JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

Memorandum in Response to FEMA Comments

New River Levee/Channel Assessment and Data Review Report

New River between Olive Avenue and 1,350 feet North of Grand Avenue

Maricopa County, Arizona

Prepared for:

Flood Control District of Maricopa County

Prepared by:

JE Fuller Hydrology & Geomorphology, Inc.
1 W. Deer Valley Road, #101
Phoenix, AZ 85027

FCD Contract No. 2007C051
Assignment #9

May 2011

U.S Department of Homeland Security
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 11, 2012

The Honorable Max Wilson
Chairman, Maricopa County Board of Supervisors
301 West Jefferson Street, 10th Floor
Phoenix, Arizona 85003

Dear Chairman Wilson:

We are writing in response to a letter dated July 10, 2012, submitted by Mr. Timothy Phillips, Chief Engineer and General Manager of the Flood Control District of Maricopa County (FCDMC), requesting that the U.S. Department of Homeland Security's, Federal Emergency Management Agency (FEMA) de-accredit the New River Levee System with Levee ID No. 30 in the City of Peoria and in unincorporated Maricopa County. On June 23, 2011 and March 2, 2012, the FCDMC sent the following information to support their determination that the Provisionally Accredited Levee (PAL) designation for the New River Levee System (Levee ID No. 30) was unnecessary and that the levee should be de-accredited:

- A report prepared by JE Fuller Hydrology & Geomorphology, Inc. titled, "New River Levee/Channel Assessment and Data Review Report – New River between Olive Avenue and 1,350 feet North of Grand Avenue, Maricopa County, Arizona."
- A technical memorandum submitted on June 16, 2011, that was prepared to address FEMA's comments based on the review of the JE Fuller report.

All of the above documentation and data have been reviewed and based on receipt of this information the New River Levee System (Levee ID No. 30) will be de-accredited in a future Physical Map Revision (PMR) following the completion of Maricopa Countywide Digital Flood Insurance Rate Map (DFIRM) project. The PAL period officially expired on June 25, 2011, and the PAL note will remain on the Maricopa County DFIRM that is expected to be effective in 2013. The revised Special Flood Hazard Areas (SFHAs) for the New River that maps the effects of the levee de-accreditation will be included in the upcoming PMR project.

FEMA floodplain management and engineering staff will continue to coordinate with Maricopa County staff regarding the PMR project and ensure local officials understand the project tasks and timeline. Although mapping current flood hazards is an ongoing challenge, FEMA will continue to work closely with Maricopa County communities to develop accurate flood hazard information, and make residents aware of the risks they face, the availability of flood insurance, and steps to lower their flood risk.

Communities are encouraged to increase their floodplain management efforts and promote the purchase of flood insurance for all homes and businesses in areas impacted by levee systems, including those areas with certified and accredited levee systems. Levee systems are designed and built to provide a certain level of flood protection and to reduce the risks associated with flooding events; these systems can be overtopped or fail during flood events that exceed the

design-level storm. Additionally, FEMA strongly recommends that Maricopa County consider this risk when updating local emergency management and community mitigation plans, including creating evacuation routes and sheltering strategies for a potential flood event in this area.

If you have questions or need additional information regarding the levee certification or flood mapping for your community, please contact Robert Bezek, Regional Engineer of our Risk Analysis Branch, at (510) 627-7274, or by e-mail at robert.bezek@fema.dhs.gov.

Sincerely,

Sally Ziolkowski

Sally Ziolkowski, Director
Mitigation Division

Enclosures:

- Requirements of 44 CFR 65.10: Mapping of Areas Protected by Levee Systems
- New Levee Analysis and Mapping Approaches Being Developed

cc: Timothy S. Phillips, Chief Engineer and General Manager, FCDMC
Tim Murphy, Floodplain Delineation Branch Manager, FCDMC
Frank Brown, Senior Civil Engineer, FCDMC
Katherine Gross, Hydrologist, FCDMC
The Honorable Bob Barrett, Mayor, City of Peoria
Carl Swenson, City Manager, City of Peoria
Burton Charron, Senior Civil Engineer, City of Peoria
Andrew Granger, Engineering Director, City of Peoria
Jon T. Ahern, JE Fuller Hydrology & Geomorphology, Inc.
Brian Cosson, AZ DWR, NFIP State Coordinator
Senator Jon Kyl, State Office
Senator John McCain, State Office
Representative Trent Franks, District Office

Flood Control District
of Maricopa County

Board of Directors
Fulton Brock, District 1
Don Stapley, District 2
Andrew Kunasek, District 3
Max Wilson, District 4
Mary Rose Wilcox, District 5

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September 26, 2011

Burton Charron, P.E., CFM
Senior Civil Engineer, Engineering Department
City of Peoria
9875 N. 85th Avenue
Peoria, AZ 85345

Subject: FEMA Certification for New River Levee /Channel, PAL ID#30

Dear Mr. Charron:

This letter is in response to our conversation on September 26, 2011 to share with the City of Peoria the updated certification information for the New River Levee / Channel between Olive Avenue and ¼ mile north of Grand Avenue. This information was submitted to FEMA at the end of June 2011. The District's analysis was successful in proving to FEMA that this particular channelization project, while it looks like a levee, actually functions as a channel with high banks and more than adequate freeboard since it was constructed for the Standard Project Flood. Enclosed is a 3 ring notebook with the reports and disk containing RAS models and PDF format files for the May 2011 comments report and the March 2010 original report.

The Flood Zone Limits maps in Appendix B depict two new Zone A floodplains adjacent to the New River, and no structures are in the new floodplain. The parcel on the west in a new Zone A is owned by Desert Vista Place Property Owners Association (APN 142-52-286B), which is a small lake. The parcels on the east in a new Zone A are owned by the City of Peoria and by the Flood Control District of Maricopa County.

The final processing for this certification information is being performed by FEMA Region IX, as you are aware from FEMA's contractor, MBaker Corporation. It is important that the City understand that this information is pending FEMA's placement on Flood Insurance Rate Maps, Panel 04013C1610J, and receipt of the official FEMA acceptance letter for this Levee / Channel.

If you have questions concerning this information, please call me at 602-506-4617.

Sincerely,

Frank Brown

Frank Edward Brown, P.E., CFM
Senior Civil Engineer, Mitigation Planning & Technical Programs Branch,
Floodplain Management and Services Division

C: Linda Mendenhall, FCDMC
Jon Ahern, JE Fuller Hydrology and Geomorphology
John Holmes, FCDMC

Flood Control District
of Maricopa County

Board of Directors
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July 10, 2012

Sally Ziolkowski, Director
FEMA Region IX Mitigation Division
U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

RE: PAL ID #30, New River between Olive Avenue and 1350 feet north of Grand Avenue – Maricopa County, Arizona

Dear Ms. Ziolkowski:

This letter concerns the Provisionally Accredited Levee (PAL) agreement for a portion of New River, located between Olive Avenue and 1350 feet north of Grand Avenue, which the District operates and maintains. This area is within the City of Peoria; the City and the District entered into a PAL agreement with FEMA in 2009.

While performing the levee accreditation analyses required by the PAL agreement, it became known that, for the 1% annual chance flood, this portion of New River functions as a channel and not as a levee. The Memorandum in Response to FEMA Comments Package submitted to FEMA on June 16, 2011 documents this fact and delineates the proposed new floodplains, which includes some lands outside of the channelization project previously not in a floodplain. These facts have been made known to, and coordinated with, the City of Peoria.

The largest areas of proposed new floodplains are known as the West-side Low Area and East-side Low Area, as shown on the enclosed maps. There are 3 additional flooded areas located at existing tributary inflow points, also depicted on an enclosed map. The affected landowners are the District, the City of Peoria, a private landowner and a property owners association, as stated on an enclosed list. The current land uses within these new floodplains are vacant land, a paved street and a detention basin with a permanent water pool and; furthermore, there are no insurable structures within the proposed floodplains. We understand that the City of Peoria is planning to notify affected property owners in the future.

Therefore, it would be acceptable to the District that this portion of the New River be re-classified as channel and that the "New River Levee PAL ID#30" no longer be shown as a levee for FEMA purposes for the 1% annual chance flood. Furthermore, it is acceptable to the District that the low lying areas adjacent to the soil cement channel be depicted on the next County-wide DFIRM Panels as Zone A floodplain with no reported Base Flood Elevation. The word "levee", the levee symbol and the levee notes should be removed from the DFIRM Panels. We further request that the larger Zone A limits shown on the 2010 DFIRM Maps not be mapped, since they depict a "protected area" behind the levee which is no longer true. These larger Zone A areas were delineated by HDR under contract to FEMA. The District will continue to perform maintenance of the soil cement bank protection and natural channel bottom regardless of the FEMA status for this project.

We request in addition that FEMA map the main stem river as Zone AE, and map the Base Flood Elevations (BFE's) from the detailed analysis, which utilized the HEC-RAS model. The hydraulic model is found in the New River Levee / Channel Assessment and Data Review Report and the Memorandum in Response to FEMA Comments, previously submitted to FEMA on June 16, 2011.

Thank you for reviewing our request. If you have additional questions concerning this request, please contact Frank Brown at 602-506-4617 or FrankBrown@mail.maricopa.gov.

Sincerely,

Timothy S. Phillips, P.E.
Chief Engineer and General Manager

Enclosures for PAL ID #30, New River between Olive Avenue and 1350 feet north of Grand Avenue:

1. FIRM Panel with notes depicting resultant floodplains
2. Flood Zone Limits Map from the Levee Certification Package, Figure B-2
3. Parcel boundaries map for the West-side Low Area and East-side Low Area
4. Description of Parcels Affected by Additional Zone A
5. Computer Disk with above sheets plus GIS shapefiles with revised floodplains
6. File Inventory List

Cc: Robert J. Bezek, Regional Engineer, FEMA Region IX (all Enclosures minus disk)
Sarah Houghland, Michael Baker Corporation (all Enclosures)
Brian Cosson, ADWR, NFIP Coordinator
Carl Swenson, City Manager, City of Peoria
Burton Charron, Senior Civil Engineer, City of Peoria (all Enclosures)
Andrew Granger, Floodplain Administrator, City of Peoria

Disk name: PAL ID#30 New River Request to Remove Levee-FCDMC

Overall Folder Name: PAL ID#30 New River Request to Remove Levee

New_River_No_PAL_Letter_Request_to_Proceed_PAL#30.pdf (a scanned copy of the signed letter)

File Inventory List.pdf

Folder: Listed Enclosures

2005 FIRM with_notes.pdf

B.4 Figure_B-2.pdf

Parcel Boundaries Map.pdf

Description of Parcels Affected by Additional Zone A.pdf

Sub-Folder: shapefiles for NewRiver_FP_FCDMC _proposed_Zones

NewRiver_FP_FCDMC _proposed_Zones.prj

NewRiver_FP_FCDMC _proposed_Zones.dbf

NewRiver_FP_FCDMC _proposed_Zones.idx

NewRiver_FP_FCDMC _proposed_Zones.sbn

NewRiver_FP_FCDMC _proposed_Zones.sbx

NewRiver_FP_FCDMC _proposed_Zones.shp

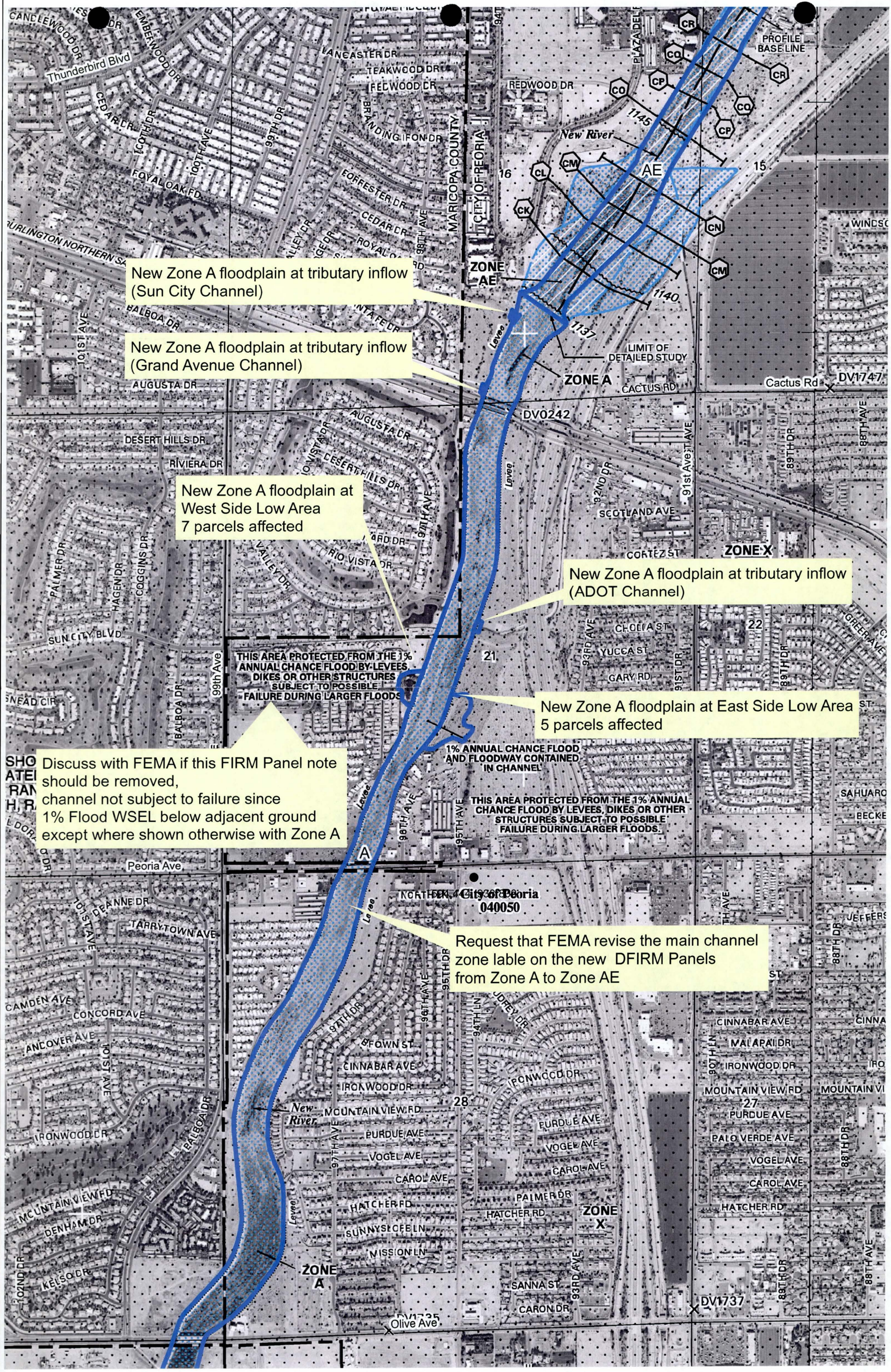
NewRiver_FP_FCDMC _proposed_Zones.xml

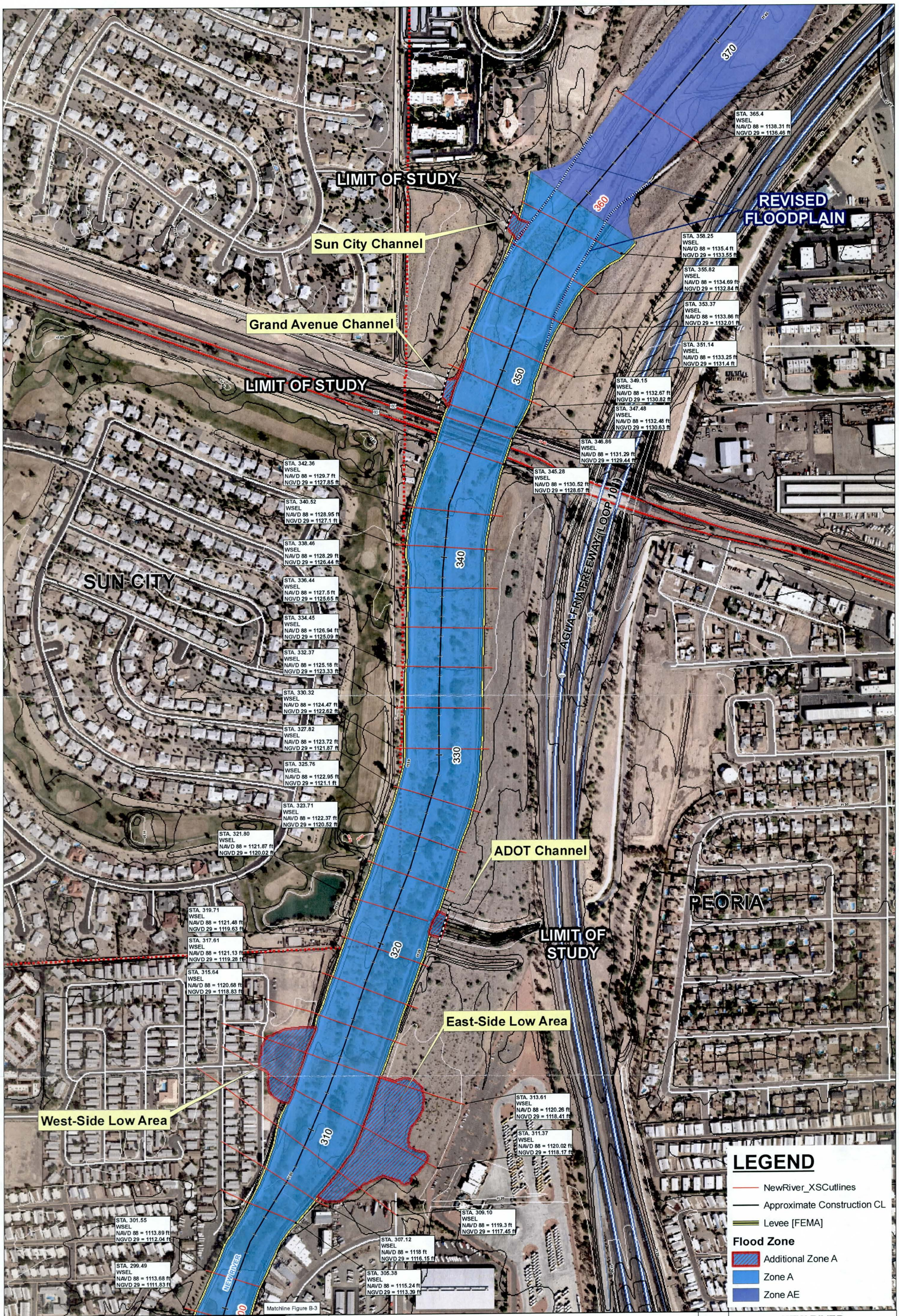
NewRiver_FP_FCDMC _proposed_Zones.shx

Folder: Floodplain Zones from Certification Report

Sub-folder: not referenced in letter, south of Figure B-2

B.4 Figure_B-3.pdf


New Zone A floodplain at tributary inflow (Sun City Channel)
New Zone A floodplain at tributary inflow (Grand Avenue Channel)
New Zone A floodplain at West Side Low Area 7 parcels affected
New Zone A floodplain at tributary inflow (ADOT Channel)
New Zone A floodplain at East Side Low Area 5 parcels affected
Discuss with FEMA if this FIRM Panel note should be removed, channel not subject to failure since 1% Flood WSEL below adjacent ground except where shown otherwise with Zone A
Request that FEMA revise the main channel zone lable on the new DFIRM Panels from Zone A to Zone AE
THIS AREA PROTECTED FROM THE 1% ANNUAL CHANCE FLOOD BY LEVEES, DIKES OR OTHER STRUCTURES SUBJECT TO POSSIBLE FAILURE DURING LARGER FLOODS
1% ANNUAL CHANCE FLOOD AND FLOODWAY CONTAINED IN CHANNEL
THIS AREA PROTECTED FROM THE 1% ANNUAL CHANCE FLOOD BY LEVEES, DIKES OR OTHER STRUCTURES SUBJECT TO POSSIBLE FAILURE DURING LARGER FLOODS.
ZONE AE
ZONE A
ZONE X
LIMIT OF DETAILED STUDY
PROFILE BASE LINE
New River
City of Peoria
040050
Thunderbird Blvd
Cactus Rd
Peoria Ave
Olive Ave
DV0242
DV1747
DV1737
DV1735



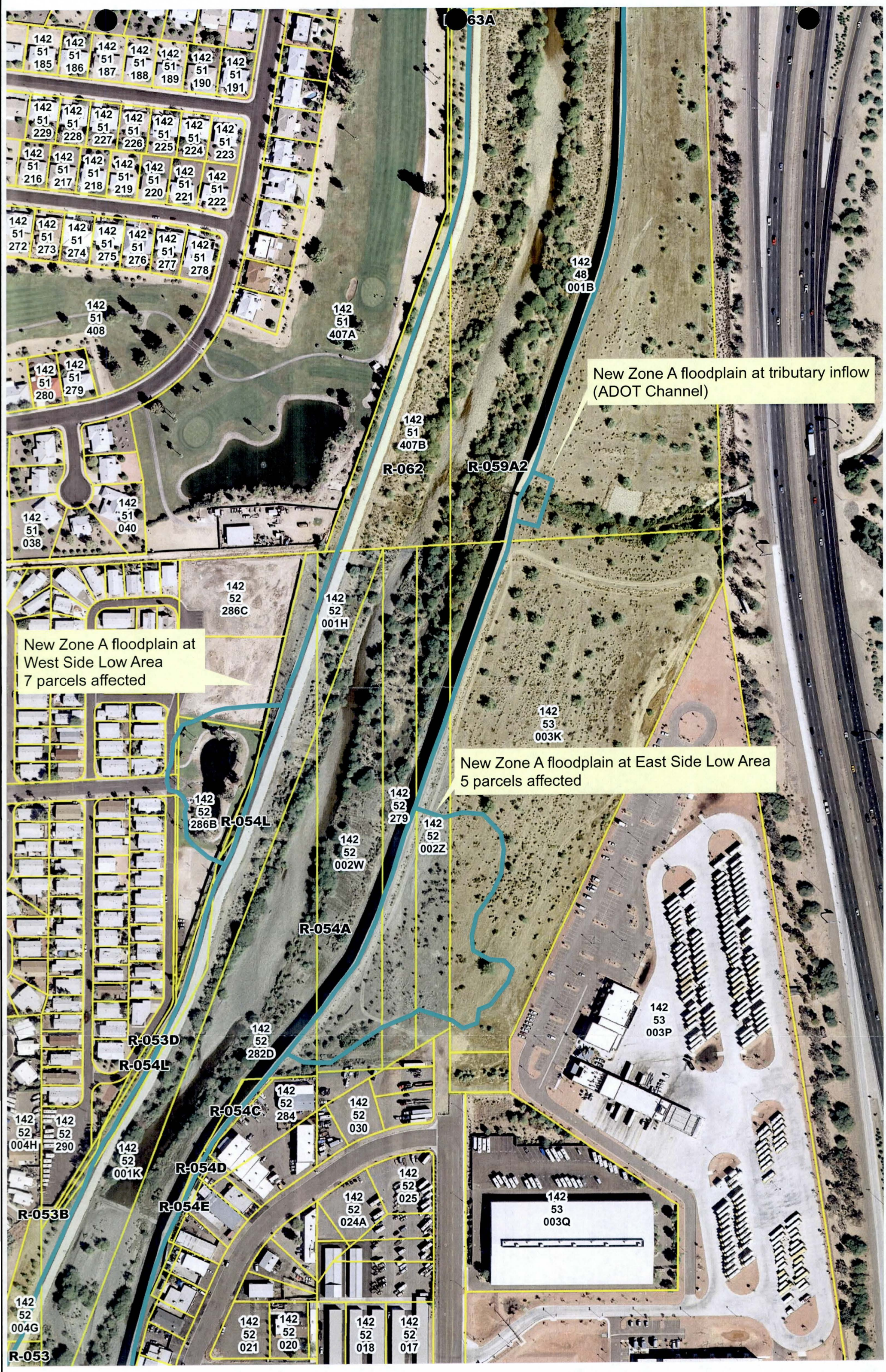
JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

CREATED: 05-2011

FIGURE B-2: FLOOD ZONE LIMITS

* Contour Interval 2 ft. (NGVD 1929)

NEW RIVER LEVEE/CHANNEL MARICOPA COUNTY, ARIZONA


63A
142 51 185
142 51 186
142 51 187
142 51 188
142 51 189
142 51 190
142 51 191
142 51 229
142 51 228
142 51 227
142 51 226
142 51 225
142 51 224
142 51 223
142 51 216
142 51 217
142 51 218
142 51 219
142 51 220
142 51 221
142 51 222
142 51 272
142 51 273
142 51 274
142 51 275
142 51 276
142 51 277
142 51 278
142 51 408
142 51 407A
142 51 280
142 51 279
142 51 038
142 51 040
142 48 001B
New Zone A floodplain at tributary inflow (ADOT Channel)
142 51 407B
R-062
R-059A2
142 52 286C
142 52 001H
New Zone A floodplain at West Side Low Area 7 parcels affected
142 53 003K
New Zone A floodplain at East Side Low Area 5 parcels affected
142 52 286B
R-054L
142 52 279
142 52 002Z
142 52 002W
R-054A
142 53 003P
R-053D
R-054L
142 52 282D
142 52 284
142 52 030
R-054C
142 52 004H
142 52 290
142 52 001K
R-054D
142 52 025
142 52 024A
R-054E
R-053B
142 53 003Q
142 52 004G
142 52 021
142 52 020
142 52 018
142 52 017
R-053

Description of Parcels Affected by Additional Zone A

Background: refer to letter from FCD of MC to FEMA, Sally Ziolkowski, Director FEMA Region IX Mitigation Division

All newly flooded parcels are within the City of Peoria.

This reach appears on FIRM Panel MAP 04013C1610J. and FIRM_PAN 04013C1685L (depending on current effective panel number and 2012 DFIRM number, respectively).

A search of the Maricopa County Assessors web site lists the owners of these parcels as shown below, a total of 12 parcels affected by the Additional Zone A floodplains. The Assessors Use Codes are miscellaneous commercial, open space and easements.

Parcels Affected

East side of New River

1. The larger East Side Low Area floods 5 parcels and they are vacant lands.
    a) District land: APN 142-53-003K (fee land in R-059A2)
    b) City of Peoria land which the District controls via Easement (non-fee land) PIN R-054A: APN 142-52-002Z, 142-52-279, 142-52-002W and 142-52-282D.
2. The smaller east side floods 1 parcel (the ADOT Channel), owned by the District (fee land), APN 142-48-001B.

West side of New River

The West Side Low Area floods 7 parcels, owned by:

a) LAND HOLDINGS LLC APN 142-52-286D, Use Code Description MISCELLANEOUS COMMERCIAL and currently vacant land
b) The DESERT VISTA PLACE PROPERTY OWNERS ASSOC APN 142-52-286B and APN 142-52-277; Use code Description Open Space Area - Qualified, and currently used as a detention basin directly connected to New River.
c) The DESERT VISTA PLACE PROPERTY OWNERS ASSOC, APN 142-52-267, APN 142-52-270 Use code Description Open Space Area - Qualified, and currently used as a paved street.
d) the District (fee land) APN 142-52-287 and within two easements R-054A and R-054L,
e) City of Peoria land which the District controls via Easement (non-fee land) PIN R-054A: APN 142-52-001K.

Memorandum in Response to FEMA Comments

New River Levee/Channel Assessment and Data Review Report

New River between Olive Avenue and 1,350 feet North of Grand Avenue

Maricopa County, Arizona

Prepared for:

Flood Control District of Maricopa County

Prepared by:

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

1 West Deer Valley Road, Suite 101
Phoenix, AZ 85027

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34141
JON T.
AHERN
Date Signed 5/20/2011
ARIZONA, U. S. A.
Expires 09/30/2011

May, 2011
FCD Contract No. 2007C051
Assignment #9

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by JE Fuller Hydrology & Geomorphology, Inc., shall be without liability to JE Fuller Hydrology & Geomorphology, Inc.

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1. Introduction

This Memorandum addresses concerns raised by FEMA in a comment letter dated September 17, 2010, addressed to Flood Control District of Maricopa County. FEMA completed a review of *New River Levee/Channel Assessment and Data Review Report* (Assessment Report), dated March 2010, by JE Fuller, Hydrology/Geomorphology, Inc. (JEF). Responses to the concerns are provided below, with supporting data provided in the appendices.

2. Response to FEMA Comments

Comments from FEMA comment review letter are reproduced in "italics" with responses directly below. A copy of the FEMA comment letter and the Assessment Report are included in **Appendix A**. Additional supporting documentation is contained in the appendices.

Comment #1

The above referenced report states that a comparison between the HEC-RAS and HEC-2 cross section data and field surveyed points was conducted for this segment of the New River. Our review of the cross section comparison section of the report revealed that the cross sections that were compared differ in elevation by as much as five feet along the channel of the river. For example, at cross section 313.2, the left corner of the channel rises to 1,109 feet in the submitted HEC-2 hydraulic model; however at this same point the field survey recorded an elevation of 1,104 feet. Please submit an updated existing conditions hydraulic analysis that uses the field survey and topographic data for this reach of the New River.

Response to Comment #1

While differences were visible in the cross sections, the review focused on the cross section geometry below the 100-year flood elevation and not the geometry along the banks of the channel. As part of the overall response to these comments, a hydraulic model was prepared using the field survey data collected along the levee. Details of the hydraulic modeling are presented in **Appendix B**.

The basis of the hydraulic model is the surveyed cross sections along the channel (east and west banks) at approximately 200 foot intervals from Olive Avenue Bridge to approximately 1350 feet north of Grand Avenue. A second field survey was conducted to collect ground survey at several low lying over bank areas and to supplement limited design plans for the Peoria Avenue Bridge. RLS-sealed field survey of the New River Channel and Peoria Avenue Bridge are included in **Appendix C.**

Comment #2

It appears that the complete set of workmaps was not submitted in the above referenced report since only sheet 1 was included. Please resubmit sheets 1-4 of the work map entitled "New River –Grand Avenue to Skunk Creek Project Number FCD2003C001," prepared by the Flood Control

District of Maricopa County, Engineering Division, dated December 2004. Also, please make sure that these maps are submitted at the correct scale. The scale bar on sheet I indicates that the map scale is 1" = 100' but actual measurements of the scale bar showed that the noted scale was incorrect.

Response to Comment #2

A complete digital set of work maps are included on the data disk in **Appendix E** with select pages from the design plans and portions of the CLOMR/LOMR (05-09-1046R/07-09-0425P) for FCD Project Number 2003C001 included in **Appendix D**. The Work maps are scaled to fit on 11x17 inch paper. Four AutoCAD dxf files are included on the data disk in **Appendix E**, which can be used to scale/measure if warranted.

Comment #3

The submitted existing conditions HEC-2 model does not include the existing bridge over New River at Peoria Avenue. Please submit an existing conditions model that includes the bridge or explain why this is not necessary. Please also provide as-built plans, certified by a registered professional engineer, or a certified survey that show(s) the dimensions of the bridge.

Response to Comment #3

The initial hydraulic comparison was conducted using the unaltered HEC-2 model. As noted in Comment #1, a field survey was conducted to supplement limited design plans for the Peoria Avenue Bridge (See RLS-sealed Field Survey Report in **Appendix C.2** and on the data disk in **Appendix E**). Peoria Avenue Bridge was added to the current conditions hydraulic model. Details of the hydraulic model input data and results are included in **Appendix B**.

Comment #4

The submitted report discusses that light to moderate vegetation growth, including larger native mesquite trees, has developed within the channel. Please provide an explanation indicating whether there should or should not be any change in the Manning's N values for the submitted existing conditions HEC-RAS and HEC-2 hydraulic models.

Response to Comment #4

Three reports were reviewed to add a historical perspective to the selection of N values for this segment of the New River. These reports include the CLOMR/LOMR (05-09-1046R/07-09-0425P) and the Design Report for the reaches directly upstream and downstream of the study reach. The N values noted in the reports and used in the hydraulic models are summarized below. Full electronic versions of these reports are included on the data disk in **Appendix E.**

New River Channel, Grand Avenue to Skunk Creek and Paradise Shores, Design Report, (FCD 2003C001) dated January 25, 2005

Existing HEC-2 N values
- Main Channel 0.030
- Overbank – 0.03 & 0.045

Revised HEC-RAS N values
- Small vegetation w/shrubs < 3 ft = 0.035
- Heavy Vegetation areas w/ small trees = 0.06
- Existing low flow Channel = 0.03

New River Channelization, Grand Avenue to Skunk Creek, Conditional Letter of Map Revision Submittal, Technical Data Notebook, (FCD 2003C001) dated December 2004.

CLOMR/LOMR N values
- Overbank = 0.045
- Gabions = 0.035
- Existing Vegetation next to Low Flow = 0.06
- Low Flow = 0.03
- New Pole Plantings = 0.15

The downstream segment included a Manning's N value for the channel between the banks of 0.035. This is documented on the Design Report for the New River Channelization, Bethany Home Road to Olive Avenue also part of the LOMR 95-09-544P noted in the Assessment Report.

In addition to a review of the historic N values, an evaluation of the current vegetated conditions within the channel was conducted with multiple field visits (5/29/09, 11/24/09, and 2/17/11) in conjunction with delineating the aerial extent of the N value categories using November 2010 aerial imagery.

The following N value categories were incorporated in the current conditions HEC-RAS model;

Current Conditions N values
- Overbank = 0.04
- Soil Cement = 0.025
- Low Flow = 0.03
- Light Vegetation in Main Channel = 0.04
- Medium Vegetation in Main Channel = 0.05
- Heavy Vegetation in Main Channel = 0.07

Table 2-1 summarizes the N values used in the hydraulic studies noted above for the New River channel. The aerial extent of the N values is included as **Figure B-1** in **Appendix B**.

Table 2-1: Summary of Hydraulic Model N values

N values	New River to Skunk Creek Design Report (FCD 2003C001)		New River to Skunk Creek CLOMR/LOMR (FCD 2003C001)	New River Channel Current Conditions Model
	Existing	Revised		
Overbanks	Ob = 0.03 & 0.045		Overbank = 0.045	Overbank = 0.04
Main Channel	MC = 0.030	Existing LF = 0.03 Small Veg. = 0.035 Heavy Veg. = 0.06	LF = 0.03 Gabions = 0.035 Existing Veg. LF = 0.06 New Pole Plantings = 0.15	Soil Cement = 0.025 LF = 0.03 Light Veg. = 0.04 Medium Veg. = 0.05 Heavy Veg. = 0.07

Abbreviations: MC – Main Channel
LF – Low Flow
Veg. – Vegetation
Ex – Existing
Ob - Overbank

3. Conclusion

Based on the current conditions hydraulic model noted in **Section 2**, the levee/channel geometry appears to convey flows below the adjacent grade in the over banks except for several areas noted on **Figure B-2**.

Additionally, three inflow locations are designated "Limit of Study" lines on **Figure B-2** in **Appendix B.** Floodplains at these locations appear to be contained when water surface elevations from the New River are extended upstream into the tributary channels.

4. Recommendations:

Based on the review of historical documentation, current field survey, updated hydraulic assessment, and field observations this segment of the New River should be remapped per **Figure B-1** located in the **Appendix B**.

Figure B-2 includes the current condition Zone A floodplain limits consistent with the Effective Zone A floodplain limits with the following changes;

1. Two low lying areas outside of the channel banks where surveyed ground points are below the water surface elevation computed for the New River Channel. The soil cement embankments at each area are above the computed water surface elevation in the channel. There is no direct connection from the New River Channel to the ponding area on the west-side. However, the east-side ponding area is connected via a storm drain inlet with a flap-gated culvert through the levee.

2. Limit of Study lines were added at three tributary channels. These channels are labeled on **Figure B-2** as the ADOT Channel, Grand Avenue Channel and Sun City Channel.
3. The upstream limit tie-in with the New River to Skunk Creek CLOMR/LOMR (05-09-1046R/07-09-0425P) study was modified to match the water surface elevation/limits determined in the current conditions HEC-RAS model and the CLOMR/LOMR (05-09-1046R/07-09-0425P) work maps in **Appendix D**.

5. References

1) Design Report for the New River Channelization, Bethany Home Road to Olive Avenue, (part of LOMR 95-09-544P), CVL, July 31, 1992.

2) FEMA comment letter dated September 17, 2010.

3) New River Channel, Grand Avenue to Skunk Creek and Paradise Shores, Design Report, (FCD 2003C001), J2 Engineering, January 25, 2005

4) New River Channelization, Grand Avenue to Skunk Creek, Conditional Letter of Map Revision Submittal, Technical Data Notebook, (FCD 2003C001) J2 Engineering, December 2004.

5) New River Levee/Channel Assessment and Data Review Report (Assessment Report), dated March 2010, by JE Fuller, Hydrology/Geomorphology, Inc. (JEF)

Additional references included in Assessment Report in **Appendix A.2**

A. Review Documents

A.1 FEMA Comment Letter

A.2 Assessment Report

A.1 FEMA Comment Letter

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 17, 2010

Mandar Nangare, P.E., CFM
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

RE: Flood Control District Maricopa County PAL ID #30 – New River Levee

Dear Mr. Nangare:

This letter is in regard to the report recently submitted to the Department of Homeland Security's Federal Emergency Management Agency (FEMA) entitled, "New River Levee/Channel Assessment and Data Review Report – New River between Olive Avenue and 1,350 Feet North of Grand Avenue," prepared by JE Fuller Hydrology & Geomorphology, Inc., dated March 2010, and the supporting hydraulic data and floodplain mapping for FEMA's comment and evaluation. The report was submitted to support the District's position that a Provisionally Accredited Levee designation is not necessary for the New River Levee (ID #30). Based on our review of the submitted data and documentation, this letter provides a summary of comments and requests for additional data. .

The above referenced report included a hydraulic analysis review of two Letters of Map Revision (LOMRs) (Case Nos. 95-09-544P and 07-09-0452P) for approximately 2.4 miles of the New River from Olive Avenue Bridge to approximately 1,350 feet upstream of the Grand Avenue Bridge. The analysis was completed using the HEC-RAS and HEC-2 computer programs. JE Fuller topographic mapping was used to develop updated cross section geometry and was supplemented with existing 2-foot contours from the Flood Control District of Maricopa County. Although the hydraulic submittal was thorough and well documented, the following items require additional analysis before this study is incorporated into the countywide Digital Flood Insurance Rate Map:

1. The above referenced report states that a comparison between the HEC-RAS and HEC-2 cross section data and field surveyed points was conducted for this segment of the New River. Our review of the cross section comparison section of the report revealed that the cross sections that were compared differ in elevation by as much as five feet along the channel of the river. For example, at cross section 313.2, the left corner of the channel rises to 1,109 feet in the submitted HEC-2 hydraulic model; however at this same point the field survey recorded an elevation of 1,104 feet. Please submit an updated existing conditions hydraulic analysis that uses the field survey and topographic data for this reach of the New River.

2. It appears that the complete set of work maps was not submitted in the above referenced report since only sheet 1 was included. Please resubmit sheets 1-4 of the work map entitled "New River – Grand Avenue to Skunk Creek Project Number FCD2003C001," prepared by the Flood Control District of Maricopa County, Engineering Division, dated December 2004. Also, please make sure that these

maps are submitted at the correct scale. The scale bar on sheet 1 indicates that the map scale is 1"=100' but actual measurements of the scale bar showed that the noted scale was incorrect.

3. The submitted existing conditions HEC-2 model does not include the existing bridge over New River at Peoria Avenue. Please submit an existing conditions model that includes the bridge or explain why this is not necessary. Please also provide as-built plans, certified by a registered professional engineer, or a certified survey that show(s) the dimensions of the bridge.

4. The submitted report discusses that light to moderate vegetation growth, including larger native mesquite trees, has developed within the channel. Please provide an explanation indicating whether there should or should not be any change in the Manning's N values for the submitted existing conditions HEC-RAS and HEC-2 hydraulic models.

If you have any questions or would like to discuss these comments in further detail, please do not hesitate to contact me by telephone at (510) 627-7207 or by email at edward.curtis@dhs.gov.

Sincerely,

Edward Curtis

Edward Curtis, P.E., CFM
Senior Engineer
Mitigation Division

Copies Furnished:

Tim Murphy, Flood Control District of Maricopa County
Burton Charron, Floodplain Manager, City of Peoria
Raymond Lenaburg, Chief, Risk Analysis Branch, FEMA Region IX

A.2 Assessment Report

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

New River Levee/Channel Assessment and Data Review Report

New River between Olive Avenue and 1,350 feet North of Grand Avenue

Maricopa County, Arizona

Prepared for:

Flood Control District of Maricopa County

Prepared by:

JE Fuller Hydrology & Geomorphology, Inc.
1 W. Deer Valley Road, #101
Phoenix, AZ 85027

March 2010

New River Levee/Channel Assessment and Data Review Report

New River between Olive Avenue and 1,350 feet North of Grand Avenue

Maricopa County, Arizona

Prepared for:

Flood Control District of Maricopa County

Prepared by:

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

1 West Deer Valley Road, Suite 101
Phoenix, AZ 85027

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34141
JON T.
AHERN
Date Signed 3/18/2010
ARIZONA, U. S. A.
Expires 09/30/2011

March, 2010

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by JE Fuller Hydrology & Geomorphology, Inc., shall be without liability to JE Fuller Hydrology & Geomorphology, Inc.

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1. Introduction

1.1. Project Objectives

JE Fuller (JEF) has completed the review of available design data and hydraulic modeling information collected for the initial evaluation of New River Levee/Channel segment from Olive Avenue to 1350 feet north of Grand Avenue. A summary of our findings and the recommendations are presented below.

1.2. Site Location

The site is located in Maricopa County, Arizona on the border of Sun City and the City of Peoria (**Exhibit 1**).

1.3. General Discussion of the New River Levee/Channel System

New River Levee/Channel system was designed by the U.S. Army Corps of Engineers (USACE) in February 1988. The system is comprised of two levees/channel embankments identified as the left and right bank and constructed on the east and west side of the New River, respectively. Each levee/channel embankment is approximately 2.4 miles long. The downstream and upstream limits of the levees are Olive Avenue and 1350 feet north of Grand Avenue, respectively.

This memo does not evaluate the design elements of the levee/channel but rather the water surfaces elevations for the FEMA effective 100-year peak discharge from the existing hydraulic models in relation to the existing natural ground elevations on the river side and land side of the levee/channel.

2. Design, Construction and Hydraulic Modeling History

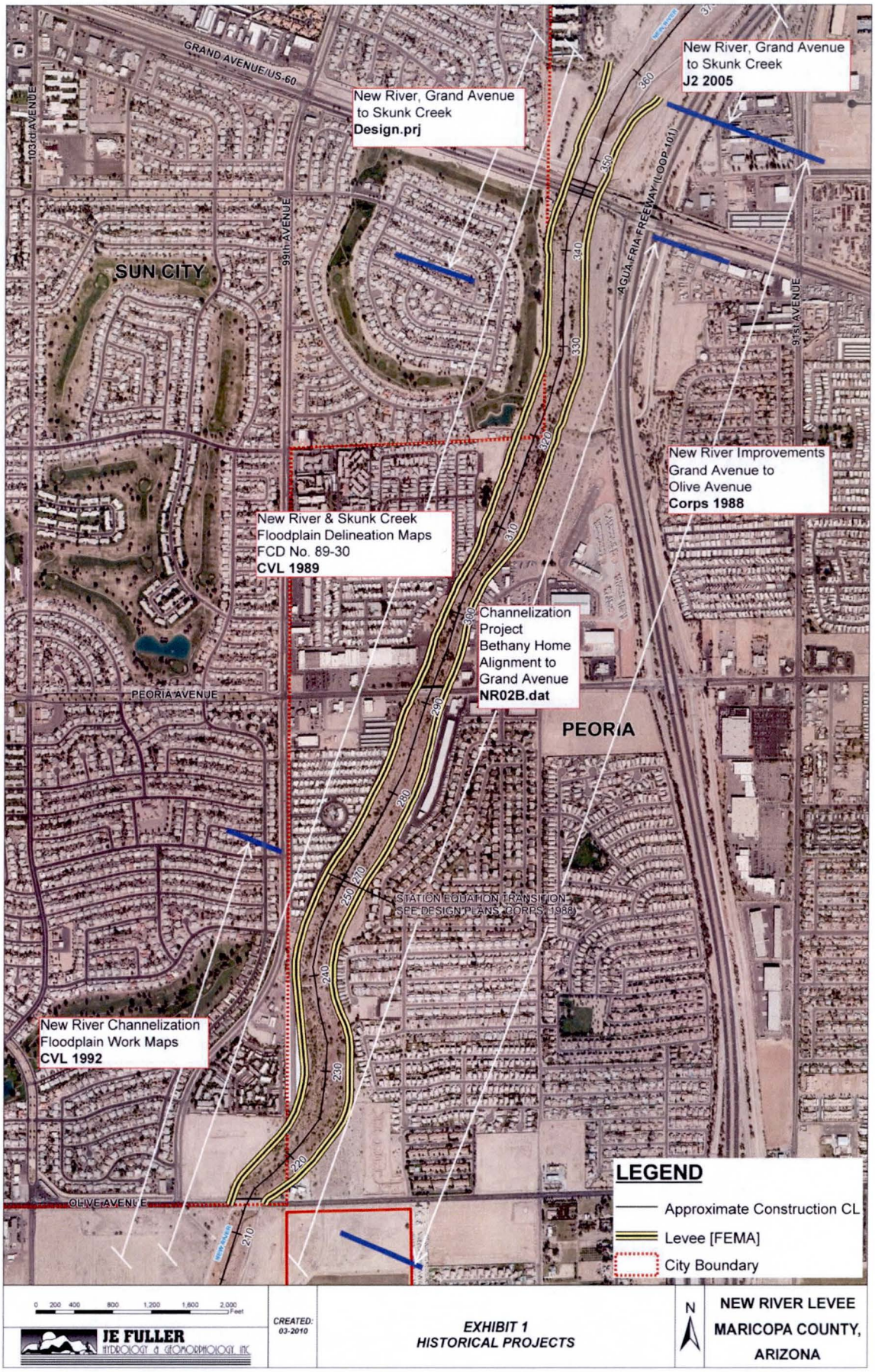
Items reviewed as part of the data collection effort are documented in tabular form in the **Appendix**. Four sets of plans/floodplain work maps and two hydraulic models contain relevant floodplain/hydraulic information used as the basis for the New River Levee/Channel assessment. The plans, floodplain work maps and hydraulic models are listed in **Table 1** below. The following documents

The segment from Olive Avenue to 1350 feet north of Grand Avenue is designated on the FEMA Flood Insurance Rate maps as Zone A (base flood elevations not determined). This segment of the New River was submitted to FEMA as part of USACE Channelization Project, Effective Date September 29, 1989 (as noted in **CVL 1989** in **Table 1**) with LOMR 95-09-544P abutting the downstream limits and LOMR 07-09-0452P abutting the upstream (north) end.

Table 1: New River Design Plans and Floodplain Work Maps

Project Name	Project Limits	Timeline Notes [1](Document Reference)	Reference ID Numbers	General Notes	Hydraulic Modeling Notes
Gila River Basin, Phoenix, Arizona and Vicinity (Including New River) New River Improvements, Grand Avenue to Olive Avenue, Corps of Engineers. (New River Improvements, As-built Grand Ave. to Olive Ave.,	This project includes the bank protection from Olive Avenue to approximately 1350 feet north of Grand Avenue.	Dated 1988 (**Corps 1988**)	DACW09-88-R0001	As Built plans for this segment of the New River Bank Projection	
Flood Control District of Maricopa County, New River & Skunk Creek Floodplain Delineation Map	Segments of the New River and Skunk Creek	Dated 1989 (**CVL 1989**)	FCD 89-30	Floodplain Delineation Work Maps	
Design Plans for New River Channelization, Bethany Home Road to Olive Avenue, by Coe & Van Loo,	Agua Fria River to approximate station 250+40, 3,600 feet north of Olive Avenue	Dated 1992 (**CVL 1992**)		Floodplain Delineation Work Maps, North of Olive Avenue (station 213+50) the channel was regraded and a grade control structure was added at station 238+69	
Flood Control District Channelization Project, Bethany Home Alignment to Grand Avenue. (Noted in HEC02 model title lines)	Confluence with the Agua Fria River to approximately 50 feet downstream of Grand Avenue Bridge, at cross section 344.9	1995 (**NR02B.dat**)	LOMR 95-09-544P	HEC-2 model collected from FEMA	HEC-2 model NR02B.dat Data received from the FEMA Library on (9/9/09) contained a HEC-2 model named NRO2B.dat. This file was located under a folder labeled *New River 95-09-544P.*
Flood Control District of Maricopa County, Plans for Construction of New River _Grand Avenue to Skunk Creek including Paradise Shores		Dated 2005 (**J2 2005**).	*FCD 2004C014* LOMR 07-09-0452P March 9, 2007	These plans tie into the upstream limits of the bank protection designed by the Corps of Engineers	HEC-RAS model **Design.prj** Additional data received from the FEMA Library on 9/9/2009 contained hydraulic models from the LOMR (07-09-0452P) *New River – Grand to Skunk Creek* FEMA submittal. Three folders (Duplicated, Corrected and Design) contained hydraulic models. The Design.prj HEC-RAS model starts at cross section 334, approximately 1120 feet downstream of Grand Avenue. The HEC-RAS model (Design.prj) under folder *Design* extends from cross section 344 (1120 feet downstream of Grand Avenue) to approximately 6300 feet upstream of Thunderbird Road. This model was used to remap the floodplain for the New River- Grand Avenue to Skunk Creek channel design project. Although the HEC-RAS model extended south of Grand Avenue the limits for the LOMR extend north from the upstream project limits, approximately 1,150 feet upstream of Grand Avenue.

1 – Reference designation used in this memorandum


GRAND AVENUE/US-60
103rd AVENUE
99th AVENUE
SUN CITY
PEORIA AVENUE
OLIVE AVENUE
AGUA FRIA FREEWAY (LOOP 101)
91st AVENUE
PEORIA
New River, Grand Avenue to Skunk Creek
Design.prj
New River, Grand Avenue to Skunk Creek
J2 2005
New River Improvements Grand Avenue to Olive Avenue
Corps 1988
New River & Skunk Creek Floodplain Delineation Maps FCD No. 89-30
CVL 1989
Channelization Project Bethany Home Alignment to Grand Avenue
NR02B.dat
STATION EQUATION TRANSITION
(SEE DESIGN PLANS, CORPS, 1988)
New River Channelization Floodplain Work Maps
CVL 1992
LEGEND
Approximate Construction CL
Levee [FEMA]
City Boundary
0 200 400 800 1,200 1,600 2,000 Feet
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
CREATED: 03-2010
EXHIBIT 1
HISTORICAL PROJECTS
N
NEW RIVER LEVEE
MARICOPA COUNTY, ARIZONA

3. Existing Survey and Field Conditions

3.1. Existing Survey

Two sources of topographic information were used to evaluate this segment of the New River Levee/Channel.

1. Field survey data points were collected at 200 foot intervals along the New River starting at the Olive Avenue Bridge ending approximately 1350 feet north of Grand Avenue. Field survey data was collected at natural ground elevation in the left/right overbank near existing Flood Control District of Maricopa County (FCDMC) right-of-way, left/right top of levee, and left/right toe of levee.

    - Horizontal Control: North American Datum 1983 (NAD 83)
    - Vertical Control: National Geodetic Vertical Datum 1929 (NGVD 29).

2. FCDMC-provided 2-foot contour data for the overall project limits within New River and in the overbank areas. The contour data is depicted on **Exhibit 3** in the **Appendix.** Digital data included an ESRI shape file containing contours based on the following control:

    - Horizontal Control: North American Datum 1927 (NAD 27)
    - Vertical Control: National Geodetic Vertical Datum 1929 (NGVD 29).

The HEC-RAS model, **Design.prj**, discussed in **Section 2** above was based on the North American Vertical Datum 1988 (NAVD 88), a conversion to NGVD 29 was necessary to compare historical elevation. The conversion factor was determined by comparing local benchmarks, survey control within the project area and the datum shift using the American Vertical Datum Conversion Utility software. The final data shift was determined to be equivalent to -1.85 feet or

NGVD 29 = NAVD 88 – 1.85 feet.

Refer to additional survey electronic data included on CD in the **Appendix.**

3.2. Field Conditions

The general field visit, conducted on November 24, 2009, focused on apparent, surficial levee/channel conditions. Observations from the visit indicate that the levee/channel is in overall satisfactory condition.

Photo 1: Looking east at tributary entrance to New River (Approximate Channel Station 356+60).

Photo 2: Looking south at tributary inlet to New River (Approximate Channel Station 348+44).

Photo 3: Looking west along tributaru channle north of Grand Avenue (Approximate Channel Station 348+44).

Photo 4: Looking south at New River Channel (Approximate Channel Station 330+00).

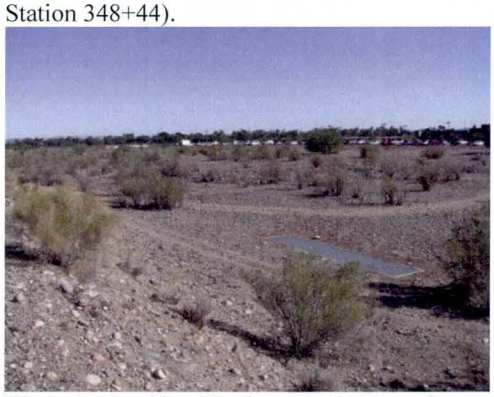


Photo 5: Looking Northwest at low spot in overbank (Approximate Channel Station 309+00).

Photo 6: Looking North across top of channel at tributary inlet. (Approximate Channel Station 322+00).

Minor embankment and channel deficiencies discussed below do not appear to be significant and may be corrected through routine maintenance activities.

Evidence of flow overtopping the embankment, or signs of significant flow depth against the embankment, were not observed. However, indications of low flows within the channel and against the embankment include minor material scour/erosion at inflow confluences and minor local erosion/deposition along the waterside embankment toe. These areas of minor local deposition and erosion do not appear to significantly reduce the conveyance capacity of the channel.

Light to moderate vegetation growth has developed within the channel and does include some include larger native mesquite trees. Vegetation is monitored and maintained in accordance with the officially adopted maintenance plan in order to preserve channel capacity.

4. Evaluation

4.1. Hydraulic Cross Section Comparison

A comparison of HEC-2 cross section data and field surveyed points was conducted for this segment of the New River. Field survey sections located within 50 feet of HEC-2 cross section locations (as depicted on **CVL 1992** reference noted in **Table 1**) were plotted together for a general comparison of channel cross section geometry. Cross section data from the HEC-2 model (**NRO2B.dat**) compares favorably with the field survey data (see *cross section plots* and channel profile lines in the two *New River Levee Assessment – Various Profile Plots* in the **Appendix**).

4.2. Profile Comparison

A profile plot was created to compare historical design/floodplain data with existing site conditions for the New River Channel from Olive Avenue to approximately 1350 feet north of Grand Avenue. To be consistent with the existing FEMA Flood Insurance Rate Maps all elevations are reported in NGVD 1929. Water surface and minimum channel elevations for the plot were taken from the following sources.

1. From Olive Avenue to 1120 feet downstream of Grand Avenue elevations were taken from the HEC-2 model (NR02B.dat). Model vertical datum is reported to be NGVD 1929.
2. From cross section 344.9 to approximately 1120 feet south of Grand Avenue elevations were taken from the HEC-RAS model, Design.prj. Model vertical datum is listed as NAVD 1988.
3. Six profiles were created from the field survey for top of bank protection (left and right), toe of bank protection (left and right) and natural ground elevations at the existing right of way limits (left and right)
4. Two profiles from were created **Corps 1988** as-built plans for left/right top of levee elevations
5. Composite channel profiles from **Corps 1988** and **CVL 1992**.

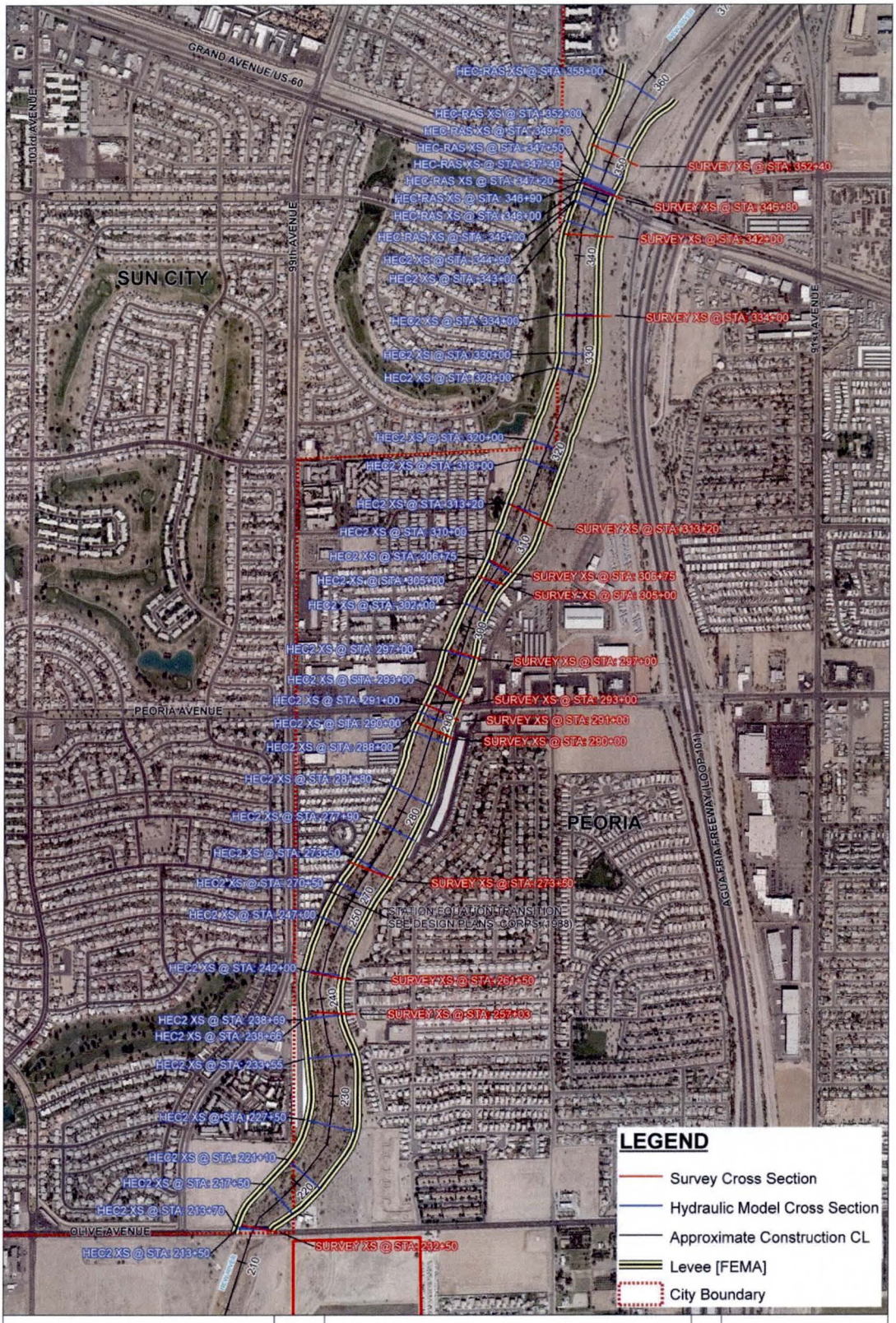


EXHIBIT 2
SURVEY/HEC2 CROSS SECTIONS

5. Conclusion

Based on the favorable comparison of cross section data and profile comparisons noted in **Section 4**, the levee/channel geometry appears to reflect the geometry included the hydraulic models (NR02B.dat and Design.prj). Additionally the water surface profile results from the hydraulic models, as shown in the profile comparison plot, is below the natural ground elevation in the landside areas adjacent to the New River Levee/Channel. For this segment of the New River from Olive Avenue to 1,350 feet north of Grand Avenue the New River functions as a channel for the 100-year water surface elevation except at locations noted below.

Using the reported composite water surface elevation within the New River Levee/Channel, four areas show water surface elevations extending above adjacent ground elevations. Three locations occur at existing tributary/inflow locations. Floodplains at these locations appear to be contained within the tributary channels where water surface elevations from the New River are extended upstream into tributary channels. These locations are noted as "Limit of Study" lines on **Exhibit 3** in the **Appendix**. The fourth location where the 100-year floodplain elevation exceeds the adjacent ground elevation is at a localized depression along the left (east) overbank at cross section 310. At this location, using topographic data discussed in **Section 3,** a ponding area was delineated adjacent to the existing embankment. See **Exhibit 3** in the **Appendix**.

At this location, a search of the Maricopa County Assessors web site lists the owners of these parcels as Maricopa County Flood Control District and the City of Peoria (County parcels attached to this memo).

6. Recommendations:

Based on the review of historical documentation and current survey and field observations this segment of the New River should be remapped per **Exhibit 3** located in the **Appendix**.

Appendix

- Data Collection Spreadsheet
- Exhibit 3: Flood Zone Limits
- New River, Grand Avenue to Skunk Creek, Floodplain Work Map 1 of 4. **J2 2005**
- Cross section Comparison from HEC-RAS
- Profiles
- Parcels
- CD with backup data
    - PDFs of plans outlined in Table 1
    - Hydraulic Models (NR02B.dat and Design.prj)
    - Survey Notes and electronic data
    - PDFs of Exhibits 1, 2 and 3

Data Collection Spreadsheet

New River Levee/Channel
Data Collection Summary

Abbreviation Descriptions-
ADEM = Arizona Deptartment of Emergency Management
ADEQ = Arizona Deptartment of Environmental Quality
ADOT = Arizona Department of Transportation
ADWR = Arizona Department of Water Resources
ARIA = Arizona Regional Image Archive
FEMA = Federal Emergency Management Agency
NRCS = Natural Resource Conservation Service
USGS = United States Geological Survey

Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR001	A371.915S	Flood-Plain Information Study for Maricopa County, Arizona, Vol. V New River Report		U. S. Corps of Engineers-COE	1967					
NR002	A650.702S	Gila River Basin, New River and Phoenix City Streams, Design Memorandum No. 2, Hydrology, Part 1		U. S. Corps of Engineers-COE	1973					
NR003	A371.607S	New River and Phoenix City Streams, Arizona, Design Memorandum No. 2, Hydrology, Part 1		U. S. Corps of Engineers-COE	1974	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_607NewRiverPhoenixCityStreamsArizonaDesignMemorandumNo_2HydrologyPart1_Oct_1974.pdf
NR004	A371.604S	Draft, New River and Phoenix City Streams, Arizona, Design Memorandum No. 3, General Design Memorandum - Phase I, Plan Formulation, Main Report		U. S. Corps of Engineers-COE	1975					
NR005	A371.603S	New River and Phoenix City Streams, Arizona, Design Memorandum No. 3, General Design Memorandum - Phase I, Plan Formulation, Appendixes		U. S. Corps of Engineers-COE	1976	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_603NewRiverandPhoenixCityStreams_Arizona_DesignMemorandumNo_3GeneralDesignMemorandum_Phase_I.pdf
NR006	A371.605S	New River and Phoenix City Streams, Arizona, Design Memorandum No. 3, General Design Memorandum - Phase I, Plan Formulation, Supplement to Main Report, Correspondence		U. S. Corps of Engineers-COE	1976					
NR007	A350.602S	Gila River Basin, New River and Phoenix City Streams, Arizona, Cave Buttes Dam (Including Cave Creek to Peoria Avenue) Design Memorandum No. 3 General Design Memorandum - Phase II Project Design Part 1		U. S. Corps of Engineers-COE	1976					
NR008	A371.614S	Gila River Basin, New River and Phoenix City Streams, Arizona, Addendum to Design Memorandum No. 3, General Design Memorandum - Phase I, Plan Formulation		U. S. Corps of Engineers-COE	1977					
NR009	A371.609S	New River and Phoenix City Streams, Arizona, Design Memorandum No. 4, Overall Master Plan		U. S. Corps of Engineers-COE	1980					
NR010	A371.601S	Final, New River Dam (Including New River to Skunk Creek) Design Memorandum No. 3, General Design Memorandum Phase II, Project Design Part 3 (Draft Version of Study in Box No. 03-013)		U. S. Corps of Engineers-COE	1982					

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Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR011	A371.606S	Gila River Basin, Phoenix, Arizona and Vicinity (Including New River) Hydrology Part 2, Design Memorandum No. 2		U. S. Corps of Engineers-COE	1982					
NR012	A371.905	New River, Skunk Creek, Agua Fria River Flood Control Plan		Willdan Assoc.	1982					Mark Mayer Reviewed. Do not need document.
NR013	A371.906	New River, Skunk Creek, Agua Fria River Flood Control Master Plan, Draft		Flood Control District of Maricopa County-FCD	1983					Mark Mayer Reviewed. Do not need document.
NR014	A371.503	Specifications for New River Improvements Maricopa County, Arizona		U. S. Corps of Engineers-COE	1984	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_503SpecificationsforNewRiverImprovementsMaricopaCounty_Arizona.pdf
NR015	A371.912	Final Sediment Transport Report for the New River and Skunk Creek		Simons, Li and Assoc. Inc. for U. S. Corps of Engineers-COE	1985	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_912FinalSedimentTransportReportfortheNewRiverandSkunkCreek.pdf
NR016	A371.925	Flood Insurance Study, New River Below Skunk Creek Maricopa County, Arizona (FIS)		Coe and Van Loo Consult. Eng. Inc.	1986					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR017	A371.701	Hydrology Update November 15, 1986 New River Below Skunk Creek Maricopa County, Arizona (For New River Flood Insurance Study) (FIS)		Coe and Van Loo Consult. Eng. Inc.	1986					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR018	A400.608S	Hydraulic and Geotechnical Engineering Studies		Dames and Moore; Ellis-Murphy Inc.	1987					
NR019	A371.505	Project Specifications and Contract Documents, New River Improvements - Utility Relocations, Olive Avenue to Grand Avenue		NBS/Lowry Eng. and Planners	1988	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_505ProjectSpecificationsandContractDocuments_NewRiverImprovements_UtilityRelocations_OliveAv.pdf
NR020	A371.940S	New River Improvements Project Site, Landfill Investigation Report		Camp Dresser and McKee Inc. for U. S. Corps of Engineers-COE	1988					
NR021	A371.602S	Proposed Channelization of the New River Between Olive Avenue and Bethany Home Road, Soil-Cement Mix Proportions		Western Technologies Inc. for Coe and Van Loo	1988					
NR022	A371.918	New River Channelization Bethany Home Road to Olive Avenue (Western Technologies Report)		Western Technologies Inc. for Coe and Van Loo Consult. Eng.	1989					Mark Mayer Reviewed. Document probably not relevent or material out of date.

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Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR023	A371.927	Evaluation of Landfills for the New River Project		Western Technologies Inc. for Patel, Ash C.	1989					Mark Mayer Reviewed. Do not need document.
NR024	A371.506	Specifications for New River Erosion Control and Esthetic Treatment Maricopa County, Arizona		U. S. Corps of Engineers-COE	1989	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_506SpecificationsforNewRiverErosionControlandEstheticTreatmentMaricopaCounty_Arizona.pdf
NR025	A371.910S	Investigation of Alternatives and Mitigation Proposal for the New River Flood Control Project, Bethany Home Road to Olive Avenue		Maricopa County Flood Control District-FCD	1990					
NR026	A371.401	LOMR Submittal Package for the New River Channelization Bethany Home Road to Olive Avenue		Coe and Van Loo Consult. Eng. Inc.	1992					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR027	A371.608S	Design Report for the New River Channelization, Bethany Home Road to Olive Avenue		Coe and Van Loo Consult. Eng. Inc.	1992	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_608DesignReportfortheNewRiverChannelization_BethanyHomeRoadtoOliveAvenue.pdf
NR028	A371.507S	Construction Specifications for New River Channelization, Bethany Home Road to Olive Avenue		Coe and Van Loo Consult. Eng. Inc.	1992	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_507ConstructionSpecificationsforNewRiverChannelization_BethanyHomeRoadtoOliveAvenue.pdf
NR029	A371.926	Subsurface Assessment of the Banks of the New River Between Bethany Home Road and Olive Avenue, Glendale and Peoria, Arizona		WT Environmental Consult., Inc.	1992					Mark Mayer Reviewed. Do not need document.
NR030	A371.936S	New River Drop Structure, Technical Data on Stepped Spillway		Wood, Patel and Assoc., Inc.	1993					
NR031	A371.917	Report for Geotechnical Engineering Services, New River Channelization, Grand Avenue to Greenway Road, Peoria, Arizona		Thomas-Hartig and Assoc. Inc. for Wood, Patel and Assoc. Inc.	1993					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR032	A371.941S	New River from Grand Avenue to Greenway Road, Addendum #1		Wood, Patel and Assoc., Inc.	1994	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_941NewRiverfromGrandAvenuetoGreenwayRoad_Addendum_1.pdf
NR033	A371.504	Construction Specifications for New River Channelization Grand Avenue to Greenway Road		Wood, Patel and Assoc., Inc.	1994	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_504ConstructionSpecificationsforNewRiverChannelizationGrandAvenuetoGreenwayRoad.pdf

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Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR034	A371.932	New River from Grand Avenue to Greenway Road		Wood, Patel and Assoc., Inc.	1994	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A371_932NewRiverfromGrandAvenuetoGreenwayRoad.pdf
NR035	A901.929S	Final Bridge Scour Assessment Reports for 16 Maricopa County Bridges, Vol. II Structure Nos. 9427, 9588, 9999, 8038, 7818, 9154, 9142, 7553 (Peoria, Olive over New River; Old US80 over Hassayampa; Rittenhouse, Haws, Power, Higley over Queen Creek; Deer Valley.		Cannon and Assoc., Inc.	1996					
NR036	A901.928S	Final Bridge Scour Assessment Reports for 16 Maricopa County Bridges, Vol. I Structure Nos. 9691, 8981, 9301, 9859, 9145, 7819, 8028, 8639 (Bell, Olive, Glendale, Camelback, Indian School, MC 85 Bridges over Agua Fria; New River, I-17 over New River)		Cannon and Assoc.	1996					
NR037	A901.942	Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual, Phoenix, Arizona (Including New River) Maricopa County, Arizona (Dreamy Draw, Cave Buttes Dam, Adobe Dam, ACDC, Cudia City, Cave Creek, Skunk Creek, Agua Fria)		U. S. Corps of Engineers-COE	1997	FCDMC	Electronic File delivered on CD	09/28/09	Mark Mayer	A901_942Operation_Maintenance_Repair_ReplacementandRehabilitationManual_PhoenixArizona_IncludingN.pdf
NR038	A371.951S	Candidate Assessment Report, New River Channel Improvement, Grand Avenue to Skunk Creek, Assignment No. 1, Final Revision June 2000 (CAR)		Willdan	2000					
NR039	603.056S	Surveying for the Land Subsidence Evaluation of the Upper Agua Fria River Levees and for Levee Monitoring Camelback Ranch South Levee, Camelback Ranch North Levee, Glendale Airport Levee, New River Levees, and for Skunk Creek Levee		Premier Eng.	2000	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	603_056SurveyingfortheLandSubsidenceEvaluationoftheUpperAguaFriaRiverLeveesandforLeveeMonitoringC.pdf
NR040	A371.945S	Levee Monitoring for New River Levees (Olive to Grand), Assignment 1		Premier Eng.	2000	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_945LeveeMonitoringforNewRiverLevees_OlivetoGrand__Assignment1.pdf
NR041	A371.944S	Levee Monitoring for New River Levees (Bethany Home to Olive) Assignment 1		Premier Eng. Corp.	2000					
NR042	A371.952S	New River Channel Improvement, Grand Avenue to Skunk Creek, Addendum No. 1, Assignment No. 4		Willdan	2001					

New River Levee/Channel Data Collection Summary

Abbreviation Descriptions-
ADEM = Arizona Deptartment of Emergency Management
ADEQ = Arizona Deptartment of Environmental Quality
ADOT = Arizona Department of Transportation
ADWR = Arizona Department of Water Resources
ARIA = Arizona Regional Image Archive
FEMA = Federal Emergency Management Agency
NRCS = Natural Resource Conservation Service
USGS = United States Geological Survey

Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR043	A371.960	Geotechnical Engineering Report, New River Channel Bank Protection, Grand Avenue to Skunk Creek, Peoria, Arizona		Ricker, Atkinson, McBee and Assoc., Inc. for J2 Engineering and Environmental Design	2003					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR044	A371.963	New River Channelization, Grand Avenue to Skunk Creek, Conditional Letter of Map Revision Submittal, Technical Data Notebook (CLOMR, TDN)		J2 Eng. and Environmental Design; Wood, Patel and Assoc. Inc.	2004					
NR045	A371.965	Phase I Environmental Site Assessment, New River Bank Stabilization and Channelization Project, Peoria, Arizona		Kleinfelder, Inc.	2004					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR046	A371.611S	New River Channel, Grand Avenue to Skunk Creek and Paradise Shores Design Report, Final Report		J2 Engineering and Environmental Design	2005	FCDMC	Electronic File delivered on CD	10/27/09	Mark Mayer	A371_611NewRiverChannel_GrandAvenuetoSkunkCrekandParadiseShoresDesignReport_FinalReport.pdf
NR047	A371.964	New River Channelization, Grand Avenue to Skunk Creek, Letter of Map Revision Submittal (LOMR)		Flood Control District of Maricopa County-FCD for Submittal to FEMA	2007					Mark Mayer Reviewed. Document probably not relevent or material out of date.
NR048		Design Plans for New River Channelization, Bethany Home Road to Olive Avenue Contract FCD 91-36	As-Built (11/4/93) 45 sheets	Coe and Van Loo Consult. Eng. Inc.	December 1991	FCDMC	Electronic File on CD	09/05/09	JTA	New River Channelization Bethany Hm to Olive 2.pdf
NR049		Supplamental Design Plans for New River Channelization, Bethany Home road to Olive Avenue (99th Avenue Realigned) Contract FCD 91-36	As-Built (3/12/93) 45 sheets	Coe and Van Loo Consult. Eng. Inc.	April 1989	FCDMC	Electronic File on CD	09/05/09	JTA	New River Channelization Bethany Hm to Olive multi.pdf
NR050	DACW09-90-B0003	Gila River Basin, Phoenix, Arizona and Vicinity (Including New River), New River Erosion Control and Esthetic Treatment, Grand Avenue to Olive Avenue	Landscape and Irrigation plans Record Drawing As Built 1/17/91 22 sheets	U. S. Corps of Engineers-COE	1989	FCDMC	Electronic File on CD	09/05/09	JTA	New River Erosion Control and Esthetic Treatment.pdf
NR051	DACW09-88-R0001	Gila River Basin, Phoenix, Arizona and Vicinity (Including New River), New River Improvements, Grand Avenue to Olive Avenue	Record Drawing As Built 1990 40 sheets	U. S. Corps of Engineers-COE	February 1988	FCDMC	Electronic File on CD	09/05/09	JTA	New River Improvements Grand Avenue to Olive Road.pdf
NR052	DACW09-88-R0001	Gila River Basin, Phoenix, Arizona and Vicinity (Including New River), New River Improvements, Grand Avenue to Olive Avenue	Record Drawing As Built 1990 40 sheets **Same as NR51**	U. S. Corps of Engineers-COE	February 1989	FCDMC	Electronic File from FTP site	09/23/09	FCDMC	New River Improvements Grand to Olive Avenue.pdf

New River Levee/Channel
Data Collection Summary

Abbreviation Descriptions-
ADEM = Arizona Deptartment of Emergency Management
ADEQ = Arizona Deptartment of Environmental Quality
ADOT = Arizona Department of Transportation
ADWR = Arizona Department of Water Resources
ARIA = Arizona Regional Image Archive
FEMA = Federal Emergency Management Agency
NRCS = Natural Resource Conservation Service
USGS = United States Geological Survey

Project	Document	DOCUMENT				TRACKING				
Library No.	Reference No.	Title	Description	Author	Date	Source	Format	Date Collected	Collected By	File Name/Notes
NR053		Construction Plans for New River Improvements Utility Relocations, Olive Avenue to Grand Avenue, Project No. FCD 88-2	As Built 11 sheets Contains Extra Sheet (7 of 9)	NBS/Lowery Engineers & Planners	November 1987	FCDMC	Electronic File on CD	09/05/09	JTA	New River Improvements Utility Relocations, Grand Avenue to Olive Avenue.pdf
NR054		Flood Control Distirct of Maricopa County, Contract No. FDC 99-067, New River Levee (Olive Ave to Grand Ave) Levee Monitoring	Levee Survey 16 sheets	Premier Engineering	12/20/00	FCDMC	Electronic File on CD	09/05/09	JTA	New River Levee Olive Ave to Grand Ave.pdf
NR055		Flood Control Distirct of Maricopa County, Contract No. FDC 99-067, New River Levee (Bethnay Home Rd to Olive Ave) Levee Monitoring	Levee Survey 15 sheets	Premier Engineering	12/20/00	FCDMC	Electronic File on CD	09/05/09	JTA	New River Levee Bethany hm to Olive.pdf
NR056		Construction Plans for New River Improvements Utility Relocations, Olive Avenue to Grand Avenue, Project No. FCD 88-2	As Built 10 sheets **Simular to NR53**	NBS/Lowery Engineers & Planners	November 1987	FCDMC	Electronic File from FTP site	09/23/09	FCDMC	New River Utility Relocations Olive to Grand Avenue.pdf
NR057		Plans for the Construction of New River - Grand Avenue to Skunk Creek Including Paradise Shores, PCN 400 06 31, FCD Contract No. FCD 2004C014	As Built 170 sheets	J2 Engineering and Environmental Design	January 2005	FCDMC	Electronic File on CD	09/05/09	JTA	New River-Grand Avenue to Skunk Creek Including Paradise Shores.pdf

Exhibit 3: Flood Zone Limits

0 200 400 800 1,200 1,600 2,000 Feet

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC

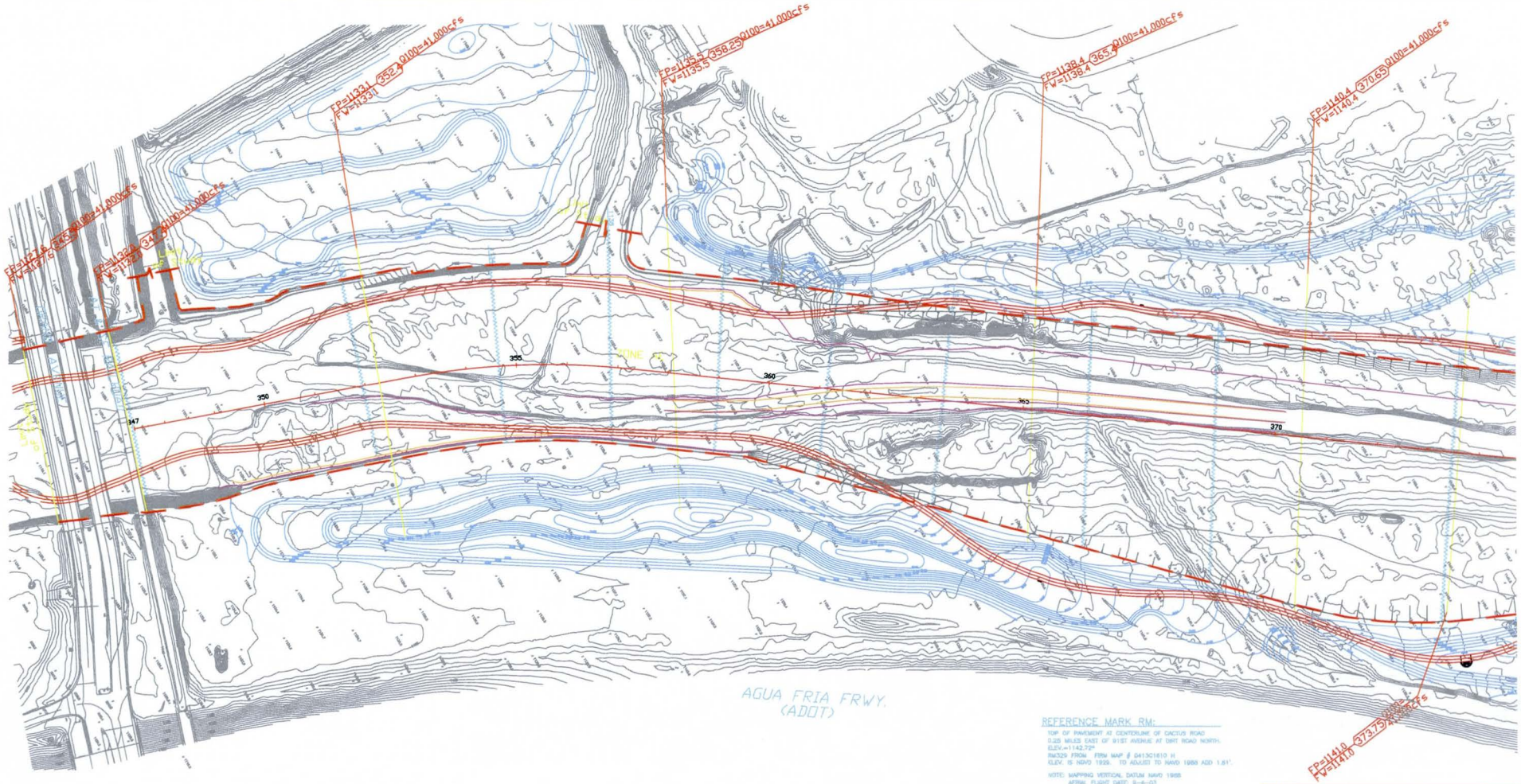
CREATED:
03-2010

EXHIBIT 3
FLOOD ZONE LIMITS

N

NEW RIVER LEVEE
MARICOPA COUNTY, ARIZONA

New River, Grand Avenue to Skunk Creek, Floodplain Work Map 1 of J2 2005



REFERENCE MARK RM:

TOP OF PAVEMENT AT CENTERLINE OF CACTUS ROAD 0.25 MILES EAST OF 91ST AVENUE AT DIRT ROAD NORTH. ELEV.=1142.72'
RM325 FROM FIRM MAP # 04130151O H
ELEV. IS NGVD 1929. TO ADJUST TO NAVD 1988 ADD 1.61'.

NOTE: MAPPING VERTICAL DATUM NAVD 1988
AERIAL FLIGHT DATE: 9-4-03

LEGEND:

352.4	CROSS SECTION NUMBER
FP=1133.1	FLOODPLAIN WATER SURFACE
FW=1133.1	FLOODWAY WATER SURFACE
Q100=41,000cfs	100-YEAR PEAK DISCHARGE = 41,000 CUBIC FEET PER SEC.
1352	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	POST PROJECT CONDITION FLOODWAY BOUNDARY
	POST PROJECT CONDITION FLOODPLAIN BOUNDARY
	EFFECTIVE FLOODWAY BOUNDARY
	EFFECTIVE FLOODPLAIN BOUNDARY
ZONE AE	FLOOD INSURANCE RATE ZONE
365	EFFECTIVE FIS CROSS SECTION NUMBER

50 0 50 100
Scale In Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

NEW RIVER - GRAND AVENUE TO SKUNK CREEK
PROJECT NUMBER
FCD2003C001

	BY	DATE
DESIGNED	KD/SZ	12-04
DRAWN	KD/DH	12-04
CHECKED	JH/AP	12-04

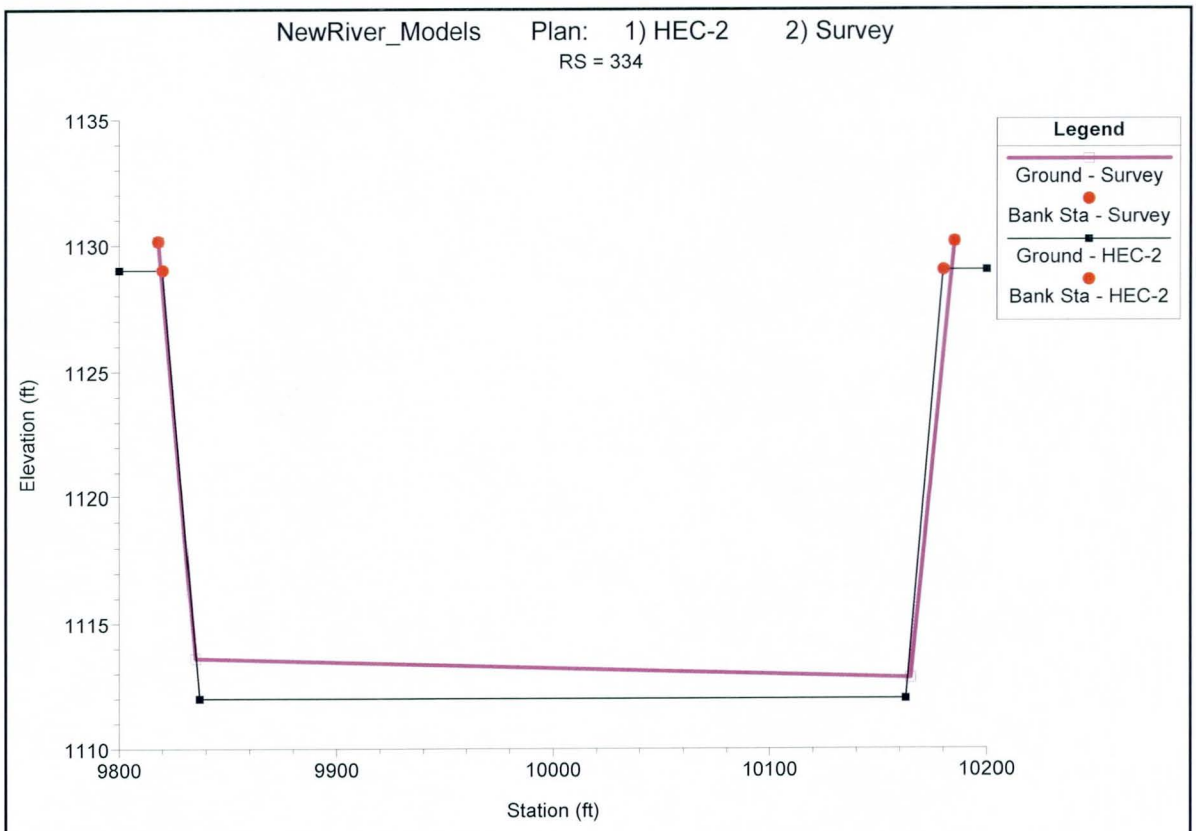
Registered Professional Engineer (Civil) CERTIFICATE NO. 32854 STEVEN ZOU ARIZONA, U.S.A.

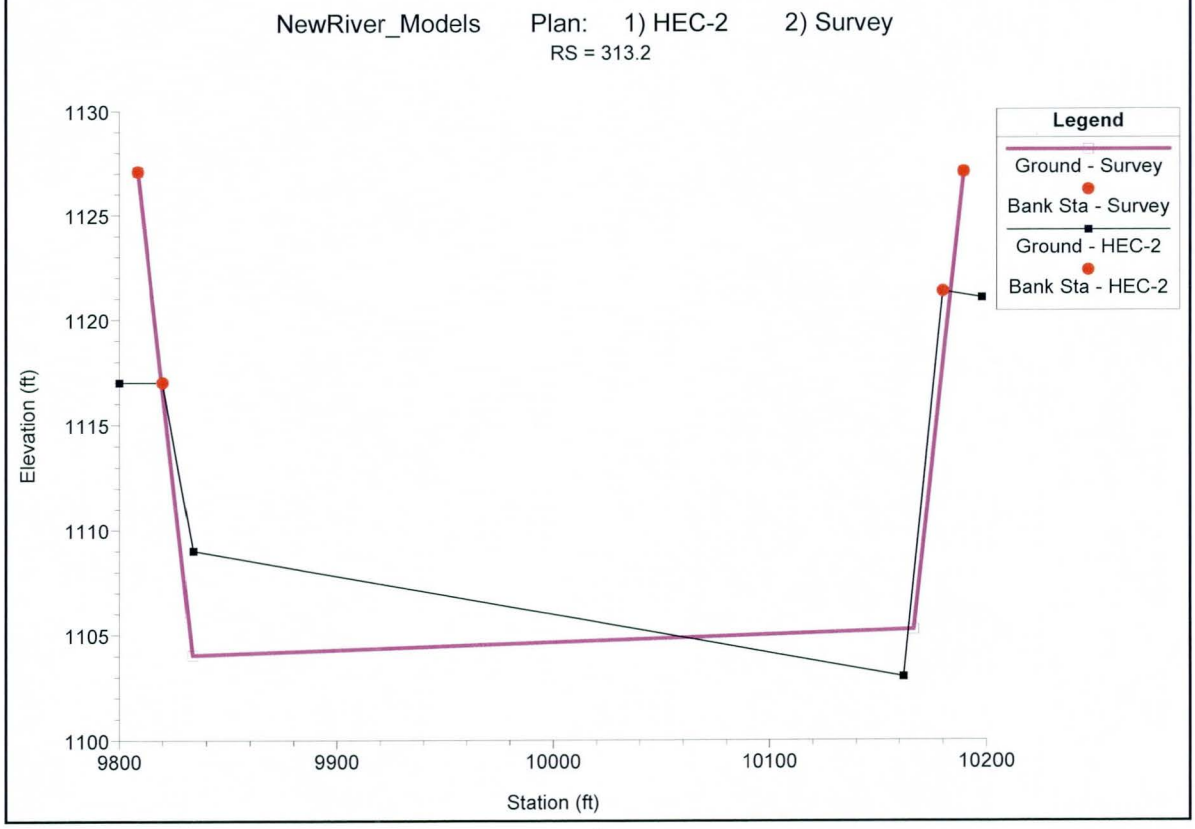
JE Engineering and Environmental Design
8222 South 48th Street, Ste. 135
Phoenix, AZ 85044

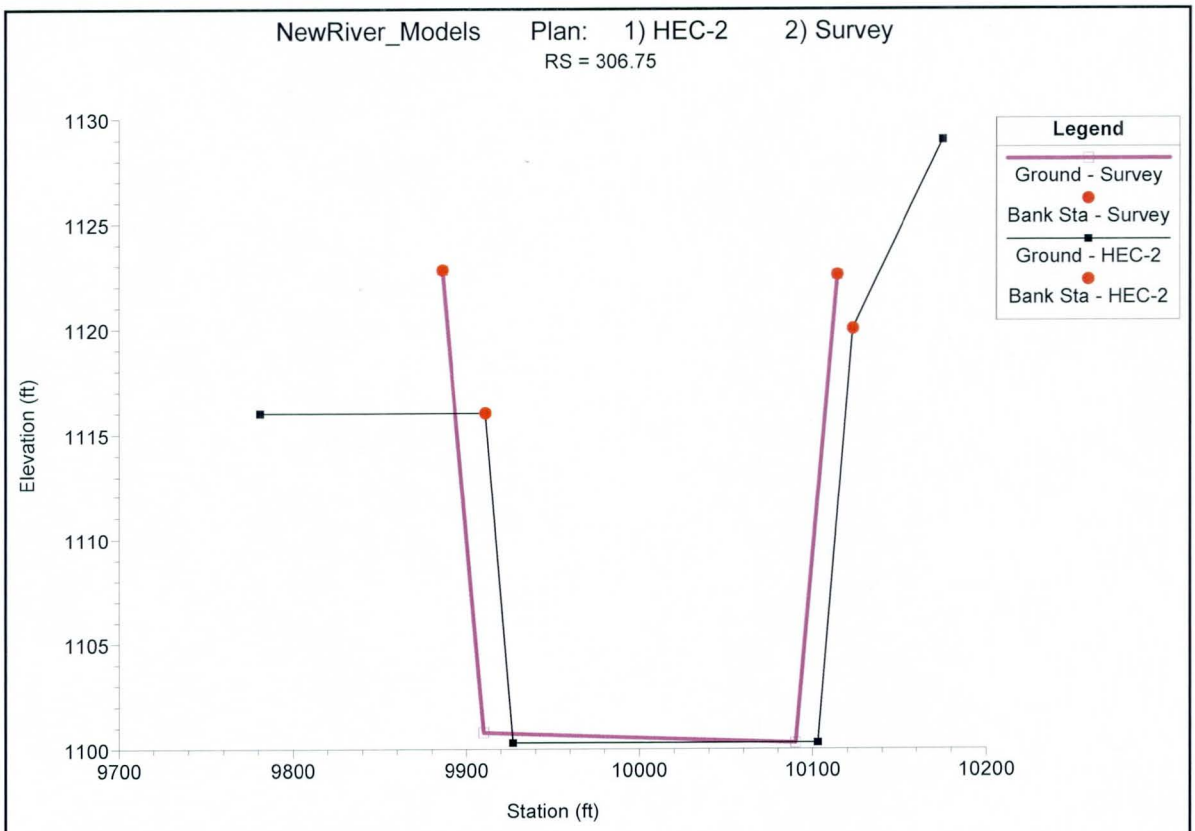
Wood, Patel & Associates, Inc.
8501 West Northern, Ste. 100
Phoenix, AZ 85021

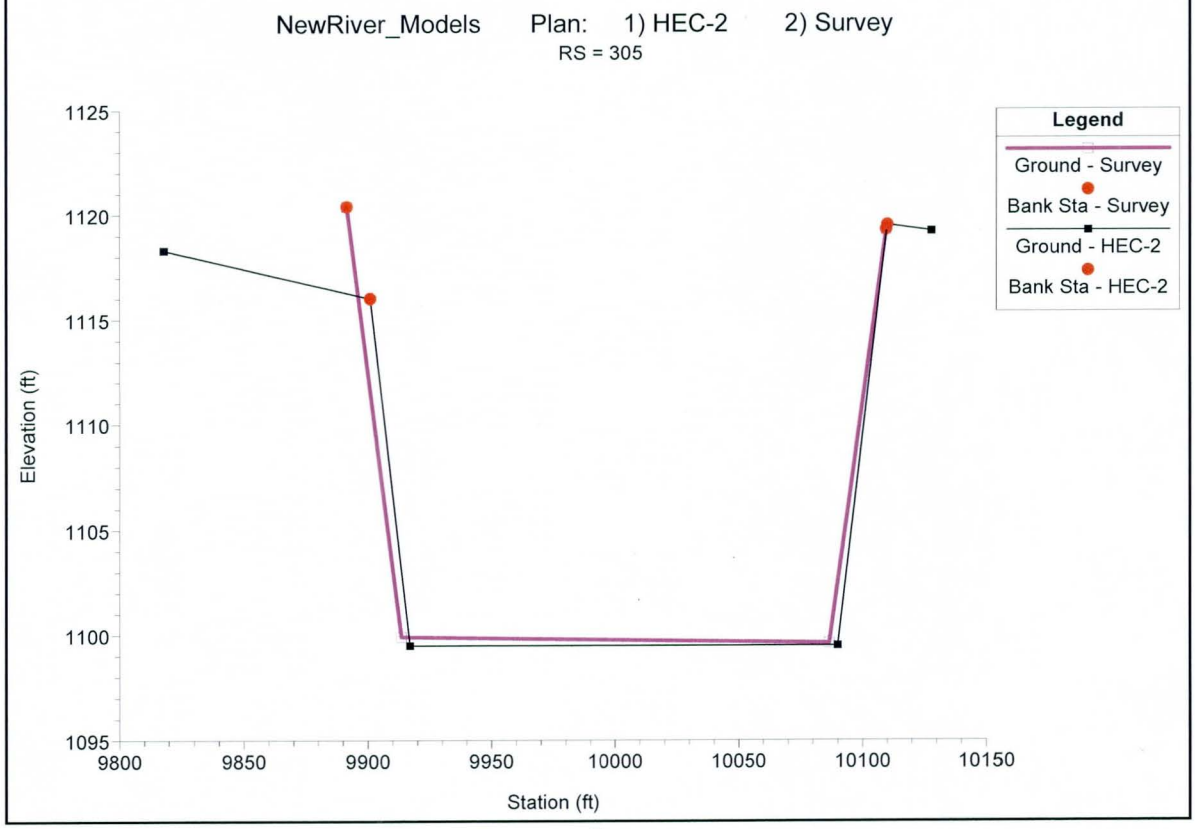
DRAWING NO. | EXHIBIT B1 STUDY WORK MAP | SHEET OF 1 4

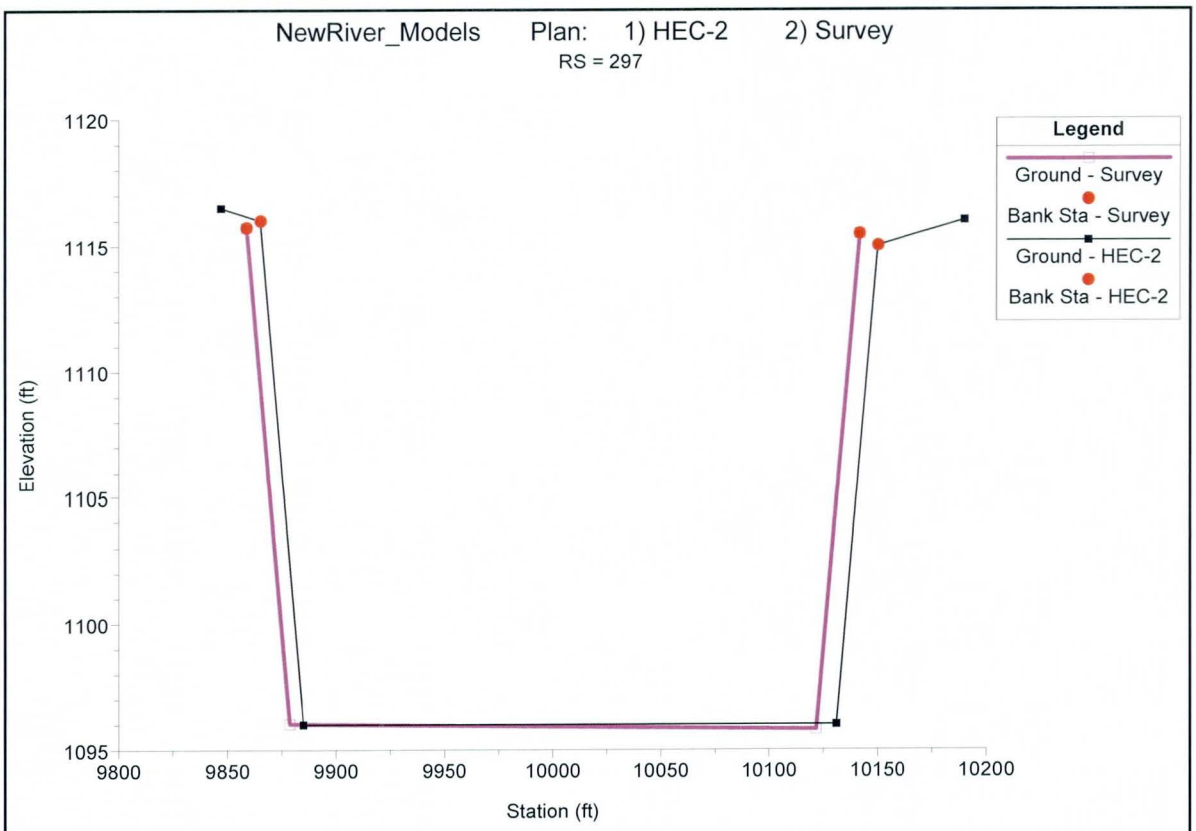
Cross section Comparison from HEC-RAS

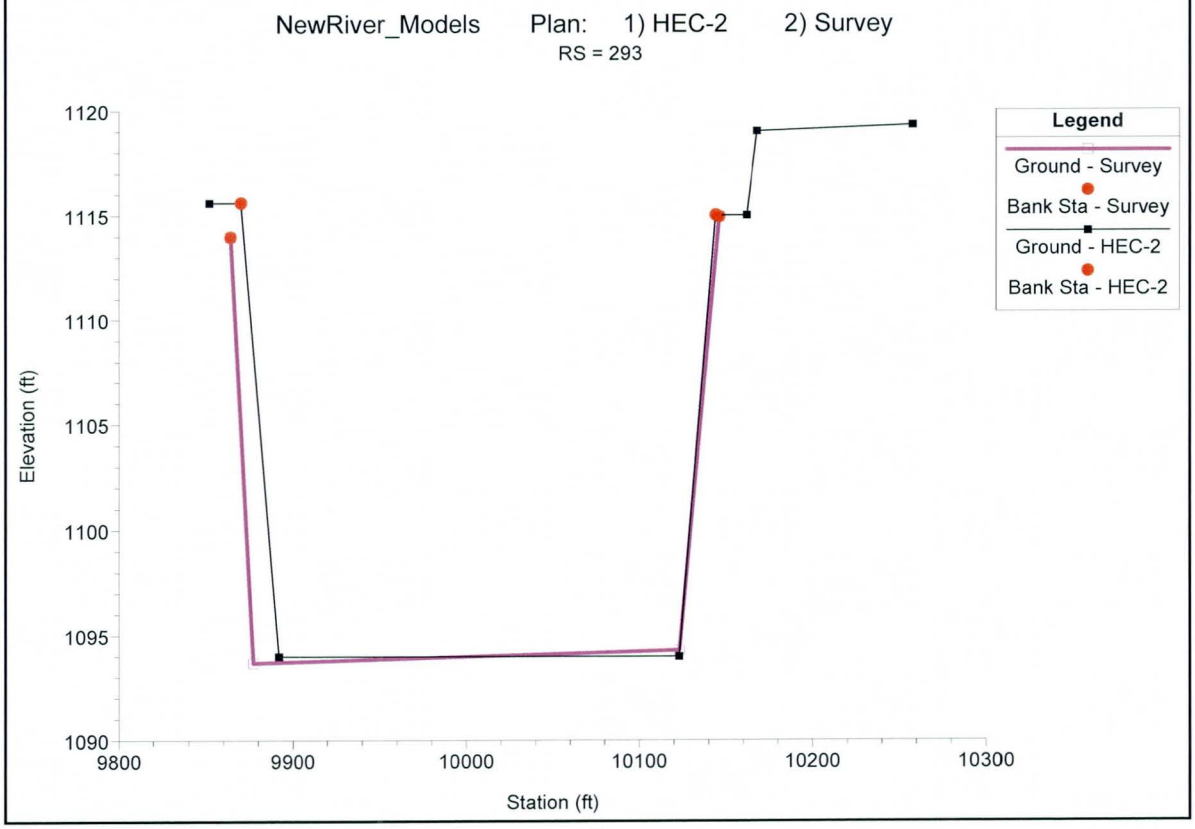

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 334
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1135
1130
1125
1120
1115
1110
9800
9900
10000
10100
10200
Station (ft)

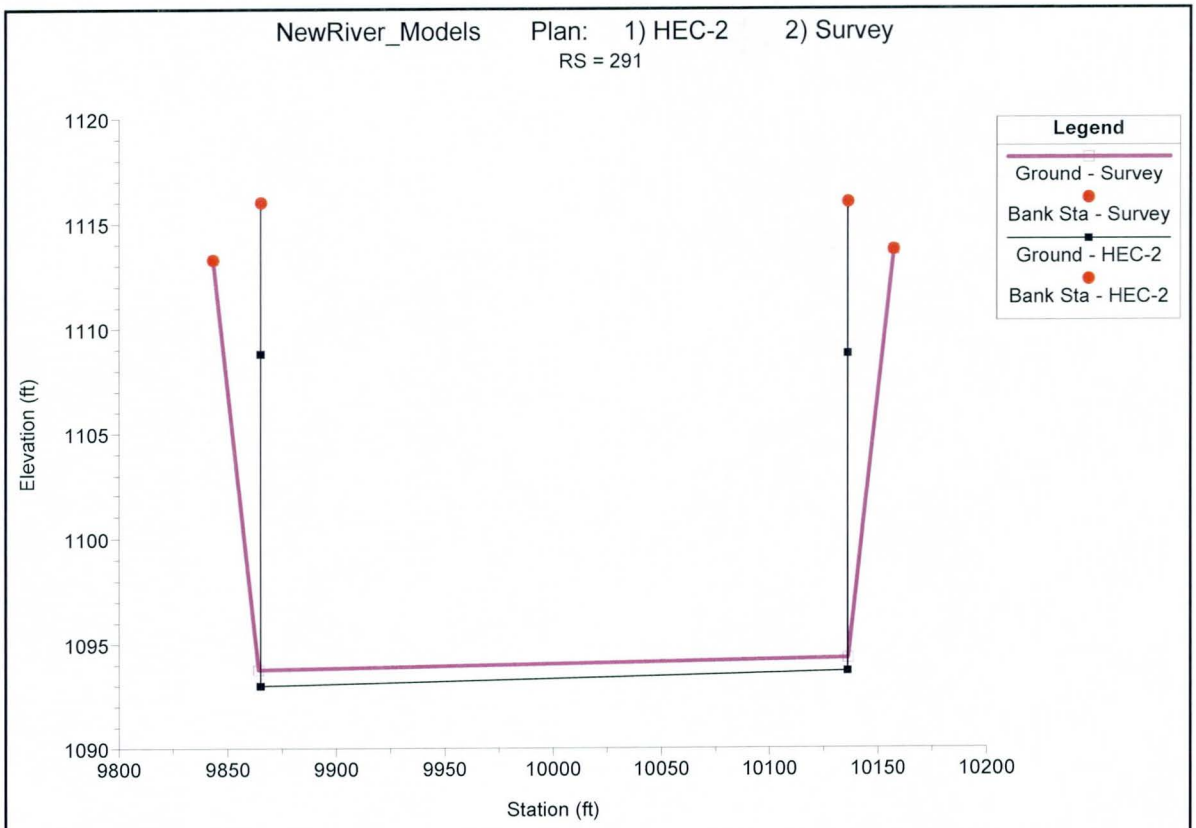

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 313.2
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1130
1125
1120
1115
1110
1105
1100
9800
9900
10000
10100
10200
Station (ft)

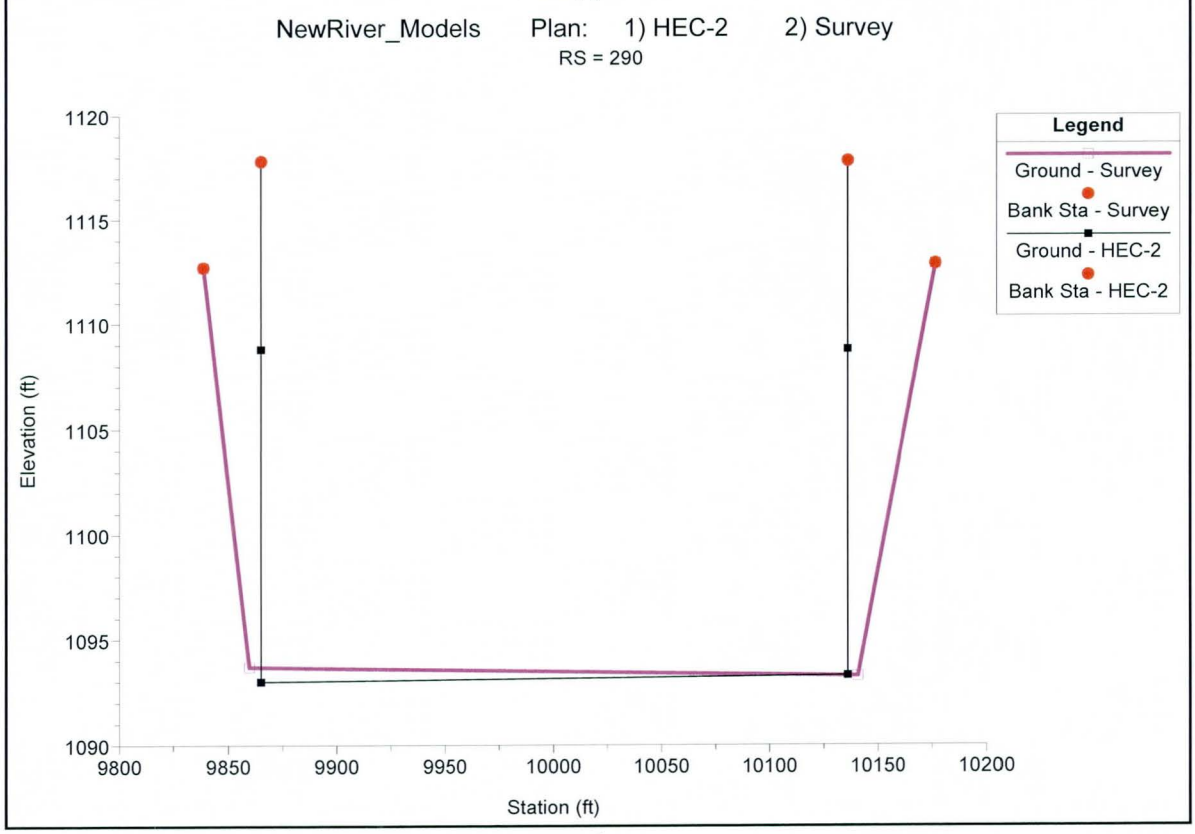

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 306.75
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1130
1125
1120
1115
1110
1105
1100
9700
9800
9900
10000
10100
10200
Station (ft)

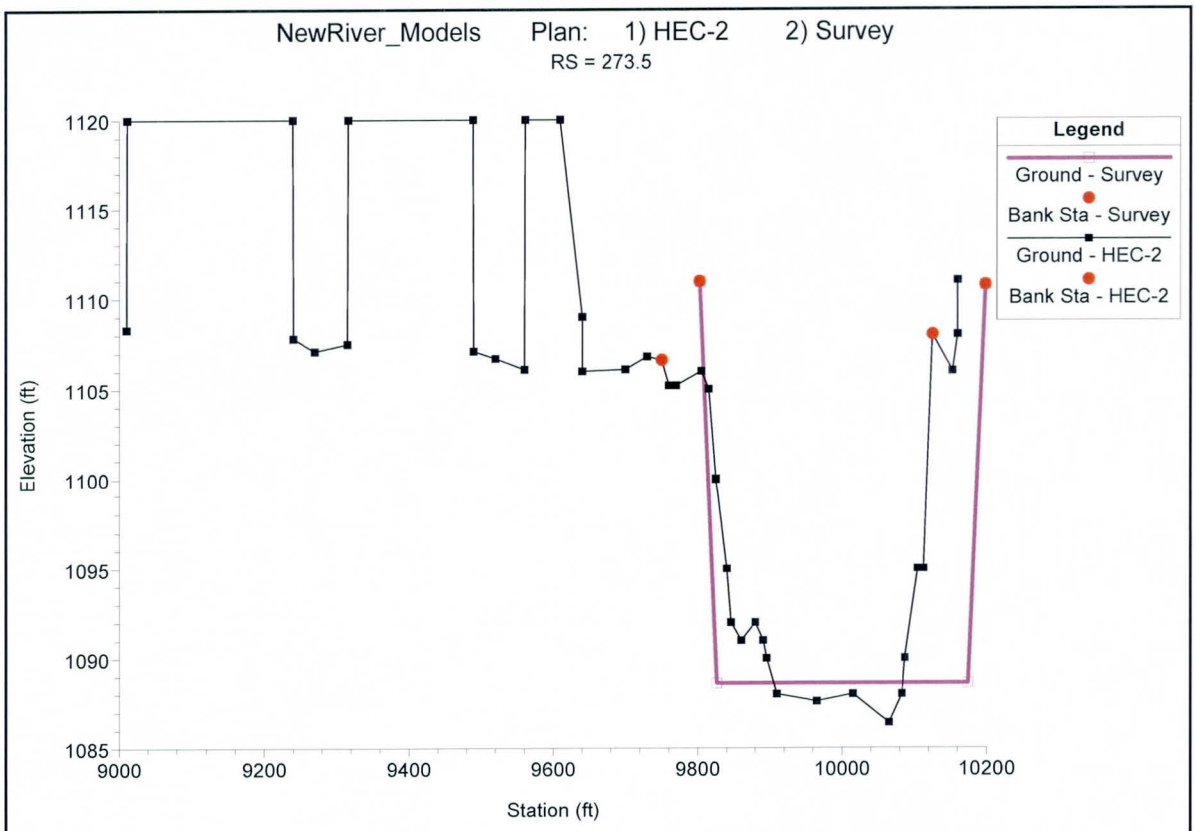

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 305
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1125
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
Station (ft)

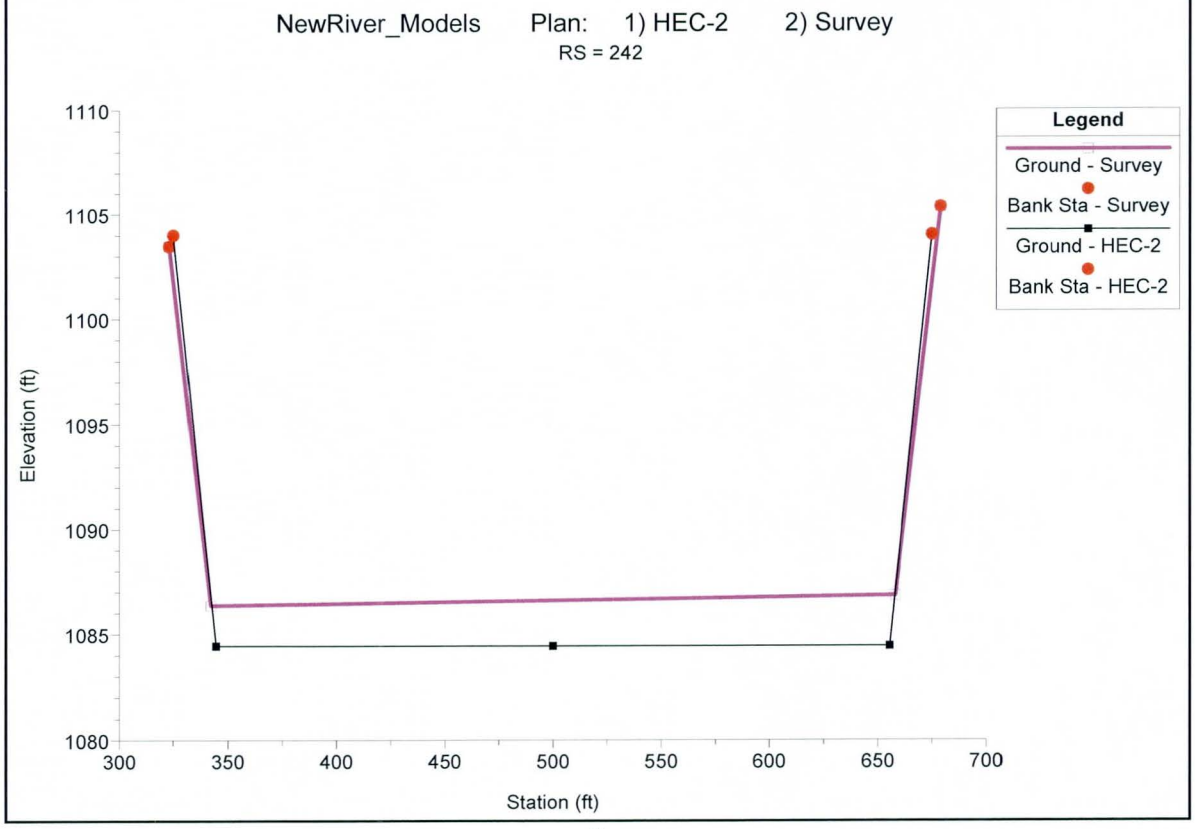

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 297
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

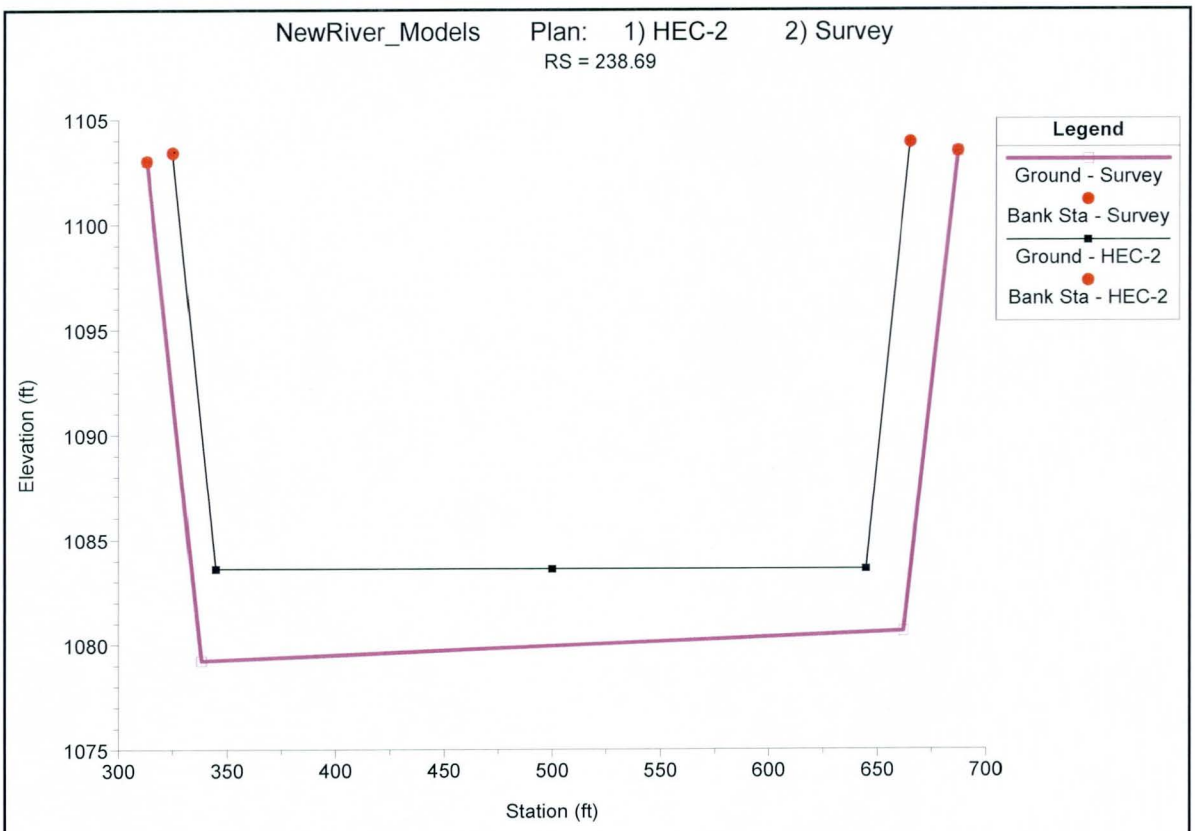

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 293
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9800
9900
10000
10100
10200
10300
Station (ft)

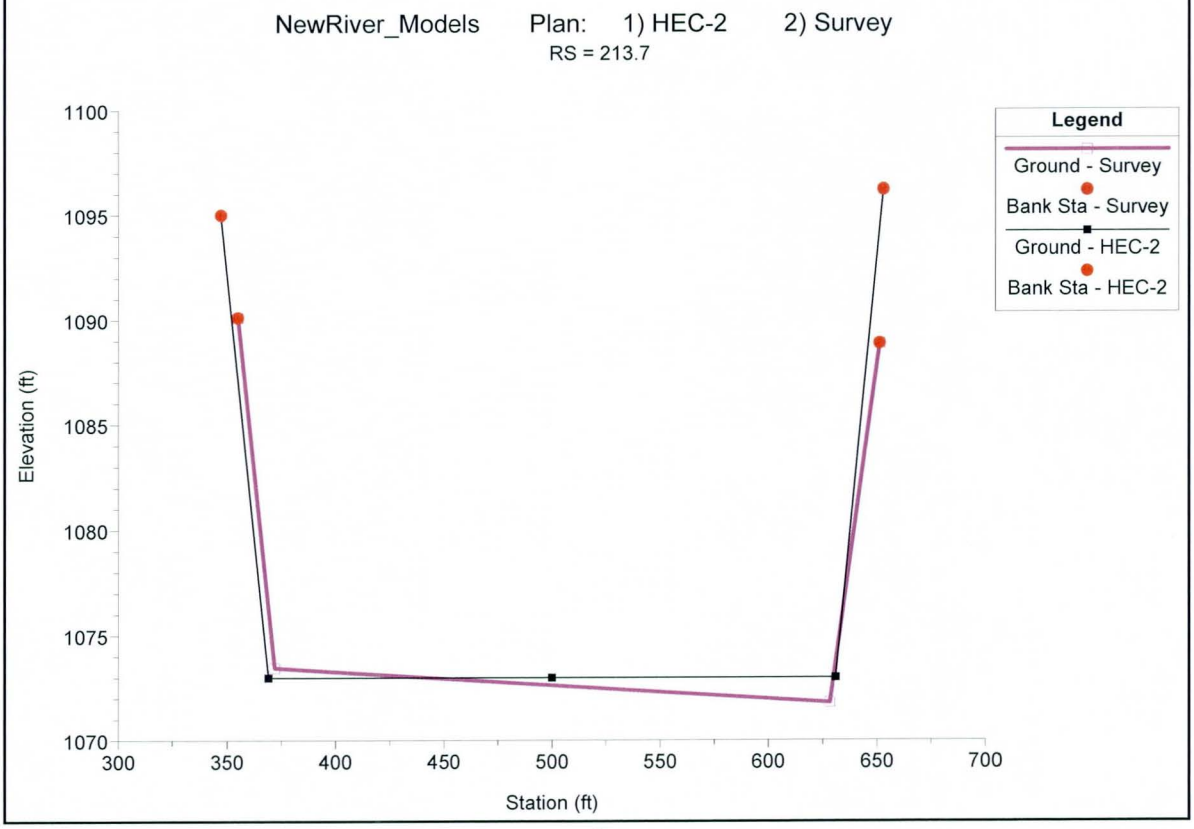

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 291
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)


NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 290
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

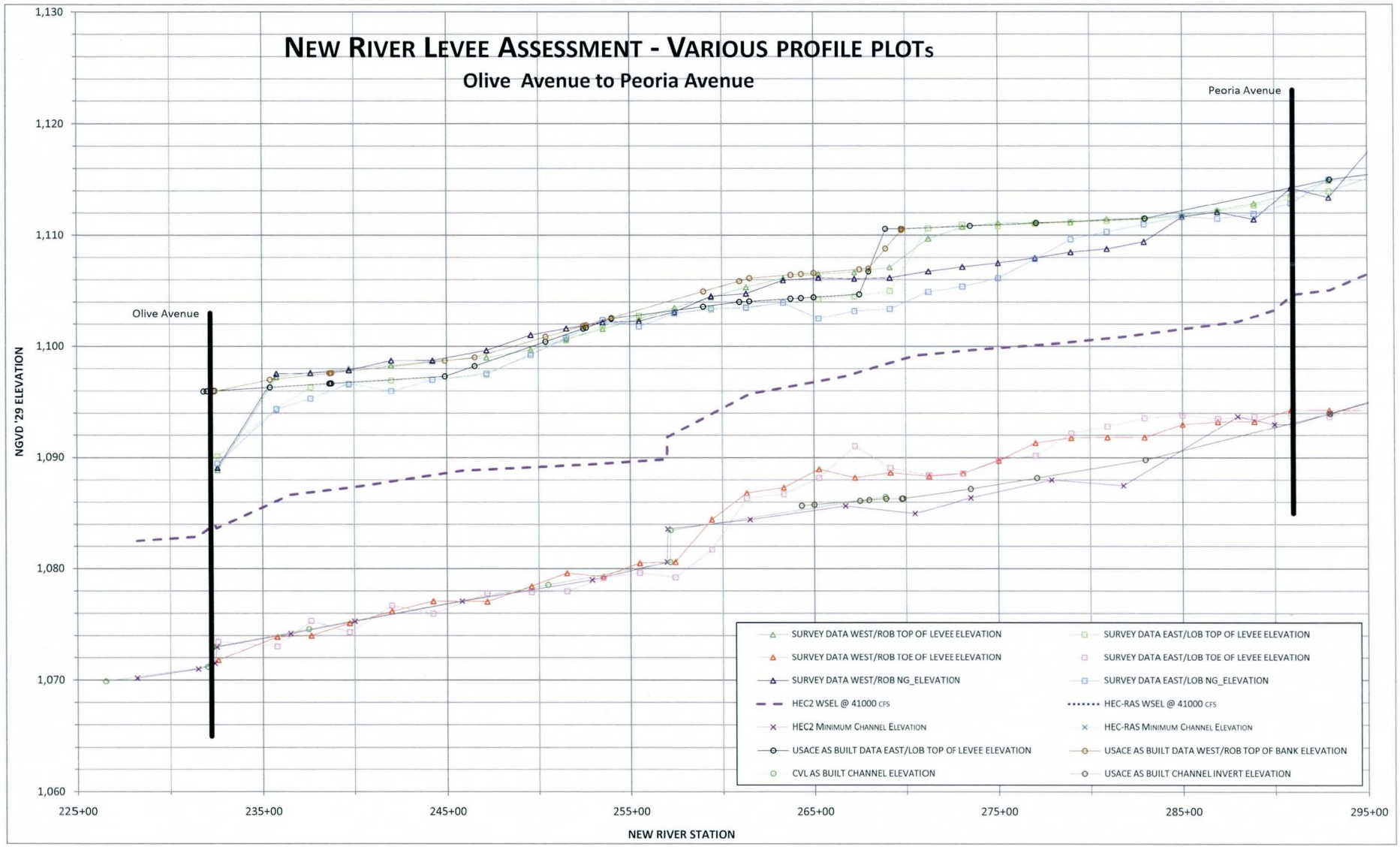

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 273.5
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
1085
9000
9200
9400
9600
9800
10000
10200
Station (ft)

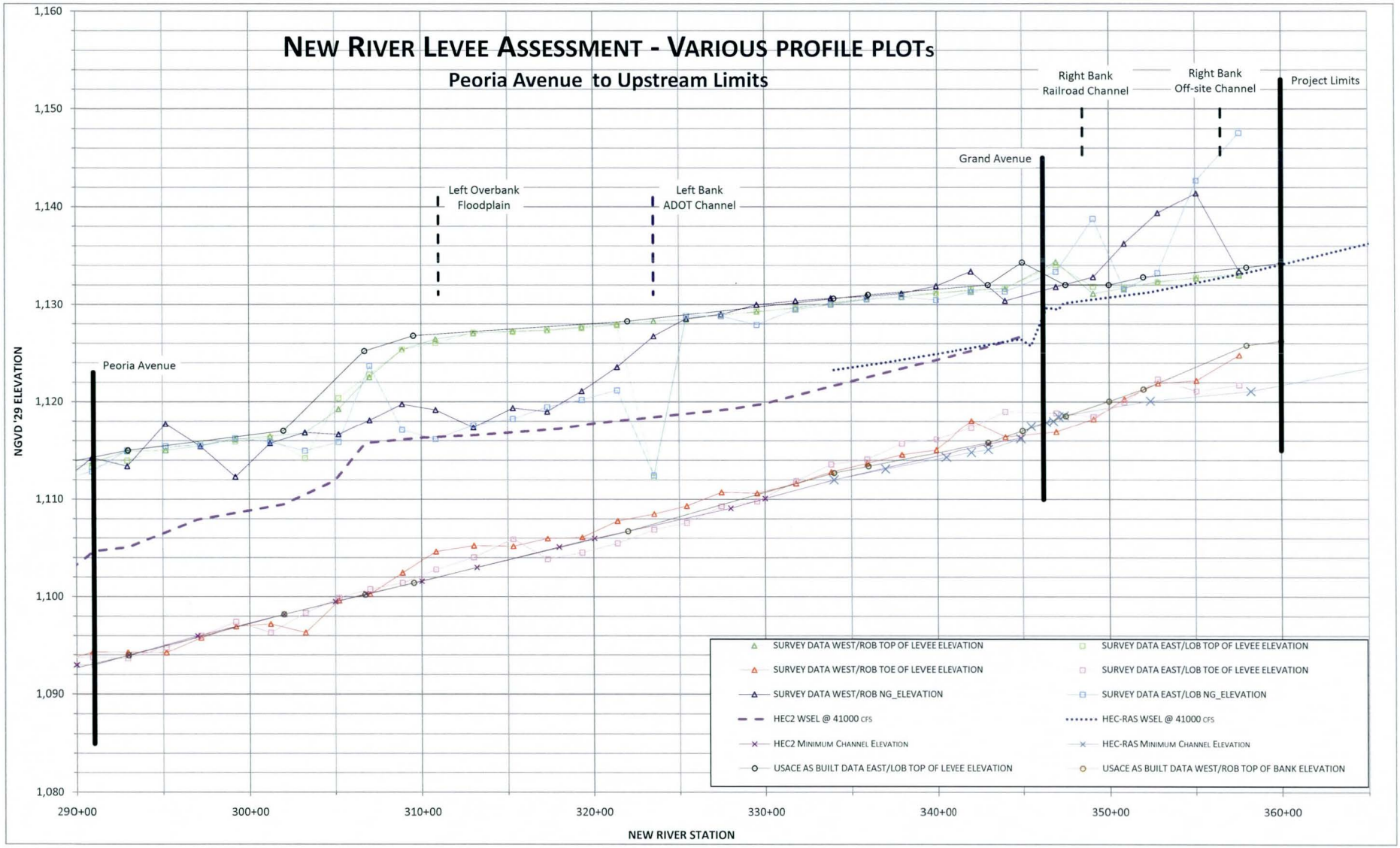

NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 242
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2
Elevation (ft)
1110
1105
1100
1095
1090
1085
1080
300
350
400
450
500
550
600
650
700
Station (ft)


NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 238.69
Elevation (ft)
Station (ft)
1105
1100
1095
1090
1085
1080
1075
300
350
400
450
500
550
600
650
700
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2


NewRiver_Models Plan: 1) HEC-2 2) Survey
RS = 213.7
Elevation (ft)
Station (ft)
1100
1095
1090
1085
1080
1075
1070
300
350
400
450
500
550
600
650
700
Legend
Ground - Survey
Bank Sta - Survey
Ground - HEC-2
Bank Sta - HEC-2

Profiles


NEW RIVER LEVEE ASSESSMENT - VARIOUS PROFILE PLOTs
Olive Avenue to Peoria Avenue
Olive Avenue
Peoria Avenue
NGVD '29 ELEVATION
1,130
1,120
1,110
1,100
1,090
1,080
1,070
1,060
225+00
235+00
245+00
255+00
265+00
275+00
285+00
295+00
NEW RIVER STATION
SURVEY DATA WEST/ROB TOP OF LEVEE ELEVATION
SURVEY DATA EAST/LOB TOP OF LEVEE ELEVATION
SURVEY DATA WEST/ROB TOE OF LEVEE ELEVATION
SURVEY DATA EAST/LOB TOE OF LEVEE ELEVATION
SURVEY DATA WEST/ROB NG_ELEVATION
SURVEY DATA EAST/LOB NG_ELEVATION
HEC2 WSEL @ 41000 CFS
HEC-RAS WSEL @ 41000 CFS
HEC2 MINIMUM CHANNEL ELEVATION
HEC-RAS MINIMUM CHANNEL ELEVATION
USACE AS BUILT DATA EAST/LOB TOP OF LEVEE ELEVATION
USACE AS BUILT DATA WEST/ROB TOP OF BANK ELEVATION
CVL AS BUILT CHANNEL ELEVATION
USACE AS BUILT CHANNEL INVERT ELEVATION


NEW RIVER LEVEE ASSESSMENT - VARIOUS PROFILE PLOTs
Peoria Avenue to Upstream Limits
Peoria Avenue
Left Overbank Floodplain
Left Bank ADOT Channel
Grand Avenue
Right Bank Railroad Channel
Right Bank Off-site Channel
Project Limits
NGVD '29 ELEVATION
1,160
1,150
1,140
1,130
1,120
1,110
1,100
1,090
1,080
290+00
300+00
310+00
320+00
330+00
340+00
350+00
360+00
NEW RIVER STATION
SURVEY DATA WEST/ROB TOP OF LEVEE ELEVATION
SURVEY DATA EAST/LOB TOP OF LEVEE ELEVATION
SURVEY DATA WEST/ROB TOE OF LEVEE ELEVATION
SURVEY DATA EAST/LOB TOE OF LEVEE ELEVATION
SURVEY DATA WEST/ROB NG_ELEVATION
SURVEY DATA EAST/LOB NG_ELEVATION
HEC2 WSEL @ 41000 CFS
HEC-RAS WSEL @ 41000 CFS
HEC2 MINIMUM CHANNEL ELEVATION
HEC-RAS MINIMUM CHANNEL ELEVATION
USACE AS BUILT DATA EAST/LOB TOP OF LEVEE ELEVATION
USACE AS BUILT DATA WEST/ROB TOP OF BANK ELEVATION

Parcels

County Parcels

CD with backup data

B. Hydraulic Evaluation

Appendix B

New River Channel
Maricopa County, Arizona

Hydraulic Evaluation

Table of Contents

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   1.2 HEC-RAS Model Development 1
      1.2.1 Steady Flow Data 1
      1.2.2 Boundary Conditions 1
      1.2.3 Flow Regime 1
      1.2.4 Development of the Hydraulic Modeling Parameters 1
   1.3 Hydraulic Analysis Results 3
   1.4 Summary 5

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Figure B-2: HEC-RAS Work map (Sheet 1) ..... Appendix B.4
Figure B-3: HEC-RAS Work map (Sheet 2) ..... Appendix B.4
FEMA DFIRM (reduced to 11"x17") ..... Appendix B.4

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B.1 Roughness Coefficient Estimation
B.2 Cross Section Plots
B.3 HEC-RAS Summary Tables
B.4 Figures

1. HEC-RAS Modeling

1.1 Updated Method Description

A HEC-RAS model was developed for hydraulic analysis (NewRiverChannel.*prj*) of the New River Channel between Olive Avenue and 1350 feet north of Grand Avenue. The analysis was completed using the U.S. Army Corps of Engineers HEC-RAS River Analysis System, Version 4.1.0 (January 2010). The subcritical steady-state flow regime option was selected. A hydraulic profile was computed for the 100-year peak discharge and the results were used in the evaluation of New River Channel.

1.2 HEC-RAS Model Development

New River was modeled using the steady-flow routine in HEC-RAS. For the purpose of this evaluation, only an existing condition HEC-RAS model was created. To aid in HEC-RAS modeling, ArcView procedures, tools and utilities were used to process field survey data and incorporated into the HEC-RAS model.

Additional discussion pertaining to HEC-RAS model development is provided below. In addition, HEC-RAS existing condition work maps are shown in **Figure B-2,** and **Figure B-3** provided in **Appendix B.4**.

1.2.1 Steady Flow Data

The 100-year peak discharge of 41,000 cfs below the confluence with Skunk Creek was taken from Table 3 in the Existing FEMA FIS dated September 30, 2005.

1.2.2 Boundary Conditions

The HEC-RAS starting downstream boundary condition for the 100-year discharge was taken directly from cross section 213.7 of the HEC-2 model (NRO2B.dat) provided by FEMA under a folder with LOMR designation 95-09-544P. The starting water surface elevation was converted from NGVD29 to match project datum of NAVD88 as shown below. The conversion factor was determined by comparing local benchmarks, survey control within the project area and the datum shift using the American Vertical Datum Conversion Utility software. The final data shift was determined to be equivalent to +1.85 feet or

1085.52 ft (NAVD 88)	=	1083.67 ft (NGVD 29)	+	1.85ft
(Project Datum)		*(NRO2B.out)*		*(Vertical Datum Correction)*

1.2.3 Flow Regime

A subcritical flow regime was used for HEC-RAS modeling per FEMA Standards.

1.2.4 Development of the Hydraulic Modeling Parameters

HEC-RAS modeling parameters were developed and incorporated into the current conditions model. The following elements were developed:

Stream Centerline

The stream centerline was developed based upon the construction centerline for New River Improvements, Grand Avenue to Olive Avenue (Corps 1992) and is located in the approximate center if the channel. For the purpose of this evaluation, the stream centerline was stationed based upon the centerline distance from Olive Avenue Bridge

upstream to the end of the levee approximately 1350 feet upstream of Grand Avenue. The existing project model (NRO2B.dat) incorporated a conversion in station equation line in the Corps 1988 design plans (**Appendix D**).

Cross-Section Cut Lines

Based on the stream centerline and the placement of the first cross section upstream of Olive Avenue, cross sections were placed approximately every 200 feet based upon the field survey points. Cross section ground points were derived by a best fit cross section line connecting ground points along the east and west bank of the new river. Survey points were projected perpendicular to the cross section lines and then added to the HEC-RAS model.

Bank Stations

Bank stations are located at the hinge point along the top of the soil cement bank protection.

Flow Path Centerlines

Flow path centerlines are used to identify the hydraulic flow path in the left overbank, main channel, and right overbank by identifying the center-of-mass of flow. Downstream reach lengths are calculated for each cut line based on the distance between cut lines along the flow path centerlines.

Cross-Sectional Roughness Coefficients

Roughness coefficients represent the resistance to flow in channels and overbank areas. HEC-RAS accounts for this roughness by use of the Manning's "n" value. The "n" value is determined from the values of the factors that affect the roughness, such as vegetation type and density, bed material and channel irregularities.

Manning's "n" values were assigned to riverine areas having the same vegetation and channel characteristics. These "n" values are shown schematically on **Figure B-1**, provided in **Appendix B.4**.

Ineffective flow areas

Due to the channelized nature of this reach of New River ineffective areas were not needed to remove area not expected to convey flow within the channel area or upstream/downstream for the bridge crossings at Peoria or Grand Avenues. However, ineffective flow areas were added at the bank stations for cross sections where the over bank areas appeared to be lower than the calculated water surface elevation (without levee analysis). These sections are listed in **Table B-1**.

Table B-1: HEC-RAS Ineffective Areas

HEC-RAS River Station	Ineffective area East or West
215.38	East
215.26	East/West
215.22	East/West
215.18	East/West
215.14	East/West
215.10	East/West
215.07	East/West

Note: East and West side of the New River Channel

1.3 Hydraulic Analysis Results

The results of the HEC-RAS model were used to assess whether this reach of the New River acts as a channel or under a levee condition for the water surface elevation determined in the HEC-RAS model.

In addition to the summary table below, Standard Table 1 results are located in **Appendix B.3**. The HEC-RAS output report is included on the data disk in **Appendix E**. HEC-RAS cross-sections plots are provided in **Appendix B.2**.

Table B-2: HEC-RAS Results for a New River

HEC-RAS River Station	Water Surface Elevation (ft)	(1)Minimum Overbank Elevation East (ft)	(1)Minimum Overbank Elevation West (ft)	Levee Condition Yes/No Side East/West
358.25	1135.4	1136	1135.5	No
355.82	1134.69	1135.1	1135.03	No
353.37	1133.86	1134.61	1134.61	No
351.14	1133.25	1133.53	1132.52	(2)No
349.15	1132.67	1133.41	1133.975	No
347.48	1132.48	1143.3	1143.3	No
347.17	Bridge			No
346.86	1131.29	1140.7	1140.7	No
346.02	Bridge			No
345.28	1130.52	1140.7	1140.7	No
342.36	1129.7	1133.18	1131.74	No
340.52	1128.95	1133.14	1134	No
338.46	1128.29	1132.32	1133.75	No
336.44	1127.5	1132.62	1132.99	No
334.45	1126.94	1132.39	1132.69	No
332.37	1125.18	1131.85	1132.5	No
330.32	1124.47	1131.34	1132.23	No
327.82	1123.72	1129.74	1131.85	No
325.76	1122.95	1130.62	1130.82	No
323.71	1122.37	1129.89	1130.37	No

HEC-RAS River Station	Water Surface Elevation (ft)	(1)Minimum Overbank Elevation East (ft)	(1)Minimum Overbank Elevation West (ft)	Levee Condition Yes/No Side East/West
321.8	1121.87	ADOT Channel	1128.58	No
319.71	1121.48	1123.04	1125.42	No
317.61	1121.13	1122.06	1122.64	No
315.64	1120.68	1121.31	1120.75	No
313.61	1120.26	1120.11	1118.38	Yes/East/West
311.37	1120.02	1119.44	1116.15	Yes/East/West
309.1	1119.3	1118.02	1120.03	Yes/East
307.12	1118	1117.874	1119.616	Yes/East
305.38	1115.24	1124.91	1119.3	No
301.55	1113.89	1116.82	1118.69	No
299.49	1113.68	1117.72	1117.6	No
297.57	1112.5	1118.11	1114.6	No
295.53	1111.4	1117.36	1116.76	No
293.49	1109.86	1117.29	1117.3	No
291.72	1109.22	1116.23	1115.92	No
291.37	Bridge			No
291.02	1108.54	1116.23	1115.92	No
289.18	1108.18	1114.72	1116.1	No
287.18	1107.61	1113.77	1113.25	No
285.26	1107.07	1113.33	1113.94	No
283.27	1106.5	1113.54	1113.51	No
281.22	1106.3	1112.83	1111.26	No
279.22	1105.71	1112.16	1110.62	No
277.26	1105.08	1111.47	1110.33	No
275.29	1104.54	1109.7	1109.81	No
273.36	1104.18	1108.31	1109.35	No
271.37	1103.73	1106.78	1109.01	No
269.52	1103.27	1106.74	1108.61	No
248.56	1102.4	1105.22	1108.03	No
246.62	1101.73	1105.03	1107.93	No
244.77	1100.72	1104.35	1108.02	No
242.79	1099.76	1105.78	1107.79	No
240.81	1095.62	1105.33	1106.61	No
238.9	1093.78	1104.95	1106.37	No
236.99	1094.09	1104.8	1104.95	No
235.1	1093.89	1103.61	1104.08	No
233.14	1093.46	1103.84	1103.84	No
231.18	1092.84	1102.5	1103.04	No
228.5	1092.11	1100.03	1102	No
226.62	1091.8	1099.33	1101.47	No
223.55	1090.9	1098.83	1100.58	No
221.39	1090.12	1097.83	1100.56	No
219.16	1089.6	1098.41	1099.7	No

HEC-RAS River Station	Water Surface Elevation (ft)	(1)Minimum Overbank Elevation East (ft)	(1)Minimum Overbank Elevation West (ft)	Levee Condition Yes/No Side East/West
217.06	1088.71	1097.16	1100.56	No
213.7	1085.52	1096.2	1098.77	No

Notes: 1. Minimum elevation from HEC-RAS Model.
2. Small ditch adjacent to toe of slope.

1.4 Summary

The results for the HEC-RAS floodplain modeling were utilized to evaluate segments of the New River channel that may be in a levee condition. The floodplain within the New River channel and areas in a levee condition are depicted on **Figure B-2** and **Figure B-3.** For comparison, the existing FEMA DFIRM is included in **Appendix B.4**

B Hydraulic Data for Levee Freeboard Evaluation

B.1 Roughness Coefficient Estimation

B.2 Cross Section Plots

New River Channel HEC-RAS cross sections 213.7 to 358.25
(Only cross sections within the study reach were plotted)

B.3 HEC-RAS Summary Tables

Standard Table 1 for New River "without-levee" condition

HEC-RAS Report (NewRiverChannel.pdf) on data disk in **Appendix E

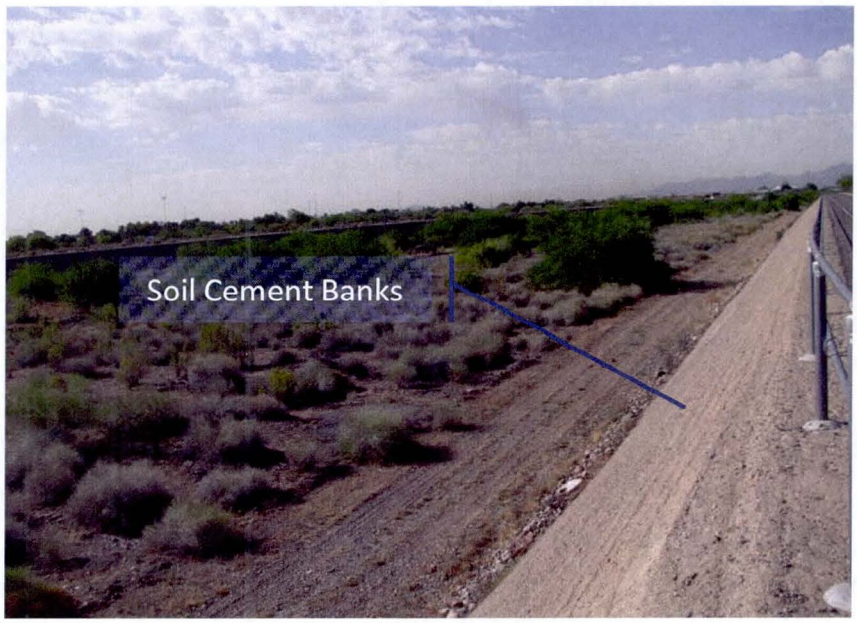
B.4 Figures

Figure B-2: HEC-RAS Manning's n-Values
Figure B-3: HEC-RAS Work map (Sheet 1)
Figure B-4: HEC-RAS Work map (Sheet 2)
FEMA DFIRM (reduced to 11"x17")

B.1 Roughness Coefficient Estimation

Project: **FCDMC 2007C051 Task #9**
Stream: **New River**
Location: **Maricopa County, Arizona**

Photo NR_13 : Typical photo of Soil Cement Banks



Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n_b	0.012-0.018	
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	0.025
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n_1	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n_2	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n_3	0.002-0.010	
	Medium		0.010-0.025	
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n_4	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.025
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				**0.025**

Project: **FCDMC 2007C051 Task #9**
Stream: **New River**
Location: **Maricopa County, Arizona**

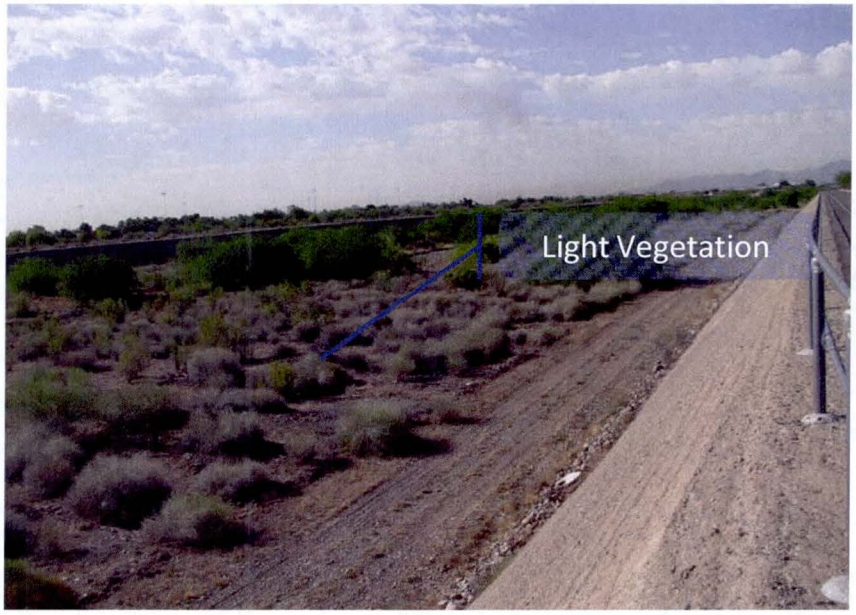
Photo NR_114 : Typical photo of Low Flow Channel

Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n_b	0.012-0.018	
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	0.03
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n_1	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n_2	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n_3	0.002-0.010	
	Medium		0.010-0.025	
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n_4	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.03
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				**0.030**

Low Flow Channel

Project: **FCDMC 2007C051 Task #9**
Stream: **New River**
Location: **Maricopa County, Arizona**

Photo NR_13 : Typical photo of Light Vegetation



Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n_b	0.012-0.018	
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	0.03
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n_1	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n_2	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n_3	0.002-0.010	0.01
	Medium		0.010-0.025	
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n_4	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.04
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				**0.040**

Project: **FCDMC 2007C051 Task #9**
Stream: **New River**
Location: **Maricopa County, Arizona**

Photo NR_35 : Typical photo of Medium Vegetation

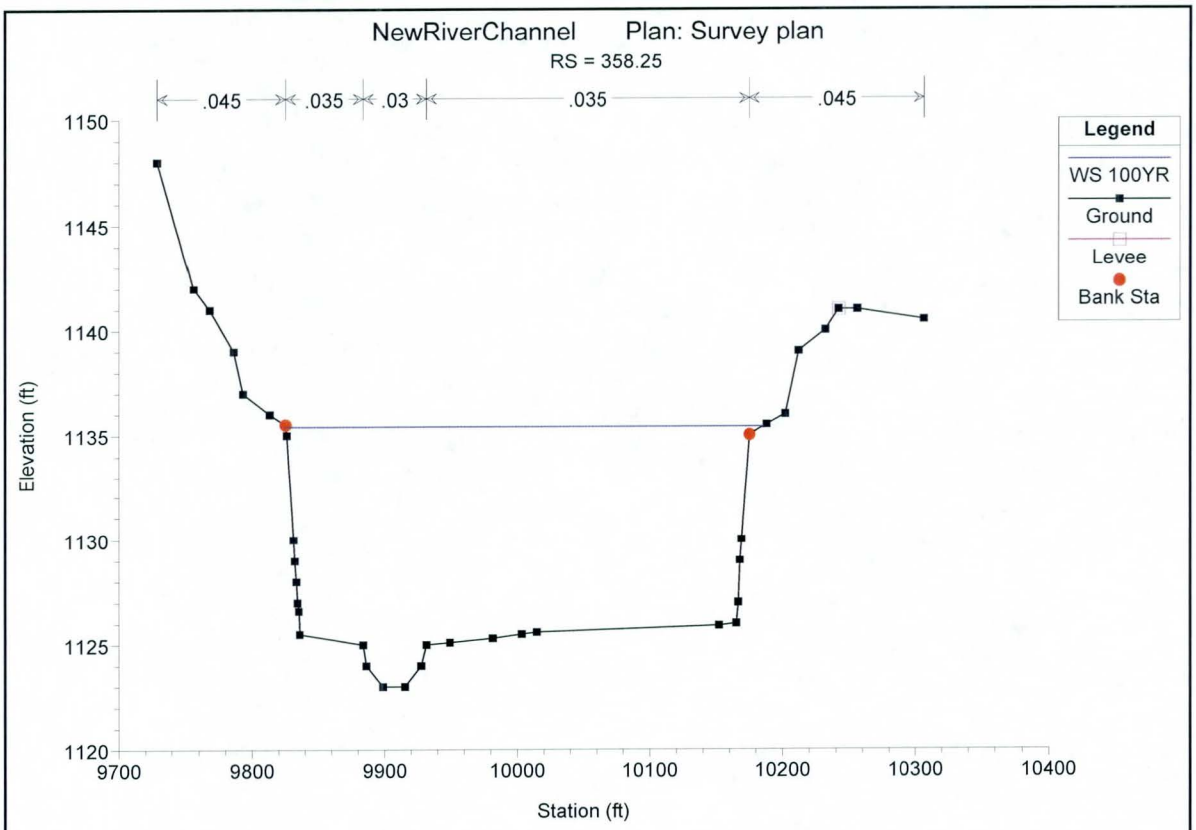
Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n_b	0.012-0.018	
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	0.03
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n_1	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n_2	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n_3	0.002-0.010	
	Medium		0.010-0.025	0.02
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n_4	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.05
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				**0.050**

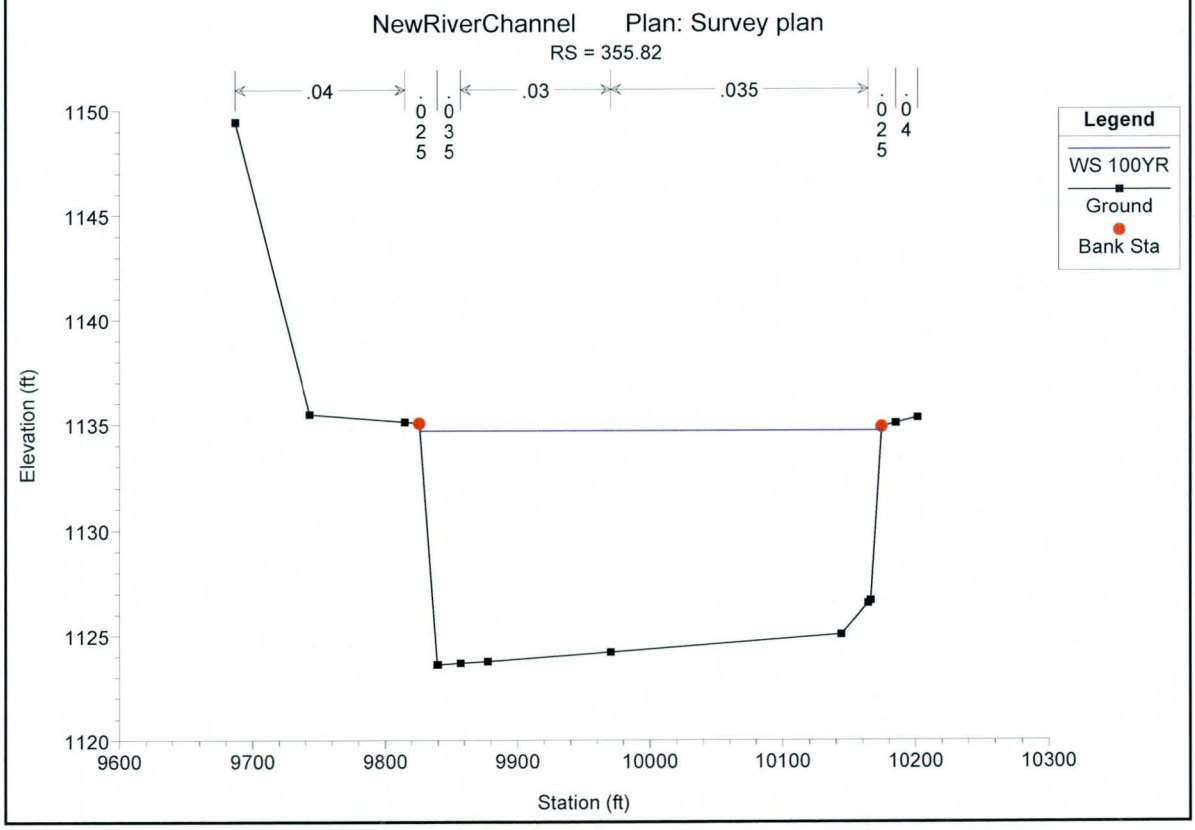
Project: **FCDMC 2007C051 Task #9**
Stream: **New River**
Location: **Maricopa County, Arizona**

Photo NR_10 : Typical photo of Heavy Vegetation

Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n_b	0.012-0.018	
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	0.03
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n_1	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n_2	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n_3	0.002-0.010	
	Medium		0.010-0.025	
	Large		0.025-0.050	0.04
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n_4	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.07
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				**0.070**

B.2 Cross Section Plots


NewRiverChannel Plan: Survey plan
RS = 358.25
.045
.035
.03
.035
.045
Legend
WS 100YR
Ground
Levee
Bank Sta
Elevation (ft)
1150
1145
1140
1135
1130
1125
1120
9700
9800
9900
10000
10100
10200
10300
10400
Station (ft)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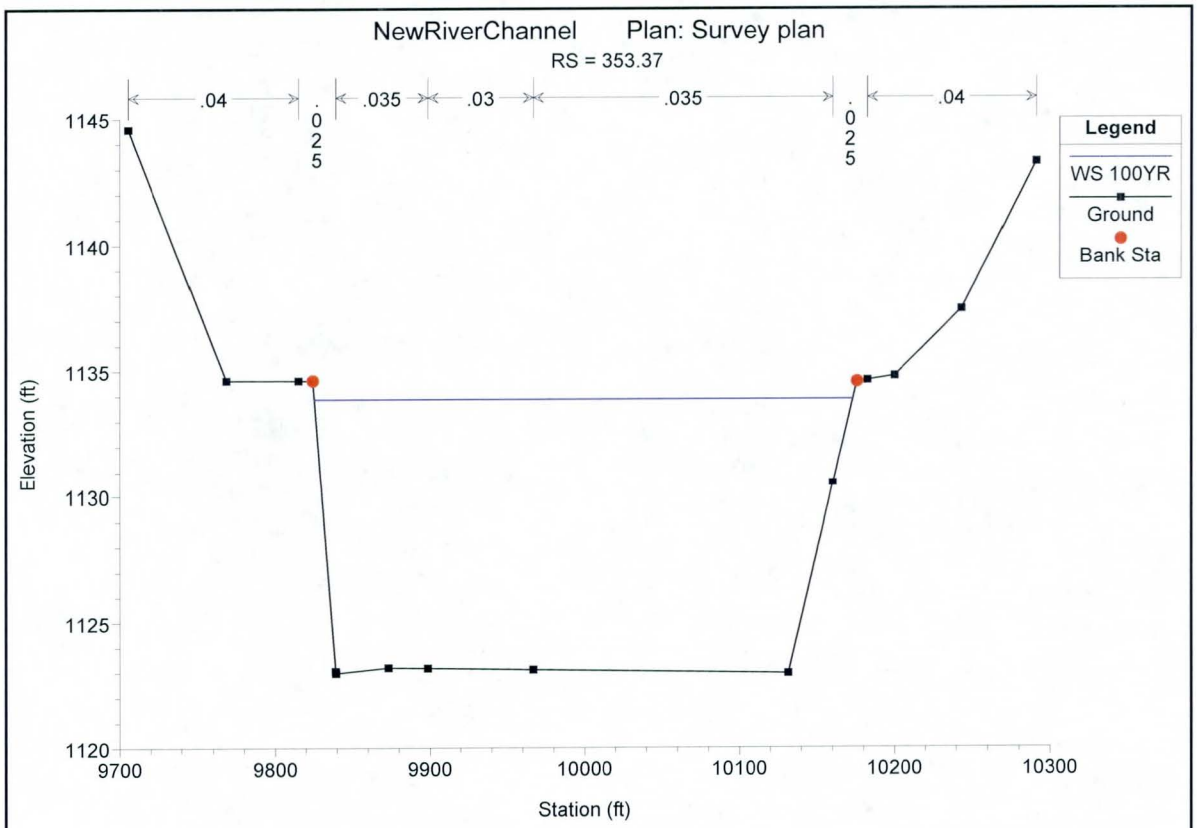
.025
.035
.03
.035
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1150
1145
1140
1135
1130
1125
1120
9600
9700
9800
9900
10000
10100
10200
10300
Station (ft)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.025
.035
.03
.035
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
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1130
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9700
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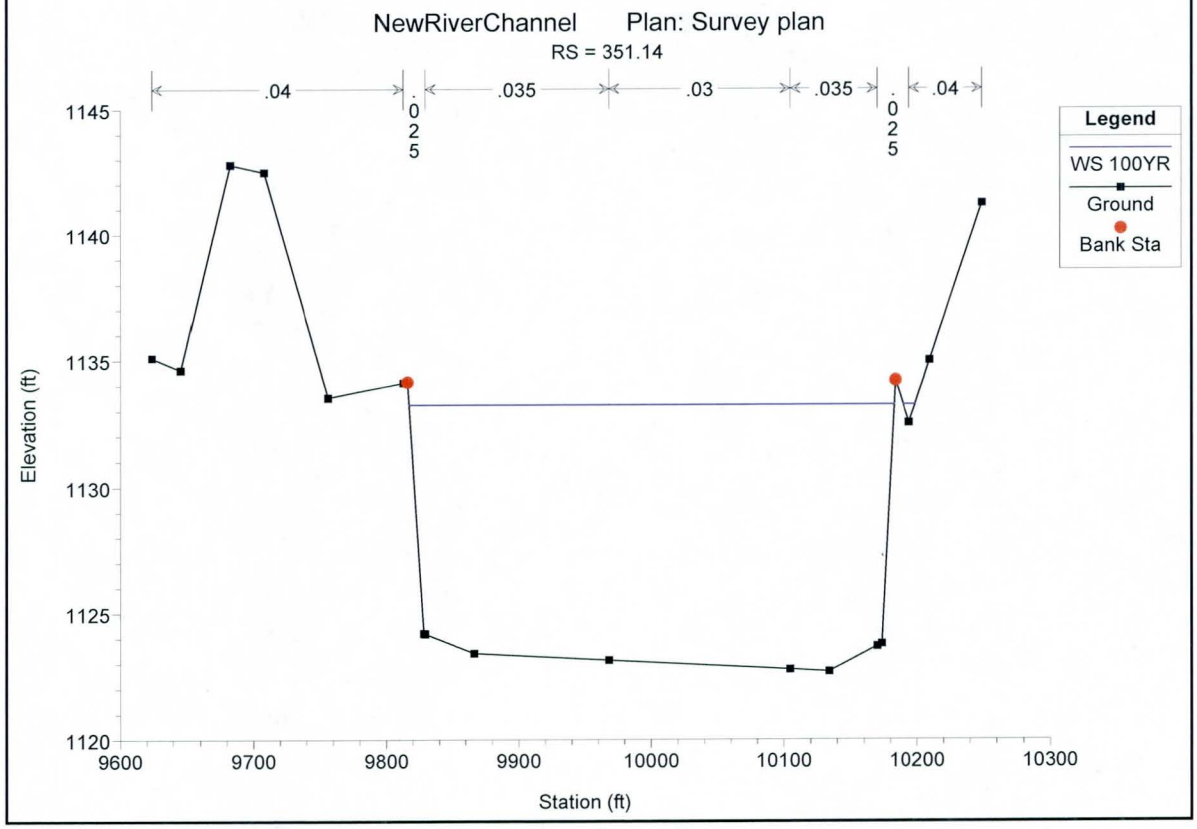
10100
10200
10300
Station (ft)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.025
.035
.03
.035
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
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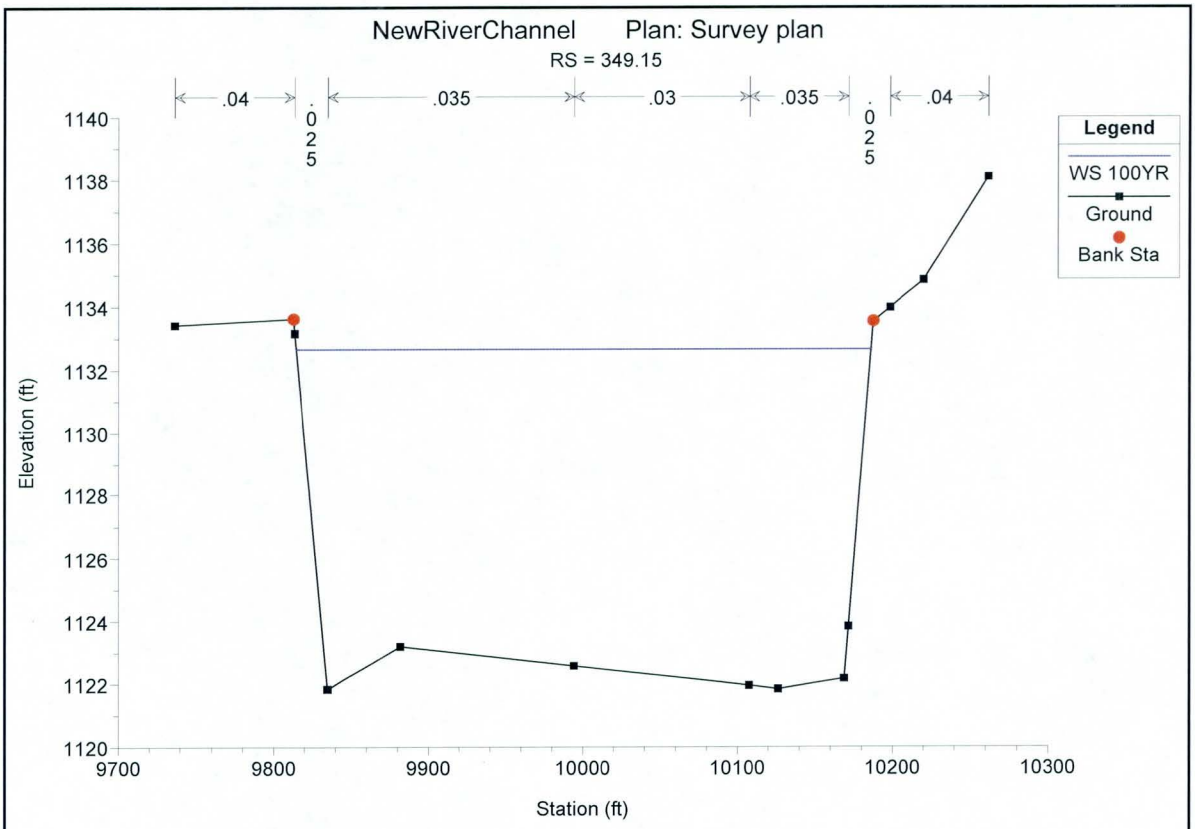
1130
1125
1120
9600
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
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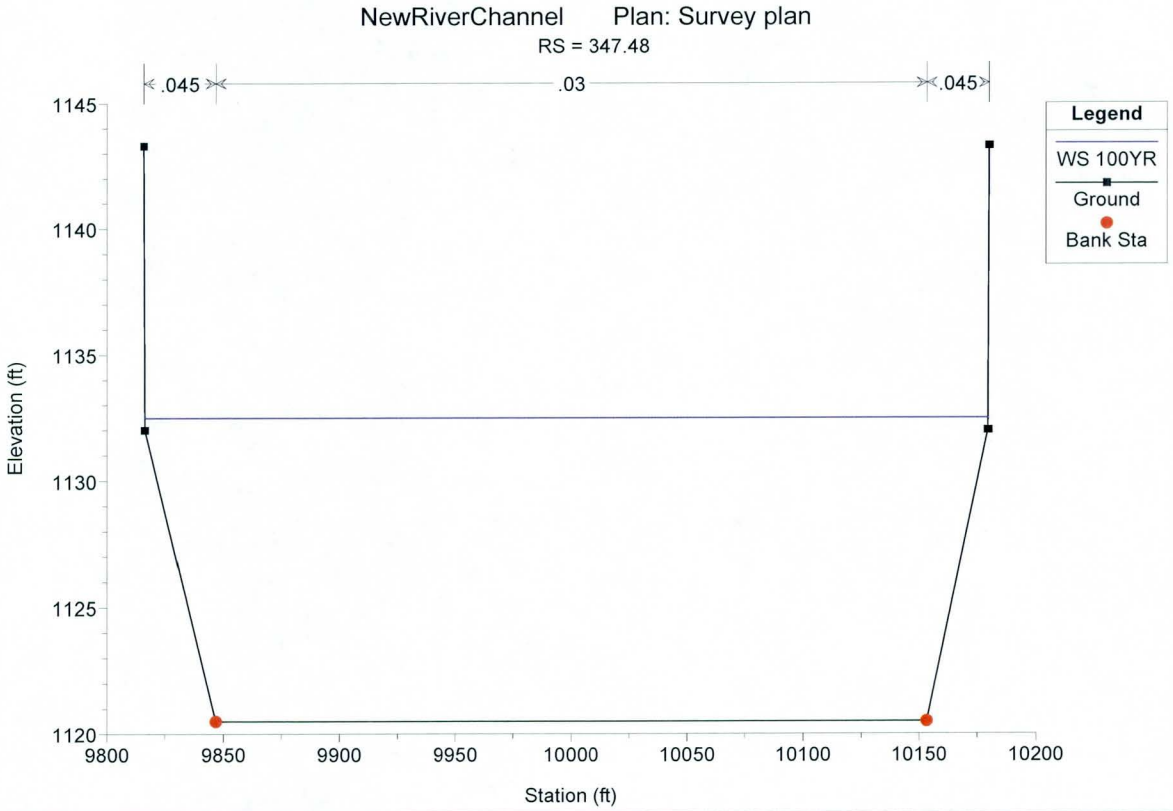
.025
.035
.03
.035
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1140
1138
1136
1134
1132
1130
1128
1126
1124
1122
1120
9700
9800
9900
10000
10100
10200
10300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.03
.045
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
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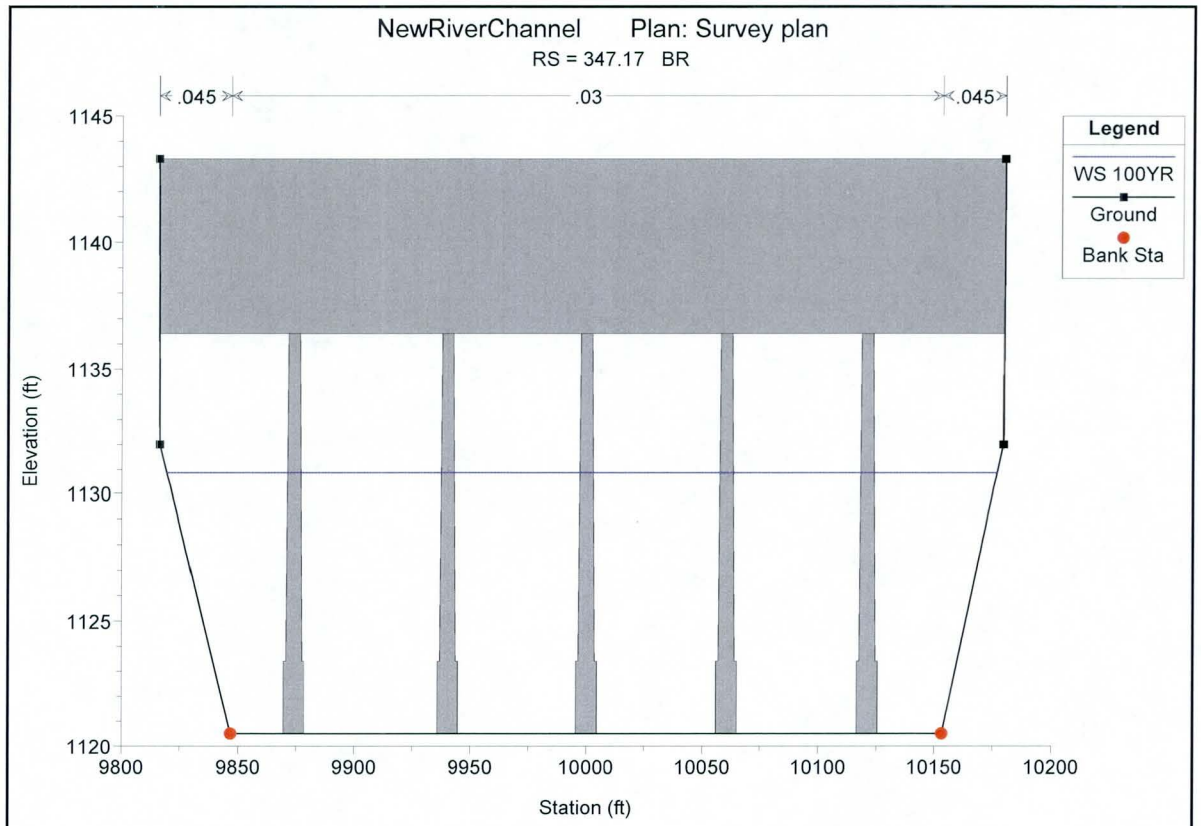
1140
1135
1130
1125
1120
9800
9850
9900
9950
10000
10050
10100
10150
10200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.03
.045
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
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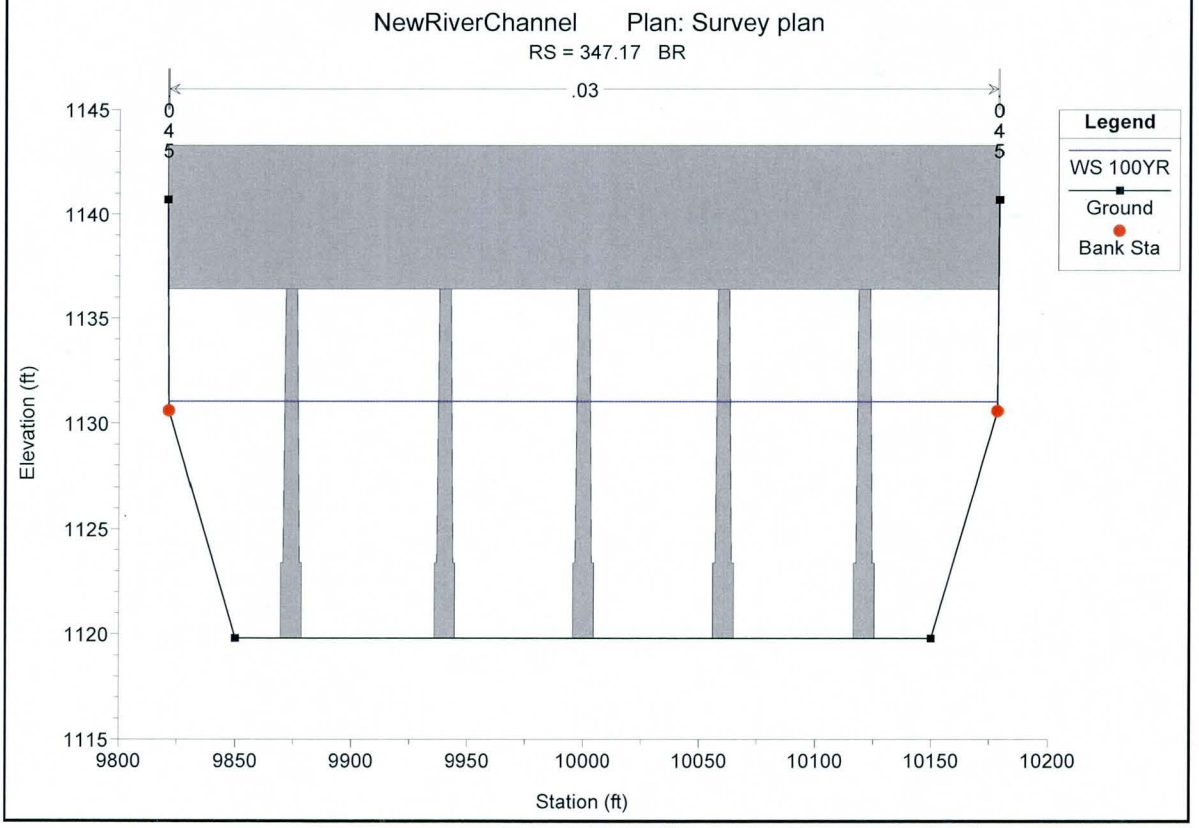
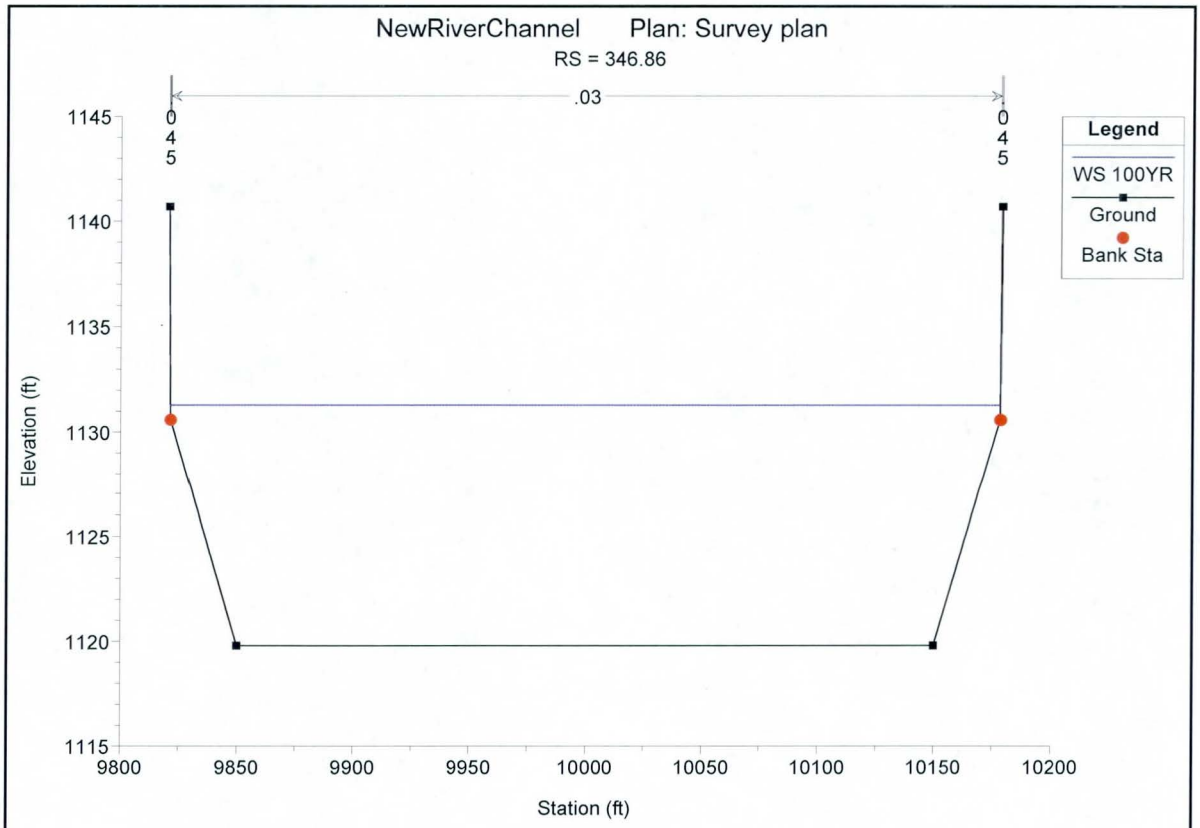
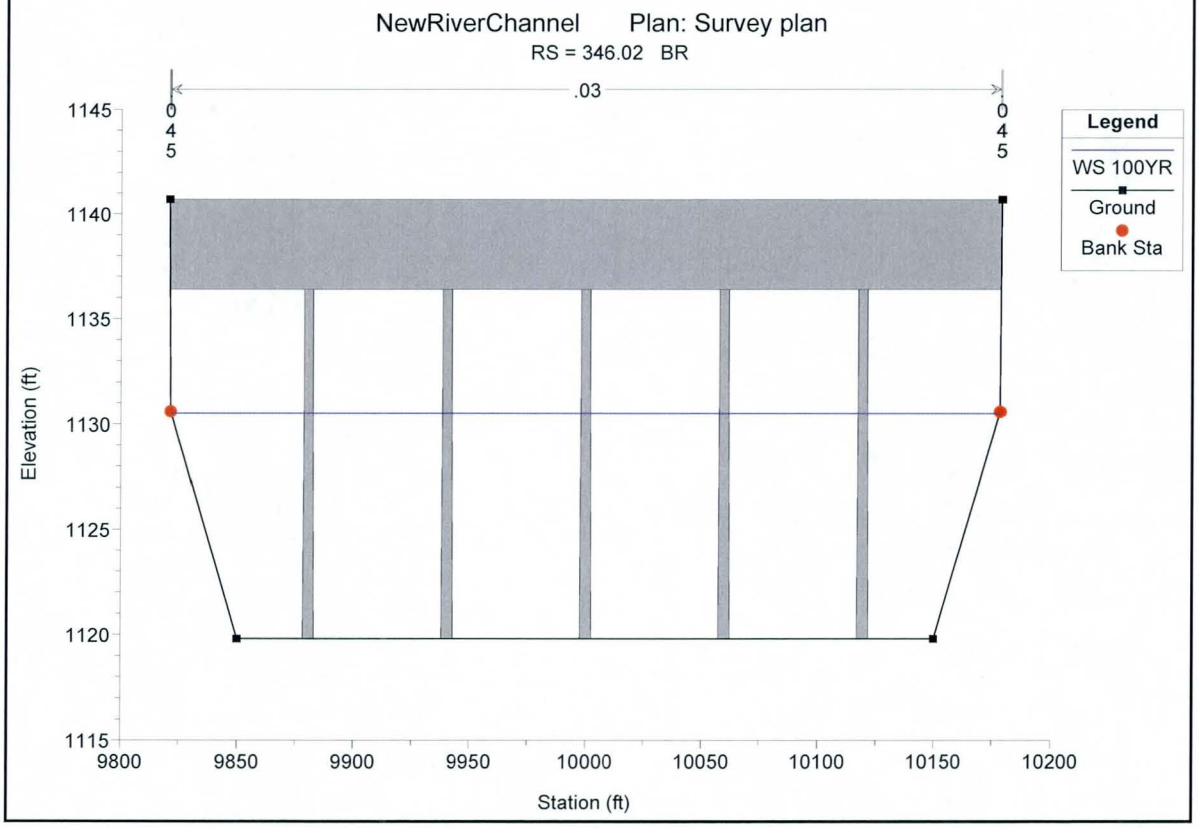
1140
1135
1130
1125
1120
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 347.17 BR
.03
0
4
5
0
4
5
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
1135
1130
1125
1120
1115
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 346.86
.03
0
4
5
0
4
5
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
1135
1130
1125
1120
1115
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)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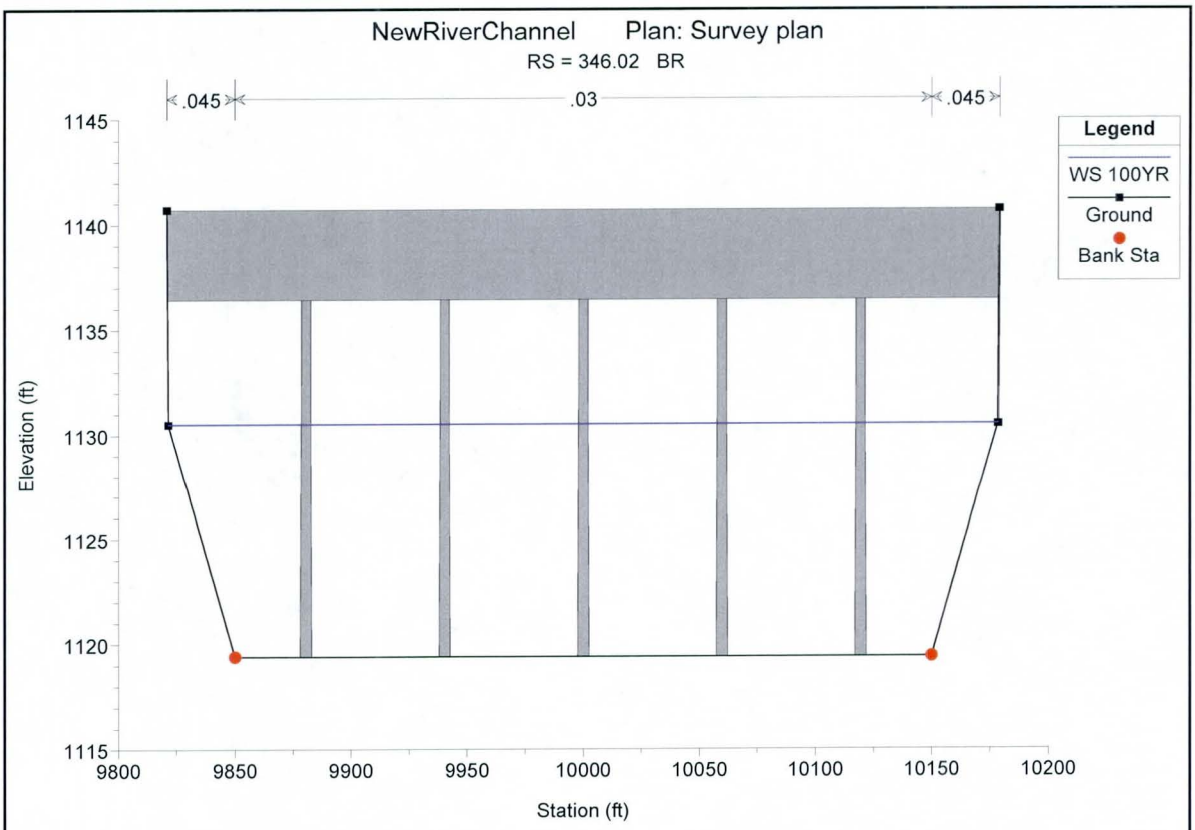
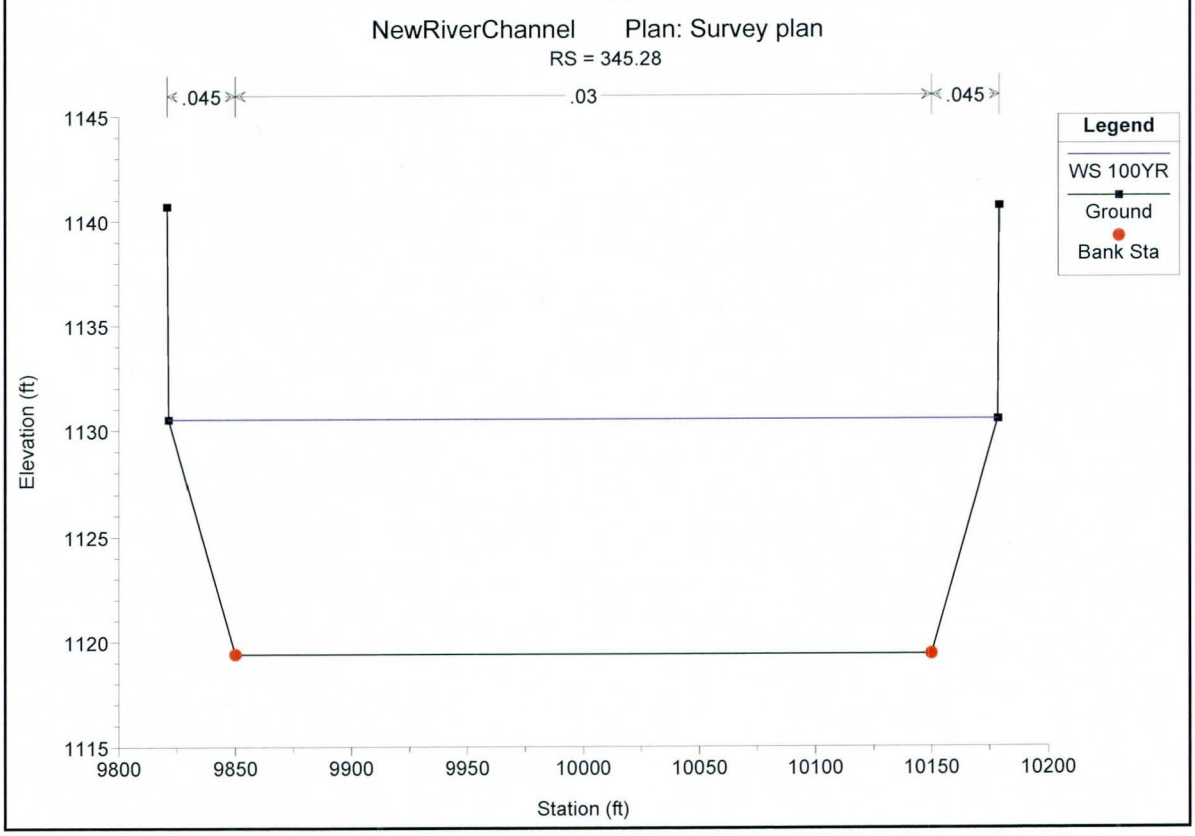
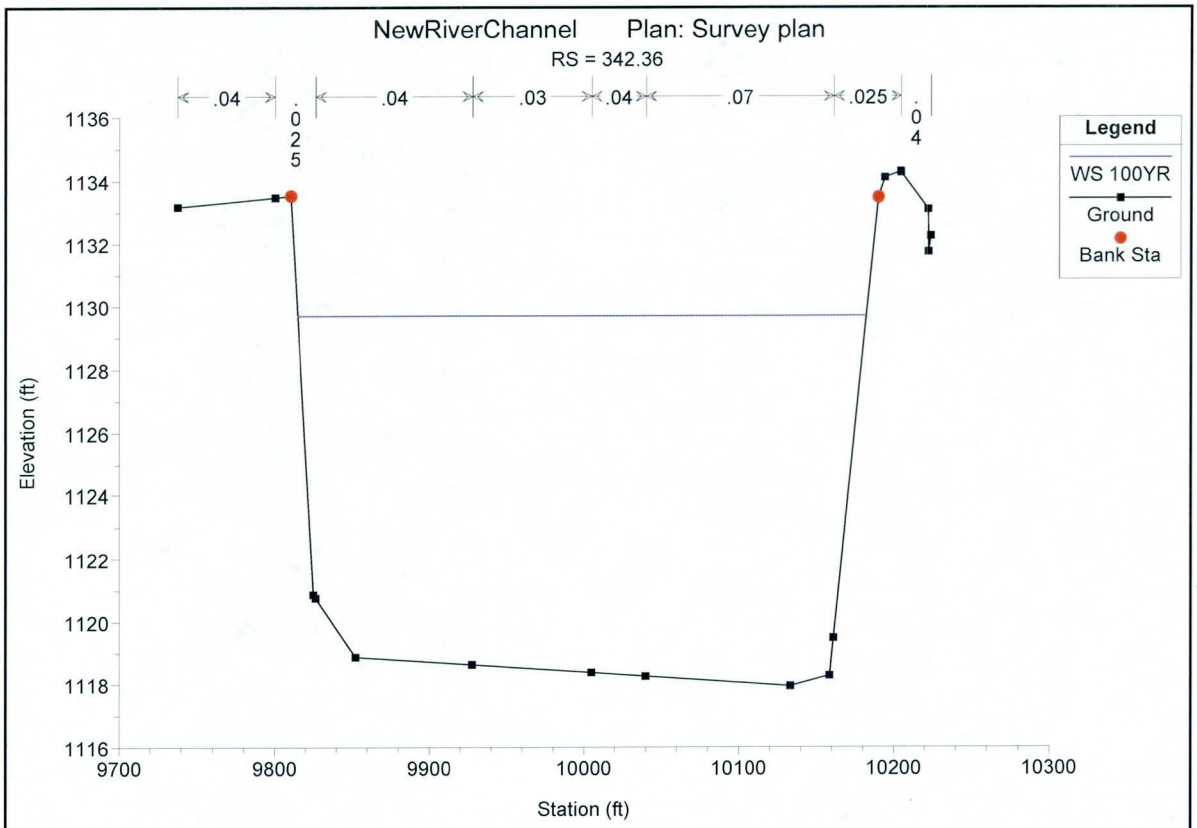
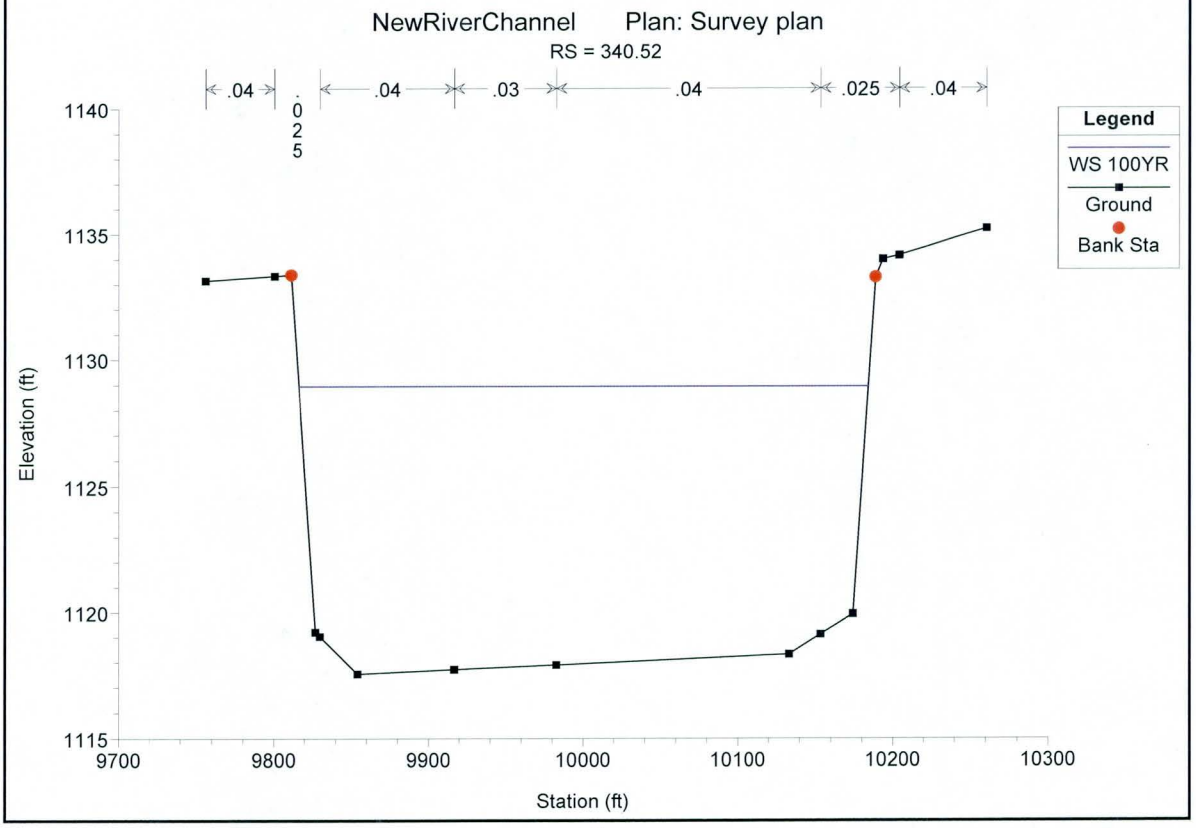
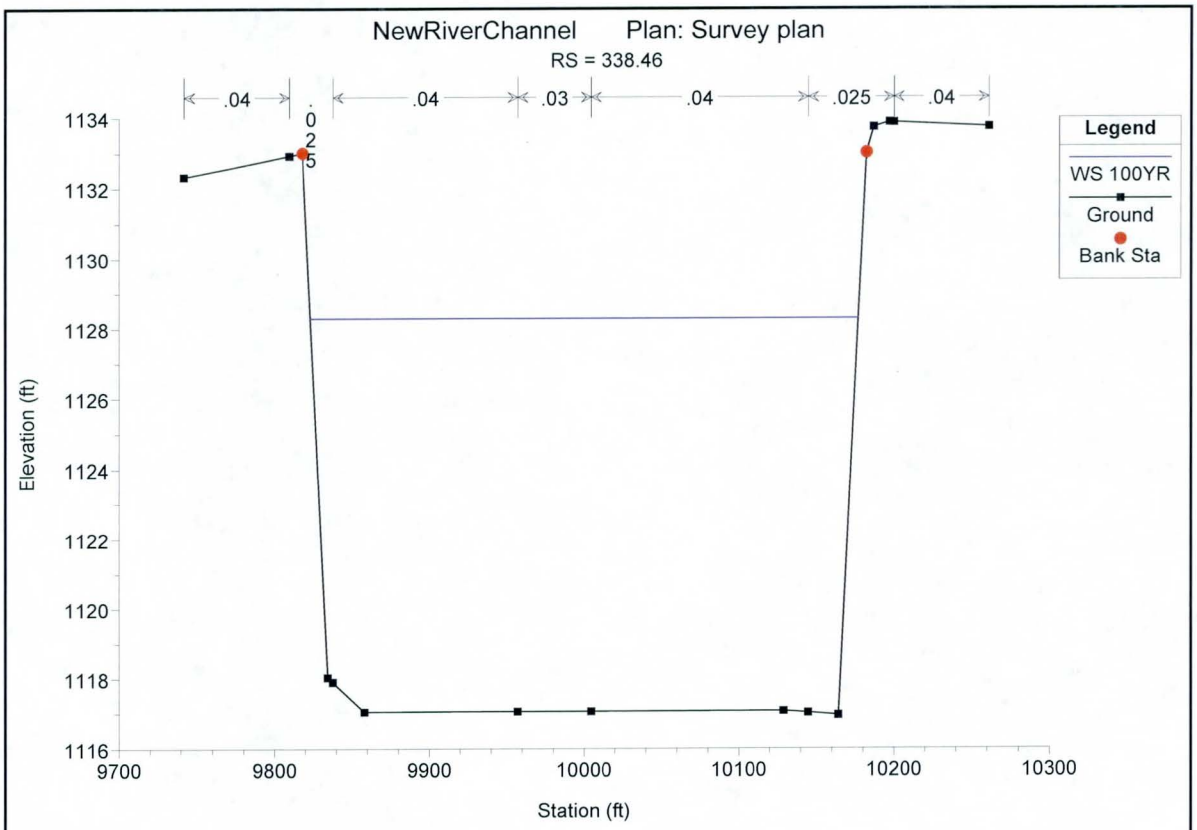
RS = 346.02 BR
.03
0
4
5
0
4
5
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
1135
1130
1125
1120
1115
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

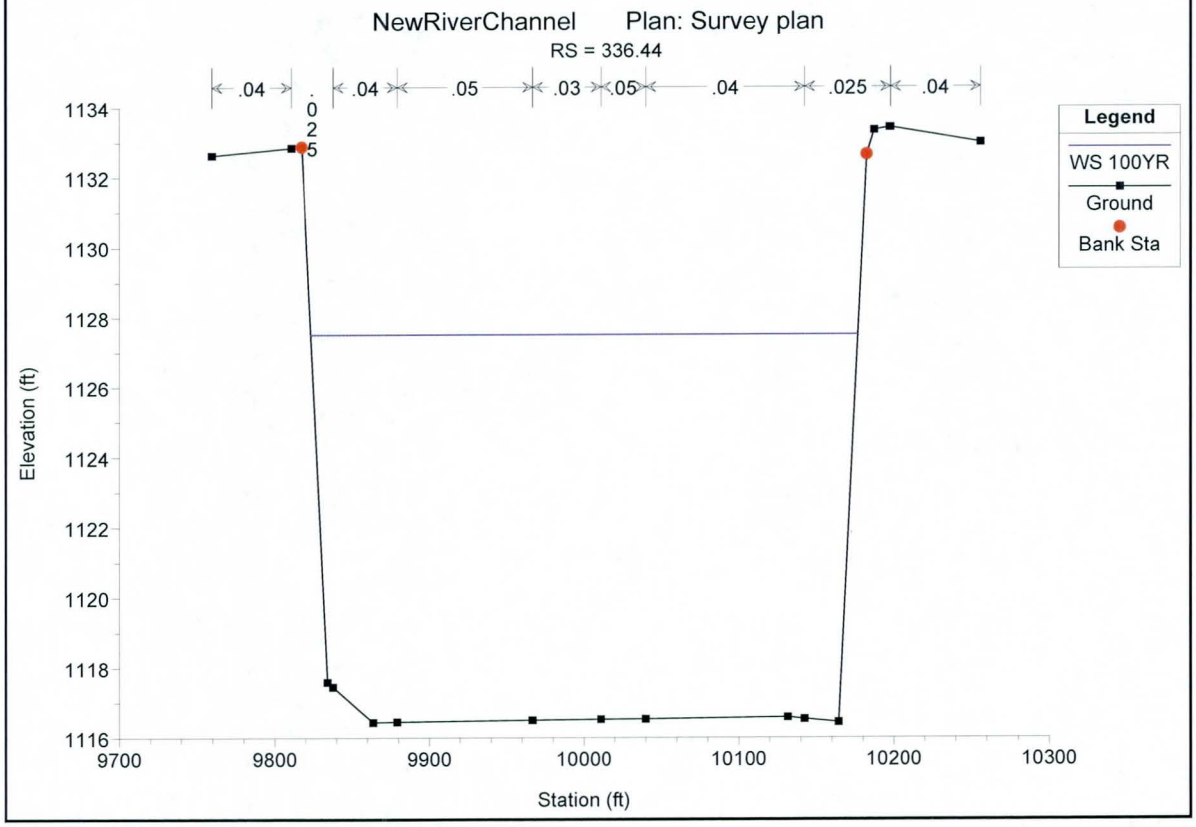

NewRiverChannel Plan: Survey plan
RS = 346.02 BR
.045
.03
.045
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
1135
1130
1125
1120
1115
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

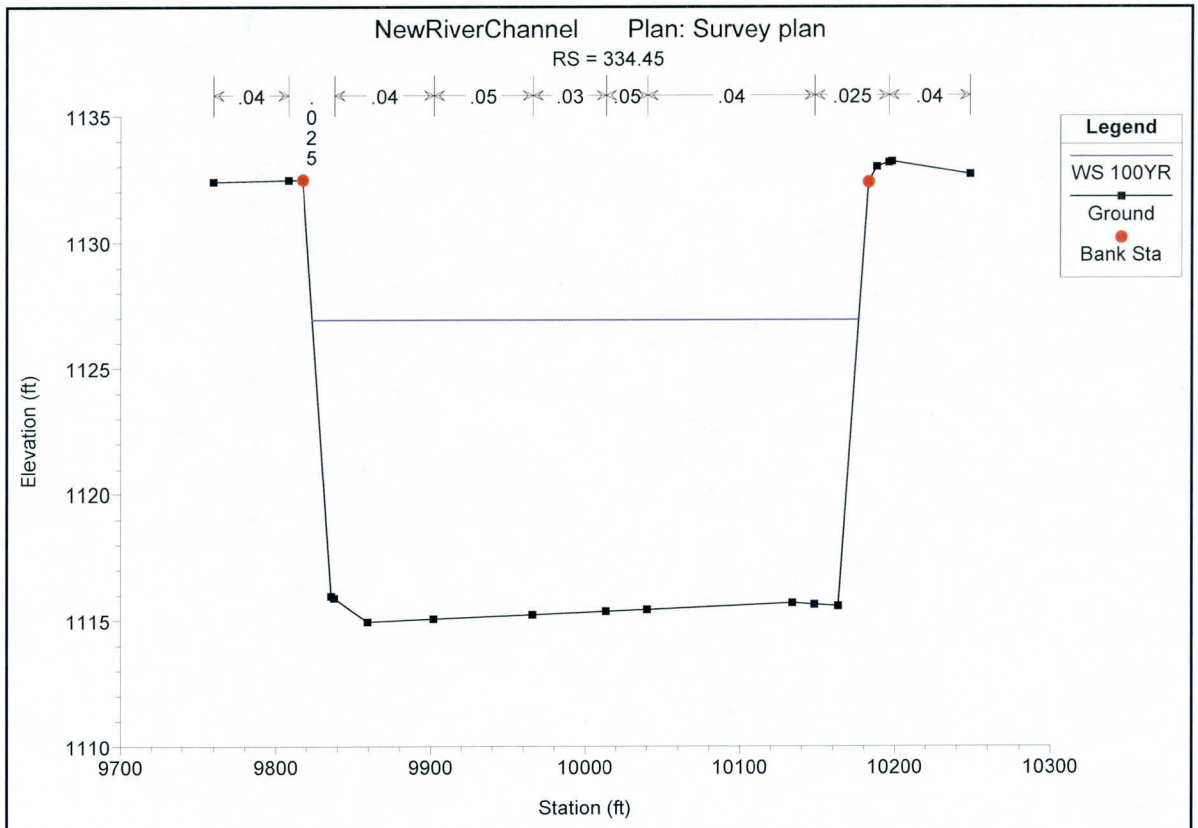

NewRiverChannel Plan: Survey plan
RS = 345.28
.045
.03
.045
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1145
1140
1135
1130
1125
1120
1115
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

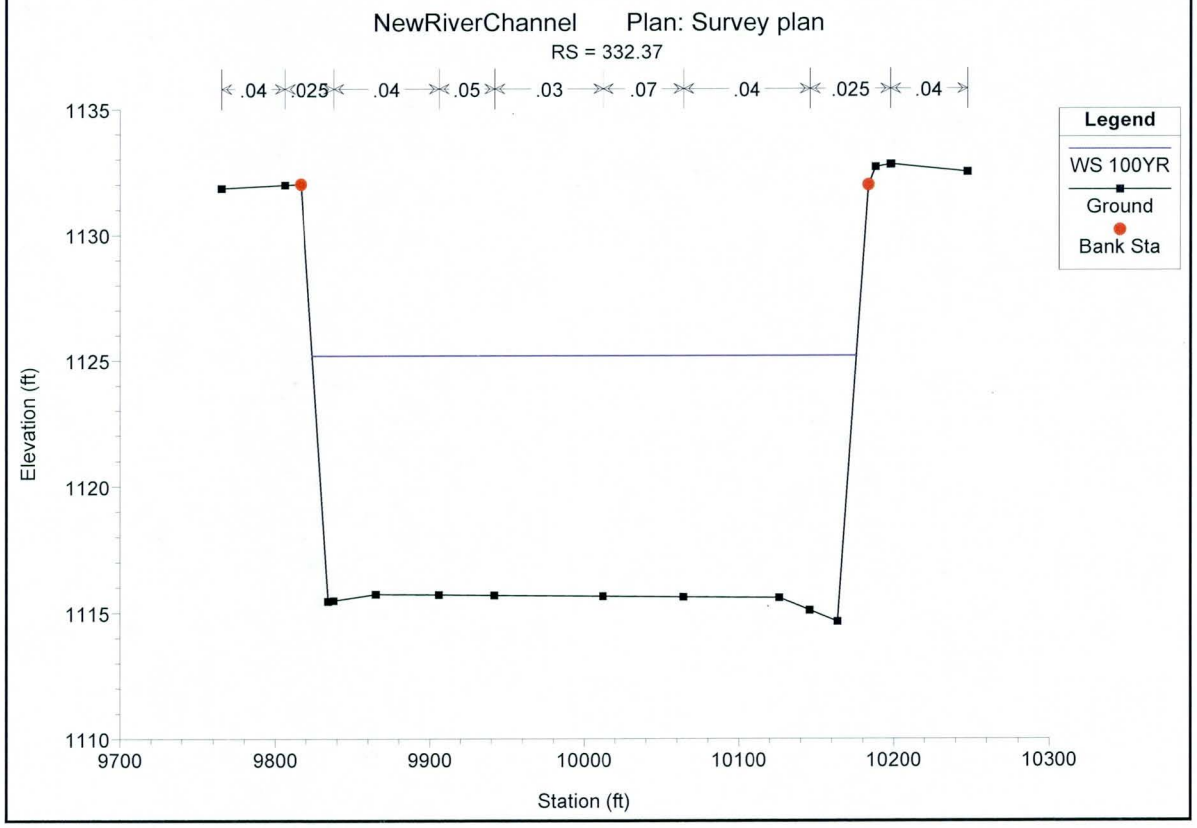

NewRiverChannel Plan: Survey plan
RS = 342.36
.04
.025
.04
.03
.04
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1136
1134
1132
1130
1128
1126
1124
1122
1120
1118
1116
9700
9800
9900
10000
10100
10200
10300

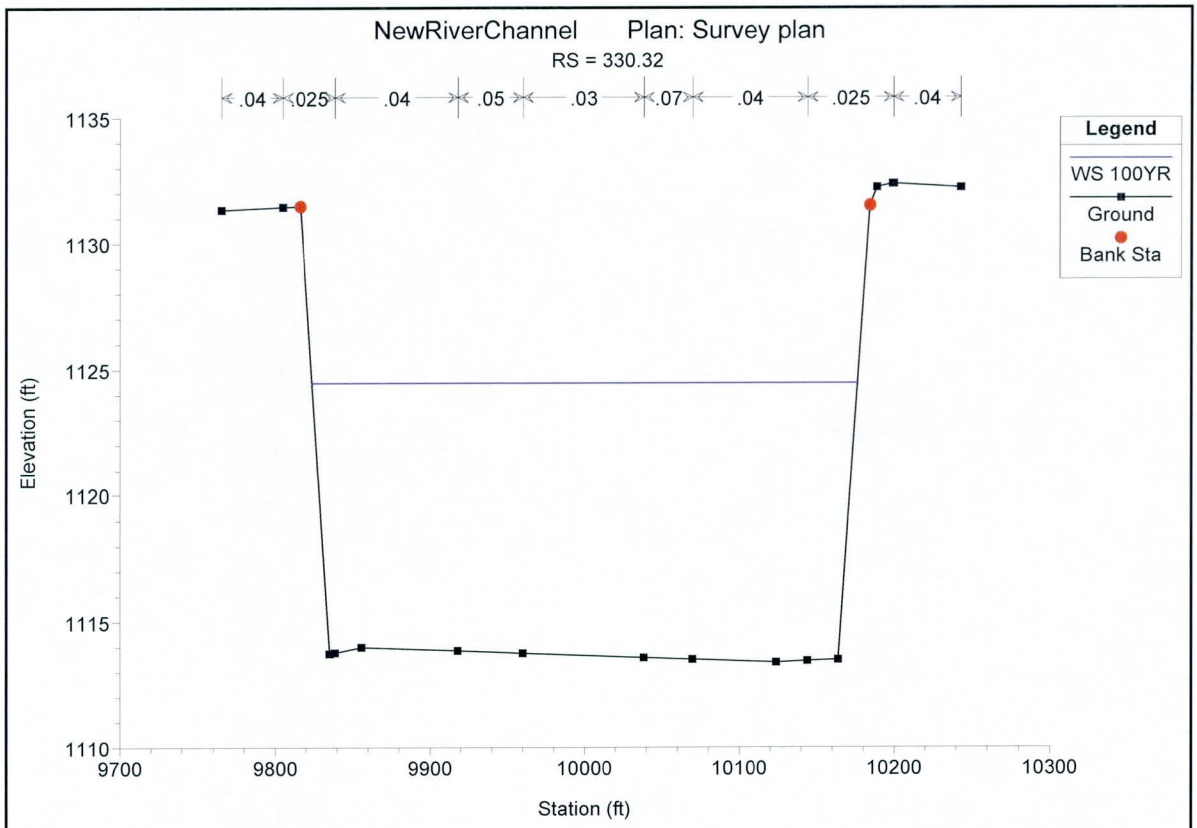

NewRiverChannel Plan: Survey plan
RS = 340.52
.04
.025
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1140
1135
1130
1125
1120
1115
9700
9800
9900
10000
10100
10200
10300

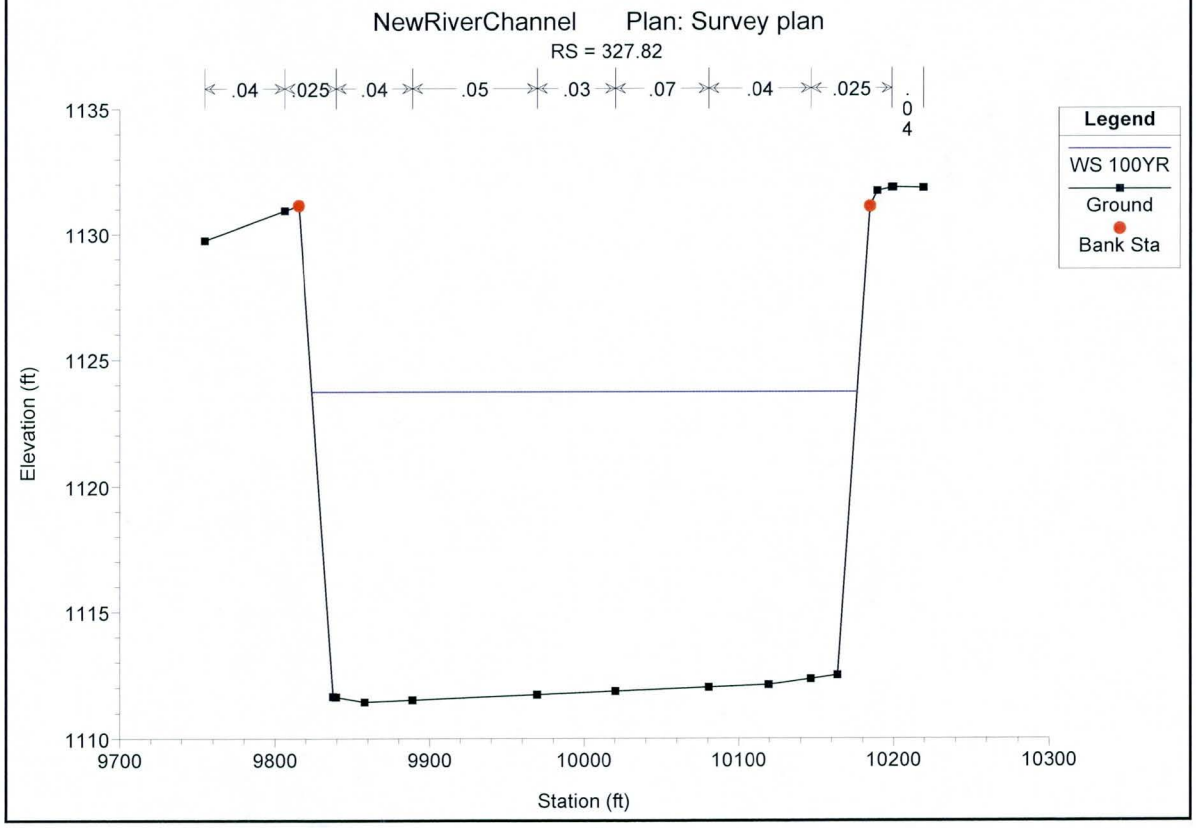

NewRiverChannel Plan: Survey plan
RS = 338.46
.04
.025
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1134
1132
1130
1128
1126
1124
1122
1120
1118
1116
9700
9800
9900
10000
10100
10200
10300

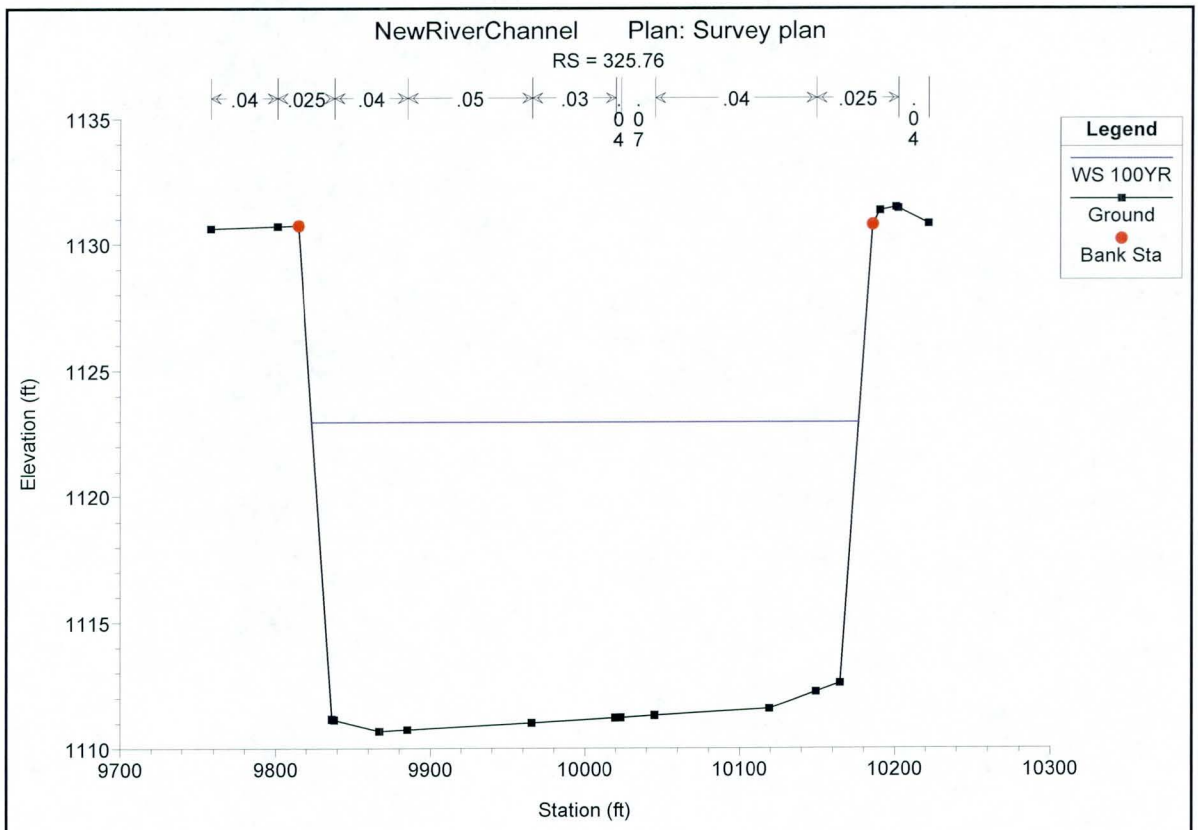

NewRiverChannel Plan: Survey plan
RS = 336.44
.04
.025
.04
.05
.03
.05
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1134
1132
1130
1128
1126
1124
1122
1120
1118
1116
9700
9800
9900
10000
10100
10200
10300

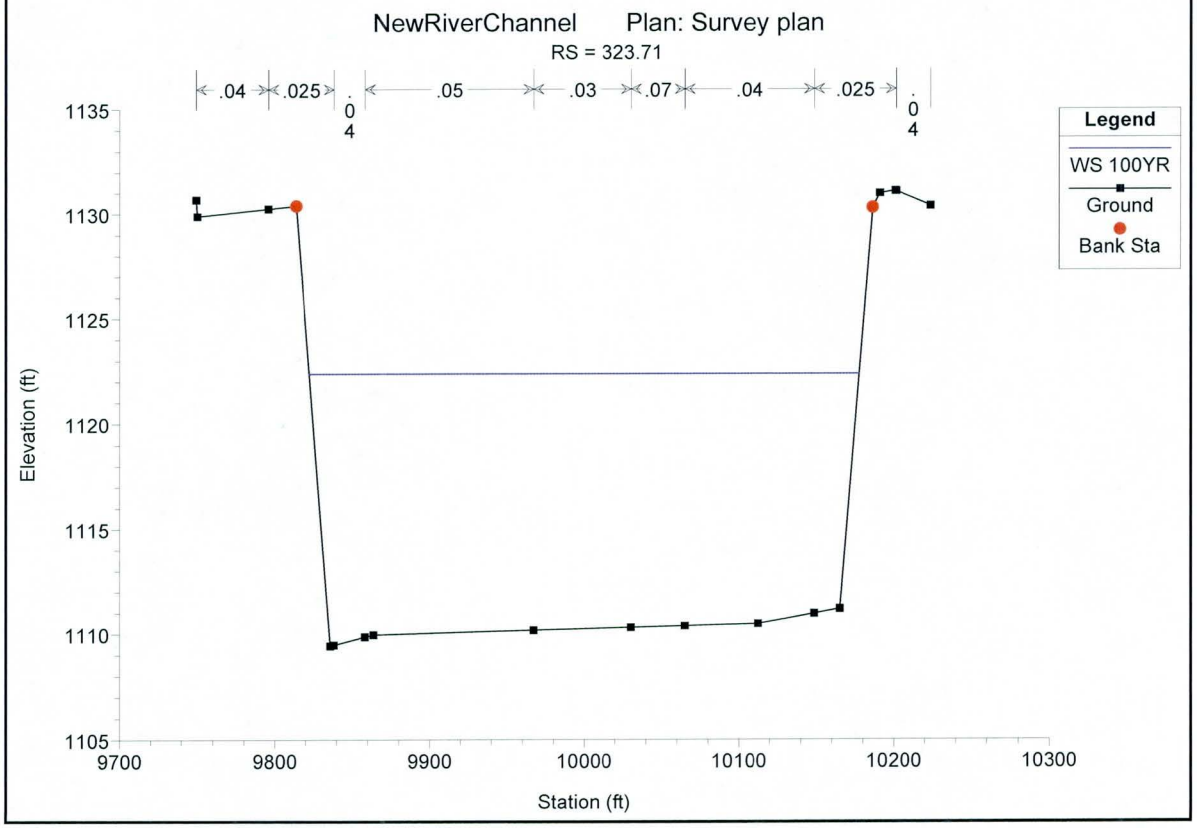

NewRiverChannel Plan: Survey plan
RS = 334.45
.04
.025
.04
.05
.03
.05
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1135
1130
1125
1120
1115
1110
9700
9800
9900
10000
10100
10200
10300
Station (ft)

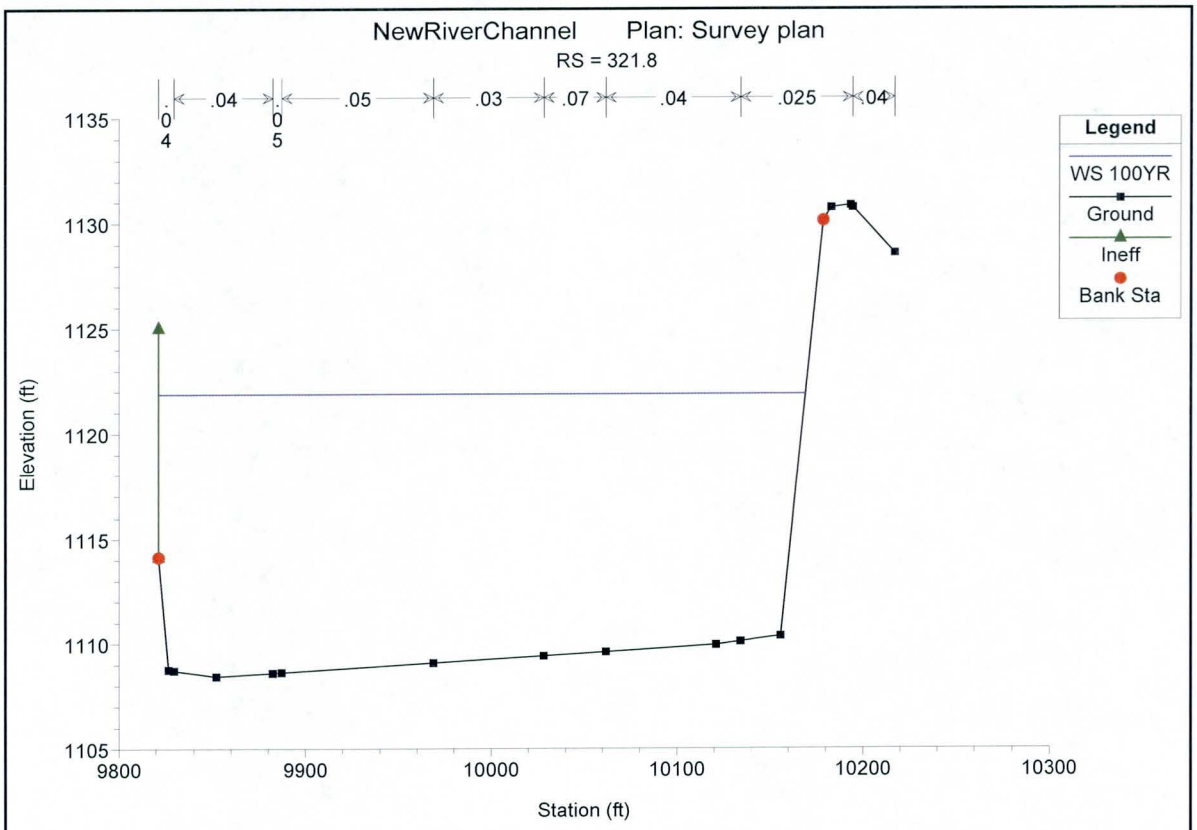

NewRiverChannel Plan: Survey plan
RS = 332.37
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1135
1130
1125
1120
1115
1110
9700
9800
9900
10000
10100
10200
10300
Station (ft)

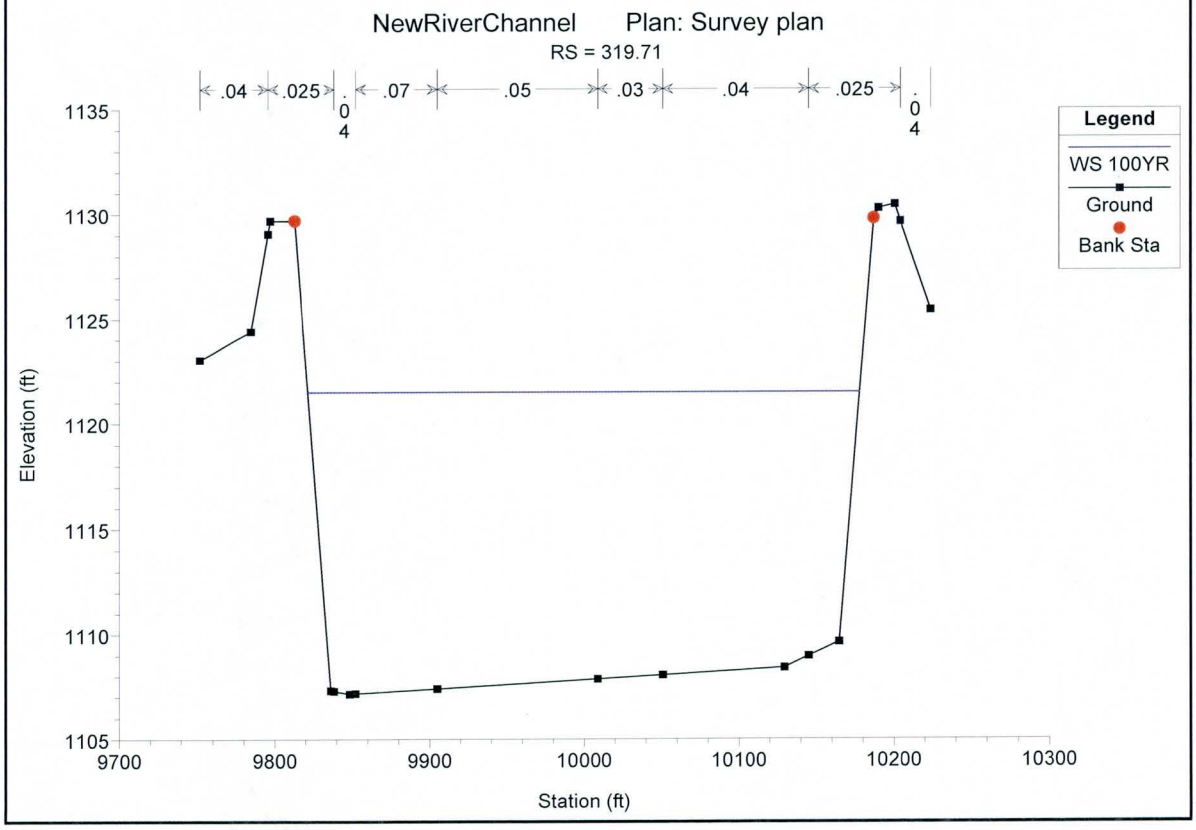

NewRiverChannel Plan: Survey plan
RS = 330.32
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1135
1130
1125
1120
1115
1110
9700
9800
9900
10000
10100
10200
10300
Station (ft)

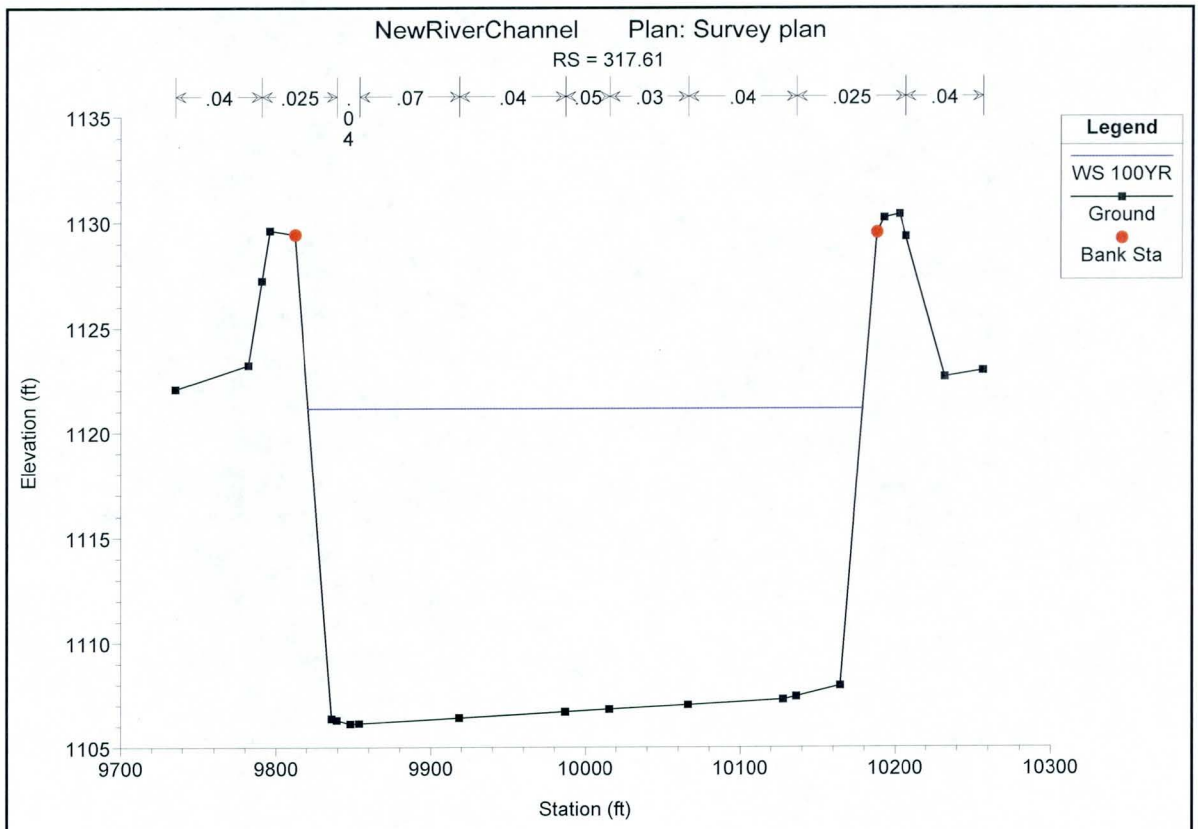

NewRiverChannel Plan: Survey plan
RS = 327.82
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1135
1130
1125
1120
1115
1110
9700
9800
9900
10000
10100
10200
10300
Station (ft)

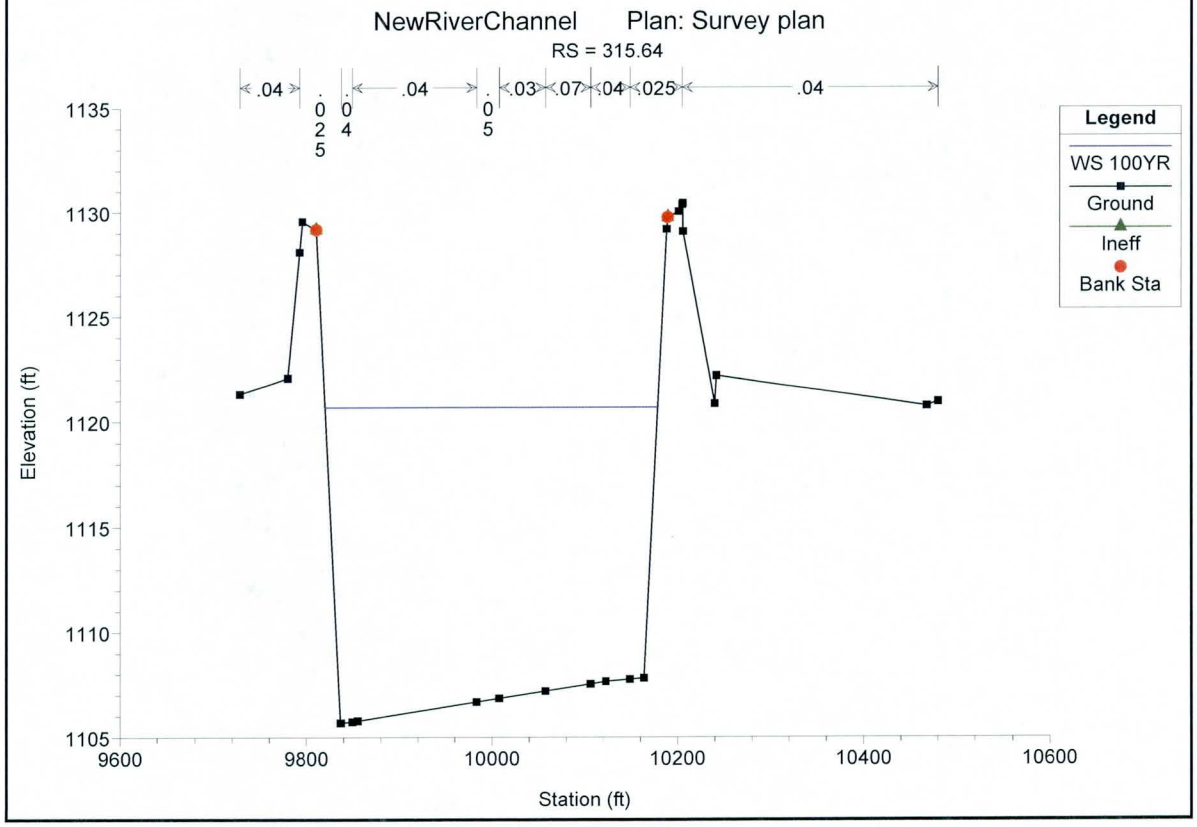

NewRiverChannel Plan: Survey plan
RS = 325.76
.04
.025
.04
.05
.03
.04
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
9700
9800
9900
10000
10100
10200
10300

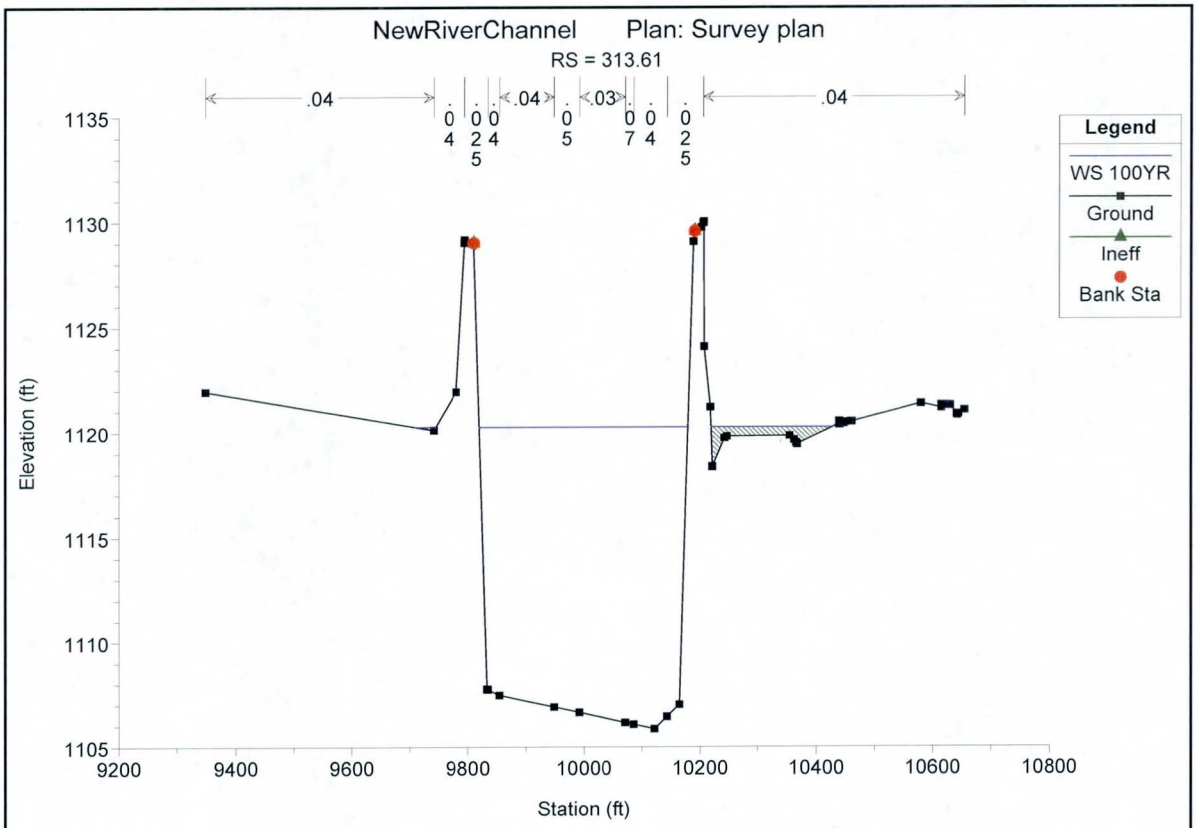

NewRiverChannel Plan: Survey plan
RS = 323.71
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
1105
9700
9800
9900
10000
10100
10200
10300

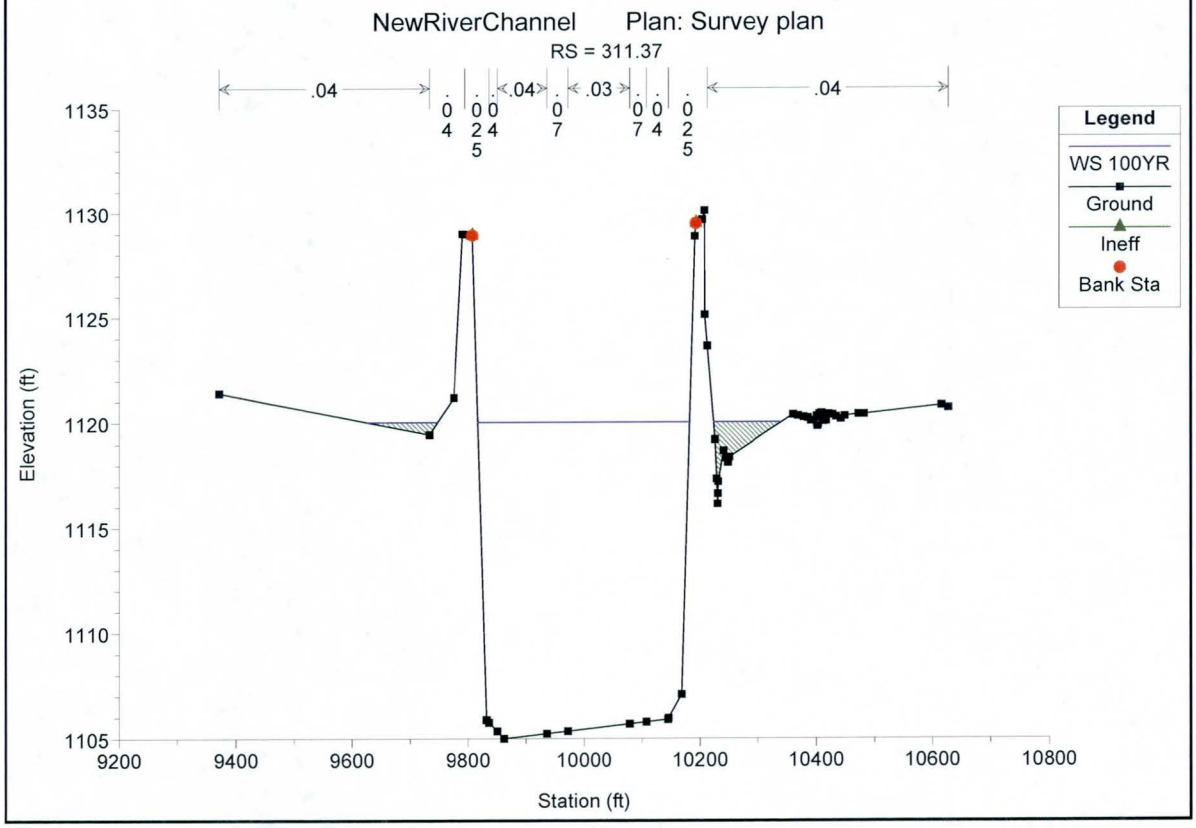

NewRiverChannel Plan: Survey plan
RS = 321.8
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
1105
9800
9900
10000
10100
10200
10300

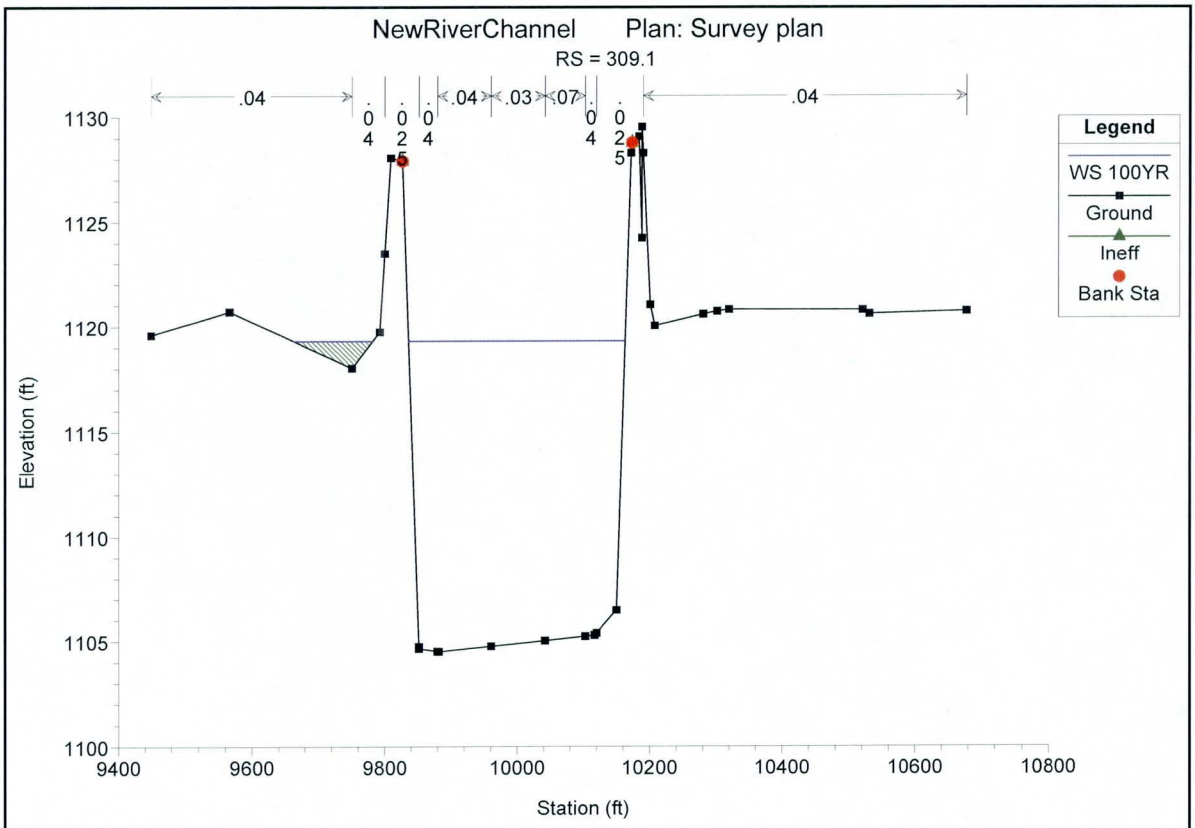

NewRiverChannel Plan: Survey plan
RS = 319.71
.04
.025
.07
.05
.03
.04
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
1105
9700
9800
9900
10000
10100
10200
10300

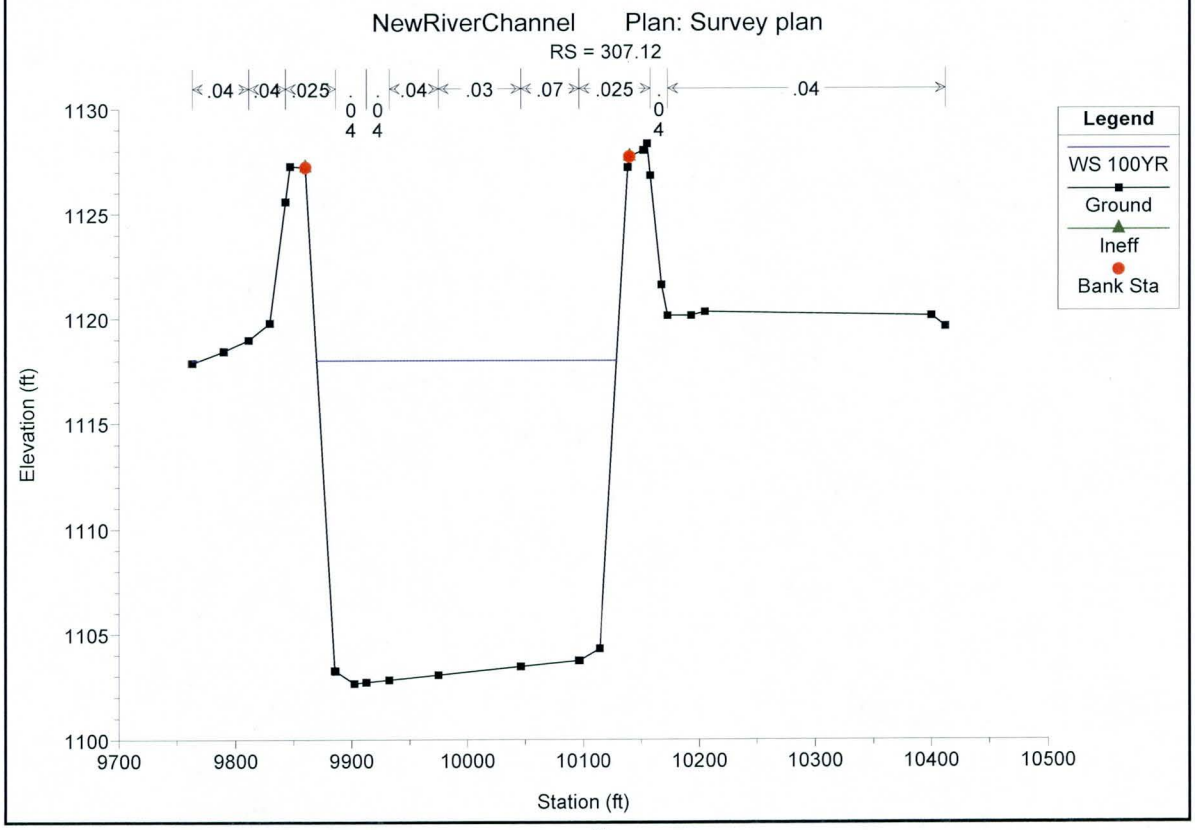

NewRiverChannel Plan: Survey plan
RS = 317.61
.04
.025
.04
.07
.04
.05
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
1105
9700
9800
9900
10000
10100
10200
10300

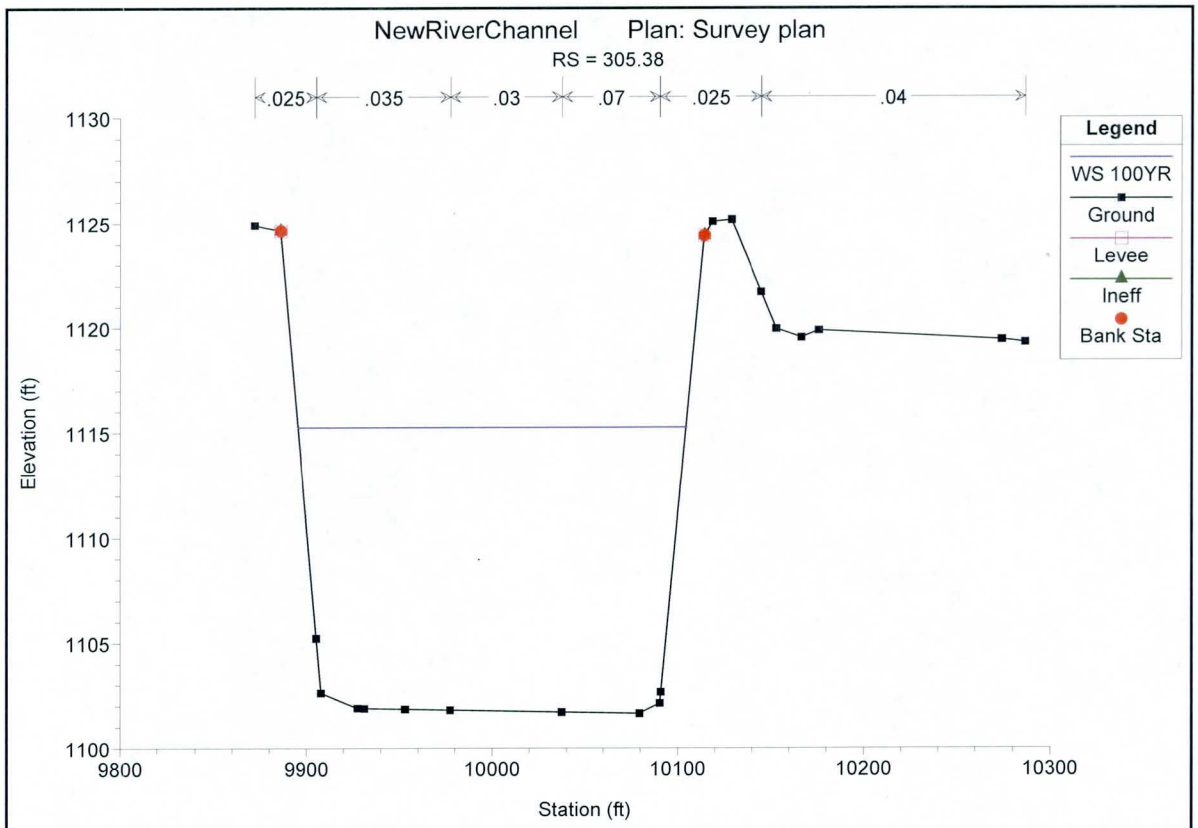

NewRiverChannel Plan: Survey plan
RS = 315.64
.04
.025
.04
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1135
1130
1125
1120
1115
1110
1105
9600
9800
10000
10200
10400
10600

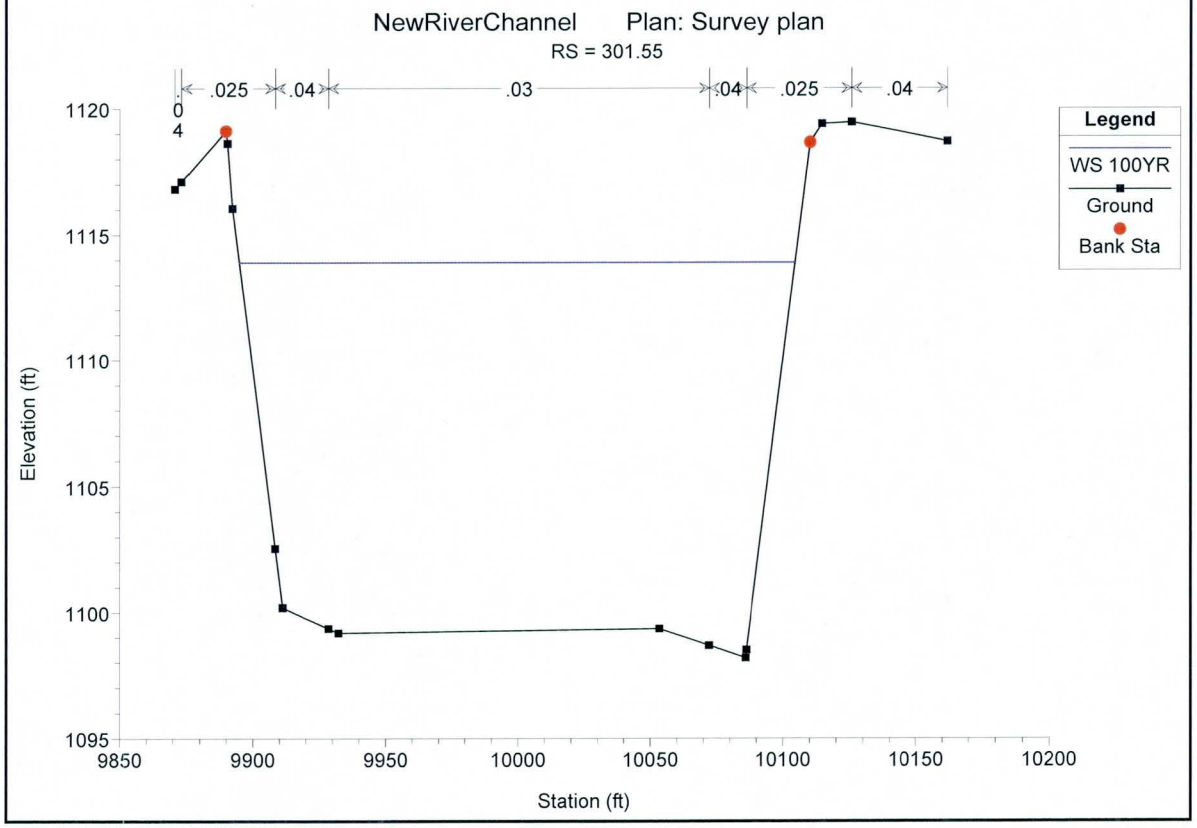

NewRiverChannel Plan: Survey plan
RS = 313.61
.04
.04
.03
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

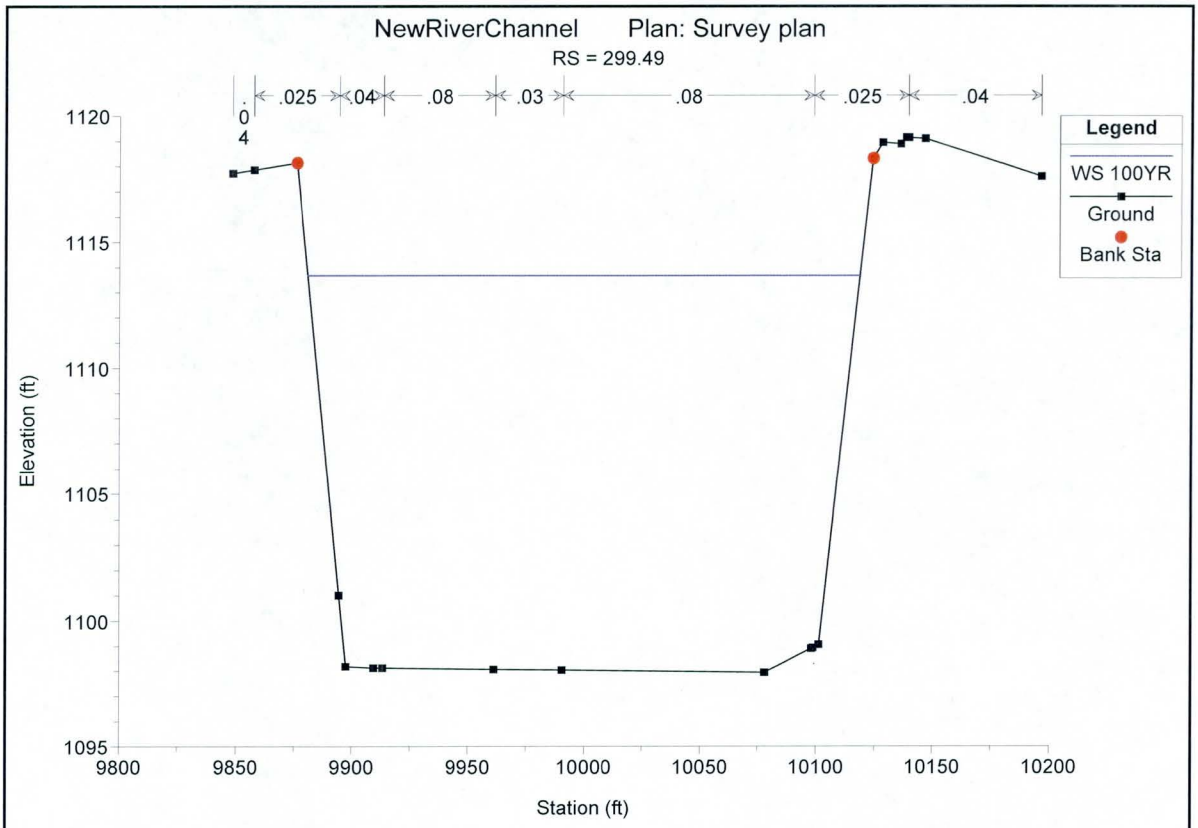

NewRiverChannel Plan: Survey plan
RS = 311.37
.04
.04
.03
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

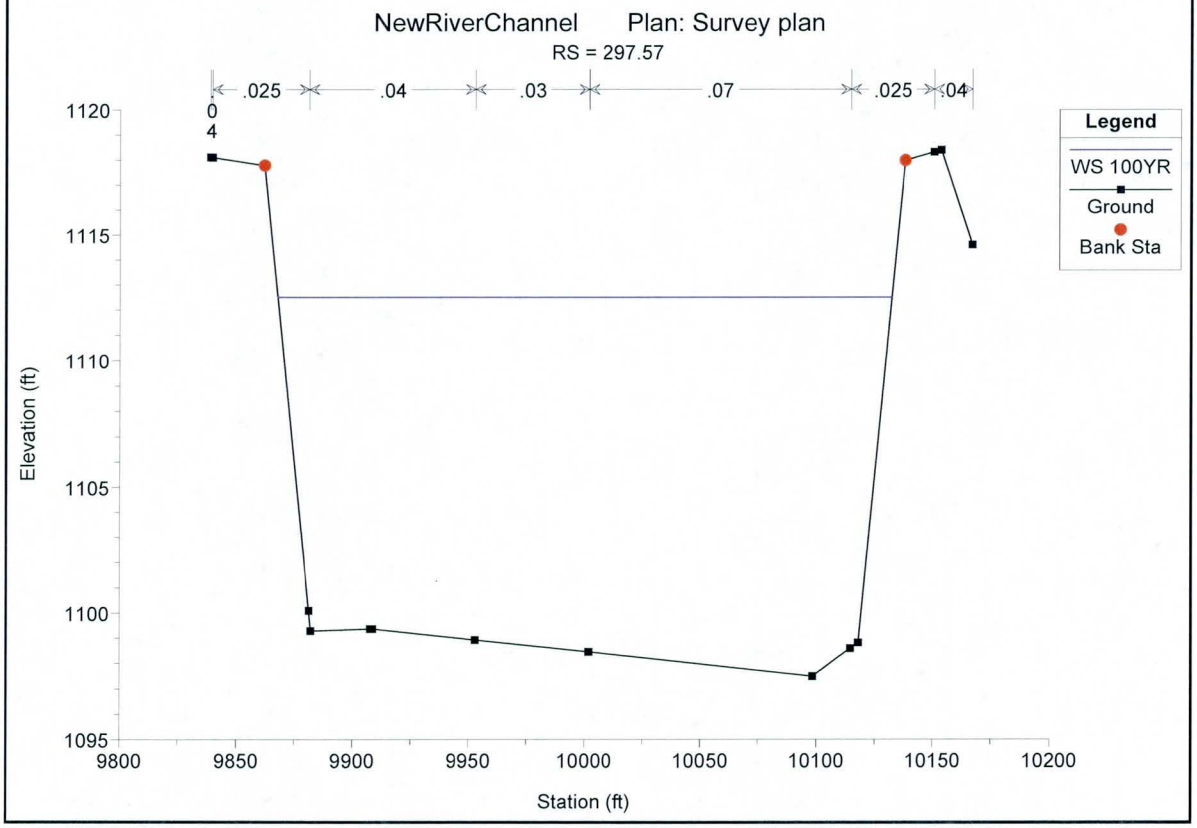

NewRiverChannel Plan: Survey plan
RS = 309.1
.04
.04
.03
.07
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

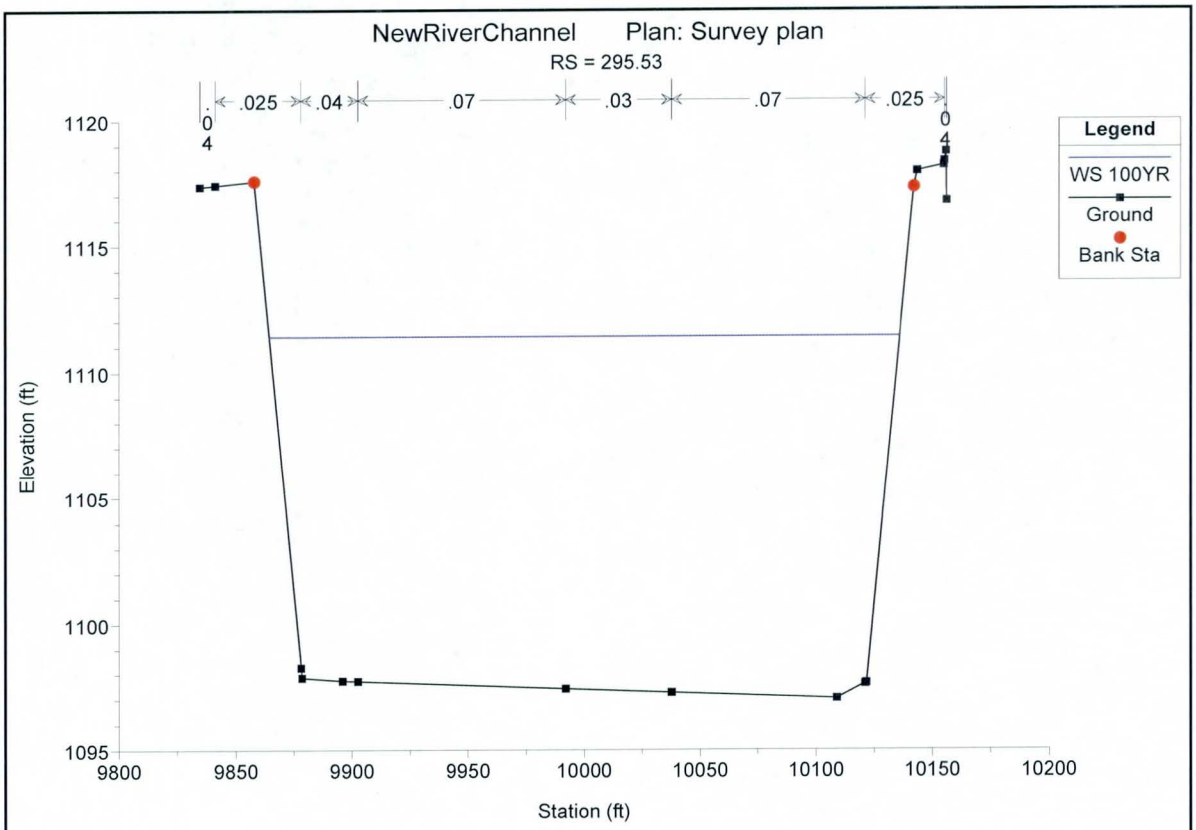

NewRiverChannel Plan: Survey plan
RS = 307.12
.04
.04
.025
.04
.03
.07
.025
.04
Legend
WS 100YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

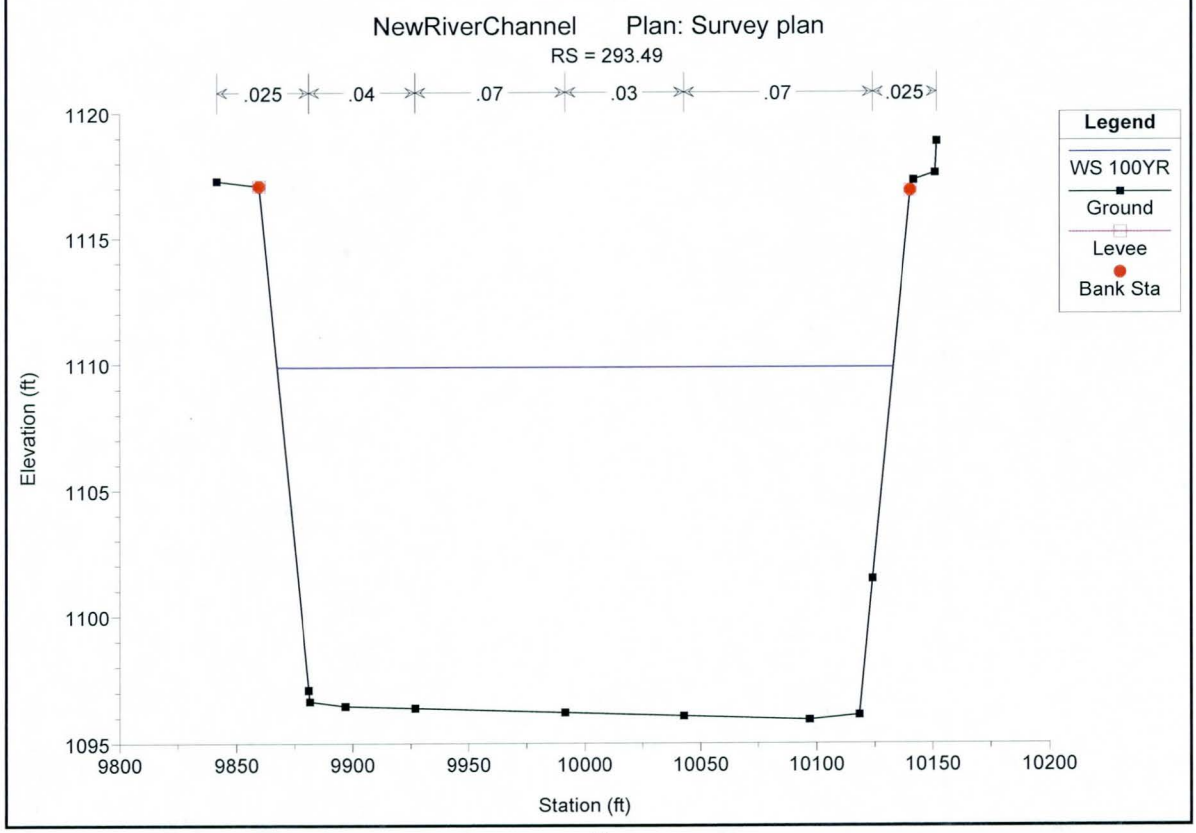

NewRiverChannel Plan: Survey plan
RS = 305.38
.025
.035
.03
.07
.025
.04
Legend
WS 100YR
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1130
1125
1120
1115
1110
1105
1100
9800
9900
10000
10100
10200
10300
Station (ft)

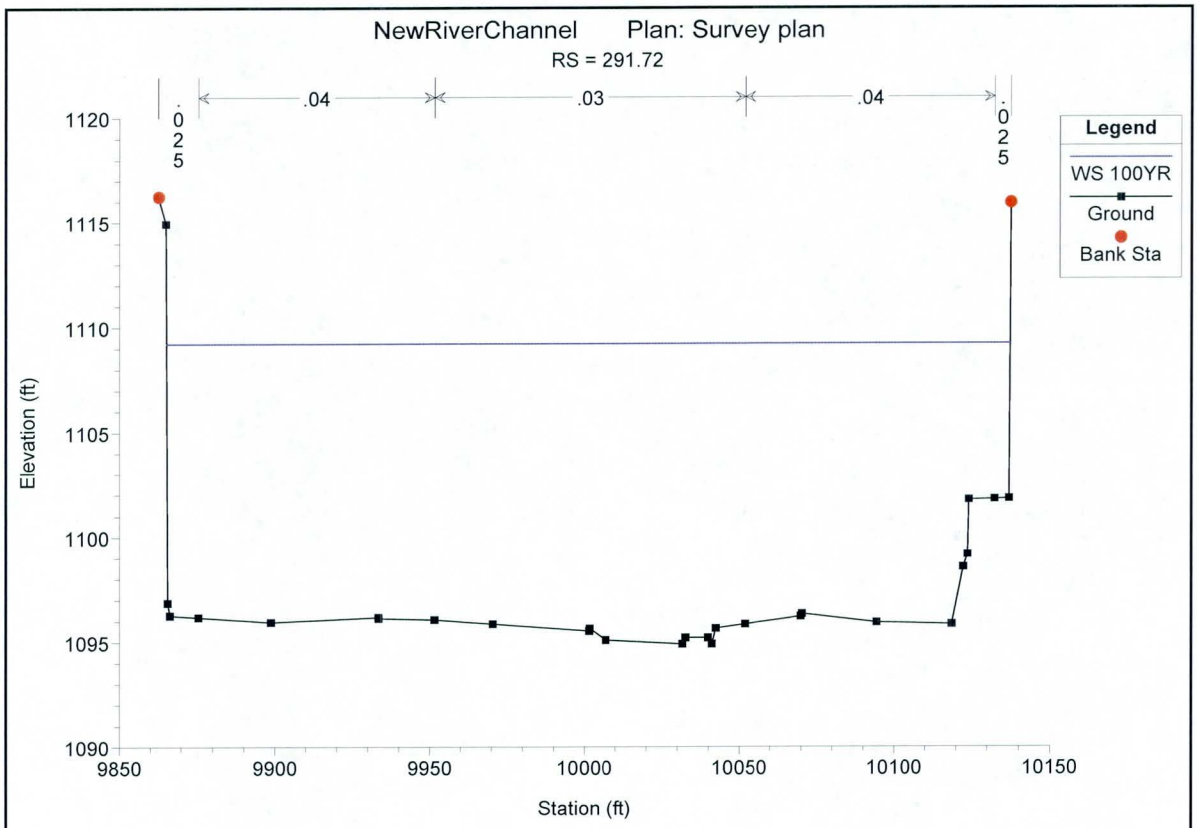

NewRiverChannel Plan: Survey plan
RS = 301.55
.025
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

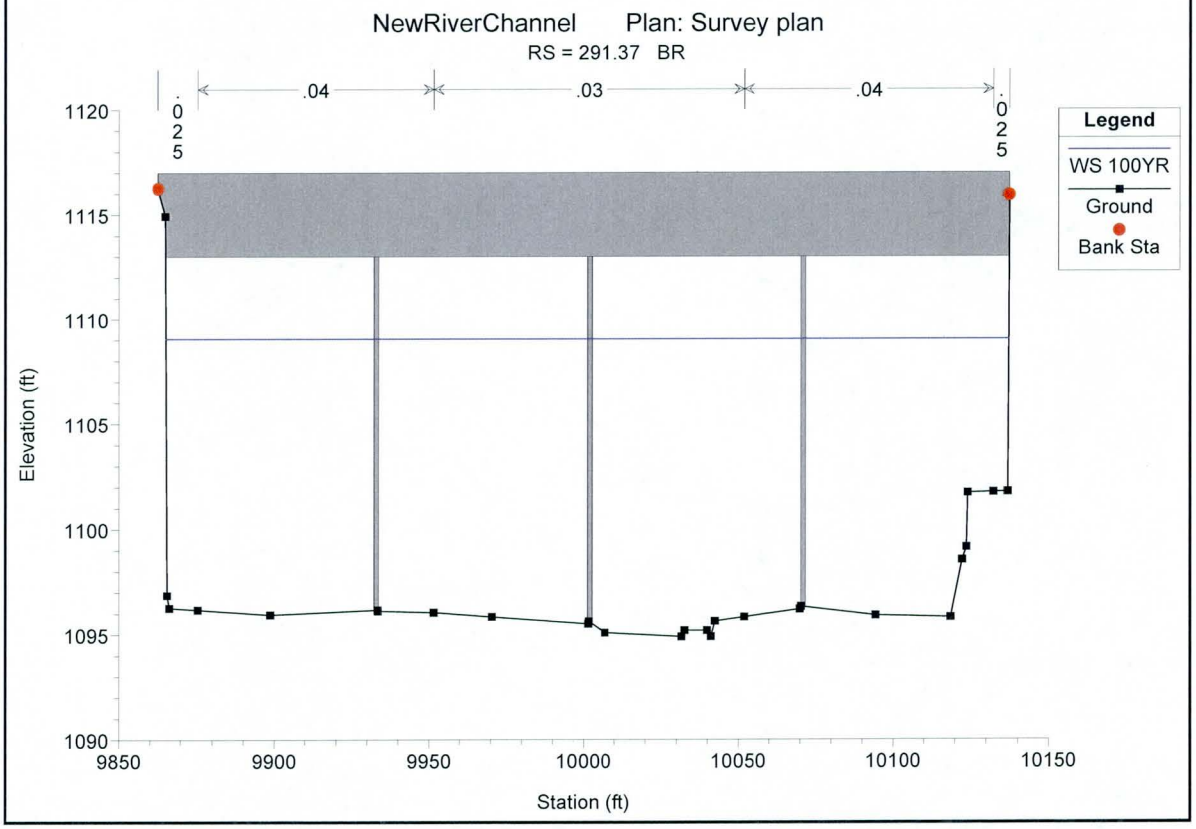

NewRiverChannel Plan: Survey plan
RS = 299.49
.04
.025
.04
.08
.03
.08
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

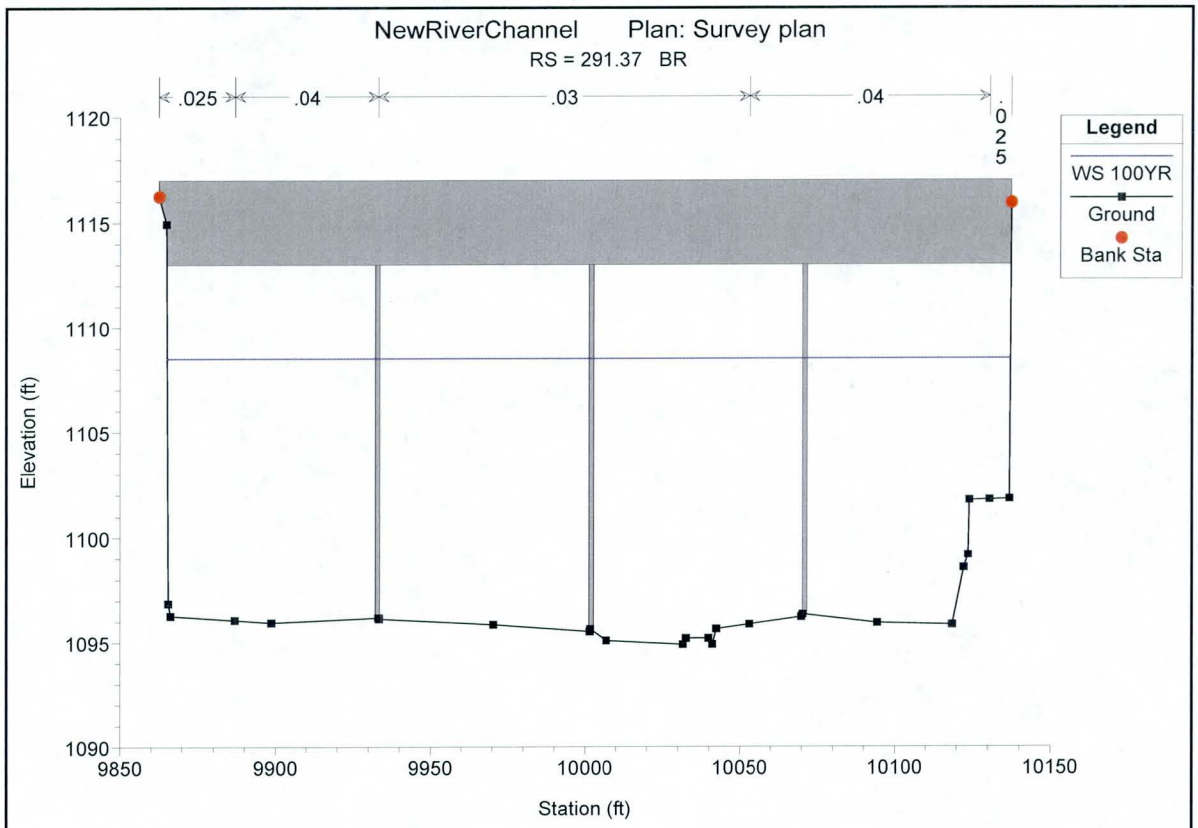

NewRiverChannel Plan: Survey plan
RS = 297.57
.04
.025
.04
.03
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

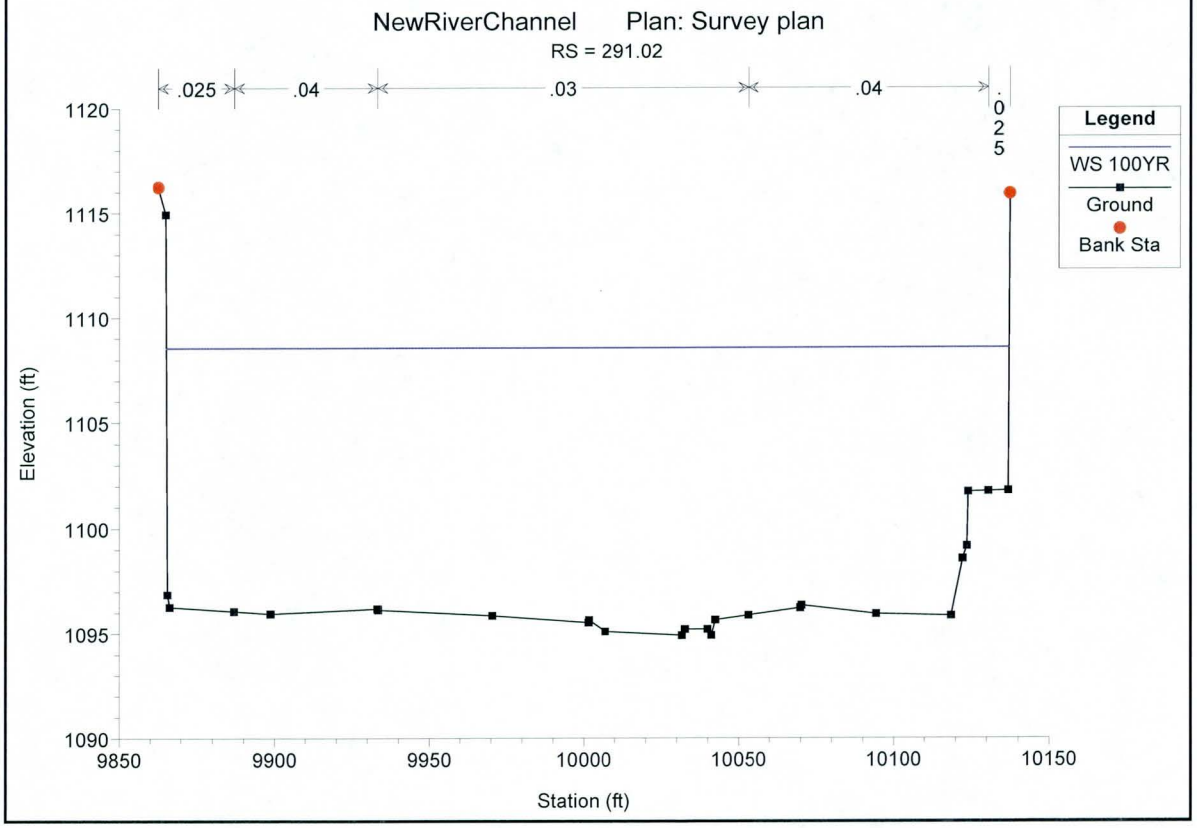

NewRiverChannel Plan: Survey plan
RS = 295.53
.04
.025
.04
.07
.03
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

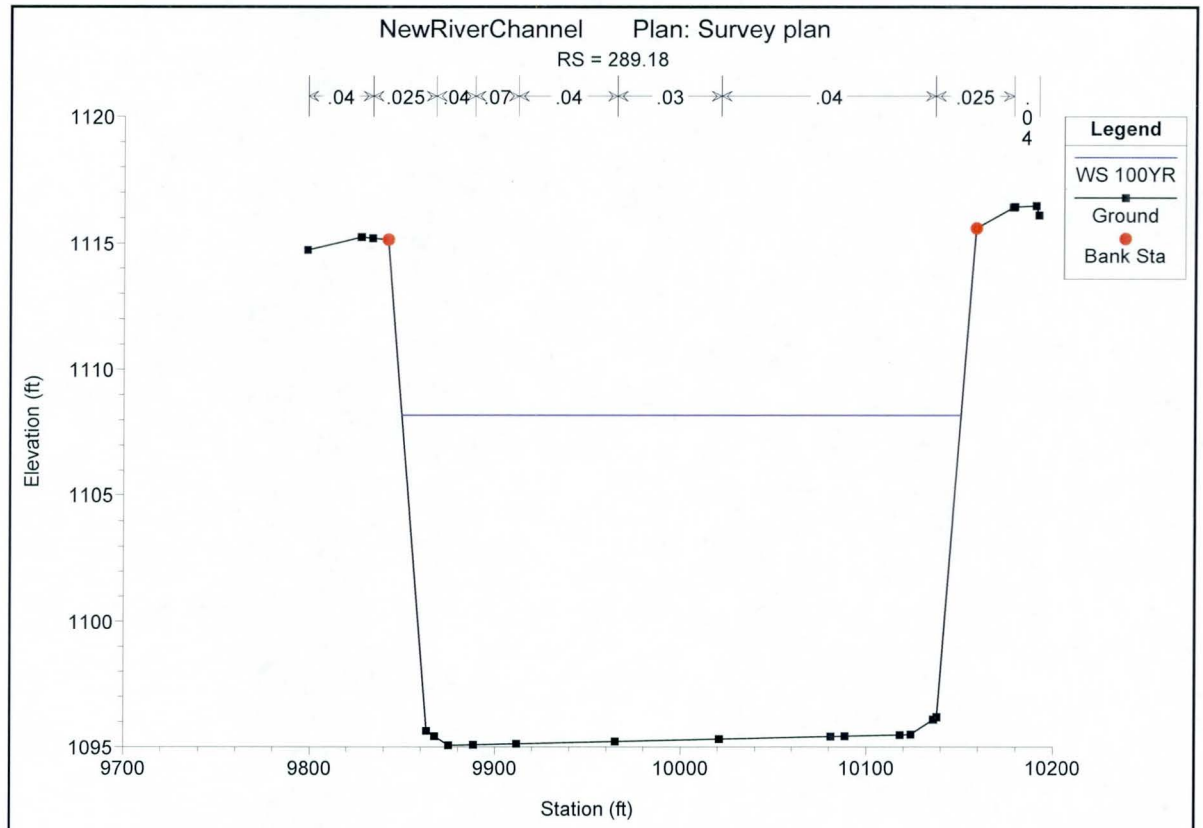

NewRiverChannel Plan: Survey plan
RS = 293.49
.025
.04
.07
.03
.07
.025
Legend
WS 100YR
Ground
Levee
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9800
9850
9900
9950
10000
10050
10100
10150
10200
Station (ft)

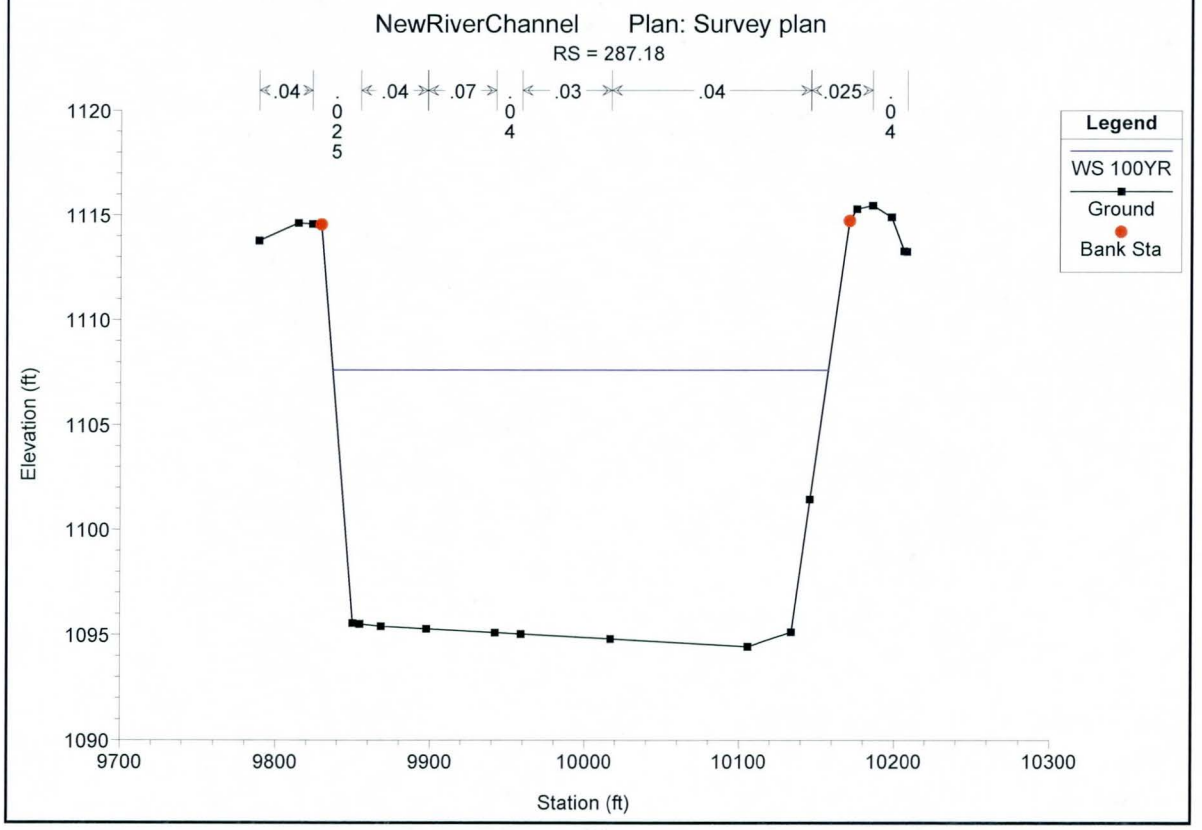

NewRiverChannel Plan: Survey plan
RS = 291.72
.04
.03
.04
.025
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9850
9900
9950
10000
10050
10100
10150
Station (ft)

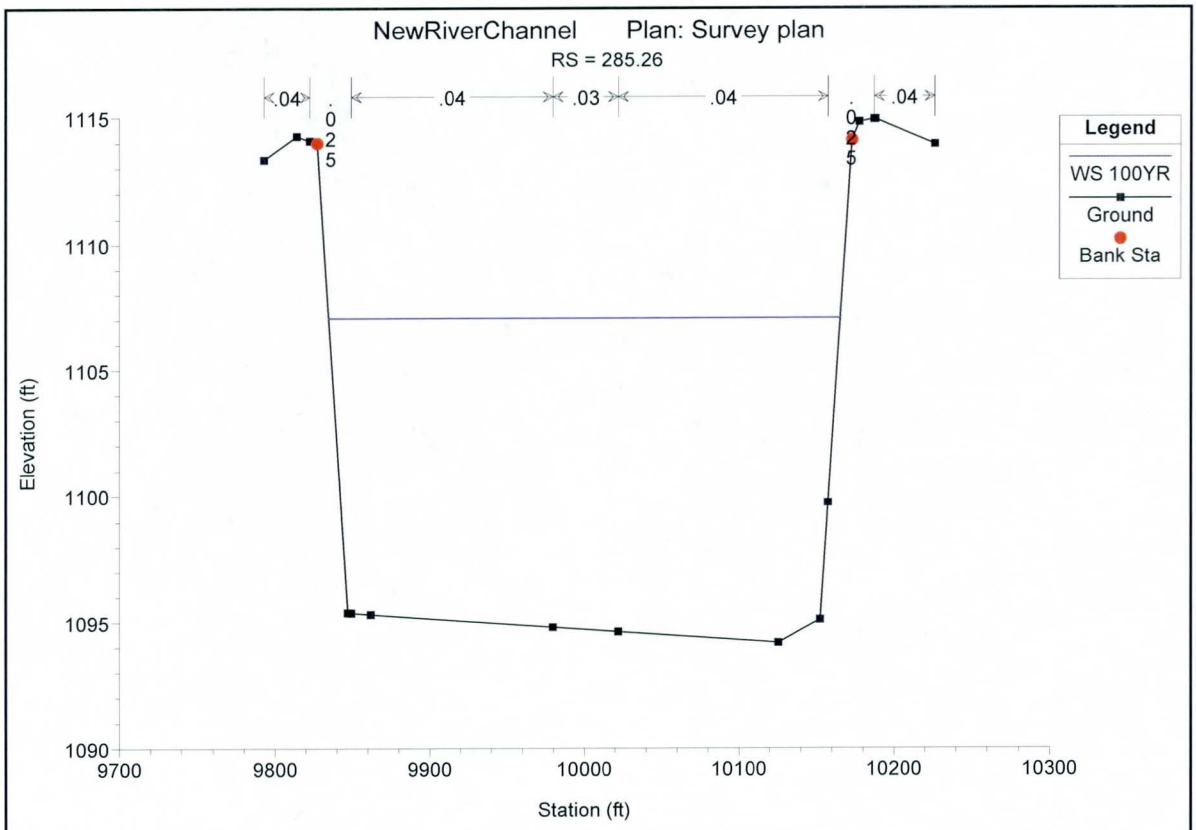

NewRiverChannel Plan: Survey plan
RS = 291.37 BR
.04
.03
.04
.025
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9850
9900
9950
10000
10050
10100
10150
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 291.37 BR
.025
.04
.03
.04
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9850
9900
9950
10000
10050
10100
10150
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 291.02
.025
.04
.03
.04
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9850
9900
9950
10000
10050
10100
10150
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 289.18
.04
.025
.04
.07
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
9700
9800
9900
10000
10100
10200
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 287.18
.04
.025
.04
.07
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1120
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 285.26
.04
.025
.04
.03
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1115
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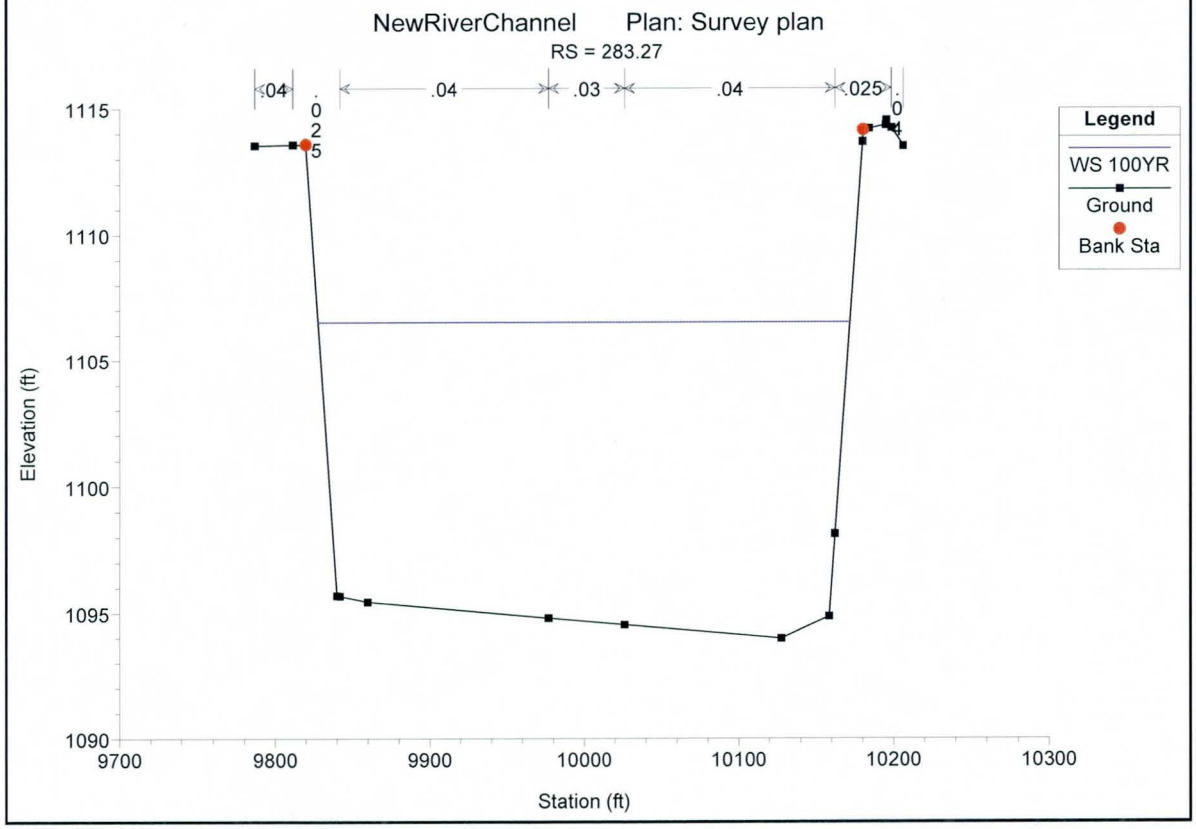
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
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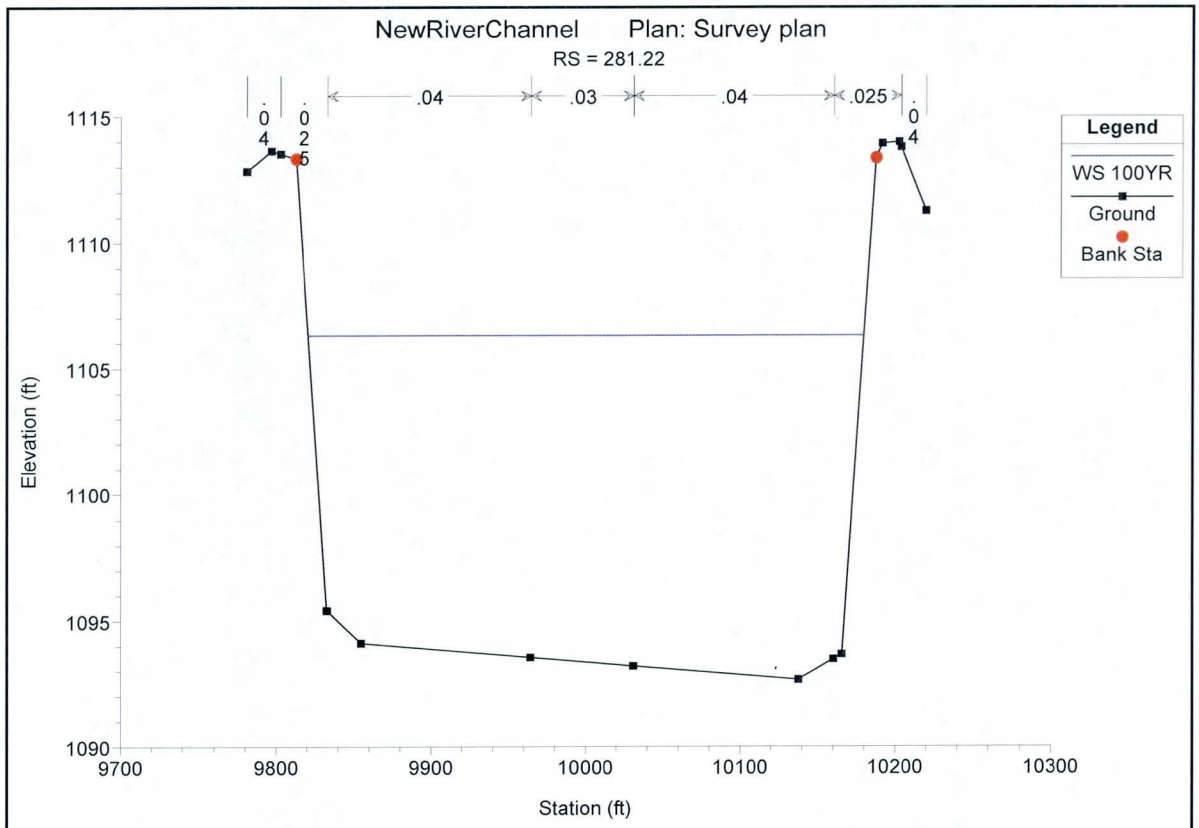
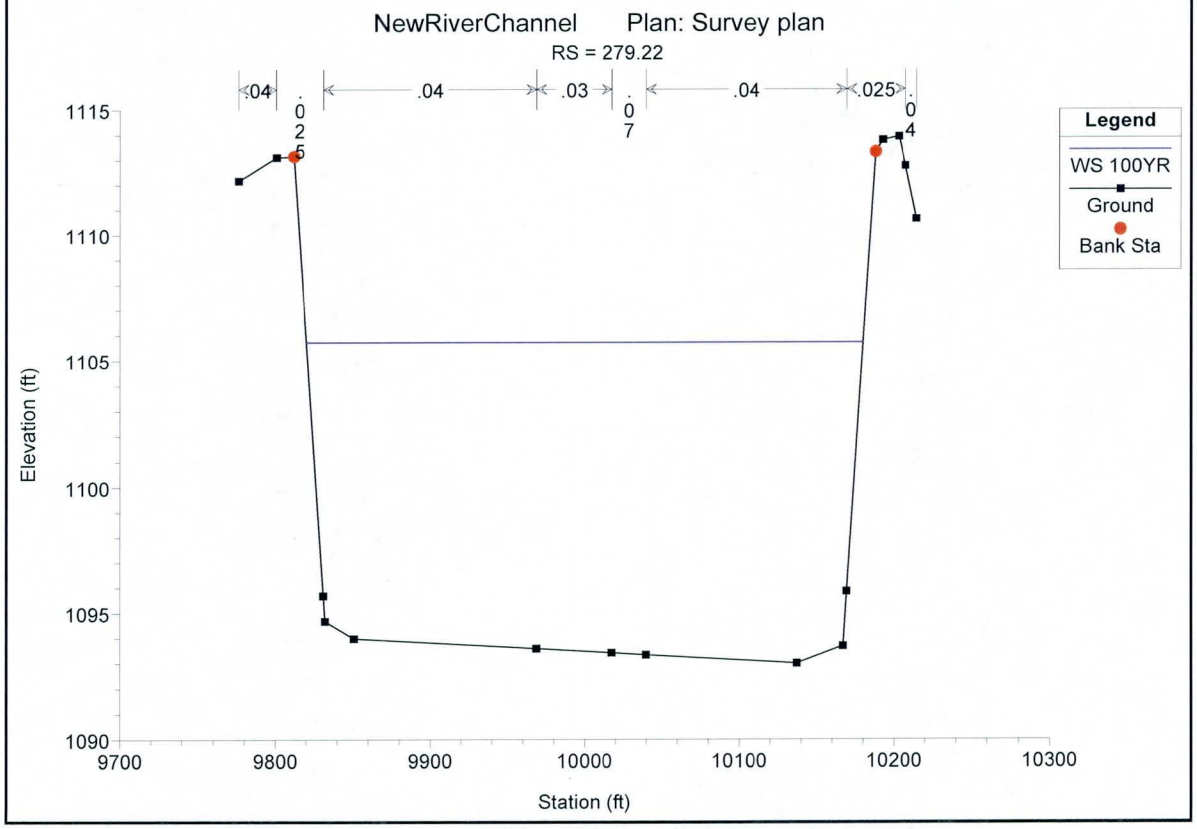
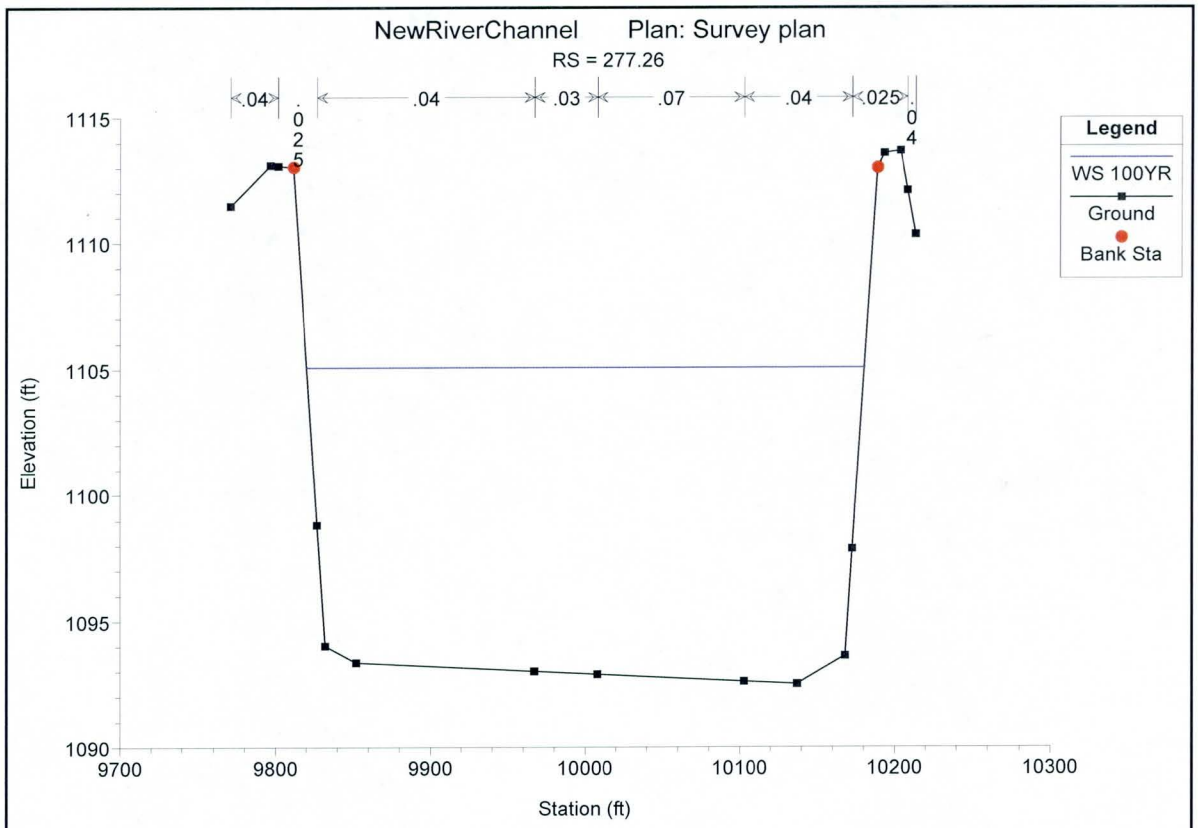
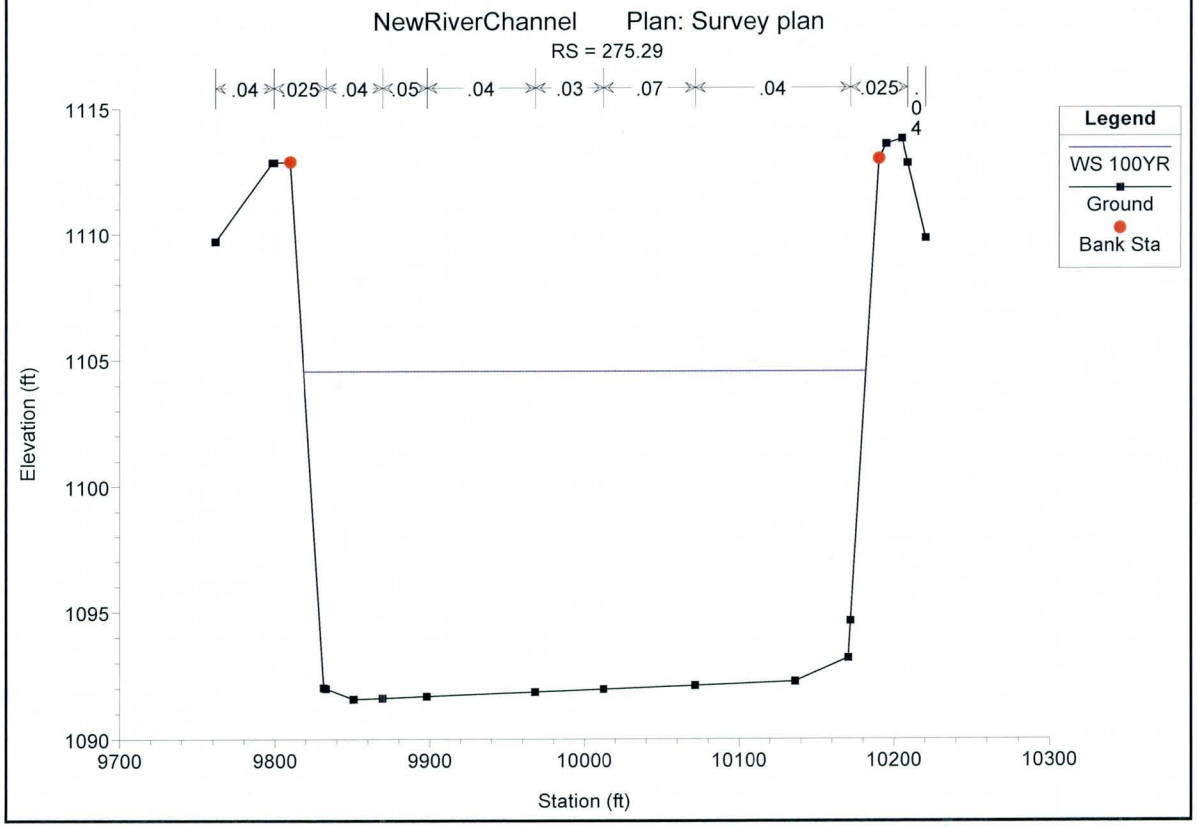
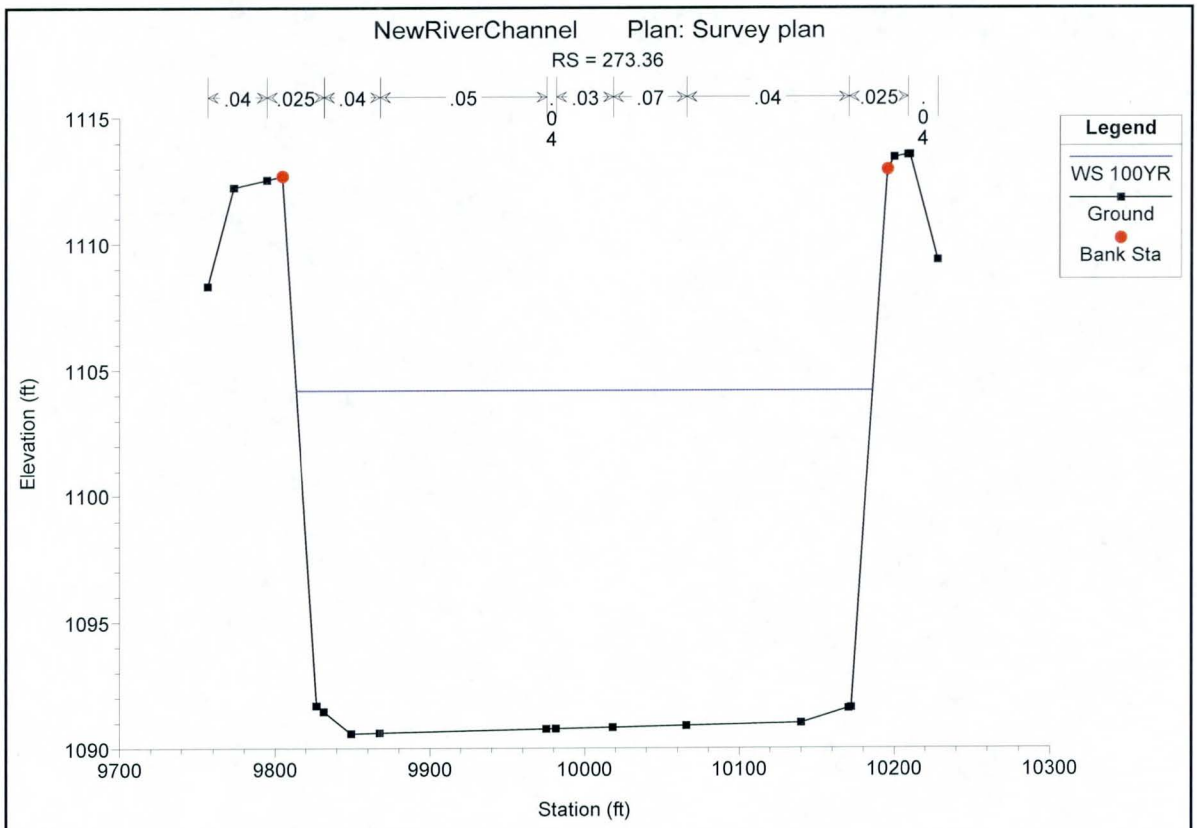
.04
.025
.04
.03
.04
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300
Station (ft)

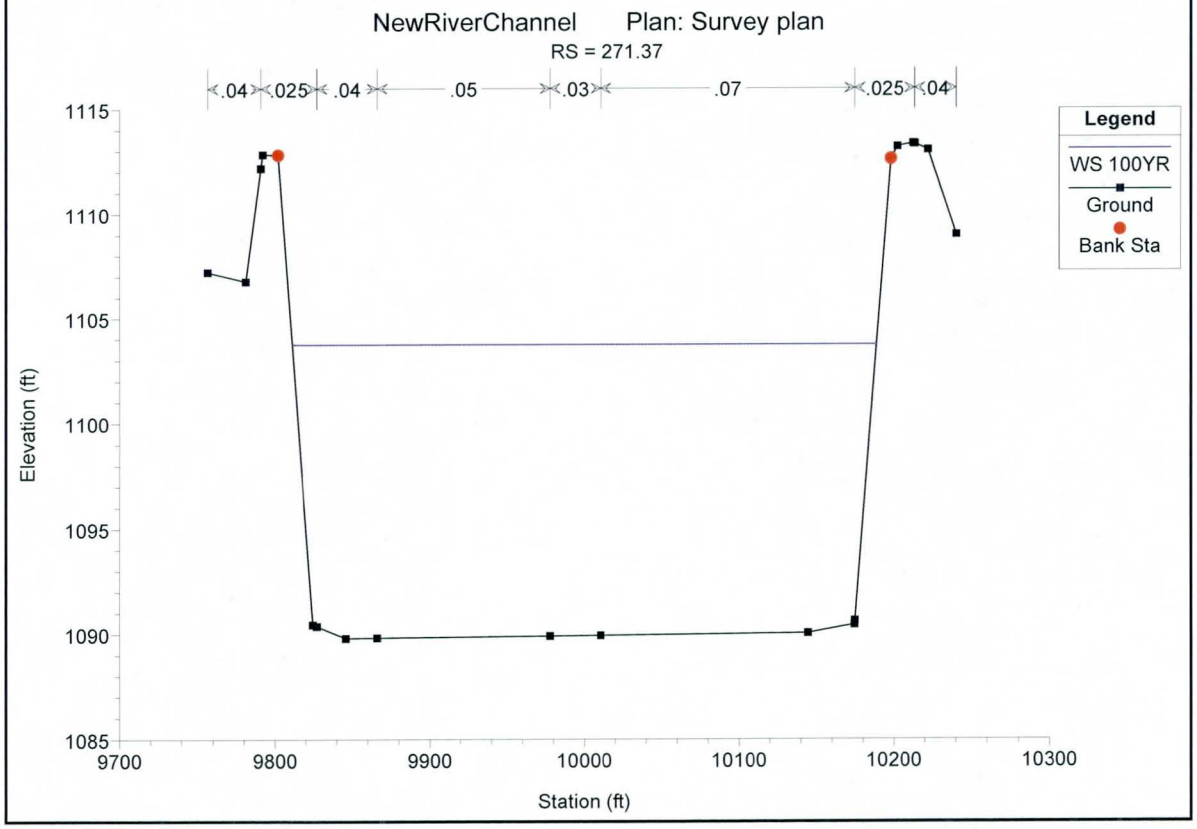

NewRiverChannel Plan: Survey plan
RS = 281.22
.04
.03
.04
.025
.04
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300

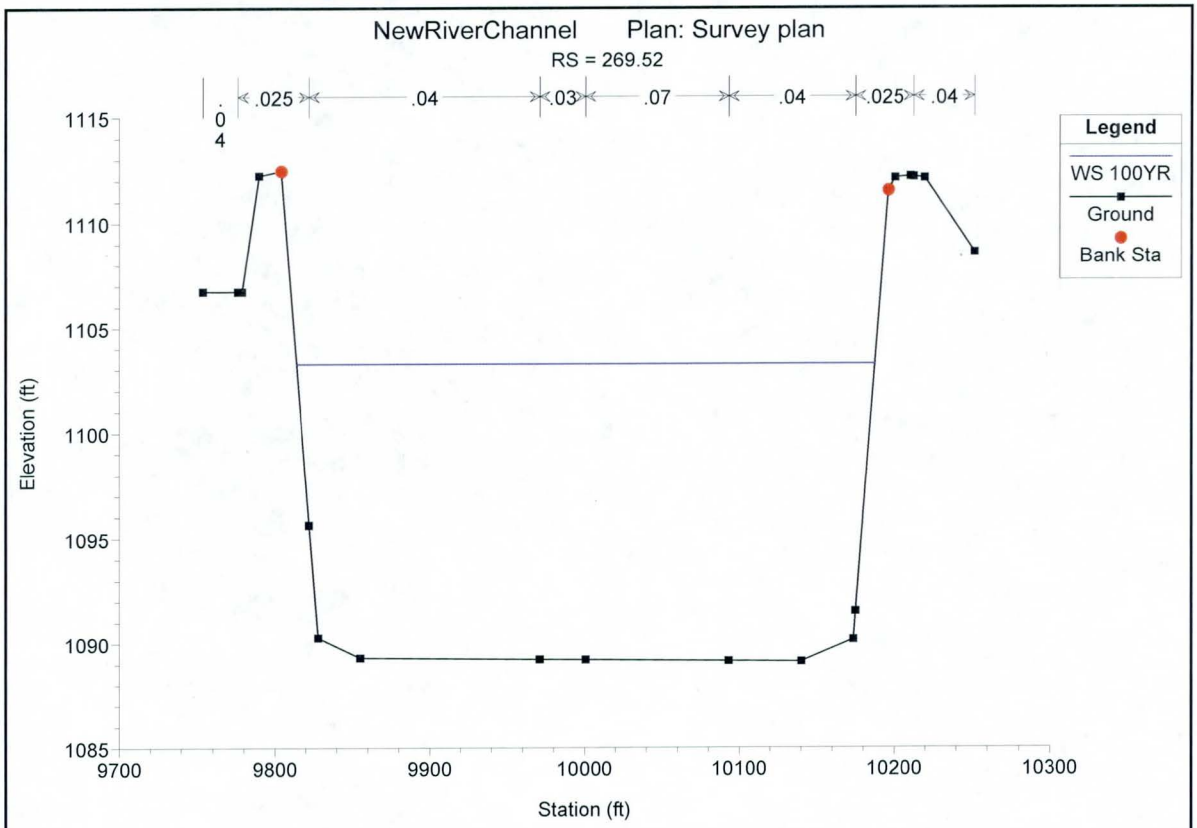

NewRiverChannel Plan: Survey plan
RS = 279.22
.04
.04
.03
.07
.04
.025
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300

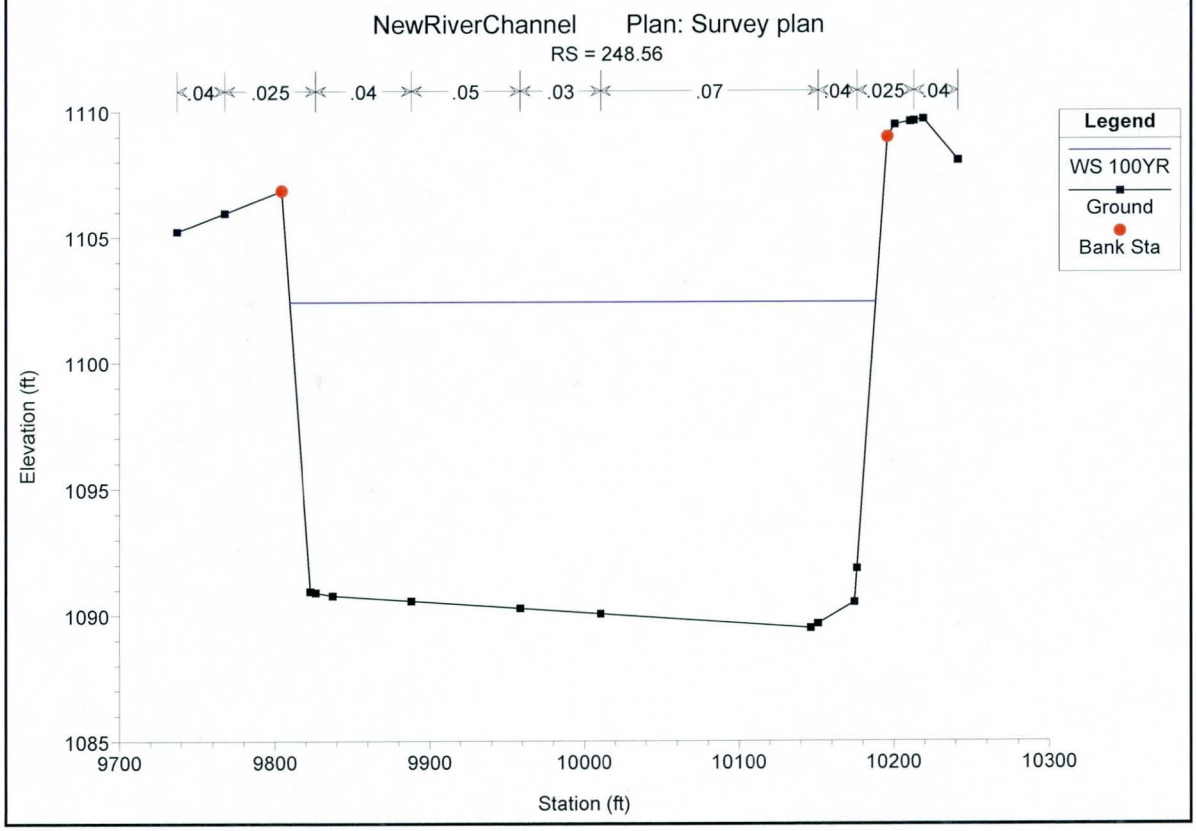

NewRiverChannel Plan: Survey plan
RS = 277.26
.04
.025
.04
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300
Station (ft)

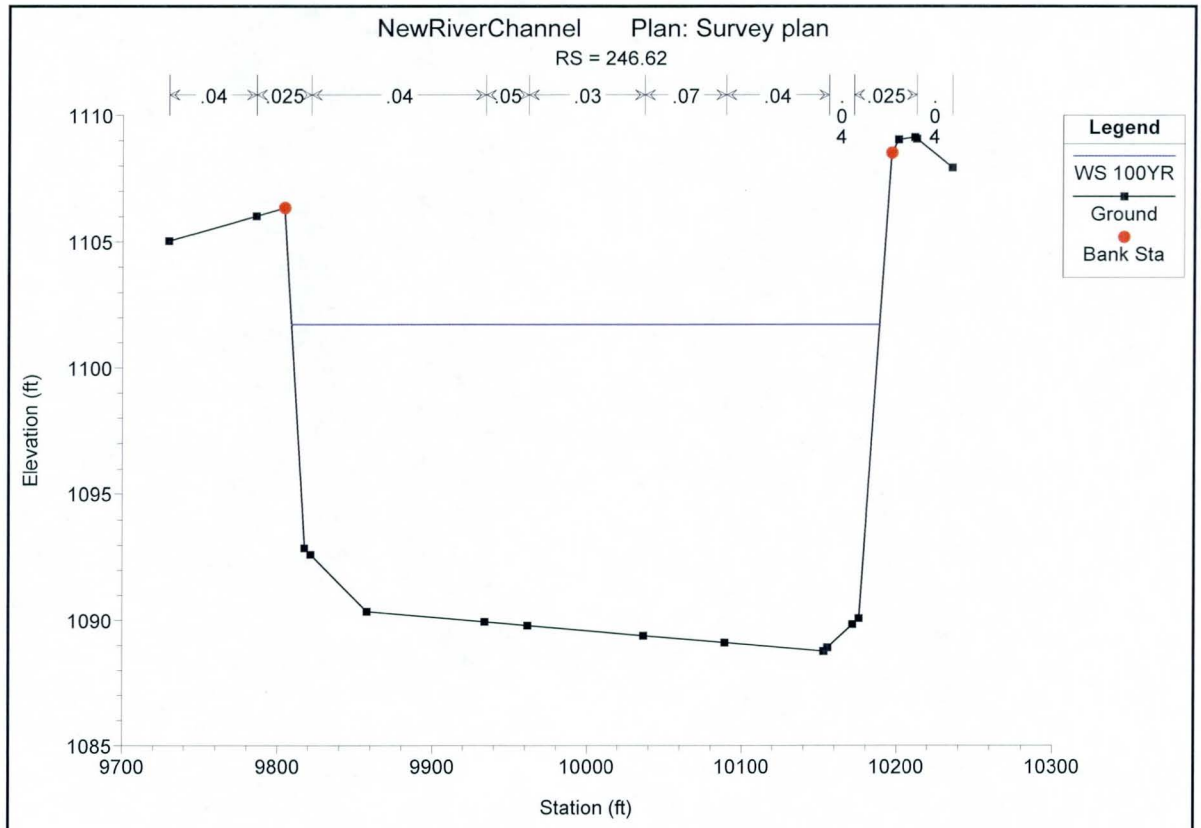

NewRiverChannel Plan: Survey plan
RS = 275.29
.04
.025
.04
.05
.04
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300
Station (ft)

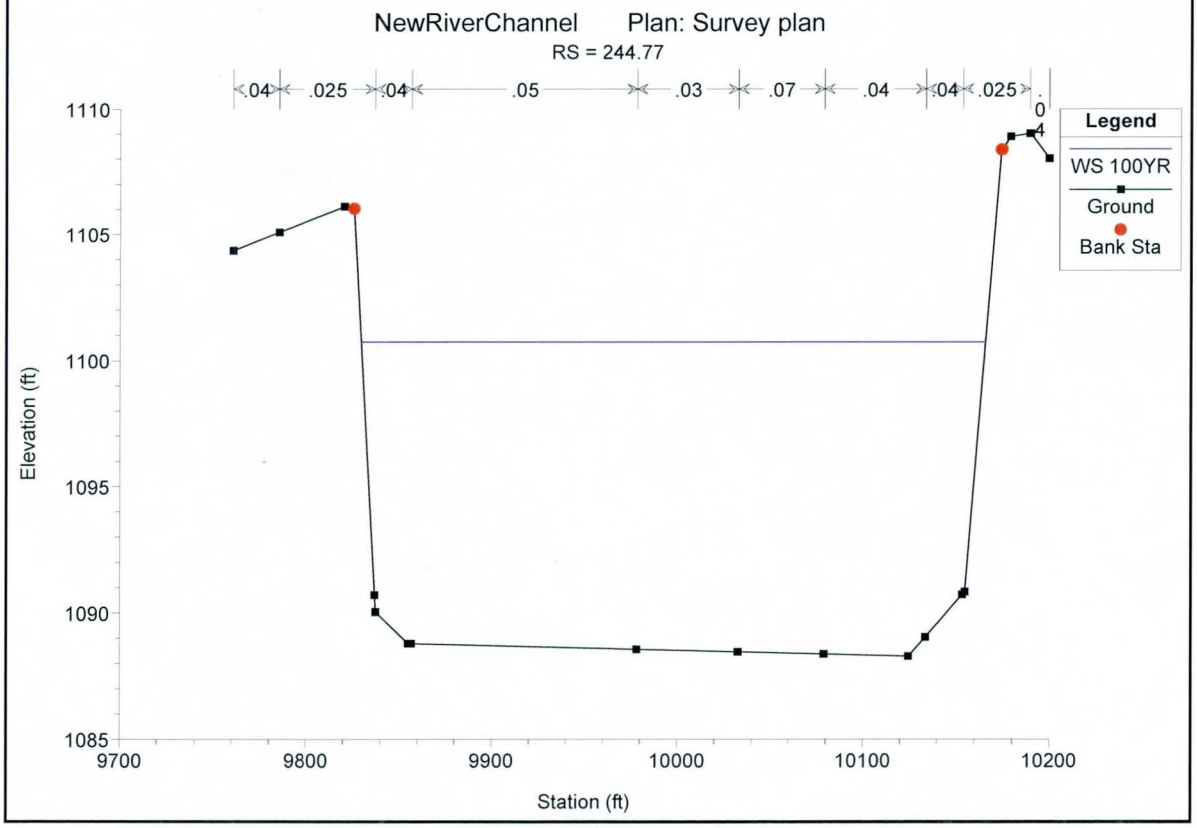

NewRiverChannel Plan: Survey plan
RS = 273.36
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1115
1110
1105
1100
1095
1090
9700
9800
9900
10000
10100
10200
10300

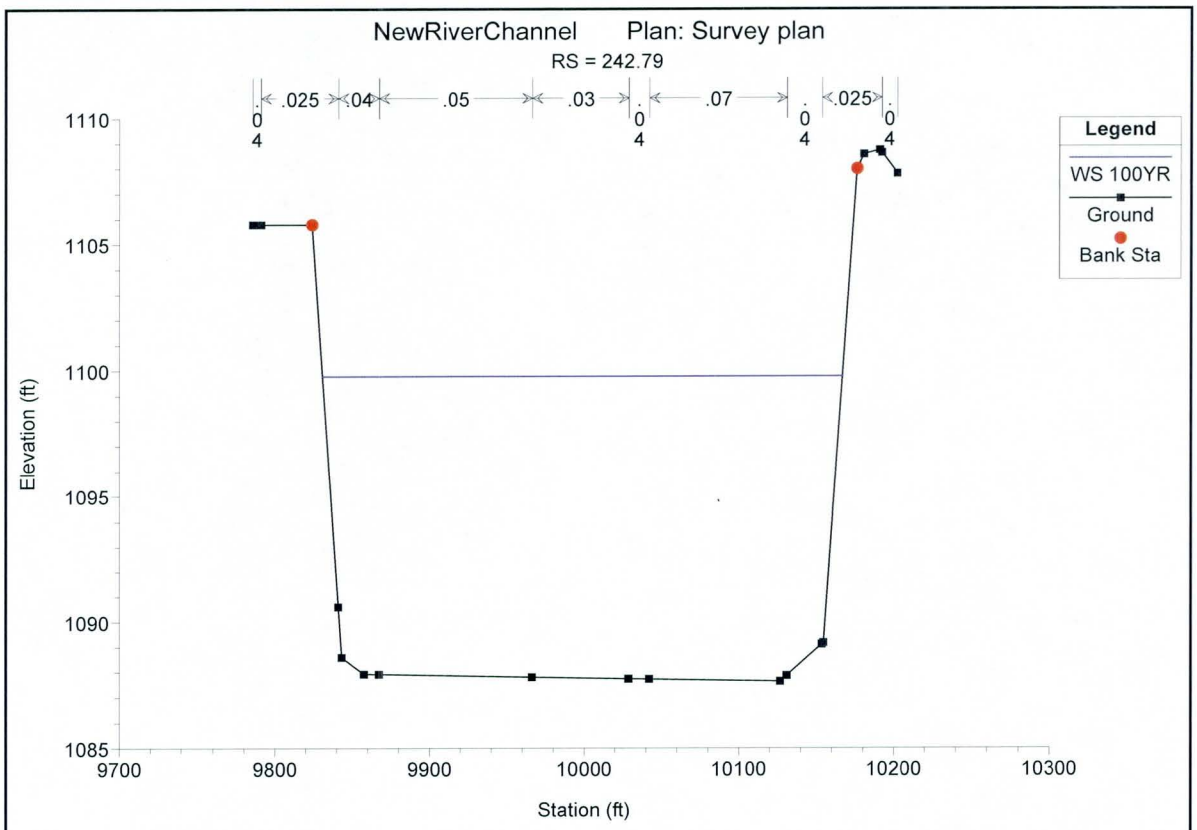

NewRiverChannel Plan: Survey plan
RS = 271.37
.04
.025
.04
.05
.03
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1115
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300

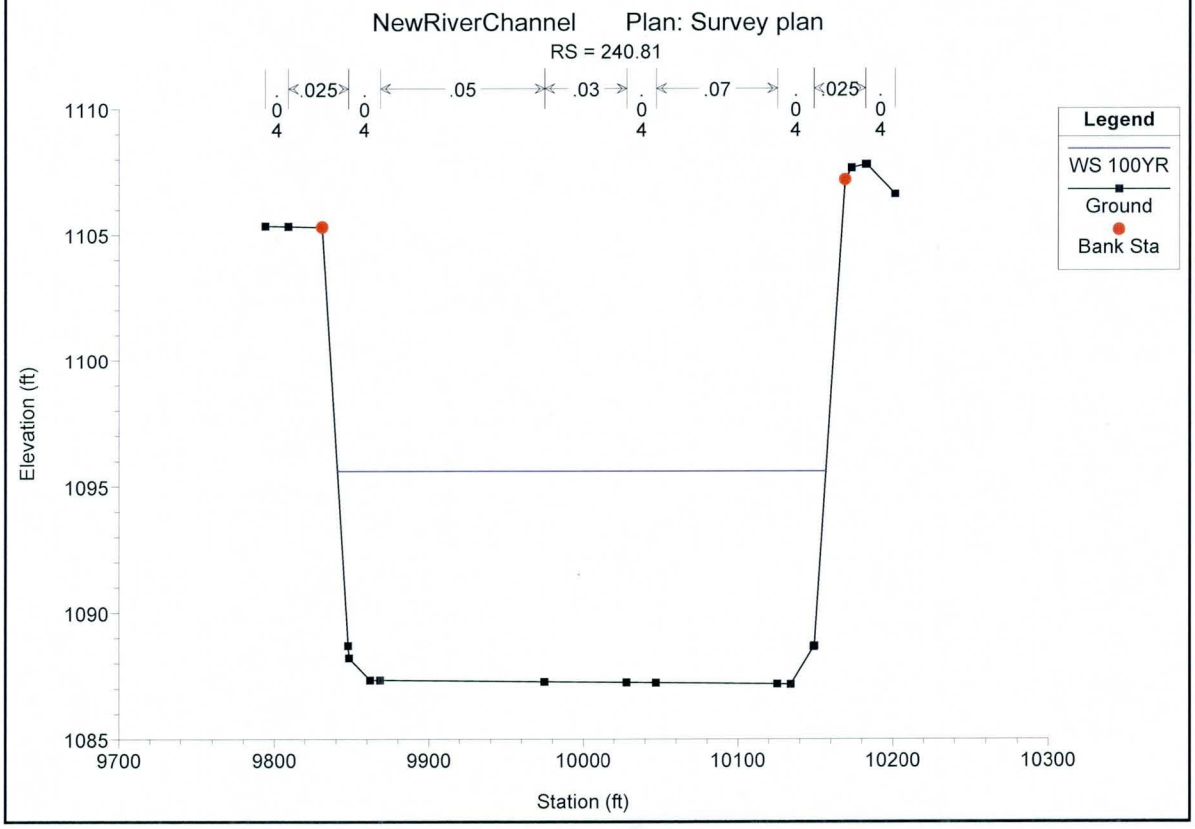

NewRiverChannel Plan: Survey plan
RS = 269.52
.04
.025
.04
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1115
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300

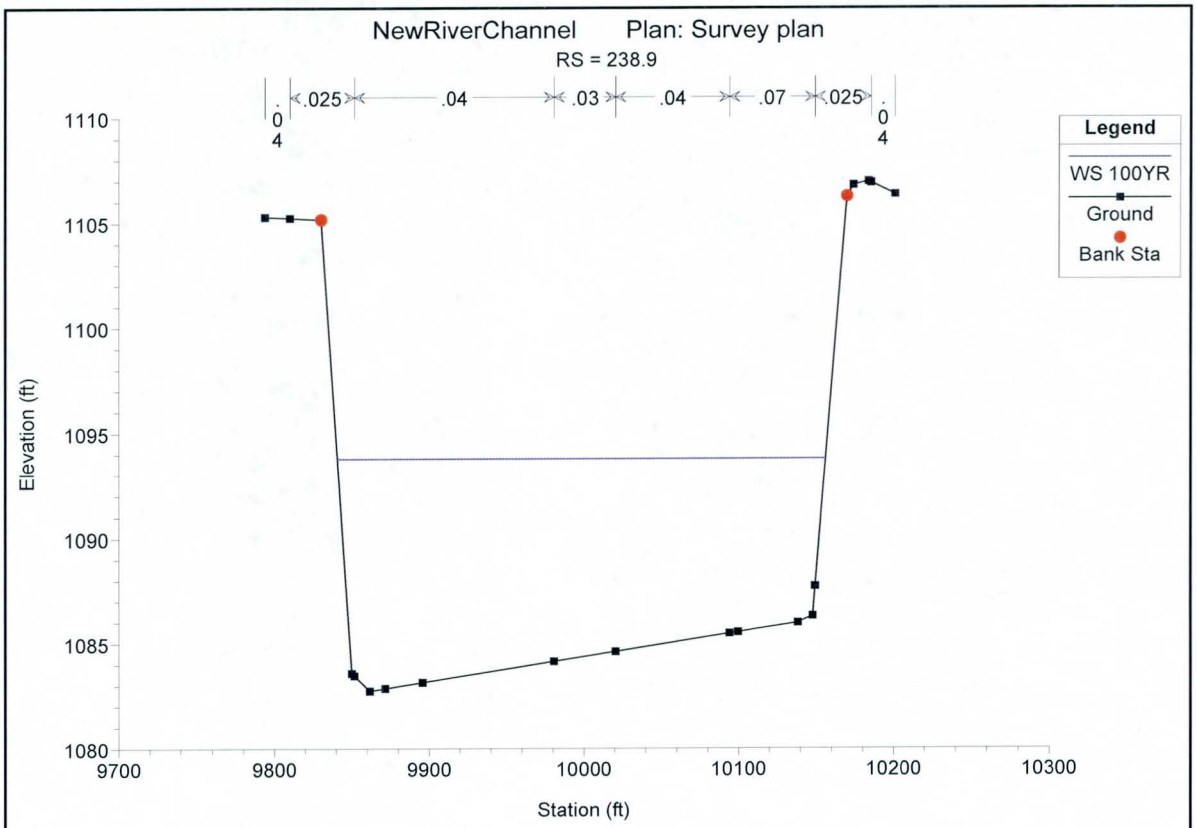

NewRiverChannel Plan: Survey plan
RS = 248.56
.04
.025
.04
.05
.03
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300


NewRiverChannel Plan: Survey plan
RS = 246.62
.04
.025
.04
.05
.03
.07
.04
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 244.77
.04
.025
.04
.05
.03
.07
.04
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 242.79
.04
.025
.04
.05
.03
.04
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 240.81
.04
.025
.04
.05
.03
.04
.07
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1110
1105
1100
1095
1090
1085
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 238.9
.04
.025
.03
.04
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
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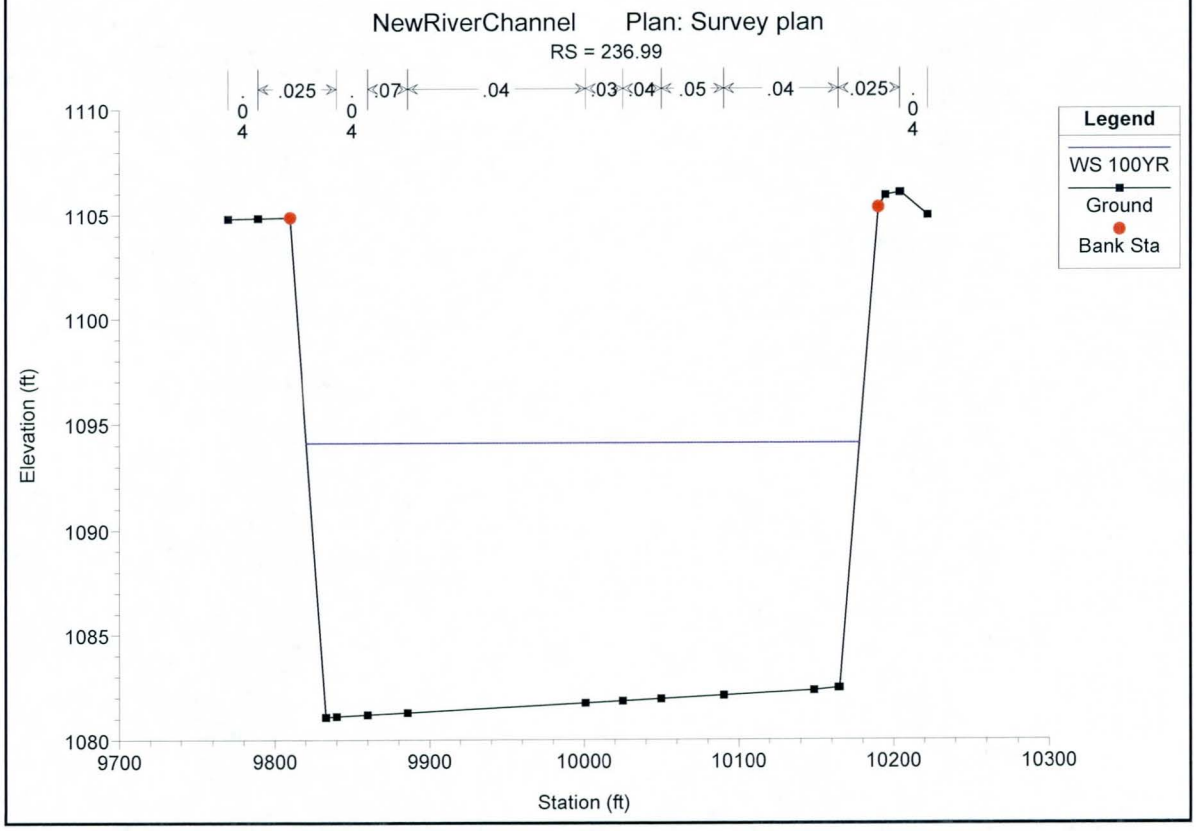
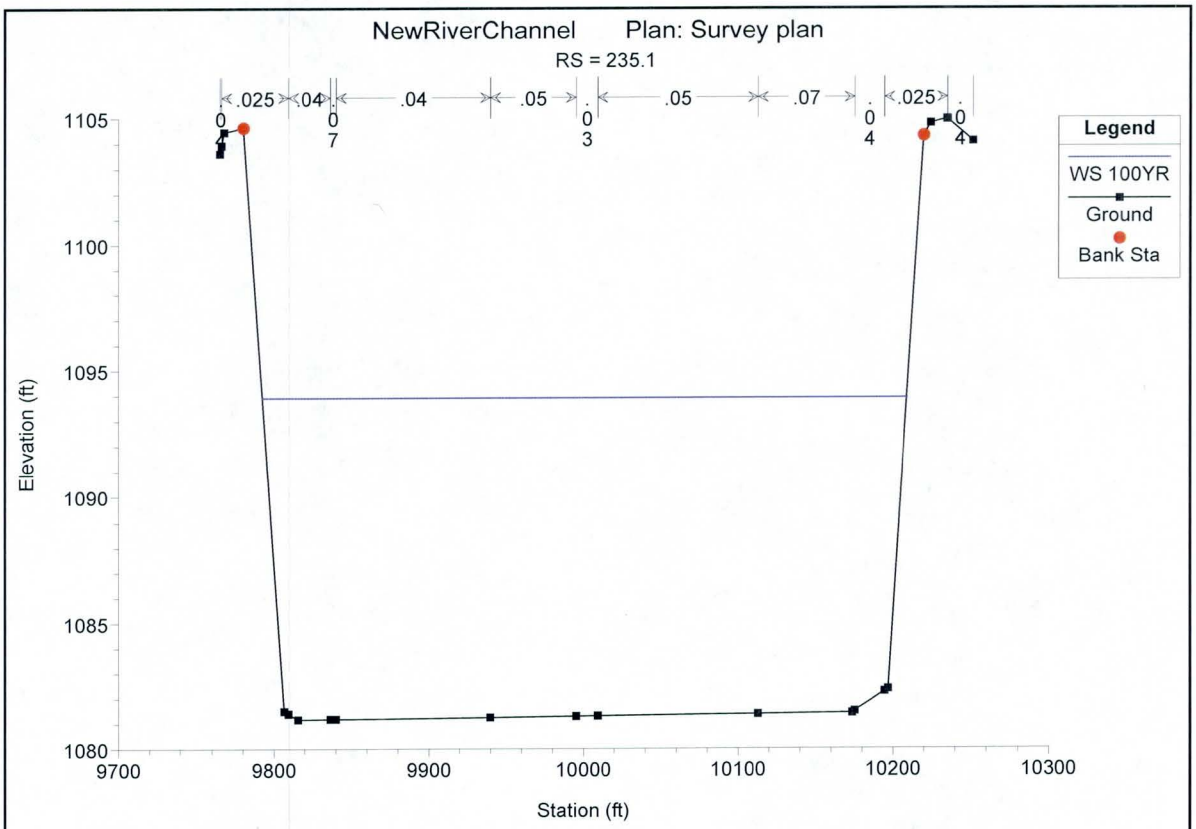
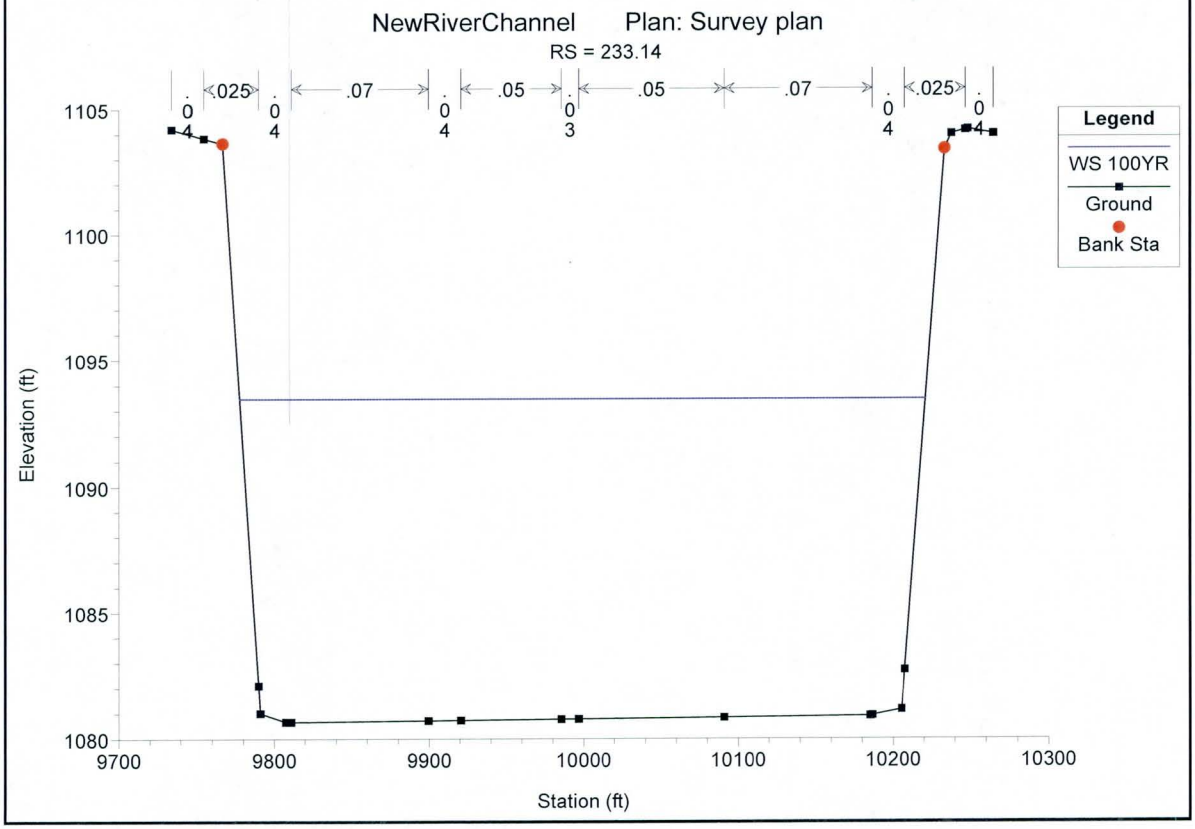
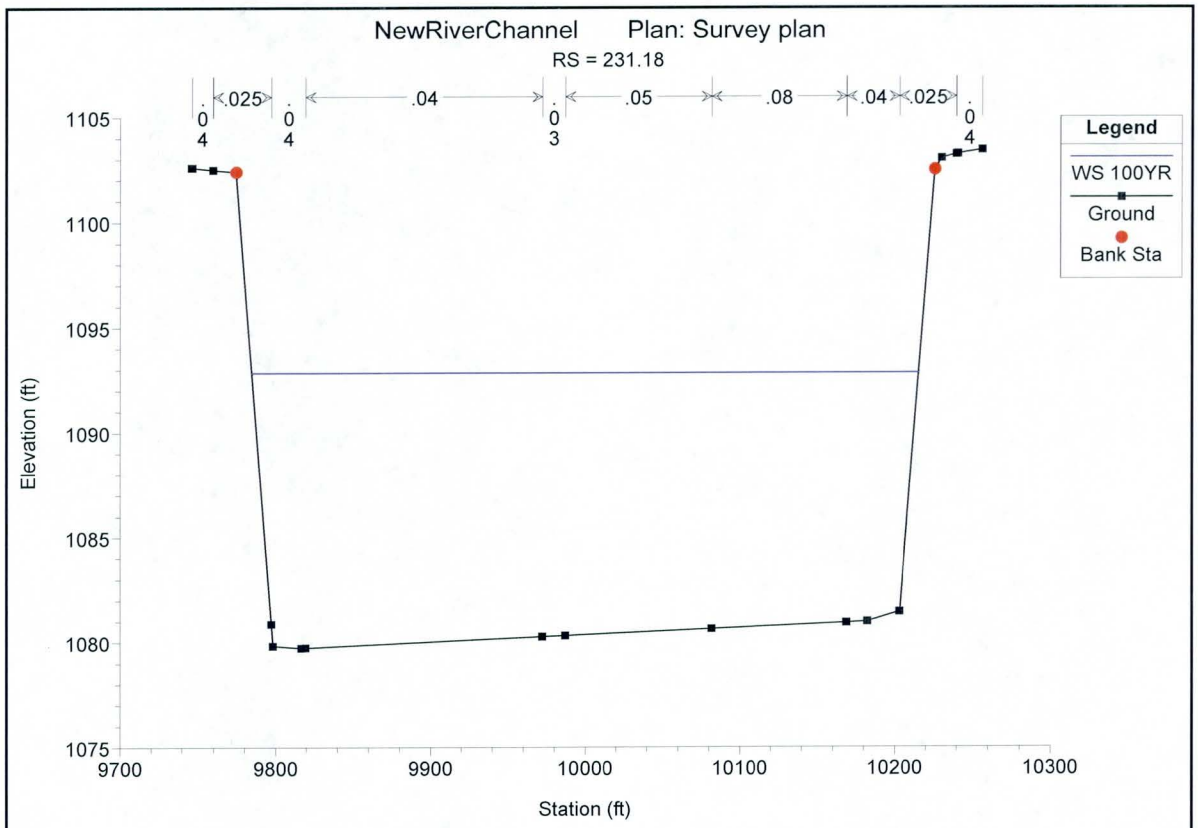
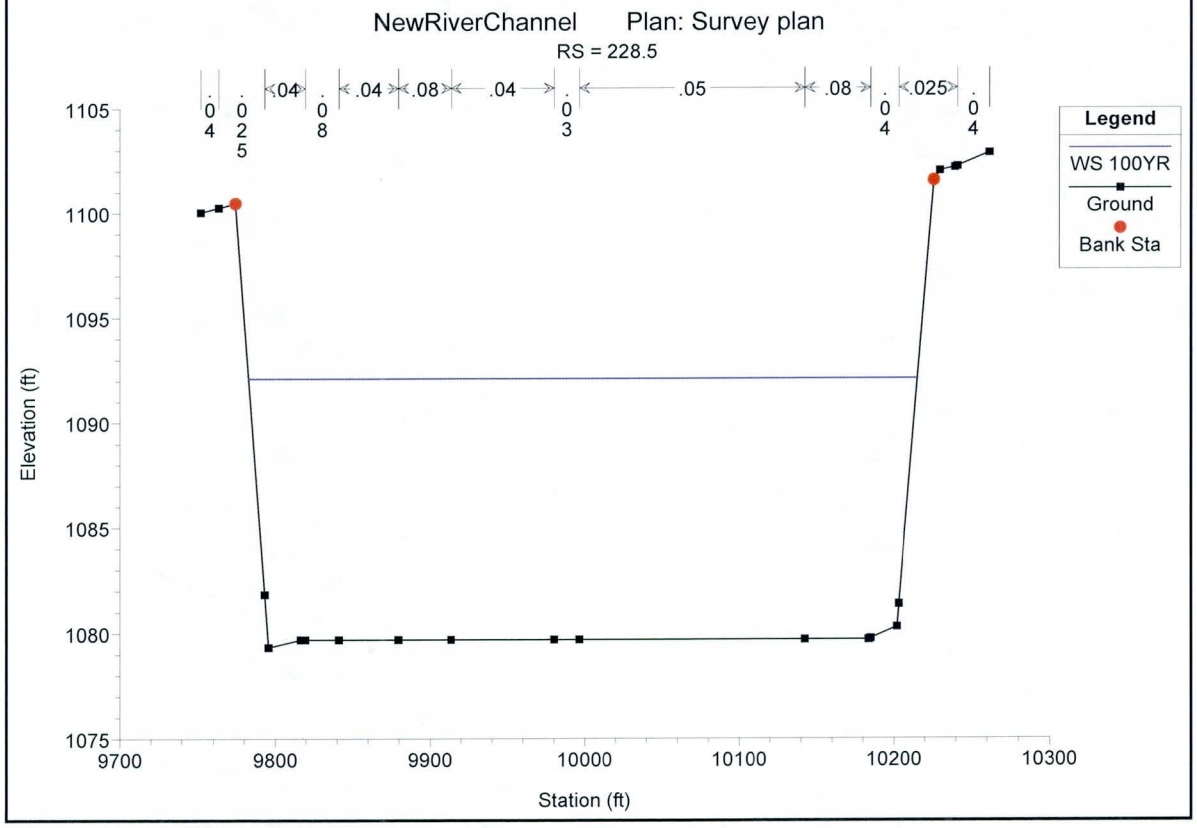
1105
1100
1095
1090
1085
1080
9700
9800
9900
10000
10100
10200
10300

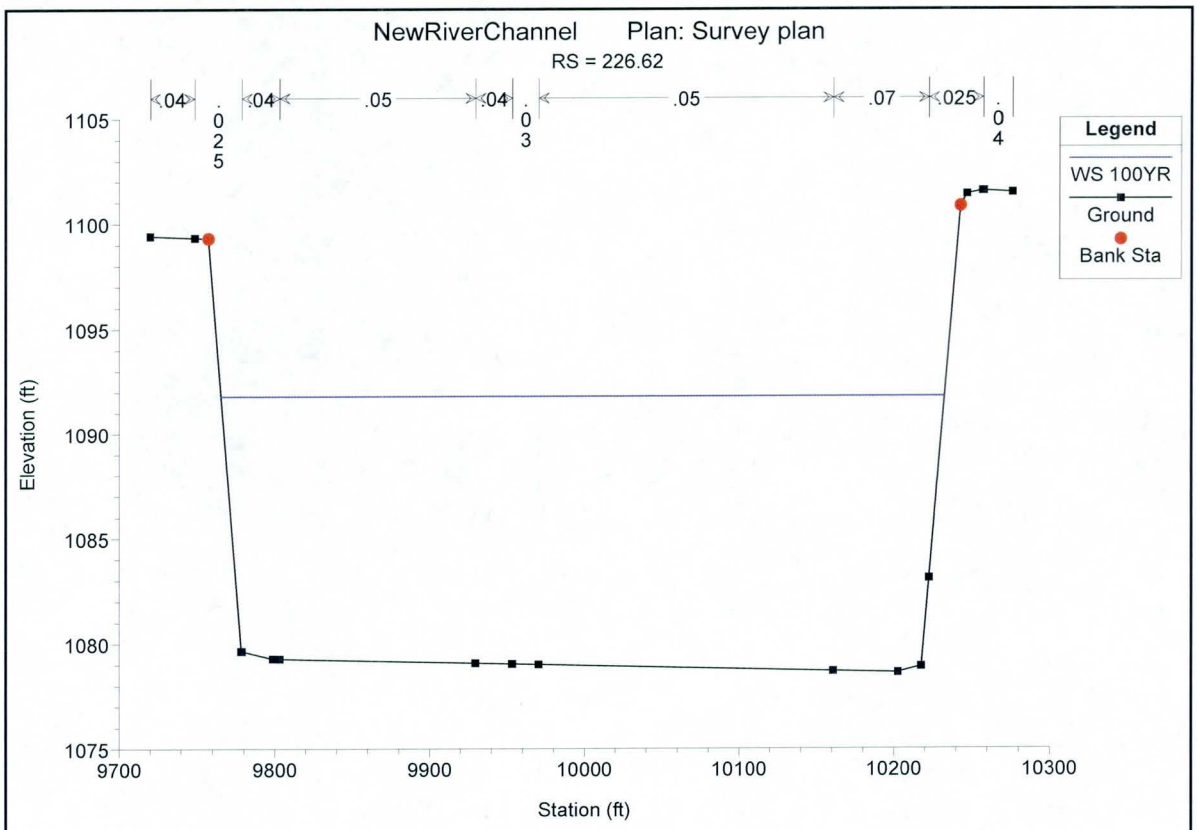

NewRiverChannel Plan: Survey plan
RS = 236.99
.04
.025
.07
.04
.03
.04
.05
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1110
1105
1100
1095
1090
1085
1080
9700
9800
9900
10000
10100
10200
10300

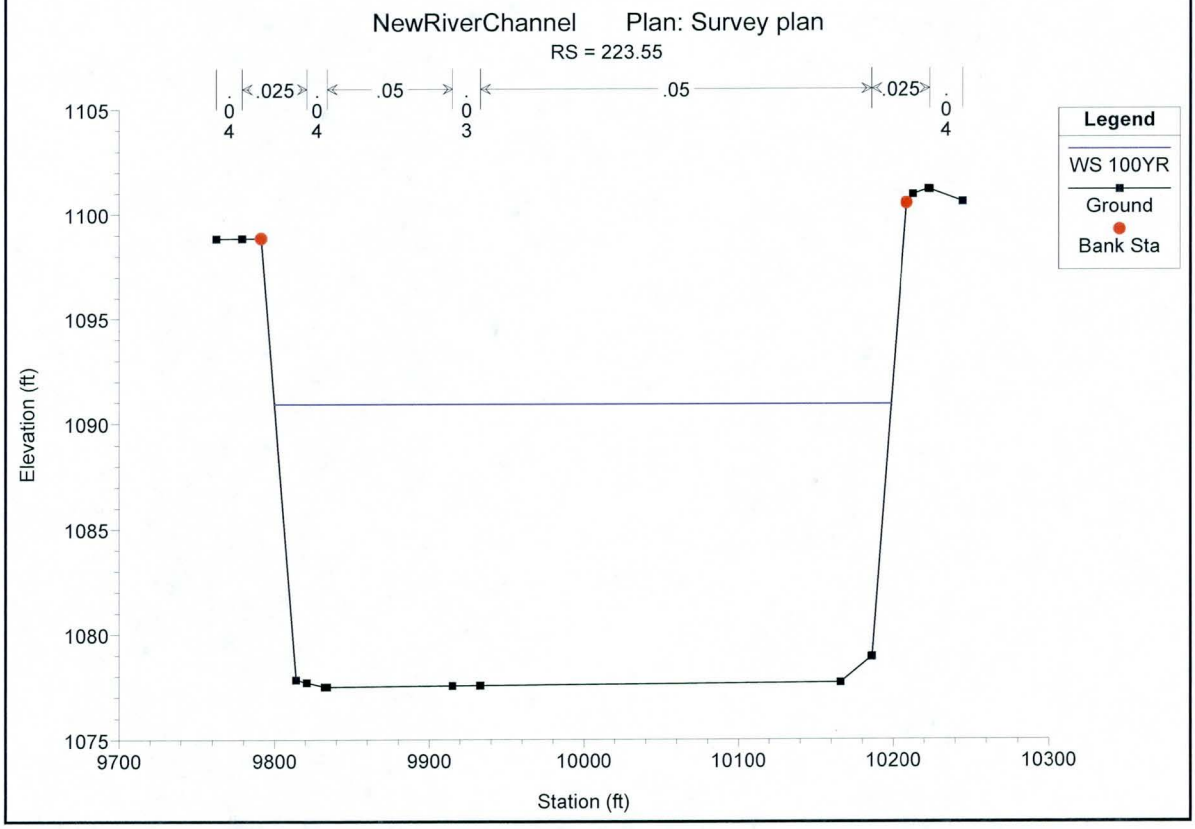

NewRiverChannel Plan: Survey plan
RS = 235.1
.025
.04
.04
.05
.05
.07
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1105
1100
1095
1090
1085
1080
9700
9800
9900
10000
10100
10200
10300

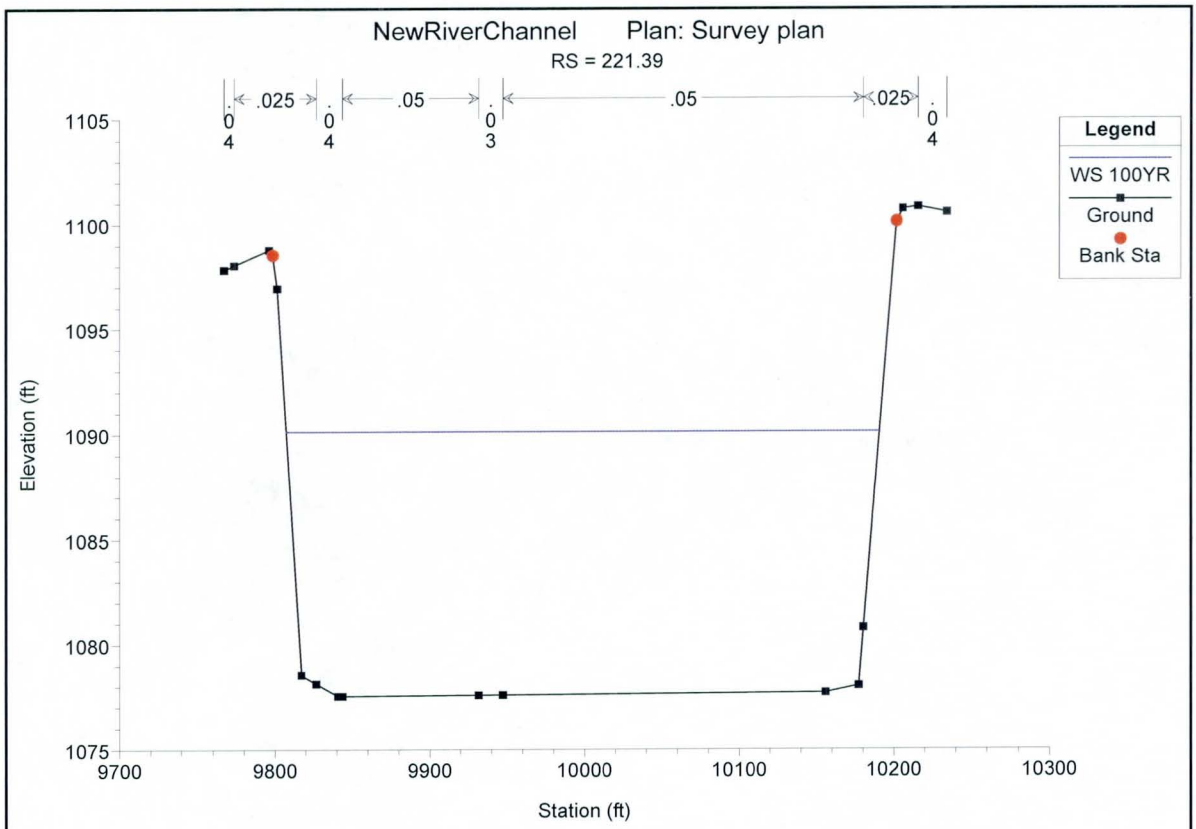

NewRiverChannel Plan: Survey plan
RS = 233.14
.025
.07
.05
.05
.07
.025
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
1105
1100
1095
1090
1085
1080
9700
9800
9900
10000
10100
10200
10300

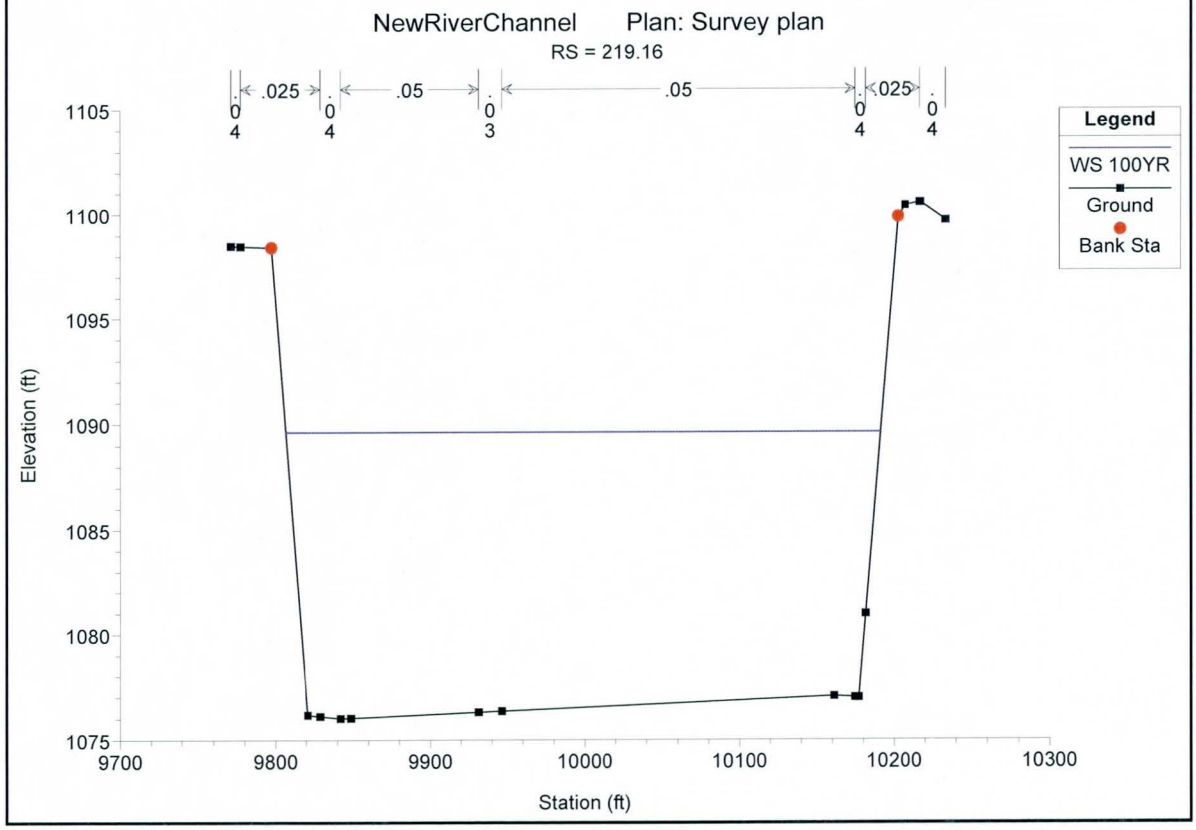

NewRiverChannel Plan: Survey plan
RS = 231.18
.04
.025
.04
.04
.03
.05
.08
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)

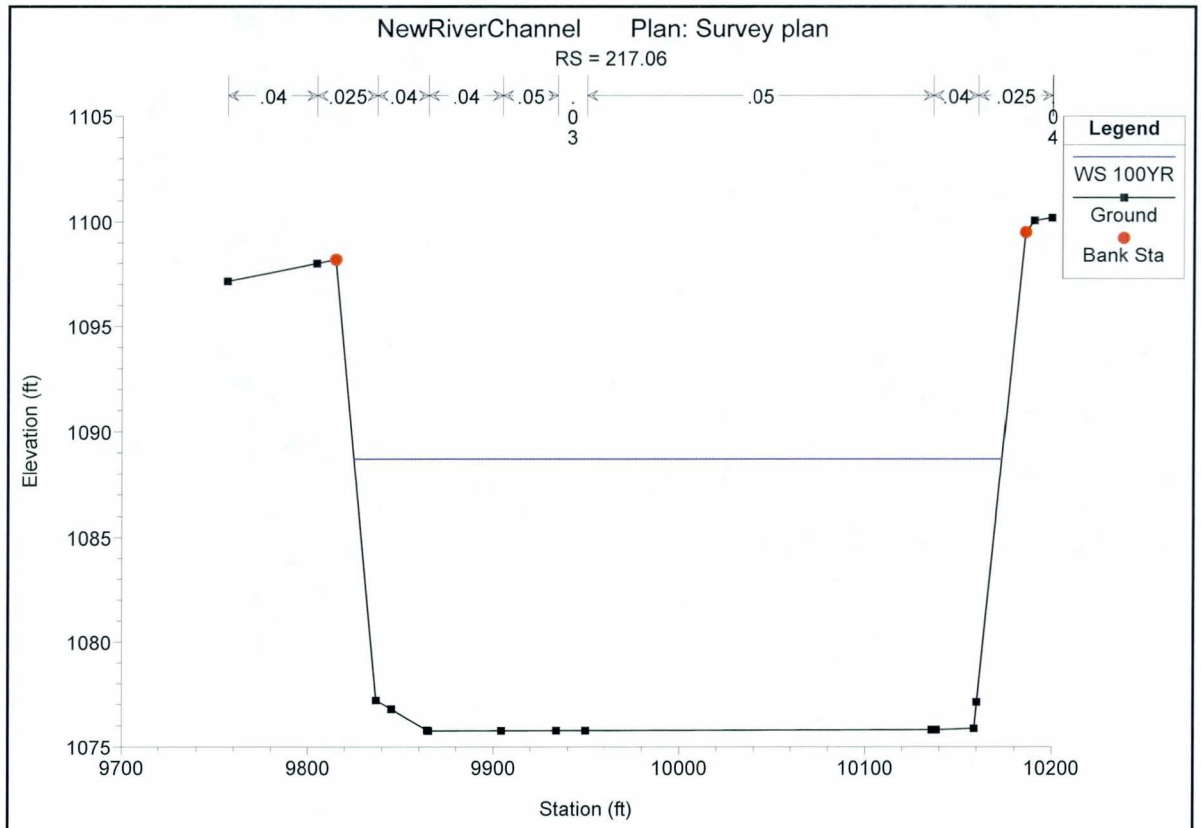

NewRiverChannel Plan: Survey plan
RS = 228.5
.04
.025
.04
.08
.04
.08
.04
.03
.05
.08
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)

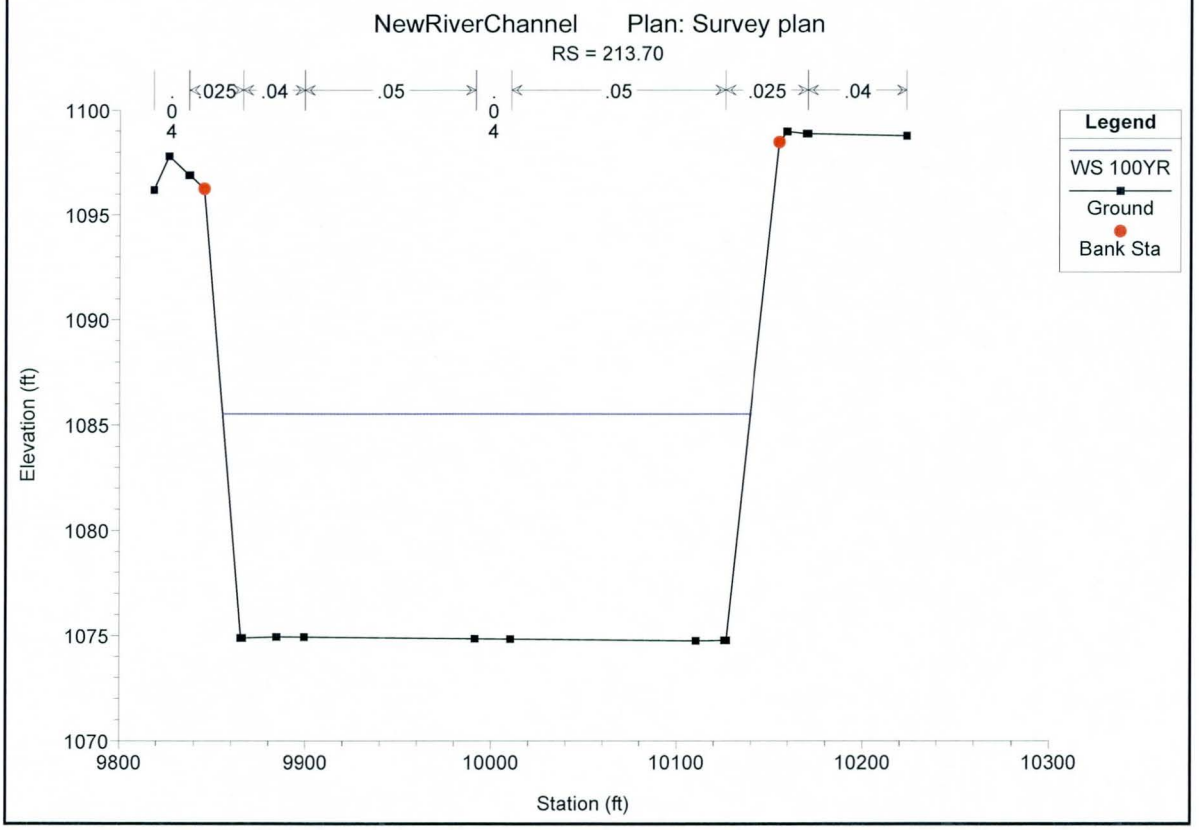

NewRiverChannel Plan: Survey plan
RS = 226.62
.04
.025
.04
.05
.04
.03
.05
.07
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 223.55
.04
.025
.04
.05
.03
.05
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 221.39
.04
.025
.04
.05
.03
.05
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 219.16
.04
.025
.04
.05
.03
.05
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
10300
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 217.06
.04
.025
.04
.04
.05
.03
.05
.04
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1105
1100
1095
1090
1085
1080
1075
9700
9800
9900
10000
10100
10200
Station (ft)


NewRiverChannel Plan: Survey plan
RS = 213.70
.04
.025
.04
.05
.04
.05
.025
.04
Legend
WS 100YR
Ground
Bank Sta
Elevation (ft)
1100
1095
1090
1085
1080
1075
1070
9800
9900
10000
10100
10200
10300
Station (ft)

B.3 HEC-RAS Summary Tables

Standard Table 1

HEC-RAS Plan: NewRiver River: New River Reach: Reach Profile: 100YR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	458.94	100YR	41000.00	1163.62	1176.55	1173.90	1178.50	0.003441	11.20	3659.12	378.03	0.63
Reach	458.88	100YR	41000.00	1161.92	1172.95	1172.95	1176.78	0.009115	15.69	2612.31	340.34	1.00
Reach	458.81	100YR	41000.00	1160.12	1170.81	1168.33	1172.74	0.003619	11.15	3677.31	401.04	0.65
Reach	458.73	100YR	41000.00	1157.92	1169.55	1166.66	1171.34	0.003180	10.74	3817.79	399.40	0.61
Reach	458.66	100YR	41000.00	1157.12	1168.17	1165.36	1170.04	0.003311	10.96	3742.35	382.16	0.62
Reach	453.23	100YR	41000.00	1154.00	1165.90	1163.16	1168.25	0.002654	12.31	3330.96	308.20	0.66
Reach	452.73	100YR	41000.00	1154.00	1165.50	1163.25	1168.09	0.003069	12.91	3175.76	303.93	0.70
Reach	452.65	100YR	41000.00	1155.00	1163.70	1163.70	1167.89	0.006633	16.42	2496.50	297.88	1.00
Reach	452.5	100YR	41000.00	1153.00	1161.82	1161.82	1166.06	0.006583	16.52	2482.35	291.34	1.00
Reach	452.23	100YR	41000.00	1144.00	1162.62	1154.21	1163.77	0.000758	8.59	4774.26	288.48	0.37
Reach	451.23	100YR	41000.00	1144.00	1162.56	1153.83	1163.69	0.000736	8.54	4800.03	285.37	0.37
Reach	451.05	100YR	41000.00	1144.00	1162.54	1154.14	1163.66	0.002331	8.51	4818.35	295.13	0.37
Reach	450.23	100YR	41000.00	1143.00	1162.39	1153.65	1163.49	0.001760	8.40	4878.86	299.66	0.37
Reach	449.05	100YR	41000.00	1143.00	1161.84	1154.33	1163.24	0.002633	9.51	4313.14	276.92	0.42
Reach	446.87	100YR	41000.00	1142.00	1161.48	1153.72	1162.68	0.001903	8.80	4660.96	303.52	0.40
Reach	441.6	100YR	41000.00	1142.00	1159.45	1154.56	1161.34	0.003220	11.03	3716.20	310.06	0.54
Reach	435.37	100YR	41000.00	1138.00	1158.70	1150.39	1159.84	0.001410	8.57	4785.65	301.81	0.38
Reach	429.37	100YR	41000.00	1139.00	1157.92	1149.79	1159.03	0.001306	8.45	4849.85	310.50	0.38
Reach	424.17	100YR	41000.00	1138.00	1157.20	1148.77	1158.27	0.001608	8.30	4940.62	312.57	0.37
Reach	418.97	100YR	41000.00	1138.00	1155.94	1149.29	1157.26	0.002340	9.22	4446.97	311.54	0.43
Reach	412.76	100YR	41000.00	1137.00	1154.71	1148.03	1155.87	0.001945	8.64	4743.04	342.43	0.41
Reach	410.54	100YR	41000.00	1137.30	1152.79	1148.88	1155.22	0.002808	12.50	3279.55	254.37	0.61
Reach	410.02		Bridge									
Reach	409.5	100YR	41000.00	1136.97	1150.22	1148.51	1153.73	0.004784	15.06	2723.34	244.41	0.79
Reach	406.5	100YR	41000.00	1136.00	1149.89	1146.63	1151.84	0.002784	11.21	3659.02	345.71	0.61
Reach	402.5	100YR	41000.00	1136.00	1147.58	1145.90	1150.35	0.004593	13.35	3071.86	318.97	0.76
Reach	395.5	100YR	41000.00	1133.00	1145.87	1142.42	1147.66	0.002577	10.74	3817.72	354.31	0.58
Reach	392	100YR	41000.00	1131.00	1145.41	1140.94	1146.78	0.001948	9.37	4377.32	387.49	0.49
Reach	388.5	100YR	41000.00	1131.00	1144.64	1140.45	1146.04	0.002259	9.50	4315.32	396.72	0.51
Reach	384.5	100YR	41000.00	1130.50	1143.31	1140.05	1144.97	0.003060	10.34	3964.00	392.21	0.57
Reach	379.75	100YR	41000.00	1129.00	1142.02	1138.55	1143.59	0.002703	10.07	4071.21	398.56	0.56
Reach	376.75	100YR	41000.00	1128.00	1141.14	1137.85	1142.70	0.003228	10.03	4087.82	416.60	0.56
Reach	373.75	100YR	41000.00	1127.00	1140.92	1136.07	1141.88	0.001516	7.88	5206.31	487.93	0.42
Reach	370.65	100YR	41000.00	1126.50	1140.39	1135.95	1141.40	0.001567	8.05	5093.78	495.37	0.44
Reach	365.4	100YR	41000.00	1125.50	1138.31	1135.82	1140.12	0.003524	10.80	3796.60	415.28	0.63
Reach	358.25	100YR	41000.00	1123.00	1135.40	1133.04	1137.60	0.003569	11.90	3447.21	360.25	0.67
Reach	355.82	100YR	41000.00	1123.60	1134.69	1132.25	1136.87	0.003251	11.84	3461.61	347.90	0.66
Reach	353.37	100YR	41000.00	1122.97	1133.86	1131.37	1136.05	0.003379	11.88	3450.41	347.71	0.66
Reach	351.14	100YR	41000.00	1122.69	1133.25	1130.73	1135.29	0.003051	11.45	3584.45	374.91	0.64

HEC-RAS Plan: NewRiver River: New River Reach: Reach Profile: 100YR (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	349.15	100YR	41000.00	1121.84	1132.67	1130.10	1134.67	0.003037	11.35	3611.96	371.61	0.64
Reach	347.48	100YR	41000.00	1120.50	1132.48	1128.60	1134.22	0.001717	10.75	4024.44	363.04	0.55
Reach	347.17		Bridge									
Reach	346.86	100YR	41000.00	1119.80	1131.29	1127.94	1133.10	0.002071	10.81	3791.47	356.96	0.58
Reach	346.02		Bridge									
Reach	345.28	100YR	41000.00	1119.40	1130.52	1127.64	1132.63	0.002304	11.84	3652.04	356.88	0.63
Reach	342.36	100YR	41000.00	1117.94	1129.70	1126.22	1131.40	0.004938	10.48	3912.80	367.15	0.57
Reach	340.52	100YR	41000.00	1117.54	1128.95	1125.66	1130.70	0.003025	10.62	3861.57	367.94	0.58
Reach	338.46	100YR	41000.00	1116.94	1128.29	1124.84	1130.08	0.003013	10.72	3826.31	353.66	0.57
Reach	336.44	100YR	41000.00	1116.44	1127.50	1124.32	1129.37	0.003907	10.97	3736.07	353.35	0.59
Reach	334.45	100YR	41000.00	1114.94	1126.94	1123.18	1128.62	0.003172	10.41	3939.27	353.04	0.55
Reach	332.37	100YR	41000.00	1114.66	1125.18	1123.35	1127.62	0.006717	12.53	3271.69	351.81	0.72
Reach	330.32	100YR	41000.00	1113.39	1124.47	1121.41	1126.40	0.004112	11.15	3677.58	352.44	0.61
Reach	327.82	100YR	41000.00	1111.44	1123.72	1119.66	1125.32	0.003768	10.18	4029.14	352.51	0.53
Reach	325.76	100YR	41000.00	1110.68	1122.95	1119.06	1124.60	0.003316	10.29	3985.63	353.21	0.54
Reach	323.71	100YR	41000.00	1109.45	1122.37	1118.06	1123.89	0.003199	9.91	4138.52	355.34	0.51
Reach	321.8	100YR	41000.00	1108.44	1121.87	1117.03	1123.29	0.002797	9.56	4289.80	347.70	0.48
Reach	319.71	100YR	41000.00	1107.16	1121.48	1115.72	1122.69	0.002385	8.83	4642.62	356.38	0.43
Reach	317.61	100YR	41000.00	1106.13	1121.13	1114.60	1122.21	0.001844	8.34	4915.69	358.02	0.40
Reach	315.64	100YR	41000.00	1105.69	1120.68	1114.59	1121.83	0.001946	8.61	4764.32	358.52	0.42
Reach	313.61	100YR	41000.00	1105.85	1120.26	1114.46	1121.45	0.001742	8.77	4674.82	603.39	0.43
Reach	311.37	100YR	41000.00	1105.00	1120.02	1113.23	1121.03	0.001555	8.09	5067.67	604.50	0.38
Reach	309.1	100YR	41000.00	1104.50	1119.30	1113.28	1120.60	0.002057	9.15	4482.11	446.37	0.44
Reach	307.12	100YR	41000.00	1102.65	1118.00	1113.12	1120.03	0.003163	11.43	3587.27	264.59	0.54
Reach	305.38	100YR	41000.00	1101.64	1115.24	1113.26	1119.05	0.007251	15.66	2618.53	209.00	0.78
Reach	301.55	100YR	41000.00	1098.19	1113.89	1110.85	1117.18	0.003044	14.55	2818.28	209.65	0.70
Reach	299.49	100YR	41000.00	1097.94	1113.68	1108.71	1115.90	0.007989	11.95	3430.43	237.68	0.55
Reach	297.57	100YR	41000.00	1097.49	1112.50	1108.20	1114.64	0.005287	11.74	3491.86	264.55	0.57
Reach	295.53	100YR	41000.00	1097.04	1111.40	1106.92	1113.43	0.006337	11.42	3591.66	271.51	0.55
Reach	293.49	100YR	41000.00	1095.93	1109.86	1105.87	1112.09	0.006675	11.97	3424.60	265.46	0.59
Reach	291.72	100YR	41000.00	1094.90	1109.22	1105.09	1111.30	0.002708	11.57	3544.77	271.80	0.56
Reach	291.37		Bridge									
Reach	291.02	100YR	41000.00	1094.90	1108.54	1105.09	1110.85	0.002982	12.20	3361.08	271.75	0.61
Reach	289.18	100YR	41000.00	1095.06	1108.18	1104.09	1110.08	0.003130	11.08	3700.27	301.19	0.56
Reach	287.18	100YR	41000.00	1094.44	1107.61	1103.51	1109.40	0.003431	10.74	3818.64	320.32	0.55
Reach	285.26	100YR	41000.00	1094.18	1107.07	1102.95	1108.78	0.002716	10.49	3908.83	330.62	0.54
Reach	283.27	100YR	41000.00	1093.98	1106.50	1102.71	1108.23	0.002885	10.55	3885.16	343.80	0.55
Reach	281.22	100YR	41000.00	1092.65	1106.30	1101.22	1107.63	0.001898	9.25	4430.72	359.00	0.46
Reach	279.22	100YR	41000.00	1093.00	1105.71	1101.25	1107.17	0.002626	9.72	4220.11	359.74	0.50

HEC-RAS Plan: NewRiver River: New River Reach: Reach Profile: 100YR (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	277.26	100YR	41000.00	1092.51	1105.08	1100.68	1106.56	0.003727	9.77	4196.71	360.11	0.50
Reach	275.29	100YR	41000.00	1091.57	1104.54	1099.64	1105.88	0.002832	9.32	4399.24	363.36	0.47
Reach	273.36	100YR	41000.00	1090.58	1104.18	1098.42	1105.33	0.002317	8.60	4768.06	372.20	0.42
Reach	271.37	100YR	41000.00	1089.81	1103.73	1097.40	1104.78	0.002991	8.20	4999.96	377.54	0.40
Reach	269.52	100YR	41000.00	1089.13	1103.27	1096.88	1104.31	0.002139	8.19	5005.32	373.37	0.39
Reach	248.56	100YR	41000.00	1089.48	1102.40	1097.63	1103.71	0.003865	9.18	4464.89	378.62	0.47
Reach	246.62	100YR	41000.00	1088.75	1101.73	1097.17	1103.07	0.002768	9.32	4399.57	379.96	0.48
Reach	244.77	100YR	41000.00	1088.28	1100.72	1096.71	1102.42	0.004061	10.46	3918.01	336.19	0.54
Reach	242.79	100YR	41000.00	1087.64	1099.76	1095.97	1101.53	0.004925	10.68	3838.73	335.89	0.56
Reach	240.81	100YR	41000.00	1087.17	1095.62	1095.61	1099.62	0.017838	16.06	2552.71	315.91	1.00
Reach	238.9	100YR	41000.00	1082.75	1093.78	1092.72	1096.94	0.009565	14.26	2875.44	315.38	0.83
Reach	236.99	100YR	41000.00	1081.08	1094.09	1089.47	1095.53	0.002745	9.63	4258.19	357.49	0.49
Reach	235.1	100YR	41000.00	1081.17	1093.89	1088.25	1094.91	0.002468	8.10	5060.86	416.49	0.41
Reach	233.14	100YR	41000.00	1080.67	1093.46	1087.48	1094.35	0.002882	7.55	5428.98	443.36	0.38
Reach	231.18	100YR	41000.00	1079.73	1092.84	1087.19	1093.81	0.002606	7.88	5205.94	430.90	0.40
Reach	228.5	100YR	41000.00	1079.34	1092.11	1086.50	1093.07	0.002863	7.88	5200.93	432.53	0.40
Reach	226.62	100YR	41000.00	1078.62	1091.80	1085.42	1092.57	0.002005	7.06	5807.94	467.22	0.35
Reach	223.55	100YR	41000.00	1077.49	1090.90	1084.82	1091.91	0.002180	8.03	5107.76	398.77	0.40
Reach	221.39	100YR	41000.00	1077.54	1090.12	1085.03	1091.34	0.002902	8.86	4626.08	383.38	0.45
Reach	219.16	100YR	41000.00	1076.01	1089.60	1083.93	1090.71	0.002482	8.46	4843.50	384.56	0.42
Reach	217.06	100YR	41000.00	1075.75	1088.71	1083.75	1090.11	0.002966	9.53	4304.30	348.56	0.48
Reach	213.70	100YR	41000.00	1074.75	1085.52	1083.89	1088.60	0.008787	14.07	2913.47	284.26	0.77

B.4 Figures

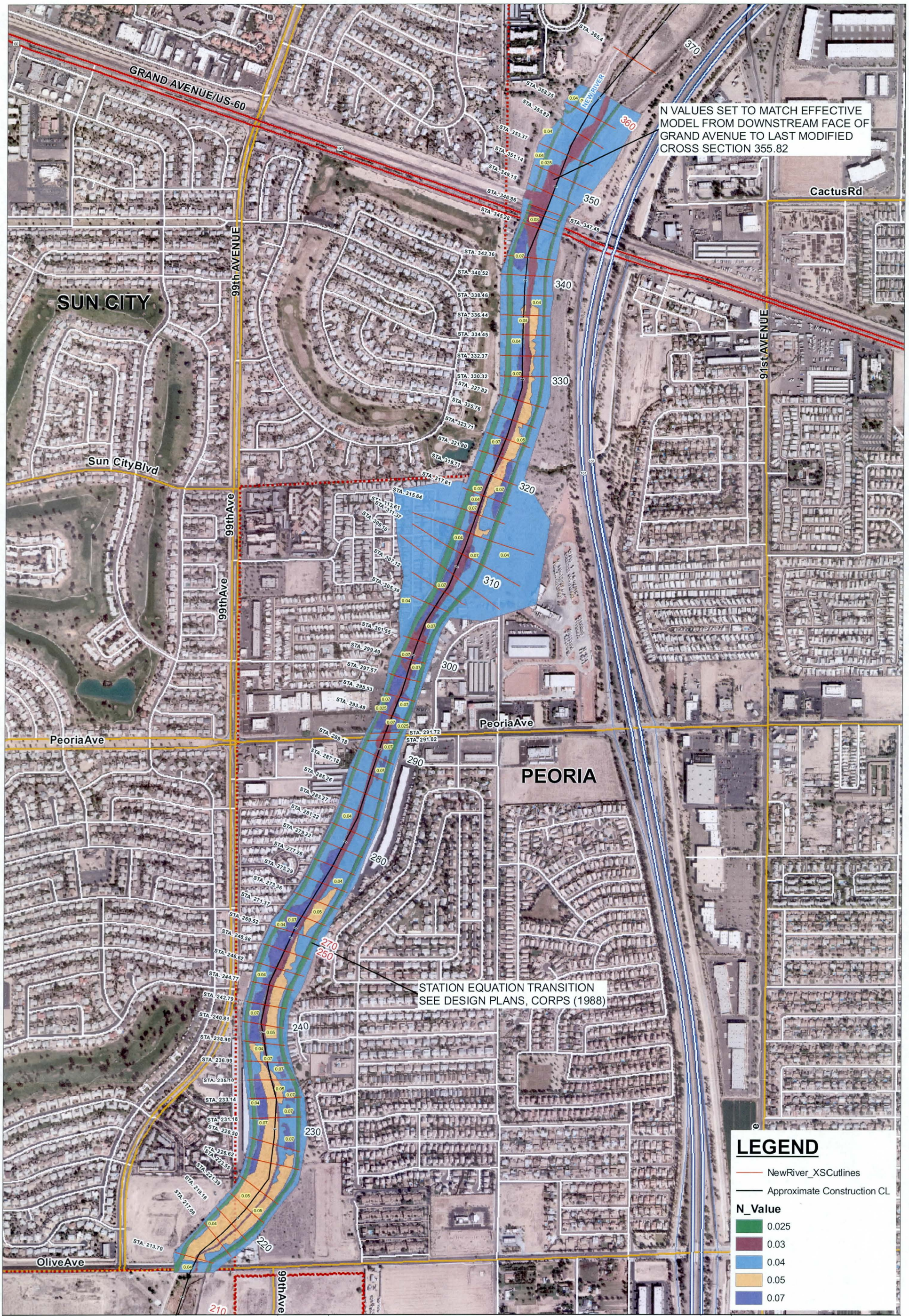


FIGURE B-1: MANNINGS N VALUE LIMITS

NEW RIVER LEVEE/CHANNEL MARICOPA COUNTY, ARIZONA

0 50 100 200 300 400 500 Feet

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

CREATED: 05-2011

FIGURE B-2: FLOOD ZONE LIMITS

* Contour Interval 2 ft. (NGVD 1929)

N

NEW RIVER LEVEE/CHANNEL MARICOPA COUNTY, ARIZONA

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

CREATED:
05-2011

FIGURE B-3: FLOOD ZONE LIMITS

* Contour Interval 2 ft. (NGVD 1929)

NEW RIVER
LEVEE/CHANNEL
MARICOPA COUNTY,
ARIZONA

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the *National Geodetic Vertical Datum of 1929*. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

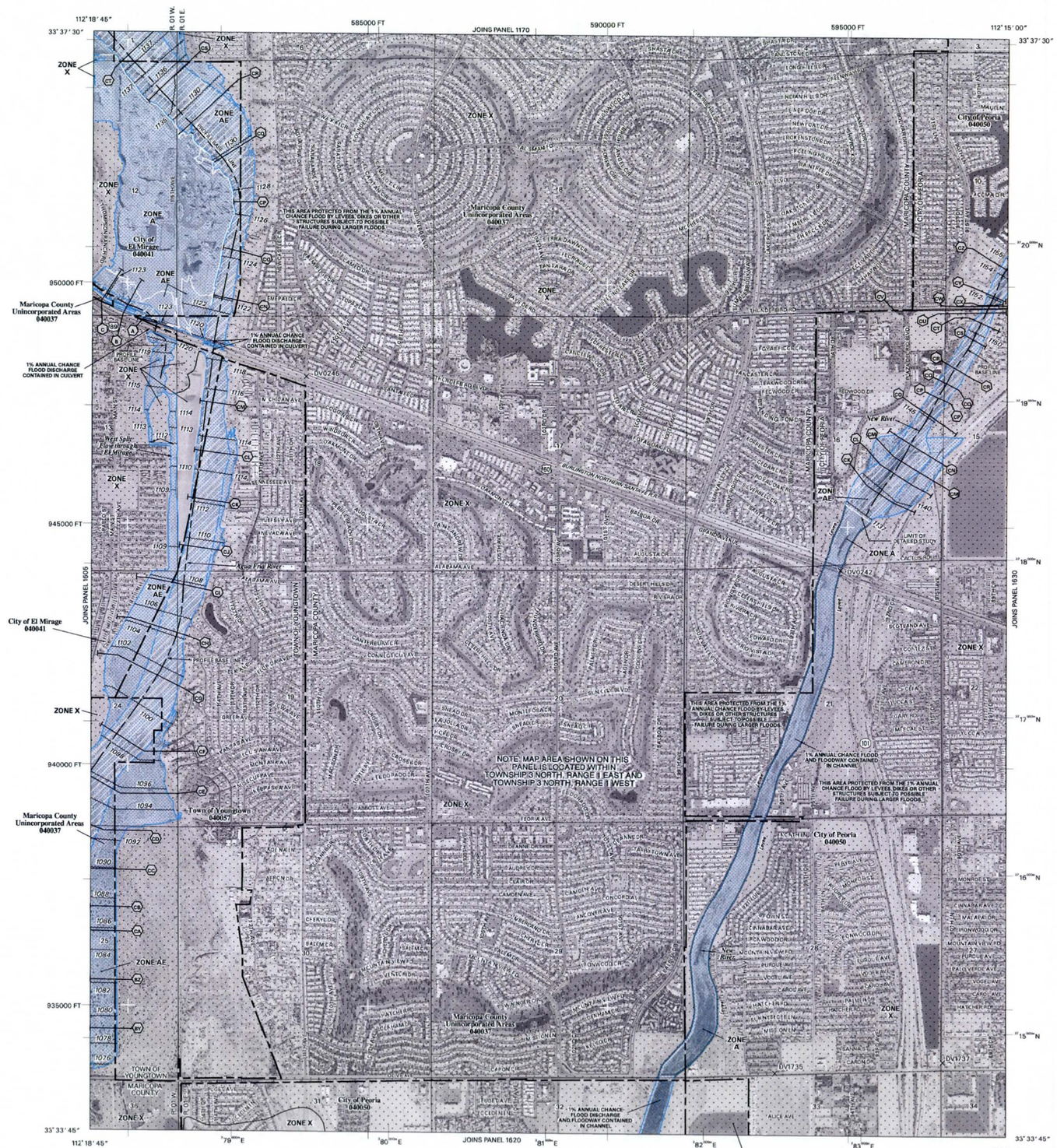
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map**, or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMAMAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)———(A)	Cross section line
(2)———(2)	Transect line
112° 07' 08", 33° 25' 41"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.
76000 E	1000-meter Universal Transverse Mercator grid tick values, zone 12
875000 FT	5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)
x DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 15, 1989

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 29, 1989, September 4, 1991, December 3, 1993, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1610J

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1610 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1610	J
MARICOPA COUNTY	040037	1610	J
PEORIA, CITY OF	040050	1610	J
YOUNGTOWN, TOWN OF	040057	1610	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1610J

MAP REVISED

SEPTEMBER 30, 2005

Federal Emergency Management Agency

C. Project Survey and Mapping

Appendix C

New River Channel
Maricopa County, Arizona

Project Survey and Mapping

Table of Contents

Section **Page**

1. Project Mapping 1

List of Appendices

A. FEMA Review Comment Letter
B. Hydraulic Modeling
C.
D. Data on Disk

1. Project Mapping

Three sources of topographic information were used to evaluate this segment of the New River Levee/Channel.

1. Field survey data points were collected at 200 foot intervals along the New River starting at the Olive Avenue Bridge ending approximately 1350 feet north of Grand Avenue. Field survey data was collected at natural ground elevation in the left/right overbank near existing Flood Control District of Maricopa County (FCDMC) right-of-way, left/right top of levee, and left/right toe of levee (**Appendix C.1**).

   - Horizontal Control: North American Datum 1983 (NAD 83)
   - Vertical Control: National Geodetic Vertical Datum 1929 (NGVD 29) and North American Vertical Datum 1988 (NAVD 88).

2. Field survey points collected for several low lying overbank areas and supplemental survey at Peoria Avenue Bridge (**Appendix C.2**).

   - Horizontal Control: North American Datum 1983 (NAD 83)
   - Vertical Control: North American Vertical Datum 1988 (NAVD 88).

3. FCDMC-provided 2-foot contour data for the overall project limits within New River and in the overbank areas. The contour data is depicted on **Exhibit 3** in the Assessment Report and on **Figures** in **Appendix B.** Digital data included an ESRI shape file containing contours based on the following control:

   - Horizontal Control: North American Datum 1927 (NAD 27)
   - Vertical Control: National Geodetic Vertical Datum 1929 (NGVD 29).

A conversion to North American Vertical Datum 1988 (NAVD 88) from NGVD 29 was necessary to compare historical elevation. The conversion factor was determined by comparing local benchmarks, survey control within the project area and the datum shift using the American Vertical Datum Conversion Utility software. The final data shift was determined to be equivalent to -1.85 feet or

NGVD 29 = NAVD 88 – 1.85 feet.

Refer to additional survey electronic data included on data disk in the **Appendix E.**

C. Survey Reports

C.1 Premier Engineering Survey Report

C.2 Wilson & Company Survey Report

C.1 Premier Engineering Survey Report

PREMIER
ENGINEERING CORPORATION

NEW RIVER LEVEE COORDINATE AND ELEVATION POINT LIST

HORIZONTAL DATUM:

ARIZONA STATE PLANE COORDINATE SYSTEM, NAD '83 SCALED BY A COMBINED SCALE FACTOR OF 1.00016 ABOUT THE CARTESIAN ORIGIN (NORTHING 0, EASTING 0).

VERTICAL DATUM:

NORTH AMERICAN VERTICAL DATUM 1988 (NAVD '88).

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
42937
JESSE
BOYD
Date Signed 3/10/11
ARIZONA U.S.A.

Expires: 6/30/20 11

Project No. 2009028

6437 W. Chandler Blvd., Suite 1 • Chandler, AZ 85226 • (480) 829-6000 • Fax (480) 829-6016

```
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40187,943918.8896,594423.3472,1132.2519,TOP RET WALL FNC_CH
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40264,939501.3860,593208.1354,1116.7596,TOE RET WALL
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40266,939314.7368,593135.0904,1119.5832,CURB_BC
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40275,939147.2604,593045.3990,1116.4519,PVMT_EDGE
40276,939106.6524,593069.9868,1116.5796,TOP
40277,939106.6831,593070.2294,1112.6193,SD_INV 36""
40278,939113.9649,593047.3875,1116.8434,TOP HW
40279,939113.8978,593046.9988,1113.0120,SD_INV 36""
40280,939112.8525,593049.0014,1116.5446,TOE RET WALL
40281,939112.6259,593049.1509,1118.1477,TOP RET WALL
40282,939112.1888,593049.8571,1117.9522,PVMT_EDGE
40283,938942.7583,592982.2773,1115.5918,TOP
40284,938948.7550,592962.7154,1116.4342,PVMT_EDGE
40285,938951.6124,592951.1862,1116.4693,PVMT_EDGE
40286,938952.3358,592949.4489,1116.1005,FNC_BARB NG_SPOT
40287,938762.2518,592869.4370,1113.2467,FNC_BARB NG_SPOT
40288,938761.4495,592871.2161,1113.2724,NG_TOE
40289,938759.8419,592879.4269,1114.8963,NG_TOP
40290,938757.6740,592891.7145,1115.4616,PVMT_EDGE
40291,938755.4560,592902.0161,1115.2892,PVMT_BL
40292,938754.6928,592906.7635,1114.7157,TOP
40293,938563.3541,592857.2417,1114.0965,TOP
40294,938561.0525,592859.9461,1110.5930,SD_INV 12""
40295,938564.8493,592852.6728,1114.8154,PVMT_BL
40296,938566.7512,592842.2415,1114.9305,PVMT_EDGE
40297,938571.7660,592802.4894,1113.9362,WALL_RT NG_SPOT
40298,938618.0867,592866.1939,1109.9092,SD_INV 12""
40299,938394.0174,592782.1010,1114.6447,PVMT_EDGE
40300,938389.1389,592780.2425,1114.5264,PVMT_EDGE
40301,938387.9632,592795.7530,1114.1563,TOP
40302,938383.3837,592794.0466,1114.1366,TOP
40303,938382.6972,592795.8718,1111.6567,CONC BOTTOM
40304,938387.1142,592797.2999,1111.6476,CONC BOTTOM
40305,938370.3002,592788.9224,1113.6776,TOP
40306,938371.9119,592785.0241,1114.1959,PVMT_BL
40307,938375.5081,592775.0293,1114.3409,PVMT_EDGE
40308,938380.2215,592762.9685,1113.5104,WALL_RT NG_SPOT
40309,938389.0707,592779.2673,1111.8045,CONC BOTTOM
40310,938393.6648,592781.1063,1111.8311,CONC BOTTOM
40311,938185.7506,592706.8207,1113.3515,TOP
40312,938187.3856,592703.0396,1113.9284,PVMT_BL
40313,938192.0447,592693.2475,1113.9861,PVMT_EDGE
40314,938199.3516,592677.2337,1111.2632,FNC_WOOD NG_TOE
40315,938014.3829,592596.1613,1110.6232,FNC_WOOD NG_TOE
40316,938010.1275,592606.6414,1113.9182,PVMT_EDGE
40317,938005.8141,592616.1996,1113.7919,PVMT_BL
40318,938004.0298,592620.5830,1113.3134,TOP
40319,937823.8580,592534.1294,1113.0010,TOP
40320,937825.5633,592529.8744,1113.5855,PVMT_BL

40321,937830.0488,592520.3887,1113.6844,PVMT_EDGE
40322,937834.5008,592511.5964,1110.3275,FNC_WOOD NG_TOE
40323,937660.1528,592416.5241,1109.8134,FNC_WOOD NG_TOE
40324,937652.7495,592430.0909,1113.7849,PVMT_EDGE
40325,937647.7520,592439.1839,1113.5819,PVMT_BL
40326,937645.2112,592443.2739,1112.9945,TOP
40327,937474.4845,592336.2240,1112.9540,TOP
40328,937477.2256,592332.4358,1113.4354,PVMT_BL
40329,937483.1540,592323.7493,1113.5361,PVMT_EDGE
40330,937496.6444,592309.1665,1109.3538,FNC_WOOD NG_TOE
40331,937334.6416,592187.4447,1109.0131,FNC_WOOD NG_TOE
40332,937323.4898,592202.7945,1113.0315,NG_TOP
40333,937318.5454,592210.8961,1113.3478,PVMT_EDGE
40334,937312.8611,592219.9562,1113.1880,PVMT_BL
40335,937310.3910,592223.4619,1112.5969,TOP
40336,937139.2459,592127.5735,1111.5298,TOP
40337,937141.2060,592123.5327,1112.1259,PVMT_BL
40338,937145.5987,592114.1228,1112.1963,PVMT_EDGE
40339,937147.6779,592105.3750,1112.1164,NG_TOP
40340,937163.0461,592076.4804,1108.6059,FNC_WOOD NG_TOE
40341,936979.9488,591997.5319,1108.0270,FNC_WOOD NG_TOE
40342,936972.3967,592018.5768,1109.6781,NG_TOP
40343,936968.4399,592026.1234,1109.5807,PVMT_EDGE
40344,936964.2712,592035.4806,1109.4623,PVMT_BL
40345,936962.4957,592039.9192,1108.9618,TOP
40346,936779.2101,591965.1416,1108.5188,TOP
40347,936780.8383,591960.9158,1109.0398,PVMT_BL
40348,936784.4161,591950.8189,1109.1347,PVMT_EDGE
40349,936792.3793,591927.8285,1107.9350,FNC_WOOD NG_SPOT
40350,936590.8500,591908.1315,1108.3723,TOP
40351,936591.6086,591903.5875,1108.8975,PVMT_BL
40352,936594.2946,591893.2233,1109.0203,PVMT_EDGE
40353,936596.7615,591883.4524,1108.0172,WALL_RT NG_SPOT
40354,936529.5520,591873.4958,1106.4415,SD_INV 18""
40355,936529.4338,591874.2543,1108.8277,TOP HW
40356,936525.0529,591890.0443,1108.1920,TOP
40357,936524.8557,591891.0232,1105.9518,SD_INV 18""
40358,936398.0090,591855.5514,1107.9834,TOP
40359,936398.9638,591851.1540,1108.5572,PVMT_BL
40360,936401.0954,591841.1497,1108.7251,PVMT_EDGE
40361,936403.9832,591829.9838,1107.7938,FNC_WOOD NG_SPOT
40362,936204.8936,591826.6599,1107.1763,TOP
40363,936205.0914,591822.1376,1107.6480,PVMT_BL
40364,936205.3106,591811.6872,1107.7889,PVMT_EDGE
40365,936206.1262,591792.2028,1106.6060,FNC_BARB NG_SPOT
40366,936007.5336,591806.0688,1106.3673,WALL_RT NG_SPOT
40367,936008.0466,591824.0043,1106.9758,PVMT_EDGE
40368,936009.0915,591834.3372,1106.8090,PVMT_BL
40369,936009.7754,591838.8246,1106.2701,TOP
40370,935811.0361,591856.9160,1105.3254,TOP
40371,935810.9122,591852.4523,1105.8961,PVMT_BL
40372,935809.8296,591842.3208,1106.0412,PVMT_EDGE
40373,935805.9712,591824.5739,1104.9471,WALL_RT NG_SPOT
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40375,935613.6321,591870.8477,1104.7930,PVMT_BL
40376,935612.5348,591860.2565,1104.9555,PVMT_EDGE
40377,935610.9803,591843.5785,1104.0777,FNC_BARB NG_TOE
40378,935413.8362,591862.1152,1103.9953,FNC_BARB NG_SPOT
40379,935414.2189,591878.4823,1104.1806,PVMT_EDGE
40380,935415.0856,591889.1253,1103.9973,PVMT_BL
40381,935415.2798,591893.4682,1103.3924,TOP
40382,935219.1090,591911.4492,1102.4907,TOP
40383,935219.0302,591906.9298,1103.0373,PVMT_BL

40384,935217.6701,591896.5873,1103.2454,PVMT_EDGE
40385,935216.9660,591880.7657,1103.4441,FNC_BARB NG_SPOT
40386,935017.8629,591875.9945,1102.8638,FNC_BARB NG_SPOT
40387,935020.2896,591900.2408,1102.1612,PVMT_EDGE
40388,935019.5642,591910.4583,1102.0030,PVMT_BL
40389,935019.1754,591914.5127,1101.5290,TOP
40390,934820.7719,591873.1490,1100.8336,TOP
40391,934821.6772,591869.0238,1101.4045,PVMT_BL
40392,934824.6754,591859.2501,1101.5484,PVMT_EDGE
40393,934829.0292,591840.9561,1101.4737,WALL_RT NG_SPOT
40394,934630.3709,591811.4842,1100.4994,TOP
40395,934632.1254,591807.4605,1100.9284,PVMT_BL
40396,934636.1560,591798.1727,1101.1873,PVMT_EDGE
40397,934647.2386,591778.3629,1100.5790,FNC_WI NG_SPOT
40398,934519.0363,591702.0084,1094.8734,NG_FL
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40400,934508.1520,591714.7595,1094.3805,SD_INV 30""
40401,934505.0281,591712.4184,1094.4872,SD_INV 30""
40402,934504.7779,591712.7666,1097.7083,TOP HW
40403,934510.7130,591717.4028,1097.6668,TOP HW
40404,934508.3263,591719.8907,1100.9350,PVMT_EDGE
40405,934499.2734,591731.4529,1100.3380,TOP
40406,934492.9868,591726.4173,1100.2612,TOP
40407,934490.3769,591729.4984,1093.9467,SD_INV 30""
40408,934493.2457,591732.0416,1094.1271,SD_INV 30""
40409,934496.9313,591734.6501,1094.0937,SD_INV 30""
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40413,934480.1829,591673.0872,1100.5618,FNC_BARB NG_SPOT
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40415,934324.1033,591552.3553,1100.5646,PVMT_EDGE
40416,934317.4675,591559.8409,1100.4104,PVMT_BL
40417,934314.2772,591563.0900,1099.8572,TOP
40418,934169.9194,591429.1588,1099.5002,TOP
40419,934173.2163,591425.6767,1100.0630,PVMT_BL
40420,934179.6932,591418.3007,1100.1879,PVMT_EDGE
40421,934165.1265,591404.4664,1100.0791,PVMT_EDGE
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40423,934046.1159,591272.4645,1099.3945,FNC_BARB NG_SPOT
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40425,934028.1239,591290.7170,1099.5979,PVMT_BL
40426,934025.0281,591294.0225,1099.0793,TOP
40427,933858.8324,591196.2766,1098.4704,TOP
40428,933859.9134,591192.1680,1098.9673,PVMT_BL
40429,933863.2465,591182.2523,1098.8707,PVMT_EDGE
40430,933876.6686,591129.8737,1098.7653,FNC_BARB NG_SPOT
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40432,933774.7180,591129.5276,1097.7476,PVMT_EDGE
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40434,933669.7447,591118.5220,1097.4415,NG_TOP
40435,933641.8101,591115.4161,1090.9350,NG_TOE
40436,933635.7853,591130.3970,1090.7208,TOP
40437,933581.7445,591422.7346,1091.9689,TOP
40438,933570.6462,591466.4873,1091.3266,NG_SPOT
40439,933773.0025,591493.8295,1096.2486,TOP
40440,933768.5151,591511.8063,1097.7991,NG_TOP
40441,933764.2823,591519.0807,1096.2014,NG_TOE
40442,933875.6405,591654.6900,1098.1751,TOP
40443,933832.4334,591694.0671,1097.1629,NG_SPOT
40444,934011.7091,591832.9548,1098.4050,TOP
40445,933992.2622,591850.2865,1098.4892,FNC_CH NG_SPOT
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40447,934169.0285,592022.6245,1097.8331,FNC_BARB NG_SPOT
40448,934211.0639,592017.1766,1098.5310,TOP
40449,934225.5699,592026.2238,1096.9343,TOP
40450,934212.0852,592045.8801,1096.9152,NG_FL
40451,934240.3663,592039.5356,1098.7390,TOP
40452,934377.0019,592142.9552,1098.8545,TOP
40453,934358.8216,592165.5108,1098.8293,FNC_BARB NG_SPOT
40454,934524.1747,592290.4252,1099.4644,FNC_BARB NG_SPOT
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40457,934703.1850,592383.0407,1099.4132,FNC_BARB NG_SPOT
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40459,934898.2443,592385.7269,1100.0291,FNC_BARB NG_SPOT
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40467,935492.5078,592350.1709,1103.4566,TOP
40468,935506.3459,592345.9896,1102.0018,TOP
40469,935525.3468,592342.0818,1103.8457,TOP
40470,935603.2135,592315.0114,1104.6220,TOP
40471,935608.7359,592327.3033,1104.4543,NG_TOP
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40473,935783.6091,592276.3595,1104.8012,WALL NG_SPOT
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40475,935953.8491,592188.1710,1105.1686,TOP
40476,935959.3001,592226.7782,1105.2915,WALL NG_SPOT
40477,936133.2826,592216.7492,1105.3534,WALL NG_SPOT
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40480,936327.7672,592240.9994,1105.7763,WALL NG_SPOT
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40484,936477.1810,592240.4066,1106.0200,TOP
40485,936517.7376,592254.2370,1106.1130,TOP
40486,936490.9559,592309.7375,1104.3523,NG_SPOT
40487,936650.8749,592414.0194,1105.0277,NG_SPOT
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40515,938229.5618,593120.3356,1113.5833,TOP
40516,938220.2316,593152.2938,1113.5406,WALL NG_SPOT
40517,938418.5316,593171.1341,1113.9932,TOP
40518,938415.7153,593184.5174,1114.2670,NG_TOP
40519,938407.9024,593204.0574,1113.3327,WALL NG_TOE
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40523,938792.0733,593261.1404,1115.1359,TOP
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40525,938780.1838,593304.0162,1114.7187,WALL NG_TOE
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40527,938963.3472,593363.8158,1116.8735,NG_SPOT
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40529,939106.9859,593385.8559,1116.7377,NG_SPOT
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40531,939219.9626,593437.8680,1117.2932,FNC_BARB NG_SPOT
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40534,939613.8987,593546.2366,1117.7754,TOP
40535,939606.3871,593568.2959,1118.1175,FNC_WI NG_SPOT
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40537,939796.4473,593623.0216,1117.7202,FNC_CH NG_SPOT
40538,939981.2319,593647.8132,1118.6165,TOP
40539,939996.7382,593650.6259,1116.0510,TOP
40540,940016.3020,593659.2738,1119.1009,TOP
40541,939991.7485,593664.6717,1116.4223,NG_FL
40542,939989.7120,593670.9195,1116.8245,FNC_CH NG_SPOT
40543,940188.9299,593746.1340,1122.2339,TOP
40544,940177.4060,593755.1993,1121.9669,NG_TOP
40545,940164.8366,593760.1040,1117.7209,FNC_CH NG_TOE
40546,940301.2217,593828.4506,1124.6377,TOP
40547,940289.7504,593838.5734,1124.9068,NG_SPOT
40548,940289.7069,593838.7439,1125.5420,TOP RET WALL
40549,940434.5891,593941.3099,1127.2104,TOP
40550,940427.2066,593952.5718,1127.2568,NG_TOP
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40554,940565.4533,594072.3472,1128.0464,NG_TOP
40555,940557.3584,594087.9258,1119.7406,NG_TOE
40556,940532.5940,594124.2555,1118.0241,NG_SPOT
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50009,934384.5407,591530.6472,1100.8174,SS_MH _RIM
50011,933988.4748,591260.5331,1099.0254,CTRL_BCF _3""_MCFCD_235+00
50013,933903.3087,591698.9750,1098.3913,CTRL_BCF _3""_MCFCD_235+00
50015,941351.7691,593752.2862,1121.7830,PVMT_SPOT
50016,941351.7028,593712.6729,1120.9407,PVMT_SPOT
50017,941429.7590,593713.6718,1121.0593,PVMT_SPOT
50018,941533.0382,593713.5277,1121.5707,PVMT_SPOT
50019,941537.5311,593753.7095,1122.2335,PVMT_SPOT
50020,941429.0818,593752.4816,1121.9391,PVMT_SPOT
50021,939435.2824,593201.0648,1117.3358,CTRL_BCHH _3""_MCFCD_295+00
50023,939406.7796,593492.9425,1117.5802,CTRL_BCF _3""_MCFCD_295+00
```

C.2 Wilson & Company Survey Report

Survey Report

New River Survey

submitted to:
Flood Control District of Maricopa County

submitted by:
Wilson & Company, Inc., Engineers & Architects

WILSON
&COMPANY
ENGINEERS & ARCHITECTS

March 30, 2011

WILSON
&COMPANY

410 N. 44th Street
Suite 460
Phoenix, AZ 85008
602-283-2701
602-273-1230 Fax

Albuquerque
Colorado Springs
Denver
Fort Worth
Houston
Kansas City
Lenexa
Omaha
Pasadena
Phoenix
Rio Rancho
Salina
San Bernardino
San Diego

Wilson & Company
Latin America, LLC

March 30, 2011

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

New River

Survey Report

2011

This Survey Report is the result of a survey conducted for Flood Control District of Maricopa County to provide on the ground field survey, drainage structure and bridge data.

The survey was conducted during the month of March 2011. It began with the gathering of research data on existing NGS control points in area of the project. These points form the basis of the survey control for this project. A Virtual Reference Station (VRS) network was utilized in lieu of standard GPS base stations as a major component of the RTK system. GPS data gathered during this survey used this system and standard GPS base set up.

Field work consisting of control checks into existing NGS monuments, setting and referencing project control monuments was completed March 29, 2011. Members of the field crew were Dane Branfort, Hector Bejarano, and James Flemings. GPS equipment used for this survey was Trimble R8 receivers combined with Trimble TSC2 data collectors.

Surveyors Certificate

I, Gregory L Thompson, a Registered Land Surveyor in the State of Arizona, do hereby certify that the accompanying survey conducted March, 2011 was made under my direct supervision and the information contained hereon is true and accurate to the best of my belief.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
42688
GREGORY L.
THOMPSON
Date Signed 3/30/2011
ARIZONA U.S.A.

Gregory L Thompson

Expires 3/31/2013

WILSON & COMPANY

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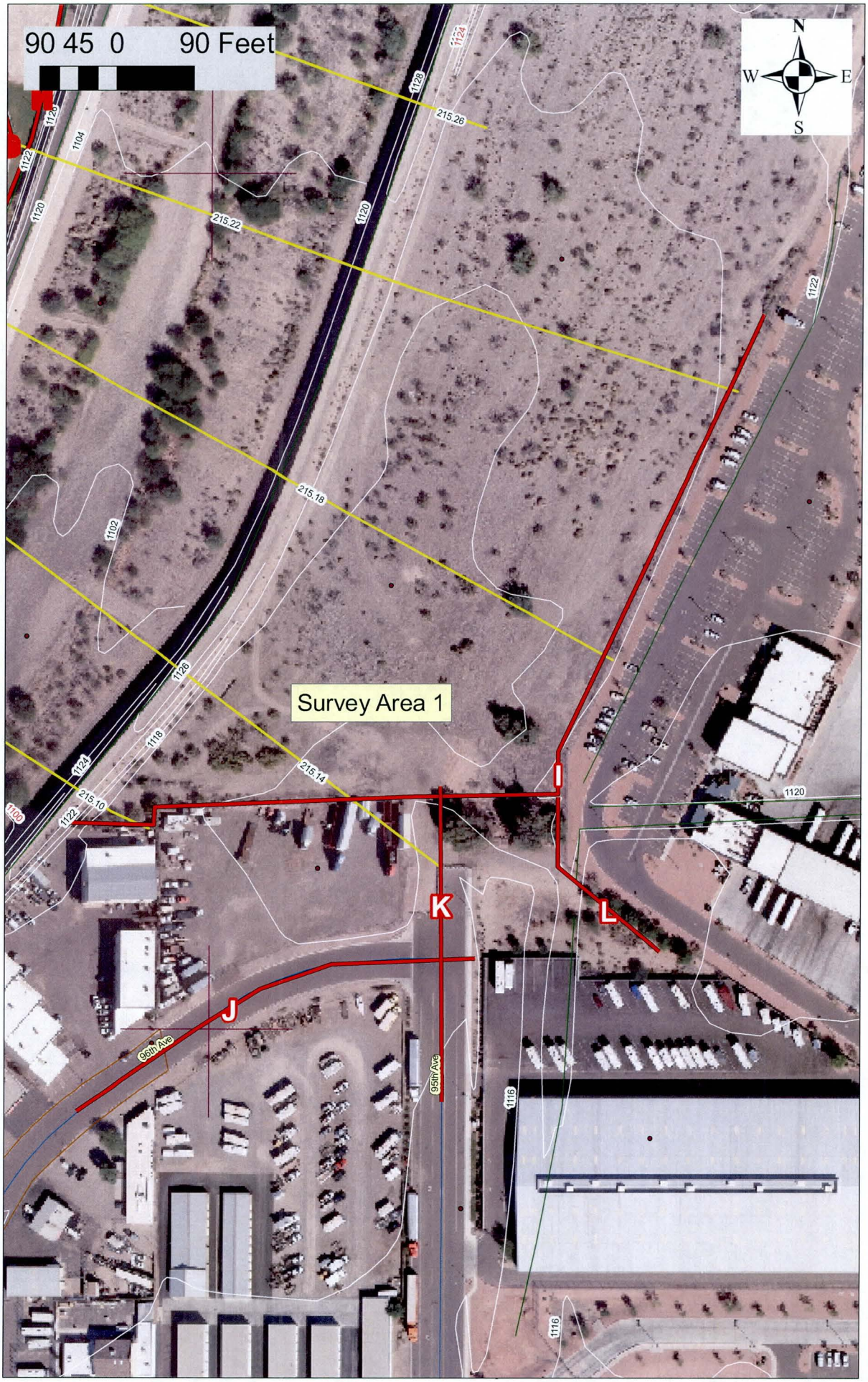
Contents	Number of Pages
Project Maps	3
Control Point Coordinates	4
NGS Data Sheets	6
Control Point Reference Sheets	8
Structure Sketches	3
Project Photos	9
Survey Point List	22


90 45 0 90 Feet
N
W
E
S
Survey Area 1
I
J
K
L
96th Ave
95th Ave
215.26
215.22
215.18
215.14
215.10
1124
1128
1120
1104
1122
1102
1126
1118
1100
1116

90 45 0 90 Feet
N
W
E
S
Illinois
Illinois
Alberta
Alberta
Desert Cove
Michigan
Iowa
Iowa
Wyoming
Minnesota
Montana
Mobile Homes
Mobile Homes
Survey Area 2
A
B
C
D
E
F
G
H
I
215.30
215.26
215.22
215.18
215.14
215.10
215.07
1106
1124
1126
1104
1120
1102
1100
1122
1118
1116

Field surveyor:

Computer operator:

Reference:

Scale 1" to 2083 ft

0 3500 ift

International feet

0°00'00"

Plot Scale: 1" to 2083 ft
Printed on 3/30/2011, at 8:12:26 AM

Printed from Trimble Geomatics Office

Site: Not selected, System: US State Plane 1983
Zone: Arizona Central 0202, Datum: NAD 1983 (Conus)

Project: FCDMC_tgo
AZ central international feet Alpha codes

TYP_LID	HOR_LID	VER_LID	XNAD27	YNAD27	XNAD83	YNAD83	NGVD29	NAVD88	MNT_LID	PNTNUM	DESCRIPTION
6	7	8	0.000	0.000	597120.521	943398.195	0.000	1137.762	27	1FB1	Aluminum cap compressed onto an stainless steel rod driven to refusal, in sleeve.
6	7	8	0.000	0.000	582098.635	928137.005	0.000	1067.257	27	1EA1	Aluminum cap compressed onto an stainless steel rod driven to refusal, in sleeve.
6	7	8	0.000	0.000	593613.201	941164.209	0.000	1120.644	10	100	Set 5/8" Rebar with aluminum cap flush with ground.
6	7	8	0.000	0.000	593590.239	940708.682	0.000	1120.568	10	101	Set 5/8" Rebar with aluminum cap flush with ground.
6	7	8	0.000	0.000	594269.177	940082.902	0.000	1119.595	8	102	Brass Disk Set in Concrete
6	7	8	0.000	0.000	594001.247	940012.218	0.000	1119.334	8	103	Brass Disk Set in Concrete
6	7	8	0.000	0.000	593041.469	939129.076	0.000	1117.063	17	104	MAG Nail with washer
6	7	8	0.000	0.000	592829.819	938685.197	0.000	1115.241	17	105	MAG Nail with washer
6	7	8	0.000	0.000	593226.524	938818.705	0.000	1115.575	17	106	MAG Nail with washer
6	7	8	0.000	0.000	593286.131	938977.537	0.000	1116.546	17	107	MAG Nail with washer

FCDMC New River Survey
New River Survey
US State Plane, Arizona Central Zone, NAD83(1992)
Inernational Feet
Geoid 09

Point Name	Northing	Easting	NAVD88 Elevation	NGVD29 Elevation	Latitude	Longitude	Ellipsoidal Height	Combined Scale Factor
100	941164.209	593613.201	1120.644	1137.155	33ø35'12.00351"N	112ø15'57.65057"W	1021.932	0.9997953
101	940708.682	593590.239	1120.568	1066.694	33ø35'07.49585"N	112ø15'57.90385"W	1021.842	0.9997951
102	940082.902	594269.177	1119.595	1120.042	33ø35'01.32710"N	112ø15'49.85323"W	1020.875	0.9997949
103	940012.218	594001.247	1119.334	1119.967	33ø35'00.61887"N	112ø15'53.01760"W	1020.603	0.9997949
104	939129.076	593041.469	1117.063	1118.996	33ø34'51.84919"N	112ø16'04.32761"W	1018.275	0.9997948
105	938685.197	592829.819	1115.241	1118.735	33ø34'47.45043"N	112ø16'06.81161"W	1016.434	0.9997948
106	938818.705	593226.524	1115.575	1116.466	33ø34'48.78465"N	112ø16'02.12775"W	1016.785	0.9997948
107	938977.537	593286.131	1116.546	1114.645	33ø34'50.35809"N	112ø16'01.42951"W	1017.763	0.9997948
1EA1	928137.005	582098.635	1067.257	1114.979	33ø33'02.71019"N	112ø18'13.19218"W	967.864	0.9997967
1FB1	943398.195	597120.521	1137.762	1115.95	33ø35'34.22123"N	112ø15'16.27561"W	1039.231	0.9997939

Coordinate System Details

Project : FCDMC_tgo

User name	DRBranfort	**Date & Time**	10:46:31 AM 3/30/2011
Coordinate System	US State Plane 1983	**Zone**	Arizona Central 0202
Project Datum	NAD 1983 (Conus)		
Vertical Datum		**Geoid Model**	Geoid 09
Coordinate Units	International feet		
Distance Units	International feet		
Height Units	International feet		

```
Coordinate System
Coordinate System : US State Plane 1983
Zone              : Arizona Central 0202
Datum             : NAD 1983 (Conus)
Ellipsoid Name    : Geodetic Ref System 1980
Geoid Model       : Geoid 09
Site              : Not selected


Ellipsoid
Ellipsoid Name    : Geodetic Ref System 1980
Flattening 1/f    : 298.257
Semi Major Axis   : 20925646.325ift


Datum Transformation : Three Parameter
WGS84 to Geodetic Ref System 1980
Translation X    :   0.000ift          Rotation X :              N/A
Translation Y    :   0.000ift          Rotation Y :              N/A
Translation Z    :   0.000ift          Rotation Z :              N/A
Scale Factor     :        N/A ppm


Transverse Mercator Projection
Projection Origin                      False Origin
Latitude      :   31°00'00.00000"NFalse Northing  :        0.000ift
Longitude     :  111°55'00.00000"WFalse Easting   :   700000.000ift
Height        :          N/A         False Elevation    :            N/A
Scale Factor  :   0.99990000


Shift grid name              :              None
Azimuth at projection centre :               N/A
Azimuth at equator           :               N/A
Projection Parallel 1        :               N/A
Projection Parallel 2        :               N/A
Projection Ferro Constant    :               N/A
Projection Point 1 Latitude  :               N/A
Projection Point 1 Longitude :               N/A
Projection Point 2 Latitude  :               N/A
```

Projection Point 2 Longitude	:	N/A
Projection grid name	:	N/A

Local site settings

Project latitude	:	?
Project longitude	:	?
Project height	:	997.000ift
Ground scale factor	:	N/A
False northing offset	:	N/A
False easting offset	:	N/A

GPS Site Calibration Details

Horizontal Adjustment

North Origin	:	N/A	Translation North	:	N/A
East Origin	:	N/A	Translation East	:	N/A
Scale	:	N/A	Rotation	:	N/A

Vertical Adjustment

North Origin	:	N/A
East Origin	:	N/A
Vertical constant correction	:	N/A
Slope North	:	N/A
Slope East	:	N/A

Network Adjustment Parameters

Longitude Deflection	:	N/A
Latitude Deflection	:	N/A
Azimuth Rotation	:	N/A
Network Scale	:	N/A
Distance Scale	:	N/A
Distance Constant	:	N/A
Height Constant	:	N/A

Back to top

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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DATABASE =  ,PROGRAM = datasheet, VERSION = 7.86
1         National Geodetic Survey,   Retrieval Date = MARCH 30, 2011
 AJ3848 ***********************************************************************
 AJ3848  HT_MOD       -  This is a Height Modernization Survey Station.
 AJ3848  DESIGNATION -  1FB1
 AJ3848  PID          -  AJ3848
 AJ3848  STATE/COUNTY-  AZ/MARICOPA
 AJ3848  USGS QUAD    -  EL MIRAGE (1982)
 AJ3848
 AJ3848                          *CURRENT SURVEY CONTROL
 AJ3848
 AJ3848* NAD 83(2007)-  33 35 34.22123(N)    112 15 16.27561(W)     ADJUSTED
 AJ3848* NAVD 88      -       346.79   (meters)    1137.8    (feet)  GPS OBS
 AJ3848
 AJ3848  EPOCH DATE   -        2007.00
 AJ3848  X            -  -2,014,285.257 (meters)                     COMP
 AJ3848  Y            -  -4,922,460.645 (meters)                     COMP
 AJ3848  Z            -   3,509,091.601 (meters)                     COMP
 AJ3848  LAPLACE CORR-            4.24  (seconds)                   DEFLEC09
 AJ3848  ELLIP HEIGHT-         316.725  (meters)          (02/10/07) ADJUSTED
 AJ3848  GEOID HEIGHT-         -30.03   (meters)                     GEOID09
 AJ3848
 AJ3848  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AJ3848  Type     PID    Designation                       North   East  Ellip
 AJ3848  ----------------------------------------------------------------------
 AJ3848  NETWORK AJ3848 1FB1                                 0.86   0.71   1.18
 AJ3848  ----------------------------------------------------------------------
 AJ3848
 AJ3848.The horizontal coordinates were established by GPS observations
 AJ3848.and adjusted by the National Geodetic Survey in February 2007.
 AJ3848
 AJ3848.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AJ3848.See National Readjustment for more information.
 AJ3848.The horizontal coordinates are valid at the epoch date displayed above.
 AJ3848.The epoch date for horizontal control is a decimal equivalence
 AJ3848.of Year/Month/Day.
 AJ3848
 AJ3848.The orthometric height was determined by GPS observations and a
 AJ3848.high-resolution geoid model using precise GPS observation and
 AJ3848.processing techniques.
 AJ3848
 AJ3848.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AJ3848
 AJ3848.The Laplace correction was computed from DEFLEC09 derived deflections.
 AJ3848
 AJ3848.The ellipsoidal height was determined by GPS observations
 AJ3848.and is referenced to NAD 83.
 AJ3848
 AJ3848.The geoid height was determined by GEOID09.
 AJ3848
 AJ3848;                     North         East     Units Scale Factor Converg.
 AJ3848;SPC AZ C      -   287,547.770   182,002.335   MT  0.99991212   -0 11 13.0
 AJ3848;SPC AZ C      -   943,398.20    597,120.52   iFT  0.99991212   -0 11 13.0
```

```
AJ3848;UTM  12       - 3,717,717.460   383,594.254   MT  0.99976705   -0 41 39.1
AJ3848
AJ3848!              -  Elev Factor  x  Scale Factor =   Combined Factor
AJ3848!SPC AZ C      -   0.99995028  x   0.99991212  =   0.99986240
AJ3848!UTM  12       -   0.99995028  x   0.99976705  =   0.99971734
AJ3848
AJ3848                          SUPERSEDED SURVEY CONTROL
AJ3848
AJ3848  NAD 83(1992)-  33 35 34.22050(N)    112 15 16.27496(W) AD(       ) B
AJ3848  ELLIP H (04/12/01)  316.757  (m)                       GP(       ) 3 2
AJ3848
AJ3848.Superseded values are not recommended for survey control.
AJ3848.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AJ3848.See file dsdata.txt to determine how the superseded data were derived.
AJ3848
AJ3848_U.S. NATIONAL GRID SPATIAL ADDRESS: 12SUC8359417717(NAD 83)
AJ3848_MARKER: I = METAL ROD
AJ3848_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AJ3848_STAMPING: 1FB1 1999
AJ3848_MARK LOGO: MCDOT
AJ3848_PROJECTION: FLUSH
AJ3848_MAGNETIC: B = BAR MAGNET IMBEDDED IN MONUMENT
AJ3848_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AJ3848+STABILITY: POSITION/ELEVATION WELL
AJ3848_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AJ3848+SATELLITE: SATELLITE OBSERVATIONS - August 25, 2007
AJ3848_ROD/PIPE-DEPTH:  3.6 meters
AJ3848_SLEEVE-DEPTH  :  0.8 meters
AJ3848
AJ3848  HISTORY     - Date     Condition        Report By
AJ3848  HISTORY     - 1999     MONUMENTED       MCDOT
AJ3848  HISTORY     - 20070825 GOOD             MCDOT
AJ3848
AJ3848                          STATION DESCRIPTION
AJ3848
AJ3848'DESCRIBED BY MARICOPA CO DOT 1999 (JJR)
AJ3848'THE STATION IS LOCATED WITHIN THE CITY OF PEORIA, TOWNSHIP 3 NORTH,
AJ3848'RANGE 1 EAST, SECTION 22
AJ3848'OWNERSHIP - SANTA FE RAILROAD RIGHT OF WAY
AJ3848'TO REACH THE STATION FROM THE JUNCTION OF US HIGHWAY 60 AND 91ST
AJ3848'AVENUE, DRIVE NORTH ON 91ST AVENUE AND CROSS THE RAILROAD TRACTS THAT
AJ3848'PARALLEL US 60 ON THE NORTHEAST SIDE, THENCE TURN RIGHT (EAST) ONTO A
AJ3848'DIRT ACCESS TRAIL AND DRIVE EASTERLY 190 FT (57.9 M) TO THE STATION
AJ3848'MONUMENT DESCRIPTION - THE STATION IS MARKED BY AN ALUMINUM CAP
AJ3848'COMPRESSED ON A 11.9 FT (3.6 M) STAINLESS STEEL ROD DRIVEN TO REFUSAL,
AJ3848'ENCASED IN A 1 INCH GREASED PVC SLEEVE ENCLOSED IN A 5 INCH PVC PIPE
AJ3848'WITH A COUNTY LOGO ACCESS COVER STAMPED 1FB1 1999, SURROUNDED WITH A
AJ3848'CONCRETE COLLAR FLUSH WITH THE GROUND, WITNESSED BY A WHITE CARSONITE
AJ3848'MARKER
AJ3848'STATION TIES -
AJ3848'12 FT (3.7 M) SOUTHWEST OF THE CENTERLINE OF A 12 FT (3.7 M) WIDE
AJ3848'CONCRETE DITCH
AJ3848'41 FT (12.5 M) NORTHEAST OF THE CENTERLINE OF THE SANTA FE RAILROAD
AJ3848'19 FT (5.8 M) SOUTHWEST OF A CHAIN LINK FENCE
AJ3848'FOR A TO REACH MAP, STATION IMAGES AND ADDITIONAL INFORMATION, YOU CAN
AJ3848'VISIT-WWW.MCDOT.MARICOPA.GOV       SEARCH KEYWORD  GDACS
AJ3848
AJ3848                          STATION RECOVERY (2007)
AJ3848
AJ3848'RECOVERY NOTE BY MARICOPA CO DOT 2007 (BPD)
```

```
AJ3848'FOUND THE MONUMENT IN GOOD CONDITION HOWEVER IT APPEARS IT IS
AJ3848'SUBSIDENCE. WE PERFORMED FAST STATIC GPS (TWO 30 MINUTE OBSERVATIONS)
AJ3848'FROM BED ROCK 1. IT WAS DOWN 0.24 FEET AND 0.44 FEET.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE =  ,PROGRAM = datasheet, VERSION = 7.86
1         National Geodetic Survey,   Retrieval Date = MARCH 30, 2011
 AJ3846 ***********************************************************************
 AJ3846  HT_MOD       -  This is a Height Modernization Survey Station.
 AJ3846  DESIGNATION -  1EA1
 AJ3846  PID          -  AJ3846
 AJ3846  STATE/COUNTY-  AZ/MARICOPA
 AJ3846  USGS QUAD    -  EL MIRAGE (1982)
 AJ3846
 AJ3846                          *CURRENT SURVEY CONTROL
 AJ3846
 AJ3846* NAD 83(2007)-  33 33 02.71019(N)    112 18 13.19218(W)     ADJUSTED
 AJ3846* NAVD 88      -       325.30   (meters)    1067.3    (feet)  GPS OBS
 AJ3846
 AJ3846  EPOCH DATE   -        2007.00
 AJ3846  X            -  -2,019,479.411 (meters)                     COMP
 AJ3846  Y            -  -4,923,102.706 (meters)                     COMP
 AJ3846  Z            -   3,505,190.046 (meters)                     COMP
 AJ3846  LAPLACE CORR-            3.15  (seconds)                    DEFLEC09
 AJ3846  ELLIP HEIGHT-         294.987 (meters)          (02/10/07) ADJUSTED
 AJ3846  GEOID HEIGHT-         -30.30  (meters)                     GEOID09
 AJ3846
 AJ3846  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AJ3846  Type    PID    Designation                       North   East  Ellip
 AJ3846  ---------------------------------------------------------------------
 AJ3846  NETWORK AJ3846 1EA1                               0.63   0.53   0.98
 AJ3846  ---------------------------------------------------------------------
 AJ3846
 AJ3846.The horizontal coordinates were established by GPS observations
 AJ3846.and adjusted by the National Geodetic Survey in February 2007.
 AJ3846
 AJ3846.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AJ3846.See National Readjustment for more information.
 AJ3846.The horizontal coordinates are valid at the epoch date displayed above.
 AJ3846.The epoch date for horizontal control is a decimal equivalence
 AJ3846.of Year/Month/Day.
 AJ3846
 AJ3846.The orthometric height was determined by GPS observations and a
 AJ3846.high-resolution geoid model using precise GPS observation and
 AJ3846.processing techniques.
 AJ3846
 AJ3846.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AJ3846
 AJ3846.The Laplace correction was computed from DEFLEC09 derived deflections.
 AJ3846
 AJ3846.The ellipsoidal height was determined by GPS observations
 AJ3846.and is referenced to NAD 83.
 AJ3846
 AJ3846.The geoid height was determined by GEOID09.
 AJ3846
 AJ3846;                     North         East     Units Scale Factor Converg.
 AJ3846;SPC AZ C      -   282,896.159   177,423.664   MT  0.99991592   -0 12 50.0
 AJ3846;SPC AZ C      -   928,137.00    582,098.64   iFT  0.99991592   -0 12 50.0
```

```
AJ3846;UTM  12       - 3,713,107.192   378,975.251   MT  0.99978057   -0 43 14.1
AJ3846
AJ3846!              -  Elev Factor  x  Scale Factor =   Combined Factor
AJ3846!SPC AZ C      -   0.99995369  x   0.99991592  =   0.99986962
AJ3846!UTM  12       -   0.99995369  x   0.99978057  =   0.99973427
AJ3846
AJ3846                          SUPERSEDED SURVEY CONTROL
AJ3846
AJ3846  NAD 83(1992)-  33 33 02.70949(N)    112 18 13.19156(W) AD(       ) B
AJ3846  ELLIP H (04/12/01)  295.016  (m)                       GP(       ) 3 2
AJ3846
AJ3846.Superseded values are not recommended for survey control.
AJ3846.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AJ3846.See file dsdata.txt to determine how the superseded data were derived.
AJ3846
AJ3846_U.S. NATIONAL GRID SPATIAL ADDRESS: 12SUC7897513107(NAD 83)
AJ3846_MARKER: I = METAL ROD
AJ3846_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AJ3846_STAMPING: 1EA1 1999
AJ3846_MARK LOGO: MCDOT
AJ3846_PROJECTION: FLUSH
AJ3846_MAGNETIC: B = BAR MAGNET IMBEDDED IN MONUMENT
AJ3846_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AJ3846+STABILITY: POSITION/ELEVATION WELL
AJ3846_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AJ3846+SATELLITE: SATELLITE OBSERVATIONS - March 14, 2008
AJ3846_ROD/PIPE-DEPTH:  7.8 meters
AJ3846_SLEEVE-DEPTH  :  0.8 meters
AJ3846
AJ3846  HISTORY     - Date     Condition        Report By
AJ3846  HISTORY     - 1999     MONUMENTED       MCDOT
AJ3846  HISTORY     - 20080314 GOOD             GEOCAC
AJ3846
AJ3846                          STATION DESCRIPTION
AJ3846
AJ3846'DESCRIBED BY MARICOPA CO DOT 1999 (JJR)
AJ3846'THE STATION IS LOCATED WITHIN THE CITY OF GLENDALE, TOWNSHIP 2 NORTH,
AJ3846'RANGE 1 EAST, SECTION 6
AJ3846'OWNERSHIP - CITY OF GLENDALE
AJ3846'TO REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAY 101 AND
AJ3846'NORTHERN AVENUE AT EXIT 8, DRIVE WEST ON NORTHERN AVENUE 2.2 MI (3.5
AJ3846'KM) TO THE STATION ON THE LEFT 35 FT (10.7 M) SOUTH OF THE SOUTH EDGE
AJ3846'OF ASPHALT OF NORTHERN AVENUE IN A LANDSCAPE AREA
AJ3846'MONUMENT DESCRIPTION - THE STATION IS MARKED BY AN ALUMINUM CAP
AJ3846'COMPRESSED ON A 25.6 FT (7.8 M) STAINLESS STEEL ROD DRIVEN TO REFUSAL,
AJ3846'ENCASED IN A 1 INCH GREASED PVC SLEEVE ENCLOSED IN A 5 INCH PVC PIPE
AJ3846'WITH A COUNTY LOGO ACCESS COVER STAMPED 1EA1 1999, SURROUNDED WITH A
AJ3846'CONCRETE COLLAR FLUSH WITH THE GROUND, WITNESSED BY A WHITE CARSONITE
AJ3846'MARKER
AJ3846'STATION TIES -
AJ3846'35 FT (10.7 M) SOUTH OF THE SOUTH EDGE OF ASPHALT OF NORTHERN AVENUE
AJ3846'21 FT (6.4 M) NORTH OF A BLOCK WALL
AJ3846'23 FT (7.0 M) NORTHWEST OF THE CORNER OF A WROUGHT IRON FENCE
AJ3846'FOR A TO REACH MAP, STATION IMAGES AND ADDITIONAL INFORMATION, YOU CAN
AJ3846'VISIT-WWW.MCDOT.MARICOPA.GOV       SEARCH KEYWORD  GDACS
AJ3846
AJ3846                          STATION RECOVERY (2008)
AJ3846
AJ3846'RECOVERY NOTE BY GEOCACHING 2008 (ACM)
AJ3846'RECOVERED IN GOOD CONDITION.
```

```
*** retrieval complete.
Elapsed Time = 00:00:00
```

WILSON
&COMPANY
SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 100

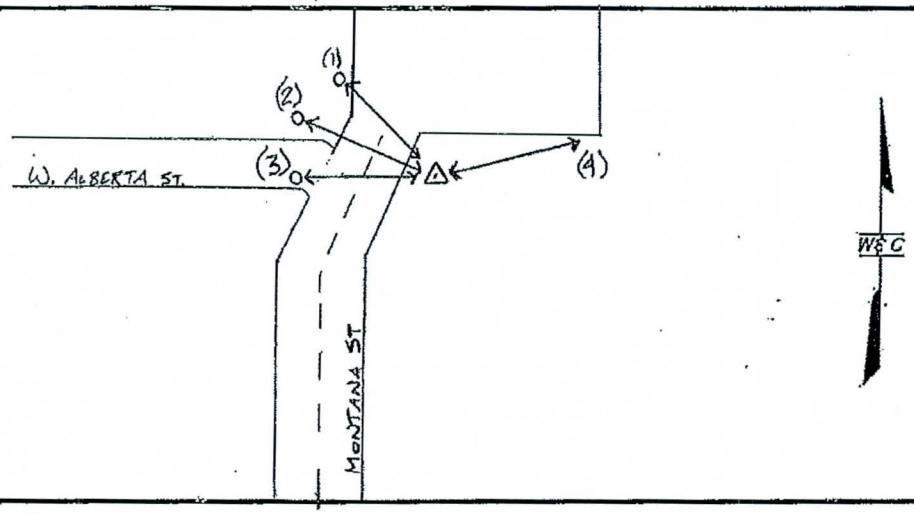
[X] Horizontal
[X] Vertical

Description G.C.I. 2" ALUMINUM CAP STAMPED "100"

References

1) FIRE HYDRANT	N(.)	48.20
2) LIGHT POLE	WNW	48.00
3) SANITARY SEWER MANHOLE	W	41.70
4) CORNER OF PARKING LOT CURB	ENE	57.90
5)		
6) Sta. Offset		

Sketch



Location: 3.6' FROM THE BACK OF CURB ON THE EAST SIDE OF N. MONTANA ST NORTH OF PEORIA AVE & EAST OF 99TH AVE.

Project No: 0930018605
Date: 3/29/2011
Crew Chief: H. BEJARANO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 101

☒ Horizontal

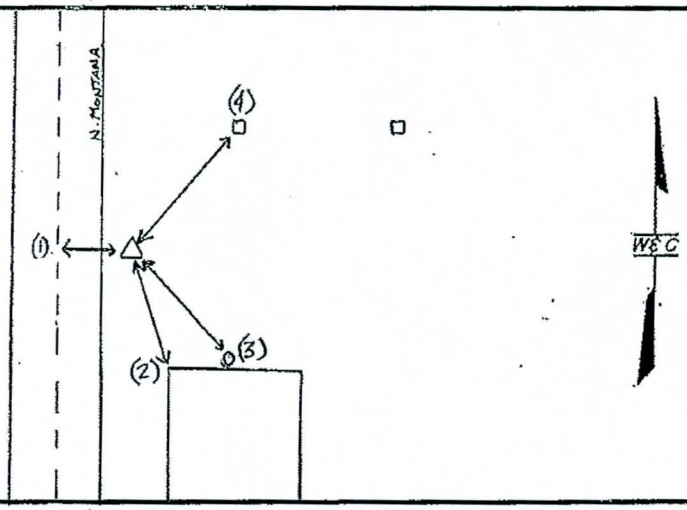
☒ Vertical

Description LVCI 2" ALUMINUM CAP STAMPED "101"

References

1) ℄ N MONTANA ST	W	13.00
2) NW CORNER OF CONCRETE FOR BASKETBALL COURT	SSE	35.00
3) POLE FOR BASKETBALL GOAL	SE	40.10
4) VOLLEYBALL NET POST	NE	58.50
5)		
6) Sta. Offset		

Sketch



Location: 1.5' FROM THE BACK OF CURB ON THE EAST SIDE OF MONTANA ST NORTH OF PEORIA AVE & EAST OF 99TH AVE.

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BESARANO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 102

☒ Horizontal

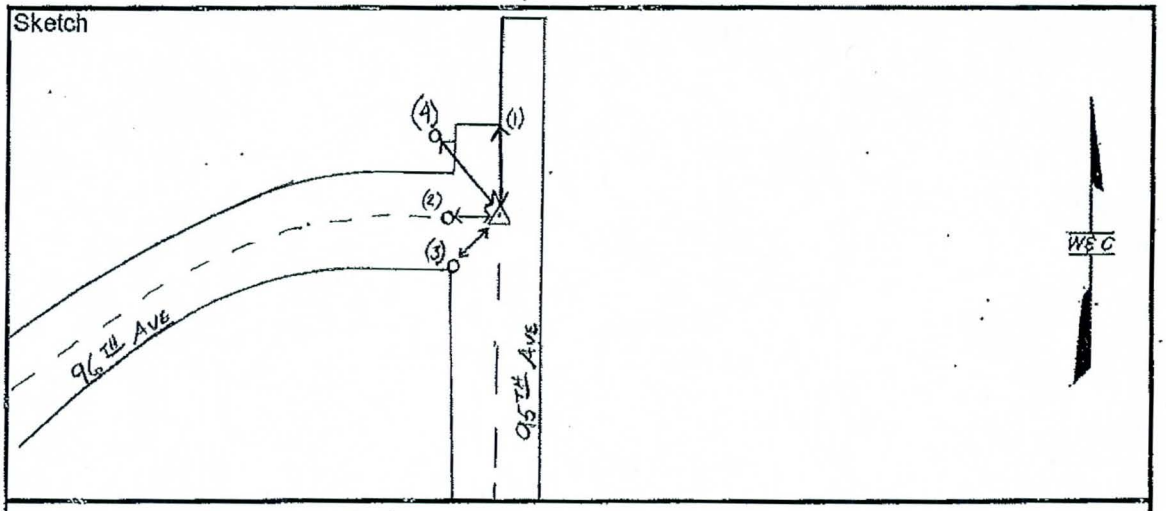
☒ Vertical

Description CITY OF PEORIA 3" BRASS CAP

References

1) PI IN BACK OF CURB LINE	N 53 40
2) WATER VALVE	W 30 20"
3) WATER VALVE	SW 50 40
4) PROPERTY CORNER/PLASTIC CAP "DELBRIDGE 18214"	NW 63 85
5)	
6) Sta. Offset	

Sketch



Location: ℄ OF 95TH AVE NORTH OF PEORIA AVE

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BEJARANO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 103

[X] Horizontal

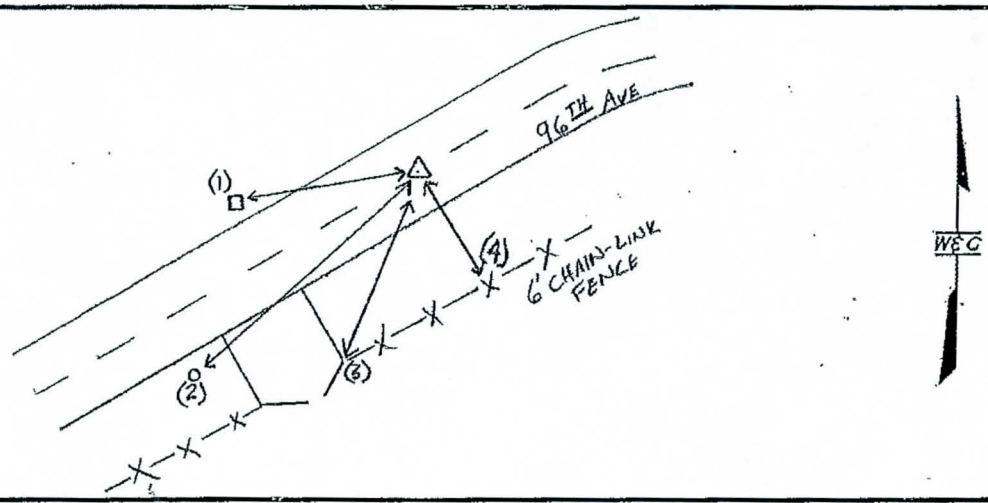
[X] Vertical

Description CITY OF PEORIA 3" BRASS CAP

References

1) QWEST TELEPHONE PEDESTAL	WSW	61.20
2) "NO PARKING" SIGN	SW	66.50
3) NORTHEASTERN EDGE OF CHAIN-LINK GATE	SW	47.90
4) 6' CHAIN-LINK SECURITY FENCE	SE	38.70
5)		
6) Sta. Offset		

Sketch



Location: ℄ OF 96TH AVE WEST OF ITS INTERSECTION WITH 95TH AVE NORTH OF PEORIA AVE

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BEJARANO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 104

☒ Horizontal

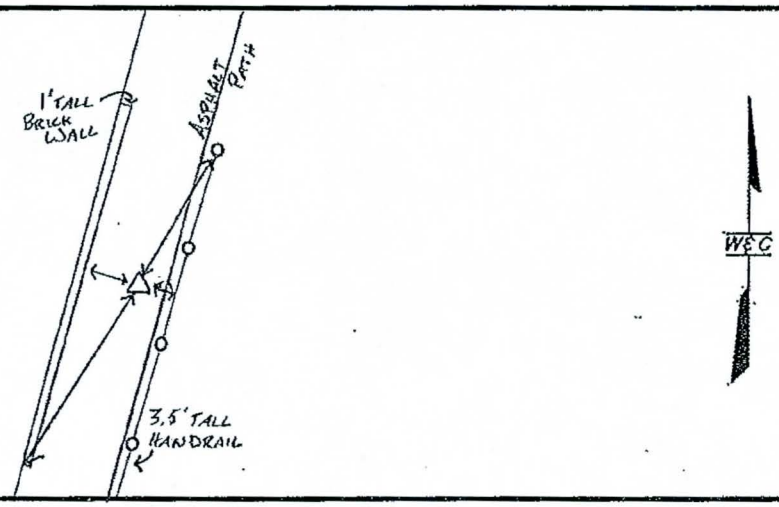
☒ Vertical

Description MAG NAIL WITH WASHER STAMPED "WCI 104"

References

1) 3.5' TALL HANDRAIL	ESE 2.75
2) NORTH END OF 3.5' TALL HANDRAIL	NE 20.00
3) EAST FACE OF 1' TALL BRICK WALL	WNW 7.30
4) SOUTH END OF 1' TALL BRICK WALL	SW 21.90
5)	
6) Sta. Offset	

Sketch



Location: NORTH OF PEORIA AVE ON THE WEST SIDE OF NEW RIVER, ON TOP OF THE LEVEE SET IN THE WALKING PATH

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BEJARANO

WILSON
&COMPANY
SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 105

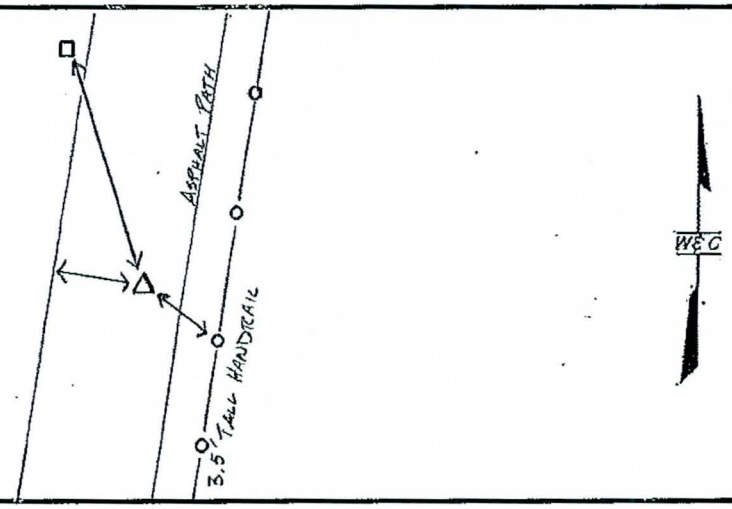
[X] Horizontal
[X] Vertical

Description MAG NAIL WITH WASHER STAMPED "WCI 105"

References

1) NEW RIVER TRAIL MILE MARKER 2.0	NW 66.70
2) EDGE OF ASPHALT	WNW 8.30
3) HANDRAIL POST WITH U.S. FLAG STICKER	SE 8.00
4)	
5)	
6) Sta. Offset	

Sketch



Location: SOUTH OF PEORIA AVE ON THE WEST SIDE OF NEW RIVER, ON TOP OF THE LEVEE SET IN THE WALKING PATH

Project No: 0930018605
Date: 3/29/2011
Crew Chief: H. BESARAWO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 106

☒ Horizontal

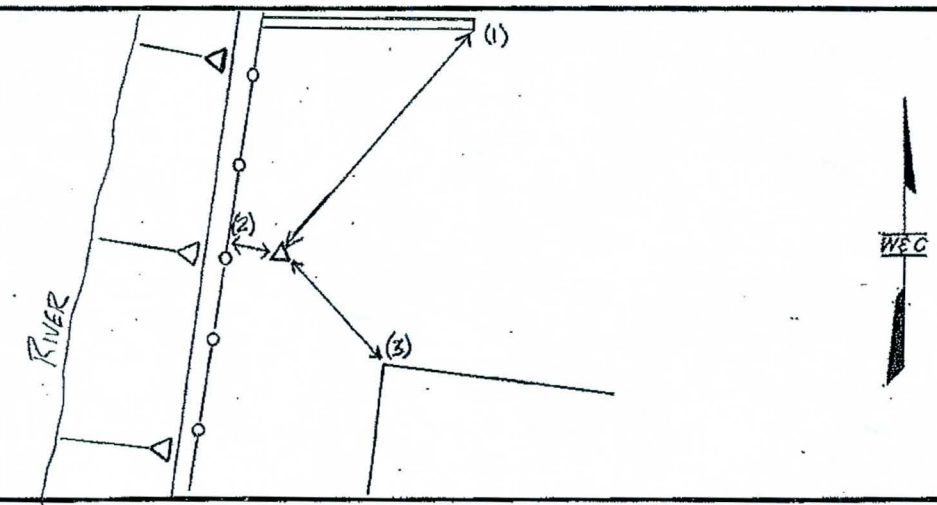
☒ Vertical

Description MAG NAIL WITH WASHER STAMPED "WCI 106"

References

1) EAST END OF 5' BLOCK WALL	NE 71.90
2) 3.5' TALL HANDRAIL	WNW 3.10
3) CORNER OF 8' TALL BLOCKWALL	SE 55.90
4)	
5)	
6) Sta. Offset	

Sketch



Location: ON THE SOUTH SIDE OF PEORIA AVE ON THE EAST SIDE OF NEW RIVER, ON TOP OF THE LEVEE 3.1' EAST OF HANDRAIL

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BEDARANO

WILSON & COMPANY

SURVEYS & MAPPING

CONTROL REFERENCE SHEET

Point Name: 107

☒ Horizontal

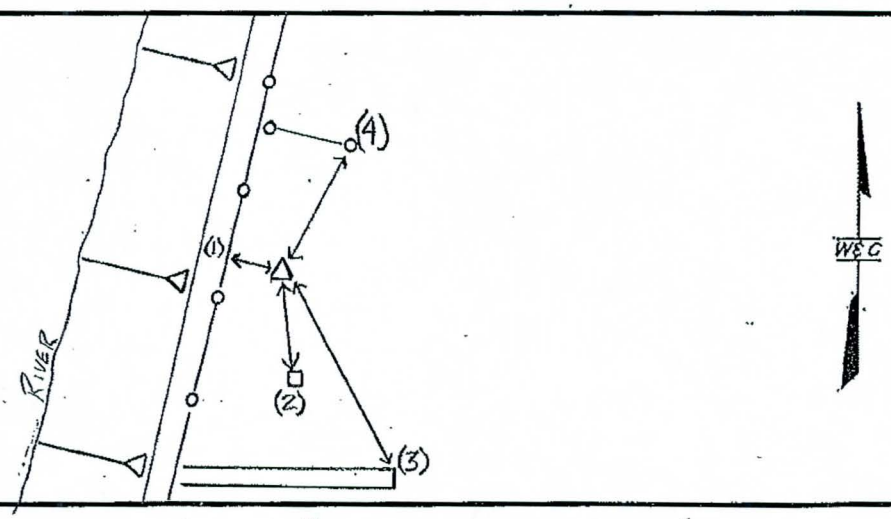
☒ Vertical

Description MAG NAIL WITH WASHER STAMPED "WCI 107"

References

1) 3.5' TALL HANDRAIL	WNW	3.70
2) STATION SIGN STA 293+00	SSE	11.20
3) EAST END OF CONCRETE RETAINING WALL	SE	27.60
4) EAST GATE POST OF FLOOD CONTROL GATE	NE	35.40
5)		
6) Sta. Offset		

Sketch



Location: ON THE NORTH SIDE OF PEORIA AVE ON THE EAST SIDE OF NEW RIVER, SET 3.7' EAST OF THE HANDRAIL

Project No: 0930018605

Date: 3/29/2011

Crew Chief: H. BESARANO

COMP. PEORIA AVENUE BRIDGE

CK. H. BEJARANO

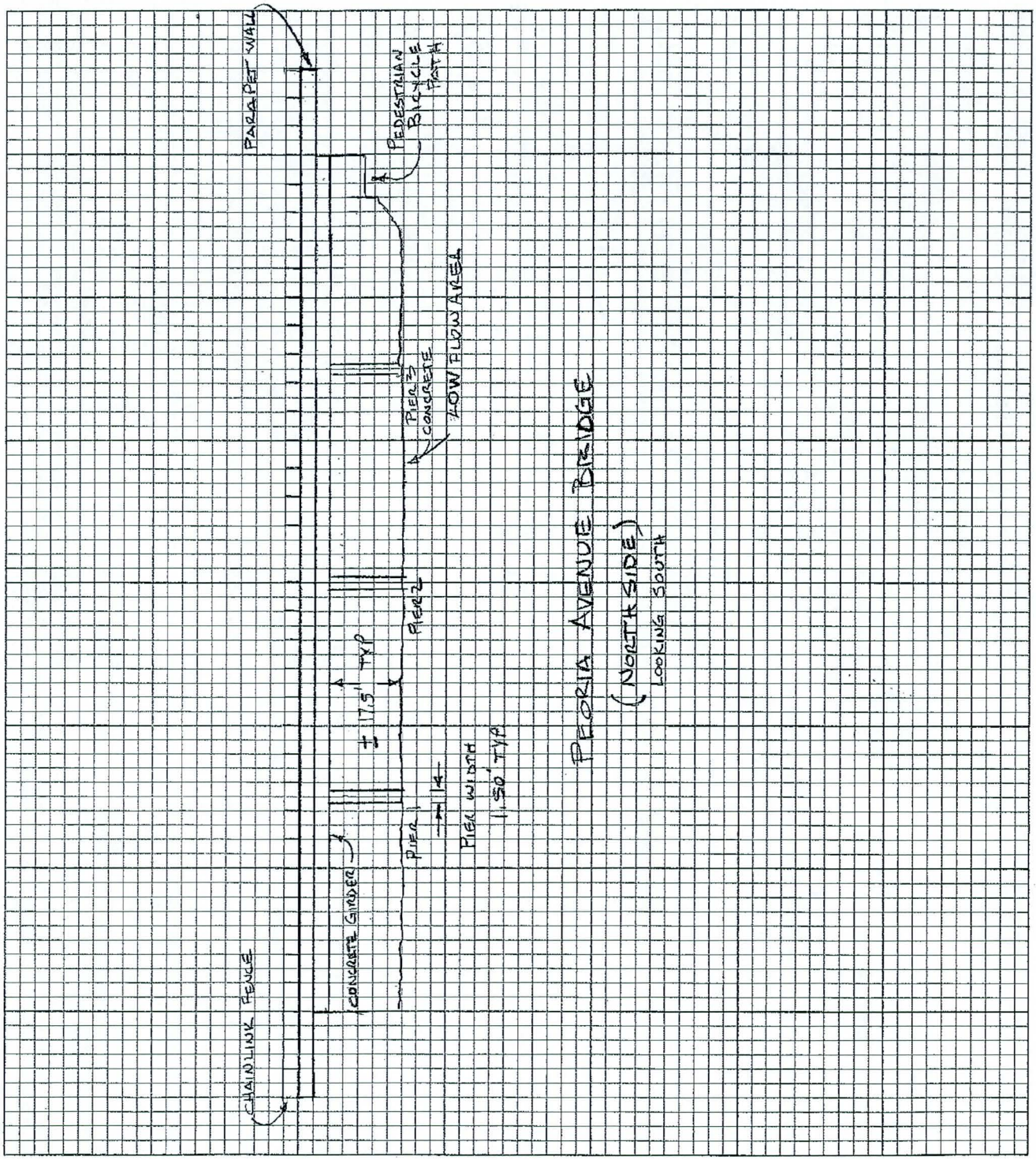
DATE. 03-24-2011

WILSON & COMPANY

LCC. FCDMC FILE

PROJ. 09-300-186-05 SHEET

SUBJ. PEORIA AVE BRIDGE OF



HIGHER Relationships

SHARED OWNERSHIP • COLLABORATION • INTENSITY • DISCIPLINE • SOLUTIONS

COMP. FCDMC

CK. H. BEVARANO

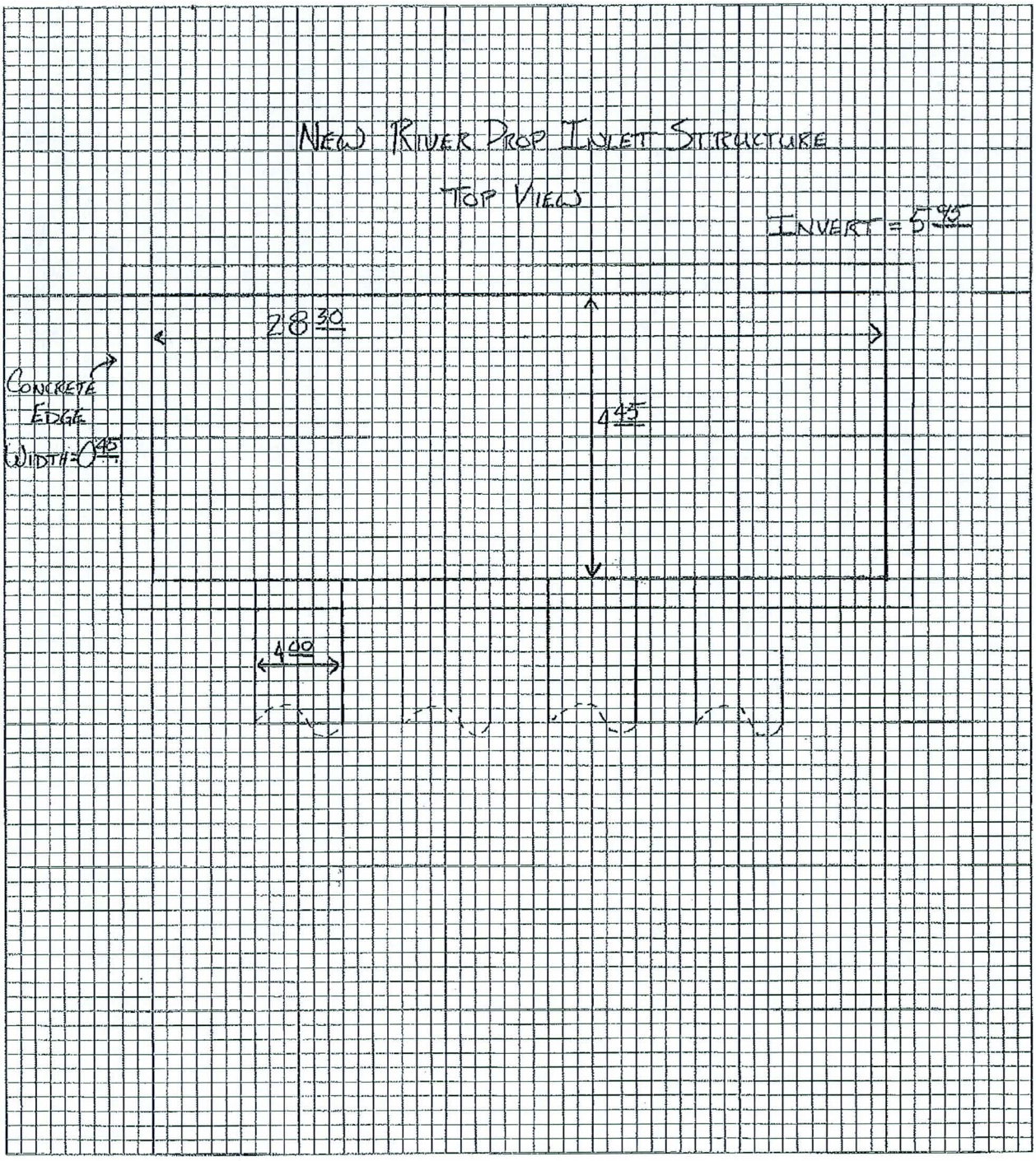
DATE. 3/29/2011

WILSON & COMPANY

LCC. FILE

PROJ. 0930018605 SHEET

SUBJ. NEW RIVER STRUCTURES OF



HIGHER Relationships

COMP. FCDMC

CK. H. BESARANO

DATE 3/29/2011

WILSON & COMPANY

LCC.

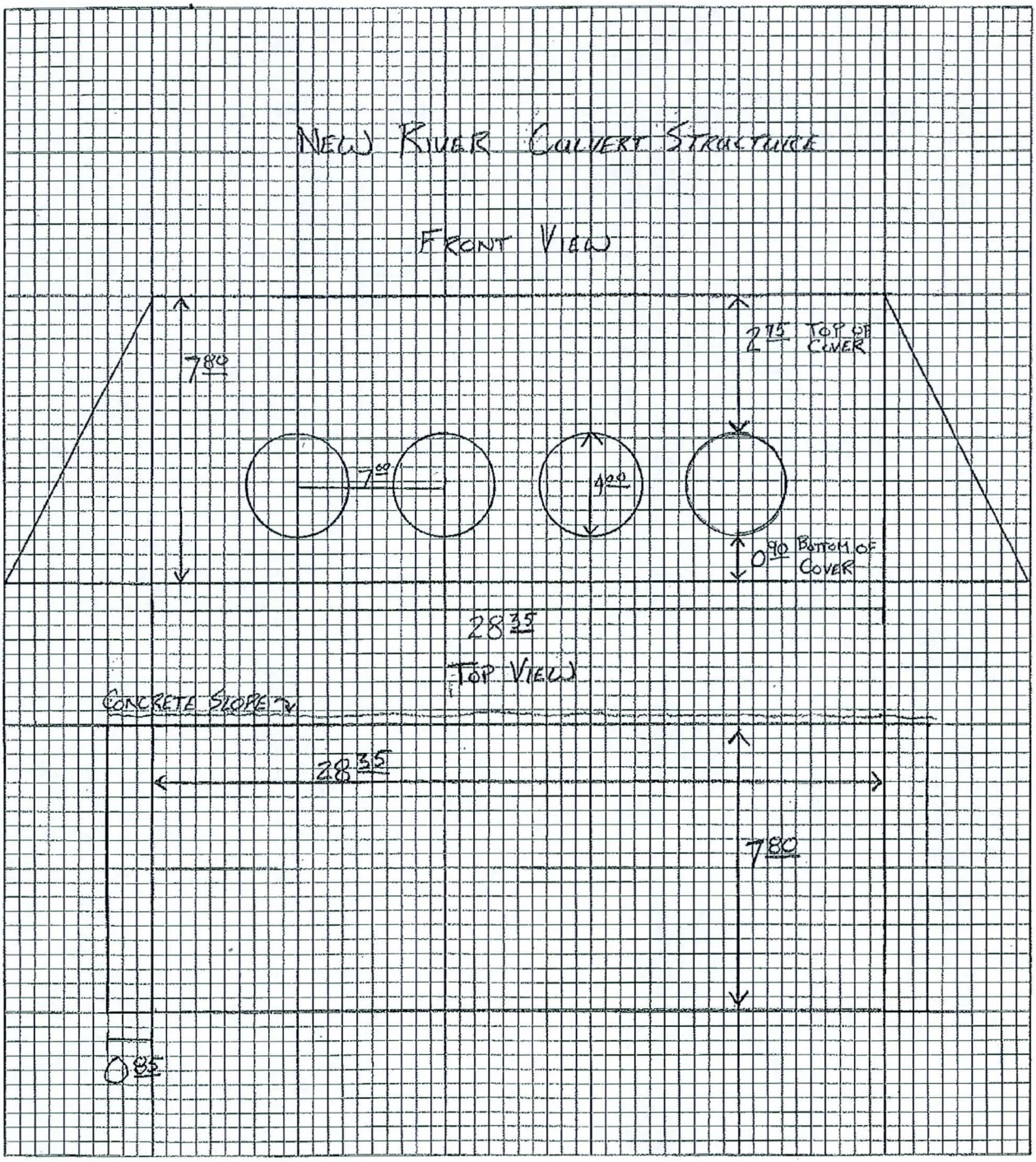
FILE

PROJ. 09300/8605

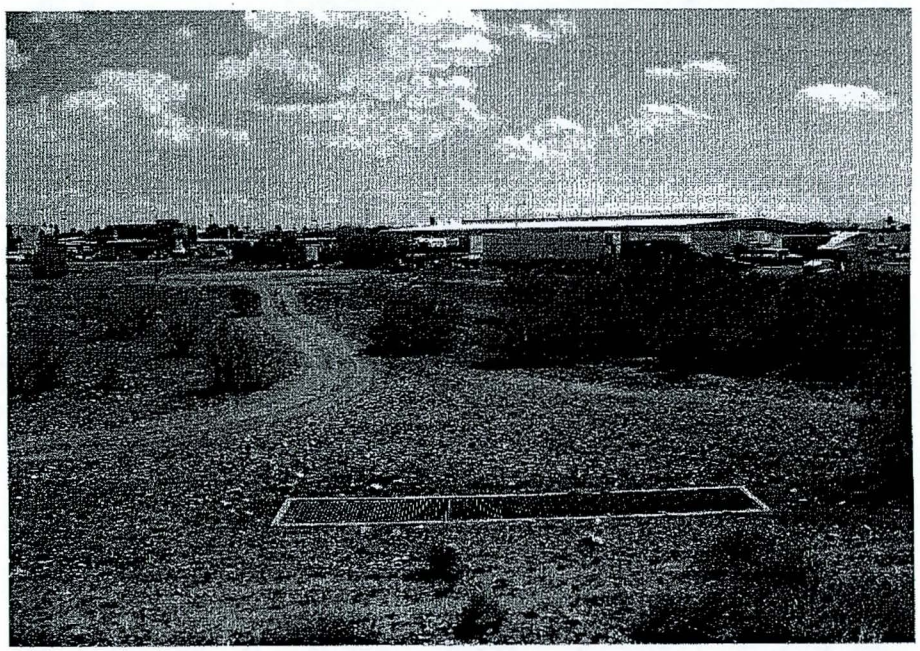
SHEET

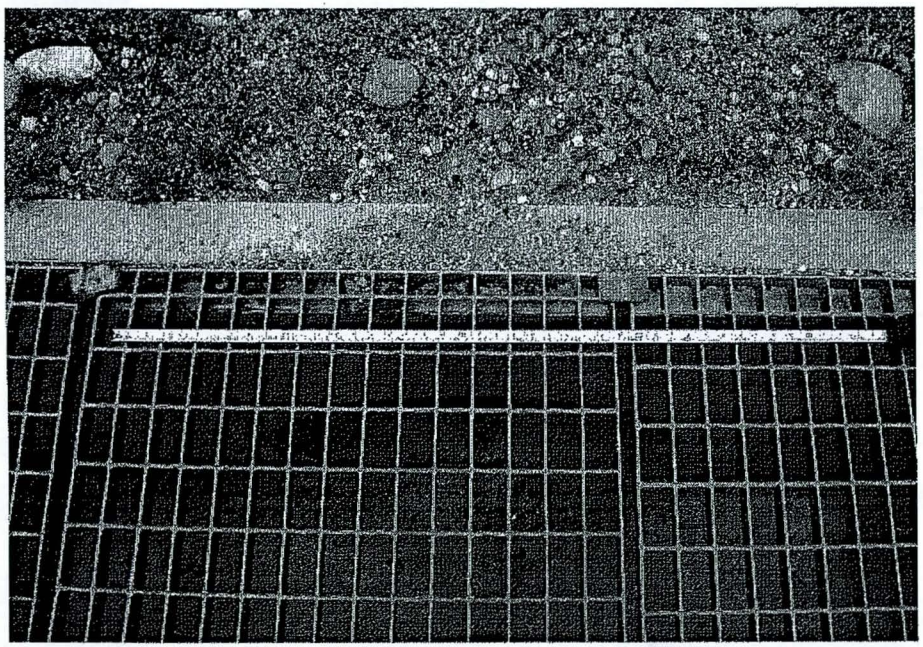
SUBJ. NEW RIVER STRUCTURES

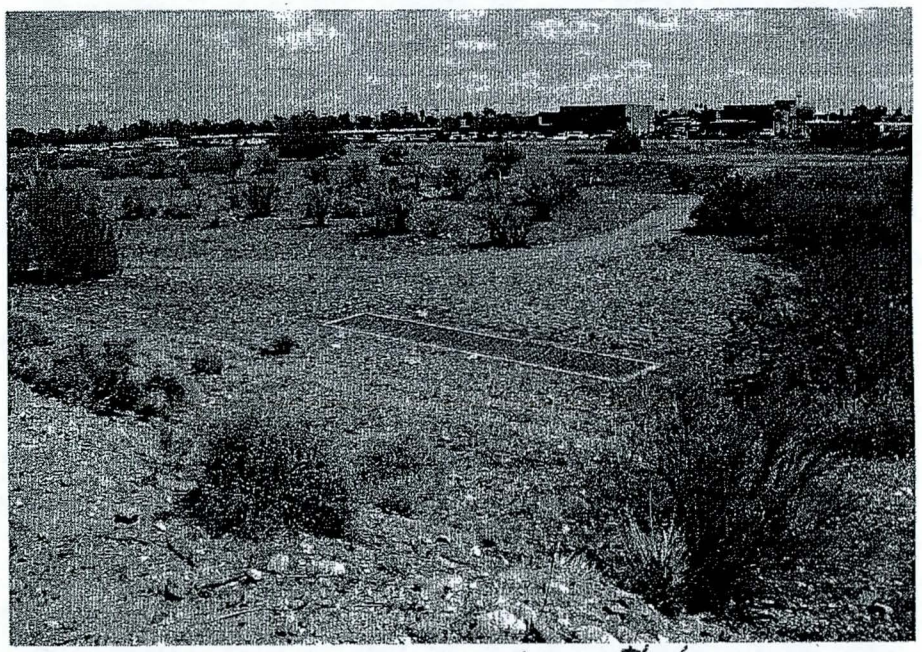
OF



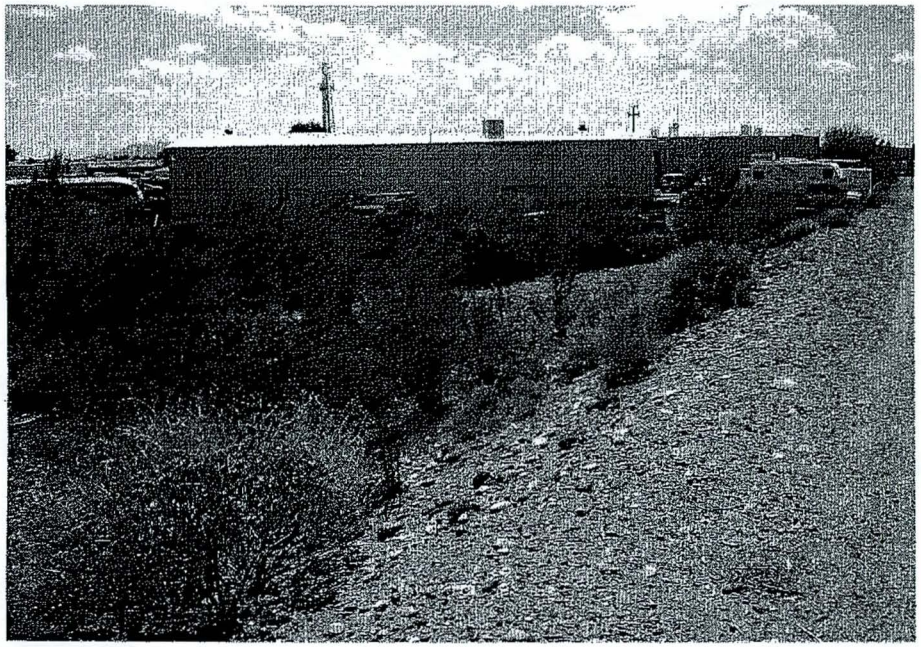
HIGHER Relationships

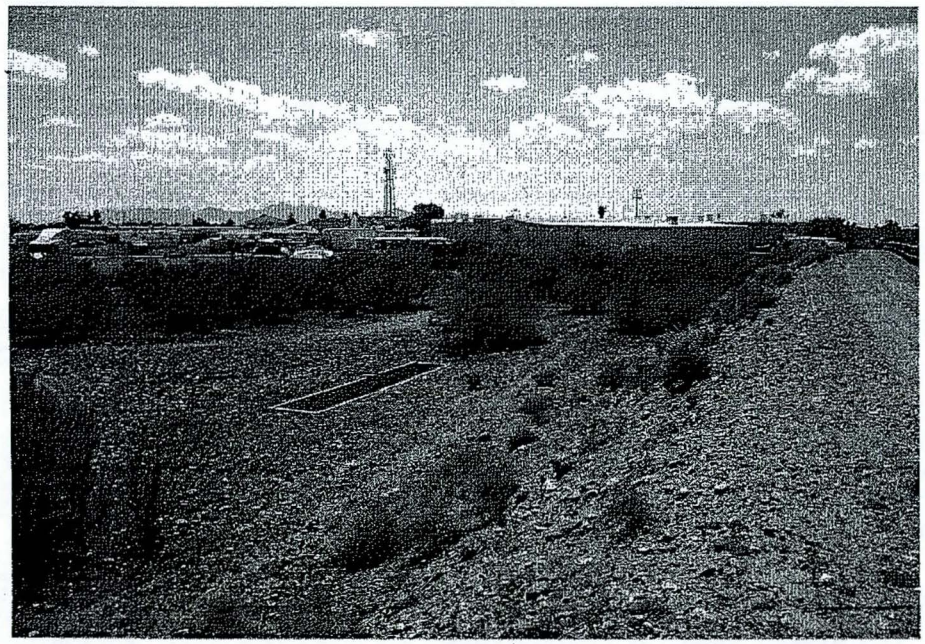




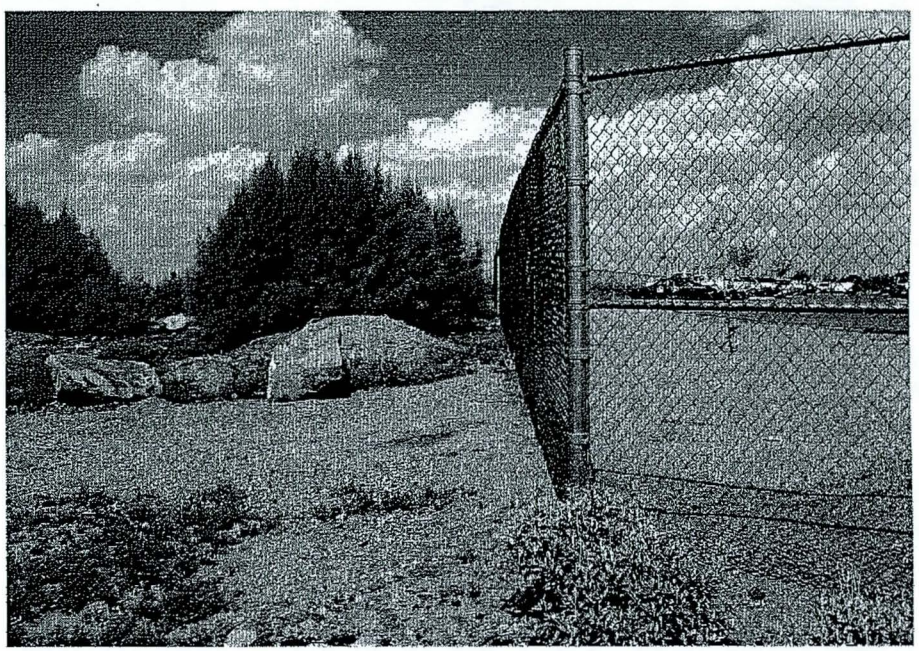


East Side of New River Survey Area #1

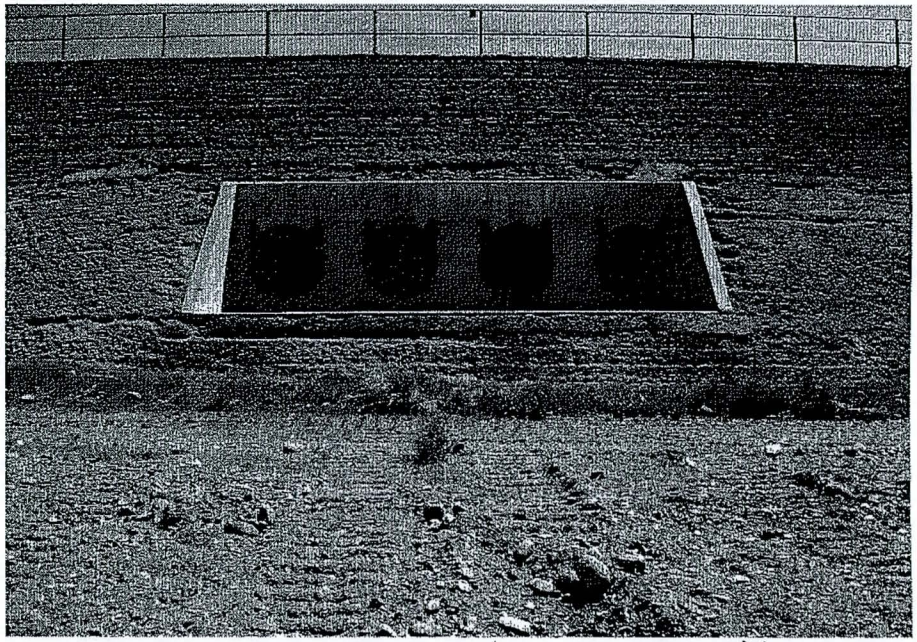




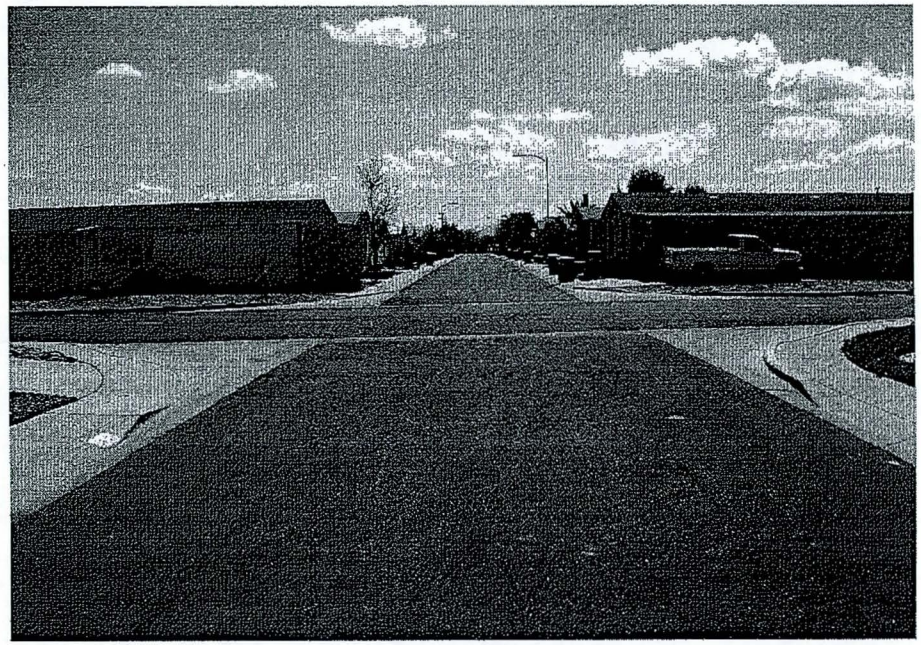
East Side of New River Survey Area #1

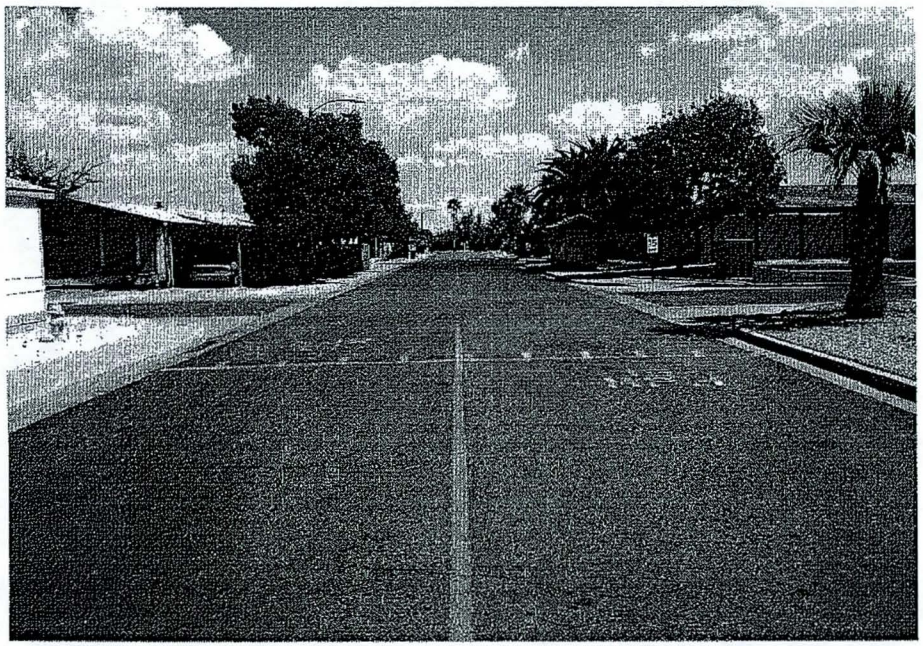


East Side of New River Survey Area #1

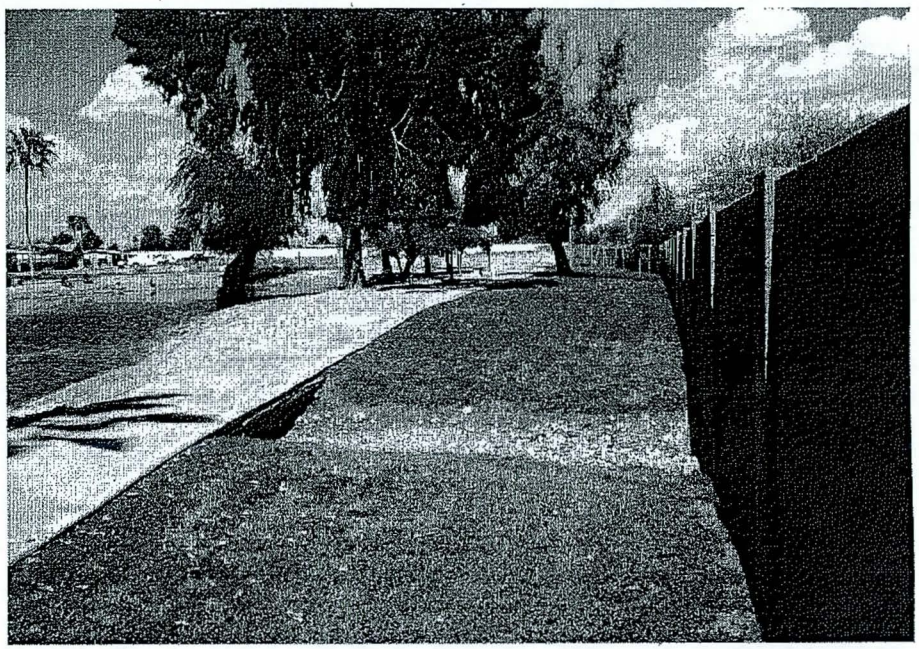


East Side of New River Survey Area #1

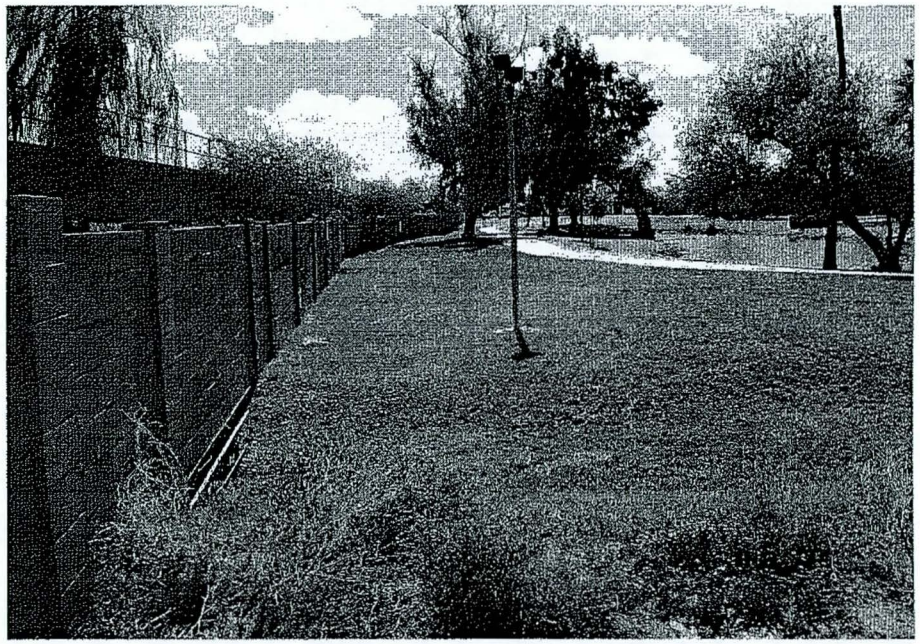




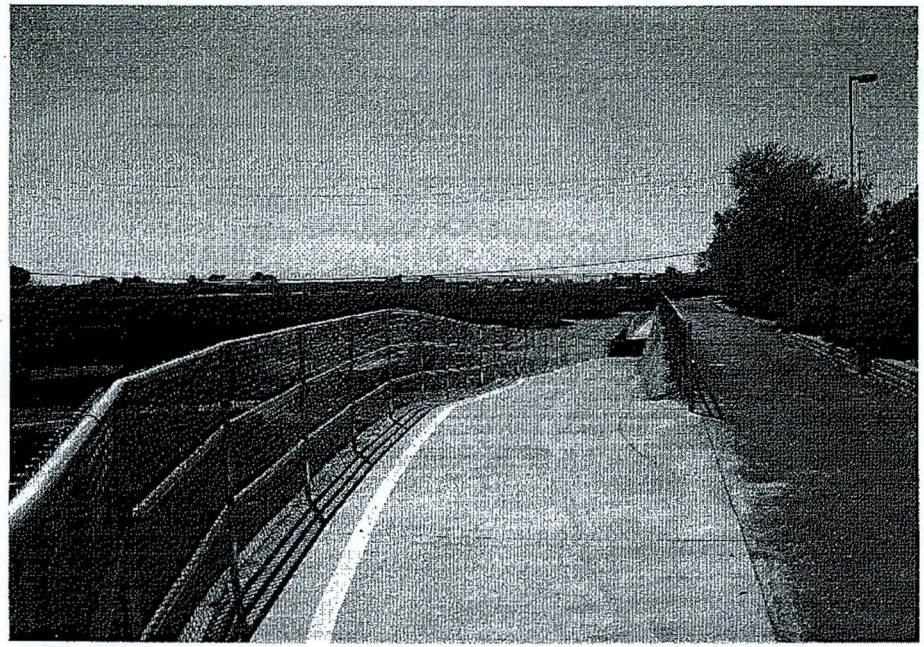
West Side of New River Survey Area #2

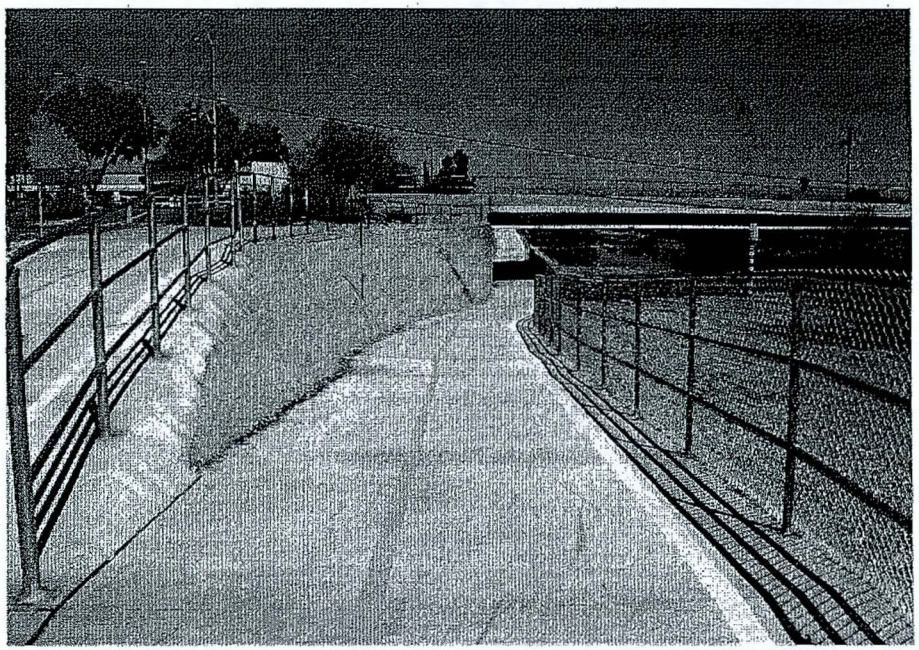


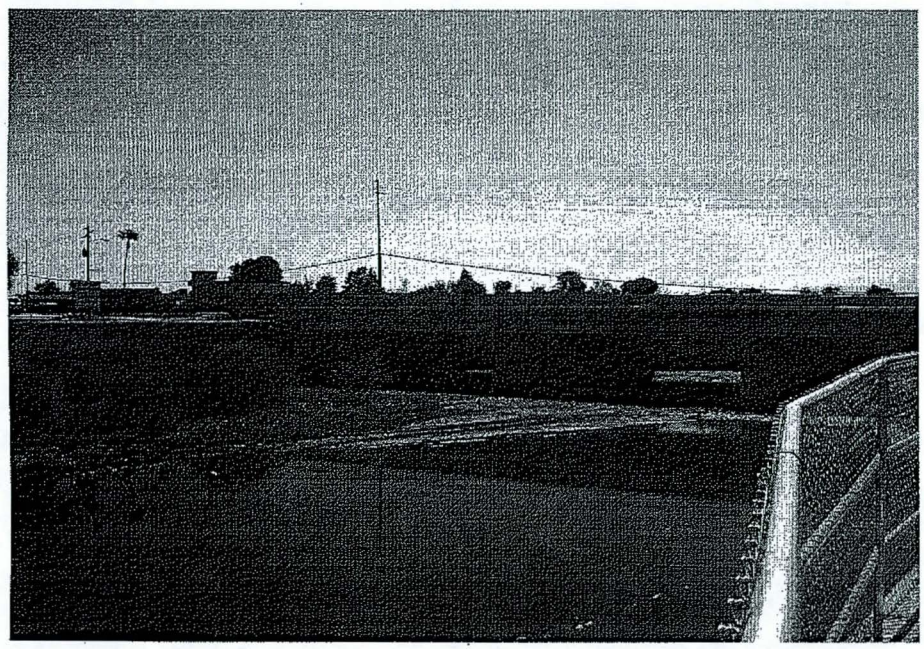
West side of New River Survey Area #2

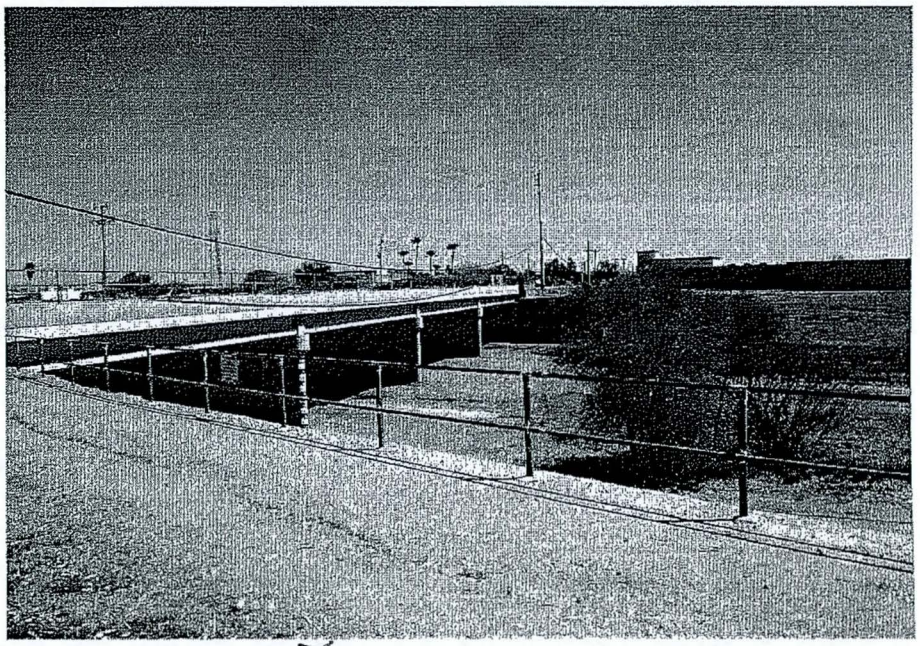


West side of New River Survey Area #2

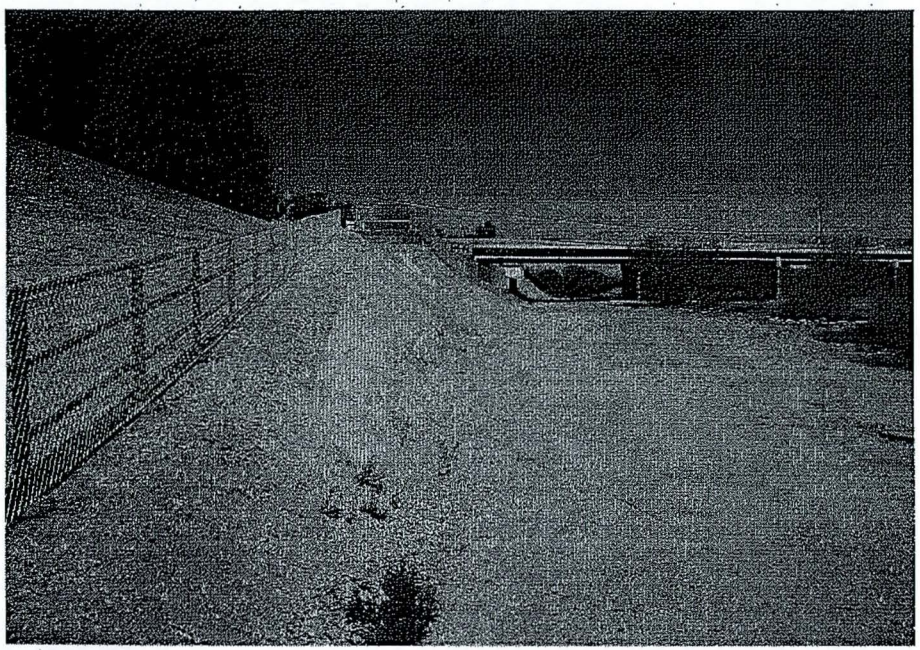


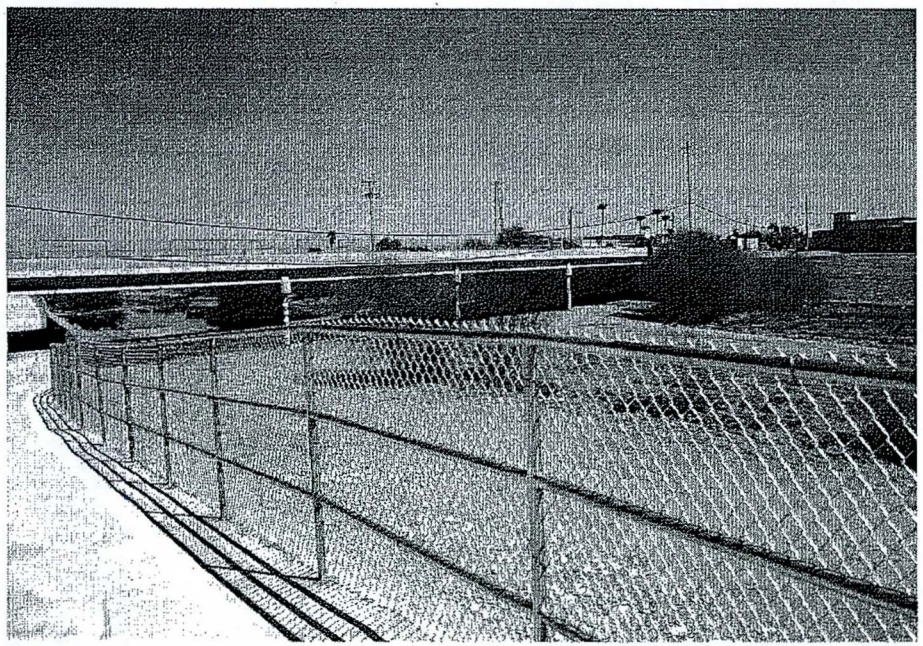


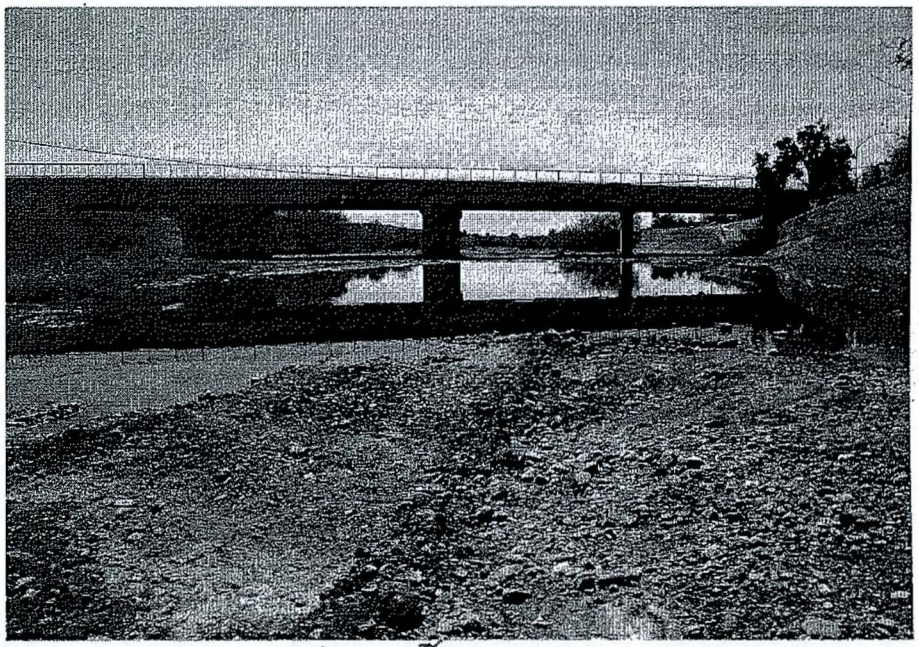




Peoria Ave Bridge Survey Area #3







Peoria Ave. Bridge Survey Area #3

D. Existing Studies

D.1 Select pages from CLOMR/LOMR (05-09-1046R/07-09-0425P)

D.2 New River/Skunk Creek Floodplain Maps (CVL 1989, 10N to 20N)

D.1 Select pages from CLOMR/LOMR (05-09-1046R/07-09-0425P)

50 0 50 100
Scale In Feet

Printed not to Scale

REFERENCE MARK RM:

TOP OF PAVEMENT AT CENTERLINE OF CACTUS ROAD
0.25 MILES EAST OF 91ST AVENUE AT DIRT ROAD NORTH.
ELEV.=1142.72'
RM329 FROM FIRM MAP # 0413C1610 H
ELEV. IS NGVD 1929. TO ADJUST TO NAVD 1988 ADD 1.81'.

NOTE: MAPPING VERTICAL DATUM NAVD 1988
AERIAL FLIGHT DATE: 9-4-03

LEGEND:

352.4	CROSS SECTION NUMBER
FP=1133.1	FLOODPLAIN WATER SURFACE
FW=1133.1	FLOODWAY WATER SURFACE
Q100=41,000cfs	100-YEAR PEAK DISCHARGE = 41,000 CUBIC FEET PER SEC.
1252	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	POST PROJECT CONDITION FLOODWAY BOUNDARY
	POST PROJECT CONDITION FLOODPLAIN BOUNDARY
	EFFECTIVE FLOODWAY BOUNDARY
	EFFECTIVE FLOODPLAIN BOUNDARY
ZONE AE	FLOOD INSURANCE RATE ZONE
365	EFFECTIVE FIS CROSS SECTION NUMBER

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

NEW RIVER - GRAND AVENUE TO SKUNK CREEK
PROJECT NUMBER
FCD2003C001

	BY	DATE
DESIGNED	KD/SZ	12-04
DRAWN	KD/DH	12-04
CHECKED	JH/AP	12-04

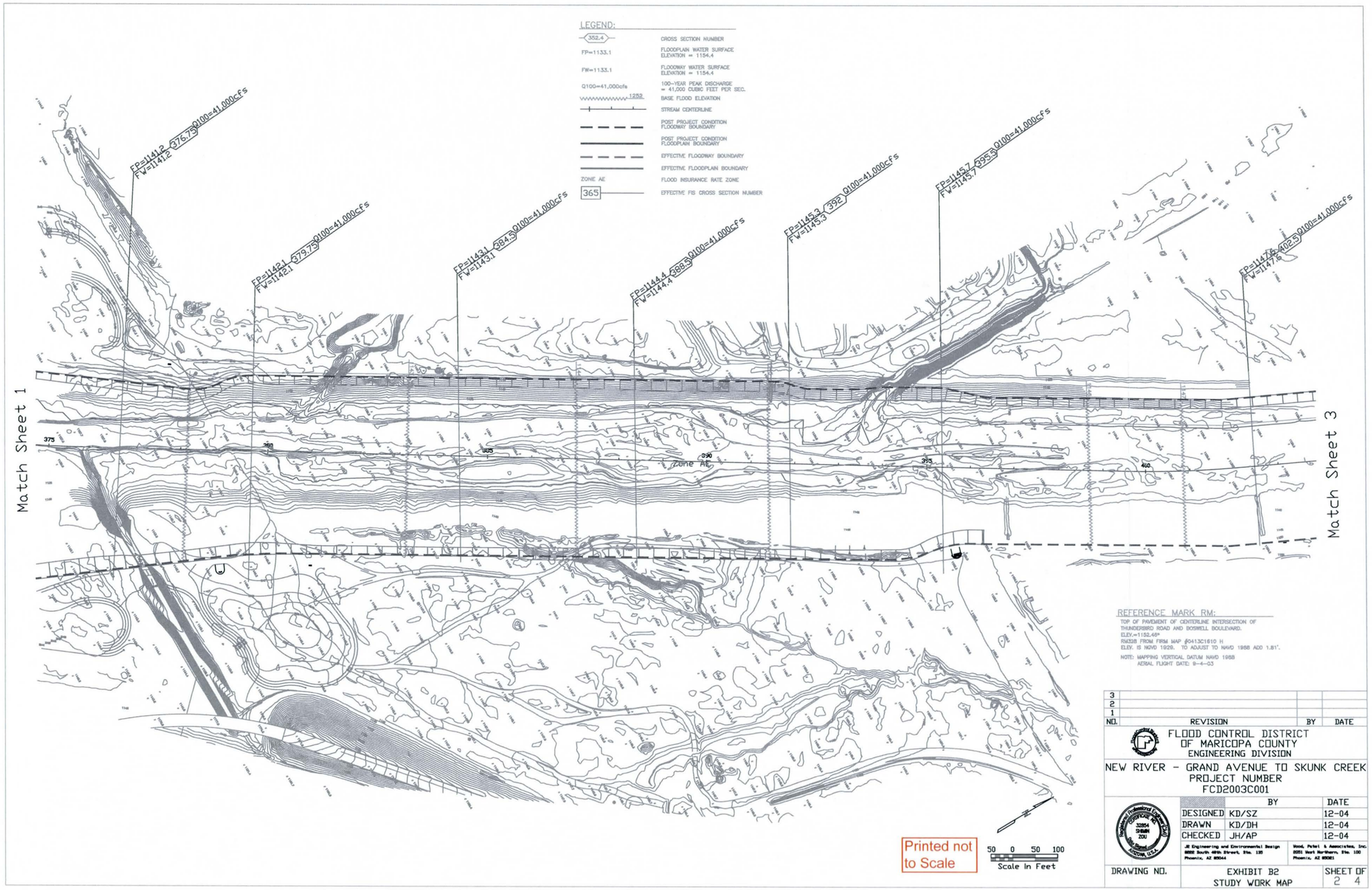
JE Engineering and Environmental Design
8222 South 48th Street, Ste. 135
Phoenix, AZ 85044

Wood, Patel & Associates, Inc.
2051 West Northern, Ste. 100
Phoenix, AZ 85021

DRAWING NO.

EXHIBIT B1
STUDY WORK MAP

SHEET OF
1 4



REFERENCE MARK RM:

TOP OF PAVEMENT OF CENTERLINE INTERSECTION OF THUNDERBIRD ROAD AND BOSWELL BOULEVARD.
ELEV.=1152.48'
RM32B FROM FIRM MAP #0413C1610 H
ELEV. IS NGVD 1929. TO ADJUST TO NAVD 1988 ADD 1.81'.

NOTE: MAPPING VERTICAL DATUM NAVD 1988
AERIAL FLIGHT DATE: 9-4-03

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

NEW RIVER - GRAND AVENUE TO SKUNK CREEK
PROJECT NUMBER
FCD2003C001

	BY	DATE
DESIGNED	KD/SZ	12-04
DRAWN	KD/DH	12-04
CHECKED	JH/AP	12-04

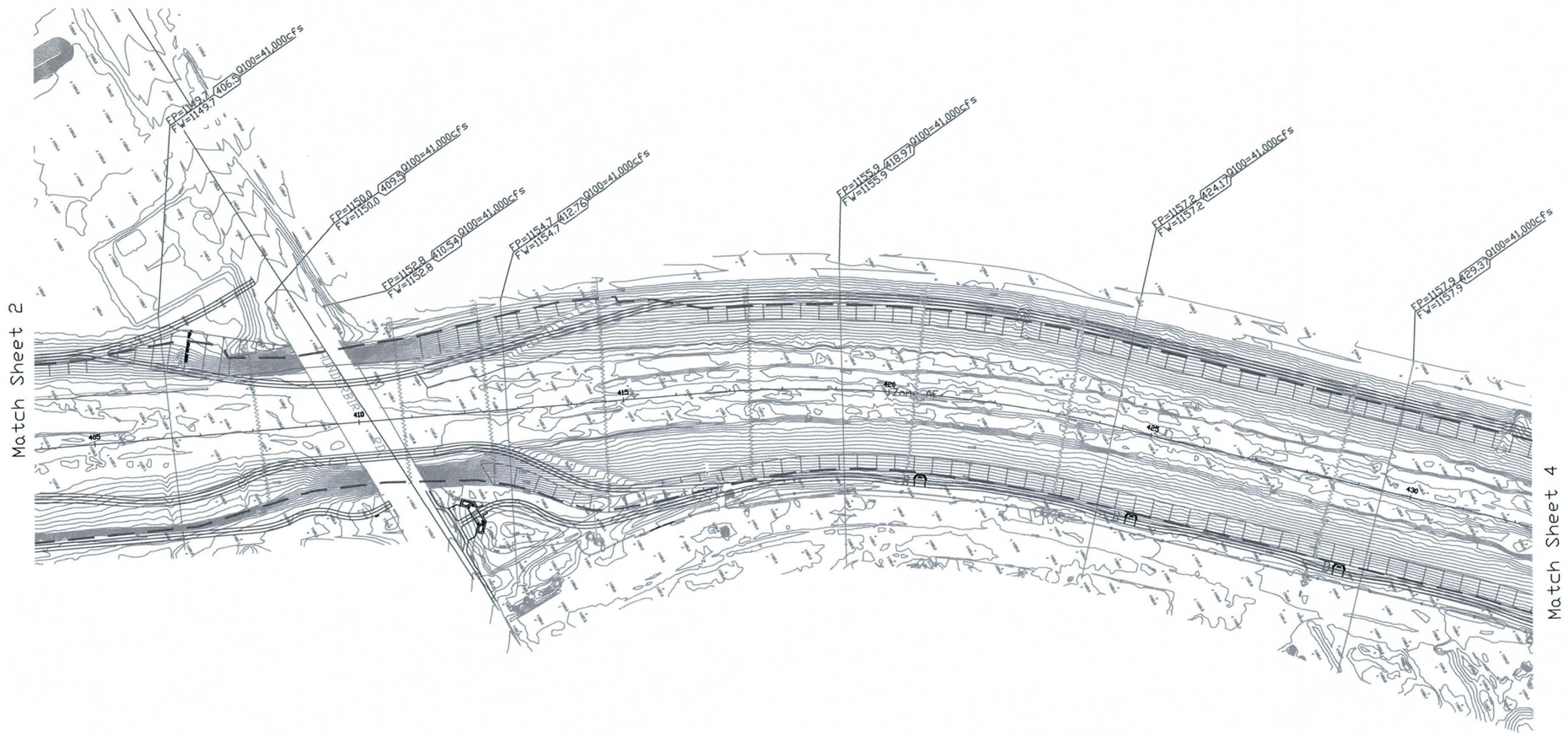
JE Engineering and Environmental Design
8222 South 48th Street, Ste. 135
Phoenix, AZ 85044

Wood, Patel & Associates, Inc.
8051 West Northern, Ste. 100
Phoenix, AZ 85021

DRAWING NO.

EXHIBIT B2
STUDY WORK MAP

SHEET OF
2 4



REFERENCE MARK RM:

TOP OF PAVEMENT OF CENTERLINE INTERSECTION OF THUNDERBIRD ROAD AND BOSWELL BOULEVARD.
ELEV.=1152.46'
RM328 FROM FIRM MAP #04013C1810 H
ELEV. IS NGVD 1929. TO ADJUST TO NAVD 1988 ADD 1.81'.

NOTE: MAPPING VERTICAL DATUM NAVD 1988
AERIAL FLIGHT DATE: 8-4-03

LEGEND:

352.4	CROSS SECTION NUMBER
FP=1133.1	FLOODPLAIN WATER SURFACE
FW=1133.1	FLOODWAY WATER SURFACE
Q100=41,000cfs	100-YEAR PEAK DISCHARGE = 41,000 CUBIC FEET PER SEC.
1282	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	POST PROJECT CONDITION FLOODWAY BOUNDARY
	POST PROJECT CONDITION FLOODPLAIN BOUNDARY
	EFFECTIVE FLOODWAY BOUNDARY
	EFFECTIVE FLOODPLAIN BOUNDARY
ZONE AE	FLOOD INSURANCE RATE ZONE
365	EFFECTIVE FIS CROSS SECTION NUMBER

50 0 50 100
Scale in Feet

Printed not to Scale

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

NEW RIVER - GRAND AVENUE TO SKUNK CREEK
PROJECT NUMBER
FCD2003C001

	BY	DATE
DESIGNED	KD/SZ	12-04
DRAWN	KD/DH	12-04
CHECKED	JH/AP	12-04

JE Engineering and Environmental Design
8802 South 48th Street, Ste. 135
Phoenix, AZ 85044

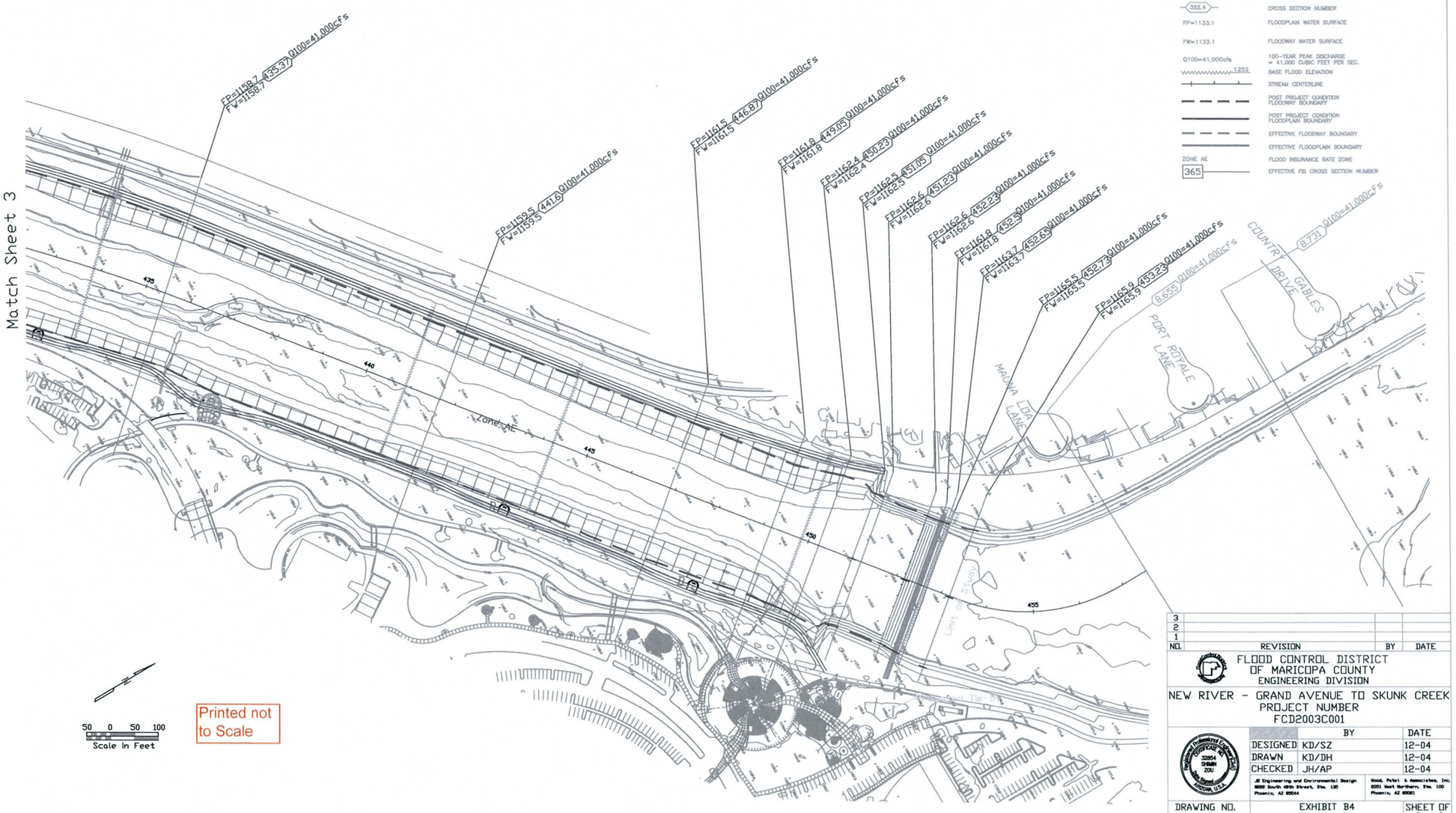
Wood, Patel & Associates, Inc.
8051 West Northern, Ste. 100
Phoenix, AZ 85061

Registered Professional Engineer (Civil)
CERTIFICATE NO. 32854
STUART ZOU
Date Signed
ARIZONA, U.S.A.

DRAWING NO.

EXHIBIT B3
STUDY WORK MAP

SHEET OF
3 4



REFERENCE MARK RM:

TOP OF PAVEMENT OF CENTERLINE INTERSECTION OF THUNDERBIRD ROAD AND BOSWELL BOULEVARD.
ELEV.=1152.46ft
RM328 FROM FIRM MAP #0413C1610 H
ELEV. IS NGVD 1929. TO ADJUST TO NAVD 1988 ADD 1.81'.

NOTE: MAPPING VERTICAL DATUM NAVD 1988
AERIAL FLIGHT DATE: 8-4-03

LEGEND:

352.4	CROSS SECTION NUMBER
FP=1133.1	FLOODPLAIN WATER SURFACE
FW=1133.1	FLOODWAY WATER SURFACE
Q100=41,000cfs	100-YEAR PEAK DISCHARGE = 41,000 CUBIC FEET PER SEC.
1252	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	POST PROJECT CONDITION FLOODWAY BOUNDARY
	POST PROJECT CONDITION FLOODPLAIN BOUNDARY
	EFFECTIVE FLOODWAY BOUNDARY
	EFFECTIVE FLOODPLAIN BOUNDARY
ZONE AE	FLOOD INSURANCE RATE ZONE
365	EFFECTIVE FIS CROSS SECTION NUMBER

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

NEW RIVER - GRAND AVENUE TO SKUNK CREEK
PROJECT NUMBER
FCD2003C001

	BY	DATE
DESIGNED	KD/SZ	12-04
DRAWN	KD/DH	12-04
CHECKED	JH/AP	12-04

Registered Professional Engineer (Civil) CERTIFICATE NO. 32854 STATE OF ARIZONA Date Signed 2001

JE Engineering and Environmental Design
8802 South 48th Street, Ste. 135
Phoenix, AZ 85044

Wood, Patel & Associates, Inc.
8051 West Northern, Ste. 100
Phoenix, AZ 85021

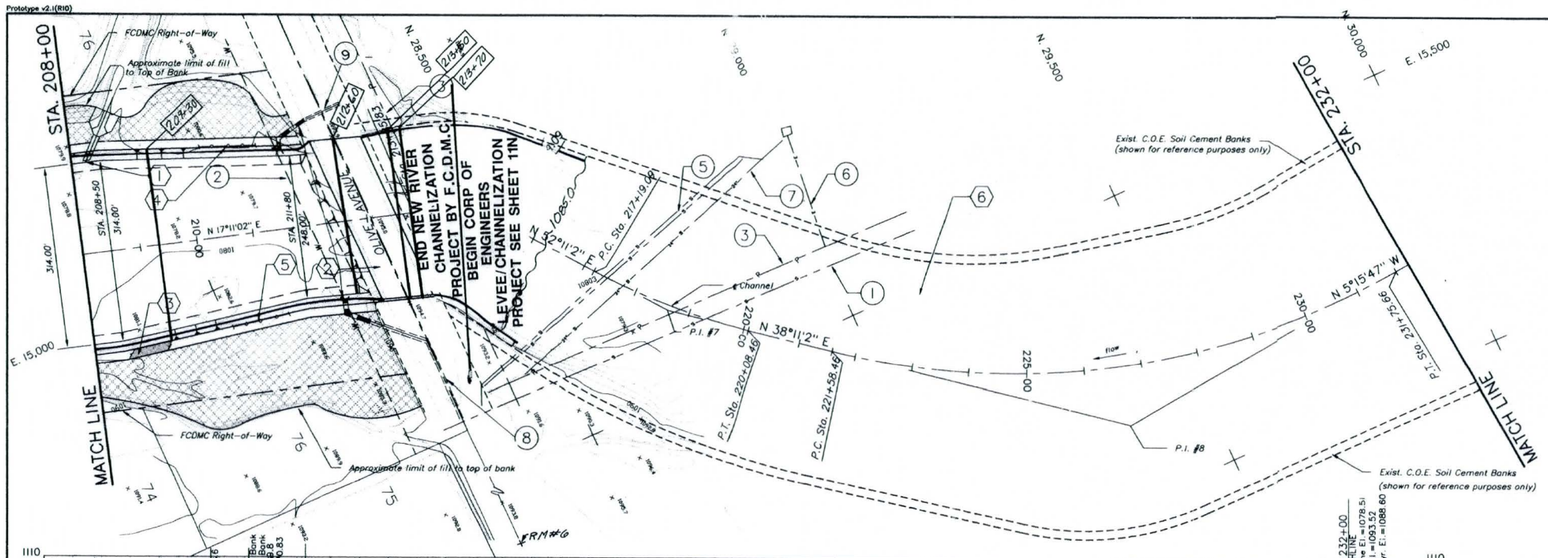
DRAWING NO.

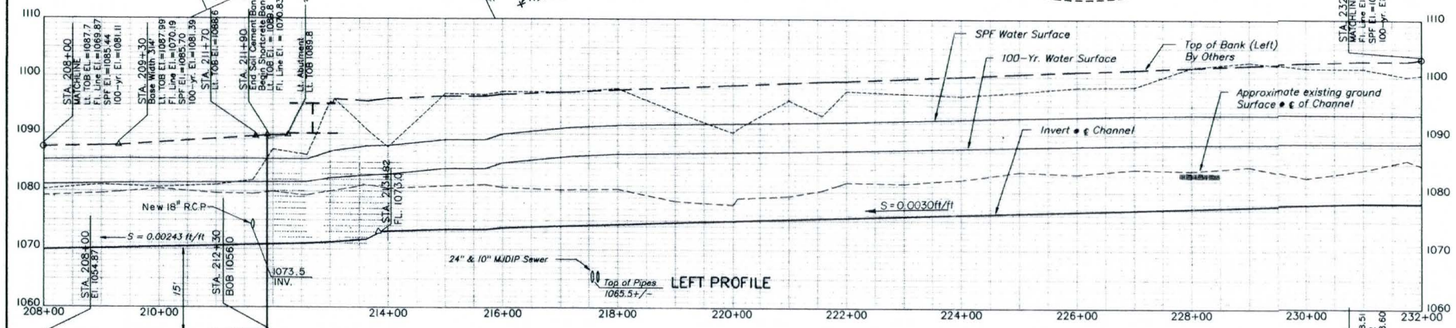
EXHIBIT B4
STUDY WORK MAP

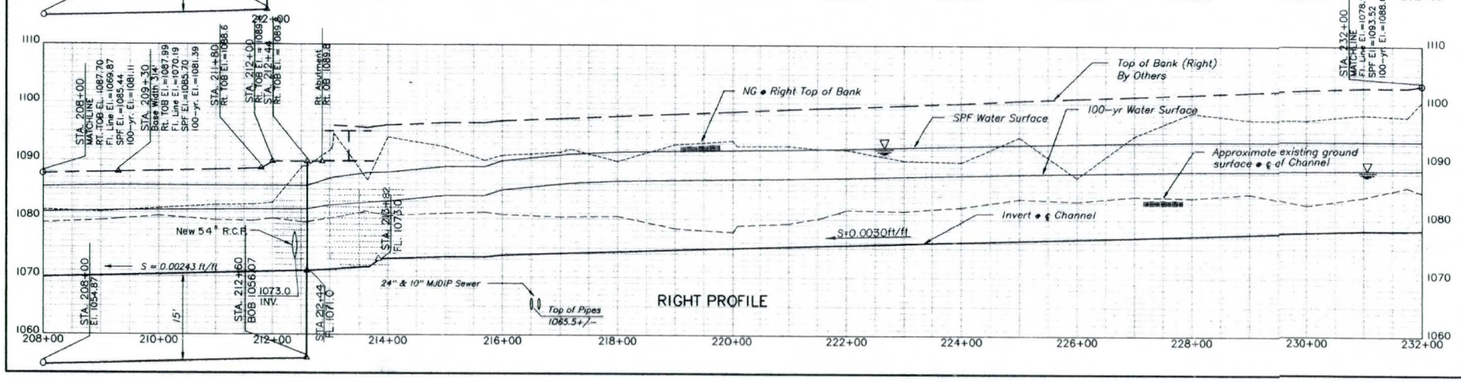
SHEET OF
4 4

D.2 New River/Skunk Creek Floodplain Maps (CVL 1989, 10N to 20N)

Prototype v2.1(R10)







CONSTRUCTION NOTES

1. STA. 208+25 (LT)
   Construct Concrete Box Culvert w/ spillway per Sun City Channel Outlet Detail, sheet 9.
2. STA. 212+60
   Construct Bridge Protection, Utilities, Access Roads per Olive Avenue Bridge Protection Details, sheet 24.
3. STA. 208+00 to 213+18 (RT)
   Place 7' x 4" thick A.B.C. Maintenance Road (405 s.y.) per Typical Bank Section Sheet 3.
4. STA. 208+00 to STA. 212+25 (LT)
   Install 420 L.F. Safety Rail, per detail sheet 4.
5. STA. 208+00 to STA. 213+00 (RT)
   Install 510 L.F. Safety Rail, per detail sheet 4.
6. North of Olive Ave., Construction entails earthwork excavation only. Soil Cement Bank and all other items not shown will be constructed by others.

EXISTING UTILITIES

1. 14" ACP FM Sewer (To be abandoned by Others)
2. 16" Water, 100' S. of ℄ (City of Peoria)
3. Overhead Power Lines
5. 10" and 24" MJDIP Sewer, proposed by FCD
6. Electric Line
7. 24" Dip Sewer (To be removed by Others)
8. 54" RGRCP, proposed by MCHD
9. 18" R.G.R.C.P.

CAUTION:

See Note Sheet 16 for Electric.

CONTOUR INTERVAL: 2 FEET

Topographic Mapping by Aerial Mapping Co. Flown March 1988.

KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- STATIONING IN FEET
- 2+04 ○ CROSS-SECTION NUMBER
- ℄ of ℄ REFERENCE MARK

NOTE:
1) SEE SHEET 1 FOR SHEET INDEX MAP
2) SEE EXHIBIT 2 FOR 10,50,100 & 500-YEAR PROFILE PLOTS
3) 100-YEAR PROFILE SHOWN ON CONSTRUCTION PLANS CORRESPONDS TO A DISCHARGE HIGHER THAN THE F.E.M.A. REGULATORY DISCHARGES.

HORIZ. SCALE: 1 IN. = 100 FT.

100 0 100 200

VERT. SCALE: 1 IN. = 10 FT.

10 0 10 20

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
INSIDE MARICOPA COUNTY

REVISION BY				
NO.	DESCRIPTION	REV. BY	DWD. BY	DATE

REVISION BY				
NO.	DESCRIPTION	REV. BY	DWD. BY	DATE

REVISION BY				
NO.	DESCRIPTION	REV. BY	DWD. BY	DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER CHANNELIZATION

PLAN / PROFILE STA. 208+00 to STA. 232+00

BETHANY HOME ROAD TO OLIVE AVENUE

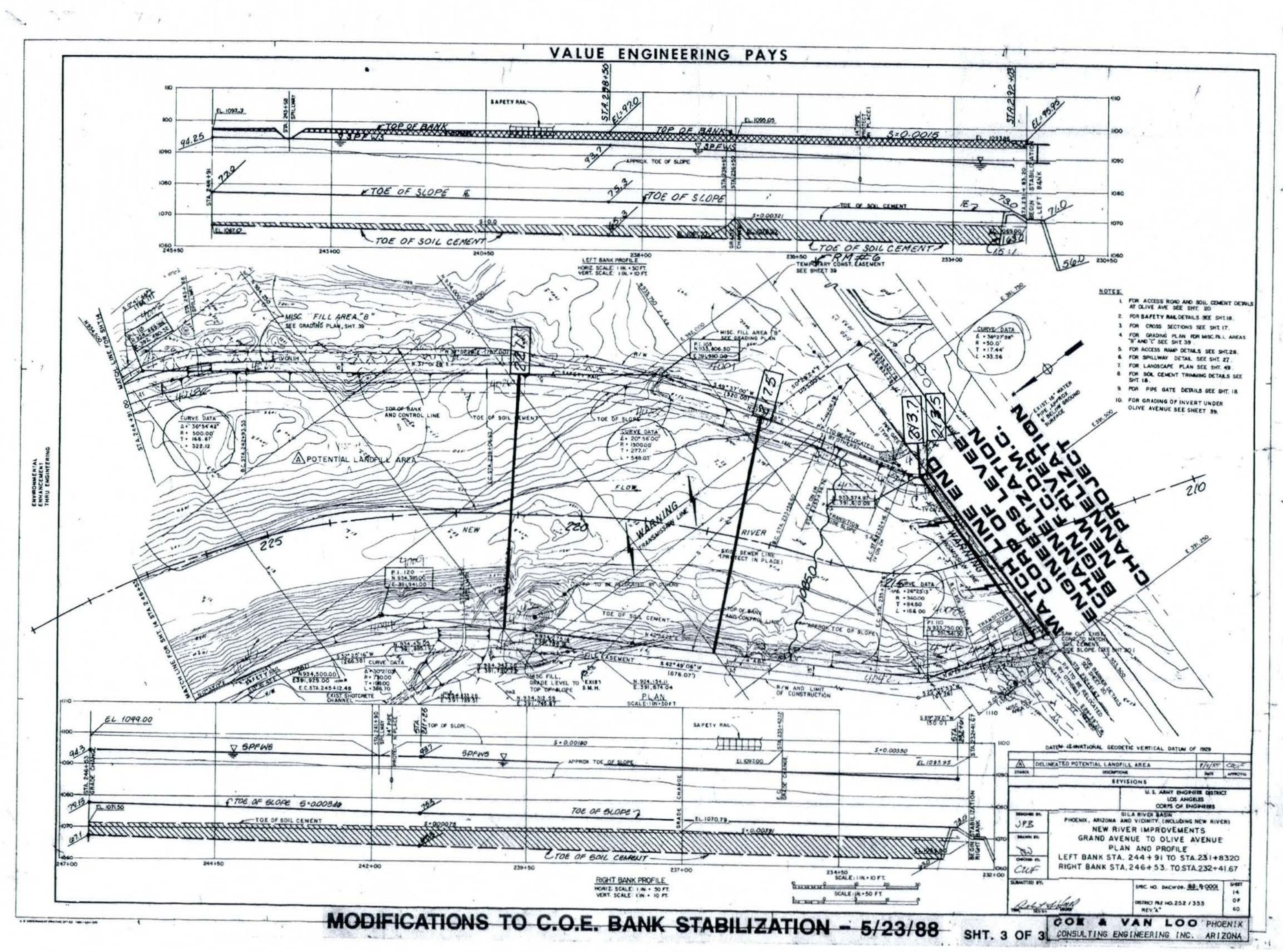
RECOMMENDED BY:
APPROVED BY: DATE:
CHIEF ENGINEER & GENERAL MANAGER:

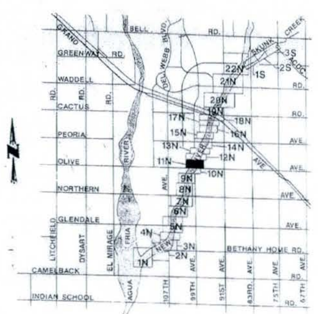
SHEET 10N OF 22N

DESIGNED	DRAWN	CHECKED	
PH	BR/RC	AP	CVL# 1090-03-02
DATE 10/88	DATE 1/89	DATE 2/89	

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL JOB NO. 1090-04-01





KEY MAP
NTS

LEGEND

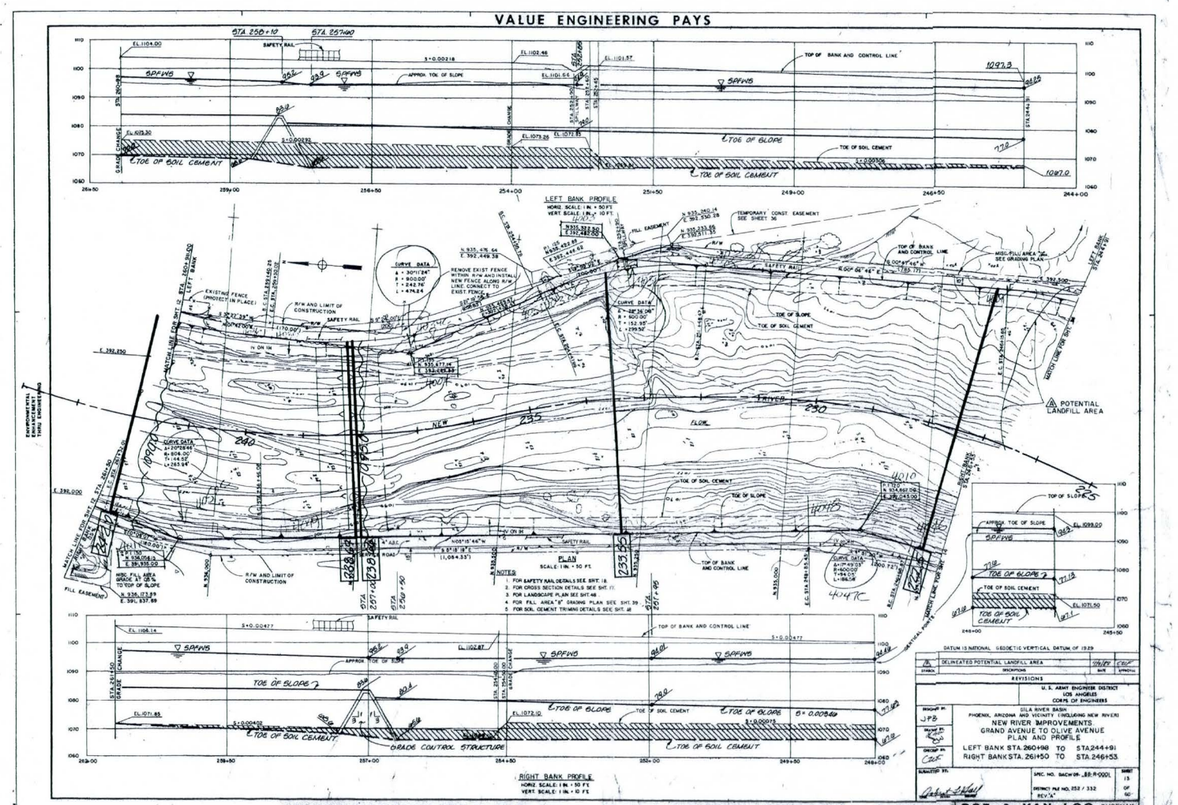
- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85+00 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER
FLOODPLAIN DELINEATION
AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:			SHEET 11N OF 22N
APPROVED BY:		DATE:	
CHIEF ENGINEER & GENERAL MANAGER:			
DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX
ARIZONA



MODIFICATIONS TO C.O.E. BANK STABILIZATION – 5/23/88 SHT. 2 OF 3

KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 850.00 — STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 — CROSS-SECTION NUMBER
- RM#4 — REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

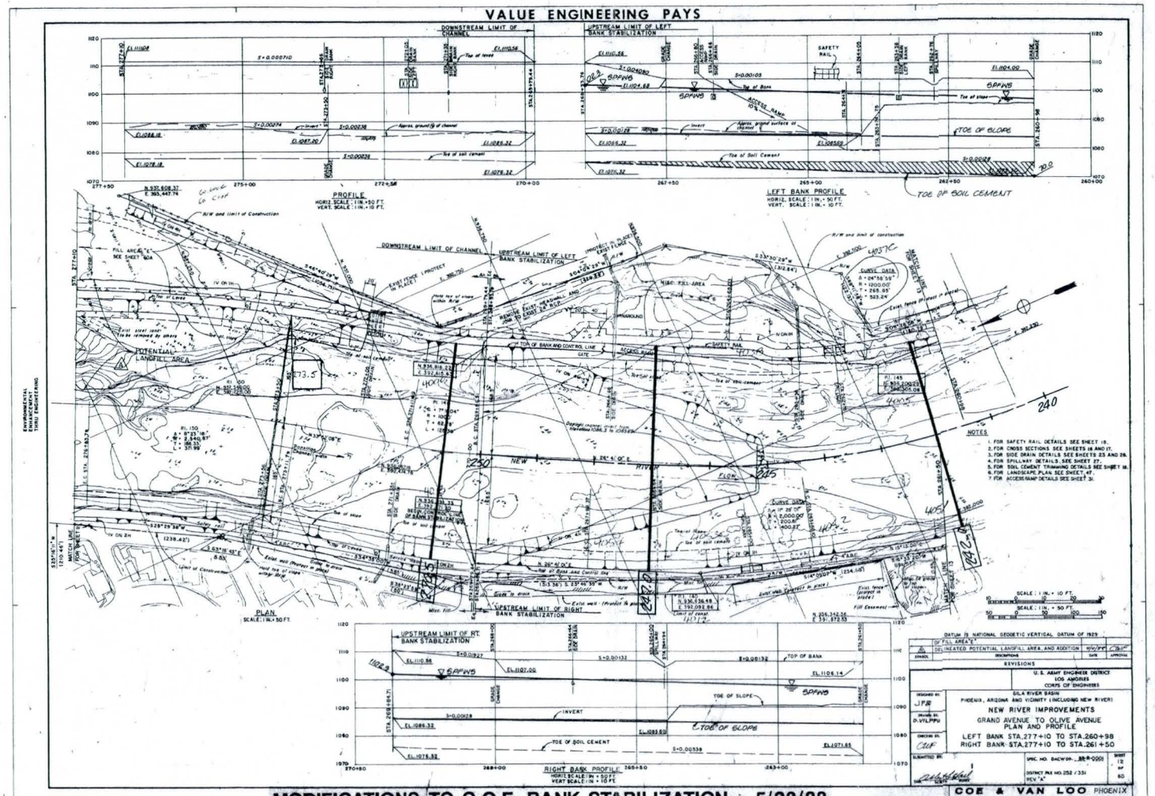
AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:
APPROVED BY: DATE:
CHIEF ENGINEER & GENERAL MANAGER:

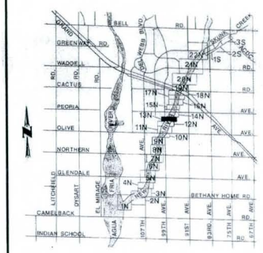
SHEET 12N OF 22N

DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX
ARIZONA



MODIFICATIONS TO C.O.E. BANK STABILIZATION - 5/23/88 SHT. 1 OF 3



KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85+00 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

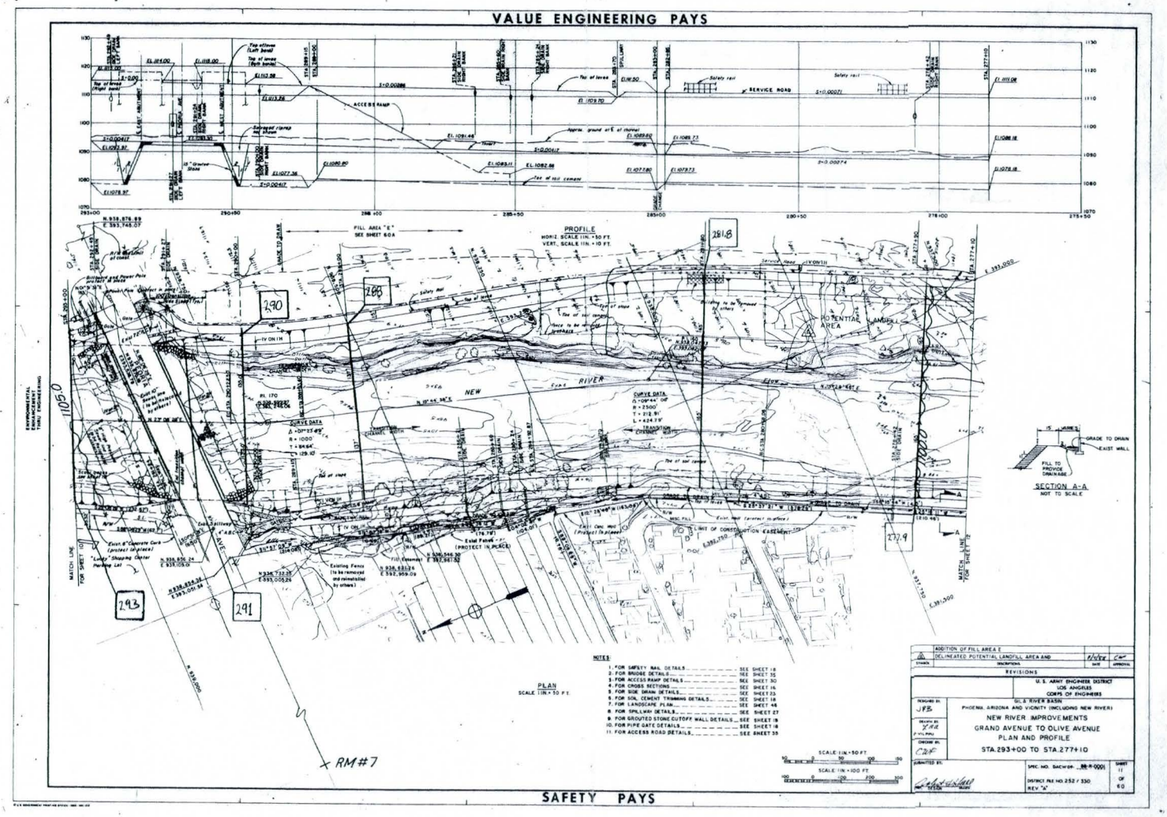
RECOMMENDED BY:
APPROVED BY: DATE:
CHIEF ENGINEER & GENERAL MANAGER:

SHEET 13N OF 22N

DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX ARIZONA

VALUE ENGINEERING PAYS



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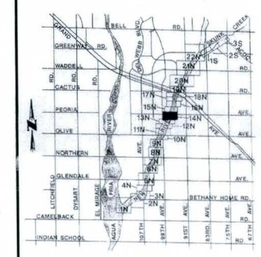


KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 185+00 — STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 — CROSS-SECTION NUMBER
- RM#4 — REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

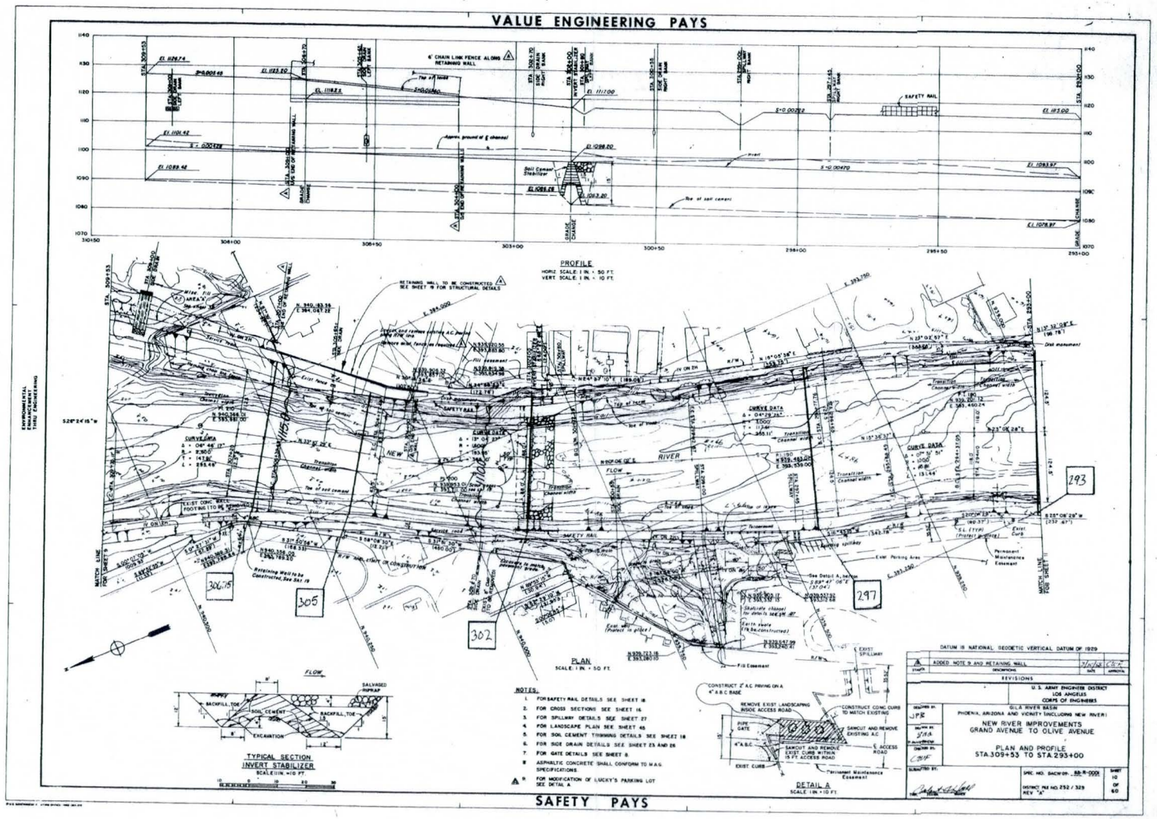
AUGA FRIA RIVER TO SKUNK CREEK

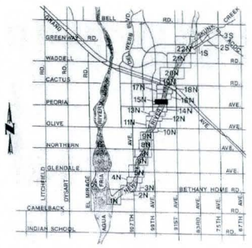
RECOMMENDED BY:
APPROVED BY: DATE:
CHIEF ENGINEER & GENERAL MANAGER:

SHEET 14N OF 22N

DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX
ARIZONA





LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85+00 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

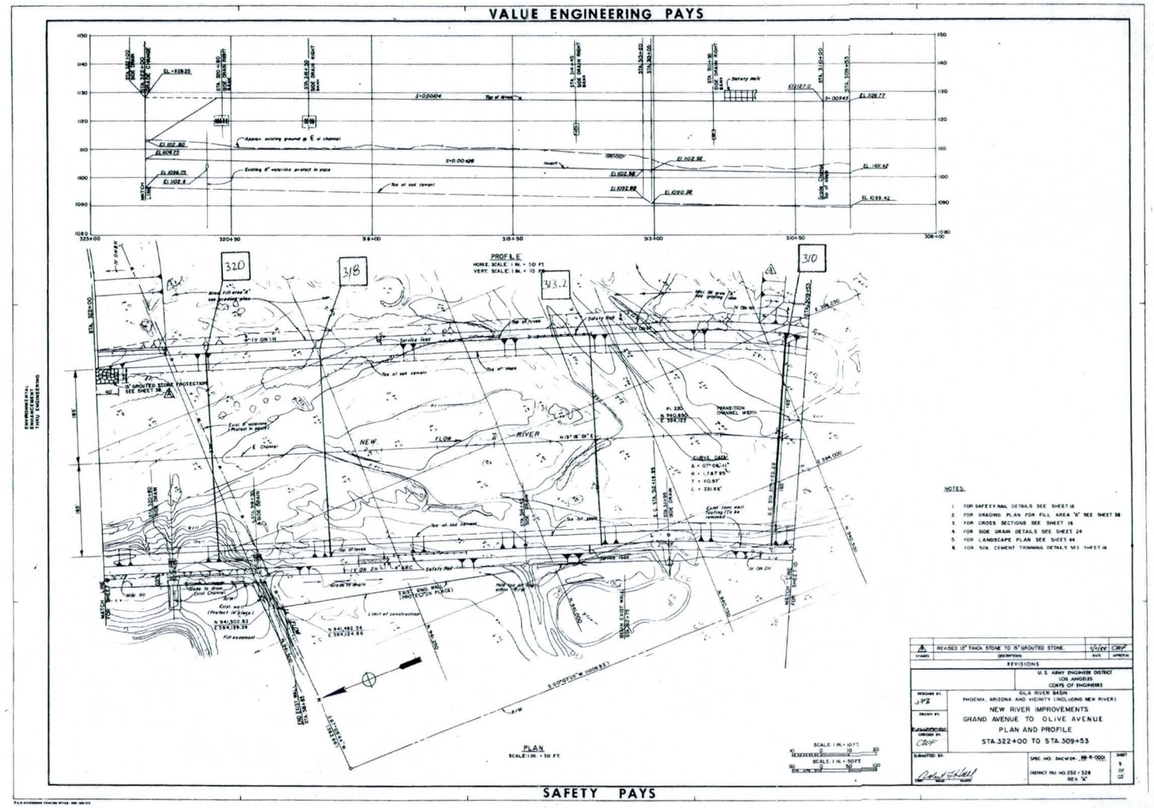
RECOMMENDED BY:
APPROVED BY: DATE:
CHIEF ENGINEER & GENERAL MANAGER:

SHEET 15N OF 22N

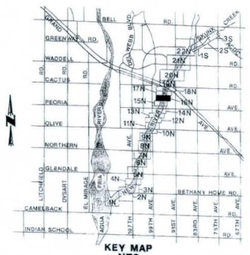
DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO CONSULTING ENGINEERING INC. PHOENIX ARIZONA

VALUE ENGINEERING PAYS



SAFETY PAYS



KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85.00 — STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 — CROSS-SECTION NUMBER
- RM#4 — REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:

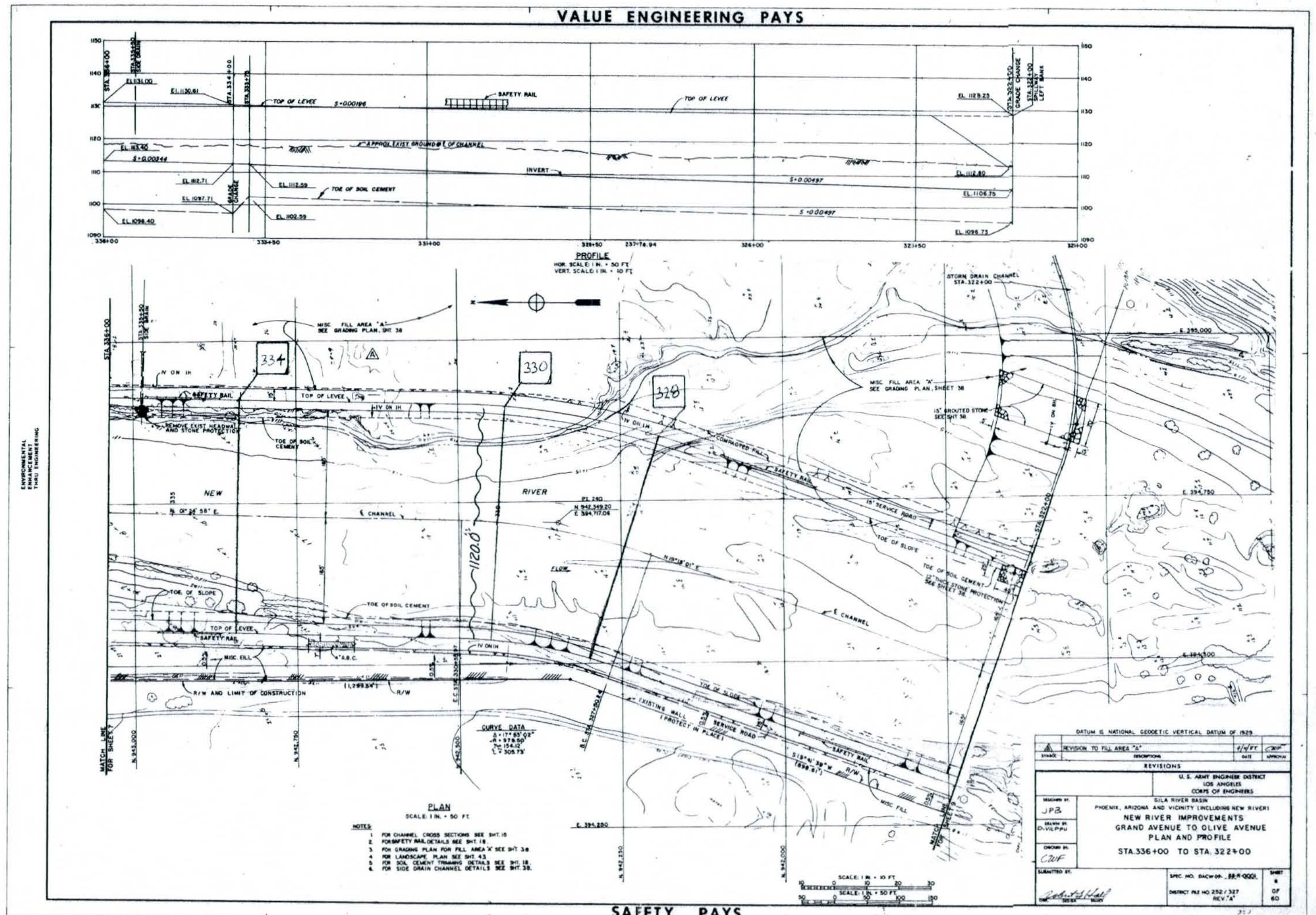
APPROVED BY: DATE:

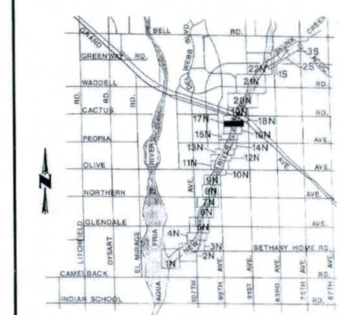
CHIEF ENGINEER & GENERAL MANAGER:

SHEET 16N OF 22N

DES. GKH	DR. CB/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX ARIZONA





KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85+00 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

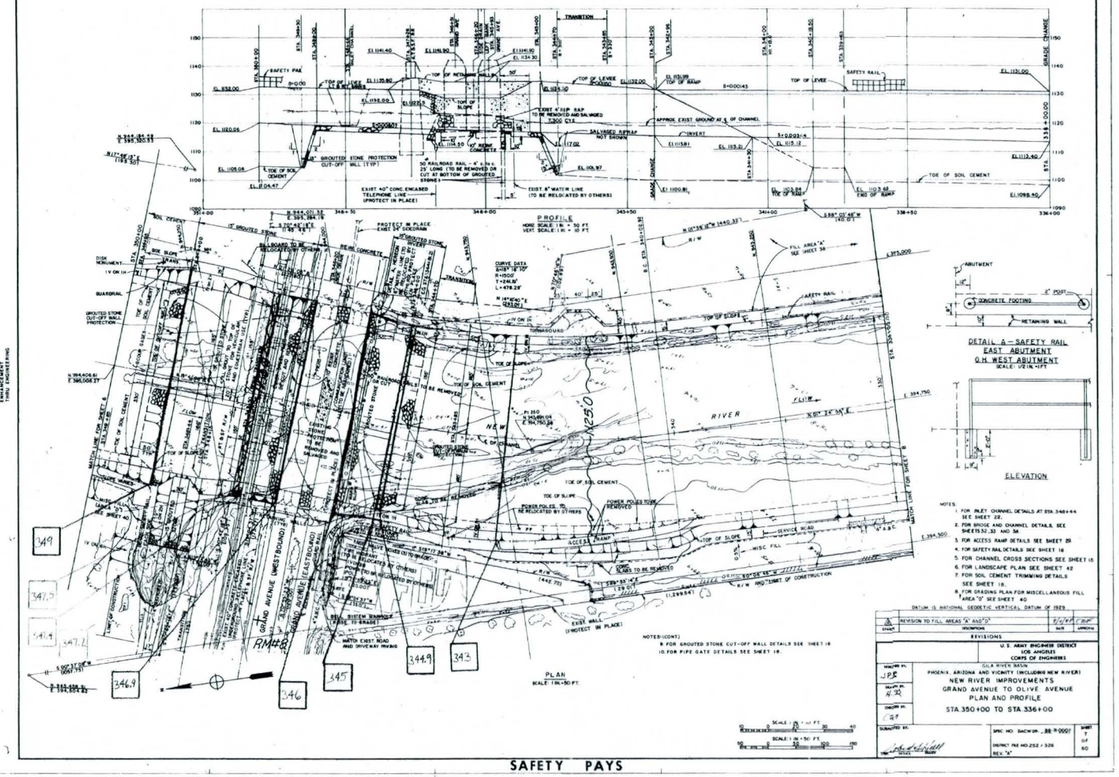
NEW RIVER
FLOODPLAIN DELINEATION
AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:		SHEET **17N** OF **22N**
APPROVED BY:	DATE:	
CHIEF ENGINEER & GENERAL MANAGER:		

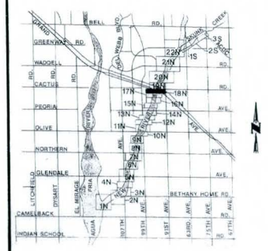
DES. **GKH**	DR. **CS/NW**	CK. **DWD**	CVL JOB NO.
DATE **12/89**	DATE **12/89**	DATE **12/89**	**1090-04-01**

COE & VAN LOO CONSULTING ENGINEERING INC. — PHOENIX ARIZONA

VALUE ENGINEERING PAYS



SAFETY PAYS



KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 80 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:

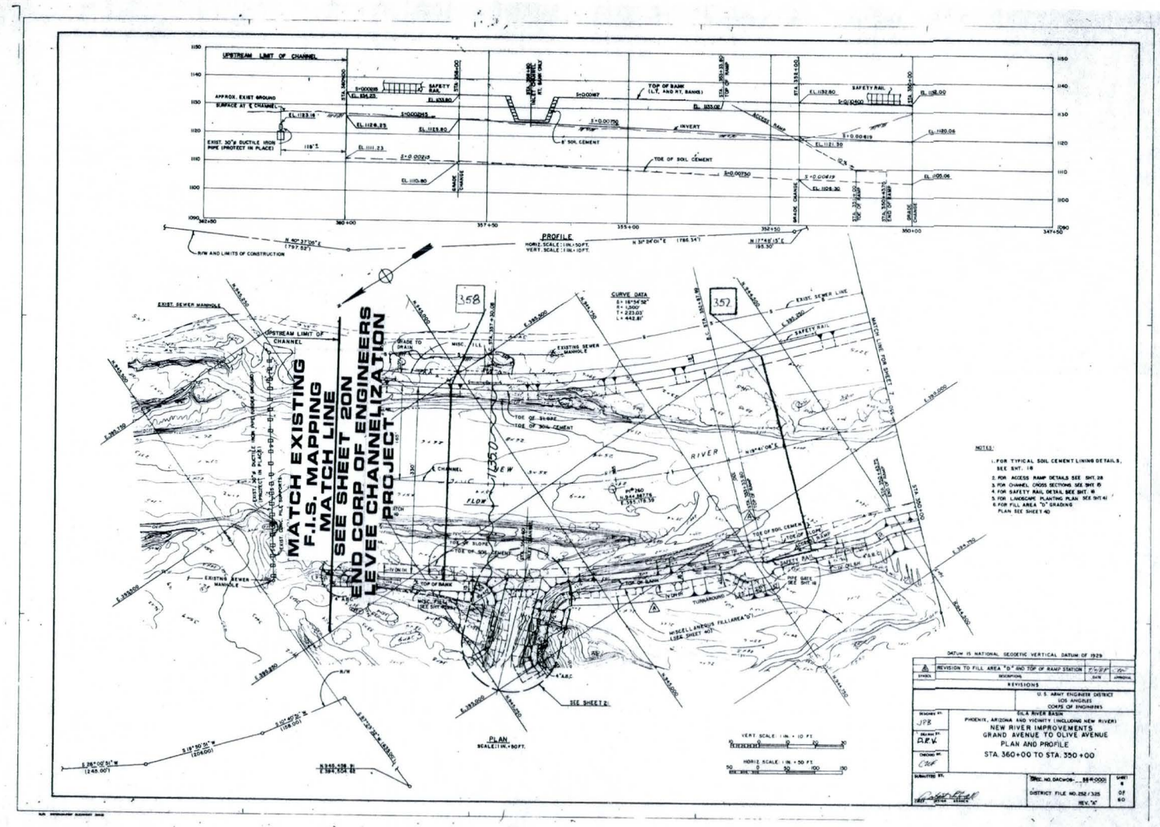
APPROVED BY: DATE:

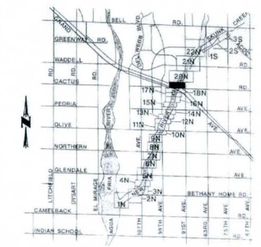
CHIEF ENGINEER & GENERAL MANAGER

SHEET 18N OF 22N

DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX ARIZONA





LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 85+00 STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED BY:

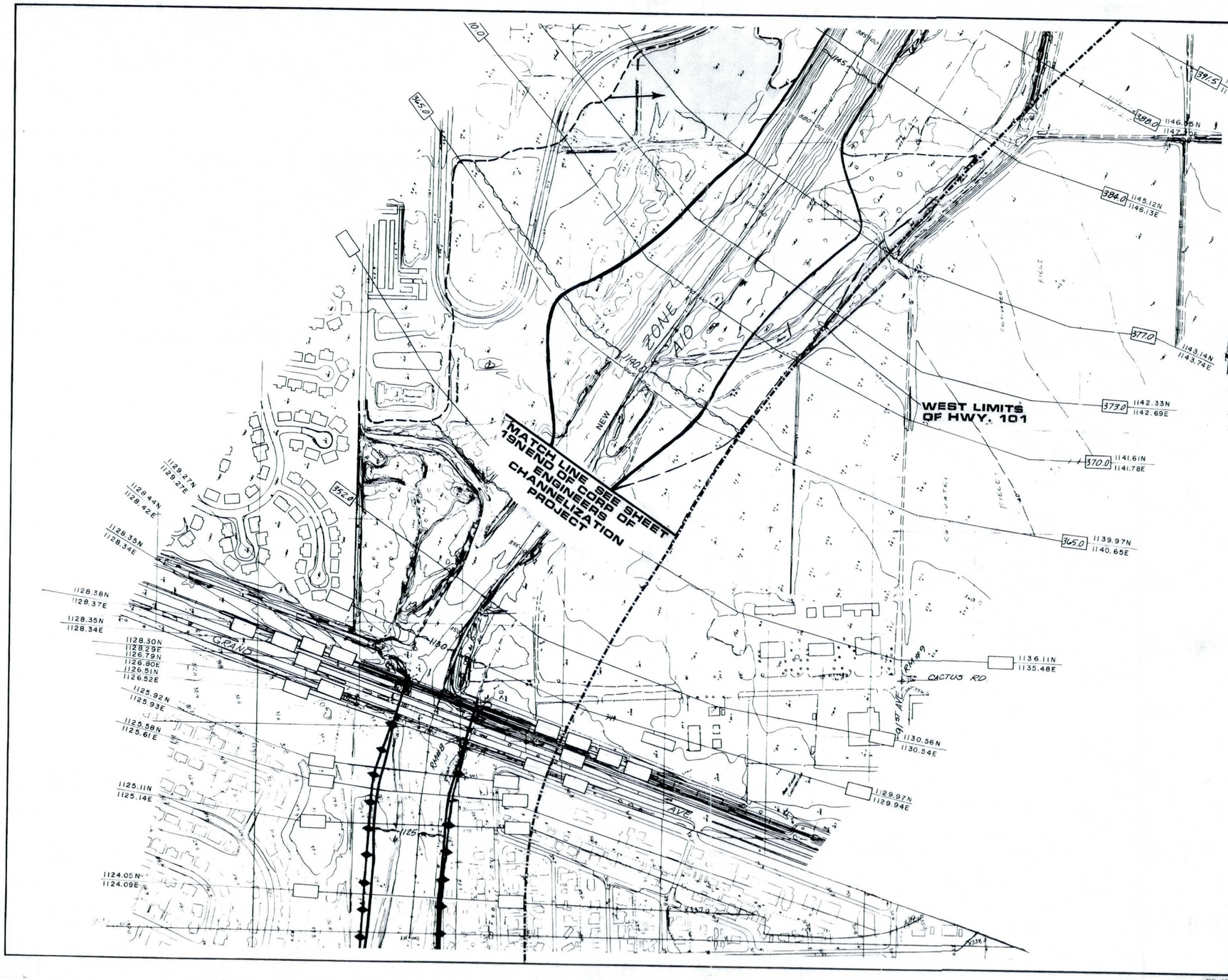
APPROVED BY: DATE:

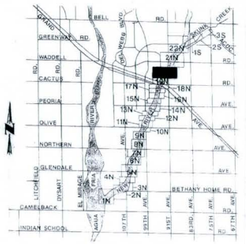
CHIEF ENGINEER & GENERAL MANAGER:

SHEET 19N OF 22N

DES. GKH	DR. CS/NW	CK. DWD	CVL JOB NO.
DATE 12/89	DATE 12/89	DATE 12/89	1090-04-01

COE & VAN LOO
CONSULTING ENGINEERING INC.
PHOENIX ARIZONA





KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- 800 — STATIONING IN RIVER FEET UPSTREAM FROM AGUA FRIA RIVER
- 204.0 — CROSS-SECTION NUMBER
- + RM#6 — REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

NOTES

THIS FLOOD INSURANCE STUDY WORK MAP HAS BEEN PREPARED IN ACCORDANCE WITH FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) GUIDELINES

THE STUDY HAS BEEN APPROVED BY FEMA BY LETTER DATED OCTOBER 9, 1987

MAP BASED ON 1" = 200' TOPOGRAPHIC MAPPING PREPARED BY AERIAL MAPPING COMPANY, INC. FROM PHOTOGRAPHS TAKEN IN 1975 AND 1981

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

NEW RIVER, ARIZONA

COMPILATION SCALE	1" = 200'
CONTOUR INTERVAL	2'
FLIGHT ALTITUDE	6000'
DATUM MSL	1929
FLOWN BY:	AMCI
COMPILED BY:	AMCI
CONTROL BY:	USCE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER FLOODPLAIN DELINEATION

AGUA FRIA RIVER TO SKUNK CREEK

RECOMMENDED DATE:

APPROVED BY: DATE:

FLOODPLAIN ADMINISTRATOR

20N OF 22N

COE & VAN LOO CONSULTING ENGINEERS INC. PHOENIX ARIZONA

CVL JOB NO. 1090-04-01 CVL JOB NO. 1090-02

E. Data on Disk

Documents from FEMA Data Request

Hydraulic Models
- NewRiverChannel.prj
- NewRiverChannel.rep
- Hydraulic Models (NR02B.dat and Design.prj) from Assessment Report

PDFs of plans outlined in Table 1 of the Assessment Report

Report Figures
- PDFs of Figures 1, 2 and 3

Survey
- Survey Notes and electronic data