Floodplain Delineation for

EAGLE BLUFF III
LOMR for BOX CULVERT

A Revision of FEMA Case #02-09-695R
FLOODPLAIN DELINEATION FOR EAGLE BLUFF II

FEMA Case #04-09-0882R

Prepared for
Courtland Homes
5333 N. 7th Street, Suite 305
Phoenix, Arizona 85014
602 265-9467

Registered Professional Engineer (Civil)
CERTIFICATE NO.
38798
CESAR
PEREZ
Date Signed 12/7/04
ARIZONA U.S.A.

Prepared by
Sage Engineering Corporation
3414 South 48th Street Suite 8
Phoenix, Arizona 85040
Telephone (480) 966-9971
Fax (480) 929-9901

S.E.C. Job No. 1324002
December 7, 2004

Sage engineering corporation

City of Phoenix
STREET TRANSPORTATION DEPARTMENT

December 16, 2004

FEMA Depot
3601 Eisenhower Avenue
Alexandria, Virginia 22304

ATTN: LOMR Depot

RE: LETTER OF MAP REVISION (LOMR),
FLOODPLAIN DELINEATION FOR EAGLE BLUFF III, PHOENIX, AZ
PANEL 04013C1210G, NOVEMBER 13, 2003 AND
PANEL 04013C1220G JULY 19, 2001

Please find enclosed a Letter of Map Revision (LOMR) application for Eagle Bluff III in Phoenix, Arizona. The following items are included with this application.

ITEMS:

1- Check for $3,800.
2- Copy of approved CLOMR, dated August 18, 2004.
3- Payment Information Form.
4- Overview and Concurrence Form MT-2 Form 1, (Section 2.0).
5- Riverine Hydrology & Hydraulics Form MT-2 Form 2, (Section 2.0).
6- Riverine Structures Form MT-2 Form 3, (Section 2.0).
7- As-Builts Plans, certified by registered professional engineer (Appendix D).
8- Flood Profiles and Floodway Data Table (Appendix C).
9- Annotated Map (Section 2.0).

If you have any technical questions regarding this project, please contact Mr. Cesar Perez, P.E., Sage Engineering Corporation, phone number 480-966-991; fax 480-929-9901. For any other questions, please contact this office at 602-262-4960.

Sincerely,

Hasan Mushtaq, Ph.D., P.E., CFM
Floodplain Manager

FLOOD CONTROL DISTRICT
RECEIVED
DEC 21 '04
FINANCE
LANDS
O & M
P & PM
FILE
TMM

Cc: Mr. Brian Cosson, Arizona Department of Water Resources
Mr. Tim Murphy, P.E., CFM, Flood Control District of Maricopa County
Mr. Cesar Perez, P.E. Sage Engineering Corporation.

200 West Washington Street, Fifth Floor, Phoenix, Arizona 85003 1611 602-262-6284 FAX: 602-495-2016
Recycled Paper

Sage engineering corporation

December 7, 2004

City of Phoenix
Floodplain Management
ATTN: Mr. Hasan Mushtaq, Ph.D, P.E.
200 W. Washington Street
Phoenix, AZ 85003

Re: Eagle Bluff III LOMR for box culvert
(S.E.C. Job #1324002)
(FEMA Case No. 04-09-0882R)

Dear Mr. Mushtaq,

This letter is in reference to FEMA form MT-2 Form 2, page 2 of 2, Section "D", question 1. The following will address the seven criteria as called out in Section 65.12 of the NFIP regulations:

1. A LOMR report has been submitted to the City of Phoenix Floodplain Management Department with the appropriate fee of $3800.00.
2. A box culvert was added to the wash with established BFE's. The addition of this culvert caused an increase in water surface elevation by approximately 0.20'. Several alternatives were considered in an attempt to lower the new BFE's:

   The addition of storage areas upstream and down stream of the culvert did not change the water surface elevations.

   The addition of several more box culverts in the space allowed showed a very minor change in lowering the water surface elevations

   Raising the culvert, lowering the culvert and changing the slope of the culvert all had no effect on lowering the water surface elevation.

   Changing the size of the culvert to a point where it could still be utilized as a roadway crossing, lowered the water surface elevation slightly.

   The use of one or all the scenarios listed above did not lower the water surface elevation by the necessary 0.20'.

3414 south 48th street, suite 8, phoenix, az 85040 (480) 966-9971

3. No other property owners will be affected by this rise in water surface elevation other than those that were affected by the original CLOMR/LOMR.
4. No other community is or will be impacted by the proposed increase in BFE's.
5. There are no structures located in the area that will be impacted by the increase in BFE's.
6. All data, as called out in Section 65.5 of the NFIP Regulations, to revise the BFE's are presented in the LOMR report.
7. All data, as called out in Section 65.7 of the NFIP Regulations, to revise the floodway are also presented in the LOMR report.

Sincerely,

Registered Professional Engineer (Civil)
CERTIFICATE No.
38798
CESAR
PEREZ
Date Signed 12/7/04
ARIZONA U.S.A.

Cesar Perez, P.E.
Project Manager

FEDERAL EMERGENCY MANAGEMENT AGENCY

PAYMENT INFORMATION FORM

Community Name: CITY OF PHOENIX

Project Identifier: EAGLE BLUFF III

THIS FORM MUST BE MAILED, ALONG WITH THE APPROPRIATE FEE, TO THE ADDRESS BELOW OR FAXED TO THE FAX NUMBER BELOW.

Type of Request:

☐ MT-1 application
☒ MT-2 application

FEMA
Fee Charge System Administrator
P.O. Box 22787
Alexandria, VA 22304
FAX (703) 317-3076

☐ EDR application

FEMA Project Library
3601 Eisenhower Avenue
Alexandria, VA 22304
FAX (703) 751-7391

Request No.: _____ (if known)

Amount: $3,800.00

☐ INITIAL FEE* ☐ FINAL FEE ☐ FEE BALANCE** ☐ MASTER CARD ☐ VISA ☒ CHECK ☐ MONEY ORDER

*Note: Check only for EDR and/or Alluvial Fan requests (as appropriate).

**Note: Check only if submitting a corrected fee for an ongoing request.

COMPLETE THIS SECTION ONLY IF PAYING BY CREDIT CARD

CARD NUMBER

☐☐☐☐ — ☐☐☐☐ — ☐☐☐☐ — ☐☐☐☐
1 2 3 4 — 5 6 7 8 — 9 10 11 12 — 13 14 15 16

EXP. DATE

☐☐ — ☐☐
Month — Year

_____ Date

_____ Signature

NAME *(AS IT APPEARS ON CARD)*: _____
(please print or type)

ADDRESS: _____
(for your credit card receipt-please print or type) _____

DAYTIME PHONE: _____

Sage engineering corporation

To Whom It May Concern: December 7, 2004

The riverine analysis for the Tributary Wash to Cave Creek was approved by FEMA under Case #02-09-695R. When that analysis was performed, Courtland Homes was in the process of developing the south side of the Tributary wash mentioned above. The name of that development is Eagle Bluff II. In designing Eagle Bluff II, the finished pad grades were set at approximately 2 feet above the water surface elevation of the floodway as shown in the FEMA Case Study entitled "Floodplain Delineation for Eagle Bluff II" mention above. When the grading of that development was complete, as-builts of the finished grades were submitted back to FEMA along with the "Floodplain Delineation" report to receive L.O.M.R. approval. That L.O.M.R. approval was received on November 13, 2003.

Courtland Homes is now in the process of developing the north side of the Tributary Wash to Cave Creek. This development is called Eagle Bluff III. The only access to this project is via 17th Street which crosses the Wash. The crossing involves the addition of box culverts to the already approved L.O.M.R. hydraulic model for Eagle Bluff II. This addition of the box culverts to the original hydraulic model has caused an increase in water surface elevation by approximately 0.20 feet in both the floodplain and floodway. This rise in elevation occurs for approximately 700 feet immediately upstream of the box culvert. The pad grades on each side of the Wash in this area have been set at a minimum of 2 feet above the floodway water surface elevation of the approved L.O.M.R. for Eagle Bluff II. This rise in water surface elevation has no adverse impact on the adjoining lots.

The CLOMR (Case No. 04-09-0882R) for the inclusion of the box culverts in the riverine analysis has been approved by FEMA in a letter dated August 18, 2004. We are now formally submitting this LOMR which is identical to the CLOMR that was approved, with the exception that "as-built" plans for the box culvert have been included in the pocket of this report.

Sincerely,

Registered Professional Engineer (Civil)
CERTIFICATE NO.
38798
CESAR
PEREZ
Date Signed
ARIZONA U.S.A.

Cesar Perez, P.E.
Project Manager

3414 south 48th street, suite 8, phoenix, az 85040 (480) 966-9971

Federal Emergency Management Agency

Washington, D.C. 20472

AUG 18 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 04-09-0882R

The Honorable Phil Gordon
Mayor, City of Phoenix
200 West Washington Street, 11th Floor
Phoenix, AZ 85003-1611

Community: City of Phoenix, AZ
Community No.: 040051

104

Dear Mayor Gordon:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated April 6, 2004, Hasan Mushtaq, Ph.D., P.E., CFM, Floodplain Manager, Street Transportation Department, City of Phoenix, requested that FEMA evaluate the effects that a detailed hydraulic analysis along Tributary to Cave Creek Wash (Tributary) from approximately 600 feet upstream to approximately 3,400 feet upstream of the confluence with Cave Creek Wash and construction of four 10-foot by 4-foot reinforced-concrete box culverts (RCBs) along the Tributary from approximately 1,700 feet upstream to approximately 1,800 feet upstream of the confluence with Cave Creek Wash would have on the flood hazard information shown on the effective FIRM and FIS report. This request also included a redelineation of the regulatory floodway boundary along the Tributary from approximately 1,300 feet upstream to approximately 1,500 feet upstream of the confluence with Cave Creek Wash to better reflect the effects of a Letter of Map Revision (LOMR) issued on November 13, 2003 (Case No. 03-09-0552P).

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Dr. Mushtaq.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. We believe that, if the proposed project is constructed as shown on the plans entitled "Eagle Bluff III Paving Plan," dated July 2003, and as described in the submitted report entitled "Floodplain Delineation For Eagle Bluff III," dated February 20, 2004, both prepared by Sage Engineering Corporation, and the data listed below are received, a revision to the FIRM would be warranted.

In the map attachment to the November 13 LOMR, the effective regulatory floodway was inadvertently shown as wider than necessary. As a result of the redelineation, the width of the regulatory floodway for the Tributary will decrease compared to the effective floodway width. The maximum decrease in floodway width, approximately 100 feet, will occur approximately 1,400 feet upstream of the confluence with Cave Creek Wash.

The submitted proposed conditions HEC-RAS hydraulic computer model dated February 20, 2004, included the proposed four 10-foot by 4-foot RCBs. As a result of the proposed project, the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for the

Tributary will increase compared to the effective Base Flood Elevations (BFEs). The maximum increase in BFE, 0.2 foot, will occur approximately 2,300 feet upstream of the confluence with Cave Creek Wash. As a result of the proposed project, the widths of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, and the regulatory floodway will not change compared to the effective SFHA and redelineated floodway widths.

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report.

- Detailed application and certification forms, which were used in processing this request, must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the preliminary plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

  Hydraulic analyses, for as-built conditions, of the base flood and the regulatory floodway, together with a topographic work map showing the revised floodplain and floodway boundaries, must be submitted with Form 2.

- Effective September 1, 2002, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $3,800 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card. The payment must be forwarded to the following address:

  Federal Emergency Management Agency
  Fee-Charge System Administrator
  P.O. Box 3173
  Merrifield, VA 22116-3173

- As-built plans, certified by a registered professional engineer, of all proposed project elements

- Community acknowledgment of the map revision request

- A copy of the public notice distributed by your community stating its intent to revise the regulatory floodway, or a statement by your community that it has notified all affected property owners and affected adjacent jurisdictions

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM. Because the BFEs would change as a result of the project, a 90-day appeal period would be initiated, during which community officials and interested persons may appeal the revised BFEs based on scientific or technical data.

The basis of this CLOMR is, in whole or in part, a culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the culverts rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Federal Insurance and Mitigation Division of FEMA in Oakland, California, at (510) 627-7103. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: Hasan Mushtaq, Ph.D., P.E., CFM
Floodplain Manager
Street Transportation Department
City of Phoenix

Mr. Ted Collins
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

Mr. Cesar Perez, P.E.
Project Engineer
Sage Engineering Corporation

Table of Contents

1.0 Introduction
- 1.1 Purpose of Study
- 1.2 Authority for study
- 1.3 Location of study
- 1.4 Summary of Methodology

Figure 1.1 (Vicinity Map)

2.0 FEMA Forms
- 2.1 Study Document Abstract for FEMA Submittal
  - MT-2 Form 1
  - MT-2 Form 2
  - MT-2 Form 3
  - Existing FIRM Exhibit

3.0 Survey and Mapping Information
- 3.1 Field Survey Information
- 3.2 Mapping

4.0 Hydrology
- 4.1 Method Description
- 4.2 Parameter Estimation
- 4.3 Problems Encountered

5.0 Hydraulics
- 5.1 Method Description
- 5.2 Parameter Estimation
- 5.3 Cross section description
- 5.4 Modeling Considerations
- 5.5 Floodway Modeling
- 5.6 Problems Encountered
- 5.7 Final Results

6.0 Erosion and Sediment Transport

7.0 Draft FIS Report Data
- 7.1 Summary of Discharges
- 7.2 Floodway Data
- 7.3 Annotated Flood Insurance Rate Map
- 7.4 Flood Profiles

Appendix
- A. Hydrologic Analysis (HEC-1 Report)
- B. Hydraulic Analysis(HEC-RAS Report)
- C. Flood Profiles
- D. Pocket
  - Drainage Map (Flow Values & Locations)
  - Box Culvert "As-Builts"
- E. Disk included in Pocket

1.0 Introduction

1.1 Purpose of Study

This Flood Delineation Study for Eagle Bluff III revises and updates the information in the Delineation Study for Eagle Bluff II. In that study, base flood elevations (BFE) were determined and approved by FEMA on November 13, 2003 under FEMA Case #02-09-695R. In the approved study, the hydraulic model for a proposed street crossing which involved the use of box culverts to convey the flow under 17th Street was not included as part of that analysis. This analysis focuses on the Tributary Wash to Cave Creek and in no way affects the Tributary to the Tributary Wash to Cave Creek.

The City of Phoenix will use the information in this floodplain delineation study to regulate floodplain development, to promote sound land use practices, and for floodplain management.

When the Central Arizona Project Canal was built, (it replaced the old Verde Canal as shown on the USGS Quad Map), it was bermed on the north thereby setting up a flooding condition. A relief channel runs parallel to the CAP Canal, north of the berm. This channel directs any water to the northwest to the Cave Creek Wash. No detailed delineation was done at that time, probably because no residences or other flood hazards were north of the berm. An assumption that water would be impounded (Zone A—No defined elevations), was made and reflected on the FIRM Map.

This study is based on HEC-1 hydrology and HEC-RAS Hydraulics.

1.2 Authority for Study

Sage Engineering, Inc. performed the hydrologic and hydraulic analyses for this study, for Courtland Homes under contract #1324002. The project manager for the Eagle Bluff Floodplain Delineation Study is Cesar Perez. This study was completed in February 2004 and submitted to the City of Phoenix for Submittal to FEMA. Floodplain Management for the City of Phoenix performed an "administratively correct review"of the Study.

1.3 Location of Study

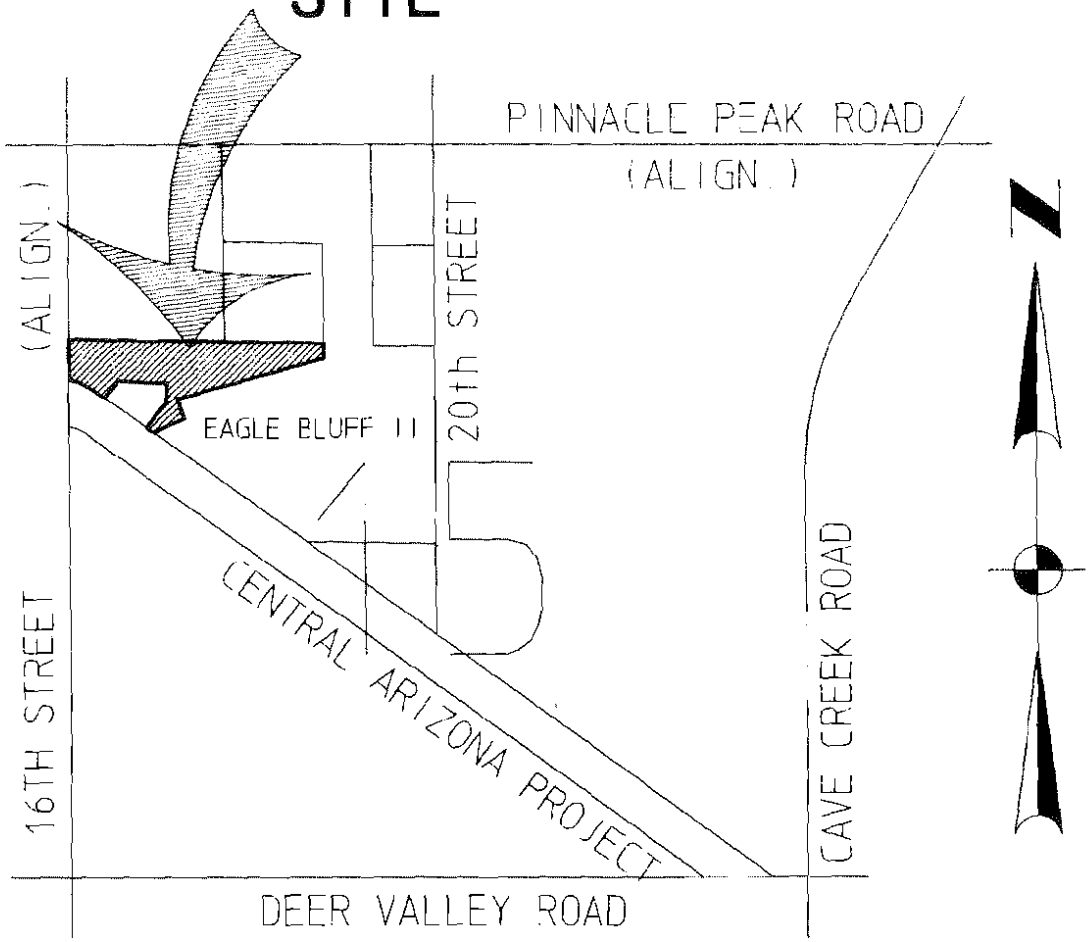
The Eagle Bluff FDS area is located within portions of the City of Phoenix, (Figure 1. 1). The flooding areas studied are generally located in Section 15 Township 4 North, Range 3 East. The Eagle Bluff Floodplain Delineation Study area includes reaches of riverine-like flow upstream of, and parallel to the CAP Canal.

These riverine-type floodplains are a combination of defined rivers and/or manmade channels. Storm water runoff flows through the site in existing washes and along dirt roadway/trails that parallel the CAP Canal. These floodplains were modeled using the HEC-RAS hydraulic model along the boundaries of the Eagle Bluff II property.

1.4 Summary of Methodology

A Hydrologic model was developed using the HEC-1 Model. Floodplain areas are delineated using the HEC-RAS computer models. Topographic data for HEC-RAS modeling was obtained from a digital terrain model developed with Geopak using aerial photos.

EAGLE BLUFF III SITE



SECTION 15, T.4N., R.3E.
N.T.S

VICINITY MAP

FIGURE 1.1

2.0 FEMA Forms and ADWR Abstracts

Study Documentation Abstract for FEMA Submittals		
2.1.1	Date Study Accepted	
2.1.2	Study Contractor: Contact Address Phone/Fax Email	Sage Engineering Corporation Cesar Perez, P.E. 3414 South 48th street suite 8 Phoenix, AZ 85040 (480)966-9971/(480)929-9901 cperez@sage-engr.com
2.1.3	FEMA Technical Reviewer Contractor: Contact Address Phone/Fax Email	 Michael Baker, Jr. Inc Alexandria, VA (703)960-8800
2.1.4	FEMA Regional Reviewer Phone Email	
2.1.5	State Technical Reviewer Phone Email	Brian Cosson Arizona Department of Water Resources (602)417-4100
2.1.6	Local Technical Reviewer Phone Email	Hasan Mushtaq Floodplain Administrator, City of Phoenix (602)262-4026
2.1.7	Reach Description	Tributary To Cave Creek Portions of FIRM # 04013C1210G (revised November 13, 2003) And FIRM #04013C1220G (Revised July 19, 2001
2.1.8	USGS Quadrangle Sheet	Union Hills, Arizona,7.5 Minute 10' C.I. Photo Date: 1954 Latest Photo Revision: 1973
2.1.9	FIRM Maps	Portions of FIRM # 04013C1210G (revised November 13, 2003) And FIRM #04013C1220G (Revised July 19, 2001)

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
040051	PHOENIX, CITY OF	AZ	04013C	1210G	11/13/03

2. Flooding Source: TRIBUTARY TO CAVE CREEK

3. Project Name/Identifier: EAGLE BLUFF III

4. FEMA zone designations affected: AE (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: $3800

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/fhm/frm_fees.shtm **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: CESAR PEREZ	Company: SAGE ENGINEERING CORPORATION	
Mailing Address: 3414 S 48TH STREET SUITE 8 PHOENIX, AZ 85040	Daytime Telephone No.: (480) 966-9971	Fax No.: (480) 929-9901
	E-Mail Address: CPEREZ@SAGE-ENGR.COM	
Signature of Requester (required):		Date: NOVEMBER 10, 2004

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: HASAN MUSHTAQ Ph.D., PE, CFM		Telephone No.: (602) 262-4960
Community Name: CITY OF PHOENIX	Community Official's Signature (required):	Date: 12/16/04

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: CESAR PEREZ	License No.: ARIZONA 38798	Expiration Date: MARCH 31, 2006
Company Name: SAGE ENGINEERING CORPORATION	Telephone No.: (480) 966-9971	Fax No.: (480) 929-9901
Signature:		Date: NOVEMBER 10, 2004

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)

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: TRIBUTARY TO CAVE CREEK
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)
EAGLE BLUFF III	1100 ACRES	469	N/A

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/fhm/en_modl.shtm.

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 transport 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. VELOCITIES ARE VERY LOW TRANSPORT IS INSIGNIFICANT

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	REACH 112	.365	1518.58	1518.79
Upstream Limit	REACH 112	.431	1518.60	1518.80

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/fhm/frm_soft.shtm. 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:
Revised or Post-Project Conditions Model	Natural File Name: PROFILE 1	Floodway File Name: PROFILE 2
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/fhm/en_modl.shtm.

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:
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:**

Type (check one): ☐ Channelization ☑ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

2. **Name of Structure:**

Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

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:

Name of Structure:

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

N/A

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 (cfs) and/or the -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): HEC-RAS
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. VELOCITIES ARE VERY LOW

TRANSPORT IS INSIGNIFICANT

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.

N/A

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	to
☐ 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?

N/A

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers:
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:
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:
4. A layout detail for the embankment protection measures. Sheet Numbers:
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers:

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 s 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:

b. The maximum levee slope floodside is:

c. The range of velocities along the levee during the base flood is: (min.) to (max.)

d. Embankment material is protected by (describe what kind):

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)

N/A

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)

N/A

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 hours.

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ Other (specify):

b. Foundation scour protection is provided check box

☐ 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.

N/A

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.

N/A

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.

N/A

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:

Name of Structure:

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 acre-feet

Debris load associated with the base flood discharge: Volume acre-feet

Sediment transport rate (percent concentration by volume)

Method used to estimate sediment transport:

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.

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.

N/A

APPROXIMATE SCALE IN FEET

1,000 500 0 1,000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1210 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

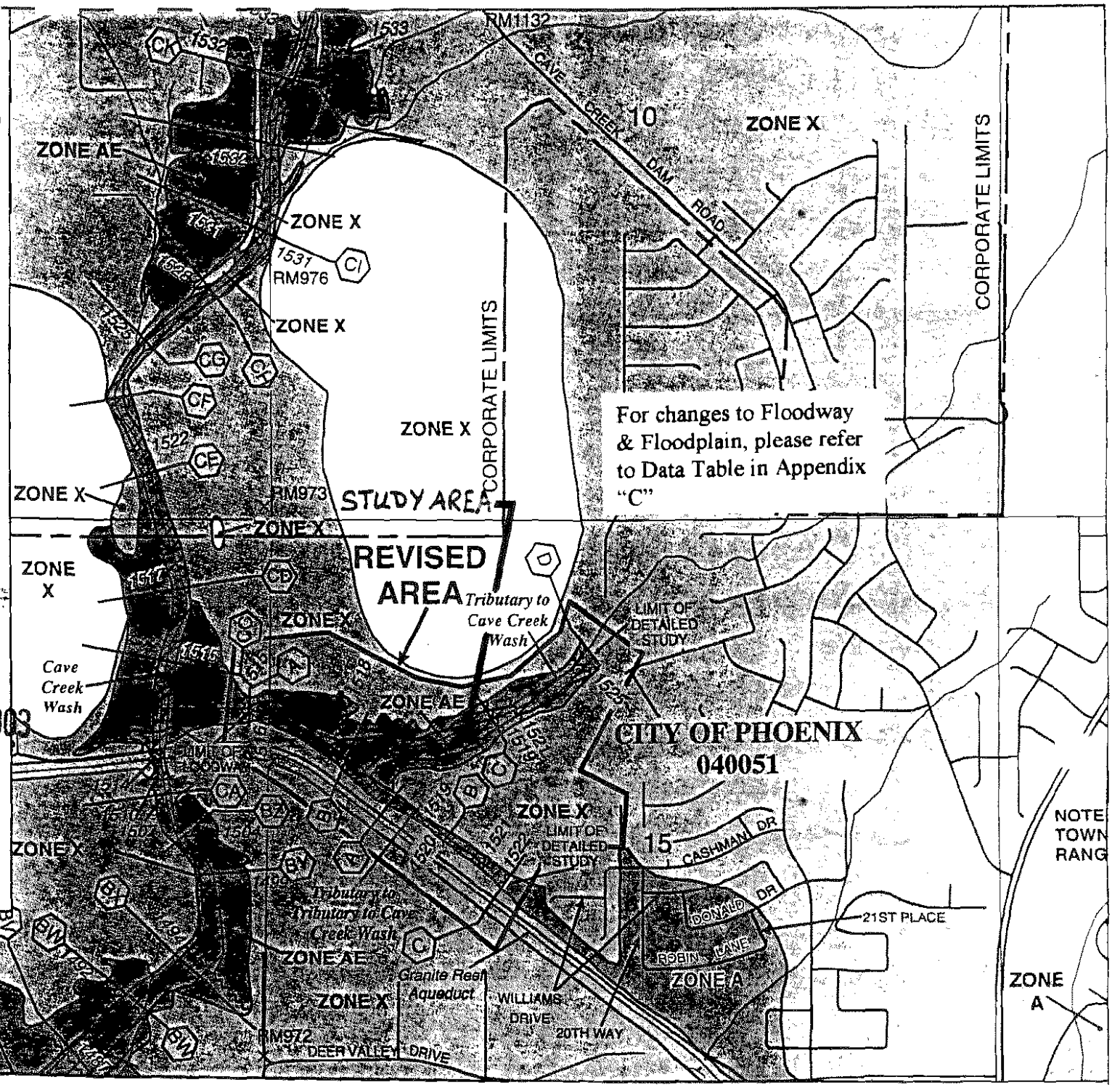
COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	1210	G
PHOENIX, CITY OF	040051	1210	G

REVISED TO
EFFECT ON
NOV 13 2003

MAP NUMBER
04013C1210 G

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency



3.0 Survey & Mapping Information

3.1 Field Survey Information

Sage Engineering crews conducted vertical control survey in February of 2002 to verify the Benchmark Elevations. All elevations within this FIS are based on RM 1132, which has an Elevation of 1562.67 per FIRM 04013C1210.

3.2 Mapping

Topographic mapping was provided by Kenney Aerial Mapping Inc. at 1 "=200' scale and with 1-foot contours. This mapping was based on survey data provided by Sage Engineering Corporation. Vertical elevations are based on the National Geodetic Vertical Datum of 1929. Horizontal control uses Arizona State Plane Coordinates based on the 1927 North American Datum. The flight date for the mapping was November 7, 2001.

4.0 Hydrology

4.1 Method Description

The hydrologic analysis is to provide runoff data (flows) for delineation of flood hazard areas upstream of Cave Creek along the CAP Canal. Runoff is computed for the 100-year, 24-hour storm. The resulting model will be used as a tool for managing the development of the watershed.

The HEC-1 Model was developed to determine the Rainfall runoff in the study area. The limits of the watershed were initially determined from the USGS Quadrangle Maps. After this, a field inspection was made to determine the validity of the drainage map. The watershed is a mix of residential developments and vacant desert landscape.

The watershed for this model consists of 1100 acres. It was divided into two Basins with separate areas. The main Basin has been divided into nine sub-basins (Sub-basins 1-9). Only sub-basins 1 through 8 were analyzed in this LOMR. The tributary basin has been divided into five sub-basins (sub-basins A- E). The Drainage areas used in the HEC-1 model are illustrated in Exhibit 1(Appendix A). Exhibit 2(Appendix A) is a composite aerial photo of the watershed that clarifies how modeling assumptions were made. The drainage areas are overlaid on the photos so that the percentage of land use for the sub-basins could be determined. The city of Phoenix requires detention in all of the newly developed areas. An assumption was made that this retention was equivalent to 15% of the developed areas (10 Acres developed = 1.5 acre-feet of detention).

4.2 Parameter Estimation

Parameter estimates were made using the SCS methodology for soil conditions and land use of the watershed. These parameters are summarized in Exhibit 3(Appendix A).

4.3 Problems encountered.

No problems were encountered in the study.

5.0 Hydraulics

5.1 Method Description

Two types of flood hazards along the upstream side of the embankments of the CAP Canal studied by detailed methods for the Eagle Bluff Floodplain Delineation Study: (1) ponding areas, and (2) riverine and/or sheet flow along the CAP Canal between adjacent ponding areas. Storm water runoff in the study area generally flows toward the southwest, following the natural topography of the watershed. The CAP Canal embankments are generally aligned northwest to southeast, creating obstructions to the southerly component of the natural runoff pattern. These obstructions divert the runoff to the northwest parallel to the CAP Canal embankments.

Riverine flow is modeled using HEC-RAS (Version 3.0.1 March 2001).

The starting water surface elevation was computed by the normal depth method. The calculated elevation is nearly equivalent to the elevation of 1515.0 that is the backwater elevation from Cave Creek. Elevation 1515.0 will remain the regulatory elevation in that section of the reach.

5.2 Parameter Estimation

5.2.1 Roughness Coefficients. Manning's roughness coefficients, or "n" values, are determined using procedures adopted by the FCDMC. They are summarized below. They are based on hydraulic information and geomorphic data gathered during field reconnaissance trips.

Typical "N" Values for HEC-RAS Model

Description	Average Value	Range
Vacant Desert Land	0.045	0.035-0.055
Dirt/trailway Areas	0.030-0.035	0.030-0.045

In practice, "n" values were selected for each cross section based on features observed in the field

5.2.2 Expansion & Contraction Coefficients. The default values of expansion and contraction coefficients, 0.1 and 0.3, respectively, are used in the HEC-RAS modeling.

5.3 Cross Section Description

HEC-RAS cross sections were spaced at 200-foot intervals; additional cross sections were added to the model immediately upstream and downstream of the north-south control feature to better model flow over the submerged obstruction. In general, cross sections are oriented perpendicular to their respective reaches.

Cross section stationing is also based on reach distance from Cave Creek for the tributary and reach distance upstream of the tributary for the tributary to the tributary. Cross section data are obtained from the digital terrain model developed using Geopak software, and are checked against the surveyed topographic data and the printed FCDMC topographic mapping for the study area.

5.4 Modeling Considerations

5.4.1 Hydraulic jump and Drop Analysis. No hydraulic jumps were modeled in the study area. No drop structures exist in the areas mapped by detailed methods.

5.4.2 Bridges & Culverts. There is only one culvert crossing in this study which is located at river station 0.338 in the Tributary to Cave Creek Wash (Reach 112). The first analysis approved by FEMA did not include the hydrology for this crossing. This analysis shows that there is a 0.20 foot rise in water surface elevation for approximately 700 feet upstream of the box culvert.

5.5 Floodway Modeling

The floodway was determined using the HEC-RAS Model, limiting the encroachment elevation to less than one foot. The encroachment station values that were originally used in the Delineation for Eagle Bluff II were not changed for this study. The boundary of the floodway remains the same while the water surface elevation of the floodway increases by 0.20 feet. This does not adversely affect the adjacent lots on either side of the wash since their pad grades were set at a minimum of 2 feet above the approved floodway water surface elevations. This increase in elevation occurs for 700 feet immediately north of the box culvert.

5.6 Problems Encountered During the Study

None.

5.7 Final Results

5.7.1 Hydraulic Analysis Results. The HEC-RAS data sheets in Appendix B, summarizes the results of the hydraulic analysis for the box culvert.

5.7.2 Verification of Results. The last table titled "WSE Comparison" presented in Appendix B compares the water surface elevations without the box culvert, as previously approved by FEMA, with the water surface elevations including the box culvert. The data will show that there was a 0.20 foot increase in WSE from the approved floodplain BFE as called out in the Delineation Study for Eagle Bluff II. Because the building pads on each side of the wash were set at 2 feet above the approved floodway WSE, the rise in WSE due to the addition of the box culvert has no adverse impact on the adjoining lots.

6.0 Erosion and Sediment Transport

No detailed erosion and sediment transport analyses were included in the Eagle Bluff II Floodplain Delineation Study. In general, the flood hazards considered in the study area included low velocity flow within existing washes/channels. Outside of peak flooding during the 1% annual-chance storm, the probable impact of scour and sedimentation on the flood hazards mapped for this study is insignificant.

7.0 Draft FIS Report Data

7.1 Summary of Discharges

The Discharges are summarized in the HEC-1 printout in Appendix A and on the work map in the pocket of Appendix D.

7.2 Floodway Data

Floodway data is tabulated in Appendix C and on the Workmap located in Appendix D

7.3 Annotated Flood Insurance Rate Map

The reduced-scale floodplain delineation maps are presented as Exhibit 3 in Appendix C.

7.4 Flood Profiles

The flood profiles are included in Appendix C.

APPENDIX A

Hydrologic Analysis

(HEC-1 Report)

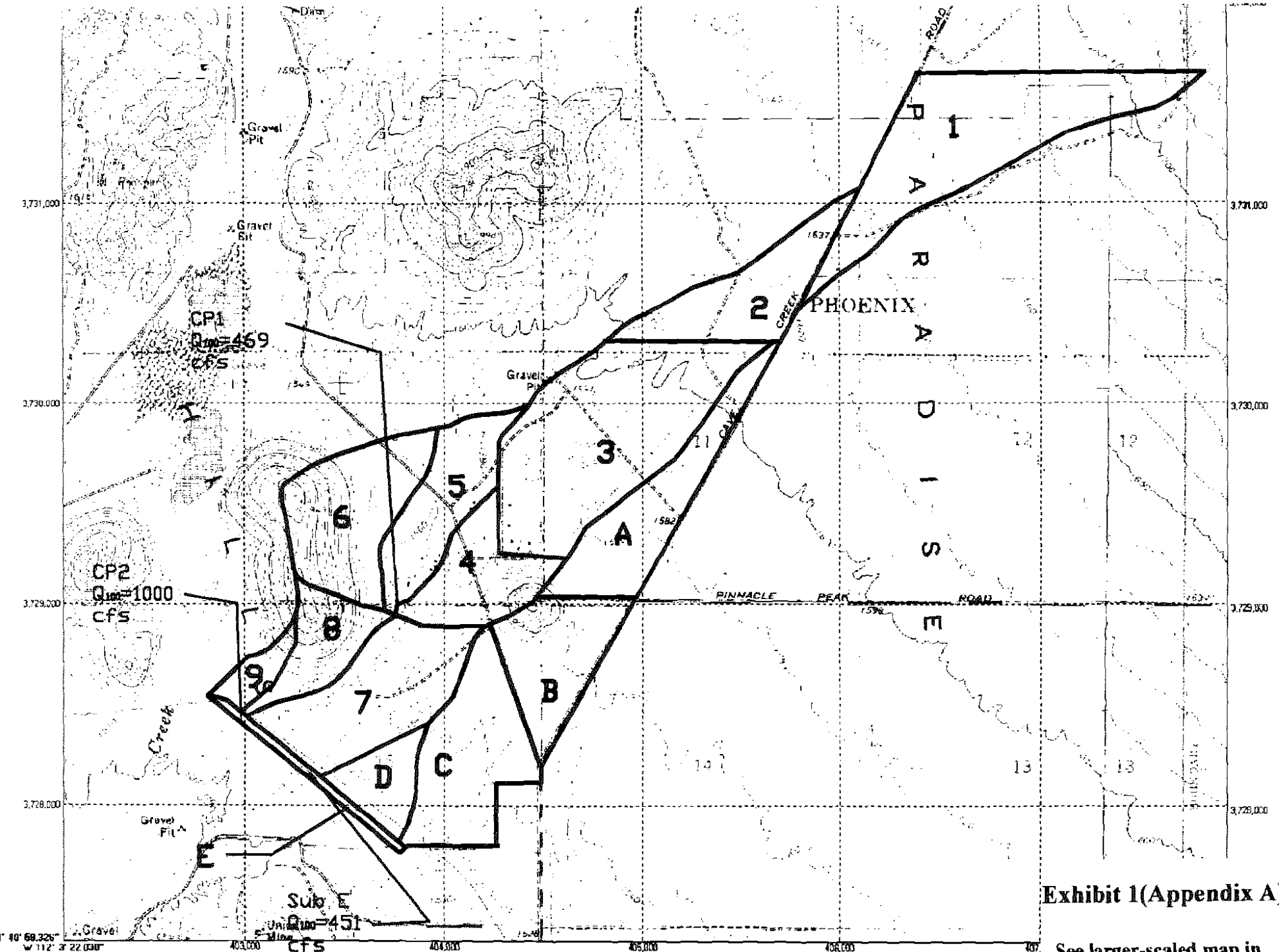
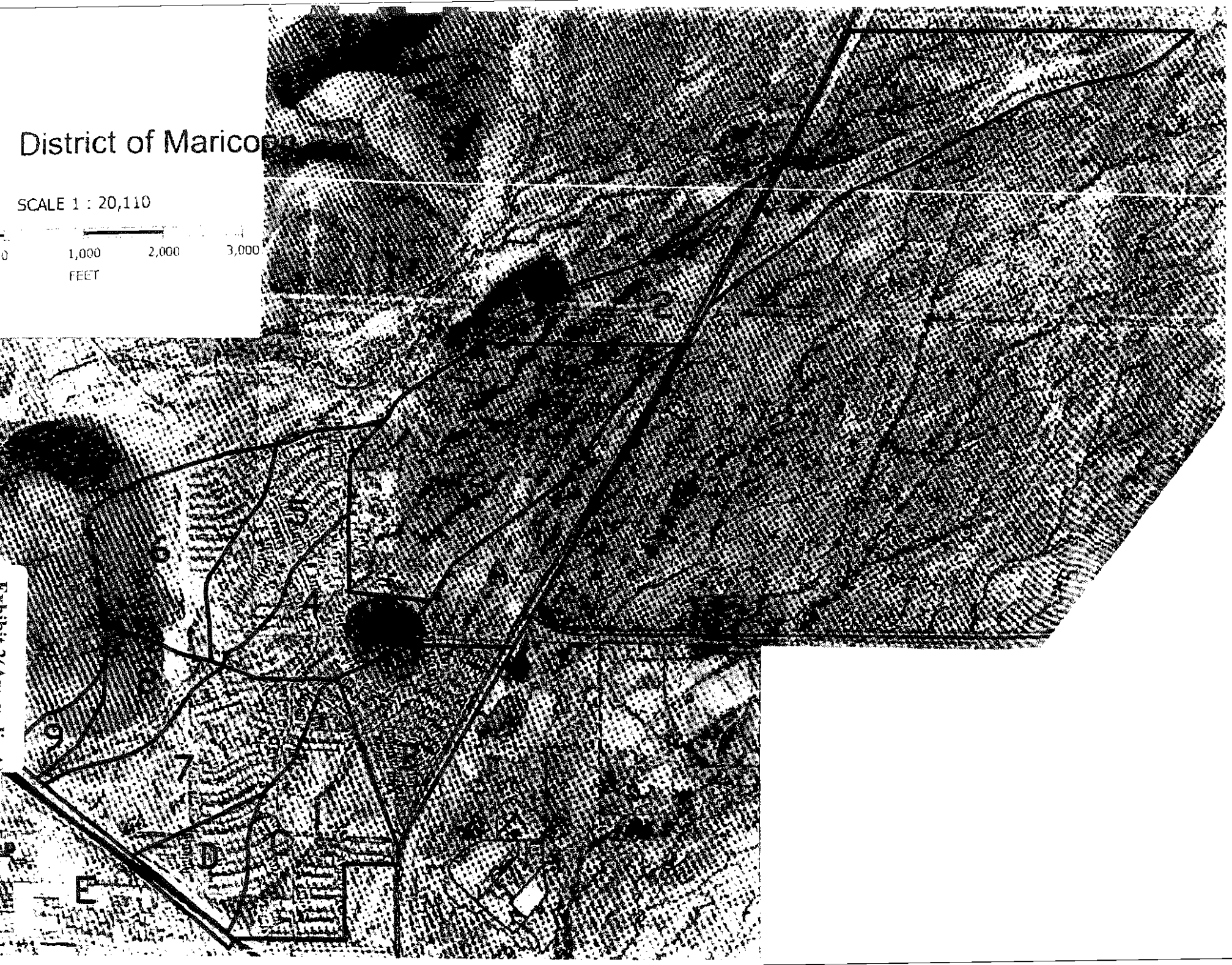


Exhibit 1(Appendix A)

See larger-scaled map in Pocket D--Drainage Map


District of Maricopa
SCALE 1 : 20,110
0
1,000
2,000
3,000
FEET
6
5
4
9
7
D
E

Drainage Areas
Properties

Sub-Area	Acres	Mi^2	Length	Slope	Gently Sloping Desert	Steep Native Desert	Residential (no Detention)	Residential (with Detention)
1	156.47	0.244	6095	1.23%	100%			
2	76.63	0.120	3193	1.16%	97%	3%		
3	183.18	0.286	4863	0.82%	94%	6%		
4	67.75	0.106	2086	0.96%			12%	88%
5	67.50	0.105	3560	1.11%	4%			96%
6	92.04	0.144	2617	1.11%	14%	62%	12%	12%
7	131.55	0.206	1572	1.84%		33%	55%	7%
8	15.64	0.024	520	0.01%	25%	75%		
		1.236						
A	122.23	0.191	4942	0.81%	97%	3%		
B	70.69	0.110	1957	1.02%		24%		76%
C	99.99	0.156	3098	0.71%	11%		22%	67%
D	22.25	0.035	1200	0.50%			45%	55%
E	7.15	0.011	3115	0.01%			66%	34%
		0.492						

TOTAL	1.728	Mi^2

Soil information was obtained from maps provided and explained in the Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona. A portion of Sheet 34 is provided as Exhibit 3 (Below). Most of the undeveloped land in the watershed has soils that are classified as hydrologic group "B". The Hilly areas have soils that are classified as hydrologic group "C".

Soil Classifications

Soil#	Description	HEC-1
2	Antho, Calcareous Limy Fan, Gravelly Sandy Loam	B
18	Cherioni, Balsalt Hills, Extremely Stony Loam	C
52	Gachado, Volcanic Hills, Very Gravelly Sandy Clay Loam	C
90	Momoli, Sandy Loam Upland, Gravelly Sandy Loam	B
101	Rillito, Limy Upland	B
112	Tremant, (Non)Calcareaous Sandy Loam Upland Clay Loam	B
113	Tremant, (Non)Calcareaous Limy Fan, Gravelly Sandy Clay Loam	B
118	Tremant-Rillito complex	B

Exhibit 3(Appendix A)

1
2
3
4
5
6
7
8
9
A
B
C
D
E
CAMP CREEK ROAD
MIRACLE TRAIL ROAD

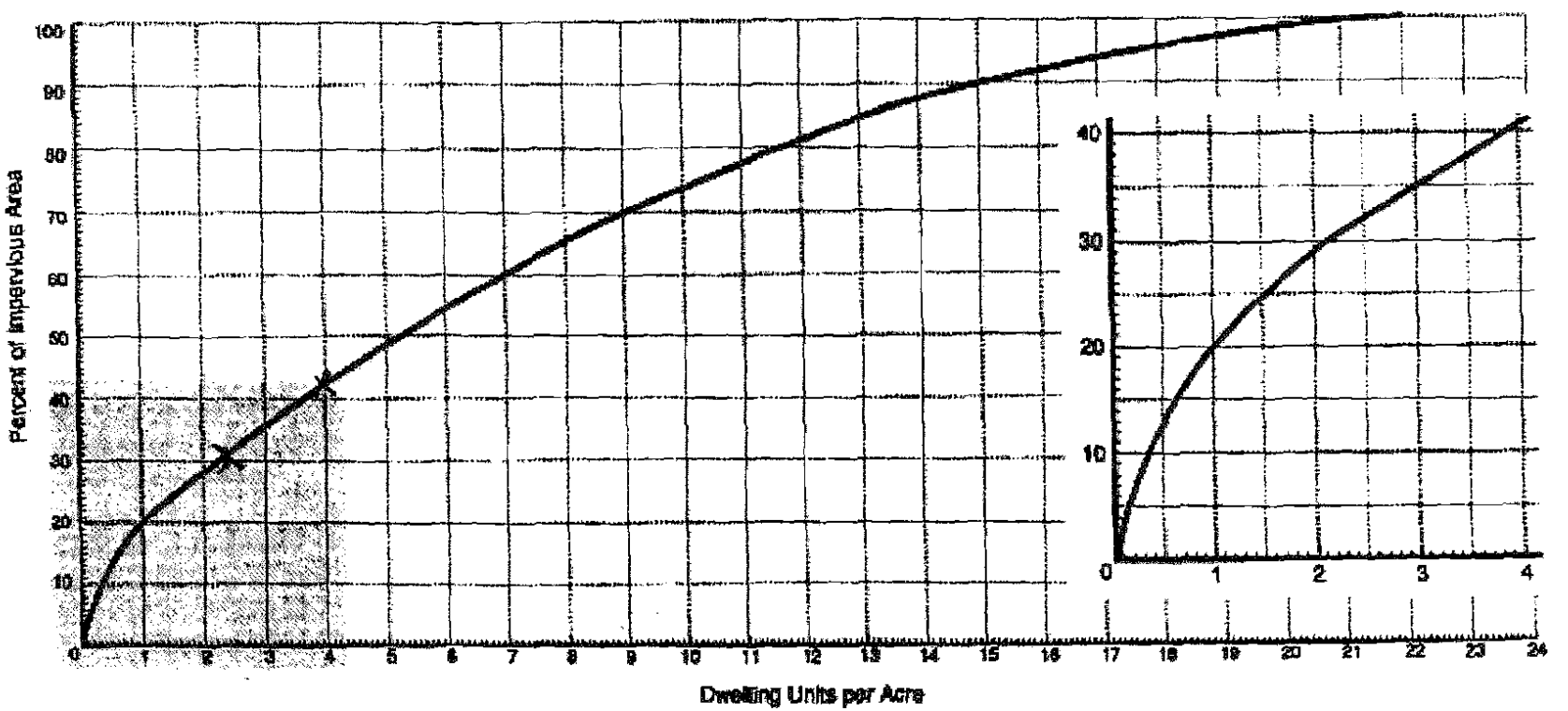


FIGURE 2.2-16

Percent of Impervious Area vs. Dwelling Density

Developed by Water Resources Associates, Inc. from data in Table 2.2a of TR-55, Urban Hydrology For Small Watersheds, and from discussions with Scottsdale city staff.

Runoff Curve Numbers for Urban Areas[1]

Cover type and hydrologic condition	Average % Impervious Area[2]	Curve numbers for hydrologic soil group A	B	C	D
Fully developed urban areas with vegetation established					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover less that 50%)		68	79	86	89
Fair condition (grass cover 50-75%)		49	69	79	84
Good condition (grass cover greater than 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roads, driveways, etc. (excld. right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewer (excld. right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	Not Applicable in Scottsdale			
Industrial	85				
Townhouse, duplexes	65				
Multi-Family	85				
Residential districts by average lot size: (See Figure 2.2-16)					
Developing Urban Areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

[1]Average runoff condition, and $I_a = 0.2S$; Table 2-2a, 210-VI-TR55, Second Ed., June 1986.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition (not applicable in Scottsdale).
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

FIGURE 2.2-19

Runoff Curve Numbers for Urban Areas[1]

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JUN   1998              *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   22FEB02  TIME  11:36:05  *
*                                      *
****************************************
```

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

HEC-1 INPUT


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

   1          ID            CITY OF PHOENIX
   2          ID            FLOODPLAIN DELINEATION STUDY FOR
   3          ID            EAGLE BLUFF II(SUBDIVISION)
   4          ID            FULL BASIN 100-YEAR
   5          ID            FILE: EBIIFDS.DAT
              *DIAGRAM
              *
   6          IT       5                    289
   7          IO       5       0
              *

   8          KK    SUB1
   9          KM            SUBBASIN 1
  10          BA   0.244
  11          PH       0       0    0.73    1.43    2.43    2.69    2.87    3.20
  12          LS       0      77       0
  13          UK    1600    .005   0.050     100
  14          RK    6095  0.0123   0.050            TRAP       5       4
              *

  15          KK    SUB2
  16          KM            SUBBASIN 2
  17          BA   0.120
  18          LS       0      77       3       0      93      40
  19          UK     850    .005   0.050      97
  20          UK     500    0.06   0.055       3
  21          RK    3193  0.0160   0.050            TRAP       4       4     YES
              *

  22          KK    SUB3
  23          KM            SUBBASIN 3
  24          BA   0.286
  25          LS       0      77       3       0      93      33
  26          UK     850    .005   0.050      94
  27          UK     500    0.06   0.055       6
  28          RK   48623  0.0082   0.050            TRAP       4       4     YES
              *

  29          KK    SUB4
  30          KM            SUBBASIN 4
  31          BA   0.106
  32          LS       0      93      42
  33          UK     850    .003   0.050     100
  34          RK    2086  0.0096   0.050            TRAP       4       4     YES
              *

  35          KK    DET4
  36          KM   DETENTION FOR SUBBASIN 4
  37          DT    DET4     6.0
  38          DI       0    1000
  39          DQ       0    1000
```

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

  40          KK    SUB5
  41          KM            SUBBASIN 5
  42          BA   0.105
  43          LS       0       77       10        0       93       42
  44          UK     850     .003    0.050       96
  45          UK     850     0.06    0.055        4
  46          RK    3560   0.0111    0.050             TRAP        4        4
              *

  47          KK    DET5
  48          KM   DETENTION FOR SUBBASIN 5
  49          DT    DET5      6.5
  50          DI       0     1000
  51          DQ       0     1000
              *

  52          KK    SUB6
  53          KM            SUBBASIN 6
  54          BA   0.144
  55          LS       0       88       20        0       93       42
  56          UK     300     .003    0.050       20
  57          UK    1500      .08    0.050       80
  58          RK    2617   0.0111    0.050             TRAP        4        4
              *

  59          KK    DET6
  60          KM   DETENTION FOR SUBBASIN 6
  61          DT    DET6      1.4
  62          DI       0     1000
  63          DQ       0     1000
              *

  64          KK     CP1
  65          KM           COMBINE BASINS 4,5,&6
  66          HC       3
              *

  67          KK    SUB7
  68          KM            SUBBASIN 7
  69          BA   0.106
  70          LS       0       93       40        0       93       40
  71          UK     850     0.05    0.050       01
  72          UK     500    0.005    0.050       99
  73          RK    2617   0.0184    0.050             TRAP        4        4
              *

  74          KK    DET7
  75          KM   DETENTION FOR SUBBASIN 7
  76          DT    DET7      0.9
  77          DI       0     1000
  78          DQ       0     1000
              *
```

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

  79          KK    SUB8
  80          KM            SUBBASIN 8
  81          BA    .068
  82          LS       0       88        2
  83          UK     850     0.06    0.050      100
  84          RK    1500     0.05    0.050             TRAP        2        5
              *

  85          KK    SUBA
  86          KM            SUBBASIN A
  87          BA   0.191
              *      0        0      .68     1.38     2.34     2.60     2.79     3.20
  88          LS       0       77        0        0       88        0
  89          UK    1200     .005    0.050       97
  90          UK     500     0.06    0.055        3
  91          RK    4942   0.0081    0.050             TRAP        5        4
              *

  92          KK    SUB8
  93          KM            SUBBASIN B
  94          BA   0.110
  95          LS       0       88        0        0       88       30
  96          UK     850     .038    0.050       24
  97          UK     300     .005    0.050       76
  98          RK    1957   0.0102    0.050             TRAP        4        4      YES
              *

  99          KK    DET8
 100          KM   DETENTION FOR SUBBASIN B
 101          DT    DETB      5.0
 102          DI       0     1000
 103          DQ       0     1000
              *

 104          KK    SUBC
 105          KM            SUBBASIN C
 106          BA   0.156
 107          LS       0       77       05        0       93       38
 108          UK     250     .003    0.050       33
 109          UK     300    0.003    0.050       67
 110          RK    3098   0.0071    0.050             TRAP       10        2      YES
              *

 111          KK    DETC
 112          KM   DETENTION FOR SUBBASIN C
 113          DT    DETC      6.8
 114          DI       0     1000
 115          DQ       0     1000
              *
```

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

 116          KK    SUBD
 117          KM            SUBBASIN D
 118          BA   0.035
 119          LS       0       93       38        0       77        0
 120          UK     250     .005    0.050       55
 121          UK     225     .005     .050       45
 122          RK    1200   0.0050    0.050             TRAP       10        2      YES
              *

 123          KK    DETD
 124          KM   DETENTION FOR SUBBASIN D
 125          DT    DETD      1.4
 126          DI       0     1000
 127          DQ       0     1000
              *

 128          KK    SUBE
 129          KM            SUBBASIN E
 130          BA   0.011
 131          LS       0       93       38
 132          UK     250     .005    0.050      100
 133          RK    3046   0.0005    0.050             TRAP       10        2      YES
              *

 134          KK    DETE
 135          KM   DETENTION FOR SUBBASIN E
 136          DT    DETE      0.2
 137          DI       0     1000
 138          DQ       0     1000
              *

 139          KK     CP2
 140          KM        COMBINE BASINS
 141          HC       4
              *

 142          KK    SUB9
 143          KM            SUBBASIN 9
 144          BA   0.024
 145          LS       0       88        5        0       77        5
 146          UK     850     0.05    0.050       35
 147          UK     500    0.008    0.050       65
 148          RK     636   0.0005    0.050             TRAP        4        4      YES
              *
 149          ZZ
```

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   8         SUB1
                V
                V
  15         SUB2 ***
                V
                V
  22         SUB3 ***
                V
                V
  29         SUB4 ***
                .
                .
  37            .------->    DET4
  35         DET4
                .
                .
  40            .        SUB5
                .           .
                .           .
  49            .           .------->    DET5
  47            .        DET5
                .           .
                .           .
  52            .           .        SUB6
                .           .           .
                .           .           .
  61            .           .           .------->    DET6
  59            .           .        DET6
                .           .           .
                .           .           .
  64          CP1.......................
                .
                .
  67            .        SUB7
                .           .
                .           .
  76            .           .------->    DET7
  74            .        DET7
                .           .
                .           .
  79            .           .        SUB8
                .           .           .
                .           .           .
  85            .           .           .        SUBA
                .           .           .           V
                .           .           .           V
  92            .           .           .        SUB8 ***
                .           .           .           .
                .           .           .           .
 101            .           .           .           .------->    DET8
  99            .           .           .        DET8
                .           .           .           V
```

```
                .           .           .           V
  104           .           .           .        SUBC ***
                .           .           .           .
                .           .           .           .
  113           .           .           .           .-------->    DETC
  111           .           .           .        DETC
                .           .           .           V
                .           .           .           V
  116           .           .           .        SUBD ***
                .           .           .           .
                .           .           .           .
  125           .           .           .           .-------->    DETD
  123           .           .           .        DETD
                .           .           .           V
                .           .           .           V
  128           .           .           .        SUBE ***
                .           .           .           .
                .           .           .           .
  136           .           .           .           .-------->    DETE
  134           .           .           .        DETE
                .           .           .           .
                .           .           .           .
  139         CP2.......................................
                V
                V
  142        SUB9 ***
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                                    ****************************************
*                                      *                                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                                    *          609 SECOND STREET           *
*                                      *                                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   22FEB02  TIME  11:36:05  *                                    *          (916) 756-1104              *
*                                      *                                    *                                      *
****************************************                                    ****************************************
```

```
                                  CITY OF PHOENIX
                                  FLOODPLAIN DELINEATION STUDY FOR
                                  EAGLE BLUFF II(SUBDIVISION)
                                  FULL BASIN 100-YEAR
                                  FILE: EBIIFDS.DAT

  7 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         289  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0000  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.00 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
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB1	125.	3.75	30.	8.	8.	.24		
HYDROGRAPH AT	SUB2	170.	3.75	46.	12.	12.	.36		
HYDROGRAPH AT	SUB3	209.	6.17	75.	23.	23.	.65		
HYDROGRAPH AT	SUB4	248.	3.25	99.	31.	31.	.76		
DIVERSION TO	DET4	248.	6.25	12.	3.	3.	.76		
HYDROGRAPH AT	DET4	215.	6.25	91.	28.	28.	.76		
HYDROGRAPH AT	SUB5	91.	3.50	16.	4.	4.	.10		
DIVERSION TO	DET5	91.	4.92	13.	3.	3.	.10		
HYDROGRAPH AT	DET5	12.	4.92	3.	1.	1.	.10		
HYDROGRAPH AT	SUB6	469.	3.17	41.	10.	10.	.14		
DIVERSION TO	DET6	41.	3.17	3.	1.	1.	.14		
HYDROGRAPH AT	DET6	469.	3.17	38.	10.	10.	.14		
3 COMBINED AT	CP1	469.	3.17	129.	38.	38.	1.00		
HYDROGRAPH AT	SUB7	335.	3.17	31.	8.	8.	.11		
DIVERSION TO	DET7	26.	3.17	2.	0.	0.	.11		
HYDROGRAPH AT	DET7	335.	3.17	29.	7.	7.	.11		
HYDROGRAPH AT	SUB8	195.	3.17	15.	4.	4.	.07		

HYDROGRAPH AT	SUBA	119.	3.67	24.	6.	6.	.19
HYDROGRAPH AT	SUBB	347.	3.17	50.	13.	13.	.30
DIVERSION TO	DETB	324.	3.25	10.	3.	3.	.30
HYDROGRAPH AT	DETB	272.	3.25	41.	10.	10.	.30
HYDROGRAPH AT	SUBC	490.	3.33	77.	20.	20.	.46
DIVERSION TO	DETC	376.	3.33	14.	3.	3.	.46
HYDROGRAPH AT	DETC	490.	3.33	65.	16.	16.	.46
HYDROGRAPH AT	SUBD	461.	3.42	71.	18.	18.	.49
DIVERSION TO	DETD	80.	3.42	3.	1.	1.	.49
HYDROGRAPH AT	DETD	461.	3.42	69.	18.	18.	.49
HYDROGRAPH AT	SUBE	451.	3.67	71.	18.	18.	.50
DIVERSION TO	DETE	9.	3.67	0.	0.	0.	.50
HYDROGRAPH AT	DETE	451.	3.67	71.	18.	18.	.50
4 COMBINED AT	CP2	1000.	3.17	244.	68.	68.	1.68
HYDROGRAPH AT	SUB9	947.	3.25	247.	69.	69.	1.71

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

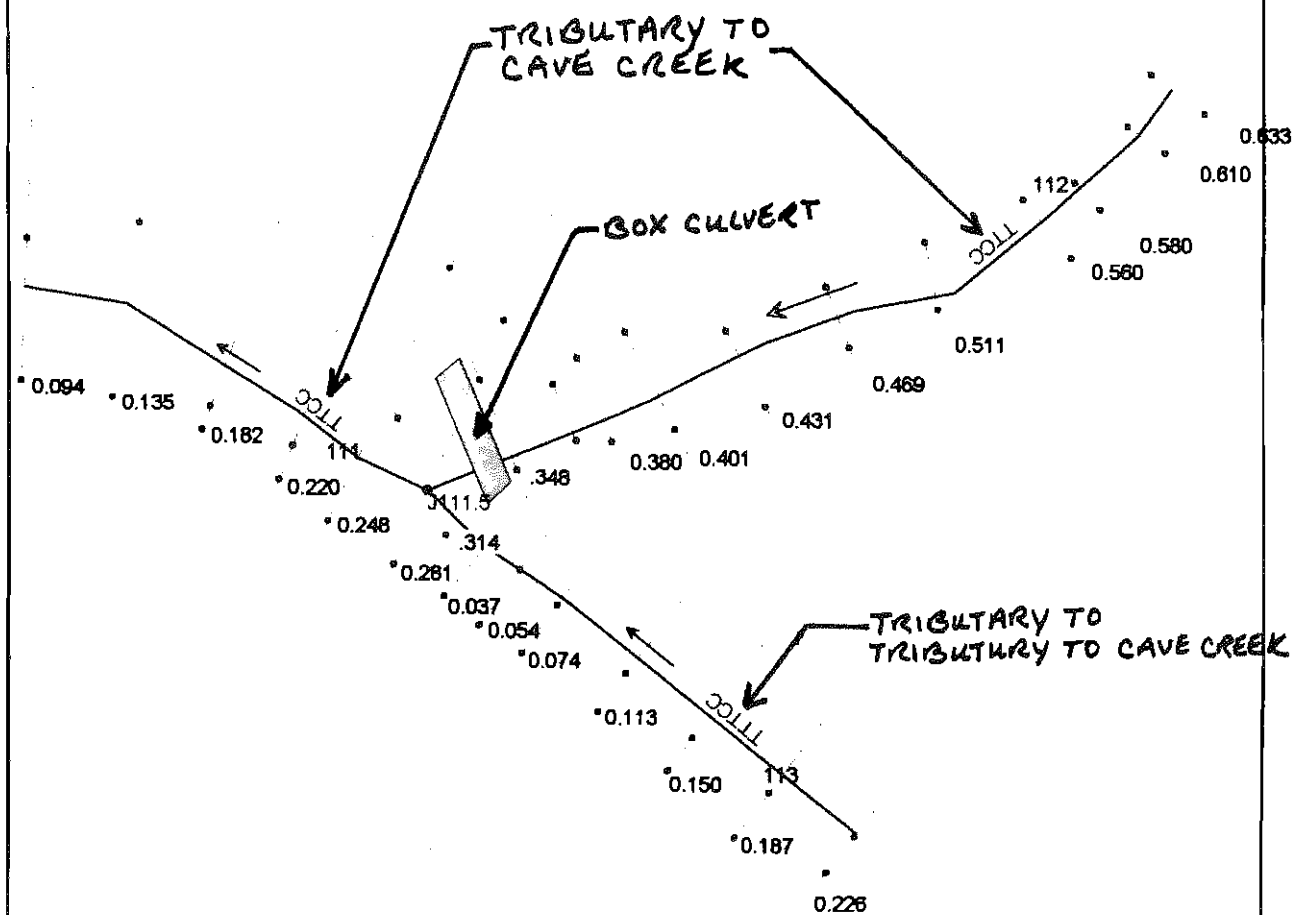
ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
SUB1	MANE	4.66	125.31	225.72	1.19	5.00	124.51	225.00	1.19
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1575E+02 OUTFLOW= .1547E+02 BASIN STORAGE= .5363E-01 PERCENT ERROR= 1.4									
SUB2	MANE	2.72	170.30	224.14	1.22	5.00	170.13	225.00	1.22
ONTINUITY SUMMARY (AC-FT) - INFLOW= .1547E+02 EXCESS= .8416E+01 OUTFLOW= .2374E+02 BASIN STORAGE= .1507E-01 PERCENT ERROR= .6									
SUB3	MANE	5.00	211.21	366.42	1.33	5.00	208.88	370.00	1.33
ONTINUITY SUMMARY (AC-FT) - INFLOW= .2373E+02 EXCESS= .2067E+02 OUTFLOW= .4623E+02 BASIN STORAGE= .5054E+00 PERCENT ERROR= -5.3									
SUB4	MANE	1.96	251.08	195.90	1.53	5.00	247.73	195.00	1.53
ONTINUITY SUMMARY (AC-FT) - INFLOW= .4618E+02 EXCESS= .1561E+02 OUTFLOW= .6161E+02 BASIN STORAGE= .3635E-01 PERCENT ERROR= .2									
SUB5	MANE	3.90	91.33	210.96	1.45	5.00	90.87	210.00	1.45
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8198E+01 OUTFLOW= .8115E+01 BASIN STORAGE= .1339E-01 PERCENT ERROR= .8									
SUB6	MANE	2.00	475.44	191.04	2.65	5.00	469.16	190.00	2.65
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2040E+02 OUTFLOW= .2036E+02 BASIN STORAGE= .3994E-02 PERCENT ERROR= .2									
SUB7	MANE	1.71	341.69	191.07	2.74	5.00	335.30	190.00	2.74
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1553E+02 OUTFLOW= .1550E+02 BASIN STORAGE= .4693E-02 PERCENT ERROR= .1									
SUB8	MANE	.83	215.37	187.17	2.02	5.00	195.14	190.00	2.01
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7327E+01 OUTFLOW= .7314E+01 BASIN STORAGE= .8248E-03 PERCENT ERROR= .2									
SUBA	MANE	4.41	120.22	218.99	1.22	5.00	119.40	220.00	1.22

```
ONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1257E+02 OUTFLOW= .1238E+02 BASIN STORAGE= .3145E-01 PERCENT ERROR=   1.2

            SUB8  MANE        1.58    348.14    190.40      1.60      5.00    347.35    190.00        1.60

ONTINUITY SUMMARY (AC-FT) - INFLOW= .1239E+02 EXCESS= .1332E+02 OUTFLOW= .2560E+02 BASIN STORAGE= .4184E-02 PERCENT ERROR=    .4

            SUBC  MANE        1.82    502.71    200.36      1.61      5.00    490.08    200.00        1.61

ONTINUITY SUMMARY (AC-FT) - INFLOW= .2061E+02 EXCESS= .1882E+02 OUTFLOW= .3924E+02 BASIN STORAGE= .1091E-01 PERCENT ERROR=    .5

            SUBD  MANE        1.01    539.90    202.65      1.38      5.00    460.67    205.00        1.38

ONTINUITY SUMMARY (AC-FT) - INFLOW= .3253E+02 EXCESS= .3822E+01 OUTFLOW= .3630E+02 BASIN STORAGE= .3593E-02 PERCENT ERROR=    .1

            SUBE  MANE        2.55    450.95    218.60      1.36      5.00    450.78    220.00        1.36

ONTINUITY SUMMARY (AC-FT) - INFLOW= .3485E+02 EXCESS= .1603E+01 OUTFLOW= .3658E+02 BASIN STORAGE= .3050E-01 PERCENT ERROR=   -.4

            SUB9  MANE        1.40   1010.37    193.34      1.50      5.00    946.86    195.00        1.50

ONTINUITY SUMMARY (AC-FT) - INFLOW= .1344E+03 EXCESS= .2012E+01 OUTFLOW= .1363E+03 BASIN STORAGE= .2522E-01 PERCENT ERROR=    .1


** NORMAL END OF HEC-1 ***
```

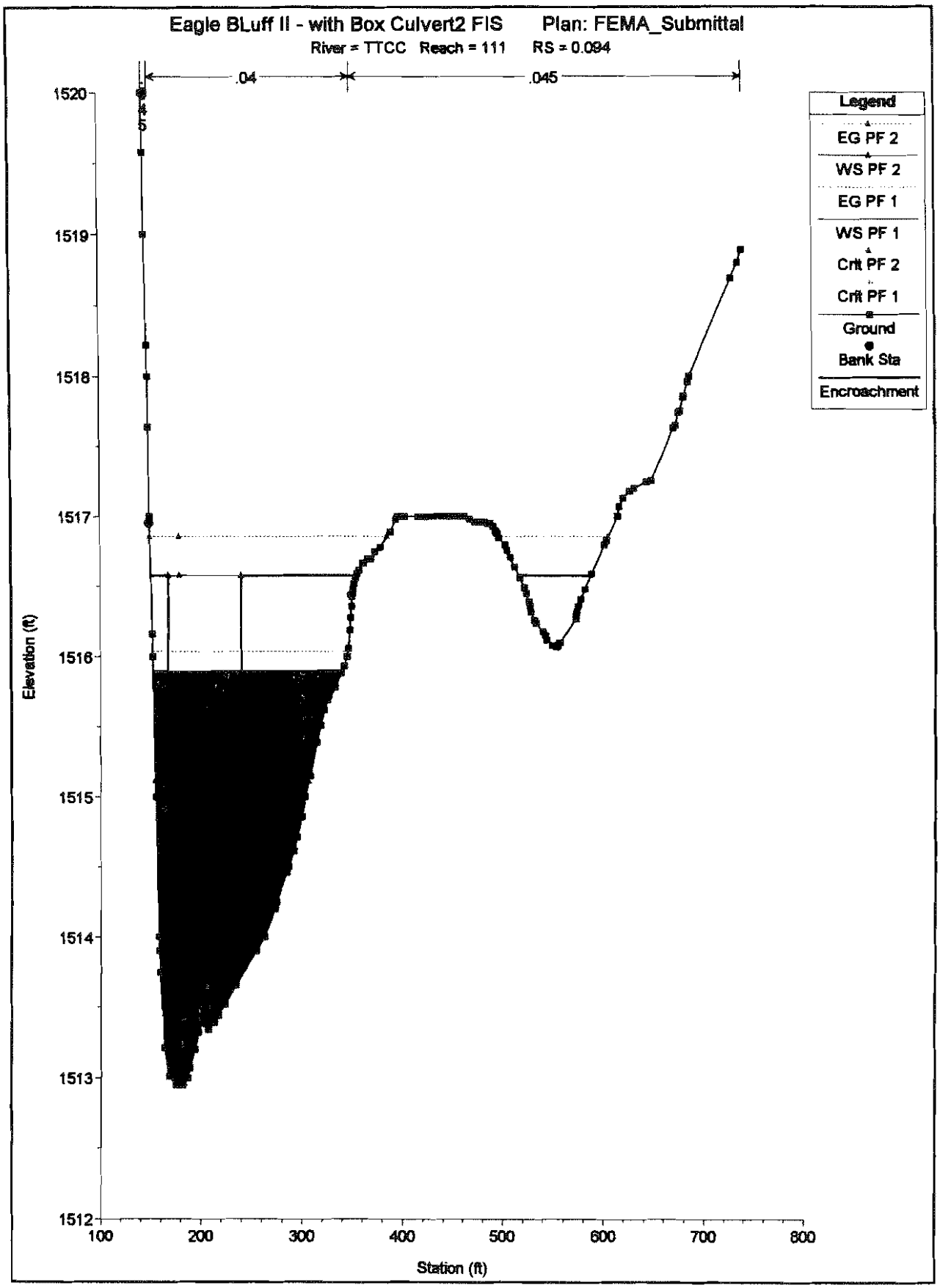
APPENDIX B

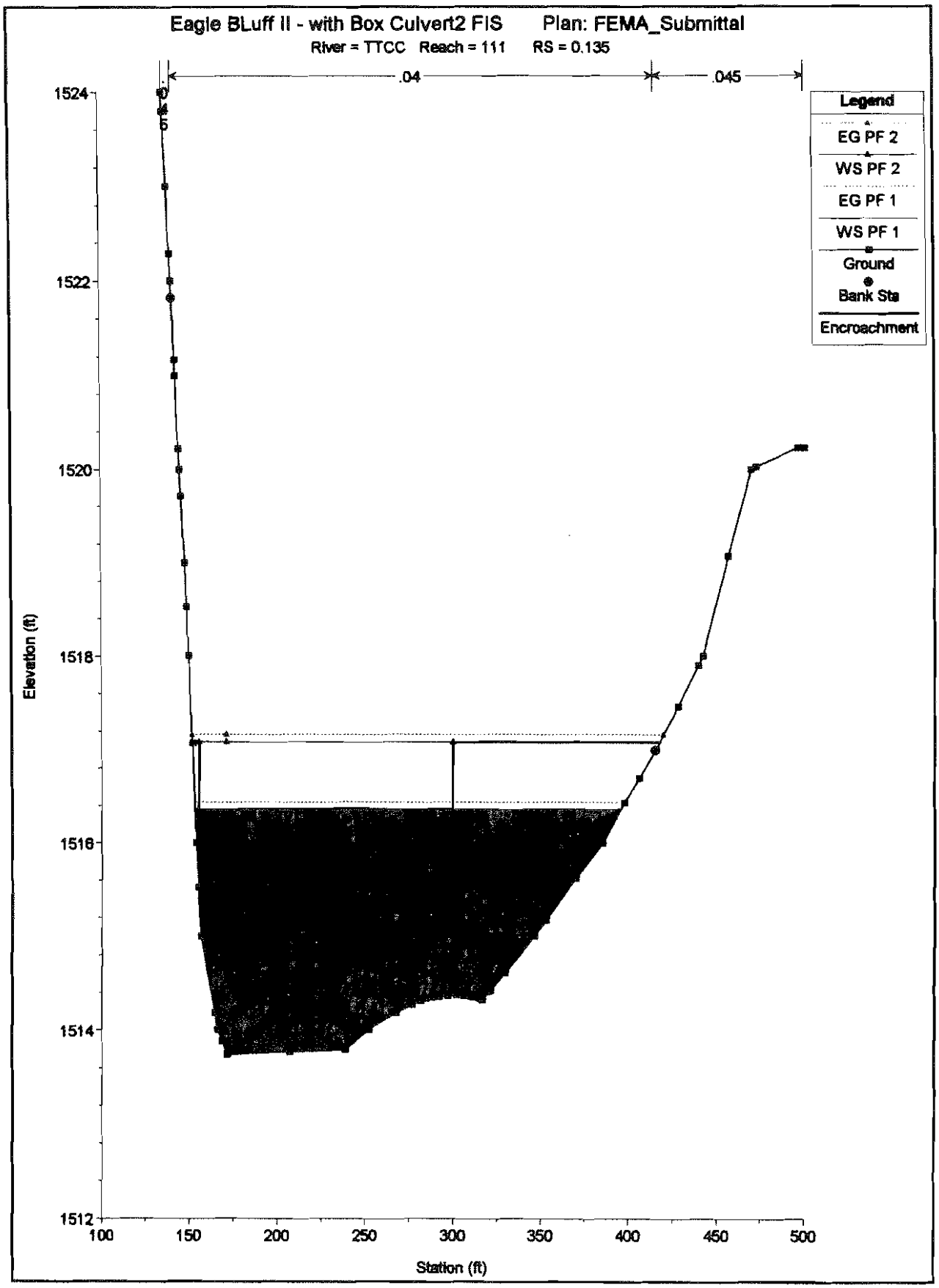
HEC-RAS Report

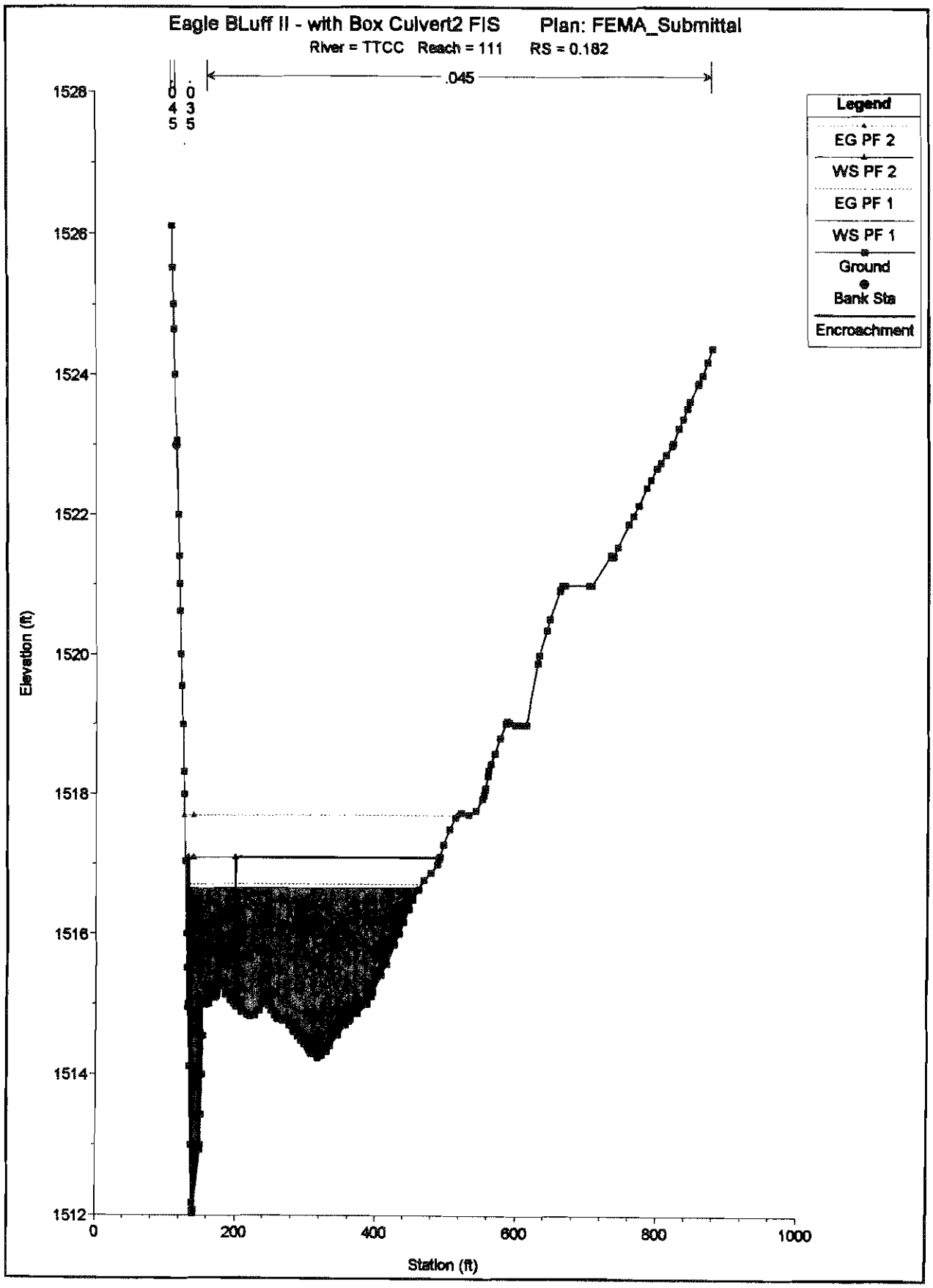
HYDRAULIC MODEL SCHEMATIC

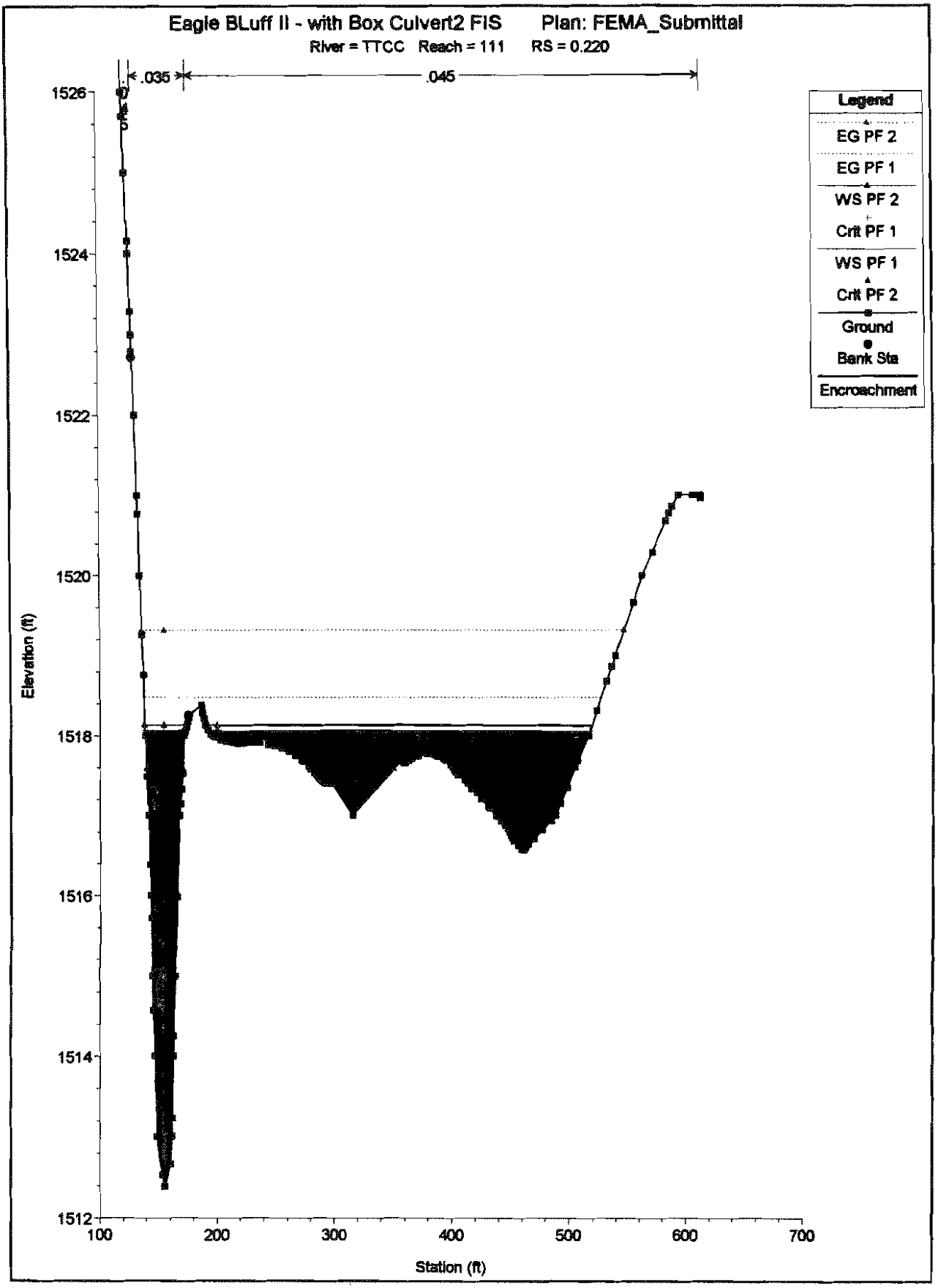


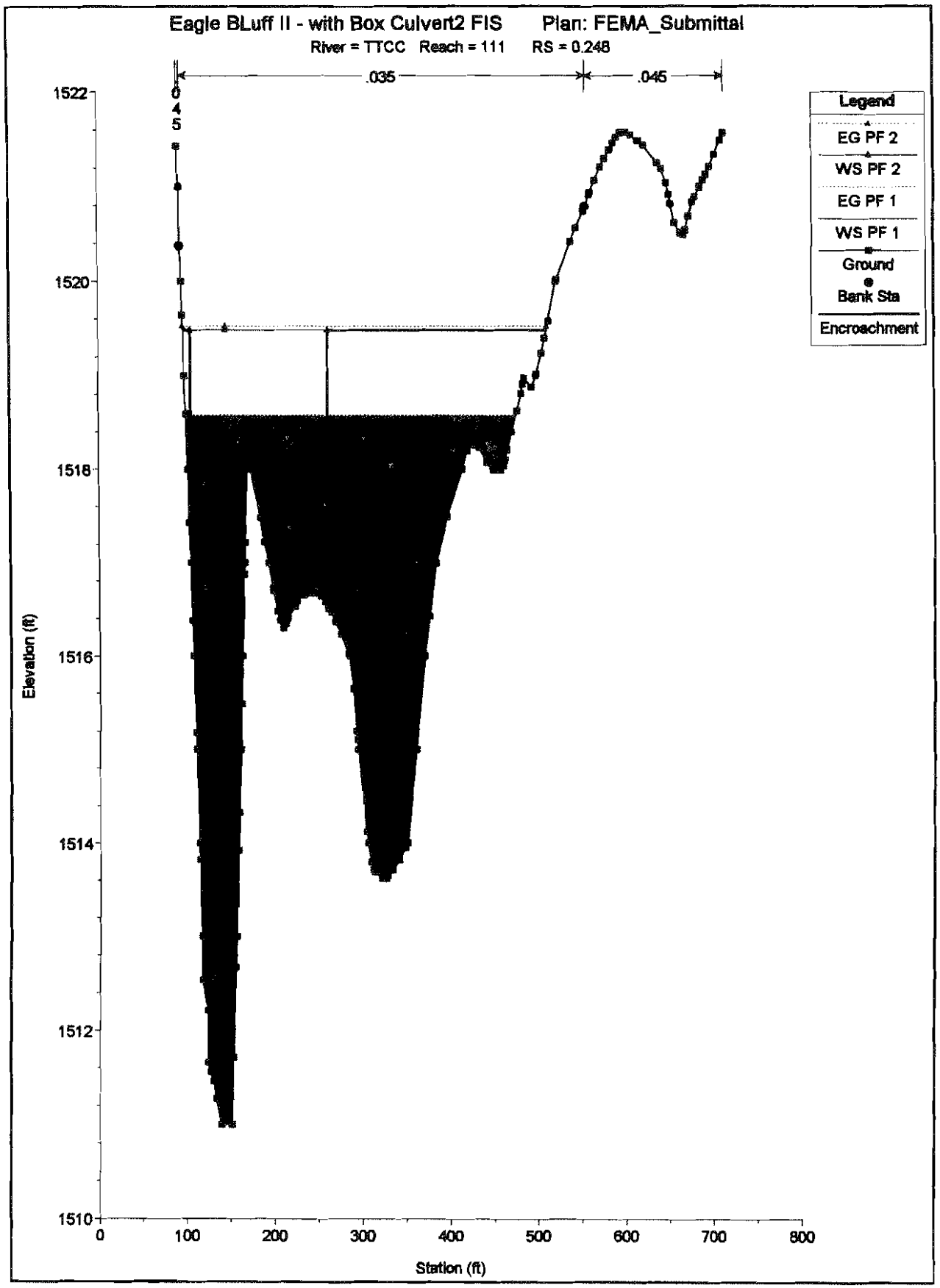
Partial GIS data

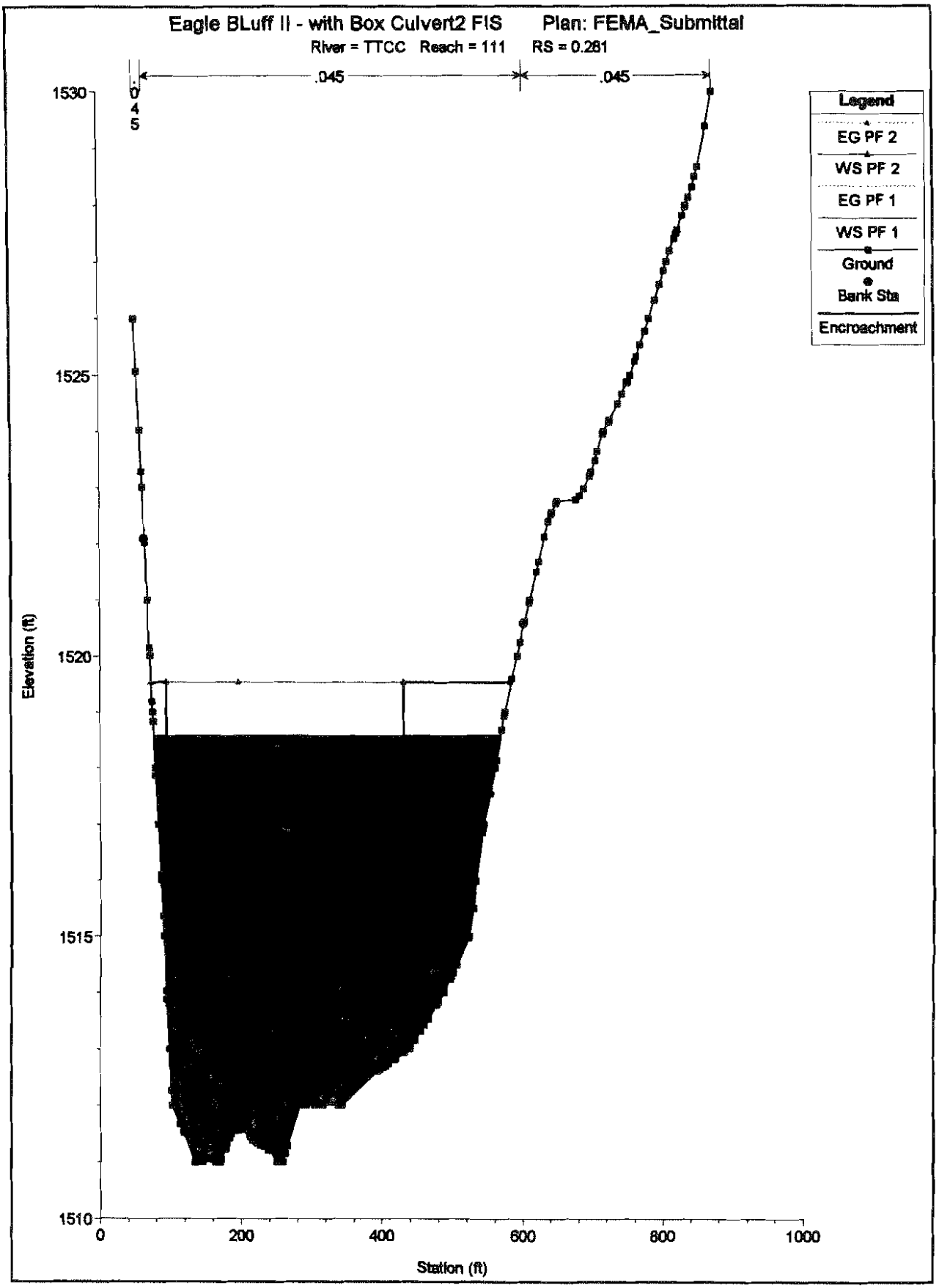

Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.094
.04
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
1520
1519
1518
1517
1516
1515
1514
1513
1512
100
200
300
400
500
600
700
800

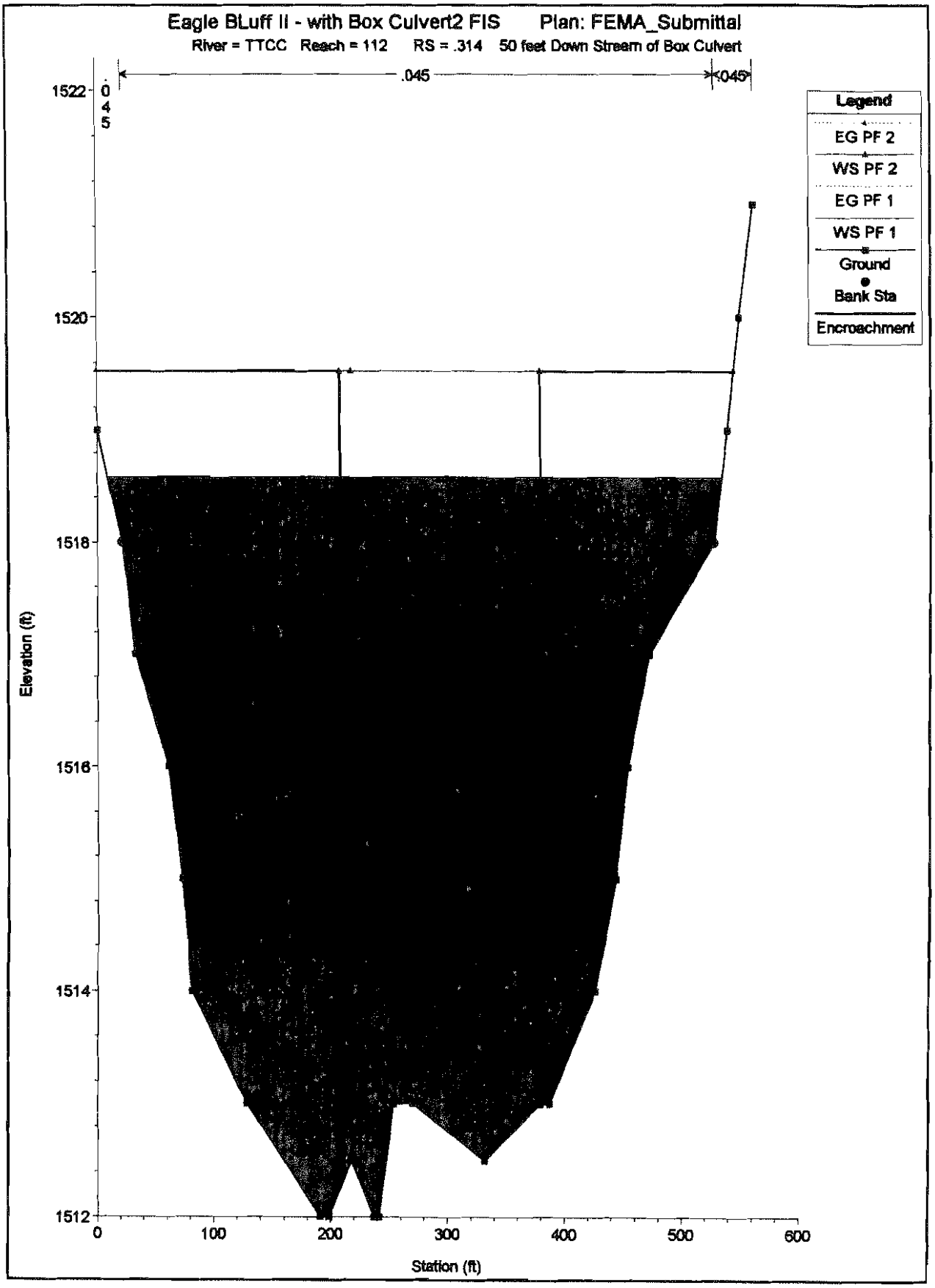

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.135
.04
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1524
1522
1520
1518
1516
1514
1512
100
150
200
250
300
350
400
450
500
Station (ft)

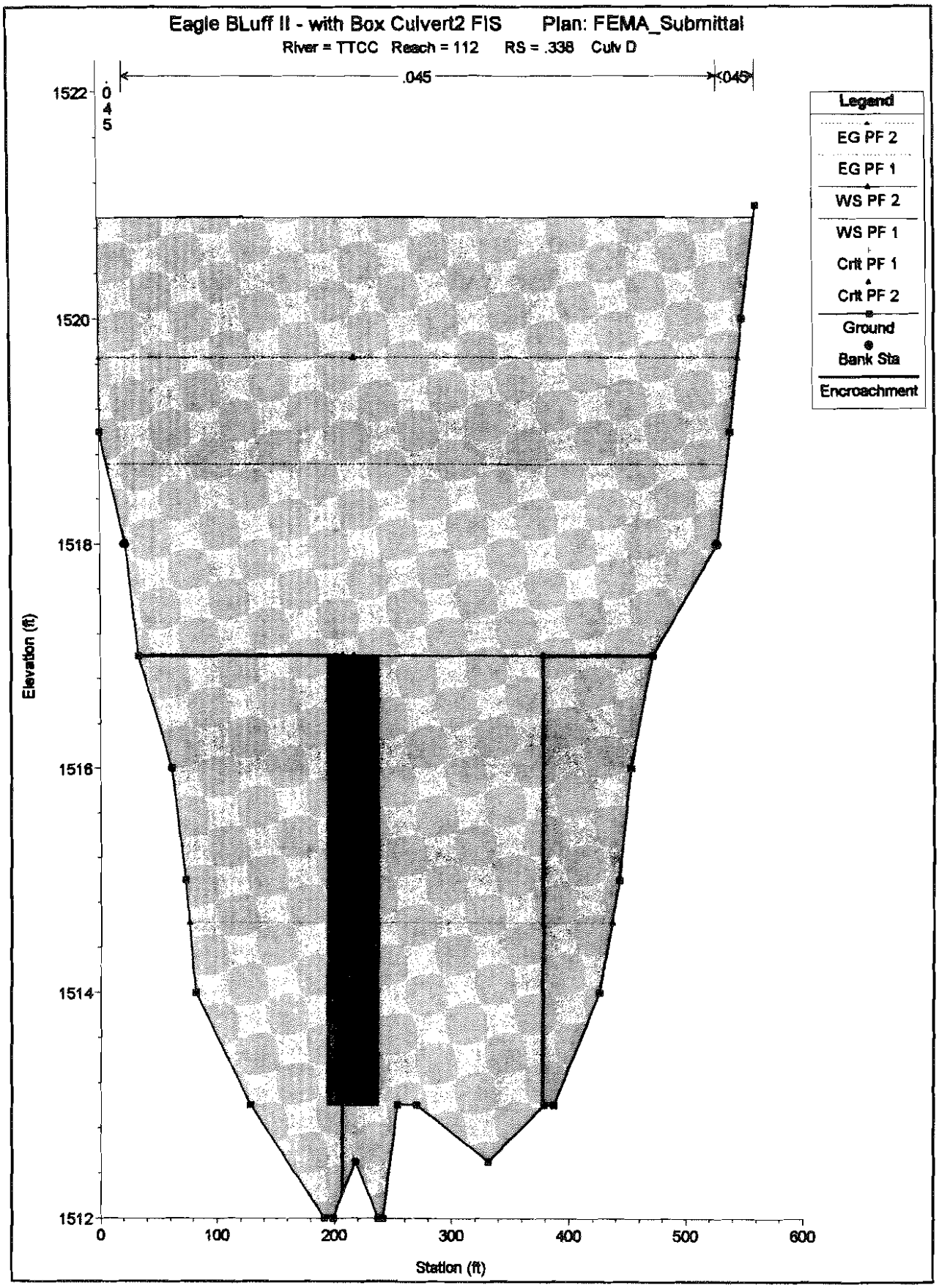

Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.182
.045
0.045
0.035
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1528
1526
1524
1522
1520
1518
1516
1514
1512
0
200
400
600
800
1000
Station (ft)

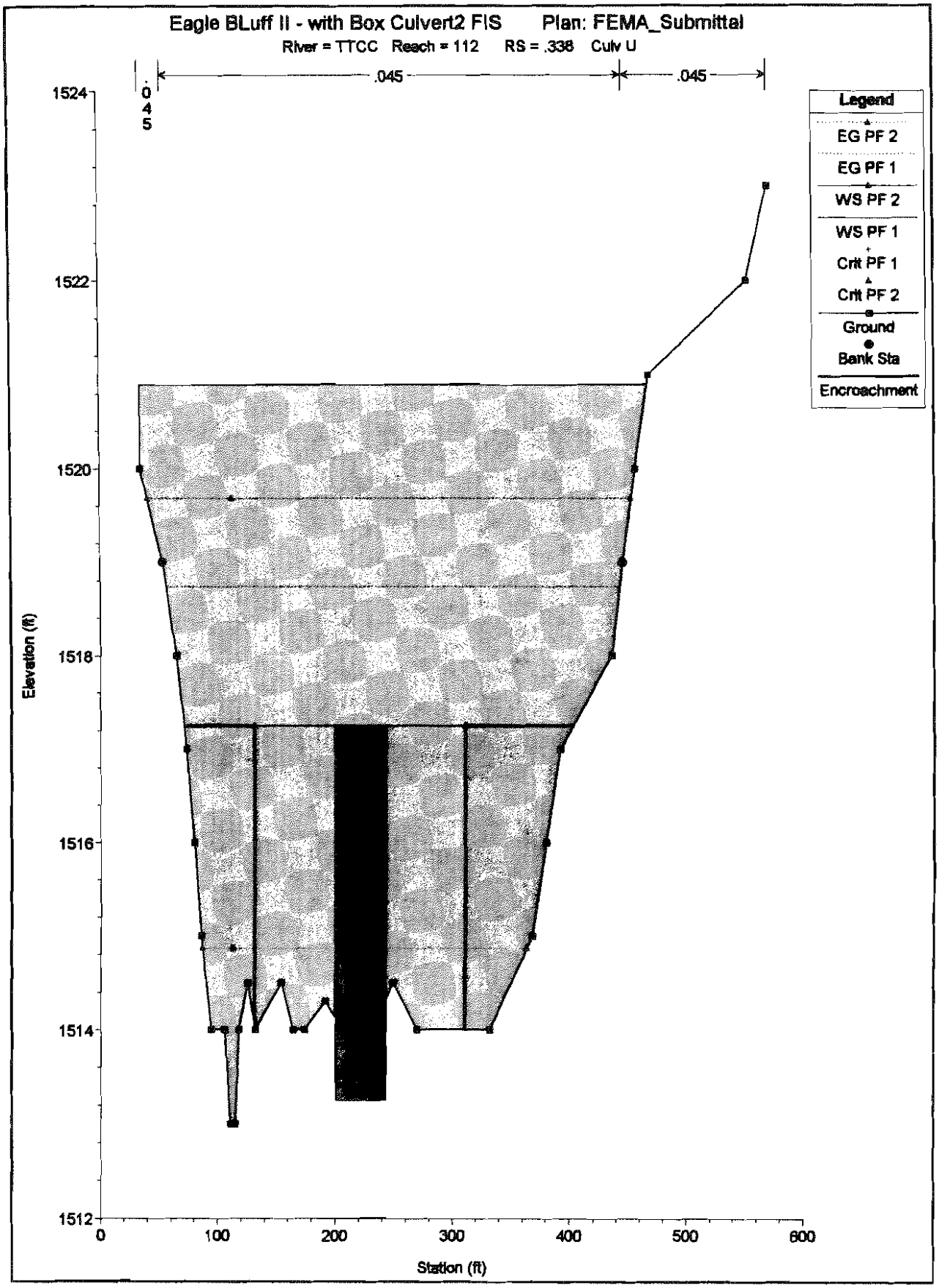

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.220
.035
.045
Legend
EG PF 2
EG PF 1
WS PF 2
Crit PF 1
WS PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1526
1524
1522
1520
1518
1516
1514
1512
100
200
300
400
500
600
700
Station (ft)

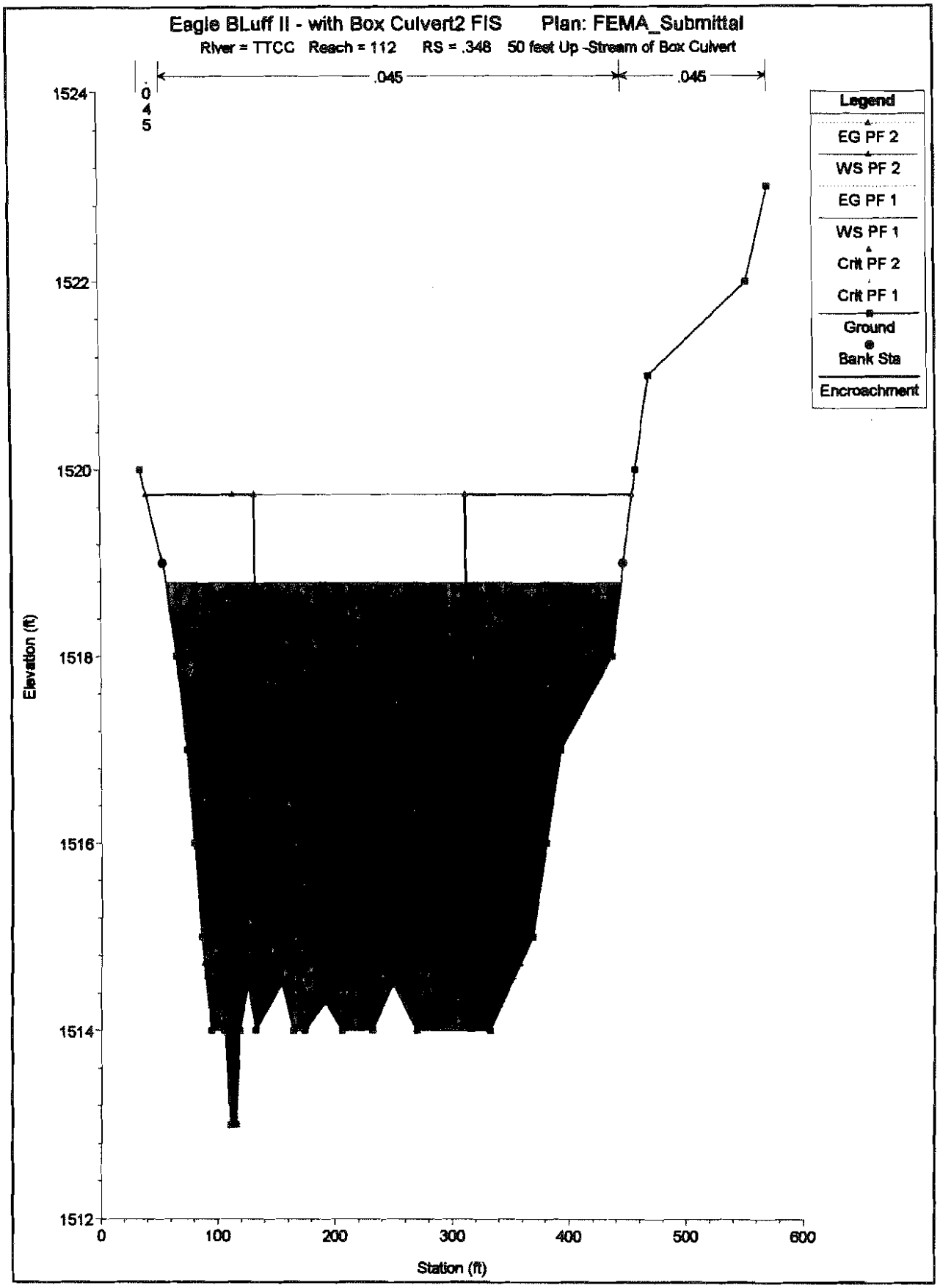

Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.248
.035
.045
0
4
5
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1522
1520
1518
1516
1514
1512
1510
0
100
200
300
400
500
600
700
800
Station (ft)

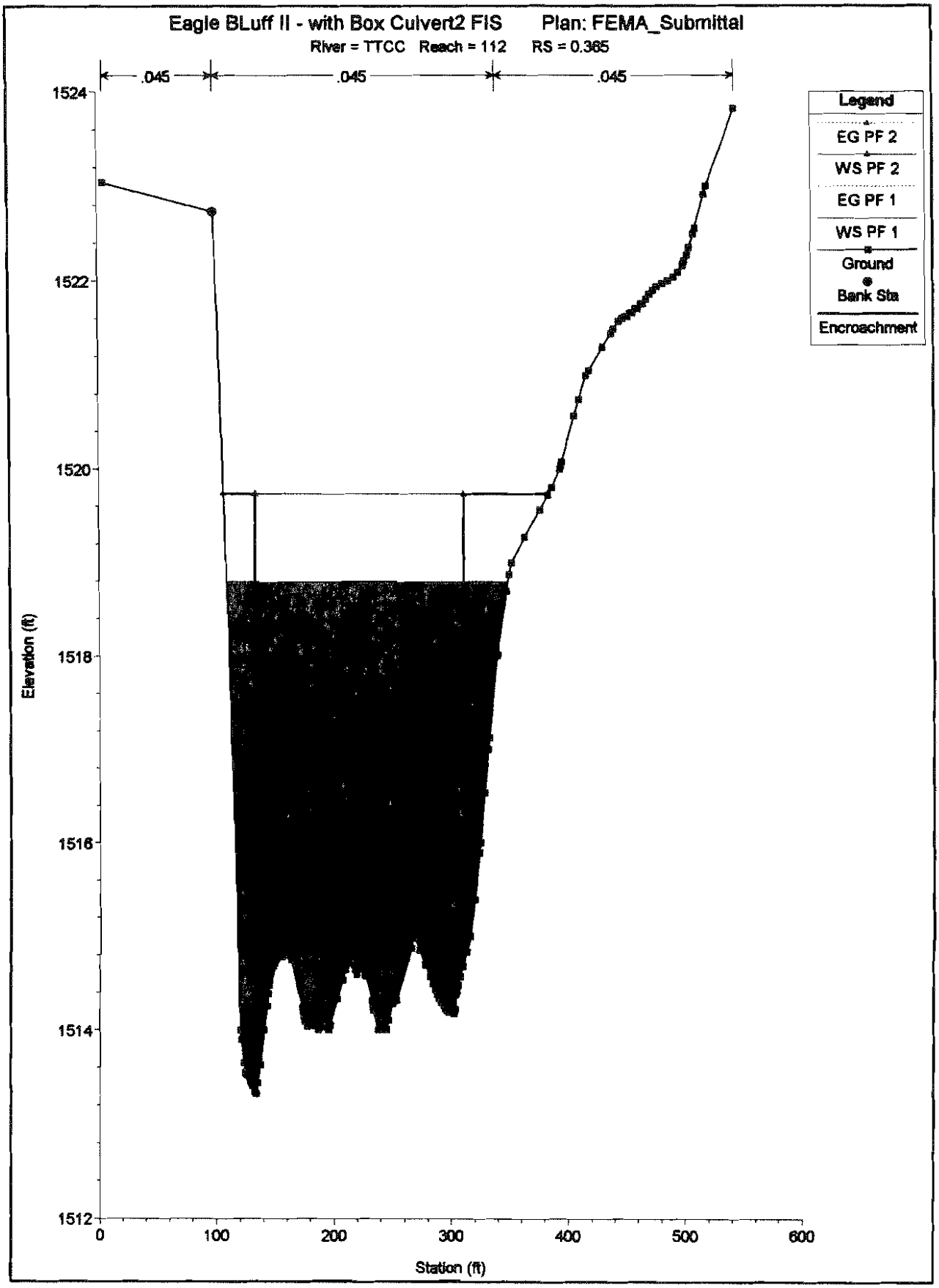

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 111 RS = 0.281
.045
.045
045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1525
1520
1515
1510
0
200
400
600
800
1000
Station (ft)

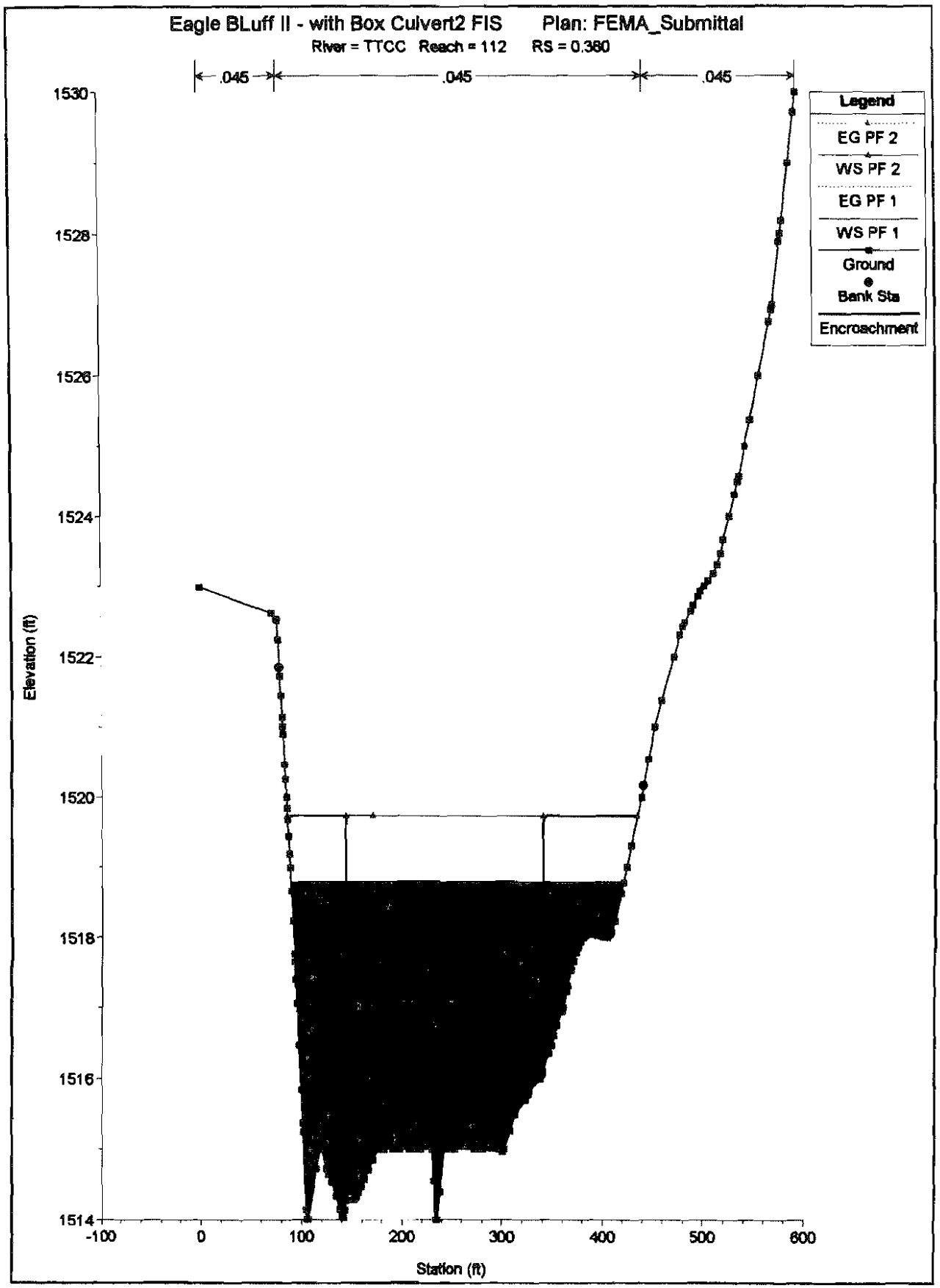

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = .314 50 feet Down Stream of Box Culvert
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1522
1520
1518
1516
1514
1512
0
100
200
300
400
500
600
Station (ft)

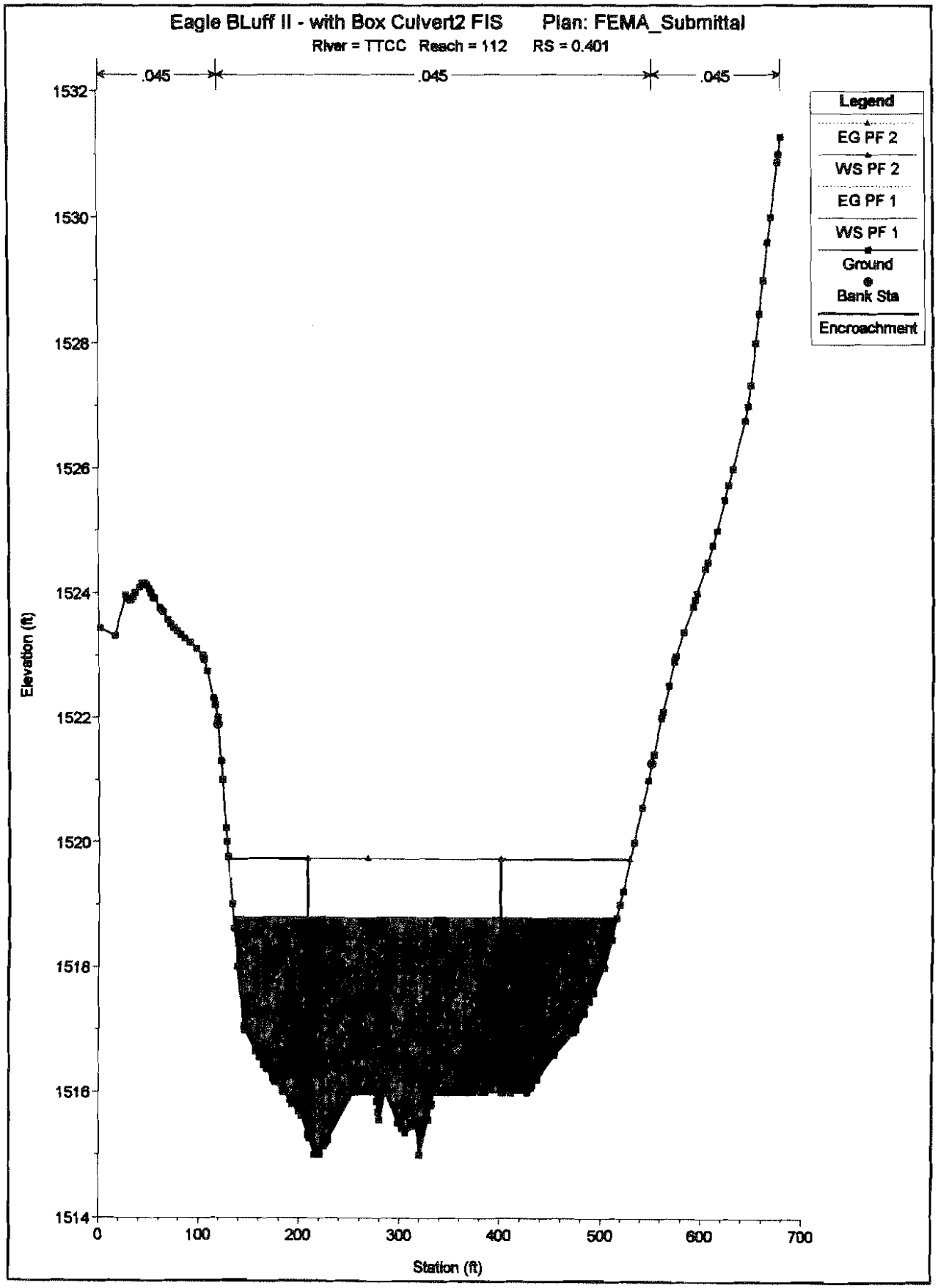

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = .338 Culv D
.045
.045
045
Legend
EG PF 2
EG PF 1
WS PF 2
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1522
1520
1518
1516
1514
1512
0
100
200
300
400
500
600
Station (ft)

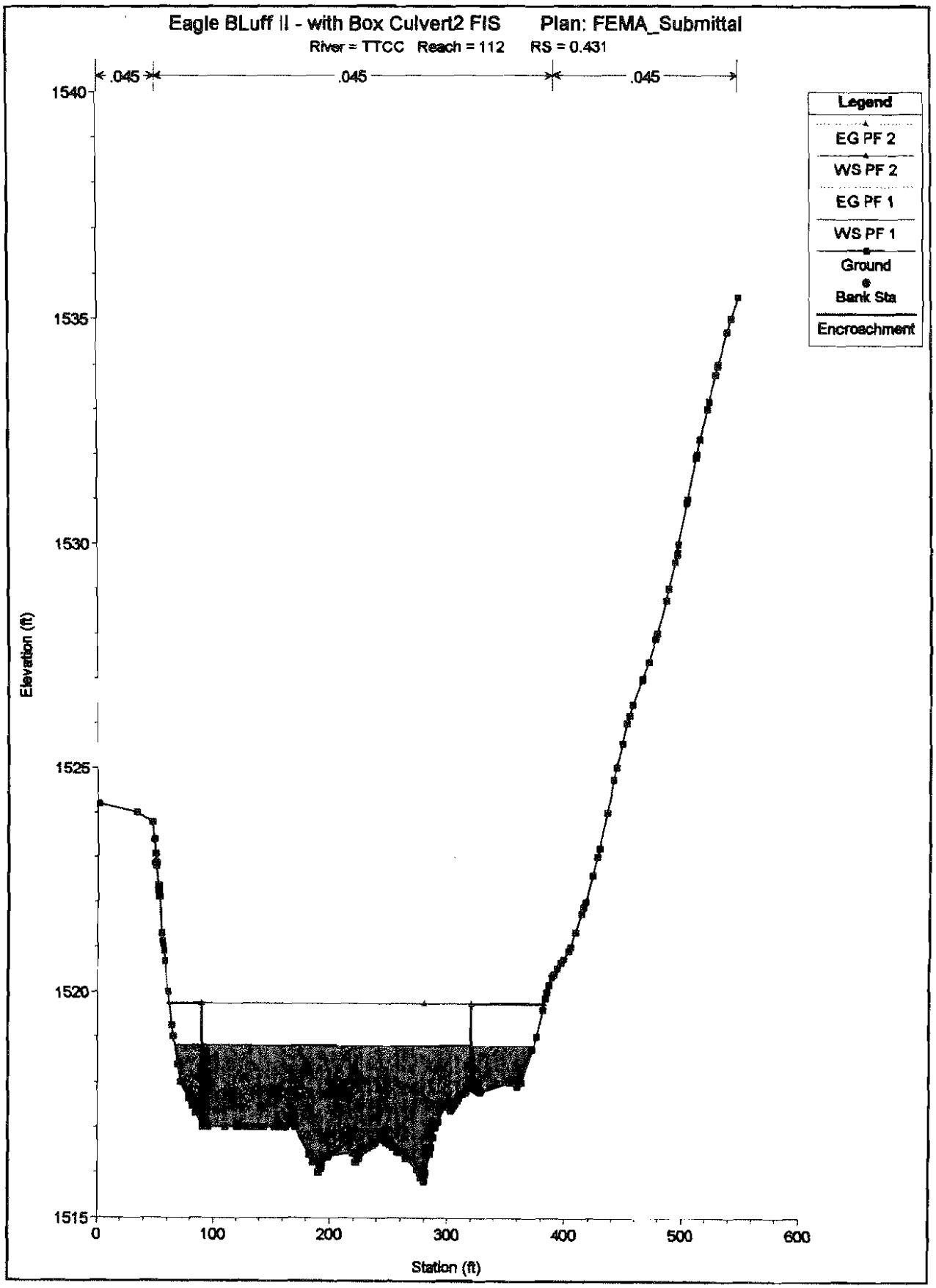

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = .338 Culv U
.045
.045
.045
Legend
EG PF 2
EG PF 1
WS PF 2
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1524
1522
1520
1518
1516
1514
1512
0
100
200
300
400
500
600
Station (ft)

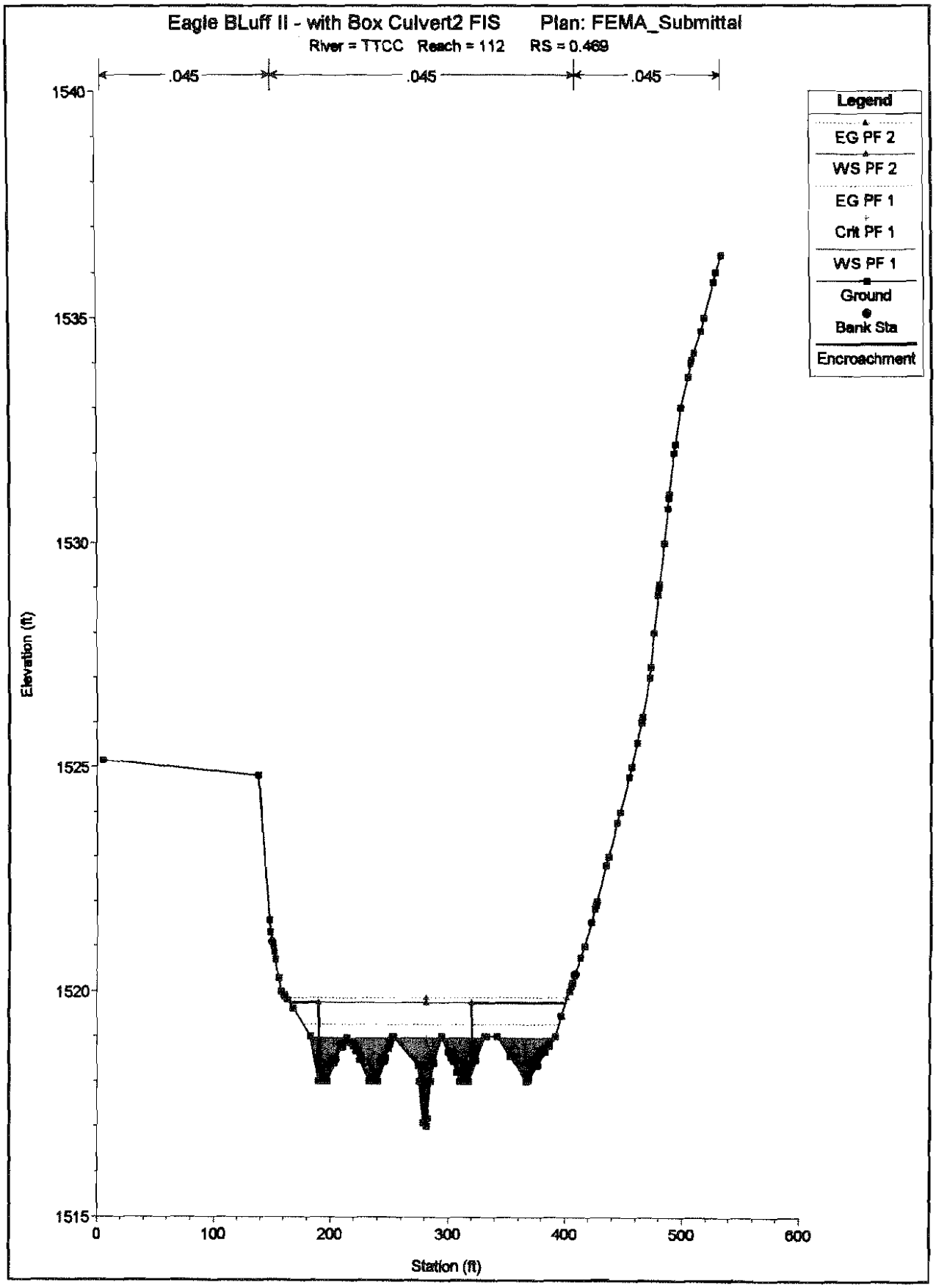

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = .348 50 feet Up -Stream of Box Culvert
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1524
1522
1520
1518
1516
1514
1512
0
100
200
300
400
500
600
Station (ft)

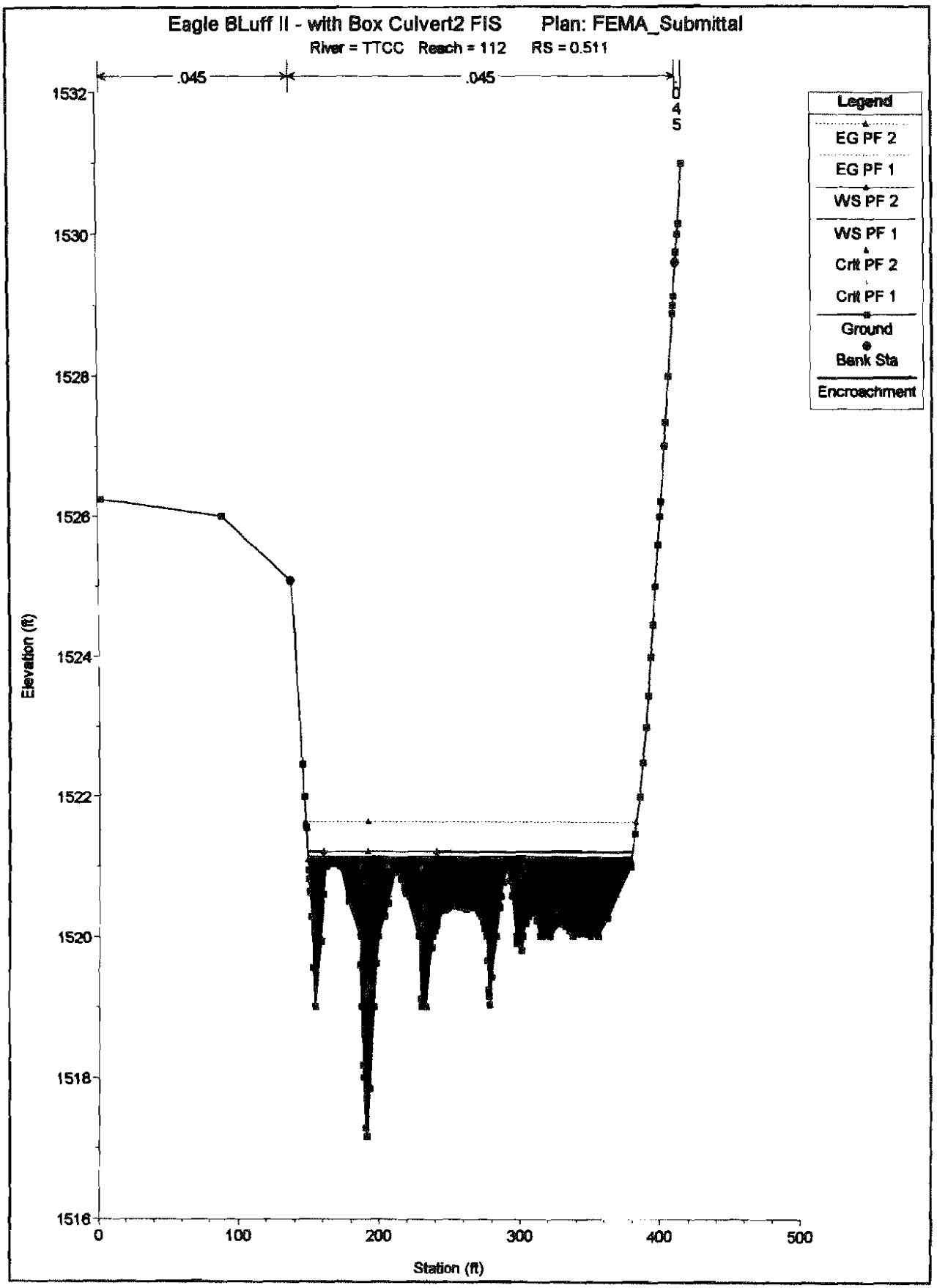

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.365
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1524
1522
1520
1518
1516
1514
1512
0
100
200
300
400
500
600
Station (ft)

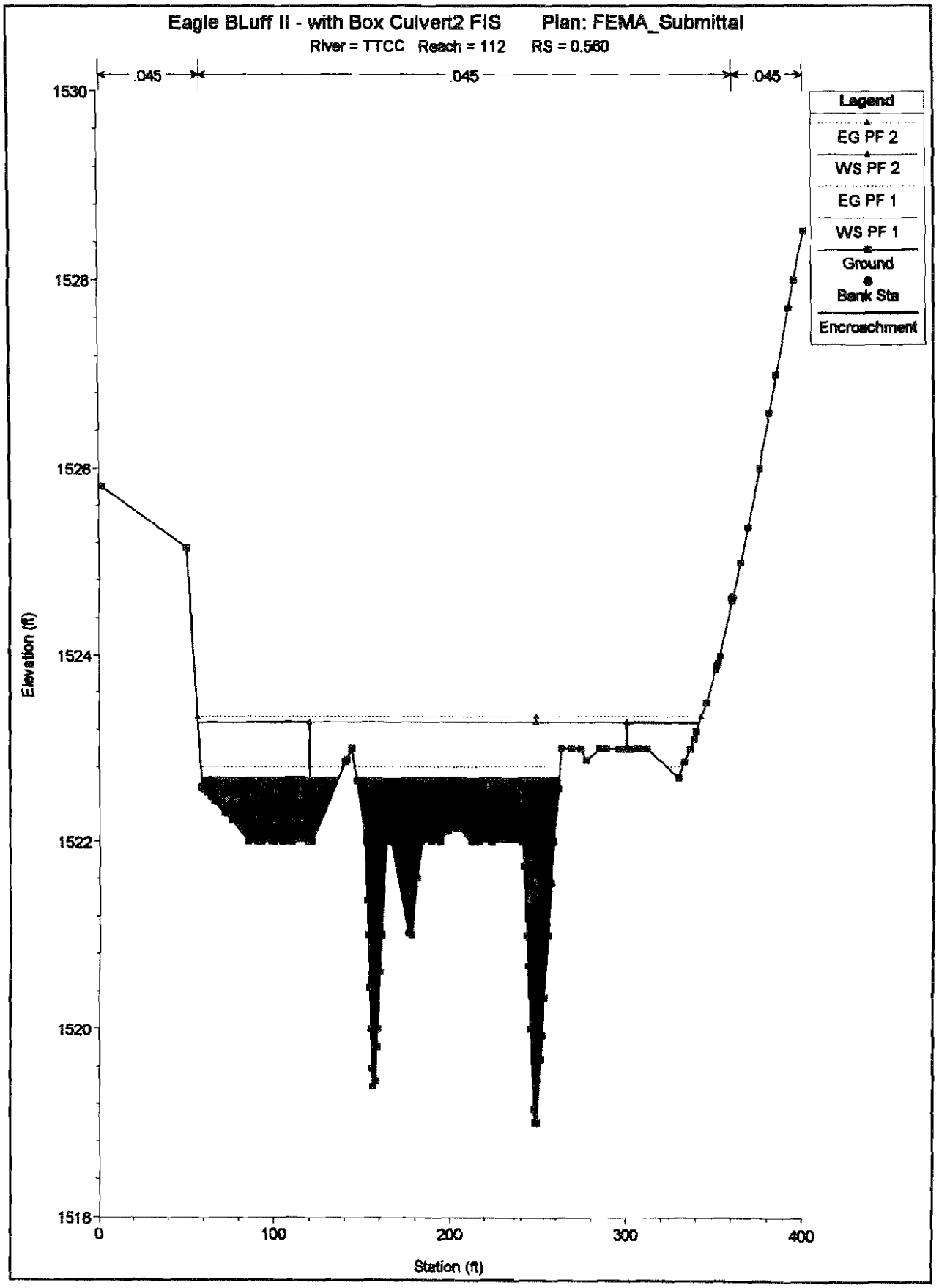

Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.360
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1528
1526
1524
1522
1520
1518
1516
1514
-100
0
100
200
300
400
500
600
Station (ft)

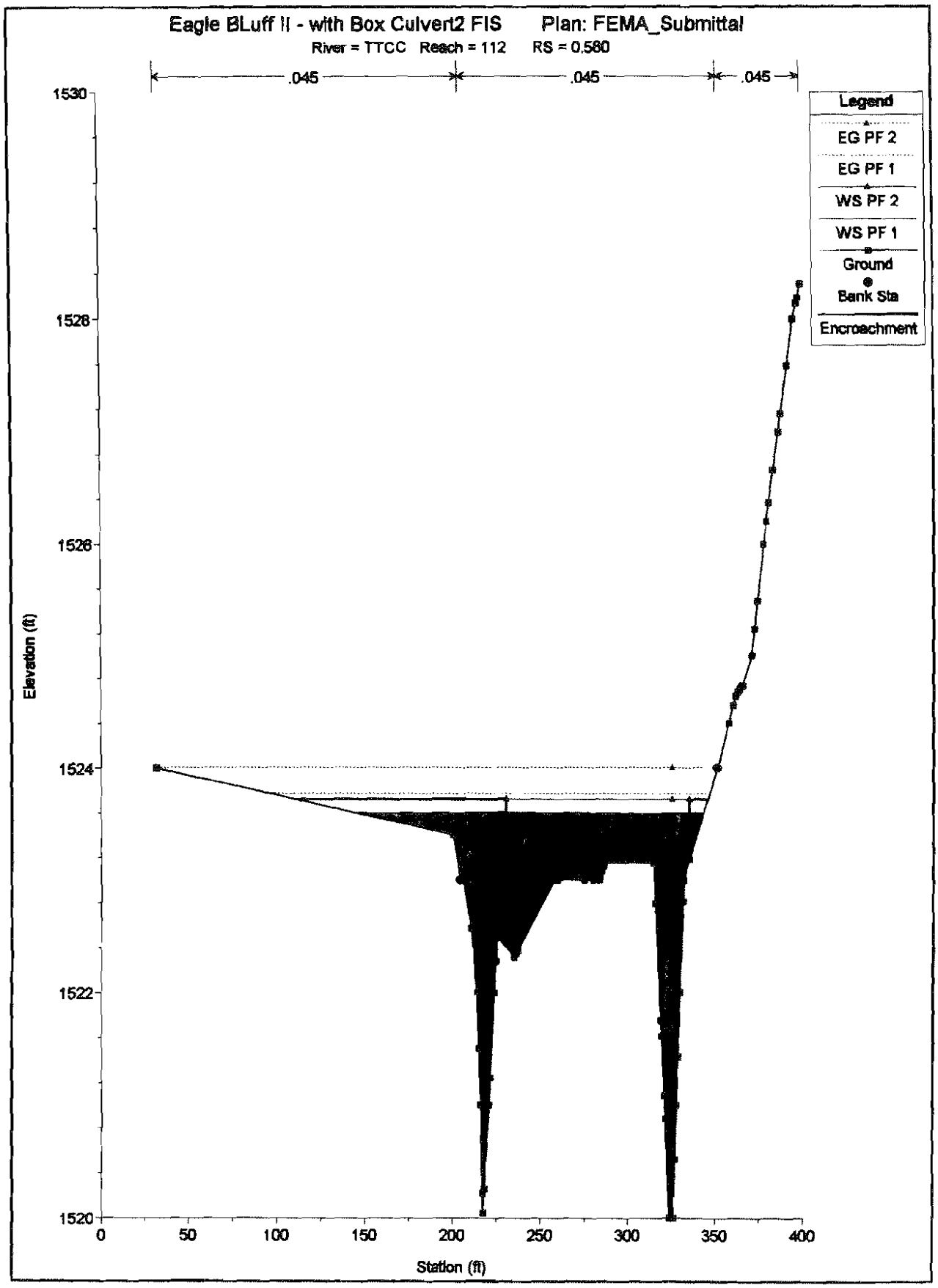

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.401
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1532
1530
1528
1526
1524
1522
1520
1518
1516
1514
0
100
200
300
400
500
600
700
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.431
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1540
1535
1530
1525
1520
1515
0
100
200
300
400
500
600
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.469
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1540
1535
1530
1525
1520
1515
0
100
200
300
400
500
600
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.511
.045
.045
0
4
5
Legend
EG PF 2
EG PF 1
WS PF 2
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1532
1530
1528
1526
1524
1522
1520
1518
1516
0
100
200
300
400
500
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.560
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1528
1526
1524
1522
1520
1518
0
100
200
300
400
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.580
.045
.045
.045
Legend
EG PF 2
EG PF 1
WS PF 2
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
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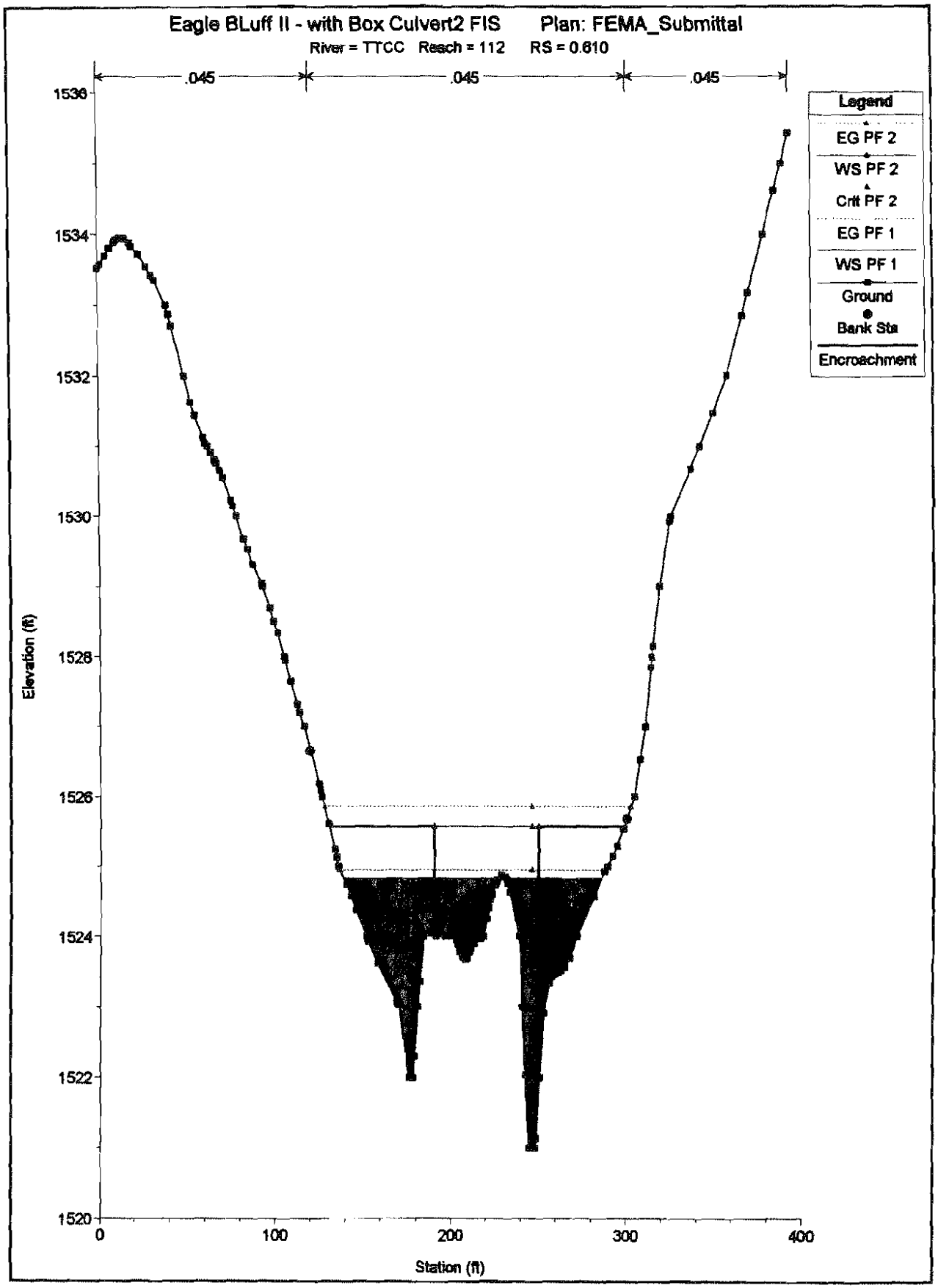
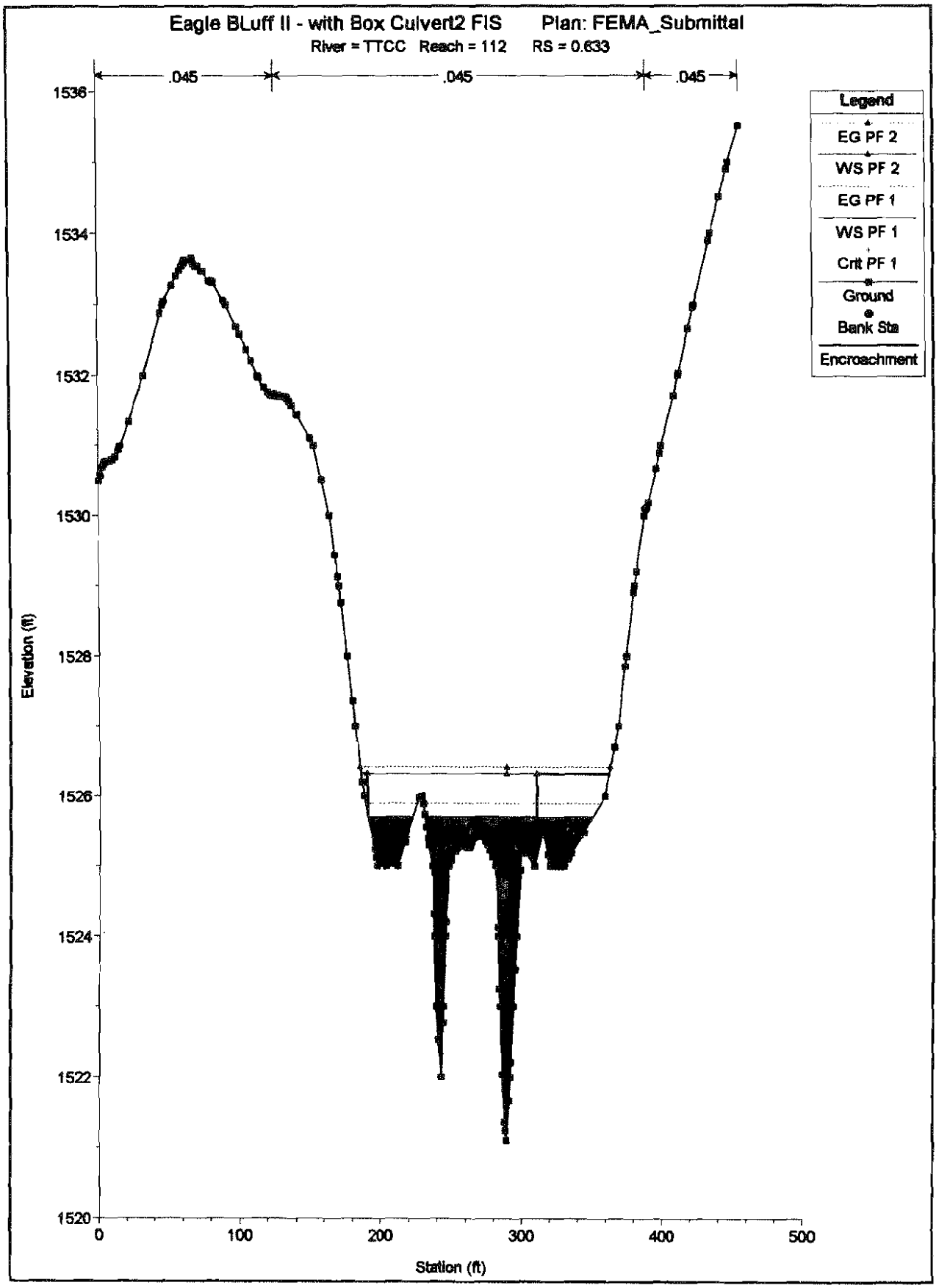
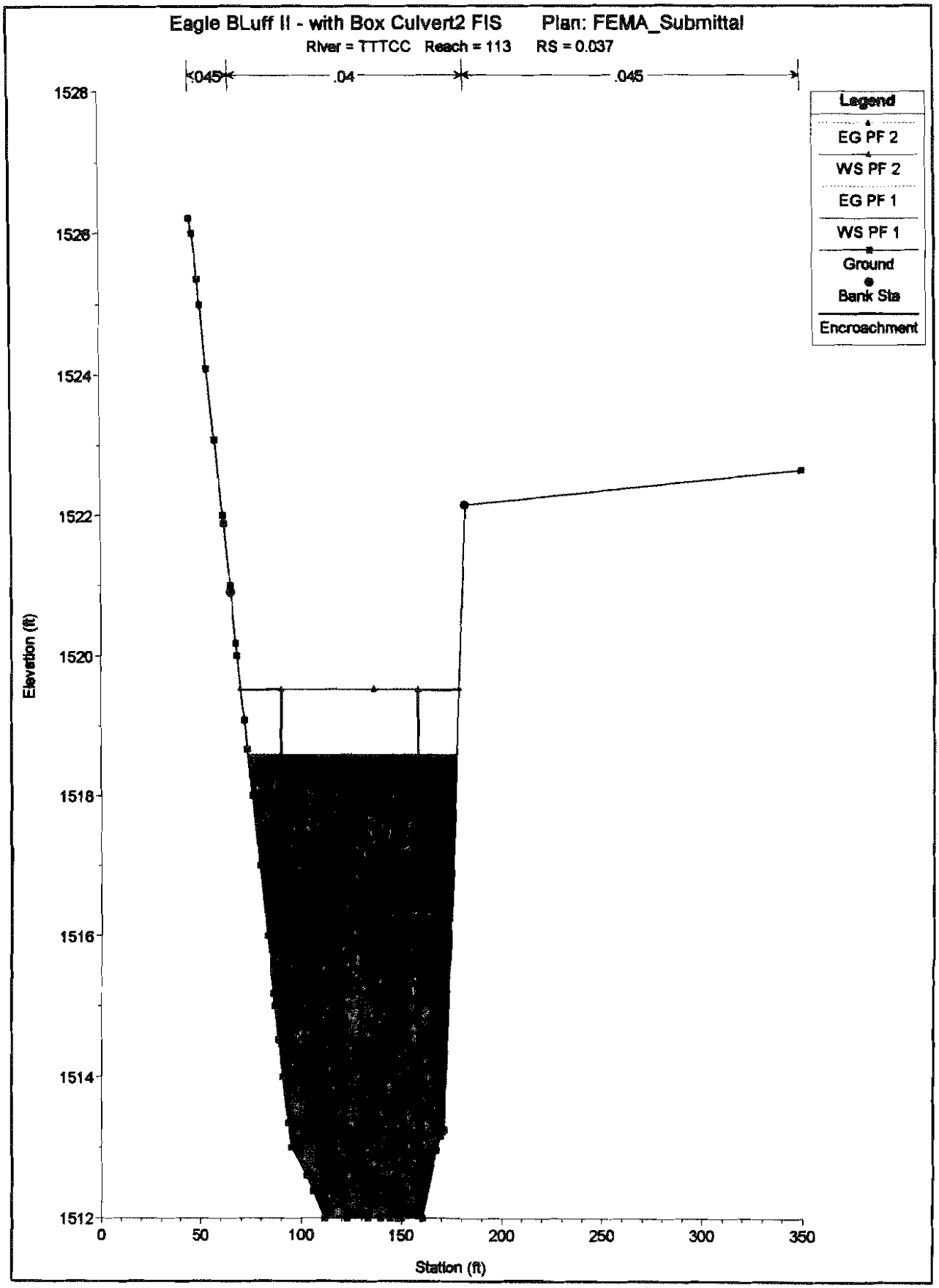
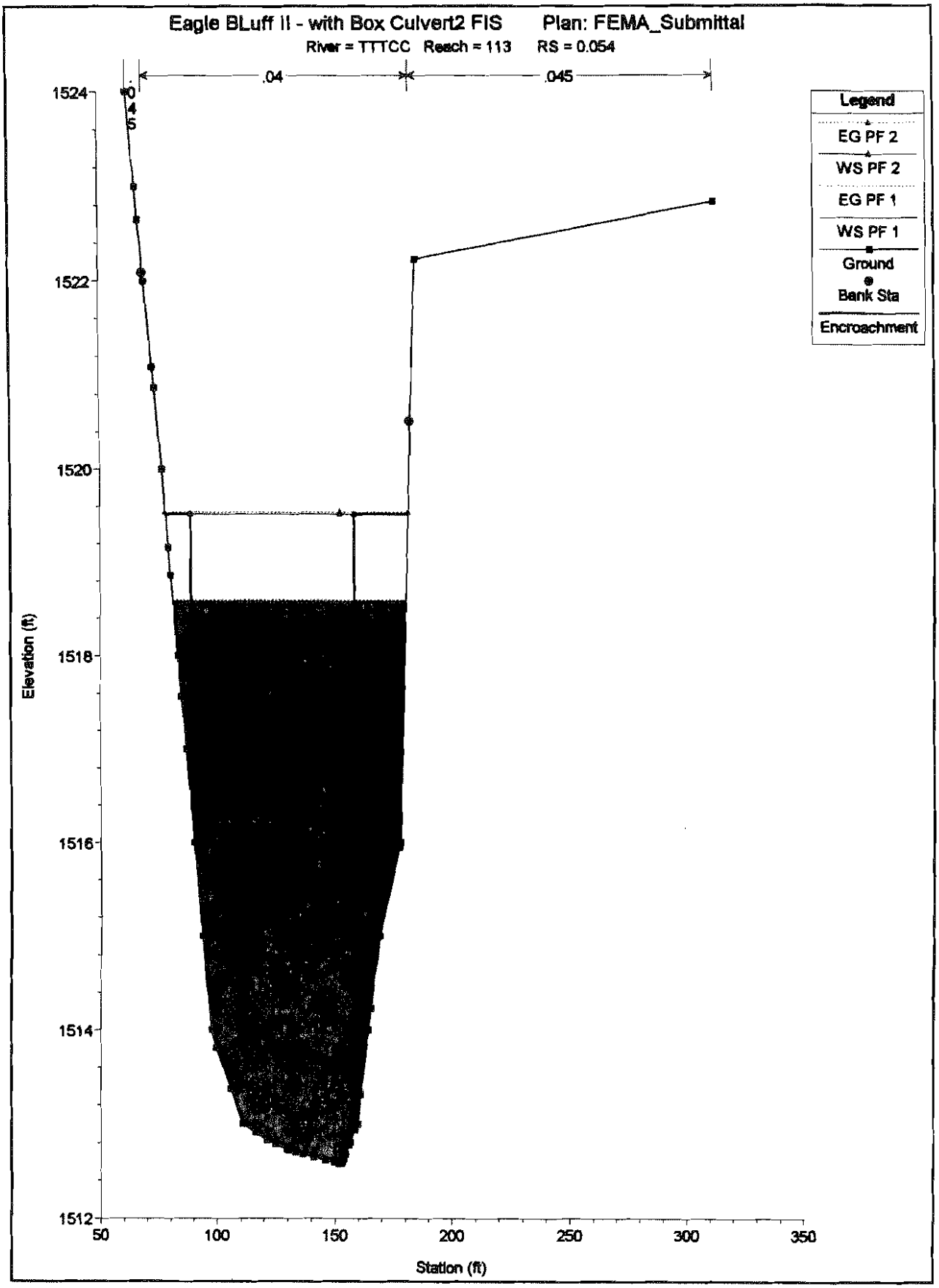
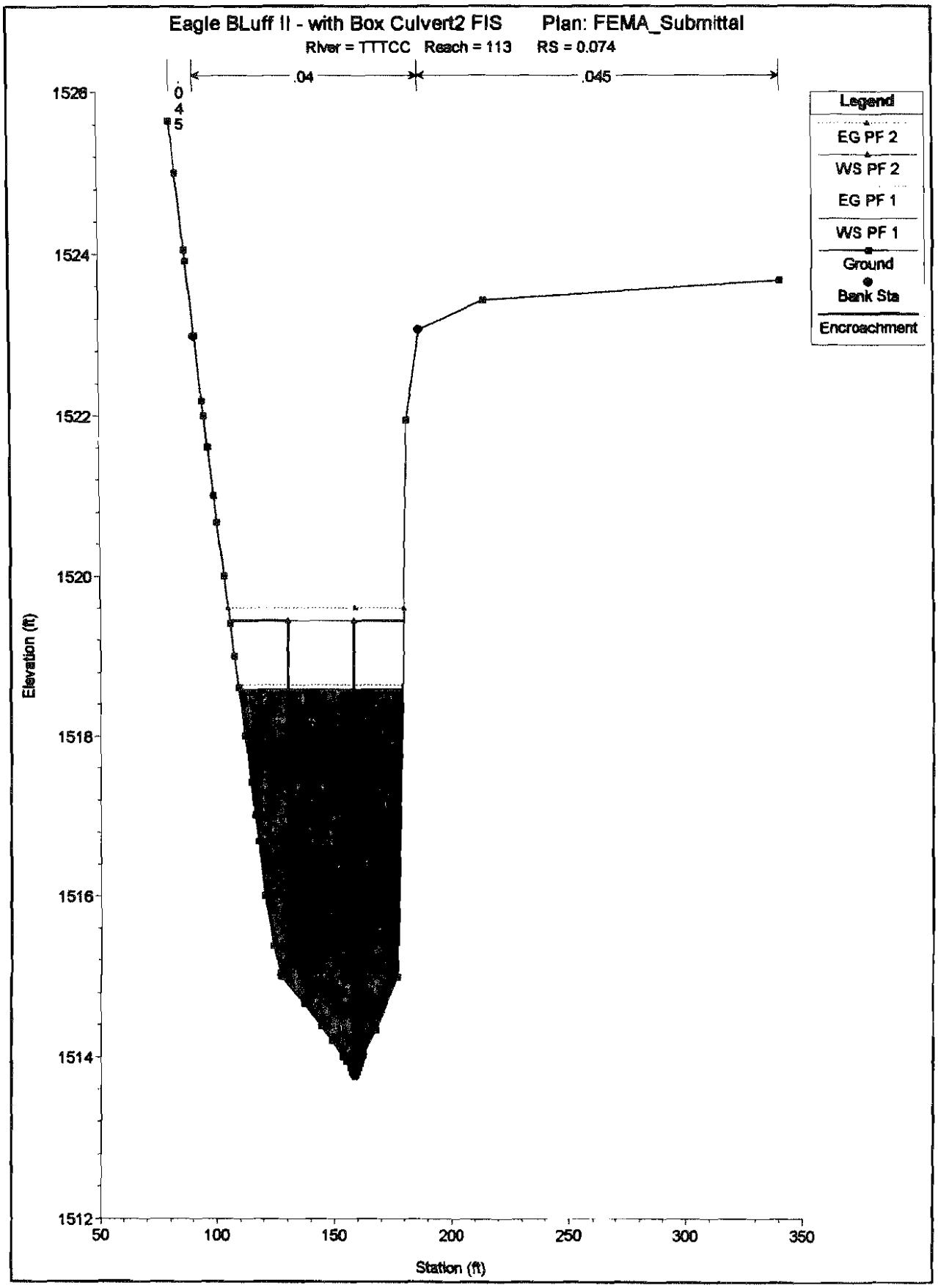
1528
1526
1524
1522
1520
0
50
100
150
200
250
300
350
400
Station (ft)

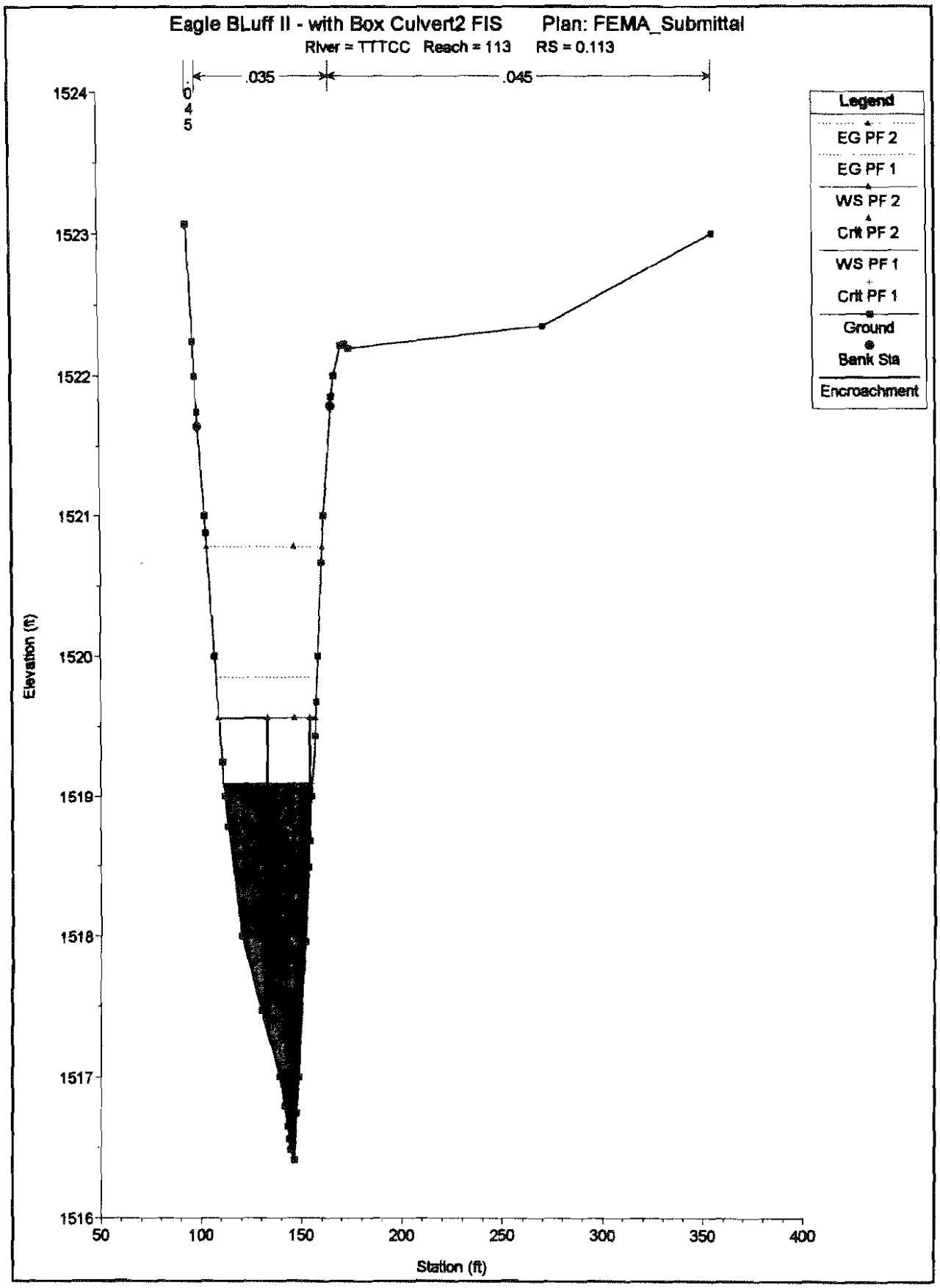

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.610
.045
.045
.045
Legend
EG PF 2
WS PF 2
Crit PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1536
1534
1532
1530
1528
1526
1524
1522
1520
0
100
200
300
400
Station (ft)

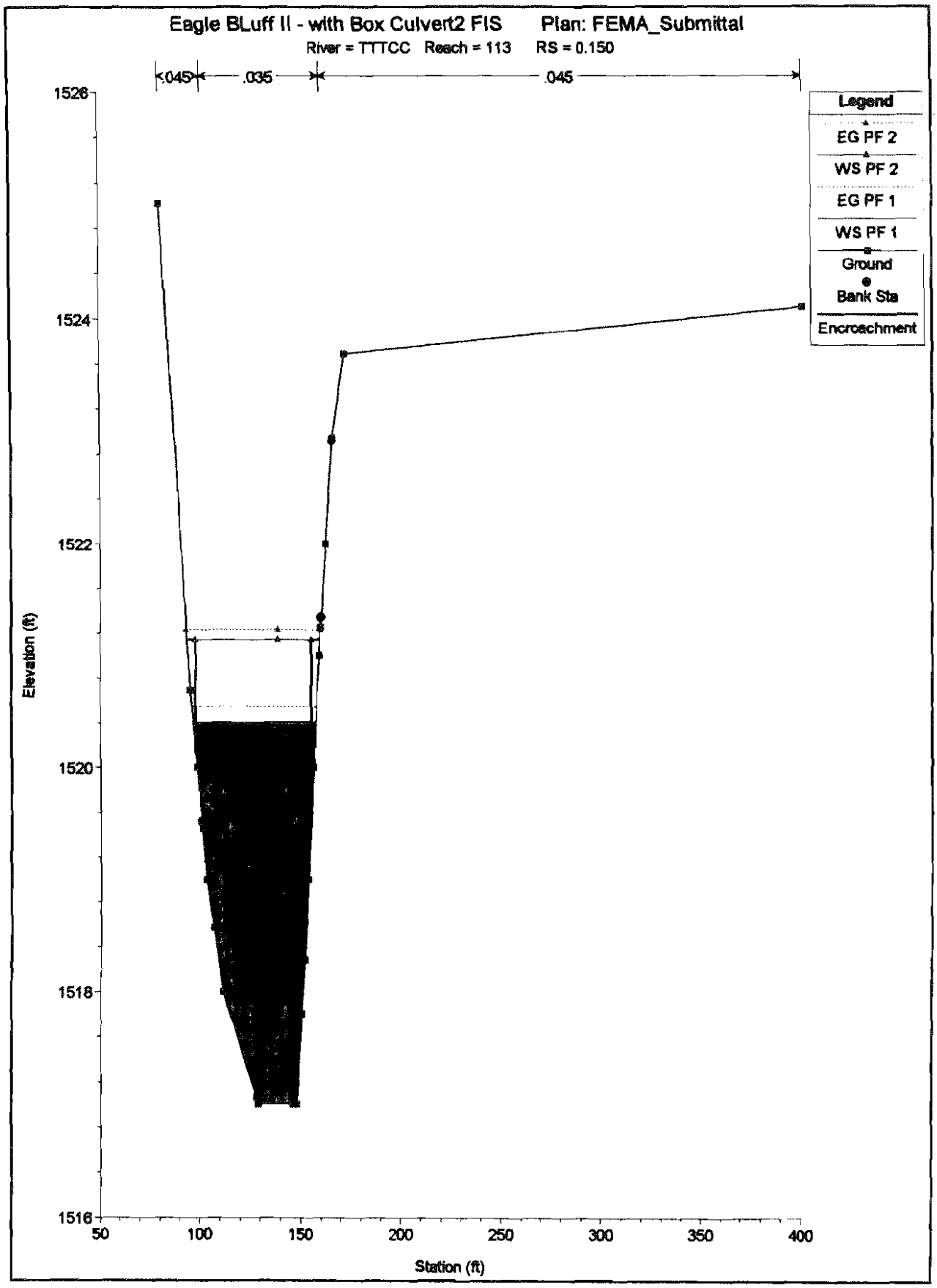

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTCC Reach = 112 RS = 0.633
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1536
1534
1532
1530
1528
1526
1524
1522
1520
0
100
200
300
400
500
Station (ft)

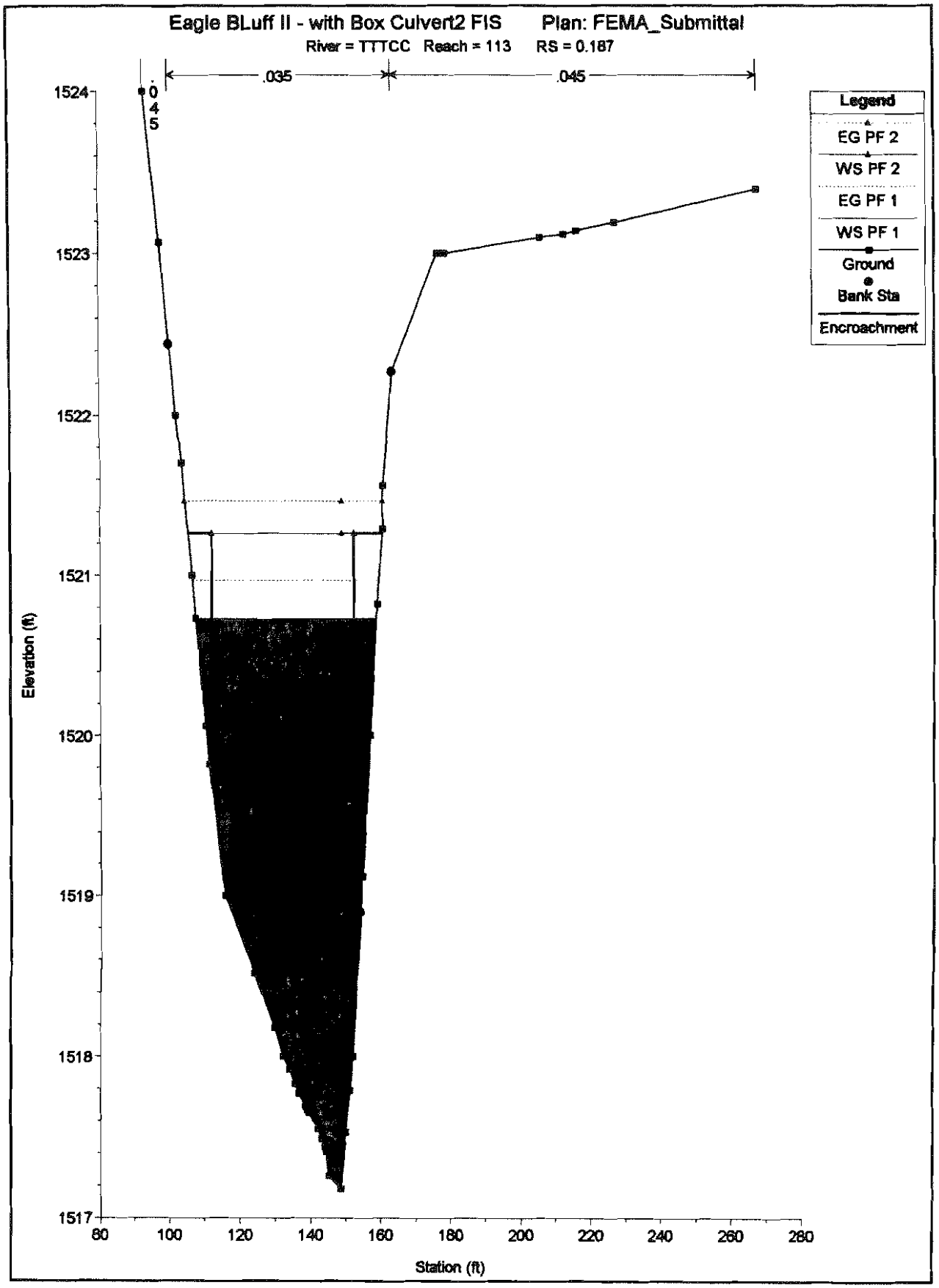

Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.037
.045
.04
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1528
1526
1524
1522
1520
1518
1516
1514
1512
0
50
100
150
200
250
300
350
Station (ft)

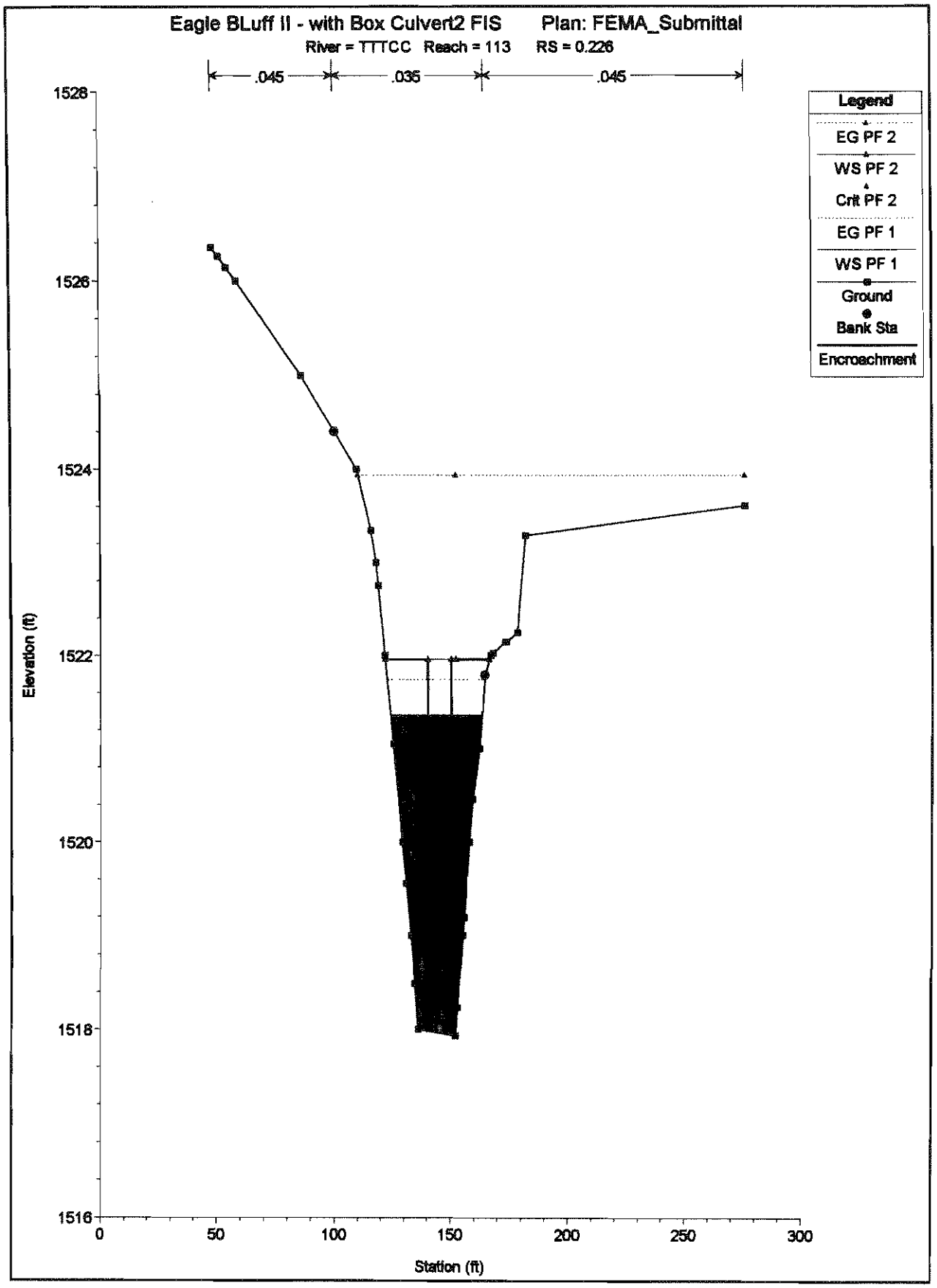

Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.054
.04
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1524
1522
1520
1518
1516
1514
1512
50
100
150
200
250
300
350
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.074
.04
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1526
1524
1522
1520
1518
1516
1514
1512
50
100
150
200
250
300
350
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.113
.035
.045
.045
Legend
EG PF 2
EG PF 1
WS PF 2
Crit PF 2
WS PF 1
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
1524
1523
1522
1521
1520
1519
1518
1517
1516
50
100
150
200
250
300
350
400


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.150
.045
.035
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1526
1524
1522
1520
1518
1516
50
100
150
200
250
300
350
400
Station (ft)


Eagle BLuff II - with Box Culvert2 FIS Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.187
.035
.045
0
4
5
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
1524
1523
1522
1521
1520
1519
1518
1517
80
100
120
140
160
180
200
220
240
260
280


Eagle BLuff II - with Box Culvert2 FIS
Plan: FEMA_Submittal
River = TTTCC Reach = 113 RS = 0.226
.045
.035
.045
Legend
EG PF 2
WS PF 2
Crit PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1528
1526
1524
1522
1520
1518
1516
0
50
100
150
200
250
300
Station (ft)

HEC-RAS Plan: FFMA

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)	
111	0.094	1000.00	1512.95	1515.90	1514.83	1516.04	0.003001	2.99	334.16	186.95	0.39
111	0.094	1000.00	1512.95	1516.58	1515.11	1516.86	0.003094	4.24	235.74	72.00	0.41
111	0.135	1000.00	1513.74	1516.36		1516.44	0.001451	2.17	460.61	241.98	0.28
111	0.135	1000.00	1513.74	1517.08		1517.16	0.000855	2.25	443.83	144.00	0.23
111	0.182	1000.00	1512.03	1516.66		1516.71	0.001102	2.78	582.52	332.64	0.29
111	0.182	1000.00	1512.03	1517.10		1517.70	0.005671	6.98	178.60	67.00	0.65
111	0.220	1000.00	1512.39	1518.06	1518.06	1518.47	0.004755	6.15	305.43	358.50	0.60
111	0.220	1000.00	1512.39	1518.13	1517.59	1519.32	0.009873	8.73	115.47	45.72	0.86
111	0.248	1000.00	1511.00	1518.56		1518.58	0.000145	0.99	1012.47	373.97	0.11
111	0.248	1000.00	1511.00	1519.48		1519.52	0.000207	1.53	654.96	155.00	0.13
111	0.281	1000.00	1511.00	1518.58		1518.58	0.000011	0.35	2837.26	490.84	0.03
111	0.281	1000.00	1511.00	1519.52		1519.53	0.000009	0.39	2596.53	335.00	0.02
112	.314	469.00	1512.00	1518.58		1518.58	0.000005	0.20	2328.99	523.46	0.02
112	.314	469.00	1512.00	1519.52		1519.53	0.000012	0.40	1174.86	171.00	0.03
112	.338	Culvert									
112	.348	469.00	1513.00	1518.79	1514.55	1518.79	0.000015	0.32	1486.58	387.22	0.03
112	.348	469.00	1514.00	1519.73	1514.72	1519.73	0.000022	0.47	1003.71	179.00	0.03
112	0.365	469.00	1513.32	1518.79		1518.79	0.000034	0.49	950.80	239.16	0.04
112	0.365	469.00	1513.32	1519.73		1519.73	0.000026	0.50	944.05	177.00	0.04
112	0.380	469.00	1514.00	1518.79		1518.79	0.000041	0.45	1042.10	332.21	0.04
112	0.380	469.00	1514.00	1519.73		1519.73	0.000031	0.50	929.69	197.00	0.04
112	0.401	469.00	1515.00	1518.79		1518.80	0.000058	0.47	989.60	380.82	0.05
112	0.401	469.00	1515.00	1519.73		1519.74	0.000056	0.61	770.13	192.00	0.05
112	0.431	469.00	1515.79	1518.80		1518.82	0.000327	0.87	539.36	306.40	0.12
112	0.431	469.00	1515.79	1519.74		1519.75	0.000103	0.68	684.90	230.00	0.07
112	0.469	469.00	1517.00	1518.96	1518.96	1519.25	0.036341	4.30	108.98	192.11	1.01
112	0.469	469.00	1517.00	1519.74		1519.85	0.004347	2.63	178.09	130.00	0.40
112	0.511	469.00	1517.16	1521.14	1520.57	1521.21	0.004412	2.12	221.26	229.91	0.38
112	0.511	469.00	1517.16	1521.21	1521.09	1521.64	0.023244	5.27	89.06	80.00	0.88
112	0.560	469.00	1519.00	1522.69		1522.81	0.008657	2.79	168.38	192.76	0.52
112	0.560	469.00	1519.00	1523.28		1523.35	0.002909	2.05	228.29	180.00	0.32
112	0.580	469.00	1520.00	1523.60		1523.77	0.009991	3.29	148.11	200.20	0.58
112	0.580	469.00	1520.00	1523.72		1524.01	0.016752	4.30	109.11	105.00	0.74
112	0.610	469.00	1521.00	1524.83		1524.95	0.005671	2.76	169.66	142.95	0.45
112	0.610	469.00	1521.00	1525.57	1524.95	1525.85	0.008502	4.26	110.05	60.00	0.55
112	0.633	469.00	1521.10	1525.70	1525.42	1525.89	0.013666	3.51	133.78	151.02	0.66
112	0.633	469.00	1521.10	1526.32		1526.42	0.003268	2.48	188.95	120.00	0.35

LEGEND:

111	0.094	FLOODPLAIN DATA
111	0.094	FLOODWAY DATA

HEC-RAS Plan: FEMA River: TITCC Reach: 113

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)	
113	0.037	451.00	1512.00	1518.58		1518.59	0.000051	0.80	562.93	103.77	0.06
113	0.037	451.00	1512.00	1519.52		1519.53	0.000064	0.91	494.41	68.00	0.06
113	0.054	451.00	1512.58	1518.58		1518.60	0.000091	0.97	462.65	99.05	0.08
113	0.054	451.00	1512.58	1519.52		1519.53	0.000079	1.03	436.88	69.00	0.07
113	0.074	451.00	1513.76	1518.58		1518.64	0.000470	1.83	246.81	68.71	0.17
113	0.074	451.00	1513.79	1519.44		1519.60	0.001780	3.18	141.66	28.00	0.25
113	0.113	451.00	1516.41	1519.09	1519.09	1519.85	0.016313	6.98	64.58	43.64	1.01
113	0.113	451.00	1516.41	1519.56	1519.56	1520.78	0.016485	8.88	50.78	21.00	1.01
113	0.150	451.00	1517.00	1520.40		1520.54	0.001401	3.02	151.03	60.64	0.33
113	0.150	451.00	1517.00	1521.14		1521.23	0.000628	2.38	192.03	57.00	0.22
113	0.187	451.00	1517.18	1520.73		1520.97	0.002979	3.93	114.62	50.90	0.46
113	0.187	451.00	1517.18	1521.26		1521.46	0.001847	3.60	125.10	40.00	0.36
113	0.226	451.00	1517.93	1521.36		1521.74	0.004561	4.95	91.06	39.10	0.57
113	0.226	451.00	1517.94	1521.96	1521.96	1523.94	0.024354	11.28	39.98	10.00	0.99

CULVERT (FLOODPLAIN)

Plan: FEMA TTCC 112 RS: .338 Profile: PF 1 Culvert ID: Culvert #1

Culv Q (cfs)	469.00	Culv Ful Lngh (ft)	80.00
# Barrels	4	Culv Vel US (ft/s)	2.93
Q Barrel (cfs)	117.25	Culv Vel DS (ft/s)	2.93
E.G. US. (ft)	1518.79	Culv Inv El Up (ft)	1513.25
W.S. US. (ft)	1518.79	Culv Inv El Dn (ft)	1513.00
E.G. DS (ft)	1518.58	Culv Frctn Ls (ft)	0.02
W.S. DS (ft)	1518.58	Culv Ext Lss (ft)	0.13
Delta EG (ft)	0.21	Culv Ent Lss (ft)	0.05
Delta WS (ft)	0.21	Q Weir (cfs)	
E.G. IC (ft)	1515.76	Weir Sta Lft (ft)	
E.G. OC (ft)	1518.79	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1517.25	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1517.00	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	1.62	Min El Weir Flow (ft)	1520.91

CULVERT (FLOODWAY)

Plan: FEMA TTCC 112 RS .338 Profile: PF 2 Culvert ID: Culvert #1

Culv Q (cfs)	469.00	Culv Ful Lngh (ft)	80.00
# Barrels	4	Culv Vel US (ft/s)	2.93
Q Barrel (cfs)	117.25	Culv Vel DS (ft/s)	2.93
E.G. US. (ft)	1519.73	Culv Inv El Up (ft)	1513.25
W.S. US. (ft)	1519.73	Culv Inv El Dn (ft)	1513.00
E.G. DS (ft)	1519.53	Culv Frctn Ls (ft)	0.02
W.S. DS (ft)	1519.52	Culv Ext Lss (ft)	0.13
Delta EG (ft)	0.21	Culv Ent Lss (ft)	0.05
Delta WS (ft)	0.21	Q Weir (cfs)	
E.G. IC (ft)	1515.76	Weir Sta Lft (ft)	
E.G. OC (ft)	1519.73	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1517.25	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1517.00	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	1.62	Min El Weir Flow (ft)	1520.91

FLOODWAY ENCROACHMENT TABLE

HEC-RAS Plan: FEMA

Reach	River Sta	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
111	0.094	1515.90		1516.04	186.95		1000.00			150.00	350.00	
111	0.094	1516.58	0.68	1516.86	72.00		1000.00		168.00	150.00	350.00	240.00
111	0.135	1516.36		1516.44	241.98		1000.00			141.00	415.00	
111	0.135	1517.08	0.72	1517.16	144.00		1000.00		156.00	141.00	415.00	300.00
111	0.182	1516.66		1516.71	332.64		255.31	744.69		115.00	161.00	
111	0.182	1517.10	0.44	1517.70	67.00		705.42	294.58	133.00	115.00	161.00	200.00
111	0.220	1518.06		1518.47	358.50		687.46	312.54		129.00	176.00	
111	0.220	1518.13	0.08	1519.32	45.72		999.22	0.78	122.00	129.00	176.00	200.00
111	0.248	1518.56		1518.58	373.97		1000.00			93.64	552.89	
111	0.248	1519.48	0.92	1519.52	155.00		1000.00		105.00	93.64	552.89	260.00
111	0.281	1518.58		1518.58	490.84		1000.00			64.00	601.00	
111	0.281	1519.52	0.95	1519.53	335.00		1000.00		95.00	64.00	601.00	430.00
112	.314	1518.58		1518.58	523.46	0.11	468.82	0.06		21.39	525.79	
112	.314	1519.52	0.94	1519.53	171.00		469.00		207.00	21.39	525.79	378.00
112	.338	Culvert										
112	.348	1518.79		1518.79	387.22		469.00			53.24	444.97	
112	.348	1519.73	0.94	1519.73	179.00		469.00		132.00	53.24	444.97	311.00
112	0.365	1518.79		1518.79	239.16		468.63	0.37		98.98	338.00	
112	0.365	1519.73	0.94	1519.73	177.00		469.00		133.00	98.98	338.00	310.00
112	0.380	1518.79		1518.79	332.21		469.00			76.95	440.00	
112	0.380	1519.73	0.94	1519.73	197.00		469.00		143.00	76.95	440.00	340.00
112	0.401	1518.79		1518.80	380.82		469.00			119.00	550.00	
112	0.401	1519.73	0.94	1519.74	192.00		469.00		208.00	119.00	550.00	400.00
112	0.431	1518.80		1518.82	306.40		469.00			50.00	390.00	
112	0.431	1519.74	0.94	1519.75	230.00		469.00		90.00	50.00	390.00	320.00
112	0.469	1518.96		1519.25	192.11		469.00			150.00	408.00	
112	0.469	1519.74	0.78	1519.85	130.00		469.00		190.00	150.00	408.00	320.00

FLOODWAY ENCROACHMENT TABLE

HEC-RAS Plan: FEMA (Continued)

Reach	River Sta	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
112	0.511	1521.14		1521.21	229.91		469.00			136.81	410.00	
112	0.511	1521.21	0.06	1521.64	80.00		469.00		160.00	136.81	410.00	240.00
112	0.560	1522.69		1522.81	192.76	0.01	468.99			59.00	360.00	
112	0.560	1523.28	0.59	1523.35	180.00		469.00		120.00	59.00	360.00	300.00
112	0.580	1523.60		1523.77	200.20	6.10	462.90			204.37	350.82	
112	0.580	1523.72	0.12	1524.01	105.00		469.00		230.00	204.37	350.82	335.00
112	0.610	1524.83		1524.95	142.95		469.00			120.00	300.00	
112	0.610	1525.57	0.74	1525.85	60.00		469.00		190.00	120.00	300.00	250.00
112	0.633	1525.70		1525.89	151.02		469.00			125.00	388.00	
112	0.633	1526.32	0.62	1526.42	120.00		469.00		190.00	125.00	388.00	310.00

FLOODWAY ENCROACHMENT TABLE

HEC-RAS Plan: FEMA River: TTTCC Reach: 113

Reach	River Sta	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
113	0.037	1518.58		1518.59	103.77		451.00			65.00	181.17	
113	0.037	1519.52	0.94	1519.53	68.00		451.00		90.00	65.00	181.17	158.00
113	0.054	1518.58		1518.60	99.05		451.00			69.00	182.08	
113	0.054	1519.52	0.94	1519.53	69.00		451.00		89.00	69.00	182.08	158.00
113	0.074	1518.58		1518.64	69.71		451.00			91.00	186.18	
113	0.074	1519.44	0.86	1519.60	28.00		451.00		130.00	91.00	186.18	158.00
113	0.113	1519.09		1519.85	43.64		451.00			99.00	165.00	
113	0.113	1519.56	0.47	1520.78	21.00		451.00		133.00	99.00	165.00	154.00
113	0.150	1520.40		1520.54	60.64	1.38	449.62			101.00	160.00	
113	0.150	1521.14	0.74	1521.23	57.00	3.22	447.78		98.00	101.00	160.00	155.00
113	0.187	1520.73		1520.97	50.90		451.00			100.00	163.06	
113	0.187	1521.26	0.53	1521.46	40.00		451.00		112.00	100.00	163.06	152.00
113	0.226	1521.36		1521.74	39.10		451.00			100.00	164.38	
113	0.226	1521.96	0.60	1523.94	10.00		451.00		140.00	100.00	164.38	150.00

"WSE COMPARISON"

Eagle Bluff III

Comparison of "Floodplain" and "Floodway" water surface elevations before and after construction of box culvert

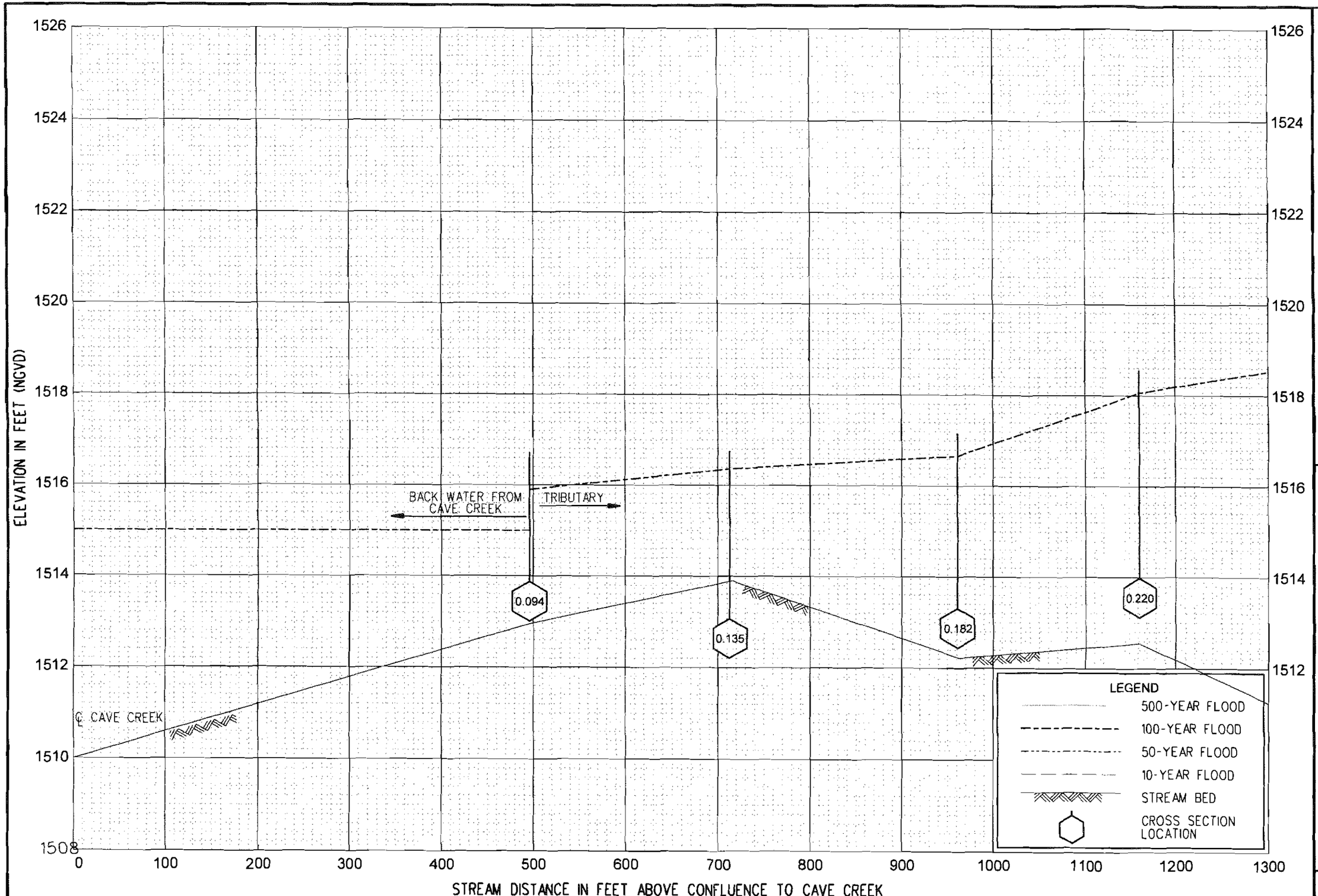
		Flood Plain		Flood Way	
	River Station	**No Culvert**	**With Culvert**	**No Culvert**	**With Culvert**
DOWNSTREAM	0.094	1515.93	1515.90	1516.58	1516.58
	0.135	1516.38	1516.36	1517.08	1517.08
	0.182	1516.66	1516.66	1517.10	1517.10
	0.220	1518.06	1518.06	1518.13	1518.13
	0.248	1518.56	1518.56	1519.48	1519.48
	0.281	1518.58	1518.58	1519.52	1519.52
	0.314	This section not part of original CLOMR	1518.58	This section not part of original CLOMR	1519.52
	0.338	**CULVERT**		**CULVERT**	
UPSTREAM	0.348	This section not part of original CLOMR	1518.79	This section not part of original CLOMR	1519.73
	0.365	1518.58	1518.79	1519.52	1519.73
	0.380	1518.58	1518.79	1519.52	1519.73
	0.401	1518.58	1518.79	1519.53	1519.73
	0.431	1518.60	1518.80	1519.54	1519.74
	0.469	1518.96	1518.95	1519.53	1519.74
	0.511	1521.14	1521.15	1521.40	1521.21
	0.560	1522.69	1522.68	1523.23	1523.28

Shaded areas indicate no change in WSE when adding Box Culvert

Building pad grades have been set at 2 feet above the shaded floodway WSE

APPENDIX C

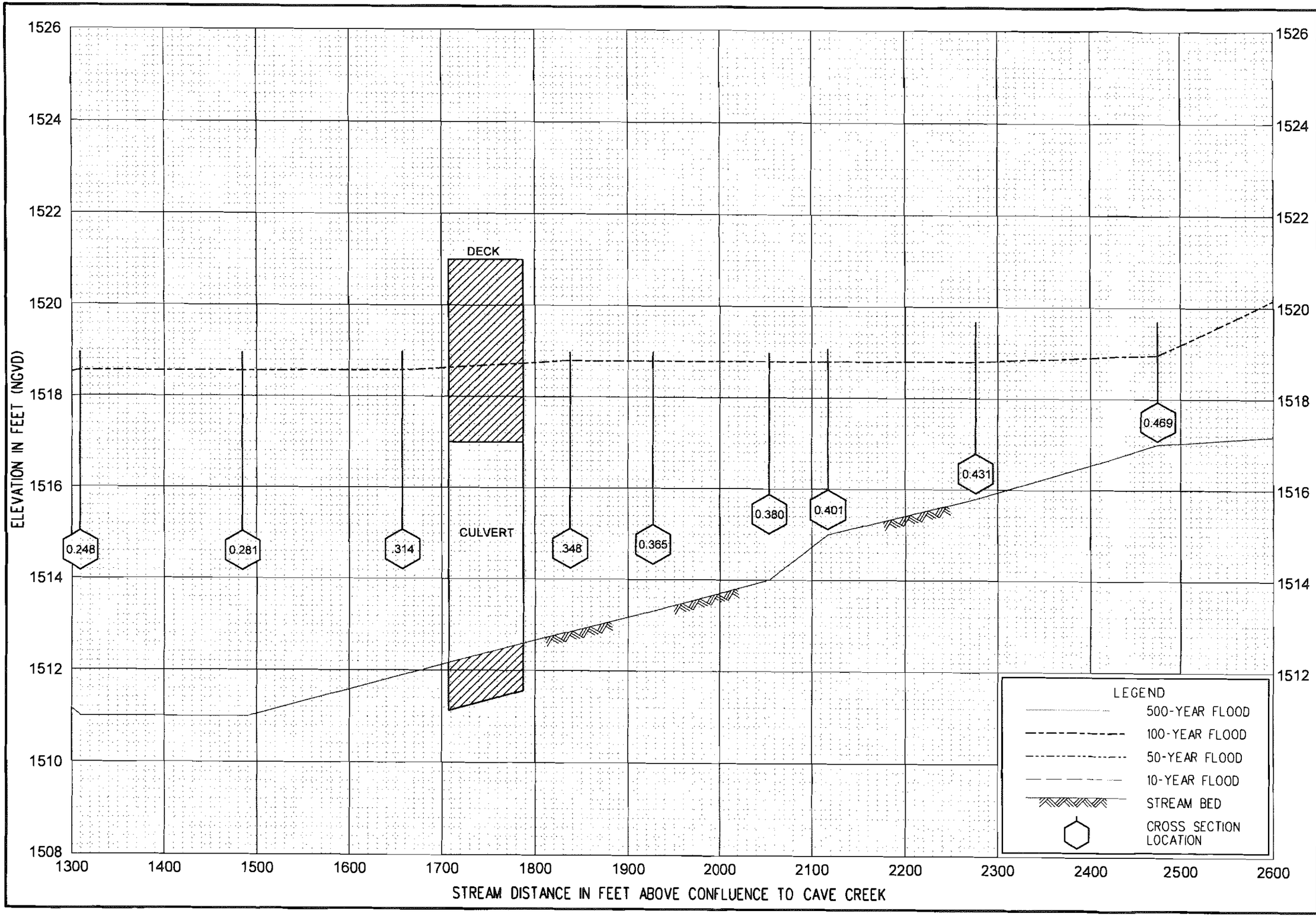
Flood Profiles



FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

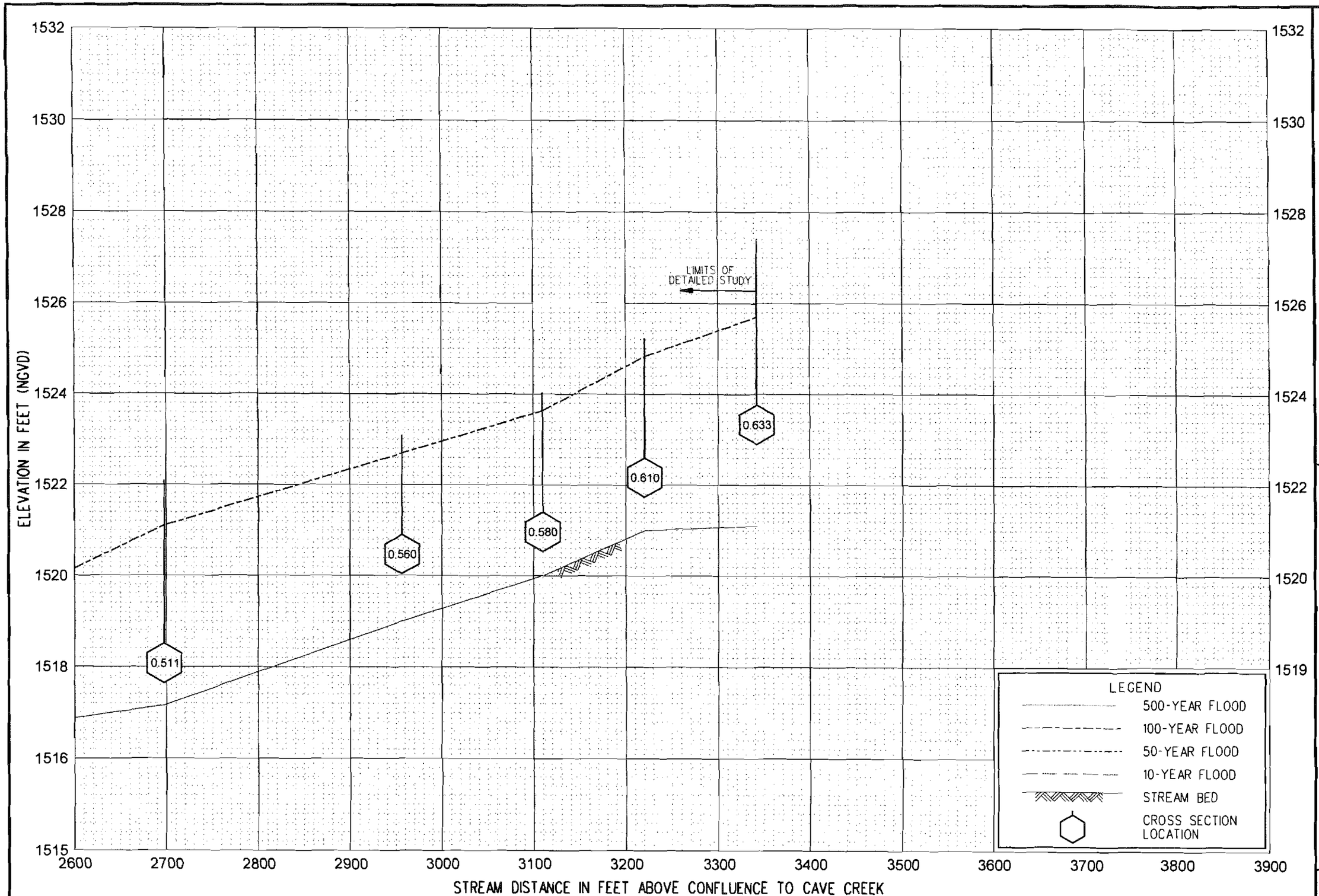


FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

02P



FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

03P

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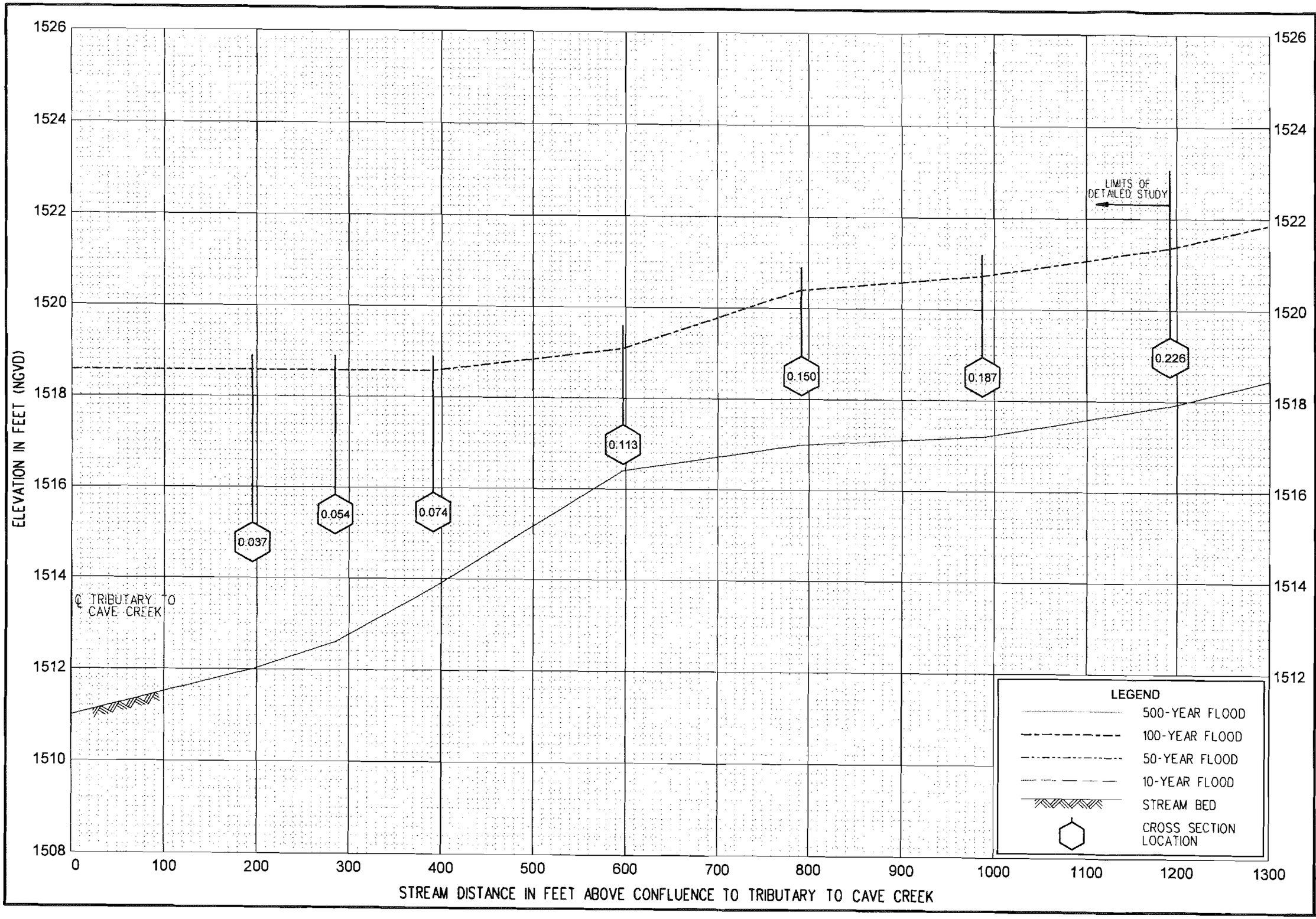

FLOOD PROFILES

TRIBUTARY TO TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

01P

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE (Mi)	WIDTH (FT)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (FT/S)	FLOODPLAIN	FLOODWAY	INCREASE (FT)
0.000	0.000	N/A	N/A	N/A	1515.0	1515.0	0.0
0.094	0.094	72	235	4.2	1515.9	1516.5	0.6
0.135	0.135	144	444	2.3	1516.4	1517.1	0.7
0.182	0.182	67	179	7.0	1516.7	1517.1	0.4
0.220	0.220	46	115	8.7	1518.1	1518.1	0.0
0.248	0.248	155	655	1.5	1518.6	1519.5	0.9
0.281	0.281	335	2597	0.4	1518.6	1519.5	0.9
0.314	0.314	171	1175	0.4	1518.6	1519.5	0.9
0.348	0.348	179	1004	0.5	1518.8	1519.7	0.9
0.365	0.365	177	944	0.5	1518.8	1519.7	0.9
0.380	0.380	197	929	0.5	1518.8	1519.7	0.9
0.401	0.401	192	770	0.6	1518.8	1519.7	0.9
0.431	0.431	230	685	0.7	1518.8	1519.7	0.9
0.469	0.469	130	178	2.6	1519.0	1519.7	0.7
0.511	0.511	80	89	5.3	1521.1	1521.2	0.1
0.560	0.560	180	228	2.0	1522.7	1523.3	0.6
0.580	0.580	105	110	4.3	1523.6	1523.7	0.1
0.610	0.610	60	110	4.3	1524.8	1525.6	0.8
0.633	0.633	120	189	2.5	1525.7	1526.3	0.6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

Tributary to Cave Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE (Mi)	WIDTH (FT)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (FT/S)	FLOODPLAIN	FLOODWAY	INCREASE (FT)
0.037	0.037	68	494	0.9	1518.6	1519.5	0.9
0.054	0.054	69	437	1.0	1518.6	1519.5	0.9
0.074	0.074	28	142	3.2	1518.6	1519.4	0.8
0.113	0.113	21	51	8.9	1519.1	1519.6	0.5
0.150	0.150	57	192	2.4	1520.4	1521.1	0.7
0.187	0.187	40	125	3.6	1520.7	1521.3	0.6
0.226	0.226	10	40	11.3	1521.4	1522.0	0.6

FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY, AZ AND INCORPORATED AREAS	FLOODWAY DATA Tributary Tributary to Cave Creek

APPENDIX D
Pocket

Drainage/Work Map
&
Box Culvert "As Builts"

EAGLE BLUFF III
PAVING PLAN

GENERAL PAVING NOTES:

1. CONSTRUCTION WITHIN THE RIGHT OF WAY SHALL CONFORM TO THE LATEST APPLICABLE MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) UNIFORM STANDARD SPECIFICATIONS AND DETAILS AND THE LATEST CITY OF PHOENIX SUPPLEMENTALS TO THE MAG UNIFORM STANDARD SPECIFICATIONS AND DETAILS
2. APPROVAL BY THE DEVELOPMENT SERVICES DEPARTMENT IS FOR COMPLIANCE WITH PROJECT STIPULATIONS AND MINIMUM CITY OF PHOENIX STANDARDS FOR WORK WITHIN PUBLIC RIGHT OF WAY. IN ADDITION, THE PROPERTY OWNER MUST DEDICATE STREETS IN ACCORDANCE WITH MINIMUM RIGHT OF WAY STANDARDS MAP (ORDINANCE NO. 437, LATEST AMENDMENT)
3. PLAN APPROVAL IS VALID FOR TWELVE MONTHS. IF CONSTRUCTION APPROVAL EXPIRES, PLANS MUST BE RESUBMITTED FOR AN UPDATE REVIEW AND APPROVAL
4. THE CITY OF PHOENIX DEVELOPMENT SERVICES DEPARTMENT'S FIELD INSPECTION GROUP, (602) 262 7811, SHALL BE NOTIFIED 48 HOURS PRIOR TO ANY CONSTRUCTION
5. OBSTRUCTIONS TO PROPOSED IMPROVEMENTS IN THE RIGHT OF WAY SHALL BE REMOVED OR RELOCATED BEFORE BEGINNING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS.
6. THE ACTUAL POINT OF PAVEMENT MATCHING, AND/OR TERMINATION, SHALL BE DETERMINED IN THE FIELD BY THE CITY OF PHOENIX, DEVELOPMENT SERVICES DEPARTMENT FIELD INSPECTOR
7. ALL FRAMES, COVERS, VALVE BOXES, AND MANHOLE COVERS SHALL BE ADJUSTED TO FINISH GRADE PRIOR TO COMPLETION OF PAVING OR RELATED CONSTRUCTION. ADJUSTMENT OF EXISTING "TYPE A" OR "TYPE B" WATERLINE VALVE BOXES IN THE PARKWAY SHALL BE CONSIDERED INCIDENTAL TO PARKWAY GRADING. EXISTING "TYPE B" WATERLINE VALVE BOXES IN CONCRETE, OR IN AREAS UNDER WHEEL LOADS, SHALL BE REPLACED WITH "TYPE A" BOXES PER C.O.P. STANDARD DETAIL P1391 1
8. CONSTRUCTION OF SURFACE IMPROVEMENTS SHALL NOT BEGIN UNTIL CONFLICTING UNDERGROUND UTILITY CONSTRUCTION IS COMPLETED AND SERVICE CONNECTIONS TO ALL PLATTED LOTS HAVE BEEN ADEQUATELY EXTENDED PAST THE RIGHT OF WAY
9. THE PERMITTEE SHALL ARRANGE FOR THE RELOCATION AND RELOCATION COSTS OF ALL UTILITIES, INCLUDING ANY STREET LIGHTS, AND SUBMIT A UTILITY RELOCATION SCHEDULE PRIOR TO THE ISSUANCE OF A CONSTRUCTION PERMIT. RELOCATION OF CITY WATER METERS SHALL BE DONE BY THE WATER SERVICES DEPARTMENT AFTER RECEIPT OF A PURCHASE ORDER OR DEPOSIT FROM THE PERMITTEE. RELOCATION OF CITY FIRE HYDRANTS SHALL BE BY SEPARATE PERMIT AND PLAN REVIEW AT DEVELOPER'S EXPENSE.
10. TREES AND SHRUBBERY IN THE RIGHT OF WAY THAT CONFLICT WITH PROPOSED IMPROVEMENTS SHALL NOT BE REMOVED WITHOUT APPROVAL OF THE CITY LANDSCAPE ARCHITECT. THE PERMITTEE SHALL BE RESPONSIBLE FOR OBTAINING AUTHORIZATION TO REMOVE AND/OR RELOCATE SAID TREES OR SHRUBBERY BY CALLING THE DEVELOPMENT SERVICES LANDSCAPE ARCHITECT AT (602) 256 4116
11. EXISTING OR NEWLY DAMAGED AND/OR DISPLACED CONCRETE CURB, GUTTER, SIDEWALK OR DRIVEWAY SLAB THAT IS WITHIN THE RIGHT OF WAY SHALL BE REPAIRED OR REPLACED, AS NOTED BY CITY INSPECTORS, BEFORE FINAL ACCEPTANCE OF THE WORK
12. THE ENGINEERING DESIGN ON THESE PLANS ARE ONLY APPROVED BY THE CITY IN SCOPE AND NOT IN DETAIL. CONSTRUCTION QUANTITIES ON THESE PLANS ARE NOT VERIFIED BY THE CITY. APPROVAL OF THESE PLANS ARE FOR PERMIT PURPOSES ONLY AND SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN THE PLANS WHERE SUCH ERRORS ARE SUBSEQUENTLY FOUND TO BE IN VIOLATION OF ANY LAW, ORDINANCE, HEALTH, SAFETY, OR OTHER DESIGN ISSUES. IN ADDITION, THE PROPERTY OWNER MUST DEDICATE STREETS IN ACCORDANCE WITH MINIMUM RIGHT OF WAY STANDARDS MAP (ORDINANCE NO. 437, LATEST AMENDMENT)
13. COMPACTION SHALL COMPLY WITH M.A.G. SECTION 601
14. AN APPROVED PAVING PLAN SHALL BE ON THE JOB SITE AT ALL TIMES. DEVIATIONS FROM THE PLAN MUST BE PRECEDED BY AN APPROVED PLAN REVISION.
15. GRADING BETWEEN BACK OF CURB AND PROPERTY LINE SHALL BE LIMITED TO 4:1 SLOPE
16. CERTIFICATE OF OCCUPANCY (C OF O) AND/OR FINAL ELECTRICAL CLEARANCE FOR ANY BUILDING IS DENIED UNTIL ALL OFFSITE IMPROVEMENTS ARE COMPLETED
17. THE CONTRACTOR MUST CONTACT STREET TRANSPORTATION DEPARTMENT, TRAFFIC OPERATIONS DIVISION AT (602) 262 6456 TWO (2) WEEKS PRIOR TO COMPLETION OF PAVING WORK FOR SIGNING & STRIPING
18. A PAVEMENT CUT SURCHARGE SHALL BE ASSESSED ON THIS PROJECT FOR ANY TRENCHING OR POTHOLING IN NEW ASPHALT PAVEMENT THAT IS LESS THAN 30 MONTHS OLD. SURCHARGE FEES ASSESSED ARE IN ADDITION TO THE REGULAR PERMIT FEES AND ARE OVER AND ABOVE ANY SPECIAL BACKFILL, COMPACTION AND PAVEMENT REPLACEMENT STIPULATIONS THAT MAY BE IMPOSED AS A CONDITION OF PERMITTING. PAVEMENT CUT SURCHARGE FEES ARE ASSESSED IN ACCORDANCE WITH SECTION 31 38 PF THE PHOENIX CITY CODE

SPECIAL NOTES:

1. THE CONTRACTOR SHALL NOTIFY THE DEVELOPER AT LEAST 48 HOURS IN ADVANCE FOR ANY STAKING OR RESTAKING REQUIRED
2. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN ANY PERMITS REQUIRED AT HIS OWN EXPENSE
3. THE CONTRACTOR WILL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT THE REVISION OF THESE PLANS, IF NECESSARY DUE TO A CONFLICT BETWEEN A FACILITY PROPOSED HEREIN AND AN EXISTING FACILITY
4. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY THE PRESENCE AND LOCATION OF ANY AND ALL EXISTING OVERHEAD AND/OR UNDERGROUND UTILITIES THAT MAY INTERFERE WITH THIS CONSTRUCTION, WHETHER OR NOT SAID UTILITIES ARE SHOWN ON THE CONSTRUCTION PLANS FOR THIS PROJECT, AND TO ADEQUATELY PROTECT AND MAINTAIN ANY SUCH UTILITIES
5. THE ENGINEER DOES NOT ASSUME ANY LIABILITY FOR ERRORS OF LINE AND/OR OF GRADE ON ANY STAKING WHICH HAS BEEN DISTURBED IN ANY WAY, NOR DOES THE ENGINEER ASSUME ANY LIABILITY FOR ERRORS OF LINE AND/OR GRADE ON ANY STAKING THAT HAS BEEN IN PLACE FOR A PERIOD OF TWENTY FOUR (24) HOURS OR MORE WITHOUT THE COMMENCEMENT OF THE CONSTRUCTION FOR WHICH IT WAS SET
6. CONSTRUCTION LOADS - DURING CONSTRUCTION OPERATIONS, HEAVY EQUIPMENT MAY CROSS EXISTING OR PROPOSED PIPE. IF THIS IS THE CASE, AN EARTH FILL SHOULD BE CONSTRUCTED TO AT LEAST 3' ABOVE PIPE. THE FILL SHOULD BE SUFFICIENT TO PREVENT THE LATERAL DISPLACEMENT OF THE PIPE
7. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER
8. ANY QUESTIONS RELATIVE TO THE ACCURACY OF IMPROVEMENT INSTALLATION SHALL NOT BE RAISED SUBSEQUENT TO COMPLETION OF THE WORK UNLESS ALL SURVEY STAKES ARE MAINTAINED INTACT. SHOULD SUCH STAKES NOT BE PRESENT AND VERIFIED AS TO THEIR ORIGIN, NO CLAIM FOR ADDITIONAL COMPENSATION FOR CORRECTION SHALL BE PRESENTED TO ANY PARTY AND SUCH WORK SHALL BE CORRECTED BY THE CONTRACTOR AT HIS EXPENSE
9. NOTIFY STREET TRANSPORTATION AT (602) 262 6456 UPON COMPLETION OF BARRICADE

ADDRESS:

INTERSECTION OF 17TH STREET & CIELO GRANDE AVENUE

M.A.G. STANDARD DETAIL

120-1	SURVEY MARKER
120-2	SURVEY MARKER
200	BACKFILL, PAVEMENT AND SURFACE REPLACEMENT
201	PAVEMENT SECTION AT TERMINATION
202	ALLEY DETAILS (PAVED AND UNPAVED)
203	SCUPPER
204	EQUIPMENT CROSSING
205	PAVED TURNOUTS
220	CURB AND GUTTER TYPES A,B,C, & D
221	CURB AND GUTTER (TRANSITION, INTERGRAL AND WARNING BEACON)
222	SINGLE CURB TYPES A,B & TERMINATION
240	VALLEY GUTTER
250	DRIVEWAY
251	RETURN TYPE DRIVEWAYS
252	PARKING BAYS
260	ALLEY ENTRANCE (WITH COMBINED CURB AND GUTTER)
261	ALLEY ENTRANCE (WITH ROLL TYPE CURB AND GUTTER)
262	WING TYPE ALLEY ENTRANCE (WITH COMBINED CURB AND GUTTER)
263	WING TYPE ALLEY ENTRANCE (WITH ROLL TYPE CURB AND GUTTER)
422	SEWER MANHOLE FRAME & COVER ADJUSTMENT

PHOENIX SUPPLEMENTAL STANDARD DETAILS:

P1022	TEMPORARY TURN AROUND EASEMENT
P1023	STREET SIGN BASE, OBJECT MARKER & DELINEATOR
P1106	BARRICADES
P1230	SIDEWALKS
P1233	SIDEWALK RAMP DETAIL TYPE A
P1234	SIDEWALK RAMP DETAIL TYPE B
P1235	SIDEWALK RAMP DETAIL TYPE C
P1236	SIDEWALK RAMP DETAIL TYPE D
P1255	DRIVEWAY ENTRANCES
P1270	FRAME AND COVER GRADE ADJUSTMENT

NOTE:

PRESERVATIVE SEAL	MAG SEC 334
A.C. PAVEMENT	MAG SEC 321
A.B.C.	MAG SEC 310

ESTIMATED QUANTITIES:

THE QUANTITIES LISTED BELOW ARE APPROXIMATE. THE CONTRACTOR SHALL MAKE HIS OWN DETERMINATION OF THE QUANTITIES AND BASE HIS BID ON HIS OWN ESTIMATE. PAYMENT WILL BE MADE IN ACCORDANCE WITH THE CONTRACT FOR WORK ACTUALLY COMPLETED

ITEM	QUANTITIES	UNIT
REMOVALS		
SAWCUT & REMOVE A.C. PAVEMENT	8	S.Y.
SAWCUT & REMOVE SIDEWALK	0	S.F.
BARRICADE REMOVAL	35	L.F.
A.C. PAVEMENT		
2" AC / 6" ABC	3594	S.Y.
3" AC / 8" ABC	2312	S.Y.
THICKENED EDGE	75	L.F.
AC SIDEWALK RAMP	1	EA
CONCRETE		
6" VERTICAL CURB & GUTTER	3324	L.F.
VALLEY GUTTER & APRON	317	S.F.
CONCRETE SIDEWALK	21833	SF
SIDEWALK RAMP ON CORNER P1241	4	EA
SIDEWALK RAMP P1235-1	0	EA
DRIVEWAY RAMP P1244	0	EA
DRIVEWAY P1255	42	EA
MISCELLANEOUS		
SURVEY MONUMENT	13	EA
ADJUST MANHOLE	9	EA
ADJUST WATERVALVE / CLEANOUT	8	EA
BARRICADE	78	L.F.
STREET SIGN BASE	2	EA
FIRE HYDRANT MARKER	4	EA
STORM DRAIN		
4 BARREL BOX CULVERT W/WINGS	80	L.F.
8 BARREL SCUPPER	1	EA

SHEET INDEX

SHEET 1 .... COVER SHEET
SHEET 2 .... KEY MAP & DETAILS
SHEET 3 .... CIELO GRANDE AVENUE
.... 17TH STREET
SHEET 4 .... CIELO GRANDE AVENUE

DEVELOPER:

COURTLAND HOMES
5333 NORTH 7TH STREET
SUITE 305
PHOENIX, AZ 85014
PHONE: (602) 265-9467
FAX: (602) 974-9488

BENCHMARK:

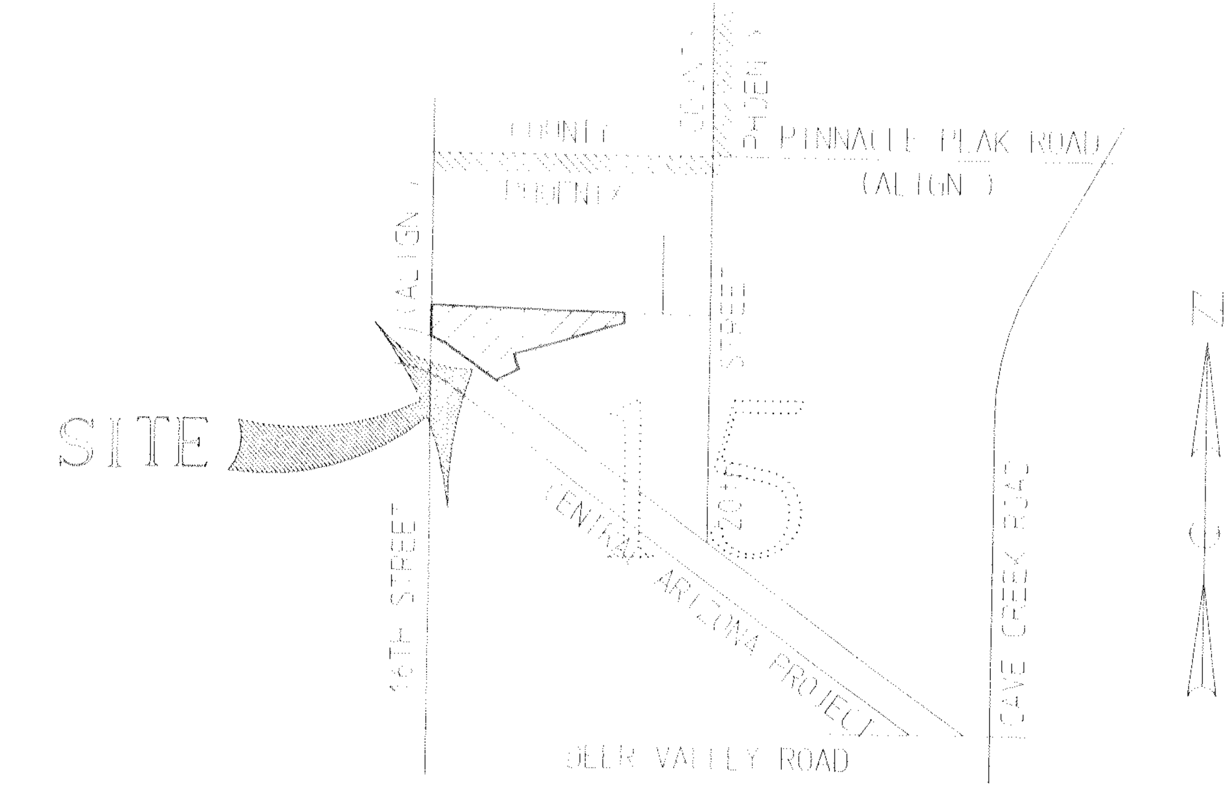
B.C. FLUSH AT INTERSECTION OF CAVE CREEK ROAD AND DEER VALLEY ROAD WEST. ELEVATION 1536.85 CITY OF PHOENIX DATUM

LEGEND:

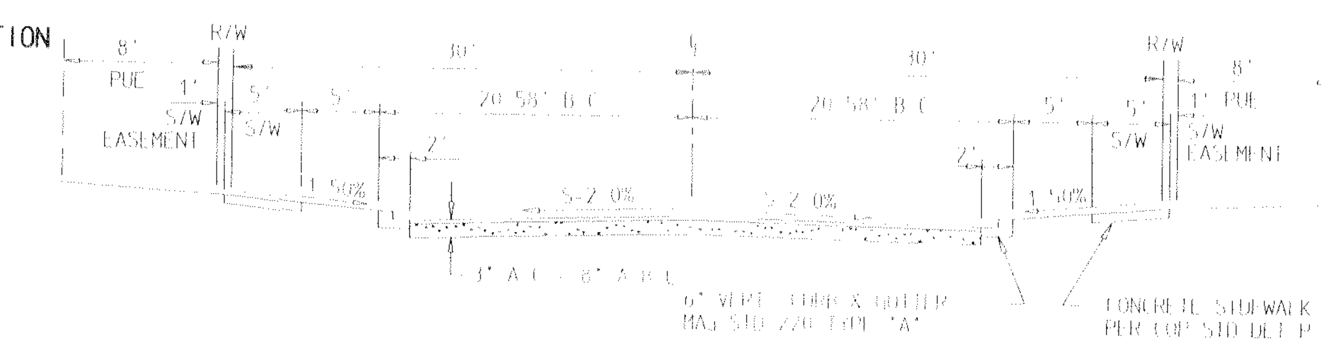
- INSTALL SURVEY MONUMENT MAG STD DET 120-1 TYPE 'B'
- S — ADJUST MANHOLE TO GRADE MAG STD DET 422
- S — ADJUST CLEANOUT TO GRADE C.O.P. STD DET 1270
- W — ADJUST VALVE BOX & COVER TO GRADE C.O.P. STD DET 1391-1-'A'
- INSTALL STREET SIGN BASE PER C.O.P. STD DET P1023
- FIRE HYDRANT MARKER

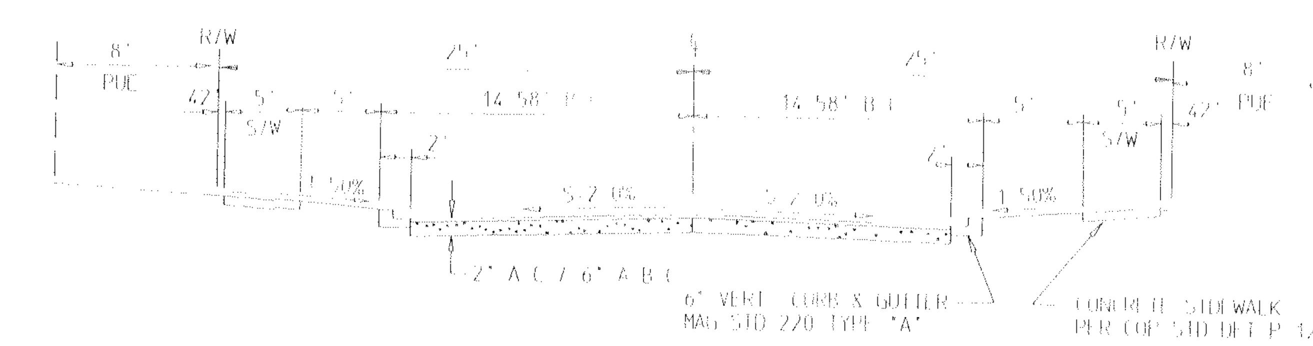
FLVG	- FLOWLINE OF VALLEY GUTTER
GB	- GRADE BREAK
CI	- CENTER OF INTERSECTION
EPT	- END PAVEMENT TRANSITION
COC	- CENTER OF CUL-DE-SAC
PRC	- POINT OF REVERSE CURVATURE
BCR	- BEGIN CURB RETURN
ECR	- END CURB RETURN
EC	- END CURVATURE
BC	- BEGIN CURVATURE
PCC	- POINT OF COMPOUND CURVATURE
FM	- FORCE MAIN

(A) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-1 W/ 5' WINGS
(B) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-2 W/ 5' WINGS
(C) CONSTRUCT 5' CURB & GUTTER TRANSITION PER M.A.G. STD DET 221



VICINITY MAP


17TH STREET


LOCAL STREETS

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

TDO 1 8-18-03
TDO 1 8-18-03
TDO 1 8-18-03

CESAR PEREZ, P.E.
REGISTERED ENGINEER/LAND SURVEYOR
SAGE ENGINEERING CORPORATION
3414 S 48th STREET - SUITE 8
PHOENIX, AZ 85040

38798
REGISTRATION NUMBER

38798 CESAR PEREZ 9/10/04

"AS BUILT" 09-07-04 JCC

263-1100

sage engineering corporation

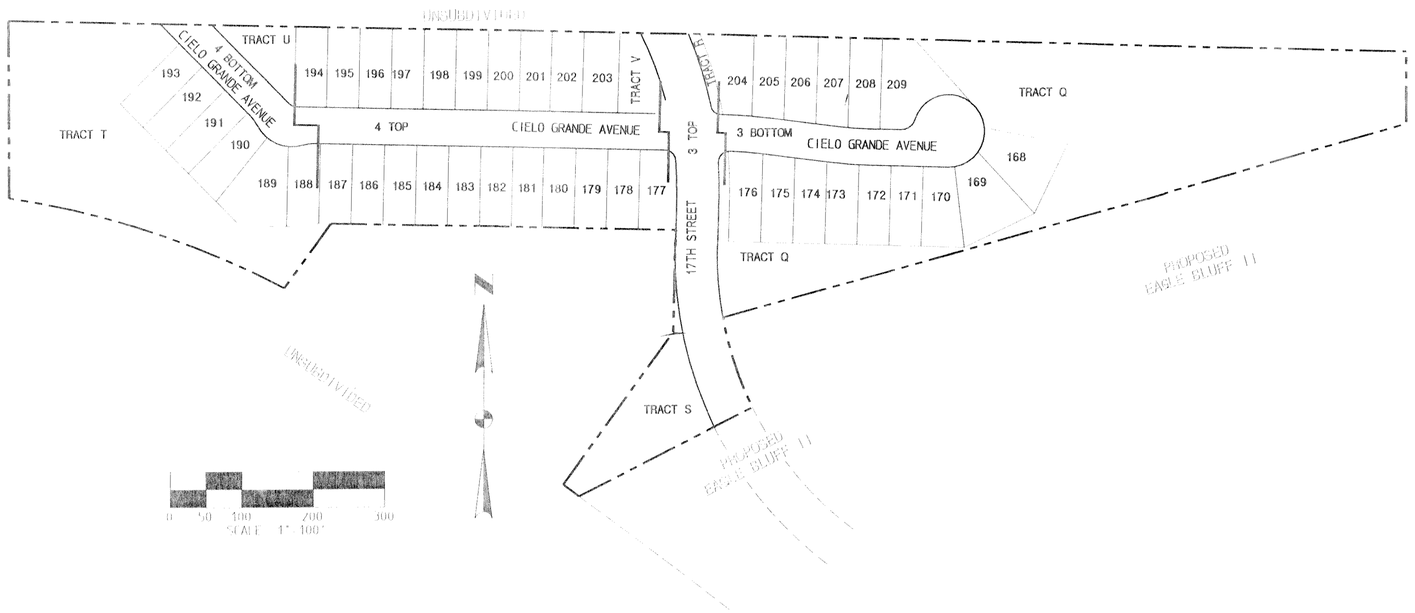
EAGLE BLUFF III --- PAVING PLAN

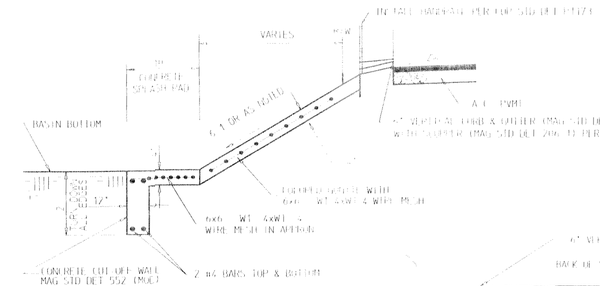
JOB NO. 1324002 JULY 2003

KIVA# 02-2138, SDEV# 0200982, CSPR# 0202798 QS 44-31

HORZ N/A
VERT N/A
DATE JULY 2003
JOB NO 1324002
AGENCY NO
SHEET NO 1 OF 4

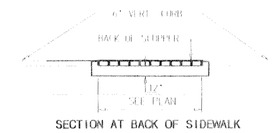
SHEET 1 OF 4



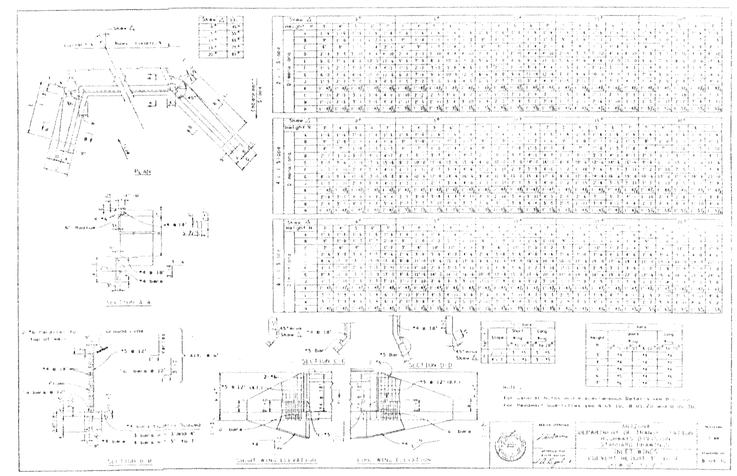


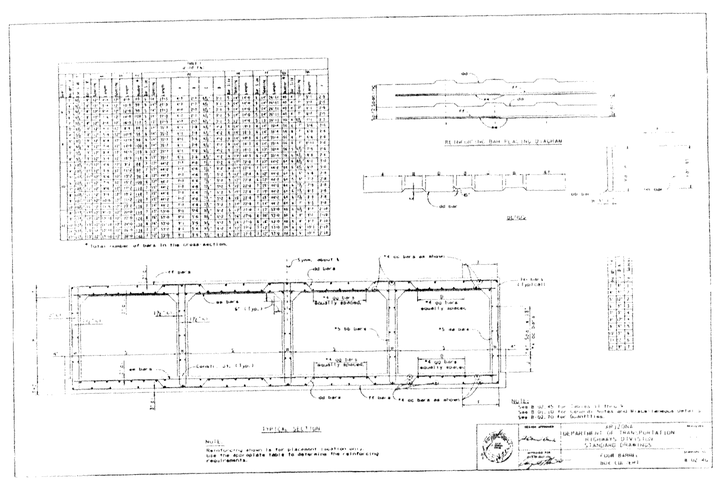
GUNITE SPILLWAY DETAIL

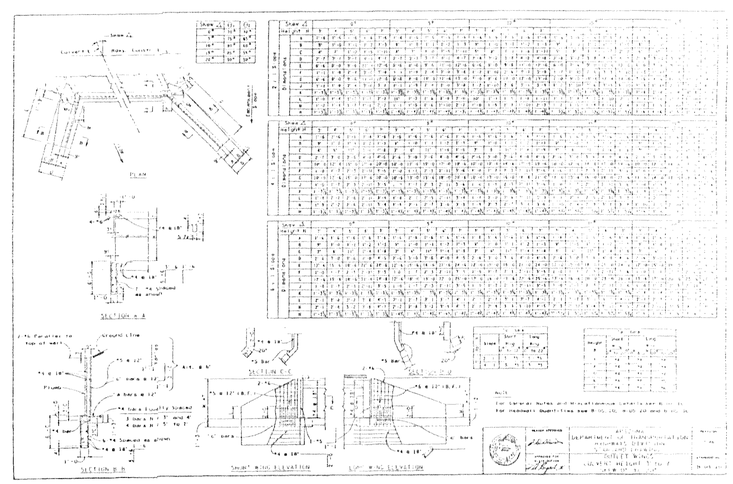
PER MAG STD SPECIFICATION SECTION 725



SECTION AT BACK OF SIDEWALK







SHEET 2 OF 4

263-1100

sage engineering corporation

EAGLE BLUFF III --- PAVING PLAN

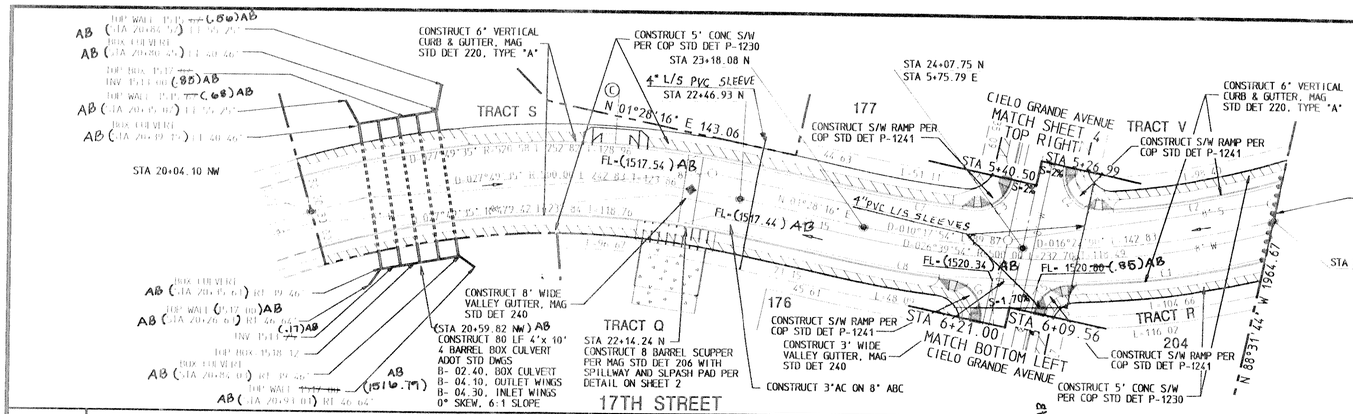
JULY 2003

JOB NO. 1324002

HORZ 1" = 100'
VERT
DATE JULY 2003
JOB NO 1324002
AGENCY NO
SHEET NO 2 OF 4

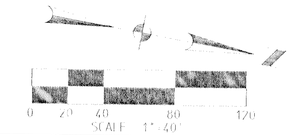
KIVA# 02-2138, SDEV# 0200982, CSPR# 0202798 OS 44-31

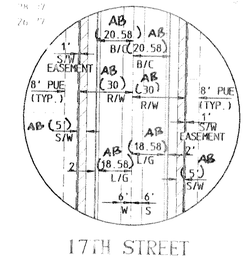
"AS BUILT" 01-07-04 JCC



BACK OF CURB - CENTER DATA TABLE

CURVE NO	RADIUS	DELTA	LENGTH	TANGENT
1	520.58	012°19'29"	111.95	56.21
2	479.42	012°20'45"	103.36	51.85
3	19.42	081°05'05"	28.16	17.21
4	19.42	105°13'02"	35.73	25.57
5	19.42	076°47'10"	26.03	15.19
6	19.42	095°54'11"	32.50	21.51
7	479.42	006°54'55"	57.86	28.97
8	520.58	005°53'13"	53.49	26.77

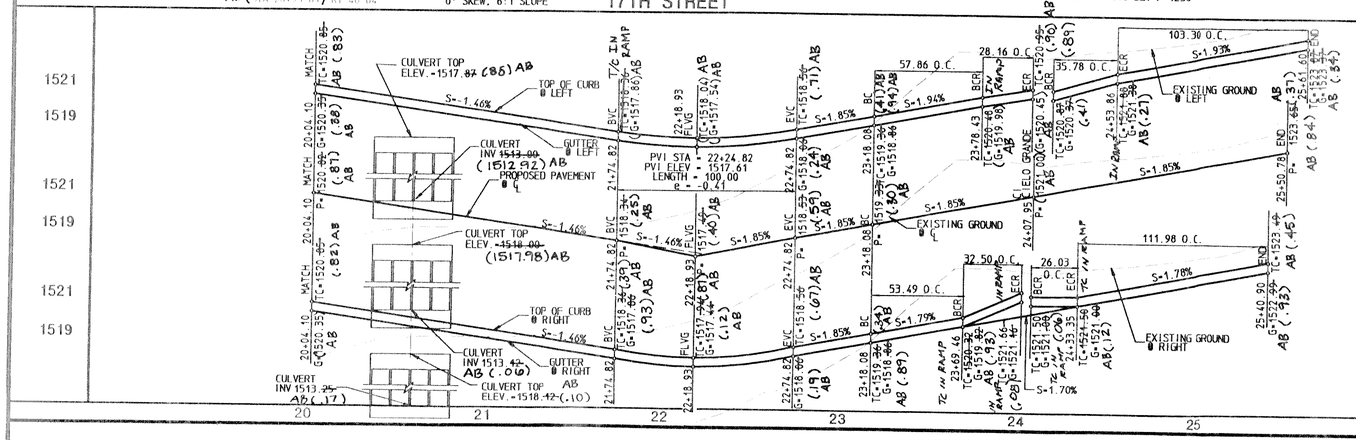




LEGEND:

- INSTALL SURVEY MONUMENT MAG STD DET 120-1 TYPE "B"
- S — ADJUST MANHOLE TO GRADE MAG STD DET 422
- S — ADJUST CLEANOUT TO GRADE C.O.P. STD DET 1270
- W — ADJUST VALVE BOX & COVER TO GRADE C.O.P. STD DET 1391-1-"A"
- INSTALL STREET SIGN BASE PER C.O.P. STD DET P1023
- FIRE HYDRANT MARKER
- DIRECTION OF DRAINAGE
- GRADE BREAK

FLVG	- FLOWLINE OF VALLEY GUTTER
GB	- GRADE BREAK
CI	- CENTER OF INTERSECTION
EPT	- END PAVEMENT TRANSITION
COC	- CENTER OF CUL-DE-SAC
PRC	- POINT OF REVERSE CURVATURE
BCR	- BEGIN CURB RETURN
ECR	- END CURB RETURN
EC	- END CURVATURE
BC	- BEGIN CURVATURE
PCC	- POINT OF COMPOUND CURVATURE
FM	- FORCE MAIN



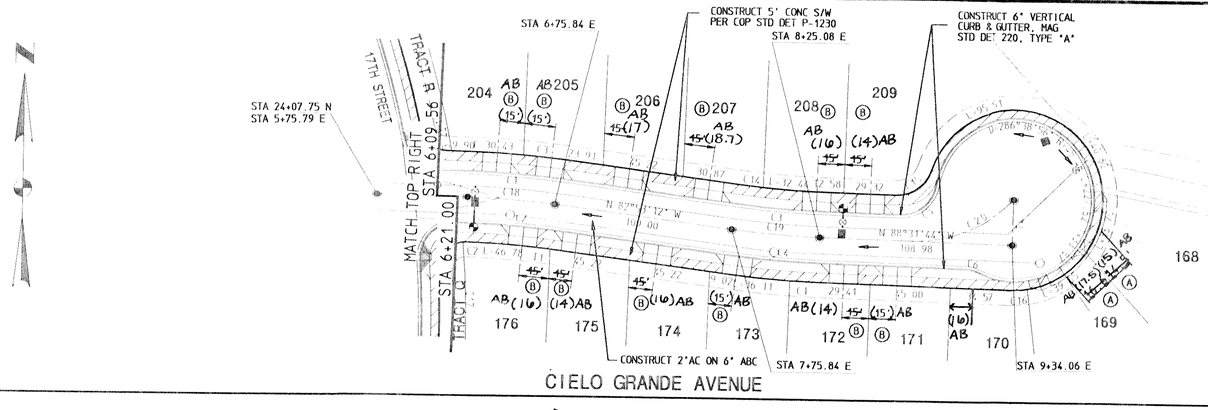
** NOTE **

DUE TO TERAIN CONSTRAINTS, THE RETURN RAMPS ON THE SOUTHEAST CORNER OF THE INTERSECTION OF 17TH STREET & CIELO GRANDE ARE NOT ADA COMPLIENT.

(A) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-1 W/ 5' WINGS

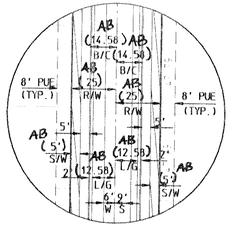
(B) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-2 W/ 5' WINGS

(C) STA 21+74.82 N CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-1 FOR ARCHEOLOGICAL SITE

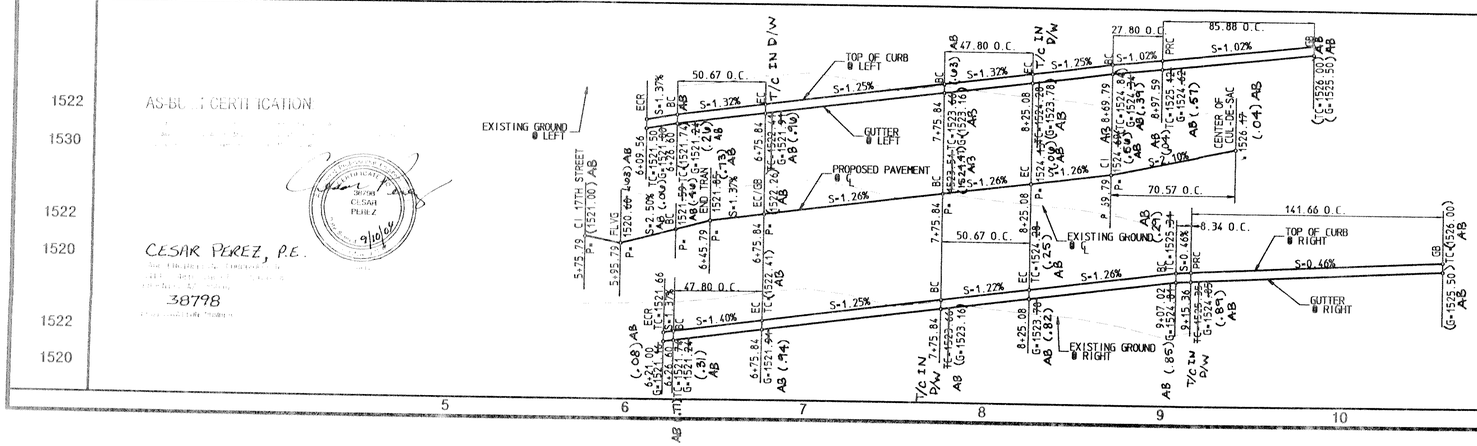


BACK OF CURB - CENTER DATA TABLE

CURVE NO	RADIUS	DELTA	LENGTH	TANGENT
1	514.58	005°38'32"	50.67	25.36
2	485.42	005°38'32"	47.80	23.92
3	485.42	005°38'32"	47.80	23.92
4	514.58	005°38'32"	50.67	25.36
5	19.42	082°01'44"	27.80	16.89
6	19.42	024°37'12"	8.34	4.24
18	500.00	005°38'32"	49.23	24.64
19	500.00	005°38'32"	49.23	24.64
20	82.39	042°23'33"	71.15	37.96



TYP. LOCAL STREET SECTION



"AS BUILT" 09-07-04 JCC

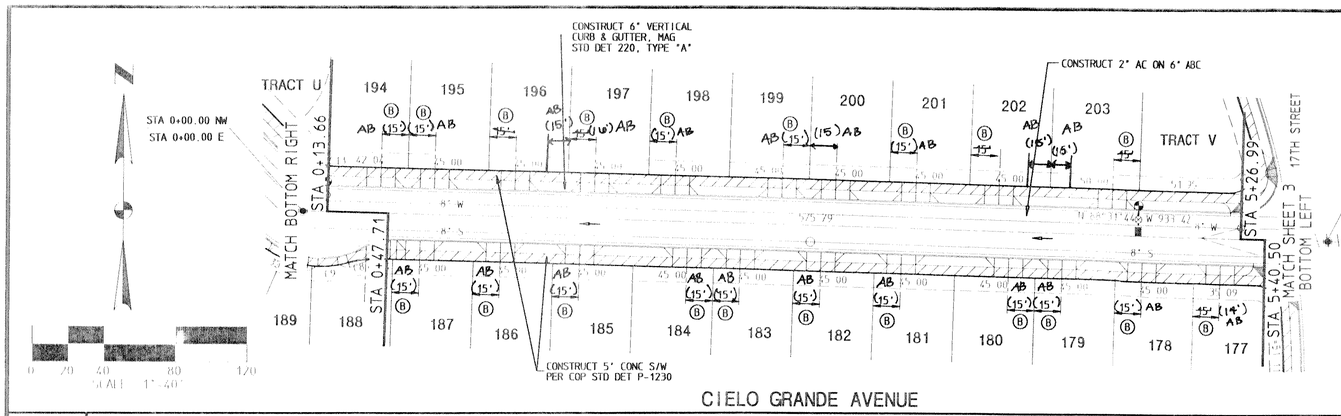
EAGLE BLUFF III --- PAVING PLAN

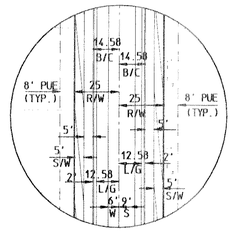
JULY 2003

JOB NO. 1324002

KIVA# 02-2138, SDEV# 0200982, CSPR# 0200798 QS.44-31

HORZ 1" = 40'
VERT 1" = 4'
DATE JULY 2003
JOB NO 1324002
AGENCY NO
SHEET NO 3 OF 4





TYP. LOCAL STREET SECTION

(A) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-1 W/ 5' WINGS

(B) CONSTRUCT 16' DRIVEWAY PER C.O.P. STD DET 1255-2 W/ 5' WINGS

(C) CONSTRUCT 5' CURB & GUTTER TRANSITION PER M.A.G. STD DET 221

LEGEND:

- INSTALL SURVEY MONUMENT MAG STD DET 120-1 TYPE "B"
- S ADJUST MANHOLE TO GRADE MAG STD DET 422
- S ADJUST CLEANOUT TO GRADE C.O.P. STD DET 1270
- W ADJUST VALVE BOX & COVER TO GRADE C.O.P. STD DET 1391-1-"A"
- INSTALL STREET SIGN BASE PER C.O.P. STD DET P1023
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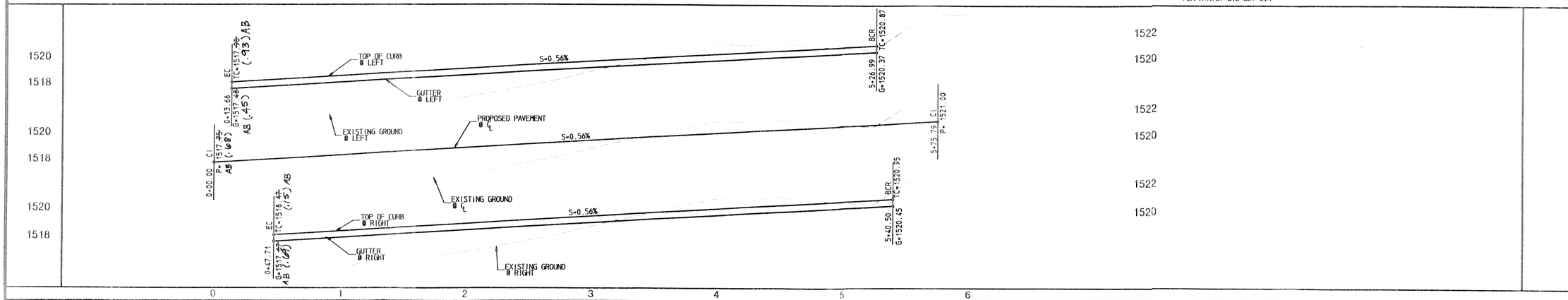
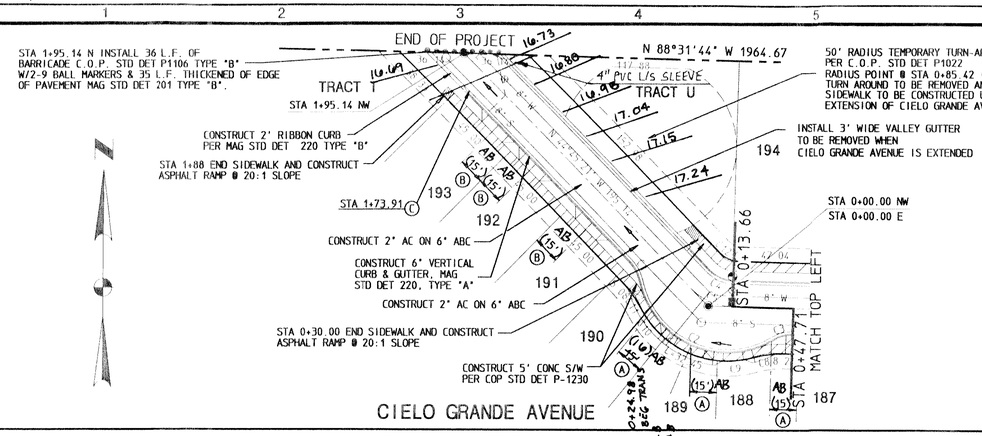
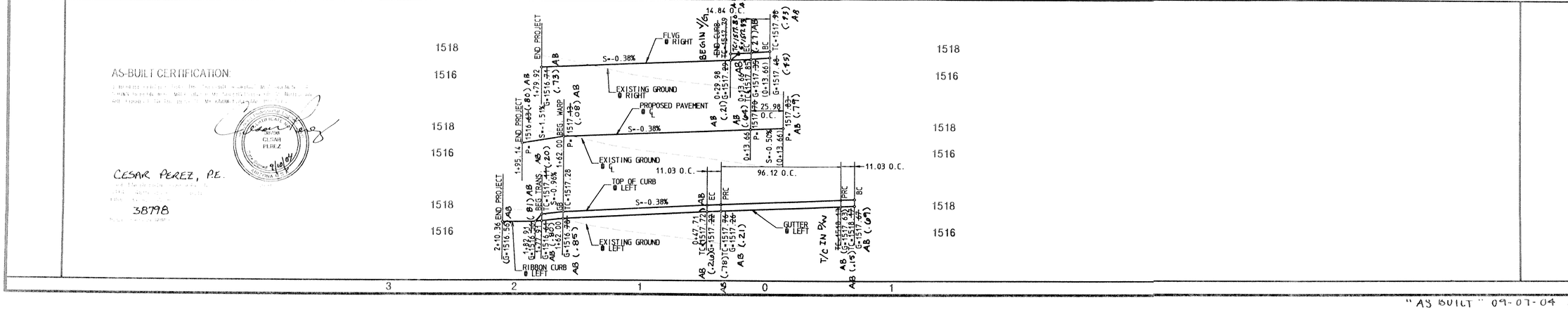




BACK OF CURB - CENTERLINE DATA TABLE

C NO	RADIUS	DELTA	LENGTH	TANGENT
1	19.42	032°33'25"	11.03	5.67
2	50.58	108°53'33"	96.12	70.76
3	19.42	032°33'25"	11.03	5.67
4	19.42	043°46'23"	14.84	7.80
5	34.00	043°46'23"	25.98	13.66



AS-BUILT CERTIFICATION:

CESAR PEREZ, P.E.

38798

"AS BUILT" 09-07-04 JCC

SHEET 4 OF 4

PROJECT NUMBER 283-1100

age engineering corporation

EAGLE BLUFF III --- PAVING PLAN

JULY 2003

JOB NO. 1324002

KIVA# 02-2138, SDEV# 0200982, QS.44-31, PLAT#

HORZ 1" = 40'
VERT 1" = 4'
DATE JULY 2003
JOB NO 1324002
AGENCY NO
SHEET NO 4 OF 4

FLOOD PLAIN DELINEATION FOR EAGLE BLUFF II & III

EAGLE BLUFF III

EAGLE BLUFF II

EAGLE BLUFF II VICINITY MAP

LIMITS OF DETAILED STUDY

FLOOD PLAIN

FLOOD WAY

CULVERT

TRACT

17TH STREET

PARKSIDE LANE

PATRICK LANE

19TH STREET

19TH WAY

DALEY LANE

CASHMAN RD

MOUNTAIN COURT

BOOK 504 PAGE 6

EASEMENT

(RETENTION AREA) 50' ELECTRIC

RETENTION 100YR-2HR

UNSUBDIVIDED

MOUNTAINGATE II BOOK 400 PAGE 17

MOUNTAINGATE BOOK 400 PAGE 18 R.-6

TRACT F

TRACT D

SCALE 1" = 100'

FEMA CASE # 04-09-0882R

SHEET 1 OF 1

WORK MAP

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(480)279-6727

PREPARED BY

Sage engineering corporation
5333 N. 7th St. Suite B
Phoenix, Arizona 85014
(480)966-9973

APPENDIX E
Sleeve
(Disk)

HEC-1 Files (Hydrology)
HEC-RAS Files (Hydraulics)