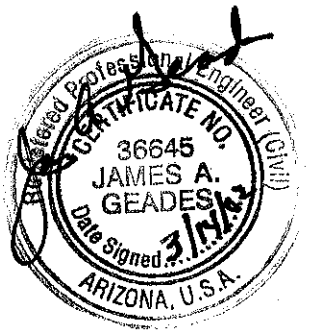
FLOODPLAIN DELINEATION for "Eagle Bluff II"

March 14, 2002
SEC Job No. 1298901
FEMA Case #_____



Prepared for:
Courtland Homes
5333 North 7th Street, Suite 305
Phoenix, AZ 85014
602-265-9467

Prepared by:
Sage Engineering Corporation
3414 South 48th Street, Suite 8
Phoenix, AZ 85040
480-966-9971

City of Phoenix

STREET TRANSPORTATION DEPARTMENT

March 19, 2002

FEMA
LOMA Depot
3602 Eisenhower Avenue, #600
Alexandria, Va. 22304-6425

Gentlemen:

RE: CLOMR FOR EAGLE BLUFF II, West OF 20th St. And South of Pinnacle Peak Rd
Phoenix, Arizona, Panel 04013C1220H

Enclosed are the following items for this CLOMR application:

1- Check for $3100.
2- Revision Requester and Community Official
3- Hydrologic Analysis
4- Riverine Hydraulic Analysis
5- Riverine / Coastal Mapping
6- Earth fill Placement
7- Copy of FIRM 1210G, and 1220H
8- Hydraulics
9- Erosion and Sediment Transport
10- Various Exhibits

If you have any technical questions concerning this project please contact Mr. James Geades, P. E., Sage Engineering Corporation, 3414 S. 48th Street, Suite 8, Phoenix, Arizona 85040, phone 602-480-966-9971. Any other questions please contact this office at 602-262-4960.

Sincerely,

Hasan Mushtaq, Ph. D., P.E., C.F.M.
Floodplain Manager

HM/DW/aff/eagle bluff.doc

Attachments

c: Mr. Geades, Sage Engineering

Table Of Contents

1.0 Introduction

1.1 Purpose of Study

This Flood Delineation Study revises and updates information on the existence and severity of flood hazards by using detailed methods for the areas upstream of the Central Arizona Project Canal in northwest Phoenix; Maricopa County, Arizona. The floodplains along the CAP were previously studied by approximate methods. Since the time of the original study, the methodology for hydrologic modeling has been revised and new topographic mapping has been developed. This re-study includes new hydrologic modeling of the watershed, as well as hydraulic modeling upstream of the CAP.

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.

Current FIRM indicates a training dike on the north side of the canal, extending in a northeasterly direction. It appears from the FIRM that this training dike is impounding water. However the training dike was never built and water is freely conveyed through this site by a channel. A field survey revealed no sign of a training dike ever being constructed built. As areas were developed assumptions were made as to the base flood elevation, and then homes were built above this assumed, yet approved elevation. This study will delineate and determine BFE's for the Zone A west of Cave Creek Road and adjacent to Eagle Bluff II. The study is based on HEC-1 hydrology and HEC-RAS Hydraulics.

Exhibit 1(Appendix D) details the results of a study done in 1998 by CMX Group Inc. The study supports the same premises stated in this report. It also shows that BFE's were established as 1526.00 NVGD, the overflow elevation on Deer Valley Road.

1.2 Authority for Study

Sage Engineering, Inc. performed the hydrologic and hydraulic analyses for this study, for Courtland Homes under contract #1298901. The project manager for the Eagle Bluff Floodplain Delineation Study is Jim Geades. This study was completed in February 2002 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.

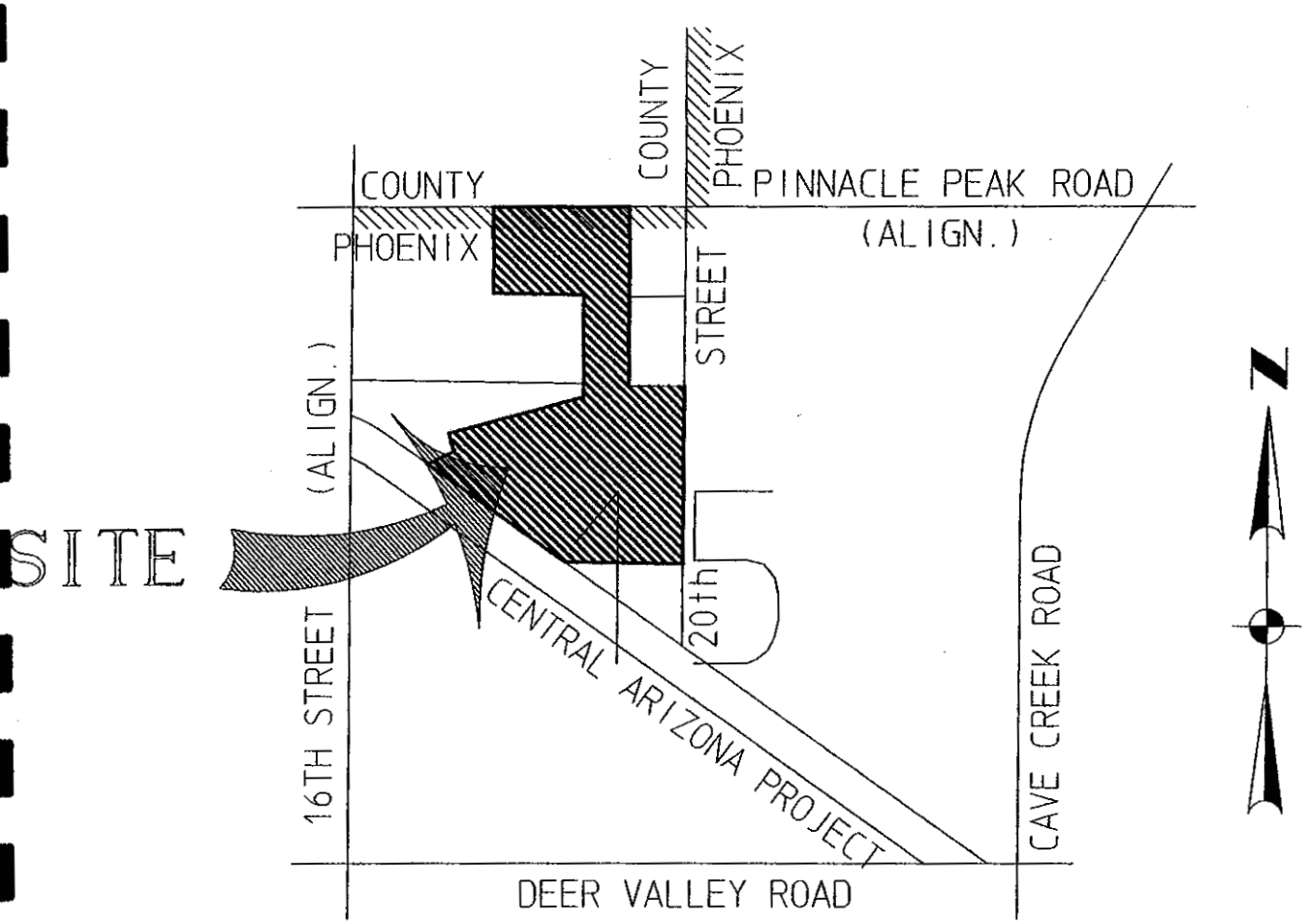
1.3 Location of Study

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 a 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 the aerial topography with a digital terrain model developed using Geopak.



EAGLE BLUFF II
VICINITY MAP

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

N.T.S.

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 James A. Geades, P. E. 3414 South 48th street suite 8 Phoenix, AZ 85040 (480)966-9971/(480)929-9901 sage@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 Manager, City of Phoenix (602)262-4960
2.1.7	Reach Description	Tributary To Cave Creek Portions of FIRM # 04013C1210G (revised July 19, 2001) 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 July 19, 2001) And FIRM #04013C1220G (Revised July 19, 2001)

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☒ 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, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☐ Other Describe:

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☒ Physical Change ☒ Improved Methodology/Data ☒ Floodway Revision

☐ Other Describe:

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Tributary to Cave Creek

3. Project Name/Identifier: Eagle Bluff II

4. FEMA zone designations affected: A, X, AE
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. 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	Katy, City	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040051	Phoenix, City of	AZ	04013C	1210G	07/19/01
040037	Maricopa County, Unincorperated Areas	AZ	04013C	1210G	07/19/01

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☒ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____ (Name) flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☐ **No** ☒ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $3100.00

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt.
☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

***Note:* I understand that my signature indicates that all information submitted in support of this request is correct**

John Wittrock

Signature of Revision Requester

John Wittrock
Printed Name and Title of Revision Requester

Courtland Homes, Phoenix, AZ
Company Name

Telephone No.: 602-265-9467 Date: 3/14/02

***Note:* Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

Signature of Community Official

Hasan Mushtaq, Floodplain Manager
Printed Name and Title of Community Official

Phoenix, City of
Community Name

Telephone No.: 602-262-4960 Date:

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

James A. Geades

Signature

James A. Geades
Printed Name and Title of Revision Requester

Registr No. 36645 Expires (Date) 09/30/04 State Arizona

Type of License/Expertise: Civil

Registered Professional Engineer (Civil) CERTIFICATE NO. 36645 JAMES A. GEADES Date Signed 3/14/02 ARIZONA U.S.A.

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☒ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Phoenix, City of

Flooding Source: Tributary to Cave Creek

Project Name/Identifier: Eagle Bluff II

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☐ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☒ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☐ Yes ☐ No **Diskettes provided:** ☐ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☒ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☒ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
N/A			

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☐ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ATTACHMENT A: STATISTICAL ANALYSIS OF GAGE RECORDS

Gaging Station:

Gage Location (latitude and longitude):

		FIS:		Revised:	
1.	Number of years of data				
	Systematic				
	Historical				
2.	Homogeneous data	☐ Yes	☐ No	☐ Yes	☐ No
3.	Data adjustments	☐ Yes	☐ No	☐ Yes	☐ No
4.	Number of high outliers				
	Low outliers				
	Zero events				
5.	Generalized skew				
6.	Station skew				
7.	Adopted skew				
8.	Probability distribution used (justify if log-Pearson III was not used)				
9.	Transfer equations to ungaged sites			☐ Yes	☐ No
	If Yes, specify method				
10.	Expected probability*			☐ Yes	☐ No
11.	Comparison of results with other analyses			☐ Yes	☐ No
	If Yes, describe comparison				

N/A

12. **Attach analysis including plot of flood-frequency curve. Analysis Attached?** ☐ Yes ☐ No

*FEMA does not accept expected probability analyses for the purpose of reflecting flood hazard information in a FIS.

If any data are not available, indicate by N/A.

ATTACHMENT B: CONFIDENCE LIMITS EVALUATION

Stream:

Select one location for Confidence Limits Evaluation (*describe location*):

1. Discharges for selected location:

Exceedence Probability		FIS:	Revised:
10%	(10-year)	_____ cfs	_____ cfs
2%	(50-year)	_____ cfs	_____ cfs
1%	(100-year)	_____ cfs	_____ cfs
0.2%	(500-year)	_____ cfs	_____ cfs

2. 1% Annual Chance (Base) Flood Confidence Intervals

90% Confidence Interval:	5% limit	_____ cfs
	95% limit	_____ cfs
50% Confidence Interval:	25% limit	_____ cfs
	75% limit	_____ cfs

3. If the discharge of the base flood in the FIS is beyond the 50% confidence interval but within the 90% confidence interval, does the base flood elevation change by 1.0 foot or more? ☐ Yes ☐ No

An example of confidence limits analysis can be found in Appendix 9 of Bulletin 17B.

4. **Confidence Limits Analysis Attached?** ☐ Yes ☐ No

ATTACHMENT C: REGIONAL REGRESSION EQUATIONS

1. Bibliographical Reference:

(Attach a copy of title page, table of contents, and pertinent pages including equations.)

2. Gaged or ungaged stream:

3. Hydrologic region(s):
Attach backup map.

4. Provide parameters, values, and source of data used to define parameters.

N/A

		FIS:		Revised:	
5.	Urbanized conditions calculations	☐ Yes	☐ No	☐ Yes	☐ No
6.	Percent of watershed urbanization				
7.	Is the watershed controlled?	☐ Yes	☐ No	☐ Yes	☐ No
8.	Comparison with other analyses	☐ Yes	☐ No	☐ Yes	☐ No

If the answer to 5, 7, or 8 is Yes, explain methdology below. If data are not available, indicate with N/A.

Comments

9. **Attach computation and supporting maps, delineating the watershed boundary and drainage area divides.**

Computation and Supporting Maps provided? ☐ Yes ☐ No

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
1.	Method or model used:			HEC-1	
	Version:			Ver. 4.1	
	Date:			June 1998	
2.	Source of rainfall depth:			NOAA Atlas	
3.	Source of rainfall distribution:			Prefre Model	
4.	Rainfall duration:			100 year, 6 hour	
5.	Areal adjustment to precipitation (%):			N/A	
6.	Maximum overland flow length			1300	
7.	Hydrograph development method:			Kinematic Wave/Muskingin	
8.	Loss rate method:			SCS	
	Source of soils information:			Soils Study	
	Source of land use information:			Zoning maps/aerial photos	
9.	Channel routing method:				
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
11.	Baseflow considerations: **If Yes, explain below how baseflow was determined:**	☐ Yes	☒ No	☐ Yes	☒ No
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration: **If Yes, explain below how calibration was performed**	☐ Yes	☒ No	☐ Yes	☒ No
14.	Future land use condition: **If Yes, explain why below**	☐ Yes	☒ No	☐ Yes	☒ No

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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Note: Fill out one form for each flooding source studied

Community Name: Phoenix, City of

Flooding Source: Tributary to Cave Creek

Project Name/Identifier: Eagle Bluff II

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit:

Upstream Limit:

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name**
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name**
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name**
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☒ **Natural** **File Name** ebfis ☒ **Floodway** **File Name** ebfis(Eagle Bluff II FIS)
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☐ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

SEE NARRATIVE

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☒ SEE NARRATIVE

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End 0.093 within 0.2 (feet) *Cross-Section #* Upstream End _____ within N/A (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within N/A (feet) *Cross-Section #* Upstream End _____ within N/A (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within N/A (feet) *Cross-Section #* Upstream End _____ within N/A (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name	☒ Community Name	☒ Corporate Limits labeled	☒ Study limits labeled
☐ Confluences labeled	☒ Channel Stationing	☐ Streambed profiled	☒ Cross Sections labeled
☒ Horizontal/Vertical Scales indicated		☐ 100-year elevs profiled*	
☒ Road Crossings	☐ Labeled	☐ Low Chord Elevations	☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☒ **Yes** ☐ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Phoenix, City of

Flooding Source: Tributary to Cave Creek

Project Name/Identifier: Eagle Bluff II

This is a ☒ Manual ☐ Digital submission. *Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance as possible.*

1. MAPPING CHANGES

1. A topographic workmap must be submitted showing the following information (check N/A when not applicable):

a. Revised approximate 100-year floodplain boundaries (Zone A)	☒ Yes	☐ No	☐ N/A
b. Revised detailed 100- and 500-year floodplain boundaries.	☒ Yes	☐ No	☐ N/A
c. Revised floodway boundaries	☒ Yes	☐ No	☐ N/A
d. Location and alignment of all cross sections with stationing control indicated.	☒ Yes	☐ No	☐ N/A
e. Stream alignments, road alignments and dam alignments.	☒ Yes	☐ No	☐ N/A
f. Current community boundaries.	☒ Yes	☐ No	☐ N/A
g. Effective 100- year floodplain and floodway boundaries from FIRM/FBFM reduced or enlarged to the scale of the topographic workmap	☐ Yes	☐ No	☒ N/A
h. Tie-ins between the effective and revised 100-, 500-year and floodway boundaries	☒ Yes	☐ No	☐ N/A
i. The requester's property boundaries and community easements	☒ Yes	☐ No	☐ N/A
j. The signed certification of a registered professional engineer	☒ Yes	☐ No	☐ N/A
k. Location and description of reference marks	☒ Yes	☐ No	☐ N/A
l. Vertical datum (example: NGVD, NAVD)	☒ Yes	☐ No	☐ N/A
m. Coastal zone designations tie into adjacent areas not being revised	☐ Yes	☐ No	☒ N/A
n. Location and alignment of all coastal transects used to revise the coastal analyze	☐ Yes	☐ No	☒ N/A
o. V-zone has been delineated to extend landward to the heel of the primary frontal dune	☐ Yes	☐ No	☒ N/A

If any items are marked No or N/A please attach an explanation.

2. What is the source and date of the updated topographic information (example: orthophoto maps, July 1985; filed survey, May 1979, beach profile, June 1987 etc.)?

3. What is the scale and contour interval of the following workmaps?

Effective FIS	Scale 2000	Contour Interval N/A
Revision Request	Scale 100	Contour Interval 1 ft

NOTE: Revised topographic information must be of equal or greater detail than effective.

4. Attach an annotated FIRM/FBFM at the scale of the effective FIRM/FBFM showing the revised 100- and 500-year floodplain and the floodway boundaries and how they tie into those shown on the effective FIRM/FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies. **FIRM/FBFM attached?** ☒ **Yes** ☐ **No**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. EARTH FILL PLACEMENT

1. The fill is: ☐ Existing ☒ Proposed

2. Has fill been/will be placed in the regulatory floodway? ☐ Yes ☒ No
If Yes, please attach completed Riverine Hydraulic Analysis Form (Form 4).

3. Has fill been/will be placed in floodway fringe (*area between the floodway and 100-year floodplain boundaries*)? ☒ Yes ☐ No

If Yes, then complete A, B, C, and D below.

a. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? ☐ Yes ☒ No

If Yes, justify steeper slopes

b. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? (*Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.)*

☒ Yes ☐ No

If No, describe erosion protection provided

c. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with *the Standard Proctor Test Method or acceptable equivalent method?* ☒ Yes ☐ No

d. Can structures conceivably be constructed on the fill at any time in the future? ☒ Yes ☐ No

If Yes, attach certification of fill compaction (item 3c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer in accordance with Subparagraph 65.5(a)(6) of the NFIP regulations.

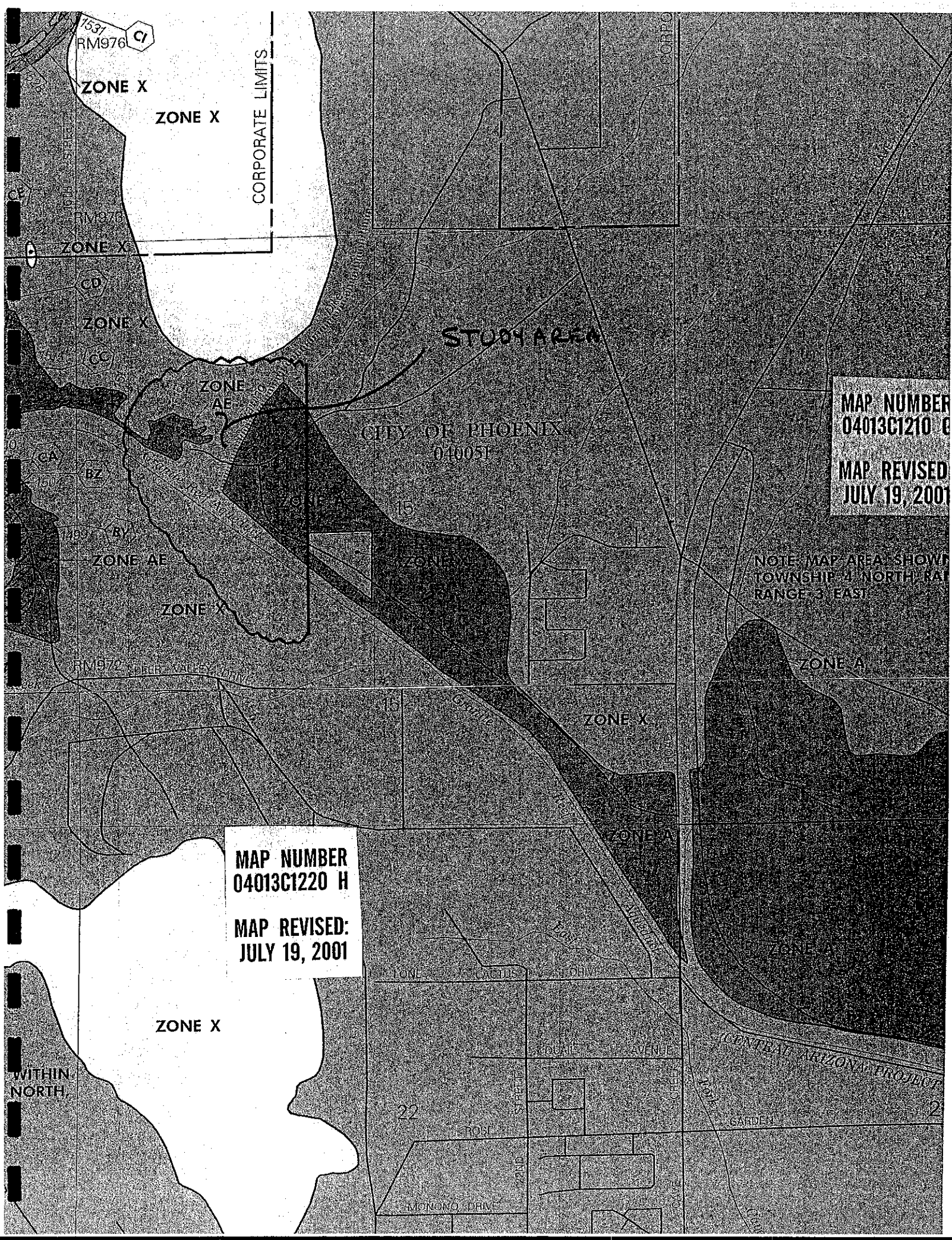
Fill certification attached ☐ **Yes** ☐ **No** PROPOSED, WILL PROVIDE UPON ACCEPTANCE OF CLOMR

4. Has fill been/will be placed in a V zone? ☐ Yes ☒ No

If Yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall?

☐ Yes ☐ No

If Yes, attach the Coastal Structures Form (Form 10).


ZONE X
ZONE X
CORPORATE LIMITS
ZONE X
ZONE X
ZONE AE
ZONE AE
ZONE X
ZONE AE
ZONE X
ZONE X
ZONE A
ZONE X
ZONE A
ZONE A
ZONE X
STUDY AREA
CITY OF PHOENIX
040051
MAP NUMBER
04013C1210 G
MAP REVISED
JULY 19, 2001
NOTE: MAP AREA SHOWN
TOWNSHIP 4 NORTH, RA
RANGE 3 EAST
MAP NUMBER
04013C1220 H
MAP REVISED:
JULY 19, 2001
WITHIN
NORTH
CENTRAL ARIZONA PROJECT
RM976
RM970
DEER VALLEY DRIVE
GRAND
CACTUS
DRIVE
AVENUE
ROSE
GARDEN
MONTANO DRIVE
15
10
22

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 to by Kenney Aerial Mapping Inc. at 1 "=200' scale and with 2-foot contours. This mapping was based on survey data provided by Sage Engineering, Inc. 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 Methodology

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 eight sub-basins (Sub-basins 1-9). 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.

4.4 Calibration-Comparison to other Drainage Reports

Exhibit 1(Appendix D) is an exhibit that agrees in concept with this 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-feet 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 o 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 are only no hydraulic structures that were identified within the floodplain delineation study limits.

5.5 Floodway Modeling

The floodway was determined using HEC-RAS Model, limiting the encroachment elevation to less than one foot.

5.6 Problems Encountered

None.

5.7 Final Results

5.7.1 Hydraulic Analysis Results.

The table presented in Appendix B summarizes the results of the hydraulic analyses, for the areas modeled in the HEC-RAS computer program.

5.7.2 Verification of Results.

No previous studies have been done to compare results.

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. 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 of Appendix A and on the work map in 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 (Appendix C).

7.4 Flood Profiles

The flood profiles are included in Appendix C.

Appendix A
Hydrologic Analysis
(HEC-1 Report)

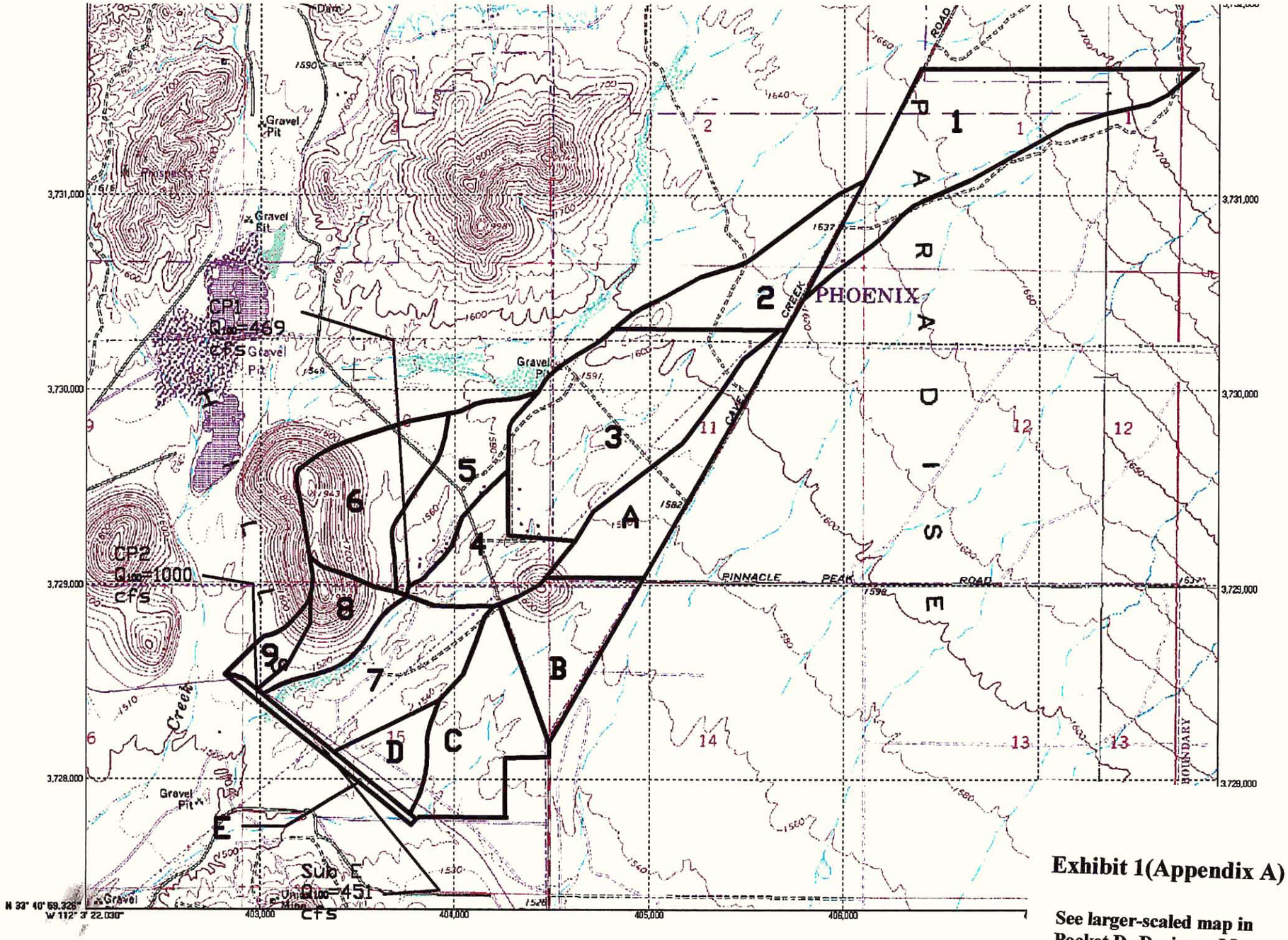


Exhibit 1(Appendix A)

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

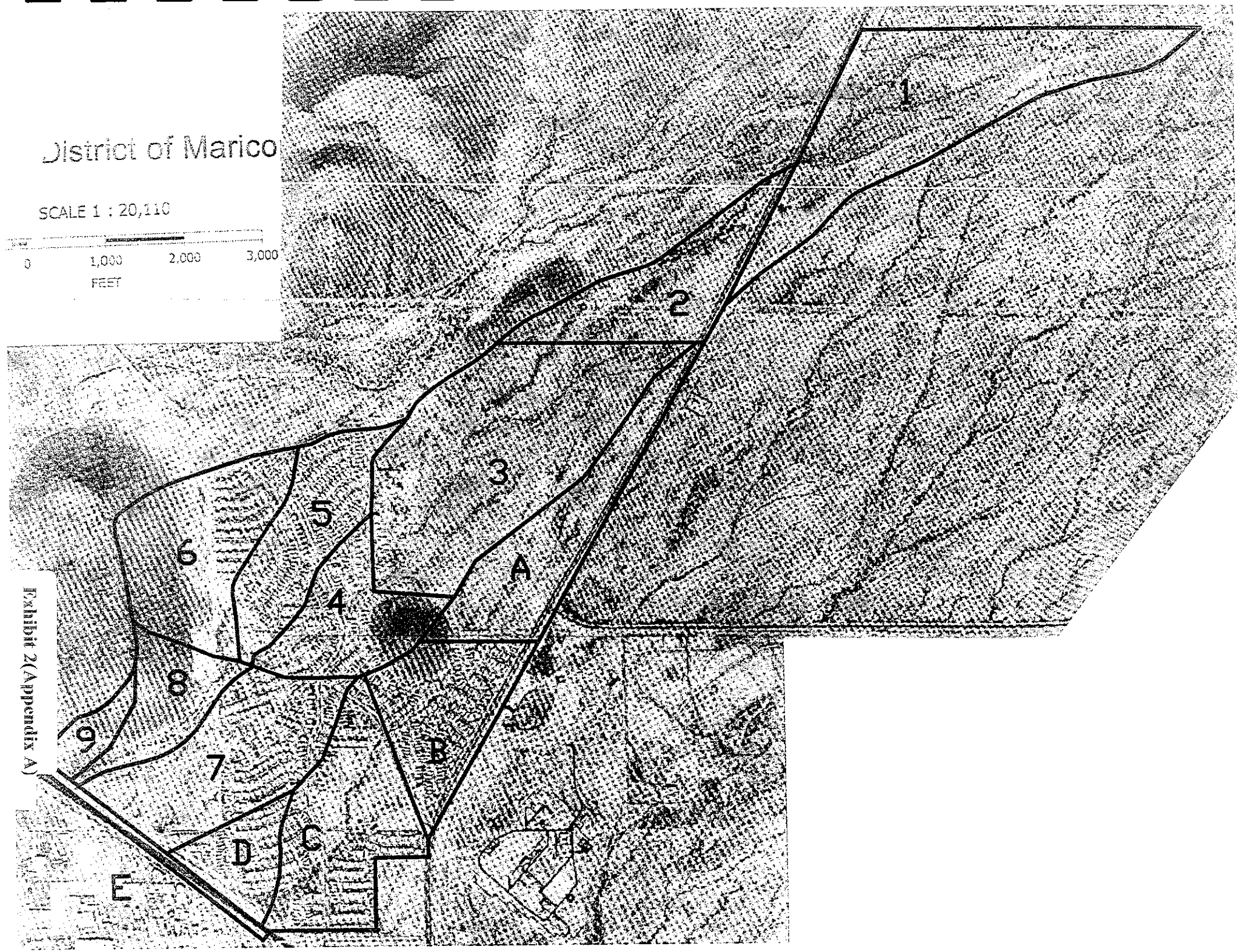


Exhibit 2(Appendix A)

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

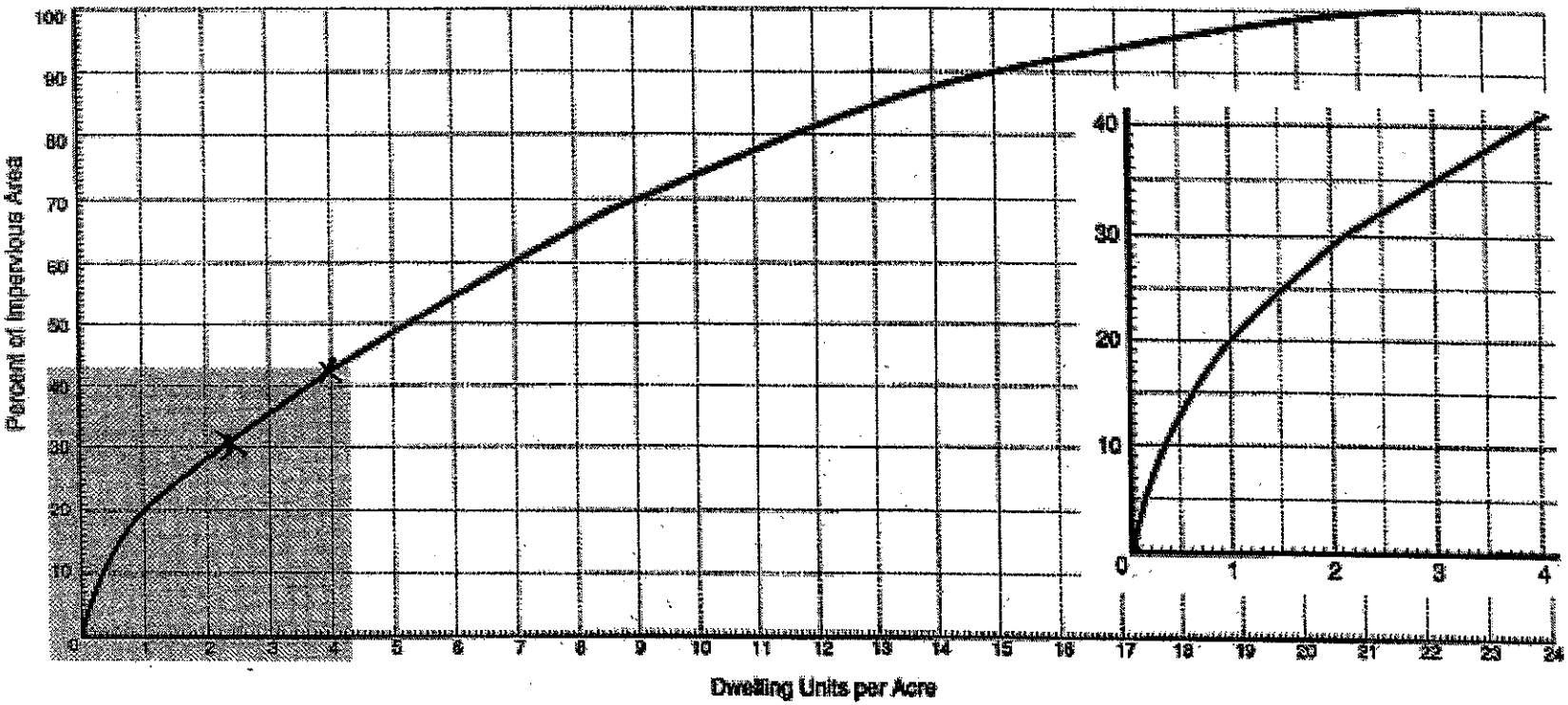


FIGURE 2.2-16

Percent of Impervious Area vs. Dwelling Density

Developed by Water Resources Associates, Inc. from data in Table 2.3a 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				
Industrial	85				
Townhouse, duplexes	65	Not Applicable in Scottsdale			
Multi-Family	85				
Residential districts by average lot size: (See Figure 2.2-1B)					
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]

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)Calcareous Sandy Loam Upland Clay Loam	B
113	Tremant, (Non)Calcareous 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
SUNAPEE
ROAD

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

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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
              *
```
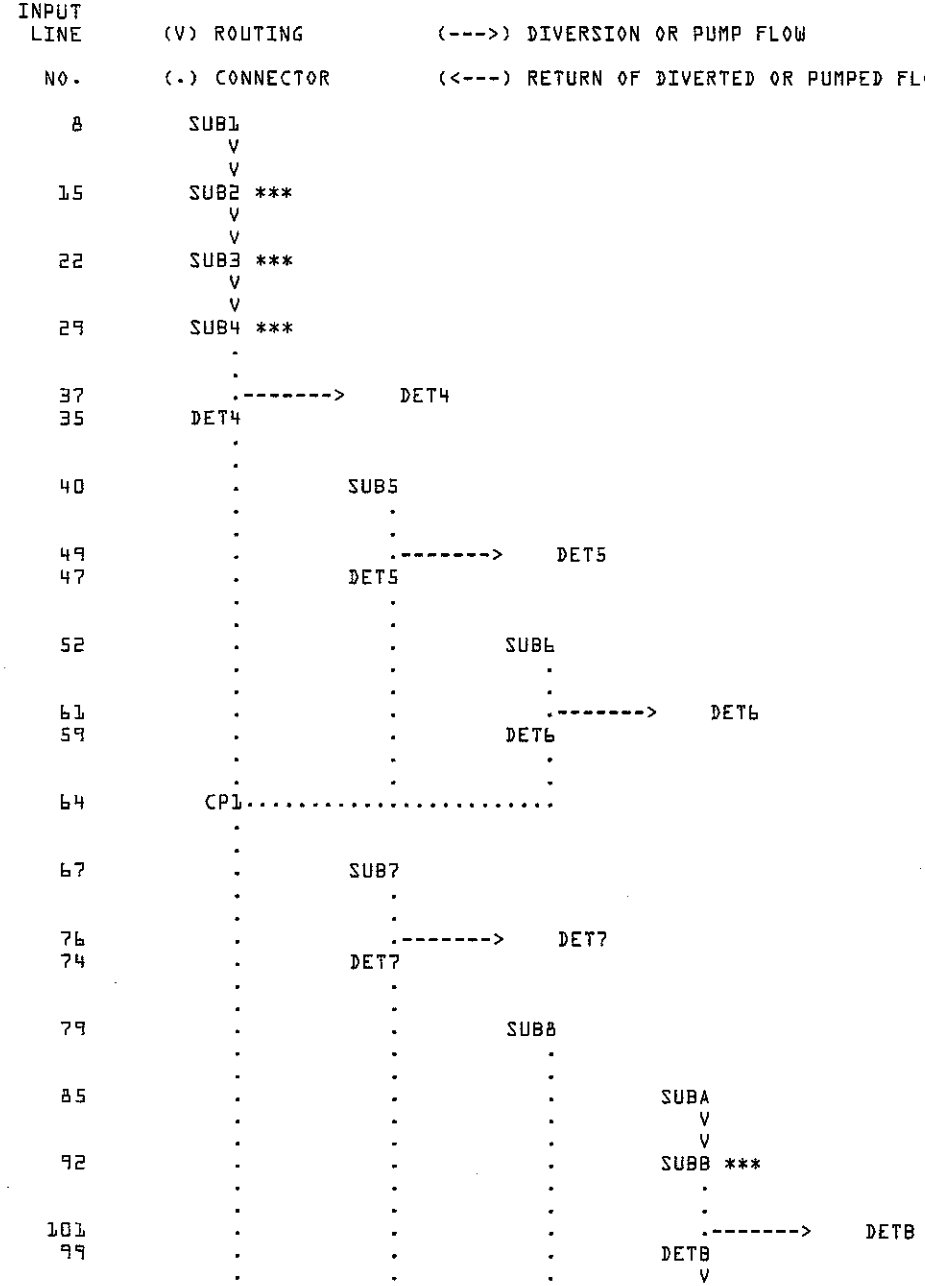

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  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    SUBB
  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    DETB
 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
              *
```

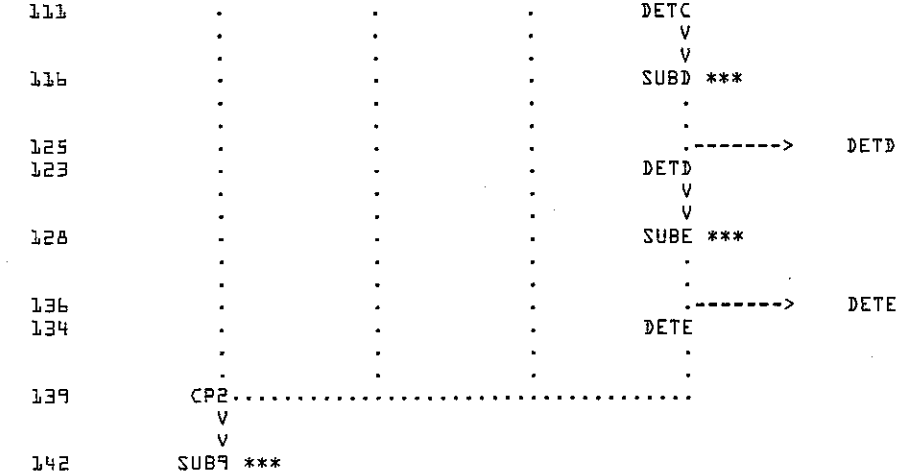
```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  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 NO.

(V) ROUTING (.) CONNECTOR (---->) DIVERSION OR PUMP FLOW (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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


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	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
SUB1	MANE	4.66	125.31	225.72	1.19	5.00	124.51	225.00	1.19
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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
CONTINUITY 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

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

SUBB	MANE	1.58	348.14	190.40	1.60	5.00	347.35	190.00	1.60

CONTINUITY 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

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

SUBD	MANE	1.01	509.90	202.65	1.38	5.00	460.67	205.00	1.38

CONTINUITY 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

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

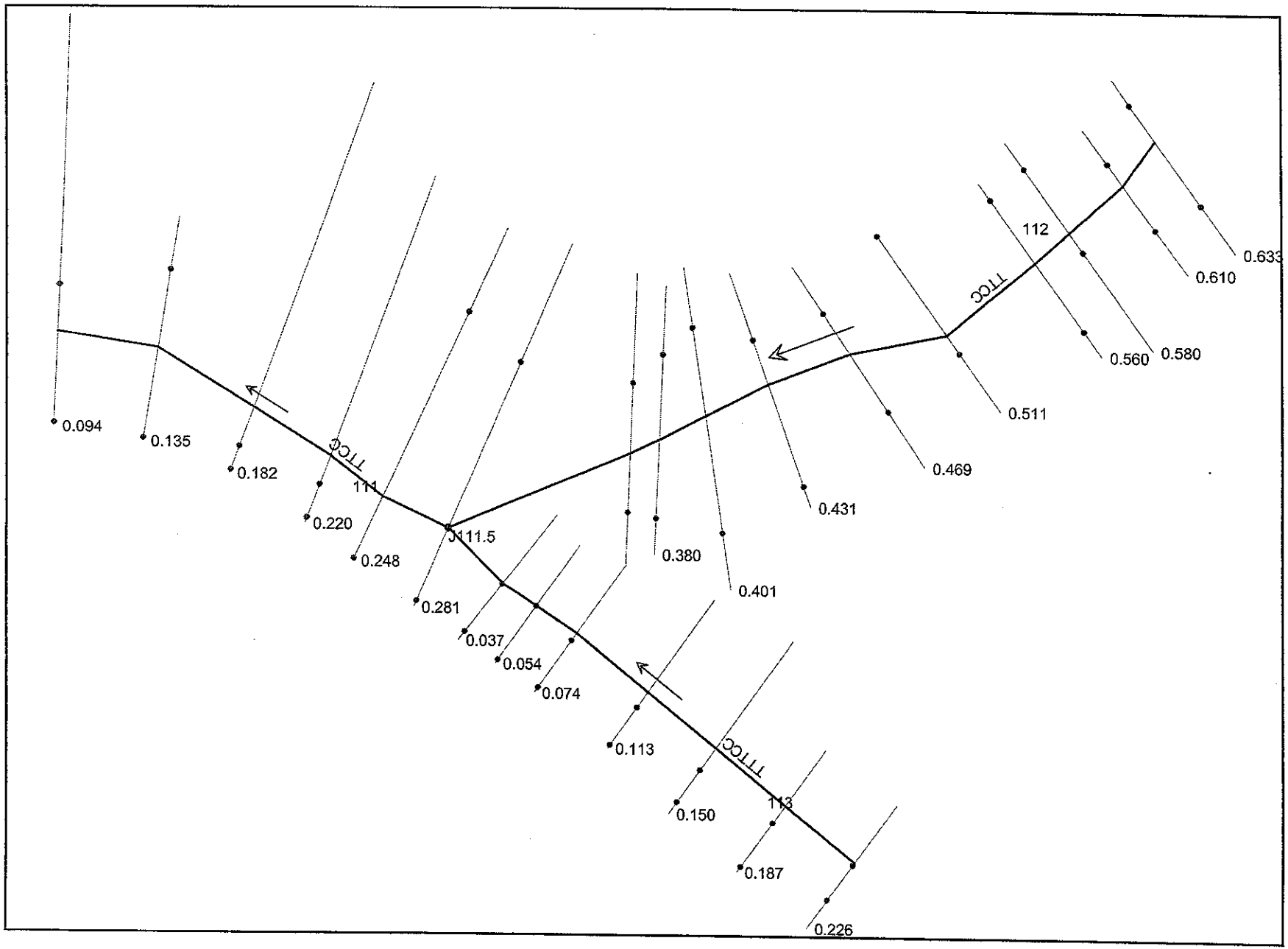
SUB9	MANE	1.40	1010.37	193.34	1.50	5.00	946.86	195.00	1.50

CONTINUITY 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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0.182
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111
0.220
0.248
J111.5
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0.074
0.113
TTCC
113
0.150
0.187
0.226
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TTCC
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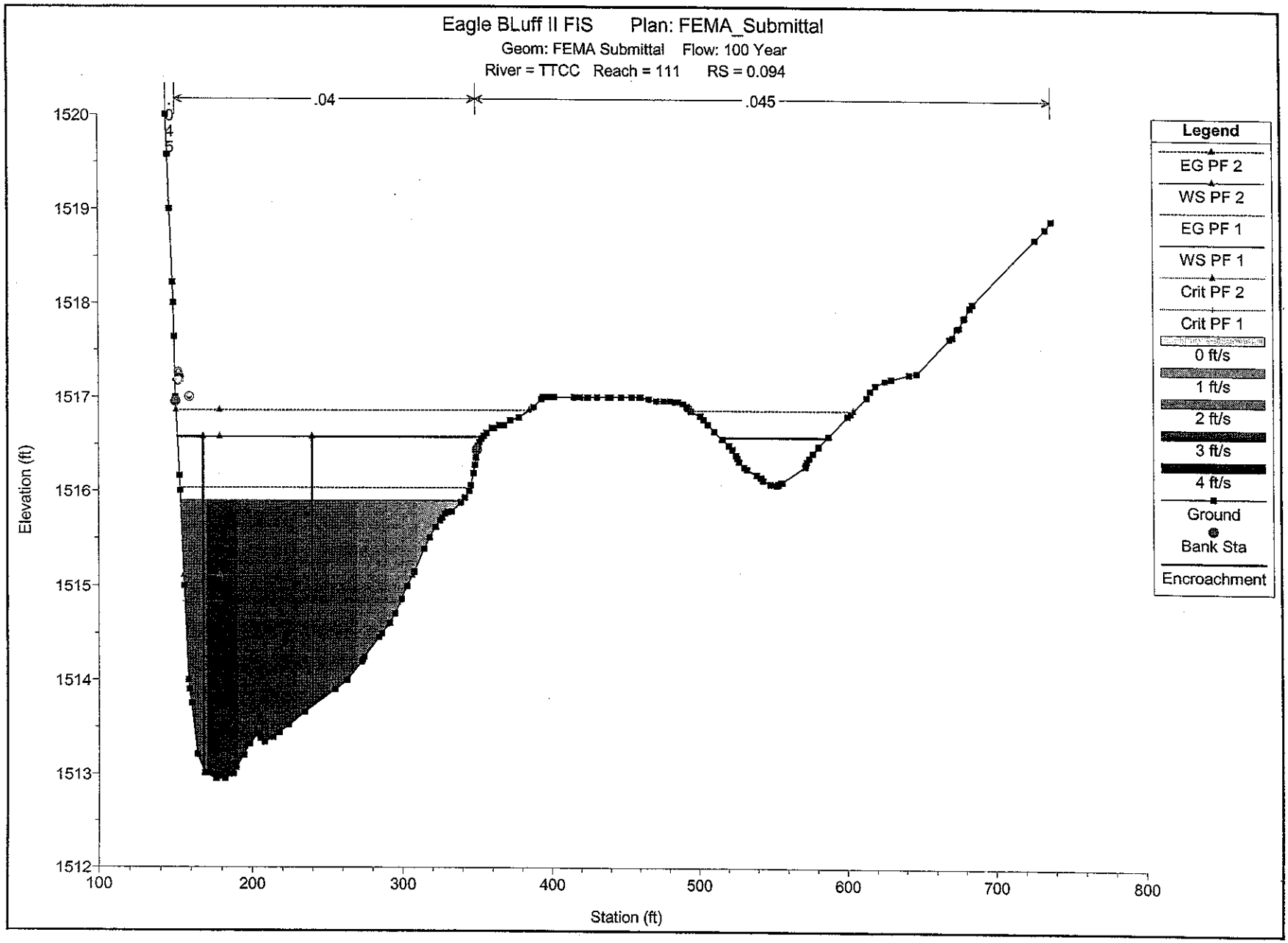
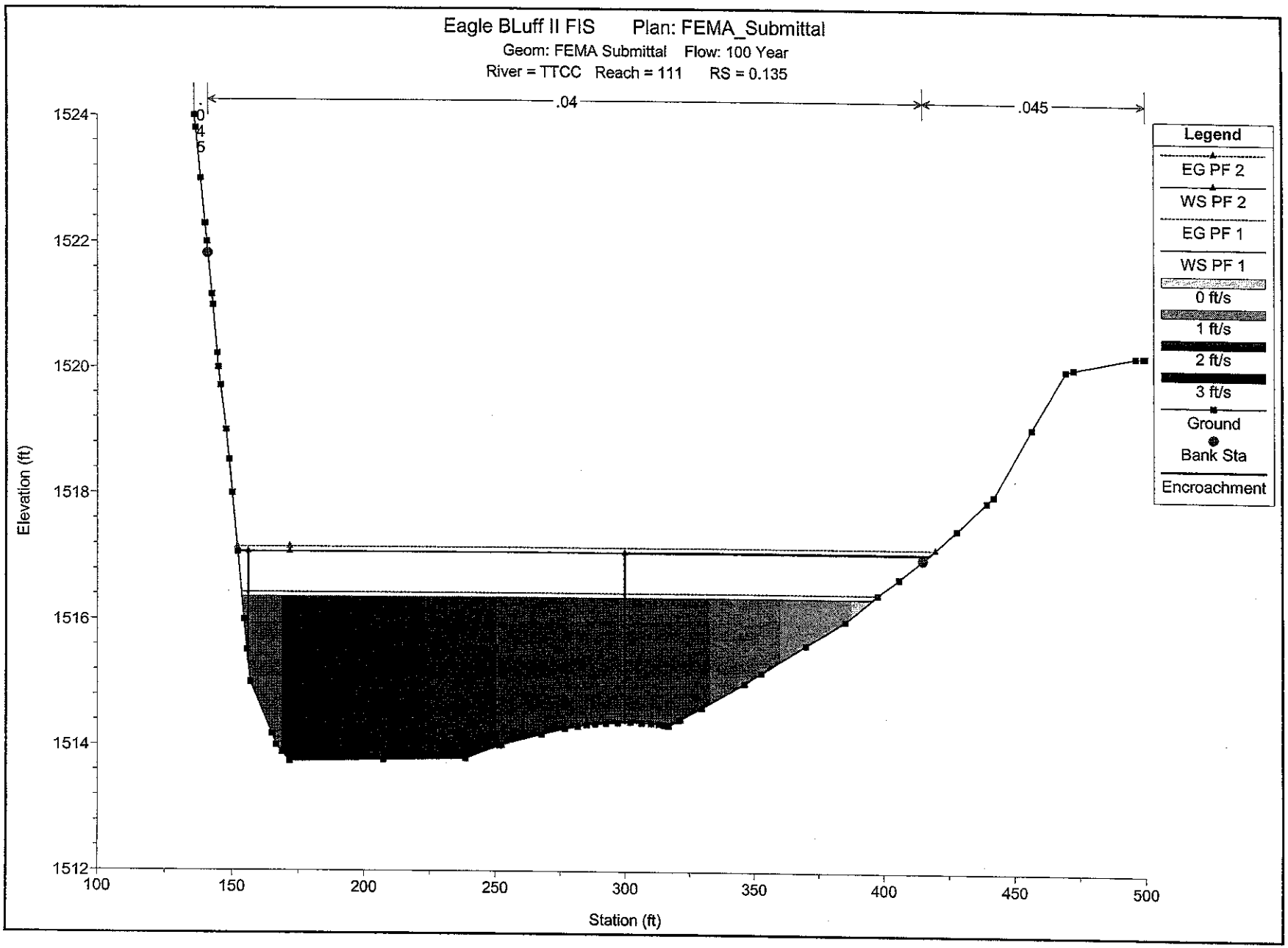

Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 111 RS = 0.094
.04
.045
Elevation (ft)
Station (ft)
1520
1519
1518
1517
1516
1515
1514
1513
1512
100
200
300
400
500
600
700
800
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Encroachment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Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 111 RS = 0.135
.04
.045
0.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
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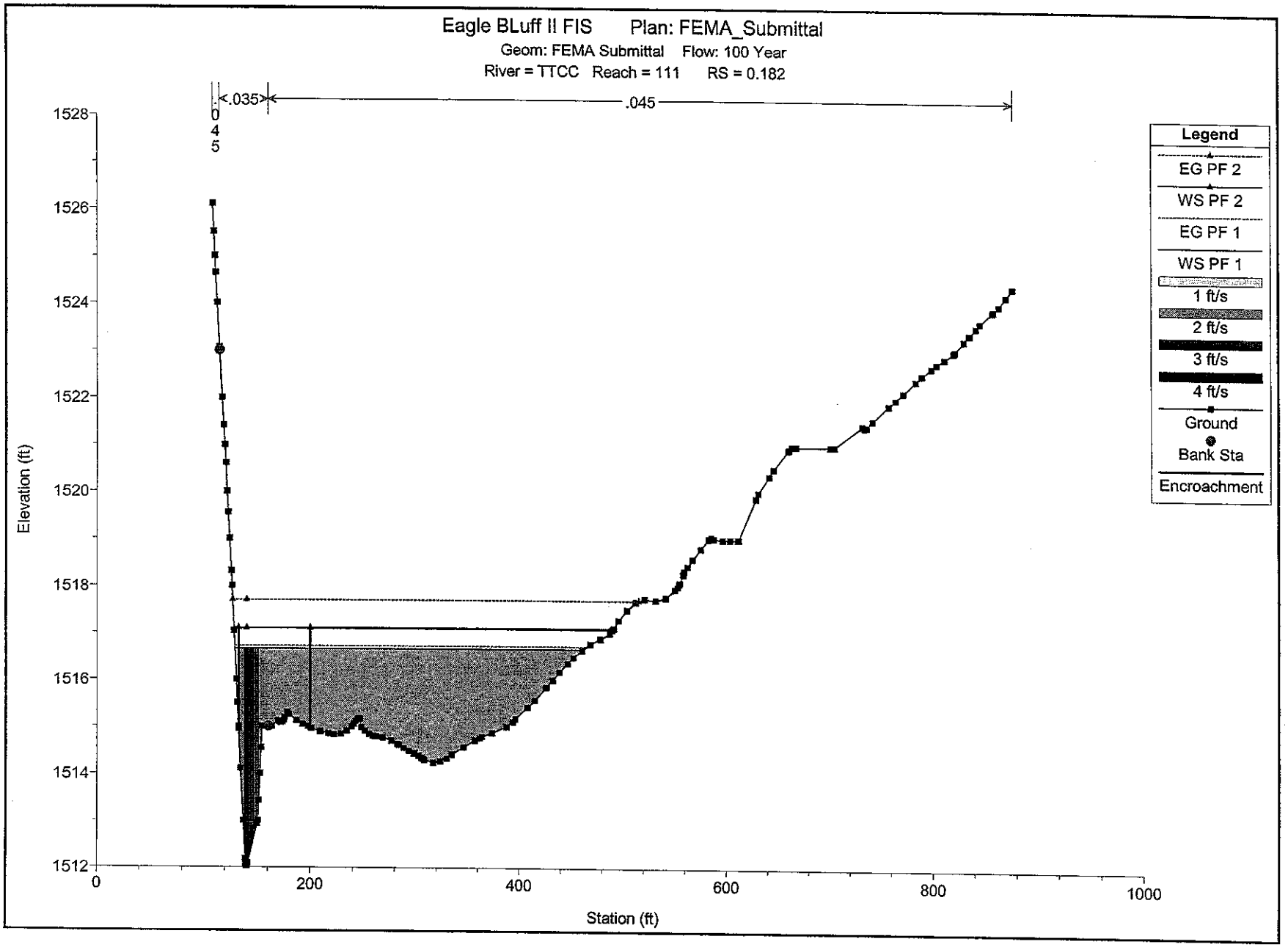
1522
1520
1518
1516
1514
1512
100
150
200
250
300
350
400
450
500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Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 111 RS = 0.182
.035
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
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1526
1524
1522
1520
1518
1516
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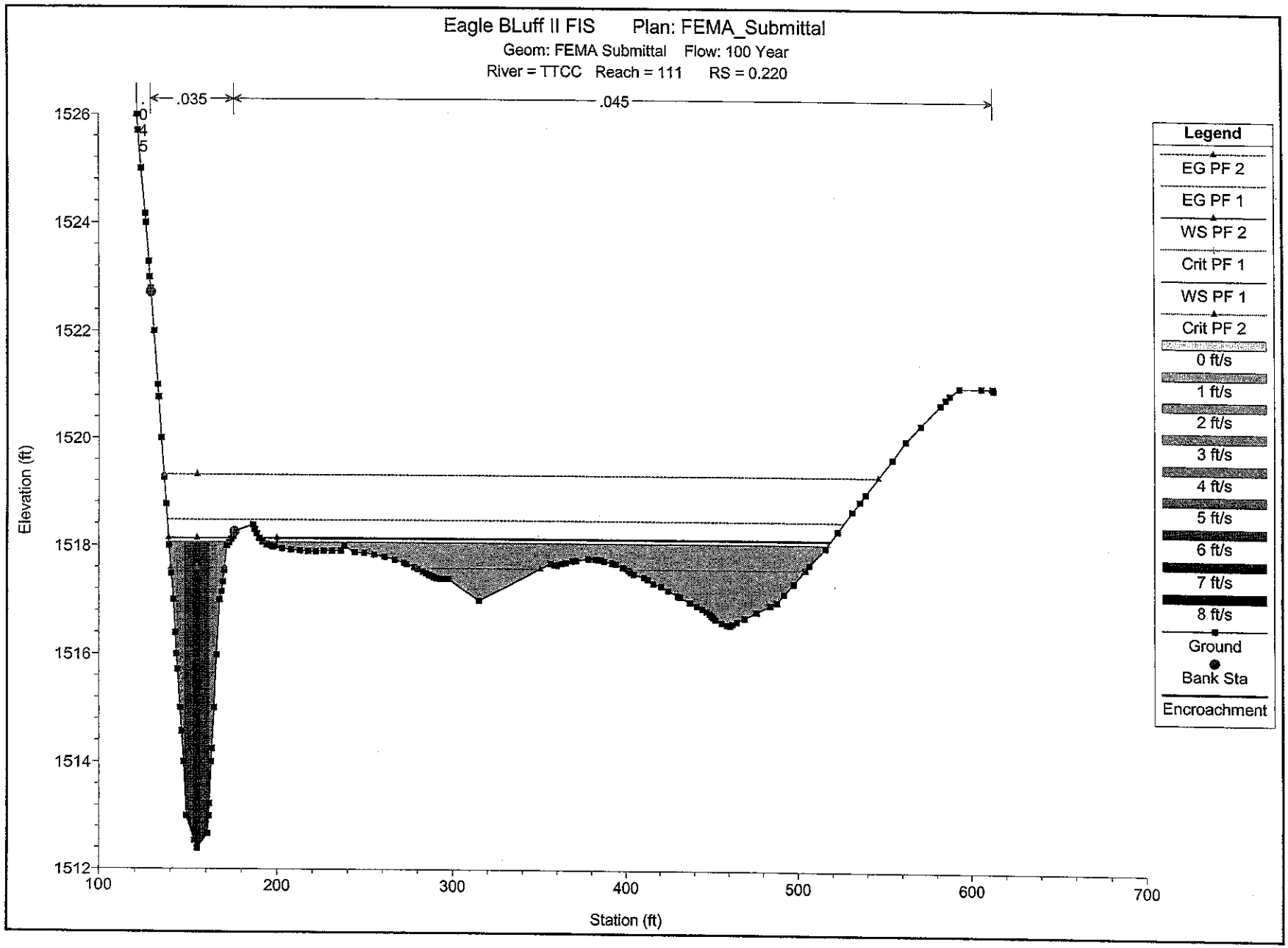
1512
0
200
400
600
800
1000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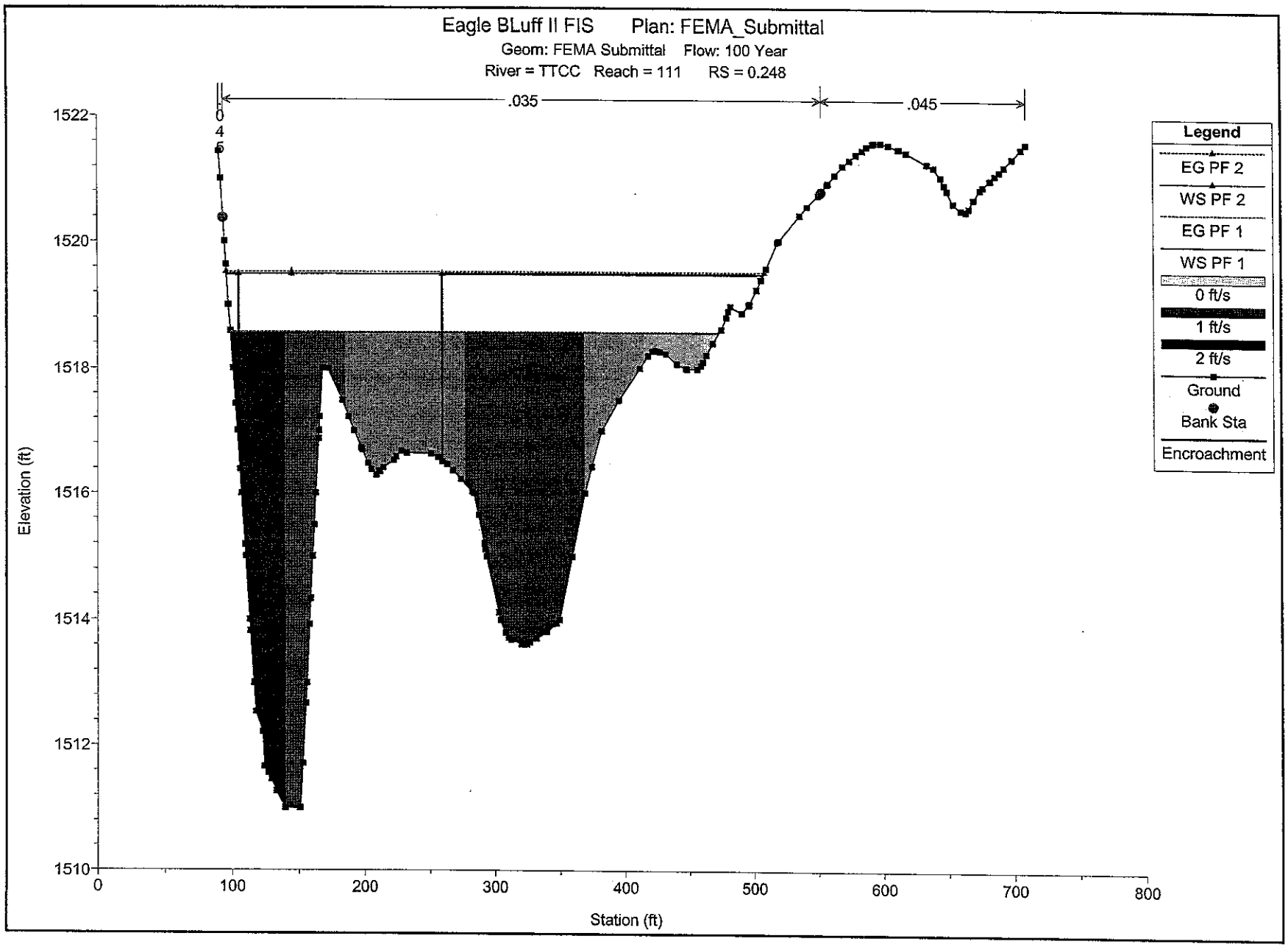
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 111 RS = 0.220
.035
.045
.04
.05
Elevation (ft)
1526
1524
1522
1520
1518
1516
1514
1512
100
200
300
400
500
600
700
Station (ft)
Legend
EG PF 2
EG PF 1
WS PF 2
Crit PF 1
WS PF 1
Crit PF 2
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
Encroachment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1 ft/s
2 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1522
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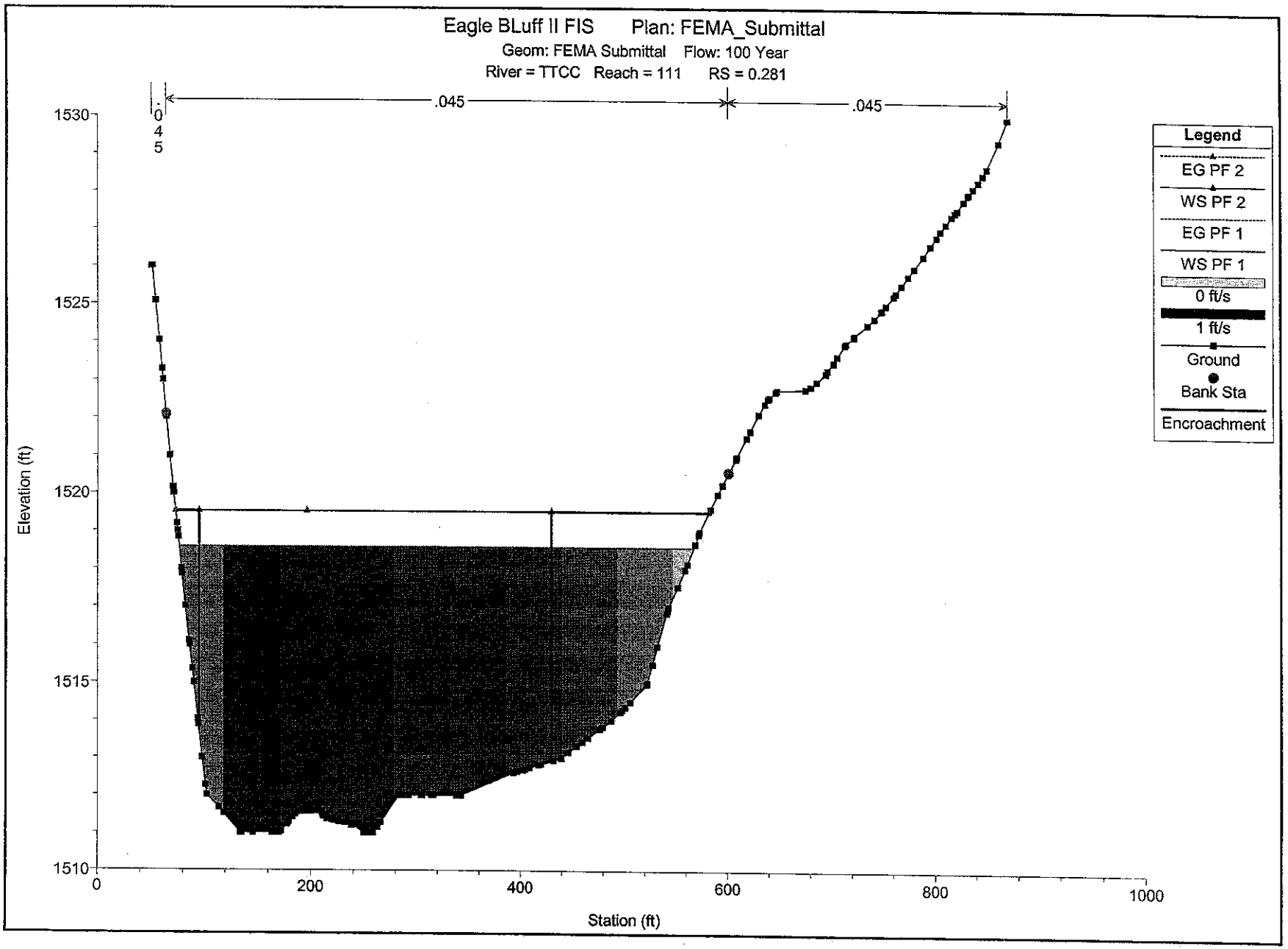
1518
1516
1514
1512
1510
0
100
200
300
400
500
600
700
800
Station (ft)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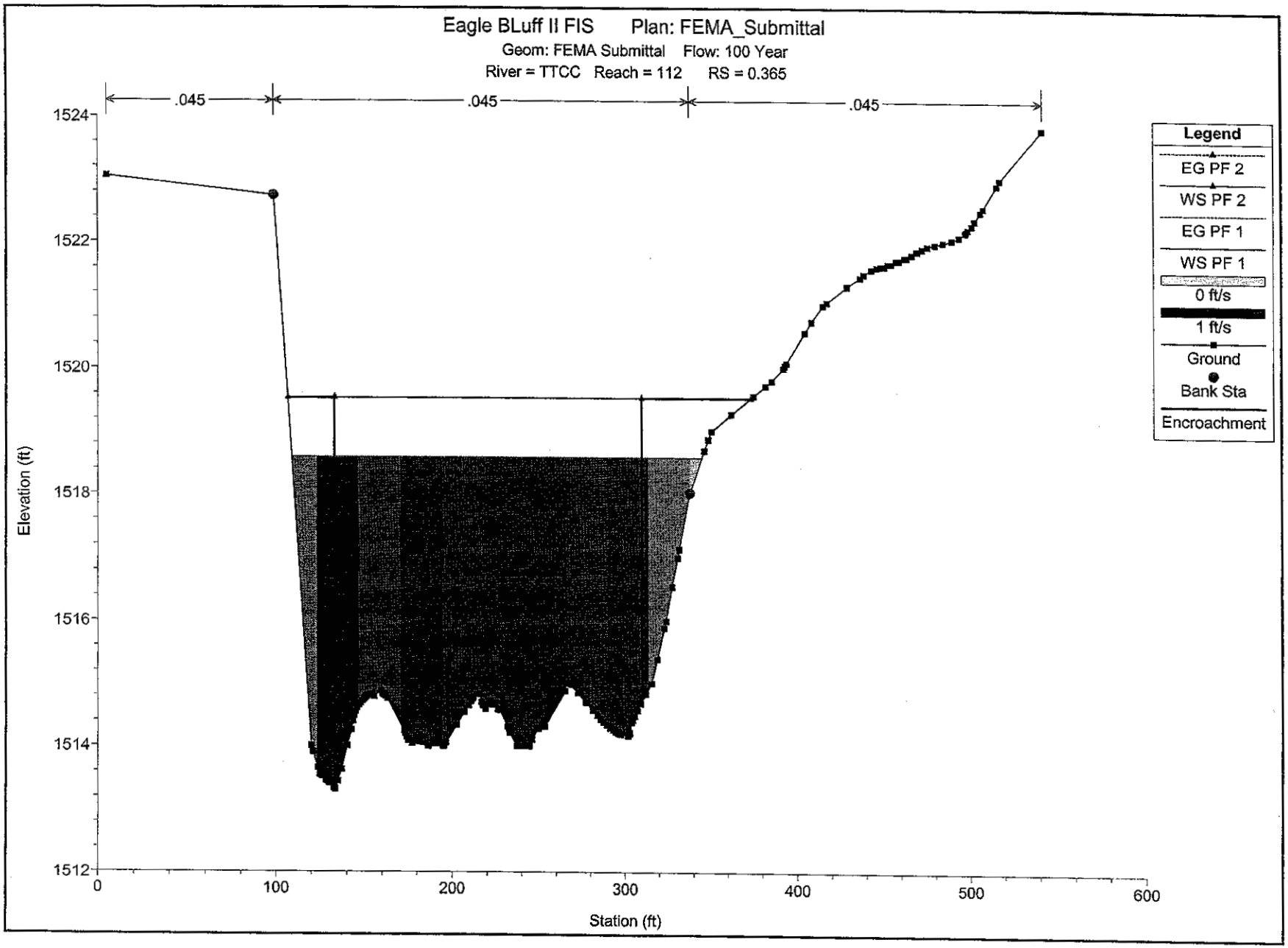
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1525
1520
1515
1510
0
200
400
600
800
1000
Station (ft)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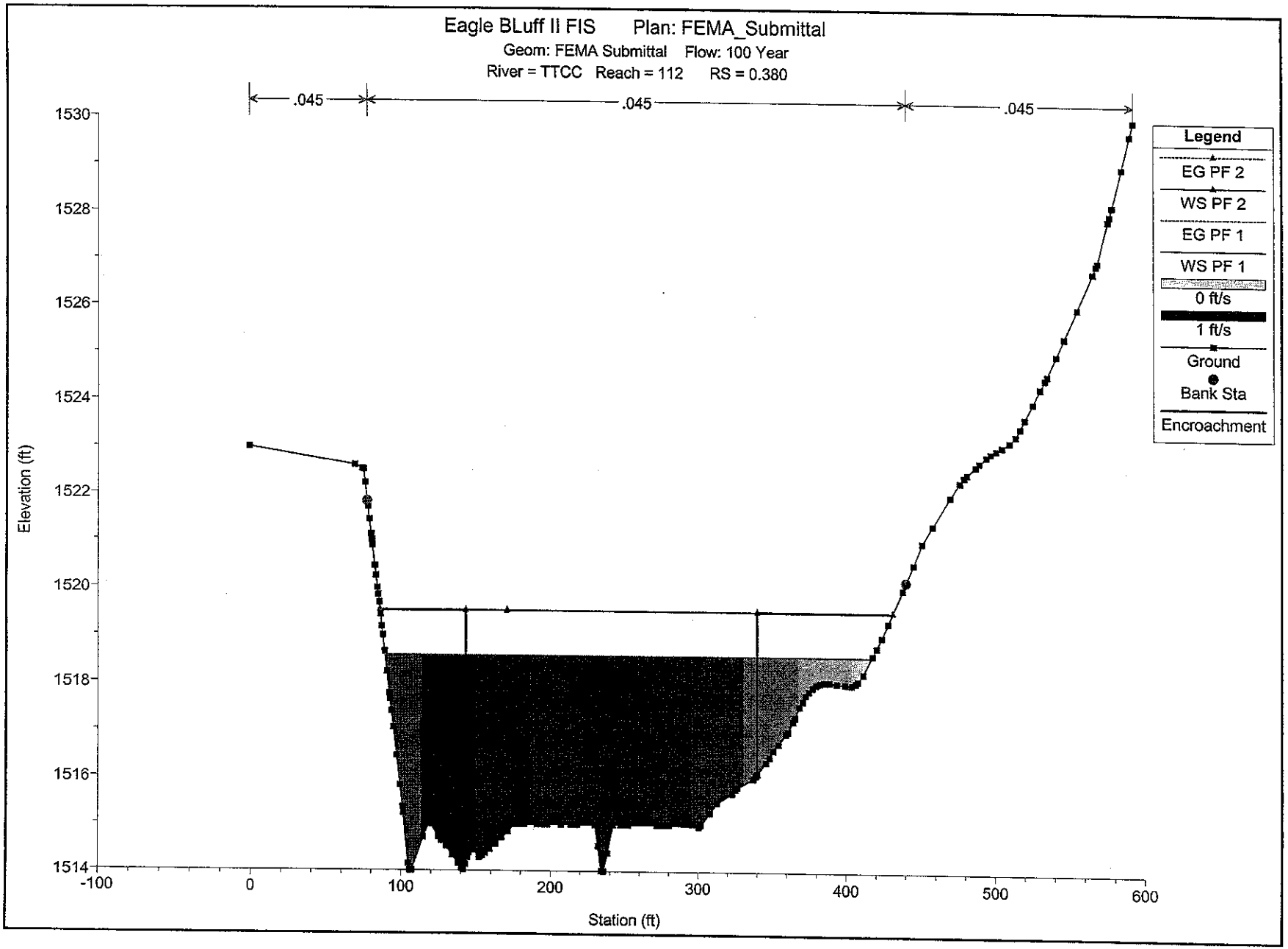
.045
.045
.045
1524
1522
1520
1518
1516
1514
1512
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment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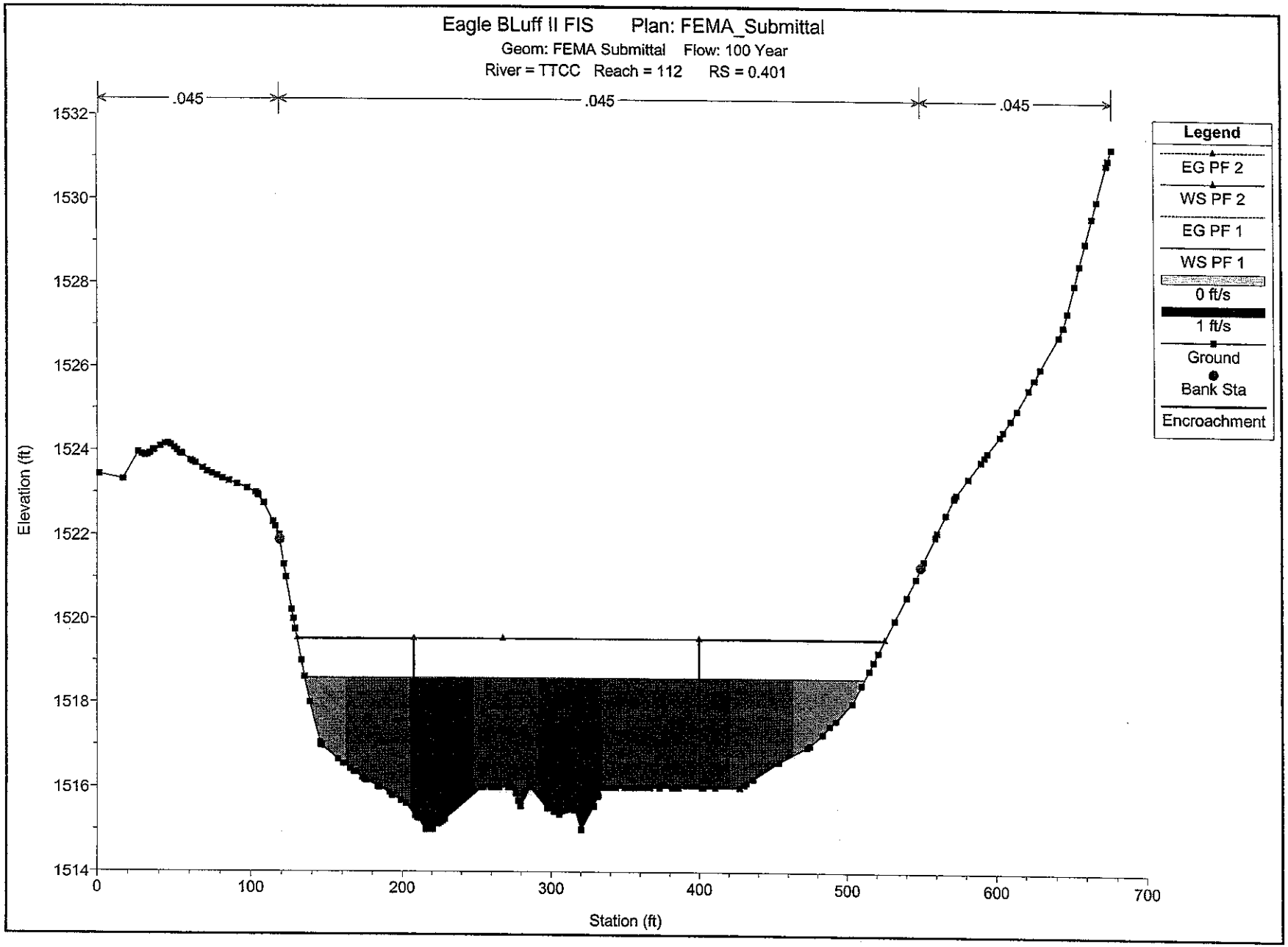
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1528
1526
1524
1522
1520
1518
1516
1514
-100
0
100
200
300
400
500
600
Station (ft)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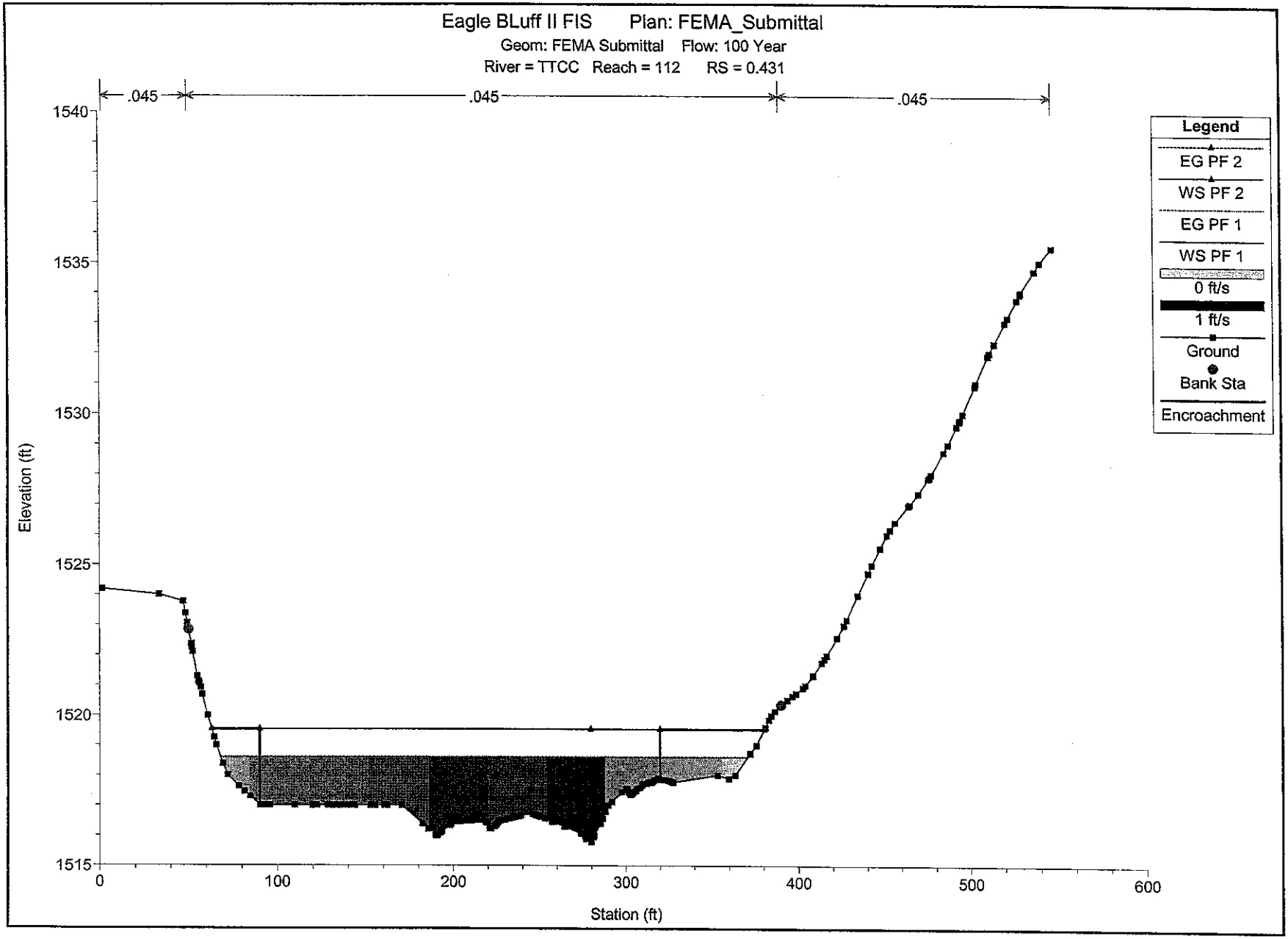
River = TTCC Reach = 112 RS = 0.401
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1532
1530
1528
1526
1524
1522
1520
1518
1516
1514
0
100
200
300
400
500
600
700
Station (ft)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Geom: FEMA Submittal Flow: 100 Year
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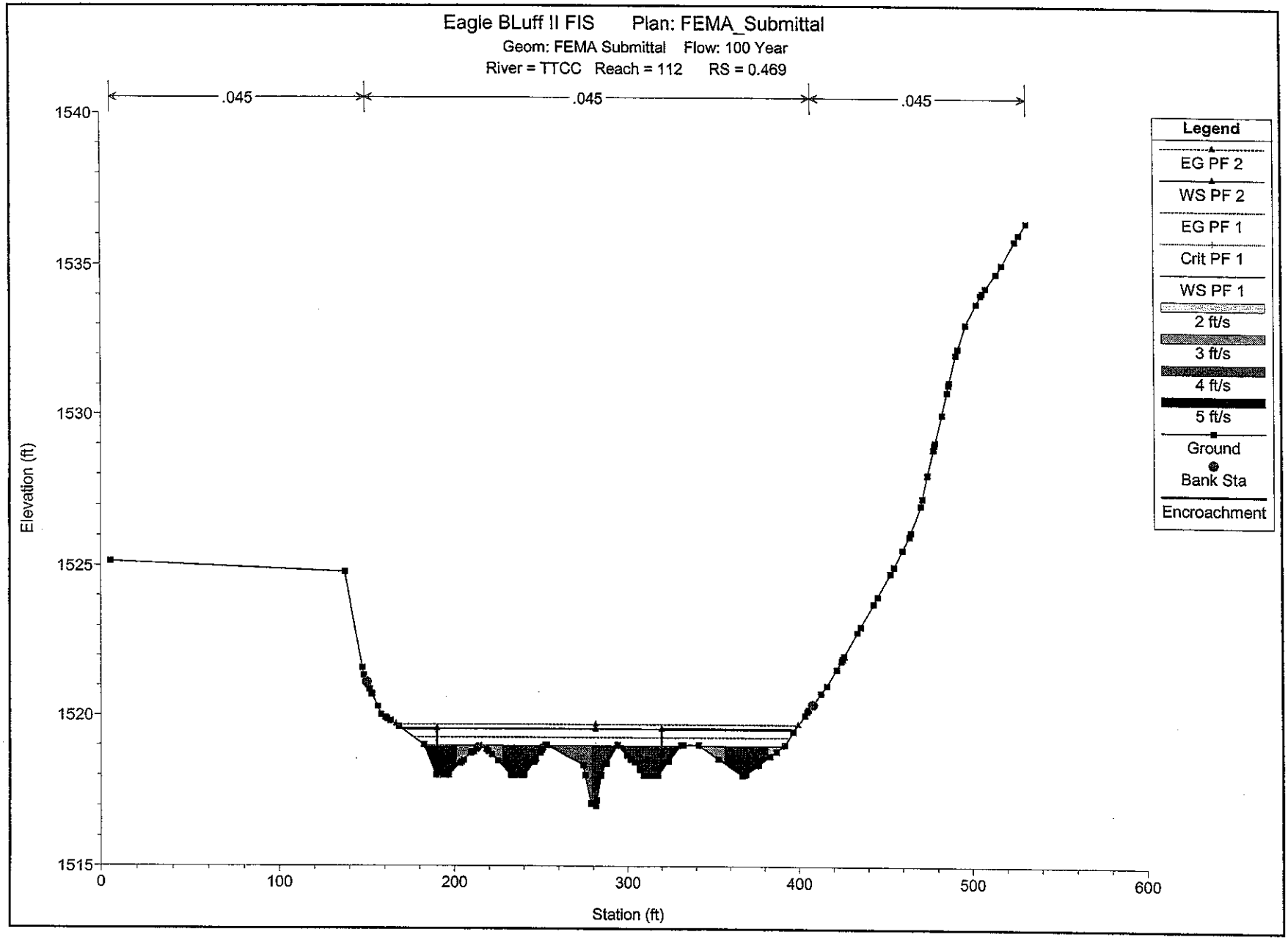
.045
.045
.045
1540
1535
1530
1525
1520
1515
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment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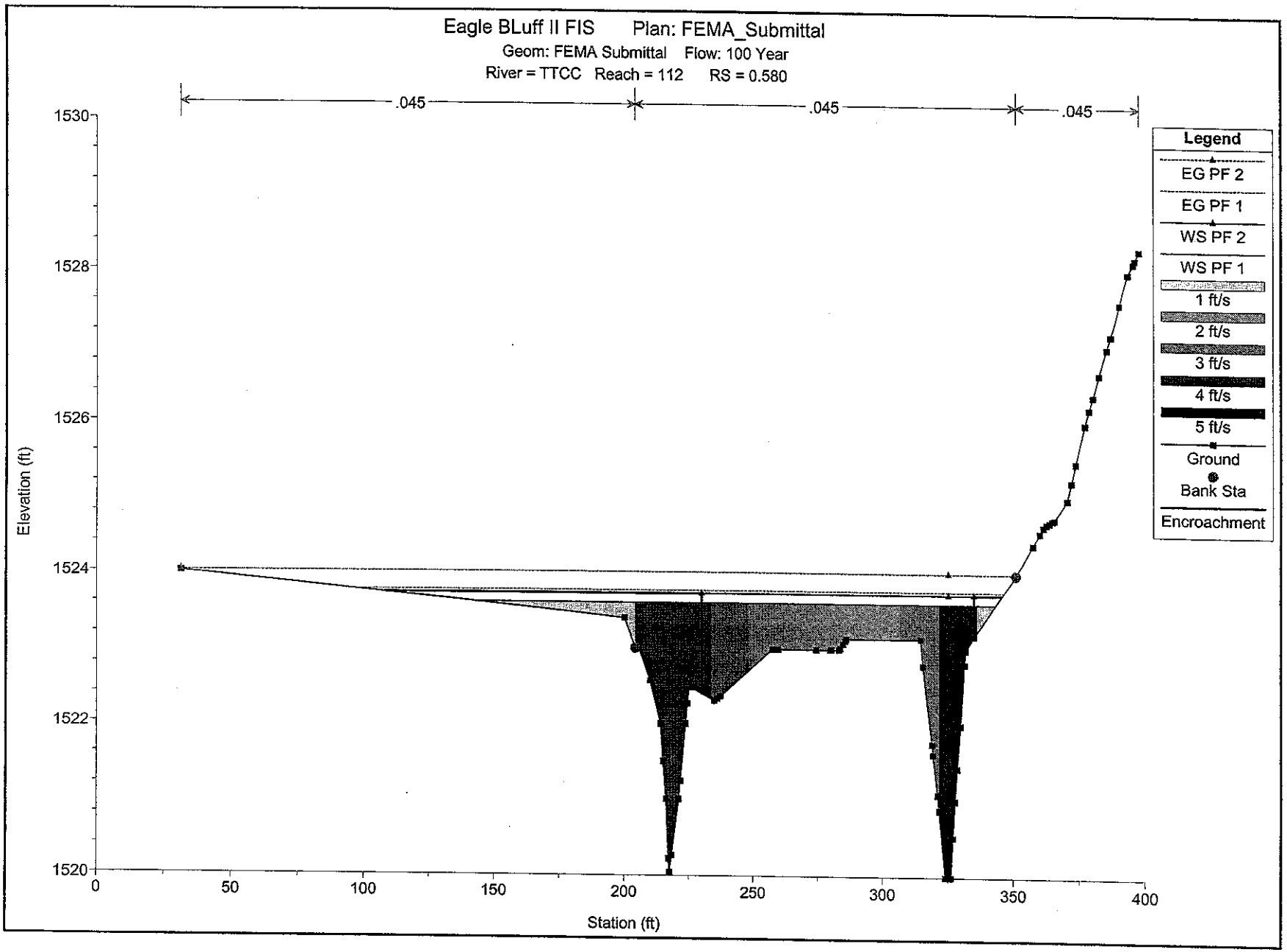
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 112 RS = 0.469
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
Crit PF 1
WS PF 1
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1540
1535
1530
1525
1520
1515
0
100
200
300
400
500
600
Station (ft)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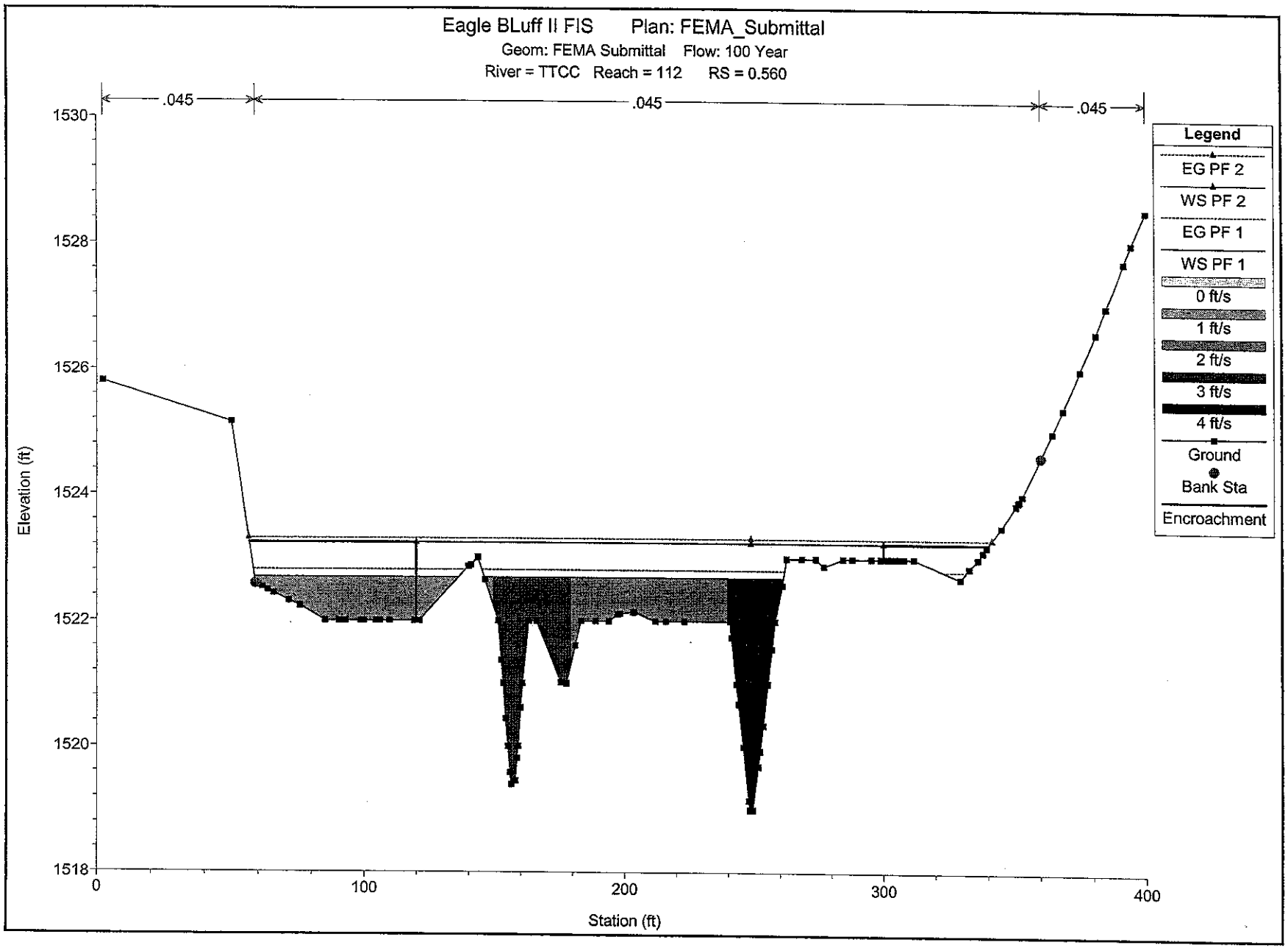
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 112 RS = 0.580
.045
.045
.045
Legend
EG PF 2
EG PF 1
WS PF 2
WS PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1530
1528
1526
1524
1522
1520
0
50
100
150
200
250
300
350
400
Station (ft)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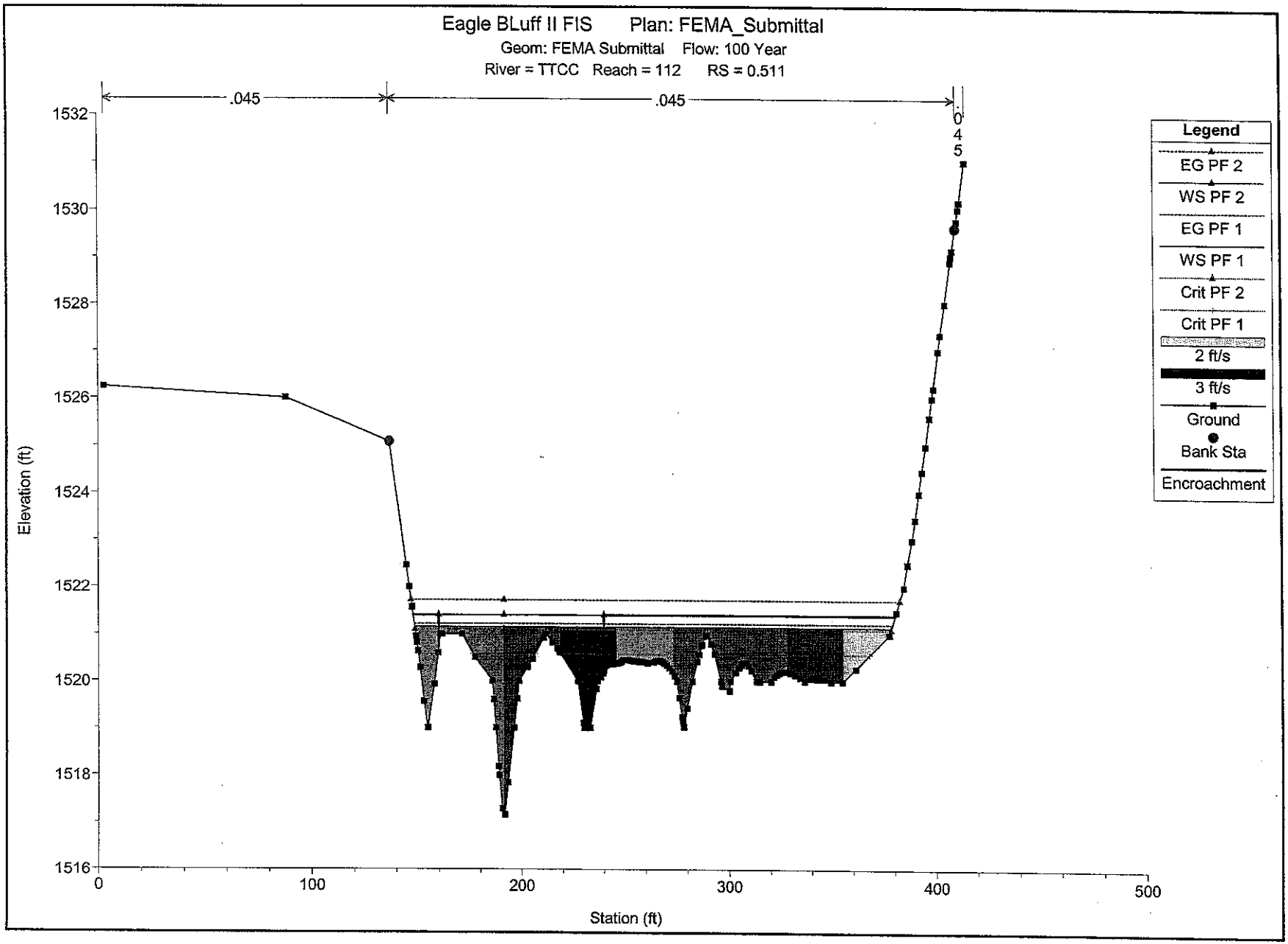
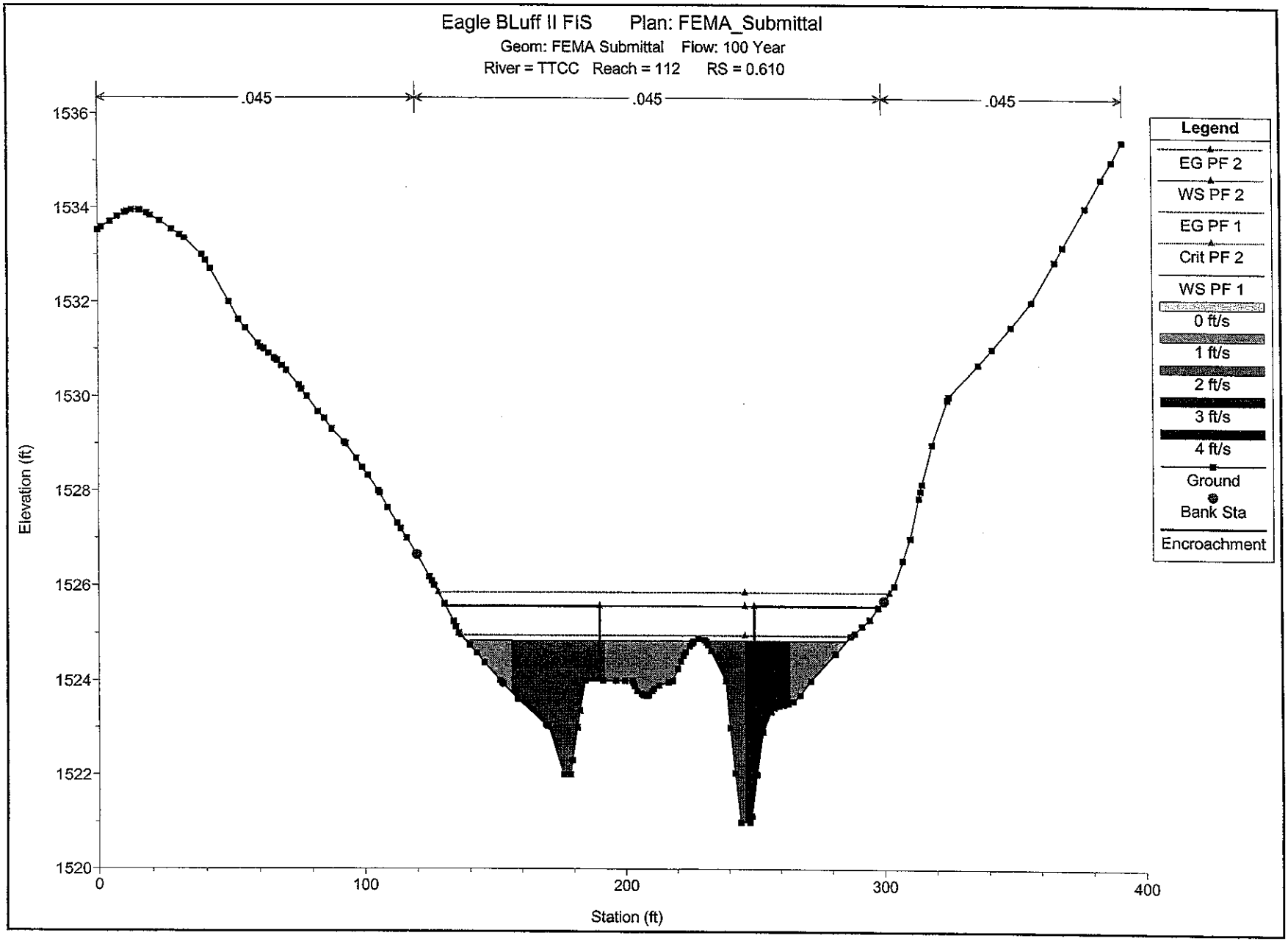
.045
.045
Elevation (ft)
1530
1528
1526
1524
1522
1520
1518
0
100
200
300
400
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Encroachment


Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 112 RS = 0.511
.045
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
2 ft/s
3 ft/s
Ground
Bank Sta
Encroachment
Elevation (ft)
1532
1530
1528
1526
1524
1522
1520
1518
1516
0
100
200
300
400
500
Station (ft)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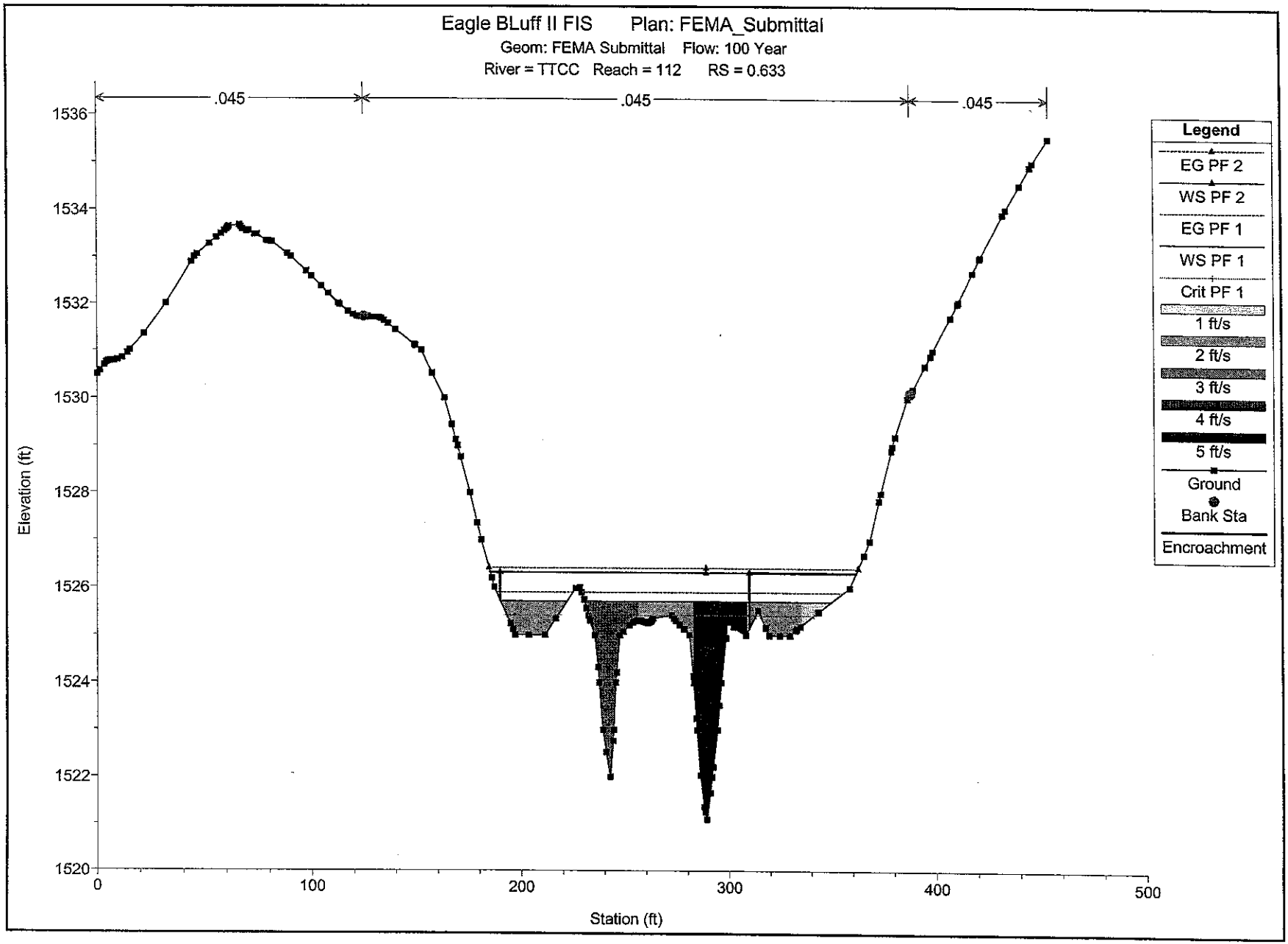
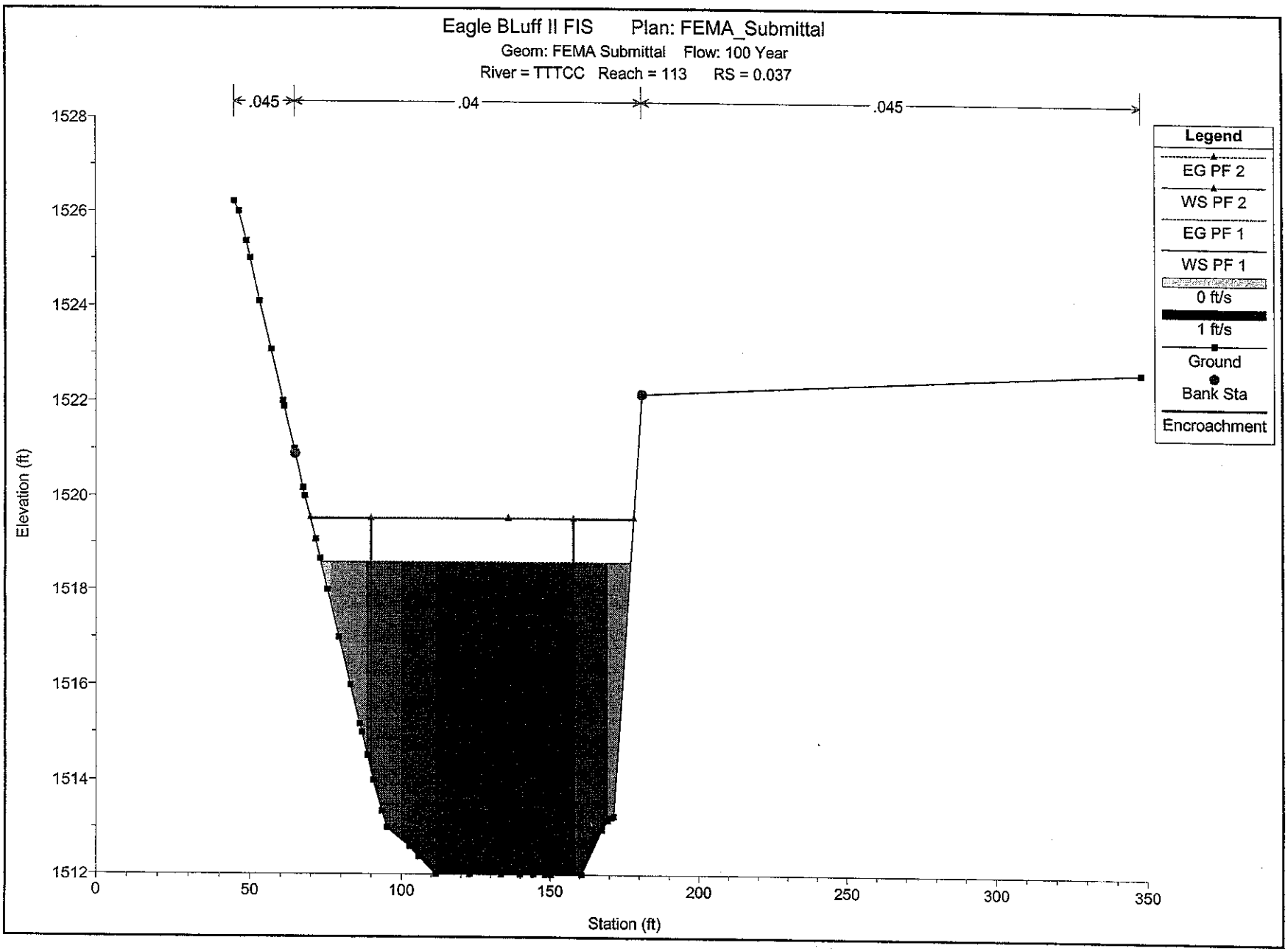
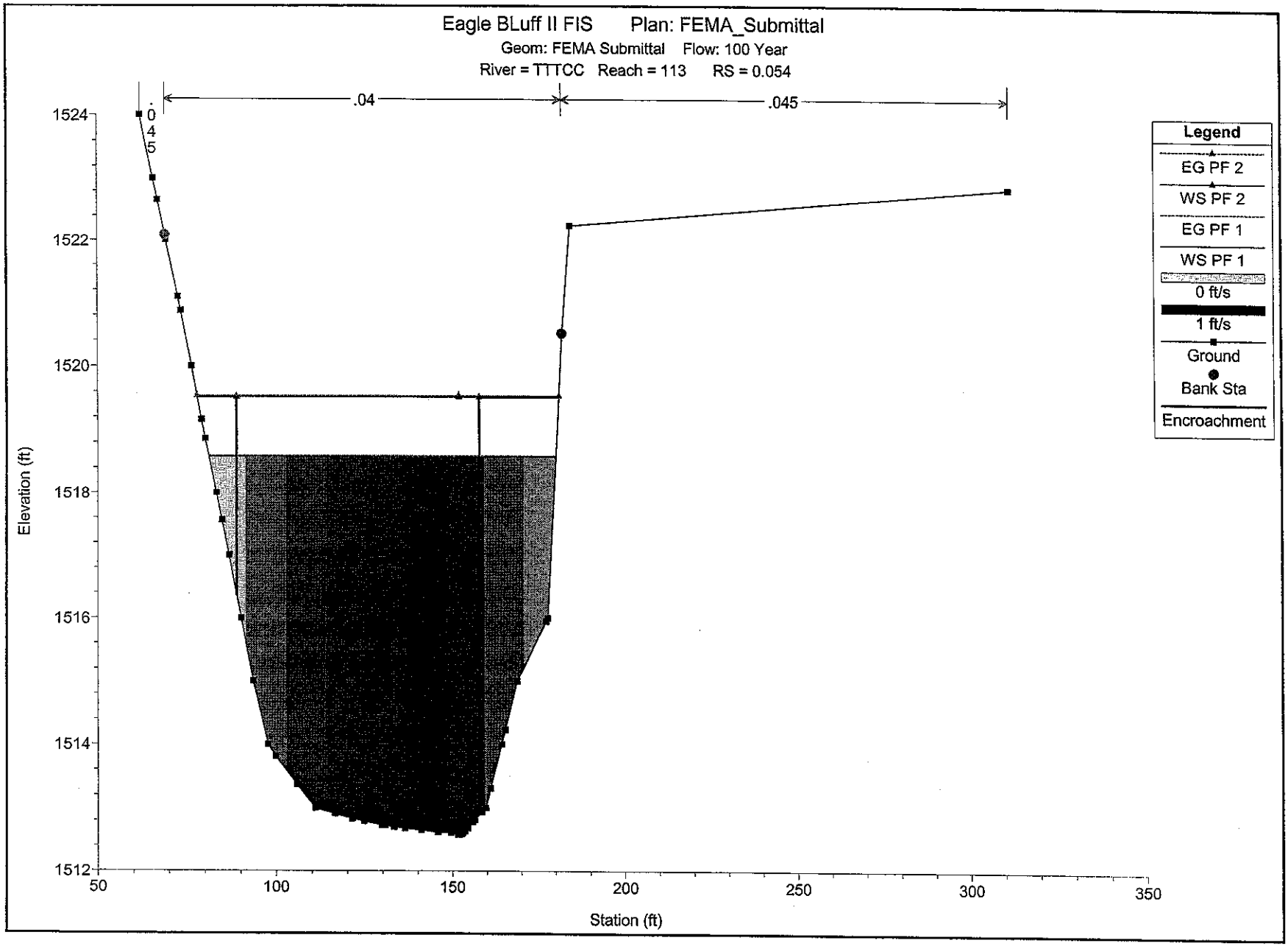
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 112 RS = 0.610
.045
.045
.045
1536
1534
1532
1530
1528
1526
1524
1522
1520
Elevation (ft)
0
100
200
300
400
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
Crit PF 2
WS PF 1
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Encroachment


Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTCC Reach = 112 RS = 0.633
.045
.045
.045
1536
1534
1532
1530
1528
1526
1524
1522
1520
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Encroachment


Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTTCC Reach = 113 RS = 0.037
.045
.04
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
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)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Geom: FEMA Submittal Flow: 100 Year
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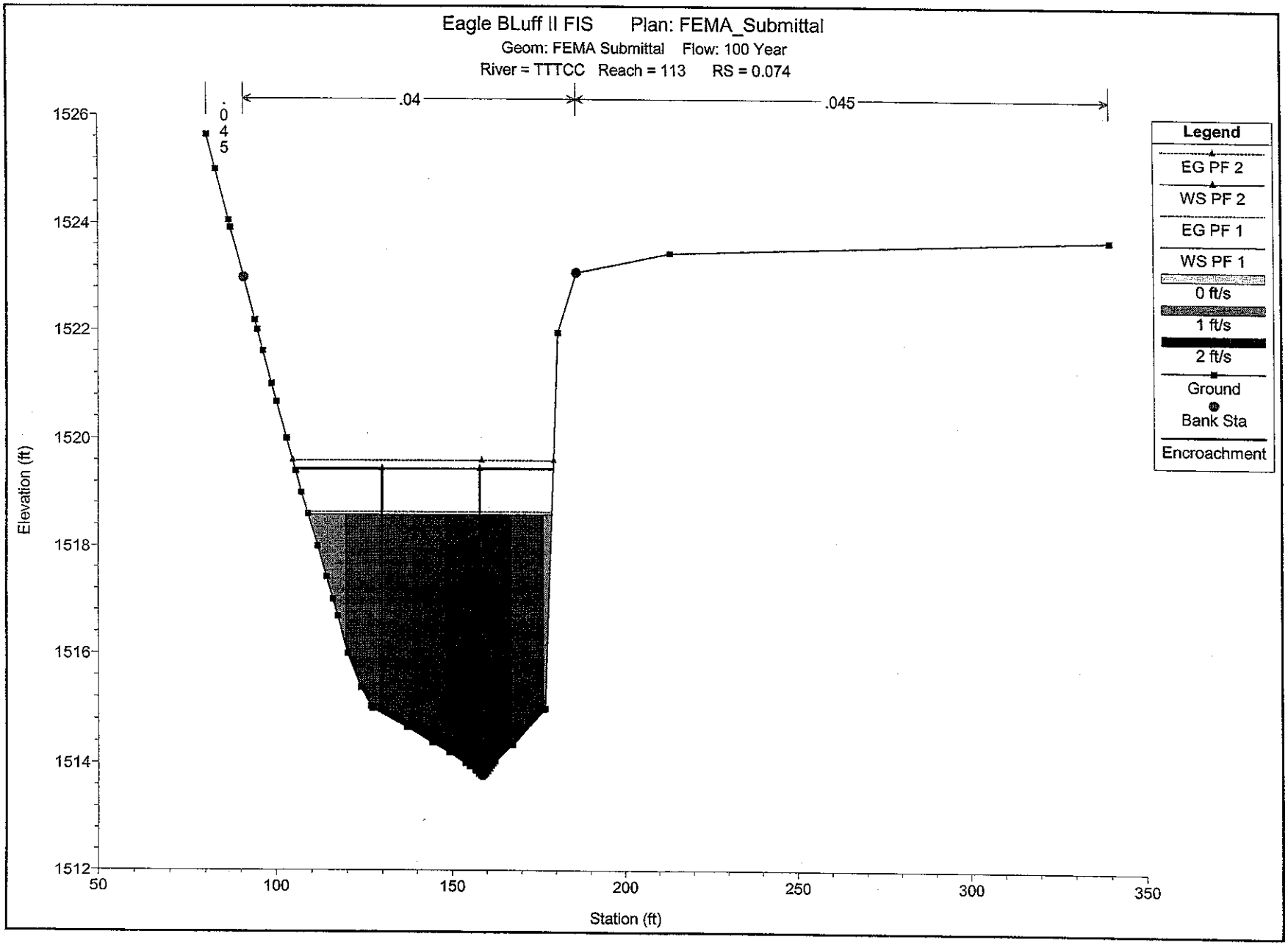
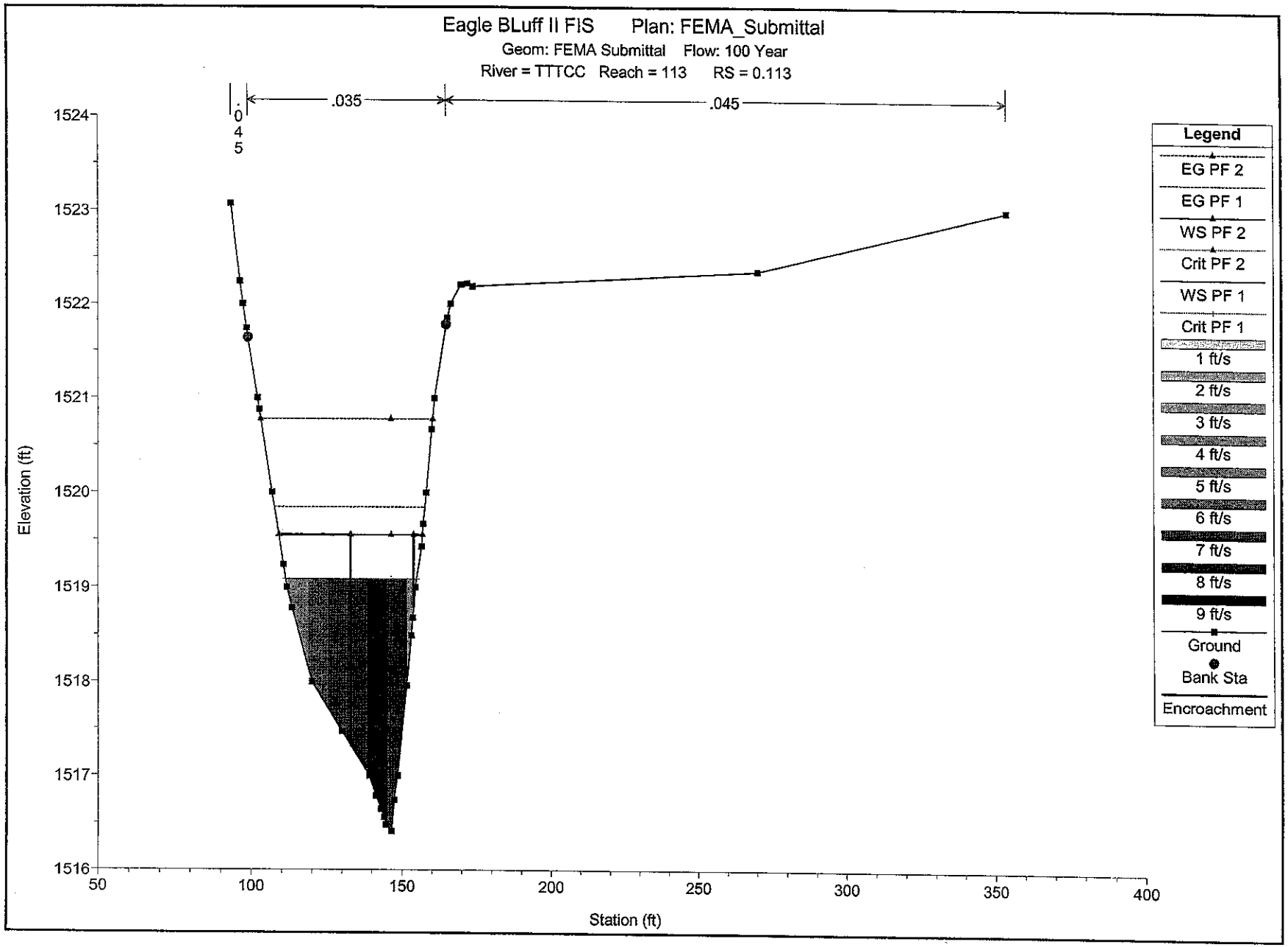
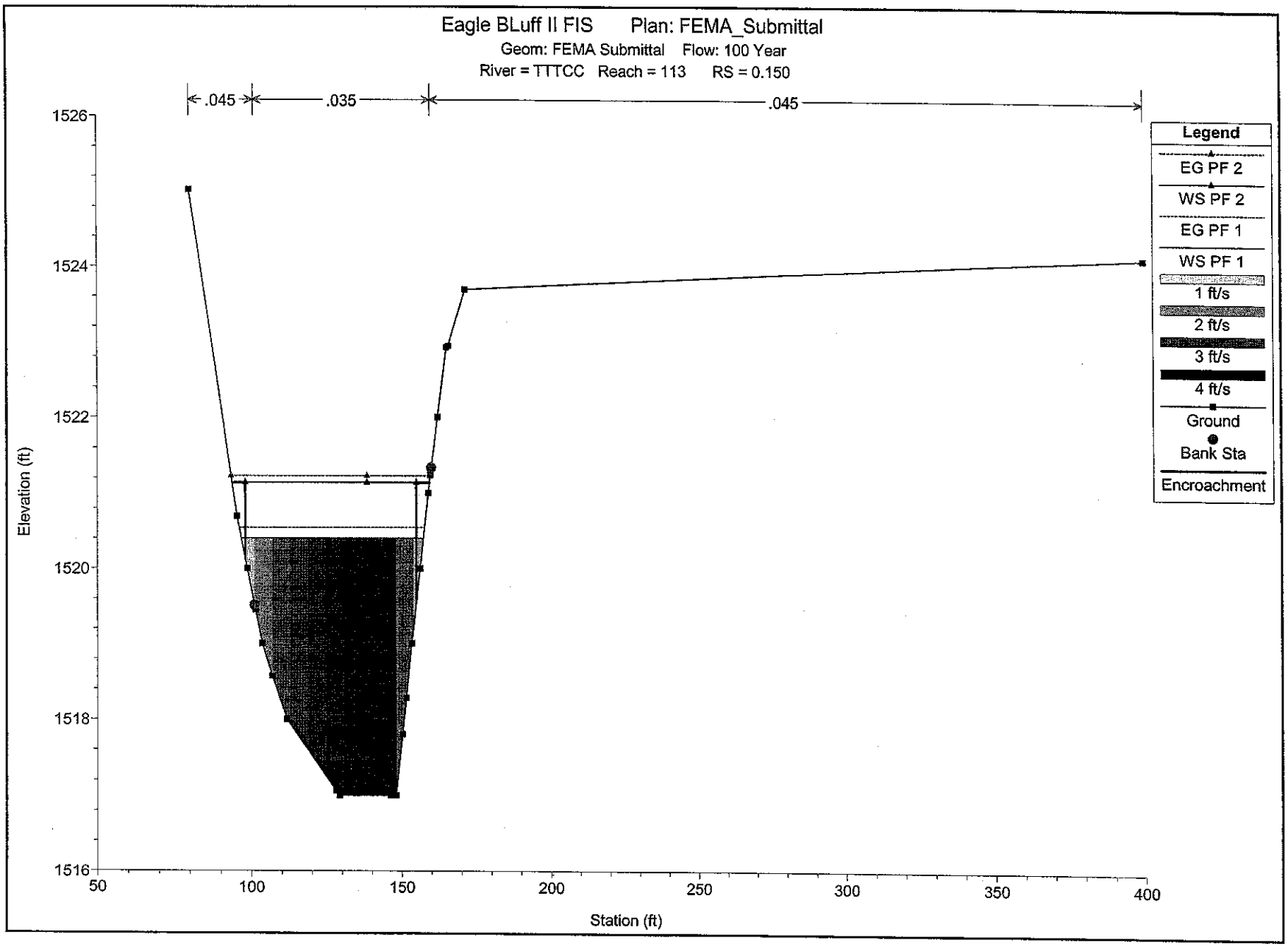
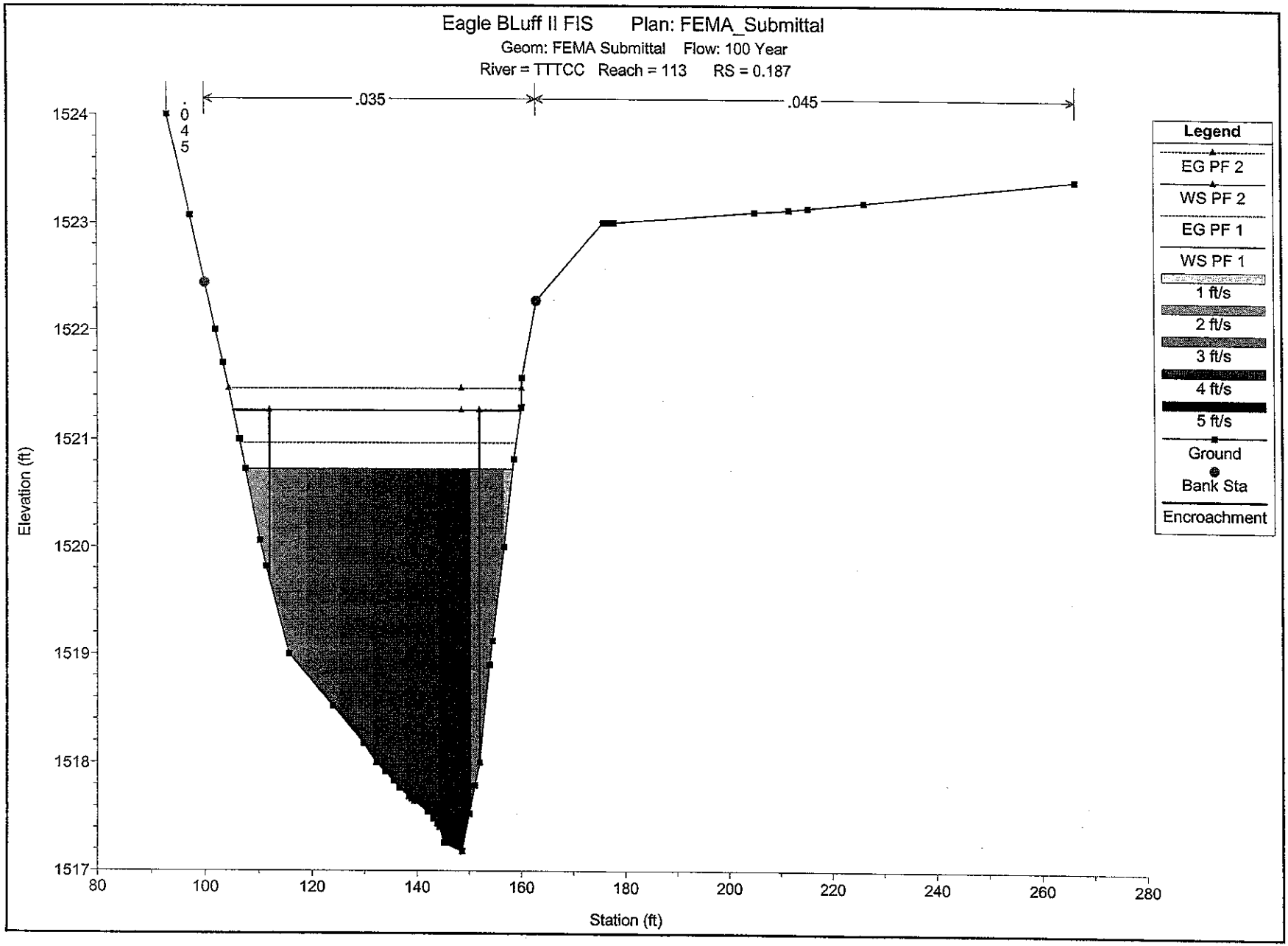
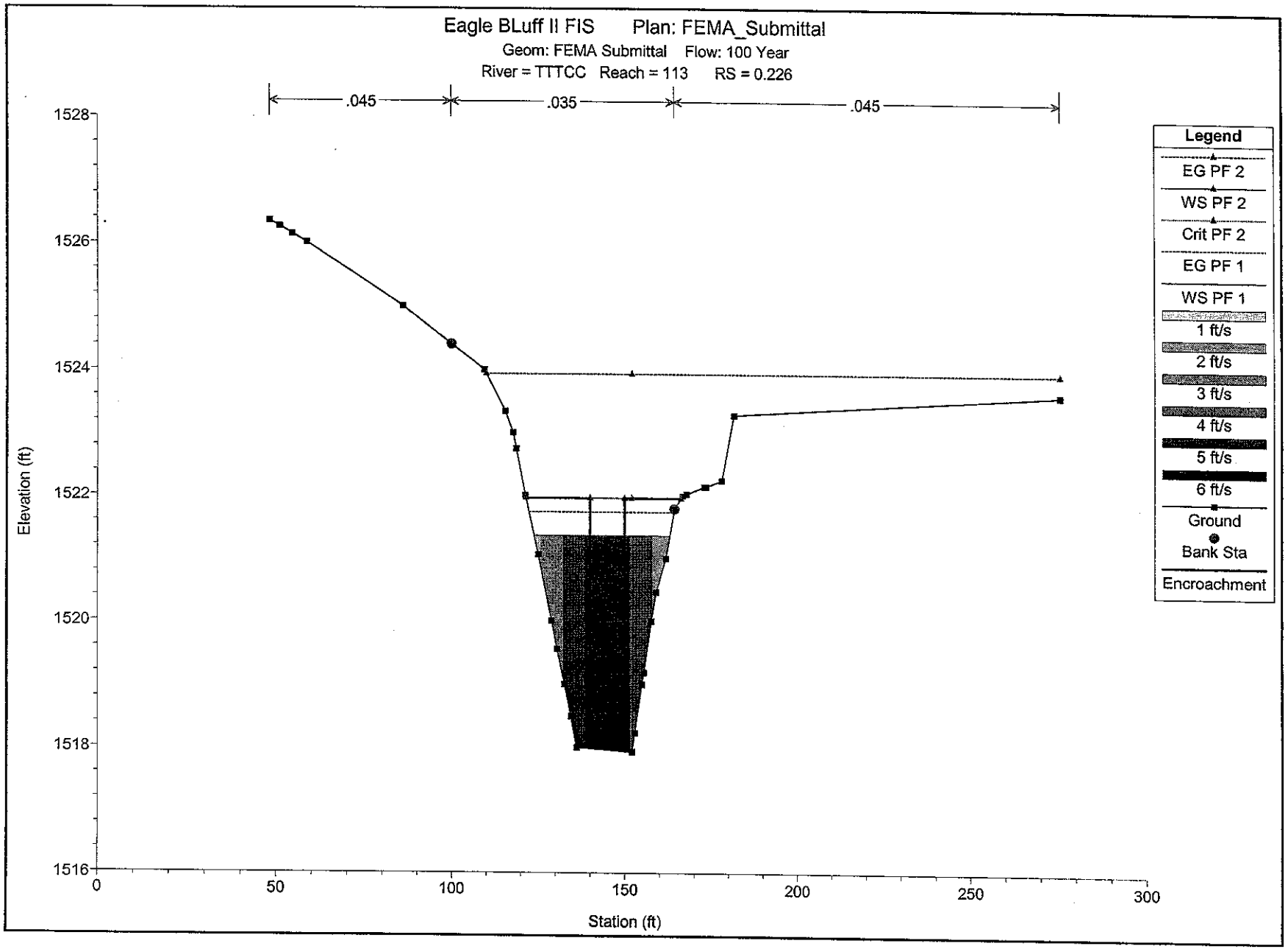
.04
.045
0
4
5
1524
1522
1520
1518
1516
1514
1512
Elevation (ft)
50
100
150
200
250
300
350
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
Ground
Bank Sta
Encroachment


Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTTCC Reach = 113 RS = 0.074
.045
.04
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
0 ft/s
1 ft/s
2 ft/s
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 FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTTCC Reach = 113 RS = 0.113
.035
.045
.045
Elevation (ft)
1524
1523
1522
1521
1520
1519
1518
1517
1516
50
100
150
200
250
300
350
400
Station (ft)
Legend
EG PF 2
EG PF 1
WS PF 2
Crit PF 2
WS PF 1
Crit PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
9 ft/s
Ground
Bank Sta
Encroachment


Eagle BLuff II FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTTCC Reach = 113 RS = 0.150
.045
.035
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
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 FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
River = TTTCC Reach = 113 RS = 0.187
.035
.045
.045
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
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 FIS Plan: FEMA_Submittal
Geom: FEMA Submittal Flow: 100 Year
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
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
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: FEMA

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	0.003004	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	0.000202	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	0.365	469.00	1513.32	1518.58		1518.58	0.000041	0.52	900.17	235.96	0.05
112	0.365	469.00	1513.32	1519.52		1519.53	0.000030	0.52	907.25	177.00	0.04
112	0.380	469.00	1514.00	1518.58		1518.58	0.000050	0.48	971.98	327.78	0.05
112	0.380	469.00	1514.00	1519.52		1519.53	0.000036	0.53	888.98	197.00	0.04
112	0.401	469.00	1515.00	1518.58		1518.59	0.000075	0.52	909.36	376.49	0.06
112	0.401	469.00	1515.00	1519.53		1519.53	0.000067	0.64	730.68	192.00	0.06
112	0.431	469.00	1515.79	1518.60		1518.61	0.000487	0.99	476.06	302.62	0.14
112	0.431	469.00	1515.79	1519.54		1519.54	0.000130	0.73	638.18	230.00	0.08
112	0.469	469.00	1517.00	1518.96	1518.96	1519.25	0.036060	4.29	109.31	192.44	1.00
112	0.469	469.00	1517.00	1519.53		1519.68	0.007477	3.10	151.16	130.00	0.51
112	0.511	469.00	1517.16	1521.14	1520.57	1521.21	0.004423	2.12	221.09	229.90	0.38
112	0.511	469.00	1517.16	1521.40	1521.10	1521.71	0.013658	4.48	104.65	80.00	0.69
112	0.560	469.00	1519.00	1522.69		1522.81	0.008638	2.78	168.50	192.78	0.52
112	0.560	469.00	1519.00	1523.23		1523.30	0.003311	2.14	219.54	180.00	0.34
112	0.580	469.00	1520.00	1523.60		1523.77	0.010000	3.29	148.06	200.12	0.58
112	0.580	469.00	1520.00	1523.73		1524.01	0.016373	4.27	109.87	105.00	0.74
112	0.610	469.00	1521.00	1524.83		1524.95	0.005668	2.76	169.69	142.97	0.45
112	0.610	469.00	1521.00	1525.57	1524.95	1525.85	0.008576	4.27	109.75	60.00	0.56
112	0.633	469.00	1521.10	1525.70	1525.42	1525.89	0.013672	3.51	133.77	151.01	0.66
112	0.633	469.00	1521.10	1526.32		1526.42	0.003274	2.48	188.85	120.00	0.35

HEC-RAS Plan: FEMA River: TTTCC 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	0.000054	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	69.71	0.17
113	0.074	451.00	1513.79	1519.44		1519.60	0.001280	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

HEC-RAS Plan: FEMA

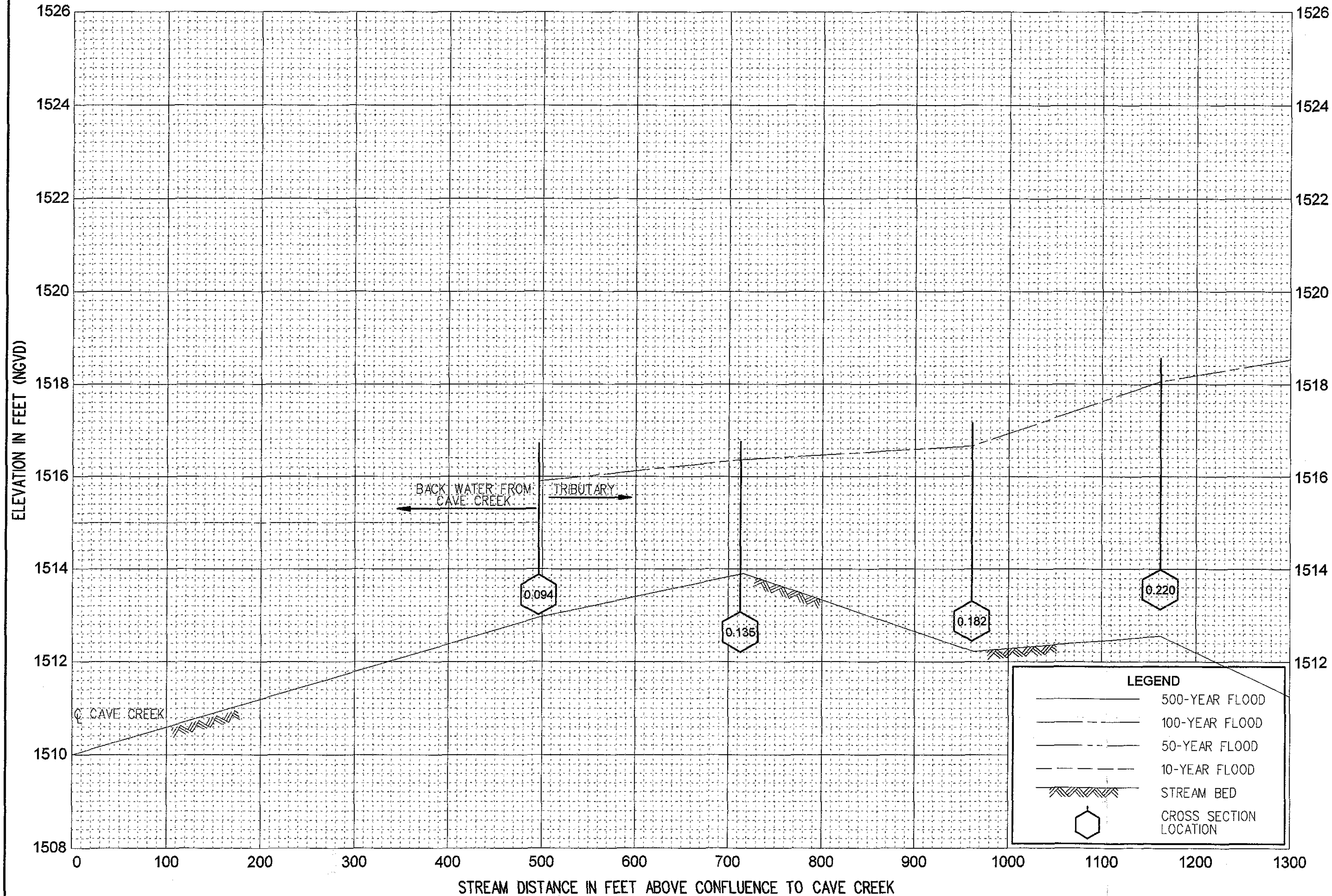
Reach	River Sta	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
111	0.094	1515.90		1516.04	186.95		1000.00			150.00	350.00	
111	0.094	1516.58	0.68	1516.86	72.00		1000.00		168.00	150.00	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	0.365	1518.58		1518.58	235.96		468.83	0.17		98.98	338.00	
112	0.365	1519.52	0.95	1519.53	177.00		469.00		133.00	98.98	338.00	310.00
112	0.380	1518.58		1518.58	327.78		469.00			76.95	440.00	
112	0.380	1519.52	0.95	1519.53	197.00		469.00		143.00	76.95	440.00	340.00
112	0.401	1518.58		1518.59	376.49		469.00			119.00	550.00	
112	0.401	1519.53	0.94	1519.53	192.00		469.00		208.00	119.00	550.00	400.00
112	0.431	1518.60		1518.61	302.62		469.00			50.00	390.00	
112	0.431	1519.54	0.94	1519.54	230.00		469.00		90.00	50.00	390.00	320.00
112	0.469	1518.96		1519.25	192.44		469.00			150.00	408.00	
112	0.469	1519.53	0.57	1519.68	130.00		469.00		190.00	150.00	408.00	320.00
112	0.511	1521.14		1521.21	229.90		469.00			136.81	410.00	
112	0.511	1521.40	0.26	1521.71	80.00		469.00		160.00	136.81	410.00	240.00
112	0.560	1522.69		1522.81	192.78	0.01	468.99			59.00	360.00	
112	0.560	1523.23	0.54	1523.30	180.00		469.00		120.00	59.00	360.00	300.00
112	0.580	1523.60		1523.77	200.12	6.09	462.91			204.37	350.82	
112	0.580	1523.73	0.12	1524.01	105.00		469.00		230.00	204.37	350.82	335.00
112	0.610	1524.83		1524.95	142.97		469.00			120.00	300.00	
112	0.610	1525.57	0.73	1525.85	60.00		469.00		190.00	120.00	300.00	250.00
112	0.633	1525.70		1525.89	151.01		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

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	1519.51	0.93	1519.52	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	1519.51	0.93	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	1519.43	0.85	1519.59	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

Appendix C

Flood Profiles
Flood Tables
Annotated Firm Map

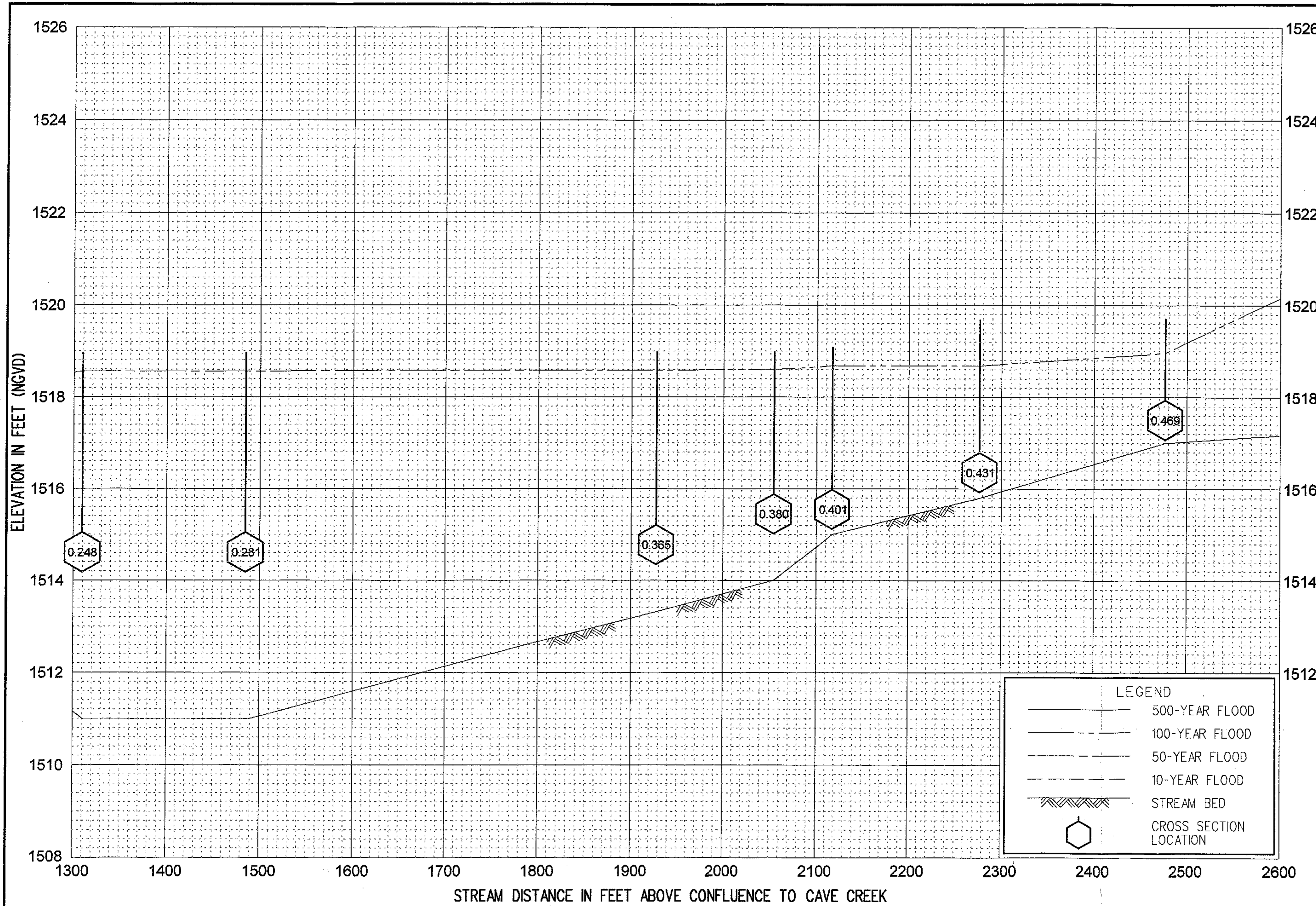


FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

01P

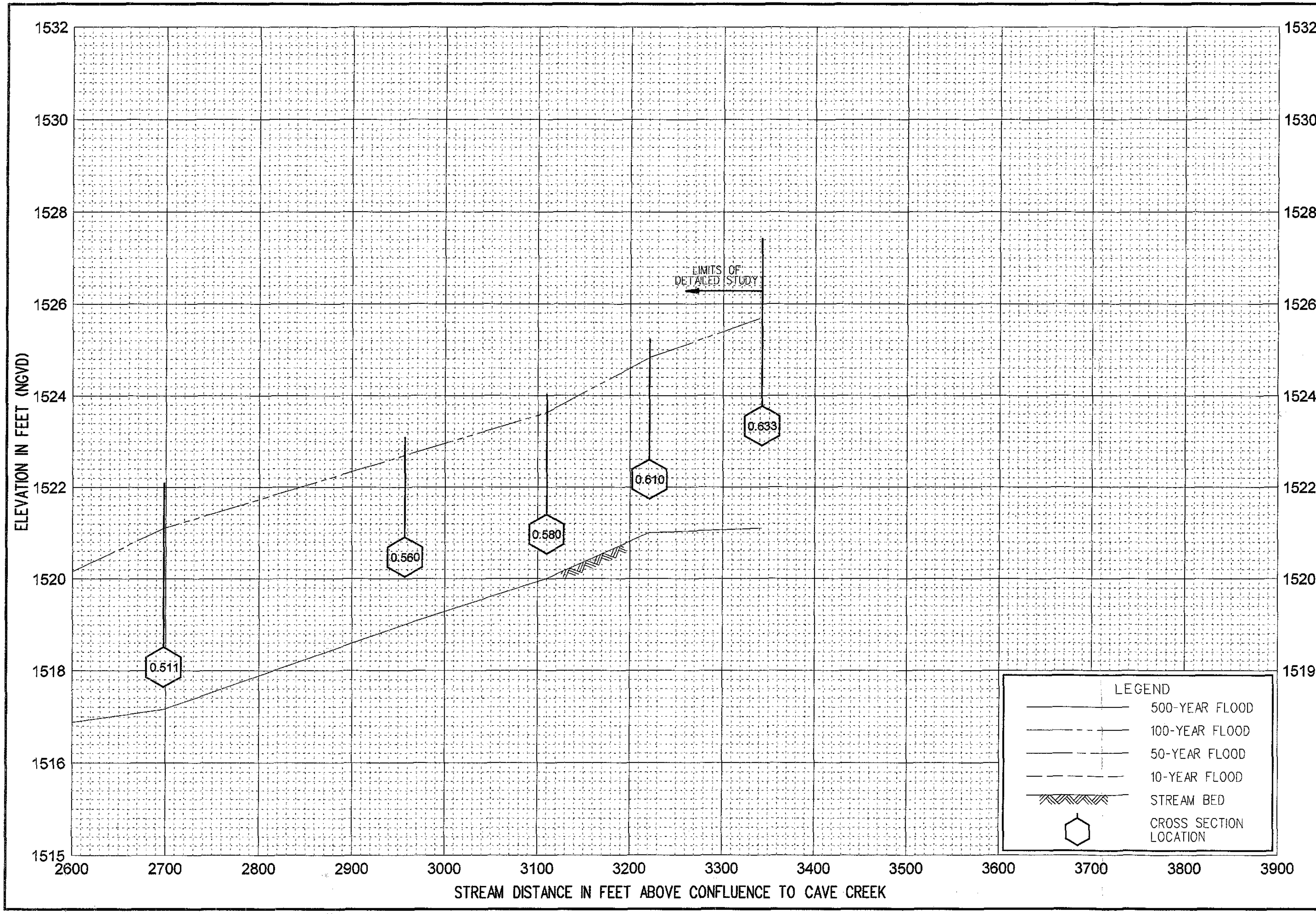


FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

02P

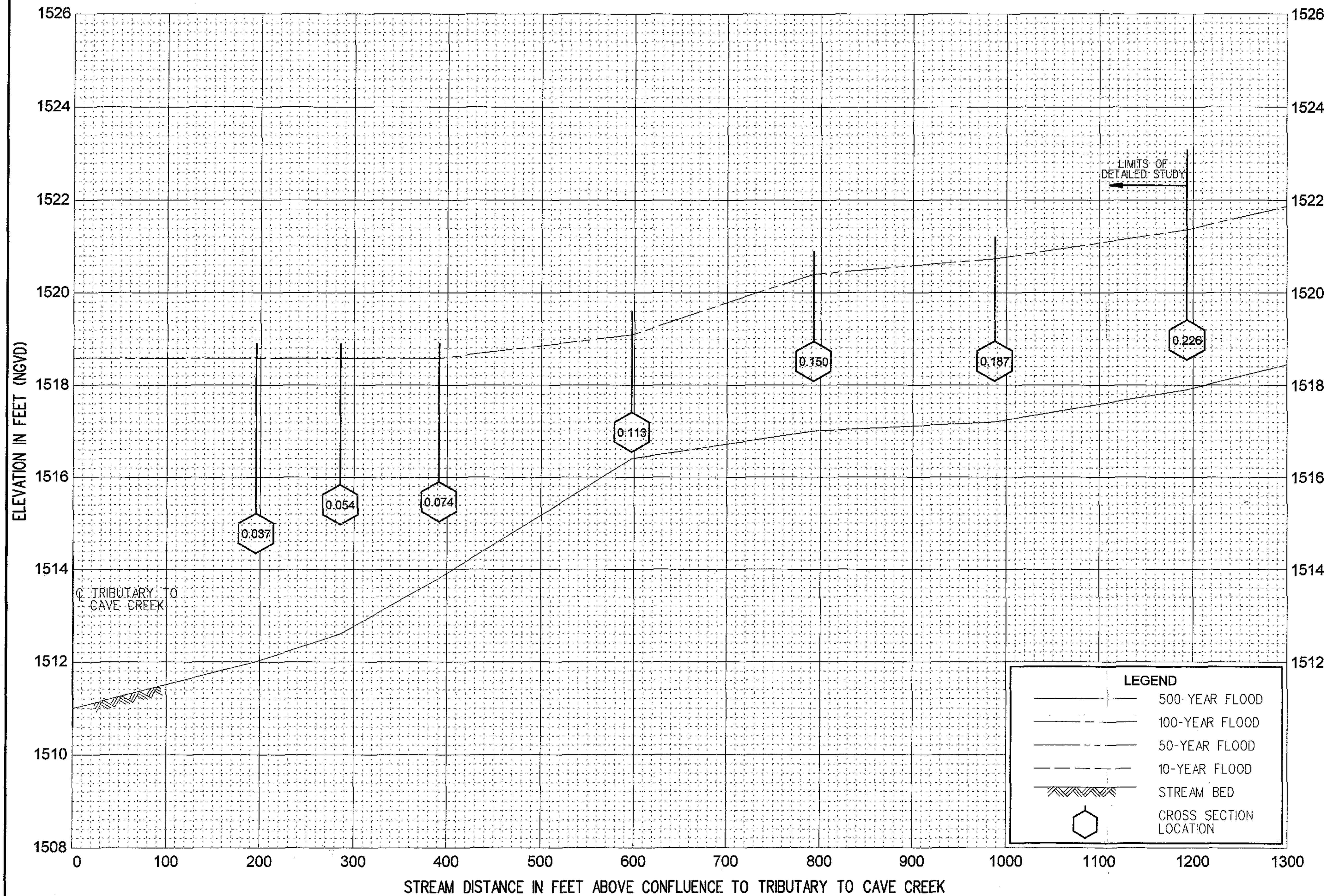


FLOOD PROFILES

TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

03P



FLOOD PROFILES

TRIBUTARY TO TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF PHOENIX, AZ
MARICOPA

01P

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE (Mi)	WIDTH (FT)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (FT/S)	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FT)
0.000	0.000	N/A	N/A	N/A	1515.0	1515.0	0.0
0.094	0.094	57	114	8.1	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	155	115	8.7	1518.1	1518.1	0.0
0.248	0.248	133	655	1.5	1518.6	1519.5	0.9
0.281	0.281	335	2597	0.4	1518.6	1519.5	0.9
0.365	0.365	177	907	0.5	1518.6	1519.5	0.9
0.380	0.380	197	889	0.5	1518.6	1519.5	0.9
0.401	0.401	192	731	0.6	1518.6	1519.5	0.9
0.431	0.431	230	638	0.7	1518.6	1519.5	0.9
0.469	0.469	130	151	3.1	1519.0	1519.5	0.5
0.511	0.511	80	105	4.5	1521.1	1521.4	0.3
0.560	0.560	180	220	2.1	1522.7	1523.2	0.5
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)	WITHOUT FLOODWAY	WITH 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

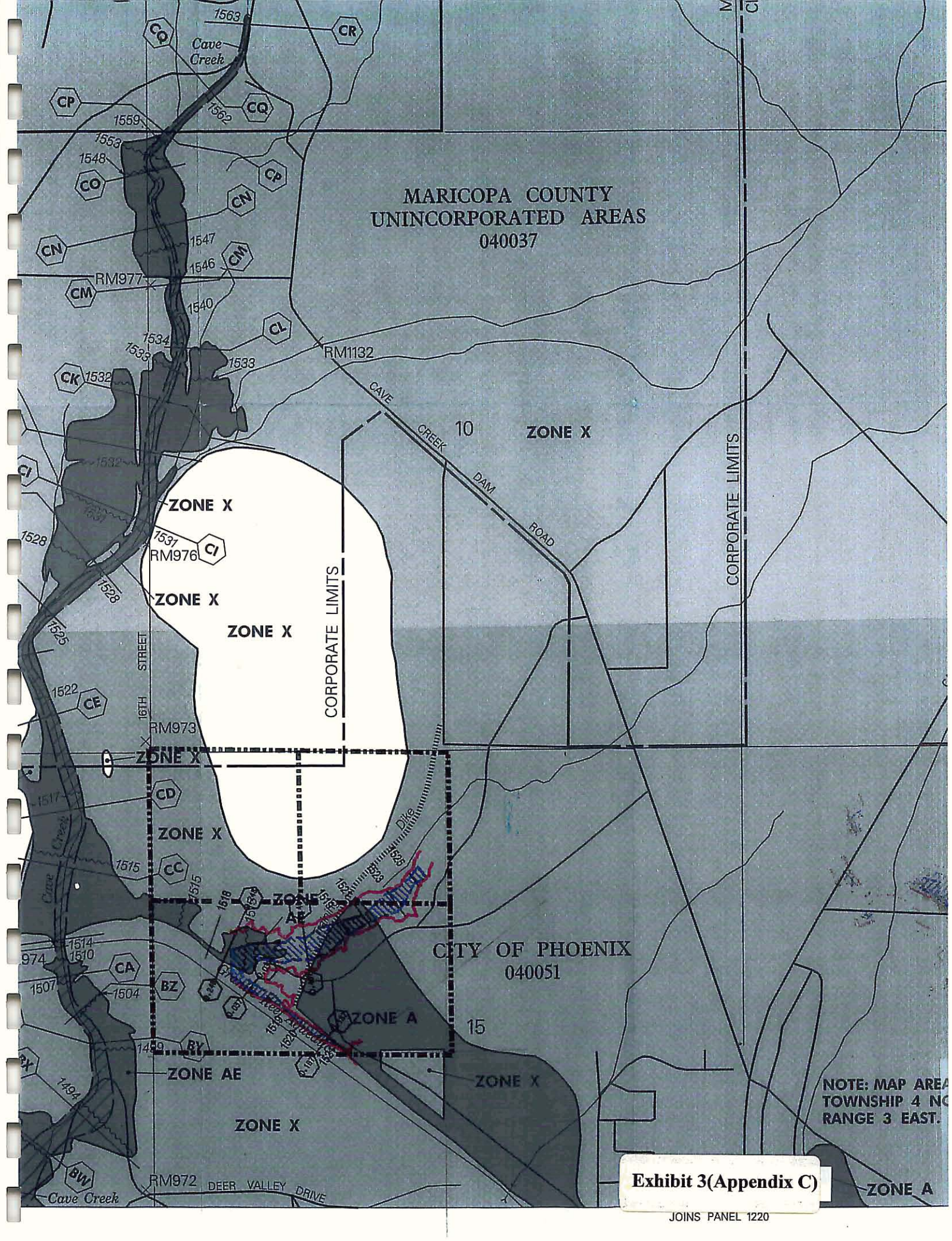


Exhibit 3(Appendix C)

JOINS PANEL 1220

Appendix D

Previous Study Exhibit 1

Pocket

Drainage Map (Hydrology)
Work Maps (Hydraulics)

Memorandum

To: Brian Burch, Metropolitan Land Co.

From: Sandra Phillips, P.E. Project Manager

Date: June 26, 1998

Re: 39-acre Property @ NWC of 20th Street & Pinnacle Peak Rd Alignment – *Subdivision Lot Analysis*

CMX Group has performed a due diligence investigation of a proposed 39-acre residential subdivision located north of Deer Valley Road and north east of the Central Arizona Project (CAP) Canal and 20th Street. (See Exhibit 'A'). The development constraints evaluated were floodplain analysis, sanitary sewer availability, lot layout, existing easements and aircraft noise levels.

FLOODPLAIN ANALYSIS

Existing Conditions: The Flood Insurance Rate Maps # 1210F and #1220 G dated September 1995(see Exhibit "B"), depict that the proposed subdivision is located primarily in Flood Zone 'A' and partially within Zone 'AE'. Zone 'A' has 'no base flood elevations determined.' Zone AE, which has 'base flood elevations determined', is associated with the Cave Creek Wash.

The FIRM map shows a training dike that prevents backwater, associated with a siphon-drained basin, from entering the Cave Creek Wash. This siphon supposedly allows the runoff located north of Deer Valley to drain to the southern side. A field visit to the site revealed no existing siphon or training dike as indicated on the FIRM maps. This existing condition is also reflected in the Mountaingate Unit I drainage report (an adjacent property to the east) dated March 12, 1997 by Sage Engineering.

The current drainage patterns are different than those shown on the FIRM maps. A drainage channel, north of the CAP canal within the CAP right-of-way, was cut to convey runoff to the Cave Creek Wash. This runoff is composed of flows from acreage north of Deer Valley Road and Mountaingate. Total 100-year storm runoff volume to be conveyed within this channel is 440cfs. However this channel disappears where it intersects a wash that runs through the subject property and Mountaingate Unit II (1293 cfs). This wash will pond and eventually spill into the Cave Creek Wash then cross over the CAP following the natural contours.

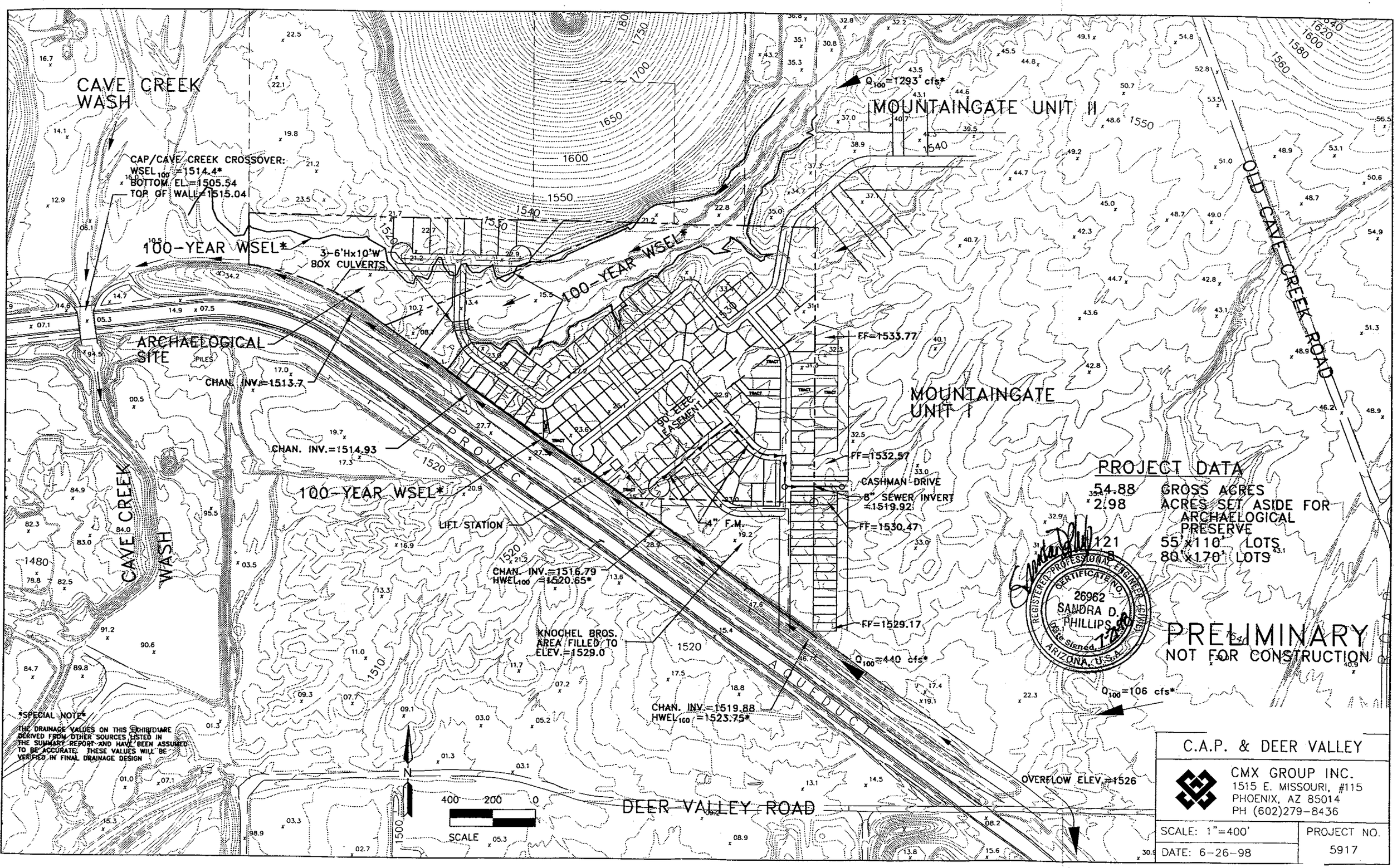
The water surface elevation associated with the 50-year storm event where the Cave Creek Wash crosses over the CAP is 1514.4. If this CAP channel or the crossing become clogged and no longer convey flows, Deer Valley Road will control the high water elevation. The overflow elevation on Deer Valley is approximately 1526.0. A Letter of Map Revision

(LOMR) is on file with FEMA that indicates the finished floor elevation of Mountaingate Unit I residences are one foot above this Deer Valley Road outfall elevation.

According to conversations with Maricopa County Flood Control Staff, there have been no formal plans filed with the agencies to alter the existing flood zones.

A portion of this project will be impacted by Federal Waters of the United States 404 Permit as determined by the U.S. Army Corps of Engineers. However, only one crossing is being considered at this time and should be discussed with the Corps. From our experience, we believe the encroachment on the wash due to a single roadway crossing would not be a problem.

Recommendations: A HEC analysis should be run on the wash that conveys 1293 cfs through the site. There have been significant changes to the upstream drainage basin that might decrease the peak flows. Where this wash has to change directions just north of the CAP, by approximately 90 degrees, backwater and erosion will occur. The high water elevation due to the flows and the backwater will need to be determined to establish minimum finished floor elevations. Due to the quantity of flow conveyed within this wash, we believe the lots that have been located by the State Land Development Staff should be moved back from the wash bank, see the proposed lot layout attached.



SPECIAL NOTE

THE DRAINAGE VALUES ON THIS EXHIBIT ARE DERIVED FROM OTHER SOURCES LISTED IN THE SUMMARY REPORT AND HAVE BEEN ASSUMED TO BE ACCURATE. THESE VALUES WILL BE VERIFIED IN FINAL DRAINAGE DESIGN

PROJECT DATA

54.88	GROSS ACRES
2.98	ACRES SET ASIDE FOR ARCHAELOGICAL PRESERVE
121	55'x110' LOTS
	80'x170' LOTS

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO. 26962
SANDRA D. PHILLIPS
Date Signed 1-7-99
ARIZONA, U.S.A.

PRELIMINARY
NOT FOR CONSTRUCTION

C.A.P. & DEER VALLEY

CMX GROUP INC.
1515 E. MISSOURI, #115
PHOENIX, AZ 85014
PH (602)279-8436

SCALE: 1"=400'
DATE: 6-26-98
PROJECT NO. 5917

Exhibit 1a(Appendix D)

Appendix D
Pocket

Drainage Map (Hydrology)
Work Maps (Hydraulics)

FLOOD PLAIN DELINEATION FOR EAGLE BLUFF II

LIMITS OF DETAILED STUDY

FLOOD PLAIN

FLOOD WAY

TRACT

CIELO GRANDE AVENUE

CASHMAN RD

PATRICK LANE

DALEY LANE

19TH WAY

19TH STREET

EASEMENT

RETENTION AREA 90' ELECTRIC

RETENTION 100 YR - 24 HR

TRACT F

TRACT D

MOUNTAIN COURT

BOOK 504 PAGE 6

MOUNTAINGATE II
BOOK 400 PAGE 17

MOUNTAINGATE
BOOK 400 PAGE 18
R1-6

UNSUBDIVIDED

ABANDONED

SITE

COUNTY
PHOENIX
PINNACLE PEAK ROAD (ALIGN.)
PHOENIX STREET (ALIGN.)
16TH STREET
20th
CENTRAL ARIZONA PROJECT
CAVE CREEK ROAD
DEER VALLEY ROAD

EAGLE BLUFF II
VICINITY MAP

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

0 50 100 200 300
SCALE: 1"=100'

FEMA CASE # _____

SHEET 1 OF 1 WORK MAP

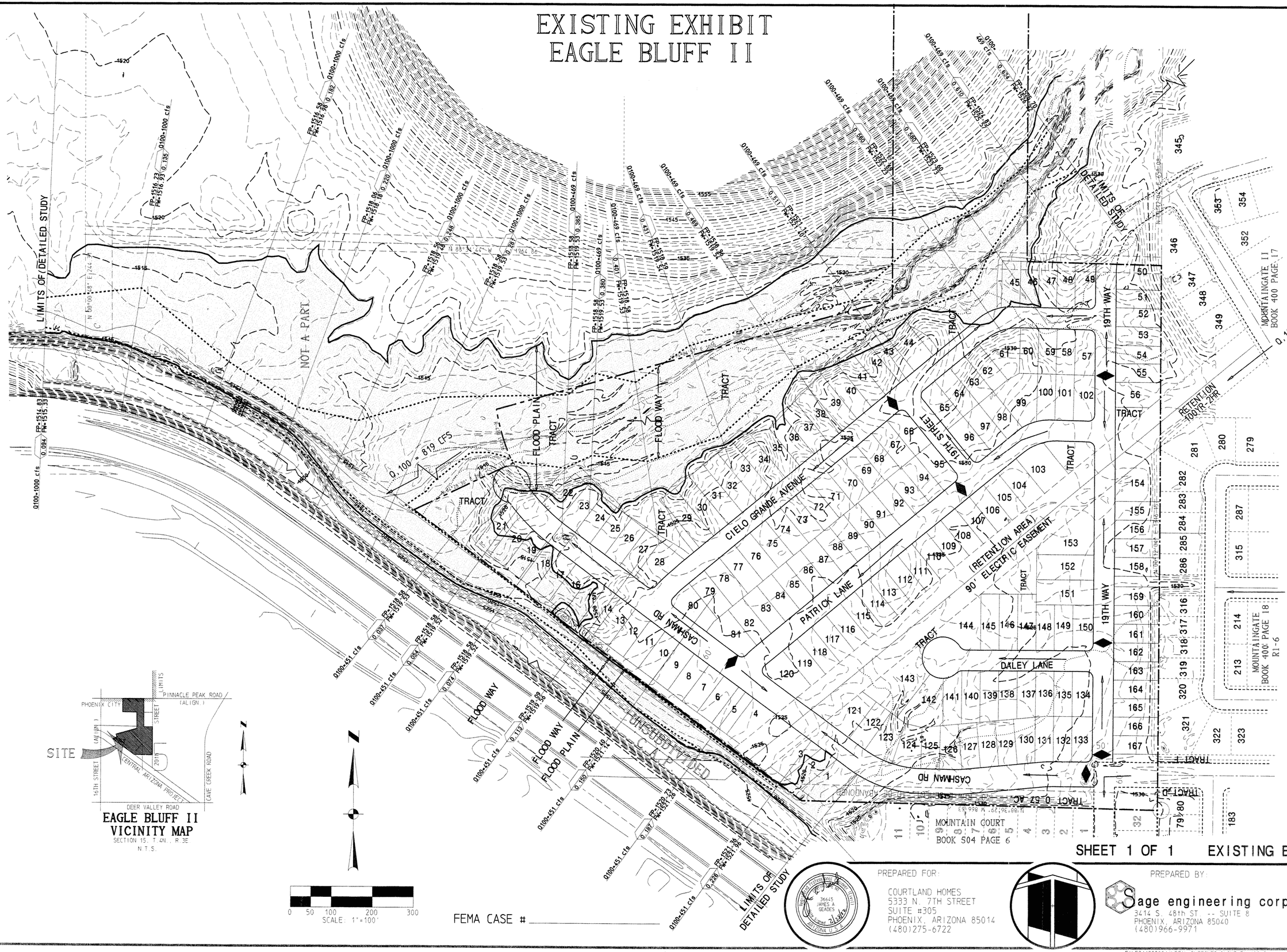
PREPARED FOR:
COURTLAND HOMES
5333 N. 7TH STREET
SUITE #305
PHOENIX, ARIZONA 85014
(480)275-6722

PREPARED BY:
sage engineering corporation
3414 S. 48th ST. -- SUITE 8
PHOENIX, ARIZONA 85040
(480)966-9971

36645 JAMES A GEADES REGISTERED LAND SURVEYOR 2/28/06 ARIZONA U.S.A.

FILE2/1298001/LEGAL_SKETCHES/CLOMR-PR-100.2

EXISTING EXHIBIT
EAGLE BLUFF II



EAGLE BLUFF II
VICINITY MAP
SECTION 15, T.4N., R.3E
N.T.S.

0 50 100 200 300
SCALE: 1"=100'

FEMA CASE # _____

SHEET 1 OF 1 EXISTING EXHIBIT

PREPARED FOR:
COURTLAND HOMES
5333 N. 7TH STREET
SUITE #305
PHOENIX, ARIZONA 85014
(480)275-6722

PREPARED BY:
Sage engineering corporation
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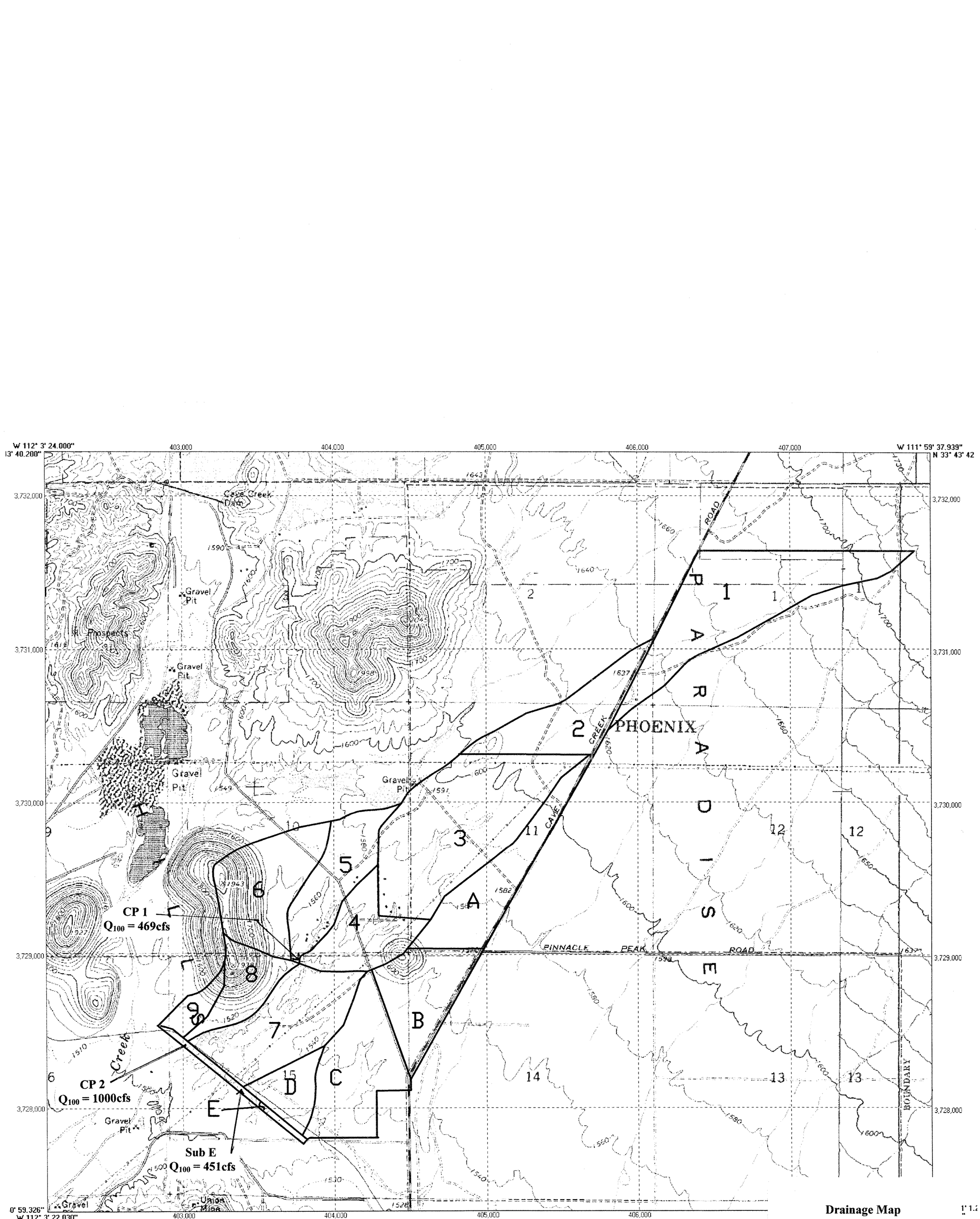
FILE2/1298001/LEGAL_SKETCHES/CLOMR-EX-100.2



Drainage Map
Eagle Bluff II
FEMA Case #_____

1" 1.2

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Appendix E
Sleeve/Back Cover

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