Repair In/Out											0.00
65-Clean Storm Drn											0.00
70-Sewer Repair											0.00
75-Clean Culverts											0.00
80-Misc Maint											0.00
85-Engr											0.00
Facility Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

I certify that the above described maintenance was/will be performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. Further, the information contained in this Request accurately reflects those costs incurred/to be incurred during the performance of this work.

_____

Project Manager Date

Figure 4-2 Disbursement / Amended Budget Request

4.20 ADMINISTRATIVE PROCEDURES

4.21 Purpose

The purpose of this element of the Operations and Maintenance Manual is to provide specific procedures for establishing standards and levels of service, preparing the annual work plan, administrating the planning, approval and enforcement elements, and updating the manual over time. The principal role of the District shall be to review and approve annual maintenance work plans and monitor the performance of work activities. The principal role of the Entities shall be development of annual work plans that are consistent with the District's approved maintenance activity list; performance of the maintenance work set forth in the approved work plans; and the submittal of quarterly reports that summarize work performance while certifying compliance with maintenance activity performance standards as set forth in the Operations and Maintenance Manual.

4.22 Annual Work Plans

In accordance with the schedule on the following page, each Entity shall submit a proposed annual maintenance work plan containing the following components:

Section 1:	Program Summary by Maintenance Project Including Cost for Each Project
Section 2:	Summary by Maintenance Activity
Section 3:	Individual Maintenance Projects Showing Narrative, Location Map, Work Activities, Results, Costs

District staff shall review the proposed plans and work with the Entities to resolve any discrepancies found with District maintenance standards and policy objectives. After the initial staff review, the plans shall be forwarded to the Technical Advisory Committee. Lastly, the plans will be incorporated in the annual District budget and submitted to the Board for final approval.

The activities in the work plan shall be consistent with the District's approved activity list for maintenance of flood control and drainage facilities. Work plans should also describe locally funded work activities that may be linked to the District maintenance work activities to show overlapping areas of responsibility for personnel and equipment. Where local personnel and equipment are going to be used to perform both District funded activities and locally funded activities, the Entity will describe how these resources are to be managed and the procedures for tracking costs related to both sets of activities.

Entities may contract for the performance of maintenance work activities. The proposed work plan must specify that a contractor is to be utilized and the time frame for selection of a contractor. In the event that maintenance work is performed under contract, the contract must specify that the District has the authority to inspect all work performed under the contract and approve or deny payments to contractors based on inspection findings.

All work performed must comply with District approved maintenance activity performance standards as set forth in subsequent sections of this Manual. The Entity is required to inspect Master Plan facilities annually, including any maintenance work performed by Entities on Master Plan Facilities, and shall notify the District prior to the annual inspection of completed maintenance work. Entities shall facilitate the inspection of maintenance work by the District. The District may withhold funding, require additional maintenance work, or seek repayment of disbursed funds when an inspection reveals that work activities were not performed in conformance with activity performance standards.

Schedule

February 1	-	Submittal of preliminary work plan proposal and tentative budget to District staff for review, recommendations, and coordination with entities. This is important for the following reasons: 1) Fiscal Year Budget Authority submittal and approval. 2) Prioritization of maintenance funding activities.
April 1	-	Submittal of tentative annual work plans, budgets, and interlocal contracts to District staff for review, recommendations, and coordination with entities.
May (TAC deadline)	-	Submittal of the Entities' final annual work plans, budgets, and interlocal contracts to the TAC and CAC for approval.
June	-	After receiving approval from the TAC and CAC, entities' final annual work plans, budgets, and interlocal contracts are submitted to the Board for approval.
July 1	-	Beginning of maintenance plan contract period, which ends June 30.

Reporting

Each Entity will submit quarterly reports indicating the status of the work completed under the current fiscal year's program (**Figure 4-3**). The reports are due 30 days after the close of the quarter, and will be submitted to the Board for review. Also, each Entity shall submit an annual certification to the District stating that all work contained in the work plan and reimbursed through the interlocal contract has been performed to the specifications established in this manual.

Figure 4-3 Quarterly Status Report

REGIONAL FLOOD CONTROL DISTRICT
MAINTENANCE WORK PROGRAM
QUARTERLY STATUS REPORT - FY 20XX-XX

MWP Facility #: _____ Entity: _____
Facility Name: _____ Date Prepared: _____
MP Facility ID: _____ Quarter: _____

Force Account/ Contract	Activity	Approved Work Plan Amount ($)	Amended Work Plan Amount ($)	Expended To Date ($)	Percent Complete	Scheduled Completion Date
	5 Inspect Channels					
	10 Clean and Reshape Channels					
	15 Repair Lined Channel					
	20 Provide/Maintain Erosion Control					
	25 Clean & Inspect Detention Debris Basins					
	30 Erosion Repair					
	35 Fence Repair					
	40 Vegetation Control - Chemical					
	45 Vegetation Control - Mechanical					
	50 Maintain Access Road					
	55 Clean & Inspect Inlet/Outlet Structures					
	60 Repair Inlet/Outlet Structures					
	65 Clean Storm Sewer Lines					
	70 Storm Sewer Repair					
	75 Clean/Flush Culverts & Bridges					
	80 Miscellaneous Work Activities					
	85 Engineering					
	TOTALS	$0.00	$0.00	$0.00	0%	

Delays or problem areas:

Work completed during current quarter:

Work to be completed during next quarter:

Consultant/ Contractor: _____
Project Manager: _____ Phone Number: _____

4.23 Approval of Annual Work Plan

The work plans received by the District will be reviewed and budget requests compiled into a summary showing the dollar amount by Entity for each of the priority areas set forth in **Section 4.11.** The Chief Engineer shall review the total maintenance budget requests against the District's proposed annual total budget for facility maintenance and make a recommendation to the District Board as to the amount of maintenance funds to be disbursed to each respective Entity based upon equity and need.

Once the Technical Advisory Committee has reviewed the maintenance work plans and budget appropriation recommendation, the Chief Engineer will forward the compiled summary to the Board for consideration and approval as a key element of the Annual District Budget.

Schedule

The Entities will submit the proposed work plan to the Chief Engineer as outlined in **Section 4.22**.

Reporting

The Chief Engineer's report to the District Board shall show both the budget requested by the Entity and the recommended amount to be appropriated, the report will also make comments on any adjustments made to the initial request.

4.24 Work Plan and Budget Amendments

Requests for amendments to approved work plans and budgets must be submitted to the Chief Engineer in writing. The amendment request must specify the work elements affected, describe the reasons for the amendment request, and describe the impact of the proposed amendment on the affected work plan objectives.

Formal approval of work plan and/or budget amendments requiring a reallocation of funds between facilities must be obtained from the Chief Engineer prior to submittal of payment requests. (See **Figure 4-2.**) The Entity shall also notify District staff of work plan and/or budget amendments within a facility. Requests requiring an increase in the overall work plan budget must be submitted to the Board for approval with a supplemental interlocal contract for the amended work in accordance with **Section 4.6** of the District Policies and Procedures Manual.

Schedule

Amendment requests shall be reviewed by District staff and responded to in writing within 15 days of receipt of the original request. Work plan amendments which require an increase in the Entity's annual budget will require submittal of an agenda item and supplemental interlocal contract for approval by the District Board of Directors.

Reporting

Annual certification of results will include addressing all amendments made to the annual work plan.

4.25 Certification of Compliance

It is the intent of the District to rely to the maximum extent possible on the Entities to carry out the maintenance activities and comply "voluntarily" with the procedures and standards set forth in this manual. The District shall from time to time inspect facilities funded by the District or those on the Master Plan to assure compliance with the interlocal contract. Each Entity shall submit an annual certification to the District stating that all work contained in the work plan and reimbursed through the interlocal contract has been performed to the specifications established in this manual. This certification shall be signed by the person executing the interlocal contract or designee. The certification should summarize proposed and actual plan accomplishments. It should also describe any major maintenance problems that have implications for the District as a whole, such as significant deterioration of major conveyance system components or the failure of system components to perform as intended, and suggest revisions to the activity list provisions.

Schedule

The certification and final payment requests shall be submitted to the District within 30 calendar days of the termination of the annual interlocal contract for maintenance funding.

Reporting

The certification shall be attested to on the Final Accounting Report (**Figure 4-4**), and an attachment may be used to describe additional pertinent information.

Figure 4-4 Final Accounting Report

(ENTITY)
MAINTENANCE WORK PROGRAM
FINAL ACCOUNTING REPORT - FY 20XX-XX
As of (Current Date)

VENDOR	P.O. NUMBER	P.O. AMOUNT	TOTAL EXPENDED	P.O. BALANCE
Sample Vendor 1	123456 01	1,000.00	1,000.00	0.00
Sample Vendor 2	123456 02	1,000.00	500.00	500.00
Sample Vendor 3	123456 03	1,000.00	200.00	800.00
	Total	$3,000	$1,700	$1,300

FY XX-XX INTERLOCAL AMOUNT/BUDGET	4,000.00	Total Encumbered	3,000.00
Total Encumbered	3,000.00	Total Expended	1,700.00
Total Unencumbered	$1,000.00	Total Unexpended	$1,300.00

Total Authorized	**$4,000.00**
Expended	**$1,700.00**
RETURN TO FUND 286	**$2,300.00**

Regional Flood Control District **(Entity)**

RFCD Date Project Manager Date

I certify that the above described maintenance was performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. Further, the information contained in this Final Accounting Report accurately reflects those costs incurred during the performance of this work. If there are any maintenance problems that have implications for the District as a whole, such as significant deterioration of major conveyence system components or failure of system components to perform as intended, a detailed description will accompany this report as an attachment.

4.26 Interlocal Contract Document

The performance of work outlined in the approved maintenance plan shall be guided by an interlocal contract entered into annually between the District and each Entity. Sample contracts are contained in **Appendices B and C**. Major provisions of the contract include: the adoption of the Board approved work plan as the document outlining the work to be performed; references to the performance standards, reimbursement and payment procedures, and plan amendment procedures outlined in this manual for governing maintenance work performance evaluations, and contract amendments; and a requirement for submittal of an annual certification of results.

Schedule

All Entities will enter into an "annual" interlocal contract in conjunction with adoption of the District and respective Entity budgets.

Reporting

Reporting requirements will be as prescribed in the respective interlocal contracts.

4.27 Contract for Maintenance Performance

If, in the opinion of the Entity, it appears to be most cost effective (or due to an emergency) to utilize the services of private contractors to perform maintenance functions, the Entity shall solicit bids from qualified contractors in compliance with their statutory procedures for the necessary work. The Entity will provide the District with copies of bid specifications and bid tabulations as well as copies of the respective contract documents. All expenditures must comply with **NRS 332**, Local Government Purchasing Act, **NRS 338,** the Public Works Act, and all relevant statutes, rules, regulations, and policies.

Schedule

All contracts for maintenance services shall be bid on an annual basis or for a specific project location.

Reporting

The Entity shall advise the District in advance that they intend to utilize a private contractor (may be included as part of annual work plan). They shall also provide a summary of work performed and a statement of inspection as part of the request for reimbursement to the Entity or directly by the District to the contractor.

4.30 MAINTENANCE PROCEDURES

4.31 Purpose

As a part of the overall operations and maintenance procedures adopted by the District, an outline for specific maintenance procedures has been developed. The accepted maintenance procedures are centered around specific elements of a management system for field maintenance, and include defined maintenance activities, standards, scheduling, and reporting procedures.

Due to the diversity in physical features among the various agencies involved, and the varied resources employed in maintenance activities, it is essential to treat these procedures as general guidelines which must be tailored to meet the situation at hand. It is also essential that these procedures remain dynamic, be actively reviewed, and periodically updated. An annual review is recommended.

4.32 Activities

Maintenance work activities identify all major maintenance work and include all activities which are performed frequently and in amounts that make them a significant part of the total work program. Each activity must be clearly defined so maintenance personnel at all levels of management uniformly understand the operation to be performed and the type of deficiency to be corrected.

Personnel who plan, schedule, perform, report, or evaluate maintenance work must know what each work activity means. Work activities are used for the following purposes:

- Planned maintenance work is identified in the annual maintenance work plan by activity name and number.
- Activity names and numbers are used for authorizing, assigning, and reporting work.
- Activity names and numbers are used on work scheduling guides and work performance summaries.

Work measurement units are established for the major maintenance activities. For example, "Acres Covered" is the work measurement unit for vegetation control while "Cubic Yards Removed" is the work unit for cleaning and reshaping channels. These measurement units are used to describe how much work is planned and to report how much work is accomplished for each activity.

For some activities, specific work measurement units--other than labor hours--would not be meaningful. For example, the miscellaneous maintenance activity includes a number of different operations. This activity cannot be measured by a common unit other than labor hours.

Following is the accepted maintenance Activity List for the District including work measure units.

ACTIVITY NUMBER	ACTIVITY NAME	WORK MEASURE UNIT
05	Inspect Channels	Miles
10	Clean and Reshape Channels	Cubic Yards
15	Repair Lined Channel	Each
20	Provide/Maintain Erosion Control	Square Feet
25	Clean and Inspect Detention/Debris Basins	Cubic Yards
30	Erosion Repair	Cubic Yards
35	Fence Repair	Linear Feet
40	Vegetation Control - Chemical	Acres
45	Vegetation Control - Mechanical	Acres
50	Maintain Access Road	Miles
55	Clean and Inspect Inlet/Outlet Structures	Each
60	Repair Inlet/Outlet Structures	Each
65	Clean Storm Sewer Lines	Linear Feet
70	Storm Sewer Repair	Repairs
75	Clean/Flush Culverts & Bridges	Each
80	Miscellaneous Work Activities	Labor Hours
85	Engineering	Labor Hours

4.33 Standards

"Performance Standards" have been established for each of the major maintenance work activities. These performance standards specify:

- The most effective crew size.
- The kinds and number of equipment required.
- The major types of material that should be used.
- Recommended procedures for performing the work.
- An estimate of expected average daily accomplishment with standard crew size, equipment and procedures.
- Authorization and scheduling criteria.

Following is an item-by-item description of the format of the performance standards.

1. Activity Identification/Date. The activity number and name are shown as well as the "effective date" of the performance standard--to be used when updating or replacing performance standards.

2. Description and Purpose. The Description and Purpose section of the performance standards explains the work activity and the kinds of defects to be corrected or reasons for doing the work.

3. Authorized By and Work Control Category. The level of management responsible for authorizing the work is identified. Certain activities requiring special equipment, coordination, or expertise are Engineer-authorized activities and should not be scheduled or performed without the Engineer's approval. The type of control to be placed on the quantity of work performed is identified. This control is unlimited or limited in terms of the amount of work done (accomplishment) or the amount of labor input (crew-day).

4. Performance Criteria. This section includes important information for the "scheduler" about when to schedule the work and for the crew leader to identify the work to be done.

5. Crew Size. The crew size outlines the numbers of personnel needed to do the work. The crew size is based on average conditions. Sometimes, there will be a need to add or delete people to satisfy special traffic safety conditions or hauling requirements.

6. Equipment. The basic requirements for major pieces of equipment are listed. Situations such as the breakdown or unavailability of equipment or special materials hauling requirements may require the addition, deletion or substitution of equipment.

7. Materials. The materials section includes a list of the major materials to be used for the activity.

8. Work Method. The work method outlines, step-by-step, the recommended procedures for performing the work. Each step should be performed in order to correctly maintain the feature as well as provide the quality of work desired.

9. Average Daily Production. The average daily production is an estimate of the amount of work a crew can accomplish during a day using the recommended crew size, equipment, materials and work method. This estimate is shown as a range and should be attainable over a period of time. Some days the accomplishment may be more or less than the estimate, but eventually, the average should fall in line.

10. Notes. Any other relevant, helpful information or instructions.

Use of Performance Standards

Maintenance supervisory personnel should become thoroughly familiar with these performance standards. It is important that the performance standards be used when making assignments and performing work. Some situations will require deviation from the performance standards--such as more or less flagmen or additional haul trucks. These situations are recognized, and crew leaders are expected to consider such situations when organizing and managing their activities.

Haul truck needs should be determined using factors such as haul distance and time estimates (spot, dump, load, and cycle times.)

The performance standards also provide guidance and a measure for supervisors to use when evaluating work in progress and completed.

Field personnel are in the best position to identify new or better work methods or difficulties with the current performance standards. These suggestions for improvements or questions should be directed to the crew leader or supervisor.

The performance standards should be reviewed and updated annually. If other changes occur that require more frequent review and update or development, the performance standards can be changed to suit these needs.

4.34 Scheduling

The objectives of work scheduling are:

- To do the planned amount of work.
- To perform the work when it should be done.
- To do the work where it should be done.
- To use the proper people, equipment and supplies to do the work.
- To ensure to the extent possible that all flood control facilities are functioning at design capacity during a storm event, noting that Flash Flood Season is July through September.

Three tools are available to help supervisors meet these objectives. The WORK PROGRAM defines the estimated amount of work and the estimated labor-days required for each activity to provide the desired levels of service; a WORK CALENDAR helps to establish when the various activities should be done; and the PERFORMANCE STANDARDS provide information about quantity standards, personnel requirements and how much work can be done in a given time.

The annual work program establishes the kinds and amount of work to be done during the year and the resources that will be required to do that work. This annual plan needs to be broken into a monthly plan for effective scheduling of work and to permit timely evaluations of work program performance.

The process of "distributing" the annual work load throughout the year is done by allocating a part of the work (in labor-hours, by activity) to specific months. Some types of work -- emergency or service activities -- must be done throughout the year as the need arises. Other types of work must be done on a regularly scheduled basis -- such as preventive maintenance work. Finally, some types of work can be done during certain periods but can be shifted from one month to the other, and still other work can be done almost any time during the year.

These factors must be considered when distributing the different types of work. Preventive maintenance and other types of work which must be performed on a regularly scheduled basis are distributed so as to level labor power needs as much as possible. Finally, work which can be performed any time is distributed to those months with the fewest labor-days. In this way, staffing needs are kept as uniform as possible resulting in more efficient use of available labor power.

A work calendar lists -- activity by activity -- the labor-hours for each month. These labor-hours are used in conjunction with the work program annual work quantities for work scheduling and

the preparation of periodic Activity Status Reports. A sample work calendar is included in **Figure 4-5**.

Once the work program and staffing levels have been set, the work load distribution can be finalized and the calendar prepared to summarize/communicate the planned monthly distribution of the work program.

Work scheduling is the process of using the Work Calendar and specific scheduling procedures to plan ahead, establish work priorities and accomplish the work.

The performance standards outlined in the previous sections apply to corrective and preventive maintenance activities. These procedures are not as rigid or foolproof as implied by the description. Equipment breakdowns, emergencies, or bad weather will disrupt a schedule -- but part of the scheduling process is to be aware that these situations will occur and to be prepared to respond with little or no difficulty. Because of these situations, supervisors should not expect to accomplish all of the work as scheduled. Generally, a supervisor can consider his scheduling efforts to be successful if 75 to 80 percent of the scheduled work is completed as planned.

REGIONAL FLOOD CONTROL DISTRICT
MAINTENANCE WORK PROGRAM
WORK CALENDAR

MWP Facility #: _____ Entity: _____

Facility Name: _____ Fiscal Year: _____

MP Facility ID: _____ Date Prepared: _____

ACTIVITY No.	Description	Monthly Distribution of Time (in hours) JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total Per Activity
5	Inspect Channels													-
10	Clean and Reshape Channels													-
15	Repair Lined Channel													-
20	Provide/Maintain Erosion Control													-
25	Clean & Inspect Detention/Debris Basins													-
30	Erosion Repair													-
35	Fence Repair													-
40	Vegetation Control - Chemical													-
45	Vegetation Control - Mechanical													-
50	Maintain Access Road													-
55	Clean & Inspect Inlet/Outlet Structures													-
60	Repair Inlet/Outlet Structures													-
65	Clean Storm Sewer Lines													-
70	Storm Sewer Repair													-
75	Clean/Flush Culverts & Bridges													-
80	Miscellaneous Work Activities													-
85	Engineering													-
	Total Per Month	-	-	-	-	-	-	-	-	-	-	-	-	-

I certify that the above described maintenance will be performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. Further the information contained in this Work Calendar accurately reflects the time expected to be incurred during the performance of this work.

_____
Project Manager Date

Figure 4-5 Work Calendar

Following are some additional hints or techniques to consider:

- It is not necessary to "formally schedule" the daily, routine activities. It is necessary, however, to regularly check the work reports and accomplishments to verify the distribution of work assignments. A periodic review and adjustment of the work assignments may be necessary to maintain a "balanced work load."

- It is usually best to prepare a schedule (and work assignments) assuming everything will work as planned -- no equipment breakdowns, no emergencies, etc. But make sure a backlog of "alternate" work is available so that little time is wasted when adjustments to the schedule must be made.

- Some guidelines for identifying alternate work:

  - Low priority work that needs to be done, but not necessarily during the next week or so.

  - Work that does not require special equipment or a lot of preparation time.

  - Preventive maintenance on light equipment.

- Take time to estimate the amount of work needed and the number of hours required to do the work. Good estimates will improve the scheduling process significantly. The performance standards, inspections and sound judgment based on experience all help the estimating process.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
05	INSPECT CHANNELS	12/99

DESCRIPTION & PURPOSE

Inspect both improved and unimproved flood channels for proper cross-section, sedimentation, debris and erosion damage, in order to schedule cleaning or repairs as needed.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Perform complete inspection of channels on an annual basis and after major storm events.

CREW SIZE

- 1 Crew Supervisor
-
-
- 1 **TOTAL**

EQUIPMENT

- 1 Pickup
-
-
-

WORK METHOD

1. Use safety devices, as required.
2. Visually inspect channels for cross-section, sediment, debris, erosion, and vegetation.
3. Prioritize a list of channels requiring maintenance.
4. Schedule cleaning of channels referring to prioritized list.

MATERIAL

-
-
-
-

AVERAGE DAILY PRODUCTION

8 miles/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
10	CLEAN & RESHAPE CHANNELS	12/99

DESCRIPTION & PURPOSE

Mechanical silt, vegetation, and debris removal, and reshaping of unlined channels to restore adequate flow.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Improved earth channels should be scheduled for cleaning and reprofiling on an annual schedule, or as appropriate following a flood event. Natural channels on a 3-year cycle.

CREW SIZE

- 2 Equipment Operators
- 1 Truck Driver
- .5 Foreman
- 3.5 **TOTAL**

EQUIPMENT

- 1* 10-wheel Dump Truck
- 1 Scraper
- 1 Gradall

WORK METHOD

1. Set up safety devices as required.
2. Remove silt and vegetation.
3. Load and haul removed material to proper disposal site.
4. Reshape channel.
5. Clean up work site.
6. Remove safety devices.

MATERIAL

- Disposal Fees

AVERAGE DAILY PRODUCTION

300 Cubic Yards/day

NOTES:

*Schedule sufficient trucks to insure maximum utilization of excavation equipment.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
15	REPAIR LINED CHANNELS	12/99

DESCRIPTION & PURPOSE

Repair of damaged concrete, rip rap, gabion, or other channel linings, retaining walls, etc., to restore to original condition and prevent further deterioration.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Repairs of channel linings, retaining walls, and other structures critical to the protection of a facility are to be scheduled immediately upon detection of damage.

CREW SIZE

- 1 Maintenance Foreman
- 2 Maintenance Workers
-
- 3 TOTAL

EQUIPMENT

- Pickup
- Flatbed Dump
- Concrete Mixer
-

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Clean and prepare damaged area.
4. Build and place forms as necessary.
5. Place and finish concrete.
6. Remove forms and back fill.

MATERIAL

- Assorted lumber
- 6-30 bags sacked concrete
- 3-15 tons concrete gravel mix
- 2-10 CY ready-mix concrete

AVERAGE DAILY PRODUCTION

1Each/Day

NOTES:

Crew size and equipment may vary significantly depending on urgency, extent and complexity of repair.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
20	PROVIDE / MAINTAIN EROSION CONTROL	12/99

DESCRIPTION & PURPOSE

Placement of rip rap, sand bags, or other erosion control materials and repair of damaged areas of erosion protection to restore material to original condition. This work is done to prevent further deterioration and eliminate potential erosion problems.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Work is to be scheduled when damage or deterioration is severe enough to present potential erosion problems. Erosion undercutting roadways, sidewalks, or prepared embankments/improvements shall be repaired immediately. Repair of undermined stabilizers shall be scheduled immediately.

CREW SIZE

- 1 Foreman
- 2 Equipment Operators
- 2 Maintenance Workers
-
- 5 **TOTAL**

EQUIPMENT

- 1 Truck Crane
- -or- Backhoe
- 1 Dump Truck
- 1 Pickup

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Shape work area to receive riprap, or other erosion control materials.
4. Place material and grout where applicable.
5. Back fill as necessary.

MATERIAL

- 20-50 Tons Rock for riprap (delivered)
- 5-12 yards ready mix concrete (if needed)
- 5,000-15,000 gal Water

AVERAGE DAILY PRODUCTION

1300 Square Feet/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
25	CLEAN & INSPECT DETENTION/DEBRIS BASINS	12/99

DESCRIPTION & PURPOSE

Inspection and removal, by loader (including hauling and disposal), of sediment and debris deposited in detention and debris basins to restore full capacity and original shape.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Remove sediment bi-annually or when debris basins or dams detention capacity is significantly reduced. Clean out is normally justified when the sedimentation reaches 1 to 2 feet in depth or as established by the design.

CREW SIZE

- 1 Foreman
- 3 Equipment Operators
- 1 Maintenance Worker
- 5 **TOTAL**

EQUIPMENT

- 1 Pickup
- 1 Loader
- 2* Dump Trucks

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Prepare removal and disposal sites for access.
4. Stockpile material for removal.
5. Load material and haul to designated disposal site.
6. Shape dam or basin to desired line and grade.
7. Grade disposal site as necessary.

MATERIAL

- Disposal Fees

AVERAGE DAILY PRODUCTION

1000 Cubic Yards/day

NOTES:

*Schedule sufficient trucks to insure maximum utilization of excavation equipment.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
30	EROSION REPAIR	12/99

DESCRIPTION & PURPOSE

The replacement and compaction of material removed by erosion, using hand tools or other methods, to restore Flood Control channels, supporting embankments, levees or access roads.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

As needed when damage has occurred which has affected or will affect the structural integrity of a channel embankment, levee, or access road,at a location where mechanical methods cannot be used.

CREW SIZE

- 1 Foreman
- 2 Maintenance Workers
-
-
- 3 **TOTAL**

EQUIPMENT

- 1 1-Ton Dump -or- Flatbed
- 1 Air Compressor w/compactor
- 1 Pickup w/Water Tank
- -or- Auxiliary Spray Truck

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Remove debris and growth from damage location.
4. Haul fill material from pre-determined source.
5. Place and compact fill material in lifts.
6. Shape repair area to conform to adjacent areas.
7. Clean up work area as necessary.

MATERIAL

- 15-30 Tons Select Fill Material
-
-
-

AVERAGE DAILY PRODUCTION

15 Cubic Yards

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
35	FENCE REPAIR	12/99

DESCRIPTION & PURPOSE

The repair and/or re-establishment of downed or damaged fences to restore fence to proper condition and to provide right-of-way control.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Repair of downed or open fence areas to be performed upon detection. Repairs to damaged locations that remain partially functional are to be scheduled in priority with other work.

CREW SIZE

- 2 Maintenance Workers
- 2 **TOTAL**

EQUIPMENT

- 1 Fence Truck
- 1 Concrete Mixer (if needed)

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Perform necessary repairs to:
   - Posts
   - Fabric
   - Top rail

MATERIAL

- 40-50 Linear Ft Fence Fabric
- Miscellaneous Hardware
- 5 bags "Readycrete"

AVERAGE DAILY PRODUCTION

100 Linear Feet/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
40	VEGETATION CONTROL - CHEMICAL	12/99

DESCRIPTION & PURPOSE

The application of herbicides, to designated areas, with a boom-mounted spray bar to prevent new growth and/or control existing vegetation, for the purpose of insuring the capacity and integrity of Flood Control facilities.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Spray pre-emergence herbicide and post-emergence herbicide annually to designated areas combining applications where possible.

CREW SIZE

- 2 Maintenance Workers
-
-
- 2 **TOTAL**

EQUIPMENT

- 1 Truck-mounted chemical tank with spray bar and hand sprayer
-
-

WORK METHOD

1. Set up safety devices as required.
2. Treat channel areas as required.
3. Remove safety devices.

MATERIAL

- Pre 12.5-25 lb/Ac
- Emerg Contact: 12.5-25 lb/Ac
- Post Brush: 120 lb/Ac
- Emerg Grass: 30 lb/Ac
- Waterweed: 1 gal/Ac
- Spreader: 1 gal/Ac
- Water 200 gal/Ac

AVERAGE DAILY PRODUCTION

Acres

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
45	VEGETATION CONTROL - MECHANICAL	12/99

DESCRIPTION & PURPOSE

The mechanical removal of brush and weeds to maintain detention, debris basins, and channels free of vegetation.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Work to be scheduled when weeds and willows grow up at unsprayable locations, or when growth is too high for effective spraying.

CREW SIZE

- 1 Equipment Operator
-
-
- 1 TOTAL

EQUIPMENT

- 1 Mower or Grader
- 1 Tilt Trailer (if needed)
- 1 Pickup
-

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Mow, blade down, or turn under unwanted vegetation.

MATERIAL

-
-
-
-

AVERAGE DAILY PRODUCTION

4 Acres/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
50	MAINTAIN ACCESS ROADS	12/99

DESCRIPTION & PURPOSE

Mechanical grading of access roads to remove minor ruts and erosion,and restore normal shape and cross slope, for access to Flood Control facilities.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

As needed prior to rainy season, or when the weather affects the road condition. Plan to re-profile access roads on a bi-annual (two year) frequency.

CREW SIZE

- 2 Equipment Operators
- 1 Maintenance Workers.
-
- 3 **TOTAL**

EQUIPMENT

- 1 Grader
- 0-1 Water Truck
- 0-1 Roller
- 1 Pickup

WORK METHOD

1. Obtain from storekeeper equipment and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Grade access roads:
   - Restoring X-section shape
   - Filling potholes
   - Grading out ruts
   - Restoring ditches and drainage.
4. Roll and compact regraded.

MATERIAL

- 10,000 Gal Water (if needed)
-
-
-

AVERAGE DAILY PRODUCTION

.5 Mile/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
55	CLEAN & INSPECT INLET/OUTLET STRUCTURES	12/99

DESCRIPTION & PURPOSE

Cleaning and inspection of catch basins, inlets, sumps, grates, outflow and other structures to remove silt and debris and to inspect for structural integrity and proper functioning.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan for structures to be inspected and cleaned a minimum of once per year. Annual cleaning shall be the major effort to allow thorough inspection of structure in order to schedule repairs.

CREW SIZE

- .25 Foreman
- 2 Maintenance Workers
- 2.25 **TOTAL**

EQUIPMENT

- 1 1-Ton Truck
- 1 Water Tanker (1500 gal)
- -or- High Pressure Vacuum (Vactor)
- Appropriate Hand Tools

WORK METHOD

1. Perform daily vehicle P.M. check and check equipment.
2. Place signs/traffic control devices as required.
3. Locate truck in the best working position and as far off roadway as practical.
4. Remove grate. Then remove debris, trash & sediment from grate.
5. Loosen solids with spade if necessary.
6. Flush/vacuum basin.
7. Inspect structure visually to determine if further cleaning or repair is necessary.
8. Dispose of debris at designated dump site.
9. Check and clean equipment after use.

MATERIAL

- Water

AVERAGE DAILY PRODUCTION

15 Each/day

NOTES:

Structures that cannot be cleaned shall be reported to the Maintenance Supervisor for initiation of corrective action.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
60	REPAIR INLET / OUTLET STRUCTURES	12/99

DESCRIPTION & PURPOSE

Repair of catch basins, grates, inlets, control gates, outfalls, weirs, manholes, sumps, and other spot structures to restore elements to their original operational condition.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Based on detailed inspection of repair, replace components, or entire structure as conditions warrant. Plan repair of five percent (5%) of system structures per year.

CREW SIZE

- 1 Foreman
- 2 Maintenance Workers
- 3 TOTAL

EQUIPMENT

- 1 Pickup
- 1 Compressor w/accessories

WORK METHOD

1. Obtain necessary safety equipment, tools, and materials.
2. Initiate applicable safety procedures and traffic control.
3. Remove and clean area of damage/failure.
4. Repair as necessary to original condition and test operation as appropriate.

MATERIAL

- Concrete
- Aggregates
- Miscellaneous parts, as required

AVERAGE DAILY PRODUCTION

1 Each/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
65	CLEAN STORM SEWER LINES	12/99

DESCRIPTION & PURPOSE

The removal of debris of any type from within conduits by: flushing with water; the use of a sewer cleaning machine; or by physically entering the conduit and manually removing debris, to restore full capacity.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan cleaning of storm sewer lines on an average 5-year cycle. Specific areas may require annual cleaning while others will require less than 5-year cleaning.

CREW SIZE

- 1 Maintenance Foreman
- 2 Maintenance Workers
- 3 **TOTAL**

EQUIPMENT

- 1 Sewer Cleaner

WORK METHOD

1. Obtain from storekeeper safety equipment and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Remove debris from conduit.
4. Load debris and haul to designated disposal site if necessary.
5. Clean up work area as necessary.

MATERIAL

- 0-5,000 Gallons Water

AVERAGE DAILY PRODUCTION

1500 linear feet/day

NOTES:

Work should be scheduled whenever possible, in conjunction with annual cleaning of adjacent structures.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
70	STORM SEWER LINE REPAIR	12/99

DESCRIPTION & PURPOSE

Excavation and repair of storm sewer lines to eliminate blockages and repair failed pipes.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Priority of repairs:
1. eliminate blockages and hazards to public safety;
2. remove flow restrictions and repair damaged/failed pipe sections.

CREW SIZE

- 1 Foreman
- 1 Equipment Operator
- 2 Maintenance Workers
-
- 4 **TOTAL**

EQUIPMENT

- 1 Dump Truck
- 1 Backhoe/Util Tractor
- 1 Air Compressor w/accessories
- Appropriate Hand Tools

WORK METHOD

1. Set up warning signs and traffic control devices.
2. Take necessary measures to control flow -- providing uninterrupted service whenever possible.
3. Cut pavement and/or excavate to the extent required to determine necessary scope of repairs.
4. Remove flow restrictions, as necessary.
5. Back fill and compact in lifts to within 10 inches of surface.
6. Place select material (rock or shell) and compact to within 2 inches of surface* (See Note below.)
7. Coordinate density test and request repaving as required.
8. Clean work area. Remove signs and warning devices.
9. Record work accomplishment.

MATERIAL

- Pipe/fittings
- Sand
- Cement
- Rock
- Asphalt, as required

AVERAGE DAILY PRODUCTION

1 Repair/day

NOTES:

Verify location of other utilities prior to excavation.

* Back fill specifications apply to paved areas. In easements and other unpaved areas, back fill and compact in 2-foot lifts to grade; re-sod as necessary. Install safety fence and secure job site at end of workday as required.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
75	CLEAN / FLUSH CULVERTS & BRIDGES	12/99

DESCRIPTION & PURPOSE

Cleaning/flushing of culverts and bridges to remove silt and debris, and eliminate restriction to flow.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan for all culverts to be cleaned/flushed annually.

CREW SIZE

- 1 Maintenance Supervisor
- 1 Maintenance Worker
-
-
- 2 **TOTAL**

EQUIPMENT

- 1 1-Ton Dump Truck
- 1 Water Tanker (1500 gal)
- -or- High Pressure/Vacuum cleaner/Vactor
- Safety Equipment
- Appropriate Hand Tools

WORK METHOD

1. Place signs and safety devices.
2. Locate truck in best working position and as far off roadway as possible.
3. Clean out ends of culvert.
4. Flush culverts until flow is unrestricted.
5. Load excess material/debris into truck for disposal at designated dump area.
6. Pick up signs and safety devices.

MATERIAL

- Water
-

AVERAGE DAILY PRODUCTION

5-7 Each/Day

NOTES:

1. Inform Maintenance Supervisor of any non-cleanable culverts or those that can only be partially cleaned.
2. Avoid damaging downstream property when flushing culverts.
3. Work should be scheduled, whenever possible, in conjunction with annual cleaning of adjacent structures.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
80	MISCELLANEOUS WORK ACTIVITIES	12/99

DESCRIPTION & PURPOSE

All work performed that is not described in previous activities. This includes, among others, activities such as catwalk repair, rodent control, pump maintenance, concrete spalled area repair, painting, building and grounds maintenance, trash pickup*, graffiti abatement, sign installation and maintenance.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan 8 labor hours per channel mile per year for miscellaneous maintenance work.

CREW SIZE

- 1 Maintenance Worker
-
-
- 1 TOTAL

EQUIPMENT

- 1 Pickup
- Hand tools
-
-

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.

MATERIAL

- As required
-
-
-

AVERAGE DAILY PRODUCTION

8 Labor Hours

NOTES:

*Includes appliances, tires, car bodies, and other large objects dumped in channels/basins.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
85	ENGINEERING	12/99

DESCRIPTION & PURPOSE

All work that is by nature engineering. This includes, among others, surveying and preparation of plans and specifications for maintenance work.

AUTHORIZED BY	LIMITS ON WORK
Director of Public Works for designee	

PERFORMANCE CRITERIA

CREW SIZE	WORK METHOD
■ N/A ■ ■ ■ TOTAL	1. As deemed most cost effective.
EQUIPMENT	
■ N/A ■ ■ ■	
MATERIAL	**AVERAGE DAILY PRODUCTION**
■ N/A ■ ■ ■	8 Hours/Day

NOTES:

4.35 Reporting

Comprehensive maintenance programs include procedures for reporting and summarizing work accomplished and labor-hours used for maintenance activities. This information enables managers and supervisors to compare actual performance with the planned work program. These planned-actual comparisons -- on a regular basis -- are essential for effective management and control of the work program.

The reporting procedures provide specific information:

- What Master Plan facility required work.
- What work was done by activity.
- How much of each activity was done.
- The labor-hours used to accomplish the work.

This information is used by managers in their effort to:

- Make sure the right kinds and amounts of maintenance work are done.
- Identify the problem areas and related corrective actions.
- Develop future work programs and budgets.
- Identify opportunities for improved productivity.

The work reporting process can consist of a simple form as outlined in the following section.

Daily Work Activity Report

The Daily Work Activity Report may be used to record and summarize (1) the kinds and amounts of work performed by maintenance personnel, and (2) the number of labor-hours used to do that work. The report can be used to summarize all work activities. Each Entity may use its standard accounting/reporting procedures for the Daily Work Activity Report.

The Maintenance Supervisor or crew leader usually prepares the Daily Work Activity Report. Following are instructions for the completion of the sample report shown on **Figure 4-6**.

1. Identification Data - Fill in all blanks: the Entity, date, name of person preparing the report, and the names and employee numbers of all persons to perform work to be reported for the day. (The form provides for several combinations of activities and employees. If additional pages are needed, number the pages accordingly).

2. Master Plan Facility ID/Name - Enter the specific 4 letter-4 digit Master Plan Facility number and reach, which indicates the "from" and "to," if applicable. This number directly corresponds to the specific Master Plan location as identified on current Master Plan maps. Also, indicate the Facility Name.

3. MWP Facility Number - Enter the identifying Maintenance Work Plan facility number. (This number directly corresponds to the budget approved for the facility and will typically include a range of Master Plan facilities and reach.)

4. Activity Number - Enter the number of each activity performed. Use the Work Activity Directory or Performance Standards to complete the blank.

5. Employee Number - Enter the employee number of the person working a specific activity at the specific facility.

6. Hours Worked by Each Employee - Record the number of hours worked by each employee, by the appropriate activity. Record the time spent to the nearest quarter-hour. For example, record 1 hour and 45 minutes as 1.75 hours and 3 hours and 20 minutes as 3.25 hours.

7. Equipment Number - Enter the assigned equipment number for any mechanical equipment on which work was performed for preventive and corrective maintenance only.

8. Work Performed - Enter the location and a brief description of the work performed.

9. Accomplishment - Measure and record the amount of work done for each activity. Use the correct measurement unit for each activity. (See the Activity List in **Section 4.32**.) Record the amount of work done to the nearest whole unit. Record labor-hours to the nearest hour. For activities with labor-hours as the unit of measure, the "quantity" will be exactly the same as "total hours" for the activity.

10. Notes/Comments - Record any additional relevant information that may be of use in summarizing and analyzing work activity data.

The completed reports can be used for monthly summarization and report preparation, and serve as completion certification backup for the monthly force account reimbursement billings.

REGIONAL FLOOD CONTROL DISTRICT
DAILY WORK ACTIVITY REPORT

ENTITY: _____

Date Work Performed: _____ 20 ____

Supervisor Name: _____

Employee Name: _____ No. _____

Employee Name: _____ No. _____

Employee Name: _____ No. _____

Employee Name: _____ No. _____

Employee Name: _____ No. _____

MWP Facility Number	Master Plan Facility ID/Facility Name	Activity Number Worked	Empl. Number	Hours Worked by Activity	Equip. Number Used	Work Performance (Location, Brief Description, Materials Used, Etc.)	Accomplishment	
							Amount	Unit of Measure

NOTES/COMMENTS: _____

_____

The undersigned hereby certifies that the above described maintenance was performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. Further, the information contained herein accurately reflects the time and accomplishments reported during the performance of this work.

_____ _____ _____

Supervisor's Signature Date Title

Page ____ of ____

Figure 4-6 Daily Work Activity Report

4.40 INVENTORY PROCEDURES

4.41 Purpose

The purpose of this element of the Operations and Maintenance Manual is to provide a record of the existing physical flood control system that is eligible for maintenance funding assistance by the District. The physical facilities that make up the collection and conveyance system have in many instances been paid for in whole or in part by the District, however, they are not "owned," operated, or maintained by the District. If, however, the total flood control system does not function properly when needed, it is ultimately the responsibility of the District to determine why and to take corrective action. A critical key to assuring the system functions properly is an up-to-date inventory of the physical system.

4.42 Physical System

In 1990, each Entity provided a list of the physical system that makes up the flood control system in their jurisdiction. Facilities eligible for maintenance funding are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan facilities, or exist in the same alignment as a proposed Master Plan facility and appurtenant facilities are eligible.

Schedule

The inventory work sheets must be expanded to represent a true and accurate accounting of facilities on the Master Plan and tributary (drainage) systems and updated as part of the annual certification process.

Reporting

The Entities should submit annual updates of the physical system inventory on the form required by the District **(Figure C-1)**.

4.43 Physical System Maps

Each Entity must have a map that shows the physical system for drainage and flood control. This map should reflect that portion that is on the Master Plan and also that portion that is eligible for maintenance funding by the District.

Schedule

The individual Entities should submit to the District updated maps annually, or more frequently as project completion dictates, reflecting the size, location and material elements of their drainage and flood control system. The update should show those systems that are eligible for Regional Flood Control District funding under the categories shown in **Section 4.11** of this manual.

Reporting

The physical system update with maps should be provided to the District and be in a form that is readily reproducible.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 5
EMERGENCY FUNDING PROCEDURES

5.10 EMERGENCY FUNDING PROCEDURES

5.11 Purpose

This element of the Operations and Maintenance Manual provides the Entities with procedures to perform emergency restoration and rehabilitation immediately following a flood event. A principal role of the District shall be to support the Entities' efforts to: (1) secure funding from state, federal, entity reserves and private sources; and (2) facilitate required immediate repairs to regional flood control facilities without delay.

Projects eligible for District emergency restoration and rehabilitation funding are those included in the Entity's approved or amended Maintenance Work Program.

5.12 Procedures

If the governing body elects to declare an emergency, then the District, in accordance with NRS 332.055 (Emergency Contracts: Competitive bidding not required; "emergency" defined.), will authorize and process emergency purchase orders to the maximum limit of unexpended funds upon written request by the Entity.

APPENDIX A

KEY STATUTORY, REGULATORY, AND POLICY REFERENCES

NEVADA REVISED STATUTES

1. CHAPTER 332 PURCHASING: LOCAL GOVERNMENTS
2. CHAPTER 338 PUBLIC WORKS PROJECTS
3. CHAPTER 543 CONTROL OF FLOODS

UNIFORM REGULATIONS FOR THE CONTROL OF DRAINAGE

1. SECTION 12 DESIGN/IMPROVEMENT STANDARDS
   a. 12.050 Construction/Operation/Maintenance

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

1. SECTION 300 DRAINAGE POLICY
   a. 303.10 Drainage Facilities Maintenance

REGIONAL FLOOD CONTROL DISTRICT POLICIES AND PROCEDURES MANUAL

1. CHAPTER 16.0 FACILITY MAINTENANCE
   a. 16.1 Annual Maintenance Work Program
   b. 16.2 Catastrophic Damage to Flood Control Facilities

APPENDIX B

SAMPLE AUTHORIZATION-TO-PROCEED INTERLOCAL CONTRACT

INTERLOCAL CONTRACT
ANNUAL MAINTENANCE WORK PROGRAM

THIS CONTRACT, made and entered into this ___ day of _____, 20____, by and between the [legal name of CITY or COUNTY], a political subdivision of the State of Nevada, hereinafter referred to as "CITY" (or "COUNTY"), and the CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT, hereinafter referred to as "DISTRICT".

W I T N E S S E T H:

WHEREAS, pursuant to Chapter 543 of the Nevada Revised Statutes, the DISTRICT may approve and fund projects to maintain flood control improvements; and

WHEREAS, the CITY (or COUNTY) desires to maintain flood control improvements within the CITY (or COUNTY) in accordance with the maintenance program set forth herein, and hereinafter referred to as "Project"; and

WHEREAS, the facilities upon which maintenance will be done are facilities described in the District's Master Plan.

NOW, THEREFORE, in consideration of the covenants, conditions, agreements, and promises of the parties hereto, the DISTRICT authorizes the Project as it is mutually understood and agreed as follows:

SECTION I - SCOPE OF PROJECT

This Interlocal Contract applies to the maintenance of flood control facilities, which are identified in the District's Master Plan facilities including updates and amendments subsequently approved. The basic maintenance to the facilities will be in accordance with performance standards set forth in the current District *Operations and Maintenance Manual.*

The Project is more specifically described in Exhibit "A" which is attached hereto and by this reference incorporated herein.

SECTION II - PROJECT COSTS

The DISTRICT agrees to provide reimbursement for Project costs within the limits specified below:

1. The Projects costs shall not exceed $_____.

The amounts allocated to each individual facility within the Project must be specified in **Exhibit "A"**. Any changes to said allocated amounts must be approved by the DISTRICT's Chief Engineer in accordance with **Section 4.24** of the District *Operations and Maintenance Manual.*

2. "Authorization to Proceed" is herein granted for maintenance of facilities in Exhibit "A" in an amount not to exceed _____, effective _____.

3. A separate request for an "Authorization to Proceed" will be required for additional facility maintenance funds.

4. A written request must be made to the DISTRICT and a Supplemental Interlocal Contract approved to increase the amount noted above prior to payment of any additional funds.

5. The CITY (or COUNTY) and DISTRICT will comply with **Section 4.12** of the *Operations and Maintenance Manual.* In accordance with said manual the CITY (or COUNTY) shall submit invoices together with a detailed summary report of the maintenance service performed. The CITY (or COUNTY) shall submit an invoice voucher in the manner prescribed by the DISTRICT. The vouchers shall include such information as is necessary for the DISTRICT to determine the nature of all expenditures. Each voucher will clearly indicate that it is for services rendered in performance under this contract. Each voucher will also be accompanied by a written certification from the CITY (or COUNTY) stating that it is for performance of maintenance activities under this contract and is composed of completed elements set forth in the annual work program.

All invoices must be submitted for payment to:

Clark County Regional Flood Control District
Accounts Payable
600 S. Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106-4511

Payment shall be considered timely if made by the DISTRICT within 30 days. Pursuant to **Section IV, Paragraph 6,** the DISTRICT may, in its sole discretion, withhold payments to the CITY (or COUNTY) for services rendered if the CITY (or COUNTY) fails to satisfactorily comply with any term or condition of this contract and/or the District *Operations and Maintenance Manual.*

SECTION III - PROJECT TIME

The CITY (or COUNTY) agrees to perform the Project to the satisfaction of the DISTRICT on or before June 30, 20____. The DISTRICT may grant extensions or terminate this contract and require all sums advanced to the CITY (or COUNTY) to be repaid if the CITY (or COUNTY) fails to perform by said date.

SECTION IV - GENERAL

1. The CITY (or COUNTY) will complete the Project as set forth in **Exhibit "A".** The CITY (or COUNTY) staff personnel responsible for coordination work under this contract are as listed below:

(list names and titles of CITY or COUNTY staff)

It is understood that staff named above will be responsible for work coordination throughout the period of this contract unless the DISTRICT is informed in writing of changes in these personnel assignments.

2. In addition to the specific terms set forth in this Contract, the parties hereto shall be subject to and governed by the District *Operations and Maintenance Manual*, and any applicable portions of the *Policies and Procedures* adopted by the DISTRICT.

3. It is the intent of the DISTRICT that scheduling of maintenance and repair of drainage and flood control facilities in general and Master Plan Facilities specifically be coordinated among entities. Therefore, in those cases where Master Plan approved, and District-funded projects have regional fund control significance impacting more than one entity, the CITY (or COUNTY) will allow all impacted entities an opportunity to review the maintenance schedule in order to coordinate maintenance efforts.

4. The Chief Engineer of the DISTRICT shall be responsible for monitoring the performance of the CITY (or COUNTY), approval for payment of billings and expenses submitted by the CITY (or COUNTY) and the acceptance of any report provided by the CITY (or COUNTY). The CITY (or COUNTY) shall be responsible for monitoring performance of CITY (or COUNTY) staff or private contractors, and the CITY (or COUNTY) shall maintain detailed records of all payments made to contractors and make such records available to the DISTRICT upon request.

5. The CITY (or COUNTY) shall provide right of access to its facilities to the DISTRICT or Chief Engineer at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this contract.

6. In the event the CITY (or COUNTY) fails to perform the maintenance according to the standards specified in this contract and in the District *Operations and Maintenance Manual,* the DISTRICT may perform or cause to be performed the maintenance necessary to assure proper operation of the facility. Cost incurred by the DISTRICT shall be reimbursed by the CITY (or COUNTY) or be deducted from the amount authorized by this contract. The DISTRICT may not exercise this right without giving the CITY (or COUNTY) specific written notice of the maintenance required and allowing the CITY (or COUNTY) 60 days within which to perform said maintenance. The notice required by this provision must be sent to:

(insert name of City or County staff)

(insert title)

(insert City or County mailing address)

7. The records of the CITY (or COUNTY) and/or private contractors pertaining to the subject matter of this contract shall at all reasonable times be subject to inspection and audit by the DISTRICT or an Agent of the DISTRICT.

8. If any provision of this contract shall be deemed in conflict with any statute or rule of law, such provision shall be deemed modified to be in conformance with said statute or rule of law.

9. All parties to this contract shall comply with applicable local, state, and federal laws.

10. Any costs found to be improperly allocated in the Project will be refunded by the CITY (or COUNTY) to the DISTRICT.

11. It is specifically understood and agreed to by and between the parties hereto that it is not intended by any of the provisions of any part of this contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this contract.

12. The CITY (or COUNTY) hereby indemnifies and shall defend and hold harmless the DISTRICT, its representatives and their employees (or their authorized representatives) from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorney's fees, costs and expenses whatsoever of any kind or nature whether arising before or after completion of the work hereunder and in any manner directly or indirectly caused, occasioned or contributed to in whole or in part, by reason of any act, omission, fault or negligence whether active or passive of the CITY (or COUNTY), of anyone acting under its direction or control, or on its behalf in connection with or incident to the performance of this Contract. The CITY'S (or COUNTY'S) aforesaid indemnity and hold harmless obligations, or portions or applications thereof, shall apply to the fullest extent permitted by law, but in no event shall they apply to liability caused by the sole negligence or willful misconduct of the party indemnified or held harmless.

IN WITNESS WHEREOF, the parties have caused this contract to be executed the day and year first above written.

Date of District Action:

REGIONAL FLOOD CONTROL DISTRICT

_____ BY:_____
ATTEST: Chairman

_____
Secretary to the Board

Approved as to Form:

BY:_____
Deputy District Attorney

****

Date of Council Action:
(or Commission Action)

CITY (or COUNTY) OF_____

_____ BY:_____
ATTEST: (Mayor or Board Chairman)

_____
City (or County Clerk)

APPENDIX C

SAMPLE INTERLOCAL CONTRACT

INTERLOCAL CONTRACT
ANNUAL MAINTENANCE WORK PROGRAM

THIS CONTRACT, made and entered into this ___ day of _____, 20____, by and between the [legal name of CITY or COUNTY], a political subdivision of the State of Nevada, hereinafter referred to as "CITY" (or "COUNTY"), and the CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT, hereinafter referred to as "DISTRICT".

W I T N E S S E T H:

WHEREAS, pursuant to Chapter 543 of the Nevada Revised Statutes, the DISTRICT may approve and fund projects to maintain flood control improvements; and

WHEREAS, the CITY (or COUNTY) desires to maintain flood control improvements within the CITY (or COUNTY) in accordance with the maintenance program set forth herein, and hereinafter referred to as "Project"; and

WHEREAS, the facilities upon which maintenance will be done are facilities described in the District's Master Plan.

NOW, THEREFORE, in consideration of the covenants, conditions, agreements, and promises of the parties hereto, the DISTRICT authorizes the Project as it is mutually understood and agreed as follows:

SECTION I - SCOPE OF PROJECT

This Interlocal Contract applies to the maintenance of flood control facilities, which are identified in the District's Master Plan facilities including updates and amendments subsequently approved. The basic maintenance to the facilities will be in accordance with performance standards set forth in the current District *Operations and Maintenance Manual*.

The Project is more specifically described in Exhibit "A" which is attached hereto and by this reference incorporated herein.

SECTION II - PROJECT COSTS

The DISTRICT agrees to provide reimbursement for Project costs within the limits specified below:

1. The Projects costs shall not exceed $_____.

The amounts allocated to each individual facility within the Project must be specified in **Exhibit "A"**. Any changes to said allocated amounts must be approved by the DISTRICT's Chief Engineer in accordance with **Section 4.24** of the District *Operations and Maintenance Manual.*

A written request must be made to the DISTRICT and a Supplemental Interlocal Contract approved to increase the amount noted above prior to payment of any additional funds.

2. The CITY (or COUNTY) and DISTRICT will comply with **Section 4.12** of the *Operations and Maintenance Manual.* In accordance with said manual the CITY (or COUNTY) shall submit invoices together with a detailed summary report of the maintenance service performed. The CITY (or COUNTY) shall submit an invoice voucher in the manner prescribed by the DISTRICT. The vouchers shall include such information as is necessary for the DISTRICT to determine the nature of all expenditures. Each voucher will clearly indicate that it is for services rendered in performance under this contract. Each voucher will also be accompanied by a written certification from the CITY (or COUNTY) stating that it is for performance of maintenance activities under this contract and is composed of completed elements set forth in the annual work program.

All invoices must be submitted for payment to:

Clark County Regional Flood Control District
Accounts Payable
600 S. Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106-4511

Payment shall be considered timely if made by the DISTRICT within 30 days. Pursuant to **Section IV, Paragraph 6**, the DISTRICT may, in its sole discretion, withhold payments to the CITY (or COUNTY) for services rendered if the CITY (or COUNTY) fails to satisfactorily comply with any term or condition of this contract and/or the District *Operations and Maintenance Manual.*

SECTION III - PROJECT TIME

The CITY (or COUNTY) agrees to perform the Project to the satisfaction of the DISTRICT on or before June 30, 20___. The DISTRICT may grant extensions or terminate this contract and require all sums advanced to the CITY (or COUNTY) to be repaid if the CITY (or COUNTY) fails to perform by said date.

SECTION IV - GENERAL

1. The CITY (or COUNTY) will complete the Project as set forth in **Exhibit "A"**. The CITY (or COUNTY) staff personnel responsible for coordination work under this contract are as listed below:

(list names and titles of CITY or COUNTY staff)

It is understood that staff named above will be responsible for work coordination throughout the period of this contract unless the DISTRICT is informed in writing of changes in these personnel assignments.

2. In addition to the specific terms set forth in this Contract, the parties hereto shall be subject to and governed by the District *Operations and Maintenance Manual*, and any applicable portions of the *Policies and Procedures* adopted by the DISTRICT.

3. It is the intent of the DISTRICT that scheduling of maintenance and repair of drainage and flood control facilities in general and Master Plan Facilities specifically be coordinated among entities. Therefore, in those cases where Master Plan approved, and District-funded projects have regional fund control significance impacting more than one entity, the CITY (or COUNTY) will allow all impacted entities an opportunity to review the maintenance schedule in order to coordinate maintenance efforts.

4. The Chief Engineer of the DISTRICT shall be responsible for monitoring the performance of the CITY (or COUNTY), approval for payment of billings and expenses submitted by the CITY (or COUNTY) and the acceptance of any report provided by the CITY (or COUNTY). The CITY (or COUNTY) shall be responsible for monitoring performance of CITY (or COUNTY) staff or private contractors, and the CITY (or COUNTY) shall maintain detailed records of all payments made to contractors and make such records available to the DISTRICT upon request.

5. The CITY (or COUNTY) shall provide right of access to its facilities to the DISTRICT or Chief Engineer at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this contract.

6. In the event the CITY (or COUNTY) fails to perform the maintenance according to the standards specified in this contract and in the District *Operations and Maintenance Manual,* the DISTRICT may perform or cause to be performed the maintenance necessary to assure proper operation of the facility. Cost incurred by the DISTRICT shall be reimbursed by the CITY (or COUNTY) or be deducted from the amount authorized by this contract. The DISTRICT may not exercise this right without giving the CITY (or COUNTY) specific written notice of the maintenance required and allowing the CITY (or COUNTY) 60 days within which to perform said maintenance. The notice required by this provision must be sent to:

(insert name of City or County staff)

(insert title)

(insert City or County mailing address)

7. The records of the CITY (or COUNTY) and/or private contractors pertaining to the subject matter of this contract shall at all reasonable times be subject to inspection and audit by the DISTRICT or an Agent of the DISTRICT.

8. If any provision of this contract shall be deemed in conflict with any statute or rule of law, such provision shall be deemed modified to be in conformance with said statute or rule of law.

9. All parties to this contract shall comply with applicable local, state, and federal laws.

10. Any costs found to be improperly allocated in the Project will be refunded by the CITY (or COUNTY) to the DISTRICT.

11. It is specifically understood and agreed to by and between the parties hereto that it is not intended by any of the provisions of any part of this contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this contract.

12. The CITY (or COUNTY) hereby indemnifies and shall defend and hold harmless the DISTRICT, its representatives and their employees (or their authorized representatives) from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorney's fees, costs and expenses whatsoever of any kind or nature whether arising before or after completion of the work hereunder and in any manner directly or indirectly caused, occasioned or contributed to in whole or in part, by reason of any act, omission, fault or negligence whether active or passive of the CITY (or COUNTY), of anyone acting under its direction or control, or on its behalf in connection with or incident to the performance of this Contract. The CITY'S (or COUNTY'S) aforesaid indemnity and hold harmless obligations, or portions or applications thereof, shall apply to the fullest extent permitted by law, but in no event shall they apply to liability caused by the sole negligence or willful misconduct of the party indemnified or held harmless.

IN WITNESS WHEREOF, the parties have caused this contract to be executed the day and year first above written.

Date of District Action:

REGIONAL FLOOD CONTROL DISTRICT

_____

ATTEST:

BY:_____
Chairman

_____

Secretary to the Board

Approved as to Form:

BY:_____
Deputy District Attorney

****

Date of Council Action:
(or Commission Action)

CITY (or COUNTY) OF _____

_____

ATTEST:

BY:_____
(Mayor or Board Chairman)

_____

City (or County Clerk)

SAMPLE EXHIBIT A

PART I

Summary of overall work plan listing specific projects and associated costs attributable to each. (See **Figure C-1**)

PART II

Facility map(s) which identify location of planned maintenance work by project.

PART III

Summary of work plan broken into maintenance activities to be completed, with associated budgeted costs, for all projects identified in Part I. (See **Figure C-2**)

Figure C-1 Maintenance Work Plan Summary

(ENTITY)
MAINTENANCE WORK PLAN SUMMARY
FISCAL YEAR 20XX-XX

Master Plan Facility ID	MWP Facility Number	Facility Description	Cost
		TOTAL	$ 0.00

Figure C-2 Annual Budget

REGIONAL FLOOD CONTROL DISTRICT
MAINTENANCE WORK PROGRAM
ANNUAL BUDGET - FY 20XX-XX

MWP Facility #: _____ Entity: _____
Facility Name: _____ Date Prepared: _____
MP Facility ID: _____

Force Account/ Contract	Activity	Requested Work Plan Amount ($)	Amended Work Plan Amount ($)	Percent Complete	Scheduled Completion Date
	5 Inspect Channels				
	10 Clean and Reshape Channels				
	15 Repair Lined Channel				
	20 Provide/Maintain Erosion Control				
	25 Clean & Inspect Detention Debris Basins				
	30 Erosion Repair				
	35 Fence Repair				
	40 Vegetation Control - Chemical				
	45 Vegetation Control - Mechanical				
	50 Maintain Access Road				
	55 Clean & Inspect Inlet/Outlet Structures				
	60 Repair Inlet/Outlet Structures				
	65 Clean Storm Sewer Lines				
	70 Storm Sewer Repair				
	75 Clean/Flush Culverts & Bridges				
	80 Miscellaneous Work Activities				
	85 Engineering				
	TOTALS	$0.00	$0.00		

Delays or problem areas:

Work completed during prior fiscal year:

Work to be completed during current fiscal year:

Consultant/ Contractor: _____
Project Manager: _____ Phone Number: _____

SEDIMENTATION ANALYSIS

SCOPE

Black & Veatch evaluated the sediment load impact on the UFWDB by determining average annual and 100-year event sediment production using the Universal Soil Loss Equation (USLE) and the Modified Universal Soil Loss Equation (MUSLE) methods. Sedimentation analysis results were then compared to the U.S. Army Corps of Engineers' adopted values.

DISCUSSION OF PARAMETERS

The following discussion defines the variables used in the USLE and MUSLE methods for estimating sediment loads delivered to the Upper Flamingo Wash Detention Basin.

Universal Soil Loss Equation (USLE)

The Universal Soil Loss Equation, developed by the USDA Soil Conservation Service, is one method for predicting the gross sediment amount produced by sheet and rill erosion. The following equation was used to predict values for average annual or single storm erosion:

$$A = RKLSCP$$

Where, A = Soil loss / unit area (tons/acre),
R = Rainfall factor,
K = Soil erodibility factor,
LS = Length-slope factor,
C = Vegetal cover factor, and
P = Conservation practice factor.

The dimensionless factors that comprise the equation take into account the characteristics of the watershed. Several authors were referenced to determine the most representative values for the UFWDB watershed. A summary of the factor selection and range of values considered for use in the USLE follows.

Rainfall Factor (R). The rainfall factor is a product of a rainfall's kinetic energy and its maximum 30-minute intensity, and represents the erosive forces of falling rain and runoff. The R value for the average annual erosion is based on a 2-year, 6-hour precipitation depth. Reference 9 (Table A) listed the annual R value for Las Vegas as 15, whereas a value of 27 was derived from figures or equations in References 1 and 6.

The following equation was used to calculate the R value for the Base Flood (100-year, 6-hour) event.

$$R_{100} = \frac{19.25P^{2.2}}{D^{0.4672}} \qquad \text{(Ref. 1)}$$

Where, R_{100} = Rainfall factor for 100-year, 6-hour storm,
P = Depth of precipitation (inches), and
D = Storm duration (hours).

The 100-year, 6-hour precipitation depth of 2.3 inches was adjusted to 3.3 inches in accordance with Reference 3, thereby producing an R value of 115.24. This was the only R value used for 100-year event calculations.

Soil Erodibility Factor (K). The K factor represents a soil's susceptibility to erosion or its resistance to detachment by rainfall and runoff. Several references estimate K values as a function of soil textures, gradation, and permeabilities. Soil characteristics for the Upper Flamingo watershed were obtained from the geotechnical investigation (Ref. 5) performed during the 1989 design of the UFWDB. Values for the K factor did not vary greatly among the references consulted. The K values used in the USLE calculations ranged from 0.13 to 0.17 for each subbasin.

Length-Slope Factor (LS). The LS factor describes the combined effect of the length and steepness of the watershed slope on the runoff energy. The LS value was calculated using the following equation:

$$LS = \left(\frac{\lambda}{72.6}\right)^m \left(\frac{430x^2 + 30x + 0.43}{6.613}\right) \quad \text{(Ref. 1)}$$

Where, λ = Slope length (ft),
x = Slope gradient (ft/ft), and
m = 0.3 for $x \leq 3\%$, 0.4 for $x = 4\%$, and 0.5 for $x \geq 5\%$.

The LS factor was calculated for the individual subbasins and then averaged over the watershed area to obtain an overall LS value of 8.48. The overall value was used in the basic USLE computations and MUSLE lumped parameter method.

Vegetal Cover Factor (C). Sometimes called the Crop Management Factor, the C factor is dependent on the type and density of plant cover. The Soil Conservation Service has compiled a table for "Permanent Pasture, Rangeland, and Idle Land" (References 1, 6, and 9) from which to estimate the C value based on the percentage of canopy and ground cover. Other tables exist for disturbed or altered lands, such as construction or agricultural sites.

The Upper Flamingo watershed is considered idle land with a random distribution of vegetation in the form of short brush and/or tall weeds over as much as 25 percent of the area, and a ground cover of weeds over 20 percent or less of the area. Each subbasin was estimated separately. Subbasins located low on the alluvial fan, or with a majority of their area comprised of washes, were rated as having no appreciable canopy or ground cover. Subbasins located midway up the fan were rated as having no canopy and 20 percent ground cover, and the remaining subbasins were estimated to have 25 percent canopy and 20 percent ground cover. The following C values were obtained from the SCS table:

Subbasin Description	Canopy Cover %	Ground Cover %	C Value
Lower fan/wash	0	0	0.45
Middle fan	0	20	0.24
Upper fan	25	20	0.20

Individual subbasin C values were weighted over the watershed area yielding 0.28 as an average C value for the watershed.

Conservation Practice Factor (P). Often used in conjunction with the C factor, the P factor is a ratio of soil loss under a certain erosion control practice, such as contour farming, to the soil loss resulting from straight-row farming. A default value of 1.0 is used for non-crop land such as the Upper Flamingo watershed.

As defined above, the USLE accounts for the detachment and transport effects of rainfall, but does not account for significant amounts of deposition within the watershed. Therefore, the sediment loading values obtained from the USLE are gross amounts and not a computed value of sediment yield.

Modified Universal Soil Loss Equation (MUSLE)

To estimate the sediment yield directly for a specific storm event, the USLE is modified by replacing the rainfall factor R with the product of runoff volume and peak discharge. The MUSLE is defined as follows:

$$Y = 95\,(Q \times V)^{0.56}\,K\,LS\,CP \qquad \text{(Ref. 7)}$$

Where, Y = Single storm sediment yield (tons),
Q = Peak discharge (cfs),
V = Runoff volume (ac-ft), and
K, LS, and CP are as defined under USLE section.

The MUSLE method may be applied to a homogeneous watershed, whereby the lumped parameter approach is used, or to a nonhomogeneous watershed using sediment routing procedures. For the lumped parameter method, the K, LS, and CP values are area weighted averages over the watershed. Peak discharge and runoff volume are the total values for the watershed and are generated from a HEC-1 model. In the sediment routing procedure, the sediment yield is calculated for each subbasin. A routing coefficient is then applied to the sediment yield produced from each subbasin to account for the size and quantity of sediment

exiting the subbasin and reaching the watershed exit, or detention basin. The sediment yield total for the watershed is then the summation of the routed subbasin yields.

Sediment Delivery Ratio

To convert the gross sediment loads calculated with the USLE method, a ratio of sediment yield to gross sediment production, or sediment delivery ratio, is required. Evaluations of a sediment delivery ratio (SDR) are typically determined from reservoir sedimentation surveys or direct measurements. In the absence of actual measurements, a range of sediment delivery ratios was developed from a relationship presented in Reference 8. The SDR values for the 34.56 sq mi Upper Flamingo watershed is 4 to 29 percent.

U.S. ARMY CORPS OF ENGINEERS' METHODS

In their 1991 report, the U.S. Army Corps of Engineers (COE) discussed several procedures for developing the sediment yield for average annual and 100-year, 6-hour storm events (Ref. 7). The first several sections of the COE report compare different methods for obtaining sediment yields. The COE then establishes a sediment yield/square mile "rule of thumb" for alluvial fans using the USLE and MUSLE methods. The COE findings are discussed below.

COE Comparisons

The COE compared the results calculated with the "Los Angeles District Debris Estimation Method" (Method) to five watersheds having geographic similarities to the Upper Flamingo watershed, and which had had their sediment yield measured or estimated. The latter watersheds were some of the watersheds used to produce the Las Vegas Regional Curve which shows sediment yield plotted against drainage area (Reference 2). When plotted on the same curve, the sediment yield from the Method watersheds was about 5.6 times greater than the study watersheds. The COE concluded that watersheds in this geographic area yield 18 percent of the sediment generated by the Method for average annual sediment amounts.

The COE then compared values for average annual and 100-year sediment yields calculated using the Method to determine a ratio between the two yields. They estimated that the 100-year sediment yield is 15 times greater than the average annual sediment yield. The average annual

yields derived using this ratio compared well to the Las Vegas Regional Curve, and the COE adopted these values for the watersheds examined in their report.

Additional data obtained from the USDA Agricultural Service for reservoirs in the same physiographic/climatic region as Las Vegas, were plotted on the Las Vegas Regional Curve. These plots were consistently below the curve, so the COE determined that the curve reflects a maximum value for average annual sediment yield rather than a minimum value as suggested in Reference 2.

The final comparison made by the COE to substantiate their adopted values was to the "Pacific Southwest Area Interagency Committee (PSIAC) Method. Their findings suggested that the values obtained using the 15:1 ratio were comparable.

COE "Unit" Sediment Yields

Using the same USLE and MUSLE equations discussed earlier in this report, the COE attempted to establish the average annual and event-based sediment yields on an alluvial fan. The following values were used for the factors on a representative 1 square mile watershed:

Parameter	USLE	MUSLE
R	27	N/A
K	.15	.15
LS	0.5928	0.5928
CP	.95	.95
Q	N/A	1130 cfs
V	N/A	87 ac-ft

The peak discharge was obtained from a table and the runoff volume was pulled from a HEC-1 model on a similar watershed with a 1 square mile area. The R and K factors are similar to those defined for the Upper Flamingo watershed in the previous section, however, the CP value of .95 is more than double the values reported in the SCS table. The CP value used by the COE is in the range reported for disturbed, i.e., bulldozed, fields, which does not represent the desert topography found throughout this region.

Using the above factors, the COE estimated the average annual sediment yield to be 0.67 ac-ft/sq mi/yr. Using a more representative, yet conservative, CP factor of 0.45 for no canopy or ground cover, the adjusted "unit" average annual sediment yield would be 0.32 ac-ft/sq mi/yr. The COE 100-year flood "unit" sediment yield is 2.30 ac-ft, which becomes 1.09 ac-ft with a more realistic CP factor.

DISCUSSION OF RESULTS

This section will compare and discuss the results of the different methods used to estimate the average annual and storm specific, or 100-year, 6-hour storm, sediment yields.

Average Annual Sediment Yield

The COE used the "unit" average annual sediment yield figure of 0.67 ac-ft/sq mi/yr to estimate the Upper Flamingo sediment yield at 24.1 ac-ft/yr. Using the adjusted "unit" value, the estimate for the average annual sediment yield would be 11.1 ac-ft/yr.

Using the Las Vegas Regional Curve, which the COE proposed to be a maximum value based on their plots of measured sediment yield/drainage area for geographically similar watersheds, the average annual sediment yield from the 34.56 sq mi Upper Flamingo watershed is 13.13 ac-ft/yr.

The USLE calculations performed by Black & Veatch for this task yield gross average annual sediment loads of between 55.3 and 117.5 ac-ft/yr. Applying the median SDR value of 16 percent, the average annual range is 8.85 to 18.8 ac-ft/yr. The value obtained from the Las Vegas Regional Curve falls in the middle of this range.

A statistical analysis method was also used to corroborate the sediment yield values obtained thus far for the Upper Flamingo watershed area. For drainage areas between 1 and 30,000 sq mi, the following relation was established by Dendy and Bolton:

$$\frac{S}{S_R} = \left(\frac{A}{A_R}\right)^{-0.16} \quad \text{(Ref. 6)}$$

Where, S = Sediment yield (tons/sq mi/yr),
S_R = Reference sediment yield for 1 sq mi = 1645 tons/yr,
A = Drainage area (sq mi), and
A_R = Reference drainage area = 1 sq mi

Applying the above relation to the Upper Flamingo watershed and using the reference values, the sediment yield generated is 17.63 ac-ft/yr. Using the COE "unit" value for sediment load produced per 1 sq mi, the yield is 15.64 ac-ft/yr. Adjusting further to correct for the high CP value used by the COE, the sediment yield becomes 7.4 ac-ft/yr.

Another method obtained from the *Journal of Hydraulics Division*, ASCE, was published as being specific to the western United States (Ref. 4). The method predicted the average annual sediment yield by using climate (average precipitation and temperature values), watershed slope, and soil characteristics as independent variables in the following equation:

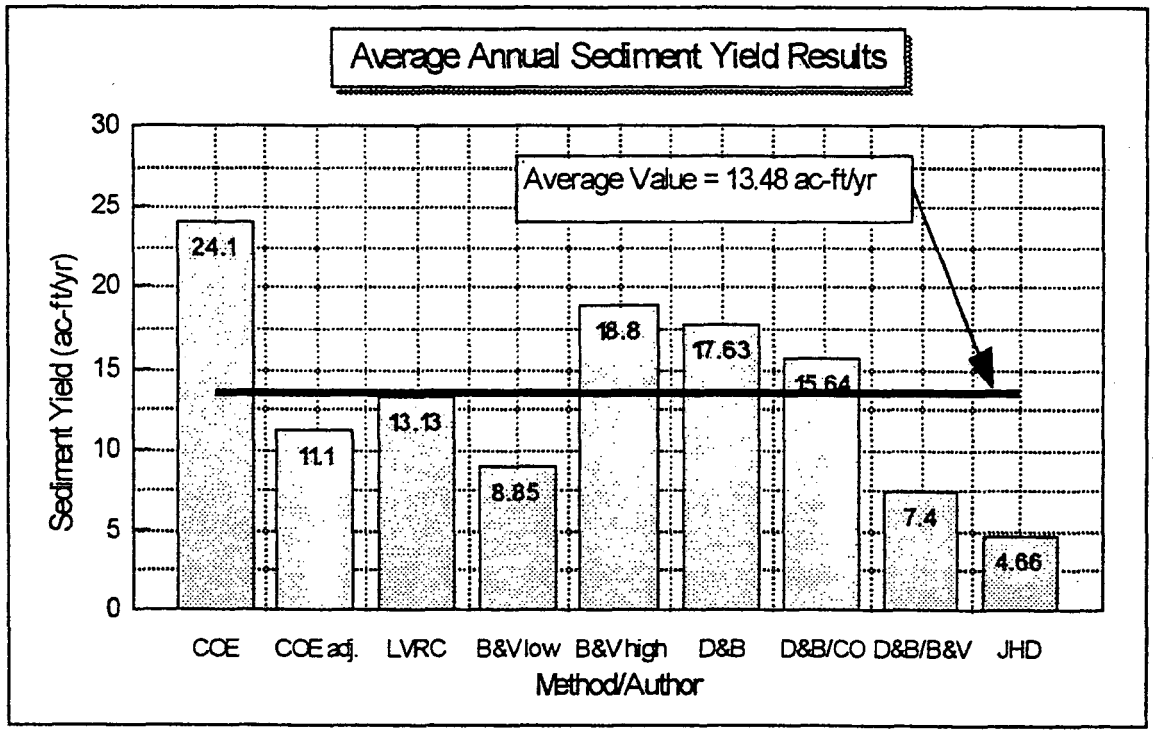
$$\log(Y + 100) = 6.21301 - 2.19113\log(X_1 + 100) + 0.06034\log(X_2 + 100) - 0.01644\log(X_3 + 100) + 0.04250\log(X_4 + 100)$$

Where, Y = Sediment Yield (ac-ft/sq mi/yr),
X_1 = Avg. precipitation / avg. temperature ratio (in/°F),
X_2 = Weighted watershed average (%),
X_3 = Soil particles > 1mm (%), and
X_4 = Soil particles < 2μm (%).

In addition to the percentage of particles smaller than 2μm, the X_4 value can be positive or negative depending on the pH of the soil. For pH values greater than 7.0, as for the Upper Flamingo watershed soils, the sign is positive; for acidic soils, the sign is negative. The average

annual sediment yield produced by the above equation is 4.66 ac-ft/yr. This value falls below the range developed from the Las Vegas Regional Curve.

In summary, average annual sediment yields calculated using values specific to this geographic region were lower than the yields generated using general approaches. The following graph depicts the range of values suggested for the average annual sediment yield for the Upper Flamingo watershed. The average annual sediment yield suggested for use in this study is 13.48 ac-ft/yr.



Storm Specific Sediment Yield

For the 100-year event, the COE took the average annual estimates for the small watersheds studied in their report, and applied the 15:1 ratio. These small watersheds accounted for 12.43 sq mi of the Upper Flamingo watershed. For the remainder of the watershed, 25.86 sq mi according to the COE report, sediment yield from sheet and rill erosion, gully erosion, channel

degradation, and bank erosion were calculated and added to the previous total. The COE also added sediment yield from the Red Rock Detention Basin based on a trap efficiency of 91 percent. The total sediment yield from the Upper Flamingo watershed is 153 ac-ft for the 100-year event. Using a trap efficiency of 90 percent for the UFWDB, the sediment remaining in the detention basin becomes 138 ac-ft.

Using the adjusted COE's "unit" sediment yield of 1.09 ac-ft/sq mi, the total sediment yield for the Upper Flamingo watershed would be 37.7 ac-ft. Adding to this the 78.2 ac-ft generated by gully, channel, and bank erosion, (adjusted for area), the total sediment yield into the UFWDB becomes 115.9 ac-ft. Applying the 90 percent trap efficiency value, the sediment load remaining in the basin is 104.3 ac-ft for the 100-year event.

The MUSLE lumped parameter method assumes a homogeneous watershed which is not characteristic of the Upper Flamingo watershed. The sediment yield obtained using this method produced an unrealistic value of 236 ac-ft over the watershed. Since the watershed is heterogeneous, the lumped parameter solution was eliminated from consideration.

The MUSLE routing procedure produced a 100-year sediment load of 116 ac-ft which would equate to 104.4 ac-ft of sediment remaining in the basin. This value is the same as that derived using the COE's information.

The following table summarizes the sediment yields estimated for the 100-year, 6-hour event.

Method / Author	Sediment Yield 100-year Storm (ac-ft)
COE	138
COE adjusted	104.3
MUSLE - Routing Method	104.4

For analysis of the impact on the UFWDB, a value of 105 ac-ft will be used for the 100-year event sediment loading.

CONCLUSION

The various methods used to estimate the average annual and storm event sediment loading on the Upper Flamingo Wash Detention Basin have produced results which differ by as much as five magnitudes. Watersheds which have had their sediment yield measured or estimated, and which have geographic similarities to the UFWDB, were considered to provide a better indication of the sediment yield expected to occur from the Flamingo watershed rather than the general analytical approaches. The average annual sediment yield estimated for the UFWDB is 13.48 acre-feet. The 100-year sediment loading is estimated to be 105 acre-feet. This value will be used to adjust the storage capacity of the UFWDB for the new Base Flood Event which will be evaluated in the following section, UFWDB PERFORMANCE ANALYSIS.

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CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
UNIVERSAL SOIL LOSS EQUATION

Subbasin	Description	Area (sq mi)	R	K	Reach (ft)	El. Drop (ft)	S (ft/ft)	m	LS	C	P	Gross Erosion (ton/ac/yr)	Gross Erosion (ac-ft/yr)	Sediment Yield/mi per LV curve (af/sqmi/yr)	Sediment Yield (ac-ft/yr)	
RR23	low fan/wash	2.03	15	0.17	13000	500	0.038	0.40	2.67	0.45	1	3.07	2.18	0.70	1.42	
R1	mid fan	1.12	15	0.15	10575	260	0.025	0.30	0.96	0.24	1	0.52	0.20	0.80	0.90	
RR20	upper fan	1.37	15	0.13	19200	2000	0.104	0.50	20.22	0.20	1	7.88	3.78	0.77	1.05	
RR21	upper fan	6.27	15	0.13	23000	1780	0.077	0.50	14.34	0.20	1	5.59	12.27	0.55	3.45	
RR22	upper fan	2.15	15	0.13	12000	1060	0.088	0.50	12.51	0.20	1	4.88	3.67	0.69	1.48	
R5	low fan/wash	5.77	15	0.17	19000	400	0.021	0.30	1.01	0.45	1	1.15	2.33	0.56	3.23	
F1	upper fan	4.63	15	0.13	14000	1600	0.114	0.50	19.90	0.20	1	7.76	12.57	0.59	2.73	
F2	upper fan	1.28	15	0.13	8000	500	0.063	0.50	6.33	0.20	1	2.47	1.10	0.78	1.00	
F3	mid fan	2.6	15	0.15	10500	840	0.080	0.50	10.15	0.24	1	5.48	4.99	0.65	1.69	
F4	upper fan	1.3	15	0.13	8000	300	0.038	0.40	2.14	0.20	1	0.84	0.38	0.78	1.01	
F5N	mid fan	4.04	15	0.15	19000	540	0.028	0.30	1.31	0.24	1	0.71	1.00	0.63	2.55	
F5S	low fan/wash	2	15	0.17	16000	280	0.018	0.30	0.83	0.45	1	0.95	0.67	0.71	1.42	SDR
											SUM	41.30	45		21.93	0.49
Weighted Averages *			15	0.15	16369	959	0.059	0.5	8.48	0.28	1	5.19	62.78			
Overall Watershed		34.56	15	0.15	40,000	2,320	0.058	0.5	12.84	0.28	1	7.86	95.01	0.38	13.24	0.14

The following values were adopted for use in the USLE table:

Subbasin Description	K	C
low fan/wash	0.17	0.45
mid fan	0.15	0.24
upper fan	0.13	0.20
Sediment Specific Weight	84	pcf

* Weighted averages are used in other USLE methods and the MUSLE methods.

CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
UNIVERSAL SOIL LOSS EQUATION

Reference: Applied Hydrology and Sedimentation for Distributed Areas
by: B.J. Barfield & R.C. Warner

A = RKLSCP

Where:
A = soil loss / unit area [tons/acre/year]
R = rainfall factor
K = soil erodibility factor
LS = length slope factor
CP = control practice factor

Annual Average
2-yr, 6-hr

A = 9.6 tons/ac/yr
using values shown in outlined boxes

A = 3.4 af/sq.mi./yr
using sediment sp. wt. 84 pcf

R	Average annual R =	27	per Fig. 5.3
K	Design K value for topsoil =	0.15	per Table 5.5 for sand
LS	Length slope factor =	8.48	weighted value per USLE spreadsheet
CP	Control practice factor =	0.28	per Table 5.A.3 for ea. subbasin, watershed avg. see USLE spreadsheet

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Storm Specific
100-yr, 6-hr

A = 41.0 tons/ac/yr
using values shown in outlined boxes

A = 14.4 af/sq.mi./yr
using sediment sp. wt. 84 pcf

R	R value for specific storm =	115.24	for 100-yr, 6-hr storm
	when: P =	3.3	in
	D =	6	hr
K	Design K value for topsoil =	0.15	per Table 5.5 for sand
LS	Length slope factor =	8.48	weighted value per USLE spreadsheet
CP	Control practice factor =	0.28	per Table 5.A.3 for ea. subbasin, watershed avg. see USLE spreadsheet

CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
UNIVERSAL SOIL LOSS EQUATION

Reference: Guides for Erosion and Sediment Control in Nevada, Aug. 1976
by: U.S. Dept. of Agriculture Soil Conservation Service, Reno, NV

A = RKLSCP

Where: A = soil loss / unit area [tons/acre/year]
R = rainfall factor
K = soil erodibility factor
LS = length slope factor
C = vegetal cover factor
P = conservation practice factor (Delete P for Nevada)

A = 4.6 tons/ac/yr
using values shown in outlined boxes

A = 1.6 af/sq.mi./yr
using sediment sp. wt. 84 pcf

R Annual R factor = 15 per Table A
% material <2.0mm = 32%
%sand (0.1mm to 2.0mm) = 21.6%

K Design K value for topsoil = 0.13 per Chart 1

LS Length slope factor = 8.48 weighted value per USLE spreadsheet

C Vegetal cover factor = 0.28 per Table 2 for ea. subbasin, watershed avg.
see USLE spreadsheet

CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
JOURNAL OF HYDRAULICS DIVISION - ASCE
Predicting Sediment Yield in Western U.S.
by Elliott M. Flaxman

Subbasin	Area (sq mi)	Reach (ft)	El. Drop (ft)	S (ft/ft)
RR23	2.03	13000	500	0.038
R1	1.12	10575	260	0.025
RR20	1.37	19200	2000	0.104
RR21	6.27	23000	1780	0.077
RR22	2.15	12000	1060	0.088
R5	5.77	19000	400	0.021
F1	4.63	14000	1600	0.114
F2	1.28	8000	500	0.063
F3	2.6	10500	840	0.080
F4	1.3	8000	300	0.038
F5N	4.04	19000	540	0.028
F5S	2	16000	280	0.018
				0.060

Independent Variables

X1 = Precipitation/Temperature ratio (avg. annual values) X1 = 0.062
Pavg = 4.13 in
Tavg = 67.1 deg. F

X2 = Weighted avg. slope across watershed X2 = 6.0

X3 = % coarse soil particles > 1mm X3 = 72.6
Takes into account armoring &
resistance of coarse materials to erosion.

X4 = Soil aggregation = soil particles < 2microns X4 = 0.0
Value is + if pH >7, and - if pH < 7
The pH is assumed to be >7 based on other
geotechnical reports from similar areas.

Dependent Variable

Y = ac-ft/sq. mi./year of sediment yield log(Y+100) = 2.001
Y = 0.135 ac-ft/sq.mi./yr

Then average annual sediment yield = 4.66 ac-ft/year

CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
MODIFIED UNIVERSAL SOIL LOSS EQUATION

Routing Method

Subbasin	Q (cfs)	V (ac-ft)	K	L (ft)	dE (ft)	S (ft/ft)	m	LS	CP
RR23	617	101	0.17	13000	500	0.038	0.4	2.67	0.45
R1	752	110	0.15	10575	260	0.025	0.3	0.96	0.24
RR20	772	138	0.13	19200	2000	0.104	0.5	20.22	0.20
RR21	2564	559	0.13	23000	1780	0.077	0.5	14.34	0.20
RR22	1174	196	0.13	12000	1060	0.088	0.5	12.51	0.20
R5	1476	243	0.17	19000	400	0.021	0.3	1.01	0.45
F1	2281	434	0.13	14000	1600	0.114	0.5	19.90	0.20
F2	901	128	0.13	8000	500	0.063	0.5	6.33	0.20
F3	1776	224	0.15	10500	840	0.080	0.5	10.15	0.24
F4	803	110	0.13	8000	300	0.038	0.4	2.14	0.20
F5N	1696	292	0.15	19000	540	0.028	0.3	1.31	0.24
F5S	893	139	0.17	16000	280	0.018	0.3	0.83	0.45

Subbasin	Area (sq mi)	Gross Erosion (ton/yr)	Gross Erosion (ac-ft/yr)	Travel Time (hours)	Delivery Ratio	Sediment Yield (ton/yr)	Sediment Yield (ac-ft/yr)
RR23	2.03	9408	5	2.67	0.31	5010	3
R1	1.12	1867	1	2.71	0.65	985	1
RR20	1.37	32643	18	2.45	0.61	18314	10
RR21	6.27	99251	54	3.19	0.58	46786	26
RR22	2.15	31093	17	1.80	0.60	20350	11
R5	5.77	9432	5	4.61	0.29	3182	2
F1	4.63	111947	61	1.83	0.63	72635	40
F2	1.28	10677	6	1.49	0.69	7509	4
F3	2.60	47465	26	1.68	0.68	31933	17
F4	1.30	3114	2	1.83	0.58	2022	1
F5N	4.04	6922	4	4.09	0.49	2641	1
F5S	2.00	4292	2	4.32	0.46	1548	1
SUM	**34.56**		**201**				**116**
AVG					**0.52**		

The following values were adopted for use in the table:

Descriptio	K	C	
lower fan	0.17	0.45	
mid fan	0.15	0.24	
upper fan	0.13	0.20	
Sediment Specific Wt =		84	pcf
2yr, 24hr rainfall depth =		1.30	in
Manning's n =		0.03	
Average D50 size, PF2=		0.410	mm leaving subbasin
Watershed Q (cfs) =		6021	cfs
Watershed V (ac-ft) =		1363	ac-ft
.56ln(Q*V) =		8.92	
Storm Value Factor, R =		115.24	per USLE worksheet
Routing Coefficient, B =		0.3683	calculated value

CCRFCD - LOMR UPPER FLAMINGO WASH DETENTION BASIN
MODIFIED UNIVERSAL SOIL LOSS EQUATION (MUSLE)

Reference: Applied Hydrology and Sedimentology for Disturbed Areas
Barfield, B.J.; Warner, R.C.; Haan, C.T.

Lumped Parameter Method

$$Y = [95(Q \times V)^{.56}] \times K \times LS \times CP$$

where, Y = single storm sediment yield (tons)
Q = peak discharge (cfs) - based on HEC-1 model
V = runoff volume (ac-ft) - based on HEC-1 model
K, LS, CP are the weighted averages shown in the USLE table

Storm Frequency (yr)	100	
Storm Duration (hr)	6	
Sediment Sp. Wt (pcf)	84	

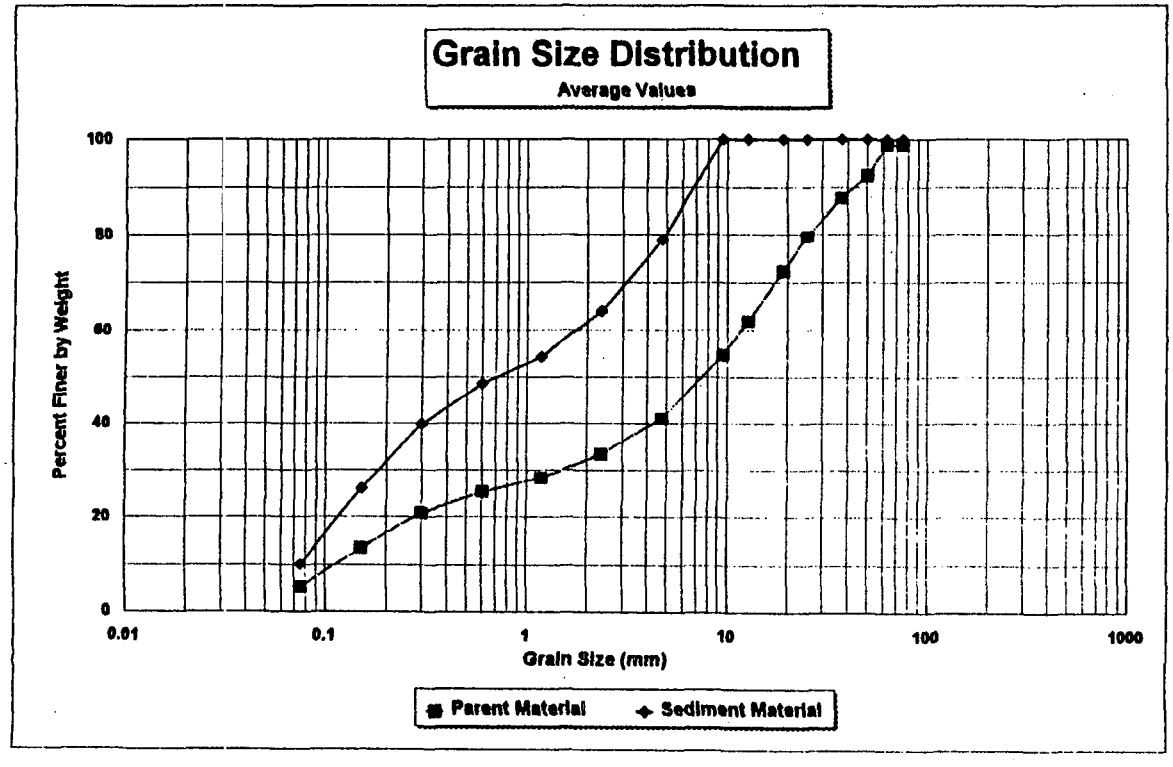
HEC-1 Model:	**UFDB**	Runoff from UF subbasins, routed to UFDB
Watershed Area =	34.56	sq. mi.
Q =	6021	cfs
V =	1363	ac-ft
K =	0.15	
LS =	8.48	
CP =	0.28	
Sediment Yield, Y =	244,899	tons or [134] ac-ft

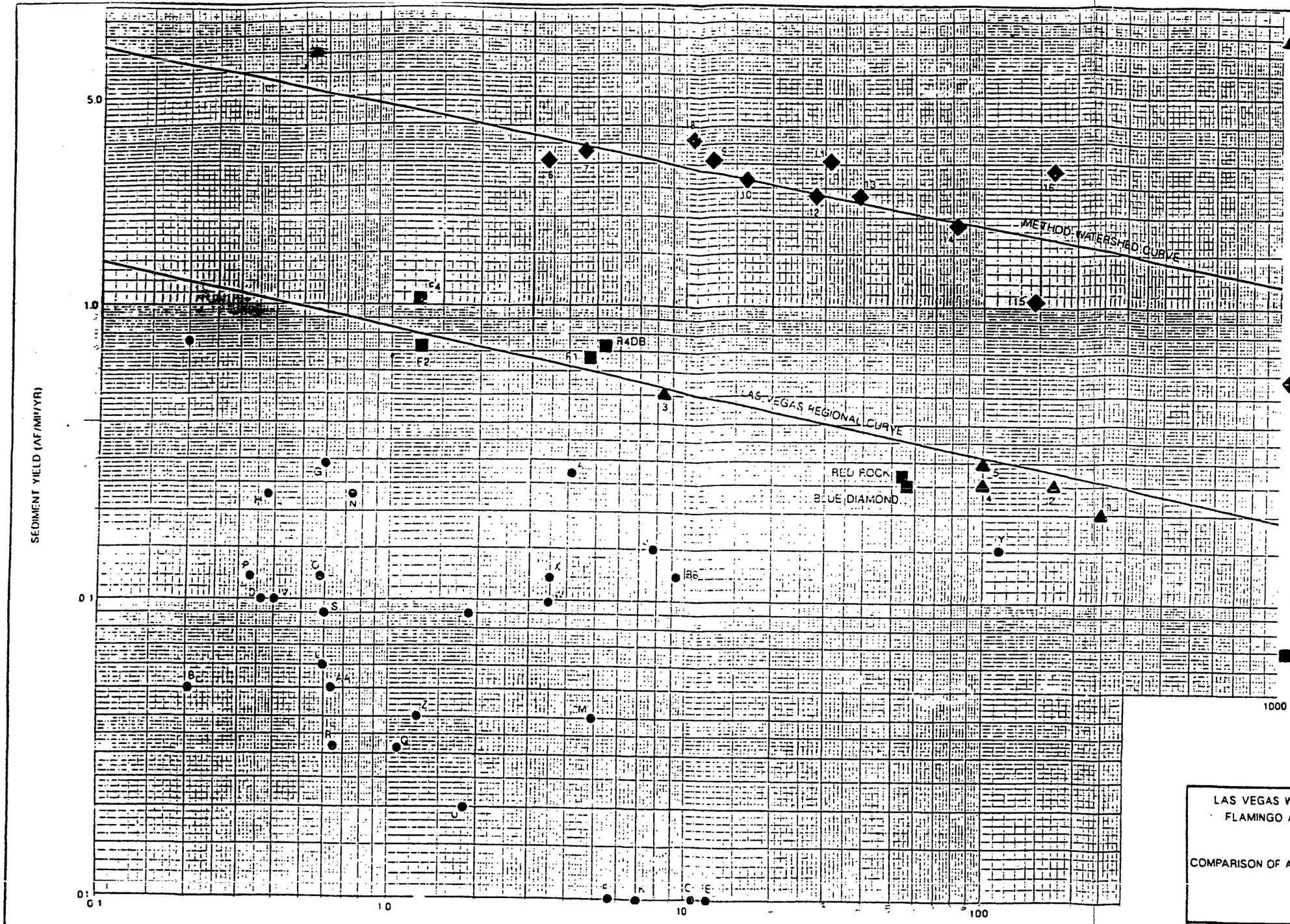
HEC-1 Model:	**RR**	Runoff from RR subbasins, routed to UFDB
Watershed Area =	87.6	sq. mi.
Q =	1407	cfs
V =	2016	ac-ft
K =	0.15	Assume same weighted USLE values
LS =	8.48	
CP =	0.28	
Sediment Yield, Y =	135,087	tons or [74] ac-ft at UF

HEC-1 Model:	**RR**	Runoff from RR subbasins at RRDB
Watershed Area =	53.04	sq. mi.
Q =	11157	cfs
V =	2794	ac-ft
K =	0.15	Assume same weighted USLE values
LS =	8.48	
CP =	0.28	
Sediment Yield, Y =	517,092	tons or [283] ac-ft (COE 100-yr debris estimate = 222 ac-ft)

HEC-1 Model:	**LOMR**	Runoff from RR & UF subbasins, routed to UFDB
Watershed Area =	87.6	sq. mi.
Q =	6660	cfs
V =	3380	ac-ft
K =	0.15	
LS =	8.48	
CP =	0.28	
Sediment Yield, Y =	430,917	tons or [236] ac-ft

Selve Size (std)	Sieve Size (mm)	Grain Size Distribution Sample #																		Average Parent Gradation	% Finer Exiting Subbasin
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
200	0.075	4.0	4.0	4.0	6.0	4.0	1.0	5.0	4.0	6.5	9.0	6.0	14.5	2.0	2.0	10.5	3.0	4.0	5.0	5.3	10.1
100	0.15	6.5	9.0	13.0	19.0	12.0	2.0	15.5	8.0	15.5	24.0	9.0	31.0	7.0	12.0	25.0	11.0	9.0	16.0	13.6	26.1
50	0.3	11.5	19.0	21.5	27.0	20.0	3.0	21.5	18.5	20.0	34.5	15.0	42.5	10.0	20.0	36.0	16.0	12.0	26.0	20.8	39.9
30	0.6	14.5	24.5	38.5	30.0	25.0	4.5	25.0	23.0	24.0	39.0	17.0	49.0	12.0	24.0	39.5	19.0	16.0	31.0	25.3	48.6
16	1.18	18.0	28.0	36.5	32.0	30.0	5.5	29.0	26.0	25.0	43.0	21.0	55.0	14.0	28.0	42.0	22.0	19.0	35.0	28.3	54.3
8	2.36	26.0	34.0	45.0	34.0	37.0	7.0	35.0	32.0	26.5	49.0	27.0	62.5	17.0	33.0	47.0	24.0	25.0	40.0	33.4	64.1
4	4.75	32.5	43.0	56.5	39.0	45.5	11.0	44.0	42.0	27.0	55.5	37.0	74.0	22.5	43.0	56.0	29.0	35.0	47.0	41.1	78.9
3/8	9.5	47.0	60.0	73.0	50.0	60.5	20.0	65.0	60.0	29.0	74.0	52.0	80.5	37.0	56.0	70.5	41.0	49.0	60.0	54.7	100.0
1/2	12.7	56.5	68.5	80.0	56.0	67.0	27.0	75.5	70.0	30.0	83.0	59.5	84.0	45.0	62.0	77.0	49.0	56.0	68.0	61.9	100.0
3/4	19	69.0	77.0	86.0	67.0	77.0	39.0	90.0	81.0	33.0	92.0	72.5	88.0	66.0	69.5	86.0	61.0	68.0	81.5	72.4	100.0
1	25	77.0	83.0	90.0	75.0	85.0	50.0	95.0	87.0	36.5	98.0	85.0	95.0	76.0	75.0	91.0	69.0	78.5	88.5	79.7	100.0
1-1/2	37.5	91.0	93.0	92.0	86.0	95.5	66.5	95.5	94.0	48.5	100.0	91.0	95.0	81.0	83.0	99.0	83.0	88.0	96.0	87.7	100.0
2	50	97.0	97.0	93.0	93.5	100.0	69.0	100.0	100.0	58.0	100.0	100.0	95.0	92.0	88.0	100.0	88.5	92.0	100.0	92.4	100.0
2-1/2	62.5													100.0	100.0	100.0	95.0			98.8	100.0
3	75	100.0	100.0	100.0	100.0	100.0	78.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	100.0
																			D50 Size (mm) =	7.86	0.41
																			Avg Subbasin SDR =		0.52





● LETTERED DATA POINTS FROM TABLE 26 AND "SEDIMENT DEPOSITION IN U.S. RESERVOIRS SUMMARY OF DATA THROUGH 1980", USDA, ARS, 1980.

LAS VEGAS WASH AND TRIBUTARIES, NV
FLAMINGO AND TROPICANA WASHES

COMPARISON OF AVERAGE ANNUAL SEDIMENT YIELD

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 39

SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

SCOPE

Black & Veatch obtained as-built information on the SVE diversion channel and berm from the CCRFCD. This design and construction information was reviewed for structural compliance with the National Flood Insurance Program (NFIP 44CFR 65.10). The influence of the berm and channel on existing downstream flood zones was also verified against the as-built information.

SOUTHERN VISTA ESTATES SITE AND DRAINAGE INFORMATION

Southern Vista Estates includes a 35-acre single family resident (SFR) development and a 15-acre condominium site. The north boundary of the SFR property is adjacent and parallel to the UFWDB discharge channel. The condominium property is south of the SFR development. Both SVE properties are located in the path of drainage basins unaffected by the UFWDB.

In November 1992, Engineers and Surveyors Inc. (ESI) prepared a technical drainage study for the Clark County Department of Public Works. (The drainage study is included in Volume 1 of this submittal.) ESI identified a 520-acre offsite drainage area, composed of five basins, which impacted the SVE development but were not included in the UFWDB watershed. According to the HEC-1 model presented in the study, the total peak discharge from the five offsite drainage basins during a 100-year storm event is 688 cfs. ESI analyzed the impact on the UFWDB stage and storage capacity if the 688 cfs was diverted to the basin. Their findings, based on the original UFWDB 100-year pool elevation of 2469.6 feet and detained volume of 880 acre-feet, elevated the peak stage to 2470.3 feet and increased the basin volume by 63 acre-feet. The diverted flows increased the impoundment area by approximately five acres. This analysis conservatively assumed that two storms would be centered over both the UFWDB and SVE watersheds simultaneously.

As proposed in the drainage study, a diversion berm and channel was constructed to "extend" the south arm of the UFWDB embankment and divert stormwater runoff from the five offsite drainage basins into the UFWDB. The SVE project consisted of approximately 1100 feet of earthen berm and 1630 feet of trapezoidal earthen channel.

The diversion berm begins at Station 1+70 and is transformed into the diversion channel at Station 12+50. According to ESI's drainage study, three offsite basins (OFF1, OFF2, and OFF3) contribute a peak runoff of 491 cfs to the berm between Stations 1+70 and 6+00 during the 100-year event. An additional 164 cfs from offsite basin OFF4 reaches the berm between Stations 6+00 and 12+50. Runoff from OFF5, 38 cfs, reaches the channel near Station 26+00.

BERM ANALYSIS

The berm was analyzed to verify adequate capacity for conveying the stormwater runoff generated by the SVE offsite basins. The results were compared to the National Flood Insurance Program (NFIP 44CFR 65.10) requirements and CCRFCD *Hydrologic Criteria and Drainage Design Manual* guidelines.

Freeboard Requirements

According to NFIP 44CFR 65.10, the minimum freeboard requirement for riverine levees is three feet above the base flood water surface elevation. However, the upstream end of the levee (Station 1+70) is required to have an additional six inches of freeboard, for a total of 3.5 feet, and then taper to the minimum at the downstream end (Station 12+50). The NFIP minimum freeboard requirements may be reduced to two feet if adequate protection can be provided with the lesser freeboard. The local requirements established by CCRFCD require a minimum freeboard of one foot for a berm or channel.

Berm Performance

Cross sections were taken every 50 feet along the length of the berm and the flow area was calculated to within two feet of the top of the berm. This calculation provided the flow capacity with two feet of freeboard, the minimum allowed by NFIP 44CFR 65.10. To determine the available freeboard for the given flow (491 cfs between Stations 1+70 and 6+00 and 688 cfs from Stations 6+00 to 12+00), a "Depth vs Capacity" curve was plotted and the desired value was interpolated from the graph. The average freeboard for the berm was approximately 2.5 feet; the minimum freeboard provided was approximately 1.8 feet at Station 3+00. The flowline at the berm has a slope of 1.35 percent. To determine the berm capacity, Manning's Equation was applied using an "n" value of 0.032.

ESI based their design of the diversion berm and channel on the CCRFCD guidelines which require a minimum freeboard of one foot. This is considered adequate protection for this berm because the contributing watershed is finite, easily defined, and predictable. Cemented, highly stable soils were exposed in the beds of the existing washes prior to construction of the berm. This signifies that sediment accumulation at the berm would be negligible. In addition, the berm nearly parallels the natural channels at the point of interest. The Depth vs Capacity curves indicate that capacity increases greatly in the top two to three feet of berm height. This increase is typically at least six times the required flow capacity.

CHANNEL ANALYSIS

The channel cross section varies along its 1630-foot alignment, and three riprap-lined drop structures make up the grade differential between the existing ground and the channel flowline. The SVE channel was analyzed to verify adequate capacity to convey the entire 688 cfs generated in the offsite drainage basins. The following table lists the channel characteristics and capacity within the two reaches. Manning's Equation was applied using an "n" value of .035 for each calculation. The flow regime in both reaches is subcritical.

CHANNEL REACH CHARACTERISTICS (Q = 688 cfs)		
STATION	13+13.38 to 21+00.00	21+00.00 to 28+00.00
Slope (%)	0.30	0.30
Bottom Width	10'	20'
Bank Slope	2 : 1	2 : 1
Bank Height	7'	5' East, 4' West
Available Freeboard	1.13'	.42' East, -0.58' West
Velocity	5.39 fps	5.15 fps

According to the results obtained from Manning's equation, the downstream channel reach has inadequate freeboard. The east, or right, bank of the channel provides five inches of freeboard

under the peak flow conditions. The freeboard results published in the ESI drainage study indicate that the minimum freeboard provided on the east bank was 1.26 feet in this reach of the channel. The reason for the difference in freeboard allowances is that, according to the ESI's HEC-2 model input, the channel was analyzed for 491 cfs. This lower flow corresponds to the peak runoff from the three offsite basins which impact the upstream end of the berm. However, ESI's report indicated that the channel would be impacted by the peak runoff of 688 cfs based on the HEC-1 model output presented in the drainage study. The study does not explain the reason for using the lower flowrate in the HEC-2 program.

The berm and channel have the capacity to convey 688 cfs without overtopping the east banks and impacting the downstream development. Although the berm was analyzed for a flow of 491 cfs from Station 1+70 to Station 6+00, it will maintain a freeboard of at least one foot for a flow of 688 cfs along that reach. The peak flow of 688 cfs will exceed the west channel bank between Stations 21+00 and 28+00, but the overflow will be directed toward the UFWDB.

CONCLUSION

The SVE diversion berm and channel is a local drainage facility designed to divert flows from a small watershed into the UFWDB, a regional flood control facility. The SVE project was constructed to extend the south arm of the UFWDB and protect the Southern Vista Estates from offsite drainage. Although the diversion berm does not maintain the minimum freeboard requirements established by the NFIP 44CFR 65.10 for a short reach, the berm was considered adequate to mitigate the flood hazard from this finite and predictable watershed as it affects downstream areas. The minimum available freeboard on the berm is approximately 1.8 feet at Station 3+00 for a flow of 491 cfs; the average available freeboard along the berm is 2.5 feet. The downstream channel has adequate capacity to convey the Base Flood Event (688 cfs) to the UFWDB. The upstream reach of the channel between Stations 12+00 and 21+00 has an available freeboard of just over one foot. The minimum available freeboard for a flow of 688 cfs in the channel is five inches from Station 21+00 to 28+00.

REFERENCES

1. Clark County Regional Flood Control District (1990). "Hydrologic Criteria and Drainage Design Manual," Clark County, Nevada.

2. Federal Emergency Management Agency. "National Flood Insurance Program (Regulations for Floodplain Management and Flood Hazard Insurance)," Revised October 1, 1990.

3. Engineers and Surveyors Inc. (ESI). "Technical Drainage Study for the Southern Vista Temporary Drainage Channel," November 1992, Las Vegas, Nevada.

4. Landmark Engineering. "Drainage Study Southern Vista Estates," July 1992, Las Vegas, Nevada.

Average Freeboard Along Berm

Station	Freeboard (ft)	Flow (cfs)
170	2.14	491
200	1.98	491
250	1.93	491
300	1.83	491
350	2.22	491
400	2.10	491
450	1.96	491
500	2.06	491
550	2.52	491
600	3.11	688
650	3.86	688
700	4.07	688
750	3.07	688
800	3.05	688
850	2.22	688
900	1.88	688
950	2.35	688
1000	2.43	688
1050	2.28	688
1100	2.14	688
1150	2.54	688
1200	3.10	688
Average Freeboard =	**2.49**	**ft**

LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/20/95

Average Slope = 0.015
Mannings n = 0.035

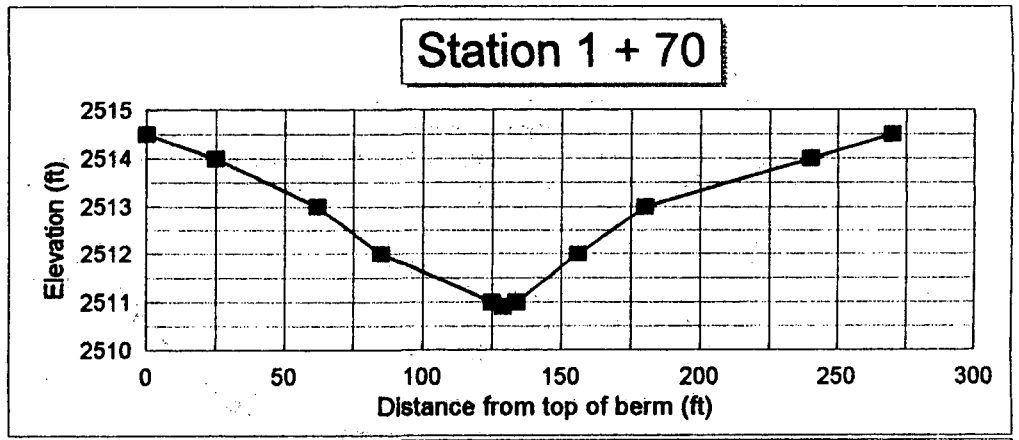
Freeboard min = 2 ft

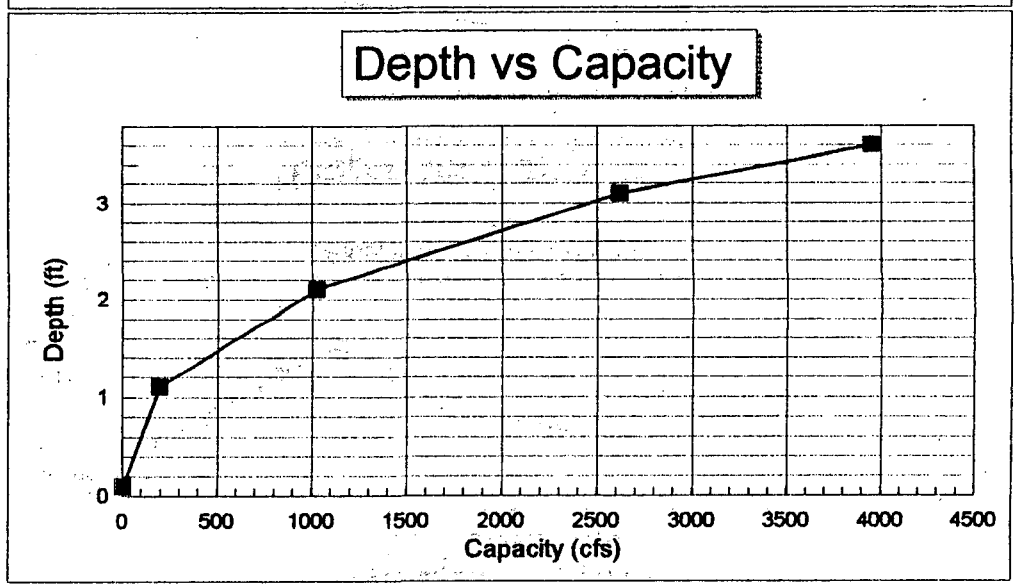
Station	Distance	Elevation
1+70	0	2514.5
	25	2514
	62	2513
	85	2512
	125	2511
	129	2510.9
	134	2511
	156	2512
	180	2513
	240	2514
	270	2514.5

For fb = 2', Q cap = 515.16 cfs
Depth Max = 1.6 ft
Max WSEL = 2512.5
Dist. berm = 73.5
Dist. fan = 168
A(fb) = 41.375
Total A(fb) = 81.825
P(fb) = 23.521
Total P = 94.56
R = 0.87
S = 0.027

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
422.70	3.6	270.11	1.56	3950.28	0
301.45	3.1	215.10	1.40	2617.37	0.5
134.95	2.1	118.08	1.14	1022.76	1.5
40.45	1.1	71.04	0.57	192.67	2.5
0.45	0.1	9.00	0.05	0.42	3.5

For Q = 491 cfs
Depth = 1.46 ft (interpolated)
Available fb = 2.14 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

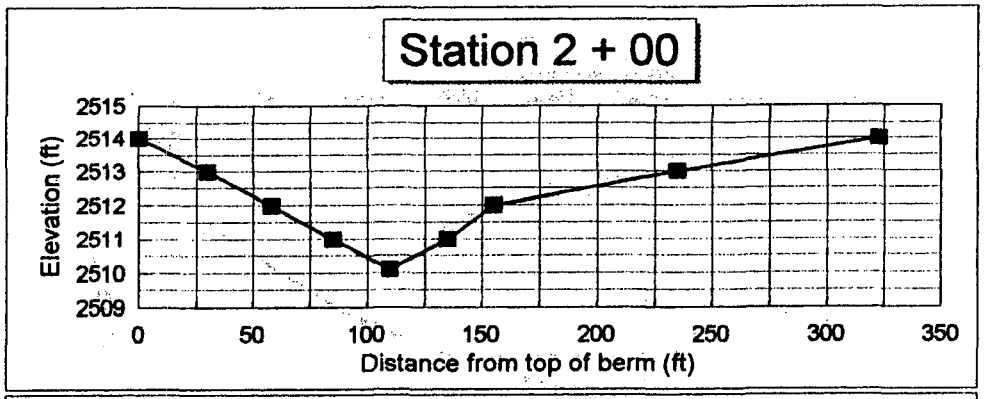
Average Slope = 0.015
Mannings n = 0.035

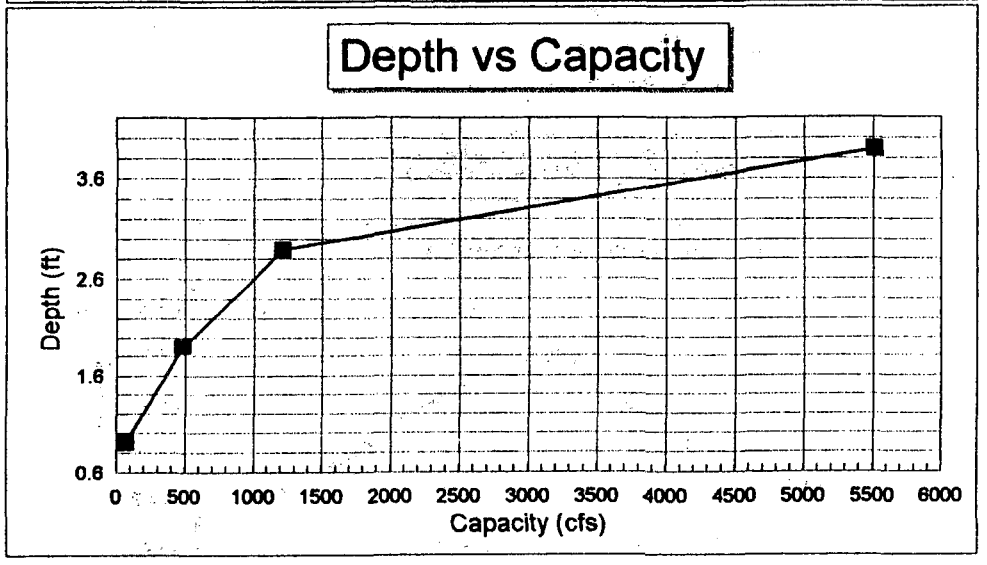
Freeboard min = 2 ft

For fb = 2', Q cap = 478.70 cfs

2 + 00	0	2514
	30	2513
	58	2512
	85	2511
	110	2510.1
	135	2511
	155	2512
	235	2513
	323	2514

Depth Max =	1.9 ft
Max WSEL =	2512
Dist. berm =	58
Dist. fan =	155
A(fb) =	73.5
Total A(fb) =	96
P(fb) =	47.043
Total P =	97.08
R =	0.99
S =	0.014





Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
437.25	3.9	110.07	3.97	5509.61	0
173.25	2.9	105.07	1.65	1214.75	1
96.00	1.9	97.08	0.99	478.70	2
22.50	0.9	50.03	0.45	66.35	3

For Q = 491 cfs
Depth = 1.92 ft (interpolated)
Available fb = 1.98 ft

LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

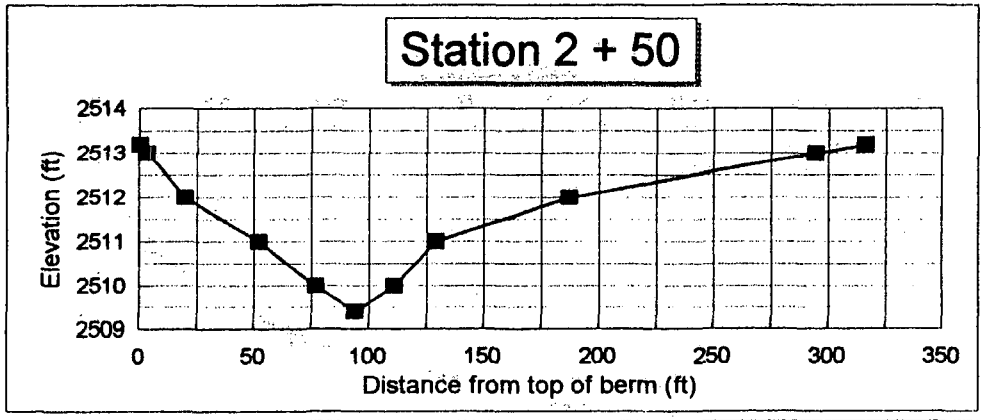
Freeboard min = 2 ft

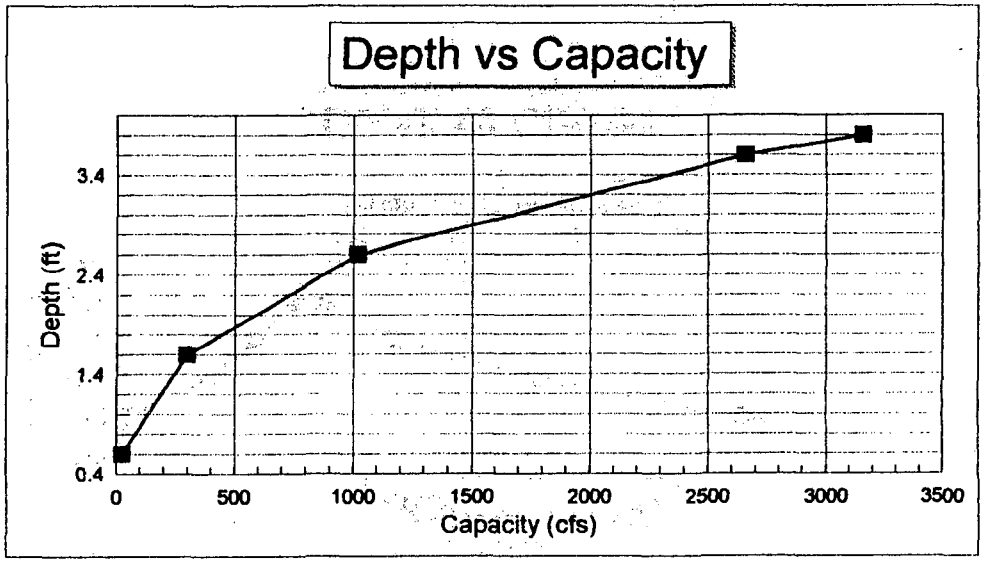
For fb = 2', Q cap = 380.10 cfs
Depth Max = 1.8 ft
Max WSEL = 2511.2
Dist. berm = 45.6
Dist. fan = 140.6
A(fb) = 17.2
Total A(fb) = 82.9
P(fb) = 18.005
Total P = 95.07
R = 0.87
S = 0.014

2 + 50	0	2513.2
	3	2513
	20	2512
	52	2511
	77	2510
	94	2509.4
	111	2510
	129	2511
	187	2512
	294.5	2513
	316	2513.2

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
477.70	3.8	316.13	1.51	3160.04	0
416.95	3.6	291.63	1.43	2658.29	0.2
187.70	2.6	167.09	1.12	1018.94	1.2
65.70	1.6	77.07	0.85	296.74	2.2
10.20	0.6	34.02	0.30	22.95	3.2

For Q = 491 cfs
Depth = 1.87 ft *(interpolated)*
Available fb = 1.93 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

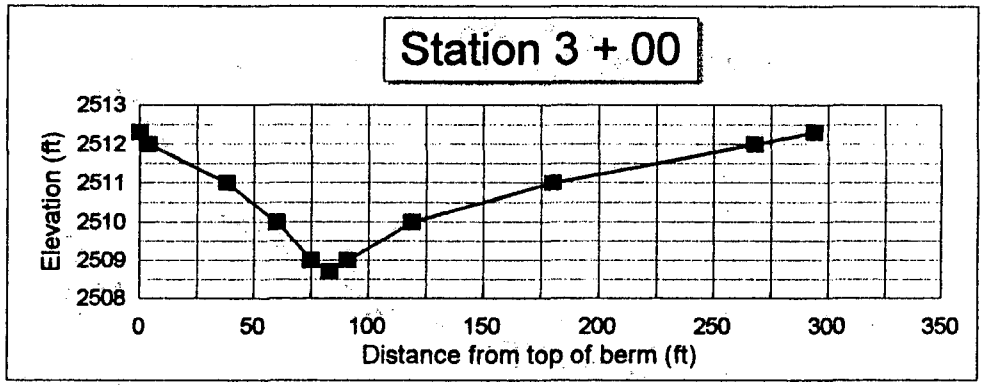
For fb = 2', Q cap = 298.69 cfs

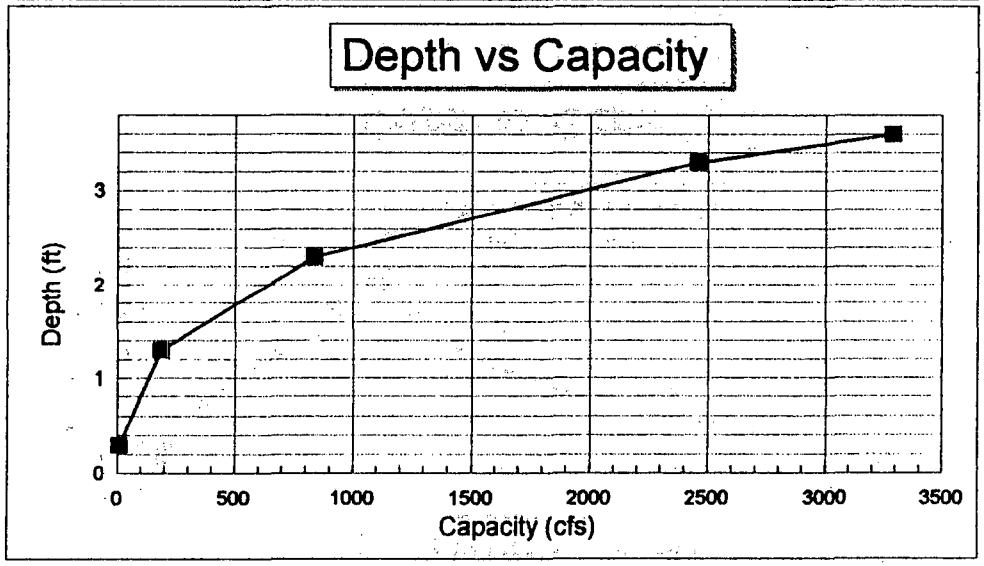
3 + 00	0	2512.3
	4	2512
	38	2511
	60	2510
	75	2509
	83	2508.7
	91	2509
	119	2510
	180	2511
	268	2512
	294	2512.3

Depth Max = 1.6 ft
Max WSEL = 2510.3
Dist. berm = 53.4
Dist. fan = 137.3
A(fb) = 21.435
Total A(fb) = 61.335
P(fb) = 24.909
Total P = 83.97
R = 0.73
S = 0.020

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
427.10	3.6	294.13	1.45	3288.46	0
343.40	3.3	264.11	1.30	2456.25	0.3
140.40	2.3	142.09	0.99	836.30	1.3
39.90	1.3	59.06	0.68	184.45	2.3
2.40	0.3	16.01	0.15	4.07	3.3

For Q = 491 cfs
Depth = 1.77 ft (interpolated)
Available fb = 1.83 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

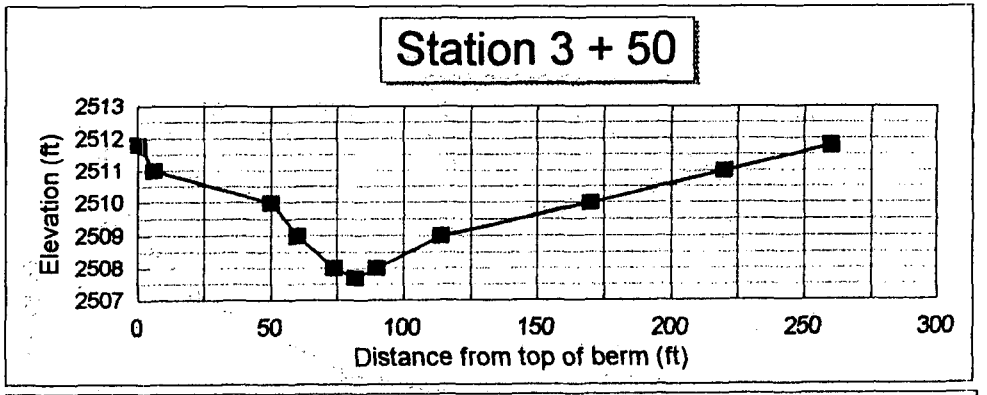
Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

For fb = 2', Q cap = 560.50 cfs

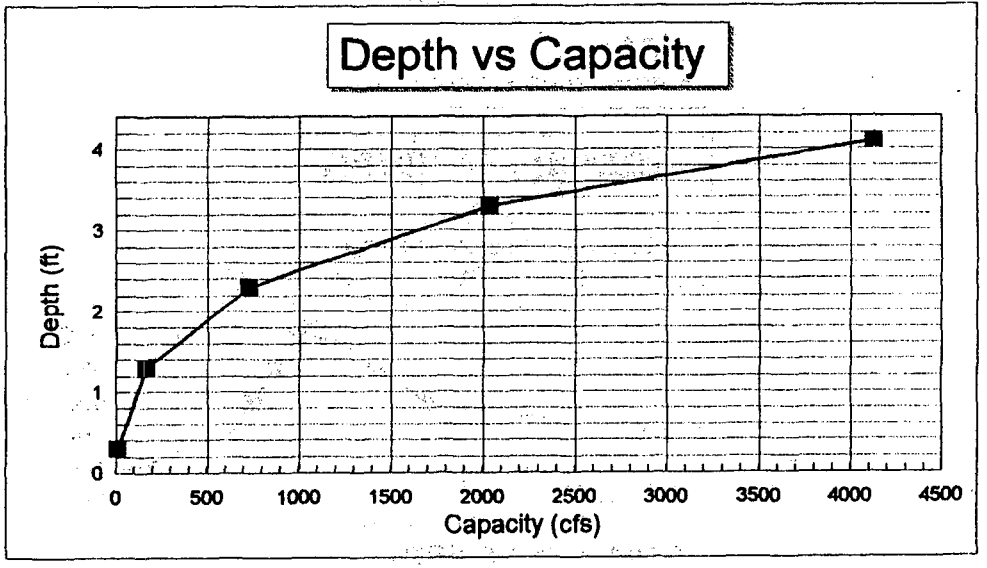
3 + 50	0	2511.8
	6	2511
	50	2510
	60	2509
	74	2508
	82	2507.7
	90	2508
	114	2509
	170	2510
	220	2511
	260	2511.8

Depth Max = 2.1 ft
Max WSEL = 2509.8
Dist. berm = 52
Dist. fan = 158.8
A(fb) = 64.32
Total A(fb) = 101.72
P(fb) = 52.847
Total P = 106.91
R = 0.95
S = 0.018



Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
481.00	4.1	260.21	1.85	4126.80	0
291.40	3.3	214.15	1.36	2038.26	0.8
124.40	2.3	120.13	1.04	725.32	1.8
37.40	1.3	54.07	0.69	166.63	2.8
2.40	0.3	16.01	0.15	3.86	3.8

For Q = 491 cfs
Depth = 1.88 ft (interpolated)
Available fb = 2.22 ft



LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

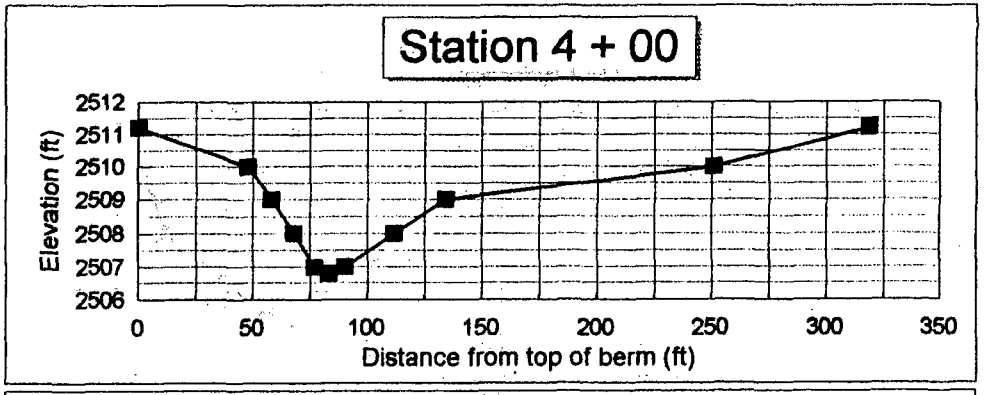
For fb = 2', Q cap = 528.58 cfs

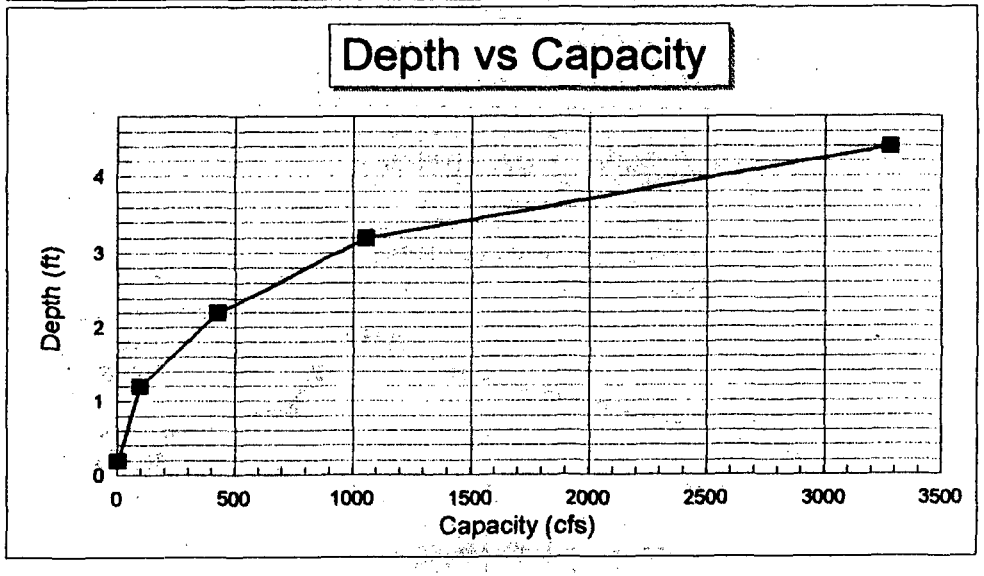
4+00	0	2511.2
	48	2510
	58	2509
	68	2508
	77	2507
	83	2506.8
	90	2507
	112	2508
	134	2509
	251	2510
	319	2511.2

Depth Max = 2.4 ft
Max WSEL = 2509.2
Dist. berm = 56
Dist. fan = 138.4
A(fb) = 15.84
Total A(fb) = 105.64
P(fb) = 6.41
Total P = 82.57
R = 1.28
S = 0.010

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
542.50	4.4	319.24	1.70	3280.01	0
229.30	3.2	203.21	1.13	1055.18	1.2
89.80	2.2	76.16	1.18	425.54	2.2
29.80	1.2	44.08	0.68	97.45	3.2
1.30	0.2	13.01	0.10	1.19	4.2

For Q = 491 cfs
Depth = 2.30 ft (interpolated)
Available fb = 2.10 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

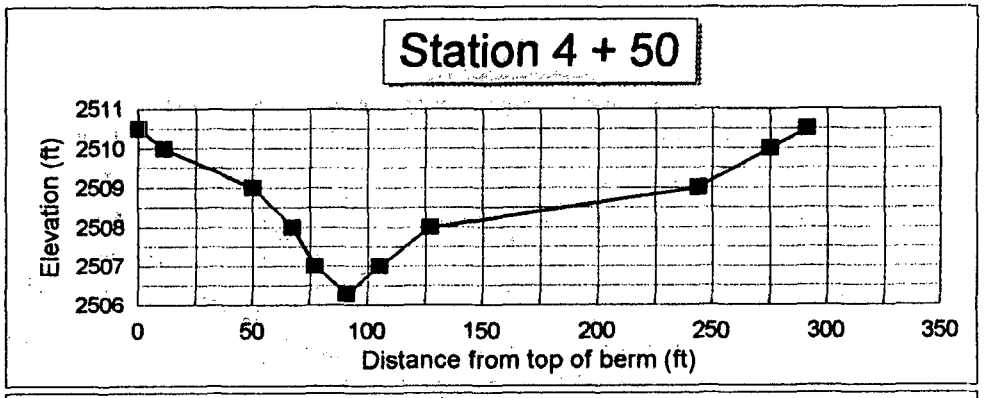
Freeboard min = 2 ft

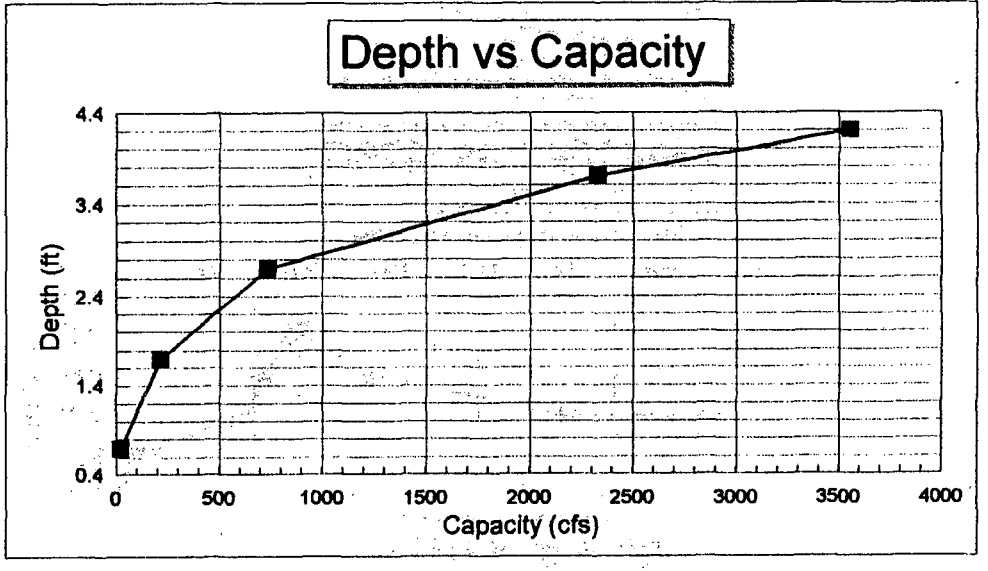
For fb = 2', Q cap = 365.12 cfs
Depth Max = 2.2 ft
Max WSEL = 2508.5
Dist. berm = 58.5
Dist. fan = 185.5
A(fb) = 46.75
Total A(fb) = 100.55
P(fb) = 67.02
Total P = 127.12
R = 0.79
S = 0.010

4+50	0	2510.5
	11	2510
	50	2509
	67	2508
	77	2507
	91	2506.3
	105	2507
	127	2508
	244	2509
	275	2510
	291	2510.5

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
548.55	4.2	291.19	1.88	3552.45	0
409.80	3.7	264.17	1.55	2331.57	0.5
180.80	2.7	194.14	0.93	732.04	1.5
53.80	1.7	60.11	0.90	212.15	2.5
9.80	0.7	28.03	0.35	20.65	3.5

For Q = 491 cfs
Depth = 2.24 ft (interpolated)
Available fb = 1.96 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

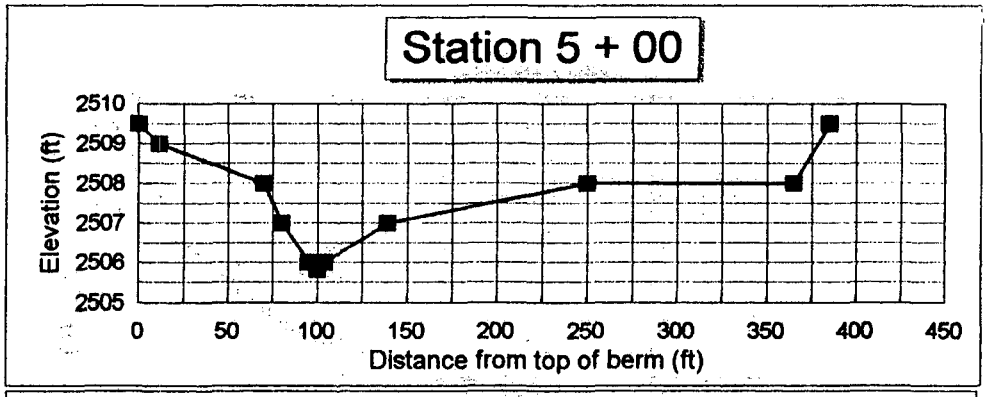
For fb = 2', Q cap = 398.52 cfs

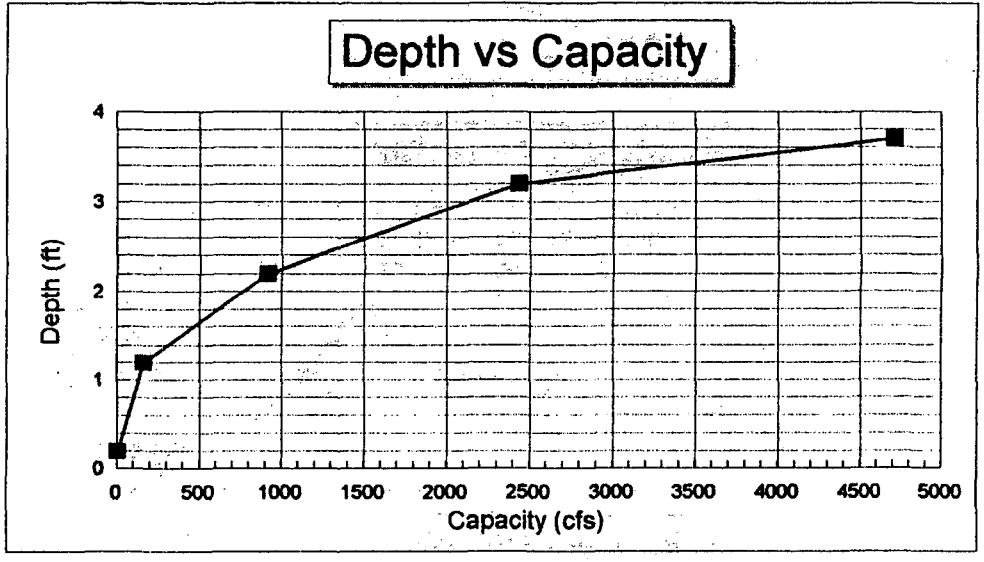
5 + 00	0	2509.5
	11	2509
	70	2508
	80	2507
	95	2506
	100	2505.8
	104	2506
	139	2507
	250	2508
	365	2508
	385	2509.5

Depth Max = 1.7 ft
Max WSEL = 2507.5
Dist. berm = 75
Dist. fan = 194.5
A(fb) = 44.625
Total A(fb) = 79.525
P(fb) = 60.53
Total P = 119.58
R = 0.67
S = 0.024

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
558.65	3.7	385.19	1.45	4708.06	0
363.90	3.2	354.12	1.03	2437.40	0.5
154.40	2.2	180.11	0.86	916.45	1.5
34.90	1.2	59.06	0.59	161.65	2.5
0.90	0.2	9.01	0.10	1.27	3.5

For Q = 491 cfs
Depth = 1.64 ft (interpolated)
Available fb = 2.06 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

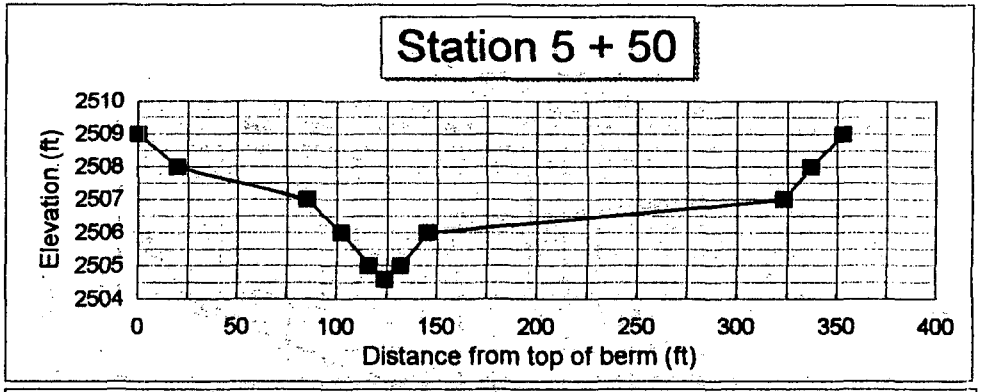
Freeboard min = 2 ft

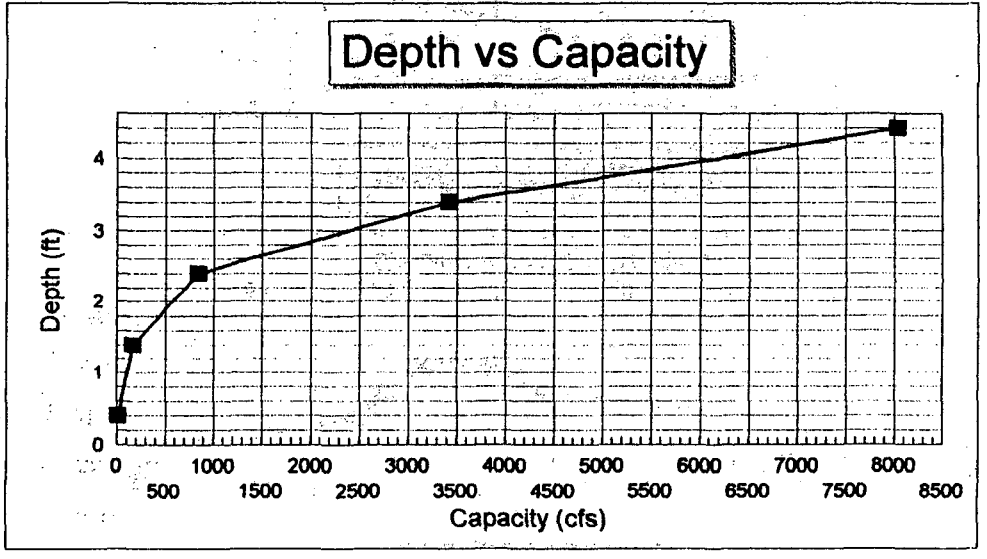
For fb = 2', Q cap = 841.09 cfs
Depth Max = 2.4 ft
Max WSEL = 2507
Dist. berm = 85
Dist. fan = 323
A(fb) = 140.5
Total A(fb) = 173.2
P(fb) = 195.03
Total P = 238.13
R = 0.73
S = 0.020

5+50	0	2509
	20	2508
	85	2507
	102	2506
	116	2505
	124	2504.6
	132	2505
	145	2506
	323	2507
	337	2508
	353	2509

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
785.70	4.4	353.23	2.22	8038.82	0
450.70	3.4	317.17	1.42	3420.46	1
173.20	2.4	238.13	0.73	841.09	2
32.70	1.4	43.09	0.76	163.34	3
3.20	0.4	16.02	0.20	6.57	4

For Q = 491 cfs
Depth = 1.88 ft (interpolated)
Available fb = 2.52 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

10/17/95

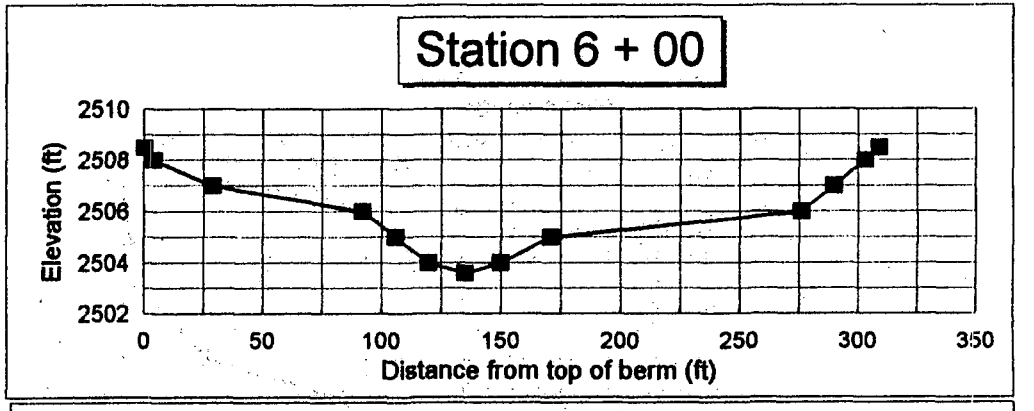
Average Slope = 0.015
Mannings n = 0.035

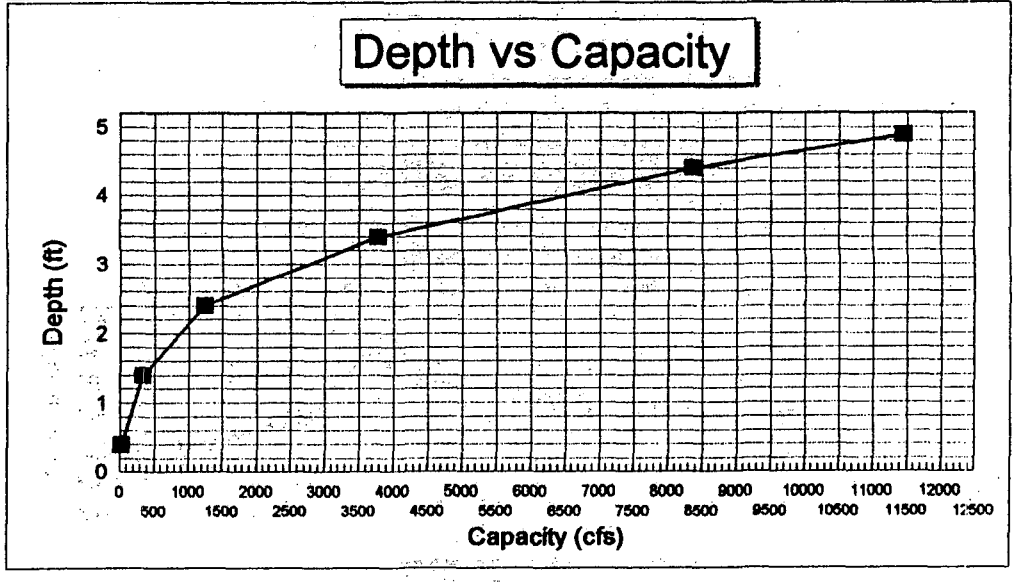
Freeboard min = 2 ft

For fb = 2', Q cap = 2312.58 cfs

6 + 00	0	2508.5
	4	2508
	29	2507
	92	2506
	106	2505
	120	2504
	135	2503.6
	150	2504
	171	2505
	276	2506
	290	2507
	303	2508
	309	2508.5

Depth Max = 2.9 ft
Max WSEL = 2506.5
Dist. berm = 60.5
Dist. fan = 283
A(fb) = 101.63
Total A(fb) = 279.62
P(fb) = 38.52
Total P = 222.63
R = 1.26
S = 0.028





Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
832.50	4.9	309.26	2.69	11445.03	0
680.50	4.4	299.21	2.27	8360.97	0.5
400.50	3.4	261.15	1.53	3783.87	1.5
178.00	2.4	184.11	0.97	1236.45	2.5
53.50	1.4	65.07	0.82	333.58	3.5
6.00	0.4	30.01	0.20	14.57	4.5

For Q = 688 cfs
Depth = 1.79 ft (interpolated)
Available fb = 3.11 ft

LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

10/17/95

Average Slope = 0.015
Mannings n = 0.035

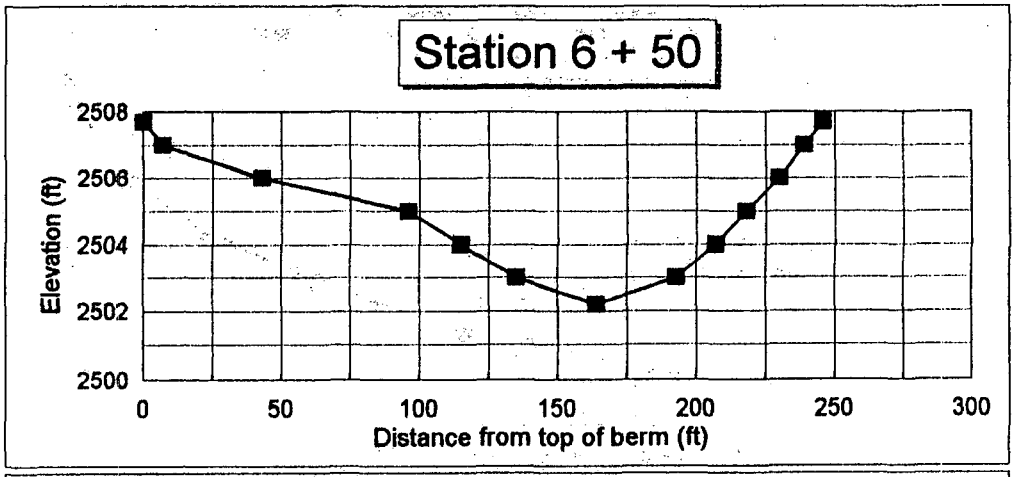
Freeboard min = 2 ft

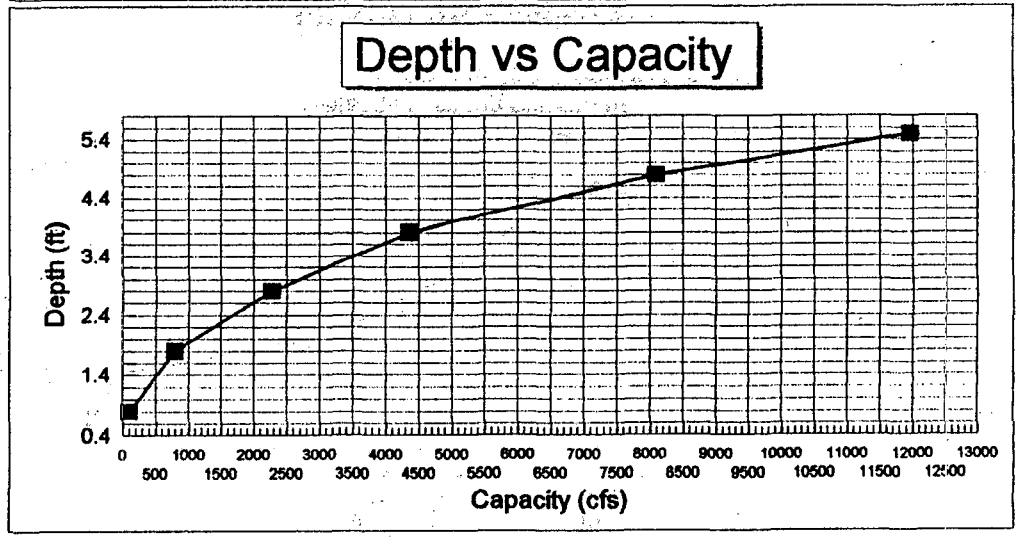
For fb = 2', Q cap = 3587.53 cfs
Depth Max = 3.5 ft
Max WSEL = 2505.7
Dist. berm = 58.9
Dist. fan = 226.4
A(fb) = 101.32
Total A(fb) = 306.52
P(fb) = 45.54
Total P = 167.69
R = 1.83
S = 0.034

6 + 50	0	2507.7
	7	2507
	43	2506
	96	2505
	115	2504
	135	2503
	164	2502.2
	193	2503
	207	2504
	218	2505
	230	2506
	239	2507
	246	2507.7

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
736.50	5.5	246.34	2.99	11966.02	0
569.20	4.8	232.27	2.45	8099.60	0.7
359.70	3.8	187.21	1.92	4352.23	1.7
205.20	2.8	122.15	1.68	2270.11	2.7
98.20	1.8	92.08	1.07	802.46	3.7
23.20	0.8	58.02	0.40	98.58	4.7

For Q = 688 cfs
Depth = 1.64 ft (interpolated)
Available fb = 3.86 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

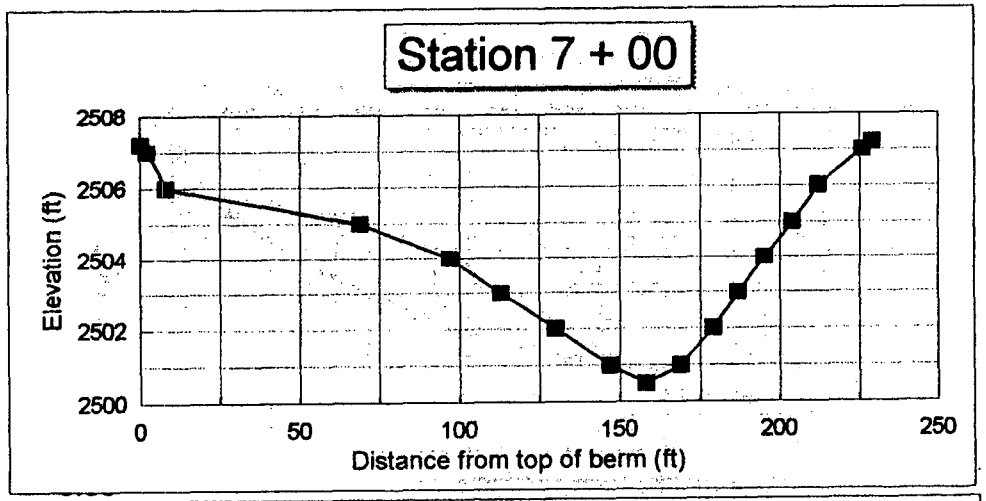
Freeboard min = 2 ft

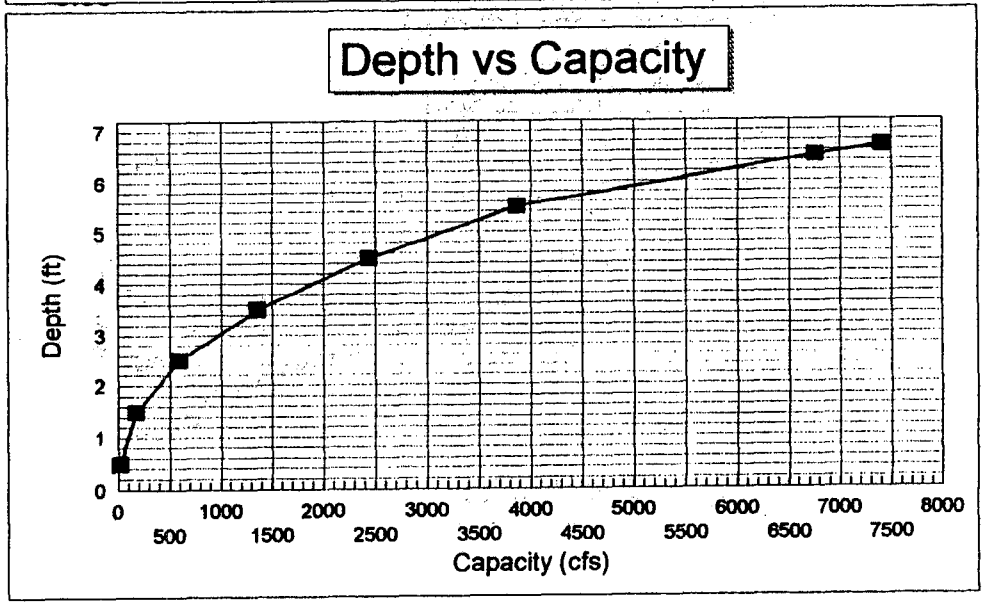
For fb = 2', Q cap = 2650.40 cfs
Depth Max = 4.7 ft
Max WSEL = 2505.2
Dist. berm = 56.8
Dist. fan = 205.6
A(fb) = 28.38
Total A(fb) = 333.38
P(fb) = 13.81
Total P = 149.17
R = 2.23
S = 0.012

7 + 00	0	2507.2
	2	2507
	8	2506
	69	2505
	97	2504
	113	2503
	130	2502
	147	2501
	158	2500.5
	169	2501
	179	2502
	187	2503
	195	2504
	204	2505
	212	2506
	226	2507
	229	2507.2

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
733.80	6.7	229.57	3.20	7405.70	0
688.50	6.5	224.55	3.07	6758.34	0.2
474.50	5.5	204.43	2.32	3868.75	1.2
305.00	4.5	135.36	2.25	2438.07	2.2
188.50	3.5	98.29	1.92	1353.31	3.2
102.50	2.5	74.19	1.38	591.34	4.2
41.00	1.5	49.10	0.83	169.09	5.2
5.50	0.5	22.02	0.25	10.14	6.2

For Q = 688 cfs
Depth = 2.63 ft (interpolated)
Available fb = 4.07 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

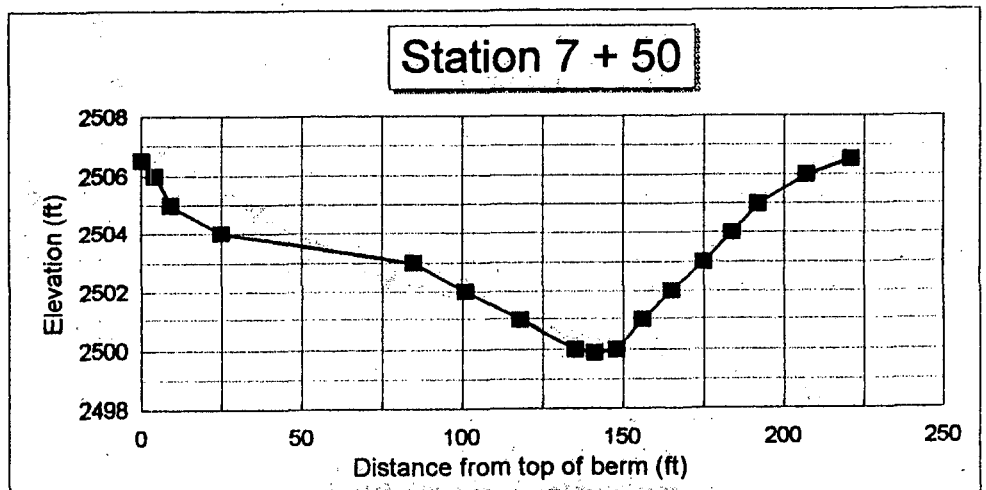
Freeboard min = 2 ft

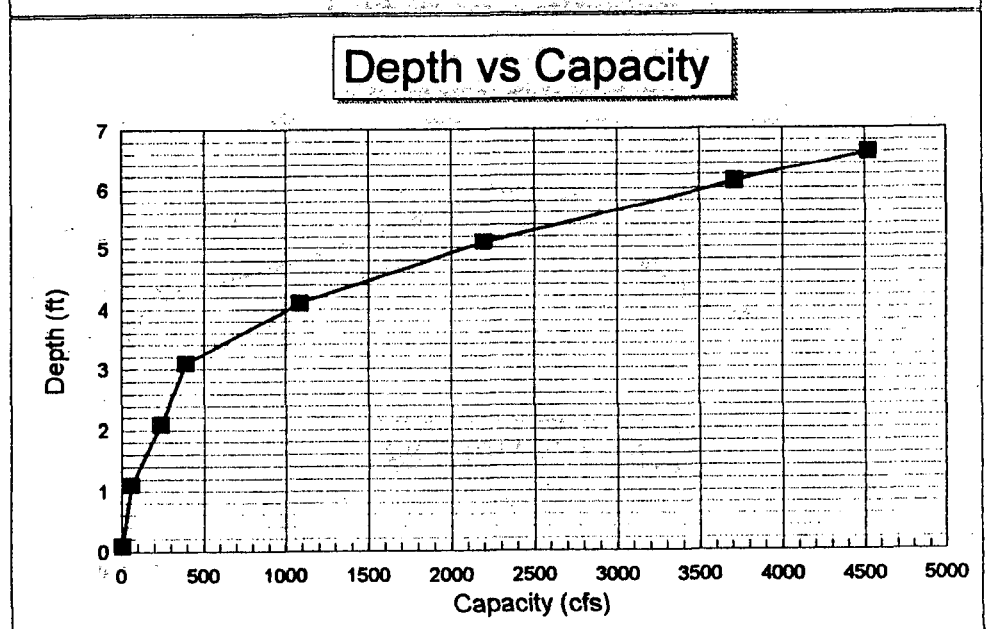
For fb = 2', Q cap = 1594.06 cfs
Depth Max = 4.6 ft
Max WSEL = 2504.5
Dist. berm = 17
Dist. fan = 188
A(fb) = 82.5
Total A(fb) = 361.15
P(fb) = 12.05
Total P = 171.37
R = 2.11
S = 0.004

7+50	0	2506.5
	4	2506
	9	2505
	25	2504
	85	2503
	101	2502
	118	2501
	135	2500
	141	2499.9
	148	2500
	156	2501
	165	2502
	175	2503
	184	2504
	192	2505
	207	2506
	221	2506.5

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
748.65	6.6	221.59	3.38	4526.34	0
642.65	6.1	203.55	3.16	3713.87	0.5
449.65	5.1	183.42	2.45	2195.23	1.5
278.65	4.1	159.32	1.75	1086.16	2.5
154.15	3.1	166.30	0.93	393.51	3.5
77.15	2.1	64.18	1.20	234.22	4.5
26.15	1.1	38.09	0.69	54.64	5.5
0.65	0.1	13.00	0.05	0.24	6.5

For Q = 688 cfs
Depth = 3.53 ft (interpolated)
Available fb = 3.07 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

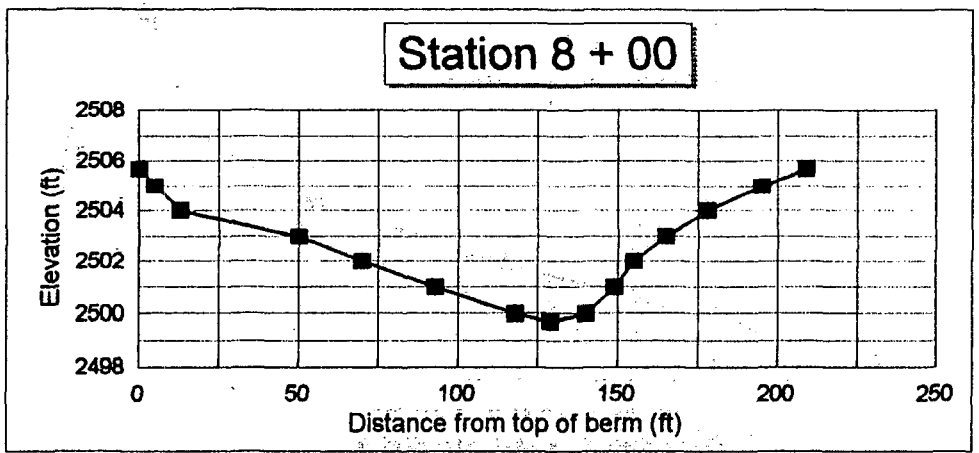
Freeboard min = 2 ft

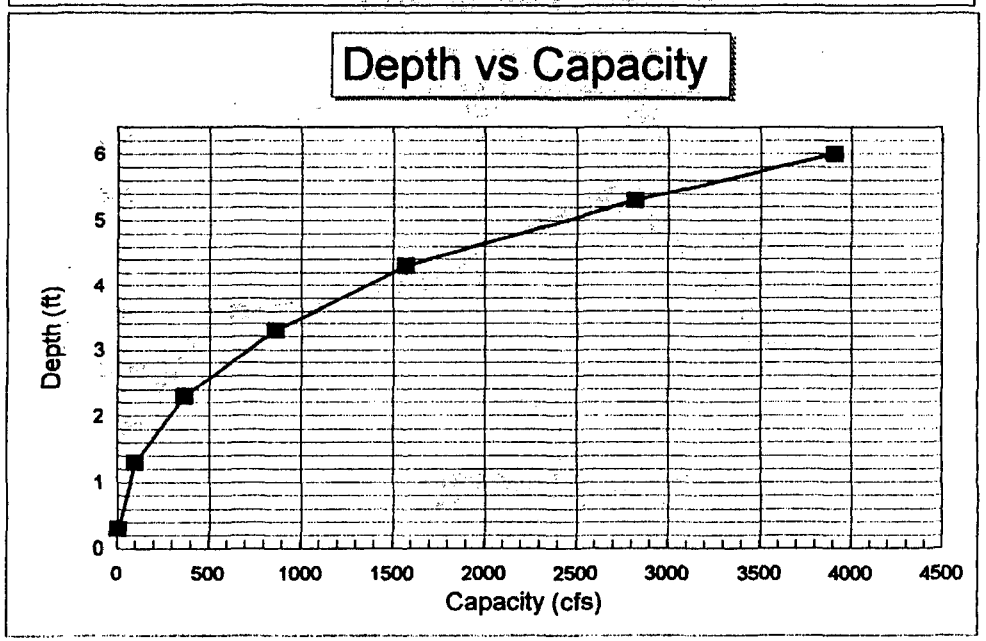
For fb = 2', Q cap = 1316.68 cfs
Depth Max = 4 ft
Max WSEL = 2503.7
Dist. berm = 24.1
Dist. fan = 174.1
A(fb) = 92.75
Total A(fb) = 305.55
P(fb) = 35.04
Total P = 150.30
R = 2.03
S = 0.004

8+00	0	2505.7
	5	2505
	13	2504
	50	2503
	70	2502
	93	2501
	118	2500
	129	2499.7
	140	2500
	149	2501
	155	2502
	165	2503
	178	2504
	195	2505
	209	2505.7

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
669.95	6	209.47	3.20	3905.11	0
530.30	5.3	190.41	2.79	2818.79	0.7
352.80	4.3	165.31	2.13	1570.32	1.7
212.80	3.3	115.26	1.85	859.95	2.7
112.80	2.3	85.19	1.32	365.24	3.7
42.30	1.3	56.08	0.75	94.11	4.7
3.30	0.3	22.01	0.15	2.50	5.7

For Q = 688 cfs
Depth = 2.95 ft (interpolated)
Available fb = 3.05 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

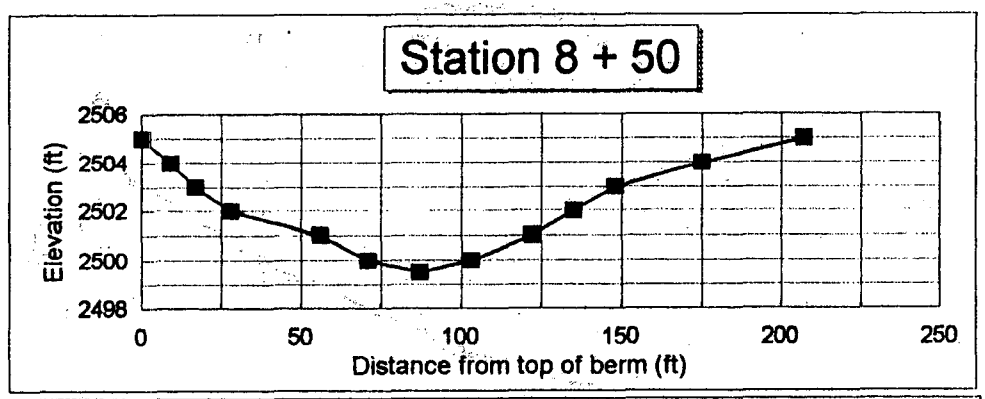
Freeboard min = 2 ft

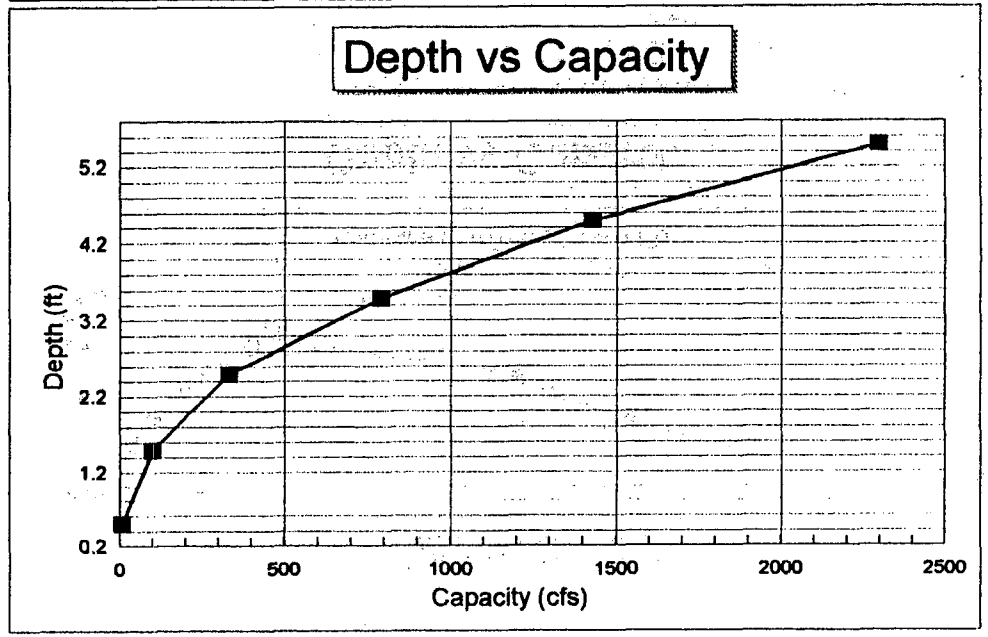
For fb = 2', Q cap = 791.33 cfs
Depth Max = 3.5 ft
Max WSEL = 2503
Dist. berm = 17
Dist. fan = 148
A(fb) = 119
Total A(fb) = 262.5
P(fb) = 24.08
Total P = 131.22
R = 2.00
S = 0.002

8 + 50	0	2505
	9	2504
	17	2503
	28	2502
	56	2501
	71	2500
	87	2499.5
	103	2500
	122	2501
	135	2502
	148	2503
	175	2504
	207	2505

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
597.50	5.5	207.37	2.88	2297.22	0
411.00	4.5	166.30	2.47	1426.53	1
262.50	3.5	131.22	2.00	791.33	2
143.50	2.5	107.13	1.34	331.09	3
57.00	1.5	66.08	0.86	98.08	4
8.00	0.5	32.02	0.25	6.03	5

For Q = 688 cfs
Depth = 3.28 ft (interpolated)
Available fb = 2.22 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

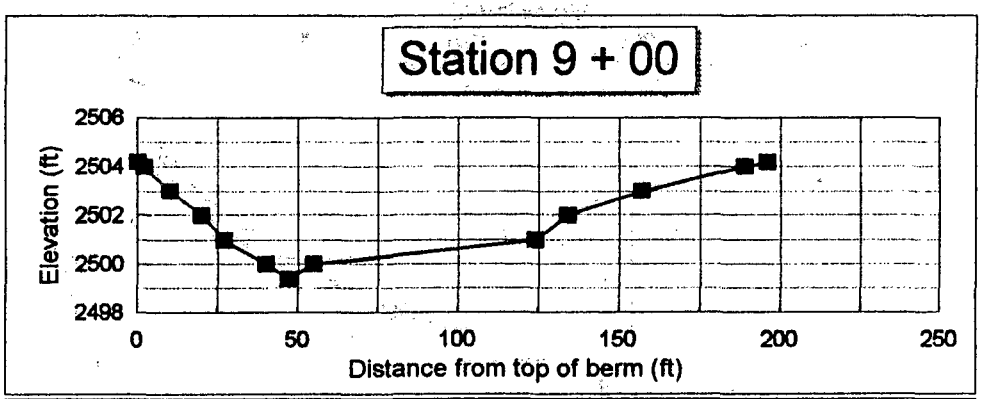
Freeboard min = 2 ft

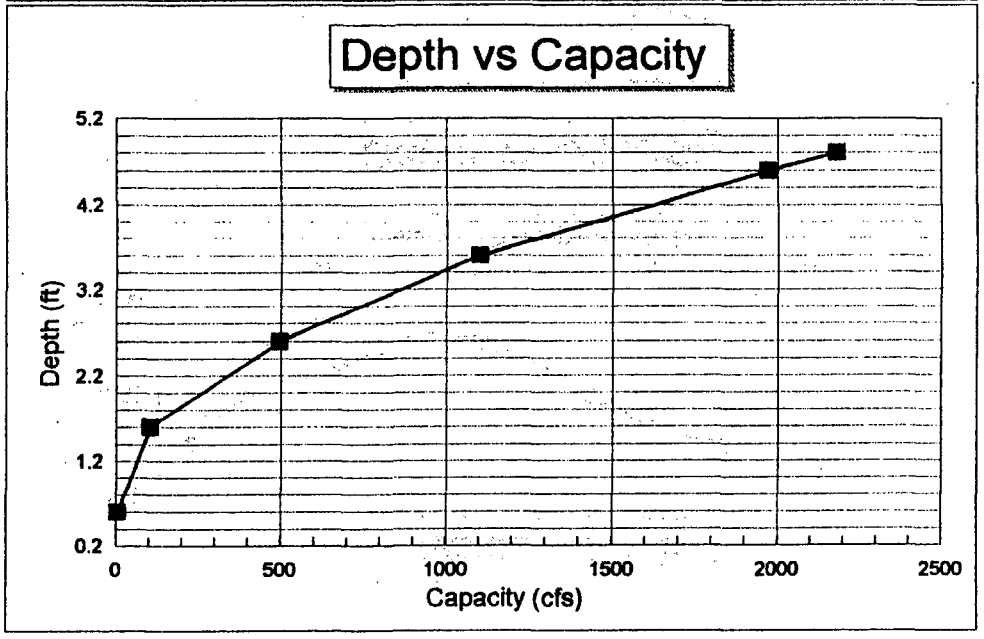
For fb = 2', Q cap = 594.65 cfs
Depth Max = 2.8 ft
Max WSEL = 2502.2
Dist. berm = 18
Dist. fan = 138.6
A(fb) = 23.46
Total A(fb) = 189.46
P(fb) = 6.61
Total P = 120.83
R = 1.57
S = 0.003

9 + 00	0	2504.2
	2	2504
	10	2503
	20	2502
	27	2501
	40	2500
	47	2499.4
	55	2500
	124	2501
	134	2502
	157	2503
	189	2504
	196	2504.2

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
501.80	4.8	196.38	2.56	2181.07	0
463.50	4.6	187.36	2.47	1971.53	0.2
296.50	3.6	147.29	2.01	1099.29	1.2
166.00	2.6	114.21	1.45	495.31	2.2
60.50	1.6	97.09	0.62	102.64	3.2
4.50	0.6	15.05	0.30	4.68	4.2

For Q = 688 cfs
Depth = 2.92 ft (interpolated)
Available fb = 1.88 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

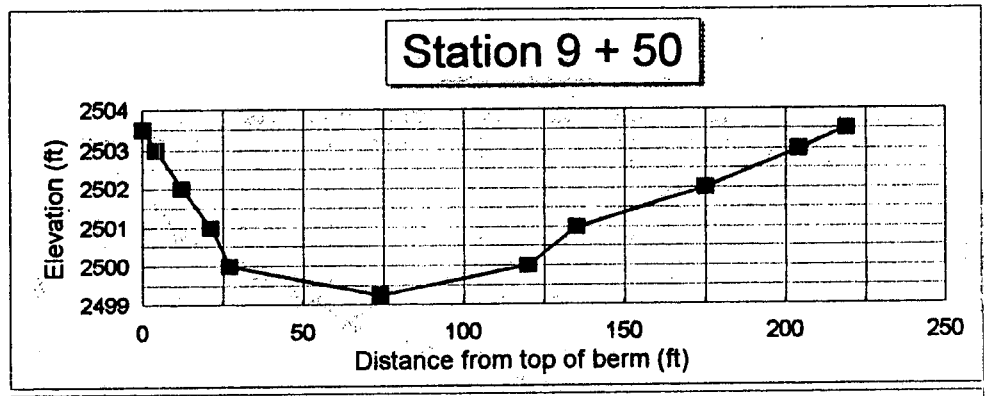
For fb = 2', Q cap = 918.30 cfs

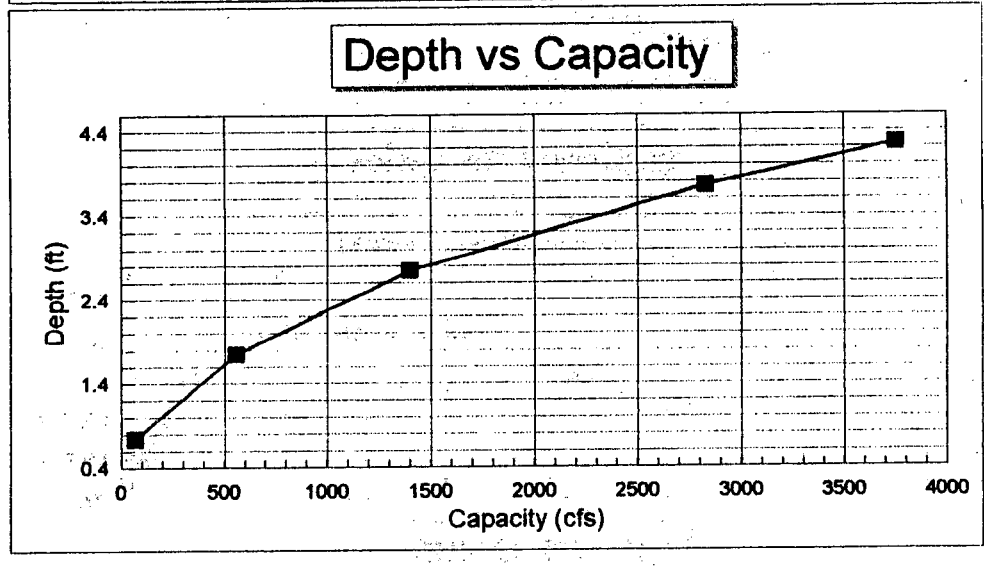
9 + 50	0	2503.5
	4	2503
	12	2502
	21	2501
	27	2500
	74	2499.25
	120	2500
	135	2501
	175	2502
	204	2503
	219	2503.5

Depth Max = 2.25 ft
Max WSEL = 2501.5
Dist. berm = 16.5
Dist. fan = 155
A(fb) = 63.125
Total A(fb) = 201.5
P(fb) = 24.534
Total P = 138.66
R = 1.45
S = 0.007

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
563.13	4.25	219.31	2.57	3750.84	0
458.38	3.75	200.28	2.29	2827.80	0.5
276.88	2.75	163.20	1.70	1399.05	1.5
138.38	1.75	114.13	1.21	558.90	2.5
34.88	0.75	93.01	0.37	64.42	3.5

For Q = 688 cfs
Depth = 1.90 ft (interpolated)
Available fb = 2.35 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

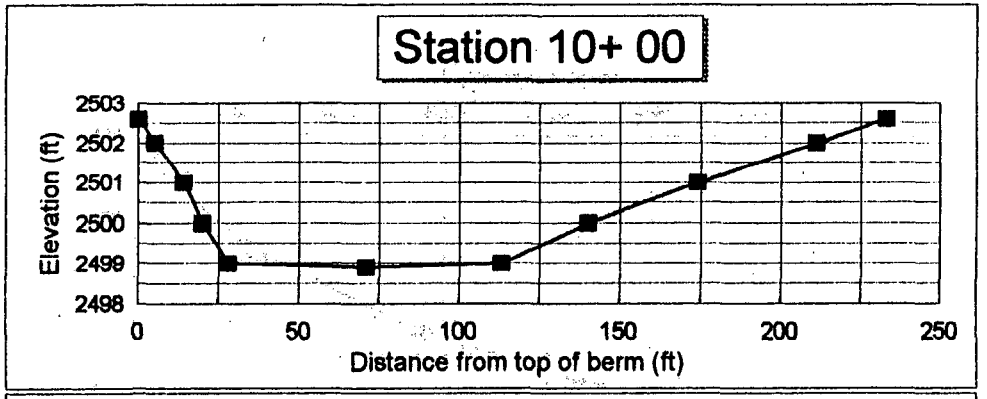
For fb = 2', Q cap = 1109.49 cfs

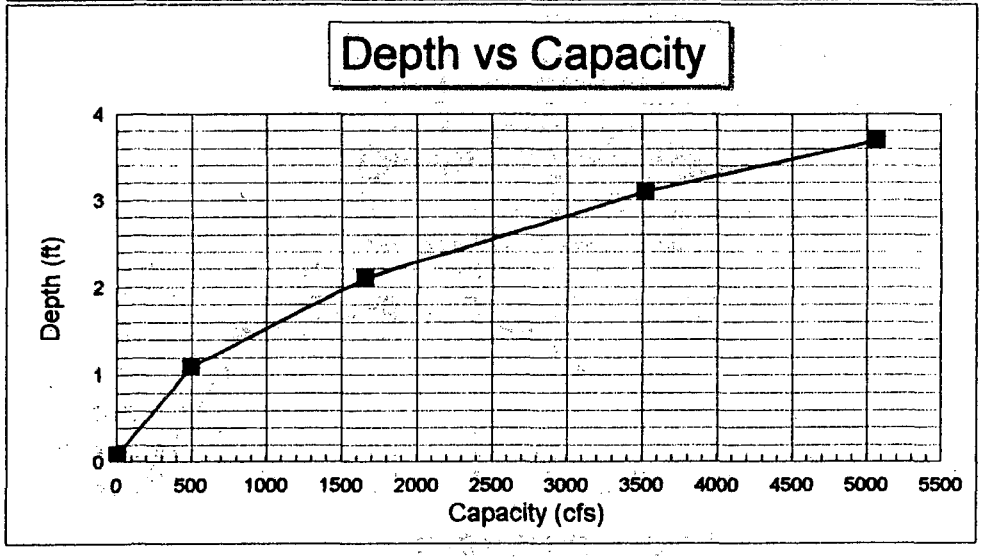
10 + 00	0	2502.6
	5	2502
	14	2501
	20	2500
	28	2499
	71	2498.9
	113	2499
	140	2500
	174	2501
	211	2502
	233	2502.6

Depth Max = 1.7 ft
Max WSEL = 2500.6
Dist. berm = 17.6
Dist. fan = 160.4
A(fb) = 78.84
Total A(fb) = 185.59
P(fb) = 22.883
Total P = 142.96
R = 1.30
S = 0.014

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
561.45	3.7	233.29	2.41	5065.25	0
429.75	3.1	206.25	2.08	3521.94	0.6
246.75	2.1	160.18	1.54	1653.38	1.6
106.75	1.1	120.08	0.89	495.81	2.6
4.25	0.1	85.00	0.05	2.90	3.6

For Q = 688 cfs
Depth = 1.27 ft (interpolated)
Available fb = 2.43 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

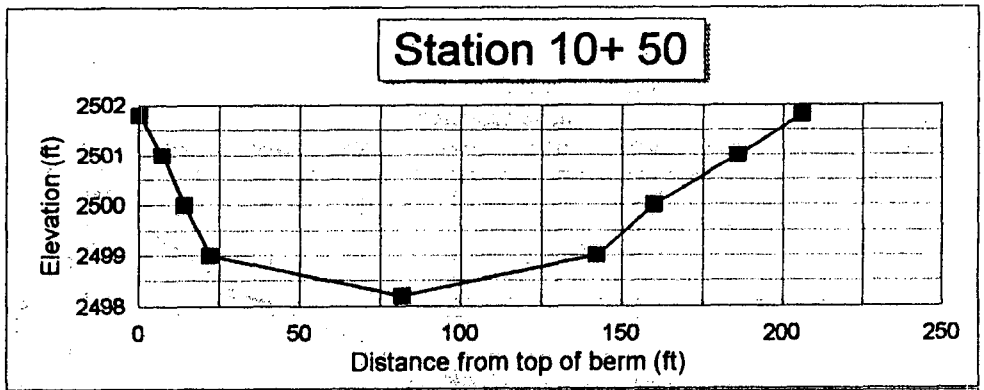
09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

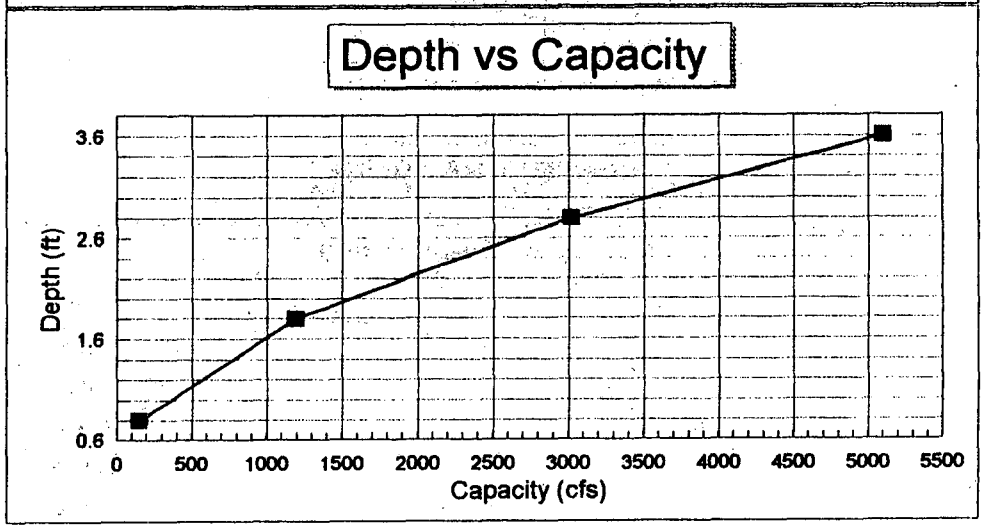
For fb = 2', Q cap = 913.99 cfs

10 + 50	0	2501.8	Depth Max = 1.6 ft
	7	2501	Max WSEL = 2499.8
	14	2500	Dist. berm = 15.6
	22	2499	Dist. fan = 156.4
	82	2498.2	A(fb) = 104.32
	142	2499	Total A(fb) = 152.32
	160	2500	P(fb) = 20.872
	186	2501	Total P = 140.88
	206	2501.8	R = 1.08
			S = 0.018



Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
497.50	3.6	206.25	2.41	5096.94	0
343.50	2.8	179.19	1.92	3019.40	0.8
181.00	1.8	146.10	1.24	1189.28	1.8
48.00	0.8	120.01	0.40	148.43	2.8

For Q = 688 cfs
Depth = 1.32 ft (interpolated)
Available fb = 2.28 ft



LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

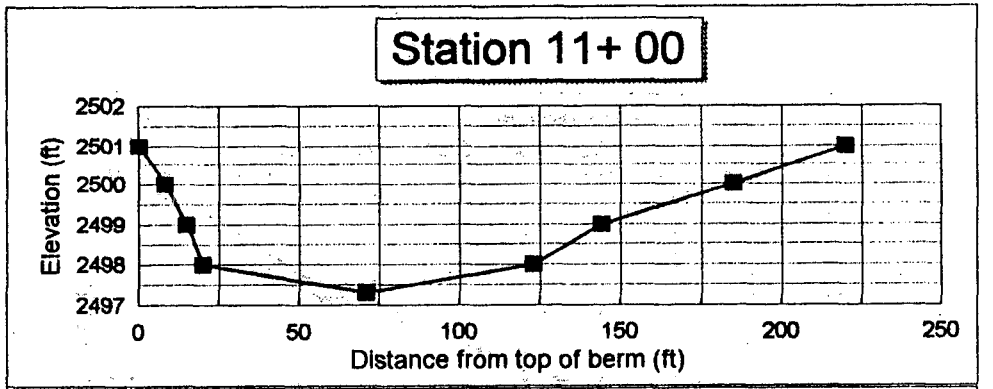
Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

For fb = 2', Q cap = 788.55 cfs

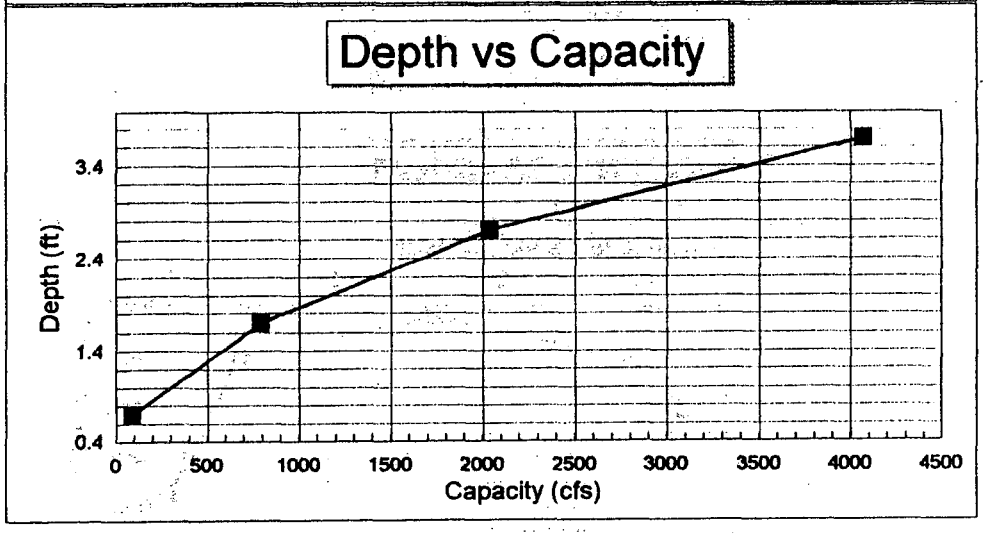
11 + 00	0	2501
	8	2500
	15	2499
	20	2498
	71	2497.3
	123	2498
	144	2499
	185	2500
	220	2501

Depth Max = 1.7 ft
Max WSEL = 2499
Dist. berm = 15
Dist. fan = 144
A(fb) = 116
Total A(fb) = 152.05
P(fb) = 26.123
Total P = 129.13
R = 1.18
S = 0.012



Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
503.55	3.7	220.29	2.29	4063.93	0
305.05	2.7	177.22	1.72	2037.79	1
152.05	1.7	129.13	1.18	788.55	2
36.05	0.7	103.01	0.35	83.27	3

For Q = 688 cfs
Depth = 1.56 ft (interpolated)
Available fb = 2.14 ft



LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

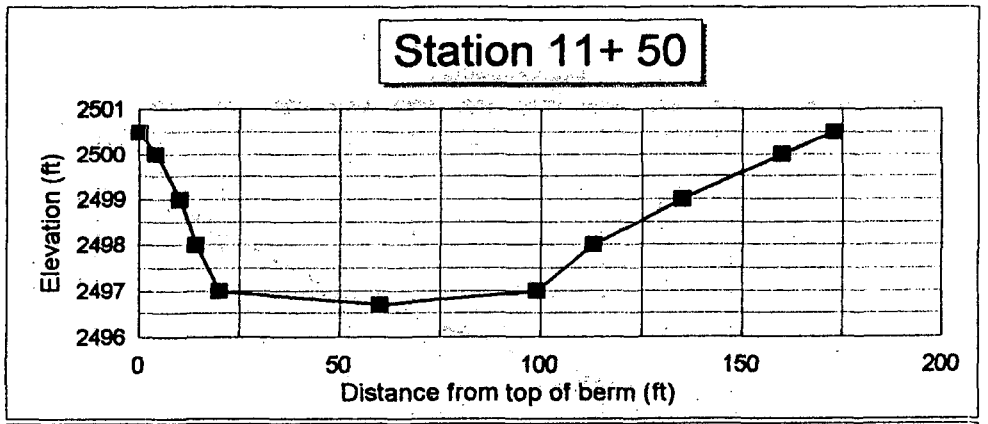
Freeboard min = 2 ft

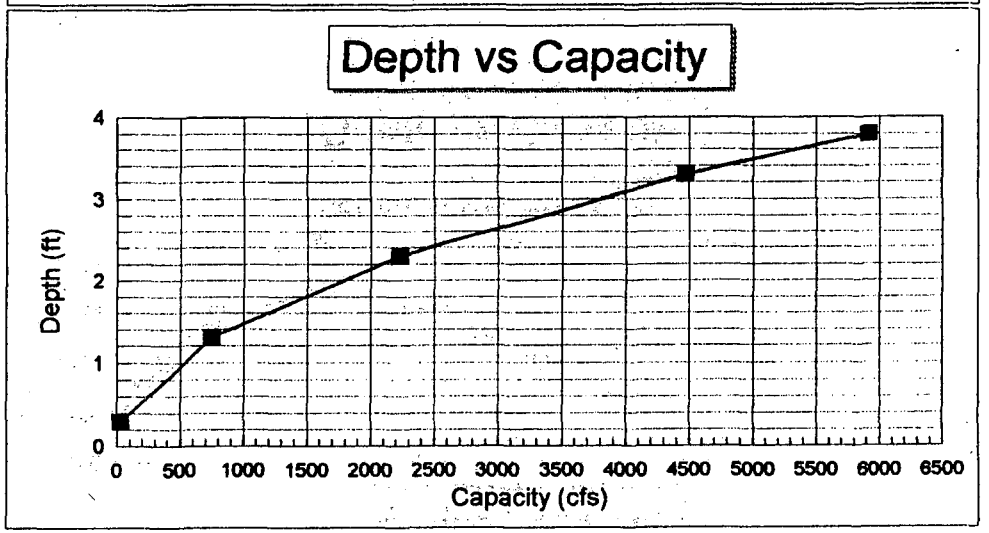
For fb = 2', Q cap = 1392.68 cfs
Depth Max = 1.8 ft
Max WSEL = 2498.5
Dist. berm = 12
Dist. fan = 124
A(fb) = 52.75
Total A(fb) = 153.6
P(fb) = 13.073
Total P = 112.19
R = 1.37
S = 0.030

11 + 50	0	2500.5
	4	2500
	10	2499
	14	2498
	20	2497
	60	2496.7
	99	2497
	113	2498
	135	2499
	160	2500
	173	2500.5

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
435.60	3.8	173.41	2.51	5919.36	0
353.35	3.3	156.37	2.26	4474.58	0.5
212.85	2.3	125.27	1.70	2228.83	1.5
100.85	1.3	99.12	1.02	750.23	2.5
11.85	0.3	79.00	0.15	24.60	3.5

For Q = 688 cfs
Depth = 1.26 ft (interpolated)
Available fb = 2.54 ft





LOMR

Capacity Behind Berm - Station 1+70 to Station 12+50

09/16/95

Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

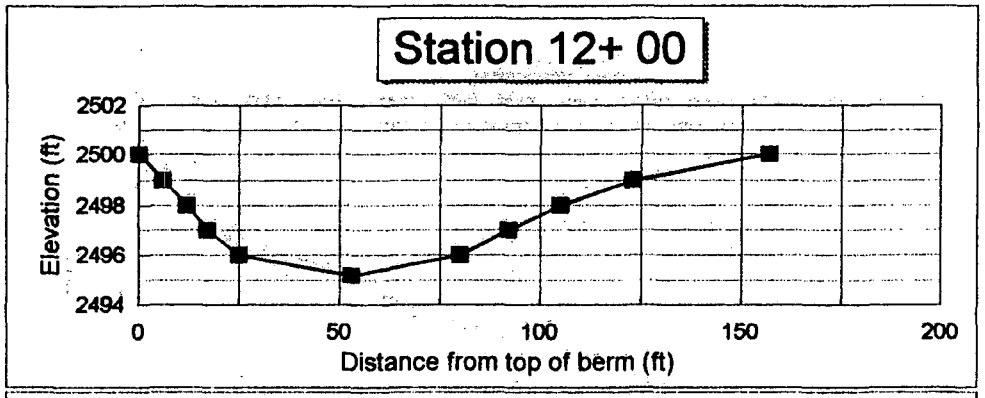
For fb = 2', Q cap = 2005.42 cfs

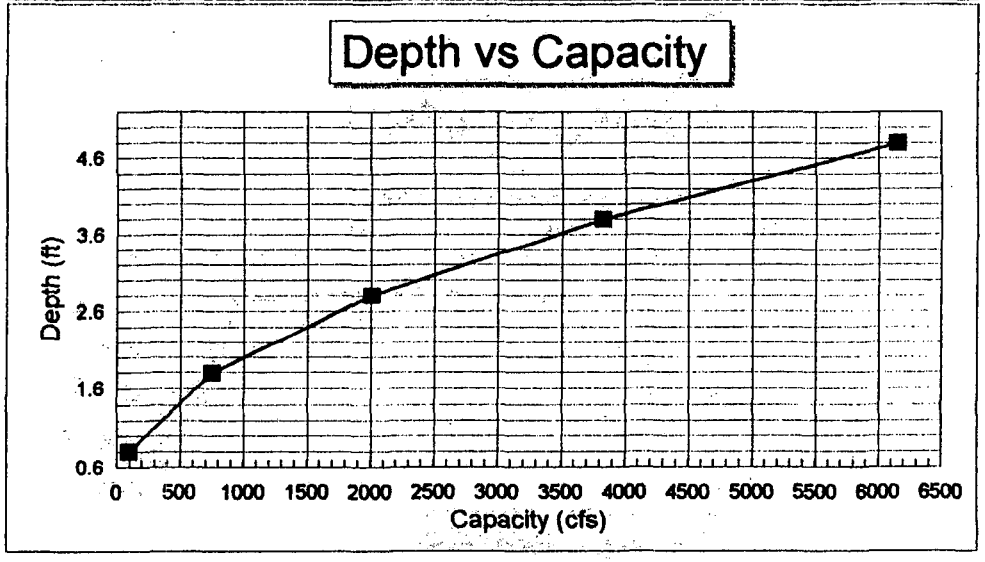
12 + 00	0	2500
	6	2499
	12	2498
	17	2497
	25	2496
	53	2495.2
	80	2496
	92	2497
	105	2498
	123	2499
	157	2500

Depth Max =	2.8 ft
Max WSEL =	2498
Dist. berm =	12
Dist. fan =	105
A(fb) =	84
Total A(fb) =	171
P(fb) =	18.137
Total P =	93.26
R =	1.83
S =	0.034

Area	Depth	Wetted Perimeter	Hydraulic Radius	Capacity	fb
413.00	4.8	157.47	2.62	6148.99	0
276.00	3.8	117.38	2.35	3820.80	1
171.00	2.8	93.26	1.83	2005.42	2
87.00	1.8	75.13	1.16	751.09	3
22.00	0.8	55.02	0.40	93.48	4

For Q = 688 cfs
Depth = 1.70 ft (interpolated)
Available fb = 3.10 ft





LOMR

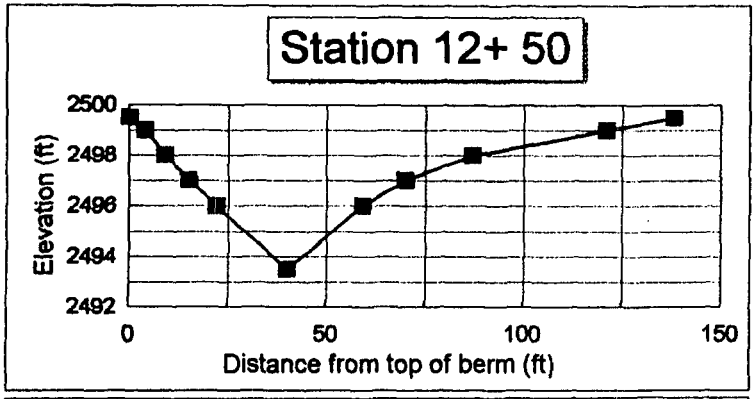
Capacity Behind Berm - Station 1+70 to Station 12+50

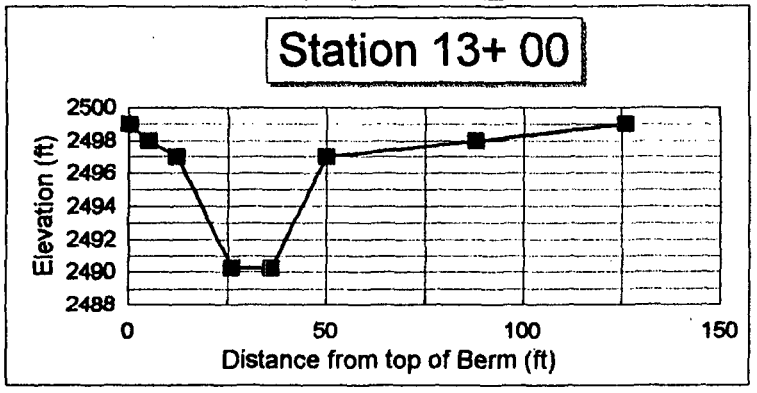
09/16/95

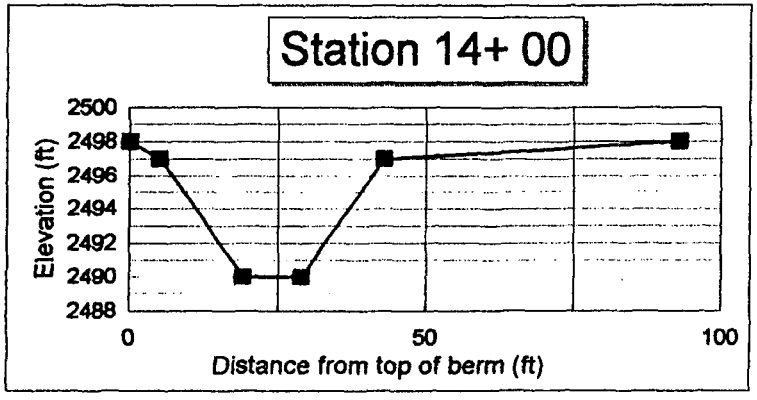
Average Slope = 0.015
Mannings n = 0.035

Freeboard min = 2 ft

12 + 50	0	2499.5
	4	2499
	9	2498
	15	2497
	22	2496
	40	2493.5
	59	2496
	70	2497
	87	2498
	121	2499
	138	2499.5
13 + 00	0	2499
	5	2498
	12	2497
	26	2490.24
	36	2490.24
	50	2497
	88	2498
	126	2499
14 + 00	0	2498
	5	2497
	19	2490
	29	2490
	43	2497
	93	2498



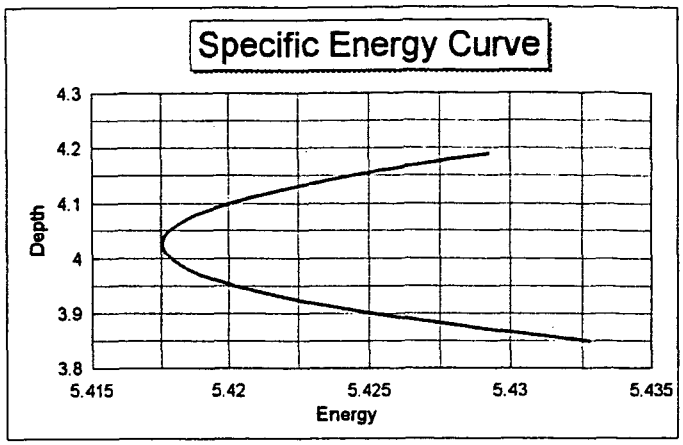




Specific Energy - y critical

Channel configuration	b	z
Flow (cfs) 688	10	2

Depth	Area	Velocity	Energy
3.850	68.15	10.10	5.43279
3.860	68.40	10.06	5.43105
3.870	68.65	10.02	5.42942
3.880	68.91	9.98	5.42790
3.890	69.16	9.95	5.42648
3.900	69.42	9.91	5.42518
3.910	69.68	9.87	5.42399
3.920	69.93	9.84	5.42290
3.930	70.19	9.80	5.42191
3.940	70.45	9.77	5.42103
3.950	70.71	9.73	5.42025
3.960	70.96	9.70	5.41957
3.970	71.22	9.66	5.41899
3.980	71.48	9.62	5.41851
3.990	71.74	9.59	5.41812
4.000	72.00	9.56	5.41784
4.010	72.26	9.52	5.41764
4.020	72.52	9.49	5.41755
4.030	72.78	9.45	5.41754
4.040	73.04	9.42	5.41763
4.050	73.31	9.39	5.41780
4.060	73.57	9.35	5.41807
4.070	73.83	9.32	5.41843
4.080	74.09	9.29	5.41887
4.090	74.36	9.25	5.41940
4.100	74.62	9.22	5.42002
4.110	74.88	9.19	5.42072
4.120	75.15	9.16	5.42151
4.130	75.41	9.12	5.42238
4.140	75.68	9.09	5.42333
4.150	75.95	9.06	5.42436
4.160	76.21	9.03	5.42547
4.170	76.48	9.00	5.42667
4.180	76.74	8.96	5.42794
4.190	77.01	8.93	5.42929



Normal Depth

Trial & Error Solution

Stations 13+13.38 to 21+00.00

Flow (cfs)	688
n =	0.035
S =	0.0030
b =	10
z =	2

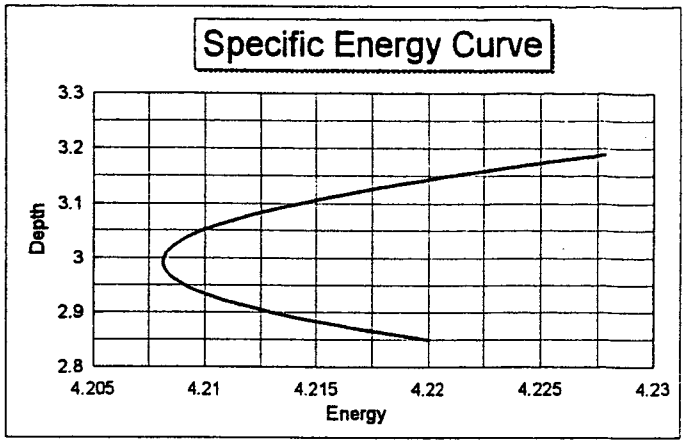
AR^(2/3) = (nQ)/(1.486*S^.5) RHS = **295.85**

Y	A	V	P	R	LHS	Fr
5.750	123.63	5.57	35.71	3.46	282.89	0.51
5.760	123.96	5.55	35.76	3.47	283.91	0.50
5.770	124.29	5.54	35.80	3.47	284.94	0.50
5.780	124.62	5.52	35.85	3.48	285.96	0.50
5.790	124.95	5.51	35.89	3.48	286.99	0.50
5.800	125.28	5.49	35.94	3.49	288.03	0.50
5.810	125.61	5.48	35.98	3.49	289.06	0.50
5.820	125.94	5.46	36.03	3.50	290.10	0.49
5.830	126.28	5.45	36.07	3.50	291.13	0.49
5.840	126.61	5.43	36.12	3.51	292.18	0.49
5.850	126.95	5.42	36.16	3.51	293.22	0.49
5.860	127.28	5.41	36.21	3.52	294.26	0.49
5.870	**127.61**	**5.39**	**36.25**	**3.52**	**295.31**	**0.49**
5.880	127.95	5.38	36.30	3.53	296.36	0.49
5.890	128.28	5.36	36.34	3.53	297.41	0.48
5.900	128.62	5.35	36.39	3.53	298.47	0.48
5.910	128.96	5.34	36.43	3.54	299.52	0.48
5.920	129.29	5.32	36.48	3.54	300.58	0.48
5.930	129.63	5.31	36.52	3.55	301.64	0.48
5.940	129.97	5.29	36.56	3.55	302.70	0.48
5.950	130.31	5.28	36.61	3.56	303.77	0.47
5.960	130.64	5.27	36.65	3.56	304.83	0.47
5.970	130.98	5.25	36.70	3.57	305.90	0.47
5.980	131.32	5.24	36.74	3.57	306.98	0.47
5.990	131.66	5.23	36.79	3.58	308.05	0.47
6.000	132.00	5.21	36.83	3.58	309.12	0.47
6.010	132.34	5.20	36.88	3.59	310.20	0.46
6.020	132.68	5.19	36.92	3.59	311.28	0.46
6.030	133.02	5.17	36.97	3.60	312.36	0.46
6.040	133.36	5.16	37.01	3.60	313.45	0.46
6.050	133.71	5.15	37.06	3.61	314.54	0.46
6.060	134.05	5.13	37.10	3.61	315.62	0.46
6.070	134.39	5.12	37.15	3.62	316.72	0.46
6.080	134.73	5.11	37.19	3.62	317.81	0.45
6.090	135.08	5.09	37.24	3.63	318.91	0.45

Specific Energy - y critical

Channel configuration	b	z
Flow (cfs) 688	20	2

Depth	Area	Velocity	Energy
2.850	73.25	9.39	4.22005
2.860	73.56	9.35	4.21837
2.870	73.87	9.31	4.21682
2.880	74.19	9.27	4.21541
2.890	74.50	9.23	4.21413
2.900	74.82	9.20	4.21297
2.910	75.14	9.16	4.21194
2.920	75.45	9.12	4.21104
2.930	75.77	9.08	4.21026
2.940	76.09	9.04	4.20960
2.950	76.41	9.00	4.20906
2.960	76.72	8.97	4.20864
2.970	77.04	8.93	4.20834
2.980	77.36	8.89	4.20814
2.990	77.68	8.86	4.20806
3.000	78.00	8.82	4.20810
3.010	78.32	8.78	4.20824
3.020	78.64	8.75	4.20849
3.030	78.96	8.71	4.20885
3.040	79.28	8.68	4.20931
3.050	79.61	8.64	4.20987
3.060	79.93	8.61	4.21054
3.070	80.25	8.57	4.21131
3.080	80.57	8.54	4.21218
3.090	80.90	8.50	4.21314
3.100	81.22	8.47	4.21420
3.110	81.54	8.44	4.21536
3.120	81.87	8.40	4.21661
3.130	82.19	8.37	4.21796
3.140	82.52	8.34	4.21940
3.150	82.85	8.30	4.22092
3.160	83.17	8.27	4.22254
3.170	83.50	8.24	4.22424
3.180	83.82	8.21	4.22603
3.190	84.15	8.18	4.22791



Normal Depth

Trial & Error Solution

Stations 21+00 to 28+00

Flow (cfs)	688
n =	0.035
S =	0.0030
b =	20
z =	2

AR^(2/3) = (nQ)/(1.486*S^.5) RHS = **295.85**

Y	A	V	P	R	LHS	Fr
4.500	130.50	5.27	40.12	3.25	286.47	0.50
4.510	130.88	5.26	40.17	3.26	287.65	0.50
4.520	131.26	5.24	40.21	3.26	288.83	0.50
4.530	131.64	5.23	40.26	3.27	290.01	0.50
4.540	132.02	5.21	40.30	3.28	291.20	0.49
4.550	132.41	5.20	40.35	3.28	292.39	0.49
4.560	132.79	5.18	40.39	3.29	293.58	0.49
4.570	133.17	5.17	40.44	3.29	294.77	0.49
4.580	**133.55**	**5.15**	**40.48**	**3.30**	**295.97**	**0.49**
4.590	133.94	5.14	40.53	3.30	297.17	0.48
4.600	134.32	5.12	40.57	3.31	298.37	0.48
4.610	134.70	5.11	40.62	3.32	299.57	0.48
4.620	135.09	5.09	40.66	3.32	300.78	0.48
4.630	135.47	5.08	40.71	3.33	301.99	0.48
4.640	135.86	5.06	40.75	3.33	303.20	0.48
4.650	136.25	5.05	40.80	3.34	304.41	0.47
4.660	136.63	5.04	40.84	3.35	305.63	0.47
4.670	137.02	5.02	40.88	3.35	306.85	0.47
4.680	137.40	5.01	40.93	3.36	308.07	0.47
4.690	137.79	4.99	40.97	3.36	309.29	0.47
4.700	138.18	4.98	41.02	3.37	310.52	0.46
4.710	138.57	4.97	41.06	3.37	311.75	0.46
4.720	138.96	4.95	41.11	3.38	312.98	0.46
4.730	139.35	4.94	41.15	3.39	314.21	0.46
4.740	139.74	4.92	41.20	3.39	315.45	0.46
4.750	140.13	4.91	41.24	3.40	316.69	0.46
4.760	140.52	4.90	41.29	3.40	317.93	0.45
4.770	140.91	4.88	41.33	3.41	319.17	0.45
4.780	141.30	4.87	41.38	3.41	320.42	0.45
4.790	141.69	4.86	41.42	3.42	321.67	0.45
4.800	142.08	4.84	41.47	3.43	322.92	0.45
4.810	142.47	4.83	41.51	3.43	324.17	0.45
4.820	142.86	4.82	41.56	3.44	325.43	0.44
4.830	143.26	4.80	41.60	3.44	326.69	0.44
4.840	143.65	4.79	41.65	3.45	327.95	0.44

new Base Flood Event is based on the assumption that all flow from the lower Red Rock watershed, including the Red Rock Detention Basin outflow, are routed through the UFWDB.

The new Base Flood Event produces a total runoff hydrograph volume of 1448 acre-feet and a peak inflow of 6660 cfs into the UFWDB, which results in spillway overtopping of 0.5 ft or less for a period of 5.5 hours. These results include provisions for 105 acre-feet of sediment storage and account for the additional basin storage volume available due to the ongoing aggregate mining operations.

The UFWDB discharge channel was originally designed for a 100-year peak discharge of 1225 cfs, and the channel was constructed with an additional 2 to 3 feet of freeboard above the 100-year water surface elevation. For the new Base Flood Event, the total peak discharge from the detention basin (including outlet works and spillway discharge) is 2579 cfs. This peak outflow exceeds the capacity of the existing discharge channel and will result in shallow depth, overbank flooding of the adjacent undeveloped lowlands. However, the width of the resulting flood plain for the new Base Flood Event is less than that depicted on the current FIRM.

The structural and geotechnical basis of design for the UFWDB was originally based on the Probable Maximum Flood (PMF) event. In review of the original design, it is concluded that the UFWDB is stable and suitable for operation during flood events in excess of the new Base Flood Event.

SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

The SVE Diversion Channel and Berm was designed by Engineers and Surveyors, Inc., and constructed in conjunction with the Southern Vista Estates development project. The diversion channel and berm function as an extension of the UFWDB embankment and are intended to collect and divert flows from approximately 520 acres of undeveloped land into the UFWDB.

The downstream section of the SVE diversion consists of an unlined trapezoidal channel. Based on review of the original design information and subsequent evaluation performed for this submittal, the channel section has adequate capacity to convey the peak 100-year discharge of

approximately 690 cfs. Available freeboard above the peak 100-year water surface elevation ranges from 0.4 to 1.1 feet.

The upstream section of the SVE diversion consists of a flat-sloped, low-height earthen berm. The upper reach of the berm is subject to 100-year peak discharges of 490 cfs. Additional drainage tributary to the lower reach of the berm increases the 100-year peak flow to approximately 650 cfs. The available freeboard above the 100-year water surface elevation for the berm ranges from 1.8 to 3.0 feet.

The SVE diversion is a local drainage improvement and not a regional facility. The channel and berm are intended to provide protection to the SVE developments from stormwater runoff from a small, defined, and predictable watershed. Although the available freeboard for the SVE facilities is less than required by NFIP 44CFR 65.10, the facilities are of adequate capacity and integrity to convey the 100-year flood to the UFWDB and should therefore, protect the SVE developments as was the original design intent.

CONCLUSION

The limits of the SFHA on the current and previous FIRM in the vicinity of the UFWDB appear to be interpretive based on early studies and mapping efforts. The revised limits of the SFHA requested with this application for a LOMR are also somewhat interpretive due to the complexity of determining exact floodplain limits resulting from the UFWDB spillway overtopping. However, it is apparent that operation of the UFWDB and discharge channel will significantly reduce the limits of downstream floodways.

The As-Built plans of the UFWDB and a QA/QC report, consisting of all the soils and concrete tests, were submitted to the State of Nevada, Department of Conservation and Natural Resources on July 6, 1992. The Clark County Department of Public Works received authorization from the State on July 14, 1992, to impound stormwater flows behind the UFWDB.

SVE DEVELOPMENT PROJECT

Subsequent to the completion of the UFWDB, the Southern Vista Estates development project was designed and constructed. The SVE project included single family housing and a condominium complex. The SVE development site was subject to stormwater runoff from approximately 520 acres of land located southwest of the planned development. To eliminate the need for conveyance facilities through the SVE site for this offsite drainage, the developer constructed a diversion berm and channel to redirect the offsite drainage into the UFWDB. The SVE diversion berm and channel was designed by Engineers and Surveyors Inc. (ESI) in late 1992. The upstream end of the SVE diversion project begins approximately 2600 feet south of the UFWDB, and extends due north 1000 feet as a low height berm at which point the cross section transforms from a berm to a channel section. The channel section continues north 1630 feet and discharges into the UFWDB at the south end of the detention basin embankment.

ESI's design was approved by the Clark County Department of Public Works and CCRFCD in conjunction with the Southern Vista Estates Condominium development project. Construction of the SVE diversion berm and channel was completed in 1993. A copy of ESI's design report, design drawings, and a letter from ESI certifying the as-built condition of the diversion berm and channel are included with this submittal.

OVERVIEW

With regard to the UFWDB, FEMA has specifically requested that an analysis be completed to evaluate the impact of flows diverted south along Durango Drive, from Red Rock Wash to the UFWDB. In response to this inquiry, and in evaluation of the information submitted with this request, the flows are defined as follows:

SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

SCOPE

Black & Veatch obtained as-built information on the SVE diversion channel and berm from the CCRFCD. This design and construction information was reviewed for structural compliance with the National Flood Insurance Program (NFIP 44CFR 65.10). The influence of the berm and channel on existing downstream flood zones was also verified against the as-built information.

SOUTHERN VISTA ESTATES SITE AND DRAINAGE INFORMATION

Southern Vista Estates includes a 35-acre single family resident (SFR) development and a 15-acre condominium site. The north boundary of the SFR property is adjacent and parallel to the UFWDB discharge channel. The condominium property is south of the SFR development. Both SVE properties are located in the path of drainage basins unaffected by the UFWDB.

In November 1992, Engineers and Surveyors Inc. (ESI) prepared a technical drainage study for the Clark County Department of Public Works. (The drainage study is included in Volume 1 of this submittal.) ESI identified a 520-acre offsite drainage area, composed of five basins, which impacted the SVE development but were not included in the UFWDB watershed. According to the HEC-1 model presented in the study, the total peak discharge from the five offsite drainage basins during a 100-year storm event is 688 cfs. ESI analyzed the impact on the UFWDB stage and storage capacity if the 688 cfs was diverted to the basin. Their findings, based on the original UFWDB 100-year pool elevation of 2469.6 feet and detained volume of 880 acre-feet, elevated the peak stage to 2470.3 feet and increased the basin volume by 63 acre-feet. The diverted flows increased the impoundment area by approximately five acres. This analysis conservatively assumed that two storms would be centered over both the UFWDB and SVE watersheds simultaneously.

As proposed in the drainage study, a diversion berm and channel was constructed to "extend" the south arm of the UFWDB embankment and divert stormwater runoff from the five offsite drainage basins into the UFWDB. The SVE project consisted of approximately 1100 feet of earthen berm and 1630 feet of trapezoidal earthen channel.

The diversion berm begins at Station 1+70 and is transformed into the diversion channel at Station 12+50. According to ESI's drainage study, three offsite basins (OFF1, OFF2, and OFF3) contribute a peak runoff of 491 cfs to the berm between Stations 1+70 and 6+00 during the 100-year event. An additional 164 cfs from offsite basin OFF4 reaches the berm between Stations 6+00 and 12+50. Runoff from OFF5, 38 cfs, reaches the channel near Station 26+00.

BERM ANALYSIS

The berm was analyzed to verify adequate capacity for conveying the stormwater runoff generated by the SVE offsite basins. The results were compared to the National Flood Insurance Program (NFIP 44CFR 65.10) requirements and CCRFCD *Hydrologic Criteria and Drainage Design Manual* guidelines.

Freeboard Requirements

According to NFIP 44CFR 65.10, the minimum freeboard requirement for riverine levees is three feet above the base flood water surface elevation. However, the upstream end of the levee (Station 1+70) is required to have an additional six inches of freeboard, for a total of 3.5 feet, and then taper to the minimum at the downstream end (Station 12+50). The NFIP minimum freeboard requirements may be reduced to two feet if adequate protection can be provided with the lesser freeboard. The local requirements established by CCRFCD require a minimum freeboard of one foot for a berm or channel.

Berm Performance

Cross sections were taken every 50 feet along the length of the berm and the flow area was calculated to within two feet of the top of the berm. This calculation provided the flow capacity with two feet of freeboard, the minimum allowed by NFIP 44CFR 65.10. To determine the available freeboard for the given flow (491 cfs between Stations 1+70 and 6+00 and 688 cfs from Stations 6+00 to 12+00), a "Depth vs Capacity" curve was plotted and the desired value was interpolated from the graph. The average freeboard for the berm was approximately 2.5 feet; the minimum freeboard provided was approximately 1.8 feet at Station 3+00. The flowline at the berm has a slope of 1.35 percent. To determine the berm capacity, Manning's Equation was applied using an "n" value of 0.032.

ESI based their design of the diversion berm and channel on the CCRFCD guidelines which require a minimum freeboard of one foot. This is considered adequate protection for this berm because the contributing watershed is finite, easily defined, and predictable. Cemented, highly stable soils were exposed in the beds of the existing washes prior to construction of the berm. This signifies that sediment accumulation at the berm would be negligible. In addition, the berm nearly parallels the natural channels at the point of interest. The Depth vs Capacity curves indicate that capacity increases greatly in the top two to three feet of berm height. This increase is typically at least six times the required flow capacity.

CHANNEL ANALYSIS

The channel cross section varies along its 1630-foot alignment, and three riprap-lined drop structures make up the grade differential between the existing ground and the channel flowline. The SVE channel was analyzed to verify adequate capacity to convey the entire 688 cfs generated in the offsite drainage basins. The following table lists the channel characteristics and capacity within the two reaches. Manning's Equation was applied using an "n" value of .035 for each calculation. The flow regime in both reaches is subcritical.

CHANNEL REACH CHARACTERISTICS (Q = 688 cfs)		
STATION	13+13.38 to 21+00.00	21+00.00 to 28+00.00
Slope (%)	0.30	0.30
Bottom Width	10'	20'
Bank Slope	2 : 1	2 : 1
Bank Height	7'	5' East, 4' West
Available Freeboard	1.13'	.42' East, -0.58' West
Velocity	5.39 fps	5.15 fps

According to the results obtained from Manning's equation, the downstream channel reach has inadequate freeboard. The east, or right, bank of the channel provides five inches of freeboard

under the peak flow conditions. The freeboard results published in the ESI drainage study indicate that the minimum freeboard provided on the east bank was 1.26 feet in this reach of the channel. The reason for the difference in freeboard allowances is that, according to the ESI's HEC-2 model input, the channel was analyzed for 491 cfs. This lower flow corresponds to the peak runoff from the three offsite basins which impact the upstream end of the berm. However, ESI's report indicated that the channel would be impacted by the peak runoff of 688 cfs based on the HEC-1 model output presented in the drainage study. The study does not explain the reason for using the lower flowrate in the HEC-2 program.

The berm and channel have the capacity to convey 688 cfs without overtopping the east banks and impacting the downstream development. Although the berm was analyzed for a flow of 491 cfs from Station 1+70 to Station 6+00, it will maintain a freeboard of at least one foot for a flow of 688 cfs along that reach. The peak flow of 688 cfs will exceed the west channel bank between Stations 21+00 and 28+00, but the overflow will be directed toward the UFWDB.

CONCLUSION

The SVE diversion berm and channel is a local drainage facility designed to divert flows from a small watershed into the UFWDB, a regional flood control facility. The SVE project was constructed to extend the south arm of the UFWDB and protect the Southern Vista Estates from offsite drainage. Although the diversion berm does not maintain the minimum freeboard requirements established by the NFIP 44CFR 65.10 for a short reach, the berm was considered adequate to mitigate the flood hazard from this finite and predictable watershed as it affects downstream areas. The minimum available freeboard on the berm is approximately 1.8 feet at Station 3+00 for a flow of 491 cfs; the average available freeboard along the berm is 2.5 feet. The downstream channel has adequate capacity to convey the Base Flood Event (688 cfs) to the UFWDB. The upstream reach of the channel between Stations 12+00 and 21+00 has an available freeboard of just over one foot. The minimum available freeboard for a flow of 688 cfs in the channel is five inches from Station 21+00 to 28+00.

REFERENCES

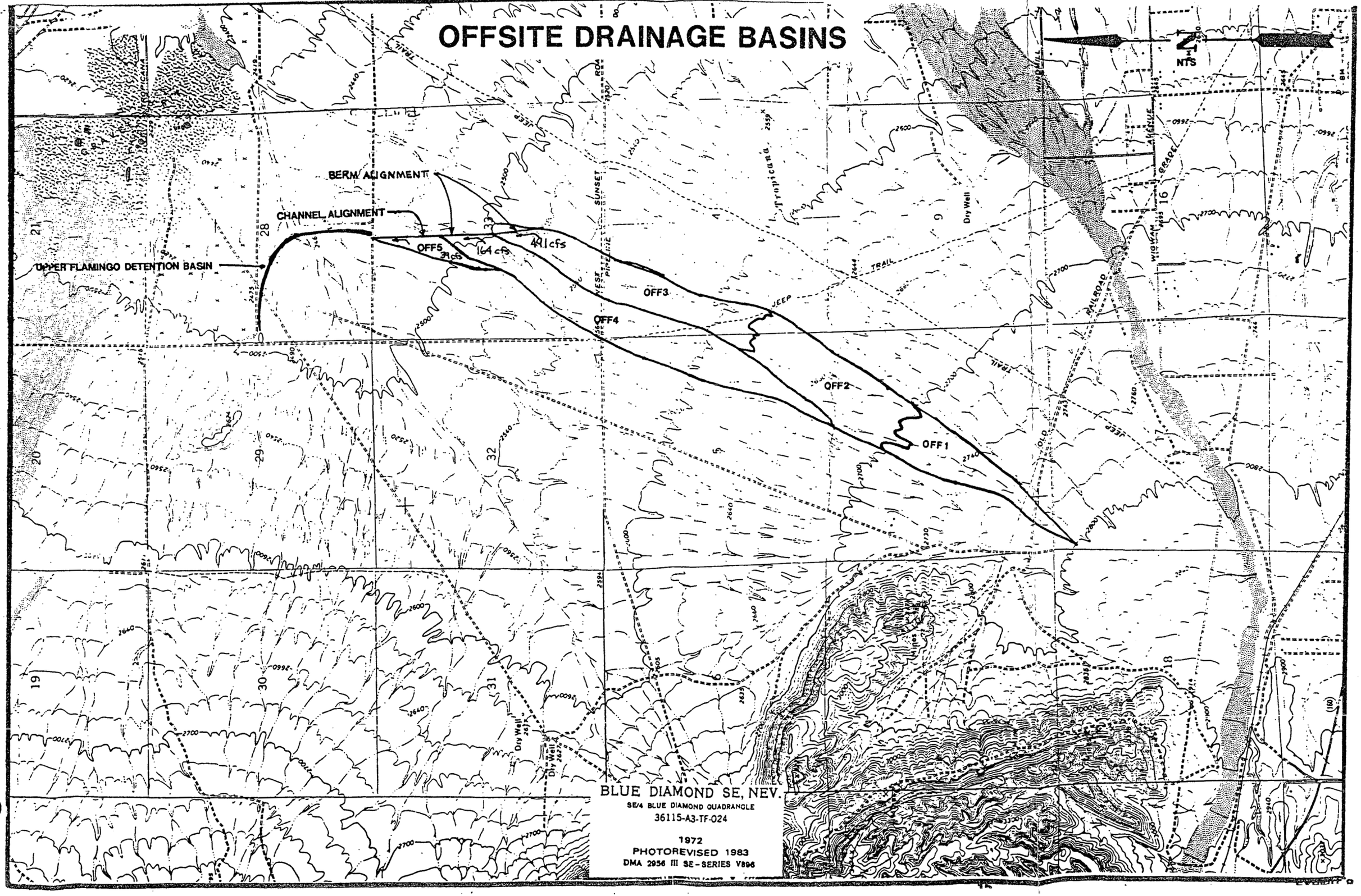
1. Clark County Regional Flood Control District (1990). "Hydrologic Criteria and Drainage Design Manual," Clark County, Nevada.

2. Federal Emergency Management Agency. "National Flood Insurance Program (Regulations for Floodplain Management and Flood Hazard Insurance)," Revised October 1, 1990.

3. Engineers and Surveyors Inc. (ESI). "Technical Drainage Study for the Southern Vista Temporary Drainage Channel," November 1992, Las Vegas, Nevada.

4. Landmark Engineering. "Drainage Study Southern Vista Estates," July 1992, Las Vegas, Nevada.

OFFSITE DRAINAGE BASINS



DEC
FLOOD CONTROL DISTRICT

TECHNICAL DRAINAGE STUDY FOR THE SOUTHERN VISTA TEMPORARY DRAINAGE CHANNEL

24+50 - 27+00

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS

7018 CHARLESTON BLVD. • LAS VEGAS, NEVADA 89117 • (702) 363-6415

TECHNICAL DRAINAGE STUDY FOR THE SOUTHERN VISTA TEMPORARY DRAINAGE CHANNEL

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Southern Vista Estates Temp. Channel Date: November 2, 1992

Location of Development: a) Descriptive Northwest Quarter
b) Sect. 33 Twn. 21 S. Rng. 60 E.

Name of Owner: Morgan Development Assessors Parcel No: N/A

Contact Person-Name: Tom Davy Telephone No: (702) 363-6415

Firm: Engineers & Surveyors, Inc.

Address: 7018 West Charleston Blvd. Las Vegas Nevada 89117

Type of Land Development/Land Disturbance Process:

- ☐ Rezoning
- ☐ Parcel Map
- ☐ Large Parcel Map
- ☐ Subdivision Map
- ☐ Planned Unit Development
- ☐ Building Permit
- ☐ Clearing and Grading Only
- ☒ Other (Please specify below) open channel

1. Total Owned Land Area: At Site: N/A Being Developed/Disturbed: _____

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES* (NO)

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? (YES*) NO

4. Proposed type of development (Residential, Commercial, Etc.)? open channel

5. Approximate upstream land area which drains to the subject site? 520 acres

6. Has the site drainage been evaluated in the past? (YES) NO. If yes, please identify documentation: Hydrology study for Southern Vista Estates Condominiums

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Upper Flamingo Detention Basin

8. Briefly describe your proposed schedule for the subject project: A.S.A.P.

REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA
11-3-92
DANIEL J. WONDERS
CIVIL
No. 6950
Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

* Review and concurrence of the Clark County Regional Flood Control District is required.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

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APPENDIX

A HEC1 runs
B HEC2 tributary files
C HEC2 postdevelopment files
D Geotechnical report
E Freeboard calcs

BACKGROUND:

In August, 1992 a drainage study titled Hydrology Study for Southern Vista Estates Condominiums, CCPW PN # 92-08-10-01 ZC # 27-91, was prepared by this firm and submitted to Clark County Public Works for review. The objective of that report was to identify the offsite drainage area that impacts the Southern Vista Estates 15 acre condominium site. The study quantified the amount of storm water that would be generated within the offsite basin during a 10 and 100 year design storm. Also presented in the report was a proposal to construct an open channel that would intercept the offsite storm water and convey it North past the condominium site, discharging into the Upper Flamingo Detention Basin outfall channel. The proposed channel was to be constructed along the Western property boundary of Southern Vista Estates, within Clark County right of way, and would have extended approximately 660 feet South of the Southwest corner of the project and 1000 feet North of the Northwest corner of the project to the existing outfall channel.

In September, 1992 a set of channel improvement plans and a supporting hydraulic analysis were submitted to the County for review. ESI received the initial set of review comments from Willdan and Associates in early October. Since that time the channel alignment proposed in the August submittal has been abandoned.

On October 8, 1992 a meeting was held at Clark County Public Works to discuss an alternate channel alignment, present at the meeting were Dan Wonders and Tom Davy of ESI, the developer Max Morgan and Robert Thompson of Clark County Public Works. The alternate alignment would also intercept the storm water generated within the basin discussed in the August study, but would discharge into the detention basin rather than the outfall channel. Neither CCPW or CCRFCD had any objections to the proposed alignment discussed in the meeting.

The purpose of this submittal is to provide the County with a revised analysis for the new channel alignment.

GENERAL:

Project location:

The location of the proposed diversion channel lies along the Western 50 feet of the East Half (E 1/2) of the East Half (E 1/2) of the Southeast Quarter (SE 1/4) of the Northwest Quarter (NW 1/4) and the East Half (E 1/2) of the Southeast Quarter (SE 1/4) of the Northeast (NE 1/4) of the Northwest Quarter (NW 1/4) of Section 33, Township 21 South, Range 60 East, M.D.B.& M., Clark County, Nevada. The channel is to be constructed within a portion of three-five acre BLM parcels and one five acre private parcel. Acquisition of the necessary easements from both the BLM and the private land owner are currently ongoing. See exhibits 1 and 2 for the vicinity map and land ownership exhibit.

Flood Hazard Zone:

A review of Flood Insurance Rate Map, Community Panel 320003 1211-B, effective date: September 29, 1989, indicates that the proposed channel lies in an area which has been classified as Zone X, an area determined to be outside the 500-year flood plain. See exhibit 3 for the project delineation on the Flood Map.

Regional Flood Control Facilities:

Refer to exhibit 4 for the location of the project site relative to regional facilities. The channel is proposed to discharge into the Upper Flamingo Detention Basin. An analysis which assess the impacts of the channel on the detention basin is included within the body of this report.

Project Description:

The proposed improvements include approximately 2000 feet of temporary open channel/earth berm which will convey storm water from the confluence of two existing washes, near Patrick Lane and the intersection of the channel alignment, North to the Upper Flamingo Detention Basin.

The collection system at the Southern end of the project consists of an earth berm that diverts storm water from the existing wash and directs it into the upstream end of the channel. Since the improvements are intended to be temporary, an earth berm will only be provided on the East bank of the channel. Fully riprap lined, sloping drop structures are proposed at several locations to make up the grade differential between existing ground and the channel flow line. The drop structures also aid in keeping the invert of the channel above a caliche layer which has been determined to be within five feet of the surface. The slope of the channel is maintained at a rate of four tenths percent to keep flow velocities at a minimum. Rip rap protection is also being proposed at the outlet of the channel into the detention basin.

The channel alignment abuts a private parcel of land along its Western boundary for the Northern most 660 feet of channel. To prevent inundation of this parcel from water contained within the channel, it will be necessary to construct an earth berm along the Western bank of the channel for a portion of this frontage. Since the improvements are of a temporary nature a single 12 foot access road is being proposed for construction along the East side of the channel. The berm/access road is proposed to tie into the existing detention basin access road at the Southeast corner of the detention basin and has been detailed on the channel improvement plans.

METHODOLOGY:

In order to estimate peak runoff values from drainage basins that discharge toward the project site, the HEC-1 Flood Hydrograph package developed by the Army Corps of Engineers Hydrologic Engineering Center was used to model a 6-hour, 100-year storm event. Infiltration rates were developed using the Soil Conservation Service (SCS) Soil Survey of the Las Vegas Valley Area. Curve numbers are based on weighted averages of each soil unit and on the percent composition of each soil unit within the drainage area (see exhibits 5, 6, & 7).

The HEC2 Water Surface Profile model was used to ascertain water surface elevations for both pre and post development conditions.

OFFSITE DRAINAGE ANALYSIS:

The offsite basin delineated on exhibit 8 is the area that was modeled to determine the 100 year design flow for the channel. The offsite basin is a portion of the offsite basin delineated on exhibit 10 of the previously submitted Hydrology Study for Southern Vista Estates. The revised basin takes into account an additional 24 acres in the extreme Northwest portion of the basin but is decreased roughly 76 acres in the Northeast portion. Hydrologic parameters for the revised basin were derived from four hundred scale topographic maps similar to the four hundred scale map provided to Willdan and Associates for reference to the Southern Vista Estates Study. Time of concentration calcs can be found in appendix A for subbasins OFF1 through OFF5. The input and output HEC1 files for the revised basin are also located in appendix A. Results from the HEC1 model indicate that a total offsite flow rate of 688 cfs will impact the channel.

Exhibit 9 depicts the channel alignment, on a 400 scale topographic map, relative to the revised offsite basins.

HEC2 ANALYSIS:

Pre-Development:

Appendix B contains the predevelopment HEC2 runs upstream of Patrick Lane. Each wash was modeled separately from the confluence of the tributaries, upstream approximately 600 feet. Exhibit 10 shows the locations of the HEC2 cross sections for both the Southeast and Southwest tributary. Both super and sub-critical flow regimes were run. The results indicate that under existing conditions the 100 year flow within both tributaries tends to flow at critical depth. The flow remains within the tributary banks. Upon convergence of the tributaries at Patrick Lane the resulting wash travels to the East of the Project alignment and did not require modeling North of Patrick Lane.

Post-Development:

Super and subcritical HEC2 runs for the developed condition are contained in Appendix C. The cross section stationing used within the HEC2 models can be referenced directly from the improvement plans for the Southern Vista Estates Temporary Channel. Cross sections used within the HEC2 model at the transition of the existing wash to the proposed channel, at the South end of the project, have also been incorporated within the models. Results of the models indicate that the flow regime remains subcritical for all portions of the channel accept the drop structures, the expansion at station 21+00, and at the terminus of the channel at the detention basin, station 28+00. At these locations the flow regime is super critical

Migration of the existing tributaries, North of the confluence point, is not expected to be significant due to the incision of the existing thalweg.

Erosion Protection:

A geotechnical study of the channel alignment was performed by Geotechnical & Environmental Services, Inc., the results of which are contained in appendix D. The geotechnical report indicates that a erosion resistant caliche layer underlies the channel alignment at a depth of roughly five to six and one half feet. The invert of the channel is maintained at or above this layer unless the results of the borings allow otherwise.

Riprap protection is proposed for the entire East bank of the channel, the drop structures and the outlet into the detention basin. Riprap sizing calculations are also provided in appendix D. The riprap protection along the East bank is proposed to extend to a minimum depth of three feet at the toe of the bank, or to the first caliche layer. The drop structures are proposed to be fully riprap lined. Riprap erosion protection is also being proposed for the bottom and East bank of the channel outlet at the detention basin.

Freeboard Protection:

Freeboard calculations are provided for all of the unique sections of channel and are listed in appendix E. The required amount of freeboard has been provided for on the East side of the channel.

7

LEVEE

Water Surface Profile:

The water surface profile for the entire channel length has been plotted on the profile portion of the channel improvement plans.

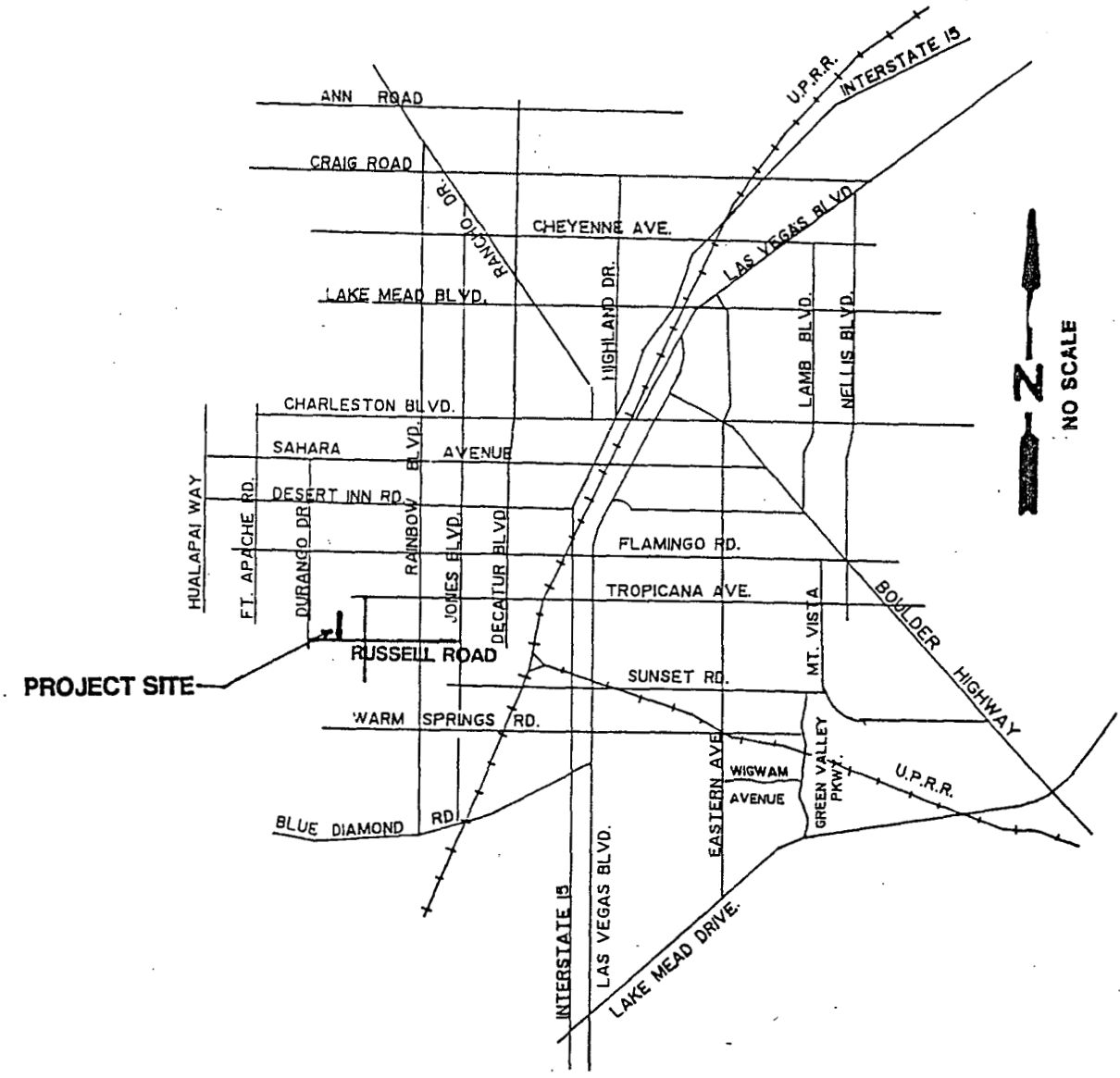
Impacts on Upper Flamingo Detention Basin:

The existing impoundment area of the Upper Flamingo Detention Basin for the 100 year 6 hour storm has a surface area of 89.5 acres, a ponding elevation of 2469.6 and a total detained volume of 880 acre feet, reference Upper Flamingo Detention Basin and Discharge Channel, by Black & Veatch Engineers, June, 1989. A total additional volume of 63 acre feet will be diverted into the detention basin with the development of the Southern Vista Channel (reference the HEC1 output files in appendix A).

The effects of this increase will be negligible on the the capacity of the basin. Exhibit 11 shows the relative differences in ponding elevation and area versus storage. The post development ponding elevation is expected to increase roughly seven tenths of a foot to an elevation of 2470.3, the total detained volume will increase to 943 acre feet. The addition of 63 acre feet to the basin will have a negligible effect on the surface area within the basin.

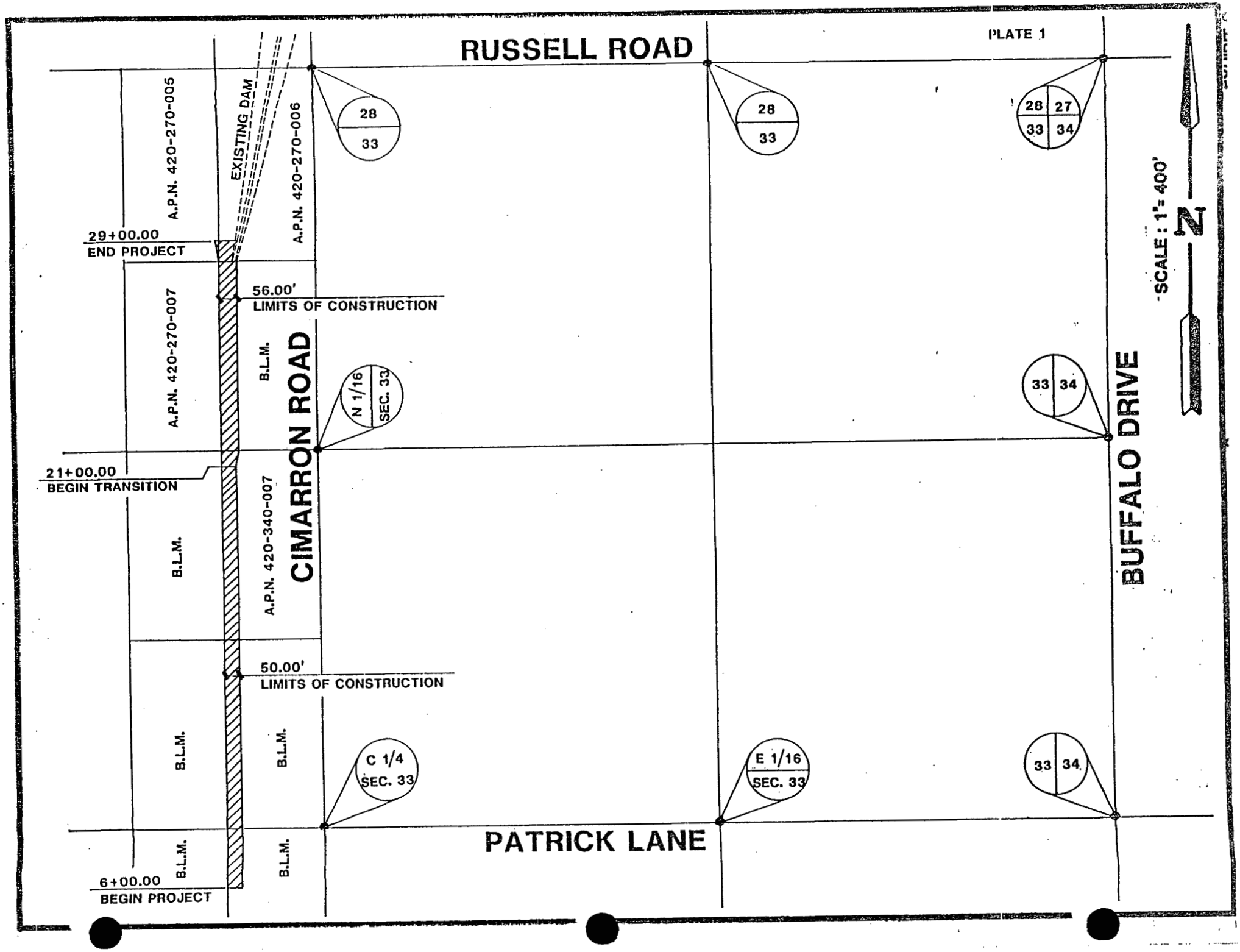
CONCLUSION

This study will comply with the CCRFCD Criteria Standards. A copy of this study and all subsequent addenda will be provided to Clark County Regional Flood Control upon approval by the County.



VICINITY MAP

PLATE 1


RUSSELL ROAD
PATRICK LANE
CIMARRON ROAD
BUFFALO DRIVE
EXISTING DAM
A.P.N. 420-270-005
A.P.N. 420-270-006
A.P.N. 420-270-007
A.P.N. 420-340-007
B.L.M.
29+00.00
END PROJECT
56.00'
LIMITS OF CONSTRUCTION
21+00.00
BEGIN TRANSITION
50.00'
LIMITS OF CONSTRUCTION
6+00.00
BEGIN PROJECT
28
33
28
27
33
34
N 1/16
SEC. 33
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E 1/16
SEC. 33
SCALE : 1"= 400'
N

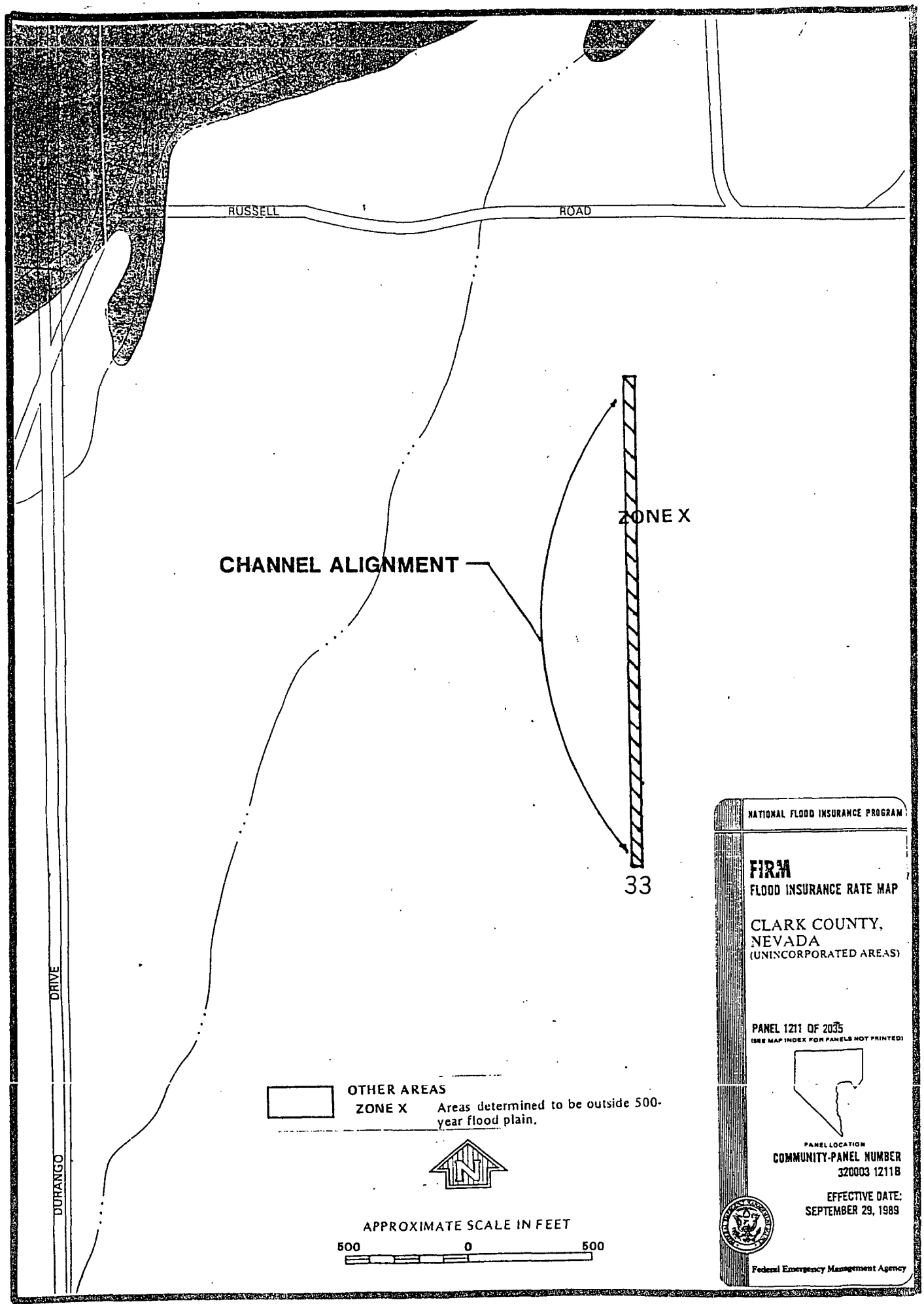
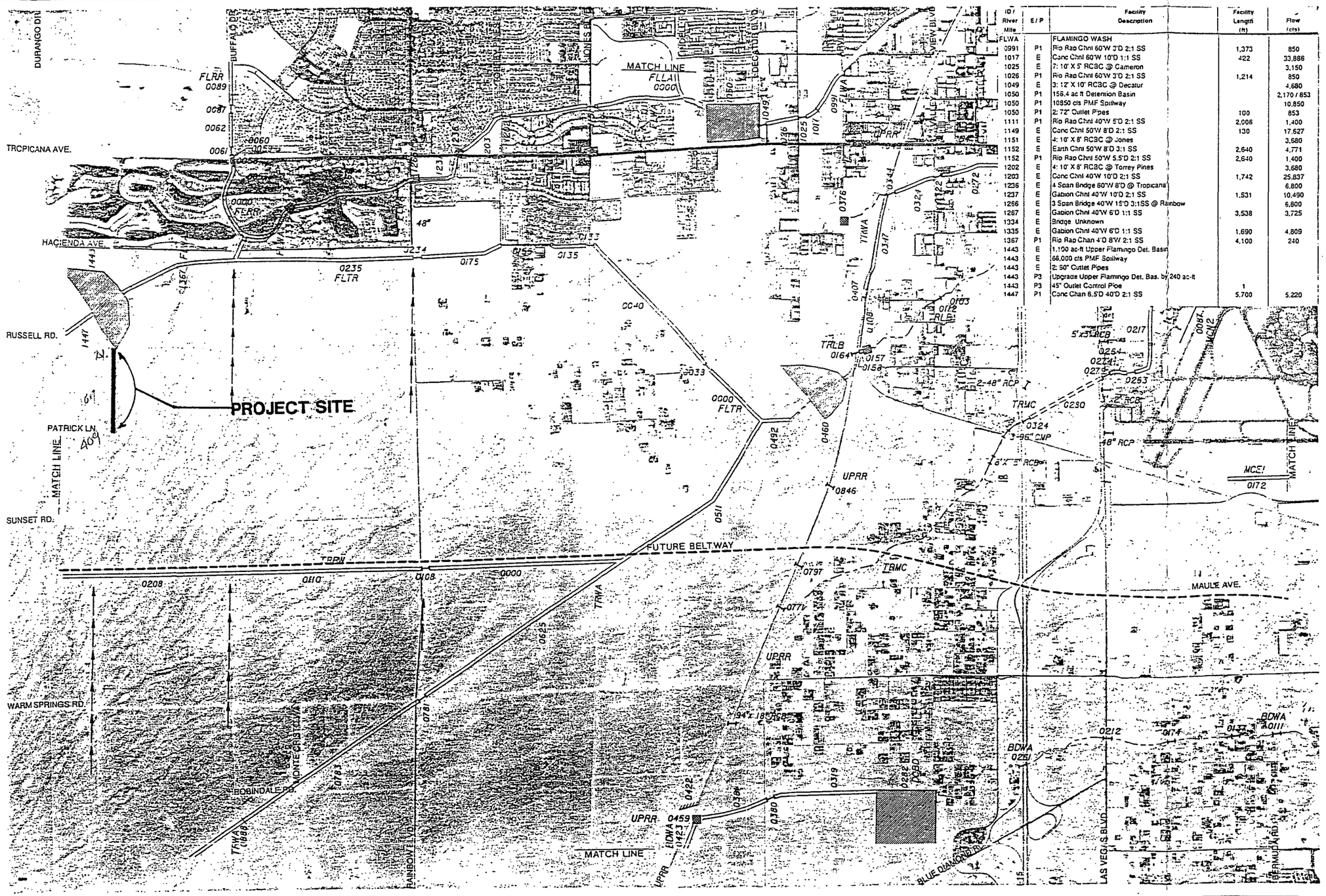

RUSSELL
ROAD
ZONE X
CHANNEL ALIGNMENT
33
DRIVE
DURANGO
OTHER AREAS
ZONE X
Areas determined to be outside 500-year flood plain.
APPROXIMATE SCALE IN FEET
500
0
500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY, NEVADA
(UNINCORPORATED AREAS)
PANEL 1211 OF 2035
(SEE MAP INDEX FOR PANELS NOT PRINTED)
PANEL LOCATION
COMMUNITY-PANEL NUMBER
320003 1211B
EFFECTIVE DATE:
SEPTEMBER 29, 1989
Federal Emergency Management Agency

EXHIBIT 3



ID / River Mile	E / P	Facility Description	Facility Length (ft)	Flow (cfs)
		FLAMINGO WASH		
0991	P1	Rip Rap Chnl 60'W 3'D 2:1 SS	1,373	850
1017	E	Conc Chnl 60'W 10'D 1:1 SS	422	33,886
1025	E	7: 10' X 5' RCBC @ Cameron		3,150
1026	P1	Rip Rap Chnl 60'W 3'D 2:1 SS	1,214	850
1049	E	3: 12' X 10' RCBC @ Decatur		4,680
1050	P1	156.4 ac-ft Detention Basin		2,170 / 853
1050	P1	10850 cfs PMF Spillway		10,850
1050	P1	2: 72" Outlet Pipes	100	853
1111	P1	Rip Rap Chnl 40'W 5'D 2:1 SS	2,006	1,400
1149	E	Conc Chnl 50'W 8'D 2:1 SS	130	17,627
1151	E	4: 16' X 8' RCBC @ Jones		3,680
1152	E	Earth Chnl 50'W 8'D 3:1 SS	2,640	4,771
1152	P1	Rip Rap Chnl 50'W 5.5'D 2:1 SS	2,640	1,400
1202	E	4: 16' X 8' RCBC @ Torrey Pines		3,680
1203	E	Conc Chnl 40'W 10'D 2:1 SS	1,742	25,837
1236	E	4 Span Bridge 60'W 8'D @ Tropicana		6,800
1237	E	Gabion Chnl 40'W 10'D 2:1 SS	1,531	10,490
1266	E	3 Span Bridge 40'W 15'D 3:1SS @ Rainbow		6,800
1267	E	Gabion Chnl 40'W 6'D 1:1 SS	3,538	3,725
1334	E	Bridge Unknown		
1335	E	Gabion Chnl 40'W 6'D 1:1 SS	1,690	4,809
1367	P1	Rip Rap Chan 4'D 8'W 2:1 SS	4,100	240
1443	E	1,100 ac-ft Upper Flamingo Det. Basin		
1443	E	66,000 cfs PMF Spillway		
1443	E	2: 50" Outlet Pipes		
1443	P3	Upgrade Upper Flamingo Det. Bas. by 240 ac-ft		
1443	P3	45" Outlet Control Pipe	1	
1447	P1	Conc Chan 6.5'D 40'D 2:1 SS	5,700	5,220

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

1991 FLOOD CONTROL MASTER PLAN UPDATE LAS VEGAS VALLEY

LEGEND

- EXISTING MASTER PLAN FACILITIES
- LOCAL OR UNSTUDIED FACILITIES
- PROPOSED MASTER PLAN FACILITIES
- BRIDGE
- CULVERT
- DEBRIS BASIN
- DETENTION BASIN
- DIKE / LEVEE
- PIPELINE
- NATURAL WASH
- FLOODWAY
- UNLINED IMPROVED CHANNEL
- LINED CHANNEL
- DROP STRUCTURE
- SECONDARY FACILITY
- ENVIRONMENTAL AREAS

N

0 1500 3000 4500
(APPROXIMATE)

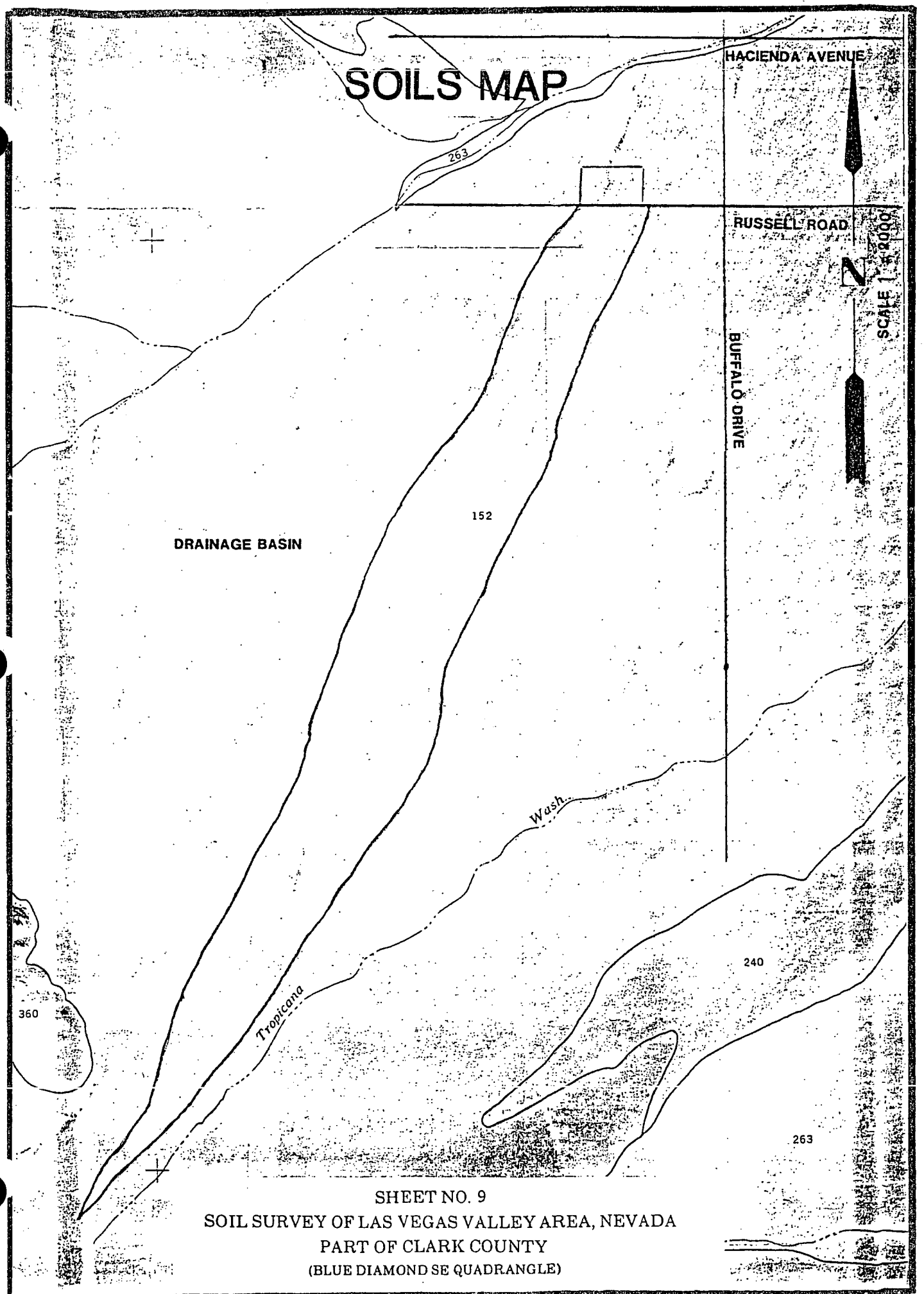
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
	25	26	

FLOOD CONTROL FACILITIES AND ENVIRONMENTAL AREAS

FIGURE F-18

JMM James M. Montgomery Consulting Engineers, Inc.
Las Vegas, Nevada

EXHIBIT 4



SHEET NO. 9

SOIL SURVEY OF LAS VEGAS VALLEY AREA, NEVADA

PART OF CLARK COUNTY

(BLUE DIAMOND SE QUADRANGLE)

EXHIBIT 5

CURVE NUMBER DETERMINATION

(For Arid to Semiarid Rangelands)

Cave gravelly fine sandy loam, Unit No. 152

Soil	Hydrologic Group	Curve No.	Percent	Weighted
Arizo	A	63	5	3.15
Canutio	B	77	5	3.85
Grapevine	B	77	5	3.85
Cave	D	88	85	74.8
			Total	85.65

EXHIBIT 7

RUNOFF CURVE NUMBERS
(SEMIARID RANGELANDS[1])

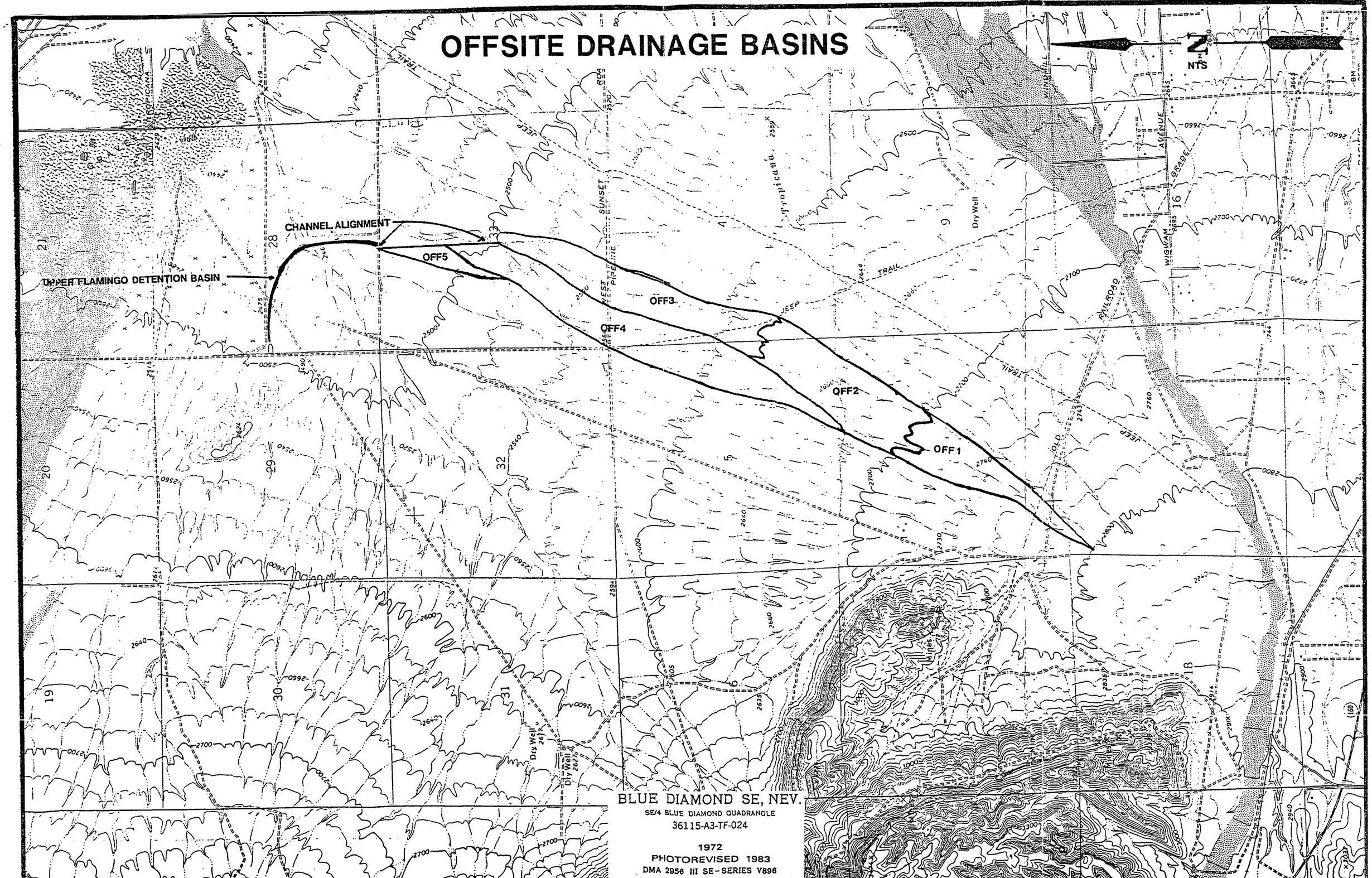
Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

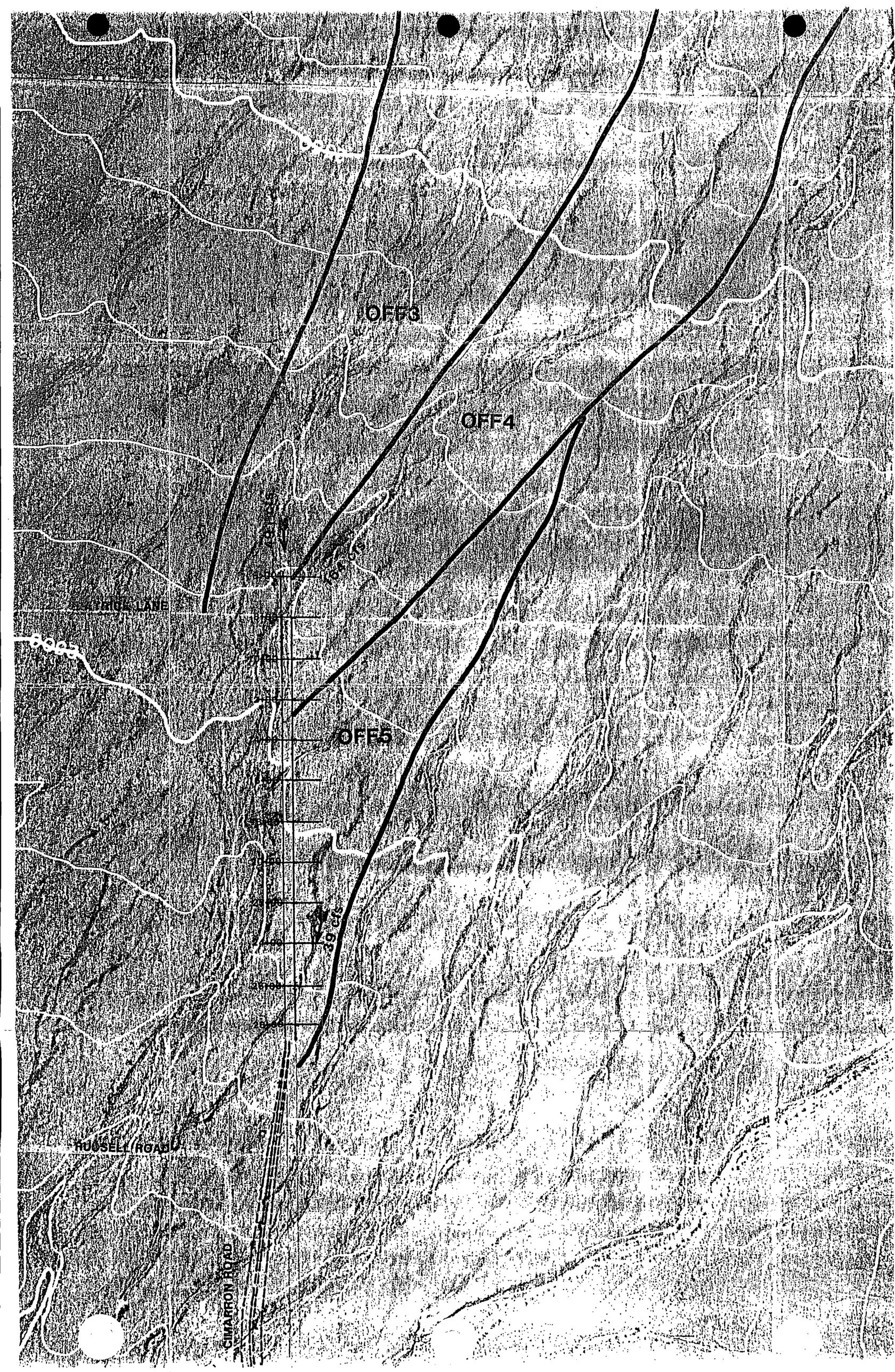
[1]Average runoff condition, and $I_a = 0.2S$.

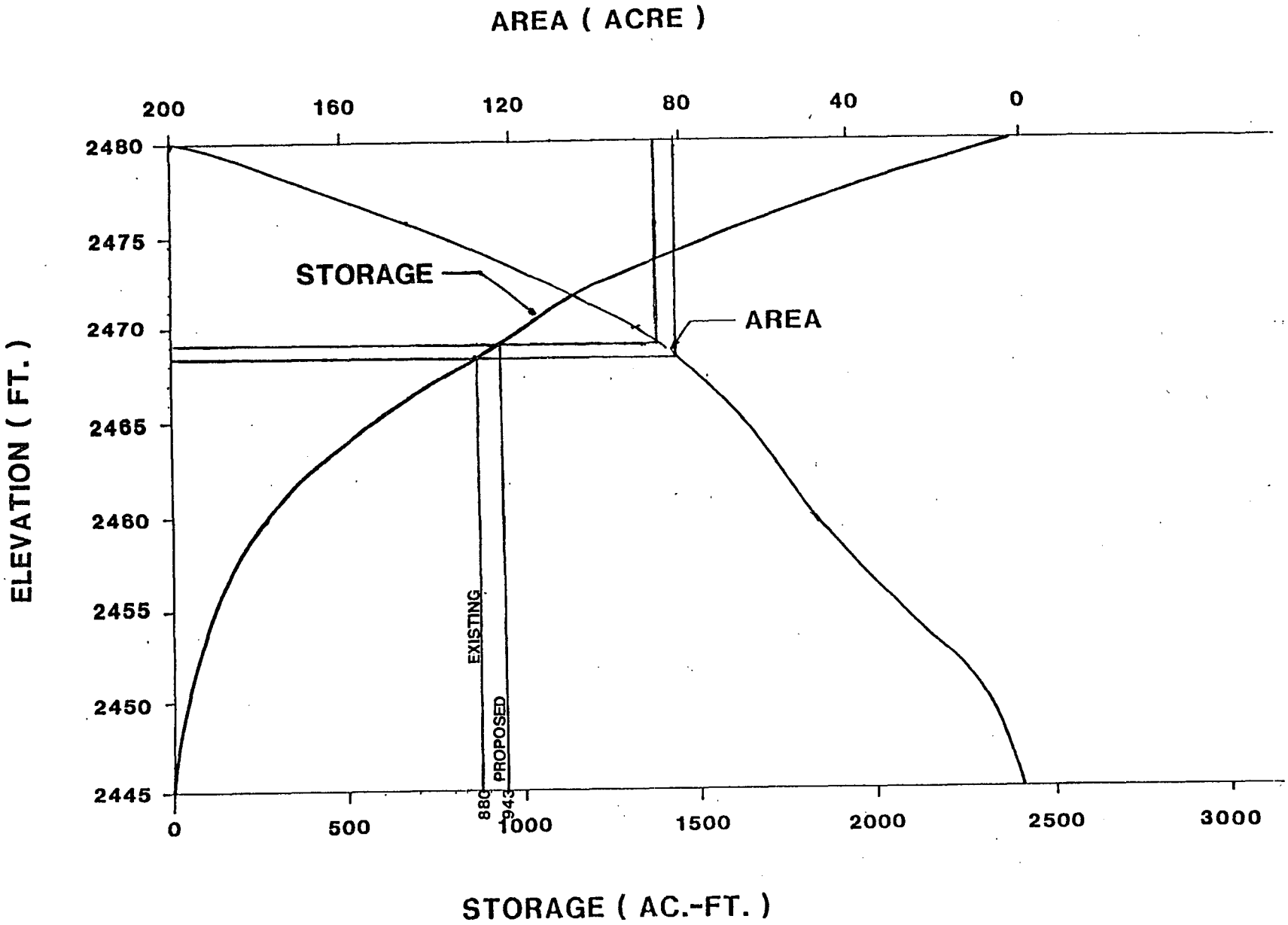
[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

OFFSITE DRAINAGE BASINS




OFF3
OFF4
OFF5
TAYLOR LANE
RUSSELL ROAD
CIMARRON ROAD



STAGE-STORAGE & STAGE-AREA CURVES

EXHIBIT 11

REFERENCES

1. Brater, Ernest F. and King, Horace W., Handbook of Hydraulics, McGraw-Hill Inc., 1976.

2. Burak, Mark H., HYDRAPAK Procedural Outline Manual, Burak Software, Version 1.2, 1988.

3. Clark County Regional Flood Control District, Master Plan, James M. Montgomery, Consulting Engineers, Inc., Volume II August, 1991.

4. Clark County Regional Flood Control District, Hydrologic Criteria and Drainage Design Manual, WRC Engineering, Inc., October, 1990.

5. HEC-1 Flood Hydrograph Package Users Manual, U.S. Army Corps of Engineers, The Hydrologic Engineering Center, Davis, CA, revised January, 1985.

6. HEC-2 Water surface profile package, U.S. Army Corps of Engineers, The Hydrologic Engineering Center, Davis, CA, revised January, 1985.

7. Hydrology Study for Southern Vista Estates, ESI Inc., August, 1992.

8. Upper Flamingo Wash Detention Basin Improvement Plans, Black & Veatch Engineers, June, 1989.

APPENDIX A

TIME OF CONCENTRATION

UPSTREAM OF DETENSION BASIN

DEVELOPMENT SOUTHERN VISTA CHANNEL

CACULATED BY T. DAVY DATE 10-10-92

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)		FINAL t_c	REMARKS
DESIG: (1)	K (2)	AREA Ac (3)	LENGTH Ft (4)	SLOPE % (5)	t_i Min (6)	LENGTH Ft (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	TOTAL LENGTH Ft (11)	$t_c = (L/180)+10$ Min (12)	Min (13)	
OFF 1	0.73*9	124	500	0.75	15.95	4650	2.26	6.15	12.60		28.55		
OFF 2	0.73*9	156	500	0.87	15.18	4800	1.67	5.00	16.00		31.18		
OFF 3	0.73*9	111	300	0.79	12.14	5340	1.80	6.50	13.69		25.83		
OFF 4	0.73*9	125	275	0.79	11.63	8450	1.78	5.62	25.06		36.69		
OFF 5	0.73*9	24	150	0.79	8.59	3200	1.56	3.91	13.64		22.23		

$t_i = 1.8\,(1.1 - K)\,L^{1/2} / S^{1/3}$ $\qquad t_c = t_i + t_t$

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985

U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

    1     ID
    2     ID
    3     ID                        OFFSITE HYDROLOGIC MODEL
    4     ID                              FOR THE
    5     ID                        SOUTHERN VISTA ESTATES
    6     ID                          DIVERSION CHANNEL
    7     ID
    8     ID
    9     ID
   10     ID
   11     ID                        ENGINEERS & SURVEYORS, INC.
   12     ID                          OCTOBER 10, 1992
   13     ID
   14     ID
   15     ID       RATIO 1=100 YR.  RATIO 2=10 YR.
   16     ID
   17     ID
          *DIAGRAM
   18     IT     5                    300
   19     IN     5
   20     IO     5     0
   21     JR   PREC    1.0    0.57

   22     KK   OFF1
   23     KM   RUNOFF FROM DRAINAGE BASIN OFF1
   24     BA   .194
   25     PB   2.77
   26     PC     0   .0200  .0570  .0700  .0870  .1080  .1240  .1300  .1300  .1300
   27     PC  .1300  .1300  .1300  .1330  .1400  .1420  .1480  .1580  .1720  .1810
   28     PC  .1900  .1970  .1990  .2000  .2010  .2040  .2140  .2290  .2410  .2490
   29     PC  .2510  .2560  .2700  .2780  .2810  .2830  .2950  .3220  .3520  .4090
   30     PC  .4990  .5900  .7100  .7440  .7810  .8120  .8190  .8350  .8510  .8560
   31     PC  .8600  .8680  .8760  .8880  .9100  .9260  .9370  .9500  .9700  .9760
   32     PC  .9820  .9850  .9870  .9890  .9900  .9930  .9930  .9940  .9950  .9980
   33     PC  .9980  .9990 1.000
   34     LS     0   85.6
   35     UD  .2855

   36     KK   RT1
   37     KM   ROUTE OFF1 RUNOFF THROUGH OFF2
   38     RK   4800   .0167   .035          TRAP     10      5

   39     KK   OFF2
   40     KM   RUNOFF FROM DRAINAGE BASIN OFF2
   41     BA    .212
   42     LS      0   85.6
   43     UD  .3118

   44     KK   COM1
   45     KM   COMBINE OFF1 WITH OFF2 RUNOFF
   46     HC      2
```

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  47      KK  RT2
  48      KM  ROUTE OFF1 AND OFF2 RUNOFF THROUGH OFF3
  49      RK   5340   .0180    .035          TRAP      10       5

  50      KK  OFF3
  51      KM  RUNOFF FROM DRAINAGE BASIN OFF3
  52      BA   .173
  53      LS      0    85.6
  54      UD  .2583

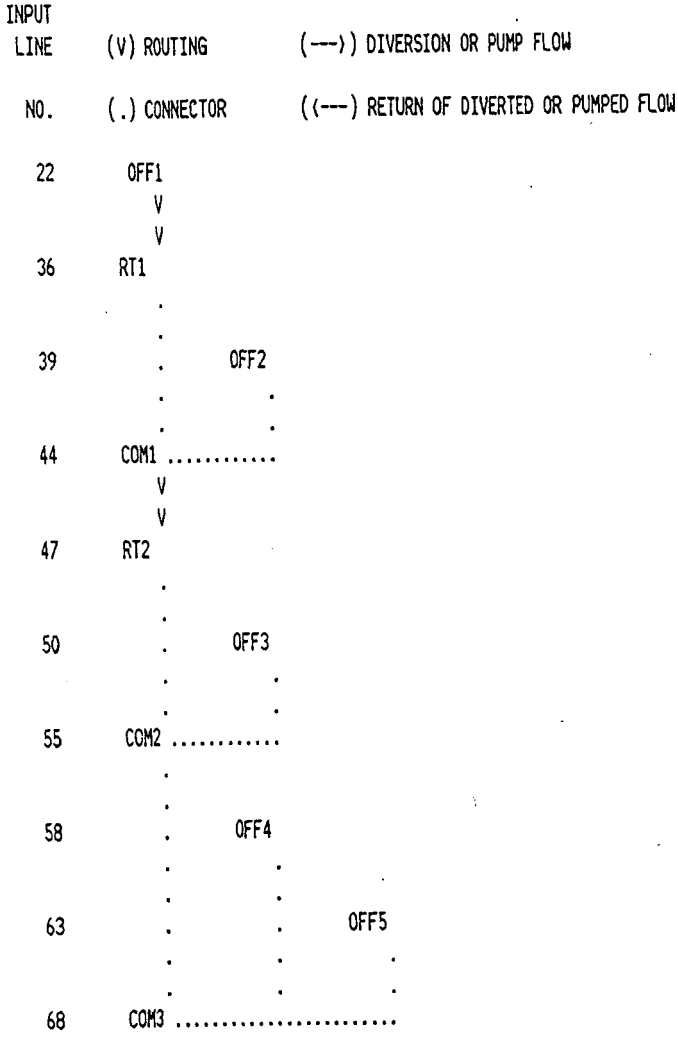
  55      KK  COM2
  56      KM  COMBINE RUNOFF FROM BASINS OFF1, OFF2 WITH OFF3
  57      HC      2

  58      KK  OFF4
  59      KM  RUNOFF FROM DRAINAGE BASIN OFF4
  60      BA  .1953
  61      LS      0    85.6
  62      UD  .3669

  63      KK  OFF5
  64      KM  RUNOFF FROM DRAINAGE BASIN OFF5
  65      BA  .0375
  66      LS      0    85.6
  67      UD  .2223

  68      KK  COM3
  69      KM  TOTAL RUNOFF FROM ALL BASINS
  70      HC      3
  71      KO      2
  72      ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

OFFSITE HYDROLOGIC MODEL
FOR THE
SOUTHERN VISTA ESTATES
DIVERSION CHANNEL

ENGINEERS & SURVEYORS, INC.
OCTOBER 10, 1992

RATIO 1=100 YR. RATIO 2=10 YR.

20 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN		5	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2	0	ENDING DATE
NDTIME		0055	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

JP MULTI-PLAN OPTION

NPLAN	1	NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .57

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

*** ***

```
         **************
         *            *
68 KK    *    COM3    *
         *            *
         **************
```

71 KO OUTPUT CONTROL VARIABLES

IPRNT	2	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

70 HC HYDROGRAPH COMBINATION

ICOMP	3	NUMBER OF HYDROGRAPHS TO COMBINE

***

****

HYDROGRAPH AT STATION COM3
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	22.	1		1230	151	0.	1		1845	226	0.
1		0005	2	0.	1		0620	77	19.	1		1235	152	0.	1		1850	227	0.
1		0010	3	0.	1		0625	78	16.	1		1240	153	0.	1		1855	228	0.
1		0015	4	0.	1		0630	79	13.	1		1245	154	0.	1		1900	229	0.
1		0020	5	0.	1		0635	80	11.	1		1250	155	0.	1		1905	230	0.
1		0025	6	0.	1		0640	81	9.	1		1255	156	0.	1		1910	231	0.
1		0030	7	0.	1		0645	82	8.	1		1300	157	0.	1		1915	232	0.
1		0035	8	0.	1		0650	83	7.	1		1305	158	0.	1		1920	233	0.
1		0040	9	0.	1		0655	84	6.	1		1310	159	0.	1		1925	234	0.
1		0045	10	0.	1		0700	85	5.	1		1315	160	0.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4.	1		1320	161	0.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4.	1		1325	162	0.	1		1940	237	0.
1		0100	13	0.	1		0715	88	3.	1		1330	163	0.	1		1945	238	0.
1		0105	14	0.	1		0720	89	3.	1		1335	164	0.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2.	1		1340	165	0.	1		1955	240	0.
1		0115	16	0.	1		0730	91	2.	1		1345	166	0.	1		2000	241	0.
1		0120	17	1.	1		0735	92	2.	1		1350	167	0.	1		2005	242	0.
1		0125	18	1.	1		0740	93	2.	1		1355	168	0.	1		2010	243	0.
1		0130	19	3.	1		0745	94	1.	1		1400	169	0.	1		2015	244	0.
1		0135	20	4.	1		0750	95	1.	1		1405	170	0.	1		2020	245	0.
1		0140	21	7.	1		0755	96	1.	1		1410	171	0.	1		2025	246	0.
1		0145	22	9.	1		0800	97	1.	1		1415	172	0.	1		2030	247	0.
1		0150	23	10.	1		0805	98	1.	1		1420	173	0.	1		2035	248	0.
1		0155	24	11.	1		0810	99	1.	1		1425	174	0.	1		2040	249	0.
1		0200	25	11.	1		0815	100	1.	1		1430	175	0.	1		2045	250	0.

1	0205	26	10.	*	1	0820	101	1.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	10.	*	1	0825	102	1.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	12.	*	1	0830	103	1.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	16.	*	1	0835	104	1.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	21.	*	1	0840	105	0.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	25.	*	1	0845	106	0.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	27.	*	1	0850	107	0.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	29.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	31.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	34.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	36.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	37.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	40.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	49.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	69.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	108.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	175.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	280.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	418.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	569.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	688.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	669.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	663.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	605.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	525.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	441.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	363.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	270.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	224.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	196.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	184.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	182.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	184.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	188.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	192.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	193.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	186.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	172.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	152.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	131.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	110.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	91.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	76.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	63.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	53.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	45.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	39.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	34.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	30.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	26.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*					

****

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	688.	3.75		127.	32.	31.	31.
			(INCHES)	1.456	1.460	1.460	1.460
			(AC-FT)	63.	63.	63.	63.

CUMULATIVE AREA = .81 SQ MI

****

HYDROGRAPH AT STATION COM3
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .57

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	12.	1		1230	151	0.	1		1845	226	0.
1		0005	2	0.	1		0620	77	10.	1		1235	152	0.	1		1850	227	0.
1		0010	3	0.	1		0625	78	9.	1		1240	153	0.	1		1855	228	0.
1		0015	4	0.	1		0630	79	7.	1		1245	154	0.	1		1900	229	0.
1		0020	5	0.	1		0635	80	6.	1		1250	155	0.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5.	1		1255	156	0.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5.	1		1300	157	0.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4.	1		1305	158	0.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3.	1		1310	159	0.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3.	1		1315	160	0.	1		1930	235	0.
1		0050	11	0.	1		0705	86	3.	1		1320	161	0.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2.	1		1325	162	0.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2.	1		1330	163	0.	1		1945	238	0.
1		0105	14	0.	1		0720	89	2.	1		1335	164	0.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2.	1		1340	165	0.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1.	1		1345	166	0.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1.	1		1350	167	0.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1.	1		1355	168	0.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1.	1		1400	169	0.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1.	1		1405	170	0.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1.	1		1410	171	0.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1.	1		1415	172	0.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1.	1		1420	173	0.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1.	1		1425	174	0.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1.	1		1430	175	0.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1.	1		1435	176	0.	1		2050	251	0.
1		0210	27	0.	1		0825	102	0.	1		1440	177	0.	1		2055	252	0.
1		0215	28	0.	1		0830	103	0.	1		1445	178	0.	1		2100	253	0.
1		0220	29	0.	1		0835	104	0.	1		1450	179	0.	1		2105	254	0.
1		0225	30	0.	1		0840	105	0.	1		1455	180	0.	1		2110	255	0.
1		0230	31	1.	1		0845	106	0.	1		1500	181	0.	1		2115	256	0.

1	0235	32	1.	*	1	0850	107	0.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	1.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	2.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	2.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	3.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	3.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	4.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	6.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	11.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	22.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	42.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	74.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	115.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	157.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	195.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	224.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	233.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	222.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	197.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	170.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	144.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	121.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	103.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	91.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	86.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	84.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	84.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	84.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	85.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	85.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	82.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	77.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	69.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	61.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	52.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	45.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	38.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	32.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	28.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	24.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	21.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	18.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	16.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	14.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*					

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	233.	3.92		46.	12.	11.	11.
			(INCHES)	.527	.528	.528	.528
			(AC-FT)	23.	23.	23.	23.

CUMULATIVE AREA = .81 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO PRECIPITATION	
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2
					1.00	.57
HYDROGRAPH AT						
+	OFF1	.19	1	FLOW	182.	68.
				TIME	3.75	3.75
ROUTED TO						
+	RT1	.19	1	FLOW	182.	63.
				TIME	3.83	3.92
HYDROGRAPH AT						
+	OFF2	.21	1	FLOW	193.	71.
				TIME	3.75	3.75
2 COMBINED AT						
+	COM1	.41	1	FLOW	370.	129.
				TIME	3.75	3.83
ROUTED TO						
+	RT2	.41	1	FLOW	369.	124.
				TIME	3.92	4.00
HYDROGRAPH AT						
+	OFF3	.17	1	FLOW	171.	63.
				TIME	3.67	3.75
2 COMBINED AT						
+	COM2	.58	1	FLOW	491.	166.
				TIME	3.75	3.92
HYDROGRAPH AT						
+	OFF4	.20	1	FLOW	164.	61.
				TIME	3.83	3.83
HYDROGRAPH AT						
+	OFF5	.04	1	FLOW	39.	15.
				TIME	3.67	3.67
3 COMBINED AT						
+	COM3	.81	1	FLOW	688.	233.
				TIME	3.75	3.92

*** NORMAL END OF HEC-1 ***

APPENDIX B

```
1*************************************************
 *  WATER SURFACE PROFILES                       *
 *  VERSION OF NOVEMBER 1976                     *
 *  UPDATED MAY 1984                             *
 *  IBM-PC-XT VERSION AUGUST 1985                *
 *  RUN DATE  11-02-92   TIME  14:45:31           *
*
 *************************************************
```


```
**************************************
*  U.S. ARMY CORPS OF ENGINEERS      *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D        *
*  DAVIS, CALIFORNIA 95616           *
   *  (916) 440-2105 (FTS) 448-2105
**************************************
```


SUB-CRITICAL
SOUTHEAST TRIBUTARY

```
X    X  XXXXXXX   XXXXX          XXXXX
X    X  X        X    X        X    X
X    X  X        X                  X
XXXXXXX  XXXX    X        XXXXX   XXXXX
X    X  X        X                 X
X    X  X        X    X            X
X    X  XXXXXXX  XXXXX             XXXXXXX
```

THIS RUN EXECUTED 11-02-92

```
**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************
```

T1 SOUTHERN VISTA ESTATES
T2 OCTOBER 20, 1992
T3 SUBCRITICAL FLOW SOUTHEAST TRIBUTARY

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	2.	0.	0.	.000000	.00	1.0	491.	506.200	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	.000	.000	.000	.000	.000	.000	-1.000	.000	.000	.000

NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
QT	1.000	491.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	9.000	11.000	.000	400.000	.000	.000	.000	.000	.000	.000
GR	510.000	.000	509.000	22.000	508.000	45.000	507.000	160.000	506.000	250.000
GR	505.000	265.000	504.000	276.000	505.000	291.000	506.000	307.000	507.000	330.000
GR	510.000	400.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	8.000	12.000	.000	450.000	125.000	95.000	75.000	.000	.000	.000
GR	512.000	.000	511.000	65.000	510.000	110.000	509.000	160.000	508.000	244.000
GR	507.000	265.000	506.000	285.000	507.000	296.000	508.000	307.000	509.000	358.000
GR	510.000	400.000	512.000	450.000	.000	.000	.000	.000	.000	.000
X1	7.000	10.000	.000	400.000	55.000	112.000	87.000	.000	.000	.000
GR	512.000	.000	511.000	80.000	510.000	140.000	509.000	205.000	508.000	248.000
GR	507.000	271.000	508.000	284.000	509.000	289.000	510.000	303.000	512.000	400.000
X1	6.000	10.000	.000	420.000	50.000	70.000	45.000	.000	.000	.000
GR	513.000	.000	512.000	72.000	511.000	140.000	510.000	253.000	509.000	276.000
GR	508.000	310.000	509.000	318.000	510.000	330.000	511.000	386.000	512.000	420.000
X1	5.000	9.000	.000	408.000	35.000	80.000	62.000	.000	.000	.000
GR	513.000	.000	512.000	80.000	511.000	240.000	510.000	267.000	509.000	292.000
GR	510.000	309.000	511.000	331.000	512.000	370.000	513.000	408.000	.000	.000
X1	4.000	7.000	.000	380.000	45.000	150.000	117.000	.000	.000	.000
GR	513.000	.000	512.000	235.000	511.000	260.000	512.000	290.000	513.000	315.000
GR	514.000	341.000	515.000	380.000	.000	.000	.000	.000	.000	.000

X1	3.000	8.000	.000	402.000	100.000	50.000	55.000	.000	.000	.000
GR	515.000	.000	514.000	180.000	513.000	235.000	512.000	260.000	513.000	300.000
GR	514.000	338.000	515.000	370.000	516.000	402.000	.000	.000	.000	.000
X1	2.000	11.000	.000	480.000	122.000	90.000	105.000	.000	.000	.000
GR	518.000	.000	517.000	83.000	516.000	190.000	515.000	296.000	514.000	307.000
GR	513.000	319.000	514.000	358.000	515.000	389.000	516.000	420.000	517.000	450.000
GR	518.000	480.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1.000	12.000	.000	508.000	75.000	60.000	65.000	.000	.000	.000
GR	520.000	.000	519.000	72.000	518.000	155.000	517.000	254.000	516.000	353.000
GR	515.000	369.000	514.000	378.000	514.000	383.000	515.000	420.000	516.000	448.000
GR	517.000	476.000	518.000	508.000	.000	.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 9.000
3720 CRITICAL DEPTH ASSUMED

9.00	2.46	506.46	506.46	506.20	506.90	.43	.00	.00	510.00
491.	0.	491.	0.	0.	93.	0.	0.	0.	510.00
.00	.00	5.28	.00	.035	.035	.035	.000	504.00	208.39
.019253	0.	0.	0.	0	7	0	.00	109.24	317.63

0
*SECNO 8.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

8.00	2.35	508.35	508.35	.00	508.78	.43	1.45	.00	512.00
491.	0.	491.	0.	0.	93.	0.	0.	0.	512.00
.00	.00	5.27	.00	.035	.035	.035	.000	506.00	214.36
.019431	125.	75.	95.	0	11	0	.00	110.64	325.00

0
*SECNO 7.000

7.00	2.54	509.54	509.11	.00	509.75	.21	.94	.02	512.00
491.	0.	491.	0.	0.	134.	0.	0.	0.	512.00
.01	.00	3.66	.00	.035	.035	.035	.000	507.00	170.27
.006863	55.	87.	112.	1	11	0	.00	126.21	296.48

0
*SECNO 6.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

6.00	2.10	510.10	510.10	.00	510.57	.48	.47	.08	513.00
491.	0.	491.	0.	0.	89.	0.	1.	1.	512.00
.01	.00	5.53	.00	.035	.035	.035	.000	508.00	242.08
.018208	50.	45.	70.	0	12	0	.00	93.33	335.41

0
*SECNO 5.000

5.00	2.25	511.25	511.03	.00	511.53	.28	.94	.02	513.00
491.	0.	491.	0.	0.	116.	0.	1.	1.	513.00
.02	.00	4.22	.00	.035	.035	.035	.000	509.00	200.10
.012719	35.	62.	80.	3	8	0	.00	140.63	340.73

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
*SECNO 4.000									
4.00	1.79	512.79	512.67	.00	512.95	.16	1.41	.01	513.00
491.	0.	491.	0.	0.	154.	0.	1.	1.	515.00
.03	.00	3.19	.00	.035	.035	.035	.000	511.00	47.58
.011464	45.	117.	150.	3	14	0	.00	262.36	309.94
0									
*SECNO 3.000									
7185 MINIMUM SPECIFIC ENERGY									
3720 CRITICAL DEPTH ASSUMED									
3.00	1.67	513.67	513.67	.00	514.07	.39	.82	.07	515.00
491.	0.	491.	0.	0.	97.	0.	1.	1.	516.00
.03	.00	5.04	.00	.035	.035	.035	.000	512.00	197.96
.020250	100.	55.	50.	0	11	0	.00	127.63	325.59
0									
*SECNO 2.000									
2.00	2.22	515.22	514.88	.00	515.47	.26	1.39	.01	518.00
491.	0.	491.	0.	0.	121.	0.	1.	2.	518.00
.04	.00	4.06	.00	.035	.035	.035	.000	513.00	272.84
.009320	122.	105.	90.	2	8	0	.00	122.93	395.77
0									
*SECNO 1.000									
7185 MINIMUM SPECIFIC ENERGY									
3720 CRITICAL DEPTH ASSUMED									
1.00	1.87	515.87	515.87	.00	516.34	.47	.80	.06	520.00
491.	0.	491.	0.	0.	89.	0.	2.	2.	518.00
.04	.00	5.49	.00	.035	.035	.035	.000	514.00	355.02
.016798	75.	65.	60.	0	14	0	.00	89.45	444.47
0									

PROFILE FOR STREAM SUBCRITICAL FLOW S

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  504.     506.     508.     510.     512.     514.     516.     518.     520.     522.
   SECNO  CUMDIS

    9.00     0. I      .WE   .      L      .      .      .      .      .      .      .
            10. .I     . WE  .      .L     .      .      .      .      .      .      .
            20. . I    . WE  .      . L    .      .      .      .      .      .      .
            30. .  I   .  WE .      .  L   .      .      .      .      .      .      .
            40. .   I  .   W E      .   L  .      .      .      .      .      .      .
            50. .    I .    W.E     .    L .      .      .      .      .      .      .
            60. .     I.     W E     .     L.      .      .      .      .      .      .
            70. .      I.    .W E    .      L.     .      .      .      .      .      .
    8.00    80. .       I    . W E   .       L     .      .      .      .      .      .
            90. .       .I   . W E   .       L     .      .      .      .      .      .
           100. .       .I   . W E   .       L     .      .      .      .      .      .
           110. .       . I  . CW E  .       L     .      .      .      .      .      .
           120. .       . I  . CW E  .       L     .      .      .      .      .      .
           130. .       .  I . CW E  .       L     .      .      .      .      .      .
           140. .       .  I . C WE  .       L     .      .      .      .      .      .
           150. .       .   I. CW E  .       L     .      .      .      .      .      .
           160. .       .   I. C WE  .       L     .      .      .      .      .      .
    7.00   170. .       .   I. C WE. .       L     .      .      .      .      .      .
           180. .       .    I. CW E .       RL    .      .      .      .      .      .
           190. .       .    I. CW.E .       R L   .      .      .      .      .      .
           200. .       .    I. CWE  .       R L   .      .      .      .      .      .
    6.00   210. .       .     I  .W E .       R  L  .      .      .      .      .      .
           220. .       .     .I .W E .       .R L  .      .      .      .      .      .
           230. .       .     . I.W E .       . R L .      .      .      .      .      .
           240. .       .     . I. W E .      . R L .      .      .      .      .      .
           250. .       .     .  I. W E .     . RL  .      .      .      .      .      .
           260. .       .     .  I. CW E .    . RL  .      .      .      .      .      .
    5.00   270. .       .     .  I. CW E .    .  L  .      .      .      .      .      .
           280. .       .     .  I. CWE  .    .  LR .      .      .      .      .      .
           290. .       .     .  I. CWE. .    .  L R.      .      .      .      .      .
           300. .       .     .  I. CWE. .    .  L R.      .      .      .      .      .
           310. .       .     .  I. CWE  .    .  L R.      .      .      .      .      .
           320. .       .     .  I. CWE  .    .  L R.      .      .      .      .      .
           330. .       .     .  I  CWE  .    .  L  R      .      .      .      .      .
           340. .       .     .  .I CWE  .    .  L  .R     .      .      .      .      .
           350. .       .     .  . I.CWE .    .  L  . R    .      .      .      .      .
           360. .       .     .  . I.CWE .    .  L  . R    .      .      .      .      .
           370. .       .     .  . I. CWEL    .  .  . R    .      .      .      .      .
           380. .       .     .  . I. CEL     .  .  . R    .      .      .      .      .
    4.00   390. .       .     .  .  I. CWE   .  .  .  R    .      .      .      .      .
           400. .       .     .  .  I. CWEL  .  .  .  R    .      .      .      .      .
           410. .       .     .  .  I. CWE L.  .  .  R .   .      .      .      .      .
           420. .       .     .  .  I. W E L   .  .  R .   .      .      .      .      .
           430. .       .     .  .  I. W E. L  .  .  R.    .      .      .      .      .
           440. .       .     .  .  I  W E  L  .  .  R     .      .      .      .      .
```

```
3.00  450.  .  .  .  .  I    WE  L  R     .  .  .  .
      460.  .  .  .  .  I     W.E  L  .R    .  .  .  .
      470.  .  .  .  .  .I     W E   L . R    .  .  .  .
      480.  .  .  .  .  .I     CWE    L. R    .  .  .  .
      490.  .  .  .  .  . I     .W E    .L R    .  .  .  .
      500.  .  .  .  .  . I     .CW E    . L R    .  .  .  .
      510.  .  .  .  .  .  I    . CWE    .  L R    .  .  .  .
      520.  .  .  .  .  .  I    . C WE    .  L R .  .  .  .
      530.  .  .  .  .  .   I   . CW E    .  L R .  .  .  .
      540.  .  .  .  .  .   I   .  CWE    .  LR.  .  .  .
2.00  550.  .  .  .  .  .    I  .  C WE .     L     .  .  .
      560.  .  .  .  .  .    I  .  C WE .     R L    .  .  .
      570.  .  .  .  .  .    I  .   CW E.     R  L   .  .  .
      580.  .  .  .  .  .    I  .    CWE.     R   L  .  .  .
      590.  .  .  .  .  .     I .    CW E     R    L .  .  .
      600.  .  .  .  .  .     I.     CW.E     R     L.  .  .
      610.  .  .  .  .  .      I      W.E     R      L.  .  .
1.00  620.  .  .  .  .  .      I      W. E     R      L   .  .
```

THIS RUN EXECUTED 11-02-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************
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1**************************************************
 *  WATER SURFACE PROFILES                        *
 *  VERSION OF NOVEMBER 1976                      *
 *  UPDATED MAY 1984                              *
 *  IBM-PC-XT VERSION AUGUST 1985                 *
 *  RUN DATE  10-20-92   TIME  14:24:56            *
*
 **************************************************
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**************************************
*  U.S. ARMY CORPS OF ENGINEERS      *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D        *
*  DAVIS, CALIFORNIA 95616           *
   *  (916) 440-2105 (FTS) 448-2105

**************************************
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SUPER-CRITICAL

SOUTHEAST TRIBUTARY

```
X    X  XXXXXXX   XXXXX           XXXXX
X    X  X        X    X         X    X
X    X  X        X                   X
XXXXXXX  XXXX    X        XXXXX   XXXXX
X    X  X        X                X
X    X  X        X    X           X
X    X  XXXXXXX  XXXXX            XXXXXXX
```

THIS RUN EXECUTED 10-20-92

```
**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************

T1          SOUTHERN VISTA ESTATES
T2          OCTOBER 20, 1992
T3          SUPERCRITICAL FLOW SOUTHEAST TRIBUTARY

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC    HVINS    Q        WSEL     FQ

       0.      2.       0.       1.  .000000       .00      1.0     491.   516.100     .000

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      .000     .000     .000     .000     .000     .000    -1.000     .000     .000     .000


NC     .035     .035     .035     .100     .300     .000     .000     .000     .000     .000
QT    1.000  491.000     .000     .000     .000     .000     .000     .000     .000     .000
X1    1.000   12.000     .000  508.000   75.000   60.000   65.000     .000     .000     .000
GR  520.000     .000  519.000   72.000  518.000  155.000  517.000  254.000  516.000  353.000
GR  515.000  369.000  514.000  378.000  514.000  383.000  515.000  420.000  516.000  448.000
GR  517.000  476.000  518.000  508.000     .000     .000     .000     .000     .000     .000

X1    2.000   11.000     .000  480.000  122.000   90.000  105.000     .000     .000     .000
GR  518.000     .000  517.000   83.000  516.000  190.000  515.000  296.000  514.000  307.000
GR  513.000  319.000  514.000  358.000  515.000  389.000  516.000  420.000  517.000  450.000
GR  518.000  480.000     .000     .000     .000     .000     .000     .000     .000     .000

X1    3.000    8.000     .000  402.000  100.000   50.000   55.000     .000     .000     .000
GR  515.000     .000  514.000  180.000  513.000  235.000  512.000  260.000  513.000  300.000
GR  514.000  338.000  515.000  370.000  516.000  402.000     .000     .000     .000     .000

X1    4.000    7.000     .000  380.000   45.000  150.000  117.000     .000     .000     .000
GR  513.000     .000  512.000  235.000  511.000  260.000  512.000  290.000  513.000  315.000
GR  514.000  341.000  515.000  380.000     .000     .000     .000     .000     .000     .000

X1    5.000    9.000     .000  408.000   35.000   80.000   62.000     .000     .000     .000
GR  513.000     .000  512.000   80.000  511.000  240.000  510.000  267.000  509.000  292.000
GR  510.000  309.000  511.000  331.000  512.000  370.000  513.000  408.000     .000     .000

X1    6.000   10.000     .000  420.000   50.000   70.000   45.000     .000     .000     .000
GR  513.000     .000  512.000   72.000  511.000  140.000  510.000  253.000  509.000  276.000
GR  508.000  310.000  509.000  318.000  510.000  330.000  511.000  386.000  512.000  420.000
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X1	7.000	10.000	.000	400.000	55.000	112.000	87.000	.000	.000	.000
GR	512.000	.000	511.000	80.000	510.000	140.000	509.000	205.000	508.000	248.000
GR	507.000	271.000	508.000	284.000	509.000	289.000	510.000	303.000	512.000	400.000
X1	8.000	12.000	.000	450.000	125.000	95.000	75.000	.000	.000	.000
GR	512.000	.000	511.000	65.000	510.000	110.000	509.000	160.000	508.000	244.000
GR	507.000	265.000	506.000	285.000	507.000	296.000	508.000	307.000	509.000	358.000
GR	510.000	400.000	512.000	450.000	.000	.000	.000	.000	.000	.000
X1	9.000	11.000	.000	400.000	.000	.000	.000	.000	.000	.000
GR	510.000	.000	509.000	22.000	508.000	45.000	507.000	160.000	506.000	250.000
GR	505.000	265.000	504.000	276.000	505.000	291.000	506.000	307.000	507.000	330.000
GR	510.000	400.000	.000	.000	.000	.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

```
   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA  LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN     SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID    ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=    .100 CEHV=    .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED
     1.00     1.85   515.85   515.85   516.10   516.34     .49      .00      .00   520.00
     491.       0.     491.       0.       0.      87.       0.       0.       0.   518.00
      .00      .00     5.64      .00     .035     .035     .035     .000   514.00   355.42
   .017978       0.       0.       0.        0       15        0      .00    88.34   443.76
0
*SECNO 2.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     2.00     1.88   514.88   514.88      .00   515.38     .49     1.17      .67   518.00
     491.       0.     491.       0.       0.      87.       0.       0.       0.   518.00
      .00      .00     5.64      .00     .035     .035     .035     .000   513.00   297.27
   .017995       75.       65.       60.       20        5        0      .00    88.14   385.41
0
*SECNO 3.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     3.00     1.67   513.67   513.67      .00   514.07     .39     2.00     1.39   515.00
     491.       0.     491.       0.       0.      97.       0.       0.       0.   516.00
      .01      .90     5.04      .00     .035     .035     .035     .000   512.00   197.91
   .020187      122.      105.       90.       20       15        0      .00   127.72   325.63
0
*SECNO 4.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     4.00     1.66   512.66   512.66      .00   512.92     .26     1.14      .76   513.00
     491.       0.     491.       0.       0.     121.       0.       0.       1.   515.00
      .01      .00     4.07      .00     .035     .035     .035     .000   511.00    79.73
   .021357      100.       55.       50.       20        6        0      .00   226.78   306.52
0
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 5.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

5.00	2.03	511.03	511.03	.00	511.49	.46	2.30	1.17	513.00
491.	0.	491.	0.	0.	90.	0.	1.	1.	513.00
.02	.00	5.46	.00	.035	.035	.035	.000	509.00	235.87
.018109	45.	117.	150.	20	11	0	.00	96.13	332.01

0
*SECNO 6.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

6.00	2.10	510.10	510.10	.00	510.57	.47	1.12	.48	513.00
491.	0.	491.	0.	0.	89.	0.	1.	1.	512.00
.02	.00	5.52	.00	.035	.035	.035	.000	508.00	241.78
.018155	35.	62.	80.	20	8	0	.00	93.78	335.56

0
*SECNO 7.000

7.00	2.01	509.01	509.12	.00	509.62	.61	.94	.01	512.00
491.	0.	491.	0.	0.	78.	0.	1.	1.	512.00
.02	.00	6.28	.00	.035	.035	.035	.000	507.00	204.82
.024172	50.	45.	70.	3	5	0	.00	84.22	289.04

0
*SECNO 8.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

8.00	2.35	508.35	508.35	.00	508.78	.43	1.88	.73	512.00
491.	0.	491.	0.	0.	93.	0.	1.	1.	512.00
.03	.00	5.28	.00	.035	.035	.035	.000	506.00	214.45
.019482	55.	87.	112.	20	8	0	.00	110.49	324.94

0
*SECNO 9.000

9.00	2.28	506.28	506.45	.00	506.96	.68	1.80	.02	510.00
491.	0.	491.	0.	0.	74.	0.	1.	2.	510.00
.03	.00	6.62	.00	.035	.035	.035	.000	504.00	225.52
.030462	125.	75.	95.	3	8	0	.00	87.74	313.26

0

1

PROFILE FOR STREAM SUPERCRITICAL FLOW

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  504.    506.    508.    510.    512.    514.    516.    518.    520.    522.
   SECNO  CUMDIS

    1.00     0.  .       .       .       .       .       I       W.E     R       L       .       .
            10.  .       .       .       .       .      I.       W.E     R     L .       .       .
            20.  .       .       .       .       .      I .      W E     R     L .       .       .
            30.  .       .       .       .       .      I .      W E.    R   L   .       .       .
            40.  .       .       .       .       .     I  .      W E.    R  L    .       .       .
            50.  .       .       .       .       .     I  .      W E .   R L     .       .       .
            60.  .       .       .       .       .    I   .      W E .   RL      .       .       .
    2.00    70.  .       .       .       .       .    I   .      W E .   L       .       .       .
            80.  .       .       .       .       .    I   .      W E .   L.      .       .       .
            90.  .       .       .       .       .   I    .      W E .   LR .    .       .       .
           100.  .       .       .       .       .   I    .      W E .   LR .    .       .       .
           110.  .       .       .       .       .  I     .      W E .   L R .   .       .       .
           120.  .       .       .       .       .  I     .      W E .   L R .   .       .       .
           130.  .       .       .       .       . I      .      W E'    .L R .  .       .       .
           140.  .       .       .       .       . I      .      W E     L R .  .       .       .
           150.  .       .       .       .       .I       .      W E .   L. R .  .       .       .
           160.  .       .       .       .       .I       .      W.E     L .R .  .       .       .
    3.00   170.  .       .       .       .       I        .      W E     L  R .  .       .       .
           180.  .       .       .       .      I.        .      W E. L  .  R. .  .       .       .
           190.  .       .       .       .      I .       .      WE .L   .  R .  .       .       .
           200.  .       .       .       .     I  .       .      WE L    .  R .  .       .       .
           210.  .       .       .       .     I  .       .      WE L .  .  R .  .       .       .
           220.  .       .       .       .    I   .       .      WEL .   .  R .  .       .       .
    4.00   230.  .       .       .       .    I   .       .      W E .   .  R .  .       .       .
           240.  .       .       .       .   I    .       .      WEL .   .  R .  .       .       .
           250.  .       .       .       .  I     .       .      WE L .  .  R .  .       .       .
           260.  .       .       .       . I      .       .      W E L .  .  R .  .       .       .
           270.  .       .       .       . I      .       .      WE  L .  .  R .  .       .       .
           280.  .       .       .       .I       .       .      W E L .  .  R .  .       .       .
           290.  .       .       .       I        .       .      W.E  L .  R .  .       .       .
           300.  .       .       .      I.        .       .      W E  L .  R. .  .       .       .
           310.  .       .       .      I .       .       .      W E  L .  R. .  .       .       .
           320.  .       .       .     I  .       .       .      WE.  L .  R .  .       .       .
           330.  .       .       .     I  .       .       .      W E .  L  R .  .       .       .
           340.  .       .       .     I  .       .       .      W E .  L  R .  .       .       .
    5.00   350.  .       .       .    I   .       .       .      W E .  L  .  .       .       .
           360.  .       .       .   I    .       .       .      W E .  RL .  .       .       .
           370.  .       .       .  I     .       .       .      W E .  R L .  .       .       .
           380.  .       .       .  I     .       .       .      W E .  R L .  .       .       .
           390.  .       .       . I      .       .       .      W E .  R L .  .       .       .
           400.  .       .       .I       .       .       .      W E .  R L .  .       .       .
    6.00   410.  .       .       I        .       .       .      W E .  R L .  .       .       .
           420.  .       .      I.        .       .       .      W.E .  R L .  .       .       .
           430.  .       .      I .       .       .       .      W.E .  R L .  .       .       .
           440.  .       .     I  .       .       .       .      W E .  R L .  .       .       .
```

```
7.00  450.  .       .  I   .  WC E .      L      .  .  .  .  .  .
      460.  .       .  I   .  W  E .      L      .  .  .  .  .  .
      470.  .       .  I   .  WC E .      L      .  .  .  .  .  .
      480.  .       . I    .  W  E .      L      .  .  .  .  .  .
      490.  .       . I    .  W E   .      L      .  .  .  .  .  .
      500.  .       .I     .  W  E  .      L      .  .  .  .  .  .
      510.  .       .I     .  W E   .      L      .  .  .  .  .  .
      520.  .       .I     . WC E   .      L      .  .  .  .  .  .
      530.  .       I      . W E    .      L      .  .  .  .  .  .
8.00  540.  .       I      . W E    .      L      .  .  .  .  .  .
      550.  .      I.      W  E     .     L.      .  .  .  .  .  .
      560.  .    I  .     W.E       .    L  .     .  .  .  .  .  .
      570.  .   I   .     W E       .   L   .     .  .  .  .  .  .
      580.  .  I    .    WC E.      .  L    .     .  .  .  .  .  .
      590.  . I     .    W  E .     . L     .     .  .  .  .  .  .
      600.  .I      .  WC  E  .     .L      .     .  .  .  .  .  .
      610.  .I      . WC E    .     .L      .     .  .  .  .  .  .
9.00  620.  I       .WC  E    .     L       .     .  .  .  .  .  .
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THIS RUN EXECUTED 10-20-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************
```

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1**************************************************
 *  WATER SURFACE PROFILES                        *
 *  VERSION OF NOVEMBER 1976                      *
 *  UPDATED MAY 1984                              *
 *  IBM-PC-XT VERSION AUGUST 1985                 *
 *  RUN DATE  10-21-92   TIME  11:54:05            *
*
 **************************************************
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**************************************
*  U.S. ARMY CORPS OF ENGINEERS      *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D        *
*  DAVIS, CALIFORNIA 95616           *
   *  (916) 440-2105 (FTS) 448-2105
**************************************
```


SUB-CRITICAL
SOUTHWEST TRIBUTARY

```
X    X  XXXXXXX  XXXXX          XXXXX
X    X  X       X    X        X    X
X    X  X       X              X
XXXXXXX  XXXX   X       XXXXX  XXXXX
X    X  X       X              X
X    X  X       X    X         X
X    X  XXXXXXX  XXXXX          XXXXXXX
```

THIS RUN EXECUTED 10-21-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************

T1          SOUTHERN VISTA ESTATES
T2          OCTOBER 21, 1992
T3          SUBCRITICAL FLOW SOUTHWEST TRIBUTARY

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

       0.      2.       0.       0.  .000000      .00     1.0     164.   505.200     .000

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      .000     .000     .000     .000     .000     .000   -1.000     .000     .000     .000


NC     .035     .035     .035     .100     .300     .000     .000     .000     .000     .000
QT    1.000  164.000     .000     .000     .000     .000     .000     .000     .000     .000
X1   13.000    9.000     .000  265.000     .000     .000     .000     .000     .000     .000
GR  509.000     .000  508.000   40.000  507.000   75.000  506.000   86.000  505.000   99.000
GR  504.000  113.000  505.000  150.000  505.000  225.000  506.000  265.000     .000     .000

X1   12.000    9.000     .000  270.000   32.000   68.000   40.000     .000     .000     .000
GR  510.000     .000  509.000   23.000  508.000   72.000  507.000   85.000  506.000   96.000
GR  505.000  112.000  506.000  155.000  507.000  200.000  508.000  270.000     .000     .000

X1   11.000    8.000     .000  246.000   56.000   50.000   55.000     .000     .000     .000
GR  510.000     .000  509.000   23.000  508.000   35.000  507.000   47.000  506.000   62.000
GR  507.000  110.000  508.000  175.000  509.000  246.000     .000     .000     .000     .000

X1   10.000    8.000     .000  305.000   64.000   10.000   50.000     .000     .000     .000
GR  512.000     .000  511.000   44.000  510.000   72.000  509.000   85.000  508.000  102.000
GR  507.000  120.000  508.000  185.000  509.000  305.000     .000     .000     .000     .000

X1    9.000   10.000     .000  240.000  113.000  109.000  110.000     .000     .000     .000
GR  514.000     .000  513.000   55.000  512.000   85.000  511.000  106.000  510.000  123.000
GR  509.000  140.000  508.000  160.000  509.000  181.000  510.000  199.000  511.000  240.000

X1    8.000   10.000     .000  374.000   77.000  146.000  108.000     .000     .000     .000
GR  514.000     .000  513.000   78.000  512.000  105.000  511.000  125.000  510.000  150.000
GR  511.000  167.000  512.000  190.000  513.000  215.000  514.000  252.000  515.000  374.000

X1    7.000   13.000     .000  300.000  155.000  133.000  143.000     .000     .000     .000
GR  517.000     .000  516.000   25.000  515.000   62.000  514.000   87.000  513.000   96.000
GR  512.000  103.000  511.000  110.000  512.000  130.000  513.000  149.000  514.000  167.000
GR  515.000  186.000  516.000  251.000  517.000  300.000     .000     .000     .000     .000
```

X1	6.000	15.000	.000	302.000	123.000	108.000	120.000	.000	.000	.000
GR	520.000	.000	519.000	36.000	518.000	67.000	517.000	100.000	516.000	131.000
GR	515.000	136.000	514.000	141.000	513.000	146.000	512.000	151.000	513.000	167.000
GR	514.000	182.000	515.000	191.000	516.000	211.000	517.000	245.000	518.000	302.000
X1	5.000	13.000	.000	300.000	37.000	25.000	34.000	.000	.000	.000
GR	519.000	.000	518.000	52.000	517.000	85.000	516.000	95.000	515.000	100.000
GR	514.000	105.000	513.000	109.000	514.000	129.000	515.000	144.000	516.000	159.000
GR	517.000	181.000	518.000	247.000	519.000	300.000	.000	.000	.000	.000
X1	4.000	11.000	.000	245.000	22.000	17.000	20.000	.000	.000	.000
GR	520.000	.000	519.000	40.000	518.000	94.000	517.000	105.000	516.000	113.000
GR	515.000	121.000	514.000	130.000	515.000	150.000	516.000	168.000	517.000	183.000
GR	518.000	245.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	3.000	10.000	.000	210.000	70.000	60.000	65.000	.000	.000	.000
GR	520.000	.000	519.000	47.000	518.000	73.000	517.000	85.000	516.000	98.000
GR	515.000	110.000	516.000	121.000	517.000	131.000	518.000	142.000	519.000	210.000
X1	2.000	9.000	.000	240.000	70.000	52.000	58.000	.000	.000	.000
GR	520.000	.000	519.000	49.000	518.000	83.000	517.000	95.000	516.000	105.000
GR	517.000	112.000	518.000	117.000	519.000	135.000	520.000	240.000	.000	.000
X1	1.000	8.000	.000	190.000	48.000	55.000	58.000	.000	.000	.000
GR	520.000	.000	519.000	40.000	518.000	50.000	517.000	62.000	518.000	72.000
GR	519.000	80.000	520.000	90.000	521.000	190.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300

*SECNO 13.000

13.00	1.20	505.20	505.18	505.20	505.36	.16	.00	.00	509.00
164.	0.	164.	0.	0.	52.	0.	0.	0.	506.00
.00	.00	3.17	.00	.035	.035	.035	.000	504.00	96.40
.020322	0.	0.	0.	0	5	0	.00	136.60	233.00

0

*SECNO 12.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

12.00	1.13	506.13	506.13	.00	506.42	.29	.85	.04	510.00
164.	0.	164.	0.	0.	38.	0.	0.	0.	508.00
.00	.00	4.34	.00	.035	.035	.035	.000	505.00	94.55
.022210	32.	40.	68.	0	11	0	.00	66.39	160.94

0

*SECNO 11.000

11.00	1.21	507.21	507.11	.00	507.40	.20	.97	.01	510.00
164.	0.	164.	0.	0.	46.	0.	0.	0.	509.00
.01	.00	3.55	.00	.035	.035	.035	.000	506.00	44.51
.014260	56.	55.	50.	2	8	0	.00	78.99	123.50

0

*SECNO 10.000

10.00	1.02	508.02	507.99	.00	508.24	.22	.84	.01	512.00
164.	0.	164.	0.	0.	43.	0.	0.	0.	509.00
.01	.00	3.79	.00	.035	.035	.035	.000	507.00	101.64
.019848	64.	50.	10.	2	15	0	.00	85.93	187.57

0

*SECNO 9.000

9.00	1.52	509.52	509.31	.00	509.71	.19	1.46	.00	514.00
164.	0.	164.	0.	0.	46.	0.	0.	0.	511.00
.02	.00	3.53	.00	.035	.035	.035	.000	508.00	131.18
.009540	113.	110.	109.	4	11	0	.00	59.16	190.34

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 8.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

8.00	1.30	511.30	511.30	.00	511.63	.33	1.48	.04	514.00
164.	0.	164.	0.	0.	35.	0.	0.	1.	515.00
.03	.00	4.63	.00	.035	.035	.035	.000	510.00	119.04
.021313	77.	108.	146.	0	15	0	.00	54.81	173.85

0
*SECNO 7.000

7.00	1.94	512.94	512.55	.00	513.11	.16	1.46	.02	517.00
164.	0.	164.	0.	0.	51.	0.	1.	1.	517.00
.04	.00	3.23	.00	.035	.035	.035	.000	511.00	96.37
.005956	155.	143.	133.	4	11	0	.00	51.64	148.00

0
*SECNO 6.000

6.00	1.85	513.85	513.71	.00	514.18	.33	1.02	.05	520.00
164.	0.	164.	0.	0.	35.	0.	1.	1.	518.00
.05	.00	4.63	.00	.035	.035	.035	.000	512.00	141.77
.013153	123.	120.	108.	2	15	0	.00	37.91	179.68

0
*SECNO 5.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

5.00	1.63	514.63	514.63	.00	515.06	.44	.54	.03	519.00
164.	0.	164.	0.	0.	31.	0.	1.	1.	519.00
.05	.00	5.30	.00	.035	.035	.035	.000	513.00	101.87
.019583	37.	34.	25.	0	15	0	.00	36.33	138.39

0
*SECNO 4.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

4.00	1.51	515.51	515.51	.00	515.90	.40	.40	.00	520.00
164.	0.	164.	0.	0.	32.	0.	1.	1.	518.00
.05	.00	5.05	.00	.035	.035	.035	.000	514.00	116.96
.020123	22.	20.	17.	0	11	0	.00	42.13	159.09

0
*SECNO 3.000

3.00	1.71	516.71	516.65	.00	517.08	.37	1.17	.00	520.00
164.	0.	164.	0.	0.	34.	0.	1.	1.	519.00
.05	.00	4.87	.00	.035	.035	.035	.000	515.00	88.75
.016270	70.	65.	60.	1	8	0	.00	39.36	128.11

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2.00	1.86	517.86	517.86	.00	518.34	.48	1.02	.03	520.00
164.	0.	164.	0.	0.	30.	0.	1.	1.	520.00
.05	.00	5.56	.00	.035	.035	.035	.000	516.00	84.64
.019005	70.	58.	52.	0	8	0	.00	31.68	116.32

0
*SECNO 1.000

1.00	1.88	518.88	518.69	.00	519.18	.30	.82	.02	520.00
164.	0.	164.	0.	0.	37.	0.	1.	1.	521.00
.06	.00	4.40	.00	.035	.035	.035	.000	517.00	41.22
.011024	48.	58.	55.	1	15	0	.00	37.81	79.03

0

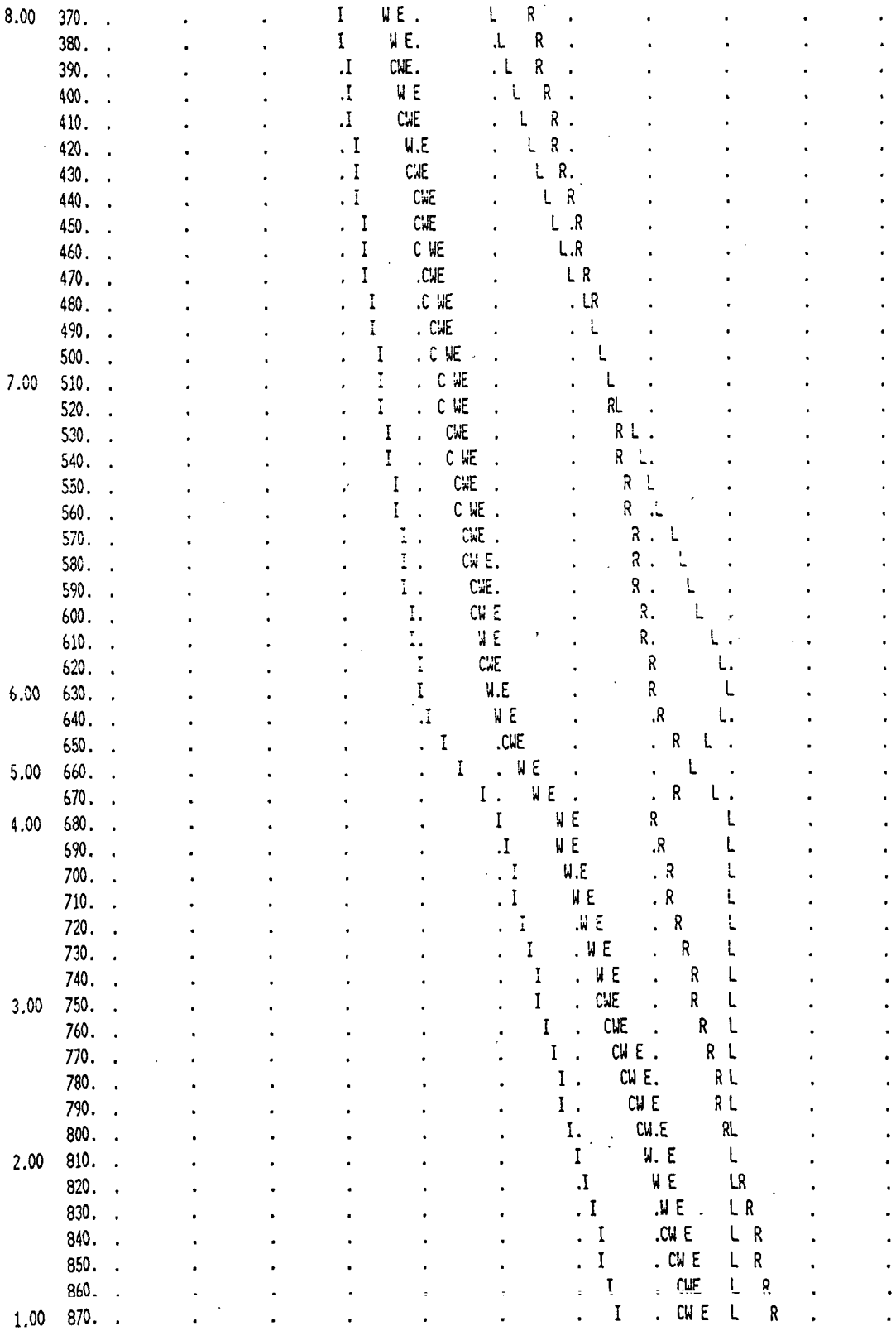
1

PROFILE FOR STREAM SUBCRITICAL FLOW S

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  504.     506.     508.     510.     512.     514.     516.     518.     520.     522.
   SECNO  CUMDIS

   13.00     0. I    WE R       .  L  .        .        .        .        .        .        .
             10. .I    WE . R     .    L  .     .        .        .        .        .        .
             20. .  I   WE.   R   .      L .     .        .        .        .        .        .
             30. .  I   W.E     R .       L.     .        .        .        .        .        .
   12.00     40. .   I   .WE      R        L     .        .        .        .        .        .
             50. .    I  . WE     .R       L     .        .        .        .        .        .
             60. .     I . CWE    . R      L     .        .        .        .        .        .
             70. .      I . CWE   . R     L     .        .        .        .        .        .
             80. .       I.  CWE  .  R    L     .        .        .        .        .        .
             90. .        I   CWE .   R   L     .        .        .        .        .        .
   11.00    100. .        I    WE .   R   L     .        .        .        .        .        .
            110. .        .I   CWE .   R   . L   .        .        .        .        .        .
            120. .        . I  CWE.   R   .  L  .        .        .        .        .        .
            130. .        . I  W E   R   .   L  .        .        .        .        .        .
            140. .        .  I  WE   R   .    L .        .        .        .        .        .
   10.00    150. .        .   I WE   R   .     L        .        .        .        .        .
            160. .        .   I .WE  R   .     .L       .        .        .        .        .
            170. .        .    I .W E  R   .     . L     .        .        .        .        .
            180. .        .    I  . WE   R .     .  L    .        .        .        .        .
            190. .        .     I . CWE   R.     .   L   .        .        .        .        .
            200. .        .     I . CWE   R      .    L  .        .        .        .        .
            210. .        .      I .  WE  R      .    L  .        .        .        .        .
            220. .        .      I .  CWE .R     .     L .        .        .        .        .
            230. .        .       I.   CWE . R   .      L .        .        .        .        .
            240. .        .       I.   CWE . R   .       L.        .        .        .        .
            250. .        .        I    CWE .  R  .       L.      .        .        .        .
    9.00    260. .        .        I     CWE.   R  .       L      .        .        .        .
            270. .        .        .I    CWE.   MR .       L      .        .        .        .
            280. .        .        . I   CWE    MR.       L      .        .        .        .
            290. .        .        . I   CWE    M.R       L      .        .        .        .
            300. .        .        .  I  CWE    .MR       L      .        .        .        .
            310. .        .        .   I .CWE   . M R     L      .        .        .        .
            320. .        .        .    I  . CWE . M  R   L      .        .        .        .
            330. .        .        .    I  . W E .  M  R  L      .        .        .        .
            340. .        .        .     I .  W E .  M   L      .        .        .        .
            350. .        .        .      I .  W E .    M L R    .        .        .        .
            360. .        .        .       I.   WE .     ML  R   .        .        .        .
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8.00
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840.
850.
860.
1.00
870.

THIS RUN EXECUTED 10-21-92

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
**************************************************
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1*************************************************
 *  WATER SURFACE PROFILES                       *
 *  VERSION OF NOVEMBER 1976                     *
 *  UPDATED MAY 1984                             *
 *  IBM-PC-XT VERSION AUGUST 1985                *
 *  RUN DATE  11-02-92   TIME  14:31:35           *
*
 *************************************************
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**************************************
*  U.S. ARMY CORPS OF ENGINEERS      *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D        *
*  DAVIS, CALIFORNIA 95616           *
   *  (916) 440-2105 (FTS) 448-2105
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SUPER-CRITICAL
SOUTHWEST TRIBUTARY

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X    X XXXXXXX  XXXXX          XXXXX
X    X X       X    X        X    X
X    X X       X              X
XXXXXXX XXXX   X       XXXXX  XXXXX
X    X X       X             X
X    X X       X    X        X
X    X XXXXXXX  XXXXX        XXXXXXX
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THIS RUN EXECUTED 11-02-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************

T1          SOUTHERN VISTA ESTATES
T2          OCTOBER 21, 1992
T3          SUPERCRITICAL FLOW SOUTHWEST TRIBUTARY

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

       0.       2.       0.       1.  .000000      .00     1.0     164.  518.700     .000

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      .000     .000     .000     .000     .000     .000    -1.000     .000     .000     .000


NC     .035     .035     .035     .100     .300     .000     .000     .000     .000     .000
QT    1.000  164.000     .000     .000     .000     .000     .000     .000     .000     .000
X1    1.000    8.000     .000  190.000   48.000   55.000   58.000     .000     .000     .000
GR  520.000     .000  519.000   40.000  518.000   50.000  517.000   62.000  518.000   72.000
GR  519.000   80.000  520.000   90.000  521.000  190.000     .000     .000     .000     .000

X1    2.000    9.000     .000  240.000   70.000   52.000   58.000     .000     .000     .000
GR  520.000     .000  519.000   49.000  518.000   83.000  517.000   95.000  516.000  105.000
GR  517.000  112.000  518.000  117.000  519.000  135.000  520.000  240.000     .000     .000

X1    3.000   10.000     .000  210.000   70.000   60.000   65.000     .000     .000     .000
GR  520.000     .000  519.000   47.000  518.000   73.000  517.000   85.000  516.000   98.000
GR  515.000  110.000  516.000  121.000  517.000  131.000  518.000  142.000  519.000  210.000

X1    4.000   11.000     .000  245.000   22.000   17.000   20.000     .000     .000     .000
GR  520.000     .000  519.000   40.000  518.000   94.000  517.000  105.000  516.000  113.000
GR  515.000  121.000  514.000  130.000  515.000  150.000  516.000  168.000  517.000  183.000
GR  518.000  245.000     .000     .000     .000     .000     .000     .000     .000     .000

X1    5.000   13.000     .000  300.000   37.000   25.000   34.000     .000     .000     .000
GR  519.000     .000  518.000   52.000  517.000   85.000  516.000   95.000  515.000  100.000
GR  514.000  105.000  513.000  109.000  514.000  129.000  515.000  144.000  516.000  159.000
GR  517.000  181.000  518.000  247.000  519.000  300.000     .000     .000     .000     .000

X1    6.000   15.000     .000  302.000  123.000  108.000  120.000     .000     .000     .000
GR  520.000     .000  519.000   36.000  518.000   67.000  517.000  100.000  516.000  131.000
GR  515.000  136.000  514.000  141.000  513.000  146.000  512.000  151.000  513.000  167.000
GR  514.000  182.000  515.000  191.000  516.000  211.000  517.000  245.000  518.000  302.000
```

X1	7.000	13.000	.000	300.000	155.000	133.000	143.000	.000	.000	.000
GR	517.000	.000	516.000	25.000	515.000	62.000	514.000	87.000	513.000	96.000
GR	512.000	103.000	511.000	110.000	512.000	130.000	513.000	149.000	514.000	167.000
GR	515.000	186.000	516.000	251.000	517.000	300.000	.000	.000	.000	.000
X1	8.000	10.000	.000	374.000	77.000	146.000	108.000	.000	.000	.000
GR	514.000	.000	513.000	78.000	512.000	105.000	511.000	125.000	510.000	150.000
GR	511.000	167.000	512.000	190.000	513.000	215.000	514.000	252.000	515.000	374.000
X1	9.000	10.000	.000	240.000	113.000	109.000	110.000	.000	.000	.000
GR	514.000	.000	513.000	55.000	512.000	85.000	511.000	106.000	510.000	123.000
GR	509.000	140.000	508.000	160.000	509.000	181.000	510.000	199.000	511.000	240.000
X1	10.000	8.000	.000	305.000	64.000	10.000	50.000	.000	.000	.000
GR	512.000	.000	511.000	44.000	510.000	72.000	509.000	85.000	508.000	102.000
GR	507.000	120.000	508.000	185.000	509.000	305.000	.000	.000	.000	.000
X1	11.000	8.000	.000	246.000	56.000	50.000	55.000	.000	.000	.000
GR	510.000	.000	509.000	23.000	508.000	35.000	507.000	47.000	506.000	62.000
GR	507.000	110.000	508.000	175.000	509.000	246.000	.000	.000	.000	.000
X1	12.000	9.000	.000	270.000	32.000	68.000	40.000	.000	.000	.000
GR	510.000	.000	509.000	23.000	508.000	72.000	507.000	85.000	506.000	96.000
GR	505.000	112.000	506.000	155.000	507.000	200.000	508.000	270.000	.000	.000
X1	13.000	9.000	.000	265.000	.000	.000	.000	.000	.000	.000
GR	509.000	.000	508.000	40.000	507.000	75.000	506.000	86.000	505.000	99.000
GR	504.000	113.000	505.000	150.000	505.000	225.000	506.000	265.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED

1.00	1.69	518.69	518.69	518.70	519.14	.45	.00	.00	520.00
164.	0.	164.	0.	0.	30.	0.	0.	0.	521.00
.00	.00	5.41	.00	.035	.035	.035	.000	517.00	43.14
.019271	0.	0.	0.	0	4	0	.00	34.35	77.49

0
*SECNO 2.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2.00	1.87	517.87	517.87	.00	518.34	.48	1.11	.66	520.00
164.	0.	164.	0.	0.	30.	0.	0.	0.	520.00
.00	.00	5.54	.00	.035	.035	.035	.000	516.00	84.60
.018837	48.	58.	55.	20	8	0	.00	31.73	116.33

0
*SECNO 3.000

3.00	1.58	516.58	516.65	.00	517.09	.51	1.25	.00	520.00
164.	0.	164.	0.	0.	29.	0.	0.	0.	519.00
.01	.00	5.71	.00	.035	.035	.035	.000	515.00	90.46
.024893	70.	58.	52.	3	15	0	.00	36.35	126.80

0
*SECNO 4.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

4.00	1.51	515.51	515.51	.00	515.90	.40	1.45	.94	520.00
164.	0.	164.	0.	0.	32.	0.	0.	0.	518.00
.01	.00	5.05	.00	.035	.035	.035	.000	514.00	116.96
.020089	70.	65.	60.	20	11	0	.00	42.14	159.10

0
*SECNO 5.000

5.00	1.34	514.34	514.63	.00	515.24	.90	.61	.05	519.00
164.	0.	164.	0.	0.	22.	0.	0.	0.	519.00
.01	.00	7.61	.00	.035	.035	.035	.000	513.00	103.26
.052408	22.	20.	17.	5	8	0	.00	30.96	134.22

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 6.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

6.00	1.72	513.72	513.72	.00	514.16	.44	1.02	.16	520.00
164.	0.	164.	0.	0.	31.	0.	0.	0.	518.00
.01	.00	5.35	.00	.035	.035	.035	.000	512.00	142.42
.019362	37.	34.	25.	20	11	0	.00	35.31	177.73

0
*SECNO 7.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

7.00	1.55	512.55	512.55	.00	512.95	.40	2.36	1.50	517.00
164.	0.	164.	0.	0.	32.	0.	0.	0.	517.00
.02	.00	5.09	.00	.035	.035	.035	.000	511.00	99.16
.020039	123.	120.	108.	20	15	0	.00	41.28	140.43

0
*SECNO 8.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

8.00	1.30	511.30	511.30	.00	511.63	.33	2.96	1.72	514.00
164.	0.	164.	0.	0.	35.	0.	0.	0.	515.00
.03	.00	4.63	.00	.035	.035	.035	.000	510.00	119.04
.021327	155.	143.	133.	20	15	0	.00	54.81	173.85

0
*SECNO 9.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

9.00	1.31	509.31	509.31	.00	509.65	.34	2.26	.09	514.00
164.	0.	164.	0.	0.	35.	0.	0.	1.	511.00
.03	.00	4.68	.00	.035	.035	.035	.000	508.00	134.68
.020548	77.	108.	146.	20	5	0	.00	51.96	186.64

0
*SECNO 10.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

10.00	.99	507.99	507.99	.00	508.24	.25	2.39	1.36	512.00
164.	0.	164.	0.	0.	41.	0.	1.	1.	509.00
.04	.00	4.03	.00	.035	.035	.035	.000	507.00	102.17
.022979	113.	110.	109.	20	15	0	.00	82.21	184.39

0
*SECNO 11.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

11.00	1.11	507.11	507.11	.00	507.39	.28	1.13	.64	510.00
164.	0.	164.	0.	0.	39.	0.	1.	1.	509.00
.04	.00	4.21	.00	.035	.035	.035	.000	506.00	45.67
.022126	64.	50.	10.	20	8	0	.00	71.54	117.21

0
*SECNO 12.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

12.00	1.14	506.14	506.14	.00	506.42	.29	1.20	.75	510.00
164.	0.	164.	0.	0.	38.	0.	1.	1.	508.00
.05	.00	4.29	.00	.035	.035	.035	.000	505.00	94.47
.021456	36.	55.	50.	20	5	0	.00	66.80	161.26

0
*SECNO 13.000

13.00	1.14	505.14	505.16	.00	505.35	.21	1.05	.02	509.00
164.	0.	164.	0.	0.	45.	0.	1.	1.	506.00
.05	.00	3.68	.00	.035	.035	.035	.000	504.00	97.10
.032672	32.	40.	68.	2	8	0	.00	133.76	230.86

0

1

PROFILE FOR STREAM SUPERCRITICAL FLOW

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  504.    506.    508.    510.    512.    514.    516.    518.    520.    522.
   SECNO  CUMDIS

  1.00      0.                                                  I    WE  L  R
           10.                                                  I    WE  L  R
           20.                                                  I    WE  L  R
           30.                                                  I    WE  L  R
           40.                                                  I    WE  L  R
           50.                                                  I    WE  LR
  2.00     60.                                                  I    WE  L
           70.                                                  I    WE  RL
           80.                                                  I    WE  RL
           90.                                                  I    WE  RL
          100.                                                  I    WE  RL
          110.                                                  I    WE  RL
  3.00    120.                                                  I    WE  RL
          130.                                                  I    WE  RL
          140.                                                  I    WE  RL
          150.                                                  I    WC E  RL
          160.                                                  I    WE  RL
          170.                                                  I    WE  RL
          180.                                                  I    WE  RL
  4.00    190.                                                  I    WE  RL
          200.                                                  I    WE  RL
  5.00    210.                                                  I    WC E  L
          220.                                                  I    WC E  RL
          230.                                                  I    WE  RL
  6.00    240.                                                  I    WE  RL
          250.                                                  I    WE  RL
          260.                                                  I    WE  RL
          270.                                                  I    WE  RL
          280.                                                  I    WE  RL
          290.                                                  I    WE  RL
          300.                                                  I    WE  RL
          310.                                                  I    WE  RL
          320.                                                  I    WE  RL
          330.                                                  I    WE  RL
          340.                                                  I    WE  RL
          350.                                                  I    WE  RL
  7.00    360.                                                  I    WE  L
          370.                                                  I    WE  L
          380.                                                  I    WE  LR
          390.                                                  I    WE  LR
          400.                                                  I    WE  LR
          410.                                                  I    WE  LR
          420.                                                  I    WE  LR
```

```
        430. .     .     .     . I   W E     .     L R     .     .     .     .
        440. .     .     .     .I    W.E     .     L R.    .     .     .     .
        450. .     .     .     .I    W.E     .    L R.     .     .     .     .
        460. .     .     .     .I    W E     .    L R .    .     .     .     .
        470. .     .     .     .I    W E     .  L  R .     .     .     .     .
        480. .     .     .     .I    WE.     .  L  R .     .     .     .     .
        490. .     .     .     I    W E.     .L    R .     .     .     .     .
8.00    500. .     .     .     I    W E .    .L    R .     .     .     .     .
        510. .     .     .    I.    WE .     .ML R   .     .     .     .     .
        520. .     .     .    I .   WE .     .M LR   .     .     .     .     .
        530. .     .     .   I  .  WE  .     .M RL   .     .     .     .     .
        540. .     .     .   I  . WE   .     .M  R L .     .     .     .     .
        550. .     .     .  I   .W E   .     .M R  L .     .     .     .     .
        560. .     .     .  I   .W E   .     .M R  L .     .     .     .     .
        570. .     .     .  I   W E    .     M R   L .     .     .     .     .
        580. .     .     . I    W.E    .     MR    L .     .     .     .     .
        590. .     .     .I    W E     .     R .   L .     .     .     .     .
        600. .     .     .I    W E.    .     R .   L .     .     .     .     .
9.00    610. .     .     .I    WE .    .     R .   L .     .     .     .     .
        620. .     .     .I    W E .   .     R .   L. .     .     .     .     .
        630. .     .     .I.   W E .   .     R .   L .     .     .     .     .
        640. .     .     .I.   WE  .   .     R .   L .     .     .     .     .
        650. .     .     . I.  W E .   .     R .   L .     .     .     .     .
        660. .     .     .I .  WE  .   .     R .   L .     .     .     .     .
        670. .     .     .I .  WE  .   .     R .   L .     .     .     .     .
        680. .     .     .I .  W E .   .     R. .   L .     .     .     .     .
        690. .     .     .I .  WE  .   .     R .   L .     .     .     .     .
        700. .     .     .I .  WE  .   .     R .   .L .     .     .     .     .
        710. .     .     .I    .WE .   .     R .   .L .     .     .     .     .
10.00   720. .     .     .I    WE  .   .     R .   L  .     .     .     .     .
        730. .     .     .I    WE  .   .     R .  L .  .     .     .     .     .
        740. .     .     .I    WE. .   .     R .  L .  .     .     .     .     .
        750. .     .     .I    W E. .   .    R .  L .  .     .     .     .     .
        760. .     .     .I    W E .   .     R .  L .  .     .     .     .     .
11.00   770. .     .     .I    WE  .   .     R  L .  .     .     .     .     .
        780. .     .     .I.   WE  .   .     R  L .  .     .     .     .     .
        790. .     .     .I .  WE  .   .     R  L .  .     .     .     .     .
        800. .     .     .I .  WE  .   .     R  L .  .     .     .     .     .
        810. .     .     .I    .WE .   .     R  L .  .     .     .     .     .
        820. .     .     .I    .W E .  .     R  L .  .     .     .     .     .
12.00   830. .     .     .I    .WE .   .     R  L .  .     .     .     .     .
        840. .     .     .I    W.E .   .     R. L .  .     .     .     .     .
        850. .     .     .I    WE. .   .     R .  L. .     .     .     .     .
        860. .     .     .I    WE . R  .     . L .  .     .     .     .     .
13.00   870. .     .     .I    WE R    .     . L .  .     .     .     .     .
```

THIS RUN EXECUTED 11-02-92

****
HEC2 RELEASE DATED NOV 76 UPDATED MAY 1984
ERROR CORR - 01,02,03,04,05,06
MODIFICATION - 50,51,52,53,54,55,56
IBM-PC-XT VERSION AUGUST 1985
****

APPENDIX C

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**************************************************
* WATER SURFACE PROFILES                         *
* VERSION OF NOVEMBER 1976                       *
* UPDATED MAY 1984                               *
* IBM-PC-XT VERSION AUGUST 1985                  *
* RUN DATE  10-29-92   TIME  12:36:55              *
*
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**************************************
* U.S. ARMY CORPS OF ENGINEERS       *
* THE HYDROLOGIC ENGINEERING CENTER  *
* 609 SECOND STREET, SUITE D         *
* DAVIS, CALIFORNIA 95616            *
  * (916) 440-2105 (FTS) 448-2105

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SUB-CRITICAL

```
X    X  XXXXXXX   XXXXX            XXXXX
X    X  X        X    X          X    X
X    X  X        X                    X
XXXXXXX  XXXX    X         XXXXX   XXXXX
X    X  X        X                 X
X    X  X        X    X            X
X    X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 10-29-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************

T1          SOUTHERN VISTA ESTATES
T2          OCTOBER 23, 1992
T3          SUBCRITICAL RUN

J1  ICHECK    INQ      NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0.       2.        0.        0.   .000000       .00      1.0     700.   481.000      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1.000      .000      .000      .000      .000      .000   -1.000      .000      .000      .000


NC      .025      .025      .025      .300      .500      .000      .000      .000      .000      .000
QT     1.000   700.000      .000      .000      .000      .000      .000      .000      .000      .000
X1  2875.000     5.000      .000   113.000      .000      .000      .000      .000      .000      .000
GR   481.060      .000   481.060    66.000   479.600    69.000   479.600   110.000   482.800   113.000

X1  2850.000     5.000      .000   113.000    25.000    25.000    25.000      .000      .000      .000
GR   483.000      .000   483.000    70.000   479.860    76.000   479.860   104.000   485.600   113.000

X1  2800.000     5.000      .000   113.000    50.000    50.000    50.000      .000      .000      .000
GR   485.400      .000   484.600    75.000   480.600    83.000   480.600   103.000   486.600   113.000

X1  2700.000     5.000      .000   113.000   100.000   100.000   100.000      .000      .000      .000
GR   485.500      .000   485.000    75.000   481.000    83.000   481.000   103.000   486.000   113.000

X1  2600.000     5.000      .000   113.000   100.000   100.000   100.000      .000      .000      .000
GR   485.800      .000   485.400    75.000   481.420    83.000   481.400   103.000   486.420   113.000

X1  2500.000     5.000      .000   113.000   100.000   100.000   100.000      .000      .000      .000
GR   487.000      .000   486.000    74.600   481.800    83.000   481.800   103.000   486.800   113.000

X1  2400.000     5.000      .000   113.000   100.000   100.000   100.000      .000      .000      .000
GR   486.300      .000   486.000    75.400   482.200    83.000   482.200   103.000   487.200   113.000

NC      .035      .035      .035      .100      .300      .000      .000      .000      .000      .000
X1  2365.000     5.000      .000   113.000    35.000    35.000    35.000      .000      .000      .000
GR   487.000      .000   486.600    75.000   482.340    83.000   482.340   103.000   487.000   113.000

X1  2350.000     5.000      .000   113.000    15.000    15.000    15.000      .000      .000      .000
GR   487.100      .000   486.700    74.400   482.400    83.000   482.400   103.000   487.400   113.000
```

X1	2340.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	487.200	.000	486.900	76.000	482.440	83.000	482.440	103.000	487.440	113.000
X1	2320.000	5.000	.000	113.000	20.000	20.000	20.000	.000	.000	.000
GR	487.400	.000	487.200	75.000	483.320	83.000	483.320	103.000	488.320	113.000
X1	2300.000	5.000	.000	113.000	20.000	20.000	20.000	.000	.000	.000
GR	487.700	.000	487.500	76.400	484.200	83.000	484.200	103.000	489.200	113.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	2290.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	487.750	.000	487.520	76.000	484.240	83.000	484.240	103.000	489.240	113.000
X1	2200.000	5.000	.000	113.000	90.000	90.000	90.000	.000	.000	.000
GR	489.000	.000	488.300	75.600	484.600	83.000	484.600	103.000	489.600	113.000
NC	.025	.025	.025	.300	.500	.000	.000	.000	.000	.000
X1	2150.000	5.000	.000	113.000	50.000	50.000	50.000	.000	.000	.000
GR	489.500	.000	489.100	74.400	484.800	83.000	484.800	103.000	489.800	113.000
X1	2140.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	489.740	.000	489.220	75.000	484.840	83.000	484.840	101.000	490.240	113.000
X1	2125.000	5.000	.000	111.000	15.000	15.000	15.000	.000	.000	.000
GR	489.920	.000	489.440	75.000	484.900	83.000	484.900	98.000	490.900	111.000
X1	2110.000	5.000	.000	110.000	15.000	15.000	15.000	.000	.000	.000
GR	490.120	.000	489.640	74.000	484.960	83.000	484.960	95.000	491.560	110.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	2100.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	490.300	.000	489.700	73.800	485.000	83.000	485.000	93.000	492.100	107.000
X1	2000.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	492.000	.000	491.000	72.800	485.400	88.000	485.400	93.000	492.500	107.000
X1	1900.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	496.000	.000	492.200	70.200	485.800	83.000	485.800	93.000	492.800	107.000
X1	1800.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	494.400	.000	492.900	70.200	486.200	83.000	486.200	93.000	493.300	107.000
X1	1700.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	496.000	.000	494.500	69.000	486.600	83.000	486.600	93.000	493.600	107.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	1615.000	5.000	.000	107.000	85.000	85.000	85.000	.000	.000	.000
GR	495.500	.000	493.800	69.400	486.940	83.000	486.940	93.000	493.940	107.000

X1	1600.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	495.700	.000	493.600	70.800	487.000	83.000	487.000	93.000	494.100	107.000
X1	1590.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	495.600	.000	493.600	71.800	487.040	83.000	487.040	93.000	494.040	107.000
X1	1570.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	495.400	.000	493.700	72.600	488.520	83.000	488.520	93.000	495.520	107.000
X1	1550.000	6.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	495.400	.000	494.000	48.000	493.700	75.800	490.000	83.000	490.000	93.000
GR	498.000	107.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	1540.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	495.300	.000	494.000	75.000	490.040	83.000	490.040	93.000	497.040	107.000
X1	1500.000	5.000	.000	107.000	40.000	40.000	40.000	.000	.000	.000
GR	496.000	.000	494.900	73.600	490.200	83.000	490.200	93.000	497.200	107.000
X1	1400.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	498.500	.000	497.000	70.800	490.600	83.000	490.600	93.000	497.700	107.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	1315.000	5.000	.000	107.000	85.000	85.000	85.000	.000	.000	.000
GR	499.600	.000	497.900	69.000	490.940	83.000	490.940	93.000	497.940	107.000
X1	1300.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	499.600	.000	498.100	69.000	491.000	83.000	491.000	93.000	498.100	107.000
X1	1290.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	500.400	.000	498.500	69.000	491.040	83.000	491.040	93.000	498.040	107.000
X1	1270.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	500.000	.000	498.400	71.000	492.320	83.000	492.320	93.000	499.320	107.000
X1	1250.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	500.000	.000	498.800	73.000	493.600	83.000	493.600	93.000	500.700	107.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	1240.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	500.400	.000	498.600	73.000	493.640	83.000	493.640	93.000	503.640	107.000
X1	1200.000	5.000	.000	107.000	40.000	40.000	40.000	.000	.000	.000
GR	501.000	.000	499.200	73.000	493.800	83.000	493.800	93.000	500.900	107.000
X1	1100.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	501.800	.000	499.700	72.000	494.200	83.000	494.200	93.000	501.200	107.000

NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	1065.000	5.000	.000	107.000	45.000	45.000	45.000	.000	.000	.000
GR	501.900	.000	501.100	69.000	494.340	83.000	494.340	93.000	501.300	107.000
X1	1050.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	502.000	.000	500.400	71.200	494.400	83.000	494.400	93.000	501.500	107.000
X1	1040.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	502.000	.000	500.350	69.000	494.440	83.000	494.440	93.000	501.440	107.000
X1	1020.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	502.000	.000	500.600	73.000	495.400	83.000	495.400	93.000	502.400	107.000
X1	1000.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	502.300	.000	501.000	74.000	496.400	83.000	496.400	93.000	503.480	107.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	990.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	502.400	.000	501.200	73.600	496.440	83.000	496.440	93.000	503.440	107.000
X1	900.000	5.000	.000	113.000	90.000	90.000	90.000	.000	.000	.000
GR	504.800	.000	503.500	68.600	496.800	83.000	496.800	93.000	502.000	113.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	875.000	5.000	.000	107.000	25.000	25.000	25.000	.000	.000	.000
GR	505.500	.000	503.700	69.400	496.900	83.000	496.900	93.000	502.000	107.000
X1	850.000	5.000	.000	107.000	25.000	25.000	25.000	.000	.000	.000
GR	505.000	.000	504.000	69.000	497.000	83.000	497.000	93.000	505.000	107.000
X1	800.000	12.000	.000	136.000	50.000	50.000	50.000	.000	.000	.000
GR	507.000	.000	506.000	30.000	505.000	50.000	504.000	68.000	503.000	76.000
GR	498.800	83.000	498.800	98.000	501.000	100.000	502.000	108.000	503.000	116.000
GR	504.000	126.000	505.000	136.000	.000	.000	.000	.000	.000	.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	790.000	5.000	.000	135.000	10.000	10.000	10.000	.000	.000	.000
GR	506.900	.000	503.000	77.000	499.720	83.000	499.720	100.000	505.000	135.000
X1	750.000	10.000	.000	138.000	40.000	40.000	40.000	.000	.000	.000
GR	507.300	.000	506.000	40.000	504.000	65.000	500.000	88.000	500.000	100.000
GR	501.000	105.000	502.000	112.000	503.000	118.000	504.000	128.000	505.000	138.000
X1	700.000	13.000	.000	135.000	50.000	50.000	50.000	.000	.000	.000
GR	507.400	.000	507.000	15.000	506.000	32.000	505.000	41.000	504.000	49.000
GR	503.000	58.000	502.000	66.000	501.000	75.000	501.000	98.000	502.000	110.000
GR	503.000	120.000	504.000	126.000	505.000	135.000	.000	.000	.000	.000

X1	650.000	11.000	.000	212.000	50.000	50.000	50.000	.000	.000	.000
GR	510.000	.000	509.000	25.000	508.000	55.000	507.000	72.000	506.000	90.000
GR	505.000	103.000	504.000	114.000	503.000	130.000	503.000	185.000	504.000	204.000
GR	505.000	212.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	600.000	9.000	.000	263.000	50.000	50.000	50.000	.000	.000	.000
GR	507.000	.000	506.000	17.000	505.000	70.000	505.000	122.000	504.000	141.000
GR	504.000	173.000	505.000	185.000	506.000	200.000	507.000	263.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .300 CEHV= .500
*SECNO 2875.000
3280 CROSS SECTION 2875.00 EXTENDED .49 FEET

3720 CRITICAL DEPTH ASSUMED

2875.00	1.95	481.55	481.55	481.00	482.10	.55	.00	.00	481.06
700.	0.	700.	0.	0.	118.	0.	0.	0.	482.80
.00	.00	5.94	.00	.025	.025	.025	.000	479.60	.00
.009507	0.	0.	0.	0	13	0	.00	111.83	111.83

0
*SECNO 2850.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2850.00	2.53	482.39	482.39	.00	483.52	1.13	.21	.29	483.00
700.	0.	700.	0.	0.	82.	0.	0.	0.	485.60
.00	.00	8.52	.00	.025	.025	.025	.000	479.86	71.16
.007401	25.	25.	25.	0	11	0	.00	36.82	107.97

0
*SECNO 2800.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2800.00	3.04	483.64	483.64	.00	484.90	1.26	.37	.07	485.40
700.	0.	700.	0.	0.	78.	0.	0.	0.	486.60
.00	.00	9.02	.00	.025	.025	.025	.000	480.60	76.93
.007262	50.	50.	50.	0	11	0	.00	31.13	108.06

0
*SECNO 2700.000

2700.00	3.85	484.85	484.01	.00	485.52	.67	.44	.18	485.50
700.	0.	700.	0.	0.	107.	0.	0.	0.	486.00
.01	.00	6.56	.00	.025	.025	.025	.000	481.00	75.30
.002990	100.	100.	100.	6	5	0	.00	35.41	110.70

0
*SECNO 2600.000

2600.00	3.74	485.14	484.42	.00	485.87	.72	.32	.03	485.80
700.	0.	700.	0.	0.	103.	0.	1.	0.	486.42
.01	.00	6.83	.00	.025	.025	.025	.000	481.40	75.52
.003355	100.	100.	100.	2	15	0	.00	34.94	110.45

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2500.000

2500.00	3.67	485.47	484.81	.00	486.23	.76	.35	.02	487.00
700.	0.	700.	0.	0.	100.	0.	1.	0.	486.80
.01	.00	6.99	.00	.025	.025	.025	.000	481.80	75.67
.003581	100.	100.	100.	2	15	0	.00	34.66	110.33

0

*SECNO 2400.000

2400.00	3.63	485.83	485.22	.00	486.61	.78	.37	.01	486.30
700.	0.	700.	0.	0.	99.	0.	1.	0.	487.20
.02	.00	7.09	.00	.025	.025	.025	.000	482.20	75.76
.003740	100.	100.	100.	2	12	0	.00	34.49	110.24

0

CCHV= .100 CEHV= .300

*SECNO 2365.000

2365.00	3.71	486.05	485.35	.00	486.78	.73	.17	.00	487.00
700.	0.	700.	0.	0.	102.	0.	1.	0.	487.00
.02	.00	6.86	.00	.035	.035	.035	.000	482.34	76.03
.006685	35.	35.	35.	2	15	0	.00	34.94	110.97

0

*SECNO 2350.000

2350.00	3.78	486.18	485.41	.00	486.88	.70	.10	.00	487.10
700.	0.	700.	0.	0.	104.	0.	1.	0.	487.40
.02	.00	6.72	.00	.035	.035	.035	.000	482.40	75.44
.006282	15.	15.	15.	2	15	0	.00	35.12	110.56

0

*SECNO 2340.000

2340.00	3.78	486.22	485.48	.00	486.96	.74	.06	.01	487.20
700.	0.	700.	0.	0.	101.	0.	1.	0.	487.44
.02	.00	6.92	.00	.035	.035	.035	.000	482.44	77.06
.006574	10.	10.	10.	0	15	0	.00	33.50	110.56

0

*SECNO 2320.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

2320.00	3.01	486.33	486.33	.00	487.56	1.23	.19	.15	487.40
700.	0.	700.	0.	0.	79.	0.	1.	0.	488.32
.02	.00	8.92	.00	.035	.035	.035	.000	483.32	76.80
.014227	20.	20.	20.	0	15	0	.00	32.22	109.01

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2300.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2300.00	3.02	487.22	487.22	.00	488.45	1.24	.28	.00	487.70
700.	0.	700.	0.	0.	78.	0.	1.	0.	489.20
.02	.00	8.92	.00	.035	.035	.035	.000	484.20	76.97
.014172	20.	20.	20.	0	5	0	.00	32.06	109.03

0
CCHV= .100 CEHV= .300
*SECNO 2290.000
3280 CROSS SECTION 2290.00 EXTENDED .59 FEET

2290.00	4.10	488.34	487.22	.00	488.60	.26	.05	.10	487.75
700.	0.	700.	0.	0.	170.	0.	1.	0.	489.24
.02	.00	4.13	.00	.025	.025	.025	.000	484.24	.00
.002826	10.	10.	10.	16	5	0	.00	111.20	111.20

J
*SECNO 2200.000

2200.00	3.68	488.28	487.62	.00	489.03	.75	.28	.15	489.00
700.	0.	700.	0.	0.	101.	0.	2.	1.	489.60
.03	.00	6.95	.00	.025	.025	.025	.000	484.60	75.63
.003521	90.	90.	90.	3	12	0	.00	34.73	110.37

0
CCHV= .300 CEHV= .500
*SECNO 2150.000

2150.00	3.65	488.45	487.81	.00	489.22	.77	.18	.01	489.50
700.	0.	700.	0.	0.	100.	0.	2.	1.	489.80
.03	.00	7.02	.00	.025	.025	.025	.000	484.80	75.70
.003632	50.	50.	50.	2	15	0	.00	34.60	110.30

0
*SECNO 2140.000

2140.00	3.56	488.40	488.01	.00	489.35	.94	.04	.09	489.74
700.	0.	700.	0.	0.	90.	0.	2.	1.	490.24
.03	.00	7.79	.00	.025	.025	.025	.000	484.84	76.49
.004712	10.	10.	10.	2	11	0	.00	32.44	108.92

0
*SECNO 2125.000
7185 MINIMUM SPECIFIC ENERGY

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       QLOSS    BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN     SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID    ENDST


 3720 CRITICAL DEPTH ASSUMED
   2125.00     3.47   488.37   488.37      .00   489.70     1.33      .09      .19   489.92
      700.       0.     700.       0.       0.     76.       0.       2.       1.    490.90
       .03      .00     9.25      .00     .025     .025     .025     .000   484.90    76.89
   .007144      15.      15.      15.        0        8        0      .00    28.63   105.52
0
 *SECNO 2110.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   2110.00     3.76   488.72   488.72      .00   490.08     1.36      .11      .02   490.12
      700.       0.     700.       0.       0.     75.       0.       2.       1.    491.56
       .03      .00     9.37      .00     .025     .025     .025     .000   484.96    75.77
   .007186      15.      15.      15.        0        8        0      .00    27.77   103.54
0
 CCHV=    .100 CEHV=    .300
 *SECNO 2100.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   2100.00     4.06   489.06   489.06      .00   490.49     1.43      .07      .02   490.30
      700.       0.     700.       0.       0.     73.       0.       2.       1.    492.10
       .03      .00     9.58      .00     .025     .025     .025     .000   485.00    75.05
   .007206      10.      10.      10.        0        8        0      .00    25.96   101.01
0
 *SECNO 2000.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   2000.00     4.66   490.06   490.06      .00   491.44     1.39      .72      .00   492.00
      700.       0.     700.       0.       0.     74.       0.       2.       1.    492.50
       .03      .00     9.45      .00     .025     .025     .025     .000   485.40    75.36
   .007155      100.     100.     100.        0        8        0      .00    26.82   102.18
0
 *SECNO 1900.000
   1900.00     5.51   491.31   489.85      .00   491.88      .57      .35      .08   496.00
      700.       0.     700.       0.       0.    116.       0.       2.       1.    492.80
       .04      .00     6.06      .00     .025     .025     .025     .000   485.80    72.00
   .002082      100.     100.     100.        3       11        0      .00    32.00   104.00
0
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1800.000
1800.00 5.27 491.47 490.28 .00 492.14 .67 .23 .03 494.40
700. 0. 700. 0. 0. 107. 0. 2. 1. 493.30
.04 .00 6.57 .00 .025 .025 .025 .000 486.20 72.94
.002560 100. 100. 100. 2 15 0 .00 30.45 103.39
0
*SECNO 1700.000
1700.00 5.07 491.67 490.69 .00 492.45 .77 .28 .03 496.00
700. 0. 700. 0. 0. 99. 0. 3. 1. 493.60
.05 .00 7.04 .00 .025 .025 .025 .000 486.60 74.00
.003058 100. 100. 100. 2 15 0 .00 29.15 103.15
0
CCHV= .100 CEHV= .300
*SECNO 1615.000
1615.00 5.15 492.09 490.99 .00 492.79 .70 .34 .01 495.50
700. 0. 700. 0. 0. 104. 0. 3. 1. 493.94
.05 .00 6.71 .00 .035 .035 .035 .000 486.94 72.79
.005363 85. 85. 85. 2 15 0 .00 30.52 103.30
0
*SECNO 1600.000
1600.00 5.15 492.15 491.08 .00 492.88 .73 .08 .01 495.70
700. 0. 700. 0. 0. 102. 0. 3. 1. 494.10
.05 .00 6.85 .00 .035 .035 .035 .000 487.00 73.48
.005580 15. 15. 15. 0 15 0 .00 29.68 103.16
0
*SECNO 1590.000
1590.00 5.15 492.19 491.14 .00 492.94 .75 .06 .01 495.60
700. 0. 700. 0. 0. 101. 0. 3. 1. 494.04
.05 .00 6.95 .00 .035 .035 .035 .000 487.04 74.20
.005735 10. 10. 10. 0 15 0 .00 29.10 103.31
0
*SECNO 1570.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1570.00 4.04 492.56 492.56 .00 493.98 1.42 .17 .20 495.40
700. 0. 700. 0. 0. 73. 0. 3. 1. 495.52
.05 .00 9.56 .00 .035 .035 .035 .000 488.52 74.88
.014155 20. 20. 20. 0 15 0 .00 26.21 101.09
0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1550.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1550.00	4.44	494.44	494.44	.00	495.20	.76	.31	.07	495.40
700.	0.	700.	0.	0.	100.	0.	3.	1.	498.00
.05	.00	6.99	.00	.035	.035	.035	.000	490.00	32.87
.016834	20.	20.	20.	0	8	0	.00	67.90	100.77

0
CCHV= .100 CEHV= .300
*SECNO 1540.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1540.00	4.57	494.61	494.61	.00	495.40	.79	.11	.01	495.30
700.	0.	700.	0.	0.	98.	0.	3.	1.	497.04
.05	.00	7.13	.00	.025	.025	.025	.000	490.04	39.68
008214	10.	10.	10.	0	8	0	.00	62.46	102.14

*SECNO 1500.000

1500.00	4.47	494.67	494.25	.00	495.73	1.06	.25	.08	496.00
700.	0.	700.	0.	0.	85.	0.	3.	1.	497.20
.05	.00	8.26	.00	.025	.025	.025	.000	490.20	74.06
.004843	40.	40.	40.	2	12	0	.00	27.89	101.94

0
*SECNO 1400.000

1400.00	4.59	495.19	494.67	.00	496.20	1.01	.47	.00	498.50
700.	0.	700.	0.	0.	87.	0.	3.	1.	497.70
.06	.00	8.07	.00	.025	.025	.025	.000	490.60	74.25
.004481	100.	100.	100.	3	11	0	.00	27.80	102.05

0
CCHV= .100 CEHV= .300
*SECNO 1315.000

1315.00	4.95	495.89	494.99	.00	496.67	.78	.45	.02	499.60
700.	0.	700.	0.	0.	99.	0.	3.	1.	497.94
.06	.00	7.10	.00	.035	.035	.035	.000	490.94	73.05
.006290	85.	85.	85.	3	11	0	.00	29.84	102.89

0
*SECNO 1300.000

1300.00	4.99	495.99	495.06	.00	496.77	.78	.09	.00	499.60
700.	0.	700.	0.	0.	99.	0.	4.	1.	498.10
.06	.00	7.08	.00	.035	.035	.035	.000	491.00	73.17
.006187	15.	15.	15.	2	15	0	.00	29.66	102.83

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1290.000
1290.00 5.00 496.04 495.11 .00 496.83 .79 .06 .00 500.40
700. 0. 700. 0. 0. 98. 0. 4. 1. 498.04
.06 .00 7.12 .00 .035 .035 .035 .000 491.04 73.63
.006241 10. 10. 10. 1 15 0 .00 29.36 102.99
0
*SECNO 1270.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1270.00 4.05 496.37 496.37 .00 497.79 1.42 .18 .19 500.00
700. 0. 700. 0. 0. 73. 0. 4. 1. 499.32
.06 .00 9.58 .00 .035 .035 .035 .000 492.32 75.01
.014160 20. 20. 20. 0 15 0 .00 26.10 101.10
0
*SECNO 1250.000
7195 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1250.00 4.08 497.68 497.68 .00 499.10 1.42 .28 .00 500.00
700. 0. 700. 0. 0. 73. 0. 4. 1. 500.70
.06 .00 9.57 .00 .035 .035 .035 .000 493.60 75.16
.014040 20. 20. 20. 0 5 0 .00 25.87 101.04
0
CCHV= .100 CEHV= .300
*SECNO 1240.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1240.00 4.17 497.81 497.81 .00 499.30 1.49 .10 .02 500.40
700. 0. 700. 0. 0. 71. 0. 4. 1. 503.64
.06 .00 9.81 .00 .025 .025 .025 .000 493.64 74.60
.007289 10. 10. 10. 0 8 0 .00 24.24 98.84
0
*SECNO 1200.000
1200.00 4.92 498.72 497.89 .00 499.56 .84 .19 .07 501.00
700. 0. 700. 0. 0. 95. 0. 4. 1. 500.90
.06 .00 7.34 .00 .025 .025 .025 .000 493.80 73.90
.003444 40. 40. 40. 4 8 0 .00 28.79 102.69
0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1100.000
1100.00 4.89 499.09 498.25 .00 499.90 .81 .34 .00 501.80
700. 0. 700. 0. 0. 97. 0. 4. 1. 501.20
.07 .00 7.23 .00 .025 .025 .025 .000 494.20 73.21
.003365 100. 100. 100. 2 15 0 .00 29.57 102.79
0
CCHV= .100 CEHV= .300
*SECNO 1065.000
1065.00 5.04 499.38 498.37 .00 500.11 .73 .19 .01 501.90
700. 0. 700. 0. 0. 102. 0. 4. 1. 501.30
.07 .00 6.84 .00 .035 .035 .035 .000 494.34 72.55
.005714 45. 45. 45. 2 15 0 .00 30.59 103.15
0
*SECNO 1050.000
1050.00 5.05 499.45 498.46 .00 500.20 .75 .09 .01 502.00
700. 0. 700. 0. 0. 100. 0. 4. 1. 501.50
.07 .00 6.97 .00 .035 .035 .035 .000 494.40 73.09
.005924 15. 15. 15. 0 15 0 .00 29.86 102.94
0
*SECNO 1040.000
1040.00 5.22 499.66 498.41 .00 500.27 .61 .05 .01 502.00
700. 0. 700. 0. 0. 112. 0. 4. 1. 501.44
.07 .00 6.26 .00 .035 .035 .035 .000 494.44 70.62
.004630 10. 10. 10. 2 15 0 .00 32.83 103.45
0
*SECNO 1020.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1020.00 4.06 499.46 499.46 .00 500.89 1.43 .15 .25 502.00
700. 0. 700. 0. 0. 73. 0. 4. 1. 502.40
.07 .00 9.60 .00 .035 .035 .035 .000 495.40 75.19
.014165 20. 20. 20. 0 15 0 .00 25.93 101.12
0
*SECNO 1000.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1000.00 4.06 500.46 500.46 .00 501.89 1.42 .28 .00 502.30
700. 0. 700. 0. 0. 73. 0. 4. 1. 503.48
.07 .00 9.57 .00 .035 .035 .035 .000 496.40 75.05
.014092 20. 20. 20. 0 5 0 .00 25.99 101.04
0

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 CCHV=    .100 CEHV=    .300
 *SECNO 990.000
    990.00     4.56   501.00   500.49      .00   502.00     1.00      .07      .04   502.40
     700.       0.     700.       0.       0.     87.       0.       4.       1.    503.44
      .07      .00     8.03      .00     .025     .025     .025     .000   496.44    73.98
   .004463      10.      10.      10.        8        5        0      .00    28.16   102.14
0
 *SECNO 900.000
    900.00     5.04   501.84   500.51      .00   502.31      .48      .26      .05   504.80
     700.       0.     700.       0.       0.     126.       0.       4.       2.    502.00
      .08      .00     5.54      .00     .025     .025     .025     .000   496.80    72.18
   .001997      90.      90.      90.        3       15        0      .00    40.19   112.37
0
 CCHV=    .100 CEHV=    .300
 *SECNO 875.000
    875.00     4.86   501.76   500.81      .00   502.46      .69      .08      .06   505.50
     700.       0.     700.       0.       0.     105.       0.       4.       2.    502.00
      .08      .00     6.68      .00     .035     .035     .035     .000   496.90    73.27
   .005748      25.      25.      25.        2       15        0      .00    33.09   106.36
0
 *SECNO 850.000
    850.00     4.76   501.76   501.10      .00   502.70      .94      .17      .07   505.00
     700.       0.     700.       0.       0.     90.       0.       5.       2.    505.00
      .08      .00     7.77      .00     .035     .035     .035     .000   497.00    73.48
   .007814      25.      25.      25.        2       15        0      .00    27.85   101.33
0
 *SECNO 800.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    800.00     3.69   502.49   502.49      .00   503.66     1.17      .52      .07   507.00
     700.       0.     700.       0.       0.     81.       0.       5.       2.    505.00
      .08      .00     8.66      .00     .035     .035     .035     .000   498.80    76.85
   .014786      50.      50.      50.        0       15        0      .00    35.08   111.93
0
 CCHV=    .100 CEHV=    .300
 *SECNO 790.000
    790.00     3.38   503.10   502.65      .00   503.78      .68      .07      .05   506.90
     700.       0.     700.       0.       0.     105.       0.       5.       2.    505.00
      .08      .00     6.60      .00     .025     .025     .025     .000   499.72    74.94
   .004352      10.      10.      10.        3       16        0      .00    47.50   122.43
0
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    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       QLOSS    BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA      LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 *SECNO 750.000
    750.00     3.23   503.23   503.03     .00   504.01     .78      .20      .03   507.30
      700.       0.     700.       0.       0.     99.       0.       5.       2.   505.00
       .08      .00     7.09      .00     .025     .025     .025     .000   500.00    69.47
    .005934     40.      40.      40.        2       11        0      .00    50.75   120.22
0
 *SECNO 700.000
    700.00     2.90   503.90   503.20     .00   504.24     .34      .19      .04   507.40
      700.       0.     700.       0.       0.     149.      0.       5.       2.   505.00
       .09      .00     4.70      .00     .025     .025     .025     .000   501.00    49.85
    .002552     50.      50.      50.        2       14        0      .00    75.59   125.44
0
 *SECNO 650.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    650.00     1.44   504.44   504.44     .00   505.03     .59      .22      .07   510.00
      700.       0.     700.       0.       0.     114.      0.       5.       2.   505.00
       .09      .00     6.15      .00     .025     .025     .025     .000   503.00   109.18
    .008832     50.      50.      50.        0        8        0      .00    98.33   207.51
0
 *SECNO 600.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    600.00     1.63   505.63   505.63     .00   506.06     .43      .46      .02   507.00
      700.       0.     700.       0.       0.     134.      0.       5.       2.   507.00
       .09      .00     5.24      .00     .025     .025     .025     .000   504.00    36.53
    .009698     50.      50.      50.        0        8        0      .00   157.95   194.47
0
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PROFILE FOR STREAM SUBCRITICAL RUN

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

ELEVATION SECNO	475. CUMDIS	480.	485.	490.	495.	500.	505.	510.	515.	520.
2875.00	0.	I. LWE R								
	5.	I. W E R								
	10.	I. WE R								
	15.	I W E R.								
	20.	I WLE R								
2850.00	25.	I WLE .R								
	30.	I WLE .R								
	35.	I W LE . R								
	40.	I WLE . R								
	45.	I W E . R								
	50.	I W E . R								
	55.	.I W E. R								
	60.	.I W E. R								
	65.	.I W EL R								
	70.	.I W E R								
300.00	75.	.I W EL R								
	80.	.I W EL R								
	85.	.I CW EL R								
	90.	.I CW EL R								
	95.	.I CW EL R								
	100.	.I CW EL R								
	105.	.I W EL R								
	110.	.I W EL R								
	115.	. I W EL R								
	120.	. I W EL R								
	125.	. I W EL R								
	130.	. I CWEL R								
	135.	. I CW.ER								
	140.	. I CW.ER								
	145.	. I CW.ER								
	150.	. I CW.ER								
	155.	. I CW.ER								
	160.	. I CW.ER								
	165.	. I CW.ER								
	170.	. I C WER								
2700.00	175.	. I C WER								
	180.	. I C WER								
	185.	. I C WER								
	190.	. I C WER								
	195.	. I C WER								
	200.	. I C WER								
	205.	. I C WER								
	210.	. I C WER								
	215.	. I C WER								
	220.	. I C WER								
	225.	. I C WER								

```
          230.  .      .I    C WER    .  .  .  .  .  .  .  .
          235.  .      .I     CWE R   .  .  .  .  .  .  .  .
          240.  .      . I    CWE R   .  .  .  .  .  .  .  .
          245.  .      . I    CWLER   .  .  .  .  .  .  .  .
          250.  .      . I    CWLER   .  .  .  .  .  .  .  .
          255.  .      . I    CWLER   .  .  .  .  .  .  .  .
          260.  .      . I    CW ER   .  .  .  .  .  .  .  .
          265.  .      . I    CW ER   .  .  .  .  .  .  .  .
          270.  .      . I    CW ER   .  .  .  .  .  .  .  .
2600.00   275.  .      . I    CW ER   .  .  .  .  .  .  .  .
          280.  .      . I    CW ER   .  .  .  .  .  .  .  .
          285.  .      . I    CW ER   .  .  .  .  .  .  .  .
          290.  .      . I    CW ER   .  .  .  .  .  .  .  .
          295.  .      . I    CW ER   .  .  .  .  .  .  .  .
          300.  .      . I    CW ER   .  .  .  .  .  .  .  .
          305.  .      . I    CW ER   .  .  .  .  .  .  .  .
          310.  .      . I    C.WER   .  .  .  .  .  .  .  .
          315.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          320.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          325.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          330.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          335.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          340.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          345.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          350.  .      . I    C.WEL   .  .  .  .  .  .  .  .
          355.  .      . I    C.WERL  .  .  .  .  .  .  .  .
          360.  .      . I     CWERL  .  .  .  .  .  .  .  .
          365.  .      .  I    CWEML  .  .  .  .  .  .  .  .
          370.  .      .  I    CWE L  .  .  .  .  .  .  .  .
2500.00   375.  .      .  I    CWE L  .  .  .  .  .  .  .  .
          380.  .      .  I    CWE L  .  .  .  .  .  .  .  .
          385.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          390.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          395.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          400.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          405.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          410.  .      .  I    CW EL  .  .  .  .  .  .  .  .
          415.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          420.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          425.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          430.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          435.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          440.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          445.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          450.  .      .  I    CW ER  .  .  .  .  .  .  .  .
          455.  .      .  I    C WER  .  .  .  .  .  .  .  .
          460.  .      .  I    C WER  .  .  .  .  .  .  .  .
          465.  .      .  I    C WER  .  .  .  .  .  .  .  .
          470.  .      .  I    C WER  .  .  .  .  .  .  .  .
2400.00   475.  .      .  I    C WER  .  .  .  .  .  .  .  .
          480.  .      .  I    C WER  .  .  .  .  .  .  .  .
          485.  .      .  I    .CWER  .  .  .  .  .  .  .  .
          490.  .      .  I    .CWER  .  .  .  .  .  .  .  .
          495.  .      .  I    .CWER  .  .  .  .  .  .  .  .
          500.  .      .  I    .CWEL  .  .  .  .  .  .  .  .
          505.  .      .  I    .CW E  .  .  .  .  .  .  .  .
```

```
2365.00 510. .  .  I   .CW E    .  .  .  .  .  .  .  .
        515. .  .  I   .CW E    .  .  .  .  .  .  .  .
        520. .  .  I   .CW ER   .  .  .  .  .  .  .  .
2350.00 525. .  .  I   .CW ER   .  .  .  .  .  .  .  .
        530. .  .  I   .CW ER   .  .  .  .  .  .  .  .
2340.00 535. .  .  I   .CW ER   .  .  .  .  .  .  .  .
        540. .  .  I   .CW EL   .  .  .  .  .  .  .  .
        545. .  .   I  . CW ER  .  .  .  .  .  .  .  .
        550. .  .   I  . CW ER  .  .  .  .  .  .  .  .
2320.00 555. .  .    I . W E R  .  .  .  .  .  .  .  .
        560. .  .    I . W LER  .  .  .  .  .  .  .  .
        565. .  .     I .  WLE R .  .  .  .  .  .  .  .
        570. .  .     I .  WLE R .  .  .  .  .  .  .  .
2300.00 575. .  .     I .  WL ER .  .  .  .  .  .  .  .
        580. .  .     I .  CLWER .  .  .  .  .  .  .  .
2290.00 585. .  .     I .  C LER .  .  .  .  .  .  .  .
        590. .  .      I.  C LE R.  .  .  .  .  .  .  .
        595. .  .      I.   CLE R.  .  .  .  .  .  .  .
        600. .  .      I.   CLE R.  .  .  .  .  .  .  .
        605. .  .      I.   CLE R.  .  .  .  .  .  .  .
        610. .  .      I.   CLE R.  .  .  .  .  .  .  .
        615. .  .      I.   CLE R.  .  .  .  .  .  .  .
        620. .  .      I.   CLWER.  .  .  .  .  .  .  .
        625. .  .      I.   C WER.  .  .  .  .  .  .  .
        630. .  .      I.   C WER.  .  .  .  .  .  .  .
        635. .  .      I.   C WER.  .  .  .  .  .  .  .
        640. .  .      I.   C WER.  .  .  .  .  .  .  .
        645. .  .      I.   C WER.  .  .  .  .  .  .  .
        650. .  .      I.   C WER.  .  .  .  .  .  .  .
        655. .  .      I.   C WER.  .  .  .  .  .  .  .
        660. .  .      I.   C WER.  .  .  .  .  .  .  .
        665. .  .      I.   C WER.  .  .  .  .  .  .  .
        670. .  .      I.   C WER.  .  .  .  .  .  .  .
2200.00 675. .  .      I.   C WER.  .  .  .  .  .  .  .
        680. .  .      I.   C WER.  .  .  .  .  .  .  .
        685. .  .      I.   C WER.  .  .  .  .  .  .  .
        690. .  .      I.   C WER.  .  .  .  .  .  .  .
        695. .  .      I.   C WER.  .  .  .  .  .  .  .
        700. .  .      I.   C WEL.  .  .  .  .  .  .  .
        705. .  .      I.   C WEL.  .  .  .  .  .  .  .
        710. .  .      I.    CWEL.  .  .  .  .  .  .  .
        715. .  .       I    CWELR  .  .  .  .  .  .  .
        720. .  .       I    CWELR  .  .  .  .  .  .  .
2150.00 725. .  .       I    CWELR  .  .  .  .  .  .  .
        730. .  .       I    CW ER  .  .  .  .  .  .  .
2140.00 735. .  .       I    CW ER  .  .  .  .  .  .  .
        740. .  .       I    CW ELR .  .  .  .  .  .  .
        745. .  .       I     W ELR .  .  .  .  .  .  .
2125.00 750. .  .       I     W EL R .  .  .  .  .  .  .
        755. .  .       I     W  E R .  .  .  .  .  .  .
        760. .  .       I     W  E R .  .  .  .  .  .  .
2110.00 765. .  .       I     W  E R .  .  .  .  .  .  .
        770. .  .       I      W LE R .  .  .  .  .  .  .
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.00.00  775.  .  .  I   W .E  R  .  .  .  .  .  .  .
        780.  .  .  I   W .E  R  .  .  .  .  .  .  .
        785.  .  .  I   W .E  R  .  .  .  .  .  .  .
        790.  .  .  I   W .E  R  .  .  .  .  .  .  .
        795.  .  .  I    W.E  R  .  .  .  .  .  .  .
        800.  .  .  I    W.E  R  .  .  .  .  .  .  .
        805.  .  .  I    W. E R  .  .  .  .  .  .  .
        810.  .  .  I    W. E R  .  .  .  .  .  .  .
        815.  .  .  I    W. E  R .  .  .  .  .  .  .
        820.  .  .  I    W. E  R .  .  .  .  .  .  .
        825.  .  .  I    W. E  R .  .  .  .  .  .  .
        830.  .  .  I    W. E  R .  .  .  .  .  .  .
        835.  .  .  I    W. EL R .  .  .  .  .  .  .
        840.  .  .  .I   W. EL R .  .  .  .  .  .  .
        845.  .  .  .I    W EL R .  .  .  .  .  .  .
        850.  .  .  .I    W EL R .  .  .  .  .  .  .
        855.  .  .  .I    W  E R .  .  .  .  .  .  .
        860.  .  .  .I    W  E R .  .  .  .  .  .  .
        865.  .  .  .I    W  ELR .  .  .  .  .  .  .
        870.  .  .  .I    W  ELR .  .  .  .  .  .  .
2000.00 875.  .  .  .I    W  ELR .  .  .  .  .  .  .
        880.  .  .  .I    W  ELR .  .  .  .  .  .  .
        885.  .  .  .I    W  EML .  .  .  .  .  .  .
        890.  .  .  .I    W  EML .  .  .  .  .  .  .
        895.  .  .  .I    CW EMRL .  .  .  .  .  .  .
        900.  .  .  .I    CW EMRL .  .  .  .  .  .  .
        905.  .  .  .I    CW EMRL .  .  .  .  .  .  .
        910.  .  .  .I    CW E R L .  .  .  .  .  .  .
        915.  .  .  .I    CW E R L .  .  .  .  .  .  .
        920.  .  .  .I    CW E R  L .  .  .  .  .  .  .
        925.  .  .  .I    CW E R  L .  .  .  .  .  .  .
        930.  .  .  .I    CW E R  L .  .  .  .  .  .  .
        935.  .  .  .I    C WE R  L. .  .  .  .  .  .  .
        940.  .  .  .I    C WE R  L. .  .  .  .  .  .  .
        945.  .  .  .I    C WE R   L .  .  .  .  .  .  .
        950.  .  .  .I    C W ER   L .  .  .  .  .  .  .
        955.  .  .  .I    C W ER   L .  .  .  .  .  .  .
        960.  .  .  .I    C W EMR  .L .  .  .  .  .  .  .
        965.  .  .  . I   C W EMR  .L .  .  .  .  .  .  .
        970.  .  .  . I   C W E R  . L .  .  .  .  .  .  .
1900.00 975.  .  .  . I   C  WE R  . L .  .  .  .  .  .  .
        980.  .  .  . I   C  WE R  . L .  .  .  .  .  .  .
        985.  .  .  . I   C  WE R  . L .  .  .  .  .  .  .
        990.  .  .  . I   C  WE R  . L .  .  .  .  .  .  .
        995.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1000.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1005.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1010.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1015.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1020.  .  .  . I   C  WE R  .L  .  .  .  .  .  .  .
       1025.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1030.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1035.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1040.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1045.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1050.  .  .  . I   C  WE R  L   .  .  .  .  .  .  .
       1055.  .  .  . I   C  WE R L.   .  .  .  .  .  .  .
       1060.  .  .  . I   C  WE R L.   .  .  .  .  .  .  .
       1065.  .  .  . I   C  WE  RL.   .  .  .  .  .  .  .
       1070.  .  .  . I    .C WE  RL.  .  .  .  .  .  .  .
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.600.00 1075. .  .  . I    .C WE R L.  .  .  .  .  .  .
        1080. .  .  . I    .C WE R L.  .  .  .  .  .  .
        1085. .  .  . I    .C WE R L.  .  .  .  .  .  .
        1090. .  .  .  I   .C WE R L.  .  .  .  .  .  .
        1095. .  .  .  I   .C WE R L.  .  .  .  .  .  .
        1100. .  .  .  I   .C WE R L   .  .  .  .  .  .
        1105. .  .  .  I   .C WE R L   .  .  .  .  .  .
        1110. .  .  .  I   .C WE R L   .  .  .  .  .  .
        1115. .  .  .  I   .C W E R L  .  .  .  .  .  .
        1120. .  .  .  I   .C W E R L  .  .  .  .  .  .
        1125. .  .  .  I   .C W E R L  .  .  .  .  .  .
        1130. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1135. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1140. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1145. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1150. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1155. .  .  .  I   .C W E R .L .  .  .  .  .  .
        1160. .  .  .  I   .C W E R . L .  .  .  .  .  .
        1165. .  .  .  I   .C W E R . L .  .  .  .  .  .
        1170. .  .  .  I   .C W E R . L .  .  .  .  .  .
1700.00 1175. .  .  .  I   .C W E R . L .  .  .  .  .  .
        1180. .  .  .  I   .C W E R . L .  .  .  .  .  .
        1185. .  .  .  I   .C W E R . L .  .  .  .  .  .
        1190. .  .  .  I   .C  WE R . L .  .  .  .  .  .
        1195. .  .  .  I   . C WE R . L .  .  .  .  .  .
        1200. .  .  .  I   . C WE R . L .  .  .  .  .  .
        1205. .  .  .  I   . C WE R . L .  .  .  .  .  .
        1210. .  .  .  I   . C WE R . L .  .  .  .  .  .
        1215. .  .  .  I   . C WE R . L .  .  .  .  .  .
        1220. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1225. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1230. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1235. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1240. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1245. .  .  .  I   . C WE R .L .  .  .  .  .  .
        1250. .  .  .  I   . C W E R .L .  .  .  .  .  .
        1255. .  .  .  I   . C W E R .L .  .  .  .  .  .
1615.00 1260. .  .  .  I   . C W E R .L .  .  .  .  .  .
        1265. .  .  .  I   . C W E R .L .  .  .  .  .  .
        1270. .  .  .  I   . C W E R .L .  .  .  .  .  .
1600.00 1275. .  .  .  I   . C W E R .L .  .  .  .  .  .
        1280. .  .  .  I   . C W E R .L .  .  .  .  .  .
1590.00 1285. .  .  .  I   . C W E R .L .  .  .  .  .  .
        1290. .  .  .  I   . C WE R.L .  .  .  .  .  .
        1295. .  .  .  I   . CW E MRL .  .  .  .  .  .
        1300. .  .  .  I   . CW E RL  .  .  .  .  .  .
1570.00 1305. .  .  .  I   .  W E .L  .  .  .  .  .  .
        1310. .  .  .  I   .  W E.LR  .  .  .  .  .  .
        1315. .  .  .  I.    W E.L R  .  .  .  .  .  .
        1320. .  .  .  I.    W EL  R  .  .  .  .  .  .
1550.00 1325. .  .  .  I     WEL  R  .  .  .  .  .  .
        1330. .  .  .  I     W.E  R  .  .  .  .  .  .
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1540.00 1335. .  .  .  I   W.E  R  .  .  .  .  .  .
        1340. .  .  .  I   W.E  R  .  .  .  .  .  .
        1345. .  .  .  I   W.E  R  .  .  .  .  .  .
        1350. .  .  .  I   W.E  R  .  .  .  .  .  .
        1355. .  .  .  I   W.E  R  .  .  .  .  .  .
        1360. .  .  .  I   W.E  R  .  .  .  .  .  .
        1365. .  .  .  I   W.EL R  .  .  .  .  .  .
        1370. .  .  .  I   W.EL R  .  .  .  .  .  .
1500.00 1375. .  .  .  I   W.EL R  .  .  .  .  .  .
        1380. .  .  .  I   W. E R  .  .  .  .  .  .
        1385. .  .  .  I   W. EL R .  .  .  .  .  .
        1390. .  .  .  .I  W. EL R .  .  .  .  .  .
        1395. .  .  .  .I  CW EL R .  .  .  .  .  .
        1400. .  .  .  .I  CW EL R .  .  .  .  .  .
        1405. .  .  .  .I  CW EMLR .  .  .  .  .  .
        1410. .  .  .  .I  CW EMLR .  .  .  .  .  .
        1415. .  .  .  .I  CW EMLR .  .  .  .  .  .
        1420. .  .  .  .I  CW E LR .  .  .  .  .  .
        1425. .  .  .  .I  CW E ML .  .  .  .  .  .
        1430. .  .  .  .I  CW E ML .  .  .  .  .  .
        1435. .  .  .  .I  CW E ML .  .  .  .  .  .
        1440. .  .  .  .I  CW E ML .  .  .  .  .  .
        1445. .  .  .  .I  CW E MRL .  .  .  .  .  .
        1450. .  .  .  .I  CW E  RL .  .  .  .  .  .
        1455. .  .  .  .I  CW E  RL .  .  .  .  .  .
        1460. .  .  .  .I  CW E  RL .  .  .  .  .  .
        1465. .  .  .  .I  CW E  R L .  .  .  .  .  .
        1470. .  .  .  .I  CW E  R L .  .  .  .  .  .
1400.00 1475. .  .  .  .I  CW E  R L .  .  .  .  .  .
        1480. .  .  .  .I  CW E  R L .  .  .  .  .  .
        1485. .  .  .  .I  C.W E R L .  .  .  .  .  .
        1490. .  .  .  .I  C.W E R L .  .  .  .  .  .
        1495. .  .  .  .I  C.W E  R L.  .  .  .  .  .
        1500. .  .  .  .I   CW E  R L.  .  .  .  .  .
        1505. .  .  .  .I   CW E  R L.  .  .  .  .  .
        1510. .  .  .  .I   CW E  R L.  .  .  .  .  .
        1515. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1520. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1525. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1530. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1535. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1540. .  .  .  . I  CW E  R L.  .  .  .  .  .
        1545. .  .  .  . I  C WE  R L.  .  .  .  .  .
        1550. .  .  .  . I  C WE  R L.  .  .  .  .  .
        1555. .  .  .  . I  C WE  R L.  .  .  .  .  .
1315.00 1560. .  .  .  . I  C WE  R L.  .  .  .  .  .
        1565. .  .  .  . I  C WE  R L.  .  .  .  .  .
        1570. .  .  .  . I  C WE  R L.  .  .  .  .  .
1300.00 1575. .  .  .  . I  C WE R L.  .  .  .  .  .
        1580. .  .  .  . I  C WE R  L  .  .  .  .  .
1290.00 1585. .  .  .  . I  C WE R  .L .  .  .  .  .
        1590. .  .  .  .  I .CW E R  .L .  .  .  .  .
        1595. .  .  .  .  I .CW E R  L  .  .  .  .  .
        1600. .  .  .  .   I .CW E R L  .  .  .  .  .
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  ?/0.00 1605. .  .  .  .  I  . W E RL  .  .  .  .  .
         1610. .  .  .  .  I  . W E RL  .  .  .  .  .
         1615. .  .  .  .   I  . W E ML  .  .  .  .  .
         1620. .  .  .  .    I .  W E LR  .  .  .  .  .
 1250.00 1625. .  .  .  .    I .  W E LR  .  .  .  .  .
         1630. .  .  .  .    I .  W E L  R  .  .  .  .  .
 1240.00 1635. .  .  .  .    I .   W E.L   R .  .  .  .  .
         1640. .  .  .  .    I .   W E.L   R .  .  .  .  .
         1645. .  .  .  .    I .   W E.L   R .  .  .  .  .
         1650. .  .  .  .    I .   W E.L  R .  .  .  .  .
         1655. .  .  .  .    I .   CW E.L  R .  .  .  .  .
         1660. .  .  .  .    I .   CW E.ML R .  .  .  .  .
         1665. .  .  .  .     I.   CW E. LR  .  .  .  .  .
         1670. .  .  .  .    I .   CW E. L  .  .  .  .  .
 1200.00 1675. .  .  .  .    I .   CW E. L  .  .  .  .  .
         1680. .  .  .  .    I .   CW E. L  .  .  .  .  .
         1685. .  .  .  .    I .   CW E. L  .  .  .  .  .
         1690. .  .  .  .     I .  C WE. L  .  .  .  .  .
         1695. .  .  .  .    I .   C WE. L  .  .  .  .  .
         1700. .  .  .  .    I .   C WE. L  .  .  .  .  .
         1705. .  .  .  .    I .   C WE. L  .  .  .  .  .
         1710. .  .  .  .    I .   C WE. RL  .  .  .  .  .
         1715. .  .  .  .    I .   C WE. RL  .  .  .  .  .
         1720. .  .  .  .    I .   C WE. RL  .  .  .  .  .
         1725. .  .  .  .    I .   C WE. RL  .  .  .  .  .
         1730. .  .  .  .    I .   C WE. RL  .  .  .  .  .
         1735. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1740. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1745. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1750. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1755. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1760. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1765. .  .  .  .    I .   C W E RL  .  .  .  .  .
         1770. .  .  .  .    I .   C W E R L  .  .  .  .  .
 1100.00 1775. .  .  .  .    I .    CW E R L  .  .  .  .  .
         1780. .  .  .  .    I .    CW E R L  .  .  .  .  .
         1785. .  .  .  .    I .    CW E R L  .  .  .  .  .
         1790. .  .  .  .    I .    CW E R L  .  .  .  .  .
         1795. .  .  .  .     I.    CW E R L  .  .  .  .  .
         1800. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1805. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1810. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1815. .  .  .  .     I.    C WE  RL  .  .  .  .  .
 1065.00 1820. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1825. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1830. .  .  .  .     I.    C WE  RL  .  .  .  .  .
 1050.00 1835. .  .  .  .     I.    C WE  RL  .  .  .  .  .
         1840. .  .  .  .     I.    C WE  RL  .  .  .  .  .
 1040.00 1845. .  .  .  .     I.    C W.E RL  .  .  .  .  .
         1850. .  .  .  .     I.    C W.E RL  .  .  .  .  .
         1855. .  .  .  .      I     CW.E ML  .  .  .  .  .
         1860. .  .  .  .      I     CW.E  L  .  .  .  .  .
  .020.00 1865. .  .  .  .     .I     W. E LR  .  .  .  .  .
         1870. .  .  .  .     .I     W. E LR  .  .  .  .  .
         1875. .  .  .  .     . I     W  EL R  .  .  .  .  .
         1880. .  .  .  .     . I     W  EL R  .  .  .  .  .
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```
.000.00 1885.  .  .  .  .  .  .  I     .W  EL R  .  .  .  .  .
        1890.  .  .  .  .  .  .  I     .W  EL R  .  .  .  .  .
 990.00 1895.  .  .  .  .  .  .  I     .CW EL R  .  .  .  .  .
        1900.  .  .  .  .  .  .  I     .CW EL R  .  .  .  .  .
        1905.  .  .  .  .  .  .  I     .CW EL R  .  .  .  .  .
        1910.  .  .  .  .  .  .  I     .CW EML   .  .  .  .  .
        1915.  .  .  .  .  .  .  I     .CW EML   .  .  .  .  .
        1920.  .  .  .  .  .  .  I     .CW EML   .  .  .  .  .
        1925.  .  .  .  .  .  .  I     .C WEML   .  .  .  .  .
        1930.  .  .  .  .  .  .  I     .C WE RL  .  .  .  .  .
        1935.  .  .  .  .  .  .  I     .C WE RL  .  .  .  .  .
        1940.  .  .  .  .  .  .  I     .C WER L  .  .  .  .  .
        1945.  .  .  .  .  .  .  I     .C WER L  .  .  .  .  .
        1950.  .  .  .  .  .  .  I     .C WER  L .  .  .  .  .
        1955.  .  .  .  .  .  .  I     .C WER  L .  .  .  .  .
        1960.  .  .  .  .  .  .  I     .C WER  L .  .  .  .  .
        1965.  .  .  .  .  .  .  I     .C WER   L.  .  .  .  .
        1970.  .  .  .  .  .  .  I     .C WRE   L.  .  .  .  .
        1975.  .  .  .  .  .  .   I    .C WRE   L.  .  .  .  .
        1980.  .  .  .  .  .  .   I    .C  WE   L.  .  .  .  .
 900.00 1985.  .  .  .  .  .  .  I     .C  WE    L  .  .  .  .
        1990.  .  .  .  .  .  .  I     .C  WE    L  .  .  .  .
        1995.  .  .  .  .  .  .  I     .C  WE    L  .  .  .  .
        2000.  .  .  .  .  .  .  I     .C  WE    L  .  .  .  .
        2005.  .  .  .  .  .  .  I     . C WE    .L  .  .  .  .
 875.00 2010.  .  .  .  .  .  .  I     . C WE    .L  .  .  .  .
        2015.  .  .  .  .  .  .  I     . C WE    .L  .  .  .  .
        2020.  .  .  .  .  .  .  I     . C WER   .L  .  .  .  .
        2025.  .  .  .  .  .  .  I     . C WE  R L   .  .  .  .
        2030.  .  .  .  .  .  .  I     . C WE   RL   .  .  .  .
 850.00 2035.  .  .  .  .  .  .  I     . C WE    L   .  .  .  .
        2040.  .  .  .  .  .  .  I     . C W E   L   .  .  .  .
        2045.  .  .  .  .  .  .   I    .  CW E   RL  .  .  .  .
        2050.  .  .  .  .  .  .   I    .  CW E   RL  .  .  .  .
        2055.  .  .  .  .  .  .   I    .  CW E   R L .  .  .  .
        2060.  .  .  .  .  .  .    I   .  W E   R L .  .  .  .
        2065.  .  .  .  .  .  .    I   .  W  E  R L .  .  .  .
        2070.  .  .  .  .  .  .     I  .  CW E  R  L .  .  .  .
        2075.  .  .  .  .  .  .     I  .  CW E  R  L .  .  .  .
        2080.  .  .  .  .  .  .     I  .   W E  R  L .  .  .  .
 800.00 2085.  .  .  .  .  .  .      I .   W E  R  L .  .  .  .
        2090.  .  .  .  .  .  .       I.   CWE  R  L .  .  .  .
 790.00 2095.  .  .  .  .  .  .       I.   CW E R  L .  .  .  .
        2100.  .  .  .  .  .  .        I   CW E R  L .  .  .  .
        2105.  .  .  .  .  .  .        I   CW E R  L .  .  .  .
        2110.  .  .  .  .  .  .        I    W E R  L .  .  .  .
        2115.  .  .  .  .  .  .        I    W E R  L .  .  .  .
        2120.  .  .  .  .  .  .        I    W E R  L .  .  .  .
        2125.  .  .  .  .  .  .        I    W E R  L .  .  .  .
        2130.  .  .  .  .  .  .        I    W E R   L.  .  .  .
 750.00 2135.  .  .  .  .  .  .        I    W E R   L.  .  .  .
        2140.  .  .  .  .  .  .        I    CWE R   L.  .  .  .
        2145.  .  .  .  .  .  .        I    CWE R   L.  .  .  .
        2150.  .  .  .  .  .  .       .I    CWE R   L.  .  .  .
        2155.  .  .  .  .  .  .       .I    CWE R   L.  .  .  .
        2160.  .  .  .  .  .  .       .I    CWE R   L.  .  .  .
        2165.  .  .  .  .  .  .       .I    CWE R   L.  .  .  .
        2170.  .  .  .  .  .  .       .I    CWE R   L.  .  .  .
        2175.  .  .  .  .  .  .       . I   C E R   L.  .  .  .
        2180                           I   C E R   L
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/00.00 2185. .  .  .  .  .  .I  C E R  L  .  .  .  .
       2190. .  .  .  .  .  .I   CWER  L  .  .  .  .
       2195. .  .  .  .  .  . I  CWER   L  .  .  .  .
       2200. .  .  .  .  .  . I  CWER   L  .  .  .  .
       2205. .  .  .  .  .  .  I CWER    L  .  .  .  .
       2210. .  .  .  .  .  .  I  WER    L  .  .  .  .
       2215. .  .  .  .  .  .  I  WER     L .  .  .  .
       2220. .  .  .  .  .  .  .  I CWE     L .  .  .  .
       2225. .  .  .  .  .  .  .  I CWE      L.  .  .  .
       2230. .  .  .  .  .  .  .   I WE      L.  .  .  .
650.00 2235. .  .  .  .  .  .  .   I WE       L  .  .  .
       2240. .  .  .  .  .  .  .   I WE      L.  .  .  .
       2245. .  .  .  .  .  .  .   I WER     L.  .  .  .
       2250. .  .  .  .  .  .  .    I WE    L .  .  .  .
       2255. .  .  .  .  .  .  .    I WER   L .  .  .  .
       2260. .  .  .  .  .  .  .    I WER  L  .  .  .  .
       2265. .  .  .  .  .  .  .    I WER L  .  .  .  .
       2270. .  .  .  .  .  .  .    I .WER L  .  .  .  .
       2275. .  .  .  .  .  .  .     I .WER L   .  .  .  .
       2280. .  .  .  .  .  .  .     I .WE RL   .  .  .  .
600.00 2285. .  .  .  .  .  .  .     I .WE L    .  .  .  .
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THIS RUN EXECUTED 10-29-92

****
HEC2 RELEASE DATED NOV 76 UPDATED MAY 1984
ERROR CORR - 01,02,03,04,05,06
MODIFICATION - 50,51,52,53,54,55,56
IBM-PC-XT VERSION AUGUST 1985
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SUBCRITICAL RUN

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	2875.000	.00	.00	.00	479.60	700.00	481.55	481.55	482.10	95.07	5.94	117.81	71.79
*	2850.000	25.00	.00	.00	479.86	700.00	482.39	482.39	483.52	74.01	8.52	82.14	81.37
*	2800.000	50.00	.00	.00	480.60	700.00	483.64	483.64	484.90	72.62	9.02	77.64	82.14
	2700.000	100.00	.00	.00	481.00	700.00	484.85	484.01	485.52	29.90	6.56	106.72	128.02
	2600.000	100.00	.00	.00	481.40	700.00	485.14	484.42	485.87	33.55	6.83	102.51	120.85
	2500.000	100.00	.00	.00	481.80	700.00	485.47	484.81	486.23	35.81	6.99	100.19	116.98
	2400.000	100.00	.00	.00	482.20	700.00	485.83	485.22	486.61	37.40	7.09	98.68	114.47
	2365.000	35.00	.00	.00	482.34	700.00	486.05	485.35	486.78	66.85	6.86	101.99	85.61
	2350.000	15.00	.00	.00	482.40	700.00	486.18	485.41	486.88	62.82	6.72	104.15	88.32
	2340.000	10.00	.00	.00	482.44	700.00	486.22	485.48	486.96	65.74	6.92	101.16	86.34
*	2320.000	20.00	.00	.00	483.32	700.00	486.33	486.33	487.56	142.27	8.92	78.52	58.69
*	2300.000	20.00	.00	.00	484.20	700.00	487.22	487.22	488.45	141.72	8.92	78.49	58.80
	2290.000	10.00	.00	.00	484.24	700.00	488.34	487.22	488.60	28.26	4.13	169.53	131.69
	2200.000	90.00	.00	.00	484.60	700.00	488.28	487.62	489.03	35.21	6.95	100.78	117.96
	2150.000	50.00	.00	.00	484.80	700.00	488.45	487.81	489.22	36.32	7.02	99.69	116.14
	2140.000	10.00	.00	.00	484.84	700.00	488.40	488.01	489.35	47.12	7.79	89.91	101.98
*	2125.000	15.00	.00	.00	484.90	700.00	488.37	488.37	489.70	71.44	9.25	75.69	82.82

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	2110.000	15.00	.00	.00	484.96	700.00	488.72	488.72	490.08	71.86	9.37	74.72	82.58
*	2100.000	10.00	.00	.00	485.00	700.00	489.06	489.06	490.49	72.06	9.58	73.05	82.46
*	2000.000	100.00	.00	.00	485.40	700.00	490.06	490.06	491.44	71.55	9.45	74.09	82.76
	1900.000	100.00	.00	.00	485.80	700.00	491.31	489.85	491.88	20.82	6.06	115.52	153.40
	1800.000	100.00	.00	.00	486.20	700.00	491.47	490.28	492.14	25.60	6.57	106.56	138.35
	1700.000	100.00	.00	.00	486.60	700.00	491.67	490.69	492.45	30.58	7.04	99.38	126.59
	1615.000	85.00	.00	.00	486.94	700.00	492.09	490.99	492.79	53.63	6.71	104.39	95.58
	1600.000	15.00	.00	.00	487.00	700.00	492.15	491.08	492.88	55.80	6.85	102.22	93.71
	1590.000	10.00	.00	.00	487.04	700.00	492.19	491.14	492.94	57.35	6.95	100.75	92.43
*	1570.000	20.00	.00	.00	488.52	700.00	492.56	492.56	493.98	141.55	9.56	73.21	58.84
	1550.000	20.00	.00	.00	490.00	700.00	494.44	494.44	495.20	168.34	6.99	100.10	53.95
*	1540.000	10.00	.00	.00	490.04	700.00	494.61	494.61	495.40	82.14	7.13	98.18	77.24
	1500.000	40.00	.00	.00	490.20	700.00	494.67	494.25	495.73	48.43	8.26	84.70	100.58
	1400.000	100.00	.00	.00	490.60	700.00	495.19	494.67	496.20	44.81	8.07	86.74	104.57
	1315.000	85.00	.00	.00	490.94	700.00	495.89	494.99	496.67	62.90	7.10	98.56	88.26
	1300.000	15.00	.00	.00	491.00	700.00	495.99	495.06	496.77	61.87	7.08	98.89	88.99
	1290.000	10.00	.00	.00	491.04	700.00	496.04	495.11	496.83	62.41	7.12	98.32	88.61
*	1270.000	20.00	.00	.00	492.32	700.00	496.37	496.37	497.79	141.60	9.58	73.10	58.82
*	1250.000	20.00	.00	.00	493.60	700.00	497.68	497.68	499.10	140.40	9.57	73.11	59.08
*	1240.000	10.00	.00	.00	493.64	700.00	497.81	497.81	499.30	72.89	9.81	71.36	81.99
	1200.000	40.00	.00	.00	493.80	700.00	498.72	497.89	499.56	34.44	7.34	95.32	119.28
	1100.000	100.00	.00	.00	494.20	700.00	499.09	498.25	499.90	33.65	7.23	96.81	120.67
	1065.000	45.00	.00	.00	494.34	700.00	499.38	498.37	500.11	57.14	6.84	102.39	92.61
	1050.000	15.00	.00	.00	494.40	700.00	499.45	498.46	500.20	59.24	6.97	100.46	90.95
	1040.000	10.00	.00	.00	494.44	700.00	499.66	498.41	500.27	46.30	6.26	111.90	102.88
*	1020.000	20.00	.00	.00	495.40	700.00	499.46	499.46	500.89	141.65	9.60	72.95	58.81

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	1000.000	20.00	.00	.00	496.40	700.00	500.46	500.46	501.89	140.92	9.57	73.12	58.97
	990.000	10.00	.00	.00	496.44	700.00	501.00	500.49	502.00	44.63	8.03	87.19	104.78
	900.000	90.00	.00	.00	496.80	700.00	501.84	500.51	502.31	19.97	5.54	126.35	156.65
	875.000	25.00	.00	.00	496.90	700.00	501.76	500.81	502.46	57.48	6.68	104.84	92.33
	850.000	25.00	.00	.00	497.00	700.00	501.76	501.10	502.70	78.14	7.77	90.08	79.19
*	800.000	50.00	.00	.00	498.80	700.00	502.49	502.49	503.66	147.86	8.66	80.80	57.57
	790.000	10.00	.00	.00	499.72	700.00	503.10	502.65	503.78	43.52	6.60	106.08	106.11
	750.000	40.00	.00	.00	500.00	700.00	503.23	503.03	504.01	59.34	7.09	98.77	90.87
	700.000	50.00	.00	.00	501.00	700.00	503.90	503.20	504.24	25.52	4.70	148.83	138.56
*	650.000	50.00	.00	.00	503.00	700.00	504.44	504.44	505.03	88.32	6.15	113.78	74.49
	600.000	50.00	.00	.00	504.00	700.00	505.63	505.63	506.06	96.98	5.24	133.70	71.08

SUBCRITICAL RUN

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	2875.000	700.00	481.55	.00	.00	.55	111.83	.00
*	2850.000	700.00	482.39	.00	.84	.00	36.82	25.00
*	2800.000	700.00	483.64	.00	1.24	.00	31.13	50.00
	2700.000	700.00	484.85	.00	1.22	.00	35.41	100.00
	2600.000	700.00	485.14	.00	.29	.00	34.94	100.00
	2500.000	700.00	485.47	.00	.33	.00	34.66	100.00
	2400.000	700.00	485.83	.00	.35	.00	34.49	100.00
	2365.000	700.00	486.05	.00	.23	.00	34.94	35.00
	2350.000	700.00	486.18	.00	.13	.00	35.12	15.00
	2340.000	700.00	486.22	.00	.03	.00	33.50	10.00
*	2320.000	700.00	486.33	.00	.11	.00	32.22	20.00
*	2300.000	700.00	487.22	.00	.89	.00	32.06	20.00
	2290.000	700.00	488.34	.00	1.12	.00	111.20	10.00
	2200.000	700.00	488.28	.00	-.06	.00	34.73	90.00
	2150.000	700.00	488.45	.00	.17	.00	34.60	50.00
	2140.000	700.00	488.40	.00	-.05	.00	32.44	10.00
*	2125.000	700.00	488.37	.00	-.03	.00	28.63	15.00
*	2110.000	700.00	488.72	.00	.35	.00	27.77	15.00
*	2100.000	700.00	489.06	.00	.34	.00	25.96	10.00
*	2000.000	700.00	490.06	.00	.99	.00	26.82	100.00
	1900.000	700.00	491.31	.00	1.25	.00	32.00	100.00
	1800.000	700.00	491.47	.00	.16	.00	30.45	100.00
	1700.000	700.00	491.67	.00	.21	.00	29.15	100.00
	1615.000	700.00	492.09	.00	.42	.00	30.52	85.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1600.000	700.00	492.15	.00	.06	.00	29.68	15.00
	1590.000	700.00	492.19	.00	.04	.00	29.10	10.00
*	1570.000	700.00	492.56	.00	.37	.00	26.21	20.00
*	1550.000	700.00	494.44	.00	1.88	.00	67.90	20.00
*	1540.000	700.00	494.61	.00	.17	.00	62.46	10.00
	1500.000	700.00	494.67	.00	.06	.00	27.89	40.00
	1400.000	700.00	495.19	.00	.52	.00	27.80	100.00
	1315.000	700.00	495.89	.00	.70	.00	29.84	85.00
	1300.000	700.00	495.99	.00	.10	.00	29.66	15.00
	1290.000	700.00	496.04	.00	.06	.00	29.36	10.00
	1270.000	700.00	496.37	.00	.33	.00	26.10	20.00
*	1250.000	700.00	497.68	.00	1.31	.00	25.87	20.00
*	1240.000	700.00	497.81	.00	.13	.00	24.24	10.00
	1200.000	700.00	498.72	.00	.92	.00	28.79	40.00
	1100.000	700.00	499.09	.00	.37	.00	29.57	100.00
	1065.000	700.00	499.38	.00	.29	.00	30.59	45.00
	1050.000	700.00	499.45	.00	.07	.00	29.86	15.00
	1040.000	700.00	499.66	.00	.21	.00	32.83	10.00
*	1020.000	700.00	499.46	.00	-.20	.00	25.93	20.00
*	1000.000	700.00	500.46	.00	1.00	.00	25.99	20.00
	990.000	700.00	501.00	.00	.54	.00	28.16	10.00
	900.000	700.00	501.84	.00	.83	.00	40.19	90.00
	875.000	700.00	501.76	.00	-.07	.00	33.09	25.00
	850.000	700.00	501.76	.00	-.01	.00	27.85	25.00
*	800.000	700.00	502.49	.00	.73	.00	35.08	50.00
	790.000	700.00	503.10	.00	.61	.00	47.50	10.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	750.000	700.00	503.23	.00	.13	.00	50.75	40.00
	700.000	700.00	503.90	.00	.67	.00	75.59	50.00
*	650.000	700.00	504.44	.00	.54	.00	98.33	50.00
*	600.000	700.00	505.63	.00	1.19	.00	157.95	50.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 2875.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 2850.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2850.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2800.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2800.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2320.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2320.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2300.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2300.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2125.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2125.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

ION SECNO= 2110.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2110.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2100.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2100.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2000.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2000.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1570.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1570.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1550.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1550.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1540.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1540.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1270.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1270.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1250.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1250.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1240.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
TION SECNO= 1240.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1020.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1020.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 1000.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1000.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 800.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 800.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 650.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 650.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 600.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 600.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

THIS RUN EXECUTED 10-29-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************
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 ATER SURFACE PROFILES                          *
 VERSION OF NOVEMBER 1976                       *
 * UPDATED MAY 1984                             *
 * IBM-PC-XT VERSION AUGUST 1985                *
 * RUN DATE  10-29-92   TIME  11:52:51            *
*
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* U.S. ARMY CORPS OF ENGINEERS *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616 *
* (916) 440-2105 (FTS) 448-2105

SUPER-CRITICAL

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X    X XXXXXXX  XXXXX          XXXXX
X    X X       X    X        X    X
X    X X       X                  X
XXXXXXX XXXX   X        XXXXX  XXXXX
X    X X       X              X
X    X X       X    X         X
X    X XXXXXXX  XXXXX         XXXXXXX
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THIS RUN EXECUTED 10-29-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************

T1          SOUTHERN VISTA ESTATES
T2          OCTOBER 23, 1992
T3          SUPERCRITICAL RUN

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0.       2.       0.       1.  .000000      .00      1.0     700.  505.600     .000

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

    -1.000     .000     .000     .000     .000     .000   -1.000     .000     .000     .000


     .025     .025     .025     .100     .300     .000     .000     .000     .000     .000
QT  1.000  700.000     .000     .000     .000     .000     .000     .000     .000     .000
X1  600.000  9.000     .000  263.000   50.000   50.000   50.000     .000     .000     .000
GR  507.000   .000  506.000   17.000  505.000   70.000  505.000  122.000  504.000  141.000
GR  504.000 173.000  505.000  185.000  506.000  200.000  507.000  263.000     .000     .000

X1  650.000  11.000     .000  212.000   50.000   50.000   50.000     .000     .000     .000
GR  510.000   .000  509.000   25.000  508.000   55.000  507.000   72.000  506.000   90.000
GR  505.000 103.000  504.000  114.000  503.000  130.000  503.000  185.000  504.000  204.000
GR  505.000 212.000     .000     .000     .000     .000     .000     .000     .000     .000

X1  700.000  13.000     .000  135.000   50.000   50.000   50.000     .000     .000     .000
GR  507.400   .000  507.000   15.000  506.000   32.000  505.000   41.000  504.000   49.000
GR  503.000  58.000  502.000   66.000  501.000   75.000  501.000   98.000  502.000  110.000
GR  503.000 120.000  504.000  126.000  505.000  135.000     .000     .000     .000     .000

X1  750.000  10.000     .000  138.000   40.000   40.000   40.000     .000     .000     .000
GR  507.300   .000  506.000   40.000  504.000   65.000  500.000   88.000  500.000  100.000
GR  501.000 105.000  502.000  112.000  503.000  118.000  504.000  128.000  505.000  138.000

NC   .035     .035     .035     .100     .300     .000     .000     .000     .000     .000
X1  790.000   5.000     .000  135.000   10.000   10.000   10.000     .000     .000     .000
GR  506.900   .000  503.000   77.000  499.720   83.000  499.720  100.000  505.000  135.000

X1  800.000  12.000     .000  136.000   50.000   50.000   50.000     .000     .000     .000
    507.000   .000  506.000   30.000  505.000   50.000  504.000   68.000  503.000   76.000
    498.800  83.000  498.800   98.000  501.000  100.000  502.000  108.000  503.000  116.000
GR  504.000 126.000  505.000  136.000     .000     .000     .000     .000     .000     .000
```

NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	850.000	5.000	.000	107.000	25.000	25.000	25.000	.000	.000	.000
GR	505.000	.000	504.000	69.000	497.000	83.000	497.000	93.000	505.000	107.000
X1	875.000	5.000	.000	107.000	25.000	25.000	25.000	.000	.000	.000
GR	505.500	.000	503.700	74.000	496.900	83.000	496.900	93.000	502.000	107.000
X1	900.000	5.000	.000	113.000	90.000	90.000	90.000	.000	.000	.000
GR	504.800	.000	503.500	68.600	496.800	83.000	496.800	93.000	502.000	113.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	990.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	502.400	.000	501.200	73.600	496.440	83.000	496.440	93.000	503.440	107.000
X1	1000.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	502.300	.000	501.000	74.000	496.400	83.000	496.400	93.000	503.480	107.000
X1	1020.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	502.000	.000	500.600	73.000	495.400	83.000	495.400	93.000	502.400	107.000
X1	1040.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	502.000	.000	500.350	69.000	494.440	83.000	494.440	93.000	501.440	107.000
	1050.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	502.000	.000	500.400	71.200	494.400	83.000	494.400	93.000	501.500	107.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	1065.000	5.000	.000	107.000	45.000	45.000	45.000	.000	.000	.000
GR	501.900	.000	501.100	69.000	494.300	83.000	494.300	93.000	501.300	107.000
X1	1100.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	501.800	.000	499.700	72.000	494.200	83.000	494.200	93.000	501.200	107.000
X1	1200.000	5.000	.000	107.000	40.000	40.000	40.000	.000	.000	.000
GR	501.000	.000	499.200	73.000	493.800	83.000	493.800	93.000	500.900	107.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	1240.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	500.400	.000	498.600	73.000	493.640	83.000	493.640	93.000	503.640	107.000
X1	1250.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	500.000	.000	498.800	73.000	493.600	83.000	493.600	93.000	500.700	107.000
X1	1270.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	500.000	.000	498.400	71.000	492.320	83.000	492.320	93.000	499.320	107.000
X1	1290.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	500.400	.000	498.500	69.000	491.040	83.000	491.040	93.000	498.040	107.000

X1	1300.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	499.600	.000	498.100	69.000	491.000	83.000	491.000	93.000	498.100	107.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	1315.000	5.000	.000	107.000	85.000	85.000	85.000	.000	.000	.000
GR	499.600	.000	497.900	69.000	490.940	83.000	490.940	93.000	497.940	107.000
X1	1400.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	498.500	.000	497.000	70.800	490.600	83.000	490.600	93.000	497.700	107.000
X1	1500.000	5.000	.000	107.000	40.000	40.000	40.000	.000	.000	.000
GR	496.000	.000	494.900	73.600	490.200	83.000	490.200	93.000	497.200	107.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	1540.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	495.300	.000	494.000	75.000	490.040	83.000	490.040	93.000	497.040	107.000
X1	1550.000	6.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
GR	495.400	.000	494.000	48.000	493.700	75.800	490.000	83.000	490.000	93.000
GR	498.000	107.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1570.000	5.000	.000	107.000	20.000	20.000	20.000	.000	.000	.000
	495.400	.000	493.700	72.600	488.520	83.000	488.520	93.000	495.520	107.000
X1	1590.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
GR	495.600	.000	493.600	71.800	487.040	83.000	487.040	93.000	494.040	107.000
X1	1600.000	5.000	.000	107.000	15.000	15.000	15.000	.000	.000	.000
GR	495.700	.000	493.600	70.800	487.000	83.000	487.000	93.000	494.100	107.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	1615.000	5.000	.000	107.000	85.000	85.000	85.000	.000	.000	.000
GR	495.500	.000	493.800	69.400	486.940	83.000	486.940	93.000	493.940	107.000
X1	1700.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	496.000	.000	494.500	69.000	486.600	83.000	486.600	93.000	493.600	107.000
X1	1800.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	494.400	.000	492.900	70.200	486.200	83.000	486.200	93.000	493.300	107.000
X1	1900.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	496.000	.000	492.200	70.200	485.800	83.000	485.800	93.000	492.800	107.000
X1	2000.000	5.000	.000	107.000	100.000	100.000	100.000	.000	.000	.000
GR	492.000	.000	491.000	72.800	485.400	88.000	485.400	93.000	492.500	107.000
NC	.025	.025	.025	.300	.500	.000	.000	.000	.000	.000
X1	2100.000	5.000	.000	107.000	10.000	10.000	10.000	.000	.000	.000
	490.300	.000	489.700	73.800	485.000	83.000	485.000	93.000	492.100	107.000

X1	2110.000	5.000	.000	110.000	15.000	15.000	15.000	.000	.000	.000
GR	490.120	.000	489.640	74.000	484.960	83.000	484.960	95.000	491.560	110.000
X1	2125.000	5.000	.000	111.000	15.000	15.000	15.000	.000	.000	.000
GR	489.920	.000	489.440	75.000	484.900	83.000	484.900	98.000	490.900	111.000
X1	2140.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	489.740	.000	489.220	75.000	484.840	83.000	484.840	101.000	490.240	113.000
X1	2150.000	5.000	.000	113.000	50.000	50.000	50.000	.000	.000	.000
GR	489.500	.000	489.100	74.400	484.800	83.000	484.800	103.000	489.800	113.000
X1	2200.000	5.000	.000	113.000	90.000	90.000	90.000	.000	.000	.000
GR	489.000	.000	488.300	75.600	484.600	83.000	484.600	103.000	489.600	113.000
NC	.035	.035	.035	.100	.300	.000	.000	.000	.000	.000
X1	2290.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	487.750	.000	487.520	76.000	484.240	83.000	484.240	103.000	489.240	113.000
X1	2300.000	5.000	.000	113.000	20.000	20.000	20.000	.000	.000	.000
GR	487.700	.000	487.500	76.400	484.200	83.000	484.200	103.000	489.200	113.000
	2320.000	5.000	.000	113.000	20.000	20.000	20.000	.000	.000	.000
	487.400	.000	487.200	75.000	483.320	83.000	483.320	103.000	488.320	113.000
X1	2340.000	5.000	.000	113.000	10.000	10.000	10.000	.000	.000	.000
GR	487.200	.000	486.900	76.000	482.440	83.000	482.440	103.000	487.440	113.000
X1	2350.000	5.000	.000	113.000	15.000	15.000	15.000	.000	.000	.000
GR	487.100	.000	486.700	74.400	482.400	83.000	482.400	103.000	487.400	113.000
NC	.025	.025	.025	.100	.300	.000	.000	.000	.000	.000
X1	2365.000	5.000	.000	113.000	35.000	35.000	35.000	.000	.000	.000
GR	487.000	.000	486.600	75.000	482.380	83.000	482.380	103.000	487.000	113.000
X1	2400.000	5.000	.000	113.000	100.000	100.000	100.000	.000	.000	.000
GR	486.300	.000	486.000	75.400	482.200	83.000	482.200	103.000	487.200	113.000
X1	2500.000	5.000	.000	113.000	100.000	100.000	100.000	.000	.000	.000
GR	487.000	.000	486.000	74.600	481.800	83.000	481.800	103.000	486.800	113.000
X1	2600.000	5.000	.000	113.000	100.000	100.000	100.000	.000	.000	.000
GR	485.800	.000	485.400	75.000	481.420	83.000	481.400	103.000	486.420	113.000
X1	2700.000	5.000	.000	113.000	100.000	100.000	100.000	.000	.000	.000
GR	485.500	.000	485.000	75.000	481.000	83.000	481.000	103.000	486.000	113.000
X1	2800.000	5.000	.000	113.000	50.000	50.000	50.000	.000	.000	.000
	485.400	.000	484.600	75.000	480.600	83.000	480.600	103.000	486.600	113.000

X1	2850.000	5.000	.000	113.000	25.000	25.000	25.000	.000	.000	.000
GR	483.000	.000	483.000	70.000	479.860	76.000	479.860	104.000	485.600	113.000
X1	2875.000	5.000	.000	113.000	.000	.000	.000	.000	.000	.000
GR	481.060	.000	481.060	66.000	479.600	69.000	479.600	110.000	482.800	113.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 600.000

600.00	1.60	505.60	505.63	505.60	506.06	.46	.00	.00	507.00
700.	0.	700.	0.	0.	129.	0.	0.	0.	507.00
.00	.00	5.44	.00	.025	.025	.025	.000	504.00	38.20
.010800	0.	0.	0.	0	4	0	.00	155.80	194.00

0
*SECNO 650.000

650.00	1.12	504.12	504.44	.00	505.23	1.11	.77	.07	510.00
700.	0.	700.	0.	0.	83.	0.	0.	0.	505.00
.00	.00	8.46	.00	.025	.025	.025	.000	503.00	112.76
.023410	50.	50.	50.	6	11	0	.00	92.14	204.90

0
*SECNO 700.000

700.00	1.80	502.80	503.20	.00	504.17	1.38	1.03	.03	507.40
700.	0.	700.	0.	0.	74.	0.	0.	0.	505.00
.00	.00	9.41	.00	.025	.025	.025	.000	501.00	59.61
.018245	50.	50.	50.	9	17	0	.00	58.37	117.98

0
*SECNO 750.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

750.00	3.04	503.04	503.04	.00	503.98	.95	.56	.24	507.30
700.	0.	700.	0.	0.	90.	0.	0.	0.	505.00
.00	.00	7.82	.00	.025	.025	.025	.000	500.00	70.55
.007595	50.	50.	50.	20	14	0	.00	47.81	118.35

0
CCHV= .100 CEHV= .300
*SECNO 790.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

790.00	2.93	502.65	502.65	.00	503.68	1.03	.41	.21	506.90
700.	0.	700.	0.	0.	86.	0.	0.	0.	505.00
.01	.00	8.15	.00	.035	.035	.035	.000	499.72	77.65
.014491	40.	40.	40.	20	8	0	.00	41.75	119.39

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 800.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

800.00	3.69	502.49	502.49	.00	503.66	1.17	.15	.14	507.00
700.	0.	700.	0.	0.	81.	0.	0.	0.	505.00
.01	.00	8.68	.00	.035	.035	.035	.000	498.80	76.85
.014845	10.	10.	10.	20	11	0	.00	35.05	111.90

0
CCHV= .100 CEHV= .300
*SECNO 850.000

1645 INT SEC ADDED BY RAISING SEC 850.00, .900FT AND MULTIPLYING BY 1.147

1.01	3.30	501.20	501.70	.00	503.23	2.03	.34	.09	505.90
700.	0.	700.	0.	0.	61.	0.	0.	0.	505.90
.01	.00	11.44	.00	.025	.025	.025	.000	497.90	87.61
012509	25.	25.	25.	6	8	0	.00	25.65	113.26

1645 INT SEC ADDED BY RAISING SEC 1.01, -.900FT AND MULTIPLYING BY .872

850.00	3.40	500.40	501.10	.00	502.85	2.45	.34	.04	505.00
700.	0.	700.	0.	0.	56.	0.	0.	0.	505.00
.01	.00	12.56	.00	.025	.025	.025	.000	497.00	76.19
.014886	25.	25.	25.	3	11	0	.00	22.76	98.96

0
*SECNO 875.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

875.00	3.87	500.77	500.93	.00	502.36	1.59	.28	.25	505.50
700.	0.	700.	0.	0.	69.	0.	1.	0.	502.00
.01	.00	10.12	.00	.025	.025	.025	.000	496.90	77.88
.008557	25.	25.	25.	20	11	0	.00	25.75	103.63

0
*SECNO 900.000

900.00	3.09	499.89	500.53	.00	502.02	2.14	.28	.05	504.80
700.	0.	700.	0.	0.	60.	0.	1.	0.	502.00
.01	.00	11.74	.00	.025	.025	.025	.000	496.80	76.35
.015338	25.	25.	25.	14	8	0	.00	28.55	104.90

0

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   SECNO    DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   BANK ELEV
   Q        QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA   LEFT/RIGHT
   TIME     VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN     SSTA
   SLOPE    XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID    ENDST


CCHV=    .100 CEHV=    .300
*SECNO 990.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   990.00    4.05  500.49  500.49     .00  501.91    1.42    1.32     .52  502.40
     700.       0.    700.       0.      0.     73.      0.      1.      0.  503.44
      .01     .00    9.57     .00    .035    .035    .035    .000  496.44   75.00
   .014123     90.     90.     90.      20      11       0     .00   26.11  101.11
0
*SECNO 1000.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1000.00    4.07  500.47  500.47     .00  501.89    1.42     .14     .14  502.30
     700.       0.    700.       0.      0.     73.      0.      1.      0.  503.48
      .01     .00    9.57     .00    .035    .035    .035    .000  496.40   75.04
    .14062     10.     10.     10.      20       5       0     .00   26.00  101.04

*SECNO 1020.000

3301 HV CHANGED MORE THAN HVINS

  1020.00    3.23  498.63  499.47     .00  501.34    2.71     .42     .13  502.00
     700.       0.    700.       0.      0.     53.      0.      1.      0.  502.40
      .01     .00   13.20     .00    .035    .035    .035    .000  495.40   76.77
   .034127     20.     20.     20.       6       5       0     .00   22.71   99.48
0
*SECNO 1040.000
  1040.00    3.00  497.44  498.42     .00  500.54    3.10     .76     .04  502.00
     700.       0.    700.       0.      0.     50.      0.      1.      0.  501.44
      .01     .00   14.13     .00    .035    .035    .035    .000  494.44   75.90
   .043051     20.     20.     20.       6      11       0     .00   23.09   98.99
0
*SECNO 1050.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3710 WSEL ASSUMED BASED ON MIN DIFF

1050.00	3.81	498.21	498.46	.00	499.92	1.70	.27	.44	502.00
700.	0.	700.	0.	0.	67.	0.	1.	0.	501.50
.01	.00	10.48	.00	.035	.035	.035	.000	494.40	75.50
.018066	10.	10.	10.	20	11	0	.00	25.02	100.52

0
CCHV= .100 CEHV= .300
*SECNO 1065.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1065.00	4.03	498.33	498.33	.00	499.75	1.41	.16	.21	501.90
700.	0.	700.	0.	0.	73.	0.	1.	0.	501.30
.01	.00	9.54	.00	.025	.025	.025	.000	494.30	74.69
.007218	15.	15.	15.	20	8	0	.00	26.37	101.07

0
*SECNO 1100.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1100.00	4.05	498.25	498.25	.00	499.67	1.41	.32	.23	501.80
700.	0.	700.	0.	0.	73.	0.	1.	1.	501.20
.01	.00	9.54	.00	.025	.025	.025	.000	494.20	74.89
.007163	45.	45.	45.	20	5	0	.00	26.22	101.11

0
*SECNO 1200.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1200.00	4.09	497.89	497.89	.00	499.32	1.43	.72	.41	501.00
700.	0.	700.	0.	0.	73.	0.	1.	1.	500.90
.02	.00	9.60	.00	.025	.025	.025	.000	493.80	75.42
.007154	100.	100.	100.	20	5	0	.00	25.65	101.07

0
CCHV= .100 CEHV= .300
*SECNO 1240.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1240.00	4.19	497.83	497.83	.00	499.30	1.48	.39	.24	500.40
700.	0.	700.	0.	0.	72.	0.	1.	1.	503.64
.02	.00	9.75	.00	.035	.035	.035	.000	493.64	74.56
.014048	40.	40.	40.	20	5	0	.00	24.30	98.86

0
*SECNO 1250.000

1250.00	3.86	497.46	497.68	.00	499.13	1.67	.16	.02	500.00
700.	0.	700.	0.	0.	68.	0.	1.	1.	500.70
.02	.00	10.36	.00	.035	.035	.035	.000	493.60	75.58
.017437	10.	10.	10.	5	8	0	.00	25.03	100.61

0
*SECNO 1270.000

3301 HV CHANGED MORE THAN HVINS

1270.00	3.08	495.40	496.37	.00	498.48	3.08	.51	.14	500.00
700.	0.	700.	0.	0.	50.	0.	1.	1.	499.32
.02	.00	14.07	.00	.035	.035	.035	.000	492.32	76.91
.040938	20.	20.	20.	10	8	0	.00	22.26	99.17

0
*SECNO 1290.000

1290.00	2.95	493.99	495.11	.00	497.53	3.54	.90	.05	500.40
700.	0.	700.	0.	0.	46.	0.	1.	1.	498.04
.02	.00	15.11	.00	.035	.035	.035	.000	491.04	77.47
.049365	20.	20.	20.	5	11	0	.00	21.43	98.90

0
*SECNO 1300.000

3301 HV CHANGED MORE THAN HVINS

1300.00	3.31	494.31	495.06	.00	496.84	2.53	.39	.31	499.60
700.	0.	700.	0.	0.	55.	0.	1.	1.	498.10
.02	.00	12.76	.00	.035	.035	.035	.000	491.00	76.46
.031091	10.	10.	10.	5	11	0	.00	23.08	99.54

0
CCHV= .100 CEHV= .300
*SECNO 1315.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3710 WSEL ASSUMED BASED ON MIN DIFF

1315.00	3.84	494.78	494.98	.00	496.43	1.65	.23	.24	499.60
700.	0.	700.	0.	0.	68.	0.	1.	1.	497.94
.02	.00	10.29	.00	.025	.025	.025	.000	490.94	75.27
.008845	15.	15.	15.	20	11	0	.00	25.41	100.68

0

*SECNO 1400.000

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

1400.00	4.07	494.67	494.67	.00	496.10	1.43	.68	.39	498.50
700.	0.	700.	0.	0.	73.	0.	1.	1.	497.70
.02	.00	9.61	.00	.025	.025	.025	.000	490.60	75.24
.007227	85.	85.	85.	20	8	0	.00	25.78	101.03

0

*SECNO 1500.000

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

PROBABLE MINIMUM SPECIFIC ENERGY

.0 CRITICAL DEPTH ASSUMED

1500.00	4.05	494.25	494.25	.00	495.67	1.42	.72	.41	496.00
700.	0.	700.	0.	0.	73.	0.	2.	1.	497.20
.03	.00	9.56	.00	.025	.025	.025	.000	490.20	74.91
.007222	100.	100.	100.	20	5	0	.00	26.18	101.09

0

CCHV= .100 CEHV= .300

*SECNO 1540.000

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

1540.00	4.57	494.61	494.61	.00	495.40	.79	.41	.03	495.30
700.	0.	700.	0.	0.	98.	0.	2.	1.	497.04
.03	.00	7.13	.00	.035	.035	.035	.000	490.04	39.66
.016094	40.	40.	40.	20	12	0	.00	62.48	102.15

0

*SECNO 1550.000

1550.00	4.34	494.34	494.46	.00	495.21	.88	.18	.01	495.40
700.	0.	700.	0.	0.	93.	0.	2.	1.	498.00
.03	.00	7.51	.00	.035	.035	.035	.000	490.00	36.48
.019849	10.	10.	10.	4	8	0	.00	64.11	100.59

0

```
   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       QLOSS   BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN     SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID    ENDST


*SECNO 1570.000

3301 HV CHANGED MORE THAN HVINS

  1570.00     3.18   491.70   492.56      .00   494.50     2.80      .52      .19   495.40
    700.        0.     700.       0.       0.      52.       0.       2.       1.   495.52
     .03       .00    13.43      .00     .035     .035     .035     .000   488.52    76.61
  .036077      20.      20.      20.        6       11        0      .00    22.76    99.37
0
*SECNO 1590.000
  1590.00     2.97   490.01   491.15      .00   493.58     3.58      .84      .08   495.60
    700.        0.     700.       0.       0.      46.       0.       2.       1.   494.04
     .03       .00    15.17      .00     .035     .035     .035     .000   487.04    77.92
  .049140      20.      20.      20.        5       11        0      .00    21.02    98.95
0
*SECNO 1600.000

 1 HV CHANGED MORE THAN HVINS

  1600.00     3.32   490.32   491.09      .00   492.90     2.57      .39      .30   495.70
    700.        0.     700.       0.       0.      54.       0.       2.       1.   494.10
     .03       .00    12.87      .00     .035     .035     .035     .000   487.00    76.85
  .031482      10.      10.      10.        5       11        0      .00    22.70    99.56
0
CCHV=    .100 CEHV=    .300
*SECNO 1615.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF
  1615.00     3.85   490.79   490.99      .00   492.44     1.65      .23      .27   495.50
    700.        0.     700.       0.       0.      68.       0.       2.       1.   493.94
     .03       .00    10.30      .00     .025     .025     .025     .000   486.94    75.37
  .008845      15.      15.      15.       20       11        0      .00    25.32   100.69
0
*SECNO 1700.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1700.00     4.09   490.69   490.69      .00   492.14     1.45      .68      .39   496.00
    700.        0.     700.       0.       0.      73.       0.       2.       1.   493.60
     .03       .00     9.65      .00     .025     .025     .025     .000   486.60    75.75
  .007234      85.      85.      85.       20        8        0      .00    25.44   101.18
0
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   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*SECNO 1800.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1800.00     4.07   490.27   490.27      .00   491.70     1.43      .72      .41   494.40
     700.       0.     700.       0.       0.      73.       0.       2.       1.    493.30
      .03      .00     9.61      .00     .025     .025     .025     .000   486.20    75.23
  .007226     100.     100.     100.       20        5        0      .00    25.80   101.02
0
*SECNO 1900.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1900.00     4.05   489.85   489.85      .00   491.27     1.42      .72      .41   496.00
     700.       0.     700.       0.       0.      73.       0.       2.       1.    492.80
      .04      .00     9.56      .00     .025     .025     .025     .000   485.80    74.91
  .007219     100.     100.     100.       20        5        0      .00    26.18   101.09

*SECNO 2000.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2000.00     4.66   490.06   490.06      .00   491.44     1.38      .72      .47   492.00
     700.       0.     700.       0.       0.      74.       0.       2.       1.    492.50
      .04      .00     9.44      .00     .025     .025     .025     .000   485.40    75.36
  .007147     100.     100.     100.       20        8        0      .00    26.83   102.18
0
CCHV=    .300 CEHV=    .500
*SECNO 2100.000
  2100.00     3.82   488.82   489.06      .00   490.53     1.72      .81      .10   490.30
     700.       0.     700.       0.       0.      67.       0.       3.       1.    492.10
      .04      .00    10.51      .00     .025     .025     .025     .000   485.00    75.55
  .009295     100.     100.     100.        3       12        0      .00    24.96   100.51
0
*SECNO 2110.000
  2110.00     3.19   488.15   488.70      .00   490.29     2.15      .11      .13   490.12
     700.       0.     700.       0.       0.      60.       0.       3.       1.    491.56
      .04      .00    11.75      .00     .025     .025     .025     .000   484.96    76.87
  .013501      10.      10.      10.       14        5        0      .00    25.37   102.24
0
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   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLCBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*SECNO 2125.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF
  2125.00     3.43   488.33   488.36      .00   489.79     1.37      .15      .56   489.92
    700.        0.     700.       0.       0.     75.        0.       3.       1.   490.90
     .04       .00     9.40      .00     .025     .025     .025     .000   484.90    76.96
 .007470       15.      15.      15.       20        8        0      .00    28.47   105.43
0
*SECNO 2140.000
  2140.00     2.73   487.57   488.01      .00   489.41     1.85      .14      .14   489.74
    700.        0.     700.       0.       0.     64.        0.       3.       1.   490.24
     .04       .00    10.90      .00     .025     .025     .025     .000   484.84    78.02
 .012386       15.      15.      15.        7       11        0      .00    29.05   107.06
0
*SECNO 2150.000
  2150.00     2.92   487.72   487.82      .00   489.06     1.34      .10      .25   489.50
    700.        0.     700.       0.       0.     75.        0.       3.       1.   489.80
     .04       .00     9.28      .00     .025     .025     .025     .000   484.80    77.16
 .08121       10.      10.      10.        3        8        0      .00    31.67   108.84
0
*SECNO 2200.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2200.00     3.01   487.61   487.61      .00   488.85     1.24      .38      .30   489.00
    700.        0.     700.       0.       0.     78.        0.       3.       1.   489.60
     .05       .00     8.93      .00     .025     .025     .025     .000   484.60    76.98
 .007260       50.      50.      50.       20        8        0      .00    32.05   109.02
0
CCHV=    .100 CEHV=    .300
*SECNO 2290.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2290.00     2.98   487.22   487.22      .00   488.47     1.25      .90      .39   487.75
    700.        0.     700.       0.       0.     78.        0.       3.       1.   489.24
     .05       .00     8.96      .00     .035     .035     .035     .000   484.24    76.63
 .014544       90.      90.      90.       20        5        0      .00    32.34   108.97
0
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2300.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2300.00	3.02	487.22	487.22	.00	488.45	1.23	.14	.12	487.70
700.	0.	700.	0.	0.	79.	0.	3.	1.	489.20
.05	.00	8.90	.00	.035	.035	.035	.000	484.20	76.96
.014091	10.	10.	10.	20	5	0	.00	32.08	109.04

0
*SECNO 2320.000

3301 HV CHANGED MORE THAN HVINS

2320.00	2.34	485.66	486.33	.00	487.93	2.27	.42	.10	487.40
700.	0.	700.	0.	0.	58.	0.	3.	1.	488.32
.05	.00	12.09	.00	.035	.035	.035	.000	483.32	78.18
.034593	20.	20.	20.	6	5	0	.00	29.50	107.68

.NO 2340.000

2340.00	2.31	484.75	485.48	.00	487.19	2.44	.72	.02	487.20
700.	0.	700.	0.	0.	56.	0.	3.	1.	487.44
.05	.00	12.54	.00	.035	.035	.035	.000	482.44	79.37
.037206	20.	20.	20.	2	11	0	.00	28.26	107.63

0
*SECNO 2350.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

2350.00	2.89	485.29	485.41	.00	486.66	1.37	.24	.31	487.10
700.	0.	700.	0.	0.	75.	0.	3.	1.	487.40
.05	.00	9.39	.00	.035	.035	.035	.000	482.40	77.22
.016445	10.	10.	10.	20	11	0	.00	31.57	108.78

0
CCHV= .100 CEHV= .300
*SECNO 2365.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

2365.00	3.01	485.39	485.39	.00	486.62	1.23	.16	.07	487.00
700.	0.	700.	0.	0.	79.	0.	3.	1.	487.00
.05	.00	8.92	.00	.025	.025	.025	.000	482.38	77.30
.007263	15.	15.	15.	20	8	0	.00	32.21	109.51

0
*SECNO 2400.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2400.00	3.02	485.22	485.22	.00	486.45	1.23	.25	.15	486.30
700.	0.	700.	0.	0.	79.	0.	3.	1.	487.20
.05	.00	8.91	.00	.025	.025	.025	.000	482.20	76.97
.007220	35.	35.	35.	20	5	0	.00	32.07	109.03

0
*SECNO 2500.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2500.00	3.01	484.81	484.81	.00	486.05	1.24	.72	.37	487.00
700.	0.	700.	0.	0.	78.	0.	3.	1.	486.80
.05	.00	8.92	.00	.025	.025	.025	.000	481.80	76.97
.007239	100.	100.	100.	20	5	0	.00	32.06	109.03

0
*SECNO 2600.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2600.00	3.03	484.43	484.43	.00	485.66	1.23	.72	.00	485.80
700.	0.	700.	0.	0.	79.	0.	3.	2.	486.42
.06	.00	8.91	.00	.025	.025	.025	.000	481.40	76.96
.007219	100.	100.	100.	20	5	0	.00	32.07	109.03

0
*SECNO 2700.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2700.00	3.01	484.01	484.01	.00	485.25	1.24	.72	.37	485.50
700.	0.	700.	0.	0.	78.	0.	4.	2.	486.00
.06	.00	8.93	.00	.025	.025	.025	.000	481.00	76.98
.007258	100.	100.	100.	20	5	0	.00	32.05	109.02

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2800.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2800.00	3.04	483.64	483.64	.00	484.90	1.25	.72	.37	485.40
700.	0.	700.	0.	0.	78.	0.	4.	2.	486.60
.06	.00	8.99	.00	.025	.025	.025	.000	480.60	76.91
.007199	100.	100.	100.	20	5	0	.00	31.16	108.07

0
*SECNO 2850.000

1645 INT SEC ADDED BY RAISING SEC 2850.00, .370FT AND MULTIPLYING BY .979

3301 HV CHANGED MORE THAN HVINS

1.01	1.94	482.07	482.80	.00	484.49	2.42	.30	.12	483.37
700.	0.	700.	0.	0.	56.	0.	4.	2.	485.97
.06	.00	12.48	.00	.025	.025	.025	.000	480.23	70.94
.023202	25.	25.	25.	8	9	0	.00	33.66	104.59

0

1645 INT SEC ADDED BY RAISING SEC 1.01, -.370FT AND MULTIPLYING BY 1.022

2850.00	1.93	481.79	482.40	.00	483.86	2.07	.52	.10	483.00
700.	0.	700.	0.	0.	61.	0.	4.	2.	485.60
.07	.00	11.55	.00	.025	.025	.025	.000	479.86	72.31
.018664	25.	25.	25.	4	11	0	.00	34.73	107.03

0
*SECNO 2875.000

2875.00	1.34	480.94	481.56	.00	483.24	2.31	.59	.02	481.06
700.	0.	700.	0.	0.	57.	0.	4.	2.	482.80
.07	.00	12.19	.00	.025	.025	.025	.000	479.60	66.26
.031208	25.	25.	25.	7	5	0	.00	45.00	111.25

0

1

'LE FOR STREAM SUPERCRITICAL RUN

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  475.    480.    485.    490.    495.    500.    505.    510.    515.    520.
   SECNO  CUMDIS
600.00      0.  .       .       .       .       .       .       I .WE L .       .       .       .
            5.  .       .       .       .       .       .       I .WE RL.       .       .       .
           10.  .       .       .       .       .       .       I .WER L.       .       .       .
           15.  .       .       .       .       .       .       I WCER L.       .       .       .
           20.  .       .       .       .       .       .       I WER  L.       .       .       .
           25.  .       .       .       .       .       .       I WER   L.      .       .       .
           30.  .       .       .       .       .       .       I WCER  L.      .       .       .
           35.  .       .       .       .       .       .       I WCE   L.      .       .       .
           40.  .       .       .       .       .       .      I W.E    L.      .       .       .
           45.  .       .       .       .       .       .      I WRE    L.      .       .       .
650.00     50.  .       .       .       .       .       .      I WCE     L      .       .       .
           55.  .       .       .       .       .       .      I WCE     L.     .       .       .
           60.  .       .       .       .       .       .     I W E      L.     .       .       .
           65.  .       .       .       .       .       .     I WC E     L.     .       .       .
           70.  .       .       .       .       .       .    I WC E      L.     .       .       .
           75.  .       .       .       .       .       .    I WCER      L.     .       .       .
           80.  .       .       .       .       .       .    I W ER      L.     .       .       .
           85.  .       .       .       .       .       .   I WC ER      L.     .       .       .
           90.  .       .       .       .       .       .   I WC ER      L.     .       .       .
           95.  .       .       .       .       .       .  .I WC ER      L.     .       .       .
700.00    100.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          105.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          110.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          115.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          120.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          125.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          130.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          135.  .       .       .       .       .       .  .I W E R      L.     .       .       .
          140.  .       .       .       .       .       .   I W E R      L.     .       .       .
          145.  .       .       .       .       .       .   I W E R      L.     .       .       .
750.00    150.  .       .       .       .       .       .   I W E R      L.     .       .       .
          155.  .       .       .       .       .       .   I W E R      L.     .       .       .
          160.  .       .       .       .       .       .   I W E R      L.     .       .       .
          165.  .       .       .       .       .       .   I W E R      L.     .       .       .
          170.  .       .       .       .       .       .   I W E R      L.     .       .       .
          175.  .       .       .       .       .       .   I W E R      L.     .       .       .
          180.  .       .       .       .       .       .   I W E R      L.     .       .       .
          185.  .       .       .       .       .       .   I W E R      L.     .       .       .
790.00    190.  .       .       .       .       .       .  .I. W E R      L.     .       .       .
          195.  .       .       .       .       .       .  .I. W E R      L.     .       .       .
800.00    200.  .       .       .       .       .       . .I . W E R      L.     .       .       .
          205.  .       .       .       .       .       .  I . WC E R      L.     .       .       .
          210.  .       .       .       .       .       .  I . W E .R L    .       .       .       .
          215.  .       .       .       .       .       .  I . WC E .R L   .       .       .       .
          220.  .       .       .       .       .       .  I . WC E .RL    .       .       .       .
    1.01  225.  .       .       .       .       .       .  I . WC E . L    .       .       .       .
          230.  .       .       .       .       .       . I . WC E .L      .       .       .       .
          235.  .       .       .       .       .       . I . WC E .L      .       .       .       .
          240.  .       .       .       .       .       . I .W C E .L      .       .       .       .
          245.  .       .       .       .       .       .I .WC  E  L       .       .       .       .
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850.00  250.  .  .  .  .  .  I    .WC  E  L  .  .  .  .
        255.  .  .  .  .  .  I    .WC  E  RL .  .  .  .
        260.  .  .  .  .  .  I    .WC  E  R L  .  .  .  .
        265.  .  .  .  .  .  I    .WC  ER  .L  .  .  .  .
        270.  .  .  .  .  .  I    .WC  E   .L  .  .  .  .
875.00  275.  .  .  .  .  .  I    . W RE   .L  .  .  .  .
        280.  .  .  .  .  .  I    .WC RE   .L  .  .  .  .
        285.  .  .  .  .  .  I    .WC E    L  .  .  .  .
        290.  .  .  .  .  .  I    WC  E    L  .  .  .  .
        295.  .  .  .  .  .  I    WC  E    L  .  .  .  .
900.00  300.  .  .  .  .  .  I    WC  E    L  .  .  .  .
        305.  .  .  .  .  .  I    WC  E    L. .  .  .  .
        310.  .  .  .  .  .  I    WC  E    L. .  .  .  .
        315.  .  .  .  .  . I     WC  E    L. .  .  .  .
        320.  .  .  .  .  . I     WC  ER   L. .  .  .  .
        325.  .  .  .  .  . I     WC  ER L .  .  .  .  .
        330.  .  .  .  .  . I     WC  ER L .  .  .  .  .
        335.  .  .  .  .  . I     WC  ER L .  .  .  .  .
        340.  .  .  .  .  . I     WC  ER L .  .  .  .  .
        345.  .  .  .  .  . I     WC  ER L .  .  .  .  .
        350.  .  .  .  .  . I     WC  E RL .  .  .  .  .
        355.  .  .  .  .  . I     .W  E RL .  .  .  .  .
        360.  .  .  .  .  . I     .W  EML  .  .  .  .  .
        365.  .  .  .  .  . I     .W  EML  .  .  .  .  .
        370.  .  .  .  .  . I     .W  EML  .  .  .  .  .
        375.  .  .  .  .  . I     .W  EML  .  .  .  .  .
        380.  .  .  .  .  . I     .W  EL R .  .  .  .  .
        385.  .  .  .  .  . I     .W  EL R .  .  .  .  .
990.00  390.  .  .  .  .  . I     .W  EL R .  .  .  .  .
        395.  .  .  .  .  . I     .W  EL R .  .  .  .  .
1000.00 400.  .  .  .  .  . I     .W  EL R .  .  .  .  .
        405.  .  .  .  .  .I      W   E R .  .  .  .  .
        410.  .  .  .  .  .I      WC  EL R .  .  .  .  .
        415.  .  .  .  .  .I      WC. ELR .  .  .  .  .
1020.00 420.  .  .  .  .  .I     W C. ELR .  .  .  .  .
        425.  .  .  .  .  I      WC . E L .  .  .  .  .
        430.  .  .  .  .  I      W C . EML .  .  .  .  .
        435.  .  .  .  .  I.     W C  .E RL .  .  .  .  .
1040.00 440.  .  .  .  .  I.     W C  .E RL .  .  .  .  .
        445.  .  .  .  .  I.     WC  E  RL .  .  .  .  .
1050.00 450.  .  .  .  .  I.     WC  E  RL .  .  .  .  .
        455.  .  .  .  .  I.      W  E  RL .  .  .  .  .
        460.  .  .  .  .  I.      W  E  RL .  .  .  .  .
1065.00 465.  .  .  .  .  I.      W  E  RL .  .  .  .  .
        470.  .  .  .  .  I.      W E. RL .  .  .  .  .
        475.  .  .  .  .  I.      W E. RL .  .  .  .  .
        480.  .  .  .  .  I.      W E. RL .  .  .  .  .
        485.  .  .  .  .  I.      W E. RL .  .  .  .  .
        490.  .  .  .  .  I .     W E. R L .  .  .  .  .
        495.  .  .  .  .  I .     W E. R L .  .  .  .  .
        500.  .  .  .  .  I .     W E. R L .  .  .  .  .
        505.  .  .  .  .  I .     W E. R L .  .  .  .  .
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1100.00  510.  .  .  .  .  .  I .    W E. R L  .  .  .  .  .
         515.  .  .  .  .  .  I .   W  E. R L  .  .  .  .  .
         520.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         525.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         530.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         535.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         540.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         545.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         550.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         555.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         560.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         565.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         570.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         575.  .  .  .  .  .  I .   W  E. RL   .  .  .  .  .
         580.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         585.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         590.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         595.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         600.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         605.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
1200.00  610.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         615.  .  .  .  .  .  I .   W  E. L    .  .  .  .  .
         620.  .  .  .  .  .  I .   W  E. LR   .  .  .  .  .
         625.  .  .  .  .  .  I .   W  E.ML R  .  .  .  .  .
         630.  .  .  .  .  .  I .   W  E.L  R  .  .  .  .  .
         635.  .  .  .  .  .  I .   W  E.L  R  .  .  .  .  .
         640.  .  .  .  .  .  I .   W  E.L   R .  .  .  .  .
         645.  .  .  .  .  .  I .   W  E.L    R .  .  .  .  .
 .240.00 650.  .  .  .  .  .  I .   W  E.L    R .  .  .  .  .
         655.  .  .  .  .  .  I .   WC E L  R  .  .  .  .  .
1250.00  660.  .  .  .  .  .  I .   W  E LR   .  .  .  .  .
         665.  .  .  .  .  .  I .  WC  E LR   .  .  .  .  .
         670.  .  .  .  .  .  I  . WC  EML    .  .  .  .  .
         675.  .  .  .  .  .  I   . WC  E RL  .  .  .  .  .
1270.00  680.  .  .  .  .  .  I   .W C  E RL  .  .  .  .  .
         685.  .  .  .  .  . I    W C  E R L  .  .  .  .  .
         690.  .  .  .  .  . I    W.C   ER L  .  .  .  .  .
         695.  .  .  .  .  . I    W.C   ER .L .  .  .  .  .
1290.00  700.  .  .  .  . .I    W C   ER  .L  .  .  .  .  .
         705.  .  .  .  . .I    W C  E R  L   .  .  .  .  .
1300.00  710.  .  .  .  . .I     WC  E R L.   .  .  .  .  .
         715.  .  .  .  . .I     WC E R L.    .  .  .  .  .
         720.  .  .  .  . .I     WC E R L.    .  .  .  .  .
1315.00  725.  .  .  .  . .I      W E R L.    .  .  .  .  .
         730.  .  .  .  . .I      W E R L.    .  .  .  .  .
         735.  .  .  .  . .I      W E R L.    .  .  .  .  .
         740.  .  .  .  . .I      W E R L.    .  .  .  .  .
         745.  .  .  .  . .I      W E R L.    .  .  .  .  .
         750.  .  .  .  . .I     WC E R L.    .  .  .  .  .
         755.  .  .  .  . .I     WC E R L .   .  .  .  .  .
         760.  .  .  .  . .I     WC E R L .   .  .  .  .  .
         765.  .  .  .  . .I     WC E R L .   .  .  .  .  .
         770.  .  .  .  . .I     WC E R L .   .  .  .  .  .
         775.  .  .  .  .  .I    WC E  R L .  .  .  .  .  .
         780.  .  .  .  .  .I    WC E  R L .  .  .  .  .  .
         785.  .  .  .  .  .I    WC E  R L .  .  .  .  .  .
         790.  .  .  .  .  .I    W. E  R L .  .  .  .  .  .
         795.  .  .  .  .  .I    W. E R L  .  .  .  .  .  .
         800.  .  .  .  .  .I    W. E R L  .  .  .  .  .  .
         805.  .  .  .  .  .I    W. E R L  .  .  .  .  .  .
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1400.00  810.  .  .  .  .I    W. E  R L  .  .  .  .  .  .
         815.  .  .  .  .I    W. E  R L  .  .  .  .  .  .
         820.  .  .  .  .I    W. E  R L  .  .  .  .  .  .
         825.  .  .  .  .I    W. E  RL   .  .  .  .  .  .
         830.  .  .  .  .I    W. E  RL   .  .  .  .  .  .
         835.  .  .  .  .I    W. E  RL   .  .  .  .  .  .
         840.  .  .  .  .I    W. E MRL   .  .  .  .  .  .
         845.  .  .  .  .I    W. E ML    .  .  .  .  .  .
         850.  .  .  .  .I    W. E ML    .  .  .  .  .  .
         855.  .  .  .  .I    W. E ML    .  .  .  .  .  .
         860.  .  .  .  .I    W. E ML    .  .  .  .  .  .
         865.  .  .  .  .I    W. E LR    .  .  .  .  .  .
         870.  .  .  .  .I    W. EMLR    .  .  .  .  .  .
         875.  .  .  .  .I    W. EMLR    .  .  .  .  .  .
         880.  .  .  .  .I    W. EMLR    .  .  .  .  .  .
         885.  .  .  .  .I    W. EL R    .  .  .  .  .  .
         890.  .  .  .  .I    W. EL R    .  .  .  .  .  .
         895.  .  .  .  .I    W.E L R    .  .  .  .  .  .
         900.  .  .  .  .I    W.EML R    .  .  .  .  .  .
         905.  .  .  .  .I    W.EL R     .  .  .  .  .  .
1500.00  910.  .  .  .  .I    W.EL R     .  .  .  .  .  .
         915.  .  .  .  .I    W.EL R     .  .  .  .  .  .
         920.  .  .  .  .I    W.EL R     .  .  .  .  .  .
         925.  .  .  .  .I    W.E  R     .  .  .  .  .  .
         930.  .  .  .  .I    W.E  R     .  .  .  .  .  .
         935.  .  .  .  .I    W.E  R     .  .  .  .  .  .
         940.  .  .  .  .I    W.E  R     .  .  .  .  .  .
         945.  .  .  .  .I    W.E  R     .  .  .  .  .  .
 .40.00  950.  .  .  .  .I    W.E  R     .  .  .  .  .  .
         955.  .  .  .  .I    W.E   R    .  .  .  .  .  .
1550.00  960.  .  .  .  .I    WEL    R   .  .  .  .  .  .
         965.  .  .  .  .I.    WC EL   R  .  .  .  .  .  .
         970.  .  .  .  .I.    WC  EL  R  .  .  .  .  .  .
         975.  .  .  .  . I .   WC  E.LR   .  .  .  .  .  .
1570.00  980.  .  .  .  .  I . W C  E.L    .  .  .  .  .  .
         985.  .  .  .  .  I . WC   ERL    .  .  .  .  .  .
         990.  .  .  .  .  I . W C  EMRL   .  .  .  .  .  .
         995.  .  .  .  .  I  .W C  ER.L   .  .  .  .  .  .
1590.00 1000.  .  .  .  .  I   W C   ER .L   .  .  .  .  .  .
        1005.  .  .  .  .  I   W C  E R .L   .  .  .  .  .  .
1600.00 1010.  .  .  .  .  I   .WC  E R .L   .  .  .  .  .  .
        1015.  .  .  .  .  I   .WC  E  R .L   .  .  .  .  .  .
        1020.  .  .  .  .  I   .WC  E  R .L   .  .  .  .  .  .
1615.00 1025.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1030.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1035.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1040.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1045.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1050.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1055.  .  .  .  .  I   . W  E  R .L   .  .  .  .  .  .
        1060.  .  .  .  .  I   .WC  E  R .L   .  .  .  .  .  .
        1065.  .  .  .  .  I   .WC  E  R .L   .  .  .  .  .  .
        1070.  .  .  .  .  I   .WC  E  R . L  .  .  .  .  .  .
        1075.  .  .  .  . I    .WC  E R  . L  .  .  .  .  .  .
        1080.  .  .  .  . I    .WC E  R  . L  .  .  .  .  .  .
        1085.  .  .  .  . I    .WC E  R  . L  .  .  .  .  .  .
        1090.  .  .  .  . I    .WC E  R  . L  .  .  .  .  .  .
        1095.  .  .  .  . I    .W  E  R  . L  .  .  .  .  .  .
        1100.  .  .  .  . I    .W  E  R  . L  .  .  .  .  .  .
        1105.  .  .  .  . I    .W  E  R  . L  .  .  .  .  .  .
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1700.00 1110. .  .  . I  .W E R . L  .  .  .  .  .  .
        1115. .  .  . I  .W E R . L  .  .  .  .  .  .
        1120. .  .  . I  .W E R . L  .  .  .  .  .  .
        1125. .  .  . I  .W E R . L  .  .  .  .  .  .
        1130. .  .  . I  .W E R .L   .  .  .  .  .  .
        1135. .  .  . I  .W E R .L   .  .  .  .  .  .
        1140. .  .  . I  .W E R .L   .  .  .  .  .  .
        1145. .  .  . I  .W E R .L   .  .  .  .  .  .
        1150. .  .  . I  .W E R .L   .  .  .  .  .  .
        1155. .  .  . I  .W E R .L   .  .  .  .  .  .
        1160. .  .  . I  .W E R L    .  .  .  .  .  .
        1165. .  .  . I  .W E R L    .  .  .  .  .  .
        1170. .  .  . I  .W E R L    .  .  .  .  .  .
        1175. .  .  . I  .W E R L    .  .  .  .  .  .
        1180. .  .  . I  .W E R L    .  .  .  .  .  .
        1185. .  .  . I  .W E R L    .  .  .  .  .  .
        1190. .  .  . I  .W E RL.    .  .  .  .  .  .
        1195. .  .  . I  .W E RL.    .  .  .  .  .  .
        1200. .  .  .I   .W E  RL.   .  .  .  .  .  .
        1205. .  .  .I   .W E  RL.   .  .  .  .  .  .
1800.00 1210. .  .  .I   .W E  RL.   .  .  .  .  .  .
        1215. .  .  .I   W E  RL.    .  .  .  .  .  .
        1220. .  .  .I   W E  RL.    .  .  .  .  .  .
        1225. .  .  .I   W E R L.    .  .  .  .  .  .
        1230. .  .  .I   W E R L.    .  .  .  .  .  .
        1235. .  .  .I   W E R  L    .  .  .  .  .  .
        1240. .  .  .I   W E R  L    .  .  .  .  .  .
        1245. .  .  .I   W E R  L    .  .  .  .  .  .
        1250. .  .  .I   W E R  L    .  .  .  .  .  .
        1255. .  .  .I   W E R  L    .  .  .  .  .  .
        1260. .  .  .I   W E R  L    .  .  .  .  .  .
        1265. .  .  .I   W E R  .L   .  .  .  .  .  .
        1270. .  .  .I   W E R  .L   .  .  .  .  .  .
        1275. .  .  .I   W E R  .L   .  .  .  .  .  .
        1280. .  .  .I   W E R  .L   .  .  .  .  .  .
        1285. .  .  .I   W E R  .L   .  .  .  .  .  .
        1290. .  .  .I   W E R  .L   .  .  .  .  .  .
        1295. .  .  .I   W E R  . L  .  .  .  .  .  .
        1300. .  .  .I   W E R  . L  .  .  .  .  .  .
        1305. .  .  .I   W E R  . L  .  .  .  .  .  .
1900.00 1310. .  .  .I   W E R  . L  .  .  .  .  .  .
        1315. .  .  .I   W E R  . L  .  .  .  .  .  .
        1320. .  .  .I   W E MR  .L  .  .  .  .  .  .
        1325. .  .  .I   W E MR  .L  .  .  .  .  .  .
        1330. .  .  .I   W E R   L   .  .  .  .  .  .
        1335. .  .  .I   W E R   L   .  .  .  .  .  .
        1340. .  .  .I   W E R   L   .  .  .  .  .  .
        1345. .  .  .I   W E R  L.   .  .  .  .  .  .
        1350. .  .  .I   W E R  L.   .  .  .  .  .  .
        1355. .  .  .I   W E R L .   .  .  .  .  .  .
        1360. .  .  .I   W E R L .   .  .  .  .  .  .
        1365. .  .  .I   W E R L .   .  .  .  .  .  .
        1370. .  .  .I   W E R L .   .  .  .  .  .  .
        1375. .  .  .I   W E R L .   .  .  .  .  .  .
        1380. .  .  .I   W EMRL  .   .  .  .  .  .  .
        1385. .  .  .I   W EMRL  .   .  .  .  .  .  .
        1390. .  .  .I   W EMRL  .   .  .  .  .  .  .
        1395. .  .  .I   W EML   .   .  .  .  .  .  .
        1400. .  .  .I   W EML   .   .  .  .  .  .  .
        1405. .  .  .I   W ELR   .   .  .  .  .  .  .
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2000.00 1410. . . .I    W  ELR . . . . . .
        1415. . . .I    W  ELR . . . . . .
        1420. . . .I    W  ELR . . . . . .
        1425. . . .I    W  E R . . . . . .
        1430. . . .I    W  E R . . . . . .
        1435. . . .I    WC EL R . . . . . .
        1440. . . .I    WC EL R . . . . . .
        1445. . . .I    W. EL R . . . . . .
        1450. . . I     W. EL R . . . . . .
        1455. . . I     W. E  R . . . . . .
        1460. . . I     W. E  R . . . . . .
        1465. . . I     W. E  R . . . . . .
        1470. . . I     W. E  R . . . . . .
        1475. . . I     WC. E R . . . . . .
        1480. . . I     WC. E R . . . . . .
        1485. . . I     WC.LE R . . . . . .
        1490. . . I     WC.E  R . . . . . .
        1495. . . I     W .E  R . . . . . .
        1500. . . I     W .E  R . . . . . .
        1505. . . I     W .E  R . . . . . .
2100.00 1510. . . I     W .E  R . . . . . .
        1515. . . I    WC LE  R . . . . . .
2110.00 1520. . . I    WC  LE R . . . . . .
        1525. . . I    WC  E  R . . . . . .
        1530. . . I     W  E R  . . . . . .
2125.00 1535. . . I     W EL R  . . . . . .
        1540. . . I    W  ELR   . . . . . .
        1545. . . I    W  ELR   . . . . . .
2140.00 1550. . . I    WC  ER   . . . . . .
        1555. . . I    WC ELR   . . . . . .
2150.00 1560. . . I    WC ELR   . . . . . .
        1565. . . I.   WC ELR   . . . . . .
        1570. . . I    WC ELR   . . . . . .
        1575. . . I.   WC EL.   . . . . . .
        1580. . . I.   W  EL.   . . . . . .
        1585. . . I.   W  EL.   . . . . . .
        1590. . . I.   W  ER.   . . . . . .
        1595. . . I.   W  ER.   . . . . . .
        1600. . . I.   W  ER.   . . . . . .
        1605. . . I.   W  ER.   . . . . . .
2200.00 1610. . . I.   W  ER.   . . . . . .
        1615. . . I.   W  ER.   . . . . . .
        1620. . . I.   W  ER.   . . . . . .
        1625. . . I.   W  ER.   . . . . . .
        1630. . . I.   W LER.   . . . . . .
        1635. . . I.   W E R.   . . . . . .
        1640. . . I.   W E R.   . . . . . .
        1645. . . I.   W E R.   . . . . . .
        1650. . . I.   W E R.   . . . . . .
        1655. . . I.   W E R.   . . . . . .
        1660. . . I.   W E R.   . . . . . .
        1665. . . I.   WLE R.   . . . . . .
        1670. . . I.   WLE R.   . . . . . .
        1675. . . I.   WLE R.   . . . . . .
        1680. . . I.   WLE R.   . . . . . .
        1685. . . I.   WLE R.   . . . . . .
        1690. . . I.   WLE R.   . . . . . .
        1695. . . I.  W LE R.   . . . . . .
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2290.00 1700.  .    .     I .  W LER .  .  .  .  .  .  .  .
        1705.  .    .     I .  WL ER .  .  .  .  .  .  .  .
2300.00 1710.  .    .     I .  WL ER .  .  .  .  .  .  .  .
        1715.  .    .     I .  WL ER .  .  .  .  .  .  .  .
        1720.  .    .     I . WCLE R .  .  .  .  .  .  .  .
        1725.  .    .    I  . WC LER .  .  .  .  .  .  .  .
2320.00 1730.  .    .    I  .W C LER .  .  .  .  .  .  .  .
        1735.  .    .   I   .WC  ER  .  .  .  .  .  .  .  .
        1740.  .    .   I   W C  ER  .  .  .  .  .  .  .  .
        1745.  .    .  I    WC   E   .  .  .  .  .  .  .  .
2340.00 1750.  .    .  I    WC  ER   .  .  .  .  .  .  .  .
        1755.  .    .  I    WC  ER   .  .  .  .  .  .  .  .
2350.00 1760.  .    .  I    .W ELR  .  .  .  .  .  .  .  .
        1765.  .    .  I    .W ELR  .  .  .  .  .  .  .  .
        1770.  .    .  I    .W EL   .  .  .  .  .  .  .  .
2365.00 1775.  .    .  I    .W EL   .  .  .  .  .  .  .  .
        1780.  .    .  I    .W EL   .  .  .  .  .  .  .  .
        1785.  .    .  I    .W EL   .  .  .  .  .  .  .  .
        1790.  .    .  I    .W ER   .  .  .  .  .  .  .  .
        1795.  .    .  I    .W ER   .  .  .  .  .  .  .  .
        1800.  .    .  I    .W ER   .  .  .  .  .  .  .  .
        1805.  .    .  I    W  ER   .  .  .  .  .  .  .  .
2400.00 1810.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1815.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1820.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1825.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1830.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1835.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1840.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1845.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1850.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1855.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1860.  .    .  I    W  ER   .  .  .  .  .  .  .  .
        1865.  .    .  I    W ELR   .  .  .  .  .  .  .  .
        1870.  .    .  I    W ELR   .  .  .  .  .  .  .  .
        1875.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1880.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1885.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1890.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1895.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1900.  .    .  I    W E L   .  .  .  .  .  .  .  .
        1905.  .    .  I    W E L   .  .  .  .  .  .  .  .
2500.00 1910.  .    .  I    W E L   .  .  .  .  .  .  .  .
        1915.  .    .  I    W E L   .  .  .  .  .  .  .  .
        1920.  .    .  I    W EML   .  .  .  .  .  .  .  .
        1925.  .    . I     W ERL   .  .  .  .  .  .  .  .
        1930.  .    . I    W. ERL   .  .  .  .  .  .  .  .
        1935.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1940.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1945.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1950.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1955.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1960.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1965.  .    . I    W. EL    .  .  .  .  .  .  .  .
        1970.  .    . I    W. EL    .  .  .  .  .  .  .  .
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          1975.  .     . I    W. ER  .  .  .  .  .  .  .  .
          1980.  .     . I    W. ER  .  .  .  .  .  .  .  .
          1985.  .     . I    W. ER  .  .  .  .  .  .  .  .
          1990.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          1995.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2000.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2005.  .     . I    W.ELR  .  .  .  .  .  .  .  .
2600.00   2010.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2015.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2020.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2025.  .     . I    W.ELR  .  .  .  .  .  .  .  .
          2030.  .     . I    W.E R  .  .  .  .  .  .  .  .
          2035.  .     . I    W.E R  .  .  .  .  .  .  .  .
          2040.  .     . I    W.E R  .  .  .  .  .  .  .  .
          2045.  .     . I    W.E R  .  .  .  .  .  .  .  .
          2050.  .     .I     W.E R  .  .  .  .  .  .  .  .
          2055.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2060.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2065.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2070.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2075.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2080.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2085.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2090.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2095.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2100.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2105.  .     .I    W .ER  .  .  .  .  .  .  .  .
700.00    2110.  .     .I    W .ER  .  .  .  .  .  .  .  .
          2115.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2120.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2125.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2130.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2135.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2140.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2145.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2150.  .     .I    W ELR  .  .  .  .  .  .  .  .
          2155.  .     .I    W EL R .  .  .  .  .  .  .  .
          2160.  .     .I    W EL R .  .  .  .  .  .  .  .
          2165.  .     .I    W EL R .  .  .  .  .  .  .  .
          2170.  .     .I    W EL R .  .  .  .  .  .  .  .
          2175.  .     .I    W EL R .  .  .  .  .  .  .  .
          2180.  .     .I    W EL R .  .  .  .  .  .  .  .
          2185.  .     .I    W EL R .  .  .  .  .  .  .  .
          2190.  .     .I    W EL R .  .  .  .  .  .  .  .
          2195.  .     .I    W EL R .  .  .  .  .  .  .  .
          2200.  .     .I    W EL R .  .  .  .  .  .  .  .
          2205.  .     .I    W EL R .  .  .  .  .  .  .  .
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2800.00 2210. .      .I    W  EL R  . . . . . .
        2215. .      .I    W  E  R  . . . . . .
        2220. .      .I   WC E.  R  . . . . . .
        2225. .      .I   WC LE. R  . . . . . .
        2230. .      .I   WC LE. R  . . . . . .
   1.01 2235. .      I   W CL E. R  . . . . . .
        2240. .      I   WC L E. R  . . . . . .
        2245. .      I   WCL E . R  . . . . . .
        2250. .      I   WCL E .R  . . . . . .
        2255. .      I   WCL E .R  . . . . . .
2850.00 2260. .      I   WCL E .R  . . . . . .
        2265. .      I  WCL E  R  . . . . . .
        2270. .      I  WC  E R.  . . . . . .
        2275. .     I.  WC  ER .  . . . . . .
        2280. .     I. WC   E  .  . . . . . .
2875.00 2285. .     I. WC  E   .  . . . . . .
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THIS RUN EXECUTED 10-29-92

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HEC2 RELEASE DATED NOV 76 UPDATED MAY 1984
ERROR CORR - 01,02,03,04,05,06
MODIFICATION - 50,51,52,53,54,55,56
IBM-PC-XT VERSION AUGUST 1985
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SUPERCRITICAL RUN

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	600.000	.00	.00	.00	504.00	700.00	505.60	505.63	506.06	108.00	5.44	128.74	67.36
	650.000	50.00	.00	.00	503.00	700.00	504.12	504.44	505.23	234.10	8.46	82.74	45.75
	700.000	50.00	.00	.00	501.00	700.00	502.80	503.20	504.17	182.45	9.41	74.35	51.82
*	750.000	50.00	.00	.00	500.00	700.00	503.04	503.04	503.98	75.95	7.82	89.56	80.32
*	790.000	40.00	.00	.00	499.72	700.00	502.65	502.65	503.68	144.91	8.15	85.94	58.15
*	800.000	10.00	.00	.00	498.80	700.00	502.49	502.49	503.66	148.45	8.68	80.67	57.45
*	850.000	50.00	.00	.00	497.00	700.00	500.40	501.10	502.85	148.86	12.56	55.75	57.37
*	875.000	25.00	.00	.00	496.90	700.00	500.77	500.93	502.36	85.57	10.12	69.20	75.67
	900.000	25.00	.00	.00	496.80	700.00	499.89	500.53	502.02	153.38	11.74	59.65	56.52
*	990.000	90.00	.00	.00	496.44	700.00	500.49	500.49	501.91	141.23	9.57	73.18	58.90
*	1000.000	10.00	.00	.00	496.40	700.00	500.47	500.47	501.89	140.62	9.57	73.18	59.03
	1020.000	20.00	.00	.00	495.40	700.00	498.63	499.47	501.34	341.27	13.20	53.01	37.89
	1040.000	20.00	.00	.00	494.44	700.00	497.44	498.42	500.54	430.51	14.13	49.55	33.74
*	1050.000	10.00	.00	.00	494.40	700.00	498.21	498.46	499.92	180.66	10.48	66.80	52.08
	1065.000	15.00	.00	.00	494.30	700.00	498.33	498.33	499.75	72.18	9.54	73.37	82.39
*	1100.000	45.00	.00	.00	494.20	700.00	498.25	498.25	499.67	71.63	9.54	73.41	82.71
*	1200.000	100.00	.00	.00	493.80	700.00	497.89	497.89	499.32	71.54	9.60	72.94	82.76

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	1240.000	40.00	.00	.00	493.64	700.00	497.83	497.83	499.30	140.48	9.75	71.80	59.06
	1250.000	10.00	.00	.00	493.60	700.00	497.46	497.68	499.13	174.37	10.36	67.56	53.01
	1270.000	20.00	.00	.00	492.32	700.00	495.40	496.37	498.48	409.38	14.07	49.74	34.60
	1290.000	20.00	.00	.00	491.04	700.00	493.99	495.11	497.53	493.65	15.11	46.33	31.51
	1300.000	10.00	.00	.00	491.00	700.00	494.31	495.06	496.84	310.91	12.76	54.87	39.70
*	1315.000	15.00	.00	.00	490.94	700.00	494.78	494.98	496.43	88.45	10.29	68.00	74.43
*	1400.000	85.00	.00	.00	490.60	700.00	494.67	494.67	496.10	72.27	9.61	72.83	82.34
*	1500.000	100.00	.00	.00	490.20	700.00	494.25	494.25	495.67	72.22	9.56	73.19	82.37
*	1540.000	40.00	.00	.00	490.04	700.00	494.61	494.61	495.40	160.94	7.13	98.20	55.18
	1550.000	10.00	.00	.00	490.00	700.00	494.34	494.46	495.21	198.49	7.51	93.15	49.69
	1570.000	20.00	.00	.00	488.52	700.00	491.70	492.56	494.50	360.77	13.43	52.12	36.85
	1590.000	20.00	.00	.00	487.04	700.00	490.01	491.15	493.58	491.40	15.17	46.13	31.58
	1600.000	10.00	.00	.00	487.00	700.00	490.32	491.09	492.90	314.82	12.87	54.37	39.45
*	1615.000	15.00	.00	.00	486.94	700.00	490.79	490.99	492.44	88.45	10.30	67.93	74.43
*	1700.000	85.00	.00	.00	486.60	700.00	490.69	490.69	492.14	72.34	9.65	72.51	82.30
*	1800.000	100.00	.00	.00	486.20	700.00	490.27	490.27	491.70	72.26	9.61	72.84	82.35
*	1900.000	100.00	.00	.00	485.80	700.00	489.85	489.85	491.27	72.19	9.56	73.20	82.39
*	2000.000	100.00	.00	.00	485.40	700.00	490.06	490.06	491.44	71.47	9.44	74.12	82.80
	2100.000	100.00	.00	.00	485.00	700.00	488.82	489.06	490.53	92.95	10.51	66.58	72.61
	2110.000	10.00	.00	.00	484.96	700.00	488.15	488.70	490.29	135.01	11.75	59.55	60.25
*	2125.000	15.00	.00	.00	484.90	700.00	488.33	488.36	489.70	74.70	9.40	74.51	80.99
	2140.000	15.00	.00	.00	484.84	700.00	487.57	488.01	489.41	123.86	10.90	64.19	62.90
	2150.000	10.00	.00	.00	484.80	700.00	487.72	487.82	489.06	81.21	9.28	75.41	77.68
*	2200.000	50.00	.00	.00	484.60	700.00	487.61	487.61	488.85	72.60	8.93	78.38	82.16
	2290.000	90.00	.00	.00	484.24	700.00	487.22	487.22	488.47	145.44	8.96	78.08	58.04
*	2300.000	10.00	.00	.00	484.20	700.00	487.22	487.22	488.45	140.91	8.90	78.64	58.97

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	2320.000	20.00	.00	.00	483.32	700.00	485.66	486.33	487.93	345.93	12.09	57.92	37.64
	2340.000	20.00	.00	.00	482.44	700.00	484.75	485.48	487.19	372.06	12.54	55.84	36.29
*	2350.000	10.00	.00	.00	482.40	700.00	485.29	485.41	486.66	164.45	9.39	74.56	54.59
*	2365.000	15.00	.00	.00	482.38	700.00	485.39	485.39	486.62	72.63	8.92	78.50	82.14
*	2400.000	35.00	.00	.00	482.20	700.00	485.22	485.22	486.45	72.20	8.91	78.52	82.38
*	2500.000	100.00	.00	.00	481.80	700.00	484.81	484.81	486.05	72.39	8.92	78.45	82.27
*	2600.000	100.00	.00	.00	481.40	700.00	484.43	484.43	485.66	72.19	8.91	78.53	82.39
*	2700.000	100.00	.00	.00	481.00	700.00	484.01	484.01	485.25	72.58	8.93	78.38	82.16
*	2800.000	100.00	.00	.00	480.60	700.00	483.64	483.64	484.90	71.99	8.99	77.87	82.50
*	2850.000	50.00	.00	.00	479.86	700.00	481.79	482.40	483.86	186.64	11.55	60.63	51.24
	2875.000	25.00	.00	.00	479.60	700.00	480.94	481.56	483.24	312.08	12.19	57.41	39.62

SUPERCRITICAL RUN

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	600.000	700.00	505.60	.00	.00	.00	155.80	.00
	650.000	700.00	504.12	.00	-1.48	.00	92.14	50.00
	700.000	700.00	502.80	.00	-1.32	.00	58.37	50.00
*	750.000	700.00	503.04	.00	.24	.00	47.81	50.00
*	790.000	700.00	502.65	.00	-.39	.00	41.75	40.00
*	800.000	700.00	502.49	.00	-.16	.00	35.05	10.00
*	850.000	700.00	500.40	.00	-.80	.00	22.76	50.00
*	875.000	700.00	500.77	.00	.37	.00	25.75	25.00
	900.000	700.00	499.89	.00	-.89	.00	28.55	25.00
*	990.000	700.00	500.49	.00	.61	.00	26.11	90.00
*	1000.000	700.00	500.47	.00	-.03	.00	26.00	10.00
	1020.000	700.00	498.63	.00	-1.83	.00	22.71	20.00
	1040.000	700.00	497.44	.00	-1.20	.00	23.09	20.00
*	1050.000	700.00	498.21	.00	.78	.00	25.02	10.00
*	1065.000	700.00	498.33	.00	.12	.00	26.37	15.00
*	1100.000	700.00	498.25	.00	-.08	.00	26.22	45.00
*	1200.000	700.00	497.89	.00	-.36	.00	25.65	100.00
*	1240.000	700.00	497.83	.00	-.07	.00	24.30	40.00
	1250.000	700.00	497.46	.00	-.37	.00	25.03	10.00
	1270.000	700.00	495.40	.00	-2.06	.00	22.26	20.00
	1290.000	700.00	493.99	.00	-1.41	.00	21.43	20.00
	1300.000	700.00	494.31	.00	.33	.00	23.08	10.00
*	1315.000	700.00	494.78	.00	.47	.00	25.41	15.00
*	1400.000	700.00	494.67	.00	-.11	.00	25.78	85.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	1500.000	700.00	494.25	.00	-.42	.00	26.18	100.00
*	1540.000	700.00	494.61	.00	.37	.00	62.48	40.00
	1550.000	700.00	494.34	.00	-.27	.00	64.11	10.00
	1570.000	700.00	491.70	.00	-2.64	.00	22.76	20.00
	1590.000	700.00	490.01	.00	-1.69	.00	21.02	20.00
	1600.000	700.00	490.32	.00	.31	.00	22.70	10.00
*	1615.000	700.00	490.79	.00	.46	.00	25.32	15.00
*	1700.000	700.00	490.69	.00	-.09	.00	25.44	85.00
*	1800.000	700.00	490.27	.00	-.42	.00	25.80	100.00
*	1900.000	700.00	489.85	.00	-.42	.00	26.18	100.00
*	2000.000	700.00	490.06	.00	.21	.00	26.83	100.00
	2100.000	700.00	488.82	.00	-1.24	.00	24.96	100.00
	2110.000	700.00	488.15	.00	-.67	.00	25.37	10.00
*	2125.000	700.00	488.33	.00	.18	.00	28.47	15.00
	2140.000	700.00	487.57	.00	-.76	.00	29.05	15.00
	2150.000	700.00	487.72	.00	.15	.00	31.67	10.00
*	2200.000	700.00	487.61	.00	-.11	.00	32.05	50.00
*	2290.000	700.00	487.22	.00	-.39	.00	32.34	90.00
*	2300.000	700.00	487.22	.00	.00	.00	32.08	10.00
	2320.000	700.00	485.66	.00	-1.56	.00	29.50	20.00
	2340.000	700.00	484.75	.00	-.91	.00	28.26	20.00
*	2350.000	700.00	485.29	.00	.54	.00	31.57	10.00
*	2365.000	700.00	485.39	.00	.10	.00	32.21	15.00
*	2400.000	700.00	485.22	.00	-.17	.00	32.07	35.00
*	2500.000	700.00	484.81	.00	-.40	.00	32.06	100.00
*	2600.000	700.00	484.43	.00	-.39	.00	32.07	100.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	2700.000	700.00	484.01	.00	-.41	.00	32.05	100.00
*	2800.000	700.00	483.64	.00	-.37	.00	31.16	100.00
*	2850.000	700.00	481.79	.00	-.27	.00	34.73	50.00
	2875.000	700.00	480.94	.00	-.86	.00	45.00	25.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 750.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 750.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 750.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 790.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 790.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 790.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 800.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 800.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 800.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 850.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= 875.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 875.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

ION SECNO= 990.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 990.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 990.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1000.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1000.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1000.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1050.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 1050.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1065.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1065.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1065.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1100.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1100.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1100.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1200.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1200.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1200.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1240.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1240.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
TION SECNO= 1240.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1315.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 1315.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1400.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1400.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1400.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1500.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1500.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1500.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1540.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1540.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1540.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1615.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 1615.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1700.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1700.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1700.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1800.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1800.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1800.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 1900.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
TION SECNO= 1900.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
ION SECNO= 1900.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2000.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2000.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2000.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2125.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 2125.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2200.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2200.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2200.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2290.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2290.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2290.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2300.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2300.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2300.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2350.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 2350.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2365.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
TION SECNO= 2365.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
ITION SECNO= 2365.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2400.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2400.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2400.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2500.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 2500.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2500.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2600.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2600.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2600.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2700.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2700.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2700.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2800.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2800.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2800.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2850.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

THIS RUN EXECUTED 10-29-92

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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APPENDIX D

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

7516 Westcliff Drive
Las Vegas, Nevada 89128
(702) 228-1490
Fax: (702) 363-4142

October 30, 1992
Project No. 834-G008

Mr. Max Morgan
Morgan Development
20341 Irvine Avenue, Suite D-3
Santa Ana Heights, CA 92707

Re: Soils Exploration at Proposed Southern Vista Channel Site, Clark County, Nevada.

Dear Mr. Morgan:

At your authorization, Geotechnical & Environmental Services, Inc. (GES, Inc.) has performed soils exploration along the proposed alignment of the Southern Vista Channel to evaluate soils and subsurface conditions as related to a scour analysis. The information obtained from this evaluation will be utilized by Engineers & Surveyors, Inc. for their soil scour evaluation of the channel. It is our understanding that the pertinent information which is needed is a grain size distribution and the depth to caliche or cemented soils. The grain size diameter at which 90 percent and 50 percent passes (D_{90} and D_{50}, respectively) is necessary for the soil scour modelling analysis.

The section of the proposed Southern Vista Channel which is being evaluated is located in Clark County, Nevada in Section 33, T21S, R60E on the south end of an existing Detention Basin and extends from approximately 672 feet south of the intersection of the alignments of Russell Road and Cimarron Road at the Southern tip of the detention basin dam to the south approximately 2,000 feet up the proposed channel alignment. Plate 1, enclosed, shows the proposed location of the channel in relation to the surrounding area.

Field exploration was performed by drilling four borings at the locations shown on Plate 1 utilizing a Mayhew 600 air rotary drill rig. Due to the presence of cemented sand and gravel deposits, it was not possible to perform backhoe excavations to obtain representative composite soil samples for sieve analysis testing.
The subsurface explorations were performed under the direction and supervision of a GES, Inc. representative who visually inspected the site, maintained detailed logs of the subsurface conditions, identified the depths of cemented caliche deposits, and classified the soils encountered. The soils encountered were classified in the field through observation of drill cuttings.

The subsurface conditions are relatively consistent at the site. Generally, a loose surface layer of sandy silty gravel overlies layers of very hard and strongly cemented sand and gravel caliche interbedded with medium dense to dense non-cemented sand and gravel. A relatively consistent layer of cemented sand and gravel caliche was encountered at a depth of 5 to 6 1/2 feet with an average thickness of approximately 2 feet. Figure 2 shows a soil profile indicating the relative locations of the borings and the depths and thicknesses of subsurface layers encountered.

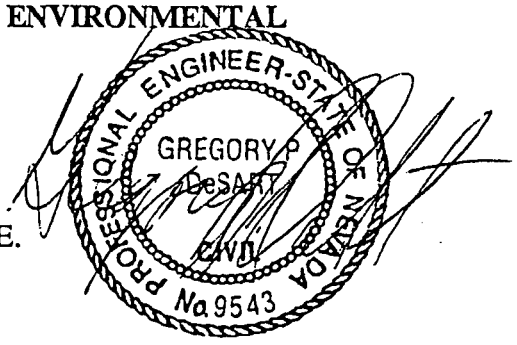
Based upon the results of our field exploration, we feel that soil scour will not occur below strongly cemented sand and gravel layers greater than 1 foot in thickness. For the scour evaluation, we recommend a D_{90} of 20 mm and a D_{50} of 5 mm. These recommended grain sizes are conservative estimates based upon the type of soils classified by the cuttings observed during drilling.

Based upon this information, we recommend that the bottom of the channel be no more than 5 feet below existing site grade. This is intended to limit soil scour to a depth of approximately 2 feet or to the top of the lowest caliche layer encountered during our exploration, whichever is less.

We appreciate this opportunity to provide our services. If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

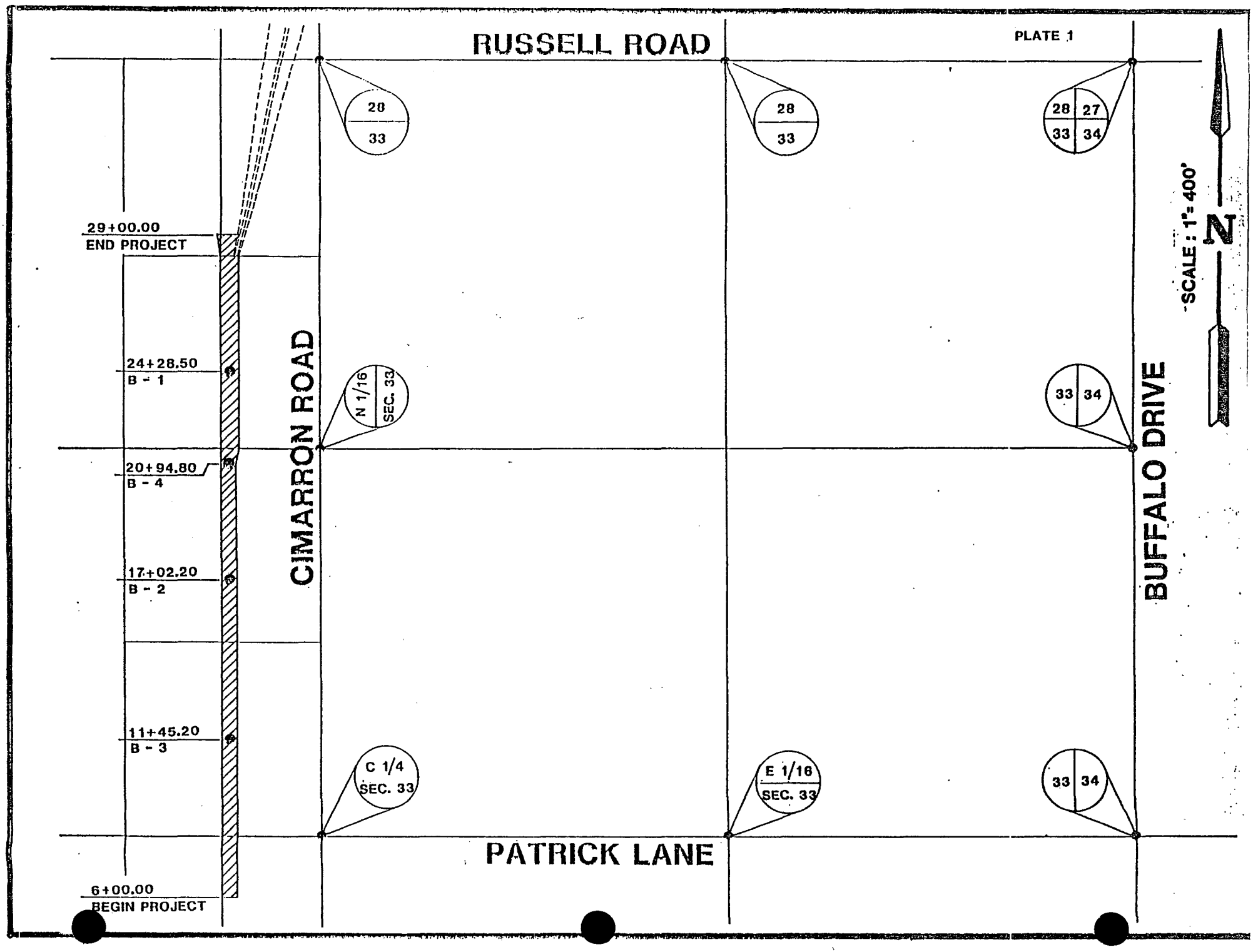


Gregory P. DeSart, P.E.
General Manager

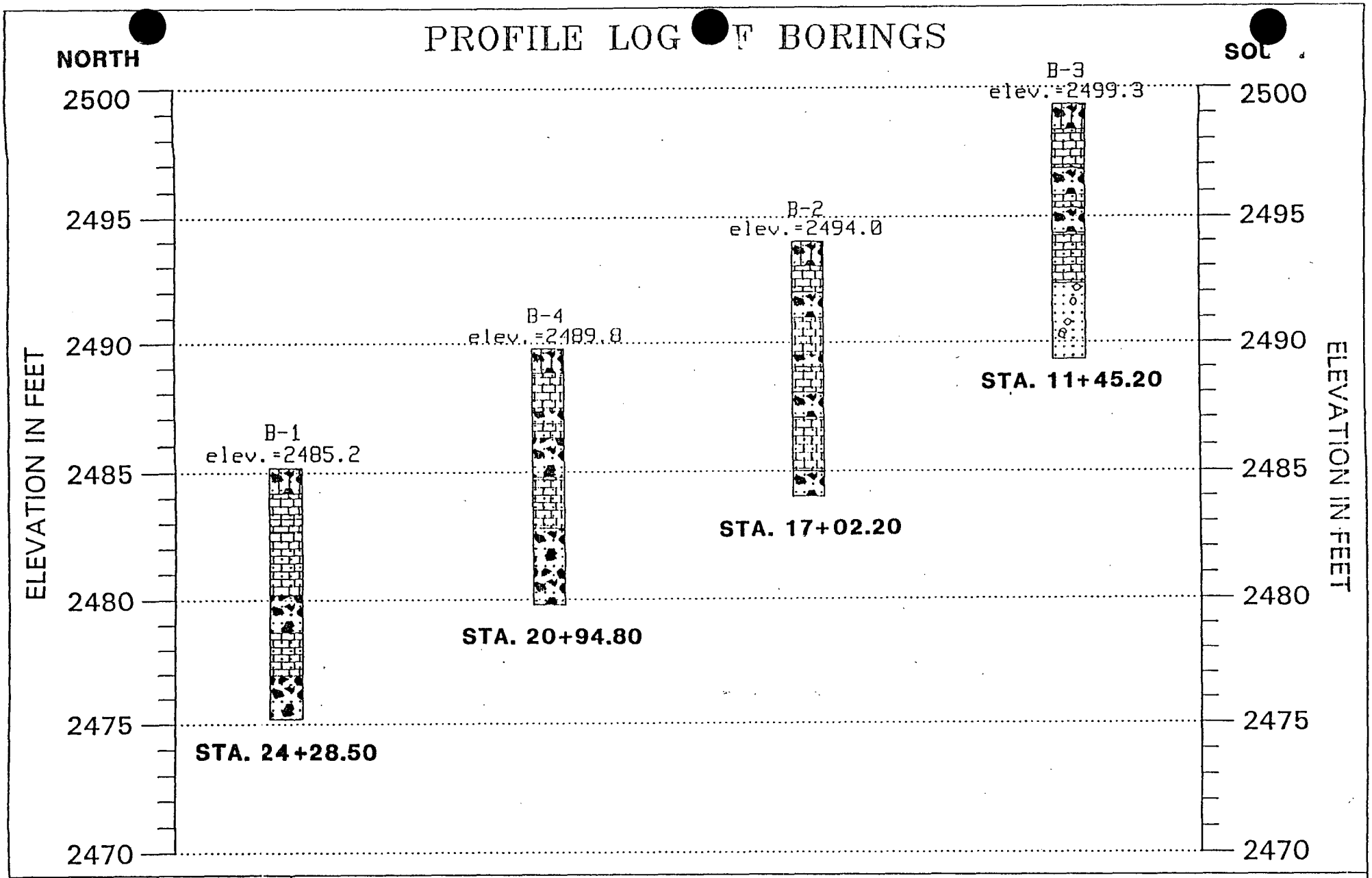
Enclosures

10-30-92

CC: Dan Wonders - Engineers & Surveyors, Inc.


PLATE 1
RUSSELL ROAD
PATRICK LANE
CIMARRON ROAD
BUFFALO DRIVE
SCALE : 1" = 400'
N
28
33
28
33
28 27
33 34
N 1/16
SEC. 33
33 34
C 1/4
SEC. 33
E 1/16
SEC. 33
33 34
29+00.00
END PROJECT
24+28.50
B - 1
20+94.80
B - 4
17+02.20
B - 2
11+45.20
B - 3
6+00.00
BEGIN PROJECT

PROFILE LOG OF BORINGS



Project No.:	Date:
834-G008	10/23/1992
Project: SOUTHERN VISTA CHANNEL	
Location: SOUTH OF EXISTING DETENTION BASIN	
Plate: 2	Scale: 5 feet/in.

Strata symbols

- Silty sandy gravel, loose to medium dense, dry.
- Cemented sand and gravel Caliche, mod. hard to hard.
- Fractured Sand and Gravel Caliche
- Sandy gravel, dense, dry.
- Sand with gravel, medium dense, dry.

RIPRAP CALCULATIONS

DROP STRUCTURES

EQUATION 7.8 FROM CCRFCD DESIGN MANUAL

$V = 3(d_{50}^{0.5})(S_s - 1)/S^{0.17}$

$V = 11.50$ ft/sec
$S = 5.7\%$

$$d_{50} = \frac{V S^{0.17}}{3(S_s - 1)}$$

$$= \left(\frac{(11.50)(0.057)^{0.17}}{3(2.7-1)} \right)^2$$

$d_{50} = 1.92$ ft.

USE 2' DIAMETER ←

EAST BANK PROTECTION

$S = 0.4\%$
$V = 8$

$$d_{50} = \left(\frac{8(.004)^{.17}}{3(1.7)} \right)^2$$

$d_{50} = 0.38'$

USE 6" diameter ←

OUTLET PROTECTION

$S = 0.4\%$
$V = 12$ ft/sec

$d_{50} = 0.85'$

USE 10" DIAMETER ←

$$d_{50} = \left(\frac{12(0.004)^{.17}}{3(1.7} \right)^2$$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

APPENDIX E

FREEBOARD CALCULATIONS

FOR SUBCRITICAL FLOW USE EQUATION 723 IN THE CCRFCD DESIGN MANUAL: $F_b = 0.5 + V^2/2g$

FOR SUPERCRITICAL FLOW USE EQUATION 729 IN THE CCRFCD DESIGN MANUAL: $F_b = 1.0 + 0.025\ V(d)^{1/3}$

WHERE F_b = FREEBOARD HEIGHT (FEET)
V = VELOCITY (FEET PER SECOND)
d = DEPTH OF FLOW (FEET)
g = ACCELERATION OF GRAVITY (FEET PER SECOND SQUARED)

STATION	FLOW REGIME	VELOCITY (ft/sec)	DEPTH (ft)	F_b (ft)
6+00 TO 6+50	SUP	6.15	1.40	1.17
7+00 TO 7+90	SUB	7.09	—	1.28
8+00 TO 9+50	SUP	12.56	3.40	1.47
8+50 TO 10+00	SUB	8.03	—	1.50
10+00 TO 10+50	SUP	14.13	3.00	1.51
10+50 TO 12+50	SUB	7.34	—	1.33
12+50 TO 13+00	SUP	15.11	2.95	1.59
13+00 TO 15+50	SUB	8.26	—	1.56
15+50 TO 16+00	SUP	15.17	2.97	1.54
16+00 TO 21+00	SUB	7.04	—	1.27
21+00 TO 21+50	SUP	11.75	3.19	1.43
21+50 TO 23+00	SUB	7.02	—	1.26
23+00 TO 23+50	SUP	12.59	2.31	1.41
23+50 TO 28+50	SUB	7.09	—	1.28
28+50 TO 29+75	SUP	12.19	1.34	1.33

REFERENCE HEC2 OUTPUT FILES FOR VELOCITY AND DEPTH.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS

November 23, 1992

Clark County, Nevada
Department of Public Works
401 South 4th Street
Las Vegas, Nevada 89101

ATTN: Mr. Robert Thompson

RE: Technical Drainage Study for the Southern Vista
Temporary Drainage Channel

Dear Mr. Thompson:

The following is a response to the memorandum, from Willdan and Associates, dated November 12, 1992 regarding comments to the above referenced drainage study.

Comment 1. It appears that the proposed channel berm will not divert the entire 491 cfs from basin OFF3 as shown on Exhibit 9. A field investigation and review of existing topo shows that extending the proposed channel/berm south will enable the entire 491 cfs to be diverted north along the proposed channel berm.

Response. The berm, as shown on the improvement plans, on the East bank of the channel has been extended roughly 400 feet to the South to assure that the entire 491 cfs is intercepted.

7018 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89117 • (702) 363-6415 FAX 363-4142

Comment 2. The HEC2 models, which appear to correctly analyze the proposed project, indicate that the entire stretch of channel/berm is flowing at an erosive velocity. While the entire channel bottom will be protected by the caliche from excessive scour, the channel side slopes will not be protected. As indicated in the Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual, Table 702 "Maximum Permissible Mean Channel Velocities," the channel side slopes must be protected as indicated with grouted riprap for velocities over 10-feet-per-second, and loose riprap for velocities under 10-feet-per-second.

Response. Loose riprap protection will be provided along both banks of the channel for the entire length with the exception of the drop structures. The drop structures will be grouted riprap.

Comment 3. An analysis of the deposition and erosive impact for the point at which the southeast and southwest tributaries combine, has not been included.

Response. As per our meeting on November 19, 1992 at Willdan and Associates. The issue of erosion analysis at the confluence of the tributaries was resolved.

Comment 4. The impact on the existing upper Flamingo Detention Basin outlet flows must be analyzed to determine if any adverse impact will occur due to the additional detention basin depth.

Response. Exhibit 1 is an analysis of the Upper Flamingo Detention Basin outfall. An increase of 21 cfs is expected to be contributed to the outfall channel. The increase to the outfall channel will have a negligible effect on the outfall channel. The increase to the water surface elevation within the basin does not breach the spillway weir.

Comment 5. At the request of Clark County Public Works, Grading Plans for the proposed development have been reviewed for compliance to permitting requirements according to section 34.030 of the "Uniform Regulations for the Control of Drainage," revised November 12, 1990. The plans submitted do not meet the minimum requirements and must be revised prior to Drainage Study approval, to address the following.

a. Legal description of project location.
b. Abbreviations
c. The following note must be added to all grading plans. All work performed within public right of way and outside of the project boundary shall be performed under a separate encroachment permit issued by the controlling authority.

Response. The above requirements have been added to the grading plan.

Comment 6. A copy of this memo is being submitted to Clark County Regional Flood Control District at their request. As a condition of final approval, the applicant must submit this study and all addenda to Clark County Regional Flood Control District for concurrence.

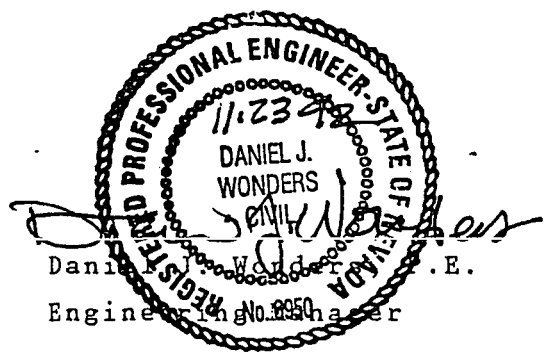
Response. Upon approval of this study by Clark County a copy of the original study and all subsequent addenda will be submitted to CCRFCD for concurrence.

This concludes my response to the comments. If you should have any questions regarding these comments please contact me.

Sincerely,

Thomas E. Davy

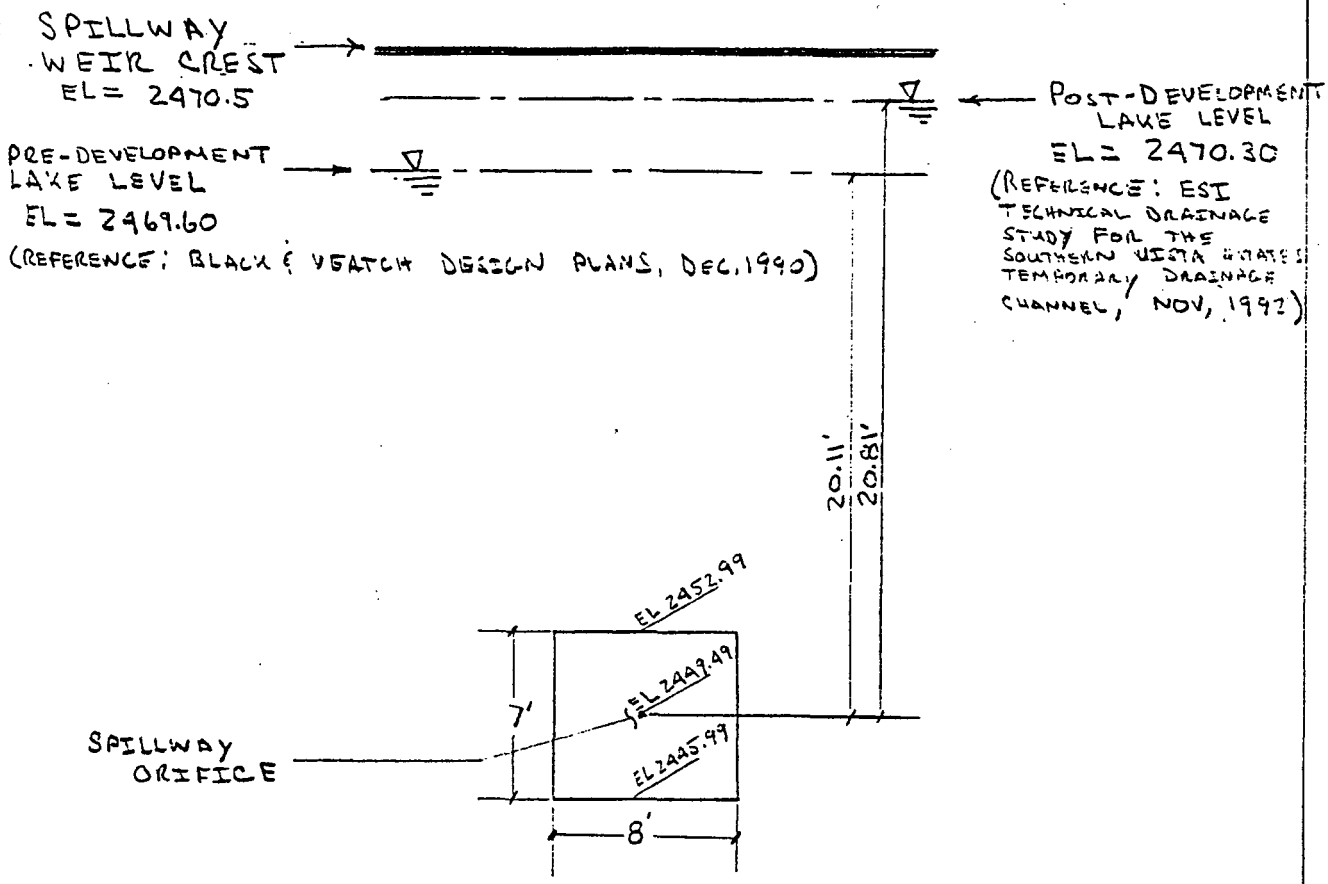
Thomas E. Davy, E.I.T.
Associate Engineer



Daniel J. Wonders, P.E.
Engineering Manager

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

UPPER FLAMINGO DETENSION BASIN OUTFALL ANALYSIS



ORIFICE EQUATION $Q = CA\sqrt{2(g)(h)}$

PRE-DEVELOPMENT

$$Q = (.6)(56)\sqrt{2(32.2)(20.11)} = 1209 \text{ cfs}$$

POST-DEVELOPMENT

$$Q = (.6)(56)\sqrt{2(32.2)(20.81)} = 1230 \text{ cfs}$$

RELATIVE INCREASE TO OUTFALL CHANNEL = 21 cfs ←

ESI ENGINEERS AND SURVEYORS, INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS

August 30, 1995
WO# 834-A580

Clark County Regional Flood Control District
301 East Clark Avenue, Suite 301
Las Vegas, Nevada 89101

ATT: Kevin Eubanks, P.E.
Assistant General Manager

RE: Flamingo Wash Diversion Channel

Dear Mr. Eubanks,

This letter is to certify that the Flamingo Wash Diversion Channel is in place, and appears to have been constructed in conformance with the approved channel improvement plans entitled, *"Improvement Plans of Southern Vista Estates, Drainage Channel,"* completed by Engineers and Surveyors, Inc., February 1993.

A recent field investigation was completed to certify the channel's location, cross sectional geometry and plan elevations. Depth of rip rap was unable to be verified. Soil borings were completed on the project prior to construction. These soil borings revealed a caliche layer was encountered three to six feet below the surface.

If you have any questions or comments regarding this project, please call me at (702) 248-6415.

Sincerely,
Engineers and Surveyors, Inc.

Byron J. Glenn, P.E.
Manager, Stormwater Management Division

7548 W. SAHARA AVE. • LAS VEGAS, NEVADA 89117 • (702) 248-6415 FAX 248-0626

FINAL DESIGN MEMORANDUM
FOR THE
SOUTHERN BELTWAY IMPROVEMENTS
RAINBOW BOULEVARD TO DURANGO DRIVE

Prepared for:

CLARK COUNTY PUBLIC WORKS
500 South Grand Central Parkway
Las Vegas, Nevada 89155

Prepared by:

SVERDRUP CIVIL, INC.
3811 West Charleston Boulevard
Suite 205
Las Vegas, Nevada 89102

And

POST, BUCKLEY, SCHUH & JERNIGAN, INC.
901 N. Green Valley Parkway, Suite 100
Henderson, Nevada 89014

Sverdrup Reference No.: 13690
PBS&J Reference No.: 51306.00
March 12, 1998

I. INTRODUCTION

Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) was subcontracted by Sverdrup Civil, Inc. (Sverdrup) to complete the hydrologic and hydraulic analysis portion of the design of the Southern Beltway from Rainbow Boulevard to Durango Drive (Beltway). Therefore the Design Memorandum is a combination of efforts performed by Sverdrup and PBS&J. This design memorandum accompanies the 100% set of improvement plans for Section 7B of the Las Vegas Beltway. It includes a discussion of the existing offsite hydrologic analysis, onsite hydrologic analysis as well as an analysis of the proposed drainage channel south of, and adjacent to, Section 7B of the Las Vegas Beltway Channel ("CH" Channel). Also included is a portion of the future lateral channel at Buffalo Road and interim cross-culvert facilities.

Section 7B of the Beltway Channel discussed within this report extends from approximately 2,500 feet west of Rainbow Drive to approximately 1500 feet west of Durango Drive (crossing Buffalo Road). The project is located between Sunset Road and Warm Springs Road to the north and south respectively (see **Figures 1 and 2**), and outlets into Section 7A of the Beltway Channel. More specifically, the project is located within the North Half (N 1/2) of Range 60 East (R 60 E), Township 22 South (T 22 S), Sections 3 and 4.

II. OFFSITE HYDROLOGIC ANALYSIS

In order to design Section 7B of the "CH" Channel to adequately function in the interim condition (prior to the complete construction of future laterals at Durango Drive and Buffalo Road), an offsite hydrologic analysis was completed to determine the interim 100-year flows from historic flow paths. These flows were used to design the interim facilities capable of conveying the 100-year flows. The interim flow rates and proposed facilities are discussed below.

A. Present Conditions Hydrology - Without Laterals

The interim offsite analysis for the Beltway was completed as suggested in the Memorandum from the United States Army Corps of Engineers (CORPS) to Clark County Regional Flood Control District dated December 9, 1996.

There are several established historical washes which intersect the proposed Beltway between Rainbow Boulevard and Durango Drive. These washes were identified using the *Southwest Las Vegas Valley Development Guidelines - Area I* (Willdan, 1996) and *Southwest Las Vegas Valley Development Guidelines - Area II* (PBS&J, 1996). These documents are both accepted by Clark County Public Works (CCPW) as well as the Clark County Regional Flood Control District (CCRFCD), and are assumed to present the most current flow rates for the existing conditions.

The existing drainage pattern between Rainbow Boulevard and Durango Drive consists of several small diverging gullies or washes on the Blue Diamond Fan Remnant. The active part of the fan is further south and impacts the Beltway east of Rainbow Boulevard. The interim flows between Durango Drive and Rainbow Boulevard do not include flow from the apex of the Blue Diamond Fan.

Figure 3 shows the various flow rates established within the several well-defined reaches shown in Southwest Las Vegas Valley Development Guideline – Area II (PBS&J, 1996). The copies of the pertinent figures showing these washes and flow rates are included in **Appendix I** for the existing conditions (to determine the flow rates) and the future conditions (to determine the future location of the Southern Beltway). The 100-year peak to peak flows were computed at each of the established washes, and were compared to the future condition flow rates in the main channel and in the laterals at Buffalo Drive and Durango Drive recommended by the CORPS. It can be noted that in all cases, the future flow rates established by the CORPS were significantly larger, therefore governing the design of the main channel and appropriate laterals.

B. Interim Drainage Facilities - South of the Beltway

In order to mitigate the 100-year existing flows, PBS&J and Sverdrup Civil Inc. proposes to utilize a combination of drainage facilities. These facilities consist of cross-culverts aligned at 30 degree angles to the "CH" Channel which are capable of conveying the existing flows into the "CH" Channel and several v-ditches along the southern edge of the east bound frontage road which discharge into the cross culverts or proposed laterals.

Additionally, there are several 24-inch culvert stubs that have been placed under the frontage road to route future flows for the future development to the "CH" Channel and eliminate the need for potential future pavement removal. The pipes have been placed at 400-660 foot spacing as required by Clark County Public Works. Exact flow rates for these pipes have not been determined, as future construction adjacent to the Beltway is subject to change, and predicting these flows are not possible, therefore no calculations are included for these laterals.

Table 1 summarizes all of the existing 100-year flows impacting the southern Beltway, and the interim facilities proposed to convey these flows into the Beltway Channel prior to the complete construction of upstream laterals and hydrologic facilities. The facilities are further described in the following subsections.



1200 600 0 1200 2400 3600

APPROX. SCALE: 1" = 1200'

POST, BUCKLEY, SCHUH & JERNIGAN

ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

FIGURE 3

TABLE 1

"V DITCHES" FOR ON-SITE INTERIM FLOWS

100 Year Flow (CFS)	Location	Side Slope H:V	Slope %	Velocity fps	Depth Ft.
140	West of Durango and South of FE line	3:1	1.85	6.32	2.72
2.80	From Durango to Buffalo, South of FE line	2:1	0.50	2.36	0.77
2.1	From Durango to Buffalo, South of FE line	2:1	0.88	2.70	.62
3.3	From Durango to Buffalo, South of FE line	2:1	1.22	3.45	.70
2.1	From Durango to Buffalo, South of FE line	2:1	1.14	2.97	0.59
3.0	From Durango to Buffalo, South of FE line	2:1	2.08	2.70	0.75
1.4	From Durango to Buffalo, South of FE line	2:1	1.08	2.60	0.52
95	From Durango to Buffalo, South of FE line	2:1	1.18	5.22	3.04
8.2	East of Durango, South of FE line	2:1	1.00	2.63	1.23
40	West of Durango, FE line to FW line	2:1	1.26	4.3	2.16
41	From Durango to Buffalo, FE line to FW line	2:1	0.67	3.41	2.45
11	From Durango to Buffalo, FE line to FW line	6:1	1.08	3.75	0.72
15	From Durango to Buffalo, FE line to FW line	6:1	0.61	3.07	0.90
21	From Durango to Buffalo, FE line to FW line	6:1	1.26	2.93	1.1
31	From Durango to Buffalo, FE line to FW line	3:1	1.26	3.75	1.66
31	East of Buffalo, FE line to FW line	4:1	0.70	2.84	1.66
23	East of Buffalo, FE line to FW line	6:1	1.18	2.92	1.15
4.0	West of Durango and North of FW line	2:1	0.50	2.57	0.88
3.1	From Durango to Buffalo, North of FW line	2:1	0.67	2.69	0.76
4.3	From Durango to Buffalo, North of FW line	2:1	0.75	3.05	0.84
5.3	From Durango to Buffalo, North of FW line	2:1	1.14	3.76	0.84

The interim drainage facilities may be divided into the following three areas: 1) The area west of Durango Drive; 2) the area between Durango Drive and Buffalo Drive; and 3) the area east of Buffalo Drive.

TABLE II

CULVERTS

100 YEAR FLOW (CFS)	LOCATION	FACILITY	SIZE FT.	SLOPE %	BELTWAY STATION
190	West of Durango Drive	RCP	3 – 36"	0.5	205+76.92 206+68.70
270	West of Durango Drive	Box Culvert	5' x 6'	2.36	"CH 1-A" 211+60.59
140	West of Durango Drive	RCP	48"	2.06	218+66.37
15	Durango Drive to Buffalo Drive	RCP	24"	4.32	242+60.37
21	Durango Drive to Buffalo Drive	RCP	24"	1.30	246+75.36
20	Durango Drive to Buffalo Drive	RCP	24"	3.61	249+10.36
50	Durango Drive to Buffalo Drive	RCP	36"	10.50	252+19.54
18	Durango Drive to Buffalo Drive	RCP	24"	3.03	255+60.36
21	Durango Drive to Buffalo Drive	RCP	24"	3.51	262+60.30
95	Durango Drive to Buffalo Drive	RCP	42"	9.62	273+52.95
31	East of Buffalo Drive	RCP	30"	3.00	289+77.38
36	East of Buffalo Drive	RCP	30"	4.00	296+24.43
23	East of Buffalo Drive	RCP	24"	1.86	297+34.78
20	East of Buffalo Drive	RCP	24"	1.18	302+85.39
168	East of Buffalo Drive	Box Culvert	6' x 4'	1.80	303+70
168	East of Buffalo Drive	Box Culvert	6' x 4'	2.50	304+35.34
40	Across Durango DR	RCP	30"	0.56	"DR" 24+30
31	Across Buffalo DR	RCP	30"	1.11	"BF" 24+10

The interim drainage facilities may be divided into the following three areas: 1) The area west of Durango Drive; 2) the area between Durango Drive and Buffalo Drive; and 3) the area east of Buffalo Drive.

West of Durango Drive

The area west of Durango Drive contains four well-defined washes. Based on the areas contributing to the washes, the proposed flows are 190 cfs, 270 cfs, 70 cfs and 70 cfs from west to east respectively. The 190 cfs flow rate contained within the westernmost wash is proposed to be conveyed within three 36-inch culverts under the proposed eastbound frontage road (See section V, Methodology for Culvert Analysis). The culverts are permanently below grade and do not cause additional inundation in areas. Areas of inundation and grading for culverts outside of the Beltway right-of-way will be located within a permanent drainage easement (see **Appendix IV**). The culverts will discharge into the "CH1" channel at a 45-degree angle to minimize future channel disturbance.

The 270 cfs generated in the center portion of the drainage area will be conveyed to the channel by a 5' W x 6' H Reinforced Concrete Box (RCB) culvert. (See section section V, Methodology for Culvert Analysis).

The 140 cfs generated within the remaining two washes will be captured within a graded v-ditch with 2:1 side slopes approximately parallel to, and south of the eastbound frontage road within a permanent drainage easement. A normal depth rating curve for flow within the v-ditch is included in **Appendix II**. The v-ditches are sized to convey the maximum amount of flow. The v-ditch discharges into a 48-inch lateral pipe, and is conveyed to the "CH1" Channel. Calculations for this culvert are included in **Appendix IV**.

Durango Drive to Buffalo Drive

The offsite area between Durango Drive and Buffalo Drive generates flows, which impact the proposed Beltway within six well-defined washes. The total peak to peak flow established within the main channel at the Buffalo Drive intersection (396-cfs) is less than the future 100-year design discharge that is recommended by the CORPS (1,900-cfs). Therefore the main channel within the reach from Durango Drive to Buffalo Drive Sta. 237+00 to Sta. 279+88 is designed using a 100-year flow rate established by the CORPS. The interim facilities are designed utilizing the existing flow rates established within Southwest Las Vegas Valley Development Guidelines – Area II (PBS&J, 1996). A normal depth rating table is included in **Appendix II** which indicates that the maximum amount of flow that can be conveyed within a v-ditch with 2:1 side slopes. The 100-year flow in each of the six washes is 215 cfs, 15 cfs, 21 cfs, 50 cfs, 40 cfs and 55 cfs from the west to east respectively. The maximum capacity of the proposed v-ditch dictates that only the flows within the two easternmost washes (95-cfs) can be conveyed within the v-ditch.

The v-ditch discharges into the Buffalo Drive lateral via a 42-inch pipe at Station 273+52.95 (see calculations included in **Appendix IV**). All portions of the v-ditch that are located outside of the Beltway Right-of-Way will be located within a permanent drainage easement.

The remaining four washes will be conveyed via proposed interim RCP drainage culverts under the frontage road and discharged into the "CH" Channel. (See section V, Methodology for Culvert Analysis).

East of Buffalo Drive

The 100-year flow rates impacting the area approximately 3000 ft to the east of Buffalo Drive impact the proposed Beltway within two historically well-defined washes. The first wash contains an existing 100-year flow rate of 36 cfs, and the second wash contains an existing 100-year flow of 336 cfs. Both of these washes will be conveyed into the "CH" Channel via culverts under the eastbound frontage road, as the next available lateral discharging into the "CH" Channel is at Rainbow Boulevard (outside of the study area). In order to convey these flows to the "CH" Channel, discussions with the CORPS and CCRFCD resulted in determining that the most acceptable solution was to have two separate 6'W x 4'H RCB's spaced such that the flow disturbance would be as minimal as possible (See section V, Methodology for Culvert). Additionally, there are several more defined washes which are located east of the two washes mentioned above and west of Rainbow Boulevard that impact the Section 7A of the Beltway to the East (Rainbow Boulevard to Decatur Drive) that were analyzed by VTN of Nevada. The flows from these washes are captured within a v-ditch, and conveyed to the east, as proposed in Section 7A by VTN.

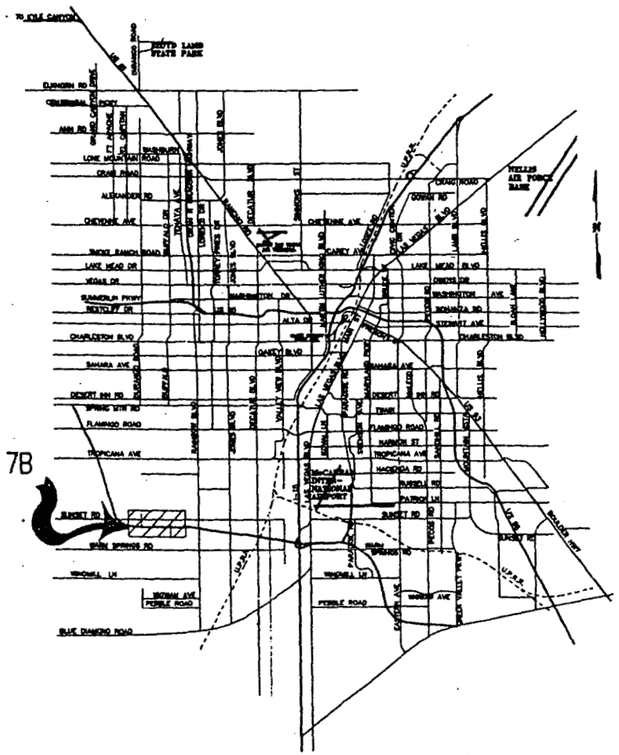
III. ONSITE HYDROLOGIC ANALYSIS

On-site hydrologic analysis was performed to determine the interim runoffs for 100 year and 10 year storms into the "CH" channel. As required in CCRFCD Section 304.3, **Rational Method** was used to determine the flows for basins/ sub-basins with a contributing areas less than 20 acres and **SCS TR-55** used to determine the flows for basins/ sub-basins with a contributing area more than 20 acres. Area for the contributing basins was determined from the drainage/roadway plans using CADD. For Rational Method Coefficient of discharge (C_{100} and C_{10}) and Rainfall Intensity (I_{100} and I_{10}) was determined from CCRFCD Table-601 and Figure-517 respectively. For SCS TR-55 method Type II storm was considered. Total rainfall (P_{100} and P_{10}), and Unit Peak Discharge q_u was determined from CCRFCD Fig. 512 and Fig, 604 respectively. Time of concentration was calculated using CCRFCD equations 601 and 602 and a minimum time of concentration of 5 minutes (CCRFCD Section 602.1) was used.

18.0

VOLUME 1 OF 4

DEPARTMENT OF PUBLIC WORKS



Vicinity Map
NOT TO SCALE

"Progress as Promised"

1997

SOUTHERN SEGMENT / AS VEGAS BELTWAY-SECTION 7B

Clark County Regional Flood Control District
Approved:
Gale Wm. Fraser, II
Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

County Manager
Dale W. Askew

IMPROVEMENT PLANS FOR
LAS VEGAS BELTWAY DRAINAGE FACILITIES
SECTION 7B - DR
DURANGO DR. TO RAINBOW BLVD.
FUNDED BY
MASTER TRANSPORTATION IMPROVEMENT BONDS
AND CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

County Commissioners

Yvonne Atkinson Gates, Chair
Lorraine T. Hunt, Vice Chair
Erin Kenny
Mary J. Kincaid
Lance M. Malone
Myrna Williams
Bruce L. Woodbury

Director of Public Works
Approved:
M.J. Manning
M.J. Manning R.P.E. 7299

NOTE: ROADWAY GRADING PLANS INCLUDED HEREIN

Sverdrup CIVIL, INC.
3811 WEST CHARLESTON BOULEVARD, SUITE 205
LAS VEGAS, NEVADA 89102-1846
PHONE (702) 870-2130
FAX (702) 870-1731

AGENCY	PLANS REVIEWED BY	DATE
SPRINT TELEPHONE COMPANY		5-11-98
LAS VEGAS VALLEY WATER DISTRICT		5-21-98
SOUTHWEST GAS COMPANY		5-11-98
NEVADA POWER COMPANY		5-14-98
CLARK COUNTY SANITATION DISTRICT		5/20/98
COMMUNITY CABLE TV		

DEPARTMENT OF PUBLIC WORKS	BY	DATE
DEPUTY DIRECTOR FOR PROFESSIONAL SERVICES		5/12/98
DEPUTY DIRECTOR FOR FIELD OPERATIONS		
COMMUNITY DEVELOPMENT DIVISION		5/12/98
CONSTRUCTION MANAGEMENT DIVISION		5/12/98
DESIGN ENGINEERING DIVISION		5-12-98
MAINTENANCE MANAGEMENT DIVISION		5/12/98
TRAFFIC MANAGEMENT DIVISION		

REVISIONS		
NUMBER	DESCRIPTION	DATE
1	ADDENDUM #2	7/31/98

DESIGN ENGINEERING DIVISION

COVER SHEET

N

Scale in Feet: 25' 0 50' 100'

FOR PLAN AND PROFILE OF "CH1" CHANNEL SEE SHEETS DF-7 AND DF-8

ACCESS LIMIT

220+00

225+00

℄ "CH1"

℄ "CH1B"

"CH1B" 222+60.38 PC

TOP OF CUT

TOP OF RIPRAP LINING SEE SHEET TS-1

TOE OF SLOPE

MATCHLINE CH1B 230+00.00

N 76°37'45" E

"CH1B" 222+02.00 END TRANSITION BEGIN TEMP. 6'X7' SS=2:1 TRAPEZOIDAL CHANNEL SEE DETAIL SHEET TS-1

"CH1B" 221+40.23 POT = "CH1" 221+42.00 POT END 8'X8' RCB BEGIN TRANSITION TO TEMP. 5'X7' SS=2:1 TRAPEZOIDAL CHANNEL

EXIST 24" SEWER LINE

EXIST. UTILITY CONDUITS TO BE RELOCATED BY OTHERS (NIC)

EXIST 16" GAS LINE TO BE RELOCATED BY OTHERS (NIC)

AL-012320-LW

176-04-201-001 R/W CLARK COUNTY

176-04-201-003 POLLACI OLGA V&V COM PPTY TR

ACCESS LIMIT

EX EDGE AC

℄ "DR"

EX SSMH RIM = 2593.86 INV = 2580.19

EX SSMH RIM = 2595.86 INV = 2583.68

EX CABLE TV BOX ELEV. = 2593.94

EX ELECTRICAL MH RIM = 2594.56

EX TELEPHONE MH RIM = 2595.37

154.00'

60'

2590

2595

(NIC)

B 1 "CH1" 218+60.13, 15' RT TO "CH1" 217+94.64, 149.68' RT — INSTALL 152 LF, 48" RCP (CLASS V) W/ NDOT RCP HEADWALL (STD. R-2.5.2, 45° SKEW). SEE DETAIL B, DETAIL DF-10

1 "CH1B" 221+40.23 TO "CH1B" 221+00.00 — CONSTRUCT TEMP. 5'x7' SS=2:1 TRAP. DITCH (NIC)

2 "CH1B" 229+86.00, 70.0 RT TO — SEE DETAIL SHEET TS-1 — U.H.E. = 2575.13, L.H.E. = 2573.00 (NIC)

3 "CH1B" 229+95 LT — CONSTRUCT EARTH BERM (NIC)

30 CONSTRUCT 4' CHAIN LINK FENCE AT CATCH POINT AROUND END OF RCB (NIC)

32 CONSTRUCT 4' CHAIN LINK FENCE AT CATCH POINT — SEE SHEET TS-1 (NIC)

35 "CH1B" 221+54.19 CONCRETE ENCASE EXIST. 24" SEWER LINE 35' LT. & 35' RT., 70 LF (NIC)

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
C2	3000.00'	691.35'	347.21'	13°12'13"

NOTE: STUB-OUTS ARE FOR FUTURE MISC. DRAINAGE NEEDS

"CH" CHANNEL PLAN

"CH" CHANNEL PROFILE

EXIST GROUND

TOP OF RIPRAP LINING

HGL

PROPOSED GRADE

"CH1" CHANNEL 8'X8' RCB SEE SHEET DF-8 (NIC)

2579.43 GRADE BREAK

-0.85%

-1.34%

"CH1B" 221+40.23 P.V.I. = "CH1" 221+42.00 P.V.I. INV. ELEV. = 2579.43 END 8'X8' RCB BEGIN TRANSITION TEMP. 5'X7' SS=2:1 TRAP. DITCH

"CH1B" 221+54.19 EXISTING 24" SEWER ENCASED IN CONC. EXIST. ELEC. CABLE & TEL. (NIC)

"CH1B" 222+02.00 END TRANSITION BEGIN TEMP. 5'X7' SS=2:1 TRAPEZOIDAL DITCH

"CH1B" 229+95 LT CONSTRUCT EARTH BERM (NIC)

"CH1B" 230+00.00 INV. ELEV. = 2567.91

TEMP. 5'x7' SS=2:1 TRAP. DITCH

869.77' OF TEMP. 5'x7' SS=2:1 TRAP. DITCH (NIC)

MATCHLINE CH1B 230+00.00

215+00 216+00 217+00 218+00 219+00 220+00 221+00 222+00 223+00 224+00 225+00 226+00 227+00 228+00 229+00 230+00

2595 2590 2585 2580 2575 2570 2565 2560 2555

1	7/31/98	ADDENDUM #2	DEP

LAS VEGAS BELTWAY DRAINAGE FACILITIES-SECTION 7B-DR

POST, BUCKLEY, SCHUH & JERNIGAN

Sverdrup CIVIL, INC.

SCALE: HORIZ: 1" = 50'

SHEET No: DF-1

MATCHLINE CH1B 230+00.00

MATCHLINE CH 245+00.00

"CH" 240+60.17

INSTALL 37 LF. 24" RCP W/ TYPE III MANHOLE (CCP.W) & PLUG, STUB OUT THROUGH 18'X1 10' RECT. CHANNEL SEE DETAIL S, SHEET DF-12

"CH" 242+85.66

INSTALL 37 LF. 24" RCP (TYPE III) STUB OUT THROUGH 18'X 10' RECT. CHANNEL
U.I.E. = 2560.50
L.I.E. = 2554.42

"CH1B" 236+25.00 BEGIN TRANSITION TEMP. 5'x7' SS-2:1(1.5:1) TRAPEZOIDAL CHANNEL TO 18'X10' RECT CHANNEL (NIC)

TOP OF RIPRAP LINING SEE SHEET TS-1 (NIC)

"CH1B" 237+00.00 P/I
"CH" 257+00.00 P/I
END TRANSITION
BEGIN 18'X10' RECT. CHANNEL
SEE DETAIL SHEET TS-3

TOP OF CUT

TYPE III MANHOLE (CCP.W)

FUTURE RCP

TOE OF SLOPE

℄ "CH1B"

N 76°57'45" E

℄ "CH" CHANNEL S 89°50'02" E

"CH1B" 231+00.00 P/I
END SLOPE TRANSITION (NIC)
BEGIN 1.5:1 DITCH SLOPE

ACCESS LIMIT

176-04-201-007

R/W

176-04-201-006
TSAI JOESPH

"CH1B" 230+50.00 P/I
END 2:1 DITCH SLOPE
BEGIN SLOPE TRANSITION
(NIC)

CONSTRUCT RECTANGULAR CHANNEL ACCESS STEPS & 4' FOOT SWING GATE, SEE DETAILS SHEETS TS-3

"CH1B" 231+00.00 TO "CH1B" 237+00.00 CONSTRUCT TEMP. 5'x7' SS-2:1(1.5:1) TRAP. DITCH (NIC)

"CH" 237+00.00 TO "CH" 257+72.57 CONSTRUCT 18'X 10' RECTANGULAR CHANNEL

"CH" 237+00.00 INSTALL BULKHEAD AT END OF RCB & BACKFILL TRENCH, SEE SHEET DS-7 FOR DETAILS

CONSTRUCT 48" CHAIN LINK FENCE AT TOP OF CHANNEL. SEE SHEET TS-1

176-04-201-008
USA

0' 25' 50' 100'
Scale in Feet

"CH" CHANNEL PLAN

NOTE
STUB OUTS ARE FOR FUTURE MISC. DRAINAGE NEEDS.

"CH" CHANNEL PROFILE

"CH1B" 230+56± ℄ FUTURE RAMP "DR2"

"CH1B" 229+95± CONSTRUCT EARTH BERM (NIC)

TOP OF RIPRAP LINING (NIC)

TOP OF RECTANGULAR "CH" CHANNEL

EXIST GROUND

"CH1B" 237+00.00 P/I = "CH" 257+00.00 P/I INV. ELEV = 2558.53 END TRANSITION BEGIN 18'X10' RECT CHANNEL

HGL

-1.34%

"CH1B" 230+00.00 INV. ELEV = 2567.91 (NIC)

PROPOSED GRADE

-0.87%

2558.53 GRADE BREAK

"CH1B" 236+25.00 BEGIN TRANSITION TEMP. 5'x7' SS-2:1(1.5:1) TRAP. CHANNEL TO 18'X10' RECT CHANNEL (NIC)

24" RCP INV. ELEV = 2554.64

24" RCP INV. ELEV = 2554.42

"CH" 245+00.00 INV. ELEV = 2551.55

700.00' OF TEMP. 5' BOTTOM TRAP. DITCH (NIC)

800.00' OF 18'x10' RECTANGULAR CHANNEL

2585 2580 2575 2570 2565 2560 2555 2550 2545

230+00 231+00 232+00 233+00 234+00 235+00 236+00 237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00

MATCHLINE CH1B 230+00.00

MATCHLINE CH 245+00.00

7/31/98	ADDENDUM #2	DEP	

CLARK COUNTY

LAS VEGAS BELTWAY DRAINAGE FACILITIES-SECTION 7B-DR

DURANGO TO RAINBOW "CH" CHANNEL

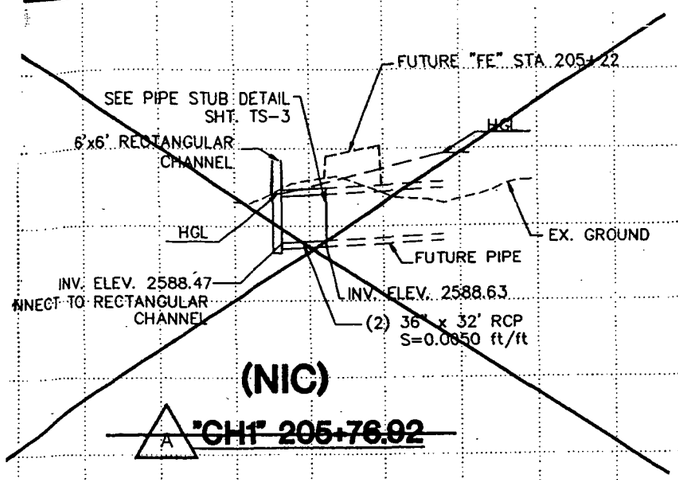
REGISTERED PROFESSIONAL ENGINEER • STATE OF NEVADA • DAVID E. [illegible]

POST, BUCKLEY, SCHUH & JERNIGAN

Sverdrup CIVIL, INC.

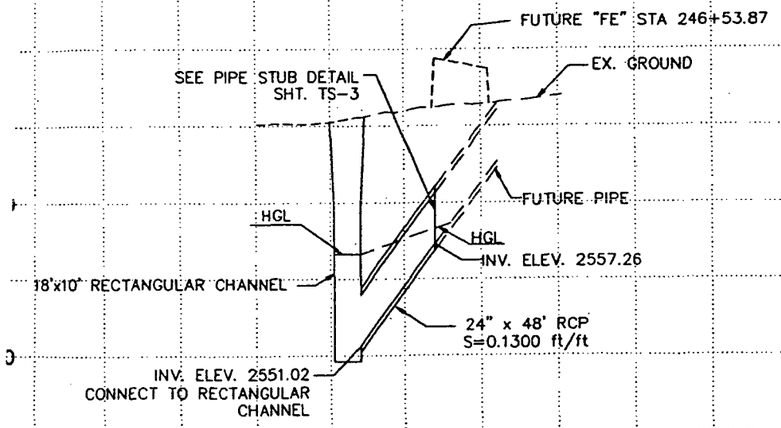
SCALE HORIZ: 1" = 50'

SHEET No DF-2

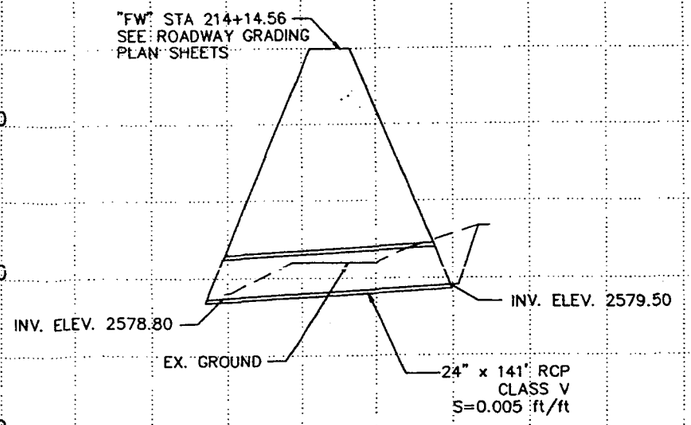


(NIC)

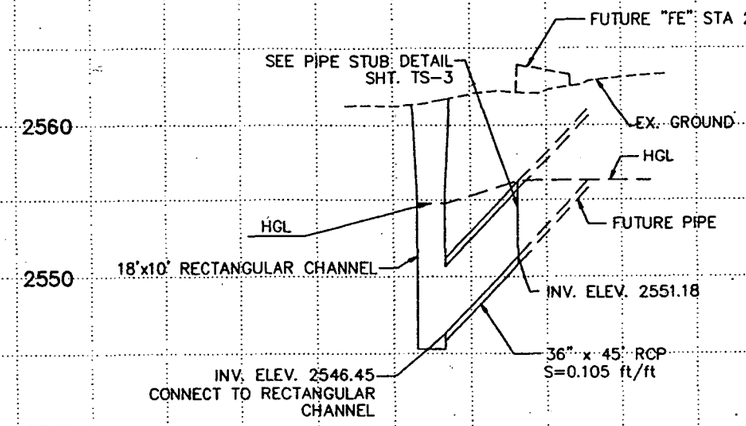
A "CH1" 205+76.92



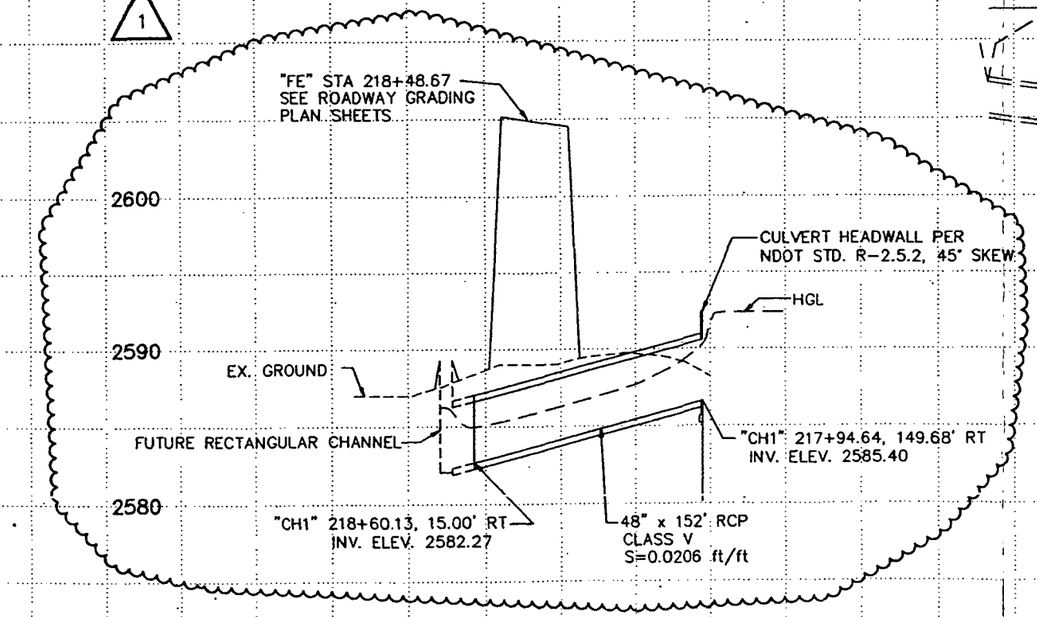
G "CH" 246+75.36



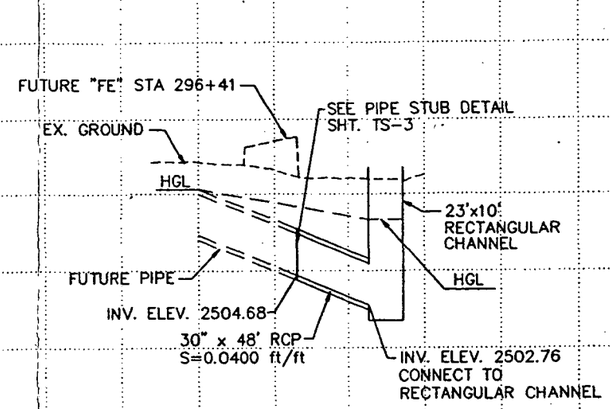
C "FW" 213+93.62 54.86' RT TO "FW" 214+42.39 76.97' LT



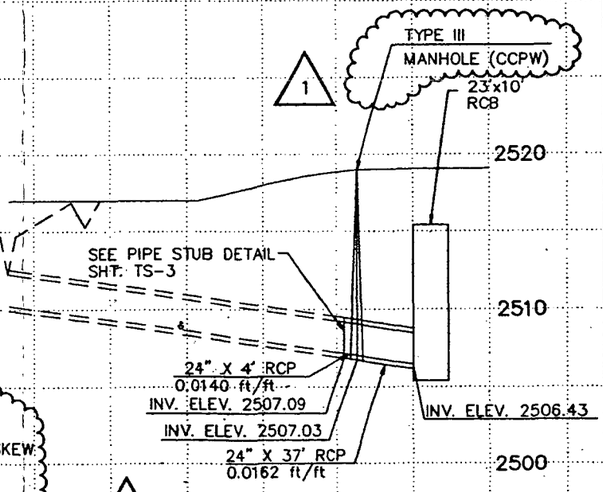
I "CH" 251+98.43



B "CH1" 218+66.37



N "CH" 296+24.43



Z "CH" 291+85.02

NOTES

1. RCP SHALL BE CLASS III, UNLESS OTHERWISE NOTED
2. RCP BEDDING SHALL BE CLASS B PER NDOT STD. PLAN R-1.1.6, UNLESS OTHERWISE NOTED

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 7B

1	7/31/98	ADDENDUM #2	DEP

CLARK COUNTY

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-DR

Sverdrup CIVIL, INC.
3811 W. CHARLESTON BLVD. SUITE 205
LAS VEGAS, NEVADA 89102-1846
PHONE: (702) 870-2130

SCALE HORIZ: 1" = 50'

SHEET No DF-10

DEPARTMENT OF PUBLIC WORKS



Vicinity Map

NOT TO SCALE

CLARK COUNTY NEVADA

"Progress as Promised"

CONFORMED

1999

IMPROVEMENT PLANS FOR

LAS VEGAS BELTWAY FRONTAGE ROADS

SECTION 7B-RD

DURANGO DR. TO RAINBOW BLVD.

FUNDED BY

MASTER TRANSPORTATION IMPROVEMENT BONDS

County Commissioners

Bruce L. Woodbury, Chairman
Erin Kenny, Vice Chair
Mary J. Kincaid
Lance M. Malone
Myrna Williams
Yvonne Atkinson Gates
Dario Herrera

County Manager

Dale W. Askew

Director of Public Works

Approved:

M.J. Manning R.P.E. 7299

Sverdrup
CIVIL, INC.
5450 WEST SARARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE (702) 870-2100
FAX (702) 870-1731

AGENCY	PLANS REVIEWED BY	DATE
SPRINT TELEPHONE COMPANY		4-27-99
LAS VEGAS VALLEY WATER DISTRICT		5/13/99
SOUTHWEST GAS COMPANY		4-27-99
NEVADA POWER COMPANY		4-27-99
CLARK COUNTY SANITATION DISTRICT		4/27/99
COX COMMUNICATIONS		4/27/99

DEPARTMENT OF PUBLIC WORKS	BY	DATE
DEPUTY DIRECTOR FOR PROFESSIONAL SERVICES		5.18.99
DEPUTY DIRECTOR FOR FIELD OPERATIONS		
COMMUNITY DEVELOPMENT DIVISION		5-18-99
CONSTRUCTION MANAGEMENT DIVISION		5/18/99
DESIGN ENGINEERING DIVISION		5.18.99
MAINTENANCE MANAGEMENT DIVISION		5/18/99
TRAFFIC MANAGEMENT DIVISION		5/18/99
COUNTY SURVEYOR'S OFFICE		5/18/99

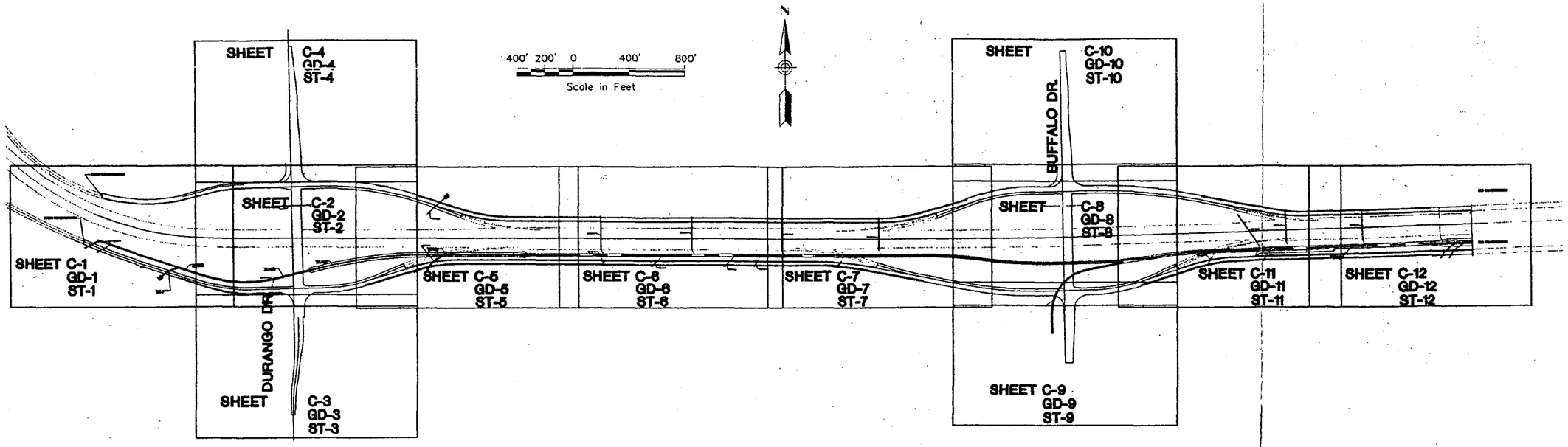
REVISIONS NUMBER	DESCRIPTION	DATE
1		

DAVID A. POTTER — PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 8881 — CIVIL

DESIGN ENGINEERING DIVISION

COVER SHEET

L—1551



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STOCKPILE BORROW SOURCE

137. STOCK PILE INDEX — SP-1
138. STOCK PILE #1 — SP-2
139. STOCK PILE #2 — SP-3
140. STOCK PILE #3 — SP-4
141. STOCK PILE #4 — SP-5
142. STOCK PILE #5 & #6 — SP-6
143. STOCK PILE #7 — SP-7
144. STOCK PILE #8 (SHEET 1 OF 2) — SP-8
145. STOCK PILE #8 (SHEET 2 OF 2) — SP-9

MODIFICATIONS OF SOUND WALLS

1 146. CONSTRUCTION PLAN — STR-01
147. SOUND BARRIER WALL TYPE B — STR-02
148. SOUND BARRIER WALL TYPE C — STR-03
2 149. TEMPORARY PORTABLE PRECAST CONCRETE BARRIER RAIL — STR-04

REV No	DATE	DESCRIPTION	APPROVED
1	5/99	Addendum #1	DEP
2	6/99	Addendum #2	DEP

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

SHEET LAYOUT

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

Overdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: YC
DRAWN BY: HCM
CHECKED BY: DEP
DATE: 4/19/99

SCALE
HORIZ: 1" = 400'
VERT: N/A
FIELD BOOK NONE

DRAWING No L-1 OF 1
Sht. No 2
L-1550

SOUTHERN SEGMENT LAS VEGAS BELTWAY SI

P: \JOB\01365\00\DWG\C5100005

176-05-501-013

176-05-501-014
ADAMS TRUST

176-05-501-015
TATUM PHILLIP D TRS

176-05-501-016
USA
ABANDON EXIST. 24" RCP

BEGIN CONSTRUCTION
SECTION 7B "FW" 206+25.67 POC AHD =
SECTION 8 "FNB" 157+70.36 POC BK, 12' RT =
"A" 206+00.00 POC, 137.16' LT

N

50' 25' 0' 50' 100'
Scale in Feet

"A" 206+00.00 POC

BEGIN CONSTRUCTION
SECTION 7B "FE" 204+66.58 POC AHD =
SECTION 8 "FSB" 166+87.78 POC BK =
"A" 206+00.00 POC, 211.43' RT

"FW" +00.00
34.00 LT
ELEV 2585
BEGIN V-DITCH

"FW" +00.00
34.00 LT
ELEV 2586
END V-DITCH

FRONTAGE ROAD WESTBOUND

"FW" +16.50
14.60 RT
ELEV 2586
BEGIN TOE OF SLOPE V-DITCH

"FW" +26.00
14.60 RT

"FW" +69.00
14.60 RT

"FW" +65.00
15.20 RT

"FW" +71.60
45.00 RT
ELEV 2583.5
END TOE OF SLOPE V-DITCH
BEGIN 20' WIDE V-DITCH

"FW" +26.00
89.00 RT

ABANDON 24" PIPE CULVERT
CONSTRUCT CONCRETE PLUG
SEE SHEET DD-2

EXIST. TOE OF SLOPE

"A"

FUTURE BELTWAY (NIC)

"CH1" 205+70.00
BEGIN 6'x6' REC. CHANNEL

TOE OF SLOPE

"CH1" CHANNEL
SEE DF PLANS

FRONTAGE ROAD EASTBOUND

176-05-601-002
PHAROAH'S MOUNTAIN LLC

"FE" 206+50
25.00 RT
ELEV 2955
END V-DITCH

"FE" 207+50
20.00 RT
ELEV 2956
ANGLE PT V-DITCH

"FE" 208+50
20.00 RT
ELEV 2956.5
BEGIN V-DITCH

176-05-601-001

176-05-601-004
PHAROAH'S MOUNTAIN LLC ETAL

TOE OF SLOPE

DRAINAGE EASE.

EXIST. TOE OF SLOPE

176-05-601-006
USA

"FE" +00.00
60.00 RT
ELEV 2596.00
BEGIN 20' WIDE V-DITCH

AA "CH1" 206+68.70, 3.00 RT TO "CH1" 205+93.71, 77.98 RT

A "CH1" 205+76.92, 3.00 RT TO "CH1" 205+02.10, 77.28 RT

CC SEE SHEET DF-1

10 CONSTRUCT "V" DITCH

CONSTRUCT 106 LF, 36" RCP (CLASS III), W/ NDOT RCP HEADWALL (STD. R-2.5.1, 30° SKEW) THROUGH 6'x6' RECT. CHANNEL. SEE DETAIL AA SHEET DP-3. (SEE DD-5 FOR INLET GRADING DETAIL).

CONSTRUCT 107 LF, (2) 36" RCP (CLASS III), W/ NDOT RCP HEADWALL (STD. R-2.5.1, 30° SKEW) THROUGH 6'x6' REC. CHANNEL. SEE DETAIL A — SHEET DP-1 (SEE DD-5 FOR INLET GRADING DETAIL).

MATCH LINE "A" 215+00
SEE SHT. GD-2

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 7B

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD
GRADING AND DRAINAGE
"A" 206+00 TO "A" 215+00

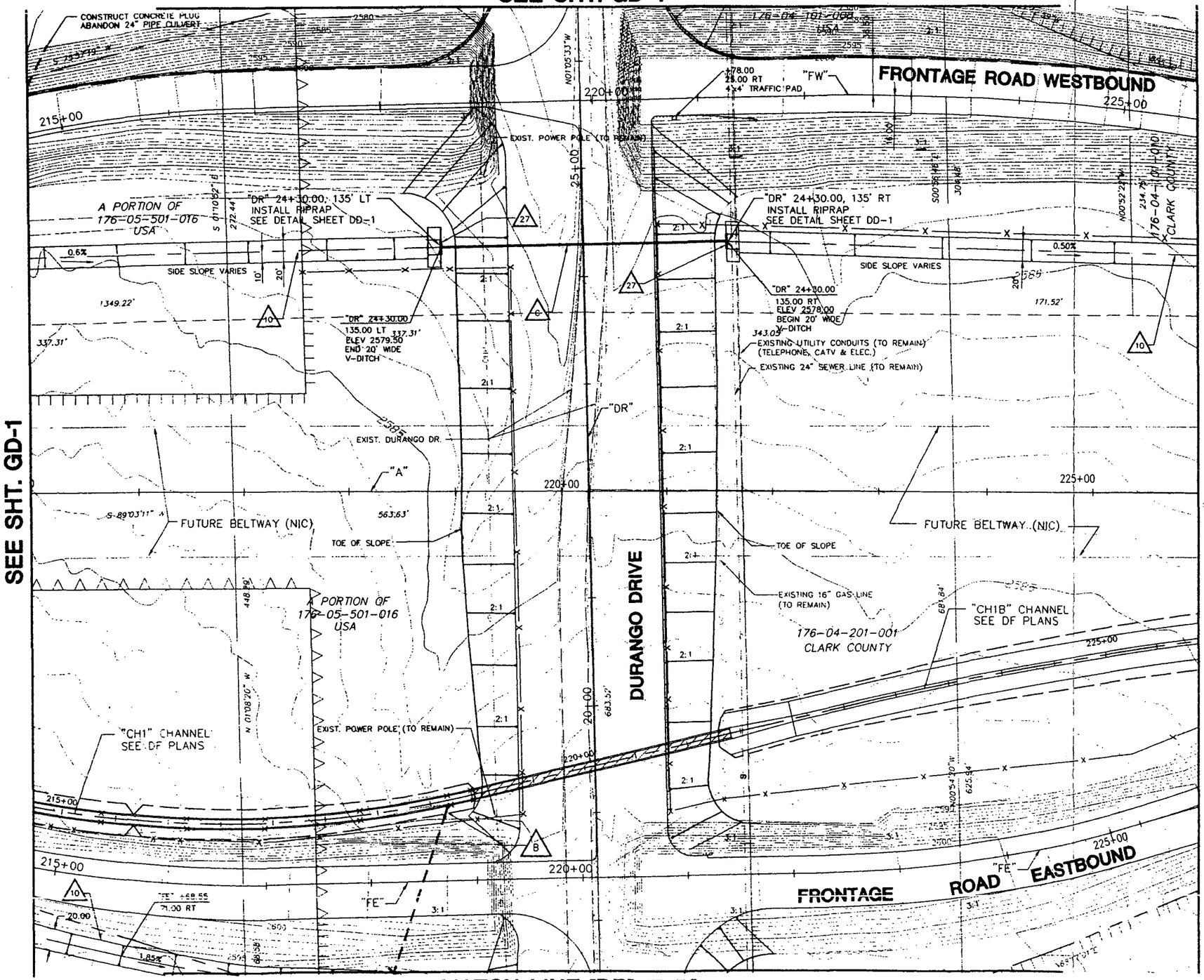
Sverdrup CIVIL, INC.
3450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: YC
DRAWN BY: HCM
CHECKED BY: DEP

SCALE
HORIZ: 1" = 50'
VERT: N/A
FIELD BOOK NONE

DRAWING No
GD-1
OF 12
Sht. No 55

MATCH LINE "DR" 26+50
SEE SHT. GD-4



MATCH LINE "A" 215+00
SEE SHT. GD-1

MATCH LINE "A" 226+00
SEE SHT. GD-5

MATCH LINE "DR" 17+50
SEE SHT. GD-3

N

50' 25' 0 50' 100'
Scale in Feet

B — SEE SHEET DF-2

C — "DR" 24+30, 135.00 LT TO "DR" 24+30, 135.00 RT CONSTRUCT 270 LF, 30" RCP (CLASS V). SEE SHEET DP-2

10 — CONSTRUCT "V" DITCH

27 — CONSTUCT CULVERT HEADWALL PER STD. DWG. NO. R-2.5.1

NOTE:
SEE DETOUR PLAN SHEETS
STC-1 THROUGH STC-7

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD
GRADING AND DRAINAGE
"A" 215+00 TO "A" 226+00

Svordrup CIVIL, INC.
3450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: YC
DRAWN BY: HCM

SCALE
HORIZ: 1" = 50'
VERT: N/A
FIELD BOOK NONE

DRAWING No
GD-2
OF 12

D:\3690\1400\DWG\C5

MATCH LINE "A" 226+00
SEE SHT. GD-2

MATCH LINE "A" 240+00
SEE SHT. GD-6

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 7B

176-04-101-011
ALFRED DERI W &
GEORGINA J TRS

176-04-101-012
TOM WEBSTER M H
REVOCABLE LIV TR

176-04-101-005

EXIST. TOE OF SLOPE

EASEMENT

"FW" 230+00

OLD R/W

"FW" +97.00
89.00 RT
ELEV 2574.48
END 20' WIDE
V-DITCH

"FW" +18.38
78.81 RT
ELEV 2573.37
END 20' WIDE
V-DITCH

PT "FW" +56.34
73.00 RT

PC "FW" +47.18
81.60 RT

R = 300

"FW" +00.00
35.00 LT
ELEV 2573
BEGIN CUT SECTION V-DITCH

TOP OF CUT

"FW" +00.00
31.00 LT
ELEV 2571
END CUT SECTION V-DITCH

TOE OF SLOPE

FRONTAGE ROAD WESTBOUND

"FW" +75.00
45.00 RT
ELEV 2575.50
BEGIN TOE OF
SLOPE V-DITCH

"FW" +65.00
24.00 RT.

"FW" +58.00
14.50 RT
ELEV 2571

FUTURE BELTWAY & RAMPS (NIC)

"A"

"CH1B" 231+10.39
9.00 RT
END 6'x4' RCB

"CH1B" 230+80.43 PT
26.30 RT

"CH1B" 230+00.80 PC
111.58 RT
BEGIN 6'x4' RCB WITH
HEADWALL

"FE" +12.00
58.00 RT
ELEV 2576.00
BEGIN CUT SECTION V-DITCH

"FE" +35.00
37.00 RT

"FE" +63.00
40.00 RT

"FE" +51.60
31.00 RT.
ELEV 2577.75

"FE" +52.00
31.00 RT
ELEV 2576.00
END CUT
SECTION V-DITCH

"FE" +25.00
31.00 RT
ELEV 2577.00
BEGIN CUT SECTION V-DITCH

EXIST. CHANNEL (TO REMAIN)

FRONTAGE ROAD EASTBOUND

176-04-201-003
POLLACI OLGA V&V COM PPTY TR

176-04-201-004
USA

176-04-201-006
TSAL JOESPH

176-04-201-007

EXIST TOE OF SLOPE

CURVE TABLE				
CURVE	RADIUS	LENGTH	TANGENT	DELTA
2	200.00	118.40	60.99	33°55'11"

D "FW" 230+18.38, 78.81 RT TO "FW" 231+10.00, 73.00 LT
CONSTRUCT 180 LF, 30" RCP (CLASS V)
CONSTRUCT TYPE 2A DROP INLET WITH CONCRETE APRON (SEE SHEET DD-7).
CONSTRUCT CULVERT HEADWALL.
SEE SHEET DD-6 FOR OUTLET DETAIL
SEE DETAIL D SHEET DP-1

E "CH1B" 231+10.39, 9.00 RT TO "CH1B" 230+00.80, 111.58 RT
CONSTRUCT 153 LF, 6'x4' RCB WITH TYPE I (NDOT STD. B-20.1, B-20.1.5, B-20.1.6, 30° SKEW) INTO TRAPEZOIDAL CHANNEL
SEE DETAIL E, SHEET DP-2.
SEE SHEET DD-4 FOR OUTLET DETAIL

10 CONSTRUCT "V" DITCH

11 "FE" 229+50.00, 24' LT
"FE" 232+69.00, 23' RT
12' WIDE DOUBLE SWING GATE PER NDOT STD. DWG R-6.3.3.8

12 INSTALL 48" CHAIN LINK FENCE

N
Scale in Feet
50' 25' 0 50' 100'

3690\4400\DWG\C5100

CLARK COUNTY

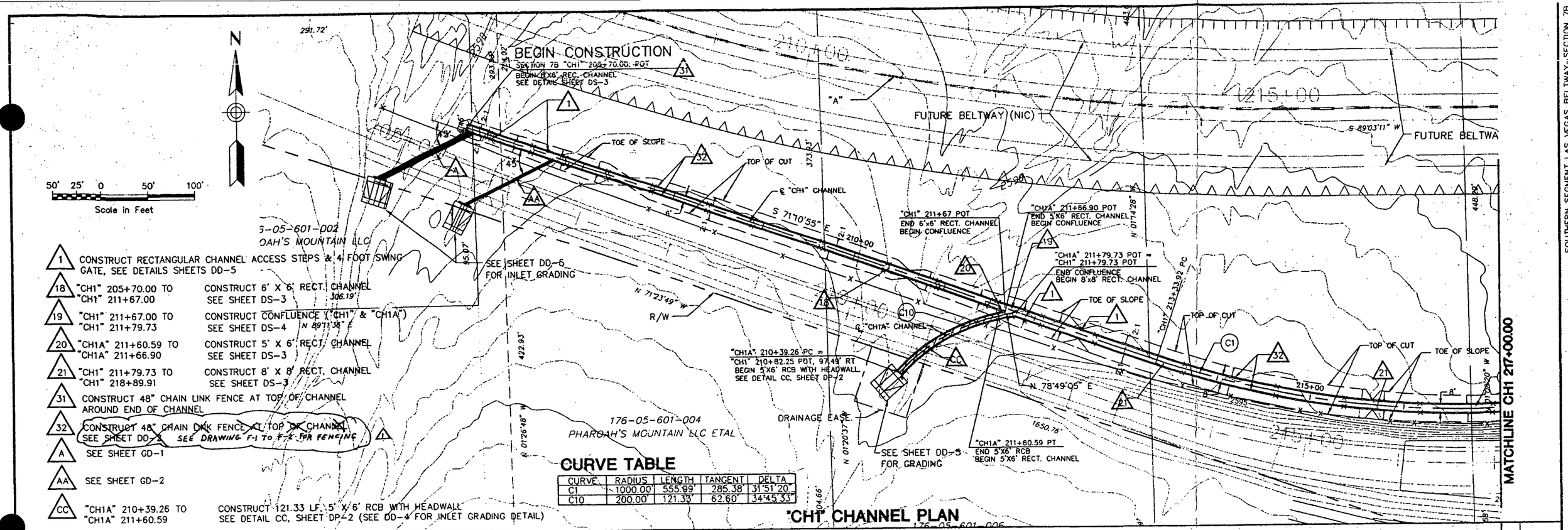
LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD
GRADING AND DRAINAGE

DAVID E. [illegible] NATIONAL ENGINEER-STATE OF [illegible]

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

SCALE
HORIZ: 1" = 50'
VERT: N/A

DRAWING No
GD-5



1	6/99	Addendum #3	DSP

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD
DURANGO TO RAINBOW "CH1" CHANNEL
PLAN AND PROFILE 205+70.00 TO 217+00

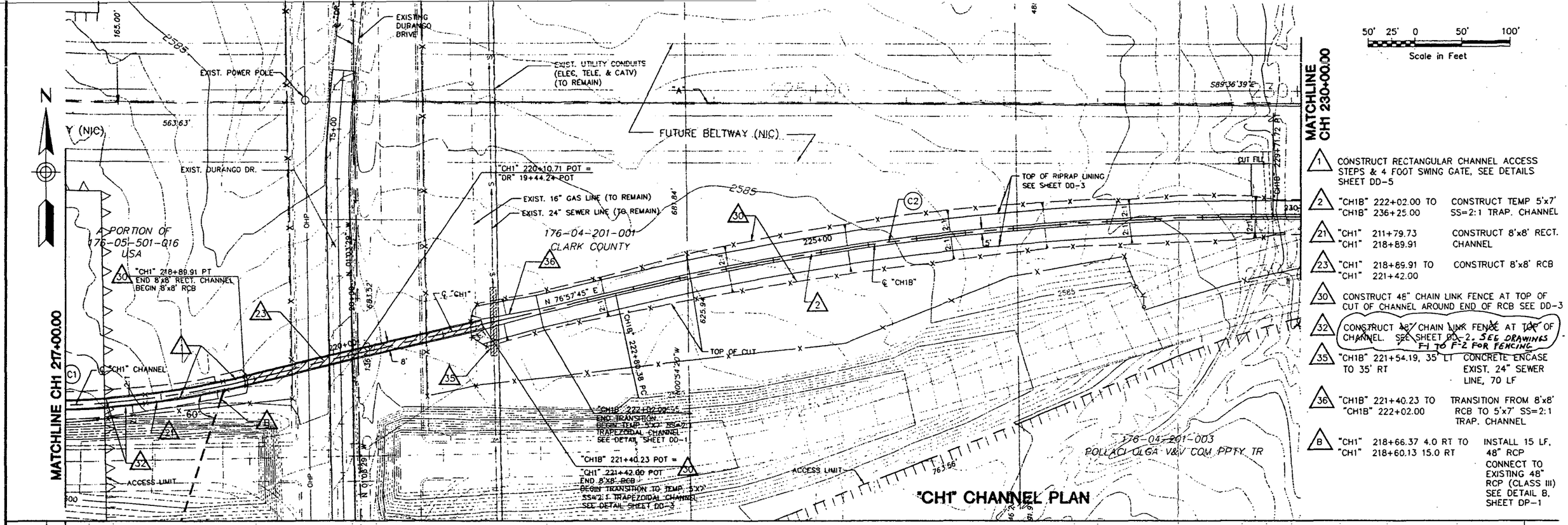
DAVID E. FOSTER — PROFESSIONAL ENGINEER-STATE OF NEVADA

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: KA
DRAWN BY: LMW
SCALE
HORIZ: 1" = 50'
VERT: 1" = 5'
FIELD BOOK NONE

DRAWING No DF-1 OF 3

\013690\5400\DP\100040

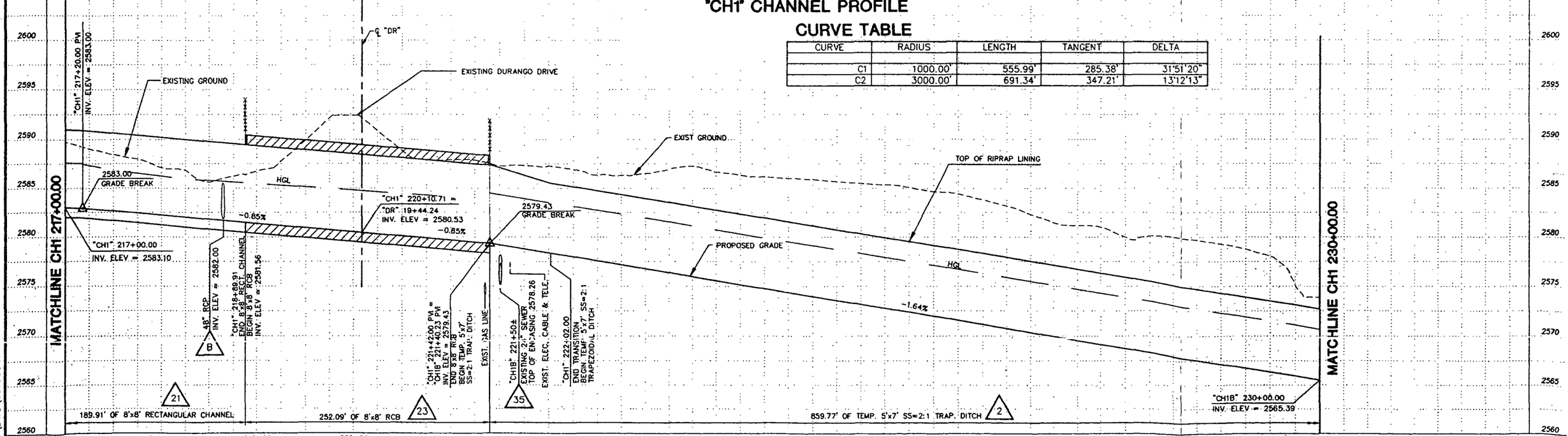


1. CONSTRUCT RECTANGULAR CHANNEL ACCESS STEPS & 4 FOOT SWING GATE, SEE DETAILS SHEET DD-5
2. "CH1B" 222+02.00 TO "CH1B" 236+25.00 — CONSTRUCT TEMP 5'x7' SS=2:1 TRAP. CHANNEL
21. "CH1" 211+79.73 TO "CH1" 218+89.91 — CONSTRUCT 8'x8' RECT. CHANNEL
23. "CH1" 218+89.91 TO "CH1" 221+42.00 — CONSTRUCT 8'x8' RCB
30. CONSTRUCT 48" CHAIN LINK FENCE AT TOP OF CUT OF CHANNEL AROUND END OF RCB SEE DD-3
32. CONSTRUCT 48" CHAIN LINK FENCE AT TOP OF CHANNEL. SEE SHEET DD-2. SEE DRAWINGS F-1 TO F-2 FOR FENCING
35. "CH1B" 221+54.19, 35' LT TO 35' RT — CONCRETE ENCASE EXIST. 24" SEWER LINE, 70 LF
36. "CH1B" 221+40.23 TO "CH1B" 222+02.00 — TRANSITION FROM 8'x8' RCB TO 5'x7' SS=2:1 TRAP. CHANNEL
B. "CH1" 218+66.37 4.0 RT TO "CH1" 218+60.13 15.0 RT — INSTALL 15 LF, 48" RCP CONNECT TO EXISTING 48" RCP (CLASS III) SEE DETAIL B, SHEET DP-1

"CH1" CHANNEL PROFILE

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
C1	1000.00'	555.99'	285.38'	31°51'20"
C2	3000.00'	691.34'	347.21'	13°12'13"



1	6/99	Addendum #3	DEP

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO TO RAINBOW "CH1" CHANNEL

PLAN AND PROFILE 217+00 TO 230+00

CLARK COUNTY, NEVADA - DEPARTMENT OF PUBLIC WORKS

DAVID E. POTTER — PROFESSIONAL ENGINEER STATE OF NEVADA

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: KA
DRAWN BY: LMW
CHECKED BY: DPW/DEP

SCALE
HORIZ: 1" = 50'
VERT: 1" = 5'
FIELD BOOK NONE

DRAWING No DF-2 OF 3
Sht. No 68

JOB \ 01369 \ 5400 \ DWG \ C9100041

MATCHLINE CH1B 230+00.00

"CH1B" 230+50.00 RT
END 2:1 DITCH SLOPE
BEGIN SLOPE TRANSITION
TO 1.5:1

"CH1B" 231+00.00 RT
END SLOPE TRANSITION
BEGIN 1.5:1 DITCH SLOPE

FILL CUT

TOE OF SLOPE

℄ "CH1B"
N 76°57'45" E

FUTURE BELTWAY & RAMPS (NIC)

TOP OF RIPRAP LINING
SEE SHEET DD-3

TOP OF CUT SLOPE

EX. TOP OF CUT

"CH1B" 241+75.00
BEGIN TRANSITION
TEMP 5'X7' SS=2:1(1.5:1)
TRAPEZOIDAL CHANNEL
TO 18'X10' RECT CHANNEL

"A"
EX. MANHOLE
(TO REMAIN)

"CH1B" 242+50.00 POT =
"CH" 242+50.00 POT
END TRANSITION
CONNECT TO EX. RECT. CHANNEL
SEE DETAIL SHEET DD-3

℄ "CH" CHANNEL

ACCESS LIMIT

SEE SHEET DD-6 FOR INLET GRADING

R/W

176-04-201-006
TSAI JOESPH

176-04-201-007

176-04-201-008
USA

N89°44'36"W 342.17'

S89°36'39"E 513.25'

N00°22'14"W 325.20'

N00°38'23"W 326.80'

N00°12'04"W 323.61'

359.40'
343.05'
342.98'
685.96'
309.11'
678.51'
338.42'
331.62'
2740.30'
2590
2580

5' 8' 5'

80

"CH1B" CHANNEL PLAN

△E SEE SHEET GD-5

△S SEE SHEET GD-6

△T SEE SHEET GD-6

△2 "CH1B" 222+02.00 TO "CH1B" 241+75.00 — CONSTRUCT TEMP. 5'x7' SS=2:1(1.5:1) TRAP. DITCH

△30 CONSTRUCT 48" CHAIN LINK FENCE AT TOP OF CUT OF TRAP. CHANNEL SEE SHEET DD-3. DO NOT INSTALL 48" CHAIN LINK FENCE AT TOP OF CUT BETWEEN "CH1B" 231+00 RT TO END OF "CH1B" TRAPEZOIDAL CHANNEL

△37 "CH1B" 241+75.00 TO "CH1B" 242+50.00 — TRANSITION FROM 5'x7' SS=2:1 TRAP. CHANNEL TO 18'x10' REC. CHANNEL

NOTE
STUB OUTS ARE FOR FUTURE MISC. DRAINAGE NEEDS.

50' 25' 0 50' 100'
Scale in Feet

"CH1B" 230+56±
℄ FUTURE RAMP "DR2"

"CH" CHANNEL PROFILE

EXIST GROUND

TOP OF RIPRAP LINING

HGL

PROPOSED GRADE

EX. TOP OF RECTANGULAR "CH" CHANNEL

MATCHLINE CH1B 230+00.00

"CH1B" 230+00.00
INV. ELEV = 2565.39

-1.64%

-0.87%

"CH1B" 231+00.00
GRADE BREAK
INV. = 2563.71

6'x4' RCB
INV. ELEV = 2564.67

700.00' OF TEMP. 5' BOTTOM TRAP. DITCH

"CH1B" 241+75.00
BEGIN TRANSITION
TEMP. 5'x7'
SS=2:1(1.5:1)
TRAP. CHANNEL
TO 18'X10'
RECT CHANNEL

2558.53
GRADE BREAK

"CH1B" 242+50.00 PVI =
"CH" 242+00.00 PVI
INV. ELEV = 2558.53
END TRANSITION
BEGIN EXIST. 18'X10'
RECT CHANNEL

2585 2580 2575 2570 2565 2560 2555 2550 2545

230+00 231+00 232+00 233+00 234+00 235+00 236+00 237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00

\013690\5400\DWG\C9100042

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD
DURANGO TO RAINBOW "CH1B" CHANNEL
PLAN AND PROFILE 230+00 TO 237+00

CLARK COUNTY

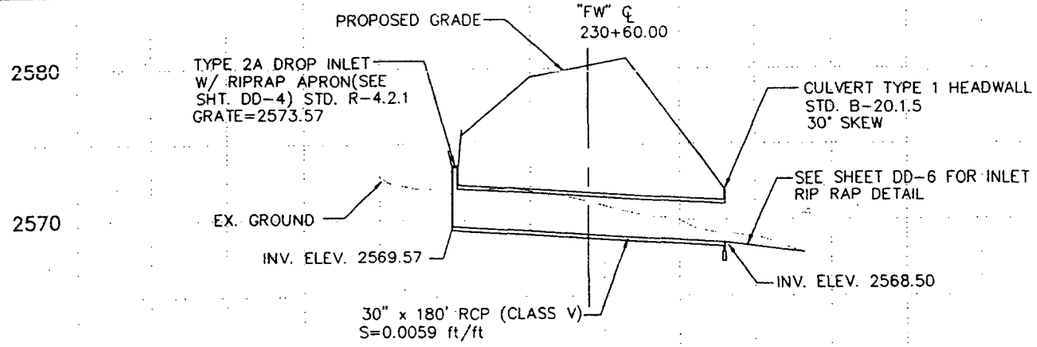
DAVID E. POTTER — PROFESSIONAL ENGINEER-STATE OF NEVADA

Svordrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

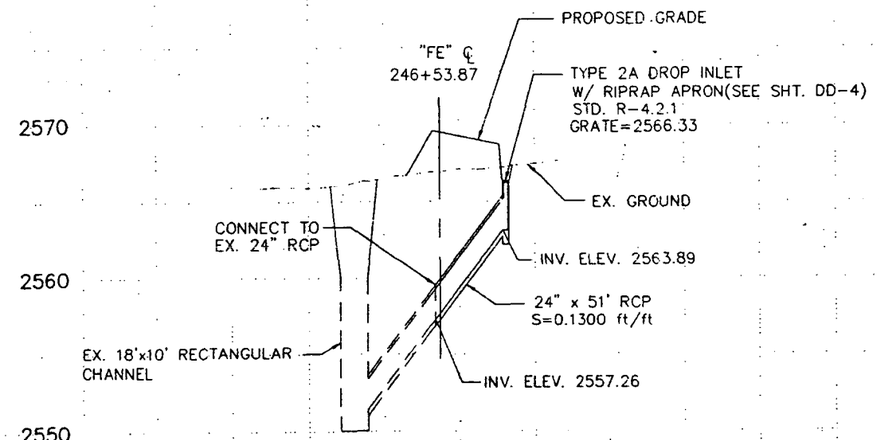
DESIGNED BY: KA
DRAWN BY: LMW

SCALE
HORIZ: 1" = 50'
VERT: 1" = 5'
FIELD BOOK NONE

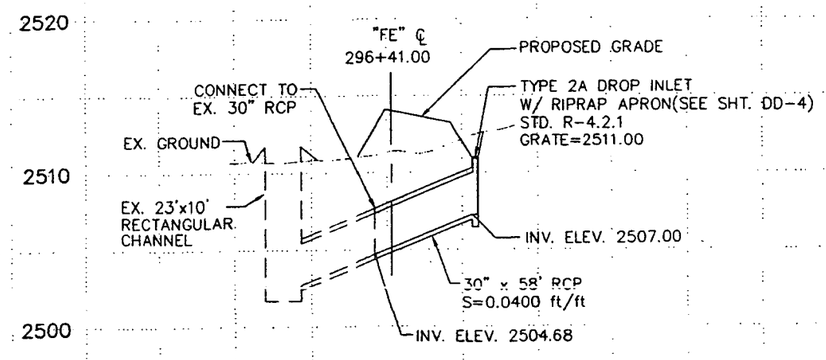
DRAWING No
DF-3
OF 3
Sht. No 69



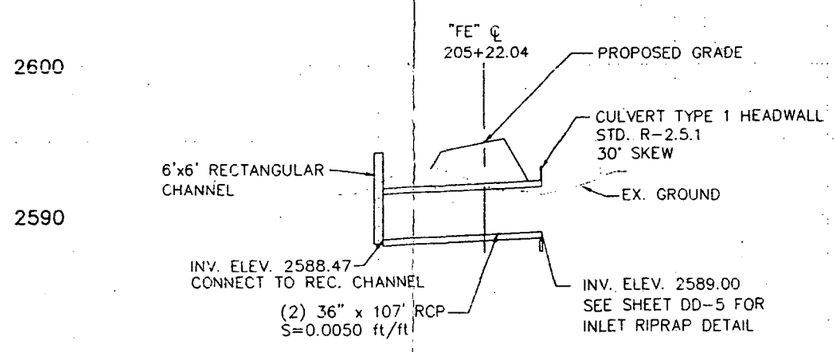
D "FW" 230+18.38 78.81 RT TO "FW" 231+10.00 73.00 LT



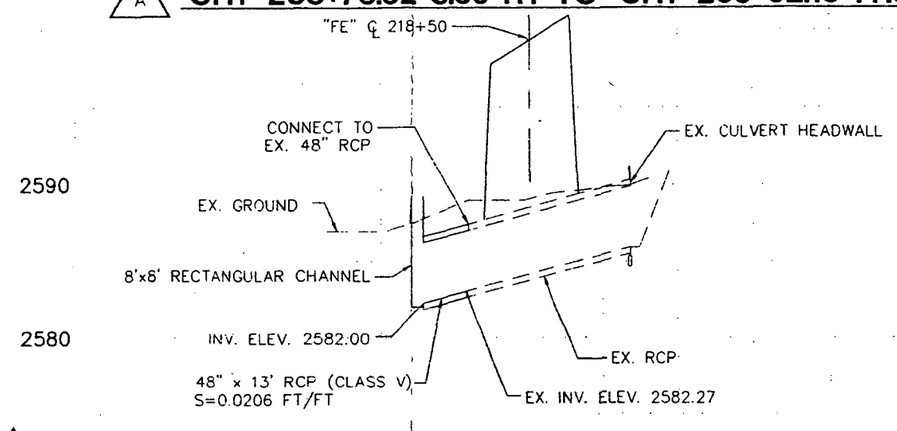
G "CH" 246+41.42 42.94' RT TO "CH" 246+05.66 78.71' RT



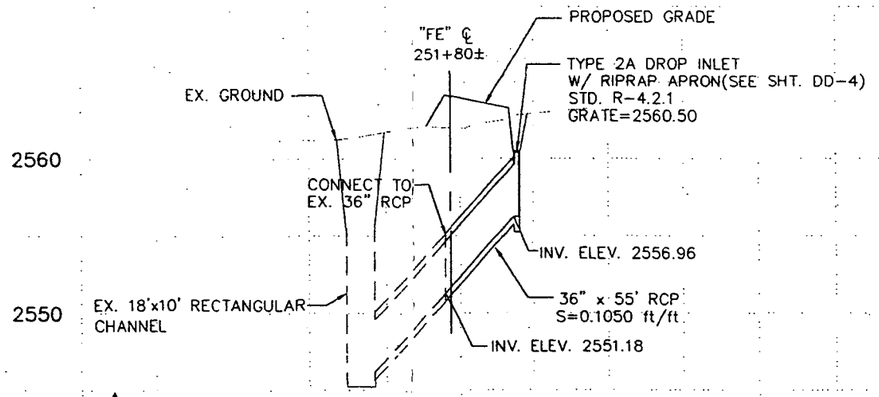
N "CH" 295+90.48 45.44' RT TO "CH" 295+49.51 86.42' RT



A "CH1" 205+76.92 3.00 RT TO "CH1" 205+02.10 77.82 RT



B "CH1" 218+66.37 4.00' RT TO "CH1" 218+60.16 15.00' RT



I "CH" 251+71.03 40.38' RT TO "CH" 251+32.04 79.38' RT

NOTES

1. RCP SHALL BE CLASS III, UNLESS OTHERWSIE NOTED
2. RCP BEDDING SHALL BE CLASS B PER NDOT STD. PLAN R-1.1.6, UNLESS OTHERWISE NOTED

013690\5400\DWG\09100025

CLARK COUNTY

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

STORM SEWER PROFILES

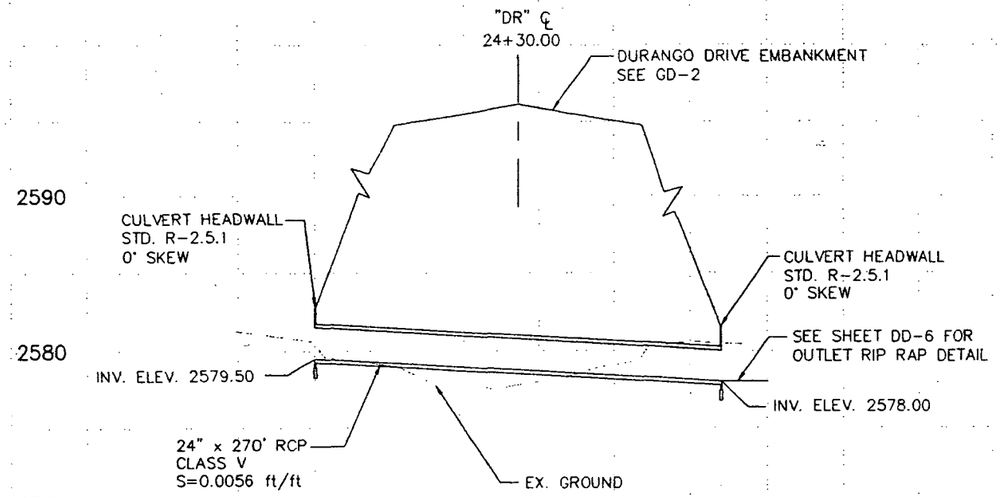
DAVID E. FOLTZ — REGISTERED ENGINEER — STATE OF NEVADA

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

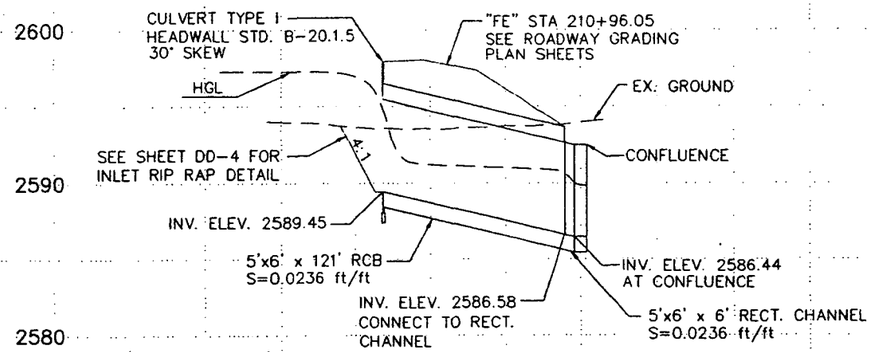
DESIGNED BY: EIP
EIP

SCALE
HORIZ: 1" = 50'
VERT: 1" = 5'
FIELD BOOK NONE

DRAWING No
DP-1
OF 3



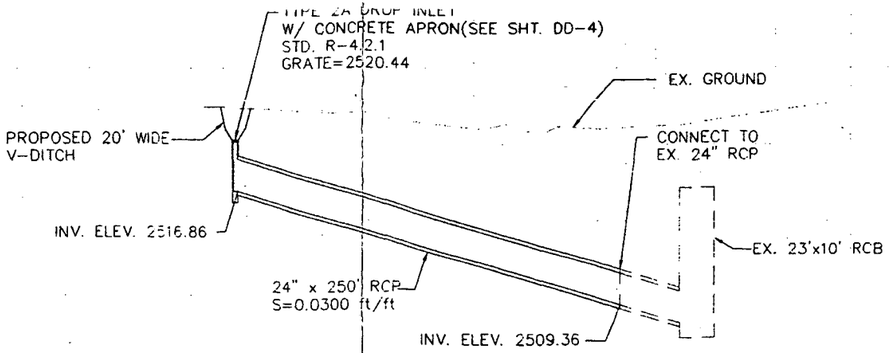
C **"DR" 24+30.00 135.00 LT TO "DR" 24+30.00 135.00 RT**



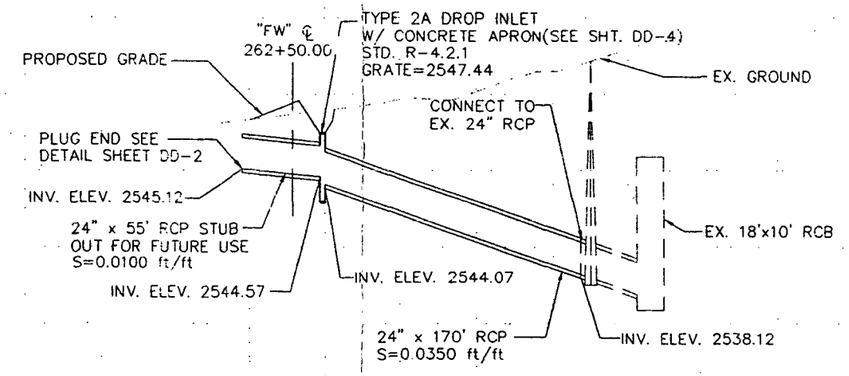
CC **"CH1" 211+67.00**

NOTES

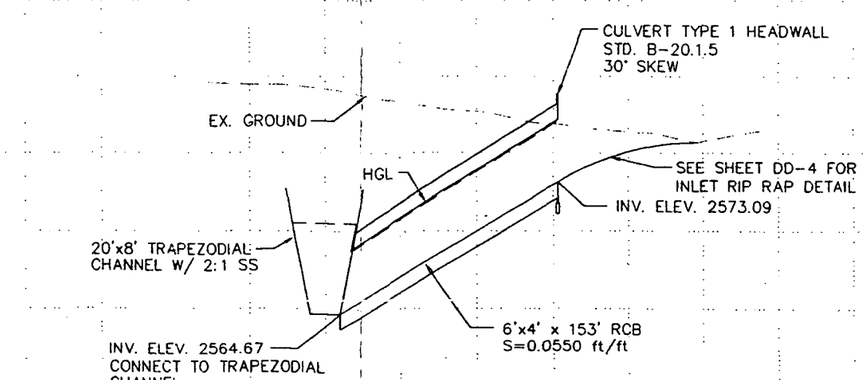
1. RCP SHALL BE CLASS III, UNLESS OTHERWSIE NOTED
2. RCP BEDDING SHALL BE CLASS B PER NDOT STD. PLAN R-1.1.6, UNLESS OTHERWISE NOTED



M **"CH" 289+55.60 45.05' LT TO "CH" 288+19.47 254.66' LT**



J **"CH" 262+41.90 45.00' LT TO "CH" 262+41.90 270.33' LT**



E **"CH1B" 231+10.39 9.00 RT TO "CH1B" 230+00.80 111.58 RT**

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

STORM SEWER PROFILES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DAVID E. POTTERY — PROFESSIONAL ENGINEER — STATE OF NEVADA

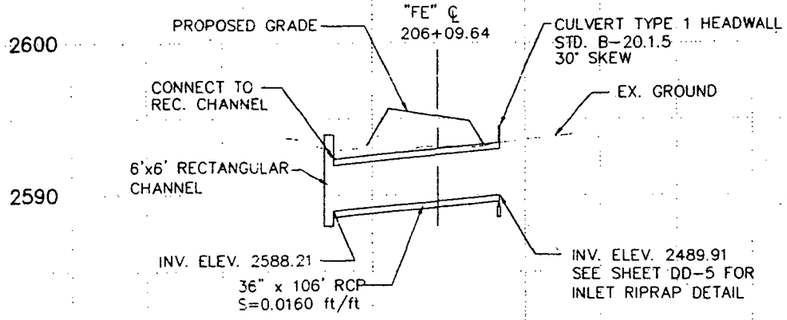
DESIGNED BY:	EIP
DRAWN BY:	EIP
CHECKED BY:	DEP

SCALE	
HORIZ:	1" = 50'
VERT:	1" = 5'
FIELD BOOK	NONE

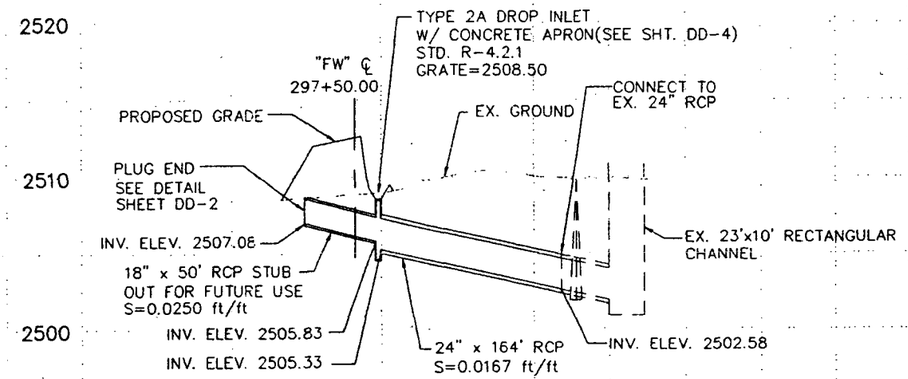
DRAWING No **DP-2** OF 3

Sht. No 71

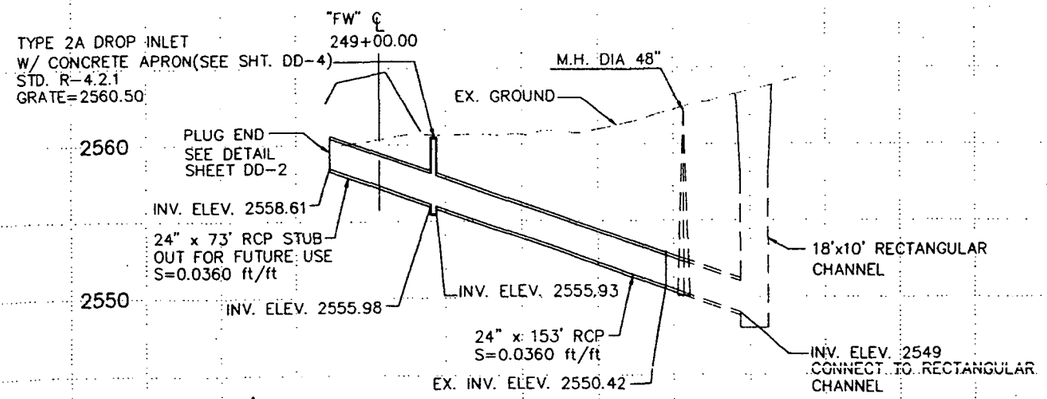
JOB \013690\5400 \C9100026



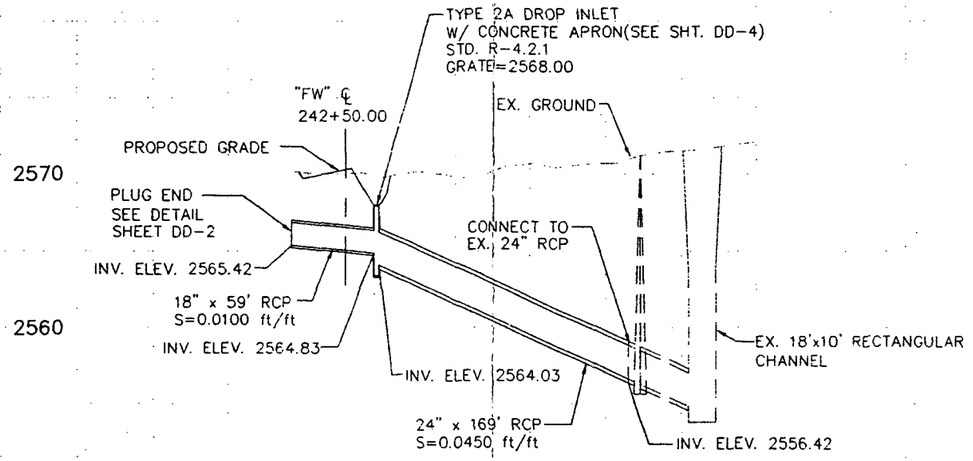
AA **"CH1" 206+68.70 3.00' RT TO "CH1" 205+93.71, 77.98' RT**



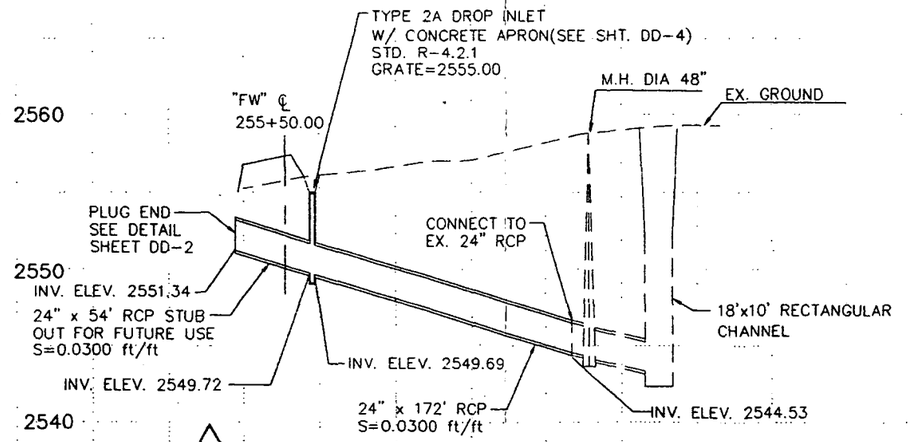
BB **"CH" 297+16.30 47.46' LT TO "CH" 297+16.30 261.70' LT**



H **"CH" 248+91.89, 45.00' LT TO 248+91.89, 271.83 LT**



S **"CH" 242+41.89 45.18' LT TO "CH" 242+41.89 272.71' LT**



V **"CH" 255+41.89, 45.00' LT TO 255+41.89, 270.51' LT**

NOTES

1. RCP SHALL BE CLASS III, UNLESS OTHERWSIE NOTED
2. RCP BEDDING SHALL BE CLASS B PER NDOT STD. PLAN R-1.1.6, UNLESS OTHERWISE NOTED

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

STORM SEWER PROFILES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

DAVID E. POTTER — PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 6040

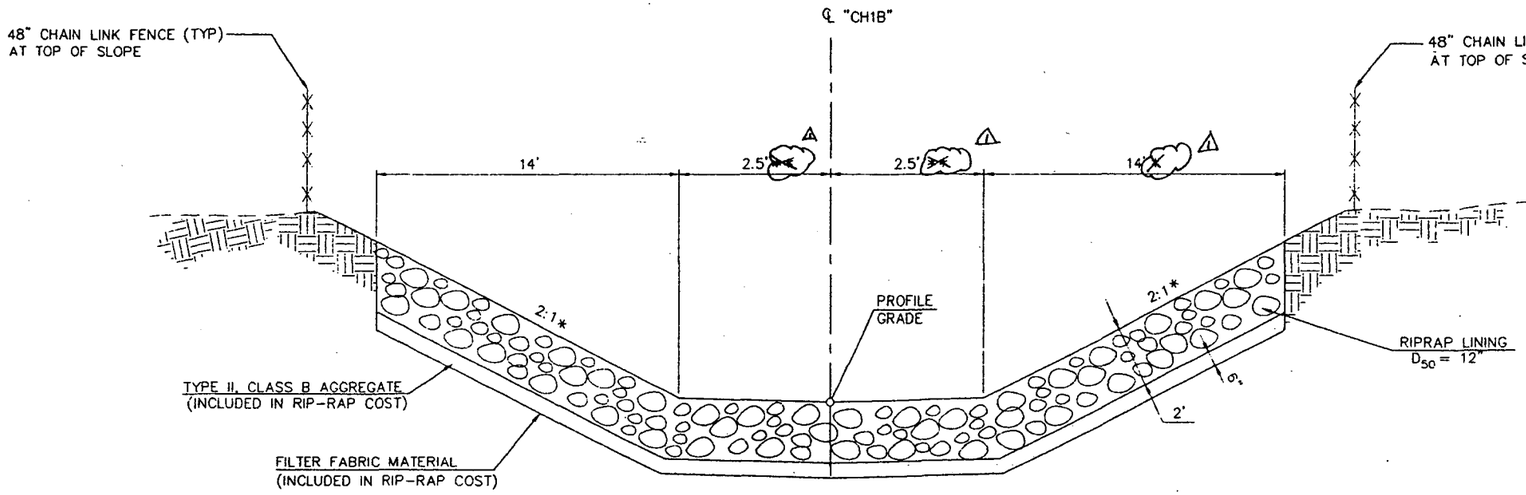
Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY: EIP
DRAWN BY: EIP
CHECKED BY: DEP

SCALE
HORIZ: 1" = 50'
VERT: 1" = 5'
FIELD BOOK NONE

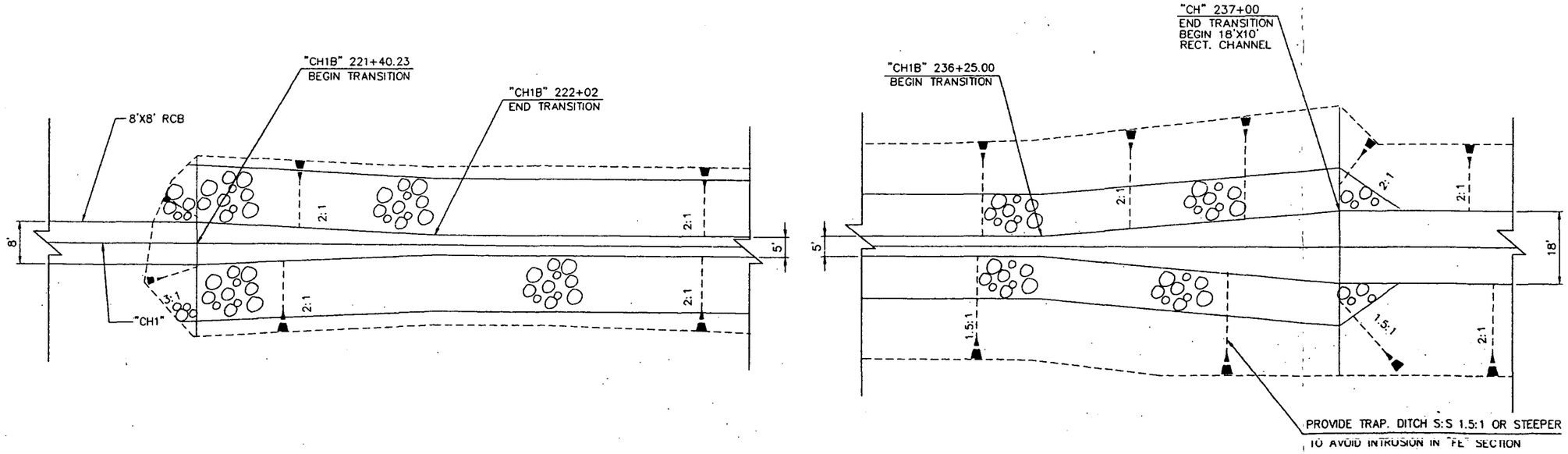
DRAWING No DP-3 OF 3
Sht. No 72

JOB\013690\5400\DWG\C9100027



TEMPORARY TRAPEZOIDAL CHANNEL

CHANNEL • 1.5:1 "CH1B" STA 222+02.00 TO ~~236+25.00~~ 242+50.00
"CH1B" 230+50.00 TO ~~236+25.00~~ 242+50.00



"CH1B" TRAP. CHANNEL TRANSITION

NOT TO SCALE

Avoid cutting underground utility lines. It's costly.

Call before you Dig.

1-800-227-2600

UNDERGROUND SERVICE ALERT (USA)



SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION

1	6/99	Addendum #3	DEP

CLARK COUNTY NEVADA

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

TYPICAL SECTIONS AND DETAILS

CLARK COUNTY, NEVADA DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA DAVID E. POTTER CIVIL No. 8880

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

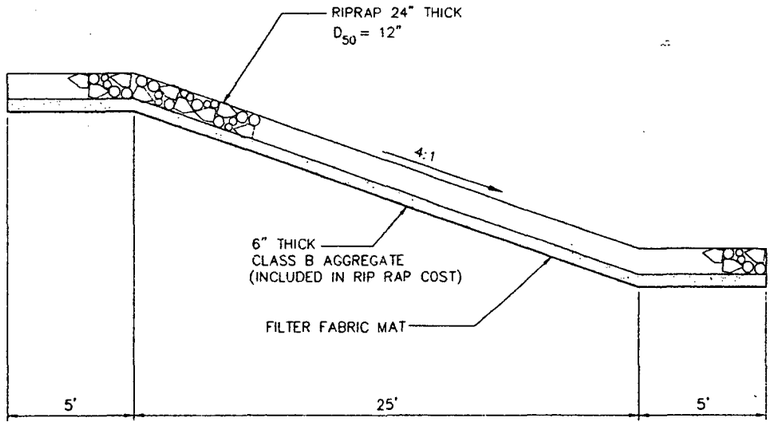
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DRAWN BY:	JXS
CHECKED BY:	YC

SCALE	
HORIZ:	N/A
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FIELD BOOK	NONE

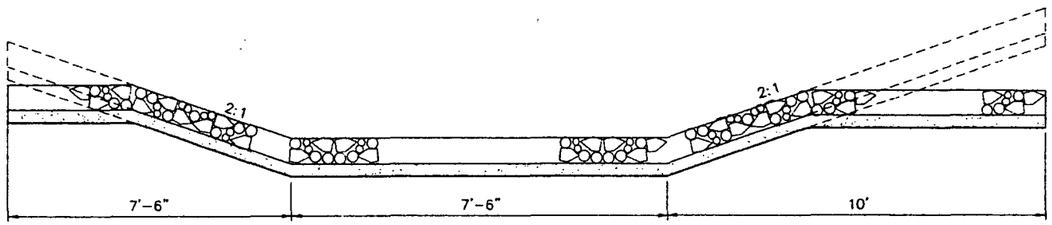
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Sht. No 75

\JOB\013690\5400\CB100012.DWG

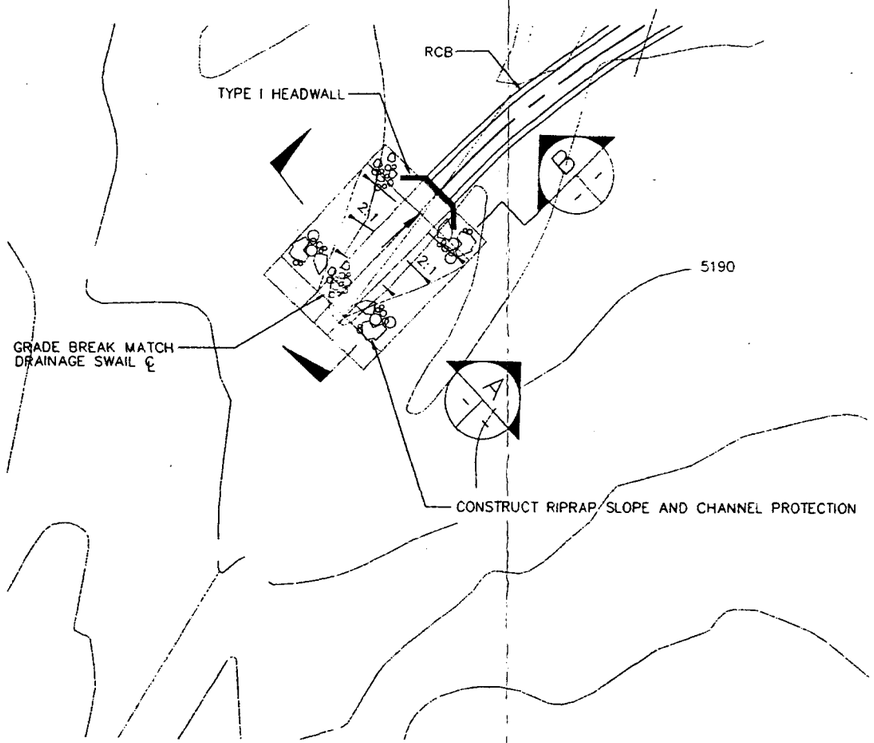


SECTION B



SECTION A

RIPRAP DETAILS
NOT TO SCALE



"CH1A", CC & E INLET RIPRAP DETAIL

NOT TO SCALE
SEE SHEETS DF-1 & GD-5

Avoid cutting underground utility lines. It's costly.

Call before you Dig.

1-800-227-2600

UNDERGROUND SERVICE ALERT (USA)



LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

TYPICAL SECTIONS & DETAILS

CLARK COUNTY, NEVADA DEPARTMENT OF PUBLIC WORKS

DAVID E. FOLEY PROFESSIONAL ENGINEER-STATE OF NEVADA

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

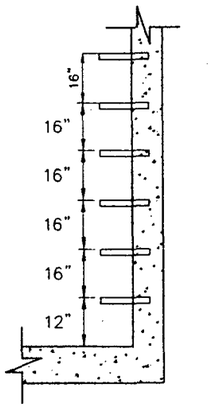
DESIGNED BY: YC
DRAWN BY: HCM
CHECKED BY: DEP

SCALE
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VERT: N/A
FIELD BOOK NONE

DRAWING No DD-4 OF 8
Sht. No 76

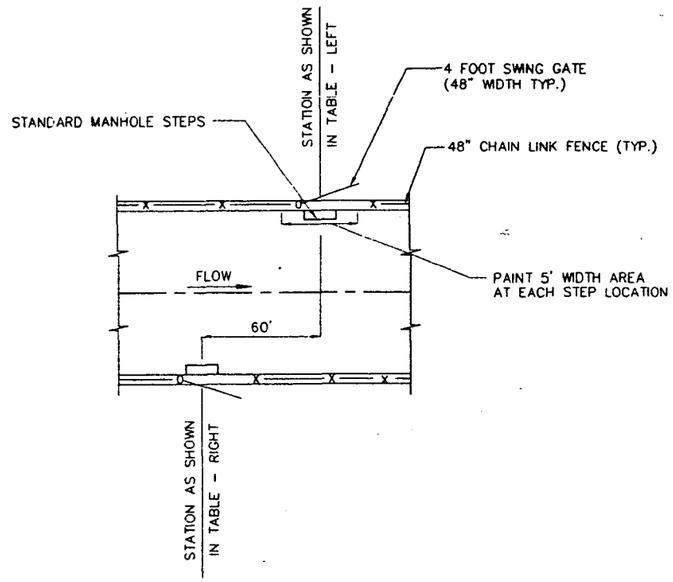
SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 7E

JOB\013690\5400\C8100016.DWG



TYPICAL STEP INSTALLATION
AT WALL OF CHANNEL

ACCESS STEP ELEVATION



ACCESS STEP PLAN

ACCESS STEP & 4 FOOT SWING GATE LOCATION			
STATIONS	DESCRIPTION	STATIONS	DESCRIPTION
"CH1"			
"CH1" 206+00	RIGHT	"CH1" 212+50	LEFT
"CH1" 206+60	LEFT	"CH1" 218+20	RIGHT
"CH1" 211+90	RIGHT	"CH1" 218+80	LEFT

NOTES:

1. SEE SHEET TS-9 FOR STRUCTURE EXCAVATION AND BACKFILL DETAILS.
2. SEE SHEET DS-3 FOR STRUCTURE AND REINFORCING DETAILS.
3. ANCHOR FENCE POST TO TOP OF CHANNEL IN THE SAME MANNER AS SHOWN FOR TYPE "M" PEDESTRIAN RAIL ON NDOT STD. DWG. B-25.1.4.

ACCESS STEP DETAIL

NOT TO SCALE

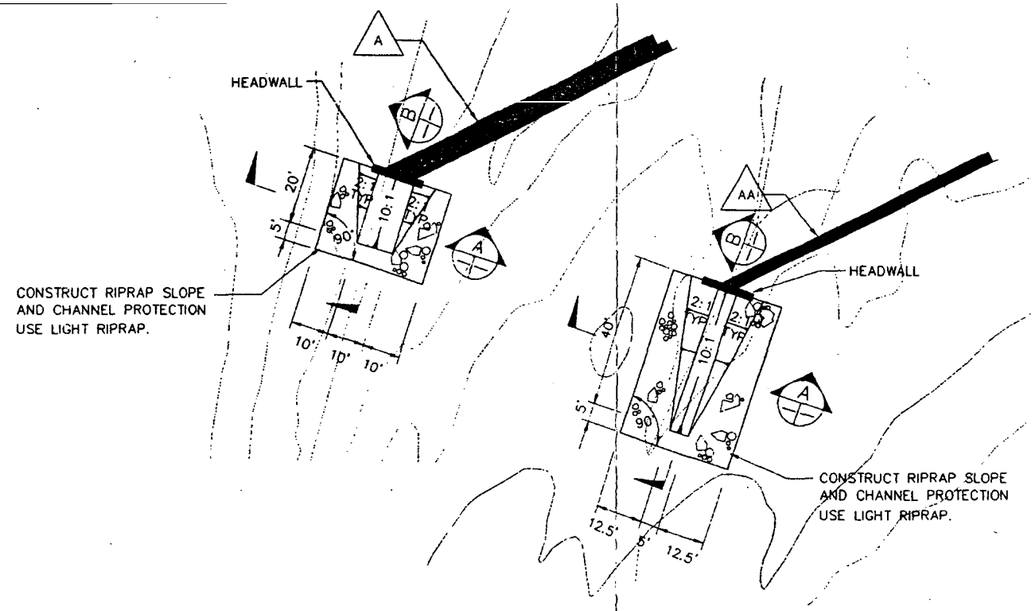
Avoid cutting underground utility lines. It's costly.

Call before you Dig.

1-800-227-2600

UNDERGROUND SERVICE ALERT (USA)



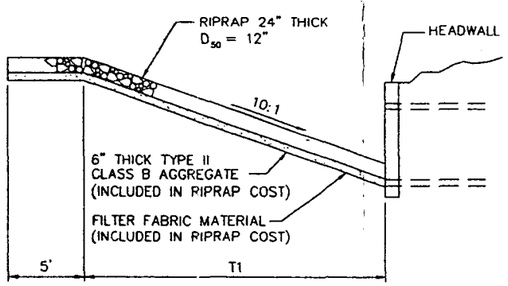


INLET A RIPRAP DETAIL

NOT TO SCALE

INLET AA RIPRAP DETAIL

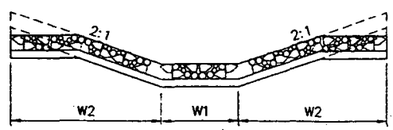
NOT TO SCALE



SECTION B

TABLE 1

INLET	T1	W1	W2
INLET AA	40'	5'	12.5'
INLET A	20'	10'	10'



SECTION A

RIPRAP DETAILS

NOT TO SCALE
REFER TO TABLE 1 FOR DIMENSIONS

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

TYPICAL SECTIONS & DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

DAVID E. POTTER, CIVIL, No. 8880, STATE OF NEVADA, PROFESSIONAL ENGINEER

Sverdrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

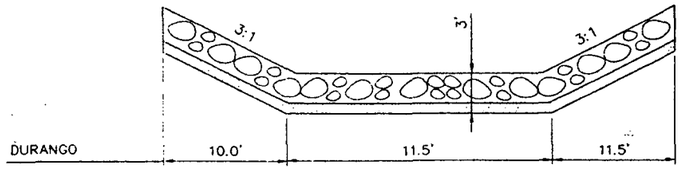
DESIGNED BY:	YC
DRAWN BY:	HCM
CHECKED BY:	DEP
DATE:	4/19/99

SCALE	
HORIZ:	N/A
VERT:	N/A
FIELD BOOK	NONE

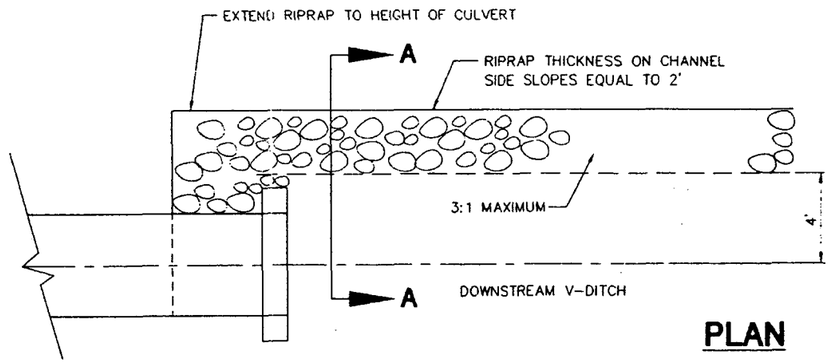
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Sht. No 77
1-1550

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION

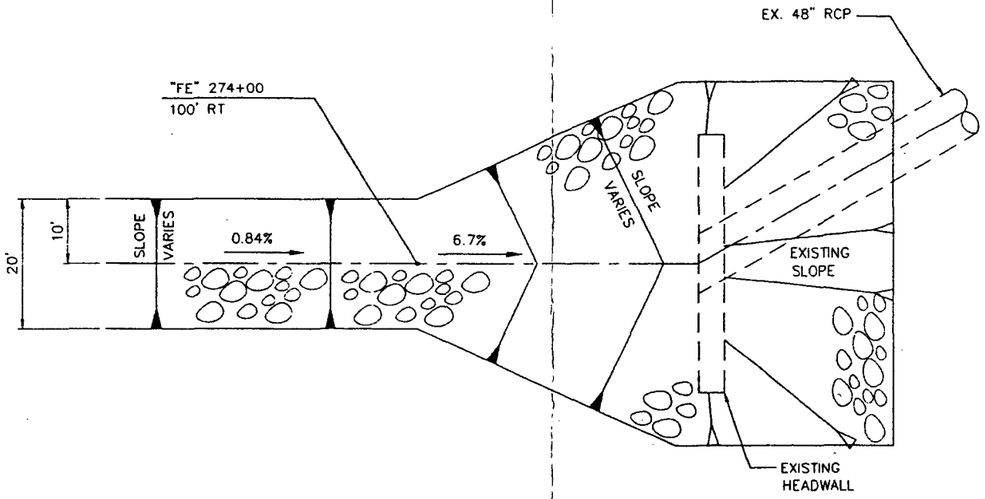
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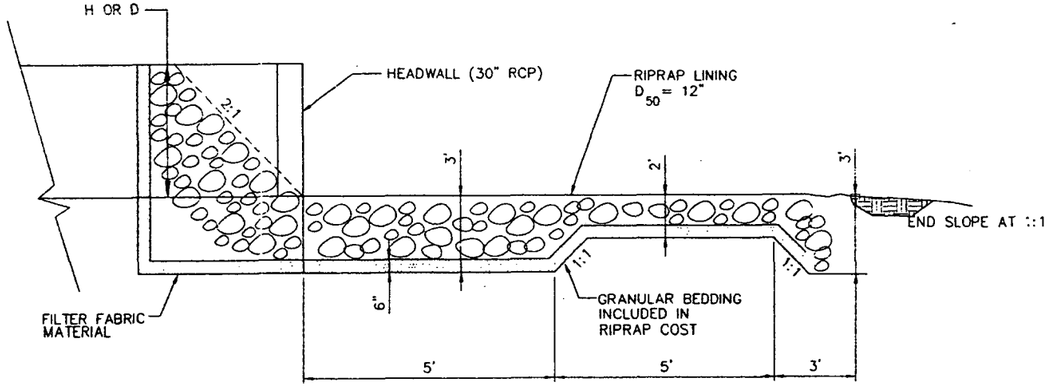
SECTION A-A



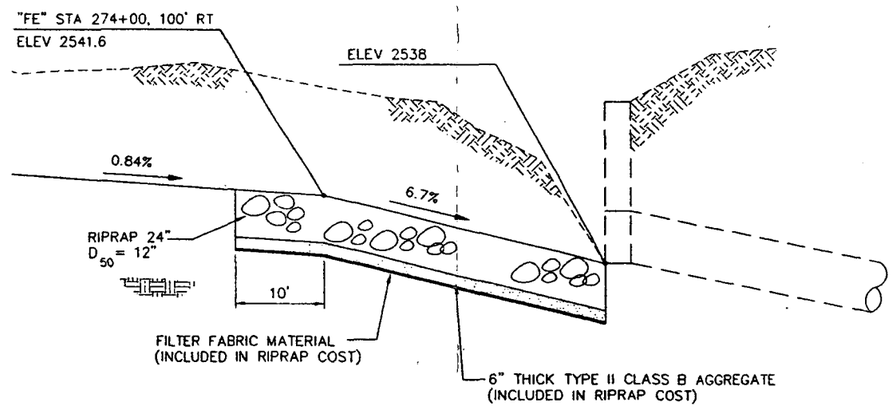
PLAN



INLET PLAN



PROFILE



INLET ELEVATION

OUTLET RIPRAP DETAIL

CULVERT Ⓒ & Ⓓ

INLET GRADING DETAIL FOR EXISTING 48" RCP

(SEE SHEET GD-9)

Avoid cutting underground utility lines. It's costly.

Call before you Dig.

1-800-227-2600

UNDERGROUND SERVICE ALERT (USA)

AVOID HITTING BURIED POWER LINES. IT'S COSTLY!
CALL BEFORE YOU DIG
OVERHEAD
1-702-593-6111

LAS VEGAS BELTWAY FRONTAGE ROADS-SECTION 7B-RD

DURANGO DRIVE TO RAINBOW BOULEVARD

TYPICAL SECTIONS & DETAILS

CLARK COUNTY NEVADA DEPARTMENT OF PUBLIC WORKS

DAVID E. POTTER, CIVIL, No. 8880, PROFESSIONAL ENGINEER, STATE OF NEVADA

Svardrup CIVIL, INC.
5450 WEST SAHARA, SUITE 150
LAS VEGAS, NEVADA 89146
PHONE: (702) 870-2130
FAX: (702) 870-1731

DESIGNED BY:	YC
DRAWN BY:	HCM
CHECKED BY:	DEP
	4/19/99

SCALE
HORIZ: N/A
VERT: N/A
FIELD BOOK NONE

DRAWING No
DD-6
OF 8
Sht. No 78

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION

\JOB\013690\540[illegible]\C8100018.DWG

APPENDIX D
FEMA Forms

Form 1 MT-2: Overview & Concurrence
Form 2 MT-2: Riverine Hydrology & Hydraulics
Form 3 MT-2: Riverine Structures

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
320003	Clark County	NV	32003C	2535E	9/27/02

2. Flooding Source: Unnamed watershed soutwest of project, approximately 350 acres in area

3. Project Name/Identifier: Southern Vista Estates Diversion Channel and Berm

4. FEMA zone designations affected: A (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☒ Channelization ☒ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $6,000
	☐ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Clark County, Nevada	Company: Clark County Regional Flood Control Dist	
Mailing Address: Clark County Regional Flood Control Dist 600 S Grand Central Parkway Suite 300 Las Vegas, NV 89106-4511	Daytime Telephone No.: 702-455-3139	Fax No.: 702-455-3870
	E-Mail Address:	
Signature of Requester (required):		Date: 11/07/02

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Dave Betley, P.E. Senior Engineer		Telephone No.: 702-455-4808
Community Name: Clark County, Nevada	Community Official's Signature (required):	Date: 11/12/02

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Stephen L. Weatherman	License No.: 09266	Expiration Date: 6/30/04
Company Name: G. C. Wallace, Inc.	Telephone No.: (702) 804-2000	Fax No.: (702) 804-2299
Signature:		Date: 11/4/02

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $6,000
	☐ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

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Mailing Address: Clark County Regional Flood Control Dist 600 S Grand Central Parkway Suite 300 Las Vegas, NV 89106-4511	Daytime Telephone No.: 702-455-3139	Fax No.: 702-455-3870
	E-Mail Address:	
Signature of Requester (required):		Date:

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Community Official's Name and Title: Dave Betley, P.E. Senior Engineer		Telephone No.: 702-455-4808
Community Name: Clark County, Nevada	Community Official's Signature (required):	Date:

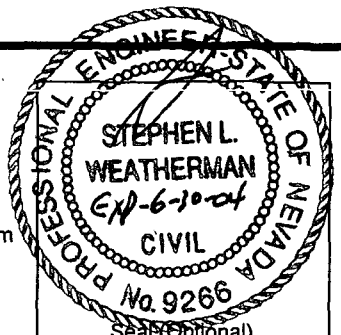
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Stephen L. Weatherman	License No.: 09266	Expiration Date: 6/30/04
Company Name: G. C. Wallace, Inc.	Telephone No.: (702) 804-2000	Fax No.: (702) 804-2299
Signature:		Date: 11/4/02

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



Seal (Optional)

11/4/02

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Unnamed watershed soutwest of project, approximately 350 acres in area
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☒ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
Station 6+00 (Confluence)	0.58/0.23	491	206
Station 29+25	0.81/0.56	688	311

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transpo rt considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	West Quail Avenue Right-Of-Way	1700		2482.00
Upstream Limit	Sobb Avenue Right-Of-Way	4270		2515.95

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☒ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name:	Floodway File Name:
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name: SVE#1.prj
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name: FW3.prj
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☒ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Unnamed watershed soutwest of project, approximately 350 acres in area
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam .....complete Section D
Levee/Floodwall .....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Structure

1. **Name of Structure: Southern Vista Estates Diversion Channel**

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Station 12+50 to Station 29+00

   Downstream Limit/Cross Section: 1700

   Upstream Limit/Cross Section: 3600

2. **Name of Structure: Southern Vista Estates Diversion Berm**

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☒ Levee/Floodwall ☐ Dam

   Location of Structure: Station 1+70 to Station 12+50

   Downstream Limit/Cross Section: 3600

   Upstream Limit/Cross Section: 4250

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: Unnamed watershed soutwest of project, approximately 350 acres in area

Name of Structure: Southern Vist Estates Diversion Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☒ Superelevated sections
- ☒ Debris basin/detention basin
- ☐ Other (Describe):
- ☒ Drop structures
- ☐ Transitions in cross sectional geometry
- ☒ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 688 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☒ Inlet to channel ☐ Outlet of channel ☒ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source:

Name of Structure:

1. This revision reflects (check one):

- ☐ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8):
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

6. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

- ☐ upgrading of an existing levee/floodwall system
- ☐ a newly constructed levee/floodwall system
- ☒ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☒ earthen embankment, dike, berm, etc.	Station 1+70 to 12+50
☐ structural floodwall	Station to
☐ Other (describe):	Station to

c. Structural Type (check one):

- ☐ monolithic cast-in place reinforced concrete
- ☐ reinforced concrete masonry block
- ☐ sheet piling
- ☐ Other (describe):

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☒ No

If Yes, by which agency?

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures.	Sheet Numbers: FIG-A, FIG-B
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system.	Sheet Numbers: PRO-1
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure.	Sheet Numbers: N/A
4. A layout detail for the embankment protection measures.	Sheet Numbers: N/A
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations.	Sheet Numbers: N/A

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☒ No
3.5 feet or more at the upstream end	☒ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☒ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☒ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope landside is: 2:1

b. The maximum levee slope floodside is: 2:1

c. The range of velocities along the levee during the base flood is: 2.16 (min.) to 6.35 (max.)

d. Embankment material is protected by (describe what kind): Unlined/natural caliche. Riprap @ drops.

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

4. Embankment Protection (continued)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☒ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):

c. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☒ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☒ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☒ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☒ No

h. The duration of the base flood hydrograph against the embankment is 2.25 hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = %g

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☒ No

b. The computed range of settlement is ft. to ft.

c. Settlement of the levee crest is determined to be primarily from :

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

d. Differential settlement of floodwalls ☐ has ☒ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: acres
Draining to ponding area: acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is cfs

h. The length of levee system used to drive this seepage rate in item g: ft.

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☒ is not a problem
Hydrocompaction ☐ is ☒ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☒ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☒ No

Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No

If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No
If No, please attach supporting documentation.

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source: Unnamed watershed soutwest of project, approximately 350 acres in area

Name of Structure: Southern Vista Estates Diversion Channel and Berm

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume 0.4 acre-feet

Debris load associated with the base flood discharge: Volume 0 acre-feet

Sediment transport rate 1 (percent concentration by volume)

Method used to estimate sediment transport: Modified Universal Soil Loss Equation

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

Bulked Flows

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

BELTWAY

SUNSET

PATRICK

OQUENDO

RUSSELL

DURANGO

TOMSICK

UPPER FLAMINGO WASH DETENTION BASIN

SOUTHERN VISTA ESTATES DIVERSION DIKE

SOUTHERN VISTA ESTATES DIVERSION CHANNEL

2550 2525 2500 2475 2575

OD1 OD2 OD3 OD4 OD5 OD6 OD7

D1 D2 D3

R1 R2

CP1 CP2 CP3 CP4 CP5 CP6

DD C1

NORTH

GRAPHIC SCALE

300 0 150 300

(IN FEET)

1 inch = 300 ft.

SUMMARY OF HEC-1 MODEL

BASIN OR LOCATION	AREA (AC.)	AREA (SM)	Q100 (CFS)
OD1	47.66	0.07447	68
OD2	71.47	0.11168	102
OD3	29.69	0.04640	46
OD4	65.69	0.10265	89
OD5	81.83	0.12785	117
OD6	8.95	0.01398	16
OD7	3.72	0.00581	8
D1	19.75	0.03085	47
D2	11.75	0.01836	29
D3	7.50	0.01172	18
R1	3.15	0.00492	8
C1	0.95	0.00149	2
CP1	-	-	204
CP2	-	-	203
CP3	-	-	23
CP4	-	-	88
CP5	-	-	301
CP6	-	-	309

LEGEND

EX-1 **DRAINAGE SUBBASIN**

PT-1 ● **CONCENTRATION POINT**

SUBBASIN BOUNDARY

FLOW DIRECTION

STATE OF NEVADA
STEPHEN L. WERTHEIMER
No. 9826
PROFESSIONAL ENGINEER
CIVIL
DATE: 11/2/12

REV.	DATE	DESCRIPTION	DATE: ADEN. APP.	DATE: CCW. APP.

% COMPLETE

ISSUE DATE:

DESIGN: SW
DRAWN: DVJ
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 09-18-02
PLOT TIME: 16:30:56

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

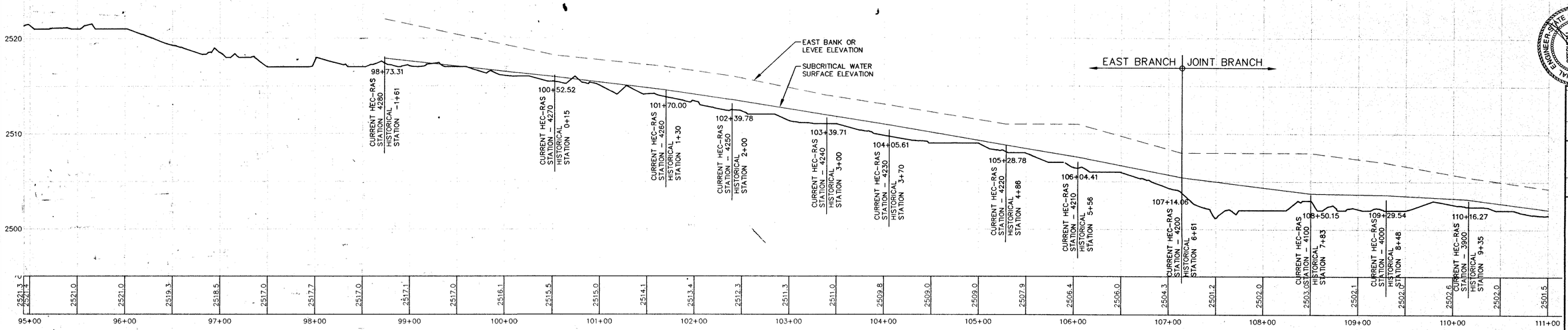
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UPPER FLAMINGO WASH DRAINAGE BASIN

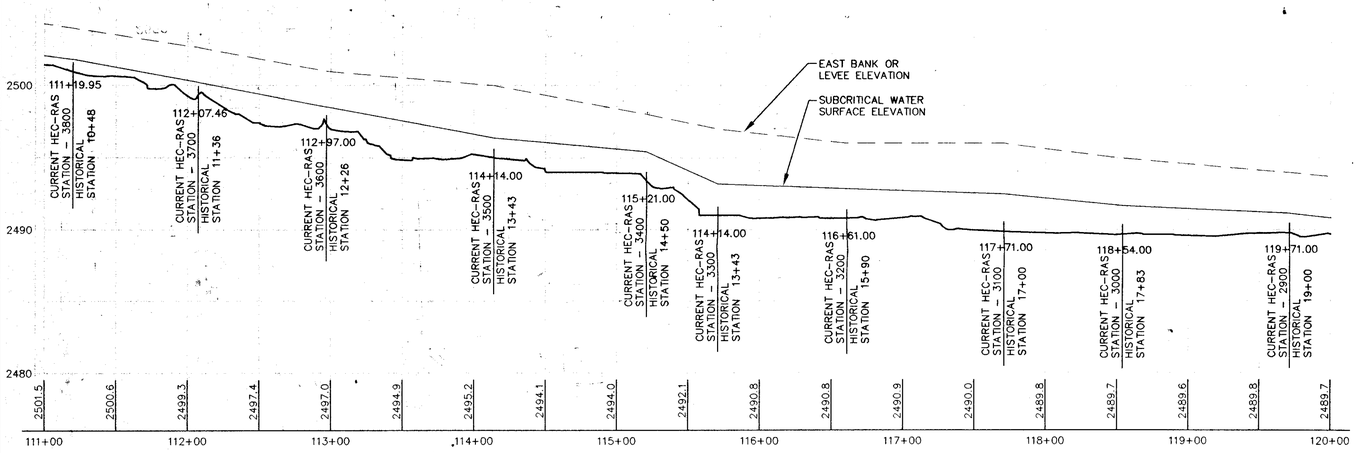
SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

DRAINAGE BASIN MAP

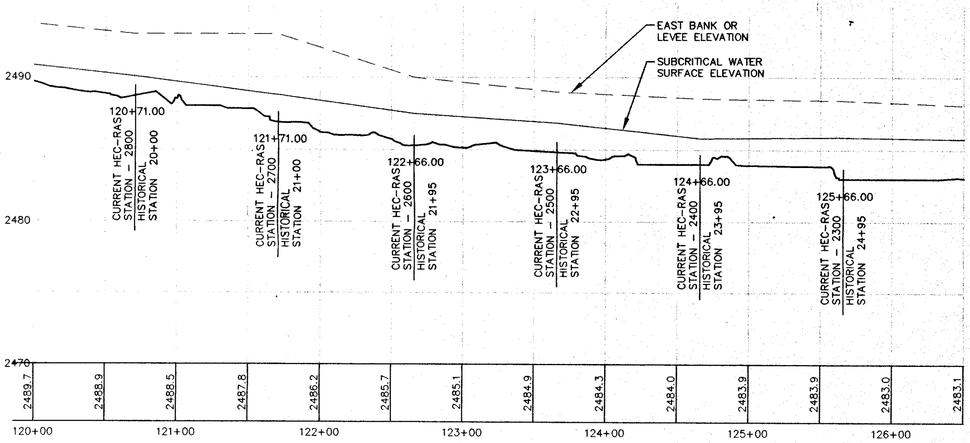
SHEET
FIG-5a
1 OF 1 SHTS



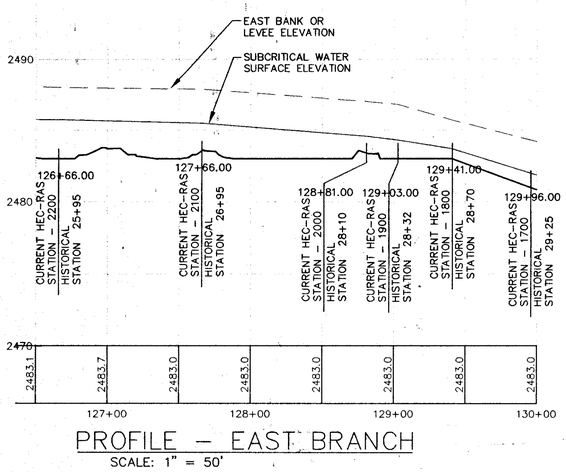
PROFILE – EAST BRANCH
SCALE: 1" = 50'



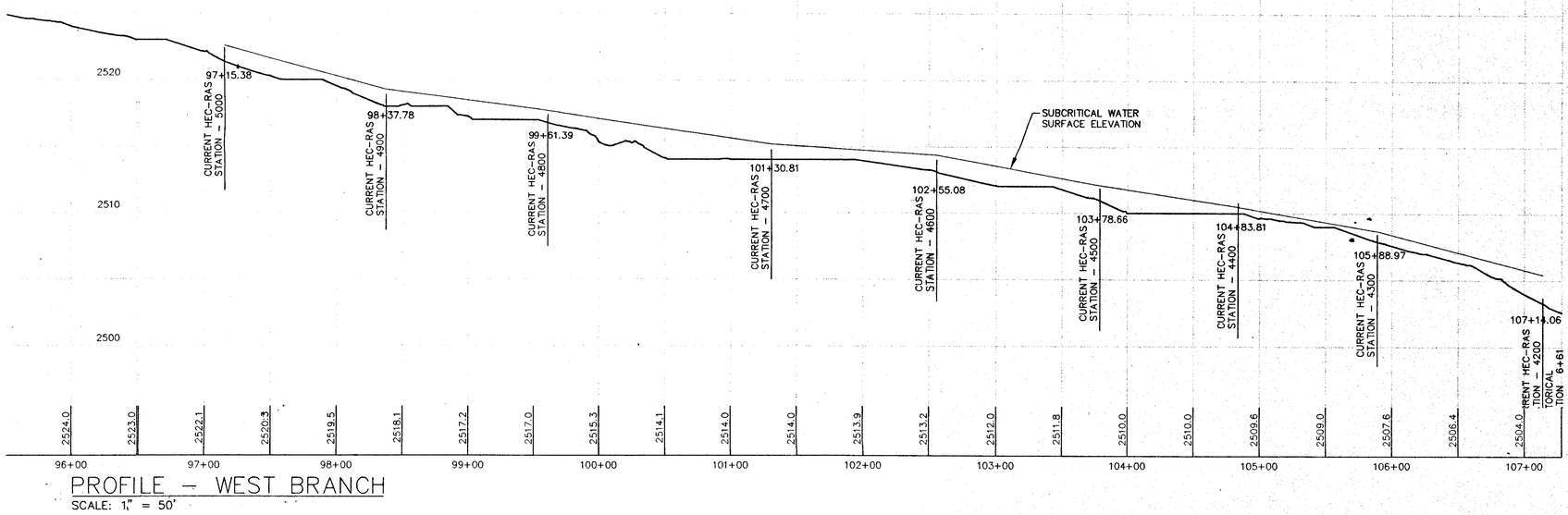
PROFILE – JOINT BRANCH
SCALE: 1" = 50'



PROFILE – WEST BRANCH
SCALE: 1" = 50'



PROFILE – EAST BRANCH
SCALE: 1" = 50'



PROFILE – WEST BRANCH
SCALE: 1" = 50'

ENGINEER – STATE OF NEVADA – STEPHEN L. WESTERMAN – 9326 – PROFESSIONAL – CIVIL – DATE: 11/1/02

REV	DATE	DESCRIPTION	RATE AGEN. APP	RATE GCW APP

DESIGN:
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ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 10-28-02
PLOT TIME: 08:47:46
dgilmson

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ISSUE DATE:

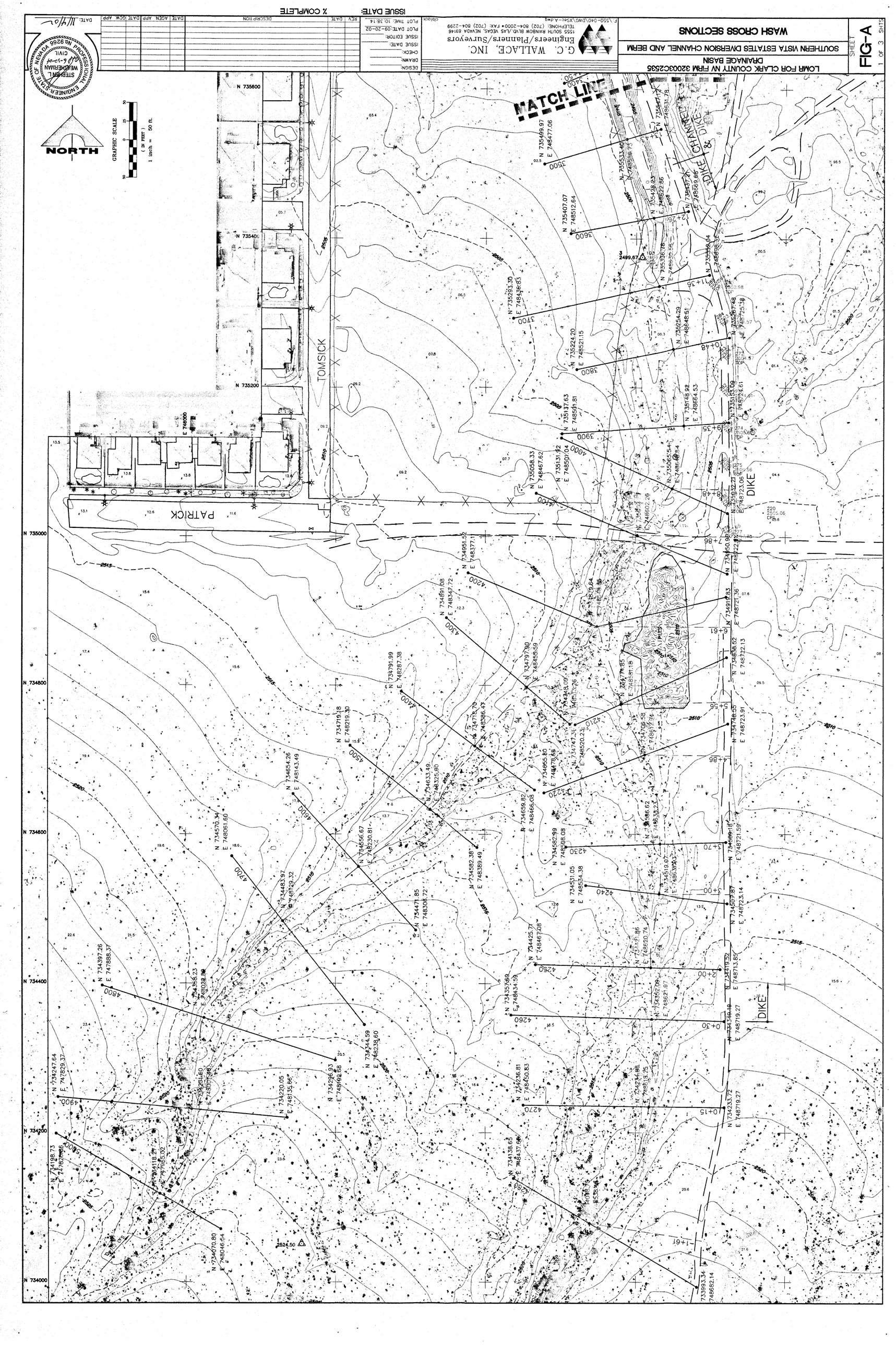
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000• FAX: (702) 804-2299

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UPPER FLAMINGO WASH DRAINAGE BASIN
SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

WASH PROFILES

SHEET
PRO-1
3 OF 3 SHTS


LOMR FOR CLARK COUNTY NV FIRM 32003C2535
DRAINAGE BASIN
SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM
WASH CROSS SECTIONS
FIG-A
SHEET 1 OF 3 SHTS
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
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PLOT DATE: 09-20-02
PLOT TIME: 10:38:14
ISSUE EDITOR:
ISSUE DATE:
CHECK:
DRAWN:
DESIGN:
REV DATE DESCRIPTION DATE AGEN APP DATE CCW APP
ISSUE DATE:
% COMPLETE
DATE: 11/4/02
STEPHEN WEDDERBURN 9266 PROFESSIONAL ENGINEER STATE OF NEVADA
11-5-02
CIVIL
NORTH
GRAPHIC SCALE
1 inch = 50 ft.
MATCH LINE
CHANNEL & DIKE
DIKE
TOMSICK
PATRICK
N 735600
N 735400
N 735200
N 735000
N 734800
N 734600
N 734400
N 734200
N 734000
E 748600
E 748800
E 749000
E 749200
E 749400
E 749600
E 749800
E 750000
E 750200
E 750400
E 750600
E 750800
E 751000
E 751200
E 751400
E 751600
E 751800
E 752000
E 752200
E 752400
E

NORTH

GRAPHIC SCALE

50 0 25 50

(IN FEET)

1 inch = 50 ft.

STATE OF NEVADA
STEPHEN L. WEICHERMAN
No. 9256
PROFESSIONAL ENGINEER
CIVIL

DATE: 1/10/11

REV	DATE	DESCRIPTION	DATE AGEN. APP	DATE BCW APP

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 09-20-02
PLOT TIME: 10:35:09

% COMPLETE

ISSUE DATE:

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

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LOMR FOR CLARK COUNTY, NV FIRM 32003C2535
DRAINAGE BASIN
SOUTHERN VISTA ESTATES DIVERSION CHANNEL AND BERM

WASH CROSS SECTIONS

SHEET
FIG-B
2 OF 3 SHTS

MATCH LINE

NOTE:
THESE FEATURES
HAVE BEEN REMOVED.
SEE PHOTO

EAST
WEST
80.0'
16.4'
12' MIN ACCESS RD
9.3'
10.0'
14.0'
2%
2%
3:1
3:1
MATCH EXIST. FINIS GRADE
85.23 FG
RIPRAP D50 = 10"
6" MIN GROUTED
(SEE PROFILE)
UPSTREAM DROP STRUCTURE
SECTION
STA. 21+00
NOT TO SCALE
EAST
WEST
80.0'
19.4'
13.9' MIN ACCESS ROAD
11.5'
10.0'
9.0'
4.0'
2%
2%
3:1
3:1
MATCH EXIST. FINISH GRADE
85.63 FG
CALICHE
10 FT. BOTTOM WIDTH
SECTION
STA. 20+00
NOT TO SCALE
EAST
WEST
80.0'
10.0'
20.0'
10.0'
4.0'
2%
2%
3:1
3:1
85.03 FG
RIPRAP D50 = 10"
6" MIN GROUTED
(SEE PROFILE)
DOWNSTREAM DROP STRUCTURE
SECTION
STA. 21+40
NOT TO SCALE
WEST
80.0'
10.0'
20.0'
10.0'
4.0'
2%
2%
3:1
3:1
85.63 FG
CALICHE
RIPRAP D50 = 6" DEPTH = 12" ON TOP OF CALICHE
20 FT. BOTTOM WIDTH
SECTION
STA. 20+00
NOT TO SCALE
2520
2510
2500
2490
0+00
1
2
3
4
5+00
6
7
8
TOP OF BERM & ACCESS ROAD
EXIST. GRADE @ F.L.
STA. 21+00 TOP OF BERM
STA. 20+00 TOP OF BERM
SCALE : 1" = 40'
0 20 40 60 80 100
Call before you Dig.
1-800-227-2600
SEE SHEET 3
CHANNEL PLAN & PROFILE
STA. 14+70.00 BEGIN BERM
A.P.N. NO. 420-230-005
R/W
PROPERTY LINE
3:1 SIDE SLOPE MAX.
LEGEND & ABBREVIATIONS
DRAINAGE CHANNEL

MATCH LINE - SEE SHEET 2

TOP OF BERM & ACCESS ROAD

EXIST. GRADE @ ℄ F.L.

℄ ACCESS LOCATION No. 2.3

EXIST. GRADE @ ℄ CHANNEL

TOP OF BERM & ACCESS ROAD

100 YEAR WATER SURFACE (Q= 500 cf.s.)

FINISH GRADE @ ℄ CHANNEL

℄ ACCESS LOCATION No. 2.2

SEE NOTE BELOW

GROUT RIPRAP 2' MIN. DEPTH

10+00 11 12 13 14 15+00 16 17 18

MATCH LINE - SEE SHEET 4

MATCH LINE - SEE SHEET 2

B.L.M.

PROPERTY LINE

℄ CONTROL LINE

FLOW LINE

℄ OF BERM (1.58% ALONG TOP OF BERM)

R/W

6' CHAIN LINK FENCE (T.Y.P.)

2:1 SLOPE MAX.

5' CHAIN LINK FENCE (T.Y.P.)

4.2 % ALONG TOP OF ROAD

2.5% MAX. "R"

A.P.N. NO. 420-340-007

LEGEND & ABBREVIATIONS

P.S.	POWER POLE
EX.	EXISTING
℄	CENTERLINE
A.P.N.	ASSESSORS PARCEL NUMBER
B.L.M.	BUREAU OF LAND MANAGEMENT

NOTES:

STATIONS FOR PROFILE ARE ALONG SURVEY CONTROL LINE

STATIONS NORTH OF HIGGINS ARE COMMON TO CONTROL LINE AND CHANNEL CENTERLINE

NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

SCALE : 1" = 40'

0 20 40 60 80 100

Call before you Dig. 1-800-227-2600

DRAINAGE CHANNEL

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

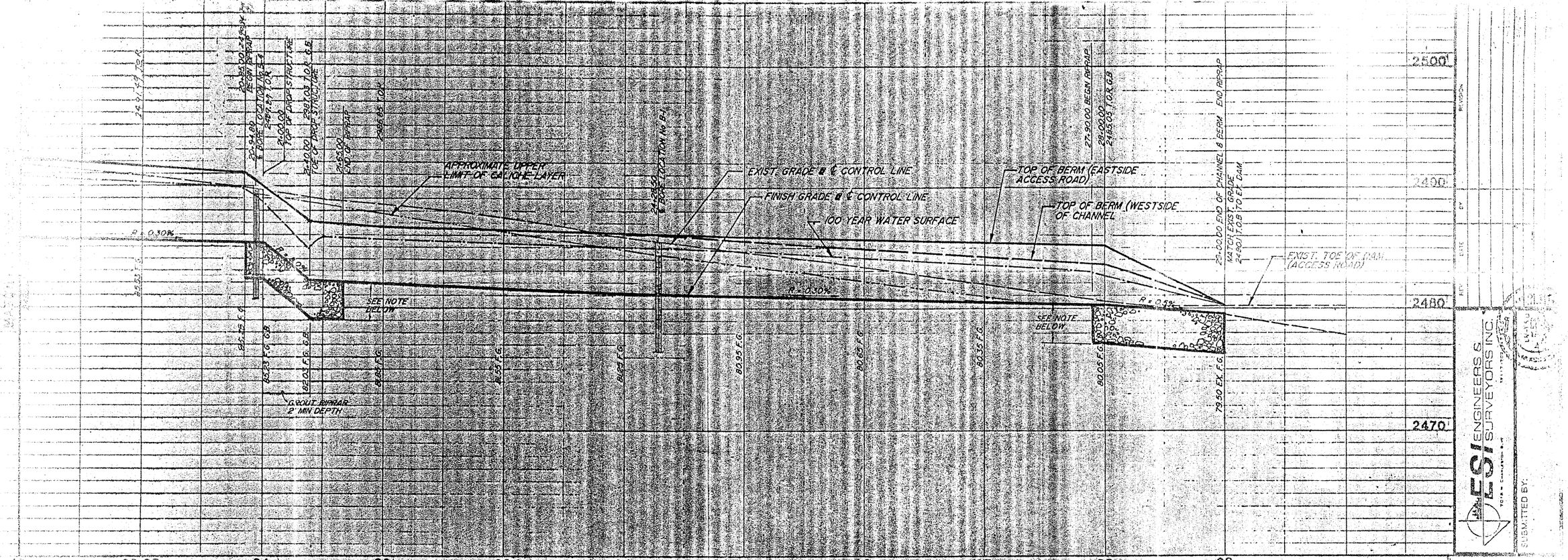
ACCEPTANCE OF PLANS FOR FILING
BY:
ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL NOT BE LIABLE FOR DAMAGES RESULTING FROM THE CONSTRUCTION OF THESE PLANS FROM THE ENGINEERING DESIGN INDICATED HEREON.

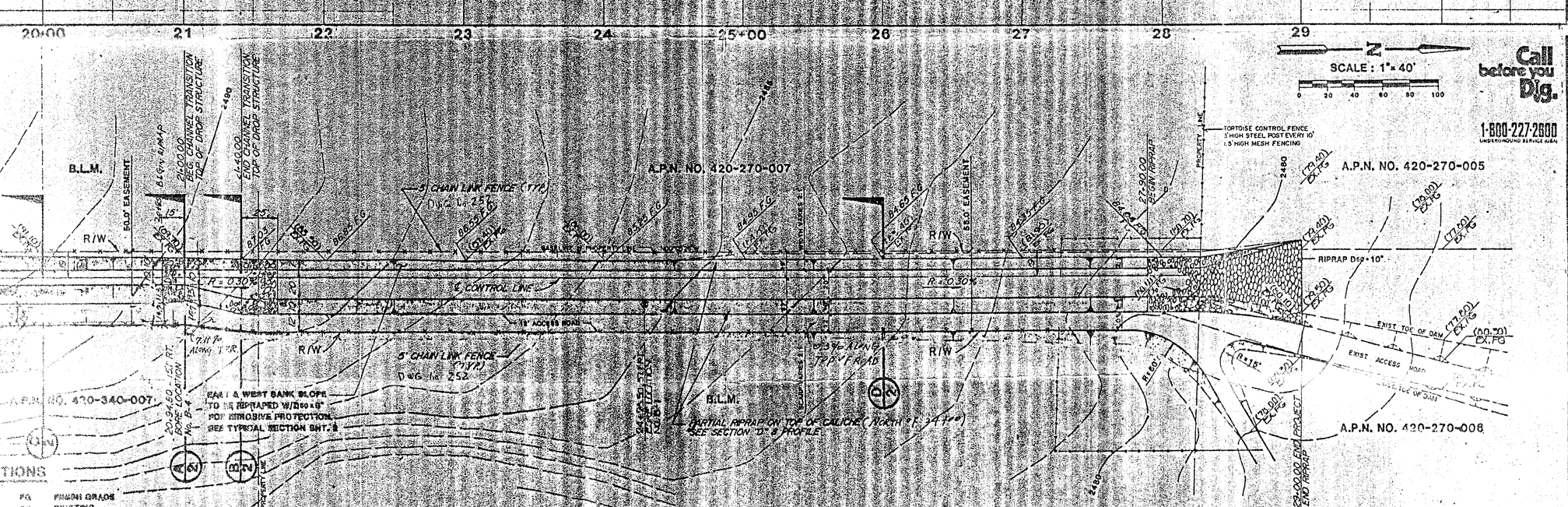
CHANNEL PLAN & PROFILE

DRAINAGE CHANNEL

FEB 2016

SHEET 3 OF 4 SHEETS





FG FINISH GRADE
EX EXISTING
℄ CENTERLINE
A.P.N. ASSESSORS PARCEL NUMBER
B.L.M. BUREAU OF LAND MANAGEMENT

NOTE: RIPRAP TO BE KEYED TO 5' MIN. OR FIRST CALICHE LAYER.

NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

DRAINAGE CHANNEL

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

ACCEPTANCE OF PLANS FOR FILING
BY: _____
ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN

ESI ENGINEERS & SURVEYORS INC.

SUBMITTED BY:

WO NO. 1834 A&B
BY DWB/TG
DATE JAN. 1993
SCALE HORIZ. 1"= 40'
VERT. 1"= 4'

SHEET 4 OF 4 SHEETS

DRAINAGE CHANNEL
CHANNEL PLAN & PROFILE

FEB 25 1993