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FEMA CLOMR SUBMITTAL FOR A PORTION OF NEW RIVER HAPPY VALLEY ROAD TO JOMAX ROAD CITY OF PEORIA MARICOPA COUNTY, ARIZONA

August 12, 1998

Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

CVL Project No. 96-0043-21

Federal Emergency Management Agency

Washington, D.C. 20472

September 25, 1998

Mr. Timothy E. Kelly, P.E.
Project Manager
Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014-4291

IN REPLY REFER TO:
Case No.: 98-09-1019R
Community: City of Peoria, Arizona
Community No.: 040050

316-ACK.FRQ

Dear Mr. Kelly:

This responds to your letter dated September 17, 1998, concerning an August 13, 1998, request that the Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	New River Bank Protection at Terramar
Flooding Source:	New River
FIRM Panel(s) Affected:	04013C1180 E

We have completed an inventory of the items that you submitted. We have received the data and the review and processing fee ($3,300) required to begin a detailed technical review of your request. If additional data are required, we will inform you within 30 days of the date of this letter.

Please direct all questions concerning your request to our Technical Evaluation Contractor at the following address:

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

Attention: Ms. Pernille Buch-Pedersen
(703) 317-6224

When you write us about your request, you must include the case number referenced above in your letter.

If you have any questions concerning FEMA policy, or the National Flood Insurance Program in general, please contact Mr. Mike Grimm of our staff in Washington, DC, either by telephone at (202) 646-2878 or by facsimile at (202) 646-4596.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

cc: Mr. George J. Geiser, P.E.
Director, Water Resources Group
Coe & Van Lou Consultants, Inc.

Mr. Dan Nissen, P.E.
City Engineer
City of Peoria

Mr. Pedro Calza, P.E.
Flood Control District of Maricopa County

CVL COE & VAN LOO CONSULTANTS, INC.

Land Planning • Civil Engineering • Water Resources Engineering • Environmental Sciences • Landscape Architecture • Surveying • Construction Management

Founded in 1958 by P.E. Coe, P.E. (1915-1977) H.W. Van Loo, P.E.

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August 13, 1998

Mr. Mathew B. Miller, P.E. Chief
Hazard Study Branch
Mitigation Directorate
Federal Emergency Management Agency
500 C. Street SW
Washington, DC 20472

ATTN: Mr. Mike Grimm

Re: Conditional Letter of Map Revision (CLOMR) Request for a Portion of New River, Between Happy Valley Road and Jomax Road in the City of Peoria, Maricopa County, Arizona
CVL Project No: 96-0043-21

Dear Mr. Miller:

This is a request for a conditional letter of map revision to the Flood Insurance Rate Map (FIRM), for the City of Peoria, Arizona. Pertinent information about this request is listed below:

Community Affected:	City of Peoria, Arizona
Identifier:	New River Bank Protection at Terramar
Flooding Source:	New River
FIRM Panel Affected:	04013C1180 E (September 29, 1989)

The purpose of this CLOMR is to construct channel improvements and bank protection so that a new residential development (Terramar) can be constructed adjacent to New River. This application also reflects new topographic mapping of 1 foot contour interval.

The following information is submitted in support of the CLOMR:

1. A check from Richfield Investments in the amount of $3,100.00 payable to National Flood Insurance Program
2. A complete set of FEMA application forms (Appendix F)
3. Effective FIS HEC-2 Model (Appendix B)
4. Duplicate Effective FIS HEC-2 Model (Appendix C)
5. Existing Condition New River HEC-RAS Model (Appendix D)
6. Proposed Condition New River HEC-RAS Model (Appendix E)
7. Annotated map for the proposed floodplain/floodplain (Figure 3)
8. One 3-1/2" diskette with hydraulic analyses input/out files

FLOOD CONTROL DISTRICT
RECEIVED
AUG 17 1998
CHENG | P & PM
PIO | REG
ADMIN | PWLMGT
FINANCE | CONTRACT
O & M | FILE
ENGR
REMARKS: PAC

N:\960043\ADMIN\43-575L.WP8

4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014-4291 (602) 264-6831 FAX (602) 264-0928

Should additional information be requested, please contact either Jim Geiser, P.E., or Kofi Awumah, Ph.D., P.E. of Coe & Van Loo Consultants, Inc., at (602) 264-6831.

Sincerely,

COE & VAN LOO
Consultants, Inc.

George J. (Jim) Geiser, P.E.
Director, Water Resources Group

GJG:mar

Enclosures

c: Dan Nissen, P.E.
City of Peoria
8401 W. Monroe St.
Peoria, AZ 85345

Pedro Calza, P.E.
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

Terri Miller
State Coordinator, HFIP
Arizona Department of Water Resources
500 N. 3rd Street
Phoenix, AZ 85004

FEMA CLOMR SUBMITTAL FOR A PORTION OF NEW RIVER HAPPY VALLEY ROAD TO JOMAX ROAD CITY OF PEORIA MARICOPA COUNTY, ARIZONA

August 12, 1998

Prepared for:

Richfield Investment Corporation
Napoleon Square
6001 Gulfton, Suite 200
Houston, TX 77081

Registered Professional Engineer (Civil)
CERTIFICATE NO
28148
KOFI
AWUMAH
Date Signed 8-12-98
ARIZONA U.S.A.

Prepared by:

Coe & Van Loo Consultants, Inc.
4550 N. 12th St.
Phoenix, AZ 85014
(602) 264-6831

CVL Project No. 96-0043-21

Registered Professional Engineer (Civil) CERTIFICATE NO. 28148 KOFI AWUMAH Date Signed 8-12-98 ARIZONA U.S.A.

FEMA CLOMR Submittal
for
A Portion of New River
Happy Valley Road to Jomax Road
City of Peoria
Maricopa County, Arizona

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(Appendices follow Figures)

Appendix A	Backup Hydrologic Documentation
Appendix B	Effective FIS HEC-2 Model
Appendix C	Duplicate Effective FIS HEC-2 Model
Appendix D	Existing Condition New River HEC-RAS Analysis
Appendix E	Proposed Condition HEC-RAS Analysis
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Appendix K	Layout and Typical Sections of Bank Protection
Appendix L	Grade Control Structure Details

1.0 INTRODUCTION

1.1 Scope and Location

The purpose of this report and its enclosures is to provide engineering analyses in support of a Conditional Letter of Map Revision (CLOMR) submittal to the Federal Emergency Management Agency (FEMA). This CLOMR involves a portion of New River between Happy Valley Road and Jomax Road in the City of Peoria in central Arizona (Figures 1 through 3). The purpose of this CLOMR request is to construct channel improvements so that a new residential development (Terramar) can be constructed adjacent to New River.

This report is focused on providing practical design information, evaluation, and calculations for statistical flood events up to and including the 100-year frequency flood. The procedures used herein are derived from, and performed with, currently accepted engineering methodologies and practices. Additionally, the criteria for this evaluation are designed to conform to currently applicable ordinances, regulations and policies effected by the appropriate jurisdictional regulatory authorities for the referenced site.

The analysis presented herein focuses on evaluating stormwater runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 100-year frequency event. A storm event exceeding the 100-year event may cause or create the risk of greater flood impact than is addressed and presented in this assessment. However, the scope of this assessment does not include, neither did CVL's client request that, evaluation of stormwater runoff resulting from storm events exceeding the 100-year frequency event. CVL assumes no responsibility for actual flood damage, increased risks of flood damage, or increased construction or development cost resulting from or related to any such events, nor shall CVL be responsible for any changes in, or additions to, regulatory requirements which may result from, or be related to, any such events or changes in hydrologic or hydraulic conditions within the watershed.

1.2 New River Bank Protection at Terramar

The bank protection of New River along with channel improvement is proposed as part of the Terramar development process. The proposed work is intended to both provide erosion/flood protection for the planned residential lots at the southwest corner of the project and stabilize the river adjacent to the remainder of the western portion of the development.

1.3 Objective

There are two locations of bank protection (Figures 1 through 3). The main project area which also involves channel improvement and bank protection begins approximately 2500 feet north of Happy Valley Road where the river deviates from its generally south alignment and crosses into the Terramar site in a southeasterly direction. The downstream limit of the channel works is approximately 1700 feet north of Happy Valley Road as the river moves west – back to its original alignment (see Figure 1: Location Map). A second location is about 100 feet north of Happy Valley Road where the proposed parcel will be partially in the 100-year floodplain fringe. This area will be removed from the floodplain using reinforced concrete floodwall and fill (Figure 3).

An opportunity to accomplish the channel improvement is created by the substantially reduced flow rate within New River due to the upstream New River Dam – peak 100-year discharge reduced from 53,000 cfs to 2,350 cfs (Reference 1). This reduced and concentrated flow hugs the eastern low flow channel and occupies only a portion of the older and wider New River channel section.

1.4 Methodology

Specifically, the purpose of the channel improvement of the eastern low flow channel within the wider New River channel is twofold:

- Redirect flows into the original southerly alignment thereby reducing the impinging action and erosion of land to the southeast which has a potential for endangering the proposed residential development.
- Reclaim land along the east side (of the river) that had been encroached by the river which has meandered from its original southerly course and stabilize the river banks.

The following subsections provide a description of the channel improvement and the hydrologic and hydraulic analyses used to accomplish the channel improvement without exacerbating existing conditions and impacting adjacent property.

1.5 Regulatory Jurisdiction

The development of this project is in accordance with the City of Peoria, Flood Control District of Maricopa County (FCDMC) and FEMA design requirements (Reference 2).

1.6 Previous Submittals to FEMA

The only known previous submittal to FEMA (Reference 3) regarding this area was the work completed for the in-force Flood Insurance Study (FIS) and associated FIRM.

1.7 FEMA Revision Requestor and Community Official Form

The Revision Requestor and Community Official Form (MT-2 Form 1) is provided in Appendix F per FEMA requirements.

1.8 FEMA Certification by Registered Professional Engineer and/or Land Surveyor Form

The Certification by Registered Professional Engineer and/or Land Surveyor Forms (MT-2 Form 2) are provided per FEMA requirements, and are provided in Appendix F. In reference to items 5 and 6 on the certification forms, the engineers and surveyor that reviewed this submittal have reviewed the current on-site conditions and the proposed development plans. As construction progresses, as-built information will be prepared and reviewed by Arizona registered professionals, as appropriate, before submitting final as-built information to FEMA. Due to the fact that this is a CLOMR submittal, neither the engineer nor the surveyor can certify as-built information at this time. Certification of final as-built information will be made upon application for the LOMR.

2.0 HYDROLOGIC SETTING

Hydrologic supporting documentation is presented in Appendix A. The original hydrology for New River below the New River Dam has been altered by the dam itself. "Clear" water (without sediment) is released from the dam at a 100-year peak flow rate of 2,350 cfs (References 1 and 2). At the river reach under consideration, lateral flows from the watershed areas downstream of the dam have increased the peak 100-year flow to 4,200 cfs (Reference 1).

3.0 HYDRAULIC ANALYSES

The HEC-RAS River Analysis System (Reference 4) computer program by the U.S. Army Corps of Engineers was used to perform steady flow backwater computations to evaluate the flow characteristics of New River in the vicinity of the project site.

A base model for existing conditions of flow was developed. This model is listed in Appendix D. Locating the flow path was a challenge due to numerous low flow channels within the wider New River main channel. Also, the reduced flow from the New River Dam results in some channels being dry and others flowing full or partially full.

Channel input parameters such as channel and overbank roughness and contraction/expansion coefficients were estimated after a site visit and verified with a previous hydraulic model prepared by the U.S. Army Corps of Engineers for the Federal Emergency Management Agency's (FEMA's) Flood Insurance Study (FIS) of Maricopa County, Arizona and incorporated areas (Reference 5). The HEC-2 input file NRIVER.DAT was provided by the FCDMC. A listing of the original FIS hydraulic model is given in Appendix B and a "Duplicate effective FIS" model is listed in Appendix C. Channel cross sections were taken from aerial photogrammetry based upon 1 foot contour interval maps prepared by Aerial Mapping Company, Inc. in 1996.

The proposed realignment hydraulic model was created by widening the low flow channel within the Terramar project site and relocating it approximately 100 feet west. This proposed condition model is listed in Appendix E. The results show that the water surface and energy elevations compare well with the existing conditions and are lower in the realigned channel. Also, the conveyance characteristics of the improved and existing channels are similar. Flow velocities are also not significantly changed (see Table 1).

4.0 PROPOSED CHANNEL IMPROVEMENTS

The improved channel is an excavated trapezoidal channel with a gabion-reinforced east bank (see Figures 3 and 4 for channel alignment and section). The existing natural side slope for the east bank transitions into a stepped gabion wall which continues southeast, south and southwest to match the existing east New River bank as the channel exits Terramar. No gabion bank protection is proposed for the short stretch of the west bank affected by the proposed realignment. Instead, the channel bank on the west side will be graded to a stable slope of 3:1. It may be noted that the original channel inverts are projected onto the new realigned channel. Top of proposed bank elevations were established by increasing the computed water surface elevations by the magnitude of computed freeboard. Freeboard calculations are given in Appendix H.

5.0 SCOUR ANALYSIS

A scour analysis (see Appendix G) was used to design the foundation of the gabion wall and the apron extending into the channel. This analysis included long term degradation as well as local and general scour. Due to the dam, "clear" water is expected to flow out of the outlet so that sediment inflow to the reach will be picked up from the upstream channel reach. The potential long term effect is a slight degradation in this reach. A grade control structure has been constructed across the channel at Happy Valley Road alignment and this will limit channel headcutting upstream. Details of this grade control structure are shown in Appendix L.

6.0 INSPECTION AND MAINTENANCE PROGRAM

The channel and bank protection in the Terramar development will be maintained by the developer until such time as it is turned over to the City of Peoria. The FCDMC has jurisdiction over the New River Channel and would have been the agency responsible for the maintenance of the bank protection. However, during negotiations among the developer, City of Peoria and FCDMC, the City of Peoria preferred gabion walls over the soil cement type favored by FCDMC. Therefore, City of Peoria will accept maintenance responsibility. A Letter of Understanding among the involved parties is in the review process.

7.0 SUMMARY AND CONCLUSIONS

The study demonstrates the feasibility and viability of the proposed New River channel realignment. In addition to freeing up area for development along the east side of the river, the proposed residential lots to the southeast are also protected from the eroding/scouring action of the river.

The peak 100-year flow rate of 4,200 cfs in New River will be safely conveyed across the CLOMR Area in a new, bank protected channel. This will essentially maintain the water surface profile and limit the 100-year floodplain width to the channel width. This channel will provide for relatively low velocities even during the 100-year flow. Erosion protection will be provided, as necessary, for the channel east side slopes across the CLOMR Area.

8.0 COMPLETED FEMA FORMS

All FEMA forms required to support this CLOMR request have been completed and are included in Appendix F. Additional supporting documentation is also included in Appendices I through J. A set of layout and sections for the proposed bank protection is included in Appendix K.

9.0 REFERENCES:

1. U.S. Army Corps of Engineers, Los Angeles District, *Gila River Basin and New River and Phoenix City Streams, Arizona, Design Memorandum No. 2, Part 2,* 1982.

2. Drainage Design Manual for Maricopa County, Volume II, Hydraulics, Flood Control District of Maricopa County, 1996.

3. Federal Emergency Management Agency, *Flood Insurance Study of Maricopa County, Arizona and Unincorporated Areas*, September 30, 1995.

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center, *HEC-RAS River Analysis System User's and Hydraulic Reference Manuals, Version 1.0*, July 1995.

5. U.S. Army Corps of Engineers, Los Angeles District, *HEC-2 Hydraulic Study, HEC-2 Model NRIVER.DAT for Federal Emergency Management Agency's Flood Insurance Study of Maricopa County, Arizona and Unincorporated Areas* (September 30, 1995).

6. Federal Emergency Management Agency, Flood Insurance Rate Map Number 04013C1180E, September 30, 1995.

DOCUMENT QUALITY ASSURANCE

As part of CVL's policy to provide quality products to its clients, all reports are subject to review for technical accuracy, validity of conclusions and appropriateness of recommendations.

This document was prepared by: Kofi Awumah

Printed/Typed Name: *Kofi Awumah, Ph.D., P.E.*

Date: *August 12, 1998*

This document was peer reviewed by: Timothy E Kelly

Printed/Typed Name: *Tim Kelly, P.E.*

Date: *August 12, 1998*

This document was prepared under the direction of: George J. Geiser

Printed/Typed Name: *George J. Geiser, P.E.*

Date: *August 12, 1998*

TABLE

TABLE 1

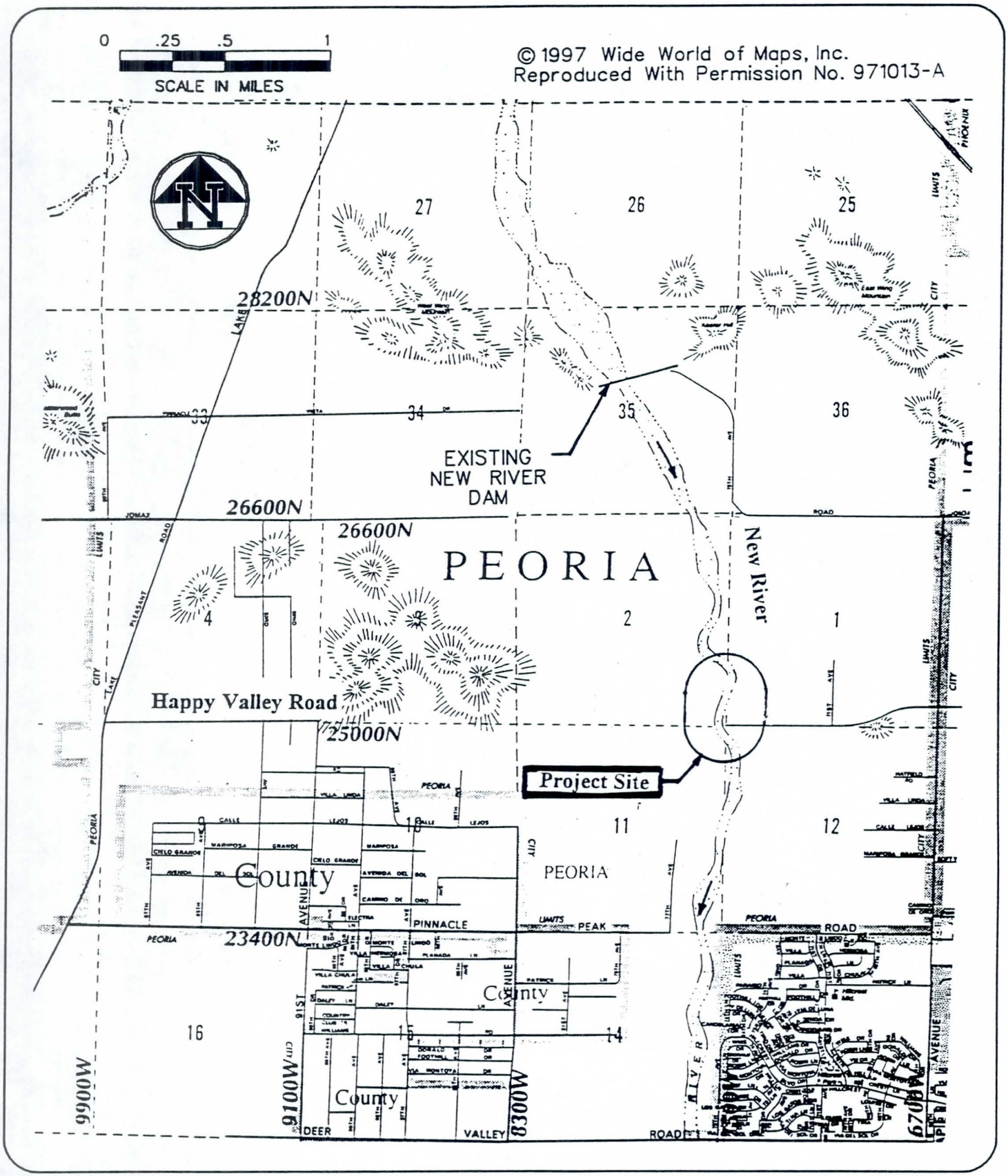
Summary Table
Comparison of Existing and Proposed Channel Characteristics[1]

Section[2] Locations	Discharge (cfs)	Water Surface Elevation (ft)		Channel Velocity (fps)		Top Width (ft)		Froude Number	
		Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
2.106 (15.144)	4200	1337.1	1337.4	4.7	5.3	776	331	0.6	0.6
2.108 (15.333)	4200	1338.8	1339.0	4.9	4.5	289	399	0.5	0.4
2.109 (15.519)	4200	1341.0	1341.0	3.7	3.7	353	352	0.4	0.4
2.120 (15.699)	4200	1347.6	1337.4	7.4	8.7	247	209	0.7	0.8
2.160 (15.977)	4200	1356.4	1356.4	5.5	5.5	475	475	0.6	0.6

Notes:

1. Sections in parenthesis refer to FIS section numbers
2. Refer to HEC-RAS output in the appendix for geometry of sections and the water surface profile graphics.

FIGURES



LOCATION MAP	TERRAMAR - NEW RIVER	JOB NO 960043-21
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 1

FILE: N:\960043\LAND\SDMAP.DGN DATE:8-98

FILE: N:\960043\LAND\SDMAPFP1.DGN DATE:7-98

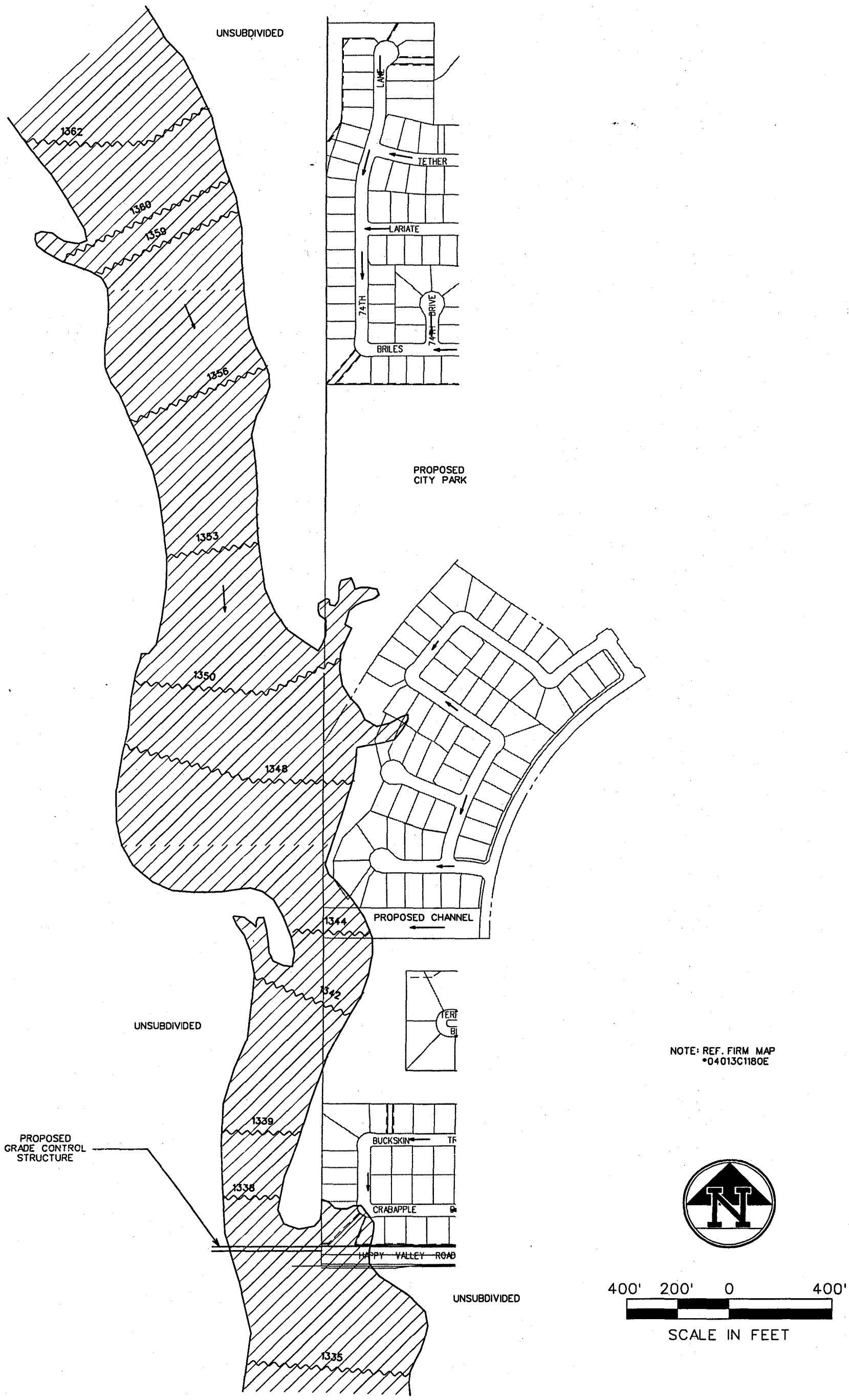


FIGURE 2

JOB NO 960043-21

EXISTING FLOODPLAIN LIMITS

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

TERRAMAR-NEW RIVER

COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE

FILE: N:\960043\LANDSDMAPFPI.DGN DATE:7-98

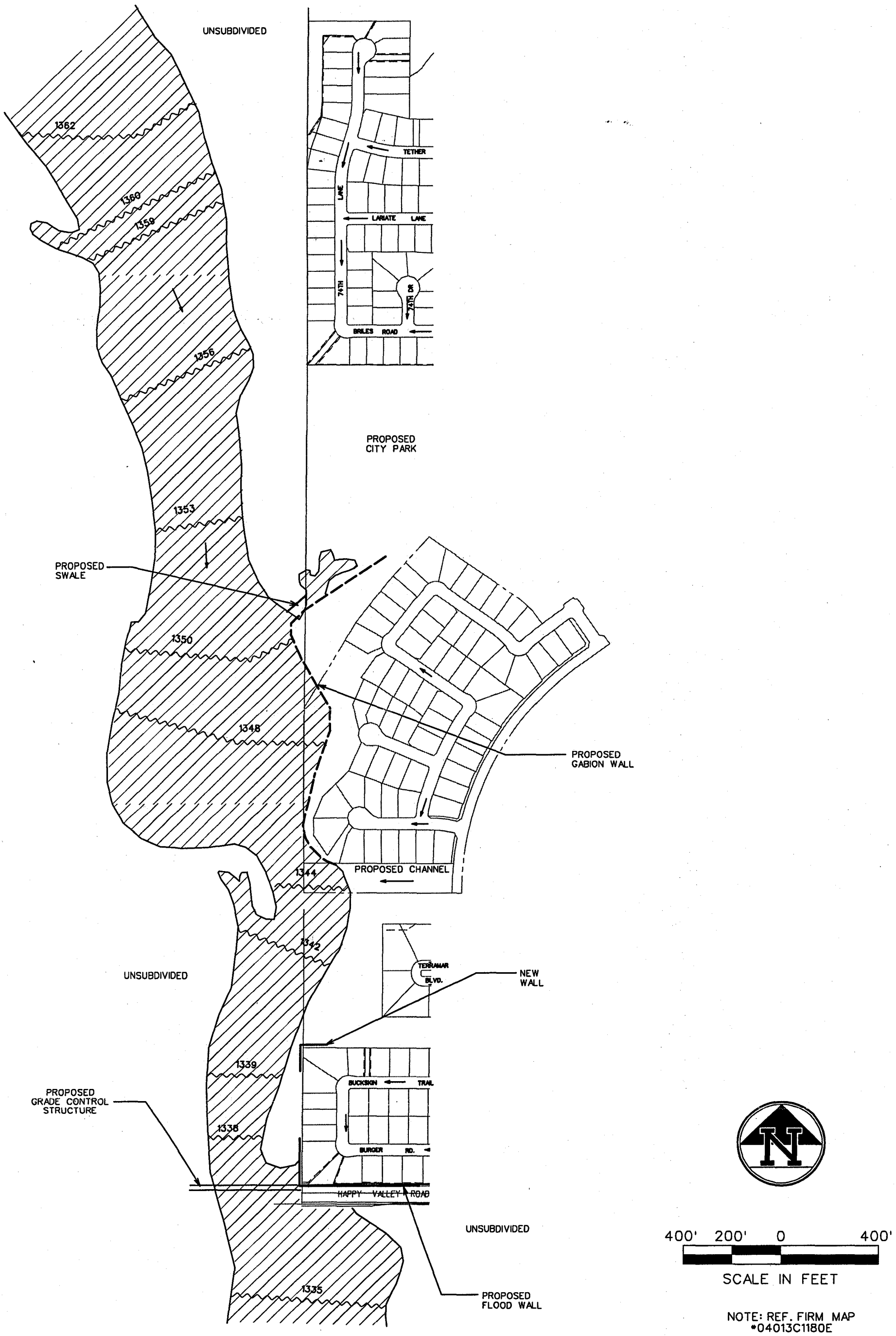


FIGURE 3

JOB NO 960043-21

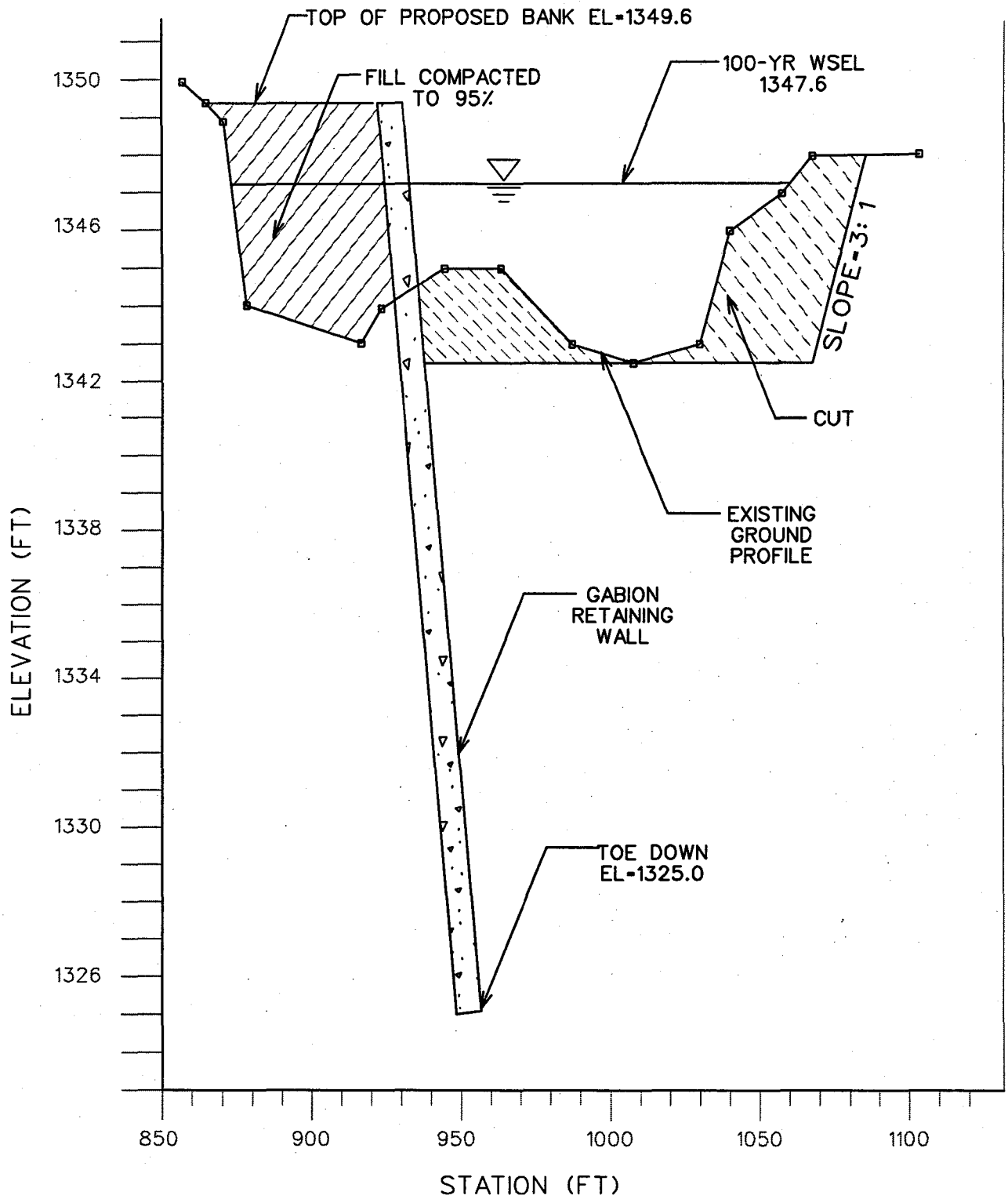
PROPOSED FLOODPLAIN LIMITS & BANK PROTECTION

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

TERRAMAR-NEW RIVER

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

NOTE: LOWEST PROPOSED ADJACENT FINISH FLOOR ELEVATION= 1351.1



SCALE: HORIZ. 1'=50'/VERT. 1"=4'

TYPICAL CHANNEL CROSS SECTION	TERRAMAR - NEW RIVER	JOB NO 960043-21
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE	FIGURE 4

FILE: N:\960043\LAND\EXHCHAN.DGN DATE:8-98

APPENDICES

Appendix A

BACKUP HYDROLOGIC DOCUMENTATION

US Army Corps
of Engineers
Los Angeles District

Gila River Basin

Phoenix, Arizona & Vicinity (including New River)

Hydrology Part 2

Design Memorandum No. 2

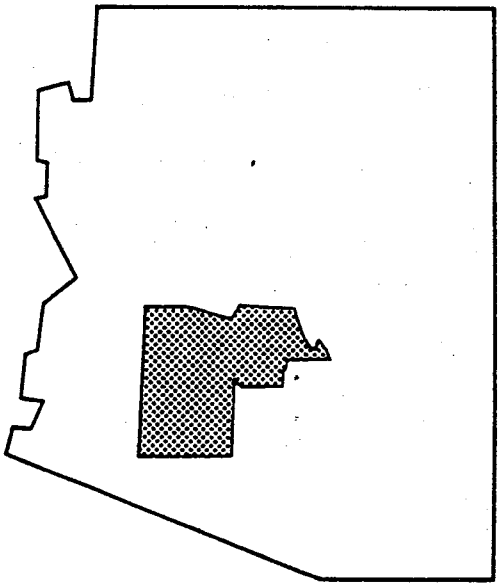
TABLE 1 (Continued)

DESIGN PEAK DISCHARGES
FUTURE CONDITIONS WITH PROJECT

CP	LOCATION	DRAINAGE AREA (mi^2)	SPF (ft^3/s)	100-YEAR FLOO (ft^3/s)
	ACDC			
1016U	Above Cave Creek	19.7	15,000(6)	15,000(2)
1016D	Below Cave Creek	61.1(8)	25,000(6)	25,000(5,8)
1018	Near 51st Ave.	70.3	26,000(6)	26,000(5)
1019	Above Skunk Creek	85.4	29,000(6)	29,000(5)
	SKUNK CREEK			
1031U	Inflow - Adobe Dam	89.6	66,000(9)	39,000(2)
1031D	Outflow - Adobe Dam	0	1890(9)	1730(9)
1021U	Above Scatter Wash	0.9	4500(9)	2800(9)
1021D	Below Scatter Wash	9.4(5)	21,000(5)	10,000(5)
1022U	Above ACDC	24.9(10)	26,000(5,10)	13,000(5,10)
1022D	Below ACDC	110.3(11)	55,000(5,11)	35,000(5,11)
1029	Above New River	111.2(11)	55,000(5,11)	35,000(5,11)
	NEW RIVER			
1033U	Inflow - New River Dam	164	76,000(3)	53,000(2)
1033D	Outflow - New River Dam	0	2665(5)	2350(5)
1025	Above Beardsley Rd.	10.3	24,000(7)	12,000(7)
1029U	Above Skunk Creek	20.7(12)	38,000(5,12)	19,000(5,12)
1029D	Below Skunk Creek	123.6	68,000(5,13)	41,000(5,13)
1039	Above Agua Fria River	159.7	69,000(5,13)	39,000(5,13)
	AGUA FRIA RIVER(14)			
1034U	Inflow - Waddell Dam	1459	158,000(5)	135,000(5)
1034D	Outflow - Waddell Dam	1459	158,000(5)	135,000(5)
1037	At Bell Rd.	1870	151,000(5)	115,000(5)

FLOOD INSURANCE STUDY

MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
VOLUME 1 OF 12



COMMUNITY NAME	COMMUNITY NUMBER
AVONDALE, CITY OF	040038
BUCKEYE, TOWN OF	040039
CAREFREE, TOWN OF	040126
CAVE CREEK, TOWN OF	040129
CHANDLER, CITY OF	040040
EL MIRAGE, TOWN OF	040041
GILA BEND, TOWN OF	040043
GILBERT, TOWN OF	040044
GLENDALE, CITY OF	040045
GOODYEAR, TOWN OF	040046
GUADALUPE, TOWN OF	040111
LITCHFIELD PARK, CITY OF	040128
MARICOPA COUNTY UNINCORPORATED AREAS	040037
MESA, CITY OF	040048
PARADISE VALLEY, TOWN OF	040049
PEORIA, CITY OF	040050
PHOENIX, CITY OF	040051
QUEEN CREEK, TOWN OF	040132
SCOTTSDALE, CITY OF	045012
SURPRISE, TOWN OF	045053
TEMPE, CITY OF	040054
TOLLESON, CITY OF	040055
WICKENBURG, TOWN OF	040056
YOUNGSTOWN, TOWN OF	040057

REVISED: SEPTEMBER 30,1995

Federal Emergency Management Agency

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Agua Fria River (cont'd)					
At confluence with Gila River	--[2]	22,000	68,000	94,000	183,000
Above downstream end of COE levee (0.7 mile below Lower Buckeye Road)	--[2]	22,000	69,000	95,000	184,000
New River					
Near Rock Springs	--[2]	--[1]	--[1]	34,500	--[1]
At New River Road	--[2]	--[1]	--[1]	32,000	--[1]
At Interstate 17	--[2]	--[1]	--[1]	33,400	--[1]
Above confluence with Sweat Canyon Wash	--[2]	--[1]	--[1]	33,000	--[1]
At Carefree Highway	--[2]	--[1]	--[1]	35,800	--[1]
Upstream of New River Dam	--[2]	--[1]	--[1]	49,300	--[1]
At Outflow of New River Dam	0	1,700	2,200	2,350	--[1]
Above Beardsley Road	10.3	2,400	6,500	9,800	--[1]
Above confluence with Skunk Creek	17.3	2,700	8,000	12,000	--[1]
Below confluence with Skunk Creek	--[2]	13,500	31,000	41,000	75,000
Sweat Canyon Wash					
Above confluence with New River	--[2]	--[1]	--[1]	19,800	--[1]
Powder House Wash					
At Jack Burden Road	1.9	300	1,300	1,900	4,400
Martinez Wash					
At Mouth	103.0	9,220	27,400	32,000	45,000
Mockingbird Wash					
At U.S. Highways 60, 70, and 89	6.9	2,750	4,040	5,060	7,400
Little San Domingo Wash					
At U.S. Highways 60, 70, and 89	6.2	1,690	2,620	3,090	4,250
Wittmann Drainage					
At Atchison, Topeka & Santa Fe Railway	8.6	1,760	2,770	3,060	4,350

[1]Not Computed
[2]Not Available

Table 3. Summary of Discharges (Cont'd)

LEGEND

——— — ——— 100 YEAR FLOODPLAIN

— — — — FLOODWAY

—•••— STREAMLINE

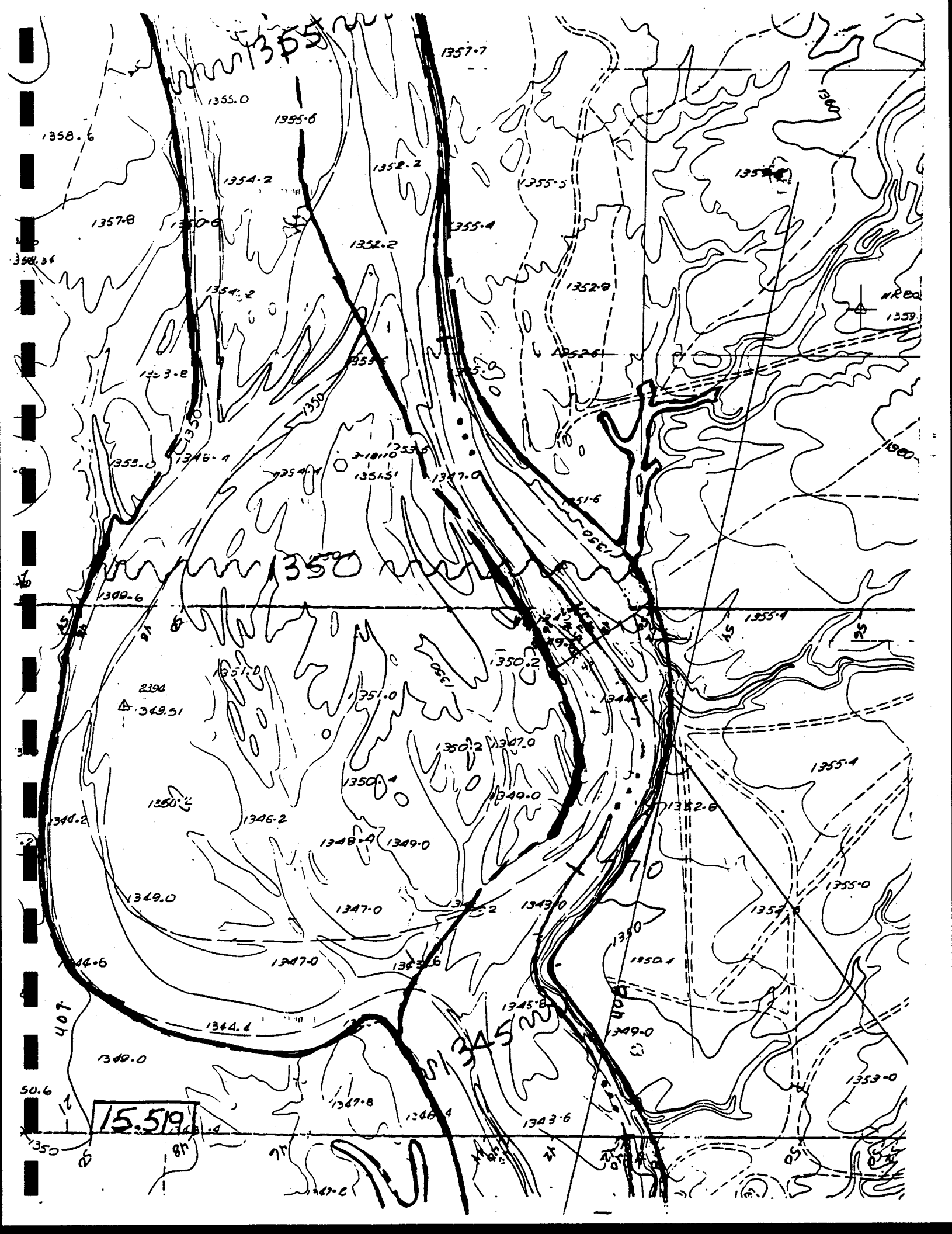
NOTE: 500 YEAR LIMIT NOT SHOWN

SCALE: 1" = 200'

2 FT C.I.

FOLLOWING SHEETS, INCLUDING HEC-2 OUTPUT, ARE FROM THE U.S. CORPS OF ENGINEERS' HEC-2 MODEL 'RIVER-2.DAT USED TO ESTIMATE 100 YR FLOOD PLAIN FOR FEMA FIS DATED SEPT. 30, 1995. COE STUDY WAS DONE IN 1985.

HEC-2 OUTPUT SHOWS CHANGE OF 2350 CFS TO 4200 CFS WITHIN THE REALIGNMENT STUDY LIMITS.


1355
1350
1345
1357.7
1355.0
1355.6
1358.6
1354.2
1352.2
1355.5
1357.8
1350.6
1355.4
1352.2
1352.0
1354.2
1353.8
1350
1353.0
1346.4
1351.51
1347.0
1351.6
1350
1349.6
1351.0
2394
349.51
1351.0
1350.2
1350.2
1347.0
1350.4
1349.0
1346.2
1348.4
1349.0
1349.0
1347.0
1347.0
1343.0
1345.8
1349.0
1344.4
1349.0
1353.0
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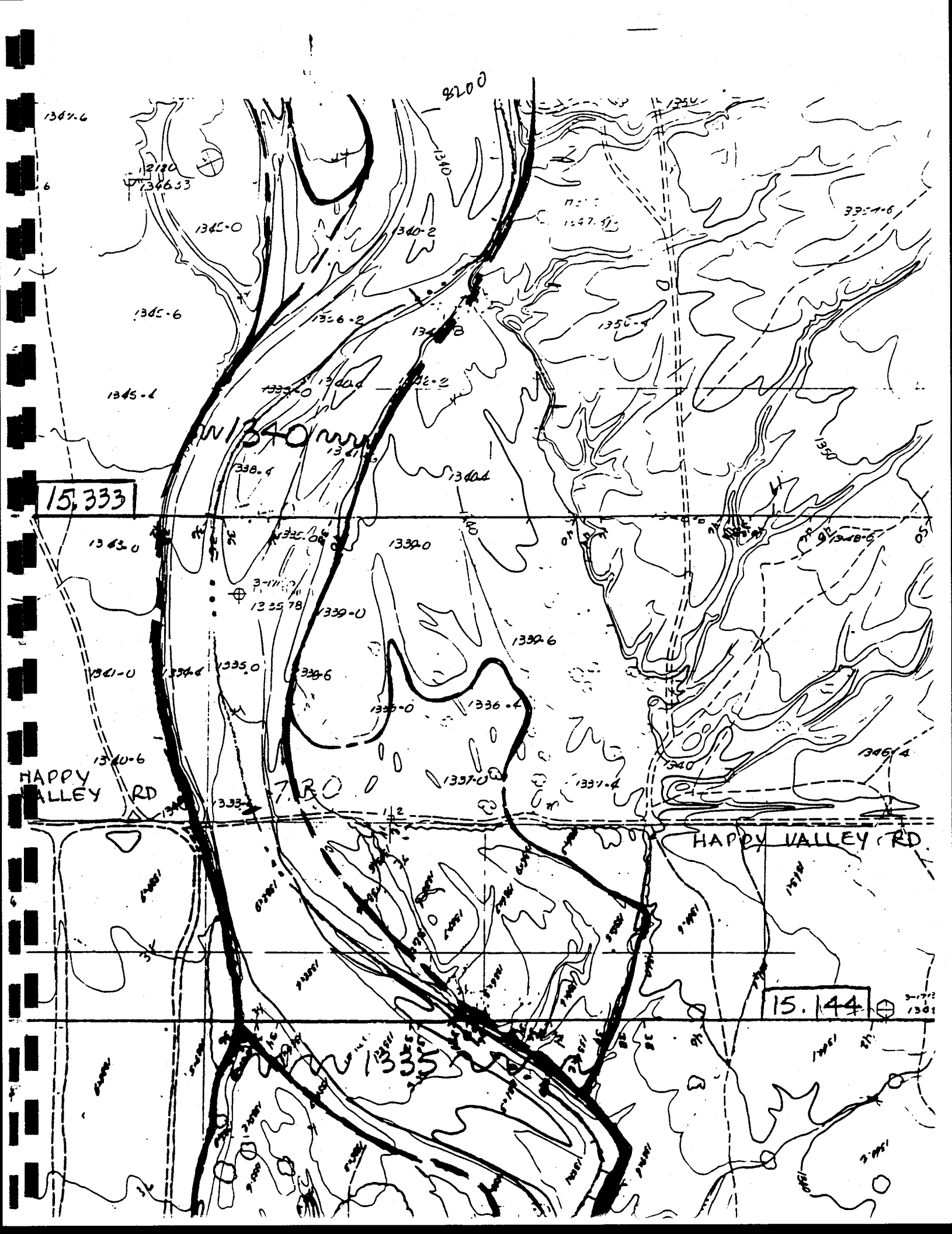
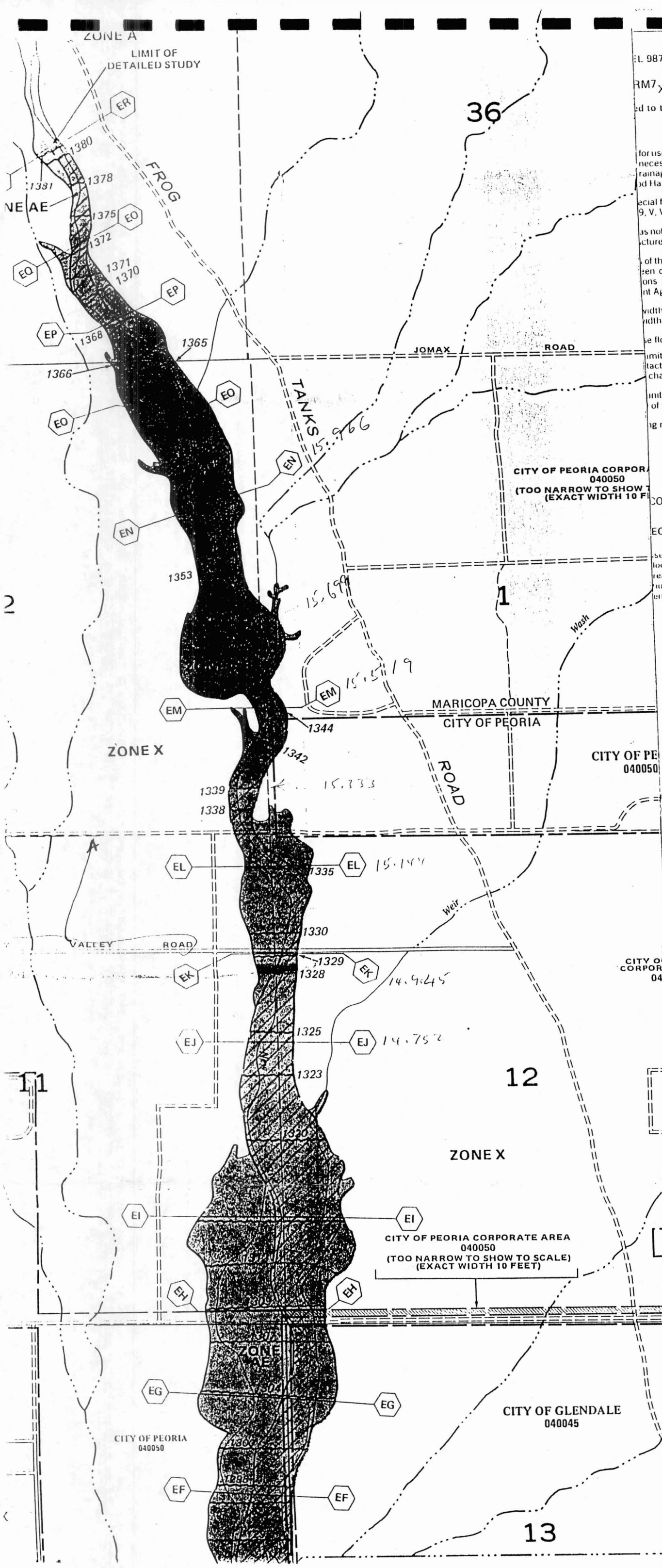
1353.0
1347.8
1343.6
15.519


15.333
HAPPY VALLEY RD
HAPPY VALLEY RD
15.144
1340
1335


ZONE A
LIMIT OF DETAILED STUDY
FROG
TANKS
JOMAX ROAD
36
1
12
13
ZONE X
ZONE AE
MARICOPA COUNTY
CITY OF PEORIA
CITY OF PEORIA CORPORATE AREA
040050
(TOO NARROW TO SHOW TO SCALE)
(EXACT WIDTH 10 FEET)
CITY OF GLENDALE
040045
VALLEY ROAD
Weir
Wash
1380
1378
1381
1375
1372
1371
1370
1368
1365
1366
1353
1344
1342
1339
1338
1335
1330
1329
1328
1325
1323
1320
1310
1300
1298
EL 987)
RM7 X
Elevation Reference Mark
Base Flood Elevation in Feet Where Uniform Within Zone*
Cross Section Line
ed to the National Geodetic Vertical Datum of 1929
NOTES
for use in administering the National Flood Insurance Program; necessarily identify all areas subject to flooding, particularly rainage sources of small size, or all planimetric features outside od Hazard Areas
ecial flood hazard (100 year flood) include Zones A, A1-30, AE, 9, V, V1-30 AND VE
as not in Special Flood Hazard Areas may be protected by flood ctures.
of the floodways were computed at cross sections and interpo een cross sections. The floodways were based on hydraulic ons with regard to requirements of the Federal Emergency nt Agency
widths in some areas may be too narrow to show to scale widths are provided in the Flood Insurance Study Report
se flood elevations apply only landward of the shoreline
imits shown are current as of the date of this map. The user tact appropriate community officials to determine if corporate changed subsequent to the issuance of the map
unity map revision history prior to countywide mapping, see of the Flood Insurance Study Report
ng map panels see separately printed Map Index
MAP REPOSITORY
Refer to Repository Listing on Index Map
EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988
ECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:
sed SEPTEMBER 29, 1989 to change base flood elevations and lood hazard areas, to add base flood elevations and special flood reas, to change zone designations, to reflect updated topographic ion, to incorporate previously issued letters of map revision and endment, and to update map format
rmine if flood insurance is available, contact an insurance r call the National Flood Insurance Program at (800) 0.
APPROXIMATE SCALE IN FEET
1000 0 1000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
PANEL 1180 OF 4350
CONTAINS
COMMUNITY NUMBER PANEL SUFFIX
GLENDALE, CITY OF 040045 1180 E
MARICOPA COUNTY, UNINCORPORATED AREAS 040037 1180 E
PEORIA, CITY OF 040050 1180 E
PHOENIX, CITY OF 040051 1180 E
MAP NUMBER
04013C1180 E

Appendix B

EFFECTIVE FIS HEC-2 MODEL

```
WATER SURFACE PROFILES                                  *
VERSION OF NOVEMBER 1976                                *
UPDATED MAY 1984                                        *
                                                        *
RUN DATE   9 OCT 85 TIME    8:02:03                     *
```

```
U.S. ARMY CORPS OF ENGINEERS
THE HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET, SUITE D
DAVIS, CALIFORNIA 95616
(916) 440-2105 (FTS) 448-2105
```

23

TOPO IS A COPY ... 46

EXISTING

VERY POOR JOB

```
X     X  XXXXXXX   XXXXX                    XXXXX
X     X  X         X     X                  X     X
X     X  X         X                        X
XXXXXXX  XXXX      X          XXXXX         XXXXX
X     X  X         X
X     X  X         X     X                  X
X     X  XXXXXXX   XXXXX                    XXXXXXX
```

NEW RIVER - 1985 FLOOD INSURANCE STUDY.

(SKUNK CREEK CONFL. TO NEW RIVER DAM.)

THIS RUN EXECUTED 9 OCT 85 8:02:05

```
*****************************************************
  HEC2 RELEASE DATED NOV 75 UPDATED MAY  1984
  FORTRAN CODE -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
*****************************************************

C
T1      NEW RIVER ABOVE SKUNK CREEK, PHOENIX, ARIZ., SEPT 1985
T2      MARICOPA COUNTY FIS
T3      FLOOD BOUNDARY

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.       2.        0.        0.  0.000000      0.00      0.0       0.  1162.800     0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLOC     IBW       CHNIM     ITRACE
     0.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000    15.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
    33.000    43.000    53.000    21.000    55.000    26.000    56.000    22.000    54.000     4.000

     1.000    50.000   200.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC      0.045     0.045     0.035     0.200     0.400     0.000     0.000     0.000     0.000     0.000
QT      2.000 21000.000 21000.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
            1985 TOPO - DIGITIZED DATA SEC.8.655 THRU SEC.9.129
          DOWNSTREAM STUDY LIMIT
          NEW RIVER-SKUNK CREEK CONFLUENCE
X1      8.655    36.000  9581.400 10224.300   750.000   150.000   400.000     0.000     0.000     0.000
X3     10.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
GR   1173.900  8649.500  1172.800  8725.600  1173.600  8761.400  1172.800  8805.700  1171.900  8882.400
GR   1171.900  8973.300  1171.700  9029.300  1170.900  9157.100  1170.500  9250.000  1170.800  9322.000
GR   1170.300  9369.500  1169.500  9443.600  1169.300  9488.500  1171.500  9503.300  1167.100  9548.100
GR   1171.600  9581.400  1166.900  9505.500  1161.400  9624.000  1157.900  9660.000  1156.600  9716.300
GR   1155.100  9744.700  1156.100  9751.100  1155.300  9864.200  1155.300  9905.700  1156.200  9954.800
GR   1156.300 10000.000  1156.300 10071.000  1156.700 10091.400  1155.700 10121.500  1155.700 10154.700
GR   1164.500 10193.700  1171.200 10224.300  1172.300 10244.200  1171.200 10247.000  1171.100 10299.300
GR   1170.600 10403.300     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC      0.000     0.000     0.000     0.100     0.300     0.000     0.000     0.000     0.000     0.000
QT      2.000 12000.000 12000.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
FT      0.000     0.000     9.100     0.000     0.000     0.000     0.000     0.000  9762.500 10213.500
          BEGIN DISCHARGE FOR NEW RIVER ONLY
X1      8.731    45.000  9762.500 10213.500   400.000   400.000   400.000     0.000     0.000     0.000
X3     10.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
GR   1174.800  8627.000  1174.100  8663.600  1172.500  8665.700  1174.400  8670.400  1172.100  8683.800
GR   1170.800  8831.800  1170.400  9040.000  1170.000  9196.900  1168.300  9265.900  1167.800  9305.700
GR   1166.800  9321.000  1173.500  9346.000  1167.400  9377.800  1160.300  9401.700  1156.900  9425.500
```

THIS RUN EXECUTED 9 OCT 85 8:06:03

```
*************************************************
EC2 RELEASE DATED NOV 76 UPDATED MAY 1984
ERROR CORR - 01,02,03,04,05,06
MODIFICATION - 50,51,52,53,54,55,56
*************************************************
```

THE ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

OOD BOUNDARY

MMARY PRINTOUT

SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
8.655	21000.00	9619.29	9581.40	0.00	5.89	0.00	10224.30	10186.17	565.87	1162.80	0.00
8.655	21000.00	9619.29	9581.40	0.00	5.89	0.00	10224.30	10186.17	565.87	1162.80	0.00
8.731	12000.00	9815.06	9762.50	0.00	5.42	0.00	10213.50	10178.01	362.94	1163.53	0.00
8.731	12000.00	9815.06	9762.50	0.00	5.42	0.00	10213.50	10178.01	362.94	1163.53	0.00
8.807	12000.00	9816.70	9771.30	0.00	6.52	0.00	10219.20	10173.95	357.25	1164.16	0.00
8.807	12000.00	9816.70	9771.30	0.00	6.52	0.00	10219.20	10173.95	357.25	1164.16	0.00
8.883	12000.00	9913.34	9824.70	0.00	11.46	0.00	10216.90	10171.78	258.44	1165.99	0.00
8.883	12000.00	9913.34	9824.70	0.00	11.46	0.00	10216.90	10171.78	258.44	1165.99	0.00
8.936	12000.00	9824.04	9809.40	0.00	7.40	0.00	10213.20	10173.93	349.89	1169.12	0.00
8.936	12000.00	9824.04	9809.40	0.00	7.40	0.00	10213.20	10173.93	349.89	1169.12	0.00
8.977	12000.00	9897.77	9836.10	0.00	8.97	0.00	10212.70	10170.56	272.79	1169.81	0.00
8.977	12000.00	9897.77	9836.10	0.00	8.97	0.00	10212.70	10170.56	272.79	1169.81	0.00
9.009	12000.00	9801.39	9764.50	0.00	5.26	0.00	10207.00	10165.46	364.07	1171.14	0.00
9.009	12000.00	9801.39	9764.50	0.00	5.26	0.00	10207.00	10165.46	364.07	1171.14	0.00
9.047	12000.00	9715.44	9689.80	0.00	4.07	0.00	10113.80	10102.26	386.93	1171.51	0.00
9.047	12000.00	9715.44	9689.80	0.00	4.07	0.00	10113.80	10102.26	386.93	1171.51	0.00
9.129	12000.00	9675.95	9641.20	0.00	5.48	0.00	10090.00	10079.62	403.67	1171.77	0.00
9.129	12000.00	9675.95	9641.20	0.00	5.48	0.00	10090.00	10079.62	403.67	1171.77	0.00
9.318	12000.00	19698.88	19660.00	0.00	10.52	0.00	20015.00	20014.45	315.57	1180.67	0.00
9.318	12000.00	19699.13	19660.00	0.00	10.70	0.00	20015.00	20014.40	315.27	1180.61	-0.06
9.492	11450.00	19833.19	19770.00	0.00	6.79	0.00	20235.00	20207.38	374.19	1187.06	0.00
9.492	11450.00	19829.89	19770.00	0.00	6.69	0.00	20235.00	20207.58	377.69	1187.11	0.05

SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
9.692	11450.00	19855.99	19840.00	0.00	11.50	0.00	20060.00	20044.60	183.61	1191.40	0.00
9.692	11450.00	19856.09	19840.00	0.00	11.55	0.00	20060.00	20044.52	188.43	1191.38	-0.02
9.889	11450.00	19856.55	19840.00	0.00	7.85	0.00	20080.00	20072.04	215.49	1197.35	0.00
9.889	11450.00	19856.42	19840.00	0.00	7.83	0.00	20080.00	20072.07	215.66	1197.36	0.01
9.953	11450.00	19794.58	19790.00	0.00	7.81	0.00	20032.00	20026.79	232.21	1198.17	0.00
9.953	11450.00	19794.56	19790.00	0.00	7.80	0.00	20032.00	20026.80	232.24	1198.18	0.01
9.967	11450.00	19839.10	19825.00	0.00	7.97	0.00	20110.00	20081.30	242.71	1198.36	0.00
9.967	11450.00	19839.08	19825.00	0.00	7.96	0.00	20110.00	20081.34	242.75	1198.37	0.01
10.096	11450.00	19639.35	19635.00	0.00	8.32	0.00	20055.00	20041.41	402.06	1200.57	0.00
10.096	11450.00	19639.35	19635.00	0.00	8.32	0.00	20055.00	20041.41	402.07	1200.57	0.00
10.271	10900.00	19863.82	19820.00	0.00	7.01	0.00	20320.00	20301.56	437.74	1205.06	0.00
10.271	10900.00	19863.82	19820.00	0.00	7.01	0.00	20320.00	20301.56	437.74	1205.06	0.00
10.443	10900.00	19742.09	19655.00	0.00	9.85	0.00	20110.00	20108.96	366.87	1209.58	0.00
10.443	10900.00	19742.09	19655.00	0.00	9.85	0.00	20110.00	20108.96	366.87	1209.58	0.00
10.612	10900.00	19972.01	19955.00	0.00	7.97	0.00	20300.00	20297.66	325.65	1215.19	0.00
10.612	10900.00	19972.01	19955.00	0.00	7.97	0.00	20300.00	20297.66	325.65	1215.19	0.00
10.803	10900.00	19750.66	19750.00	0.00	10.13	0.00	20015.00	20014.57	264.01	1219.74	0.00
10.803	10900.00	19750.66	19750.00	0.00	10.13	0.00	20015.00	20014.57	264.01	1219.74	0.00
10.999	10900.00	19911.53	19905.00	0.00	8.06	0.00	20250.00	20230.42	318.89	1225.21	0.00
10.999	10900.00	19911.55	19905.00	0.00	8.06	0.00	20250.00	20230.35	318.80	1225.21	0.00
11.129	10900.00	19832.77	19820.00	0.00	7.45	0.00	20115.00	20107.59	274.83	1227.53	0.00
11.129	10900.00	19832.77	19820.00	0.00	7.45	0.00	20115.00	20107.59	274.83	1227.53	0.00
11.188	10350.00	19841.16	19830.00	0.00	9.86	0.00	20055.00	20037.92	195.76	1228.09	0.00
11.188	10350.00	19841.16	19830.00	0.00	9.86	0.00	20055.00	20037.92	195.76	1228.09	0.00
11.301	10350.00	19919.67	19900.00	0.00	9.79	0.00	20120.00	20101.77	183.10	1230.54	0.00
11.301	10350.00	19918.67	19900.00	0.00	9.79	0.00	20120.00	20101.77	183.10	1230.54	0.00
11.386	10350.00	19900.29	19900.00	0.00	7.62	0.00	20175.00	20153.43	253.13	1232.82	0.00
11.386	10350.00	19900.30	19900.00	0.00	7.62	0.00	20175.00	20153.43	253.13	1232.82	0.00
11.481	10350.00	19784.07	19780.00	0.00	6.28	0.00	20170.00	20143.89	359.82	1234.78	0.00
11.481	10350.00	19784.07	19780.00	0.00	6.28	0.00	20170.00	20143.89	359.82	1234.78	0.00
11.566	10350.00	19480.22	19470.00	0.00	3.27	0.00	20310.00	20302.49	822.27	1235.99	0.00
11.566	10350.00	19480.22	19470.00	0.00	3.27	0.00	20310.00	20302.49	822.27	1235.99	0.00
11.759	10350.00	19935.75	19925.00	0.00	8.65	0.00	20510.00	20458.78	523.03	1238.27	0.00
11.759	10350.00	19935.75	19925.00	0.00	8.65	0.00	20510.00	20458.78	523.03	1238.27	0.00

SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
11.945	10350.00	19966.02	19865.00	0.00	6.11	0.72	20510.00	20621.11	655.10	1246.30	0.00
11.945	10350.00	19965.92	19865.00	0.00	6.12	0.00	20510.00	20510.00	544.08	1246.30	0.00
12.125	10350.00	19927.38	19890.00	0.00	6.44	0.00	20680.00	20591.20	663.82	1251.50	0.00
12.125	10350.00	19927.38	19890.00	0.00	6.44	0.00	20680.00	20591.24	663.86	1251.50	0.00
12.313	9800.00	19860.24	19830.00	0.00	7.39	0.00	20240.00	20231.91	371.67	1257.57	0.00
12.313	9800.00	19860.36	19830.00	0.00	7.39	0.00	20240.00	20231.90	371.54	1257.57	0.00
12.511	9800.00	19817.64	19810.00	0.00	6.39	0.00	20280.00	20276.63	391.50	1263.10	0.00
12.511	9800.00	19817.61	19810.00	0.00	6.38	0.00	20280.00	20276.63	391.61	1263.10	0.00
12.701	9800.00	19816.15	19810.00	0.00	6.93	1.09	20330.00	20411.84	595.69	1268.77	0.00
12.701	9800.00	19816.13	19810.00	0.00	6.94	0.00	20330.00	20330.00	513.87	1268.77	0.00
12.896	9800.00	19845.76	19845.00	0.00	5.46	0.69	20360.00	20401.88	556.12	1273.70	0.00
12.896	9800.00	19845.73	19845.00	0.00	5.45	0.00	20360.00	20360.00	514.27	1273.71	0.01
13.076	7900.00	19931.65	19930.00	0.00	6.47	0.00	20350.00	20347.53	415.88	1277.34	0.00
13.076	7900.00	19931.66	19930.00	0.00	6.48	0.00	20350.00	20347.50	415.84	1277.34	0.01
13.227	7900.00	19818.06	19810.00	0.00	5.83	0.00	20120.00	20102.33	284.26	1280.24	0.00
13.227	7900.00	19818.01	19810.00	0.00	5.82	0.00	20120.00	20102.42	284.41	1280.24	0.01
13.420	7900.00	19874.31	19870.00	0.00	10.46	0.00	20170.00	20099.96	225.66	1285.99	0.00
13.420	7900.00	19874.29	19870.00	0.00	10.44	0.00	20170.00	20099.99	225.70	1286.00	0.00
13.619	7900.00	19893.96	19870.00	0.00	4.40	2.35	20455.00	20532.09	635.96	1292.42	0.00
13.619	7900.00	19893.83	19870.00	0.00	4.51	0.00	20455.00	20455.00	561.17	1292.48	0.06
13.818	7900.00	19917.12	19890.00	0.00	7.94	4.08	20340.00	20707.55	675.27	1297.41	0.00
13.818	7900.00	19908.87	19890.00	0.00	8.45	0.00	20340.00	20338.61	429.74	1297.63	0.22
14.013	6100.00	19916.85	19915.00	0.00	4.03	2.44	20270.00	21170.01	661.03	1303.86	0.00
14.013	6100.00	19915.00	19915.00	0.00	5.09	0.00	20270.00	20270.00	355.00	1304.62	0.76
14.197	6100.00	19559.29	19715.00	1.63	6.92	2.10	20015.00	20830.76	840.35	1308.76	0.00
14.197	6100.00	19715.00	19715.00	0.00	7.73	0.00	20015.00	20010.53	295.53	1308.81	0.05
14.379	6100.00	19544.73	19540.00	0.00	5.50	2.67	20095.00	20966.20	996.54	1315.06	0.00
14.379	6100.00	19540.00	19540.00	0.00	4.74	3.49	20095.00	20250.00	710.00	1316.06	1.00
14.559	6100.00	19222.21	19220.00	0.00	4.50	0.00	20045.00	20035.00	812.79	1320.22	0.00
14.559	6100.00	19221.95	19220.00	0.00	4.00	0.00	20045.00	20040.44	813.49	1320.43	0.20
14.752	6100.00	19673.40	19670.00	0.00	4.84	0.00	20170.00	20139.40	466.00	1324.64	0.00
14.752	6100.00	19673.84	19670.00	0.00	5.17	0.00	20170.00	20135.43	461.59	1324.46	-0.19
14.945	4200.00	19903.16	19865.00	0.00	8.71	2.13	20050.00	20409.83	242.99	1328.98	0.00
14.945	4200.00	19898.80	19865.00	0.00	8.02	0.00	20050.00	20046.33	153.03	1329.37	0.39

SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
15.144	4200.00	19018.03	19015.93	0.00	4.87	0.00	19317.82	19317.51	299.48	1335.11	0.00
15.144	4200.00	19018.09	19015.93	0.00	4.92	0.00	19317.82	19317.50	299.41	1335.09	-0.02
15.333	4200.00	19779.47	19770.00	0.00	5.47	0.00	20100.00	20092.53	313.16	1339.05	0.00
15.333	4200.00	19779.26	19770.00	0.00	5.42	0.00	20100.00	20092.68	313.42	1339.07	0.01
15.519	4200.00	19963.22	19950.00	0.00	5.71	0.00	20320.00	20251.29	288.07	1344.03	0.00
15.519	4200.00	19953.28	19950.00	0.00	5.74	0.00	20320.00	20250.50	287.32	1344.01	-0.02
15.699	4200.00	19895.85	19870.00	0.00	6.83	3.28	20085.00	20385.00	362.46	1348.67	0.00
15.699	4200.00	19886.53	19870.00	0.00	7.63	0.00	20085.00	20084.76	198.23	1349.95	0.29
15.966	2350.00	1989.28	1985.00	0.00	2.76	2.46	2430.00	2670.72	536.77	1356.29	0.00
15.966	2350.00	1988.19	1985.00	0.00	2.81	0.00	2430.00	2421.70	433.51	1356.72	0.43
16.066	2350.00	1986.17	1970.00	0.00	5.50	4.73	2350.00	2697.67	430.87	1358.77	0.00
16.066	2350.00	1982.45	1970.00	0.00	6.72	0.00	2350.00	2332.82	260.93	1359.51	0.74
16.167	2350.00	1952.51	1950.00	0.00	3.60	2.27	2130.00	2621.95	669.44	1362.39	0.00
16.167	2350.00	1951.63	1950.00	0.00	4.60	1.92	2130.00	2210.00	248.37	1363.24	0.85
16.248	2350.00	1932.43	1925.00	0.00	6.35	2.20	2030.00	2630.00	697.57	1364.52	0.00
16.248	2350.00	1931.19	1925.00	0.00	8.57	0.00	2030.00	2030.00	98.81	1364.94	0.42
16.328	2350.00	1874.56	1915.00	0.65	3.72	2.55	2240.00	2398.52	405.69	1366.51	0.00
16.328	2350.00	1915.00	1915.00	0.00	2.99	0.00	2240.00	2236.74	321.74	1367.35	0.83
16.411	2350.00	1914.57	1885.00	0.00	6.83	0.00	2055.00	2051.83	137.26	1368.19	0.00
16.411	2350.00	1912.70	1885.00	0.00	6.71	0.00	2055.00	2051.94	139.23	1368.25	0.06
16.504	2350.00	1628.56	1835.00	0.96	4.06	0.00	2035.00	2030.97	291.74	1370.58	0.00
16.504	2350.00	1835.00	1835.00	0.00	4.14	0.00	2035.00	2030.99	195.99	1370.59	0.01
16.608	2350.00	1929.53	1910.00	0.00	5.91	0.00	2110.00	2091.71	162.18	1372.19	0.00
16.608	2350.00	1929.44	1910.00	0.00	5.93	0.00	2110.00	2092.04	162.61	1372.23	0.05
16.732	2350.00	1955.62	1950.00	0.00	7.57	0.00	2115.00	2114.38	158.76	1377.75	0.00
16.732	2350.00	1955.68	1950.00	0.00	7.76	0.00	2115.00	2110.00	154.31	1377.72	-0.02
16.818	2350.00	1945.20	1935.00	0.00	4.61	2.36	2045.00	2226.01	280.81	1380.64	0.00
16.818	2350.00	1942.85	1935.00	0.00	6.05	0.00	2045.00	2045.00	102.15	1380.95	0.31

FLOODWAY DATA, FLOOD BOUNDARY
PROFILE NO. 2

STATION		FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
	14.559	515.	1525.	4.0	1320.4	1320.2	0.2
EJ	14.752	462.	1179.	5.2	1324.5	1324.6	-0.1
EK	14.945	159.	524.	8.0	1329.4	1329.0	0.4
EL	15.144	299.	854.	4.9	1335.1	1335.1	0.0
	15.333	313.	774.	5.4	1339.1	1339.1	0.0
EM	15.519	237.	731.	5.7	1344.0	1344.0	0.0
	15.699	198.	551.	7.6	1350.0	1349.7	0.3
EN	15.966	434.	838.	2.8	1356.7	1356.3	0.4
	16.066	350.	350.	6.7	1359.5	1358.8	0.7
EO	16.167	246.	562.	4.2	1363.2	1362.4	0.3
	16.248	59.	274.	8.6	1364.9	1364.5	0.4
	16.328	322.	787.	3.0	1367.3	1366.5	0.8
EP	16.411	139.	350.	6.7	1368.3	1368.2	0.1
	16.504	196.	568.	4.1	1370.6	1370.6	0.0
EQ	16.608	163.	403.	5.8	1372.2	1372.2	0.0
	16.732	154.	303.	7.8	1377.7	1377.7	0.0
ER	16.818	102.	353.	6.0	1380.9	1380.6	0.3

FLOODWAY DATA, FLOOD BOUNDARY
PROFILE NO. 2

	STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE	
	8.655	567.	3566.	5.9	1162.8	1162.8	0.0	
	8.731	363.	2215.	5.4	1163.5	1163.5	0.0	
	8.807	357.	1942.	6.5	1164.2	1164.2	0.0	
	8.863	258.	1047.	11.5	1166.0	1166.0	0.0	
	8.936	350.	1621.	7.4	1169.1	1169.1	0.0	
	8.977	273.	1338.	9.0	1169.8	1169.8	0.0	
	9.009	364.	2280.	5.3	1171.1	1171.1	0.0	
	9.047	387.	2550.	4.1	1171.5	1171.5	0.0	
	9.129	404.	2192.	5.5	1171.8	1171.8	0.0	
	9.318	315.	1121.	10.7	1180.7	1180.7	0.0	
	9.452	378.	1712.	6.7	1187.1	1187.1	0.0	
DP	9.652	188.	991.	11.6	1191.4	1191.4	0.0	
	9.869	216.	1461.	7.8	1197.3	1197.3	0.0	
DQ	9.953	232.	1467.	7.8	1198.2	1198.2	0.0	
DR	9.967	243.	1438.	8.0	1198.4	1198.4	0.0	← BELL RD
	10.096	402.	1376.	8.3	1200.6	1200.6	0.0	
DS	10.271	438.	1554.	7.0	1205.1	1205.1	0.0	
	10.443	367.	1106.	9.9	1209.5	1209.5	0.0	
	10.612	325.	1365.	8.0	1215.2	1215.2	0.0	
DT	10.603	264.	1076.	10.1	1219.7	1219.7	0.0	← UNION HILLS
DU	10.989	319.	1352.	9.1	1225.2	1225.2	0.0	
	11.129	275.	1463.	7.5	1227.5	1227.5	0.0	
DV	11.188	197.	1049.	9.9	1228.1	1228.1	0.0	
	11.301	183.	1057.	9.8	1230.5	1230.5	0.0	
	11.3[illegible]6	253.	1358.	7.6	1232.8	1232.8	0.0	
	11.461	360.	1647.	6.3	1234.8	1234.8	0.0	
DW	11.566	822.	3164.	3.3	1236.0	1236.0	0.0	
	11.759	523.	1197.	8.6	1238.3	1238.3	0.0	
DX	11.949	544.	1691.	6.1	1246.3	1246.3	0.0	← BEARDSLEY
DY	12.125	664.	1608.	6.4	1251.5	1251.5	0.0	
DZ	12.313	372.	1326.	7.4	1257.6	1257.6	0.0	
EA	12.511	459.	1424.	6.9	1263.1	1263.1	0.0	
EB	12.701	514.	1411.	6.9	1268.8	1268.8	0.0	
EC	12.876	514.	1797.	5.5	1273.7	1273.7	0.0	
	13.076	416.	1219.	6.5	1277.3	1277.3	0.0	DEER VALLEY
ED	13.227	284.	1357.	5.8	1280.2	1280.2	0.0	
	13.420	226.	757.	10.4	1286.0	1286.0	0.0	
EE	13.619	561.	1753.	4.5	1292.5	1292.4	0.1	
EF	13.818	430.	935.	8.5	1297.6	1297.4	0.2	
EG	14.013	355.	1198.	5.1	1304.7	1303.9	0.8	
EH	14.197	296.	790.	7.7	1308.8	1308.8	0.0	
EI	14.375	710.	1371.	4.5	1316.1	1315.1	1.0	

DOWN STREAM OF CROSS SECTION 9.95 WAS REVISED BY FEMA BASED ON A SUBMITTAL BY COE & VAN 200 (HEC-2 MODEL REV SB). THIS PRINTOUT ONLY MATCHES THE FEMA DATA ABOVE CROSS SECTION 9.95 NOW.

JIM MURPHY
4-28-94

Appendix C

DUPLICATE EFFECTIVE FIS HEC-2 MODEL

```
*********************************************
*  HEC-2 WATER SURFACE PROFILES             *
                                            *
   Version   4.6.2;  May 1991               *
                                            *
*  RUN DATE    24JUL98    TIME    07:37:23  *
*********************************************
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*           (916) 756-1104             *
****************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

THIS RUN EXECUTED 24JUL98 07:37:23

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************************************
EC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
************************************

T3      FLOOD BOUNDARY

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ
                2                                                           1335.1

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE
                       -1                                                              15

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38       43       53       21       55       26       56       22       54       4
      1       50      200

N     .05      .05     .035      .1       .3
Q       2     4200     4200
ET            4.1      9.1             21800                                   19955    20382
X1   15.144     55    19955    20382     900      890     1056
X3      10
GR    1360    16750    1358    16880    1356    17180    1354    17540    1352    17750
GR    1350    17905    1350    18105    1348    18410    1346    18630    1344    18950
GR    1342    19115    1342    19250    1340    19555    1338    19660    1338    19720
GR    1334    19724    1334    19830    1334    19832    1332    19850    1336    19865
GR    1336    19900    1336    19955    1330    19975    1329    20000    1330    20070
GR    1332    20080    1334    20315    1334    20350    1332    20380    1336    20382
GR    1338    21510    1338    21800    1336    22035    1336    22315    1334    22350
GR    1334    22370    1336    22390    1336    22470    1334    22515    1332    22530
GR    1332    22570    1334    22625    1336    22640    1336    22700    1334    22810
GR    1332    22820    1332    22840    1334    22880    1336    22960    1338    23815
GR    1340    23960    1342    24145    1344    24305    1350    24455    1360    24660

ET            4.1      9.1             21750                                   19770    20100
X1   15.333     53    19770    20100     900      890     1000
X3      10
GR    1358    17825    1356    18010    1354    18370    1352    18530    1350    18570
GR    1348    18605    1348    18620    1350    18630    1350    18725    1348    18900
GR    1346    18930    1346    19010    1348    19040    1348    19060    1344    19070
GR    1344    19080    1346    19090    1346    19305    1344    19335    1340    19350
GR    1340    19770    1338    19790    1336    19880    1336    19980    1335    20000
GR    1336    20010    1338    20090    1342    20100    1342    21750    1338    21765
GR    1338    21790    1340    21810    1340    22045    1340    22046    1338    22060
GR    1338    22080    1340    22120    1340    22150    1336    22170    1336    22180
GR    1340    22190    1342    22270    1342    22300    1340    22540    1340    22590
```

[redacted]	1342	22760	1342	23065	1344	23360	1345	23420	1348	23530
GR	1348	23690	1350	23710	1360	23930				
[redacted]		4.1	9.1		20960				19950	20320
[redacted]	15.519	48	19950	20320	940	960	980			
[redacted]	10									
X4	1	1345	20320							
[redacted]	1360	18730	1358	18760	1358	18965	1356	19050	1354	19115
[redacted]	1354	19390	1352	19460	1352	19515	1350	19540	1350	19680
[redacted]	1348	19950	1342	19970	1340	19995	1340	20005	1342	20015
GR	1342	20130	1340	20215	1340	20225	1344	20250	1344.5	20338
GR	1346	20595	1350	20960	1350	21080	1348	21965	1344	21985
[redacted]	1344	22005	1346	22020	1348	22080	1346	22110	1346	22135
[redacted]	1348	22145	1346	22275	1346	22530	1342	22545	1344	22560
[redacted]	1346	22630	1346	22855	1344	22860	1344	22875	1346	22895
GR	1346	22925	1342	22930	1346	22945	1348	23615	1348	23765
[redacted]	1350	23950	1352	24140	1360	24300				
[redacted]		4.1	9.1		20900				19870	20085
X1	15.699	37	19870	20085	935	920	950			
GR	1364	18850	1362	18960	1360	19070	1358	19220	1356	19230
[redacted]	1356	19260	1358	19270	1358	19345	1356	19490	1354	19870
[redacted]	1352	19880	1350	19885	1348	19950	1346	19980	1345	20000
[redacted]	1346	20030	1346	20065	1348	20075	1350	20085	1350	20700
GR	1348	20760	1348	20885	1354	20900	1354	21715	1348	21790
[redacted]	1348	21880	1352	21930	1352	23430	1350	23435	1350	23445
[redacted]	1352	23450	1352	23550	1356	23920	1360	24120	1362	24170
[redacted]	1362	24470	1364	24650						
QT	2	2350	2350							
[redacted]		4.1	9.1		2690				1985	2430
[redacted]	15.966	40	1985	2430	1450	1200	1410			
[redacted]	9	1359	1900	1352	2280	1354	2300	1356	2325	1356
X4	2400	1357	2430	1357.3	2530	1352	2600	1354	2620	
[redacted]	1364	1080	1362	1180	1360	1585	1360	1725	1358	1985
[redacted]	1356	1990	1354	1995	1354	2005	1356	2010	1356	2040
[redacted]	1355	2060	1354	2150	1354	2250	1356	2560	1356	2670
GR	1358	2675	1360	2690	1360	3205	1358	3505	1358	4225
GR	1356	4415	1356	5380	1354	5381	1354	5395	1356	5405
[redacted]	1356	5495	1358	5610	1358	5745	1360	5850	1362	5925
[redacted]	1362	6150	1364	6270	1366	6410	1368	6580	1370	6615
[redacted]	1372	6755	1374	6795	1376	6835	1376	6965	1378	7010
[redacted]		4.1	9.1		2865				1970	2350
[redacted]	16.066	48	1970	2350	565	480	570			
[redacted]	3	1360.4	1970	1356.2	2560	1358	2580			
GR	1368	1090	1368	1150	1366	1305	1364	1560	1362	1650
GR	1362	1780	1360	1820	1360	1980	1356	2000	1358	2060
[redacted]	1360	2150	1360	2210	1358	2240	1358	2280	1360	2350
[redacted]	1360	2435	1358	2465	1358	2690	1360	2710	1362	2760
[redacted]	1364	2865	1364	2915	1362	3310	1360	3545	1358	3550
GR	1358	3730	1360	3745	1360	4670	1358	4920	1358	5145
GR	1356	5355	1354	5356	1354	5365	1356	5368	1358	5375
[redacted]	1358	5570	1360	5720	1362	5800	1364	5915	1364	6005

	1366	6110	1368	6380	1368	6570	1370	6680	1372	6780
GR	1374	6830	1374	6870	1376	6920				
		4.1	9.1		3030				1950	2200
	16.167	22	1950	2130	530	530	530			
X4	2	1359.7	2030	1362	2130					
GR	1370	1020	1370	1095	1368	1245	1366	1255	1366	1270
	1368	1290	1368	1420	1366	1665	1364.8	1950	1360	1955
	1360	2040	1362	2110	1362	2170	1362	2250	1362	2370
	1360	2550	1360	2590	1358	2600	1360	2610	1362	2620
GR	1364	2630	1365	2650						
		4.1	9.1		2645				1925	2030
	16.248	40	1925	2030	450	340	430			
GR	1372	1090	1370	1100	1370	1115	1370	1120	1370	1130
GR	1370	1365	1368	1590	1366	1660	1367	1925	1362	1940
	1362	1985	1361	2000	1362	2013	1364	2030	1364	2230
	1362	2240	1362	2250	1364	2300	1364	2630	1366	2645
	1366	2943	1364	2950	1364	3045	1366	3055	1366	3690
GR	1364	3755	1364	3770	1365	4105	1364	4218	1362	4765
GR	1360	5045	1358	5055	1356.1	5095	1358	5105	1360	5115
	1362	5328	1364	5485	1366	5755	1368	5810	1370	6160
		4.1	9.1		2665				1915	2240
X1	16.328	45	1915	2240	440	250	410			
	1	1367.4	2240							
	1374	980	1372	990	1372	1010	1372	1015	1372	1020
	1372	1250	1370	1520	1368	1790	1367	1835	1366	1915
GR	1364	1940	1362.8	2000	1364	2050	1366	2150	1366	2335
GR	1364	2339	1364	2370	1366	2397	1366	2403	1368	2665
	1366	2680	1366	2715	1368	2735	1368	3345	1366	3530
	1366	3730	1367	3890	1366	4145	1366	4310	1364	4355
	1364	4505	1362	4760	1362	4885	1360	4910	1358	4920
GR	1357.5	4925	1358	4937	1360	4947	1362	5050	1362	5278
	1364	5335	1366	5455	1368	5645	1370	5695	1370	5780
		4.1	9.1		2460				1885	2055
X1	16.411	46	1885	2055	510	350	450			
X3	10									
	1	1369.2	1885							
	1378	610	1376	760	1376	761	1376	762	1376	763
	1374	1090	1372	1370	1370	1500	1370	1650	1368	1665
GR	1368	1920	1366	1948	1364.3	2000	1366	2048	1370	2055
	1370	2210	1368	2223	1368	2240	1370	2260	1370	2390
	1368	2425	1368	2450	1370	2460	1370	2980	1368	3125
	1368	3390	1369	3520	1369	3580	1369	3645	1368	3830
GR	1366	4025	1366	4200	1364	4520	1362	4545	1360	4545
GR	1359.5	4555	1360	4561	1362	4565	1362	4588	1360	4594
	1360	4600	1362	4601	1364	4758	1366	4885	1368	4995
	1370	5185								

ET			9.1						1835	2035
X1	16.504	33	1835	2035	460	300	490			
[redacted]	10									
[redacted]	1380	680	1378	695	1378	712	1378	720	1378	743
GR	1376	980	1374	1180	1374	1315	1372	1625	1370	1630
GR	1370	1665	1372	1670	1372	1770	1370	1780	1370	1835
[redacted]	1368	1915	1366	1980	1365	2000	1366	2018	1372	2035
[redacted]	1372	2110	1370	2140	1370	2160	1372	2195	1372	2390
[redacted]	1370.7	2880	1371.8	3295	1970	3560	1398	3960	1366	4225
GR	1364	4310	1364	4340	1390	4340				
[redacted]			9.1						1910	2110
[redacted]	16.608	30	1910	2110	485	450	530			
X3	10									
X4	2	1376.5	1910	1374.2	2110					
[redacted]	1382	920	1380	1000	1380	1050	1380	1150	1380	1151
[redacted]	1378	1280	1376	1520	1376	1920	1374	1925	1372	1930
[redacted]	1370	1935	1370	1980	1368	1995	1367.8	2000	1368	2015
GR	1370	2020	1370	2080	1372	2090	1372	2200	1370	2210
GR	1369	2220	1370	2235	1372	2270	1374	2310	1374	2375
[redacted]	1372	2385	1372	2395	1374	2400	1376	2410	1376	2550
ET		4.1	9.1		2300				1950	2110
X1	16.732	18	1950	2115	640	420	685			
X3	10									
[redacted]	4	1375	2000	1380	1950	1376	2040	1379	2300	
[redacted]	1382	1650	1376	1960	1376	2110	1378	2115	1378	2370
GR	1376	2470	1376	2480	1378	2490	1378	2550	1376	2570
GR	1376	2620	1378	2630	1378	2850	1376	2880	1375	2885
[redacted]	1376	2890	1378	2910	1380	2920				
ET			9.1						1935	2045
X1	16.818	14	1935	2045	430	750	455			
X4	1	1381.2	2240							
[redacted]	1390	1145	1388	1340	1386	1490	1384	1640	1382	1935
[redacted]	1376	1980	1375.7	2000	1376	2030	1380.4	2045	1380	2097
GR	1378	2105	1378	2190	1380	2210	1382	2350		

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1


CCHV=     .100 CEHV=     .300
*SECNO 15.144

95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     1336.00 ELREA=     1336.00

   15.144     6.10   1335.10       .00       .00   1335.29       .19       .00       .00   1336.00
   4200.0       .0    4200.0       .0       .0    1213.7       .0       .0       .0   1336.00
      .00       .00      3.46       .00      .000      .035      .000      .000   1329.00  19958.00
  .001647     900.     1056.     890.        0         0         0       .00    423.55  20381.55


OW DISTRIBUTION FOR SECNO=     15.14         CWSEL=   1335.10

STA=   19958.   20382.
  PER Q=    100.0
 AREA=   1213.7
  VEL=      3.5
DEPTH=      2.9

*SECNO 15.333

01 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
7720 CRITICAL DEPTH ASSUMED

95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     1340.00 ELREA=     1342.00

   15.333     3.33   1338.33   1338.33       .00   1339.25       .92      3.72       .22   1340.00
   4200.0       .0    4200.0       .0       .0     546.0       .0      20.2       8.4   1342.00
      .04       .00      7.69       .00      .000      .035      .000      .000   1335.00  19786.66
  .015063     900.     1000.     890.       12        11         0       .00    304.18  20090.84


OW DISTRIBUTION FOR SECNO=     15.33         CWSEL=   1338.33

STA=   19787.   20100.
  PER Q=    100.0
 AREA=    546.0
  VEL=      7.7
DEPTH=      1.8
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 15.519

01 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.24

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1348.00 ELREA= 1345.00

15.519	4.62	1344.62	.00	.00	1344.94	.33	5.63	.06	1348.00
4200.0	.0	4200.0	.0	.0	917.8	.0	36.7	15.5	1345.00
.10	.00	4.58	.00	.000	.035	.000	.000	1340.00	19961.27
.003006	940.	980.	960.	6	0	0	.00	331.97	20293.25

OW DISTRIBUTION FOR SECNO= 15.52 CWSEL= 1344.62

STA= 19961. 20320.
PER Q= 100.0
AREA= 917.8
VEL= 4.6
DEPTH= 2.8

ECNO 15.699

3265 DIVIDED FLOW

01 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

15.699	4.29	1349.29	1349.29	.00	1350.21	.92	4.98	.18	1354.00
4200.0	.0	3530.8	669.2	.0	427.1	188.0	53.3	22.8	1350.00
.13	.00	8.27	3.56	.000	.035	.050	.000	1345.00	19908.13
.011425	935.	950.	920.	3	9	0	.00	340.18	20888.22

OW DISTRIBUTION FOR SECNO= 15.70 CWSEL= 1349.29

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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

STA=   19908.   20085.   20760.   20885.   20888.
PER Q=    84.1      1.4     14.4       .1
 AREA=   427.1     24.9    161.0      2.1
  VEL=     8.3      2.4      3.8      2.3
DEPTH=     2.5       .0      1.3       .6

ECNO 15.966

3265 DIVIDED FLOW

01 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.47

  15.966     4.44   1356.44       .00       .00   1356.53       .09      6.24       .08   1358.00
  2350.0       .0    1833.3     516.7        .0     736.6     241.8      78.1      36.4   1357.00
     .29      .00      2.49      2.14      .000      .035      .050      .000   1352.00   1988.88
 .001654    1450.     1410.     1200.         6         0         0       .00    545.98   2671.12

FLOW DISTRIBUTION FOR SECNO=     15.97        CWSEL=   1356.44

A=    1989.    2430.    2560.    2600.    2620.    2670.    2671.
PER Q=    78.0       .0      9.1      8.1      4.8       .0
 AREA=   736.6      2.3     97.9     68.9     72.4       .3
  VEL=     2.5       .4      2.2      2.7      1.5       .4
DEPTH=     1.7       .0      2.4      3.4      1.4       .2

ECNO 16.066

3265 DIVIDED FLOW

85 MINIMUM SPECIFIC ENERGY
720 CRITICAL DEPTH ASSUMED
  16.066     4.64   1358.64   1358.64       .00   1359.15       .51      2.22       .12   1360.40
  2350.0       .0    1006.7    1343.3        .0     161.7     253.7      86.7      42.3   1360.00
     .31      .00      6.23      5.29      .000      .035      .050      .000   1354.00   1986.78
 .023869     565.      570.      480.         4         9         0       .00    415.57   2696.45
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 16.07 CWSEL= 1358.64

STA=	1987.	2350.	2465.	2560.	2580.	2690.	2696.
PER Q=	42.8	.3	38.3	8.0	10.3	.2
AREA=	161.7	3.1	146.7	30.9	70.9	2.1
VEL=	6.2	2.2	6.1	6.1	3.4	2.2
DEPTH=	.9	.0	1.5	1.5	.6	.3

*SECNO 16.167

7702 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.86

16.167	4.45	1362.45	.00	.00	1362.58	.13	3.39	.04	1364.80
2350.0	.0	1157.5	1192.5	.0	333.4	547.5	94.6	48.9	1362.00
.37	.00	3.47	2.18	.000	.035	.050	.000	1358.00	1952.46
.002909	530.	530.	530.	8	0	0	.00	669.76	2622.21

FLOW DISTRIBUTION FOR SECNO= 16.17 CWSEL= 1362.45

STA=	1952.	2130.	2170.	2250.	2370.	2550.	2590.	2600.	2610.	2620.	2622.
PER Q=	49.3	.7	1.4	2.1	22.6	12.1	5.3	5.3	1.2	.0
AREA=	333.4	17.7	35.4	53.1	259.7	97.7	34.4	34.4	14.4	.5
VEL=	3.5	.9	.9	.9	2.0	2.9	3.6	3.6	2.0	.6
DEPTH=	1.9	.4	.4	.4	1.4	2.4	3.4	3.4	1.4	.2

*SECNO 16.248
7185 MINIMUM SPECIFIC ENERGY
7720 CRITICAL DEPTH ASSUMED

16.248	8.34	1364.44	1364.44	.00	1364.95	.51	1.82	.11	1367.00
2350.0	.0	1548.5	801.5	.0	225.9	346.8	100.8	54.6	1364.00
.39	.00	6.86	2.31	.000	.035	.050	.000	1356.10	1932.67
.008556	450.	430.	340.	9	15	0	.00	700.66	2633.33

FLOW DISTRIBUTION FOR SECNO= 16.25 CWSEL= 1364.44

STA=	1933.	2030.	2230.	2240.	2250.	2300.	2630.	2633.
PER Q=	65.9	6.0	2.1	5.2	10.8	10.0	.0
AREA=	225.9	88.7	14.4	24.4	72.2	146.3	.7
VEL=	6.9	1.6	3.5	5.0	3.5	1.6	1.0
DEPTH=	2.3	.4	1.4	2.4	1.4	.4	.2

```
 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 16.328

3[redacted]5 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.71

  16.328      9.02   1366.52       .00       .00   1366.71       .19      1.73       .03   1366.00
  2350.0       7.2    1989.6     353.2      10.9     542.6     155.7     105.9      58.7   1367.40
     .42       .66      3.67      2.27      .050      .035      .050      .000   1357.50   1873.19
 .002923      440.      410.      250.         3         0         0       .00    482.32   2471.46

FLOW DISTRIBUTION FOR SECNO=     16.33          CWSEL=   1366.52

S[redacted]=    1873.    1915.    2240.    2335.    2339.    2370.    2397.    2403.    2471.
 [redacted]ER Q=       .3     84.7       .3       .5      9.9      3.7       .1       .5
  AREA=     10.9    542.6      9.3      6.1     78.2     41.1      3.1     17.9
   VEL=       .7      3.7       .7      2.0      3.0      2.1      1.0       .7
 [redacted]EPTH=       .3      2.0       .1      1.5      2.5      1.5       .5       .3

*[redacted]ECNO 16.411

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .60

3[redacted]5 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1369.20 ELREA=      1370.00

  16.411      3.85   1368.15       .00       .00   1368.90       .75      2.02       .17   1369.20
  2350.0        .0    2350.0        .0        .0     337.3        .0     111.2      61.8   1370.00
     .43       .00      6.97       .00      .000      .035      .000      .000   1364.30   1915.48
 .008103      510.      450.      350.         2         0         0       .00    136.29   2051.77

F[redacted]W DISTRIBUTION FOR SECNO=     16.41          CWSEL=   1368.15

S[redacted]=    1915.    2055.
 PER Q=    100.0
  AREA=    337.3
   VEL=      7.0
 [redacted]EPTH=      2.5
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 16.504

65 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.94

95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1370.00 ELREA= 1372.00

16.504	6.54	1370.54	.00	.00	1370.78	.25	1.83	.05	1370.00
2350.0	45.1	2304.9	.0	50.0	573.9	.0	116.5	64.1	1372.00
.47	.90	4.02	.00	.050	.035	.000	.000	1364.00	1628.65
.002147	460.	490.	300.	2	0	0	.00	291.25	2030.86

OW DISTRIBUTION FOR SECNO= 16.50 CWSEL= 1370.54

A= 1629. 1665. 1780. 1835. 2035.
PER Q= .7 .0 1.2 98.1
AREA= 19.2 1.1 29.7 573.9
VEL= .9 .6 .9 4.0
DEPTH= .5 .0 .5 2.9

*SECNO 16.608

02 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .58

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1376.50 ELREA= 1374.20

16.608	4.33	1372.13	.00	.00	1372.70	.57	1.82	.10	1376.50
2350.0	.0	2350.0	.0	.0	388.4	.0	122.7	66.8	1374.20
.49	.00	6.05	.00	.000	.035	.000	.000	1367.80	1929.67
.006366	485.	530.	450.	3	0	0	.00	161.54	2091.21

FLOW DISTRIBUTION FOR SECNO= 16.61 CWSEL= 1372.13

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

STA= 1930. 2110.
PER Q= 100.0
AREA= 388.4
VEL= 6.1
DEPTH= 2.4

ECNO 16.732

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1380.00 ELREA= 1378.00

16.732	2.80	1377.80	1377.68	.00	1378.65	.85	5.86	.08	1380.00
2350.0	.0	2350.0	.0	.0	317.9	.0	128.2	69.4	1378.00
.52	.00	7.39	.00	.000	.035	.000	.000	1375.00	1955.50
.012112	640.	685.	420.	13	14	0	.00	158.99	2114.50

OW DISTRIBUTION FOR SECNO= 16.73 CWSEL= 1377.80

STA= 1956. 2115.
PER Q= 100.0
AREA= 317.9
VEL= 7.4
DEPTH= 2.0

ECNO 16.818

3501 HV CHANGED MORE THAN HVINS

2 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.33

16.818	4.92	1380.62	.00	.00	1380.88	.26	2.18	.06	1382.00
2350.0	.0	1648.2	701.8	.0	355.1	295.1	134.3	72.3	1380.40
.55	.00	4.64	2.38	.000	.035	.050	.000	1375.70	1945.33
.002225	430.	455.	750.	4	0	0	.00	280.22	2225.56

FLOW DISTRIBUTION FOR SECNO= 16.82 CWSEL= 1380.62

S= 1945. 2045. 2097. 2105. 2190. 2210. 2226.

PER Q=	70.1	.7	1.0	25.3	2.7	.1
AREA=	355.1	22.0	13.0	222.9	32.4	4.8
VEL=	4.6	.8	1.9	2.7	1.9	.6
EPTH=	3.6	.4	1.6	2.6	1.6	.3

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     NEW RIVER ABOVE SKUNK CREEK, PHOENIX, ARIZ., APRIL 1981
T2   100 YEAR FLOOD
T3   FLOODWAY
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ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	3							1335.2	

NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
15									15

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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 2


CCHV=     .100 CEHV=     .300
*SECNO 15.144

3470 ENCROACHMENT STATIONS=    19955.0   20382.0  TYPE=      1  TARGET=      427.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1336.00 ELREA=    100000.00

  15.144      6.20   1335.20       .00   1335.10   1335.37       .17       .00       .00   1336.00
  4200.0        .0    4200.0        .0        .0    1256.1        .0        .0        .0 100000.00
     .00       .00      3.34       .00      .000      .035      .000      .000   1329.00  19957.67
 .001471      900.     1056.      890.         0         0         0       .00    423.93  20381.60


FLOW DISTRIBUTION FOR SECNO=     15.14          CWSEL=   1335.20

LEA=   19958.   20382.
 PER Q=    100.0
 AREA=   1256.1
  VEL=      3.3
DEPTH=      3.0

SECNO 15.333

3301 HV CHANGED MORE THAN HVINS

3485 MINIMUM SPECIFIC ENERGY
3520 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=    19770.0   20100.0  TYPE=      1  TARGET=      330.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1340.00 ELREA=    100000.00

  15.333      3.33   1338.33   1338.33   1338.33   1339.25       .92      3.42       .23   1340.00
  4200.0        .0    4200.0        .0        .0     544.3        .0      20.7       8.4 100000.00
     .04       .00      7.72       .00      .000      .035      .000      .000   1335.00  19786.71
 .015217      900.     1000.      890.        13        11         0       .00    304.11  20090.82
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=     15.33          CWSEL=   1338.33

STA=   19787.   20100.
PER Q=    100.0
 AREA=    544.3
  VEL=      7.7
DEPTH=      1.8

*SECNO 15.519

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.25

3370 ENCROACHMENT STATIONS=    19950.0   20320.0  TYPE=      1  TARGET=      370.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1348.00 ELREA=    100000.00

  15.519      4.62   1344.62       .00   1344.62   1344.95       .32      5.63       .06   1348.00
  4200.0        .0    4200.0        .0        .0     919.2        .0      37.1      15.5 100000.00
     .10       .00      4.57       .00      .000      .035      .000      .000   1340.00  19961.26
 .002995      940.      980.      960.         6         0         0       .00    332.28  20293.54

FLOW DISTRIBUTION FOR SECNO=     15.52          CWSEL=   1344.62

STA=   19961.   20320.
PER Q=    100.0
 AREA=    919.2
  VEL=      4.6
DEPTH=      2.8

*SECNO 15.699

3301 HV CHANGED MORE THAN HVINS

3485 MINIMUM SPECIFIC ENERGY
3420 CRITICAL DEPTH ASSUMED
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3470 ENCROACHMENT STATIONS=    19870.0   20085.0  TYPE=      1  TARGET=      215.000
  15.699      4.49   1349.49   1349.49   1349.29   1350.77      1.28      5.22       .29   1354.00
  4200.0       .0    4200.0       .0        .0     462.0        .0      52.2      21.1 100000.00
     .12      .00      9.09       .00      .000      .035      .000      .000   1345.00  19901.73
 .013157     935.      950.      920.         3         8         0       .00    180.69  20082.42


FLOW DISTRIBUTION FOR SECNO=     15.70         CWSEL=   1349.49

STA=   19902.   20085.
 PER Q=    100.0
 AREA=    462.0
  VEL=      9.1
DEPTH=      2.6

* SECNO 15.966

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.73


3470 ENCROACHMENT STATIONS=     1985.0    2430.0  TYPE=      1  TARGET=      445.000
  15.966      4.85   1356.85       .00   1356.44   1356.96       .10      6.07       .12   1358.00
  2350.0       .0    2350.0       .0        .0     913.5        .0      74.5      31.1 100000.00
     .28      .00      2.57       .00      .000      .035      .000      .000   1352.00   1987.86
 .001382    1450.     1410.     1200.         7         0         0       .00    437.87   2425.73


FLOW DISTRIBUTION FOR SECNO=     15.97         CWSEL=   1356.85

STA=    1988.    2430.
 PER Q=    100.0
 AREA=    913.5
  VEL=      2.6
DEPTH=      2.1

* SECNO 16.066
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```
 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3365 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

3385 20 TRIALS ATTEMPTED WSEL,CWSEL
3393 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3370 ENCROACHMENT STATIONS=     1970.0    2350.0  TYPE=      1  TARGET=      380.000
  16.066      5.44   1359.44   1359.44   1358.64   1360.22       .78      1.96       .20   1360.40
  2350.0        .0    2350.0       .0        .0     332.4        .0      82.6      35.6 100000.00
     .30       .00      7.07       .00      .000      .035      .000      .000   1354.00   1982.79
 .019424      565.      570.      480.        20        11         0       .00    254.14   2330.45


FLOW DISTRIBUTION FOR SECNO=     16.07          CWSEL=   1359.44

STA=    1983.    2350.
 PER Q=    100.0
 AREA=    332.4
  VEL=      7.1
DEPTH=      1.3

SECNO 16.167

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.53


3370 ENCROACHMENT STATIONS=     1950.0    2200.0  TYPE=      1  TARGET=      250.000
  16.167      5.28   1363.28       .00   1362.45   1363.58       .30      3.31       .05   1364.80
  2350.0        .0    2179.3     170.7        .0     482.0      89.5      88.1      38.7   1362.00
     .33       .00      4.52      1.91      .000      .035      .050      .000   1358.00   1951.59
 .003043      530.      530.      530.         5         0         0       .00    248.41   2200.00


FLOW DISTRIBUTION FOR SECNO=     16.17          CWSEL=   1363.28

STA=    1952.    2130.    2170.    2200.
 PER Q=     92.7      4.2      3.1
 AREA=    482.0     51.1     38.3
  VEL=      4.5      1.9      1.9
DEPTH=      2.7      1.3      1.3
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 16.248

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .52

3470 ENCROACHMENT STATIONS=     1925.0    2030.0  TYPE=      1  TARGET=      105.000
   16.248      8.81   1364.91       .00   1364.44   1366.08      1.17      2.24       .26   1367.00
   2350.0       .0    2350.0       .0        .0     270.8        .0      92.2      40.3 100000.00
      .35       .00      8.68       .00      .000      .035      .000      .000   1356.10   1931.29
  .011102      450.      430.      340.         3         0         0       .00     98.71   2030.00

FLOW DISTRIBUTION FOR SECNO=     16.25          CWSEL=   1364.91

STA=    1931.    2030.
 PER Q=    100.0
 AREA=     270.8
  VEL=       8.7
DEPTH=       2.7

*SECNO 16.328

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.72

3470 ENCROACHMENT STATIONS=     1915.0    2240.0  TYPE=      1  TARGET=      325.000
   16.328      9.86   1367.36       .00   1366.52   1367.50       .14      1.32       .10   1366.00
   2350.0       .0    2350.0       .0        .0     788.5        .0      97.2      42.3 100000.00
      .39       .00      2.98       .00      .000      .035      .000      .000   1357.50   1915.00
  .001503      440.      410.      250.         1         0         0       .00    322.12   2237.12

FLOW DISTRIBUTION FOR SECNO=     16.33          CWSEL=   1367.36

STA=    1915.    2240.
 PER Q=    100.0
 AREA=     788.5
  VEL=       3.0
DEPTH=       2.4
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 16.411

01 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .45

3470 ENCROACHMENT STATIONS= 1885.0 2055.0 TYPE= 1 TARGET= 170.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1369.20 ELREA= 100000.00

16.411	3.95	1368.25	.00	1368.15	1368.94	.70	1.28	.17	1369.20
2350.0	.0	2350.0	.0	.0	350.8	.0	103.0	44.7	100000.00
.40	.00	6.70	.00	.000	.035	.000	.000	1364.30	1912.61
.007318	510.	450.	350.	3	0	0	.00	139.33	2051.94

FLOW DISTRIBUTION FOR SECNO= 16.41 CWSEL= 1368.25

A= 1913. 2055.
PER Q= 100.0
AREA= 350.8
VEL= 6.7
DEPTH= 2.5

*SECNO 16.504

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.81

3470 ENCROACHMENT STATIONS= 1835.0 2035.0 TYPE= 1 TARGET= 200.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1370.00 ELREA= 100000.00

16.504	6.54	1370.54	.00	1370.54	1370.80	.26	1.81	.04	1370.00
2350.0	.0	2350.0	.0	.0	574.6	.0	108.2	46.6	100000.00
.44	.00	4.09	.00	.000	.035	.000	.000	1364.00	1835.00
.002230	460.	490.	300.	3	0	0	.00	195.87	2030.87

```
 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=     16.50          CWSEL=   1370.54

S A=    1835.    2035.
 PER Q=    100.0
 AREA=     574.6
  VEL=       4.1
DEPTH=       2.9

*SECNO 16.608

3 02 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .60

3470 ENCROACHMENT STATIONS=     1910.0    2110.0  TYPE=      1  TARGET=      200.000

3 95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1376.50 ELREA=    100000.00

  16.608      4.37   1372.17       .00   1372.13   1372.73       .55      1.84       .09   1376.50
  2350.0        .0    2350.0        .0        .0     393.9        .0     114.1      48.8 100000.00
     .46       .00      5.97       .00      .000      .035      .000      .000   1367.80   1929.58
 .006094      485.      530.      450.         2         0         0       .00    161.94   2091.52

FLOW DISTRIBUTION FOR SECNO=     16.61          CWSEL=   1372.17

S A=    1930.    2110.
 PER Q=    100.0
 AREA=     393.9
  VEL=       6.0
DEPTH=       2.4

*SECNO 16.732

3 02 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .69

3470 ENCROACHMENT STATIONS=     1950.0    2110.0  TYPE=      1  TARGET=      160.000

3 95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1380.00 ELREA=    100000.00

  16.732      2.77   1377.77   1377.68   1377.80   1378.66       .89      5.83       .10   1380.00
  2350.0        .0    2350.0        .0        .0     310.8        .0     119.7      51.3 100000.00
     .49       .00      7.56       .00      .000      .035      .000      .000   1375.00   1955.55
 .012718      640.      685.      420.        12        14         0       .00    154.45   2110.00
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=     16.73          CWSEL=   1377.77

STA=    1956.    2115.
 PER Q=    100.0
 AREA=     310.8
  VEL=       7.6
DEPTH=       2.0

*SECNO 16.818

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.88

3470 ENCROACHMENT STATIONS=     1935.0    2045.0  TYPE=      1  TARGET=      110.000
   16.818      5.20   1380.90       .00   1380.62   1381.48       .58      2.80       .03   1382.00
   2350.0        .0    2350.0        .0        .0     383.9        .0     123.3      52.6 100000.00
      .51       .00      6.12       .00      .000      .035      .000      .000   1375.70   1943.18
 .003609      430.      455.      750.         3         0         0       .00    101.82   2045.00

FLOW DISTRIBUTION FOR SECNO=     16.82          CWSEL=   1380.90

STA=    1943.    2045.
 PER Q=    100.0
 AREA=     383.9
  VEL=       6.1
DEPTH=       3.8
```

PROFILE FOR STREAM FLOODWAY

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

```
ELEVATION  1329.     1339.     1349.     1359.     1369.     1379.     1389.     1399.     1409.     1419.
   SECNO   CUMDIS

  15.14      0. I     EL .        .        .M       .        .        .        .        .        .        R
           100. CI     E .        .        .M       .        .        .        .        .        .        R
           200. CI     EL .       .        .M       .        .        .        .        .        .        R
           300. C I    WE .       .        .M       .        .        .        .        .        .        R
           400. C I    WEL.       .        .M       .        .        .        .        .        .        R
           500. C  I    EL.       .        .M       .        .        .        .        .        .        R
           600. C   I   WE.       .        .M       .        .        .        .        .        .        R
           700. C   I   WEL       .        .M       .        .        .        .        .        .        R
           800. C    I   EL       .        .M       .        .        .        .        .        .        R
           900. C    I   WEL      .        .M       .        .        .        .        .        .        R
  15.33   1000. .      I  WEL     .        .M       .        .        .        .        .        .        R
          1100. C      I  WEL     .        .M       .        .        .        .        .        .        R
          1200. C      I  .E L    .        .M       .        .        .        .        .        .        R
          1300. C       I .WEL    .        .M       .        .        .        .        .        .        R
          1400. C       I . WEL   .        .M       .        .        .        .        .        .        R
          1500. C        I.  E L  .        .M       .        .        .        .        .        .        R
          1600. C        I.  WE L .        .M       .        .        .        .        .        .        R
          1700. C         I   E  L .        .M       .        .        .        .        .        .        R
          1800. C         I   WE  L .       .M       .        .        .        .        .        .        R
          1900. C         .I   E  L .       .M       .        .        .        .        .        .        R
  15.52   2000. C         .I    E  L.       .M       .        .        .        .        .        .        R
          2100. C         . I   WE  L       .M       .        .        .        .        .        .        R
          2200. C         . I    E  L       . M      .        .        .        .        .        .        R
          2300. C         .  I   WE .L       . M      .        .        .        .        .        .        R
          2400. C         .  I    E . L      .  M     .        .        .        .        .        .        R
          2500. C         .   I   WE. L      .  M     .        .        .        .        .        .        R
          2600. C         .   I    WE  L     .   M    .        .        .        .        .        .        R
          2700. C         .    I   WE  L     .   M    .        .        .        .        .        .        R
          2800. C         .    I    WE  L    .   M    .        .        .        .        .        .        R
          2900. C         .     I   WE   L   .    M   .        .        .        .        .        .        R
  15.70   3000. .         .     I   W E  L   .    M   .        .        .        .        .        .        R
          3100. C         .     I   .WE  L   .     M  .        .        .        .        .        .        R
          3200. C         .      I  . WE  L  .      M .        .        .        .        .        .        R
          3300. C         .      I  . WE  L  .       M.        .        .        .        .        .        R
          3400. C         .       I . WE L   .        M.       .        .        .        .        .        R
          3500. C         .       I . WE L   .         M       .        .        .        .        .        R
          3600. C         .        I.  E  L  .         .M      .        .        .        .        .        R
          3700. C         .        I.  WE L  .         . M     .        .        .        .        .        R
          3800. C         .         I   E L  .         .  M    .        .        .        .        .        R
          3900. C         .         I   WE L .         .   M   .        .        .        .        .        R
          4000. C         .         .I   E L .         .    M  .        .        .        .        .        R
          4100. C         .         .I   WEL .         .     M .        .        .        .        .        R
          4200. C         .         . I   EL .         .      M .       .        .        .        .        R
          4300. C         .         . I   E L.         .       M .      .        .        .        .        R
  15.97   4400. C         .         .  I   EL.         .        M.      .        .        .        .        R
          4500. C         .         .  I   WE.         .        M.      .        .        .        .        R
          4600. C         .         .   I   EL         .       M .      .        .        .        .        R
          4700. C         .         .   I   WE         .       M .      .        .        .        .        R
          4800. C         .         .   I    EL        .       M .      .        .        .        .        R
          4900. C         .         .    I   WE        .      M  .      .        .        .        .        R
  16.07   5000. .         .         .    I   WE        .      M  .      .        .        .        .        R
          5100. C         .         .     I  .WE       .    M    .      .        .        .        .        R
          5200. C         .         .      I . EL      .  M      .      .        .        .        .        R
          5300. C         .         .      I .  EL     .M        .      .        .        .        .        R
          5400. C         .         .       I .  WEL   M.        .      .        .        .        .        R
  16.17   5500. C         .         .        I.  RWEL  .         .      .        .        .        .        .
          5600. C         .         .        I.    ELM .         .      .        .        .        .        R
          5700. C         .         .       I .    WELM .        .      .        .        .        .        R
          5800. C         .         .       I .    WEL M.        .      .        .        .        .        R
  16.25   5900. C         .         .      I  .     WEL .M       .      .        .        .        .        R
          6000. C         .         .      I  .      EL .M       .      .        .        .        .        R
          6100. C         .         .       I .      WE .M       .      .        .        .        .        R
          6200. C         .         .       I .      LE .M       .      .        .        .        .        R
  16.33   6300. C         .         .        I.      LWE.M       .      .        .        .        .        R
          6400. C         .         .         I       LE.M       .      .        .        .        .        R
          6500. C         .         .         . I     LE.M       .      .        .        .        .        R
          6600. C         .         .         .  I     E.M       .      .        .        .        .        R
          6700. C         .         .         .    I   WEM       .      .        .        .        .        R
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16.41  6800.  C        .         .         .   I   WEM       .         .         .         .         .         R
       6900.  C        .         .         .   I    E    M   .         .         .         .         .         R
       7000.  C        .         .         .   I    WE       M.         .         .         .         .         R
       7100.  C        .         .         .   I    .E        .  M      .         .         .         .         R
       7200.  C        .         .         .   I    .E        .     M   .         .         .         .         R
16.50  7300.  C        .         .         .   I    .LE       .         .M        .         .         .         R
       7400.  C        .         .         .    I   . E       .       M .         .         .         .         R
       7500.  C        .         .         .    I   . WE      .     M   .         .         .         .         R
       7600.  C        .         .         .     I  . WE L    .  M      .         .         .         .         R
       7700.  C        .         .         .      I . E  L   M         .         .         .         .         R
16.61  7800.  C        .         .         .       I.  WE  ML .         .         .         .         .         R
       7900.  C        .         .         .        I   WE  L .         .         .         .         .         R
       8000.  C        .         .         .        .I   E  ML.         .         .         .         .         R
       8100.  C        .         .         .        . I   E  L.         .         .         .         .         R
       8200.  C        .         .         .        .  I  WE ML         .         .         .         .         R
       8300.  C        .         .         .        .   I  WE L         .         .         .         .         R
       8400.  C        .         .         .        .    I  WE.L        .         .         .         .         R
16.73  8500.  .        .         .         .        .     I  WEL        .         .         .         .         R
       8600.  C        .         .         .        .     I  WEL        .         .         .         .         R
       8700.  C        .         .         .        .     I   WEL       .         .         .         .         R
       8800.  C        .         .         .        .     I   .WE       .         .         .         .         R
16.82  8900.  C        .         .         .        .      I  . EL      .         .         .         .         R
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THIS RUN EXECUTED 24JUL98 07:37:23

****
EC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

OOD BOUNDARY

SUMMARY PRINTOUT

	SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
	15.144	4200.00	19958.00	19955.00	.00	3.46	.00	20382.00	20381.55	423.55	1335.10	.00
	15.144	4200.00	19957.67	19955.00	.00	3.34	.00	20382.00	20381.60	423.93	1335.20	.10
	15.333	4200.00	19786.66	19770.00	.00	7.69	.00	20100.00	20090.84	304.18	1338.33	.00
*	15.333	4200.00	19786.71	19770.00	.00	7.72	.00	20100.00	20090.82	304.11	1338.33	-.01
	15.519	4200.00	19961.27	19950.00	.00	4.58	.00	20320.00	20293.25	331.97	1344.62	.00
	15.519	4200.00	19961.26	19950.00	.00	4.57	.00	20320.00	20293.54	332.28	1344.62	.00
*	15.699	4200.00	19908.13	19870.00	.00	8.27	3.56	20085.00	20888.22	340.18	1349.29	.00
*	15.699	4200.00	19901.73	19870.00	.00	9.09	.00	20085.00	20082.42	180.69	1349.49	.20
*	15.966	2350.00	1988.88	1985.00	.00	2.49	2.14	2430.00	2671.12	545.98	1356.44	.00
*	15.966	2350.00	1987.86	1985.00	.00	2.57	.00	2430.00	2425.73	437.87	1356.85	.41
*	16.066	2350.00	1986.78	1970.00	.00	6.23	5.29	2350.00	2696.45	415.57	1358.64	.00
*	16.066	2350.00	1982.79	1970.00	.00	7.07	.00	2350.00	2330.45	254.14	1359.44	.80
*	16.167	2350.00	1952.46	1950.00	.00	3.47	2.18	2130.00	2622.21	669.76	1362.45	.00
*	16.167	2350.00	1951.59	1950.00	.00	4.52	1.91	2130.00	2200.00	248.41	1363.28	.83
*	16.248	2350.00	1932.67	1925.00	.00	6.86	2.31	2030.00	2633.33	700.66	1364.44	.00
*	16.248	2350.00	1931.29	1925.00	.00	8.68	.00	2030.00	2030.00	98.71	1364.91	.46
*	16.328	2350.00	1873.19	1915.00	.66	3.67	2.27	2240.00	2471.46	482.32	1366.52	.00
*	16.328	2350.00	1915.00	1915.00	.00	2.98	.00	2240.00	2237.12	322.12	1367.36	.84
*	16.411	2350.00	1915.48	1885.00	.00	6.97	.00	2055.00	2051.77	136.29	1368.15	.00
*	16.411	2350.00	1912.61	1885.00	.00	6.70	.00	2055.00	2051.94	139.33	1368.25	.10
*	16.504	2350.00	1628.65	1835.00	.90	4.02	.00	2035.00	2030.86	291.25	1370.54	.00
*	16.504	2350.00	1835.00	1835.00	.00	4.09	.00	2035.00	2030.87	195.87	1370.54	.01

	SECNO	Q	SSTA	STCHL	VLOB	VCH	VROB	STCHR	ENDST	TOPWID	CWSEL	DIFWSP
*	16.608	2350.00	1929.67	1910.00	.00	6.05	.00	2110.00	2091.21	161.54	1372.13	.00
	16.608	2350.00	1929.58	1910.00	.00	5.97	.00	2110.00	2091.52	161.94	1372.17	.04
	16.732	2350.00	1955.50	1950.00	.00	7.39	.00	2115.00	2114.50	158.99	1377.80	.00
*	16.732	2350.00	1955.55	1950.00	.00	7.56	.00	2115.00	2110.00	154.45	1377.77	-.03
	16.818	2350.00	1945.33	1935.00	.00	4.64	2.38	2045.00	2225.56	280.22	1380.62	.00
	16.818	2350.00	1943.18	1935.00	.00	6.12	.00	2045.00	2045.00	101.82	1380.90	.28

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=     15.333  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     15.333  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     15.333  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     15.333  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     15.519  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     15.519  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     15.699  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     15.699  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     15.699  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     15.699  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     15.966  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     15.966  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     16.066  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     16.066  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     16.066  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     16.066  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     16.066  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     16.167  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.167  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     16.248  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     16.248  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=     16.248  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.328  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.328  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.411  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.411  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.504  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.504  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.608  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.608  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.732  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     16.818  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     16.818  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

FLOODWAY DATA, FLOOD BOUNDARY
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
15.144	424.	1256.	3.3	1335.2	1335.1	.1
15.333	304.	544.	7.7	1338.3	1338.3	.0
15.519	332.	919.	4.6	1344.6	1344.6	.0
15.699	181.	462.	9.1	1349.5	1349.3	.2
15.966	438.	914.	2.6	1356.8	1356.4	.4
16.066	348.	332.	7.1	1359.4	1358.6	.8
16.167	248.	572.	4.1	1363.2	1362.4	.8
16.248	99.	271.	8.7	1364.9	1364.4	.5
16.328	322.	789.	3.0	1367.3	1366.5	.8
16.411	139.	351.	6.7	1368.2	1368.1	.1
16.504	196.	575.	4.1	1370.5	1370.5	.0
16.608	162.	394.	6.0	1372.1	1372.1	.0
16.732	154.	311.	7.6	1377.8	1377.8	.0
16.818	102.	384.	6.1	1380.9	1380.6	.3

Appendix D

EXISTING CONDITION
NEW RIVER HEC-RAS ANALYSIS

HEC-RAS Version 2.0 April 1997
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: new river existing conditions near terra
Project File : terraex.prj
Run Date and Time: 7/29/98 1:38:12 PM

Project in English units

Project Description:
New River Bank Protection at Terramar Development

PLAN DATA

Plan Title: Plan 01
Plan File : n:\960043\hydro\hecras\nriver\nrexist\terraex.p01

Geometry Title: New River at Terramar Existing Geomtry
Geometry File : n:\960043\hydro\hecras\nriver\nrexist\terraex.g01

Flow Title : New River near Terramar
Flow File : n:\960043\hydro\hecras\nriver\nrexist\terraex.f01

Plan Summary Information:

Number of:	Cross Sections =	18	Mulitple Openings =	0
	Culverts =	0	Inline Weirs =	0
	Bridges =	0		

Computational Information

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

Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance = True
Left Offset = 0
Right Offset = 0

River = New River Reach = Terramar

RS	Profile	Method	Value1	Value2
2.16	PF#2	1	913	1210
2.150	PF#2	1	960.9	1098.5
2.140	PF#2	1	879.7	1042.1
2.135	PF#2	1	909.9	1053.8
2.130	PF#2	1	917.9	1059.9
2.125	PF#2	1	893.5	1054
2.120	PF#2	1	872	1054
2.118	PF#2	1	854.5	1065.5
2.116	PF#2	1	935.86	1071
2.113	PF#2	1	883	1104
2.1125	PF#2	1	844.4	1142.1
2.112	PF#2	1	870	1074
2.111	PF#2	1	866	1190
2.110	PF#2	1	842	1169.5
2.109	PF#2	1	787	1120
2.108	PF#2	1	841	1133
2.107	PF#2	1	885	1134
2.106	PF#2	1	710	1053

FLOW DATA

Flow Title: New River near Terramar
Flow File : n:\960043\hydro\hecras\nriver\nrexist\terraex.f01

Flow Data (cfs)

River	Reach	RS	PF#1	PF#2
New River	Terramar	2.16	4200	4200
New River	Terramar	2.150	4200	4200
New River	Terramar	2.111	4200	4200

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
New River	Terramar	PF#1	Critical	Normal S = 0.005

GEOMETRY DATA

Geometry Title: New River at Terramar Existing Geomtry
Geometry File : n:\960043\hydro\hecras\nriver\nrexist\terraex.g01

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.16

INPUT
Description: Upstream Cross Section (15.966 of FIS)
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
913	1358	925	1357	927	1356	929	1355	932	1354
935	1353	938	1352	940	1351	960	1351	975	1352
1025	1352	1070	1352	1074	1353	1077	1354	1080	1355
1085	1356	1150	1356	1175	1355	1200	1355	1205	1356
1210	1357	1295	1357	1300	1355	1305	1354	1315	1354
1320	1355	1340	1356	1360	1356	1395	1355	1420	1354
1470	1354	1480	1355	1490	1356	1493	1357	1500	1358
1510	1359	1515	1359	1540	1360				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
913	.05	913	.035	1210	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
913	1210	870	761	465	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
913	913	1357	1210	1540	1357

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.150

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.2	1353	960.9	1353	962.9	1352	964.8	1351	966.9	1350
969	1349	971.1	1348	1009.4	1347	1014.3	1346	1025.16	1345.5
1036.1	1346	1041.1	1347	1045.9	1348	1050.5	1349	1057.2	1350
1089.6	1351	1098.5	1352	1214.4	1352	1219.4	1351	1224.6	1350
1243.2	1350	1246.9	1351	1250.1	1352	1273	1352	1280	1351
1284.6	1350	1323.3	1351	1335.5	1350	1339.4	1351	1356.3	1352
1385.8	1353	1406	1353	1416	1352	1448	1352	1473	1352
1481	1351	1486	1350	1491	1349	1507	1350	1515	1351
1520	1352	1524	1352	1566	1352	1571	1353	1593	1354
1636	1354	1639	1355						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
941.2	.05	960.9	.035	1098.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
960.9	1098.5	175	203.8	210	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1098.5	1639	1355

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.140

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
879.7	1352	899.7	1351	932.7	1350	941.2	1349	950.4	1348
970.3	1347	986.2	1346	993.4	1345	1008.4	1344.5	1023.4	1345
1025.6	1346	1037.2	1351	1042.1	1352	1092	1352	1099	1351
1104	1350	1120	1350	1124	1351	1139	1352	1184	1352
1234	1351	1267	1351	1284	1352	1287	1352	1369	1352
1389	1351	1404	1350	1417	1349	1514	1349	1524	1350
1534	1351	1544	1352	1589	1351	1624	1352	1639	1353

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
879.7	.05	879.7	.035	1042.1	.05

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         879.7  1042.1            156.4   193.4   236.6              .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev
  1042.1    1639    1352

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.135

INPUT
Description:
Station Elevation Data    num=      16
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
     810     1351     830     1351     850     1350   869.2     1349   880.4     1350
   909.9     1350   917.5     1349   926.2     1348   935.7     1347   945.4     1346
   995.3   1345.5  1045.2     1346  1048.7     1347  1051.7     1348  1053.8     1349
  1118.9     1350

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     810     .05   909.9    .035  1053.8     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         909.9  1053.8                54    51.4    66              .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev
     810   909.9    1350

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.130

INPUT
Description:
Station Elevation Data    num=      32
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
     832     1350     840     1349   866.2     1349   917.9     1349   923.3     1348
   928.4     1347   936.2     1346   996.5     1345  1005.5     1345  1050.4     1346
  1059.9     1349  1104.9     1349  1110.9     1350  1159.7     1351    1172     1351
    1183     1350    1195     1349    1200     1349    1210     1350    1295     1350
    1300     1349    1340     1349    1355     1350    1395     1350    1460     1349
    1475     1348    1490     1348    1520     1349    1560     1349    1570     1349
    1580     1350    1592     1350

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     832     .05   917.9    .035  1059.9     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         917.9  1059.9            111.5    80.9    84              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
     832   917.9    1351  1059.9    1592    1351

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.125

INPUT
Description:
Station Elevation Data    num=      31
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
   790.5     1353   794.5     1352   802.5     1351     810     1350   816.5     1349
     825     1348   842.5     1347   851.5     1346     870     1346     871     1347
     875     1348     878     1349   893.5     1349     906     1348   911.5     1347
     918     1346     923     1345     969     1345    1029     1344    1038     1344
    1043     1345    1045     1346    1048     1347    1050     1348    1054     1349
    1060     1350  1079.5     1350    1103     1349    1111     1348  1131.5     1348
    1140     1349

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   790.5     .05   893.5    .035    1054     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         893.5    1054                144   119.8   138              .1       .3
Ineffective Flow     num=       2
```

Sta L	Sta R	Elev	Sta L	Sta R	Elev
790.5	893.5	1350	1054	1140	1350

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.120

INPUT
Description:
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
872	1350	874	1349	876	1348	878	1347	880	1346
889	1345	896.5	1344	906.5	1343	911	1343	922	1344
930	1344.286	932.5	1345	970	1345	981	1344	1005	1343
1014.7	1342.5	1024.5	1343	1032.5	1344	1035	1345	1038	1346
1041	1347	1050.5	1348	1060.5	1349	1072.5	1349	1087	1348
1097	1347	1099	1347	1102	1348	1110	1349	1114	1349
1122	1348	1127	1348	1184	1348	1190	1347	1196	1347
1207	1348	1222	1349	1234	1350	1252	1351	1272	1350
1307	1349	1310	1349	1374	1349	1420	1350	1427	1349
1434	1348	1464	1347	1477	1347	1482	1348	1487	1349
1509	1349	1557	1348	1572	1348	1577	1347	1589	1347
1592	1348	1610	1349	1615	1349	1644	1350		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
872	.05	872	.035	1060.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
872	1060.5	113	67.1	47	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1060.5	1644	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.118

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
854.5	1350	867	1349	869	1348	871	1347	873	1346
874	1345	876	1344	916.5	1343	924	1344	945	1345
962	1345	974	1344	988	1343	1008.5	1342.5	1029	1343
1032	1344	1035	1345	1038.5	1346	1056	1347	1065.5	1348
1104.6	1348	1109.2	1347						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
854.5	.05	854.5	.035	1065.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
854.5	1065.5	125	77.7	49.5	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.116

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
890	1352	896	1348	898	1347	903	1343	922	1342
933.5	1341.5	945	1342	948	1343	950	1343	968	1342
984	1341.5	1000	1342	1010	1343	1017.5	1344	1037.5	1344
1040.5	1345	1043.5	1346	1053.5	1346	1071.5	1347	1110	1347

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
890	.05	950	.035	1071.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
950	1071.5	155.5	105.2	86	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.113

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
860	1351	875	1342	883	1342	889	1339	894	1338.5
899	1339	908	1340	916	1341	932	1342	950	1342.316
989	1343	1104	1343	1106.5	1344	1110	1345	1113.5	1346
1154	1347								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
860	.05	883	.035	1104	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
883	1104	205.7	131.8	49.6	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.1125

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
844.4	1349	851.1	1340	866.7	1340	907	1341	954.1	1341
985.8	1341	1022	1342	1098	1342	1128.6	1343	1137.7	1346
1142.1	1347	1169	1348						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
844.4	.05	844.4	.035	1142.1	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
844.4	1142.1	102.6	134.6	108	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.112

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
822	1348.5	856	1348	870	1341	894.5	1341	901	1341
943.5	1340	956	1339	968.5	1338.5	981	1339	997.5	1340
1017	1341	1074	1341	1080.5	1342	1085	1343	1090	1344
1094	1345	1096	1346						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
822	.05	870	.035	1074	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
870	1074	38.5	54.7	191	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.111

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
811.7	1348	844	1348	856	1342	866	1342	888	1342
896	1341	906	1341	932.5	1341	960	1340	974.5	1339
1006.5	1339	1027	1340	1154	1340	1187.5	1339	1190	1340
1201	1345	1209	1347						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
811.7	.05	866	.035	1190	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
866	1190	115	179.4	324	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.110

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
784	1348	795	1347	800	1346	805	1345	811	1344
816.5	1343	829.5	1342	842	1341	861	1340	1035	1340
1105	1339	1119	1338	1124	1337	1134.5	1336	1143.5	1336
1152.5	1337	1162.5	1338	1165	1339	1167.5	1340	1169.5	1341
1172	1342	1176.5	1343	1185	1344	1191.5	1345	1205.5	1346
1217.5	1347								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
784	.05	842	.035	1169.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
842	1169.5	180	190	210	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.109

INPUT
Description: X-Sec 2.109 Corresponds to Section 15.519 of FIS
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
685	1345	688	1344	689	1343	692	1342	780	1341
783	1340	785	1339	787	1338	798	1337	830	1338
847	1338	1045	1338	1068	1337	1080	1336	1112	1336
1115	1337	1120	1338	1124	1339	1128	1340	1132	1341
1136	1342	1140	1343						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
685	.05	787	.035	1120	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
787	1120	940	980	960	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.108

INPUT
Description: X-Sec 2.108 Corresponds to Section 15.333 of FIS
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
734	1339	770	1339	841	1339	855	1338	870	1337
890	1336	900	1336	910	1336	965	1336	1012	1336
1070	1335	1090	1334	1129	1335	1130	1336	1131	1337
1132	1338	1133	1339	1134	1340				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
734	.05	841	.035	1133	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
841	1133	150	150	150	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.107

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
515	1339	540	1338	620	1338	734	1337	747	1337
752	1338	885	1338	910	1337	914	1336	945	1335
966	1335	972	1334	995	1334	1067	1334	1127	1335
1129	1336	1131	1337	1134	1338	1137	1339	1140	1340

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
515	.05	885	.035	1134	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
885	1134	420	400	390	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
515	885	1339

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.106

INPUT
Description: X-Sec 2.106 near Happy Valley Road
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
266	1340	271	1338	274	1337	304	1336	549	1336
650	1336	710	1336	725	1336	738	1335	829	1335
880	1335	1044	1335	1047	1336	1050	1337	1053	1338
1140	1339								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
266	.05	710	.035	1053	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
710	1053	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:New River

Reach	River Sta.	n1	n2	n3
Terramar	2.16	.05	.035	.05
Terramar	2.150	.05	.035	.05
Terramar	2.140	.05	.035	.05
Terramar	2.135	.05	.035	.05
Terramar	2.130	.05	.035	.05
Terramar	2.125	.05	.035	.05
Terramar	2.120	.05	.035	.05
Terramar	2.118	.05	.035	.05
Terramar	2.116	.05	.035	.05
Terramar	2.113	.05	.035	.05
Terramar	2.1125	.05	.035	.05
Terramar	2.112	.05	.035	.05
Terramar	2.111	.05	.035	.05
Terramar	2.110	.05	.035	.05
Terramar	2.109	.05	.035	.05
Terramar	2.108	.05	.035	.05
Terramar	2.107	.05	.035	.05
Terramar	2.106	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: New River

Reach	River Sta.	Left	Channel	Right
Terramar	2.16	870	761	465
Terramar	2.150	175	203.8	210
Terramar	2.140	156.4	193.4	236.6
Terramar	2.135	54	51.4	66

Terramar	2.130	111.5	80.9	84
Terramar	2.125	144	119.8	138
Terramar	2.120	113	67.1	47
Terramar	2.118	125	77.7	49.5
Terramar	2.116	155.5	105.2	86
Terramar	2.113	205.7	131.8	49.6
Terramar	2.1125	102.6	134.6	108
Terramar	2.112	38.5	54.7	191
Terramar	2.111	115	179.4	324
Terramar	2.110	180	190	210
Terramar	2.109	940	980	960
Terramar	2.108	150	150	150
Terramar	2.107	420	400	390
Terramar	2.106	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: New River

Reach	River Sta.	Contr.	Expan.
Terramar	2.16	.1	.3
Terramar	2.150	.1	.3
Terramar	2.140	.1	.3
Terramar	2.135	.1	.3
Terramar	2.130	.1	.3
Terramar	2.125	.1	.3
Terramar	2.120	.1	.3
Terramar	2.118	.1	.3
Terramar	2.116	.1	.3
Terramar	2.113	.1	.3
Terramar	2.1125	.1	.3
Terramar	2.112	.1	.3
Terramar	2.111	.1	.3
Terramar	2.110	.1	.3
Terramar	2.109	.1	.3
Terramar	2.108	.1	.3
Terramar	2.107	.1	.3
Terramar	2.106	.1	.3

Profile Output Table - Standard Table 2

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Terramar	2.16	1356.87	1356.39	0.48	3.32	0.03		4200.00		475.41
Terramar	2.16	1356.87	1356.40	0.48	3.31	0.03		4200.00		280.77
Terramar	2.150	1353.52	1352.72	0.80	1.10	0.03		4200.00		576.84
Terramar	2.150	1353.52	1352.72	0.80	1.07	0.02		4200.00		137.05
Terramar	2.140	1352.39	1351.34	1.05	1.50	0.01		4200.00		416.62
Terramar	2.140	1352.43	1351.42	1.01	1.53	0.03		4200.00		147.90
Terramar	2.135	1350.88	1349.70	1.18	0.50	0.02		4178.76	21.24	208.01
Terramar	2.135	1350.87	1349.60	1.26	0.50	0.01		4200.00		140.90
Terramar	2.130	1350.36	1348.94	1.42	0.82	0.06		4200.00		198.83
Terramar	2.130	1350.37	1349.04	1.33	0.67	0.10		4200.00		142.00
Terramar	2.125	1349.48	1348.27	1.21	0.90	0.11		4200.00		226.33
Terramar	2.125	1349.59	1348.61	0.99	0.57	0.12		4200.00		153.99
Terramar	2.120	1348.47	1347.61	0.86	0.41	0.02		4200.00		247.32
Terramar	2.120	1348.90	1348.33	0.58	0.20	0.04		4200.00		178.41
Terramar	2.118	1348.03	1347.25	0.78	0.79	0.08		4199.93	0.07	189.06
Terramar	2.118	1348.66	1348.21	0.45	0.40	0.12		4200.00		196.93

Terramar	2.116	1347.17	1345.63	1.54			1373.48	2826.52		142.68
Terramar	2.116	1348.14	1346.51	1.63	1.29	0.21	468.32	3731.68		126.86
Terramar	2.113	1345.58	1344.73	0.84	0.70	0.13	132.51	4057.95	9.55	238.63
Terramar	2.113	1345.65	1344.70	0.95	0.71	0.17		4200.00		221.00
Terramar	2.1125	1344.74	1344.35	0.39	0.80	0.08		4200.00		284.84
Terramar	2.1125	1344.77	1344.39	0.38	0.79	0.08		4200.00		284.97
Terramar	2.112	1343.87	1342.73	1.14	0.34	0.23	8.52	4161.97	29.50	217.22
Terramar	2.112	1343.90	1342.73	1.17	0.35	0.24		4200.00		204.00
Terramar	2.111	1343.13	1342.76	0.37	1.08	0.04	11.53	4171.02	17.45	341.60
Terramar	2.111	1343.13	1342.75	0.38	1.08	0.03		4200.00		324.00
Terramar	2.110	1342.01	1341.25	0.75	0.62	0.16	0.33	4199.61	0.06	331.30
Terramar	2.110	1342.02	1341.29	0.72	0.63	0.15		4200.00		327.50
Terramar	2.109	1341.22	1341.01	0.21	2.05	0.02	11.80	4161.32	26.89	353.09
Terramar	2.109	1341.24	1341.02	0.22	1.90	0.01		4200.00		333.00
Terramar	2.108	1339.15	1338.78	0.37	0.41	0.00		4200.00		288.70
Terramar	2.108	1339.32	1339.00	0.32	0.32	0.01		4200.00		292.00
Terramar	2.107	1338.74	1338.38	0.36	1.35	0.02		4199.90	0.10	604.58
Terramar	2.107	1339.00	1338.70	0.30	1.13	0.01		4200.00		249.00
Terramar	2.106	1337.36	1337.07	0.29			978.69	3221.31		776.45
Terramar	2.106	1337.86	1337.43	0.43				4200.00		341.28

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Terramar	2.16	4200.00	1351.00	1356.39	1354.87	1356.87	0.004566	5.54	758.14	475.41	0.59
Terramar	2.16	4200.00	1351.00	1356.40	1354.87	1356.87	0.004548	5.53	759.10	280.77	0.59
Terramar	2.150	4200.00	1345.50	1352.72	1351.46	1353.52	0.004191	7.18	585.28	576.84	0.61
Terramar	2.150	4200.00	1345.50	1352.72	1351.46	1353.52	0.004204	7.17	585.95	137.05	0.61
Terramar	2.140	4200.00	1344.50	1351.34	1350.57	1352.39	0.007206	8.24	509.83	416.62	0.78
Terramar	2.140	4200.00	1344.50	1351.42	1350.57	1352.43	0.006810	8.06	521.28	147.90	0.76
Terramar	2.135	4200.00	1345.50	1349.70	1349.35	1350.88	0.008422	8.74	493.89	208.01	0.84
Terramar	2.135	4200.00	1345.50	1349.60	1349.30	1350.87	0.009305	9.03	465.35	140.90	0.88
Terramar	2.130	4200.00	1345.00	1348.94	1348.84	1350.36	0.011221	9.55	439.91	198.83	0.95
Terramar	2.130	4200.00	1345.00	1349.04	1348.84	1350.37	0.010189	9.26	453.59	142.00	0.91
Terramar	2.125	4200.00	1344.00	1348.27	1347.94	1349.48	0.009226	8.83	475.85	226.33	0.87
Terramar	2.125	4200.00	1344.00	1348.61	1347.94	1349.59	0.006890	7.97	527.19	153.99	0.76
Terramar	2.120	4200.00	1342.50	1347.61	1346.89	1348.47	0.006277	7.44	564.23	247.32	0.72
Terramar	2.120	4200.00	1342.50	1348.33	1346.91	1348.90	0.003439	6.09	689.30	178.41	0.55
Terramar	2.118	4200.00	1342.50	1347.25		1348.03	0.006040	7.07	594.37	189.06	0.70
Terramar	2.118	4200.00	1342.50	1348.21		1348.66	0.002603	5.38	780.12	196.93	0.48
Terramar	2.116	4200.00	1341.50	1345.63	1345.63	1347.17	0.015709	10.69	432.04	142.68	1.11
Terramar	2.116	4200.00	1341.50	1346.51	1346.51	1348.14	0.013469	10.54	416.24	126.86	1.05
Terramar	2.113	4200.00	1338.50	1344.73	1344.44	1345.58	0.009287	7.45	577.07	238.63	0.84
Terramar	2.113	4200.00	1338.50	1344.70	1344.51	1345.65	0.010671	7.81	537.80	221.00	0.88
Terramar	2.1125	4200.00	1340.00	1344.35		1344.74	0.003375	5.03	835.66	284.84	0.52
Terramar	2.1125	4200.00	1340.00	1344.39		1344.77	0.003249	4.97	845.47	284.97	0.51
Terramar	2.112	4200.00	1338.50	1342.73	1342.73	1343.87	0.013066	8.62	495.14	217.22	0.99
Terramar	2.112	4200.00	1338.50	1342.73	1342.73	1343.90	0.013604	8.70	483.02	204.00	1.00
Terramar	2.111	4200.00	1339.00	1342.76		1343.13	0.003615	4.87	872.38	341.60	0.53
Terramar	2.111	4200.00	1339.00	1342.75		1343.13	0.003748	4.92	853.71	324.00	0.53
Terramar	2.110	4200.00	1336.00	1341.25		1342.01	0.011993	6.97	603.15	331.30	0.91
Terramar	2.110	4200.00	1336.00	1341.29		1342.02	0.011235	6.83	615.06	327.50	0.88
Terramar	2.109	4200.00	1336.00	1341.01		1341.22	0.001500	3.70	1152.67	353.09	0.35
Terramar	2.109	4200.00	1336.00	1341.02		1341.24	0.001550	3.72	1128.15	333.00	0.36
Terramar	2.108	4200.00	1334.00	1338.78		1339.15	0.003135	4.89	858.06	288.70	0.50
Terramar	2.108	4200.00	1334.00	1339.00		1339.32	0.002502	4.55	922.46	292.00	0.45
Terramar	2.107	4200.00	1334.00	1338.38	1336.77	1338.74	0.002417	4.81	873.82	604.58	0.45
Terramar	2.107	4200.00	1334.00	1338.70	1336.77	1339.00	0.001820	4.41	953.27	249.00	0.40
Terramar	2.106	4200.00	1335.00	1337.07	1336.69	1337.36	0.005003	4.75	1131.58	776.45	0.59
Terramar	2.106	4200.00	1335.00	1337.43	1336.75	1337.86	0.005002	5.27	797.33	341.28	0.61

Profile Output Table - Encroachment 2

Reach	River Sta	Prof Delta WS (ft)	Top Wdth Act (ft)	K Perc L (ft)	Enc Sta L (ft)	Dist Center L (ft)	Center Station (ft)	Dist Center R (ft)	Enc Sta R (ft)	K Perc R (ft)	Encr WD (ft)
Terramar	2.16		280.75				1061.50				
Terramar	2.16	0.00	280.77		913.00	148.50	1061.50	148.50	1210.00		297.00
Terramar	2.150		137.04				1029.70				
Terramar	2.150	0.00	137.05		960.90	68.80	1029.70	68.80	1098.50		137.60
Terramar	2.140		145.97				960.90				
Terramar	2.140	0.08	147.90		879.70	81.20	960.90	81.20	1042.10		162.40
Terramar	2.135		186.87				981.85				
Terramar	2.135	-0.09	140.90		909.90	71.95	981.85	71.95	1053.80	0.36	143.90
Terramar	2.130		141.49				988.90				
Terramar	2.130	0.10	142.00		917.90	71.00	988.90	71.00	1059.90		142.00
Terramar	2.125		148.38				973.75				
Terramar	2.125	0.34	153.99		893.50	80.25	973.75	80.25	1054.00		160.50
Terramar	2.120		169.98				966.25				

Terramar	2.120	0.72	178.41		872.00	94.25	966.25	87.75	1054.00		182.00
Terramar	2.118		189.06				960.00				
Terramar	2.118	0.96	196.93		854.50	105.50	960.00	105.50	1065.50	0.17	211.00
Terramar	2.116		142.68				1010.75				
Terramar	2.116	0.88	126.86	24.81	935.86	74.89	1010.75	60.25	1071.00		135.14
Terramar	2.113		238.63				993.50				
Terramar	2.113	-0.03	221.00	3.16	883.00	110.50	993.50	110.50	1104.00	0.22	221.00
Terramar	2.1125		284.84				993.25				
Terramar	2.1125	0.03	284.97		844.40	148.85	993.25	148.85	1142.10		297.70
Terramar	2.112		217.22				972.00				
Terramar	2.112	0.00	204.00	0.20	870.00	102.00	972.00	102.00	1074.00	0.70	204.00
Terramar	2.111		341.60				1028.00				
Terramar	2.111	-0.01	324.00	0.27	866.00	162.00	1028.00	162.00	1190.00	0.41	324.00
Terramar	2.110		331.30				1005.75				
Terramar	2.110	0.04	327.50	0.01	842.00	163.75	1005.75	163.75	1169.50	0.00	327.50
Terramar	2.109		353.09				953.50				
Terramar	2.109	0.01	333.00	0.27	787.00	166.50	953.50	166.50	1120.00	0.64	333.00
Terramar	2.108		288.70				987.00				
Terramar	2.108	0.22	292.00	0.00	841.00	146.00	987.00	146.00	1133.00		292.00
Terramar	2.107		250.13				1009.50				
Terramar	2.107	0.32	249.00		885.00	124.50	1009.50	124.50	1134.00	0.01	249.00
Terramar	2.106		776.45				881.50				
Terramar	2.106	0.35	341.28	27.35	710.00	171.50	881.50	171.50	1053.00		343.00

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Plan 02

River: New River Reach: Terramar RS: 2.16 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

River: New River Reach: Terramar RS: 2.16 Profile: 2
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

River: New River Reach: Terramar RS: 2.150 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

River: New River Reach: Terramar RS: 2.150 Profile: 2
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

River: New River Reach: Terramar RS: 2.140 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

River: New River Reach: Terramar RS: 2.140 Profile: 2
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

River: New River Reach: Terramar RS: 2.135 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The parabolic search method failed to converge on critical

depth. The program will try the cross section
slice/secant method to find critical depth.
Note - Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: New River Reach: Terramar RS: 2.130 Profile: 1
Warning - Divided flow computed for this cross-section.
River: New River Reach: Terramar RS: 2.125 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: New River Reach: Terramar RS: 2.120 Profile: 1
Warning - Divided flow computed for this cross-section.
River: New River Reach: Terramar RS: 2.120 Profile: 2
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section
slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.118 Profile: 1
Warning - Divided flow computed for this cross-section.
Warning - The cross-section end points had to be extended vertically for the computed water surface.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.118 Profile: 2
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.116 Profile: 1
Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section
slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.116 Profile: 2
Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning - The cross section had to be extended vertically during the critical depth calculations.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.113 Profile: 1
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.113 Profile: 2
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The cross section had to be extended vertically during the critical depth calculations.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.1125 Profile: 1
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.1125 Profile: 2
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.112 Profile: 1
Warning - The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

River: New River Reach: Terramar RS: 2.112 Profile: 2
Warning - The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The cross section had to be extended vertically during the critical depth calculations.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
River: New River Reach: Terramar RS: 2.111 Profile: 1
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.111 Profile: 2
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.110 Profile: 1
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.110 Profile: 2
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.109 Profile: 1
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.109 Profile: 2
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: New River Reach: Terramar RS: 2.107 Profile: 1

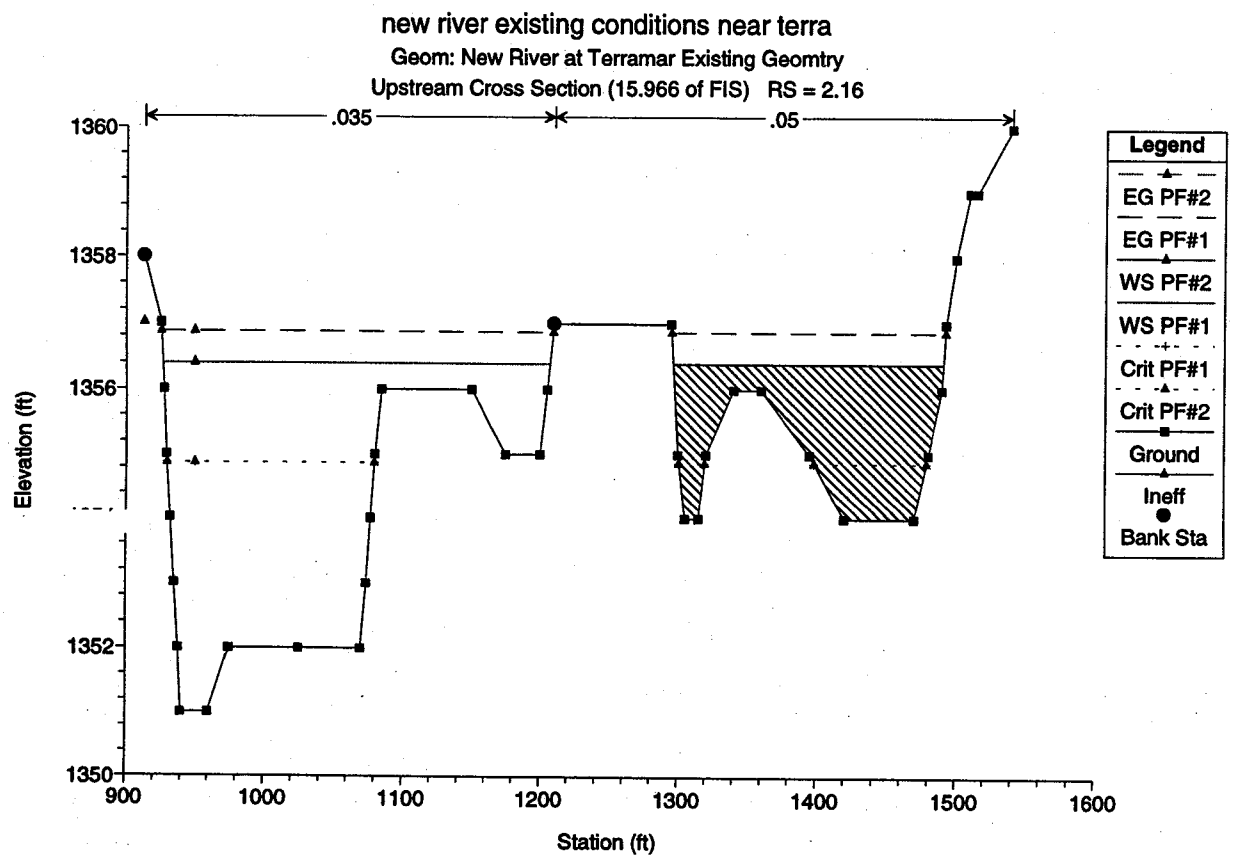
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

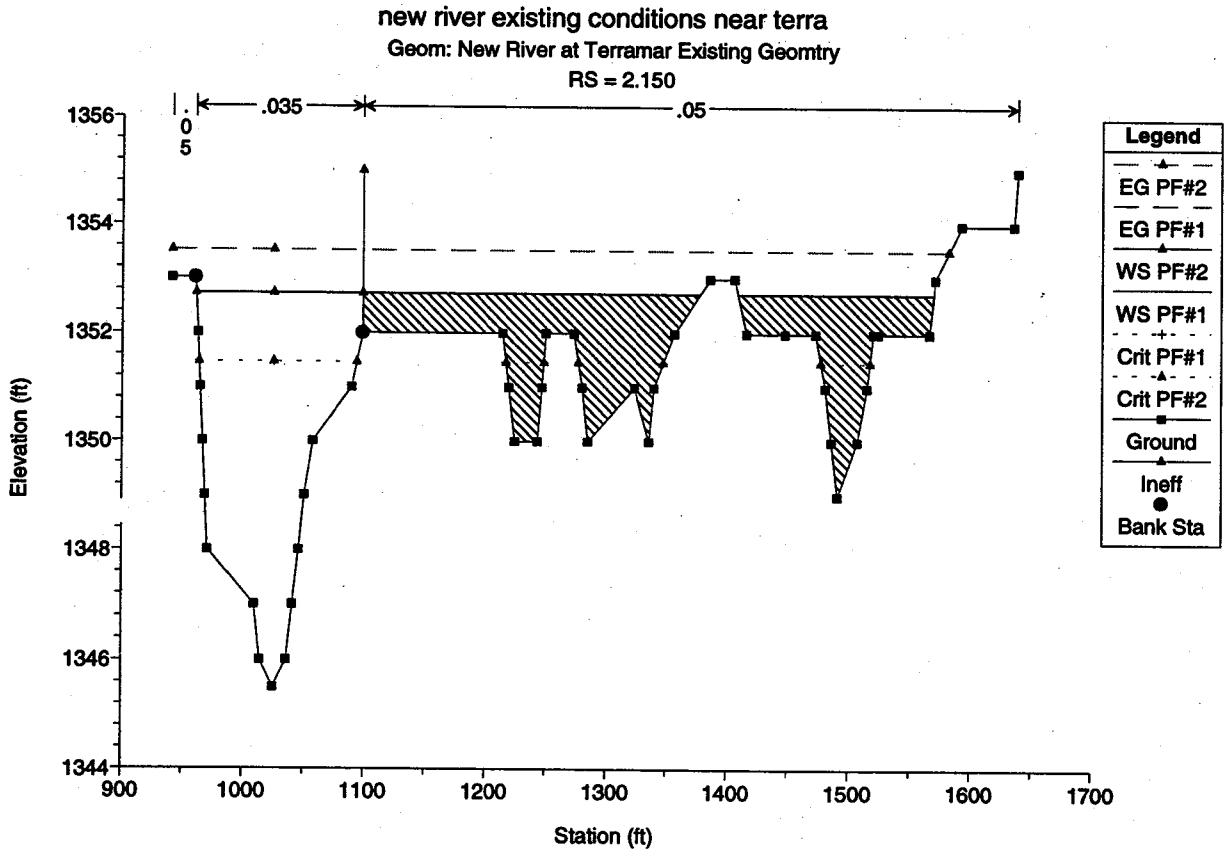
River: New River Reach: Terramar RS: 2.107 Profile: 2

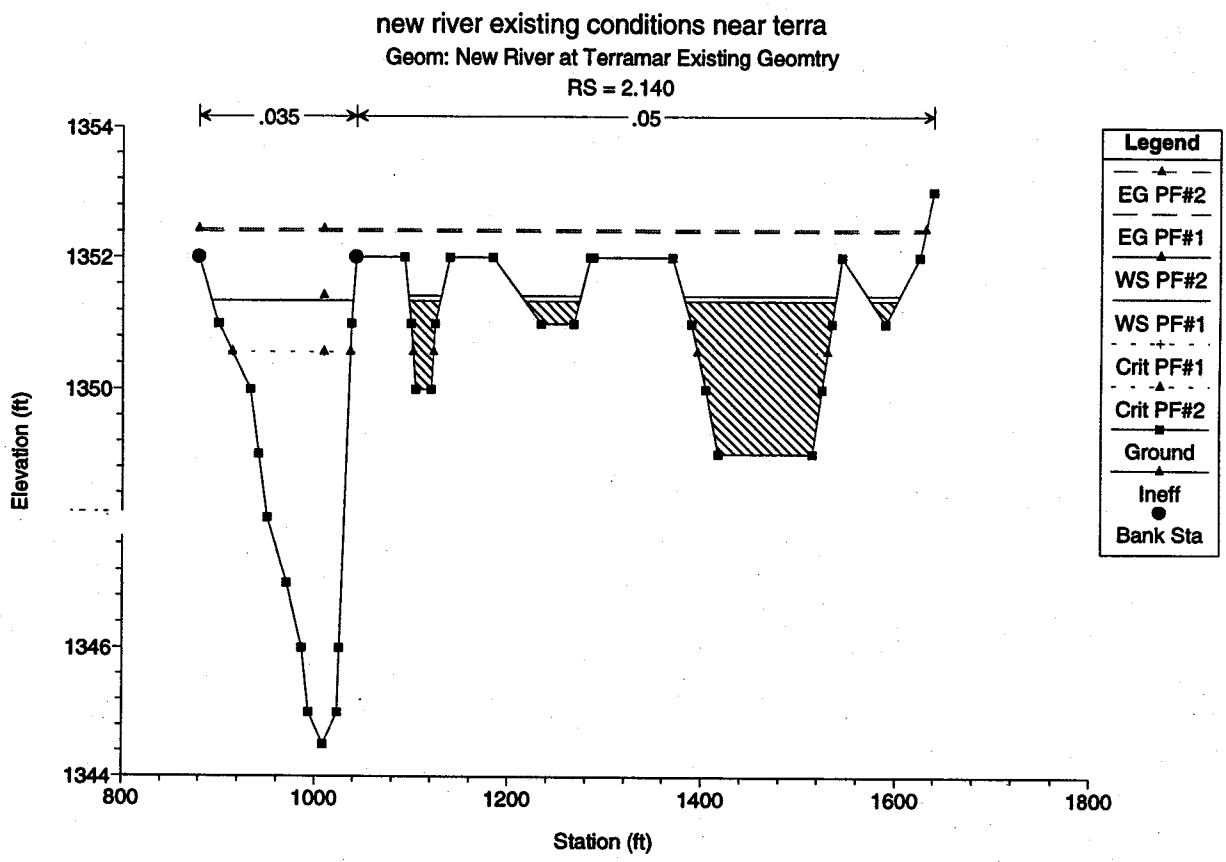
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

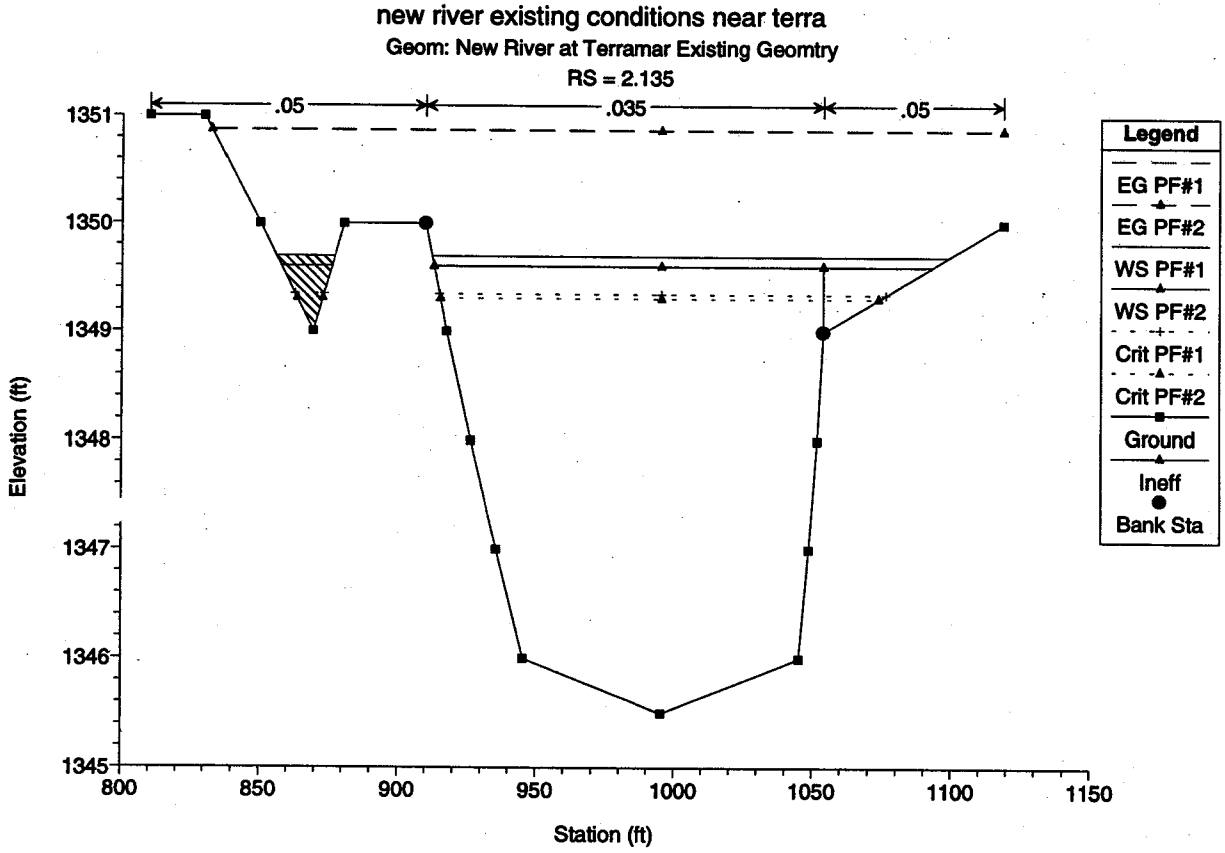
HEC-RAS Plan: Plan 02 River: New River Reach: Terramar

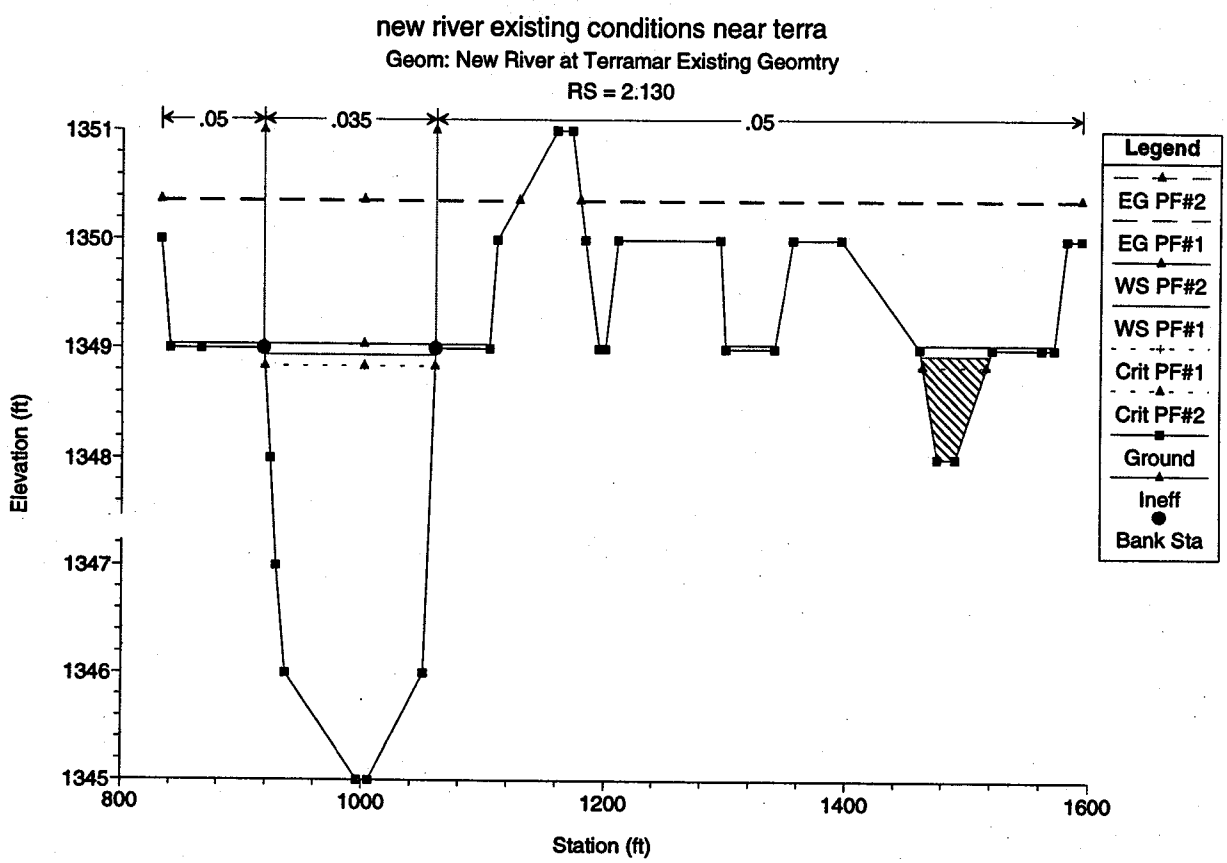
Reach	River Sta	Prof Delta WS (ft)	Top Wdth Act (ft)	K Perc L (ft)	Enc Sta L (ft)	Dist Center L (ft)	Center Station (ft)	Dist Center R (ft)	Enc Sta R (ft)	K Perc R (ft)	Encr WD (ft)
Terramar	2.16		280.75				1061.50				
Terramar	2.16	0.00	280.77		913.00	148.50	1061.50	148.50	1210.00		297.00
Terramar	2.150		137.04				1029.70				
Terramar	2.150	0.00	137.05		960.90	68.80	1029.70	68.80	1098.50		137.60
Terramar	2.140		145.97				960.90				
Terramar	2.140	0.08	147.90		879.70	81.20	960.90	81.20	1042.10		162.40
Terramar	2.135		186.87				981.85				
Terramar	2.135	-0.09	140.90		909.90	71.95	981.85	71.95	1053.80	0.36	143.90
Terramar	2.130		141.49				988.90				
Terramar	2.130	0.10	142.00		917.90	71.00	988.90	71.00	1059.90		142.00
Terramar	2.125		148.38				973.75				
Terramar	2.125	0.34	153.99		893.50	80.25	973.75	80.25	1054.00		160.50
Terramar	2.120		169.98				966.25				
Terramar	2.120	0.72	178.41		872.00	94.25	966.25	87.75	1054.00		182.00
Terramar	2.118		189.06				960.00				
Terramar	2.118	0.96	196.93		854.50	105.50	960.00	105.50	1065.50	0.17	211.00
Terramar	2.116		142.68				1010.75				
Terramar	2.116	0.88	126.86	24.81	935.86	74.89	1010.75	60.25	1071.00		135.14
Terramar	2.113		238.63				993.50				
Terramar	2.113	-0.03	221.00	3.16	883.00	110.50	993.50	110.50	1104.00	0.22	221.00
Terramar	2.1125		284.84				993.25				
Terramar	2.1125	0.03	284.97		844.40	148.85	993.25	148.85	1142.10		297.70
Terramar	2.112		217.22				972.00				
Terramar	2.112	0.00	204.00	0.20	870.00	102.00	972.00	102.00	1074.00	0.70	204.00
Terramar	2.111		341.60				1028.00				
Terramar	2.111	-0.01	324.00	0.27	866.00	162.00	1028.00	162.00	1190.00	0.41	324.00
Terramar	2.110		331.30				1005.75				
Terramar	2.110	0.04	327.50	0.01	842.00	163.75	1005.75	163.75	1169.50	0.00	327.50
Terramar	2.109		353.09				953.50				
Terramar	2.109	0.01	333.00	0.27	787.00	166.50	953.50	166.50	1120.00	0.64	333.00
Terramar	2.108		288.70				987.00				
Terramar	2.108	0.22	292.00	0.00	841.00	146.00	987.00	146.00	1133.00		292.00
Terramar	2.107		250.13				1009.50				
Terramar	2.107	0.32	249.00		885.00	124.50	1009.50	124.50	1134.00	0.01	249.00
Terramar	2.106		776.45				881.50				
Terramar	2.106	0.35	341.28	27.35	710.00	171.50	881.50	171.50	1053.00		343.00

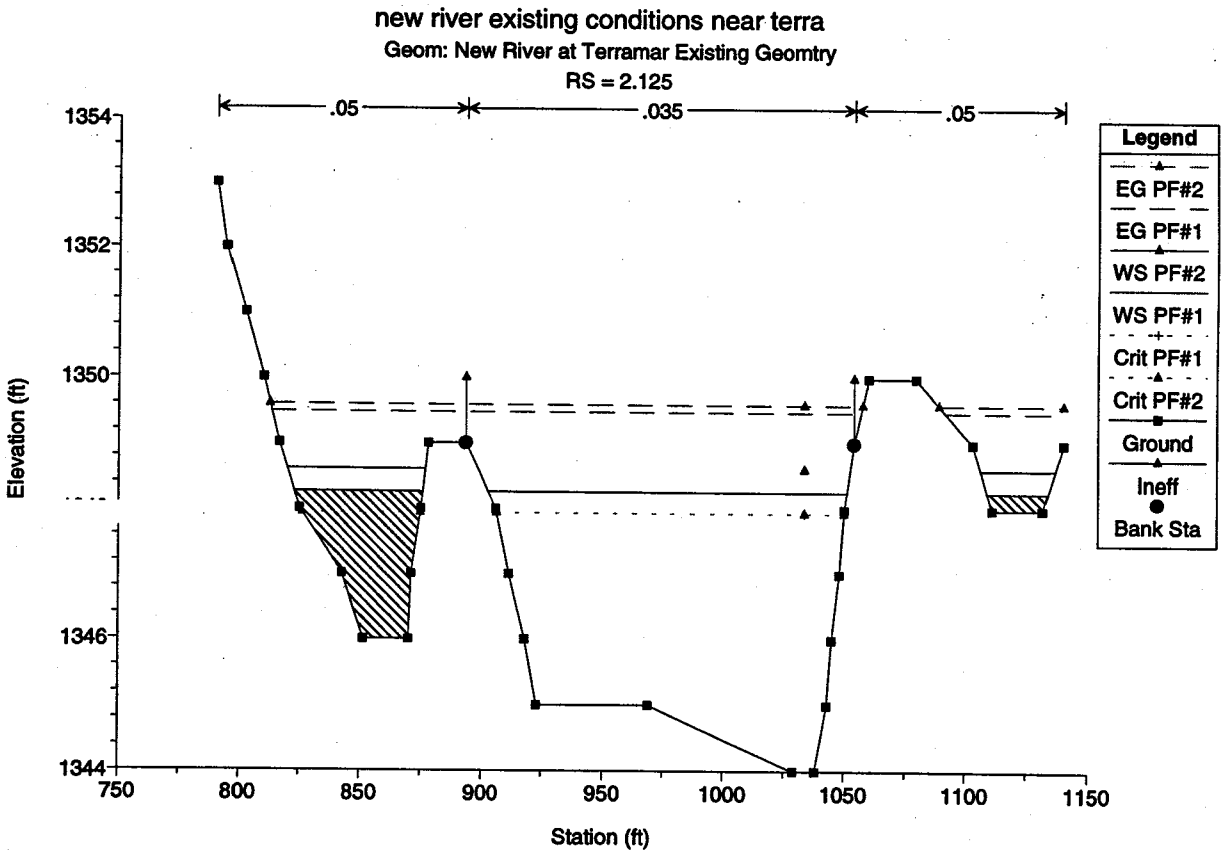

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
Upstream Cross Section (15.966 of FIS) RS = 2.16
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

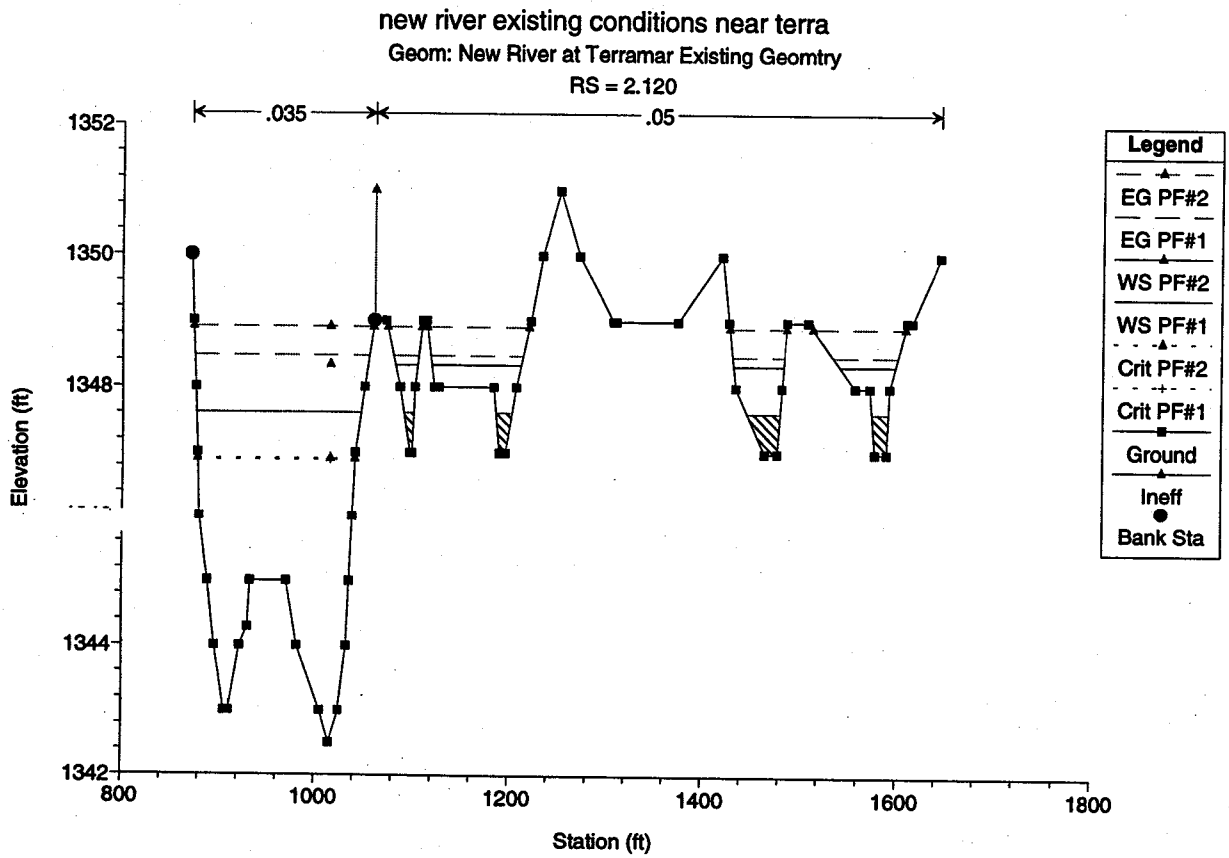

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.150
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

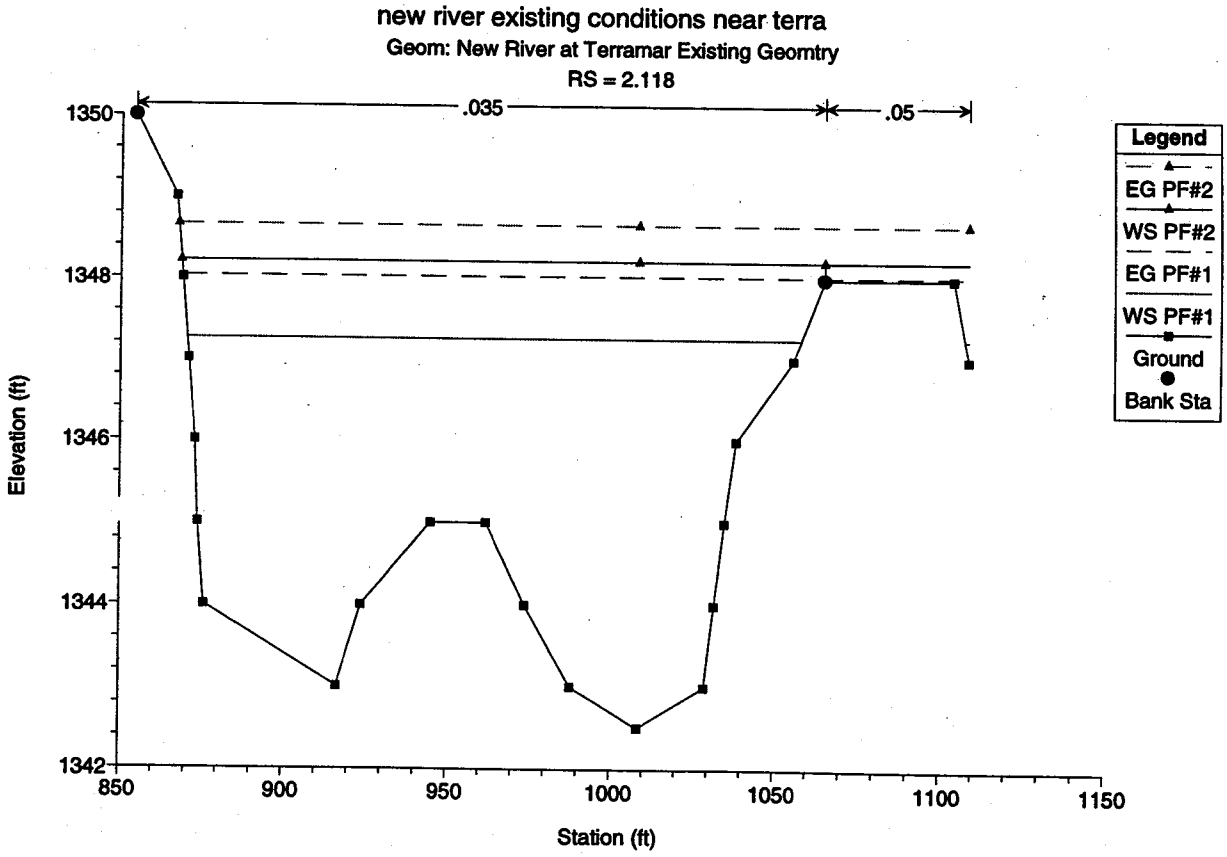

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.140
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

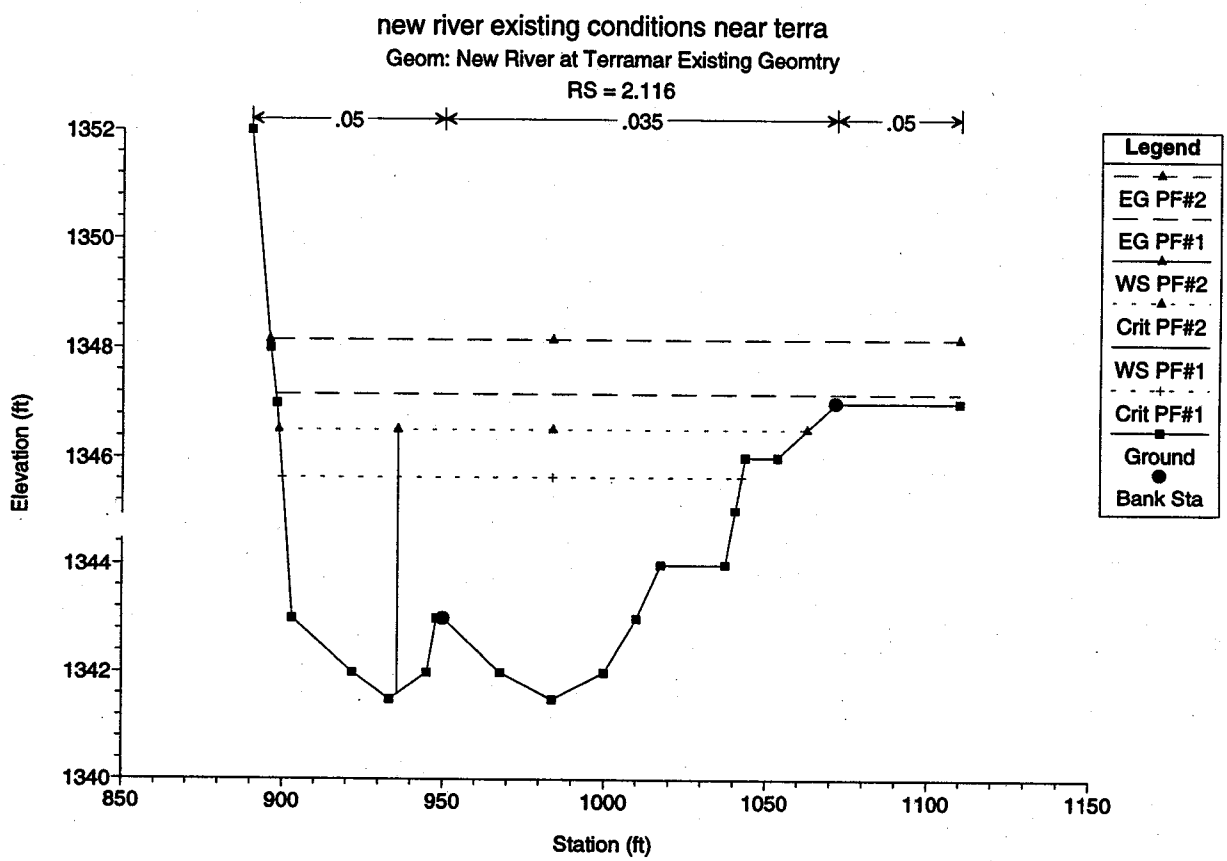

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.135
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

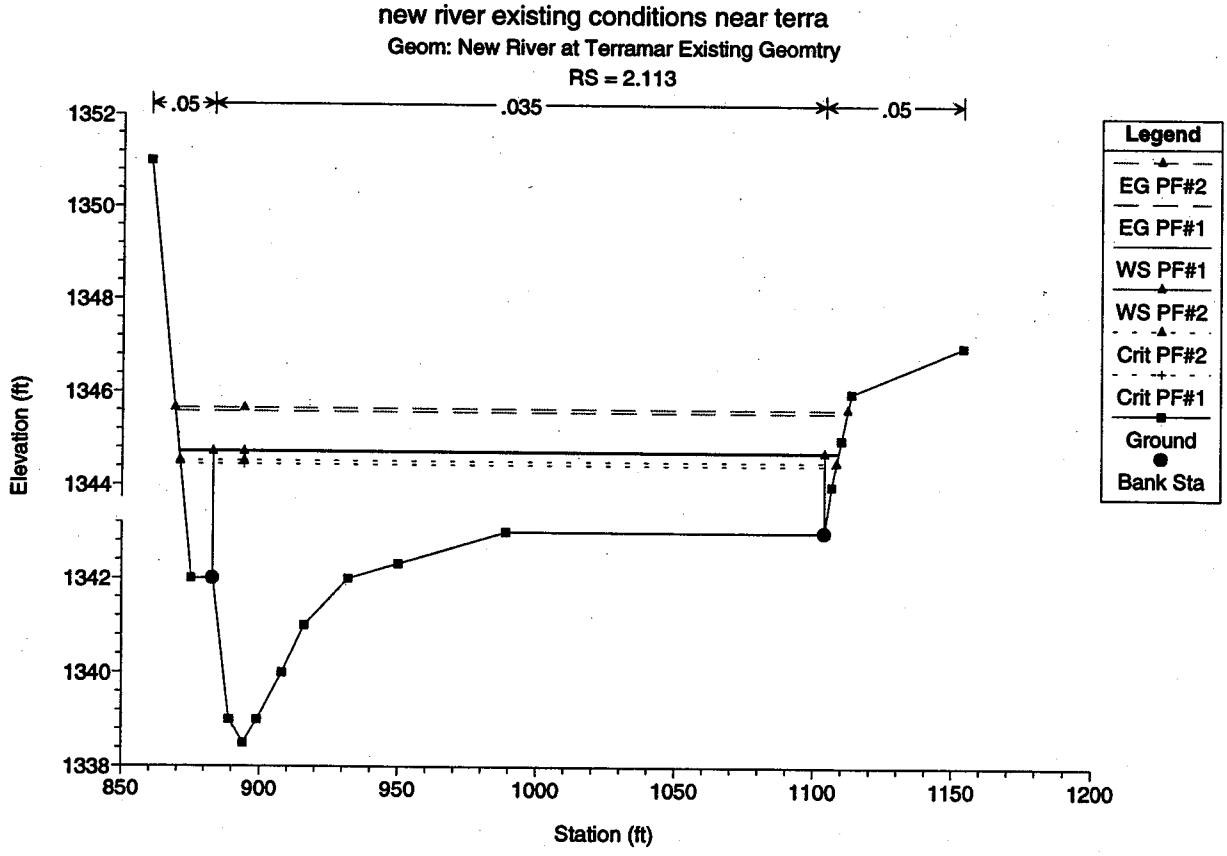

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.130
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

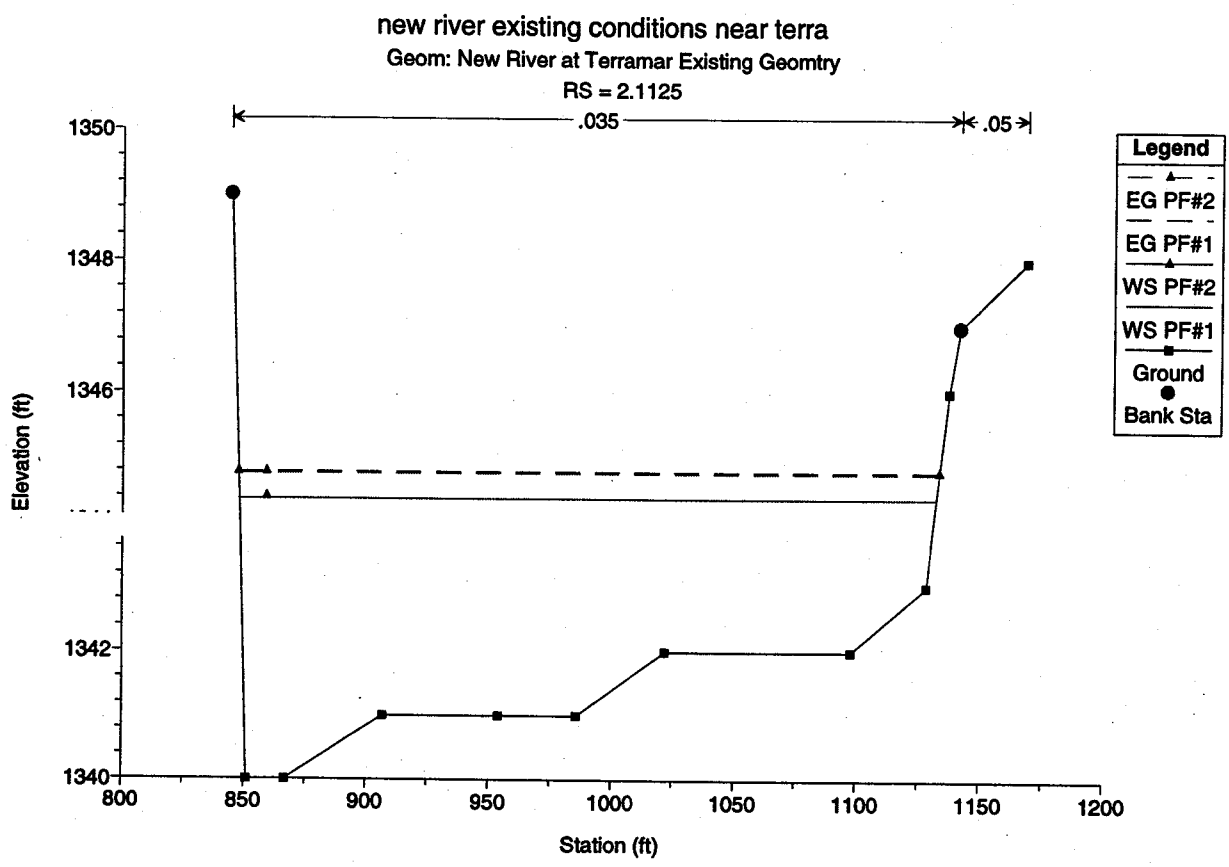

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.125
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

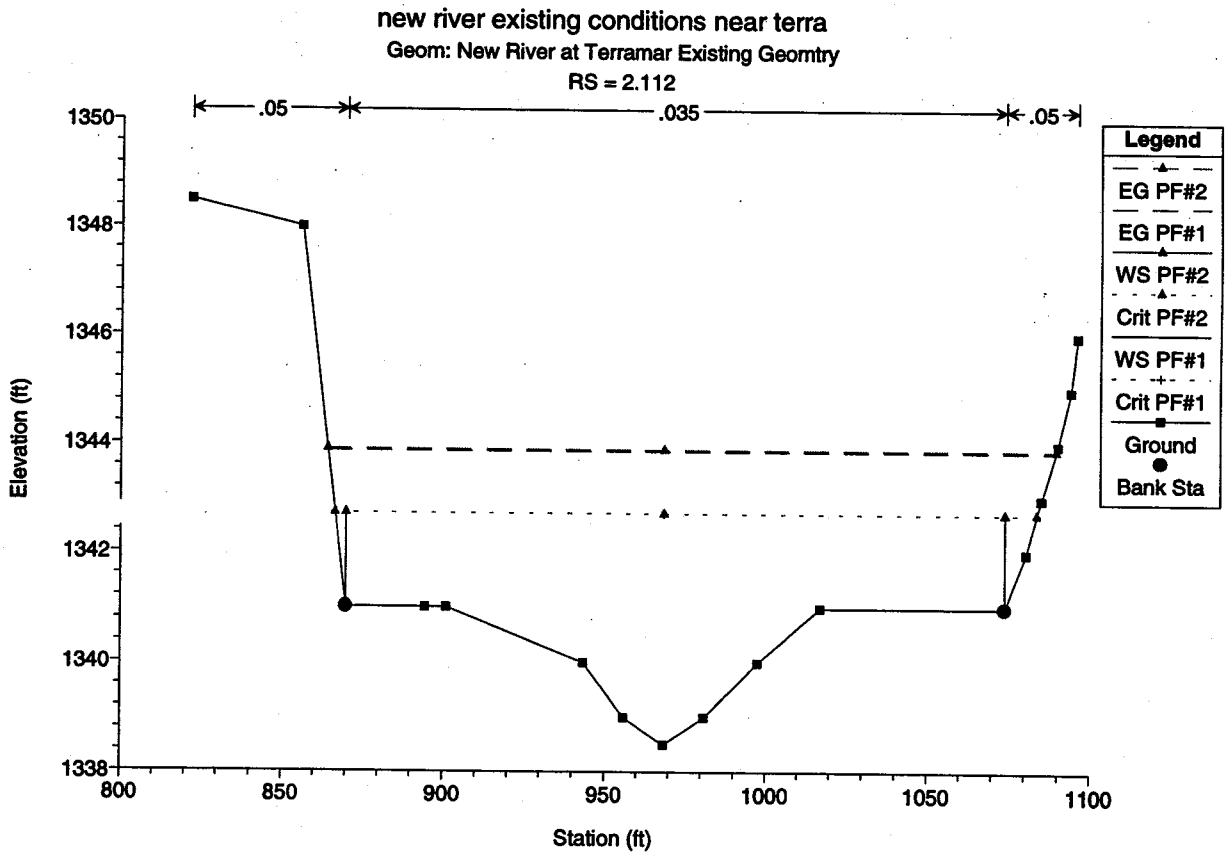

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.120
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#2
Crit PF#1
Ground
Ineff
Bank Sta

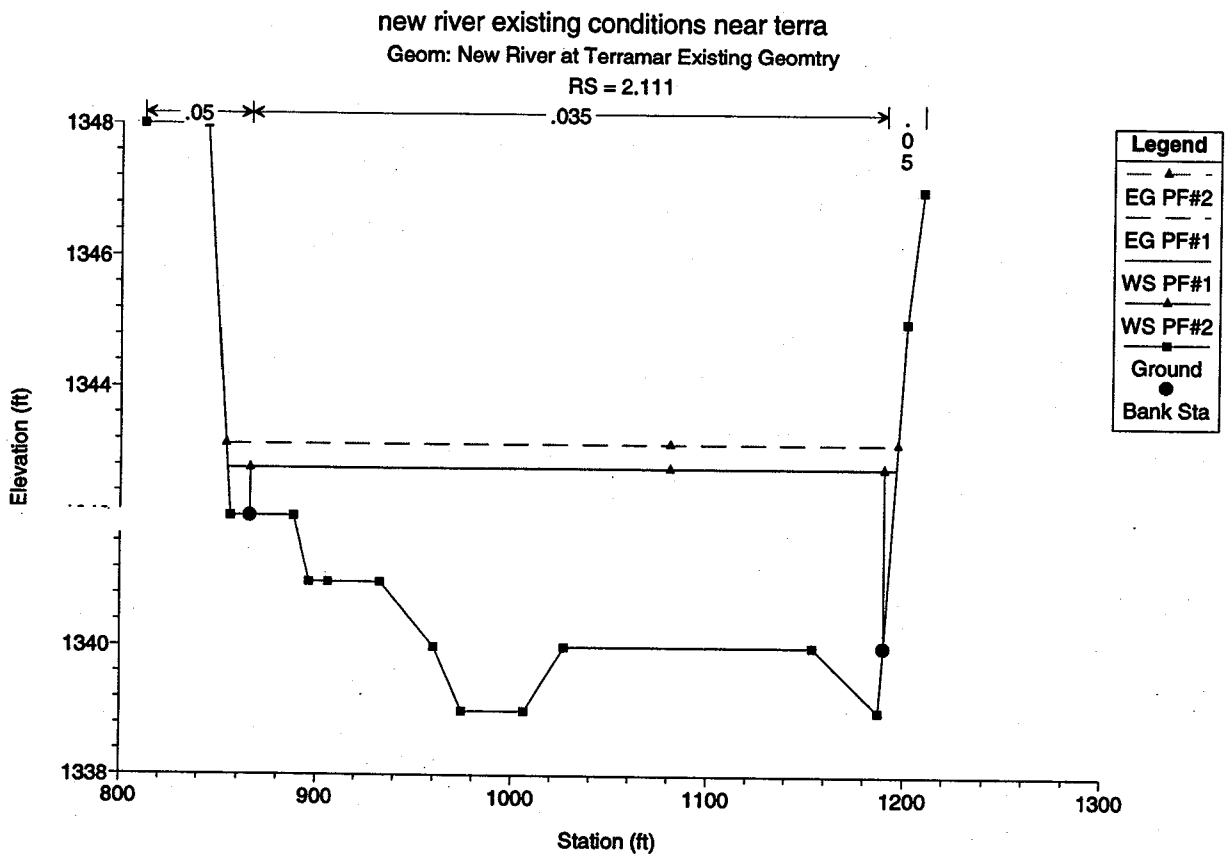

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.118
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
WS PF#2
EG PF#1
WS PF#1
Ground
Bank Sta

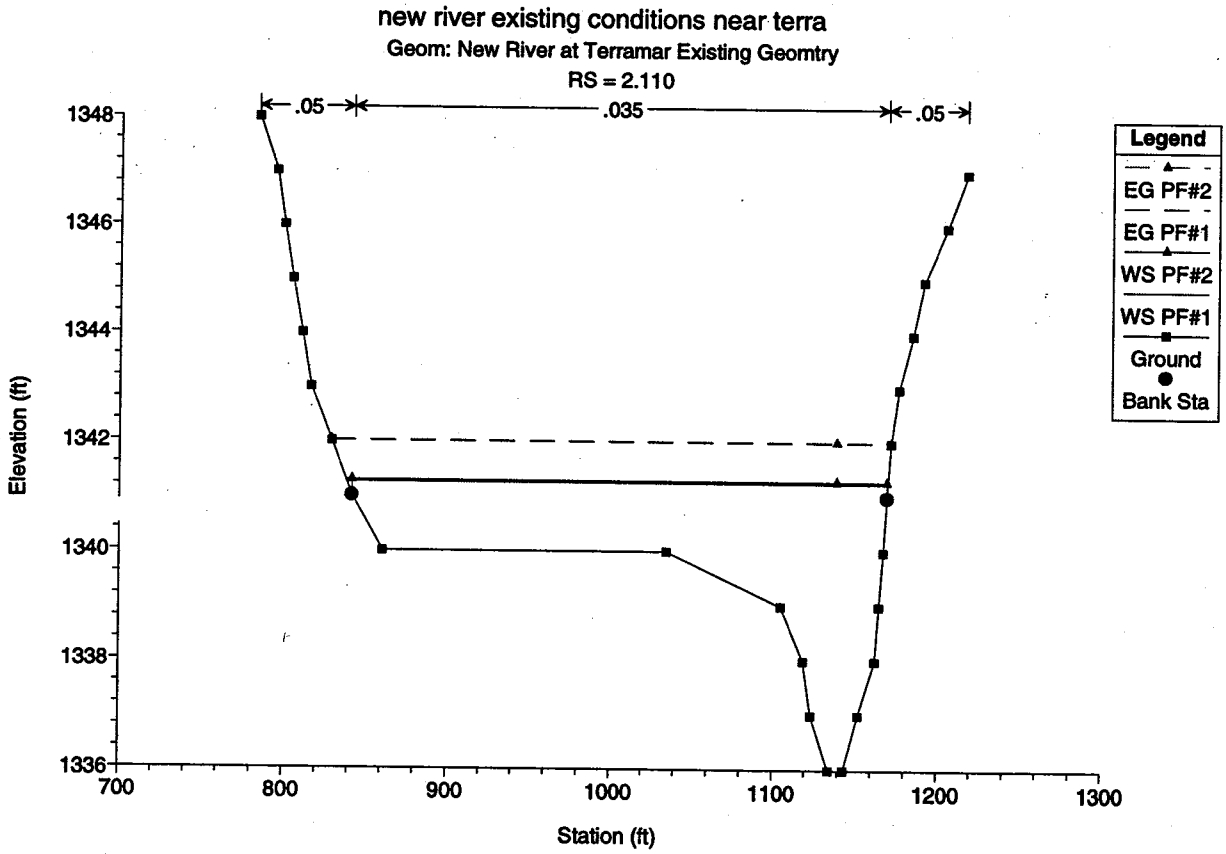

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.116
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
Crit PF#2
WS PF#1
Crit PF#1
Ground
Bank Sta

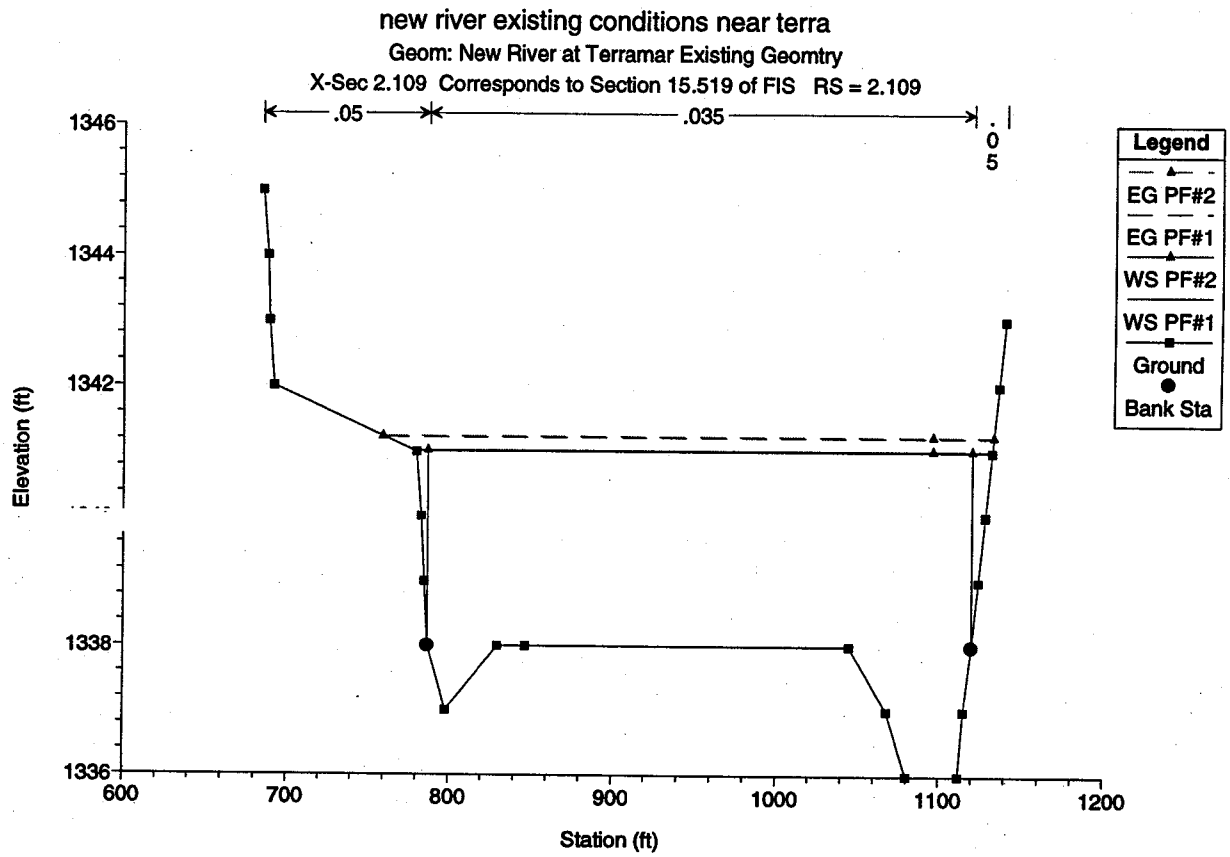

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.113
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#1
WS PF#2
Crit PF#2
Crit PF#1
Ground
Bank Sta

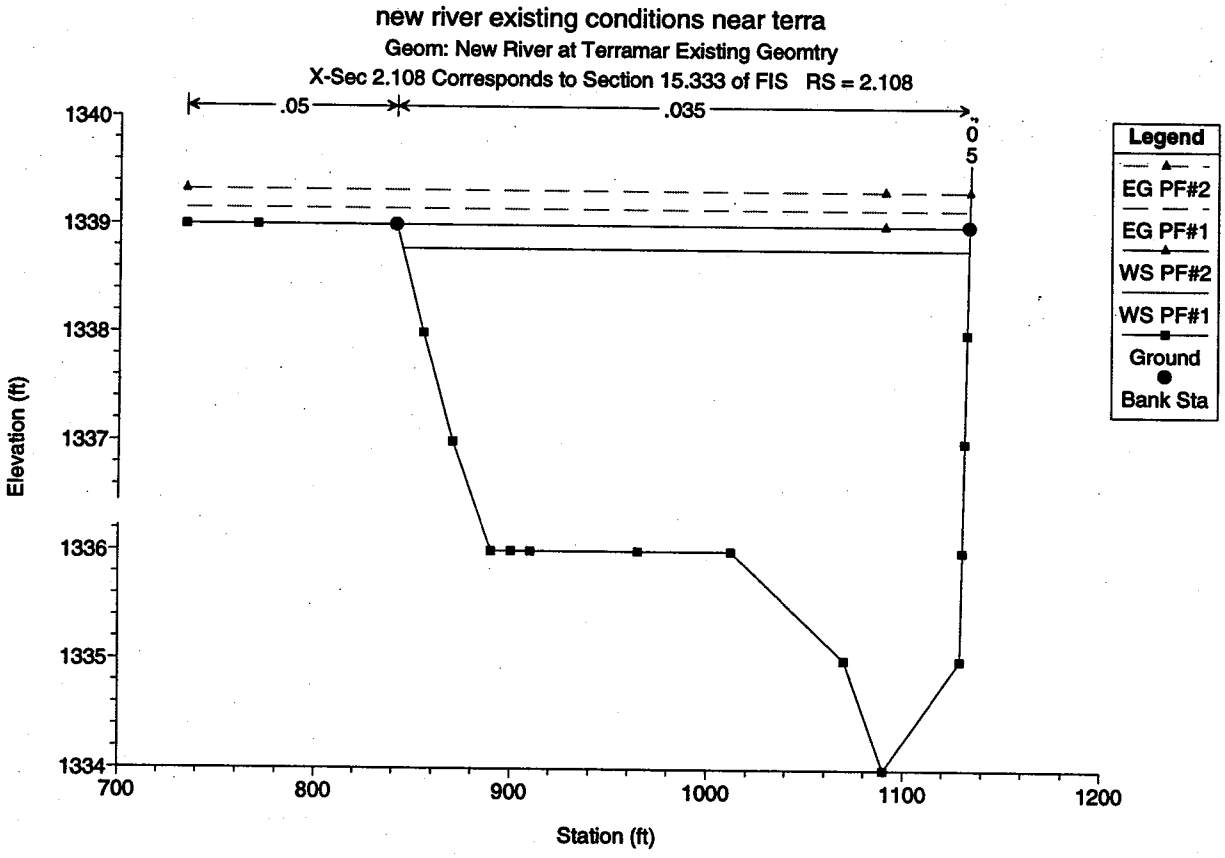

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.1125
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
1350
1348
1346
1342
1340
800
850
900
950
1000
1050
1100
1150
1200
Station (ft)

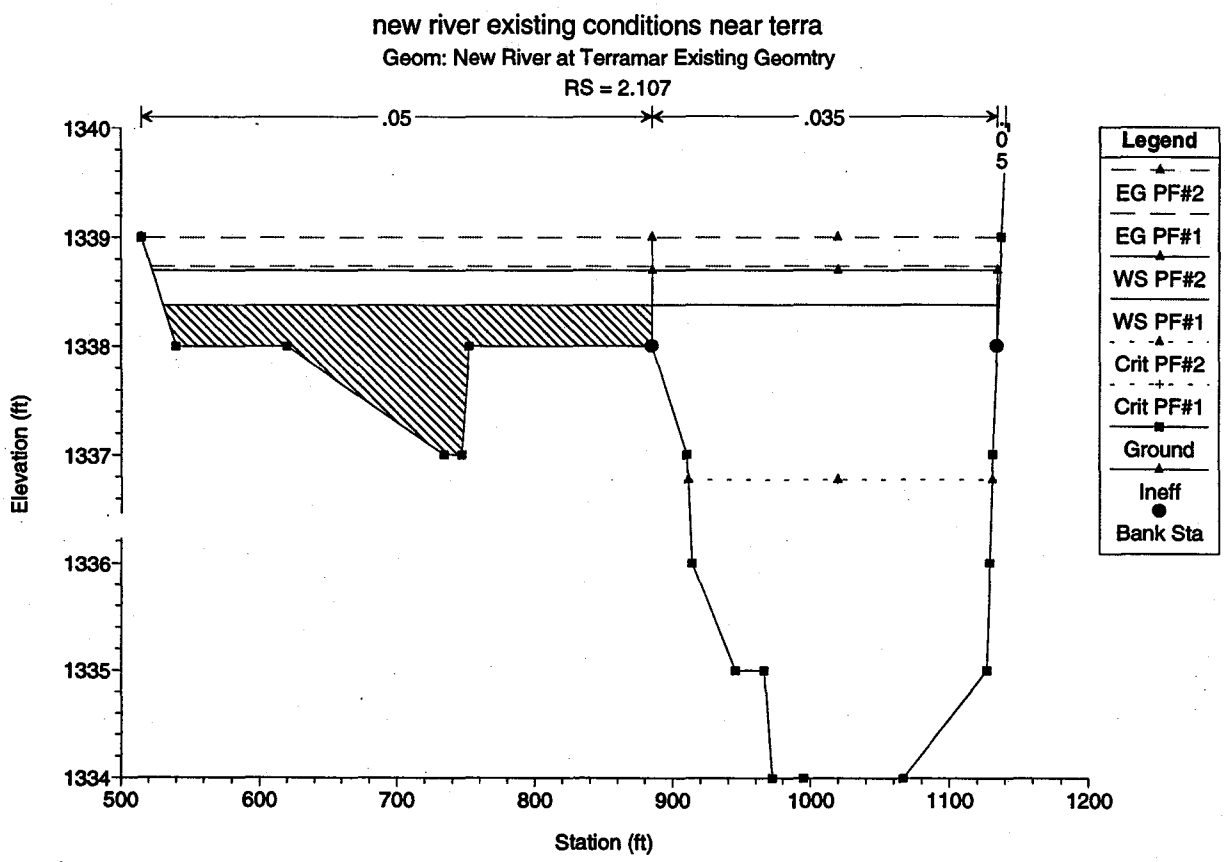

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.112
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
Crit PF#2
WS PF#1
Crit PF#1
Ground
Bank Sta
Elevation (ft)
1350
1348
1346
1344
1342
1340
1338
800
850
900
950
1000
1050
1100
Station (ft)

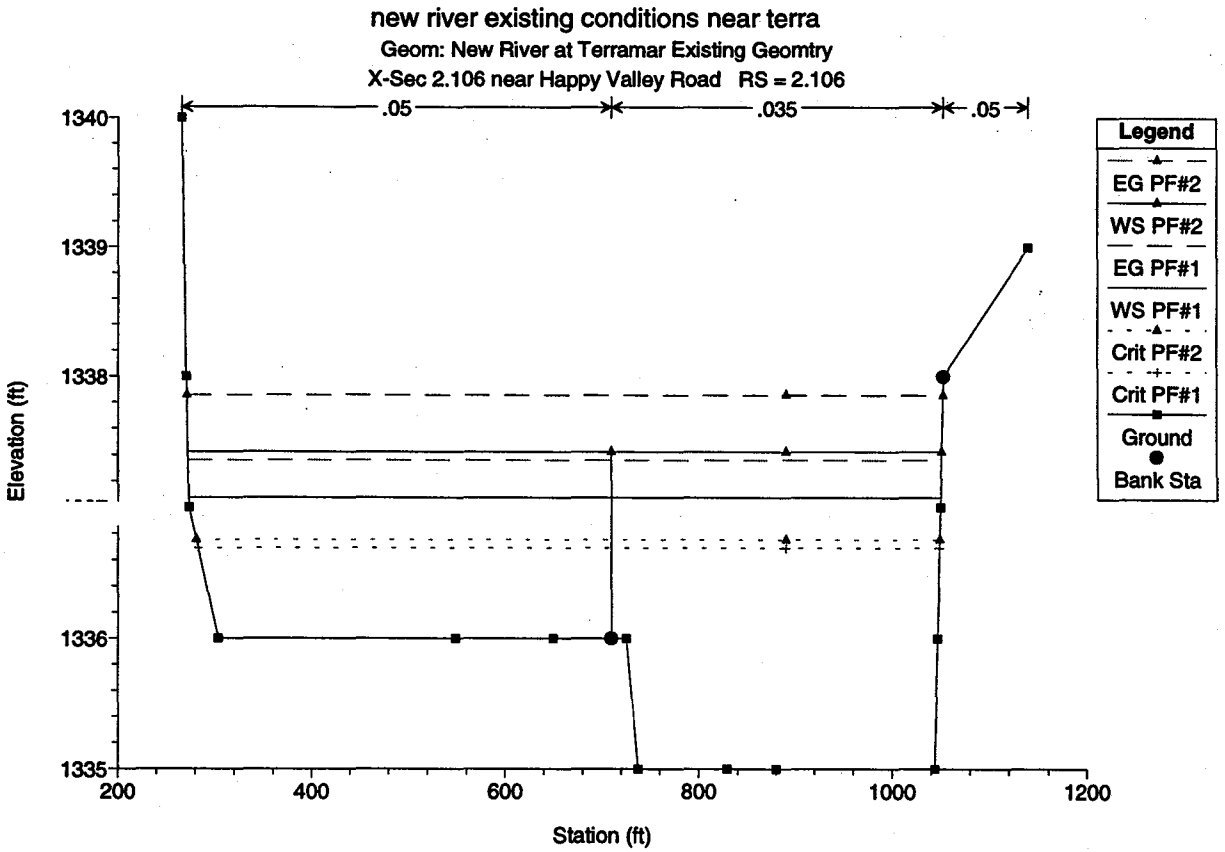

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.111
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
1348
1346
1344
1340
1338
800
900
1000
1100
1200
1300
Station (ft)

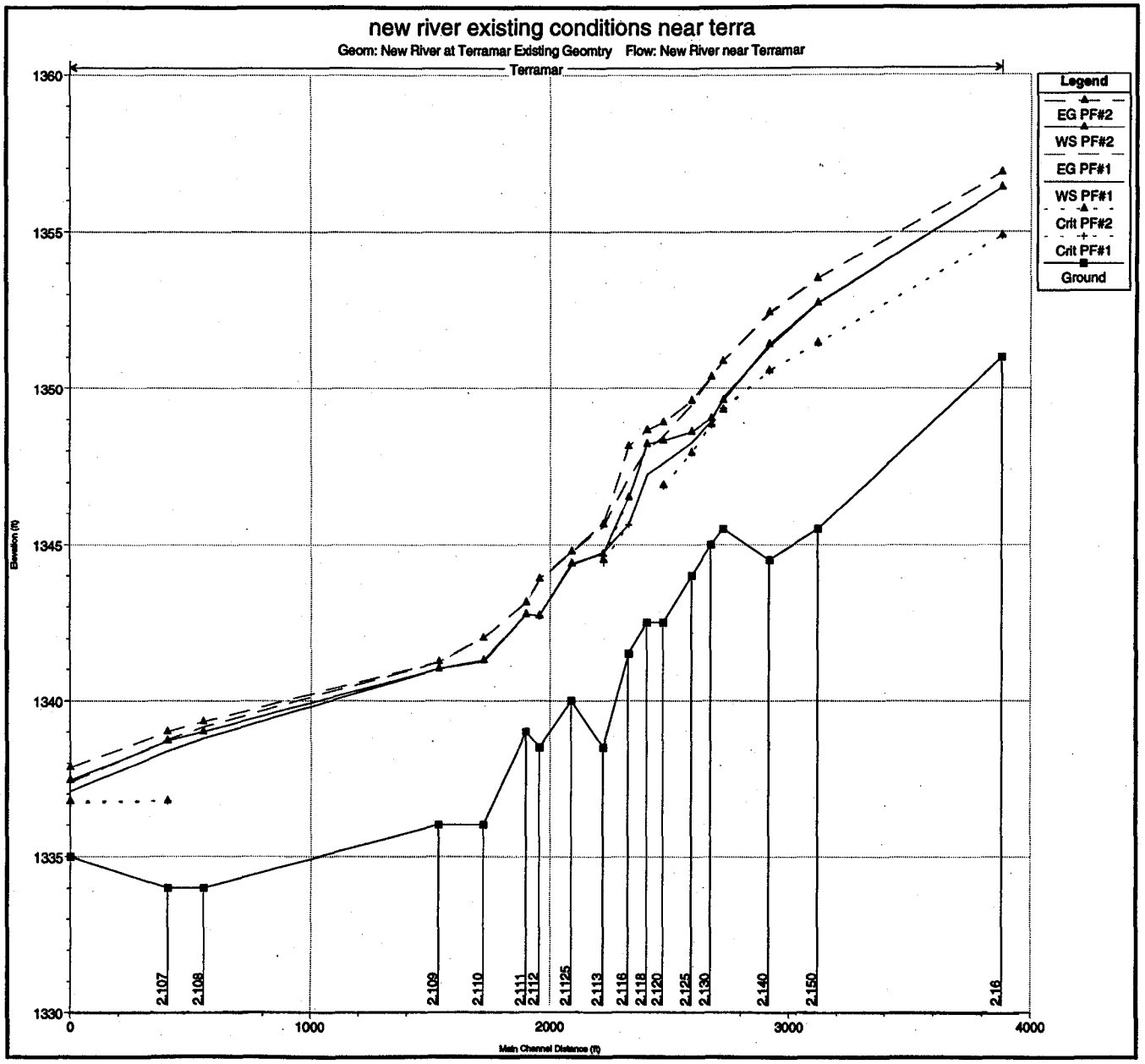

new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.110
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
1348
1346
1344
1342
1340
1338
1336
700
800
900
1000
1100
1200
1300
Station (ft)


new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
X-Sec 2.109 Corresponds to Section 15.519 of FIS RS = 2.109
.05
.035
.05
Elevation (ft)
1346
1344
1342
1338
1336
600
700
800
900
1000
1100
1200
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta


new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
X-Sec 2.108 Corresponds to Section 15.333 of FIS RS = 2.108
.05
.035
.05
Elevation (ft)
1340
1339
1338
1337
1336
1335
1334
700
800
900
1000
1100
1200
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta


new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
RS = 2.107
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#2
Crit PF#1
Ground
Ineff
Bank Sta


new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry
X-Sec 2.106 near Happy Valley Road RS = 2.106
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
WS PF#2
EG PF#1
WS PF#1
Crit PF#2
Crit PF#1
Ground
Bank Sta


new river existing conditions near terra
Geom: New River at Terramar Existing Geomtry Flow: New River near Terramar
Terramar
Legend
EG PF#2
WS PF#2
EG PF#1
WS PF#1
Crit PF#2
Crit PF#1
Ground
Elevation (ft)
1360
1355
1350
1345
1340
1335
1330
0
1000
2000
3000
4000
Main Channel Distance (ft)
2.107
2.108
2.109
2.110
2.111
2.112
2.1125
2.113
2.116
2.118
2.120
2.125
2.130
2.140
2.150
2.16

Appendix E

PROPOSED CONDITION HEC-RAS ANALYSIS

HEC-RAS Version 2.0 April 1997
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: terramar new river proposed conditions
Project File : terrapro.prj
Run Date and Time: 7/30/98 3:47:54 PM

Project in English units

Project Description:
New River Near Terramar Proposed Bank Protection

PLAN DATA

Plan Title: Plan 03
Plan File : n:\960043\hydro\hecras\nriver\nrprop\terrapro.p03

Geometry Title: New River at Terramar Proposed Geomtry
Geometry File : n:\960043\hydro\hecras\nriver\nrprop\terrapro.g02

Flow Title : New River near Terramar
Flow File : n:\960043\hydro\hecras\nriver\nrexist\terraex.f01

Plan Summary Information:

Number of:	Cross Sections =	18	Mulitple Openings =	0
	Culverts =	0	Inline Weirs =	0
	Bridges =	0		

Computational Information

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

Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance = True
Left Offset = 0
Right Offset = 0

River = New River Reach = Terramar

RS	Profile	Method	Value1	Value2
2.16	PF#2	1	913	1210
2.150	PF#2	1	960.9	1098.5
2.140	PF#2	1	932.7	1037.2
2.135	PF#2	1	909.9	1053.8
2.130	PF#2	1	917.9	1059
2.125	PF#2	1	923	1054
2.120	PF#2	1	930	1060.5
2.118	PF#2	1	945	1103
2.116	PF#2	1	950	1110
2.113	PF#2	1	950	1120
2.1125	PF#2	1	954.1	1142.1
2.112	PF#2	1	901	1017
2.111	PF#2	1	866	1201
2.110	PF#2	1	842	1169.5
2.109	PF#2	1	787	1120
2.108	PF#2	1	841	1133
2.107	PF#2	1	885	1134
2.106	PF#2	1	710	1053

FLOW DATA

Flow Title: New River near Terramar
Flow File : n:\960043\hydro\hecras\nriver\nrexist\terraex.f01

Flow Data (cfs)

River	Reach	RS	PF#1	PF#2
New River	Terramar	2.16	4200	4200
New River	Terramar	2.150	4200	4200
New River	Terramar	2.111	4200	4200

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
New River	Terramar	PF#1	Critical	Normal S = 0.005

GEOMETRY DATA

Geometry Title: New River at Terramar Proposed Geomtry
Geometry File : n:\960043\hydro\hecras\nriver\nrprop\terrapro.g02

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.16

INPUT
Description: Upstream Cross Section (15.966 of FIS)

Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
913	1358	925	1357	927	1356	929	1355	932	1354
935	1353	938	1352	940	1351	960	1351	975	1352
1025	1352	1070	1352	1074	1353	1077	1354	1080	1355
1085	1356	1150	1356	1175	1355	1200	1355	1205	1356
1210	1357	1295	1357	1300	1355	1305	1354	1315	1354
1320	1355	1340	1356	1360	1356	1395	1355	1420	1354
1470	1354	1480	1355	1490	1356	1493	1357	1500	1358
1510	1359	1515	1359	1540	1360				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
913	.05	913	.035	1210	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
913 1210 870 761 465 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
913	913	1357	1210	1540	1357

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.150

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.2	1353	960.9	1353	962.9	1352	964.8	1351	966.9	1350
969	1349	971.1	1348	1009.4	1347	1014.3	1346	1025.16	1345.5
1036.1	1346	1041.1	1347	1045.9	1348	1050.5	1349	1057.2	1350
1089.6	1351	1098.5	1352	1214.4	1352	1219.4	1351	1224.6	1350
1243.2	1350	1246.9	1351	1250.1	1352	1273	1352	1280	1351
1284.6	1350	1323.3	1351	1335.5	1350	1339.4	1351	1356.3	1352
1385.8	1353	1406	1353	1416	1352	1448	1352	1473	1352
1481	1351	1486	1350	1491	1349	1507	1350	1515	1351
1520	1352	1524	1352	1566	1352	1571	1353	1593	1354
1636	1354	1639	1355						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
941.2	.05	960.9	.035	1098.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
960.9 1098.5 175 203.8 210 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1098.5	1639	1355

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.140

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
879.7	1352	899.7	1351	932.7	1350	941.2	1349	950.4	1348
970.3	1347	986.2	1346	993.4	1345	1008.4	1344.5	1023.4	1345
1025.6	1346	1037.2	1351	1042.1	1352	1092	1352	1099	1351
1104	1350	1120	1350	1124	1351	1139	1352	1184	1352
1234	1351	1267	1351	1284	1352	1287	1352	1369	1352
1389	1351	1404	1350	1417	1349	1514	1349	1524	1350
1534	1351	1544	1352	1589	1351	1624	1352	1639	1353

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
879.7	.05	932.7	.035	1037.2	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
932.7 1037.2 156.4 193.4 236.6 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1042.1	1639	1352

CROSS SECTION RIVER: New River

REACH: Terramar RS: 2.135

INPUT
Description: Start Retaining Wall Left Bank
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
810	1351	830	1351	850	1350	869.2	1349	880.4	1350
909.9	1350	917.5	1349	926.2	1348	935.7	1347	945.4	1346
995.3	1345.5	1045.2	1346	1048.7	1347	1051.7	1348	1053.8	1349
1118.9	1350								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
810	.05	909.9	.035	1053.8	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
909.9	1053.8	54	51.4	66	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
810	880	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.130

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
832	1350	840	1349	866.2	1349	917.9	1349	923.3	1348
928.4	1347	936.2	1346	996.5	1345	1005.5	1345	1050.4	1346
1059.9	1349	1104.9	1349	1110.9	1350	1159.7	1351	1172	1351
1183	1350	1195	1349	1200	1349	1210	1350	1295	1350
1300	1349	1340	1349	1355	1350	1395	1350	1460	1349
1475	1348	1490	1348	1520	1349	1560	1349	1570	1349
1580	1350	1592	1350						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
832	.05	917.9	.035	1059.9	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
917.9	1059.9	111.5	80.9	84	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1059.9	1592	1351

Blocked Obstructions num= 1

Sta L	Sta R	Elev
832	912	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.125

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
790.5	1353	794.5	1352	802.5	1351	810	1350	816.5	1349
825	1348	842.5	1347	851.5	1346	870	1346	871	1347
875	1348	878	1349	893.5	1349	906	1348	911.5	1347
918	1346	923	1345	969	1345	1029	1344	1038	1344
1043	1345	1045	1346	1048	1347	1050	1348	1054	1349
1060	1350	1079.5	1350	1103	1349	1111	1348	1131.5	1348
1140	1349								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
790.5	.05	923	.035	1054	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
923	1054	144	119.8	138	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1054	1140	1350

Blocked Obstructions num= 1

Sta L	Sta R	Elev

790.5 929 1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.120

INPUT
Description:
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
872	1350	874	1349	876	1348	878	1347	880	1346
889	1345	896.5	1344	906.5	1343	911	1343	922	1344
930	1344.286	932.5	1345	970	1345	981	1344	1005	1343
1014.7	1342.5	1024.5	1343	1032.5	1343	1035	1343	1038	1343
1041	1343	1050.5	1343	1060.5	1343	1072.5	1349	1087	1348
1097	1347	1099	1347	1102	1348	1110	1349	1114	1349
1122	1348	1127	1348	1184	1348	1190	1347	1196	1347
1207	1348	1222	1349	1234	1350	1252	1351	1272	1350
1307	1349	1310	1349	1374	1349	1420	1350	1427	1349
1434	1348	1464	1347	1477	1347	1482	1348	1487	1349
1509	1349	1557	1348	1572	1348	1577	1347	1589	1347
1592	1348	1610	1349	1615	1349	1644	1350		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
872	.05	930	.035	1060.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
930	1060.5	113	67.1	47	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1060.5	1644	1352

Blocked Obstructions num= 1

Sta L	Sta R	Elev
872	925	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.118

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
854.5	1350	867	1349	869	1348	871	1347	873	1346
874	1345	876	1344	916.5	1343	924	1344	945	1345
962	1345	974	1344	988	1343	1008.5	1342.5	1029	1342
1032	1342	1035	1342	1038.5	1342	1056	1342	1065.5	1342
1085	1342	1103	1348	1120	1348				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
854.5	.05	945	.035	1103	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
945	1103	125	77.7	49.5	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
854.5	941	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.116

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
890	1352	896	1348	898	1347	903	1343	922	1342
933.5	1341.5	945	1342	948	1343	950	1343	968	1342
984	1341.5	1000	1342	1010	1343	1017.5	1344	1037.5	1344
1040.5	1344	1043.5	1344	1053.5	1344	1071.5	1344	1105	1344
1110	1347	1131	1347						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
890	.05	950	.035	1110	.05

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           950    1110             155.5   105.2      86              .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev
    1110    1131    1350
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
     890     952    1354

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.113

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     860    1351     875    1342     883    1342     889    1339     894  1338.5
     899    1339     908    1340     916    1341     932    1342     9501342.316
     989    1343    1104    1343  1106.5    1343    1110    1343  1113.5    1343
    1120    1347    1154    1347

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     860     .05     950    .035    1120     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           950    1120             205.7   131.8    49.6              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
     860     950    1354

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.1125

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   844.4    1349   851.1    1340   866.7    1340     907    1341   954.1    1341
   985.8    1341    1022    1342    1098    1342  1128.6    1343  1137.7    1346
  1142.1    1347    1169    1348

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   844.4     .05   954.1    .035  1142.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         954.1  1142.1             102.6   134.6     108              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
   844.4   938.5    1351

CROSS SECTION          RIVER: New River
REACH: Terramar           RS: 2.112

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     822  1348.5     856    1348     870    1341   894.5    1341     901    1341
   943.5    1340     956    1339   968.5  1338.5     981    1339   997.5    1340
    1017    1341    1074    1341  1080.5    1342    1085    1343    1090    1344
    1094    1345    1096    1346

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     822     .05     901    .035    1017     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           901    1017              38.5    54.7    191              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
     822     856    1352

CROSS SECTION          RIVER: New River
```

REACH: Terramar RS: 2.111

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
811.7	1348	844	1348	856	1342	866	1342	888	1342
896	1341	906	1341	932.5	1341	960	1340	974.5	1339
1006.5	1339	1027	1340	1154	1340	1187.5	1339	1190	1340
1201	1345	1209	1347						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
811.7	.05	866	.035	1201	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
866	1201	115	179.4	324	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
811.7	844	1352

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.110

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
784	1348	795	1347	800	1346	805	1345	811	1344
816.5	1343	829.5	1342	842	1341	861	1340	1035	1340
1105	1339	1119	1338	1124	1337	1134.5	1336	1143.5	1336
1152.5	1337	1162.5	1338	1165	1339	1167.5	1340	1169.5	1341
1172	1342	1176.5	1343	1185	1344	1191.5	1345	1205.5	1346
1217.5	1347								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
784	.05	842	.035	1169.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
842	1169.5	180	190	210	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.109

INPUT
Description: X-Sec 2.109 Corresponds to Section 15.519 of FIS
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
685	1345	688	1344	689	1343	692	1342	780	1341
783	1340	785	1339	787	1338	798	1337	830	1338
847	1338	1045	1338	1068	1337	1080	1336	1112	1336
1115	1337	1120	1338	1124	1339	1128	1340	1132	1341
1136	1342	1140	1343						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
685	.05	787	.035	1120	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
787	1120	940	980	960	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.108

INPUT
Description: X-Sec 2.108 Corresponds to Section 15.333 of FIS
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
734	1339	770	1339	841	1339	855	1338	870	1337
890	1336	900	1336	910	1336	965	1336	1012	1336
1070	1335	1090	1334	1129	1335	1130	1336	1131	1337
1132	1338	1133	1339	1134	1340				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
734	.05	841	.035	1133	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
841	1133	150	150	150	.1	.3

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.107

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
515	1339	540	1338	620	1338	734	1337	747	1337
752	1338	885	1338	910	1337	914	1336	945	1335
966	1335	972	1334	995	1334	1067	1334	1127	1335
1129	1336	1131	1337	1134	1338	1137	1339	1140	1340

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
515	.05	885	.035	1134	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
885	1134	420	400	390	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
515	885	1339

Blocked Obstructions num= 1

Sta L	Sta R	Elev
515	720	1340

CROSS SECTION RIVER: New River
REACH: Terramar RS: 2.106

INPUT
Description: X-Sec 2.106 near Happy Valley Road
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
266	1340	271	1338	274	1337	304	1336	549	1336
650	1336	710	1336	725	1336	738	1335	829	1335
880	1335	1044	1335	1047	1336	1050	1337	1053	1338
1140	1339								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
266	.05	710	.035	1053	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
710	1053	0	0	0	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
266	720	1338

SUMMARY OF MANNING'S N VALUES

River:New River

Reach	River Sta.	n1	n2	n3
Terramar	2.16	.05	.035	.05
Terramar	2.150	.05	.035	.05
Terramar	2.140	.05	.035	.05
Terramar	2.135	.05	.035	.05
Terramar	2.130	.05	.035	.05
Terramar	2.125	.05	.035	.05
Terramar	2.120	.05	.035	.05
Terramar	2.118	.05	.035	.05
Terramar	2.116	.05	.035	.05

Terramar	2.113	.05	.035	.05
Terramar	2.1125	.05	.035	.05
Terramar	2.112	.05	.035	.05
Terramar	2.111	.05	.035	.05
Terramar	2.110	.05	.035	.05
Terramar	2.109	.05	.035	.05
Terramar	2.108	.05	.035	.05
Terramar	2.107	.05	.035	.05
Terramar	2.106	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: New River

Reach	River Sta.	Left	Channel	Right
Terramar	2.16	870	761	465
Terramar	2.150	175	203.8	210
Terramar	2.140	156.4	193.4	236.6
Terramar	2.135	54	51.4	66
Terramar	2.130	111.5	80.9	84
Terramar	2.125	144	119.8	138
Terramar	2.120	113	67.1	47
Terramar	2.118	125	77.7	49.5
Terramar	2.116	155.5	105.2	86
Terramar	2.113	205.7	131.8	49.6
Terramar	2.1125	102.6	134.6	108
Terramar	2.112	38.5	54.7	191
Terramar	2.111	115	179.4	324
Terramar	2.110	180	190	210
Terramar	2.109	940	980	960
Terramar	2.108	150	150	150
Terramar	2.107	420	400	390
Terramar	2.106	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: New River

Reach	River Sta.	Contr.	Expan.
Terramar	2.16	.1	.3
Terramar	2.150	.1	.3
Terramar	2.140	.1	.3
Terramar	2.135	.1	.3
Terramar	2.130	.1	.3
Terramar	2.125	.1	.3
Terramar	2.120	.1	.3
Terramar	2.118	.1	.3
Terramar	2.116	.1	.3
Terramar	2.113	.1	.3
Terramar	2.1125	.1	.3
Terramar	2.112	.1	.3

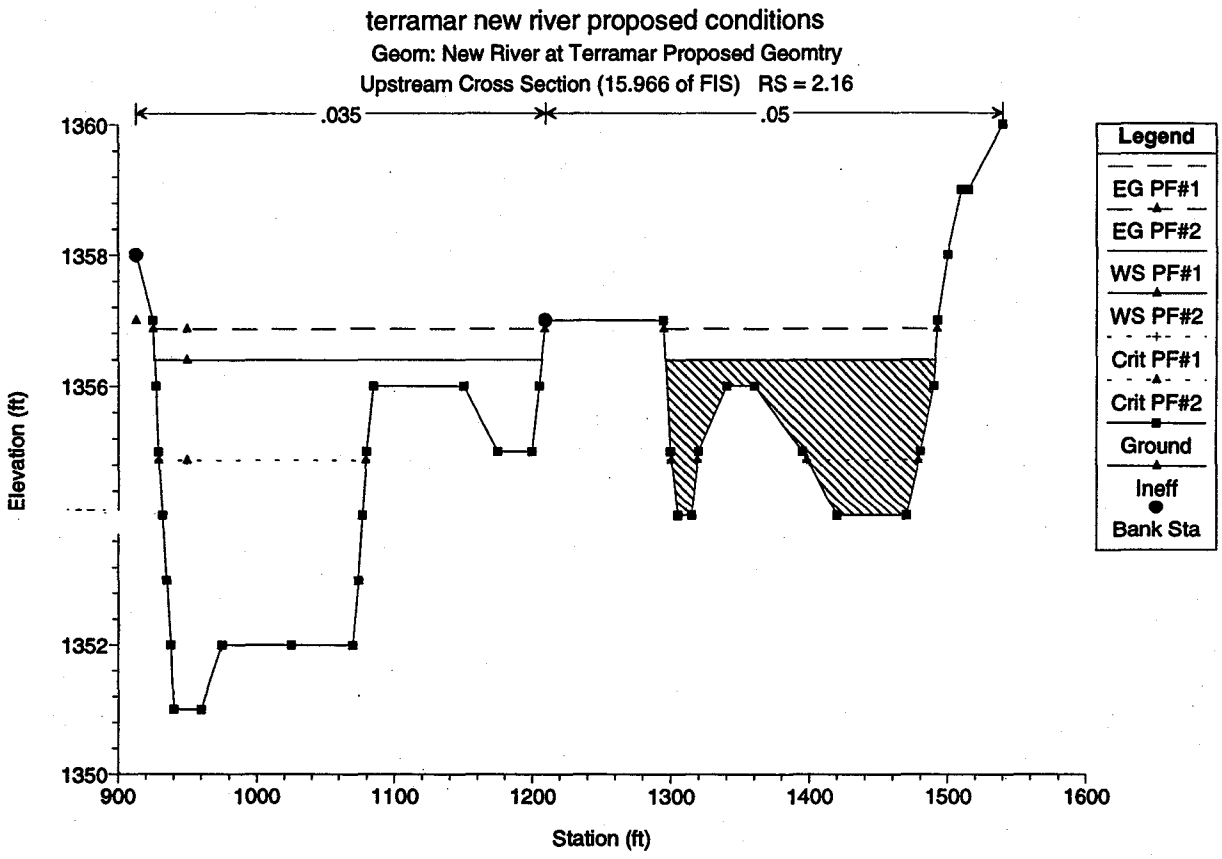
Terramar	2.111	.1	.3
Terramar	2.110	.1	.3
Terramar	2.109	.1	.3
Terramar	2.108	.1	.3
Terramar	2.107	.1	.3
Terramar	2.106	.1	.3

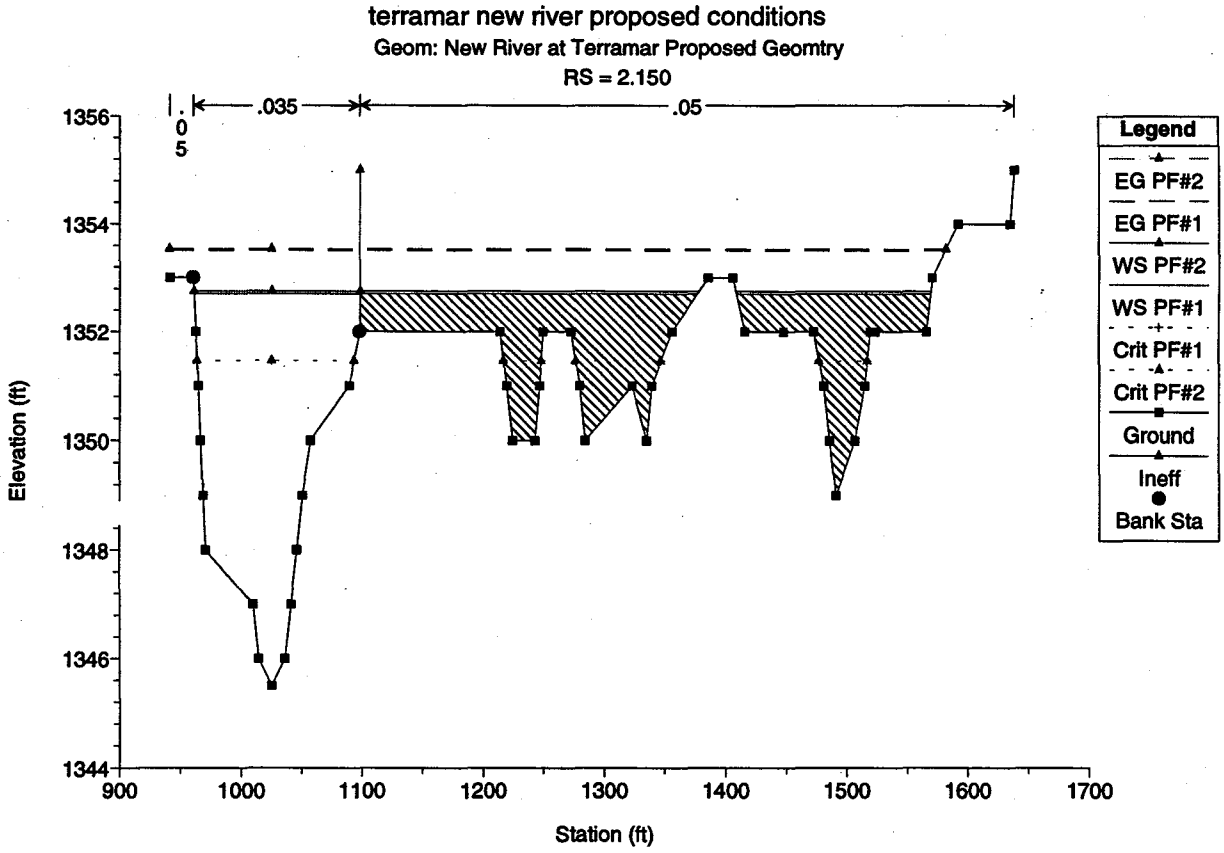
Profile Output Table - Standard Table 2

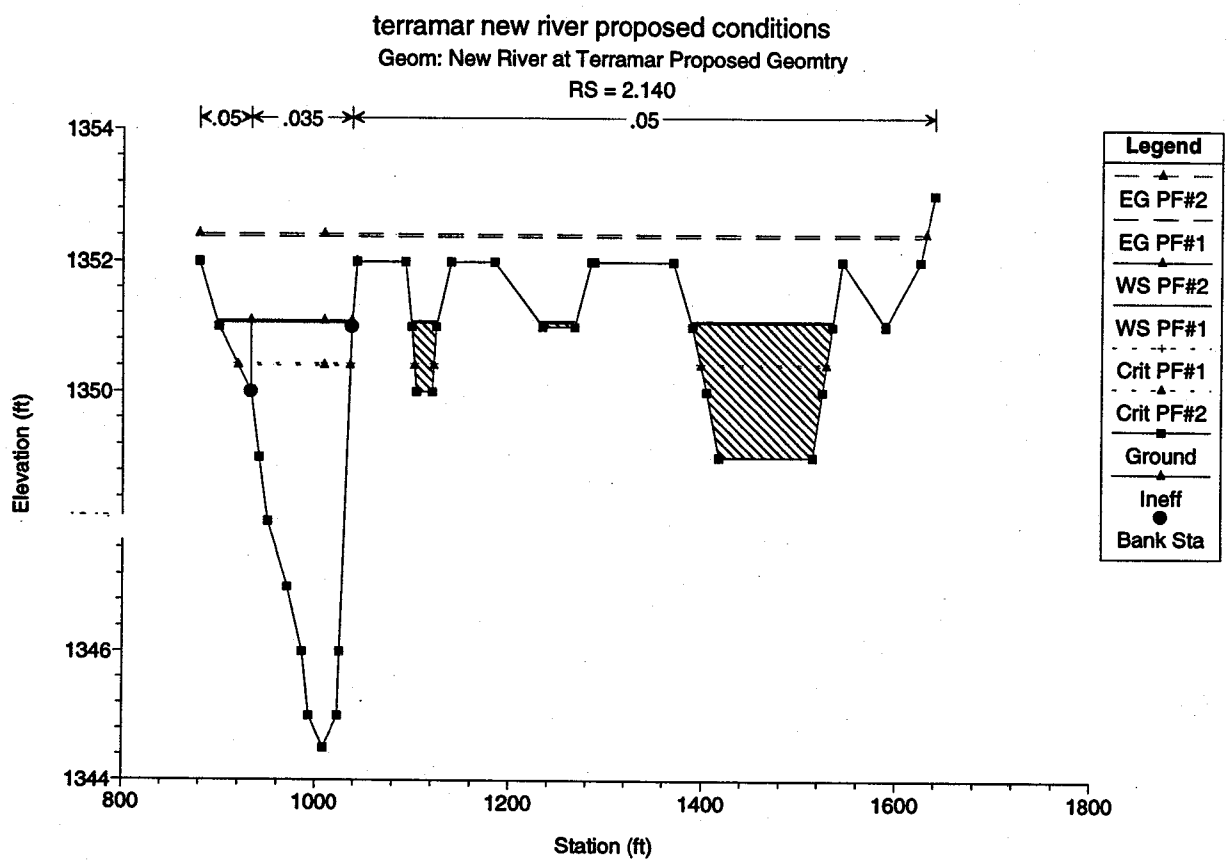
Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Terramar	2.16	1356.87	1356.40	0.48	3.33	0.03		4200.00		475.46
Terramar	2.16	1356.87	1356.39	0.48	3.29	0.03		4200.00		280.72
Terramar	2.150	1353.51	1352.70	0.81	1.08	0.05		4200.00		576.14
Terramar	2.150	1353.54	1352.75	0.79	1.07	0.05		4200.00		137.10
Terramar	2.140	1352.37	1351.06	1.32	1.42	0.06	29.93	4170.07	0.00	352.85
Terramar	2.140	1352.41	1351.08	1.33	1.46	0.05		4200.00		104.50
Terramar	2.135	1350.90	1349.77	1.12	0.37	0.03		4172.75	27.25	192.60
Terramar	2.135	1350.91	1349.74	1.17	0.39	0.03		4200.00		141.94
Terramar	2.130	1350.50	1349.47	1.03	0.68	0.05	3.83	4196.17		405.35
Terramar	2.130	1350.49	1349.43	1.06	0.66	0.04		4200.00		141.10
Terramar	2.125	1349.77	1348.25	1.53	1.07	0.11		4200.00		146.53
Terramar	2.125	1349.79	1348.36	1.43	1.11	0.06		4200.00		122.43
Terramar	2.120	1348.59	1347.43	1.16	0.28	0.19	64.78	4135.22		208.91
Terramar	2.120	1348.63	1347.38	1.25	0.30	0.21		4200.00		130.50
Terramar	2.118	1348.13	1347.58	0.54	0.28	0.03	22.18	4177.82		160.75
Terramar	2.118	1348.11	1347.56	0.56	0.29	0.03		4200.00		156.67
Terramar	2.116	1347.82	1347.02	0.80	0.78	0.04		4200.00		179.00
Terramar	2.116	1347.79	1346.97	0.82	0.72	0.03		4200.00		157.95
Terramar	2.113	1347.00	1345.78	1.22	1.42	0.07		4200.00		168.01
Terramar	2.113	1347.04	1345.97	1.07	0.83	0.12		4200.00		168.33
Terramar	2.1125	1345.51	1344.52	0.98	1.38	0.02	327.41	3872.59		194.72
Terramar	2.1125	1346.09	1345.42	0.67	0.95	0.10		4200.00		181.85
Terramar	2.112	1344.10	1342.90	1.20	0.37	0.25	292.81	3351.44	555.75	218.36
Terramar	2.112	1345.03	1343.33	1.71	0.34	0.40		4200.00		116.00
Terramar	2.111	1343.13	1342.77	0.36	1.08	0.04	11.63	4188.37		341.61
Terramar	2.111	1343.12	1342.75	0.37	1.07	0.04		4200.00		330.06
Terramar	2.110	1342.01	1341.25	0.76	0.63	0.16	0.31	4199.63	0.06	331.21
Terramar	2.110	1342.01	1341.29	0.73	0.63	0.15		4200.00		327.50
Terramar	2.109	1341.22	1341.00	0.21	1.87	0.01	12.43	4160.77	26.79	352.31
Terramar	2.109	1341.23	1341.02	0.22	1.89	0.01		4200.00		333.00
Terramar	2.108	1339.33	1339.01	0.32	0.31	0.01	0.09	4199.91		399.01
Terramar	2.108	1339.33	1339.02	0.32	0.31	0.01		4200.00		292.00
Terramar	2.107	1339.01	1338.71	0.30	1.12	0.01		4199.54	0.46	416.14
Terramar	2.107	1339.01	1338.72	0.30	1.12	0.01		4200.00		249.00
Terramar	2.106	1337.88	1337.44	0.44				4200.00		331.32
Terramar	2.106	1337.88	1337.44	0.44				4200.00		331.32

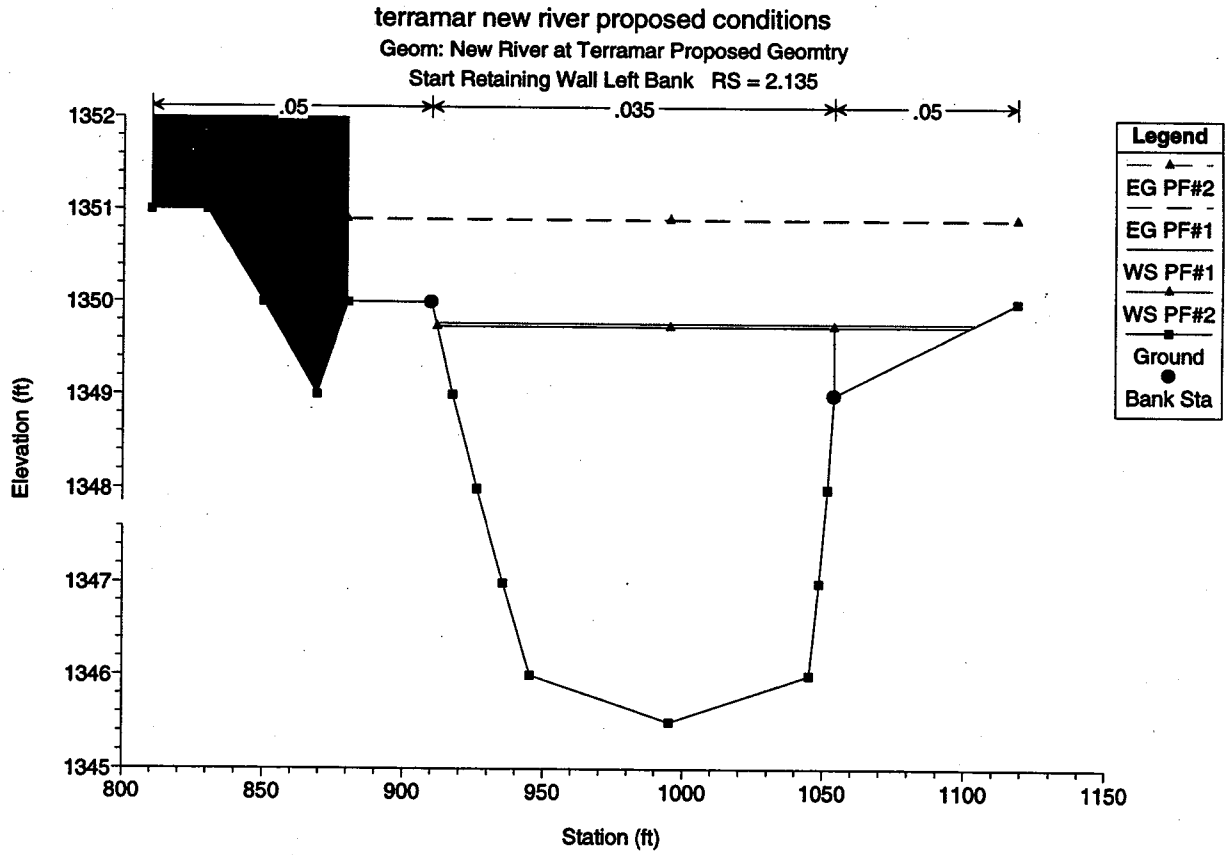
HEC-RAS Plan: Plan 01 River: New River Reach: Terramar

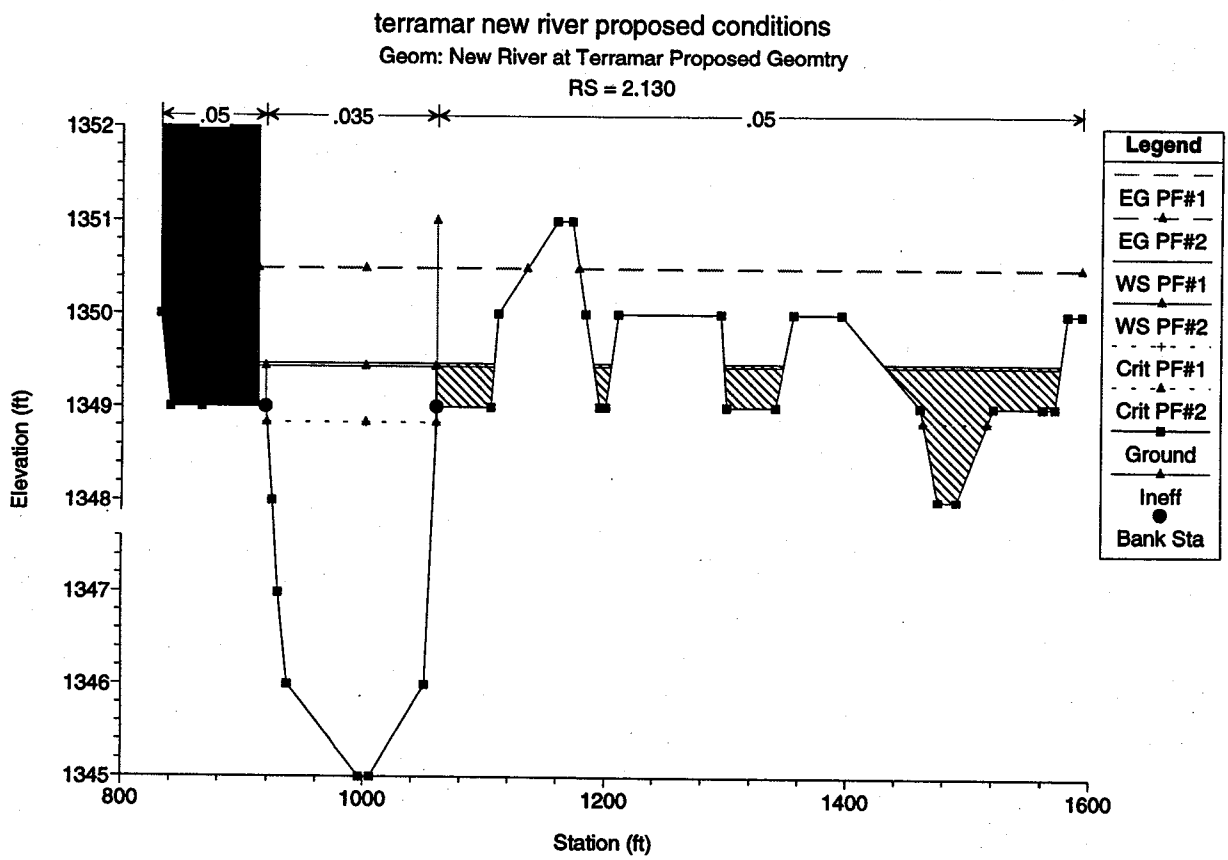
Reach	River Sta	Prof Delta WS	Top Wdth Act	K Perc L	Enc Sta L	Dist Center L	Center Station	Dist Center R	Enc Sta R	K Perc R	Encr WD
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Terramar	2.16		280.78				1061.50				
Terramar	2.16	-0.01	280.72		913.00	148.50	1061.50	148.50	1210.00		297.00
Terramar	2.150		137.01				1029.70				
Terramar	2.150	0.05	137.10		960.90	68.80	1029.70	68.80	1098.50		137.60
Terramar	2.140		138.87				984.95				
Terramar	2.140	0.03	104.50	0.76	932.70	52.25	984.95	52.25	1037.20	0.00	104.50
Terramar	2.135		192.60				981.85				
Terramar	2.135	-0.03	141.94		909.90	71.95	981.85	71.95	1053.80	0.59	143.90
Terramar	2.130		147.90				988.90				
Terramar	2.130	-0.04	141.10	0.08	917.90	71.00	988.90	70.10	1059.00		141.10
Terramar	2.125		121.98				988.50				
Terramar	2.125	0.11	122.43		923.00	65.50	988.50	65.50	1054.00		131.00
Terramar	2.120		135.50				995.25				
Terramar	2.120	-0.05	130.50	1.54	930.00	65.25	995.25	65.25	1060.50		130.50
Terramar	2.118		160.75				1024.00				
Terramar	2.118	-0.03	156.67	0.53	945.00	79.00	1024.00	79.00	1103.00		158.00
Terramar	2.116		158.00				1030.00				
Terramar	2.116	-0.05	157.95		950.00	80.00	1030.00	80.00	1110.00		160.00
Terramar	2.113		168.01				1035.00				
Terramar	2.113	0.20	168.33		950.00	85.00	1035.00	85.00	1120.00		170.00
Terramar	2.1125		194.72				1048.10				
Terramar	2.1125	0.90	181.85	6.92	954.10	94.00	1048.10	94.00	1142.10		188.00
Terramar	2.112		218.36				959.00				
Terramar	2.112	0.42	116.00	7.66	901.00	58.00	959.00	58.00	1017.00	14.60	116.00
Terramar	2.111		341.61				1033.50				
Terramar	2.111	-0.01	330.06	0.27	866.00	167.50	1033.50	167.50	1201.00		335.00
Terramar	2.110		331.21				1005.75				
Terramar	2.110	0.04	327.50	0.01	842.00	163.75	1005.75	163.75	1169.50	0.00	327.50
Terramar	2.109		352.31				953.50				
Terramar	2.109	0.02	333.00	0.27	787.00	166.50	953.50	166.50	1120.00	0.64	333.00
Terramar	2.108		399.01				987.00				
Terramar	2.108	0.00	292.00	0.00	841.00	146.00	987.00	146.00	1133.00	0.00	292.00
Terramar	2.107		251.14				1009.50				
Terramar	2.107	0.00	249.00		885.00	124.50	1009.50	124.50	1134.00	0.01	249.00
Terramar	2.106		331.32				881.50				
Terramar	2.106	0.00	331.32		710.00	171.50	881.50	171.50	1053.00		343.00

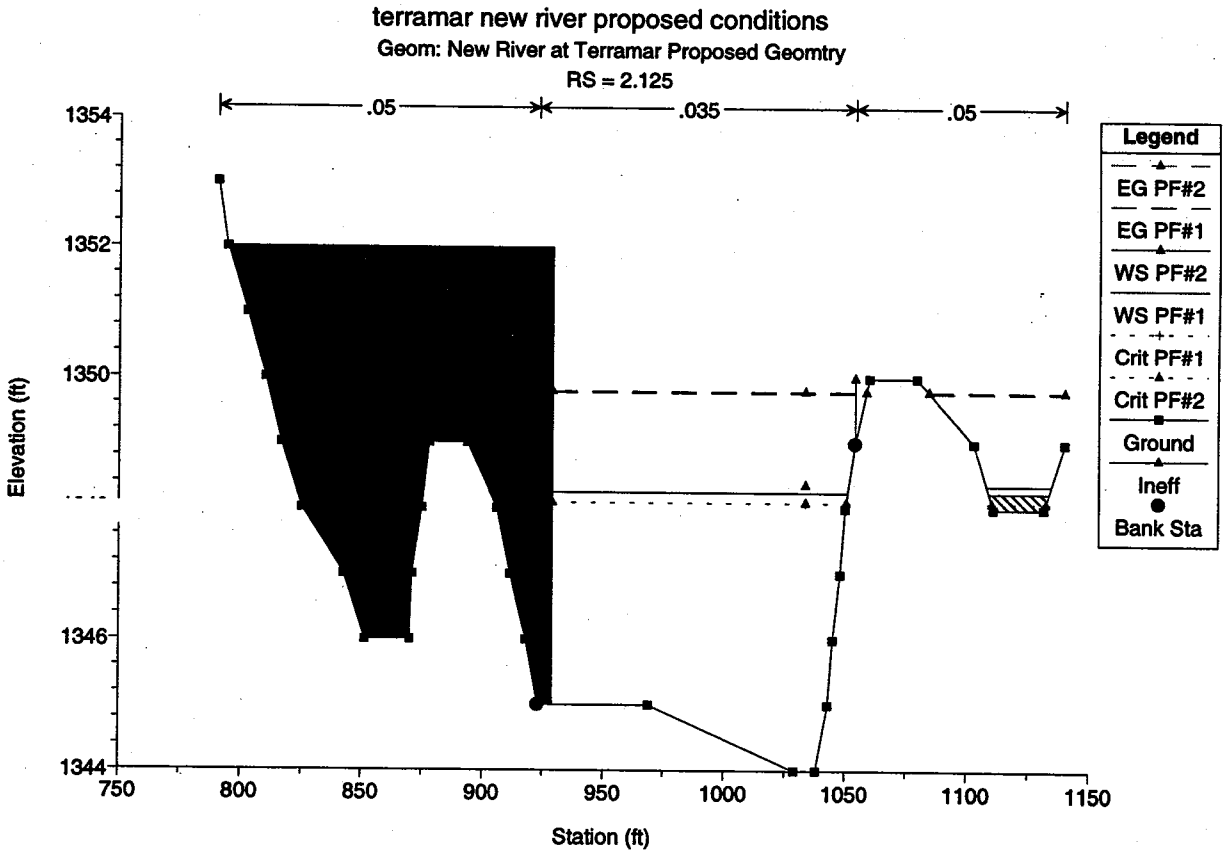

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
Upstream Cross Section (15.966 of FIS) RS = 2.16
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

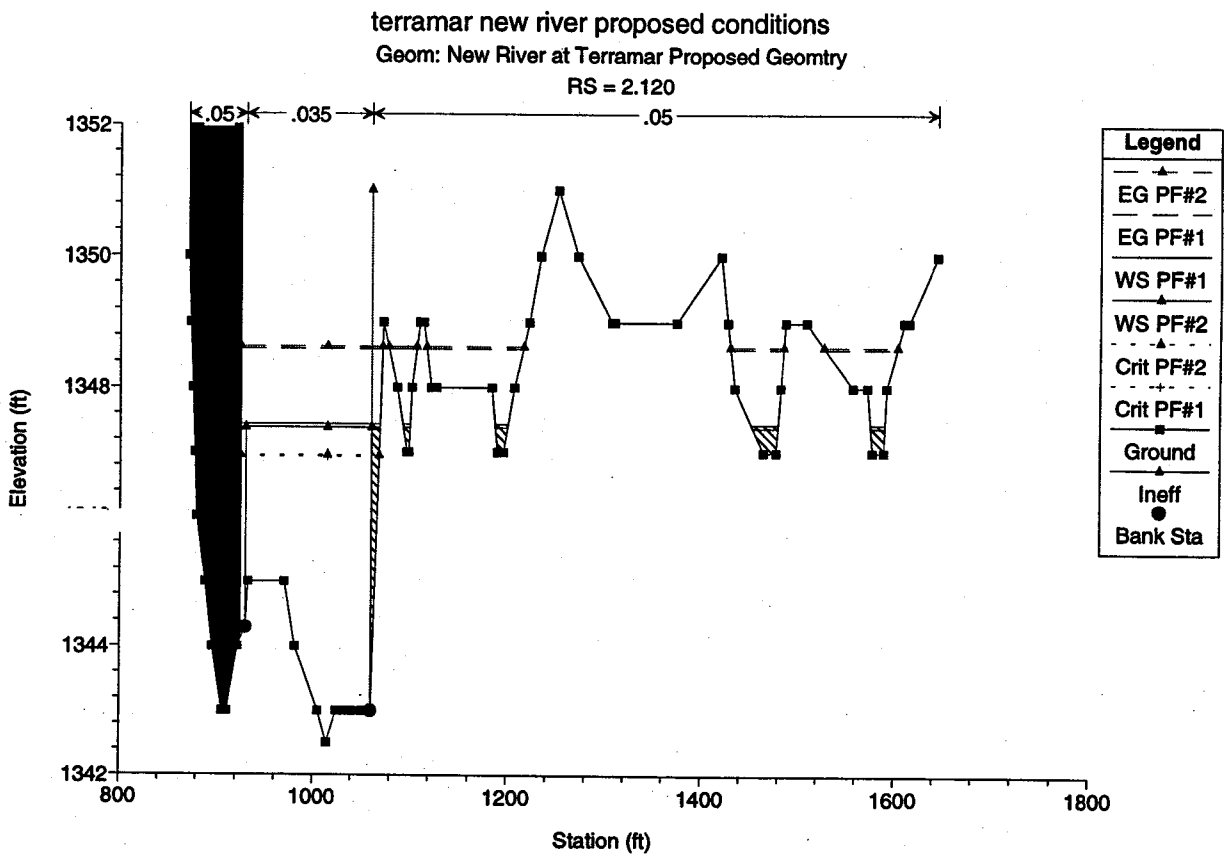

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.150
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

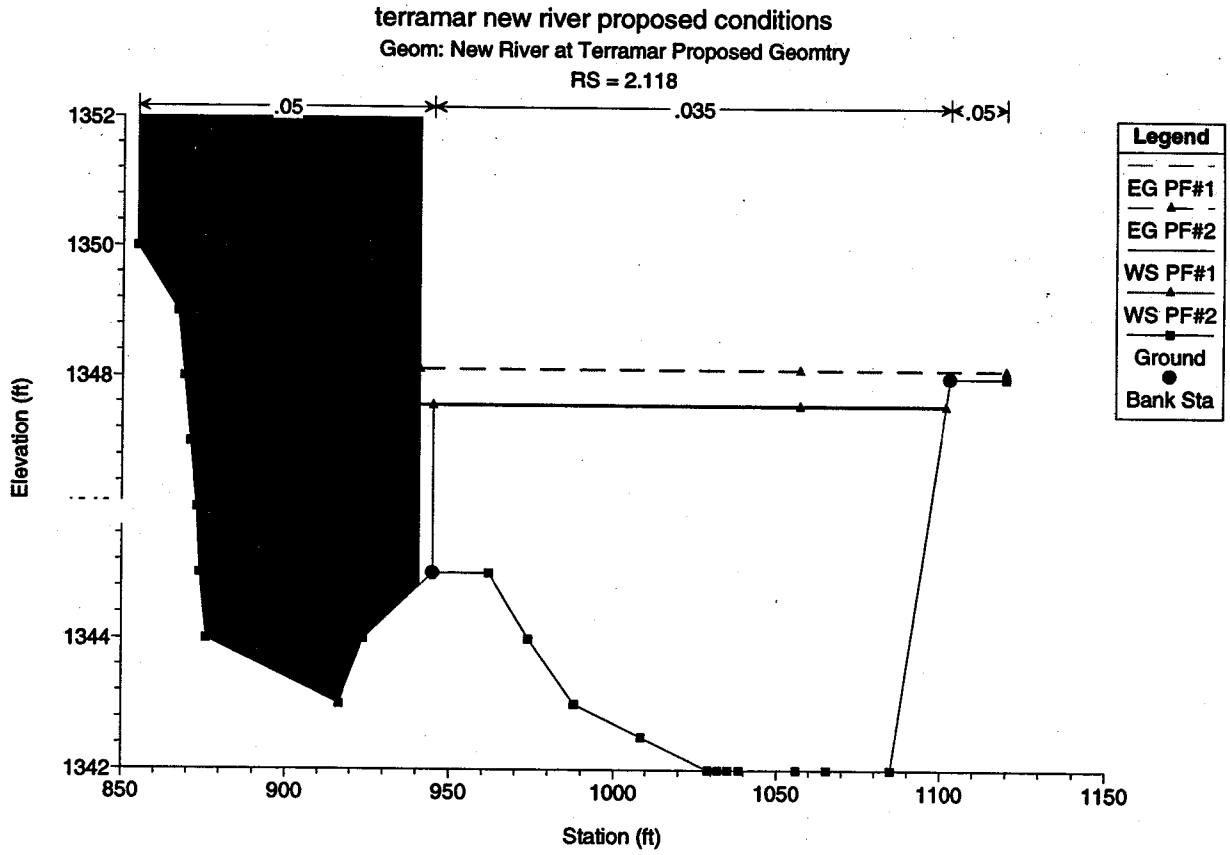

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.140
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

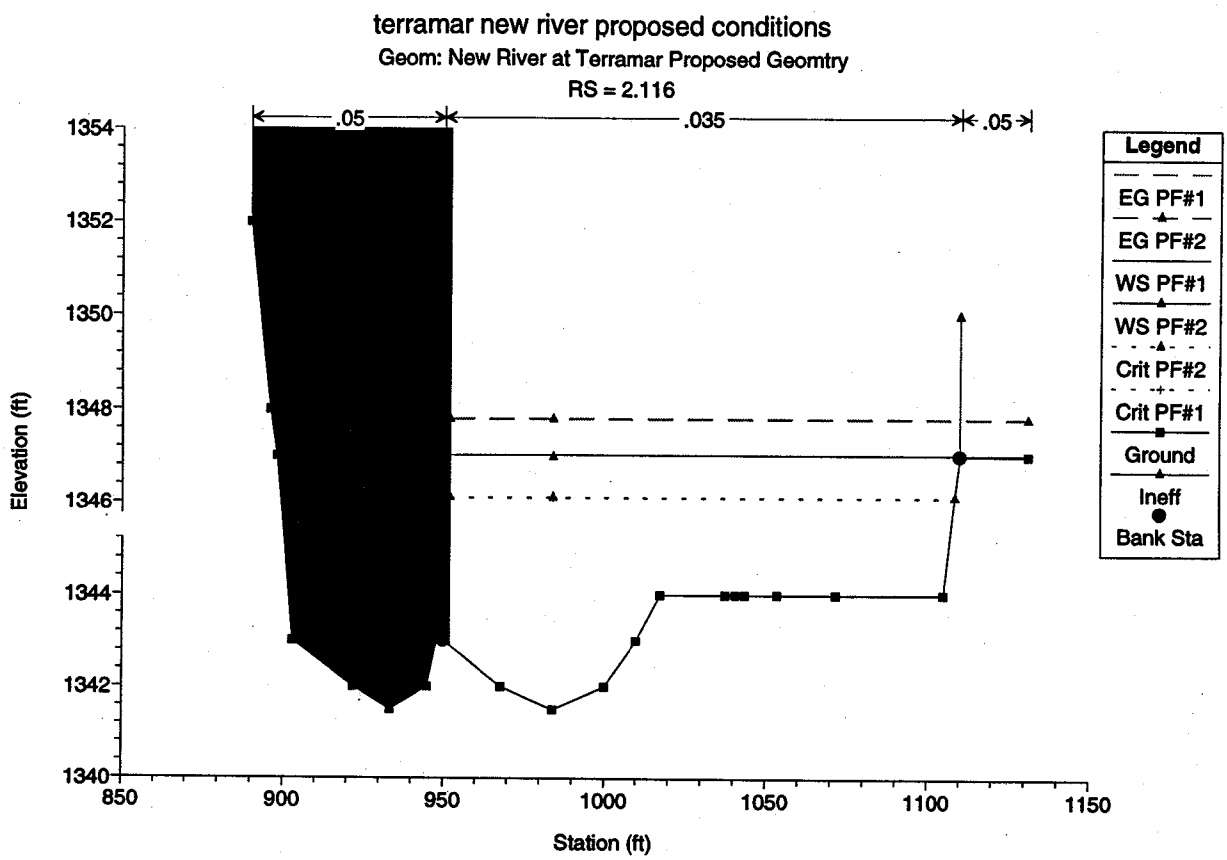

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
Start Retaining Wall Left Bank RS = 2.135
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#1
WS PF#2
Ground
Bank Sta

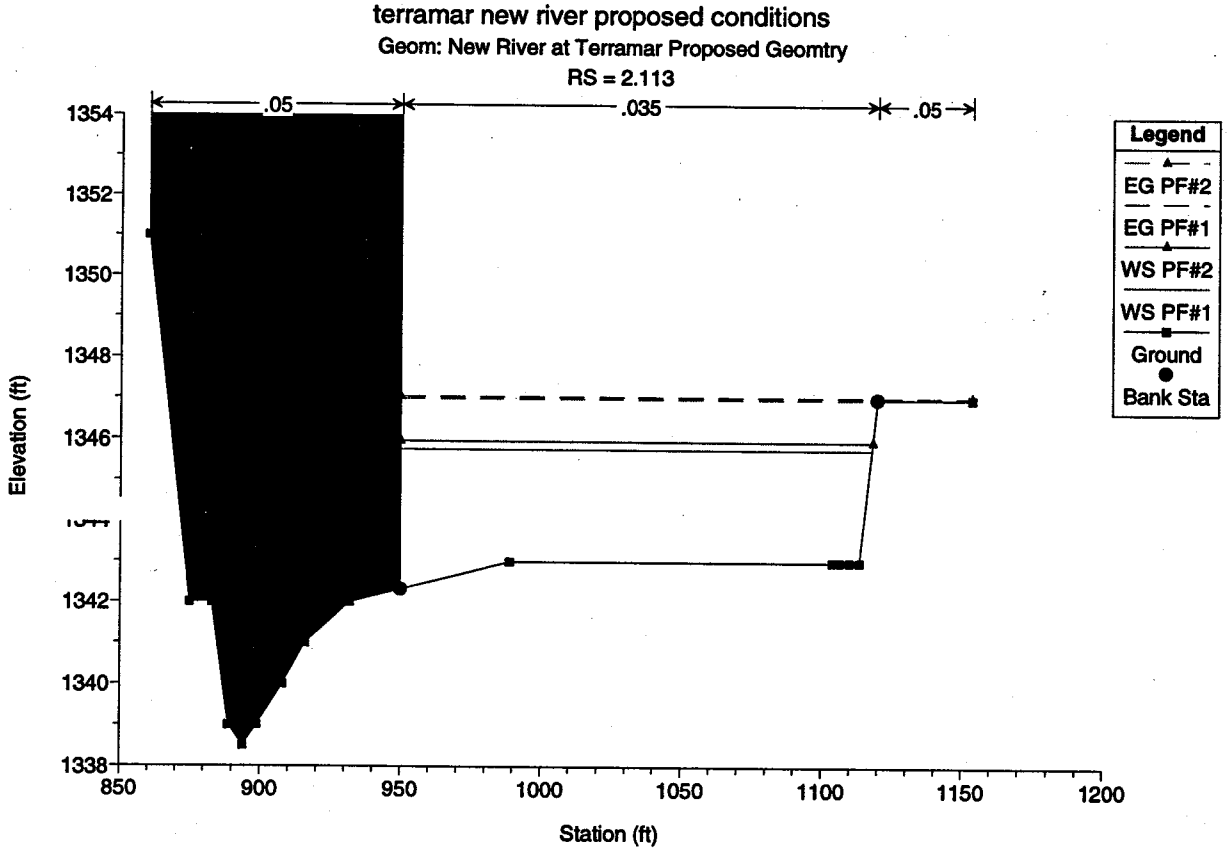

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.130
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

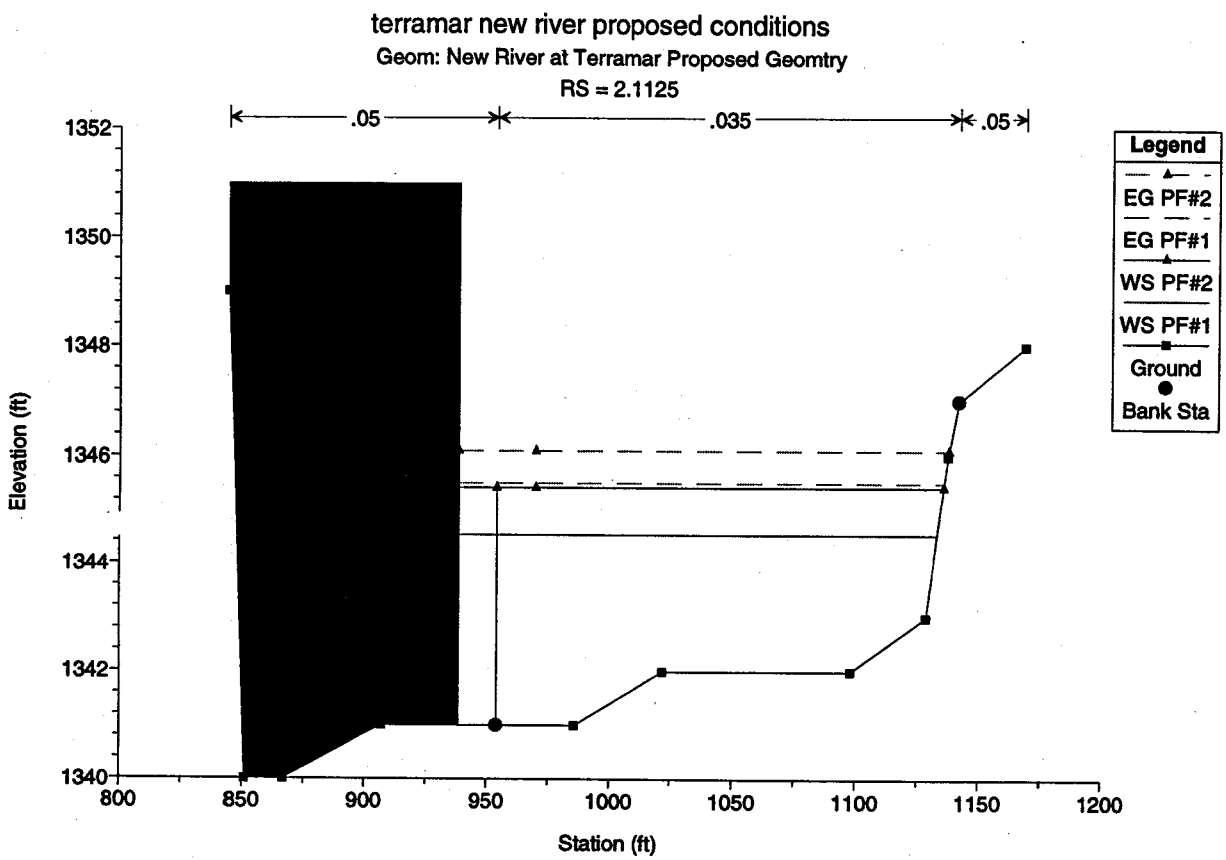

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.125
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta

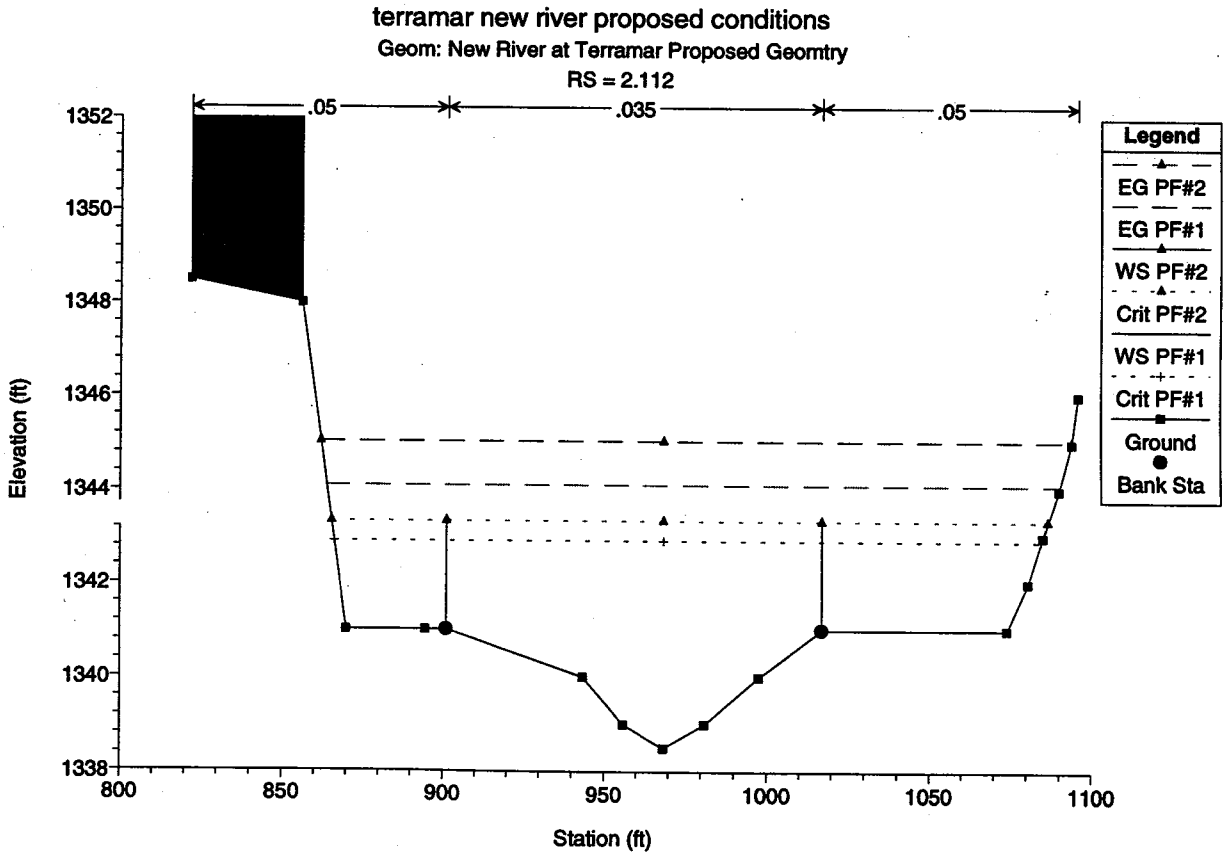

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.120
.05
.035
.05
Elevation (ft)
1352
1350
1348
1344
1342
800
1000
1200
1400
1600
1800
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#1
WS PF#2
Crit PF#2
Crit PF#1
Ground
Ineff
Bank Sta

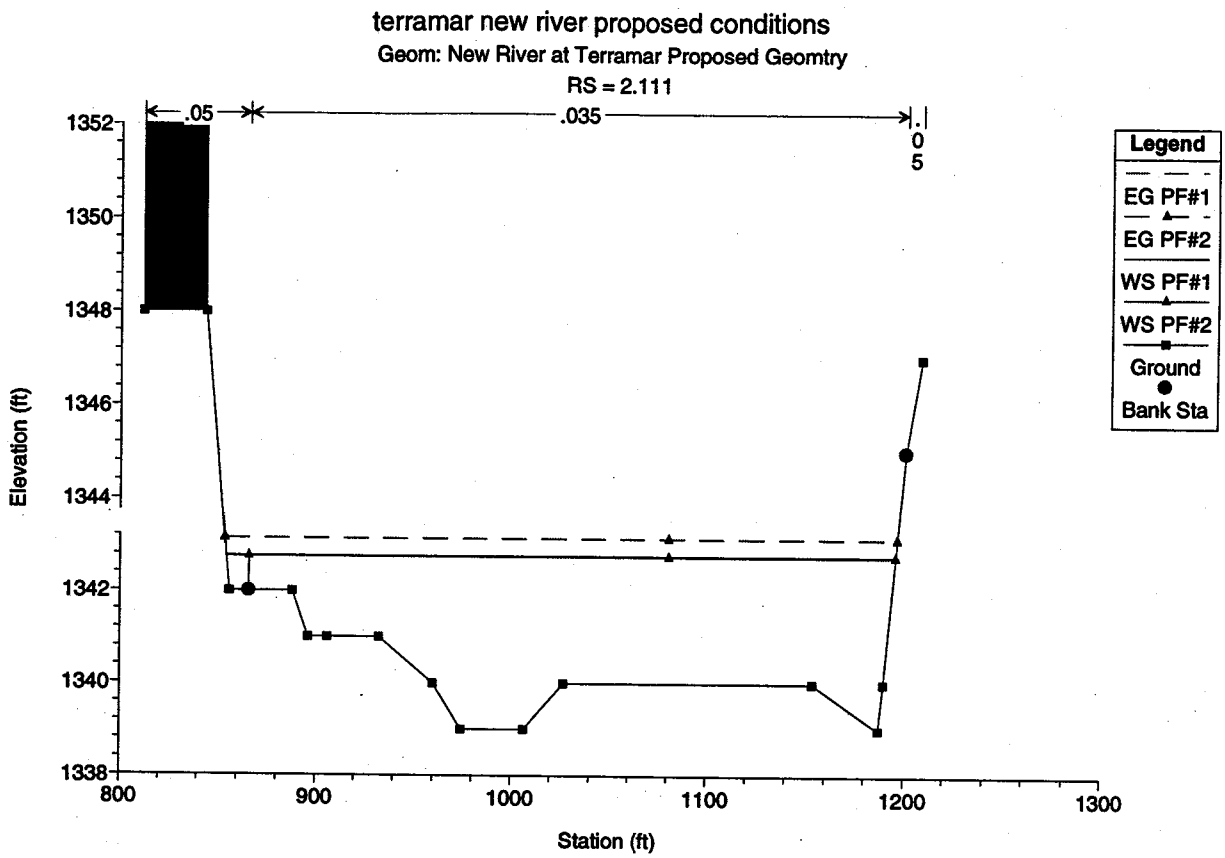

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.118
.05
.035
.05
Elevation (ft)
1352
1350
1348
1344
1342
850
900
950
1000
1050
1100
1150
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta

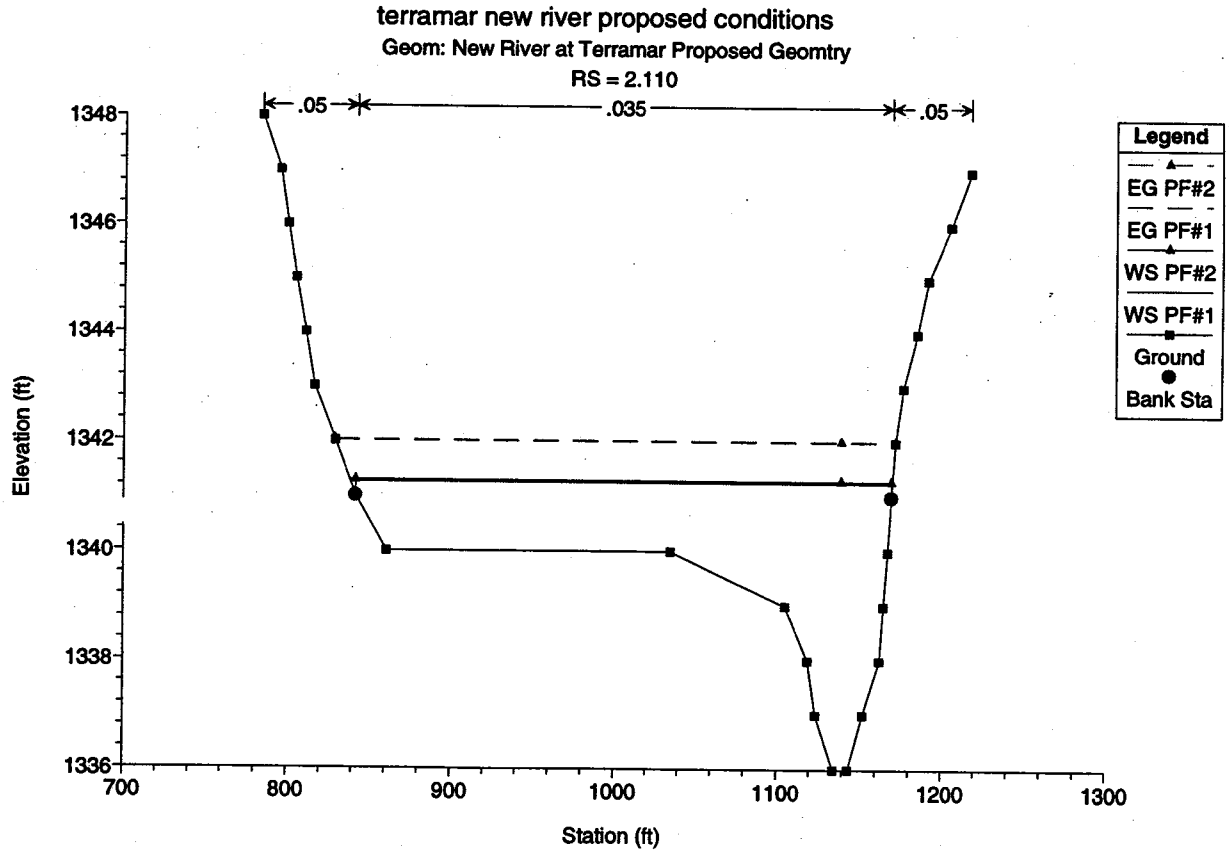

terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.116
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Crit PF#2
Crit PF#1
Ground
Ineff
Bank Sta


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.113
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.1125
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1352
1350
1348
1346
1344
1342
1340
800
850
900
950
1000
1050
1100
1150
1200


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.112
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
Crit PF#2
WS PF#1
Crit PF#1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1352
1350
1348
1346
1344
1342
1340
1338
800
850
900
950
1000
1050
1100


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.111
.05
.035
.05
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
1352
1350
1348
1346
1344
1342
1340
1338
800
900
1000
1100
1200
1300
Station (ft)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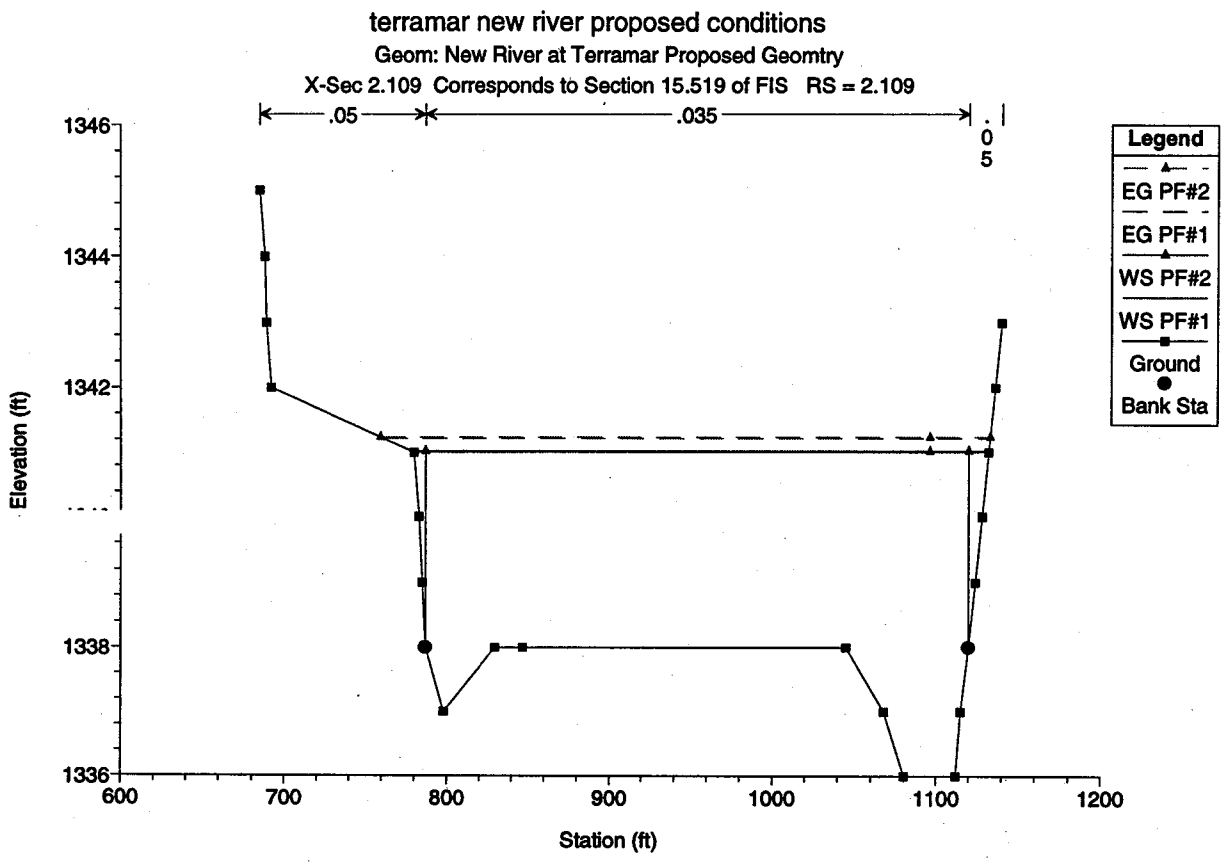
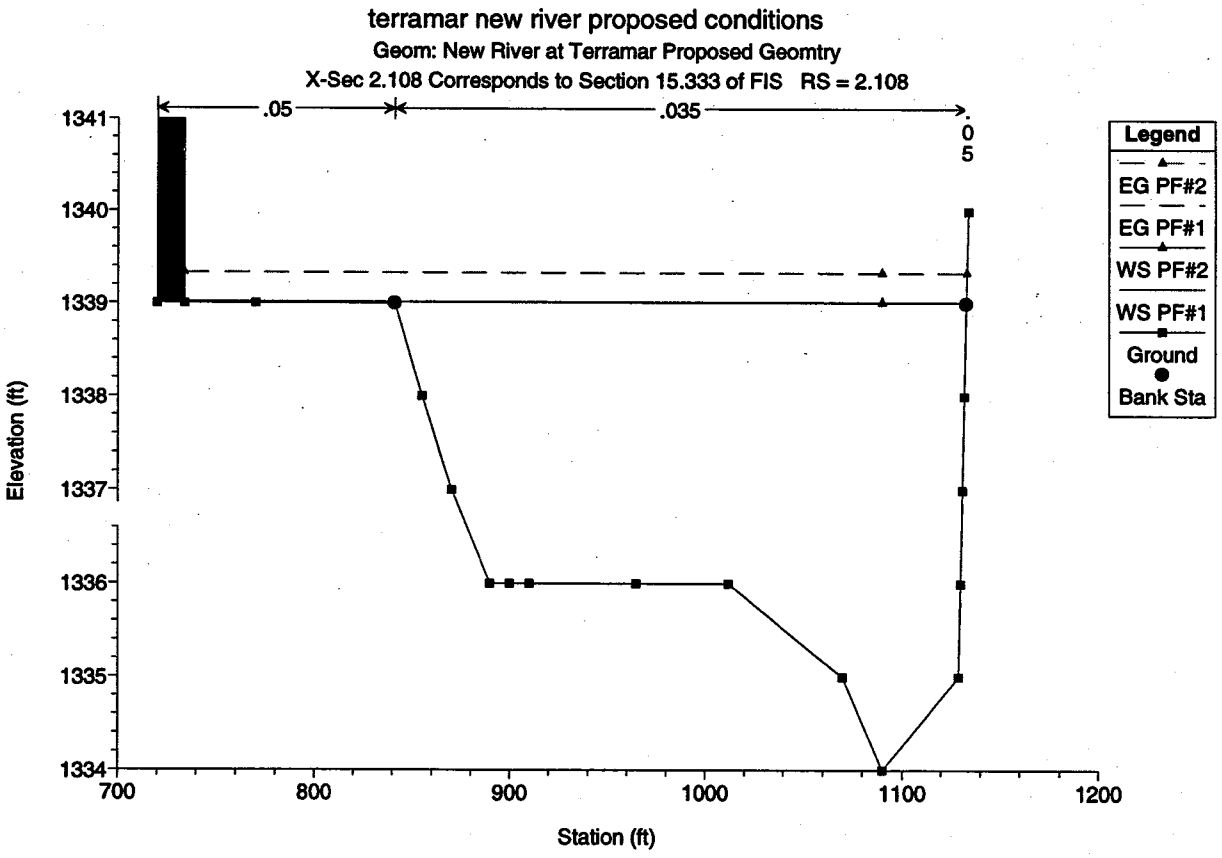
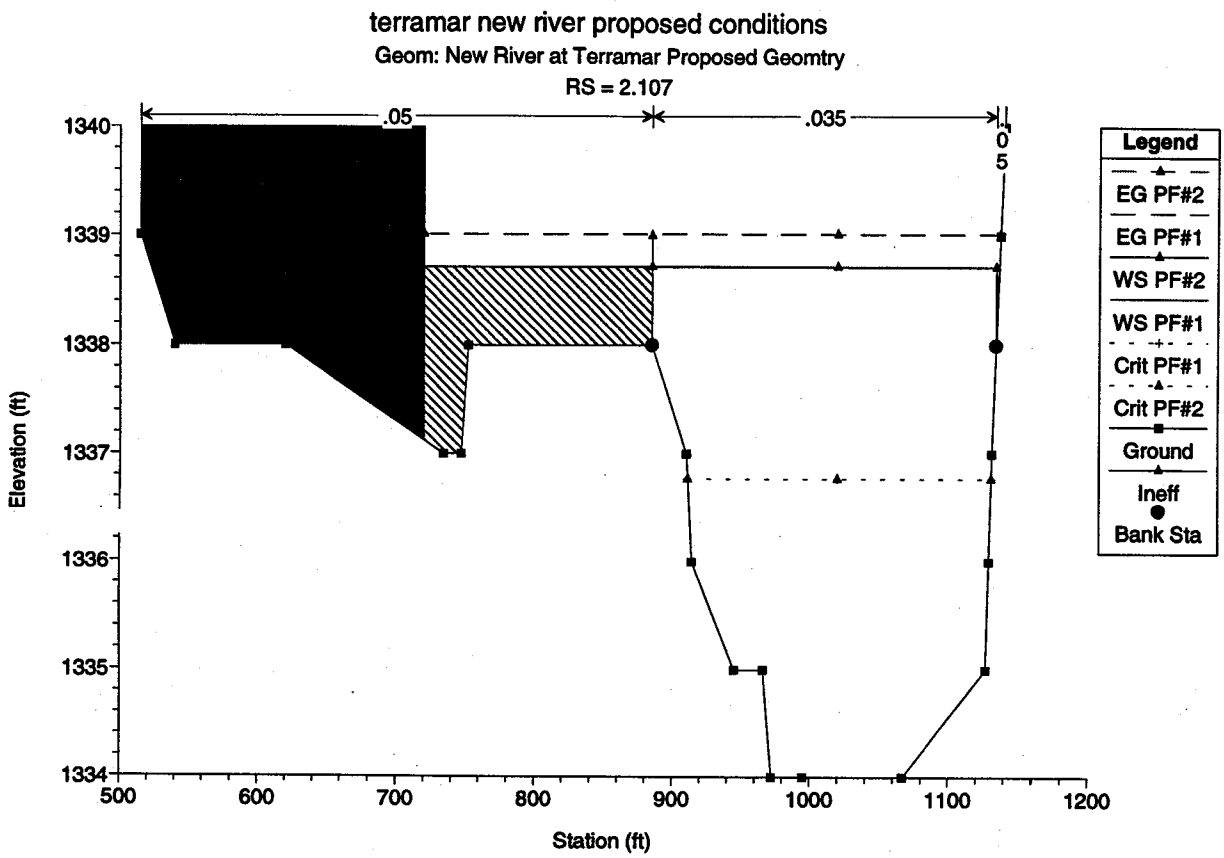
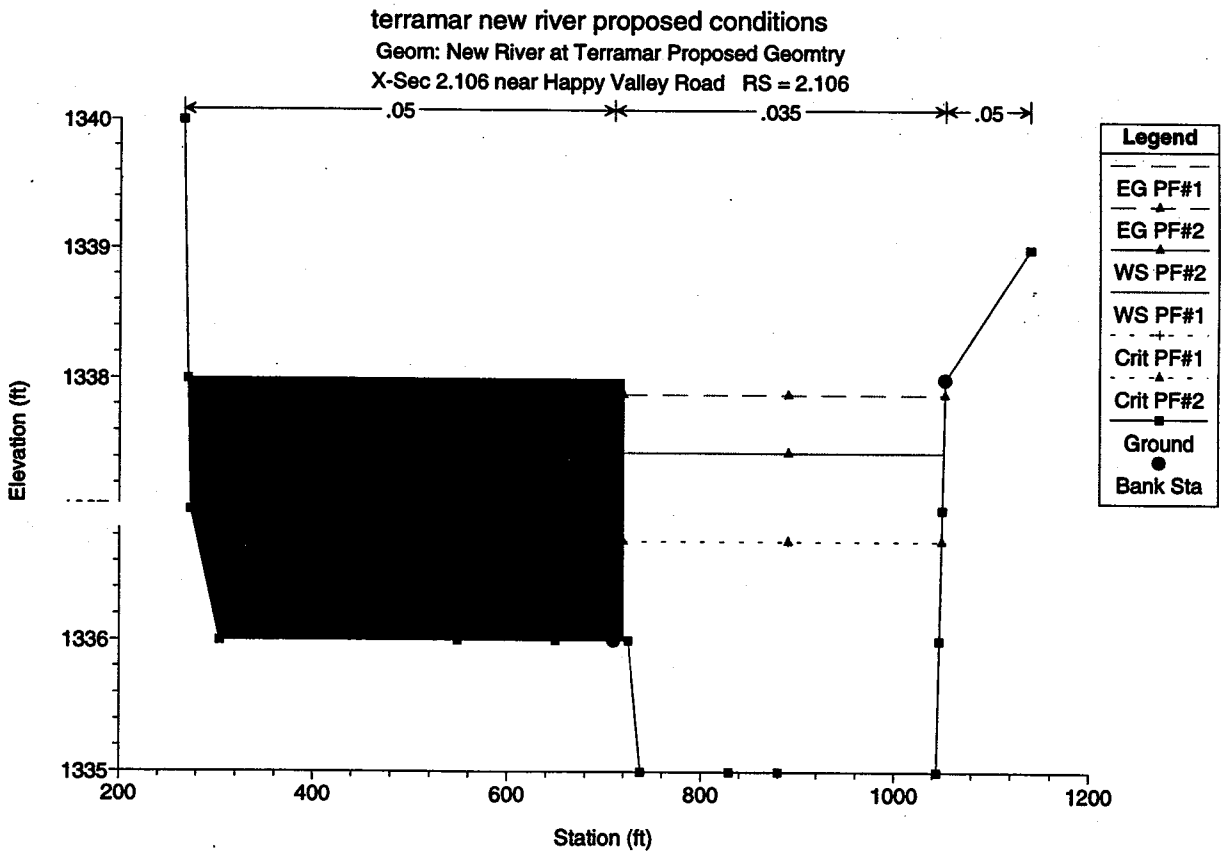
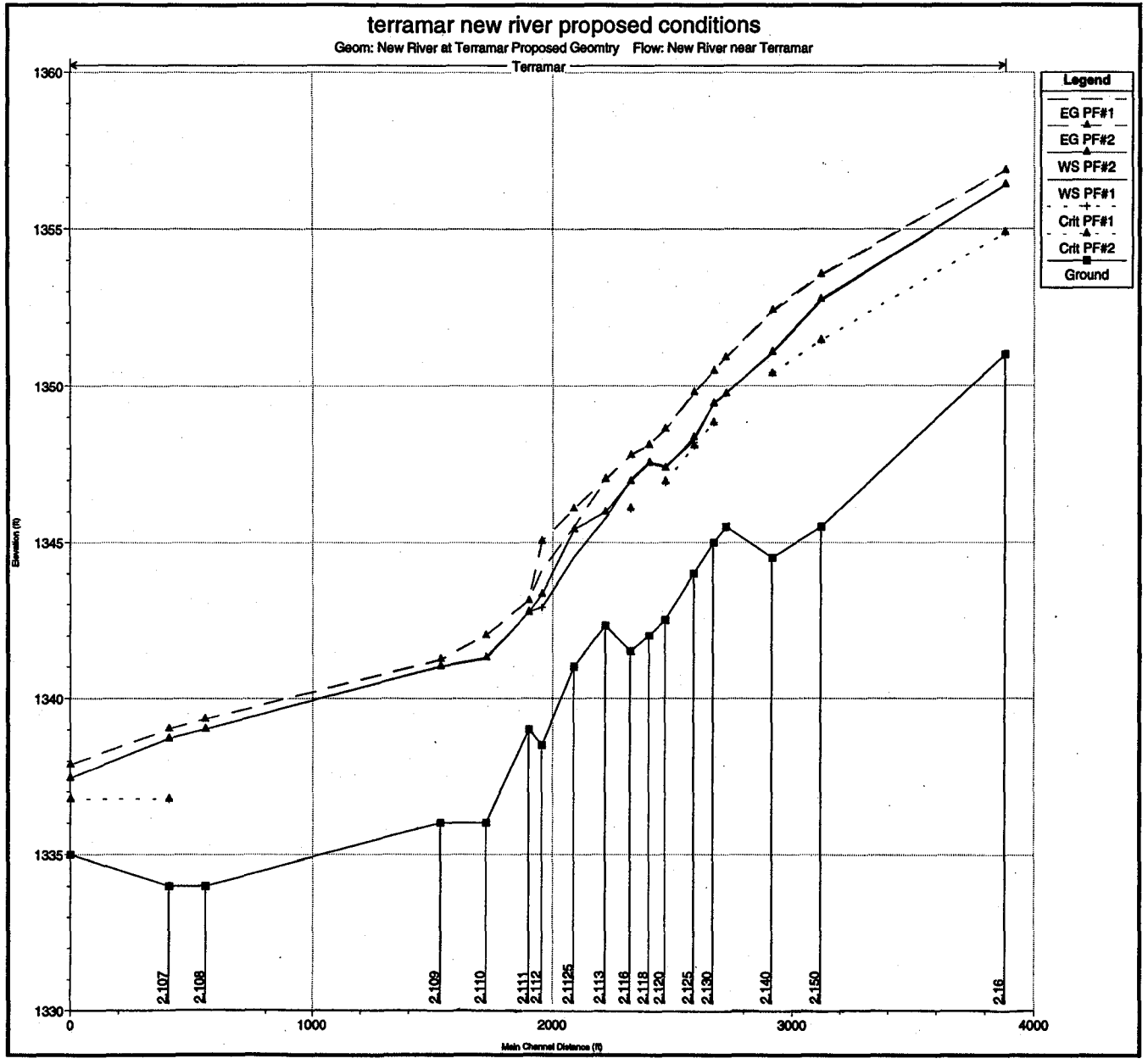
Geom: New River at Terramar Proposed Geomtry
RS = 2.110
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
1348
1346
1344
1342
1340
1338
1336
700
800
900
1000
1100
1200
1300
Station (ft)


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
X-Sec 2.109 Corresponds to Section 15.519 of FIS RS = 2.109
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
1346
1344
1342
1338
1336
600
700
800
900
1000
1100
1200
Station (ft)


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
X-Sec 2.108 Corresponds to Section 15.333 of FIS RS = 2.108
.05
.035
.05
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Ground
Bank Sta
Elevation (ft)
1341
1340
1339
1338
1337
1336
1335
1334
700
800
900
1000
1100
1200
Station (ft)


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
RS = 2.107
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#2
EG PF#1
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Ineff
Bank Sta


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry
X-Sec 2.106 near Happy Valley Road RS = 2.106
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG PF#1
EG PF#2
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Bank Sta


terramar new river proposed conditions
Geom: New River at Terramar Proposed Geomtry Flow: New River near Terramar
Terramar
Legend
EG PF#1
EG PF#2
WS PF#2
WS PF#1
Crit PF#1
Crit PF#2
Ground
Elevation (ft)
1360
1355
1350
1345
1340
1335
1330
0
1000
2000
3000
4000
Main Channel Distance (ft)
2.107
2.108
2.109
2.110
2.111
2.112
2.1125
2.113
2.116
2.118
2.120
2.125
2.130
2.140
2.150
2.16

Appendix F

FEMA FORMS

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTOR AND COMMUNITY OFFICIAL FORM**	*FEMA USE ONLY*	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*

PUBLIC BURDEN DISCLOSURE NOTICE

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.

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. OVERVIEW

1. The basis for this revision request is (are): *(check all that apply)*
   - ☒ Physical change
     - ☐ Existing
     - ☒ Proposed
   - ☐ Improved methodology
   - ☐ Improved data
   - ☐ Floodway revision
   - ☐ Other _____

   Explain _____
2. Flooding Source: New River
3. Project Name/Identifier: New River Bank Protection at Terramar
4. FEMA zone designations affected: AE

   (example: A, AH, AO, A1-A30, A99, AE, V, V1-30, VE, B, C, D, X)
5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	County	State	Map No.	Panel No.	Effective Date
040050	Peoria, City of	Maricopa	AZ	04013C	1180E	9/29/89

6. The area of revision encompasses the following types of flooding, structures, and associated disciplines: *(check all that apply)*

Types of Flooding	Structures	Disciplines*
☒ Riverine	☒ Channelization	☒ Water Resources
☐ Coastal	☒ Levee/Floodwall	☒ Hydrology
☐ Alluvial Fan	☐ Bridge/Culvert	☒ Hydraulics
☐ Shallow Flooding *(e.g. Zones AO and AH*	☐ Dam	☐ Sediment Transport
☐ Lakes	☐ Coastal	☐ Interior Drainage
	☐ Fill	☒ Structural
☐ Affected by wind/wave action	☐ Pump Station	☒ Geotechnical
☐ Yes	☐ None	☒ Land Surveying
☒ No	☐ Channel Relocation	☐ Other *(describe)*
	☐ Excavation	
	☐ Other *(describe)*	
Other *(describe)* _____	_____	_____

Attach completed "Certification by Registered Professional Engineer and/or Land Surveyor" Form for each discipline checked. (Form 2)

2. FLOODWAY INFORMATION

7. Does the affected flooding source have a floodway designated on the effective FIRM or FBFM? ☒ Yes ☐ No
8. Does the revised floodway delineation differ from that shown on the effective FIRM or FBFM? ☒ Yes ☐ No

   If yes, give reason: Channelization and Bank Protection

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Attach copy of either a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

9. 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.

3. PROPOSED ENCROACHMENTS

10. With floodways:

1A. Does the revision request involve fill, new construction, substantial improvement, or other development in the floodway? ☒ Yes ☐ No

1B. If yes, does the development cause the 100-year water surface elevation to increase at any location by more than 0.000 feet? ☒ Yes ☐ No

11. Without floodways:

2A. Does the revision request involve fill, new construction, substantial improvement, or other development in the 100-year floodplain? ☐ Yes ☐ No

2B. If yes, does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the 100-year water surface elevation to increase at any location by more than one foot *(or other surcharge limit if community or state has adopted more stringent criteria)*? ☐ Yes ☐ No

If the answer to either Items 1B or 2B is yes, please provide 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.

4. REVISION REQUESTOR ACKNOWLEDGEMENT

12. Having read NFIP Regulations, 44 CFR Ch. I, parts 59, 60, 61, and 72, I believe that the proposed revision ☒ is ☐ is not in compliance with the requirements of the aforementioned NFIP Regulations.

5. COMMUNITY OFFICIAL ACKNOWLEDGEMENT

13. Was this revision request reviewed by the community for compliance with the community's adopted floodplain management ordinances? ☒ Yes ☐ No

14. Does this revision request have the endorsement of the community? ☒ Yes ☐ No

If no to either of the above questions, please explain: _____

Please note that community acknowledgement and/or notification is required for all requests as outlined in Section 65.4 (b) of the NFIP Regulations.

6. OPERATION AND MAINTENANCE

5. Does the physical change involve a flood control structure (e.g. levees, floodwalls, channelization, basins, dams)? ☒ Yes ☐ No

If yes, please provide the following information for each of the new flood control structures:

A. Inspection of the flood control project will be conducted periodically by City of Peoria (entity) _____ with a maximum interval of 6 months between inspections.

B. Based on the results of scheduled periodic inspections, appropriate maintenance of the flood control facilities will be conducted by City of Peoria (entity) to ensure the integrity and degree of flood protection of the structure.

C. A formal plan of operation, including documentation of the flood warning system, specific actions and assignments of responsibility by individual name or title, and provisions for testing the plan at intervals not less than one year, ☒ has ☐ has not been prepared for the flood control structure.

D. The community is willing to assume responsibility for ☒ performing ☐ overseeing compliance with the maintenance and operation plans of the bank protection/floodwall
(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.

Attach operation and maintenance plans

7. REQUESTED RESPONSE FROM FEMA

16. After examining the pertinent NFIP regulations and reviewing the document entitled "Appeals, Revisions, and Amendments to Flood Insurance Maps: A Guide for Community Officials," dated January 1990, this request is for a:

X a. CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision *(LOMR or PMR)*, or proposed hydrology changes *(see 44 CFR Ch. I, Parts 60, 65, and 72)*.

____b. LOMR A letter from FEMA officially revising the current NFIP map to show changes to floodplains, floodways, or flood elevations. LOMRs typically depict decreased flood hazards. *(See 44 CFR Ch. 1, Parts 60 and 65.)*

____c. PMR A reprinted NFIP map incorporating changes to floodplains, floodways, or flood elevations. Because of the time and cost involved to change, reprint, and redistribute an NFIP map, a PMR is usually processed when a revision reflects increased flood hazards or large-scope changes. *(See 44 CFR Ch. 1, Parts 60 and 65.)*

____d. Other: Describe _____

8. FORMS INCLUDED

17. Form 2 entitled "Certification by Registered Professional Engineer And/Or Land Surveyor" must be submitted.

The following forms should be included with this request if (check the included forms):

• Hydrologic analysis for flooding source differs from that used to develop FIRM	☐ Hydrologic Analysis Form (Form 3)
• Hydraulic analysis for riverine flooding differs from that used to develop FIRM	☒ Riverine Hydraulic Analysis Form (Form 4)
• The request is based on updated topographic information or a revised floodplain or floodway delineation is requested	☒ Riverine/Coastal Mapping Form (Form 5)
• The request involves any type of channel modification	☒ Channelization Form (Form 6)
• The request involves new bridge or culvert or revised analysis of an existing bridge or culvert	☐ Bridge/Culvert Form (Form 7)
• The request involves a new revised levee/floodwall system	☒ Levee/Floodwall System Analysis Form (Form 8)
• The request involves analysis of coastal flooding	☐ Coastal Analysis Form (Form 9)
• The request involves coastal structures credited as providing protection from the 100-year flood	☐ Coastal Structures (Form 10)
• The request involves an existing, proposed, or modified dam	☐ Dam Form (Form 11)
• The request involves structures credited as providing protection from the 100-year flood on an alluvial fan	☐ Alluvial Fan Flooding Form (Form 12)

9. INITIAL REVIEW FEE

18. The minimum initial review fee for the appropriate request category has been included. ☒ Yes ☐ No

Initial fee amount: $ 3,100.00

Check or money order only. Make check or money order payable to: **National Flood Insurance Program**. If paying by Visa or Mastercard please refer to the credit card information form which follows this form.

or

19. This request is for a project that is for public benefit and is intended to reduce the flood hazard to existing development in identified flood hazard areas as opposed to planned floodplain development. ☐ Yes ☐ No

or

20. This request is to correct an error or to include the effects of natural changes within the areas of special flood hazards. ☐ Yes ☐ No

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

Signature of Revision Requestor

George J. Geiser, P.E., Director, Water Resources Group
Printed Name and Title of Revision Requestor

Coe & Van Loo Consultants, Inc.
Company Name

(602) 264-6831 8-12-98
Telephone No. Date

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

Signature of Community Official

Printed Name and Title of Community Official

Community Name

Date

oes this request impact any other communities? ☐ Yes ☒ No

yes, attach letters from all affected jurisdictions acknowledging revision request and approving changes to floodway, if applicable.

ote: Although a photograph of physical changes is not required, it may be helpful for FEMA's review.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 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.

Community Name: City of Peoria

Flooding Source: New River
(One form for each flooding source)

Project Name/Identifier: New River Bank Protection at Terramar

1. REACH TO BE REVISED

Downstream limit: 15.144 (Happy Valley Road)

Upstream limit: 15.966 (Jomax Road)

2. EFFECTIVE FIS

☐ Not studied

☐ Studied by approximate methods

Downstream limit of study _____

Upstream limit of study _____

☒ Studied by detailed methods

Downstream limit of study A C D C

Upstream limit of study New River Dam Downstream

☐ Floodway delineated

Downstream limit of Floodway Same as above

Upstream limit of Floodway Same as above

3. HYDRAULIC ANALYSIS

Why is the hydraulic analysis different from that used to develop the FIRM? *(Check all that apply)*

☐ Not studied in FIS

☐ Improved hydrologic data/analysis. Explain: _____

☐ Improved hydraulic analysis. Explain: _____

☐ Flood control structure. Explain: Bank protection and channel realignment at Terramar development reach

☐ Other. Explain: _____

3. RIVERINE HYDRAULIC ANALYSIS FORM
Models Submitted

For areas which have detailed flooding:

Full input and output listings along with files on diskette *(if available)* for each of the models listed below (items 1, 2, 3, 4, and 5) and summary of the source of input parameters used in the models must be provided. The summary must include a complete 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 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 for existing or pre-project conditions and revised or post-project conditions must be submitted. All calculations must be submitted for these analyses. (See item 6 below)

1. Duplicate Effective Model — Natural ☒ Floodway ☒

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 requestor's equipment to produce the duplicate effective model. This is required to assure that the effective model input data has been transferred correctly to the requestor'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 ☒ Floodway ☒

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 ☒ Floodway ☒

The duplicate effective or corrected 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 or duplicate effective model.

4. Revised or Post-Project Conditions Model — Natural ☒ Floodway ☒

The existing or pre-project conditions model *(or duplicate effective 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 proposed project this model should reflect proposed conditions.

5. Other: Please attach a sheet describing all other models or calculations submitted. — Natural ☐ Floodway ☐

6. Hydraulic Analyses (Only if Hydraulic Models are not developed) Natural ☐ Floodway ☐

Please attach all calculations for the existing or pre-project conditions and the revised or post-project conditions. Proceed to Form 5, "Riverine/Coastal Mapping Form".

4. MODEL PARAMETERS (from model used to revise 100-year water surface elevation)

1. Discharges:

	Upstream Limit	Downstream Limit
10-year		
50-year		
100-year	4200 cfs	4200 cfs
500-year		

Attach diagram showing changes in 100-year discharge

2. Explain how the starting water surface elevations were determined Water surface elevation of the effective model a few cross sections downstream of project location was used.

3. Give range of friction loss coefficients *(Manning's "N")* Channel 0.035

Overbanks . . . 0.050

If friction loss coefficients are different anywhere along the revised reach from those used to develop the FIRM, give location, value used in the effective FIS, and revised values and an explanation as to how the revised values were determined.

Location	FIS	Revised

Explain:

4. Describe how the cross section geometry data were determined *(e.g., field survey, topographic map, taken from previous study)* and list cross sections that were added.

New topographic map for the project reach of the river at 1.0 foot contour intervals

5. Were natural channel banks selected as the location of the left and right channel banks in the model?

☒ Yes ☐ No If no, explain why not:

4. MODEL PARAMETERS (Cont'd)

6. Explain how reach lengths for channel and overbanks were determined:

Channel reach lengths were estimated as the length along the hydraulic baseline. Overbank reach lengths were estimated as distance between center of mass of flow area in the overbanks.

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

1. Do the results indicate:

a. Water surface elevations higher than end points of cross sections? ☐ Yes ☒ No

b. Supercritical depth? ☐ Yes ☒ No

c. Critical depth? ☐ Yes ☒ No

d. Other unique situations? ☐ Yes ☒ No

If yes to any of the above, attach an explanation that discusses the situation and how it is presented on the profiles, tables, and maps.

2. What is the maximum change in energy gradient between cross-sections? 0.0106

Specify location Sections 2.100 to 2.109

3. What is the distance between the cross-sections in 2 above? 190 ft.

4. What is the maximum distance between cross-sections? 980 ft.

Specify location Sections 2.108 to 2.109

5. Floodway determination

a. What is the maximum surcharge allowed by the community or State? 1.0 foot

b. What is the maximum surcharge for the revised conditions? 0.9 foot

Specify location Section 2.115 feet

c. What is the maximum velocity? 9.91 fps

Specify location Section 2.125

d. Are there any negative surcharge values at any cross-section? ☒ Yes ☐ No

If yes, the floodway may need to be sidened. If it is not widened, please explain and indicate the maximum negative surcharge.

Explain: Negative surcharges occurred in the existing condition model as well. Maximum negative surcharge is -0.05

5. RESULTS (Cont'd)

6. Is the discharge value used to determine the floodway anywhere different from that used to determine the natural 100-year flood elevations? . . . . . ☐ Yes ☒ No

If Yes, explain:

7. Do 100-year water surface elevations increase at any location? . . . . . ☒ Yes ☐ No

If yes, please attach a list of the locations where the increases occur, state whether or not the increases are located on the requestor's property, and provide an explanation of the reason for the increases. (For example: State if the increase is due to fill placed within the floodway fringe or placed within the currently adopted floodway)

At cross sections 2.113 and 2.116 of the revised model, this is due to fill placed within the floodway. These locations are within the requestor's property on both sides of the channel.

Please attach a completed comparison table entitled: Water Surface Elevation Check (See page 6)

6. REVISED FIRM/FBFM AND FLOOD PROFILES

A. The revised water surface elevations tie into those computed by the effective FIS Model *(10-, 50-, (100-), and 500-year)*, downstream of the project at cross-section 15.144 within 0.5 feet (vertical) and upstream of the project at cross section 15.966 within 0.1 feet (vertical).

B. The revised floodway elevations tie into those computed by the effective FIS model, downstream of the project at cross section 15.144 within 0.5 feet (vertical) and upstream of the project at cross section 15.966 within 0.3 feet (vertical).

C. Attach profiles, at the same vertical and horizontal scale as the profiles in the effective FIS report, showing stream bed and profiles of all floods studied (without encroachment). Also, label all cross sections, road crossings (including low chord and top-of-road data), culverts, tributaries, corporate limits, and study limits. If channel distance has changed, the stationing should be revised for all profile sheets.

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

Proceed to Riverine/Coastal Mapping Form.

FEDERAL EMERGENCY MANAGEMENT AGENCY

WATER SURFACE ELEVATION CHECK

COMMUNITY NAME	FLOODING SOURCE	PROJECT NAME/IDENTIFIER
CITY OF PEORIA	NEW RIVER	NEW RIVER BANK PROTECTION AT TERRAMAR

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	**NCWSEL[1]	**FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
15.144	1336.9*	1336.9*	0.0	1336.5*	1336.6*	0.1	1337.1	1337.4	0.3	1337.1	1337.4	0.3	1337.4	1337.4	0.0
15.333	1339.1	1339.1	0.0	1338.3	1338.3	0.0	1338.8	1339.0	0.2	1338.8	1339.0	0.2	1338.8	1339.0	0.2
15.519	1344.0	1344.0	0.0	1344.6	1344.6	0.0	1341.0	1341.0	0.0	1341.0	1341.0	0.0	1341.0	1341.0	0.0
15.699	1349.7	1350.0	0.3	1349.5	1349.5	0.2	1347.6	1348.3	0.7	1347.6	1348.3	0.7	1347.4	1347.4	0.0
15.966	1356.3	1356.7	0.4	1356.8	1356.8	0.4	1356.4	1356.4	0.0	1356.4	1356.4	0.0	1356.4	1356.4	0.0

COMMENTS:

* Interpolated values between x-sec 15.14 and 15.333 to correspond to new cross section near Happy Valley Road.

** Using new topographic mapping of 1 foot contour intervals and additional intermediate cross-sections. Used HEC-RAS model.

1 - 100-year (natural) Water Surface Elevation 2 - Encroachment (floodway) Water Surface Elevation 3 - Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

Sheet ____ of ____

N:\960043\ADMIN\43-566X.WP8

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE/COASTAL MAPPING FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.5 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.

Community Name: City of Peoria

Flooding Source: New River

Project Name/Identifier: New River Bank Protection at Terramar

1. MAPPING CHANGES

1. A topographic work map of suitable scale, contour interval, and planimetric definition must be submitted showing *(indicate N/A when not applicable)*:

		Included		
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 100-year floodway boundaries	☒ Yes	☐ No	☐ N/A
D.	Location and alignment of all cross sections used in the revised hydraulic model with stationing control indicated	☒ Yes	☐ No	☐ N/A
E.	Stream alignments, road and dam alignments	☒ Yes	☐ No	☐ N/A
F.	Current community boundaries	☒ Yes	☐ No	☐ N/A
G.	Effective 100- and 500-year floodplain and 100-year floodway boundaries from the FIRM/FBFM reduced or enlarged to the scale of the topographic work map	☒ Yes	☐ No	☐ N/A
H.	Tie-ins between the effective and revised 100- and 500-year floodplains and 100-year floodway boundaries	☒ Yes	☐ No	☐ N/A
I.	The requestor'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, etc.)	☒ 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 analyses	☐ Yes	☐ No	☒ N/A

If any of the items above are marked no or N/A, please explain: A.) This is not an approximate delineation.

M.) This area is not a coastal floodplain.

N.) This area is not a coastal floodplain.

2. What is the source and date of the updated topographic information *(example: orthophoto maps, July 1985; field survey, May 1979, beach profiles, June 1987, etc.)*? Aerial Topographic Map 1966

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

   a. Effective FIS 200 scale 2 ft. Contour interval

   b. Revision Request 100 scale 1 ft. Contour interval

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

4. Attach an annotated FIRM and FBFM at the scale of the effective FIRM and FBFM showing the revised 100-year and 500-year floodplains and the 100-year floodway boundaries and how they tie into those shown on the effective FIRM and FBFM downstream and upstream of the revision or adjacent to the area of revision for coastal studies.

Attach additional pages if needed.

5. Flood Boundaries and 100-year water surface elevations:

Has the 100-year floodplain been shifted or increased or the 100-year water surface elevation increased at any location on property other than the requestor's or community's? ☐ Yes ☒ No

If yes, please give the location of shift or increase and an explanation for the increase.

a. Have the affected property owners been notified of this shift or increase and the effect it will have on their property? . . . . . ☒ Yes ☐ No

If yes, please attach letters from these property owners stating they have no objections to the revised flood boundaries if a LOMR is being requested.

b. What is the number of insurable structures that will be impacted by this shift or increase? _____

6. Have the floodway boundaries shifted or increased at any location compared to those shown on the effective FBFM or FIRM? . . . . . ☒ Yes ☐ No

If yes, explain:

At cross sections 2.113 and 2.116. This is due to fill placed within the floodway. These locations are within the requestor's property only.

7. If a V-zone has been designated, has it been delineated to extend landward to the heel of the primary frontal dune? ☐ Yes ☐ No

If no, explain:

8. Manual or digital map submission:

☒ Manual
☐ Digital

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 of submission as possible.

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.

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, provide certification of fill compaction (item C. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer.

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? . . . . . N/A ☐ Yes ☐ No

   If yes, attach the coastal structures form.

FEDERAL EMERGENCY MANAGEMENT AGENCY **CHANNELIZATION FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

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Community Name: City of Peoria

Flooding Source: New River

Project Name/Identifier: New River Bank Protection at Terramar

1. EXTENT OF CHANNELIZATION

Downstream limit: FIS Cross Section 15.144

Upstream limit: FIS Cross Section 15.699

2. CHANNEL DESCRIPTION

1. Describe the inlet to the channel Bank Protection - Gabion wall on west bank no channel constriction

2. Briefly describe the shape of the channel *(both cross sectional and planimetric configuration)* and its lining *(channel bottom and sides)* Natural irregular shape. East bank lined with gabion wall. West bank unlined at a slope of 3'H: 1V. Channel bottom is unlined and natural.

3. Describe the outlet from the channel Bank Protection - Gabion wall on east bank, channel width approximately the same as in the existing condition.

4. The channelization includes:

   - ☐ Levees *(Attach Levee Form)*
   - ☐ Drop structures
   - ☐ Superelevated sections
   - ☐ Transitions in cross sectional geometry
   - ☐ Debris basin/detention basin
   - ☐ Energy dissipater
   - ☐ Other

5. Attach the following:

   a. Certified engineering drawings showing channel alignment and locations of inlet, outlet, and items checked in Item 4

   b. Typical cross sections and profiles of channel banks and invert

3. HYDRAULIC CONSIDERATIONS

1. What is the 100-year discharge? . . . . . 4.200 cfs
2. Do the cross sections in the hydraulic model match the typical cross sections in the plans? . . . . . ☒ Yes ☐ No
3. Are the channel banks higher than the 100-year flood elevations everywhere? . . . . . ☒ Yes ☐ No
4. Are the channel banks higher than the 100-year flood energy grade lines everywhere? . . . . . ☐ Yes ☒ No
5. Is the land on both sides of the channel above the adjacent 100-year flood elevation at all points along the channel? . . . . . ☐ Yes ☒ No
6. What is the range of freeboard? . . . . . 1.5 - 2.5 feet
7. What is the range of the 100-year flood velocities? . . . . . 3.7 - 10.5 ft/sec
8. What is the lining type? (both bottom and sides) East bank - Gabion wall, west bank and bottom are unlined

   Explain how the channel lining prevents erosion and maintains channel stability *(attach documentation)*

   West bank slopes flattened to prevent erosion. East bank Gabion walls toe down below potential scour depth.

9. What is the design elevation in the channel based on?

   ☒ Subcritical flow
   ☐ Critical flow
   ☐ Supercritical flow
   ☐ Energy grade line

   Is 100-year flood profile based on the above type of flow? . . . . . ☒ Yes ☐ No

   If no, explain: _____

10. Is there the potential for a hydraulic jump at the following locations?

    Inlet to channel . . . . . ☐ Yes ☒ No
    Outlet of channel . . . . . ☐ Yes ☒ No
    At Drop Structures . . . . . ☐ Yes ☐ No
    At Transitions . . . . . ☐ Yes ☒ No

    Other locations. Explain: _____

    If the answer to any of the above is yes, please explain how the hydraulic jump is controlled and the effects of the hydraulic jump on the stability of the channel.

    Explain: _____

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year water surface elevations and/or the capacity of the channel? . . . . . ☐ Yes ☒ No

   B. Based on the conditions of the watershed and stream bed, is there a potential for sediment transport (including scour and deposition) to affect the 100-year water surface elevations and/or the capacity of the channel? . . . . . ☒ Yes ☐ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment (bed) load?

   11.5 cfs (attach gradation curve)

   Explain method used to estimate load Location downstream of dam, therefore inflowing sediment load is limited to bedload only. The sediment inflow to the reach was taken as the sediment transport capacity of upstream reach, based on Meyer - Peter and Muller method.

   B. Is the 100-year flood velocity anywhere within the channel less than the 100-year flood velocity of the inlet? ☒ Yes ☐ No

   C. Will sediment accumulate anywhere within the channel? ☒ Yes ☐ No

   D. Will deposition or scour occur at or near the inlet? ☒ Yes ☐ No

   E. Will deposition or scour occur at or near the outlet? ☒ Yes ☐ No

Attach documentation showing affects on the Hydrologic and Hydraulic analyses

(Scour from sediment transport was accounted for in the toe-down depth for bank protection design. Deposition from sediment transport was added to the freeboard of channel).

FEDERAL EMERGENCY MANAGEMENT AGENCY **LEVEE/FLOODWALL SYSTEM ANALYSES FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.0 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.

Community Name: City of Peoria

Flooding Source: New River

Project Name/Identifier: New River Bank Protection at Terramar

REACH TO BE REVISED

Downstream limit: 15.144

Upstream limit: 15.699

This Floodwall analysis is based on:

☐ upgrading of an existing levee/floodwall system

☒ a newly constructed floodwall system

☐ a reanalysis of an existing levee/floodwall system

LEVEE/FLOODWALL SYSTEM ELEMENTS

1. Levee elements and locations are:

☐ earthen embankment, dike, berm, etc. Station _____ to _____

☒ structural floodwall Station _____ to _____

☒ other (describe) Gabion Retaining Wall Station _____ to _____

Structural Type:

☒ monolithic cast-in place reinforced concrete

☐ reinforced concrete masonry block

☐ sheet piling

☐ other (describe) _____

2. Has this floodwall system been certified by a Federal agency to provide protection against the 100-year flood event?

☐ Yes ☒ No

If yes, by which agency? _____

If yes, complete only the interior drainage section on pages 7 and 8 of this form and the operation and maintenance section of Revision Requestor and Community Official Form.

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

a. Plan of the levee embankment and floodwall structures. Sheet Numbers _____

b. A profile of the levee/floodwall system showing the 100-year water surface elevation, levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers _____

c. A profile of the 100-year water surface elevation, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure device. Sheet Numbers _____

d. A layout detail for the embankment protection measures. Sheet Numbers _____

e. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers _____

FREEBOARD

1. The minimum freeboard provided above the 100-year water surface elevation is:

Riverine (Not Applicable - Bank Protection is not a levee condition, but an incised channel)

3.0 feet or more at the downstream end and throughout ☐ Yes ☐ No

3.5 feet or more at the upstream end ☐ Yes ☐ No

4.0 feet immediately upstream of all structures and constrictions ☐ Yes ☐ No

Coastal

1.0 foot above the height of the one percent wave for the 100-year stillwater surge elevation or maximum wave runup (whichever is greater). ☐ Yes ☐ No

2.0 feet above 100-year stillwater surge elevation ☐ Yes ☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Part 65.10 (b) (1) (ii) of the National Flood Insurance Program regulations.

If no is answered to any of the above, please explain where and why: _____

_____

2. Is there an indication from historical records that ice-jamming can effect the 100-year water surface elevation?
☐ Yes ☐ No If yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Tabulate the elevations at critical locations (tabulate values at each levee crest grade change)

Station	Location	100-Year Water Surface Elevation	Levee Crest	Freeboard (ft.)
	Upper end			
	Lower end			

(Extend table on an added sheet as needed and reference)

SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year water surface elevations?

☐ Yes ☒ No

B. Based on the conditions (such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions), is there a potential for debris and sediment transport (including scour and deposition) to affect the 100-year water surface elevations and/or the freeboard for the levee/floodwall?

☒ Yes ☐ No

2. If the answer to either 1A or 1B is yes:

A. What is the estimated sediment (bed material) load?

11.5 cfs (attach gradation curve)

Explain method used to estimate the sediment transport and the depth of scour and/or deposition

See MT-2 Form 6, Page 3 of 3, Section 2

B. Will sediment accumulate anywhere along the levee/floodwall (such as along any bends in the channel)?

☒ Yes ☐ No

If yes, what is the minimum freeboard at these locations? 2.5 feet.

CLOSURES

1. Openings through the levee system:

☐ exist ☒ do not exist

If openings exist, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Geotechnical and geologic data:

In addition to the required detail analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following levee system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers EM-1110-2-1906 Form 2086).

EMBANKMENT PROTECTION

1. The maximum levee slope landside is _____

2. The maximum levee slope floodside is _____

3. The range of 100-year riverine flood velocities along the levee? _____ (min.) to _____ (max.)

4. Embankment material is protected by (describe the kind): _____

_____

_____

_____

5. Riprap Design Parameters: (Include references) ☐ Velocity ☐ Tractive stress

Reach	Sideslope	Flow depth	Velocity	Curve or Straight	Stone Riprap D_{100} D_{50} Thickness	Depth of Toedown
Sta ____ to ____						
Sta ____ to ____						
Sta ____ to ____						

(Extend table on an added sheet as needed and reference)

6. Has a bedding/filter analysis and design been included? ☐ Yes ☐ No

Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Note: Attach engineering analysis to support construction plans.

EMBANKMENT AND FOUNDATION STABILITY

1. Describe the basis for selection of critical location for analysis:

☐ Overall height: Sta _____, height _____ ft.

☐ Limiting foundation soil strength:

Sta _____, depth _____ to _____

strength ø = _____ degrees, c = _____ psf

☐ slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

2. Specify the embankment stability analyses methodology used (e.g. circular arc, sliding block, infinite slope, etc.): _____

_____

_____

3. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction	_____	1.3
II	Sudden drawdown	_____	1.0
III	Critical flood stage	_____	1.4
IV	Steady seepage at flood stage	_____	1.4
VI	Earthquake (Case I or III)	_____	1.0

(Reference: U.S. Army Corps of Engineers EM-1110-2-1913 Table 6-1)

4. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

Describe methodology used: _____

_____

5. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

6. The duration of 100-year flood hydrograph against the embankment is _____ Hrs.

Note: Attach engineering analysis to support construction plans.

EMBANKMENT AND FOUNDATION STABILITY

1. Describe analysis submittal based on Code:

☐ UBC (1988) or ☐ Other (specify) _____

2. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding; if not, explain _____

_____

3. Loading included in the analyses were:

☐ Lateral earth @ P_A = _____ psf; P_P = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_W = _____ psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = _____%g

☐ 100-year significant wave height _____ ft.

☐ 100-year significant wave period _____ sec.

4. Summary of Stability Analysis Results: Factors of Safety. Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta ____ Overturn	To ____ Sliding	Sta ____ Overturn	To ____ Sliding
	Overturn	Sliding				
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood & Impact	1.5	1.5				
Dead, Soil & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; COE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

5. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load	Short Term Load
Computed design maximum	_____ psf	_____ psf
Maximum allowable	_____ psf	_____ psf

6. Foundation scour protection ☐ is, ☐ is not provided, (describe)

_____

Note: Attach engineering analysis to support construction plans.

SETTLEMENT

1. Anticipated potential settlement has been determined and incorporated into the specified construction elevations to maintain the established freeboard margin. ☐ Yes ☐ No

2. The computed range of settlement is _____ ft. to _____ ft.

3. Settlement of the levee crest is determined to be primarily from:

   ☐ Foundation consolidation

   ☐ Embankment compression

   ☐ Other (describe) _____

4. Differential settlement of floodwalls

   ☐ has ☐ has not been accommodated in the structural design and construction.

Note: Attach engineering analysis to support construction plans.

INTERIOR DRAINAGE

1. Specify size of each interior watershed

   Draining to pressure conduit _____

   Draining to ponding area _____

2. Relationship Established

   Ponding elevation vs. storage ☐ Yes ☐ No

   Ponding elevation vs. gravity flow ☐ Yes ☐ No

   Differential head vs. gravity flow ☐ Yes ☐ No

3. The river flow duration curve is enclosed ☐ Yes ☐ No

4. Specify the discharge capacity of the head pressure conduit _____

5. Which Flooding Conditions Were Analyzed?

   - Gravity flow (Interior Watershed) ☐ Yes ☐ No
   - Common storm (River Watershed) ☐ Yes ☐ No
   - Historical ponding probability ☐ Yes ☐ No
   - Coastal wave overtopping ☐ Yes ☐ No

   If no, explain why: _____

6. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection.

   ☐ Yes ☐ No

   If no, explain why: _____

7. The rate of seepage through the levee system for the 100-year flood is _____ cfs

INTERIOR DRAINAGE (Cont'd)

8. The length of levee system used to drive this seepage rate is _____ ft.

9. Will a pumping plant(s) be used for interior drainage? ☐ Yes ☐ No

If yes, include the number of pumping plants: _____

For each pumping plant, list:	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		
Will the operations be automatic?	☐ Yes	☐ No
If the pumps are electric, are there backup power sources?	☐ Yes	☐ No

(Reference: U.S. Army Corps of Engineers EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Note: Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

OTHER DESIGN CRITERIA

1. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem.

Hydrocompaction ☐ is ☐ is not a problem.

Heave differential movement due to soils of high shrink/swell

☐ is ☐ is not a problem.

2. For each of these problems, state the basic facts and corrective action taken.

_____

_____

_____

_____

If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure? ☐ Yes ☐ No

Note: Attach supporting documentation.

The planned/installed works are in full compliance with NFIP regulations, Section 44 CFR Ch. 1.65.10

☐ Yes ☐ No

OPERATIONAL PLAN AND CRITERIA

1. The operation plan incorporates all the provisions for closure devices as required in Section 65.10(c)(1), of the NFIP regulations.

☐ Yes ☐ No

2. The operation plan incorporates all the provisions for interior drainage as required in Section 65.10(c)(2), of the NFIP regulations.

☐ Yes ☐ No

If no to either of the above, please explain.

_____

_____

_____

_____

Appendix G

SCOUR AND EQUILIBRIUM SLOPE ANALYSIS

TERRAMAR
New River Bank Protection
Equilibrium Slope Analysis

References: 1. Design Manual for Engineering Analysis of Fluvial Systems, Arizona Department of Water Resources, 1985

Equations Used:

1. Darcy-Weisbach Friction Factor, f =116.5*n^2/R^0.3 Ref 1. Eqn. 4.8 a

where n = Manning's friction factor

R = Hydraulic radius of channel

Boundary Shear Stress = Rho* f * V^2/8

Where Rho = Density of Water

f = Darcy-Weisbach friction factor

V = Velocity of flow (cfs)

Critical Shear Stress = 0.047*Dc*(Gs-G) Ref 1. Eqn. 5.5

Where Dc = Diameter of Sediment Particle

Gs = Specific Weight of Particle

G = Specific Weight of Water

0.047 = Shield's Parameter

Sediment Transport Capacity
Meyer-Peter & Muller (MPM)= 12.85(To - Tc)^1.5/(Gs*SQRT(Rho))

Where To = Boundary Shear Stress

Tc = Critical Shear Stress

Gs = Specific Weight of Particle

Rho = Density of Water

Reach No	Cross Section	Bottom Width (ft)	Channel Slope (ft)	Manning's 'n'	Reach Length	Mean Vel
1	2.106-2.113	150	0.011	0.035	502	8.03
2	2.113-2.120	60	0.012	0.035	370	11.42
3	2.120-2.135	105	0.011	0.035	132	9.18
4	2.135-2.150	50	0.006	0.035	397	9.64

Darcy-W

Reach No	Cross Sections	Boundary Shear	D50	Crit. Shear	Hyd. Depth	f- value
1	2.106-2.113	1.617	25	0.397	2.49	0.10561
2	2.113-2.120	2.715	25	0.397	4.38	0.08765
3	2.120-2.135	1.962	25	0.397	3.12	0.09804
4	2.135-2.150	1.723	25	0.397	6.22	0.07807

Reach No	Cross Sections	MPM Sed Q (cfs/ft)
1	2.106-2.113	0.0760
2	2.113-2.120	0.1989
3	2.120-2.135	0.1104
4	2.135-2.150	0.0861

D50 =	0.082	ft	25 mm
Spec. Wt of Sed=	165.4	lb/ft^3	
Density of Water =	1.9	lb-sec^2/ft^4	

Use MPM Method
Sediment Supply =0.0861cfs/ft

Terramar
New River Bank Protection
Equilibrium Slope Analysis -Hydraulics Worksheet

Reach No	Cross Sections	Bottom Width (ft)	Channel Slope (ft)	Manning's 'n'	Depth Y	R	V	Q	Diff Q
1	2.106-2.113	150	0.011	0.035	2.491	2.4109	8.0299	3000.4	-0.373
2	2.113-2.120	60	0.012	0.035	4.378	3.8205	11.417	2999.1	0.9315
3	2.120-2.135	105	0.011	0.035	3.12	2.945	9.1819	3008	-7.991
4	2.135-2.150	50	0.006	0.035	6.22	4.9808	9.6431	2999	1.0025
1	2.106-2.113	150	0.002	0.035	4.19	3.9683	4.7811	3004.9	-4.944
1	2.106-2.113	150	0.005	0.035	3.17	3.0414	6.3256	3007.8	-7.808
1	2.106-2.113	150	0.009	0.035	2.65	2.5596	7.5604	3005.2	-5.247
1	2.106-2.113	150	0.012	0.035	2.43	2.3537	8.2531	3008.3	-8.271
2	2.113-2.120	60	0.01	0.035	4.65	4.026	10.795	3011.7	-11.75
2	2.113-2.120	60	0.004	0.035	6.2	5.1381	8.0393	2990.6	9.3704
2	2.113-2.120	60	0.003	0.035	6.82	5.5568	7.3374	3002.5	-2.463
3	2.120-2.135	105	0.001	0.035	6.55	5.8235	4.3714	3006.4	-6.439
3	2.120-2.135	105	0.002	0.035	5.28	4.7975	5.4293	3010	-10.02
3	2.120-2.135	105	0.004	0.035	4.25	3.9317	6.7197	2998.7	1.3265
3	2.120-2.135	105	0.0085	0.035	3.37	3.1667	8.4736	2998.4	1.6075

Equilibrium Slope Determination for The Reaches

Sediment Discharge Computation Worksheet

Reach Number	Slope ft/ft	Velocity fps	Boundary Shear	Critical Shear	Sediment Discharge
1	0.002	4.7811	0.57335593356	0.396962	0.004178348
1	0.005	6.3256	1.00362647262	0.396962	0.026650291
1	0.009	7.5604	1.43369973002	0.396962	0.059536385
1	0.012	8.2531	1.70845235296	0.396962	0.084708454
2	0.007	9.6318	1.93121420206	0.396962	0.107182587
2	0.006	9.1684	1.7498573231	0.396962	0.088751438
2	0.003	7.3374	1.12072723299	0.396962	0.034727673
3	0.001	4.3714	0.44494672283	0.396962	0.000592835
3	0.002	5.4293	0.68636415669	0.396962	0.008780753
3	0.004	6.7197	1.05139688379	0.396962	0.029859241
3	0.0085	8.4736	1.67187126977	0.396962	0.081189155
4	0.002	6.7165	0.83675956602	0.396962	0.016449713
4	0.006	9.6431	1.72483671794	0.396962	0.086300787
4	0.0055	9.374	1.62991345996	0.396962	0.077214359

Summary of Results

Supply Reach's Sediment Discharge: ***0.0861 cfs/ft***

Reach	Equil. Slope (FT/FT)	Exist Slope (FT/FT)	Longterm Effect	Depth of Degrad/Agg (FT)
1	0.012	0.011	Aggrade	0.502
2	0.006	0.012	Degrade	-2.22
3	0.0085	0.011	Degrade	-0.33

Terramar New River Bank Protection
Project No. 96004321

Scour Analysis For Bank Protection Toe Down Depth

References
1. Computing Degradation and Local Scour. Technical Guideline for Bureau of Reclamation, 1984
2. Design Manual for Engineering Analysis of Fluvial Systems, Arizona Department of Water Resources, 1985

1. General Scour

Zgs= Ymax [(0.0685Vm^0.8/Yh^0.4Se^0.3)-1]

where	Vm is Avg Velocity of flow, fps =	9.39
	Yh is Hydraulic Depth (ft) =	3.01
	Se is the energy slope (ft/ft) =	0.0118
	Ymax is maximum flow depth (ft)	4.76

Zgs = 0.00912601 feet

2. Bedform Scour

Zbf = 0.027Vm^2/2 *Ref. 2, Equation 4.25*

where	Vm is Avg Velocity of flow, fps =	9.39

Zbf = 1.19032335 feet

3. Local Scour

Zls = k*q^0.24 *Ref. 1 Equation 24*

where	k = constant	2.45
	q = unit discharge (cfs/ft)=Q/W	28.2618935
	Q = discharge (cfs)	3000
	W = channel width (ft)	106.15

Zls = 5.46329166 feet

4. Bend Scour

Zbs = 0.0685*Y*V^0.8[2.1(Sin^2aplha/2/Cos aplha)^0.2 -1)-1]/[Yh^0.4*Se^0.3 *Ref. 2 Equation 5.25*

where	V is Avg upstream flow velocity=	6.27
	Y is upstream flow depth (ft) =	4.69
	Yh is Hydraulic Depth (ft) =	3.87
	Se is the energy slope (ft/ft) =	0.0038
	alpha is the angle formed by the projection of the channel centerline from	45

the point of curvature (degrees)

Zbs1 = 4.32173349
Zbs2 = 0.79146366
Zbs = 3.420495 feet

5. Low Flow Incisement

Zlf = Field Inspection or typical value of 1.5 to 3.0 fe Use 2.0 feet 2

ZTOTAL = 15.7082068 feet

Terramar New River Bank Protection
Project No. 96004321

SUMMARY OF COMPUTED SCOUR

Cross Section Number	Longterm Degradation	Bed Form Scour	Local Scour	Bend Scour	Low Flow Incisement	Total Scour x 1.3 Safety Factor	Design Scour Depth (ft)
2.106-2.108	0	1.19	5.46	0	2	11.245	12
2.11	0	1.19	5.46	0	2	11.245	12
2.111	0	1.19	5.46	0	2	11.245	12
2.112	0	1.19	5.46	3.42	2	15.691	16
2.1125	0	1.19	5.46	3.42	2	15.691	16
2.113	0	1.19	5.46	3.42	2	15.691	16
2.116	2.2	1.19	5.46	3.42	2	18.551	20
2.118	2.2	1.19	5.46	3.42	2	18.551	20
2.12	2.2	1.19	5.46	3.42	2	18.551	20
2.125	0.3	1.19	5.46	0	2	11.635	12
2.13	0.3	1.19	5.46	0	2	11.635	12
2.135	0.3	1.19	5.46	0	2	9.035	12

Appendix H

FREEBOARD CALCULATIONS

Terramar New River Bank Protection
Project No. 96004321

Freeboard Analysis

References
1. Drainage Design Manual for Maricopa County, Volume II, Hyadraulics, 1996
2. Design Manual for Engineering Analysis of Fluvial Systems, Arizona Department of Water Resources, 1985

1.Maricopa County Freeboard FBmc = 0.25*(Y+V^2/2g) *Ref. 1 Equation 6.10*

Where V = Mean Flow Velocity (fps)= 9.39

Y = Flow Depth (feet) = 3.01

FBmc = 1.0948 feet

Freeboard By Component Method (ADWR Method)

2. Dune-Antidune Height = 0.5(0.027*V^2) *Ref. 2, Equation 4.25*

Where V = Mean Flow Velocity (fps)= 9.39

FBdune = 1.1903 feet

3. Superelevation = c*V^2*W/(G*R) *Ref. 2 Equation 4.26c*

Where V = Mean Flow Velocity (fps)= 9.39

r = Radius of Curve (ft)= 300

W = Channel Width (ft)= 150

c = Coefficient from Table 4.3 of Ref. 0.5

FBsup= 0.6846 feet

4. Sediment Deposition (Aggradation)

Reach 1 Cross Sections 2.106 to 2.113

Add additional freeboard of 0.5 ft for aggradation

FB TOTAL = 1.8749 feet

Conclusion Use Freeboard By Component Mthd

Design Freeboard = 2.0 feet in Curve

1.5 feet in Straight Reaches

2.5 feet between cross sections 2.106 to 2.113

Terramar New River Bank Protection
Project No. 96004321

FREEBOARD AND TOP OF BANK ELEVATIONS

Cross Section Number	CWSEL	Computed Freeboard	Design Top of Bank Elev.
2.106	1337.4	2.5	1339.9
2.107	1338.7	2.5	1341.2
2.108	1339	2.5	1341.5
2.109	1341	2	1343
2.11	1341.3	2	1343.3
2.111	1342.8	2.5	1345.3
2.112	1343.3	2.5	1345.8
2.1125	1345.2	2.5	1347.7
2.113	1346	2.5	1348.5
2.116	1347	2	1349
2.118	1347.6	2	1349.6
2.12	1347.4	2	1349.4
2.125	1348.4	2	1350.4
2.13	1349.5	1.5	1351
2.135	1349.8	1.5	1351.3

Appendix I

RETAINING WALL - GABIONS - DESIGN

NOTES

Geotech and Final Design to be completed and submitted with LOMR request.

Appendix J

RETAINING WALL - REINFORCED CONCRETE WALL DESIGN

NOTES

Retaining wall calculations will be submitted with LOMR request.

Appendix K

LAYOUT AND TYPICAL SECTIONS OF BANK PROTECTION

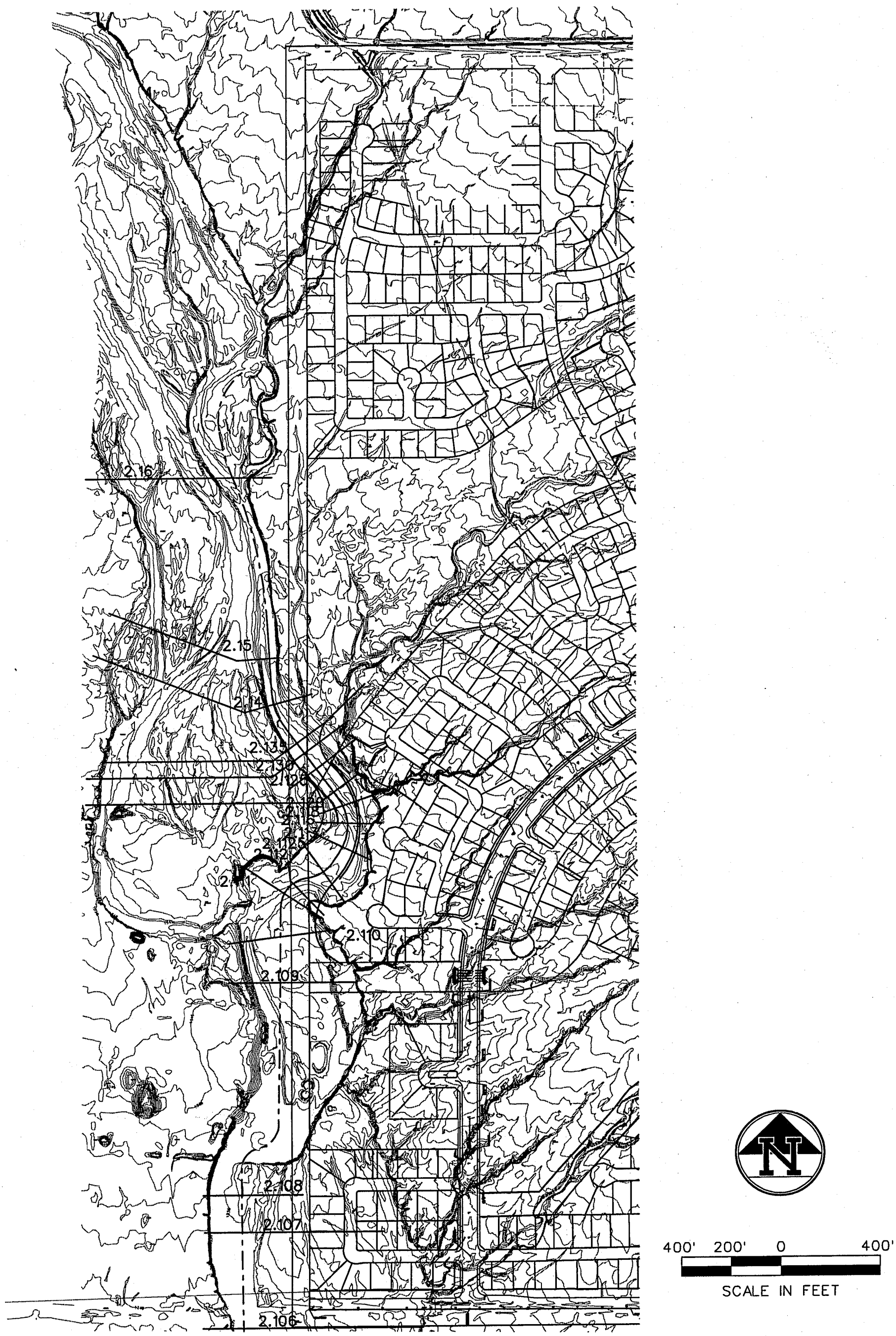

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PLATE 1

JOB NO 960043-01

HEC-RAS SECTIONS

TERRAMAR-NEW RIVER

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

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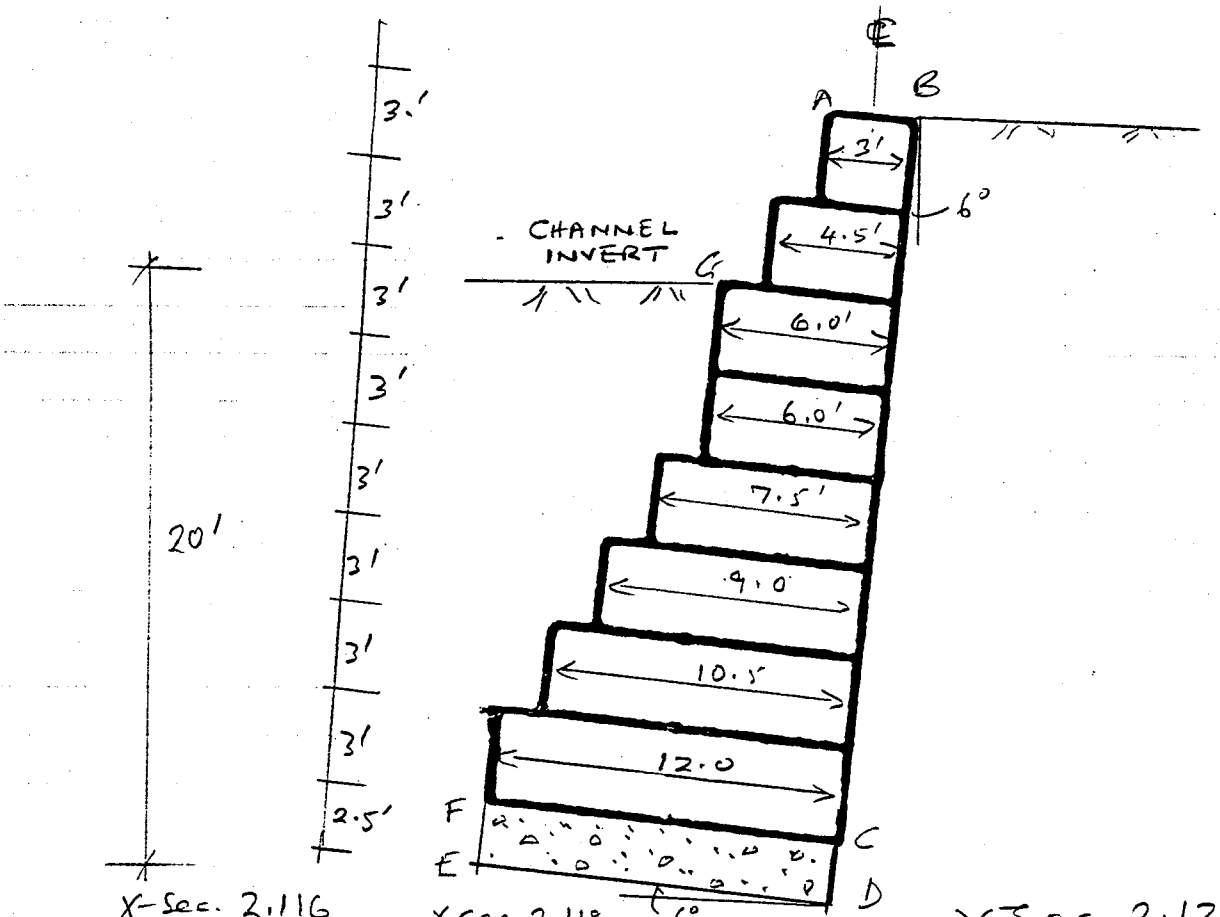
Project New River At Terramar
Project No. 960043-21-01
Sheet No. 4 of 4
Calculated by KA Date 7/98
Checked by _____ Date _____

④ 8.m Wall System
X-Sections 2.116 to 2.12
TYPE D.



X-Sec. 2.116 X-Sec 2.118 X-Sec 2.12

POINT	Offset	Elev	OFFSET	ELEV	OFFSET	ELEV
A	+1.5	1348.5	+1.5	1349.4	+1.5	1350.2
B	-1.5	1348.5	-1.5	1349.4	-1.5	1350.2
C	+1.0	1324.6	+1.0	1325.5	+1.0	1326.3
D	+1.3	1322.6	+1.3	1323.5	+1.3	1324.3
E	+13.3	1323.8	+13.3	1324.7	+13.3	1325.5
F	+13.0	1326.3	+13.0	1327.2	+13.0	1328.0
G		1342.0		1345.0		1345

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Project New River at Terramar
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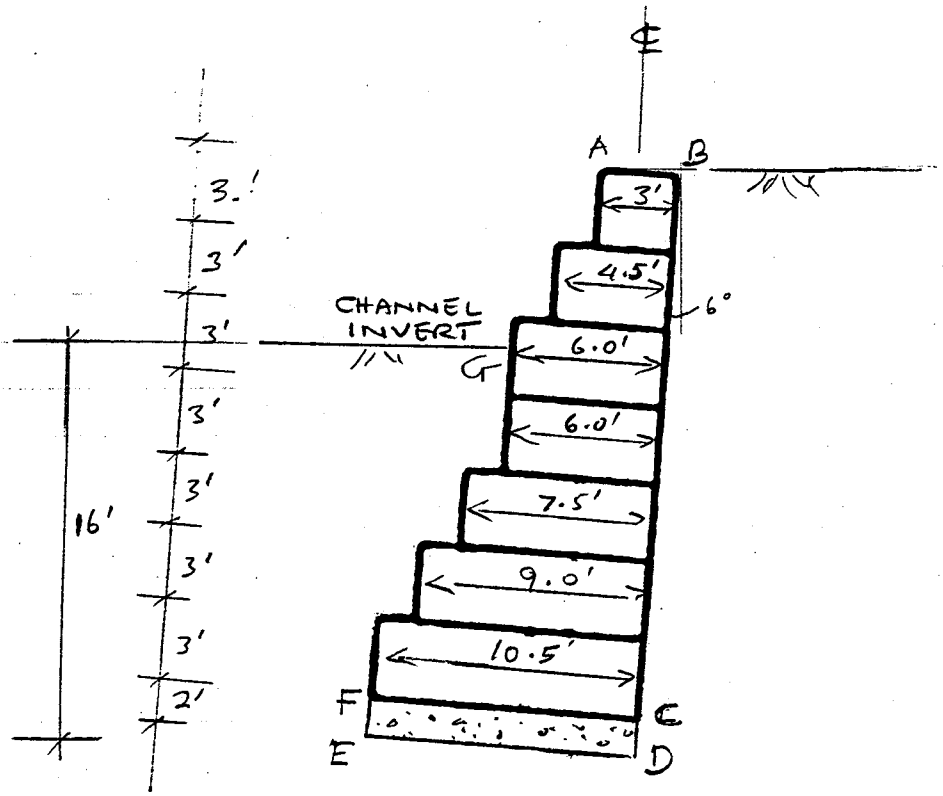
(3) 7 m Wall System
Cross Sections 2.112 to 2.113
TYPE C



	X-Sec 2.111		X-Sec 2.112		X-Sec 2.1125		X-Sec 2.113	
POINT	OFFSET	ELV.	OFFSET	ELEV	OFFSET	ELEV	OFFSET	ELEV
A	+1.5	1345.1	+1.5	1344.9	+1.5	1346.3	+1.5	1347.9
B	-1.5	1345.1	-1.5	1344.9	-1.5	1346.3	-1.5	1347.9
C	+0.7	1324.2	+0.7	1324.0	+0.7	1325.4	+0.7	1327.0
D	+0.9	1322.2	+0.9	1322.0	+0.9	1323.4	+0.9	1325.0
E	+10.9	1323.3	+10.9	1323.1	+10.9	1324.5	+10.9	1326.1
F	+10.7	1325.3	+10.7	1325.1	+10.7	1326.5	-10.7	1328.1

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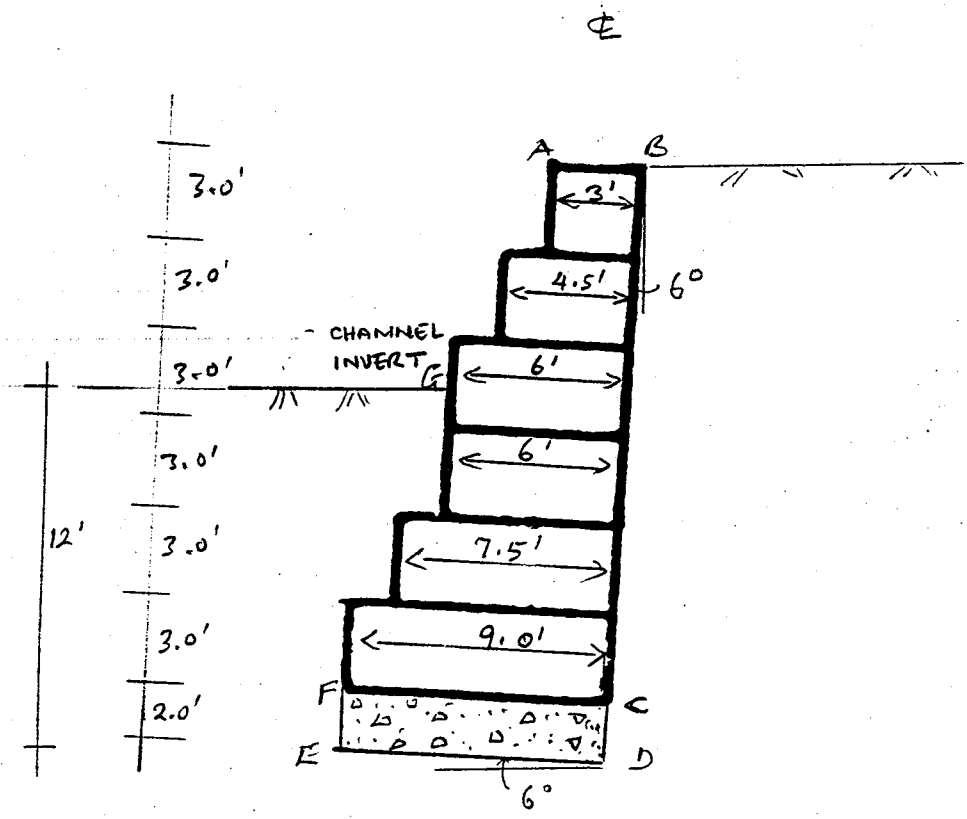
(2) 6.0m Wall System
X-Sections 2.11 to 2.111 and 2.125 to 2.13
TYPE B



POINT	X-Sec 2.11 OFFSET	X-Sec 2.11 ELEV	X-Sec 2.111 OFFSET	X-Sec 2.111 ELEV	X-Sec 2.125 OFFSET	X-Sec 2.125 ELEV	X-Sec 2.13 OFFSET	X-Sec 2.13 ELEV
A	+1.5	1343.8	+1.5	1345.1	+1.5	1350.8	+1.5	1350.4
B	-1.5	1343.8	-1.5	1345.1	-1.5	1350.8	-1.5	1350.4
C	+0.4	1325.9	+0.4	1327.2	+0.4	1332.9	+0.4	1332.5
D	+0.6	1323.9	+0.6	1325.2	+0.6	1330.9	+0.6	1330.5
E	+9.6	1324.8	+9.6	1326.3	+9.6	1332.0	+9.6	1331.6
F	+9.4	1326.8	+9.4	1328.3	+9.4	1334.0	+9.4	1333.6
G		1336		1340		1344.		1346.0

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Project NEW RIVER AT TERRAMAR
Project No. 960043-21-01
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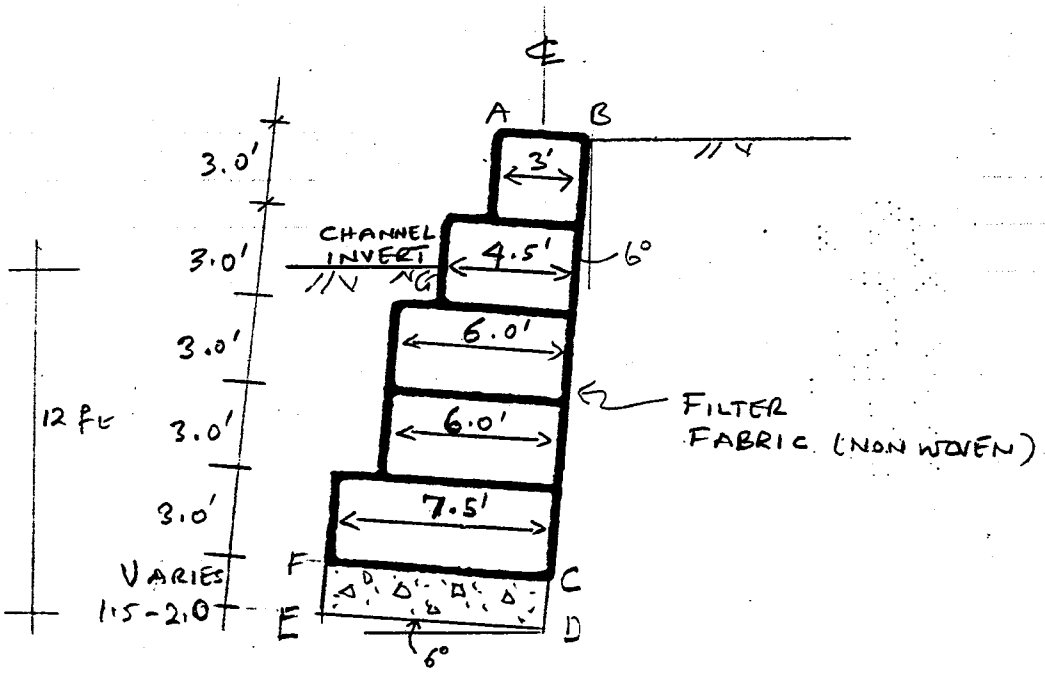
Checked by _____ Date _____

TYPICAL WALL SECTIONS

(1) 5.0 m Wall System - TYPE A
X-Sections 2.13 to 2.135



POINT	CROSS SECTION 2.13 OFFSET	CROSS SECTION 2.13 ELEVATION	CROSS SECTION 2.135 OFFSET	CROSS SECTION 2.135 ELEVATION
A	+1.5	1350.4	+1.5	1350.7
B	-1.5	1350.4	-1.5	1350.7
C	+0.1	1335.4	+0.1	1335.7
D	+0.2	1333.9	+0.2	1333.7
E	+7.6	1334.0	+7.6	1333.5
F	+7.7	1335.5	+7.7	1335.5
G		1346.0		1344.0

Appendix L

GRADE CONTROL STRUCTURE DETAILS

COE & VAN LOO

Land Planning
Civil Engineering
Water Resources Engineering
Environmental Sciences
Computer Services
Landscape Architecture
Surveying

Founded in 1958 by
P.E. Coe, P.E. (1915-1977)
H.W. Van Loo, P.E.

John B. Nelson, P.E., R.L.S.
David L. Maguire, R.L.A.
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F. Richard Jones, Jr., P.E., R.L.S.
Brad D. O'Neill, R.L.S.
Michael J. Vinson, P.E.
Jeffrey M. Engelmann, R.L.A.
Roger D. Pryor, P.E.
Nasir Raza, P.E.

October 7, 1996

Mr. Jim Jones, P.E.
CMX Group Inc.
1515 E. Missouri Road, Suite 245
Phoenix, AZ 85014

Ref: Terramar
Sewer and Water Crossings for Happy Valley Road at New River
CVL #: 96-0043-05

Dear Mr. Jones:

We have analyzed the impact of a water and sewer crossing for Happy Valley Road at New River. A grade control structure to protect the said crossings is needed. This letter report presents a description of the analytical/design procedures. The backup documentation is included within the attachments.

Project Description:

Terramar is a proposed residential development to be located at the northeast corner of 75th Avenue and Happy Valley Road intersection (see Figure 1: Location Map). A 15-inch sewer and 12-inch water line are proposed along Happy Valley Road (south of the project site). The sewer and water lines will cross New River approximately 5 and 10 feet, respectively, below the channel bed. The sewer pipe is designed for gravity flow and consequently is relatively fixed in terms of the proposed grade. The water line is placed 3 feet below the north toe of the grade control structure.

Hydrologic Setting:

Flows within New River are limited by the release from the New River Dam (located approximately 9000 feet upstream i.e., north of Happy Valley Road). Consequently, the historic 100-year flows of approximately 50,000 cfs are reduced to 2350 cfs at the dam outlet (Ref. 1). It is estimated that the 100-year flow at the project site will be approximately 4000 cfs (see hydrologic analysis in the attachments).

The dominant discharge for analysis/design purposes is taken as 2350 cfs which can continue unabated for a period of more than 10 days.

Refer to the Figures 2 and 3: Drainage Area Maps 1 and 2.

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Anticipated Channel Degradation:

Estimation of channel degradation is based on the following Level I and II analyses:

Level I Qualitative Analysis:

Level I analysis involves review of historical data, sinousity and geomorphologic relationships, historical bed profile comparisons and a visual geologic investigation (see Attachment 4b). In summary, the following remarks can be made:

- The U.S. Geological Survey quadrangle map (dated 1957) and the recent field survey information (dated 1996) do not demonstrate significant changes in the bed profile.
- The Corps of Engineers' HEC-2 floodplain study maps (dated 1985) show the low flow channel invert as being at elevation 1333.4 feet compared to elevation 1331.4 feet per the 1996 field survey.
- River run cobbles (4 - 8 inch in size) were observed on the channel bottom and along the eroded east bank during a site visit (September, 1996).
- Sloughing and erosion was observed (during the same site visit) along an approximate stretch of 1000 feet of east bank (approximately 1500 feet north of Happy Valley Road). Also, the low flow channel was noted as hugging the east bank with localized scour of the channel bed.

Level II Technical Analysis:

It was anticipated that the most significant impact on channel degradation would be due to clear water (sediment-free) discharge from the New River dam. The analysis is based on the procedures outlined within the publication 'Design of Small Dams' by the U.S. Bureau of Reclamation (Ref. 2).

In the first analysis the effect of armoring and bank sloughing was ignored. The resultant scour depth was computed as 28 feet and is based on a fixed channel width. This is deemed as unrealistic due to the observance of armoring and bank sloughing (see above).

The second analysis considered the armoring characteristic of the channel. The average D_{50} and D_{90} sizes of the channel soil within 3 feet depth are estimated to be 25 mm and 100 mm, respectively,

per the geotechnical analyses prepared by Foree and Vann (Ref. 3). Degradation depth for the armoring analysis, following the procedures within Ref. 2, was estimated as approximately one foot.

Concluding Remarks on Channel Degradation:

Significant channel degradation is not anticipated due to the armoring effect of the river run cobbles and the historical tendency of the channel bed not to scour.

Sewer and Water Line Protection by a Grade Control Structure:

A grade control structure with upstream and downstream riprap protection has been designed to protect the proposed sewer and water lines. The design procedure is based on the City of Tucson's 'Standards Manual for Drainage Design' (Ref. 4). It was assumed that the total drop below the grade control structure will be 3 feet. The consequent scour depth is 6.7 feet. Using a factor of safety of 1.5, the total design depth of the grade control structure is taken as 15 feet (see Figure 4: Grade Control Structure Section).

A structural stability analysis for the grade control structure demonstrates adequacy of the structure for overturning, sliding and foundation pressures. Soil data for this analysis were taken from a letter report by Foree and Vann (Ref. 5).

A riprap lined channel is proposed upstream and downstream of the grade control structure in order to protect it (see attached plans).

Attachments:

1. Figure 1: Location Map
2. Figures 2 and 3: Drainage Area Maps 1 and 2
3. Figure 4: Grade Control Structure Section
4. Backup Documentation
   a) Hydrologic Analyses
   b) Channel Degradation Analyses
   c) Grade Control Structure Design
   d) Stability Analysis of Grade Control Structure

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
26132
SYED NASIR
RAZA
Date Signed 12/13/96
ARIZONA, U.S.A.

CVL

5. FEMA FIS Excerpts

6. Geotechnical Studies by Foree and Vann
   a) Scour Analysis Data for New River Crossing at Happy Valley Road
   b) Additional Soil Design Parameters for New River Crossing at Happy Valley Road

7. Sewer and Water Protection Construction Plans

References:

1. Flood Insurance Study for Maricopa County, Arizona by Federal Emergency Management Agency (September, 1995)

2. Design of Small Dams by US Bureau of Reclamation (1973)

3. Scour Analysis Data for New River Crossing at Happy Valley Road by Foree and Vann (August 30, 1996)

4. Standards Manual for Drainage Design by City of Tucson (1991)

5. Additional Soil Design Parameters for New River Crossing at Happy Valley Road by Foree and Vann (October 1, 1996)

In case you may have any questions regarding our analysis and design, please do not hesitate to give us a call at 264-6831.

Note: Figure 4 revised

Sincerely,

COE & VAN LOO
Consultants, Inc.

Nasir Raza

Nasir Raza, P.E.
Assistant Director - Water Resources Group

NR:ljd

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 26132 SYED NASIF RAZA Date Signed 10/8/96 ARIZONA, U.S.A.

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 26132 SYED NASIR RAZA Date Signed 12/2 ARIZONA, U.S.A.

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ATTACHMENTS

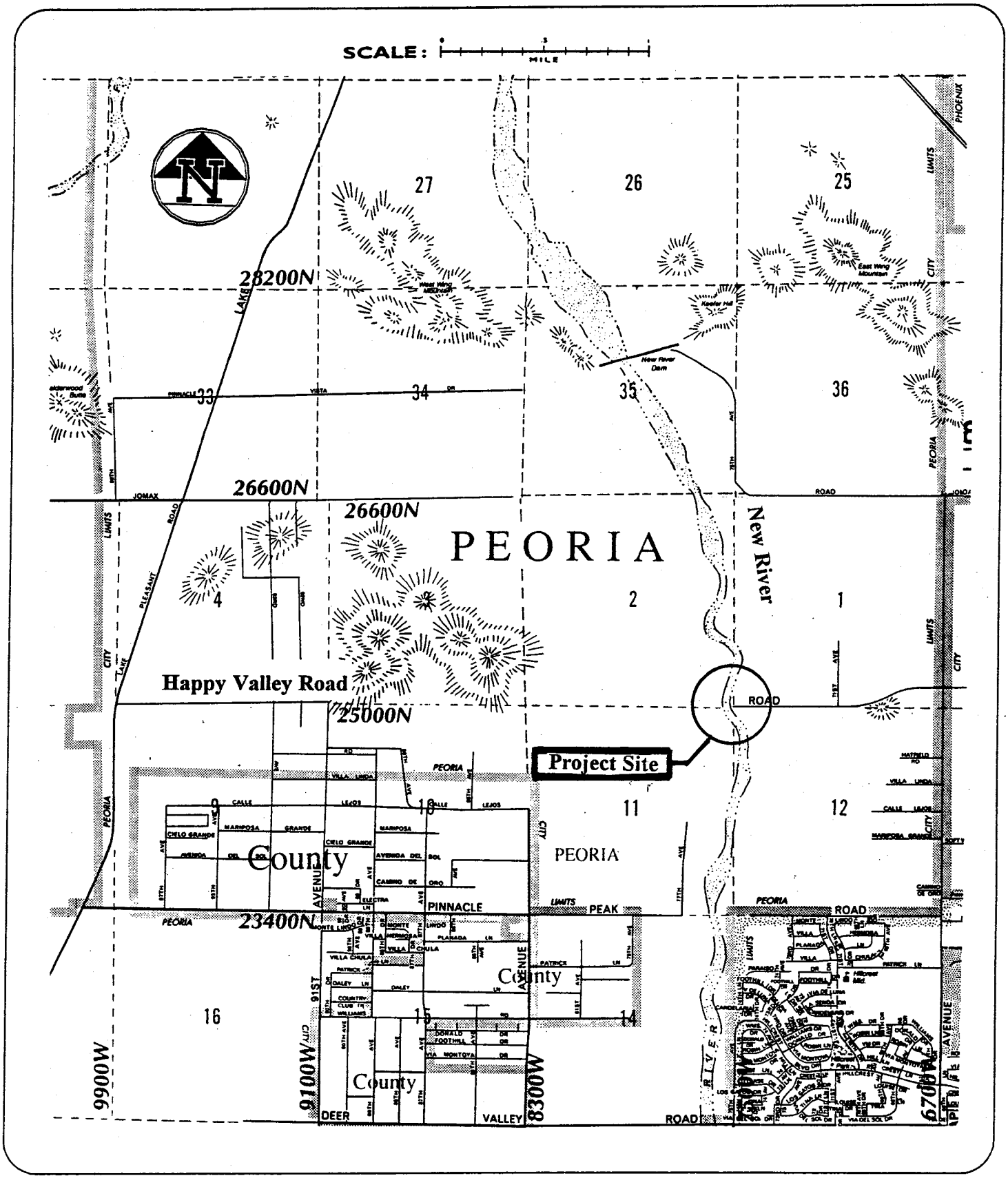
ATTACHMENTS 1- 3

FIGURE 1: LOCATION MAP

FIGURE 2: DRAINAGE AREA MAP 1

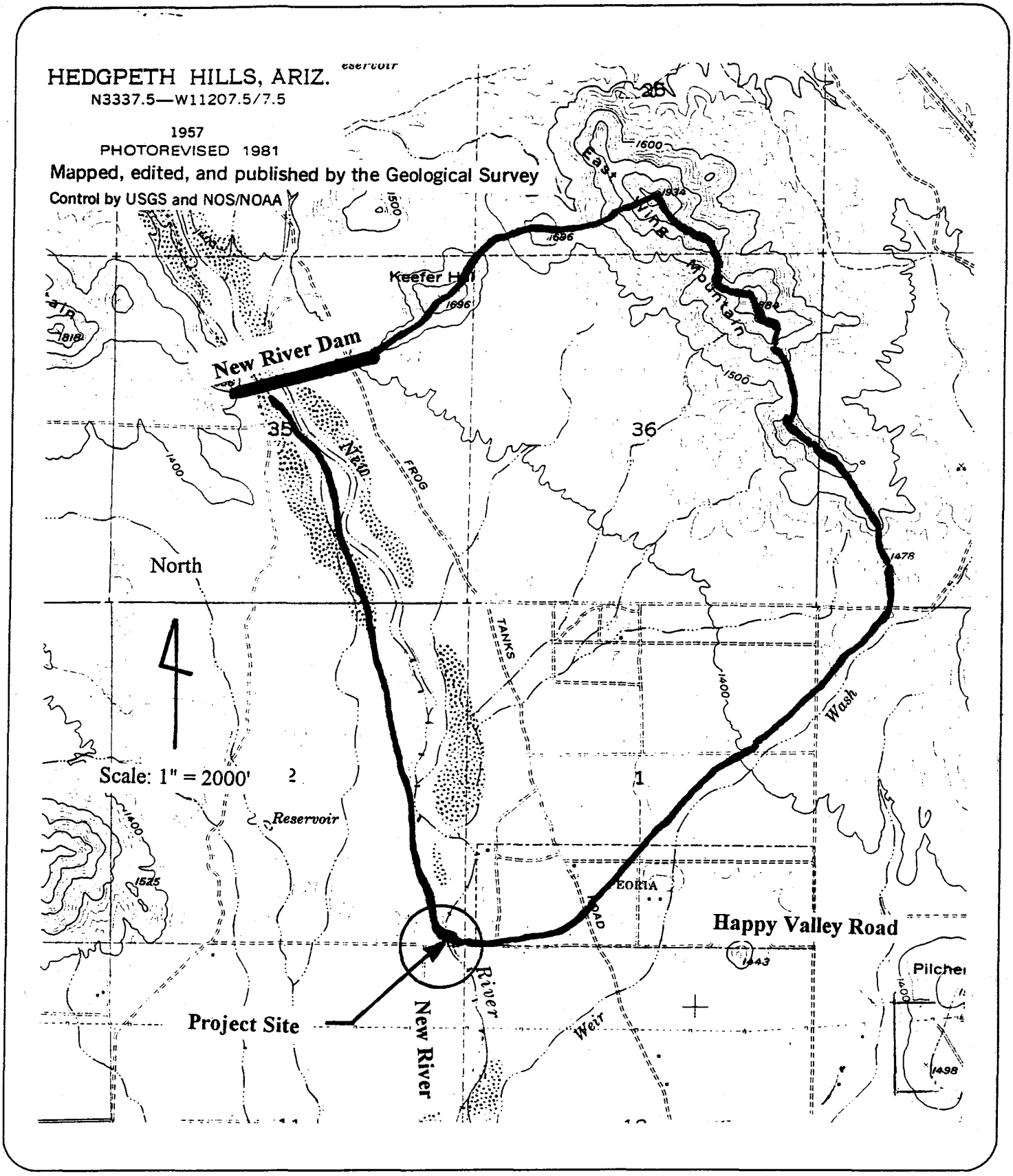
FIGURE 3: DRAINAGE AREA MAP 2

FIGURE 4: GRADE CONTROL STRUCTURE - TYPICAL SECTION



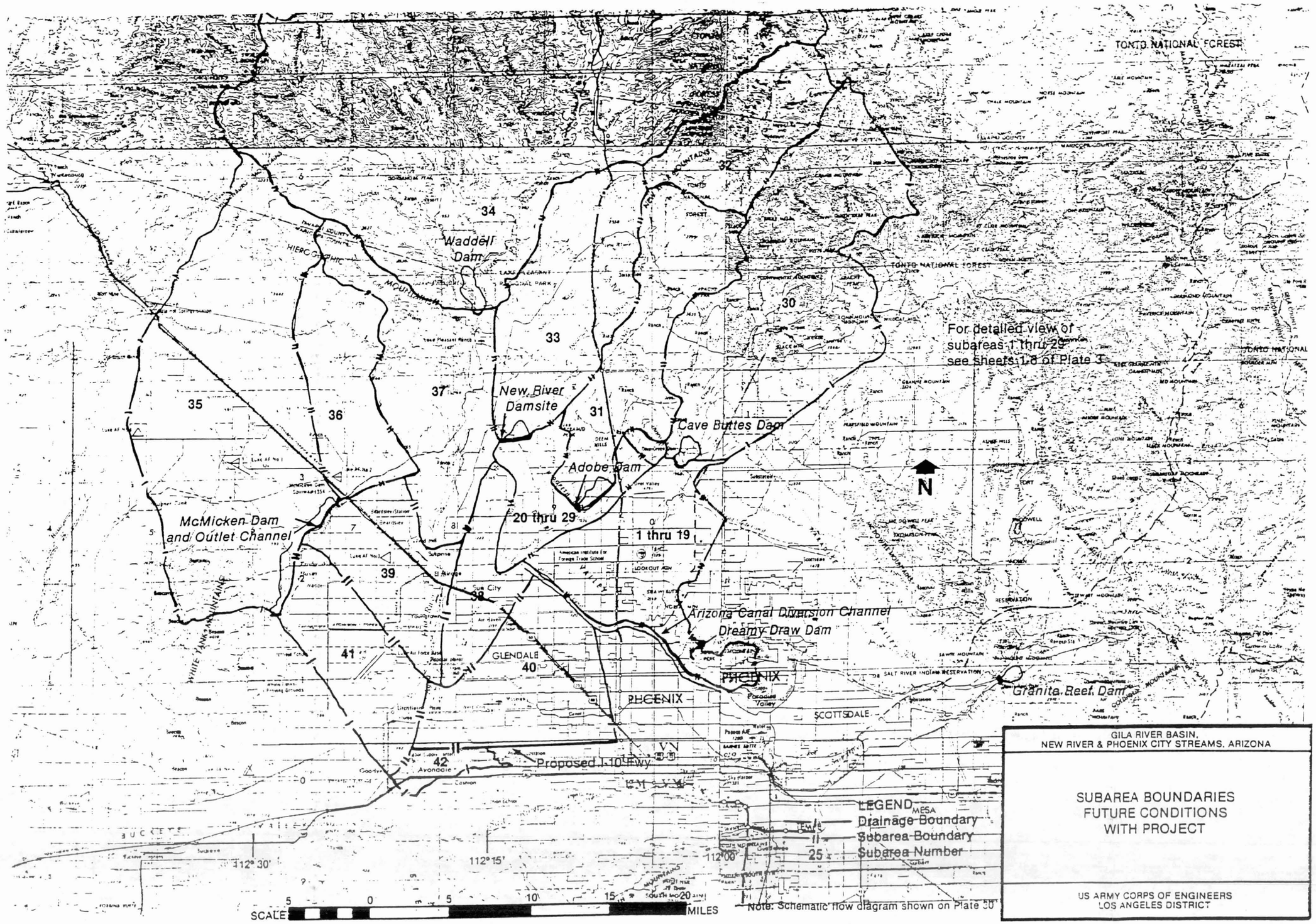
LOCATION MAP	TERRAMAR SEWER & WATER CROSSING	JOB NO 960043
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 1

FILE: N:\960043\LAND\SDMAP.DGN DATE:6-96



DRAINAGE AREA MAP 1	TERRAMAR SEWER & WATER CROSSING	JOB NO 960043
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 2

FILE: N:\960043\LAND\SDMAP.DGN DATE:6-96



GILA RIVER BASIN,
NEW RIVER & PHOENIX CITY STREAMS, ARIZONA

SUBAREA BOUNDARIES
FUTURE CONDITIONS
WITH PROJECT

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

TERRAMAR SEWER & WATER CROSSING

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DRAINAGE AREA MAP 2

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JOB NO
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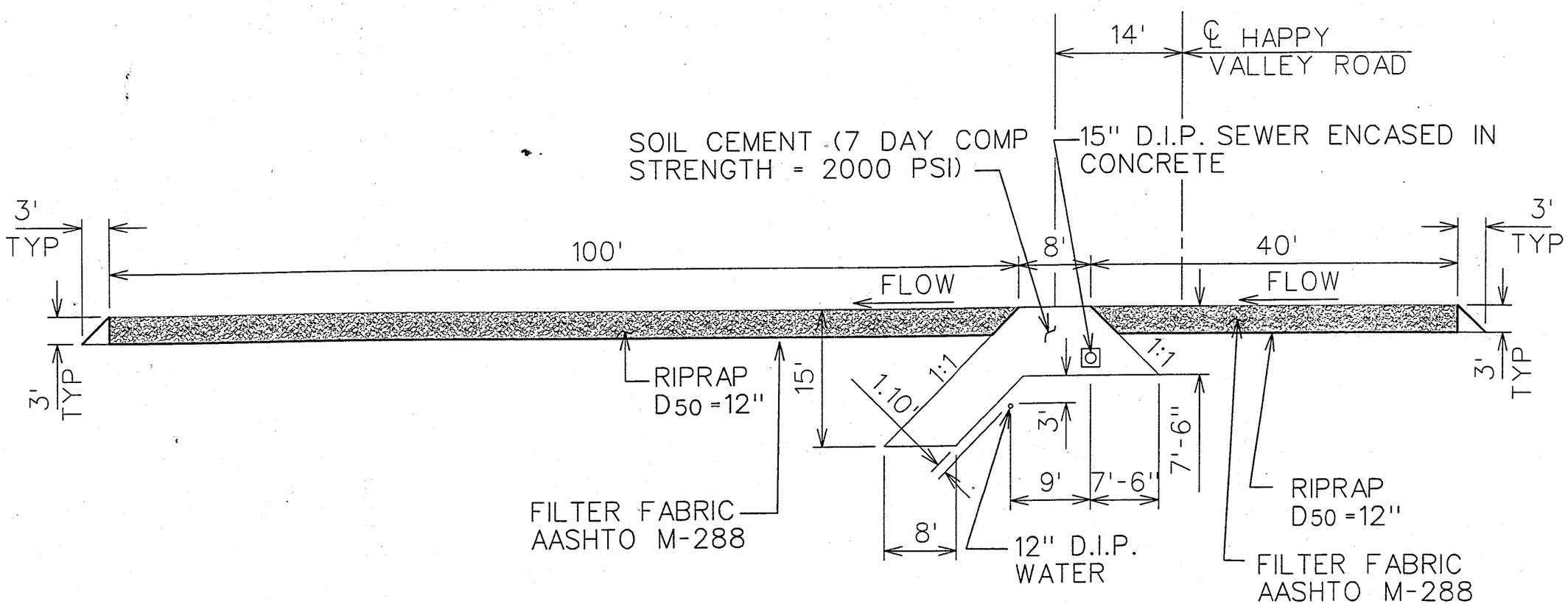
FIGURE 3



SCALE: 1"=20'

TERRAMAR SEWER & WATER CROSSING

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GRADE CONTROL STRUCTURE
TYPICAL SECTION

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FIGURE 4

ATTACHMENT 4

BACKUP DOCUMENTATION

a) Hydrologic Analyses
b) Channel Degradation Analyses
c) Grade Control Structure Design
d) Stability Analysis of Grade Control Structure

Attachment 4a

Hydrologic Analyses

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Project No. 96 00 43
Sheet No. 1 of 1
Calculated by N. RAZA Date 9-25-96
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HYDROLOGIC ANALYSES

OBJECT OF THESE ANALYSES IS TO ESTIMATE DOMINANT DISCHARGE AT NEW RIVER'S HAPPY VALLEY ROAD CROSSING

LOCATION	AREA* SQ. MI.	Q_{10} CFS	Q_{50} CFS	Q_{100} CFS
NEW RIVER DAM OUTFLOW	–	1700**	2200**	2350**
BEARDSLEY RD	10.3**	2400**	6500**	9800**
HAPPY VALLEY RD	2.2***	1850***	3120***	3950***

* AREA BELOW DAM
** FROM FEMA FIS FOR MARICOPA CO. 9/95
*** INTERPOLATED BY CVL.

NOTES: (1) PER CORPS OF ENGINEER'S HEC-2 MODEL FOR THE FEMA FIS 100 YR 'Q' AT HAPPY VALLEY RD IS 4200 CFS.

CONCLUDING REMARKS } PER DENNIS MARFICE OF CORPS OF ENGRS, 100-YR RELEASE OF 2350 CFS OCCURS FOR A DURATION GREATER THAN 10 DAYS.

CONSEQUENTLY, DOMINANT DISCHARGE AT NEW RIVER/HAPPY VALLEY RD IS TAKEN AS 2350 CFS ✓

NOTES: 1. REFER TO FIGURES 2 & 3: DRAINAGE AREA MAPS 1 & 2 (ATTACHMENT No. 2)
2. REFER TO FEMA FIS EXCERPTS. CATTACHEMENT No. 5)

Attachment 4b

Channel Degradation Analyses

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Project NEW RIVER AT HAPPY VALLEY DR
Project No. 960043
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UPDATED: 10-7-96
Checked by [signature] Date 10-7-96

LEVEL I QUALITATIVE GEOMORPHIC ANALYSIS

1. SINUOSITY

$$\text{SINUOSITY RATIO} = \frac{\text{THALWEG LENGTH}}{\text{DOWN VALLEY DISTANCE}}$$

$$= \frac{11\,900}{11\,600} = 1.026 < 1.5$$

NEW RIVER IS STRAIGHT OR BRAIDED
NOT MEANDERING (REF. 1)

SEE NEXT SHEET

2. GEOMORPHIC RELATIONSHIPS

AVG. BED SLOPE = 0.00526 ft/ft
DOMINANT DISCHARGE = 2350 CFS

PER FIG. 5.5, REF 1, CHANNEL IS IN BRAIDED REGION

3. HISTORICAL AERIAL PHOTOGRAPHS
NOT AVAILABLE

- US CORPS OF ENGINEERS' HEC-2 FLOODPLAIN MAP (DATED 1985) SHOWS THE BED ELEVATION AT HAPPY VALLEY RD X-ING AS 33.4 COMPARED TO 31.4 PER 196 SURVEY.

4. HISTORICAL BED PROFILE COMPARISON
- USGS QUAD MAP FOR MEDGPETH HILLS, AZ (1959) WAS USED FOR PLOTTING CHANNEL SLOPE.
- CURRENT 1996 SURVEY DATA AT HAPPY VALLEY DR X-ING SHOWS BED ELEVATION 2' HIGHER THAN ELEV. DEDUCED FROM USGS QUAD MAP AT SAME LOCATION — NOT A SIGNIFICANT CHANGE — IF AT ALL.
- NEW RIVER DAM UPSTREAM OF RIVER HAS HAD APPARENTLY NO SIGNIFICANT EFFECT ON CHANNEL PROFILE.

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Project NEW RIVER AT HAPPY VALLEY DR.
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5. VISUAL GEOLOGICAL INVESTIGATION

- RIVER RUN COBBLE (4"-8" DIA.) WERE OBSERVED ON CHANNEL BED AND EXPOSED EAST BANK.
- LOCALIZED COARSE SAND DEPOSITS WERE NOTICED ON CHANNEL BED.
- LOW FLOW CHANNEL HAD A CURVILINEAR PATH, HUGGING THE EAST BANK WITHIN THE PROJECT SITE.
- EAST BANK HAD SLOUGHED & ERODED APPROX. 1500' NORTH OF HAPPY VALLEY ROAD. THIS CHARACTERISTIC INDICATES LATERAL MIGRATION.
- LOW FLOW CHANNEL BED APPEARED TO HAVE SCOURED ~~AR~~ NEAR/ALONG THE CHANNEL BENDS.

REF 1 : DESIGN MANUAL FOR ENGG. ANALYSIS OF FLUVIAL SYSTEMS BY ARIZONA DEPT OF WATER RESOURCES 1985

CVL FORM 114

Project NEW RIVER AT HAPPY VALLEY RD

Project No. 960043

Sheet No. 3 of 11

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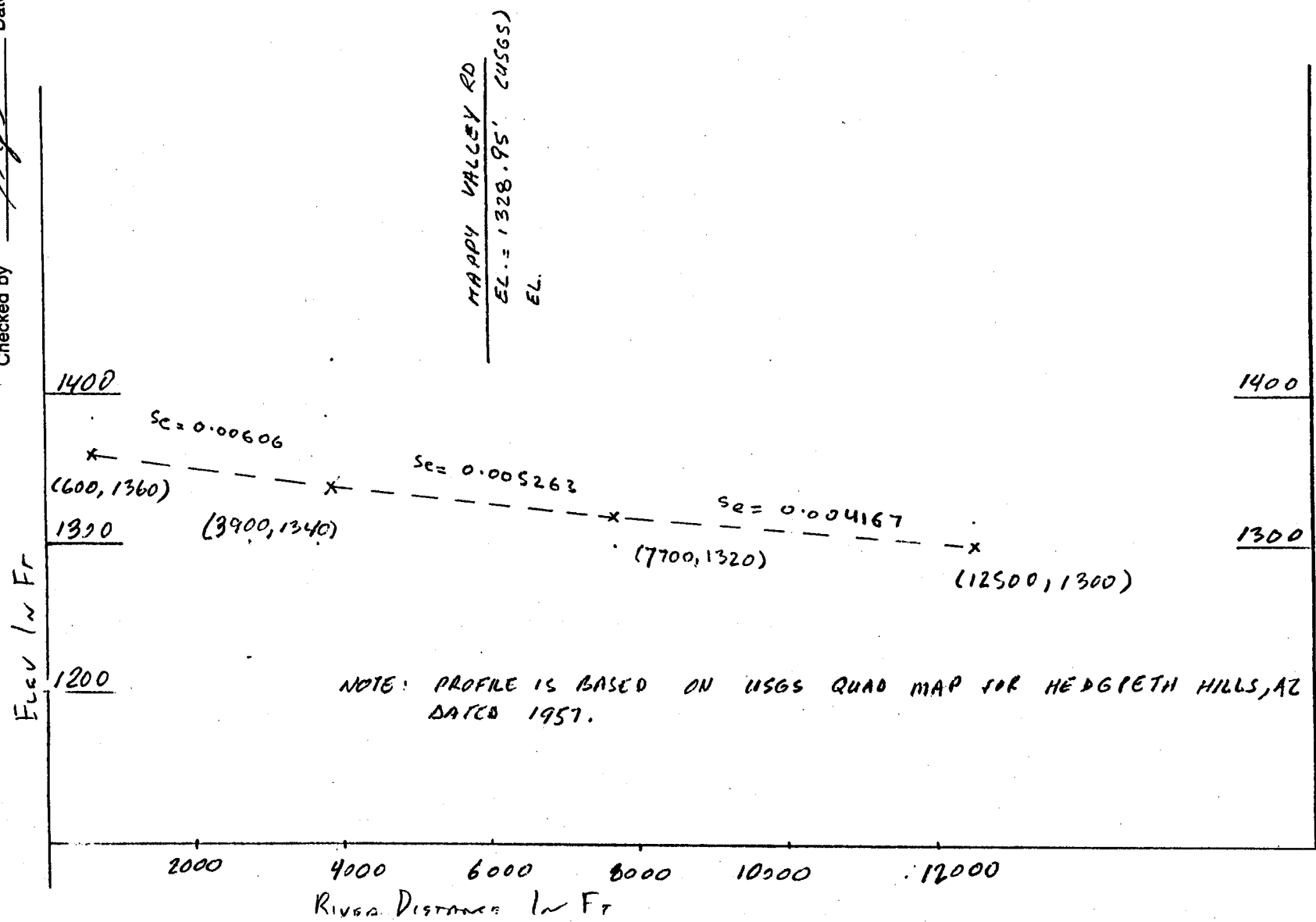

NOTE: PROFILE IS BASED ON USGS QUAD MAP FOR HEDGPETH HILLS, AZ DATED 1957.

NEW RIVER PROFILE

HORIZ. SCALE: 1" = 2000'

VERT. SCALE: 1" = 100'

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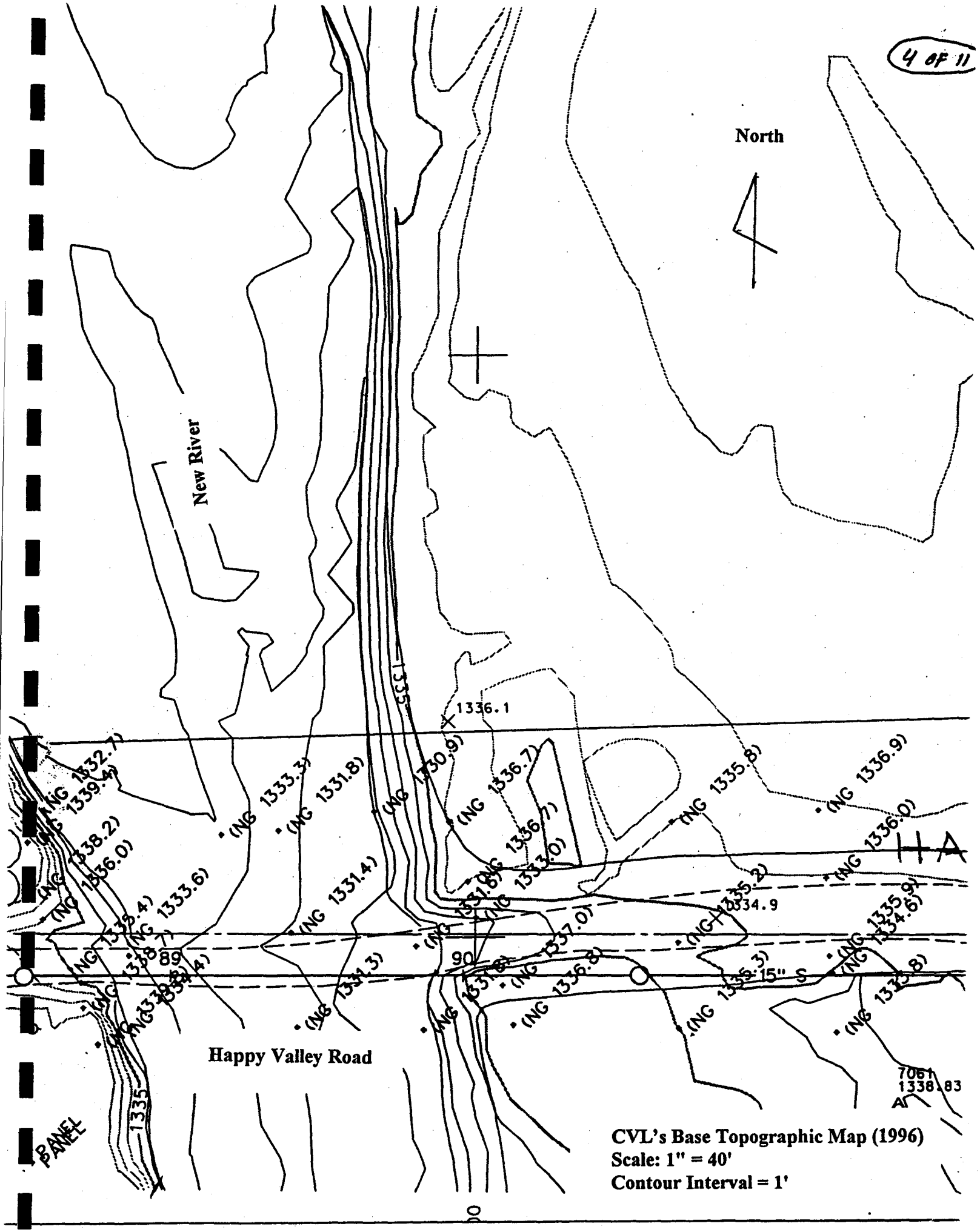
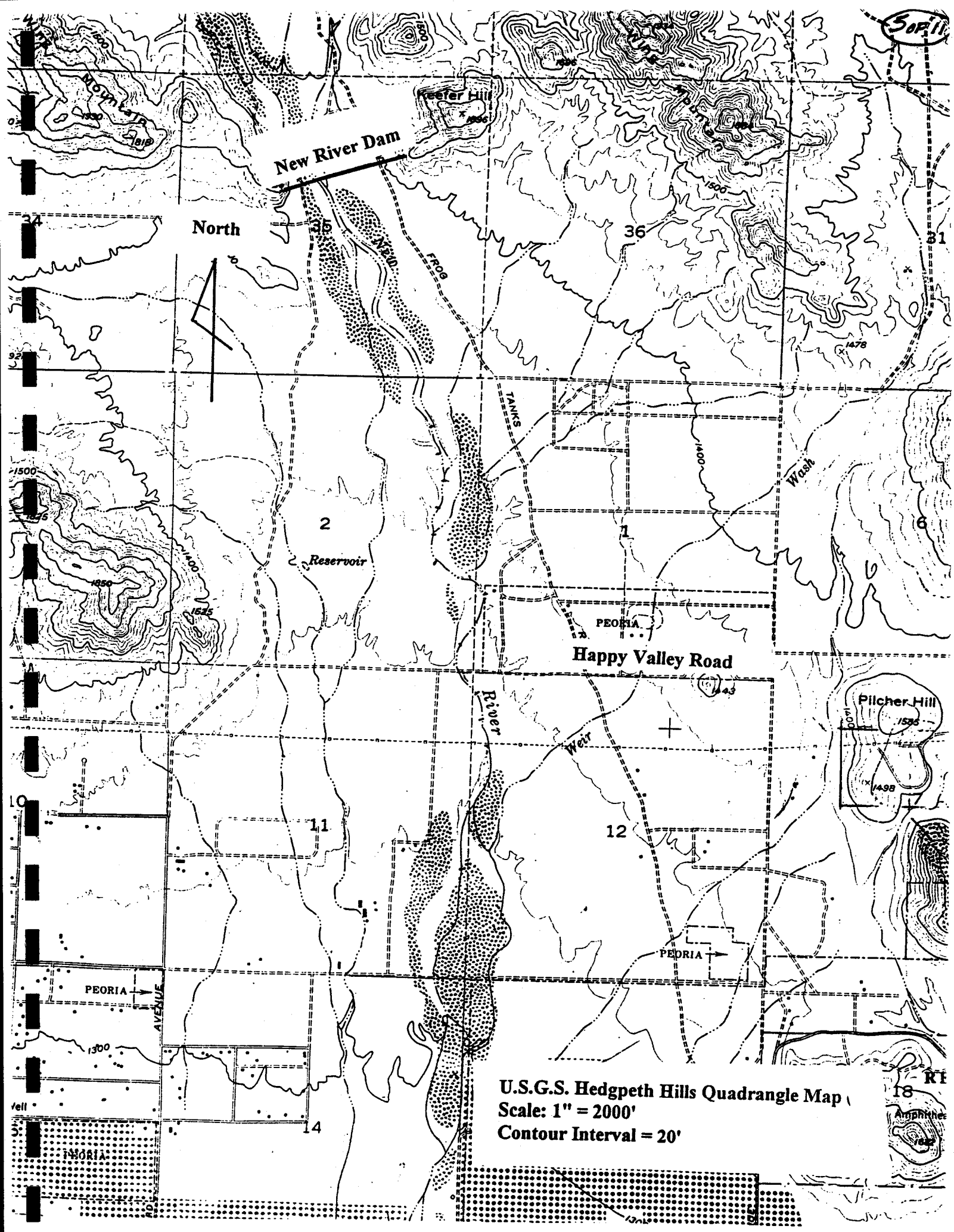
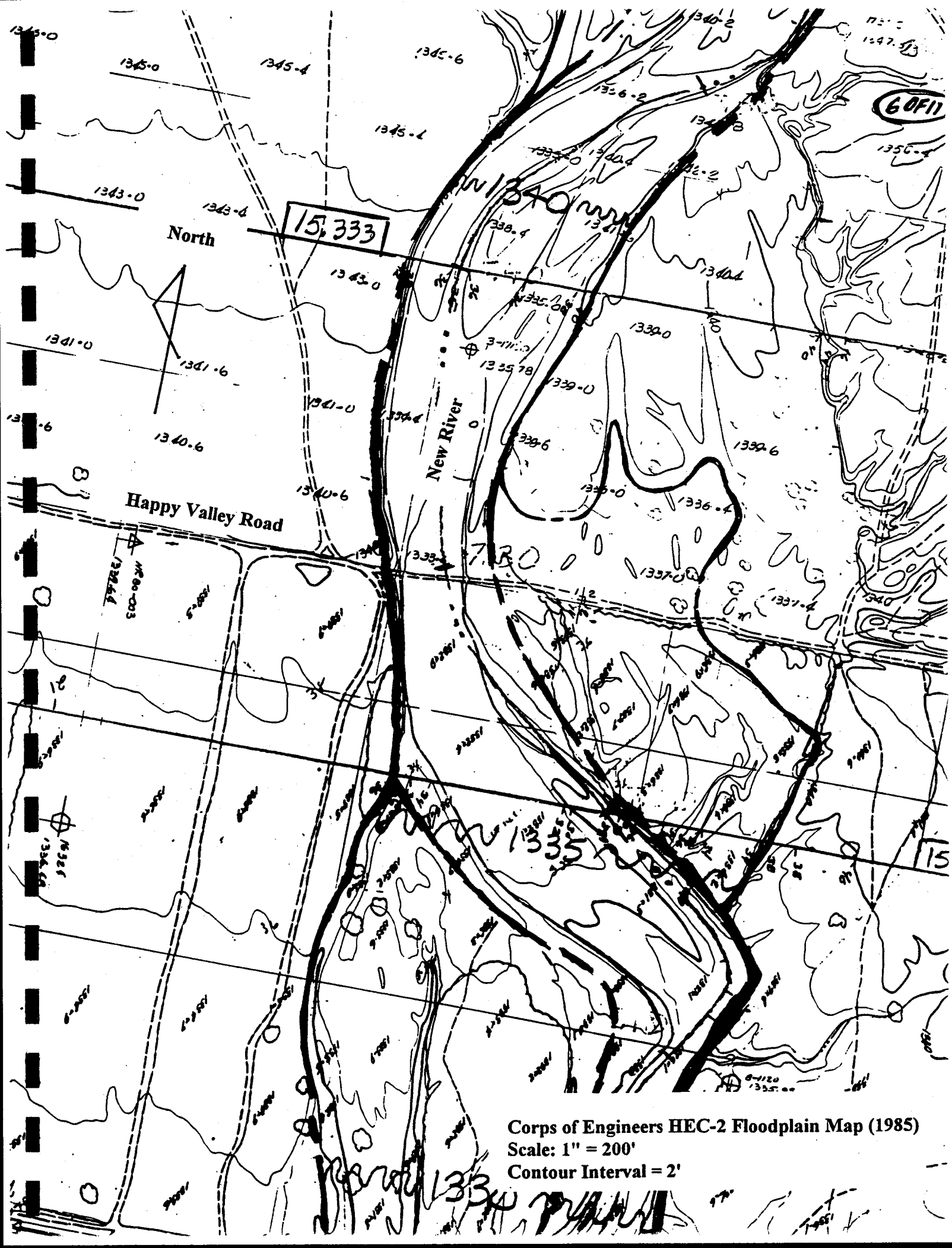
CV FORM 114



CVL's Base Topographic Map (1996)
Scale: 1" = 40'
Contour Interval = 1'


New River Dam
Keefer Hill
North
Reservoir
PEORIA
Happy Valley Road
Pilcher Hill
River
Weir
Wash
TANKS
FROG
AVENUE
U.S.G.S. Hedgpeth Hills Quadrangle Map
Scale: 1" = 2000'
Contour Interval = 20'



Corps of Engineers HEC-2 Floodplain Map (1985)
Scale: 1" = 200'
Contour Interval = 2'

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Project TERRAMAR SEWER X-ING
Project No. 96004301
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LEVEL II TECHNICAL ANALYSIS

CHANNEL DEGRADATION DOWNSTREAM OF NEW RIVER DAM

REF 1: DESIGN OF SMALL DAMS BY USDI BUR. OF RECLAMATION, (1973)
APPENDIX H: SEDIMENTATION

REF 2: FLOOD INSURANCE STUDY FOR MARICOPA CO., AZ, (1995)

REF. 3: SCOUR ANALYSIS DATA FOR NEW RIVER CROSSING AT HAPPY VALLEY RD. BY FOREE & VANN, INC. (8/30/96)

REF. 4: GILA RIVER BASIN (INCLUDING NEW RIVER) HYDROLOGY PART 2 BY USCOE (1982)

DATA: DOMINANT DISCHARGE $Q = 2350$ CFS — 100 YR Q FROM DAM PER REF. 2

CHANNEL WIDTH (AVG.) $B = 300$ FT

(WIDTH VARIES FROM 100' – 1200'; 300' IS A CONSERVATIVE EST.)

MEAN CHANNEL DEPTH d = AREA/TOP WIDTH — PER REF. 2

AT SEC. EL. $d_{EL} = 854/299 = 2.9$ (X-SEC D/S OF PROJECT)

" EM $d_{EM} = 731/287 = 2.5$ (" U/S " ")

" ER $d_{ER} = 388/102 = 3.8$ (DAM OUTFALL)

" EA $d_{EA} = 1424/459 = 3.1$ (2.63 mi D/S OF PROJECT)

USE $d = 3.0$

EXIST' STREAM GRADIENT $S_n = (1334.8 - 1329.02)/[(15.144 - 14.945) \times 5280]$

$= 0.0055$ AT PROJECT SITE

$S_n = (1380.64 - 1162.8)/[(16.818 - 8.655) \times 5280)]$

$= 0.00505$ FROM DAM TO 8.16 mi D/S

USE $S_n = 0.005$ (THIS IS ALSO AVG. STREAM SLOPE - SEE ATTACHED PROFILE)

BED MATERIAL $D_m = D_{50} = 33$ mm IN PIT #1 AT 3' DEPTH

" $D_{50} = 9$ mm IN PIT #2 " 3' "

$D_{90} = 117$ mm IN PIT #1 AT 3' "

$D_{90} = 80$ mm IN PIT #2 " 3' "

PIT #1 IS LOWEST POINT IN CHANNEL

PIT #2 " 3 FT HIGHER THAN PIT #1

USE $D_{50} = 25$ mm

$D_{90} = 100$ mm

MANNING'S 'n' = 0.035 (REF. 2)

100 YR SEDIMENT PRODUCTION AT NEW RIVER DAM $V = 4920$ AC-FT (REF. 4 TABLE 16)

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ANALYSIS 1: DEGRADATION LIMITED BY STABLE SLOPE

IT IS ASSUMED THAT EQUAL VOLUME (SAME AS DEPOSITED IN DAM) WILL ERODE FROM DOWNSTREAM CHANNEL (REF. 1)

STABLE SLOPE COMPUTATIONS (PER REF. 1, PG. 795) ARE

$$S_1 = \left(\frac{0.00021\, D\beta}{Q}\right)^{3/4}$$ SCHOKLITSCH FORMULA, EQ. 13 REF. 1

$$= \left(\frac{0.00021 \times 25 \times 300}{2350}\right)^{3/4}$$

$$= 0.004165 \checkmark$$

OR

$$S_1 = \frac{0.19\, Q/Q_B \left(n_s/D_{90}^{1/6}\right)^{3/2} D}{d}$$

$$= \frac{0.19 \times (1)\,(0.035/100^{1/6})^{3/2}\, 25}{3}$$

$$= 0.003278 \checkmark$$

MEAN OF THE TWO S_1 SLOPES $= (0.004165 + 0.003278)/2$
$= 0.003722 \checkmark$

DIFFERENCE BETWEEN EXIST. & DEGRADED SLOPE

$\Delta S = 0.005 - 0.0033$
$= 0.0017$

LONGITUDINAL DEGRADED AREA $= A_T = 43560\, V/B$
$= 43560 \times 4920/300$
$= 714{,}384$ SQ. FT $\checkmark$

DEPTH OF DEGRADATION AT DAM $= D = (64\, A_T \Delta S/39)^{1/2}$
$= (64 \times 714{,}384 \times 0.0017/39)^{1/2}$
$= 44.64$ ft. $\checkmark$

LENGTH OF DEGRADATION REACH, $L = 13\, D/(8\Delta S)$
$= 13 \times 44.64/(8 \times 0.0017)$
$= 42{,}672$ ft $\checkmark$
$= 8.1$ MILES $\checkmark$

HALF OF DEGRADATION DEPTH OCCURS AT $L_{1/2} = \frac{D}{2\Delta S} = \frac{44.6}{2 \times 0.0017} = 13{,}117$ ft
FROM DAM 2.48 mi

HAPPY VALLEY ROAD IS 9500 FT FROM DAM

∴ DEPTH OF SCOUR AT HAPPY VALLEY RD

$$D_s = \left(\frac{9500}{13117} \times \frac{44.6}{2} \right) + 44.6$$

$$= 28.45 \text{ ft}$$

CONCLUDING REMARKS:

- ABOVE ANALYSIS ASSUMES CONSTANT CHANNEL WIDTH. FIELD VISIT (9/20/96) SHOWED SIGNIFICANT LATERAL MIGRATION AND BANK SLOUGHING. CONSEQUENTLY SCOUR/DEGRADATION DEPTH IS LIKELY TO BE LESS THAN PREDICTED BY ABOVE PROCEDURE. ALSO ARMORING (SEE FOLLOWING SHEETS) IS LIKELY TO REDUCE DEGRADATION

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Project TERRAMAR SEWER X-ING
Project No. 96 0043 01
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ANALYSIS 2: DEGRADATION LIMITED BY ARMORING

BOTTOM VELOCITY $V_b = 0.7\,V_m$ P.790, REF. 1

$= 0.7 \times 5 = 3.5$ fps V_m PER REF. 2

FROM FIG H-16, REF. 1, ARMOR SIZE $D_a = 43$ mm

TRACTIVE FORCE T.F. $= \gamma D S$

$= 62.4 \times 3 \times 0.005$

$= 0.94$ lb/ft² ✓

FROM FIG. H-14, REF. 1, ARMOR SIZE - $D_a = 56$ mm

FROM EQ. 17, REF. 1, " " $D_a = \dfrac{5.26\,Sd}{(n_s D_{a0}^{1/6})^{3/2}}$

$= \dfrac{5.26 \times 0.005 \times 3}{(0.035 \times 100^{1/6})^{3/2}}$

$= 38$ mm ✓

FROM EQ. 18, REF. 1, " " $D_a = \dfrac{4762\,S^{4/3}Q}{B}$

$= \dfrac{4762 \times 0.005^{4/3} \times 2350}{300}$

$= 32$ mm ✓

MEAN OF ABOVE ARMORING SIZES $D_a = 42$ mm

USING EQ 21 & FIG. H-16 OF REF. 1

$y_a = 3\,D_a = 3 \times 42/25 = 5$ inches OR 0.42 ft

FROM PIT #1: % OF MATERIAL LARGER THAN 42 mm = 40%
@ 3' DEPTH (PER REF. 3)

DEGRADATION DEPTH $y_d = y_a\left(\dfrac{1}{\Delta P} - 1\right)$ EQ. 21, REF. 1

$= 0.42\left(\dfrac{1}{0.4} - 1\right)$

$= 0.63$ FT

FROM PIT #2: % OF MATERIAL LARGER THAN 42 mm = 29%
@ 3' DEPTH $\therefore\ y_d = 0.42\,(1/0.29 - 1) = 1.03$ FT. ✓

Project TERRAMAR SEWER X-ING
Project No. 96004301
Sheet No. 11 of 11
Calculated by N.RAZA Date

UNIFORM FLOW COMPUTATIONS

LOCATION/DESCRIPTION:

NEW RIVER X-SEC. AT HAPPY VALLEY RD

CROSS SECTION PARAMETERS: FILENAME: newrivr1.SEC

No. of Cross Section Points: 22 Bed Slope:0.00526 Max Elev.:1342.00
Bank Stations.....Left: 1074.0 Right....: 1202.0 Min Elev.:1331.00
Encroachment Stations..Left: Right....:
Manning-n Values.....LOB: 0.050 CHANNEL..: 0.035 ROB.....: 0.050

CROSS SECTION POINTS - Elevations & Stations in feet:

No.	Elev.	Sta.	No.	Elev.	Sta.	No.	Elev.	Sta.
1)	1339.00	1000.00	2)	1334.80	1074.00	3)	1334.00	1082.00
4)	1332.50	1100.00	5)	1331.60	1115.00	6)	1331.00	1145.00
7)	1331.00	1158.00	8)	1332.00	1188.00	9)	1335.00	1202.00
10)	1336.00	1212.00	11)	1335.00	1218.00	12)	1335.00	1367.00
13)	1336.30	1400.00	14)	1336.60	1447.00	15)	1336.70	1517.00
16)	1336.60	1525.00	17)	1336.60	1615.00	18)	1337.00	1655.00
19)	1337.00	1786.00	20)	1338.00	1850.00	21)	1340.00	1900.00
22)	1342.00	1933.00						

COMPUTED PARAMETERS:

WSEL(ft)	Q(cfs)	V(fps)	Fr No.	ne	D(ft)	TW(ft)	A(sf)	WP(ft)	CRWS(ft)
1335.66	2349.9	4.1	0.55	0.038	1.8	319.6	568.5	320.2	1334.21
1336.96	4200.0	3.8	0.50	0.042	1.8	614.7	1105.2	615.4	1335.66

NOTES:

1. X-SEC PER '96 FIELD SURVEY
2. SLOPE PER USGS (1959) QUAD MAP & CORROBORATED WITH US CORPS OF ENGR'S HEC-2 STUDY (1985).

Attachment 4c

Grade Control Structure Design

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Project No. 96004301
Sheet No. 1 of 3
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SCOUR BELOW SEWER PROTECTION / GRADE CONTROL STRUCTURE

REF. 1 : STANDARDS MANUAL FOR DRAINAGE DESIGN BY CITY OF TUCSON
REF. 2 : CORPS OF ENGRS HEC-2 MODEL NRIVER-2.DAT FOR FEMA FIS (9/27/90)
REF. 3 : OFF-SITE SEWER PLAN SHT. 10 BY CVL

DATA/ASSUMPTIONS :

DISCHARGE / UNIT WIDTH OF CHANNEL BOTTOM $q = \frac{Q_{100}}{B}$

$= \frac{4200}{80}$ → REF. 2 → REF. 3

$= 52.5$ CFS/FT

TOTAL DROP $h = 3$ FT ASSUMED (COMPUTED DEGRADATION = 1 FT)
DOWNSTREAM FLOW DEPTH $Y = 6$ FT SAY (BASED ON UNIFORM FLOW DEPTH AT SEWER X-ING NATURAL GROUND SECTION)
$h/Y = \frac{3}{6} = 0.5 < 0.99$.
USE SUBMERGED CONDITION EQ. 6.14, REF. 1

SCOUR DEPTH $Z_{ess} = 0.581\, q^{0.667} (h/Y)^{0.411} [1-(h/Y)]^{-0.118}$

$= 0.581 \times (52.5)^{0.667} (0.5)^{0.411} [1-(0.5)]^{-0.118}$

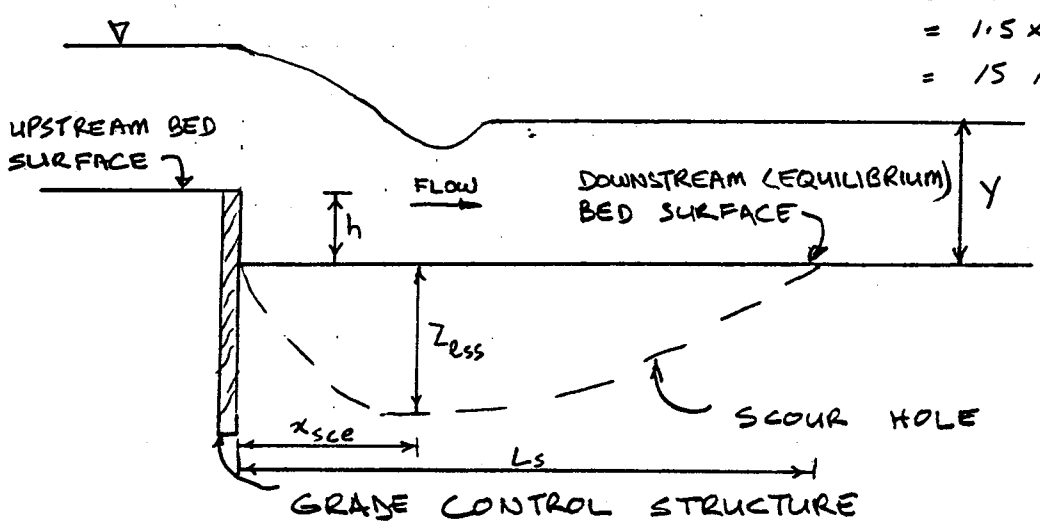
$= 6.7$ ft ✓

$x_{sce} = 6\, Z_{ess} = 40$ ft $\quad L_s = 12\, Z_{ess} = 80$ ft

∴ TOTAL DEPTH OF GRADE CONTROL STRUCTURE $= S.F. \times (6.7 + 3)$

$= 1.5 \times 9.7 = 14.55$

$= 15$ FT SAY



GRADE CONTROL STRUCTURE

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Project TERRAMAR SEWER PROTECTION
Project No. 960043
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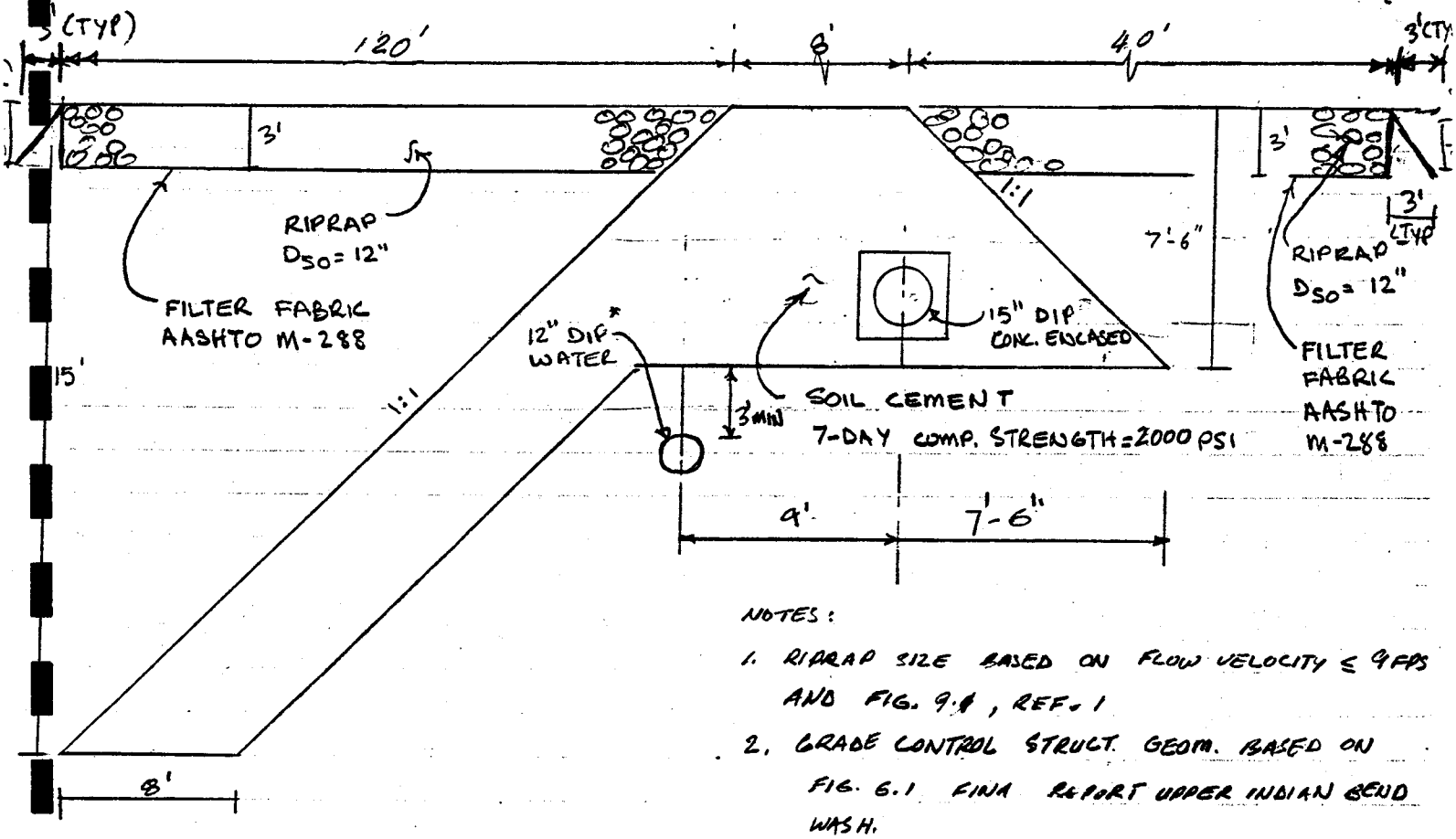
* SEE PROFILE ON SHEETS 9 & 10 FOR ELEVATION OF SEWER & WATER LINES



NOTES:

1. RIPRAP SIZE BASED ON FLOW VELOCITY ≤ 9 FPS AND FIG. 9.1, REF. 1
2. GRADE CONTROL STRUCT. GEOM. BASED ON FIG. 6.1 FINA REPORT UPPER INDIAN BEND WASH.

GRADE CONTROL STRUCTURE SECTION A-A

NTS

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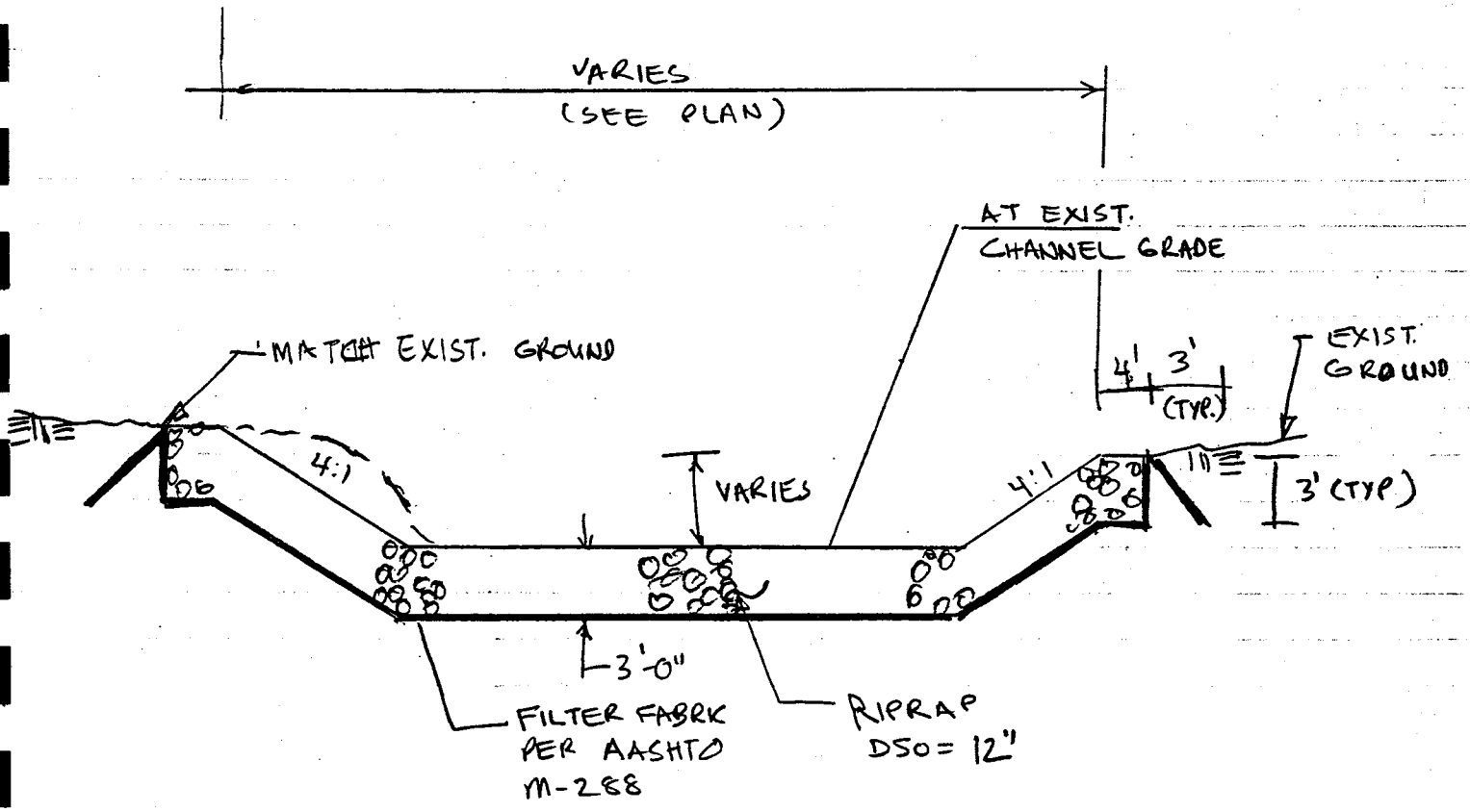

RIPRAP LINED CHANNEL SECTION B-B

SCALE: —

Attachment 4d

Stability Analysis of Grade Control Structure

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Project No. 960043
Sheet No. 1 of 2
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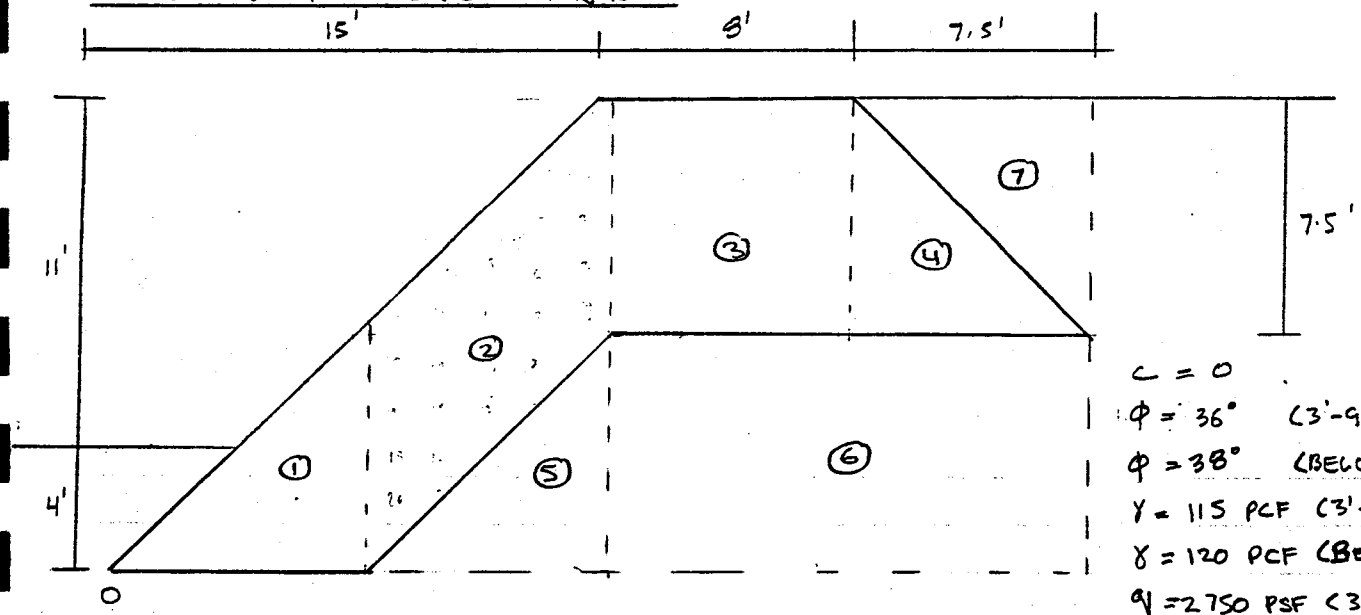
STRUCTURAL STABILITY ANALYSES

CHECK FOR OVERTURNING



$c = 0$
$\phi = 36°$ (3'-9' DEPTH)
$\phi = 38°$ (BELOW 9')
$\gamma = 115$ PCF (3'-9' DEPTH)
$\gamma = 120$ PCF (BELOW 9')
$q = 2750$ PSF (3'-9' DEPTH)
$q = 3750$ PSF (BELOW 9')

MOMENT RESISTING OVERTURNING 'M_r'

PART #	AREA ft²	UNIT WT. lb/ft³	WEIGHT lb	ARM ft	RESIST. MOMENT lb-ft
1	$8^2/2 = 32$	115	3680	$2 \times 8/3 = 5.33$	19,627
2	$8^2 = 64$	"	7360	$8 + 7.5/2 = 11.75$	86,480
3	$8 \times 7.5 = 60$	"	6900	$15 + 8/2 = 19$	131,100
4	$7.5^2/2 = 28$	"	3220	$23 + 7.5/3 = 25.5$	82,110
5	$7.5^2/2 = 28$	110	3080	$8 + 2(7)/3 = 12.7$	39,116
6	$15.5 \times 7.5 = 116$	"	12,760	$15 + 15.5/2 = 22.8$	290,290
7	$7.5^2/2 = 28$	"	3080	$23 + 2(7.5)/3 = 28$	86,240

$\Sigma W = 40,080$ lb $\qquad \Sigma M_r = 734,963$ LB-F

OVERTURNING MOMENT 'M_o'

ASSUME UNIT WT $\gamma = 110$ lb/ft³ SAY, ACTIVE EARTH PRESSURE COEFF 'K_a' = 0.3 SAY

$$P_a = \gamma \frac{H^2}{2} K_a = 110 \times \frac{15^2}{2} \times 0.26 = 3218 \text{ lb}$$

$$M_o = P_a H/3 = 3218 \times 15/3 = 16,090 \text{ lb-ft} < M_r \quad \text{OK}$$

SAFETY FACTOR AGAINST OVERTURNING 'F_o' $= M_r/M = 734,963/16,090 = 46.$ OK

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Project TERRAMAR SEWER X-ING
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CHECK FOR SLIDING

RESISTING FORCE $F_r = \Sigma W \tan \phi$
$= 40{,}080 \times \tan 38$
$= 31{,}314$ lb

SLIDING FORCE $P_a = 3218$ lb (SEE PREVIOUS SHEET)

FACTOR OF SAFETY AGAINST SLIDING $= \frac{31314}{3218} = 9.7$ OK

CHECK FOR FOUNDATION PRESSURES

AT DEPTH 7.5':

LOAD = ③ + ④ + ⑦
= 6900 + 3220 + 3080 = 13,200 lbs

PRESSURE = LOAD / AREA
= 13200 / 15.5 = 851 lb/ft

SOIL BEARING CAPACITY = 2750 PSF (3'-9' BELOW GROUND) OK

AT DEPTH 15'

LOAD = ① = 3680 lb

PRESSURE = 3680/8 = 460 lb/ft

SOIL BEARING CAPACITY = 3750 PSF (BELOW 9' DEPTH) OK

NOTE: SOIL DATA & BEARING CAPACITY VALUES ARE PROVIDED BY FORBE & VANN, INC. PER ATTACHED LETTER DATED OCT. 1, '96 BY STAN O'SICK. (ATTACH 6)

Attachment 5

Geotechnical Studies by Foree & Vann

FOREE & VANN, INC.
9013 NORTH 24TH AVENUE, SUITE 7, PHOENIX, ARIZONA 85021-2851
TELEPHONE (602) 943-6997 FACSIMILE (602) 943-7179

August 30, 1996 Project 8130

Mr. Mike Vinson
Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

Transmitted herewith is a copy of the Scour Analysis Data report for the below-referenced subject site. The data provide information regarding subsurface soil conditions in the area of a proposed bridge.

SCOUR ANALYSIS DATA
NEW RIVER CROSSING
HAPPY VALLEY ROAD
PEORIA, ARIZONA

Questions regarding any of the comments expressed herein should be referred to this office as soon as possible.

Respectfully submitted,

FOREE & VANN, INC.

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 26867
STANLEY G. O'SICK
Date Signed 8/30/96
ARIZONA, U.S.A.

Stanley G. O'Sick, P.E.
Project Engineer, Environmental Services

Copies: Addressee (4)

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SECTION III 7

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Grain Size Distribution Curves 9

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE
26867
STANLEY G
O'SICK
Date Signed 8/20/96
ARIZONA, U.S.A.

INTRODUCTION AND SCOPE OF WORK

As requested by Coe & Van Loo Consultants, Inc. this firm has performed a subsurface soil investigation of the New River channel at Happy Valley Road. The New River channel lies near the alignment of 75th Avenue at Happy Valley Road, which is an unimproved dirt road in the subject site's vicinity.

The subsurface soil investigation consisted of two exploratory test pits which were excavated with a backhoe for the purpose of visually identifying changes in soil strata and retrieving grab samples for sieve analyses and plasticity index tests.

It is the understanding of this firm that this data will be used in the design of a bridge to cross New River at Happy Valley Road.

FIELD INVESTIGATION

The New River channel is about 135 feet wide at Happy Valley Road, which dips through the channel. West and east of the channel is a wide shallow floodplain. There are no obvious structures, utilities, or pavements in the vicinity of the subject site.

On August 26, 1996, Scot Sandefur supervised two excavations at the subject site conducted with a standard backhoe having a 24 inch bucket. The approximate locations of these exploratory test pits are tabulated below:

Test Pit #	Test Pit Location	Comments
1	20 feet west of the east bank at 60 feet north of the edge of the existing roadway	This is the very lowest point in the channel near the roadway (cut bank).
2	30 feet east of the west bank at 50 feet south of the edge of the existing roadway	This point is about 3 feet higher in elevation that the other location (point bar).

The soils encountered were poorly graded gravels with a maximum particle size of about 18 inches; the percentage of particles of size 8 inches or greater in diameter was estimated to be about 10% in all of the soils encountered. The binder (minus # 40) material changed from non-plastic silt to medium-plasticity clay at about 9 feet in Test Pit # 1 and at about 12 feet in Test Pit # 2.

A log of each test pit is included in Section II.

At each test pit, a bulk soil sample (5-gallon bucket) was obtained at 3 feet, 6 feet, 9 feet, and 12 feet in depth below the existing subject site grade (bottom of the channel). Care was taken to ensure that the percent of cobbles was representative of the in-situ soil, although no particles greater that 8 inches in diameter could be included in any sample. A total of eight samples were obtained and submitted to the Foree & Vann, Inc. geotechnical laboratory.

LABORATORY ANALYSES

A sieve analysis and plasticity index test were conducted on each of the eight samples. The sieve analysis and plasticity index test results may be found in Section III. The sieve analysis data are plotted as a Grain Size Distribution Curve for each sample, also included in Section III.

LIMITATIONS

Our professional services have been performed using that degree of skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, express or implied, is made.

This report is not intended as a bidding document and any contractor reviewing the report must draw his own conclusions regarding specific construction techniques to be used on this project.

The data presented in this report are representative of the subsurface soils at the locations and to depths investigated only.

This report is for the sole use of Coe & Van Loo Consultants, Inc. No other entity may rely on this data without the express written consent of Coe & Van Loo Consultants, Inc. and Foree & Vann, Inc.

Project: 8130 Date: 8/30/96 Test Pit #: 1 Stopped Excavation at 13.0 Feet.

Blow Count	Sample	Sample Type	USCS	Symbol	DESCRIPTION	In Situ Moisture	% Dist. Boulders	% Dist. Cobbles	% Dist. Gravel	% Dist. Sand	% Dist. Silt/Clay	Grad. Well	Grad. Medium	Grad. Poor	Grain Shape Subang.	Grain Shape Angular	Grain Shape Subrnd.	Grain Shape Rounded	Relative Density/ Consistency	Estimated P.I.	Degree of Cementation
0			GP		COBBLY SANDY GRAVEL trace silt	Dry	T	40	40	20	T			X			X	X	Loose	N.P.	None
1						Slightly Damp															
2																					
3		G				Slightly Damp	T	30	45	25	T			X			X	X	Med. Dense	N.P.	None
4																					
5																					
6		G	GP		SANDY GRAVEL with cobbles trace silt	Damp	T	15	55	30	T			X			X	X	Med. Dense	N.P.	None
7																					
8																					
9		G	GP		COBBLY SANDY GRAVEL trace clay	Damp to Moist	T	20	50	30	T			X			X	X	Dense	25	None
10																					
11																					
12		G	GP		SANDY GRAVEL with cobbles trace clay	Damp to Moist	T	15	55	30	T			X			X	X	Dense	20	None
13					Stopped backhoe excavation and sampling at 13.0 feet. Note: Infrequent boulders up to 18 inches in diameter were encountered throughout the excavation. Boulders ranging from 8 to 18 inches in diameter are estimated to be present overall.																

B=Block C=Bull Nose D=Dutch Cone G=Grab L=Bulk Disturbed N=SPT P=Push R=Ring

Foree & Vann, Inc. provides this scour analysis data for the use of the client in their bridge design. The test pit log represents this firm's interpretation of the subsurface conditions at the test pit location, at the indicated depths, under conditions of the field effort.

Project: 8130 Date: 8/30/96 Test Pit #: 2 Stopped Excavation at 13.0 Feet.

Blow Count	Sample	Sample Type	USCS	Symbol	DESCRIPTION	In Situ Moisture	% Dist. Boulders	% Dist. Cobbles	% Dist. Gravel	% Dist. Sand	% Dist. Silt/Clay	Grad. Well	Grad. Medium	Grad. Poor	Grain Shape Subang.	Grain Shape Angular	Grain Shape Submd.	Grain Shape Rounded	Relative Density/ Consistency	Estimated P.I.	Degree of Cementation
0			GP		COBBLY SANDY GRAVEL trace silt	Dry	T	40	40	20	T			X			X	X	Loose	N.P.	None
1						Slightly Damp															
2																					
3	X	G	GP		SANDY GRAVEL with cobbles trace silt	Slightly Damp	T	15	40	45	T			X			X	X	Med. Dense	N.P.	None
4																					
5																					
6	X	G	GP		COBBLY GRAVEL with sand trace silt	Damp	T	40	45	15	T			X			X	X	Med. Dense	N.P.	None
7																					
8																					
9	X	G	GP		COBBLY SANDY GRAVEL trace silt	Damp	T	35	45	20	T			X			X	X	Dense	N.P.	None
10																					
11																					
12	X	G	GP		COBBLY SANDY GRAVEL trace clay	Damp to Moist	T	35	45	20	T			X			X	X	Dense	20	None
13					Stopped backhoe excavation and sampling at 13.0 feet. Note: Infrequent boulders up to 18 inches in diameter were encountered /throughout the excavation. Boulders ranging from 8 to 18 inches in diameter are estimated to be present overall.																

B=Block C=Bull Nose D=Dutch Cone G=Grab L=Bulk Disturbed N=SPT P=Push R=Ring

Foree & Vann, Inc. provides this scour analysis data for the use of the client in their bridge design. The test pit log represents this firm's interpretation of the subsurface conditions at the test pit location, at the indicated depths, under conditions of the field effort.

FOREE & VANN, INC.

9013 N. 24th Ave, Suite 7, Phoenix AZ 85021-2851

Material Qualification

Project: New River Crossing — Project No: 8130

Project Location: Happy Valley Road, Peoria — Lab No: 8130

Sample Location: Pits #1 and #2 — Sample Date: 8/26/96

Sample Description: River run — Sample ID: A-H

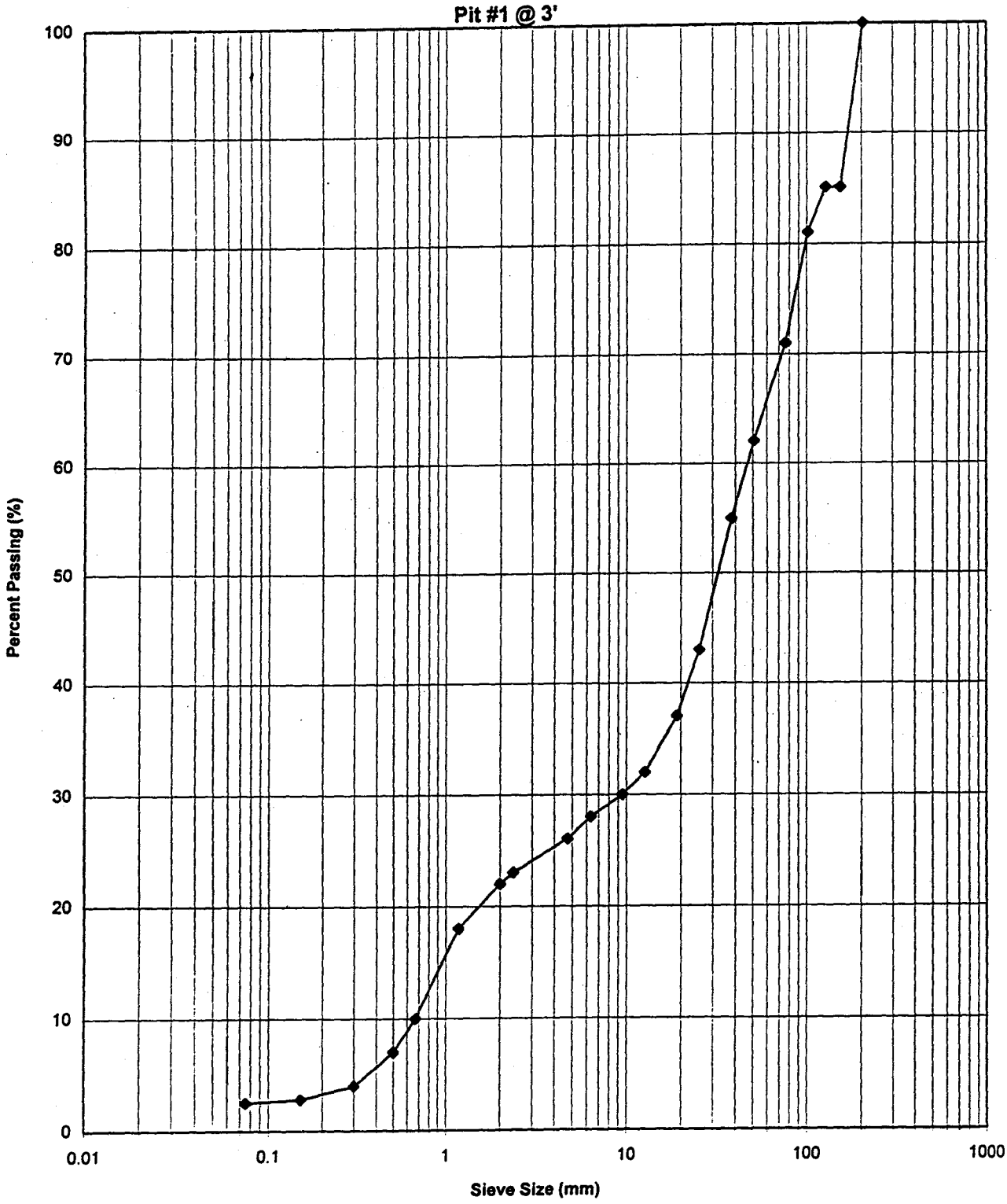
Mechanical Sieve Analysis (ASTM C136)

Sieve Size	% Passing							
	Pit #1 (3')	Pit #1 (6')	Pit #1 (9')	Pit #1 (12')	Pit #2 (3')	Pit #2 (6')	Pit #2 (9')	Pit #2 (12')
8 in	100	100	100	100	100	100	100	100
6 in	85	100	100	100	100	91	83	80
5 in	85	100	91	95	100	83	76	73
4 in	81	100	90	94	100	71	68	68
3 in	71	86	80	87	87	58	67	63
2 in	62	74	73	70	73	43	56	48
1 1/2 in	55	64	61	62	70	38	50	43
1 in	43	52	53	54	64	32	45	38
3/4 in	37	45	47	49	60	28	40	34
1/2 in	32	39	41	42	54	23	33	30
3/8 in	30	35	37	38	51	21	31	27
1/4 in	28	31	32	33	47	18	26	23
#4	26	29	30	29	45	17	21	21
#8	23	26	26	26	40	15	17	19
#10	22	24	24	24	37	14	16	18
#16	18	18	17	19	28	12	13	16
#30	10	9	9	12	12	9	7	11
#40	7	7	7	10	8	7	5	8
#50	4	5	6	8	5	6	4	6
#100	2.8	3	4.6	6	3	3	3	5
#200	2.5	2.4	4.2	4.4	1.9	2.1	2.6	3.6

Plasticity Index (ASTM D4318)

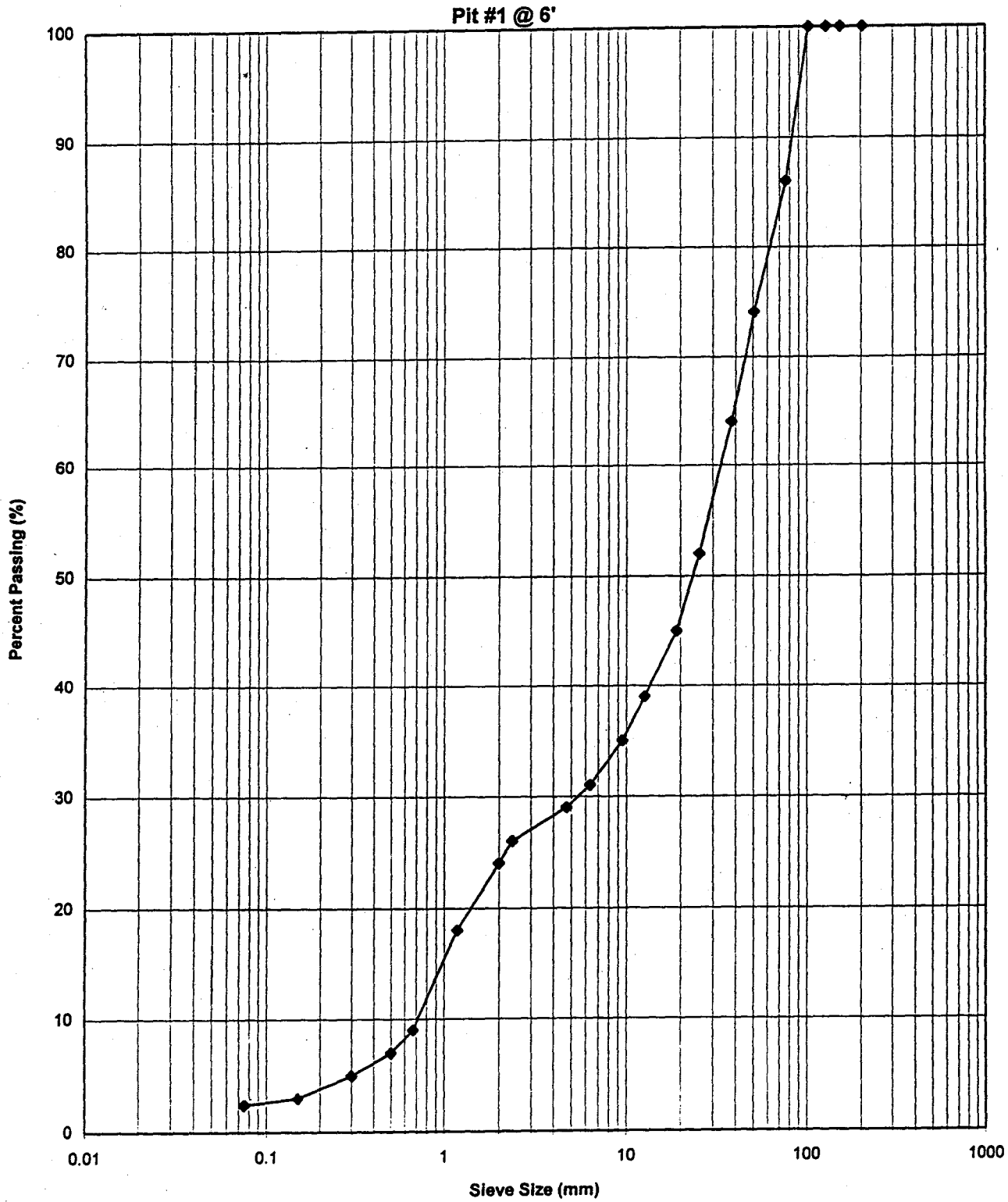
	Test Results							
	Pit #1 (3')	Pit #1 (6')	Pit #1 (9')	Pit #1 (12')	Pit #2 (3')	Pit #2 (6')	Pit #2 (9')	Pit #2 (12')
Liquid Limit	NA	NA	49	57	NA	NA	NA	41
Plastic Index	NP	NP	24	19	NP	NP	NP	19

SIEVE ANALYSIS ASTM D-422



Foree Vann, Inc. Project No. 8130

SIEVE ANALYSIS ASTM D-422



Foree Vann, Inc. Project No. 8130

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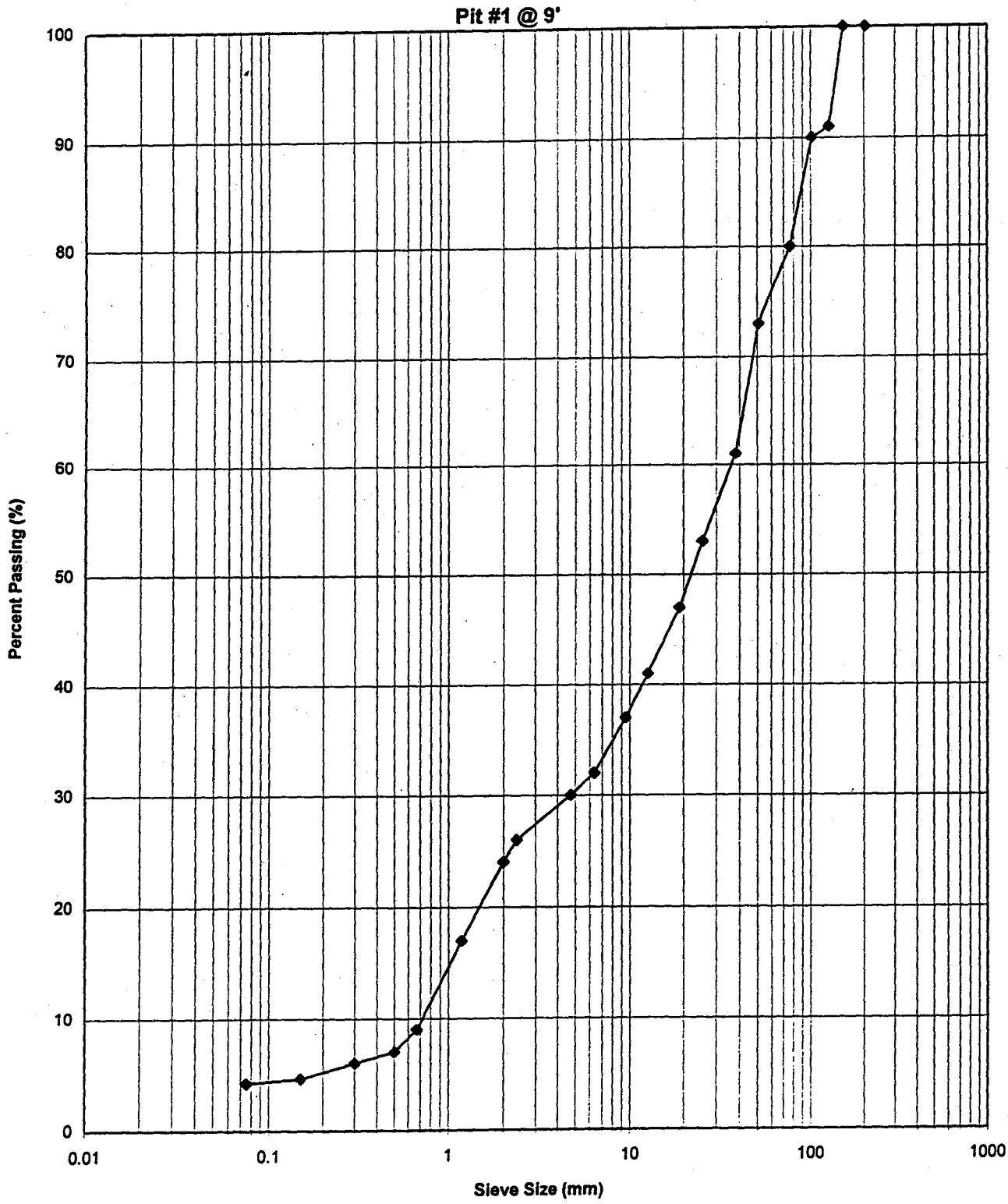

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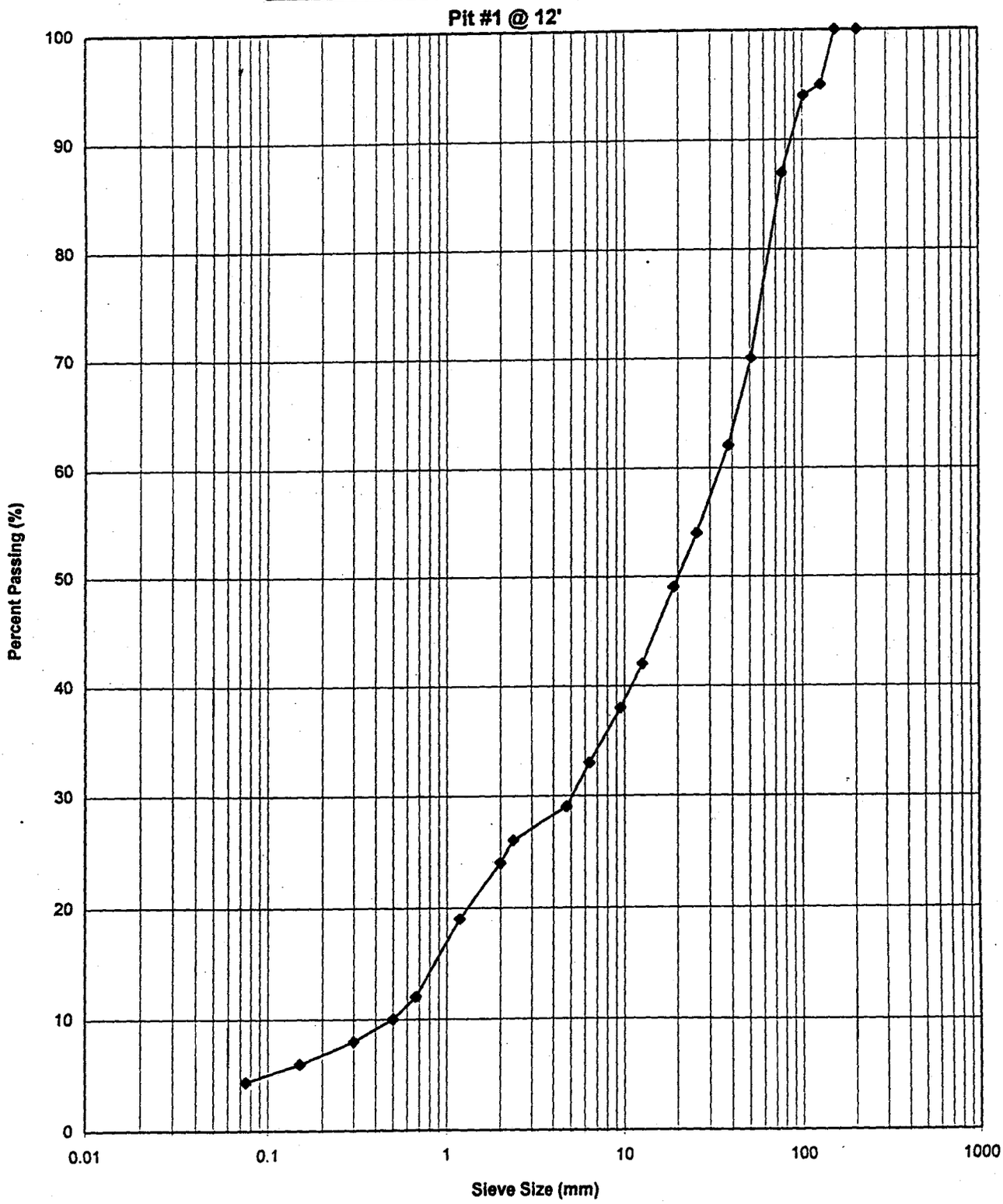

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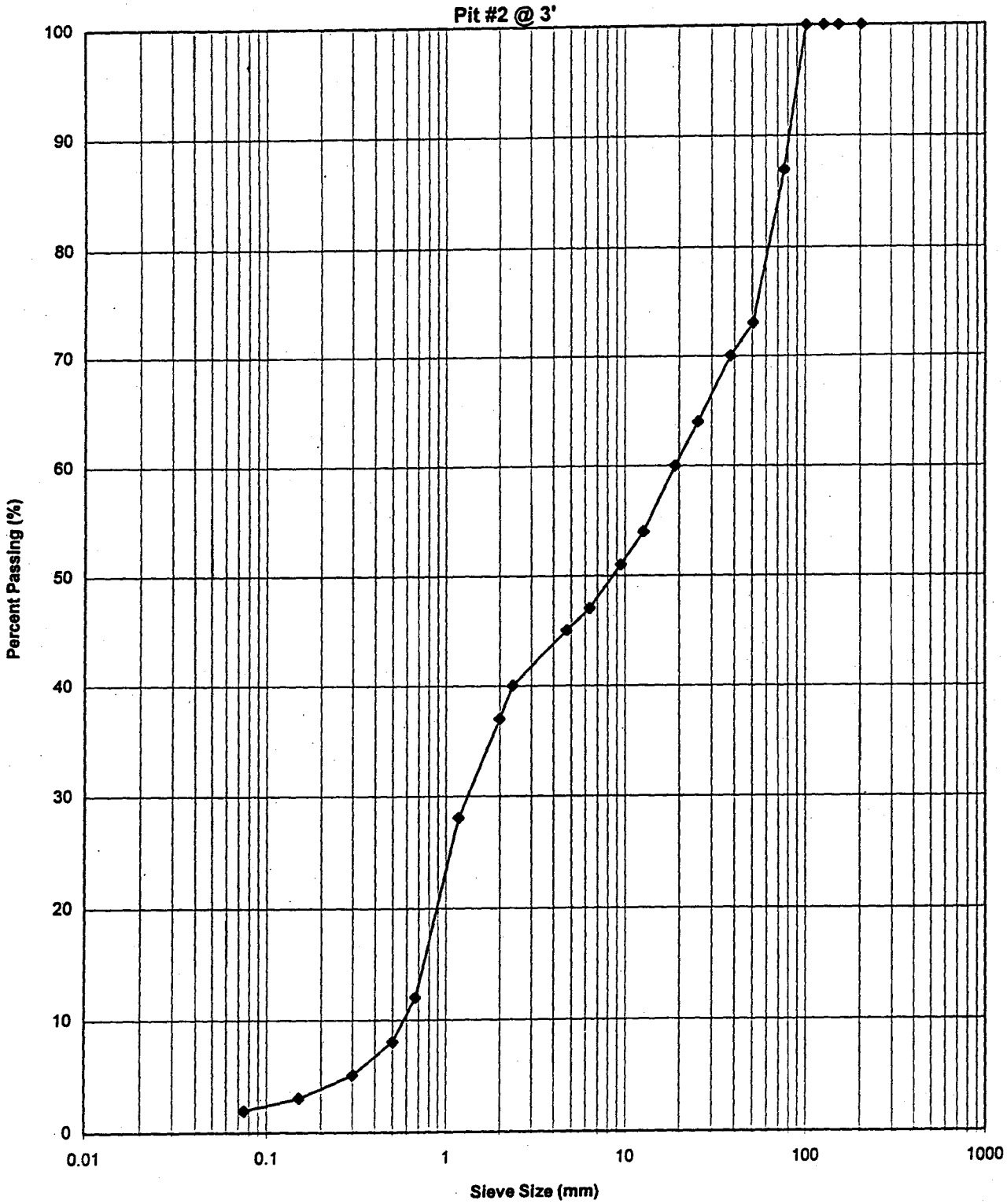

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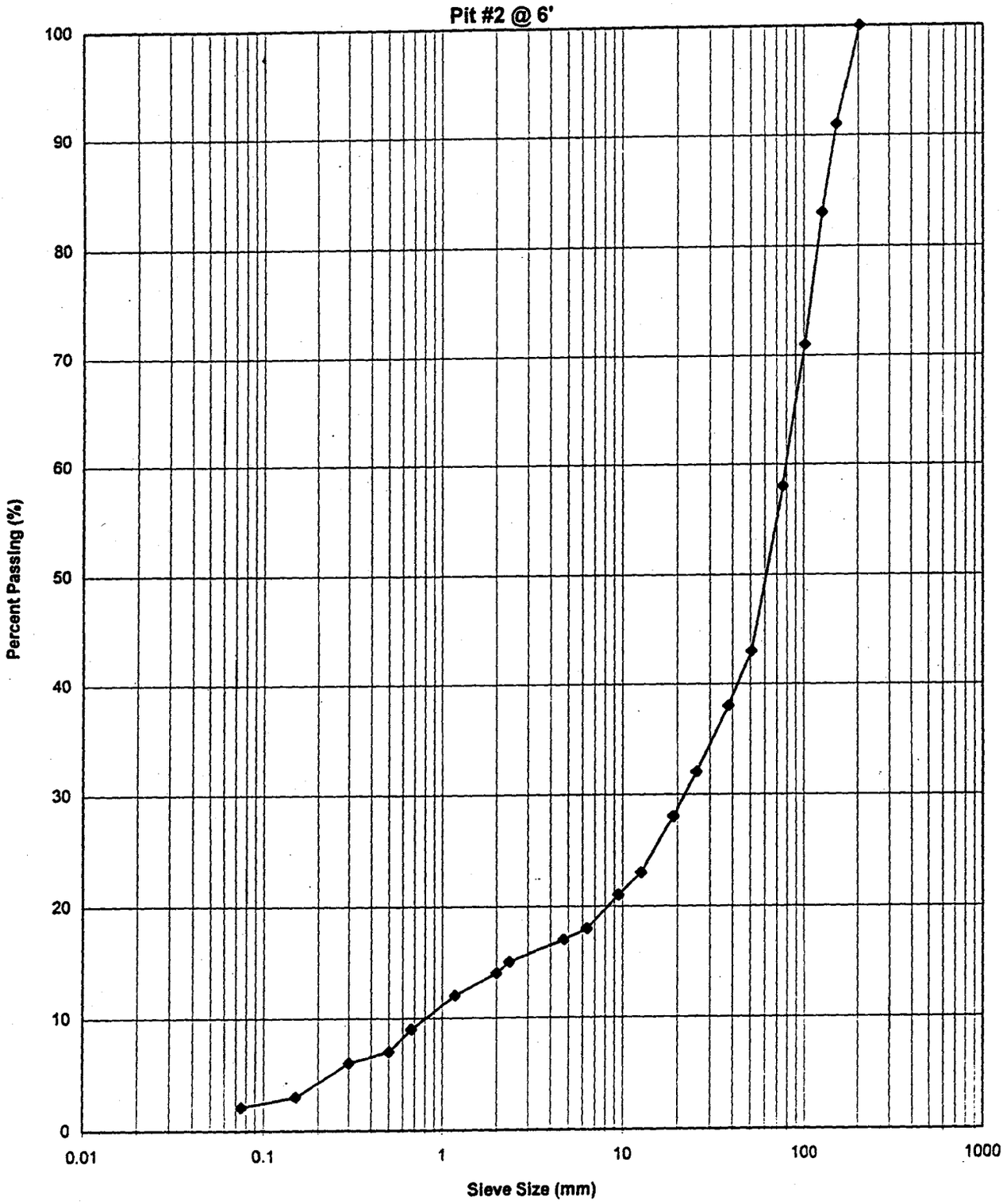

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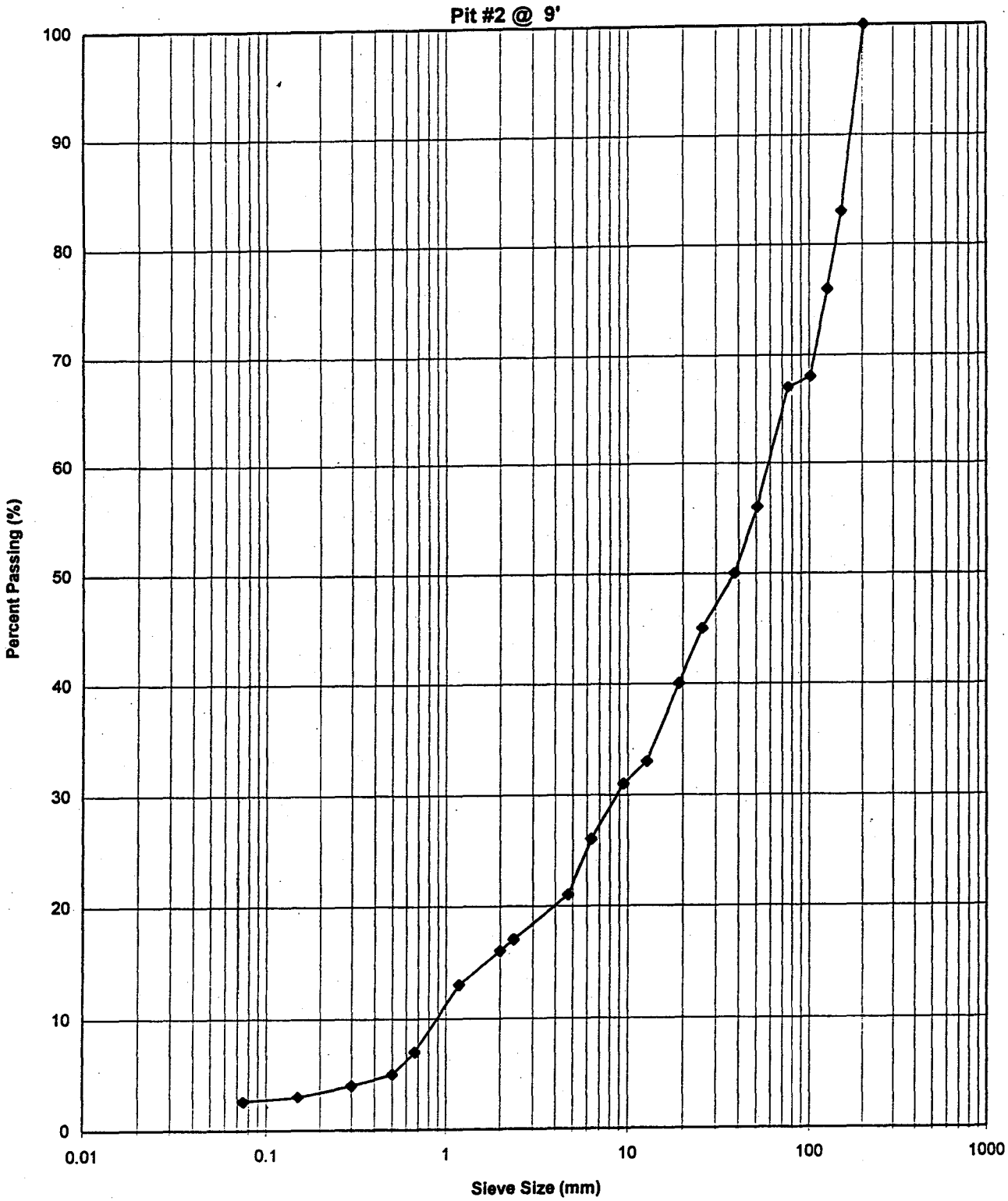

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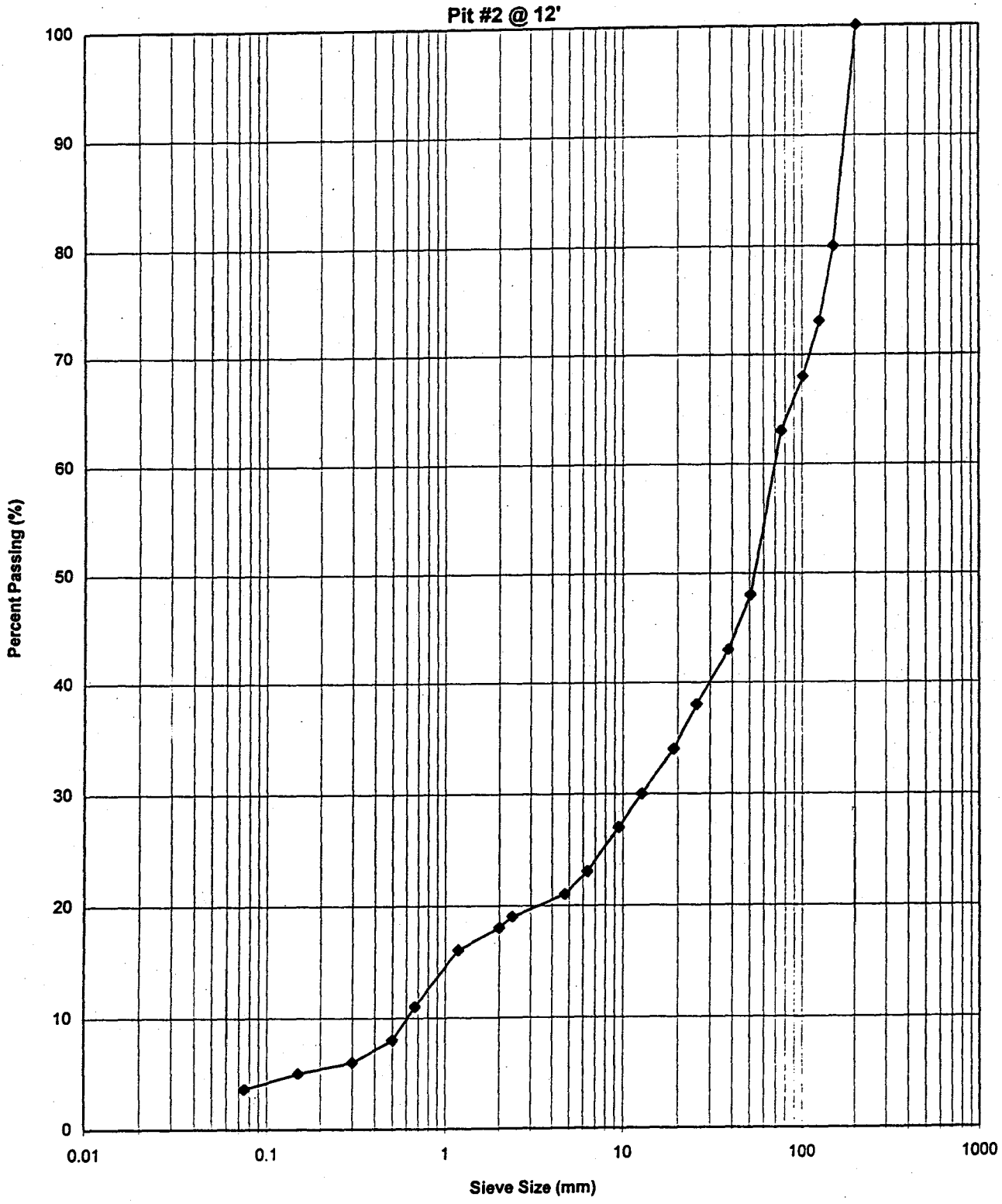

Foree Vann, Inc. Project No. 8130

FOREE & VANN, INC.
9013 NORTH 24TH AVENUE, SUITE 7, PHOENIX, ARIZONA 85021-2851
TELEPHONE (602) 943-6997 FACSIMILE (602) 943-7179

October 1, 1996 Project 8130

Mr. Nasir Raza
Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

Re: Additional Soil Design Parameters
New River Crossing
Happy Valley Road
Peoria, Arizona

Dear Mr. Raza:

As requested, this firm is pleased to provide additional design parameters based on the existing soil data obtained from exploratory test pits on August 26, 1996. It is our understanding that this additional information will be used in the design of a soil-cement drop structure.

Design Parameters

The following soil parameters may be utilized in your design:

Depth Below Existing Channel Surface	0 - 3 feet	3 - 9 feet	Below 9 feet
Angle of Internal Friction, ϕ	34°	36°	38°
Unit Weight	110 PCF	115 PCF	120 PCF

Cohesion	zero (all materials encountered)

Depth Below Existing Channel Surface	7.5 feet	15.0 feet
Bearing Capacity	2750 PSF	3750 PSF

Note: PCF = pounds per cubic foot
PSF = pounds per square foot

Limitations

Our professional services have been performed using that degree of skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, express or implied, is made.

This report is not intended as a bidding document and any contractor reviewing the report must draw his own conclusions regarding specific construction techniques to be used on this project.

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This report is for the sole use of Coe & Van Loo Consultants, Inc. No other entity may rely on this data without the express written consent of Coe & Van Loo Consultants, Inc. and Foree & Vann, Inc.

Please call if you have any questions or need further information.

Sincerely,

FOREE & VANN, INC.

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
26867
STANLEY G.
O'SICK
Date Signed 10 May 96
ARIZONA, U.S.A.

Stanley G. O'Sick, P.E.
Project Engineer, Environmental Services

Copies: Addressee (2) and via FAX 264-0928