Wash 11 East at Bonita Dam

Letter of Map Revision

Flood Control District of Maricopa County

Engineering Division

June 27, 2014

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: June 27th, 2014

To: William D. Wiley, P.E., Chief Engineer and General Manager

From: Jennifer Thorne, P.E, Hydrologist, Hydrology and Hydraulics Branch

Subject: Wash 11 East LOMR between Bonita Dam and Jomax Road

The floodplain redelination study and LOMR for Wash 11 East between the breached Bonita Dam and Jomax Road is ready for use as the best available technical information. The study documentation will be sent to FEMA for review and incorporation into the County's FIRM panels.

The background for the study includes the following: When the Wittmann Area Drainage Master Study Update (WADMSU) was prepared in 2005, the Bonita Lake Dam had been deemed unsafe and was breached. Since then, the physical conditions in the area have changed, and local homeowners mentioned to the District that the mapped floodplains were not accurate. To investigate this, the District sent out their survey group to obtain an updated topographic surface, and the area was modelled using the effective hydrology. This study revises 0.43 linear miles of existing Zone AE floodplains with floodway along Wash 11 East. The project manager for the District was Jennifer Thorne, P.E.

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

Date 6/27/14 Jennifer Thorne, P.E. Project Manager	Date: 6/27/2014 Ed Raleigh, P.E. Engineering Division Manager
Date: 6.27.14 Amir Motamedi, P.E., CFM Hydrology/Hydraulics Branch Manager	Date: 7-1-14 William D. Wiley, P.E., Chief Engineer and General Manager
Date: 6/30/14 Kelli Sertich, AICP Floodplain Management & Services Division Manager	Date:
File Copies: 1. ____ 2. ____	YES ☐ GIS Posted (Pending Floodplain Only) Date: ____ N/A

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

AT FEMA FOR REVIEW

Redelination of Wash 11 East Downstream of Bonita Lake Dam in Maricopa County, Arizona

Technical Support Data Notebook for Letter of Map Revision Application

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

Registered Professional Engineer (Civil)
CERTIFICATE NO.
50474
JENNIFER LYNN
THORNE
DATE SIGNED 6/27/14
ARIZONA U.S.A.
EXPIRATION 12/31/2015

June 2014

Registered Professional Engineer (Civil)
CERTIFICATE NO. 50474
JENNIFER LYNN THORNE
DATE SIGNED 6/27/14
ARIZONA U.S.A.
EXPIRATION 12/31/2015

TABLE OF CONTENTS

FIGURES

TABLES

EXHIBITS

EXPIRATION 12/31/2015

APPENDICIES (On Disk)

APPENDIX C. MANNING'S N-VALUE CALCUATIONS

C.1 Pictures from field visit

C.2 N-Value calculations

APPENDIX D. FIELD SURVEY DATA

APPENDIX E. PUBLIC NOTIFICATION

Registered Professional Engineer (Civil)
CERTIFICATE NO. 50474
JENNIFER LYNN THORNE
DATE SIGNED 6/27/14
ARIZONA U.S.A.
EXPIRATION 12/31/2015

SECTION 1: Introduction

This Technical Support Data Notebook presents the results of the flood engineering analysis produced by the Flood Control District of Maricopa County (FCDMC) to update the floodplain and floodway delineation downstream of the breached Bonita Lake Dam in Maricopa County, AZ. This new analysis is based on updated topographic information obtained by FCDMC and uses the previously approved Hydrology from the Wittmann Area Drainage Master Study Update (WADMSU) (Reference 1). This report is formatted to meet Arizona Department of Water Resources State Standard 1, dated August 2012 (Arizona Department of Water Resources, 2012).

1.1 Purpose and Authority

The purpose of this study and application is to update the floodplain and floodway delineations downstream of the breached Bonita Lake Dam to Jomax Road. The breach caused significant changes in the topography in the area, and property owners in the area brought up concerns that the effective data was not accurately representing the existing conditions.

1.2 Location of Study

The area under study is about 35 miles northwest of Downtown Phoenix. The latitude is 33.727597 and longitude is -112.372885. There are approximately ten properties that may be affected by this redelineation project. The figure below shows the location graphically.

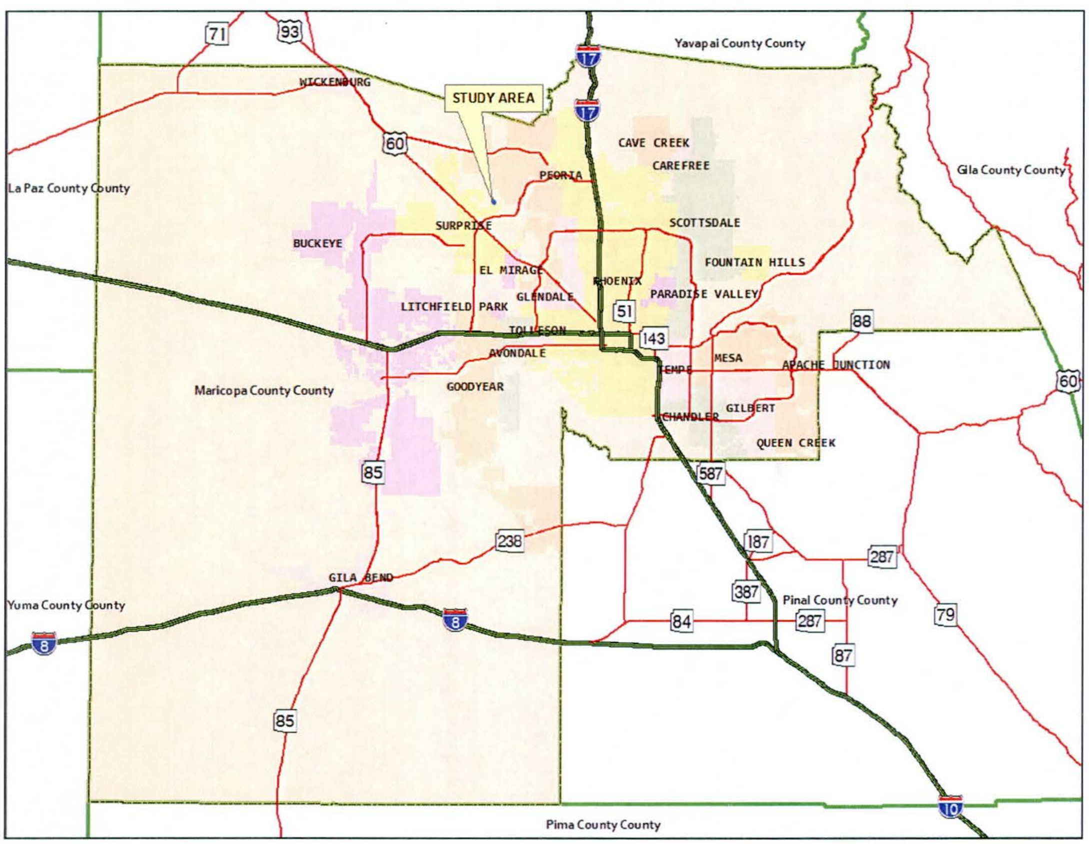


Figure 1: Bonita Lake dam Location Map (not to scale)

1.3 Hydrologic and Hydraulic Overview

The hydrology used in this study was part of the WADMSU, completed for FCDMC in 2005. The 100-year peak flow used in this study is the same as that found in the WADMSU, 1310 cfs.

The hydraulic model is the US Army Corps of Engineers program HEC-RAS 4.1.0 (U.S. Army Corps of Engineers, 2010). The model geometry was extracted with the aid of HEC-GeoRAS 10.0 (U.S. Army Corps of Engineers, 2012) and ESRI ArcMap 10.1 (Environmental Systems Research Institute, 2011). The topography used is two foot contour interval FCDMC developed survey points collected by FCDMC in February 2014. The model is 0.43 linear miles and the proposed Special Flood Hazard Area is Zone AE.

SECTION 2: FEMA forms

The next six pages are the FEMA's MT-2 forms required for a LOMR application. As this package will be submitted digitally, the Overview and Concurrence form is not necessary, but a copy of Summary of the Online LOMC in included.

Online Letter of Map Change

LOMC Application

Application ID: R638940464416 **Revision**

Revision Review

Project Type

Project Type: LOMR

Payment Total

Fee: $0.00 (LOMR/PMR Based Solely on Submission of More Detailed Data)

Project Name/Identifier

Project Name/Identifier: Wash 11 East Between Bonita Lake Dam and Jomax Road

Community Information

State, District or Territory:	AZ
County:	Maricopa County
Community Name:	MARICOPA COUNTY*
Map Panel Number - Effective Date:	04013C1230L - 10/16/2013
CID:	040037

Flooding

Flooding Source: Wash 11 East

Types of Flooding: Riverine

Basis for Request

The basis for this revision request is: New Topographic Data

Zone Designation

FEMA Zone designations affected: AE

Revision Structures

The area of revision encompasses the following structures: No Project

Primary Contact Information

Title:	Ms.
First Name:	Jennifer
Last Name:	Thorne
Address 1:	2801 W. Durango Street
City:	Phoenix
State, District or Territory:	AZ
ZIP Code:	85009
E-mail Address:	thornej@mail.maricopa.gov
Company/Organization:	Flood Control District of Maricopa County
Phone:	602-506-3320

Community Official Information

Title:	Mr.
First Name:	William D.
Last Name:	Wiley
Professional Title:	Chief Engineer and General Manager
Community Name:	MARICOPA COUNTY*
Address 1:	2801 W. Durango Street
City:	Phoenix
State, District or Territory:	AZ
ZIP Code:	85009
E-mail Address:	williamwiley@mail.maricopa.gov
Phone:	602-506-4708

As the CEO or designee responsible for the 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 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 request, the applicant has documented Endangered Species Act (ESA) compliance to DHS/FEMA prior to DHS/FEMA's review of the Conditional LOMR application. For LOMR request, I acknowledge that compliance with sections 9 and 10 of the ESA has been achieved independently of DHS/FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44 CFR 65.2(c), and that we have available upon request by DHS/FEMA, all analyses and documentation used to make this determination.

Community Official Signature: [signature]

Date: 2-1-14

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 instruction. 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.

First Name: Jennifer
Last Name: Thorne
License Number: 50474
Expiration Date: 12/31/2015
Company Name: Flood Control District of Maricopa County
E-mail Address: thornej@mail.maricopa.gov
Telephone Number: 602-506-3320
Fax Number: 602-506-4601
Certifier's Signature: [signature]
Date: 6/27/2014

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

RIVERINE HYDROLOGY & HYDRAULICS 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 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, 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, 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).

Flooding Source: Wash 11 East

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)

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

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: ____________
☐ 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

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit*	Jomax Road	1.189	1385.22-NAVD88	1385.22-NAVD88
Upstream Limit*	Bonita Lake Dam	1.613	1402.85-NAVD88	1402.85-NAVD88

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: ______

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. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
	File Name	Plan Name	File Name	Plan Name	
Duplicate Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name: Effective_Model.prj	Plan Name: Effective_Model.P01	File Name: Effective_Model.prj	Plan Name: Effective_Model.P02	NAVD88
Revised or Post-Project Conditions Model	File Name: Updated_Model.prj	Plan Name: Updated_Model.P01	File Name: Updated_Model.prj	Plan Name: Updated_Model.P02	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 work 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 (preferred)

Topographic Information: New Field Survey

Source: Flood Control District of Maricopa County   Date: 01/28/2014

Accuracy: ±0.10 foot

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**, at the same scale as the original, 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 on 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 compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No

   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications 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 established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (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. Please see the MT-2 instructions for more detail.

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

SECTION 3: Survey and Mapping Information

3.1 Digital Projection Information

The digital projection for the digital terrain model, triangulated irregular network, topography and the floodplain mapping results of this study are in the table below.

Table 1: Digital Projection Information

Projected Coordinate System:	NAD_1983_HARN_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Projection:	Transverse_Mercator
False_Easting:	700000.00000000
False_Northing:	0.00000000
Central_Meridian:	-111.91666667
Scale_Factor:	0.99990000
Latitude_Of_Origin:	31.00000000
Linear Unit:	Foot
Geographic Coordinate System:	GCS_North_American_1983_HARN
Datum:	D_North_American_1983_HARN
Prime Meridian:	Greenwich
Angular Unit:	Degree

3.2 Field Survey Information

A field survey of the study area was completed on January 28th, 2014, by the survey department of FCDMC. This data is included on the CD contained within the report.

3.3 Mapping

The topographic mapping was extracted from the field survey data collected by FCDMC. The contour interval is 2 feet and accuracy is ± 0.10 foot.

3.4 Elevation Reference Marks

Elevation Reference Marks were not necessary as part of this study.

SECTION 4: Hydrology

The hydrology used in this study was prepared for FCDMC during the Wittmann Area Drainage Master Plan Update completed by Entellus in 2005. Work maps from the WADMSU show that the 100-year peak discharge for Wash 11 East at Bonita Lake is 1310 cfs. Supporting documentation from the WADMSU can be found in Appendix B.

SECTION 5: Hydraulics

5.1 Method Description

The study area is located in a collection of approximately ten private properties in northwest unincorporated Maricopa County. The terrain is undeveloped desert rangeland and Wash 11 East is a confined stream between natural slopes. The extent of hydraulic modeling is from just north of the breached Bonita Lake Dam to just south of Jomax Road.

5.2 Work Study Maps

The study work maps were developed using aerial photography and topography from the FCDMC. The aerial photography was flown in September 2013. The topography is two foot contour interval and was developed from the survey data collected in February 2014. Work maps for the entire study area are included at the end of the report.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

Review of the effective model showed that the existing roughness coefficients did not appear accurate, so new Manning's N-Values were determined by a field visit and using the methodology shown in section 7.6 of the FCDMC's Hydraulics Manual (Reference 5). The channel immediately downstream of the breached dam is a concrete spillway, and is represented by a Manning's N value of 0.015. The overbanks for the entire study were found to have a Manning's N value of 0.06, and the channel downstream of the concrete spillway was found to have a Manning's N value of 0.03. See Appendix C for the calculations pertaining to the N-value estimation.

5.3.2 Expansion and Contraction Coefficients

All expansion and contraction coefficients are set at 0.3 and 0.1 respectively. These are the values for cross sections with gradual transitions and subcritical flow.

5.4 Cross Section Description

Cross section locations were determined by the locations of the cross sections in the effective FIS. In some locations, cross sections were added to provide more detailed information near structures.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

The maximum Froude number achieved in HEC-RAS is 1.11, despite running the model with a supercritical flow regime. The final model was limiting the flow regime to subcritical.

5.5.2 Bridges and Culverts

No bridges or culverts were modeled or identified in the study area.

5.5.3 Levees and Dikes

No levees or dikes were modeled or identified in the study area.

5.5.4 Non-Levee Embankments

No non-levee embankments were modeled or identified in the study area.

5.5.5 Islands and Flow Splits

No islands or flow splits were modeled or identified in the study area.

5.5.6 Ineffective Flow Areas

At cross section 1.613, there is an ineffective flow area that is a carryover from the effective model. It is due to area of Bonita Lake Dam that was not breached. There is an additional ineffective flow area at cross section 1.567. Grading in the right overbank on this property slopes downward, but there is no conveyance for this area, and the entire 100-year flow is contained in the channel.

5.5.7 Supercritical Flow

The steady flow analysis is set to keep the flow regime at subcritical. HEC-RAS defaulted to critical depth for several cross sections. The highest three Froude numbers calculated are 1.11, 1.09 and 1.01.

5.6 Floodway Modeling

The floodway was revised as part of this study. Care was taken to ensure that there were no negative surcharges. The largest water surface increases were 0.95, 0.92 and 0.85, and the highest Froude numbers for the Floodway model were 1.13, 1.00 and 0.99.

5.7 Issues Encountered During the Study

5.7.1 Special Issues and Solutions

There were no special issues for this study.

5.7.2 Modeling Warning and Error Messages

There are warnings for the energy equation defaulting to critical depth for many locations in the study area, as detailed in sections 5.5.1 and 5.5.7.

5.8 Calibration

No calibration was calculated for this study since no data was available.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

The floodplain and floodway were mapped to the surface generated by the new survey data using GeoRAS, and were tied into the existing floodplain and floodway within half a foot where accurate to the effective HEC-RAS model.

Table 2: Summary of HEC-RAS Results

River Sta	W.S. Elev	Crit W.S.	Invert Slope	Vel Chnl	Top Width	Hydr Depth	Froude # Chl
	(ft)	(ft)		(ft/s)	(ft)	(ft)	
1.613	1402.85	1402.85	0.0245	7.66	746.93	1.33	1.09
1.598	1401.5	1401.5	0.0352	8.34	73.08	2.15	0.99
1.591	1400.24	1400.24	0.0333	8.56	68.07	2.25	1.01
1.578	1400.68		0.0073	4.75	104.41	3.35	0.36
1.567	1400.69	1398.59	-0.0048	4.55	147.97	2.92	0.38
1.557	1399.51	1399.5	-0.0054	9.44	98.73	1.74	0.96
1.546	1399.7	1399.7	0.0059	8.21	188.53	1.51	0.83
1.517	1398.3	1398.3	0.0052	8.11	263.2	1.22	0.79
1.482	1397.55		0.0127	8.3	279.28	1.62	0.74
1.461	1395.9	1395.9	0.0085	10.56	97.36	2.33	0.95
1.431	1394.66	1394.63	0.0037	9.01	153.65	1.69	0.83
1.397	1393.44	1393.24	0.0075	8.92	237.22	1.2	0.88
1.35	1392.09	1392.09	0.0049	8.12	304.42	1.16	0.78
1.294	1389.24	1389.24	0.01	7.77	187.05	1.29	0.85
1.255	1387.27	1387.11	0.0098	10.16	210.47	1.3	1.11
1.189	1385.22	1384.67		6.29	272.22	1.21	0.66

5.9.2 Verification or Comparison of Results

There was no verification of hydraulic modeling results completed for this study.

SECTION 6: Erosion, Sediment Transport, and Geomorphic Analysis

There was no erosion, sediment transport, or geomorphic analysis completed for this study.

SECTION 7: Draft FIS Data

7.1 Summary of Discharges

The discharged used for the entire HEC-RAS modeled reach is 1310 cfs, from the effective FIS.

7.2 Floodway Data

Table 3: Floodway Data Table

Flooding Source		Floodway			Base Flood Water Surface Elevation			
Cross Section	Distance*	Width (feet)	Section Area (sf)	Mean Velocity (fps)	Regulatory	W/out Floodway	With Floodway	Increase
					(Feet NAVD)			
Wash 11 East								
I	7,127	59	167.41	10.44	1392.09	1392.09	1392.13	0.04
J	8,166	67.43	177.97	9.28	1399.70	1399.70	1399.83	0.013
K	8,336	64.84	329.65	4.55	1400.68	1400.68	1400.97	0.28
L	8,442	73.08	157.18	8.34	1401.50	1401.50	1401.50	0.00

*Feet Above Confluence with Beardsley Canal

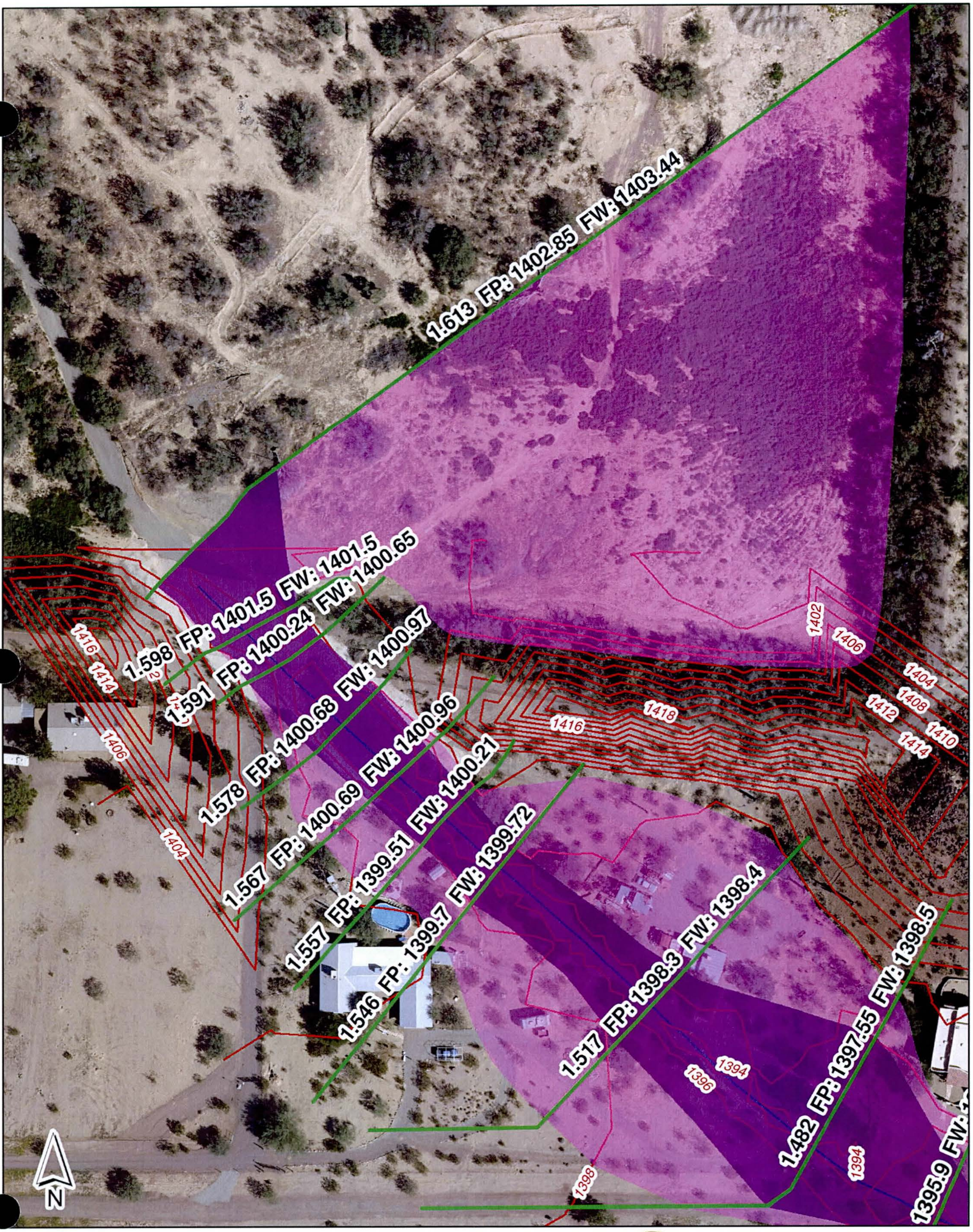
7.3 Annotated Flood Insurance Rate Maps

The annotated FIRM panel is attached at the end of this report.

7.4 Flood Profiles

A copy of the flood profile from HEC-RAS is included with this report, and a digital copy is included with the submittal.

EXHIBITS



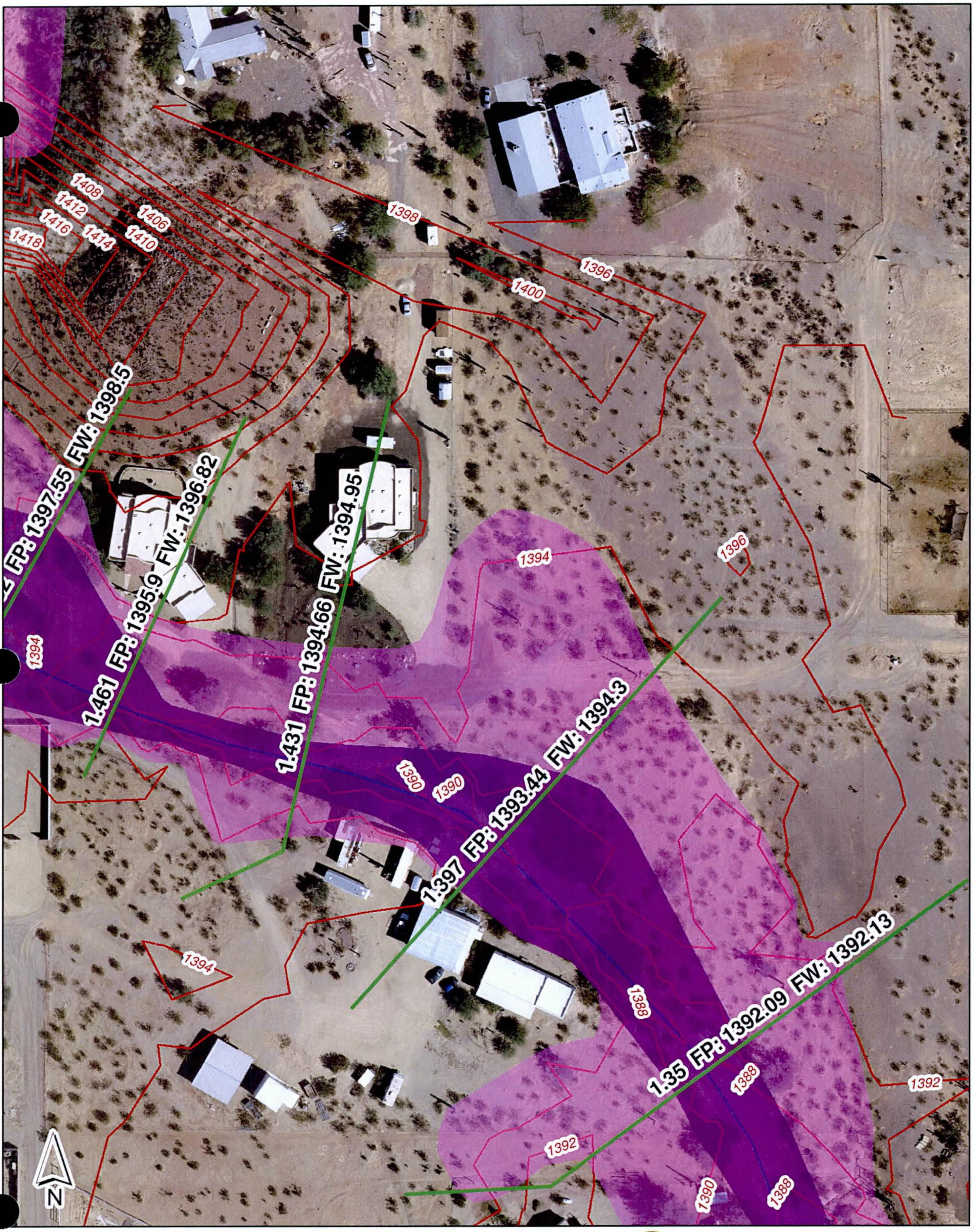
Legend

- Updated Floodway
- Updated Floodplain

0 25 50 100 150 200 Feet

Flood Control District of Maricopa County

Wash 11 East Redelineation From Bonita Lake to Jomax Road



Legend

Updated Floodway

Updated Floodplain

0 25 50 100 150 200 Feet

Flood Control District of Maricopa County

Wash 11 East Redelineation From Bonita Lake to Jomax Road

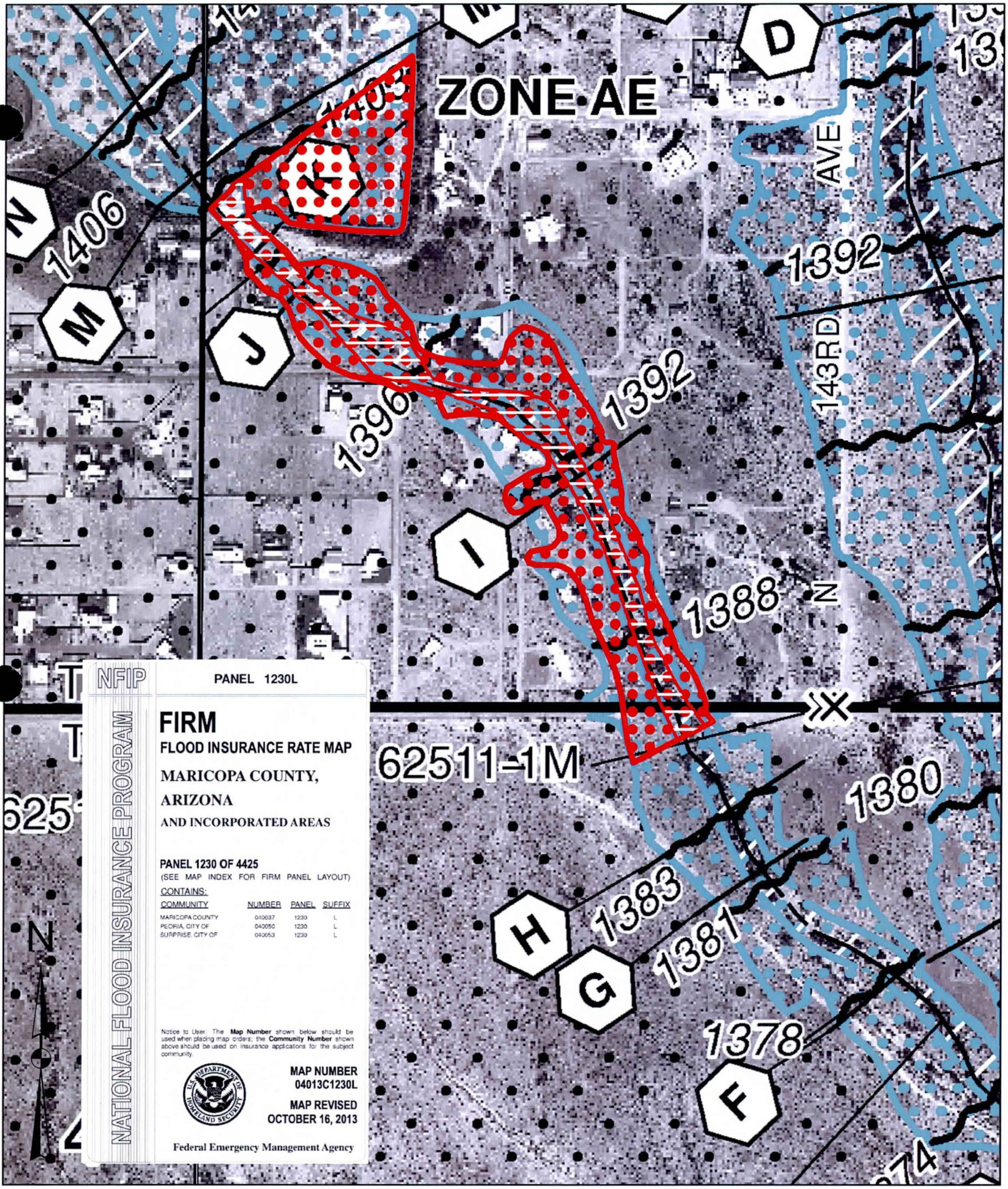
Legend

Updated Floodway
Updated Floodplain

0 25 50 100 150 200 Feet

Flood Control District of Maricopa County

Wash 11 East Redelineation From Bonita Lake to Jomax Road



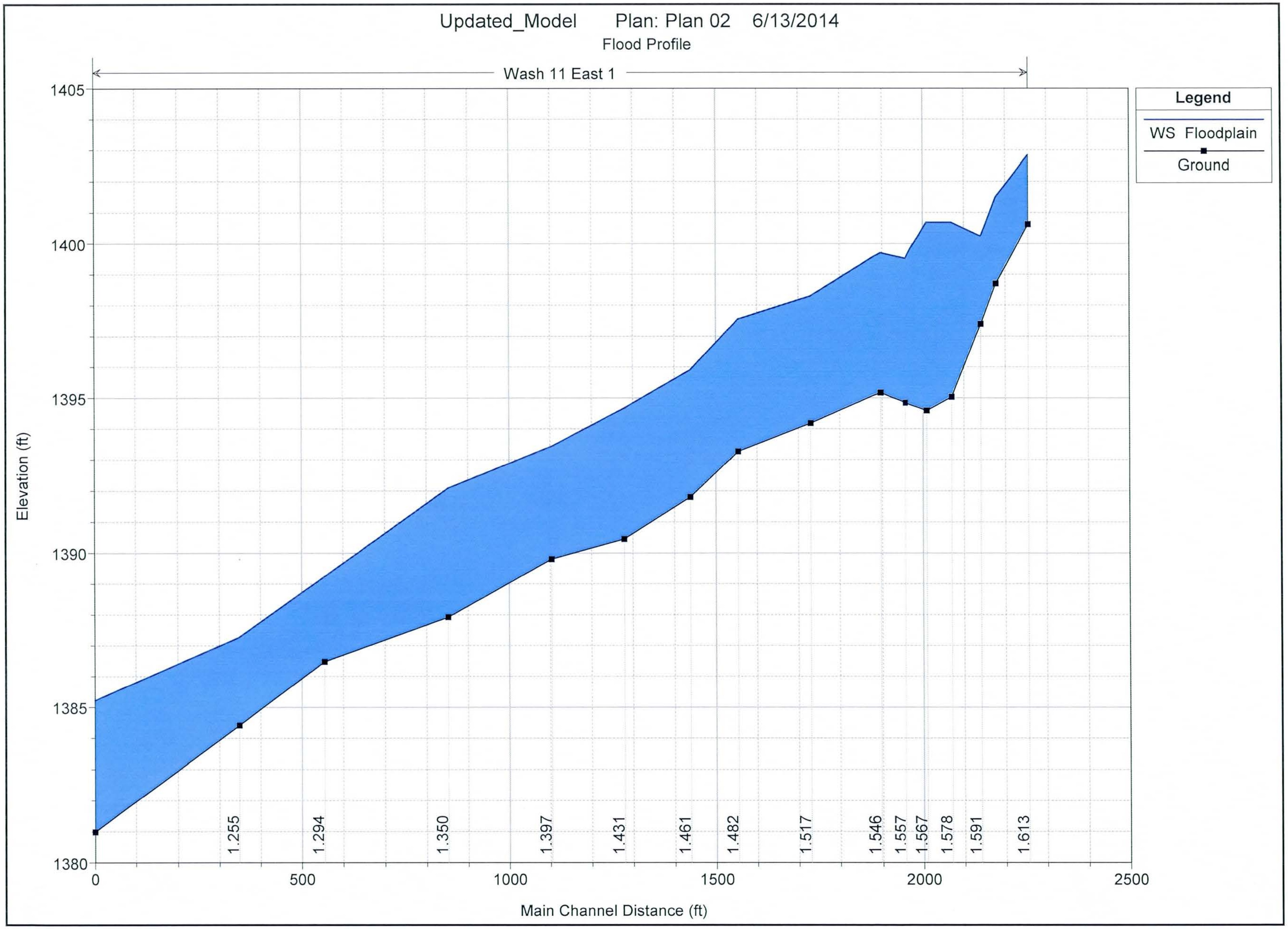
Legend

- Updated Floodplain
- Updated Floodway

0 125 250 500 750 1,000
Feet

Flood Control District of Maricopa County

ANNOTATED FIRM PANEL


Updated_Model Plan: Plan 02 6/13/2014
Flood Profile
Wash 11 East 1
Legend
WS Floodplain
Ground
Elevation (ft)
Main Channel Distance (ft)
1405
1400
1395
1390
1385
1380
0
500
1000
1500
2000
2500
1.255
1.294
1.350
1.397
1.431
1.461
1.482
1.517
1.546
1.557
1.567
1.578
1.591
1.613

APPENDICIES

APPENDIX A. REFERENCES

Referenced Documents

1. Entellus, Inc. *Wittmann Area Dranage Master Study Update.* Maricopa County, AZ. Completed for FCDMC, July 2005.

2. U.S. Army Corps of Engineers, 2010. *HEC-RAS River Analysis System Version 4.1.0 Jan 2010,* Davis, CA: Hydrologic Engineering Center.

3. U.S. Army Corps of Engineers, 2012. *HEC-GeoRAS 10.0 GIS Tools for Support of HEC-RAS using ArcGIS User's Manual,* Davis, CA: Hydrologic Engineering Center.

4. Environmental Systems Research Institute, 2011. *ArcGIS Desktop: Release 10.1,* Redlands, CA: s.n.

5. FCDMC. *Drainage Design Manual for Maricopa County: Hydraulics.* Maricopa County, AZ. August 2013.

APPENDIX B. Excerpt from the Wittmann Area Drainage Master Study Update

Flood Control District of Maricopa County

WITTMANN AREA DRAINAGE MASTER STUDY UPDATE

ADMSU FLOODPLAIN DELINEATIONS REPORT

VOLUME HD-2 OF 8

Registered Professional Engineer
CERTIFICATE NO. 29737
HERNAN A ARISTIZABAL
Date Signed 7/29/05
ARIZONA, U.S.A.

CONTRACT FCD 2002C029

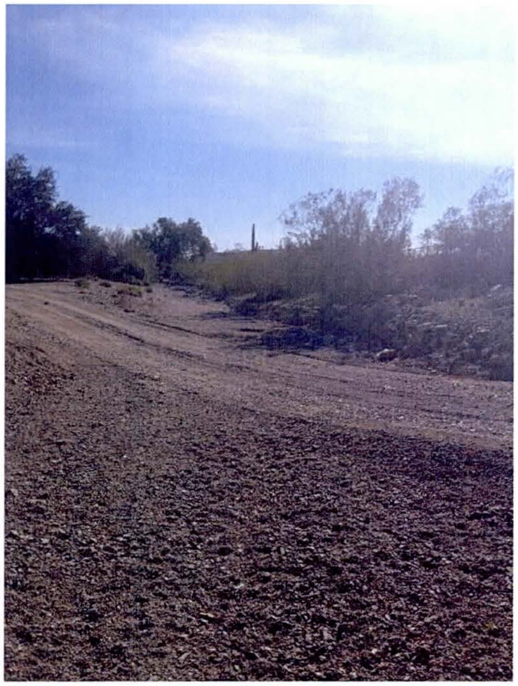
Entellus™

Flood Source and Location	Drainage Area (Sq. miles)	100 Year Discharge (cfs)
~1440 feet south of Jomax Rd	19.9	1310
At Bonita Dam	19.8	1300
~840 feet south of Patton Rd	14.4	1030
~580 feet west of Reems Rd	13.5	970
Bonita Dike Channel		
~2200 feet upstream of Wash 14 East confluence with Wash 13 East	N/A	140
Wash 12 East		
~780 feet south of Patton Rd	4.9	360
Wash 12 East-Split		
At Reems Rd	N/A	70
Wash 13 East		
~1400 feet south of Jomax Rd	21.6	1830
~2300 feet south of Jomax Rd	21.4	1810

APPENDIX C. MANNING'S N-VALUE CALCULATIONS

Photos from Field Visit

February 11th, 2014



Crossing of Red Bird Rd.

Looking Downstream of Red Bird Rd

Typical Overbank

Bed Material

Based on methodology from the Drainage Design Manual for Maricopa County: Hydraulics
See attached exerpt

Bonita Dam Channel N Value

Downstream of Concrete Spillway

Average size:	1"	
Base N value		0.03
Degree of irregularity		0
Variation in xsec		0
Effect of obstructions		0
Amount of Vegetation		0
Degree of meandering		1
Total N Value		0.03

Bonita Dam Bank N Value

Average size:	2.5"	
Base N value		0.035
Degree of irregularity		0.005
Variation in xsec		0
Effect of obstructions		0
Amount of Vegetation		0.02
Degree of meandering		1
Total N Value		0.06

TABLE 7.2
BASE VALUES OF n FOR UPPER-REGIME FLOWS IN SAND CHANNELS
[Modified from Benson and Dalrymple (1967)]

Median Size of Bed Material (mm)	Base n-value
0.2	0.012
0.3	0.017
0.4	0.020
0.5	0.022
0.6	0.023
0.8	0.025
1.0	0.026

7.6.2 Base Values of *n* for Stable Channels

A stable channel is defined as a channel in which the bed is composed of firm earth, gravel, cobbles, boulders, or bedrock and remains relatively unchanged through most of the range in flow (Aldridge and Garrett, 1973). Base n-values for stable channels have been determined mainly from field-verification studies. Base n-values for firm earth, gravel, cobble, and boulder channels can be selected by visually comparing the characteristics with those of channels that have known or verified coefficients (Barnes, 1967; Aldridge and Garrett, 1973; Phillips and Ingersoll, 1998), by comparing measured size of bed material with verified values of Manning's *n* (Table 7.3), or by use of equations derived from channel and hydraulic parameters and verified values of Manning's *n*. Base n-values for bedrock channels can be selected by visual comparison with bedrock channels where Manning's *n* has been verified.

TABLE 7.3
BASE VALUES OF MANNING'S n FOR CHANNELS CONSIDERED STABLE

Channel Type	Median Size of Bed Material		Base n-value	
	Millimeters	Inches	Benson and Dalrymple (1967)	Chow (1959)
Firm earth	---	---	0.025–0.032	0.020
Coarse sand	1–2	---	0.026–0.035	---
Fine gravel	---	---	---	0.024
Gravel	2–64	0.08–2.5	0.028–0.035	---
Coarse gravel	---	---	---	0.028

TABLE 7.3
BASE VALUES OF MANNING'S n FOR CHANNELS CONSIDERED STABLE

Channel Type	Median Size of Bed Material		Base n-value	
	Millimeters	Inches	Benson and Dalrymple (1967)	Chow (1959)
Cobble	64–256	2.5–10.5	0.030–0.050	---
Boulder	> 256	> 10	0.040–0.070	---

7.6.3 Equations for Selection of Base n-values for Stable Channels

Base n-values for stable channels also can be assigned through the use of equations developed from verified channel reaches that relate Manning's n to easily measured hydraulic and channel parameters (equations (7.3) and (7.4)). Several investigators have presented data that indicate trends exist among depth or hydraulic radius, median grain size diameter, and verified base values of n. For example, Limerinos (1970) examined verified values of n for 11 streams in California (Figure 7.6). Limerinos developed an equation to assign base n-values for stable channels that is expressed as:

$$n = \frac{0.0926R^{1/6}}{1.16 + 2.0\log\left(\frac{R}{d_{84}}\right)} \qquad (7.3)$$

where: R = hydraulic radius, in feet, and

d_{84} = intermediate diameter of bed material, in feet, that equals or exceeds that of 84 percent of the particles.

FIGURE 7.5
TYPICAL COBBLE-BED CHANNEL IN CENTRAL ARIZONA
for Which Manning's **n** was Verified
(Used for Development of Equation (7.4))

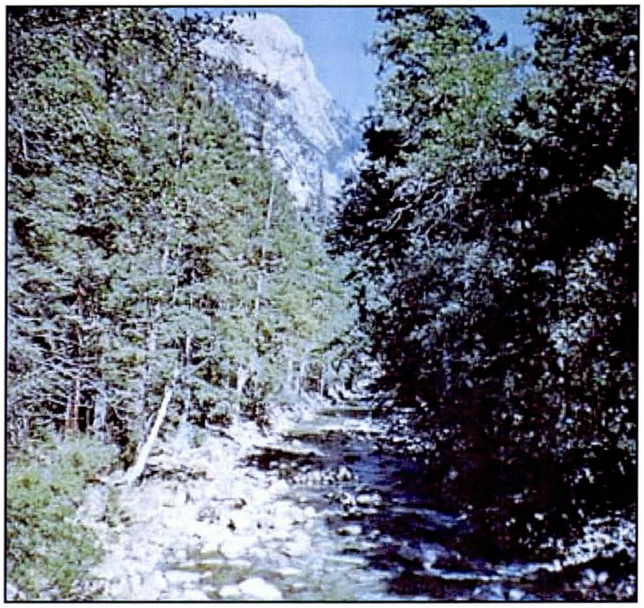
A similar equation was developed for generally lower-gradient stable channels in central Arizona for which the base n-value was the only perceivable factor that contributed to total roughness (Figure 7.5; Phillips and Ingersoll, 1998). That equation is in the form of:

$$n = \frac{0.0926R^{1/6}}{1.46 + 2.23\log\left(\frac{R}{d_{50}}\right)} \tag{7.4}$$

where: d_{50} = intermediate diameter of bed material, in feet, that equals or exceeds that of 50 percent of the particles.

The equation was developed by utilizing channels with a median diameter of bed material that ranged from 0.28 to 0.36 foot. These equations have their limitations, but can be utilized as a check or reference for assigning base values of *n*.

FIGURE 7.6
TYPICAL HIGH-GRADIENT COBBLE-BED CHANNEL IN CALIFORNIA
for Which Manning's **n** was Verified and Utilized for Development of Equation (7.3)



7.6.4 Flow Depth and Channel Gradient

Previous investigations indicate there is a relation between depth of flow and n-values (Jarrett, 1985; Phillips and Ingersoll, 1998). In the absence of bank vegetation and other obstructions, the roughness coefficient for flows in a uniform stable streambed generally decreases with increasing depth of flow (equations (7.3) and (7.4)). With increased flow depth, the energy losses associated with the channel-bed roughness elements generally become less significant. As flow approaches bank-full stage, the roughness coefficient may approach a constant value for a given median bed-size material (Limerinos, 1970; Jarrett, 1985; Phillips and Ingersoll, 1998).

Channel roughness seems to be directly related to channel gradient or slope (Riggs, 1976; Jarrett, 1985). Channels with low gradients have been shown to have lower roughness coefficients than channels with high gradients (Jarrett, 1985). Because of the relation between channel slope, size of bed material, and energy losses, the effect of slope on *n* should be considered in the selection of base n-values (Aldridge and Garrett, 1973). Information presented by Jarrett (1985) can be used as a reference for selecting n-values that may be impacted by the channel gradient.

7.6.5 Values and Descriptions For Components of Manning's n

The general procedure for determining n-values is to select a base value of *n* for the bed material (Table 7.2 and Table 7.3) and then select *n*-value adjustments for channel irregularities, alignment, obstructions, vegetation, and other factors (Table 7.4; Cowen, 1956). Utilizing this procedure, the value of *n* is computed as follows:

$$n = (n_0 + n_1 + n_2 + \dots + n_n)m \tag{7.5}$$

where:

n_0	=	base value of *n* for a straight, uniform channel,
$n_1, n_2, \dots, n_n$	=	adjustments for roughness factors other than meanders, and
m	=	adjustments for meanders.

Degree of Channel Irregularity

The impact of channel irregularity may be negligible where channel margins are extremely smooth (Figure 7.7). Roughness caused by eroded and scoured banks, projecting points, and exposed tree roots along the channel margins, however, can be accounted for by adding adjustments to the base value of *n* (Figure 7.8 and Figure 7.9). Chow (1959) and Benson and Dalrymple (1967) indicate that severely eroded and scoured banks can increase n-values by as much as 0.020 (Figure 7.10; Table 7.4).

FIGURE 7.7
THE MANNING'S n COMPONENT FOR CHANNEL BANK IS CONSIDERED SMOOTH
with a Corresponding Component of 0.000 (Table 7.4)

FIGURE 7.8
THE MANNING'S n COMPONENT FOR THE ERODED AND SCOURED BANKS
is Considered Moderate with a Range of 0.006 to 0.010 (Table 7.4)

FIGURE 7.9
THE MANNING'S n COMPONENT FOR THE ERODED AND SLIGHTLY SCOURED BANKS
is Considered Minor with a Range of 0.001 to 0.005 (Table 7.4)

Variation in Channel Cross Section

Gradual changes in the size and shape of a channel cross section should have no impact on energy losses (Figure 7.11). Where large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side, adjustments to the base n-value can range from 0.001 to 0.005. Chow (1959) gave a maximum increase of 0.015 in channels where large and small cross sections alternate frequently or where the low-water channel frequently shifts from side to side (Table 7.4).

TABLE 7.4
ADJUSTMENT FACTORS OR COMPONENT RANGES FOR VARIOUS CHANNEL CONDITIONS
Used to Determine Manning's n-values

(Adjustment to degree of meandering values apply to flow confined in the channel and does not apply where flow crosses meanders; Modified from Cowen, 1956; and Chow, 1959.)

Channel Conditions	Manning's n Adjustment	Example
Degree of irregularity		
Smooth	0.000	Smoothest channel attainable in a given bed material.
Minor	0.001–0.005	Channels with slightly scoured or eroded side slopes.
Moderate	0.006–0.010	Channels with moderately sloughed or eroded side slopes.
Severe	0.011–0.020	Channels with badly sloughed banks; unshaped, jagged, and irregular surfaces of channels in rock.
Variation in channel cross section		
Gradual	0.000	Size and shape of channel cross sections change gradually.
Alternating occasion-ally	0.001–0.005	Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross section shape.
Alternating frequently	0.010–0.015	Large and small cross sections alternate frequently, or the main flow frequently shifts from side to side owing to changes in cross section shape.
Effects of obstructions		
Negligible	0.000–0.004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, which occupy less than 5 percent of the channel.
Minor	0.005–0.015	Obstructions occupy from 5 to 15 percent of the cross section area and spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved, smooth-surfaced objects than are used for sharp-edged, angular objects.
Appreciable	0.020–0.030	Obstructions occupy from 15 to 50 percent of the cross section area, or the space between obstructions is small enough to cause the effects of severe obstructions to be additive, thereby blocking an equivalent part of a cross section.

TABLE 7.4
ADJUSTMENT FACTORS OR COMPONENT RANGES FOR VARIOUS CHANNEL CONDITIONS
Used to Determine Manning's n-values

(Adjustment to degree of meandering values apply to flow confined in the channel and does not apply where flow crosses meanders; Modified from Cowen, 1956; and Chow, 1959.)

Channel Conditions	Manning's n Adjustment	Example
Severe	0.040–0.060	Obstructions occupy more than 50 percent of the cross section area, or the space between obstructions is small enough to cause turbulence across most of the cross section.
Amount of vegetation		
Negligible	0.000–0.002	Grass, shrubs, or weeds were permanently laid over during flow.
Small	0.002–0.010	Dense growths of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation where the vegetation is not laid over. Trees, such as willow, cottonwood, or saltcedar, growing where the average depth of flow is at least three times the height of the vegetation. Flow depth is about two times the tree height, and the trees are laid over.
Medium	0.010–0.025	Moderately dense grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of vegetation; brushy, moderately dense vegetation, similar to 1- to 2-year-old willow trees growing along the banks. A few 8 to 10-year old willow, cottonwood, mesquite, or palo verde, which blocks flow by approximately 1 to 10 percent, and spheres of influence or turbulence do not overlap.
Large	0.025–0.050	8- to 10-year-old willow, cottonwood, mesquite or palo verde trees (block flow by approximately 10 to 30 percent where the sphere's of influence overlap) intergrown with some weeds and brush where the hydraulic radius exceeds 2 feet.
Very large	0.050–0.100	Bushy willow trees about 1-year old intergrown with weeds alongside slopes or dense cattails growing along the channel bottom; trees intergrown with weeds and brush. Moderately dense (blocks flow by approximately 30 to 50 percent and the sphere's of influence overlap) 8- to 10-year old trees spaced randomly throughout channel where depth of flow approximates height of vegetation.

TABLE 7.4
ADJUSTMENT FACTORS OR COMPONENT RANGES FOR VARIOUS CHANNEL CONDITIONS
Used to Determine Manning's n-values

(Adjustment to degree of meandering values apply to flow confined in the channel and does not apply where flow crosses meanders; Modified from Cowen, 1956; and Chow, 1959.)

Channel Conditions	Manning's n Adjustment	Example
Extremely large	0.100–0.200	Mature (greater than 10 years old) willow trees and tamarisk intergrown with brush and blocking flow by more than 70 percent of the flow area, causing turbulence across most of the section. Depth of flow is less than average height of the vegetation. Dense stands of palo verde or mesquite that block flow by 70 percent or more and hydraulic radius is about equal to or greater than average height of vegetation.
Degree of meandering		
Minor	1.00	Ratio of the channel length to valley length is 1.0 to 1.2.
Appreciable	1.15	Ratio of the channel length to valley length is 1.2 to 1.5.
Severe	1.30	Ratio of the channel length to valley length is greater than 1.5.

FIGURE 7.10
THE MANNING'S n COMPONENT FOR THE SLOUGHED BANKS
(Jagged and irregular surfaces are considered severe with a range of 0.011 to 0.020 (Table 7.4))

FIGURE 7.11
CHANNEL REACH WHERE THE SIZE AND SHAPE OF SECTIONS CHANGES GRADUALLY
(The Manning's n component for this example is considered negligible or 0.000 (Table 7.4))

Effect of Obstructions

Isolated boulders, debris deposits, logs, power poles and towers, and bridge piers that disturb the flow pattern in the channel increase energy losses, or n-values (Figure 7.12 - Figure 7.16). The amount of increase depends on the shape of the obstruction, its size in relation to other roughness elements in the cross section, the number, arrangement, and spacing of the obstructions, and the magnitude of flow velocity (Aldridge and Garrett, 1973). When the flow velocity is high, an obstruction exerts a sphere of influence that can be much larger than the obstruction because the obstruction can affect the flow pattern for considerable distances on each side. At velocities that generally occur in channels that have gentle to moderately steep slopes, the sphere of influence is about 3 to 5 times the width of the obstruction (Figure 7.12; Aldridge and Garrett, 1973). Several obstructions create overlapping spheres of influence and can cause considerable disturbance and loss of energy even though the obstructions may occupy only a small part of the cross section. Aldridge and Garrett (1973) assigned values to four degrees of obstructions (Table 7.4).

FIGURE 7.12
GENERAL FLOW DISTURBANCE CAUSED BY BRIDGE PIERS
at Colorado River near Moab, Utah

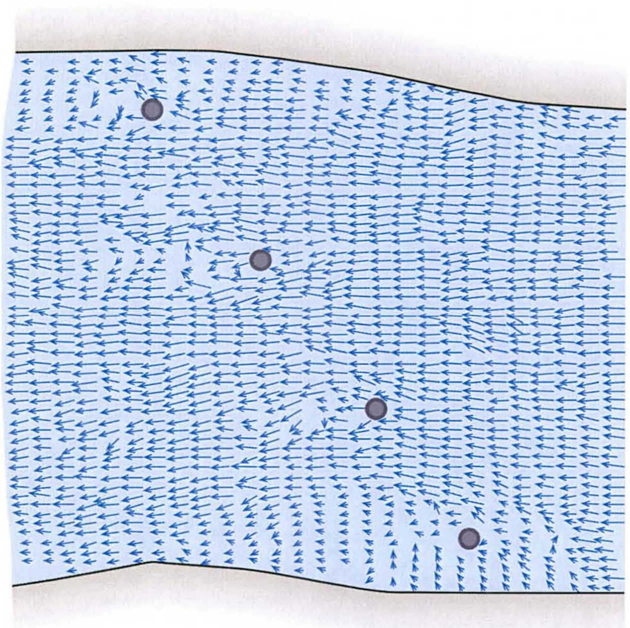


FIGURE 7.13
LARGE ANGULAR BOULDER IN MIDCHANNEL

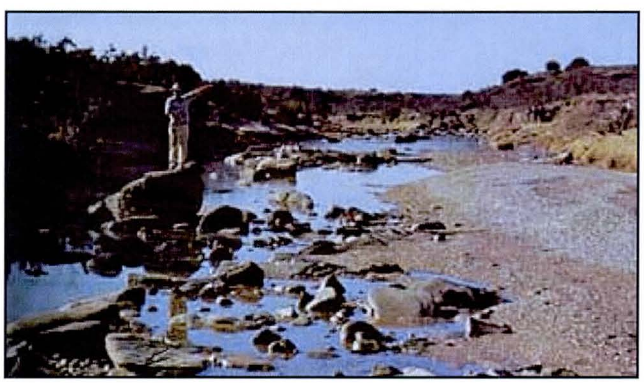


FIGURE 7.14
POWER POLE OBSTRUCTING LESS THAN 5 PERCENT OF THE CHANNEL AREA
(The Manning's n component for the obstruction is considered negligible, with a corresponding range of 0.000 to 0.004 (Table 7.4))

FIGURE 7.15
REMOVED BRUSH CAUGHT ON MORE FLOW RESISTANT VEGETATION
(Resulting in a localized angular obstruction with a larger sphere of influence than the resistant vegetation alone)

FIGURE 7.16
BRIDGE PIER DEBRIS
(The Manning's n component is considered to range from 0.005 to 0.015 (Table 7.4))

Amount of Vegetation

The degree to which vegetation affects flow depends on the depth of flow relative to vegetation height, the percentage of flow obstructed by the vegetation, the degree to which vegetation is affected or flattened by high water, and the alignment of vegetation relative to the flow (Figure 7.17 - ; Phillips, et al., 1998). In wide channels having small depth to width ratios and no vegetation on the channel bed, the effect of bank vegetation is generally small, and the maximum adjustment is about 0.005. If the channel is relatively narrow and has steep banks covered by dense vegetation that hangs over the channel, the maximum adjustment would be about 0.030. The larger adjustment values given in Table 7.4 apply primarily in places where vegetation covers most of the main channel. If vegetation is the primary factor that affects *n*, as in flood plains, in parts of a channel that are seldom flooded, or in the main channel of ephemeral or intermittent streams, the n-value is assigned for the vegetation rather than for the material in which it is growing (Thomsen and Hjalmarson, 1991). Similar to the impact of obstructions on energy losses, at flow velocities that generally occur in channels that have gentle to moderately steep slopes, the sphere of influence can be about 3 to 5 times the width of the vegetation. Closely clumped trees or reaches where flow-resistant vegetation blocks flow by more than 50 percent of the cross sectional area can create overlapping spheres of influence and can cause considerable disturbance and loss of energy with n-value adjustments that range from 0.050 to 0.200 (Table 7.4).

APPENDIX D. SURVEY INFORMATION

Bonita Dam Topo

Meta Data:
Vertical Datum: NAVD 88
Coordinate System: US State Plane 1983
Zone: Arizona Central 0202
Datum: NAD 1983 (NSRS 2007)
Geoid Model: Geoid09AZ
Note: The elevations were adjusted by -0.25ft. Reference Control Report for details

LEGEND

NG	Natural Ground
TB	Top of Bank

Point #	Northing	Easting	Elevation	Description
101	991558.6	562062.1	1384.171	TB
102	991559.9	562066.1	1382.548	TOE
103	991563	562077	1381.923	TOE
104	991564	562079.8	1382.825	TB
105	991566.7	562106.2	1383.627	TB
106	991566.8	562109.8	1382.953	TOE
107	991567	562116.4	1382.5	TOE
108	991564.6	562128	1383.406	TB
109	991624.3	562116.7	1384.533	TB
110	991622.3	562110.5	1383.845	TOE
111	991618.5	562091.7	1383.289	TOE
112	991617.2	562085.6	1383.914	TB
113	991610.4	562061.7	1384.63	TB
114	991608.2	562053.7	1382.64	TOE
115	991603.1	562047.4	1382.353	TOE
116	991602.8	562046.7	1383.774	TB
117	991690.6	562001.3	1384.531	TB
118	991692.1	562004.7	1383.413	TOE
119	991695.2	562014.6	1384.298	TOE
120	991699	562023.9	1385.846	TB
121	991714.1	562040.7	1386.171	TB
122	991715.2	562047.2	1385.081	TOE
123	991724.9	562078.7	1384.632	TOE
124	991726.8	562085.2	1386.214	TB
125	991804.8	562044.5	1385.264	TB
126	991801.9	562039.4	1384.504	TOE
127	991799	562033	1384.316	TOE
128	991794.4	562024.9	1385.121	TB
129	991778.1	561996.7	1386.252	TB
130	991774.9	561988.7	1385.207	TOE
131	991770.5	561970.4	1384.012	TOE
132	991760.6	561956	1386.745	TB
133	991844.6	561928.7	1386.93	TB
134	991847.1	561936.3	1385.41	TOE

135	991853.6	561965.2	1385.768	TOE
136	991854.9	561970.9	1386.679	TB
137	991847.3	561993.1	1386.95	TB
138	991849.5	561997.6	1385.783	TOE
139	991858.9	562014.2	1384.201	TOE
140	991862.9	562020.3	1387.094	TB
141	992003.9	561865.6	1388.838	TB
142	992005.8	561870.3	1387.828	TOE
143	992005.7	561895.6	1387.292	NG
144	992005.6	561907.5	1386.394	NG
145	992005.1	561941.1	1386.436	TOE
146	992008.5	561966.7	1390.359	TB
147	992115.9	561850.6	1388.92	TB
148	992118.3	561855.2	1387.373	TOE
149	992131	561888.2	1386.981	TOE
150	992138.2	561900.6	1389.275	TB
151	992214.9	561785.4	1390.832	TB
152	992223	561793.3	1388.679	TOE
153	992258.8	561820.8	1387.68	TOE
154	992265.4	561830.9	1390.658	TB
155	992335.8	561762.3	1390.892	TB
156	992322.1	561753.2	1388.457	TOE
157	992306.6	561738.9	1387.618	TOE
158	992295	561729.4	1391.82	TB
159	992405.3	561714.9	1392.67	TB
160	992392.5	561701.9	1388.555	TOE
161	992372.9	561672.7	1390.119	TOE
162	992367.2	561667.5	1392.729	TB
163	992453.2	561576.4	1393.716	TB
164	992461	561579	1390.396	TOE
165	992488.1	561595.4	1388.434	TOE
166	992498.1	561602.3	1392.998	TB
167	992522.5	561467.1	1392.246	TB
168	992516.9	561465.7	1390.731	TOE
169	992501.4	561460.8	1390.44	TOE
170	992489.1	561456	1393.454	TB
171	992548.7	561369.8	1393.045	TB
172	992539.8	561366.4	1390.779	TOE
173	992532.2	561362.9	1391.551	TOE
174	992511.9	561356.1	1395.941	TB
175	992572	561615.9	1393.696	NG
176	992667.6	561606.2	1393.966	NG
177	992760.9	561608	1394.737	NG
178	992851.3	561603	1395.601	NG
179	992869.9	561695.5	1400.291	NG
180	992778.3	561704.6	1397.182	NG
181	992687	561709.9	1394.016	NG

182	992590	561723.7	1393.208	NG
183	992583.9	561821.3	1394.711	NG
184	992678.3	561814.3	1396.275	NG
185	992772.8	561821.9	1394.086	NG
186	992875.1	561820.4	1394.453	NG
187	992884.4	561914.6	1394.609	NG
188	992789	561917	1392.984	NG
189	992692.3	561915.8	1392.292	NG
190	992601.9	561912.9	1393.239	NG
191	992534.9	561483	1391.96	NG
192	992531.2	561580.7	1394.186	NG
193	992524.1	561678.2	1393.429	NG
194	992514.6	561773.6	1392.591	NG
195	992508.8	561872.6	1394.606	NG
196	992504.5	561913.5	1394.843	NG
197	992429.8	561908.2	1394.435	NG
198	992448	561822.2	1391.301	NG
199	992445.4	561729.3	1392.439	NG
200	992364.7	561767.2	1392.173	NG
201	992384	561907	1394.03	NG
202	992304.3	561912.9	1393.64	TB
203	992370.5	561877.4	1394.346	TB
204	992418.9	561865.4	1395.246	TB
205	992464	561857.6	1395.08	TB
206	992460.3	561841.2	1392.731	TOE
207	992395.2	561855.1	1391.669	TOE
208	992338.5	561876.1	1390.904	TOE
209	992292.1	561900.3	1391.057	TOE
210	992283.1	561870.7	1390.361	NG
211	992353.8	561819.6	1391.856	NG
212	992219.5	561882.6	1390.445	NG
215	991567.8	561768.1	1388.054	NG
216	991601.2	561770.9	1388.239	NG
217	991612.5	561849.2	1387.457	NG
218	991568.8	561848.2	1387.204	NG
219	991568.7	561932.6	1386.493	NG
220	991572.2	562023	1385.075	NG
221	991611.7	562001.8	1385.373	NG
222	991611.2	561947.1	1386.804	NG
223	991656.1	561913.6	1386.802	NG
224	991665.9	561973	1385.967	NG
225	991726.7	561955.6	1386.674	NG
226	991717.6	561906.4	1386.596	NG
227	991778.3	561901.1	1386.581	NG
228	991791.3	561929.5	1387.483	NG
229	991836.4	561897.5	1387.43	NG
230	991840	561912.6	1388.052	NG

231	991886.1	561891.1	1387.855	NG
232	991933.6	561892.6	1387.258	NG
233	991932.5	561904.7	1387.658	NG
234	991925.7	561926.6	1386.099	NG
235	991915.9	561955.5	1387.035	NG
236	991908.1	561971.9	1386.312	TB
237	991908.8	561974.7	1385.191	TOE
238	991907.4	561986.7	1385.481	TOE
239	991908.5	561997.8	1387.788	TB
240	991960.7	561862.1	1388.903	NG
241	992154.4	561899.8	1389.404	NG
243	991876.7	561757.3	1389.658	NG HOUSE
244	991852.2	561774.4	1388.945	NG
245	991839.2	561726.2	1389.669	NG
246	991823.7	561668	1390.185	NG
247	991810.9	561622	1390.444	NG
248	991858	561621.9	1390.62	NG
249	991896.4	561621.7	1390.764	NG
250	991892.4	561652.7	1390.451	NG
251	991867	561682.4	1390.225	NG
252	991869.6	561722.5	1389.55	NG
253	991908.1	561719.8	1389.801	NG
254	991918.7	561676.6	1390.052	NG
255	991942	561721.6	1390.277	NG HOUSE
256	991954.5	561749	1390.336	NG HOUSE
257	991961.4	561847.1	1388.784	NG STRUCTURE
258	991947.8	561850.7	1388.356	NG STRUCTURE
259	991945.8	561839.6	1388.435	NG STRUCTURE
260	991958.9	561836.5	1388.645	NG STRUCTURE
261	991911.3	561839.2	1388.512	NG
262	991895.2	561869.9	1388.422	NG
263	991927.5	561870.5	1388.115	NG
264	992000.6	561854.4	1388.546	NG
265	992033.7	561836.2	1389.069	NG
266	992006.2	561796.2	1389.273	NG
267	992064.5	561813.6	1390.096	NG
268	992076.9	561772.2	1389.567	NG
269	992059	561733.8	1390.762	NG
270	992003.2	561749.8	1389.704	NG
271	991984.9	561718.3	1390.292	NG STRUCTURE
272	991968.8	561734.2	1390.384	NG STRUCTURE
273	991946.1	561714.6	1390.364	NG STRUCTURE
274	991963.6	561695.2	1390.295	NG STRUCTURE
275	992036.6	561689.3	1390.471	NG
276	992011.1	561639.4	1390.379	NG
277	991960.8	561659.1	1390.076	NG
278	991922.1	561617.7	1390.638	NG

279	991973	561615.5	1390.553	NG
280	992025.6	561605.8	1391.011	NG
281	991574.2	562346.6	1385.136	NG
282	991640	562333.7	1385.419	NG
283	991702.7	562328.2	1386.074	NG
284	991771.9	562322.1	1387.498	NG
285	991844.6	562262.8	1388.267	NG
286	991759.6	562262.8	1386.557	NG
287	991693.1	562267.8	1386.281	NG
288	991633.4	562272.7	1385.394	NG
289	991574.9	562268.8	1385.263	NG
290	991568.5	562201.5	1387.901	NG
291	991644.6	562188.6	1387.315	NG
292	991702.5	562173.9	1388.097	NG
293	991774.4	562163.7	1389.253	NG
294	991837.2	562158.4	1389.906	NG
295	991918.4	562163.1	1389.034	NG
296	991908.4	562122.7	1390.682	NG
297	991896.7	562093.6	1390.583	NG
298	991832	562103.7	1389.745	NG
299	991749.6	562118.5	1389.071	NG
300	991699.1	562129.4	1386.852	NG
301	991693.2	562143.9	1386.991	TOE
302	991643.1	562146.4	1385.931	TOE
303	991578.4	562173.6	1385.464	TOE
304	991580.5	562184.1	1387.511	TB
305	991635	562160.3	1387.496	TB
306	991686.4	562155.1	1388.282	TB
307	991712.2	562127.9	1388.533	TB
308	991708.9	562116.3	1387.084	TOE
309	991742.6	562089.8	1386.115	TOE
310	991748.5	562099.1	1388.88	TB
311	991789.2	562096.6	1389.039	TB
312	991790.7	562084.5	1387.67	TOE
313	991851.7	562081.4	1389.459	NG
314	991909.8	562081.9	1390.592	NG STRUCTURE
315	991905.1	562069.1	1390.175	NG STRUCTURE
316	991960	562050.4	1390.799	NG STRUCTURE
317	991965.6	562064.5	1391.059	NG STRUCTURE
318	991980.1	562071.2	1391.175	NG
319	991990.6	562106.1	1390.439	NG
320	992003.9	562138.5	1389.64	NG
321	992045	562121.2	1390.081	NG
322	992088.9	562100.4	1390.543	NG
323	992092.8	562039.3	1391.48	NG
324	992022.9	562042.5	1391.446	NG
325	991965	562003.7	1388.716	NG

326	992032.6	561993.1	1388.988	NG
327	992082.4	561953.8	1389.091	NG
328	992072.4	561974.1	1388.713	TOE
329	992076.4	561984.8	1390.32	TB
330	992108	561953.5	1388.908	TOE
331	992116.9	561963.4	1392.521	TB
332	992169.9	561942.5	1392.67	TB
333	992171.2	561932.9	1390.677	TOE
334	992234	561930.5	1391.386	TB
335	992231.2	561916.4	1390.149	TOE
336	992275.7	561926.4	1393.313	NG
337	992374.8	561930.5	1393.649	NG
338	992476	561924.2	1394.729	NG
339	992473.6	562020.9	1391.935	NG
340	992367.6	562027.5	1393.233	NG
341	992258.5	562035	1392.146	NG
342	992163.8	562034.3	1391.595	NG
343	992099.3	561705.1	1392.41	NG HOUSE
344	992083.9	561677.8	1392.33	NG HOUSE
345	992146	561673.7	1392.666	NG HOUSE
346	992130.4	561650.2	1392.741	NG HOUSE
347	992199.2	561415.1	1393.074	NG
348	992207.8	561529.1	1392.763	NG
349	992203.9	561634	1391.791	NG
350	992202.6	561737.8	1390.814	NG
351	992206.9	561775.6	1391.048	NG
352	992144.6	561437	1392.847	NG
353	992144.1	561529.9	1392.408	NG
354	992148.5	561636.9	1391.926	NG
355	992148.9	561728.4	1390.798	NG
356	992157	561780.2	1389.941	NG
357	992134.7	561720.8	1390.971	NG
358	992109.5	561772.6	1389.994	NG
359	992057.7	561641.4	1390.905	NG
360	992046.7	561594.9	1391.32	NG
361	992044.6	561544	1391.49	NG
362	992088.3	561474.6	1392.291	NG
363	992095	561544.3	1391.524	NG
364	992096.6	561616.6	1391.605	NG
365	992711.7	560893.3	1399.802	NGHOUSE
366	992726.1	560801.5	1400.132	NG HOUSE
367	992783.6	560803.2	1400.139	NG HOUSE
368	992779.9	560884.9	1400.129	NG HOUSE
369	992785.2	560767.9	1400.288	NG
370	992731.2	560765.6	1400.151	NG
371	992670.2	560773.7	1399.76	NG
372	992605.4	560766.9	1399.223	NG

373	992609.2	560861.1	1399.213	NG
374	992610.1	560958.9	1398.306	NG
375	992605.4	561058.9	1397.725	NG
376	992598	561171.9	1397.119	NG
377	992630.5	561137.2	1397.156	NG
378	992643.4	561033.6	1398.155	NG
379	992644.9	560939.8	1398.527	NG
380	992640.9	560839.8	1399.782	NG
381	992687	560838.5	1399.9	NG
382	992690	560937.7	1398.777	NG
383	992711.7	561034.1	1398.065	NG
384	992761.4	560998.8	1397.424	NG
385	992753.4	560938.9	1399.145	NG
386	992801.9	560942.7	1397.664	NG
387	992805.4	560884.1	1399.991	NG
388	992811.4	560827.8	1400.022	NG
389	992813.7	560770.2	1400.608	NG
390	992874	560772.2	1400.718	NG
391	992863.4	560819.2	1400.748	NG
392	992864.2	560864.1	1398.771	NG
393	992902.7	560822.6	1398.809	NG
394	992909.3	560774.9	1401.089	NG
395	992944.9	560765.7	1401.277	NG
396	992944.4	560799.2	1398.915	TB
397	992952.8	560809.5	1395.15	TOE
398	992981.5	560837.6	1395.46	TOE
399	992996.2	560851.8	1401.67	TB
400	992965	560887.4	1402.039	TB
401	992948.6	560869.6	1394.729	TOE
402	992922.6	560840.9	1394.45	TOE
403	992911.3	560833	1398.641	TB
404	992877.5	560878.6	1398.382	TB
405	992883.2	560883.2	1394.765	TOE
406	992905.6	560904.8	1394.772	TOE
407	992915.2	560916.2	1399.213	TB
408	992878.5	560943.5	1399.059	TB
409	992872.9	560936.7	1394.949	TOE
410	992851.9	560918.1	1395.174	TOE
411	992848.3	560915.4	1397.608	TB
412	992820.7	560954.1	1398.074	TB
413	992823.7	560957.7	1395.34	TOE
414	992841.7	560977	1395.125	TOE
415	992845.6	560980.8	1397.878	TB
416	992812.8	561014	1397.161	TB
417	992809	561009.8	1394.265	TOE
418	992784.1	560997.8	1395.138	TOE
419	992779.6	560994.8	1398.136	TB

420	992740	561040.5	1397.199	TB
421	992743.9	561044.1	1394.29	TOE
422	992761.1	561058.8	1394.476	TOE
423	992765.1	561062	1397.608	TB
424	992726.2	561116.3	1396.129	TB
425	992720	561112.9	1394.391	TOE
426	992696.8	561096	1393.65	TOE
427	992686.8	561087.3	1397.136	TB
428	992652.3	561133.9	1396.158	TB
429	992655.7	561139.1	1394.311	TOE
430	992672.9	561159.1	1393.965	TOE
431	992677.1	561163.4	1396.343	TB
432	992603	561213	1394.298	TB
433	992605.8	561214.9	1392.573	TOE
434	992615.4	561222.9	1392.846	TOE
435	992619.2	561225.4	1394.363	TB
436	992623.3	561242.9	1394.082	NG
437	992653.8	561221.6	1394.111	NG
438	992704.1	561244.3	1395.814	NG
439	992699.8	561200.3	1396.231	NG
440	992727.9	561158.8	1396.745	NG
441	992762.2	561203.4	1396.319	NG
442	992776.5	561232.7	1396.558	NG
443	992781.7	561250.2	1398.98	NG
444	992831.4	561245.4	1402.94	NG
445	992804.7	561204.3	1396.833	NG
446	992779.7	561164.6	1397.023	NG
447	992748.8	561133.9	1397.669	NG STRUCTURE
448	992772.1	561141.3	1397.619	NG STRUCTURE
449	992791.8	561082.5	1397.959	NG STRUCTURE
450	992778.9	561075.9	1397.82	NG STRUCTURE
451	992755.8	561106.7	1397.639	NG STRUCTURE
452	992827.6	561133.1	1397.092	NG
453	992851.8	561166.5	1396.268	NG
454	992859.9	561250.4	1406.106	NG
455	992911	561240.7	1407.872	TOE
456	992900.7	561178.1	1399.975	TOE
457	992909.6	561114.3	1398.605	TOE
458	992916.8	561053.3	1399.024	TOE
459	992931.2	560981.1	1400.137	TOE
460	992936.1	560925.3	1401.557	TOE
461	992959.1	560947.7	1411.955	TB
462	992970.1	560993.5	1420.82	TB
463	992963	561042	1420.673	TB
464	992953.6	561105.4	1420.15	TB
465	992946.3	561166.5	1418.878	TB
466	992936.5	561245.4	1418.54	TB

467	992945.3	561247.8	1418.304	TB
468	992952.6	561193.3	1419.346	TB
469	992961.3	561127	1419.566	TB
470	992969.7	561059.3	1420.187	TB
471	992978	560999.5	1420.818	TB
472	992901.6	560992.7	1398.59	NG
473	992879.2	561071.2	1397.987	NG
474	992849.5	561111.2	1397.116	NG
475	992815.1	561081.4	1397.775	NG
476	992857.2	561028.6	1398.089	NG
477	993018.6	560711.1	1403.358	TB
478	993026.8	560729.7	1398.934	TOE
479	993048.2	560772.2	1398.505	TOE
480	993054.7	560783.2	1401.408	TB
481	993065.2	560801.2	1401.736	NG
482	993049.7	560903.8	1402.383	TOE
483	993046.3	560964.5	1401.482	TOE
484	993038.9	561031.3	1400.419	TOE
485	993028.3	561084.4	1400.486	TOE
486	993022	561142.7	1400.23	TOE
487	993018.3	561203.3	1401.067	TOE
488	993091.4	561202	1399	NG
489	993093.2	561150.6	1399.021	NG
490	993094	561099.1	1399.512	NG
491	993094.5	561043.6	1400.25	NG
492	993099.3	560994.2	1400.769	NG
493	993098.9	560959.3	1401.451	NG
494	993109.2	560911.5	1402.33	NG
495	993103.8	560857	1402.217	NG
496	993098	560807.3	1402.507	NG
497	993094.9	560755.4	1401.421	NG
498	993093.7	560695.3	1400.136	NG
499	993090.7	560646.8	1402.665	NG
500	993104.2	560595.1	1402.291	NG
501	993094	560527.8	1403.921	NG
502	993025.9	560661.1	1411.972	NG
503	993029.7	560628.7	1419.703	NG
504	992274.8	561430.3	1393.611	NG
505	992256.9	561498.7	1392.854	NG
506	992240.2	561574.6	1392.873	NG
507	992236.3	561635.9	1392.501	NG
508	992240.7	561707.5	1391.653	NG
509	992236.8	561753.3	1391.424	NG
510	992301.4	561675.4	1392.845	NG HOUSE
511	992333.3	561685.7	1393.354	NG HOUSE
512	992362.4	561616.4	1393.732	NG HOUSE
513	992336.7	561599.1	1393.595	NG HOUSE

514	992340.2	561593.9	1393.502	NG STRUCTURE
515	992387.1	561607.5	1393.6	NG STRUCTURE
516	992413.6	561563.8	1394.154	NG STRUCTURE
517	992363.3	561536.5	1393.751	NG STRUCTURE
518	992290.7	561361.5	1394.143	NG
519	992357.2	561343.2	1393.798	NG
520	992328	561427.5	1394.085	NG
521	992306.9	561521.3	1393.72	NG
522	992280.4	561600.6	1392.863	NG
523	992269.9	561651.5	1392.051	NG
524	992369.8	561469	1393.885	NG
525	992386.4	561377.2	1395.175	NG
526	992382.7	561302.4	1394.412	NG
527	992381.1	561254.7	1395.117	NG
528	992451.4	561258.4	1395.667	NG
529	992519.5	561261.3	1396.505	NG
530	992495.2	561332.2	1396.171	NG
531	992439.4	561331.3	1395.478	NG
532	992418.1	561389	1395.253	NG
533	992391.1	561456.3	1394.134	NG
534	992393.3	561519.2	1394.031	NG
535	992434.4	561517.7	1394.384	NG
536	992448.8	561456.5	1395.076	NG
537	992634	561352.3	1397.418	NG HOUSE
538	992652.5	561384.6	1397.539	NG HOUSE
539	992721.3	561372	1397.873	NG HOUSE
540	992686.7	561408.3	1396.023	NG
541	992759.4	561408	1398.1	NG
542	992826.5	561407.7	1404.608	NG
543	992823.7	561353.8	1408.206	NG
544	992834	561308.2	1410.279	NG
545	992792.7	561294.6	1403.447	NG
546	992784.5	561343	1403.442	NG
547	992751	561334.8	1399.181	NG
548	992750.2	561309.5	1398.595	NG
549	992732.5	561306.3	1398.139	NG HOUSE
550	992734.7	561264.8	1396.184	NG
551	992654.1	561271.5	1394.798	NG
552	992608.2	561275.5	1394.356	NG
553	992619.5	561319.1	1393.612	NG
554	992606.2	561363.8	1393.583	NG
555	992625.3	561401.9	1395.562	NG
556	992604.7	561559.8	1394.481	NG
557	992678.7	561562.1	1394.775	NG
558	992697.4	561551.6	1396.209	NG HOUSE
559	992754.4	561569.6	1394.994	NG
560	992753	561551.9	1396.237	NG HOUSE

561	992803.9	561555.7	1395.563	NG
562	992875	561558.7	1396.146	NG
563	992889.3	561502.9	1397.259	NG
564	992888.9	561442.2	1404.676	NG
565	992835.7	561439.8	1402.467	NG
566	992843.3	561502.5	1397.409	NG
567	992797.4	561512.9	1396.351	NG
568	992786.8	561459.3	1397.21	NG
569	992751.3	561485.1	1396.065	NG HOUSE
570	992749.9	561449.3	1396.061	NG
571	992690.4	561461.6	1396.289	NG HOUSE
572	992683	561446.9	1395.719	NG
573	992630.5	561449.1	1395.748	NG
574	992621.2	561510.9	1395.594	NG
575	992665.8	561495.9	1396.127	NG HOUSE
576	992658	561526.3	1394.969	NG
577	992565.6	561558.4	1394.264	NG
578	992560.8	561501.3	1393.773	NG
579	992566	561448.3	1392.553	NG
580	992582.5	561400	1393.195	NG
581	992576.5	561351.1	1394.009	NG
582	992574.5	561322.2	1393.723	NG
583	992573.7	561296.7	1392.105	NG
584	992572.9	561264.4	1392.229	NG
585	992572.2	561244.6	1394.292	NG
586	992565.1	561212.8	1396.375	NG
587	992559.9	561126.4	1397.444	NG
588	992561	561008.2	1397.983	NG
589	992557.4	560903.3	1398.488	NG
590	992555.3	560793.8	1399.02	NG

APPENDIX E. PUBLIC NOTIFICATION

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 2nd, 2014

Terrence and Joanne Czarnecki
27020 N. 145th Avenue
Sun City, AZ, 85373

Maricopa County Assessor's Parcel Number(s): 503-52-032U, 503-52-032V

Re: Notification of widening or narrowing of the 1% annual chance (100-year) floodplain and floodway

Dear Sir or Madam:

The Flood Control District of Maricopa County (District) has recently completed a study to re-analyze floodplain and floodway delineations between Bonita Lake and Jomax Road near your property and has determined that the floodplain and floodway need to be revised. The District regularly conducts studies to identify or re-analyze floodplains throughout the county.

The District will be submitting the results of the study to Federal Emergency Management Agency (FEMA) so they can update the floodplain and flood zones on the Flood Insurance Rate Maps (FIRM). The FIRM for a community depicts land which has been determined to be subject to a 100-year flood. A 100-year flood has a 1% chance of occurring or being exceeded in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management. To help you better understand your Zone designation, enclosed you will find a Zone AE fact sheet and a map of the area in which your property is located that contains both the existing floodplain and floodway delineations along with the updated floodplain and floodway.

This letter is to inform you that the revision of the 100-year floodplain and floodway impacts your property.

The updated analysis results in changes in floodplain widths (both increases and decreases) associated with the watercourse studied, named Wash 11 East.

The District anticipates that FEMA will adopt the study within the next six months. Once adopted, if your home is located within the 100-year floodplain and you have a federally backed or insured mortgage, you may be contacted by your lender to purchase flood insurance. If you do not carry a mortgage, flood insurance is still recommended as protection on your investment. The same insurance company for your homeowner's policy can usually offer a flood insurance policy. As flooding can and does occur even in areas outside of delineated 100-year floodplains, flood insurance is always recommended.

In the interim period, the District and other jurisdictions will use the data as the "best available information" for area floodplain management.

If you have any questions or concerns about the proposed changes to the FIRM or its effect on your property, you may contact me at 602-506-3320 or thornej@mail.maricopa.gov.

Sincerely,

Jennifer Thorne, P.E.

Flood Zone AE with Floodway

What Is Flood Zone AE?

The Federal Emergency Management Agency (FEMA) determines flood risk for the United States and then creates maps to clearly show the geographic areas prone to flooding. FEMA uses various zone designations to indicate the type of flooding (riverine, ponding, or shallow, sheet flooding), the level of study analysis used (detailed or approximate methods), and the annual chance of flooding. The designation AE indicates an area of riverine flooding, studied using detailed methodology, and subject to the 1 percent annual chance flood, more commonly referred to as the 100-year floodplain. In a Zone AE, base flood elevations (BFEs) are established.

What is a Base Flood Elevation?

A base flood elevation (BFE) is the predicted highest flood water elevation expected to occur at a location during a 100-year flood. New habitable construction must be built above the BFE; habitable means floors with living areas on them.

What is a Floodway?

A floodway is a special designation within a Zone AE floodplain. The floodway generally includes the deepest and fastest moving waters of the watercourse. Because the floodway is typically an area subject to more frequent flooding and, often, more hazardous flood conditions than the remaining Zone AE, construction of new habitable structures is not permitted within a floodway.

How Does This Flood Zone Designation Affect My Property? How Do I Get A Building Permit?

A permit is required for all development within unincorporated Maricopa County. Common development activities such as residential, swimming pool/spa, and grading/paving construction all require a building permit. Applications for building permits are submitted through the One Stop Shop at the Maricopa County Planning & Development Department. All submitted building permit applications are reviewed by a Flood Control District representative. If it is determined that the development will be located within a Zone AE floodplain, then the development must be in compliance with the Floodplain Regulations for Maricopa County and a Floodplain Use Permit is required.

Floodplain Regulations for Maricopa County

A person shall not engage in any development which will divert, retard, or obstruct the flow of water in any watercourse and threaten public health or safety or the general welfare without securing written authorization from the Board or its designee. Written authorization from the Board is established herein as the Floodplain Use Permit signed by the Floodplain Administrator.

No permit shall be processed, and no permit shall be considered to be issued, until all applicable fees have been paid pursuant to these Regulations.

What types of development may be permitted within the floodway of a Zone AE?

A Floodplain Use Permit may be granted for any of the following allowed development within Zone AE Floodway:

- Accessory residential uses including, but not limited to, lawns, gardens, parking areas, and play areas.
- Agricultural uses including, but not limited to, general farming, pasture, grazing.
- Outdoor plant nurseries, horticulture, truck farming, sod farming, and wild crop harvesting.
- Stockyards, corrals, and shade structures.
- Fencing that is open or breakaway to allow for conveyance.

What types of development may be permitted within a Zone AE, not within a floodway?

A Floodplain Use Permit may be granted for any of the following allowed development within Zone AE Floodplain:

- Any development permitted in Zone AE Floodway.
- Structures and buildings, including dwellings and manufactured homes, additions, improvements, recreational vehicles, and residential development.
- Septic systems, whether public or privately owned.
- Any other development which will not be subject to substantial flood damage and will not cause a hazard to life or property or to the public. These may include uses that can be readily removed from the floodplain areas during times of flooding.

Additional Information

Where do I find the flood maps?

FEMA provides access to communities' Flood Insurance Rate Maps (FIRMs) online via its Map Service Center. You may also contact the District or your local municipality.

Flood Insurance Update

On January 1, 2013 the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) went into effect. The BW-12 requires FEMA to take steps to eliminate a variety of existing flood insurance subsidies and provides for long-term changes to the National Flood Insurance Program. Under the new law, rates will likely increase overall to reflect the true flood risk of your home. Changes will depend on external factors such as when the Flood Insurance Rate Maps are revised, elevation of your home in comparison to the BFE, number of flood claims filed and number of buildings damaged or improved.

Contact Information

For additional information please contact the Flood Control District at 602-506-1501 or visit the following websites:

Flood Control District of Maricopa County
www.fcd.maricopa.gov

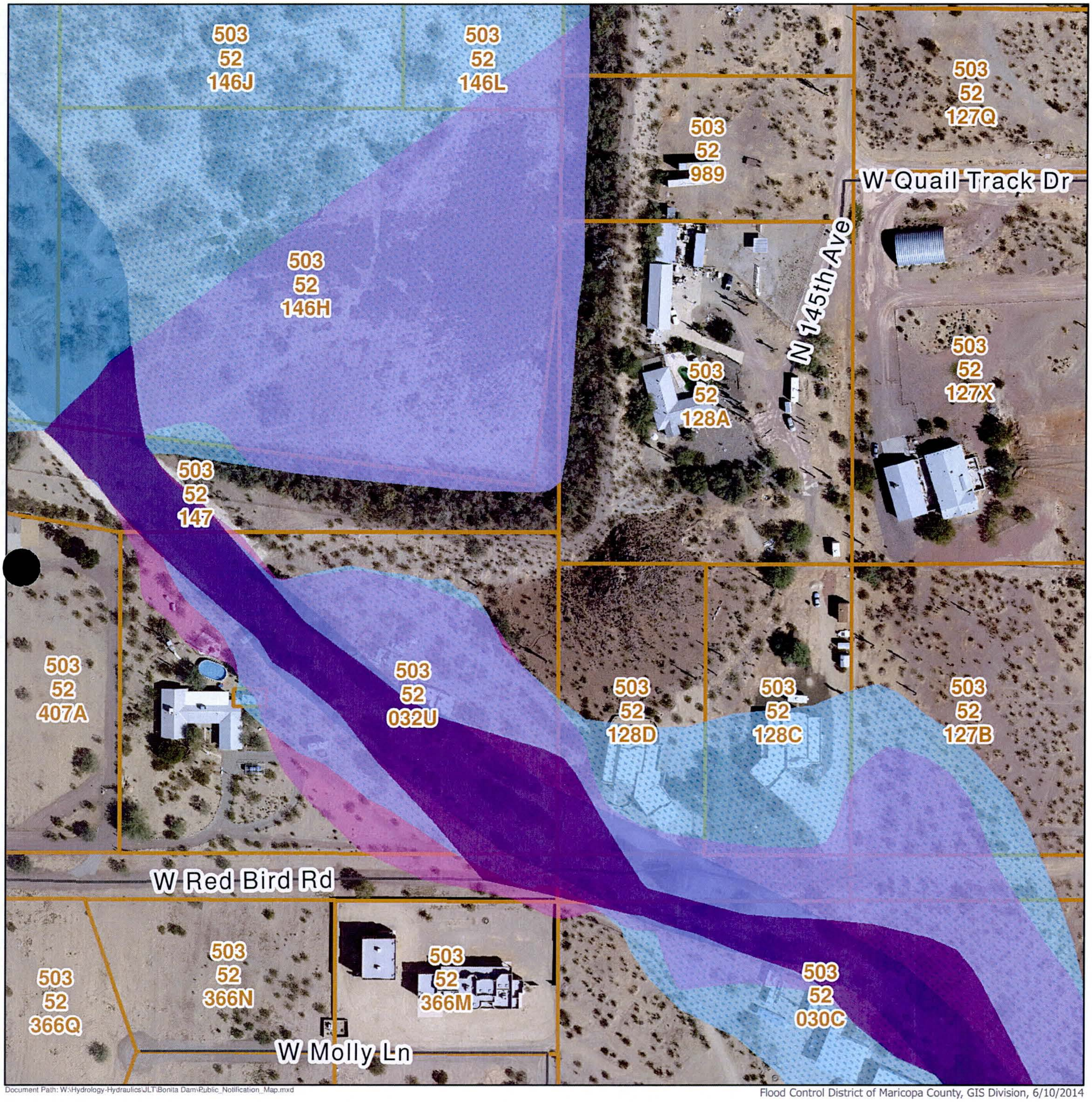
Maricopa County Department of Planning & Development
www.maricopa.gov/planning/BuildingServices

FEMA's Map Service Center
https://msc.fema.gov

FEMA's Flood Hazard Mapping Program
www.fema.gov/national-flood-insurance-program-flood-hazard-mapping

National Flood Insurance Program
www.floodsmart.gov

Wash 11 East Redelineation
From Bonita Lake Dam to Jomax Road



Document Path: W:\Hydrology-Hydraulics\JLT\Bonita Dam\Public_Notification_Map.mxd

Flood Control District of Maricopa County, GIS Division, 6/10/2014

Legend

- Updated Floodway
- Updated Floodplain
- Existing Floodway
- Existing Floodplain
- Parcel

Map 1 of 2

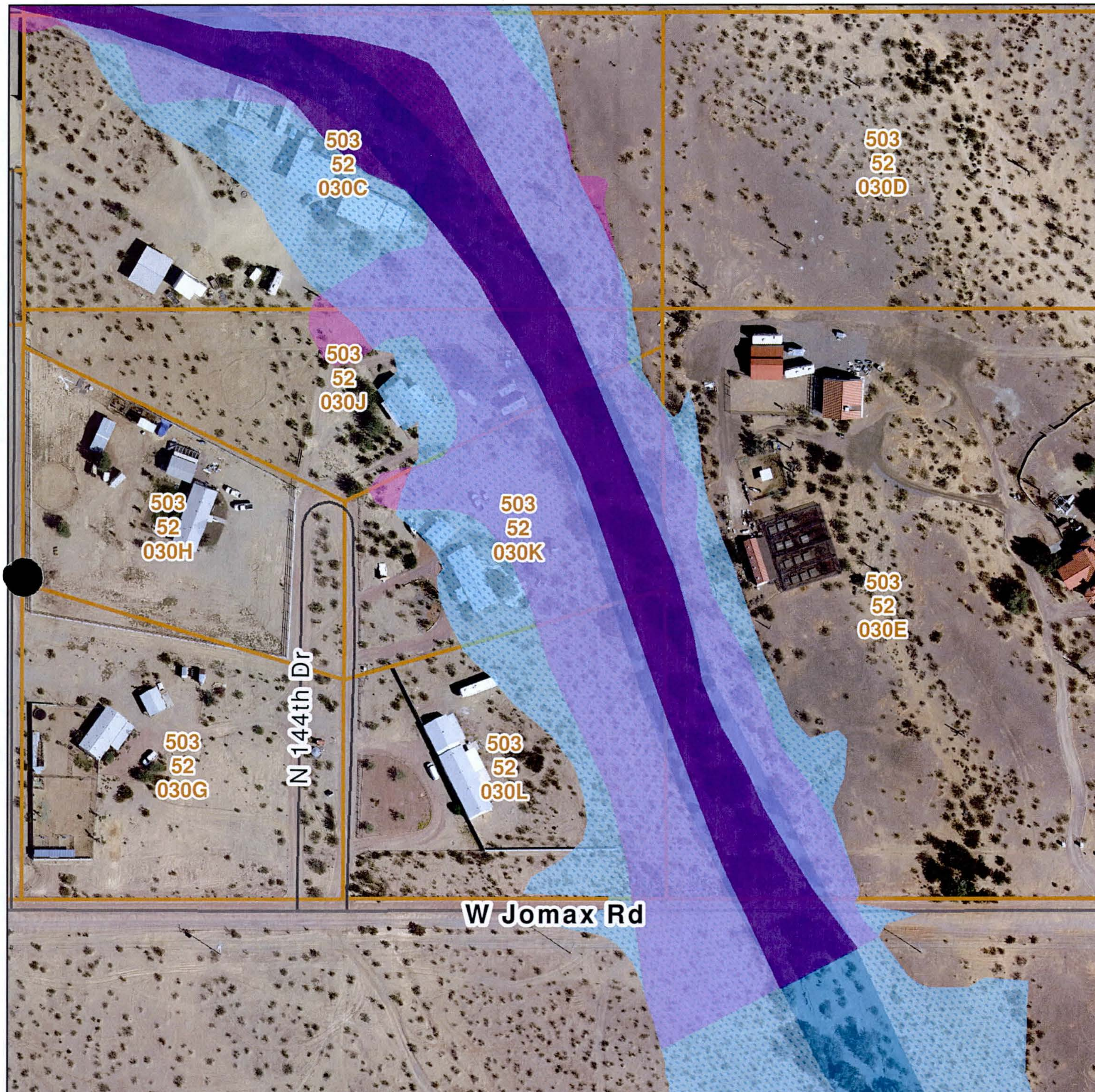
0 50 100 200 300 400 Feet

N

2801 West Durango Street, Phoenix, Arizona 85009, (602) 506-1501

www.fcd.maricopa.gov

Wash 11 East Redelineation
From Bonita Lake Dam to Jomax Road



Document Path: W:\Hydrology-Hydraulics\JLT\Bonita Dam\Public_Notification_Map.mxd

Flood Control District of Maricopa County, GIS Division, 6/10/2014

Legend

Map 2 of 2

Updated Floodway | Existing Floodway | Parcel

Updated Floodplain | Existing Floodplain

0 50 100 200 300 400 Feet

N

SEE SHEET Q-16

SEE SHEET P-15

SEE SHEET R-15

SEE SHEET Q-14

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WITTMANN AREA DRAINAGE MASTER STUDY UPDATE

CONTRACT FCD 2002C029

LEGEND

EFFECTIVE ZONE A — ZONE A
EFFECTIVE ZONE AE — ZONE AH
EFFECTIVE ZONE AH — ZONE AE
EFFECTIVE FLOODWAY — FLOODWAY (FW)
ZONE AO

HYDRAULIC BASE LINE
ZONE DESIGNATION — ZONE A
WASH I.D. LABEL — WASH 9 EAST
ELEVATION REFERENCE MARK — ERM AJ3866
CROSS SECTION — 2.199 Q100=1270 FP=1400.55 FW=1400.56
BASE FLOOD ELEVATION — 1320
DIKE / LEVEE — DIKE
COUNTY BOUNDARY
CORPORATE LIMIT
LIMIT OF STUDY
LIMIT OF DETAILED STUDY
TOWNSHIP/RANGE LINE
SECTION LINE
SECTION NUMBER — 29

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
DV2039		NOTE: FOR ERM DESCRIPTION AND ELEVATIONS GO TO THE NATIONAL GEODETIC SURVEY WEB SITE, WWW.NGS.NOAA.GOV

NOTE:
1. NGVD 29 + 1.90 FEET = NAVD 88.

CERTIFICATE NO. 26737 HERNAN A. ARISTIZABAL ARIZONA, U.S.A.

INDEX MAP

LONE MOUNTAIN RD.
DIXILETA DR.
PATTON RD.
JOMAX RD.
HAPPY VALLEY RD.
PINNACLE PEAK RD.
C.A.P. CANAL
BEARDSLEY CANAL
T5N T4N
R2W R1W
163RD AVE
155TH AVE
147TH AVE
139TH AVE
131ST AVE
N O P Q R S T

SCALE: 1"= 200'

Entellus 2255 N. 44th Street Suite 125 Phoenix, AZ 85008.3279 Tel 602.244.2566 Fax 602.244.8947 WEB www.entellus.com

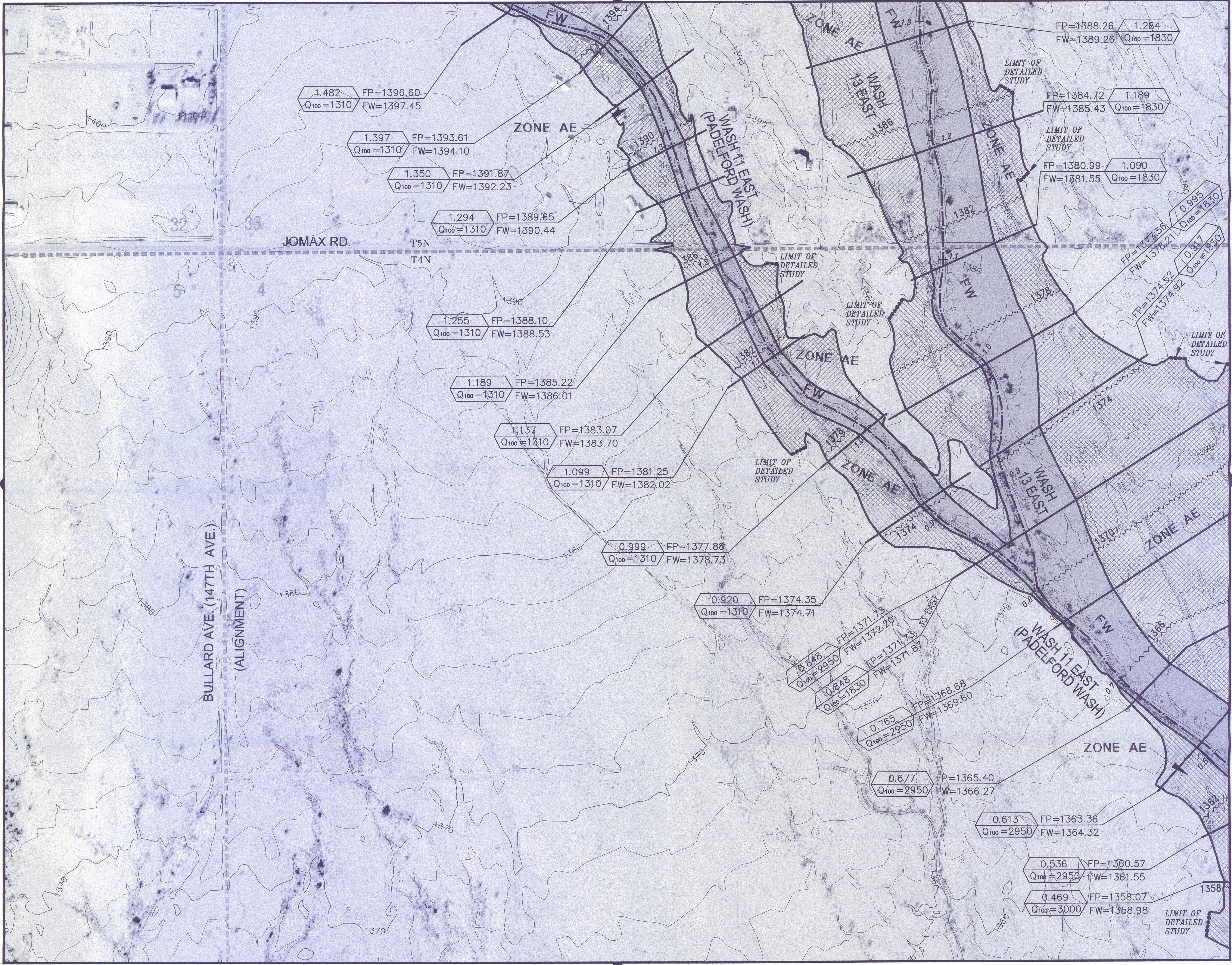
	BY	DATE	
DESIGN	AMG/RAS	07/2005	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	HAA	07/2005	RECOMMENDED BY: DATE
PLANS	KAB	07/2005	APPROVED BY: DATE
PLANS CHK.	AMG/HAA	07/2005	CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY:	09/16/05 DATE:		SHEET Q-15 OF FLOODPLAIN DELINEATION

FILE: P:\300\310\310032 (Wittmann ADMSU)\Task\hydraulics\FP-Q_15.dwg DATE: 07/12/05

1" = 600' (1:7200) FLIGHT DATES: (04/18/02), (04/19/02), (04/23/02), 1"=1200' (1:14400) (04/23/02) BY: STEWART GEO TECHNOLOGIES

SEE SHEET Q-15

ERM DV2039



SEE SHEET Q-13

1" = 600' (1:7200) FLIGHT DATES: (04/18/02), (04/19/02), (04/23/02), 1"=1200' (1:14400) (04/23/02) BY: STEWART GEO TECHNOLOGIES

FILE: P:\300\310\310032 (Wittmann ADMSU)\Task\hydraulics\FP-Q_14.dwg DATE: 07/12/05

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WITTMANN AREA DRAINAGE MASTER STUDY UPDATE

CONTRACT FCD 2002C029

LEGEND

- EFFECTIVE ZONE A
- EFFECTIVE ZONE AE
- EFFECTIVE ZONE AH
- EFFECTIVE FLOODWAY
- ZONE A
- ZONE AH
- ZONE AE
- FLOODWAY (FW)
- ZONE AO
- HYDRAULIC BASE LINE
- ZONE DESIGNATION: ZONE A
- WASH I.D. LABEL: WASH 9 EAST
- ELEVATION REFERENCE MARK: ERM AJ3866
- CROSS SECTION: 2.199 Q100=1270 FP=1400.55 FW=1400.56
- BASE FLOOD ELEVATION: 1320
- DIKE / LEVEE: DIKE
- COUNTY BOUNDARY
- CORPORATE LIMIT
- LIMIT OF STUDY
- LIMIT OF DETAILED STUDY
- TOWNSHIP/RANGE LINE
- SECTION LINE
- SECTION NUMBER: 29

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

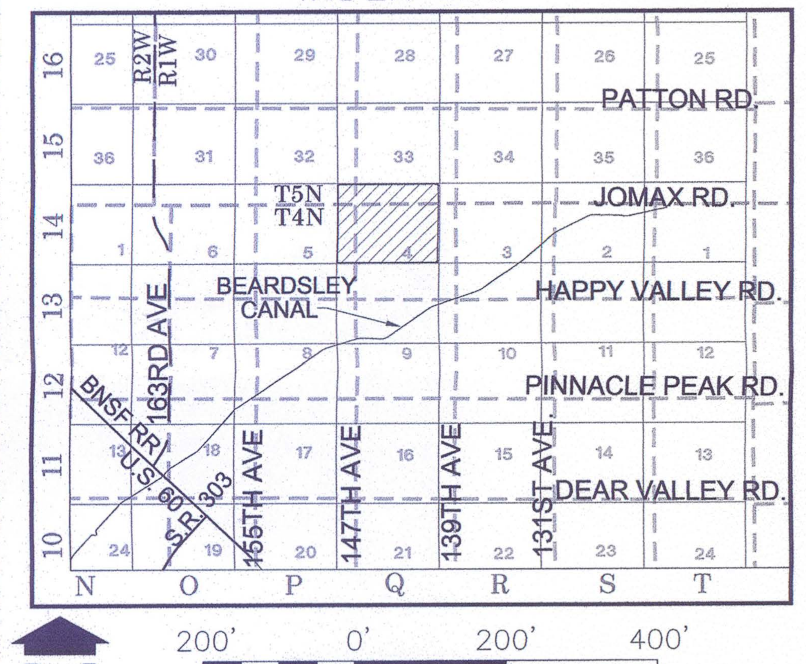
I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
DV2039		NOTE: FOR ERM DESCRIPTION AND ELEVATIONS GO TO THE NATIONAL GEODETIC SURVEY WEB SITE, WWW.NGS.NOAA.GOV

NOTE:

1. NGVD 29 + 1.90 FEET = NAVD 88.

HERNAN A. ARISTIZABAL 29737 ARIZONA, U.S.A.

INDEX MAP



200' 0' 200' 400'

SCALE: 1" = 200'

Entellus
2255 N. 44th Street Suite 125
Phoenix, AZ 85008.3279
Tel 602.244.2566
Fax 602.244.8947
WEB www.entellus.com

	BY	DATE
DESIGN	AMG/RAS	07/2005
DESIGN CHK.	HAA	07/2005
PLANS	KAB	07/2005
PLANS CHK.	AMG/HAA	07/2005

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET Q-14 OF FLOODPLAIN DELINEATION