LETTER OF MAP REVISION REQUEST
FOR WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
McDOWELL ROAD TO BETHANY HOME ROAD
FEMA Case No. 13-09-2406P

MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

TECHNICAL DATA NOTEBOOK

June 17, 2013

Prepared by:

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009
(602) 506-1501

CONDITIONAL LETTER OF MAP REVISION REQUEST
FOR WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
McDOWELL ROAD TO BETHANY HOME ROAD
FCD 2009-C012

MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

TECHNICAL DATA NOTEBOOK

October 17, 2011

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009
(602) 506-1501

Prepared by:

Hoskin-Ryan Consultants, Inc.
6245 N. 24th Pkwy, Ste. 100
Phoenix, AZ 85016
(602) 252-8384

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
19690
PAUL W.R.
HOSKIN
Date Signed..........
ARIZONA, U.S.A.

EXPIRES 3/31/2012

Federal Emergency Management Agency

Washington, D.C. 20472

November 1, 2013

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Andrew Kunasek
Chairman, Maricopa County Board of Supervisors
301 West Jefferson, 10th Floor
Phoenix, AZ 85003

IN REPLY REFER TO:
Case No.: 13-09-2[illegible]06R
Follows Conditional Case No. 11-09-2260R
Community Name: Maricopa County, AZ
Community No.: 040037
Effective Date of This Revision: **March 14, 2014**

Dear Mr. Kunasek:

The Flood Insurance Study Report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Sincerely,

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

List of Enclosures:

- Letter of Map Revision Determination Document
- Annotated Flood Insurance Rate Map
- Annotated Flood Insurance Study Report

cc: (See attached list)

Courtesy Copy List – Maricopa County, AZ

The Honorable Jackie A Meck
Mayor, Town of Buckeye

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

Mr. Tim Murphy, P.E.
Mitigation Planning & Technical Programs Manager
Floodplain Management and Services Division
Flood Control District of Maricopa County

Mr. Kenneth Rakestraw
Hydrologist
Flood Control District of Maricopa County

Ms. Kelli Sertich, AICP, CFM
FMS Division Manger
Flood Control District of Maricopa County

Mr. Gary Wesch, P.E.
Project Engineer
Flood Control District of Maricopa County

Mr. Kevin Lavalle
GIS Analyst
Flood Control District of Maricopa County

Page 1 of 6	Issue Date: November 1, 2013	Effective Date: March 14, 2014	Case No.: 13-09-2406P	LOMR-APP

Follows Conditional Case No.: 11-09-2260R

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Maricopa County Arizona (Unincorporated Areas) COMMUNITY NO.: 040037	CHANNELIZATION CULVERT	FLOODWAY HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	White Tanks FRS No. 3 Outfall Channel	APPROXIMATE LATITUDE & LONGITUDE: 33.495, -112.478 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 04013C1665L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C2130L DATE: October 16, 2013	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT: October 16, 2013 PROFILE(S): 693P-696P(a), 1730P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES) See Page 2 for Additional Flooding Sources

White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
White Tanks FRS #3 Outfall Channel	Floodway	Floodway	YES	YES
	Zone A	Zone AE	YES	YES
	Zone AE	Zone AE	YES	YES
	BFEs*	BFEs	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

OTHER FLOODING SOURCES AFFECTED BY THIS REVISION

FLOODING SOURCE(S) & REVISED REACH(ES)

White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3

Jackrabbit Trail Wash - from approximately 630 feet downstream of Minnezona Avenue to approximately 2,660 feet upstream of Meadowbrook Avenue

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
White Tanks FRS #3 Outfall Channel	Zone X (shaded)	Zone AE	YES	NONE
Jackrabbit Trail Wash	Floodway	Floodway	NONE	YES
	BFEs*	BFEs	YES	YES
	Zone AE	Zone AE	YES	YES

* BFEs - Base Flood Elevations

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS REVISION

CID Number: 040039 **Name:** Town of Buckeye, Arizona

AFFECTED MAP PANELS	AFFECTED PORTIONS OF THE FLOOD INSURANCE STUDY REPORT
TYPE: FIRM* NO.: 04013C1665L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C2130L DATE: October 16, 2013	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT: September 30, 2005 PROFILE(S): 693P-696P(a), 1730P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic analysis. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp.

LOCAL NEWSPAPER Name: *Arizona Business Gazette*
Dates: November 7, 2013 and November 14, 2013

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination information presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

November 1, 2013

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Jackie A Meck
Mayor, Town of Buckeye
530 East Monroe Avenue
Buckeye, AZ 85326

IN REPLY REFER TO:
Case No.: 13-09-2406P
Follows Conditional Case No. 11-09-2260R
Community Name: Town of Buckeye, AZ
Community No.: 040039
Effective Date of
This Revision: **March 14, 2014**

Dear Mayor Meck:

The Flood Insurance Study Report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Sincerely,

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

List of Enclosures:

- Letter of Map Revision Determination Document
- Annotated Flood Insurance Rate Map
- Annotated Flood Insurance Study Report

cc: (See attached list)

Courtesy Copy List – Town of Buckeye, AZ

The Honorable Andrew Kunasek
Chairman, Maricopa County Board of Supervisors

Mr. Stephen Cleveland
Town Manager
Town of Buckeye

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

Mr. Tim Murphy, P.E.
Mitigation Planning & Technical Programs Manager
Floodplain Management and Services Division
Flood Control District of Maricopa County

Mr. Kenneth Rakestraw
Hydrologist
Flood Control District of Maricopa County

Ms. Kelli Sertich, AICP, CFM
FMS Division Manger
Flood Control District of Maricopa County

Mr. Gary Wesch, P.E.
Project Engineer
Flood Control District of Maricopa County

Mr. Kevin Lavalle
GIS Analyst
Flood Control District of Maricopa County

Follows Conditional Case No.: 11-09-2260R

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Town of Buckeye Maricopa County Arizona COMMUNITY NO.: 040039	CHANNELIZATION CULVERT	FLOODWAY HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	White Tanks FRS No. 3 Outfall Channel	APPROXIMATE LATITUDE & LONGITUDE: 33.495, -112.478 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 04013C1665L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C2130L DATE: October 16, 2013	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT: September 30, 2005 PROFILE(S): 693P-696P(a), 1730P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES) See Page 2 for Additional Flooding Sources

White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
White Tanks FRS #3 Outfall Channel	Floodway	Floodway	YES	YES
	Zone A	Zone X (shaded)	NONE	YES
	Zone AE	Zone AE	YES	YES
	BFEs*	BFEs	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

OTHER FLOODING SOURCES AFFECTED BY THIS REVISION

FLOODING SOURCE(S) & REVISED REACH(ES)

White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3

Jackrabbit Trail Wash - from approximately 630 feet downstream of Minnezona Avenue to approximately 2,660 feet upstream of Meadowbrook Avenue

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
White Tanks FRS #3 Outfall Channel	Zone A	Zone AE	YES	YES
	Zone X (shaded)	Zone AE	YES	NONE
Jackrabbit Trail Wash	Floodway	Floodway	YES	YES
	BFEs*	BFEs	NONE	YES
	Zone AE	Zone AE	YES	YES
	Zone X (shaded)	Zone AE	YES	NONE

* BFEs - Base Flood Elevations

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS REVISION

CID Number: 040037 **Name:** Maricopa County, Arizona

AFFECTED MAP PANELS	AFFECTED PORTIONS OF THE FLOOD INSURANCE STUDY REPORT
TYPE: FIRM* NO.: 04013C1665L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C2130L DATE: October 16, 2013	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT: October 16, 2013 PROFILE(S): 693P-696P(a), 1730P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3

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Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic analysis. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

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Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp.

LOCAL NEWSPAPER   Name: *Arizona Business Gazette*
Dates: November 7, 2013 and November 14, 2013

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination information presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	Drainage Area (Sq. Miles)	Peak Discharges (cfs)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2 PERCENT ANNUAL CHANCE
White Tanks FRS No. 3 Outfall Channel					
At Mouth	3.7	--[1]	--[1]	1,073	--[1]
At I-10 Freeway	2.5	--[1]	--[1]	931	--[1]
At Thomas Road	1.8	--[1]	--[1]	851	--[1]
At Indian School Road	1.5	--[1]	--[1]	790	--[1]
At Minnezona Avenue	0.6	--[1]	--[1]	507	--[1]

REVISED TO
REFLECT LOMR
EFFECTIVE: March 14, 2014

[1]Data Not Available

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
Jackrabbit Trail Wash					
At Mouth	0.70	--[1]	--[1]	339	--[1]
Upstream of Minnezona Avenue	0.59	--[1]	--[1]	250	--[1]
~~At Camelback Road~~	~~0.43~~	~~--[1]~~	~~--[1]~~	~~221~~	~~--[1]~~
~~At Medlock Drive~~	~~0.22~~	~~--[1]~~	~~--[1]~~	~~187~~	~~--[1]~~
Jackrabbit Wash					
Approximately 1.420 miles upstream of the Hassayampa River Confluence	--[1]	--[1]	--[1]	32,500	--[1]
Approximately 3.406 miles upstream of the Hassayampa River Confluence	--[1]	--[1]	--[1]	33,100	--[1]
Approximately 3.5 miles downstream of the Central Arizona Project Canal	--[1]	--[1]	--[1]	33,400	--[1]
Approximately 1.5 miles downstream of the Central Arizona Project Canal	--[1]	--[1]	--[1]	33,600	--[1]
Approximately 1,000 feet upstream of the Central Arizona Project Canal	--[1]	--[1]	--[1]	33,200	--[1]
Upstream of Star Wash	152.4	--[1]	--[1]	19,300	--[1]
Downstream of Unnamed Tributary	148.7	--[1]	--[1]	19,800	--[1]
Upstream of Unnamed Tributary	140.3	--[1]	--[1]	19,700	--[1]
At Wickenburg Road	140.3	--[1]	--[1]	20,000	--[1]
At Vulture Mine Road	138.1	--[1]	--[1]	21,100	--[1]
Jackrabbit Wash Unnamed Tributary					
At Mouth	8.4	--[1]	--[1]	2,900	--[1]
At Wickenburg Road	8.4	--[1]	--[1]	3,000	--[1]
At Vulture Mine Road	3.7	--[1]	--[1]	3,000	--[1]

Revised Data

--[1] Data Not Computed
--[2] Data Not Available

REVISED TO
REFLECT LOMR
EFFECTIVE: March 14, 2014

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NAVD)			
White Tanks FRS #3 Outfall Channel								
A	370	141	184	5.9	1,043.3	1,043.3	1,043.3	0.0
B	1,900	50	121	8.9	1,050.1	1,050.1	1,050.1	0.0
C	3,500	48	119	9.0	1,059.5	1,059.5	1,059.5	0.0
D	5,600	47	117	8.0	1,078.3	1,078.3	1,078.3	0.0
E	7,306	79	346	2.7	1,095.3	1,095.3	1,095.3	0.0
F	9,608	83	382	2.4	1,114.9	1,114.9	1,114.9	0.0
G	11,300	76	319	2.7	1,128.4	1,128.4	1,128.4	0.0
H	13,600	84	281	3.0	1,144.5	1,144.5	1,144.5	0.0
I	15,300	74	290	2.9	1,152.6	1,152.6	1,152.6	0.0
J	17,350	80	314	2.5	1,162.9	1,162.9	1,162.9	0.0
K	19,650	85	294	2.5	1,172.2	1,172.2	1,172.2	0.0
L	21,900	64	207	2.5	1,181.5	1,181.5	1,181.5	0.0
M	24,400	78	245	2.1	1,184.8	1,184.8	1,184.8	0.0
N	26,200	64	216	2.4	1,186.6	1,186.6	1,186.6	0.0
Revised Data								

[1] Stream Distance in Feet Above White Tanks Structure #4

REVISED TO
REFLECT LOMR
EFFECTIVE: March 14, 2014

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

WHITE TANKS FRS #3 OUTFALL CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NAVD)			
Jacklin Wash								
A	2,640[1]	173	426	2.3	1,513.5	1,513.5	1,513.5	0.0
B	3,627[1]	141	168	5.4	1,528.0	1,528.0	1,528.0	0.0
C	4,833[1]	60	62	5.3	1,550.9	1,550.9	1,550.9	0.0
D	6,835[1]	102	72	4.5	1,591.6	1,591.6	1,591.6	0.0
E	7,902[1]	69	74	4.4	1,615.5	1,615.5	1,615.5	0.0
Jackrabbit Trail Wash								
A	467[2]	35	51	6.7	1,170.0	1,170.0	1,170.0	0.0
B	2,164[2]	56	115	4.2	1,181.8	1,181.8	1,181.9	0.1
C	3,602[2]	46	61	1.6	1,188.3	1,188.3	1,188.3	0.0
D	3,951[2]	96	191	0.1	1,188.4	1,188.4	1,188.5	0.1

Revised Data

[1] Stream Distance in Feet Above Mouth

[2] Feet Above White Tanks FRS #3 Outfall Channel

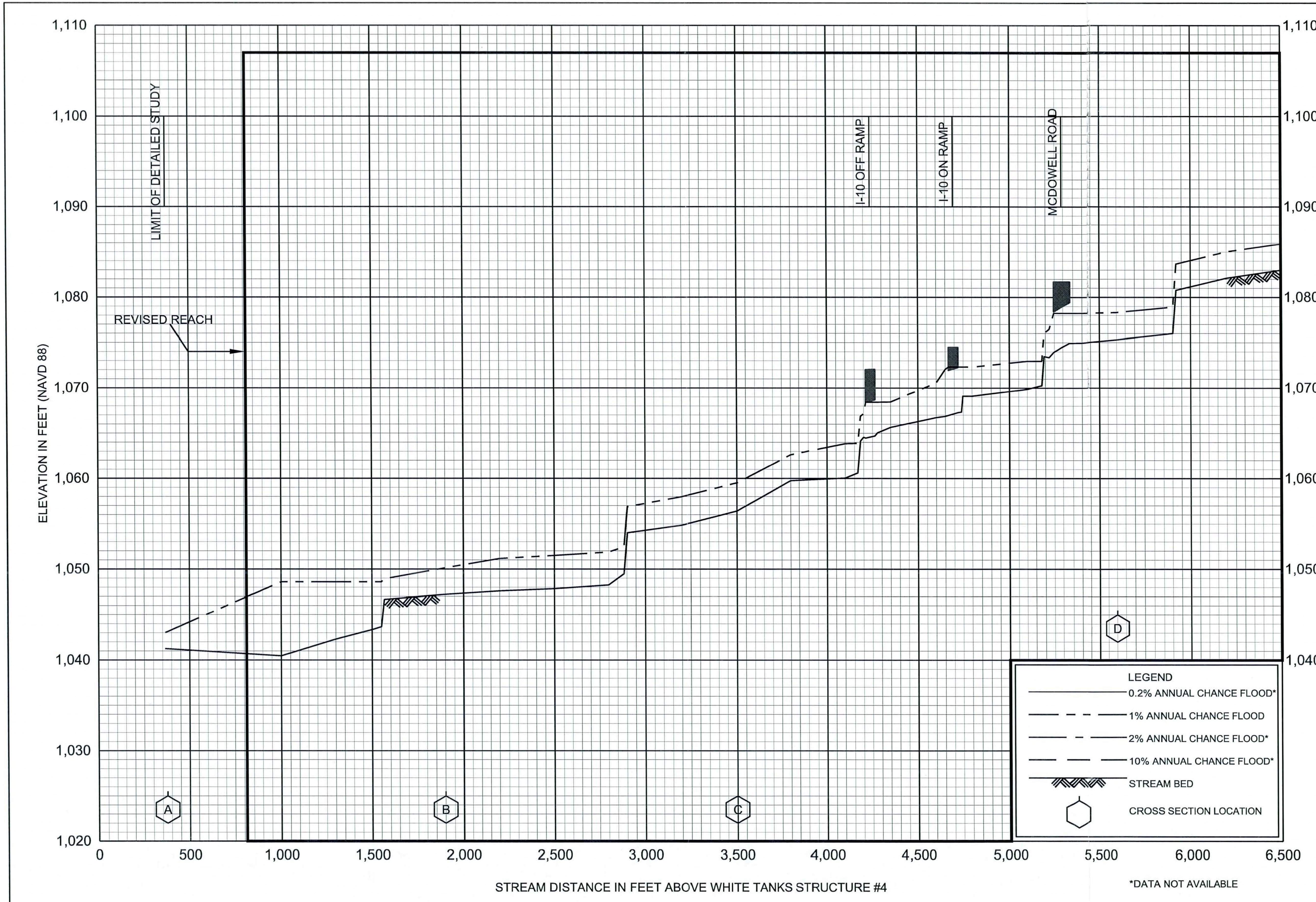
REVISED TO REFLECT LOMR EFFECTIVE: March 14, 2014

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

JACKLIN WASH - JACKRABBIT TRAIL WASH



FLOOD PROFILES

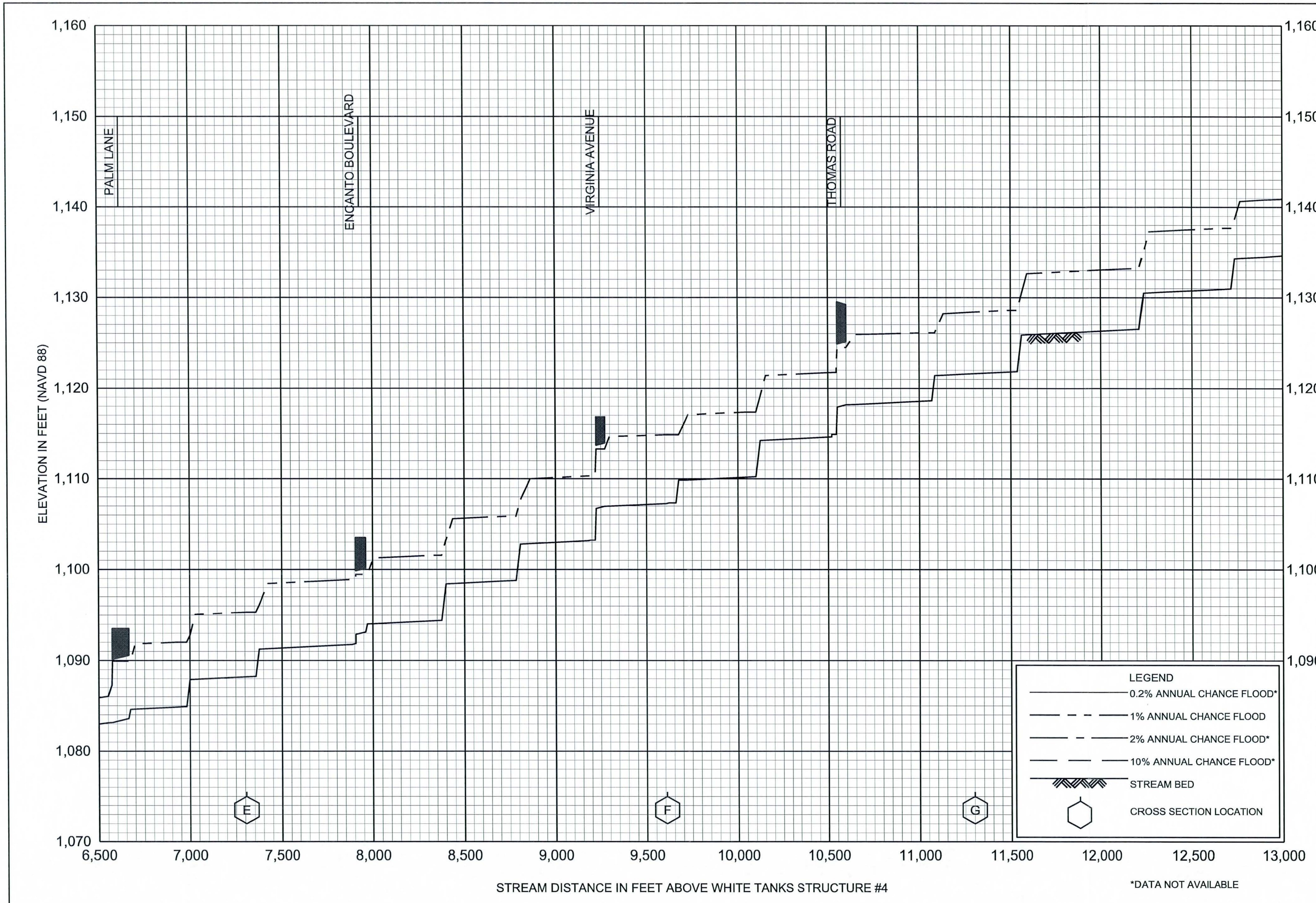
REVISED TO REFLECT LOMR
EFFECTIVE: March 14, 2014

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

693P



FLOOD PROFILES REVISED TO REFLECT LOMR

EFFECTIVE: March 14, 2014

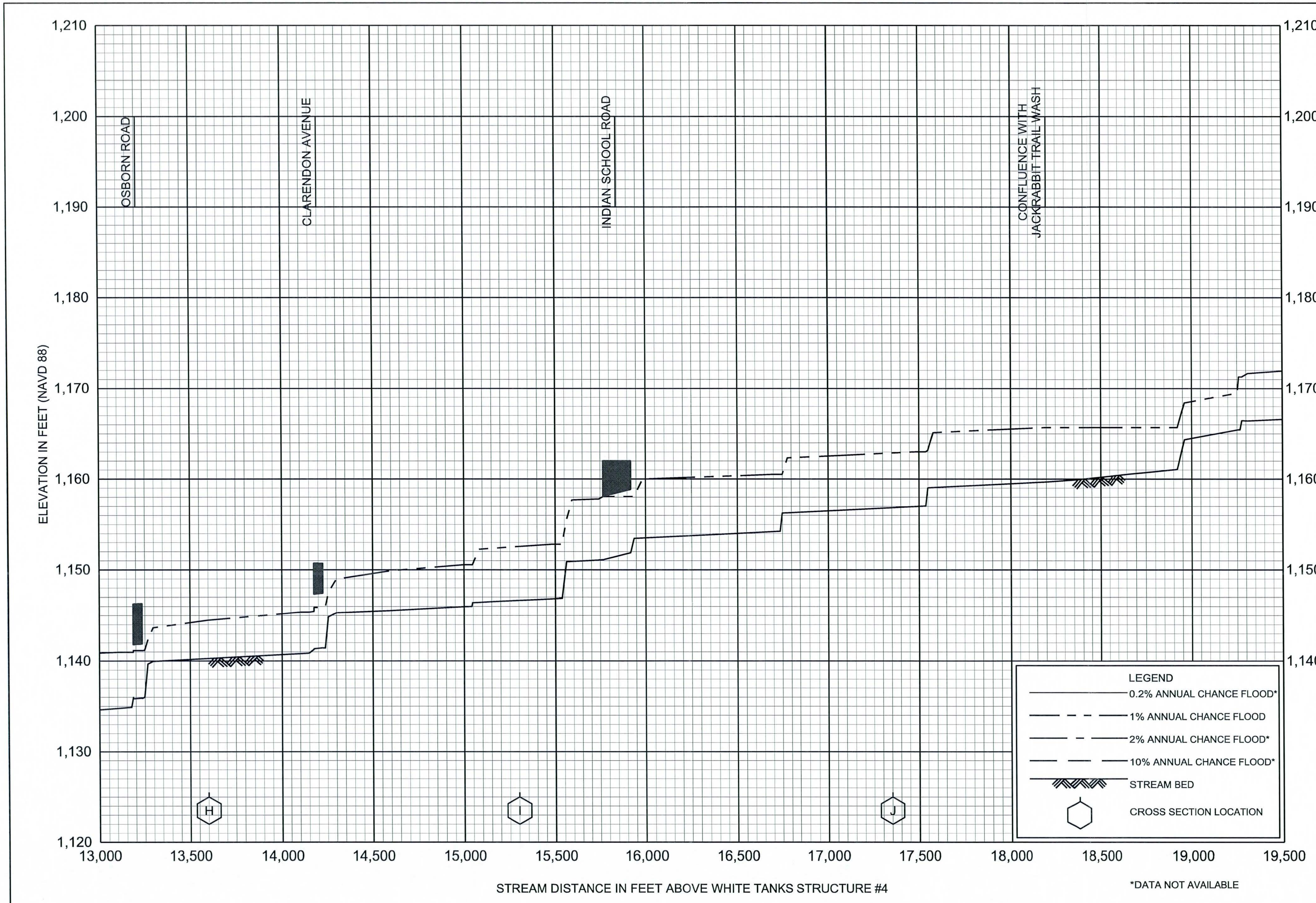
WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

694P



FLOOD PROFILES

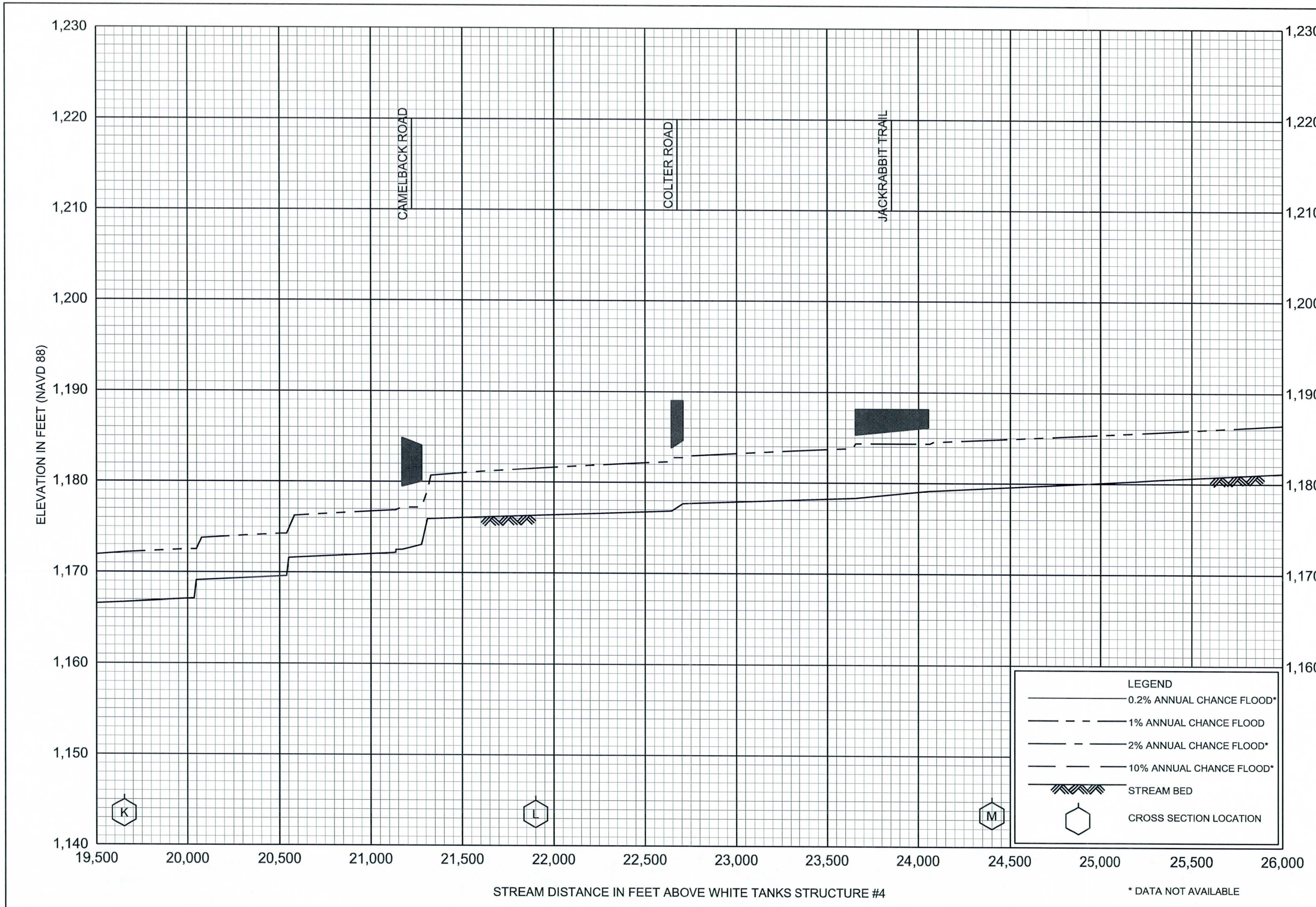
REVISED TO REFLECT LOMR EFFECTIVE: March 14, 2014

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

695P



FLOOD PROFILES

REVISED TO REFLECT LOMR

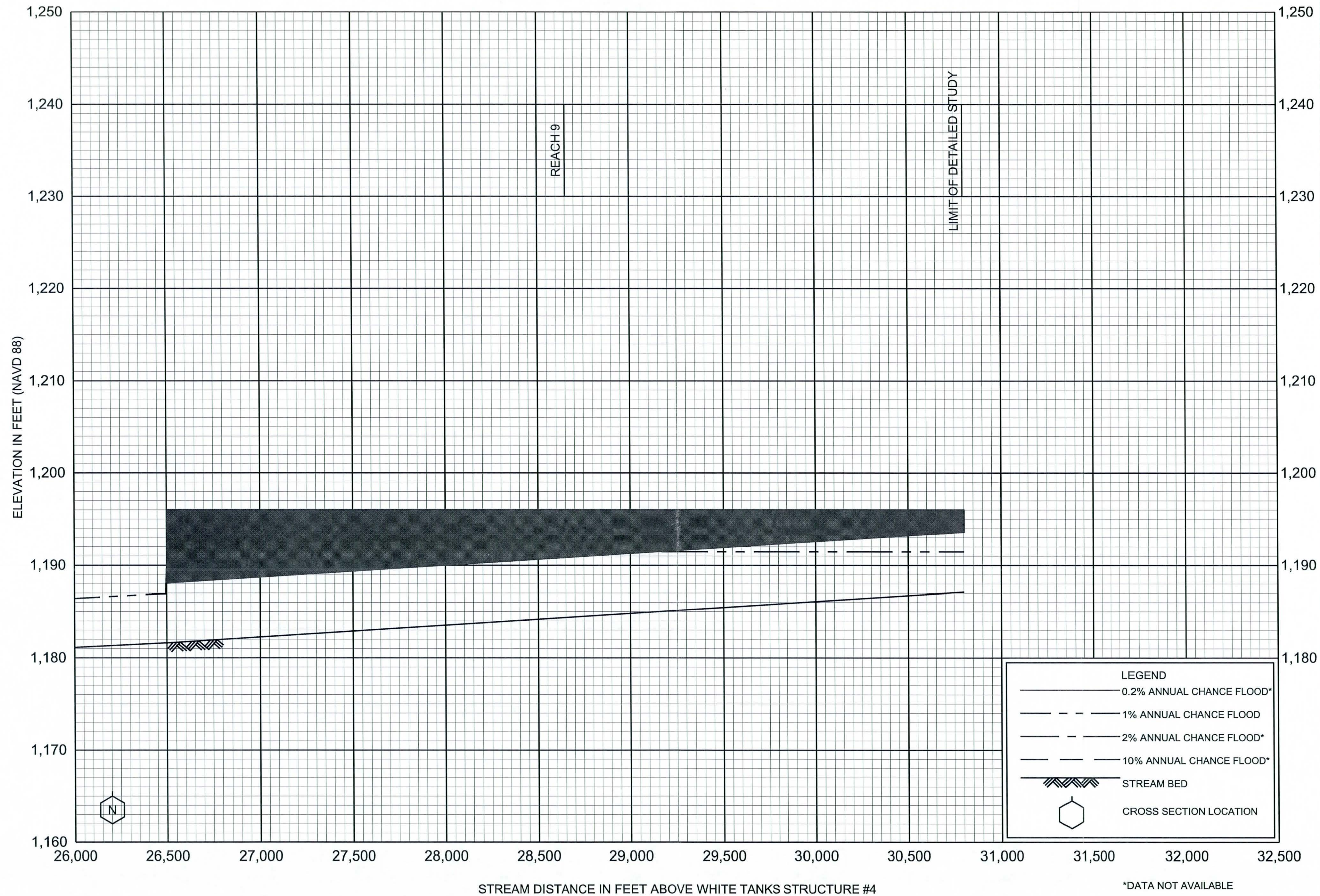
EFFECTIVE: March 14, 2014

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS



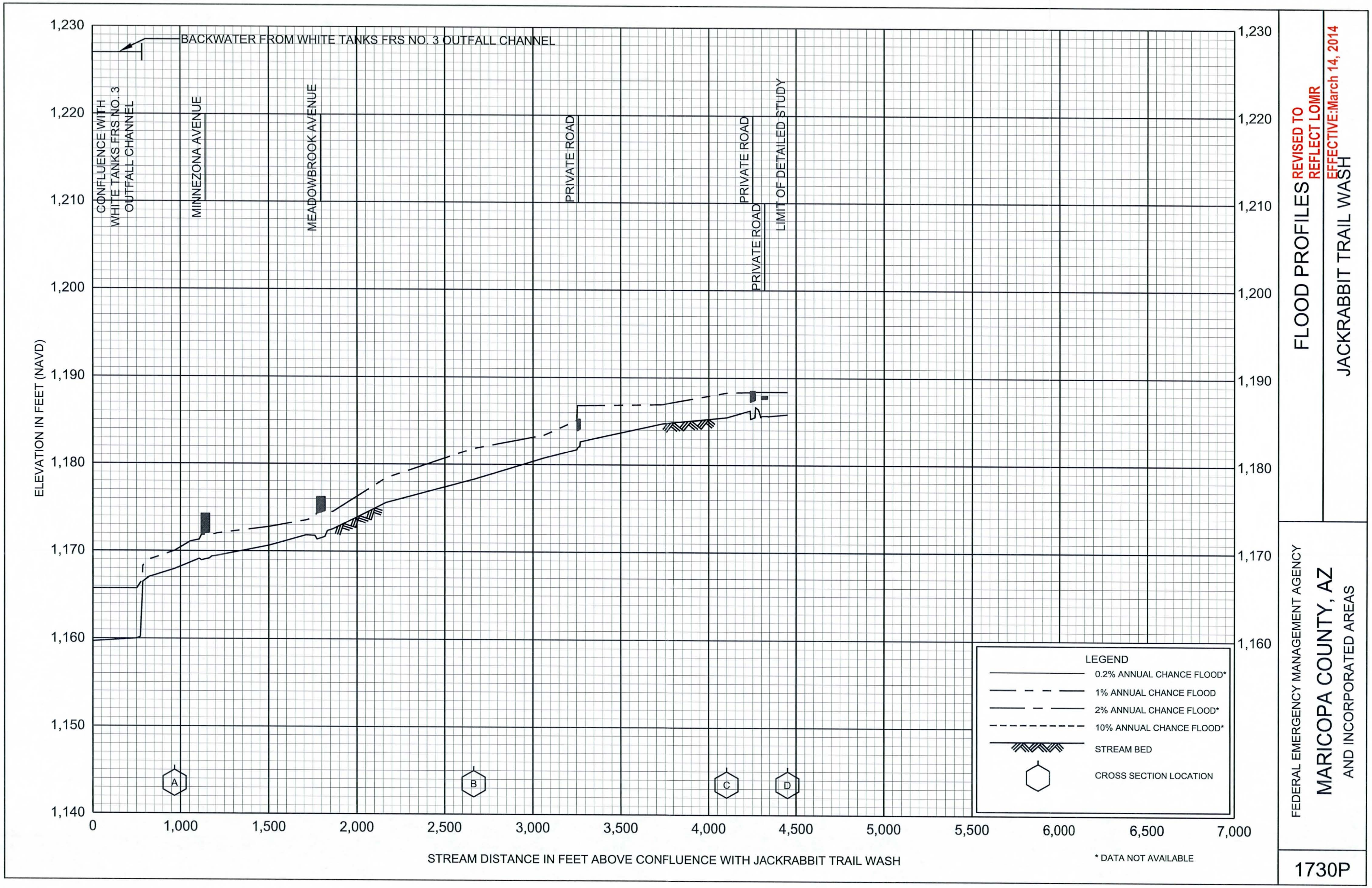
FLOOD PROFILES REVISED TO REFLECT LOMR EFFECTIVE: March 14, 2014

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

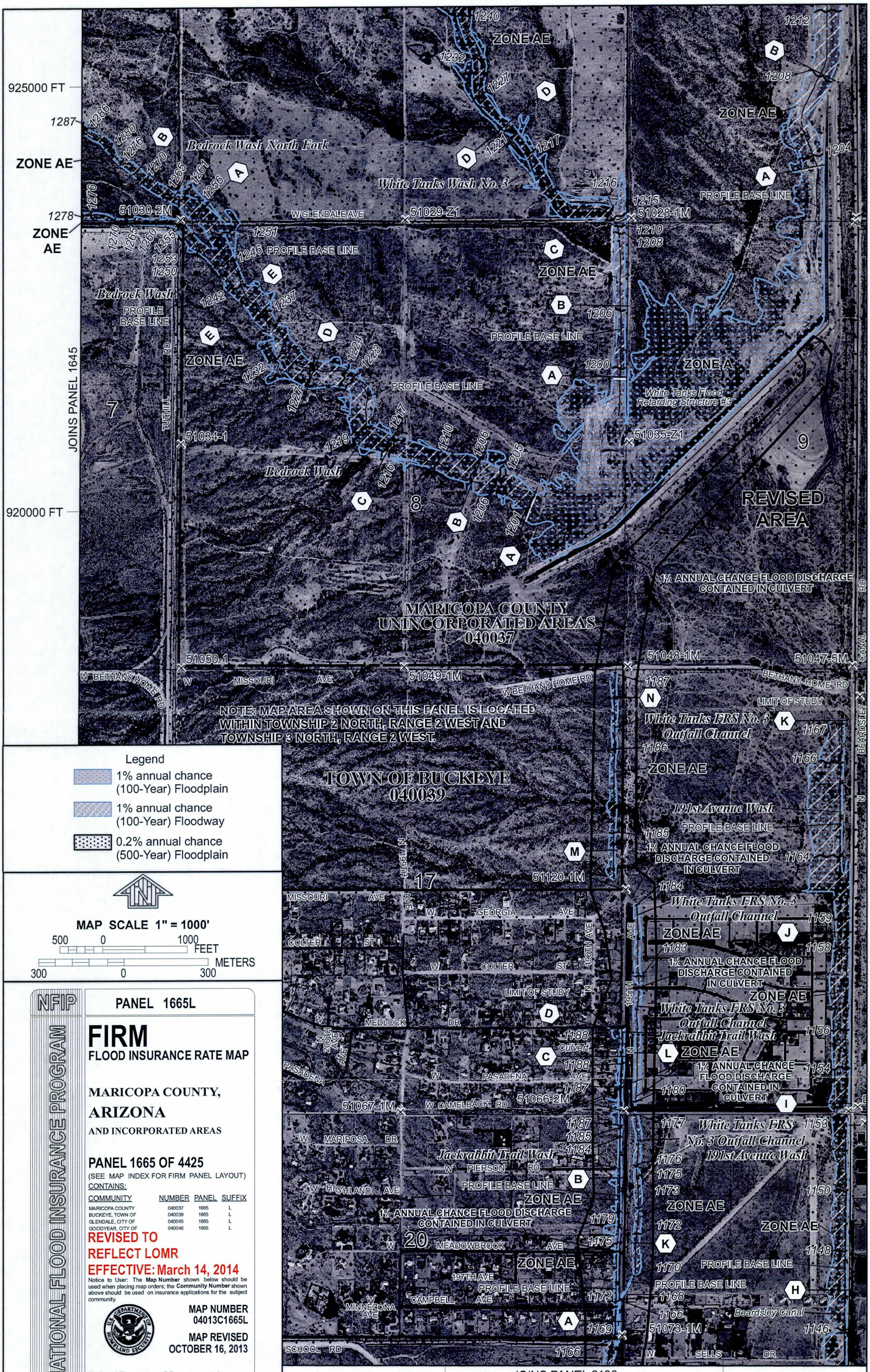
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

696P(a)



BACKWATER FROM WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
CONFLUENCE WITH WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
MINNEZONA AVENUE
MEADOWBROOK AVENUE
PRIVATE ROAD
PRIVATE ROAD
PRIVATE ROAD
LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD)
1,230
1,220
1,210
1,200
1,190
1,180
1,170
1,160
1,150
1,140
0
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
A
B
C
D
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH JACKRABBIT TRAIL WASH
LEGEND
0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
* DATA NOT AVAILABLE
FLOOD PROFILES
REVISED TO REFLECT LOMR
EFFECTIVE:March 14, 2014
JACKRABBIT TRAIL WASH
FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS
1730P



Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

N

MAP SCALE 1" = 1000'

500 0 1000 FEET

300 0 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1665L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1665 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1665	L
BUCKEYE, TOWN OF	040039	1665	L
GLENDALE, CITY OF	040045	1665	L
GOODYEAR, CITY OF	040046	1665	L

REVISED TO REFLECT LOMR EFFECTIVE: March 14, 2014

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 04013C1665L

MAP REVISED OCTOBER 16, 2013

Federal Emergency Management Agency

Federal Emergency Management Agency

Washington, D.C. 20472

March 24, 2014

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 13-09-2406P

The Honorable Jackie A Meck
Mayor, Town of Buckeye
530 East Monroe Avenue
Buckeye, AZ 85326

Follows Conditional Case No. 11-09-2260R
Community Name: Town of Buckeye, AZ
Community No.: 040039
FIRM Panel Affected: 04013C1665L, 04013C2130L

116

Dear Mayor Meck:

In a Letter of Map Revision (LOMR) dated November 1, 2013, you were notified of proposed flood hazard determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for the Town of Buckeye, Maricopa County, AZ. These determinations were for White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3; and Jackrabbit Trail Wash - from approximately 630 feet downstream of Minnezona Avenue to approximately 2,660 feet upstream of Meadowbrook Avenue. The 90-day appeal period that was initiated on November 14, 2013, when the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published a notice of proposed Flood Hazard Determinations in *The Arizona Business Gazette* has elapsed.

FEMA received no valid requests for changes to the modified flood hazard information. Therefore, the modified flood hazard information for your community that became effective on March 14, 2014, remains valid and revises the FIRM and FIS report that were in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number(s) and suffix code(s) are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified flood hazard information to carry out the floodplain management regulations for the NFIP. The modified flood hazard information will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please contact the Mitigation Division Director, FEMA Region IX, in Oakland, California, either by telephone at (510) 627-7100, or in writing at 1111 Broadway, Suite 1200, Oakland, California, 94607-4052. If you have any questions regarding the LOMR, the proposed flood hazard determinations, or mapping issues in general, please call the FEMA Map Information eXchange, toll free, at (877) 336-2627 (877-FEMA MAP).

Sincerely,

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

cc: The Honorable Andrew Kunasek
Chairman, Maricopa County Board of Supervisors

Mr. Stephen Cleveland
Town Manager
Town of Buckeye

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

Mr. Tim Murphy, P.E.
Mitigation Planning & Technical Programs Manager
Floodplain Management and Services Division
Flood Control District of Maricopa County

Mr. Kenneth Rakestraw
Hydrologist
Flood Control District of Maricopa County

Ms. Keili Sertich, AICP, CFM
FMS Division Manger
Flood Control District of Maricopa County

Mr. Gary Wesch, P.E.
Project Engineer
Flood Control District of Maricopa County

Mr. Kevin Lavalle
GIS Analyst
Flood Control District of Maricopa County

Federal Emergency Management Agency

Washington, D.C. 20472

March 24, 2014

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 13-09-2406P

The Honorable Andrew Kunasek
Chairman, Maricopa County Board of Supervisors
301 West Jefferson, 10th Floor
Phoenix, AZ 85003

Follows Conditional Case No. 11-09-2260R
Community Name: Maricopa County, AZ
Community No.: 040037
FIRM Panel Affected: 04013C1665L,
04013C2130L

116

Dear Mr. Kunasek:

In a Letter of Map Revision (LOMR) dated November 1, 2013, you were notified of proposed flood hazard determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, AZ. These determinations were for White Tanks FRS #3 Outfall Channel - from approximately 4,480 feet downstream of McDowell Road to just downstream of White Tanks Flood Retarding Structure #3; and Jackrabbit Trail Wash - from approximately 630 feet downstream of Minnezona Avenue to approximately 2,660 feet upstream of Meadowbrook Avenue The 90-day appeal period that was initiated on November 14, 2013, when the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published a notice of proposed Flood Hazard Determinations in *The Arizona Business Gazette* has elapsed.

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Sincerely,

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

cc: The Honorable Jackie A Meck
Mayor, Town of Buckeye

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Project Engineer
Flood Control District of Maricopa County

Mr. Kevin Lavalle
GIS Analyst
Flood Control District of Maricopa County

NOTES TO USERS

This map is for use in administering the Nation 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 and 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' North American Vertical Datum of 1988 (NAVD 88). 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 Central zone (FIPSZONE 0202). The **horizontal datum** was NAD 83 HARN, GRS1980 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 North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm

This web tool allows users to obtain point-specific datum conversion values by *zooming in and hovering over a VERTCON checkbox on the layers menu on the* left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current elevation, description, and/or location information for National Geodetic Survey 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. To obtain information about Geodetic Densification and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at:
http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm.

Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October 2009 to November 2009. Additional National Agricultural Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALRIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

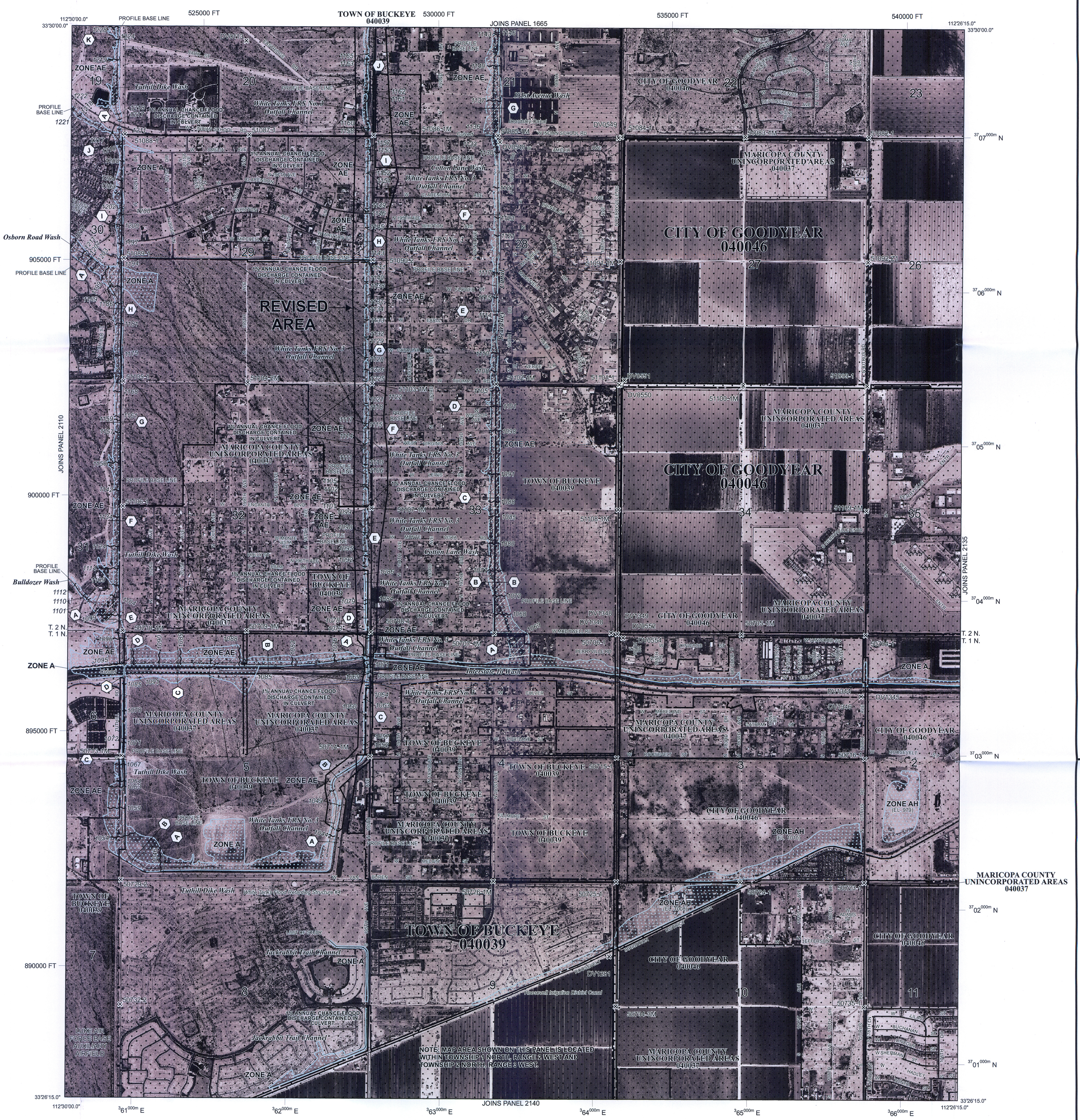
The **profile base line** depicted on this map represents the hydraulic modeling baselines that match flood profiles in the FIS report. As a result of improved topographic data, the profile base line, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

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.

For Information on available products associated with this FIRM, visit the **FEMA Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) 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 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 North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N	1000-meter Universal Transverse Mercator grid ticks, zone 12
6000000 M	5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 15, 1988
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 30, 1995 July 19, 2001 September 30, 2005
October 16, 2013 –to incorporate previously issued letters of map revision, to add special flood hazard areas, to add roads and road names, to advance suffix, to change base flood elevations, to add floodway, to update corporate limits, to add base flood elevation, and to change floodway.

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

PANEL 2130L

NATIONAL FLOOD INSURANCE PROGRAM

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

PANEL 2130 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	2130	L
BUCKEYE, TOWN OF	040039	2130	L
GOODYEAR, CITY OF	040046	2130	L

REVISED TO
REFLECT LOMR
EFFECTIVE: March 14, 2014

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
04013C2130L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

LETTER OF MAP REVISION REQUEST
FOR WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
McDOWELL ROAD TO BETHANY HOME ROAD
FEMA Case No. 13-09-2406P

MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

TECHNICAL DATA NOTEBOOK

June 17, 2013

Prepared by:

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009
(602) 506-1501

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: July 17, 2013

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

From: Kenneth Rakestraw, Hydrologist

Subject: White Tanks FRS 3 Outfall Channel, Detailed Floodplain Delineation Study TDN and Maps

The floodplain delineation for the White Tanks FRS 3 Outfall Channel is ready for use as the best available technical information for the study area. The study documentation, including as-built data for the completed Channel, has been submitted as a LOMR to FEMA following an approved CLOMR for incorporation into the County's FIRM panels. The floodplain/floodway for the new Channel is contained within District property. Most of the 100-year flow is contained within the project limits (see attached). Re-delineation included a portion of the existing, remnant Jackrabbit Channel from Medlock Drive to just south of Minnezona Ave.

The background information for the study includes the following:
This study produced new hydrology, topography, and floodplain mapping. It replaces 4.1 linear miles of Zone AE floodplain with floodway with updated Zone AE floodplains with floodway and delineates 1.4 linear miles of new Zone AE floodplain with floodway. The project manager for the District is Kenneth Rakestraw, Hydrologist.

Please concur and authorize below the use of this new study.

Kenneth Rakestraw 7/15/13 Project Manager Date:	Timothy S. Phillips, P.E., Chief Engineer and General Manager Date: 7/18/13
Catherine W. Regester FOR AMIR MOTAMEDI 7/15/13 Hydrology/Hydraulics Branch Manager Date:	Assistant Project Manager Date:
7/15/2013 Engineering Division Manager Date:	Assistant Project Manager Date:
7/16/2013 Floodplain Management & Services Division Manager Date:	Assistant Project Manager Date:
7/16/13 Planning and Project Management Division Manager Date:	Assistant Project Manager Date:
File Copies: 1. ____________ 2. ____________	YES ☒ GIS Posted (Pending Floodplain Only) Date: 7/10/13 NO In Progress

2801 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-1501 Fax: 602-506-4601

Flood Control District
of Maricopa County

www.fcd.maricopa.gov

2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

June 17, 2013

LOMC Clearinghouse
847 South Pickett Street
Alexandria, Virginia 22304-4605
Attn: LOMC Manager

RE: Jackrabbit Trail Wash(195th Avenue Alignment), New White Tanks FRS No. 3 Outfall Channel -- Town of Buckeye and Unincorporated County, Maricopa County, Arizona- **Reference CLOMR Case No. 11-09-2260R**

Dear Sir or Madam:

Please find enclosed a LOMR request for the subject wash from approximately 1000 feet north of the White Tanks FRS No. 4 to Bethany Home Road alignment. This LOMR request follows the completion of construction of the White Tanks FRS 3 Outfall Channel. The new channel extends upstream from the existing floodplain delineation limit of study from Medlock Drive to the Bethany Home Road alignment. Construction is complete and As-Built data have been obtained.

In response to data requested in FEMA's CLOMR Comment Document dated November 29, 2011 (see attached), the following data are provided on CD included in this submittal:

- MT-2, Form 1, "Overview and Concurrence Form" –**Hard Copy**
- Hydraulic Analysis for As-Built Conditions (As-Built conditions closely represent those provided in the CLOMR submittal. The Hydraulic Analysis has not been modified).
- Annotated copy of the FIRM, showing revised floodplain/floodway boundaries.
- As-Built plans of all project elements.
- Public Notification Information
- CLOMR Comment Letters to Maricopa County and Buckeye

The Flood Control District of Maricopa County (FCDMC) provides floodplain administration and regulation of floodplains in unincorporated Maricopa County and for certain municipalities by agreement (see http://www.fcd.maricopa.gov/Floodplain/floodplain.aspx). FCDMC provides the floodplain administration for the Town of Buckeye (http://www.fcd.maricopa.gov/Permitting/permitting.aspx) which borders a portion of this floodplain.

A check for $5,000 to cover FEMA's required fees for the processing of the LOMR is enclosed.

The pertinent FIRM panels are 04013C1590H and 04013C2055G.

If you have any questions or require additional information, please feel free to call me at 602-506-2201 or contact me by e-mail at kennethrakestraw@mail.maricopa.gov .

Yours truly,

Kenneth Rakestraw

Kenneth Rakestraw
Hydrologist

Enclosures: As listed above

Copies to (w/o enclosures):

Robert Bezek
Department of Homeland Security, FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources
PO Box 36020
Phoenix, AZ 85067-6020

John Schneeman
Floodplain Management Services
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Stephen Cleveland, Town Manager
100 North Apache Road
Buckeye, AZ 85326

Kevin LaVallee, GIS
Public Works Department- Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	1590H	9/30/05
040037	Maricopa County	AZ	04013C	2055G	9/30/05

2. a. Flooding Source: White Tanks FRS No. 3 Outfall Channel

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: White Tanks FRS No. 3 Outfall Channel

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☒ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☒ Fill	☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $5,000
	☐ No, Attach Explanation	

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Kenneth Rakestraw	Company: Flood Control District Maricopa County	
Mailing Address: 2801 W. Durango Street Phoenix, Az 85009	Daytime Telephone No.: (602) 506-2201	Fax No.: (602)506-4601
	E-Mail Address: kennethrakestraw@mail.maricopa.gov	
Signature of Requester (required): Kenneth Rakestraw	Date: May 22, 2013	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Timothy S. Phillips, P.E.	Community Name: Maricopa County	
Mailing Address: 2801 W. Durango Street Phoenix, Az 85009	Daytime Telephone No.: (602) 506-1501	Fax No.: (602)506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required): TSP	Date: 5/22/13	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Gary Wesch, P.E.	License No.: 20499	Expiration Date: 12/31/2013
Company Name: Flood Control District Maricopa County	Telephone No.: (602) 506-4592	Fax No.: (602) 506-4601
Signature: Gary W. Wesch	Date: 5/22/13	E-Mail Address: garywesch@mail.maricopa.gov

b. The area of revision encompasses the following structures (check all that apply)			
Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☒ Fill	☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $5,000

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Kenneth Rakestraw	Company: Flood Control District Maricopa County	
Mailing Address: 2801 W Durango Street Phoenix, Az 85009	Daytime Telephone No.: 602-506-2201	Fax No.: (602)506-4601
	E-Mail Address: kennethrakestraw@mail.maricopa.gov	
Signature of Requester (required): Kenneth Rakestraw	Date: May 22, 2013	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Stephen Cleveland, Town Manager	Community Name: Town of Buckeye	
Mailing Address: 100 North Apache Road Buckeye, Az 85326	Daytime Telephone No.: (623) 349-6000	Fax No.:
	E-Mail Address: scleveland@buckeyeaz.gov	
Community Official's Signature (required): Stephen Cleveland	Date: 6/11/13	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Gary Wesch, P.E.	License No.: 20499	Expiration Date: 12/31/2013
Company Name: Flood Control District Maricopa County	Telephone No.: (602) 506-4592	Fax No.: (602) 506-4601
Signature: Gary W. Wesch	Date: 5/22/13	E-Mail Address: garywesch@mail.maricopa.gov

CONDITIONAL LETTER OF MAP REVISION REQUEST FOR WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
McDOWELL ROAD TO BETHANY HOME ROAD
FCD 2009-C012

MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

TECHNICAL DATA NOTEBOOK

October 17, 2011

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009
(602) 506-1501

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
19690
PAUL W.R.
HOSKIN
Date Signed 10/17/11
ARIZONA, U.S.A.

Prepared by:

Hoskin-Ryan Consultants, Inc.
6245 N. 24th Pkwy, Ste. 100
Phoenix, AZ 85016
(602) 252-8384

EXPIRES 3/31/2012

APPROVED

TOWN OF BUCKEYE ENGINEER DATE

THE TOWN APPROVES THIS REPORT FOR CONCEPT ONLY AND ACCEPTS NO LIABILITY FOR ERRORS OR OMISSIONS

- The following two sets of maps are located with the ADMS/FDS/FIS Maps

White Tanks FRS No. 3 Outfall Channel
Conditional Letter of Map Revision (CLOMR)
Existing Condition Floodplain Work Maps
PCN 470.04.32
FCD 009C012
By Hoskin-Ryan Consult. for FCD - 10 Sheets

&

White Tanks FRS No. 3 Outfall Channel
Conditional Letter of Map Revision (CLOMR)
Floodplain Work Maps
PCN 470.04.32
FCD 009C012
By Hoskin-Ryan Consult. for FCD - 9 Sheets

CONDITIONAL LETTER OF MAP REVISION REQUEST
FOR THE WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

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CONDITIONAL LETTER OF MAP REVISION REQUEST FOR THE WHITE TANKS FRS NO. 3 OUTFALL CHANNEL MARICOPA COUNTY AND TOWN OF BUCKEYE, ARIZONA

TECHNICAL DATA NOTEBOOK TABLE OF CONTENTS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
19690
PAUL W.R.
HOSKIN
Date Signed
ARIZONA, U.S.A.

EXPIRES 3/31/2012

1 Introduction

Hoskin•Ryan Consultants, Inc. (HRC) is under contract with the Flood Control District of Maricopa County (District) to prepare a Conditional Letter of Map Revision (CLOMR) submittal package for the White Tanks FRS No. 3 Outfall Channel Project (*Outfall Channel*) (Figure 1). Final Design plans for the *Outfall Channel* are complete and construction is anticipated to commence in May 2011 (Ref. 7). Construction is underway for the rehabilitation of the Flood Retarding Structure (FRS) #3 (Phase II). A new gated Principal Spillway that outlets adjacent to the Beardsley Canal, was constructed as part of FRS #3 Rehabilitation Phase I.

The project provides a complete *Outfall Channel* along the Jackrabbit Trail corridor, to convey the Principal Spillway flows from FRS#3 to FRS#4. The *Outfall Channel* extends south from the Principal Spillway of FRS#3 to the existing FRS#4 inlet channel north of McDowell Road. Portions of the project lie within either the Town of Buckeye or unincorporated Maricopa County.

The *Outfall Channel* will replace the majority of the existing Jackrabbit Trail Wash with the exception of approximately 3,600 feet located from 200 feet north of Sells Road to Medlock Drive, west of Jackrabbit Trail. This section of the existing Jackrabbit Trail Wash is referred as the *Remnant Channel*. The only improvement within the *Remnant Channel* is the construction of a sediment basin.

This CLOMR request encompasses the existing FEMA-designated Flood Zone "A" and "AE" from 1000 feet north of FRS #4 to approximately Medlock Drive (Figure 2). The majority of this existing floodplain is shown to be contained within the FRS#4 Inlet Channel and the proposed FRS#3 *Outfall Channel* with the exception of the *Remnant Channel* alignment. The floodplain currently impacts some property owners within the area. The *Outfall Channel* is designed on the west side of the roadway from approximately Palm Lane to Minnezona Avenue and from the Missouri Avenue Alignment to the Bethany Home Road Alignment. Between Minnezona Avenue and the Missouri

Avenue Alignment the *Outfall Channel* is designed on the east side of the roadway.

The existing FRS#4 Inlet Channel includes a concrete section beginning at FRS#4, south of the I-10 Freeway (I-10), to north of McDowell Road. Currently, this concrete lined channel contains the FEMA designated Flood Zone "A" (Figure 2). North of the existing concrete-lined channel, the existing Jackrabbit Wash, parallel to Jackrabbit Trail, consists of an unlined ditch of varying dimensions and capacities. Between Missouri Avenue and the Bethany Home Road alignment, natural drainage patterns continue across the Jackrabbit Trail alignment from west to east. From the Bethany Home Road alignment north to FRS#3, the predominant land slope is east towards the Beardsley Canal.

The purpose of this CLOMR request is to revise the Zone "AE" floodplain to reflect the results of updated hydrology and the construction of the *Outfall Channel*. In addition, the Zone "A" floodplain for the existing FRS#4 Inlet Channel is revised to Zone "AE".

1.1 Authority for Study

The District contract number is FCD 2009C012, with official Notice to Proceed Date of October 22, 2009. The District Project Manager is Gary Wesch, P.E. The Hoskin•Ryan Consultants job number is HRC 09-077-01, Task 11.0.

1.2 Location of Study

The FRS 3 *Outfall Channel* addressed by this CLOMR request is located in west-central Maricopa County. It extends from just south of the 1-10 Freeway to the Principal Spillway of FRS#3 located north of Bethany Home Road on the west side of Beardsley Canal. The *Outfall Channel* alignment lies within Sections 16, 17, 20, 21, 29, and 32, Township 2 North, Range 2 West, of the Gila and Salt River Meridian (Figure 1).

1.3 Methodology Summary

The current effective Zone "A" and "AE" Floodplains along the FRS#4 Inlet Channel and the *FRS#3 Outfall Channel* alignment are delineated from the *White Tanks / Agua Fria Area Drainage Master Study* (White Tanks / Agua Fria ADMS) completed in October, 1992 (Ref. 9). This floodplain is based on existing hydrologic conditions at the time it was prepared. An excerpt related to the floodplain delineation from the *White Tanks / Agua Fria ADMS* is provided in Appendix A.

The hydrologic analysis for existing conditions with the *Outfall Channel* in place was updated by HDR in September of 2009 in the *Loop 303 / White Tanks Area Drainage Master Plan Update Area hydrologic Analysis* (ADMPU AHA) (Ref. 11). Revisions have been made to this model as part of the current *Outfall Channel* design project. Changes include: adjustments to the rainfall depth, area reduction, channel routing and removing retention from within the Pasqualetti Mountain Ranch Subdivision. A summary of the resulting 100-year peak flow rates is included in Table 1 (Page 12) and the output from the HEC-1 model is included in Appendix D.

This study includes updated and more accurate one foot contour interval topography. In addition, this study includes a detailed HEC-RAS model based upon revised hydrology, cross-section geometry and culverts using the *Outfall Channel* Design Plans (Ref. 7). The updated HEC-1 and HEC-RAS model outputs are provided in the appendices, and electronic copies of HEC-1 and HEC-RAS models are provided on the data CD. The resulting 100-year floodplain delineation is plotted and shown on Figures 3A to 3D – Annotated FIRM, and the CLOMR Submittal 100-Year Floodplain sheets 1 through 10.

1.4 Acknowledgements

Individuals with HRC responsible for the completion of this project include Paul Hoskin P.E., Project Manager; Doug Both C.F.M., Senior Hydrologist; Peng Zhang P.E., Project Engineer; and Nick Zavala E.I.T., Project Hydrologist.

2 ADWR/FEMA Forms

2.1 Study Documentation Abstract for FEMA Submittals

2.1: Study Documentation Abstract for FEMA Submittals		Initial Study		Restudy		CLOMR	X	LOMR		Other	
2.1.1	Date Study Accepted										
2.1.2	Study Contractor	Hoskin-Ryan Consultants, Inc.									
	Contact(s)	Paul Hoskin P.E.; Doug Both C.F.M.; Peng Zhang P.E.; Nick Zavala E.I.T.									
	Address	6245 N. 24th Pkwy, Ste. 100 Phoenix, AZ 85016									
	Phone	(602) 252-8384									
	Internal Ref. No.	HRC 09-077-01; FCD 2009 C012									
	Subcontractors w/ Phone										
2.1.3	FEMA Technical Review Contractor	FEMA National Service Provider									
	Contact(s)										
	Address	3601 Eisenhower Ave Alexandria, VA 22304-6425									
	Phone										
	Internal Ref. No.										
2.1.4	FEMA Regional Reviewer										
	Phone										
2.1.5	State Technical Reviewer										
	Phone										
2.1.6	Local Technical Reviewer	Flood Control District of Maricopa County 2801 W Durango Street Phoenix, AZ 85009									
	Phone	(602)506-1501									
	Internal Ref. No.	2009C012									
2.1.7	Reach Description	White Tanks FRS No. 3 Outfall Channel Floodplain, between Bethany Home Road and the I-10 Freeway FIRM 04013C1590H, FIRM 04013C2055G,									
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	Waddell, Arizona; 1957; Photo inspected 1975 Perryville, Arizona; 1957; Photo revised 1982									
2.1.9	Unique Conditions and Problems										
2.1.10	Coordination of Discharges (Agency, Date, Comments)	Peak flows are from the updated HEC-1 model in Appendix D.									

2.2 FEMA Forms

FEMA MT-2 FORMS ATTACHMENT (WHITE TANKS FRS NO. 3 OUTFALL CHANNEL)

Form 1, Section C – Review Fee

The fee will be paid upon request.

Form 2, Sections D, Item 1 – NFIP Section 65.12 Compliance:

The conditions of NFIP Regulation 44CFR Ch. 1, Section 65.12 include:

(1) An evaluation of alternatives, which would not result in a BFE increase above that permitted demonstrating why these alternatives are not feasible;

(2) Documentation of individual legal notice to all affected property owners within and outside of the community, explaining the impact of the proposed action on their property;

(3) Concurrence of the Chief Executive Officer (CEO) and any other communities affected by the proposed actions; and

(4) Certification that no structures are located in areas that would be impacted by the increased base flood elevation.

To comply with these conditions,

(1) An evaluation of alternatives to convey discharge from FRS#3 to FRS#4 had been studied and documented in the *White Tanks FRS No. 3 Outfall Channel 30% Design Report* (Ref. 4) and the most feasible alternative was selected. The proposed project will contain 100-year flow within the channel and no negative impact will be posed to the community.

(2) The typical notice and a list of affected properties have been provided in Appendix B.4.

(3) See the signatures of community official on Form 1.

(4) The hydraulic models have proved that flows will be contained within the channel. No structures will be impacted by this project.

Form 2, Sections D, Item 4 – Endangered Species Act Compliance:

The Project's Clean Water Act Section 404 Permit Application included in Appendix A.2.3 indicates that no threatened species are identified on the site. Also included in Appendix B.4 are:

- USACE Nationwide Permit Verification
- Email Stating that FEMA will accept Permit Verification letter as evidence of Endangered Species Act compliance.

Form 3, Sections B and C, Item 4 – Sediment Transport Considerations:

Velocities are generally 3 fps or lower. The channel will be maintained by Flood Control District of Maricopa County on a regular basis in accordance with the Operations and Maintenance Manual (Ref. 8). Therefore, sediment will not impact the hydraulic capacity of the project.

FEMA MT-2 FORMS ATTACHMENT (REMNANT CHANNEL)

Form 2, Sections D, Item 1 – NFIP Section 65.12 Compliance:

The conditions of NFIP Regulation 44CFR Ch. 1, Section 65.12 include:

(1) An evaluation of alternatives, which would not result in a BFE increase above that permitted demonstrating why these alternatives are not feasible;

(2) Documentation of individual legal notice to all affected property owners within and outside of the community, explaining the impact of the proposed action on their property;

(3) Concurrence of the Chief Executive Officer (CEO) and any other communities affected by the proposed actions; and

(4) Certification that no structures are located in areas that would be impacted by the increased base flood elevation.

To comply with these conditions,

(1) The proposed channel helps reduce the upstream discharge from north of Medlock Drive and diverts the flow at Meadowbrook Avenue, posing no negative impact on the conveyance of the remnant channel. Therefore, the rise of water surface elevation along the remnant channel is not caused by the proposed channel, but by the updated hydrology and topographic mapping. No alternative analysis is necessary.

(2) The list of affected properties, a sample letter and documentation of the individual legal notice have been provided in Appendix B.4.

(3) See the signatures of community official on Form 1.

(4) The hydraulic models have proved that flows will be contained within the remnant channel. No structure will be impacted by this project.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY **OVERVIEW & CONCURRENCE FORM**	*O.M.B No. 1660-0016* *Expires: 12/31/2010*

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	MARICOPA COUNTY	AZ	04013C	1590H	09/30/05
[illegible]037	MARICOPA COUNTY	AZ	04013C	2055G	09/30/05

2. a. Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

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

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
☐ Coastal Analysis ☒ Hydraulic Analysis ☒ Hydrologic Analysis ☐ Corrections
☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
☒ New Topographic Data ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert
☐ Dam ☒ Fill ☐ Other (Attach Description)

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK BURDEN DISCLOSURE NOTICE

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A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040039	TOWN OF BUCKEYE	AZ	04013C	1590H	09/30/05
[illegible]039	TOWN OF BUCKEYE	AZ	04013C	2055G	09/30/05

2. a. Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

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

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes

☐ Coastal Analysis ☒ Hydraulic Analysis ☒ Hydrologic Analysis ☐ Corrections

☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes

☒ New Topographic Data ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☒ Fill ☐ Other (Attach Description)

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $4,400
	☐ No, Attach Explanation	

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: GARY WESCH, P.E.	Company: FLOOD CONTROL DISTRICT, MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ 85009	Daytime Telephone No.: (602) 506-4592	Fax No.: (602)506-4601
	E-Mail Address: garywesch@mail.maricopa.gov	
Signature of Requester (required): Gary W. Wesch	Date: 3/31/2011	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: TIMOTHY S. PHILLIPS, P.E.	Community Name: MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET HOENIX, AZ 85009	Daytime Telephone No.: (602) 506-1501	Fax No.: (602) 506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required):	Date: 4/5/11	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting data. All documents submitted in support of this request are correct to the best of my knowledge. All analyses have been performed correctly and in accordance with sound engineering practices. All project works are designed in accordance with sound engineering practices to provide protection from the 1% annual chance flood. If "as-built" conditions data/plan provided, then the structure(s) has been built according to the plans being certified, is in place, and is fully functioning. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: PAUL W.R. HOSKIN, P.E	License No.: AZ 19690	Expiration Date: 2/31/2012
Company Name: HOSKIN RYAN CONSULTANTS, INC	Telephone No.: (602) 252-8384	Fax No.: (602) 252-8385
Signature:		Date: 3/17/11

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	**Required if ...**
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes ☐ No, Attach Explanation	Fee amount: $4,400

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: GARY WESCH, P.E.	Company: FLOOD CONTROL DISTRICT, MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ 85009	Daytime Telephone No.. (602) 506-4592	Fax No. (602)506-4601
	E-Mail Address: garywesch@mail.maricopa.gov	
Signature of Requester (required): Gary W. Wesch	Date: 3/31/11	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: STEPHEN CLEVELAND, TOWN MANAGER	Community Name: TOWN OF BUCKEYE	
Mailing Address: 100 NORTH APACHE ROAD BUCKEYE, AZ 85326	Daytime Telephone No. (623)349-6000	Fax No.
	E-Mail Address: scleveland@buckeyeaz.gov	
Community Official's Signature (required): Stephen Cleveland	Date: 3/31/11	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor. registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting data. All documents submitted in support of this request are correct to the best of my knowledge. All analyses have been performed correctly and in accordance with sound engineering practices. All project works are designed in accordance with sound engineering practices to provide protection from the 1% annual chance flood. If "as-built" conditions data/plan provided, then the structure(s) has been built according to the plans being certified, is in place, and is fully functioning. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001

Certifier's Name: PAUL W.R. HOSKIN, P.E	License No. AZ 19690	Expiration Date: 2/31/2012
Company Name: HOSKIN RYAN CONSULTANTS, INC	Telephone No. (602) 252-8384	Fax No.: (602) 252-8385
Signature:		Date: 3/30/11

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
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☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDROLOGY & HYDRAULICS FORM**	*O.M.B No. 1660-0016* *Expires: 12/31/2010*

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☒ Proposed Conditions (CLOMR) ☒ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
I-10 FREEWAY ON-RAMP	19.29	1,186	1,073
INDIAN SCHOOL ROAD	2.19	726	851
CAMELBACK ROAD	0.84	221	507

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	OUTLET TO WHITE TANKS FRS NO. 4	RS 1000	1046.50 (NAVD88)	1048.60 (NAVD88)
Upstream Limit	BETHANY HOME ROAD	RS 26495	N/A	1186.88 (NAVD88)

2. Hydraulic Method/Model Used

HEC-RAS

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs may help verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. **These tools do not replace engineering judgment.** CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/plan/prevent/fhm/frm_soft.shtm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. Review of your submittal and resolution of valid modeling discrepancies may result in reduced review time.

4. Models Submitted

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: 195W.prj	Plan Name: 195W.p01	File Name: N/A	Plan Name: N/A	NGVD
Corrected Effective Model*	File Name: N/A	Plan Name:	File Name: N/A	Plan Name:	____
Existing or Pre-Project Conditions Model	File Name: Jackrabbit ExistingConditions.prj	Plan Name: Jackrabbit ExistingConditions.p01			
Revised or Post-Project Conditions Model	File Name: CLOMRSub.prj	Plan Name: CLOMRSub.p01	File Name: N/A	Plan Name: N/A	NAVD88
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	____

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:
   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot.

   b. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☒ Yes ☐ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR/CLOMR requests, does this request have the potential to impact an endangered species? ☐ Yes ☒ No

   If Yes, please submit documentation to the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the ESA.

   For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL**

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

   Location of Structure: ALONG THE JACKRABBIT TRAIL, BETWEEN MCDOWELL ROAD AND THE WHITE TANKS FRS NO. 3

   Downstream Limit/Cross Section: WHITE TANKS FRS NO. 4 / RS 1000

   Upstream Limit/Cross Section: WHITE TANKS FRS NO. 3 / RS 31266

2. **Name of Structure: (1) 16' X 7' CBC AT RS 6661.6**

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

   Location of Structure: PALM LANE AT RS 6661.6

   Downstream Limit/Cross Section: RS 6570

   Upstream Limit/Cross Section: RS 6663

3. **Name of Structure: (1) 16' X 7' CBC AT RS 7958.2**

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

   Location of Structure: ENCANTO BOULEVARD AT RS 7958.2

   Downstream Limit/Cross Section: RS 7907.3

   Upstream Limit/Cross Section: RS 7960

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization...............complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (1) 16' X 7' CBC AT RS 9272**

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

   Location of Structure: VIRGINIA AVENUE AT RS 9272

   Downstream Limit/Cross Section: RS 9218

   Upstream Limit/Cross Section: RS 9273

2. **Name of Structure: (1) 16' X 7' CBC AT RS 10598**

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

   Location of Structure: THOMAS ROAD AT RS 10598

   Downstream Limit/Cross Section: RS 10535

   Upstream Limit/Cross Section: RS 10599

3. **Name of Structure: (3) 12' X 6' CBC AT RS 13233.5**

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

   Location of Structure: OSBORD ROAD AT RS 13233.5

   Downstream Limit/Cross Section: RS 13185

   Upstream Limit/Cross Section: RS 13235

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

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Expires: 12/31/2010

PAPERWORK REDUCTION ACT

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Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (3) 12' X 6' CBC AT RS 14223.6**

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

Location of Structure: CLARENDON AVENUE AT RS 14223.6

Downstream Limit/Cross Section: RS 14175

Upstream Limit/Cross Section: RS 14225

2. **Name of Structure: (1) 16' X 7' CBC AT RS 15918.6**

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

Location of Structure: INDIAN SCHOOL ROAD AT RS 15918.6

Downstream Limit/Cross Section: RS 15742

Upstream Limit/Cross Section: RS 15919

3. **Name of Structure: (1) 16' X 7' CBC AT RS 19260**

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

Location of Structure: JACKRABBIT TRAIL AT RS 19260

Downstream Limit/Cross Section: RS 18340

Upstream Limit/Cross Section: RS 19267

NOTE: For more structures, attach additional pages as needed.

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (1) 16' X 7' CBC AT RS 21265.8**

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

   Location of Structure: CAMELBACK ROAD AT RS 21265.8

   Downstream Limit/Cross Section: RS 21136

   Upstream Limit/Cross Section: RS 21275

2. **Name of Structure: (1) 16' X 7' CBC AT RS 22704.4**

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

   Location of Structure: COLTER STREET AT RS 22704.4

   Downstream Limit/Cross Section: RS 22635

   Upstream Limit/Cross Section: RS 22711

3. **Name of Structure: (2) 10' X 7' CBC AT RS 24052.5**

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

   Location of Structure: JACKRABBIT TRAIL AT RS 24052.5

   Downstream Limit/Cross Section: RS 23639

   Upstream Limit/Cross Section: RS 24061

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: SEDIMENT BASIN #1**

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

   Location of Structure: SHEET #10

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure: SEDIMENT BASIN #2**

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

   Location of Structure: SHEET #10

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure: SEDIMENT BASIN #3**

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

   Location of Structure: SHEET #8

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: SEDIMENT BASIN #4**

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

Location of Structure: SHEET #8

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

2. **Name of Structure: (2) 48" PIPE**

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

Location of Structure: SHEET #8

Downstream Limit/Cross Section: N/A

Upstream Limit/Cross Section: N/A

3. **Name of Structure:**

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

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization...............complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (5) 10' X 4' CBC AT RS 4271 (EXISTING)**

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

   Location of Structure: I-10 FREEWAY OFF RAMP AT RS 4271

   Downstream Limit/Cross Section: RS 4200

   Upstream Limit/Cross Section: RS 4278

2. **Name of Structure: (5) 10' X 5' CBC AT RS 4729.5 (EXISTING)**

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

   Location of Structure: I-10 FREEWAY ON RAMP AT RS 4729.5

   Downstream Limit/Cross Section: RS 4650

   Upstream Limit/Cross Section: RS 4740

3. **Name of Structure: (4) 12' X 4.5' CBC AT RS 5342.1 (EXISTING)**

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

   Location of Structure: MCDOWELL ROAD AT RS 5342.1

   Downstream Limit/Cross Section: RS 5220

   Upstream Limit/Cross Section: RS 5400

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☒ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☒ Drop structures
☒ Transitions in cross sectional geometry
☒ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 507 TO 931 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☒ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 6661.6

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 7958.2

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 9272

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☒ Wing Wall Angle
- ☒ Skew Angle
- ☐ Distances Between Cross Sections
- ☒ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

   The channelization includes (check one):

   ☐ Levees [Attach Section E (Levee/Floodwall)]
   ☐ Superelevated sections
   ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
   ☐ Other (Describe):
   ☐ Drop structures
   ☐ Transitions in cross sectional geometry
   ☐ Energy dissipator

2. Drawing Checklist

   Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

   The channel was designed to carry (cfs) and/or the -year flood.

   The design elevation in the channel is based on (check one):

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

   If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 10598

1. This revision reflects (check one):

   ☒ Bridge/culvert not modeled in the FIS
   ☐ Modified bridge/culvert previously modeled in the FIS
   ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

   ☒ Dimensions (height, width, span, radius, length)
   ☒ Shape (culverts only)
   ☒ Material
   ☒ Beveling or Rounding
   ☒ Wing Wall Angle
   ☒ Skew Angle
   ☐ Distances Between Cross Sections
   ☒ Erosion Protection
   ☐ Low Chord Elevations – Upstream and Downstream
   ☒ Top of Road Elevations – Upstream and Downstream
   ☒ Structure Invert Elevations – Upstream and Downstream
   ☒ Stream Invert Elevations – Upstream and Downstream
   ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (3) 12' X 6' CBC AT RS 13233.5

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (3) 12' X 6' CBC AT RS 14223.6

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 15918.6

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 19260

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 21265.8

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (1) 16' X 7' CBC AT RS 22704.4

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (2) 10' X 7' CBC AT RS 24052.5

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☒ Wing Wall Angle
- ☒ Skew Angle
- ☐ Distances Between Cross Sections
- ☒ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (5) 10' X 4' CBC AT RS 4271 (EXISTING)

1. This revision reflects (check one):

- ☐ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☒ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☒ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (5) 10' X 5' CBC AT RS 4729.5 (EXISTING)

1. This revision reflects (check one):

- ☐ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☒ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☒ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: (4) 12' X 4.5' CBC AT RS 5342.1 (EXISTING)

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☒ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☒ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

D. DAM/BASIN

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam

2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency ☐ Private organization

   Name of the agency or organization:

3. The Dam was permitted as (check one):

   a. ☐ Federal Dam ☐ State Dam

      Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

      Permit or ID number Permitting Agency or Organization

   b. ☐ Local Government Dam ☐ Private Dam

      Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm?

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☒ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.

6. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

	Stillwater Elevation Behind the Dam	
FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

   a. This Levee/Floodwall analysis is based on (check one):

      ☐ upgrading of an existing levee/floodwall system
      ☐ a newly constructed levee/floodwall system
      ☐ reanalysis of an existing levee/floodwall system

   b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc.	Station	to
☐ structural floodwall	Station	to
☐ Other (describe):	Station	to

   c. Structural Type (check one):

      ☐ monolithic cast-in place reinforced concrete
      ☐ reinforced concrete masonry block
      ☐ sheet piling
      ☐ Other (describe):

   d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

      ☐ Yes ☐ No

      If Yes, by which agency?

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

      1. Plan of the levee embankment and floodwall structures. Sheet Numbers:
      2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers:
      3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:
      4. A layout detail for the embankment protection measures. Sheet Numbers:
      5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers:

2. Freeboard

   a. The minimum freeboard provided above the BFE is:

      Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

      Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

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

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

Note: Geotechnical and geologic data

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

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

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

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

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

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

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

4. Embankment Protection (continued)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

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

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

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

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

c. Summary of stability analysis results:

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

(Reference: USACE EM-1110-2-1913 Table 6-1)

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

If Yes, describe methodology used:

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

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

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

h. The duration of the base flood hydrograph against the embankment is hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

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

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

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

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

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

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

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

e. Foundation bearing strength for each soil type:

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

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is ft. to ft.

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

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: acres
Draining to ponding area: acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: cfs

e. Which flooding conditions were analyzed?

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

If No for any of the above, attach explanation.

f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is cfs

h. The length of levee system used to drive this seepage rate in item g: ft.

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

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

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

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

Attach supporting documentation

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

Attach supporting documentation

d. Sediment Transport Considerations:

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

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations? ☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations? ☐ Yes ☐ No

If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No
If No, please attach supporting documentation.

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source: WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

Name of Structure: SEDIMENT BASINS #1, 2, 3 AND 4

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume 0.727 acre-feet

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

Sediment transport rate (percent concentration by volume)

Method used to estimate sediment transport: MODIFIED UNIVERSAL SOIL LOSS EQUATION AND ZELLER-FULLERTON EQUATION

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040037	MARICOPA COUNTY	AZ	04013C	1590H	09/30/05
040037	MARICOPA COUNTY	AZ	04013C	2055G	09/30/05

2. a. Flooding Source: JACKRABBIT TRAIL WASH

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: REMNANT CHANNEL

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☒ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

   b. The area of revision encompasses the following structures (check all that apply)

   Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert
   ☐ Dam ☐ Fill ☐ Other (Attach Description)

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☐ Yes ☒ No, Attach Explanation	Fee amount: $_____

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: GARY WESCH, P.E.	Company: FLOOD CONTROL DISTRICT, MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ 85009	Daytime Telephone No.: (602) 506-4592	Fax No.: (602)506-4601
	E-Mail Address: garywesch@mail.maricopa.gov	
Signature of Requester (required):	Date:	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: TIMOTHY S. PHILLIPS, P.E.	Community Name: MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ 85009	Daytime Telephone No.: (602) 506-1501	Fax No.: (602) 506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required):	Date:	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting data. All documents submitted in support of this request are correct to the best of my knowledge. All analyses have been performed correctly and in accordance with sound engineering practices. All project works are designed in accordance with sound engineering practices to provide protection from the 1% annual chance flood. If "as-built" conditions data/plan provided, then the structure(s) has been built according to the plans being certified, is in place, and is fully functioning. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: PAUL W.R. HOSKIN, P.E	License No.: AZ 19690	Expiration Date: 2/31/2012
Company Name: HOSKIN RYAN CONSULTANTS, INC	Telephone No.: (602) 252-8384	Fax No.: (602) 252-8385
Signature:		Date:

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☒ Proposed Conditions (CLOMR) ☒ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
RS 2415	0.59	221	482
RS 3982	0.29	221	237
RS 4700	0.03	187	25

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	WHITE TANKS FRS NO. 3 OUTFALL CHANNEL	RS 1000	N/A	1165.74
Upstream Limit	MEDLOCK DRIVE	RS 4700	1187.65	1188.37

2. Hydraulic Method/Model Used

HEC-RAS

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs may help verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. **These tools do not replace engineering judgment.** CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/plan/prevent/fhm/frm_soft.shtm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. Review of your submittal and resolution of valid modeling discrepancies may result in reduced review time.

4. Models Submitted

Models Submitted	Natural Run	Floodway Run	Datum
Duplicate Effective Model*	File Name: 195W.prj Plan Name: 195W.p01	File Name: N/A Plan Name: N/A	NGVD
Corrected Effective Model*	File Name: N/A Plan Name:	File Name: N/A Plan Name:	______
Existing or Pre-Project Conditions Model	File Name: Plan Name:	File Name: Plan Name:	______
Revised or Post-Project Conditions Model	File Name: REMNANTCHANNEL.prj Plan Name: REMNANTCHANNEL.p01	File Name: N/A Plan Name: N/A	NAVD88
Other - (attach description)	File Name: Plan Name:	File Name: Plan Name:	______

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach a **copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:
      - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
      - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot.

   b. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No
      If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR/CLOMR requests, does this request have the potential to impact an endangered species? ☐ Yes ☒ No

   If Yes, please submit documentation to the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the ESA.

   For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: JACKRABBIT TRAIL WASH REMNANT CHANNEL**

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

   Location of Structure: ALONG THE JACKRABBIT TRAIL, BETWEEN SELLS ROAD AND MEDLOCK DRIVE

   Downstream Limit/Cross Section: WHITE TANKS FRS NO. 3 DROP STRUCTURE / RS 1000

   Upstream Limit/Cross Section: MEDLOCK DRIVE / RS 4700

2. **Name of Structure: (3) 10' X 3' CBC AT RS 1391.38 (EXISTING)**

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

   Location of Structure: MINNEZONA AVENUE AT RS 1391.38

   Downstream Limit/Cross Section: RS 1354

   Upstream Limit/Cross Section: RS 1426

3. **Name of Structure: (3) 10' X 3' CBC AT RS 2043 (EXISTING)**

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

   Location of Structure: MEADOWBROOK AVENUE AT RS 2043

   Downstream Limit/Cross Section: RS 2010

   Upstream Limit/Cross Section: RS 2081

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

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Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert ....complete Section C
Dam/Basin ....complete Section D
Levee/Floodwall ....complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (1) 24" HDPE PIPE AT RS 3510.50 (EXISTING)**

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

   Location of Structure: SOUTH OF CAMELBACK ROAD / RS 3510.50

   Downstream Limit/Cross Section: RS 3500

   Upstream Limit/Cross Section: RS 3519

2. **Name of Structure: (1) 24" CMP AT RS 4496.5 (EXISTING)**

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

   Location of Structure: SOUTH OF MEDLOCK DRIVE / RS 4496.5

   Downstream Limit/Cross Section: RS 4483

   Upstream Limit/Cross Section: RS 4514

3. **Name of Structure: (1) 24" CMP AT RS 4570.5 (EXISTING)**

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

   Location of Structure: SOUTH OF MEDLOCK DRIVE / RS 4570.5

   Downstream Limit/Cross Section: RS 4545

   Upstream Limit/Cross Section: RS 4589

NOTE: For more structures, attach additional pages as needed.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE STRUCTURES FORM**	*O.M.B No. 1660-0016* *Expires: 12/31/2010*

PAPERWORK REDUCTION ACT

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Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization................complete Section B
Bridge/Culvert................complete Section C
Dam/Basin......................complete Section D
Levee/Floodwall.............complete Section E
Sediment Transport........complete Section F (if required)

Description Of Structure

1. **Name of Structure: (1) 24" CMP AT RS 3510.50 (EXISTING)**

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

   Location of Structure: SOUTH OF CAMELBACK ROAD / RS 3510.50

   Downstream Limit/Cross Section: RS 3500

   Upstream Limit/Cross Section: RS 3519

2. **Name of Structure: (1) 24" CMP AT RS 4496.5 (EXISTING)**

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

   Location of Structure: SOUTH OF MEDLOCK DRIVE / RS 4496.5

   Downstream Limit/Cross Section: RS 4483

   Upstream Limit/Cross Section: RS 4514

3. **Name of Structure: (1) 24" CMP AT RS 4570.5 (EXISTING)**

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

   Location of Structure: SOUTH OF MEDLOCK DRIVE / RS 4570.5

   Downstream Limit/Cross Section: RS 4545

   Upstream Limit/Cross Section: RS 4589

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

'ame of Structure: REMNANT CHANNEL

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☒ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

Name of Structure: (3) 10' X 3' CBC AT RS 1391.38 (EXISTING)

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

Name of Structure: (3) 10' X 3' CBC AT RS 2043 (EXISTING)

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe):

☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

Name of Structure: (1) 24" HDPE PIPE AT RS 3510.50 (EXISTING)

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☐ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☐ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections

☐ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☐ Top of Road Elevations – Upstream and Downstream
☐ Structure Invert Elevations – Upstream and Downstream
☐ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

Name of Structure: (1) 24" CMP AT RS 4496.5 (EXISTING)

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

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

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: JACKRABBIT TRAIL WASH REMNANT CHANNEL

Name of Structure: (1) 24" CMP AT RS 4570.5 (EXISTING)

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

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

D. DAM/BASIN

Flooding Source:

ame of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam

2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency ☐ Private organization

   Name of the agency or organization:

3. The Dam was permitted as (check one):

   a. ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number Permitting Agency or Organization

   b. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm?

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☒ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.

6. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

7. Please attach a copy of the formal Operation and Maintenance Plan

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

☐ upgrading of an existing levee/floodwall system
☐ a newly constructed levee/floodwall system
☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station to
☐ structural floodwall Station to
☐ Other (describe): Station to

c. Structural Type (check one):

☐ monolithic cast-in place reinforced concrete
☐ reinforced concrete masonry block
☐ sheet piling
☐ Other (describe):

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency?

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

1. Plan of the levee embankment and floodwall structures. Sheet Numbers:

2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers:

3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:

4. A layout detail for the embankment protection measures. Sheet Numbers:

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

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout ☐ Yes ☐ No
3.5 feet or more at the upstream end ☐ Yes ☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions ☐ Yes ☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater). ☐ Yes ☐ No

2.0 feet above the 1%-annual-chance stillwater surge elevation ☐ Yes ☐ No

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

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

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

Note: Geotechnical and geologic data

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

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

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

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

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

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

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

4. Embankment Protection (continued)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

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

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

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

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

c. Summary of stability analysis results:

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

(Reference: USACE EM-1110-2-1913 Table 6-1)

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

If Yes, describe methodology used:

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

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

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

h. The duration of the base flood hydrograph against the embankment is hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

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

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

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

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

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

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

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

e. Foundation bearing strength for each soil type:

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

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is ft. to ft.

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

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: acres
Draining to ponding area: acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: cfs

e. Which flooding conditions were analyzed?

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

If No for any of the above, attach explanation.

f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is cfs

h. The length of levee system used to drive this seepage rate in item g: ft.

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

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

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

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

Attach supporting documentation

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

Attach supporting documentation

d. Sediment Transport Considerations:

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

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations? ☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations? ☐ Yes ☐ No

If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No
If No, please attach supporting documentation.

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source:

Name of Structure:

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

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

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

Sediment transport rate (percent concentration by volume)

Method used to estimate sediment transport:

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

3 Survey and Mapping Information

3.1 Field Survey Information

HRC performed detailed topographic survey for structure crossings, street intersections and areas with walls and/or domiciles (Ref. 14). Cross Sections for aerial topography checks were performed by the District Survey Department and by Cooper Aerial Surveying Company.

In addition the new field survey data consisted of horizontal and vertical control. All field data has been collected on the Arizona State Plane Coordinate System NAD83 (North American Datum 1983) and realized to NAVD88 (North American Vertical Datum 1988).

The calibration was based on the Maricopa County Geodetic Densification and Cadastral Survey (GDACS) for horizontal position of sectional control. The vertical control was based on the Maricopa County Department of Transportation Benchmark WT-4, a 9/16" Stainless Steel Rod drilled and domed in handhole 6.5' deep with carsonite marker, Elevation=1046.3'.

3.2 Mapping

One foot contour interval topographic mapping for the entire *Outfall Channel* floodplain area was produced by Cooper Aerial Surveying Company at a mapping scale of 1"=40' (Ref. 14). All topography was acquired on November 15, 2009 at a photo scale of 1"=300' (1:3,600). Fifty (50) Aerial Panels were set and observations taken on the center points for map control. In addition, six (6) "Blind Panels" were set to check the accuracy of the aerial topography.

3.3 Vertical Datum

The effective FEMA floodplain study was based on the vertical datum NGVD 1929, while this project is based on NAVD 1988. At this study area, a difference of 1.99 feet needs to be added to elevations when converted from NGVD 1929 to NAVD 1988. The difference was identified using VERTCON web service and results are provided in Appendix C.

4 Hydrology

4.1 Method Description

The FEMA effective floodplain delineation was based on the *White Tanks / Agua Fria ADMS* completed in 1997 (Ref. 9). The 1997 study was updated in 2004 by URS (Ref. 10). In 2009, the URS study was updated by HDR to adopt the NOAA 14 precipitation (Ref. 11). The HDR hydrologic model was chosen for the existing condition hydraulic modeling and floodplain delineation, *Existing Condition without Project in Place*. The discharges from the existing condition hydrologic model are further prorated based on tributary area sizes.

The hydrologic analysis for existing conditions with the *Outfall Channel* project in place was conducted in the HDR study (Ref. 11). Revisions have been made to the hydrology model, *Existing Condition with Project in Place*, as part of the White Tanks FRS No. 3 Outfall Channel, Final Design Report, by HRC (Ref. 5). Changes include: adjustments to the rainfall depth, areal reduction, stage-storage discharge curve of FRS No. 3, retention volumes, and channel routing geometry. Peak flows from the 100-Year storm event HEC-1 model named 'Existing Conditions with Project in Place," dated April 1, 2010, is used for the hydraulics modeling and the floodplain delineation for the post-construction condition.

4.2 Parameter Estimation

A schematic map for the HEC-1 model is provided in Appendix D. No changes to the ADMPU AHA are shown in the schematic diagram or the contributing sub basin areas. Although, several parameters have been modified to reflect changed conditions as follows:

- The rainfall depth was modified to reflect NOAA 14 precipitation values, which for this location is 3.661 inches, which is lower than the point precipitation of 4.03 inches in the 1997 study used to delineate the FEMA effective floodplain.
- The ADMPU AHA includes retention for the Pasqualetti Mountain Ranch residential development. The current development does not provide on-lot retention, and it does not appear likely that it will in the future.
- The channel routing was updated with the channel geometry. Parameters selected for routing are shown in Appendix D.

A summary of 100-year peak flow rates is included in Table 1 and the output from the HEC-1 model is included in Appendix D.

4.3 Problems encountered during the study

No special problems encountered during the hydrologic study.

4.4 Calibration

No data is available and no calibration was performed for the hydrologic model.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

4.5.1.1 Existing Condition without Project in Place

The HEC-1 schematic map is shown in Figure 4. Each sub-basin was further divided into smaller tributary areas to prorate the flows along Jackrabbit Wash (Figure 4 right). The HEC-1 output model is provided in Appendix D, and the flow proration results are shown Table 1. Table 1 summarizes those peak discharges along Jackrabbit Wash.

Table 1: 100-Year Peak Flow Rates (Existing Condition without Project in Place)

Side Flow (Flow Proration)				Upstream Inflow (cfs)	Combined Flow (cfs)	River Station
HEC-1 ID	**Tributary Area ID**	**Area (ac)**	**Prorated Flow (cfs)**			
W33			795*			
	W33-1	27	40	0	**40**	**22197**
	W33-2	60.2	89	40	**128**	**21847**
	W33-3	99.8	147	128	**275**	**21478**
	W33-4	23.3	34	275	**310**	**21016**
	W33-5	168.4	248	310	**558**	**19912**
	W33-6	34.5	51	558	**609**	**19608**
	W33-7	43.3	64	609	**672**	**18953**
	W33-8	83.2	123	672	**795**	**18563**
CPW35					**985**	**17408**
SRW35					**784**	**15855**
CPW36 - SRW35**			266*			
	W36-1	17.1	10	784	**794**	**15750**
	W36-2	60.1	34	794	**828**	**15022**
	W36-3	40.7	23	828	**851**	**14122**
	W36-4	25.2	14	851	**865**	**13622**
	W36-5	177.5	101	865	**966**	**13122**
	W36-6	28.1	16	966	**982**	**12341**
	W36-7	31.1	18	982	**1000**	**11350**
	W36-8	87.6	50	1000	**1050**	**10818**
DW37 - CPW36***			434*			
	W37-1	78.5	44	1050	**1094**	**9324**
	W37-2	170.9	96	1094	**1190**	**8320**
	W37-3	525	294	1190	**1484**	**6310**
CPW37B					**1597**	**4650**

*** Flow rates to be prorated**
**** Q =1050 cfs at CPW36, see HEC-1 outputs**
***** Q=1484 cfs at DW37, see HEC-1 outputs**

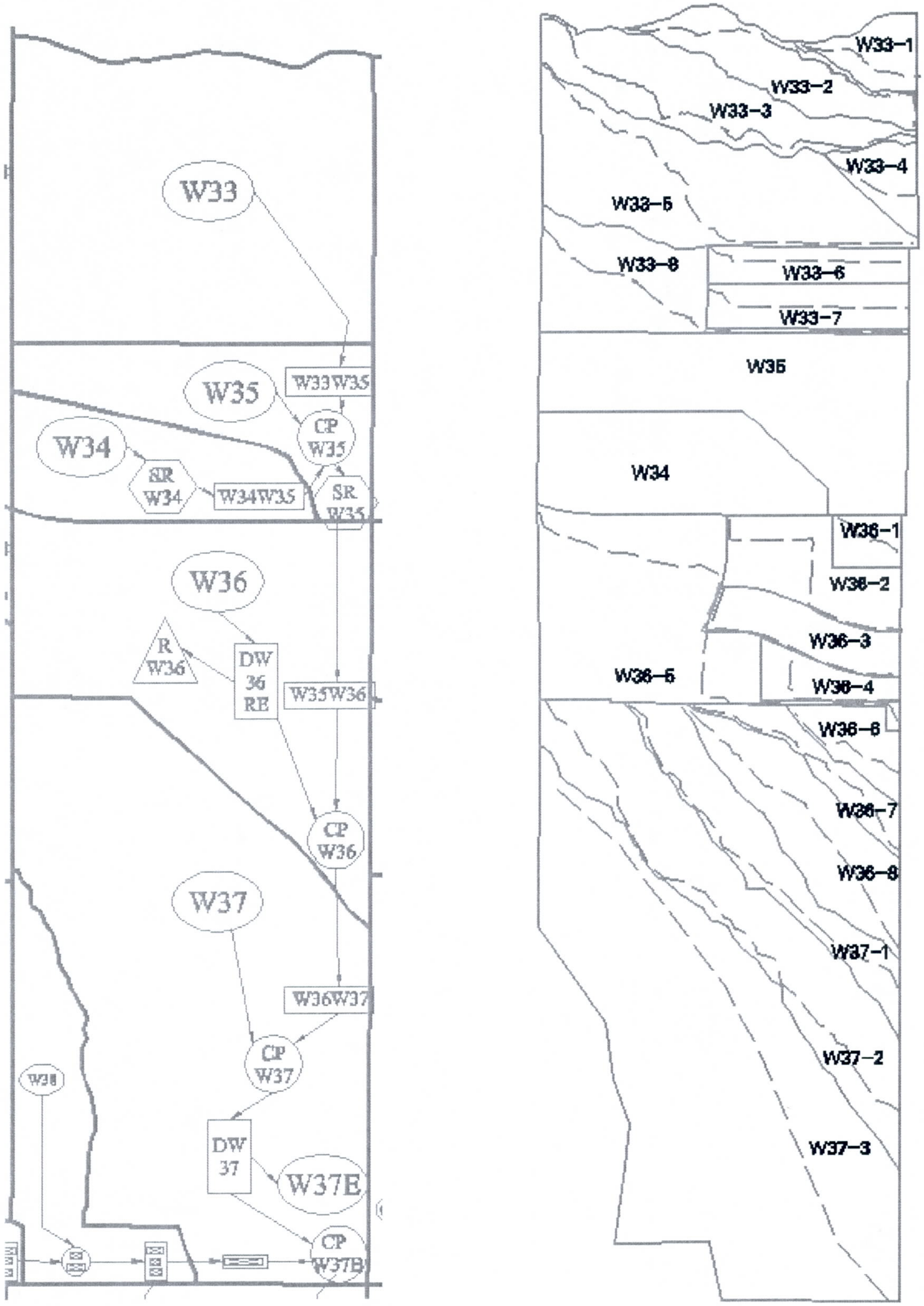


Figure 4. Existing Condition HEC-1 Schematic Map (left) and Tributary Area (right)

4.5.1.2 Existing Condition with Project in Place

The HEC-1 output model is provided in Appendix D, and peak flows for the *Outfall Channel* HEC-RAS model are shown Table 2. Table 2 summarizes those peak discharges along the *Outfall Channel*.

Table 2: 100-Year Peak Flow Rates (Outfall Channel)

Location	CP*	Q100 (cfs)
Bethany Home Rd. to Minnezona Ave	CPW28A	507
Minnezona Ave to Sells Road	**	739
Sells Rd. to Indian School Rd.	CPW33	790
Indian School Rd. to Thomas Rd.	CPW35	851
Thomas Rd. to I-10 Freeway	CPW36	931
I-10 Freeway to FRS#4	CPW37	1073

*** Concentration Point (CP) from HEC-1 Model**
**** (2) 48" pipes divert 232 cfs into the channel at Minnezona Avenue. See Appendix D.5 for calculations.**

In addition, the flow from the HEC-1 Sub-Basin W33 was prorated to determine the flows that were used in the *Remnant Channel* HEC-RAS model. Table 3 summarizes the peak discharges along the *Remnant Channel*.

Table 3: 100-Year Peak Flow Rates (Remnant Channel)

Sub-Basin ID	Q100 (cfs)	Channel Flow (cfs)
W33A	25	25
W33B	98	98
W33C	237	237
W33D	482	250*
W33E	571	339*

*** Q100 – diverted flow to the east (232 cfs) (Refer to Appendix D.5 for calculations)**

4.5.2 Verification of Results

The results were compared to the Effective Model at three representative locations. Refer to the MT-2 Form 2 for the comparison. Although the NOAA 14 precipitation used for this study is about 10% less than the NOAA 2 precipitation used in the FEMA effective hydrology study, the updated hydrology does not show a significant decrease in channel discharges. On the contrary, the updated hydrology indicates a much higher discharges north of Indian School Road. This is because:

(1) The updated hydrology reflects the recent development within the tributary area. The 100-year peak discharge from some developments increases dramatically due to the developments not providing retention.

(2) The proposed channel improvement captures more drainage area than the existing wash.

(3) The flow breaks out towards the east along the existing wash, while the proposed channel captures all the tributary flows and outlets to FRS#4.

5 Hydraulics

5.1 Method Description

The effective Zone "A" and "AE" floodplains along the *Outfall Channel* Alignment from FRS #3 to FRS #4 were previously delineated using the HEC-2 hydraulics model in the ADMS. HRC converted the HEC-2 model to a HEC-RAS model. This model output is included in Appendix E for reference and is called the "Duplicate Effective Model".

The *Outfall Channel* delineation was created using the final design plans (Appendix A) (Ref. 7). A subcritical condition was evaluated for delineating the floodplain because it reflects the most conservative water surface elevations.

Cross-sections are located to achieve representative channel and bank geometry. In addition, cross sections are located where abrupt channel or bank changes occur, as well as at road crossings. HEC-RAS Version 4.1 (Ref. 13) was used for the hydraulic modeling. The 100-year, 24-hour Water Surface Elevation (WSE) of 1048.6 feet (NAVD88) in FRS #4 reservoir (Ref. 15) was defined as the downstream boundary condition for the *Outfall Channel* model and the existing condition *Jackrabbit Wash* model. The proposed HEC-RAS stationing starts at RS 1000 at the downstream end of FRS #4 inlet channel. Refer to Appendix A.2.5 for excerpts from the White Tanks FRS No. 4 Rehabilitation Project Report (Ref. 15).

However, the Duplicate Effective Model downstream boundary condition is set at an elevation of 1038.61 feet (NGVD29) approximately 865 feet south of RS 1000 (Ref. 9). To compare the downstream boundary conditions between the proposed model and the Duplicate Effective Model, the WSE of the Duplicate Effective Model is calculated at the proposed RS 1000. The calculated WSE of the Duplicate Effective Model at RS 1000 is 1046.50 feet (NAVD88) which is approximately 2.1 feet lower than the known WSE of 1048.6.

The upstream boundary of the floodplain for the *Outfall Channel* model is at an elevation of 1186.88 feet (NAVD88) (RS 26495), which is the end of the *Outfall Channel*, downstream of two pipe culverts at the Bethany Home Road Alignment (Ref 7). The upstream boundary of the floodplain for the existing condition *Jackrabbit Wash* model is set at Medlock Drive (RS 22197). The Effective FIS upstream limit occurs near Medlock Drive which is approximately 4,160 feet south of RS 26495.

The *Remnant Channel* ties in at the proposed Spillway #7 located south of Minnezona Avenue (100-Year Floodplain sheet #8). The downstream boundary condition for the *Remnant Channel* model is set at the 100-year, 24-hour WSE of 1165.74 (NAVD88), downstream of the proposed 1-16' x 7' CBC (RS 18380). The proposed HEC-RAS stationing starts at RS 1000, downstream of spillway #7.

The *Remnant Channel* upstream boundary condition is set at an elevation of 1188.37 (NAVD 88) (RS 4700), located at the intersection of Medlock Drive and Jackrabbit Trail. The proposed RS 4700 is located at the same location as RS 4.152 of the Duplicate Effective Model.

However, the Duplicate Effective Model upstream boundary condition (RS 4.152) is set at an elevation of 1185.66 feet (NGVD29) which is equivalent to an elevation of 1187.65 (NAVD88). Therefore, the proposed WSE is approximately 0.72 feet higher than the effective WSE.

5.2 Work Study Maps

Refer to sheets 1 through 10 of the 100-Year Floodplain Maps.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

For the *Outfall Channel,* a Manning's roughness coefficient ('n' value) of 0.045 is used for the channel banks, whereas the channel bottom ranges from 0.015 to 0.045. These 'n' values are conservative and reflect a mature and unmaintained vegetation condition.

For the *Remnant Channel,* an n-value of 0.049 is used for the channel banks and an n-value of 0.034 for the channel bottom. The n-values represent the current wash conditions with a sandy bottom and full grown trees and bushes along the banks.

For the existing condition *Jackrabbit Wash* model, an n-value of 0.049 is used for the channel banks and an n-value of 0.034 is used for the channel bottom. The n-values represent the current wash conditions of a sandy bottom, full grown trees, and bushes along the banks. For the man-made channel at Pasqualetti Mountain Ranch, a Manning's roughness coefficient ('n' value) of 0.045 is used for the channel bottom and banks, assuming that the channel is not well maintained.

At the concrete drop structure #7, the n-values range from 0.013 to 0.035 to represent the concrete structure and the riprap downstream.

5.3.2 Expansion and Contraction Coefficients

Expansion and contraction coefficients are based on the HEC-RAS User's Manual (Ref. 13). Values of 0.3 and 0.1 are used for the expansion and contraction coefficients, respectively. For the culverts Cross-Sections 2, 3 and 4 of the *Remnant Channel*, the values of 0.3 and 0.5 are used for the expansion and contraction coefficients, respectively. For the culverts at RS 22067, RS 21993, RS 21007, RS 19539, RS 18888 and RS 15886 of the existing condition *Jackrabbit Wash* model, the values of 0.3 and 0.5 are used for the expansion and contraction coefficients, respectively.

5.3.3 Entrance Loss Coefficients

For culverts without drop inlets that are located within the *Outfall Channel,* north of Camelback Road, the upstream water surface elevations are impacted by the shape of the entrance. To reduce entrance energy losses, these culverts are designed with a rounded-edge entrance with a rounding radius of 1/12 diameter or rise. An entrance loss coefficient of 0.2 applies to all the culverts within the *Outfall Channel*.

For the two box culverts within the *Remnant Channel* and the existing condition *Jackrabbit Wash*, due to the flared wingwalls (30 to 75 degrees), an entrance loss coefficient of 0.4 is used. The CMP culvert crossing to private property #1 is projected from fill. Therefore, the entrance loss coefficient of 0.9 was applied. For the CMP culvert crossings with headwalls to private properties #1 and #2, an entrance loss coefficient of 0.5 was applied.

5.4 Cross-Section Description

Cross-sections are located along the channel such that the distance between two consecutive sections is not greater than 500 ft. Cross-sections are also added upstream and downstream of the culvert crossings based on placement recommendations in the *HEC-RAS Hydraulic Reference Manual* (Ref. 13). Cross-section topographic data is from the one foot contour interval topography dated February 2, 2009. Elevations are on the NAVD88 vertical datum.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump

There are no adjustments to the model regarding hydraulic jump.

5.5.2 Bridges and Culverts

Eleven culverts are analyzed in the existing condition *Jackrabbit Wash* model. Simulations of the culverts are from standard culvert modeling in HEC-RAS. Invert elevations of the culverts are on the NAVD 1988 vertical datum. Refer to Tables 4 for the culvert summary tables. Refer to Appendix C.3 for the culvert sketches showing inverts and wingwall.

Table 4: Culvert Summary (Existing Condition Jackrabbit Wash)

Culvert Location	RS	Shape	Number of Barrels	Size	Length
I-10 Off Ramp	4271	Box	5	10'x4'	51'
I-10 On Ramp	4729.5	Box	5	10'x5'	52'
McDowell Road	5342.1	Box	4	12'X4.5'	88'
Osborn Road	13233.5	Box	3	12'x6'	48'
Clarendon Road	14223.6	Box	3	12'x6'	48'
Indian School Road	15886	Pipe	1	36"	70'
Minnezona Avenue	18888	Box	3	10'x3'	45'
Meadowbrook Avenue	19539	Box	3	10'x3'	44'
Private Property #1	21007	Pipe	1	24"	14'
Private Property #2	21993	Pipe	1	24"	25'
Private Property #3	22067	Pipe	1	24"	34'

Sixteen culverts are analyzed in the *Outfall Channel* HEC-RAS model. In addition, five culverts are analyzed in the *Remnant Channel* HEC-RAS model. Simulations of the culverts are from standard culvert modeling in HEC-RAS. Invert elevations of the culverts are on the NAVD 1988 vertical datum. A reduced-scale set of plans showing the inverts are included in Appendix A. Refer to Tables 5 and 6 for the culvert summary tables.

Table 5: Culvert Summary (Outfall Channel)

Culvert Location	Downstream RS	Number of Barrels	Size	Length
I-10 Off Ramp	42+00	5	10'x4'	51'
I-10 On Ramp	46+50	5	10'x5'	52'
McDowell Road	52+20	4	12'X4.5'	88'
Palm Lane	65+70	1	16'x7'	90'
Encanto Boulevard	79+07.3	1	16'x7'	53'
Virginia Street	92+18	1	16'X7'	48'
Thomas Road	105+35	1	16'X7'	58'
Osborn Road	131+85	3	12'x6'	48'
Clarendon Road	141+75	3	12'x6'	48'
Indian School Road	157+42	1	16'x7'	152'
Jackrabbit Trail	183+40	1	16'x7'	902'
Camelback Road	211+36	1	16'x7'	105'
Colter Street	226+35	1	16'x7'	62'
Jackrabbit Trail	236+39	2	10'x7'	399'
Under Spillway	308+01	2*	72"	4299'

* This culvert is a 2-72"' concrete pipe culvert

Table 6: Culvert Summary (Remnant Channel)

Culvert Location	Downstream RS	Number of Barrels	Size	Length
Minnezona Avenue	13+54	3	10'x3'	45'
Meadowbrook Avenue	20+10	3	10'x3'	44'
Private Property #1	35+00	1*	24"	14'
Private Property #2	44+83	1*	24"	25'
Private Property #3	45+45	1*	24"	34'

* These are pipe culverts

5.5.3 Levees and Dikes

There are berms along east side of Jackrabbit Wash between Camelback Road and Indian School Road. The berm heights vary along the wash and are generally not more than 2 feet above ground. At the Verrado property north of Indian School Road, there is a berm on the west side of the Jackrabbit Wash. The berms are modeled as levees in the existing condition *Jackrabbit Wash* model as well as in the *Remnant Channel*. Levees are also placed between the roadside swales and Jackrabbit Wash for some cross-sections in the existing condition *Jackrabbit Wash* model. This is to separate the roadside swales along Jackrabbit Trail from Jackrabbit Wash. These levees settings are just for modeling purpose to confine the flow and obtain conservative water surface elevation. No certified levee is present within the study reach.

5.5.4 Islands and Flow Splits

There are no islands or flow splits in the reach covered by this submittal.

5.5.5 Ineffective Flow Areas

Ineffective flow locations are included upstream and downstream of the culvert crossings, based upon recommended guidelines in the *HEC-RAS Hydraulic Reference Manual* (Ref. 13). Ineffective flow areas are also assigned to the side inflow areas and back flow areas which do not contribute to the conveyance of the peak flow along Jackrabbit Wash.

5.5.6 Supercritical Flow

There are not any adjustments to the effective model regarding supercritical flow. All models are in the subcritical flow regime.

5.6 Floodway Modeling

Floodway modeling and delineation is conducted for the WT03 *Outfall Channel*, the Remnant Channel and for the Existing Conditions Wash. Floodway encroachment Method 1 was used for the Remnant Channel and for the Existing Conditions Wash with a water surface elevation rise of less than one foot. Floodway encroachment Method 4 with no surcharge is used for the WT03 Outfall Channel.

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

There are no special problems and solutions associated with this study.

5.7.2 Modeling Warning and Error Messages

HEC-RAS (Existing Condition Jackrabbit Wash)

The following types of warning messages are encountered for the steady flow HEC-RAS model. Discussions regarding the messages are also provided below.

(1) The conveyance ratio is higher than 1.4 or less than 0.7, which may indicate the need for additional cross-sections.

Response: In the HEC-RAS model, a maximum distance of 500 feet was set between 2 neighboring cross-sections. Cross-sections are selected where channel geometry (including slope, n value etc.) changes. Therefore, no additional cross-sections are necessary.

Interpolated cross-sections are added for those neighboring cross-sections whose conveyance ratio is too high or too low and cause significant errors in the back water calculations.

(2) The velocity head has changed by more than 0.5 foot. This may indicate the need for additional cross-section.

Response: As discussed above, no additional cross-sections are necessary.

(3) The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Response: At some cross-sections with dramatic changes in geometry or discharge, the flow profile changes, e.g. from M2 to S2. It is okay to set critical depth at these locations.

(4) The cross-section end points had to be extended vertically for the computed water surface.

Response: For some locations, the flow cannot be contained within the wash and will overtop Jackrabbit Trail and flow southeast. For these locations, the cross-section end points are below the water surface. No correction is needed for this warning message.

(5) The energy loss was greater than 1.0 foot between the current and previous cross section. This may indicate the need for additional cross sections.

Response: As discussed above, no additional cross-sections are necessary.

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

Response: It is okay to set critical depth at these locations.

(7) The weir over culvert is submerged.

Response: This happens to culverts without enough capacity and the flow will overtop the roadway above the culverts. No correction is needed.

HEC-RAS (Outfall Channel)

The following types of warning messages are encountered for the steady flow HEC-RAS model. Discussions regarding the messages are also provided below.

(1) The conveyance ratio is higher than 1.4 or less than 0.7, which may indicate the need for additional cross-section.

Response: In the HEC-RAS model, a maximum distance of 500 feet was set between 2 neighboring cross-sections. Cross-sections are selected where channel geometry (including slope, n value etc.) changes. Therefore, no additional cross-sections are necessary.

(2) The velocity head has changed by more than 0.5 feet. This may indicate the need for additional cross-section.

Response: As discussed above, no additional cross-sections are necessary.

(3) The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Response: At some cross-sections with dramatic changes in geometry or discharge, the flow profile changes, e.g. from M2 to S2. It is okay to set critical depth at these locations.

(4) RS 30801: During subcritical analysis, with the exit loss set = 1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

Response: The downstream cross section does not block part of the culvert and the ineffective area is not set too far in. Since the culvert length is 4,299 feet, this *could affect the projected WSEL within the culvert to have a lower energy than the downstream energy.*

(5) The energy loss was greater than 1.0 foot between the current and previous cross section. This may indicate the need for additional cross sections.

Response: As discussed above, no additional cross-sections are necessary.

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

Response: As discussed on item #4 above, it is okay to set critical depth at these locations.

(7) RS 6661.6: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.

Response: For the determination of the extents of the floodplain, the appropriate model run is subcritical because it calculates the most conservative water surface elevation and resulting floodplain limits.

(8) During subcritical analysis, the water surface upstream of culvert went to critical depth.

Response: As discussed on item #4 above, it is okay to set critical depth at these locations.

(9) RS 1000: Divided flow calculated for this cross-section.

Response: The downstream boundary condition was set to the known WSE of 1048.0, which is higher than the channel top of bank.

HEC-RAS (Remnant Channel)

The following types of warning messages are encountered for the steady flow HEC-RAS model. Discussions regarding the messages are also provided below.

(1) The conveyance ratio is higher than 1.4 or less than 0.7, which may indicate the need for additional cross-sections.

Response: In the HEC-RAS model, there is a maximum distance of 500 feet between 2 neighboring cross-sections. Cross-section locations are selected where channel geometry (including slope, n value etc.) changes. No additional cross-sections are necessary.

(2) The cross-section end points had to be extended vertically for the computed water surface.

Response: At the private property culvert crossings #2 and #3, the culverts don't have enough capacity to convey the flow. Therefore, water will back up and overtop the channel bank, causing this warning message. The water enters the adjacent road. As a result, the points cannot be extended vertically because the cross sections depict the existing wash condition.

(3) The velocity head has changed by more than 0.5 feet. This may indicate the need for additional cross-section.

Response: As discussed above, no additional cross-sections are necessary.

(4) The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Response: At some cross-sections with dramatic changes in geometry or discharge, the flow profile changes, e.g. from M2 to S2. It is okay to set critical depth at these locations.

(5) RS 4570.50 and RS 4496.5: The weir over culvert is submerged.

Response: Refer to response for item #2 above.

(6) The energy loss was greater than 1.0 foot between the current and previous cross section. This may indicate the need for additional cross sections.

Response: As discussed above, no additional cross-sections are necessary.

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

Response: As discussed on item #4 above, it is okay to set critical depth at these locations.

(8) RS 4570.50 and RS 4496.5: During the culvert inlet control computations, the program could not balance the culvert/weir flow. The reported inlet energy grade answer may not be valid.

Response: Refer to response for item #2 above.

CHECK-RAS NT (Outfall Channel)

The following warning messages were generated by CHECK-RAS NT, and they are addressed as below.

(1) The left overbank n value of 0.045 and the right overbank n values of 0.035 and 0.045 are less than or equal to the channel n value of 0.045. The overbank n values should be reevaluated.

Response: The n value of 0.045 is conservative and reflects a mature and unmaintained vegetation condition. Generally, the same n value of 0.045 was used to represent the left and right overbanks and the channel.

(2) Channel n value is equal to or less than 0.025. The n value of the channel is usually larger than 0.025. The n value should be reevaluated it if is not representing a concrete lined channel.

Response: The n-values equal to or less than 0.025 represent concrete culverts, drop structures and the existing concrete channel.

CHECK-RAS NT (Remnant Channel)

The following warning messages were generated by CHECK-RAS NT, and they are addressed as below.

(1) Right overbank n value is less than 0.035. The n value for overbank is usually larger than 0.035. The n values should be reevaluated.

Response: The right overbank n values less than 0.035 represent the concrete drop structure.

(2) Channel n value is equal to or less than 0.025. The n value of the channel is usually larger than 0.025. The n value should be reevaluated it if is not representing a concrete lined channel.

Response: The n-values equal to or less than 0.025 represent concrete culverts and drop structures.

(3) RS 3982: Contraction and expansion loss coefficients are 0.1 and 0.3. They should be equal to 0.3 and 0.5, respectively.

Response: RS 3982 is set too far upstream from the culvert. No additional cross section was set at specified section 4 location because the majority of the flow weirs over the culvert. Therefore, there is not a major impact in the WSE.

CHECK-RAS XS (Outfall Channel)

The following warning messages were generated by CHECK-RAS XS, and they are addressed as below.

(1) Discharge is different between the upstream side and downstream side of the structure.

Response: As flow keeps increasing downstream, the flow increase coincidently occurred just downstream of the culvert.

(2) This cross-section is located too far upstream from the critical depth cross-section.

Response: The downstream cross-sections are generally located within 30 feet. Therefore, no additional cross-sections are necessary.

(3) The maximum number of iterations is 0. It should not be less than 20.

Response: No iterations are performed at drop structure locations where the program uses critical depth for the water surface.

CHECK-RAS XS (Remnant Channel)

The following warning messages were generated by CHECK-RAS XS, and they are addressed as below.

(1) Left levee option is used at this river station. Please investigate whether the NFIP requirements for levees are met.

Response: The levee option is used to encroach the wash cross section. Since the wash cross section is too wide, it depicts contributing washes. Therefore, removing the levee is not necessary.

(2) Right levee option is used at this river station. Please investigate whether the NFIP requirements for levees are met.

Response: Refer to response for item #1 above.

(3) Discharge decreases in the downstream direction.

Response: 200 cfs is diverted to the east through an 8'x6' CBC.

CHECK-RAS Structure (Outfall Channel)

The following warning messages were generated by CHECK-RAS Structure, and they are addressed as below.

(1) RS 30801: The end station of 250 from downstream road/weir data is greater than the end station of 81 from downstream internal section. The high chord elevation of 1196 for the end road/weir station is greater than the ground elevation of 1190.983 for the end ground station. The EGEL at section 3 of 1191.14 is greater than the ground elevation. The road/weir data should be included in the ground data.

Response: The deck/roadway data is from the proposed contour at Culvert RS 30801. The upstream/downstream internal sections are defaulted to the upstream /downstream cross-sections (RS 30801.1 and 26495). It is okay to keep these settings. This is a typical comment for many of the culverts. Therefore, it is okay to keep these settings for all culverts.

(2) RS 30801: 'Culvert Upstrm Dist' of 0.1 is less than the height of the culvert opening of 6. Section 3 should be placed at the foot of the road embankment or wing walls. Distance at sections 4 & 3, and 'Distance from Upstream XS' should be adjusted.

Response: If section 3 gets moved further upstream, the head loss between the cross sections will be less. Currently, the head loss between the cross sections is low. Therefore, there is no need to move any cross sections. This is a typical comment for many of the culverts. Therefore, there is no need to move any cross sections for all culverts.

(3) RS 30801: Culvert chart # is 1 and scale # is 1. Culvert entrance shape is square edge entrance with headwall. Culvert entrance loss coefficient is 0.2. It should be equal to 0.5.

Response: For this pipe culvert, the entrance loss coefficient of 0.2 is based on the assumption that a similar type of headwall would be used as compared to the rest of the box culverts.

(4) RS 25271.8: The channel distance of 6.8 at downstream internal section is less than height of the culvert opening of 7. Section 2 should be placed at

the foot of the road embankment or wing walls. Distances at sections 2, 3 & 4 should be adjusted.

Response: If section 2 is moved further downstream, the head loss between the cross sections will be less. Currently, the head loss between the cross sections is low. Therefore, there is no need to move any cross sections. This is a typical comment for many of the culverts. Therefore, there is no need to move any cross sections for any of the culverts.

(5) RS 25271.8: Culvert chart # is 8 and scale # is 1. Culvert entrance shape is wingwall flared 30 to 75 deg. Culvert entrance loss coefficient is 0.2. It should be equal to 0.4.

Response: For this type of culvert, the beveled top edge wingwall flared 30 to 75 degrees was used. The entrance loss coefficient for this type of wingwall is 0.2. This is a typical comment for most of the culverts. Therefore, there is no need to revise the entrance loss coefficient for all culverts.

(6) Right levee option is used at this river station. Please investigate whether the NFIP requirements for levees are met.

Response: Refer to response for item #1 above.

(7) RS 15872.6: The end station of 251.811 from upstream road/weir data is greater than the end station of 28 from upstream internal section / section 3. The high chord elevation of 1162.845 for the end road/weir station is greater than the ground elevation of 1158.42 for the end ground station. The EGL at section 3 of

1159.41 is greater than the ground elevation. The road/weir data should be included in the ground data.

Response: The deck/roadway data is from the proposed contour at Culvert RS 15872.6. The upstream/downstream internal sections are defaulted to the upstream /downstream cross-sections (RS 15872.7 and 15794.4). It is okay to keep these settings. This is a typical comment for many of the culverts. Therefore, it is okay to keep these settings for all culverts.

CHECK-RAS Structure (Remnant Channel)

The following warning messages were generated by CHECK-RAS Structure, and they are addressed as below.

(1) RS 4570.5: The starting station of 906.12 from upstream road/weir data is less than the end station of 906.98 from upstream internal section/ section 3. The high chord elevation of 1187.117 for the starting road/weir station is greater than the ground elevation of 1187.066 for the starting ground station. The EGL at section 3 of 1188.23 is greater than the ground elevation. The road/weir data should be included in the ground data.

Response: The deck/roadway data is from the existing contour at Culvert RS 4570.5. The upstream/downstream internal sections are defaulted to the upstream /downstream cross-sections (RS 4589 and 4545). It is okay to keep these settings. This is a typical comment for many of the culverts. Therefore, it is okay to keep these settings for all culverts.

(2) RS 3510.5: The end station of 1254.769 from downstream road/weir data is less than the end station of 1254.79 from downstream internal section. The high chord elevation of 1189.518 for the end road/weir station is greater than the ground elevation of 1189.463 for the same ground station. The road/weir profile may be extended.

Response: The deck/roadway data is from the existing contour at Culvert RS 3510.5. The upstream/downstream internal sections are defaulted to the upstream /downstream cross-sections (RS 3519 and 3500). It is okay to keep these settings. This is a typical comment for other culverts. Therefore, it is okay to keep these settings for all culverts.

(3) RS 4496.5: The end station of 1253.678 from upstream road/weir data is less than the end station of 1254.35 from upstream internal section 3. The high chord elevation of 1192.412 for the end road/weir station is greater than the ground elevation of 1191.951 for the same ground station. The road/weir profile may be extended.

Response: The deck/roadway data is from the existing contour at Culvert RS 4496.5. The upstream/downstream internal sections are defaulted to the upstream /downstream cross-sections (RS 4514 and 4483). It is okay to keep these settings. This is a typical comment for other culverts. Therefore, it is okay to keep these settings for all culverts.

(4) RS 3500: This is section 2. Weir flow occurs at Culvert Group 1. However, the ineffective flow elevation of 1185.2 between stations 900.43 and 996.5

is equal to or greater than the WSEL of 1184.82. The LMnTpRdD is 1184.744 and the MXLoCdD is 1184.1. The ineffective flow elevation should be between the LMnTpRdD and the MXLoCdD If LMnTpRdD is greater than MXLoCdD. Otherwise, it should be equal to LMnTpRdD. It should also be less than the WSEL.

Response: If the ineffective flow elevation is greater than either LMnTpRdD or the MXLoCdD, it does not affect the WSEL. It is okay to keep these settings.

(5) RS 1426: This is section 3. EGEL 3 (1172.15) is greater than the MnTpRd (1172.088) at Culvert Group 1. However, the ineffective flow elevation of 1173.9 between stations 886.01 and 970.5 is equal to or greater than the WSEL of 1171.89. The ineffective flow elevation should be equal to or lower than the MnTpRd. It should also be less than the WSEL.

Response: If the ineffective flow elevation is greater than the MnTpRd, it does not affect the WSE. It is okay to keep these settings. This is a typical comment for other culverts. Therefore, it is okay to keep these settings for all culverts.

5.8 Calibration

No special calibration is needed as part of this study.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

5.9.1.1 Existing Condition Jackrabbit Wash

The HEC-RAS model outputs are included in Appendix E, and the floodplain/floodway water surface elevations are summarized in Tables 7. Jackrabbit Wash between Camelback Road and Medlock Drive does not have enough capacity to contain the 100-year peak flow and the excess flow overtops Jackrabbit Trail. For this section of the wash, the 100-year floodplain elevations are set at the the ground elevation along Jackrabbit Trail roadway centerline. The east boundary of the 100-year floodplain is set along Jackrabbit Trail centerline.

Table 7: Floodplain/Floodway Summary (Jackrabbit Wash)

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	HEC-RAS WSEL	100-Year Floodplain Elevation	100-Year Floodway Elevation
22197	40	1188.36	1187.53*	1188.79
22085	40	1188.35	1188.00*	1188.77
22041	40	1188.35	1187.82*	1188.73
22028	40	1188.35	1187.82*	1188.73
22010	40	1188.35	1188.00*	1188.72
21979	40	1188.35	1187.98*	1188.69
21847	128	1188.21	1187.94*	1188.57
21478	275	1187.31	1187.19*	1187.68
21016	310	1186.87	1186.87	1187.41
20997	310	1185.21	1185.21	1185.21
20809	310	1183.53	1183.53	1183.53
20409	310	1181.75	1181.75	1181.76
19912	558	1178.61	1178.61	1178.63
19608	609	1176.76	1176.76	1176.95
19578	609	1176.79	1176.79	1176.93
19507	609	1175.25	1175.25	1175.27
19457	609	1174.96	1174.96	1175.13
19247	609	1174.43	1174.43	1174.74

*** Floodplain elevations are set at the ground elevations along Jackrabbit Trail centerline**

Table 7: Floodplain/Floodway Summary (Jackrabbit Wash) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	HEC-RAS WSEL	100-Year Floodplain Elevation	100-Year Floodway Elevation
18953	672	1173.62	1173.62	1174.29
18923	672	1173.64	1173.64	1174.28
18850	672	1172.82	1172.82	1172.82
18800	672	1172.72	1172.72	1172.72
18713	672	1172.56	1172.56	1172.56
18563	795	1171.77	1171.77	1171.77
18214	795	1169.56	1169.56	1169.56
17914	795	1168.01	1168.01	1168.01
17408	985	1165.37	1165.37	1165.38
16918	985	1163.02	1163.02	1163.48
16407	985	1162.72	1162.72	1163.42
15976	985	1162.61	1162.61	1163.32
15933	985	1162.27	1162.27	1163.24
15855	784	1157.75	1157.75	1157.88
15750	794	1157.18	1157.18	1157.20
15344	794	1154.51	1154.51	1154.53
15022	828	1150.55	1150.55	1150.55
14622	828	1149.88	1149.88	1149.88
14322	828	1148.92	1148.92	1148.92
14277	828	1147.45	1147.45	1147.45
14260	828	1145.92	1145.92	1145.92
14247	828	1145.88	1145.88	1145.88
14197	828	1145.47	1145.47	1145.47
14122	851	1145.42	1145.42	1145.42
13925	851	1145.05	1145.05	1145.05
13622	865	1144.54	1144.54	1144.54
13318	865	1143.7	1143.7	1143.70
13288	865	1142.33	1142.33	1142.33
13270	865	1141.72	1141.72	1141.72
13257	865	1141.7	1141.7	1141.70
13207	865	1141.52	1141.52	1141.52
13122	966	1141.54	1141.54	1141.54
12922	966	1141.4	1141.4	1141.40
12341	982	1139.55	1139.55	1139.55
11844	982	1135.8	1135.8	1135.80
11350	1000	1132.44	1132.44	1132.45
10818	1050	1127.56	1127.56	1127.55
10316	1050	1123.15	1123.15	1123.31
9824	1050	1119.74	1119.74	1119.77
9324	1094	1114.88	1114.88	1114.88
8824	1094	1110.99	1110.99	1110.99
8320	1190	1106.29	1106.29	1106.33
7826	1190	1101.8	1101.8	1101.80
7330	1190	1097.98	1097.98	1098.01

Table 7: Floodplain/Floodway Summary (Jackrabbit Wash) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	HEC-RAS WSEL	100-Year Floodplain Elevation	100-Year Floodway Elevation
6826	1190	1093.44	1093.44	1093.49
6310	1484	1086.69	1086.69	1086.71
5920	1484	1084.53	1084.53	1084.53
5902	1484	1079.95	1079.95	1079.94
5600	1484	1079.64	1079.64	1079.63
5400	1484	1079.69	1079.69	1079.69
5220	1484	1077.29	1077.29	1077.29
5193	1484	1076.79	1076.79	1076.79
5181	1484	1073.74	1073.74	1073.82
5100	1484	1073.92	1073.92	1073.99
4800	1484	1073.83	1073.83	1073.91
4748	1484	1073.87	1073.87	1073.94
4740	1484	1074.04	1074.04	1074.10
4650	1597	1073.35	1073.35	1073.41
4600	1597	1071.57	1071.57	1071.62
4350	1597	1069.27	1069.27	1069.27
4278	1597	1069.86	1069.86	1069.86
4200	1597	1067.66	1067.66	1067.65
4183	1597	1067.53	1067.53	1067.54
4168	1597	1064.86	1064.86	1064.86
4100	1597	1064.82	1064.82	1064.82
3800	1597	1063.39	1063.39	1063.40
3500	1597	1060.31	1060.31	1060.31
3200	1597	1058.79	1058.79	1058.79
2903	1597	1057.67	1057.67	1057.67
2885	1597	1053.24	1053.24	1053.24
2800	1597	1052.72	1052.72	1052.72
2500	1597	1052.33	1052.33	1052.33
2200	1597	1051.99	1051.99	1051.99
1900	1597	1050.91	1050.91	1050.91
1568	1597	1049.53	1049.53	1049.53
1552	1597	1048.55	1048.55	1048.55
1500	1597	1048.61	1048.61	1048.62
1300	1597	1048.62	1048.62	1048.62
1000	1597	1048.6	1048.6	1048.60

5.9.1.2 Outfall Channel and Remnant Channel

The 100-year water surface elevations from the proposed conditions Outfall Channel and Remnant Channel HEC-RAS models are used to delineate the east and west boundaries of the proposed Zone AE floodplain, as shown in Figures 3A to 3D and Sheets 1 through 10 of the 100-Year Floodplain Maps. The HEC-RAS model outputs are included in Appendix E, and the floodplain/floodway water surface elevations are summarized in Tables 8 and 9.

Table 8: Floodplain/Floodway Summary (Outfall Channel)

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
31266	187	1191.51
31216	187	1191.56
31204	187	1191.58
31000	187	1191.59
30812	187	1191.56
30802	187	1191.48
30801	Culvert	
26495	507	1186.88
26475	507	1186.93
26200	507	1186.64
25900	507	1186.32
25600	507	1185.99
25299	507	1185.66
25195	507	1185.54
25000	507	1185.37
24700	507	1185.08
24400	507	1184.81
24081	507	1184.52
24061	507	1184.34
24052.5	Culvert	

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
23639	507	1183.75
23619	507	1183.81
23300	507	1183.52
23000	507	1183.22
22731	507	1182.93
22711	507	1182.75
22704.4	Culvert	
22635	507	1182.22
22615	507	1182.29
22500	507	1182.18
22200	507	1181.87
21900	507	1181.53
21600	507	1181.14
21326	507	1180.69
21308	507	1179.05
21275	507	1177.17
21265.8	Culvert	
21136	507	1176.89
21135	507	1176.87
21124	507	1176.87
20850	507	1176.57
20580	507	1176.25
20550	507	1174.79
20538	507	1173.87
20532	507	1173.99
20502	507	1174.27
20501	507	1174.22
20486	507	1174.25
20300	507	1174.04
20077	507	1173.77
20048	507	1172.31
20036	507	1172.24
20030	507	1172.3
20000	507	1172.49
19999	507	1172.47
19984	507	1172.49
19650	739	1172.15
19310	739	1171.65
19277	739	1171.15
19267	739	1171.28
19260	739	1171.28
19252	739	1169.47
18960	739	1168.4

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
18920	739	1165.68
18340	739	1164.95
18200	790	1165.69
17900	790	1165.43
17579	790	1165.12
17549	790	1163.17
17537	790	1162.44
17531	790	1162.59
17501	790	1163.01
17500	790	1162.96
17486	790	1163.02
17350	790	1162.89
17050	790	1162.6
16779	790	1162.35
16749	790	1160.39
16737	790	1160
16731	790	1160.12
16701	790	1160.49
16700	790	1160.45
16686	790	1160.51
16500	790	1160.36
16200	790	1160.16
15984	790	1160
15939	790	1157.69
15919	851	1158.07
15918.6	Culvert	
15742	851	1157.8
15741	851	1157.77
15731	851	1157.79
15591	851	1157.69
15561	851	1155.5
15537	851	1151.62
15531	851	1152.05
15501	851	1152.81
15500	851	1152.75
15485	851	1152.81
15300	851	1152.56
15081	851	1152.26
15046	851	1150.23
15042	851	1149.82
15000	851	1150.57
14600	851	1149.91
14300	851	1148.97

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
14255	851	1147.49
14238	851	1145.95
14225	851	1145.9
14223.6	Culvert	
14175	851	1145.46
14150	851	1145.34
14100	851	1145.38
13900	851	1145.01
13600	851	1144.5
13296	851	1143.66
13266	851	1142.3
13248	851	1141.18
13235	851	1141.15
13233.5	Culvert	
13185	851	1140.92
13175	851	1140.92
13100	851	1140.96
12900	851	1140.8
12767	851	1140.64
12736	851	1138.62
12716	851	1137.2
12710	851	1137.3
12680	851	1137.68
12679	851	1137.64
12665	851	1137.68
12450	851	1137.48
12270	851	1137.28
12240	851	1135.09
12216	851	1132.52
12210	851	1132.67
12180	851	1133.19
12179	851	1133.15
12164	851	1133.19
11900	851	1132.95
11590	851	1132.63
11560	851	1130.44
11536	851	1127.94
11530	851	1128.09
11500	851	1128.59
11499	851	1128.56
11484	851	1128.59
11300	851	1128.41
11133	851	1128.22

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
11086	851	1126
11069	851	1125.59
11063	851	1125.68
11033	851	1126.07
11032	851	1126.04
11017	851	1126.08
10800	851	1125.96
10645	851	1125.9
10599	931	1124.49
10598	Culvert	
10545	931	1120.76
10521	931	1121.75
10520	931	1121.73
10500	931	1121.73
10350	931	1121.59
10154	931	1121.41
10124	931	1119.09
10100	931	1116.66
10094	931	1116.8
10064	931	1117.35
10063	931	1117.31
10048	931	1117.36
9900	931	1117.24
9728	931	1117.06
9675	931	1114.71
9660	931	1114.26
9654	931	1114.37
9624	931	1114.85
9623	931	1114.81
9608	931	1114.86
9450	931	1114.75
9299	931	1114.67
9273	931	1113.29
9272	Culvert	
9218	931	1109.47
9194	931	1110.33
9193	931	1110.31
9183	931	1110.31
9000	931	1110.14
8863	931	1110
8809	931	1107.65
8785	931	1105.15
8779	931	1105.31

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
8749	931	1105.86
8748	931	1105.82
8733	931	1105.87
8600	931	1105.76
8437	931	1105.59
8400	931	1103.27
8376	931	1100.86
8370	931	1101
8340	931	1101.54
8339	931	1101.5
8325	931	1101.55
8150	931	1101.39
8004	931	1101.26
7970	931	1098.79
7960	931	1099.47
7958.2	Culvert	
7907.3	931	1098.01
7886	931	1098.91
7885	931	1098.88
7876	931	1098.89
7700	931	1098.72
7425	931	1098.45
7376	931	1096.11
7358	931	1094.62
7352	931	1094.77
7322	931	1095.33
7321	931	1095.29
7306	931	1095.33
7150	931	1095.19
7030	931	1095.08
7000	931	1092.76
6982	931	1091.32
6976	931	1091.46
6946	931	1092.01
6945	931	1091.97
6930	931	1092.02
6800	931	1091.91
6700	931	1091.84
6673	931	1089.3
6663	931	1089.93
6661.6	Culvert	
6570	931	1087.28
6550	931	1086.04

Table 8: Floodplain/Floodway Summary (Outfall Channel) - Continued

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain/Floodway Elevations
6200	931	1085.03
5920	931	1083.66
5902	931	1078.92
5600	931	1078.32
5400	931	1078.24
5342.1	Culvert	
5220	931	1076.46
5193	931	1076.01
5181	931	1072.87
5100	931	1072.96
4800	1073	1071.88
4748	1073	1071.81
4740	1073	1072.31
4729.5	Culvert	
4650	1073	1072.06
4600	1073	1070.57
4350	1073	1068.45
4278	1073	1068.42
4271	Culvert	
4200	1073	1067.15
4183	1073	1066.88
4168	1073	1063.88
4100	1073	1063.85
3800	1073	1062.62
3500	1073	1059.51
3200	1073	1057.99
2903	1073	1056.89
2885	1073	1052.44
2800	1073	1051.87
2500	1073	1051.49
2200	1073	1051.17
1900	1073	1050.14
1568	1073	1048.93
1552	1073	1048.58
1500	1073	1048.61
1300	1073	1048.61
1000	1073	1048.6

Table 9: Floodplain/Floodway Summary (Remnant Channel)

Note: Elevations shown are on the NAVD88 Datum.

RS	Q (cfs)	100-Year Floodplain Elevation	100-Year Floodway Elevation
4700	25	1188.39	1188.47
4589	25	1188.39	1188.46
4570.5	Culvert		
4545	25	1188.38	1188.46
4532	25	1188.38	1188.45
4514	25	1188.38	1188.45
4496.5	Culvert		
4483	25	1188.34	1188.43
4351	98	1188.27	1188.31
3982	237	1186.91	1187.40
3519	237	1186.76	1187.18
3510.5	Culvert		
3500	237	1185.07	1185.07
3313	237	1183.37	1183.45
2913	482	1181.83	1181.86
2415	482	1178.42	1178.43
2112	250	1174.55	1174.55
2081	250	1174.52	1174.52
2043	Culvert		
2010	250	1173.88	1173.87
1960	250	1173.57	1173.57
1751	250	1172.78	1172.78
1456	250	1172.02	1172.02
1426	339	1171.85	1171.85
1391.38	Culvert		
1354	339	1171.3	1171.30
1304	339	1171.08	1171.08
1216	339	1170	1170.00
1069	339	1168.98	1168.98
1034	339	1168.28	1168.28
1030	339	1166.26	1166.26
1025	339	1165.61	1165.61
1020	339	1165.75	1165.75
1000	339	1165.74	1165.74

5.9.2 Verification of Results

Since the majority of the Jackrabbit Trail Wash is to be replaced with the *Outfall Channel*, the proposed Zone "AE" floodplain would be contained within the channel banks. The Jackrabbit Trail Wash effective floodplain currently affects many properties along its alignment. With the construction of the *Outfall Channel* all of those properties will be removed from the floodplain zone.

6 Erosion and Sediment Transport

6.1 Method Description

Total sediment yield from tributary areas is from calculations using the District's DDMSW program, Beta Version 4.5.3. Refer to Appendix A for calculations. The DDMSW program calculates the wash loads using the Modified Universal Soil Loss Equation (MUSLE) and bed load using the Zeller-Fullerton equation.

6.2 Parameter Estimation

For wash load calculations, the tributary area soils information is from GIS files provided by the District. For bed load calculations, the grain size distribution from the wash sand bed samples are as follows; D84=4.0mm, D50=1.2mm, D14=0.2mm.

6.3 Modeling Considerations

Tributary wash cross section geometry is from the one-foot contour interval topography provided by Cooper Aerial. The Rational Method is used to calculate peak discharges and runoff volumes.

6.4 Problems Encountered During the Study

6.4.1 Special Problems and Solutions

No special problems or solutions are associated with erosion and sediment transport.

6.4.2 Modeling Warning and Error Messages

No warnings or error messages are associated with erosion and sediment transport.

6.5 Calibration

No special calibrations are needed for the erosion and sediment transport analysis.

6.6 Final Results

6.6.1 Erosion and Sediment Transport Analysis Results

Three in-line sediment-trapping basins are designed within the *Outfall Channel* to collect and trap sediment from tributary washes (SF07, SF08 and SF17). One drop inlet box culvert is designed to trap sediment from one of the contributing washes (SF14). The sediment basins are designed with a storage volume sufficient to accommodate the tributary sediment yield from the 100-year event. Table 10 summarizes the storage volumes.

Initially, the sediment storage calculations were obtained from the White Tanks FRS No. 3 Outfall Channel Final Design, Drainage Report (Ref. 6). The sediment storage calculations were revised as part of this CLOMR report and are included in Appendix F.

Table 10: Sediment Storage Summary

Sheet #	Sediment Basin #	Side Flow ID	Sediment Quantity, 100-Year (Acre-ft)	Sediment Storage (Acre-ft)
10	1	SF07	0.199	0.239
10	2	SF08	0.169	0.182
8	3	SF14	0.219	0.269
8	4	SF17	0.140	0.198
Total=			**0.727**	**0.888**

6.6.2 Verification of Results

Sediment transport has not been analyzed in previous studies therefore, the results cannot be compared.

7 Draft FIS Report Data

7.1 Summary of Discharges

See Tables 8 and 9 in Section 5.9 of this report for the 100-year discharges at each cross-section. Updated hydrology is included as part of this study in order to reflect current conditions and regulations.

7.2 Floodway Data

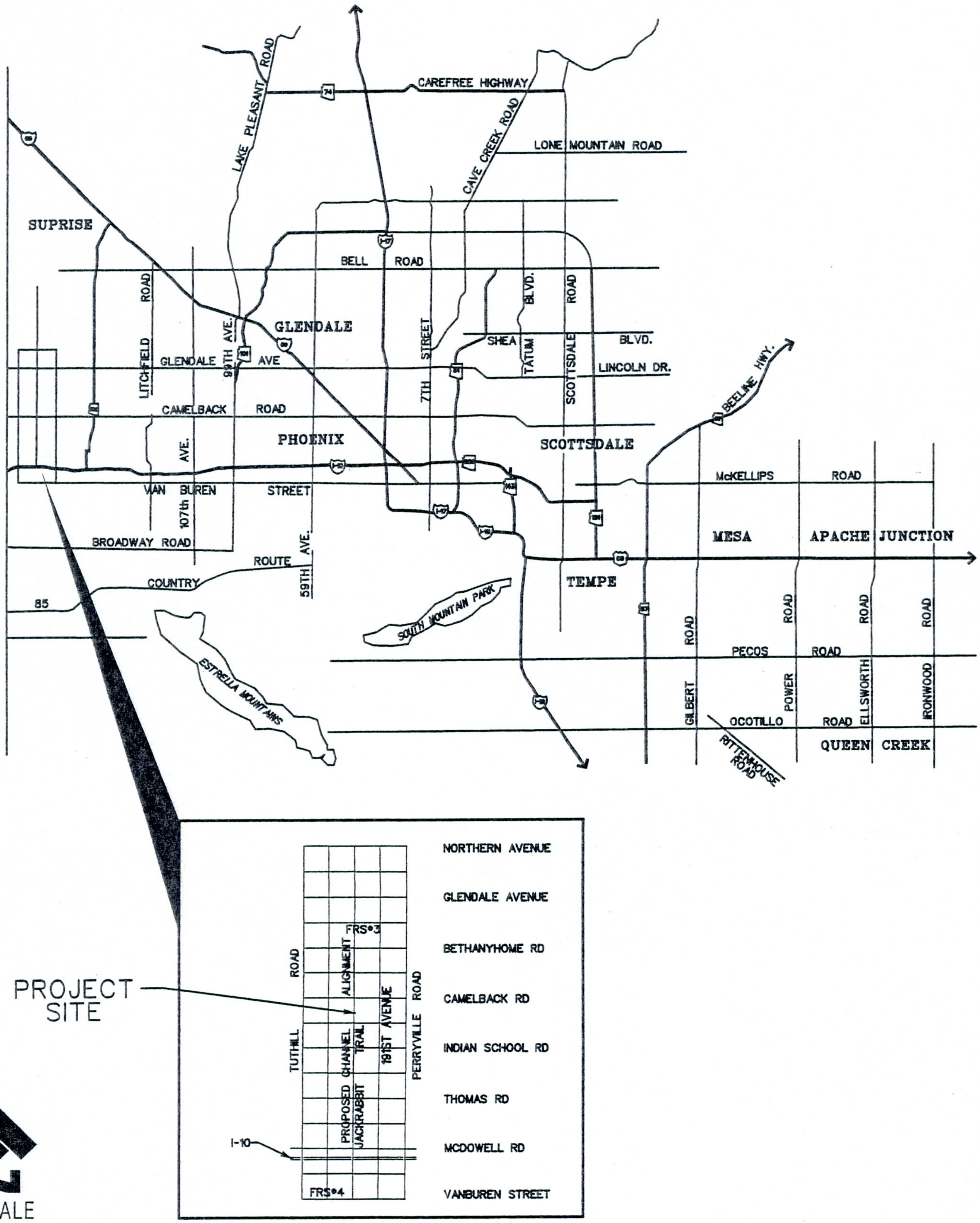
For White Tanks FRS3 Outfall Channel, the 100-year flow is contained within the channel and the floodway is set at the same boundary of the floodplain. For the remnant channel, see Table 9 in Section 5.9 of this report for the floodway data.

7.3 Annotated Flood Insurance Rate Map

The Annotated Flood Insurance Rate Maps are shown in Figure 3A to Figure 3D.

7.4 Flood Profiles

Flood profiles are provided in Appendix E.



NO SCALE

Hoskin • Ryan Consultants
creative engineering solutions

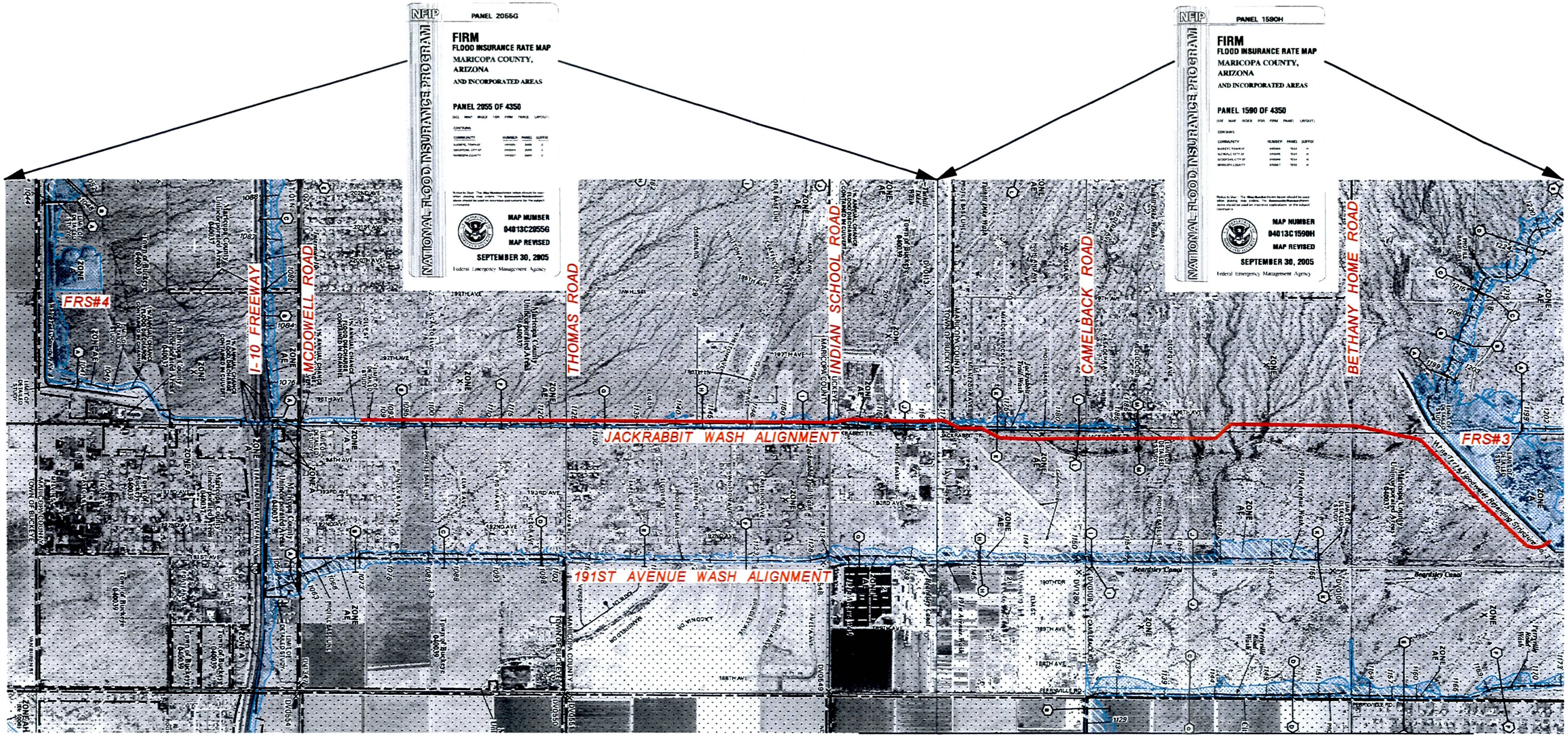
6245 N. 24th Parkway, Suite #100 Phoenix, Arizona 85016

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
VICINITY MAP

FIGURE 1

Office: (602) 252-8384 Fax: (602) 252-8385 www.hoskinryan.com

G:\Projec...\09\09-077 WT03 Final\05 - Jackrabbit CLOMR\E-FIG1.dgn
2/17/201...



SCALE: 1"=2000'

G:\Projects\09\09-077 WTOS Final\05 - Jackrabbit CLOMR\X-FIG2.dgn
2/17/2011

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LEGEND

FRS NO. 3 CHANNEL ALIGNMENT

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR EFFECTIVE FLOOD INSURANCE MAP

FIGURE 2

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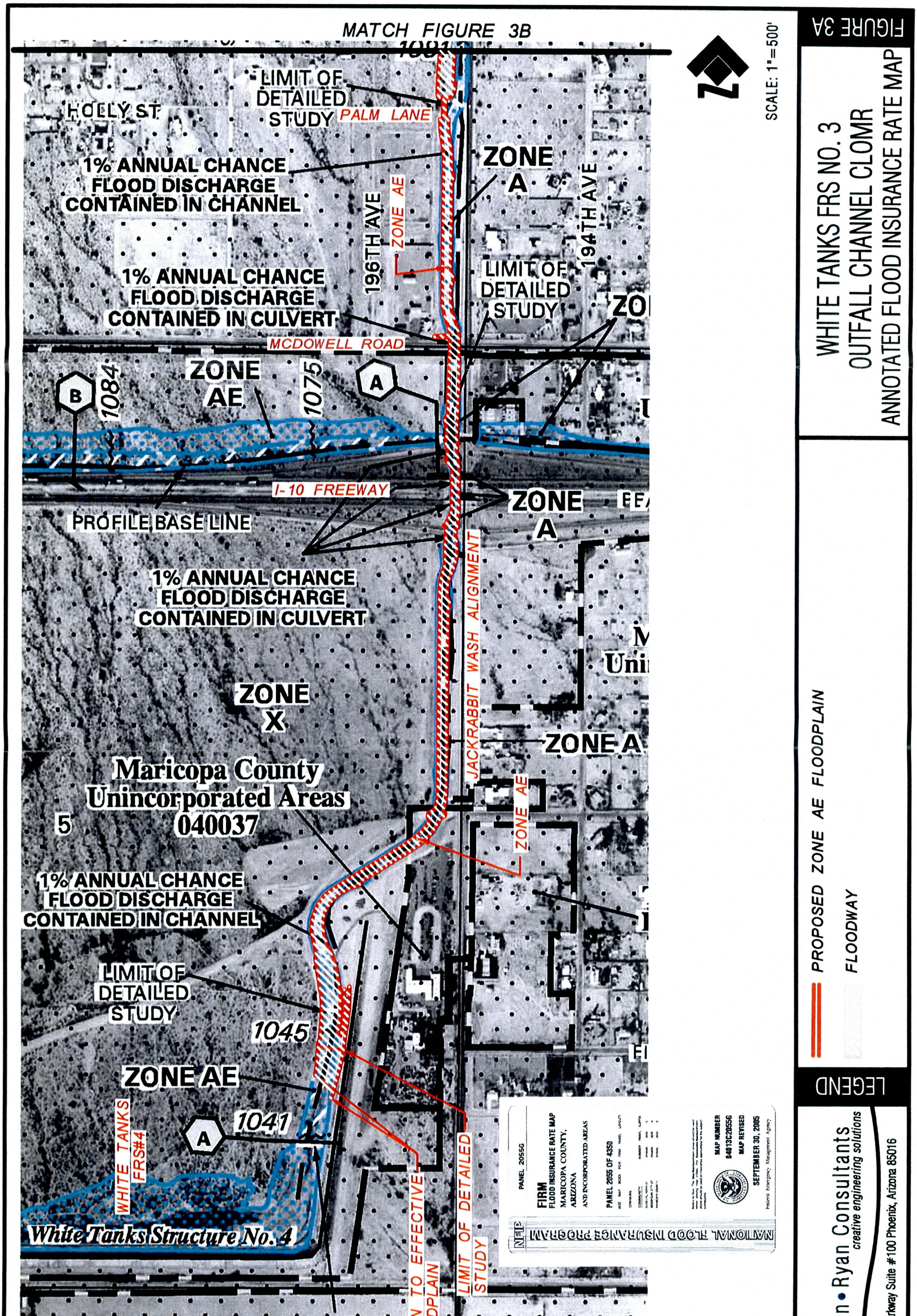

G:\Projects\09\09-077 WTOS Final\05 - Jackrabbit CLOMR\E-FIG3-A.dgn
8/17/2011

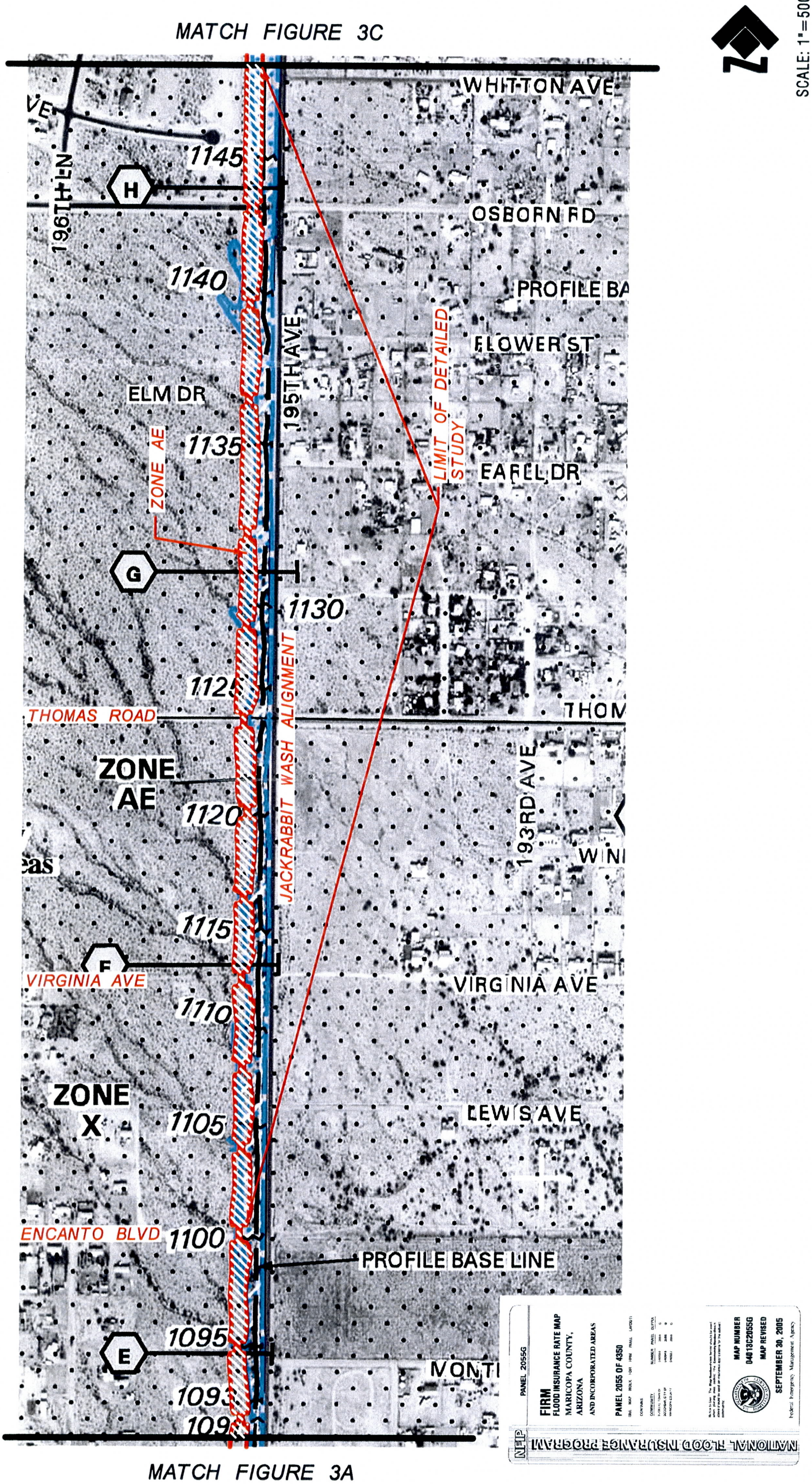

FIGURE 3B

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL CLOMR
ANNOTATED FLOOD INSURANCE RATE MAP

LEGEND

PROPOSED ZONE AE FLOODPLAIN

FLOODWAY

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G:\Projects\09\09-077 WTOS Final\05 - Jackrabbit CLOMR\Report\Digital Data for TDN\Floodplain Delineation CAD\Annotated Map 3-B.dgn
8/26/2011

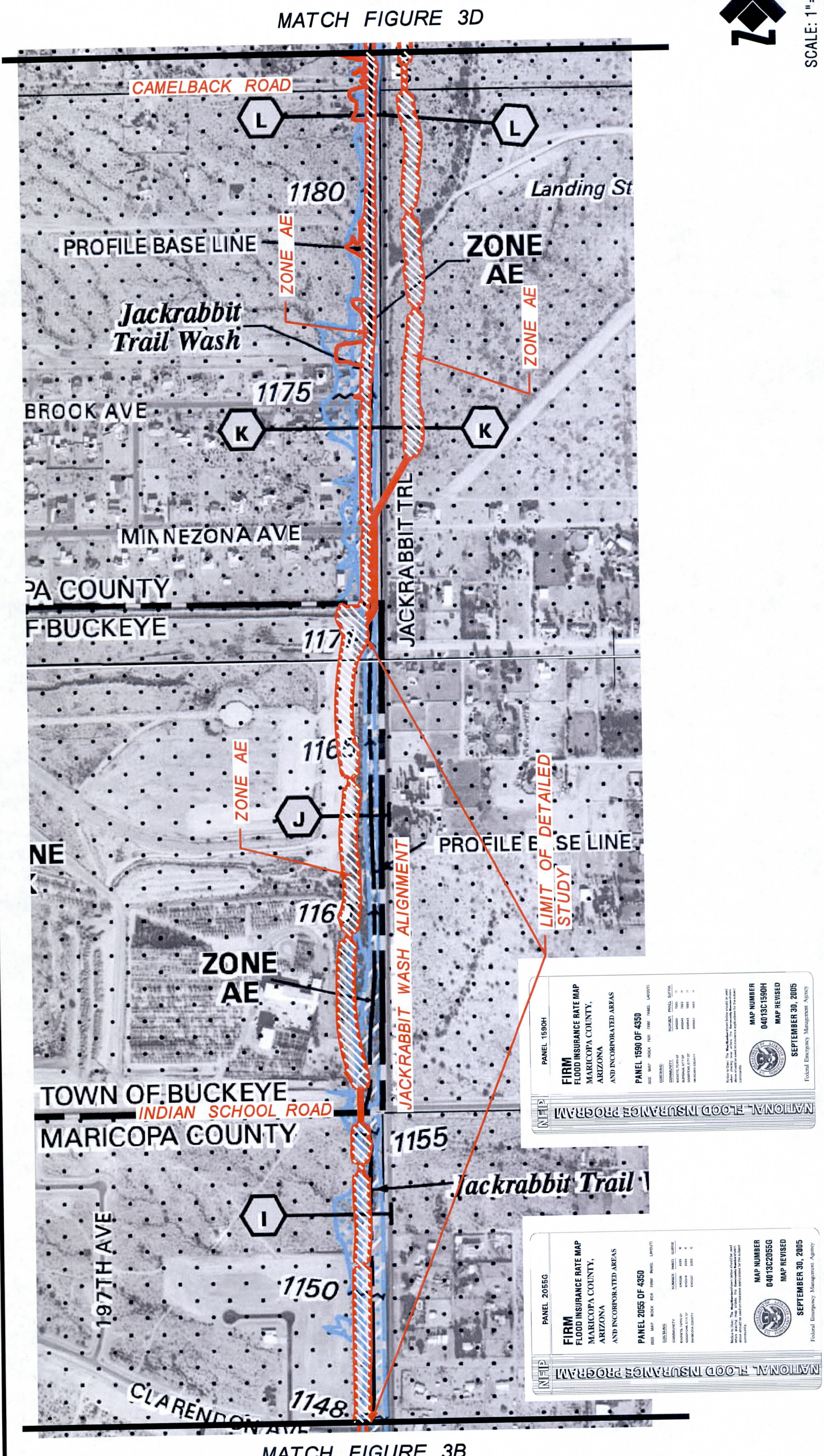

FIGURE 3C

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL CLOMR
ANNOTATED FLOOD INSURANCE RATE MAP

LEGEND

PROPOSED ZONE AE FLOODPLAIN

FLOODWAY

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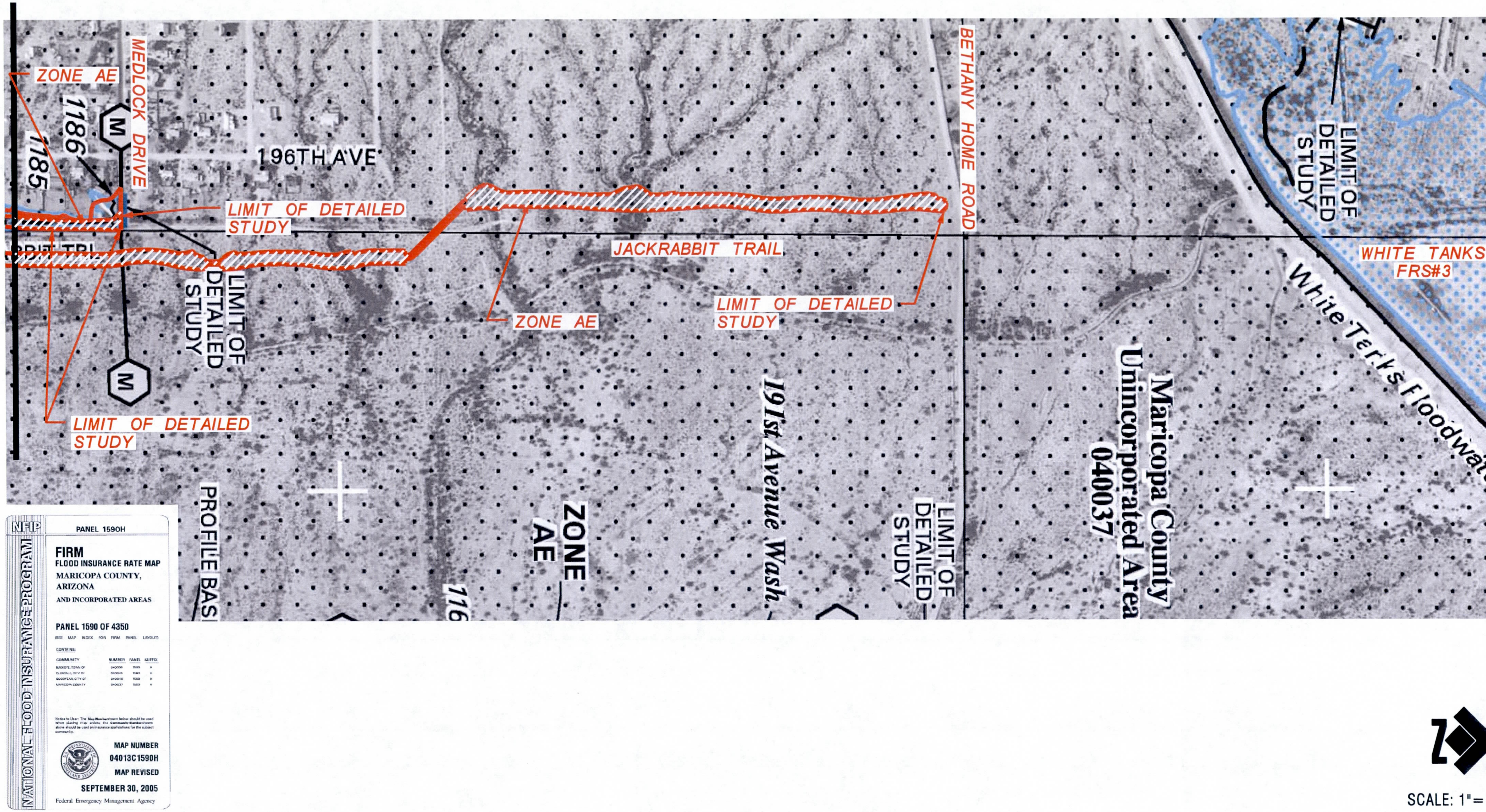
10/14/2011
G:\Projects\09\09-077 WT03 Final\05 - Jackrabbit CLOMR\Annotated Map 3-C.dgn



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LEGEND

- PROPOSED ZONE AE FLOODPLAIN
- FLOODWAY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL CLOMR
ANNOTATED FLOOD INSURANCE RATE MAP

FIGURE 3D

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G:\Projects\09\09-077 WT03 Final\05 - Jackrabbit CLOMR\Annotated Map 3-D.dgn
10/14/2011

Appendix A: References

A.1 Data Collection Summary (References)

A.2 Referenced Documents

- **A.2.1 Excerpt from *White Tanks / Agua Fria ADMS* (Ref. 9)**
- **A.2.2 Excerpt from White Tanks FRS No. 3 Outfall Channel Final Design, Drainage Report (Ref. 6)**
- **A.2.3 White Tanks FRS #3 Outlet Channel Project, Clean Water Act Section 404 Report (Ref. 17)**
- **A.2.4 White Tanks FRS No. 3 Outfall Channel Final Design, Final Construction Plans (Ref. 7)**
- **A.2.5 Excerpts from the Inflow Design Flood Hydrology for the White Tanks FRS No. 4 Rehabilitation Project (Ref. 15).**

A.1 Data Collection Summary (References)

A.1 References

1. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County Arizona, Volume I – Hydrology,* November 18, 2009.

2. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County Arizona, Volume II – Hydraulics,* Draft June 2010.

3. Federal Emergency Management Agency, *Flood Insurance Rate Map (FIRM): Maricopa County, Arizona and Unincorporated Areas, Maps Numbered 04013C1590H and 04013C2055G,* both dated September 30, 2005.

4. Hoskin Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel, 30% Design Report, FCD 2007C016*, June 30, 2009

5. Hoskin Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel, Final Design Report, FCD 2009C012*, February, 2011.

6. Hoskin Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel, Final Design, FCD 2009C012 – Drainage Report*, February, 2011.

7. Hoskin Ryan Consultants, Inc., *Final Plans for the Construction of White Tanks FRS No. 3 Outfall Channel, Final Design, PCN 470.04.32, FCD Contract No. 2009-C012,* February, 2011.

8. Hoskin Ryan Consultants, Inc., *Operations and Maintenance Manual, Construction Contract FCD 2010C031, White Tanks FRS No. 3 Outfall Channel*, PCN 470.04.32, February 7, 2011

9. The WLB Group, *White Tanks / Agua Fria Area Drainage Master Study*, prepared for Flood Control District of Maricopa County, October, 1992.

10. URS, *Loop 303 / White Tanks Area Drainage Master Plan Update,* Flood Control District of Maricopa County Contract No. 99-40, April, 2004.

11. HDR, *Loop 303 / White Tanks Area Drainage Master Plan Update Area Hydrologic Analysis* (ADMPU AHA), September 2009

12. United States Army Corps of Engineers, Hydrologic Engineering Center, *HEC-1, Version 4.1*, June 1998.

13. United States Army Corps of Engineers, Hydrologic Engineering Center, *HEC-RAS River Analysis System, Version 4.1*, January 2010.

14. Hoskin Ryan Consultants, Inc., *White Tanks FRS No. 3 Outfall Channel, FCD 2009C012 –Survey Report*, April 2010.

15. Wood, Patel and Associates, Inc., Inflow Design Flood Hydrology for the *White Tanks FRS no. 4 Rehabilitation Project,* November 2010.

16. Phillips, J.V., and Tadayon,S., 2006, Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetation and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona: U.S. Geological Survey, Scientific Investigation Report 2006-5108, 41 p.

17. Flood Control District of Maricopa County, *White Tanks FRS #3 Outfall Channel Project, Clean Water Act Section 404 Report,* June 2010.

18. Flood Control District of Maricopa County, *White Tanks FRS No.3 Outfall Channel, Maintenance Plan,* October 2010.

A.2.1 Excerpt from *White Tanks / Agua Fria ADMS (Ref. 9)*

WHITE TANKS / AGUA FRIA
AREA DRAINAGE MASTER STUDY

Part A:
Flood Study Technical Data Notebook

Prepared For:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango
Phoenix, Arizona 85009

October, 1992

Prepared by:
THE WLB GROUP, INC.
333 East Osborn Road, Suite 380
Phoenix, Arizona 85012
(602) 279-1016

B4 VERTICAL CONTROL DATUM

(NGVD29)

The vertical control is based on the NATIONAL GEODETIC VERTICAL DATUM. The following National Geodetic Survey monuments were used to establish vertical control. See the following recovery notes by the Arizona Department of Transportation.

Name of Survey Monument	Location	Elevation
BEDROCK-1	Northern Avenue, 2.5 Miles West of Beardsley Canal	1514.92
N-475	Northern Avenue, 2.5 Miles West of Beardsley Canal	1474.15
M-475	Northern Avenue, 1.8 Miles West of Beardsley Canal	1343.22
L-475	Northern Avenue, 0.7 Miles West of Beardsley Canal	1264.23
P-475	Northern Avenue, 2.5 Miles West of Beardsley Canal	1443.02

• NAVD 88

Latitude: 33°27'49" N

Longitude: 112° 28'13" W

NGVD29: 1056.65

NAVD88: 1058.64

1.99 diff. in elevation

4.5.6 Bedrock Wash - Wash 3

Bedrock Wash begins in the detention basin behind White Tanks Structure #3 and continues upstream west and northwest into the White Tank Mountains. The slope-area method was used to begin the backwater analysis at normal depth. Both the floodplain and floodway were matched into the 100-year ponding water surface elevation behind White Tanks Structure #3 as taken from the HEC-1 model. This wash flows through an earthen embankment created by Case Proving Grounds equipment at cross section X1 = 0.395. No other unique conditions exist in this reach.

4.5.7 North Fork Bedrock Wash - Wash 3A

North Fork Bedrock Wash begins at the confluence with Bedrock Wash and continues upstream west and northwest into the White Tank Mountains. The beginning water surface elevation was taken from HEC-2 analysis of Bedrock Wash where it joins the confluence with North Fork Bedrock Wash. No unique conditions or problems exist on this wash.

4.5.8 Jackrabbit Trail Wash - Wash 4

Two culvert under I-10 RS 0.76 and RS 0.85

Jackrabbit Trail Wash begins in the detention basin behind White Tanks Flood Retarding Structure #4 and continues upstream north along the west side of Jackrabbit Trail to the limit of study at Medlock Drive, approximately 1000 feet north of Camelback Road Extended. A split flow analysis was run along the length of Jackrabbit Trail to compute final discharges that would be used in the final HEC-2 analysis. This split flow analysis is included in Appendix J, Volume 11 of 15, under separate cover, for review.

The backwater analysis was started at normal depth using the slope-area method. Both the floodplain and floodway are matched into the 100-year ponding water surface elevation behind White Tanks Structure #4 as obtained from the HEC-1 model. There are a number of areas along Jackrabbit Trail where flows exceed the capacity of the channel and overtop the road. Following is a list of the areas where these flows will break out:

1. Approximately 250 CFS will break out to the east over Jackrabbit Trail from cross section X1 = 0.440 to X1 = 0.566. Break out flows then continue overland to the southeast as sheet flow. 1000' south of I-10

2. There are five 10' x 4' box culverts located underneath the eastbound off-ramp of Interstate 10 and four 12' x 4.5' box culverts are located under the westbound on-ramp of Interstate 10. A concrete lined channel connects these two culverts. There are also four 12' x 4.5' box culverts conveying flows underneath McDowell Road. Some flow will break out to the east over Jackrabbit Trail at cross section X1 = 1.159 to X1 = 1.348 upstream of McDowell Road, however these are very small amounts (less than 10 CFS). Breakout flows will then continue overland to the southeast as sheet flow.

to south of Thomas Rd.

3. Approximately 390 CFS will breakout to the east over Jackrabbit Trail from cross section X1 = 1.631 to X1 = 1.818. Break out flows continue overland to the southeast as sheet flow. The wash flows through a man-made retention basin east of the Caterpillar Proving Grounds buildings at cross sections X1 = 2.973 to X1 = 3.154.

4. Approximately 152 CFS will break out to the east over Jackrabbit Trail between cross section X1 = 4.016 and X1 = 4.152. → North of Camelback Rd

5. The last break out flow that occurs on this wash is at cross section X1 = 4.152 where 187 CFS breaks out over the top of Jackrabbit Trail.

No other unique conditions or problems exist on this reach.

4.5.9 Tuthill Dike Wash - Wash 5

Tuthill Dike Wash begins in the detention basin behind White Tanks Flood Retarding Structure #4 and continues west upstream approximately 1/2 mile to the Tuthill Road alignment, then turns north and continues along the west side of Tuthill Dike and terminates approximately 1/2 mile north of Camelback Road Extended. The backwater analysis was started at normal depth using the slope-area method behind White Tanks Flood Retarding Structure #4. Both the floodplain and floodway were then matched into the 100-year ponding water surface elevation behind White Tanks Structure #4 as obtained from the HEC-1 model.

Flow is conveyed through four 10' x 4' box culverts underneath Interstate 10. The capacity of these culverts is not sufficient to handle the flows collected at this point, and approximately 1440 CFS flows over the dike to the east.

The effective flow option was incorporated for the five cross sections upstream of the Interstate 10 culverts where there is a large ponding area in the right overbank. Actual mapped floodplain limits correspond to the calculated water surface elevation and are shown at the correct limits on the floodplain workmap. The HEC-2 model will only show the effective flood limits.

The wash flows through a man-made retention basin on the Caterpillar Proving Grounds at cross section X1 = 1.313 to X1 = 1.362. Effective flow limits are imposed to model this situation correctly. The map limits are shown on the floodplain map to correctly depict the actual ponding area. This is also the confluence with Bulldozer Wash.

The confluence of Caterpillar Wash with Tuthill Dike Wash is located at cross section X1 = 2.563 and the confluence of Tractor Wash with Tuthill Dike Wash is located at cross section X1 = 3.250.

Bedrock Wash	Drainage Area (Square Miles)	Peak Discharge (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
At White Tanks F.R.S. #3	4.93	---[1]	---[1]	1738	---[1]
At the Confluence with North Fork Bedrock Wash	3.86	---[1]	---[1]	1920	---[1]
At 1.317 miles upstream	0.63	---[1]	---[1]	520[2]	---[1]

1 Not Computed
2 Interpolated Discharge from White Tanks/Agua Fria ADMS HEC-1 Run

North Fork Bedrock Wash	Drainage Area (Square Miles)	Peak Discharge (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
At the Confluence with Bedrock Wash	3.86	---[1]	---[1]	1920	---[1]
At 0.147 miles upstream	2.1[2]	---[1]	---[1]	1560[2]	---[1]
At 1.003 miles upstream	1.78[2]	---[1]	---[1]	1362[2]	---[1]
At 1.640 miles upstream	1.47	---[1]	---[1]	1163	---[1]

1 Not Computed

Jackrabbit Trail Wash	Drainage Area (Square Miles)	Peak Discharge (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
At White Tanks F.R.S. #4	32.10	---[1]	---[1]	1093[3]	---[1]
Downstream of Interstate 10 Culverts.	17.43	---[1]	---[1]	1186[3]	---[1]
Upstream of Interstate 10 Culverts.	17.43	---[1]	---[1]	1186[3]	---[1]
Downstream of McDowell Rd. Culverts.	17.43	---[1]	---[1]	1186[3]	---[1]
Upstream of McDowell Rd. Culverts.	17.43	---[1]	---[1]	1186[3]	---[1]
At Thomas Road	2.07	---[1]	---[1]	1105[3]	---[1]
At Indian School Road	1.36	---[1]	---[1]	726[3]	---[1]
At Camelback Road	0.43	---[1]	---[1]	221[3]	---[1]
At Medlock Drive	0.22	---[1]	---[1]	187[3]	---[1]

1 Not Computed
3 Peak discharges have been derived by performing a HEC-2 split flow analysis along the Jackrabbit Trail Wash.

FLOOD STUDY
TECHNICAL DATA NOTEBOOK

for

WHITE TANKS/AGUA FRIA
AREA DRAINAGE MASTER STUDY

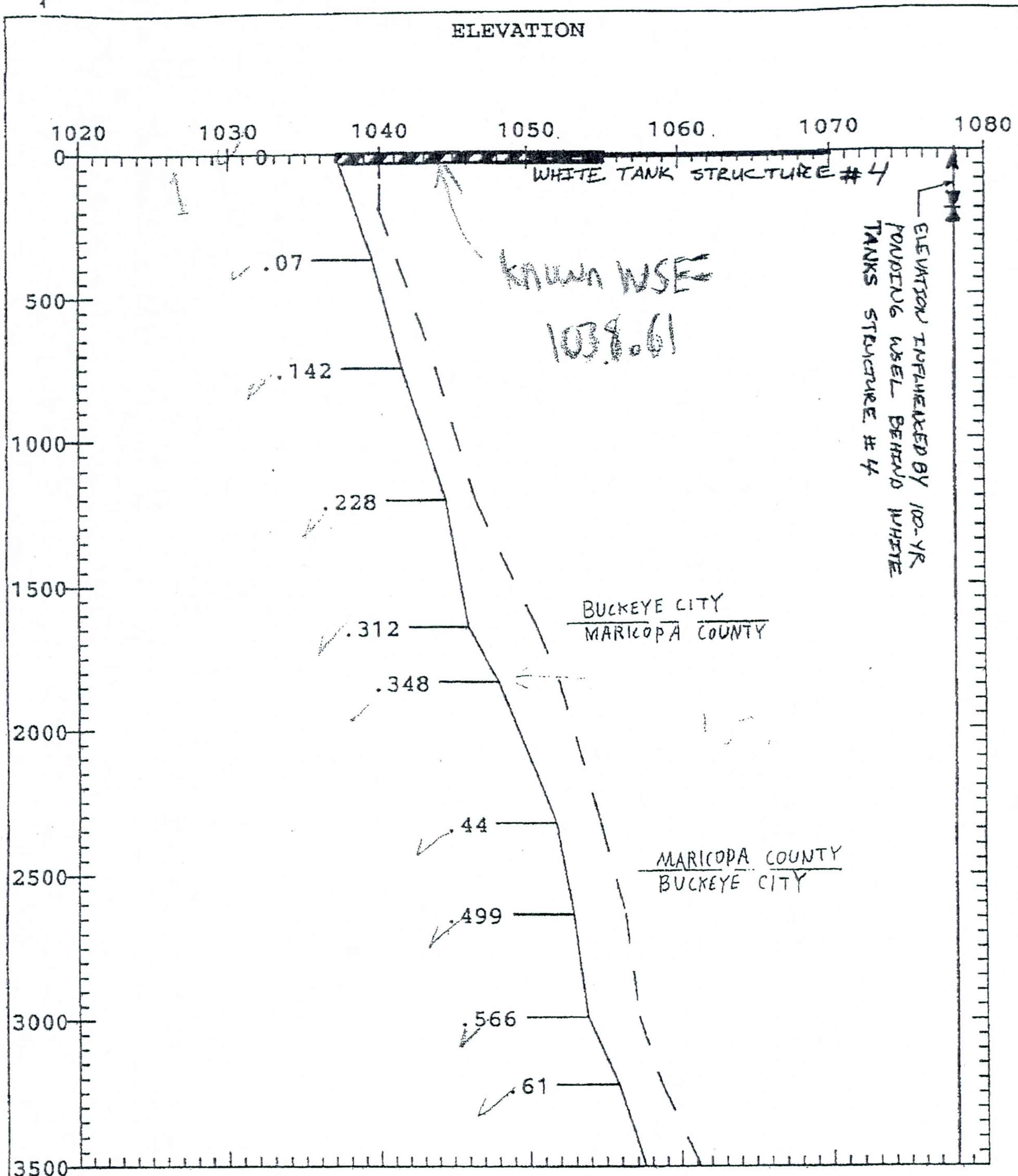
APPENDIX K
VOLUME 14 OF 15

STREAM PROFILES

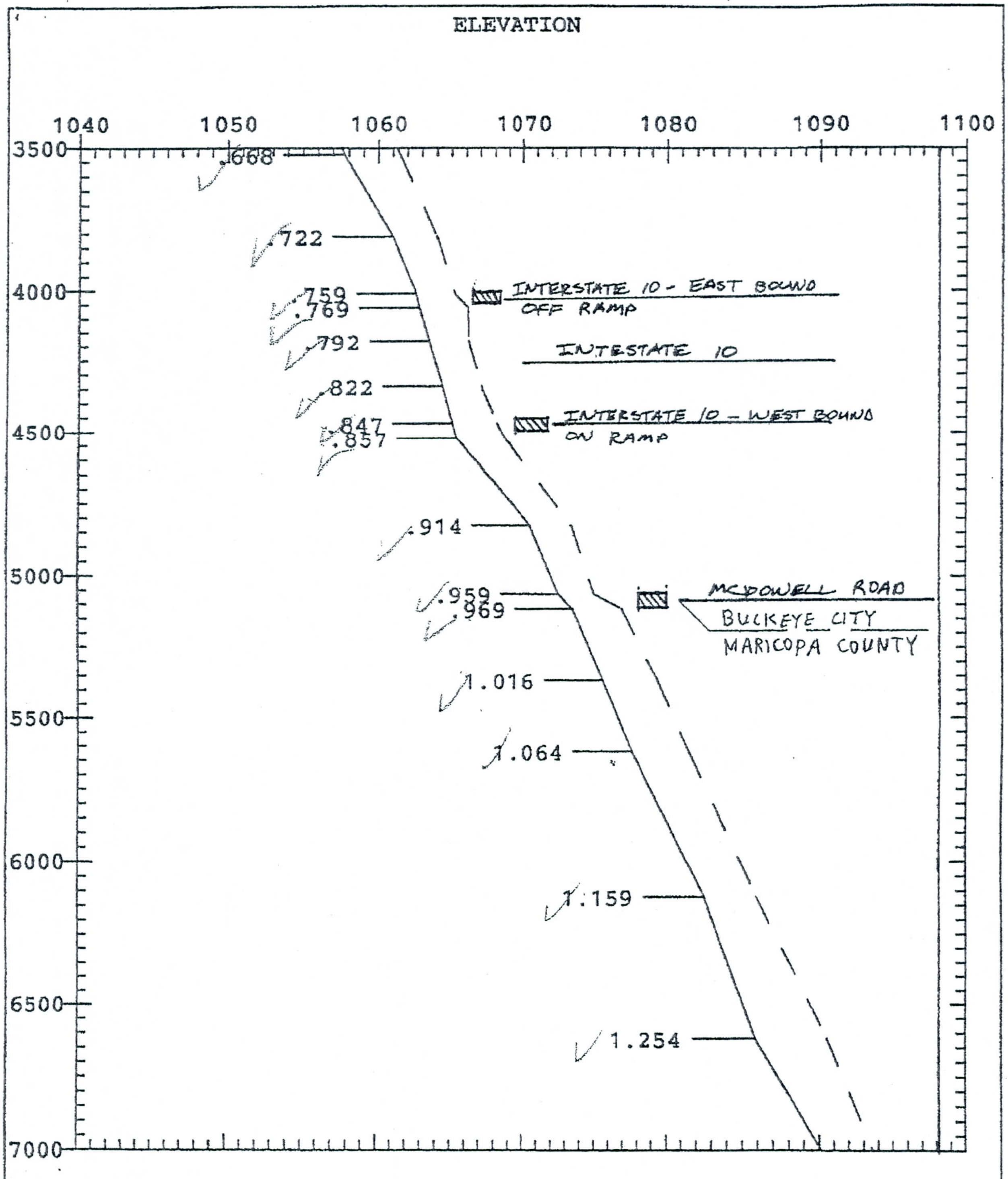
Prepared for:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Prepared by:
THE WLB GROUP, INC.
333 East Osborn Road, Suite 380
Phoenix, Arizona 85012
(602) 279-1016

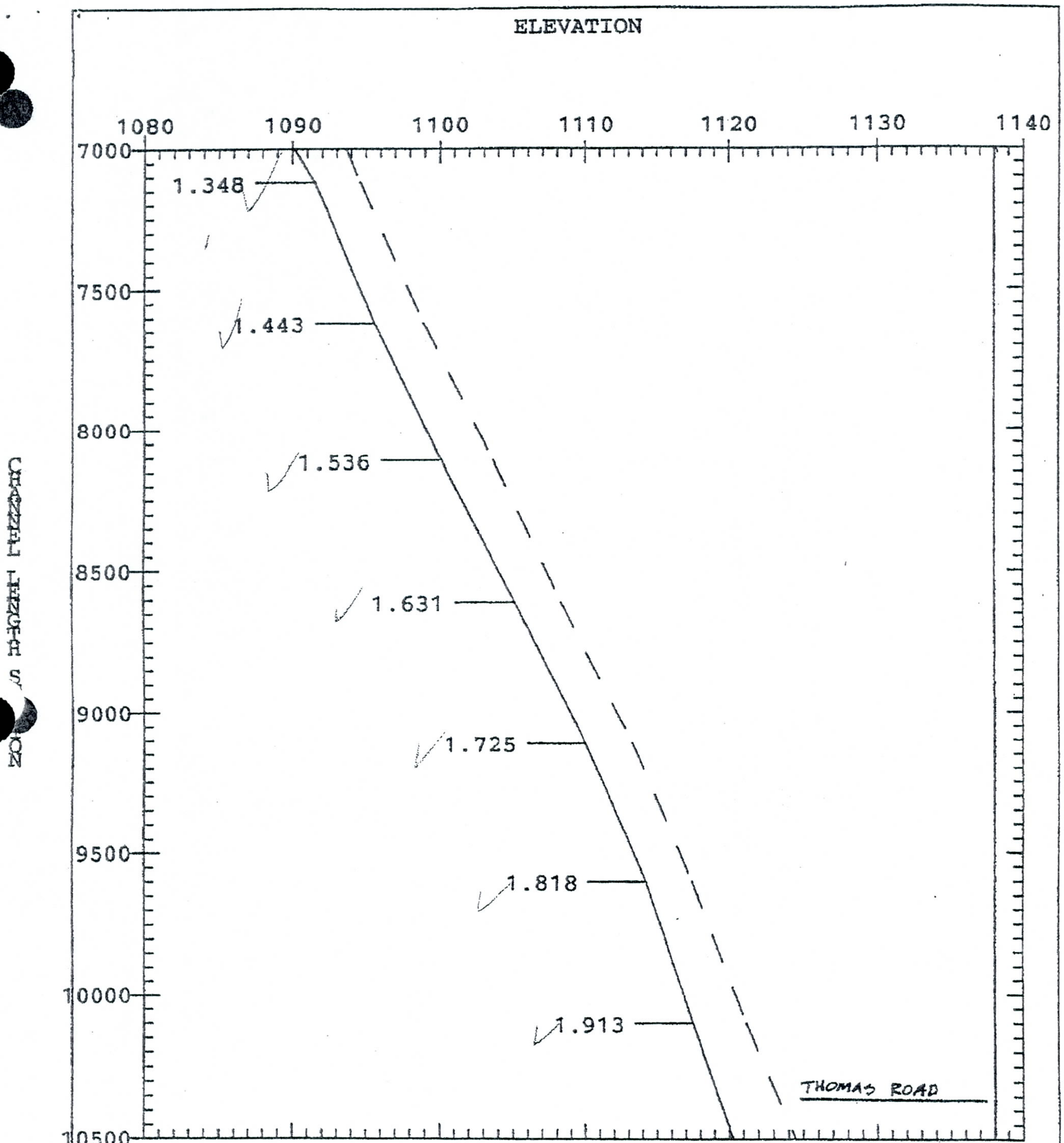
May 28, 1992



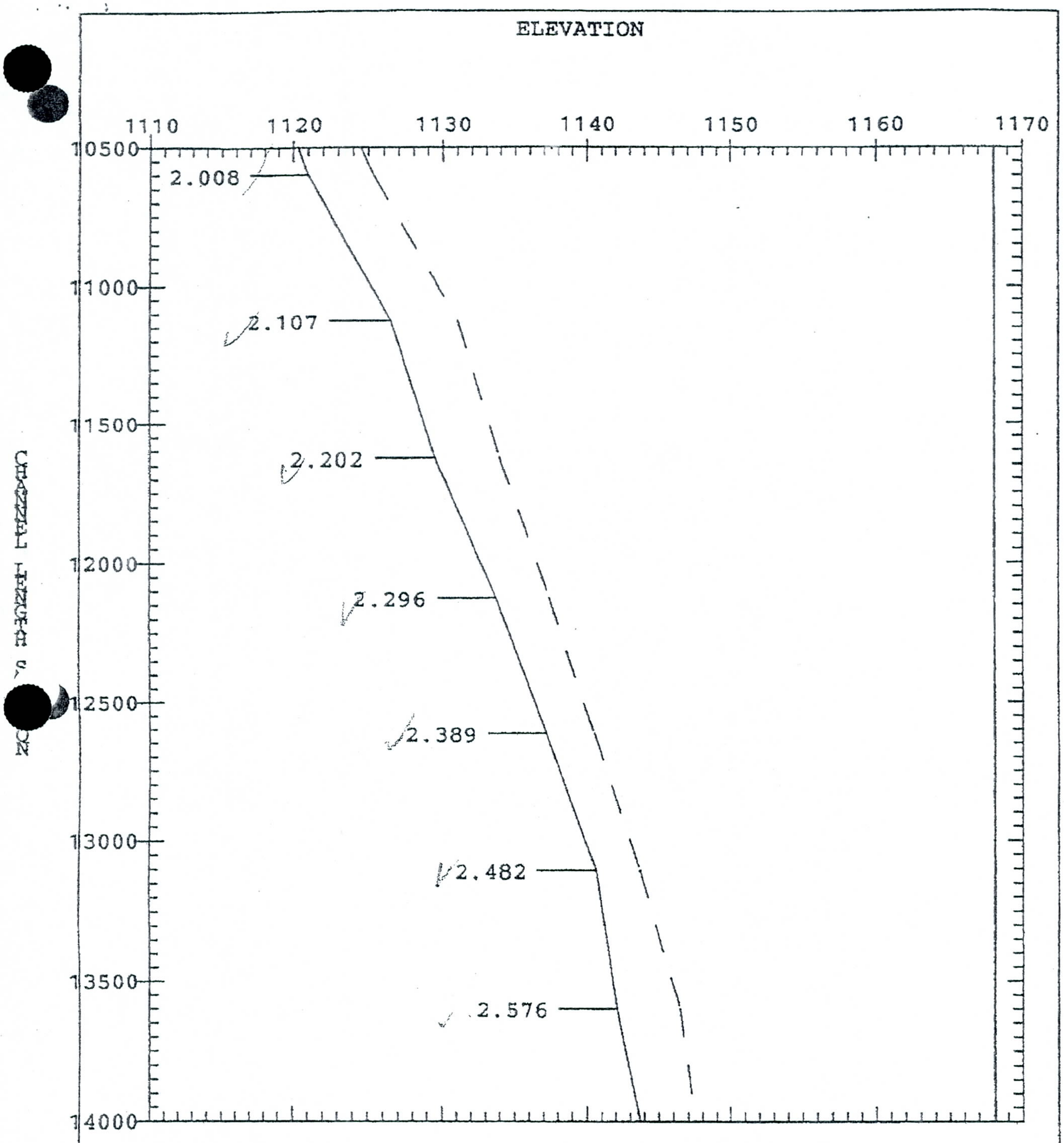
WASH 4 - JACKRABBIT TRAIL WASH



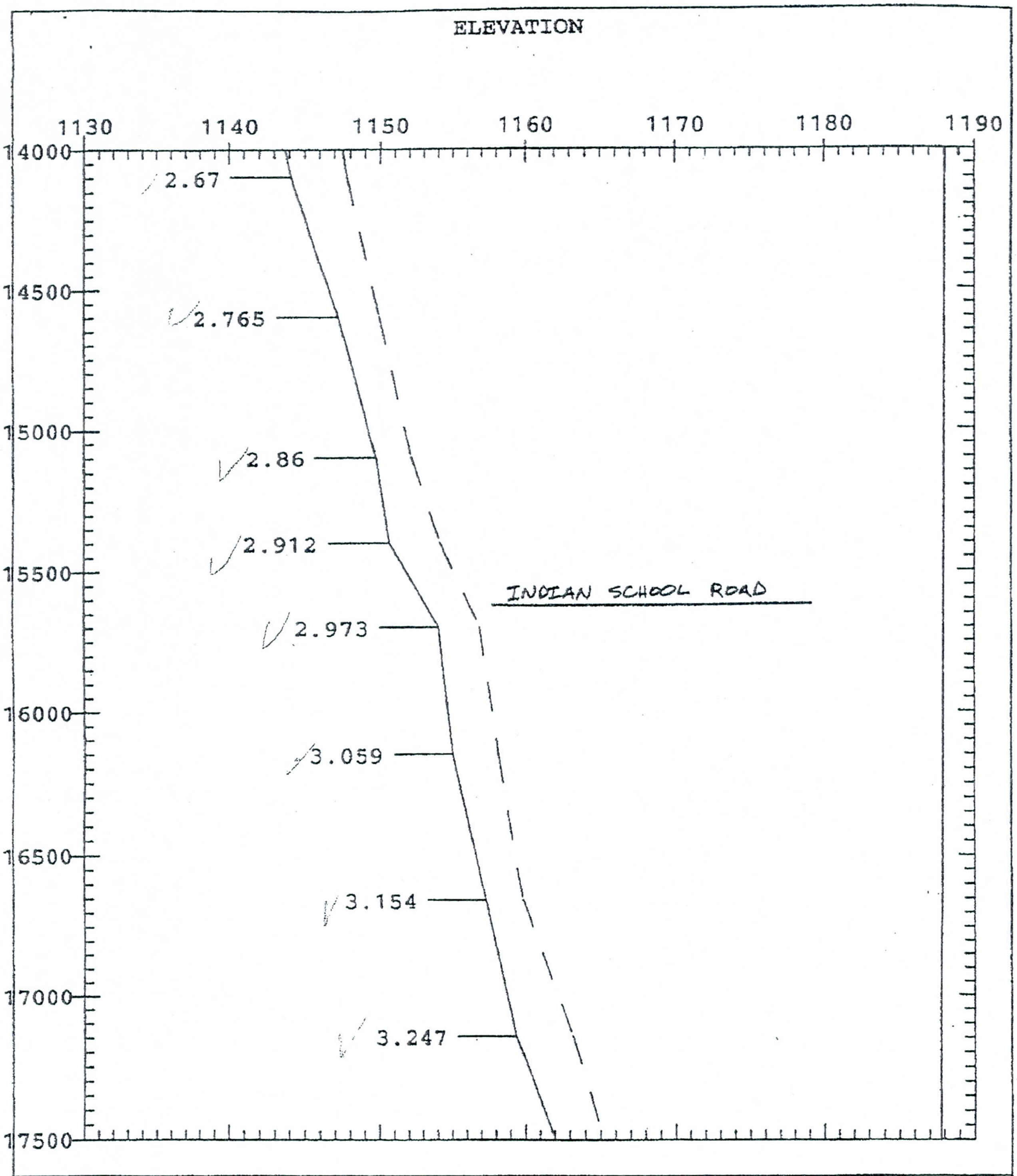
WASH 4 - JACKRABBIT TRAIL WASH



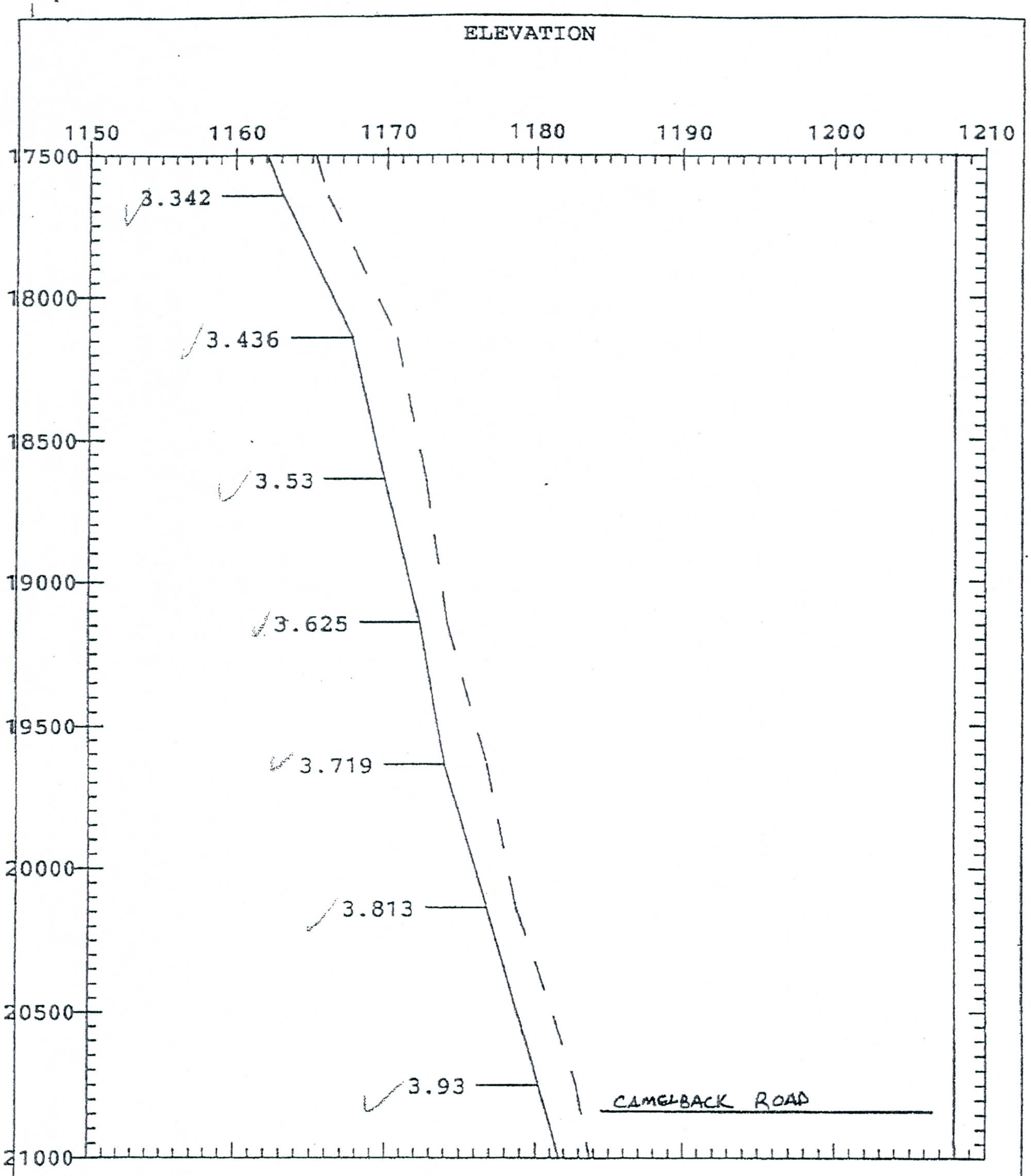
WASH 4 - JACKRABBIT TRAIL WASH



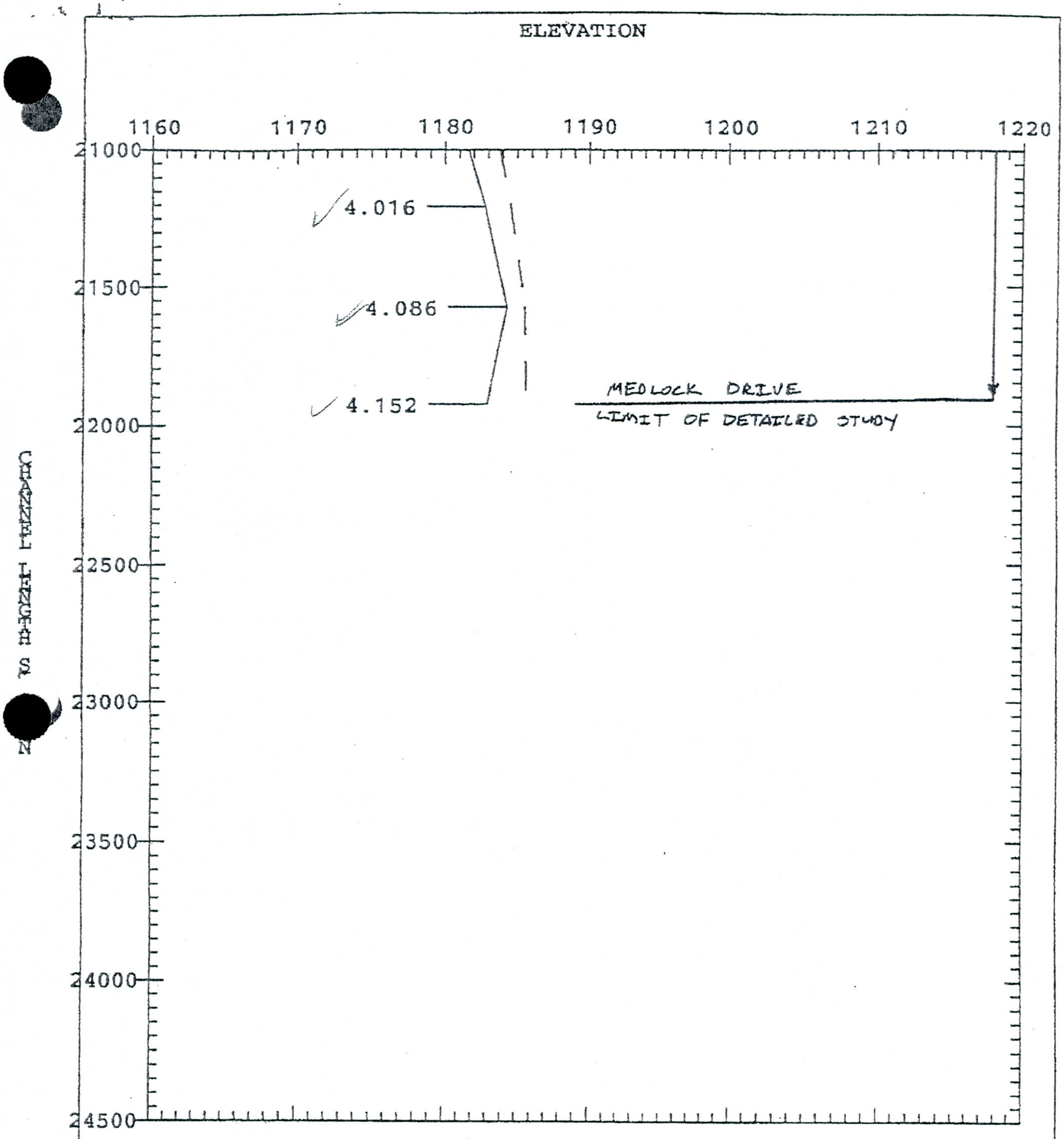
WASH 4 - JACKRABBIT TRAIL WASH



WASH 4 - JACKRABBIT TRAIL WASH



WASH 4 - JACKRABBIT TRAIL WASH



WASH 4 - JACKRABBIT TRAIL WASH

FLOOD STUDY
TECHNICAL DATA NOTEBOOK

for

WHITE TANKS/AGUA FRIA
AREA DRAINAGE MASTER STUDY

APPENDIX L
VOLUME 15 OF 15

STUDY ABSTRACTS

Prepared for:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Prepared by:
THE WLB GROUP, INC.
333 East Osborn Road, Suite 380
Phoenix, Arizona 85012
(602) 279-1016

May 28, 1992

STUDY DOCUMENTATION ABSTRACT		INITIAL STUDY [X] RESTUDY [ ] LOMR [ ] OTHER [ ]
SECTION 1: GENERAL INFORMATION		
1A	COMMUNITY	Maricopa County, Unincorporated Areas
1B	COMMUNITY NUMBER	040037, 040039
1C	COUNTY	Maricopa
1D	STATE	Arizona
1E	DATE STUDY ACCEPTED	
1F	STUDY CONTRACTOR CONTACT (S) ADDRESS PHONE	The WLB Group, Inc. Jeff Erickson or Mark Gavan 333 East Osborn Road, Suite 380 Phoenix, Arizona 85012 (602) 279-1016
1G	TECH. REVIEWER (FEMA) PHONE	Michael Baker Jr., Inc. Contact: Michelle Monde (703) 960-8800
1H	FEMA REGIONAL REVIEWER PHONE	N/A
1I	STATE REVIEWER PHONE	N/A
1J	LOCAL REVIEWER PHONE	Flood Control District of Maricopa County Contact: Greg Rodzenko (602) 506-1501
1K	RIVER OR STREAM NAME	Jackrabbit Trail Wash (Wash 4)
1L	REACH DESCRIPTION	FIRM Panel Numbers 1600 and 2055 - Wash begins at White Tanks Structure #4 and continues upstream north along the west side of Jackrabbit Trail to the Limit of Study at Medlock Drive, approximately 1000 feet north of Camelback Road Extended. Mouth - Latitude: 33° 27' 01" Longitude: 112° 28' 51" Head - Latitude: 33° 30' 41" Longitude: 112° 28' 42"
1M	STUDY TYPE	Detailed Analysis - Riverine
SECTION 2: MAPPING INFORMATION		
2A	USGS QUAD SHEET(S)	Waddell, Perryville 7.5 min.
2B	MAPPING FOR HYDRAULIC STUDY TYPE/SOURCE SCALE DATE	Topographic mapping developed for White Tanks/Agua Fria ADMS by: Cooper Aerial and Western Air Maps, Inc. 1" = 400' 12-22-89
2C	MAPPING FOR HYDRAULIC STUDY TYPE/SOURCE SCALE DATE	Topographic mapping developed for White Tanks/Agua Fria ADMS by: Cooper Aerial and Western Air Maps, Inc. 1" = 400' 12-22-89

STUDY DOCUMENTATION ABSTRACT - Jackrabbit Trail Wash (Wash 4)		
SECTION 3: HYDROLOGY		
3A	MODEL OR METHOD USED (including vendor and version description)	HEC-1 Flood Hydrograph Package, Version 4.0 from McTrans Center
3B	STORM DURATION	24-Hour
3C	HYETOGRAPH TYPE	SCS Type II
3D	FREQUENCIES DETERMINED	100-Year
3E	LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership)	Gage data is not compiled sufficiently in this area for calibration of model. Q's were compared to a number of previous studies to make sure the computed discharges were reasonable.
3F	RAINFALL AMOUNTS AND REFERENCE	4.03 in. - NOAA Atlas 2, Volume VIII
3G	UNIQUE CONDITIONS AND PROBLEMS	A split flow analysis was performed on Jackrabbit Trail to compute discharges for the final HEC-2 run. This analysis is included in this submittal for review along with the calculated discharges. (Continued)
3H	COORDINATION OF Q'S (agency, date, comments)	Flood Control District of Maricopa County - July 9, 1991 Hydrology accepted - ongoing review and comments were incorporated throughout the study.
SECTION 4: HYDRAULICS		
4A	MODEL OR METHOD USED (including vendor and version description)	HEC-2 Water Surface Profiles, Version 4.6.0, February 1991, from McTrans Center
4B	REGIME	Subcritical
4C	FREQUENCIES FOR WHICH PROFILES WERE COMPUTED	100-Year
4D	METHOD OF FLOODWAY CALCULATION	Initially methods 10.4 or 10.6 were used then floodways were smoothed using method 9.1. Floodways were calculated to provide a natural conveyance corridor and may not reach the 1.0 ft. rise in WSEL designated for floodway encroachment. This was incorporated per instructions from the Flood Control District of Maricopa County.
4E	UNIQUE CONDITIONS AND PROBLEMS	Final discharges were computed in the split flow analysis run for Jackrabbit Trail Wash and are included in this submittal for review. Begin backwater analysis at normal depth and match floodplain and floodway into 100-year ponding WSEL = 1040.07 behind White Tanks Structure #4. X1 = 0.440 to X1 = 0.566 Approximately 250 cfs will break out to the east over Jackrabbit Trail in the next three upstream cross sections. Breakout flows then continue overland to the southeast as sheet flow. X1 = 0.759 to X1 = 0.847 5 - 10' x 4' box culverts are located underneath the eastbound offramp of I-10 and 4 - 12' x 4.5' box culverts are located under the westbound onramp of I-10. A concrete lined channel connects these two culverts. (Continued)

STUDY DOCUMENTATION ABSTRACT - Jackrabbit Trail Wash (Wash 4)	
ADDITIONAL STUDY INFORMATION	
ITEM	DESCRIPTION / DISCUSSION
3G UNIQUE CONDITIONS AND PROBLEMS (Continued)	X1 = 0.000 to X1 = 0.348 Q = 1093 CFS X1 = 0.440 to X1 = 0.499 Approximately 250 CFS will breakout to the east over Jackrabbit Trail in the next three upstream cross sections. Breakout flows then continue overland to the southeast as sheet flow. Q = 963 CFS X1 = 0.566 to X1 = 1.254 Q = 1186 CFS. (This is the average discharge over the next upstream cross sections.) X1 = 1.159 Flow will breakout to the east over Jackrabbit Trail, however very small amount in the next three upstream cross sections. Breakout flows will then continue overland to the southeast as sheet flow. X1 = 1.348 to X1 = 1.725 Q = 955 CFS X1 = 1.631 Approximately 390 CFS will breakout to the east over Jackrabbit Trail for the next three upstream cross sections. Breakout flows will continue overland to the southeast as sheet flow. X1 = 1.818 to X1 = 2.482 Q = 1105 CFS X1 = 2.576 to X1 = 2.912 Q = 915 CFS X1 = 2.973 to X1 = 3.342 Q = 726 CFS X1 = 3.436 to X1 = 3.719 Q = 994 CFS X1 = 3.813 to X1 = 4.016 Q = 221 CFS X1 = 4.016 Approximately 152 CFS will breakout to the east over Jackrabbit Trail for the next three upstream cross sections. Breakout flows will then continue overland to the southeast as sheet flow. X1 = 4.086 Q = 68 CFS X1 = 4.152 Q = 187 CFS. Again, these discharges are connected to the split flow analysis run which was computed previously and this run is included for your review. See following report, Section 3: Hydrologic Analysis, for a description of conditions and unique problems encountered throughout the watershed.

STUDY DOCUMENTATION ABSTRACT - Jackrabbit Trail Wash (Wash 4)	
ADDITIONAL STUDY INFORMATION	
ITEM	DESCRIPTION / DISCUSSION
4E UNIQUE CONDITIONS AND PROBLEMS (Continued)	X1 = 0.959 to X1 = 0.969 4 - 12' x 4.5' box culverts convey flows underneath McDowell Road. X1 = 1.159 to X1 = 1.348 Flow will break out to the east over Jackrabbit Trail, however, this is a small amount in the next three upstream cross sections. Break out flows then continue overland to the southeast as sheet flow. X1 = 1.631 to X1 = 1.818 Approximately 390 cfs will break out to the east over Jackrabbit Trail for the next three upstream cross sections. Break out flows continue overland to the southeast as sheet flow. X1 = 2.973 to X1 = 3.154 Wash flows through a man-made retention basin east of the Caterpillar Proving Grounds buildings. X1 = 4.016 to X1 = 4.152 Approximately 152 cfs will break out to the east over Jackrabbit Trail for the next three upstream cross sections. Break out flows will then continue overland to the southeast as sheet flow.

KEY TO CROSS-SECTION LABELING

COMMUNITY NAME: Maricopa County, Unincorporated Area	Page 1 of 2
COUNTY: Maricopa	STATE: Arizona
PREPARED BY: The WLB Group, Inc.	
STREAM NAME: Jackrabbit Trail Wash (Wash 4)	RUN DATE: 11/25/91 12:43:07

FIELD SURVEY SECTION NO.	XS LETTER-DRAFT FIS	COMPUTER STATIONING	XS LETTER - FINAL FIS	EPA REACH NO.
		0.000		
		0.070		
		0.142		
		0.228		
		0.312		
		0.348		
		0.440		
		0.499		
		0.566		
		0.610		
		0.668		
		0.722		
		0.759		
		0.769		
		0.792		
		0.822		
		0.847		
		0.857		
		0.914		
		0.959		
		0.969		
		1.016		
		1.064		
		1.159		
		1.254		
		1.348		
		1.443		
		1.536		
		1.631		
		1.725		

KEY TO CROSS-SECTION LABELING

COMMUNITY NAME: Maricopa County, Unincorporated Area

COUNTY: Maricopa | STATE: Arizona

PREPARED BY: The WLB Group, Inc.

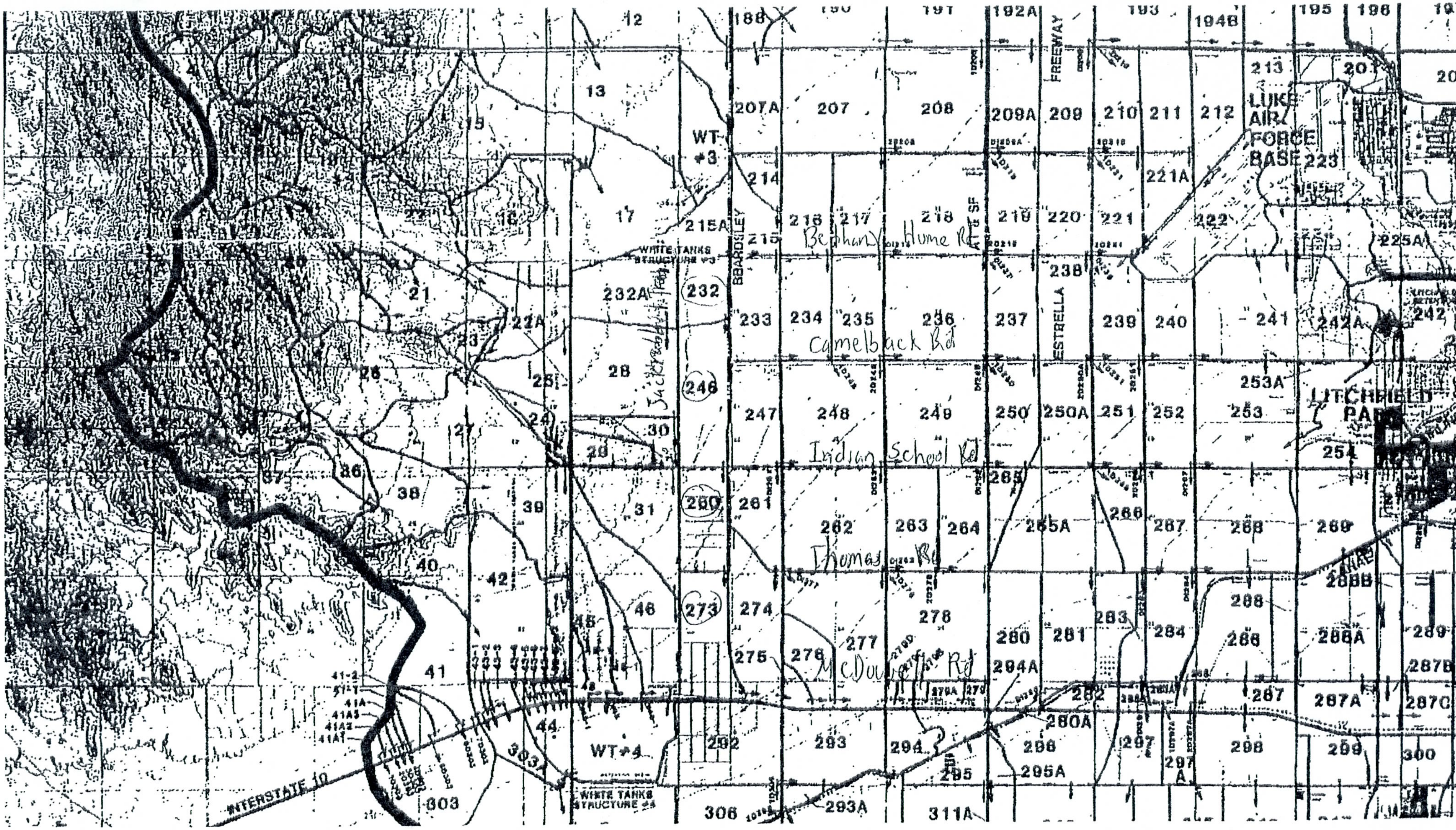
STREAM NAME: Jackrabbit Trail Wash (Wash 4) | RUN DATE: 11/25/91 12:43:07

FIELD SURVEY SECTION NO.	XS LETTER-DRAFT FIS	COMPUTER STATIONING	XS LETTER - FINAL FIS	EPA REACH NO.
		1.818		
		1.913		
		2.008		
		2.107		
		2.202		
		2.296		
		2.389		
		2.482		
		2.576		
		2.670		
		2.765		
		2.860		
		2.912		
		2.973		
		3.059		
		3.154		
		3.247		
		3.342		
		3.436		
		3.530		
		3.625		
		3.719		
		3.813		
		3.930		
		4.016		
		4.086		
		4.152		

White Tanks ADMS (WLB Group, 1997)

HEC-1 Schematic Map

Vol. 4 of 15



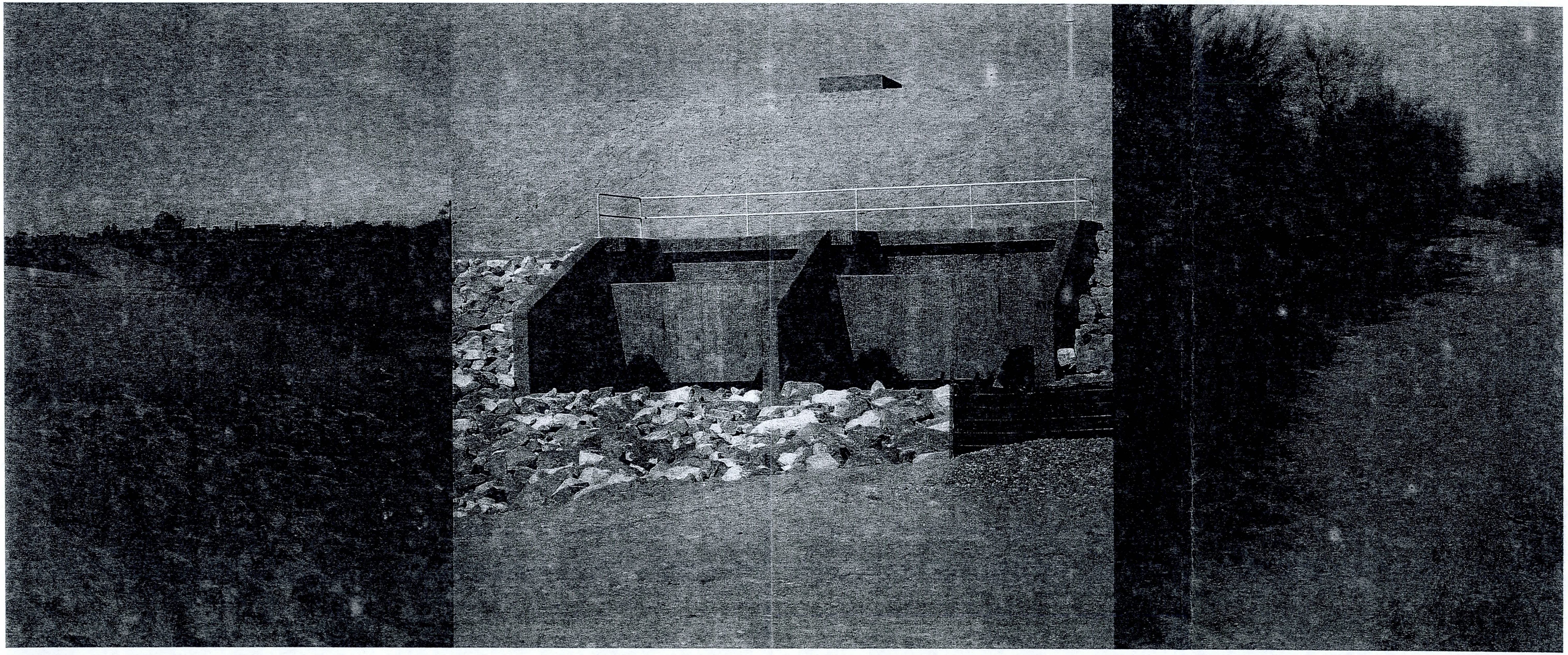
A.2.2 Excerpt from White Tanks FRS No. 3 Outfall Channel Final Design, Drainage Report (Ref. 6)

White Tanks FRS No. 3 Outfall Channel Final Design

FCD 2009C012 - FINAL DRAINAGE REPORT

Prepared for:
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009
(602) 506.1501

February 2011



Hoskin•Ryan Consultants, Inc.
creative engineering solutions
6245 N. 24th Parkway, Suite 100 • Phoenix, AZ 85016 • (602) 252.8384

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SITES Model and Tech Memo by URS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 19690
PAUL W.R. HOSKIN
Date Signed 2.7.11
ARIZONA, U.S.A.

EXPIRES 3/31/2012

3 HYDRAULICS

3.1 Soil Data and Permissible Velocity

Alpha Geotechnical and Materials, Inc., geotechnical subconsultant for this project, collected and tested 60 soil samples along the proposed channel alignment, 5 soil samples at the stockpile, and 12 soil samples within the sandy bottom of the Jackrabbit Wash (Ref.1). Test results show that the penetration resistance ranges from 8-80 blows per foot, which indicates firm or hard soil covers the project area. The grain size distribution from the laboratory tests indicates that the soil at the design depth of the channel is sandy loam and generally contains about 30% silt.

The channel was designed for Static Equilibrium conditions. Two common methods for Static Equilibrium channel design are the Permissible Velocity approach and Permissible Tractive Force approach (Refs. 5, 7). The permissible velocities recommended by ASCE Special Committee on Irrigation Research (Ref. 14) and referenced by the District's Hydraulics Manual (Ref. 9) and HDS 4 (Ref. 4) were adopted for this project. Per the recommendation (Ref. 14), the maximum permissible velocities for sandy loam and ordinary firm loam are 2.5 fps and 3.5 fps, respectively. Therefore, an average of 3.0 fps was selected as the maximum design velocity for the proposed earthen channel.

3.2 Channel Hydraulics – HEC-RAS Modeling

The HEC-RAS model (Ref. 32) was used to analyze the hydraulic performance of the proposed channel design. The HEC-RAS models cover the proposed FRS #3 outfall channel and the existing FRS # 4 inlet channel. The water surface elevation in FRS #4 reservoir during the 100-year 6-hour storm event (Ref. 40) was defined as the downstream boundary condition for the model. The HEC-RAS stationing starts with Sta 10+00 at the downstream end of FRS #4 inlet channel and increases along the channel alignment. This differs from the design stationing along Jackrabbit Trail, however, both systems are referenced with the HEC-RAS models.

It is recognized that the Manning's roughness of the channel will vary as the landscape grows and matures. Upon the completion of the construction, the Manning's roughness could be as low as 0.020. Conversely, the fully established vegetation without regular maintenance could result in a Manning's roughness as high as 0.045. Without long-term maintenance, the Manning's roughness could be increased to 0.045 or more. Three HEC-RAS models have been created as follows:

- Model 1 – Mixed Flow analysis with n=0.020
- Model 2 – Subcritical Flow analysis with n=0.035
- Model 3 – Subcritical Flow analysis with n=0.045

Model 1 is used to identify locations where hydraulic jump occurs or the velocity is higher than 3 fps. The hydraulic jumps are contained within the grade control structures, and riprap is applied where the velocity is higher than 3 fps. Model 2 is used to identify the water surface profile for the design condition. Model 3 is used to check the water surface profile and freeboard when the Manning's roughness rises to 0.045.

Cross-sections were located where geometry, roughness, or slope changes. A maximum distance of 350 feet was held between two neighboring cross-sections. Interpolated cross-sections were generated for Model 1 to identify hydraulic jumps and velocity variations.

The culvert which crosses Jackrabbit Trail between Indian School Road and Camelback Road and connects Reach 5 and 6 will be a broken-back culvert. To model the broken-back culvert in HEC-RAS, four vertical cross-sections were used along with lids to cover these sections. The culvert was also modeled using the Broken-Back Culvert Analysis Program (BCAP) (Re. 28). The BCAP results indicate that the inlet controls the upstream water surface elevation where the water surface elevation upstream is 1172.10 feet. This is close to the HEC-RAS output of 1171.60 feet at RS19620. The BCAP results also indicate a hydraulic jump occurs within the culvert. This helps dissipate energy before reaching the downstream dissipater basin. The BCAP results are included in Appendix B.

For culverts without drop inlets, the upstream water surface elevations are impacted by the shape of the entrance. To reduce entrance energy losses, all new culverts have a beveled top edge. An entrance loss coefficient of 0.2 was applied to all new culverts (Ref. 5), whereas an entrance loss coefficient of 0.5 was applied for existing culverts at Pasqualetti Mountain Ranch.

Manning's roughnesses were selected as follows:

- 0.015 for concrete channel
- 0.020 for newly constructed earthen channel
- 0.035 for earthen channel with proposed landscape
- 0.045 for earthen channel with overgrown landscape vegetation
- 0.035 for riprap
- 0.013 for concrete culverts, and a combination of CIPP pipes (0.014) and HDPE pipes (0.012)
- 0.014 for two long culverts crossing Jackrabbit Trail, to account for bend loss (Refs. 19, 20)

A Manning's roughness of 0.013 was selected for the combination of CIPP and HDPE pipes at Reach 9. Per the ADOT manual, the Manning's roughness are 0.014 and 0.012 for CIPP and HDPE, respectively, which justifies the selection of 0.013 for the combination.

A Manning's roughness of 0.035 was selected for the proposed earthen channel design and the landscape has been designed to meet the roughness requirements. Per Tables 2 and 3 of the *USGS Guidelines on Manning's Roughness* (Ref. 26), the base value of Manning's 'n' for a earthen channel is 0.020, and an adjustment of 0.015 is appropriate when trees block flow by approximately 10 percent. In the landscape design, each clump of trees will block approximately 10 percent of the flow when fully established, and the distance between two clumps is designed to be greater than three cross-section lengths to avoid the overlapping of spheres of influence.

The design discharge for Reach 9 is 285 cfs. This flow of 285 cfs combines with two major wash inflows from the west at Reach 8, resulting a combined flow of 700 cfs at the downstream end of Reach 8. To reflect the discharge variation within Reach 8, the flow rate is prorated to be 300 cfs upstream, 500 cfs downstream of the first wash, and 700 cfs downstream of the second wash (Appendix B).

The required freeboard was calculated using the equation in the *Hydraulic Manual* (Ref. 10) (Appendix B). The results indicate that sufficient freeboard has been provided for the channel with a Manning's 'n' from 0.020 to 0.045.

3.3 Reach 9 Design

One 78-inch and one 66-inch pipes are selected to convey the PMF peak flow of 285 cfs through Reach 9. This pair of pipes was proposed as a savings in the cost of HDPE pipes by nesting two pipes during transportation. Unlike the 48-inch conduit of the Primary Spillway, which requires a headwater depth of 16 feet at the inlet to convey the peak flow of 285 cfs (Appendix A), the pipe system of HDPE/CIPP combination is outlet controlled and only requires a headwater depth of 5.6 feet at the inlet. A freeboard of 1.4 feet, which is adequate, is provided upstream of the pipes.

A side weir is proposed at the left headwall of the impact basin extension. The crest of the weir is at an elevation of 1193.1 feet while the water surface elevation is 1992.8 feet. Under some emergency conditions such as the the pipes being blocked, the weir will direct flow to the wasteway.

Per the FRS3 Phase I design report (Refs. 33, 34), the capacity of the Pricinpal Spillway is basically controlled by the difference of the water surface elevation in the reservoir and the tailwater downstream of the 48-inch conduit. The tailwater is set at the the crown of the 48-inch conduit outlet, i.e. 1194.0 feet. If the water surface elevation downstream of the impact basin is higher than 1194.0 feet, then the capacity of the Principal Spillway will be reduced and the release from the Dam will be impacted. Per the HEC-RAS models, the water surface elevation downstream of the impact basin is 1192.89 feet, which is below the crown of the 48-inch conduit. Therefore, the proposed 66-inch and 78-inch pipes will not create a tailwater condition that will negatively impact the capacity of the Principal Spillway. More detailed information regarding the tailwater condition at the impact basin is located in Appendix B.

The riprap at the impact basin outlet is sized to be 20-inches (D50) to match the existing riprap, and the calculations are provided in Appnedix F.

3.4 Channel Hydraulics – Trashrack Headloss

Per the County Policy and Standard Manual (Ref. 11), it is required to install trashrack and access barrier at culverts that are bent and the opposite end cannot been clearly seen. Therefore, trashracks are proposed at Culvert #6 and Culvert #10. The headloss at trashracks were calculated assuming 50% clogged, according to the District Hydraulic Manual (Ref. 9). In the calculation, a trial approaching depth upstream of trashrack was first assumed to estimate the clogging headloss, and then the estimated headloss was used to verify the assumed approaching flow depth. The results indicate that upstream approaching flow depths at both culverts will be less than 7 feet, and a minimum freeboard of 1 foot is still available when the trashracks are 50% clogged. The calculations are included in Appendix B.

3.5 Sedimentation Analysis

The sediment yield from tributary areas was calculated using the District's DDMSW program (Beta Version 4.5.3) (Ref. 25). The DDMSW program calculates wash load using the Modified Universal Soil Loss Equation (MUSLE) method and bed load using the Zeller-Fullerton equation, as documented in the District's *River Mechanics Manual* (Ref. 13). For wash load calculations, the tributary area soils information was obtained from GIS files provided by the District (Ref. 12). For bed load calculations, the grain size distribution from the wash sand bed samples (D84=4.0mm, D50=1.2mm, and D14=0.2mm) (Ref. 1) was used. Tributary wash cross-section geometry was obtained from the one-foot contour interval topography provided by Cooper Aerial (Ref. 3). The Rational Method was used to calculate peak discharges and runoff volumes (see Section 2.8). A comparison to the HEC-1 output indicates that the Rational Method overestimates the runoff volume for large tributary areas. An adjustment factor of 0.8 was found to be appropriate and was applied to the runoff volumes from large tributary areas (Appendix C).

It should be noted that the slope lengths and percent slopes for the sediment yield calculations are different from those used for the Rational Method calculations. For the Rational Method calculations, the slope lengths and percent slopes were measured from the longest flow path. For the sediment yield calculations, the slope lengths usually refer to the travel distance of sheet flow and are required to be less than 400 feet. In this project, the slope lengths were set to be 300 feet. The percent slope for the sediment yield calculation was measured from the upstream sheet flow area, not from the longest flow path.

Four tributary washes, SF07, SF08, SF14, and SF17 (Figure C.1 and C.2 in Appendix C), were identified to be major sediment contributors. Two in-line basins will be located within Reach 8 to collect and trap sediment from SF07 and SF08. One sediment-trapping basin is located at the north end of Reach 5 to collect and trap sediment from SF17. One in-line basin will collect and trap sediment from SF14, and two 48-inch pipes downstream of the basin will divert flow across Jackrabbit Trail to Reach 6. The crest of the culvert drop inlet was set one (1) foot above the existing channel bottom. The diversion calculations are included in Appendix G.

Each sediment basin was designed with a storage volume sufficient to accommodate the tributary sediment yield from the 100-year event. Storage volume calculations are provided in Appendix C. The flow velocities at the tributary washes and sediment basins were also checked to ensure a significant velocity reduction at the basins.

3.6 Emergency Spillway Scour Analysis and Erosion Protection

One 66-inch and one 78-inch pipes will cross under the Emergency Spillway, which is currently under construction as a part of the Phase 2 Remediation (Ref. 37). A scour analysis was conducted for this crossing and the SITES (Ref. 38) model was updated by URS (Ref. 35). The general scour depth was analyzed using Blench's equation (Ref. 13) and the PMF discharge of 26,838 cfs was used (Ref.35). The bedform scour depth was calculated using the equation DDMS18 (Ref. 13) and the anti-dune height equation (Ref. 13).

The low flow scour was estimated to be one foot. The local scour depth downstream of the pipe crossing were calculated using the Zimmerman and Maniak equation (Ref. 13). In compliance with ADWR's requirement, two ways were used to estimate the total scour depth. The first one is to estimate the local scour depth with the average particle size D85 and to estimate the total scour depth with a safety factor of 1.3. The second one is to estimate the local scour depth with the minimum particle size D85 and to estimate the total scour depth with a safety factor of 1.0. The greater one of two results was selected for the erosion protection design. Three soil test pits were developed for this project at the emergency spillway, and the average and minimum D85 are 5.0 mm and 4.76 mm, respectively. The calculations are included in Appendix D, and the total scour depth is estimated to be 14.1 feet.

URS had conducted the same calculations with soil test results for the FRS#3 Remediation Project (Appendix D). Their calculations indicated a total scour depth of 19.6 feet, which resulted from a smaller minimum D85 of 0.2 mm.

To be conservative, the total scour depth of 20 feet was used for the erosion protection at the pipe crossing. The erosion measures include the upstream and downstream launchable apron and the toe protection for dikes. The launchable apron, with 7 feet thick riprap of D50=20 inches, extends 16 feet upstream and 40 feet downstream of the CIPP crossing. The dimensions were sized by the District and followed the District's Hydraulic Manual (Ref. 9). The calculations can be found in Appendix D. The toe protection for dikes are designed to the total scour depth, and riprap sizes are in compliance with the URS design. A slurry backfill and cap was selected to protect the pipes and reduce the impact of buoyancy.

3.7 Stepped Spillway Design

Stepped spillways were designed to receive flows from ten major tributary washes whose 100-year peak flows are more than 60 cfs. A riprap stilling basin was proposed immediate downstream of steps to dissipate flow energy.

Per the reference studies, two types of flow regime occur at a stepped spillway: Nappe-Flow during low discharges, and Skimming Flow during high discharges (Ref. 2, 16, 27). The side inlet structures were designed for skimming flow conditions, with the 100-year discharges. The fluid friction coefficient from Rajaratnam's study (Ref. 27) was selected to estimate the friction between skimming flow and recirculating flow trapped between steps. Calculations were conducted for typical steps with a ratio of 2.0 for horizontal length over height (Appendix E).

To identify the locations of hydraulic jump along the spillway, a momentum equation was established with some assumptions (Appendix E). Once hydraulic jump locations were identified, the stilling basin upstream flow depths were determined, as well as flow velocities within the stilling basins. Based on the estimated velocities, the ripraps within the stilling basins were sized to be 0.28 foot, however, riprap with a D50 of 18-inches was selected to protect against uncertain erosions. The lengths of the stilling basins were set to be equal to the hydraulic jump lengths which were estimated according to HEC-14 (Ref. 6). The stepped spillway calculations are included in Appendix E and riprap sizing is included in Appendix F.

3.8 Structure Seepage Analysis and Cut-Off Wall Design

The computed scour depth at box culverts and downstream of grade control structures was used to identify the design depth for cut-off walls (Appendix F). The scour depths are calculated to be less than five (5) feet and cut-off walls of four (4) and six (6) feet are typically used at the upstream and downstream ends of the structures.

Lane's Weighted-Creep method (Ref. 9) was used to analyze the seepage potential and piping risk along structure foundations. The calculations provided in Appendix F indicate that the 4-foot and 6-foot cut-off walls will effectively prevent potential seepage flow under the box culverts and grade control structures, however deeper cut-off walls are required for stepped spillways.

3.9 Diversion at Litchfield Heights

Flow which approaches Jackrabbit Trail from the west within an existing drainage path through the Litchfield Heights development (Reach 6) will be conveyed across Jackrabbit Trail to the channel via two 48-inch pipes. Flow split calculations were performed to determine the amount of flow that will be diverted through the culvert, versus flow that will continue south within the existing channel along the west side of Jackrabbit Trail. The capacities of the pipes and the existing channel at various water surface elevations were calculated and presented in Appendix G. The drop inlet structure on the box culvert was sized such that when a 100-year peak flow of 556 cfs approaches, 256 cfs will be diverted east across Jackrabbit Trail to the proposed channel, and the remaining flow of 300 cfs will continue to the south, fully contained within the existing channel.

3.10 Wasteway Flows to Beardsley Canal and Wash

One of the two Principal Spillway pipes (east pipe), i.e. the gated outlet, will remain for use as an emergency wasteway. This wasteway will only be used if the operation of FRS#4 does not allow a discharge or if construction of the outfall channel is incomplete.

The inundation effects from the wasteway outflow were analyzed and mapped (Figure 4). The wasteway discharge of 221 cfs from the gated outlet occurs when the water surface elevation in the FRS#3 reservoir reaches the crest of the emergency spillway, i.e. 1,212 feet (NAVD 88) (Appendix A). Under this condition, no flow will be discharged from the emergency spillway, and the downstream flood inundation will be dominated by the discharge of 221 cfs.

The flow depths from the normal depth calculations were used to identify the inundation area along the wasteway between the impact basin and Beardsley Wash. The flow depths for a typical wasteway cross-sections with 14-feet bottom width and 2.5-10:1 side slopes vary from 1.9 feet to 2.5 feet. The inundation along the wasteway was identified based on the estimated flow depth range and the proposed grading at along the wasteway. The normal depth calculation and the inundation are included in Appendix H.

A steady flow HEC-RAS model was prepared for the inundation along Beardsley Wash. Cross-section geometries were obtained from the one-foot aerial mapping prepared by Cooper Aerial in December 2009. Cross-sections were located along the wash every 200 feet, except at the Beardsley Canal overchute and where trails cross the wash. Ineffective flow areas were identified at some cross-sections where water can pond. Due to the density of the existing vegetation, a Manning's 'n' roughness coefficient of 0.045 was chosen for the entire wash along the Beardsley Canal. The justification of Manning's 'n' selection is provided in Appendix H.

The HEC-RAS model output is also included in Appendix H. Results from the normal depth calculations and the HEC-RAS model were used to delineate the inundation area shown in Figure 4. The potential flood inundation area occurs along the west side of the Beardsley Canal, southward toward an overchute that is located south of Bethany Home Road.

3.11 Riprap Sizing

Riprap sizing is according to the *River Mechanics Manual* (Ref. 13) and HEC-14 (Ref. 6). Three sizes are selected, D50= 9 inches, 18 inches and 20 inches.

Riprap of D50=9 inches is applied at grade control structures, culverts, the stilling basins of stepped spillways, the storm drain oulet collecting off-site drainage, and the impact basin at Reach 9.

Riprap of D50=18 inches is applied at the stiling basins of stepped spillway and the slope of the silt basin at Station 244+00.

Riprap of D50=20 inches is applied at the emergency spillway to protect the CIPP pipe crossing.

The calculations are provided in Appendix F.

APPENDIX C – SEDIMENTATION ANALYSIS

C.1 MAPS OF TRIBURATY BASINS AND WASHES

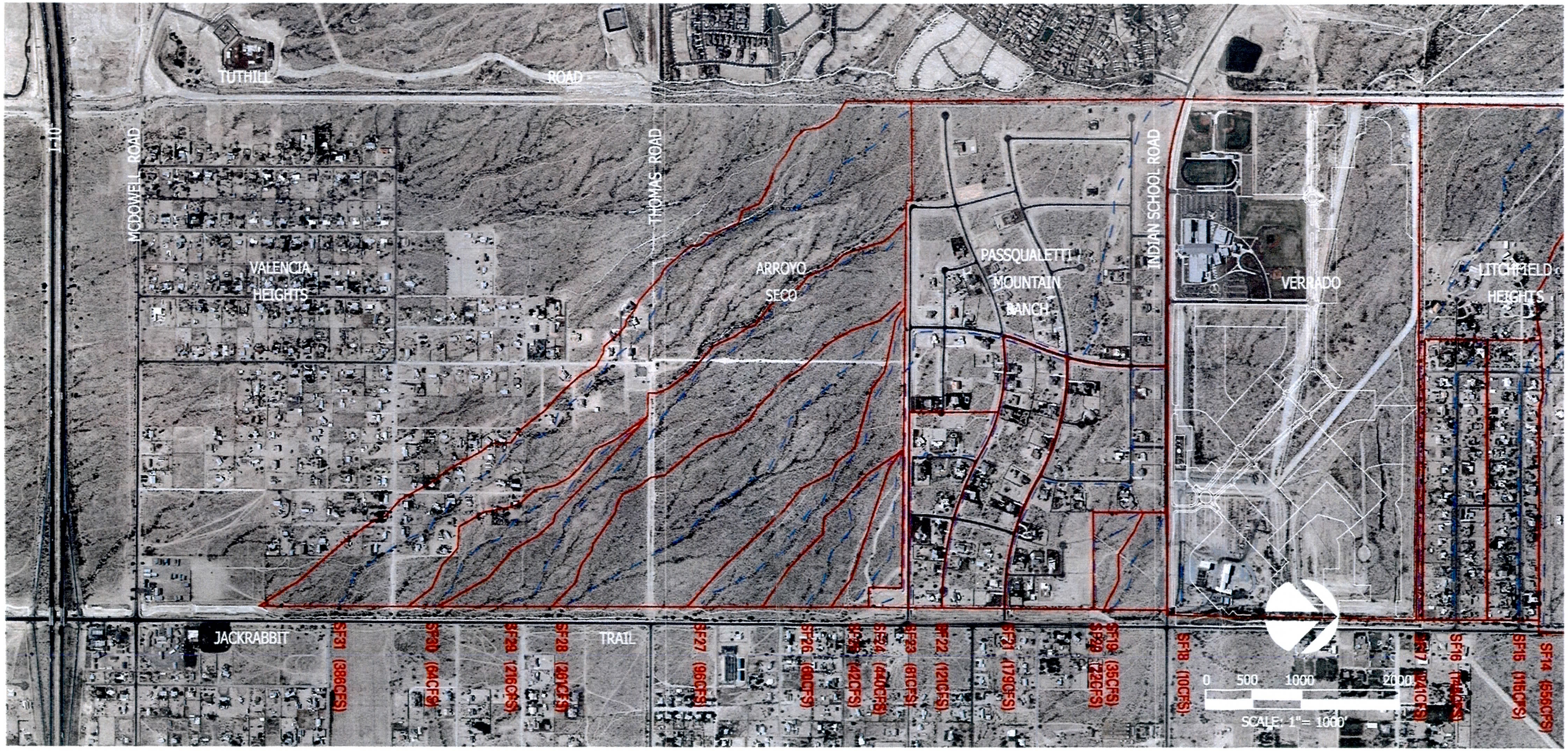


FIGURE C.1 – TRIBUTARY BASIN AND WASH MAP 1

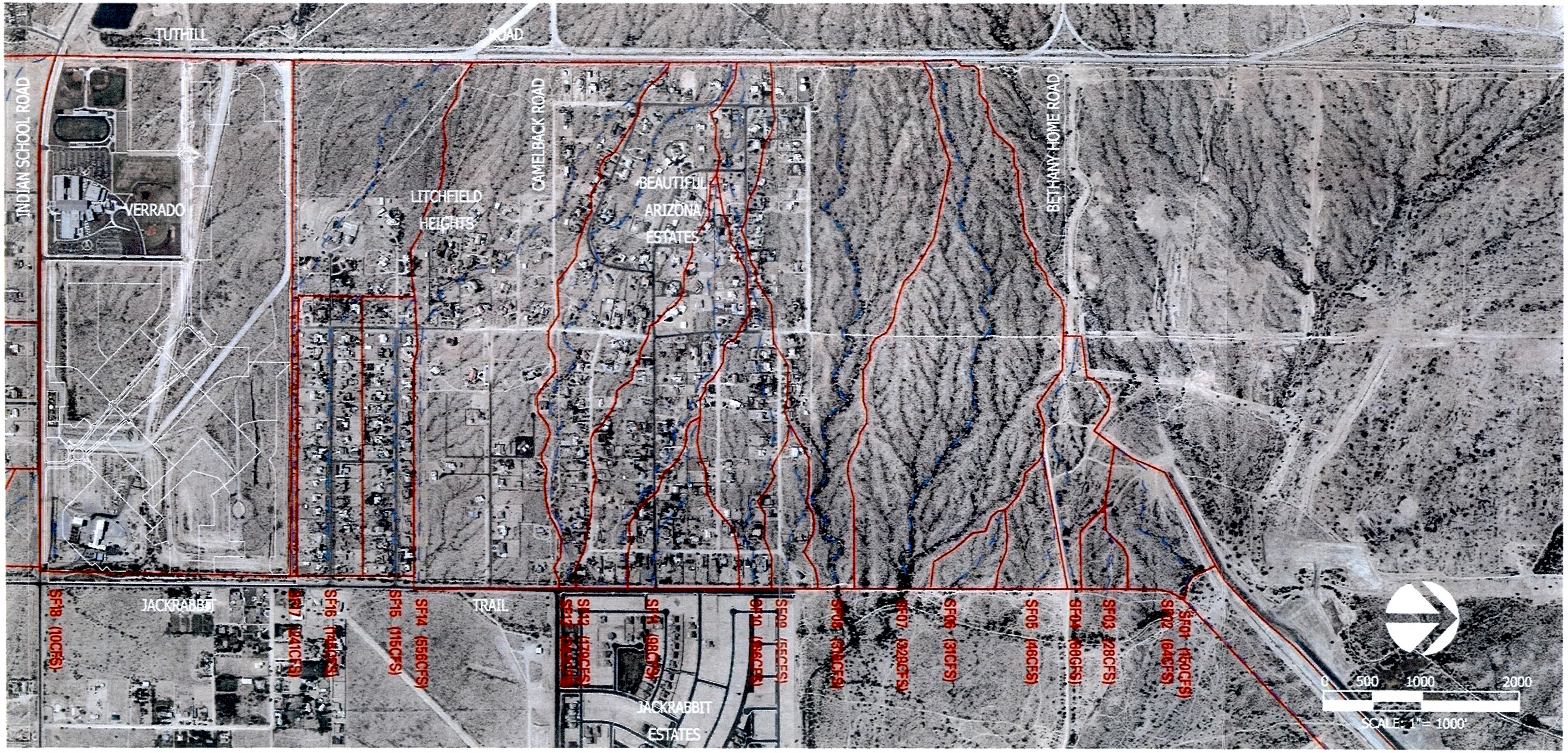


FIGURE C.2 – TRIBUTARY BASIN AND WASH MAP 2

C.3 SEDIMENT YIELDS

WT03
Sediment Yield - DDMSW Output

ID		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Design	Annual
SF05	Peak Flow, Q (cfs)	11	16	21	29	38	46	46	
	Volume (AF)	1	1.3	1.53	2.06	2.54	2.99	2.99	
	Wash Load (AF)	0.002	0.003	0.004	0.005	0.007	0.009	0.009	0.002
	Bed Load (AF)	0.001	0.001	0.001	0.003	0.004	0.006	0.006	0.001
	Total Yield (AF)	0.00	0.00	0.01	0.01	0.01	0.02	0.015	0.003
SF06	Peak Flow, Q (cfs)	8	11	14	20	26	31	31	
	Volume (AF)	0.62	0.8	0.95	1.28	1.57	1.85	1.85	
	Wash Load (AF)	0.001	0.002	0.002	0.003	0.004	0.004	0.004	0.001
	Bed Load (AF)	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
	Total Yield (AF)	0.00	0.00	0.00	0.00	0.01	0.01	0.005	0.002
SF07	Peak Flow, Q (cfs)	71	112	144	211	270	329	329	
	Volume (AF)	8.84	11.45	13.53	18.19	22.39	26.41	26.41	
	Wash Load (AF)	0.012	0.019	0.024	0.034	0.044	0.054	0.054	0.013
	Bed Load (AF)	0.034	0.05	0.062	0.096	0.127	0.145	0.145	0.036
	Total Yield (AF)	0.046	0.069	0.086	0.13	0.171	0.199	0.199	0.049
SF08	Peak Flow, Q (cfs)	71	110	141	202	262	310	310	
	Volume (AF)	7.87	10.19	12.04	16.24	20.05	23.32	23.32	
	Wash Load (AF)	0.009	0.013	0.017	0.024	0.031	0.037	0.037	0.01
	Bed Load (AF)	0.043	0.065	0.083	0.124	0.122	0.132	0.132	0.046
	Total Yield (AF)	0.05	0.08	0.10	0.15	0.15	0.17	0.169	0.056
SF09	Peak Flow, Q (cfs)	14	21	26	36	45	55	55	
	Volume (AF)	0.94	1.22	1.44	1.93	2.39	2.79	2.79	
	Wash Load (AF)	0.002	0.003	0.004	0.005	0.006	0.008	0.008	0.002
	Bed Load (AF)	0.002	0.002	0.002	0.003	0.005	0.002	0.002	0.002
	Total Yield (AF)	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.004
SF10	Peak Flow, Q (cfs)	42	62	78	111	143	166	166	
	Volume (AF)	3.53	4.57	5.4	7.23	9.01	10.51	10.51	
	Wash Load (AF)	0.008	0.011	0.014	0.02	0.026	0.03	0.03	0.008
	Bed Load (AF)	0.011	0.017	0.015	0.018	0.023	0.028	0.028	0.01
	Total Yield (AF)	0.02	0.03	0.03	0.04	0.05	0.06	0.058	0.018
SF11	Peak Flow, Q (cfs)	27	40	48	67	84	98	98	
	Volume (AF)	1.66	2.15	2.54	3.4	4.24	4.94	4.94	
	Wash Load (AF)	0.003	0.005	0.006	0.008	0.01	0.012	0.012	0.003
	Bed Load (AF)								
	Total Yield (AF)	0.00	0.01	0.01	0.01	0.01	0.01	0.012	0.003
SF12	Peak Flow, Q (cfs)	45	66	84	120	150	179	179	
	Volume (AF)	3.7	4.8	5.67	7.58	9.44	11.02	11.02	
	Wash Load (AF)	0.009	0.012	0.015	0.022	0.028	0.034	0.034	0.009
	Bed Load (AF)	0.001	0.002	0.003	0.006	0.008	0.011	0.011	0.002
	Total Yield (AF)	0.01	0.01	0.02	0.03	0.04	0.05	0.045	0.011
SF13	Peak Flow, Q (cfs)	67	102	129	184	236	282	282	
	Volume (AF)	6.14	7.95	9.39	12.57	15.66	18.27	18.27	
	Wash Load (AF)	0.014	0.02	0.025	0.037	0.048	0.057	0.057	0.015
	Bed Load (AF)	0.021	0.03	0.005	0.008	0.013	0.019	0.019	0.016
	Total Yield (AF)	0.04	0.05	0.03	0.05	0.06	0.08	0.076	0.031
SF14	Peak Flow, Q (cfs)	136	201	254	363	465	556	556	
	Volume (AF)	9.43	12.22	14.43	19.32	24.06	28.07	28.07	
	Wash Load (AF)	0.022	0.031	0.039	0.056	0.073	0.088	0.088	0.023
	Bed Load (AF)	0.017	0.029	0.039	0.063	0.097	0.131	0.131	0.022
	Total Yield (AF)	0.04	0.06	0.08	0.12	0.17	0.22	0.219	0.045
SF15	Peak Flow, Q (cfs)	30	42	54	76	99	115	115	
	Volume (AF)	2.12	2.75	3.25	4.35	5.41	6.32	6.32	
	Wash Load (AF)	0.005	0.007	0.009	0.012	0.016	0.019	0.019	0.005
	Bed Load (AF)								
	Total Yield (AF)	0.01	0.01	0.01	0.01	0.02	0.02	0.019	0.005
SF16	Peak Flow, Q (cfs)	37	53	65	95	119	145	145	
	Volume (AF)	2.66	3.45	4.08	4.45	6.79	7.93	7.93	
	Wash Load (AF)	0.006	0.009	0.011	0.014	0.02	0.025	0.025	0.006
	Bed Load (AF)								
	Total Yield (AF)	0.01	0.01	0.01	0.01	0.02	0.03	0.025	0.006
SF17	Peak Flow, Q (cfs)	58	87	110	157	202	241	241	
	Volume (AF)	5.12	7.63	7.83	10.48	13.05	15.23	15.23	
	Wash Load (AF)	0.011	0.017	0.02	0.029	0.037	0.045	0.045	0.012
	Bed Load (AF)	0.024	0.036	0.038	0.059	0.078	0.095	0.095	0.025
	Total Yield (AF)	0.04	0.05	0.06	0.09	0.12	0.14	0.14	0.037

ID		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Design	Annual
SF19	Peak Flow, Q (cfs)	9	13	16	23	29	35	35	
	Volume (AF)	0.74	0.96	1.13	1.52	1.87	2.21	2.21	
	Wash Load (AF)	0.002	0.002	0.003	0.004	0.005	0.006	0.006	0.002
	Bed Load (AF)					0.001	0.001	0.001	
	Total Yield (AF)	0.00	0.00	0.00	0.00	0.01	0.01	0.007	0.002
SF20	Peak Flow, Q (cfs)	5	8	10	14	18	22	22	
	Volume (AF)	0.47	0.6	0.71	0.96	1.18	1.39	1.39	
	Wash Load (AF)	0.001	0.001	0.001	0.002	0.003	0.003	0.003	0.001
	Bed Load (AF)								
	Total Yield (AF)	0.00	0.00	0.00	0.00	0.00	0.00	0.003	0.001
SF21	Peak Flow, Q (cfs)	45	66	82	117	150	179	179	
	Volume (AF)	3.7	4.79	5.66	7.57	9.43	11	11	
	Wash Load (AF)	0.006	0.009	0.011	0.016	0.021	0.025	0.025	0.006
	Bed Load (AF)	0.006	0.009	0.005	0.009	0.013	0.018	0.018	0.005
	Total Yield (AF)	0.01	0.02	0.02	0.03	0.03	0.04	0.043	0.011
SF22	Peak Flow, Q (cfs)	30	44	55	79	101	121	121	
	Volume (AF)	2.5	3.24	3.83	5.13	6.39	7.45	7.45	
	Wash Load (AF)	0.004	0.005	0.007	0.01	0.013	0.015	0.015	0.004
	Bed Load (AF)	0.002	0.003	0.005	0.007	0.01	0.012	0.012	0.002
	Total Yield (AF)	0.01	0.01	0.01	0.02	0.02	0.03	0.027	0.006
SF23	Peak Flow, Q (cfs)	20	29	37	52	67	81	81	
	Volume (AF)	1.55	2.01	2.37	3.17	3.95	4.61	4.61	
	Wash Load (AF)	0.003	0.004	0.005	0.007	0.009	0.011	0.011	0.003
	Bed Load (AF)	0.002	0.003	0.003	0.005	0.004	0.004	0.004	0.002
	Total Yield (AF)	0.01	0.01	0.01	0.01	0.01	0.02	0.015	0.005
SF24	Peak Flow, Q (cfs)	102	150	195	279	368	440	440	
	Volume (AF)	8.74	11.31	13.37	17.89	22.28	25.99	25.99	
	Wash Load (AF)	0.014	0.02	0.026	0.037	0.049	0.06	0.06	0.015
	Bed Load (AF)								
	Total Yield (AF)	0.01	0.02	0.03	0.04	0.05	0.06	0.06	0.015
SF25	Peak Flow, Q (cfs)	11	16	20	29	36	42	42	
	Volume (AF)	0.71	0.92	1.09	1.46	1.82	2.12	2.12	
	Wash Load (AF)	0.002	0.003	0.003	0.005	0.006	0.007	0.007	0.002
	Bed Load (AF)								
	Total Yield (AF)	0.00	0.00	0.00	0.01	0.01	0.01	0.007	0.002
SF26	Peak Flow, Q (cfs)	15	22	28	39	51	60	60	
	Volume (AF)	1.02	1.31	1.55	2.08	2.59	3.02	3.02	
	Wash Load (AF)	0.002	0.003	0.004	0.006	0.008	0.009	0.009	0.002
	Bed Load (AF)				0.001	0.001	0.001	0.001	
	Total Yield (AF)	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.002
SF27	Peak Flow, Q (cfs)	24	35	44	62	79	96	96	
	Volume (AF)	1.91	2.48	2.93	3.92	4.88	5.69	5.69	
	Wash Load (AF)	0.004	0.006	0.008	0.011	0.014	0.018	0.018	0.004
	Bed Load (AF)		0.001	0.001	0.001	0.002	0.002	0.002	
	Total Yield (AF)	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.004
SF28	Peak Flow, Q (cfs)	64	97	119	170	218	261	261	
	Volume (AF)	5.39	6.98	8.24	11.03	13.74	16.04	16.04	
	Wash Load (AF)	0.01	0.014	0.017	0.025	0.032	0.038	0.038	0.01
	Bed Load (AF)	0.001	0.002	0.003	0.005	0.009	0.013	0.013	0.002
	Total Yield (AF)	0.01	0.02	0.02	0.03	0.04	0.05	0.051	0.012
SF29	Peak Flow, Q (cfs)	52	78	99	141	180	216	216	
	Volume (AF)	4.83	6.25	7.39	9.89	12.32	14.37	14.37	
	Wash Load (AF)	0.009	0.013	0.016	0.023	0.03	0.036	0.036	0.009
	Bed Load (AF)	0.003	0.005	0.005	0.007	0.011	0.016	0.016	0.003
	Total Yield (AF)	0.01	0.02	0.02	0.03	0.04	0.05	0.052	0.012
SF30	Peak Flow, Q (cfs)	16	23	29	41	52	64	64	
	Volume (AF)	1.17	1.51	1.79	2.39	2.98	3.48	3.48	
	Wash Load (AF)	0.003	0.004	0.005	0.008	0.01	0.012	0.012	0.003
	Bed Load (AF)	0.001	0.001			0.001	0.001	0.001	0.001
	Total Yield (AF)	0.00	0.01	0.01	0.01	0.01	0.01	0.013	0.004
SF31	Peak Flow, Q (cfs)	89	132	172	245	322	386	386	
	Volume (AF)	7.48	9.68	11.44	15.31	19.07	22.24	22.24	
	Wash Load (AF)	0.012	0.018	0.023	0.033	0.043	0.052	0.052	0.013
	Bed Load (AF)	0.025	0.005	0.007	0.013	0.022	0.03	0.03	0.013
	Total Yield (AF)	0.04	0.02	0.03	0.05	0.07	0.08	0.082	0.026

C.4 SEDIMENT BASINS

WT03 Sediment Storage

Note:

The annual sediment yield and the 100-year event yield were provided. Per the District, the storage volume is required to be not less than the 100-year event yield.

The velocities in washes and storage area are compared. The velocities in washes were from DDMSW outputs, and the velocities in storage area were estimated based on discharges and flow areas which are listed below the table.

In-line sediment trapping basins were provided for Wash SF07, SF08, SF14 and SF17. Those basins were one foot deep.

Culvert #7 was designed to divert flow from the existing channel east of Litchfield Heights to Reach 6. The drop-inlet crest of Culvert #7 was set at one foot above the bottom of the existing channel. Sediment is assumed to deposit at the sediment trapping basin upstream of the drop inlet.

The sediment of small quantities brought by side flows other than SF07, SF08, SF14 and SF 17 will be partly trapped at the drop structure aprons where velocities are below 3 fps.

Reach	Side Flow	Velocities (fps)		Sediment Quantity (AF)			Sediment Storage		
		In Washes	In Storage Area	100-Yr Event	Annual	Total	Bottom Area (AC)	Surface Area (AC)	Volume Provided (AF)
8	SF07	6.1	0.9 [1]	**0.199**	0.049	0.248	0.180	0.251	**0.215**
8	SF08	6.7	1.6 [2]	**0.169**	0.056	0.225	0.177	0.204	**0.190**
6	SF14	6.2	3 [3]	**0.219**	0.045	0.264	0.300	0.340	**0.320**
5	SF17	6.7	0.9 [4]	**0.140**	0.037	0.177	0.100	0.305	**0.193**

[1] Discharge = 500 cfs, average flow area = 600 sq ft
[2] Discharge = 700 cfs, average flow area = 450 sq ft
[3] Discharge = 300 cfs (with 256 cfs being diverted by Culvert #7), average flow area = 100 sq ft
[4] Discharge =241+300=541 cfs, flow area = 600 sq ft

APPENDIX G – DIVERSION AT LITCHFIELD HEIGHTS

WT30
Litchfield Heights Diversion

Drop inlet weir width, L=	45	ft	
Drop inlet weir elevation =	1174.1	ft	(NAVD88)
Wash flow line =	1173.1	ft	(NAVD88)

Note: The wash discharges were calculated using FlowMaster with a cross-section and wash slope obtained from the topo provided by Cooper Aerial. Weir discharges were calculated using the weir equation with c=3.0.

WSEL (ft)	Flow depth (ft)	Wash Discharge (cfs)	Weir Discharge (cfs)	Total Discharge (cfs)
1174.1	1	30.22	0	30.22
1174.3	1.2	46.94	12.07	59.01
1174.5	1.4	66.75	34.15	100.90
1174.7	1.6	93.16	62.74	155.90
1174.9	1.8	120.76	96.60	217.36
1175.1	2	166.27	135.00	301.27
1175.3	2.2	217.48	177.46	394.94
1175.5	2.4	274.36	223.63	497.99
1175.7	2.6	336.72	273.22	609.94
1175.9	2.8	404.43	326.02	730.45

The capacity of (2) 48" RGRCP pipes was calculated using the Dodson program. To pass a flow of 326 cfs, the required headwater for the culvert is 1168.0+7.86=1175.86 ft, which is slightly less than the WSEL at the wash, 1175.90 ft. Therefore, it is the drop-inlet crest that controls the flow, not the culvert.

```
                     PIPE CULVERT ANALYSIS
             COMPUTATION OF CULVERT PERFORMANCE CURVE

                         June 29, 2010

==============================================================================
                        PROGRAM INPUT DATA
DESCRIPTION                                                          VALUE
------------------------------------------------------------------------------
Culvert Diameter (ft)....................................          4.0
FHWA Chart Number........................................          1
FHWA Scale Number (Type of Culvert Entrance).............          2
Manning's Roughness Coefficient (n-value)................          0.013
Entrance Loss Coefficient of Culvert Opening.............          0.5
Culvert Length (ft)......................................        190.0
Invert Elevation at Downstream end of Culvert (ft).......      1,166.7
Invert Elevation at Upstream end of Culvert (ft).........      1,168.0
Culvert Slope (ft/ft)....................................          0.0068

Starting Flow Rate (cfs).................................        163.0
Incremental Flow Rate (cfs)..............................          0.0
Ending Flow Rate (cfs)...................................        163.0

Starting Tailwater Depth (ft)............................          2.8
Incremental Tailwater Depth (ft).........................          0.0
Ending Tailwater Depth (ft)..............................          2.8

==============================================================================

                       COMPUTATION RESULTS

   Flow  Tailwater   Headwater (ft)       Normal  Critical  Depth at   Outlet
   Rate    Depth    Inlet     Outlet      Depth    Depth    Outlet   Velocity
  (cfs)    (ft)    Control   Control      (ft)     (ft)      (ft)     (fps)
------------------------------------------------------------------------------
  163.0     2.8     7.86      6.31        4.0      3.69      4.0      12.97

==============================================================================
HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.
```

According to the rating curve in the table, a flow of 256 cfs will be diverted through these two 48-inch pipes from the 100-year peak flow of 556 cfs from SF14 (Appendix C.2). The remaining flow of 300 cfs will be conveyed by the existing channel.

A.2.3 Excerpt from White Tanks FRS #3 Outlet Channel, Clean Water Act Section 404 Report (Ref. 17)

WHITE TANKS FRS #3 OUTLET CHANNEL PROJECT

CLEAN WATER ACT SECTION 404

Prepared for

U.S. Army Corps of Engineers

Submitted by the Flood Control District of Maricopa County

June, 2010

Table of Contents

<u>List of Figures</u>

be provided below the surrounding grade.

7. **Erosion and Accretion Patterns**
The channel improvement project will improve erosion and accretion patterns during periods of flow.

8. **Aquifer Recharge**
There will be no recharge within the channel

9. **Baseflow**
The modified channel will retain the existing baseflow.

10. **Mixing Zone, in light of the depth of water at the disposal site; current velocity, direction and variability at the disposal site; degree of turbulence; water column stratification; discharge vessel speed and direction; rate of discharge; dredged material characteristics; number of discharges per unit of time; and any other relevant factors affecting rates and patterns of mixing**
The Jackrabbit Wash is an ephemeral channel, which only flows in response to rainfall and stormwater discharge events. Consequently, there will be minimum impacts to the mixing zone.

B. **Anticipated Changes to the Biological Characteristics of the Aquatic Environment**

1. **Special Aquatic Sites (wetlands, mudflats, coral reefs, pool and riffle areas, vegetated shallows, sanctuaries and refuges, as defined in 40 CFR 230.40-45)**
There will be minimum impact to special aquatic sites. Aquatic Sites could be created in off-site in-lieu fee mitigation areas.

2. **Habitat for Fish and Other Aquatic Organisms**
There is not suitable habitat for fish or other aquatic organisms.

3. **Wildlife Habitat (breeding, cover, food, travel, general)**
There will be minimum impacts to habitat breeding, cover, food and travel.

4. **Endangered or Threatened Species**
According to data provided by the AGF and USFW on this area, there have been no T&E species identified in the project area.

a. **Listed endangered and/or threatened species or designated critical habitat present on site**:
There have been no T&E species identified at the site.

b. **Proposed listed endangered and/or threatened species or proposed critical habitat present on site**: There is little habitat for T&E species present on the site.

c. **Compliance with ESA - Formal/Informal consultation or conference:**

5. **Biological availability of possible contaminants in dredged or fill material, considering hydrography in relation to known or anticipated sources of contaminants; results of previous**

A.2.4 Final Plans for the Construction of White Tanks FRS No. 3 Outfall Channel, Final Design (Ref. 7)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

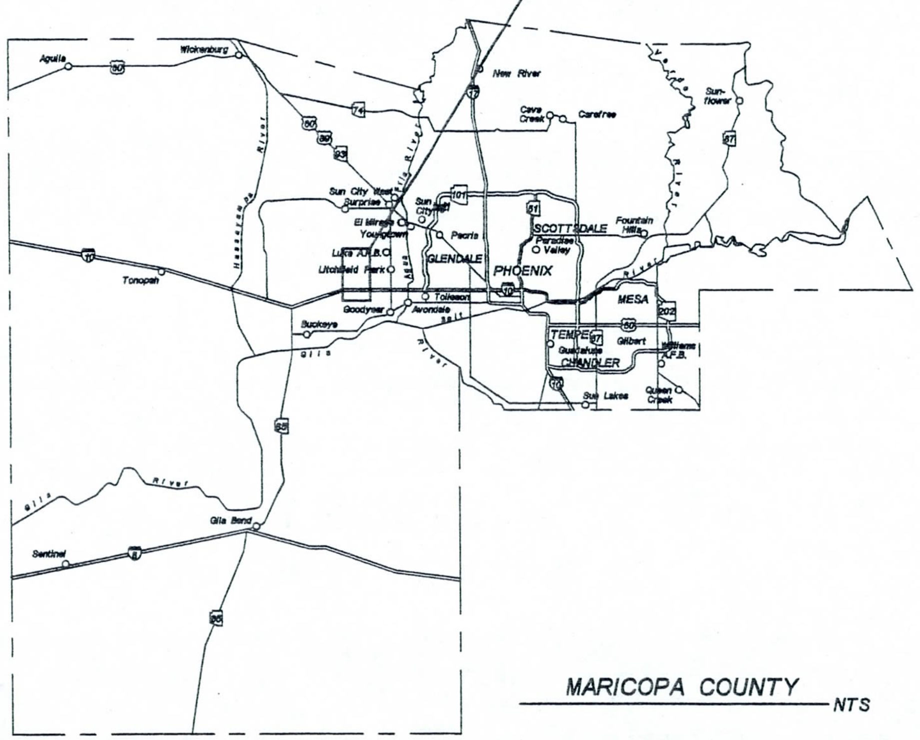
PLANS FOR THE CONSTRUCTION OF WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

PCN 470.04.32

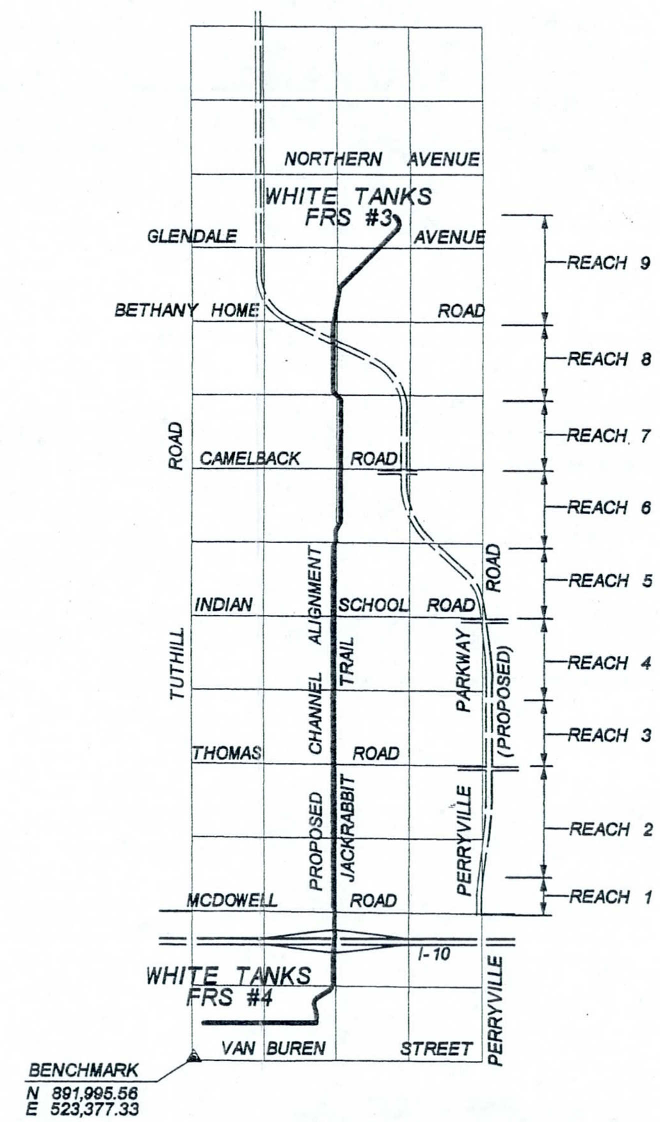
FCD CONTRACT NO. 2009-C012

FCD CONSTRUCTION CONTRACT NO. 2010-C031

PROJECT LOCATION



MARICOPA COUNTY NTS



VICINITY MAP NTS

NTS

DISCLAIMER:

THE TOWN APPROVES THESE PLANS FOR CONCEPT ONLY AND ACCEPTS NO LIABILITY FOR ERRORS OR OMMISIONS.

BY: ______________________ ________
TOWN OF BUCKEYE ENGINEER DATE

ISSUE RECOMMENDED BY:

______________________ ________
PROJECT MANAGER DATE

ISSUED FOR PUBLIC BIDDING BY:

______________________ ________
CHIEF ENGINEER & GENERAL MANAGER DATE

BOARD OF DIRECTORS OF THE FLOOD CONTROL DISTRICT

DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX

ADWR APPROVAL

Hoskin • Ryan Consultants
creative engineering solutions
6245 N. 24th Parkway, Suite 100, Phoenix, Arizona 85016
Office: (602) 252-8384 Fax: (602) 252-8385 www.hoskinryan.com

FLOOD CONTROL DISTRICT OF MAROCOPA COUNTY

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

COVER SHEET & VICINITY MAP

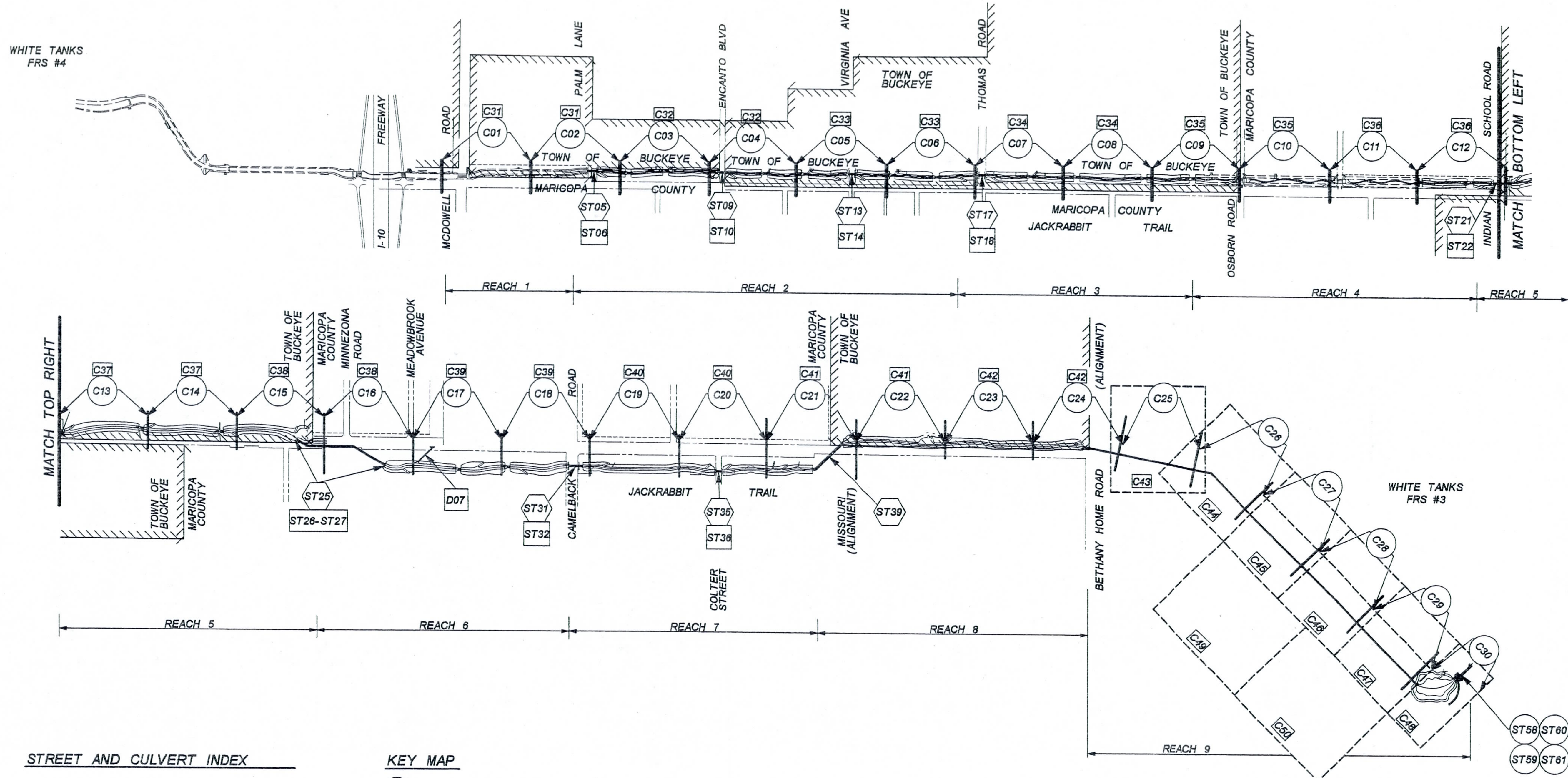
DRAWING NO. G01 SHEET 01 OF 204

EXPIRES 3/31/2012

1-800-STAKE-IT

NO	REVISION	BY	DATE
1			
2			
3			

2/3/2011



STREET AND CULVERT INDEX

PALM LANE ROADWAY	ST05
PALM LANE CULVERT	ST06
ENCANTO BOULEVARD ROADWAY	ST09
ENCANTO BOULEVARD CULVERT	ST10
VIRGINIA AVENUE ROADWAY	ST13
VIRGINIA AVENUE CULVERT	ST14
THOMAS ROAD ROADWAY	ST17
THOMAS ROAD CULVERT	ST18
INDIAN SCHOOL ROAD ROADWAY	ST21
INDIAN SCHOOL ROAD CULVERT	ST22
MINNEZONA ROAD ROADWAY	ST25
MINNEZONA ROAD CULVERT	ST26-ST27
CAMELBACK ROAD ROADWAY	ST31
CAMELBACK ROAD CULVERT	ST32
COLTER STREET ROADWAY	ST35
COLTER STREET CULVERT	ST36
JACKRABBIT TRAIL CULVERT	ST39
PRINCIPAL SPILLWAY	ST58-ST61

KEY MAP

- C20 - CHANNEL SHEET DESIGNATION
- C43 - GRADING SHEET DESIGNATION
- JURISDICTION BOUNDARY (THIS SHEET ONLY)
- ST05 - ROAD PROFILE
- ST06 - CULVERT PLAN, PROFILE AND GEOMETRY

NO.	REVISION	BY	DATE
1			
2			
3			

Z

250 0 250 500
Scale in Feet

1-800-STAKE-IT

ADWR APPROVAL

Hoskin • Ryan Consultants
creative engineering solutions
6245 N. 24th Parkway, Suite 100, Phoenix, Arizona 85016
Office: (602) 252-8384 Fax: (602) 252-8385 www.hoskinryan.com

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PAUL W. HOSKIN
EXPIRES 3/31/2012

KEY MAP

DRAWING NO. G02 SHEET 02 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

g:\projects\D2\09-077 wtrs3 fras\28 - 100% design \NS00-G02-100%.dgn
2/3/2011

TOPOGRAPHY SOURCE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
WHITE TANKS FRS #3 POST PHASE 1 REMEDIATION
TOPOGRAPHY
1 FOOT CONTOUR INTERVAL
FLOWN COOPER AERIAL SURVEY
DATE FLOWN: 11/2009
DATUM: NAD 1983, NAVD 1988

PROJECT BENCHMARK

THE BENCHMARK USED FOR THIS PROJECT IS A 9/16" STAINLESS STEEL ROD DRILLED AND DOMED IN HANDHOLE, LOCATED AT THE SOUTHWEST CORNER OF THE WHITE TANKS #4 DAM,
ID NO.: WT-4
N: 891,995.56
E: 523,377.33
ELEV= 1046.30
9/16" SS ROD DRILLED AND DOME IN HAND HOLE

SUPPLEMENTAL SURVEY

HOSKIN RYAN CONSULTANTS
SURVEY REPORT DATED: 4/6/2010

PROPOSED FEMA CLASSIFICATION

ZONE AE
AN AREA INUNDATED BY 100-YEAR FLOODING
(BASE FLOOD ELEVATIONS DETERMINED)

DESIGN REFERENCES

DESIGN REFERENCES		DATE
GEOTECHNICAL INVESTIGATION	ALPHA GEOTECHNICAL	8/4/10
UTILITY REPORT	HOSKIN RYAN CONSULTANTS	10/18/10
DESIGN REPORT	HOSKIN RYAN CONSULTANTS	8/5/10
HYDROLOGY REPORT	HOSKIN RYAN CONSULTANTS	8/3/10
SUPPLEMENTAL GENERAL CONDITIONS	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	10/18/10
SPECIAL PROVISIONS	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	10/18/10

INDEX OF SHEETS

UTILITY CONTACTS

COMPANY	CONTACT	CONTACT TEL	E-MAIL	DATE
ARIZONA PUBLIC SERVICE (APS)	JOHN RAEL	(602) 371-6945	John.rael@aps.com	11-13-2009
ARIZONA AMERICAN WATER	CLIFF WAHLERS	(623) 445-2447	clifford.wahlers@amwater.com	11-13-2009
ARIZONA WATER COMPANY	JOE WHELAN	(602) 240-6860	jwhelan@azwater.com	11-13-2009
COX COMMUNICATIONS	JOHN O' CONNELL	(623) 328-3627	john.oconnell@cox.com	11-13-2009
MARICOPA WATER DISTRICT	ONEY URQUIZA	(623) 546-8266	oneyu@mwdaz.com	11-13-2009
QWEST COMMUNICATIONS	MATTHEW PHILIPS	(602) 630-1393	matthew.phillips@qwest.com	11-13-2009
SOUTHWEST GAS	VALERIE GALLARDO-WELLER	(602) 484-5342	valerie.gallardo-weller@swgas.com	11-13-2009
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	GARY MAIERS	(602) 506-0562	gsm@mail.maricopa.gov	11-13-2009
TOWN OF BUCKEYE	MANUEL ALVAREZ	(623) 349-6106	malvarez@buckeyeaz.gov	11-13-2009

NO	REVISION	BY	DATE
1			
2			
3			

TWO WORKING DAYS BEFORE YOU DIG CALL FOR THE BLUE STAKES
1-800-STAKE-IT
Blue Stake Center 1-800-782-5348

ADWR APPROVAL

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

19690 PAUL ME. HOSKIN ARIZONA, U.S.A.
EXPIRES 3/31/2012

SHEET INDEX & UTILITY NOTIFICATION

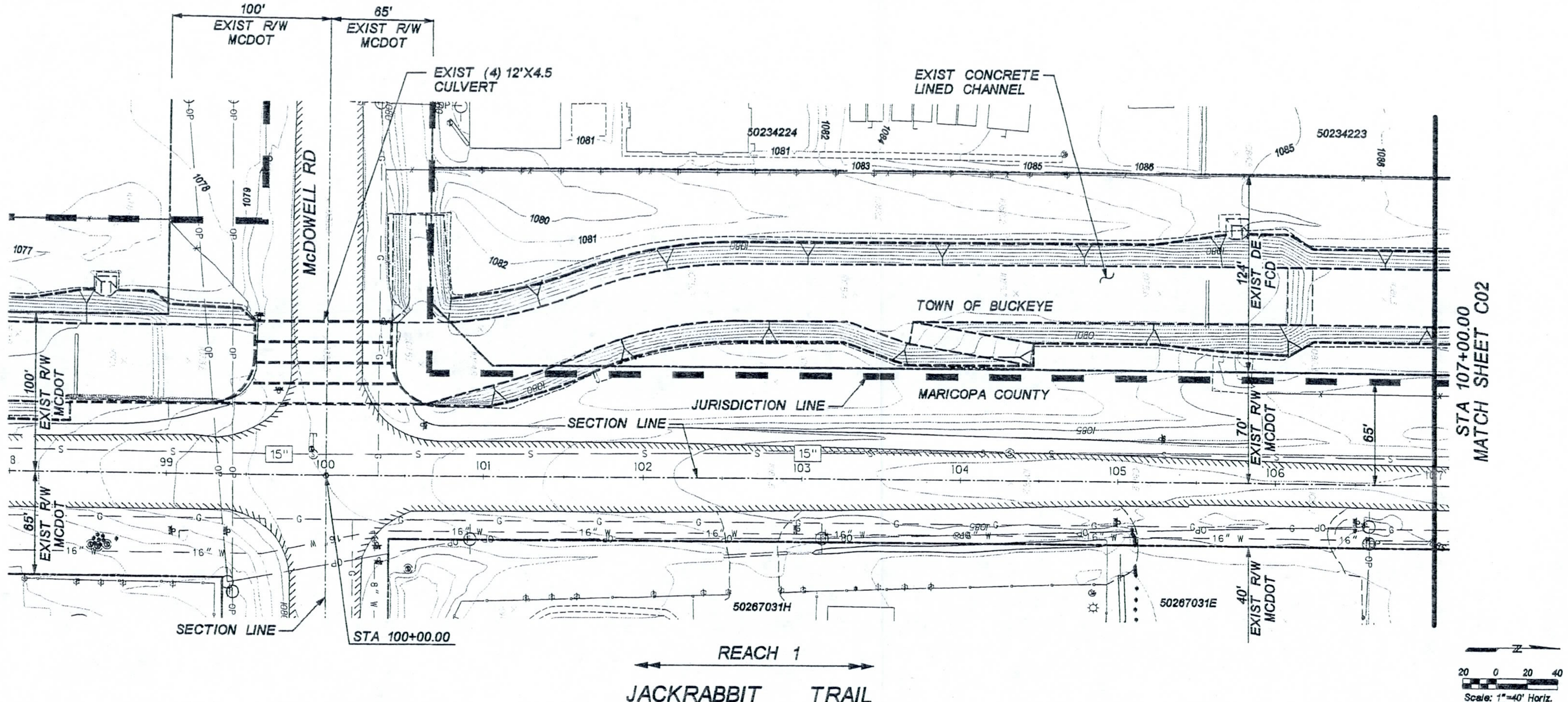
DRAWING NO. G03 SHEET 03 OF 204

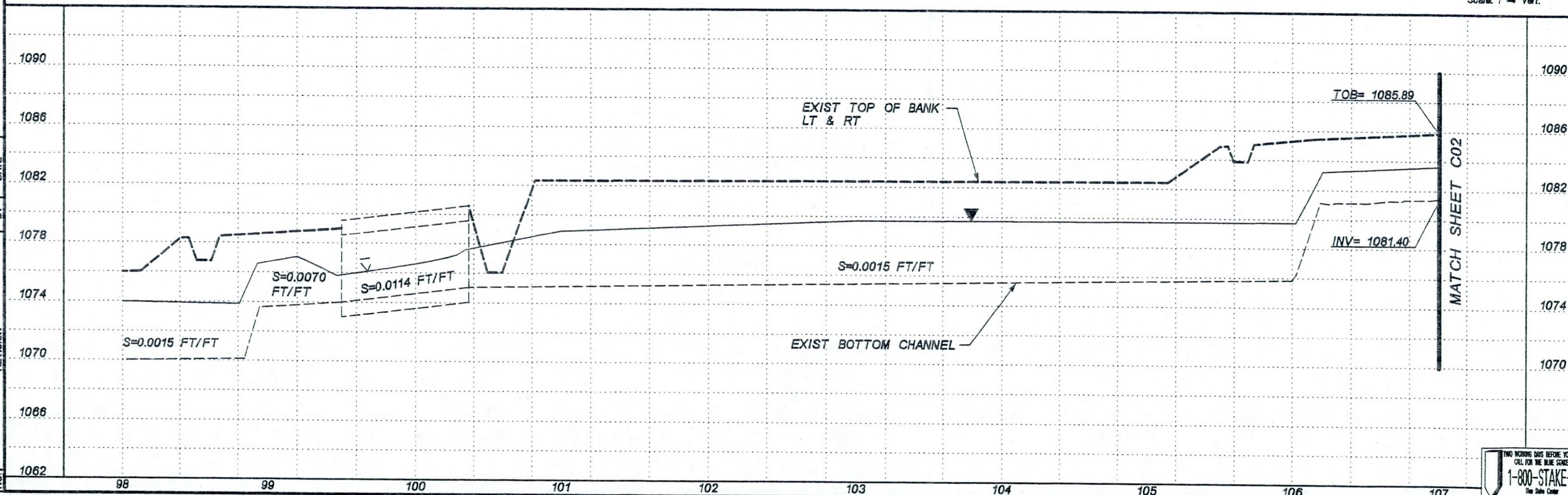
GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

g:\projects\2009-077 wts3 final\08 - 100% design\NS00-G03-100%.dgn
2/3/2011

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





REMOVE

CONSTRUCT

FOR REFERENCE ONLY.
NO CONSTRUCTION ON THIS SHEET.

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C01 — SHEET 55 OF 204

NO.	REVISION	BY	DATE
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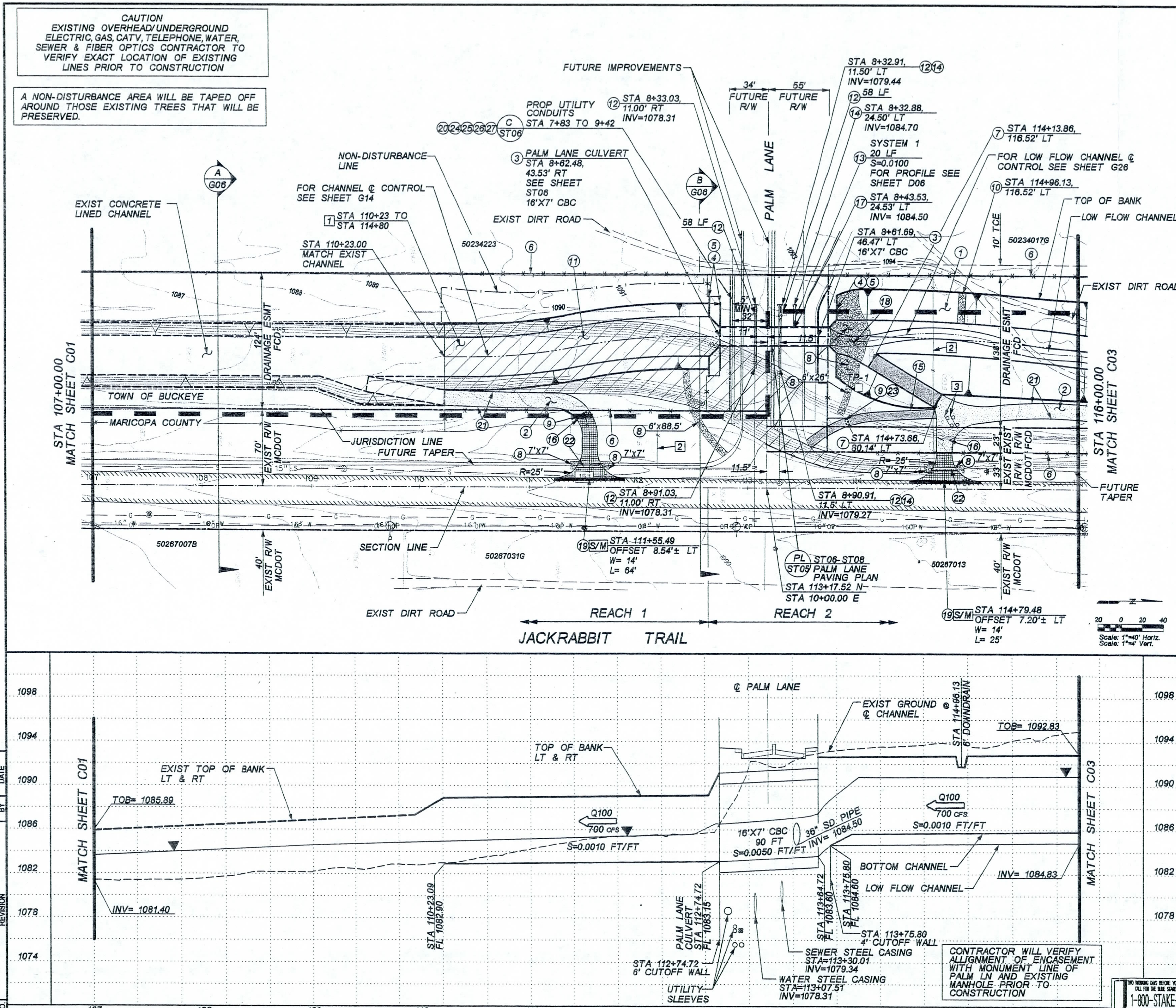
1-800-STAKE-IT

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

2/4/2011



REMOVE		
1	REMOVE CONCRETE LINED CHANNEL	2,523 SY
2	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	1,127 LF
3	SIGN TO BE REMOVED/ RELOCATED AS NECESSARY	3 EA
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	28 SY

CONSTRUCT		
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	484 SY
3	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST06	90 LF
4	CONSTRUCT CONCRETE HEADWALL, PER DETAIL SHEETS ST07&ST08 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,361 SF
5	INSTALL HANDRAIL PER DETAIL SHEET D02	286 LF
6	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,106 LF
7	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
8	INSTALL RIP-RAP (D50=9",18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	144 CY
9	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	6 EA
10	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9" 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	17 CY
11	CONSTRUCT CONCRETE CHANNEL LINING PER TYPICAL SECTION SHEET G06	16,538 SF
12	24" DIA STEEL CASING SLEEVE WITH TEMPORARY PLUGS PER DETAIL SHEET D10	116 LF
13	INSTALL 36" RGRCP CLASS IV STORM DRAIN PIPE	21 LF
14	INSTALL PIPE PLUG PER MAG STD DET 427	3 EA
15	INSTALL 4" ABC ON 8' TRAIL	109 SY
16	INSTALL GATE TYPE 1,PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2 EA
17	BOX CULVERT STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1 EA
18	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	21 CY
19	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	178 SY
20	INSTALL 8" DIP UTILITY CONDUIT	176 LF
21	THICKENED EDGE PER MAG STD DET 201 TYPE A	780 LF
22	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	137 SF
23	INSTALL GATE TYPE 3,PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
24	INSTALL 2" DIP UTILITY CONDUIT	704 LF
25	INSTALL 4" DIP UTILITY CONDUIT	352 LF
26	INSTALL 5" DIP UTILITY CONDUIT	352 LF
27	UTILITY CONDUIT JOINT TRENCH EXCAVATION AND BACKFILL	176 LF

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C02 SHEET 56 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

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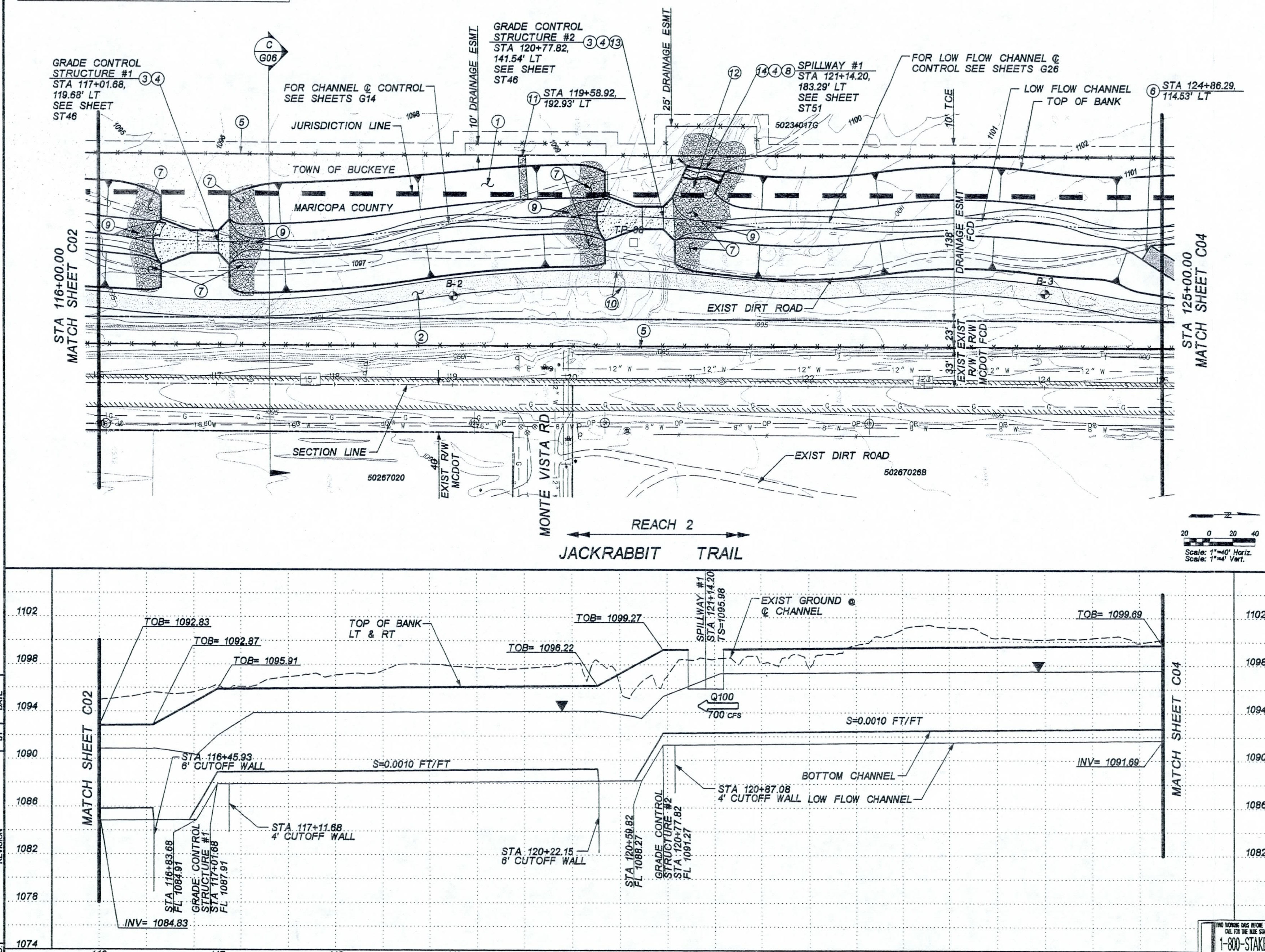

CONSTRUCT

① CONSTRUCT EARTHEN CHANNEL		
② CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,406	SY
③ CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST46)	2,727	SF
④ INSTALL HANDRAIL PER DETAIL SHEET D02	463	LF
⑤ INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,870	LF
⑥ CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109	SY
⑦ INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	490	CY
⑧ CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST51)	270	SF
⑨ INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	88	CY
⑩ THICKENED EDGE PER MAG STD DET 201 TYPE A	1,808	LF
⑪ 6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	22	CY
⑫ INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	52	CY
⑬ CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	211	CY
⑭ CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	30	CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C03 SHEET 57 OF 204

1-800-STAKE-IT

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

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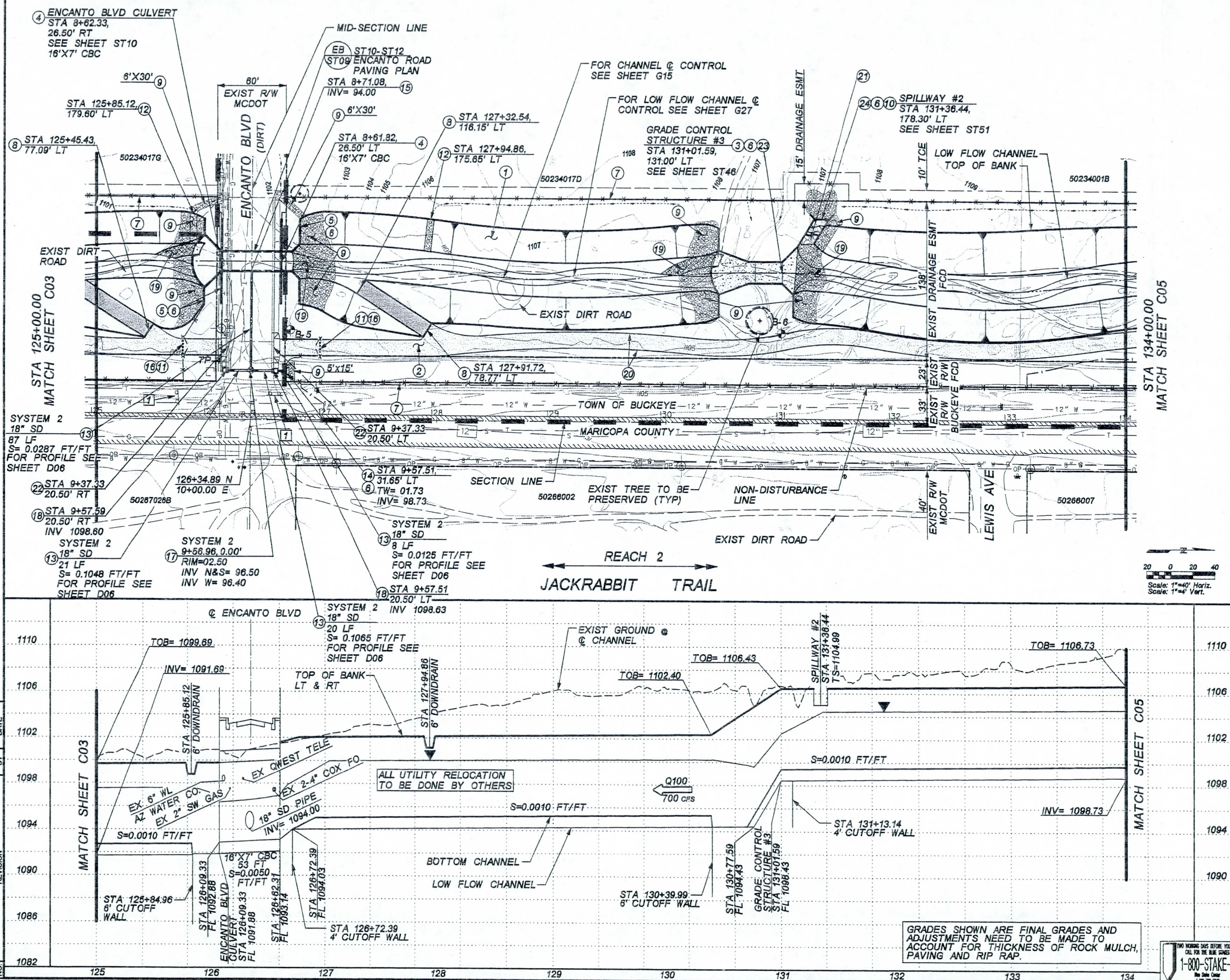

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

REMOVE

1	SIGN TO BE REMOVED/ RELOCATED AS NECESSARY	2 EA

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,377 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST46)	1,453 SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST10	53 LF
5	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST11 & ST12 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,760 SF
6	INSTALL HANDRAIL PER DETAIL SHEET D02	581 LF
7	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,901 LF
8	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
9	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	440 CY
10	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST51)	204 SF
11	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	8 EA
12	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	34 CY
13	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	136 LF
14	CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	1 EA
15	BOX CULVERT STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1 EA
16	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2 EA
17	CONSTRUCT STORM DRAIN MANHOLE PER COP STD DETAIL P-1520 & MAG STD DETAIL 522	1 EA
18	CONSTRUCT CATCH BASIN PER MAG STD DET 530 TYPE "A"	2 EA
19	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	84 CY
20	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,712 LF
21	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	10 CY
22	CONSTRUCT 16' DRIVEWAY PER MAG STD DET 250-2	250 SF
23	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	108 CY
24	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	14 CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

EXPIRES 3/31/2012

PLAN AND PROFILE

DRAWING NO. C04 SHEET 58 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

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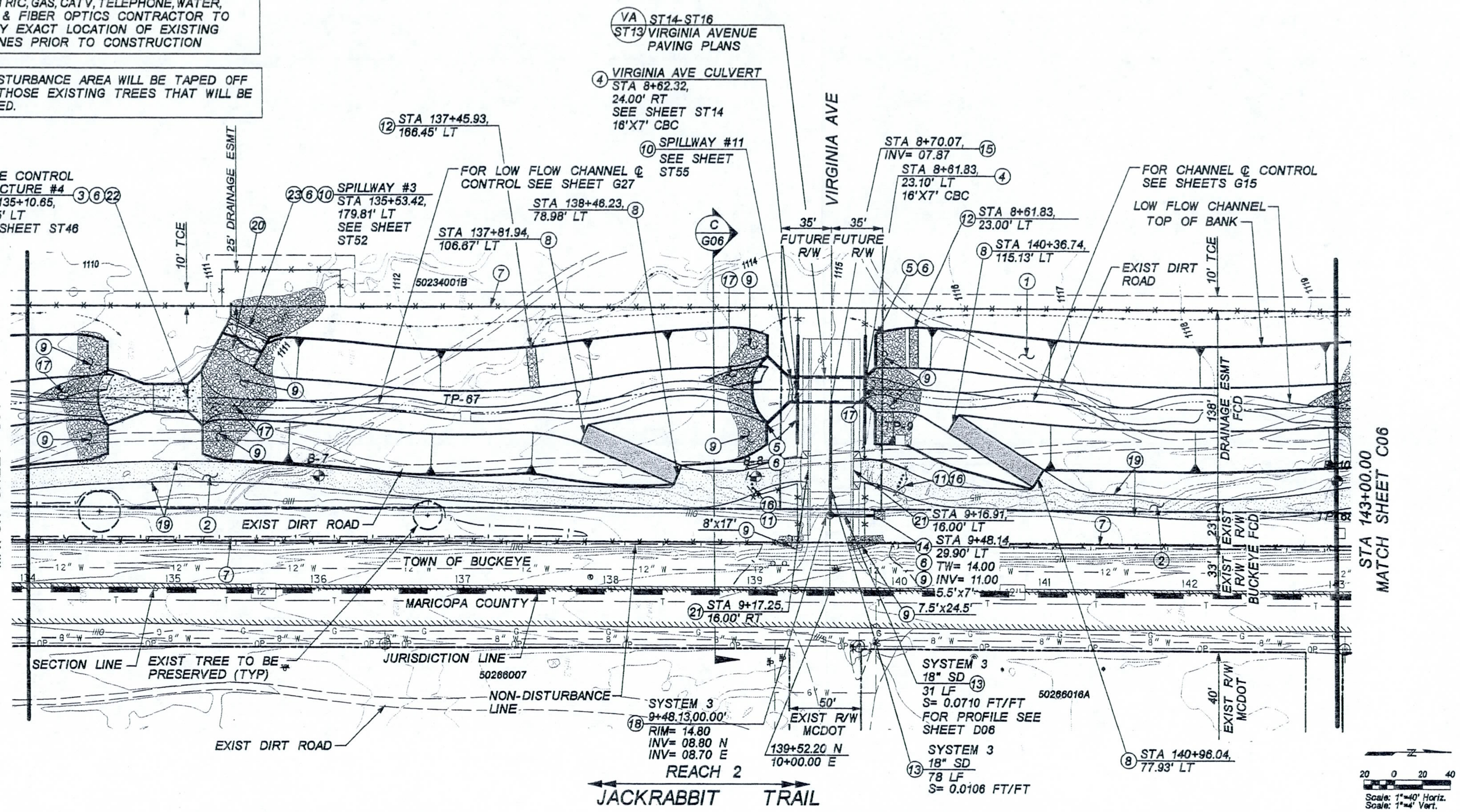

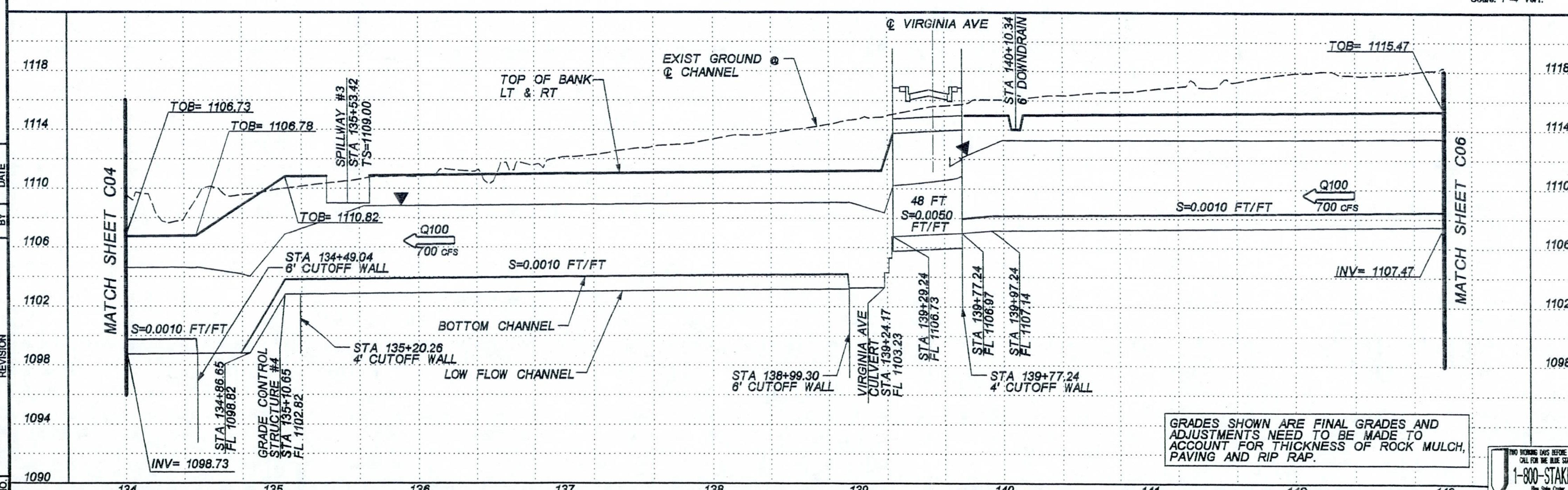

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

REMOVE

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL		
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,446	SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST46)	1,404	SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST14	48	LF
5	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST15 & ST16 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,510	SF
6	INSTALL HANDRAIL PER DETAIL SHEET D02	592	LF
7	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	2,013	LF
8	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	218	SY
9	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	520	CY
10	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST52 AND ST55)	290	SF
11	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	8	EA
12	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	34	CY
13	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	109	LF
14	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	1	EA
15	BOX CULVERT STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1	EA
16	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2	EA
17	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	93	CY
18	CONSTRUCT STORM DRAIN MANHOLE PER COP STD DETAIL P-1520 & MAG STD DETAIL 522	1	EA
19	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,760	LF
20	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	35	CY
21	CONSTRUCT 16' DRIVEWAY PER MAG STD DET 250-2	250	SF
22	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	112	CY
23	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	31	CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

EXPIRES 3/31/2012

PLAN AND PROFILE

DRAWING NO. C05 SHEET 59 OF 204

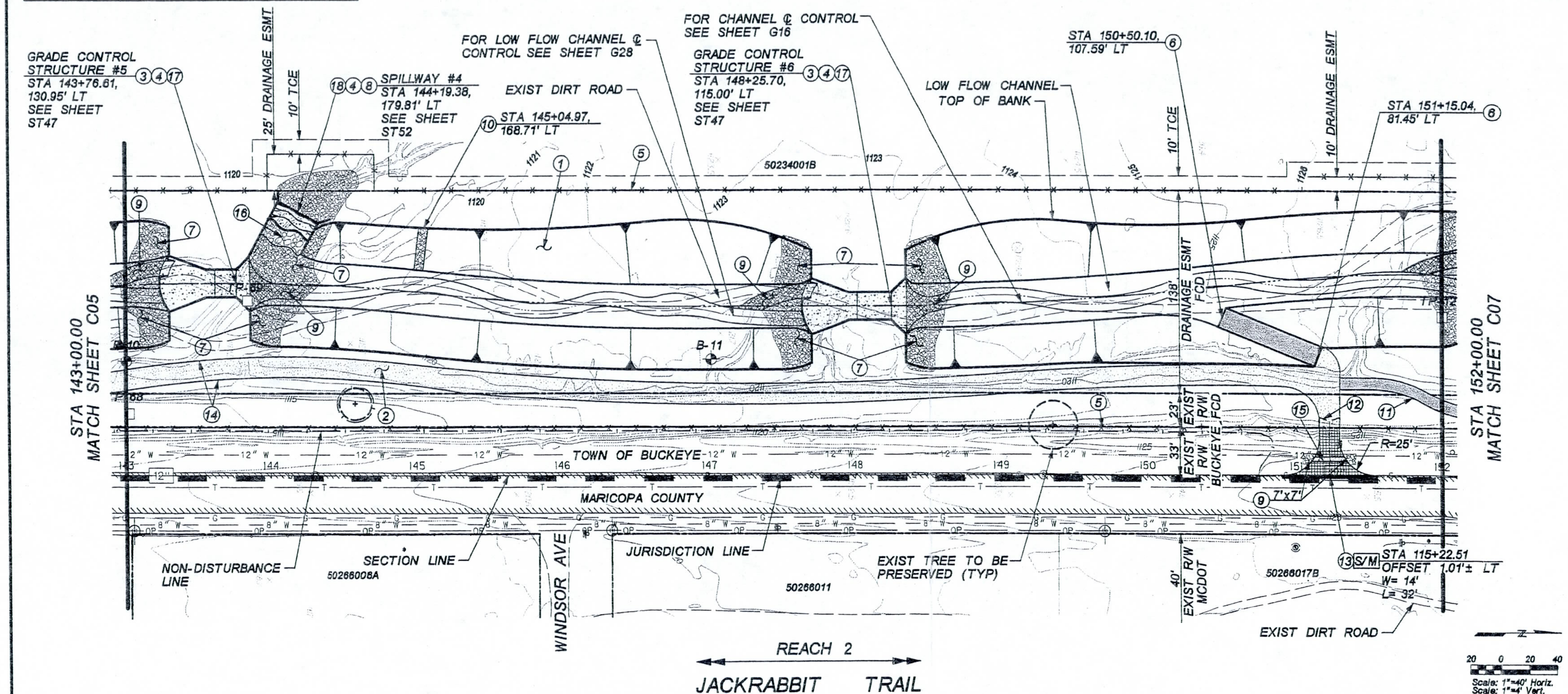
1-800-STAKE-IT

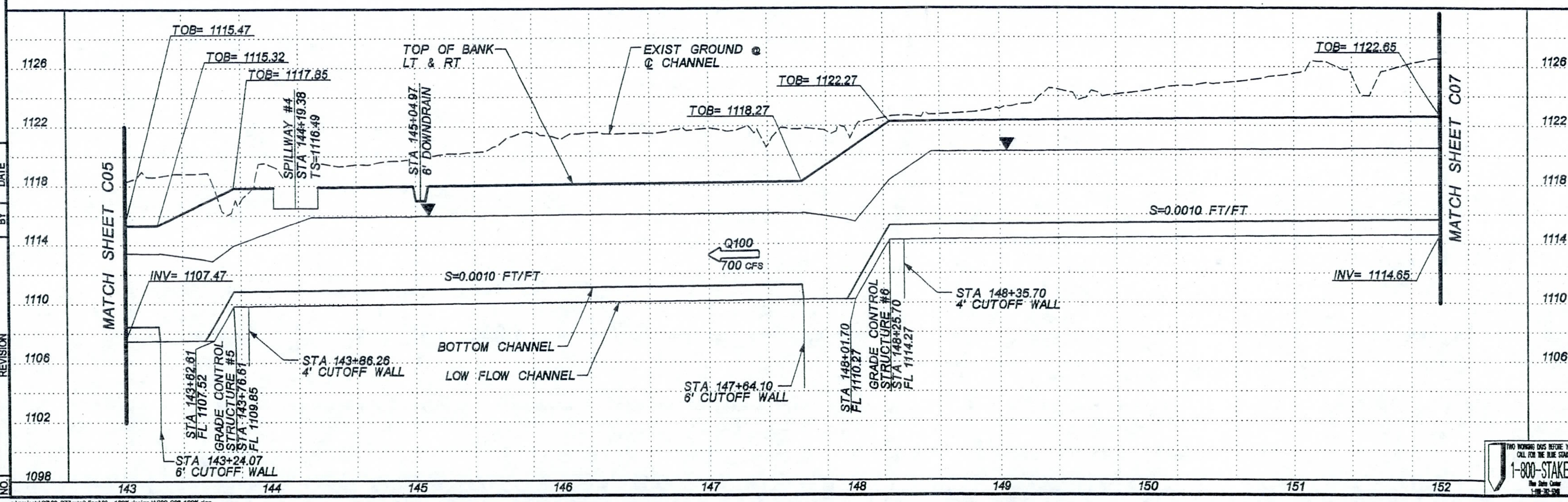
GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

REVISION | BY | DATE

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





REMOVE		
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	14 SY

CONSTRUCT		
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,392 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST47)	2,801 SF
4	INSTALL HANDRAIL PER DETAIL SHEET D02	484 LF
5	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,861 LF
6	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
7	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	497 CY
8	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST52)	320 SF
9	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	100 CY
10	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	18 CY
11	INSTALL 4" ABC ON 8' TRAIL	65 SY
12	INSTALL GATE TYPE 1 PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
13	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	73 SY
14	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,820 LF
15	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	68 SF
16	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	39 CY
17	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	215 CY
18	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	33 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
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	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

DRAWING NO. C06 SHEET 80 OF 204

EXPIRES 3/31/2012

NO.	REVISION	BY	DATE
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1-800-STAKE-IT

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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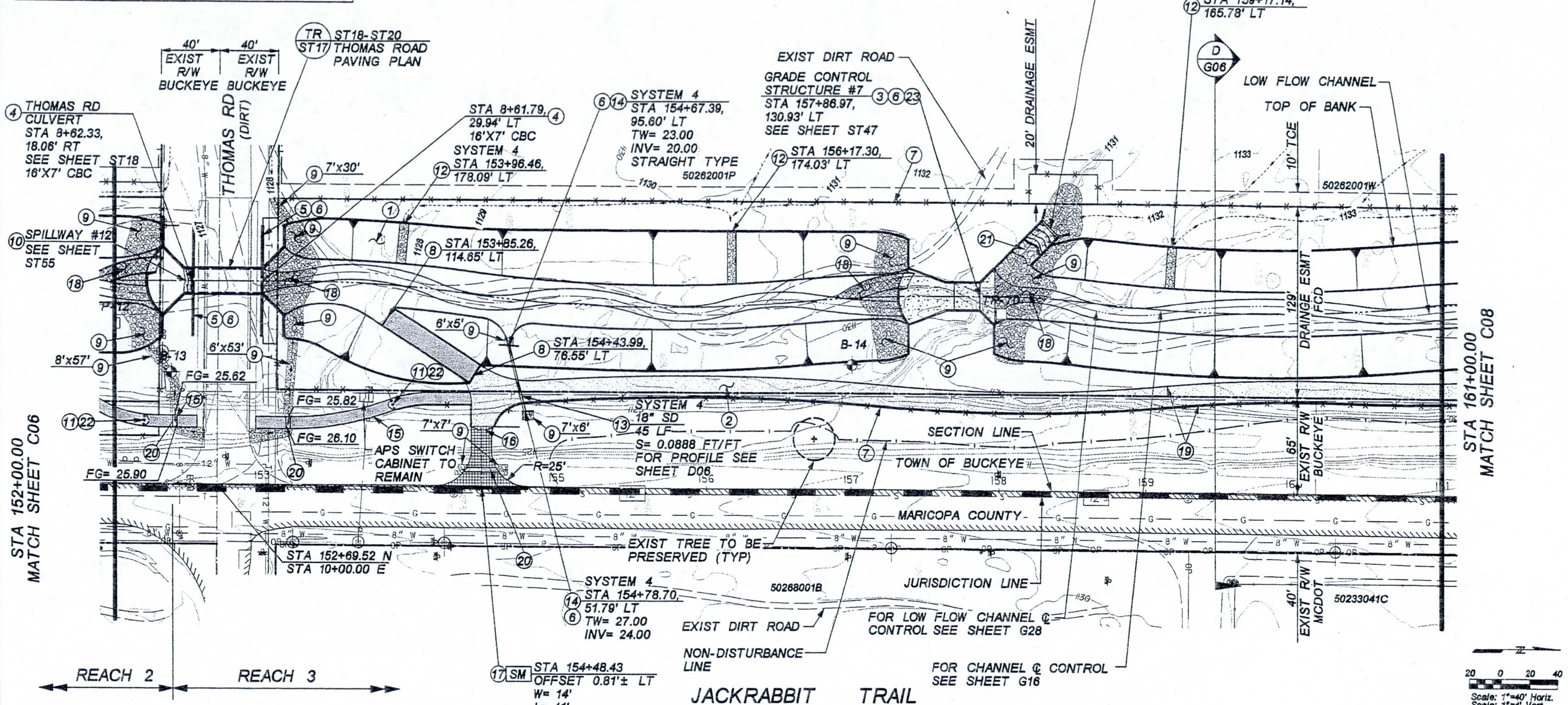
2/4/2011

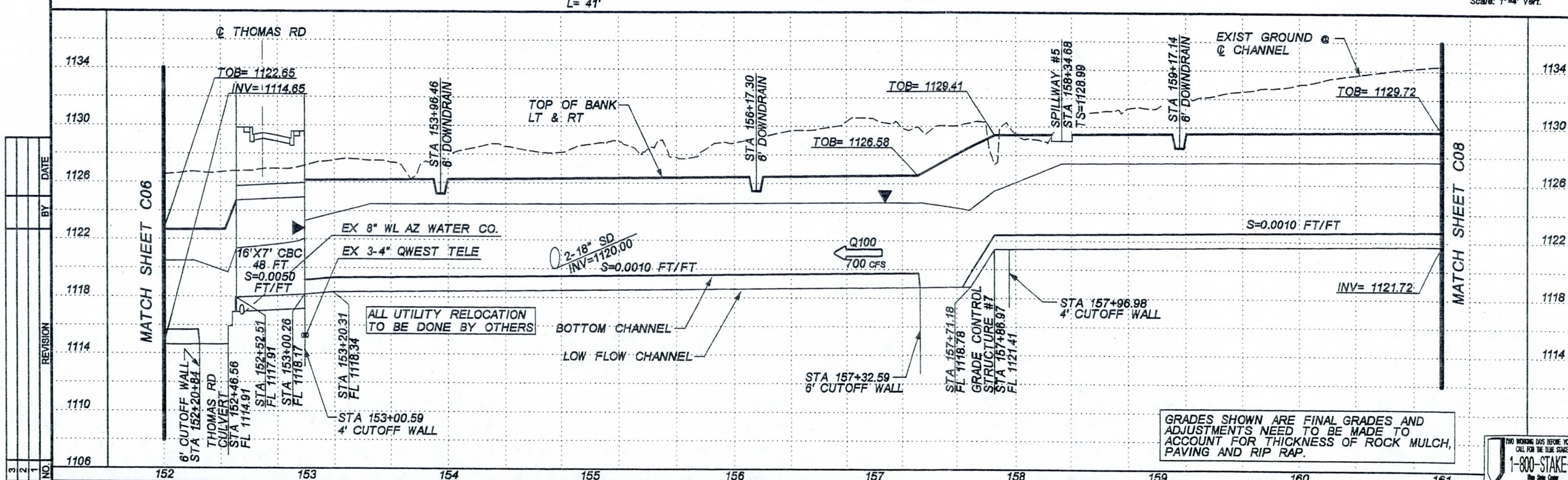
CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"

STA 153+00 TO 194+00
CONTRACTOR TO USE CAUTION EXCAVATING AND RECOMMEND CONTRACTOR OBTAIN ADDITIONAL POTHOLES BEFORE CONSTRUCTION WITHIN THIS AREA

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

REMOVE

S/M	SAWCUT AND MATCH EXISTING PAVEMENT	14 SY

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,086 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST47)	1,318 SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST18	48 LF
5	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST19 & ST20 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,940 SF
6	INSTALL HANDRAIL PER DETAIL SHEET D02	616 LF
7	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,893 LF
8	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
9	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	490 CY
10	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST53)	320 SF
11	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	4 EA
12	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	55 CY
13	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	48 LF
14	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	2 EA
15	INSTALL 4" ABC ON 8' TRAIL	182 SY
16	INSTALL GATE TYPE 1, PER DETAIL SHEET D05	1 EA
17	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 8" ABC) SEE DETAIL SHEET D13	86 SY
18	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	92 CY
19	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,466 LF
20	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	68 SF
21	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	18 CY
22	INSTALL GATE TYPE 3 PER DETAIL SHEET D05	2 EA
23	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	106 CY
24	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	19 CY
25	28" STEEL CASING WITH TEMPORARY PLUGS PER AZ WATER CO. STD DETAIL E-9-24-1	28 LF

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

EXPIRES 3/31/2012

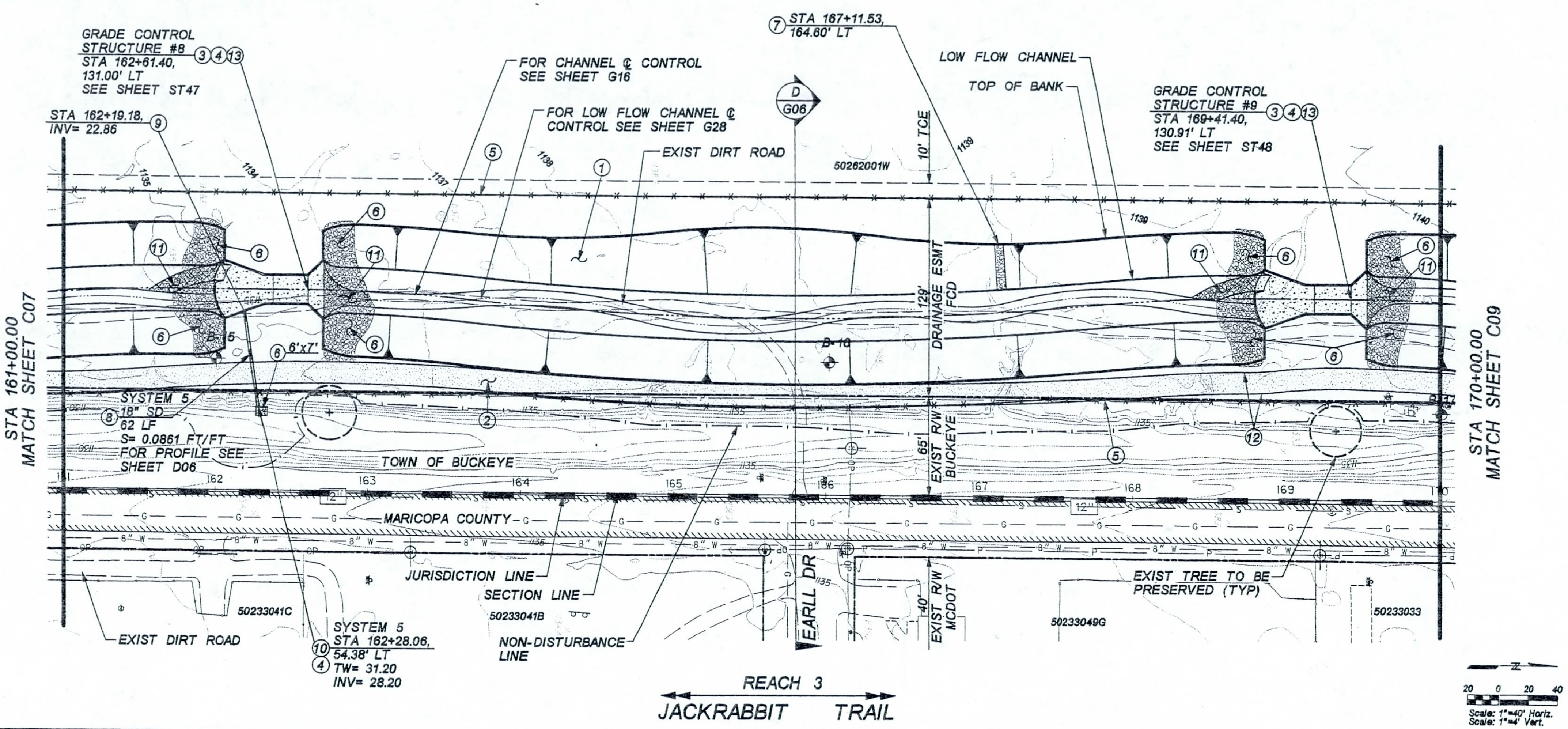
DRAWING NO. C07 | SHEET 61 OF 204

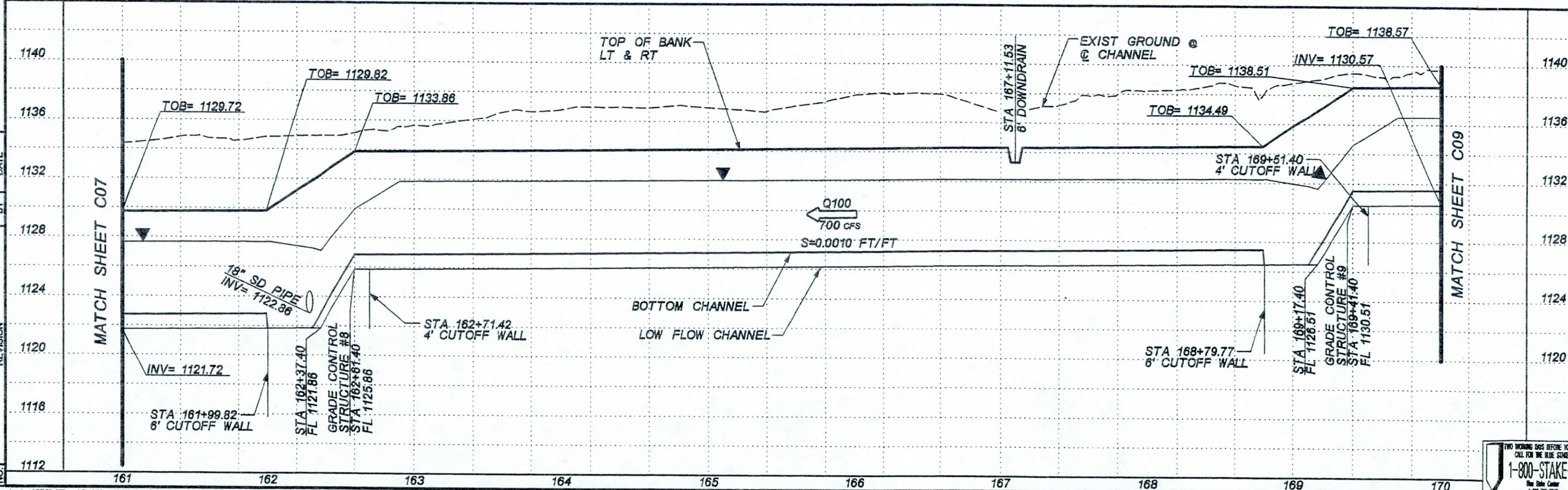
1-800-STAKE-IT

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

STA 153+00 TO 194+00
CONTRACTOR TO USE CAUTION EXCAVATING AND RECOMMEND CONTRACTOR OBTAIN ADDITIONAL POTHOLES BEFORE CONSTRUCTION WITHIN THIS AREA





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REMOVE

CONSTRUCT

①	CONSTRUCT EARTHEN CHANNEL	
②	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,403 SY
③	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEET ST47 & ST48)	2,540 SF
④	INSTALL HANDRAIL PER DETAIL SHEET D02	453 LF
⑤	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,801 LF
⑥	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	416 CY
⑦	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	18 CY
⑧	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	64 LF
⑨	GRADE CONTROL STRUCTURE STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1 EA
⑩	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	1 EA
⑪	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	93 CY
⑫	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,800 LF
⑬	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	204 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C08 SHEET 62 OF 204

1-800-STAKE-IT

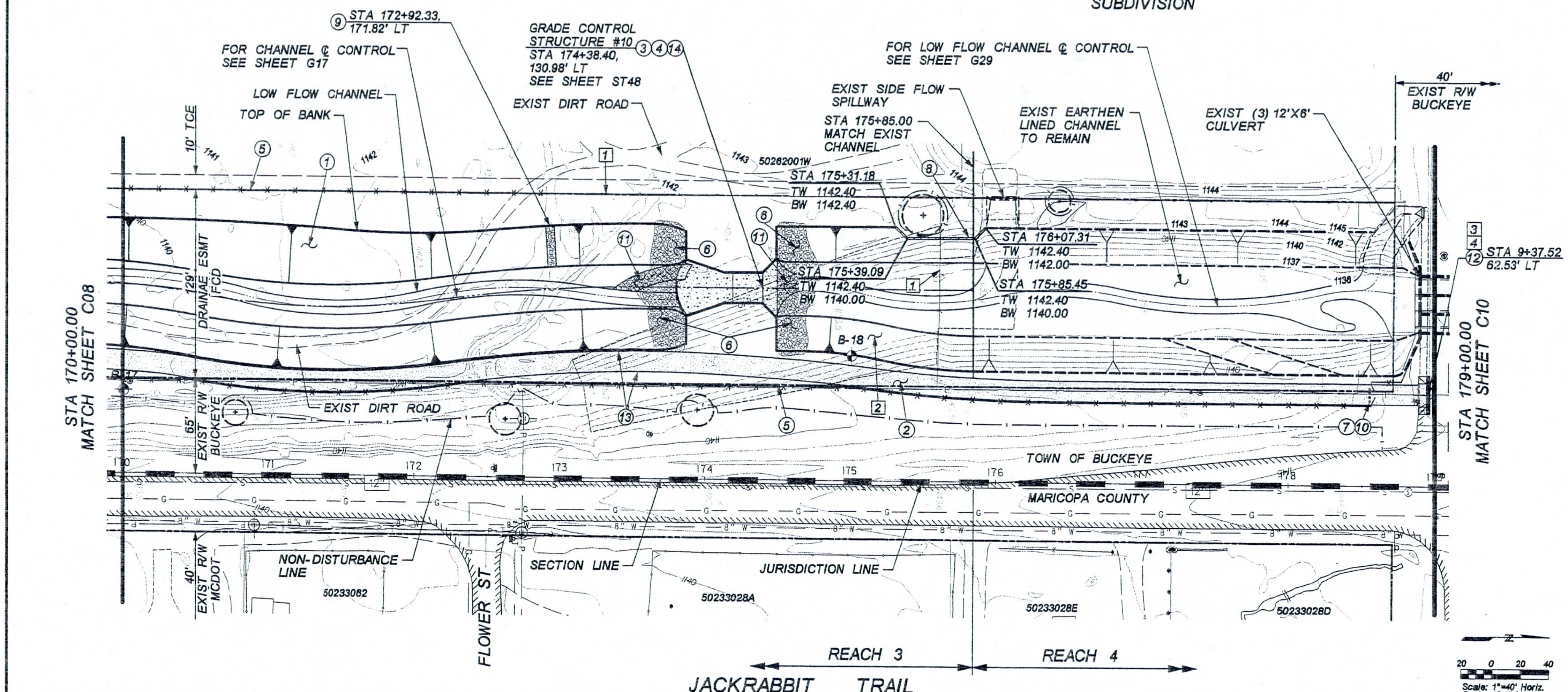
GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

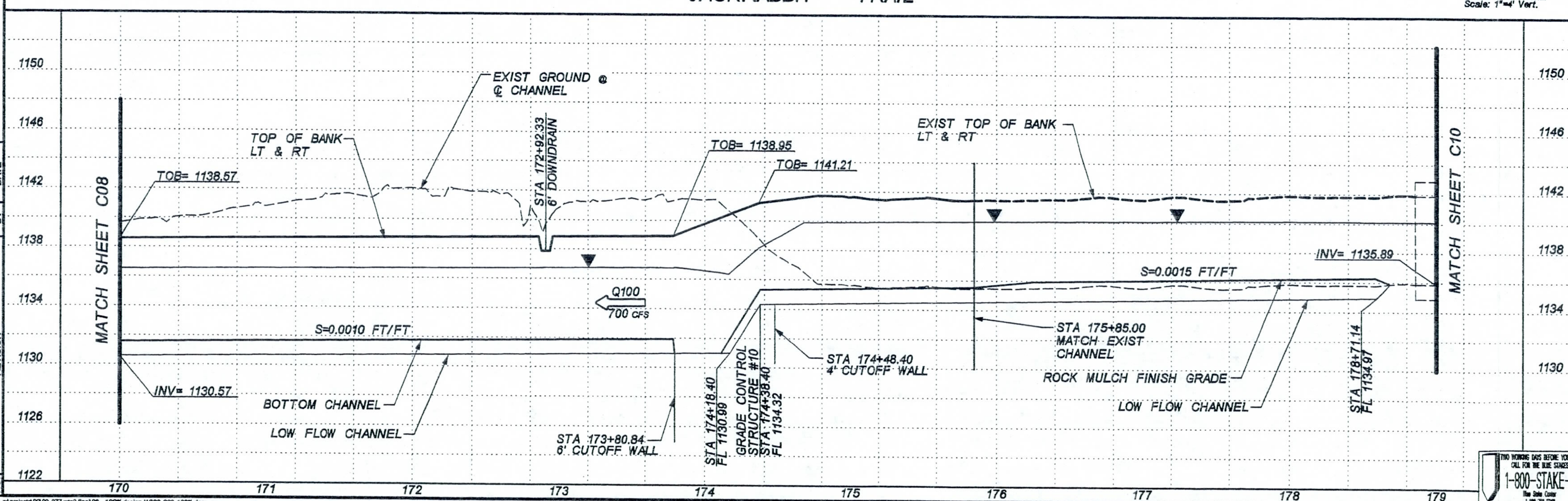
CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"

STA 153+00 TO 194+00
CONTRACTOR TO USE CAUTION EXCAVATING AND RECOMMEND CONTRACTOR OBTAIN ADDITIONAL POTHOLES BEFORE CONSTRUCTION WITHIN THIS AREA





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REMOVE

1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	432 LF
2	REMOVE GROUTED RIPRAP	2,404 SY
3	SAWCUT AND REMOVE CURB AND GUTTER	21 LF
4	SAWCUT AND REMOVE SIDEWALK	94 SF
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	10 SY

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,388 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST48)	1,471 SF
4	INSTALL HANDRAIL PER DETAIL SHEET D02	284 LF
5	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,200 LF
6	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	200 CY
7	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	4 EA
8	CONSTRUCT RETAINING WALL (2'-3')	139 SF
9	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	17 CY
10	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
11	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	47 CY
12	CONSTRUCT 16' DRIVEWAY PER MAG STD DET 250-2	125 SF
13	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,785 LF
14	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	115 CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

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CHECKED	PH, MM, JU	11/10

PAUL PHIL HOSKIN 19690 ARIZONA, U.S.A.
EXPIRES 3/31/2012

1-800-STAKE-IT

PLAN AND PROFILE

DRAWING NO. C09 | SHEET 63 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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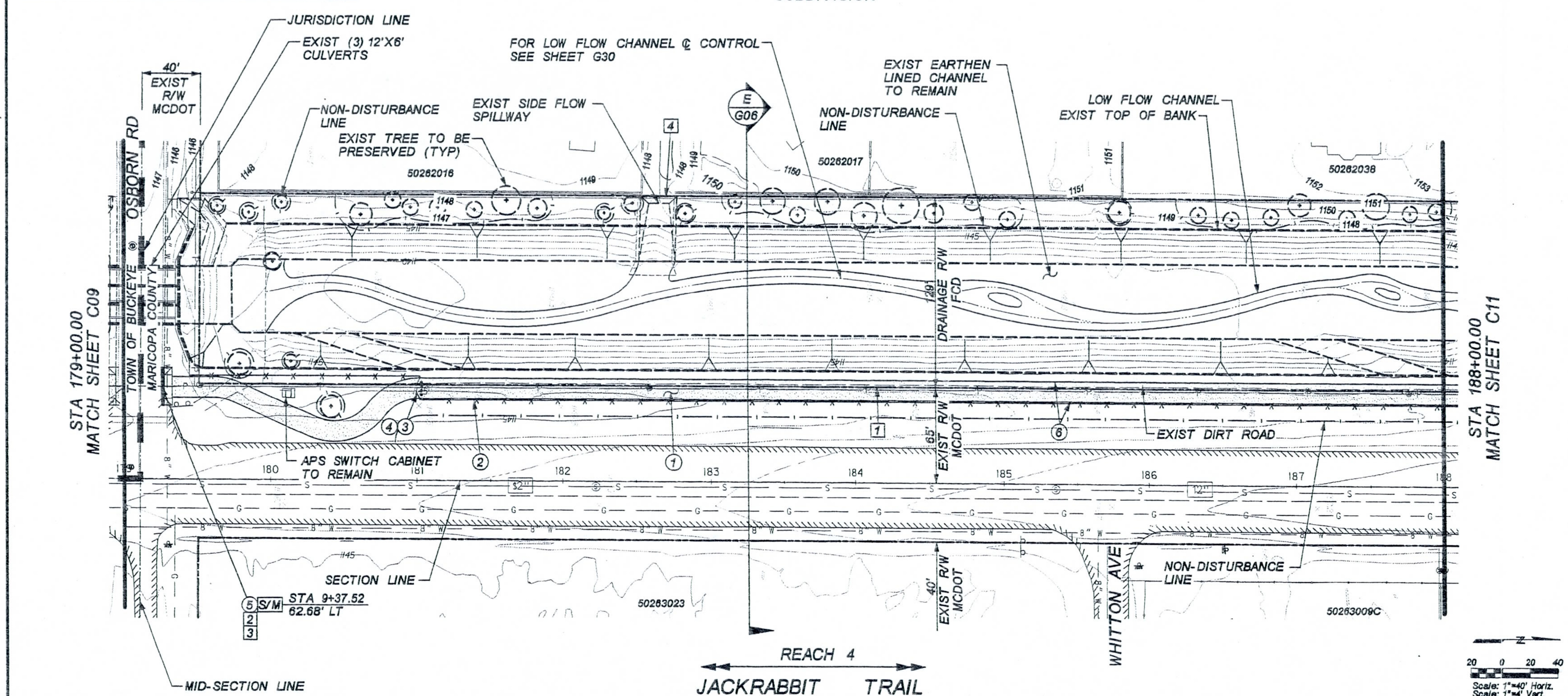
2/4/2011

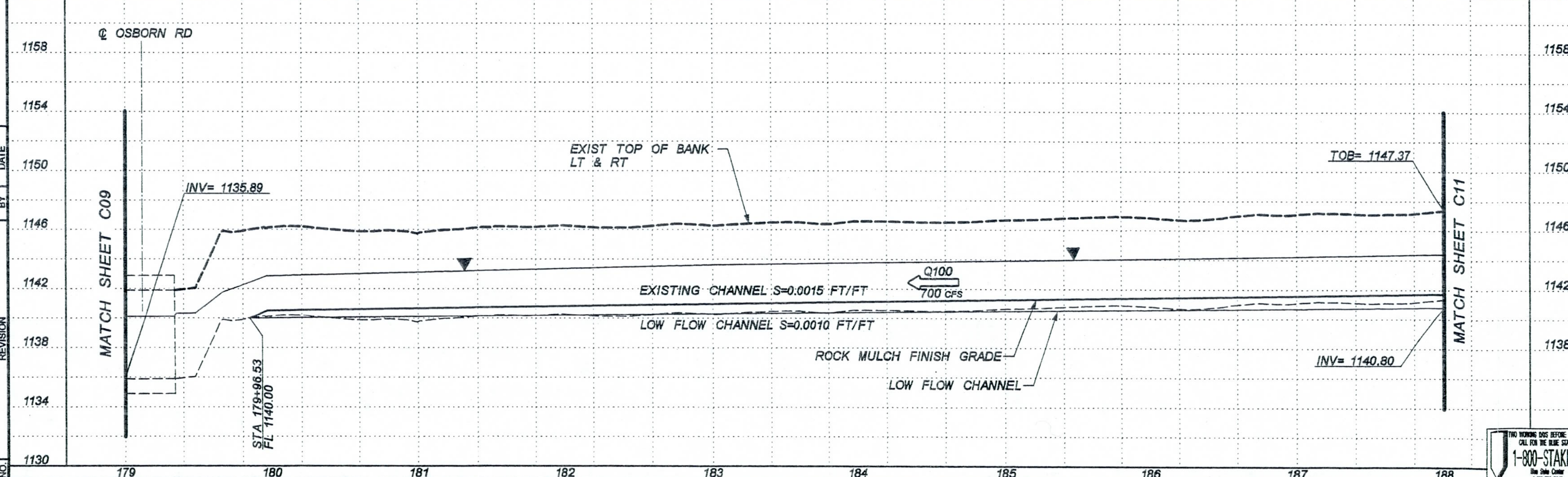
CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"

STA 153+00 TO 194+00
CONTRACTOR TO USE CAUTION EXCAVATING AND RECOMMEND CONTRACTOR OBTAIN ADDITIONAL POTHOLES BEFORE CONSTRUCTION WITHIN THIS AREA





REMOVE

1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	835 LF
2	SAWCUT AND REMOVE CURB AND GUTTER	26 LF
3	SAWCUT AND REMOVE SIDEWALK	143 SF
4	REMOVE AND REPLACE EXIST SPILLWAY	1 EA
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	9 SY

CONSTRUCT

1	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,372 SY
2	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	868 LF
3	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	4 EA
4	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
5	CONSTRUCT 16' DRIVEWAY PER MAG STD DET 250-2	125 SF
6	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,765 LF

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

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PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C10 SHEET 64 OF 204

1-800-STAKE-IT

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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2/4/2011

CAUTION
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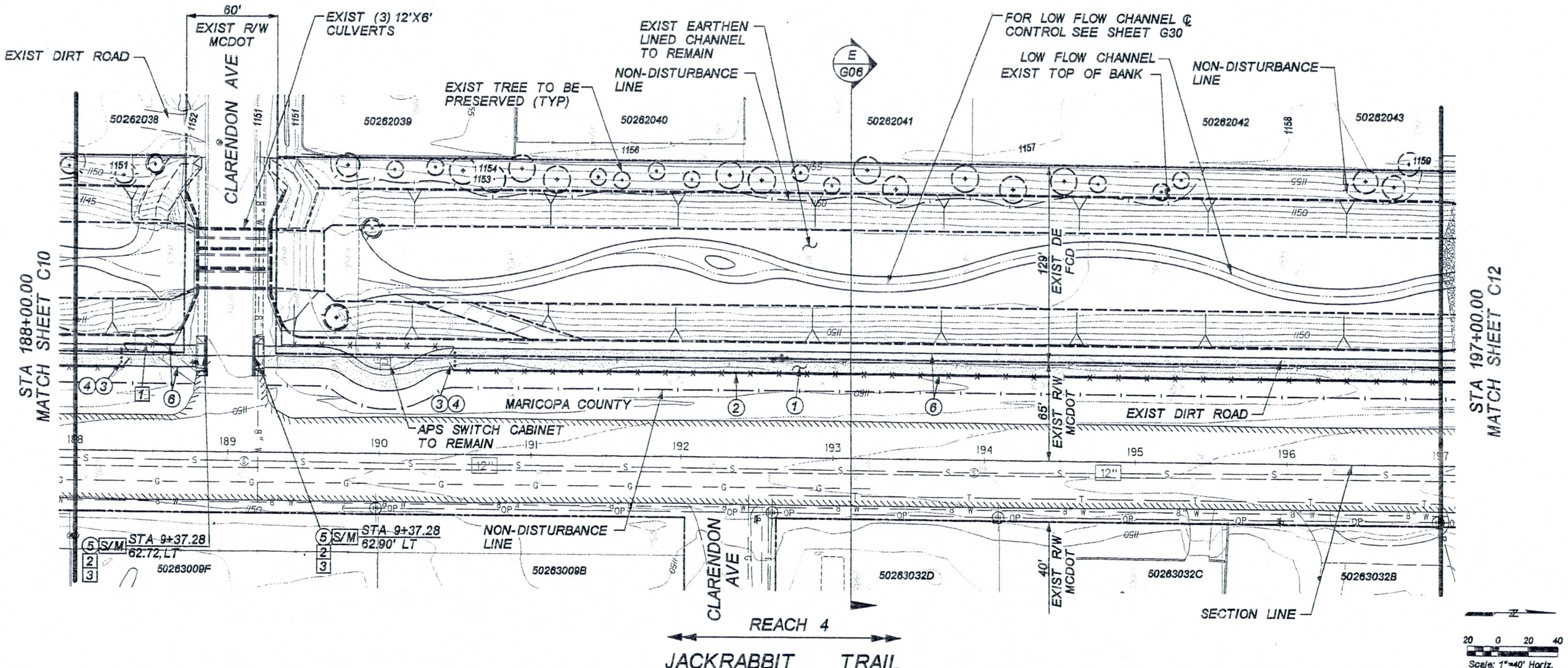
"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"

STA 153+00 TO 194+00
CONTRACTOR TO USE CAUTION EXCAVATING AND RECOMMEND CONTRACTOR OBTAIN ADDITIONAL POTHOLES BEFORE CONSTRUCTION WITHIN THIS AREA

PASQUALETTI MOUNTAIN RANCH SUBDIVISION



REMOVE		
[1]	REMOVE EXIST. FENCE, BLOCK WALL AND/OR RETAINING WALL	868 LF
[2]	SAWCUT AND REMOVE CURB AND GUTTER	46 LF
[3]	SAWCUT AND REMOVE SIDEWALK	203 SF
[S/M]	SAWCUT AND MATCH EXISTING PAVEMENT	20 SY

CONSTRUCT		
(1)	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,341 SY
(2)	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	860 LF
(3)	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	8 EA
(4)	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2 EA
(5)	CONSTRUCT 16' DRIVEWAY PER MAG STD DET 250-2	250 SF
(6)	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,726 LF

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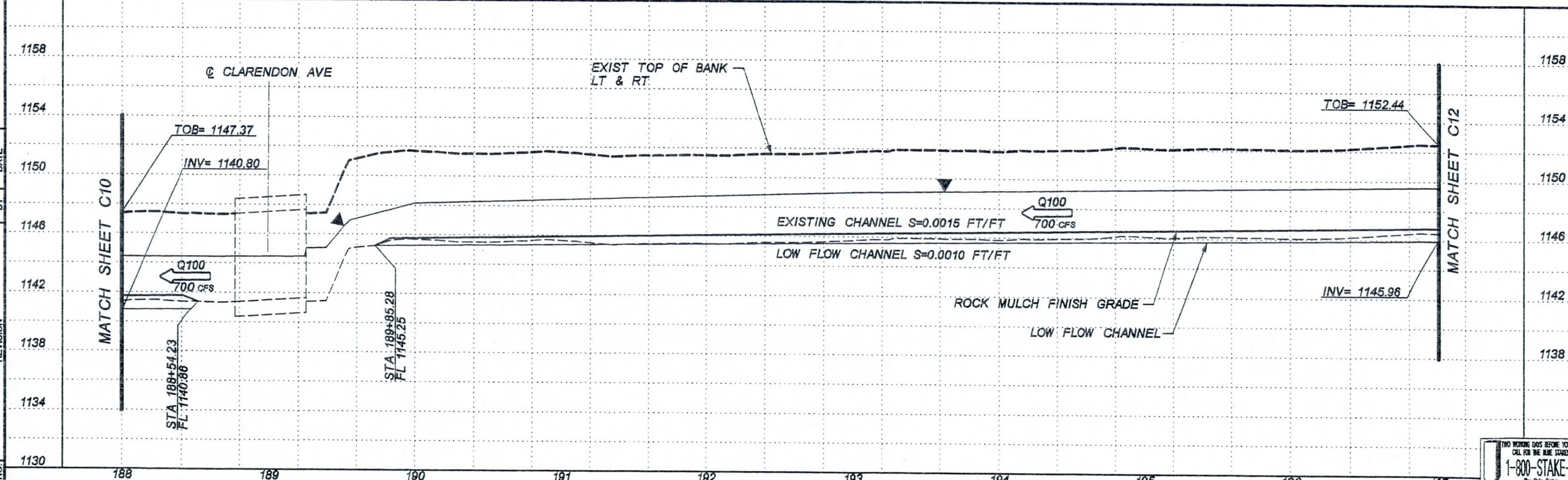

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1-800-STAKE-IT

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

PLAN AND PROFILE

DRAWING NO. C11 | SHEET 65 OF 204

EXPIRES 3/31/2012

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

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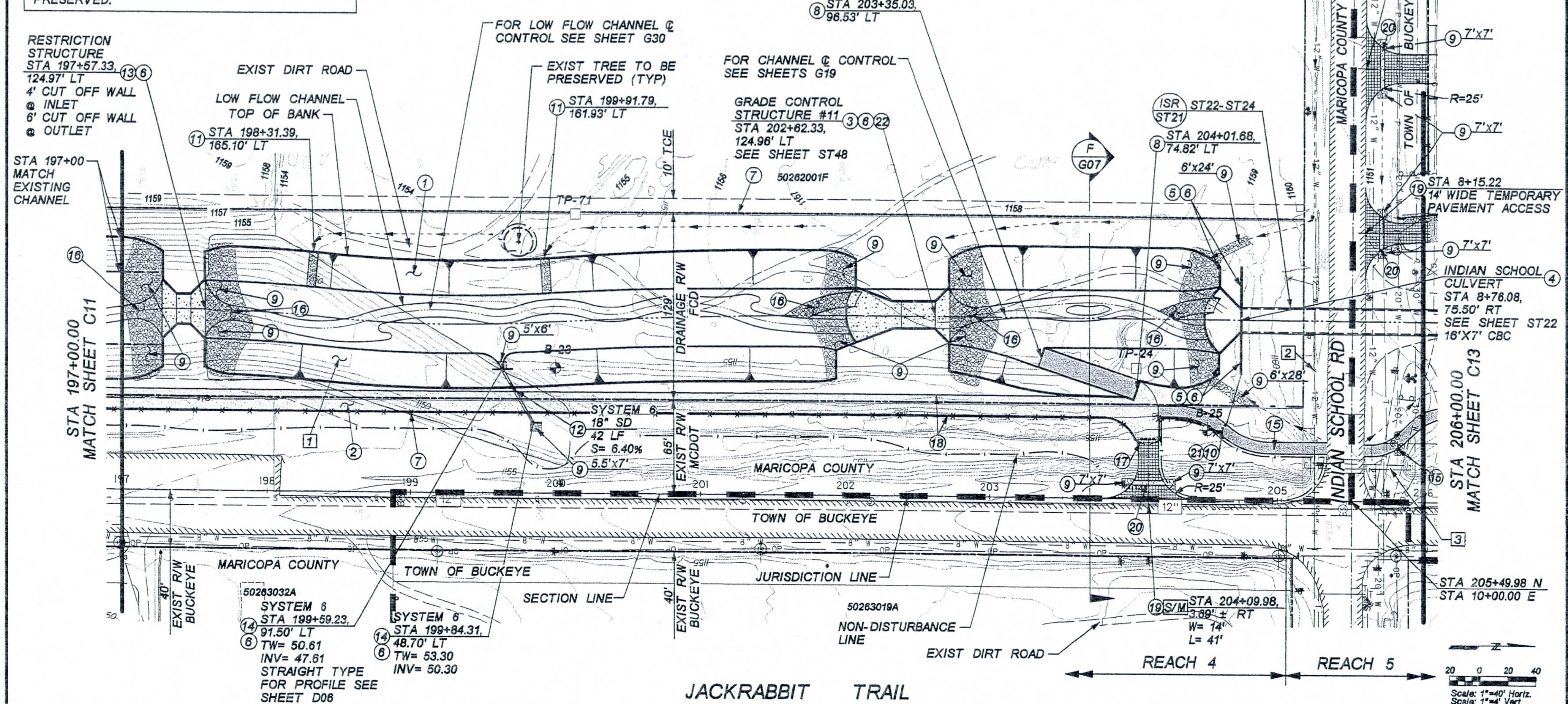
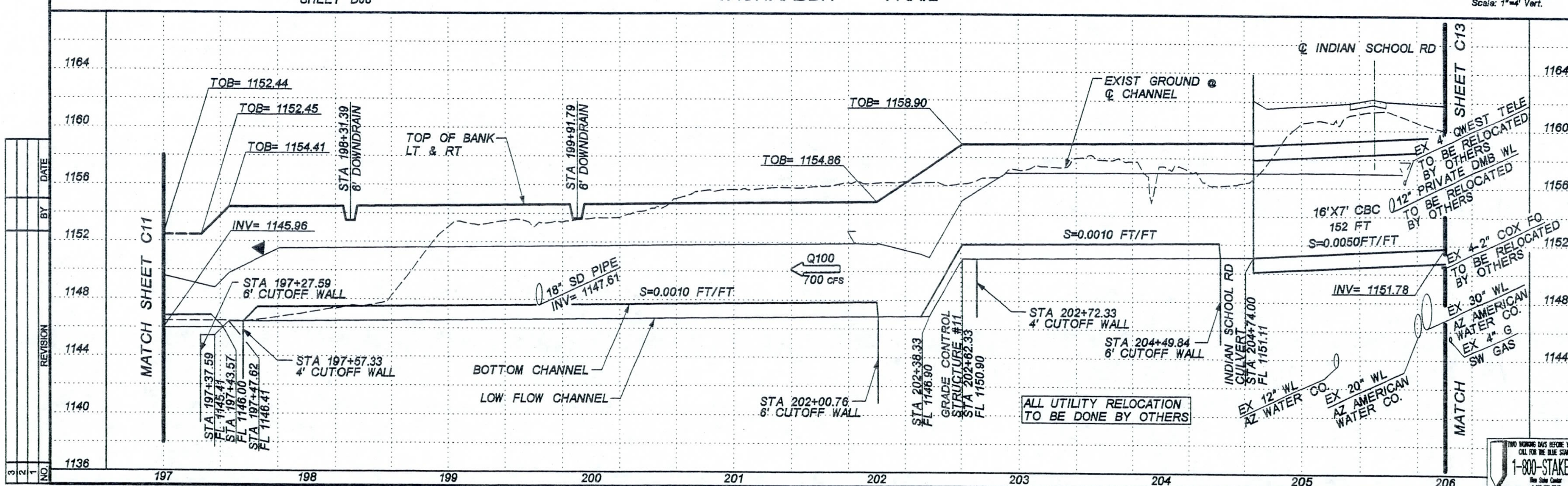
A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





REMOVE		
1	REMOVE GROUTED RIPRAP	2,043 SY
2	REMOVE EXIST. FENCE, BLOCK WALL AND/OR RETAINING WALL	350 LF
3	REMOVE EXIST. STORM DRAIN PIPE	70 LF
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	14 SY

CONSTRUCT		
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,165 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST48)	1,658 SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST22	131 LF
5	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST23 & ST24 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	697 SF
6	INSTALL HANDRAIL PER DETAIL SHEET D02	560 LF
7	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,502 LF
8	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
9	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	540 CY
10	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	2 EA
11	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	30 CY
12	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	44 LF
13	RESTRICTION STRUCTURE PER DETAIL SHEET ST49	60 CY
14	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	2 EA
15	INSTALL 4" ABC ON 8' TRAIL	153 SY
16	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	111 CY
17	INSTALL GATE TYPE 1, PER DETAIL SHEET D05	1 EA
18	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,577 LF
19	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	296 SY
20	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	68 SF
21	INSTALL GATE TYPE 3 PER DETAIL SHEET D05	1 EA
22	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	113 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

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PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C12 SHEET 66 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

NO.	REVISION	BY	DATE
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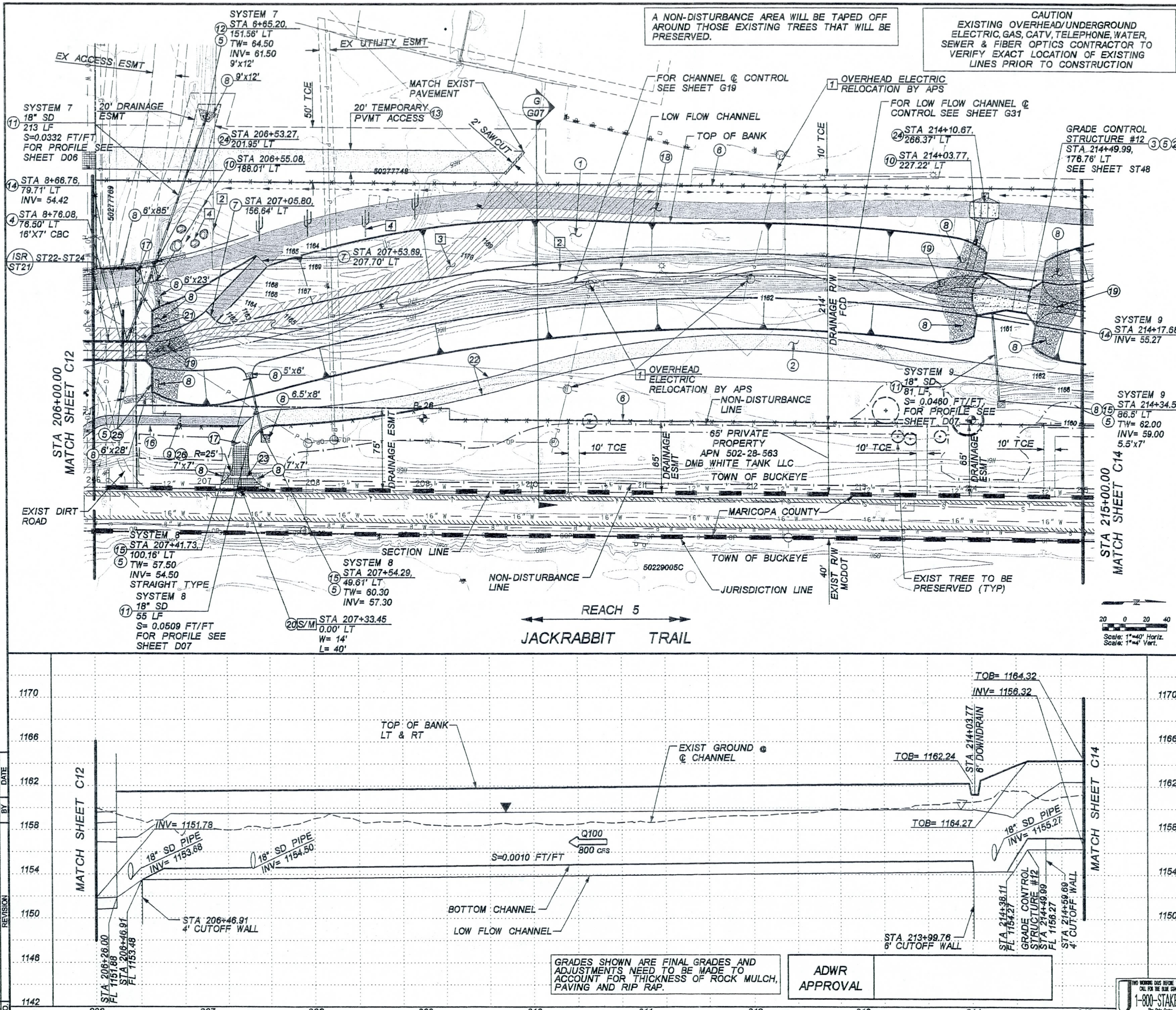

REMOVE		
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	14 SY
1	UTILITY LINE RELOCATION (TYPE PER SHEET)	
2	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	1,406 LF
3	REMOVE EXIST ASPHALT PAVEMENT	16,500 SF
4	REMOVE AND SALVAGE LARGE BOULDERS & CACTI SEE LANDSCAPE PLANS	

CONSTRUCT		
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,224 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST48)	1,357 SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST22	21 LF
5	INSTALL HANDRAIL PER DETAIL SHEET D02	527 LF
6	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,944 LF
7	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
8	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	398 CY
9	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	2 EA
10	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	15 CY
11	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	352 LF
12	CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	1 EA
13	CONSTRUCT 20' WIDE TEMPORARY ACCESS PAVEMENT 2 1/2" AC OVER 6" ABC	850 SY
14	BOX CULVERT/GRADE CONTROL STRUCTURE STORM DRAIN PIPE CONECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	2 EA
15	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	3 EA
16	INSTALL 4" ABC ON 8' TRAIL	125 SY
17	INSTALL GATE TYPE 1, PER DETAIL SHEET D05	2 EA
18	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,443 SY
19	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	77 CY
20	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	84 SY
21	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST23 & ST24 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	877 SF
22	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,679 LF
23	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	68 SF
24	CONSTRUCT CONCRETE CROSSING PER DETAIL B SHEET D11	17 CY
25	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST23 & ST24 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	877 SF
26	INSTALL GATE TYPE 3 PER DETAIL SHEET D05	1 EA
27	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	105 CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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PLAN AND PROFILE

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DRAWING NO. C13 | SHEET 67 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

NO.	REVISION	BY	DATE
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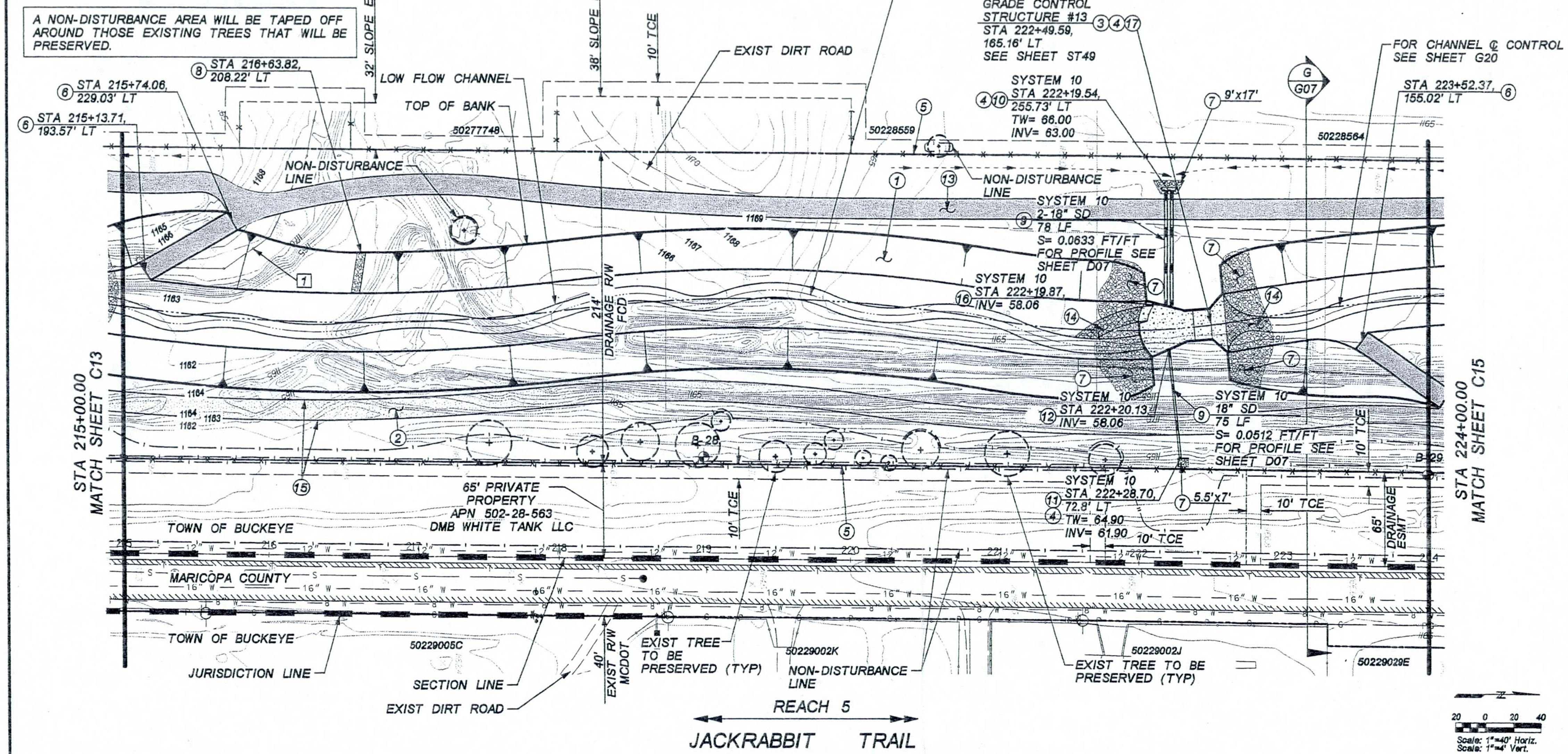

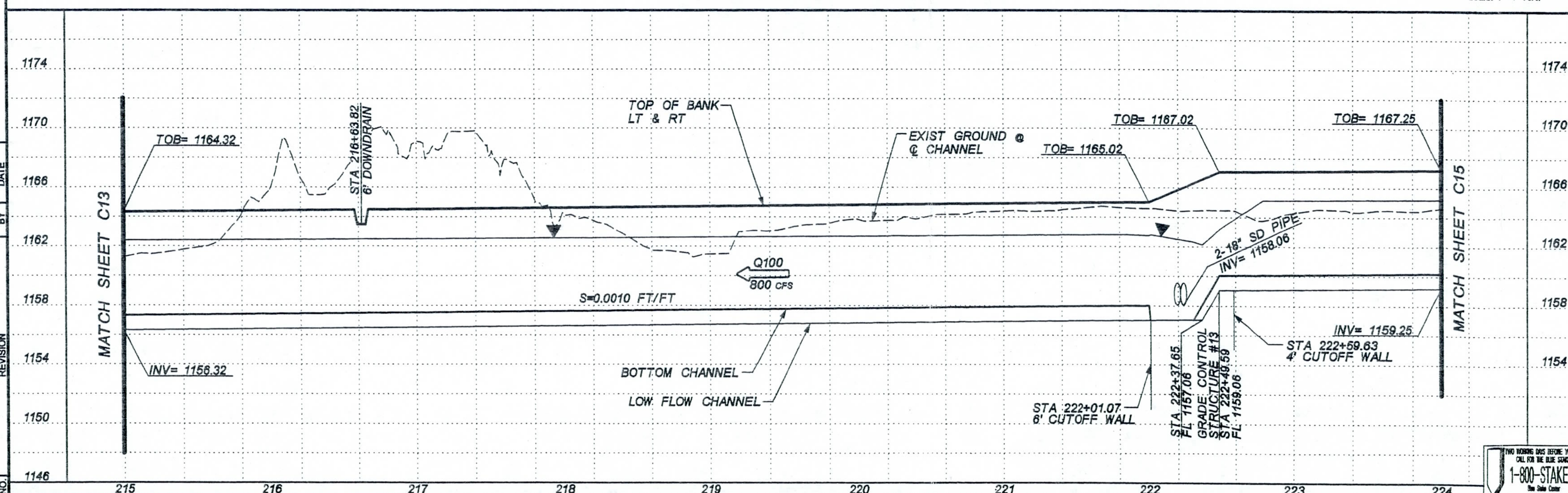

REMOVE

①	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	208 LF

CONSTRUCT

①	CONSTRUCT EARTHEN CHANNEL	
②	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,391 CY
③	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST49)	1,357 SF
④	INSTALL HANDRAIL PER DETAIL SHEET D02	222 LF
⑤	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,940 LF
⑥	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	218 SY
⑦	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	255 CY
⑧	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	17 CY
⑨	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	238 LF
⑩	CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	1 EA
⑪	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	1 EA
⑫	GRADE CONTROL STRUCTURE STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1 EA
⑬	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,434 SY
⑭	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	50 CY
⑮	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,808 LF
⑯	GRADE CONTROL STRUCTURE DUAL STORM DRAIN PIPE CONNECTION PER DETAIL SHEET ST43 (NON-PAY ITEM)	1 EA
⑰	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	105 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

REGISTERED PROFESSIONAL ENGINEER 19690 PAUL R. HOSKIN ARIZONA, U.S.A.
EXPIRES 3/31/2012

PLAN AND PROFILE

DRAWING NO. C14 SHEET 68 OF 204

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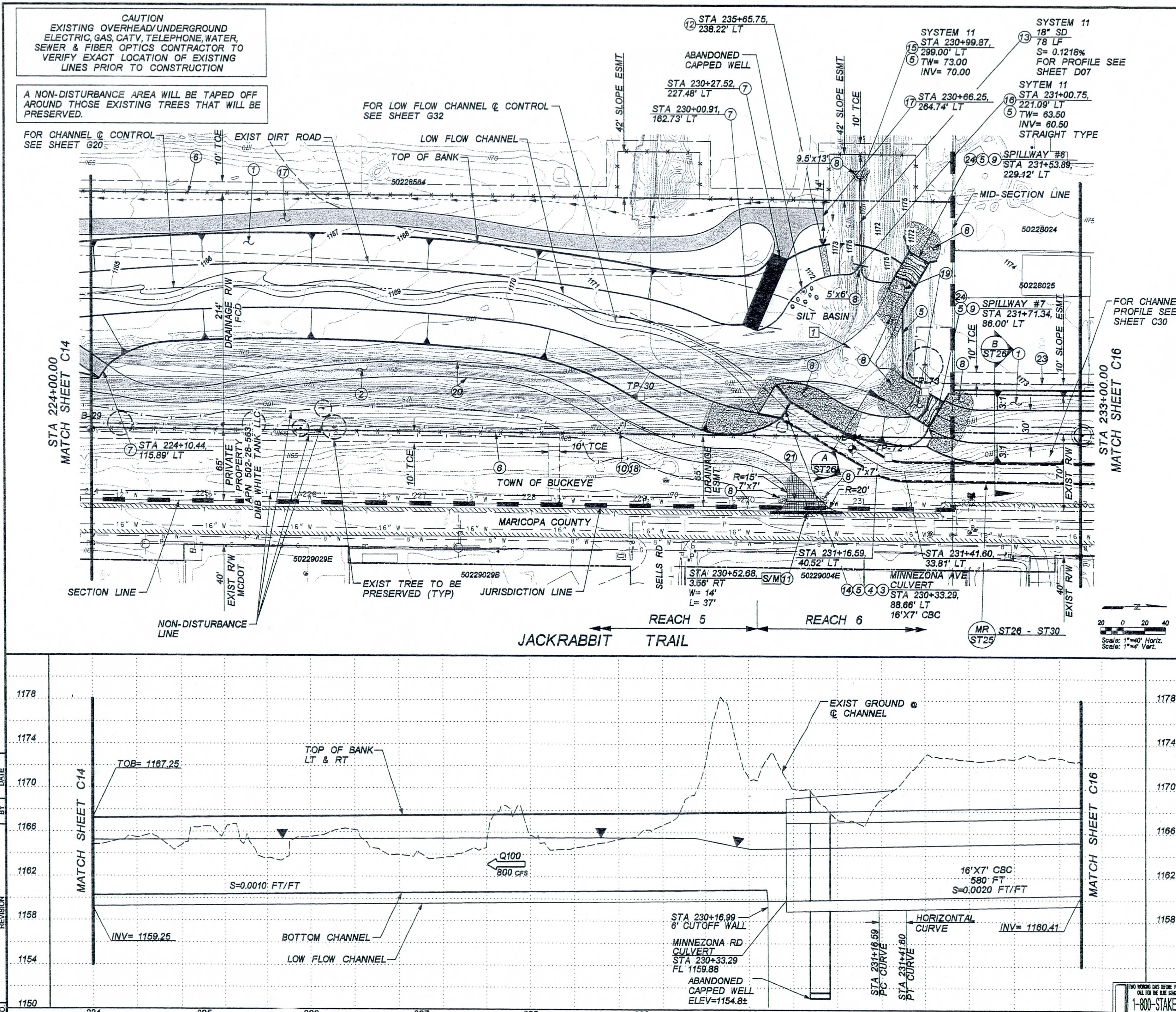
2/4/2011



REMOVE

S/M	SAWCUT AND MATCH EXISTING PAVEMENT	14 SY
1	REMOVE AND SALVAGE LARGE BOULDERS SEE LANDSCAPE PLANS	

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,050 SY
3	CONSTRUCT BOX CULVERT PER DETAIL SHEETS ST26 & ST27	281 LF
4	CONSTRUCT CONCRETE HEADWALL, PER DETAIL SHEET ST30 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	164 SF
5	INSTALL HANDRAIL PER DETAIL SHEET D02	340 LF
6	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,715 LF
7	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
8	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	435 CY
9	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST54)	1,374 SF
10	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	4 EA
11	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" OVER 6" ABC) SEE DETAIL SHEET D13	89 SY
12	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	17 CY
13	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	80 LF
14	ACCESS BARRIER - PER DETAIL SHEET D03	1 EA
15	CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	1 EA
16	HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	1 EA
17	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,137 SY
18	INSTALL GATE TYPE 1 PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
19	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	74 CY
20	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,423 LF
21	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	92 SF
22	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	69 CY
23	REMOVE AND REPLACE HORSE FENCE	1 LS

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PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C15 SHEET 69 OF 204

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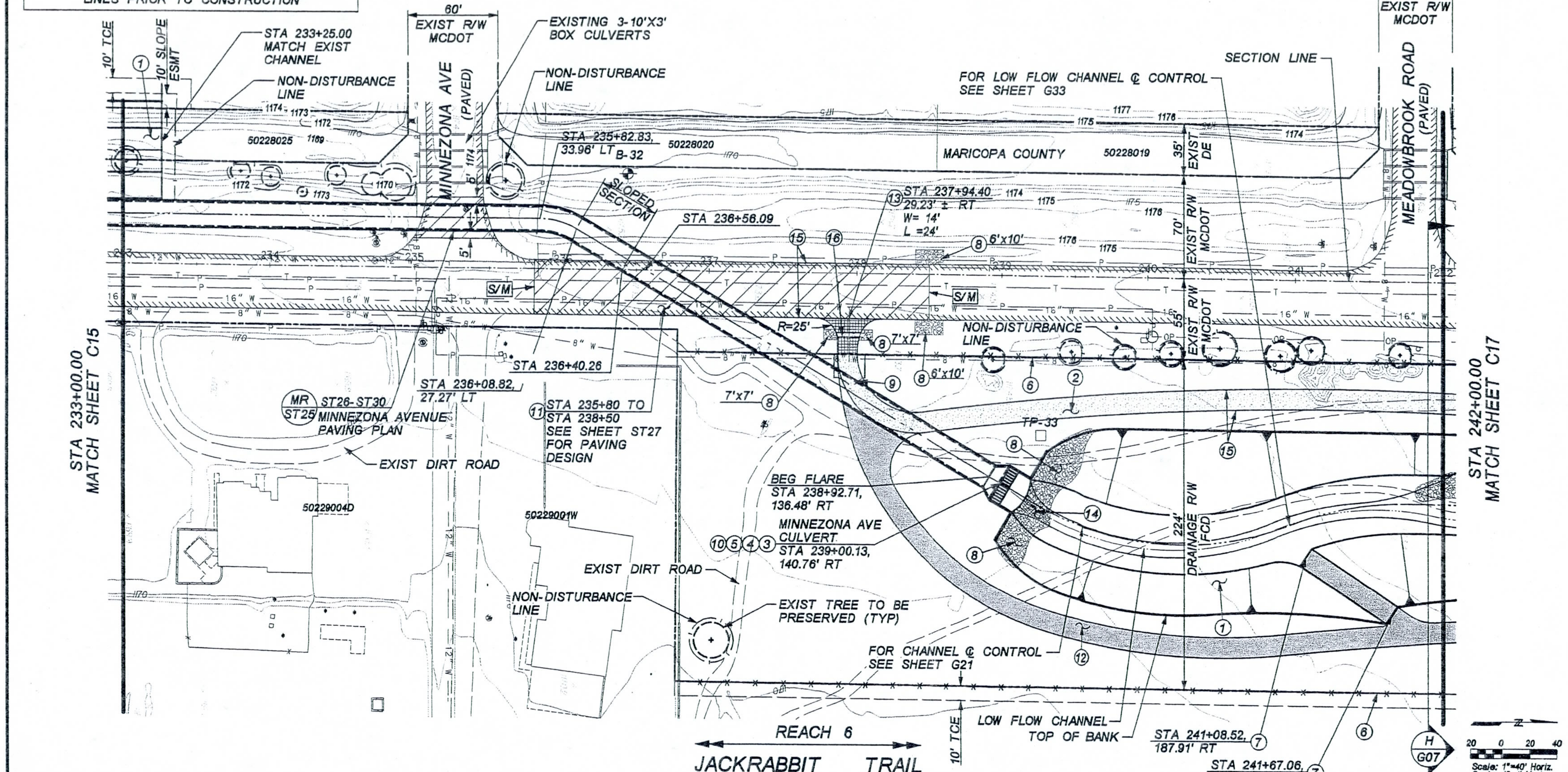
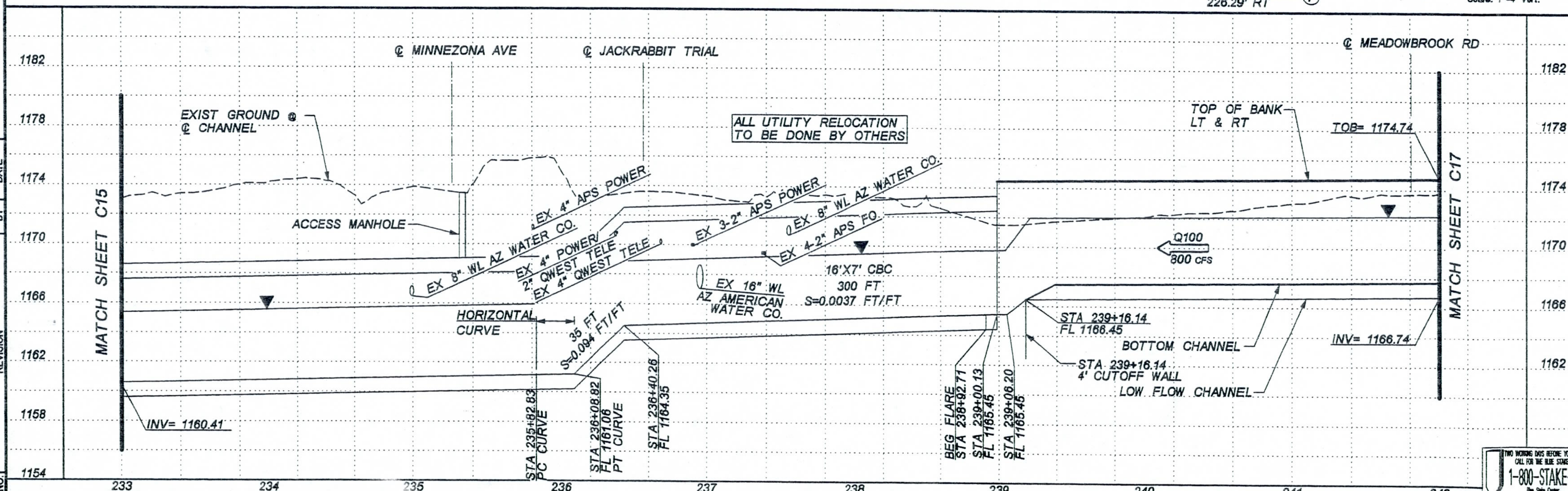
2/4/2011

CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"





REMOVE	
S/M SAWCUT AND MATCH EXIST OR 5" AC / 7" ABC WHICHEVER IS GREATER (MAG STD DET 200 TYPE T-TOP	1,117 SY

CONSTRUCT	
(1) CONSTRUCT EARTHEN CHANNEL	
(2) CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	697 SY
(3) CONSTRUCT BOX CULVERT PER DETAIL SHEETS ST26 & ST27	645 LF
(4) CONSTRUCT CONCRETE HEADWALL, PER DETAIL SHEET ST30 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	634 SF
(5) INSTALL HANDRAIL PER DETAIL SHEET D02	105 LF
(6) INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,070 LF
(7) CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
(8) INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	147 CY
(9) INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	1 EA
(10) INSTALL TRASH RACK PER MAG STD DETAIL 502-1 MODIFIED PER DETAIL SHEET D04	1 EA
(11) CONSTRUCT NEW PAVEMENT STRUCTURAL SECTION WITH MIN 2 1/2" / 6" ABC OR MATCH EXIST	1,117 SY
(12) CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC)	803 SY
(13) PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	43 SY
(14) INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	17 CY
(15) THICKENED EDGE PER MAG STD DET 201 TYPE A	1,482 LF
(16) 3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	68 SF

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OUTFALL CHANNEL
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PAUL M. HOSKIN 19690
EXPIRES 3/31/2012

PLAN AND PROFILE

DRAWING NO. C16 SHEET 70 OF 204

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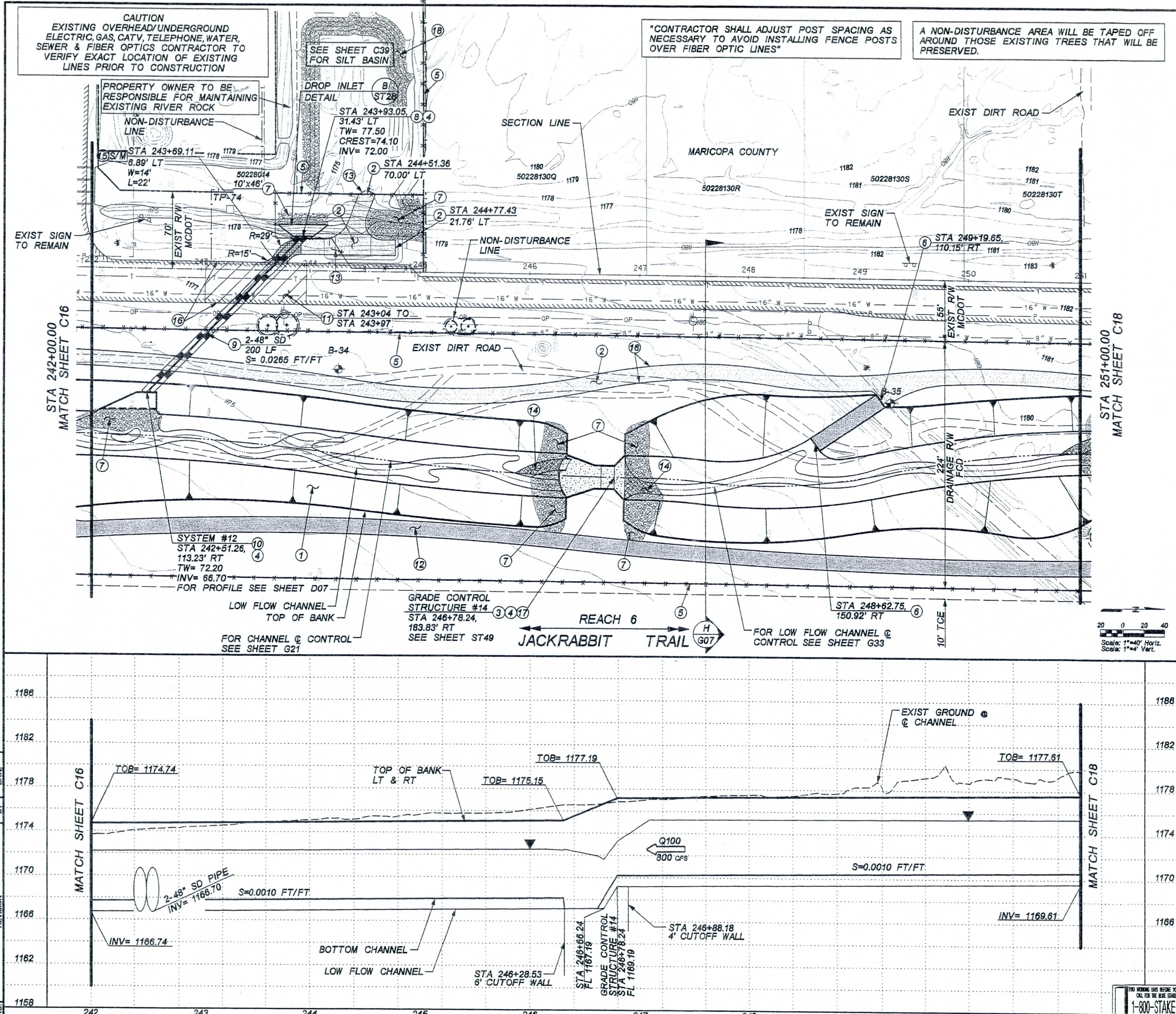

REMOVE

S/M SAWCUT AND MATCH EXIST OR 5" AC / 7" ABC WHICHEVER IS GREATER (MAG STD DET 200 TYPE T-TOP	391	SY

CONSTRUCT

1 CONSTRUCT EARTHEN CHANNEL		
2 CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,647	SY
3 CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST49)	1,357	SF
4 INSTALL HANDRAIL PER DETAIL SHEET D02	363	LF
5 INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	2,363	LF
6 CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109	SY
7 INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	446	CY
8 CONSTRUCT DROP INLET STRUCTURE PER MAG STD DETAIL 501-5 (MODIFIED PER DETAIL SHEET ST28	46	CY
9 CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	406	LF
10 CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	1	EA
11 CONSTRUCT NEW PAVEMENT STRUCTURAL SECTION WITH MIN 2 1/2" / 6" ABC OR MATCH EXIST	391	SY
12 CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC)	1,402	SY
13 INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2	EA
14 INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	46	CY
15 PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	44	SY
16 THICKENED EDGE PER MAG STD DET 201 TYPE A	2,005	LF
17 CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	105	CY
18 INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	184	CY

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
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PLAN AND PROFILE

EXPIRES 3/31/2012

DRAWING NO. C17 SHEET 71 OF 204

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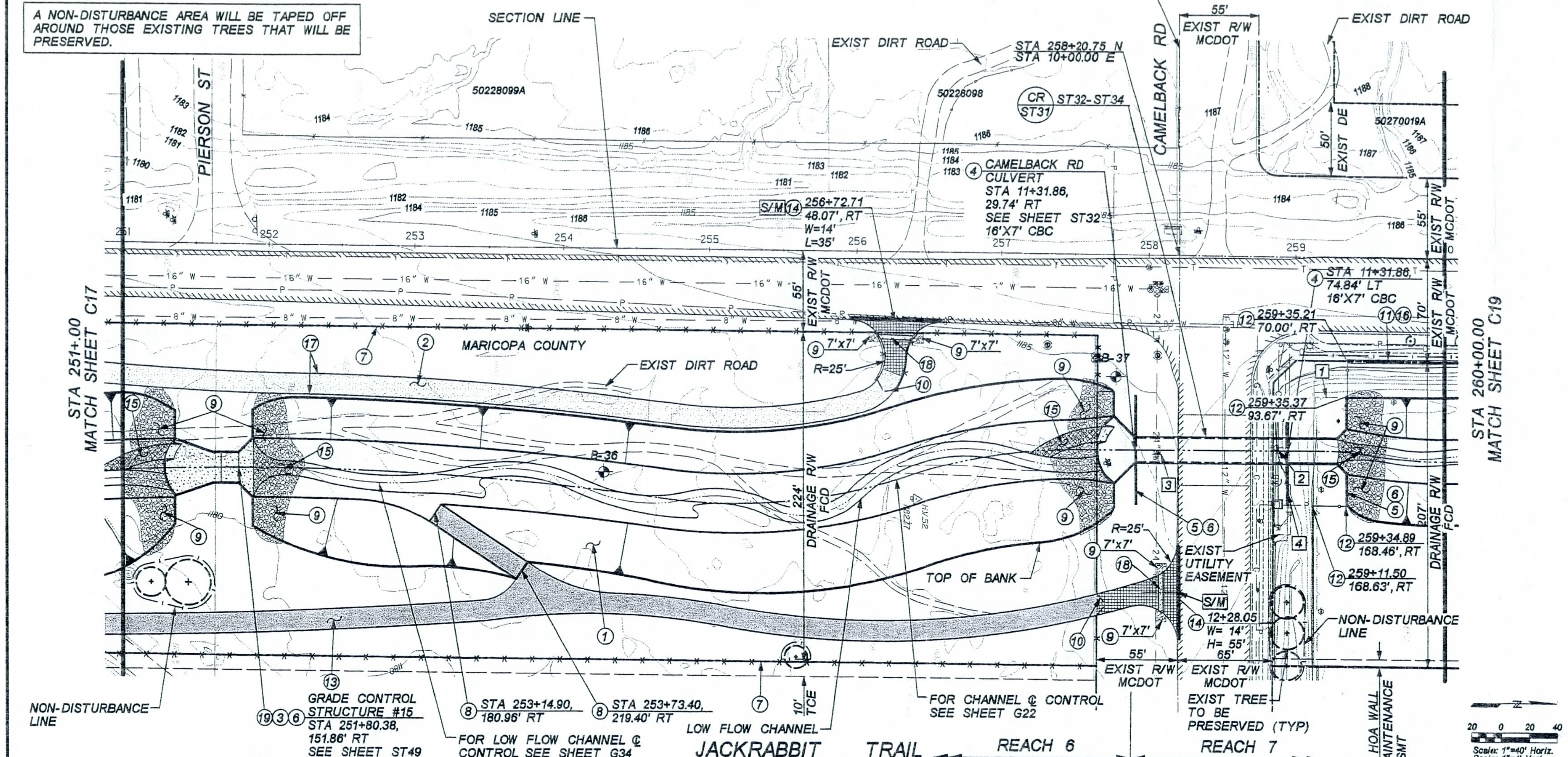
CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

GAS LINE CONTRACTOR TO CONTACT SOUTHWEST GAS 1-800-528-4277 PRIOR TO REMOVAL OF ABANDON GAS LINE, SOUTHWEST GAS TO CAP PORTION OF REMAINING ABANDONED GAS LINE

"CONTRACTOR SHALL ADJUST POST SPACING AS NECESSARY TO AVOID INSTALLING FENCE POSTS OVER FIBER OPTIC LINES"

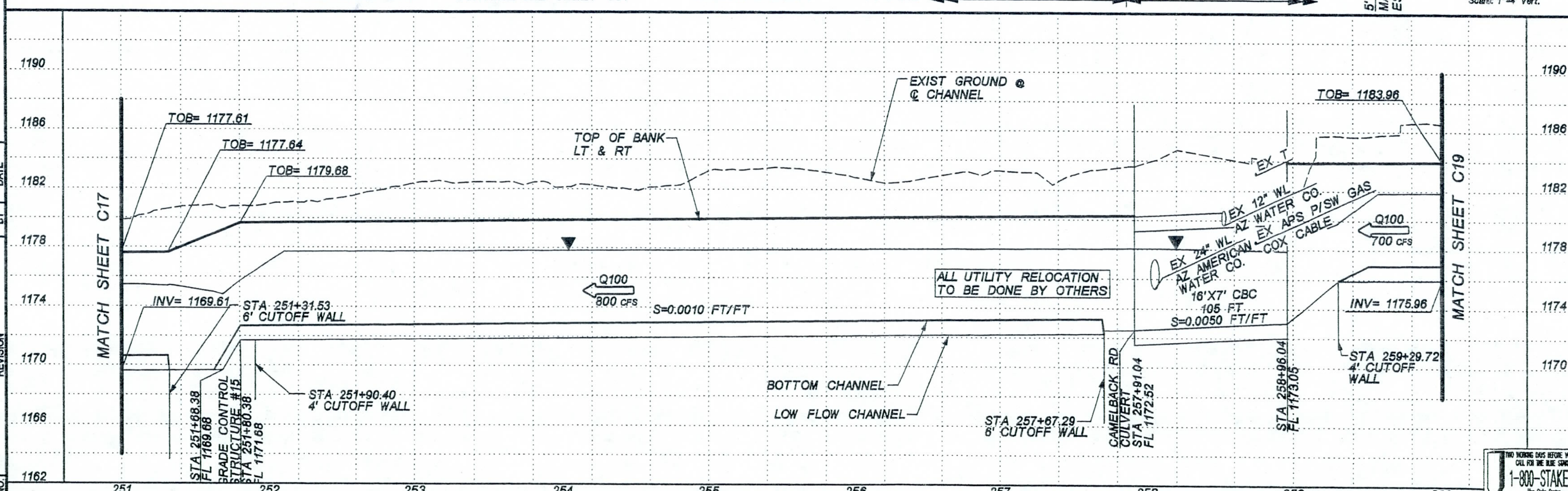
SEE WALL PLAN & DETAILS FOR JACKRABBIT ESTATES (SHEETS ST62 - ST67)



	REMOVE	
S/M	SAWCUT AND MATCH EXISTING PAVEMENT	28 SY
1	REMOVE EXIST. FENCE, BLOCK WALL AND/OR RETAINING WALL	250 LF
2	REMOVE AND REPLACE EXIST LIGHT BOLLARD	1 EA
3	REMOVE AND SALVAGE EXIST STREET SIGN, REFLECTIVE SURFACE TO BE PROTECTED AND REPLACED AFTER CULVERT CONSTRUCTION	1 EA
4	REMOVE EXIST CONCRETE RETAINING WALL	15± LF

	CONSTRUCT	
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	833 SY
3	CONSTRUCT GRADE CONTROL STRUCTURE RETAINING WALL (SEE DETAIL SHEETST49)	1,357 SF
4	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST32	105 LF
5	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST33 & ST34 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	2,070 SF
6	INSTALL HANDRAIL PER DETAIL SHEET D02	550 LF
7	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,524 LF
8	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
9	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	490 CY
10	INSTALL GATE TYPE 1, PER DETAIL SHEET D05	2 EA
11	CONSTRUCT BLOCK WALL PER WALL PLAN SHEETS ST62-ST67 (MATCH EXIST MATERIAL & COLOR)	195 SF
12	CONSTRUCT 6' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	47 LF
13	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC)	1,110 SY
14	PAVED TURNOUT PER MAG STD DET 205 TYPE C (2 1/2" AC OVER 6" ABC) SEE DETAIL SHEET D13	208 SY
15	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	95 CY
16	CONSTRUCT 4' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	63 LF
17	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,248 LF
18	3' VALLEY GUTTER PER MAG STD DET 240 SEE DETAIL SHEET D13	137 SF
19	CONSTRUCT GRADE CONTROL STRUCTURE APRON AND CUTOFF WALL	105 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

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PLAN AND PROFILE

DRAWING NO. C18 SHEET 72 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

2/7/2011

CAUTION
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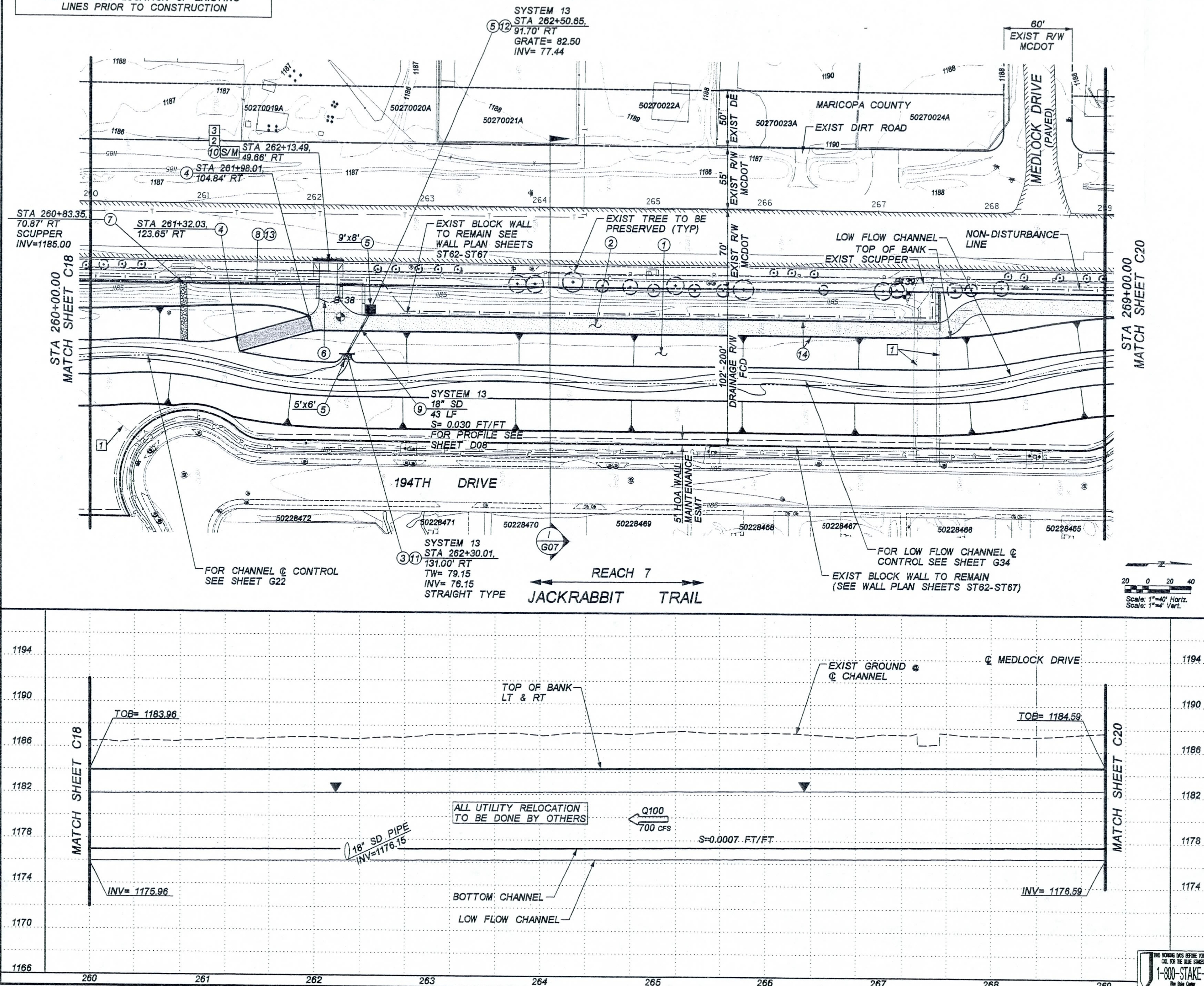
GAS LINE CONTRACTOR TO CONTACT SOUTHWEST GAS 1-800-528-4277 PRIOR TO REMOVAL OF ABANDON GAS LINE, SOUTHWEST GAS TO CAP PORTION OF REMAINING ABANDONED GAS LINE

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.

SEE WALL PLAN & DETAILS FOR JACKRABBIT ESTATES (SHEETS ST62-ST67)

REMOVE	
[1] REMOVE EXIST. FENCE, BLOCK WALL AND/OR RETAINING WALL	531 LF
[2] SAWCUT AND REMOVE CURB AND GUTTER	26 LF
[3] SAWCUT AND REMOVE SIDEWALK	190 SF
[S/M] SAWCUT AND MATCH EXISTING PAVEMENT	7 SY

CONSTRUCT	
(1) CONSTRUCT EARTHEN CHANNEL	
(2) CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,186 SY
(3) INSTALL HANDRAIL PER DETAIL SHEET D02	14 LF
(4) CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
(5) INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	6 CY
(6) INSTALL GATE TYPE 2, PER DETAIL SHEET D05	1 EA
(7) 6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	30 CY
(8) CONSTRUCT BLOCK WALL PER WALL PLAN SHEETS ST62-ST67	1,161 SF
(9) CONSTRUCT RCRCP CLASS IV STORM DRAIN PIPE (SIZE PER PLAN)	45 LF
(10) CONSTRUCT 16' DRIVEWAY PER MAG STD DETAIL 250-2	189 SF
(11) HEADWALL PER MAG STD DETAIL 501-1 AND 501-2 L-TYPE UNLESS OTHERWISE NOTED	1 EA
(12) INSTALL TYPE F CATCH BASIN PER MAG DETAIL 535	1 EA
(13) CONSTRUCT 4' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	926 LF
(14) THICKENED EDGE PER MAG STD DET 201 TYPE A	1,476 LF



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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PAUL W. HOSKIN 10690 ARIZONA, U.S.A.
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PLAN AND PROFILE

DRAWING NO. C19 | SHEET 73 OF 204

GENERAL | QUANTITIES | DETAILS | CIVIL CONSTRUCTION | STRUCTURES | LANDSCAPE | CROSS SECTIONS | SOIL BORINGS

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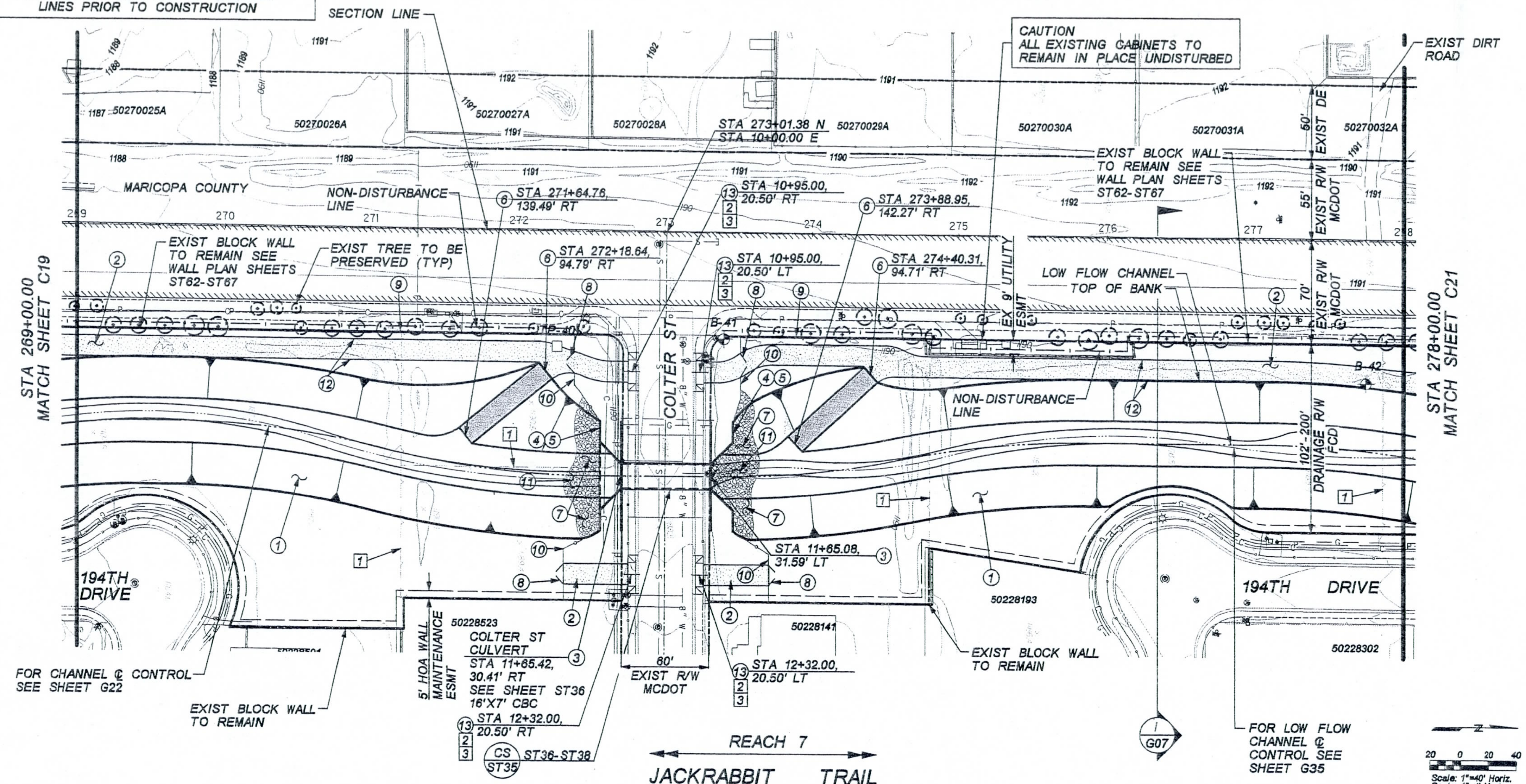
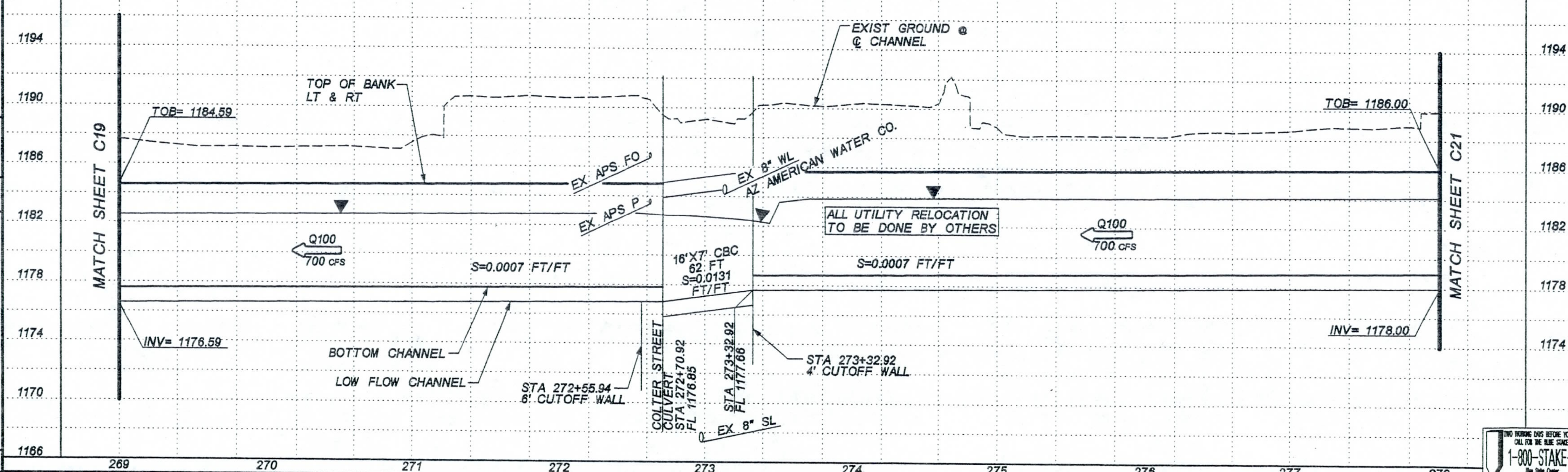
SEE WALL PLAN & DETAILS FOR JACKRABBIT ESTATES (SHEETS ST62-ST67)





	REMOVE	
1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	998 LF
2	REMOVE EXISTING CURB AND GUTTER	104 LF
3	REMOVE EXISTING SIDEWALK	564 SF

	CONSTRUCT	
1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,361 SY
3	CONSTRUCT BOX CULVERT PER DETAIL SHEET ST36	62 LF
4	CONSTRUCT CONCRETE HEADWALL, PER DETAIL SHEET ST40 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,710 SF
5	INSTALL HANDRAIL PER DETAIL SHEET D02	288 LF
6	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	218 SY
7	INSTALL RIP-RAP (D50=9", 18" THICK UNLESS OTHERWISE NOTED) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	171 CY
8	INSTALL GATE TYPE 2 PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	4 EA
9	CONSTRUCT 4' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	805 LF
10	CONSTRUCT 6' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	179 LF
11	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	33 CY
12	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,918 LF
13	CONSTRUCT 16' DRIVEWAY PER MAG STD DETAIL 250-2	500 SF

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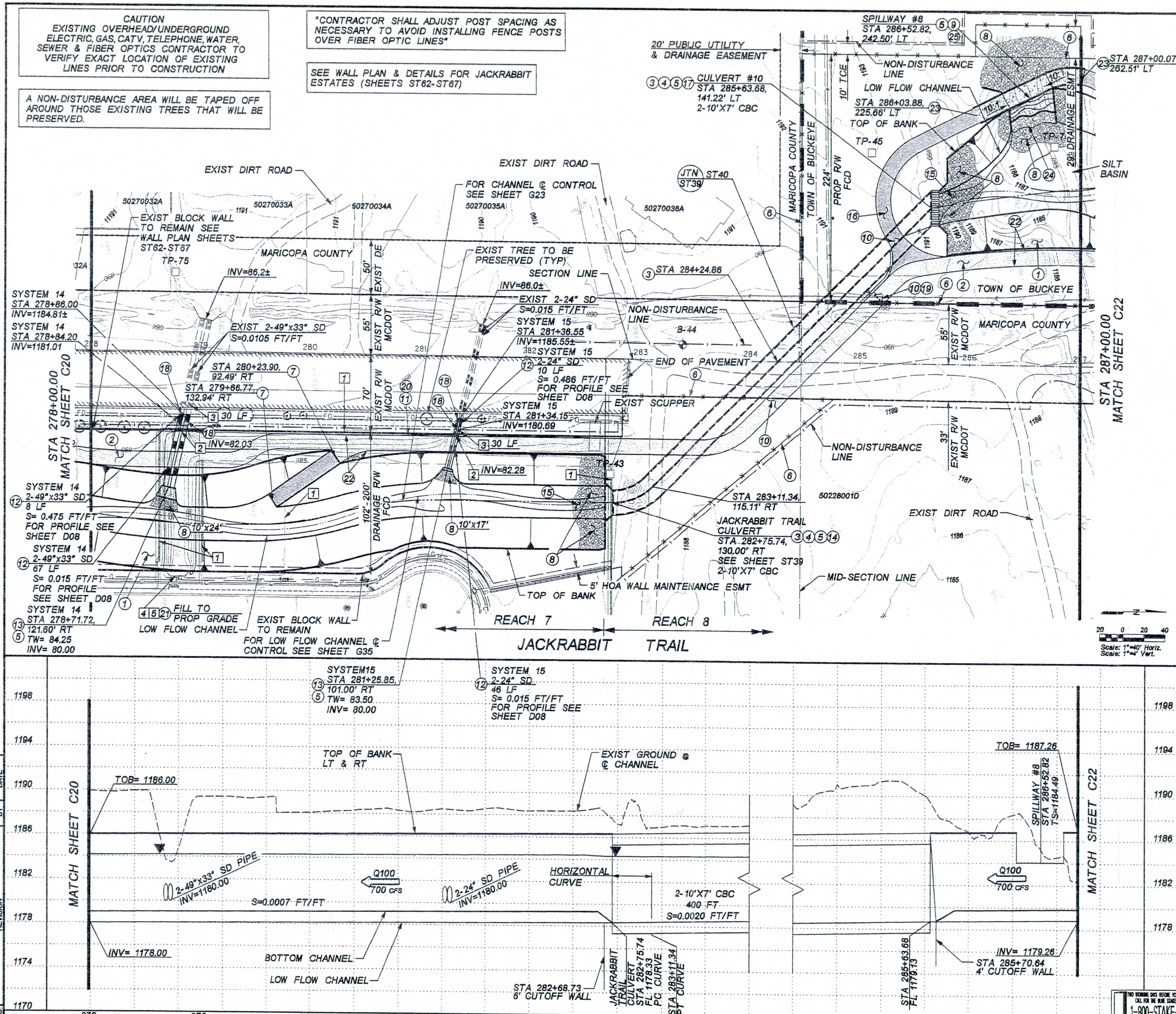

REMOVE

1	REMOVE EXIST. FENCE, BLOCK WALL AND/OR RETAINING WALL	1,251 LF
2	REMOVE EXIST HEADWALL	2 EA
3	REMOVE EXIST STORM DRAIN PIPE	60 LF
4	REMOVE EXIST TRASH RACK	1 EA
5	REMOVE EXIST HANDRAIL	1 EA

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,527 SY
3	CONSTRUCT BOX CULVERT PER ADOT DETAIL B-02.20	400 LF
4	CONSTRUCT CONCRETE HEADWALL PER DETAIL SHEETS ST39 & ST40 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1,110 SF
5	INSTALL HANDRAIL PER DETAIL SHEET D02	403 LF
6	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,280 LF
7	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
8	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	488 CY
9	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST53)	366 SF
10	INSTALL GATE TYPE 1, PER DETAIL SHEET D05	3 EA
11	CONSTRUCT BLOCK WALL PER WALL PLAN SHEETS ST62-ST67	1,688 SF
12	CONSTRUCT RGRCP CLASS IV STORM DRAIN PIPE OR CMP (SIZE PER PLAN)	228 LF
13	CONSTRUCT HEADWALL PER MAG STD DETAIL 501-4	2 EA
14	ACCESS BARRIER - PER DETAIL SHEET D03	2 EA
15	INSTALL GROUTED RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	46 CY
16	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	415 SY
17	INSTALL TRASH RACK PER MAG STD DETAIL 502-1 MODIFIED PER DETAIL SHEET D04	2 EA
18	VERTICAL CONCRETE COLLAR PER MAG STD DETAIL 505 (NON PAY ITEM)	4 EA
19	INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET D02	4 EA
20	CONSTRUCT 4' WROUGHT IRON FENCING PER WALL PLAN SHEETS ST62-ST67	442 LF
21	PLUG EXISTING PIPES (INLETS/OUTLETS) PER MAG STD DET 427	4 EA
22	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,950 LF
23	CONSTRUCT 8" PORTLAND CEMENT CONCRETE CROSSING (STA PER PLAN)	1,458 SF
24	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	44 CY
25	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	142 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

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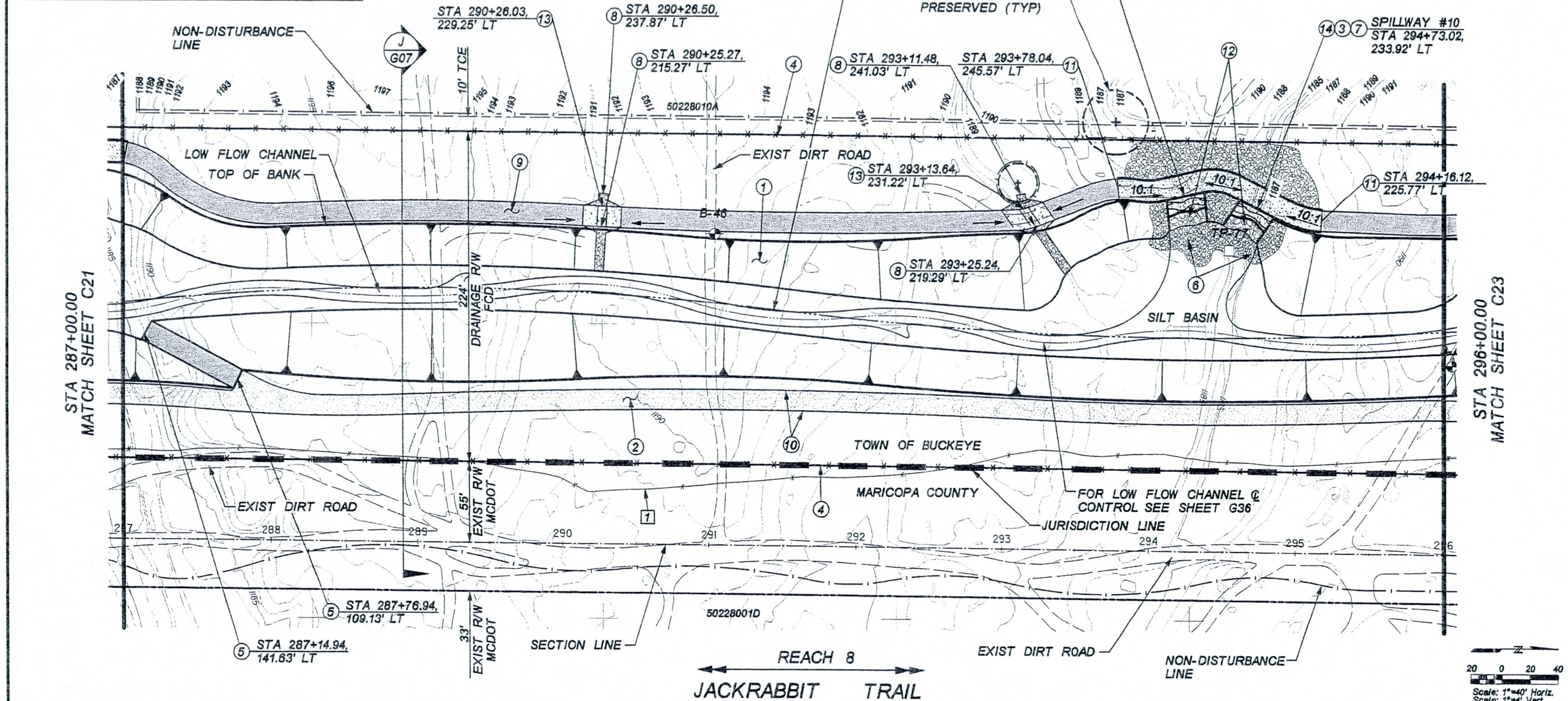
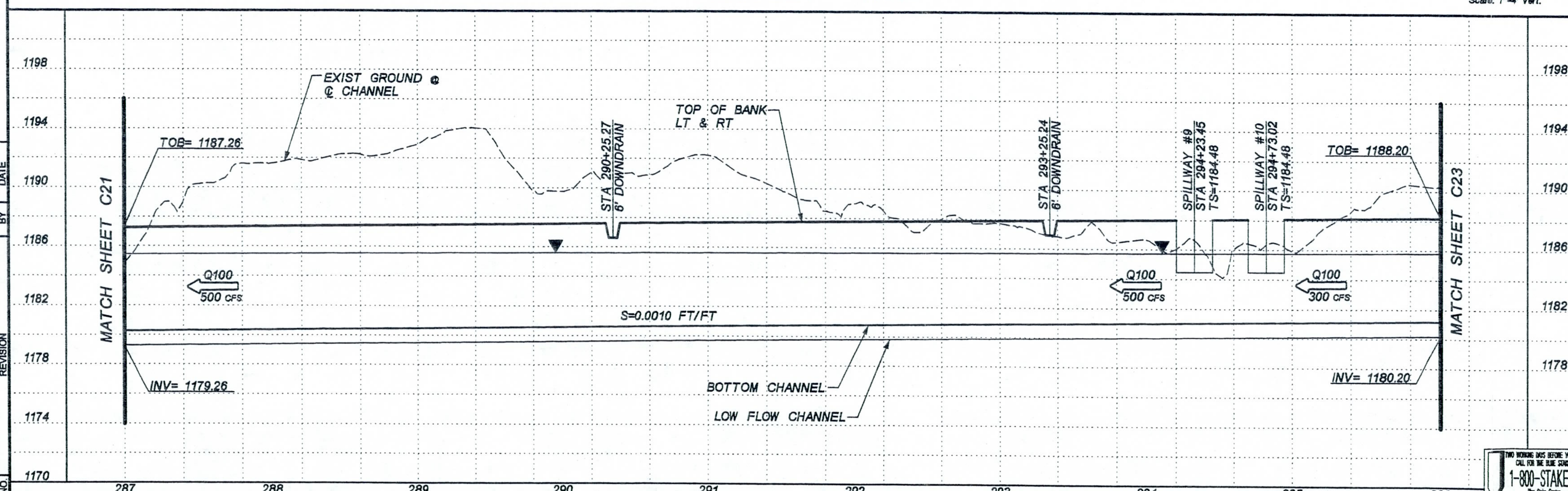
CAUTION
EXISTING OVERHEAD/UNDERGROUND ELECTRIC, GAS, CATV, TELEPHONE, WATER, SEWER & FIBER OPTICS CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING LINES PRIOR TO CONSTRUCTION

A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





REMOVE

1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	907 LF

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,436 SY
3	INSTALL HANDRAIL PER DETAIL SHEET D02	175 LF
4	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,800 LF
5	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
6	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	340 CY
7	CONSTRUCT SIDE FLOW SPILLWAY RETAINING WALLS (SEE DETAIL SHEET ST55)	366 SF
8	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	77 CY
9	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,271 SY
10	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,811 LF
11	CONSTRUCT 8" PORTLAND CEMENT CONCRETE CROSSING (STA PER PLAN)	68 CY
12	INSTALL RIP-RAP (D50=18", 36" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	50 CY
13	CONSTRUCT CONCRETE CROSSING PER DETAIL B SHEET D11	2,760SF
14	CONSTRUCT SIDE FLOW SPILLWAY APRON AND CUTOFF WALL	142 CY

GRADES SHOWN ARE FINAL GRADES AND ADJUSTMENTS NEED TO BE MADE TO ACCOUNT FOR THICKNESS OF ROCK MULCH, PAVING AND RIP RAP.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
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CHECKED	PH, MM, JU	11/10

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CAUTION
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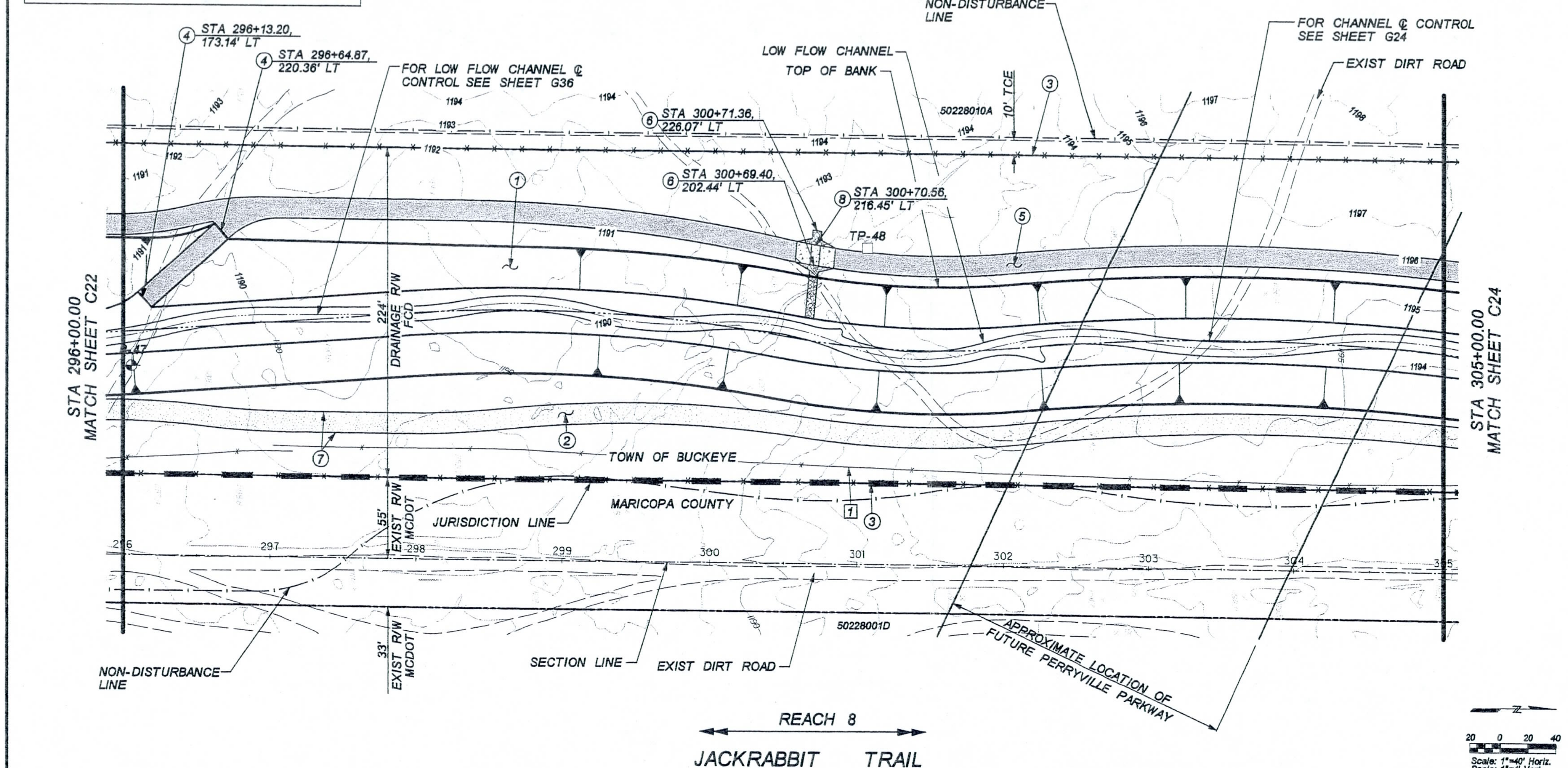
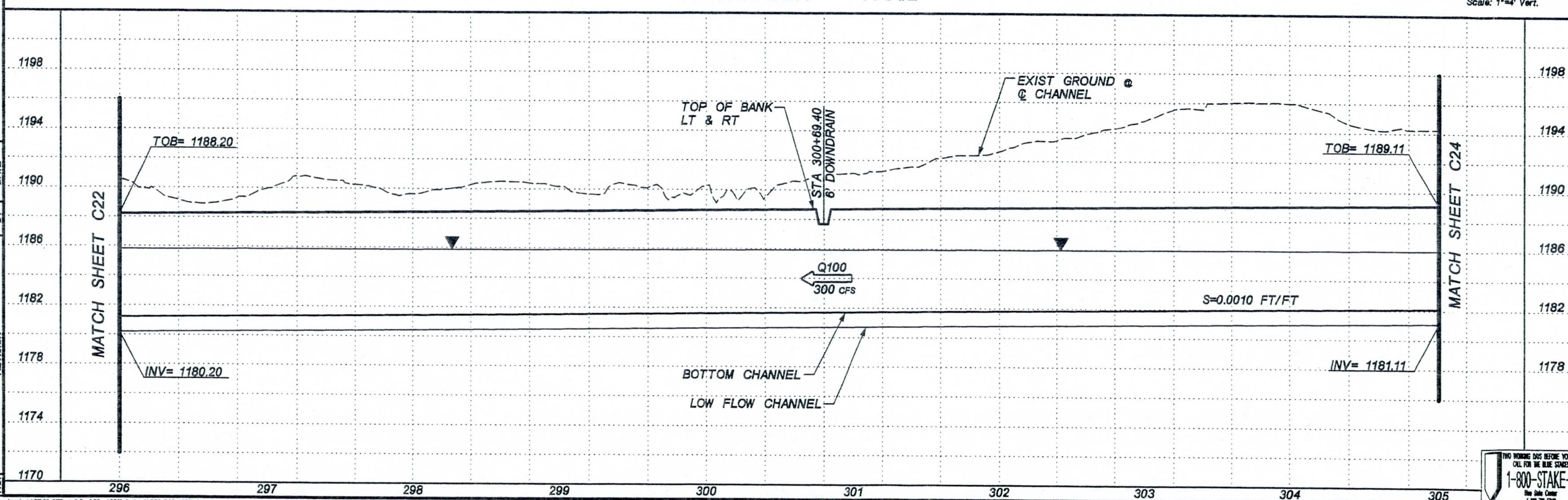
A NON-DISTURBANCE AREA WILL BE TAPED OFF AROUND THOSE EXISTING TREES THAT WILL BE PRESERVED.





REMOVE

1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	915 LF

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,403 SY
3	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,800 LF
4	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
5	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,391 SY
6	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	45 CY
7	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,802 LF
8	CONSTRUCT CONCRETE CROSSING PER DETAIL B SHEET D11	365 SF

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

19690 PAUL M. HOSKIN
EXPIRES 3/31/2012

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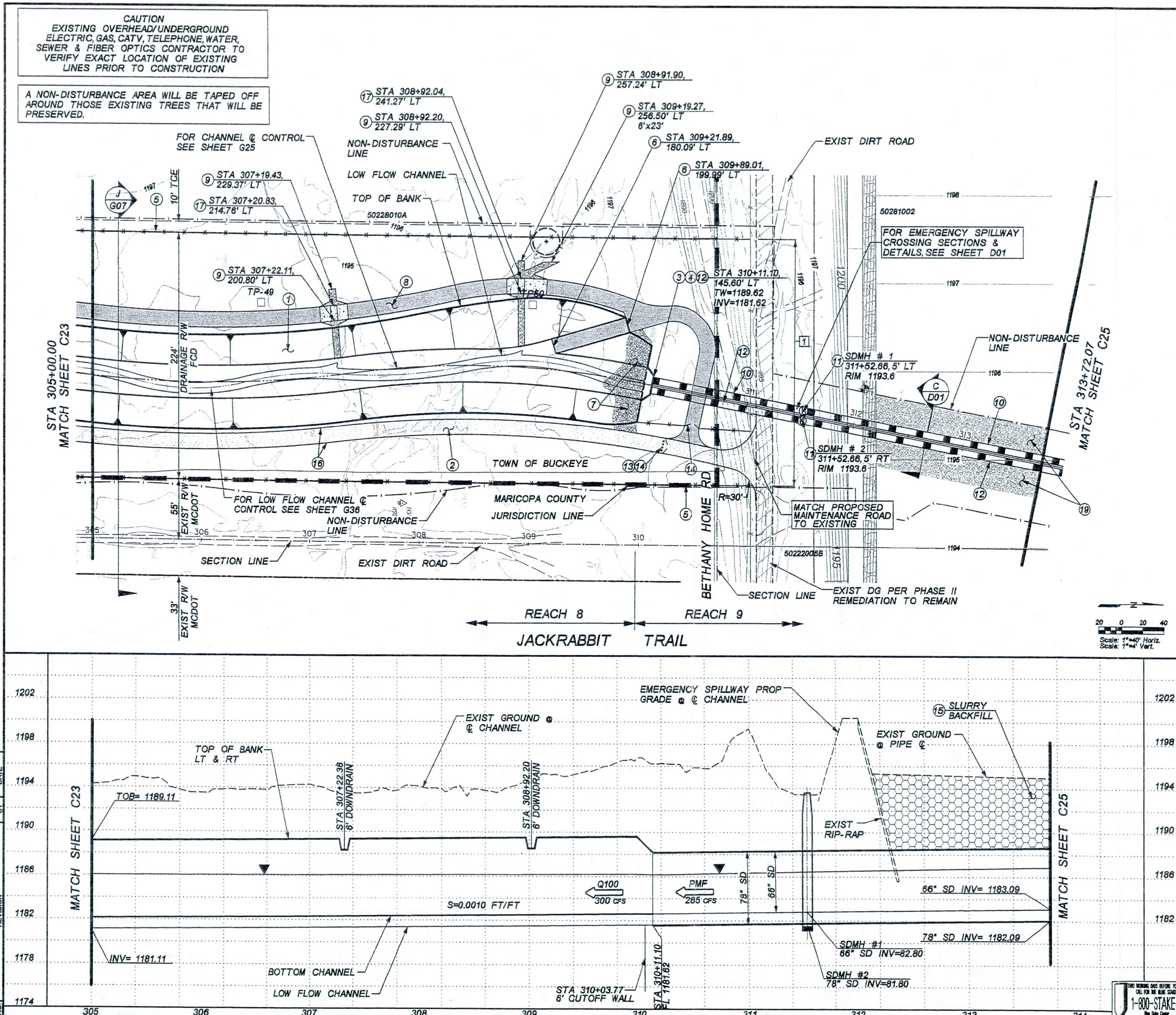

REMOVE

1	REMOVE EXIST FENCE, BLOCK WALL AND/OR RETAINING WALL	1,029 LF

CONSTRUCT

1	CONSTRUCT EARTHEN CHANNEL	
2	CONSTRUCT 14' WIDE MAINTENANCE ROAD (2" AC OVER 6" ABC)	1,000 SY
3	CONSTRUCT CONCRETE HEADWALL, PER ADOT STD DETAILS B-11.14 (PLYWOOD IN CONSTRUCTION JOINTS NEEDS TO BE REMOVED)	1 EA
4	INSTALL HANDRAIL PER DETAIL SHEET D02	77 LF
5	INSTALL 4-STRAND SMOOTH WIRE FENCE PER DETAIL SHEET D05	1,208 LF
6	CONSTRUCT MAINTENANCE RAMP, (4" ABC) PER DETAIL SHEET D12	109 SY
7	INSTALL RIP-RAP (D50=9", 18" THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	122 CY
8	CONSTRUCT 14' WIDE MAINTENANCE ROAD (4" ABC SURFACE)	1,050 SY
9	6' WIDE GROUTED RIP-RAP DOWNDRAIN (D50=9", 18" THICK) PER DETAIL SHEET D11 COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	124 CY
10	CONSTRUCT 66" CIPP STORM DRAIN PIPE	220 LF
11	CONSTRUCT STORM DRAIN MANHOLE PER COP STD DETAIL P-1560 (MODIFIED PER DETAIL SHEET D09)	2 EA
12	ACCESS BARRIER - PER DETAIL SHEET D03	2 EA
13	INSTALL BOLLARDS PER MAG STD DETAIL 140, TYPE 2	4 EA
14	INSTALL GATE TYPE 1, PER DETAIL SHEET D05 (UNLESS OTHERWISE NOTED)	2 EA
15	1 1/2 SACK CLSM SLURRY BACKFILL	639 CY
16	THICKENED EDGE PER MAG STD DET 201 TYPE A	1,336 LF
17	CONSTRUCT CONCRETE CROSSING PER DETAIL B SHEET D11	22 CY
18	CONSTRUCT 78" CIPP STORM DRAIN PIPE	220 LF
19	INSTALL RIP-RAP (D50=20", 7' THICK) COLOR SHALL MATCH 3" MINUS ROCK MULCH COLOR OR SIMILAR	2,193 CY

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ADWR APPROVAL

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WHITE TANKS FRS NO. 3
OUTFALL CHANNEL
FCD 2009C012

	BY	DATE
DESIGNED	PZ, JM	11/10
DRAWN	STAFF	11/10
CHECKED	PH, MM, JU	11/10

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PLAN AND PROFILE

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A.2.5 Excerpt from the Inflow Design Flood Hydrology for the White Tanks FRS No. 4 Rehabilitation Project (Ref. 15)

INFLOW DESIGN FLOOD HYDROLOGY
WHITE TANKS FRS No. 4 REHABILITATION PROJECT
BUCKEYE, ARIZONA

FCD CONTRACT No. 2008C002
PROJECT CONTROL No. 201.02.31
LOW ORG No. 6975

PREPARED FOR:

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PREPARED BY:
WOOD/PATEL

IN ASSOCIATION WITH
Ninyo & Moore

November, 2010

Inflow Design Flood Hydrology

White Tanks Floodwater Retarding Structure No. 4

REHABILITATION PROJECT

FCD CONTRACT NO. 2008C002

Revised November 2010

WP# 083264.02

Prepared For: **Flood Control District of Maricopa County**
2801 West Durango Street
Phoenix, Arizona 85009-6399
Phone: (602) 506-1501
Fax: (602) 506-4730

Prepared By: **Wood, Patel & Associates, Inc.**
2051 West Northern Avenue
Suite 100
Phoenix, Arizona 85021
Phone: (602) 335-8500
Fax: (602) 335-8580
Website: www.woodpatel.com

In Association With: **Ninyo & Moore**
3001 South 35th Street, Suite 6
Phoenix, Arizona 85034
Phone: (602) 243-1600
Fax: (602) 243-2699

CERTIFICATE NO. 24999
JEFFREY R. MINCH
DATE SIGNED 11-22-10
ARIZONA, U.S.A.

EXPIRES 9-30-12

TABLE OF CONTENTS

Professional Engineer CERTIFICATE NO. 24999 JEFFREY R. MINCH DATE SIGNED 11-4-10 ARIZONA, U.S.A.

EXPIRES 9-30-12

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
24999
JEFFREY R.
MINCH
DATE SIGNED 11-24-10
ARIZONA, U.S.A.

EXPIRES 9-30-12

LIST OF TABLES

LIST OF FIGURES

List of Exhibits

CERTIFICATE NO. 24999 JEFFREY R. MINCH (Civil)
DATE SIGNED 11-24-10
ARIZONA, U.S.A.

EXPIRES 9-30-12

1.0 INTRODUCTION

1.1 Project Location and Features

The White Tanks Floodwater Retarding Structure (FRS) No. 4 is located in central Maricopa County at the southeast end of the White Tank Mountains approximately 20 miles west of Phoenix, Arizona. The FRS structure can be reached by driving west from downtown Phoenix on Interstate 10 (I-10) and exiting south on Jackrabbit Trail (195^{th} Avenue). FRS No.4 is less than one mile south of I-10 and is located between the Tuthill Road alignment on the west, Jackrabbit Trail on the east, and the Van Buren Street alignment on the south. FRS No.4 is generally located in Township 1 North, Range 2 West, Section 5 of the Gila and Salt River Baseline and Meridian. A project location map is provided as Figure 1.

The White Tanks FRS No.4 was constructed in 1954 under the supervision of the Natural Resources Conservation Service (NRCS). The dam is approximately 6,840 feet in length, and is a compacted homogeneous earthen embankment with a maximum height of approximately 20 feet and upstream and downstream slopes of 2:1 (H: V). The embankment top width is typically 10 feet at an elevation of 1,058 feet. The embankment is founded on native soils at approximately existing grades with no key trench or significant foundation treatment. The structure includes two gated corrugated metal pipe (CMP) principal spillways, two auxiliary spillways, and a centerline filter with 33 outlet drains. A central filter was installed along the length of the dam in 1982. The crest elevation of the two auxiliary spillways is about 1,052 feet (NAVD 1988 for all elevations).

The structure is currently classified by Arizona Department of Water Resources (ADWR) criteria as a "small" dam with a "high" downstream hazard, and as a "High Hazard Class" dam according to NRCS. The construction of I-10, Tuthill Dike Wash channel, Jackrabbit Trail Wash channel, and developments in the watershed have resulted in doubling the contributing drainage area of the FRS No.4 – from 10.3 square miles to approximately 20.0 square miles.

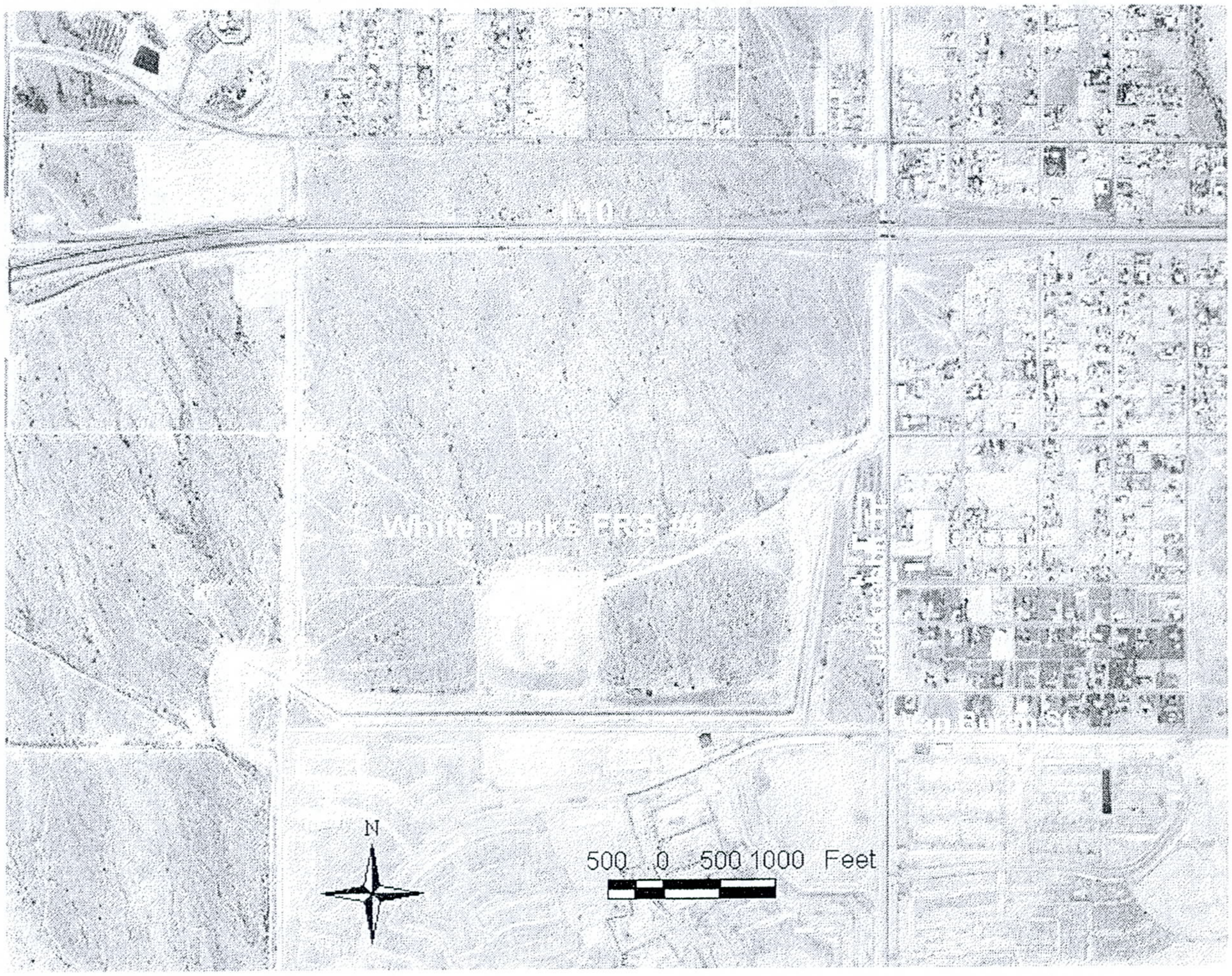

Figure 1 - Location Map

1.2 Authorization

Wood/Patel developed this report for the inflow design flood hydrology of the FRS No.4 in accordance with the FCDMC Contract No. 2008C002, White Tanks Flood Retarding Structure No. 4, Remediation Design and Engineering Support, Work Assignment No. 3: 30% to 100% Design, under contract to Ninyo & Moore. The project manager for the FCDMC is Mr. Dave Degerness, P.E., the project manager for Ninyo & Moore is Mr. Steven Nowaczyk, P.E., and the project manager for Wood/Patel is Mr. Jeff Minch, P.E.

1.3 Purpose

The purpose of this report is to document the assumptions, criteria, and methodologies used for the hydrologic modeling of the inflow design floods as well as the modeling results in support of the remediation design for White Tanks FRS No. 4. To meet the project requirements, hydrologic models were developed for nine (9) different storm events to define the inflow design floods for both existing and future land use conditions:

Hydrologic Model Type	Design Activity	Storm Frequency	Storm Duration	Modeling Condition
1	low flow channel & downstream floodplain	100-year	24-hour	existing
				future
2	additional risk assessment	200-year	24-hour	existing
				future
3	additional risk assessment	500-year	24-hour	existing
				future
4	principal spillway & storage requirements	100-year	10-day	existing
				future
5	stability design hydrograph – auxiliary spillway capacity	P_{100} + 0.26 ($PMP - P_{100}$)	6-hour	existing
				future
6	integrity hydrograph - freeboard	PMP/PMF	6-hour	existing
				future
7	integrity hydrograph - freeboard	PMP/PMF	24-hour	existing
				future
8	integrity hydrograph - freeboard	PMP/PMF	72-hour	existing
				future
9	ADWR requirement	Half PMF	24-hour	existing
				future

1.4 Report Organization

All of the referenced appendices in this report are provided electronically on the CD in Exhibit F at the end of this report. Printed copies of the referenced material can be provided upon request.

3.0 HYDROLOGIC MODELING ASSUMPTIONS AND CONSTRAINTS

3.1 General Approach Outline

One of the major goals of the hydrologic analysis is to define the inflow design floods to the White Tanks FRS No. 4 for existing and future conditions. This goal was accomplished by the following tasks:

Task	Description	Design Feature
1	Review previous studies	Identify applicable available data.
2	Principal Spillway Hydrographs	Define principal outlet(s); auxiliary spillway crest elevation, storage requirements; and infiltration.
3	Stability Design (Auxiliary Spillway) Hydrographs	Auxiliary spillway discharge capacity and stability (surface erosion potential).
4	Integrity Design Hydrograph (Freeboard)-PMF Inflow Hydrographs	Auxiliary spillway designs (breaching potential); define top of dam and freeboard requirements.
5	100-year, 24-hour Inflow Hydrograph	FEMA floodplain evaluation; principal outlets for ADWR criteria.
6	Hydrologic Routing Evaluation	Establish principal spillway and auxiliary spillway configurations.
7	200 and 500-year, 24-hour Hydrologic Models	Evaluate system performance for extreme flood events with the goal of increasing the level of downstream flood protection and reducing the risk of auxiliary spillway discharges.

3.2 Existing and Future Conditions

For purposes of the hydrologic modeling effort, existing conditions were defined as existing MAG land use incorporating agency capital improvement projects currently under construction within the contributing watershed. Future conditions were defined as future MAG land use incorporating agency programmed capital improvement projects within the contributing watershed. During the hydrologic model development, the following features were modeled for each inflow design hydrograph (existing and future conditions) for the White Tanks FRS No. 4:

- Levee-like Structures (I-10, Tuthill Dike Wash)
- Detention/Retention Basins

The FCDMC is designing the White Tanks FRS No. 3 outfall channel from the principal outlet (PO) to the Jackrabbit Trail channel. Ultimate conditions for White Tanks FRS

No. 4 will consider one White Tanks FRS No. 3 principal outlet discharging to the improved channel as well as the additional contributing drainage area to the channel. Based on discussions with the FCDMC, it is assumed that the Jackrabbit Trail Channel will be designed to convey the 100-year event; and that the auxiliary spillway discharges from White Tanks FRS No. 3 will bypass the channel through an overchute or the principal outlet discharge will be piped preventing mixing of the flows. Hydrologically, the capacity of the Jackrabbit Trail Channel to convey flow south into White Tanks FRS No. 4 was evaluated based on existing topography. The channel capacity was evaluated using the 60% design hydraulic model for the Jackrabbit Trail Channel for future conditions only since the hydrologic models for the future conditions are in control.

The on-site retention volumes for both existing and future conditions from Verrado development and Loop 303/White Tanks ADMPU models within the watershed were applied to the development of the HEC-1 models for the inflow design flood hydrographs. The on-site retention volume data are summarized in Appendix 1.

3.3 Hydrologic Routing

For existing and future conditions, hydrologic routing of the inflow hydrograph(s) was accomplished using the HEC-1 computer program. The following hydrologic components were modeled for each design scenario (existing and future land use conditions) for the White Tanks FRS No. 4:

- Principal Spillway Outlet Capacity;
- Auxiliary Spillway Design;
- Sediment Considerations;
- Infiltration;
- Reservoir Antecedent Moisture Condition.

Specific elements of the hydrologic routing methods are summarized below:

Channel Routing

For existing and future conditions, Normal depth routing (a hydrologic routing method) was used to route the inflow hydrographs along the Tuthill and Jackrabbit Trail Channels.

5.0 FEMA HYDROLOGY

The 100-year, 24-hour HEC-1 models approved by the FCDMC and FEMA for the Loop 303 – White Tanks Area Drainage Master Plan Update by URS (ADMPU, 2004) was reviewed and revised for the application of the FRS No.4 project using data from the existing available Verrado Master Drainage Study by Wood/Patel (September 2007), and the preliminary ADMPU models by HDR (2009). The purpose of the 100-year, 24-hour hydrologic models is to design the low-flow channel, evaluate downstream floodplain impacts, and define the water-surface elevations in the pool for both the existing and the proposed design conditions.

5.1 Drainage Area Boundaries

The sub-basin boundary map from the White Tanks ADMPU (2004) was reviewed and slightly modified. The sub-basin boundaries and the HEC-1 schematic are presented in Exhibit C.

5.2 Sub-basin Physical Parameters

The sub-basin physical parameters have been reviewed and approved by both the FCDMC and FEMA. Sub-basin physical parameters are included in Appendix 8.

5.3 Rainfall Parameters

The rainfall parameters (NOAA 2) have been reviewed and approved by both the FCDMC and FEMA. Rainfall parameters are the same as the ADMPU (2004) model.

5.4 Soils

The hydrologic variables related to soil types have been reviewed and approved by both the FCDMC and FEMA. These parameters are the same as the ADMPU (2004) models. Soil data is summarized in Appendix 5 and soil maps are provided in Exhibit A.

5.5 Land Uses

The existing land uses were reviewed and updated for recent development within the watershed including the Verrado development. Some of these parameters were modified (i.e. RTIMP and retention volumes) for recent development. Future land uses were updated (i.e. RTIMP and retention volumes) for the ultimate approved master planned development within the watershed. Land use data is included in Appendix 6 and land use maps are presented in Exhibit B.

5.6 Rainfall Loss Parameters

Rainfall infiltration losses were computed using the Green and Ampt methodology. These calculations have been reviewed and approved by both the FCDMC and FEMA. These parameters were updated based on the ADMPU (2009) default databases using DDMSW version 2.1.0.

5.7 Rainfall Excess to Runoff Transformation

Precipitation excess is transformed to direct runoff using S-Graph methodology. These calculations have been reviewed and approved by both the FCDMC and FEMA. These parameters were updated using the DDMSW version 2.1.0.

5.8 Flow Diversions

Flow diversion data was reviewed and approved by both the FCDMC and FEMA. These parameters are the same as the ADMPU models with the exception of flow diversions at I-10 and Jackrabbit Trail channel for future conditions (both north and south of I-10). The revised diversion rating curves and supporting calculations including the HEC-RAS models are included in Appendix 7.

5.9 Hydrologic Routing

Hydrologic routing including channel and storage routing was performed using several methods. These calculations have been reviewed and approved by both the FCDMC and FEMA. These parameters are the same as the ADMPU models with the exception of White Tanks No. 4 stage-storage-discharge rating curves. The stage-storage-discharge data is provided in Appendix 2.

5.10 Modeling Results

The HEC-1 models for both existing and future land use conditions were revised to include the updated on-site retention volumes and impervious area percentages. The updated HEC-1 models without FRS No.3 PO flows are EC24BASE.DAT for the existing conditions and FC24BASE.DAT for the future conditions. The HEC-1 model with FRS No.3 PO flow is FC24BASA.DAT for the future conditions. The hydrologic components incorporated into the HEC-1 models are defined in Table 1 and the modeling results are summarized in Table 2. Table 2 identifies that the future land use conditions with the FRS No.3 flow connection is the controlling inflow hydrograph for the 100-year, 24-hour storm, and the peak stage in the pool is 1,052.1 ft.

5.11 Additional Risk Assessment Models

In order to minimize the potential for downstream impacts associated with auxiliary spillway discharges, one of the project goals is to evaluate flood protection (no auxiliary spillway discharges) for the 200-year and 500-year, 24-hour flood events if feasible to do so. Therefore, the 100-year, 24-hour models were used to develop the 200-year and 500-year, 24-hour models by replacing the rainfall data (JD records) of the 100-year, 24-hour models with the 200-year and 500-year, 24-hour rainfall depths for the existing and future conditions since the S-graph unit hydrograph method used in the HEC-1 models is relatively independent of the precipitation depth. The 200-year and 500-year HEC-1 models for the existing conditions without FRS No.3 connection are E200BASE.DAT and E500BASE.DAT, respectively. The 200-year and 500-year HEC-1 models for the future conditions without FRS No.3 connection are F200BASE.DAT and F500BASE.DAT, respectively. The 200-year and 500-year HEC-1 models for the future conditions with FRS No.3 connection are F200BASA.DAT and F500BASA.DAT, respectively. The hydrologic assumptions incorporated into the HEC-1 models are defined in Table 1 and the modeling results are summarized in Table 2. Table 2 shows that the controlling inflow hydrograph for the 200-year, 24-hour storm is the future land use conditions with FRS No.3 connection and the peak stage in the pool is 1,052.2 ft. The controlling inflow hydrograph for the 500-year, 24-hour storm is the future land use conditions with FRS No.3 connection and the peak stage in the pool is 1,052.3 ft.

Table 2 HEC-1 Modeling Results for Inflow Design Floods

Hydrologic Model Description Summary				HEC-1 Model Name and No.		FRS#3 Flow			Total FRS#4 Inflow						FRS#4 Storage Routing				
				Name	No.	Hydrograph Name	Peak Flow (cfs)	Volume (Ac-Ft)	Hydrograph Name	Peak Flow (cfs)	HEC1 Vol (cfs)	Residual Q (cfs)	FRS3 Residual Vol (Ac-Ft)	Total Volume (Ac-Ft)	Peak Flow PO (cfs)	Peak Flow Infiltration (cfs)	Peak Flow Total (cfs)	Peak Storage (Ac-Ft)	Peak Stage (NAVD88,ft)
Existing Land Uses	Without FRS#3 PO Flow Connection	100-Year 10-Day Model		EC10BASE.DAT	BE1	N/A	N/A	N/A	FRS4	2251	1654	1	N/A	1654	133	102	235	835	1049.8
		100-Year 24-Hour Model		EC24BASE.DAT	BE2	N/A	N/A	N/A	CPWT4	6721	818	0	N/A	818	118	0	118	717	1048.6
		200-Year 24-Hour Model		E200BASE.DAT	BE3	N/A	N/A	N/A	CPWT4	7986	1031	0	N/A	1031	141	0	141	924	1050.6
		500-Year 24-Hour Model		E500BASE.DAT	BE4	N/A	N/A	N/A	CPWT4	9140	1247	0	N/A	1247	154	0	318	1110	1052.1
		Site-specific PMP 6-Hour SDH Model	Area Rainfall = 4.8	ESDHBASE.DAT	BE5	N/A	N/A	N/A	CFRS4	8749	2264	0	N/A	2264	170	149	4974	1372	1053.9
		Site-specific PMP 6-Hour Storm Models	Local Storm = 10.3	EPMF6BS1.DAT	BE6	N/A	N/A	N/A	CFRS4	15561	5591	0	N/A	5591	183	0	15204	1683	1055.8
				EPMF6BS2.DAT	BE7	N/A	N/A	N/A	CFRS4	15652	5474	0	N/A	5474	184	0	15286	1685	1055.8
		Site-specific PMP 24-Hour Storm Models	Tropical Storm = 13.0	EPMF24B1.DAT	BE8	N/A	N/A	N/A	CFRS4	16809	8076	0	N/A	8076	184	0	15327	1686	1055.8
				EPMF24B2.DAT	BE9	N/A	N/A	N/A	CFRS4	11069	9219	0	N/A	9219	178	0	10841	1565	1055.1
				EPMF24B3.DAT	BE10	N/A	N/A	N/A	CFRS4	14829	7954	0	N/A	7954	182	0	13919	1648	1055.6
			General Storm = 6.3	EPMF24B4.DAT	BE11	N/A	N/A	N/A	CFRS4	7050	3530	0	N/A	3530	171	0	5938	1411	1054.2
				EPMF24B5.DAT	BE12	N/A	N/A	N/A	CFRS4	6990	3530	0	N/A	3530	171	0	5922	1411	1054.2
		Site-specific PMP 72-Hour Storm Models	Tropical Storm = 13.5	EPMF72B1.DAT	BE13	N/A	N/A	N/A	CFRS4	7263	10346	0	N/A	10346	173	0	7136	1450	1054.4
				EPMF72B2.DAT	BE14	N/A	N/A	N/A	CFRS4	10759	9647	0	N/A	9647	178	0	10686	1561	1055.1
			General Storm = 10.8	EPMF72B3.DAT	BE15	N/A	N/A	N/A	CFRS4	7057	7738	0	N/A	7738	173	0	7017	1446	1054.4
				EPMF72B4.DAT	BE16	N/A	N/A	N/A	CFRS4	6730	7739	0	N/A	7739	172	0	6581	1432	1054.3
		Half PMF 24-hour Model	Half Flows	EPMF_H24.DAT	BE17	N/A	N/A	N/A	CFRS4	11391	4451	0	N/A	4451	175	0	8653	1499	1054.7
Future Land Uses	Without FRS#3 PO Flow Connection	100-Year 10-Day Model		FC10BASE.DAT	BF1	N/A	N/A	N/A	FRS4	2202	1666	0	N/A	1666	129	100	229	804	1049.5
		100-Year 10-Day Model w/o Infiltration		FC10BNI3.DAT	BF1-I	N/A	N/A	N/A	FRS4	2202	1666	0	N/A	1666	142		142	938	1050.7
		100-Year 24-Hour Model		FC24BASE.DAT	BF2	N/A	N/A	N/A	CPWT4	6599	967	0	N/A	967	132	0	132	828	1049.7
		200-Year 24-Hour Model		F200BASE.DAT	BF3	N/A	N/A	N/A	CPWT4	8594	1177	0	N/A	1177	148	0	148	1013	1051.3
		500-Year 24-Hour Model		F500BASE.DAT	BF4	N/A	N/A	N/A	CPWT4	9841	1360	0	N/A	1360	154	0	382	1115	1052.1
		Site-specific PMP 6-Hour SDH Model	Area Rainfall = 4.8	FSDHBASE.DAT	BF5	N/A	N/A	N/A	CFRS4	9087	2351	0	N/A	2351	170	150	5181	1382	1054.0
		PMP 6-Hr SDH Model w/o Infiltration	Area Rainfall = 4.8	FSDHBNI3.DAT	BF5-I	N/A	N/A	N/A	CFRS4	9087	2351	0	N/A	2351	170	0	5246	1389	1054.0
		Site-specific PMP 6-Hour Storm Models	Local Storm = 10.3	FPMF6BS1.DAT	BF6	N/A	N/A	N/A	CFRS4	16117	5729	0	N/A	5729	184	0	15729	1697	1055.9
				FPMF6BS2.DAT	BF7	N/A	N/A	N/A	CFRS4	16268	5617	0	N/A	5617	184	0	15804	1699	1055.9
		Site-specific PMP 24-Hour Storm Models	Tropical Storm = 13.0	FPMF24B1.DAT	BF8	N/A	N/A	N/A	CFRS4	17526	8353	0	N/A	8353	184	0	15898	1701	1055.9
				FPMF24B2.DAT	BF9	N/A	N/A	N/A	CFRS4	11534	9535	0	N/A	9535	179	0	11277	1577	1055.2
				FPMF24B3.DAT	BF10	N/A	N/A	N/A	CFRS4	15486	8165	0	N/A	8165	182	0	14252	1657	1055.7
			General Storm = 6.3	FPMF24B4.DAT	BF11	N/A	N/A	N/A	CFRS4	7584	3664	0	N/A	3664	172	0	6363	1425	1054.3
				FPMF24B5.DAT	BF12	N/A	N/A	N/A	CFRS4	7535	3665	0	N/A	3665	172	0	6339	1424	1054.3
		Site-specific PMP 72-Hour Storm Models	Tropical Storm = 13.5	FPMF72B1.DAT	BF13	N/A	N/A	N/A	CFRS4	7703	10833	0	N/A	10833	174	0	7564	1464	1054.5
				FPMF72B2.DAT	BF14	N/A	N/A	N/A	CFRS4	11053	9950	0	N/A	9950	179	0	10975	1568	1055.2
			General Storm = 10.8	FPMF72B3.DAT	BF15	N/A	N/A	N/A	CFRS4	7493	8100	0	N/A	8100	174	0	7437	1460	1054.5
				FPMF72B4.DAT	BF16	N/A	N/A	N/A	CFRS4	7280	8101	0	N/A	8101	173	0	7080	1448	1054.4
		Half PMF 24-hour Model	Half Flows	FPMF_H24.DAT	BF17	N/A	N/A	N/A	CFRS4	11667	4537	0	N/A	4537	176	0	8764	1502	1054.7
	With FRS#3 PO Flow Connection	100-Year 10-Day Model		FC10BASA.DAT	BF1a	FRS3	210	1516	FRS4	2290	3182	1	0	3182	154	127	313	1100	1052.0
		100-Year 10-Day Model w/o Infiltration		FC10BASA.DAT	BF1a-I	FRS3	210	1516	FRS4	2290	3182	1	0	3182	154	0	499	1125	1052.2
		100-Year 24-Hour Model		FC24BASA.DAT	BF2a	FRS3	243	2337	CPWT4	7034	3268	22	28	3296	154	0	290	1108	1052.1
		200-Year 24-Hour Model		F200BASA.DAT	BF3a	FRS3	253	2337	CPWT4	8622	3802	73	109	3911	154	0	405	1117	1052.2
		500-Year 24-Hour Model		F500BASA.DAT	BF4a	FRS3	259	2337	CPWT4	9859	4119	120	183	4302	156	0	620	1134	1052.3
		Site-specific PMP 6-Hour SDH Model	Area Rainfall = 4.8	FSDHBASA.DAT	BF5a	FRS3	265	2365	CFRS4	9135	4704	12	9	4713	171	151	5453	1391	1054.1
		PMP 6-Hr SDH Model w/o Infiltration	Area Rainfall = 4.8	FSDHBSNI.DAT	BF5a-I	FRS3	265	2365	CFRS4	9135	4704	12	9	4713	171	0	5499	1397	1054.1
		Site-specific PMP 6-Hour Storm Models	Local Storm = 10.3	FPM6BS1A.DAT	BF6a	FRS3	287	2848	CFRS4	16118	8434	48	70	8504	184	0	15730	1697	1055.9
				FPM6BS2A.DAT	BF7a	FRS3	287	2848	CFRS4	16269	8297	48	70	8367	184	0	15805	1699	1055.9
		Site-specific PMP 24-Hour Storm Models	Tropical Storm = 13.0	FPM24B1A.DAT	BF8a	FRS3	281	3127	CFRS4	17526	11183	126	194	11377	184	0	15946	1703	1055.9
				FPM24B2A.DAT	BF9a	FRS3	281	3127	CFRS4	11541	12303	126	194	12497	179	0	11325	1578	1055.2
				FPM24B3A.DAT	BF10a	FRS3	281	3127	CFRS4	15491	10948	126	194	11142	182	0	14255	1657	1055.7
			General Storm = 6.3	FPM24B4A.DAT	BF11a	FRS3	281	3127	CFRS4	7855	6592	126	194	6786	173	0	6729	1437	1054.3
				FPM24B5A.DAT	BF12a	FRS3	281	3127	CFRS4	7808	6592	126	194	6786	173	0	6703	1436	1054.3
		Site-specific PMP 72-Hour Storm Models	Tropical Storm = 13.5	FPM72B1A.DAT	BF13a	FRS3	284	3794	CFRS4	7840	13747	203	847	14594	174	0	7715	1468	1054.5
				FPM72B2A.DAT	BF14a	FRS3	284	3794	CFRS4	11061	12720	203	847	13567	179	0	10983	1569	1055.2
			General Storm = 10.8	FPM72B3A.DAT	BF15a	FRS3	284	3794	CFRS4	7684	11016	203	847	11863	174	0	7636	1466	1054.5
				FPM72B4A.DAT	BF16a	FRS3	284	3794	CFRS4	7546	11029	203	847	11876	174	0	7434	1459	1054.5
		Half PMF 24-hour Model	Half Flows	FPM_H24A.DAT	BF17a	FRS3	281	3127	CFRS4	11676	5973	65	103	6076	176	0	8821	1504	1054.8

HEC-RAS Downstream Boundary Condition

Appendix B: General Documentation and Correspondence

B.1 Special Problem Reports

Note: There are no Special Problem Reports associated with this submittal

B.2 Contact Reports

Note: There are no Contact Reports associated with this submittal.

B.3 Meeting Minutes

B.4 General Correspondence

- *FEMA CLOMR correspondence*
- *USACE Nationwide Permit Verification*
- *Endangered Species Act Compliance e-mails*
- *List of affected property, a sample letter, and Individual legal notice documentation*

B.5 Contract Documents

B.3 Meeting Minutes

Hoskin • Ryan Consultants, Inc.
201 West Indian School Road
Phoenix, AZ 85013
Tel: (602) 252-8384
Fax: (602) 252-8385
admin@hoskinryan.com

MEETING MINUTES

May 24, 2010

PROJECT NAME: White Tanks FRS No. 3 Outfall Channel Final Design
PROJECT NO: FCD 2009C012, HRC 09-077-01

PURPOSE: Coordination Meeting

REPRESENTATIVES (See Sign-In Sheet):

- ☐ FCDMC
- ☐ Hoskin Ryan Consultants, Inc.
- ☐ EPG
- ☐ WC Scoutten

Meetings, Public Involvement & Submittals

1. ADWR/NRCS Meeting 3 is set for Wednesday, June 9th. It was suggested that a meeting be held with URS prior to this meeting, to review any questions regarding their comments.
2. Public Meeting 2 is set for Thursday, June 10th at Verrado High School. HRC will provide refreshments.
3. A meeting is set for Tuesday, June 1st at the District to review the design of the walls at Arroyo Mountain Estates (Jackrabbit Estates) with Dave Garcia.
4. HRC will review comments and prepare a list of items that need resolution.
5. Gary will set up a meeting with MCDOT, to discuss review comments. Include Scott in the meeting.
6. Gary requested the comments responses be merged into one Word document when submitted to the District. Merge with the NRCS and URS comments, as well.

Survey

7. Notification letter sent by certified mail to the remaining finished floor survey property was returned as undeliverable. HRC will attempt to survey the finish floor elevation.

Right-of-Way

8. Gary will review the ROW/easement exhibit provided by HRC. The final hardcopy and cadd files will go to Rob.
9. Scott will check if Buckeye can request that DMB go ahead with dedication of the strip at Verrado now, instead of waiting for a later date.

Environmental

10. Bob Stevens has started the 404 application to the Army Corps for the entire length of the JD.
11. The 404 JD covers the area from approximately Medlock Drive south. Is there any chance that the new channel will be considered a 404 JD?

Utility Coordination

12. Comments from the Utility Coordination Meeting 4/26 were addressed.
13. Cadd files for the conceptual paving plans for Jackrabbit Trail were provided to WC Scoutten's office.
14. A utility strip map was presented.

15. A broken-back culvert will be used to cross Jackrabbit Trail where the future sewer line is currently shown in conflict.
16. Alignment of the O&M Road/Trail at the APS cabinet locations was adjusted. Review the location at Pasqualetti Mountain Ranch.

Geotechnical, Geological, and Subsidence

17. Test pits were dug at three locations along the Arroyo Mountain Estates (Jackrabbit Estates) perimeter wall to determine the depth and type of footing. The results were received from Alpha Geotech.
18. Mike commented that the caliche/spillway are shown in the wrong location on the geotech maps in the 60% Design Plans set.
19. Per Mike, excavation has started for Phase 2 improvements, and they have encountered caliche.

Engineering, Hydrology, and Hydraulics

20. Per Mike's discussion with Ravi (ADWR), the project requires a permit for adding on to the stilling basin.
21. Mike will extend the contract with URS so they can review the 90% plans.
22. Kumar has concerns with the ConSpan structures, where the base and wall connect. There is no mechanical tie, it is a gravity keyway.
23. What is the status of Jeff Riddle's move towards approval of the ConSpan product? Jeff and Kumar need to resolve approval/requirements for use of this product.
24. Engineering group has no comment on the Jensen precast box culverts.
25. Doug and Nick from HRC office met with Ken to review the Beardsley CLOMR hydrology. Ken has the HEC-1 modeling for review.
26. Beardsley CLOMR and Jackrabbit CLOMR will be separate TDN and submittals, in order to facilitate easier FEMA review and future LOMR preparation.
27. Scott will review with Woody Scoutten regarding if Buckeye can prepare a separate IGA for extension of the culverts other than at Palm Lane.
28. John presented the side inlet exhibits, showing the step design and layout.
29. How will the side inlet structures be poured/constructed?
30. Scour analysis will be required to determine the size and depth of riprap at the side inlets.
31. How much clearance will be required at the pipe crossings of the emergency spillway dikes? Mark up the required distance and get this info to Mike so URS can change on their plans.
32. Can the O&M Road/Trail access point be pulled further to the west, away from the intersections?
33. Review the location of access ramps into the channel. Can some be eliminated?

Landscaping

34. PAAC 3 meeting was held 5/20/10. Concerns were mostly regarding the establishment of vegetation along the corridor without the use of irrigation. Perhaps more extensive watering truck usage?
35. The aesthetic using the Oregon Basalt formliner was chosen over the wave-patterened look. Paint was chosen instead of stain for ease of cover due to graffiti.
36. John will coordinate with Nicole and Gary regarding the exhibits for the public meeting.

Action Items (See attached)
Next Project Coordination Meeting: Monday 6/21/10, 10am-12pm, New River room

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Flood Control District of Maricopa County

MEETING MINUTES

April 26, 2010

PROJECT NAME: White Tanks FRS No. 3 Outfall Channel Final Design
PROJECT NO: FCD 2009C012, HRC 09-077-01

PURPOSE: Coordination Meeting

REPRESENTATIVES (See Sign-In Sheet):

- ☐ FCDMC
- ☐ Hoskin Ryan Consultants, Inc.
- ☐ EPG

Meetings, Public Involvement & Submittals

1. Gary provided HRC with a CD containing review comments on the 60% Plans. More review comments will follow. He gave the reviewers until May 7th to respond.
2. HRC will review comments and prepare a list of items that need resolution. A review meeting is tentatively scheduled for the afternoon of May 17th.
3. The 90% design submittal date has been moved to July 12th.
4. Send 60% Plans to ADWR and NRCS, cc Mike on the submittal.
5. Send 60% Plans to stakeholders, cc Gary on the submittals.
6. Utility Coordination Meeting 2, set for 4/26/10
7. PAAC Meeting 3, set for 5/20/10
8. ADWR Meeting 3, proposed for 5/27/10
9. Public Meeting 2, set for 6/10/10

Photogrammetry/Survey

10. The Survey Report was submitted 4/22/10.
11. Finished Floor elevation survey was completed, with one property exception due to no access. The notification letter will be resent via certified mail.
12. Include the finished floor elevations of the seven properties surveyed on the plans.

Right-of-Way

13. The District needs the ROW map, with TCEs/DEs detailed, as soon as possible in order to process through the ROW dept.

Environmental

14. Bob Stevens has started the 404 application to the Army Corps for the entire length of the JD.

Utility Coordination

15. Utility Meeting will be held 4/26/10

Geotechnical, Geological, and Subsidence

16. Alpha Geotech will be exposing the footing depths at the Jackrabbit Estates perimeter wall this week.
17. Need to define the caliche material in the specs if want to use as a separate cost item for the contractor.
18. Caliche location to be added to the channel profile.
19. On-call geotech consultant would field-inspect the caliche layer if refusal depth is met during construction.

Engineering, Hydrology, and Hydraulics

20. 60% Plans, Specifications, Drainage Report, and Design Report were submitted 4/22/10.
21. Work on the CLOMR has started.
22. The limits of wall to remain or to be replaced along Jackrabbit Estates needs to be clearly identified on the plans.
23. CIPP may be specified across the emergency spillway, due to encasement in concrete. Language will be included in the specs re. watertight pipe connections.
24. Curved headwalls
    a. What is the cost increase for curved vs. straight?
    b. How will it impact construction?
    c. Will they provide significant benefit re. visual interest?
25. Locate a stockpile site on the plans
26. Detail the drainage along the east side of the channel, next to Jackrabbit Trail. Where is the existing swale being kept, how does the water get into the channel?
27. Need to review the grading for true edge conditions along the length of the channel in order to determine grading limits, required TCE and DE.
28. Rock Mulch
    a. Specify 5-inch thick coverage on the 3-inch minus rock mulch.
    b. Show 4 feet minimum coverage width outside top of bank, or to the multi-use path for the rock mulch extent.
    c. Need to inset the rock mulch so that it is not a barrier to flows into the channel.
29. Specs
    a. Gary W and Gary S will be reviewing and making changes to the Specs. The introduction section is not needed.
    b. The term "rock mulch" will be used instead of "gravel mulch."

Landscaping

30. PAAC Meeting
    a. Scheduled for 5/20/10. John will follow up on the PAAC invite with phone calls.
    b. A graphic of the overall channel concept will be prepared for the meeting.
    c. John needs feedback from the District re. the preferred design option (of the 2 presented in the 60% Design), in order to present only one to the PAAC.
    d. Need design feedback and decisions from the PAAC meeting so the design can be detailed in the 90% plans.
31. Reach 9
    a. Hydroseeding at the FRS3 dam – use the Phase 2 plans fence line as the limit of hydroseeding, none on the dam, and away from the maintenance road.

b. Keep the grading over the pipe in Reach 9 to a depth of less than 16 feet.
c. Maintain a 60-foot clear zone (no trees) around the pipes in Reach 9, in order to accommodate a maximum excavation depth of 16 feet at 1.5:1 sideslopes.

32. Trees
   a. Maintain a 15-foot distance from headwalls and structures for the trunks of trees. Need to show root barrier on the plans.
   b. Keep trees out of intersection sight-lines.
   c. Review the locations where existing trees are to be kept – tree location/elevation versus graded elevation.

Action Items (See attached)

Next Project Coordination Meeting: Monday 5/24/10, 10am-12pm, New River room

B.4 General Correspondence

July 27, 2011

Mr. Paul W.R. Hoskin, P.E.
Project Engineer
Hoskin Ryan Consultants, Inc.
6245 North 24th Parkway, Suite 100
Phoenix, AZ 85016

IN REPLY REFER TO:
Case No.: 11-09-2260R
Communities: Town of Buckeye and Maricopa County, AZ
Community Nos.: 040039 and 040037

316-AD

Dear Mr. Hoskin:

This responds to your submittal dated June 28, 2011, concerning an April 5, 2011, request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	White Tanks FRS #3 Outfall Channel
Flooding Source:	Jackrabbit Trail Wash
FIRM Panel(s) Affected:	04013C1590H and 2055H

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is available on the FEMA website at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Information eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, Mr. Paul Anderson, P.E., CFM, by e-mail at PMAnderson@mbakercorp.com or by telephone at 720-514-1121, or the Revisions Coordinator for your request, Mrs. Jaclyn Bloor, CFM, at jbloor@mbakercorp.com or at (720) 479-3160.

Sincerely,

Syed Qayum

Syed Qayum, CFM
LOMR Technical Manager
BakerAECOM

Enclosures

cc: Mr. Timothy S Phillips, P.E.
Chief Engineer and General Manager
Maricopa County

Mr. Gary Wesch, P.E.
Maricopa County Flood Control District

Mr. Kenneth Rakestraw
Hydrologist
Maricopa County Flood Control District

Mr. Stephen Cleveland
Town Manager
Town of Buckeye

NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

Summary of Additional Data Required to Support a
Conditional Letter of Map Revision (CLOMR)

Case No.: 11-09-2260R

Requester: Mr. Paul W.R. Hoskin, P.E.

Communities: Town of Buckeye and Maricopa County, AZ

Community Nos.: 040037 and 040039

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

1. The rainfall depth of 3.661 inches in the submitted existing conditions HEC-1 model does not match the recommended base (1-percent-annual-chance) flood values on the National Oceanic and Atmospheric Administration's precipitation website (http://hdsc.nws.noaa.gov/hdsc/pfds/). Please revise the submitted existing conditions HEC-1 model so that it uses the correct rainfall depth values at the project's location.

2. From the submitted drainage area map entitled, "Remnant Channel Pro-rated Flow Map," prepared by Hoskin-Ryan Consultants, dated February 17, 2011, the drainage area for W33C, W33D and W33E appear to be approximately 0.167, 0.31 and 0.11 square miles, respectively. However, the drainage areas of W33C, W33D, and W33E found in the submitted HEC-1 model are 0.29, 0.59 and 0.70 square miles, respectively. Please revise the pro-rated drainage areas for W33 found in the submitted HEC-1 model, or explain why this is not necessary. In addition, please make any necessary revisions to the submitted HEC-RAS hydraulic models, the existing topographic work maps entitled, "White Tanks FRS No. 3 Outfall Channel CLOMR Work Maps FCD 2009C012 - Existing Condition 100-Year Floodplain," prepared by Hoskin-Ryan Consultants, dated June 2011 and the proposed topographic work maps entitled, "White Tanks FRS No. 3 Outfall Channel CLOMR Work Maps FCD 2009C012 - 100 Year Floodplain," prepared by Hoskin-Ryan Consultants, dated February 2011.

3. The submitted existing HEC-1 model incorporates storage routing through Detention Basin #29, SR20, SR21, PH6 Golf, SR23, SR42 and one unnamed detention basin. Please provide back-up data and calculations that support the stage-storage relationship within these detention basins used in the existing HEC-1 model. Please submit the charts, spreadsheets and calculations and topographic work maps that were used to make any storage calculations. In addition, please submit this same information for the sedimentation basins.

4. The submitted report entitled, "Conditional Letter of Map Revision Request for the White Tanks FRS No. 3 Outfall Channel Maricopa County and Town of Buckeye, Arizona, Technical Data Notebook," prepared by Hoskin-Ryan Consultants, dated June 2011, states that a water-surface elevation of 1048.0 feet in FRS #4 reservoir was defined as the downstream boundary condition for the proposed conditions Outfall Channel HEC-RAS hydraulic model and the existing conditions Jackrabbit Wash HEC-RAS hydraulic model. Please submit the section of the report entitled, "White Tanks FRS no. 4 Rehabilitation Project," prepared by Wood Patel and Associates, Inc., dated December 2008 that provides this starting water-surface elevation data.

5. It appears from the submitted existing and proposed conditions HEC-RAS hydraulic models that a levee condition exists from Cross Sections 6826 to 12341 and from Cross Sections 16407 to 21478. If the levee condition is due to man-made conditions (i.e. fill placed in the floodplain as part of a road or trail), then the project must meet all parts of Section 65.10 of the NFIP regulations (copy enclosed). Please provide evidence that the project meets all parts of Section 65.10 of the NFIP regulations, or explain why this is not necessary.

6. The submitted existing and proposed conditions HEC-RAS hydraulic models did not include a floodway analysis. Please revise the existing and proposed HEC-RAS hydraulic models to include an analysis of the regulatory floodway. Please be sure that the surcharges do not exceed the 1-foot maximum allowed.

7. Our review revealed that the proposed conditions channel topography is not on the above-referenced proposed conditions work maps. In addition, the proposed plan and profile sheets entitled, "White Tanks FRS No. 3 Outfall Channel FCD 2009C012 - Plan and Profile," prepared by Hoskin-Ryan Consultants, dated November 2010 do not show the location of the proposed conditions cross sections. We cannot properly check the consistency between the proposed work map and model without documents that show the proposed cross sections overlaid on the proposed topographic information. Please submit proposed conditions work maps or plans and profile that portray this information.

8. The downstream reach lengths shown in the submitted existing HEC-RAS hydraulic analysis at Cross Sections 15750, 16918 through 18713, 19247, 20809 and 21478 do not match the approximate downstream reach lengths shown on the above-referenced existing conditions topographic work map. Please make the appropriate changes, or explain why this is not necessary.

9. The base floodplain topwidth shown in the existing HEC-RAS hydraulic analysis at Cross Section 12922 does not match the approximate base floodplain topwidth shown on the above-referenced topographic work map. Please provide an explanation for this discrepancy, or make the appropriate changes.

10. Our review revealed that the proposed regulatory floodway was not delineated on the above-referenced proposed conditions work maps for the proposed Remnant Channel. Please submit proposed conditions work maps that provide a regulatory floodway delineation for the proposed Remnant Channel.

11. Our review revealed a set of two-pipe culverts at the upstream end of the proposed Outfall Channel hydraulic model. Please provide evidence that the upstream end of the proposed outfall channel ties into this two-pipe culvert within 0.5 feet vertically, in accordance with Paragraph 65.6(a)(2) of the National Flood Insurance Program (NFIP) regulations, which states that to avoid discontinuities between revised and unrevised flood data, hydraulic analyses must have a logical transition between revised elevations of the base flood and those developed previously for areas not affected by the revision.

12. Our detailed review revealed water surface elevations higher than the end points of the cross section at Cross Sections 1000, and 22197 through 21478, in the existing conditions HEC-2 hydraulic model along Jackrabbit Trail Wash. Water surface elevations higher than the end points of the cross section

were also found in the proposed conditions outfall channel model at Cross Sections 4351 through 4700 in the proposed conditions Remnant Channel HEC-RAS hydraulic model. Please extend the cross sections so that the end points of all cross sections are equal to or higher than the corresponding WSEL.

13. Our review revealed that there are no records indicating the invert elevations and data to verify the chart and scale numbers of the existing culverts in the submitted existing conditions HEC-RAS hydraulic model for Jackrabbit Trail Wash. Please provide data to verify the culvert inverts and chart and scale numbers in the submitted existing conditions HEC-RAS model.

14. Our review revealed that the top of road elevations do match between the above-referenced proposed plan and profile details, and the proposed conditions Outfall Channel HEC-RAS hydraulic model at Encanto Boulevard, Thomas Road, Indian School Road and Camelback Road. Please submit a proposed conditions Outfall Channel hydraulic model that displays the correct top of road elevations and their respective locations.

Please send the required data and/or fee directly to us at the address shown at the bottom of the first page. For identification purposes, please include the case number referenced above on all correspondence.

Flood Control District
of Maricopa County

www.fcd.maricopa.gov

2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

July 11, 2011

LOMC Clearinghouse
7930 Coca Cola Drive, Suite 204
Hanover, MD 21076

ATTN: CLOMR Manager

RE: Case No. 11-09-2260R--Jackrabbit Trail Wash (195th Avenue Alignment), New White Tanks FRS (Flood Retarding Structure) No. 3 Outfall Channel --Town of Buckeye and Unincorporated County, Maricopa County, Arizona

Dear Sir or Madam:

Please find enclosed data pertaining to a request for additional data required for review of the subject CLOMR application. The additional data were requested by letter dated April 19, 2011 (copy attached), to Mr. Paul Hoskin, PE, Hoskin-Ryan Consultants, Inc. from Syed Qayum, LOMR Technical Manager, Baker AECOM.

The following items are included for your review:

- *White Tanks FRS No. 3 Outfall Channel Conditional Letter of Map Revision*, Technical Data Notebook, revised and dated June 28, 2011. The revised TDN contains data pertaining to an existing conditions hydraulic model requested in the April 19th letter. A revised CD is included which contains the digital copy of the HECRAS hydraulic model for existing conditions as well as additional hydrologic back-up data and calculations used to determine discharges for the base flood for the existing conditions HEC-1 hydrologic model. Also included on the CD is a copy of the Nationwide 404 Permit for the Project which addresses Endangered Species Act Compliance.

- A new set of certified Work Maps showing both the existing conditions floodplain and the effective floodplain are provided separately.

The pertinent FIRM panels are 04013C1590H and 04013C2055G.

We believe this analysis addresses all the comments included in your April 19th letter. If you have any questions or require additional information, please feel free to call me at 602-506-2201 or contact me by e-mail at kennethrakestraw@mail.maricopa.gov.

Sincerely,

Kenneth Rakestraw

Kenneth Rakestraw
Hydrologist

Enclosures: As listed above

Copies to (w/o enclosures):

Beth Norton
Federal Emergency Management Agency
500 C Street SW
Washington, D.C. 20472-0001

Ed Curtis
Department of Homeland Security, FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources
500 North Third Street
Phoenix, AZ 85004

John Schneeman
Floodplain Management Services
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Stephen Cleveland, Town Manager
100 North Apache Road
Buckeye, AZ 85326

Kevin LaVallee, GIS
Public Works Department- Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Paul Hoskin, P.E.
Hoskin - Ryan Consultants, Inc.
6245 N. 24th Pkwy, Suite 100
Phoenix, AZ 85016

Flood Control District
of Maricopa County

www.fcd.maricopa.gov
2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

April 5, 2011

LOMC Clearinghouse
7930 Coca Cola Drive, Suite 204
Hanover, MD 21076
ATTN: CLOMR Manager

RE: Jackrabbit Trail Wash(195th Avenue Alignment), New White Tanks FRS (Flood Retarding Structure) No. 3 Outfall Channel -- Town of Buckeye and Unincorporated County, Maricopa County, Arizona

Dear Sir or Madam:

Please find enclosed a CLOMR request for the subject wash from approximately 1000 feet north of the White Tanks 4 FRS to Bethany Home Road alignment. The new channel will extend upstream from the existing floodplain delineation limit of study from Medlock Drive to the Bethany Home Road alignment. The project is being implemented by Flood Control District of Maricopa County.

The following items are included for your review:

- *White Tanks FRS No. 3 Outfall Channel Conditional Letter of Map Revision*, Technical Data Notebook, dated February 15, 2011. (Note: The FEMA forms (see Section 2), annotated FIRM panels, digital updated hydrology model, digital hydraulic models, and all pertinent back-up data are included in the TDN. The Work Maps are included separate from the TDN.)

- Check for $4,400 to cover FEMA's required fees for the processing of the CLOMR.

The pertinent FIRM panels are 04013C1590H and 04013C2055G.

If you have any questions or require additional information, please feel free to call me at 602-506-2201 or contact me by e-mail at kennethrakestraw@mail.maricopa.gov .

Yours truly,

Kenneth Rakestraw

Kenneth Rakestraw
Hydrologist

Enclosures: As Listed above

Copies to (w/o enclosures):

Beth Norton
Federal Emergency Management Agency
500 C Street SW
Washington, D.C. 20472-0001

Ed Curtis
Department of Homeland Security, FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources
500 North Third Street
Phoenix, AZ 85004

John Schneeman
Floodplain Management Services
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Stephen Cleveland, Town Manager
100 North Apache Road
Buckeye, AZ 85326

Kevin LaVallee, GIS
Public Works Department- Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Paul Hoskin, P.E.
Hoskin and Ryan Consultants, Inc.
6245 N. 24th Pkwy, Suite 100
Phoenix, AZ 85016

April 19, 2011

Mr. Paul W.R. Hoskin, P.E.
Project Engineer
Hoskin Ryan Consultants, Inc.
6245 North 24th Parkway, Suite 100
Phoenix, AZ 85016

IN REPLY REFER TO:
Case No.: 11-09-2260R
Communities: Town of Buckeye and
Maricopa County, AZ
Community Nos.: 040039 and 040037

316-AD

Dear Mr. Hoskin:

This responds to your request dated April 5, 2011, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	White Tanks FRS #3 Outfall Channel
Flooding Source:	Jackrabbit Trail Wash
FIRM Panel(s) Affected:	04013C1590H and 2055H

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is available on the FEMA website at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Information eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, Mr. Paul Anderson, P.E., CFM, by e-mail at PMAnderson@mbakercorp.com or by telephone at 720-514-1121, or the Revisions Coordinator for your request, Mrs. Jaclyn Bloor, CFM, at jbloor@mbakercorp.com or at (720) 479-3160.

Sincerely,

Syed Qayum

Syed Qayum, CFM
LOMR Technical Manager
BakerAECOM

Enclosures

cc: Mr. Timothy S Phillips, P.E.
Chief Engineer and General Manager
Maricopa County

Mr. Gary Wesch, P.E.
Maricopa County Flood Control District

Mr. Kenneth Rakestraw
Hydrologist
Maricopa County Flood Control District

Mr. Stephen Cleveland
Town Manager
Town of Buckeye

Summary of Additional Data Required to Support a
Conditional Letter of Map Revision (CLOMR)

Case No.: 11-09-2260R

Requester: Mr. Paul W.R. Hoskin, P.E.

Communities: Town of Buckeye and
Maricopa County, AZ

Community Nos.: 040037 and 040039

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

1. Please provide all relevant hydrologic back-up data and calculations used to determine the discharges for the base (1-percent-annual-chance) flood found in the submitted existing conditions HEC-1 hydrologic model.

2. The submitted application did not include an existing/pre-project hydraulic model. The existing/pre-project conditions model should reflect any modifications that have occurred within the floodplain since the date of the effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the duplicate effective model. Please submit an existing/pre-project conditions hydraulic model for Jackrabbit Trail Wash. Please provide paper and digital copies of the input and output files for this model.

3. Please submit an existing conditions certified topographic work map that includes the following items.

   (a) Boundary delineations of the effective and existing base flood
   (b) Topographic contour information used for the boundary delineation of the existing base flood
   (c) Locations and alignment of all Cross Sections used in the hydraulic model with stationing control indicated
   (d) Stream and road alignments
   (e) Boundaries of the requestor's property
   (f) Certification by a registered professional engineer
   (g) Location and description of reference marks
   (h) Referenced vertical datum
   (i) Flow line used in the hydraulic model
   (j) Scale and north arrow

4. This CLOMR request will be processed by FEMA only after FEMA receives documentation from the requestor that demonstrates compliance with the Endangered Species Act (ESA). The requestor must demonstrate ESA compliance by submitting to FEMA either an Incidental Take Permit, Incidental Take Statement, "not likely to adversely affect" determination from the National Marine Fisheries Service or the US Fish and Wildlife Service (collectively known as "the Services"), or an official letter from the Services concurring that the project has "No Effect" on listed species or critical habitat.

   If the project is likely to cause jeopardy or adverse modification to species, then FEMA may deny the Conditional LOMC request. Please see the enclosed guidance for additional information about the ESA and compliance requirements and for responses to frequently asked questions.

Please send the required data and/or fee directly to us at the address shown at the bottom of the first page. For identification purposes, please include the case number referenced above on all correspondence.

DEPARTMENT OF THE ARMY

LOS ANGELES DISTRICT, CORPS OF ENGINEERS
ARIZONA-NEVADA AREA OFFICE
3636 NORTH CENTRAL AVENUE, SUITE 900
PHOENIX, ARIZONA 85012-1939

REPLY TO
ATTENTION OF:

December 14, 2010

Office of the Chief
Regulatory Division

Tim Phillips
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

Subject: Nationwide Permit Verification (File No. SPL-2010-804-AP)

Dear Mr. Phillips:

I am responding to your Clean Water Act Section 404 permit application dated June 9, 2010, regarding your proposal to discharge dredged and/or fill materials for improvements and expansion of an existing stormwater management facility as described in the enclosed Maricopa County Flood Control District's Wash Corridor Vegetation Plan (Exhibits 1 & 2), and as shown on the detailed 95% design plans dated November 2010. This proposed project is bounded to the north by White Tanks FRS #3 and to the south by White Tanks FRS #4 at Latitude 33°29'15"N and Longitude 112°28'45"W, Maricopa County, Arizona.

The Corps of Engineers has determined, under Section 404 of the Clean Water Act (33 U.S.C. 1344), that your proposed activity complies with the terms of Nationwide Permit No. 43, "Stormwater Management Facilities" You must comply with all terms and applicable conditions (regional, general, and 401 conditions) described in Enclosure 1 and complete the compliance statement (Enclosure 2).

Furthermore, you must comply with the following **Special Condition(s)**:

a. No excavation, fill, or leveling is permitted in waters of the U.S. outside the boundary of the permitted work areas (as described above). Work shall be contained within the boundary of these work areas. These areas shall be clearly marked prior to the start of any construction activities and the contractor(s) (if applicable) shall be thoroughly familiarized with the permitted work area boundaries, as described in the enclosed Maricopa County Flood Control District's Wash Corridor Vegetation Plan (Exhibits 1 & 2), and as shown on the detailed 95% design plans dated November 2010.

b. No fill shall be taken from the water of the U.S. outside the boundary of the permitted work areas (as described above). Fill shall come from an area outside the Ordinary High Water Mark that does not impact the waters of the U.S. Fill shall be free of any contaminants or pollutants. The permitted work area boundaries are described in the enclosed Maricopa County

Flood Control District's Wash Corridor Vegetation Plan (Exhibits 1 & 2), and as shown on the detailed 95% design plans dated November 2010.

c. The permittee shall ensure that the 404 work areas provided by this authorization is restored after construction to an environmentally acceptable condition which includes that the physical integrity of the altered watercourses and watercourse morphology are re-established to match pre-construction configuration, as described in the enclosed Maricopa County Flood Control District's Wash Corridor Vegetation Plan (Exhibits 1 & 2), and as shown on the detailed 95% design plans dated November 2010.

This verification is valid until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2012. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit.

If you sell/transfer the property associated with this letter of verification you should work with the new owner to complete the enclosed Transfer Statement (Enclosure 3). This transfer is necessary to ensure that the new owner of the property is aware of all terms and conditions of this letter of this verification including any special conditions that will continue to be binding on the new owner.

A nationwide permit does not grant any property rights or exclusive privileges. Also, it does not authorize any injury to the property or rights of others or authorize interference with any existing or proposed Federal project. Furthermore, it does not obviate the need to obtain other Federal, state, or local authorizations required by law.

Thank you for participating in our regulatory program. If you have questions, please contact Ann Palaruan at (602) 640-5385 ext.227.

Sincerely,

Sallie McGuire

Sallie McGuire
Chief, Arizona Branch
Regulatory Division

Enclosures

LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS

CERTIFICATION OF COMPLIANCE WITH DEPARTMENT OF THE ARMY NATIONWIDE PERMIT

Permit Number: SPL-2010-804-AP

Date of Issuance: December 14, 2010

Name of Permittee: Tim Phillips
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

Upon completion of the activity authorized by this permit, sign this certification and return it with an original signature to the following address:

U.S. Army Corps of Engineers
ATTENTION: Regulatory Division (SPL-2010-804-AP)
3636 North Central Avenue, Suite 900
Phoenix, Arizona 85012-1939

Please note that your permitted activity is subject to a compliance inspection by a Corps of Engineers' representative. If you fail to comply with this Nationwide Permit you may be subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced Nationwide Permit has been completed in accordance with the terms and conditions of said permit.

______________________________ ______________________________

Signature of Permittee Date

Enclosure 2

Transfer Statement

To validate the transfer of this nationwide permit verification from the current permittee to a transferee, pursuant to nationwide permit General Condition 25 described below, the following steps must be completed. The transferee must add their contact information to the **Name of Transferee** block below and must sign and date this Transfer Statement. The completed Transfer Statement and a copy of the original nationwide permit verification then must then be mailed to the Corps of Engineers. Receipt of this information by the Corps of Engineers completes the transfer process.

Current Nationwide Permit Verification

Permit Number: SPL-2010-804-AP

Date of Issuance: December 14, 2010

Name of Permittee: Tim Phillips
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

General Condition 25. *Transfer of Nationwide Permit Verifications* states

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

Your signature below, as transferee, indicates that you accept and agree to comply with all terms and conditions of this nationwide permit authorization

Name of Transferee:

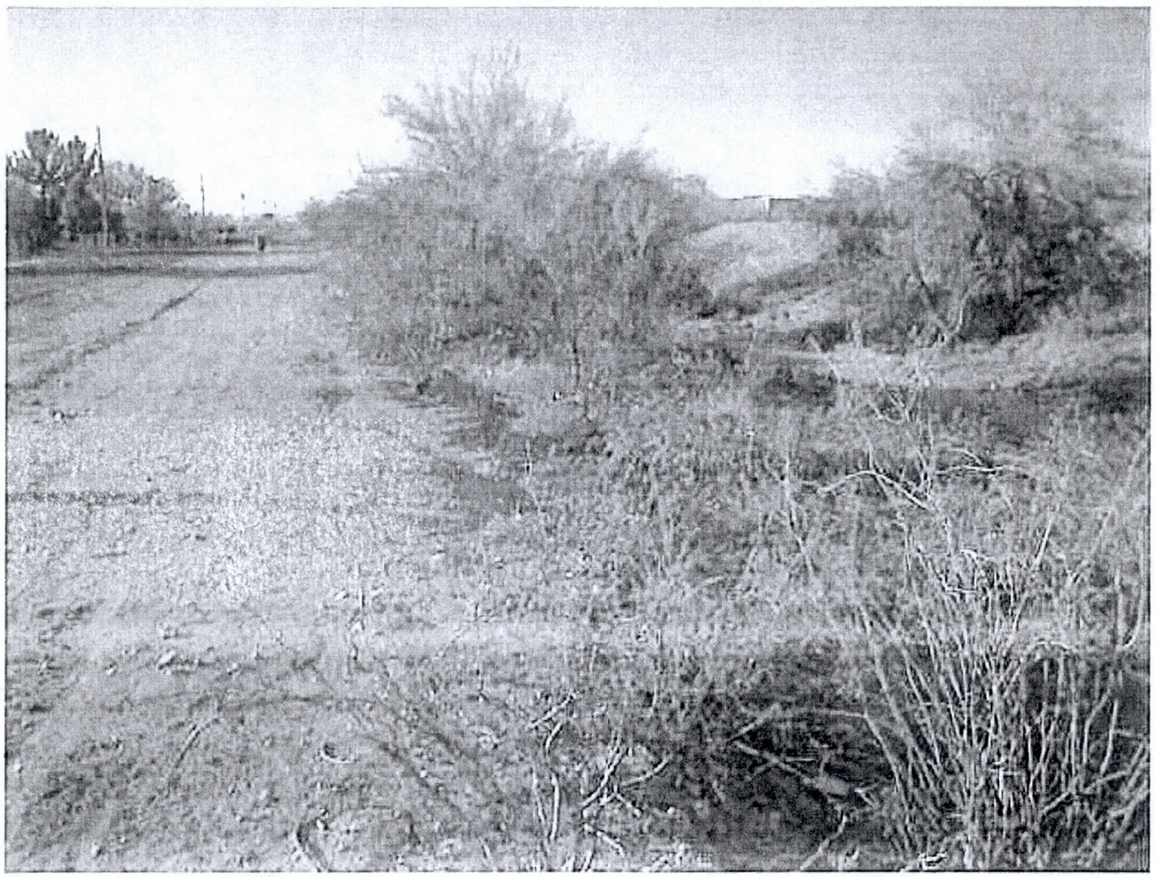
______________________________ ________________
(Transferee) (Date)

Enclosure 3

EXHIBIT 1

WHITE TANKS FRS #3 OUTLET CHANNEL PROJECT

Wash Corridor Vegetation Plan



CLEAN WATER ACT SECTION 404

Prepared for

U.S. Army Corps of Engineers

Submitted by the Flood Control District of Maricopa County

December 10, 2010

Flood Control District of Maricopa County's Wash Corridor/Vegetation Plan (written description) to include - see detailed 95% design plans dated November 2010

Responsible Party

Flood Control District of Maricopa County
Robert B. Stevens, Environmental Program Manager
2801 West Durango Street
(602) 506-4073

Location

The Project area is within the existing White Tanks outfall channel and primarily crosses the Town of Buckeye. It is bounded to the north by White Tanks FRS #3 (FRS#3) and to the south by White Tanks FRS #4 (FRS#4) at Latitude 33°29'15"N and longitude 112°28'45"W, Maricopa County, Arizona

Description

The Flood Control District of Maricopa County (District) is in the process of rehabilitation of the White Tanks Flood Retarding Structure (FRS) No. 3 dam and outlet works. The principal spillway currently outlets to the proximity of the Beardsley Canal, as well as other areas to the south and east of it. The proposed FRS#3 Outfall Channel Project will provide an outfall for the Principal Spillway flows and will extend south to the existing FRS #4 inlet channel..

The southerly segment of the outlet (from McDowell Road south to the FRS# 4) was completed under a previous 404 permit (Permit no. 974-0591-LSF). The proposed Outfall Channel extends 5.5 miles from just north of McDowell north along Jackrabbit Trail to FRS# 3. Its primary purpose is to convey discharges from FRS #3 when that facility is drained after controlling major storm events. The secondary purpose is to provide a conveyance for local drainage areas west of Jackrabbit Trail. The Outfall Channel is designed to contain 100-year storm events and reduce the flooding hazard along Jackrabbit Trail. The project alignment lies within the Town of Buckeye and unincorporated Maricopa County.

404 Jurisdictional Area Description

Based on earlier section 404 permits in the project area such as the FRS #4 drain (Permit no. 974-0591-LSF), the wash to the west of Jackrabbit Road extending from the FRS #4 structure to about Osborn Road was considered a jurisdictional waters of the US (wus). This determination was also supported by a Flood Emergency Management Agency (FEMA) map of the area, which indicated that the wash defined a 100 year floodway, extending from the FRS #4 inlet channel to Medlock Road where the designation terminated. Additionally, the USGS map (7.5 minute Perryville and Valencia Quadrangle) indicates the presence of historic drainages (blue line) which follow the alignment of the wash downstream of Bethany Home Road Alignment. The Corps typically considers the 100 year floodway limits and the presence of historic drainages in their determination of the ordinary high water mark for defining wus. In continuing with the same precedent upstream of the drain, a preliminary JD for the project was submitted by the District and approved by the COE for the segment of the wash from McDowell Road to Medlock Road where it becomes undefined to the north.

Goals of your wash activities, wash creation, salvage & revegetation, vegetation planting to include vegetation creation and buffers for wash corridors

The proposed channel will extend from the FRS #3 principal outlet to the existing FRS #4 inlet drain at the Palm Lane alignment. Future modifications to the FRS #4 will include an outfall from the principal outlet to the Gila River via the Loop 303 channel. Consequently, the two dams and associated outlet channels will all be interconnected and eventually convey runoff from the White Tanks watershed into the Gila River.

In calculating impacts to wus, the project can be divided into two types of habitats, including the reaches along the west side of Jackrabbit Road versus those on the east side of the road. The portion of the channel along the east side of the road extends from the FRS #3 principal outlet to Minnezona Avenue, and is not located within any proposed nor approved (wus). Continuing downstream, the segment of the channel on the west side of Jackrabbit road, which extends from Minnezona Avenue to the existing FRS #4 inlet channel, will be rehabilitated/improved where the existing degraded habitat and wus, currently exist.

As indicated in the table below, the channel invert on the east side of the road will be approximately 30 feet in width and extend a length of approximately 2.26 miles. Landscaping is proposed along the banks and invert of the new channel and will consist of an area of approximately 8.2 acres. Areas within the invert and banks of the channel will be planted with native desert vegetation using tall pot planting and hydroseeding. Given that the new channel will be connected to the principal outlet of the FRS #3, approximately 8.2 acres of new wus will be created as a result of the channelization on the east side of Jackrabbit road.

Discharge of dredged and/or fill materials for channelization consisting of 404 temporary impacts will occur within the portion of the wash on the west side of Jackrabbit Road from Minnezona Avenue to the FRS #4 inlet channel. As indicated in the application, this existing wash is bordered by the road and has been degraded due to impacts from adjacent development. Discharges of dredged and/or fill materials from the channelization work in wus will consist of temporary impacts that are approximately 20 feet in width and 2.3 miles in length in wus, yielding an area of approximately 5.5 acres. Of the 5.5 acres there are approximately .9 acres of existing channel along the Pasqualleti development (south of Indian School) which will be avoided. This will then leave approximately 4.6 acres of temporary impact to the wash from the proposed channelization project. There will be .2 acres of permanent loss in the project area that will occur from the construction of the box culverts in wus along the west side of Jackrabbit road, and an additionally 2 acres due to prior mitigation obligations for the FRS #4 inlet channel. Consequently, there is a total of 6.8 acres of impact to wus from the channelization project.

The new channel will increase the existing drainage area to another 10 feet in width yielding a new channel area of approximately 2.78 acres of proposed wus. Re-vegetation in the form of landscaping consisting of tall pots and hydroseeding is proposed within the banks and invert of the new channel. Consequently, approximately 2.78 acres of proposed wus would be added as a result of the channelization project.

In combining both channel segments there is approximately 11 acres of added wus which would be created to convey runoff from the upper White Tanks watershed in contrast to the 6.8 acres of impact to the existing degraded wash. For a summary of the aforementioned project impacts within wus see Table on the following page.

The specific purpose of the new wash stabilization/creation is to provide a passive multi-use drainage corridor which functions as a facility and an amenity for wildlife and pedestrian use.

Table. Proposed Impacts within Waters of the US

Vicinity to Jackrabbit Road	Reaches	Width of the channel invert (feet)	Length (miles)	Area of impact (square feet)	Area of impact to wash (acres)	Area of new waters of the US (acres)
East side (created wus)	White Tanks FRS #3 PO to Minnezona Avenue	30	2.26	357,984		8.2
West side (temporary impact)	Minnezona Avenue to inlet drain at Palm Lane (existing structure)	20	2.3	242,880	5.5	
West side (avoided)	Pasqualetti channel (already constructed channel south of Indian School	20	2000	4,0000	-.9	
West side (temporary impact)	Minnezona Avenue to the White Tanks FRS #4 inlet drain at Palm Lane (additional channel width)	10	2.3	121,440		2.78
West side (permanent impact)	Box culverts within wash	20 feet	400 feet	8,000	.2	
West side Mitigation from Permit No. 974-0591-LSF (not successful)	Mitigation area	40	2178 feet		2	

The re-vegetation efforts will be conducted following channelization activities. Estimated total costs for revegetation inclusive of site preparation and planting is approximately $740,000.00. A specific schedule for maintenance and monitoring has not yet been developed but would be completed on an "as needed" basis. Revegetation plans have been included in the 95 % design plans (Hoskins-Ryan Consultants, Inc, 2010). The channelization projects will eventually provide connectivity between the two dams and convey runoff from White Tanks watershed into the Gila River, via the White Tanks FRS #3 and #4 and associated outlet and inlet channels.

Description of the Proposed Wash Corridor

The proposed corridor within the modified channel was selected as a feasible re-vegetation and habitat corridor site because landscaping was already proposed for the site and due to its proximity within the White Tanks Mountains watershed and to the FRS structures. As aforementioned, the location of the re-vegetation corridor will be in the new channel footprint. The average size of the new channel extending from the FRS #3 to Palm Lane is approximately 5 miles in length and 30 feet in width yielding an area of approximately 18 acres. The channel will be owned and maintained by the District and will include replanting in the invert and along the banks of the channel.

The baseline condition for vegetation maintenance of the structure will be determined by the as-builts and the hydraulic roughness coefficients established for various cross-sections of the channel. An approximate roughness value or (n) value of .040 will be maintained throughout the invert of the channel alignment. The new wash will be a flood control channel with a primary function of providing flood protection, and a secondary function to provide landscape and trails for the community and potential habitat corridors for wildlife. The structural integrity of the channels and density of the vegetation in the channel will be maintained by the District O&M in accordance with the new baseline standards, as established in the 95% design plans and ultimately the final as-builts following construction. Cross sections or survey monuments will be established to determine design criteria for maintaining vegetation.

Implementation Plan for the Wash Corridor Project (LS01 White Tanks FRS No.3 Outfall Channel Landscape Plans)

The re-vegetation in the channel will include both hydro-seeding and tall pots for better plant coverage and erosion control, and to ensure a better success rate for plant growth in the channel. Per the landscape plans, prepared by EPG (Hoskins-Ryan Consultants), the plant palate for the hydroseed and tall pots would consist of primarily blue palo verde (*parkinsonia florida*), little leaf palo verde (*parkinsona microphyla*), velvet mesquite (*prosopis velutina*) and ironwood (*olneya tesota*) trees. The re-vegetation will be completed in the new channel following construction of the structure and during the later part of the year, when conditions are more conducive for seed germination and plant growth. The soils at the site will be scarified from the proposed channelization activities, and the channel bottom prepared with top soil and fertilizer and dry water to provide a better platform for plant growth. Tall pots will be installed per the attached landscape details on drawing no. LS23 of the 95% preliminary design plans (Hoskins Ryan Consultants, Inc, 2010). Per the specifications, the tall pots will not require irrigation and will be sustained with a dry water supplement. Areas which have been hydro-seeded and/or planted will be sustained with water from supplemental water sources such as water trucks for temporary periods in the event that plant growth has been hindered due to extreme weather conditions. The landscaping will be monitored by the Town of Buckeye and the District on a periodic basis to ensure the success of the revegetation efforts.

References

Hoskin-Ryan Consultants, Inc.
2010 95% Plans for the Construction of White Tanks FRS No. 3 Outfall Channel, Landscape Plans (Drawings LS01-LS24), FCD Contract No. 2010-CO12, October 10.

Hoskin-Ryan Consultants, Inc.
2010 White Tanks FRS No. 3 Outfall Channel, Final Design, FCD 2009CO12 – Design Report, 95% Submittal, November 10.

Exhibit 2

Impacts to proposed waters of the US from new box culverts along White Tanks FRS #3 Outlet Channel

Culvert Location at Road Crossings	Length of culvert along flow line (feet)	Width of Wash (feet)	Area (square feet)	Total Area (acres)
Indian School	152	20		
Thomas Road	48	20		
Virginia	48	20		
Encanto	48	20		
Palm Lane	90	20		
Total	400	20	8000	.20

Explanation:

As indicated in the 95% design report and plans, there are only 5 new culverts which will be constructed within the approved preliminary Jurisdictional limits of the wash. The remaining culverts are existing and will not create any new impacts to the wash. Disturbances to the Jackrabbit wash do not occur until Minnezona Road, where the new channel crosses from the east side of Jackrabbit road via a pipe under the road. Additionally there is an existing box culvert at Minnezona Road, so the impacts to the wash do not start until Indian School Road.

NATIONWIDE PERMIT NUMBER 43

STORMWATER MANAGEMENT FACILITIES

US Army Corps of Engineers
Los Angeles District
Regulatory Division/Arizona Branch

Pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344) and/or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq) the U.S. Army Corps of Engineers published the "Reissuance of Nationwide Permits" in the Federal Register (72 FR 11092) on March 12, 2007. This Nationwide Permit is effective from March 19, 2007 to March 18, 2012 unless modified, reissued or revoked before that time. It is incumbent upon the permittee to remain informed of changes to the nationwide permits.

43. Stormwater Management Facilities. Discharges of dredged or fill material into non-tidal waters of the United States for the construction and maintenance of stormwater management facilities, including the excavation of stormwater ponds/facilities, detention basins, and retention basins; the installation and maintenance of water control structures, outfall structures and emergency spillways; and the maintenance dredging of existing stormwater management ponds/ facilities and detention and retention basins.

The discharge must not cause the loss of greater than ½-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds this 300 linear foot limit is waived in writing by the district engineer. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters. This NWP does not authorize discharges of dredged or fill material for the construction of new stormwater management facilities in perennial streams.

Notification: For the construction of new stormwater management facilities, or the expansion of existing stormwater management facilities, the permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 27.) Maintenance activities do not require pre-construction notification if they are limited to restoring the original design capacities of the stormwater management facility. (Section 404)

401 Certification

303[d]-impaired waters (see Water Quality Definitions): For projects on a waterbody with an impaired reach, if the project impacts the listed waterbody within 800 meters (or ½ mile) downstream of an impaired reach to within 1600 meters (or 1 mile) upstream of an impaired reach: Individual Certification required.

Tributaries to 303[d]-impaired waters: For projects on a tributary to a waterbody listed as impaired, if the tributary mouth is on an impaired reach and the project impacts the tributary within 1600 meters (or 1 mile) of its mouth: Individual Certification required.

Outstanding Arizona Waters (a.k.a. "unique Waters") (see Water Quality Definitions): For projects on a designated Outstanding Arizona Water, if the project impacts the designated waterbody within 800 meters (or ½ mile) downstream of a designated reach to within 1600 meters (or 1 mile) upstream of a designated reach: Individual Certification required.

Tributaries to Outstanding Arizona Waters: For projects on a tributary to a designated Outstanding Arizona Water, if the tributary mouth is on a designated reach and the project impacts the tributary within 1600 meters (or 1 mile) of its mouth: Individual Certification required.

Lake (see Water Quality Definitions): Individual Certification required.

Other waters: Individual certification required if activity causes the loss of greater than 300 lineal feet of any streambed or greater than 0.1 acre aggregate loss; otherwise, conditionally certified (all applicable general 401 conditions below). *Note: Conditional certification only applies when none of the other 401 certification categories apply.*

Tribal Waters:
Hualapai Tribe – Individual Certification required
Navajo Nation – Individual Certification required
White Mountain Apache Tribe – Individual Certification required
All other reservations – Contact EPA Region IX

State of Arizona 401 Water Quality Conditions

Except as noted, the following 401 General Conditions apply to all waters of the U.S. (WUS) and all applicable NWP:

1. Any discharge (including runoff or seepage) occurring as a result of activities certified for the subject project shall not cause a violation of surface water quality standards for any WUS. Applicability of this condition is as defined in A.A.C. R18-11-102.
2. This certification does not authorize the discharge of process water, material processing residues, wastewater or other residual material to any WUS.
3. Activities herein certified shall be performed during periods of low flow (baseflow or less) in any watercourse or other WUS, or no flow in the case of ephemeral and intermittent waterbodies.
4. If activities are likely to create an erosion or sedimentation problem, operations shall cease until the problem is resolved or until reasonable control measures have been undertaken.
5. Erosion control, sediment control and/or bank protection measures shall be installed before construction and pre-operation activities, and shall be maintained as necessary during construction and post-construction periods to minimize channel or bank erosion, soil loss and sedimentation. Control measures shall not be constructed of uncemented or unconfined soil, or other easily transportable (by flow) materials.
6. The applicant is responsible for ensuring construction material and/or fill including, but not limited to: rock, gabion fill or other uncemented channel-lining materials, placed within the Ordinary High Water Mark (OHWM) of any WUS, shall not include materials that can cause or contribute to an exceedence of Arizona Water Quality Standards for Surface Waters (18, A.A.C., 11, Article 1). Any fill material washing must occur outside of the floodplain of any WUS prior to placement and the rinseate from such washing shall be contained and settled or otherwise prevented from contributing sediment or causing erosion to any WUS. Fill placed in locations subject to scour shall contain not more than ten percent (10%) on a dry weight basis of particles finer than 0.25 mm diameter (passing a No. 60 sieve).
7. Any dredged material is to be placed and retained in areas outside the OHWM of any WUS. Runoff from materials deposited outside the OHWM is to be settled, filtered or otherwise treated to prevent escape of pollutants (including sediment) to any WUS.
8. Except as otherwise allowed herein, upon completion of construction the applicant shall ensure no adverse change due to the subject project has occurred in the stability (with respect to stream geometry, erosion and sedimentation) of any WUS, including upstream and downstream from the project. If such change has occurred, the applicant shall take steps to restore the pre-project stability of any impacted segments.
9. Except where the activities certified herein are intended to permanently alter any WUS, all disturbed areas between the OHWM shall be restored to preconstruction conditions. Denuded areas shall be revegetated as soon as possible with native and/or salvaged plants and seed. Vegetation should be maintained on unarmored banks and slopes to stabilize soil and prevent erosion.
10. Where needed to prevent erosion/sedimentation, flows unimpacted by the subject project shall be diverted around work operations, and material and equipment storage areas. Permanent and temporary access roadways, staging areas and material stockpiles shall be designed or located to allow storm flows to pass unimpeded. Except as otherwise allowed herein, when flow is present in any wash or other WUS within the project area, the applicant and any contractor will not impede, restrict, or stop the flow by any means.
11. Permanent and temporary pipes and culverted crossings and pads shall be adequately sized to handle expected flow and properly set with end section, splash pads, or headwalls that dissipate water energy to control erosion. Culverted and unculverted crossings and pads shall be constructed so as to accommodate the overtopping of the fill by streamflow and armored to prevent erosion of the fill.
12. Acceptable construction materials that will or may contact water in any WUS are: crushed stone, native fill (meeting the requirements in 401 General Condition 6) concrete, steel, plastic, or aluminum and other materials specifically approved in writing by ADEQ.
13. Silt laden or turbid water resulting from project activity shall be settled, filtered or otherwise treated prior to discharge to ensure no violation of Arizona Surface Water Quality Standards in any WUS.
14. When flow greater than described in 401 General Condition 3 above is present within the project area, all activities certified herein shall cease and construction equipment and materials easily transported by flow will be moved outside the flow area and the OHWM of any WUS. If such movement cannot be accomplished rapidly enough to prevent pollution of a WUS, measures shall be taken to prevent transport of sediment or other pollutants out of the construction area or into any WUS.
15. Work shall be conducted and monitored to ensure that pollution from the activities certified herein including, but not limited to: earthwork, concrete mixing and placement, detention ponds, and equipment maintenance and washing does not drain into any WUS.
16. If water is used for dust suppression, it shall not contain contaminants that could violate Arizona Surface Water Quality Standards of any WUS.

17. The applicant will erect any barriers, covers, shields and other protective devices as necessary to prevent any construction materials, equipment or contaminants/pollutants from falling, being thrown or otherwise entering any flowing WUS.

18. Upon completion of the activities certified herein, areas within the OHWM of all WUS at the project site shall be promptly cleared of all false work, piling, construction residues, equipment, debris or other obstructions. Any debris including, but not limited to: soil, silt, sand, rubbish, cement, bituminous material, oil or petroleum products, organic materials, tires or batteries, derived from the activities certified herein shall not be stored at any site where it may be washed into a WUS and shall be properly disposed of after completion of the work.

19. The applicant must designate area(s) for equipment staging and storage located where runoff from these activities cannot enter any WUS. Any equipment maintenance, washing or fueling that cannot be done offsite will be done here. Material specifically manufactured and sold as spill adsorbent/absorbent will be on hand to control small spills. All equipment and workboats shall be inspected for leaks daily and prior to use. All leaks shall be repaired immediately. All equipment and workboats will be steam cleaned prior to use in any WUS with flow.

20. The applicant shall have a spill containment plan onsite to ensure that pollutants are contained, removed and properly disposed of. In addition, the applicant must designate areas, located where runoff from these activities cannot enter any WUS, for chemical and petroleum storage, and solid waste containment. All materials stored onsite will be stored in appropriate containers or packaging. Any pollutant produced by activities certified herein shall be properly disposed of in accordance with applicable regulations. A spill response kit will be maintained in this (these) area(s) to mitigate a potential spill. The kit will include material specifically manufactured and sold as spill adsorbent/absorbent including booms. The applicant will ensure that whenever there is activity on the site, that there are personnel on site trained in the proper response to spills and the use of spill response equipment.

21. If fully, partially or occasionally submerged structures are constructed of cast-in-place concrete instead of pre-cast concrete planks or slabs, applicant will take steps; e.g., sheet piling or temporary dams (except for NWP 33 & 15, filled cofferdams are not allowed), to prevent contact between water (instream and runoff) and the concrete until it cures and until any curing agents have evaporated or otherwise cease to be available; i.e., are no longer a pollutant threat. Where possible, construction work will be during extreme low water conditions or at a time and season that ensures all work is done in the dry.

22. For portions of the project utilizing potable water or groundwater for irrigation, direct runoff of irrigation water and overflows from runoff detention and/or retention areas into washes shall be limited to the extent practicable and shall not cause downstream erosion or flooding.

23. For portions of the project utilizing reclaimed wastewater for irrigation, direct runoff of irrigation water and overflow from retention/detention structures or storage impoundments into WUS is prohibited without the proper permits including, but not limited to, Arizona's Reclaimed Wastewater Permit and, if within the wetted area of a 25-year flood event (or within the floodplain in some cases), a AZPDES permit.

24. Fertilizer, herbicide and insecticide chemicals used for development of vegetated areas shall be selected based on minimum environmental impacts and approved for the intended use. Application rates printed on the product labels shall be strictly followed. Excess chemicals shall not be applied on recently treated areas and must either be stored, used elsewhere or disposed of (in any case, in accordance with all applicable regulations).

Water Quality Definitions

303[d]-listed Impaired Waters: These are waterbodies that as a result of the CWA 305[b] process are listed under CWA 303[d] as impaired; i.e., consistently not meeting water quality standards, and as a result merit special attention. The complete current 303[d] list of Impaired Waters is available on ADEQ's website:
http://www.azdeq.gov/environ/water/assessment/assess.html
(401 conditions herein are meant to apply to waterbodies on the current, not draft, list)

Lake: The following are lakes which require an individual 401 certification for activities undertaken via a NWP:

Apache County
- Becker Lake — Lat.: 34° 9' 14.4" — Long.: 109° 18' 18.0"
- Carnero Lake — Lat.: 34° 6' 57.6" — Long.: 109° 31' 40.8"
- Lyman Lake — Lat.: 34° 21' 28.8" — Long.: 109° 21' 28.8"

Cochise County
- Parker Canyon Lake — Lat.: 31° 25' 33.6" — Long.: 110° 27' 14.4"

Coconino County
- Ashurst Lake — Lat.: 35° 1' 08.4" — Long.: 111° 24' 10.8"

- Bear Canyon Lake Lat.: 34° 24' 10.8" Long.: 111° 0' 10.8"
- Blue Ridge Reservoir Lat.: 34° 33' 14.4" Long.: 111° 11' 02.4"
- Boot Lake Lat.: 34° 58' 51.6" Long.: 111° 19' 58.8"
- Chevelon Canyon Lake Lat.: 34° 30' 39.6" Long.: 110° 49' 26.4"
- Kinnikinick Lake Lat.: 34° 53' 52.8" Long.: 111° 18' 21.6"
- Lake Mary, Lower Lat.: 35° 6' 21.6" Long.: 111° 34' 19.2"
- Lake Mary, Upper Lat.: 35° 4' 44.4" Long.: 111° 31' 55.2"
- Long Lake Lat.: 34° 46' 44.4" Long.: 111° 12' 0.0"
- Long Lake Lat.: 35° 0' 0.0" Long.: 111° 20' 60.0"
- Mormon Lake Lat.: 34° 56' 38.4" Long.: 111° 27' 10.8"
- Odell Lake Lat.: 34° 56' 02.4" Long.: 111° 37' 51.6"
- Soldier Annex Lake Lat.: 34° 47' 13.2" Long.: 111° 13' 48.0"
- Soldier Lake Lat.: 34° 47' 13.96" Long.: 111° 13' 48.0"
- Steel Dam Lake Lat.: 35° 13' 37.2" Long.: 112° 24' 50.4"
- Stone Dam Lake Lat.: 35° 13' 37.2" Long.: 112° 24' 14.4"
- Stoneman Lake Lat.: 34° 46' 44.4" Long.: 111° 31' 04.8"
- Whitehorse Lake Lat.: 35° 7' 01.2" Long.: 112° 0' 46.8"
- Woods Canyon Lake Lat.: 34° 20' 06.0" Long.: 110° 56' 34.8"

Gila County
- Roosevelt Lake Lat.: 33° 40' 44.4" Long.: 111° 9' 14.4"

La Paz County
- Alamo Lake Lat.: 34° 14' 45.6" Long.: 113° 34' 58.8"

Maricopa County
- Apache Lake Lat.: 33° 35' 31.2" Long.: 111° 20' 31.2"
- Bartlett Lake Lat.: 33° 49' 01.2" Long.: 111° 37' 44.4"
- Canyon Lake Lat.: 33° 32' 38.2" Long.: 111° 26' 06.1"
- Lake Pleasant Lat.: 33° 51' 14.4" Long.: 112° 16' 15.6"
- Painted Rock Borrow Pit Lat.: 33° 4' 58.8" Long.: 113° 1' 19.2"
- Painted Rock Reservoir Lat.: 33° 4' 15.6" Long.: 113° 0' 28.8"
- Roosevelt Lake Lat.: 33° 40' 44.4" Long.: 111° 9' 14.4"
- Saguaro Lake Lat.: 33° 34' 01.2" Long.: 111° 32' 06.0"

Mojave County
- Alamo Lake Lat.: 34° 14' 45.6" Long.: 113° 34' 58.8"

Navajo County
- Rainbow Lake Lat.: 34° 9' 03.6" Long.: 109° 59' 02.4"
- Show Low Lake Lat.: 34° 11' 24.0" Long.: 109° 59' 56.4"

Pima County
- Arivaca Lake Lat.: 31° 31' 51.6" Long.: 111° 15' 03.6"

Santa Cruz County
- Arivaca Lake Lat.: 31° 31' 51.6" Long.: 111° 15' 03.6"
- Patagonia Lake Lat.: 31° 29' 31.2" Long.: 110° 52' 01.2"
- Peña Blanca Lake Lat.: 31° 24' 10.8" Long.: 111° 5' 02.4"

Yavapai County
- Granite Basin Lake Lat.: 34° 37' 02.1" Long.: 112° 32' 56.5"
- Horseshoe Reservoir Lat.: 33° 58' 58.8" Long.: 111° 42' 28.8"
- Horsethief Lake Lat.: 34° 9' 43.2" Long.: 112° 17' 56.4"
- Lake Pleasant Lat.: 33° 51' 14.4" Long.: 112° 16' 15.6"
- Lynx Lake Lat.: 34° 31' 08.4" Long.: 112° 23' 06.0"
- Peck's Lake Lat.: 34° 47' 06.0" Long.: 112° 2' 31.2"
- Watson Lake Lat.: 34° 35' 16.8" Long.: 112° 25' 04.8"

Other Waters: Any waters of the United States, occurring on non-tribal land, that does not fall within one of the other definitions listed here.

Outstanding Arizona Waters: ADEQ is in the process of the triennial review of surface water quality standards (18 Arizona Administrative Code 11, Art 1) and among other things, this entails an updating of the Unique Waters of the state. A definite change is the name: instead of "Unique Waters", these bodies of water shall be referred to as "Outstanding Arizona Waters". Current Water Quality Standards For Surface Waters are available on the Arizona Secretary of State website (http://azsos.gov/public_services/Title_18/18-11.pdf).

The following are currently classified as Unique Waters (from R18-11-112(E), Arizona Administrative Code):

Apache County
- The West Fork of the Little Colorado River, from its headwaters to Government Springs at Latitude 33° 59' 33" / Longitude 109° 27' 54".
- Lee Valley Creek, from its headwaters to confluence with Lee Valley Reservoir.
- Hay Creek, from its headwaters to its confluence with the West Fork of the Black River.
- Stinky Creek, from the White Mountain Apache Indian Reservation boundary to its confluence with the West Fork of the Black River.

Cochise County
- Cave Creek from the headwaters to the Coronado National Forest boundary.
- South Fork of Cave Creek from its headwaters to its confluence with Cave Creek.

Coconino County
- Oak Creek from its headwaters to confluence with the Verde River.
- West Fork of Oak Creek from its headwaters to confluence with Oak Creek.

Gila County
- (Proposed) Fossil Creek, from its headwaters at the confluence of Sandrock and Calf Pen Canyons above Fossil Springs to its confluence with the Verde River.

Graham County
- Bonita Creek, from the boundary of the San Carlos Indian Reservation to its confluence with the Gila River.
- Aravaipa Creek, from its confluence with Stowe Gulch at Latitude 32° 52' 10" / Longitude 110° 22' 03" to the downstream boundary of Aravaipa Canyon Wilderness Area at Latitude 32° 54' 23" / Longitude 110° 33' 42".

Greenlee County
- Bear Wallow Creek, from its headwaters to the boundary of the San Carlos Indian Reservation.
- North Fork of Bear Wallow Creek, from its headwaters to confluence with Bear Wallow Creek.
- South Fork of Bear Wallow Creek, from its headwaters to confluence with Bear Wallow Creek.
- Snake Creek, from its headwaters to its confluence with the Black River.
- KP Creek, from its headwaters to its confluence with the Blue River.

Mohave County
- Francis Creek, from its headwaters to its confluence with Burro Creek.

Pima County
- Cienega Creek, from confluence with Gardner Canyon and Spring Water Canyon to USGS gaging station at Latitude 32° 02 ' 09" / Longitude 110° 40' 36".
- Buehman Canyon Creek, from its headwaters to confluence with unnamed tributary at Latitude 32° 24' 31.5"/ Longitude 110° 32' 08".
- Aravaipa Creek, from its confluence with Stowe Gulch at Latitude 32° 52' 10" / Longitude 110° 22' 03" to the downstream boundary of Aravaipa Canyon Wilderness Area at Latitude 32° 54' 23" / Longitude 110° 33' 42".

Yavapai County
- Oak Creek from its headwaters to confluence with the Verde River.
- Peoples Canyon Creek from its headwaters to confluence with the Santa Maria River.
- Burro Creek, from its headwaters to confluence with Boulder Creek.
- Francis Creek, from its headwaters to its confluence with Burro Creek.

Tribal Waters: All waters of the United States occurring on tribal lands.

Unique Waters: Now known as "Outstanding Arizona Waters"

Regional Conditions

Of the ten regional conditions effective within the Los Angeles District of the Corps of Engineers, three apply to projects within Arizona (2, 3, and 4). The remaining conditions apply to specific geographic areas, resources or species in California.

The following regional conditions must be followed in order for any authorization by an NWP to be valid in the State of Arizona:

2. For the State of Arizona and the Mojave and Sonoran (Colorado) desert regions of California in Los Angeles District (generally north and east of the San Gabriel, San Bernardino, San Jacinto, and Santa Rosa mountain ranges, and south of Little Lake, Inyo County), no nationwide permit, except Nationwide Permits 1 (Aids to Navigation), 2 (Structures in Artificial Canals), 3 (Maintenance), 4 (Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities), 5 (Scientific Measurement Devices), 6 (Survey Activities), 9 (Structures in Fleeting and Anchorage Areas), 10 (Mooring Buoys), 11 (Temporary Recreational Structures), 20 (Oil Spill Cleanup), 22 (Removal of Vessels), 27 (Stream and Wetland Restoration Activities), 30 (Moist Soil Management for Wildlife), 31 (Maintenance of Existing Flood Control Projects), 32 (Completed Enforcement Actions), 35 (Maintenance Dredging of Existing Basins), 37 (Emergency Watershed Protection and Rehabilitation), and 38 (Cleanup of Hazardous and Toxic Waste), or other nationwide or regional general permits that specifically authorize maintenance of previously authorized structures or fill, can be used to authorize the discharge of dredged or fill material into a jurisdictional special aquatic site as defined at 40 CFR Part 230.40-45 (sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle-and-pool complexes).

3. For all projects proposed for authorization by nationwide or regional general permits where prior notification to the District Engineer is required, applicants must provide color photographs or color photocopies of the project area taken from representative points documented on a site map. Pre-project photographs and the site map would be provided with the permit application. Photographs should represent conditions typical or indicative of the resources before impacts.

4. Notification pursuant to general condition 13 shall be required for projects in all special aquatic sites as defined at 40 CFR Part 230.40-45 (sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle-and-pool complexes), and in all perennial watercourses or waterbodies in the State of Arizona and the Mojave and Sonoran (Colorado) desert regions of California in Los Angeles District (generally north and east of the San Gabriel, San Bernardino, San Jacinto, and Santa Rosa mountain ranges, and south of Little Lake, Inyo County), excluding the Colorado River from Davis Dam downstream to the north end of Topock and downstream of Imperial Dam.

General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/ or Coastal Zone Management Act consistency for an NWP.

1. Navigation
(a) No activity may cause more than a minimal adverse effect on navigation.
(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.
(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements
No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

3. Spawning Areas
Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas
Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds
No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48.

6. Suitable Material
No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. Water Supply Intakes.

No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments.

If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows

To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains.

The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment

Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls

Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. Removal of Temporary Fills

Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance

Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

15. Wild and Scenic Rivers

No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

16. Tribal Rights

No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

17. Endangered Species

(a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

(c) Non-federal permittees shall notify the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. FWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide Web pages at http://www.fws.gov/ and http://www.noaa.gov/fisheries.html respectively.

18. Historic Properties

(a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.
(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed.
(e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h–2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

19. Designated Critical Resource Waters

Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment.
(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.
(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

20. Mitigation

The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:
(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).
(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.
(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10 acre and require pre-construction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. For wetland losses of 1/10 acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.
(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment.
(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of ½ acre, it cannot be used to authorize any project resulting in the loss of greater than ½ acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.
(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(g) Permittees may propose the use of mitigation banks, in-lieu fee arrangements or separate activity-specific compensatory mitigation. In all cases, the mitigation provisions will specify the party responsible for accomplishing and/or complying with the mitigation plan.
(h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

21.Water Quality

Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

22. Coastal Zone Management

In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

23. Regional and Case-By-Case Conditions

The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

24. Use of Multiple Nationwide Permits

The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

25. Transfer of Nationwide Permit Verifications

If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:
"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

____

(Transferee)

____

(Date)

26. Compliance Certification

Each permittee who received an NWP verification from the Corps must submit a signed certification regarding the completed work and any required mitigation. The certification form must be forwarded by the Corps with the NWP verification letter and will include:
(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;
(b) A statement that any required mitigation was completed in accordance with the permit conditions; and
(c) The signature of the permittee certifying the completion of the work and mitigation.

27. Pre-Construction Notification

(a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:
(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or
(2) Forty-five calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 17 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 18 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) is completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).
(b) *Contents of Pre-Construction Notification:* The PCN must be in writing and include the following information:
(1) Name, address and telephone numbers of the prospective permittee;
(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided result in a quicker decision.);
(4) The PCN must include a delineation of special aquatic sites and other waters of the United States on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters of the United States, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, where appropriate;
(5) If the proposed activity will result in the loss of greater than 1/10 acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.
(6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and
(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.
(c) *Form of Pre-Construction Notification:* The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.
(d) *Agency Coordination:* (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.
(2) For all NWP 48 activities requiring pre-construction notification and for other NWP activities requiring pre-construction notification to the district engineer that result in the loss of greater than ½-acre of waters of the United States, the district engineer will immediately provide (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy of the PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.
(3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.
(4) Applicants are encouraged to provide the Corps multiple copies of pre-construction notifications to expedite agency coordination.
(5) For NWP 48 activities that require reporting, the district engineer will provide a copy of each report within 10 calendar days of receipt to the appropriate regional office of the NMFS.
(e) *District Engineer's Decision:* In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If the proposed activity requires a PCN and will result in a loss of greater than 1/10 acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed work are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the district engineer will notify the permittee and include any conditions the district engineer deems necessary. The district engineer must approve any compensatory mitigation proposal before the permittee commences work. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP.
If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either:
(1) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal

adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

28. Single and Complete Project

The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project.

Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration, establishment (creation), enhancement, or preservation of aquatic resources for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Discharge: The term "discharge" means any discharge of dredged or fill material.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities eligible for exemptions under Section 404(f) of the Clean Water Act are not considered when calculating the loss of waters of the United States.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. The definition of a wetland can be found at 33 CFR 328.3(b). Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas (see 33 CFR 328.3(e)).

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: Re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects waterbodies with their adjacent uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 20.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete project: The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete project must have independent utility (see definition). For linear projects, a "single and complete project" is all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a wetland (i.e., water of the United States) that is inundated by tidal waters. The definitions of a wetland and tidal waters can be found at 33 CFR 328.3(b) and 33 CFR 328.3(f), respectively. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line, which is defined at 33 CFR 328.3(d).

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a jurisdictional water of the United States that, during a year with normal patterns of precipitation, has water flowing or standing above ground to the extent that an ordinary high water mark (OHWM) or other indicators of jurisdiction can be determined, as well as any wetland area (see 33 CFR 328.3(b)). If a jurisdictional wetland is adjacent—meaning bordering, contiguous, or neighboring— to a jurisdictional waterbody displaying an OHWM or other indicators of jurisdiction, that waterbody and its adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

Kenneth Rakestraw - FCDX

From: Snyder, Jodie [JASnyder@mbakercorp.com]
Sent: Tuesday, May 10, 2011 8:47 AM
To: Kenneth Rakestraw - FCDX
Cc: Anderson, Paul; Bloor, Jaclyn
Subject: RE: White Tanks 3 Outfall Channel, CLOMR, Case No. 11-09-2260R
Attachments: WT3O Section 404 Nationwide Permit SPL-2010-804-AP 20101214.pdf

Good morning Ken,

Thanks again for submitting a copy of the verification letter you received from the USACE to utilize Nationwide Permit # 43. This permit is sufficient documentation to fulfill FEMA's Procedure Memorandum 64 requirements. As we discussed yesterday, FEMA confirmed we can utilize this permit for CLOMR No. 11-09-2260R to demonstrate that Endangered Species Act compliance was carried out for the project through the Department of Army permitting process.

Please let us know if you have any questions/concerns. Thanks again for your coordination.

Kind regards,
Jodie

Jodie Snyder, LEED® AP
Transportation/Environmental Planner | Michael Baker Jr., Inc.
165 S. Union Blvd, Ste 200, Lakewood, CO 80228 | jasnyder@mbakercorp.com
(D) 720-514-1114 | (M) 303-842-6609 | (F) 720-479-3157

From: Anderson, Paul
Sent: Thursday, May 05, 2011 3:44 PM
To: Snyder, Jodie
Cc: Bloor, Jaclyn
Subject: FW: White Tanks 3 Outfall Channel, CLOMR, Case No. 11-09-2260R

From: Kenneth Rakestraw - FCDX [mailto:kennethrakestraw@mail.maricopa.gov]
Sent: Thursday, May 05, 2011 3:25 PM
To: Anderson, Paul
Cc: Doug Both; Gary Wesch - FCDX; Bob Stevens - FCDX
Subject: White Tanks 3 Outfall Channel, CLOMR, Case No. 11-09-2260R

Hello Paul,

Doug Both with Hoskin Ryan advised me that you had indicated that our 404 permit may indeed serve to fill the ESA requirements for the application.

Please see the attached and let me know if this is sufficient to fill this requirement.

Ken Rakestraw
Hydrologist
Flood Control District of Maricopa County
602-506-2201

AFFECTED PROPERTIES

PROPOSED CHANNEL ALONG JACKRABBIT TRAIL

APN	LOCATION	LAND USE	OWNER	CONTACT	MAX WSEL RISE (FT	RS	NOTE
50234225	NORTH OF MCDOWELL	VACANT	NEVADA INVESTMENT HOLDINGS INC	8095 OTHELLO AVE, SAN DIEGO, CA, 92111	0.91	5503	CONTAINED WITHIN CONCRETE CHANNEL
50262001P	NORTHWEST OF THOMAS AND JACKRABBIT TRAIL	VACANT	SOUTHWEST NEXT NWC JACKRABBIT & THOMAS LLC	11811 N TATUM BLVD STE 1051 PHOENIX AZ 85028	-1.41	11042	REMOVED FROM ZONE AE
50262001W	NORTHWEST OF THOMAS AND JACKRABBIT TRAIL	VACANT	CROWN-PHOENIX ARROYO SECO-NORTH I LLC	3808 N SULLIVAN RD BLDG N15 STE 202 SPOKANE VALLEY WA 99216	-1.41	11042	REMOVED FROM ZONE AE
50262001X	SOUTH OF PASQUALETTI	RETENTION BASIN	PASQUALETTI MOUNTAIN RANCH COMMUNITY ASSOC	9633 S 48TH ST STE 150 PHOENIX AZ 85044	-1.6	13054	REMOVED FROM ZONE AE
50262042	PASQUALETTI	RESIDENTIAL	SANDERS JERRY L/VERNA S TR	8705 W ROANOKE AVE, PHOENIX, AZ 85037	-2.05	15039	REMOVED FROM ZONE AE
50262043	PASQUALETTI	VACANT	YUONG TAI QUOC/DOAN PHUONG	11155 W EDGEMONT AVE AVONDALE AZ 85323	APPROX -2.0	15039	FLOODPLAIN BEING REMOVED FROM PROPERTY
50262041	PASQUALETTI	RESIDENTIAL	GEORGE DAVID/HELEN	3807 N 195TH DR BUCKEYE AZ 85396	APPROX -2.0	15039	FLOODPLAIN BEING REMOVED FROM PROPERTY
50262001F	SOUTHWEST OF INDIAN SCHOOL AND JACKRABBIT	VACANT	HERITAGE BANK	4222 E CAMELBACK RD STE J200 PHOENIX AZ 85018	-1.88	15540	REMOVED FROM ZONE AE
50228553	VERRADO DEVELOPMENT	VACANT	DMB WHITE TANK LLC	7600 E DOUBLETREE RANCH RD STE 300, SCOTTSDALE, AZ 85258	-5.47	18340	CONTAINED WITHIN PROPOSED CHANNEL
50228554	VERRADO DEVELOPMENT	VACANT	DMB WHITE TANK LLC	7601 E DOUBLETREE RANCH RD STE 300, SCOTTSDALE, AZ 85258	-3.42	18200	CONTAINED WITHIN PROPOSED CHANNEL
50228559	VERRADO DEVELOPMENT	VACANT	DMB WHITE TANK LLC	7602 E DOUBLETREE RANCH RD STE 300, SCOTTSDALE, AZ 85258	-1.50	17486	CONTAINED WITHIN PROPOSED CHANNEL
50228563	VERRADO DEVELOPMENT	VACANT	DMB WHITE TANK LLC	7603 E DOUBLETREE RANCH RD STE 300, SCOTTSDALE, AZ 85258	-5.47	18340	CONTAINED WITHIN PROPOSED CHANNEL
50228564	VERRADO DEVELOPMENT	VACANT	DMB WHITE TANK LLC	7604 E DOUBLETREE RANCH RD STE 300, SCOTTSDALE, AZ 85258	-1.79	17549	CONTAINED WITHIN PROPOSED CHANNEL
50277748	VERRADO DEVELOPMENT	VACANT	FIDELITY NATIONAL TITLE INS CO TR B176	1661 E CAMELBACK RD STE 250 PHOENIX AZ 85016	-0.10	16700	CONTAINED WITHIN PROPOSED CHANNEL
50228010A	SOUTHWEST OF BETHANY HOME RD AND JACKRABBIT TRAIL	VACANT	KLONDIKE LAND PORTFOLIO LLC	12790 EL CAMINO REAL STE 105, SAN DIEGO, CA 92130	N/A	26475	CONTAINED WITHIN PROPOSED CHANNEL, NO EXISTING FLOODPLAIN

REMNANT CHANNEL

APN	LOCATION	LAND USE	OWNER	CONTACT	MAX WSEL RISE (FT	RS	NOTE
50228025	LITCHFIELD HEIGHTS UNIT 1	RESIDENTIAL	KINGERY JAMES R/LORI M	19503 W CAMPBELL AVE, LITCHFIELD PARK, AZ 85340	-3.4	1354	CONTAINED WITHIN THE EXISTING CHANNEL AND DRAINAGE EASEMENT
50228020	LITCHFIELD HEIGHTS UNIT 1	RESIDENTIAL	VARBEL DUANE	1537 W LYNWOOD PHOENIX AZ 85007	-2.82	1751	CONTAINED WITHIN THE EXISTING CHANNEL AND DRAINAGE EASEMENT
50228021	LITCHFIELD HEIGHTS UNIT 1	RESIDENTIAL	BARTZ ROBERT F/CLAUDIA L/VARBEL DUANE	19512 W MINNEZONA AVE LITCHFIELD PARK AZ 85340	APPROX -2.8	1751	FLOODPLAIN BEING REMOVED FROM PROPERTY
50228019	LITCHFIELD HEIGHTS UNIT 1	RESIDENTIAL	BUSALACCHI PAUL J/CYNTHIA L	19505 W MEADOWBROOK, LITCHFIELD PARK, AZ 85340	-2.92	2010	CONTAINED WITHIN THE EXISTING CHANNEL AND DRAINAGE EASEMENT
50228014	LITCHFIELD HEIGHTS UNIT 1	RESIDENTIAL	CANTOR GREG/TAMMY C	19506 W MEADOWBROOK AVE, LITCHFIELD PARK, AZ 85340	-0.28	2415	CONTAINED WITHIN THE EXISTING CHANNEL AND DRAINAGE EASEMENT
50270023A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	GAGE TIMOTHY M/KUMMETZ HEIDI	7337 N 183RD AVE, WADDELL, AZ 85355	0.68	4545	STRUCTURE OUT OF FLOODPLAIN
50270024A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	SMAYLIS JACLYNN	5111 N 196TH AVE, LITCHFIELD PARK, AZ 85340	0.69	4700	STRUCTURE OUT OF FLOODPLAIN
50270019A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	GILLIAM GERALD W/JUNE E	5001 N 196TH AVE, LITCHFIELD PARK, AZ 85340	0.31	3982	STRUCTURE OUT OF FLOODPLAIN
50270020A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	VINCENT MICHAEL/SHARON	5021 N 196TH AVE, LITCHFIELD PARK, AZ 85340	0.31	3982	STRUCTURE OUT OF FLOODPLAIN
50270022A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	STINEHART JEAN M	5045 N 196TH AVE, LITCHFIELD PARK, AZ 85340	0.77	4351	STRUCTURE OUT OF FLOODPLAIN
50270021A	BEAUTIFUL ARIZONA ESTATES SUB	RESIDENTIAL	EDGLEY KEVIN S/KAREN D	5035 N 196TH AVE, LITCHFIELD PARK, AZ 85340	0.77	4351	STRUCTURE OUT OF FLOODPLAIN
50228098		RESIDENTIAL	TAYLOR BEAN WHITAKER MARTGAGE CORP	1417 N MAGNOLIA AVE OCALA FL 34475	0.27	3500	
50228130R		VACANT	HOLSINGER FAMILY REVOCABLE TRUST	6658 EVENING GLOW DR SCOTTSDALE, AZ 58262	0.13		
50228130T		VACANT	HOLSINGER FAMILY REVOCABLE TRUST	6658 EVENING GLOW DR SCOTTSDALE, AZ 58262	0.38	2913	
50228130S		VACANT	HOLSINGER FAMILY REVOCABLE TRUST	6658 EVENING GLOW DR SCOTTSDALE, AZ 58262	-0.13		
50228130Q		VACANT	HOLSINGER FAMILY REVOCABLE TRUST	6658 EVENING GLOW DR SCOTTSDALE, AZ 58262	-0.38	2415	
50228099A		VACANT	DICKENS BERNARD/ALDINE R TR	10808 W CAMEO DR, SUN CITY, AZ 85351	0.27	3500	

Flood Control District
of Maricopa County

www.fcd.maricopa.gov

2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

March 28, 2011

Jean M. Stinehart
5045 North 196th Avenue
Litchfield Park, Arizona 85340

Re: Notification/acceptance of 1% (100-year) annual chance water-surface/floodway elevation increases/narrowing of 1% annual chance floodplain/floodway, FCDMC Case No. FAC10-033.

Dear Sir or Madam:

The Flood Insurance Rate Map (FIRM) for a community depicts land which has been determined to be subject to a 1% (100-year) or greater annual chance flooding in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management.

The Flood Control District of Maricopa County is applying for a Conditional Letter of Map Revision (CLOMR) from the Federal Emergency Management Agency (DHS-FEMA) to revise FIRM Map Numbers 04013C1590H and 04013C2055G for Maricopa County, AZ, Community Number 040037, and the Town of Buckeye, AZ, Community Number 040039. The Flood Control District of Maricopa County is proposing to revise the Jackrabbit Trail Wash floodway/floodplain limits by construction of channel/culvert/erosion control improvements.

The Conditional Letter of Map Revision will result in updated FIRM panels which will include both the establishment of new Zone AE floodplain and floodway with Base Flood Elevations north of Minnezona Avenue where a new channel is proposed (and the existing channel remains); and the modification of Zone AE floodplain widths, Base Flood Elevations (increases and decreases), and floodway widths (increases and decreases) where the existing channel will be improved or replaced with a new channel located to the west of the existing channel. Sections of Zone A floodplain will be replaced with Zone AE floodplains and floodways.

If you have any questions or concerns about the proposed changes to the FIRM or its affect on your property, you may contact me at (602) 506-4717.

Sincerely,

Stacey A. Lapp, P.E., CFM
Senior Civil Engineer, Floodplain Management & Services Division

Enclosures

Copy to: Gary Wesch, P.E., FCDMC Planning & Project Management Division
Woodrow C. Scoutten, P.E., Town Engineer, Town of Buckeye
Stephen S. Cleveland, Town Manager, Town of Buckeye
Scott W. Lowe, P.E., Public Works Director, Buckeye

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Nevada Investment Holdings Inc
8095 Othello Ave.
San Diego, CA 92111

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Southwest Next NWC Jackrabbit and Thomas LLC
11811 N Tatum Blvd Ste 1051
Phoenix AZ 85028

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A. Signature
X D. Moss ☑ Agent ☐ Addressee

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1. Article Addressed to:

Crown-Phoenix Arroyo Seco-
North I LLC
3080 N Sullivan Rd
Bldg N15 Ste 202
Spokane Valley, WA 99216

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Kim Paulsen ☐ Agent ☐ Address

B. Received by (Printed Name) Kim Paulsen

C. Date of Delive 4/11/2011

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If YES, enter delivery address below: ☒ No

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Street, Apt. No.; or PO Box No. 3080 N Sullivan Rd Bldg N15 Ste 202
City, State, ZIP+4 Spokane Valley WA 99216

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1. Article Addressed to:

Pasqualetti Mountain Ranch
Community Association
9633 S 48th St Ste 150
Phoenix AZ 85044

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A. Signature
X Linda Kosko ☐ Agent ☐ Addres

B. Received by (*Printed Name*) LINDA KOSKO

C. Date of Deliv 4/8/11

D. Is delivery address different from item 1? ☐ Yes
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Street, Apt. No.; or PO Box No. 9633 S 48th St Ste 150
City, State, ZIP+4 Phoenix AZ 85044

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1. Article Addressed to:

Jerry L / Verna Sanders
8705 W. Roanoke Ave
Phoenix Az 85037

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A. Signature
X Verna Sanders ☐ Agent ☐ Addres

B. Received by (*Printed Name*) Verna Sanders

C. Date of Deli 3-30

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Street, Apt. No.; or PO Box No. 8705 W Roanoke Ave
City, State, ZIP+4 Phoenix Az 85037

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of
Maricopa County
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PHOENIX, ARIZONA 85009-6399

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1. Article Addressed to:

David / Helen George
3807 N. 195th Dr
Buckeye AZ 85396

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (*Printed Name*) David George

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Street, Apt. No.; or PO Box No. 3807 N 195th Dr
City, State, ZIP+4 Buckeye AZ 85396

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Heritage Bank
4222 E. Camelback Rd Ste J200
Phoenix AZ 85018

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Colette Osum

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number 7006 2150 0004 3987 5478
(Transfer from service label)

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-02-M-1540

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7006 2150 0004 3987 5478

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Heritage Bank
Street, Apt. No.; or PO Box No. 4222 E. Camelback Rd Ste J200
City, State, ZIP+4 Phoenix AZ 85018

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

DMB WhiteTank LLC
7600 E Doubletree Ranch Rd
Ste 300
Scottsdale, AZ 85258

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Michelle Alameda ☐ Agent ☐ Addressee

B. Received by (*Printed Name*) Michelle Alameda | C. Date of Delivery 3-30-11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (*Extra Fee*) ☐ Yes

2. Article Number
7006 2150 0004 3987 5256

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7006 2150 0004 3987 5256

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To DMB WhiteTank LLC
Street, Apt. No.; or PO Box No. 7600 E DoubleTree Ranch Rd Ste 300
City, State, ZIP+4 Scottsdale AZ 85258

PS Form 3800, August 2006 See Reverse for Instructions

I FMO 10HL

Flood Control District
of
Maricopa County

2801 WEST DURANGO ST.
PHOENIX, ARIZONA 85009-6399

7006 2150 0004 3987 5461

UNITED STATES POSTAGE
02 1R
0006558529
MAILED FROM ZIP

Fidelity National Title Ins. Co. TR B176
1661 E Camelback Rd Ste 250
Phoenix, AZ 85018 - 6

NIXIE 850 DE 1 00

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

BC: 85009639999 *1779-12
8500906399

U.S. Postal Service™
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OFFICIAL USE

7006 2150 0004 3987 5461

Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To: Fidelity National Title Ins Co
Street, Apt. No.; or PO Box No.: 1661 E Camelback Rd, Ste 250
City, State, ZIP+4: Phoenix AZ 85018

PS Form 3800, August 2006 See Reverse for Instructions

FMS/SAL
Flood Control District
of
Maricopa County
2801 WEST DURANGO ST.
PHOENIX, ARIZONA 85009-6399

CERTIFIED MAIL™

7006 2150 0004 3987 5263

UNITED STATES POSTAGE
0004293640
MAILED FROM ZIP

Klondike Land Portfolio LLC
11975 El Camino Real 205
San Diego, CA

X 921 N7E 1 B09F 00 04,
FORWARD TIME EXP RTN TO SEND
:KLONDIKE LAND PORTFOLIO LLC
12790 EL CAMINO REAL STE 150
SAN DIEGO CA 92130-2008
RETURN TO SENDER

85009S06399

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7006 2150 0004 3987 5263

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Klondike Land Portfolio LLC
Street, Apt. No.; or PO Box No. 11975 El Camino Real 205
City, State, ZIP+4 San Diego CA 92130

PS Form 3800, August 2006 See Reverse for Instructions

F1NS15PL

Flood Control District
of
Maricopa County
2801 WEST DURANGO ST.
PHOENIX, ARIZONA 85009-6399

7006 2150 0004 3987 5270

UNITED STATES POSTAGE

MAILED FROM ZIP C

UTF

James and Lori Kingery
19503 W. Campbell Ave.
Litchfield Par'

NIXIE 850 SE 1 00 03

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

8534036613 8500906399

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7006 2150 0004 3987 5270

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To James or Lori Kingery

Street, Apt. No.; or PO Box No. 19503 W Campbell Ave

City, State, ZIP+4 Litchfield Park AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Duane Varbel
1537 W Lynwood
Phoenix AZ 85007

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name)

C. Date of Delivery 4/11/11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7006 2150 0004 3987 5492

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7006 2150 0004 3987 5492

Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To: Duane Varbel
Street, Apt. No.; or PO Box No. 1537 W Lynwood
City, State, ZIP+4 Phoenix AZ 85007

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Robert/Claudia Bortz
or Duane Varble
19512 W Minnezona Ave
Litchfield Park AZ 85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Claudia Bartz ☐ Ager ☐ Addr

B. Received by (Printed Name) Claudia BARTZ C. Date of De 8-7-

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Mercha
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7006 2150 0004 3987 5416

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-02-I

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7006 2150 0004 3987 5416

Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To: Robert/Claudia Bortz or Duane Varble
Street, Apt. No.; or PO Box No.: 19512 W Minnezona Ave
City, State, ZIP+4: Litchfield Park AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Paul / Cynthia Busalacchi
19505 W Meadowbrook
Litchfield Park Az 85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature X Paul Busalacchi ☐ Agent ☐ Addres

B. Received by (Printed Name) PAUL BUSALACCHI

C. Date of Deliv 7-20-

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchand
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

Article N
(Transfer 7006 2150 0004 3987 5287

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-02-M-

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Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

7006 2150 0004 3987 5287

Sent To Paul / Cynthia Busalacchi
Street, Apt. No.; or PO Box No. 19505 W Meadowbrook
City, State, ZIP+4 Litchfield Park, Az 85340

PS Form 3800, August 2006 See Reverse for Instructions

UNITED STATES POSTAL SERVICE®

Track & Confirm

Search Results

Label/Receipt Number: **7006 2150 0004 3987 5294**
Status: **Delivered**

Your item was delivered at 12:12 pm on March 30, 2011 in LITCHFIELD PARK, AZ 85340. A proof of delivery record may be available through your local Post Office for a fee.

Additional information for this item is stored in files offline.

Restore Offline Details > ? Return to USPS.com Home >

Track & Confirm
Enter Label/Receipt Number.
Go >

 No FEAR Act EEO Data FOIA

7006 2150 0004 3987 5294

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Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To Greg / Tammy Cantor
Street, Apt. No.; or PO Box No. 19506 W. Meadowbrook
City, State, ZIP+4 Litchfield Park Az 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Timothy Gage or Heidi Kummetz
7337 N 183rd Ave
Waddell, AZ 85355

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☐ Agent
☐ Addres

B. Received by (*Printed Name*) Heidi Kummetz

C. Date of Deliv 3/31

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchanc
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (*Extra Fee*) ☐ Yes

Article N
(*Transfer*
7006 2150 0004 3987 5300

PS Form 3811, February 2004 Domestic Return Receipt FMJ/SAL 102595-02-M-

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7006 2150 0004 3987 5300

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Timothy Gage or Heidi Kummetz
Street, Apt. No.; or PO Box No. 7337 N 183rd Ave
City, State, ZIP+4 Waddell, AZ 85355

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Jaclynn Smaglis
5111 N. 19th Ave
Litchfield Park Az
85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Jaclynn Smaglis ☐ Agent ☒ Addressee

B. Received by (Printed Name) Jaclynn Smaglis

C. Date of Delivery 4/11/11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7006 2150 0004 3987 5447

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-02-M-1540

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7006 2150 0004 3987 5447

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Jaclynn Smaglis
Street, Apt. No.; or PO Box No. 5111 N. 19th Ave
City, State, ZIP+4 Litchfield Park, AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Gerald / June Gilliam
5001 N 196th Ave
Litchfield Park, Az
85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Gerald Gilliam ☐ Agent ☐ Addressee

B. Received by (Printed Name) GERALD GILLIAM
C. Date of Delivery 3-31-8

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (T 7006 2150 0004 3987 5317

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-02-M-1540

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7006 2150 0004 3987 5317

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Gerald / June Gilliam
Street, Apt. No.; or PO Box No. 5001 N. 196th Ave
City, State, ZIP+4 Litchfield Park, Az 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Michael / Sharon Vincent
5021 N 196th Ave
Litchfield Park, AZ
85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Mike Vincent

C. Date of Delivery 9-2-11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Art (Tr 7006 2150 0004 3987 5324

PS Form 3811, February 2004 Domestic Return Receipt PMS/SAL 102595-02-M-1540

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7006 2150 0004 3987 5324

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Michael / Sharon Vincent
Street, Apt. No.; or PO Box No. 5021 N. 196th Ave
City, State, ZIP+4 Litchfield Park AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Jean Stinehart
5045 N 196th Ave
Litchfield Park, AZ
85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Jean M Stinehart ☐ Agent ☒ Addressee

B. Received by (*Printed Name*) Jean Stinehart

C. Date of Delivery 8-30-11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (*Extra Fee*) ☐ Yes

2. Article Number
7006 2150 0004 3987 5331

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Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

7006 2150 0004 3987 5331

Sent To Jean Stinehart
Street, Apt. No.; or PO Box No. 5045 N 196th Ave
City, State, ZIP+4 Litchfield Park, AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Kevin / Karen Edgley
5035 N 196th Ave
Litchfield Park, AZ
85340

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☒ Agent
☐ Addressee

B. Received by (*Printed Name*) Karen Edgley

C. Date of Delivery 3-30-12

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (*Extra Fee*) ☐ Yes

2. Artic... (*Trar...* 7006 2150 0004 3987 5348

PS Form 3811, February 2004 Domestic Return Receipt FMS / SAL 102595-02-M-1540

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7006 2150 0004 3987 5348

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Kevin / Karen Edgley
Street, Apt. No.; or PO Box No. 5035 N 196th Ave
City, State, ZIP+4 Litchfield Park AZ 85340

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Taylor Bean & Whitaker
Mortgage Corp
1417 N. Magnolia Ave
Ocala FL 34475

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Dorothy Hamble ☐ Ag ☐ Ad

B. Received by (*Printed Name*) Dorothy R. Hamble C. Date of [illegible] 4-

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merch
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7006 2150 0004 3987 5430

PS Form 3811, February 2004 Domestic Return Receipt FMS/SAL 102595-0

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OFFICIAL USE

7006 2150 0004 3987 5430

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Taylor, Bean, Whitaker Mortgage Corp
Street, Apt. No.; or PO Box No. 1417 N Magnolia Ave
City, State, ZIP+4 Ocala, FL 34475

PS Form 3800, August 2006 See Reverse for Instructions

UNITED STATES POSTAL SERVICE®

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Track & Confirm FAQs

Track & Confirm

Search Results

Label/Receipt Number: **7006 2150 0004 3987 5362**
Status: **Delivered**

Your item was delivered at 2:59 pm on April 04, 2011 in SCOTTSDALE, AZ 85266. A proof of delivery record may be available through your local Post Office for a fee.

Additional information for this item is stored in files offline.

Restore Offline Details > ? Return to USPS.com Home >

Track & Confirm

Enter Label/Receipt Number.

Go >

 No FEAR Act EEO Data FOIA

7006 2150 0004 3987 5362

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OFFICIAL USE

Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To Holsinger Family Revocable Trust

Street, Apt. No.; or PO Box No. 6658 E Evening Glow Dr

City, State, ZIP+4 Scottsdale AZ 85262

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Bernadine/ Aldine Dickens
10808 W Cameo Dr
Sun City, AZ 85351

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Bernard Dickens ☐ Ag ☐ Ad

B. Received by (*Printed Name*) BERNARD DICKENS C. Date of

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☑ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merch
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number (*Transfer from service label*) 7006 2150 0004 3987 5355

PS Form 3811, February 2004 Domestic Return Receipt FMS SAL 102595-02

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

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OFFICIAL USE

7006 2150 0004 3987 5355

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Bernadine/ Aldine Dickens
Street, Apt. No.; or PO Box No. 10808 W Cameo Dr
City, State, ZIP+4 Sun City AZ 85351

PS Form 3800, August 2006 See Reverse for Instructions

B.5 Contract Documents

Flood Control District
of Maricopa County

www.fcd.maricopa.gov

2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

October 26, 2009

Mr. Paul Hoskin, P.E.
Hoskin Ryan Consultants, Inc.
201 West Indian School Road
Phoenix, AZ 85013

RE: NOTICE OF AWARD
Contract FCD 2009C012, White Tanks FRS No.3 Outfall Channel Final Design

Dear Mr. Hoskin:

Congratulations on the award of the above referenced contract. Enclosed is an original of the fully executed contract document. In accordance with Contract Specifications, Section II – Period of Service, this letter is the official Notice-to-Proceed (NTP) effective Thursday, October 22, 2009. The work under the contract is to be completed within three hundred sixty five (365) calendar days. The contract completion date is October 22, 2010.

This letter also serves as a reminder of the importance that the Flood Control District of Maricopa County (District) places on the contract completion date. Maintaining schedule milestones is imperative in meeting the District's planning and future funding goals. The contract completion date is not only a contractual requirement, but is also a commitment on the part of Hoskin Ryan Consultants, Inc. Throughout the term of the contract it must be treated with a high degree of importance. The District expects and anticipates that this will be the case.

Please note that a completed SBE Program Participation Report form *(included in the contract)* must be submitted with each invoice.

The District welcomes this opportunity to work with Hoskin Ryan Consultants Inc. and is looking forward to an enjoyable and profitable relationship. Should there be any questions regarding the contract, please contact me at (602) 506-2206.

Yours truly,

Patrick Schafer
Contracts Specialist

Enclosure: Contract FCD 2009C012

cc: Contract File
Finance Dept.
Project Manager

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL

SCOPE of WORK

TABLE OF CONTENTS

- A discussion of the estimated earthwork shrinkage values;
- Additional Items as presented in the Consultant Guidelines, Section 8.4 Report.

Optional Task 8A: Subsidence and Fissure Risk Assessment. Several investigations have been conducted in the vicinity of the White Tanks FRS #3 Outfall Channel alignment that have reported historic and ongoing land subsidence and earth fissure formation in response to the land subsidence in the area. A recent District investigation conducted by AMEC (2009) compiled much of the existing land subsidence and earth fissure related data. Additional earth fissure and land subsidence risk assessments, if deemed necessary, may be conducted by the District's on-call consultant, or others, as directed by the District. The CONSULTANT shall design reasonable and economical mitigation measures to defend against the land subsidence and earth fissure risks along the outfall channel alignment, based on the results of the AMEC (2009) investigation and the findings made based on results of additional subsidence and fissure risk assessment subsequently authorized by the District.

Develop a land subsidence and earth fissure monitoring program as part of the Maintenance Plan (see Section 16.0). The CONSULTANT shall prepare an earth fissure risk defense (mitigation) final design plans and construction documents. **This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.**

Optional Task 8B: Soil Cement Mix Design. The CONSULTANT shall use samples gathered during our geotechnical investigation to determine suitability of onsite materials for use in soil-cement mix design. A preliminary mix design will be prepared and presented as part our geotechnical report.
This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.

Optional Task 14B: Principal Outlet Structure Geotechnical Tests. The CONSULTANT shall explore subsurface conditions at principle outlet in order to gather geotechnical data for structural design of a proposed wasteway structure. The information will be presented as part of the geotechnical report. The testing will be coordinated with Optional Task 14 (Principal Outlet Structure Design). **This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.**

9.0 HYDROLOGY

The CONSULTANT shall use the "Future Condition with Project in Place" hydrologic model prepared for the 30% Design plans as documented in the report "White Tanks FRS No. 3 Outfall Channel – 30% Design Report," dated June 30, 2009 and as prepared by Hoskin Ryan Consultants, Inc. The DISTRICT will provide the hydrology model to the CONSULTANT. The CONSULTANT shall review the DISTRICT provided hydrology and shall update for revised spillway discharge rating curves that may result from the implementation of Pre-Design Alternatives identified in Section 13.0. The CONSULTANT will model the proposed condition based on the project design. The off-site hydrology prepared with the 30% Design Report shall be used for local drainage flows.

The CONSULTANT shall develop an "Existing Conditions with Project in Place" hydrologic model using the "Future Condition" model described above as a basis of the FEMA CLOMR application. Existing conditions will be based upon current land use and site retention.

9.7 MEETINGS

Delete this section and replace it with the following:

Two (2) meetings shall be held with the DISTRICT staff specifically to discuss and review the completed hydrologic model and assumptions. These meetings will be held during or after the Bi-weekly meetings. The CONSULTANT shall include minimum of two (2) field meetings to verify hydrological model and side drainage assumptions.

9.8 HYDROLOGY REPORT

Delete this section and replace it with the following:

The findings of the hydrologic study will be presented in the Drainage Report. No separate hydrology report is necessary.

Optional Task 9A: Beardsley Hydro. CONSULTANT shall use the Loop 303/White Tanks ADMPU Area Hydrologic Analysis Model and the "Existing Conditions with Project in Place" model, as described above, and make revisions for the watershed area downstream of the Project. This hydrologic model will be used in support of preparation of a CLOMR for the Beardsley Canal Wash floodplain. This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. **This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.**

10.0 HYDRAULICS

Add to this section the following:

The CONSULTANT shall produce a new model. The new topographic data obtained for this project shall be utilized to prepare the new HEC-RAS model. Hydraulic analysis shall be provided within the project limits and shall extend upstream and downstream as required to ensure proper function of the project improvements and the future planned channel improvements. The hydraulic analysis shall be documented in the Drainage Report.

Road Crossings:

Hydraulic analysis shall include existing and proposed culvert crossings under McDowell Road, Palm Lane, Thomas Road, Osborn Road, Clarendon Avenue, Indian School Road, Jackrabbit Trail (2 locations), Camelback Road, Colter Street, Jackrabbit Parkway, and FRS No. 3 Emergency Spillway. The CONSULTANT shall evaluate 100-yr storm-sized culvert alternatives for each crossing. The hydraulic analysis shall be performed for the upstream and downstream riprap protection.

The CONSULTANT shall analyze a need for drop structures and erosion protection (bank lining) within the project reach. The channel will be designed as an earthen channel. The acceptable velocity for the earthen channel will be per the DISTRICT "Drainage Design Manual", latest version. The need for the drop structures will be analyzed based on the slope required to bring the velocity that is acceptable for the earthen channel. The hydraulics for the drop structure shall include upstream and downstream velocities, depth of flows, Froude number, as well as the proposed lining for the drop structure. The upstream and downstream cut-off walls need to be designed to prevent scour holes.

CONSULTANT shall conduct a floodplain review of the area between the Principal Outlet and the Beardsley Canal siphon overchute. This analysis will be based upon the 100-year and maximum potential discharge from a single pipe outlet which may be used as a "wasteway." A floodplain delineation or submittal to FEMA for this reach will not be required.

The CONSULTANT shall use bed gradation samples obtained in Section 8.0 to conduct a sediment transport analysis for the Project. The HEC-RAS model will be used with the application of appropriate sediment transport equations. Watershed analysis of sediment load will be based upon side wash gradation analysis and application of the Universal Soil Loss Equation (USLE).

Optional Task 10A: I-10 Culverts Analysis. CONSULTANT shall evaluate alternative design scenarios for culvert and bridge structure crossing of the Interstate 10 traffic interchange with Jackrabbit Trail. The purpose is to evaluate future widening of the interchange and any possible impacts to the channel collection system and backwater flow effects. **This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.**

11.0 FLOODPLAIN DELINEATION STUDIES

Delete this section and replace it with the following:
The CONSULTANT shall generate the CLOMR Technical Data Notebook (TDN) for the project per the Arizona Department of Water Resources (ADWR) State Standards Attachment 1-97 (SSA1-97) using the ADWR/FEMA submittals outline. The CLOMR package will include but not be limited to the hydraulic analysis (including cross-section identification), new floodplain delineation, and FEMA forms and other miscellaneous information as necessary. The CONSULTANT shall run the profiles for the design conditions for the CLOMR using the "Existing Conditions with Project in Place" model developed in Section 9.0. The CLOMR package shall be submitted to the DISTRICT with the 90% submittal and finalized after the 100% submittal.

The DISTRICT will take the lead to submit the CLOMR information to FEMA. The CONSULTANT shall make corrections to the CLOMR TDN and hydraulic models as required by FEMA.

Optional Task 11A: Beardsley CLOMR. CONSULTANT shall prepare a CLOMR for the Beardsley Canal Wash floodplain to reflect the "Existing Conditions with Project in Place" condition. This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. **This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the DISTRICT.**

12.0 PLANNING STUDIES

Delete this section.

Appendix C: Survey Field Notes

C.1 Survey Field Notes for Aerial Mapping Control

C.2 Survey Field Notes for Hydrologic Modeling

Note: Survey for hydrologic modeling purposes is not included as part of this study.

C.3 Survey Field Notes for Hydraulic Modeling

The conversion between NGVD 1929 and NAVD 1988 is included.

C.3 Survey Field Notes for Hydraulic Modeling

Questions concerning the VERTCON process may be mailed to NGS

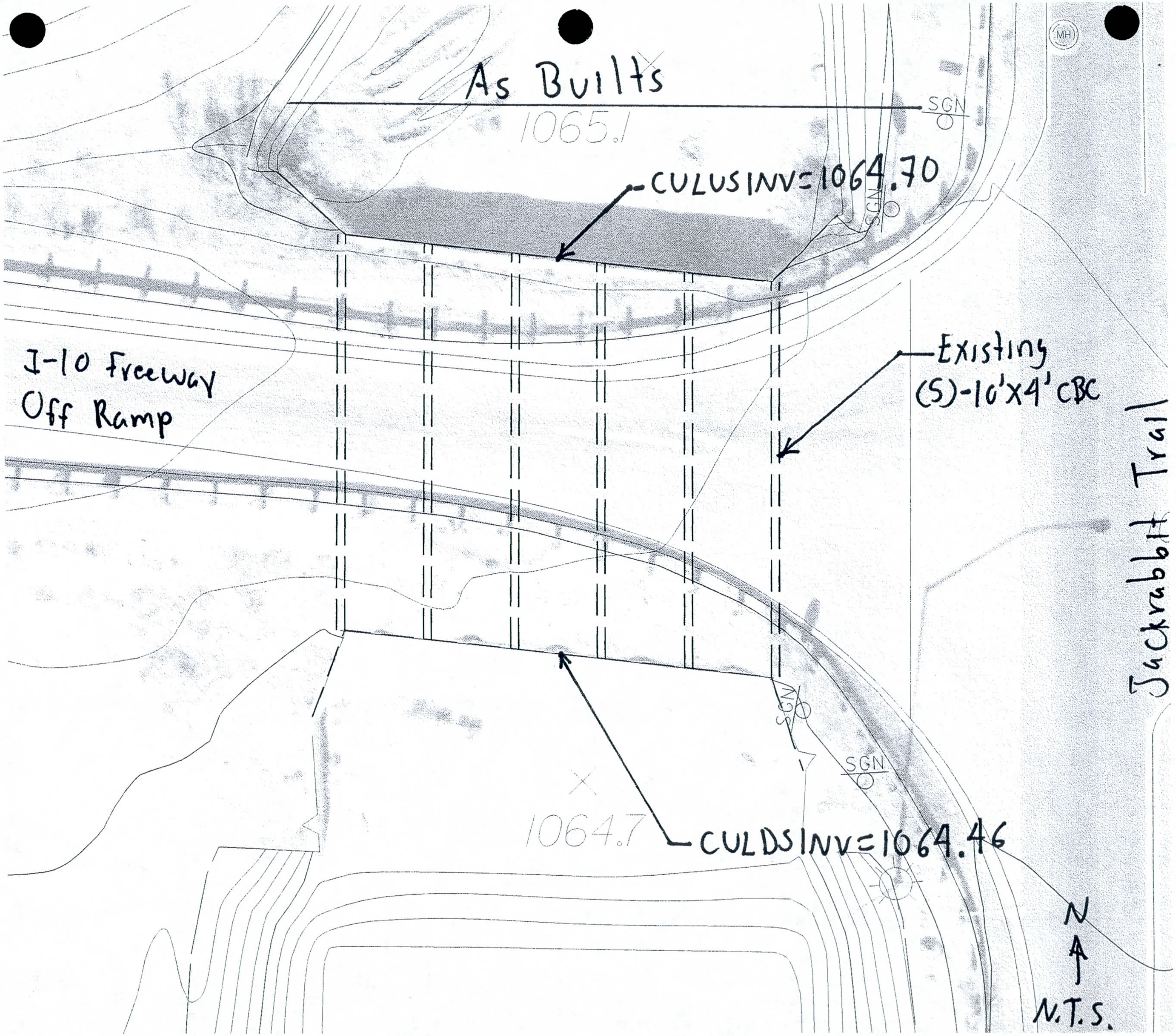
Latitude: 33.463611

Longitude: 112.470278

NGVD 29 height: 1056.65 FT

Datum shift(NAVD 88 minus NGVD 29): 1.991 feet

Converted to NAVD 88 height: 1058.642 feet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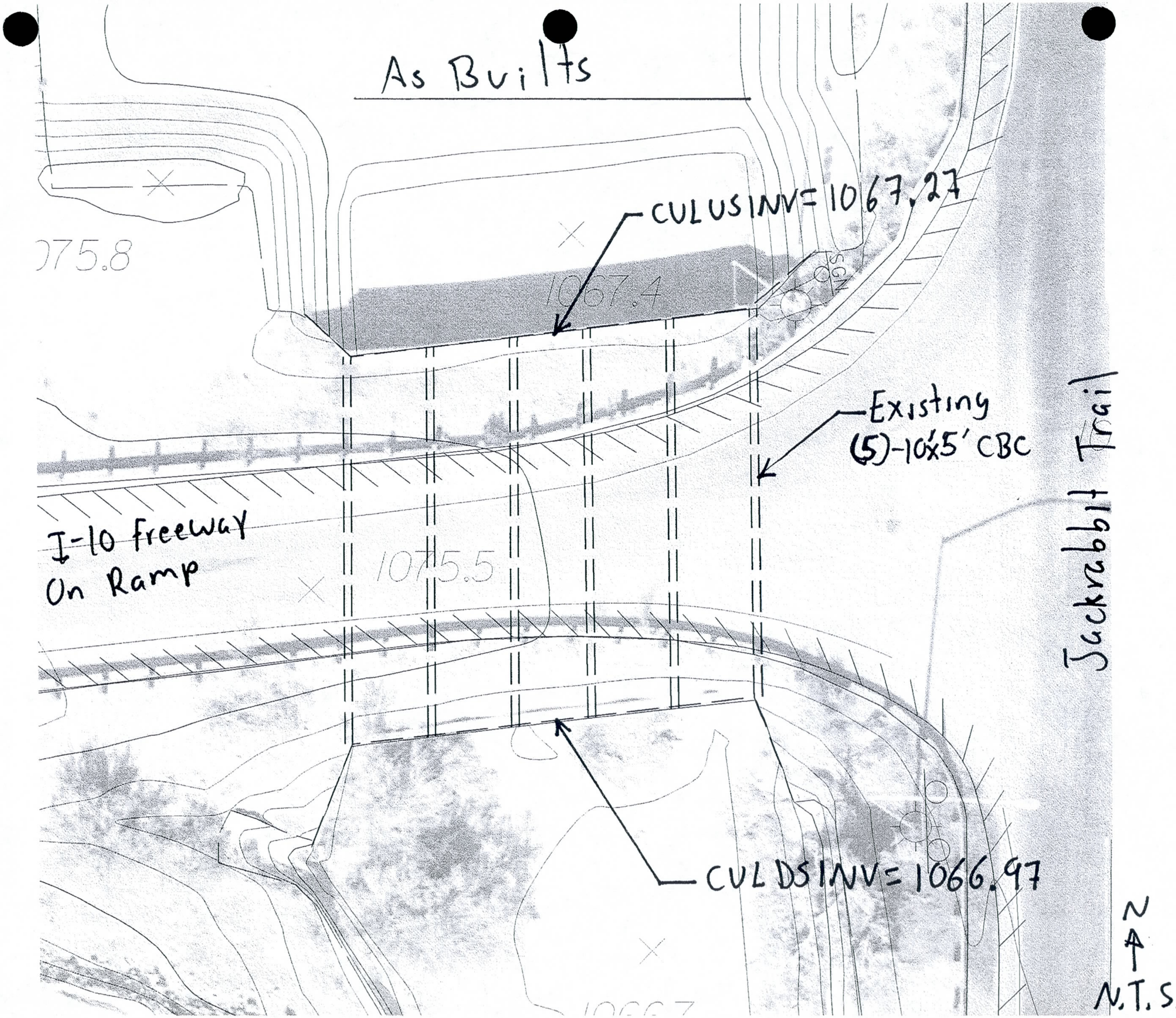
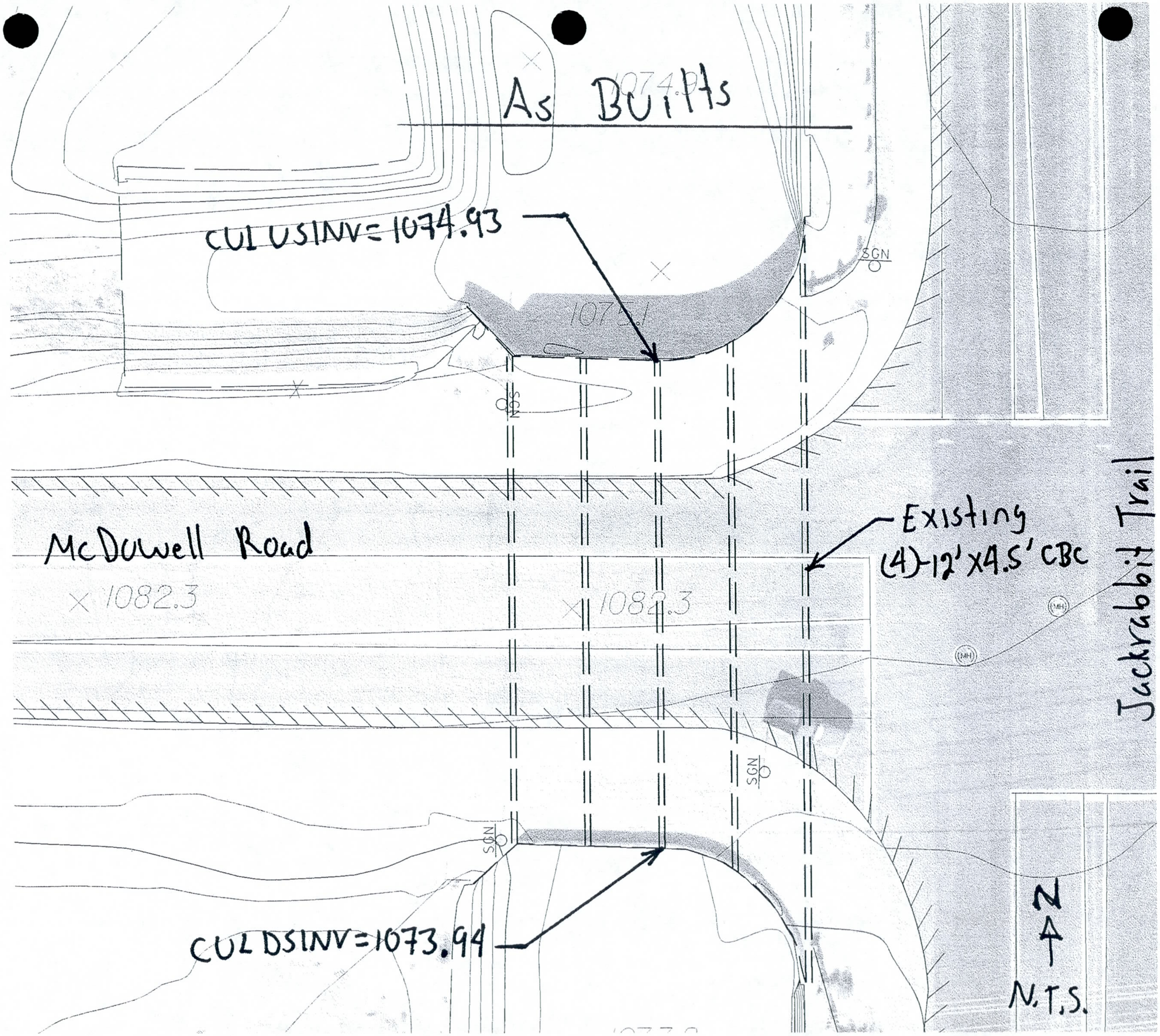
1065.1
SGN
MH
CULUSINV=1064.70
SGN
I-10 Freeway
Off Ramp
Existing
(5)-10'X4' CBC
Jackrabbit Trail
SGN
SGN
1064.7
CULDSINV=1064.46
N
N.T.S.



As Builts
CULUSINV= 1067.27
075.8
1067.4
SGN
Existing
(5)-10'x5' CBC
I-10 freeway
On Ramp
1075.5
Jackrabbit Trail
CUL DS INV= 1066.97
N
N.T.S.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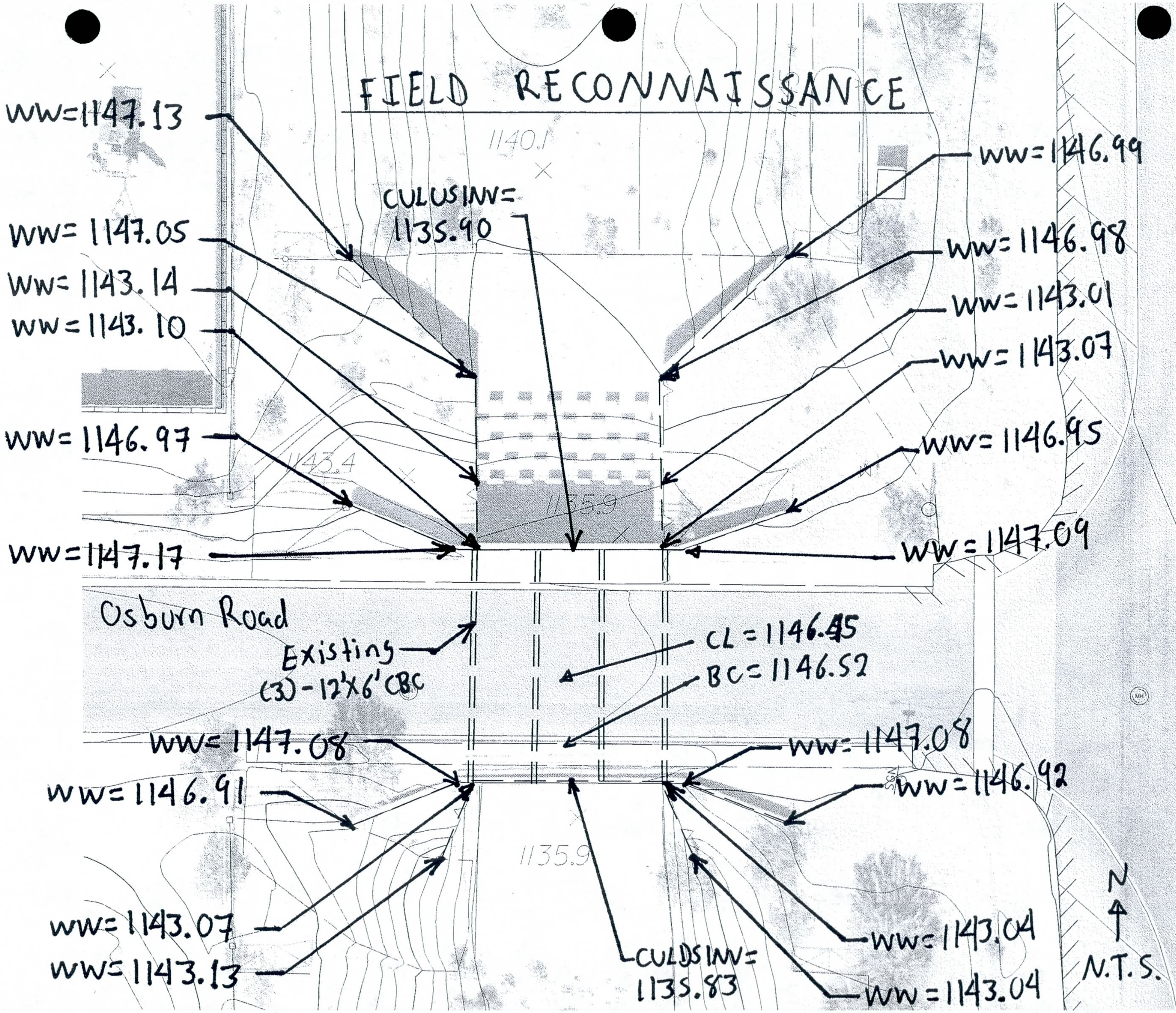
McDowell Road
1082.3
1082.3
Existing
(4)-12'x4.5' CBC
Jackrabbit Trail
MH
MH
SGN
SGN
CUL DSINV=1073.94
N
N.T.S.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WW= 1147.05
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WW=1143.01
WW=1143.10
WW=1143.07
WW=1146.97
1143.4
WW=1146.95
1135.9
WW=1147.17
WW=1147.09
Osburn Road
Existing
(3)-12'X6' CBC
CL=1146.45
BC=1146.52
Jackrabbit Trail
WW=1147.08
WW=1147.08
WW=1146.91
WW=1146.92
1135.9
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CUL DS INV=
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WW=1143.04
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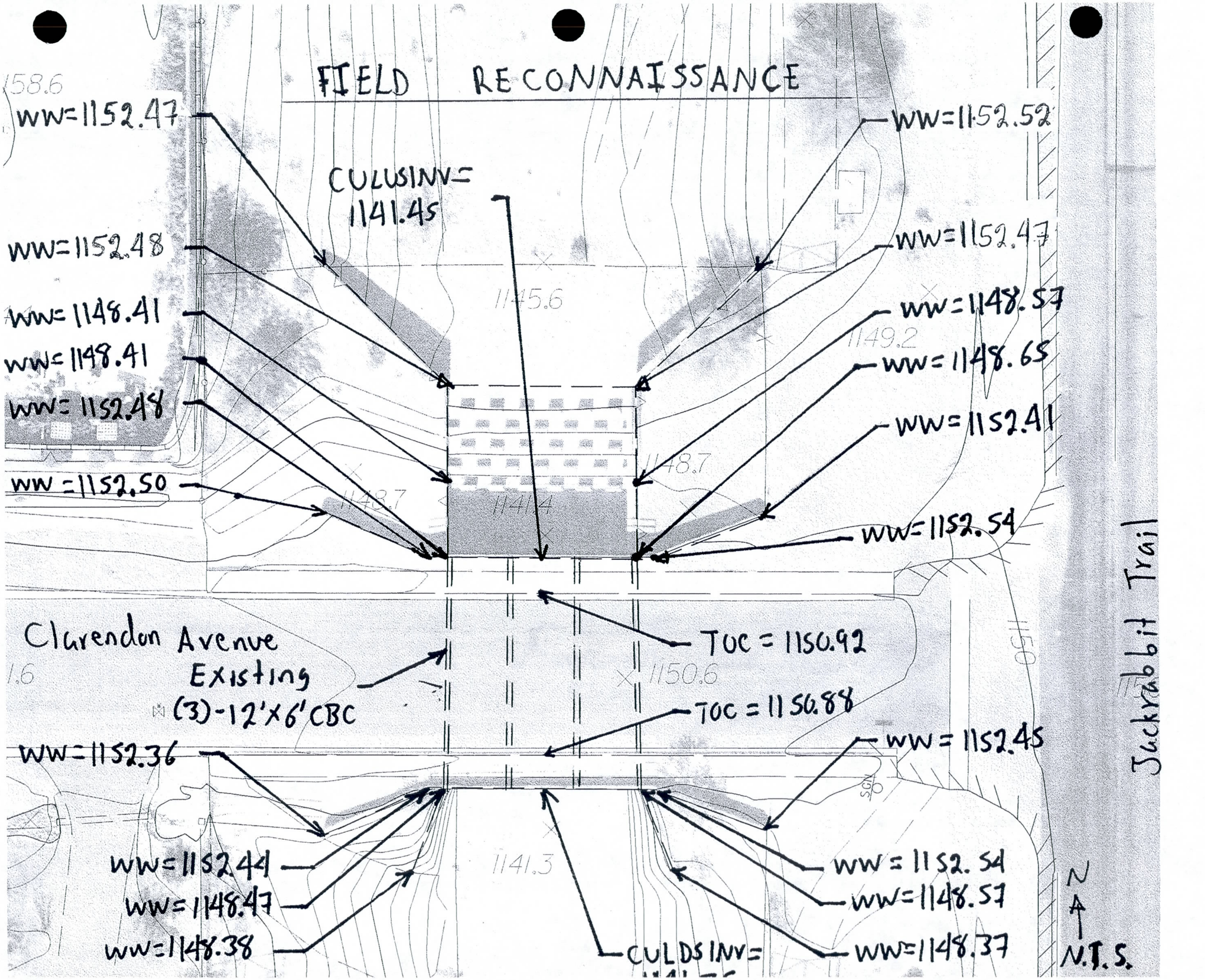
N.T.S.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CULUSINV=
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WW=1148.57
WW=1148.41
WW=1148.65
WW=1152.48
WW=1152.41
WW=1152.50
WW=1152.54
1145.6
1149.2
1148.7
1141.4
TOC=1150.92
Clarendon Avenue
Existing
(3)-12'X6'CBC
1150.6
TOC=1150.88
WW=1152.36
WW=1152.45
Jackrabbit Trail
WW=1152.44
WW=1152.54
WW=1148.47
WW=1148.57
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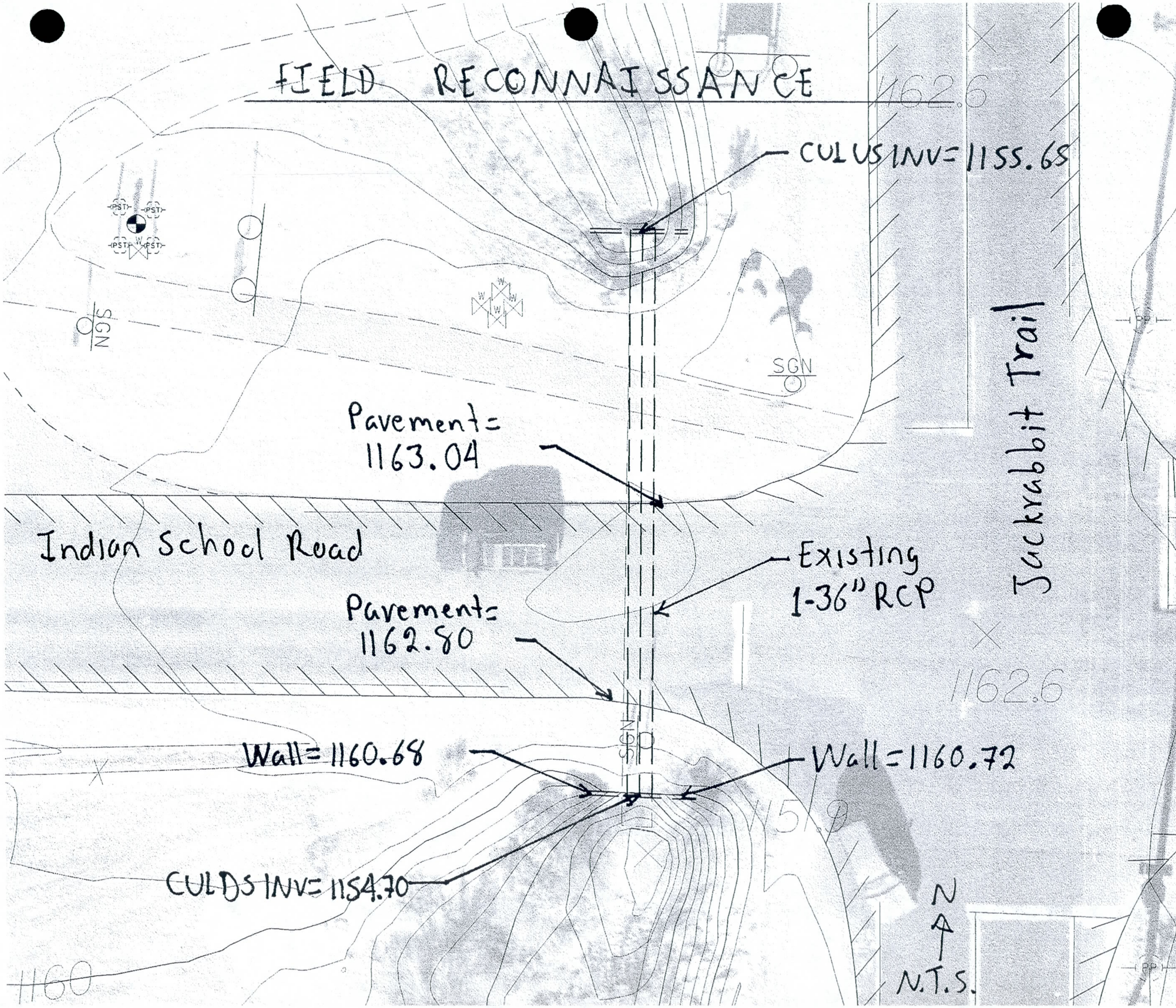
WW=1148.37
1141.3
CULDS INV=
N
N.T.S.


FIELD RECONNAISSANCE
CUL US INV=1155.65
Pavement=
1163.04
Indian School Road
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Pavement=
1162.80
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Wall=1160.68
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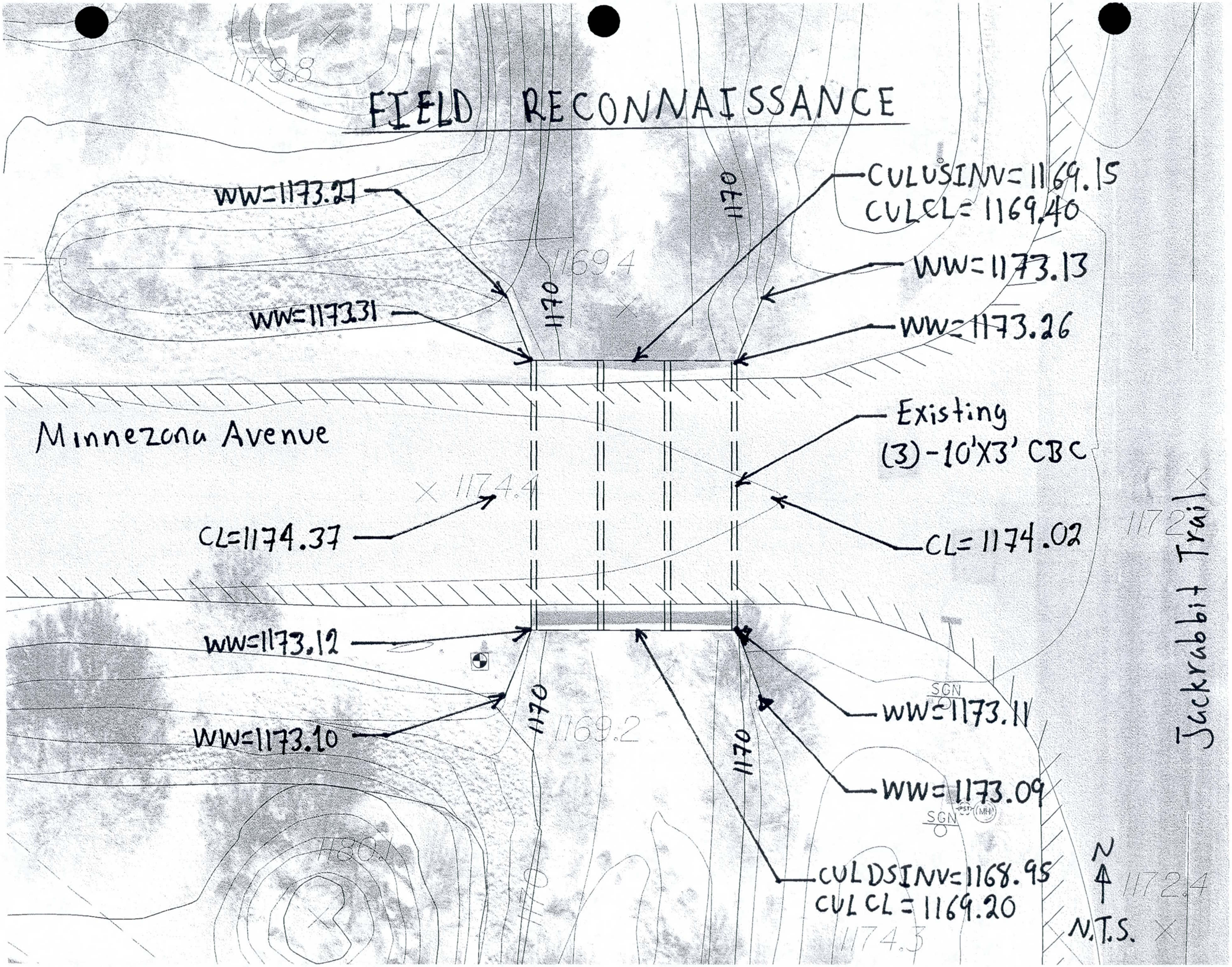
PST
N
N.T.S.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1170
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WW=1173.31
WW=1173.26
Minnezona Avenue
Existing
(3)-10'X3' CBC
1174.4
CL=1174.37
CL=1174.02
1172
Jackrabbit Trail
WW=1173.12
WW=1173.11
WW=1173.10
1169.2
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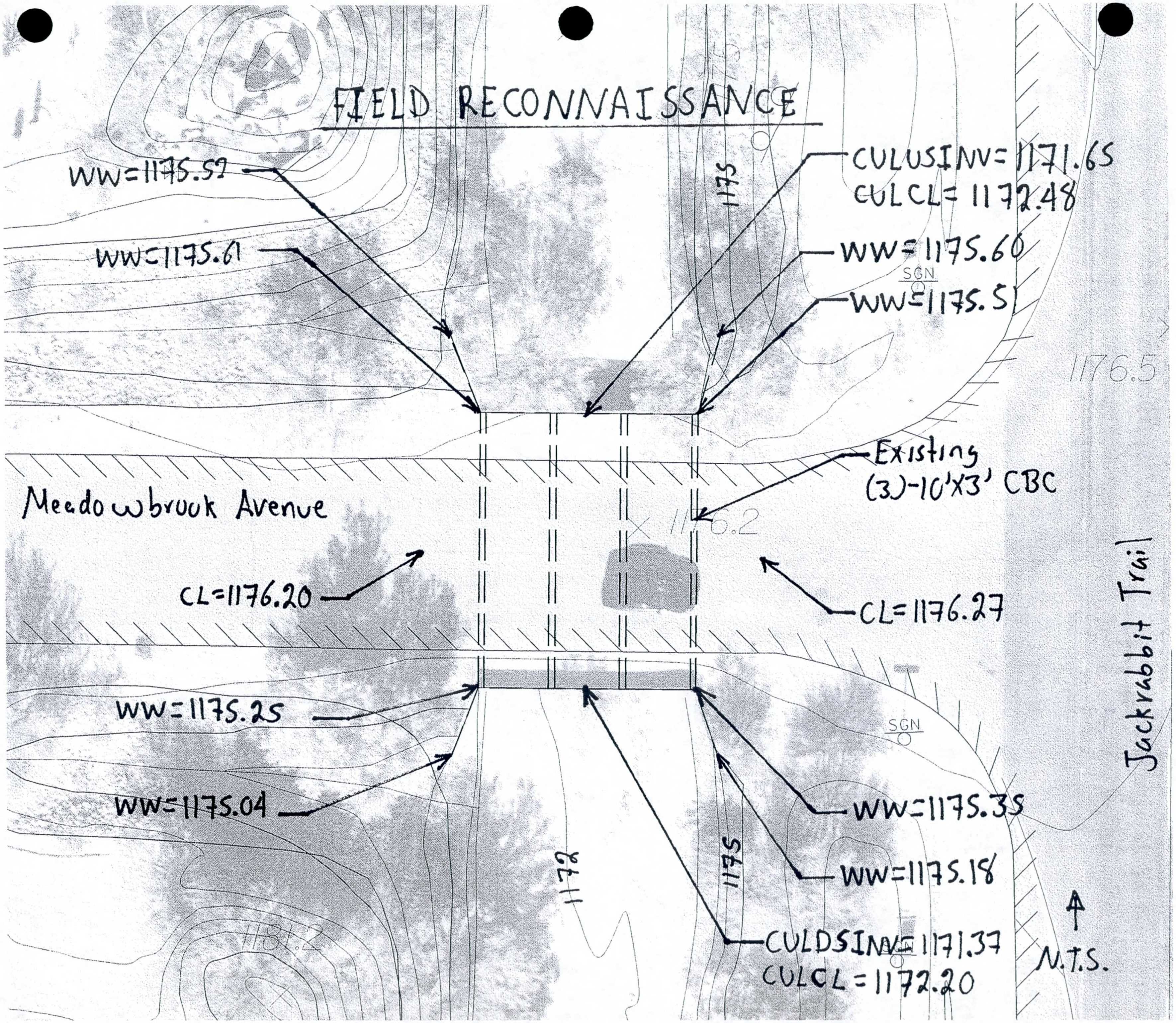

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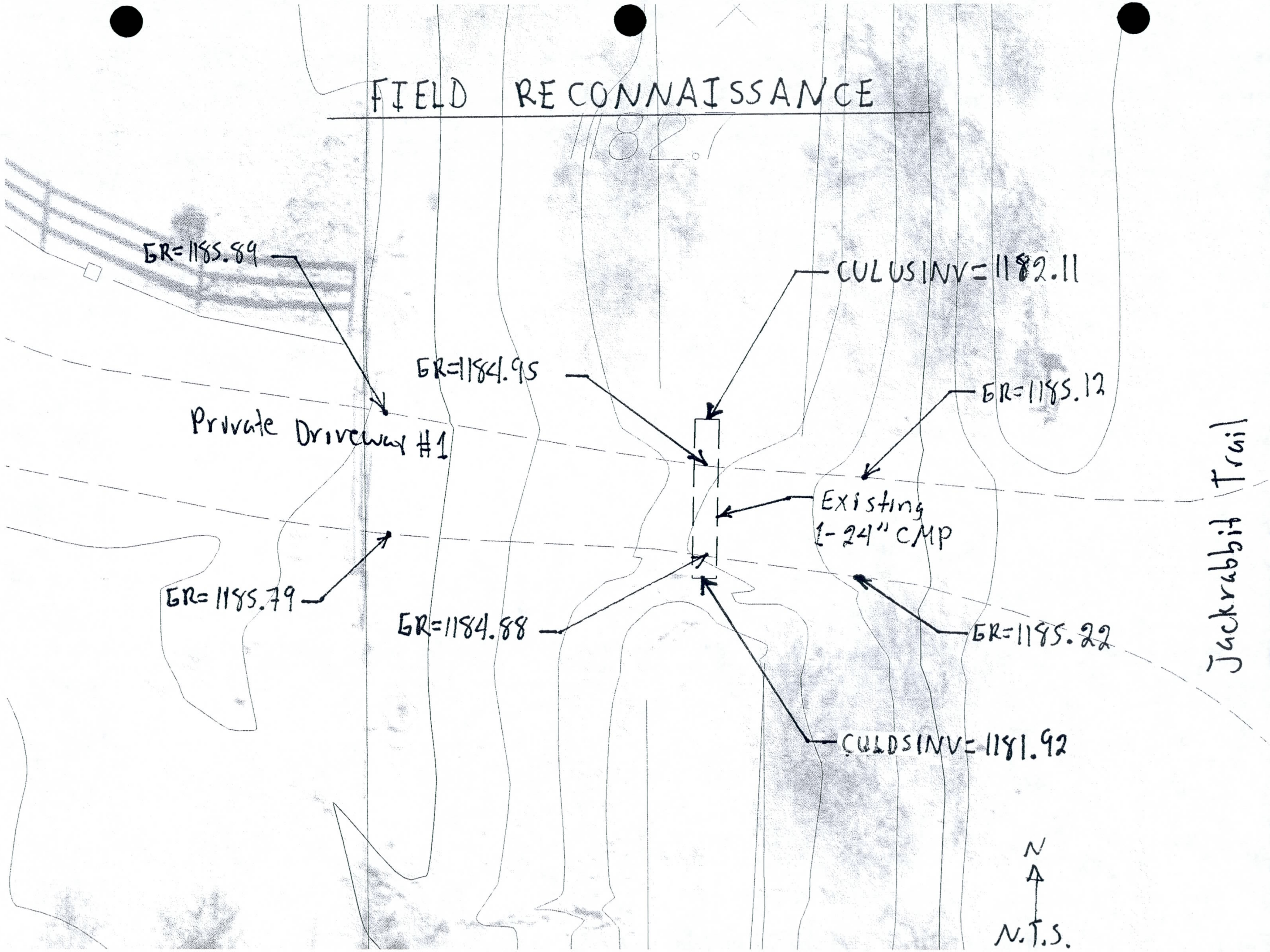
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CULUSINV=1182.11
GR=1184.95
GR=1185.12
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Existing
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Jackrabbit Trail
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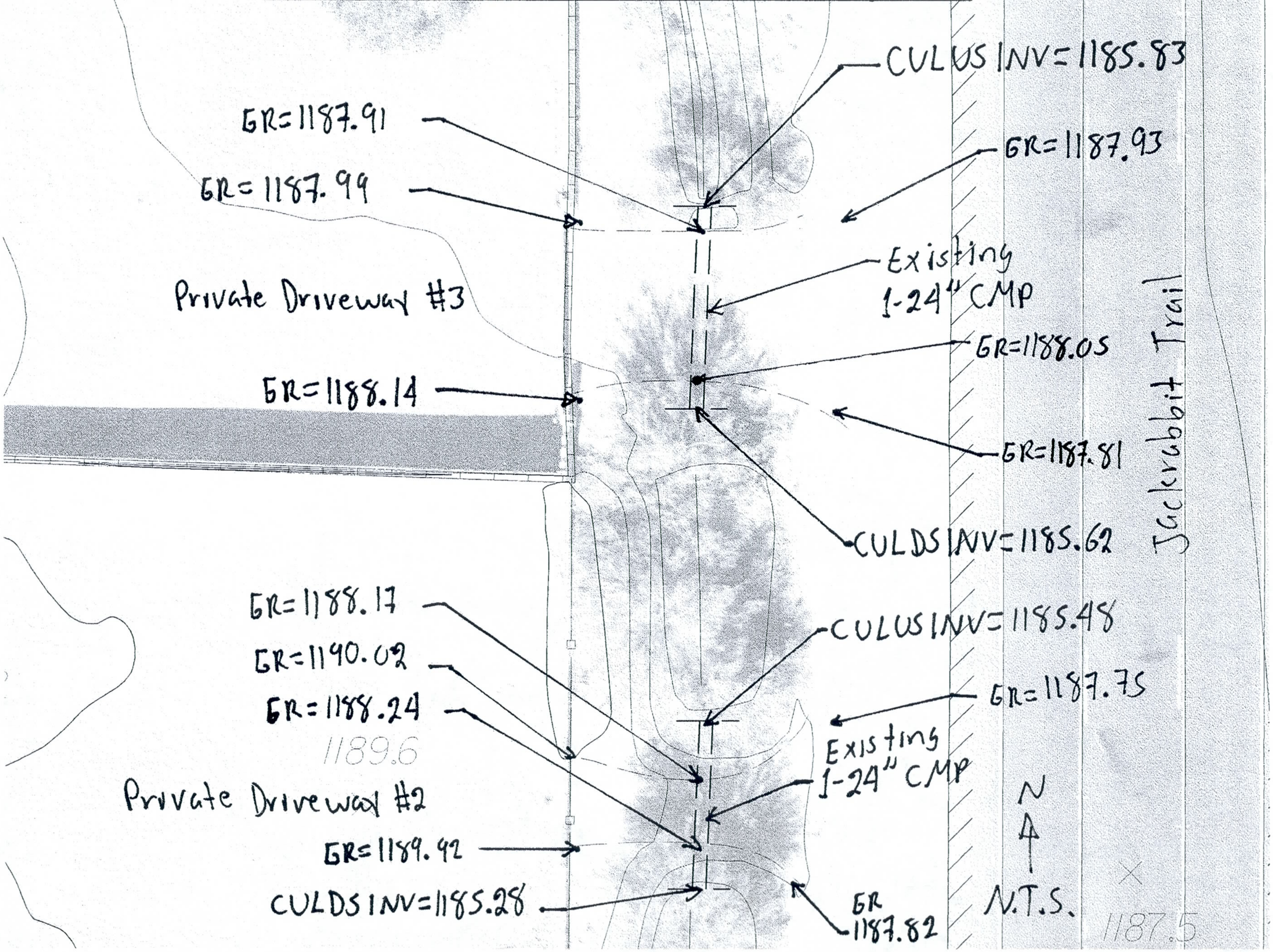
GR=1184.88
GR=1185.22
CULDSINV=1181.92
N
N.T.S.

FIELD RECONNAISSANCE

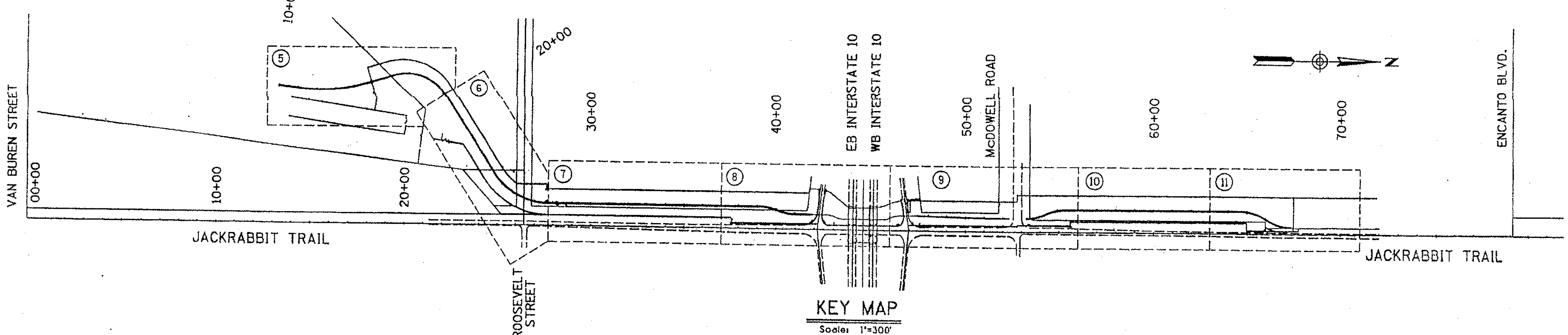


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PLANS FOR THE CONSTRUCTION OF:

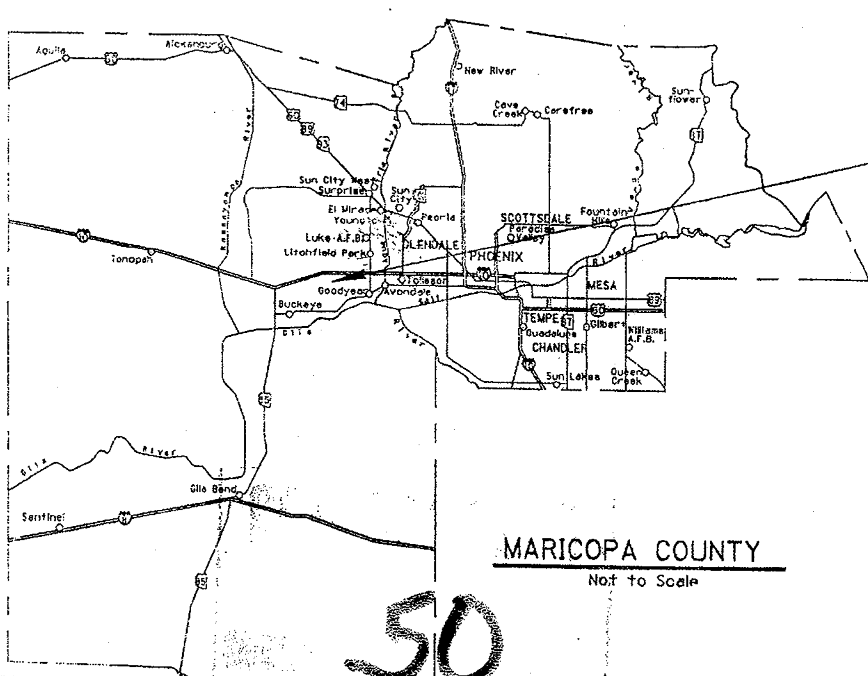
WHITE TANKS #4 FRS INLET IMPROVEMENTS - ROOSEVELT STREET TO McDOWELL ROAD

FCD CONTRACT NO. 94-09
FCD PROJECT NO. 470050



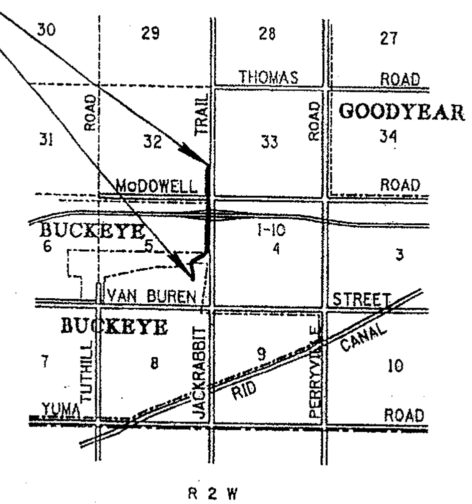
KEY MAP
Scale: 1"=300'
○ PLAN & PROFILE SHEETS

PROJECT NO. 94-09



MARICOPA COUNTY
Not to Scale

50



VICINITY MAP
Not to Scale

INDEX OF SHEETS

1	COVER
2	QUANTITY SUMMARY, NOTES
3-4	TYPICAL SECTIONS
5-11	CHANNEL PLAN & PROFILE
12-13	DROP STRUCTURE DETAILS
14	RETAINING WALL DETAILS
15-16	MISCELLANEOUS DETAILS
17	SOIL BORING LOGS

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
3625 NORTH 16TH STREET, PHOENIX, AZ 85016

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ISSUED FOR PUBLIC BIDDING BY:

DIRECTOR — DATE

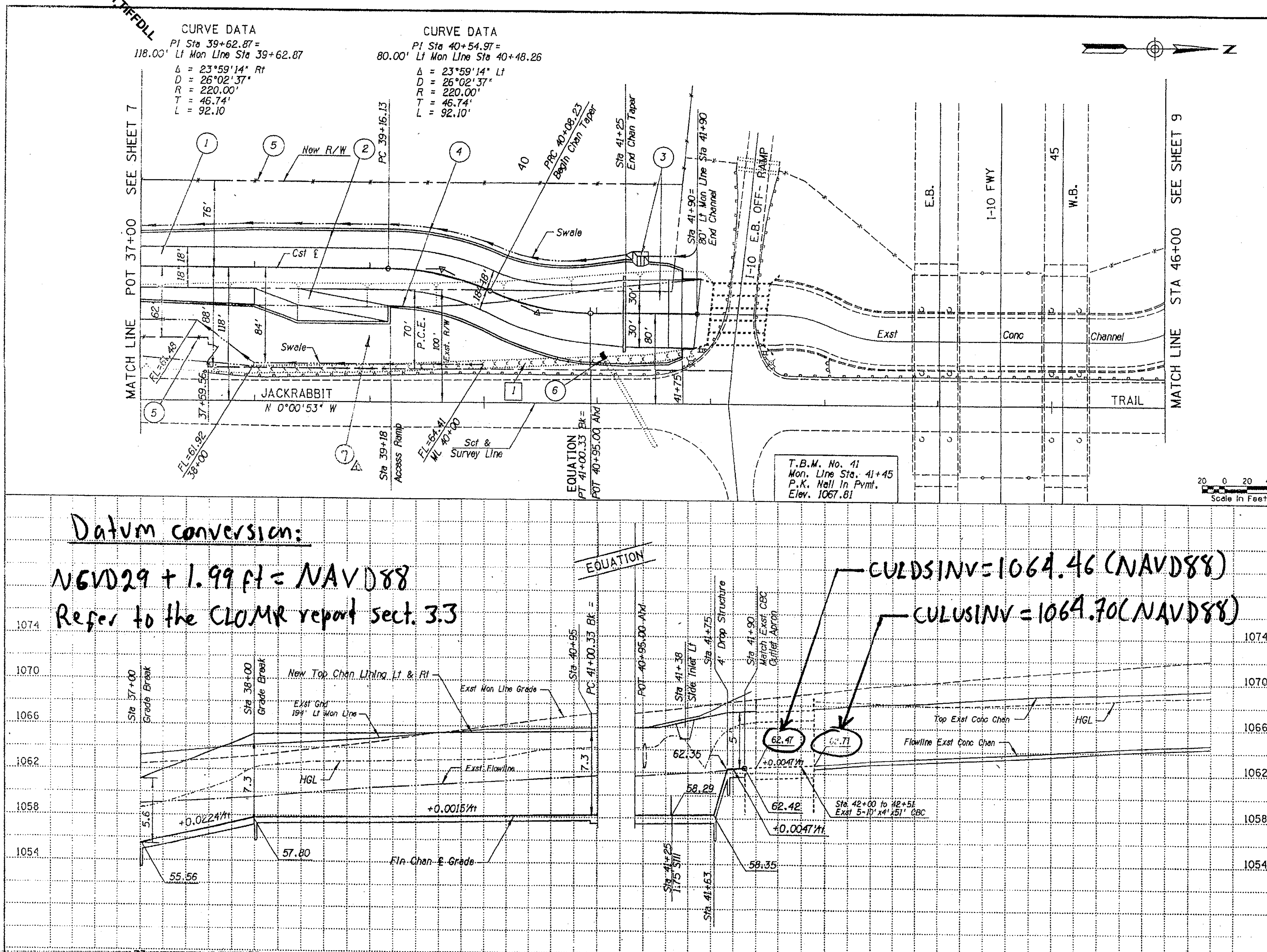
COUNTY BOARD OF SUPERVISORS

DON STAPLEY - CHAIRMAN

DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	JAN BREWER
DISTRICT 5	MARY ROSE WILCOX

WHITE TANKS #4 FRS INLET IMPROVEMENTS ROOSEVELT ST TO MCDOWELL RD CONSTRUCTION PLANS

MFCDCOVR.DGN 1/4/93



REMOVE

1. Remove 165 LF Rail Bank Protection

7. Sta. 37+00 to 46+00 120 Tons ABC

CONSTRUCT

1. Sta. 37+00 to 38+00
Const. 720 SY 7" Conc. Channel Liner
Const. 130 LF Transverse Cutoff Wall
See Section Sh. 4
See Cutoff Wall Detail 1 Sh. 15

2. Sta. 38+00 to 40+95
Const. 2455 SY 6" Conc. Channel Liner
See Section Sh. 4
See Ramp Detail 1 Sh. 16

3. Sta. 40+95 to 41+90
Const. 890 SY 9" Conc. Channel Liner
Const. 16 SY 6" Conc. Side Inlet Liner
Const. 152 LF Transverse Cutoff Wall
Const. 43 LF Conc. Retaining Walls W-1 & W-2
See Detail 1 Sh. 13

4. Sta. 37+00 to 41+75
Const. 978 LF Longitudinal Cutoff Wall
See Detail 1 Sh. 4

5. Sta. 37+00 to 41+75 Lt.
Sta. 37+00 to 37+50 Rt.
Install 600 LF 4-Wire Fence w/1-14' Type 1 Single Gate
ADOT Detail C-12.10

6. Sta. 41+08 40' Lt. Mon. Line
Install 48"x30" Flap Gate
See Detail 4, Sh. 16

NO.	REVISION	BY	DATE
1	ABC NOTE 7		
2			
3			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

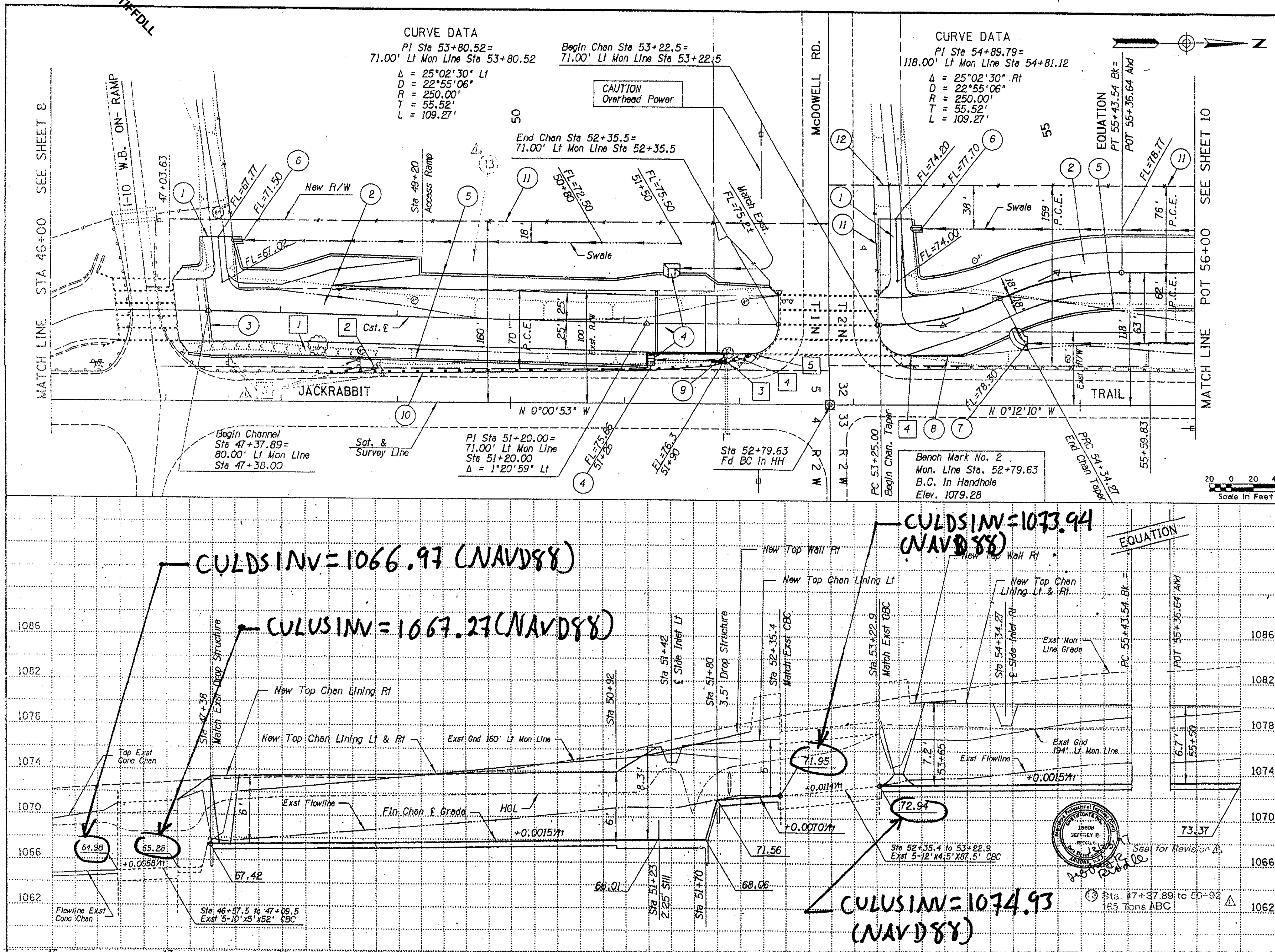
WHITE TANKS #4 FRS INLET IMPROVEMENTS
ROOSEVELT STREET TO McDOWELL ROAD
PROJECT NO. 94-09

	BY	DATE
DESIGNED	K. SNYDER	7-28-94
DRAWN	R. CARLSON	7-28-94
CHECKED	J. DOSS	7-28-94

DIBBLE & ASSOCIATES CONSULTING ENGINEERS 3625 N 16TH ST PHOENIX, AZ 85016

JACKRABBIT TRAIL CHANNEL PLAN & PROFILE Sta 37+00 to 46+00

SHEET 8 OF 17



REMOVE

1. Remove 170 LF Rail Bank Protection
2. Sta 48+31 to 48+81
   Remove 50 LF Guard Rail
3. Remove 1-Hdwl & 17 SY Slope Paving
4. Remove 18 LF Conc. Wingwall
5. Remove 2-Signs

CONSTRUCT

1. Sta. 47+46 65' Lt to 47+50 25' Lt
   Sta. 53+47 92' Lt to 53+43 39' Lt
   Const. 386 SY 6" Conc. Channel Liner w/10' Base
   Const. 64 LF 3' Transverse Cutoff Wall
   See Section Sh. 4 (Similar)
   See Cutoff Wall Detail 8 Sh. 15
2. Sta. 47+10 to 50+92 & Sta. 53+22.5 to 56+00
   Sta. 51+80 to 52+35
   Const. 5625 SY 6" Conc. Channel Liner
   See Section Sh. 3
   See Ramp Detail 1 Sh. 16
3. Sta. 47+37.89, Const. 82 LF Trans. Cutoff Wall
   See Cutoff Wall Details 1 and 9, Sh. 15
4. Sta. 50+92 to 51+80
   Const. 715 SY 9" Conc. Channel Liner
   Const. 23 SY 6" Conc. Side Inlet Liner
   Const. 130 LF Transverse Cutoff Wall
   12 LF Ret. Wall, ADOT Dtl. B-18.10
   89 LF Ret. Wall W-3, ADOT Dtl. B-18.40
   See Detail 2 Sh. 13
5. Sta. 47+15± to 52+28± & Sta. 53+25 to 56+00
   Const. 1550 LF Longitudinal Cutoff Wall
   See Detail 1 Sh. 4
6. Const. 8 SY 6" Conc. Side Inlet Liner
   See Detail 3 Sh. 16
7. Sta. 54+34.27 Rt.
   Const. 28 SY 6" Conc. Side Inlet Liner
   See Detail 3 Sh. 16
8. Mon. Line Sta. 53+50.5 to 53+96, 45.5' Lt
   Const. 45.5 LF Ret. Wall W-4, ADOT Dtl. B-18.40
   See Detail 1 Sh. 14
9. Sta. 51+89 35' Lt to 25.5' Lt.
   Extend Exst. 24" RCP (10 LF)
   Install 1-24" dia. Flap Gate, Detail 10 Sh. 14
   1-Conc. Pipe Collar Std. Dtl. 505
10. Sta. 48+31 to 52+19, 42' Lt. of Mon. Line
    Install 387.5 LF New Guard Rail
    ADOT Dtl. C-10.04 & C-10.15
    1-BCT Assembly Steel, ADOT Dtl. C-10.17
11. Sta. 47+54± to 52+28 & 53+23 to 56+00
    Install 810 LF 4-Wire Fence
    1-14' Type 1 Single Gate
    ADOT Dtl C-12.10
12. Sta. 53+23 to 53+75
    Install 50 LF Floodgate, ADOT Dtl. C-12.10

NO.	REVISION	BY	DATE
3			
2			
1	ADD NOTE (13) CHANGED NOTE (5)	[illegible]	[illegible]

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

WHITE TANKS #4 FRS INLET IMPROVEMENTS
ROOSEVELT STREET TO McDOWELL ROAD
PROJECT NO. 94-09

	BY	DATE
DESIGNED	K. SNYDER	7-28-94
DRAWN	R. CARLSON	7-28-94
CHECKED	J. DOSS	7-28-94

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
3625 N 16TH ST
PHOENIX, AZ 85016

JACKRABBIT TRAIL CHANNEL PLAN & PROFILE
Sta 46+00 to 56+00

SHEET 9 OF 17

Appendix D: Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

Note: Precipitation data is not used in this study.

D.2 Physical Parameter Calculations

Note: Physical parameter calculations are not included with this study.

D.3 Hydrograph Routing Data

Note: No separate hydrograph routing is included as part of this study.

D.4 Reservoir Routing Data

Note: Separate reservoir routing is not part of this study.

D.5 Flow Splits and Diversions Data – Culvert Capacity

D.6 Hydrologic Calculations

D.5 Flow Splits and Diversions Data – Culvert Capacity

WHITE TANKS FRS NO. 3 OUTFALL REMNANT CHANNEL CLOMR

(2) 48" Pipe Diversion

For a total flow of 482 cfs, 232 cfs will be diverted through two 48" pipes, and 250 cfs will remain in the wash. And the weir flow depth is 1.44 feet, the water surface elevation at the weir is 1175.54 feet. These discharges are interpolated from the following table.

Wash Flow depth (ft)	Weir Flow depth (ft)	Wash Discharge (cfs)	Weir Discharge (cfs)	Total Discharge (cfs)
1	0	28.79	0	28.79
1.2	0.2	44.73	12.07	56.80
1.4	0.4	63.85	34.15	98.00
1.6	0.6	87.81	62.74	150.55
1.8	0.8	107.92	96.60	204.52
2	1	147.74	135.00	282.74
2.2	1.2	192.11	177.46	369.57
2.3	1.3	216.01	200.10	416.11
2.4	**1.4**	**241.01**	**223.63**	**464.64**
2.5	**1.5**	**267.09**	**248.01**	**515.10**
2.6	1.6	294.24	273.22	567.46
2.8	1.8	351.66	**326.02**	677.68

Weir Flow (Q) = $C * L * d^{1.5}$, Equation # 3.13 (FCDMC Draft Hydraulics Manual (Ref. 2)

Drop inlet weir width, L=	45 ft	
Drop inlet weir elevation =	1174.1 ft	(NAVD88)
Wash flow line =	1173.1 ft	(NAVD88)

Note: The wash discharges were calculated using FlowMaster with a cross-section and wash slope obtained from the topo provided by Cooper Aerial. Weir discharges were calculated using the weir equation with c=3.0.

The capacity of the 2-48" RGRCP Pipes was calculated using Dodson Calc. To convey an arbitrary flow of 326 cfs, the required headwater is 1168.0+7.86=1175.86 ft, which is less than the WSEL at the wash (1173.1+2.8=1175.9 ft). Therefore, it is the drop-inlet crest that controls the weif flow. not the culvert.

BOX CULVERT ANALYSIS

COMPUTATION OF CULVERT PERFORMANCE CURVE

THE ANALYSIS SHOWS THE RESULTS OF 1-48" RGRCP PIPE

March 31, 2010

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)..	4.0
FHWA Chart Number..	1
FHWA Scale Number (Type of Culvert Entrance)................	2
Manning's Roughness Coefficient (n-value)...................	0.013
Entrance Loss Coefficient of Culvert Opening................	0.5
Culvert Length (ft)...	190.0
Invert Elevation at Downstream end of Culvert (ft)..........	1,166.7
Invert Elevation at Upstream end of Culvert (ft)............	1,168.0
Culvert Slope (ft/ft).......................................	0.0068
Starting Flow Rate (cfs)....................................	163.0
Incremental Flow Rate (cfs).................................	0.0
Ending Flow Rate (cfs)......................................	163.0
Starting Tailwater Depth (ft)...............................	2.8
Incremental Tailwater Depth (ft)............................	0.0
Ending Tailwater Depth (ft).................................	2.8

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
163.0	2.8	7.86	6.31	4.0	3.69	4.0	12.97

Cross Section for Culvert Diversion at Litchfield Heights

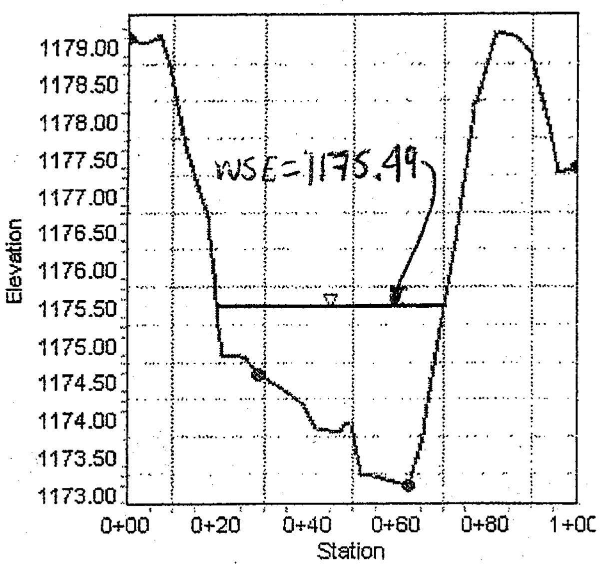
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	2.40	ft
Discharge	241.01	ft^3/s

Cross Section Image



Worksheet for Culvert Diversion at Litchfield Heights

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	2.80	ft
Section Definitions		

Station (ft)	Elevation (ft)
0+00	1179.10
0+00	1179.10
0+03	1179.02
0+06	1179.10
0+07	1179.11
0+07	1179.14
0+09	1178.72
0+13	1177.66
0+15	1177.21
0+18	1176.69
0+18	1176.37
0+19	1175.92
0+20	1175.21
0+21	1174.84
0+24	1174.86
0+26	1174.80
0+29	1174.59
0+33	1174.43
0+39	1174.20
0+39	1174.14
0+42	1173.88
0+42	1173.86
0+42	1173.87
0+45	1173.85
0+47	1173.81
0+48	1173.91
0+49	1173.91

Worksheet for Culvert Diversion at Litchfield Heights

Input Data

Station (ft)	Elevation (ft)
0+49	1173.91
0+50	1173.80

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1179.10)	(0+29, 1174.59)	0.049
(0+29, 1174.59)	(0+62, 1173.09)	0.034
(0+62, 1173.09)	(1+00, 1177.36)	0.049

Results

Discharge	351.66	ft^3/s
Elevation Range	1173.09 to 1179.18 ft	
Flow Area	92.79	ft^2
Wetted Perimeter	53.04	ft
Top Width	52.17	ft
Normal Depth	2.80	ft
Critical Depth	2.10	ft
Critical Slope	0.02273	ft/ft
Velocity	3.79	ft/s
Velocity Head	0.22	ft
Specific Energy	3.03	ft
Froude Number	0.50	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft

Worksheet for Culvert Diversion at Litchfield Heights

GVF Output Data

Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.80	ft
Critical Depth	2.10	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.02273	ft/ft

D.6 Hydrologic Calculations

Flood Control District of Maricopa County
Drainage Design Management System
RAINFALL DATA
Project Reference: JR CHANNEL INFLOW

 4/4/2010

Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Rainfall Method: NOAA14						
5 MIN	0.255	0.347	0.417	0.511	0.584	0.658
10 MIN	0.389	0.528	0.635	0.778	0.888	1.001
15 MIN	0.482	0.655	0.787	0.965	1.101	1.241
30 MIN	0.649	0.882	1.060	1.299	1.483	1.671
1 HOUR	0.803	1.092	1.312	1.608	1.835	2.068
2 HOUR	0.897	1.203	1.437	1.757	2.002	2.259
3 HOUR	0.935	1.234	1.472	1.802	2.066	2.345
6 HOUR	1.070	1.380	1.626	1.965	2.232	2.511
12 HOUR	1.191	1.516	1.771	2.116	2.381	2.655
24 HOUR	1.538	1.992	2.353	2.852	3.246	3.661

Flood Control District of Maricopa County - JR CHANNEL INFLOW

File Edit Hydrology Hydraulics River Mechanics Maps Tools Admin Submittals Window Help

NOAA 14 Rainfall

Map	From	To
62	1498	1499
62	1538	1539
62	1578	1579
62	1618	1619
62	1658	1659
62	1698	1699
62	1738	1739
62	1778	1779
62	1818	1819
62	1858	1859
62	1898	1899

Multiple Map Selection

Map Index 62

From (No) 1459

To (No) 1459

Data Source

Source Manual

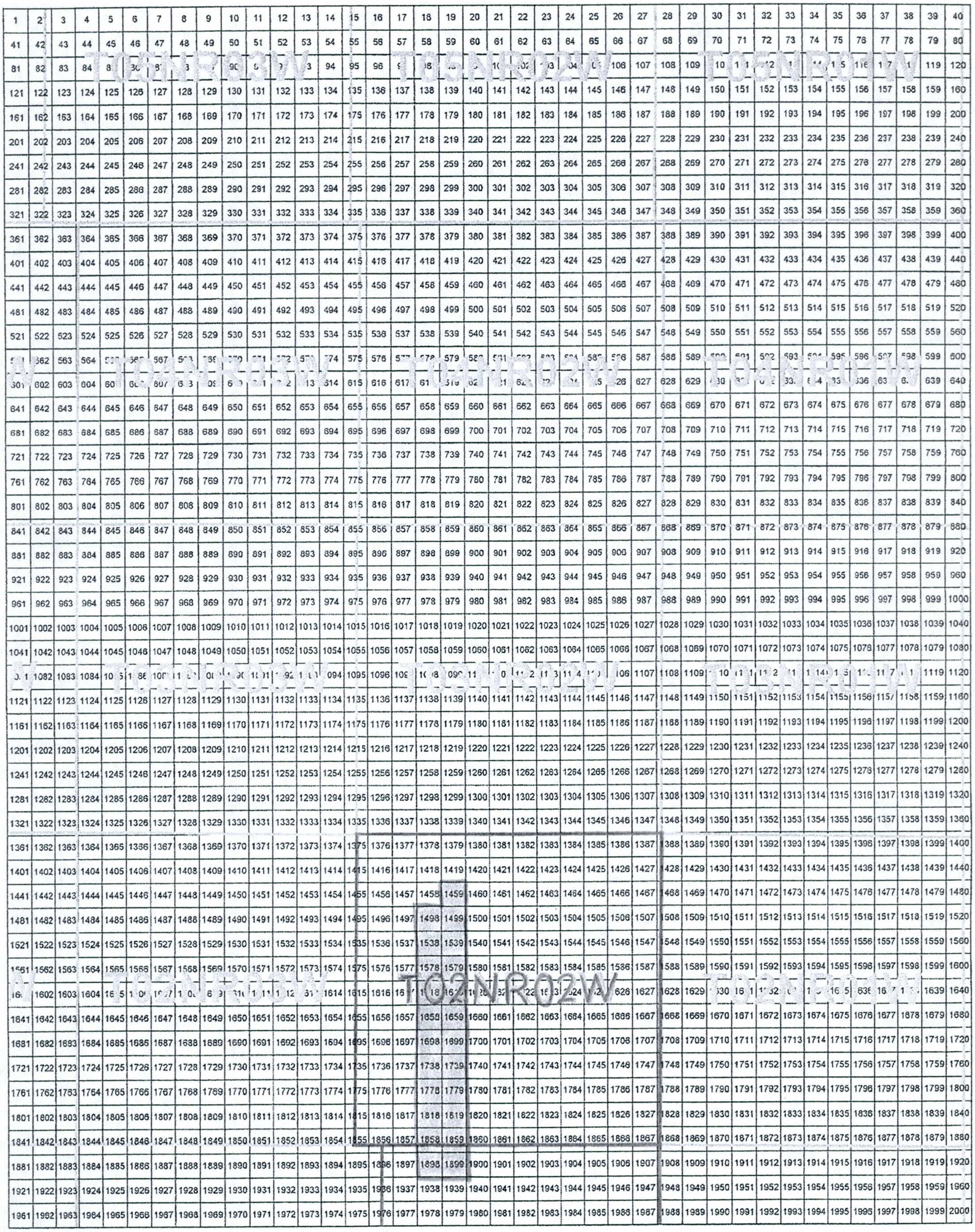
Maps

Average Rainfall Data for Project

	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
5 Min	0.255	0.347	0.417	0.511	0.584	0.658
10 Min	0.389	0.528	0.635	0.778	0.888	1.001
15 Min	0.482	0.655	0.787	0.965	1.101	1.241
30 Min	0.649	0.882	1.060	1.299	1.483	1.671
1 Hour	0.803	1.092	1.312	1.608	1.835	2.068
2 Hour	0.897	1.203	1.437	1.757	2.002	2.259
3 Hour	0.935	1.234	1.472	1.802	2.066	2.345
6 Hour	1.070	1.380	1.626	1.965	2.232	2.511
12 Hour	1.191	1.516	1.771	2.116	2.381	2.655
24 Hour	1.538	1.992	2.353	2.852	3.246	3.661

Info Delete Add Print... Update OK

NUM



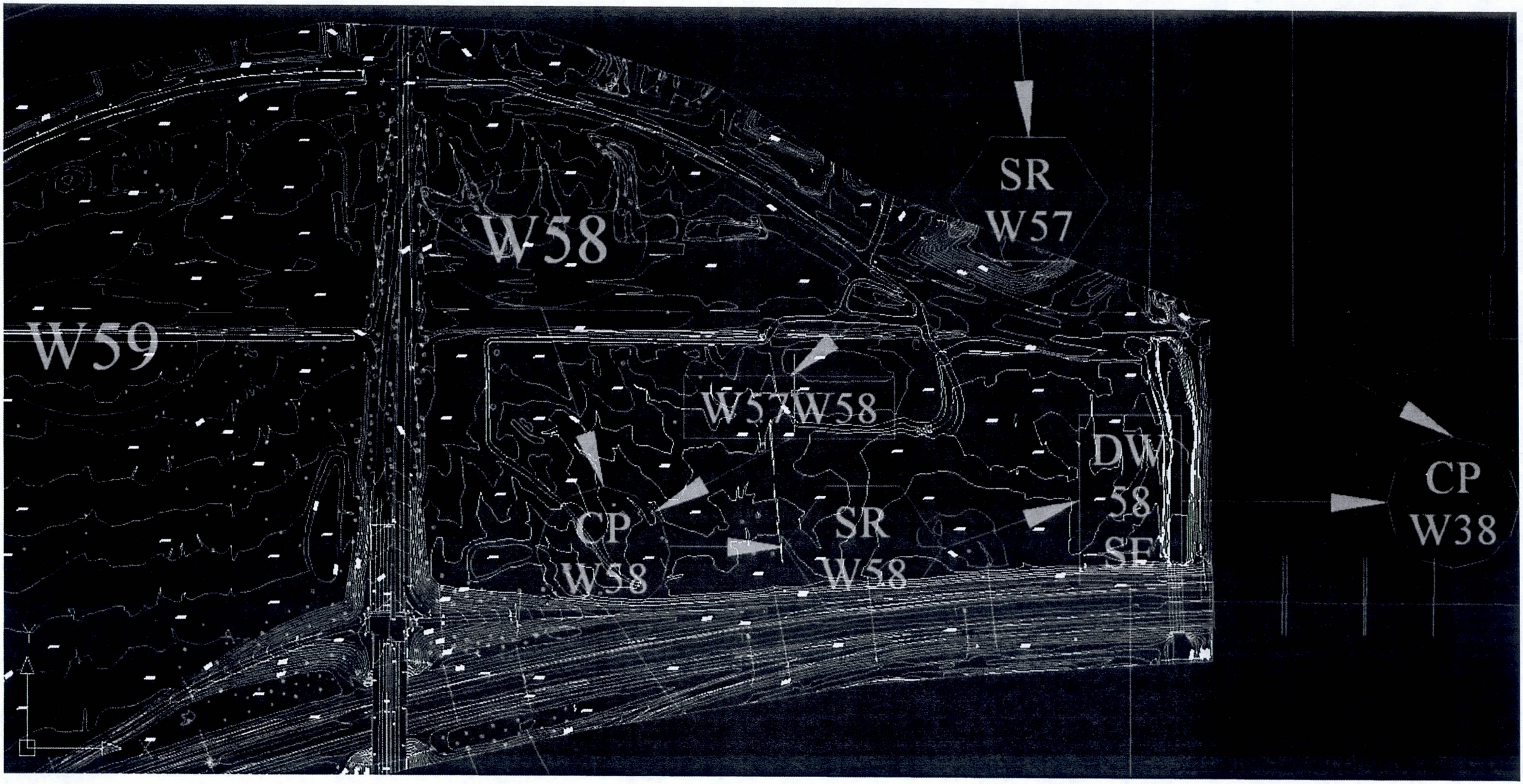
KVL Consultants, Inc.
Noaa14CellIndex62.wor

Cell Size = 2500'x2500'

NOAA 14 Cell Index

Map No. 62

SRW58 STORAGE CALCULATIONS



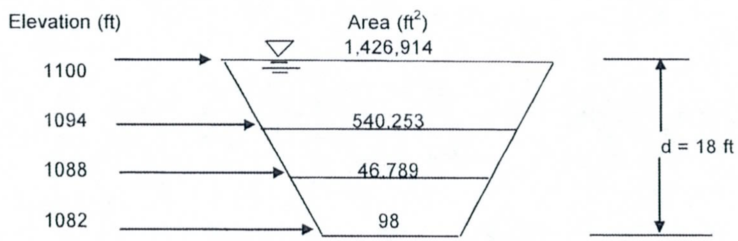
HDR - DRAFT Storage Basin Volume Calculation

Average End Method Storage Volume - SRW58

Example:

NON-Engineered Storage (SRW58) for stormwater runoff collection adjacent to I-10 and Verado Way.
Basin has undefined and varrying sideslopes, is 18 feet deep, with elevation range of : 1082 to 1100

FOR REFERENCE ONLY
NOT INTENDED TO REPLACE LOOP303 HEC-1 DATA



Average End Method - SRWR58 ESTIMATED!!!

Elevation	Area (ft^2)	Avg Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)	Volume (ac-ft)	Σ Volume (ac-ft)
1100	1,426,914						
		1,305,510	2.0	2,611,020	2,611,020	59.94	173.32
1098	1,184,106						
		1,042,329	2.0	2,084,657	4,695,677	47.86	113.38
1096	900,551						
		720,402	2.0	1,440,804	6,136,481	33.08	65.52
1094	540,253						
		408,783	2.0	817,565	6,954,046	18.77	32.44
1092	277,312						
		177,461	2.0	354,922	7,308,968	8.15	13.68
1090	77,610						
		62,200	2.0	124,399	7,433,367	2.86	5.53
1088	46,789						
		36,075	2.0	72,149	7,505,516	1.66	2.67
1086	25,360						
		17,383	2.0	34,765	7,540,281	0.80	1.02
1084	9,405						
		4,752	2.0	9,503	7,549,784	0.22	
1082	98				7,549,784	173.32	

Equation: $V = d * [(A1 + A2) / 2]$
Equation: $V = \{d * [(A1 + A2) / 2]\} / 43560$

Volume Provided : 7,549,784 (ft^3)
Volume Provided : 173.32 (ac-ft)

9/21/2011

projectid	basinid	storid	se1	se2	se3	se4	se5	se6	se7	se8	se9	se10
	02	SRW19	1198.00	1200.00	1210.00	1220.00	1230.00	1240.00	1250.00	1260.00	1261.00	1262.00
	02	SRW20	1196	1196.30	1199.00	1201.00	1206.00	1208.60	1210.00	1212.00	1215.00	1218.00
	02	SRW25	1443.00	1446.00	1454.00	1458.00	1462.00	1466.00	1469.00	1470.00	1472.00	1474.00
	02	SRW26	1319.00	1320.00	1330.00	1340.00	1347.00	1348.00	1350.00	1351.00		
	02	SRW34	1164.50	1166.00	1170.00	1172.00	1174.00	1176.00	1177.50	1178.00	1180.00	
	02	SRW35	1154.00	1156.00	1158.00	1160.00	1162.00					
	02	SRW43	1272.00	1276.00	1280.00	1284.00	1296.00	1300.00	1304.00	1305.00	1306.00	1308.00
	02	SRW57	1084.00	1090.00	1091.00	1092.00	1093.00	1094.00	1095.00	1096.00	1097.00	1098.00
	02	SRS60	1039.00	1039.14	1041.77	1042.77	1044.77	1049.57	1049.77	1049.87	1051.77	1053.77
	02	SRW58	1084.00	1086.00	1088.00	1090.00	1092.00	1094.00	1095.00	1096.00	1098.00	1100.00

projectid	basinid	storid	sv1	sv2	sv3	sv4	sv5	sv6	sv7	sv8	sv9	sv10
	02	SRW19	0.00	1.00	31.00	114.00	270.00	502.00	807.00	1319.00	1388.00	1460.00
	02	SRW20	0.00	135.00	385.00	810.00	1600.00	2200.00	2560.00	3175.00	4300.00	5500.00
	02	SRW25	0.00	1.05	26.91	54.31	92.89	138.67	176.47	190.08	219.05	249.57
	02	SRW26	0.00	0.68	20.68	57.58	95.91	102.34	117.65	130.00		
	02	SRW34	0.00	0.99	12.73	23.45	36.25	50.68	54.76	59.33	83.20	
	02	SRW35	0.00	1.46	7.31	19.76	47.29					
	02	SRW43	0.00	6.04	20.38	53.82	325.98	455.42	606.10	645.49	685.61	767.98
	02	SRW57	0.00	24.40	29.60	35.70	42.00	48.50	55.20	62.20	69.30	76.70
	02	SRS60	0.00	573.00	573.00	627.00	760.00	1239.00	1263.00	1275.00	1524.00	1787.00
	02	SRW58	0.00	0.17	2.57	5.40	13.08	31.52	47.89	64.25	111.96	171.81

projectid	basinid	storid	sq1	sq2	sq3	sq4	sq5	sq6	sq7	sq8	sq9	sq10
	02	SRW19	0	0	0	0	0	0	0	0	0	135
	02	SRW20	0	0.00	0	0	0	0	68	1343	16310	45000
	02	SRW25	0	0	0	0	0	0	0	265	1377	2963
	02	SRW26	0	0	0	0	0	265	1377	2000		
	02	SRW34	0	0	0	0	0	0	0	88	6226	
	02	SRW35	0	0	0	735.39	2080					
	02	SRW43	0	0	0	0	0	0	0	0	928	8950
	02	SRW57	0	0	0	0	368	1040	1912	2944	4114	5410
	02	SRS60	0	0	0	0	0	0	40	50	2305	7450
	02	SRW58	0	0	784.1	2217.6	3099.2	3799.8	4122.9	4540	6878.8	12250

The WLB Group Inc.

COMPUTATION DATA SHEET

STORAGE DATA

Subject WHITE TANKS / AGUA FRIA ADMS Prepared by JSE Date 5-3-90

STAGE - STORAGE - DISCHARGE TABLE

TANK ON EAST SIDE OF SUBBASIN # 20

CATERPILLAR PROVING GROUNDS

ELEV. (FT)	AREA (AC)		VOLUME (AC-FT)	DISCHARGE (CFS)
1443.0	0		0	0
		1.05		
1446.0	0.70		1.05	0
		8.38		
1450.0	3.49		9.43	0
		17.48		
1454.0	5.25		26.91	0
		27.4		
1458.0	8.45		54.31	0
		38.58		
1462.0	10.84		92.89	0
		45.78		
1466.0	12.05		138.67	0
		37.8		
*1469.0	13.15		176.47	0
		13.61		
1470	14.06		190.08	265
		28.97		
1472	14.91		219.05	1377
		30.52		
1474	15.61		249.57	2963

* Overflow Elevation

The WLB Group Inc. WLB

COMPUTATION DATA SHEET

Subject WHITE TANKS/AGUA FRIA ADMS Prepared by JSE Date 5-2-90

STAGE - STORAGE - DISCHARGE TABLE

TANK ON EAST SIDE OF SUBBASIN # 21

CATERPILLAR PROVING GROUNDS

ELEV (FT.)	AREA (AC)		VOLUME (AC-FT)	DISCHARGE (CFS)
1319.0	0		0	0
		0.68		
1320.0	1.36		0.68	0
		20.0		
1330	2.64		20.68	0
		36.9		
1340	4.74		57.58	0
		38.33		
* 1347	6.21		95.91	0
		6.43		
1348	6.64		102.34	265
		15.31		
1350	8.67		117.65	1377
1351			130	2100

* Overflow Elevation

at 1.0 L = 105' $Q = 2.5\ 105(1.0)^{3/2} = 265$

at 3.0 L = 105 $Q = 2.5\ 105\ (3.0)^{3/2} = 1377$

at 4.0 L = 105 $Q = 2.5\ 105\ (4.0)^{3/2} = 2100$

The WLB Group Inc. WLB

COMPUTATION DATA SHEET

Subject WHITE TANKS / AGUA FRIA ADMS Prepared by JSE Date 5-2-90

STAGE - STORAGE - DISCHARGE TABLE

TANK ON SOUTHEAST SIDE OF SUBBASIN # 23

CATERPILLAR PROVING GROUNDS

ELEV. (FT)	AREA (AC)		VOLUME (AC-FT)	DISCHARGE (CFS)
1272	0.85		0	0
		6.04		
1276	2.17		6.04	0
		14.34		
1280	5.00		20.38	0
		33.44		
1284	11.72		53.82	0
		66.56		
1288	21.56		120.38	0
		95.86		
1292	26.37		216.24	0
		109.74		
1296	28.5		325.98	0
		129.44		
1300	36.22		455.42	0
		150.68		
1304	39.12		606.1	0
		39.39		
*1305	39.66		645.49	0
		40.12		
1306	40.58		685.61	928
		82.37		
1308	41.79		767.98	8950

* Overflow Elevation

The WLB Group Inc. WLB

COMPUTATION DATA SHEET

Subject WHITE TANKS / AGUA FRIA ADMS Prepared by JSE Date 5-2-90

STAGE - STORAGE - DISCHARGE TABLE

TANK IN THE SOUTHEAST CORNER OF SUBBASIN # 29

CATERPILLAR PROVING GROUNDS

ELEV. (FT)	AREA (AC)		VOLUME (AC-FT)	DISCHARGE (CFS)
1164.5	0		0	0
		0.99		
1166	1.32		0.99	0
		11.74		
1170	4.55		12.73	0
		10.72		
1172	6.17		23.45	0
		12.8		
1174	6.63		36.25	0
		14.43		
1176	7.80		50.68	0
		4.08		
1177.5 *	8.52		54.76	0
		4.57		
1178	9.77		59.33	88
		23.87		
1180	14.10		83.20	6226

* Overflow Elevation

C = 2.5

at .5 L = 100 $Q = 2.5(100)(.5)^{3/2} = 88$

at 2.5 L = 630 $Q = 2.5(630)(2.5)^{3/2} = 6226$

Form 209

The WLB Group Inc.

COMPUTATION DATA SHEET

Subject WHITE TANKS / AGUA FRIA ADMS Prepared by JSE Date 4-27-90

STAGE - STORAGE - DISCHARGE TABLE

TANK IN SOUTHEASTERN PART OF SUBBASIN # 42

ELEV. (FT)	AREA (AC)		VOLUME (AC-FT)	DISCHARGE (CFS)
1071.5	0		0	0
		.11		
1072	.45		.11	0
		10.32		
1080	2.13		10.43	0
		31.20		
1090	4.11		41.63	0
		28.27		
* 1095	7.20		69.90	0
		7.44		
1096	7.68		77.34	163
		16.86		
1098	9.18		94.20	844
		19.46		
1100	10.28		113.66	2096
		21.04		
1102	10.76		134.70	4630
		26.08		
1104	15.32		160.78	13500

* Overflow Elevation C = 2.5

at 1.0 L = 65 $Q = 2.5(65)(1)^{3/2} = 163$

at 3.0 L = 65 $Q = 2.5(65)(3)^{3/2} = 844$

at 5.0 L = 75 $Q = 2.5(75)(5)^{3/2} = 2096$

at 7.0 L = 100 $Q = 2.5(100)(7)^{3/2} = 4630$

at 9.0 L = 200 $Q = 2.5\ 200\ (9)^{3/2}$ 13500

EXISTING CONDITION WITHOUT PROJECT
HDR STUDY


```
1*****************************************                   ****************************************
 *                                        *                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE   (HEC-1)   *                   *   U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998                *                   *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                  *                   *         609 SECOND STREET            *
 *                                        *                   *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE    19AUG09  TIME   09:12:35  *                   *          (916) 756-1104              *
 *                                        *                   *                                      *
******************************************                   ****************************************


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


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

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


1                                            HEC-1 INPUT                                          PAGE  1

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

     1        ID        Flood Control District of Maricopa County
     2        ID        L303_EX_MB02 - Loop 303/ White Tanks ADMPU AHA
     3        ID        100 YEAR
     4        ID        24 Hour Storm
     5        ID        Unit Hydrograph: S-Graph
     6        ID        08/18/2009
     7        ID   FCDMC CONTRACT 2007C031
     8        ID   BY HDR ENGINEERING (#79902)
     9        ID   EXISTING CONDITIONS-AUGUST 2009
    10        ID   MAJOR BASIN 02
    11        ID   FILE NAME: EX-MB02.DAT
    12        IT       5       0       0    2000
    13        IN      15
    14        IO       3
              *DIAGRAM
              *
    15        JD   3.941  0.0001
    16        PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
    17        PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
    18        PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
    19        PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
    20        PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
    21        PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
    22        PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
    23        PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
    24        PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
    25        PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
    26        JD   3.843     5.0
    27        JD   3.744    10.0
    28        JD   3.646    20.0
    29        JD   3.547    30.0
    30        JD   3.429    60.0
              *

    31        KK     L21BASIN
    32        KM        Basin Boundary from McMicken Dam on the west and the Beardsley CSR on
    33        KM        the east
    34        BA   0.525
    35        LG    0.34    0.32    4.55    0.37       1
    36        UI       0      20      20      20      21      58      70      88     109     125
    37        UI     140     158     170     180     187     193     193     194     187     179
    38        UI     172     150     140     123     113     101      93      83      76      70
    39        UI      61      56      51      45      40      38      34      31      32      22
    40        UI      21      21      20      14      14      14      13      14      11       5
              *

    41        KK   DL21REDIVERT
    42        KM        Mass grading and storage along canal
    43        DT     RL21    57.3     0.0
    44        DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
    45        DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
1                                            HEC-1 INPUT                                          PAGE  2

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

    46        KK   L21L22ROUTE
    47        KM        Cross-section: Cross-section determined from A-team survey
    48        KM        Manning's N Value: earth w/sparse trees and brush, ponding against canal
    49        RS       1    FLOW
    50        RC   0.032   0.032   0.032    8793  0.0020    0.00
    51        RX  100.00  101.00  107.00  117.00  169.00  409.00  512.00  513.00
    52        RY  1328.1 1328.00 1326.00 1324.00 1324.10 1326.00 1328.00 1328.10
              *

    53        KK     L22BASIN
    54        KM        Basin Boundary from McMicken Dam on the west and the Beardsley CSR on
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```
 889      UI      93      68      51      36      27      20      14       7       7       8
 890      UI       7       0       0       0       0       0       0       0       0       0
 891      UI       0       0       0       0       0       0       0       0       0       0
 892      UI       0       0       0       0       0       0       0       0       0       0
          *

 893      KK   CPW38COMBINE
 894      HC       2  15.168
          *

 895      KK  DW38SEDIVERT
 896      KM          Full flow capacity of culverts under I-10 is main flow. Diverted flow go
 897      DT   DW38S     0.0     0.0
 898      DI     0.0   100.0   200.0   300.0   400.0   467.0   500.0   800.0  1000.0 10000.0
 899      DQ     0.0   100.0   200.0   300.0   400.0   467.0   467.0   467.0   467.0   467.0
          *

 900      KK  W38W37ROUTE
 901      KM          Cross section based from 1990 topo, Manning's N Value: clean earth
 902      RS       3    FLOW
 903      RC   0.022   0.022   0.022    2849  0.0053    0.00
 904      RX  100.00  204.00  440.00  608.00  687.00  700.00  736.00  759.00
 905      RY  1083.0 1082.00 1080.00 1078.00 1078.00 1080.00 1082.00 1083.00
          *

 906      KK      W33BASIN
 907      KM          BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 908      KM          WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 909      BA   0.839
 910      LG    0.31    0.27    4.00    0.47       4
 911      UI       0      92     207     460     670     834     886     810     641     473
1                                          HEC-1 INPUT                                        PAGE 23

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

 912      UI     361     275     195     155     114      85      63      52      23      22
 913      UI      23      22      23       0       0       0       0       0       0       0
 914      UI       0       0       0       0       0       0       0       0       0       0
 915      UI       0       0       0       0       0       0       0       0       0       0
          *

 916      KK  W33W35ROUTE
 917      KM          Cross-section: Estimated 4' deep and 4:1 side slopes, width based on aer
 918      KM          Manning's N Value: clean straight earth
 919      RS       1    FLOW
 920      RC   0.032   0.022   0.032    2658  0.0034    0.00
 921      RX  100.00  112.00  124.00  154.00  174.00  210.00  230.00  240.00
 922      RY  1162.5 1162.25 1162.00 1158.00 1158.50 1162.00 1162.25 1162.50
          *

 923      KK      W34BASIN
 924      KM          BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 925      KM          WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 926      BA   0.228
 927      LG    0.32    0.31    3.74    0.46      20
 928      UI       0      33     131     238     312     316     236     162     111      74
 929      UI      52      34      23      13       9       8       9       0       0       0
 930      UI       0       0       0       0       0       0       0       0       0       0
 931      UI       0       0       0       0       0       0       0       0       0       0
 932      UI       0       0       0       0       0       0       0       0       0       0
          *

 933      KK   SRW34STORAGE
 934      KM          Master Drainage Plan for the Caterpillar Property (Basin #29)
 935      KO
 936      RS       1    STOR
 937      SV            0.99   12.73   23.45   36.25   50.68   54.76   59.33   83.20
 938      SQ                                                            88.00 6226.00
 939      SE  1164.5 1166.00 1170.00 1172.00 1174.00 1176.00 1177.50 1178.00 1180.00
 940      ST
          *

 941      KK  W34W35ROUTE
 942      KM          Cross-section: Estimated 3' deep and 4:1 side slopes, width based on aer
 943      KM          Manning's N Value: clean straight earth
 944      RS       1    FLOW
 945      RC   0.022   0.022   0.022     813  0.0111    0.00
 946      RX  100.00  104.00  108.00  120.00  132.00  144.00  152.00  160.00
 947      RY  1166.2 1166.10 1166.00 1160.00 1160.10 1162.00 1162.10 1162.20
          *

 948      KK      W35BASIN
 949      KM          BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 950      KM          WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 951      BA   0.283
 952      LG    0.32    0.34    3.71    0.47       4
 953      UI       0      33      83     180     257     312     308     268     201     146
 954      UI     108      80      58      43      33      22      19       8       8       8
 955      UI       8       8       0       0       0       0       0       0       0       0
 956      UI       0       0       0       0       0       0       0       0       0       0
1                                          HEC-1 INPUT                                        PAGE 24

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

 957      UI       0       0       0       0       0       0       0       0       0       0
          *

 958      KK   CPW35COMBINE
 959      HC       3    1.35
          *

 960      KK   SRW35STORAGE
 961      KM          Storage behind Indian School Road
 962      KO
 963      RS       1    STOR
 964      SV            1.46    7.31   19.76   47.29
```

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965             SQ                           735.39 2080.00
966             SE   1154.0 1156.00 1158.00 1160.00 1162.00
967             ST
                *

968             KK   W35W36ROUTE
969             KM        Cross-section: Estimated 3' deep and 4:1 side slopes, width based on aer
970             KM        Manning's N Value: earth w/ sparse trees and shrubs
971             RS        2    FLOW
972             RC    0.032   0.032   0.032    6051  0.0076    0.00
973             RX   100.00  108.00  116.00  132.00  156.00  172.00  192.00  212.00
974             RY   1136.2 1136.10 1136.00 1132.00 1132.10 1134.00 1135.00 1136.00
                *

975             KK      W36BASIN
976             KM        PASQUELETTI MOUNTAIN RANCH for areas outside Ph1 that have homes
977             BA    0.720
978             LG     0.31    0.28    4.00    0.47       4
979             UI        0      65     101     247     385     507     591     617     609     513
980             UI      409     329     255     204     160     126     102      76      64      45
981             UI       45      25      16      16      15      16      16      16       0       0
982             UI        0       0       0       0       0       0       0       0       0       0
983             UI        0       0       0       0       0       0       0       0       0       0
                *

984             KK   DW36REDIVERT
985             DT     RW36    12.5     0.0
986             DI      0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
987             DQ      0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *

988             KK   CPW36COMBINE
989             HC        2    2.07
                *

990             KK   W36W37ROUTE
991             KM        Cross-section: Estimated 4' deep and 4:1 side slopes, width based on aer
992             KM        Manning's N Value: earth w/ sparse trees and brush
993             RS        2    FLOW
994             RC    0.032   0.032   0.032    4527  0.0084    0.00
995             RX   100.00  112.00  118.00  130.00  154.00  184.00  196.00  208.00
996             RY   1094.2 1094.10 1094.00 1090.00 1090.10 1094.00 1094.10 1094.20
                *
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LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

997             KK      W37BASIN
998             KM        WESTERN LIMIT DEFINED BY JACKRABBIT WASH
999             KM        CAPACITY APPROX 12,000 CFS, VALENCIA HEIGHTS
1000            BA    1.210
1001            LG     0.32    0.31    4.20    0.44       4
1002            UI        0      96     108     313     489     656     805     894     927     886
1003            UI      789     650     519     424     350     279     227     187     151     120
1004            UI      103      74      65      67      26      23      24      23      24      23
1005            UI       24      23       0       0       0       0       0       0       0       0
1006            UI        0       0       0       0       0       0       0       0       0       0
                *

1007            KK   CPW37COMBINE
1008            HC        2    3.28
                *

1009            KK     DW37DIVERT
1010            KM        Overtopping of Jackrabbit due to unimproved channel
1011            DT    DW37E     0.0     0.0
1012            DI      0.0  1484.0  2484.0  3484.0     0.0     0.0     0.0     0.0     0.0     0.0
1013            DQ      0.0     0.0  1000.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *

1014            KK  CPW37BCOMBINE
1015            HC        2  18.448
                *

1016            KK   W37S60ROUTE
1017            KM        As-Built plans for WT FRS#4 Inlet Improvments
1018            KM        FCD Contract No 94-09, Sta 19+31.29 to 28+00 Cross Section
1019            RS        1    FLOW
1020            RC    0.013   0.013   0.013    8927  0.0015    0.00
1021            RX   100.00  104.60  108.60  112.60  148.60  152.60  156.60  162.40
1022            RY   1051.8 1048.50 1046.50 1045.50 1044.90 1046.90 1048.90 1051.80
                *

1023            KK  DW58SERETRIEVE
1024            KM        Diverted flow from flow overtopping berm east of 4-10x8 boxes under I-10
1025            DR    DW58S
                *

1026            KK   W58S60ROUTE
1027            KM        Cross-section: I-10 to Van Buren, FRS #4 Inlet Channel
1028            KM        taken from aerial and topo
1029            KM        Manning's N Value: earth w/ sparse trees and shrubs
1030            RS        1    FLOW
1031            RC    0.035   0.035   0.035    4164  0.0067    0.00
1032            RX   100.00  115.50  121.80  142.00  179.30  191.30  199.60  207.80
1033            RY   1072.0 1070.00 1064.00 1062.00 1061.90 1064.00 1065.00 1066.00
                *
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LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1034            KK  DW38SERETRIEVE
1035            KM        Flow that did not go south thru culverts under I-10 continues east
1036            DR    DW38S
```

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                    *
1037                KK   W38S60ROUTE
1038                KM         Desert, assumed 0.5% side slopes, V-ditch
1039                KM         Manning's N Value: avg value for cultivated areas from
1040                KM         Estimated Manning's Roughness Coefficient for
1041                KM         Stream Channels and Flood Plains in MC
1042                RS        8     FLOW
1043                RC    0.035   0.035   0.035    6303  0.0057    0.00
1044                RX   100.00  200.00  400.00  500.00  550.00  600.00  800.00  900.00
1045                RY   1000.0  999.50  998.50  998.00  998.25  998.50  999.50 1000.00
                    *

1046                KK      S60BASIN
1047                KM         WHITE TANKS #3 FRS. S-S-D CURVE FROM JAN 2009 FCDMC CURVES
1048                BA    1.014
1049                LG     0.34    0.34    4.15    0.45       6
1050                UI        0     134     431     837    1174    1303    1147     835     595     419
1051                UI      291     218     144      96      79      33      33      33      33       0
1052                UI        0       0       0       0       0       0       0       0       0       0
1053                UI        0       0       0       0       0       0       0       0       0       0
1054                UI        0       0       0       0       0       0       0       0       0       0
                    *

1055                KK   DS60REDIVERT
1056                KM         Retention volume estimated based on aerial
1057                DT     RS60    18.7     0.0
1058                DI      0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
1059                DQ      0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                    *

1060                KK    CPS60COMBINE
1061                HC        4  19.462
                    *

1062                KK    SRS60STORAGE
1063                KM         White Tanks #4 from FCDMC 1/8/2009
1064                KO
1065                RS        1     STOR
1066                SV           573.00  573.00  627.00  760.00 1239.00 1263.00 1275.00 1524.00 1787.00
1067                SQ                                                     40.00   50.00 2305.00 7450.00
1068                SE   1039.0 1039.10 1041.80 1042.80 1044.80 1049.60 1049.80 1049.90 1051.80 1053.80
1069                ST
                    *
1070                ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE        (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

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

   31           L21
                  .
                  .
   43             .------->    RL21
   41         DL21RE
                  V
                  V
   46         L21L22
                  .
                  .
   53             .           L22
                  .             .
                  .             .
   65             .             .------->    RL22
   63             .         DL22RE
                  .             .
                  .             .
   68          CPL22............
                  V
                  V
   70         L22W01
                  .
                  .
   77             .           W01
                  .             .
                  .             .
   86          CPW01............
                  V
                  V
   88         W01W02
                  .
                  .
   96             .           W02
                  .             .
                  .             .
  106          CPW02............
                  V
                  V
  108         W02W05
                  .
                  .
  114             .           W03
                  .             V
                  .             V
  123             .         W03W04
                  .             .
                  .             .
  130             .             .           W04
                  .             .             .
                  .             .             .
  139             .          CPW04............
                  .             V
                  .             V
  141             .         W04W05
```

+	HYDROGRAPH AT	W56	644.	12.25	46.	12.	4.	.45
+	DIVERSION TO	RW56	644.	12.25	46.	12.	4.	.45
+	HYDROGRAPH AT	DW56RE	0.	.00	0.	0.	0.	.45
+	ROUTED TO	W56W57	0.	.00	0.	0.	0.	.45
+	HYDROGRAPH AT	W55	585.	12.25	65.	19.	6.	.50
+	DIVERSION TO	DW55S	426.	12.25	30.	8.	3.	.50
+	HYDROGRAPH AT	DW55RE	159.	12.25	34.	11.	4.	.50
+	ROUTED TO	W55W57	144.	12.58	34.	11.	4.	.50
+	HYDROGRAPH AT	W57	1425.	12.42	169.	49.	16.	1.16
+	DIVERSION TO	DW57RE	651.	12.08	37.	11.	4.	1.16
+	HYDROGRAPH AT	DW57RE	1425.	12.42	144.	38.	13.	1.16
+	4 COMBINED AT	CPW57	7483.	12.58	1338.	380.	127.	14.79
+	ROUTED TO	SRW57	7274.	12.67	1338.	364.	121.	14.79
+	ROUTED TO	W57W58	7265.	12.67	1338.	364.	121.	14.79
+	HYDROGRAPH AT	W58	197.	12.25	19.	5.	2.	.13
+	2 COMBINED AT	CPW58	7290.	12.67	1354.	369.	123.	14.92
+	ROUTED TO	SRW58	5850.	12.92	1354.	369.	123.	14.92
+	DIVERSION TO	DW58S	4799.	12.92	1281.	350.	117.	14.92
+	HYDROGRAPH AT	DW58SE	1051.	12.92	73.	18.	6.	14.92
+	HYDROGRAPH AT	W38	272.	12.33	32.	8.	3.	.25
+	2 COMBINED AT	CPW38	1097.	12.92	102.	26.	9.	15.17
+	DIVERSION TO	DW38S	467.	12.75	71.	18.	6.	15.17
+	HYDROGRAPH AT	DW38SE	630.	12.92	31.	8.	3.	15.17
+	ROUTED TO	W38W37	527.	13.08	31.	8.	3.	15.17
+	HYDROGRAPH AT	W33	795.	12.42	95.	25.	8.	.84
+	ROUTED TO	W33W35	744.	12.50	95.	25.	8.	.84
+	HYDROGRAPH AT	W34	291.	12.25	33.	10.	3.	.23
+	ROUTED TO	SRW34	0.	.00	0.	0.	0.	.23
+	ROUTED TO	W34W35	0.	.00	0.	0.	0.	.23
+	HYDROGRAPH AT	W35	273.	12.33	31.	8.	3.	.28
+	3 COMBINED AT	CPW35	985.	12.42	125.	33.	11.	1.35
+	ROUTED TO	SRW35	784.	12.67	114.	29.	10.	1.35
+	ROUTED TO	W35W36	707.	12.83	113.	29.	10.	1.35
+	HYDROGRAPH AT	W36	578.	12.50	81.	21.	7.	.72
+	DIVERSION TO	RW36	494.	12.33	24.	6.	2.	.72
	HYDROGRAPH AT							

```
+                     DW36RE       578.   12.50           58.        15.          5.        .72
           2 COMBINED AT
+                     CPW36       1050.   12.75          171.        44.         15.       2.07
           ROUTED TO
+                     W36W37      1010.   12.92          170.        44.         15.       2.07
           HYDROGRAPH AT
+                     W37          860.   12.58          134.        35.         12.       1.21
           2 COMBINED AT
+                     CPW37       1651.   12.75          302.        78.         26.       3.28
           DIVERSION TO
+                     DW37E        167.   12.75            6.         1.          0.       3.28
           HYDROGRAPH AT
+                     DW37        1484.   12.67          297.        77.         26.       3.28
           2 COMBINED AT
+                     CPW37B      1597.   13.00          301.        78.         26.      18.45
           ROUTED TO
+                     W37S60      1476.   13.17          299.        78.         26.      18.45
           HYDROGRAPH AT
+                     DW58SE      4799.   12.92         1281.       350.        117.      14.92
           ROUTED TO
+                     W58S60      4776.   13.00         1281.       350.        117.      14.92
           HYDROGRAPH AT
+                     DW38SE       467.   12.75           71.        18.          6.      15.17
           ROUTED TO
+                     W38S60       408.   13.50           70.        18.          6.      15.17
           HYDROGRAPH AT
+                     S60         1092.   12.33          113.        30.         10.       1.01
           DIVERSION TO
+                     RS60         822.   12.17           36.         9.          3.       1.01
           HYDROGRAPH AT
+                     DS60RE      1092.   12.33           80.        21.          7.       1.01
           4 COMBINED AT
+                     CPS60       6461.   13.08         1703.       459.        153.      19.46
           ROUTED TO
+                     SRS60          0.     .00            0.         0.          0.      19.46
1                              SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION   SRW19
                            (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)

     PLAN  1 ..............                 INITIAL VALUE     SPILLWAY CREST    TOP OF DAM
                               ELEVATION       1198.00              .00              .00
                               STORAGE            0.                0.               0.
                               OUTFLOW            0.                0.               0.

             RATIO      MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM   DURATION    TIME OF     TIME OF
              OF       RESERVOIR      DEPTH     STORAGE    OUTFLOW   OVER TOP  MAX OUTFLOW   FAILURE
              PMF       W.S.ELEV    OVER DAM     AC-FT       CFS      HOURS       HOURS       HOURS

             1.00      1218.06     1218.06        98.         0.     166.58        .00         .00

     PLAN  2 ..............                 INITIAL VALUE     SPILLWAY CREST    TOP OF DAM
                               ELEVATION       1198.00              .00              .00
                               STORAGE            0.                0.               0.
                               OUTFLOW            0.                0.               0.

             RATIO      MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM   DURATION    TIME OF     TIME OF
              OF       RESERVOIR      DEPTH     STORAGE    OUTFLOW   OVER TOP  MAX OUTFLOW   FAILURE
              PMF       W.S.ELEV    OVER DAM     AC-FT       CFS      HOURS       HOURS       HOURS

             1.00      1217.65     1217.65        95.         0.     166.58        .00         .00

     PLAN  3 ..............                 INITIAL VALUE     SPILLWAY CREST    TOP OF DAM
                               ELEVATION       1198.00              .00              .00
                               STORAGE            0.                0.               0.
                               OUTFLOW            0.                0.               0.

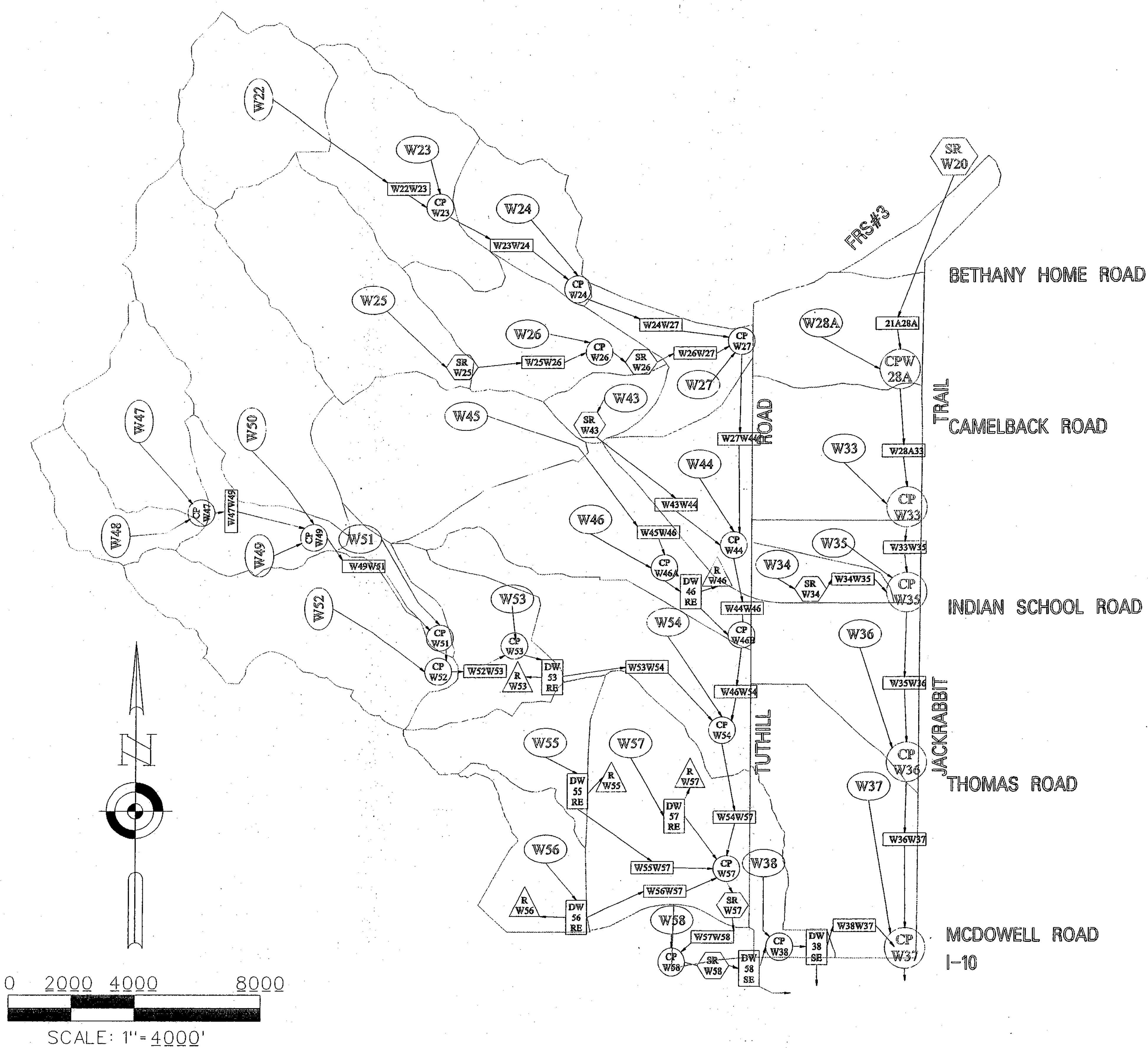
             RATIO      MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM   DURATION    TIME OF     TIME OF
              OF       RESERVOIR      DEPTH     STORAGE    OUTFLOW   OVER TOP  MAX OUTFLOW   FAILURE
              PMF       W.S.ELEV    OVER DAM     AC-FT       CFS      HOURS       HOURS       HOURS

             1.00      1217.24     1217.24        91.         0.     166.58        .00         .00

     PLAN  4 ..............                 INITIAL VALUE     SPILLWAY CREST    TOP OF DAM
                               ELEVATION       1198.00              .00              .00
                               STORAGE            0.                0.               0.
                               OUTFLOW            0.                0.               0.

             RATIO      MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM   DURATION    TIME OF     TIME OF
              OF       RESERVOIR      DEPTH     STORAGE    OUTFLOW   OVER TOP  MAX OUTFLOW   FAILURE
              PMF       W.S.ELEV    OVER DAM     AC-FT       CFS      HOURS       HOURS       HOURS

             1.00      1216.82     1216.82        88.         0.     166.58        .00         .00
```



SUB-BASIN
DIVERSION
RETENTION
CHANNEL ROUTING
CONCENTRATION POINT
STORAGE ROUTING

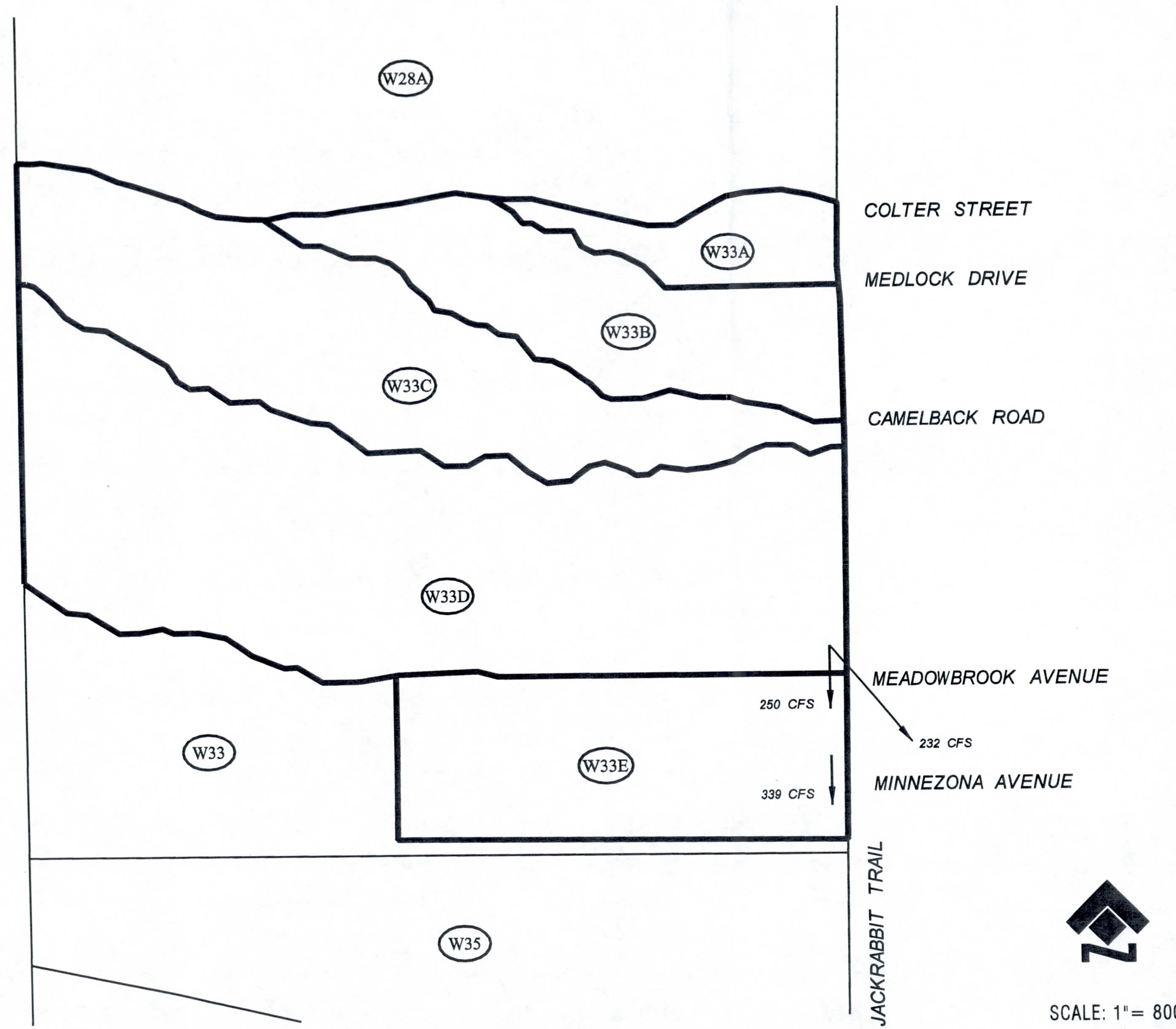
SCHEMATIC MAP FOR JACKRABBIT CORRIDOR HEC-1 MODEL
EXISTING CONDITION WITH PROJECT-IN-PLACE

UPDATE BASED ON LOOP 303/WHITE TANKS ADMPU AREA HYDROLOGIC ANALYSIS (HDR,2009)

SUB-BASIN ID	SUB-BASIN AREA (MI^2)	CUMULATIVE SUB-BASIN AREA (MI^2)	PRORATED * FLOW (CFS)	CUMULATIVE PRORATED * FLOW (CFS)	CUMULATIVE WASH FLOW (CFS)
W33A	0.03	0.03	25	25	25
W33B	0.09	0.12	73	98	98
W33C	0.17	0.29	139	237	237
W33D	0.30	0.59	245	482	250 **
W33E	0.11	0.70	89	571	339 **

* PRORATED FLOW FROM HEC-1 SUB-BASIN W33 (Q= 685 CFS, AREA= 0.84 MI^2)

** PRORATED FLOW - CULVERT DIVERSION FLOW (232 CFS)



G:\Projects\09\09-077 WT03 Final\05 - Jackrabbit CLOMR\Draft Submittal Work Maps\E-Remnent Channel.dgn
8/8/2011

Hoskin • Ryan Consultants
creative engineering solutions
6245 N. 24th Parkway Suite #100 Phoenix, Arizona 85016

LEGEND

- SUB-BASIN BOUNDARY
- SUB-BASIN
- PRORATED SUB-BASIN BOUNDARY
- DIRECTION OF FLOW

REMNENT CHANNEL PRO-RATED FLOW MAP

Office: (602) 252-8384 Fax: (602) 252-8385 www.hoskinryan.com

```
1****************************************                                    ***************************************
 *                                        *                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                  *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998                *                                  *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1                 *                                  *         609 SECOND STREET           *
 *                                        *                                  *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   04APR10  TIME  13:51:35    *                                  *          (916) 756-1104             *
 *                                        *                                  *                                     *
******************************************                                   ***************************************

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

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

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

1                                      HEC-1 INPUT                                              PAGE  1

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

   1        ID  WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
   2        ID  PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
   3        ID  FRS#3 OUTLET CHANNEL DESIGN, 04-01-2010
   4        ID  BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
   5        ID  HEC-1 MODEL OF EXISTING CONDITIONS WITH CIP
   6        ID  MODIFICATIONS INCLUDE:
   7        ID  (1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR JACKRABBIT CORRIDOR
   8        ID  (2) UPDATE THE PROPOSED CHANNEL DESIGN
   9        ID  (3) DELETE RETENTION OF PASQUELETTI TO REFLECT EXIST CONDITIONS
  10        ID  (4) DELETE BASIN W21A DUE TO THE ADOPTION OF PIPE AT REACH 9
  11        ID
  12        ID  *****************************************************************
  13        ID        Flood Control District of Maricopa County
  14        ID        L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  15        ID        100 YEAR
  16        ID        24 Hour Storm
  17        ID        Unit Hydrograph: S-Graph
  18        ID        08/18/2009
  19        ID  FCDMC CONTRACT 2007C031
  20        ID  BY HDR ENGINEERING (#79902)
  21        ID  EXISTING CONDITIONS WITH CIP-AUGUST 2009
  22        ID  MAJOR BASIN 02
  23        ID  FILE NAME: ECIP-MB2.DAT
  24        IT       5  1JAN99     1200     2000
  25        IN      15
  26        IO       5
            *DIAGRAM
            *
  27        JD   3.661  0.0001
  28        PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  29        PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  30        PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  31        PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  32        PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  33        PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  34        PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  35        PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  36        PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  37        PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  38        JD   3.478    10.0
            *

  39        KK     WT3
  40        KM   OUTFLOW FROM WT FRS#3 OUTLET
  41        BA   21.52
  42        KO       5
  43        ZR   =QI A=WT B=FRS3 C=FLOW
            *

  44        KK  21A28A   ROUTE
  45        KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 6:1
  46        ZW   A=CIP B=21A28A C=FLOW
  47        RS       4    FLOW      -1
  48        RC   0.045   0.035   0.045    3560  0.0010
  49        RX     100     110     120     150     180     210     220     230
1                                      HEC-1 INPUT                                              PAGE  2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 50           RY    1001    1000    1000     995     995    1000    1000    1001
              *

 51           KK    W28ABASIN
 52           KM        Boundary based on Preliminary Design Plans for
 53           KM        White Tanks FRS #3 Outfall Channel dated
 54           KM        12-08-2008 prepared by Gannett Fleming
 55           ZW   A=CIP B=W28A C=FLOW
 56           BA   0.642
 57           LG    0.34    0.32    4.55    0.35       1
 58           UI       0      65     127     296     444     573     621     609     524     407
 59           UI     308     239     181     135     110      80      64      45      44      16
 60           UI      17      16      16      16      16       0       0       0       0       0
 61           UI       0       0       0       0       0       0       0       0       0       0
 62           UI       0       0       0       0       0       0       0       0       0       0
              *

 63           KK   CPW28ACOMBINE
 64           ZW   A=CIP B=CPW28A C=FLOW
 65           HC       2   0.841
              *

 66           KK   W28A33   ROUTE
 67           KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
 68           ZW   A=CIP B=W28A33 C=FLOW
 69           RS       5    FLOW      -1
 70           RC   0.045   0.035   0.045    4336  0.0010
 71           RX     100     110     120     140     180     200     210     220
 72           RY    1001    1000    1000     995     995    1000    1000    1001
              *

 73           KK    W33BASIN
 74           KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 75           KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 76           ZW   A=CIP B=W33 C=FLOW
 77           BA   0.839
 78           LG    0.31    0.27    4.00    0.47       4
 79           UI       0      92     207     460     670     834     886     810     641     473
 80           UI     361     275     195     155     114      85      63      52      23      22
 81           UI      23      22      23       0       0       0       0       0       0       0
 82           UI       0       0       0       0       0       0       0       0       0       0
 83           UI       0       0       0       0       0       0       0       0       0       0
              *

 84           KK   CPW33COMBINE
 85           ZW   A=CIP B=CPW33 C=FLOW
 86           HC       2    1.68
              *

 87           KK   W33W35   ROUTE
 88           KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 6:1
 89           ZW   A=CIP B=W33W35 C=FLOW
 90           RS       3    FLOW      -1
 91           RC   0.045   0.035   0.045    2658  0.0010
 92           RX     100     110     116     152     192     228     240     250
1                                           HEC-1 INPUT                                              PAGE  3

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

 93           RY    1001    1000    1000     994     994    1000    1000    1001
              *

 94           KK    W35BASIN
 95           KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 96           KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 97           BA   0.283
 98           LG    0.32    0.34    3.71    0.47       4
 99           UI       0      33      83     180     257     312     308     268     201     146
100           UI     108      80      58      43      33      22      19       8       8       8
101           UI       8       8       0       0       0       0       0       0       0       0
102           UI       0       0       0       0       0       0       0       0       0       0
103           UI       0       0       0       0       0       0       0       0       0       0
              *

104           KK    W34BASIN
105           KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
106           KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
107           BA   0.228
108           LG    0.32    0.31    3.74    0.46      20
109           UI       0      33     131     238     312     316     236     162     111      74
110           UI      52      34      23      13       9       8       9       0       0       0
111           UI       0       0       0       0       0       0       0       0       0       0
112           UI       0       0       0       0       0       0       0       0       0       0
113           UI       0       0       0       0       0       0       0       0       0       0
              *

114           KK   SRW34STORAGE
115           KM        Master Drainage Plan for the Caterpillar Property (Basin #29)
116           KO
117           RS       1    STOR
118           SV            0.99   12.73   23.45   36.25   50.68   54.76   59.33   83.20
119           SQ                                                             88.00 6226.00
120           SE  1164.5 1166.00 1170.00 1172.00 1174.00 1176.00 1177.50 1178.00 1180.00
```

```
 121          ST
              *

 122          KK  W34W35ROUTE
 123          KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
 124          KM         aerial. Manning's N Value: clean straight earth
 125          RS       1     FLOW
 126          RC   0.022   0.022   0.022     813  0.0111    0.00
 127          RX  100.00  104.00  108.00  120.00  132.00  144.00  152.00  160.00
 128          RY  1166.2 1166.10 1166.00 1160.00 1160.10 1162.00 1162.10 1162.20
              *

 129          KK   CPW35COMBINE
 130          ZW   A=CIP B=CPW35 C=FLOW
 131          HC       3   2.191
              *
```



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

 132          KK  W35W36    ROUTE
 133          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=40FT, SIDE SLOPE 4:1
 134          ZW   A=CIP B=W35W36 C=FLOW
 135          RS       7     FLOW      -1
 136          RC   0.045   0.035   0.045    6051  0.0010
 137          RX     100     110     116     140     180     204     220     230
 138          RY    1001    1000    1000     994     994    1000    1000    1001
              *

 139          KK     W36BASIN
 140          KM         Boundary based on Aerial, topo, and Preliminary
 141          KM         Design Plans for White Tanks FRS #3 Outfall Channel
 142          KM         dated 12-08-2008 prepared by Gannett Fleming
 143          BA   0.720
 144          LG    0.31    0.28    4.00    0.47       4
 145          UI       0      65     101     247     385     507     591     617     609     513
 146          UI     409     329     255     204     160     126     102      76      64      45
 147          UI      45      25      16      16      15      16      16      16       0       0
 148          UI       0       0       0       0       0       0       0       0       0       0
 149          UI       0       0       0       0       0       0       0       0       0       0
              *

 150          KK   CPW36COMBINE
 151          ZW   A=CIP B=CPW36 C=FLOW
 152          HC       2   2.911
              *

 153          KK  W36W37    ROUTE
 154          KM   PROPOSED JACKRABBIT CHANNEL, BOTTOM WIDTH=30FT, SIDE SLOPE 4:1
 155          ZW   A=CIP B=W36W37 C=FLOW
 156          RS       5     FLOW      -1
 157          RC   0.045   0.035   0.045    4527  0.0010
 158          RX     100     110     122     150     178     210     220     230
 159          RY    1001    1000    1000     993     993    1000    1000    1001
              *

 160          KK     W37BASIN
 161          KM         WESTERN LIMIT DEFINED BY JACKRABBIT WASH
 162          KM         CAPACITY APPROX 12,000 CFS, VALENCIA HEIGHTS
 163          BA   1.210
 164          LG    0.32    0.31    4.20    0.44       4
 165          UI       0      96     112     318     497     664     822     897     937     893
 166          UI     777     643     515     421     344     278     221     186     148     115
 167          UI     104      69      66      63      23      24      23      24      23      24
 168          UI      24       0       0       0       0       0       0       0       0       0
 169          UI       0       0       0       0       0       0       0       0       0       0
              *

 170          KK     W22BASIN
 171          KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 172          KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 173          BA   0.782
 174          LG    0.35    0.35    4.15    0.44      19
 175          UI       0     237     914    1559    1035     751     503     352     228     158
```



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

 176          UI     107      80      37      31      31      31       0       0       0       0
 177          UI       0       0       0       0       0       0       0       0       0       0
 178          UI       0       0       0       0       0       0       0       0       0       0
 179          UI       0       0       0       0       0       0       0       0       0       0
              *

 180          KK  W22W23ROUTE
 181          KM         Cross-section: Based on aerial and topo
 182          KM         Manning's N Value: pavement and natural desert wash w/ vegetation
 183          RS       1     FLOW
 184          RC   0.035   0.013   0.035    4866  0.0719    0.00
 185          RX  100.00  112.00  113.00  126.00  439.00  477.00  496.00  515.00
 186          RY  1820.0 1815.00 1810.00 1800.00 1799.90 1810.00 1815.00 1820.00
              *

 187          KK     W23BASIN
```

```
188            KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
189            KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
190            BA   0.897
191            LG    0.35    0.35    4.35    0.40      18
192            UI       0     236     906    1581    1306     885     636     424     309     204
193            UI     145      98      80      33      34      33      33       0       0       0
194            UI       0       0       0       0       0       0       0       0       0       0
195            UI       0       0       0       0       0       0       0       0       0       0
196            UI       0       0       0       0       0       0       0       0       0       0
               *

197            KK   CPW23COMBINE
198            HC       2   1.679
               *

199            KK  W23W24ROUTE
200            KM        Cross-section: Based on aerial and topo
201            KM        Manning's N Value: natural desert wash w/ vegetation
202            RS       1     FLOW
203            RC   0.045   0.035   0.045    5335  0.0367    0.00
204            RX  100.00  120.00  140.00  180.00  220.00  240.00  260.00  280.00
205            RY  1462.0 1461.00 1460.00 1450.00 1450.10 1460.00 1461.00 1462.00
               *

206            KK     W24BASIN
207            KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
208            KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
209            BA   0.475
210            LG    0.35    0.35    4.90    0.29      14
211            UI       0      88     342     575     788     483     372     280     201     154
212            UI     104      82      60      39      38      15      14      15      15       0
213            UI       0       0       0       0       0       0       0       0       0       0
214            UI       0       0       0       0       0       0       0       0       0       0
215            UI       0       0       0       0       0       0       0       0       0       0
               *
1                                           HEC-1 INPUT                                           PAGE  6

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


216            KK   CPW24COMBINE
217            HC       2   2.154
               *

218            KK  W24W27ROUTE
219            KM        Cross-section: Based on aerial and topo
220            KM        Manning's N Value: natural desert wash w/ vegetation
221            RS       1     FLOW
222            RC   0.035   0.035   0.035    5873  0.0289    0.00
223            RX  100.00  120.00  140.00  160.00  180.00  200.00  220.00  240.00
224            RY  1094.0 1092.00 1090.00 1084.00 1084.10 1090.00 1090.25 1090.50
               *

225            KK     W25BASIN
226            KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
227            KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
228            BA   1.099
229            LG    0.35    0.35    4.80    0.30       8
230            UI       0     143     438     866    1174    1490     915     737     620     467
231            UI     358     307     216     171     140     110      76      71      53      27
232            UI      28      28      27      28       0       0       0       0       0       0
233            UI       0       0       0       0       0       0       0       0       0       0
234            UI       0       0       0       0       0       0       0       0       0       0
               *

235            KK   SRW25STORAGE
236            KM        Verrado on-line storage basin (WoodPatel ID SR20)
237            KO
238            RS       1     STOR
239            SV            1.05    9.43   26.91   54.31   92.89  138.67  176.47  190.08  219.05
240            SQ                                                                265.00 1377.00
241            SE  1443.0 1446.00 1450.00 1454.00 1458.00 1462.00 1466.00 1469.00 1470.00 1472.00
242            ST
               *

243            KK  W25W26ROUTE
244            KM        Cross-section: Based on aerial and topo
245            KM        Manning's N Value: natural desert wash w/ vegetation
246            RS       1     FLOW
247            RC   0.035   0.035   0.035    6978  0.0178    0.00
248            RX  100.00  120.00  140.00  156.00  176.00  192.00  212.00  232.00
249            RY  1451.5 1451.25 1451.00 1447.00 1447.10 1451.00 1451.25 1451.50
               *

250            KK     W26BASIN
251            KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
252            KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
253            BA   0.682
254            LG    0.33    0.37    6.20    0.17      15
255            UI       0      86     245     500     680     926     574     465     390     304
256            UI     231     197     152     110      95      69      59      43      42      21
257            UI      17      16      17      16      17       0       0       0       0       0
258            UI       0       0       0       0       0       0       0       0       0       0
259            UI       0       0       0       0       0       0       0       0       0       0
               *
```

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

  260      KK   CPW26COMBINE
  261      HC       2   1.781
           *

  262      KK   SRW26STORAGE
  263      KM        Verrado on-line storage basin (WoodPatel ID SR21 and PH 6 Golf)
  264      KO
  265      RS       1     STOR
  266      SV             0.68   20.68   57.58   95.91  102.34  117.65  130.00
  267      SQ                                           265.00 1377.00 2000.00
  268      SE   1319.0 1320.00 1330.00 1340.00 1347.00 1348.00 1350.00 1351.00
  269      ST
           *

  270      KK  W26W27ROUTE
  271      KM        Cross-section: based on topo and aerial
  272      KM        Manning's N Value: natural desert wash w/ vegetation
  273      RS       1     FLOW
  274      RC   0.035   0.035   0.035    3484  0.0172    0.00
  275      RX  100.00  120.00  140.00  152.00  168.00  180.00  200.00  220.00
  276      RY  1298.5 1298.25 1298.00 1294.00 1294.10 1298.00 1298.25 1298.50
           *

  277      KK     W27BASIN
  278      KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
  279      KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
  280      BA   0.411
  281      LG    0.32    0.37    5.80    0.20      11
  282      UI       0      76     296     498     681     418     323     241     174     133
  283      UI      91      71      51      34      33      13      13      13      13       0
  284      UI       0       0       0       0       0       0       0       0       0       0
  285      UI       0       0       0       0       0       0       0       0       0       0
  286      UI       0       0       0       0       0       0       0       0       0       0
           *

  287      KK   CPW27COMBINE
  288      HC       3   4.345
           *

  289      KK  W27W44ROUTE
  290      KM        Cross-section: Clean straight earth
  291      RS       1     FLOW
  292      RC   0.022   0.022   0.022    7169  0.0098    0.00
  293      RX  100.00  182.00  270.00  288.00  318.00  329.00  333.00  338.00
  294      RY  1256.0 1254.00 1250.00 1248.00 1248.00 1250.00 1254.00 1256.00
           *

  295      KK     W43BASIN
  296      KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
  297      KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
  298      BA   0.209
  299      LG    0.20    0.28    3.48    0.55      61
  300      UI       0     971     508     111       0       0       0       0       0       0
  301      UI       0       0       0       0       0       0       0       0       0       0
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 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  302      UI       0       0       0       0       0       0       0       0       0       0
  303      UI       0       0       0       0       0       0       0       0       0       0
  304      UI       0       0       0       0       0       0       0       0       0       0
           *

  305      KK   SRW43STORAGE
  306      KM        Verrado on-line storage basin (WLB) (WoodPatel ID SR23)
  307      KO
  308      RS       1     STOR
  309      SV             6.04   20.38   53.82  120.38  216.24  325.98  455.42  606.10  645.49
  310      SQ
  311      SE  1272.0 1276.00 1280.00 1284.00 1288.00 1292.00 1296.00 1300.00 1304.00 1305.00
  312      ST
           *

  313      KK  W43W44ROUTE
  314      KM        Cross-section: Side slopes and width based on aerial and topo
  315      KM        Manning's N Value: natural desert wash w/ vegetation
  316      RS       1     FLOW
  317      RC   0.035   0.035   0.035    8415  0.0125    0.00
  318      RX  100.00  145.00  180.00  210.00  220.00  245.00  270.00  295.00
  319      RY  1266.0 1264.00 1262.00 1258.00 1258.00 1262.00 1265.50 1266.00
           *

  320      KK     W44BASIN
  321      KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
  322      KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
  323      BA   0.598
  324      LG    0.35    0.35    4.90    0.29       0
  325      UI       0      55      89     214     334     438     500     527     506     421
  326      UI     332     266     206     162     127      99      82      59      48      37
  327      UI      37      13      14      13      14      13      14       0       0       0
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 328        UI       0       0       0       0       0       0       0       0       0       0
 329        UI       0       0       0       0       0       0       0       0       0       0
            *

 330        KK   CPW44COMBINE
 331        HC       3   5.153
            *

 332        KK  W44W46ROUTE
 333        KM         Cross-section: Estimated 2' deep, side slopes and width based on aerial
 334        KM         and topo. Manning's N Value: earth w/ sparse trees and shrubs
 335        RS       1    FLOW
 336        RC   0.032   0.032   0.032    1706  0.0070    0.00
 337        RX  100.00  116.00  132.00  162.00  192.00  252.00  272.00  292.00
 338        RY  1216.0 1215.00 1214.00 1208.00 1208.10 1210.00 1211.00 1212.00
            *

 339        KK     W45BASIN
 340        KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 341        KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 342        BA   1.035
 343        LG    0.35    0.33    7.30    0.11       3
 344        UI       0     136     414     824    1120    1399     860     697     573     441
1                                          HEC-1 INPUT                                          PAGE  9

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

 345        UI     336     286     202     161     130     104      71      67      47      26
 346        UI      26      26      26      26       0       0       0       0       0       0
 347        UI       0       0       0       0       0       0       0       0       0       0
 348        UI       0       0       0       0       0       0       0       0       0       0
            *

 349        KK  W45W46ROUTE
 350        KM         Cross-section: Based on aerial and topo
 351        KM         Manning's N Value: natural desert wash w/ vegetation
 352        RS       4    FLOW
 353        RC   0.035   0.035   0.035    9372  0.0125    0.00
 354        RX  100.00  160.00  205.00  265.00  285.00  310.00  345.00  385.00
 355        RY  1274.0 1270.00 1268.00 1262.00 1262.10 1272.00 1275.50 1276.00
            *

 356        KK     W46BASIN
 357        KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 358        KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 359        BA   0.926
 360        LG    0.27    0.29    6.40    0.18      16
 361        UI       0      88     165     367     477     592     749    1082     916     727
 362        UI     580     459     331     180     148      97      75      27      27      27
 363        UI      28      27       0       0       0       0       0       0       0       0
 364        UI       0       0       0       0       0       0       0       0       0       0
 365        UI       0       0       0       0       0       0       0       0       0       0
            *

 366        KK  CPW46ACOMBINE
 367        HC       2   1.961
            *

 368        KK  DW46REDIVERT
 369        KM         Master Drainage Plan for the Caterpillar Property (Basin #27)
 370        DT    RW46     0.0     0.0
 371        DI     0.0    35.0    98.0   179.0   276.0   520.0   888.0  1339.0  1859.0  2439.0
 372        DQ     0.0     0.0     0.0     0.0     0.0   135.0   382.0   701.0  1080.0  1509.0
            *

 373        KK  CPW46BCOMBINE
 374        HC       2   7.114
            *

 375        KK  W46W54ROUTE
 376        KM         Cross-section: side slopes, width based on aerial and topo
 377        KM         Manning's N Value: natural desert wash w/ vegetation
 378        RS       1    FLOW
 379        RC   0.035   0.035   0.035    3908  0.0397    0.00
 380        RX  100.00  112.00  124.00  140.00  160.00  190.00  220.00  240.00
 381        RY  1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
            *
1                                          HEC-1 INPUT                                          PAGE 10

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

 382        KK     W47BASIN
 383        KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 384        KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 385        BA   0.666
 386        LG    0.35    0.35    3.95    0.40      20
 387        UI       0      96     349     638     936     788     540     432     340     243
 388        UI     202     142     111      83      66      47      43      19      19      18
 389        UI      19      18       0       0       0       0       0       0       0       0
 390        UI       0       0       0       0       0       0       0       0       0       0
 391        UI       0       0       0       0       0       0       0       0       0       0
            *

 392        KK     W48BASIN
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393          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
394          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
395          BA   0.353
396          LG    0.35    0.35    3.95    0.40      20
397          UI       0      57     232     395     573     367     281     216     157     124
398          UI      85      65      48      36      28      20      10      11      11      11
399          UI       0       0       0       0       0       0       0       0       0       0
400          UI       0       0       0       0       0       0       0       0       0       0
401          UI       0       0       0       0       0       0       0       0       0       0
             *

402          KK   CPW47COMBINE
403          HC       2   1.019
             *

404          KK  W47W49ROUTE
405          KM        Cross-section: Based on aerial and topo
406          KM        Manning's N Value: natural desert wash w/ vegetation
407          RS       1    FLOW
408          RC   0.035   0.035   0.035    5077  0.0414    0.00
409          RX  100.00  150.00  190.00  210.00  235.00  255.00  275.00  310.00
410          RY  1740.0 1720.00 1710.00 1707.00 1708.00 1714.00 1730.00 1740.00
             *

411          KK     W50BASIN
412          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
413          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
414          BA   1.345
415          LG    0.35    0.35    4.25    0.42      19
416          UI       0     122     193     458     725     898    1129    1321     842     706
417          UI     619     546     461     378     312     278     240     189     156     135
418          UI     120      93      88      60      60      59      35      24      23      24
419          UI      23      24      24      23      23       0       0       0       0       0
420          UI       0       0       0       0       0       0       0       0       0       0
             *
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421          KK     W49BASIN
422          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
423          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
424          BA   0.385
425          LG    0.35    0.35    3.95    0.40      20
426          UI       0      67     265     450     633     398     302     232     166     129
427          UI      89      70      48      35      31      16      12      12      12      11
428          UI       0       0       0       0       0       0       0       0       0       0
429          UI       0       0       0       0       0       0       0       0       0       0
430          UI       0       0       0       0       0       0       0       0       0       0
             *

431          KK   CPW49COMBINE
432          HC       3   2.749
             *

433          KK  W49W51ROUTE
434          KM        Cross-section: side slopes, width based on aerial and topo
435          KM        Manning's N Value: natural desert wash w/ vegetation
436          RS       1    FLOW
437          RC   0.035   0.035   0.035    5726  0.0253    0.00
438          RX  100.00  150.00  220.00  236.00  286.00  300.00  340.00  380.00
439          RY  1485.0 1482.00 1479.00 1476.00 1476.10 1479.00 1485.00 1490.00
             *

440          KK     W51BASIN
441          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
442          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
443          BA   0.149
444          LG    0.35    0.35    3.85    0.43       1
445          UI       0      21      74     140     188     200     165     113      79      55
446          UI      38      26      18      14       5       5       5       5       0       0
447          UI       0       0       0       0       0       0       0       0       0       0
448          UI       0       0       0       0       0       0       0       0       0       0
449          UI       0       0       0       0       0       0       0       0       0       0
             *

450          KK   CPW51COMBINE
451          HC       2   2.898
             *

452          KK     W52BASIN
453          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
454          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
455          BA   1.123
456          LG    0.35    0.35    4.40    0.38       9
457          UI       0     116     224     522     764     958    1288     824     673     577
458          UI     489     413     317     275     240     179     147     128     100      88
459          UI      67      57      56      35      22      22      22      22      22      22
460          UI      22       0       0       0       0       0       0       0       0       0
461          UI       0       0       0       0       0       0       0       0       0       0
             *
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KK   CPW52COMBINE
HC       2   4.021
*

KK  W52W53ROUTE
KM         Cross-section: Estimated 3' deep and 4:1 side slopes, width based on
KM         aerial. Manning's N Value: natural desert wash w/ vegetation
RS       1     FLOW
RC   0.035    0.035    0.035     4917  0.0112     0.00
RX  100.00   118.00   124.00   130.00  146.00   150.00  164.00  182.00
RY  1375.0 1373.00 1370.00 1368.00 1368.00 1370.00 1373.00 1375.00
*

KK      W53BASIN
KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
BA   0.568
LG    0.30     0.32     4.45     0.42       7
UI       0      223      858     1219     946      528      288      161       89       32
UI      31        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
*

KK   CPW53COMBINE
HC       2   4.589
*

KK  DW53REDIVERT
KM         Verrado - Planning Unti Drainage Plan for Portions of Planning Unit V
KM         (2nd Submittal) (ESTIMATED FROM GOLF BASINS IN REPORT)
DT    RW53      0.0      0.0
DI     0.0   1000.0   1500.0   2000.0  2500.0   3000.0   3500.0   4000.0   4145.0   4500.0
DQ     0.0     10.0    115.0    290.0   460.0    715.0    980.0   1100.0   1145.0   1260.0
*

KK  W53W54ROUTE
KM         Cross-section: side slopes, width based on aerial and topo
KM         Manning's N Value: natural desert wash w/ vegetation
RS       2     FLOW
RC   0.035    0.035    0.035     9900  0.0157     0.00
RX  100.00   124.00   144.00   150.00  160.00   190.00  220.00  240.00
RY  1194.5 1194.00 1190.00 1184.00 1184.10 1186.00 1190.00 1190.50
*

KK      W54BASIN
KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
BA   0.980
LG    0.23     0.26     4.50     0.43      18
UI       0      105      248      485     621      807     1191     1143      882      676
UI     520      329      183      143     104       33       32       32       33        0
UI       0        0        0        0       0        0        0        0        0        0
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UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
*

KK   CPW54COMBINE
HC       3  12.683
*

KK  W54W57ROUTE
KM         Cross-section: side slopes and width based on aerial
KM         Manning's N Value: natural desert wash w/ vegetation
RS       1     FLOW
RC   0.035    0.035    0.035     5173  0.0151     0.00
RX  100.00   124.00   144.00   156.00  180.00   204.00  216.00  228.00
RY  1126.0 1125.00 1124.00 1114.00 1114.10 1117.00 1117.50 1118.00
*

KK      W56BASIN
KM         BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
KM         WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
BA   0.448
LG    0.17     0.28     4.20     0.61       5
UI       0      143      474      812     956      583      279      126       47       28
UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
UI       0        0        0        0       0        0        0        0        0        0
*

KK  DW56REDIVERT
KM         Sienna Hills (aka Tesota Hills) Preliminary Drainage Report
DT    RW56     35.6      0.0
DI     0.0    500.0   5000.0  50000.0     0.0      0.0      0.0      0.0      0.0      0.0
DQ     0.0    500.0   5000.0  50000.0     0.0      0.0      0.0      0.0      0.0      0.0
*
```

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 530          KK  W56W57ROUTE
 531          KM        Cross-section: Estimated 3' deep and 4:1 side slopes, width
 532          KM        based on aerial / Manning's N Value: clean straight earth
 533          RS      1    FLOW
 534          RC   0.022   0.022   0.022    4948  0.0038    0.00
 535          RX  100.00  108.00  116.00  128.00  131.00  143.00  153.00  163.00
 536          RY  1108.5 1108.25 1108.00 1105.00 1105.10 1108.00 1108.25 1108.50
              *

 537          KK     W55BASIN
 538          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 539          KM        WOOD/PATEL (2006) MODIFIED SLIGHTLY TO MATCH 1990 2' CI TOPO
 540          BA   0.496
 541          LG    0.32    0.33    4.00    0.50      17
 542          UI       0      80     326     555     806     516     393     304     221     173
 543          UI     120      92      67      51      38      29      15      15      15      15
 544          UI       0       0       0       0       0       0       0       0       0       0
 545          UI       0       0       0       0       0       0       0       0       0       0
 546          UI       0       0       0       0       0       0       0       0       0       0
              *
1                                         HEC-1 INPUT                                            PAGE 14

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

 547          KK  DW55REDIVERT
 548          KM        Verado GOB5
 549          DT   DW55S     0.0     0.0
 550          DI     0.0    55.0   101.0   537.0  1297.0  2269.0  4708.0  7684.0 11074.0     0.0
 551          DQ     0.0     0.0     0.0   382.0  1080.0  1984.0  4269.0  7072.0 10310.0     0.0
              *

 552          KK  W55W57ROUTE
 553          KM        Cross-section: Estimated 2' deep and 4:1 side slopes, width
 554          KM        based on aerial / Manning's N Value: natural desert wash w/ vegetation
 555          RS      4    FLOW
 556          RC   0.035   0.035   0.035    5747  0.0096    0.00
 557          RX  100.00  110.00  120.00  136.00  156.00  172.00  192.00  212.00
 558          RY  1136.5 1136.25 1136.00 1134.00 1134.10 1136.00 1136.25 1136.50
              *

 559          KK     W57BASIN
 560          KM        BASIN BOUNDARY FROM VERRADO DEVELOPED CONDITIONS DRAINAGE PLAN
 561          KM        WOOD/PATEL, 2006 MODIFIED SLIGHTLY TO MATCH NEW TOPO
 562          BA   1.161
 563          LG    0.27    0.29    4.65    0.37      19
 564          UI       0     138     388     695     889    1284    1641    1231     946     700
 565          UI     409     239     166     101      43      43      42       0       0       0
 566          UI       0       0       0       0       0       0       0       0       0       0
 567          UI       0       0       0       0       0       0       0       0       0       0
 568          UI       0       0       0       0       0       0       0       0       0       0
              *

 569          KK  DW57REDIVERT
 570          KM        Master Drainage Plan for the Caterpillar Property (Basin #42)
 571          DT    RW57    21.6     0.0
 572          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 573          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 574          KK   CPW57COMBINE
 575          HC      4  14.788
              *

 576          KK   SRW57STORAGE
 577          KM        Verrado SR42
 578          KO
 579          RS      1    STOR
 580          SV           24.40   29.60   35.70   42.00   48.50   55.20   62.20   69.30   76.70
 581          SQ                                   368.00 1040.00 1912.00 2944.00 4114.00 5410.00
 582          SE  1084.0 1090.00 1091.00 1092.00 1093.00 1094.00 1095.00 1096.00 1097.00 1098.00
 583          ST
              *
1                                         HEC-1 INPUT                                            PAGE 15

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

 584          KK  W57W58ROUTE
 585          KM        Cross-section: Taken from aerial and topo
 586          RS      1    FLOW
 587          RC   0.022   0.022   0.022    1236  0.0067    0.00
 588          RX  100.00  115.50  121.80  142.00  179.30  191.30  199.60  207.80
 589          RY  1072.0 1070.00 1064.00 1062.00 1061.90 1064.00 1065.00 1066.00
              *

 590          KK     W58BASIN
 591          KM        BASIN BOUNDARY VARIES FROM VERRADO DEVEL.COND.PLAN WOOD/PATEL 2006
 592          KM        NEW 2' CI TOPO OBTAINED 2008
 593          BA   0.131
 594          LG    0.30    0.33    4.65    0.35      18
 595          UI       0      25     101     176     208     180     117      75      48      32
 596          UI      19      14       5       5       6       0       0       0       0       0
 597          UI       0       0       0       0       0       0       0       0       0       0
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598            UI      0       0       0       0       0       0       0       0       0       0
599            UI      0       0       0       0       0       0       0       0       0       0
               *

600            KK   CPW58COMBINE
601            HC      2  14.919
               *

602            KK   SRW58STORAGE
603            KM         Storage based on new topo section calculations
604            KO
605            RS      1     STOR
606            SV           0.17    2.57    5.40   13.08   31.52   47.89   64.25  111.96  171.81
607            SQ                 784.10 2217.60 3099.20 3799.80 4122.90 4540.00 6878.8012249.90
608            SE  1084.0 1086.00 1088.00 1090.00 1092.00 1094.00 1095.00 1096.00 1098.00 1100.00
609            ST
               *

610            KK  DW58SEDIVERT
611            KM         Divert is stage storage on 4-10x8 boxes under I-10. Diverted flow goes s
612            DT   DW58S     0.0     0.0
613            DI     0.0   100.0  2000.0  4100.0  4200.0  5000.0  6000.0  7000.0  8000.0  9000.0
614            DQ     0.0   100.0  2000.0  4100.0  4195.5  4606.7  4833.2  4983.7  5102.6  5203.3
               *

615            KK     W38BASIN
616            KM         BASIN BOUNDARY FORMED BY MCDOWELL, I-10, JACKRABBIT
617            KM         AND TUTHILL, DETAILED I-10 TOPO AND CULVERT INFO
618            BA   0.251
619            LG    0.32    0.32    4.65    0.33      7.
620            UI      0      30      77     163     235     279     279     236     174     127
621            UI     93      68      51      36      27      20      14       7       7       8
622            UI      7       0       0       0       0       0       0       0       0       0
623            UI      0       0       0       0       0       0       0       0       0       0
624            UI      0       0       0       0       0       0       0       0       0       0
               *
1                                           HEC-1 INPUT                                                PAGE 16

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


625            KK   CPW38COMBINE
626            HC      2   15.17
               *

627            KK  DW38SEDIVERT
628            KM         Full flow capacity of culverts under I-10 is diverted flow
629            DT   DW38S     0.0     0.0
630            DI     0.0   100.0   200.0   300.0   400.0   467.0   500.0   800.0  1000.0 10000.0
631            DQ     0.0   100.0   200.0   300.0   400.0   467.0   467.0   467.0   467.0   467.0
               *

632            KK  W38W37ROUTE
633            KM         Cross section based from 1990 topo, Manning's N Value: clean earth
634            RS      3    FLOW
635            RC   0.022   0.022   0.022    2849  0.0053    0.00
636            RX  100.00  204.00  440.00  608.00  687.00  700.00  736.00  759.00
637            RY  1083.0 1082.00 1080.00 1078.00 1078.00 1080.00 1082.00 1083.00
               *

638            KK   CPW37COMBINE
639            ZW   A=CIP B=CPW37 C=FLOW
640            HC      3  19.291
               *
641            ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  39        WT3
              V
              V
  44     21A28A
              .
              .
  51          .         W28A
              .            .
              .            .
  63     CPW28A............
              V
              V
  66     W28A33
              .
              .
  73          .          W33
              .            .
              .            .
  84      CPW33............
              V
              V
  87     W33W35
              .
```

```
              .
  94          .       W35
              .         .
              .         .
 104          .         .       W34
              .         .         V
              .         .         V
 114          .         .     SRW34
              .         .         V
              .         .         V
 122          .         .    W34W35
              .         .         .
              .         .         .
 129      CPW35....................
              V
              V
 132     W35W36
              .
              .
 139          .       W36
              .         .
              .         .
 150      CPW36..........
              V
              V
 153     W36W37
              .
              .
 160          .       W37
              .         .
              .         .
 170          .         .       W22
              .         .         V
              .         .         V
 180          .         .    W22W23
              .         .         .
              .         .         .
 187          .         .         .       W23
              .         .         .         .
              .         .         .         .
 197          .         .     CPW23..........
              .         .         V
              .         .         V
 199          .         .    W23W24
              .         .         .
              .         .         .
 206          .         .         .       W24
              .         .         .         .
              .         .         .         .
 216          .         .     CPW24..........
              .         .         V
              .         .         V
 218          .         .    W24W27
              .         .         .
              .         .         .
 225          .         .         .       W25
              .         .         .         V
              .         .         .         V
 235          .         .         .     SRW25
              .         .         .         V
              .         .         .         V
 243          .         .         .    W25W26
              .         .         .         .
              .         .         .         .
 250          .         .         .         .       W26
              .         .         .         .         .
              .         .         .         .         .
 260          .         .         .     CPW26..........
              .         .         .         V
              .         .         .         V
 262          .         .         .     SRW26
              .         .         .         V
              .         .         .         V
 270          .         .         .    W26W27
              .         .         .         .
              .         .         .         .
 277          .         .         .         .       W27
              .         .         .         .         .
              .         .         .         .         .
 287          .         .     CPW27....................
              .         .         V
              .         .         V
 289          .         .    W27W44
              .         .         .
              .         .         .
 295          .         .         .       W43
              .         .         .         V
              .         .         .         V
 305          .         .         .     SRW43
              .         .         .         V
              .         .         .         V
 313          .         .         .    W43W44
              .         .         .         .
              .         .         .         .
 320          .         .         .         .       W44
```

```
            .         .         .         .         .
330         .         .     CPW44....................
            .         .         v
            .         .         v
332         .         .   W44W46
            .         .         .
            .         .         .
339         .         .         .       W45
            .         .         .         v
            .         .         .         v
349         .         .         .   W45W46
            .         .         .         .
            .         .         .         .
356         .         .         .         .       W46
            .         .         .         .         .
            .         .         .         .         .
366         .         .         .   CPW46A..........
            .         .         .         .
            .         .         .         .
370         .         .         .         .------->   RW46
368         .         .         .   DW46RE
            .         .         .         .
            .         .         .         .
373         .         .    CPW46B..........
            .         .         v
            .         .         v
375         .         .   W46W54
            .         .         .
            .         .         .
382         .         .         .       W47
            .         .         .         .
            .         .         .         .
392         .         .         .         .       W48
            .         .         .         .         .
            .         .         .         .         .
402         .         .         .    CPW47..........
            .         .         .         v
            .         .         .         v
404         .         .         .   W47W49
            .         .         .         .
            .         .         .         .
411         .         .         .         .       W50
            .         .         .         .         .
            .         .         .         .         .
421         .         .         .         .         .       W49
            .         .         .         .         .         .
            .         .         .         .         .         .
431         .         .         .    CPW49....................
            .         .         .         v
            .         .         .         v
433         .         .         .   W49W51
            .         .         .         .
            .         .         .         .
440         .         .         .         .       W51
            .         .         .         .         .
            .         .         .         .         .
450         .         .         .    CPW51..........
            .         .         .         .
            .         .         .         .
452         .         .         .         .       W52
            .         .         .         .         .
            .         .         .         .         .
462         .         .         .    CPW52..........
            .         .         .         v
            .         .         .         v
464         .         .         .   W52W53
            .         .         .         .
            .         .         .         .
471         .         .         .         .       W53
            .         .         .         .         .
            .         .         .         .         .
481         .         .         .    CPW53..........
            .         .         .         .
            .         .         .         .
486         .         .         .         .------->   RW53
483         .         .         .   DW53RE
            .         .         .         v
            .         .         .         v
489         .         .         .   W53W54
            .         .         .         .
            .         .         .         .
496         .         .         .         .       W54
            .         .         .         .         .
            .         .         .         .         .
506         .         .     CPW54....................
            .         .         v
            .         .         v
508         .         .   W54W57
            .         .         .
            .         .         .
515         .         .         .       W56
            .         .         .         .
            .         .         .         .
527         .         .         .         .------->   RW56
```

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 525        .          .          .     DW56RE
            .          .          .          V
            .          .          .          V
 530        .          .          .     W56W57
            .          .          .          .
            .          .          .          .
 537        .          .          .          .         W55
            .          .          .          .          .
            .          .          .          .          .
 549        .          .          .          .          .------->   DW55S
 547        .          .          .          .     DW55RE
            .          .          .          .          V
            .          .          .          .          V
 552        .          .          .          .     W55W57
            .          .          .          .          .
            .          .          .          .          .
 559        .          .          .          .          .         W57
            .          .          .          .          .          .
            .          .          .          .          .          .
 571        .          .          .          .          .          .------->   RW57
 569        .          .          .          .          .     DW57RE
            .          .          .          .          .          .
            .          .          .          .          .          .
 574        .          .     CPW57..................................
            .          .          V
            .          .          V
 576        .          .     SRW57
            .          .          V
            .          .          V
 584        .          .     W57W58
            .          .          .
            .          .          .
 590        .          .          .         W58
            .          .          .          .
            .          .          .          .
 600        .          .     CPW58............
            .          .          V
            .          .          V
 602        .          .     SRW58
            .          .          .
            .          .          .
 612        .          .          .------->   DW58S
 610        .          .     DW58SE
            .          .          .
            .          .          .
 615        .          .          .         W38
            .          .          .          .
            .          .          .          .
 625        .          .     CPW38............
            .          .          .
            .          .          .
 629        .          .          .------->   DW38S
 627        .          .     DW38SE
            .          .          V
            .          .          V
 632        .          .     W38W37
            .          .          .
            .          .          .
 638   CPW37.......................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    ***************************************
 *                                       *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS      *
 *            JUN   1998                 *                    *   HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                    *        609 SECOND STREET            *
 *                                       *                    *      DAVIS, CALIFORNIA 95616        *
 * RUN DATE   04APR10  TIME  13:51:35    *                    *          (916) 756-1104             *
 *                                       *                    *                                     *
 *****************************************                    ***************************************
```

```
WHITE TANKS AREA, WATERSHED CONTRIBUTING TO FRS#3
PREPARED BY HOSKIN RYAN CONSULTANTS EXCLUSIVELY FOR
FRS#3 OUTLET CHANNEL DESIGN, 04-01-2010
BASED ON HDR LOOP303/WHITE TANKS ADMPU AHA (09-04-09)
HEC-1 MODEL OF EXISTING CONDITIONS WITH CIP
MODIFICATIONS INCLUDE:
(1) UPDATE WITH AVERAGE RAINFALL DEPTH FOR JACKRABBIT CORRIDOR
(2) UPDATE THE PROPOSED CHANNEL DESIGN
(3) DELETE RETENTION OF PASQUELETTI TO REFLECT EXIST CONDITIONS
(4) DELETE BASIN W21A DUE TO THE ADOPTION OF PIPE AT REACH 9

*****************************************************************
  Flood Control District of Maricopa County
  L303_EX_CIP_MB02 - Loop 303/ White Tanks ADMPU AHA
  100 YEAR
  24 Hour Storm
  Unit Hydrograph: S-Graph
  08/18/2009
FCDMC CONTRACT 2007C031
BY HDR ENGINEERING (#79902)
```

```
                                 EXISTING CONDITIONS WITH CIP-AUGUST 2009
                                 MAJOR BASIN 02
                                 FILE NAME: ECIP-MB2.DAT

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

  IT           HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1JAN99  STARTING DATE
                     ITIME       1200  STARTING TIME
                        NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     8JAN99  ENDING DATE
                    NDTIME       1035  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE  166.58 HOURS

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

27 JD          INDEX STORM NO. 1
                      STRM       3.66  PRECIPITATION DEPTH
                      TRDA        .00  TRANSPOSITION DRAINAGE AREA

28 PI            PRECIPITATION PATTERN
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .01      .00      .01
                     .01      .01      .01      .01      .01      .01      .01      .01      .03      .03
                     .03      .09      .09      .09      .01      .01      .01      .01      .01      .01
                     .01      .01      .01      .01      .01      .01      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00

38 JD          INDEX STORM NO. 2
                      STRM       3.48  PRECIPITATION DEPTH
                      TRDA      10.00  TRANSPOSITION DRAINAGE AREA

 0 PI            PRECIPITATION PATTERN
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .01      .00      .01
                     .01      .01      .01      .01      .01      .01      .01      .01      .03      .03
                     .03      .09      .09      .09      .01      .01      .01      .01      .01      .01
                     .01      .01      .01      .01      .01      .01      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                     .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00

 42 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
   -----DSS---ZOPEN:  Existing File Opened,  File: EX100YR.DSS
                      Unit:  71;  DSS Version: 6-JG
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:      5  Number of data values:       1
        Starting date and time:  Jan 1, 1999  1200  (  36160   720)
        Ending   date and time:  Jan 1, 1999  1200  (  36160   720)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/01JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/01JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:    1    JULS:    36160  ISTIME:    720
        NLDATA:  288   JULSD:   36160
        JULS: 01JAN99         JULSD: 01JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:  144  NDATA:  288  NREAD:    1  ILIM:     1
      ----- Exiting ZRRTS, Number of data values:      1,  Status:  0
        Offset:       0,  Units: CFS      ,  Type:INST-VAL
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:      5  Number of data values:     744
        Starting date and time:  Jan 1, 1999  1200  (  36160   720)
        Ending   date and time:  Jan 4, 1999  0155  (  36163   115)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/01JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/01JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:  744    JULS:    36160  ISTIME:    720
        NLDATA:  288   JULSD:   36160
        JULS: 01JAN99         JULSD: 01JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:  144  NDATA:  288  NREAD:  145  ILIM:   145
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/02JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/02JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  146   NVALS:  744    JULS:    36160  ISTIME:    720
        NLDATA:  288   JULSD:   36161
        JULS: 01JAN99         JULSD: 02JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:  288  ILIM:   433
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/03JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/03JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  434   NVALS:  744    JULS:    36160  ISTIME:    720
        NLDATA:  288   JULSD:   36162
        JULS: 01JAN99         JULSD: 03JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:  288  ILIM:   721
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/04JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/04JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  722   NVALS:  744    JULS:    36160  ISTIME:    720
        NLDATA:  288   JULSD:   36163
        JULS: 01JAN99         JULSD: 04JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:   23  ILIM:   744
      ----- Exiting ZRRTS, Number of data values:    744,  Status:  0
        Offset:       0,  Units: CFS      ,  Type:INST-VAL
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:      5  Number of data values:       1
        Starting date and time:  Jan 4, 1999  0155  (  36163   115)
        Ending   date and time:  Jan 4, 1999  0155  (  36163   115)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/04JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/04JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:    1    JULS:    36163  ISTIME:    115
```

```
        NLDATA: 288   JULSD:   36163
        JULS: 04JAN99        JULSD: 04JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:   23  NDATA:  288  NREAD:    1  ILIM:    1
      ----- Exiting ZRRTS, Number of data values:       1,  Status:  0
        Offset:        0,  Units: CFS      ,  Type:INST-VAL
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:     5  Number of data values:     744
        Starting date and time:  Jan 4, 1999  0155  (  36163  115)
        Ending   date and time:  Jan 6, 1999  1550  (  36165  950)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/04JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/04JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:  744    JULS:    36163  ISTIME:    115
        NLDATA:  288   JULSD:   36163
        JULS: 04JAN99        JULSD: 04JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:   23  NDATA:  288  NREAD:  266  ILIM:  266
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/05JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/05JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  267   NVALS:  744    JULS:    36163  ISTIME:    115
        NLDATA:  288   JULSD:   36164
        JULS: 04JAN99        JULSD: 05JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:  288  ILIM:  554
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/06JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/06JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  555   NVALS:  744    JULS:    36163  ISTIME:    115
        NLDATA:  288   JULSD:   36165
        JULS: 04JAN99        JULSD: 06JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:  190  ILIM:  744
      ----- Exiting ZRRTS, Number of data values:     744,  Status:  0
        Offset:        0,  Units: CFS      ,  Type:INST-VAL
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:     5  Number of data values:       1
        Starting date and time:  Jan 6, 1999  1550  (  36165  950)
        Ending   date and time:  Jan 6, 1999  1550  (  36165  950)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/06JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/06JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:    1    JULS:    36165  ISTIME:    950
        NLDATA:  288   JULSD:   36165
        JULS: 06JAN99        JULSD: 06JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:  190  NDATA:  288  NREAD:    1  ILIM:    1
      ----- Exiting ZRRTS, Number of data values:       1,  Status:  0
        Offset:        0,  Units: CFS      ,  Type:INST-VAL
        ----- Entering ZRRTSX for unit 71 -----
Pathname: /WT/FRS3/FLOW//5MIN//
        Time Window set.  Interval:     5  Number of data values:     744
        Starting date and time:  Jan 6, 1999  1550  (  36165  950)
        Ending   date and time:  Jan 9, 1999  0545  (  36168  345)
        Input time offset:        0
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/06JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/06JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:    1   NVALS:  744    JULS:    36165  ISTIME:    950
        NLDATA:  288   JULSD:   36165
        JULS: 06JAN99        JULSD: 06JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:  190  NDATA:  288  NREAD:   99  ILIM:   99
        After ZRDINF, Record found: T
        Pathname: /WT/FRS3/FLOW/07JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/07JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  100   NVALS:  744    JULS:    36165  ISTIME:    950
        NLDATA:  288   JULSD:   36166
        JULS: 06JAN99        JULSD: 07JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:  288  NREAD:  288  ILIM:  387
        After ZRDINF, Record found: T
```

```
        Pathname: /WT/FRS3/FLOW/08JAN1999/5MIN//
        Number of actual data:  288  Header length:   0
        Compression:   0  Quality:   0
-----DSS--- ZREAD Unit  71; Vers.    4:  /WT/FRS3/FLOW/08JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  388   NVALS:  744    JULS:    36165  ISTIME:    950
        NLDATA:  288   JULSD:    36167
        JULS: 06JAN99         JULSD: 08JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:   288  NREAD:   288  ILIM:  675
        After ZRDINF, Record found: F
        Pathname: /WT/FRS3/FLOW/09JAN1999/5MIN//
      ----DSS---Debug:  Enter ZRRTSB;  Unit:  71
        NSTART:  676   NVALS:  744    JULS:    36165  ISTIME:    950
        NLDATA:  288   JULSD:    36168
        JULS: 06JAN99         JULSD: 09JAN99
        Quality Read: F,  Quality Requested: F
        ---ZRRTSB Calculations:  NPOS:    1  NDATA:   288  NREAD:    69  ILIM:  744
-----DSS*** ZRRTS:  CAUTION - Data block not found in file.  Unit:   71
Pathname: /WT/FRS3/FLOW/09JAN1999/5MIN//
      ----- Exiting ZRRTS, Number of data values:     744,   Status:   3
        Offset:          0,  Units: CFS      ,  Type:INST-VAL
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/21A28A/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    1:  /CIP/W28A/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW28A/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W28A33/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW33/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W33W35/FLOW/08JAN1999/5MIN//


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
114 KK      *    SRW34   *      STORAGE
            *            *
            **************

116 KO          OUTPUT CONTROL VARIABLES
                        IPRNT            5  PRINT CONTROL
                        IPLOT            0  PLOT CONTROL
                        QSCAL           0.  HYDROGRAPH PLOT SCALE
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/01JAN1999/5MIN//
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-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW35/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W35W36/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/CPW36/FLOW/08JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    4:  /CIP/W36W37/FLOW/08JAN1999/5MIN//


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
235 KK       *   SRW25    *    STORAGE
             *            *
             **************

237 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
262 KK       *   SRW26    *    STORAGE
             *            *
             **************

264 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
305 KK       *   SRW43    *    STORAGE
             *            *
             **************

307 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
576 KK       *   SRW57    *    STORAGE
             *            *
             **************

578 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 602 KK     *    SRW58   *     STORAGE
            *            *
            **************

 604 KO          OUTPUT CONTROL VARIABLES
                        IPRNT             5  PRINT CONTROL
                        IPLOT             0  PLOT CONTROL
                        QSCAL            0.  HYDROGRAPH PLOT SCALE
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/01JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/02JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/03JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/04JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/05JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/06JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/07JAN1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.     4:  /CIP/CPW37/FLOW/08JAN1999/5MIN//
1
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WT3	187.	17.00	186.	180.	99.	21.52		
+	ROUTED TO	21A28A	187.	17.42	186.	180.	99.	21.52		
+	HYDROGRAPH AT	W28A	508.	12.42	61.	16.	5.	.64		
+	2 COMBINED AT	CPW28A	507.	12.42	186.	181.	104.	.84		
+	ROUTED TO	W28A33	424.	12.75	186.	180.	104.	.84		
+	HYDROGRAPH AT	W33	685.	12.42	81.	21.	7.	.84		
+	2 COMBINED AT	CPW33	790.	12.58	241.	197.	111.	1.68		
+	ROUTED TO	W33W35	761.	12.75	238.	196.	110.	1.68		
+	HYDROGRAPH AT	W35	233.	12.33	26.	7.	2.	.28		
+	HYDROGRAPH AT	W34	255.	12.25	28.	8.	3.	.23		
+	ROUTED TO	SRW34	0.	.00	0.	0.	0.	.23		
+	ROUTED TO	W34W35	0.	.00	0.	0.	0.	.23		
+	3 COMBINED AT	CPW35	851.	12.67	258.	201.	113.	2.19		
+	ROUTED TO	W35W36	799.	13.08	251.	199.	112.	2.19		
+	HYDROGRAPH AT	W36	496.	12.50	69.	18.	6.	.72		
+	2 COMBINED AT	CPW36	931.	13.08	298.	212.	118.	2.91		
+	ROUTED TO	W36W37	884.	13.33	294.	211.	118.	2.91		
+	HYDROGRAPH AT	W37	736.	12.58	113.	30.	10.	1.21		
+	HYDROGRAPH AT	W22	961.	12.17	92.	27.	9.	.78		
+	ROUTED TO	W22W23	934.	12.25	92.	27.	9.	.78		
+	HYDROGRAPH AT	W23	1064.	12.17	106.	31.	10.	.90		

+	2 COMBINED AT	CPW23	1968.	12.25	198.	58.	19.	1.68
+	ROUTED TO	W23W24	1783.	12.25	198.	58.	19.	1.68
+	HYDROGRAPH AT	W24	547.	12.25	57.	16.	5.	.47
+	2 COMBINED AT	CPW24	2320.	12.25	254.	74.	25.	2.15
+	ROUTED TO	W24W27	2107.	12.33	254.	74.	25.	2.15
+	HYDROGRAPH AT	W25	1037.	12.25	120.	32.	11.	1.10
+	ROUTED TO	SRW25	0.	.00	0.	0.	0.	1.10
+	ROUTED TO	W25W26	0.	.00	0.	0.	0.	1.10
+	HYDROGRAPH AT	W26	714.	12.33	92.	26.	9.	.68
+	2 COMBINED AT	CPW26	710.	12.33	91.	26.	9.	1.78
+	ROUTED TO	SRW26	0.	.00	0.	0.	0.	1.78
+	ROUTED TO	W26W27	0.	.00	0.	0.	0.	1.78
+	HYDROGRAPH AT	W27	495.	12.25	51.	14.	5.	.41
+	3 COMBINED AT	CPW27	2525.	12.33	303.	87.	29.	4.34
+	ROUTED TO	W27W44	2142.	12.50	302.	87.	29.	4.34
+	HYDROGRAPH AT	W43	467.	12.08	41.	14.	5.	.21
+	ROUTED TO	SRW43	0.	.00	0.	0.	0.	.21
+	ROUTED TO	W43W44	0.	.00	0.	0.	0.	.21
+	HYDROGRAPH AT	W44	440.	12.50	58.	14.	5.	.60
+	3 COMBINED AT	CPW44	2572.	12.50	359.	101.	34.	5.15
+	ROUTED TO	W44W46	2548.	12.50	359.	101.	34.	5.15
+	HYDROGRAPH AT	W45	1151.	12.25	134.	34.	11.	1.03
+	ROUTED TO	W45W46	994.	12.58	134.	34.	11.	1.03
+	HYDROGRAPH AT	W46	957.	12.50	130.	37.	12.	.93
+	2 COMBINED AT	CPW46A	1918.	12.50	263.	71.	24.	1.96
+	DIVERSION TO	RW46	1124.	12.50	108.	27.	9.	1.96
+	HYDROGRAPH AT	DW46RE	794.	12.50	155.	44.	15.	1.96
+	2 COMBINED AT	CPW46B	3331.	12.50	512.	144.	48.	7.11
+	ROUTED TO	W46W54	3283.	12.58	512.	144.	48.	7.11
+	HYDROGRAPH AT	W47	692.	12.25	83.	24.	8.	.67
+	HYDROGRAPH AT	W48	389.	12.25	44.	13.	4.	.35
	2 COMBINED AT							

+		CPW47	1077.	12.25	127.	37.	12.	1.02
+	ROUTED TO	W47W49	998.	12.33	127.	37.	12.	1.02
+	HYDROGRAPH AT	W50	971.	12.42	160.	47.	16.	1.35
+	HYDROGRAPH AT	W49	430.	12.25	48.	14.	5.	.38
+	3 COMBINED AT	CPW49	2214.	12.33	332.	98.	33.	2.75
+	ROUTED TO	W49W51	2034.	12.50	332.	98.	33.	2.75
+	HYDROGRAPH AT	W51	143.	12.33	13.	3.	1.	.15
+	2 COMBINED AT	CPW51	2144.	12.42	345.	101.	34.	2.90
+	HYDROGRAPH AT	W52	850.	12.42	117.	32.	11.	1.12
+	2 COMBINED AT	CPW52	2980.	12.42	459.	132.	44.	4.02
+	ROUTED TO	W52W53	2758.	12.50	459.	132.	44.	4.02
+	HYDROGRAPH AT	W53	791.	12.17	57.	15.	5.	.57
+	2 COMBINED AT	CPW53	2902.	12.50	514.	147.	49.	4.59
+	DIVERSION TO	RW53	665.	12.50	59.	15.	5.	4.59
+	HYDROGRAPH AT	DW53RE	2237.	12.50	455.	132.	44.	4.59
+	ROUTED TO	W53W54	2116.	12.67	455.	132.	44.	4.59
+	HYDROGRAPH AT	W54	957.	12.42	122.	35.	12.	.98
+	3 COMBINED AT	CPW54	6076.	12.58	1082.	309.	104.	12.68
+	ROUTED TO	W54W57	5911.	12.67	1081.	309.	104.	12.68
+	HYDROGRAPH AT	W56	558.	12.25	39.	10.	3.	.45
+	DIVERSION TO	RW56	558.	12.25	39.	10.	3.	.45
+	HYDROGRAPH AT	DW56RE	0.	.00	0.	0.	0.	.45
+	ROUTED TO	W56W57	0.	.00	0.	0.	0.	.45
+	HYDROGRAPH AT	W55	507.	12.25	56.	16.	5.	.50
+	DIVERSION TO	DW55S	355.	12.25	24.	6.	2.	.50
+	HYDROGRAPH AT	DW55RE	151.	12.25	31.	10.	3.	.50
+	ROUTED TO	W55W57	136.	12.58	31.	10.	3.	.50
+	HYDROGRAPH AT	W57	1251.	12.42	148.	43.	14.	1.16
+	DIVERSION TO	RW57	559.	12.08	37.	11.	4.	1.16
+	HYDROGRAPH AT	DW57RE	1251.	12.42	121.	32.	11.	1.16
+	4 COMBINED AT	CPW57	6785.	12.58	1228.	350.	117.	14.79
+	ROUTED TO	SRW57	6604.	12.67	1228.	334.	111.	14.79

+	ROUTED TO W57W58	6575.	12.67	1228.	334.	111.	14.79
+	HYDROGRAPH AT W58	166.	12.25	17.	5.	2.	.13
+	2 COMBINED AT CPW58	6608.	12.67	1243.	338.	113.	14.92
+	ROUTED TO SRW58	5281.	12.92	1244.	338.	113.	14.92
+	DIVERSION TO DW58S	4670.	12.92	1207.	329.	110.	14.92
+	HYDROGRAPH AT DW58SE	611.	12.92	37.	9.	3.	14.92
+	HYDROGRAPH AT W38	237.	12.33	27.	7.	2.	.25
+	2 COMBINED AT CPW38	657.	12.92	63.	16.	5.	15.17
+	DIVERSION TO DW38S	467.	12.83	58.	15.	5.	15.17
+	HYDROGRAPH AT DW38SE	190.	12.92	5.	1.	0.	15.17
+	ROUTED TO W38W37	78.	13.17	5.	1.	0.	15.17
+	3 COMBINED AT CPW37	1073.	13.25	390.	236.	127.	19.29

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW34
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1164.50	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1170.87	1170.87	17.	0.	166.58	.00	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1164.50	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1170.63	1170.63	16.	0.	166.58	.00	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW25
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1443.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1459.50	1459.50	69.	0.	166.58	.00	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1443.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1458.94	1458.94	63.	0.	166.58	.00	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW26
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1319.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1339.05	1339.05	54.	0.	166.58	.00	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1319.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1338.00	1338.00	50.	0.	166.58	.00	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW43

(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1272.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1280.93	1280.93	28.	0.	166.58	.00	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1272.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1280.74	1280.74	27.	0.	166.58	.00	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW57

(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1084.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1099.37	1099.37	87.	7190.	166.58	12.67	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1084.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1098.94	1098.94	84.	6624.	166.58	12.67	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRW58

(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1084.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1097.07	1097.07	90.	5791.	166.58	12.92	.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1084.00	.00	.00
STORAGE	0.	0.	0.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1096.65	1096.65	80.	5298.	166.58	12.92	.00

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

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-----DSS---ZCLOSE Unit:  71,   File: EX100YR.DSS
           Pointer Utilization:    .31
           Number of Records:    136
           File Size:    242.8  Kbytes
           Percent Inactive:     .0
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Appendix E: Hydraulic Analysis Supporting Documentation (Steady-Flow HEC-RAS)

E.1 Roughness Coefficient Estimation

E.2 Cross-Section Plots

Note: Cross-section plots are included in their respective model output in Section E.5

E.3 Expansion and Contraction Coefficients

E.4 Analysis of Structures

Note: No separate hydraulic calculations are included.

E.5 Hydraulic Modeling

E.5.1 Schematic

E.5.2 Report

E.5.3 Summary Table

E.5.4 Cross-Sections

E.5.5 100-Year Profile

E.1 Roughness Coefficient Estimation

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Duplicate Effective Model Manning's n-Value

River Station	LOB	Channel	ROB
RS	n-Value	n-Value	n-Value
4.152	0.035	0.03	0.06
4.086	0.035	0.03	0.06
4.016	0.035	0.03	0.06
3.93	0.035	0.03	0.06
3.813	0.035	0.03	0.06
3.719	0.035	0.03	0.06
3.625	0.035	0.03	0.06
3.53	0.035	0.03	0.06
3.436	0.035	0.03	0.06
3.342	0.035	0.03	0.06
3.247	0.035	0.03	0.06
3.154	0.035	0.03	0.06
3.059	0.035	0.03	0.06
2.973	0.035	0.03	0.06
2.912	0.035	0.03	0.06
2.86	0.035	0.03	0.06
2.765	0.035	0.03	0.06
2.67	0.035	0.03	0.06
2.576	0.035	0.03	0.06
2.482	0.035	0.03	0.06
2.389	0.035	0.03	0.06
2.296	0.035	0.03	0.06
2.202	0.035	0.03	0.06
2.107	0.035	0.03	0.06
2.008	0.035	0.03	0.06
1.913	0.035	0.03	0.06
1.818	0.035	0.03	0.06
1.725	0.035	0.03	0.06
1.631	0.035	0.03	0.06
1.536	0.035	0.03	0.06
1.443	0.035	0.03	0.06
1.348	0.035	0.03	0.06
1.254	0.035	0.03	0.06
1.159	0.035	0.03	0.06
1.064	0.035	0.03	0.06
1.016	0.025	0.025	0.025
0.969	0.012	0.012	0.012
0.964		Bridge	
0.959	0.012	0.012	0.012
0.914	0.016	0.022	0.016

0.857	0.016	0.022	0.016
0.852	Bridge		
0.847	0.016	0.022	0.016
0.822	0.016	0.022	0.016
0.792	0.016	0.022	0.016
0.769	0.016	0.022	0.016
0.764	Bridge		
0.759	0.016	0.022	0.016
0.722	0.03	0.03	0.04
0.668	0.03	0.03	0.04
0.61	0.03	0.03	0.04
0.566	0.03	0.03	0.04
0.499	0.03	0.03	0.04
0.44	0.03	0.03	0.04
0.348	0.03	0.03	0.04
0.312	0.03	0.03	0.04
0.228	0.03	0.03	0.04
0.142	0.03	0.03	0.04
0.07	0.03	0.03	0.04
0	0.03	0.03	0.04

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station RS	LOB n-Value	Channel n-Value	ROB n-Value
31266	0.045	0.015	0.045
31216	0.045	0.035	0.045
31204	0.045	0.045	0.045
31000	0.045	0.045	0.045
30812	0.045	0.045	0.045
30802	0.045	0.035	0.045
30801			
26495	0.045	0.045	0.045
26475	0.045	0.045	0.045
26200	0.045	0.045	0.045
25900	0.045	0.045	0.045
25600	0.045	0.045	0.045
25299	0.045	0.045	0.045
25195	0.045	0.045	0.045
25000	0.045	0.045	0.045
24700	0.045	0.045	0.045
24400	0.045	0.045	0.045
24081	0.045	0.045	0.045
24061	0.045	0.035	0.045
24052.5			
23639	0.045	0.035	0.045
23619	0.045	0.045	0.045
23300	0.045	0.045	0.045
23000	0.045	0.045	0.045
22731	0.045	0.045	0.045
22711	0.045	0.035	0.045
22704.4			
22635	0.045	0.035	0.045
22615	0.045	0.045	0.045
22500	0.045	0.045	0.045
22200	0.045	0.045	0.045
21900	0.045	0.045	0.045
21600	0.045	0.045	0.045
21326	0.045	0.045	0.045
21308	0.045	0.015	0.045
21275	0.045	0.015	0.045
21265.8			
21136	0.045	0.015	0.045
21135	0.045	0.035	0.045
21124	0.045	0.045	0.045
20850	0.045	0.045	0.045
20580	0.045	0.045	0.045
20550	0.045	0.015	0.045

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station	LOB	Channel	ROB
RS	n-Value	n-Value	n-Value
20538	0.045	0.015	0.045
20532	0.045	0.015	0.045
20502	0.045	0.015	0.045
20501	0.045	0.035	0.045
20486	0.045	0.045	0.045
20300	0.045	0.045	0.045
20077	0.045	0.045	0.045
20048	0.045	0.015	0.045
20036	0.045	0.015	0.045
20030	0.045	0.015	0.045
20000	0.045	0.015	0.045
19999	0.045	0.035	0.045
19984	0.045	0.045	0.045
19650	0.045	0.045	0.045
19310	0.045	0.045	0.045
19277	0.045	0.015	0.045
19267	0.045	0.015	0.045
19260	0.013	0.013	0.013
19252	0.013	0.013	0.013
18960	0.013	0.013	0.013
18920	0.013	0.013	0.013
18340	0.013	0.013	0.013
18200	0.045	0.045	0.045
17900	0.045	0.045	0.045
17579	0.045	0.045	0.045
17549	0.045	0.015	0.045
17537	0.045	0.015	0.045
17531	0.045	0.015	0.045
17501	0.045	0.015	0.045
17500	0.045	0.035	0.045
17486	0.045	0.045	0.045
17350	0.045	0.045	0.045
17050	0.045	0.045	0.045
16779	0.045	0.045	0.045
16749	0.045	0.015	0.045
16737	0.045	0.015	0.045
16731	0.045	0.015	0.045
16701	0.045	0.015	0.045
16700	0.045	0.035	0.045
16686	0.045	0.045	0.045
16500	0.045	0.045	0.045
16200	0.045	0.045	0.045
15984	0.045	0.045	0.045

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station	LOB	Channel	ROB
RS	n-Value	n-Value	n-Value
15939	0.045	0.015	0.045
15919	0.045	0.015	0.045
15918.6			
15742	0.045	0.015	0.045
15741	0.045	0.035	0.045
15731	0.045	0.045	0.045
15591	0.045	0.045	0.045
15561	0.045	0.015	0.045
15537	0.045	0.015	0.045
15531	0.045	0.015	0.045
15501	0.045	0.015	0.045
15500	0.045	0.035	0.045
15485	0.045	0.045	0.045
15300	0.045	0.045	0.045
15081	0.045	0.045	0.045
15046	0.045	0.015	0.045
15042	0.045	0.015	0.045
15000	0.045	0.045	0.045
14600	0.045	0.045	0.045
14300	0.045	0.045	0.045
14255	0.045	0.045	0.045
14238	0.045	0.045	0.045
14225	0.045	0.045	0.045
14223.6			
14175	0.045	0.045	0.045
14150	0.045	0.045	0.045
14100	0.045	0.045	0.045
13900	0.045	0.045	0.045
13600	0.045	0.045	0.045
13296	0.045	0.045	0.045
13266	0.045	0.045	0.045
13248	0.045	0.045	0.045
13235	0.045	0.045	0.045
13233.5			
13185	0.045	0.045	0.045
13175	0.045	0.045	0.045
13100	0.045	0.045	0.045
12900	0.045	0.045	0.045
12767	0.045	0.045	0.045
12736	0.045	0.015	0.045
12716	0.045	0.015	0.045
12710	0.045	0.015	0.045
12680	0.045	0.015	0.045

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station RS	LOB n-Value	Channel n-Value	ROB n-Value
12679	0.045	0.035	0.045
12665	0.045	0.045	0.045
12450	0.045	0.045	0.045
12270	0.045	0.045	0.045
12240	0.045	0.015	0.045
12216	0.045	0.015	0.045
12210	0.045	0.015	0.045
12180	0.045	0.015	0.045
12179	0.045	0.035	0.045
12164	0.045	0.045	0.045
11900	0.045	0.045	0.045
11590	0.045	0.045	0.045
11560	0.045	0.015	0.045
11536	0.045	0.015	0.045
11530	0.045	0.015	0.045
11500	0.045	0.015	0.045
11499	0.045	0.035	0.045
11484	0.045	0.045	0.045
11300	0.045	0.045	0.045
11133	0.045	0.045	0.045
11086	0.045	0.015	0.045
11069	0.045	0.015	0.045
11063	0.045	0.015	0.045
11033	0.045	0.015	0.045
11032	0.045	0.035	0.045
11017	0.045	0.045	0.045
10800	0.045	0.045	0.045
10645	0.045	0.045	0.045
10599	0.045	0.015	0.045
10598			
10545	0.045	0.015	0.045
10521	0.045	0.015	0.045
10520	0.045	0.035	0.045
10500	0.045	0.045	0.045
10350	0.045	0.045	0.045
10154	0.045	0.045	0.045
10124	0.045	0.015	0.045
10100	0.045	0.015	0.045
10094	0.045	0.015	0.045
10064	0.045	0.015	0.045
10063	0.045	0.035	0.045
10048	0.045	0.045	0.045
9900	0.045	0.045	0.045

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station	LOB	Channel	ROB
RS	n-Value	n-Value	n-Value
9728	0.045	0.045	0.045
9675	0.045	0.015	0.045
9660	0.045	0.015	0.045
9654	0.045	0.015	0.045
9624	0.045	0.015	0.045
9623	0.045	0.035	0.045
9608	0.045	0.045	0.045
9450	0.045	0.045	0.045
9299	0.045	0.045	0.045
9273	0.045	0.015	0.045
9272			
9218	0.045	0.015	0.045
9194	0.045	0.015	0.045
9193	0.045	0.035	0.045
9183	0.045	0.045	0.035
9000	0.045	0.045	0.045
8863	0.045	0.045	0.045
8809	0.045	0.015	0.045
8785	0.045	0.015	0.045
8779	0.045	0.015	0.045
8749	0.045	0.015	0.045
8748	0.045	0.035	0.045
8733	0.045	0.045	0.045
8600	0.045	0.045	0.045
8437	0.045	0.045	0.045
8400	0.045	0.015	0.045
8376	0.045	0.015	0.045
8370	0.045	0.015	0.045
8340	0.045	0.015	0.045
8339	0.045	0.035	0.045
8325	0.045	0.045	0.045
8150	0.045	0.045	0.045
8004	0.045	0.045	0.045
7970	0.045	0.015	0.045
7960	0.045	0.015	0.045
7958.2			
7907.3	0.045	0.015	0.045
7886	0.045	0.015	0.045
7885	0.045	0.035	0.045
7876	0.045	0.045	0.045
7700	0.045	0.045	0.045
7425	0.045	0.045	0.045
7376	0.045	0.015	0.045

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station RS	LOB n-Value	Channel n-Value	ROB n-Value
7358	0.045	0.015	0.045
7352	0.045	0.015	0.045
7322	0.045	0.015	0.045
7321	0.045	0.035	0.045
7306	0.045	0.045	0.045
7150	0.045	0.045	0.045
7030	0.045	0.045	0.045
7000	0.045	0.015	0.045
6982	0.045	0.015	0.045
6976	0.045	0.015	0.045
6946	0.045	0.015	0.045
6945	0.045	0.035	0.045
6930	0.045	0.045	0.045
6800	0.045	0.045	0.045
6700	0.045	0.045	0.045
6673	0.045	0.015	0.045
6663	0.045	0.015	0.045
6661.6			
6570	0.035	0.015	0.035
6550	0.035	0.015	0.035
6200	0.035	0.015	0.035
5920	0.035	0.015	0.035
5902	0.035	0.015	0.035
5600	0.035	0.015	0.035
5400	0.035	0.015	0.035
5342.1			
5220	0.035	0.015	0.035
5193	0.035	0.015	0.035
5181	0.035	0.015	0.035
5100	0.035	0.015	0.035
4800	0.035	0.015	0.035
4748	0.035	0.015	0.035
4740	0.035	0.015	0.035
4729.5			
4650	0.035	0.015	0.035
4600	0.035	0.015	0.035
4350	0.035	0.015	0.035
4278	0.035	0.015	0.035
4271			
4200	0.035	0.015	0.035
4183	0.035	0.015	0.035
4168	0.035	0.015	0.035
4100	0.035	0.015	0.035

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Manning's n-Value

River Station	LOB	Channel	ROB
RS	n-Value	n-Value	n-Value
3800	0.035	0.015	0.035
3500	0.035	0.015	0.035
3200	0.035	0.015	0.035
2903	0.035	0.015	0.035
2885	0.035	0.015	0.035
2800	0.035	0.015	0.035
2500	0.035	0.015	0.035
2200	0.035	0.015	0.035
1900	0.035	0.015	0.035
1568	0.035	0.015	0.035
1552	0.035	0.015	0.035

WHITE TANKS FRS NO. 3 OUTFALL REMNANT CHANNEL CLOMR
REACH 1
Manning's n-Value Calculation

Reach #	Cross Section		LOB							Channel							ROB						
			Base Value[1]	Adjustments for Roughness Factors[2]				Degree of Meandering, m [3]	Calculated n-Value [4]	Base Value[1]	Adjustments for Roughness Factors[2]				Degree of Meandering, m [3]	Calculated n-Value [4]	Base Value[1]	Adjustments for Roughness Factors[2]				Degree of Meandering, m [3]	Calculated n-Value [4]
	#	Station	n_0	n_1	n_2	n_3	n_4			n_0	n_1	n_2	n_3	n_4			n_0	n_1	n_2	n_3	n_4		
	1	4700	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	2	4589	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	3	4545	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	4	4532	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	5	4514	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	6	4483	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	7	4351	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	8	3982	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	9	3519	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	10	3500	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	11	3313	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	12	2913	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	13	2415	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
Remnant	14	2112	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
Channel	15	2081	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	16	2010	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	17	1960	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	18	1751	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	19	1456	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	20	1426	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	21	1354	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	22	1304	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	23	1216	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	24	1069	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**	0.020	0.001	0.001	0.002	0.010	1.0	**0.034**	0.020	0.001	0.001	0.002	0.025	1.0	**0.049**
	25	1034	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**
	26	1030	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**
	27	1025	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**
	28	1020	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.035	0.000	0.000	0.000	0.000	1.0	**0.035**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**
	29	1000	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**	0.035	0.000	0.000	0.000	0.000	1.0	**0.035**	0.013	0.000	0.000	0.000	0.000	1.0	**0.013**

Reference: Phillips, J.V., and Tadayon, S., 2006, *Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona: U.S. Geological Survey, Scientific Investigations Report 2006-5108, 41 p.*

Notes:

1. n_0 = Base value of n for a straight, uniform channels (Tables 1 and 2)
2. Adjustments for roughness factors other than meanders (Table 3), where:
   n_1 = Degree of Irregularity
   n_2 = Variation in channel cross section
   n_3 = Effect of obstructions
   n_4 = Amount of Vegetation
3. m = Degree of meandering (Table 3)
4. n-value $= (n_0 + n_1 + n_2 + n_3 + n_4)*m$

EXISTING CONDITION JACKRABBIT WASH MANNING'S N

River	Station	Frctn (n/K)	n #1	n #2	n #3
1	22197	n	0.049	0.034	0.049
2	22085	n	0.049	0.034	0.049
3	22067	Culvert			
4	22041	n	0.049	0.034	0.049
5	22028	n	0.049	0.034	0.049
6	22010	n	0.049	0.034	0.049
7	21993	Culvert			
8	21979	n	0.049	0.034	0.049
9	21847	n	0.049	0.034	0.049
10	21478	n	0.049	0.034	0.049
11	21016	n	0.049	0.034	0.049
12	21007	Culvert			
13	20997	n	0.049	0.034	0.049
14	20809	n	0.049	0.034	0.049
15	20709.*	n	0.049	0.034	0.049
16	20609.*	n	0.049	0.034	0.049
17	20509.*	n	0.049	0.034	0.049
18	20409	n	0.049	0.034	0.049
19	19912	n	0.049	0.034	0.049
20	19608	n	0.049	0.034	0.049
21	19578	n	0.049	0.034	0.049
22	19539	Culvert			
23	19507	n	0.049	0.034	0.049
24	19457	n	0.049	0.034	0.049
25	19247	n	0.049	0.034	0.049
26	18953	n	0.049	0.034	0.049
27	18923	n	0.049	0.034	0.049
28	18888	Culvert			
29	18850	n	0.049	0.034	0.049
30	18800	n	0.049	0.034	0.049
31	18713	n	0.049	0.034	0.049
32	18563	n	0.049	0.034	0.049
33	18214	n	0.049	0.034	0.049
34	17914	n	0.049	0.034	0.049
35	17408	n	0.049	0.034	0.049
36	16918	n	0.049	0.034	0.049
37	16832.8*	n	0.049	0.034	0.049
38	16747.6*	n	0.049	0.034	0.049
39	16662.5*	n	0.049	0.034	0.049
40	16577.3*	n	0.049	0.034	0.049
41	16492.1*	n	0.049	0.034	0.049
42	16407	n	0.049	0.034	0.049
43	15976	n	0.049	0.034	0.049
44	15933	n	0.049	0.034	0.049
45	15886	Culvert			
46	15855	n	0.049	0.034	0.049
47	15750	n	0.049	0.034	0.049
48	15344	n	0.049	0.034	0.049
49	15022	n	0.045	0.045	0.045
50	14622	n	0.045	0.045	0.045
51	14322	n	0.045	0.045	0.045
52	14277	n	0.045	0.045	0.045
53	14260	n	0.045	0.045	0.045
54	14247	n	0.045	0.045	0.045
55	14223.6	Culvert			
56	14197	n	0.045	0.045	0.045
57	14122	n	0.045	0.045	0.045
58	13925	n	0.045	0.045	0.045
59	13622	n	0.045	0.045	0.045
60	13318	n	0.045	0.045	0.045
61	13288	n	0.045	0.045	0.045
62	13270	n	0.045	0.045	0.045

63	13257	n	0.045	0.045	0.045
64	13233.5	Culvert			
65	13207	n	0.045	0.045	0.045
66	13122	n	0.045	0.045	0.045
67	12922	n	0.045	0.045	0.045
68	12341	n	0.049	0.034	0.049
69	11844	n	0.049	0.034	0.049
70	11350	n	0.049	0.034	0.049
71	10818	n	0.049	0.034	0.049
72	10316	n	0.049	0.034	0.049
73	9824	n	0.049	0.034	0.049
74	9324	n	0.049	0.034	0.049
75	8824	n	0.049	0.034	0.049
76	8320	n	0.049	0.034	0.049
77	8221.2*	n	0.049	0.034	0.049
78	8122.4*	n	0.049	0.034	0.049
79	8023.6*	n	0.049	0.034	0.049
80	7924.8*	n	0.049	0.034	0.049
81	7826	n	0.049	0.034	0.049
82	7330	n	0.049	0.034	0.049
83	6826	n	0.049	0.034	0.049
84	6310	n	0.035	0.015	0.035
85	5920	n	0.035	0.015	0.035
86	5902	n	0.035	0.015	0.035
87	5600	n	0.035	0.015	0.035
88	5400	n	0.035	0.015	0.035
89	5342.1	Culvert			
90	5220	n	0.035	0.015	0.035
91	5193	n	0.035	0.015	0.035
92	5181	n	0.035	0.015	0.035
93	5100	n	0.035	0.015	0.035
94	4800	n	0.035	0.015	0.035
95	4748	n	0.035	0.015	0.035
96	4740	n	0.035	0.015	0.035
97	4729.5	Culvert			
98	4650	n	0.035	0.015	0.035
99	4600	n	0.035	0.015	0.035
100	4350	n	0.035	0.015	0.035
101	4278	n	0.035	0.015	0.035
102	4271	Culvert			
103	4200	n	0.035	0.015	0.035
104	4183	n	0.035	0.015	0.035
105	4168	n	0.035	0.015	0.035
106	4100	n	0.035	0.015	0.035
107	3800	n	0.035	0.015	0.035
108	3500	n	0.035	0.015	0.035
109	3200	n	0.035	0.015	0.035
110	2903	n	0.035	0.015	0.035
111	2885	n	0.035	0.015	0.035
112	2800	n	0.035	0.015	0.035
113	2500	n	0.035	0.015	0.035
114	2200	n	0.035	0.015	0.035
115	1900	n	0.035	0.015	0.035
116	1568	n	0.035	0.015	0.035
117	1552	n	0.035	0.015	0.035
118	1500	n	0.035	0.015	0.035
119	1300	n	0.035	0.015	0.035
120	1000	n	0.035	0.015	0.035

E.2 Cross-Section Plots

Note: Cross-section plots are included in their respective model output in Section E.5

E.3 Expansion and Contraction Coefficients

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Duplicate Effective Model Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
4.152	0.1	0.3
4.086	0.1	0.3
4.016	0.1	0.3
3.93	0.1	0.3
3.813	0.1	0.3
3.719	0.1	0.3
3.625	0.1	0.3
3.53	0.1	0.3
3.436	0.1	0.3
3.342	0.1	0.3
3.247	0.1	0.3
3.154	0.1	0.3
3.059	0.1	0.3
2.973	0.1	0.3
2.912	0.1	0.3
2.86	0.1	0.3
2.765	0.1	0.3
2.67	0.1	0.3
2.576	0.1	0.3
2.482	0.1	0.3
2.389	0.1	0.3
2.296	0.1	0.3
2.202	0.1	0.3
2.107	0.1	0.3
2.008	0.1	0.3
1.913	0.1	0.3
1.818	0.1	0.3
1.725	0.1	0.3
1.631	0.1	0.3
1.536	0.1	0.3
1.443	0.1	0.3
1.348	0.1	0.3
1.254	0.1	0.3
1.159	0.1	0.3
1.064	0.1	0.3
1.016	0.1	0.3
0.969	0.3	0.5
0.964	Bridge	
0.959	0.3	0.5

0.914	0.1	0.3
0.857	0.3	0.5
0.852	Bridge	
0.847	0.3	0.5
0.822	0.3	0.5
0.792	0.1	0.3
0.769	0.3	0.5
0.764	Bridge	
0.759	0.3	0.5
0.722	0.3	0.5
0.668	0.1	0.3
0.61	0.1	0.3
0.566	0.1	0.3
0.499	0.1	0.3
0.44	0.1	0.3
0.348	0.1	0.3
0.312	0.1	0.3
0.228	0.1	0.3
0.142	0.1	0.3
0.07	0.1	0.3
0	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
31266	0.1	0.3
31216	0.1	0.3
31204	0.1	0.3
31000	0.1	0.3
30812	0.1	0.3
30802	0.1	0.3
30801	Culvert	
26495	0.1	0.3
26475	0.1	0.3
26200	0.1	0.3
25900	0.1	0.3
25600	0.1	0.3
25299	0.1	0.3
25195	0.1	0.3
25000	0.1	0.3
24700	0.1	0.3
24400	0.1	0.3
24081	0.1	0.3
24061	0.1	0.3
24052.5	Culvert	
23639	0.1	0.3
23619	0.1	0.3
23300	0.1	0.3
23000	0.1	0.3
22731	0.1	0.3
22711	0.1	0.3
22704.4	Culvert	
22635	0.1	0.3
22615	0.1	0.3
22500	0.1	0.3
22200	0.1	0.3
21900	0.1	0.3
21600	0.1	0.3
21326	0.1	0.3
21308	0.1	0.3
21275	0.1	0.3
21265.8	Culvert	
21136	0.1	0.3
21135	0.1	0.3
21124	0.1	0.3
20850	0.1	0.3
20580	0.1	0.3
20550	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
20538	0.1	0.3
20532	0.1	0.3
20502	0.1	0.3
20501	0.1	0.3
20486	0.1	0.3
20300	0.1	0.3
20077	0.1	0.3
20048	0.1	0.3
20036	0.1	0.3
20030	0.1	0.3
20000	0.1	0.3
19999	0.1	0.3
19984	0.1	0.3
19650	0.1	0.3
19310	0.1	0.3
19277	0.1	0.3
19267	0.1	0.3
19260	0.1	0.3
19252	0.1	0.3
18960	0.1	0.3
18920	0.1	0.3
18340	0.1	0.3
18200	0.1	0.3
17900	0.1	0.3
17579	0.1	0.3
17549	0.1	0.3
17537	0.1	0.3
17531	0.1	0.3
17501	0.1	0.3
17500	0.1	0.3
17486	0.1	0.3
17350	0.1	0.3
17050	0.1	0.3
16779	0.1	0.3
16749	0.1	0.3
16737	0.1	0.3
16731	0.1	0.3
16701	0.1	0.3
16700	0.1	0.3
16686	0.1	0.3
16500	0.1	0.3
16200	0.1	0.3
15984	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
15939	0.1	0.3
15919	0.1	0.3
15918.6	Culvert	
15742	0.1	0.3
15741	0.1	0.3
15731	0.1	0.3
15591	0.1	0.3
15561	0.1	0.3
15537	0.1	0.3
15531	0.1	0.3
15501	0.1	0.3
15500	0.1	0.3
15485	0.1	0.3
15300	0.1	0.3
15081	0.1	0.3
15046	0.1	0.3
15042	0.1	0.3
15000	0.1	0.3
14600	0.1	0.3
14300	0.1	0.3
14255	0.1	0.3
14238	0.1	0.3
14225	0.1	0.3
14223.6	Culvert	
14175	0.1	0.3
14150	0.1	0.3
14100	0.1	0.3
13900	0.1	0.3
13600	0.1	0.3
13296	0.1	0.3
13266	0.1	0.3
13248	0.1	0.3
13235	0.1	0.3
13233.5	Culvert	
13185	0.1	0.3
13175	0.1	0.3
13100	0.1	0.3
12900	0.1	0.3
12767	0.1	0.3
12736	0.1	0.3
12716	0.1	0.3
12710	0.1	0.3
12680	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
12679	0.1	0.3
12665	0.1	0.3
12450	0.1	0.3
12270	0.1	0.3
12240	0.1	0.3
12216	0.1	0.3
12210	0.1	0.3
12180	0.1	0.3
12179	0.1	0.3
12164	0.1	0.3
11900	0.1	0.3
11590	0.1	0.3
11560	0.1	0.3
11536	0.1	0.3
11530	0.1	0.3
11500	0.1	0.3
11499	0.1	0.3
11484	0.1	0.3
11300	0.1	0.3
11133	0.1	0.3
11086	0.1	0.3
11069	0.1	0.3
11063	0.1	0.3
11033	0.1	0.3
11032	0.1	0.3
11017	0.1	0.3
10800	0.1	0.3
10645	0.1	0.3
10599	0.1	0.3
10598	Culvert	
10545	0.1	0.3
10521	0.1	0.3
10520	0.1	0.3
10500	0.1	0.3
10350	0.1	0.3
10154	0.1	0.3
10124	0.1	0.3
10100	0.1	0.3
10094	0.1	0.3
10064	0.1	0.3
10063	0.1	0.3
10048	0.1	0.3
9900	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
9728	0.1	0.3
9675	0.1	0.3
9660	0.1	0.3
9654	0.1	0.3
9624	0.1	0.3
9623	0.1	0.3
9608	0.1	0.3
9450	0.1	0.3
9299	0.1	0.3
9273	0.1	0.3
9272	Culvert	
9218	0.1	0.3
9194	0.1	0.3
9193	0.1	0.3
9183	0.1	0.3
9000	0.1	0.3
8863	0.1	0.3
8809	0.1	0.3
8785	0.1	0.3
8779	0.1	0.3
8749	0.1	0.3
8748	0.1	0.3
8733	0.1	0.3
8600	0.1	0.3
8437	0.1	0.3
8400	0.1	0.3
8376	0.1	0.3
8370	0.1	0.3
8340	0.1	0.3
8339	0.1	0.3
8325	0.1	0.3
8150	0.1	0.3
8004	0.1	0.3
7970	0.1	0.3
7960	0.1	0.3
7958.2	Culvert	
7907.3	0.1	0.3
7886	0.1	0.3
7885	0.1	0.3
7876	0.1	0.3
7700	0.1	0.3
7425	0.1	0.3
7376	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
7358	0.1	0.3
7352	0.1	0.3
7322	0.1	0.3
7321	0.1	0.3
7306	0.1	0.3
7150	0.1	0.3
7030	0.1	0.3
7000	0.1	0.3
6982	0.1	0.3
6976	0.1	0.3
6946	0.1	0.3
6945	0.1	0.3
6930	0.1	0.3
6800	0.1	0.3
6700	0.1	0.3
6673	0.1	0.3
6663	0.1	0.3
6661.6	Culvert	
6570	0.1	0.3
6550	0.1	0.3
6200	0.1	0.3
5920	0.1	0.3
5902	0.1	0.3
5600	0.1	0.3
5400	0.1	0.3
5342.1	Culvert	
5220	0.1	0.3
5193	0.1	0.3
5181	0.1	0.3
5100	0.1	0.3
4800	0.1	0.3
4748	0.1	0.3
4740	0.1	0.3
4729.5	Culvert	
4650	0.1	0.3
4600	0.1	0.3
4350	0.1	0.3
4278	0.1	0.3
4271	Culvert	
4200	0.1	0.3
4183	0.1	0.3
4168	0.1	0.3
4100	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
3800	0.1	0.3
3500	0.1	0.3
3200	0.1	0.3
2903	0.1	0.3
2885	0.1	0.3
2800	0.1	0.3
2500	0.1	0.3
2200	0.1	0.3
1900	0.1	0.3
1568	0.1	0.3
1552	0.1	0.3

WHITE TANKS FRS NO. 3 OUTFALL REMNANT CHANNEL CLOMR
Contraction / Expansion Coefficients

River Station RS	Contraction	Expansion
4700	0.3	0.5
4589	0.3	0.5
4570.5	Culvert	
4545	0.3	0.5
4532	0.3	0.5
4514	0.3	0.5
4496.5	Culvert	
4483	0.3	0.5
4351	0.1	0.3
3982	0.1	0.3
3519	0.3	0.5
3510.5	Culvert	
3500	0.3	0.5
3313	0.1	0.3
2913	0.1	0.3
2415	0.1	0.3
2112	0.3	0.5
2081	0.3	0.5
2043	Culvert	
2010	0.3	0.5
1960	0.1	0.3
1751	0.1	0.3
1456	0.3	0.5
1426	0.3	0.5
1391.38	Culvert	
1354	0.3	0.5
1304	0.1	0.3
1216	0.1	0.3
1069	0.1	0.3
1034	0.1	0.3
1030	0.1	0.3
1025	0.1	0.3
1020	0.1	0.3
1000	0.1	0.3

EXISTING CONDITION JACKRABBIT WASH

Expansion and Contraction Coefficients.txt

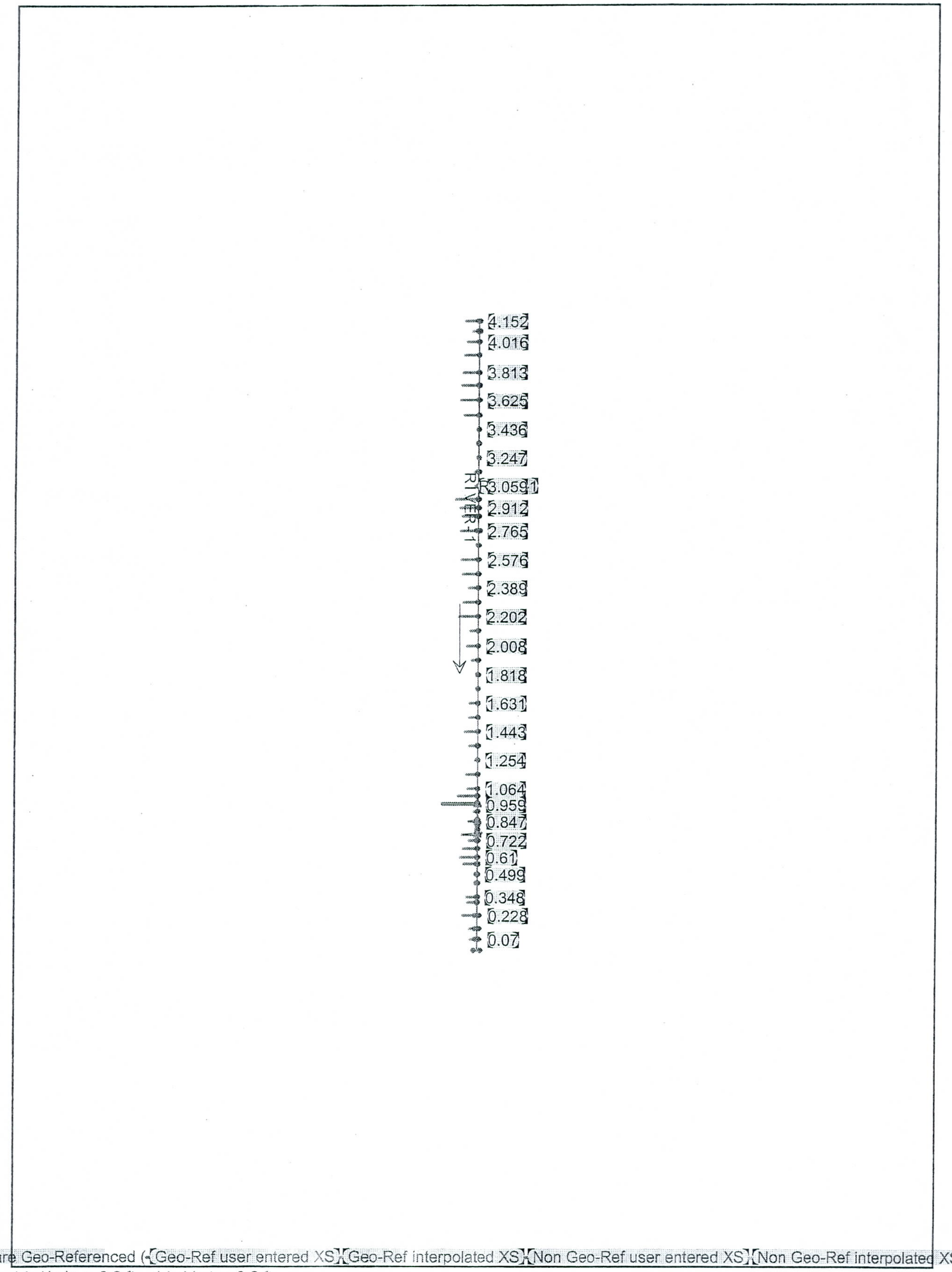
River	Station	Contraction	Expansion
1	22197	0.3	0.5
2	22085	0.3	0.5
3	22067	Culvert	
4	22041	0.3	0.5
5	22028	0.3	0.5
6	22010	0.3	0.5
7	21993	Culvert	
8	21979	0.3	0.5
9	21847	0.1	0.3
10	21478	0.1	0.3
11	21016	0.3	0.5
12	21007	Culvert	
13	20997	0.3	0.5
14	20809	0.1	0.3
15	20709.*	0.1	0.3
16	20609.*	0.1	0.3
17	20509.*	0.1	0.3
18	20409	0.1	0.3
19	19912	0.1	0.3
20	19608	0.3	0.5
21	19578	0.3	0.5
22	19539	Culvert	
23	19507	0.3	0.5
24	19457	0.1	0.3
25	19247	0.1	0.3
26	18953	0.3	0.5
27	18923	0.3	0.5
28	18888	Culvert	
29	18850	0.3	0.5
30	18800	0.1	0.3
31	18713	0.1	0.3
32	18563	0.1	0.3
33	18214	0.1	0.3
34	17914	0.1	0.3
35	17408	0.1	0.3
36	16918	0.1	0.3
37	16832.8*	0.1	0.3
38	16747.6*	0.1	0.3
39	16662.5*	0.1	0.3
40	16577.3*	0.1	0.3
41	16492.1*	0.1	0.3
42	16407	0.1	0.3
43	15976	0.3	0.5
44	15933	0.3	0.5
45	15886	Culvert	
46	15855	0.3	0.5
47	15750	0.1	0.3
48	15344	0.1	0.3
49	15022	0.1	0.3
50	14622	0.1	0.3
51	14322	0.1	0.3
52	14277	0.1	0.3
53	14260	0.1	0.3
54	14247	0.1	0.3
55	14223.6	Culvert	
56	14197	0.1	0.3
57	14122	0.1	0.3
58	13925	0.1	0.3
59	13622	0.1	0.3
60	13318	0.1	0.3
61	13288	0.1	0.3
62	13270	0.1	0.3

63	13257	0.1	0.3
64	13233.5	Culvert	
65	13207	0.1	0.3
66	13122	0.1	0.3
67	12922	0.1	0.3
68	12341	0.1	0.3
69	11844	0.1	0.3
70	11350	0.1	0.3
71	10818	0.1	0.3
72	10316	0.1	0.3
73	9824	0.1	0.3
74	9324	0.1	0.3
75	8824	0.1	0.3
76	8320	0.1	0.3
77	8221.2*	0.1	0.3
78	8122.4*	0.1	0.3
79	8023.6*	0.1	0.3
80	7924.8*	0.1	0.3
81	7826	0.1	0.3
82	7330	0.1	0.3
83	6826	0.1	0.3
84	6310	0.1	0.3
85	5920	0.1	0.3
86	5902	0.1	0.3
87	5600	0.1	0.3
88	5400	0.1	0.3
89	5342.1	Culvert	
90	5220	0.1	0.3
91	5193	0.1	0.3
92	5181	0.1	0.3
93	5100	0.1	0.3
94	4800	0.1	0.3
95	4748	0.1	0.3
96	4740	0.1	0.3
97	4729.5	Culvert	
98	4650	0.1	0.3
99	4600	0.1	0.3
100	4350	0.1	0.3
101	4278	0.1	0.3
102	4271	Culvert	
103	4200	0.1	0.3
104	4183	0.1	0.3
105	4168	0.1	0.3
106	4100	0.1	0.3
107	3800	0.1	0.3
108	3500	0.1	0.3
109	3200	0.1	0.3
110	2903	0.1	0.3
111	2885	0.1	0.3
112	2800	0.1	0.3
113	2500	0.1	0.3
114	2200	0.1	0.3
115	1900	0.1	0.3
116	1568	0.1	0.3
117	1552	0.1	0.3
118	1500	0.1	0.3
119	1300	0.1	0.3
120	1000	0.1	0.3

E.4 Analysis of Structures

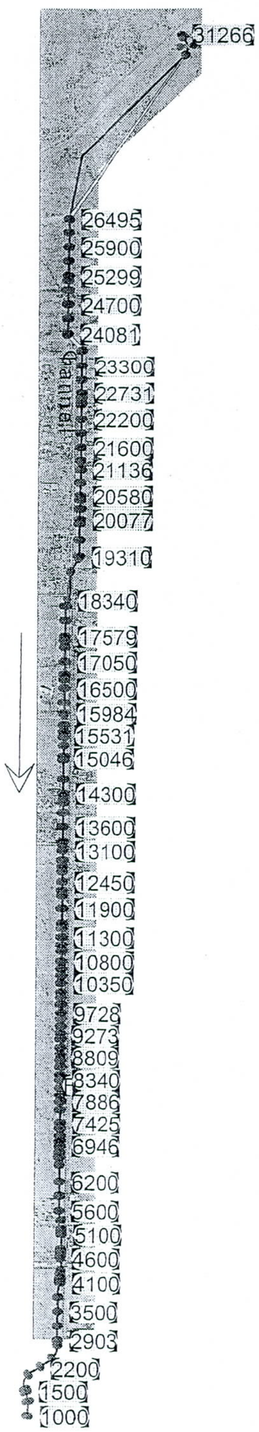
Note: No separate hydraulic calculations are Included.

E.5.1 Schematic



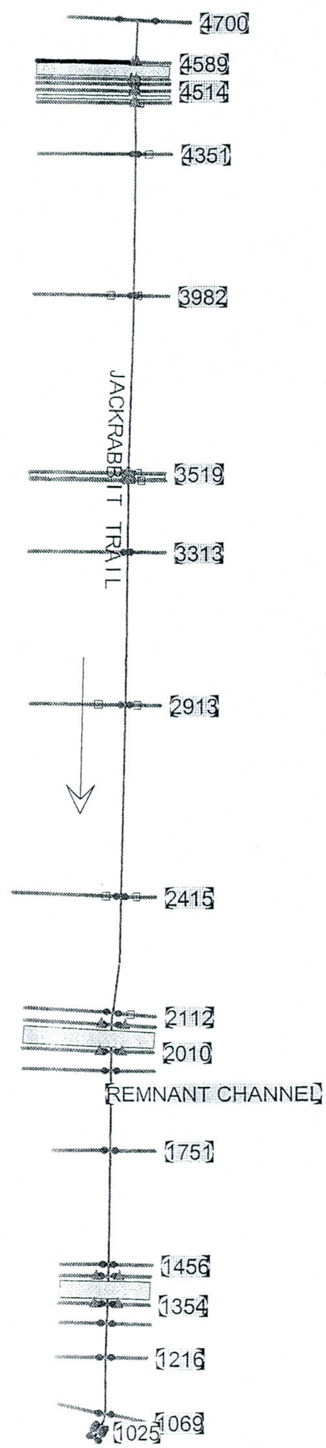
of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS

1 in Horiz. = 0.2 ft 1 in Vert. = 0.2 ft



: of the XS's are Geo-Referenced (-Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

1 in Horiz. = 4000 ft 1 in Vert. = 4000 ft

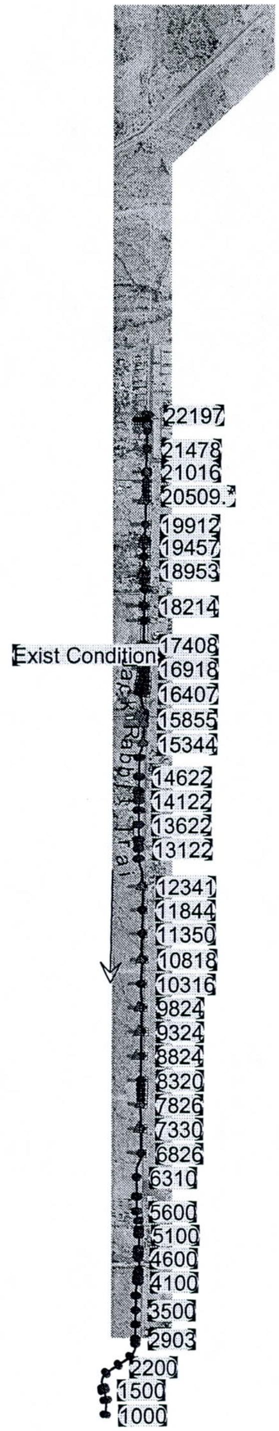


e natic data outside default extents (see View/Set Schematic Plot Extents...)

of the XS's are Geo-Referenced (Geo-Ref user entered XS) (Geo-Ref interpolated XS) (Non Geo-Ref user entered XS) (Non Geo-Ref interpolated XS)

1 in Horiz. = 500 ft   1 in Vert. = 500 ft

EXISTING CONDITION JACKRABBIT WASH



of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

1 in Horiz. = 4000 ft 1 in Vert. = 4000 ft

E.5.2 Report

E.5.2 Report

OUTFALL CHANNEL

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: FRS Outlet Channel CLOMR
Project File : CLOMRSub.prj
Run Date and Time: 10/14/2011 11:16:21 AM

Project in English units

Project Description:
Project: White Tanks FRS #3 Outlet Channel 100% Design CLOMR

Prepared
by:
Hoskin Ryan Consultants, Inc.
6245 N. 24th Parkway, Suite 100
Phoenix,
AZ 85016

Prepared for:
Flood Control District of Maricopa County
(FCDMC)
2801 W. Durango Street
Phoenix, AZ 85009

FCDMC: Contract No.:
2009-C012

FCDMC Project Manager: Gary Wesch

Topographic Mpping:

Storm
Event: 100-Year

Discharges were obtained from the HEC-1 model prepared for
this project.

Floodplain = Floodway
Encroachment Method 4 with no surcharge
is used.

****

PLAN DATA

Plan Title: Subcritical Flow Calc
Plan File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\CLOMRSub.p01

Geometry Title: 100% Design
Geometry File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\CLOMRSub.g01

Flow Title : 100-year design flow
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\CLOMRSub.f01

Plan Description:
Subcritical flow with Manning's n=0.045

Plan Summary Information:

Number of:	Cross Sections =	258	Multiple Openings =	0
	Culverts =	14	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data
Equal Conveyance = False
Left Offset = 0
Right Offset = 0

River = Channel Reach = FRS3

RS	Profile	Method	Value1	Value2
31266	FLOODWAY	4	0	
31216	FLOODWAY	4	0	
31204	FLOODWAY	4	0	
31000	FLOODWAY	4	0	

30812	FLOODWAY	4	0
30802	FLOODWAY	4	0
26495	FLOODWAY	4	0
26475	FLOODWAY	4	0
26200	FLOODWAY	4	0
25900	FLOODWAY	4	0
25600	FLOODWAY	4	0
25299	FLOODWAY	4	0
25195	FLOODWAY	4	0
25000	FLOODWAY	4	0
24700	FLOODWAY	4	0
24400	FLOODWAY	4	0
24081	FLOODWAY	4	0
24061	FLOODWAY	4	0
23639	FLOODWAY	4	0
23619	FLOODWAY	4	0
23300	FLOODWAY	4	0
23000	FLOODWAY	4	0
22731	FLOODWAY	4	0
22711	FLOODWAY	4	0
22635	FLOODWAY	4	0
22615	FLOODWAY	4	0
22500	FLOODWAY	4	0
22200	FLOODWAY	4	0
21900	FLOODWAY	4	0
21600	FLOODWAY	4	0
21326	FLOODWAY	4	0
21308	FLOODWAY	4	0
21275	FLOODWAY	4	0
21136	FLOODWAY	4	0
21135	FLOODWAY	4	0
21124	FLOODWAY	4	0
20850	FLOODWAY	4	0
20580	FLOODWAY	4	0
20550	FLOODWAY	4	0
20538	FLOODWAY	4	0
20532	FLOODWAY	4	0
20502	FLOODWAY	4	0
20501	FLOODWAY	4	0
20486	FLOODWAY	4	0
20300	FLOODWAY	4	0
20077	FLOODWAY	4	0
20048	FLOODWAY	4	0
20036	FLOODWAY	4	0
20030	FLOODWAY	4	0
20000	FLOODWAY	4	0
19999	FLOODWAY	4	0
19984	FLOODWAY	4	0
19650	FLOODWAY	4	0
19310	FLOODWAY	4	0
19277	FLOODWAY	4	0
19267	FLOODWAY	4	0
19260	FLOODWAY	4	0
19252	FLOODWAY	4	0
18960	FLOODWAY	4	0
18920	FLOODWAY	4	0
18340	FLOODWAY	4	0
18200	FLOODWAY	4	0
17900	FLOODWAY	4	0
17579	FLOODWAY	4	0
17549	FLOODWAY	4	0
17537	FLOODWAY	4	0
17531	FLOODWAY	4	0
17501	FLOODWAY	4	0
17500	FLOODWAY	4	0
17486	FLOODWAY	4	0
17350	FLOODWAY	4	0
17050	FLOODWAY	4	0
16779	FLOODWAY	4	0
16749	FLOODWAY	4	0
16737	FLOODWAY	4	0
16731	FLOODWAY	4	0
16701	FLOODWAY	4	0
16700	FLOODWAY	4	0
16686	FLOODWAY	4	0
16500	FLOODWAY	4	0
16200	FLOODWAY	4	0
15984	FLOODWAY	4	0
15939	FLOODWAY	4	0
15919	FLOODWAY	4	0
15742	FLOODWAY	4	0
15741	FLOODWAY	4	0
15731	FLOODWAY	4	0
15591	FLOODWAY	4	0
15561	FLOODWAY	4	0
15537	FLOODWAY	4	0
15531	FLOODWAY	4	0
15501	FLOODWAY	4	0
15500	FLOODWAY	4	0
15485	FLOODWAY	4	0
15300	FLOODWAY	4	0
15081	FLOODWAY	4	0
15046	FLOODWAY	4	0
15042	FLOODWAY	4	0
15000	FLOODWAY	4	0
14600	FLOODWAY	4	0
14300	FLOODWAY	4	0
14255	FLOODWAY	4	0
14238	FLOODWAY	4	0
14225	FLOODWAY	4	0
14175	FLOODWAY	4	0
14150	FLOODWAY	4	0
14100	FLOODWAY	4	0
13900	FLOODWAY	4	0
13600	FLOODWAY	4	0
13296	FLOODWAY	4	0

13266	FLOODWAY	4	0
13248	FLOODWAY	4	0
13235	FLOODWAY	4	0
13185	FLOODWAY	4	0
13175	FLOODWAY	4	0
13100	FLOODWAY	4	0
12900	FLOODWAY	4	0
12767	FLOODWAY	4	0
12736	FLOODWAY	4	0
12716	FLOODWAY	4	0
12710	FLOODWAY	4	0
12680	FLOODWAY	4	0
12679	FLOODWAY	4	0
12665	FLOODWAY	4	0
12450	FLOODWAY	4	0
12270	FLOODWAY	4	0
12240	FLOODWAY	4	0
12216	FLOODWAY	4	0
12210	FLOODWAY	4	0
12180	FLOODWAY	4	0
12179	FLOODWAY	4	0
12164	FLOODWAY	4	0
11900	FLOODWAY	4	0
11590	FLOODWAY	4	0
11560	FLOODWAY	4	0
11536	FLOODWAY	4	0
11530	FLOODWAY	4	0
11500	FLOODWAY	4	0
11499	FLOODWAY	4	0
11484	FLOODWAY	4	0
11300	FLOODWAY	4	0
11133	FLOODWAY	4	0
11086	FLOODWAY	4	0
11069	FLOODWAY	4	0
11063	FLOODWAY	4	0
11033	FLOODWAY	4	0
11032	FLOODWAY	4	0
11017	FLOODWAY	4	0
10800	FLOODWAY	4	0
10645	FLOODWAY	4	0
10599	FLOODWAY	4	0
10545	FLOODWAY	4	0
10521	FLOODWAY	4	0
10520	FLOODWAY	4	0
10500	FLOODWAY	4	0
10350	FLOODWAY	4	0
10154	FLOODWAY	4	0
10124	FLOODWAY	4	0
10100	FLOODWAY	4	0
10094	FLOODWAY	4	0
10064	FLOODWAY	4	0
10063	FLOODWAY	4	0
10048	FLOODWAY	4	0
9900	FLOODWAY	4	0
9728	FLOODWAY	4	0
9675	FLOODWAY	4	0
9660	FLOODWAY	4	0
9654	FLOODWAY	4	0
9624	FLOODWAY	4	0
9623	FLOODWAY	4	0
9608	FLOODWAY	4	0
9450	FLOODWAY	4	0
9299	FLOODWAY	4	0
9273	FLOODWAY	4	0
9218	FLOODWAY	4	0
9194	FLOODWAY	4	0
9193	FLOODWAY	4	0
9183	FLOODWAY	4	0
9000	FLOODWAY	4	0
8863	FLOODWAY	4	0
8809	FLOODWAY	4	0
8785	FLOODWAY	4	0
8779	FLOODWAY	4	0
8749	FLOODWAY	4	0
8748	FLOODWAY	4	0
8733	FLOODWAY	4	0
8600	FLOODWAY	4	0
8437	FLOODWAY	4	0
8400	FLOODWAY	4	0
8376	FLOODWAY	4	0
8370	FLOODWAY	4	0
8340	FLOODWAY	4	0
8339	FLOODWAY	4	0
8325	FLOODWAY	4	0
8150	FLOODWAY	4	0
8004	FLOODWAY	4	0
7970	FLOODWAY	4	0
7960	FLOODWAY	4	0
7907.3	FLOODWAY	4	0
7886	FLOODWAY	4	0
7885	FLOODWAY	4	0
7876	FLOODWAY	4	0
7700	FLOODWAY	4	0
7425	FLOODWAY	4	0
7376	FLOODWAY	4	0
7358	FLOODWAY	4	0
7352	FLOODWAY	4	0
7322	FLOODWAY	4	0
7321	FLOODWAY	4	0
7306	FLOODWAY	4	0
7150	FLOODWAY	4	0
7030	FLOODWAY	4	0
7000	FLOODWAY	4	0
6982	FLOODWAY	4	0
6976	FLOODWAY	4	0
6946	FLOODWAY	4	0

6945	FLOODWAY	4	0
6930	FLOODWAY	4	0
6800	FLOODWAY	4	0
6700	FLOODWAY	4	0
6673	FLOODWAY	4	0
6663	FLOODWAY	4	0
6570	FLOODWAY	4	0
6550	FLOODWAY	4	0
6200	FLOODWAY	4	0
5920	FLOODWAY	4	0
5902	FLOODWAY	4	0
5600	FLOODWAY	4	0
5400	FLOODWAY	4	0
5220	FLOODWAY	4	0
5193	FLOODWAY	4	0
5181	FLOODWAY	4	0
5100	FLOODWAY	4	0
4800	FLOODWAY	4	0
4748	FLOODWAY	4	0
4740	FLOODWAY	4	0
4650	FLOODWAY	4	0
4600	FLOODWAY	4	0
4350	FLOODWAY	4	0
4278	FLOODWAY	4	0
4200	FLOODWAY	4	0
4183	FLOODWAY	4	0
4168	FLOODWAY	4	0
4100	FLOODWAY	4	0
3800	FLOODWAY	4	0
3500	FLOODWAY	4	0
3200	FLOODWAY	4	0
2903	FLOODWAY	4	0
2885	FLOODWAY	4	0
2800	FLOODWAY	4	0
2500	FLOODWAY	4	0
2200	FLOODWAY	4	0
1900	FLOODWAY	4	0
1568	FLOODWAY	4	0
1552	FLOODWAY	4	0
1500	FLOODWAY	4	0
1300	FLOODWAY	4	0
1000	FLOODWAY	4	0

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FLOW DATA

Flow Title: 100-year design flow
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\CLOMRSub.f01

Flow Data (cfs)

River	Reach	RS	N=0.045	FLOODWAY
Channel	FRS3	31266	187	187
Channel	FRS3	26495	507	507
Channel	FRS3	19650	739	739
Channel	FRS3	18200	790	790
Channel	FRS3	15919	851	851
Channel	FRS3	10599	931	931
Channel	FRS3	4800	1073	1073

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Channel	FRS3	N=0.045	Normal S = 0.001	Known WS = 1048.6

Inline Structure Gate Openings
River = Channel
Reach = FRS3 RS = 30790
Gate = Slide Gate

# Open	Open Ht	# Open	Open Ht
5	2	0	0

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SUMMARY OF MANNING'S N VALUES

River:Channel

Reach	River Sta.	n1	n2	n3
FRS3	31266	.045	.015	.045
FRS3	31216	.045	.035	.045
FRS3	31204	.045	.045	.045
FRS3	31000	.045	.045	.045
FRS3	30812	.045	.045	.045
FRS3	30802	.045	.035	.045
FRS3	30801	Culvert		
FRS3	26495	.045	.045	.045
FRS3	26475	.045	.045	.045
FRS3	26200	.045	.045	.045
FRS3	25900	.045	.045	.045
FRS3	25600	.045	.045	.045
FRS3	25299	.045	.045	.045
FRS3	25195	.045	.045	.045
FRS3	25000	.045	.045	.045
FRS3	24700	.045	.045	.045
FRS3	24400	.045	.045	.045
FRS3	24081	.045	.045	.045
FRS3	24061	.045	.035	.045
FRS3	24052.5	Culvert		
FRS3	23639	.045	.035	.045

*FRS3	23619	.045	.045	.045
*FRS3	23300	.045	.045	.045
*FRS3	23000	.045	.045	.045
*FRS3	22731	.045	.045	.045
*FRS3	22711	.045	.035	.045
*FRS3	22704.4	Culvert		
*FRS3	22635	.045	.035	.045
*FRS3	22615	.045	.045	.045
*FRS3	22500	.045	.045	.045
*FRS3	22200	.045	.045	.045
*FRS3	21900	.045	.045	.045
*FRS3	21600	.045	.045	.045
*FRS3	21326	.045	.045	.045
*FRS3	21308	.045	.015	.045
*FRS3	21275	.045	.015	.045
*FRS3	21265.8	Culvert		
*FRS3	21136	.045	.015	.045
*FRS3	21135	.045	.035	.045
*FRS3	21124	.045	.045	.045
*FRS3	20850	.045	.045	.045
*FRS3	20580	.045	.045	.045
*FRS3	20550	.045	.015	.045
*FRS3	20538	.045	.015	.045
*FRS3	20532	.045	.015	.045
*FRS3	20502	.045	.015	.045
*FRS3	20501	.045	.035	.045
*FRS3	20486	.045	.045	.045
*FRS3	20300	.045	.045	.045
*FRS3	20077	.045	.045	.045
*FRS3	20048	.045	.015	.045
*FRS3	20036	.045	.015	.045
*FRS3	20030	.045	.015	.045
*FRS3	20000	.045	.015	.045
*FRS3	19999	.045	.035	.045
*FRS3	19984	.045	.045	.045
*FRS3	19650	.045	.045	.045
*FRS3	19310	.045	.045	.045
*FRS3	19277	.045	.015	.045
*FRS3	19267	.045	.015	.045
*FRS3	19260	.013	.013	.013
*FRS3	19252	.013	.013	.013
*FRS3	18960	.013	.013	.013
*FRS3	18920	.013	.013	.013
*FRS3	18340	.013	.013	.013
*FRS3	18200	.045	.045	.045
*FRS3	17900	.045	.045	.045
*FRS3	17579	.045	.045	.045
*FRS3	17549	.045	.015	.045
*FRS3	17537	.045	.015	.045
*FRS3	17531	.045	.015	.045
*FRS3	17501	.045	.015	.045
*FRS3	17500	.045	.035	.045
*FRS3	17486	.045	.045	.045
*FRS3	17350	.045	.045	.045
*FRS3	17050	.045	.045	.045
*FRS3	16779	.045	.045	.045
*FRS3	16749	.045	.015	.045
*FRS3	16737	.045	.015	.045
*FRS3	16731	.045	.015	.045
*FRS3	16701	.045	.015	.045
*FRS3	16700	.045	.035	.045
*FRS3	16686	.045	.045	.045
*FRS3	16500	.045	.045	.045
*FRS3	16200	.045	.045	.045
*FRS3	15984	.045	.045	.045
*FRS3	15939	.045	.015	.045
*FRS3	15919	.045	.015	.045
*FRS3	15918.6	Culvert		
*FRS3	15742	.045	.015	.045
*FRS3	15741	.045	.035	.045
*FRS3	15731	.045	.045	.045
*FRS3	15591	.045	.045	.045
*FRS3	15561	.045	.015	.045
*FRS3	15537	.045	.015	.045
*FRS3	15531	.045	.015	.045
*FRS3	15501	.045	.015	.045
*FRS3	15500	.045	.035	.045
*FRS3	15485	.045	.045	.045
*FRS3	15300	.045	.045	.045
*FRS3	15081	.045	.045	.045
*FRS3	15046	.045	.015	.045
*FRS3	15042	.045	.015	.045
*FRS3	15000	.045	.045	.045
*FRS3	14600	.045	.045	.045
*FRS3	14300	.045	.045	.045
*FRS3	14255	.045	.045	.045
*FRS3	14238	.045	.045	.045
*FRS3	14225	.045	.045	.045
*FRS3	14223.6	Culvert		
*FRS3	14175	.045	.045	.045
*FRS3	14150	.045	.045	.045
*FRS3	14100	.045	.045	.045
*FRS3	13900	.045	.045	.045
*FRS3	13600	.045	.045	.045
*FRS3	13296	.045	.045	.045
*FRS3	13266	.045	.045	.045
*FRS3	13248	.045	.045	.045
*FRS3	13235	.045	.045	.045
*FRS3	13233.5	Culvert		
*FRS3	13185	.045	.045	.045
*FRS3	13175	.045	.045	.045
*FRS3	13100	.045	.045	.045
*FRS3	12900	.045	.045	.045
*FRS3	12767	.045	.045	.045
*FRS3	12736	.045	.015	.045
*FRS3	12716	.045	.015	.045

*FRS3	*	12710	* .045*	.015*	.045*
*FRS3	*	12680	* .045*	.015*	.045*
*FRS3	*	12679	* .045*	.035*	.045*
*FRS3	*	12665	* .045*	.045*	.045*
*FRS3	*	12450	* .045*	.045*	.045*
*FRS3	*	12270	* .045*	.045*	.045*
*FRS3	*	12240	* .045*	.015*	.045*
*FRS3	*	12216	* .045*	.015*	.045*
*FRS3	*	12210	* .045*	.015*	.045*
*FRS3	*	12180	* .045*	.015*	.045*
*FRS3	*	12179	* .045*	.035*	.045*
*FRS3	*	12164	* .045*	.045*	.045*
*FRS3	*	11900	* .045*	.045*	.045*
*FRS3	*	11590	* .045*	.045*	.045*
*FRS3	*	11560	* .045*	.015*	.045*
*FRS3	*	11536	* .045*	.015*	.045*
*FRS3	*	11530	* .045*	.015*	.045*
*FRS3	*	11500	* .045*	.015*	.045*
*FRS3	*	11499	* .045*	.035*	.045*
*FRS3	*	11484	* .045*	.045*	.045*
*FRS3	*	11300	* .045*	.045*	.045*
*FRS3	*	11133	* .045*	.045*	.045*
*FRS3	*	11086	* .045*	.015*	.045*
*FRS3	*	11069	* .045*	.015*	.045*
*FRS3	*	11063	* .045*	.015*	.045*
*FRS3	*	11033	* .045*	.015*	.045*
*FRS3	*	11032	* .045*	.035*	.045*
*FRS3	*	11017	* .045*	.045*	.045*
*FRS3	*	10800	* .045*	.045*	.045*
*FRS3	*	10645	* .045*	.045*	.045*
*FRS3	*	10599	* .045*	.015*	.045*
*FRS3	*	10598	*Culvert *	*	*
*FRS3	*	10545	* .045*	.015*	.045*
*FRS3	*	10521	* .045*	.015*	.045*
*FRS3	*	10520	* .045*	.035*	.045*
*FRS3	*	10500	* .045*	.045*	.045*
*FRS3	*	10350	* .045*	.045*	.045*
*FRS3	*	10154	* .045*	.045*	.045*
*FRS3	*	10124	* .045*	.015*	.045*
*FRS3	*	10100	* .045*	.015*	.045*
*FRS3	*	10094	* .045*	.015*	.045*
*FRS3	*	10064	* .045*	.015*	.045*
*FRS3	*	10063	* .045*	.035*	.045*
*FRS3	*	10048	* .045*	.045*	.045*
*FRS3	*	9900	* .045*	.045*	.045*
*FRS3	*	9728	* .045*	.045*	.045*
*FRS3	*	9675	* .045*	.015*	.045*
*FRS3	*	9660	* .045*	.015*	.045*
*FRS3	*	9654	* .045*	.015*	.045*
*FRS3	*	9624	* .045*	.015*	.045*
*FRS3	*	9623	* .045*	.035*	.045*
*FRS3	*	9608	* .045*	.045*	.045*
*FRS3	*	9450	* .045*	.045*	.045*
*FRS3	*	9299	* .045*	.045*	.045*
*FRS3	*	9273	* .045*	.015*	.045*
*FRS3	*	9272	*Culvert *	*	*
*FRS3	*	9218	* .045*	.015*	.045*
*FRS3	*	9194	* .045*	.015*	.045*
*FRS3	*	9193	* .045*	.035*	.045*
*FRS3	*	9183	* .045*	.045*	.035*
*FRS3	*	9000	* .045*	.045*	.045*
*FRS3	*	8863	* .045*	.045*	.045*
*FRS3	*	8809	* .045*	.015*	.045*
*FRS3	*	8785	* .045*	.015*	.045*
*FRS3	*	8779	* .045*	.015*	.045*
*FRS3	*	8749	* .045*	.015*	.045*
*FRS3	*	8748	* .045*	.035*	.045*
*FRS3	*	8733	* .045*	.045*	.045*
*FRS3	*	8600	* .045*	.045*	.045*
*FRS3	*	8437	* .045*	.045*	.045*
*FRS3	*	8400	* .045*	.015*	.045*
*FRS3	*	8376	* .045*	.015*	.045*
*FRS3	*	8370	* .045*	.015*	.045*
*FRS3	*	8340	* .045*	.015*	.045*
*FRS3	*	8339	* .045*	.035*	.045*
*FRS3	*	8325	* .045*	.045*	.045*
*FRS3	*	8150	* .045*	.045*	.045*
*FRS3	*	8004	* .045*	.045*	.045*
*FRS3	*	7970	* .045*	.015*	.045*
*FRS3	*	7960	* .045*	.015*	.045*
*FRS3	*	7958.2	*Culvert *	*	*
*FRS3	*	7907.3	* .045*	.015*	.045*
*FRS3	*	7886	* .045*	.015*	.045*
*FRS3	*	7885	* .045*	.035*	.045*
*FRS3	*	7876	* .045*	.045*	.045*
*FRS3	*	7700	* .045*	.045*	.045*
*FRS3	*	7425	* .045*	.045*	.045*
*FRS3	*	7376	* .045*	.015*	.045*
*FRS3	*	7358	* .045*	.015*	.045*
*FRS3	*	7352	* .045*	.015*	.045*
*FRS3	*	7322	* .045*	.015*	.045*
*FRS3	*	7321	* .045*	.035*	.045*
*FRS3	*	7306	* .045*	.045*	.045*
*FRS3	*	7150	* .045*	.045*	.045*
*FRS3	*	7030	* .045*	.045*	.045*
*FRS3	*	7000	* .045*	.015*	.045*
*FRS3	*	6982	* .045*	.015*	.045*
*FRS3	*	6976	* .045*	.015*	.045*
*FRS3	*	6946	* .045*	.015*	.045*
*FRS3	*	6945	* .045*	.035*	.045*
*FRS3	*	6930	* .045*	.045*	.045*
*FRS3	*	6800	* .045*	.045*	.045*
*FRS3	*	6700	* .045*	.045*	.045*
*FRS3	*	6673	* .045*	.015*	.045*
*FRS3	*	6663	* .045*	.015*	.045*
*FRS3	*	6661.6	*Culvert *	*	*

FRS3	6570	.035	.015	.035
FRS3	6550	.035	.015	.035
FRS3	6200	.035	.015	.035
FRS3	5920	.035	.015	.035
FRS3	5902	.035	.015	.035
FRS3	5600	.035	.015	.035
FRS3	5400	.035	.015	.035
FRS3	5342.1	Culvert		
FRS3	5220	.035	.015	.035
FRS3	5193	.035	.015	.035
FRS3	5181	.035	.015	.035
FRS3	5100	.035	.015	.035
FRS3	4800	.035	.015	.035
FRS3	4748	.035	.015	.035
FRS3	4740	.035	.015	.035
FRS3	4729.5	Culvert		
FRS3	4650	.035	.015	.035
FRS3	4600	.035	.015	.035
FRS3	4350	.035	.015	.035
FRS3	4278	.035	.015	.035
FRS3	4271	Culvert		
FRS3	4200	.035	.015	.035
FRS3	4183	.035	.015	.035
FRS3	4168	.035	.015	.035
FRS3	4100	.035	.015	.035
FRS3	3800	.035	.015	.035
FRS3	3500	.035	.015	.035
FRS3	3200	.035	.015	.035
FRS3	2903	.035	.015	.035
FRS3	2885	.035	.015	.035
FRS3	2800	.035	.015	.035
FRS3	2500	.035	.015	.035
FRS3	2200	.035	.015	.035
FRS3	1900	.035	.015	.035
FRS3	1568	.035	.015	.035
FRS3	1552	.035	.015	.035
FRS3	1500	.035	.015	.035
FRS3	1300	.035	.015	.035
FRS3	1000	.035	.015	.035

SUMMARY OF REACH LENGTHS

River: Channel

Reach	River Sta.	Left	Channel	Right
FRS3	31266	50	50	50
FRS3	31216	12.7	12.7	12.7
FRS3	31204	203.5	203.5	203.5
FRS3	31000	188.5	188.5	188.5
FRS3	30812	10.4	10.4	10.4
FRS3	30802	4306.1	4306.1	4306.1
FRS3	30801	Culvert		
FRS3	26495	20	20	20
FRS3	26475	275	275	275
FRS3	26200	300	300	300
FRS3	25900	300	300	300
FRS3	25600	301	301	301
FRS3	25299	104	104	104
FRS3	25195	195	195	195
FRS3	25000	300	300	300
FRS3	24700	300	300	300
FRS3	24400	319	319	319
FRS3	24081	20	20	20
FRS3	24061	422	422	422
FRS3	24052.5	Culvert		
FRS3	23639	20	20	20
FRS3	23619	319	319	319
FRS3	23300	300	300	300
FRS3	23000	269	269	269
FRS3	22731	20	20	20
FRS3	22711	76	76	76
FRS3	22704.4	Culvert		
FRS3	22635	20	20	20
FRS3	22615	115	115	115
FRS3	22500	300	300	300
FRS3	22200	300	300	300
FRS3	21900	300	300	300
FRS3	21600	274	274	274
FRS3	21326	18.2	18.2	18.2
FRS3	21308	32.9	32.9	32.9
FRS3	21275	138.9	138.9	138.9
FRS3	21265.8	Culvert		
FRS3	21136	1	1	1
FRS3	21135	20	11	20
FRS3	21124	274	274	274
FRS3	20850	270	270	270
FRS3	20580	30	30	30
FRS3	20550	12	12	12
FRS3	20538	6	6	6
FRS3	20532	30	30	30
FRS3	20502	1	1	1
FRS3	20501	20	15	20
FRS3	20486	186	186	186
FRS3	20300	223	223	223
FRS3	20077	29	29	29
FRS3	20048	12	12	12
FRS3	20036	6	6	6
FRS3	20030	30	30	30
FRS3	20000	1	1	1
FRS3	19999	20	15	20
FRS3	19984	334	334	334
FRS3	19650	340	340	340

*FRS3	*	19310	*	33*	33*	33*
*FRS3	*	19277	*	10*	10*	10*
*FRS3	*	19267	*	7*	7*	7*
*FRS3	*	19260	*	8.3*	8.3*	8.3*
*FRS3	*	19252	*	291.7*	291.7*	291.7*
*FRS3	*	18960	*	40*	40*	40*
*FRS3	*	18920	*	580*	580*	580*
*FRS3	*	18340	*	140*	140*	140*
*FRS3	*	18200	*	300*	300*	300*
*FRS3	*	17900	*	321*	321*	321*
*FRS3	*	17579	*	30*	30*	30*
*FRS3	*	17549	*	12*	12*	12*
*FRS3	*	17537	*	6*	6*	6*
*FRS3	*	17531	*	30*	30*	30*
*FRS3	*	17501	*	1*	1*	1*
*FRS3	*	17500	*	20*	14*	20*
*FRS3	*	17486	*	136*	136*	136*
*FRS3	*	17350	*	300*	300*	300*
*FRS3	*	17050	*	271*	271*	271*
*FRS3	*	16779	*	30*	30*	30*
*FRS3	*	16749	*	12*	12*	12*
*FRS3	*	16737	*	6*	6*	6*
*FRS3	*	16731	*	5.73*	30*	30*
*FRS3	*	16701	*	1*	1*	1*
*FRS3	*	16700	*	20*	14*	20*
*FRS3	*	16686	*	186*	186*	186*
*FRS3	*	16500	*	300*	300*	300*
*FRS3	*	16200	*	216*	216*	216*
*FRS3	*	15984	*	45.3*	45.3*	45.3*
*FRS3	*	15939	*	20*	20*	20*
*FRS3	*	15919	*	176.3*	176.3*	176.3*
*FRS3	*	15918.6	*Culvert	*	*	*
*FRS3	*	15742	*	1*	1*	1*
*FRS3	*	15741	*	20*	10.4*	20*
*FRS3	*	15731	*	140*	140*	140*
*FRS3	*	15591	*	30*	30*	30*
*FRS3	*	15561	*	24*	24*	24*
*FRS3	*	15537	*	6*	6*	6*
*FRS3	*	15531	*	30*	30*	30*
*FRS3	*	15501	*	1*	1*	1*
*FRS3	*	15500	*	20*	15*	20*
*FRS3	*	15485	*	185*	185*	185*
*FRS3	*	15300	*	219*	219*	219*
*FRS3	*	15081	*	35*	35*	35*
*FRS3	*	15046	*	4*	4*	4*
*FRS3	*	15042	*	42*	42*	42*
*FRS3	*	15000	*	400*	400*	400*
*FRS3	*	14600	*	300*	300*	300*
*FRS3	*	14300	*	45*	45*	45*
*FRS3	*	14255	*	17*	17*	17*
*FRS3	*	14238	*	13*	13*	13*
*FRS3	*	14225	*	50*	50*	50*
*FRS3	*	14223.6	*Culvert	*	*	*
*FRS3	*	14175	*	25*	25*	25*
*FRS3	*	14150	*	50*	50*	50*
*FRS3	*	14100	*	200*	200*	200*
*FRS3	*	13900	*	300*	300*	300*
*FRS3	*	13600	*	304*	304*	304*
*FRS3	*	13296	*	30*	30*	30*
*FRS3	*	13266	*	18*	18*	18*
*FRS3	*	13248	*	13*	13*	13*
*FRS3	*	13235	*	50*	50*	50*
*FRS3	*	13233.5	*Culvert	*	*	*
*FRS3	*	13185	*	10*	10*	10*
*FRS3	*	13175	*	75*	75*	75*
*FRS3	*	13100	*	200*	200*	200*
*FRS3	*	12900	*	133*	133*	133*
*FRS3	*	12767	*	31*	31*	31*
*FRS3	*	12736	*	20*	20*	20*
*FRS3	*	12716	*	6*	6*	6*
*FRS3	*	12710	*	30*	30*	30*
*FRS3	*	12680	*	1*	1*	1*
*FRS3	*	12679	*	20*	14*	20*
*FRS3	*	12665	*	215*	215*	215*
*FRS3	*	12450	*	180*	180*	180*
*FRS3	*	12270	*	30*	30*	30*
*FRS3	*	12240	*	24*	24*	24*
*FRS3	*	12216	*	6*	6*	6*
*FRS3	*	12210	*	30*	30*	30*
*FRS3	*	12180	*	1*	1*	1*
*FRS3	*	12179	*	20*	15*	20*
*FRS3	*	12164	*	264*	264*	264*
*FRS3	*	11900	*	310*	310*	310*
*FRS3	*	11590	*	30*	30*	30*
*FRS3	*	11560	*	24*	24*	24*
*FRS3	*	11536	*	6*	6*	6*
*FRS3	*	11530	*	30*	30*	30*
*FRS3	*	11500	*	1*	1*	1*
*FRS3	*	11499	*	20*	15*	20*
*FRS3	*	11484	*	184*	184*	184*
*FRS3	*	11300	*	167*	167*	167*
*FRS3	*	11133	*	47.5*	47.5*	47.5*
*FRS3	*	11086	*	16.8*	16.8*	16.8*
*FRS3	*	11069	*	6*	6*	6*
*FRS3	*	11063	*	30*	30*	30*
*FRS3	*	11033	*	1*	1*	1*
*FRS3	*	11032	*	20*	14.5*	20*
*FRS3	*	11017	*	217.2*	217.2*	217.2*
*FRS3	*	10800	*	155*	155*	155*
*FRS3	*	10645	*	45.9*	45.9*	45.9*
*FRS3	*	10599	*	54*	54*	54*
*FRS3	*	10598	*Culvert	*	*	*
*FRS3	*	10545	*	24.3*	24.3*	24.3*
*FRS3	*	10521	*	1*	1*	1*
*FRS3	*	10520	*	30*	19.8*	30*
*FRS3	*	10500	*	150*	150*	150*

FRS3	10350	196	196	196
FRS3	10154	30	30	30
FRS3	10124	24	24	24
FRS3	10100	6	6	6
FRS3	10094	30	30	30
FRS3	10064	1	1	1
FRS3	10063	20	15	20
FRS3	10048	148	148	148
FRS3	9900	172	172	172
FRS3	9728	53	53	53
FRS3	9675	15	15	15
FRS3	9660	6	6	6
FRS3	9654	30	30	30
FRS3	9624	1	1	1
FRS3	9623	20	15	20
FRS3	9608	158	158	158
FRS3	9450	151	151	151
FRS3	9299	26.9	26.9	26.9
FRS3	9273	54	54	54
FRS3	9272	Culvert		
FRS3	9218	24.3	24.3	24.3
FRS3	9194	1	1	1
FRS3	9193	20	9.8	20
FRS3	9183	183	183	183
FRS3	9000	137	137	137
FRS3	8863	54	54	54
FRS3	8809	24	24	24
FRS3	8785	6	6	6
FRS3	8779	30	30	30
FRS3	8749	1	1	1
FRS3	8748	20	15	20
FRS3	8733	133	133	133
FRS3	8600	163	163	163
FRS3	8437	37	37	37
FRS3	8400	24	24	24
FRS3	8376	6	6	6
FRS3	8370	30	30	30
FRS3	8340	1	1	1
FRS3	8339	20	14	20
FRS3	8325	175	175	175
FRS3	8150	146	146	146
FRS3	8004	33.6	33.6	33.6
FRS3	7970	10	10	10
FRS3	7960	53.1	53.1	53.1
FRS3	7958.2	Culvert		
FRS3	7907.3	21.3	21.3	21.3
FRS3	7886	1	1	1
FRS3	7885	19	9	19
FRS3	7876	176	176	176
FRS3	7700	275	275	275
FRS3	7425	49	49	49
FRS3	7376	18	18	18
FRS3	7358	6	6	6
FRS3	7352	30	30	30
FRS3	7322	1	1	1
FRS3	7321	20	15	20
FRS3	7306	156	156	156
FRS3	7150	120	120	120
FRS3	7030	30	30	30
FRS3	7000	18	18	18
FRS3	6982	6	6	6
FRS3	6976	30	30	30
FRS3	6946	1	1	1
FRS3	6945	20	15	20
FRS3	6930	130	130	130
FRS3	6800	100	100	100
FRS3	6700	26.84	26.84	26.84
FRS3	6673	10	10	10
FRS3	6663	93.16	93.16	93.16
FRS3	6661.6	Culvert		
FRS3	6570	20	20	20
FRS3	6550	350	350	350
FRS3	6200	280	280	280
FRS3	5920	18	18	18
FRS3	5902	302	302	302
FRS3	5600	200	200	200
FRS3	5400	180	180	180
FRS3	5342.1	Culvert		
FRS3	5220	27	27	27
FRS3	5193	12	12	12
FRS3	5181	81	81	81
FRS3	5100	300	300	300
FRS3	4800	52	52	52
FRS3	4748	8	8	8
FRS3	4740	90	90	90
FRS3	4729.5	Culvert		
FRS3	4650	50	50	50
FRS3	4600	250	250	250
FRS3	4350	72	72	72
FRS3	4278	78	78	78
FRS3	4271	Culvert		
FRS3	4200	17	17	17
FRS3	4183	15	15	15
FRS3	4168	68	68	68
FRS3	4100	300	300	300
FRS3	3800	300	300	300
FRS3	3500	300	300	300
FRS3	3200	297	297	297
FRS3	2903	18	18	18
FRS3	2885	85	85	85
FRS3	2800	300	300	300
FRS3	2500	300	300	300
FRS3	2200	300	300	300
FRS3	1900	332	332	332
FRS3	1568	16	16	16
FRS3	1552	52	52	52

FRS3	1500	200	200	200
FRS3	1300	300	300	300
FRS3	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Channel

Reach	River Sta.	Contr.	Expan.
FRS3	31266	.1	.3
FRS3	31216	.1	.3
FRS3	31204	.1	.3
FRS3	31000	.1	.3
FRS3	30812	.1	.3
FRS3	30802	.1	.3
FRS3	30801	Culvert	
FRS3	26495	.1	.3
FRS3	26475	.1	.3
FRS3	26200	.1	.3
FRS3	25900	.1	.3
FRS3	25600	.1	.3
FRS3	25299	.1	.3
FRS3	25195	.1	.3
FRS3	25000	.1	.3
FRS3	24700	.1	.3
FRS3	24400	.1	.3
FRS3	24081	.1	.3
FRS3	24061	.1	.3
FRS3	24052.5	Culvert	
FRS3	23639	.1	.3
FRS3	23619	.1	.3
FRS3	23300	.1	.3
FRS3	23000	.1	.3
FRS3	22731	.1	.3
FRS3	22711	.1	.3
FRS3	22704.4	Culvert	
FRS3	22635	.1	.3
FRS3	22615	.1	.3
FRS3	22500	.1	.3
FRS3	22200	.1	.3
FRS3	21900	.1	.3
FRS3	21600	.1	.3
FRS3	21326	.1	.3
FRS3	21308	.1	.3
FRS3	21275	.1	.3
FRS3	21265.8	Culvert	
FRS3	21136	.1	.3
FRS3	21135	.1	.3
FRS3	21124	.1	.3
FRS3	20850	.1	.3
FRS3	20580	.1	.3
FRS3	20550	.1	.3
FRS3	20538	.1	.3
FRS3	20532	.1	.3
FRS3	20502	.1	.3
FRS3	20501	.1	.3
FRS3	20486	.1	.3
FRS3	20300	.1	.3
FRS3	20077	.1	.3
FRS3	20048	.1	.3
FRS3	20036	.1	.3
FRS3	20030	.1	.3
FRS3	20000	.1	.3
FRS3	19999	.1	.3
FRS3	19984	.1	.3
FRS3	19650	.1	.3
FRS3	19310	.1	.3
FRS3	19277	.1	.3
FRS3	19267	.1	.3
FRS3	19260	.1	.3
FRS3	19252	.1	.3
FRS3	18960	.1	.3
FRS3	18920	.1	.3
FRS3	18340	.1	.3
FRS3	18200	.1	.3
FRS3	17900	.1	.3
FRS3	17579	.1	.3
FRS3	17549	.1	.3
FRS3	17537	.1	.3
FRS3	17531	.1	.3
FRS3	17501	.1	.3
FRS3	17500	.1	.3
FRS3	17486	.1	.3
FRS3	17350	.1	.3
FRS3	17050	.1	.3
FRS3	16779	.1	.3
FRS3	16749	.1	.3
FRS3	16737	.1	.3
FRS3	16731	.1	.3
FRS3	16701	.1	.3
FRS3	16700	.1	.3
FRS3	16686	.1	.3
FRS3	16500	.1	.3
FRS3	16200	.1	.3
FRS3	15984	.1	.3
FRS3	15939	.1	.3
FRS3	15919	.1	.3
FRS3	15918.6	Culvert	
FRS3	15742	.1	.3
FRS3	15741	.1	.3
FRS3	15731	.1	.3
FRS3	15591	.1	.3

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*FRS3      *   15561   *      .1*    .3*
*FRS3      *   15537   *      .1*    .3*
*FRS3      *   15531   *      .1*    .3*
*FRS3      *   15501   *      .1*    .3*
*FRS3      *   15500   *      .1*    .3*
*FRS3      *   15485   *      .1*    .3*
*FRS3      *   15300   *      .1*    .3*
*FRS3      *   15081   *      .1*    .3*
*FRS3      *   15046   *      .1*    .3*
*FRS3      *   15042   *      .1*    .3*
*FRS3      *   15000   *      .1*    .3*
*FRS3      *   14600   *      .1*    .3*
*FRS3      *   14300   *      .1*    .3*
*FRS3      *   14255   *      .1*    .3*
*FRS3      *   14238   *      .1*    .3*
*FRS3      *   14225   *      .1*    .3*
*FRS3      *   14223.6 *Culvert  *      *
*FRS3      *   14175   *      .1*    .3*
*FRS3      *   14150   *      .1*    .3*
*FRS3      *   14100   *      .1*    .3*
*FRS3      *   13900   *      .1*    .3*
*FRS3      *   13600   *      .1*    .3*
*FRS3      *   13296   *      .1*    .3*
*FRS3      *   13266   *      .1*    .3*
*FRS3      *   13248   *      .1*    .3*
*FRS3      *   13235   *      .1*    .3*
*FRS3      *   13233.5 *Culvert  *      *
*FRS3      *   13185   *      .1*    .3*
*FRS3      *   13175   *      .1*    .3*
*FRS3      *   13100   *      .1*    .3*
*FRS3      *   12900   *      .1*    .3*
*FRS3      *   12767   *      .1*    .3*
*FRS3      *   12736   *      .1*    .3*
*FRS3      *   12716   *      .1*    .3*
*FRS3      *   12710   *      .1*    .3*
*FRS3      *   12680   *      .1*    .3*
*FRS3      *   12679   *      .1*    .3*
*FRS3      *   12665   *      .1*    .3*
*FRS3      *   12450   *      .1*    .3*
*FRS3      *   12270   *      .1*    .3*
*FRS3      *   12240   *      .1*    .3*
*FRS3      *   12216   *      .1*    .3*
*FRS3      *   12210   *      .1*    .3*
*FRS3      *   12180   *      .1*    .3*
*FRS3      *   12179   *      .1*    .3*
*FRS3      *   12164   *      .1*    .3*
*FRS3      *   11900   *      .1*    .3*
*FRS3      *   11590   *      .1*    .3*
*FRS3      *   11560   *      .1*    .3*
*FRS3      *   11536   *      .1*    .3*
*FRS3      *   11530   *      .1*    .3*
*FRS3      *   11500   *      .1*    .3*
*FRS3      *   11499   *      .1*    .3*
*FRS3      *   11484   *      .1*    .3*
*FRS3      *   11300   *      .1*    .3*
*FRS3      *   11133   *      .1*    .3*
*FRS3      *   11086   *      .1*    .3*
*FRS3      *   11069   *      .1*    .3*
*FRS3      *   11063   *      .1*    .3*
*FRS3      *   11033   *      .1*    .3*
*FRS3      *   11032   *      .1*    .3*
*FRS3      *   11017   *      .1*    .3*
*FRS3      *   10800   *      .1*    .3*
*FRS3      *   10645   *      .1*    .3*
*FRS3      *   10599   *      .1*    .3*
*FRS3      *   10598   *Culvert  *      *
*FRS3      *   10545   *      .1*    .3*
*FRS3      *   10521   *      .1*    .3*
*FRS3      *   10520   *      .1*    .3*
*FRS3      *   10500   *      .1*    .3*
*FRS3      *   10350   *      .1*    .3*
*FRS3      *   10154   *      .1*    .3*
*FRS3      *   10124   *      .1*    .3*
*FRS3      *   10100   *      .1*    .3*
*FRS3      *   10094   *      .1*    .3*
*FRS3      *   10064   *      .1*    .3*
*FRS3      *   10063   *      .1*    .3*
*FRS3      *   10048   *      .1*    .3*
*FRS3      *   9900    *      .1*    .3*
*FRS3      *   9728    *      .1*    .3*
*FRS3      *   9675    *      .1*    .3*
*FRS3      *   9660    *      .1*    .3*
*FRS3      *   9654    *      .1*    .3*
*FRS3      *   9624    *      .1*    .3*
*FRS3      *   9623    *      .1*    .3*
*FRS3      *   9608    *      .1*    .3*
*FRS3      *   9450    *      .1*    .3*
*FRS3      *   9299    *      .1*    .3*
*FRS3      *   9273    *      .1*    .3*
*FRS3      *   9272    *Culvert  *      *
*FRS3      *   9218    *      .1*    .3*
*FRS3      *   9194    *      .1*    .3*
*FRS3      *   9193    *      .1*    .3*
*FRS3      *   9183    *      .1*    .3*
*FRS3      *   9000    *      .1*    .3*
*FRS3      *   8863    *      .1*    .3*
*FRS3      *   8809    *      .1*    .3*
*FRS3      *   8785    *      .1*    .3*
*FRS3      *   8779    *      .1*    .3*
*FRS3      *   8749    *      .1*    .3*
*FRS3      *   8748    *      .1*    .3*
*FRS3      *   8733    *      .1*    .3*
*FRS3      *   8600    *      .1*    .3*
*FRS3      *   8437    *      .1*    .3*
*FRS3      *   8400    *      .1*    .3*
*FRS3      *   8376    *      .1*    .3*
```

```
*FRS3           *     8370    *        .1*        .3*
*FRS3           *     8340    *        .1*        .3*
*FRS3           *     8339    *        .1*        .3*
*FRS3           *     8325    *        .1*        .3*
*FRS3           *     8150    *        .1*        .3*
*FRS3           *     8004    *        .1*        .3*
*FRS3           *     7970    *        .1*        .3*
*FRS3           *     7960    *        .1*        .3*
*FRS3           *     7958.2  *Culvert  *          *
*FRS3           *     7907.3  *        .1*        .3*
*FRS3           *     7886    *        .1*        .3*
*FRS3           *     7885    *        .1*        .3*
*FRS3           *     7876    *        .1*        .3*
*FRS3           *     7700    *        .1*        .3*
*FRS3           *     7425    *        .1*        .3*
*FRS3           *     7376    *        .1*        .3*
*FRS3           *     7358    *        .1*        .3*
*FRS3           *     7352    *        .1*        .3*
*FRS3           *     7322    *        .1*        .3*
*FRS3           *     7321    *        .1*        .3*
*FRS3           *     7306    *        .1*        .3*
*FRS3           *     7150    *        .1*        .3*
*FRS3           *     7030    *        .1*        .3*
*FRS3           *     7000    *        .1*        .3*
*FRS3           *     6982    *        .1*        .3*
*FRS3           *     6976    *        .1*        .3*
*FRS3           *     6946    *        .1*        .3*
*FRS3           *     6945    *        .1*        .3*
*FRS3           *     6930    *        .1*        .3*
*FRS3           *     6800    *        .1*        .3*
*FRS3           *     6700    *        .1*        .3*
*FRS3           *     6673    *        .1*        .3*
*FRS3           *     6663    *        .1*        .3*
*FRS3           *     6661.6  *Culvert  *          *
*FRS3           *     6570    *        .1*        .3*
*FRS3           *     6550    *        .1*        .3*
*FRS3           *     6200    *        .1*        .3*
*FRS3           *     5920    *        .1*        .3*
*FRS3           *     5902    *        .1*        .3*
*FRS3           *     5600    *        .1*        .3*
*FRS3           *     5400    *        .1*        .3*
*FRS3           *     5342.1  *Culvert  *          *
*FRS3           *     5220    *        .1*        .3*
*FRS3           *     5193    *        .1*        .3*
*FRS3           *     5181    *        .1*        .3*
*FRS3           *     5100    *        .1*        .3*
*FRS3           *     4800    *        .1*        .3*
*FRS3           *     4748    *        .1*        .3*
*FRS3           *     4740    *        .1*        .3*
*FRS3           *     4729.5  *Culvert  *          *
*FRS3           *     4650    *        .1*        .3*
*FRS3           *     4600    *        .1*        .3*
*FRS3           *     4350    *        .1*        .3*
*FRS3           *     4278    *        .1*        .3*
*FRS3           *     4271    *Culvert  *          *
*FRS3           *     4200    *        .1*        .3*
*FRS3           *     4183    *        .1*        .3*
*FRS3           *     4168    *        .1*        .3*
*FRS3           *     4100    *        .1*        .3*
*FRS3           *     3800    *        .1*        .3*
*FRS3           *     3500    *        .1*        .3*
*FRS3           *     3200    *        .1*        .3*
*FRS3           *     2903    *        .1*        .3*
*FRS3           *     2885    *        .1*        .3*
*FRS3           *     2800    *        .1*        .3*
*FRS3           *     2500    *        .1*        .3*
*FRS3           *     2200    *        .1*        .3*
*FRS3           *     1900    *        .1*        .3*
*FRS3           *     1568    *        .1*        .3*
*FRS3           *     1552    *        .1*        .3*
*FRS3           *     1500    *        .1*        .3*
*FRS3           *     1300    *        .1*        .3*
*FRS3           *     1000    *        .1*        .3*
*********************************************************
```

REMNANT CHANNEL

REMNANTCHANNEL.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: REMNANT CHANNEL
Project File : REMNANTCHANNEL.prj
Run Date and Time: 10/14/2011 11:36:23 AM

Project in English units

Project Description:
Project: White Tanks FRS #3 Outlet Channel 100% Design CLOMR - Remnant Channel
Update

Prepared by:
Hoskin Ryan Consultants, Inc.
6245 N. 24th Parkway,
Suite 100
Phoenix, AZ 85016

Prepared for:
Flood Control District of
Maricopa County (FCDMC)
2801 W. Durango Street
Phoenix, AZ 85009

FCDMC:
Contract No.: 2009-C012

FCDMC Project Manager: Gary Wesch

Topographic
Mpping:

Storm Event: 100-Year

Discharges were obtained from the HEC-1
model prepared for this project.

****

PLAN DATA

Plan Title: REMNANT CHANNEL
Plan File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\REMNANTCHANNEL.p01

Geometry Title: REMNANT CHANNEL
Geometry File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\REMNANTCHANNEL.g01

Flow Title : REMNANT CHANNEL
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\REMNANTCHANNEL.f01

Plan Summary Information:

Number of:					
	Cross Sections =	29	Multiple Openings =	0
	Culverts =	5	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

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

River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL

RS	Profile	Method	Value1	Value2
4700	FLOODWAY	1	965	1060.72
4589	FLOODWAY	1	965	1012
4545	FLOODWAY	1	965	1010.49
4532	FLOODWAY	1	965	1008.44
4514	FLOODWAY	1	965	1009.3
4483	FLOODWAY	1	964	1008.11
4351	FLOODWAY	1	966.65	1012.77
3982	FLOODWAY	1	987.17	1039.22
3519	FLOODWAY	1	975.4	1016.13
3500	FLOODWAY	1	980.42	1016
3313	FLOODWAY	1	984.06	1016.18

2913	FLOODWAY	1	979.11	1035
2415	FLOODWAY	1	975.33	1022.44
2112	FLOODWAY	1	983.19	1025.4
2081	FLOODWAY	1	978.73	1030
2010	FLOODWAY	1	979.64	1025
1960	FLOODWAY	1	981.62	1024.12
1751	FLOODWAY	1	985.85	1027.04
1456	FLOODWAY	1	982.94	1021.33
1426	FLOODWAY	1	981.25	1026
1354	FLOODWAY	1	980.07	1019.97
1304	FLOODWAY	1	979.65	1021.45
1216	FLOODWAY	1	983	1018.42
1069	FLOODWAY	1	977.21	1023.08
1034	FLOODWAY	1	987.5	1012.5
1030	FLOODWAY	1	987.5	1012.5
1025	FLOODWAY	1	987.5	1012.5
1020	FLOODWAY	1	987.5	1012.5
1000	FLOODWAY	1	987.5	1012.5

FLOW DATA

Flow Title: REMNANT CHANNEL
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\REMNANTCHANNEL.f01

Flow Data (cfs)

River	Reach	RS	FLOODPLAIN	FLOODWAY
JACKRABBIT TRAIL	REMNANT CHANNEL	4700	25	25
JACKRABBIT TRAIL	REMNANT CHANNEL	4351	98	98
JACKRABBIT TRAIL	REMNANT CHANNEL	3982	237	237
JACKRABBIT TRAIL	REMNANT CHANNEL	3519	237	237
JACKRABBIT TRAIL	REMNANT CHANNEL	2913	482	482
JACKRABBIT TRAIL	REMNANT CHANNEL	2415	482	482
JACKRABBIT TRAIL	REMNANT CHANNEL	2112	250	250
JACKRABBIT TRAIL	REMNANT CHANNEL	1426	339	339
JACKRABBIT TRAIL	REMNANT CHANNEL	1354	339	339

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
JACKRABBIT TRAIL	REMNANT CHANNEL	FLOODPLAIN		Known WS = 1165.74

SUMMARY OF MANNING'S N VALUES

River:JACKRABBIT TRAIL

Reach	River Sta.	n1	n2	n3
REMNANT CHANNEL	4700	.049	.034	.049
REMNANT CHANNEL	4589	.049	.034	.049
REMNANT CHANNEL	4570.50	Culvert		
REMNANT CHANNEL	4545	.049	.034	.049
REMNANT CHANNEL	4532	.049	.034	.049
REMNANT CHANNEL	4514	.049	.034	.049
REMNANT CHANNEL	4496.5	Culvert		
REMNANT CHANNEL	4483	.049	.034	.049
REMNANT CHANNEL	4351	.049	.034	.049
REMNANT CHANNEL	3982	.049	.034	.049
REMNANT CHANNEL	3519	.049	.034	.049
REMNANT CHANNEL	3510.50	Culvert		
REMNANT CHANNEL	3500	.049	.034	.049
REMNANT CHANNEL	3313	.049	.034	.049
REMNANT CHANNEL	2913	.049	.034	.049
REMNANT CHANNEL	2415	.049	.034	.049
REMNANT CHANNEL	2112	.049	.034	.049
REMNANT CHANNEL	2081	.049	.034	.049
REMNANT CHANNEL	2043	Culvert		
REMNANT CHANNEL	2010	.049	.034	.049
REMNANT CHANNEL	1960	.049	.034	.049
REMNANT CHANNEL	1751	.049	.034	.049
REMNANT CHANNEL	1456	.049	.034	.049
REMNANT CHANNEL	1426	.049	.034	.049
REMNANT CHANNEL	1391.38	Culvert		
REMNANT CHANNEL	1354	.049	.034	.049
REMNANT CHANNEL	1304	.049	.034	.049
REMNANT CHANNEL	1216	.049	.034	.049
REMNANT CHANNEL	1069	.049	.034	.049
REMNANT CHANNEL	1034	.013	.013	.013
REMNANT CHANNEL	1030	.013	.013	.013
REMNANT CHANNEL	1025	.013	.013	.013
REMNANT CHANNEL	1020	.013	.035	.013
REMNANT CHANNEL	1000	.013	.035	.013

SUMMARY OF REACH LENGTHS

River: JACKRABBIT TRAIL

Reach	River Sta.	Left	Channel	Right
REMNANT CHANNEL	4700	111	111	111
REMNANT CHANNEL	4589	44	44	44
REMNANT CHANNEL	4570.50	Culvert		
REMNANT CHANNEL	4545	13	13	13
REMNANT CHANNEL	4532	18	18	18
REMNANT CHANNEL	4514	31	31	31

REMNANT CHANNEL	4496.5	Culvert			
REMNANT CHANNEL	4483		132	132	132
REMNANT CHANNEL	4351		369	369	369
REMNANT CHANNEL	3982		463	463	463
REMNANT CHANNEL	3519		19	19	19
REMNANT CHANNEL	3510.50	Culvert			
REMNANT CHANNEL	3500		187	187	187
REMNANT CHANNEL	3313		400	400	400
REMNANT CHANNEL	2913		498	498	498
REMNANT CHANNEL	2415		303	303	303
REMNANT CHANNEL	2112		31	31	31
REMNANT CHANNEL	2081		71	71	71
REMNANT CHANNEL	2043	Culvert			
REMNANT CHANNEL	2010		50	50	50
REMNANT CHANNEL	1960		209	209	209
REMNANT CHANNEL	1751		295	295	295
REMNANT CHANNEL	1456		30	30	30
REMNANT CHANNEL	1426		72	72	72
REMNANT CHANNEL	1391.38	Culvert			
REMNANT CHANNEL	1354		50	50	50
REMNANT CHANNEL	1304		88	88	88
REMNANT CHANNEL	1216		147	147	147
REMNANT CHANNEL	1069		42	35	27
REMNANT CHANNEL	1034		4	4	4
REMNANT CHANNEL	1030		5	5	5
REMNANT CHANNEL	1025		5	5	5
REMNANT CHANNEL	1020		20	20	20
REMNANT CHANNEL	1000				

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: JACKRABBIT TRAIL

Reach	River Sta.		Contr.	Expan.
REMNANT CHANNEL	4700		.3	.5
REMNANT CHANNEL	4589		.3	.5
REMNANT CHANNEL	4570.50	Culvert		
REMNANT CHANNEL	4545		.3	.5
REMNANT CHANNEL	4532		.3	.5
REMNANT CHANNEL	4514		.3	.5
REMNANT CHANNEL	4496.5	Culvert		
REMNANT CHANNEL	4483		.3	.5
REMNANT CHANNEL	4351		.1	.3
REMNANT CHANNEL	3982		.1	.3
REMNANT CHANNEL	3519		.3	.5
REMNANT CHANNEL	3510.50	Culvert		
REMNANT CHANNEL	3500		.3	.5
REMNANT CHANNEL	3313		.1	.3
REMNANT CHANNEL	2913		.1	.3
REMNANT CHANNEL	2415		.1	.3
REMNANT CHANNEL	2112		.3	.5
REMNANT CHANNEL	2081		.3	.5
REMNANT CHANNEL	2043	Culvert		
REMNANT CHANNEL	2010		.3	.5
REMNANT CHANNEL	1960		.1	.3
REMNANT CHANNEL	1751		.1	.3
REMNANT CHANNEL	1456		.3	.5
REMNANT CHANNEL	1426		.3	.5
REMNANT CHANNEL	1391.38	Culvert		
REMNANT CHANNEL	1354		.3	.5
REMNANT CHANNEL	1304		.1	.3
REMNANT CHANNEL	1216		.1	.3
REMNANT CHANNEL	1069		.1	.3
REMNANT CHANNEL	1034		.1	.3
REMNANT CHANNEL	1030		.1	.3
REMNANT CHANNEL	1025		.1	.3
REMNANT CHANNEL	1020		.1	.3
REMNANT CHANNEL	1000		.1	.3

EXISTING CONDITIONS MODEL

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: Jackrabbit Trail Wash_Existing Condition
Project File : Jackrabbit_ExistingConditions.prj
Run Date and Time: 10/14/2011 8:16:15 AM

Project in English units

Project Description:
Project: White Tanks FRS #3 Outlet Channel 100% Design
CLOMR

Existing/Pre-Project Hydraulic Model

Prepared by:
Hoskin Ryan
Consultants, Inc.
6245 N. 24th Parkway, Suite 100
Phoenix, AZ
85016

Prepared for:
Flood Control District of Maricopa County (FCDMC)
2801
W. Durango Street
Phoenix, AZ 85009

FCDMC: Contract No.: 2009-C012

FCDMC
Project Manager: Gary Wesch

Topographic Mpping:

Storm Event:
100-Year

Discharges were obtained from the HEC-1 model prepared by HDR.

****

PLAN DATA

Plan Title: Subcritical Flow Calc
Plan File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Jackrabbit_ExistingConditions.p01

Geometry Title: Existing Conditions
Geometry File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Jackrabbit_ExistingConditions.g01

Flow Title : Existing Conditions
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Jackrabbit_ExistingConditions.f01

Plan Summary Information:

Number of:					
	Cross Sections	= 109	Multiple Openings	=	0
	Culverts	= 11	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

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

River = Jack Rabbit Trai Reach = Exist Conditions

RS	Profile	Method	Value1	Value2
22197	FLOODWAY	1	975	1025
22085	FLOODWAY	1	965	1019
22041	FLOODWAY	1	964	1008.7
22028	FLOODWAY	1	964.6	1007.2
22010	FLOODWAY	1	964	1008.5
21979	FLOODWAY	1	964.23	1007.33
21847	FLOODWAY	1	967	1023.8
21478	FLOODWAY	1	968.5	1021.2
21016	FLOODWAY	1	974.92	1016.73
20997	FLOODWAY	1	979.89	1017

20809	FLOODWAY	1	983.58	1016.75
20709.*	FLOODWAY	1	983.49	1019.65
20609.*	FLOODWAY	1	983.08	1023.24
20509.*	FLOODWAY	1	981.49	1029.3
20409	FLOODWAY	1	979.32	1037
19912	FLOODWAY	1	974.56	1020
19608	FLOODWAY	1	982.4	1025.93
19578	FLOODWAY	1	978.35	1021.4
19507	FLOODWAY	1	979.3	1020.5
19457	FLOODWAY	1	976.93	1028.64
19247	FLOODWAY	1	978.84	1030.12
18953	FLOODWAY	1	972.93	1025.21
18923	FLOODWAY	1	974.36	1021.2
18850	FLOODWAY	1	978.5	1021.61
18800	FLOODWAY	1	973.77	1027.12
18713	FLOODWAY	1	971.12	1025.6
18563	FLOODWAY	1	984.67	1031.83
18214	FLOODWAY	1	969.32	1012.91
17914	FLOODWAY	1	962.44	1010.2
17408	FLOODWAY	1	970	1038.33
16918	FLOODWAY	1	967.9	1032
16832.8*	FLOODWAY	1	954.62	1049.45
16747.6*	FLOODWAY	1	943.51	1054.95
16662.5*	FLOODWAY	1	932.46	1060.55
16577.3*	FLOODWAY	1	922.02	1066.2
16492.1*	FLOODWAY	1	911.81	1071.88
16407	FLOODWAY	1	901.85	1077.56
15976	FLOODWAY	1	965	1130
15933	FLOODWAY	1	987.9	1155
15855	FLOODWAY	1	991.07	1016.32
15750	FLOODWAY	1	989.01	1050
15344	FLOODWAY	1	978.45	1185.03
15022	FLOODWAY	1	959.91	1043.4
14622	FLOODWAY	1	954.71	1038.11
14322	FLOODWAY	1	955.56	1030.53
14277	FLOODWAY	1	973.62	1011.83
14260	FLOODWAY	1	973.56	1011.85
14247	FLOODWAY	1	973.59	1011.98
14197	FLOODWAY	1	972.02	1014.35
14122	FLOODWAY	1	952.23	1034.71
13925	FLOODWAY	1	953.23	1036.68
13622	FLOODWAY	1	953.71	1037.61
13318	FLOODWAY	1	956.99	1036.94
13288	FLOODWAY	1	978.76	1016.7
13270	FLOODWAY	1	978.62	1016.87
13257	FLOODWAY	1	978.61	1016.77
13207	FLOODWAY	1	978.68	1016.07
13122	FLOODWAY	1	937.35	1044.02
12922	FLOODWAY	1	942.11	1047.96
12341	FLOODWAY	1	976.23	1017.4
11844	FLOODWAY	1	978.69	1017.11
11350	FLOODWAY	1	981.89	1020
10818	FLOODWAY	1	988	1041
10316	FLOODWAY	1	980.98	1030
9824	FLOODWAY	1	968.89	1015
9324	FLOODWAY	1	982.81	1023.84
8824	FLOODWAY	1	966.08	1165
8320	FLOODWAY	1	963.12	1085.6
8221.2*	FLOODWAY	1	961.42	1092.76
8122.4*	FLOODWAY	1	961.33	1101.9
8023.6*	FLOODWAY	1	960.28	1132.42
7924.8*	FLOODWAY	1	959.72	1164.18
7826	FLOODWAY	1	960.63	1160
7330	FLOODWAY	1	955.43	1034.14
6826	FLOODWAY	1	984.59	1029.91
6310	FLOODWAY	1	973.71	1025.23
5920	FLOODWAY	1	976.26	1027.8
5902	FLOODWAY	1	976.44	1028.04
5600	FLOODWAY	1	976.23	1029.13
5400	FLOODWAY	1	973.34	1034.69
5220	FLOODWAY	1	978.36	1035.46
5193	FLOODWAY	1	978.42	1035.65
5181	FLOODWAY	1	979.64	1034.89
5100	FLOODWAY	1	972.01	1037.38
4800	FLOODWAY	1	973.09	1041.7
4748	FLOODWAY	1	971.55	1044.61
4740	FLOODWAY	1	966.55	1043.27
4650	FLOODWAY	1	968	1047.83
4600	FLOODWAY	1	970	1020.48
4350	FLOODWAY	1	976.04	1024.22
4278	FLOODWAY	1	961.03	1037
4200	FLOODWAY	1	973.33	1032.13
4183	FLOODWAY	1	971.13	1031.74
4168	FLOODWAY	1	964.96	1038.21
4100	FLOODWAY	1	966.27	1038.31
3800	FLOODWAY	1	972.46	1025.55
3500	FLOODWAY	1	975.36	1026.41
3200	FLOODWAY	1	975.58	1026.83
2903	FLOODWAY	1	975.23	1027.98
2885	FLOODWAY	1	975.9	1026.76
2800	FLOODWAY	1	975.15	1028.53
2500	FLOODWAY	1	973.77	1026.67
2200	FLOODWAY	1	972.6	1027.46
1900	FLOODWAY	1	973.77	1027.06
1568	FLOODWAY	1	967.53	1042.47
1552	FLOODWAY	1	961.67	1045.57
1500	FLOODWAY	1	956.95	1060.86
1300	FLOODWAY	1	961.32	1072.05
1000	FLOODWAY	1	953	1075.66

****

FLOW DATA

Flow Title: Existing Conditions

```
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Jackrabbit_ExistingConditions.f01

Flow Data (cfs)
*******************************************************************************
* River          Reach             RS       *Existing Condition         FLOODWAY *
* Jack Rabbit TraiExist Conditions22197    *              40                40 *
* Jack Rabbit TraiExist Conditions21847    *             128               128 *
* Jack Rabbit TraiExist Conditions21478    *             275               275 *
* Jack Rabbit TraiExist Conditions21016    *             310               310 *
* Jack Rabbit TraiExist Conditions19912    *             558               558 *
* Jack Rabbit TraiExist Conditions19608    *             609               609 *
* Jack Rabbit TraiExist Conditions18953    *             672               672 *
* Jack Rabbit TraiExist Conditions18563    *             795               795 *
* Jack Rabbit TraiExist Conditions17408    *             985               985 *
* Jack Rabbit TraiExist Conditions15855    *             784               784 *
* Jack Rabbit TraiExist Conditions15750    *             794               794 *
* Jack Rabbit TraiExist Conditions15022    *             828               828 *
* Jack Rabbit TraiExist Conditions14122    *             851               851 *
* Jack Rabbit TraiExist Conditions13622    *             865               865 *
* Jack Rabbit TraiExist Conditions13122    *             966               966 *
* Jack Rabbit TraiExist Conditions12341    *             982               982 *
* Jack Rabbit TraiExist Conditions11350    *            1000              1000 *
* Jack Rabbit TraiExist Conditions10818    *            1050              1050 *
* Jack Rabbit TraiExist Conditions9324     *            1094              1094 *
* Jack Rabbit TraiExist Conditions8320     *            1190              1190 *
* Jack Rabbit TraiExist Conditions6310     *            1484              1484 *
* Jack Rabbit TraiExist Conditions4650     *            1597              1597 *
*******************************************************************************

Boundary Conditions
**********************************************************************************************************
* River          Reach             Profile           *           Upstream                  Downstream     *
**********************************************************************************************************
* Jack Rabbit TraiExist ConditionsExisting Condition *                                Known WS = 1048.6 *
**********************************************************************************************************

Inline Structure Gate Openings
River = Channel
Reach = FRS3              RS = 30790
Gate  = Slide Gate
  # Open Open Ht  # Open Open Ht
*********************************
      5      2       0      0

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

SUMMARY OF MANNING'S N VALUES

```
River:Jack Rabbit Trai
*******************************************************************
*     Reach      *  River Sta.   *   n1    *   n2    *   n3    *
*******************************************************************
*Exist Conditions*   22197       *     .049*    .034*     .049*
*Exist Conditions*   22085       *     .049*    .034*     .049*
*Exist Conditions*   22067       *Culvert  *        *         *
*Exist Conditions*   22041       *     .049*    .034*     .049*
*Exist Conditions*   22028       *     .049*    .034*     .049*
*Exist Conditions*   22010       *     .049*    .034*     .049*
*Exist Conditions*   21993       *Culvert  *        *         *
*Exist Conditions*   21979       *     .049*    .034*     .049*
*Exist Conditions*   21847       *     .049*    .034*     .049*
*Exist Conditions*   21478       *     .049*    .034*     .049*
*Exist Conditions*   21016       *     .049*    .034*     .049*
*Exist Conditions*   21007       *Culvert  *        *         *
*Exist Conditions*   20997       *     .049*    .034*     .049*
*Exist Conditions*   20809       *     .049*    .034*     .049*
*Exist Conditions*   20709.*     *     .049*    .034*     .049*
*Exist Conditions*   20609.*     *     .049*    .034*     .049*
*Exist Conditions*   20509.*     *     .049*    .034*     .049*
*Exist Conditions*   20409       *     .049*    .034*     .049*
*Exist Conditions*   19912       *     .049*    .034*     .049*
*Exist Conditions*   19608       *     .049*    .034*     .049*
*Exist Conditions*   19578       *     .049*    .034*     .049*
*Exist Conditions*   19539       *Culvert  *        *         *
*Exist Conditions*   19507       *     .049*    .034*     .049*
*Exist Conditions*   19457       *     .049*    .034*     .049*
*Exist Conditions*   19247       *     .049*    .034*     .049*
*Exist Conditions*   18953       *     .049*    .034*     .049*
*Exist Conditions*   18923       *     .049*    .034*     .049*
*Exist Conditions*   18888       *Culvert  *        *         *
*Exist Conditions*   18850       *     .049*    .034*     .049*
*Exist Conditions*   18800       *     .049*    .034*     .049*
*Exist Conditions*   18713       *     .049*    .034*     .049*
*Exist Conditions*   18563       *     .049*    .034*     .049*
*Exist Conditions*   18214       *     .049*    .034*     .049*
*Exist Conditions*   17914       *     .049*    .034*     .049*
*Exist Conditions*   17408       *     .049*    .034*     .049*
*Exist Conditions*   16918       *     .049*    .034*     .049*
*Exist Conditions*   16832.8*    *     .049*    .034*     .049*
*Exist Conditions*   16747.6*    *     .049*    .034*     .049*
*Exist Conditions*   16662.5*    *     .049*    .034*     .049*
*Exist Conditions*   16577.3*    *     .049*    .034*     .049*
*Exist Conditions*   16492.1*    *     .049*    .034*     .049*
*Exist Conditions*   16407       *     .049*    .034*     .049*
*Exist Conditions*   15976       *     .049*    .034*     .049*
*Exist Conditions*   15933       *     .049*    .034*     .049*
*Exist Conditions*   15886       *Culvert  *        *         *
*Exist Conditions*   15855       *     .049*    .034*     .049*
*Exist Conditions*   15750       *     .049*    .034*     .049*
*Exist Conditions*   15344       *     .049*    .034*     .049*
*Exist Conditions*   15022       *     .045*    .045*     .045*
*Exist Conditions*   14622       *     .045*    .045*     .045*
*Exist Conditions*   14322       *     .045*    .045*     .045*
*Exist Conditions*   14277       *     .045*    .045*     .045*
*Exist Conditions*   14260       *     .045*    .045*     .045*
*Exist Conditions*   14247       *     .045*    .045*     .045*
*Exist Conditions*   14223.6     *Culvert  *        *         *
```

Exist Conditions	14197	* .045*	.045*	.045*
Exist Conditions	14122	* .045*	.045*	.045*
Exist Conditions	13925	* .045*	.045*	.045*
Exist Conditions	13622	* .045*	.045*	.045*
Exist Conditions	13318	* .045*	.045*	.045*
Exist Conditions	13288	* .045*	.045*	.045*
Exist Conditions	13270	* .045*	.045*	.045*
Exist Conditions	13257	* .045*	.045*	.045*
Exist Conditions	13233.5	*Culvert *	*	*
Exist Conditions	13207	* .045*	.045*	.045*
Exist Conditions	13122	* .045*	.045*	.045*
Exist Conditions	12922	* .045*	.045*	.045*
Exist Conditions	12341	* .049*	.034*	.049*
Exist Conditions	11844	* .049*	.034*	.049*
Exist Conditions	11350	* .049*	.034*	.049*
Exist Conditions	10818	* .049*	.034*	.049*
Exist Conditions	10316	* .049*	.034*	.049*
Exist Conditions	9824	* .049*	.034*	.049*
Exist Conditions	9324	* .049*	.034*	.049*
Exist Conditions	8824	* .049*	.034*	.049*
Exist Conditions	8320	* .049*	.034*	.049*
Exist Conditions	8221.2*	* .049*	.034*	.049*
Exist Conditions	8122.4*	* .049*	.034*	.049*
Exist Conditions	8023.6*	* .049*	.034*	.049*
Exist Conditions	7924.8*	* .049*	.034*	.049*
Exist Conditions	7826	* .049*	.034*	.049*
Exist Conditions	7330	* .049*	.034*	.049*
Exist Conditions	6826	* .049*	.034*	.049*
Exist Conditions	6310	* .035*	.015*	.035*
Exist Conditions	5920	* .035*	.015*	.035*
Exist Conditions	5902	* .035*	.015*	.035*
Exist Conditions	5600	* .035*	.015*	.035*
Exist Conditions	5400	* .035*	.015*	.035*
Exist Conditions	5342.1	*Culvert *	*	*
Exist Conditions	5220	* .035*	.015*	.035*
Exist Conditions	5193	* .035*	.015*	.035*
Exist Conditions	5181	* .035*	.015*	.035*
Exist Conditions	5100	* .035*	.015*	.035*
Exist Conditions	4800	* .035*	.015*	.035*
Exist Conditions	4748	* .035*	.015*	.035*
Exist Conditions	4740	* .035*	.015*	.035*
Exist Conditions	4729.5	*Culvert *	*	*
Exist Conditions	4650	* .035*	.015*	.035*
Exist Conditions	4600	* .035*	.015*	.035*
Exist Conditions	4350	* .035*	.015*	.035*
Exist Conditions	4278	* .035*	.015*	.035*
Exist Conditions	4271	*Culvert *	*	*
Exist Conditions	4200	* .035*	.015*	.035*
Exist Conditions	4183	* .035*	.015*	.035*
Exist Conditions	4168	* .035*	.015*	.035*
Exist Conditions	4100	* .035*	.015*	.035*
Exist Conditions	3800	* .035*	.015*	.035*
Exist Conditions	3500	* .035*	.015*	.035*
Exist Conditions	3200	* .035*	.015*	.035*
Exist Conditions	2903	* .035*	.015*	.035*
Exist Conditions	2885	* .035*	.015*	.035*
Exist Conditions	2800	* .035*	.015*	.035*
Exist Conditions	2500	* .035*	.015*	.035*
Exist Conditions	2200	* .035*	.015*	.035*
Exist Conditions	1900	* .035*	.015*	.035*
Exist Conditions	1568	* .035*	.015*	.035*
Exist Conditions	1552	* .035*	.015*	.035*
Exist Conditions	1500	* .035*	.015*	.035*
Exist Conditions	1300	* .035*	.015*	.035*
Exist Conditions	1000	* .035*	.015*	.035*

SUMMARY OF REACH LENGTHS

River: Jack Rabbit Trai

* Reach *	River Sta.	* Left	* Channel *	Right *
Exist Conditions	22197	* 111*	111*	111*
Exist Conditions	22085	* 44*	44*	44*
Exist Conditions	22067	*Culvert *	*	*
Exist Conditions	22041	* 13*	13*	13*
Exist Conditions	22028	* 18*	18*	18*
Exist Conditions	22010	* 31*	31*	31*
Exist Conditions	21993	*Culvert *	*	*
Exist Conditions	21979	* 132*	132*	132*
Exist Conditions	21847	* 369*	369*	369*
Exist Conditions	21478	* 463*	463*	463*
Exist Conditions	21016	* 19*	19*	19*
Exist Conditions	21007	*Culvert *	*	*
Exist Conditions	20997	* 187*	187*	187*
Exist Conditions	20809	* 100*	100*	100*
Exist Conditions	20709.*	* 100*	100*	100*
Exist Conditions	20609.*	* 100*	100*	100*
Exist Conditions	20509.*	* 100*	100*	100*
Exist Conditions	20409	* 498*	498*	498*
Exist Conditions	19912	* 303*	303*	303*
Exist Conditions	19608	* 31*	31*	31*
Exist Conditions	19578	* 71*	71*	71*
Exist Conditions	19539	*Culvert *	*	*
Exist Conditions	19507	* 50*	50*	50*
Exist Conditions	19457	* 209*	209*	209*
Exist Conditions	19247	* 295*	295*	295*
Exist Conditions	18953	* 30*	30*	30*
Exist Conditions	18923	* 72*	72*	72*
Exist Conditions	18888	*Culvert *	*	*
Exist Conditions	18850	* 50*	50*	50*
Exist Conditions	18800	* 88*	88*	88*
Exist Conditions	18713	* 150*	150*	150*

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*Exist Conditions*    18563      *       349*     349*     349*
*Exist Conditions*    18214      *       300*     300*     300*
*Exist Conditions*    17914      *       506*     506*     506*
*Exist Conditions*    17408      *       490*     490*     490*
*Exist Conditions*    16918      *     85.17*   85.17*   85.17*
*Exist Conditions*    16832.8*   *     85.17*   85.17*   85.17*
*Exist Conditions*    16747.6*   *     85.17*   85.17*   85.17*
*Exist Conditions*    16662.5*   *     85.17*   85.17*   85.17*
*Exist Conditions*    16577.3*   *     85.17*   85.17*   85.17*
*Exist Conditions*    16492.1*   *     85.17*   85.17*   85.17*
*Exist Conditions*    16407      *       431*     431*     431*
*Exist Conditions*    15976      *        43*      43*      43*
*Exist Conditions*    15933      *        78*      78*      78*
*Exist Conditions*    15886      *Culvert  *        *        *
*Exist Conditions*    15855      *       105*     105*     105*
*Exist Conditions*    15750      *       406*     406*     406*
*Exist Conditions*    15344      *       322*     322*     322*
*Exist Conditions*    15022      *       400*     400*     400*
*Exist Conditions*    14622      *       300*     300*     300*
*Exist Conditions*    14322      *        45*      45*      45*
*Exist Conditions*    14277      *        17*      17*      17*
*Exist Conditions*    14260      *        13*      13*      13*
*Exist Conditions*    14247      *        50*      50*      50*
*Exist Conditions*    14223.6    *Culvert  *        *        *
*Exist Conditions*    14197      *        75*      75*      75*
*Exist Conditions*    14122      *       200*     200*     200*
*Exist Conditions*    13925      *       300*     300*     300*
*Exist Conditions*    13622      *       304*     304*     304*
*Exist Conditions*    13318      *        30*      30*      30*
*Exist Conditions*    13288      *        18*      18*      18*
*Exist Conditions*    13270      *        13*      13*      13*
*Exist Conditions*    13257      *        50*      50*      50*
*Exist Conditions*    13233.5    *Culvert  *        *        *
*Exist Conditions*    13207      *        85*      85*      85*
*Exist Conditions*    13122      *       200*     200*     200*
*Exist Conditions*    12922      *       581*     581*     581*
*Exist Conditions*    12341      *       497*     497*     497*
*Exist Conditions*    11844      *       494*     494*     494*
*Exist Conditions*    11350      *       532*     532*     532*
*Exist Conditions*    10818      *       502*     502*     502*
*Exist Conditions*    10316      *       492*     492*     492*
*Exist Conditions*    9824       *       500*     500*     500*
*Exist Conditions*    9324       *       500*     500*     500*
*Exist Conditions*    8824       *       504*     504*     504*
*Exist Conditions*    8320       *      98.8*    98.8*    98.8*
*Exist Conditions*    8221.2*    *      98.8*    98.8*    98.8*
*Exist Conditions*    8122.4*    *      98.8*    98.8*    98.8*
*Exist Conditions*    8023.6*    *      98.8*    98.8*    98.8*
*Exist Conditions*    7924.8*    *      98.8*    98.8*    98.8*
*Exist Conditions*    7826       *       496*     496*     496*
*Exist Conditions*    7330       *       504*     504*     504*
*Exist Conditions*    6826       *       516*     516*     516*
*Exist Conditions*    6310       *       390*     390*     390*
*Exist Conditions*    5920       *        18*      18*      18*
*Exist Conditions*    5902       *       302*     302*     302*
*Exist Conditions*    5600       *       200*     200*     200*
*Exist Conditions*    5400       *       180*     180*     180*
*Exist Conditions*    5342.1     *Culvert  *        *        *
*Exist Conditions*    5220       *        27*      27*      27*
*Exist Conditions*    5193       *        12*      12*      12*
*Exist Conditions*    5181       *        81*      81*      81*
*Exist Conditions*    5100       *       300*     300*     300*
*Exist Conditions*    4800       *        52*      52*      52*
*Exist Conditions*    4748       *         8*       8*       8*
*Exist Conditions*    4740       *        90*      90*      90*
*Exist Conditions*    4729.5     *Culvert  *        *        *
*Exist Conditions*    4650       *        50*      50*      50*
*Exist Conditions*    4600       *    249.99*  249.99*  249.99*
*Exist Conditions*    4350       *        72*      72*      72*
*Exist Conditions*    4278       *        78*      78*      78*
*Exist Conditions*    4271       *Culvert  *        *        *
*Exist Conditions*    4200       *        17*      17*      17*
*Exist Conditions*    4183       *        15*      15*      15*
*Exist Conditions*    4168       *        68*      68*      68*
*Exist Conditions*    4100       *       300*     300*     300*
*Exist Conditions*    3800       *       300*     300*     300*
*Exist Conditions*    3500       *       300*     300*     300*
*Exist Conditions*    3200       *       297*     297*     297*
*Exist Conditions*    2903       *        18*      18*      18*
*Exist Conditions*    2885       *        85*      85*      85*
*Exist Conditions*    2800       *       300*     300*     300*
*Exist Conditions*    2500       *       300*     300*     300*
*Exist Conditions*    2200       *       300*     300*     300*
*Exist Conditions*    1900       *       332*     332*     332*
*Exist Conditions*    1568       *        16*      16*      16*
*Exist Conditions*    1552       *        52*      52*      52*
*Exist Conditions*    1500       *       200*     200*     200*
*Exist Conditions*    1300       *       300*     300*     300*
*Exist Conditions*    1000       *         0*       0*       0*
******************************************************************

*********************************************************************************

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Jack Rabbit Trai

********************************************************
*      Reach      *   River Sta.   * Contr.   * Expan.  *
********************************************************
*Exist Conditions*    22197    *        .3*       .5*
*Exist Conditions*    22085    *        .3*       .5*
*Exist Conditions*    22067    *Culvert   *         *
*Exist Conditions*    22041    *        .3*       .5*
*Exist Conditions*    22028    *        .3*       .5*
*Exist Conditions*    22010    *        .3*       .5*
*Exist Conditions*    21993    *Culvert   *         *
```

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*Exist Conditions*    21979    *          .3*         .5*
*Exist Conditions*    21847    *          .1*         .3*
*Exist Conditions*    21478    *          .1*         .3*
*Exist Conditions*    21016    *          .3*         .5*
*Exist Conditions*    21007    *Culvert   *            *
*Exist Conditions*    20997    *          .3*         .5*
*Exist Conditions*    20809    *          .1*         .3*
*Exist Conditions*    20709.*  *          .1*         .3*
*Exist Conditions*    20609.*  *          .1*         .3*
*Exist Conditions*    20509.*  *          .1*         .3*
*Exist Conditions*    20409    *          .1*         .3*
*Exist Conditions*    19912    *          .1*         .3*
*Exist Conditions*    19608    *          .3*         .5*
*Exist Conditions*    19578    *          .3*         .5*
*Exist Conditions*    19539    *Culvert   *            *
*Exist Conditions*    19507    *          .3*         .5*
*Exist Conditions*    19457    *          .1*         .3*
*Exist Conditions*    19247    *          .1*         .3*
*Exist Conditions*    18953    *          .3*         .5*
*Exist Conditions*    18923    *          .3*         .5*
*Exist Conditions*    18888    *Culvert   *            *
*Exist Conditions*    18850    *          .3*         .5*
*Exist Conditions*    18800    *          .1*         .3*
*Exist Conditions*    18713    *          .1*         .3*
*Exist Conditions*    18563    *          .1*         .3*
*Exist Conditions*    18214    *          .1*         .3*
*Exist Conditions*    17914    *          .1*         .3*
*Exist Conditions*    17408    *          .1*         .3*
*Exist Conditions*    16918    *          .1*         .3*
*Exist Conditions*    16832.8**           .1*         .3*
*Exist Conditions*    16747.6**           .1*         .3*
*Exist Conditions*    16662.5**           .1*         .3*
*Exist Conditions*    16577.3**           .1*         .3*
*Exist Conditions*    16492.1**           .1*         .3*
*Exist Conditions*    16407    *          .1*         .3*
*Exist Conditions*    15976    *          .3*         .5*
*Exist Conditions*    15933    *          .3*         .5*
*Exist Conditions*    15886    *Culvert   *            *
*Exist Conditions*    15855    *          .3*         .5*
*Exist Conditions*    15750    *          .1*         .3*
*Exist Conditions*    15344    *          .1*         .3*
*Exist Conditions*    15022    *          .1*         .3*
*Exist Conditions*    14622    *          .1*         .3*
*Exist Conditions*    14322    *          .1*         .3*
*Exist Conditions*    14277    *          .1*         .3*
*Exist Conditions*    14260    *          .1*         .3*
*Exist Conditions*    14247    *          .1*         .3*
*Exist Conditions*    14223.6 *Culvert   *            *
*Exist Conditions*    14197    *          .1*         .3*
*Exist Conditions*    14122    *          .1*         .3*
*Exist Conditions*    13925    *          .1*         .3*
*Exist Conditions*    13622    *          .1*         .3*
*Exist Conditions*    13318    *          .1*         .3*
*Exist Conditions*    13288    *          .1*         .3*
*Exist Conditions*    13270    *          .1*         .3*
*Exist Conditions*    13257    *          .1*         .3*
*Exist Conditions*    13233.5 *Culvert   *            *
*Exist Conditions*    13207    *          .1*         .3*
*Exist Conditions*    13122    *          .1*         .3*
*Exist Conditions*    12922    *          .1*         .3*
*Exist Conditions*    12341    *          .1*         .3*
*Exist Conditions*    11844    *          .1*         .3*
*Exist Conditions*    11350    *          .1*         .3*
*Exist Conditions*    10818    *          .1*         .3*
*Exist Conditions*    10316    *          .1*         .3*
*Exist Conditions*    9824     *          .1*         .3*
*Exist Conditions*    9324     *          .1*         .3*
*Exist Conditions*    8824     *          .1*         .3*
*Exist Conditions*    8320     *          .1*         .3*
*Exist Conditions*    8221.2*  *          .1*         .3*
*Exist Conditions*    8122.4*  *          .1*         .3*
*Exist Conditions*    8023.6*  *          .1*         .3*
*Exist Conditions*    7924.8*  *          .1*         .3*
*Exist Conditions*    7826     *          .1*         .3*
*Exist Conditions*    7330     *          .1*         .3*
*Exist Conditions*    6826     *          .1*         .3*
*Exist Conditions*    6310     *          .1*         .3*
*Exist Conditions*    5920     *          .1*         .3*
*Exist Conditions*    5902     *          .1*         .3*
*Exist Conditions*    5600     *          .1*         .3*
*Exist Conditions*    5400     *          .1*         .3*
*Exist Conditions*    5342.1   *Culvert   *            *
*Exist Conditions*    5220     *          .1*         .3*
*Exist Conditions*    5193     *          .1*         .3*
*Exist Conditions*    5181     *          .1*         .3*
*Exist Conditions*    5100     *          .1*         .3*
*Exist Conditions*    4800     *          .1*         .3*
*Exist Conditions*    4748     *          .1*         .3*
*Exist Conditions*    4740     *          .1*         .3*
*Exist Conditions*    4729.5   *Culvert   *            *
*Exist Conditions*    4650     *          .1*         .3*
*Exist Conditions*    4600     *          .1*         .3*
*Exist Conditions*    4350     *          .1*         .3*
*Exist Conditions*    4278     *          .1*         .3*
*Exist Conditions*    4271     *Culvert   *            *
*Exist Conditions*    4200     *          .1*         .3*
*Exist Conditions*    4183     *          .1*         .3*
*Exist Conditions*    4168     *          .1*         .3*
*Exist Conditions*    4100     *          .1*         .3*
*Exist Conditions*    3800     *          .1*         .3*
*Exist Conditions*    3500     *          .1*         .3*
*Exist Conditions*    3200     *          .1*         .3*
*Exist Conditions*    2903     *          .1*         .3*
*Exist Conditions*    2885     *          .1*         .3*
*Exist Conditions*    2800     *          .1*         .3*
*Exist Conditions*    2500     *          .1*         .3*
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*Exist Conditions*    2200    *      .1*      .3*
*Exist Conditions*    1900    *      .1*      .3*
*Exist Conditions*    1568    *      .1*      .3*
*Exist Conditions*    1552    *      .1*      .3*
*Exist Conditions*    1500    *      .1*      .3*
*Exist Conditions*    1300    *      .1*      .3*
*Exist Conditions*    1000    *      .1*      .3*
*******************************************************
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DUPLICATE EFFECTIVE MODEL


```
                  HEC-RAS Version 4.1.0 Jan 2010
                   U.S. Army Corps of Engineers
                  Hydrologic Engineering Center
                        609 Second Street
                        Davis, California

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

********************************************************************************

PROJECT DATA
Project Title: 195W
Project File : 195W.prj
Run Date and Time: 10/14/2011 2:51:57 PM

Project in English units

Project Description:
WHITE TANKS / AGUA FRIA AREA DRAINAGE MASTER STUDY
      100 - YEAR
STORM EVENT     FLOODPLAIN RUN       FILE: 4.H2I
      JACKRABBIT TRAIL WASH
(WASH 4) -  WHITE TANK STRUCTURE #4 NORTH TO
      MEDLOCK DRIVE.


********************************************************************************

PLAN DATA

Plan Title: 195W
Plan File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Duplicate Effective Model\195W.p01

           Geometry Title: 195W
           Geometry File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Duplicate Effective Model\195W.g01

           Flow Title    : 195W
           Flow File     : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Duplicate Effective Model\195W.f01

Plan Summary Information:
Number of:  Cross Sections =    57   Multiple Openings  =     0
            Culverts       =     0   Inline Structures  =     0
            Bridges        =     3   Lateral Structures =     0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow

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

River = RIVER-1          Reach = Reach-1
RS       Profile           Method  Value1  Value2
0        PF 2                   1 9906.9710159.09
0.07     PF 2                   1 9910.9610051.54
0.142    PF 2                   1  9942.810105.32
0.228    PF 2                   1 9940.7210151.41
0.312    PF 2                   1 9964.5410109.65
0.348    PF 2                   1 9969.9210091.41
0.44     PF 2                   1 9974.8610065.28
0.499    PF 2                   1    995510030.97
0.566    PF 2                   1 9940.3210035.81
0.61     PF 2                   1 9957.2210039.59
0.668    PF 2                   1 9967.18   10040
0.722    PF 2                   1 9950.1810029.91
0.759    PF 2                   1 9972.7210027.45
0.764    PF 2                   0
0.769    PF 2                   1 9972.6710027.17
0.792    PF 2                   1 9974.5210025.55
0.822    PF 2                   1 9974.5210025.55
0.847    PF 2                   1 9973.8910026.71
0.852    PF 2                   0
0.857    PF 2                   1 9973.8210026.81
0.914    PF 2                   1  9954.8   10050
0.959    PF 2                   1 9973.3710026.73
0.964    PF 2                   0
0.969    PF 2                   1 9973.3510026.75
1.016    PF 2                   1 9971.6810307.46
1.064    PF 2                   1 9972.8410034.32
1.159    PF 2                   1 9970.6210076.92
1.254    PF 2                   1    996510030.03
1.348    PF 2                   1 9981.8910068.66
1.443    PF 2                   1 9970.88   10075
1.536    PF 2                   1 9961.8610085.96
1.631    PF 2                   1    996410119.84
```

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1.725    PF 2              1    995010064.99
1.818    PF 2              1 9954.2410035.52
1.913    PF 2              1 9978.0510041.95
2.008    PF 2              1 9953.7710059.34
2.107    PF 2              1    995010063.51
2.202    PF 2              1  9975.3 10039.4
2.296    PF 2              1  9968.3   10060
2.389    PF 2              1 9950.08   10050
2.482    PF 2              1 9923.0910026.91
2.576    PF 2              1    991510052.32
2.67     PF 2              1 9921.0210036.54
2.765    PF 2              1 9930.3910058.45
2.86     PF 2              1 9934.26   10050
2.912    PF 2              1 9963.0910025.47
2.973    PF 2              1 9955.7610098.48
3.059    PF 2              1 9959.25   10050
3.154    PF 2              1  9975.8 10033.8
3.247    PF 2              1 9963.2910016.04
3.342    PF 2              1 9974.9410020.06
3.436    PF 2              1 9981.0310033.59
3.53     PF 2              1 9969.33   10080
3.625    PF 2              1 9963.55   10080
3.719    PF 2              1 9968.09   10100
3.813    PF 2              1 9986.22   10055
3.93     PF 2              1 9986.0110035.96
4.016    PF 2              1 9961.38   10060
4.086    PF 2              1    996510043.82
4.152    PF 2              1    993010104.94
```

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FLOW DATA

Flow Title: 195W
Flow File : g:\Projects\09\09-077 WTO3 Final\05 - Jackrabbit CLOMR\HEC-RAS\Duplicate Effective Model\195W.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2
RIVER-1	Reach-1	4.152	187	187
RIVER-1	Reach-1	4.086	68	68
RIVER-1	Reach-1	4.016	221	221
RIVER-1	Reach-1	3.719	594	594
RIVER-1	Reach-1	3.342	726	726
RIVER-1	Reach-1	2.912	915	915
RIVER-1	Reach-1	2.482	1105	1105
RIVER-1	Reach-1	1.725	955	955
RIVER-1	Reach-1	1.254	1186	1186
RIVER-1	Reach-1	0.499	963	963
RIVER-1	Reach-1	0.348	1093	1093

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1		Normal S = 0.00591
RIVER-1	Reach-1	PF 2		Known WS = 1038.61

****

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	4.152	.035	.03	.06
Reach-1	4.086	.035	.03	.06
Reach-1	4.016	.035	.03	.06
Reach-1	3.93	.035	.03	.06
Reach-1	3.813	.035	.03	.06
Reach-1	3.719	.035	.03	.06
Reach-1	3.625	.035	.03	.06
Reach-1	3.53	.035	.03	.06
Reach-1	3.436	.035	.03	.06
Reach-1	3.342	.035	.03	.06
Reach-1	3.247	.035	.03	.06
Reach-1	3.154	.035	.03	.06
Reach-1	3.059	.035	.03	.06
Reach-1	2.973	.035	.03	.06
Reach-1	2.912	.035	.03	.06
Reach-1	2.86	.035	.03	.06
Reach-1	2.765	.035	.03	.06
Reach-1	2.67	.035	.03	.06
Reach-1	2.576	.035	.03	.06
Reach-1	2.482	.035	.03	.06
Reach-1	2.389	.035	.03	.06
Reach-1	2.296	.035	.03	.06
Reach-1	2.202	.035	.03	.06
Reach-1	2.107	.035	.03	.06
Reach-1	2.008	.035	.03	.06
Reach-1	1.913	.035	.03	.06
Reach-1	1.818	.035	.03	.06
Reach-1	1.725	.035	.03	.06
Reach-1	1.631	.035	.03	.06
Reach-1	1.536	.035	.03	.06
Reach-1	1.443	.035	.03	.06
Reach-1	1.348	.035	.03	.06
Reach-1	1.254	.035	.03	.06
Reach-1	1.159	.035	.03	.06
Reach-1	1.064	.035	.03	.06
Reach-1	1.016	.025	.025	.025
Reach-1	0.969	.012	.012	.012

Reach-1	0.964	Bridge		
Reach-1	0.959	.012	.012	.012
Reach-1	0.914	.016	.022	.016
Reach-1	0.857	.016	.022	.016
Reach-1	0.852	Bridge		
Reach-1	0.847	.016	.022	.016
Reach-1	0.822	.016	.022	.016
Reach-1	0.792	.016	.022	.016
Reach-1	0.769	.016	.022	.016
Reach-1	0.764	Bridge		
Reach-1	0.759	.016	.022	.016
Reach-1	0.722	.03	.03	.04
Reach-1	0.668	.03	.03	.04
Reach-1	0.61	.03	.03	.04
Reach-1	0.566	.03	.03	.04
Reach-1	0.499	.03	.03	.04
Reach-1	0.44	.03	.03	.04
Reach-1	0.348	.03	.03	.04
Reach-1	0.312	.03	.03	.04
Reach-1	0.228	.03	.03	.04
Reach-1	0.142	.03	.03	.04
Reach-1	0.07	.03	.03	.04
Reach-1	0	.03	.03	.04

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	4.152	350	350	350
Reach-1	4.086	370	370	370
Reach-1	4.016	455	455	455
Reach-1	3.93	615	615	615
Reach-1	3.813	500	500	500
Reach-1	3.719	495	495	495
Reach-1	3.625	500	500	500
Reach-1	3.53	500	500	500
Reach-1	3.436	495	495	500
Reach-1	3.342	500	500	500
Reach-1	3.247	490	490	490
Reach-1	3.154	505	505	505
Reach-1	3.059	450	450	450
Reach-1	2.973	300	300	300
Reach-1	2.912	300	300	300
Reach-1	2.86	500	500	500
Reach-1	2.765	500	500	500
Reach-1	2.67	500	500	500
Reach-1	2.576	495	495	495
Reach-1	2.482	490	490	490
Reach-1	2.389	490	490	490
Reach-1	2.296	500	500	500
Reach-1	2.202	500	500	500
Reach-1	2.107	525	525	525
Reach-1	2.008	500	500	500
Reach-1	1.913	500	500	500
Reach-1	1.818	490	490	490
Reach-1	1.725	500	500	500
Reach-1	1.631	500	500	500
Reach-1	1.536	490	490	490
Reach-1	1.443	500	500	500
Reach-1	1.348	500	500	500
Reach-1	1.254	500	500	500
Reach-1	1.159	500	500	500
Reach-1	1.064	253	253	253
Reach-1	1.016	250	250	250
Reach-1	0.969	52	52	52
Reach-1	0.964	Bridge		
Reach-1	0.959	240	240	240
Reach-1	0.914	301	301	301
Reach-1	0.857	52	52	52
Reach-1	0.852	Bridge		
Reach-1	0.847	130	130	130
Reach-1	0.822	160	160	160
Reach-1	0.792	120	120	120
Reach-1	0.769	52	52	52
Reach-1	0.764	Bridge		
Reach-1	0.759	200	200	200
Reach-1	0.722	280	285	280
Reach-1	0.668	305	305	305
Reach-1	0.61	230	230	230
Reach-1	0.566	350	355	350
Reach-1	0.499	325	310	225
Reach-1	0.44	510	490	410
Reach-1	0.348	160	190	300
Reach-1	0.312	420	440	460
Reach-1	0.228	450	455	450
Reach-1	0.142	380	380	380
Reach-1	0.07	370	370	370
Reach-1	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	4.152	.1	.3
Reach-1	4.086	.1	.3
Reach-1	4.016	.1	.3

```
*Reach-1          *    3.93     *          .1*        .3*
*Reach-1          *    3.813    *          .1*        .3*
*Reach-1          *    3.719    *          .1*        .3*
*Reach-1          *    3.625    *          .1*        .3*
*Reach-1          *    3.53     *          .1*        .3*
*Reach-1          *    3.436    *          .1*        .3*
*Reach-1          *    3.342    *          .1*        .3*
*Reach-1          *    3.247    *          .1*        .3*
*Reach-1          *    3.154    *          .1*        .3*
*Reach-1          *    3.059    *          .1*        .3*
*Reach-1          *    2.973    *          .1*        .3*
*Reach-1          *    2.912    *          .1*        .3*
*Reach-1          *    2.86     *          .1*        .3*
*Reach-1          *    2.765    *          .1*        .3*
*Reach-1          *    2.67     *          .1*        .3*
*Reach-1          *    2.576    *          .1*        .3*
*Reach-1          *    2.482    *          .1*        .3*
*Reach-1          *    2.389    *          .1*        .3*
*Reach-1          *    2.296    *          .1*        .3*
*Reach-1          *    2.202    *          .1*        .3*
*Reach-1          *    2.107    *          .1*        .3*
*Reach-1          *    2.008    *          .1*        .3*
*Reach-1          *    1.913    *          .1*        .3*
*Reach-1          *    1.818    *          .1*        .3*
*Reach-1          *    1.725    *          .1*        .3*
*Reach-1          *    1.631    *          .1*        .3*
*Reach-1          *    1.536    *          .1*        .3*
*Reach-1          *    1.443    *          .1*        .3*
*Reach-1          *    1.348    *          .1*        .3*
*Reach-1          *    1.254    *          .1*        .3*
*Reach-1          *    1.159    *          .1*        .3*
*Reach-1          *    1.064    *          .1*        .3*
*Reach-1          *    1.016    *          .1*        .3*
*Reach-1          *    0.969    *          .3*        .5*
*Reach-1          *    0.964    *Bridge     *          *
*Reach-1          *    0.959    *          .3*        .5*
*Reach-1          *    0.914    *          .1*        .3*
*Reach-1          *    0.857    *          .3*        .5*
*Reach-1          *    0.852    *Bridge     *          *
*Reach-1          *    0.847    *          .3*        .5*
*Reach-1          *    0.822    *          .3*        .5*
*Reach-1          *    0.792    *          .1*        .3*
*Reach-1          *    0.769    *          .3*        .5*
*Reach-1          *    0.764    *Bridge     *          *
*Reach-1          *    0.759    *          .3*        .5*
*Reach-1          *    0.722    *          .3*        .5*
*Reach-1          *    0.668    *          .1*        .3*
*Reach-1          *    0.61     *          .1*        .3*
*Reach-1          *    0.566    *          .1*        .3*
*Reach-1          *    0.499    *          .1*        .3*
*Reach-1          *    0.44     *          .1*        .3*
*Reach-1          *    0.348    *          .1*        .3*
*Reach-1          *    0.312    *          .1*        .3*
*Reach-1          *    0.228    *          .1*        .3*
*Reach-1          *    0.142    *          .1*        .3*
*Reach-1          *    0.07     *          .1*        .3*
*Reach-1          *    0        *          .1*        .3*
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E.5.3 Summary Table

OUTFALL CHANNEL

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	31266	187.00	1187.60	1191.51		1191.67	0.000291	3.18	58.82	15.10	0.28
FRS3	31266	187.00	1187.60	1191.51		1191.67	0.000291	3.18	58.82	15.10	0.28
FRS3	31216	187.00	1187.55	1191.56		1191.62	0.000495	1.96	95.18	23.81	0.17
FRS3	31216	187.00	1187.55	1191.56		1191.62	0.000495	1.96	95.18	23.81	0.17
FRS3	31204	187.00	1187.54	1191.58		1191.60	0.000271	1.20	155.50	44.91	0.11
FRS3	31204	187.00	1187.54	1191.58		1191.60	0.000271	1.20	155.50	44.91	0.11
FRS3	31000	187.00	1187.33	1191.59		1191.59	0.000007	0.21	891.31	237.79	0.02
FRS3	31000	187.00	1187.33	1191.59		1191.59	0.000007	0.21	891.31	237.79	0.02
FRS3	30812	187.00	1187.14	1191.56		1191.58	0.000292	1.29	144.89	37.88	0.12
FRS3	30812	187.00	1187.14	1191.56		1191.58	0.000292	1.29	144.89	37.88	0.12
FRS3	30802	187.00	1187.13	1191.48	1188.67	1191.57	0.000835	2.49	75.01	17.32	0.21
FRS3	30802	187.00	1187.13	1191.48	1188.67	1191.57	0.000835	2.49	75.01	17.32	0.21
FRS3	30801	Culvert									
FRS3	26495	507.00	1181.63	1186.88		1187.09	0.002282	3.66	138.71	30.06	0.30
FRS3	26495	507.00	1181.63	1186.88		1187.09	0.002282	3.66	138.71	30.06	0.30
FRS3	26475	507.00	1181.61	1186.93		1187.02	0.001076	2.38	212.77	63.29	0.23
FRS3	26475	507.00	1181.61	1186.93		1187.02	0.001076	2.38	212.77	63.29	0.23
FRS3	26200	507.00	1181.33	1186.64		1186.73	0.001056	2.35	215.50	64.48	0.23
FRS3	26200	507.00	1181.33	1186.64		1186.73	0.001056	2.35	215.50	64.48	0.23
FRS3	25900	507.00	1181.03	1186.32		1186.41	0.001088	2.38	213.32	64.30	0.23
FRS3	25900	507.00	1181.03	1186.32		1186.41	0.001088	2.38	213.32	64.30	0.23
FRS3	25600	507.00	1180.73	1185.99		1186.08	0.001120	2.40	211.10	64.02	0.23
FRS3	25600	507.00	1180.73	1185.99		1186.08	0.001120	2.40	211.10	64.02	0.23
FRS3	25299	507.00	1180.43	1185.66		1185.74	0.001084	2.35	215.29	65.69	0.23
FRS3	25299	507.00	1180.43	1185.66		1185.74	0.001084	2.35	215.29	65.69	0.23
FRS3	25195	507.00	1180.28	1185.54		1185.63	0.001118	2.36	214.96	67.06	0.23
FRS3	25195	507.00	1180.28	1185.54		1185.63	0.001118	2.36	214.96	67.06	0.23
FRS3	25000	507.00	1180.08	1185.37		1185.43	0.000878	2.02	250.73	82.76	0.20
FRS3	25000	507.00	1180.08	1185.37		1185.43	0.000878	2.02	250.73	82.76	0.20
FRS3	24700	507.00	1179.78	1185.08		1185.16	0.000954	2.19	231.01	71.48	0.22
FRS3	24700	507.00	1179.78	1185.08		1185.16	0.000954	2.19	231.01	71.48	0.22
FRS3	24400	507.00	1179.48	1184.81		1184.88	0.000872	2.07	244.99	77.58	0.21
FRS3	24400	507.00	1179.48	1184.81		1184.88	0.000872	2.07	244.99	77.58	0.21
FRS3	24081	507.00	1179.16	1184.52		1184.60	0.000892	2.18	232.94	69.22	0.21
FRS3	24081	507.00	1179.16	1184.52		1184.60	0.000892	2.18	232.94	69.22	0.21
FRS3	24061	507.00	1179.14	1184.34	1181.83	1184.56	0.001489	3.78	134.12	29.15	0.31
FRS3	24061	507.00	1179.14	1184.34	1181.83	1184.56	0.001489	3.78	134.12	29.15	0.31
FRS3	24052.5	Culvert									
FRS3	23639	507.00	1178.33	1183.75		1183.94	0.001237	3.53	143.80	30.13	0.28
FRS3	23639	507.00	1178.33	1183.75		1183.94	0.001237	3.53	143.80	30.13	0.28
FRS3	23619	507.00	1178.31	1183.81		1183.88	0.000921	2.24	226.44	65.90	0.21
FRS3	23619	507.00	1178.31	1183.81		1183.88	0.000921	2.24	226.44	65.90	0.21
FRS3	23300	507.00	1178.09	1183.52		1183.59	0.000899	2.18	232.49	69.27	0.21
FRS3	23300	507.00	1178.09	1183.52		1183.59	0.000899	2.18	232.49	69.27	0.21
FRS3	23000	507.00	1177.88	1183.22		1183.30	0.001048	2.34	216.26	64.69	0.23
FRS3	23000	507.00	1177.88	1183.22		1183.30	0.001048	2.34	216.26	64.69	0.23
FRS3	22731	507.00	1177.69	1182.93		1183.02	0.001080	2.32	218.46	68.10	0.23
FRS3	22731	507.00	1177.69	1182.93		1183.02	0.001080	2.32	218.46	68.10	0.23
FRS3	22711	507.00	1177.68	1182.75	1180.37	1182.98	0.001550	3.80	133.46	30.11	0.32

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	22711	507.00	1177.68	1182.75	1180.37	1182.98	0.001550	3.80	133.46	30.11	0.32
FRS3	22704.4	Culvert									
FRS3	22635	507.00	1176.86	1182.22		1182.42	0.001281	3.57	142.20	30.12	0.29
FRS3	22635	507.00	1176.86	1182.22		1182.42	0.001281	3.57	142.20	30.12	0.29
FRS3	22615	507.00	1176.84	1182.29		1182.36	0.000926	2.19	231.95	70.47	0.21
FRS3	22615	507.00	1176.84	1182.29		1182.36	0.000926	2.19	231.95	70.47	0.21
FRS3	22500	507.00	1176.76	1182.18		1182.26	0.000926	2.20	230.28	69.18	0.21
FRS3	22500	507.00	1176.76	1182.18		1182.26	0.000926	2.20	230.28	69.18	0.21
FRS3	22200	507.00	1176.55	1181.87		1181.96	0.001055	2.35	215.69	64.60	0.23
FRS3	22200	507.00	1176.55	1181.87		1181.96	0.001055	2.35	215.69	64.60	0.23
FRS3	21900	507.00	1176.34	1181.53		1181.63	0.001180	2.45	207.19	63.53	0.24
FRS3	21900	507.00	1176.34	1181.53		1181.63	0.001180	2.45	207.19	63.53	0.24
FRS3	21600	507.00	1176.13	1181.14		1181.24	0.001392	2.60	195.32	62.04	0.26
FRS3	21600	507.00	1176.13	1181.14		1181.24	0.001392	2.60	195.32	62.04	0.26
FRS3	21326	507.00	1175.93	1180.69		1180.81	0.001739	2.81	180.22	59.97	0.29
FRS3	21326	507.00	1175.93	1180.69		1180.81	0.001739	2.81	180.22	59.97	0.29
FRS3	21308	507.00	1175.91	1179.05	1179.05	1180.62	0.003499	10.08	50.28	16.08	1.01
FRS3	21308	507.00	1175.91	1179.05	1179.05	1180.62	0.003499	10.08	50.28	16.08	1.01
FRS3	21275	507.00	1173.05	1177.17	1176.19	1178.08	0.001567	7.66	66.19	16.12	0.67
FRS3	21275	507.00	1173.05	1177.17	1176.19	1178.08	0.001567	7.66	66.19	16.12	0.67
FRS3	21265.8	Culvert									
FRS3	21136	507.00	1172.50	1176.89		1176.97	0.000087	2.23	226.95	51.73	0.19
FRS3	21136	507.00	1172.50	1176.89		1176.97	0.000087	2.23	226.95	51.73	0.19
FRS3	21135	507.00	1172.19	1176.87		1176.97	0.000677	2.48	204.16	52.51	0.22
FRS3	21135	507.00	1172.19	1176.87		1176.97	0.000677	2.48	204.16	52.51	0.22
FRS3	21124	507.00	1172.16	1176.87		1176.96	0.001201	2.32	218.69	74.17	0.24
FRS3	21124	507.00	1172.16	1176.87		1176.96	0.001201	2.32	218.69	74.17	0.24
FRS3	20850	507.00	1171.89	1176.57		1176.65	0.001034	2.21	229.89	75.19	0.22
FRS3	20850	507.00	1171.89	1176.57		1176.65	0.001034	2.21	229.89	75.19	0.22
FRS3	20580	507.00	1171.62	1176.25		1176.34	0.001266	2.41	210.14	69.69	0.24
FRS3	20580	507.00	1171.62	1176.25		1176.34	0.001266	2.41	210.14	69.69	0.24
FRS3	20550	507.00	1171.59	1174.79	1174.79	1176.15	0.003274	9.38	54.08	20.08	1.01
FRS3	20550	507.00	1171.59	1174.79	1174.79	1176.15	0.003274	9.38	54.08	20.08	1.01
FRS3	20538	507.00	1169.59	1173.87		1174.56	0.001184	6.69	75.80	20.12	0.61
FRS3	20538	507.00	1169.59	1173.87		1174.56	0.001184	6.69	75.80	20.12	0.61
FRS3	20532	507.00	1169.59	1173.99		1174.50	0.000754	5.74	88.30	20.13	0.48
FRS3	20532	507.00	1169.59	1173.99		1174.50	0.000754	5.74	88.30	20.13	0.48
FRS3	20502	507.00	1169.55	1174.27		1174.38	0.000119	2.65	191.30	40.63	0.22
FRS3	20502	507.00	1169.55	1174.27		1174.38	0.000119	2.65	191.30	40.63	0.22
FRS3	20501	507.00	1169.55	1174.22		1174.37	0.001107	3.12	162.34	41.30	0.28
FRS3	20501	507.00	1169.55	1174.22		1174.37	0.001107	3.12	162.34	41.30	0.28
FRS3	20486	507.00	1169.54	1174.25		1174.33	0.001181	2.32	218.12	72.73	0.24
FRS3	20486	507.00	1169.54	1174.25		1174.33	0.001181	2.32	218.12	72.73	0.24
FRS3	20300	507.00	1169.36	1174.04		1174.12	0.001103	2.22	228.87	78.20	0.23
FRS3	20300	507.00	1169.36	1174.04		1174.12	0.001103	2.22	228.87	78.20	0.23
FRS3	20077	507.00	1169.13	1173.77		1173.86	0.001247	2.39	212.34	70.78	0.24
FRS3	20077	507.00	1169.13	1173.77		1173.86	0.001247	2.39	212.34	70.78	0.24
FRS3	20048	507.00	1169.11	1172.31	1172.31	1173.67	0.003276	9.38	54.07	20.08	1.01
FRS3	20048	507.00	1169.11	1172.31	1172.31	1173.67	0.003276	9.38	54.07	20.08	1.01

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	20036	507.00	1167.11	1172.24		1172.70	0.000652	5.46	92.83	20.14	0.45
FRS3	20036	507.00	1167.11	1172.24		1172.70	0.000652	5.46	92.83	20.14	0.45
FRS3	20030	507.00	1167.11	1172.30		1172.67	0.000467	4.87	104.15	20.15	0.38
FRS3	20030	507.00	1167.11	1172.30		1172.67	0.000467	4.87	104.15	20.15	0.38
FRS3	20000	507.00	1167.07	1172.49		1172.58	0.000078	2.30	220.08	40.65	0.17
FRS3	20000	507.00	1167.07	1172.49		1172.58	0.000078	2.30	220.08	40.65	0.17
FRS3	19999	507.00	1167.07	1172.47		1172.57	0.000653	2.64	192.37	41.33	0.22
FRS3	19999	507.00	1167.07	1172.47		1172.57	0.000653	2.64	192.37	41.33	0.22
FRS3	19984	507.00	1167.06	1172.49		1172.55	0.000646	1.92	263.47	73.93	0.18
FRS3	19984	507.00	1167.06	1172.49		1172.55	0.000646	1.92	263.47	73.93	0.18
FRS3	19650	739.00	1166.73	1172.15		1172.25	0.001128	2.51	294.35	84.67	0.24
FRS3	19650	739.00	1166.73	1172.15		1172.25	0.001128	2.51	294.35	84.67	0.24
FRS3	19310	739.00	1166.41	1171.65		1171.79	0.001613	2.97	248.49	72.06	0.28
FRS3	19310	739.00	1166.41	1171.65		1171.79	0.001613	2.97	248.49	72.06	0.28
FRS3	19277	739.00	1166.45	1171.15		1171.71	0.000709	6.03	122.48	26.13	0.49
FRS3	19277	739.00	1166.45	1171.15		1171.71	0.000709	6.03	122.48	26.13	0.49
FRS3	19267	739.00	1165.45	1171.28		1171.65	0.000374	4.86	152.13	26.17	0.36
FRS3	19267	739.00	1165.45	1171.28		1171.65	0.000374	4.86	152.13	26.17	0.36
FRS3	19260	739.00	1165.45	1171.28	1168.38	1171.65	0.000282	4.86	151.99	26.15	0.36
FRS3	19260	739.00	1165.45	1171.28	1168.38	1171.65	0.000282	4.86	151.99	26.15	0.36
FRS3	19252	739.00	1165.42	1169.47	1169.47	1171.48	0.002641	11.38	64.95	16.10	1.00
FRS3	19252	739.00	1165.42	1169.47	1169.47	1171.48	0.002641	11.38	64.95	16.10	1.00
FRS3	18960	739.00	1164.35	1168.40	1168.40	1170.41	0.002641	11.38	64.95	16.10	1.00
FRS3	18960	739.00	1164.35	1168.40	1168.40	1170.41	0.002641	11.38	64.95	16.10	1.00
FRS3	18920	739.00	1161.06	1165.68	1165.11	1167.22	0.001801	9.96	74.23	16.12	0.82
FRS3	18920	739.00	1161.06	1165.68	1165.11	1167.22	0.001801	9.96	74.23	16.12	0.82
FRS3	18340	739.00	1159.88	1164.95	1163.93	1166.23	0.001382	9.07	81.51	16.13	0.71
FRS3	18340	739.00	1159.88	1164.95	1163.93	1166.23	0.001382	9.07	81.51	16.13	0.71
FRS3	18200	790.00	1159.69	1165.69		1165.75	0.000555	1.96	402.05	98.16	0.17
FRS3	18200	790.00	1159.69	1165.69		1165.75	0.000555	1.96	402.05	98.16	0.17
FRS3	17900	790.00	1159.39	1165.43		1165.53	0.000967	2.51	314.85	80.36	0.22
FRS3	17900	790.00	1159.39	1165.43		1165.53	0.000967	2.51	314.85	80.36	0.22
FRS3	17579	790.00	1159.07	1165.12		1165.22	0.000971	2.52	313.41	79.63	0.22
FRS3	17579	790.00	1159.07	1165.12		1165.22	0.000971	2.52	313.41	79.63	0.22
FRS3	17549	790.00	1159.04	1163.17	1163.17	1165.00	0.003248	10.86	72.76	20.11	1.01
FRS3	17549	790.00	1159.04	1163.17	1163.17	1165.00	0.003248	10.86	72.76	20.11	1.01
FRS3	17537	790.00	1157.04	1162.44		1163.44	0.001337	8.03	98.41	20.15	0.64
FRS3	17537	790.00	1157.04	1162.44		1163.44	0.001337	8.03	98.41	20.15	0.64
FRS3	17531	790.00	1157.04	1162.59		1163.37	0.000934	7.09	111.43	20.16	0.53
FRS3	17531	790.00	1157.04	1162.59		1163.37	0.000934	7.09	111.43	20.16	0.53
FRS3	17501	790.00	1157.00	1163.01		1163.18	0.000138	3.24	244.03	40.67	0.23
FRS3	17501	790.00	1157.00	1163.01		1163.18	0.000138	3.24	244.03	40.67	0.23
FRS3	17500	790.00	1157.00	1162.96		1163.17	0.001114	3.66	215.80	41.34	0.28
FRS3	17500	790.00	1157.00	1162.96		1163.17	0.001114	3.66	215.80	41.34	0.28
FRS3	17486	790.00	1156.99	1163.02		1163.12	0.001000	2.56	308.81	78.38	0.23
FRS3	17486	790.00	1156.99	1163.02		1163.12	0.001000	2.56	308.81	78.38	0.23
FRS3	17350	790.00	1156.86	1162.89		1162.99	0.000975	2.52	313.88	80.26	0.22
FRS3	17350	790.00	1156.86	1162.89		1162.99	0.000975	2.52	313.88	80.26	0.22
FRS3	17050	790.00	1156.56	1162.60		1162.70	0.000972	2.51	314.36	80.33	0.22

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	17050	790.00	1156.56	1162.60		1162.70	0.000972	2.51	314.36	80.33	0.22
FRS3	16779	790.00	1156.29	1162.35		1162.44	0.000921	2.45	322.77	82.52	0.22
FRS3	16779	790.00	1156.29	1162.35		1162.44	0.000921	2.45	322.77	82.52	0.22
FRS3	16749	790.00	1156.26	1160.39	1160.39	1162.22	0.003248	10.86	72.76	20.11	1.01
FRS3	16749	790.00	1156.26	1160.39	1160.39	1162.22	0.003248	10.86	72.76	20.11	1.01
FRS3	16737	790.00	1154.26	1160.00		1160.88	0.001103	7.51	105.20	20.16	0.58
FRS3	16737	790.00	1154.26	1160.00		1160.88	0.001103	7.51	105.20	20.16	0.58
FRS3	16731	790.00	1154.26	1160.12		1160.82	0.000801	6.72	117.60	20.17	0.49
FRS3	16731	790.00	1154.26	1160.12		1160.82	0.000801	6.72	117.60	20.17	0.49
FRS3	16701	790.00	1154.22	1160.49		1160.64	0.000121	3.10	254.65	40.68	0.22
FRS3	16701	790.00	1154.22	1160.49		1160.64	0.000121	3.10	254.65	40.68	0.22
FRS3	16700	790.00	1154.22	1160.45		1160.64	0.000955	3.48	226.90	41.35	0.26
FRS3	16700	790.00	1154.22	1160.45		1160.64	0.000955	3.48	226.90	41.35	0.26
FRS3	16686	790.00	1154.21	1160.51		1160.60	0.000829	2.39	330.16	80.53	0.21
FRS3	16686	790.00	1154.21	1160.51		1160.60	0.000829	2.39	330.16	80.53	0.21
FRS3	16500	790.00	1154.03	1160.36		1160.45	0.000791	2.34	338.26	82.67	0.20
FRS3	16500	790.00	1154.03	1160.36		1160.45	0.000791	2.34	338.26	82.67	0.20
FRS3	16200	790.00	1153.73	1160.16		1160.23	0.000632	2.05	386.22	97.95	0.18
FRS3	16200	790.00	1153.73	1160.16		1160.23	0.000632	2.05	386.22	97.95	0.18
FRS3	15984	790.00	1153.52	1160.00		1160.08	0.000736	2.29	345.12	82.23	0.20
FRS3	15984	790.00	1153.52	1160.00		1160.08	0.000736	2.29	345.12	82.23	0.20
FRS3	15939	790.00	1153.48	1157.69	1157.69	1159.81	0.003581	11.69	67.60	16.11	1.01
FRS3	15939	790.00	1153.48	1157.69	1157.69	1159.81	0.003581	11.69	67.60	16.11	1.01
FRS3	15919	851.00	1151.88	1158.07	1156.31	1159.21	0.001393	8.54	99.66	16.18	0.61
FRS3	15919	851.00	1151.88	1158.07	1156.31	1159.21	0.001393	8.54	99.66	16.18	0.61
FRS3	15918.6	Culvert									
FRS3	15742	851.00	1151.09	1157.80		1157.89	0.000066	2.45	346.78	51.77	0.17
FRS3	15742	851.00	1151.09	1157.80		1157.89	0.000066	2.45	346.78	51.77	0.17
FRS3	15741	851.00	1151.06	1157.77		1157.89	0.000512	2.74	310.90	52.56	0.20
FRS3	15741	851.00	1151.06	1157.77		1157.89	0.000512	2.74	310.90	52.56	0.20
FRS3	15731	851.00	1151.06	1157.79		1157.87	0.000690	2.26	376.41	87.25	0.19
FRS3	15731	851.00	1151.06	1157.79		1157.87	0.000690	2.26	376.41	87.25	0.19
FRS3	15591	851.00	1150.92	1157.69		1157.78	0.000697	2.29	371.30	84.78	0.19
FRS3	15591	851.00	1150.92	1157.69		1157.78	0.000697	2.29	371.30	84.78	0.19
FRS3	15561	851.00	1150.89	1155.50	1155.50	1157.54	0.003360	11.48	74.14	18.13	1.00
FRS3	15561	851.00	1150.89	1155.50	1155.50	1157.54	0.003360	11.48	74.14	18.13	1.00
FRS3	15537	851.00	1146.89	1151.62	1151.49	1153.55	0.003072	11.13	76.46	18.13	0.96
FRS3	15537	851.00	1146.89	1151.62	1151.49	1153.55	0.003072	11.13	76.46	18.13	0.96
FRS3	15531	851.00	1146.89	1152.05		1153.34	0.001734	9.13	93.23	18.15	0.71
FRS3	15531	851.00	1146.89	1152.05		1153.34	0.001734	9.13	93.23	18.15	0.71
FRS3	15501	851.00	1146.85	1152.81		1153.00	0.000164	3.52	241.78	40.67	0.25
FRS3	15501	851.00	1146.85	1152.81		1153.00	0.000164	3.52	241.78	40.67	0.25
FRS3	15500	851.00	1146.85	1152.75		1152.99	0.001344	3.99	213.06	41.34	0.31
FRS3	15500	851.00	1146.85	1152.75		1152.99	0.001344	3.99	213.06	41.34	0.31
FRS3	15485	851.00	1146.85	1152.81		1152.94	0.001273	2.90	293.81	73.97	0.26
FRS3	15485	851.00	1146.85	1152.81		1152.94	0.001273	2.90	293.81	73.97	0.26
FRS3	15300	851.00	1146.66	1152.56		1152.70	0.001328	2.94	289.53	73.62	0.26
FRS3	15300	851.00	1146.66	1152.56		1152.70	0.001328	2.94	289.53	73.62	0.26
FRS3	15081	851.00	1146.44	1152.26		1152.40	0.001415	3.01	283.16	73.02	0.27

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	15081	851.00	1146.44	1152.26		1152.40	0.001415	3.01	283.16	73.02	0.27
FRS3	15046	851.00	1146.41	1150.23	1150.23	1152.15	0.003244	11.12	76.50	20.10	1.00
FRS3	15046	851.00	1146.41	1150.23	1150.23	1152.15	0.003244	11.12	76.50	20.10	1.00
FRS3	15042	851.00	1146.00	1149.82	1149.82	1151.74	0.003242	11.12	76.51	20.10	1.00
FRS3	15042	851.00	1146.00	1149.82	1149.82	1151.74	0.003242	11.12	76.51	20.10	1.00
FRS3	15000	851.00	1145.98	1150.57		1150.70	0.001610	2.98	285.86	83.62	0.28
FRS3	15000	851.00	1145.98	1150.57		1150.70	0.001610	2.98	285.86	83.62	0.28
FRS3	14600	851.00	1145.55	1149.91		1150.05	0.001673	3.02	282.22	83.56	0.29
FRS3	14600	851.00	1145.55	1149.91		1150.05	0.001673	3.02	282.22	83.56	0.29
FRS3	14300	851.00	1145.30	1148.97		1149.25	0.004594	4.26	199.91	75.43	0.46
FRS3	14300	851.00	1145.30	1148.97		1149.25	0.004594	4.26	199.91	75.43	0.46
FRS3	14255	851.00	1144.86	1147.49	1147.49	1148.75	0.025980	8.99	94.70	38.22	1.01
FRS3	14255	851.00	1144.86	1147.49	1147.49	1148.75	0.025980	8.99	94.70	38.22	1.01
FRS3	14238	851.00	1141.44	1145.95		1146.34	0.004120	5.01	169.96	38.29	0.42
FRS3	14238	851.00	1141.44	1145.95		1146.34	0.004120	5.01	169.96	38.29	0.42
FRS3	14225	851.00	1141.43	1145.90	1143.91	1146.28	0.004063	4.97	171.09	38.39	0.42
FRS3	14225	851.00	1141.43	1145.90	1143.91	1146.28	0.004063	4.97	171.09	38.39	0.42
FRS3	14223.6	Culvert									
FRS3	14175	851.00	1141.28	1145.46		1145.88	0.004777	5.20	163.63	42.32	0.47
FRS3	14175	851.00	1141.28	1145.46		1145.88	0.004777	5.20	163.63	42.32	0.47
FRS3	14150	851.00	1140.86	1145.34		1145.76	0.004807	5.21	163.45	42.17	0.47
FRS3	14150	851.00	1140.86	1145.34		1145.76	0.004807	5.21	163.45	42.17	0.47
FRS3	14100	851.00	1140.80	1145.38		1145.54	0.001982	3.19	266.59	82.20	0.31
FRS3	14100	851.00	1140.80	1145.38		1145.54	0.001982	3.19	266.59	82.20	0.31
FRS3	13900	851.00	1140.60	1145.01		1145.16	0.001745	3.06	278.08	83.14	0.29
FRS3	13900	851.00	1140.60	1145.01		1145.16	0.001745	3.06	278.08	83.14	0.29
FRS3	13600	851.00	1140.28	1144.50		1144.64	0.001705	3.03	280.56	83.61	0.29
FRS3	13600	851.00	1140.28	1144.50		1144.64	0.001705	3.03	280.56	83.61	0.29
FRS3	13296	851.00	1139.96	1143.66		1143.90	0.003701	3.91	217.86	79.70	0.42
FRS3	13296	851.00	1139.96	1143.66		1143.90	0.003701	3.91	217.86	79.70	0.42
FRS3	13266	851.00	1139.67	1142.30	1142.30	1143.56	0.025838	9.01	94.48	37.94	1.01
FRS3	13266	851.00	1139.67	1142.30	1142.30	1143.56	0.025838	9.01	94.48	37.94	1.01
FRS3	13248	851.00	1136.01	1141.18		1141.48	0.002799	4.43	192.18	38.17	0.35
FRS3	13248	851.00	1136.01	1141.18		1141.48	0.002799	4.43	192.18	38.17	0.35
FRS3	13235	851.00	1135.87	1141.15	1138.44	1141.44	0.002584	4.31	197.32	38.09	0.33
FRS3	13235	851.00	1135.87	1141.15	1138.44	1141.44	0.002584	4.31	197.32	38.09	0.33
FRS3	13233.5	Culvert									
FRS3	13185	851.00	1135.99	1140.92		1141.26	0.003289	4.70	181.16	37.30	0.38
FRS3	13185	851.00	1135.99	1140.92		1141.26	0.003289	4.70	181.16	37.30	0.38
FRS3	13175	851.00	1134.89	1140.92		1141.22	0.002715	4.40	193.50	37.30	0.34
FRS3	13175	851.00	1134.89	1140.92		1141.22	0.002715	4.40	193.50	37.30	0.34
FRS3	13100	851.00	1134.76	1140.96		1141.05	0.000851	2.43	352.14	95.08	0.21
FRS3	13100	851.00	1134.76	1140.96		1141.05	0.000851	2.43	352.14	95.08	0.21
FRS3	12900	851.00	1134.46	1140.80		1140.89	0.000764	2.30	369.96	90.35	0.20
FRS3	12900	851.00	1134.46	1140.80		1140.89	0.000764	2.30	369.96	90.35	0.20
FRS3	12767	851.00	1134.34	1140.64		1140.76	0.001141	2.81	302.54	73.20	0.24
FRS3	12767	851.00	1134.34	1140.64		1140.76	0.001141	2.81	302.54	73.20	0.24
FRS3	12736	851.00	1134.29	1138.62	1138.62	1140.53	0.003218	11.09	76.73	20.12	1.00
FRS3	12736	851.00	1134.29	1138.62	1138.62	1140.53	0.003218	11.09	76.73	20.12	1.00

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	12716	851.00	1130.97	1137.20		1138.05	0.000989	7.39	115.11	20.18	0.55
FRS3	12716	851.00	1130.97	1137.20		1138.05	0.000989	7.39	115.11	20.18	0.55
FRS3	12710	851.00	1130.97	1137.30		1138.00	0.000744	6.69	127.23	20.18	0.47
FRS3	12710	851.00	1130.97	1137.30		1138.00	0.000744	6.69	127.23	20.18	0.47
FRS3	12680	851.00	1130.93	1137.68		1137.83	0.000113	3.11	273.81	40.67	0.21
FRS3	12680	851.00	1130.93	1137.68		1137.83	0.000113	3.11	273.81	40.67	0.21
FRS3	12679	851.00	1130.93	1137.64		1137.82	0.000860	3.45	246.64	41.36	0.25
FRS3	12679	851.00	1130.93	1137.64		1137.82	0.000860	3.45	246.64	41.36	0.25
FRS3	12665	851.00	1130.92	1137.68		1137.79	0.001033	2.69	316.14	76.03	0.23
FRS3	12665	851.00	1130.92	1137.68		1137.79	0.001033	2.69	316.14	76.03	0.23
FRS3	12450	851.00	1130.71	1137.48		1137.57	0.000923	2.51	339.71	84.01	0.22
FRS3	12450	851.00	1130.71	1137.48		1137.57	0.000923	2.51	339.71	84.01	0.22
FRS3	12270	851.00	1130.53	1137.28		1137.40	0.001034	2.69	316.07	76.02	0.23
FRS3	12270	851.00	1130.53	1137.28		1137.40	0.001034	2.69	316.07	76.02	0.23
FRS3	12240	851.00	1130.50	1135.09	1135.09	1137.15	0.003399	11.52	73.85	18.13	1.01
FRS3	12240	851.00	1130.50	1135.09	1135.09	1137.15	0.003399	11.52	73.85	18.13	1.01
FRS3	12216	851.00	1126.50	1132.52		1133.65	0.001426	8.52	99.90	18.17	0.64
FRS3	12216	851.00	1126.50	1132.52		1133.65	0.001426	8.52	99.90	18.17	0.64
FRS3	12210	851.00	1126.50	1132.67		1133.58	0.001042	7.62	111.68	18.18	0.54
FRS3	12210	851.00	1126.50	1132.67		1133.58	0.001042	7.62	111.68	18.18	0.54
FRS3	12180	851.00	1126.46	1133.19		1133.34	0.000114	3.12	273.17	40.67	0.21
FRS3	12180	851.00	1126.46	1133.19		1133.34	0.000114	3.12	273.17	40.67	0.21
FRS3	12179	851.00	1126.46	1133.15		1133.34	0.000867	3.46	245.97	41.36	0.25
FRS3	12179	851.00	1126.46	1133.15		1133.34	0.000867	3.46	245.97	41.36	0.25
FRS3	12164	851.00	1126.45	1133.19		1133.30	0.001045	2.70	314.87	75.89	0.23
FRS3	12164	851.00	1126.45	1133.19		1133.30	0.001045	2.70	314.87	75.89	0.23
FRS3	11900	851.00	1126.19	1132.95		1133.04	0.000877	2.43	350.84	87.80	0.21
FRS3	11900	851.00	1126.19	1132.95		1133.04	0.000877	2.43	350.84	87.80	0.21
FRS3	11590	851.00	1125.88	1132.63		1132.75	0.001034	2.69	316.08	76.02	0.23
FRS3	11590	851.00	1125.88	1132.63		1132.75	0.001034	2.69	316.08	76.02	0.23
FRS3	11560	851.00	1125.85	1130.44	1130.44	1132.50	0.003398	11.52	73.86	18.13	1.01
FRS3	11560	851.00	1125.85	1130.44	1130.44	1132.50	0.003398	11.52	73.86	18.13	1.01
FRS3	11536	851.00	1121.85	1127.94		1129.04	0.001376	8.41	101.18	18.17	0.63
FRS3	11536	851.00	1121.85	1127.94		1129.04	0.001376	8.41	101.18	18.17	0.63
FRS3	11530	851.00	1121.85	1128.09		1128.97	0.001012	7.54	112.84	18.18	0.53
FRS3	11530	851.00	1121.85	1128.09		1128.97	0.001012	7.54	112.84	18.18	0.53
FRS3	11500	851.00	1121.81	1128.59		1128.74	0.000111	3.09	275.31	40.67	0.21
FRS3	11500	851.00	1121.81	1128.59		1128.74	0.000111	3.09	275.31	40.67	0.21
FRS3	11499	851.00	1121.81	1128.56		1128.74	0.000843	3.43	248.20	41.36	0.25
FRS3	11499	851.00	1121.81	1128.56		1128.74	0.000843	3.43	248.20	41.36	0.25
FRS3	11484	851.00	1121.80	1128.59		1128.70	0.001009	2.67	318.75	76.26	0.23
FRS3	11484	851.00	1121.80	1128.59		1128.70	0.001009	2.67	318.75	76.26	0.23
FRS3	11300	851.00	1121.62	1128.41		1128.52	0.001012	2.67	318.57	76.29	0.23
FRS3	11300	851.00	1121.62	1128.41		1128.52	0.001012	2.67	318.57	76.29	0.23
FRS3	11133	851.00	1121.45	1128.22		1128.34	0.001105	2.82	301.83	70.85	0.24
FRS3	11133	851.00	1121.45	1128.22		1128.34	0.001105	2.82	301.83	70.85	0.24
FRS3	11086	851.00	1121.41	1126.00	1126.00	1128.06	0.003399	11.52	73.85	18.13	1.01
FRS3	11086	851.00	1121.41	1126.00	1126.00	1128.06	0.003399	11.52	73.85	18.13	1.01
FRS3	11069	851.00	1118.61	1125.59		1126.41	0.000911	7.26	117.26	18.17	0.50

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	11069	851.00	1118.61	1125.59		1126.41	0.000911	7.26	117.26	18.17	0.50
FRS3	11063	851.00	1118.61	1125.68		1126.37	0.000716	6.65	127.88	18.18	0.44
FRS3	11063	851.00	1118.61	1125.68		1126.37	0.000716	6.65	127.88	18.18	0.44
FRS3	11033	851.00	1118.59	1126.07		1126.19	0.000083	2.80	303.63	40.69	0.18
FRS3	11033	851.00	1118.59	1126.07		1126.19	0.000083	2.80	303.63	40.69	0.18
FRS3	11032	851.00	1118.59	1126.04		1126.19	0.000602	3.07	277.46	41.38	0.21
FRS3	11032	851.00	1118.59	1126.04		1126.19	0.000602	3.07	277.46	41.38	0.21
FRS3	11017	851.00	1118.56	1126.08		1126.16	0.000630	2.24	380.04	83.16	0.18
FRS3	11017	851.00	1118.56	1126.08		1126.16	0.000630	2.24	380.04	83.16	0.18
FRS3	10800	851.00	1118.35	1125.96		1126.03	0.000552	2.09	406.87	89.69	0.17
FRS3	10800	851.00	1118.35	1125.96		1126.03	0.000552	2.09	406.87	89.69	0.17
FRS3	10645	851.00	1118.20	1125.90		1125.95	0.000399	1.86	457.63	94.24	0.15
FRS3	10645	851.00	1118.20	1125.90		1125.95	0.000399	1.86	457.63	94.24	0.15
FRS3	10599	931.00	1118.17	1124.49	1122.87	1125.79	0.001574	9.15	101.76	16.18	0.64
FRS3	10599	931.00	1118.17	1124.49	1122.87	1125.79	0.001574	9.15	101.76	16.18	0.64
FRS3	10598	Culvert									
FRS3	10545	931.00	1114.91	1120.76		1122.28	0.001951	9.89	94.15	16.17	0.72
FRS3	10545	931.00	1114.91	1120.76		1122.28	0.001951	9.89	94.15	16.17	0.72
FRS3	10521	931.00	1114.91	1121.75		1121.85	0.000074	2.64	353.29	51.77	0.18
FRS3	10521	931.00	1114.91	1121.75		1121.85	0.000074	2.64	353.29	51.77	0.18
FRS3	10520	931.00	1114.63	1121.73		1121.85	0.000505	2.81	331.10	52.57	0.20
FRS3	10520	931.00	1114.63	1121.73		1121.85	0.000505	2.81	331.10	52.57	0.20
FRS3	10500	931.00	1114.61	1121.73		1121.83	0.000898	2.57	362.35	84.36	0.22
FRS3	10500	931.00	1114.61	1121.73		1121.83	0.000898	2.57	362.35	84.36	0.22
FRS3	10350	931.00	1114.46	1121.59		1121.70	0.000922	2.61	356.78	83.45	0.22
FRS3	10350	931.00	1114.46	1121.59		1121.70	0.000922	2.61	356.78	83.45	0.22
FRS3	10154	931.00	1114.26	1121.41		1121.51	0.000934	2.63	354.28	82.08	0.22
FRS3	10154	931.00	1114.26	1121.41		1121.51	0.000934	2.63	354.28	82.08	0.22
FRS3	10124	931.00	1114.23	1119.09	1119.09	1121.26	0.003376	11.82	78.74	18.13	1.00
FRS3	10124	931.00	1114.23	1119.09	1119.09	1121.26	0.003376	11.82	78.74	18.13	1.00
FRS3	10100	931.00	1110.23	1116.66		1117.83	0.001400	8.69	107.18	18.18	0.63
FRS3	10100	931.00	1110.23	1116.66		1117.83	0.001400	8.69	107.18	18.18	0.63
FRS3	10094	931.00	1110.23	1116.80		1117.75	0.001047	7.83	118.89	18.19	0.54
FRS3	10094	931.00	1110.23	1116.80		1117.75	0.001047	7.83	118.89	18.19	0.54
FRS3	10064	931.00	1110.20	1117.35		1117.51	0.000114	3.21	290.08	40.68	0.21
FRS3	10064	931.00	1110.20	1117.35		1117.51	0.000114	3.21	290.08	40.68	0.21
FRS3	10063	931.00	1110.20	1117.31		1117.50	0.000845	3.54	263.21	41.37	0.25
FRS3	10063	931.00	1110.20	1117.31		1117.50	0.000845	3.54	263.21	41.37	0.25
FRS3	10048	931.00	1110.19	1117.36		1117.46	0.000918	2.61	357.01	82.56	0.22
FRS3	10048	931.00	1110.19	1117.36		1117.46	0.000918	2.61	357.01	82.56	0.22
FRS3	9900	931.00	1110.04	1117.24		1117.33	0.000833	2.48	375.72	87.48	0.21
FRS3	9900	931.00	1110.04	1117.24		1117.33	0.000833	2.48	375.72	87.48	0.21
FRS3	9728	931.00	1109.87	1117.06		1117.17	0.000989	2.76	337.60	75.49	0.23
FRS3	9728	931.00	1109.87	1117.06		1117.17	0.000989	2.76	337.60	75.49	0.23
FRS3	9675	931.00	1109.85	1114.71	1114.71	1116.88	0.003380	11.83	78.71	18.13	1.00
FRS3	9675	931.00	1109.85	1114.71	1114.71	1116.88	0.003380	11.83	78.71	18.13	1.00
FRS3	9660	931.00	1107.35	1114.26		1115.26	0.001125	8.03	115.92	18.17	0.56
FRS3	9660	931.00	1107.35	1114.26		1115.26	0.001125	8.03	115.92	18.17	0.56
FRS3	9654	931.00	1107.35	1114.37		1115.21	0.000873	7.33	126.99	18.18	0.49

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	9654	931.00	1107.35	1114.37		1115.21	0.000873	7.33	126.99	18.18	0.49
FRS3	9624	931.00	1107.35	1114.85		1114.99	0.000099	3.06	304.29	40.69	0.20
FRS3	9624	931.00	1107.35	1114.85		1114.99	0.000099	3.06	304.29	40.69	0.20
FRS3	9623	931.00	1107.35	1114.81		1114.99	0.000717	3.35	277.92	41.38	0.23
FRS3	9623	931.00	1107.35	1114.81		1114.99	0.000717	3.35	277.92	41.38	0.23
FRS3	9608	931.00	1107.27	1114.86		1114.95	0.000733	2.43	382.48	82.69	0.20
FRS3	9608	931.00	1107.27	1114.86		1114.95	0.000733	2.43	382.48	82.69	0.20
FRS3	9450	931.00	1107.12	1114.75		1114.84	0.000699	2.39	389.67	83.60	0.20
FRS3	9450	931.00	1107.12	1114.75		1114.84	0.000699	2.39	389.67	83.60	0.20
FRS3	9299	931.00	1106.99	1114.67		1114.74	0.000526	2.12	439.04	91.25	0.17
FRS3	9299	931.00	1106.99	1114.67		1114.74	0.000526	2.12	439.04	91.25	0.17
FRS3	9273	931.00	1106.97	1113.29	1111.67	1114.60	0.001578	9.16	101.69	16.16	0.64
FRS3	9273	931.00	1106.97	1113.29	1111.67	1114.60	0.001578	9.16	101.69	16.16	0.64
FRS3	9272	Culvert									
FRS3	9218	931.00	1103.23	1109.47		1110.81	0.001637	9.28	100.33	16.16	0.66
FRS3	9218	931.00	1103.23	1109.47		1110.81	0.001637	9.28	100.33	16.16	0.66
FRS3	9194	931.00	1103.23	1110.33		1110.43	0.000066	2.54	367.06	51.78	0.17
FRS3	9194	931.00	1103.23	1110.33		1110.43	0.000066	2.54	367.06	51.78	0.17
FRS3	9193	931.00	1103.23	1110.31		1110.43	0.000511	2.82	329.86	52.57	0.20
FRS3	9193	931.00	1103.23	1110.31		1110.43	0.000511	2.82	329.86	52.57	0.20
FRS3	9183	931.00	1103.17	1110.31		1110.42	0.000883	2.56	364.06	84.29	0.22
FRS3	9183	931.00	1103.17	1110.31		1110.42	0.000883	2.56	364.06	84.29	0.22
FRS3	9000	931.00	1102.98	1110.14		1110.25	0.000957	2.68	347.14	79.23	0.23
FRS3	9000	931.00	1102.98	1110.14		1110.25	0.000957	2.68	347.14	79.23	0.23
FRS3	8863	931.00	1102.84	1110.00		1110.11	0.000976	2.74	339.58	75.90	0.23
FRS3	8863	931.00	1102.84	1110.00		1110.11	0.000976	2.74	339.58	75.90	0.23
FRS3	8809	931.00	1102.79	1107.65	1107.65	1109.82	0.003378	11.83	78.72	18.13	1.00
FRS3	8809	931.00	1102.79	1107.65	1107.65	1109.82	0.003378	11.83	78.72	18.13	1.00
FRS3	8785	931.00	1098.79	1105.15		1106.35	0.001442	8.78	106.07	18.18	0.64
FRS3	8785	931.00	1098.79	1105.15		1106.35	0.001442	8.78	106.07	18.18	0.64
FRS3	8779	931.00	1098.79	1105.31		1106.27	0.001072	7.90	117.88	18.19	0.55
FRS3	8779	931.00	1098.79	1105.31		1106.27	0.001072	7.90	117.88	18.19	0.55
FRS3	8749	931.00	1098.76	1105.86		1106.02	0.000116	3.23	288.21	40.68	0.21
FRS3	8749	931.00	1098.76	1105.86		1106.02	0.000116	3.23	288.21	40.68	0.21
FRS3	8748	931.00	1098.76	1105.82		1106.02	0.000864	3.56	261.27	41.37	0.25
FRS3	8748	931.00	1098.76	1105.82		1106.02	0.000864	3.56	261.27	41.37	0.25
FRS3	8733	931.00	1098.75	1105.87		1105.98	0.000970	2.69	345.99	79.40	0.23
FRS3	8733	931.00	1098.75	1105.87		1105.98	0.000970	2.69	345.99	79.40	0.23
FRS3	8600	931.00	1098.61	1105.76		1105.85	0.000854	2.49	373.94	88.09	0.21
FRS3	8600	931.00	1098.61	1105.76		1105.85	0.000854	2.49	373.94	88.09	0.21
FRS3	8437	931.00	1098.45	1105.59		1105.71	0.000957	2.68	347.63	79.53	0.23
FRS3	8437	931.00	1098.45	1105.59		1105.71	0.000957	2.68	347.63	79.53	0.23
FRS3	8400	931.00	1098.41	1103.27	1103.27	1105.44	0.003382	11.83	78.69	18.13	1.00
FRS3	8400	931.00	1098.41	1103.27	1103.27	1105.44	0.003382	11.83	78.69	18.13	1.00
FRS3	8376	931.00	1094.41	1100.86		1102.02	0.001387	8.66	107.55	18.18	0.63
FRS3	8376	931.00	1094.41	1100.86		1102.02	0.001387	8.66	107.55	18.18	0.63
FRS3	8370	931.00	1094.41	1101.00		1101.95	0.001039	7.81	119.22	18.19	0.54
FRS3	8370	931.00	1094.41	1101.00		1101.95	0.001039	7.81	119.22	18.19	0.54
FRS3	8340	931.00	1094.38	1101.54		1101.70	0.000113	3.20	290.69	40.68	0.21

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	8340	931.00	1094.38	1101.54		1101.70	0.000113	3.20	290.69	40.68	0.21
FRS3	8339	931.00	1094.38	1101.50		1101.70	0.000839	3.53	263.85	41.37	0.25
FRS3	8339	931.00	1094.38	1101.50		1101.70	0.000839	3.53	263.85	41.37	0.25
FRS3	8325	931.00	1094.37	1101.55		1101.66	0.000940	2.67	349.26	79.39	0.22
FRS3	8325	931.00	1094.37	1101.55		1101.66	0.000940	2.67	349.26	79.39	0.22
FRS3	8150	931.00	1094.19	1101.39		1101.50	0.000931	2.66	350.52	79.55	0.22
FRS3	8150	931.00	1094.19	1101.39		1101.50	0.000931	2.66	350.52	79.55	0.22
FRS3	8004	931.00	1094.05	1101.26		1101.37	0.000841	2.56	363.22	80.52	0.21
FRS3	8004	931.00	1094.05	1101.26		1101.37	0.000841	2.56	363.22	80.52	0.21
FRS3	7970	931.00	1094.03	1098.79	1098.73	1101.09	0.003510	12.19	76.37	16.12	0.99
FRS3	7970	931.00	1094.03	1098.79	1098.73	1101.09	0.003510	12.19	76.37	16.12	0.99
FRS3	7960	931.00	1093.14	1099.47	1097.84	1100.77	0.001577	9.15	101.70	16.16	0.64
FRS3	7960	931.00	1093.14	1099.47	1097.84	1100.77	0.001577	9.15	101.70	16.16	0.64
FRS3	7958.2	Culvert									
FRS3	7907.3	931.00	1091.88	1098.01		1099.40	0.001721	9.45	98.52	16.15	0.67
FRS3	7907.3	931.00	1091.88	1098.01		1099.40	0.001721	9.45	98.52	16.15	0.67
FRS3	7886	931.00	1091.76	1098.91		1099.00	0.000065	2.52	369.35	51.78	0.17
FRS3	7886	931.00	1091.76	1098.91		1099.00	0.000065	2.52	369.35	51.78	0.17
FRS3	7885	931.00	1091.76	1098.88		1099.00	0.000500	2.80	332.22	52.57	0.20
FRS3	7885	931.00	1091.76	1098.88		1099.00	0.000500	2.80	332.22	52.57	0.20
FRS3	7876	931.00	1091.76	1098.89		1098.99	0.000836	2.48	375.81	87.71	0.21
FRS3	7876	931.00	1091.76	1098.89		1098.99	0.000836	2.48	375.81	87.71	0.21
FRS3	7700	931.00	1091.58	1098.72		1098.83	0.000964	2.69	346.04	79.10	0.23
FRS3	7700	931.00	1091.58	1098.72		1098.83	0.000964	2.69	346.04	79.10	0.23
FRS3	7425	931.00	1091.30	1098.45		1098.57	0.000951	2.68	347.99	79.42	0.23
FRS3	7425	931.00	1091.30	1098.45		1098.57	0.000951	2.68	347.99	79.42	0.23
FRS3	7376	931.00	1091.25	1096.11	1096.11	1098.28	0.003379	11.83	78.72	18.13	1.00
FRS3	7376	931.00	1091.25	1096.11	1096.11	1098.28	0.003379	11.83	78.72	18.13	1.00
FRS3	7358	931.00	1088.25	1094.62		1095.81	0.001437	8.77	106.20	18.18	0.64
FRS3	7358	931.00	1088.25	1094.62		1095.81	0.001437	8.77	106.20	18.18	0.64
FRS3	7352	931.00	1088.25	1094.77		1095.74	0.001070	7.89	117.99	18.19	0.55
FRS3	7352	931.00	1088.25	1094.77		1095.74	0.001070	7.89	117.99	18.19	0.55
FRS3	7322	931.00	1088.22	1095.33		1095.49	0.000116	3.23	288.42	40.68	0.21
FRS3	7322	931.00	1088.22	1095.33		1095.49	0.000116	3.23	288.42	40.68	0.21
FRS3	7321	931.00	1088.22	1095.29		1095.48	0.000862	3.56	261.48	41.37	0.25
FRS3	7321	931.00	1088.22	1095.29		1095.48	0.000862	3.56	261.48	41.37	0.25
FRS3	7306	931.00	1088.21	1095.33		1095.45	0.000961	2.69	346.27	78.93	0.23
FRS3	7306	931.00	1088.21	1095.33		1095.45	0.000961	2.69	346.27	78.93	0.23
FRS3	7150	931.00	1088.05	1095.19		1095.30	0.000935	2.64	353.12	81.41	0.22
FRS3	7150	931.00	1088.05	1095.19		1095.30	0.000935	2.64	353.12	81.41	0.22
FRS3	7030	931.00	1087.93	1095.08		1095.18	0.000924	2.62	355.63	82.20	0.22
FRS3	7030	931.00	1087.93	1095.08		1095.18	0.000924	2.62	355.63	82.20	0.22
FRS3	7000	931.00	1087.90	1092.76	1092.76	1094.93	0.003382	11.83	78.69	18.13	1.00
FRS3	7000	931.00	1087.90	1092.76	1092.76	1094.93	0.003382	11.83	78.69	18.13	1.00
FRS3	6982	931.00	1084.90	1091.32		1092.49	0.001405	8.70	107.05	18.18	0.63
FRS3	6982	931.00	1084.90	1091.32		1092.49	0.001405	8.70	107.05	18.18	0.63
FRS3	6976	931.00	1084.90	1091.46		1092.42	0.001050	7.84	118.77	18.19	0.54
FRS3	6976	931.00	1084.90	1091.46		1092.42	0.001050	7.84	118.77	18.19	0.54
FRS3	6946	931.00	1084.87	1092.01		1092.17	0.000114	3.21	289.85	40.68	0.21

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	6946	931.00	1084.87	1092.01		1092.17	0.000114	3.21	289.85	40.68	0.21
FRS3	6945	931.00	1084.87	1091.97		1092.17	0.000847	3.54	262.98	41.37	0.25
FRS3	6945	931.00	1084.87	1091.97		1092.17	0.000847	3.54	262.98	41.37	0.25
FRS3	6930	931.00	1084.86	1092.02		1092.13	0.000944	2.66	349.40	79.74	0.22
FRS3	6930	931.00	1084.86	1092.02		1092.13	0.000944	2.66	349.40	79.74	0.22
FRS3	6800	931.00	1084.73	1091.91		1092.01	0.000874	2.54	366.29	84.97	0.22
FRS3	6800	931.00	1084.73	1091.91		1092.01	0.000874	2.54	366.29	84.97	0.22
FRS3	6700	931.00	1084.63	1091.84		1091.93	0.000685	2.33	399.08	87.61	0.19
FRS3	6700	931.00	1084.63	1091.84		1091.93	0.000685	2.33	399.08	87.61	0.19
FRS3	6673	931.00	1084.60	1089.30	1089.30	1091.66	0.003628	12.33	75.49	16.12	1.00
FRS3	6673	931.00	1084.60	1089.30	1089.30	1091.66	0.003628	12.33	75.49	16.12	1.00
FRS3	6663	931.00	1083.60	1089.93	1088.30	1091.23	0.001572	9.15	101.80	16.18	0.64
FRS3	6663	931.00	1083.60	1089.93	1088.30	1091.23	0.001572	9.15	101.80	16.18	0.64
FRS3	6661.6	Culvert									
FRS3	6570	931.00	1083.15	1087.28	1087.28	1089.31	0.003125	11.42	81.49	20.28	1.00
FRS3	6570	931.00	1083.15	1087.28	1087.28	1089.31	0.003125	11.42	81.49	20.28	1.00
FRS3	6550	931.00	1083.13	1086.04		1086.95	0.001783	7.66	121.48	47.62	0.85
FRS3	6550	931.00	1083.13	1086.04		1086.95	0.001783	7.66	121.48	47.62	0.85
FRS3	6200	931.00	1082.12	1085.03	1085.03	1086.18	0.002586	8.60	108.28	47.51	1.00
FRS3	6200	931.00	1082.12	1085.03	1085.03	1086.18	0.002586	8.60	108.28	47.51	1.00
FRS3	5920	931.00	1080.77	1083.66	1083.66	1084.81	0.002615	8.60	108.20	47.71	1.01
FRS3	5920	931.00	1080.77	1083.66	1083.66	1084.81	0.002615	8.60	108.20	47.71	1.01
FRS3	5902	931.00	1076.00	1078.92	1078.78	1079.95	0.002157	8.14	114.44	47.40	0.92
FRS3	5902	931.00	1076.00	1078.92	1078.78	1079.95	0.002157	8.14	114.44	47.40	0.92
FRS3	5600	931.00	1075.31	1078.32	1078.12	1079.31	0.002005	7.96	117.01	47.46	0.89
FRS3	5600	931.00	1075.31	1078.32	1078.12	1079.31	0.002005	7.96	117.01	47.46	0.89
FRS3	5400	931.00	1074.96	1078.24	1077.64	1078.89	0.001232	6.50	143.24	54.81	0.71
FRS3	5400	931.00	1074.96	1078.24	1077.64	1078.89	0.001232	6.50	143.24	54.81	0.71
FRS3	5342.1	Culvert									
FRS3	5220	931.00	1073.37	1076.46		1077.14	0.001373	6.65	140.07	54.98	0.73
FRS3	5220	931.00	1073.37	1076.46		1077.14	0.001373	6.65	140.07	54.98	0.73
FRS3	5193	931.00	1073.47	1076.01	1076.01	1077.06	0.002736	8.22	113.26	54.83	1.01
FRS3	5193	931.00	1073.47	1076.01	1076.01	1077.06	0.002736	8.22	113.26	54.83	1.01
FRS3	5181	931.00	1070.26	1072.87	1072.65	1073.75	0.001976	7.54	123.49	53.13	0.87
FRS3	5181	931.00	1070.26	1072.87	1072.65	1073.75	0.001976	7.54	123.49	53.13	0.87
FRS3	5100	931.00	1069.87	1072.96		1073.54	0.001159	6.12	152.10	61.07	0.68
FRS3	5100	931.00	1069.87	1072.96		1073.54	0.001159	6.12	152.10	61.07	0.68
FRS3	4800	1073.00	1069.10	1071.88	1071.88	1072.97	0.002639	8.39	127.84	59.35	1.01
FRS3	4800	1073.00	1069.10	1071.88	1071.88	1072.97	0.002639	8.39	127.84	59.35	1.01
FRS3	4748	1073.00	1069.09	1071.81	1071.71	1072.75	0.002279	7.80	137.64	64.09	0.94
FRS3	4748	1073.00	1069.09	1071.81	1071.71	1072.75	0.002279	7.80	137.64	64.09	0.94
FRS3	4740	1073.00	1067.33	1072.31	1069.75	1072.52	0.000210	3.68	291.29	68.44	0.31
FRS3	4740	1073.00	1067.33	1072.31	1069.75	1072.52	0.000210	3.68	291.29	68.44	0.31
FRS3	4729.5	Culvert									
FRS3	4650	1073.00	1066.87	1072.06		1072.23	0.000165	3.29	325.77	75.71	0.28
FRS3	4650	1073.00	1066.87	1072.06		1072.23	0.000165	3.29	325.77	75.71	0.28
FRS3	4600	1073.00	1066.72	1070.57	1070.57	1072.07	0.002382	9.86	110.73	41.16	0.99
FRS3	4600	1073.00	1066.72	1070.57	1070.57	1072.07	0.002382	9.86	110.73	41.16	0.99

HEC-RAS Plan: Subcritical River: Channel Reach: FRS3 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
FRS3	4350	1073.00	1065.64	1068.45	1068.45	1069.75	0.002565	9.14	117.42	45.73	1.01
FRS3	4350	1073.00	1065.64	1068.45	1068.45	1069.75	0.002565	9.14	117.42	45.73	1.01
FRS3	4278	1073.00	1065.04	1068.42	1067.67	1068.95	0.000965	5.80	185.05	69.73	0.63
FRS3	4278	1073.00	1065.04	1068.42	1067.67	1068.95	0.000965	5.80	185.05	69.73	0.63
FRS3	4271	Culvert									
FRS3	4200	1073.00	1064.55	1067.15		1068.02	0.001910	7.48	143.37	58.74	0.84
FRS3	4200	1073.00	1064.55	1067.15		1068.02	0.001910	7.48	143.37	58.74	0.84
FRS3	4183	1073.00	1064.14	1066.88	1066.88	1067.96	0.002871	8.35	128.56	60.54	1.01
FRS3	4183	1073.00	1064.14	1066.88	1066.88	1067.96	0.002871	8.35	128.56	60.54	1.01
FRS3	4168	1073.00	1060.61	1063.88		1064.30	0.000678	5.20	206.24	70.46	0.54
FRS3	4168	1073.00	1060.61	1063.88		1064.30	0.000678	5.20	206.24	70.46	0.54
FRS3	4100	1073.00	1060.04	1063.85		1064.25	0.000600	5.09	210.71	67.74	0.51
FRS3	4100	1073.00	1060.04	1063.85		1064.25	0.000600	5.09	210.71	67.74	0.51
FRS3	3800	1073.00	1059.76	1062.62	1062.62	1063.84	0.002589	8.86	121.06	50.38	1.01
FRS3	3800	1073.00	1059.76	1062.62	1062.62	1063.84	0.002589	8.86	121.06	50.38	1.01
FRS3	3500	1073.00	1056.41	1059.51	1059.51	1060.77	0.002527	8.99	119.31	47.83	1.00
FRS3	3500	1073.00	1056.41	1059.51	1059.51	1060.77	0.002527	8.99	119.31	47.83	1.00
FRS3	3200	1073.00	1054.86	1057.99	1057.99	1059.25	0.002540	9.00	119.22	47.96	1.01
FRS3	3200	1073.00	1054.86	1057.99	1057.99	1059.25	0.002540	9.00	119.22	47.96	1.01
FRS3	2903	1073.00	1054.01	1056.89	1056.89	1058.12	0.002545	8.91	120.46	49.48	1.01
FRS3	2903	1073.00	1054.01	1056.89	1056.89	1058.12	0.002545	8.91	120.46	49.48	1.01
FRS3	2885	1073.00	1049.49	1052.44	1052.44	1053.70	0.002546	9.00	119.22	47.91	1.01
FRS3	2885	1073.00	1049.49	1052.44	1052.44	1053.70	0.002546	9.00	119.22	47.91	1.01
FRS3	2800	1073.00	1048.25	1051.87		1052.74	0.001462	7.49	143.30	49.94	0.78
FRS3	2800	1073.00	1048.25	1051.87		1052.74	0.001462	7.49	143.30	49.94	0.78
FRS3	2500	1073.00	1047.85	1051.49		1052.31	0.001314	7.25	148.04	50.07	0.74
FRS3	2500	1073.00	1047.85	1051.49		1052.31	0.001314	7.25	148.04	50.07	0.74
FRS3	2200	1073.00	1047.61	1051.17		1051.92	0.001191	6.96	154.24	51.64	0.71
FRS3	2200	1073.00	1047.61	1051.17		1051.92	0.001191	6.96	154.24	51.64	0.71
FRS3	1900	1073.00	1047.22	1050.14	1050.14	1051.36	0.002556	8.89	120.75	49.96	1.01
FRS3	1900	1073.00	1047.22	1050.14	1050.14	1051.36	0.002556	8.89	120.75	49.96	1.01
FRS3	1568	1073.00	1046.68	1048.93	1048.93	1049.89	0.002729	7.87	136.33	71.96	1.01
FRS3	1568	1073.00	1046.68	1048.93	1048.93	1049.89	0.002729	7.87	136.33	71.96	1.01
FRS3	1552	1073.00	1043.68	1048.58		1048.73	0.000149	3.07	349.60	84.01	0.27
FRS3	1552	1073.00	1043.68	1048.58		1048.73	0.000149	3.07	349.60	84.01	0.27
FRS3	1500	1073.00	1043.36	1048.61		1048.70	0.000100	2.51	427.31	103.86	0.22
FRS3	1500	1073.00	1043.36	1048.61		1048.70	0.000100	2.51	427.31	103.86	0.22
FRS3	1300	1073.00	1042.30	1048.61		1048.68	0.000066	2.17	496.95	119.24	0.18
FRS3	1300	1073.00	1042.30	1048.61		1048.68	0.000066	2.17	496.95	119.24	0.18
FRS3	1000	1073.00	1040.47	1048.60	1043.66	1048.66	0.000041	2.03	615.38	150.00	0.15
FRS3	1000	1073.00	1040.47	1048.60	1043.66	1048.66	0.000041	2.03	615.38	150.00	0.15

REMNANT CHANNEL

HEC-RAS Plan: REMNANT CHAN River: JACKRABBIT TRAIL Reach: REMNANT CHANNEL

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
REMNANT CHANNEL	4700	25.00	1185.82	1188.39		1188.39	0.000001	0.09	370.69	273.06	0.01
REMNANT CHANNEL	4700	25.00	1185.82	1188.47		1188.48	0.000004	0.15	191.10	95.72	0.02
REMNANT CHANNEL	4589	25.00	1185.60	1188.39	1186.83	1188.39	0.000036	0.42	112.84	112.02	0.05
REMNANT CHANNEL	4589	25.00	1185.60	1188.46	1186.83	1188.47	0.000151	0.88	46.73	47.00	0.10
REMNANT CHANNEL	4570.50	Culvert									
REMNANT CHANNEL	4545	25.00	1185.50	1188.38	1186.52	1188.38	0.000025	0.37	118.64	104.70	0.04
REMNANT CHANNEL	4545	25.00	1185.50	1188.46	1186.52	1188.46	0.000062	0.60	59.34	45.49	0.07
REMNANT CHANNEL	4532	25.00	1186.34	1188.38		1188.38	0.000035	0.38	109.88	102.25	0.05
REMNANT CHANNEL	4532	25.00	1186.34	1188.45		1188.46	0.000099	0.66	51.89	43.44	0.09
REMNANT CHANNEL	4514	25.00	1186.64	1188.38	1187.40	1188.38	0.000053	0.44	99.50	102.55	0.06
REMNANT CHANNEL	4514	25.00	1186.64	1188.45	1187.40	1188.46	0.000196	0.86	44.30	44.30	0.12
REMNANT CHANNEL	4496.5	Culvert									
REMNANT CHANNEL	4483	25.00	1186.23	1188.34	1186.97	1188.34	0.000054	0.51	94.60	102.63	0.06
REMNANT CHANNEL	4483	25.00	1186.23	1188.43	1186.97	1188.44	0.000138	0.84	46.71	44.11	0.10
REMNANT CHANNEL	4351	98.00	1185.46	1188.27	1186.89	1188.30	0.000433	1.59	106.23	121.17	0.18
REMNANT CHANNEL	4351	98.00	1185.46	1188.31	1186.89	1188.36	0.000758	2.03	60.96	46.12	0.23
REMNANT CHANNEL	3982	237.00	1184.73	1186.91	1186.91	1187.40	0.011262	6.37	50.85	52.05	0.88
REMNANT CHANNEL	3982	237.00	1184.73	1187.40	1186.90	1187.60	0.003673	4.32	76.14	52.05	0.52
REMNANT CHANNEL	3519	237.00	1182.64	1186.76	1185.21	1186.81	0.000337	1.92	169.66	113.15	0.18
REMNANT CHANNEL	3519	237.00	1182.64	1187.18	1185.21	1187.23	0.000285	1.89	142.64	40.73	0.16
REMNANT CHANNEL	3510.50	Culvert									
REMNANT CHANNEL	3500	237.00	1181.73	1185.07	1185.07	1186.70	0.011186	10.25	23.12	41.56	0.99
REMNANT CHANNEL	3500	237.00	1181.73	1185.07	1185.07	1186.70	0.011186	10.25	23.12	35.58	0.99
REMNANT CHANNEL	3313	237.00	1180.75	1183.37		1183.73	0.004551	4.93	53.28	32.12	0.59
REMNANT CHANNEL	3313	237.00	1180.75	1183.45		1183.78	0.003985	4.73	55.88	32.12	0.55
REMNANT CHANNEL	2913	482.00	1178.29	1181.83	1181.26	1182.15	0.003646	5.19	126.08	73.95	0.55
REMNANT CHANNEL	2913	482.00	1178.29	1181.86	1181.22	1182.22	0.003840	5.36	114.95	55.89	0.56
REMNANT CHANNEL	2415	482.00	1175.59	1178.42	1178.42	1179.26	0.010141	7.83	74.71	47.10	0.89
REMNANT CHANNEL	2415	482.00	1175.59	1178.43	1178.43	1179.26	0.009947	7.78	75.26	47.11	0.88
REMNANT CHANNEL	2112	250.00	1172.54	1174.55	1173.91	1174.78	0.003564	3.96	68.53	42.21	0.51
REMNANT CHANNEL	2112	250.00	1172.54	1174.55	1173.91	1174.78	0.003571	3.96	68.48	42.20	0.51
REMNANT CHANNEL	2081	250.00	1172.34	1174.52	1173.65	1174.65	0.001922	3.01	90.94	81.33	0.38
REMNANT CHANNEL	2081	250.00	1172.34	1174.52	1173.65	1174.65	0.001953	3.04	89.88	51.26	0.38
REMNANT CHANNEL	2043	Culvert									
REMNANT CHANNEL	2010	250.00	1171.79	1173.88	1173.24	1174.07	0.003407	3.69	75.26	52.46	0.49
REMNANT CHANNEL	2010	250.00	1171.79	1173.87	1173.24	1174.07	0.003476	3.72	73.78	45.36	0.50
REMNANT CHANNEL	1960	250.00	1171.84	1173.57		1173.84	0.004971	4.36	62.97	42.50	0.59
REMNANT CHANNEL	1960	250.00	1171.84	1173.57		1173.84	0.004971	4.36	62.97	42.50	0.59
REMNANT CHANNEL	1751	250.00	1170.64	1172.78		1173.00	0.003199	3.95	70.39	41.19	0.49
REMNANT CHANNEL	1751	250.00	1170.64	1172.78		1173.00	0.003197	3.95	70.40	41.19	0.49
REMNANT CHANNEL	1456	250.00	1169.47	1172.02		1172.21	0.002207	3.64	74.98	38.38	0.42
REMNANT CHANNEL	1456	250.00	1169.47	1172.02		1172.21	0.002204	3.64	75.01	38.39	0.42
REMNANT CHANNEL	1426	339.00	1169.38	1171.85	1171.09	1172.11	0.003217	4.15	86.93	51.34	0.49
REMNANT CHANNEL	1426	339.00	1169.38	1171.85	1171.09	1172.11	0.003245	4.17	85.86	44.74	0.50
REMNANT CHANNEL	1391.38	Culvert									
REMNANT CHANNEL	1354	339.00	1169.11	1171.30	1170.76	1171.67	0.004951	5.02	72.72	39.91	0.61
REMNANT CHANNEL	1354	339.00	1169.11	1171.30	1170.76	1171.67	0.004954	5.02	72.71	39.90	0.61
REMNANT CHANNEL	1304	339.00	1168.68	1171.08		1171.43	0.004490	4.88	75.77	41.80	0.58
REMNANT CHANNEL	1304	339.00	1168.68	1171.08		1171.43	0.004493	4.88	75.76	41.80	0.59

HEC-RAS Plan: REMNANT CHAN River: JACKRABBIT TRAIL Reach: REMNANT CHANNEL (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
REMNANT CHANNEL	1216	339.00	1167.94	1170.00	1170.00	1170.75	0.013626	7.01	50.57	35.75	0.97
REMNANT CHANNEL	1216	339.00	1167.94	1170.00	1170.00	1170.75	0.013612	7.01	50.56	35.42	0.97
REMNANT CHANNEL	1069	339.00	1167.00	1168.98		1169.36	0.005500	5.12	75.25	45.87	0.64
REMNANT CHANNEL	1069	339.00	1167.00	1168.98		1169.36	0.005496	5.12	75.27	45.87	0.64
REMNANT CHANNEL	1034	339.00	1166.50	1168.28	1168.28	1169.18	0.002448	7.61	44.56	25.00	1.00
REMNANT CHANNEL	1034	339.00	1166.50	1168.28	1168.28	1169.18	0.002448	7.61	44.56	25.00	1.00
REMNANT CHANNEL	1030	339.00	1164.48	1166.26	1166.26	1167.16	0.002459	7.62	44.50	25.00	1.01
REMNANT CHANNEL	1030	339.00	1164.48	1166.26	1166.26	1167.16	0.002459	7.62	44.50	25.00	1.01
REMNANT CHANNEL	1025	339.00	1162.45	1165.61		1165.90	0.000409	4.29	79.11	25.00	0.42
REMNANT CHANNEL	1025	339.00	1162.45	1165.61		1165.90	0.000409	4.29	79.11	25.00	0.42
REMNANT CHANNEL	1020	339.00	1160.20	1165.75		1165.84	0.000551	2.44	138.66	25.00	0.18
REMNANT CHANNEL	1020	339.00	1160.20	1165.75		1165.84	0.000551	2.44	138.66	25.00	0.18
REMNANT CHANNEL	1000	339.00	1160.00	1165.74	1161.78	1165.83	0.000499	2.36	143.50	25.00	0.17
REMNANT CHANNEL	1000	339.00	1160.00	1165.74	1161.78	1165.83	0.000499	2.36	143.50	25.00	0.17

EXISTING CONDITIONS MODEL

HEC-RAS Plan: Subcritical River: Jack Rabbit Trai Reach: Exist Conditions

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist Conditions	22197	40.00	1185.82	1188.36		1188.36	0.000004	0.15	362.93	271.29	0.02
Exist Conditions	22197	40.00	1185.95	1188.79		1188.79	0.000037	0.46	103.86	50.00	0.05
Exist Conditions	22085	40.00	1185.60	1188.35	1187.12	1188.36	0.000116	0.75	108.26	112.02	0.09
Exist Conditions	22085	40.00	1185.60	1188.77	1187.12	1188.78	0.000178	1.04	67.10	54.00	0.11
Exist Conditions	22067	Culvert									
Exist Conditions	22041	40.00	1185.50	1188.35	1186.74	1188.36	0.000073	0.63	115.79	104.59	0.07
Exist Conditions	22041	40.00	1185.50	1188.73	1186.74	1188.74	0.000098	0.81	71.70	44.70	0.09
Exist Conditions	22028	40.00	1186.34	1188.35		1188.35	0.000100	0.64	107.54	102.15	0.08
Exist Conditions	22028	40.00	1186.34	1188.73		1188.74	0.000145	0.88	63.50	42.60	0.11
Exist Conditions	22010	40.00	1186.64	1188.35	1187.66	1188.35	0.000159	0.75	96.97	102.44	0.10
Exist Conditions	22010	40.00	1186.64	1188.72	1187.66	1188.73	0.000258	1.09	57.00	44.50	0.14
Exist Conditions	21993	Culvert									
Exist Conditions	21979	40.00	1186.23	1188.35	1187.22	1188.35	0.000143	0.83	96.49	102.66	0.10
Exist Conditions	21979	40.00	1186.23	1188.69	1187.22	1188.70	0.000209	1.11	57.90	43.10	0.13
Exist Conditions	21847	128.00	1185.46	1188.21		1188.27	0.000894	2.24	99.74	120.41	0.26
Exist Conditions	21847	128.00	1185.46	1188.57		1188.63	0.000665	2.13	84.59	56.80	0.23
Exist Conditions	21478	275.00	1184.73	1187.31	1187.08	1187.48	0.003801	4.29	124.46	157.42	0.53
Exist Conditions	21478	275.00	1184.73	1187.68	1187.12	1187.94	0.003697	4.73	82.53	52.70	0.54
Exist Conditions	21016	310.00	1182.64	1186.87	1185.21	1186.95	0.000546	2.48	181.79	114.70	0.22
Exist Conditions	21016	310.00	1182.64	1187.41	1185.21	1187.49	0.000407	2.34	153.85	41.81	0.20
Exist Conditions	21007	Culvert									
Exist Conditions	20997	310.00	1181.73	1185.21	1185.21	1185.45	0.002212	4.08	87.41	42.78	0.43
Exist Conditions	20997	310.00	1181.73	1185.21	1185.21	1185.45	0.002247	4.11	84.59	37.11	0.43
Exist Conditions	20809	310.00	1180.75	1183.53	1183.13	1184.06	0.006141	6.00	58.41	33.17	0.69
Exist Conditions	20809	310.00	1180.75	1183.53	1183.13	1184.06	0.006139	6.00	58.42	33.17	0.69
Exist Conditions	20709.*	310.00	1180.14	1182.92	1182.55	1183.43	0.006256	5.94	59.67	36.16	0.69
Exist Conditions	20709.*	310.00	1180.14	1182.92	1182.55	1183.43	0.006254	5.94	59.67	36.16	0.69
Exist Conditions	20609.*	310.00	1179.52	1182.33	1181.98	1182.80	0.006097	5.77	62.74	40.16	0.68
Exist Conditions	20609.*	310.00	1179.52	1182.33	1181.98	1182.81	0.006041	5.75	62.95	40.16	0.68
Exist Conditions	20509.*	310.00	1178.90	1181.88	1181.38	1182.25	0.004584	5.13	73.85	47.81	0.59
Exist Conditions	20509.*	310.00	1178.90	1181.91	1181.38	1182.26	0.004380	5.05	75.12	47.81	0.58
Exist Conditions	20409	310.00	1178.29	1181.75	1180.73	1181.91	0.001801	3.58	120.62	82.18	0.38
Exist Conditions	20409	310.00	1178.29	1181.76	1180.73	1181.93	0.001850	3.64	111.54	57.68	0.39
Exist Conditions	19912	558.00	1175.59	1178.61	1178.61	1179.54	0.010322	8.31	83.84	48.88	0.91
Exist Conditions	19912	558.00	1175.59	1178.63	1178.63	1179.55	0.010063	8.24	83.59	45.44	0.90
Exist Conditions	19608	609.00	1172.54	1176.76	1174.87	1176.99	0.001374	4.13	177.97	58.65	0.36
Exist Conditions	19608	609.00	1172.54	1176.95	1174.89	1177.17	0.001230	4.03	172.64	43.53	0.34
Exist Conditions	19578	609.00	1172.34	1176.79	1174.45	1176.90	0.000677	2.98	309.12	175.75	0.25
Exist Conditions	19578	609.00	1172.34	1176.93	1174.53	1177.12	0.001056	3.56	183.64	43.05	0.30
Exist Conditions	19539	Culvert									
Exist Conditions	19507	609.00	1171.79	1175.25	1174.12	1175.58	0.002793	4.92	142.85	115.95	0.49
Exist Conditions	19507	609.00	1171.79	1175.27	1174.13	1175.68	0.003197	5.30	127.32	41.20	0.53
Exist Conditions	19457	609.00	1171.84	1174.96	1174.03	1175.39	0.003643	5.58	128.69	51.70	0.56
Exist Conditions	19457	609.00	1171.84	1175.13	1174.03	1175.51	0.002987	5.24	137.51	51.71	0.51
Exist Conditions	19247	609.00	1170.64	1174.43	1173.06	1174.77	0.002302	4.99	147.38	51.28	0.46
Exist Conditions	19247	609.00	1170.64	1174.74	1173.06	1175.02	0.001693	4.52	163.53	51.28	0.40
Exist Conditions	18953	672.00	1169.47	1173.62	1172.27	1174.04	0.002542	5.51	146.92	52.28	0.49

HEC-RAS Plan: Subcritical River: Jack Rabbit Trai Reach: Exist Conditions (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist Conditions	18953	672.00	1169.47	1174.29	1172.27	1174.57	0.001397	4.53	181.93	52.28	0.37
Exist Conditions	18923	672.00	1169.38	1173.64	1171.91	1173.90	0.001507	4.24	176.80	121.58	0.37
Exist Conditions	18923	672.00	1169.38	1174.28	1171.86	1174.51	0.001044	3.89	187.34	46.84	0.32
Exist Conditions	18888	Culvert									
Exist Conditions	18850	672.00	1169.11	1172.82	1171.63	1173.26	0.002954	5.58	147.14	158.80	0.52
Exist Conditions	18850	672.00	1169.11	1172.82	1171.63	1173.26	0.002925	5.55	136.53	43.11	0.52
Exist Conditions	18800	672.00	1168.68	1172.72	1171.34	1173.09	0.002411	5.21	153.63	53.35	0.47
Exist Conditions	18800	672.00	1168.68	1172.72	1171.34	1173.09	0.002410	5.21	153.64	53.35	0.47
Exist Conditions	18713	672.00	1167.94	1172.56	1170.89	1172.89	0.001878	4.90	163.39	54.49	0.42
Exist Conditions	18713	672.00	1167.94	1172.56	1170.89	1172.89	0.001878	4.90	163.39	54.48	0.42
Exist Conditions	18563	795.00	1167.00	1171.77	1170.81	1172.46	0.003864	7.25	141.84	47.16	0.61
Exist Conditions	18563	795.00	1167.00	1171.77	1170.81	1172.46	0.003864	7.25	141.83	47.16	0.61
Exist Conditions	18214	795.00	1165.03	1169.56	1169.26	1170.59	0.007576	8.22	103.72	43.59	0.80
Exist Conditions	18214	795.00	1165.03	1169.56	1169.27	1170.59	0.007571	8.22	103.74	43.59	0.80
Exist Conditions	17914	795.00	1164.00	1168.01	1167.27	1168.64	0.005008	6.38	127.34	47.76	0.65
Exist Conditions	17914	795.00	1164.00	1168.01	1167.25	1168.64	0.005024	6.39	127.20	47.75	0.65
Exist Conditions	17408	985.00	1162.00	1165.37	1164.80	1165.99	0.005454	6.45	164.97	70.12	0.67
Exist Conditions	17408	985.00	1162.00	1165.38	1164.80	1166.00	0.005356	6.42	165.67	68.33	0.67
Exist Conditions	16918	985.00	1159.94	1163.02	1162.30	1163.51	0.004594	5.64	178.94	76.47	0.61
Exist Conditions	16918	985.00	1159.94	1163.48	1162.37	1163.91	0.003298	5.28	190.92	64.10	0.52
Exist Conditions	16832.8*	985.00	1159.62	1162.87	1161.75	1163.17	0.002531	4.36	231.30	99.32	0.46
Exist Conditions	16832.8*	985.00	1159.62	1163.48	1161.75	1163.67	0.001290	3.55	288.71	94.83	0.34
Exist Conditions	16747.6*	985.00	1159.29	1162.80	1161.25	1162.98	0.001367	3.40	297.19	111.44	0.34
Exist Conditions	16747.6*	985.00	1159.29	1163.45	1161.25	1163.57	0.000701	2.77	370.01	111.44	0.25
Exist Conditions	16662.5*	985.00	1158.97	1162.76	1160.78	1162.87	0.000763	2.70	374.92	128.09	0.26
Exist Conditions	16662.5*	985.00	1158.97	1163.44	1160.78	1163.51	0.000404	2.22	461.67	128.09	0.19
Exist Conditions	16577.3*	985.00	1158.65	1162.74	1160.34	1162.81	0.000443	2.18	464.27	144.18	0.20
Exist Conditions	16577.3*	985.00	1158.65	1163.43	1160.34	1163.48	0.000244	1.82	563.70	144.18	0.15
Exist Conditions	16492.1*	985.00	1158.32	1162.73	1159.91	1162.78	0.000268	1.79	564.40	160.08	0.16
Exist Conditions	16492.1*	985.00	1158.32	1163.42	1159.91	1163.46	0.000154	1.51	675.90	160.07	0.12
Exist Conditions	16407	985.00	1158.00	1162.72	1159.49	1162.75	0.000169	1.50	675.02	175.71	0.13
Exist Conditions	16407	985.00	1158.00	1163.42	1159.49	1163.45	0.000101	1.28	798.11	175.71	0.10
Exist Conditions	15976	985.00	1157.40	1162.61		1162.65	0.000374	2.09	759.32	353.97	0.19
Exist Conditions	15976	985.00	1157.40	1163.32		1163.37	0.000315	2.15	600.78	165.00	0.18
Exist Conditions	15933	985.00	1157.00	1162.27	1161.53	1162.54	0.003064	5.28	299.16	328.09	0.50
Exist Conditions	15933	985.00	1157.00	1163.24	1161.44	1163.34	0.000836	3.26	476.71	167.10	0.27
Exist Conditions	15886	Culvert									
Exist Conditions	15855	784.00	1152.00	1157.75		1158.96	0.009131	8.83	88.75	25.25	0.83
Exist Conditions	15855	784.00	1152.00	1157.88		1159.00	0.008161	8.51	92.13	25.25	0.79
Exist Conditions	15750	794.00	1154.00	1157.18	1156.89	1157.79	0.007535	7.48	161.81	99.74	0.78
Exist Conditions	15750	794.00	1154.00	1157.20		1157.94	0.008436	7.95	132.34	60.99	0.83
Exist Conditions	15344	794.00	1150.94	1154.51	1154.51	1155.07	0.005937	6.39	184.59	206.58	0.69
Exist Conditions	15344	794.00	1150.94	1154.53	1154.53	1155.06	0.005772	6.32	187.44	206.58	0.68
Exist Conditions	15022	828.00	1146.39	1150.55		1150.68	0.001648	2.97	278.78	83.49	0.29
Exist Conditions	15022	828.00	1146.39	1150.55		1150.68	0.001648	2.97	278.78	83.49	0.29
Exist Conditions	14622	828.00	1145.62	1149.88		1150.02	0.001655	2.98	278.24	83.40	0.29
Exist Conditions	14622	828.00	1145.62	1149.88		1150.02	0.001655	2.98	278.23	83.40	0.29

HEC-RAS Plan: Subcritical River: Jack Rabbit Trai Reach: Exist Conditions (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist Conditions	14322	828.00	1145.48	1148.92		1149.21	0.004984	4.33	191.26	74.97	0.48
Exist Conditions	14322	828.00	1145.48	1148.92		1149.21	0.004985	4.33	191.25	74.96	0.48
Exist Conditions	14277	828.00	1144.86	1147.45	1147.45	1148.68	0.026049	8.90	93.01	38.22	1.01
Exist Conditions	14277	828.00	1144.86	1147.45	1147.45	1148.68	0.026041	8.90	93.02	38.21	1.01
Exist Conditions	14260	828.00	1141.44	1145.92		1146.29	0.003968	4.90	169.02	38.29	0.41
Exist Conditions	14260	828.00	1141.44	1145.92		1146.29	0.003969	4.90	169.02	38.29	0.41
Exist Conditions	14247	828.00	1141.43	1145.88	1143.86	1146.24	0.003904	4.86	170.24	38.39	0.41
Exist Conditions	14247	828.00	1141.43	1145.88	1143.86	1146.24	0.003905	4.86	170.24	38.39	0.41
Exist Conditions	14223.6	Culvert									
Exist Conditions	14197	828.00	1141.28	1145.47		1145.87	0.004493	5.05	163.97	42.32	0.45
Exist Conditions	14197	828.00	1141.28	1145.47		1145.87	0.004493	5.05	163.96	42.32	0.45
Exist Conditions	14122	851.00	1141.30	1145.42		1145.58	0.002053	3.23	263.80	82.48	0.32
Exist Conditions	14122	851.00	1141.30	1145.42		1145.58	0.002053	3.23	263.80	82.48	0.32
Exist Conditions	13925	851.00	1140.78	1145.05		1145.20	0.001735	3.05	278.92	83.45	0.29
Exist Conditions	13925	851.00	1140.78	1145.05		1145.20	0.001735	3.05	278.92	83.45	0.29
Exist Conditions	13622	865.00	1140.28	1144.54		1144.68	0.001707	3.05	283.60	83.89	0.29
Exist Conditions	13622	865.00	1140.28	1144.54		1144.68	0.001707	3.05	283.60	83.89	0.29
Exist Conditions	13318	865.00	1139.96	1143.70		1143.94	0.003661	3.91	221.00	79.95	0.41
Exist Conditions	13318	865.00	1139.96	1143.70		1143.94	0.003660	3.91	221.02	79.95	0.41
Exist Conditions	13288	865.00	1139.67	1142.33	1142.33	1143.60	0.025753	9.05	95.56	37.94	1.01
Exist Conditions	13288	865.00	1139.67	1142.33	1142.33	1143.60	0.025805	9.06	95.50	37.94	1.01
Exist Conditions	13270	865.00	1136.01	1141.72		1141.98	0.002116	4.06	212.97	38.25	0.30
Exist Conditions	13270	865.00	1136.01	1141.72		1141.98	0.002116	4.06	212.97	38.25	0.30
Exist Conditions	13257	865.00	1135.87	1141.70	1138.47	1141.95	0.001966	3.96	218.30	38.16	0.29
Exist Conditions	13257	865.00	1135.87	1141.70	1138.47	1141.95	0.001966	3.96	218.30	38.16	0.29
Exist Conditions	13233.5	Culvert									
Exist Conditions	13207	865.00	1135.99	1141.52		1141.80	0.002387	4.25	203.47	37.38	0.32
Exist Conditions	13207	865.00	1135.99	1141.52		1141.80	0.002387	4.25	203.47	37.38	0.32
Exist Conditions	13122	966.00	1135.83	1141.54		1141.64	0.000782	2.47	397.95	106.67	0.21
Exist Conditions	13122	966.00	1135.83	1141.54		1141.64	0.000782	2.47	397.95	106.67	0.21
Exist Conditions	12922	966.00	1135.21	1141.40		1141.48	0.000709	2.33	414.58	102.96	0.20
Exist Conditions	12922	966.00	1135.21	1141.40		1141.48	0.000709	2.33	414.59	102.97	0.20
Exist Conditions	12341	982.00	1135.00	1139.55	1138.91	1140.45	0.006923	7.60	129.23	41.17	0.76
Exist Conditions	12341	982.00	1135.00	1139.55	1138.91	1140.45	0.006913	7.60	129.29	41.17	0.76
Exist Conditions	11844	982.00	1131.20	1135.80	1135.31	1136.81	0.007702	8.06	121.86	38.41	0.80
Exist Conditions	11844	982.00	1131.20	1135.80	1135.30	1136.81	0.007708	8.06	121.83	38.41	0.80
Exist Conditions	11350	1000.00	1127.55	1132.44	1131.74	1133.39	0.006190	7.82	129.42	43.39	0.73
Exist Conditions	11350	1000.00	1127.55	1132.45	1131.74	1133.40	0.006176	7.82	128.64	38.11	0.73
Exist Conditions	10818	1050.00	1123.70	1127.56	1127.56	1128.71	0.013064	8.62	121.77	60.94	1.00
Exist Conditions	10818	1050.00	1123.70	1127.55	1127.55	1128.71	0.013089	8.64	121.59	52.39	1.00
Exist Conditions	10316	1050.00	1119.48	1123.15	1122.59	1123.90	0.006693	6.95	151.10	54.55	0.74
Exist Conditions	10316	1050.00	1119.48	1123.31	1122.64	1124.07	0.006212	6.98	150.44	49.02	0.70
Exist Conditions	9824	1050.00	1115.00	1119.74	1119.12	1120.68	0.006366	7.81	140.67	68.45	0.74
Exist Conditions	9824	1050.00	1115.00	1119.77	1119.12	1120.84	0.006835	8.31	130.96	46.11	0.74
Exist Conditions	9324	1094.00	1111.00	1114.88	1114.88	1116.28	0.012370	9.47	115.47	41.03	1.00
Exist Conditions	9324	1094.00	1111.00	1114.88	1114.88	1116.28	0.012375	9.48	115.45	41.03	1.00
Exist Conditions	8824	1094.00	1106.83	1110.99	1110.99	1111.64	0.006303	7.16	232.39	219.38	0.72
Exist Conditions	8824	1094.00	1106.83	1110.99	1110.99	1111.64	0.006221	7.12	232.12	198.51	0.72

HEC-RAS Plan: Subcritical River: Jack Rabbit Trai Reach: Exist Conditions (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist Conditions	8320	1190.00	1101.88	1106.29	1106.29	1107.27	0.009078	8.02	164.57	122.48	0.85
Exist Conditions	8320	1190.00	1101.88	1106.33	1106.33	1107.27	0.008612	7.88	169.08	122.48	0.83
Exist Conditions	8221.2*	1190.00	1100.99	1105.43	1105.43	1106.36	0.008100	7.91	180.63	131.35	0.82
Exist Conditions	8221.2*	1190.00	1100.99	1105.49	1105.49	1106.36	0.007499	7.70	187.61	131.34	0.79
Exist Conditions	8122.4*	1190.00	1100.10	1104.51	1104.51	1105.43	0.007817	8.00	190.65	140.58	0.81
Exist Conditions	8122.4*	1190.00	1100.10	1104.61	1104.61	1105.42	0.006810	7.62	203.76	140.57	0.76
Exist Conditions	8023.6*	1190.00	1099.20	1103.65	1103.65	1104.48	0.006846	7.83	216.70	172.14	0.77
Exist Conditions	8023.6*	1190.00	1099.20	1103.75	1103.75	1104.48	0.005915	7.42	232.84	172.14	0.71
Exist Conditions	7924.8*	1190.00	1098.31	1102.76	1102.76	1103.46	0.005758	7.48	255.49	204.46	0.71
Exist Conditions	7924.8*	1190.00	1098.31	1102.82	1102.82	1103.46	0.005220	7.20	267.62	204.46	0.68
Exist Conditions	7826	1190.00	1097.42	1101.80	1101.80	1102.45	0.005433	7.48	276.45	220.36	0.69
Exist Conditions	7826	1190.00	1097.42	1101.80	1101.80	1102.44	0.005320	7.40	272.43	199.37	0.69
Exist Conditions	7330	1190.00	1093.00	1097.98	1097.24	1098.87	0.005355	7.67	173.35	102.43	0.69
Exist Conditions	7330	1190.00	1093.00	1098.01	1097.24	1098.88	0.005229	7.61	175.22	78.71	0.68
Exist Conditions	6826	1190.00	1089.00	1093.44	1093.44	1095.11	0.011420	10.39	117.21	45.32	0.97
Exist Conditions	6826	1190.00	1089.00	1093.49	1093.49	1095.11	0.010970	10.26	119.10	45.32	0.95
Exist Conditions	6310	1484.00	1082.95	1086.69	1086.69	1088.18	0.002397	9.79	151.65	51.52	1.01
Exist Conditions	6310	1484.00	1082.95	1086.71	1086.71	1088.18	0.002363	9.74	152.33	51.52	1.00
Exist Conditions	5920	1484.00	1080.77	1084.53	1084.53	1086.02	0.002420	9.80	151.42	51.54	1.01
Exist Conditions	5920	1484.00	1080.77	1084.53	1084.53	1086.02	0.002424	9.81	151.34	51.53	1.01
Exist Conditions	5902	1484.00	1076.00	1079.95	1079.67	1081.20	0.001819	8.98	165.27	51.59	0.88
Exist Conditions	5902	1484.00	1076.00	1079.94	1079.65	1081.20	0.001822	8.98	165.17	51.58	0.88
Exist Conditions	5600	1484.00	1075.31	1079.64		1080.66	0.001339	8.11	183.08	52.89	0.77
Exist Conditions	5600	1484.00	1075.31	1079.63		1080.66	0.001345	8.12	182.82	52.87	0.77
Exist Conditions	5400	1484.00	1074.96	1079.69	1078.48	1080.35	0.000785	6.52	227.61	61.35	0.60
Exist Conditions	5400	1484.00	1074.96	1079.69	1078.48	1080.35	0.000785	6.52	227.60	61.35	0.60
Exist Conditions	5342.1	Culvert									
Exist Conditions	5220	1484.00	1073.37	1077.29	1076.74	1078.27	0.001430	7.95	186.61	57.10	0.78
Exist Conditions	5220	1484.00	1073.37	1077.29	1076.74	1078.27	0.001431	7.95	186.59	57.10	0.78
Exist Conditions	5193	1484.00	1073.47	1076.79	1076.79	1078.18	0.002514	9.46	156.87	57.24	1.01
Exist Conditions	5193	1484.00	1073.47	1076.79	1076.79	1078.18	0.002516	9.46	156.83	57.23	1.01
Exist Conditions	5181	1484.00	1070.26	1073.74	1073.44	1074.91	0.001821	8.69	170.86	55.26	0.87
Exist Conditions	5181	1484.00	1070.26	1073.82		1074.93	0.001685	8.48	175.06	55.25	0.84
Exist Conditions	5100	1484.00	1069.87	1073.92		1074.68	0.001053	6.96	213.21	65.38	0.68
Exist Conditions	5100	1484.00	1069.87	1073.99		1074.71	0.000989	6.82	217.48	65.37	0.66
Exist Conditions	4800	1484.00	1069.10	1073.83		1074.37	0.000638	5.87	252.92	68.62	0.54
Exist Conditions	4800	1484.00	1069.10	1073.91		1074.42	0.000598	5.75	258.02	68.61	0.52
Exist Conditions	4748	1484.00	1069.09	1073.87		1074.31	0.000505	5.34	278.12	73.06	0.48
Exist Conditions	4748	1484.00	1069.09	1073.94		1074.37	0.000475	5.24	283.46	73.06	0.47
Exist Conditions	4740	1484.00	1067.33	1074.04	1070.29	1074.23	0.000144	3.57	415.48	76.73	0.27
Exist Conditions	4740	1484.00	1067.33	1074.10	1070.29	1074.29	0.000139	3.53	420.45	76.72	0.27
Exist Conditions	4729.5	Culvert									
Exist Conditions	4650	1597.00	1066.87	1073.35		1073.56	0.000156	3.74	431.06	90.96	0.28
Exist Conditions	4650	1597.00	1066.87	1073.41		1073.63	0.000160	3.81	422.21	79.83	0.28
Exist Conditions	4600	1597.00	1066.72	1071.57	1071.57	1073.39	0.002105	10.89	157.81	53.23	0.97
Exist Conditions	4600	1597.00	1066.72	1071.62	1071.62	1073.45	0.002049	10.95	157.51	50.48	0.94
Exist Conditions	4350	1597.00	1065.64	1069.27	1069.27	1070.90	0.002396	10.24	155.88	48.19	1.00

HEC-RAS Plan: Subcritical River: Jack Rabbit Trai Reach: Exist Conditions (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist Conditions	4350	1597.00	1065.64	1069.27	1069.27	1070.90	0.002398	10.25	155.84	48.18	1.00
Exist Conditions	4278	1597.00	1065.04	1069.86	1068.29	1070.34	0.000538	5.52	289.43	75.97	0.50
Exist Conditions	4278	1597.00	1065.04	1069.86	1068.29	1070.34	0.000538	5.52	289.43	75.97	0.50
Exist Conditions	4271	Culvert									
Exist Conditions	4200	1597.00	1064.55	1067.66	1067.54	1068.98	0.002307	9.23	173.08	58.79	0.95
Exist Conditions	4200	1597.00	1064.55	1067.65	1067.54	1068.98	0.002315	9.24	172.88	58.79	0.95
Exist Conditions	4183	1597.00	1064.14	1067.53	1067.53	1068.93	0.002674	9.50	168.04	60.61	1.01
Exist Conditions	4183	1597.00	1064.14	1067.54	1067.54	1068.93	0.002644	9.47	168.64	60.61	1.00
Exist Conditions	4168	1597.00	1060.61	1064.86		1065.38	0.000601	5.77	276.54	73.25	0.52
Exist Conditions	4168	1597.00	1060.61	1064.86		1065.37	0.000602	5.78	276.36	73.25	0.52
Exist Conditions	4100	1597.00	1060.04	1064.82		1065.33	0.000571	5.73	278.83	72.04	0.51
Exist Conditions	4100	1597.00	1060.04	1064.82		1065.33	0.000572	5.73	278.63	72.03	0.51
Exist Conditions	3800	1597.00	1059.76	1063.39	1063.39	1064.92	0.002411	9.94	160.71	53.09	1.01
Exist Conditions	3800	1597.00	1059.76	1063.40	1063.40	1064.92	0.002384	9.90	161.28	53.09	1.00
Exist Conditions	3500	1597.00	1056.41	1060.31	1060.31	1061.88	0.002366	10.05	158.90	51.06	1.00
Exist Conditions	3500	1597.00	1056.41	1060.31	1060.31	1061.88	0.002373	10.06	158.76	51.04	1.01
Exist Conditions	3200	1597.00	1054.86	1058.79	1058.79	1060.36	0.002378	10.05	158.87	51.26	1.01
Exist Conditions	3200	1597.00	1054.86	1058.79	1058.79	1060.36	0.002386	10.06	158.70	51.24	1.01
Exist Conditions	2903	1597.00	1054.01	1057.67	1057.67	1059.21	0.002380	9.96	160.40	52.75	1.01
Exist Conditions	2903	1597.00	1054.01	1057.67	1057.67	1059.21	0.002382	9.96	160.35	52.75	1.01
Exist Conditions	2885	1597.00	1049.49	1053.24	1053.24	1054.81	0.002381	10.07	158.53	50.86	1.01
Exist Conditions	2885	1597.00	1049.49	1053.24	1053.24	1054.81	0.002388	10.08	158.40	50.85	1.01
Exist Conditions	2800	1597.00	1048.25	1052.72		1053.85	0.001471	8.55	186.88	53.39	0.80
Exist Conditions	2800	1597.00	1048.25	1052.72		1053.85	0.001471	8.55	186.88	53.38	0.80
Exist Conditions	2500	1597.00	1047.85	1052.33		1053.41	0.001354	8.37	190.87	52.90	0.78
Exist Conditions	2500	1597.00	1047.85	1052.33		1053.41	0.001354	8.37	190.87	52.90	0.78
Exist Conditions	2200	1597.00	1047.61	1051.99		1053.00	0.001246	8.05	198.36	54.86	0.75
Exist Conditions	2200	1597.00	1047.61	1051.99		1053.00	0.001246	8.05	198.35	54.86	0.75
Exist Conditions	1900	1597.00	1047.22	1050.91	1050.91	1052.44	0.002388	9.93	160.86	53.29	1.01
Exist Conditions	1900	1597.00	1047.22	1050.91	1050.91	1052.44	0.002388	9.93	160.84	53.29	1.01
Exist Conditions	1568	1597.00	1046.68	1049.53	1049.53	1050.75	0.002515	8.85	180.44	74.94	1.01
Exist Conditions	1568	1597.00	1046.68	1049.53	1049.53	1050.75	0.002521	8.86	180.29	74.93	1.01
Exist Conditions	1552	1597.00	1043.68	1048.55		1048.88	0.000336	4.60	347.11	83.90	0.40
Exist Conditions	1552	1597.00	1043.68	1048.55		1048.88	0.000335	4.60	347.45	83.90	0.40
Exist Conditions	1500	1597.00	1043.36	1048.61		1048.83	0.000219	3.73	428.10	103.90	0.32
Exist Conditions	1500	1597.00	1043.36	1048.62		1048.83	0.000219	3.73	428.52	103.91	0.32
Exist Conditions	1300	1597.00	1042.30	1048.62		1048.78	0.000146	3.22	498.07	119.54	0.27
Exist Conditions	1300	1597.00	1042.30	1048.62		1048.78	0.000146	3.22	496.61	110.73	0.27
Exist Conditions	1000	1597.00	1040.47	1048.60	1044.35	1048.74	0.000090	3.02	615.37	150.00	0.22
Exist Conditions	1000	1597.00	1040.47	1048.60	1044.35	1048.74	0.000092	3.05	576.63	122.66	0.22

DUPLICATE EFFECTIVE MODEL

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.152	187.00	1183.00	1185.66		1185.67	0.000222	1.02	225.08	174.59	0.14
Reach-1	4.152	187.00	1183.00	1185.69		1185.71	0.000206	1.00	231.21	174.94	0.14
Reach-1	4.086	68.00	1184.30	1185.54		1185.56	0.001148	1.28	52.92	78.71	0.28
Reach-1	4.086	68.00	1184.30	1185.59		1185.61	0.000916	1.20	56.68	78.82	0.25
Reach-1	4.016	221.00	1182.80	1184.56	1184.29	1184.68	0.003215	3.09	100.70	145.29	0.51
Reach-1	4.016	221.00	1182.80	1184.58	1184.29	1184.73	0.003521	3.28	81.95	98.62	0.53
Reach-1	3.93	221.00	1180.20	1182.80	1182.31	1183.06	0.003869	4.10	59.05	50.03	0.58
Reach-1	3.93	221.00	1180.20	1182.82	1182.31	1183.07	0.003741	4.05	59.78	49.95	0.57
Reach-1	3.813	221.00	1176.80	1178.75	1178.75	1179.16	0.012127	5.19	48.19	69.12	0.95
Reach-1	3.813	221.00	1176.80	1178.74	1178.74	1179.17	0.012830	5.32	45.35	59.15	0.97
Reach-1	3.719	594.00	1174.00	1176.79	1176.47	1177.03	0.003016	4.24	221.33	259.72	0.53
Reach-1	3.719	594.00	1174.00	1176.94	1176.32	1177.20	0.002805	4.30	173.90	131.91	0.52
Reach-1	3.625	594.00	1172.30	1174.17	1174.17	1174.56	0.009483	5.34	148.57	217.89	0.87
Reach-1	3.625	594.00	1172.30	1174.13	1174.13	1174.64	0.012132	5.89	112.44	116.15	0.98
Reach-1	3.53	594.00	1169.90	1172.70		1172.85	0.001438	3.43	225.92	145.50	0.38
Reach-1	3.53	594.00	1169.90	1172.71		1172.87	0.001446	3.45	215.03	110.67	0.39
Reach-1	3.436	594.00	1167.70	1170.71	1170.49	1171.43	0.007085	6.86	89.92	52.38	0.83
Reach-1	3.436	594.00	1167.70	1170.69	1170.49	1171.43	0.007288	6.92	89.02	52.08	0.84
Reach-1	3.342	726.00	1163.10	1166.03	1166.03	1167.04	0.010758	8.07	89.92	45.16	1.01
Reach-1	3.342	726.00	1163.10	1166.05	1166.05	1167.04	0.010451	8.00	90.71	45.12	0.99
Reach-1	3.247	726.00	1159.40	1163.21	1162.53	1163.81	0.004000	6.25	122.00	52.75	0.65
Reach-1	3.247	726.00	1159.40	1163.21	1162.53	1163.81	0.003975	6.24	122.26	52.75	0.65
Reach-1	3.154	726.00	1157.30	1159.84	1159.84	1160.70	0.011268	7.42	97.83	58.00	1.01
Reach-1	3.154	726.00	1157.30	1159.83	1159.83	1160.70	0.011391	7.45	97.45	57.92	1.01
Reach-1	3.059	726.00	1155.00	1158.15		1158.31	0.001623	3.58	268.93	146.10	0.41
Reach-1	3.059	726.00	1155.00	1158.21		1158.42	0.001885	3.92	216.03	90.75	0.44
Reach-1	2.973	726.00	1154.00	1156.84		1157.19	0.004142	5.02	189.87	142.64	0.63
Reach-1	2.973	726.00	1154.00	1156.83		1157.18	0.004281	5.08	187.37	142.38	0.64
Reach-1	2.912	915.00	1150.60	1154.12	1154.12	1155.15	0.010562	8.15	112.75	62.74	1.00
Reach-1	2.912	915.00	1150.60	1154.14	1154.14	1155.14	0.010078	8.03	114.54	62.38	0.98
Reach-1	2.86	915.00	1149.70	1152.11	1151.70	1152.52	0.004982	5.32	211.93	243.47	0.68
Reach-1	2.86	915.00	1149.70	1152.12		1152.55	0.005087	5.38	187.89	115.74	0.69
Reach-1	2.765	915.00	1147.20	1149.93		1150.22	0.004128	4.39	208.30	128.12	0.61
Reach-1	2.765	915.00	1147.20	1149.93		1150.23	0.004114	4.39	208.47	128.06	0.61
Reach-1	2.67	915.00	1145.50	1147.77		1148.12	0.004288	3.98	196.60	115.46	0.60
Reach-1	2.67	915.00	1145.50	1147.77		1148.12	0.004301	3.98	196.39	115.37	0.60
Reach-1	2.576	915.00	1142.80	1146.44		1146.65	0.002025	3.64	251.46	137.01	0.44
Reach-1	2.576	915.00	1142.80	1146.45		1146.66	0.001994	3.62	252.99	137.32	0.44
Reach-1	2.482	1105.00	1140.70	1143.70	1143.66	1144.44	0.011732	7.08	159.48	103.92	1.01
Reach-1	2.482	1105.00	1140.70	1143.68	1143.66	1144.44	0.012121	7.16	157.68	103.57	1.03
Reach-1	2.389	1105.00	1137.20	1140.49	1140.13	1141.07	0.004433	6.68	217.32	148.58	0.69
Reach-1	2.389	1105.00	1137.20	1140.53		1141.10	0.004249	6.61	209.67	99.92	0.68
Reach-1	2.296	1105.00	1133.70	1137.41	1137.41	1138.35	0.006907	8.10	168.96	120.23	0.85
Reach-1	2.296	1105.00	1133.70	1137.36	1137.36	1138.36	0.007393	8.30	159.30	91.07	0.88
Reach-1	2.202	1105.00	1129.50	1133.92	1133.50	1134.92	0.005043	8.22	155.01	63.84	0.76
Reach-1	2.202	1105.00	1129.50	1133.88	1133.50	1134.91	0.005252	8.33	152.47	63.24	0.77
Reach-1	2.107	1105.00	1126.50	1131.06	1131.06	1132.01	0.006751	8.07	167.14	114.46	0.85
Reach-1	2.107	1105.00	1126.50	1131.10	1131.10	1132.00	0.006293	7.88	172.56	113.51	0.82
Reach-1	2.008	1105.00	1121.00	1125.31	1125.31	1126.31	0.006418	8.30	165.64	105.66	0.84
Reach-1	2.008	1105.00	1121.00	1125.37	1125.37	1126.30	0.005975	8.10	171.16	105.57	0.81

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

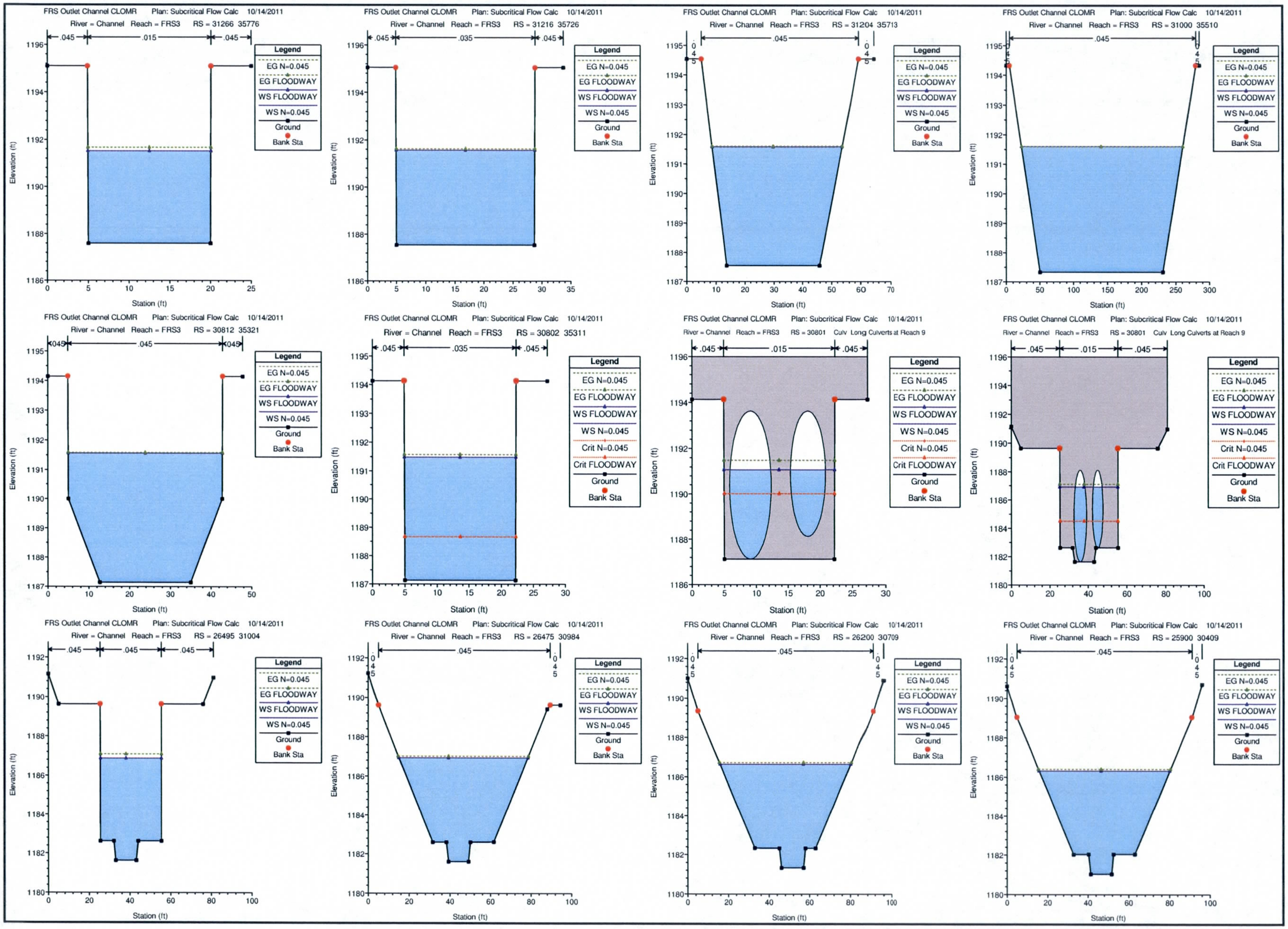
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.913	1105.00	1117.50	1121.18	1121.17	1122.43	0.008062	9.08	132.39	63.61	0.93
Reach-1	1.913	1105.00	1117.50	1121.20	1121.20	1122.43	0.007888	9.02	133.54	63.90	0.92
Reach-1	1.818	1105.00	1114.20	1117.42	1117.42	1118.44	0.007614	8.39	149.55	81.63	0.90
Reach-1	1.818	1105.00	1114.20	1117.45	1117.45	1118.44	0.007314	8.28	151.84	81.28	0.88
Reach-1	1.725	955.00	1110.00	1113.26	1113.26	1114.10	0.006555	8.17	161.15	114.45	0.84
Reach-1	1.725	955.00	1110.00	1113.30	1113.30	1114.10	0.006112	7.97	166.32	114.99	0.81
Reach-1	1.631	955.00	1105.10	1108.29	1108.29	1109.00	0.006696	7.93	198.29	155.96	0.84
Reach-1	1.631	955.00	1105.10	1108.31	1108.31	1109.00	0.006572	7.88	199.98	155.84	0.84
Reach-1	1.536	955.00	1100.10	1103.63	1103.63	1104.45	0.007083	7.82	170.83	124.38	0.86
Reach-1	1.536	955.00	1100.10	1103.70	1103.70	1104.44	0.006304	7.50	179.36	124.10	0.81
Reach-1	1.443	955.00	1095.60	1098.91	1098.91	1099.74	0.007262	7.52	161.22	141.22	0.86
Reach-1	1.443	955.00	1095.60	1098.88	1098.88	1099.74	0.007689	7.66	149.83	103.76	0.88
Reach-1	1.348	955.00	1091.50	1094.63	1094.21	1095.25	0.005450	6.34	156.48	86.98	0.74
Reach-1	1.348	955.00	1091.50	1094.60	1094.21	1095.24	0.005646	6.41	154.44	86.16	0.75
Reach-1	1.254	1186.00	1085.80	1090.49	1090.49	1091.83	0.008004	9.32	133.02	64.85	0.92
Reach-1	1.254	1186.00	1085.80	1090.53	1090.53	1091.83	0.007714	9.21	135.13	65.03	0.91
Reach-1	1.159	1186.00	1082.50	1085.86	1085.81	1086.80	0.007620	8.18	182.21	105.75	0.89
Reach-1	1.159	1186.00	1082.50	1085.85	1085.85	1086.80	0.007769	8.23	180.79	105.35	0.90
Reach-1	1.064	1186.00	1077.60	1081.46	1081.46	1082.79	0.008261	9.41	138.09	61.83	0.95
Reach-1	1.064	1186.00	1077.60	1081.52	1081.52	1082.79	0.007617	9.17	142.30	61.48	0.91
Reach-1	1.016	1186.00	1075.60	1079.40	1079.40	1079.86	0.002538	6.28	281.96	338.85	0.63
Reach-1	1.016	1186.00	1075.60	1079.42	1079.42	1079.86	0.002385	6.12	291.05	335.78	0.61
Reach-1	0.969	1186.00	1073.50	1076.86	1076.00	1077.54	0.000662	6.61	179.39	53.40	0.64
Reach-1	0.969	1186.00	1073.50	1076.86	1076.00	1077.54	0.000663	6.61	179.30	53.40	0.64
Reach-1	0.964	Bridge									
Reach-1	0.959	1186.00	1072.50	1074.98	1074.98	1076.23	0.001749	8.95	132.45	53.37	1.00
Reach-1	0.959	1186.00	1072.50	1074.99	1074.99	1076.23	0.001731	8.92	132.90	53.36	1.00
Reach-1	0.914	1186.00	1070.50	1073.40	1073.40	1074.07	0.003600	7.07	190.59	145.04	0.82
Reach-1	0.914	1186.00	1070.50	1073.38	1073.38	1074.22	0.004215	7.61	163.57	94.75	0.89
Reach-1	0.857	1186.00	1065.40	1070.13	1067.95	1070.48	0.000772	4.78	248.14	53.75	0.39
Reach-1	0.857	1186.00	1065.40	1070.12	1067.95	1070.48	0.000778	4.79	247.36	52.99	0.39
Reach-1	0.852	Bridge									
Reach-1	0.847	1186.00	1065.10	1068.01	1067.65	1068.97	0.003685	7.84	151.31	52.74	0.82
Reach-1	0.847	1186.00	1065.10	1068.01	1067.64	1068.97	0.003684	7.84	151.32	52.74	0.82
Reach-1	0.822	1186.00	1064.40	1067.61		1068.49	0.003044	7.53	157.48	52.02	0.76
Reach-1	0.822	1186.00	1064.40	1067.61		1068.50	0.003036	7.55	157.15	51.03	0.76
Reach-1	0.792	1186.00	1063.50	1067.43		1068.00	0.001561	6.08	195.11	53.36	0.56
Reach-1	0.792	1186.00	1063.50	1067.42		1068.01	0.001574	6.13	193.37	51.03	0.56
Reach-1	0.769	1186.00	1062.80	1067.46	1065.28	1067.81	0.000760	4.71	251.61	55.17	0.39
Reach-1	0.769	1186.00	1062.80	1067.46	1065.30	1067.81	0.000763	4.72	251.17	54.50	0.39
Reach-1	0.764	Bridge									
Reach-1	0.759	1186.00	1062.60	1065.25	1065.08	1066.31	0.004604	8.28	143.27	54.73	0.90
Reach-1	0.759	1186.00	1062.60	1065.20	1065.05	1066.30	0.004840	8.41	141.05	54.72	0.92
Reach-1	0.722	1186.00	1061.00	1063.93	1063.93	1064.91	0.010987	7.93	149.62	78.99	1.01
Reach-1	0.722	1186.00	1061.00	1064.14		1064.93	0.007912	7.14	166.00	79.73	0.87
Reach-1	0.668	1186.00	1057.70	1061.47	1061.47	1062.35	0.007181	7.96	183.79	121.65	0.87
Reach-1	0.668	1186.00	1057.70	1061.43	1061.43	1062.50	0.008490	8.56	150.94	72.43	0.94
Reach-1	0.61	1186.00	1055.80	1058.63	1058.63	1059.68	0.008926	8.27	148.79	82.07	0.95

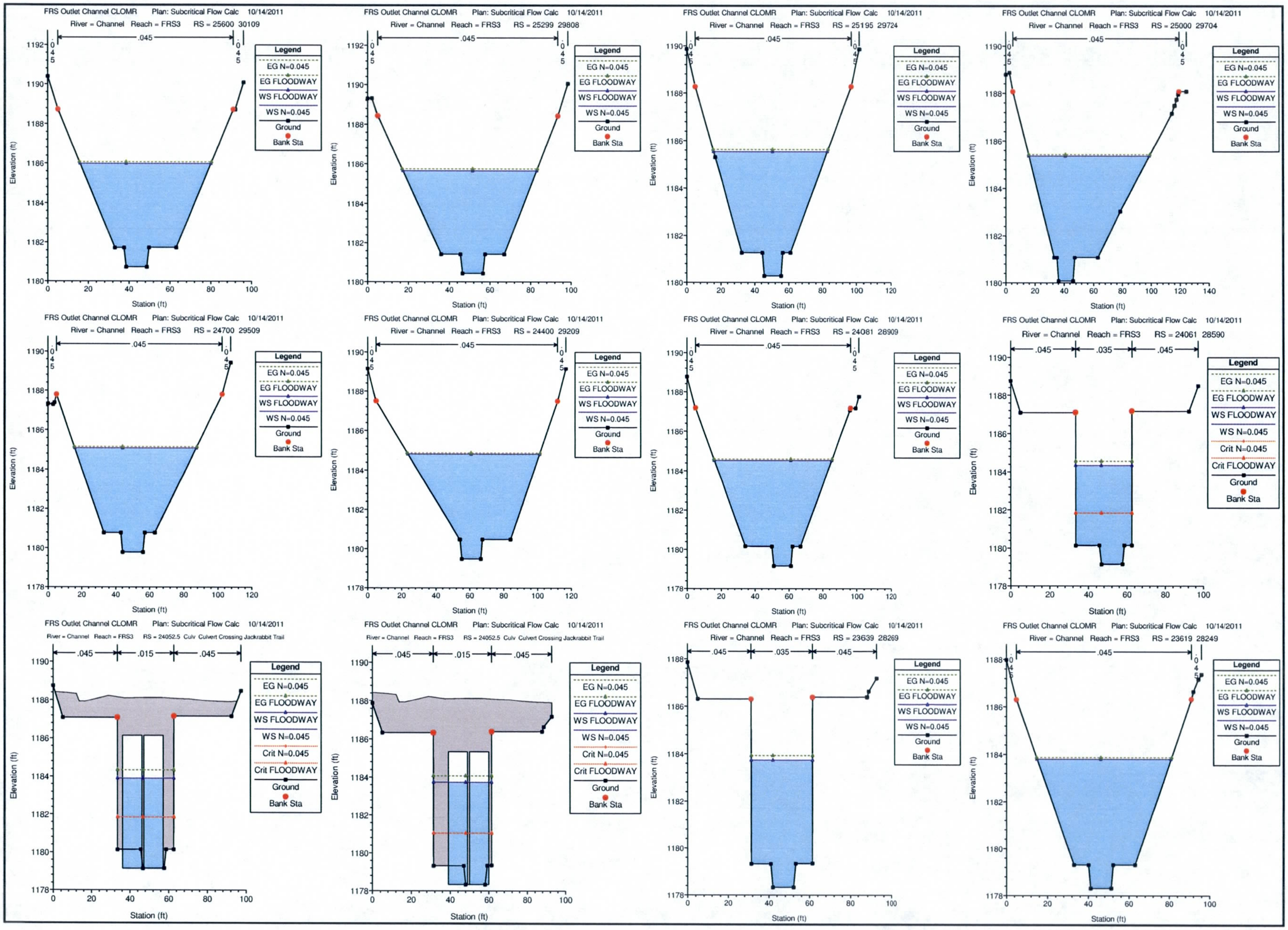
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

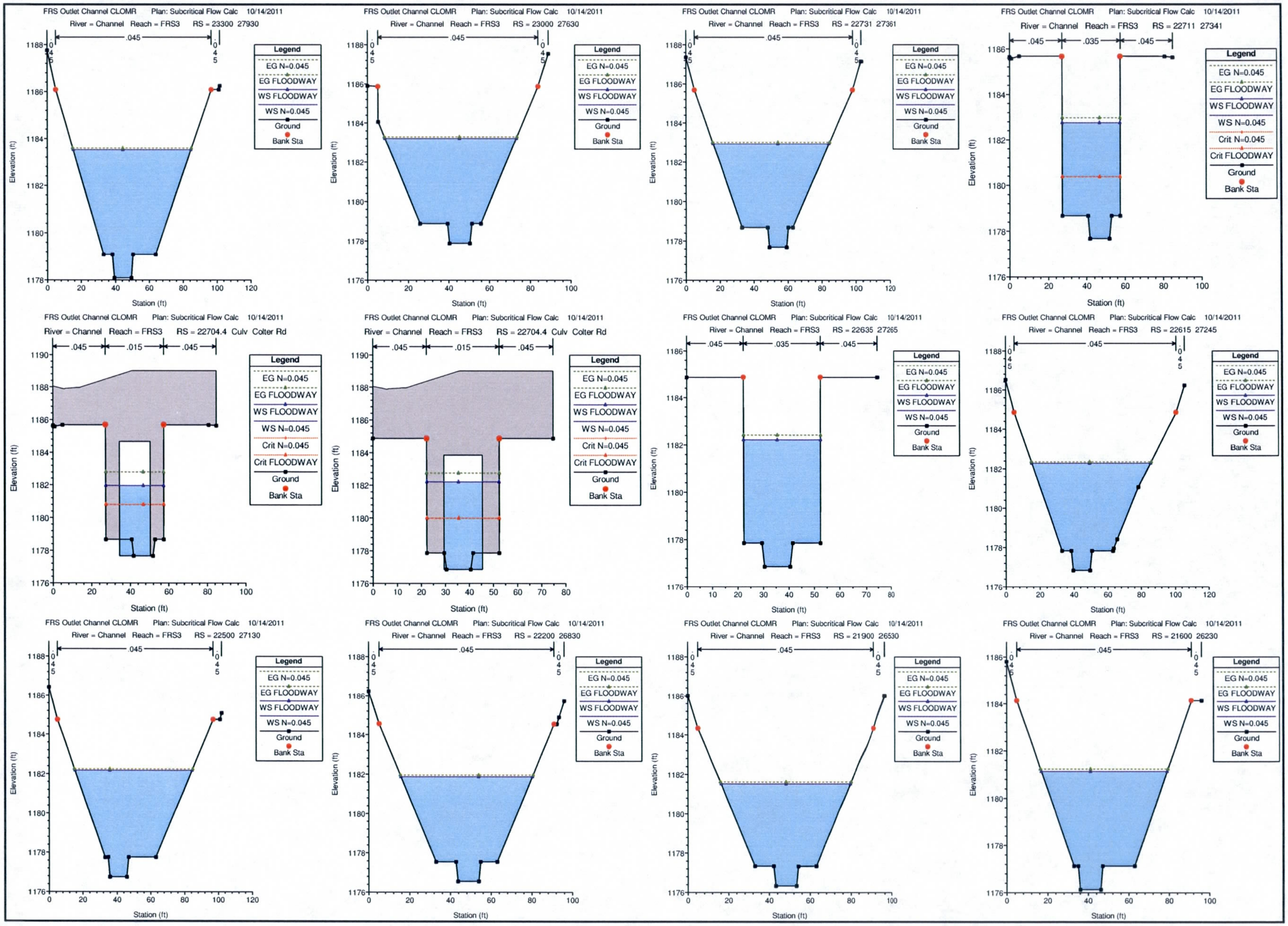
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	0.61	1186.00	1055.80	1058.66	1058.66	1059.68	0.008543	8.15	151.20	82.37	0.93
Reach-1	0.566	1186.00	1053.80	1057.16		1057.55	0.002490	5.03	242.06	95.44	0.52
Reach-1	0.566	1186.00	1053.80	1057.16		1057.55	0.002497	5.03	241.83	95.41	0.52
Reach-1	0.499	963.00	1052.90	1056.31		1056.65	0.002475	4.74	203.49	75.95	0.51
Reach-1	0.499	963.00	1052.90	1056.29		1056.64	0.002535	4.77	201.99	75.89	0.51
Reach-1	0.44	963.00	1051.80	1054.69	1054.52	1055.37	0.007699	6.67	148.26	90.44	0.85
Reach-1	0.44	963.00	1051.80	1054.74	1054.51	1055.38	0.007052	6.49	152.66	90.42	0.82
Reach-1	0.348	1093.00	1048.00	1052.03		1052.55	0.004571	6.18	212.96	121.55	0.69
Reach-1	0.348	1093.00	1048.00	1051.96		1052.52	0.005050	6.41	204.68	118.33	0.72
Reach-1	0.312	1093.00	1046.00	1050.55	1050.55	1051.41	0.006818	7.57	164.68	145.15	0.84
Reach-1	0.312	1093.00	1046.00	1050.63	1050.63	1051.41	0.005939	7.22	177.01	145.11	0.78
Reach-1	0.228	1093.00	1044.50	1046.49	1046.42	1046.97	0.009482	5.57	206.32	210.99	0.88
Reach-1	0.228	1093.00	1044.50	1046.49	1046.43	1046.97	0.009581	5.59	205.55	210.57	0.89
Reach-1	0.142	1093.00	1041.50	1043.81		1044.11	0.004309	4.35	251.43	162.52	0.62
Reach-1	0.142	1093.00	1041.50	1043.82		1044.11	0.004290	4.34	251.76	162.52	0.61
Reach-1	0.07	1093.00	1039.50	1041.15	1041.07	1041.72	0.009721	6.11	183.84	140.52	0.91
Reach-1	0.07	1093.00	1039.50	1041.15	1041.07	1041.72	0.009718	6.11	183.86	140.52	0.91
Reach-1	0	1093.00	1037.00	1038.61	1038.36	1038.87	0.005912	4.08	270.15	252.20	0.68
Reach-1	0	1093.00	1037.00	1038.61	1038.36	1038.87	0.005914	4.08	270.12	252.12	0.68

E.5.4 Cross-Sections

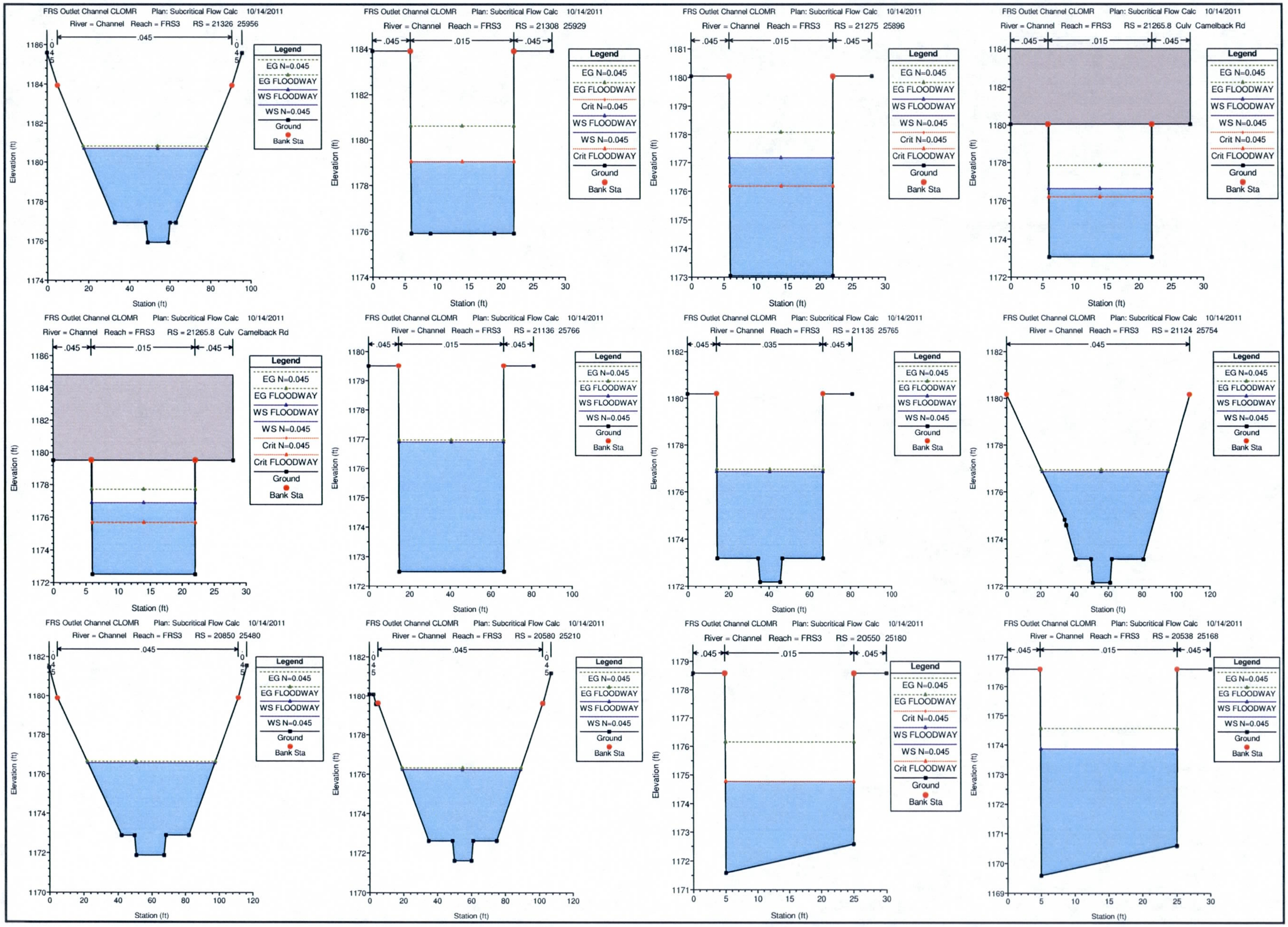
OUTFALL CHANNEL



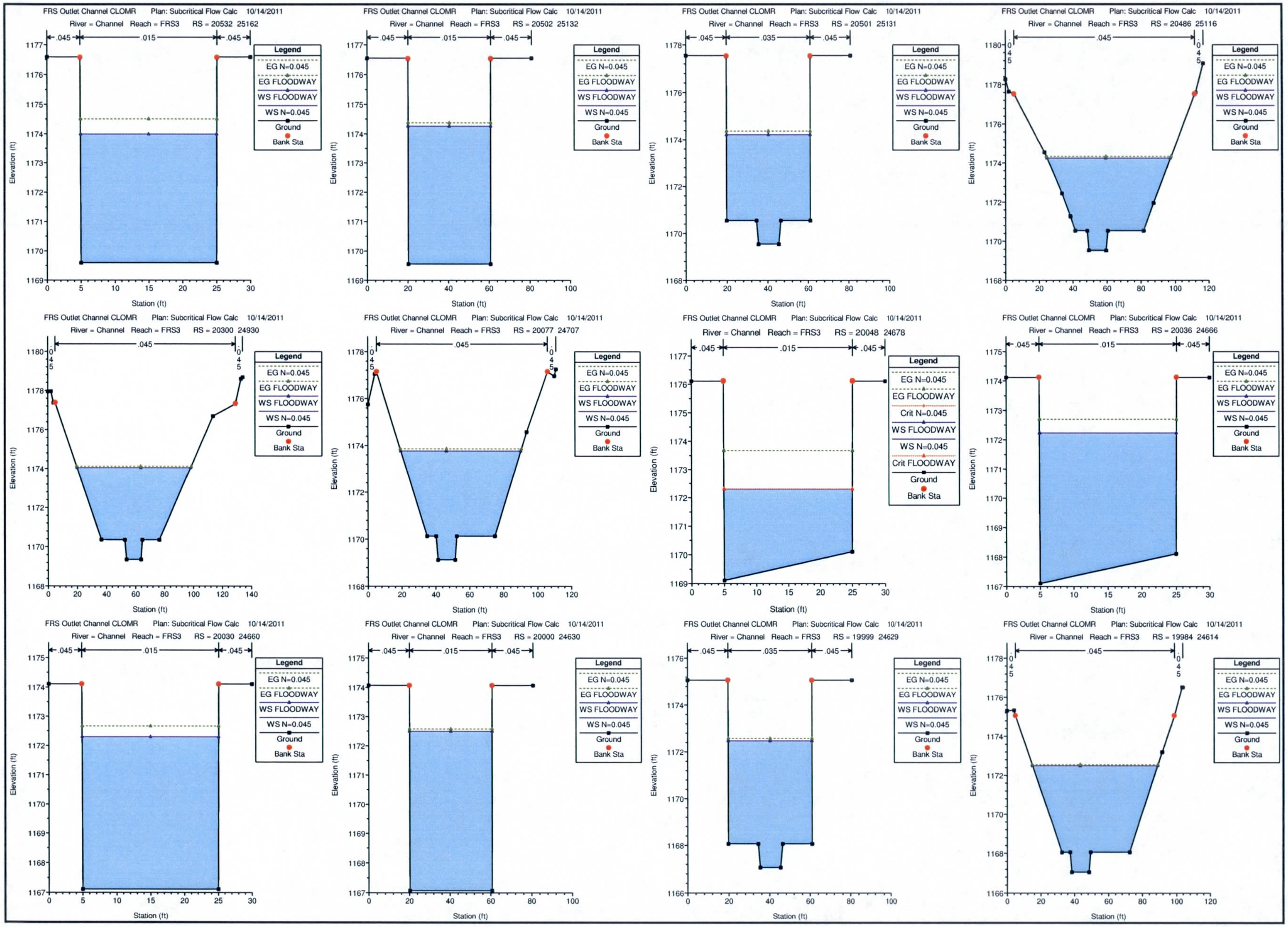

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 25600 30109
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 25299 29808
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 25195 29724
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 25000 29704
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24700 29509
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24400 29209
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24081 28909
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24061 28590
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24052.5 Culv Culvert Crossing Jackrabbit Trail
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 24052.5 Culv Culvert Crossing Jackrabbit Trail
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 23639 28269
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 23619 28249
.045
.035
.015
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

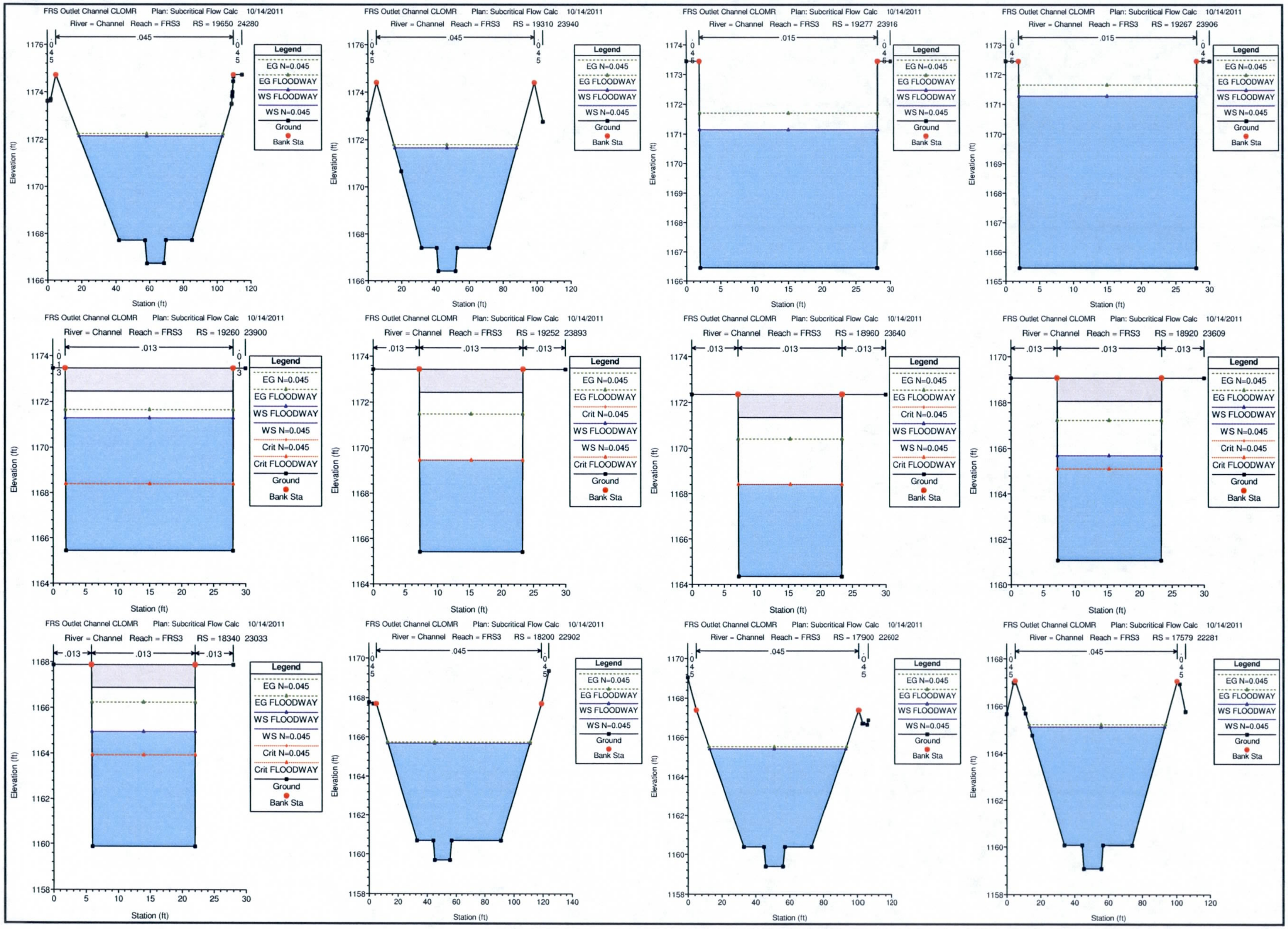


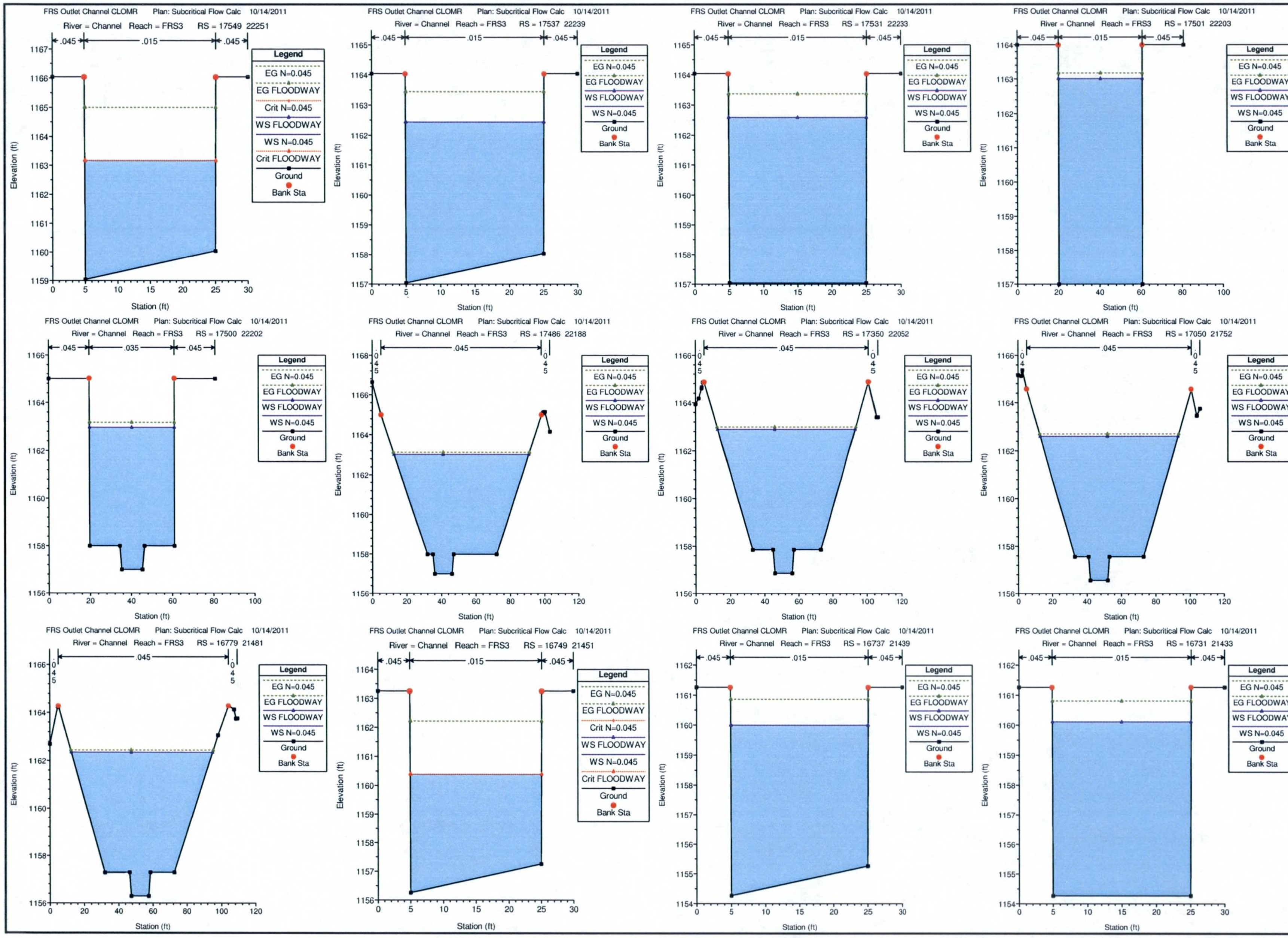
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 23300 27930
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 23000 27630
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22731 27361
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22711 27341
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22704.4 Culv Colter Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22704.4 Culv Colter Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22635 27265
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22615 27245
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22500 27130
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 22200 26830
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21900 26530
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21600 26230
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
.045
.035
.015

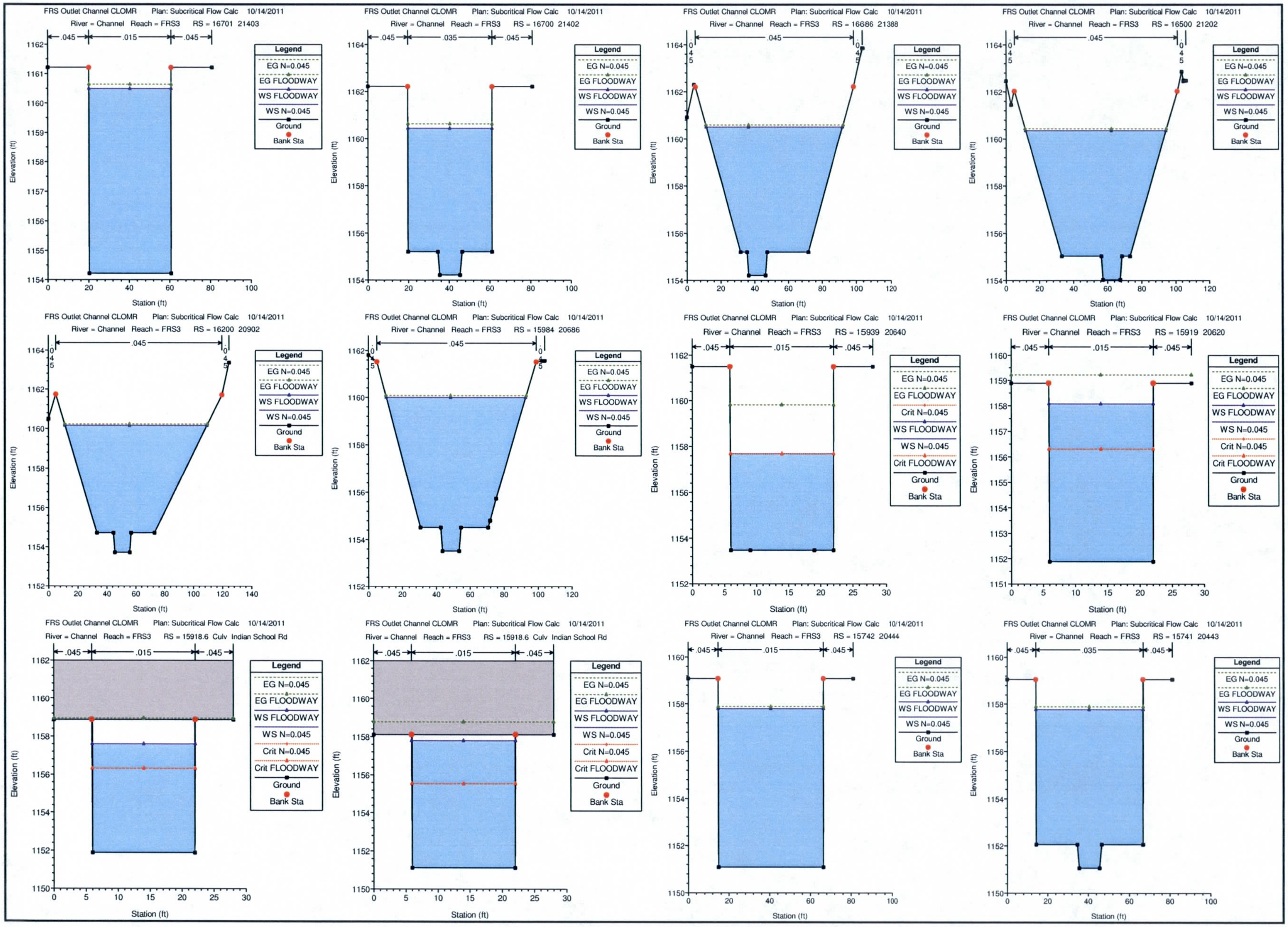


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21326 25956
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21308 25929
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21275 25896
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21265.8 Culv Camelback Rd
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21265.8 Culv Camelback Rd
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21136 25766
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21135 25765
.045 .035 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 21124 25754
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20850 25480
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20580 25210
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20550 25180
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20538 25168
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

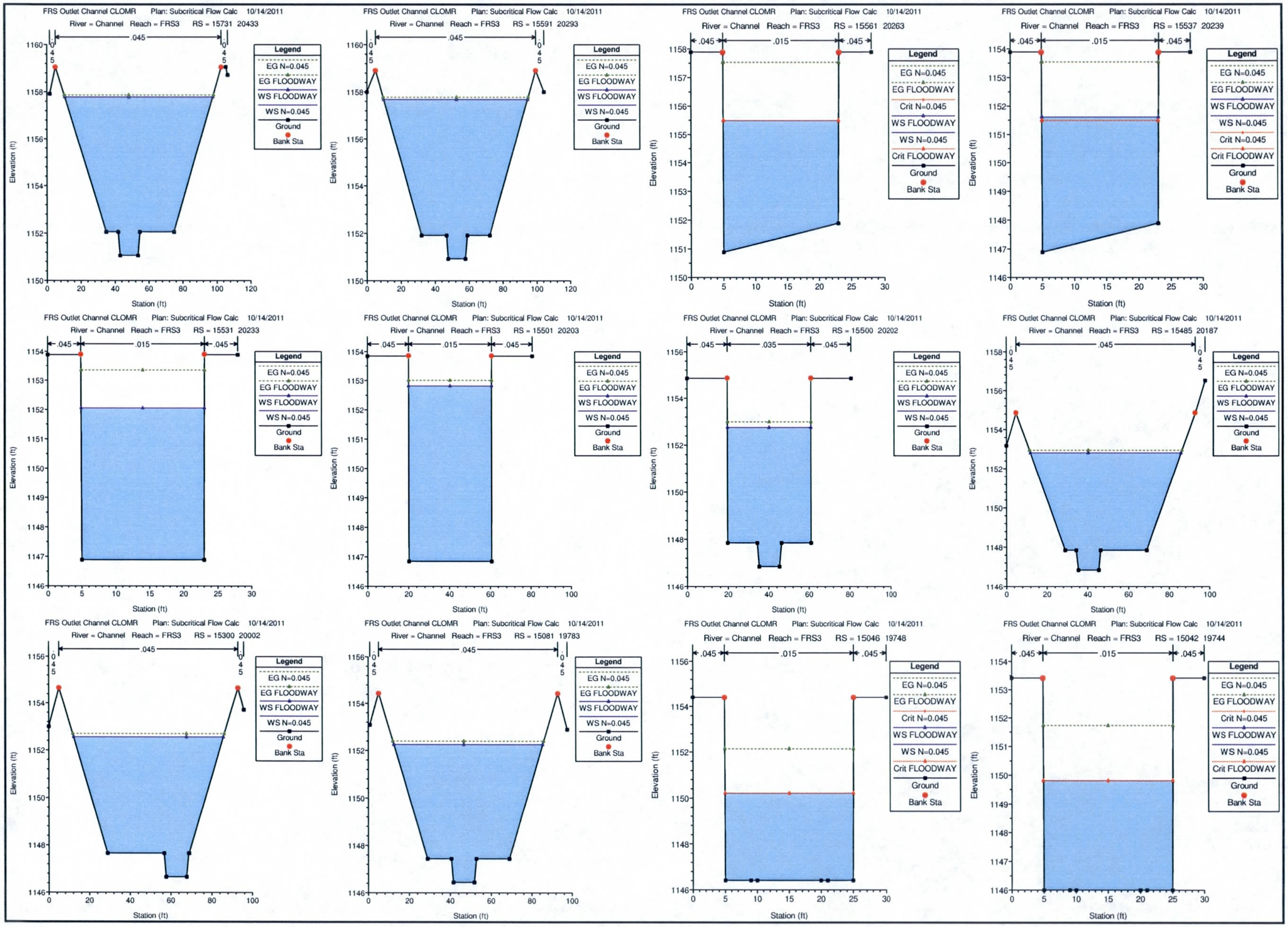

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20532 25162
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20502 25132
.045 .015 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20501 25131
.045 .035 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20486 25116
.045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20300 24930
.045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20077 24707
.045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20048 24678
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20036 24666
.045 .015 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20030 24660
.045 .015 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 20000 24630
.045 .015 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 19999 24629
.045 .035 .045
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 19984 24614
.045

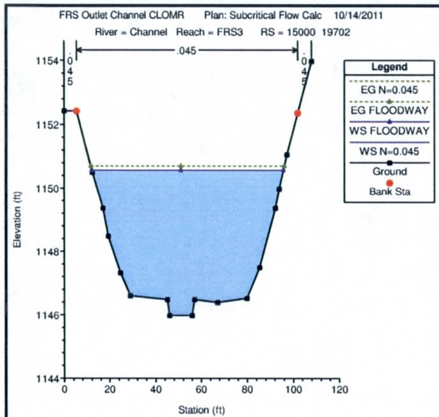
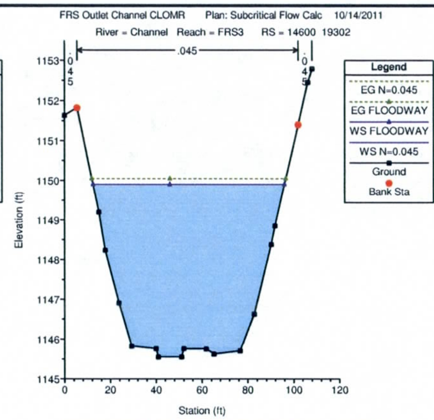
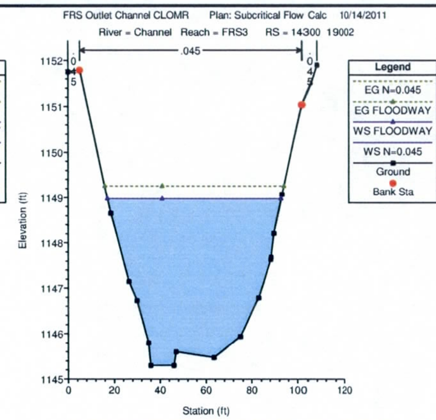
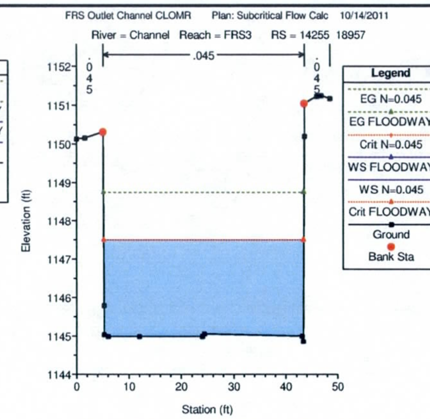
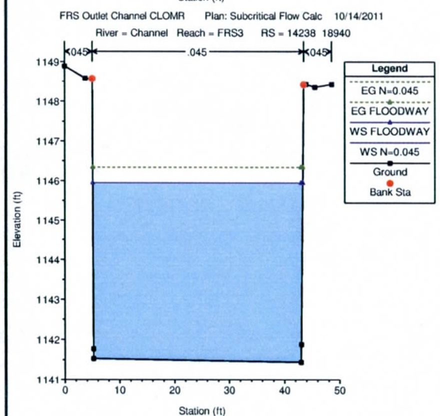
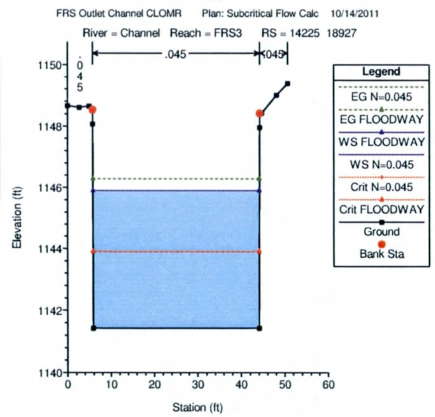
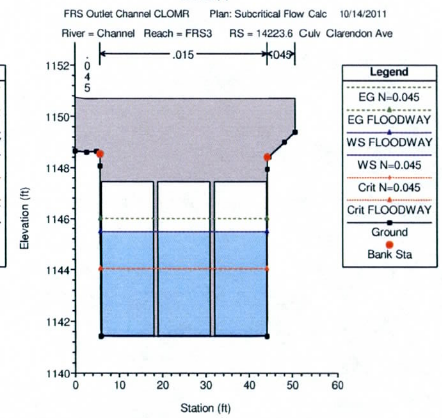
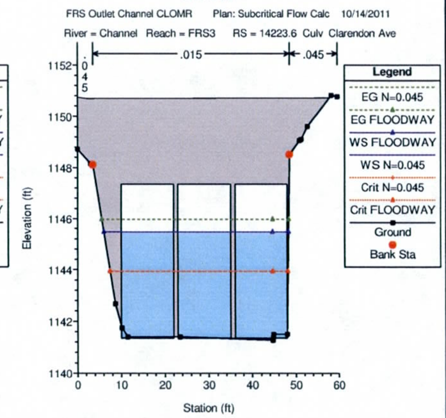
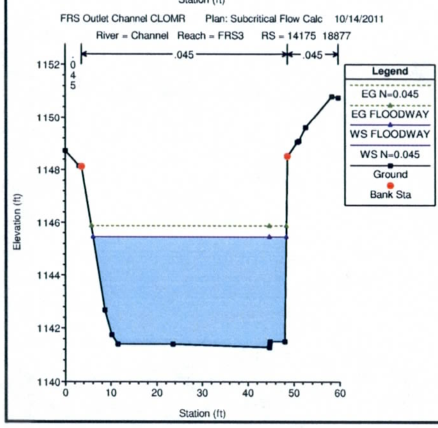
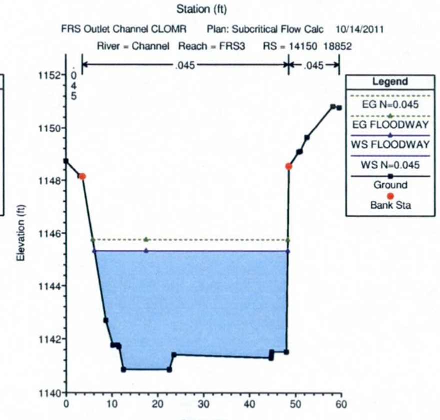
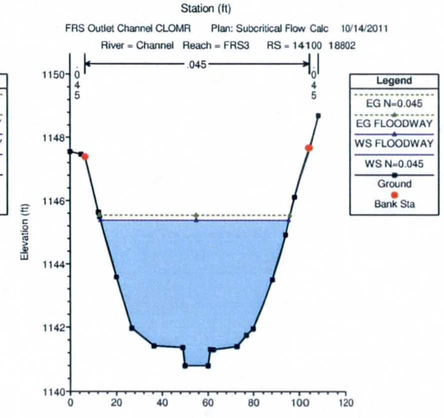
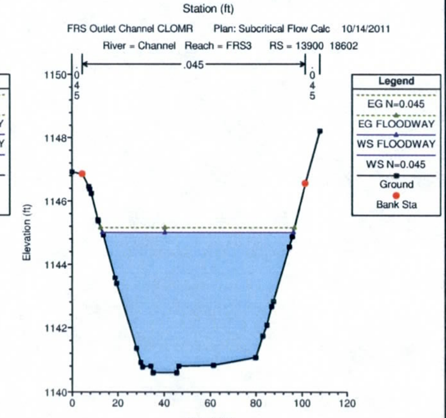

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 19650 24280
River = Channel Reach = FRS3 RS = 19310 23940
River = Channel Reach = FRS3 RS = 19277 23916
River = Channel Reach = FRS3 RS = 19267 23906
River = Channel Reach = FRS3 RS = 19260 23900
River = Channel Reach = FRS3 RS = 19252 23893
River = Channel Reach = FRS3 RS = 18960 23640
River = Channel Reach = FRS3 RS = 18920 23609
River = Channel Reach = FRS3 RS = 18340 23033
River = Channel Reach = FRS3 RS = 18200 22902
River = Channel Reach = FRS3 RS = 17900 22602
River = Channel Reach = FRS3 RS = 17579 22281
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

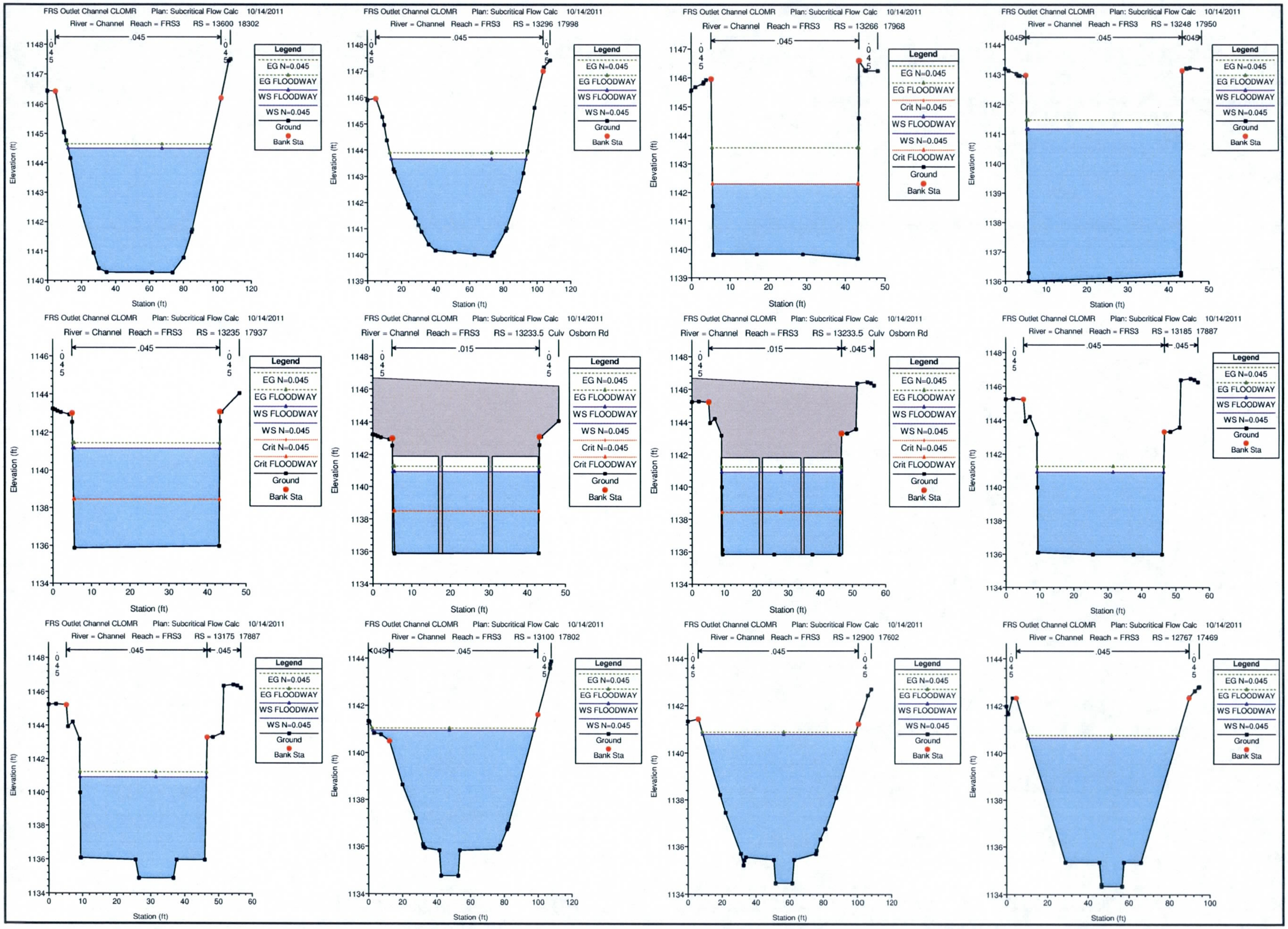

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17549 22251
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17537 22239
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17531 22233
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17501 22203
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17500 22202
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17486 22188
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17350 22052
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 17050 21752
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16779 21481
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16749 21451
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16737 21439
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16731 21433
Elevation (ft)
Station (ft)

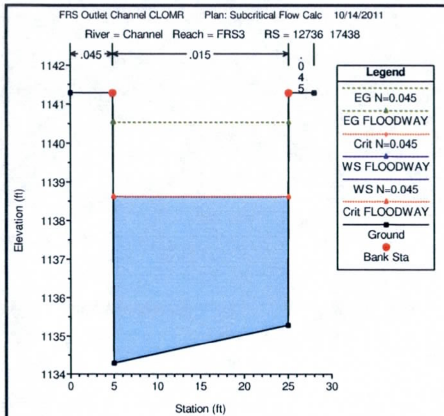


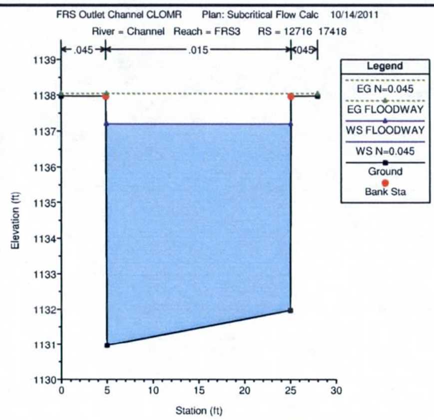
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16701 21403
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16700 21402
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16686 21388
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16500 21202
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 16200 20902
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15984 20686
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15939 20640
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15919 20620
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15918.6 Culv Indian School Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15918.6 Culv Indian School Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15742 20444
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15741 20443
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

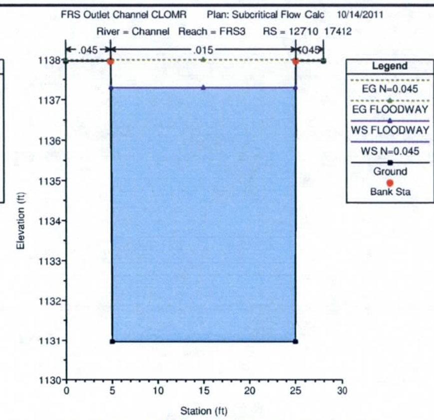

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15731 20433
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15591 20293
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15561 20263
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15537 20239
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15531 20233
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15501 20203
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15500 20202
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15485 20187
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15300 20002
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15081 19783
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15046 19748
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15042 19744
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

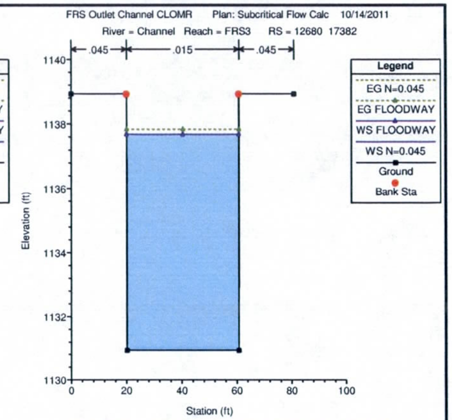

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 15000 19702
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14600 19302
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14300 19002
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14255 18957
.045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14238 18940
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14225 18927
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14223.6 Culv Clarendon Ave
.015
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14223.6 Culv Clarendon Ave
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14175 18877
.045
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14150 18852
.045
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 14100 18802
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13900 18602
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

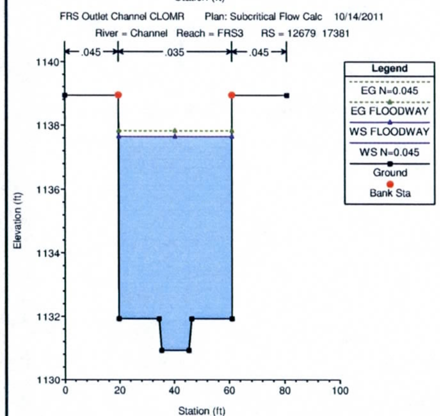

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13600 18302
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13296 17998
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13266 17968
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13248 17950
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13235 17937
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13233.5 Culv Osborn Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13233.5 Culv Osborn Rd
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13185 17887
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13175 17887
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 13100 17802
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12900 17602
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12767 17469
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

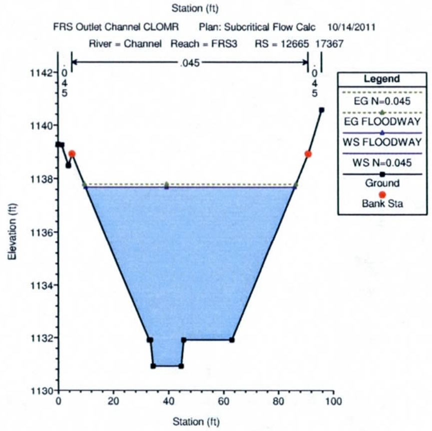

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12736 17438
.045
.015
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

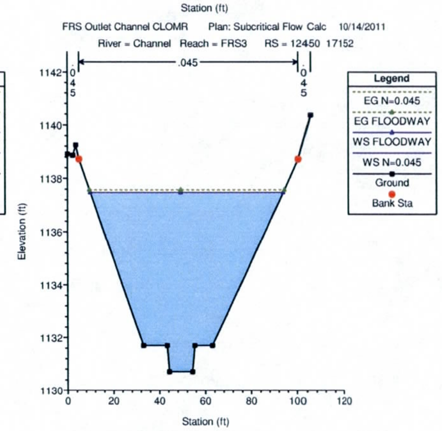

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12716 17418
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

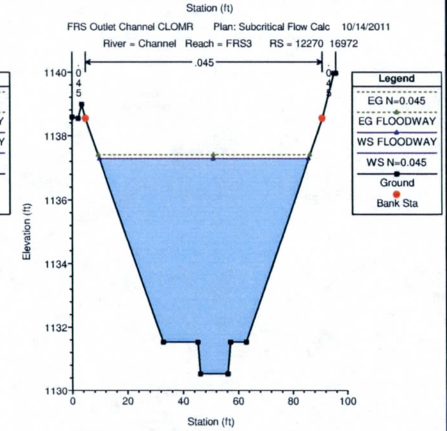

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12710 17412
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

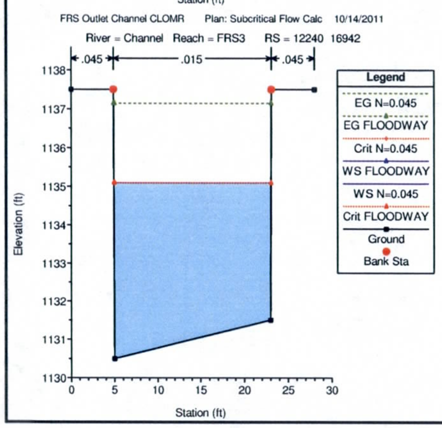

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12680 17382
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

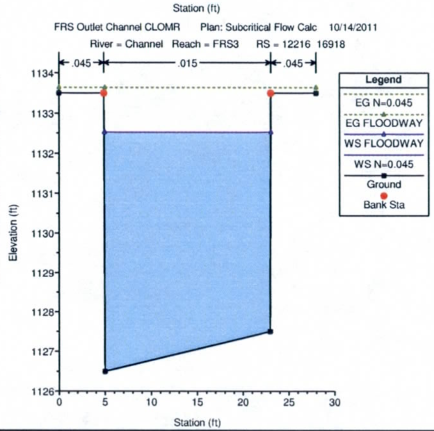

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12679 17381
.045
.035
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

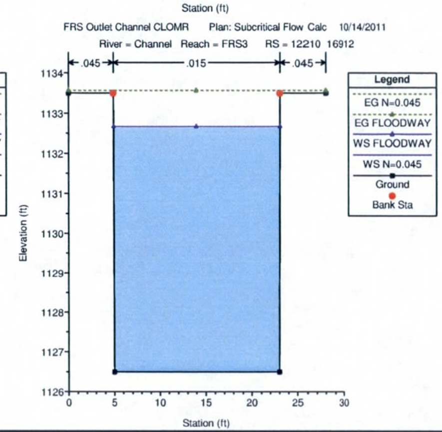

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12665 17367
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

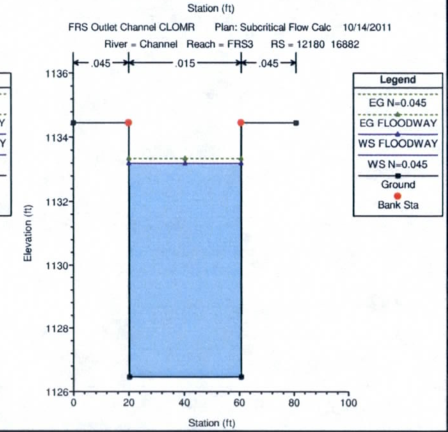

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12450 17152
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

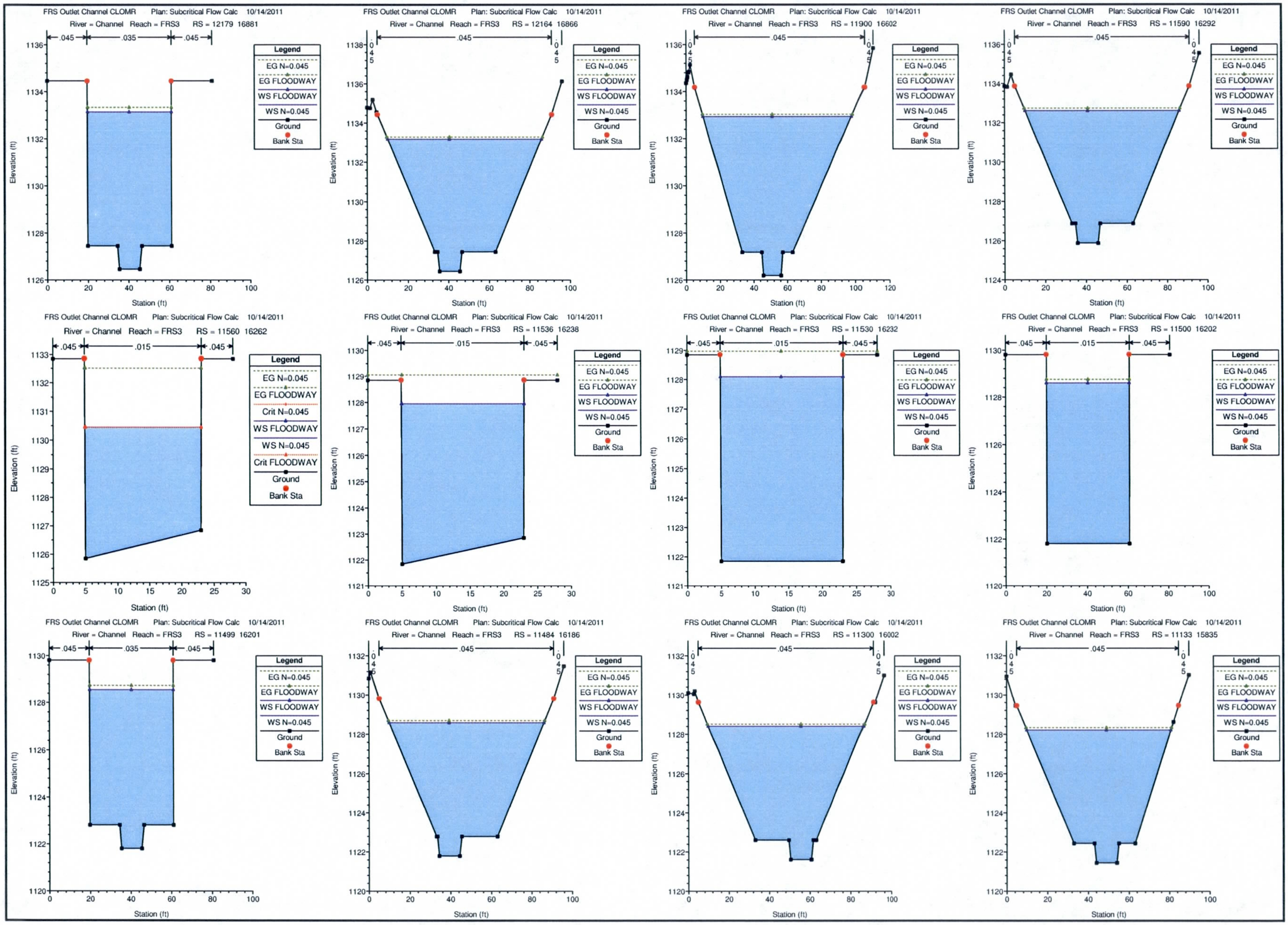

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12270 16972
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

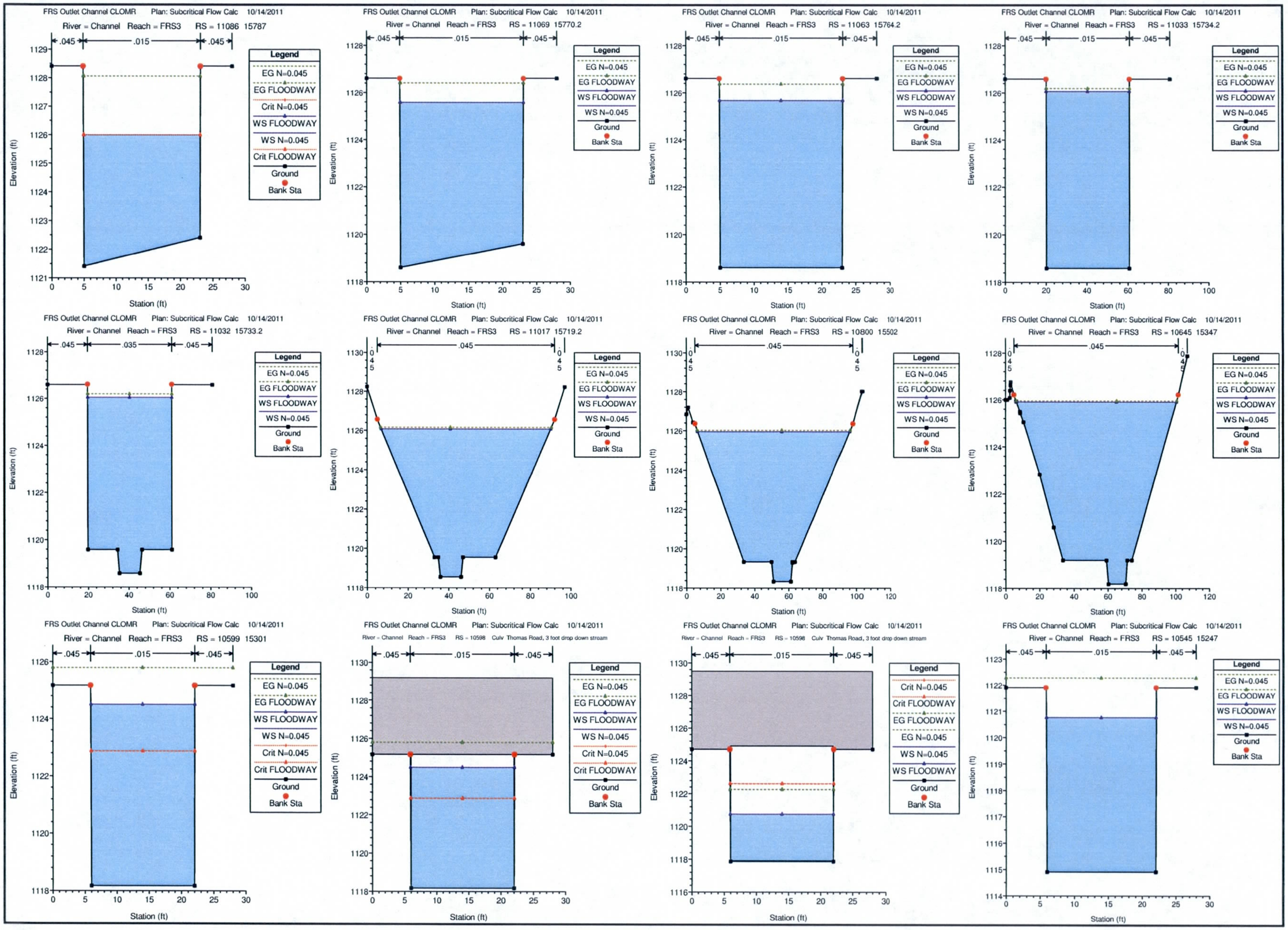

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12240 16942
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12216 16918
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

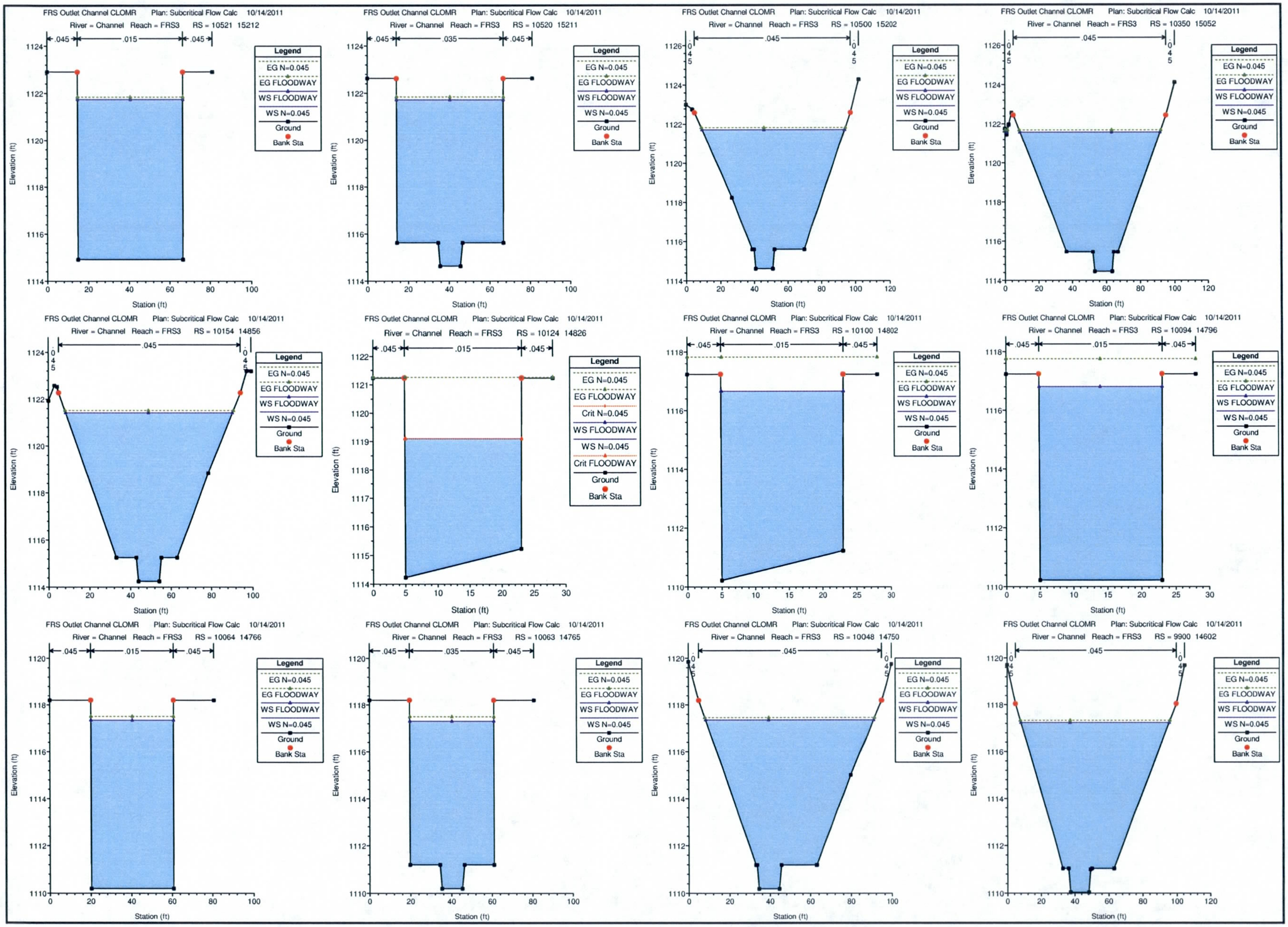

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12210 16912
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12180 16882
.045
.015
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

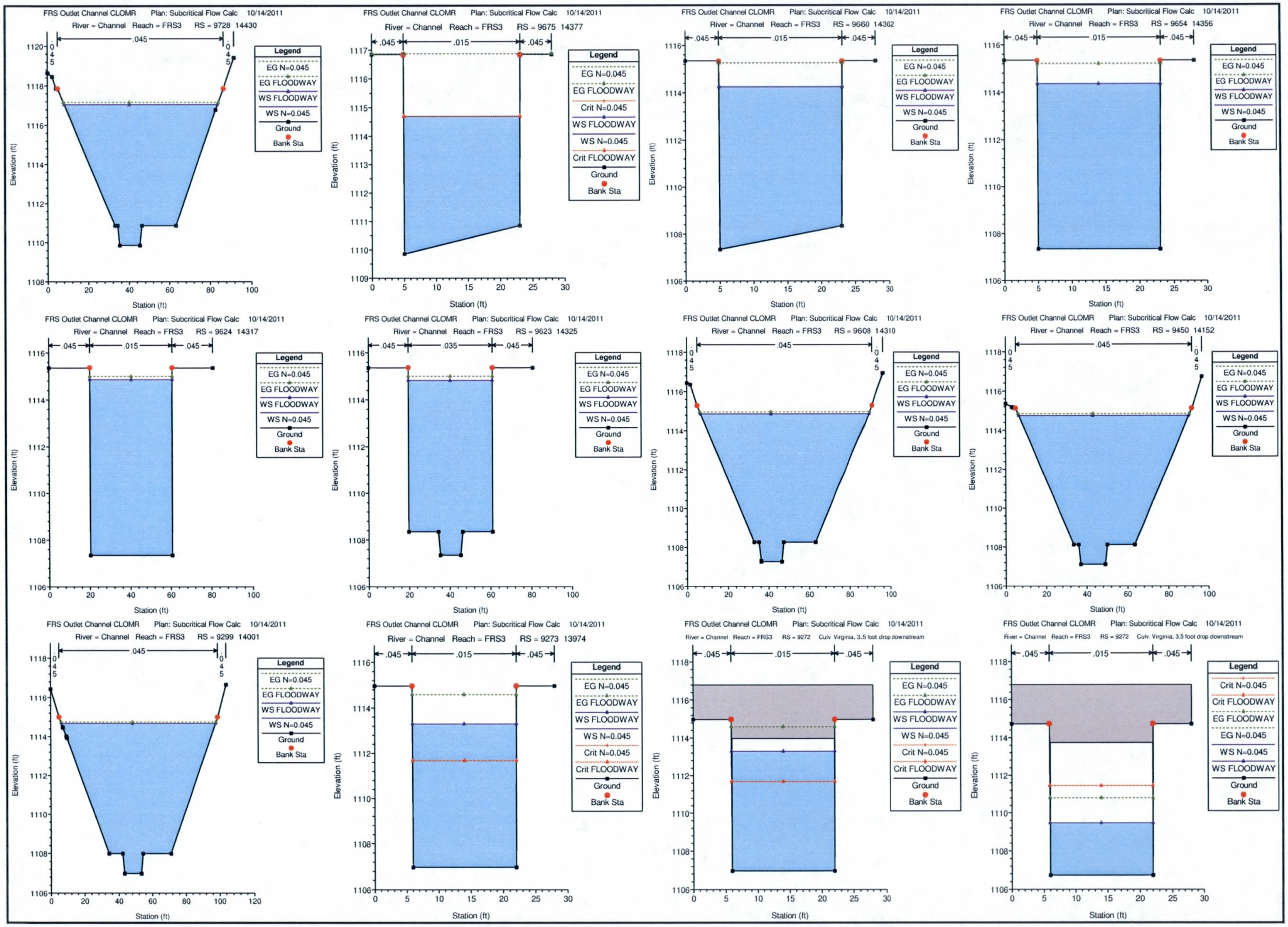

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12179 16881
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 12164 16866
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11900 16602
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11590 16292
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11560 16262
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11536 16238
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11530 16232
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11500 16202
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11499 16201
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11484 16186
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11300 16002
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11133 15835
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

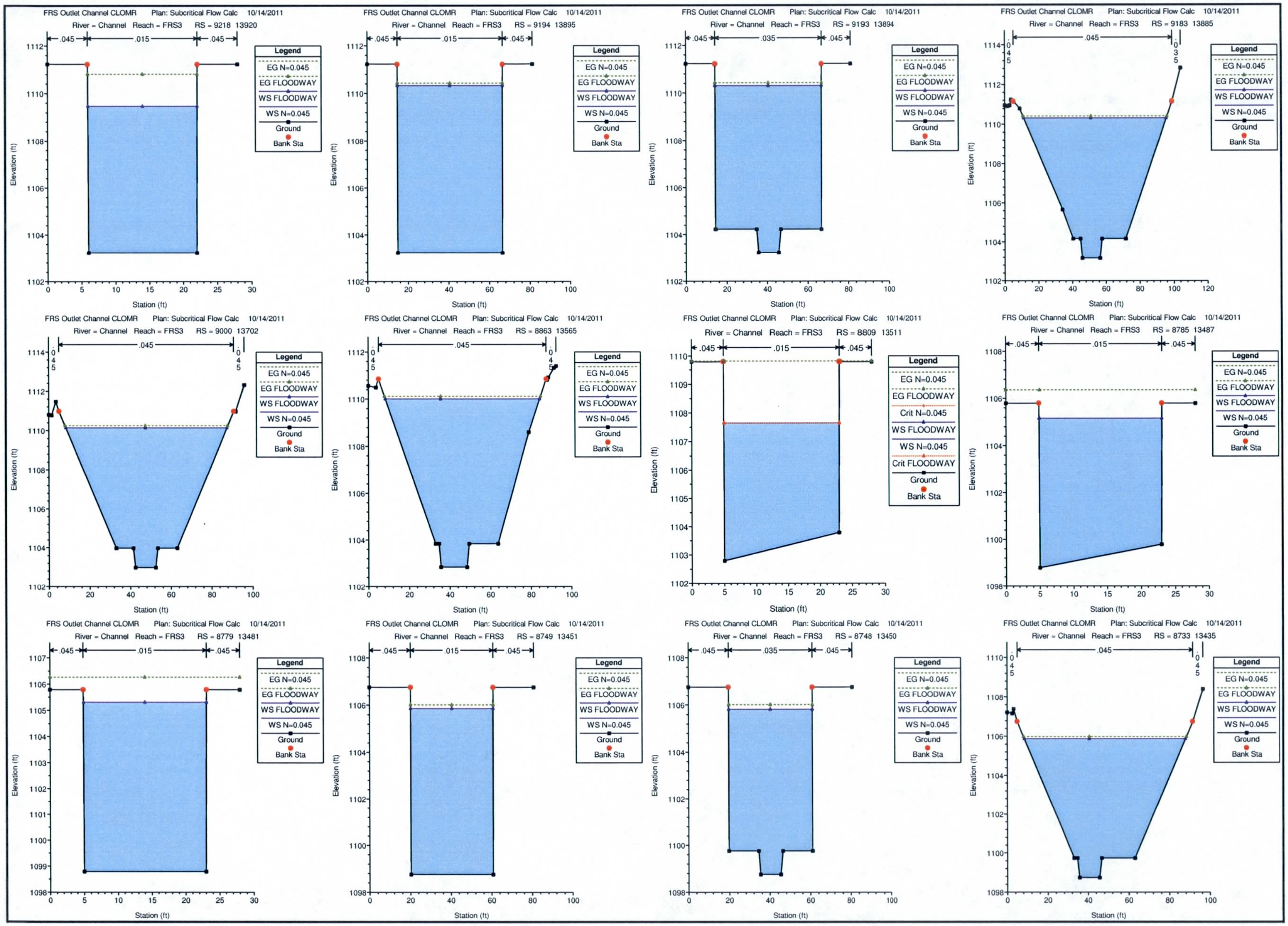


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 11086 15787
River = Channel Reach = FRS3 RS = 11069 15770.2
River = Channel Reach = FRS3 RS = 11063 15764.2
River = Channel Reach = FRS3 RS = 11033 15734.2
River = Channel Reach = FRS3 RS = 11032 15733.2
River = Channel Reach = FRS3 RS = 11017 15719.2
River = Channel Reach = FRS3 RS = 10800 15502
River = Channel Reach = FRS3 RS = 10645 15347
River = Channel Reach = FRS3 RS = 10599 15301
River = Channel Reach = FRS3 RS = 10598 Culv Thomas Road, 3 foot drop down stream
River = Channel Reach = FRS3 RS = 10545 15247
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

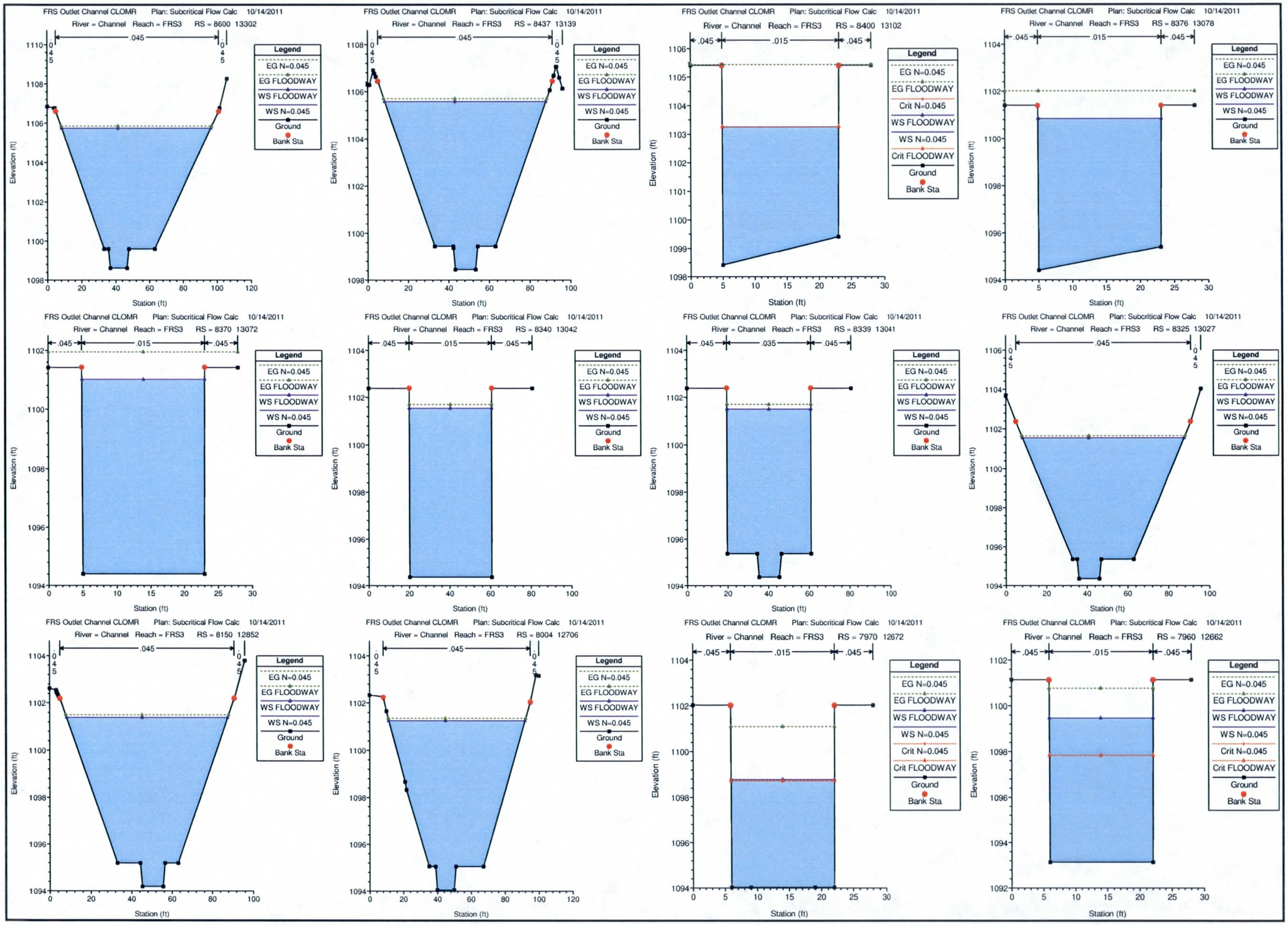


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10521 15212
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10520 15211
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10500 15202
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10350 15052
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10154 14856
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10124 14826
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10100 14802
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10094 14796
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10064 14766
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10063 14765
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 10048 14750
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9900 14602
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

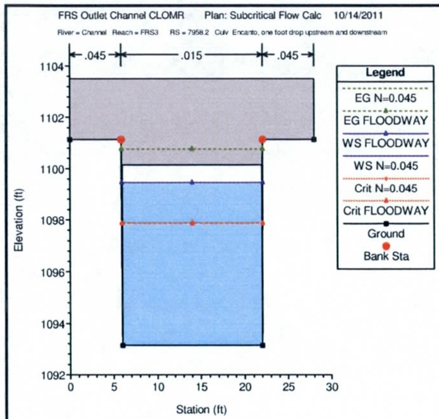

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9728 14430
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9675 14377
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9660 14362
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9654 14356
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9624 14317
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9623 14325
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9608 14310
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9450 14152
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9299 14001
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9273 13974
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9272 Culv Virginia, 3.5 foot drop downstream
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9272 Culv Virginia, 3.5 foot drop downstream
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
.045
.015
.035
Elevation (ft)
Station (ft)



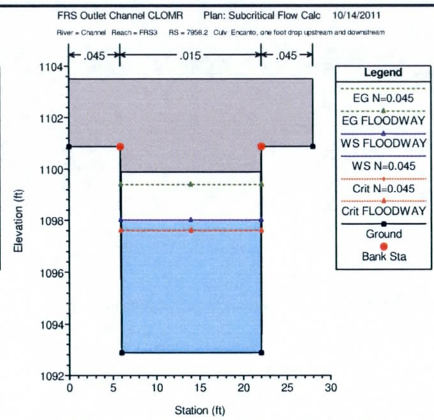
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9218 13920
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9194 13895
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9193 13894
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9183 13885
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 9000 13702
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8863 13565
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8809 13511
Crit N=0.045
Crit FLOODWAY
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8785 13487
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8779 13481
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8749 13451
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8748 13450
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8733 13435



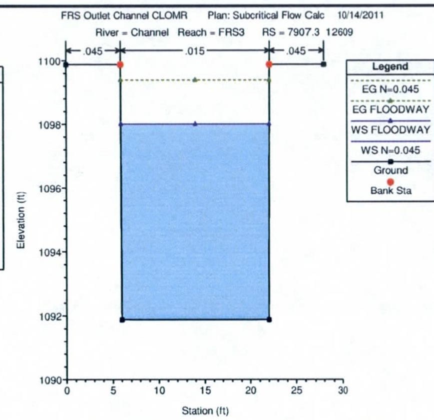
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8600 13302
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8437 13139
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8400 13102
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8376 13078
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8370 13072
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8340 13042
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8339 13041
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8325 13027
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8150 12852
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 8004 12706
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7970 12672
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7960 12662
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)



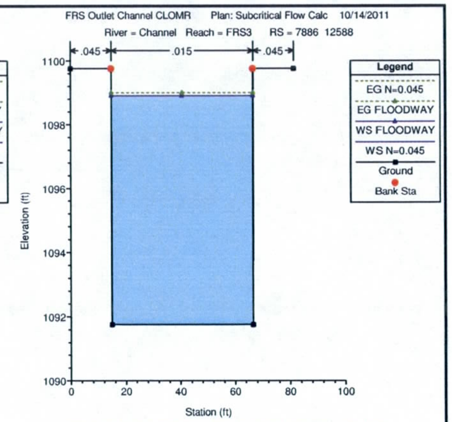
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7958.2 Culv Encanto, one foot drop upstream and downstream
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)



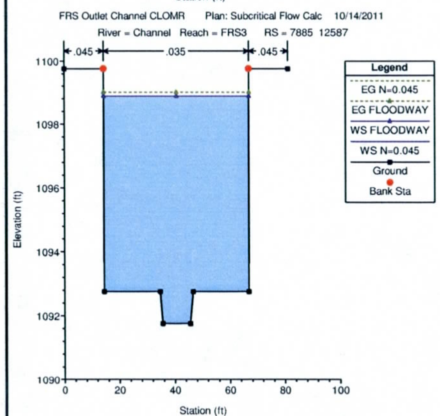
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7958.2 Culv Encanto, one foot drop upstream and downstream
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)



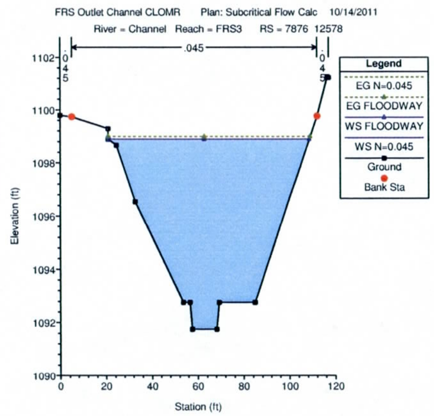
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7907.3 12609
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



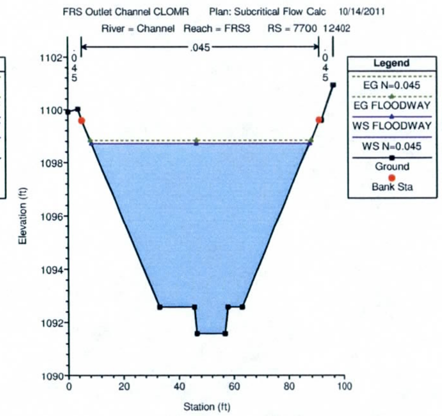
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7886 12588
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



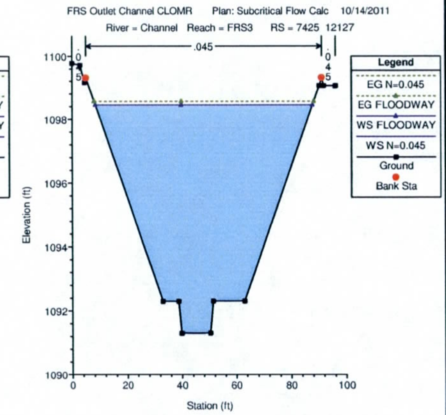
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7885 12587
.045 .035 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



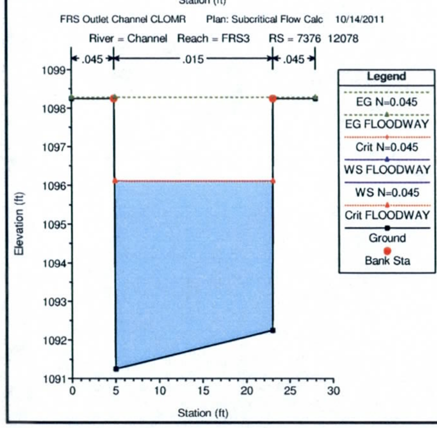
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7876 12578
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



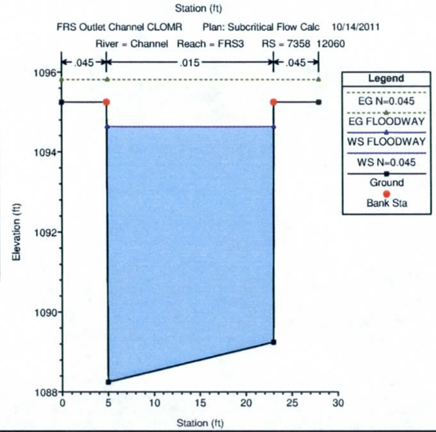
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7700 12402
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



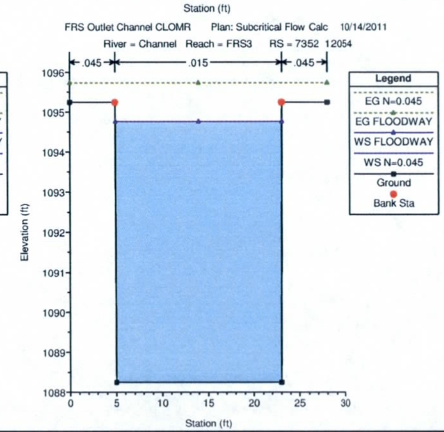
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7425 12127
.045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



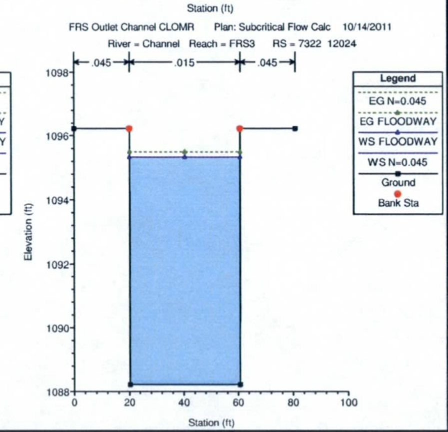
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7376 12078
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)



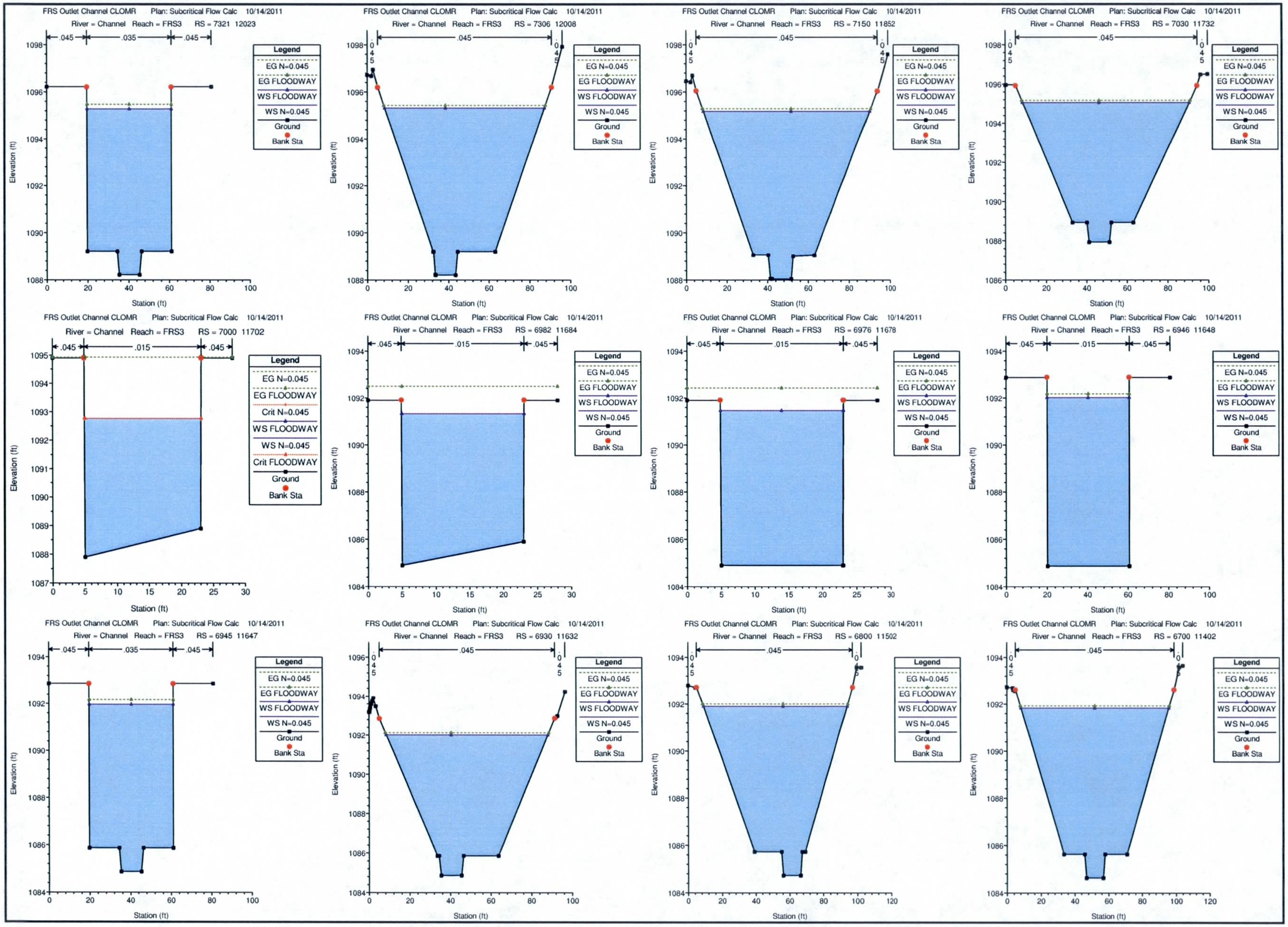
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7358 12060
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)



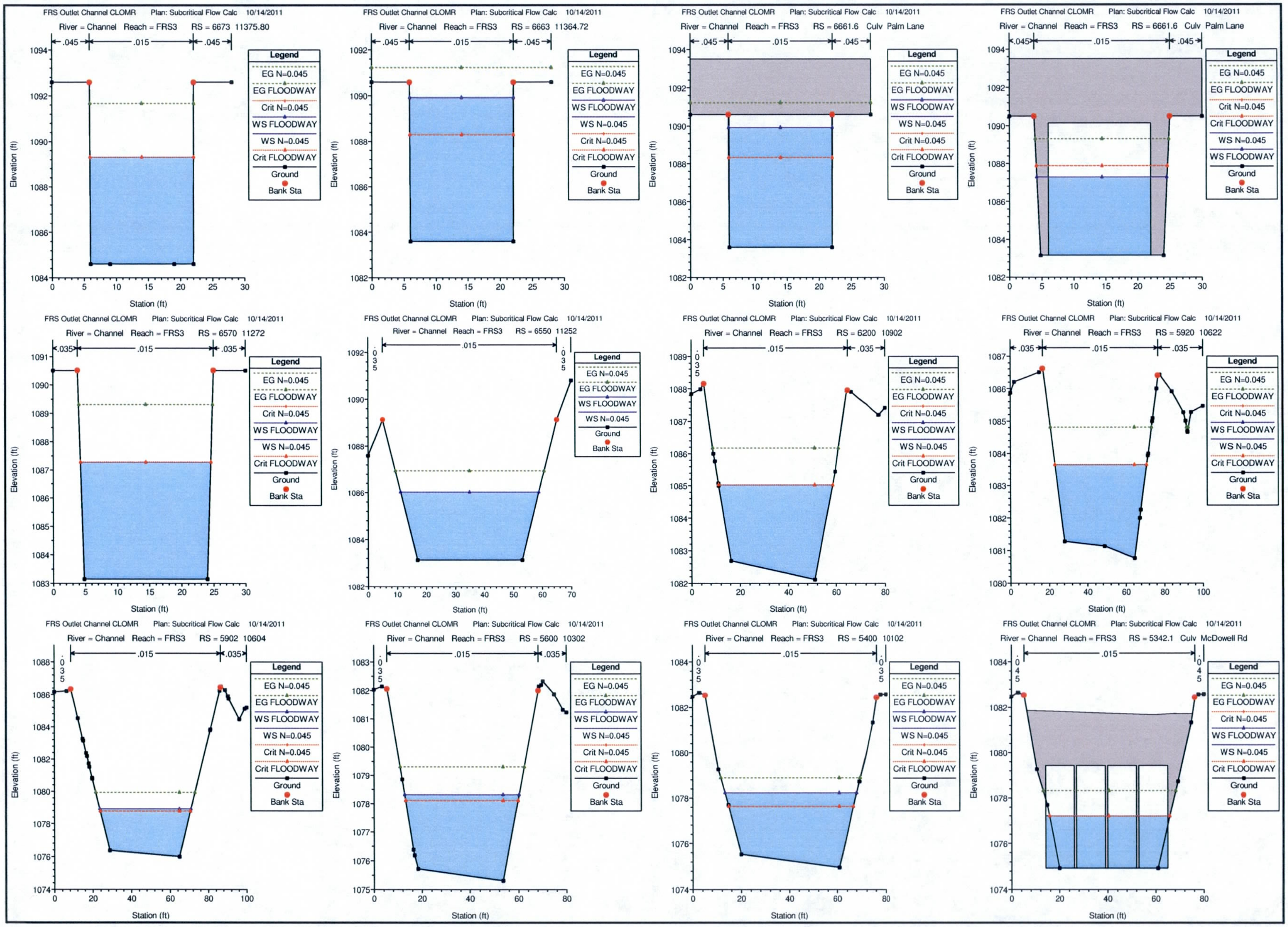
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7352 12054
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)

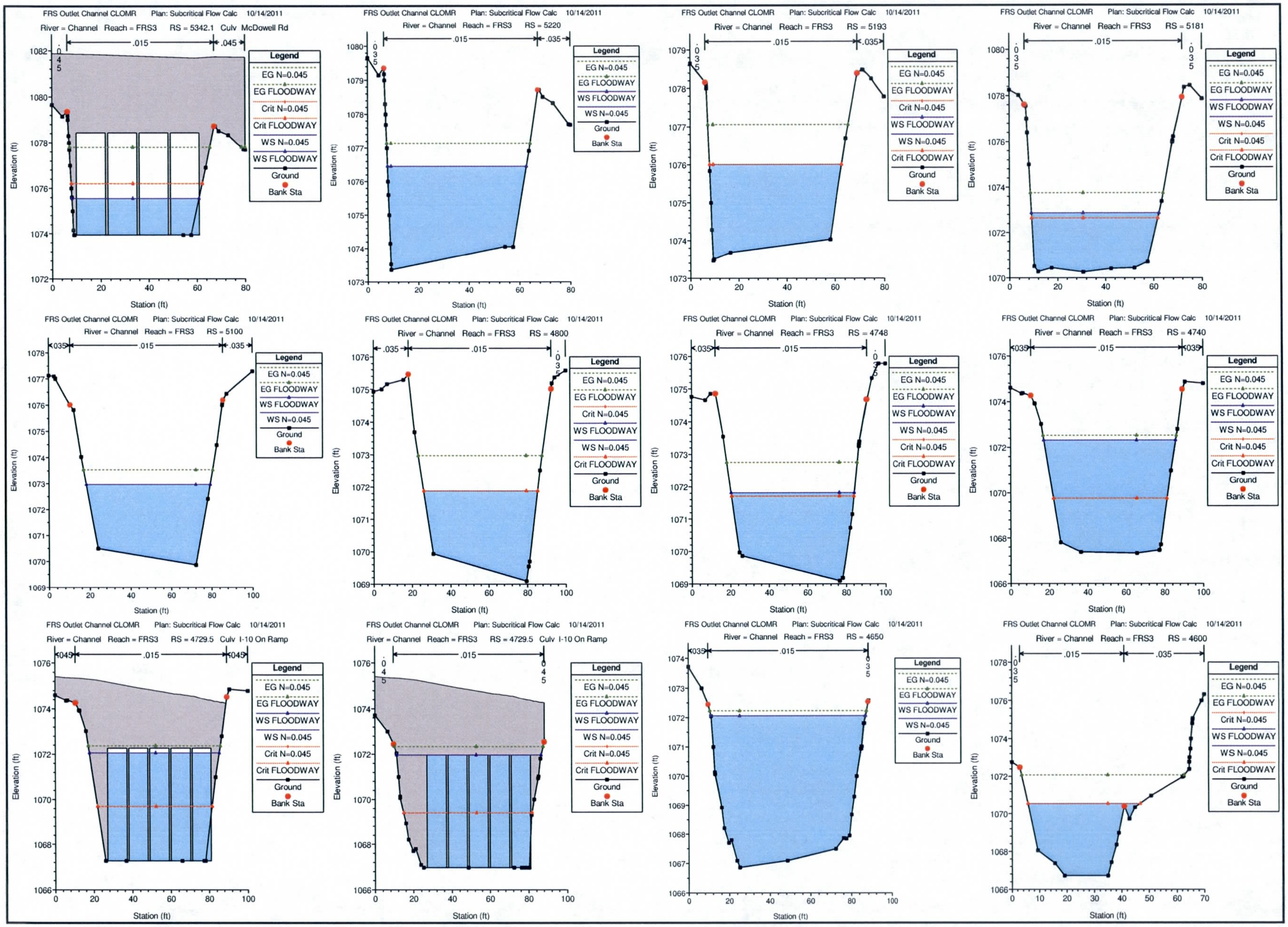


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7322 12024
.045 .015 .045
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Bank Sta
Elevation (ft)
Station (ft)

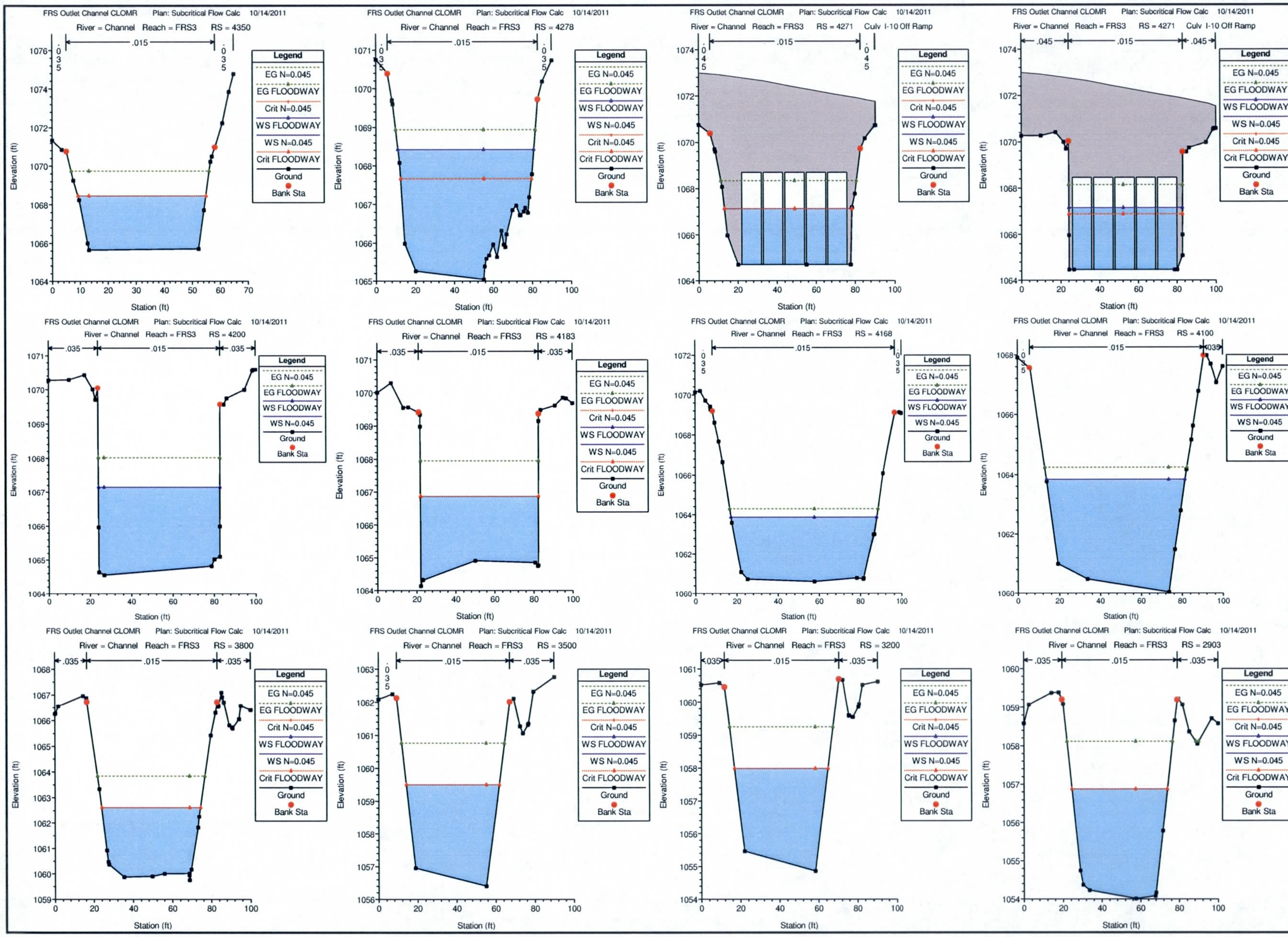


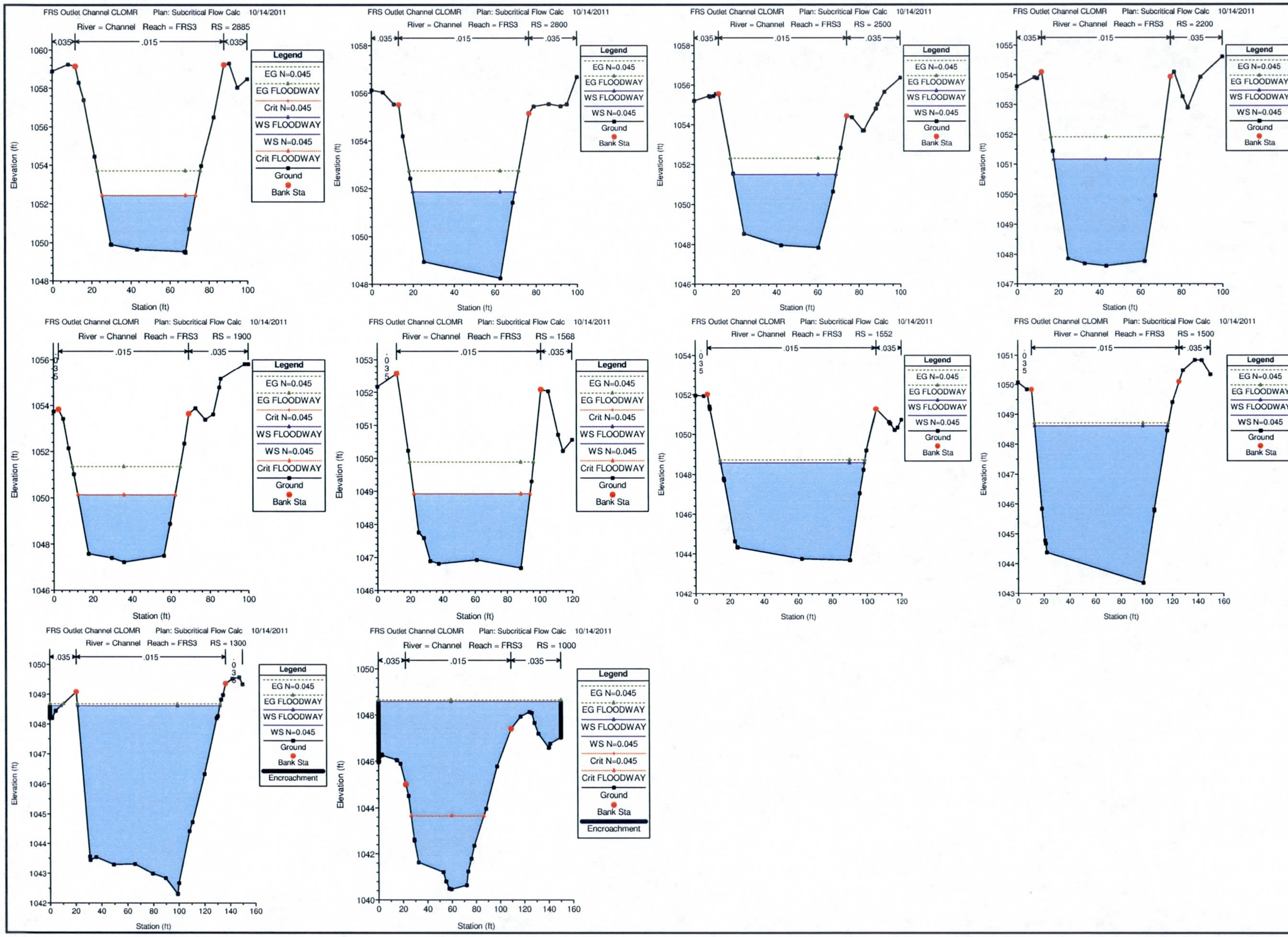
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7321 12023
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
Elevation (ft)
Station (ft)
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7306 12008
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7150 11852
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7030 11732
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 7000 11702
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6982 11684
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6976 11678
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6946 11648
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6945 11647
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6930 11632
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6800 11502
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6700 11402


FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6673 11375.80
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6663 11364.72
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6661.6 Culv Palm Lane
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6661.6 Culv Palm Lane
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6570 11272
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6550 11252
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 6200 10902
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5920 10622
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5902 10604
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5600 10302
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5400 10102
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5342.1 Culv McDowell Rd
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

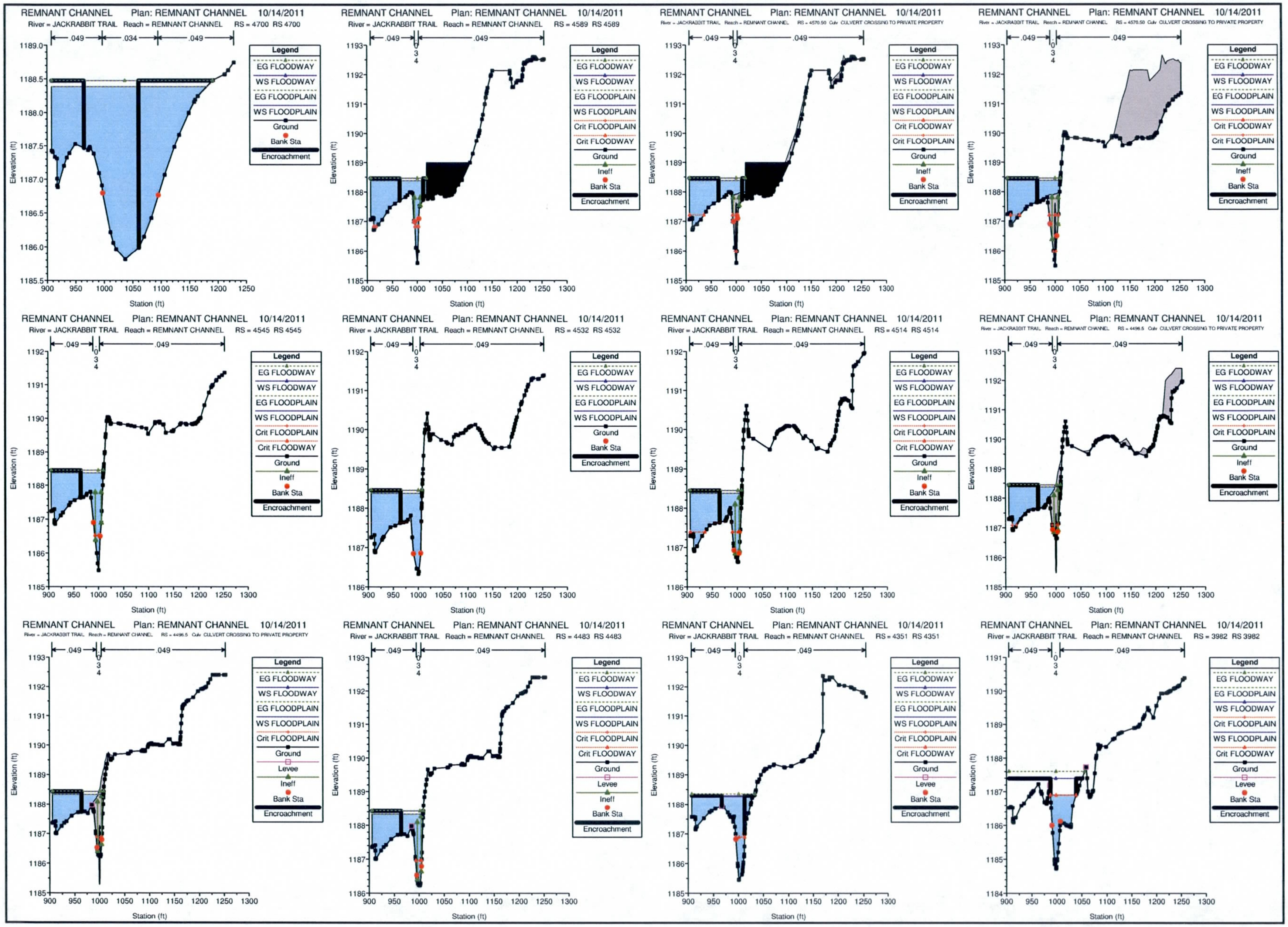


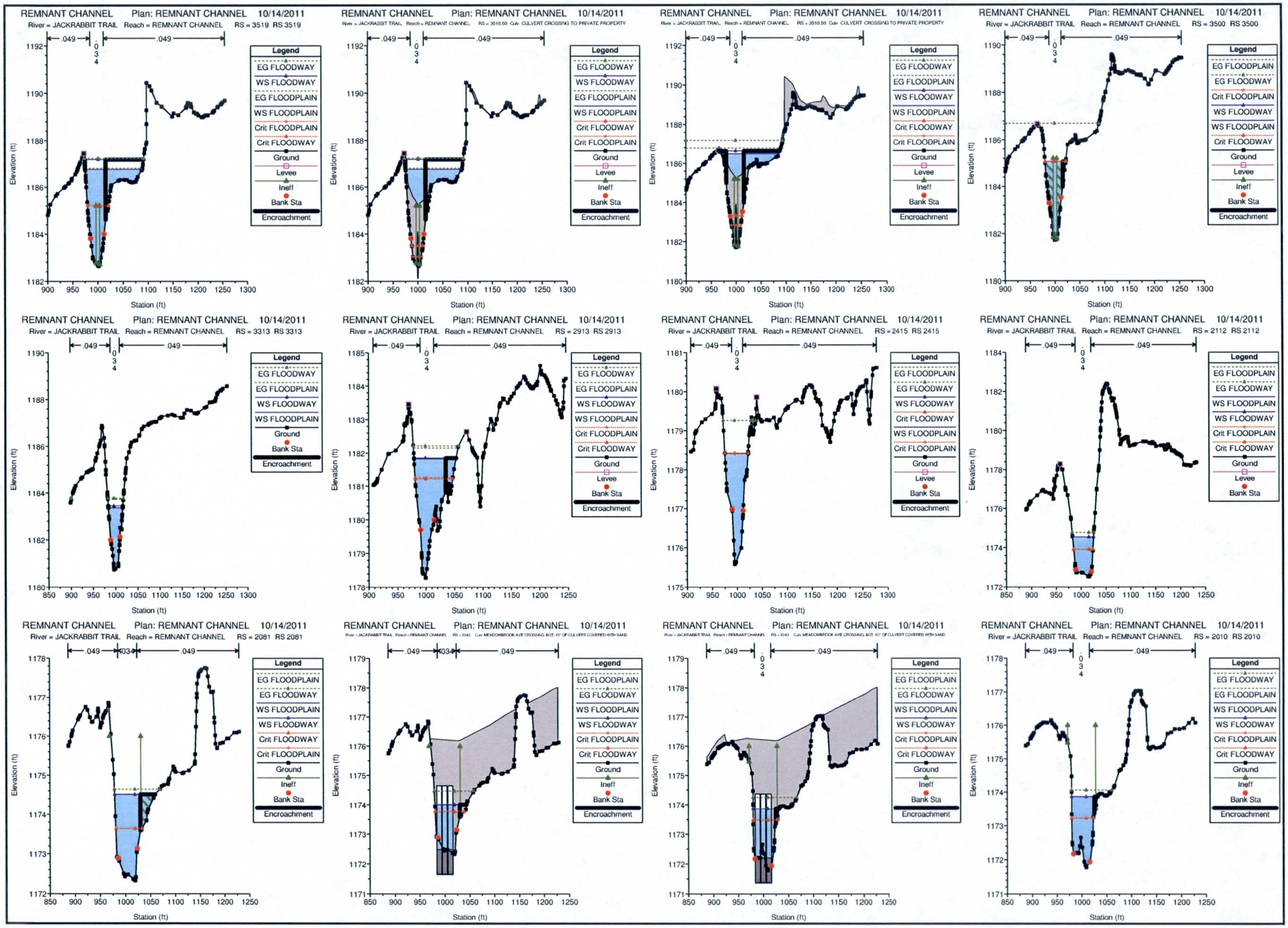
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5342.1 Culv McDowell Rd
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
Crit FLOODWAY
WS N=0.045
WS FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5220
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5193
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5181
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 5100
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4800
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4748
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4740
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4729.5 Culv I-10 On Ramp
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4729.5 Culv I-10 On Ramp
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Crit N=0.045
Crit FLOODWAY
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4650
Legend
EG N=0.045
EG FLOODWAY
WS FLOODWAY
WS N=0.045
Ground
Bank Sta
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4600
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)

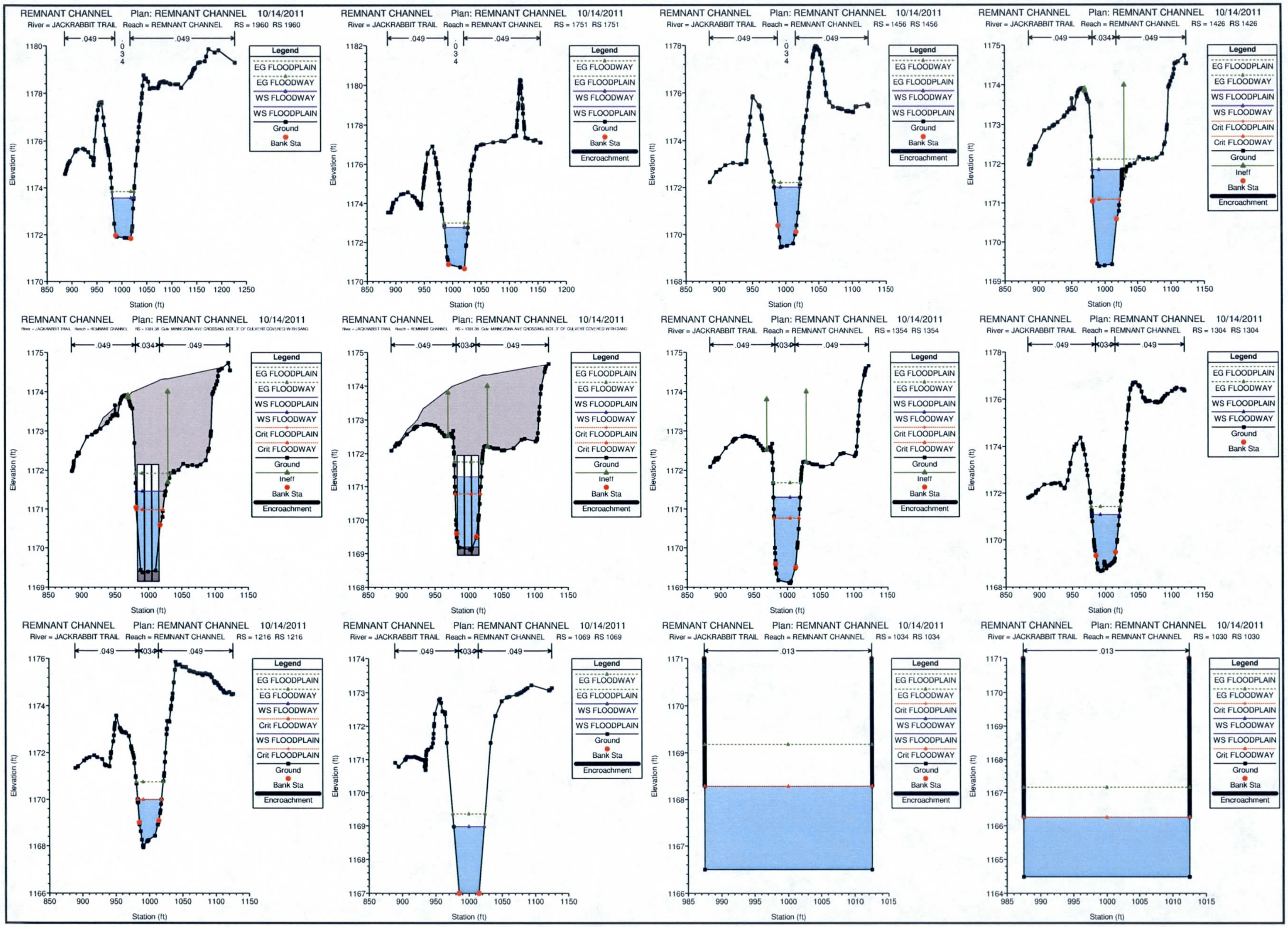

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4350
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4278
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4271 Culv I-10 Off Ramp
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4271 Culv I-10 Off Ramp
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4200
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4183
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4168
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 4100
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 3800
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 3500
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 3200
FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 2903
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
.015
.035
.045
Elevation (ft)
Station (ft)

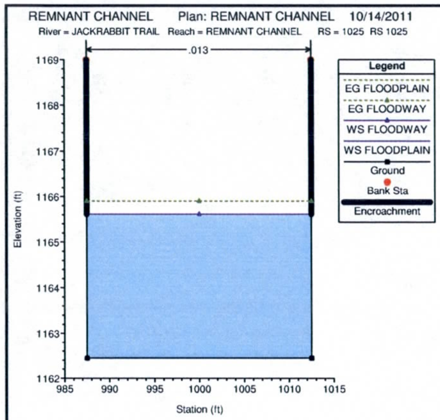

FRS Outlet Channel CLOMR Plan: Subcritical Flow Calc 10/14/2011
River = Channel Reach = FRS3 RS = 2885
River = Channel Reach = FRS3 RS = 2800
River = Channel Reach = FRS3 RS = 2500
River = Channel Reach = FRS3 RS = 2200
River = Channel Reach = FRS3 RS = 1900
River = Channel Reach = FRS3 RS = 1568
River = Channel Reach = FRS3 RS = 1552
River = Channel Reach = FRS3 RS = 1500
River = Channel Reach = FRS3 RS = 1300
River = Channel Reach = FRS3 RS = 1000
.035
.015
Legend
EG N=0.045
EG FLOODWAY
Crit N=0.045
WS FLOODWAY
WS N=0.045
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

REMNANT CHANNEL

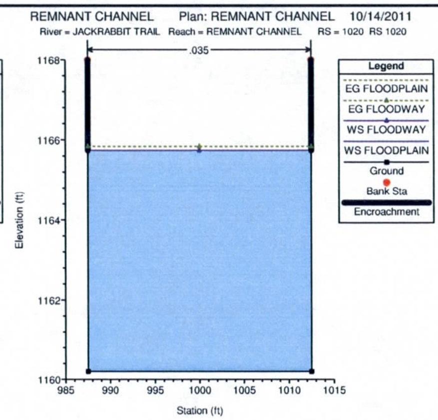



REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 3519 RS 3519
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 3500 RS 3500
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 3313 RS 3313
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 2913 RS 2913
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 2415 RS 2415
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 2112 RS 2112
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 2081 RS 2081
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 2010 RS 2010
Legend
EG FLOODWAY
WS FLOODWAY
EG FLOODPLAIN
WS FLOODPLAIN
Crit FLOODPLAIN
Crit FLOODWAY
Ground
Levee
Ineff
Bank Sta
Encroachment
.049
.034
Elevation (ft)
Station (ft)

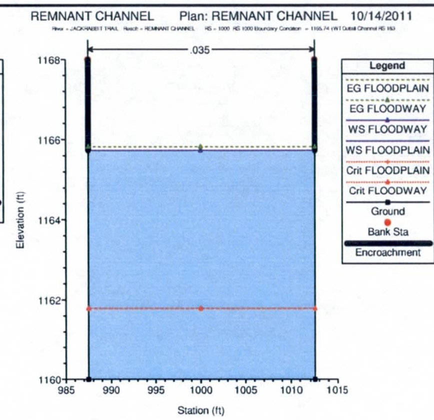

REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1960 RS 1960
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1751 RS 1751
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1456 RS 1456
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1426 RS 1426
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1391.38 Culv MINNEZONA AVE CROSSING, BOT. 3' OF CULVERT COVERED WITH SAND
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1391.38 Culv MINNEZONA AVE CROSSING, BOT. 3' OF CULVERT COVERED WITH SAND
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1354 RS 1354
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1304 RS 1304
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1216 RS 1216
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1069 RS 1069
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1034 RS 1034
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1030 RS 1030
Legend
EG FLOODPLAIN
EG FLOODWAY
WS FLOODWAY
WS FLOODPLAIN
Crit FLOODPLAIN
Crit FLOODWAY
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)



REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1025 RS 1025
.013
Legend
EG FLOODPLAIN
EG FLOODWAY
WS FLOODWAY
WS FLOODPLAIN
Ground
Bank Sta
Encroachment
Elevation (ft)
1169
1168
1167
1166
1165
1164
1163
1162
985 990 995 1000 1005 1010 1015
Station (ft)

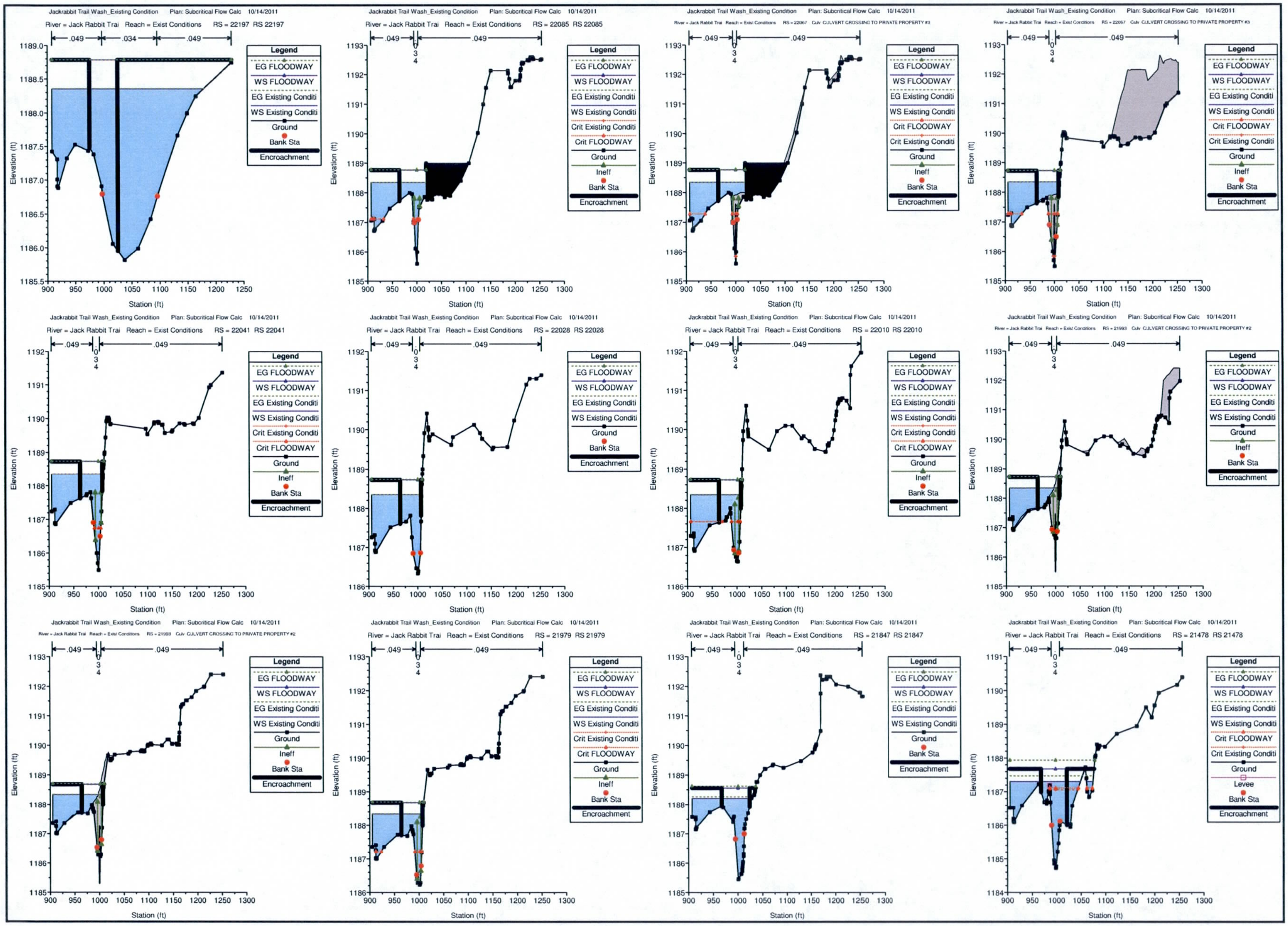


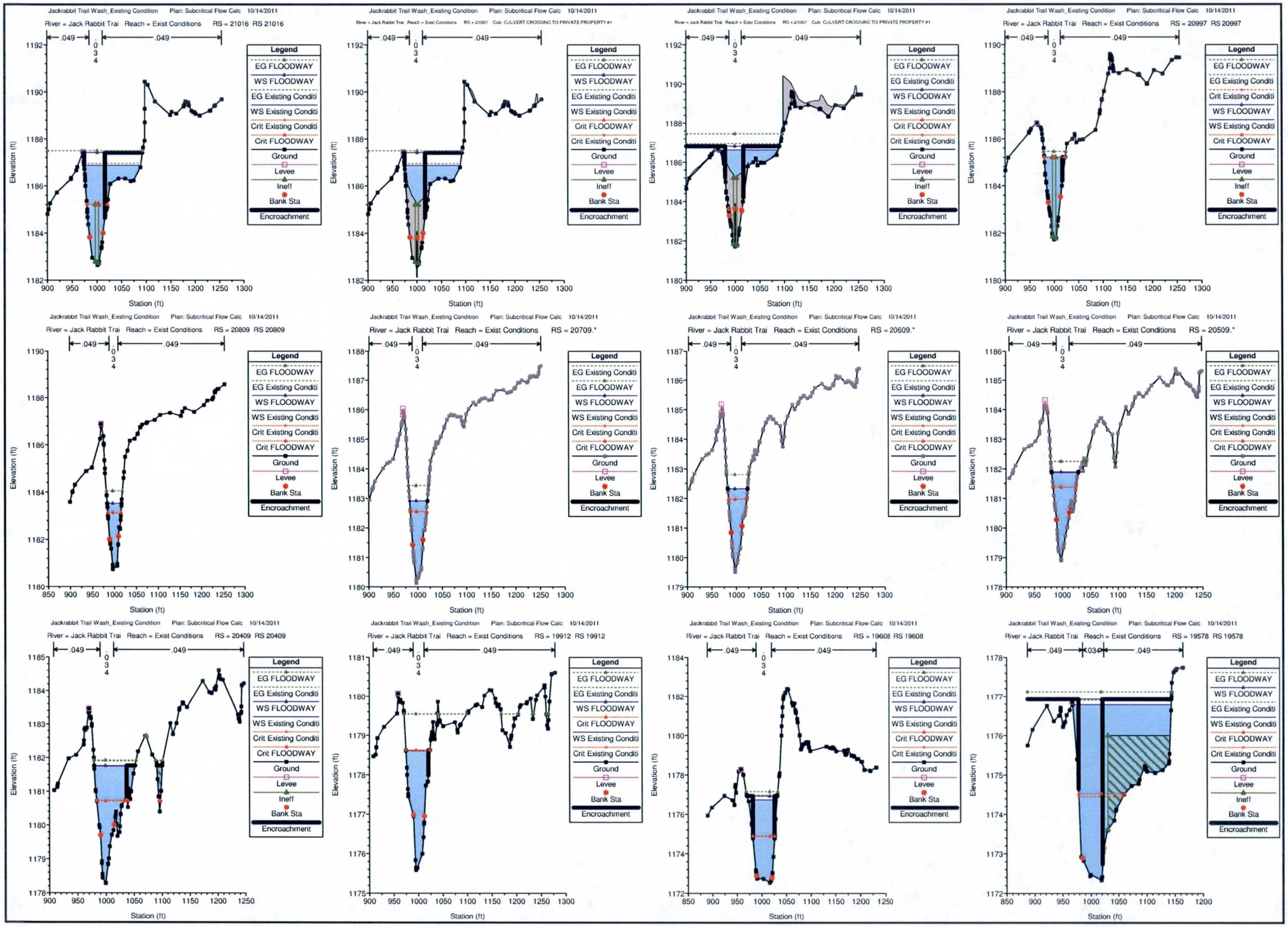
REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
River = JACKRABBIT TRAIL Reach = REMNANT CHANNEL RS = 1020 RS 1020
.035
Legend
EG FLOODPLAIN
EG FLOODWAY
WS FLOODWAY
WS FLOODPLAIN
Ground
Bank Sta
Encroachment
Elevation (ft)
1168
1166
1164
1162
1160
985 990 995 1000 1005 1010 1015
Station (ft)

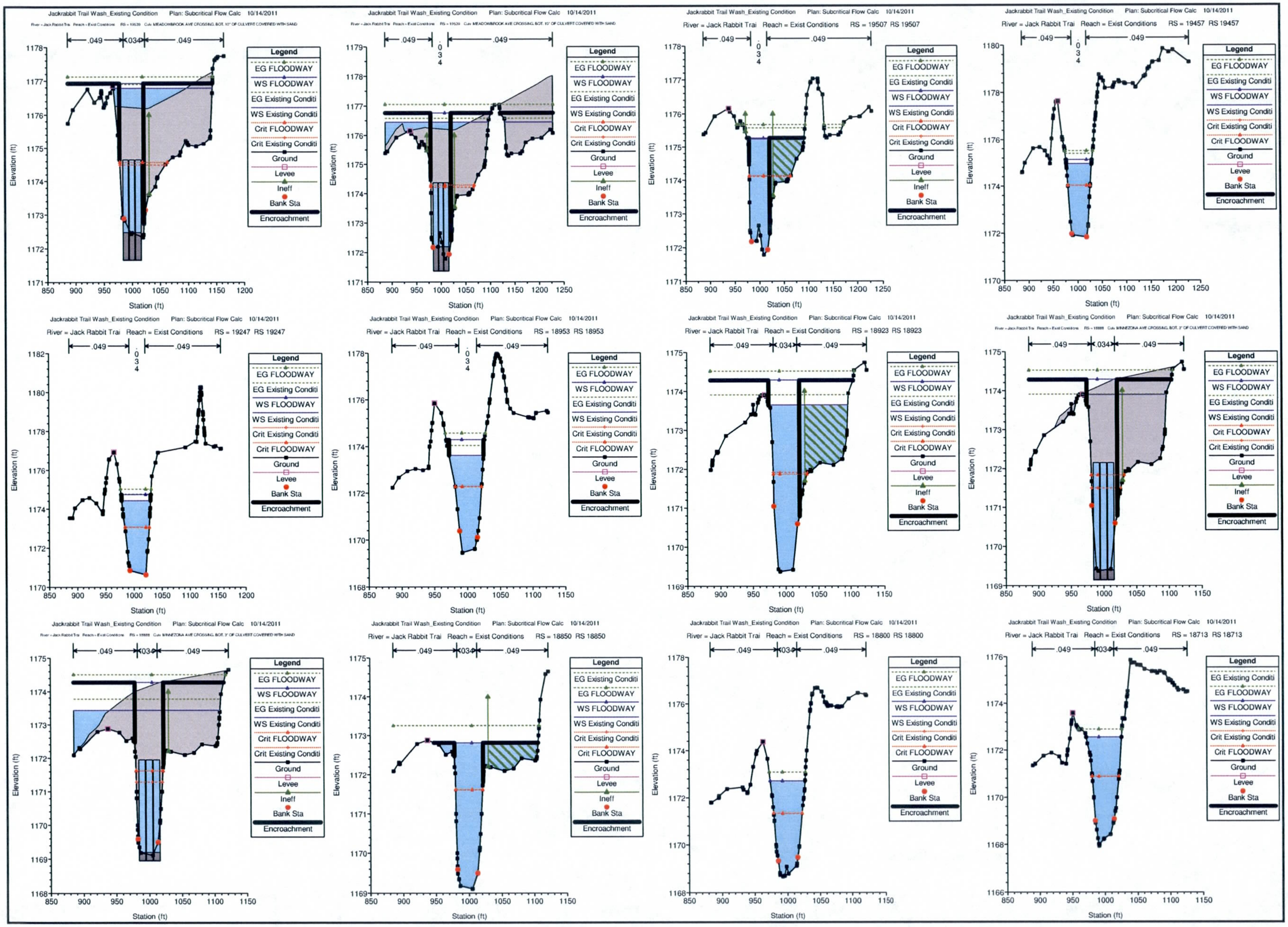


REMNANT CHANNEL Plan: REMNANT CHANNEL 10/14/2011
.035
Legend
EG FLOODPLAIN
EG FLOODWAY
WS FLOODWAY
WS FLOODPLAIN
Crit FLOODPLAIN
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
1168
1166
1164
1162
1160
985 990 995 1000 1005 1010 1015
Station (ft)

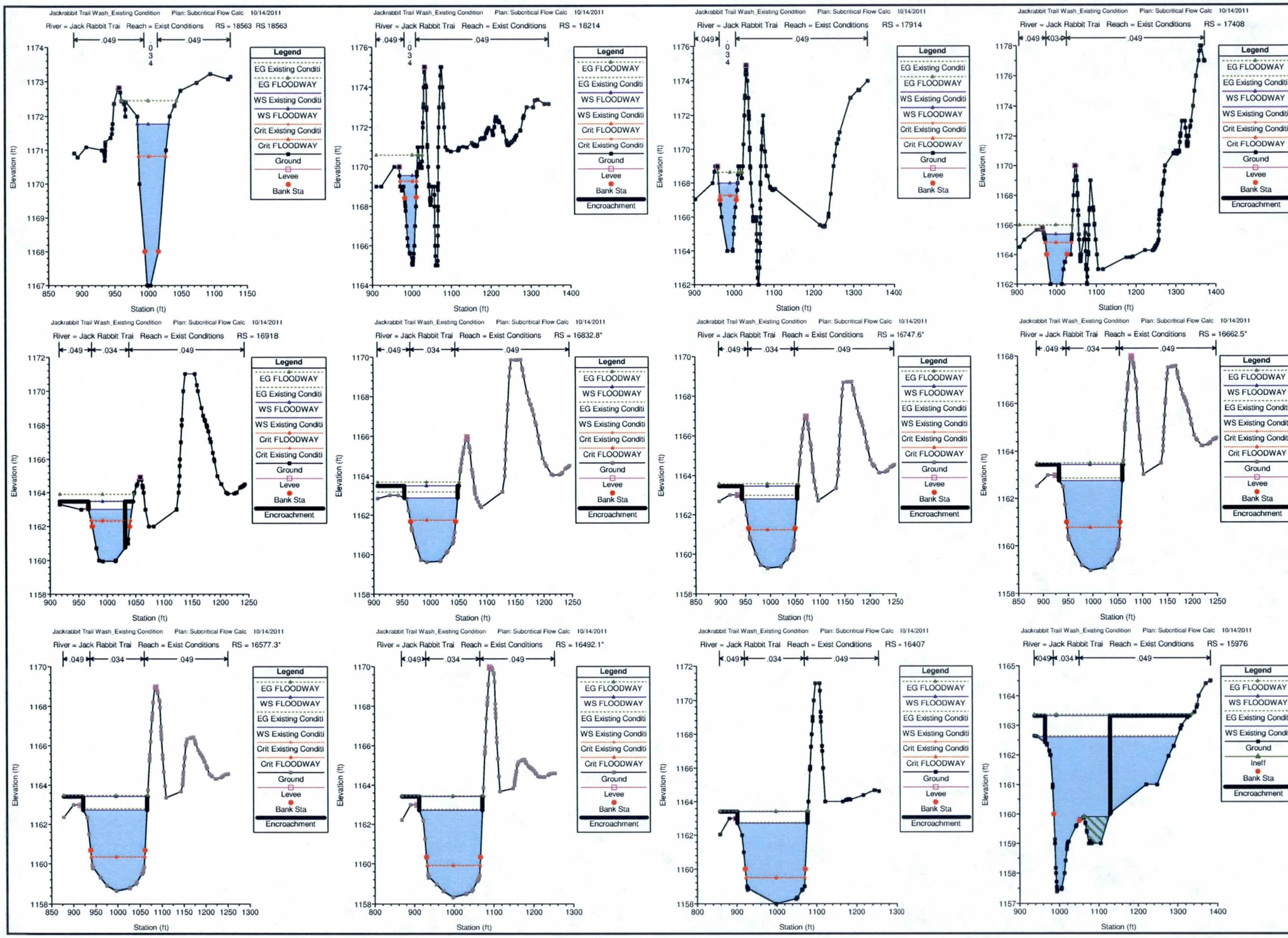
EXISTING CONDITIONS MODEL

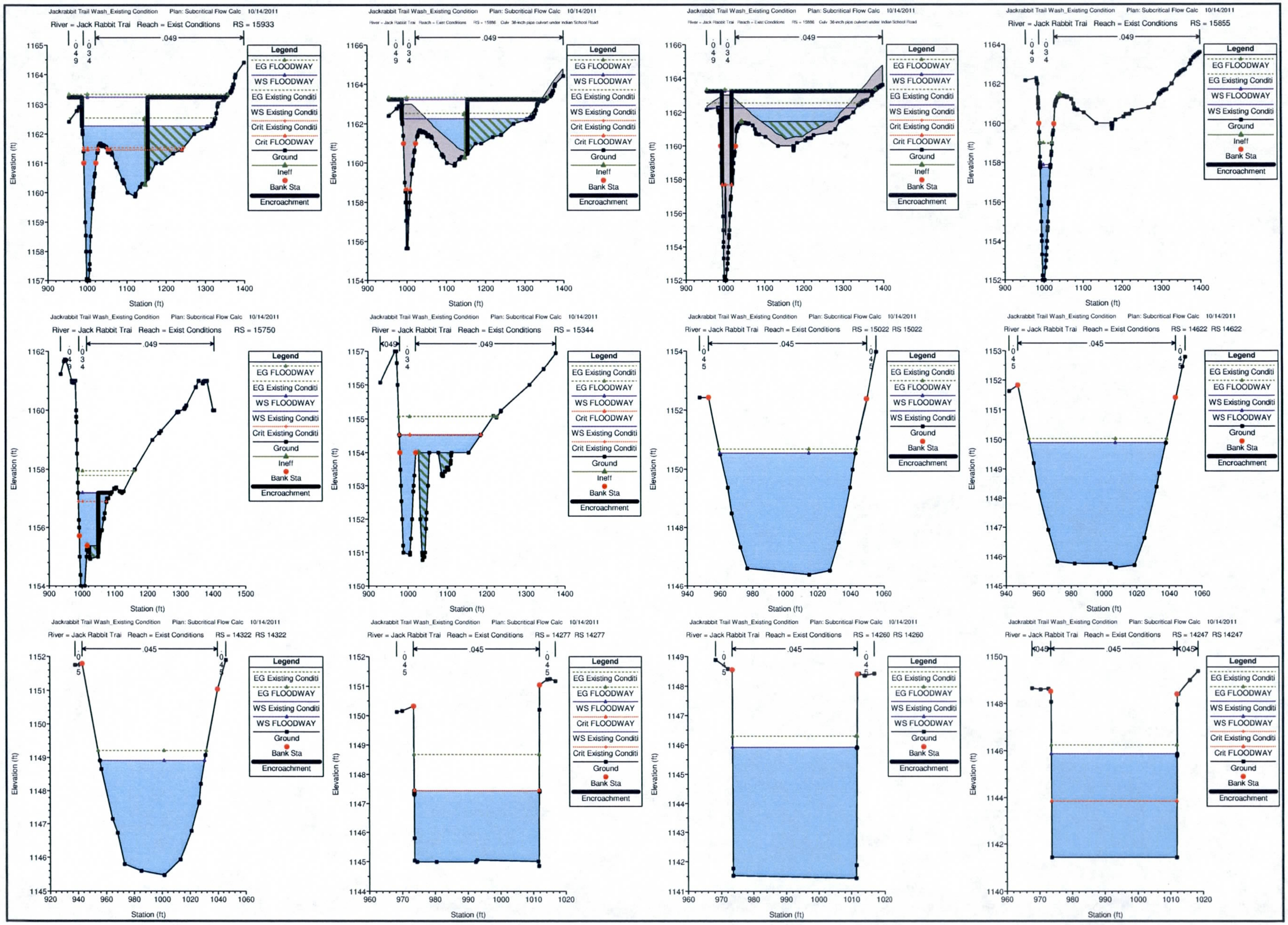



Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 21016 RS 21016
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 21007 Culv CULVERT CROSSING TO PRIVATE PROPERTY #1
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 21007 Culv CULVERT CROSSING TO PRIVATE PROPERTY #1
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20997 RS 20997
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20809 RS 20809
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20709.*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20609.*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20509.*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 20409 RS 20409
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19912 RS 19912
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19608 RS 19608
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19578 RS 19578
Station (ft)
Elevation (ft)

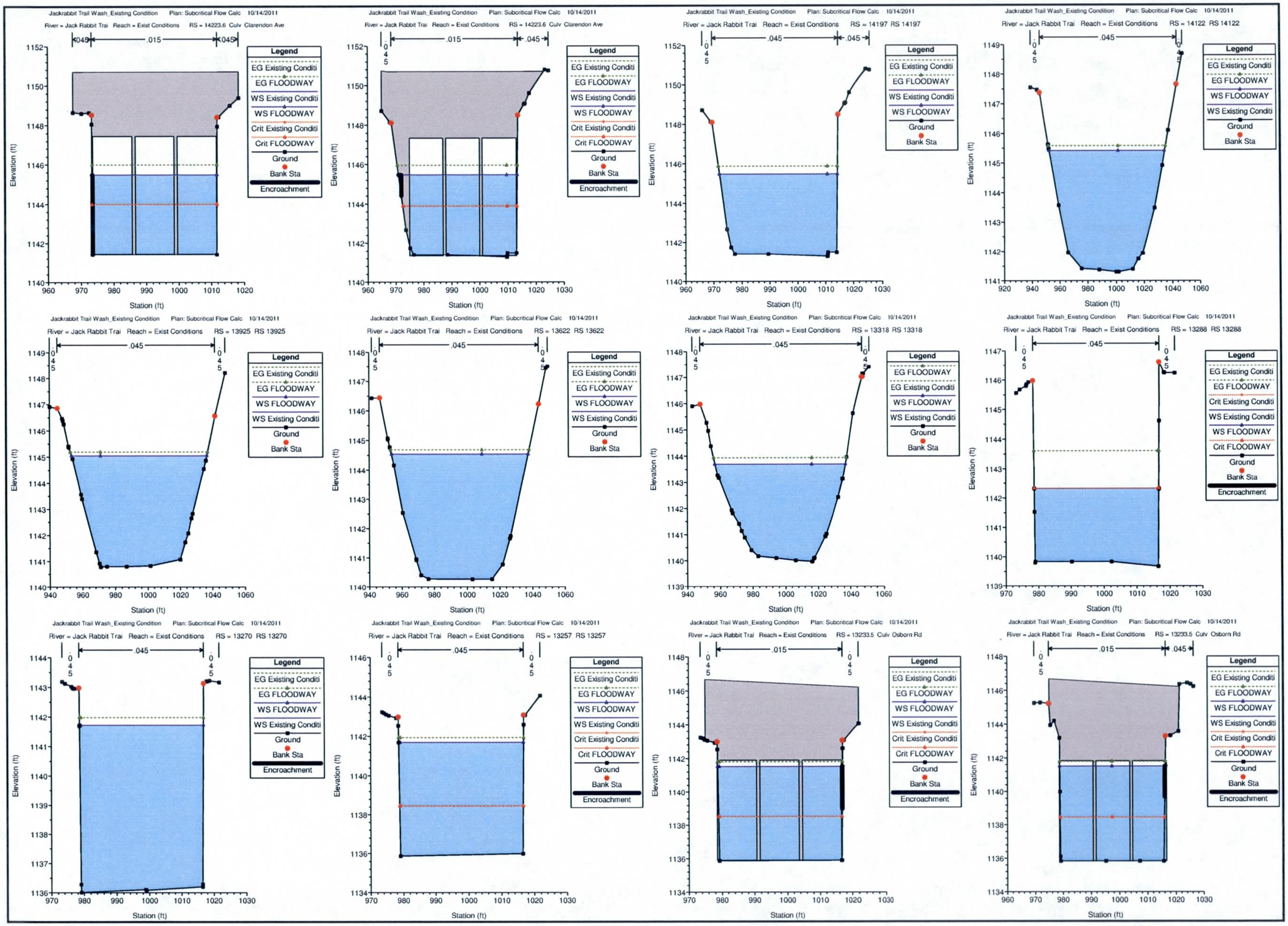


Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19507 RS 19507
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19457 RS 19457
River = Jack Rabbit Trai Reach = Exist Conditions RS = 19247 RS 19247
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18953 RS 18953
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18923 RS 18923
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18850 RS 18850
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18800 RS 18800
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18713 RS 18713
Legend
EG FLOODWAY
WS FLOODWAY
EG Existing Conditi
WS Existing Conditi
Crit FLOODWAY
Crit Existing Conditi
Ground
Levee
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

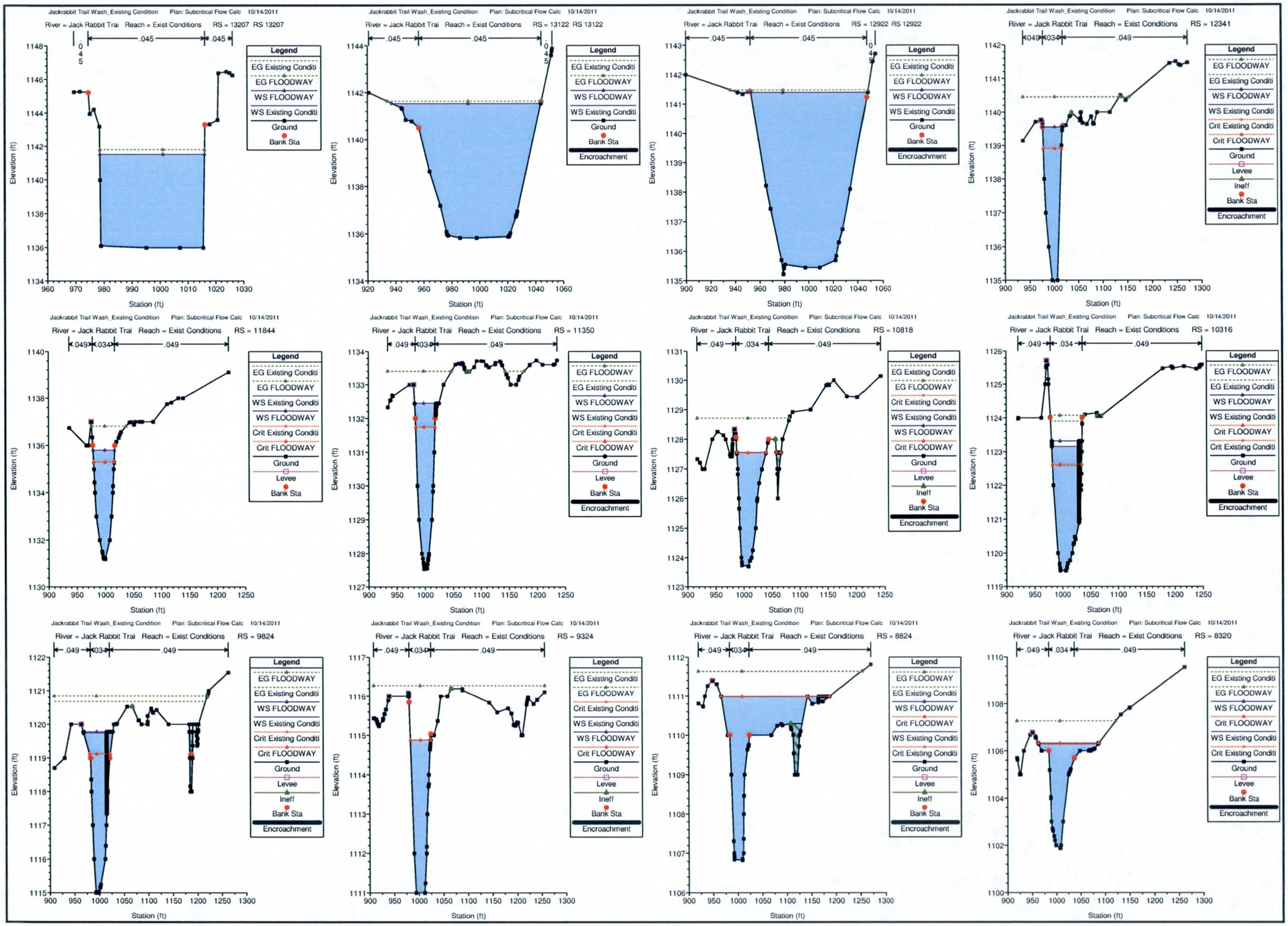

Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18563 RS 18563
Legend: EG Existing Conditi, EG FLOODWAY, WS Existing Conditi, WS FLOODWAY, Crit Existing Conditi, Crit FLOODWAY, Ground, Levee, Bank Sta
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 18214
Legend: EG FLOODWAY, EG Existing Conditi, WS FLOODWAY, WS Existing Conditi, Crit FLOODWAY, Crit Existing Conditi, Ground, Levee, Bank Sta, Encroachment
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 17914
Legend: EG Existing Conditi, EG FLOODWAY, WS Existing Conditi, WS FLOODWAY, Crit Existing Conditi, Crit FLOODWAY, Ground, Levee, Bank Sta
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 17408
Legend: EG FLOODWAY, EG Existing Conditi, WS FLOODWAY, WS Existing Conditi, Crit Existing Conditi, Crit FLOODWAY, Ground, Levee, Bank Sta, Encroachment
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16918
Legend: EG FLOODWAY, EG Existing Conditi, WS FLOODWAY, WS Existing Conditi, Crit FLOODWAY, Crit Existing Conditi, Ground, Levee, Bank Sta, Encroachment
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16832.8*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16747.6*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16662.5*
Legend: EG FLOODWAY, WS FLOODWAY, EG Existing Conditi, WS Existing Conditi, Crit Existing Conditi, Crit FLOODWAY, Ground, Levee, Bank Sta, Encroachment
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16577.3*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16492.1*
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 16407
Legend: EG FLOODWAY, WS FLOODWAY, EG Existing Conditi, WS Existing Conditi, Crit Existing Conditi, Crit FLOODWAY, Ground, Levee, Bank Sta, Encroachment
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15976
Legend: EG FLOODWAY, WS FLOODWAY, EG Existing Conditi, WS Existing Conditi, Ground, Ineff, Bank Sta, Encroachment
Elevation (ft)
Station (ft)

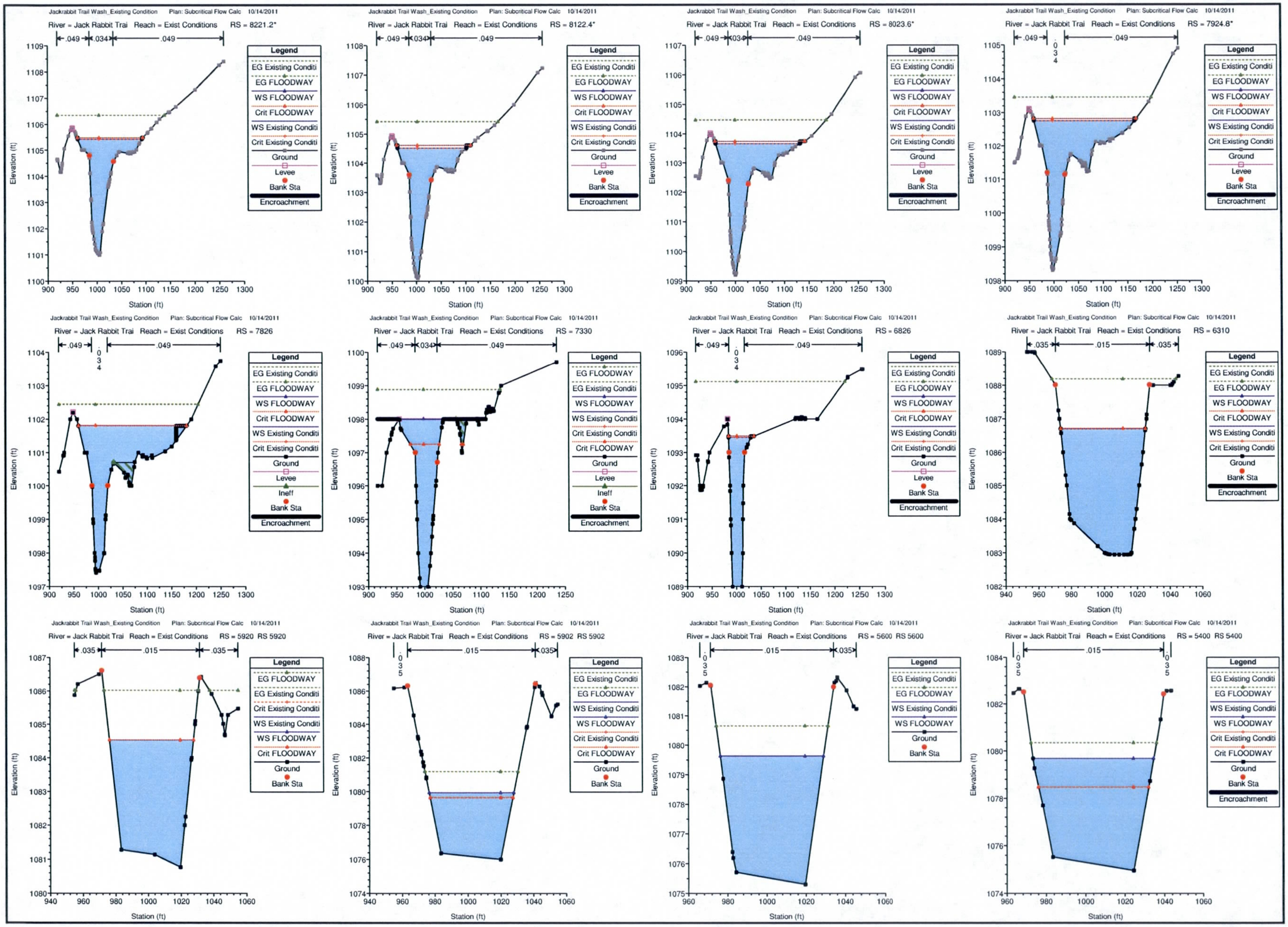


Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15933
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15886 Culv 36-inch pipe culvert under Indian School Road
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15855
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15750
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15344
River = Jack Rabbit Trai Reach = Exist Conditions RS = 15022 RS 15022
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14622 RS 14622
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14322 RS 14322
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14277 RS 14277
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14260 RS 14260
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14247 RS 14247
Legend
EG FLOODWAY
WS FLOODWAY
EG Existing Conditi
WS Existing Conditi
Crit Existing Conditi
Crit FLOODWAY
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

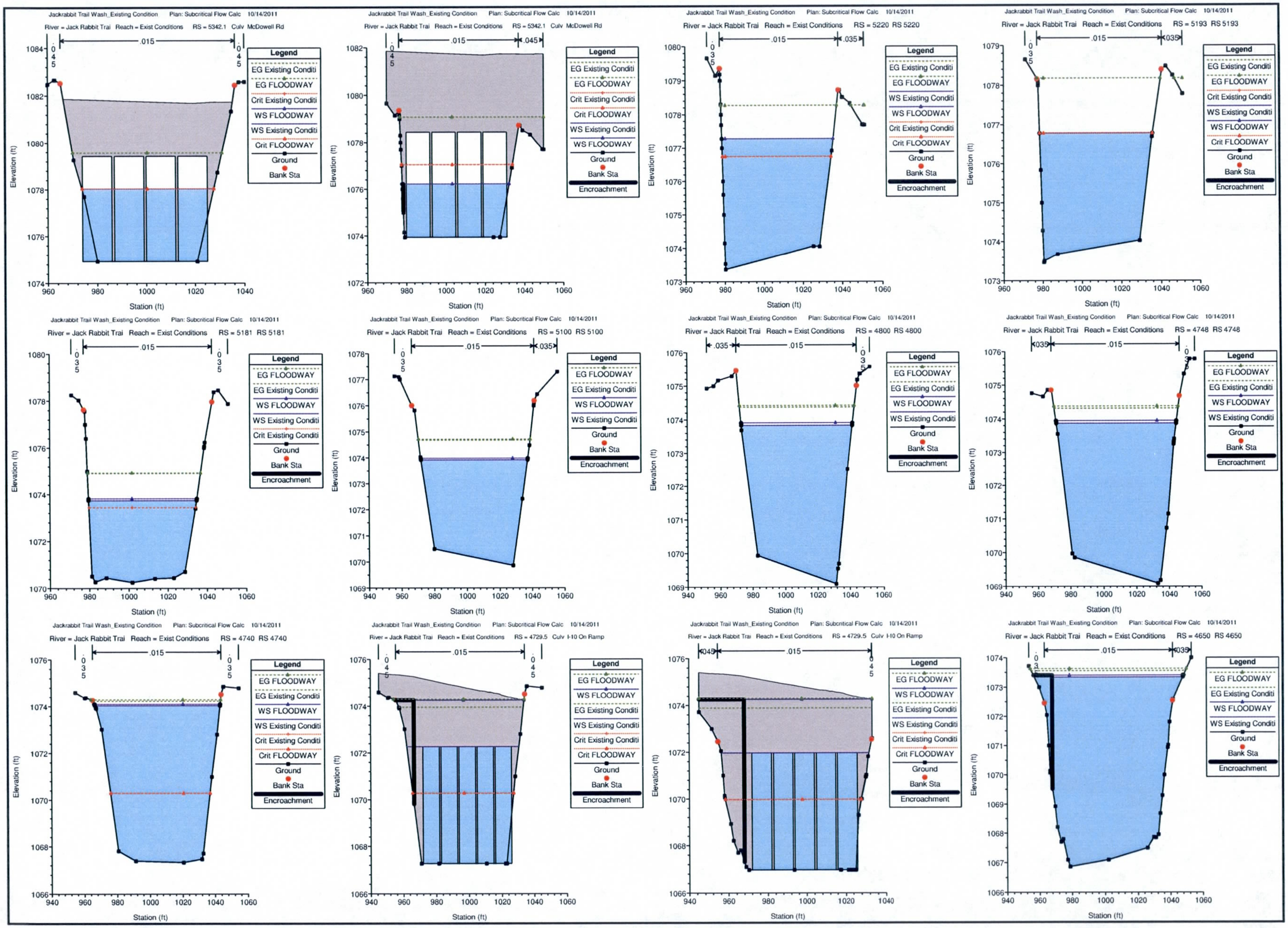


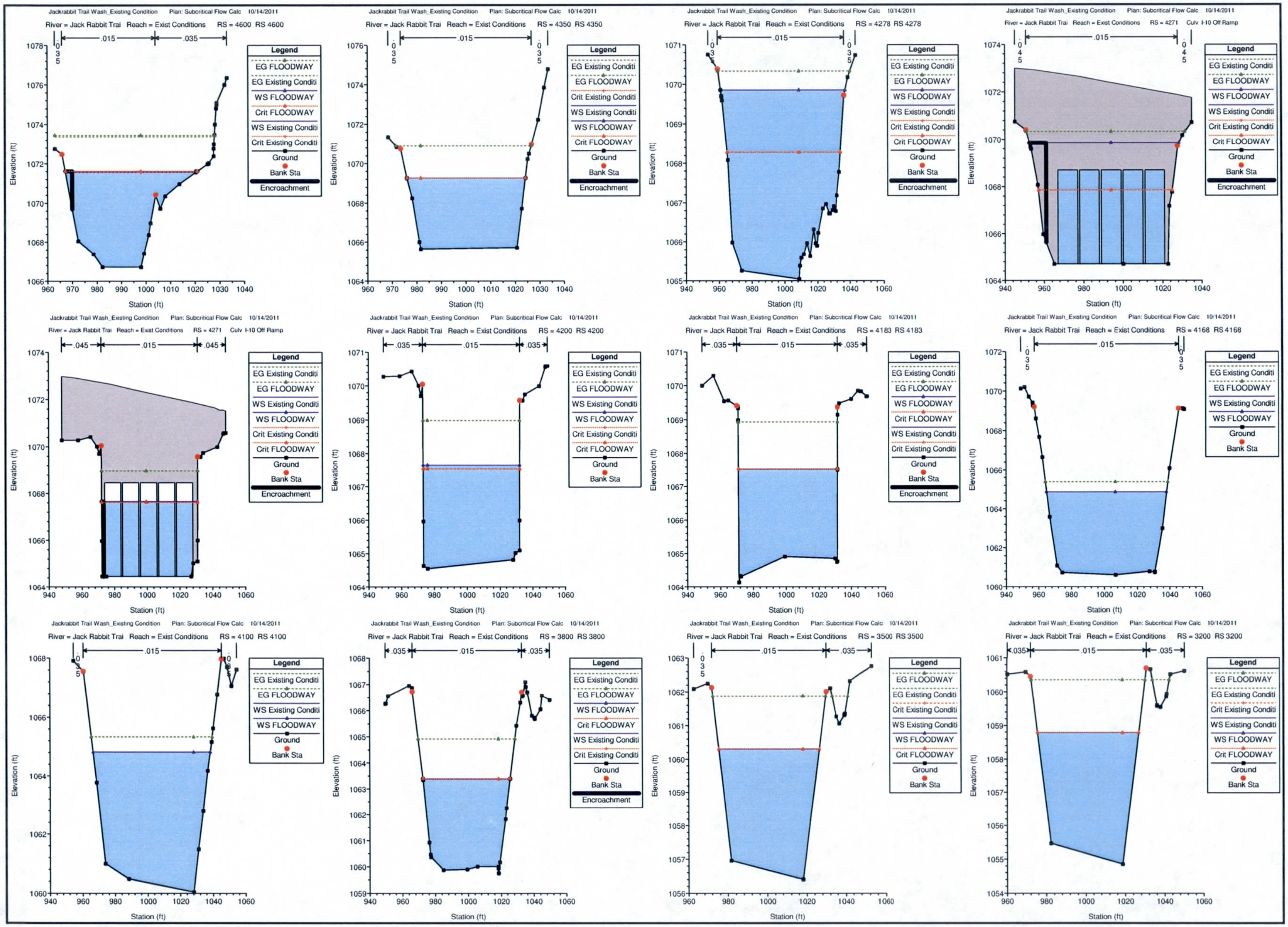
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14223.6 Culv Clarendon Ave
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14223.6 Culv Clarendon Ave
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14197 RS 14197
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 14122 RS 14122
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13925 RS 13925
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13622 RS 13622
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13318 RS 13318
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13288 RS 13288
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13270 RS 13270
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13257 RS 13257
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13233.5 Culv Osborn Rd
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13233.5 Culv Osborn Rd
Legend
EG Existing Conditi
EG FLOODWAY
WS Existing Conditi
WS FLOODWAY
Crit Existing Conditi
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

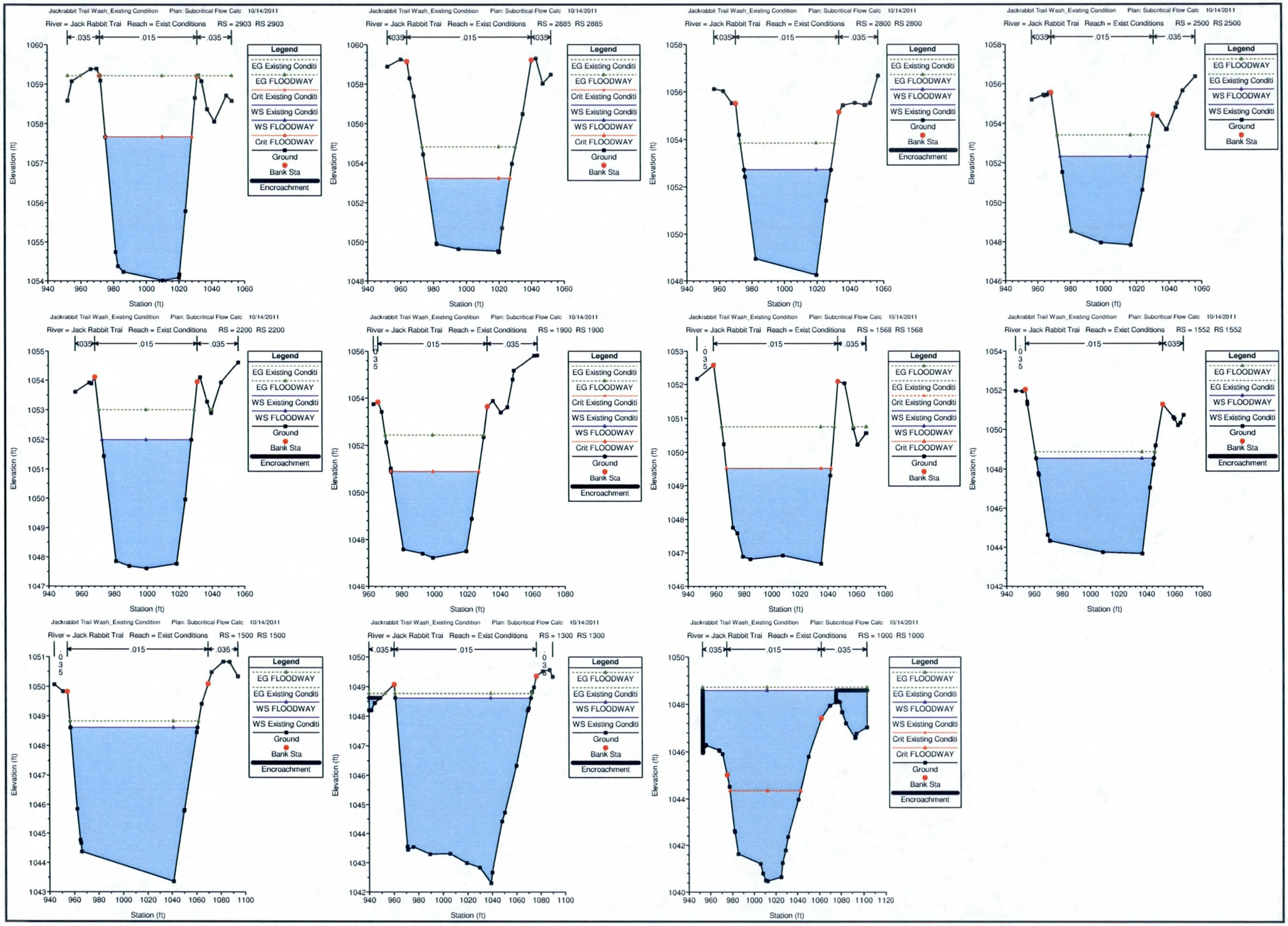

Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13207 RS 13207
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 13122 RS 13122
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 12922 RS 12922
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 12341
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 11844
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 11350
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 10818
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 10316
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 9824
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 9324
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 8824
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 8320
Elevation (ft)
Station (ft)



Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 8221.2*
River = Jack Rabbit Trai Reach = Exist Conditions RS = 8122.4*
River = Jack Rabbit Trai Reach = Exist Conditions RS = 8023.6*
River = Jack Rabbit Trai Reach = Exist Conditions RS = 7924.8*
River = Jack Rabbit Trai Reach = Exist Conditions RS = 7826
River = Jack Rabbit Trai Reach = Exist Conditions RS = 7330
River = Jack Rabbit Trai Reach = Exist Conditions RS = 6826
River = Jack Rabbit Trai Reach = Exist Conditions RS = 6310
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5920 RS 5920
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5902 RS 5902
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5600 RS 5600
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5400 RS 5400
Legend
EG Existing Conditi
EG FLOODWAY
WS FLOODWAY
Crit FLOODWAY
WS Existing Conditi
Crit Existing Conditi
Ground
Levee
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

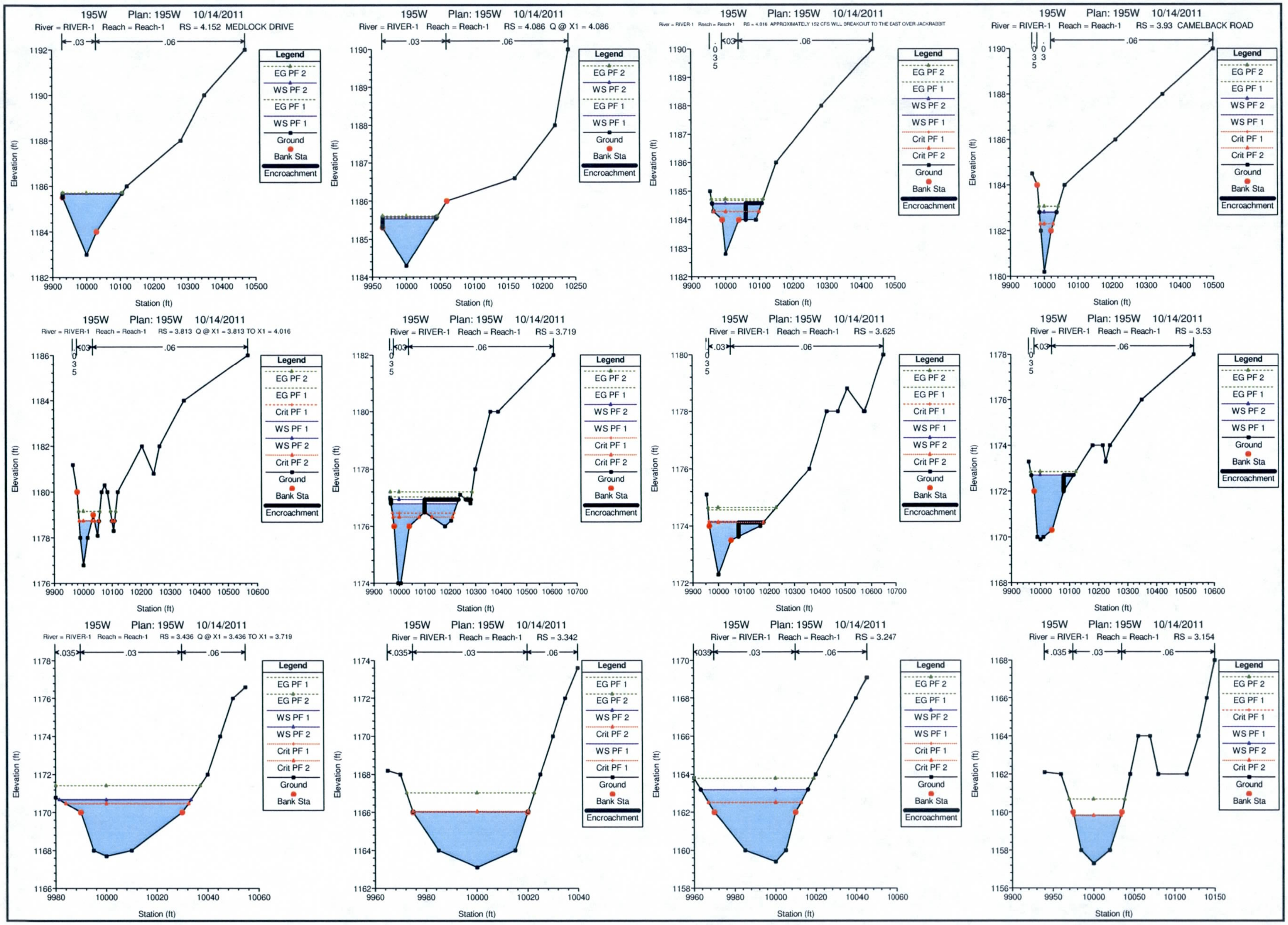

Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5342.1 Culv McDowell Rd
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5342.1 Culv McDowell Rd
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5220 RS 5220
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5193 RS 5193
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5181 RS 5181
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 5100 RS 5100
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4800 RS 4800
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4748 RS 4748
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4740 RS 4740
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4729.5 Culv I-10 On Ramp
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4729.5 Culv I-10 On Ramp
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4650 RS 4650
Legend
EG Existing Conditi
EG FLOODWAY
Crit Existing Conditi
WS FLOODWAY
WS Existing Conditi
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

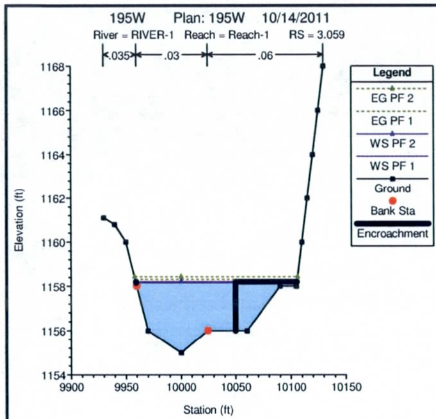

Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4600 RS 4600
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4350 RS 4350
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4278 RS 4278
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4271 Culv I-10 Off Ramp
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4271 Culv I-10 Off Ramp
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4200 RS 4200
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4183 RS 4183
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4168 RS 4168
River = Jack Rabbit Trai Reach = Exist Conditions RS = 4100 RS 4100
River = Jack Rabbit Trai Reach = Exist Conditions RS = 3800 RS 3800
River = Jack Rabbit Trai Reach = Exist Conditions RS = 3500 RS 3500
River = Jack Rabbit Trai Reach = Exist Conditions RS = 3200 RS 3200
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Crit FLOODWAY
Crit Existing Conditi
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)



Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 2903 RS 2903
.035 .015 .035
Legend
EG Existing Conditi
EG FLOODWAY
Crit Existing Conditi
WS Existing Conditi
WS FLOODWAY
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 2885 RS 2885
.035 .015 .035
Legend
EG Existing Conditi
EG FLOODWAY
Crit Existing Conditi
WS Existing Conditi
WS FLOODWAY
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 2800 RS 2800
.035 .015 .035
Legend
EG Existing Conditi
EG FLOODWAY
WS FLOODWAY
WS Existing Conditi
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 2500 RS 2500
.035 .015 .035
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Ground
Bank Sta
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 2200 RS 2200
.035 .015 .035
Legend
EG Existing Conditi
EG FLOODWAY
WS Existing Conditi
WS FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1900 RS 1900
035 .015 .035
Legend
EG Existing Conditi
EG FLOODWAY
Crit Existing Conditi
WS Existing Conditi
WS FLOODWAY
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1568 RS 1568
035 .015 .035
Legend
EG FLOODWAY
EG Existing Conditi
Crit Existing Conditi
WS Existing Conditi
WS FLOODWAY
Crit FLOODWAY
Ground
Bank Sta
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1552 RS 1552
035 .015 .035
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1500 RS 1500
035 .015 .035
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1300 RS 1300
.035 .015 035
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Jackrabbit Trail Wash_Existing Condition Plan: Subcritical Flow Calc 10/14/2011
River = Jack Rabbit Trai Reach = Exist Conditions RS = 1000 RS 1000
.035 .015 .035
Legend
EG FLOODWAY
EG Existing Conditi
WS FLOODWAY
WS Existing Conditi
Crit Existing Conditi
Crit FLOODWAY
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

DUPLICATE EFFECTIVE MODEL

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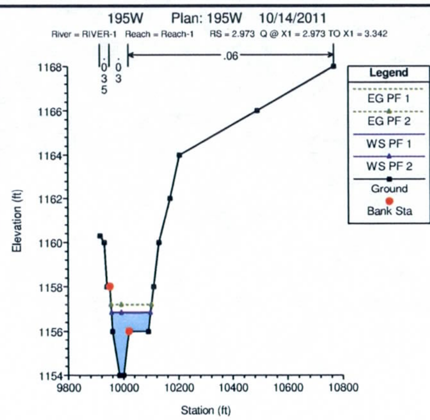
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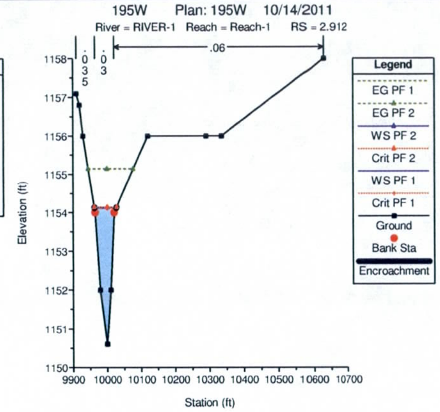
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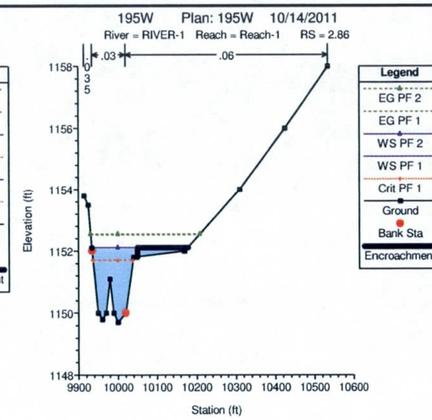
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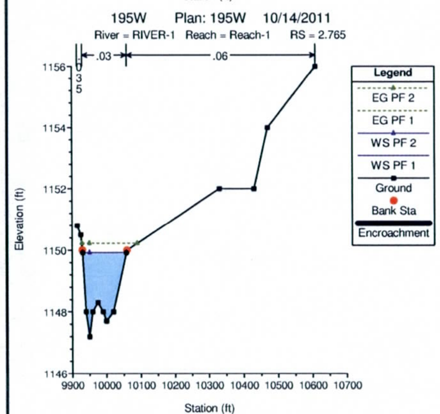
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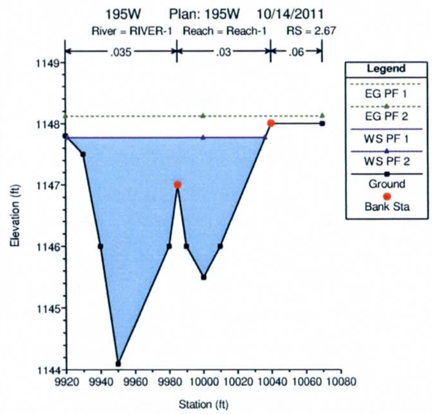
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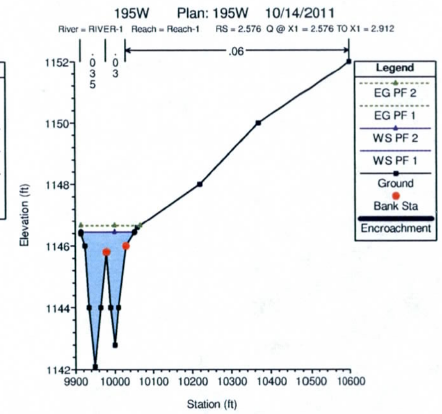
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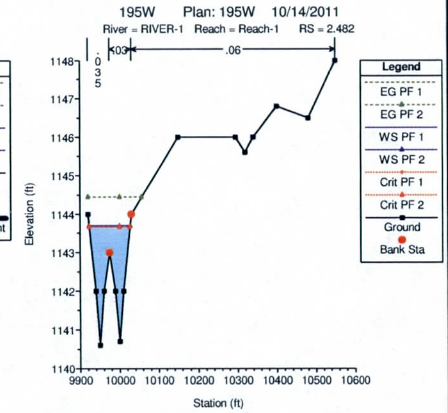
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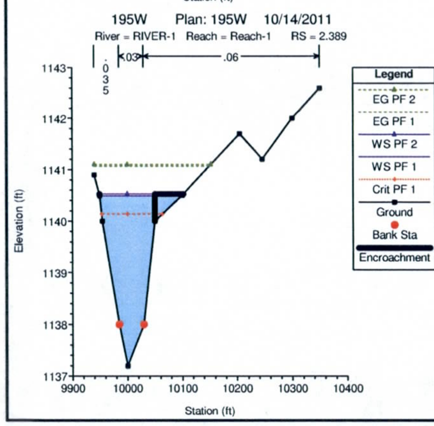
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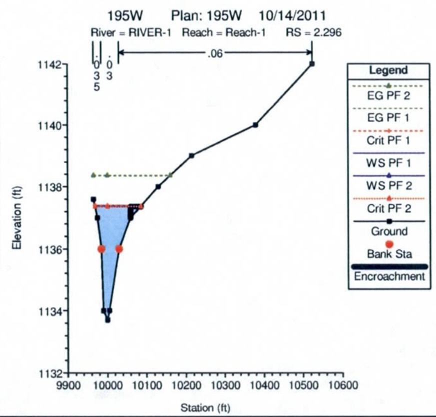
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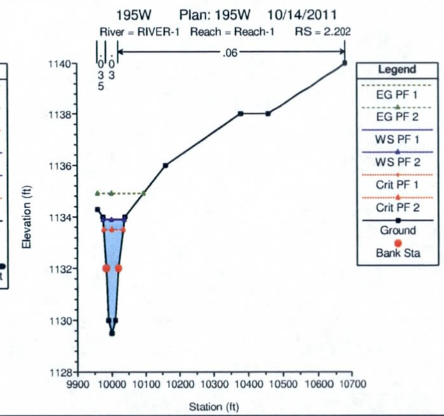
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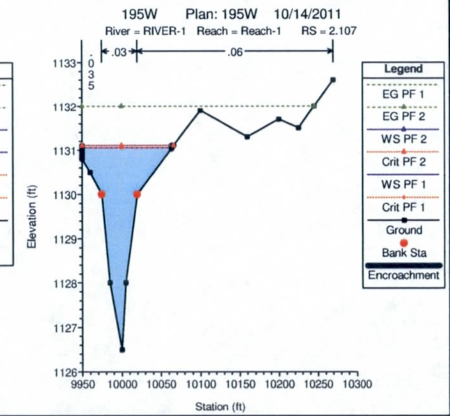
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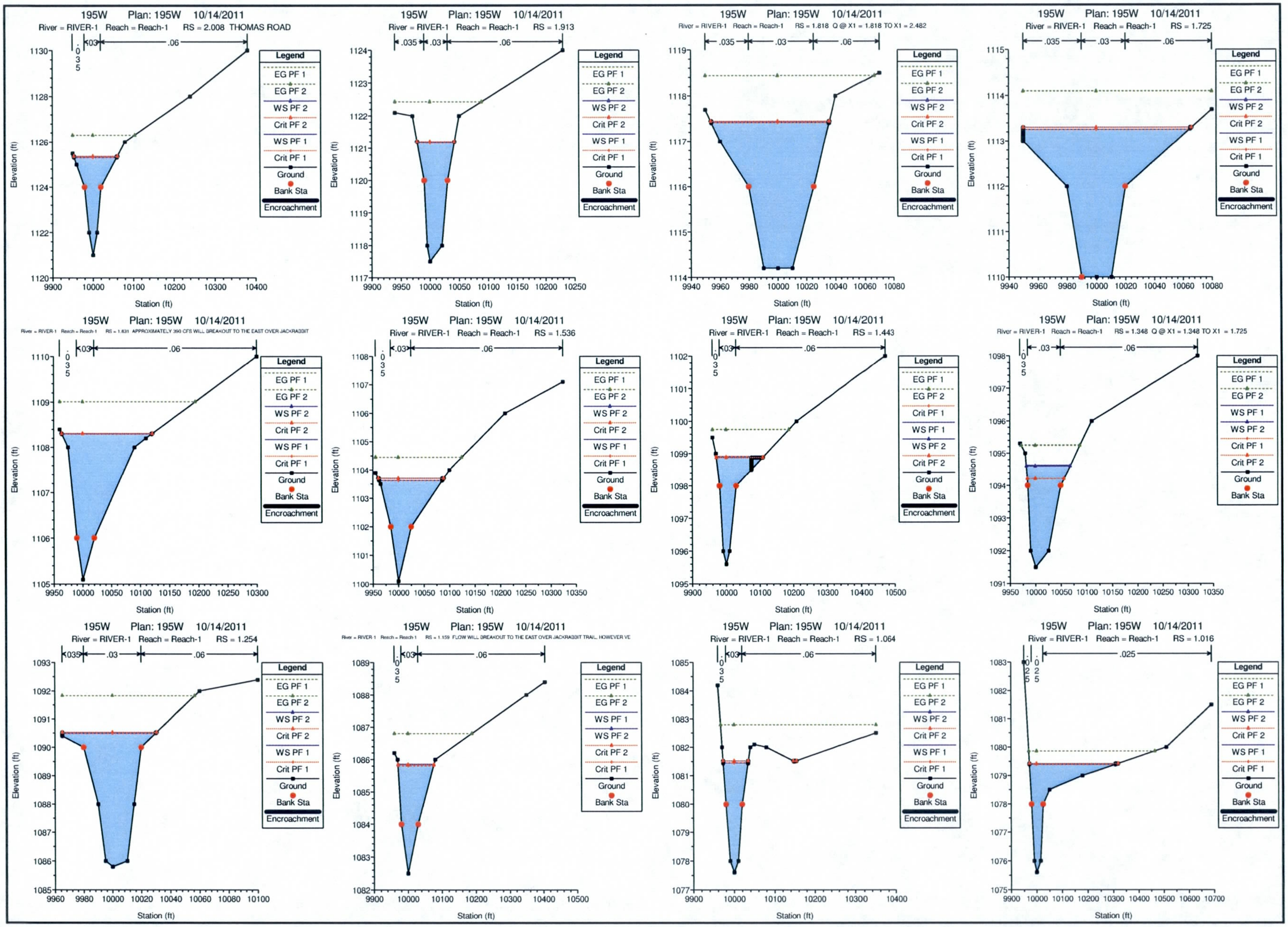
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195W Plan: 195W 10/14/2011
River = RIVER-1 Reach = Reach-1 RS = 1.159 FLOW WILL BREAKOUT TO THE EAST OVER JACKRABBIT TRAIL, HOWEVER VE
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River = RIVER-1 Reach = Reach-1 RS = 1.064
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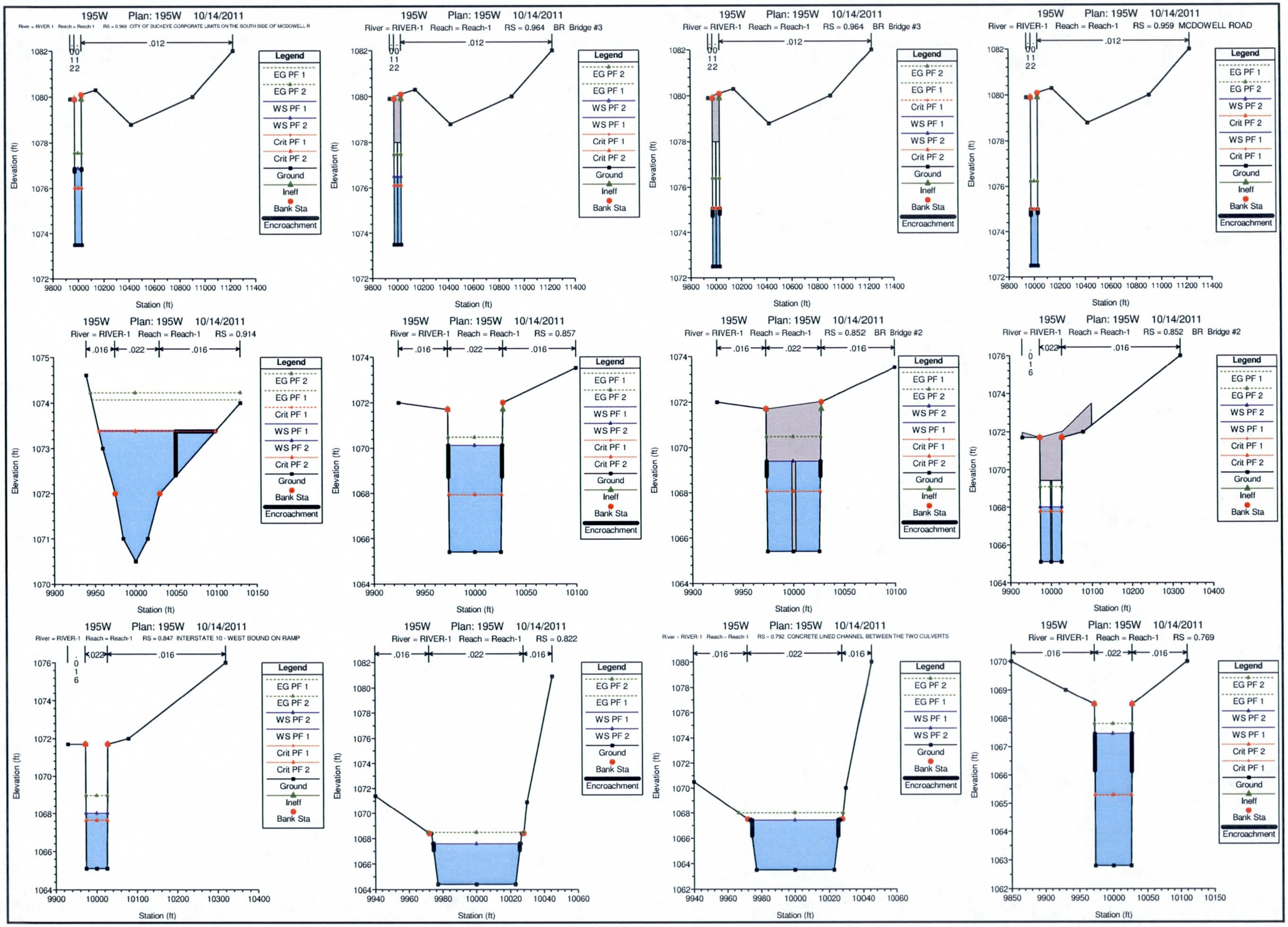
River = RIVER-1 Reach = Reach-1 RS = 1.016
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 2
Crit PF 2
WS PF 1
Crit PF 1
Ground
Bank Sta
Encroachment



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River = RIVER-1 Reach = Reach-1 RS = 0.964 BR Bridge #3
195W Plan: 195W 10/14/2011
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River = RIVER-1 Reach = Reach-1 RS = 0.822
195W Plan: 195W 10/14/2011
River = RIVER-1 Reach = Reach-1 RS = 0.792 CONCRETE LINED CHANNEL BETWEEN THE TWO CULVERTS
195W Plan: 195W 10/14/2011
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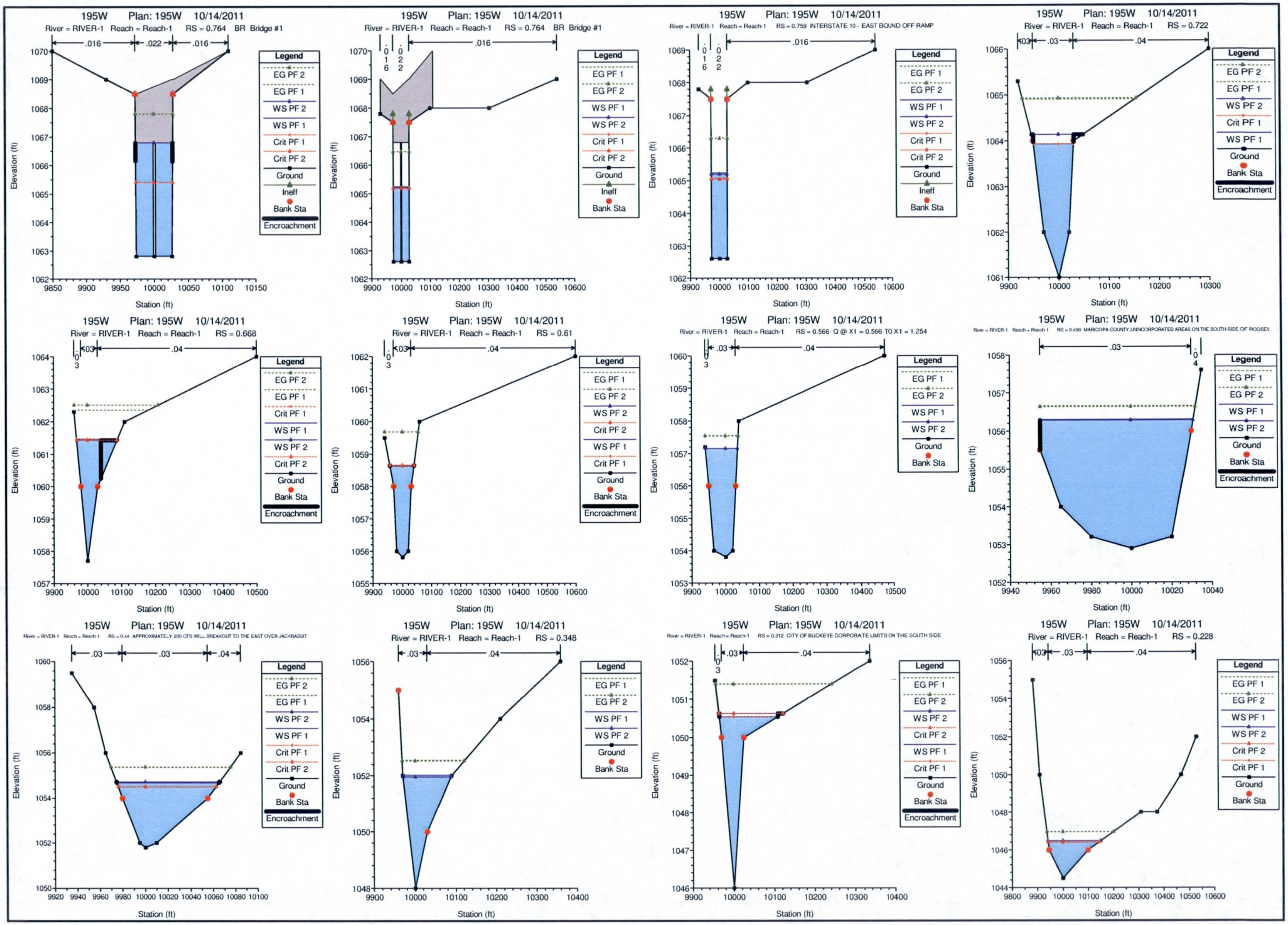
Legend
EG PF 1
EG PF 2
WS PF 1
WS PF 2
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)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195W Plan: 195W 10/14/2011
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Legend
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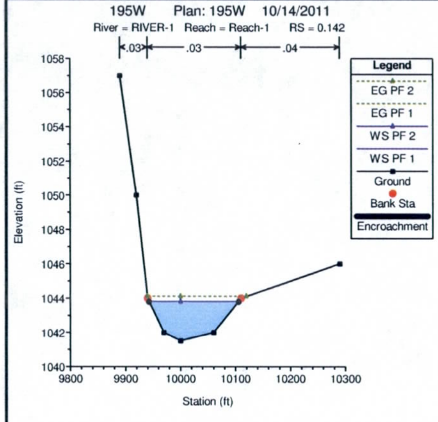
EG PF 2
WS PF 1
WS PF 2
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)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.03
.03
.04
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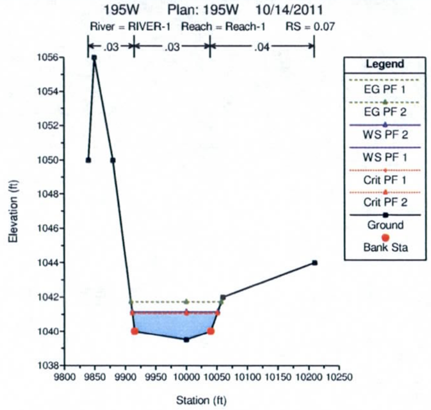
EG PF 1
WS PF 2
WS PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)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.03
.04
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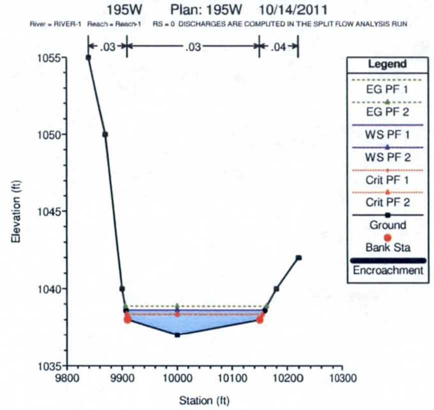
EG PF 2
WS PF 2
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)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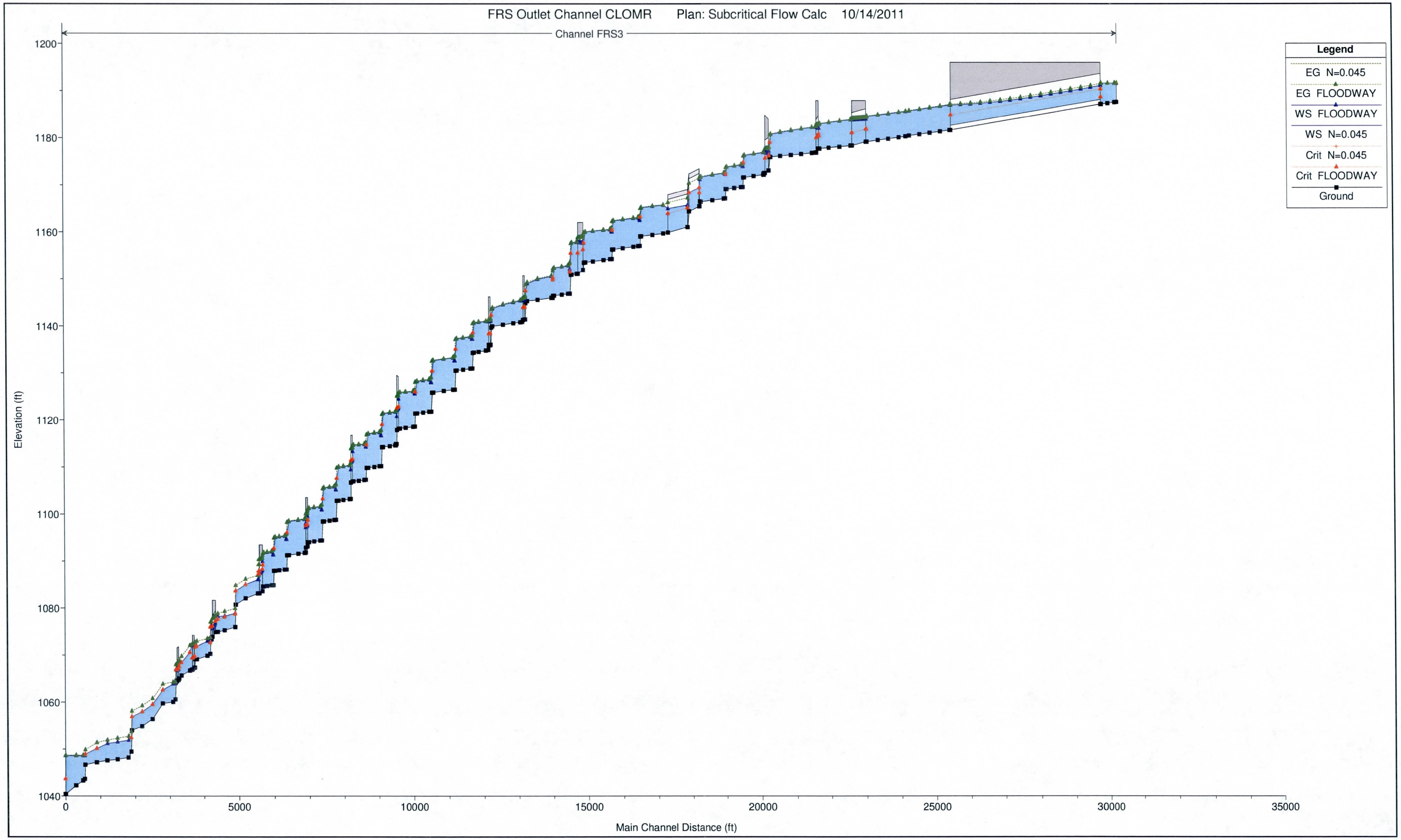
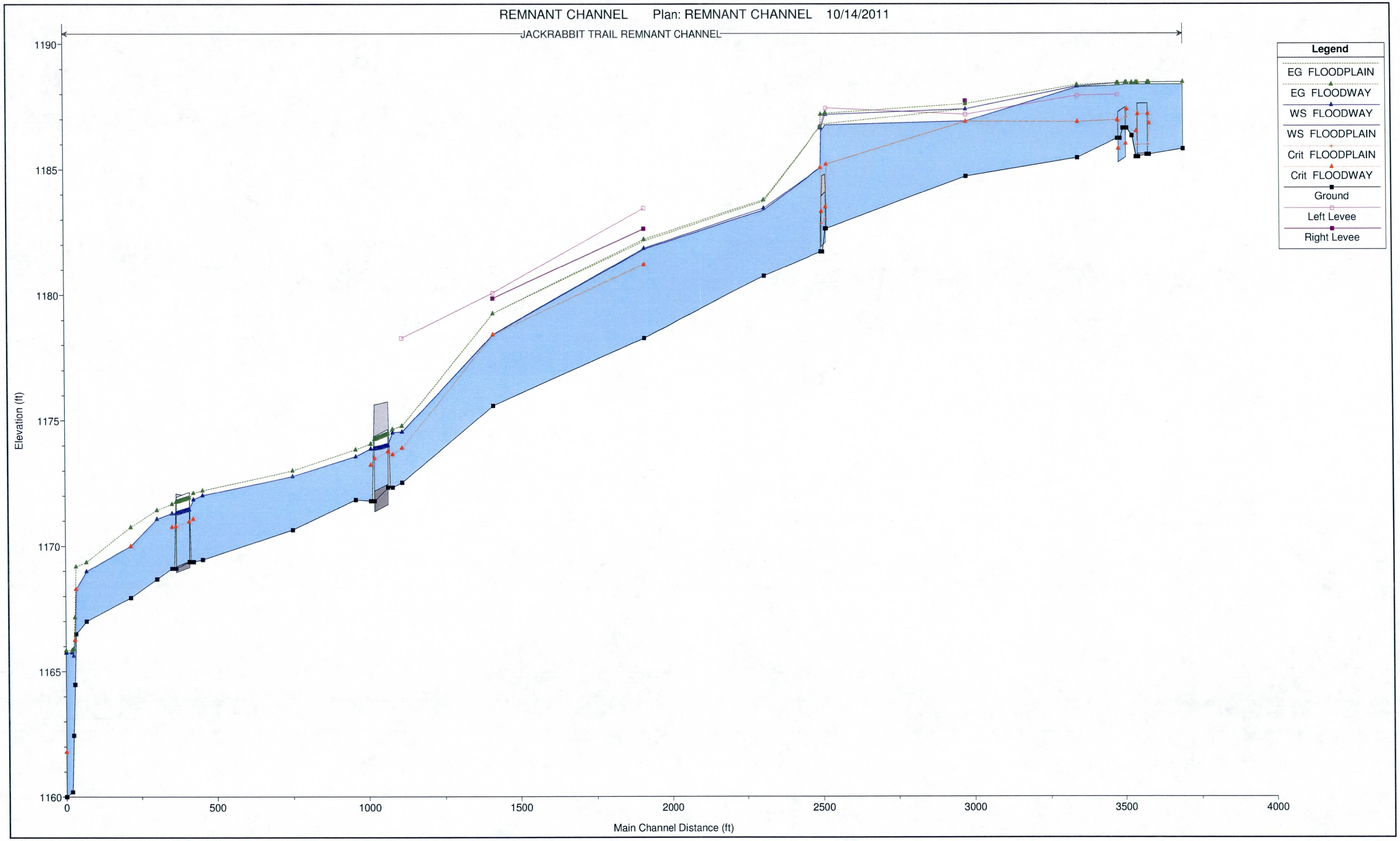
.03
.03
.04
Legend
EG PF 1
EG PF 2
WS PF 1
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

E.5.5 100-Year Profile

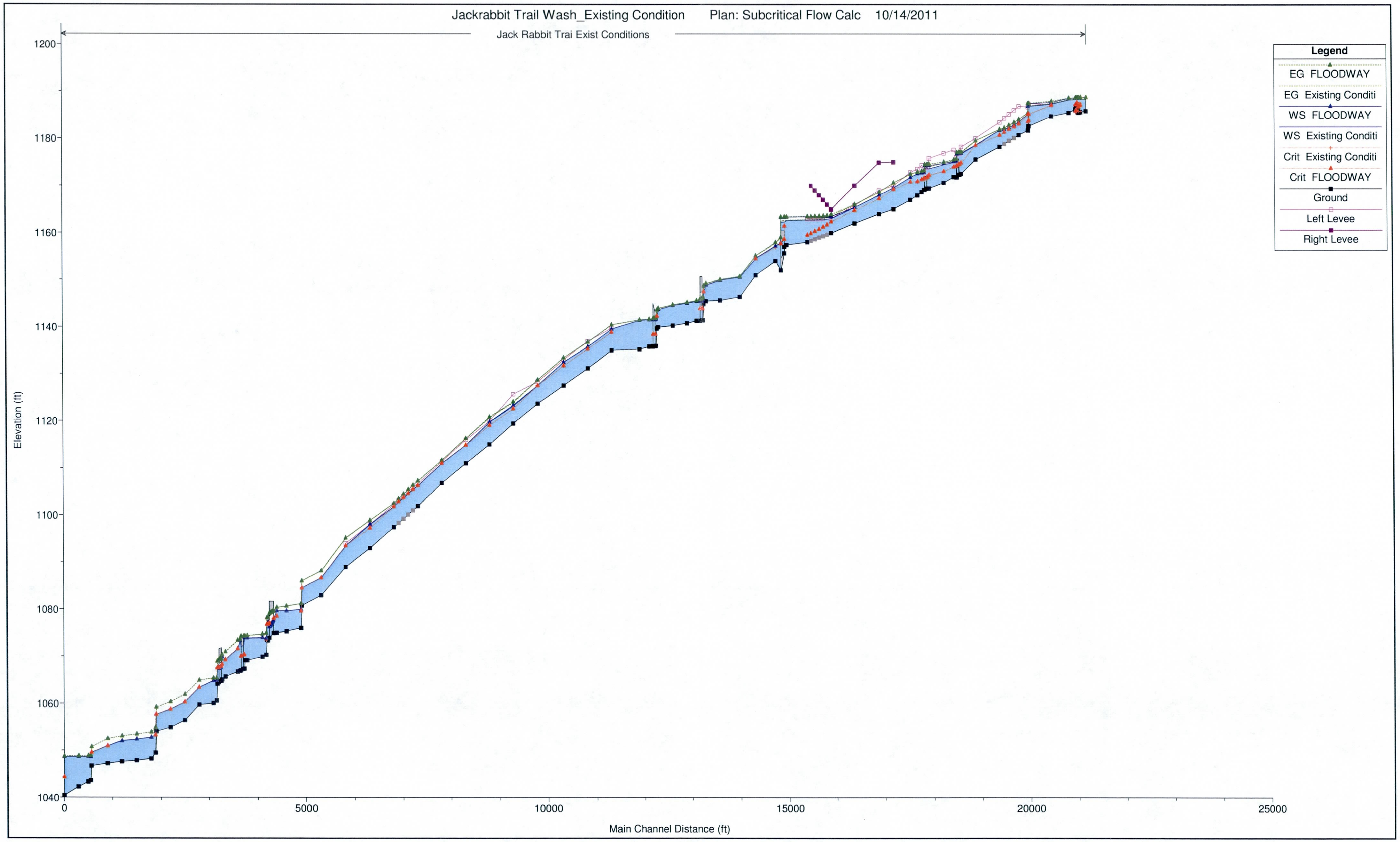
OUTFALL CHANNEL



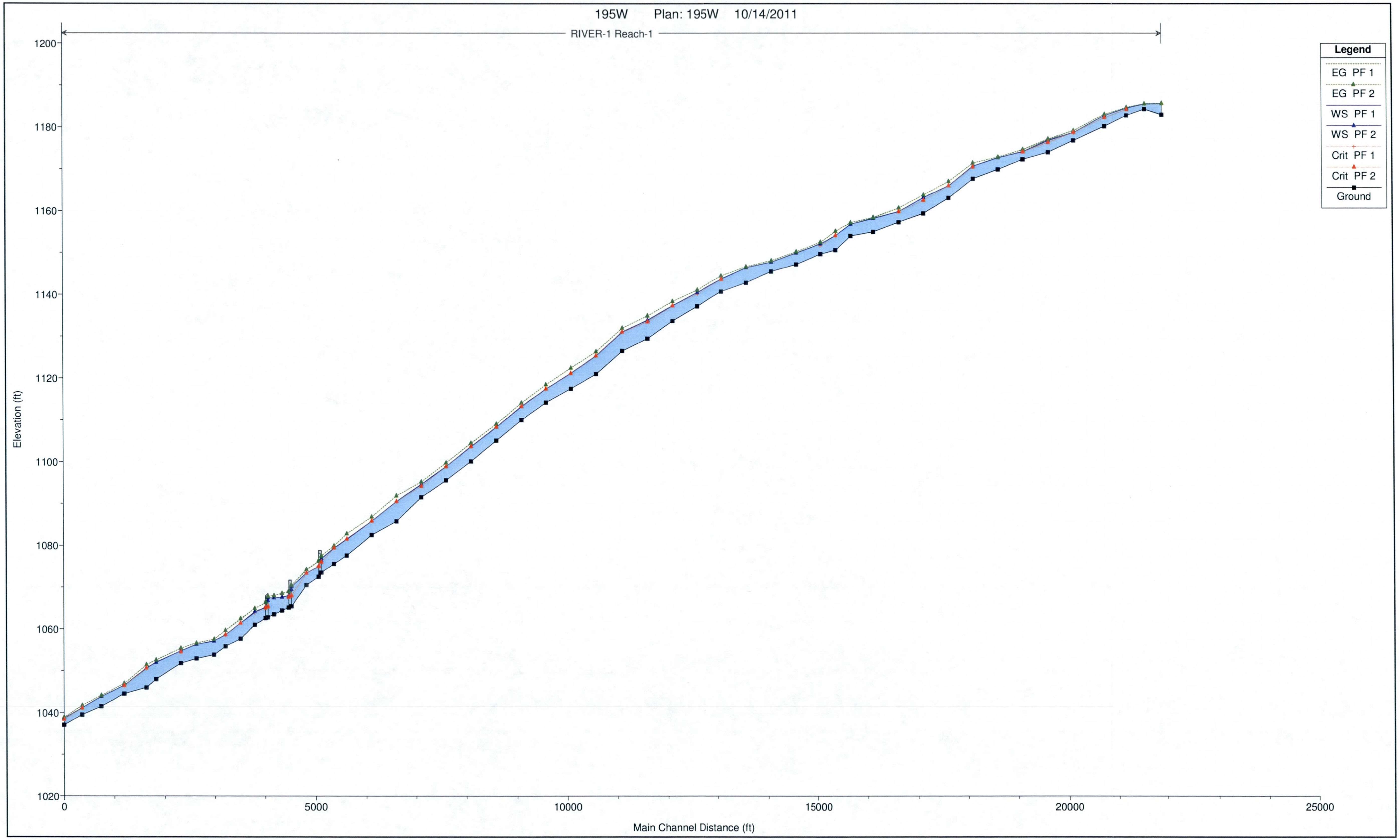
REMNANT CHANNEL



EXISTING CONDITIONS MODEL



DUPLICATE EFFECTIVE MODEL



Appendix F: Erosion and Sediment Transportation Supporting Documentation

Note: Erosion and Sediment Transportation analysis Supporting Documentation can be found in Appendix A.2.2. The FCDMC will perform regular maintenance to remove sediment from the channel and basin.

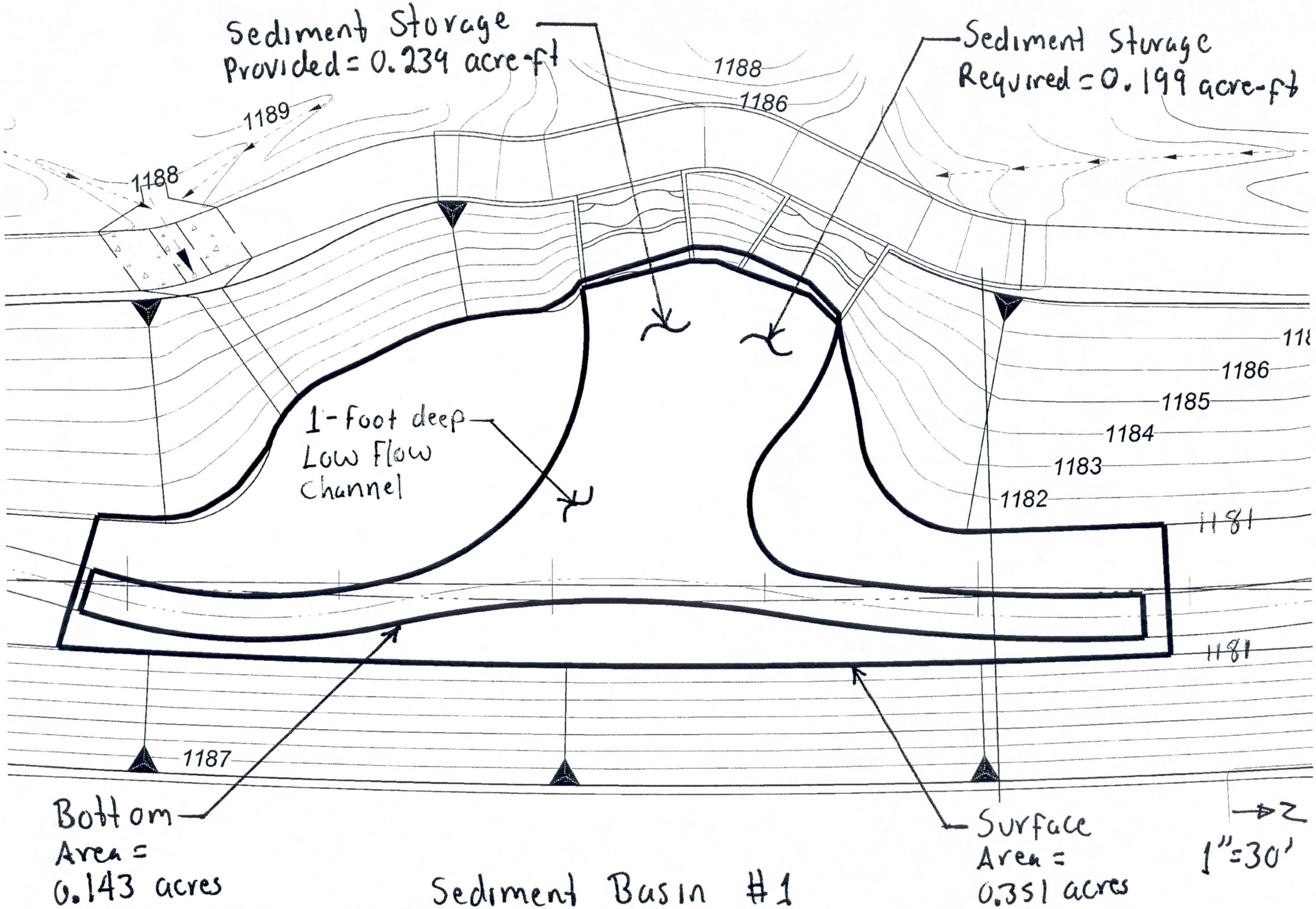
WT03
Sediment Storage

Notes:

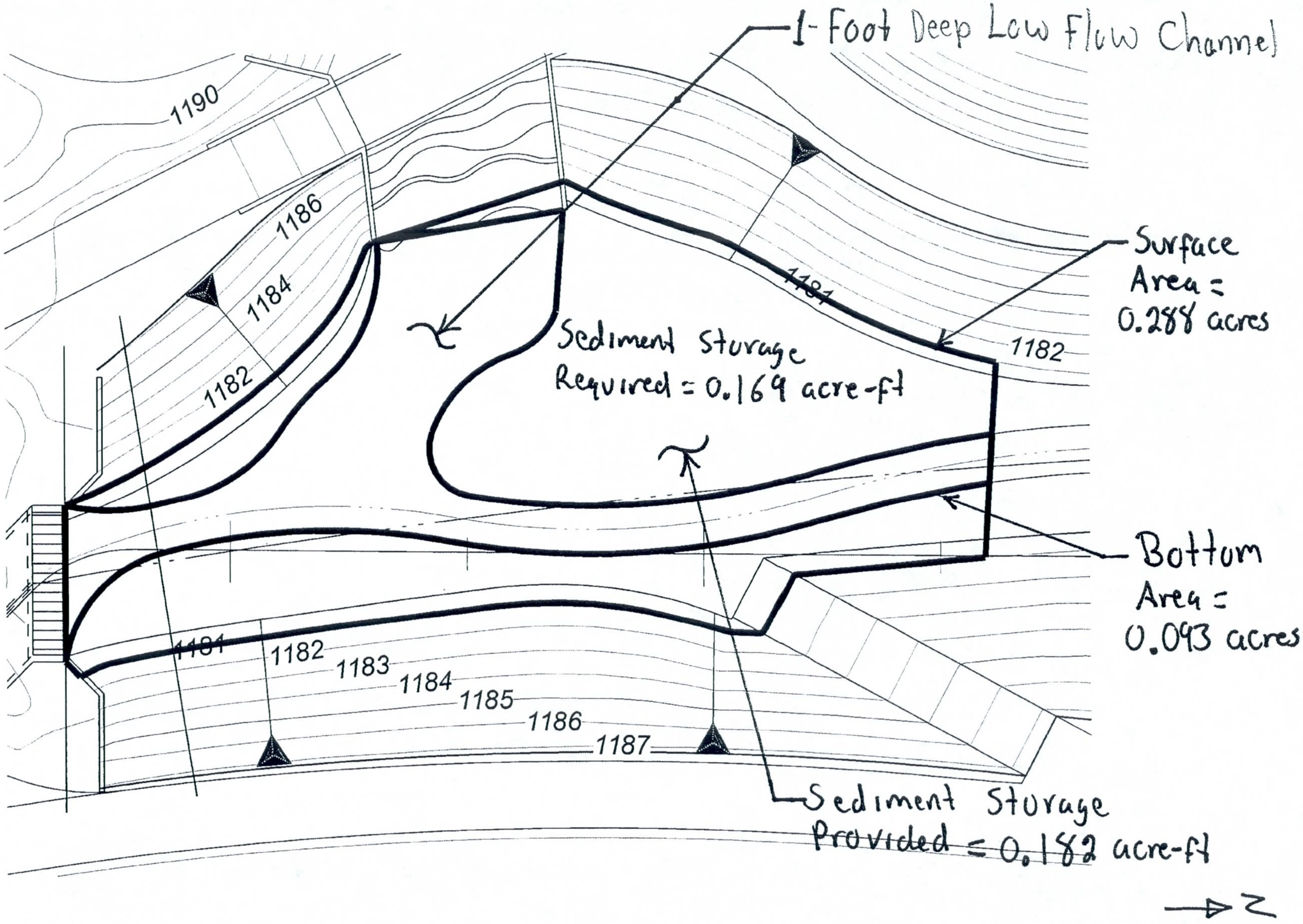
* *The annual sediment yield and the 100-year event yield were provided. Per the District, the storage volume is required to be not less than the 100-year event yield.*
* *The velocities in washes and storage area are compared. The velocities in washes were from DDMSW outputs, and the velocities in storage area were estimated based on discharges and flow areas which are listed below the table.*
* *In-line sediment trapping basins were provided for Wash SF07, SF08, SF14 and SF17. Those basins were one foot deep.*
* *Culvert #7 was designed to divert flow from the existing channel east of Litchfield Heights to Reach 6. The drop-inlet crest of Culvert #7 was set at one foot above the bottom of the existing channel. Sediment is assumed to deposit at sediment storage basin #3 upstream of the drop inlet.*
* *The sediment of small quantities brought by side flows other than SF07, SF08, SF14 and SF 17 will be partly trapped at the drop structure aprons where velocities are below 3 fps.*

Basin ID	Side Flow	Velocities (fps)		Sediment Quantity Required (Acre-ft)			Sediment Storage Provided (Acre-ft) [5]				Sediment Storage Excess (Acre-ft)
		In Washes	In Storage Area	100-Yr Event	Annual	Total	Basin Depth, h (ft)	Bottom Area, A1 (Acres)	Surface Area, A2 (Acres)	Volume Provided	
1	SF07	6.1	0.9 [1]	**0.199**	0.049	0.248	1.0	0.143	0.351	**0.239**	0.040
2	SF08	6.7	1.6 [2]	**0.169**	0.056	0.225	1.0	0.093	0.288	**0.182**	0.013
3	SF14	6.2	3 [3]	**0.219**	0.045	0.264	1.0	0.240	0.299	**0.269**	0.050
4	SF17	6.7	0.9 [4]	**0.140**	0.037	0.177	1.0	0.108	0.304	**0.198**	0.058

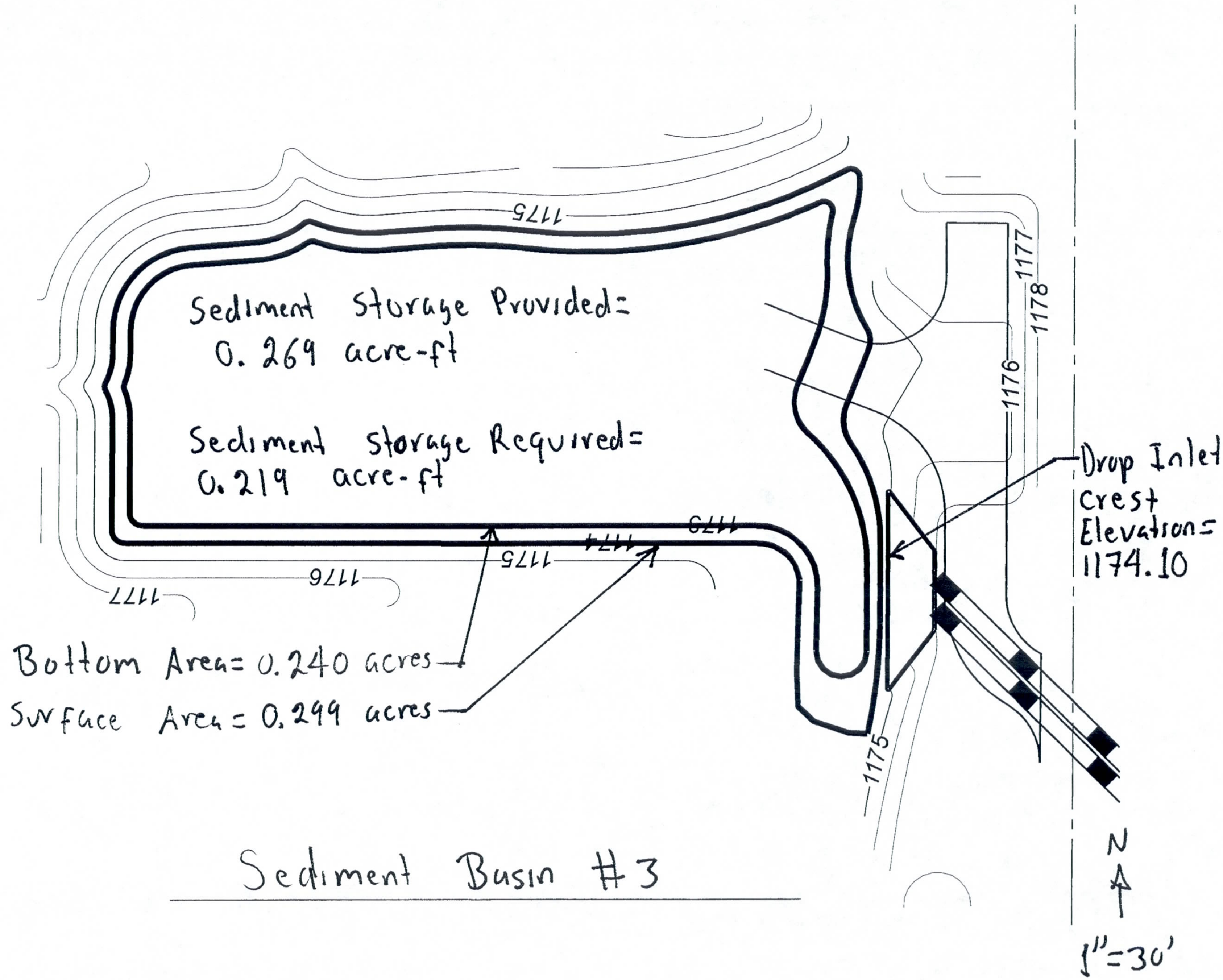
[1] Discharge = 500 cfs, average flow area = 600 sq ft
[2] Discharge = 700 cfs, average flow area = 450 sq ft
[3] Discharge = 300 cfs (with 256 cfs being diverted by Culvert #7), average flow area = 100 sq ft
[4] Discharge =241+300=541 cfs, flow area = 600 sq ft
[5] Volume computations are based upon Conic Method where Volume = $h/3(A1+A2+(A1*A2)^{0.5})$



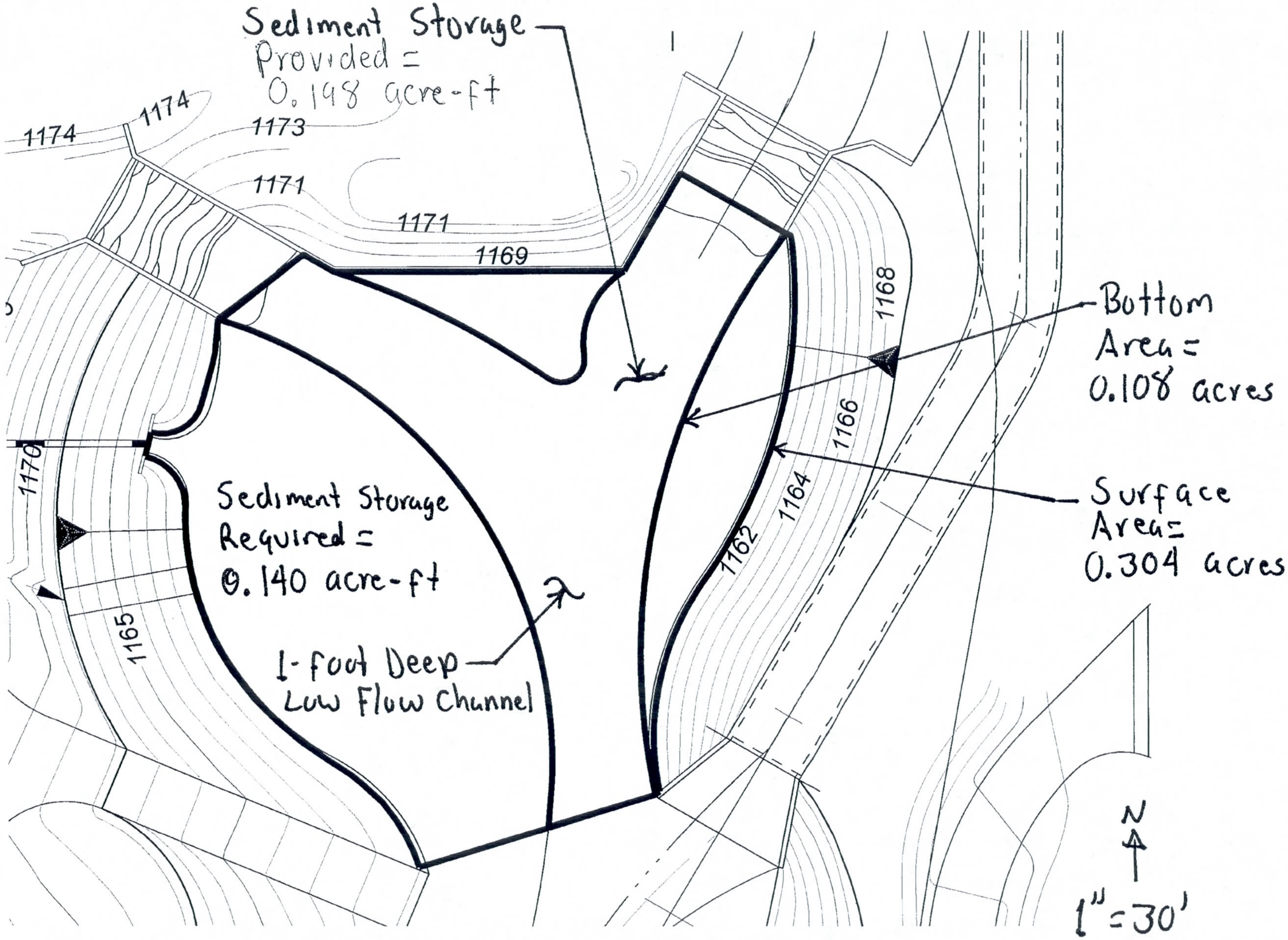
Sediment Basin #1



Sediment Basin #2



Sediment Basin #3

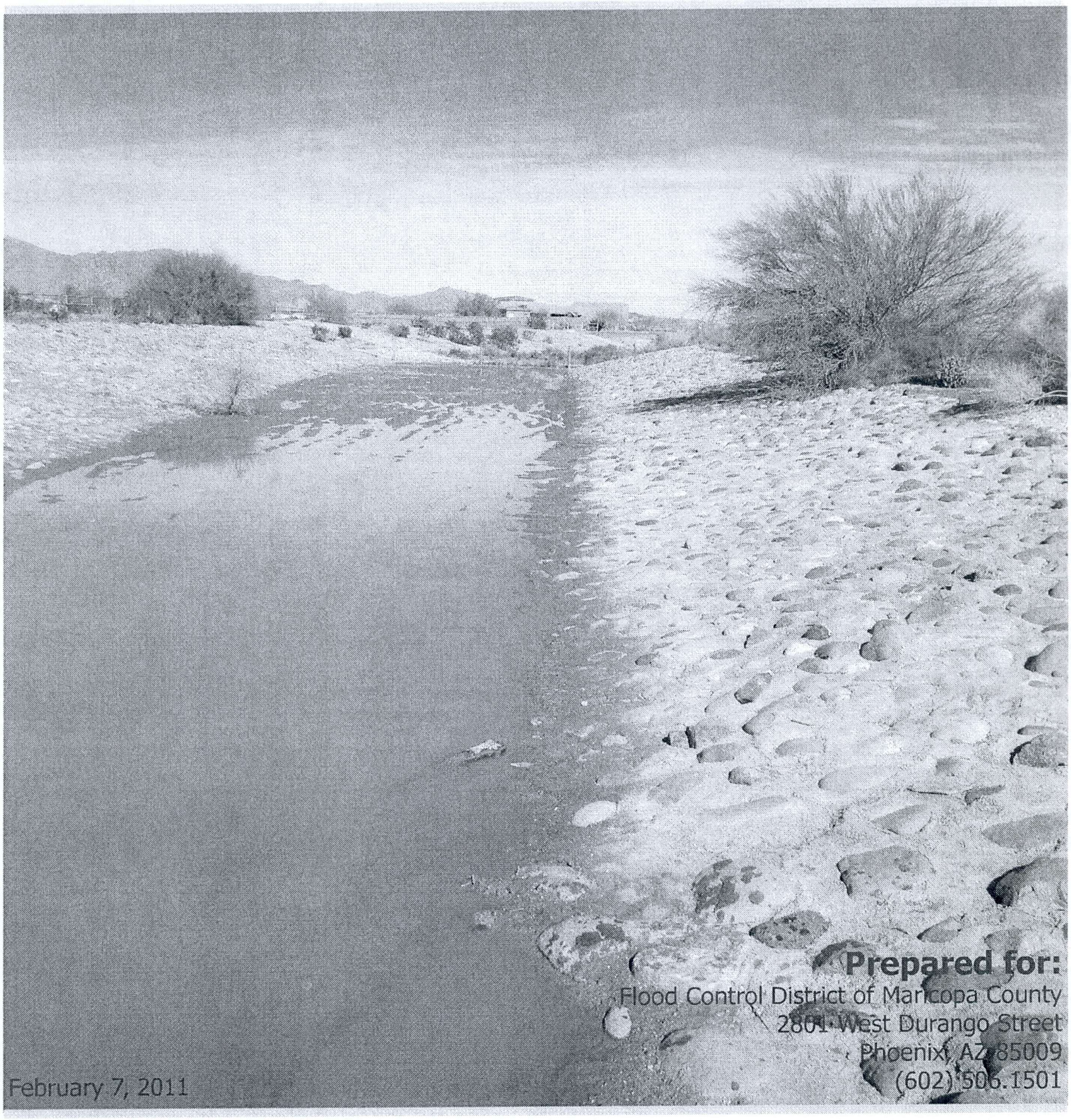


Sediment Basin #4

Appendix G: Operations and Maintenance Manual

White Tanks FRS No. 3
Outfall Channel Final Design

FCD 2009C012 - OPERATIONS AND MAINTENANCE MANUAL



Prepared for:

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009
(602) 506.1501

February 7, 2011

Prepared by:

Hoskin • Ryan Consultants, Inc.
creative engineering solutions

TABLE OF CONTENTS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
19690
PAUL W.R.
HOSKIN
Date Signed 2/7/11
ARIZONA, U.S.A.

EXPIRES 3/31/2012

TABLE OF CONTENTS (Continued)

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
19690
PAUL W.R.
HOSKIN
Date Signed
ARIZONA, U.S.A.

EXPIRES 3/31/2012

1 INTRODUCTION

The White Tanks FRS No 3 Outfall Channel (WT3OC) is an approximately five mile long channel and pipe system capable of handling, either the discharge from the FRS#3 Principal Spillway or, the full 100-year flood flows which enter the channel along its length. The WT3OC extends south from the Principal Spillway of White Tanks Flood Retarding Structure No. 3 (FRS#3) to the White Tanks Flood Retarding Structure No. 4 (FRS#4) concrete inlet channel.

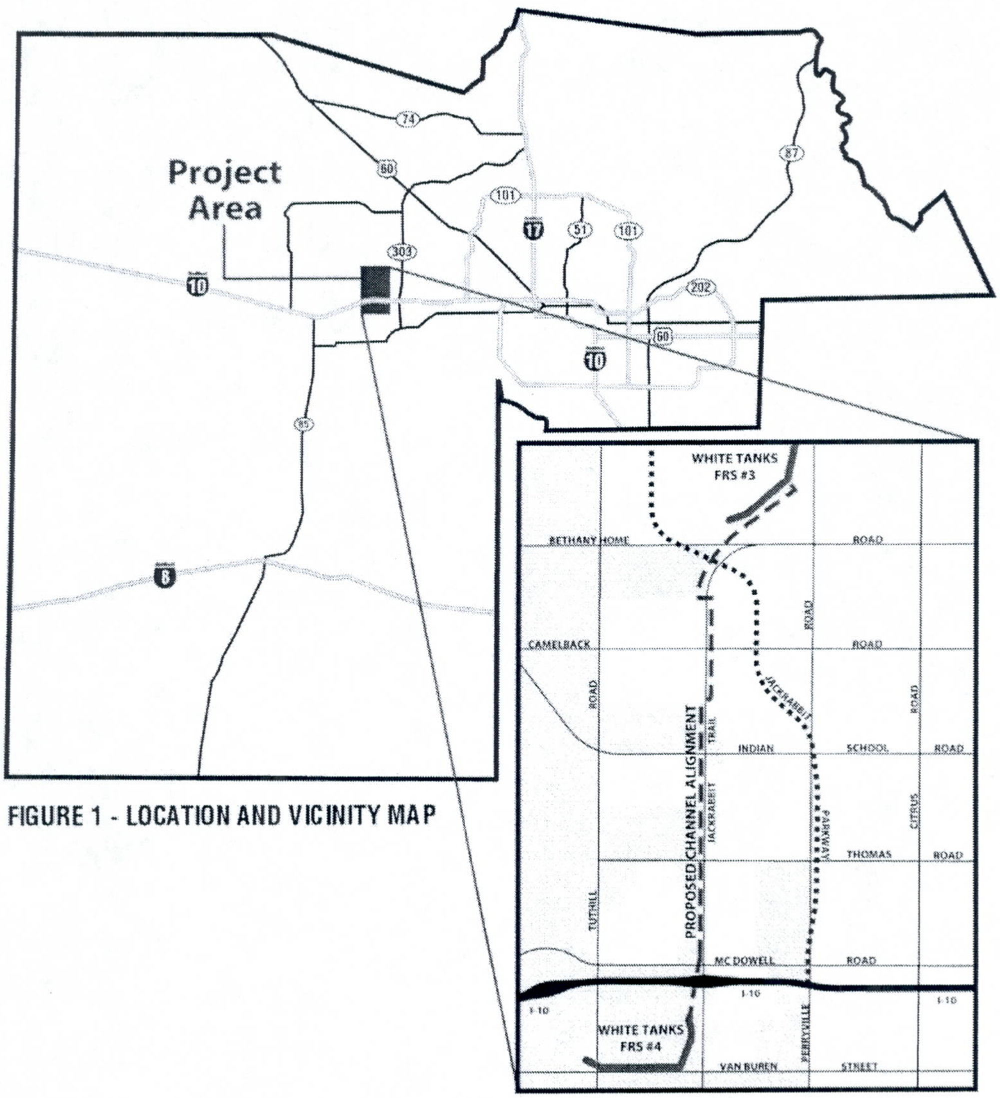


FIGURE 1 - LOCATION AND VICINITY MAP

1.1 Location

The project lies along the Jackrabbit Trail corridor between FRS#3 and FRS#4, from approximately Roosevelt Street to approximately one mile north of the Bethany Home Road alignment. This channel lies within the jurisdictions of the Town of Buckeye and unincorporated Maricopa County. Jackrabbit Trail is maintained by the Maricopa County Department of Transportation (MCDOT), and is within a right-of-way strip of varying dimensions along its length.

1.2 Directions

To arrive at the WT3OC, travel west on I-10 to Jackrabbit Trail (Exit 121). The WT3OC lies on the west side of Jackrabbit Trail.

Driving directions to W McDowell Rd & N Jackrabbit Trail, Buckeye, AZ 85396

Suggested routes

1. **I-10 W** — **30 mins**
   23.5 mi — 40 mins in traffic
2. W Buckeye Rd and I-10 W — 35 mins
   23.2 mi — 45 mins in traffic

(A) **2801 W Durango St**
Phoenix, AZ 85009

1. Head **east** on **W Durango St** toward **S 27th Ave** — 0.1 mi
2. Take the 1st **left** onto **S 27th Ave** — 3.3 mi
3. Turn **left** to merge onto **I-10 W** toward **Los Angeles** — 20.4 mi
4. Take exit **121** for **Jackrabbit Trail** — 0.5 mi
5. Turn **right** at **N 195th Ave/N Jackrabbit Trail** — 0.1 mi

(B) **W McDowell Rd & N Jackrabbit Trail**
Buckeye, AZ 85396

The WT3OC continues northward on the west side of Jackrabbit Trail until approximately the Sells Drive alignment (north of Indian School Road). At this point it continues underneath the road within a concrete box culvert and emerges approximately 900 feet north on the east side of Jackrabbit Trail. The channel continues north on the east side of Jackrabbit Trail, crosses Camelback Road, and through the Arroyo Mountain Estates subdivision. At approximately the Missouri Avenue alignment, the channel crosses diagonally across Jackrabbit Trail and continues north on the west side. Pavement on Jackrabbit Trail ends at this location.

The channel terminates at the Bethany Home Road alignment, where it crosses the Emergency Spillway of FRS#3 through two underground pipes. Access to this area is restricted to the District. The O&M road circumnavigates the Emergency Spillway to the east and continues on to the Principal Spillway. Roadway access to the manholes of the underground pipes is from four (4) spur roads to the south.

1.3 Description

The upstream end of the WT3OC connects to the FRS#3 Principal Spillway. The downstream end of the WT3OC connects to the previously-existing FRS#4 concrete-lined inlet channel approximately 0.25 miles north of McDowell Road. North of the Bethany Home Road alignment, the WT3OC transitions from an open channel to two (2) pipes. The pipes cross the FRS#3 emergency spillway, parallel the dam, and outlet to a basin at the Principal Spillway. Connection to the main outflow at the FRS#3 Principal Spillway is via rectangular concrete channel.

The project has been divided into nine (9) Reaches, each of which has its own channel cross-section and right-of-way requirements. Each of the Reaches are described as follows.

1.3.1 Reach 1

Reach 1 extends from the FRS#4 inlet channel, upstream to a point approximately 1,300 feet north of McDowell Road. The existing FRS#4 inlet channel is concrete-lined and trapezoidal in shape, and is located within District or ADOT right-of-way.

1.3.2 Reach 2

Reach 2 extends from the south side of Palm Lane, north to the south side of Thomas Road, along the west side of Jackrabbit Trail. The channel is unlined with grade control structures, and a design slope of 0.0010 ft/ft. The District owns a 138 feet wide strip of right-of-way through this reach; however, future dedication of a full 65 feet of half-street right-of-way to MCDOT will reduce this to 129 feet. The O&M road is limited to the east side of the channel.

Culvert structures in this reach include crossings of Palm Lane, Encanto Boulevard and Virginia Avenue. The channel in this reach is an unlined, earthen conveyance channel with six (6) grade control structures. A paved O&M road is located on the east side of the channel.

1.3.3 Reach 3

Reach 3 extends from the south end of the Thomas Road culvert crossing, north to the south end of the Pasqualetti Mountain Ranch subdivision, within an existing 129 foot-wide right-of-way. The channel in this reach is an unlined, earthen conveyance channel with four (4) grade control structures. A paved O&M road is located on the east side of the channel.

1.3.4 Reach 4

Reach 4 runs through the Pasqualetti Mountain Ranch, within an existing 129 foot-wide drainage easement, and extends north to the south side of Indian School Road. Culvert structures in this reach include Thomas Road, Osborn Road and Clarendon Avenue. The channel in this reach is an unlined, earthen conveyance channel with one (1) grade control structure and one (1) flow restriction structure. The concrete box culvert segment begins approximately 500 feet south of Minnezona Avenue, crosses to the east side of Jackrabbit Trail, and continues to approximately 400 feet north of Minnezona Avenue. The unlined, earthen conveyance channel segment lies east of Jackrabbit Trail, extends from approximately 400 feet north of Minnezona Avenue to the south side of the Camelback Road culvert crossing, and has two (2) drop structures. A paved O&M road is located on the east side of the channel.

1.3.5 Reach 5

Reach 5 extends from Indian School Road to south of Minnezona Avenue. Right-of-way is 214 feet in width, except a strip adjacent to Jackrabbit Trail, which is privately owned until the 65 feet is dedicated in the future. Access easements for O&M access cross this property. There is an abandoned well at approximately Station 230+00.

At the north end of this reach (Sells Road), the main channel transitions to concrete box culverts under Jackrabbit Trail.

Culvert structures in this reach include Indian School Road. The channel in this reach is an unlined, earthen conveyance channel with three (3) grade control structures. A sediment basin is located at the north end of this reach at the confluence of two drainageways and a box culvert that conveys the main flow. The concrete box culvert segment begins approximately 500 feet south of Minnezona Avenue, crosses to the east side of Jackrabbit Trail, and continues to approximately 400 feet north of Minnezona Avenue. The unlined, earthen conveyance channel segment lies east of Jackrabbit Trail, extends from approximately 400 feet north of Minnezona Avenue to the south side of the Camelback Road culvert crossing, and has two (2) drop structures.

A paved O&M road is located on the west side of the channel, and an unpaved O&M road is located on the east side of the channel.

1.3.6 Reach 6

Reach 6 extends from approximately 500 feet south of Minnezona Avenue to the south end of the Camelback Road culvert crossing. The channel in Reach 6 lies on the east side of Jackrabbit Trail. Right-of-way is 224 feetwhich includes 10 feet for future road widening.

A 16' x 7' concrete box culvert segment begins approximately 500 feet south of Minnezona Avenue, crosses to the east side of Jackrabbit Trail, and continues to approximately 400 feet north of Minnezona Avenue.

The unlined, earthen conveyance channel segment lies east of Jackrabbit Trail, extends from approximately 400 feet north of Minnezona Avenue to the south side of the Camelback Road culvert crossing, and has two (2) drop structures.

A cross-drainage culvert (2-48-inch pipes) north of Meadowbrook Avenue conveys flow from the west side of Jackrabbit Trail to the channel. At this location, a sedimentation basin is located within a drainage easement. In addition, a local collection channel along the west side of Jackrabbit Trail intercepts runoff generated within the Litchfield Heights subdivision and conveys it south. This local channel extends from Sells Road to approximately 300 feet north of MeadowbrookAvenue and lies within MCDOT right-of-way.

Culvert structures in this reach include two (2) crossings of Jackrabbit Trail. The channel in this reach is an unlined, earthen conveyance channel with two (2) grade control structures. A paved O&M road is located on the east side of the channel, and an unpaved O&M road is located on the west side of the channel.

1.3.7 Reach 7

Reach 7 extends from the south end of the Camelback Road culvert crossing, north through the Arroyo Mountain Estates subdivision on the east side of Jackrabbit Trail, to the Missouri Road alignment. A perimeter theme wall and landscape around the perimeter of Jackrabbit Estates are maintained by the Home Owners Association (HOA).

The channel in this reach is an unlined, earthen conveyance channel with two (2) concrete box culverts located at Camelback Road and Colter Street, and a single drop structure built at the Camelback Road culvert crossing. Additionally, two sets of storm drain pipes outlet to the channel from the west, at approximately 600 feet and 800 feet north of Colter Street.

A paved O&M road lies along the west side of the channel and is through a gate just north of Camelback Road, through gates on either side of Colter Street, or from Missouri Avenue.

1.3.8 Reach 8

Reach 8 extends from the north side of Arroyo Mountain Estates (Missouri Avenue alignment) to the Bethany Home Road alignment. The channel in this reach is an unlined, earthen conveyance channel which ties into the two pipes that cross under the emergency spillway within Reach 9. At the south end of Reach 8, the WT3OC crosses to the west side of Jackrabbit Trail through concrete box culverts. A paved O&M road is located on the east side of the channel, and an unpaved O&M road is located on the west side of the channel. Three

(3) spillway structures enter the WT3OC from the west, conveying flows from three washes into the channel.

The channel crosses Jackrabbit Trail to the west side through (2) 10'x7' box culverts. A diagonal portion of right-of-way crosses through property currently owned by the Maricopa County Municipal Water District. This right-of-way on the west side of Jackrabbit Trails is 224 feet in width and is adjacent to an additional 88 feet of MCDOT right-of-way.

Currently, Jackrabbit Trail does not exist in this location. The future Jackrabbit Parkway will cross the channel south of Bethany Home Road. Culverts will be required at this crossing in the future, however this roadway is only in the planning stages and its alignment is not set.

1.3.9 Reach 9

Reach 9 extends from the Bethany Home Road alignment, northeast and parallel to the FRS#3 dam, to the Principal Spillway located west of the Beardsley Canal. A 66-inch and a 78-inch diameter pipe convey the flow from the Principal Spillway under the emergency spillway, and outlet to an earthen channel in Reach 8, downstream of the emergency spillway. The pipes across the emergency spillway will be constructed from concrete since a flexible pipe is not required in this area. The pipes are bedded and capped with a controlled low strength material (CLSM). The Principal Spillway consists of two 48-inch diameter gated pipes. Flow from the west pipe is directed to a basin via a rectangular concrete channel, which connects to the Principal Spillway structure. Flows into the basin are directed to the west, into the Reach 9 pipes described above.

The east Principal Spillway pipe is intended as a wasteway outlet, to be operated in the event that the downstream outfall channel is not complete, or if FRS#4 is unable to accept additional discharge. Outflow from this pipe is directed to the east via grading and landscape mounding. Riprap is placed at the outlet to prevent erosion adjacent to the outlet channel. Two culverts route flows away from the toe of the dam and under the main conveyance pipes.

The slope of the two main pipes within Reach 9 will accommodate the risk of long-term subsidence. Monitoring of long-term movementrequires periodic measurements to the pipe invert at benchmark manhole locations.

2 INSPECTIONS

2.1 Inspection and Maintenance

Items directly associated with FRS#3 and FRS#4 are not included in this Operations and Maintenance Manual and their respective maintenance plans should be referred to for those facilities. The items that are to be inspected and maintained as part of the WT3OC are listed below:

- Concrete-lined channel within Reach 1, downstream of Palm Lane
- Unlined, earthen channel within Reaches 2 to 9.
- Low Flow Channel within Reaches 2 to 8.
- All culvert crossings to be maintained by MCDOT.
- Drop Structures within Reaches 2 to 8.
- Side Inflow Spillways within Reaches 2 to 8.
- Dual HDPE Pipes within Reach 9.
- Dual CIPP Pipes within Reach 9.
- Storm drain inlets and culverts not within MCDOT right-of-way.
- Plain and Grouted Riprap.
- Spillway Channel connected to the Principal Spillway in Reach 9.
- Sedimentation Basins located within the WT3OC in Reaches 5 and 8.
- Bypass pipe culverts under the two main pipes in Reach 9.
- Storm drain pipes collecting local flows from the west within Reaches 6 and 7.

- Localized flow channel within Litchfield Heights, Reach 6.
- Sedimentation basin at north end of Reach 5 (Sta 231+00).
- Sedimentation basin within Reach 6 (Sta. 244+00).
- Landscape within Reaches 2 to 9, excluding Reach 7. Reach 7 shall be maintained by the Arroyo Mountain Estates HOA.
- O&M Roads within Reaches 2 to 9.
- Fencing and gates within Reaches 2 to 9.
- Headwalls and trash racks.
- Retaining Wall on east side of Reach 7.

The following items are to be maintained by others, as described:

Arroyo Mountain Estates HOA (Contact: Melanie Veach (602) 288-2663)

- Landscape and Irrigation between Jackrabbit Trail and the Western Split Face Wall, from Camelback Road to Missouri Ave. (Reach 7)
- Split-Face Wall on east side of WT3OC in Reach 7

Maricopa County Department of Transportation (Contact: Tom Sonnemann (602)506-8600)

- All culvert crossings along the length of the project.

Parameters for inspection and maintenance are noted in the subsequent sections. A plan set and special provisions should be used in conjunction with this manual.

2.2 Monitoring

Monitoring of the WT3OC is to be accomplished to identify and report abnormal conditions between scheduled inspections. Trained personnel will perform monitoring while carrying out their routine duties. Irregularities are to be reported as soon as they are discovered along with a remediation plan.

2.3 Survey

Survey elevations were recorded at the manhole locations along the two main pipes in Reach 9. These locations shall be surveyed on an annual basis to determine if potential setting within the fissure risk zone adjacent to the FRS#3 dam has occurred. This data will be sent to the FCD Dams Branch Manager for review and record.

2.4 Inspection Schedule

Special inspections will be conducted immediately following severe storms, earthquakes, vandalism, and other significant events. Regular inspections shall be completed quarterly in the first year following construction, and on an annual basis thereafter.

3 MAINTENANCE

3.1 Fencing and Access Barriers

Inspect all gates, bollards, and fencing at least once each year and replace posts and appurtenances as needed. Repairs shall be made as soon as possible to continue to protect the property against unauthorized access. See O&M road section on authorized access for public use of the O&M road as a multi-use trail.

3.1.1 Gates

All gates should be closed and locked.

3.1.2 Bollards

All collapsible bollards should be exercised during annual inspections and special inspections. Bollards should be kept in an upright, closed and locked position.

3.2 O&M Road

Maintain the asphalt,or decomposed granite, surface over the O&M road in a drivable condition. The O&M road, also serves as a multi-use trail, in places. Maintain pedestrian and bicycle access to and along the trail in these areas and repair any surface damage to the asphalt that may cause injury during trail use. Remove obstructions to the passage of vehicles and bicycles. Shoulder erosion within 1-foot of the roadway and more than 8" wide and 6" deep shall be repaired. Roadway repairs shall conform to Section 321 of the Special Provisions.

3.3 Concrete Structures

The concrete structures in the WT3OC include:

- Concrete-lined channel within Reach 1
- Culvert crossings, which will be maintained by MCDOT where crossing all east-west streets or across Jackrabbit Trail
- Drop Structures within Reaches 2 to 6
- Side Inflow Spillways within Reaches 2 to 8
- Dual CIPP Pipes within Reach 9
- Spillway Channel connected to the Principal Spillway in Reach 9

<u>Erosion and Scour</u>

Check the soil around the structures for erosion and check the structure for possible scour. Erosion repairs are to be made by replacing lost material with compacted earth. If severe scour has occurred, repair the concrete to restore the original form and function. It is extremely important to re-establish concrete cover over steel reinforcing bars corrosion. If steel corrosion has occurred, further chipping of concrete may be needed to uncover non-corroded zones prior to patching. All repairs shall be finished to match adjacent surface treatment (i.e. – painted, stained, etc.).

Refer to the section on the side inlet spillways for additional information regarding the intentional "weathered" appearance of the spillway step faces.

Settlement

Check structures for settling and report any settlement to the District Facilities Manager.

Cracking

Concrete shall be visually inspected for spalls, cracks, misalignment, or structural breakage. Spalls deeper than one (1) inch and cracks less than 0.25-inch shall be repaired with cement mortar and sealing compound respectively. Cracks greater than 0.25-inch, misalignments of more than 0.5-inch, and any structural breakage shall be measured, monitored, and repaired as determined by the District Facilities Management Branch. All repairs shall be finished to match adjacent surface treatment (i.e. – painted, stained, etc.).

Refer to the section on the side inlet spillways for additional information regarding the intentional "weathered" appearance of the spillway step faces.

Joints

Exposed joints shall be visually inspected. Any joints where the sealing compound or joint filler is missing shall be repaired with materials similar to that used in original construction. Any joints found to have opened more than one (1) inch shall be measured and promptly repaired. All repairs shall be finished to match adjacent surface treatment (i.e. – painted, stained, etc.).

Vandalism

Inspect structures for the evidence of vandalism. Clean or paint over the surface of any markings in accordance with Section 505 of the Special Provisions. If concrete components have been damaged or broken, make concrete patching and repairs to restore original form and function. It is extremely important to re-establish concrete cover over steel reinforcing bars so that corrosion does not take place. If steel corrosion has occurred, further chipping of concrete may be required to remove corrosion prior to patching.

Railing, Access Barriers and Trash Racks

All railing shall be visually inspected and repaired or replaced if it is damaged or improperly removed. All stained surfaces shall be cleaned and re-stained if surface shows signs of exposed galvanized steel. Bent or damaged railing shall be restored or replaced to its original configuration. Replacement pipe shall meet the original plans and special provisions.

Sediment and Debris

Inspect structures for sediment deposits that are greater than 2-inches or that cause ponding that does not infiltrate within 36 hours of wetting. Remove all debris and sediment that might affect the operation of the structure.

Animal Burrows

Check around the structure for animal burrows such as ground squirrel and gophers. If animal burrows are observed, notify the District Environmental Programs Manager to determine if species require special consideration and handling such as burrowing owls or other protected species. Follow District Environmental Staff direction regarding relocation or other handling of protected species. Following clearing of burrows, treat and control for rodent activity, excavate holes, refill, and compact to the original required density. Replace any lost or displaced erosion protection.

3.3.1 Side Inlet Spillways

Inspect structures for sediment deposits greater than 2-inches in depth. Some sediment deposited on the structure is desirable and should be left in place. Inspect the structure for erosion at the base of the structure between the riprap and the toe-down wall. Re-grade soil and replace riprap to the depth required on the construction plans.

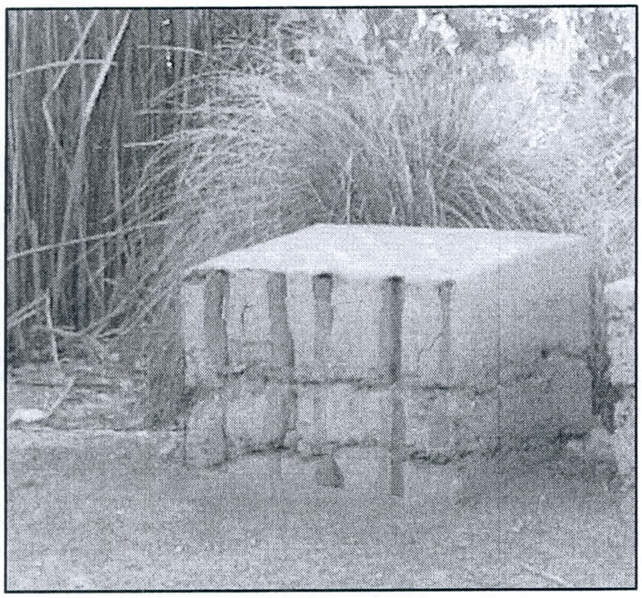


Figure 2 – Example of Desirable Spillway Step-face Surface Treatment

The face of the structure has been designed to replicate weathered, exposed bedrock. Figure 2 shows an example of the desirable step-face surface treatment.

Aesthetictreatment is designed to penetrate +/- 3 inches into the concrete face. Further weathering that does not penetrate to the reinforcing is acceptable. **It is extremely important that no steel reinforcing be exposed.** Re-establish concrete cover over steel reinforcing bars so that corrosion does not take place. If steel corrosion has occurred, further chipping of concrete may be required to remove corrosion prior to patching. Refinish the repairs using a simulated desert varnish to match adjacent coloration.

3.3.2 Drop Structures

Inspect the drop structures for sediment and trash build-up. Remove sediment and trash.

3.3.3 Culverts

Culvert inlets and outlets should be inspected for sedimentation buildup that inhibits the flow or alters the grade. Remove excess soil and re-grade the channel bottom to match grade specified on the construction plans.

3.4 Channel and Overbank Areas

All exposed earth or rock mulch along the length of the channel should be physically inspected and observations made for any disturbances.

Cracking or Settlement

Any observed cracks or settlement observed during inspections shall be reviewed by a Geotechnical Engineer to determine if conditions warrant additional investigations. Follow the Engineer's instructions for the repair of the channel embankments and replace soil that has been misplaced or removed.

Erosion

Determine if the disturbance is due to surface conditions and is likely to happen again. If so, take corrective actions such as re-grading or filling to prevent similar occurrences.

Animal Burrows

Check for animal burrows such as ground squirrel and gophers within the channel embankment. If animal burrows are observed, notify the District Environmental Programs Manager to determine if species require special consideration and handling such as burrowing owls or other protected species. Follow District Environmental Staff direction regarding relocation or other handling of protected species. Following clearing of burrows, treat and control for rodent activity, excavate holes, refill, and compact to the original required density. Replace any lost or displaced erosion protection.

Dumped Riprap

Dumped riprap shall be inspected for deterioration and damages. Reposition riprap to maintain configuration as shown on the plans. Riprap shall conform to the requirements of Section 220 of the Special Provisions.

3.5 Low Flow Channel

The low flow channel is designed to naturalize and establish itself within the channel bottom. Sediment deposits and low flow bank erosion or collapse are acceptable and part of the design intent for the project. Do not repair low flow to its original alignment. Low flow repair is only required where sediment deposits cause water ponding that fails to infiltrate within 36 hours of wetting, or where erosion of the main channel banks occurs. Remove debris and obstructions from the low flow that impede channel function.

3.6 Vegetation

The channel is designed for Manning's 'n' Coefficients ranging from 0.020 to 0.045, with 0.035 being the optimal operating coefficient. Vegetation within the channel is intended to provide engineering benefits to control flow velocities and should be maintained in accordance with the following guidelines. Original planting layouts are shown on the planting plan and should be referred to in the event that tree removal is required from within the channel to ensure that desirable tree groupings can be identified from undesirable trees that require removal.

Wildlife Protection

All birds, except pigeons, house sparrows, European starlings, grackles, and quail, are protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712; Chapter 128; as amended). It is especially important to avoid disturbing active bird nests (those with eggs or hatchlings present) during Arizona's breeding bird season (roughly February through June in Maricopa County, however an individual nest is only active for 30-45 days). Additionally, burrowing owls are present in many project sites where vegetation is sparse. In the event that vegetation removal is planned, the District biologist should assess the potential impact of extensive maintenance and vegetation removal on the sensitive bird species, and where necessary, prepare an action plan to minimize the impact. It is the responsibility of O&M staff to notify the District Environmental Program Manager immediately if burrowing owls or active nests are found within the project limits during planned vegetation clearing or maintenance. It may be necessary to delay removal of vegetation to avoid disturbing nesting birds.

Maintenance staff is to be familiar with the requirements of and follow State, County, and Local guidelines and regulations dealing with sensitive wildlife species.

3.6.1 Initial Installation

Tall pot trees have been planted within the channel bottom along the low flow channel. Trees have been planted in groupings, with the average distance between each group being 120-foot from center-of-grouping to center-of-grouping. These trees are to be allowed to mature.

Hydroseed has been applied throughout the extents of the project. The plant species included in the plant mix include native trees, shrubs, grasses, and wildflowers. These plants should be allowed to mature and grow. Intentional species include those listed in Table 1.

Figure 3 schematically shows the relationship of the plant material to the various channel elements at the time of initial installation:

Table 1: Intentional Landscape Vegetation Species

Botanical Name	Common Name	Pure Live Seed (pounds/Acre)
Trees		
Cercidiummicrophyllum	Foothills Paloverde	0.5
Prosopisvelutina	Velvet Mesquite	0.5
Shrubs		
Acacia greggii	Catclaw Acacia	0.5
Ambrosia deltoidea	Triangle Bursage	2.0
Atriplexpolycarpa	Desert Saltbush	0.5
Calliandraeriophylla	Fairy Duster	0.5
Encelia farinose	Brittlebush	1.0
Larreatridentata	Creosote	0.5
Sennacovesii	Senna	0.25
Annuals and Perennials		
Aristidapurpurea	Purple Three-Awn	0.25
Baileyamultiradiata	Desert Marigold	0.25
Boutelouaaristidoides	Needle Grama	0.2
Eschscholtziamexicana	Mexican Gold Poppy	0.5
Penstemonparryi	Parry Penstemon	0.5
Plantagoinsularis	Indian Wheat	0.5
Lesquerellagordoni	Bladder Pod	0.5
Lupinussparsiflorus	Desert Lupine	0.5
Sphaeralceaambigua	Globe Mallow	0.25
Sporoboliscryptandrus	Sand Dropseed	1.0

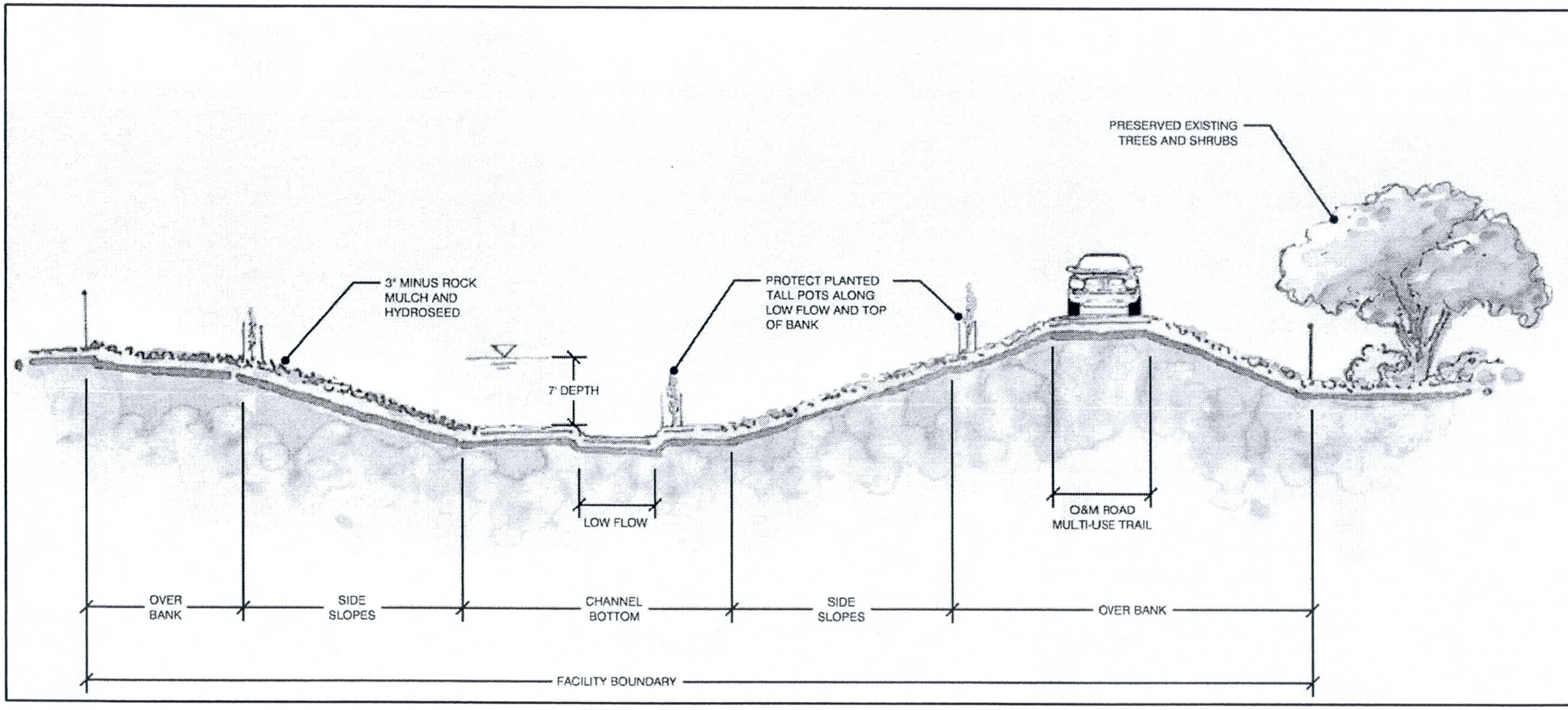


Figure 3 –Initial Installation

3.6.2 Moderate Plant Establishment

Tall pot trees planted at the time of project construction are to be allowed to mature. New trees that begin to grow within the channel bottom should be evaluated and removed if they increase the obstruction of the channel by more than 10%. New trees that begin to grow on the overbank area should be allowed to grow.

Remove chicken wire cages from tall pots and recycle or dispose of wire after 2 years of growth or as otherwise directed by the District Landscape Architect or Environmental Programs Managers.

Shrub material included in the hydroseed mix will mature more quickly than the tall pots. Shrub material within the channel bottom should be allowed to grow unless determined by the Facility Management Branch and verified by the District Landscape Architecture staff that shrub material should be removed for public health and safety.

Shrub material on the overbank area should be maintained to not obstruct access along the O&M road, hinder visibility at road intersections and other points of traffic conflict, or otherwise create an unsafe condition.

Figure 4 schematically shows the relationship of the plant material to the various channel elements at the time of moderate plant establishment.

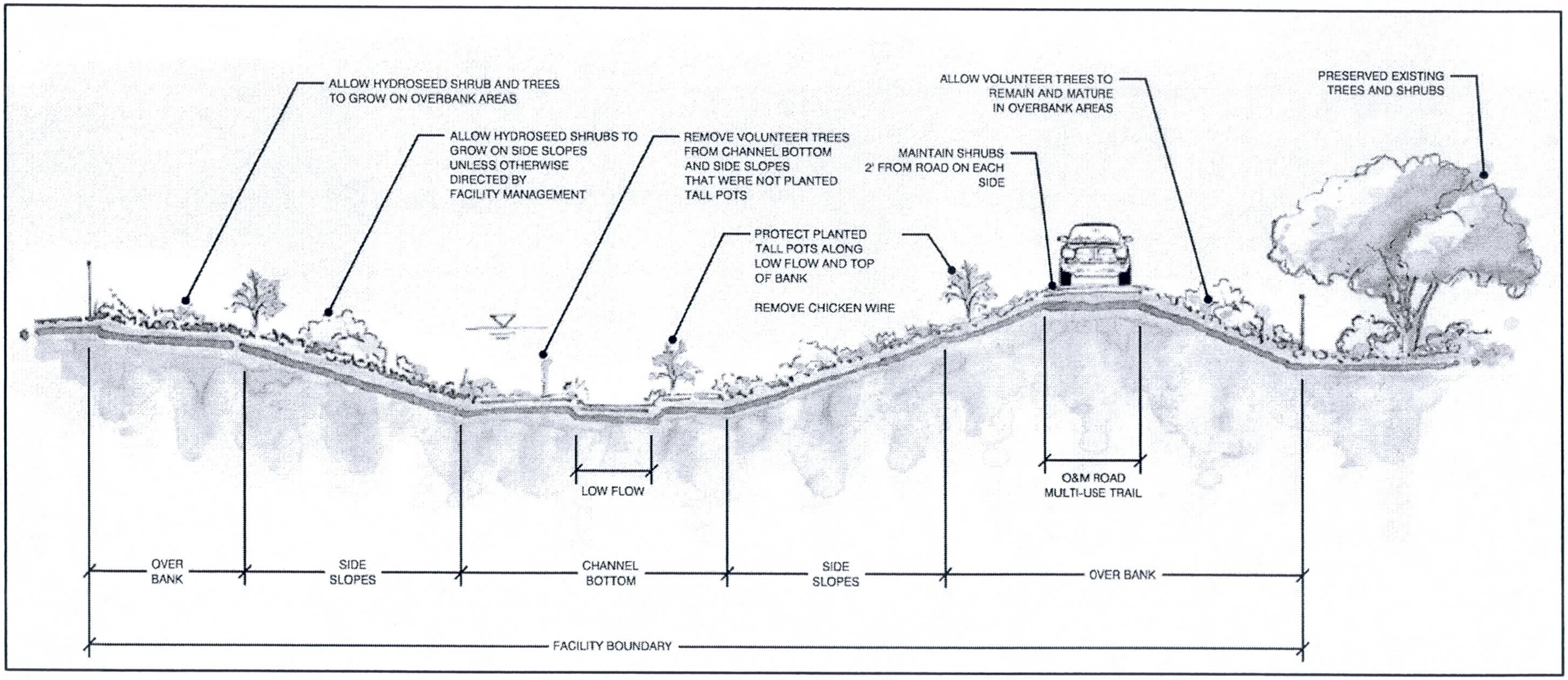


Figure 4 – Moderate Plant Establishment

3.6.3 Full Plant Establishment and Desirable Maintenance Condition

Tall pot trees planted at the time of project construction within the low flow channel shall be considered fully establishedfor pruning purposes at such time that the tree reaches a height of 8-foot and/or a width of 5-foot. Lower branches of the tree shall be removed to either 1/3 the height of the tree, or up to 6-foot above channel grade, whichever is less.Continue to remove new trees that begin to grow within the channel bottom. New trees that begin to grow on the overbank area should be allowed to grow.

Tree branches or foliage that reduces roadway clearance to less than 14 feet above the road surface or which reduces the width to less than 12 feet will require trimming or removal.

Shrub material within the channel bottom should be allowed to grow unless determined by the Facility Management Branch and verified by the District Landscape Architecture staff that shrub material should be removed for public health and safety.

Shrub material on the overbank area should be maintained to not obstruct access along the O&M road, hinder visibility at road intersections and other points of traffic conflict, or otherwise create an unsafe condition.

Figure 5 schematically shows the desirable final establishment and maintenance of the plant material as they relate to the various channel elements.

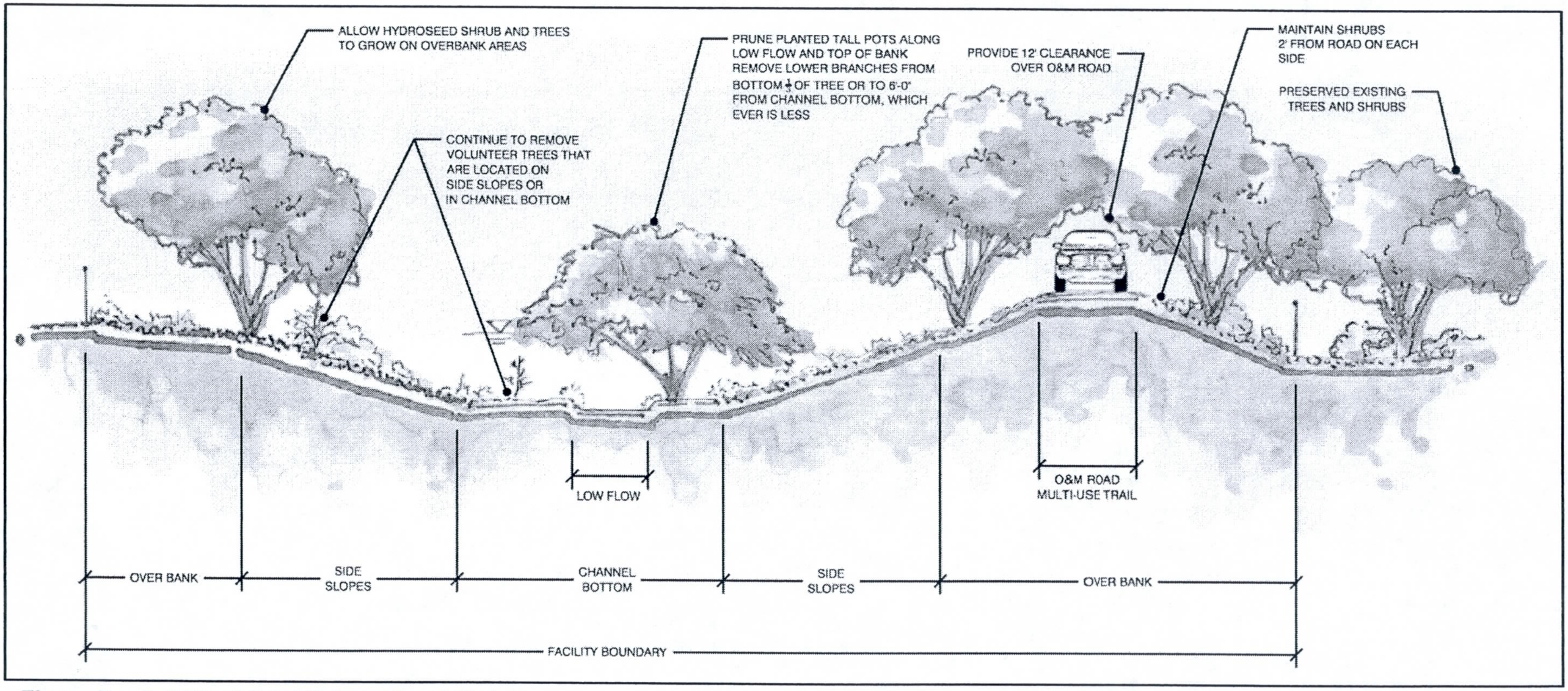


Figure 5 – Full Plant Establishment and Maintenance

4 PERSONNEL

All personnel involved in conducting inspections and performing O&M activities shall be properly trained and equipped. Any questions arising as to safety of current conditions of the WT3OCshould be reported immediately.

5 RECORDS

As-Built drawings have been completed as a part of the construction project. If there are significant changes to the project after construction, these plans should be updated and kept on record at the District.