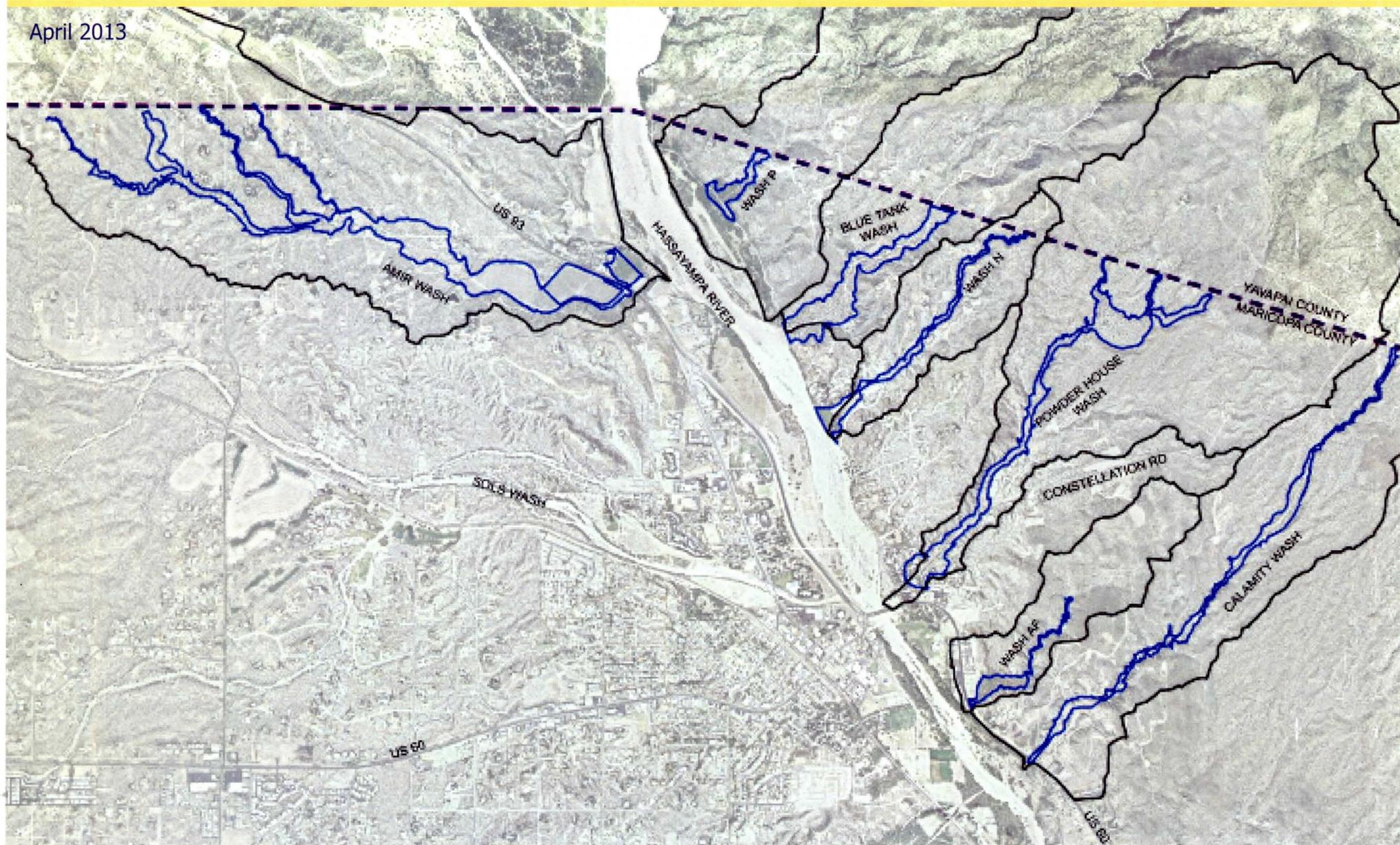




# Wickenburg Area Drainage Master Study/Plan

FCD 2009C030 - PHASE 2 EAST TECHNICAL DATA NOTEBOOK

April 2013



## Prepared for:

Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, AZ 85009  
(602) 506.1501

## Prepared by:



Hoskin • Ryan Consultants, Inc.  
*creative engineering solutions*

**WICKENBURG  
AREA DRAINAGE MASTER STUDY/PLAN  
(FCD 2009C030)**

**PHASE 2 EAST TRIBUTARY WASHES  
TECHNICAL DATA NOTEBOOK**

April 11, 2013

*Prepared for:*  
Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, AZ 85009  
(602) 506-1501



Expire 6/30/15

*Prepared by:*  
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EXPIRES 3/31/2015

in association with :

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4550 N. 12th Street  
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Phoenix, AZ 85020  
(602) 943-1585

**WICKENBURG AREA DRAINAGE MASTER STUDY/PLAN**  
**(FCD 2009C030)**

**PHASE 2 EAST TRIBUTARY WASHES**  
**TECHNICAL DATA NOTEBOOK**  
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- F Erosion and Sediment Transport Analysis Supporting Documentation  
*Note: Erosion and sediment transport analysis is not covered by the scope of this study,*
- G Field Reconnaissance Data  
*Wickenburg ADMS/P Phase 2 East Field Reconnaissance Report is included as Appendix G.*

**WICKENBURG AREA DRAINAGE MASTER STUDY/PLAN  
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- Exhibits 2.C1-2.E1 – Routing Map
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- Exhibits 4.C1-4.E1 – Existing Land Use Map
- Exhibits 5.C1-5.E1 – Flow Map
- Exhibits 6.C1-6.E1 – Prorated Flow Map

**Floodplain Work Study Maps**

100-Year Floodplain Maps, Sheets 1-15



EXPIRES 3/31/2015



Expire 6/30/15



The study is being completed in three phases, (Figure 2) with submittals to FEMA as either Letters of Map Revision (LOMRs) or Physical Map Revisions (PMRs). The study will delineate the floodplains of the Sols Wash and the Hassayampa River tributary washes within the Town of Wickenburg corporate limits and surrounding area.

The first phase, which is now complete, identified the current floodplain and flood hazards for Sunset Wash and Sunnycove Wash and was documented in a TDN. The second phase, or current phase, (Figure 3) delineates the floodplains for Sols Wash and Hassayampa River tributary washes that occur within, or in close proximity to, the Town limits. The third phase will include floodplain delineations for select washes outside the Town's jurisdictional limits.

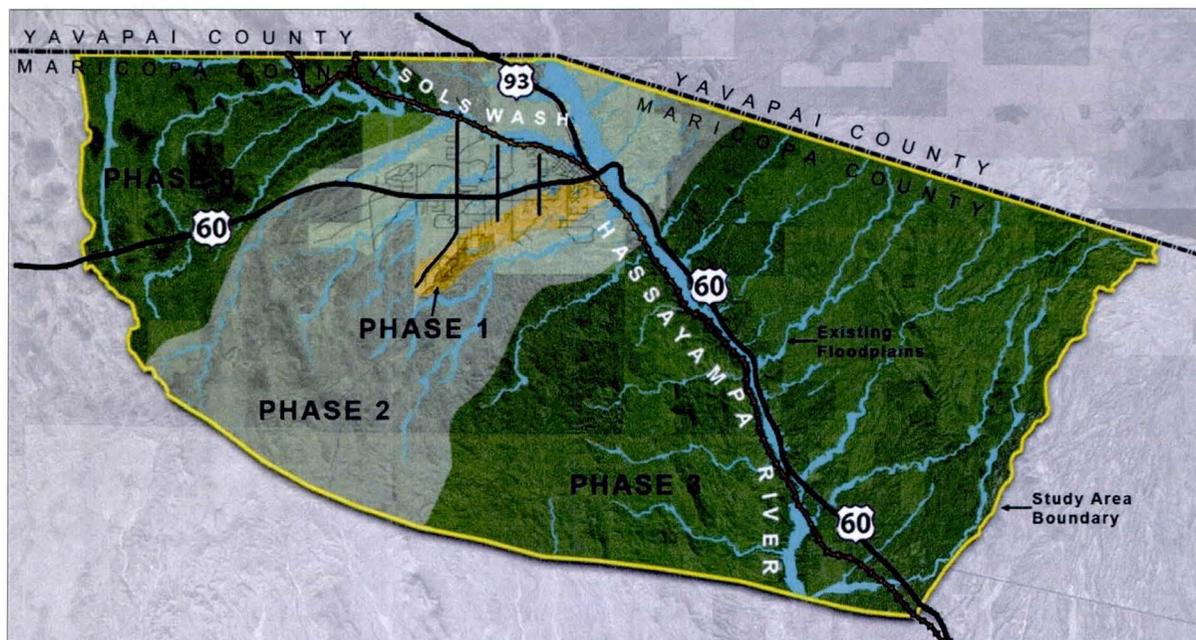


FIGURE 2 – STUDY PHASES

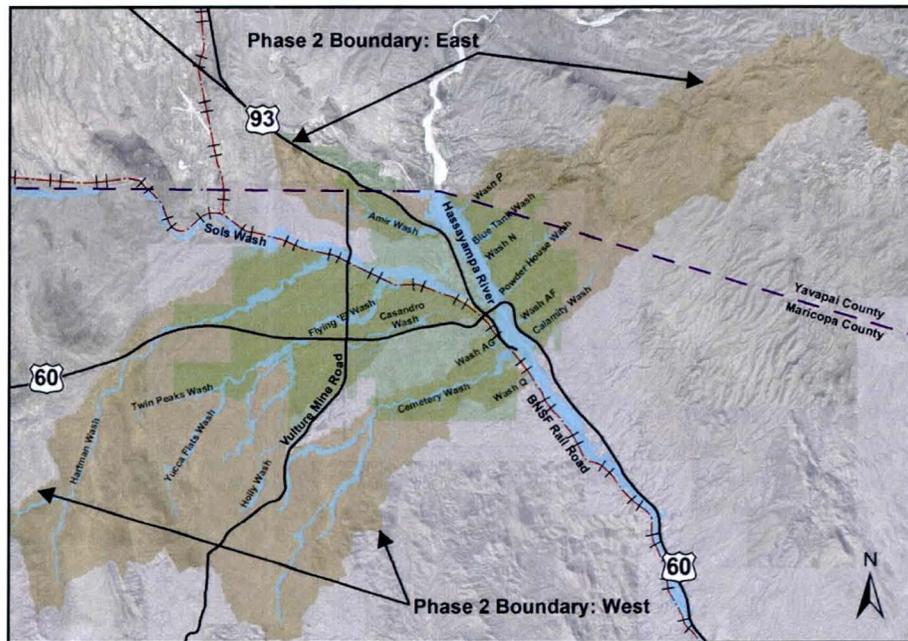


FIGURE 3 – PHASE 2 WATERSHED

The Phase 2 study is divided into geographic regions and is documented in two separate TDN volumes. Tributaries north of Sols Wash and east of the Hassayampa River are documented in this TDN (Phase 2 East Tributaries). This includes all tributaries that are east of the Hassayampa River (East Tributaries) and Amir Wash Watershed which is north of Sols Wash and west of the Hassayampa River (West Tributary). Tributaries south of Sols Wash and west of the Hassayampa River will be documented in a separate TDN. The purpose of this TDN is a technical submission of new hydrologic and hydraulic analysis to FEMA. The new hydrologic and hydraulic analyses are based on recent NOAA rainfall data and topographic mapping.

### 1.1 Authority for Study

The study is a joint effort between the District and the Town. The District's contract number is FCD 2009C030. The official Notice to Proceed date is July 12, 2010. The District Project Manager is Gregory L. Jones, PE, AICP.

## 1.2 Location of Study

The Phase 2 East Tributaries watersheds encompass approximately 22 square miles within Maricopa County and surrounding the Town. The watershed area is located within Townships 7 & 8 North, and Ranges 3, 4 & 5 West of the Gila and Salt River Meridian. Washes included in this TDN are tributaries to the Hassayampa River. See the Work Maps Index Map, included with this report, for wash locations. These washes include:

- |                                 |                                |
|---------------------------------|--------------------------------|
| • Amir Wash                     | Tributary to Hassayampa River  |
| • Amir Wash Tributary 1         | Tributary to Amir Wash         |
| • Amir Wash Tributary 2         | Tributary to Amir Wash         |
| • Amir Wash Tributary 3         | Tributary to Amir Wash         |
| • Wash P                        | Tributary to Hassayampa River  |
| • Blue Tank Wash                | Tributary to Hassayampa River  |
| • Wash N                        | Tributary to Hassayampa River  |
| • Powder House Wash             | Tributary to Hassayampa River  |
| • Powder House Tributary 1 Wash | Tributary to Powder House Wash |
| • Powder House Tributary 2 Wash | Tributary to Powder House Wash |
| • Wash AF                       | Tributary to Hassayampa River  |
| • Calamity Wash                 | Tributary to Hassayampa River  |

## 1.3 Methodology Summary

### Hydrologic Modeling

Hydrology for the contributing watersheds of the Phase 2 East Tributaries was developed using the U.S. Army Corps of Engineers *HEC-1, Version 4.1, Flood Hydrograph Package* (Ref. 33). Hydrologic models prepared as part of the WADMS include the following:

- 500-year; 6-hour and 24-hour Existing Condition
- 100-year; 6-hour and 24-hour Existing Condition
- 50-year; 6-hour and 24-hour Existing Condition
- 10-year; 6-hour and 24-hour Existing Condition

The models were developed following the procedures recommended in the District's *Drainage Design Manual for Maricopa County, Volume I, Hydrology* (Ref. 17). Watersheds

were divided into major watersheds contributing to the Hassayampa River. Each major watershed was then further divided into sub-basins based on topographic mapping and field observations.

The District's *Drainage Design Management System Version 4.6.0* software (DDMSW), dated August 2010 (Ref. 15), was used to generate the sub-basin HEC-1 data. Sub-basin parameters were gathered from a combination of field observations and existing land use and soils maps. Soil losses were estimated using the Green & Ampt method and excess rainfall runoff was generated for the sub-basins using the Phoenix Mountain S-graph. Recent changes in development within the watershed areas are reflected in this study. *NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 1, Arizona* (Ref. 29) was used as the point precipitation rainfall data source for the project.

Refer to Section 4 of this report for a detailed description of the hydrologic modeling methods.

#### Hydraulic Modeling

The effective Zone "AE" floodplains were previously delineated in the WADMS-94 using the HEC-2 hydraulic model (the effective model). However, HEC-RAS version 4.1 (Ref. 35) was used to analyze the 100-year floodplains for this study.

HEC-RAS cross-section geometry was obtained from the 2004 two-foot contour interval topographic mapping provided by the District (Ref. 21) and was supplemented by additional survey where development had significantly changed the terrain (See section 3: Survey and Mapping Information). Elevations for the study are on the NAVD88 vertical datum. Cross-sections were created at the same locations as the effective model wherever practical

and supplemented with cross-sections at additional locations, including new culverts. Supplemental ground survey was conducted at drainage structures.

Encroachment Method #4 was used for the first iteration of floodway modeling followed by Method #1. Encroachment limits were modified as necessary to optimize the floodway water surface elevation (WSE). Refer to Section 5 of this report for a detailed description of the hydraulic modeling methods.

#### **1.4 Acknowledgements**

This study was performed under the authority of the District, in cooperation with the Town. HRC was the Prime Consultant responsible for all aspects of the study; Dewberry, and Coe and Van Loo Consultants, Inc., assisted with data collection, hydrology, hydraulics, and floodplain delineation. Environmental Planning Group assisted with data collection and existing conditions analysis. Bender Consulting Services assisted with Public Involvement. Geological Consultants, Inc., provided soils and bedrock analysis, and Alpha Geotechnical provided soils sampling and testing.

#### **1.5 Summary of Study Results**

The HEC-1 output for each hydrologic model is included in Appendix D.6. The USGS data for Arizona and the regional regression equations were used to verify the peak discharges. Refer to Section 4.5 for the hydrologic results.

The 100-year, 6-hour and the 100-year, 24-hour storm were compared to determine the highest peak discharge for each wash to use in the floodplain and floodway delineations. One additional tributary wash along Amir Wash (Tributary 2) was delineated as part of this study. The delineations for Calamity Wash, Amir Wash Tributary 1, and Wash N were

extended beyond their limits in the WADMS-94. Refer to the Floodplain Work Maps located at the back of this report for the wash locations.

## 2 Study Documentation Abstract and FEMA Forms

2.1: Study Documentation Abstract for FEMA Submittals		Initial Study	Restudy	X	CLOMR	LOMR	X	Other
2.1.1	Date Study Accepted							
2.1.2	Study Contractor	Hoskin-Ryan Consultants, Inc.						
	Contact(s)	Paul W.R. Hoskin, PE / Douglas Both, CFM / Peng Zhang, PE, CFM						
	Address	6245 N. 24 <sup>th</sup> Parkway, Suite 100 Phoenix, AZ 85016						
	Phone	(602) 252-8384						
	Internal Ref. No.	HRC 10-003-01						
	Subcontractors w/ Phone	Coe & Van Loo Consultants, Inc. – (602) 264-6831 Dewberry & Davis, LLC – (602) 943-1585						
2.1.3	FEMA Technical Review Contractor							
	Contact(s)							
	Address							
	Phone							
	Internal Ref. No.							
2.1.4	FEMA Regional Reviewer							
	Phone							
2.1.5	State Technical Reviewer							
	Phone							
2.1.6	Local Technical Reviewer	Greg Jones, PE, AICP – Flood Control District of Maricopa County Kathryn Gross, CFM, MA – Flood Control District of Maricopa County						
	Phone	Greg Jones (602) 506-5537 Kathryn Gross (602) 506-4837						
	Internal Ref. No.	FCD 2009C030						
2.1.7	Reach Description	<p>Amir Wash between headwaters and confluence with the Hassayampa River.            Amir Wash Tributary 1 between headwaters and confluence with Amir Wash.            Amir Wash Tributary 2 between headwaters and confluence with Amir Wash.            Amir Wash Tributary 3 between headwaters and confluence with Amir Wash.            Wash P between headwaters and confluence with the Hassayampa River.            Blue Tank Wash between headwaters and confluence with the Hassayampa River.            Wash N between headwaters and confluence with the Hassayampa River.            Powder House Wash between headwaters and confluence with the Hassayampa River.            Powder House Wash Tributary 1 between headwaters and confluence with Powder House Wash.            Powder House Wash Tributary 2 between headwaters and confluence with Powder House Wash.            Wash AF between headwaters and Hassayampa River            Calamity Wash between headwaters and Hassayampa River</p> <p>FIRM 04013C0235G, 04103C0251H, 04013C0252H, 04013C0254H, and 04013C0253H</p>						
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	7.5-Minute Topographic Quadrangle Map Series: Vulture Peak, Arizona, provisional editing 1990. Wickenburg, Arizona, 1964, photo inspected 1978.						
2.1.9	Unique Conditions and Problems							

2.1.10	Coordination of Discharges (Agency, Date, Comments)	Peak flows to be generated as part of the study. Review and approval of peak flows to be completed by the Flood Control District of Maricopa County.
--------	--	--

<b>Study Documentation Abstract for Local Government and ADWR Submittals</b>		
<b>2.1: General Information</b>		
2.1.1	Community	Wickenburg, Town of
2.1.2	Community Number	040056
2.1.3	County	Maricopa County
2.1.4	State	Arizona
2.1.5	Date Study Accepted	
2.1.6	Study Contractor	Hoskin-Ryan Consultants, Inc.
	Contact(s)	Paul W.R. Hoskin, PE / Douglas Both, CFM / Peng Zhang, PE, CFM
	Address	6245 N. 24 <sup>th</sup> Parkway, Suite 100 Phoenix, AZ 85016
	Phone	(602) 252-8384
	Internal Ref. No.	HRC 10-003-01
2.1.7	State Technical Reviewer	
	Phone	
2.1.8	Local Technical Reviewer	Greg Jones, PE, AICP – Flood Control District of Maricopa County Kathryn Gross, CFM, MA – Flood Control District of Maricopa County
	Phone	Greg Jones (602) 506-5537 Kathryn Gross (602) 506-4837
	Internal Ref. No.	FCD 2009C030
2.1.9	River or Stream Name	Wash Q, Cemetery Wash, Wash AG, Casandro Wash, Flying E Wash, and Hartman Wash
2.1.10	Reach Description	Amir Wash between headwaters and confluence with the Hassayampa River. Amir Wash Tributary 1 between headwaters and confluence with Amir Wash. Amir Wash Tributary 2 between headwaters and confluence with Amir Wash. Amir Wash Tributary 3 between headwaters and confluence with Amir Wash. Wash P between headwaters and confluence with the Hassayampa River. Blue Tank Wash between headwaters and confluence with the Hassayampa River. Wash N between headwaters and confluence with the Hassayampa River. Powder House Wash between headwaters and confluence with the Hassayampa River. Powder House Wash Tributary 1 between headwaters and confluence with Powder House Wash. Powder House Wash Tributary 2 between headwaters and confluence with Powder House Wash. Wash AF between headwaters and Hassayampa River Calamity Wash between headwaters and Hassayampa River
2.1.11	Study Type (riverine, alluvial, fan, etc.)	Riverine
<b>Section 2.2: Mapping Information</b>		
2.2.1	USGS Quad Sheet(s) with original photo date & latest photo revision date	7.5-Minute Topographic Quadrangle Map Series: Vulture Peak, Arizona, provisional editing 1990. Wickenburg, Arizona, 1964, photo inspected 1978.
2.2.2	Mapping for Hydrologic Study, Type/Source, Scale, Date	Maricopa County: 2-foot contour interval topographic mapping, covering the study area, from the Flood Control District of Maricopa County, dated 7/7/2004 Yavapai County: USGS points obtained on 08/31/2010 from National Elevation Dataset released in June 2010.
2.2.3	Mapping for Hydraulic Study, Type/Source, Scale, Date, Subcontractor, Date of Aerial Mapping	2-foot contour interval topographic mapping, covering the study area, from the Flood Control District of Maricopa County, dated 7/7/2004

<b>Section 2.3: Hydrology</b>		
2.3.1	Model or Method Used (incl. vendor and version)	<i>HEC-1 Flood Hydrograph Package, Version 4.1</i> , U.S. Army Corps of Engineers, Hydrologic Engineering Center, June 1998 <i>Drainage Design Management System, Version 4.6.0</i> , KVL Consultants, Inc., for Flood Control District of Maricopa County, 8/12/2010
2.3.2	Storm Duration	6-hour and 24-hour
2.3.3	Hydrograph Type	Flood Control District of Maricopa County 6-hour distribution for 6-hour modeling; SCS Type II distribution for 24-hour modeling
2.3.4	Frequencies Determined	10-year, 50-year, 100-year, and 500-year
2.3.5	List of Gages Used in Frequency Analysis or Calibration	Frequency analysis and calibration not completed for this study.
2.3.6	Rainfall Amounts and Reference	Isopluvials for Maricopa County, Arizona, from the Flood Control District of Maricopa County's <i>Drainage Design Manual for Maricopa County, Arizona, Volume I-Hydrology</i> , June 14, 2010 <i>Powder House Wash Watershed, Blue Tanks Wash, Wash N, Wash P, Wash AF, &amp; Calamity Wash</i> 10-year, 6-hour Precipitation = 2.26 inches 10-year, 24-hour Precipitation = 3.10 inches 50-year, 6-hour Precipitation = 3.12 inches 50-year, 24-hour Precipitation = 4.21 inches 100-year, 6-hour Precipitation = 3.51 inches 100-year, 24-hour Precipitation = 4.72 inches 500-year, 6-hour precipitation = 3.51 inches 500-year, 24-hour precipitation = 6.08 inches <i>Amir Wash Watershed</i> 10-year, 6-hour Precipitation = 2.18 inches 10-year, 24-hour Precipitation = 2.88 inches 50-year, 6-hour Precipitation = 3.02 inches 50-year, 24-hour Precipitation = 3.93 inches 100-year, 6-hour Precipitation = 3.40 inches 100-year, 24-hour Precipitation = 4.41 inches 500-year, 6-hour precipitation = 4.39 inches 500-year, 24-hour precipitation = 5.60 inches
2.3.7	Unique Conditions and Problems	
2.3.8	Coordination of Discharges (agency, date, comments)	Peak flows generated as part of the study. Review and approval of peak flows to be completed by the Flood Control District of Maricopa County.
<b>Section 2.4: Hydraulics</b>		
2.4.1	Model or Method Used (incl. vendor and version)	<i>HEC-RAS River Analysis System, Version 4.1</i> , U.S. Army Corps of Engineers, Hydrologic Engineering Center, March 2008. <i>HEC-GeoRAS, Version 4.2.93</i> , U.S. Army Corps of Engineers, September 2009.
2.4.2	Regime	Subcritical
2.4.3	Frequencies for which Profiles Were Computed	10-year, 50-year, 100-year and 500-year
2.4.4	Method of Floodway Calculation	HEC-RAS Floodway Modeling Method 1
2.4.5	Unique Conditions and Problems	
<b>Section 2.5: Additional Information</b>		
	Item	Description / Discussion

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	0235G	09/30/05
040037	Maricopa County	AZ	04013C	0251H	09/30/05

2. a. Flooding Source: See attached sheet for names of Flooding Sources.

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

3. Project Name/Identifier: WICKENBURG AREA DRAINAGE MASTER STUDY/PLANNING

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: \$\_\_\_\_\_  
 No, Attach Explanation

Please see the DHS-FEMA Web site at [http://www.fema.gov/plan/prevent/fhm/frm\\_fees.shtm](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: KATHRYN GROSS, CFM	Company: FLOOD CONTROL DISTRICT, MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ, 85006	Daytime Telephone No.: (602) 506-4837	Fax No.: (602) 506-4601
	E-Mail Address: kag@mail.maricopa.gov	

Signature of Requester (required):  Date: 9/20/2013

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: <i>Steve Boyle Community Development Director</i>	Community Name: TOWN OF WICKENBURG	
Mailing Address: <i>155 N. Tegner St Wickenburg, AZ 85390</i>	Daytime Telephone No.: <i>668-0512</i>	Fax No.:
	E-Mail Address: <i>stboyle@wickenburgaz.org</i>	

Community Official's Signature (required):  Date: 5-23-13

**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: PAUL W.R. HOSKIN, P.E.	License No.: AZ 19690	Expiration Date: 3/31/2015
Company Name: HOSKIN RYAN CONSULTANTS, INC	Telephone No.: (602) 252-8384	Fax No.: (602) 252-8385
Signature:	Date:	E-Mail Address: paulh@hoskinryan.com

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: \$\_\_\_\_  
 No, Attach Explanation

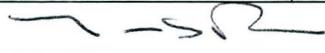
Please see the DHS-FEMA Web site at [http://www.fema.gov/plan/prevent/fhm/frm\\_fees.shtm](http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm) for Fee Amounts and Exemptions.

**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: KATHRYN GROSS, CFM		Company: FLOOD CONTROL DISTRICT, MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ, 85006		Daytime Telephone No.: (602) 506-4837	Fax No.: (602) 506-4601
		E-Mail Address: kag@mail.maricopa.gov	
Signature of Requester (required): 		Date: 5/20/2013	

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., CHIEF ENGINEER AND GENERAL MANAGER		Community Name: MARICOPA COUNTY	
Mailing Address: 2801 W. DURANGO STREET PHOENIX, AZ, 85006		Daytime Telephone No.: (602) 506-1501	Fax No.: (602) 506-4601
		E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required): 		Date: 6/12/13	

**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: PAUL W.R. HOSKIN, P.E.		License No.: AZ 19690	Expiration Date: 3/31/2015
Company Name: HOSKIN RYAN CONSULTANTS, INC		Telephone No.: (602) 252-8384	Fax No.: (602) 252-8385
Signature:		Date:	E-Mail Address: paulh@hoskinryan.com

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

**Form Name and (Number)**

**Required if ...**

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Riverine Hydrology and Hydraulics Form (Form 2) | New or revised discharges or water-surface elevations   |
| <input checked="" type="checkbox"/> Riverine Structures Form (Form 3)               | Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam |
| <input type="checkbox"/> Coastal Analysis Form (Form 4)                             | New or revised coastal elevations   |
| <input type="checkbox"/> Coastal Structures Form (Form 5)                           | Addition/revision of coastal structure  |
| <input type="checkbox"/> Alluvial Fan Flooding Form (Form 6)                        | Flood control measures on alluvial fans   |



**Additional Information for MT-2 Form 1:**

Section B1:

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County	AZ	04013C	0251H	09/30/05
040037	Maricopa County	AZ	04013C	0252H	09/30/05
040037	Maricopa County	AZ	04013C	0253H	09/30/05
040037	Maricopa County	AZ	04013C	0254H	09/30/05

Section B2:

**Flooding Sources:** Amir Wash, Amir Wash Tributary 1, Amir Wash Tributary 2, Amir Wash Tributary 3, Wash P, Wash N, Wash AF, Powder House Wash, Powder House Wash Tributary 1, Powder House Wash Tributary 2, Powder House Side Channel, Blue Tank Wash, and Calamity Wash.

**Additional Information for MT-2 Form 1:**

Section B1:

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040056	Town of Wickenburg	AZ	04013C	0251H	09/30/05
040056	Town of Wickenburg	AZ	04013C	0252H	09/30/05
040056	Town of Wickenburg	AZ	04013C	0253H	09/30/05
040056	Town of Wickenburg	AZ	04013C	0254H	09/30/05

Section B2:

**Flooding Sources:** Amir Wash, Amir Wash Tributary 1, Amir Wash Tributary 2, Amir Wash Tributary 3, Wash P, Wash N, Wash AF, Powder House Wash, Powder House Wash Tributary 1, Powder House Wash Tributary 2, Powder House Side Channel, Blue Tank Wash, and Calamity Wash.

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: Amir Wash

**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)
At Hassayampa River	2.18	1,500	1,827

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

- Statistical Analysis of Gage Records       Precipitation/Runoff Model → Specify 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

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*	<u>Confluence with Hassayampa River</u>	<u>0.332</u>	<u>N/A</u>	<u>2087.12-NAVD88</u>
Upstream Limit*	<u>2.874 miles upstream</u>	<u>2.874</u>	<u>2265.18-NAVD88</u>	<u>2268.31-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

U.S. DEPARTMENT OF HOMELAND SECURITY  
 FEDERAL EMERGENCY MANAGEMENT AGENCY  
**RIVERINE HYDROLOGY & HYDRAULICS FORM**

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

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**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: Amir Wash Tributary 1

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.09	N/A	201

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Amir Wash</u>	<u>0.076</u>	<u>N/A</u>	<u>2196.33-NAVD88</u>
Upstream Limit*	<u>Maricopa County Line</u>	<u>0.666</u>	<u>N/A</u>	<u>2271.68-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	_____	_____	_____	_____	_____
Existing or Pre-Project Conditions Model	_____	_____	_____	_____	_____
Revised or Post-Project Conditions Model	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	<u>NAVD88</u>
Other - (attach description)	_____	_____	_____	_____	_____

\* 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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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: Amir Wash Tributary 2

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.30	N/A	453

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Amir Wash</u>	<u>0.090</u>	<u>N/A</u>	<u>2202.96-NAVD88</u>
Upstream Limit*	<u>Maricopa County Line</u>	<u>0.853</u>	<u>N/A</u>	<u>2261.95-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	_____	_____	_____	_____	_____
Existing or Pre-Project Conditions Model	_____	_____	_____	_____	_____
Revised or Post-Project Conditions Model	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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Flooding Source: Amir Wash Tributary 3

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.18	N/A	446

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Amir Wash</u>	<u>0.049</u>	<u>N/A</u>	<u>2247.97-NAVD88</u>
Upstream Limit*	<u>Maricopa County Line</u>	<u>0.727</u>	<u>N/A</u>	<u>2307.33-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	_____	_____	_____	_____	_____
Existing or Pre-Project Conditions Model	_____	_____	_____	_____	_____
Revised or Post-Project Conditions Model	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	File Name: <u>AmirWash.prj</u>	Plan Name: <u>AmirWash.p01</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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**:
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- 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  
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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.

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Flooding Source: Blue Tank Wash

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	10.89	4,071	4,899

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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

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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*	<u>Confluence with the Hassayampa River</u>	<u>0.206</u>	<u>2079.60-NAVD88</u>	<u>2077.49-NAVD88</u>
Upstream Limit*	<u>Maricopa County line</u>	<u>1.046</u>	<u>2178.20-NAVD88</u>	<u>2175.36-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

3. Pre-Submittal Review of Hydraulic Models\*

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4.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____
Revised or Post-Project Conditions Model	File Name: <u>WashN,P,BlueTank.pr</u>	Plan Name: <u>WashN,P,BlueTank.n01</u>	File Name: <u>WashN,P,BlueTank.pr</u>	Plan Name: <u>WashN,P,BlueTank.p</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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Annotated FIRM and/or FBFM (Required)

#### D. COMMON REGULATORY REQUIREMENTS\*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase?  Yes  No
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  - 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.
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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.)
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Flooding Source: Calamity Wash

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	4.28	3,098	3,544
2.4 miles upstream	3.19	2,415	2,834

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Hassayampa River</u>	<u>0.049</u>	<u>2026.00-NAVD88</u>	<u>2027.68-NAVD88</u>
Upstream Limit*	<u>Maricopa County line</u>	<u>2.422</u>	<u>N/A</u>	<u>2360.57-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: <u>Calamity_WashAF.prj</u>	Plan Name: <u>Calamity_WashAF.p n1</u>	File Name: <u>Calamity_WashAF.prj</u>	Plan Name: <u>Calamity_WashAF.p0 1</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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**

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**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: Powder House Wash

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	1.95	2,114	2,652
0.80 miles upstream	1.83	2,034	2,610

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Just US of Hassayampa River</u>	<u>0.158</u>	<u>2055.7-NAVD88</u>	<u>2052.61-NAVD88</u>
Upstream Limit*	<u>2.09 miles upstream</u>	<u>2.09</u>	<u>2284.2-NAVD88</u>	<u>2284.47-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	_____	_____	_____	_____	_____
Existing or Pre-Project Conditions Model	_____	_____	_____	_____	_____
Revised or Post-Project Conditions Model	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash. n01	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash.p n01	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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

**B. Hydraulics**

4.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>	
	File Name:	Plan Name:	File Name:	Plan Name:
Other- Optimization Model	Opt_PowderHouse Wash.prj	Opt_PowderHouse Wash.p01	N/A	N/A

Opt\_PowderHouseWash.prj

Model used to determine the amount of flow overtopping the side of the main wash and flowing along Constellation road in Powder House Wash Side Channel. Resulting flows are used in the Steady Flow Analysis in PowderhouseWash.prj. Model not used for floodplain or floodway mapping.

U.S. DEPARTMENT OF HOMELAND SECURITY  
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**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 AF

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.31	420	881

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Hassayampa River</u>	<u>0.122</u>	<u>N/A</u>	<u>2027.00-NAVD88</u>
Upstream Limit*	<u>0.92 miles upstream</u>	<u>0.92</u>	<u>N/A</u>	<u>2152.58-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*					
Corrected Effective Model*					
Existing or Pre-Project Conditions Model					
Revised or Post-Project Conditions Model	File Name: <u>Calamity_WashAF.prj</u>	Plan Name: <u>Calamity_WashAF.p n1</u>	File Name: <u>N/A</u>	Plan Name: <u>N/A</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

U.S. DEPARTMENT OF HOMELAND SECURITY  
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**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).

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**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 N

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.34	429	865

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Hassayampa River</u>	<u>0.138</u>	<u>N/A</u>	<u>2057.35-NAVD88</u>
Upstream Limit*	<u>Maricopa County line</u>	<u>1.461</u>	<u>N/A</u>	<u>2280.28-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*					
Corrected Effective Model*					
Existing or Pre-Project Conditions Model					
Revised or Post-Project Conditions Model	File Name: <u>WashN,P,BlueTank.pri</u>	Plan Name: <u>WashN,P,BlueTank.n01</u>	File Name: <u>N/A</u>	Plan Name: <u>N/A</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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**

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**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 P

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Hassayampa River	0.85	898	1,239

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence of Hassayampa River</u>	<u>0.154</u>	<u>2100.20-NAVD88</u>	<u>2096.54-NAVD88</u>
Upstream Limit*	<u>Maricopa County line</u>	<u>0.458</u>	<u>2132.98-NAVD88</u>	<u>2136.34-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____
Revised or Post-Project Conditions Model	File Name: <u>WashN,P,BlueTank.pri</u>	Plan Name: <u>WashN,P,BlueTank.n01</u>	File Name: <u>N/A</u>	Plan Name: <u>N/A</u>	<u>NAVD88</u>
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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

U.S. DEPARTMENT OF HOMELAND SECURITY  
 FEDERAL EMERGENCY MANAGEMENT AGENCY  
**RIVERINE HYDROLOGY & HYDRAULICS FORM**

*O.M.B No. 1660-0016  
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**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: Powder House Wash Side 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)
	N/A	N/A	N/A
	N/A	N/A	N/A

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

- Statistical Analysis of Gage Records       Precipitation/Runoff Model → Specify 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

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*	<u>Confluence with Powder House Wash</u>	<u>0.051</u>	<u>N/A</u>	<u>2058.96-NAVD88</u>
Upstream Limit*	<u>Constellation Rd and El Recreo Dr</u>	<u>0.202</u>	<u>N/A</u>	<u>2077.86-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash. n01	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash.p n1	NAVD88
Other - (attach description)	File Name: _See Attached_	Plan Name: _See Attached_	File Name: N/A	Plan Name: N/A	NAVD88

\* 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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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**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).

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**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: Powder House Wash Tributary 1

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Conf. w/ Powder House	0.19	N/A	342

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Confluence with Powder House Wash</u>	<u>0.105</u>	<u>2227.4-NAVD88</u>	<u>2224.58-NAVD88</u>
Upstream Limit*	<u>1 mile US of Conf. w/ Powder House Wash</u>	<u>0.331</u>	<u>2257.6-NAVD88</u>	<u>2260.22-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

---

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

	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	_____	_____	_____	_____	_____
Existing or Pre-Project Conditions Model	_____	_____	_____	_____	_____
Revised or Post-Project Conditions Model	<u>PowderhouseWash.pr</u>	<u>PowderhouseWash.n01</u>	<u>PowderhouseWash.pr</u>	<u>PowderhouseWash.p01</u>	<u>NAVD88</u>
Other - (attach description)	_____	_____	_____	_____	_____

\* 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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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.

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: Powder House Wash Tributary 2

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis        | <input checked="" type="checkbox"/> Improved data                           |
| <input type="checkbox"/> Alternative methodology         | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
At Conf. w/ Powder House	N/A	N/A	300

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

- |   |  |
|---|--|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>HEC-1</u> |
| <input type="checkbox"/> Regional Regression Equations        | <input type="checkbox"/> 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*	<u>Previous DS Limit, ~488' US of Confluence</u>	<u>0.065</u>	<u>2254.8-NAVD88</u>	<u>2248.59-NAVD88</u>
Upstream Limit*	<u>Previous US Limit</u>	<u>0.231</u>	<u>2280.4-NAVD88</u>	<u>2278.63-NAVD88</u>

\*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: HEC-RAS VERSION 4.1

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.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
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:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash. n01	File Name: PowderhouseWash.pr i	Plan Name: PowderhouseWash.p n1	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: 2' contour interval mapping (NAVD88)

Source: Flood Control District of Maricopa County

Date: July 7th, 2004

Accuracy: +/- 1' interval mapping

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**:
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- 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  
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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).

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**RIVERINE STRUCTURES FORM**

**PAPERWORK BURDEN DISCLOSURE NOTICE**

Public reporting burden for this form is estimated to average 7 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 20598-3005, 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; 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 AF

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.....complete Section D
- Levee/Floodwall.....complete Section E
- Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: AF 100 - 1-5.67'x7' Concrete Box Culvert

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

Location of Structure: Between RS 0.135 and RS 0.158 at the US-60 crossing.

Downstream Limit/Cross Section: 0.135

Upstream Limit/Cross Section: 0.158

2. Name of Structure: \_\_\_\_\_

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

Location of Structure: \_\_\_\_\_

Downstream Limit/Cross Section: \_\_\_\_\_

Upstream Limit/Cross Section: \_\_\_\_\_

3. Name of Structure: \_\_\_\_\_

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

Location of Structure: \_\_\_\_\_

Downstream Limit/Cross Section: \_\_\_\_\_

Upstream Limit/Cross Section: \_\_\_\_\_

**NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.**

B. CHANNELIZATION

Flooding Source:

Name of Structure: \_\_\_\_\_

1. 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): \_\_\_\_\_

2. Channel Design Plans

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

3. Accessory Structures

The channelization includes (check one):

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

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport?  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.

C. BRIDGE/CULVERT

Flooding Source: Wash AF

Name of Structure: AF-100

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

Are the hydraulics of the structure affected by sediment transport?  Yes  No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.



**D. DAM/BASIN**

Flooding Source: \_\_\_\_\_  
 Name of Structure: \_\_\_\_\_

1. This request is for (check one):  Existing dam/basin  New dam/basin  Modification of existing dam/basin
2. The dam/basin was designed by (check one):  Federal agency  State agency  Private organization  Local government agency

Name of the agency or organization: \_\_\_\_\_

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

- a.  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? (must account for the maximum volume of runoff)

- 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/basin or downstream of the dam/basin change?  Yes  No

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

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin	
	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                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3.5 feet or more at the upstream end                                     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4.0 feet within 100 feet upstream of all structures and/or constrictions | <input type="checkbox"/> Yes | <input type="checkbox"/> 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). | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2.0 feet above the 1%-annual-chance stillwater surge elevation  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

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 land side is: \_\_\_\_\_
- b. The maximum levee slope flood side 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 <sub>100</sub>	D <sub>50</sub>	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)

- 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:  
Strength  $\phi$  = \_\_\_\_\_ 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:

**E. LEVEE/FLOODWALL (CONTINUED)**

5. Embankment And Foundation Stability (continued)

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)  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. LEVEE/FLOODWALL (CONTINUED)**

6. Floodwall And Foundation Stability (continued)

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.

e. 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.

**E. LEVEE/FLOODWALL (CONTINUED)**

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.

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.

**E. LEVEE/FLOODWALL (CONTINUED)**

11. Maintenance Plan

Please attach a copy of the formal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

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

**CERTIFICATION OF THE LEVEE DOCUMENTATION**

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) 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: \_\_\_\_\_ License No.: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

Company Name: \_\_\_\_\_ Telephone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**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.

DEPARTMENT OF HOMELAND SECURITY  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**RIVERINE STRUCTURES FORM**

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

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**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; 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: Amir Wash

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.....complete Section D
- Levee/Floodwall.....complete Section E
- Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: AM-100 - 3-10'x10' Concrete Box Culvert

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

Location of Structure: Between RS 0.415 and RS 0.399 at the US-93 crossing.

Downstream Limit/Cross Section: 0.399

Upstream Limit/Cross Section: 0.415

2. Name of Structure: AM-300 - 1 span 5'x20' bridge

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

Location of Structure: Between RS 0.830 and 0.823 at the access road

Downstream Limit/Cross Section: 0.823

Upstream Limit/Cross Section: 0.830

3. Name of Structure: \_\_\_\_\_

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

Location of Structure: \_\_\_\_\_

Downstream Limit/Cross Section: \_\_\_\_\_

Upstream Limit/Cross Section: \_\_\_\_\_

**NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.**

B. CHANNELIZATION

Flooding Source:

Name of Structure: \_\_\_\_\_

1. 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): \_\_\_\_\_

2. Channel Design Plans

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

3. Accessory Structures

The channelization includes (check one):

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

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport?  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.

C. BRIDGE/CULVERT

Flooding Source: Amir Wash

Name of Structure: AM-100, AM-300

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

Are the hydraulics of the structure affected by sediment transport?  Yes  No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.



**D. DAM/BASIN**

Flooding Source: \_\_\_\_\_  
 Name of Structure: \_\_\_\_\_

1. This request is for (check one):  Existing dam/basin  New dam/basin  Modification of existing dam/basin
2. The dam/basin was designed by (check one):  Federal agency  State agency  Private organization  Local government agency

Name of the agency or organization: \_\_\_\_\_

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

- a.  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? (must account for the maximum volume of runoff)

- 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/basin or downstream of the dam/basin change?  Yes  No

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

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin	
	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                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3.5 feet or more at the upstream end                                     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4.0 feet within 100 feet upstream of all structures and/or constrictions | <input type="checkbox"/> Yes | <input type="checkbox"/> 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). | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2.0 feet above the 1%-annual-chance stillwater surge elevation  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

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 land side is: \_\_\_\_\_
- b. The maximum levee slope flood side 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 <sub>100</sub>	D <sub>50</sub>	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)

- 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:  
Strength  $\phi$  = \_\_\_\_\_ 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:

**E. LEVEE/FLOODWALL (CONTINUED)**

5. Embankment And Foundation Stability (continued)

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)  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. LEVEE/FLOODWALL (CONTINUED)**

6. Floodwall And Foundation Stability (continued)

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.

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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.

e. 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.

**E. LEVEE/FLOODWALL (CONTINUED)**

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.

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.

**E. LEVEE/FLOODWALL (CONTINUED)**

- 11. Maintenance Plan  
Please attach a copy of the formal maintenance plan for the levee/floodwall
  
- 12. Operations and Maintenance Plan  
Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

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This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) 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: \_\_\_\_\_ License No.: \_\_\_\_\_ Expiration Date: \_\_\_\_\_  
Company Name: \_\_\_\_\_ Telephone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**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.

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DEPARTMENT OF HOMELAND SECURITY  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**RIVERINE STRUCTURES FORM**

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

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**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; 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: Calamity Wash

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.....complete Section D
- Levee/Floodwall.....complete Section E
- Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: CAL 100 - 4 span bridge  
Type (check one):     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: Between RS 0.049 and RS 0.069 at the US-60 crossing.  
Downstream Limit/Cross Section: 0.049  
Upstream Limit/Cross Section: 0.069
2. Name of Structure: \_\_\_\_\_  
Type (check one):     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: \_\_\_\_\_  
Downstream Limit/Cross Section: \_\_\_\_\_  
Upstream Limit/Cross Section: \_\_\_\_\_
3. Name of Structure: \_\_\_\_\_  
Type (check one)     Channelization                       Bridge/Culvert                       Levee/Floodwall                       Dam  
Location of Structure: \_\_\_\_\_  
Downstream Limit/Cross Section: \_\_\_\_\_  
Upstream Limit/Cross Section: \_\_\_\_\_

**NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.**

B. CHANNELIZATION

Flooding Source:

Name of Structure: \_\_\_\_\_

1. 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): \_\_\_\_\_

2. Channel Design Plans

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

3. Accessory Structures

The channelization includes (check one):

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

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport?  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.

C. BRIDGE/CULVERT

Flooding Source: Calamity Wash

Name of Structure: CAL-100

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

Are the hydraulics of the structure affected by sediment transport?  Yes  No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.



**D. DAM/BASIN**

Flooding Source: \_\_\_\_\_  
 Name of Structure: \_\_\_\_\_

1. This request is for (check one):  Existing dam/basin  New dam/basin  Modification of existing dam/basin
2. The dam/basin was designed by (check one):  Federal agency  State agency  Private organization  Local government agency

Name of the agency or organization: \_\_\_\_\_

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

- a.  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? (must account for the maximum volume of runoff)

- 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/basin or downstream of the dam/basin change?  Yes  No

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

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin	
	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                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3.5 feet or more at the upstream end                                     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4.0 feet within 100 feet upstream of all structures and/or constrictions | <input type="checkbox"/> Yes | <input type="checkbox"/> 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). | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2.0 feet above the 1%-annual-chance stillwater surge elevation  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

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 land side is: \_\_\_\_\_
- b. The maximum levee slope flood side 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 <sub>100</sub>	D <sub>50</sub>	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)

- 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:  
Strength  $\phi$  = \_\_\_\_\_ 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:

**E. LEVEE/FLOODWALL (CONTINUED)**

5. Embankment And Foundation Stability (continued)

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)  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. LEVEE/FLOODWALL (CONTINUED)**

6. Floodwall And Foundation Stability (continued)

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.

e. 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.

**E. LEVEE/FLOODWALL (CONTINUED)**

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.

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.

**E. LEVEE/FLOODWALL (CONTINUED)**

- 11. Maintenance Plan  
Please attach a copy of the formal maintenance plan for the levee/floodwall
  
- 12. Operations and Maintenance Plan  
Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

**CERTIFICATION OF THE LEVEE DOCUMENTATION**

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) 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: \_\_\_\_\_ License No.: \_\_\_\_\_ Expiration Date: \_\_\_\_\_  
Company Name: \_\_\_\_\_ Telephone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**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**

The Phase 2 *Survey Report* prepared by HRC (Ref. 26) is included as Appendix C. Information in this section is a summary of the detailed information found in the Survey Report.

#### **3.1 Field Survey Information**

##### **3.1.1 Roadway Structures**

Field survey of major existing roadway culvert structures was conducted on several trips between December 2010 and September 2011 to supplement the topographic mapping. All structures surveyed were documented in a manner consistent with the requirements in the *FEMA Guidelines and Specifications for Flood Hazard Mapping Partners* (Ref. 12), and are documented in Appendix C. Control Points were provided by the National Geodetic Survey, via the Maricopa County Department of Transportation (MCDOT) website.

##### **3.1.2 Railroad Structures**

A field survey of drainage structures crossing the Burlington Northern Santa Fe (BNSF) Railroad was conducted in March and April of 2011. Survey included top of rail, culvert and trestle dimensions and flow line elevations. Refer to Appendix C for survey field notes.

##### **3.1.3 Finished Floor Elevations**

Finished floor elevation surveys were performed for 17 homes within the project area adjacent to, or within, the delineated floodplains of the washes. The intent of the surveys was primarily as justification for refinement of the floodplain delineation boundary. Results for the surveys are documented in the Survey Report included as Appendix C.

### 3.2 Mapping

Topographic mapping data from the Wickenburg Mapping Project (FCD 03-66), dated July 7th, 2004 (Ref. 21), was provided by the District and used to create 2-foot contour interval mapping within Maricopa County. This information was augmented with USGS points for areas within Yavapai County from the National Elevation Dataset, released in June 2010 (Ref. 40). The vertical datum of the topographic data is NAVD88 and its geographic coordinate system is State Plane Arizona Central (NAD83).

Since the time of the original topographic mapping, several locations have been newly constructed or modified along the east watersheds. For locations where this construction may impact the delineation, new field survey data replaced the 2004 data. Specifically survey was completed along a parcel that was constructed along the edge of Amir Wash. All survey data is included in the survey report in Appendix C.

## 4 Hydrology

### 4.1 Method Description

Hydrologic analyses were performed using the US Army Corps of Engineer's computer program HEC-1, Version 4.1, Flood Hydrograph Package in accordance with procedures and parameters recommended in the District's *Drainage Design Manual for Maricopa County, Volume I, Hydrology* (Ref. 17). Hydrologic Models for the Phase 2 East Tributaries are as follows:

- 500-year; 6-hour and 24-hour Existing Condition
- 100-year; 6-hour and 24-hour Existing Condition
- 50-year; 6-hour and 24-hour Existing Condition
- 10-year; 6-hour and 24-hour Existing Condition

Each model uses the Green and Ampt methodology to estimate rainfall losses, and the Phoenix Mountain S-graph for the unit hydrograph. Flow is routed using the Normal Depth routing option. The watershed sub-basins and the flow routing schematic for the runoff model are shown on Exhibits 2.B2-2.C3.

The Amir Wash watershed is west of the Hassayampa River and thus a separate HEC-1 model was created for its watershed. Wash P, Blue Tank Wash, Wash N, Powder House Wash, Wash AF, and Calamity Wash Watersheds are east of the Hassayampa River and were combined into one HEC-1 model.

The study identified the 100-year, 6-hour and 24-hour peak discharges and compared the discharges along each wash to determine which produced the higher discharge. The peak discharge from the 500-year storm event was also produced for the study.

## 4.2 Parameter Estimation

### 4.2.1 Drainage Area Boundaries

The watershed basin and sub-basin boundaries, along with a schematic of the HEC-1 sub-basins and routings are shown on Exhibits 1 & 2.C1-2.E1.

A terrain surface file was created in ArcGIS using the 2004 topographic mapping and was used to delineate the watershed and sub-basin boundaries. If necessary, adjustments were made to the sub-basin boundaries based on visual assessments of the topography, aerial photography and field observations. Flow concentration points occur at the natural confluence of tributaries, split flow locations, and where manmade drainage facilities or structures affect flow characteristics. Concentration points were also located near existing developments prone to flooding.

### 4.2.2 Watershed Work Maps

The Work Maps for this study include land use, soils, and routing on GIS layers and mapping provided by the District. The parameters used in the models, and the basin and routing information, are depicted in Exhibits 1 through 5.E1.

All sub-basins are named after the main wash using five or six digit alphanumeric characters. The first two to three characters identify the wash and watershed that the sub-basin is located within (e.g. Basin AM01 is located within the Amir Wash Watershed). The remaining characters are numeric values that start at the upstream end of the sub-basin and increase in the downstream direction. Channel routes are identified by an "R" followed by the wash name initials and the downstream operation.

### **4.2.3 Gage Data**

There is one streamflow gage station within the study area called Powder House Wash northeast of Constellation road and US 60 with recorded flood stages for Powder House Wash since 1995. Additionally there is one rainfall gage station with records since 1994 called Constellation Road that is to the northeast of US60 and US93. All gages are maintained by the District. The rainfall and stream gages of record and their data is available on the District's website. Calibration of hydrology models is not included in the scope of this study.

### **4.2.4 Statistical Parameters**

The HEC-1 models were used to evaluate the hydrologic response of the study area to a range of precipitation events. A statistical analysis is not included in the scope of this study and thus is not included in this TDN. The runoff models were compared with the results from USGS and regional regression equations (see Section 4.5.2 and Appendix D.7)

### **4.2.5 Precipitation and Inflow Hydrographs**

#### **4.2.5.1 Precipitation**

The District uses the Mean Partial Duration Time Series point precipitation values from NOAA Atlas 14 (Ref. 29). This results in a decrease in precipitation values for most of Maricopa County, however for the WADMS watershed, the precipitation values on average increased by approximately ten percent.

Isopluvial maps of rainfall intensities contained in the NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 1, Arizona (Ref. 29)

are used for this study. Rainfall data from the District's GIS shape files are embedded in the District's DDMSW program. DDMSW was used to develop hydrologic models for the 10, 50, and 100-year events. Precipitation for the 500-year event was read from the NOAA 14 table and graphs extracted from the NOAA website: ([http://hdsc.nws.noaa.gov/hdsc/pfds/sa/az\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/sa/az_pfds.html)) based on the geographic coordinates of the Centroid of the study area. The point values are summarized in Table 1, and precipitation tables and graphs are provided in Appendix D.1.

**Table 1 – Phase 2 East Tributaries Point Precipitation Values**

<b>Watershed</b>	<b>Frequency and Duration</b>	<b>Point Precipitation (inches)</b>
East Tributaries	2-Year, 6-Hour	1.49
	2-Year, 24-Hour	2.07
	10-Year, 6-Hour	2.26
	10-Year, 24-Hour	3.10
	50-Year, 6-Hour	3.12
	50-Year, 24-Hour	4.21
	100-Year, 6-Hour	3.51
	100-Year, 24-Hour	4.72
	500-Year, 6-Hour	4.52
	500-Year, 24-Hour	6.08
Amir Wash Watershed	2-Year, 6-Hour	1.42
	2-Year, 24-Hour	1.92
	10-Year, 6-Hour	2.18
	10-Year, 24-Hour	2.88
	50-Year, 6-Hour	3.02
	50-Year, 24-Hour	3.93
	100-Year, 6-Hour	3.40
	100-Year, 24-Hour	4.41
	500-Year, 6-Hour	4.39
	500-Year, 24-Hour	5.60

#### 4.2.5.2 Distribution Pattern

This study delivers HEC-1 modeling for the 6- and 24-hour storm distribution for the 10-, 50-, 100-, and 500-year storm events.

Typically, the 6-hour storm distribution is used for drainage areas of less than 20 square miles except for on-site storage facilities (Ref. 18). The 6-hour distribution may also be used for drainage areas between 20 square miles and 100 square miles to estimate the peak flood discharges that could be realized on watersheds due to the occurrence of a local storm critically centered over part or the entire watershed.

The Maricopa County 6-hour local storm distributions consist of five dimensionless storm patterns as shown in Table 2.4 of the *Hydrology Manual* (Ref. 17). Pattern 1 has the greatest rainfall intensities that can be expected in the eye of a local storm.

The 24-hour storm SCS Type II distribution is used for flood studies in Maricopa County for watershed areas between 20 and 500 square miles. This distribution is listed in Table 5 of the District's *Hydrology Manual* (Ref. 17).

Watersheds in the East Phase 2 WADMS range in size from 0.3 to 10.9 square miles. Peak discharges from the 100-year 6-hour storm and the 100-year 24-hour storm were compared to determine whether a more localized or a general storm produces the greater discharge. In general, for smaller watersheds, the 100-year 6-hour storm produces a higher peak discharge than the 100-year 24-hour storm. For larger watersheds, the 100-year 24-hour

storm generally produces a higher peak discharge than the 100-year 6-hour storm. The higher peak discharge was used for floodplain delineation.

#### **4.2.5.3 Depth-Area Reduction**

Depth-Area reduction was applied using the JD record option of HEC-1 and is based on the curves presented in Tables 2.1 and 2.2 of the *Hydrology Manual* (Ref. 17). The DDMSW program has these curves embedded in it.

### **4.2.6 Physical Parameters**

#### **4.2.6.1 Soils and Land Use**

Detailed digital soil survey data from the Natural Resources Conservation Service (NRCS), as provided by the District, was used to develop the soils maps for the WADMS.

The existing 2010 land use dataset developed by MAG contains 94 different MAG land use categories that do not directly correlate to the 17 shown in Table 4.2 of the District's *Hydrology Manual* (Ref. 17). Since the DDMSW program utilizes MAG land use categories, and provides Green and Ampt parameters for each category, the MAG land use categories were used in this study instead of Table 4.2 of the District's *Hydrology Manual* (Ref. 17).

The soil texture and land use data provide information regarding rainfall infiltration, and is discussed in the next section.

#### **4.2.6.2 Rainfall Losses – Green-Ampt Infiltration**

The Green-Ampt infiltration equation was selected to calculate the rainfall losses. Two phases are involved by using the Green-Ampt method. The first phase is surface retention loss, which is represented by a parameter

called initial abstraction (IA) in HEC-1. The initial abstraction is a function of land use. The DDMSW program provides initial abstraction for each category of land use.

The second phase simulates the infiltration of rainfall into soil. The Green-Ampt equation, which is represented as follows, takes into account the soil suction head, porosity, hydraulic conductivity and time.

$$f = \text{XKSAT} \left( 1 + \frac{\text{PSIF} \cdot \text{DTHETA}}{F} \right)$$

$$f = \frac{dF}{dt}$$

where  $f$  = infiltration rate (inches/hour)

XKSAT = saturated hydraulic conductivity (inches/hour)

PSIF = wetting front capillary suction (inches)

DTHETA = soil moisture deficit, pre-condition

F = accumulated infiltration depth (inches)

The saturated hydraulic conductivity (XKSAT) for bare ground conditions varies with soil texture and is provided by the DDMSW program. The DDMSW program adjusts the XKSAT values for vegetation cover and land use for each sub-basin. The wetting front capillary suction (PSIF) is also a function of soil texture and decreases with XKSAT. The DDMSW program calculates the PSIF from XKSAT based on the relationship depicted in Figure 4.3 of the District's *Hydrology Manual* (Ref. 17).

The soil moisture deficit (DTHETA) is a function of land use and is computed by the DDMSW program. Observation of the aerial photographs

show that some land use types within the study area have different soil moisture deficits than their default values. Where necessary, adjustments were made by adding new land use categories with reasonable DTHETA values. These new categories are provided in Appendix D.2.

For impervious areas of a sub-basin, no infiltration occurs. A default percentage of impervious area (RTIMP) for each land use type is provided in the DDMSW program, however, some land use types exhibit different impervious percentages than their default values. Where necessary, adjustments were made by adding new land use categories with reasonable RTIMP values. These new categories can be found in Appendix D.2.

#### 4.2.6.3 Unit Hydrograph

The four S-graphs appropriate for use within Maricopa County are Phoenix Mountain, Phoenix Valley, Desert/Rangeland, and Agricultural S-graphs. Given the terrain of the study area, the Phoenix Mountain S-graph was selected to generate the unit hydrographs within each sub-basin. The lag time is required to obtain the unit hydrograph from the S-graph.

Per the District's *Hydrology Manual*, lag time is computed using the following equation:

$$Lag = 24K_n \left( \frac{L \cdot Lca}{S^{0.5}} \right)^{0.38}$$

$Lag$  = basin lag in hours

$K_n$  = mean Manning's n for channels within the basin

$L$  = length of the longest watercourse in miles

$Lca$  = length along the watercourse to a point opposite the centroid in miles

$S$  = watercourse slope in feet per mile

The DDMSW program calculates the  $Kn$  for the drainage basins based on the land use types within the sub-basin. The  $Kn$  values for the land use types added to the DDMSW program were estimated based on the aerial and topography mapping.

The longest watercourses for each sub-basin were traced using the terrain model produced from the 2004 mapping.  $Lca$  values for all sub-basins were calculated by identifying their centroids. The watercourse slopes were calculated using ArcGIS tools.

#### **4.2.7 Reach Routing**

The Normal Depth Routing Method can be used for both natural and artificial channels in both urbanized and non-urbanized watersheds and was used for routing hydrographs within the WADMS. This method simulates attenuation due to overbank storage.

Longitudinal slopes and Manning's "n" values for the routing reaches were estimated based on the topographic mapping, aerial photographs, and field observations. Worksheets for "n" value calculations are located in the Field Reconnaissance Report, included as Appendix G (Ref. 25). These worksheets show tabulated reach routing parameters, cross-section sketches and "n" value estimations. Because the roughness for well-defined channels does not change appreciably with varying depths of flow, a single 'n' value was used for a routing reach.

A spreadsheet was created to verify the NSTPS time step values calculated using the DDMSW program (Appendix D.3). The NSTPS values were calculated for the 100-year 6-hour event using the following equation:

$$NSTPS = \frac{Reach\ Length}{Celerity \times Time\ Step \times 60}$$

$NSTPS = \text{time steps}$

$Reach\ Length = \text{reach routing length}$

$Celerity = \partial Q / \partial A$ , for a rectangular channel it is 5/3 of normal velocity. This ratio is also used to estimate the celerity in the spreadsheet.

$Time\ Step = 5 \text{ minutes for larger watersheds, } 3 \text{ minutes for smaller.}$

Calculated NSTPS were used wherever possible, however in locations of low slopes and long reach routes, the calculated result caused more attenuation in the peak flow than was reasonable. In these cases, NSTPS were modified through trial and error and the resulting values are noted in the HEC-1 models and included in Appendix D.

#### 4.2.8 Storage Routing

Typically, the capacity of existing roadway culverts in the area will be exceeded for events less than the 100-year. Typically these roadway crossings do not have much upstream storage capacity, and therefore do not have an effect on the peak flows downstream. Hence, roadway crossings are not modeled in the HEC-1 model, and flow is assumed to continue downstream unimpeded.

#### 4.2.9 Flow Splits and Diversions

There were no splits or diversion used in the two HEC-1 models developed for the Phase 2 East Tributaries. These washes typically originate in the mountainous areas and have well defined routing reaches that were used in the hydrologic modeling

#### 4.3 Problems Encountered During the Study

No special problem was encountered. No error messages occur in the models. The following warnings occurred in the Amir Wash Watershed HEC-1 Models:

WARNING --- MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR FLOWS BETWEEN (Value) TO (Value).

This warning was encountered in the same three routes in all eight models. In most cases, the calculated peak discharges was not within the range reported and the warning message was disregarded. In the 24-hour models, the calculated peak discharge was in range for one route. The hydrograph of that route appeared normal and the warning was ignored.

The following warnings occurred in the East Washes HEC-1 Models:

WARNING --- MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR FLOWS BETWEEN (Value) TO (Value).

WARNING --- EXCESS AT PONDING LESS THAN ZERO FOR PERIOD, EXCESS SET TO ZERO

The first warning was encountered in all the models. In most cases, the calculated peak discharge was not within the range reported and the warning message was disregarded. The calculated peak discharge was in range for a few of the routes. No irregularities were found in the hydrographs, thus the warning was ignored.

The second warning message listed above refers to the rainfall loss calculations performed by HEC-1 using Green and Ampt methodology. For any particular time period, it is possible to have the rainfall intensity smaller than the estimated infiltration rate. If this situation was encountered in the modeling, HEC-1 would automatically set the rainfall to zero and print the warning message. Thus this message is not an indication of modeling problems and was ignored.

#### **4.4 Calibration**

A lack of accurate discharge data for the washes prevented us from performing calibration on the hydrology models. No calibration was included with this study.

#### **4.5 Final Results**

##### **4.5.1 Hydrologic Analysis Results**

Hydrologic models were prepared for the 10-year, 6- and 24 hour, 50-year, 6- and 24 hour, 100-year, 6- and 24-hour and 500-year, 6- and 24 hour storm events for the existing condition using the NOAA 14. For smaller watersheds like Wash N, the 6-hour storm produces higher peak discharges than the 24-hour storm and was therefore used for the floodplain delineations. For larger watersheds like Powder House Wash, the 24-hour storm was used for floodplain delineation when it produced higher overall peak discharges. HEC-1 outputs for each model are included in Appendix D.6, and the peak flow rates used in the floodplain delineation are summarized in Tables 2-7. Refer to Exhibits 5.C1-5.E1 for the Flow Map.

In general, the flows obtained are higher than the WADMS-94. This increase can be attributed to: (1) higher precipitation from NOAA 14 in comparison with NOAA

2; and (2) new developments in the area. Sub-basin runoff and concentration points for 100-Year 6- and 24-Hour flows are summarized in Tables 2-6.

**Table 2 – 100-Year Hydrologic Results Summary for Amir Wash Watershed**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
AM01	0.62	826	4.33	688	12.33
AM02	0.05	120	4.08	89	12.08
AM03	0.26	508	4.17	399	12.17
AM04	0.68	1044	4.33	885	12.33
AM11	0.18	446	4.17	358	12.17
AM21	0.3	453	4.33	357	12.33
AM31	0.09	201	4.17	160	12.17
C1	0.86	1004	4.25	910	12.25
C2	1.5	1402	4.33	1415	12.25
C3	2.18	1699	4.42	1827	12.42

**Table 3 – 100-Year Hydrologic Results Summary for Wash P**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
P01	0.55	991	4.25	827	12.25
P02	0.19	573	4.08	459	12.08
P03	0.1	325	4.08	264	12.08
PC1	0.74	1123	4.17	1006	12.17
PC2	0.85	1239	4.17	1146	12.17

**Table 4 – 100-Year Hydrologic Results Summary for Calamity Wash**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
CL01	0.73	1017	4.33	902	12.33
CL03	2.46	1730	4.58	2126	12.5
CL05	0.85	1225	4.33	1118	12.33
CL07	0.25	742	4.17	604	12.17
CLC1	3.19	2228	4.58	2926	12.5
CLC2	4.03	2750	4.67	3498	12.58
CLC3	4.28	2757	4.75	3544	12.67

**Table 5 – 100-Year Hydrologic Results Summary for Wash N**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
N01	0.22	594	4.17	485	12.17
N02	0.12	366	4.17	298	12.17
NC1	0.34	865	4.17	708	12.17

**Table 6 – 100-Year Hydrologic Results Summary Blue Tank Wash**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
BT01	2.51	1534	4.67	1840	12.67
BT02	1.86	1277	4.5	1535	12.42
BT03	2.8	1248	4.58	1956	12.58
BT04	3.31	1347	4.83	1854	12.83
BT05	0.42	854	4.25	694	12.25
BTC1	4.36	1878	4.83	2405	12.83
BTC2	7.17	2380	4.67	3994	12.67
BTC3	10.47	2867	5.17	4910	13
BTC4	10.89	2863	5.33	4899	13.17

**Table 7 – 100-Year Hydrologic Results Summary for Powder House Wash Watershed**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
PH01	0.62	1143	4.25	974	12.25
PH03	0.09	260	4.08	213	12.08
PH04	0.77	1323	4.25	1200	12.25
PH05	0.11	339	4.08	277	12.08
PH11	0.16	300	4.17	232	12.17
PH21	0.19	342	4.17	270	12.17
PHC1	0.79	1324	4.25	1195	12.25
PHC2	1.06	1527	4.25	1480	12.25
PHC3	1.83	2283	4.33	2610	12.33
PHC4	1.95	2321	4.42	2652	12.42

**Table 8 – 100-Year Hydrologic Results Summary for Wash AF & Hassayampa Tributaries**

HEC-1 I.D.	Contributing Drainage Area (sq. mi.)	100-Year 6-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)	100-Year 24-Hour Peak Discharge (cfs)	Time to Peak Discharge (hr)
AF01	0.16	486	4.17	396	12.17
AF02	0.15	436	4.17	355	12.17
AFC1	0.31	881	4.17	718	12.17
HT01	0.17	445	4.17	354	12.17
HT02	0.11	383	4.08	313	12.08
HT03	0.04	153	4.08	124	12.08
HT04	0.34	824	4.17	674	12.17
HT05	0.35	754	4.25	617	12.25

#### 4.5.2 Verification of Results

USGS data for Arizona and regional regression equations were used to verify the peak discharges.

### 4.5.2.1 USGS Data for Arizona

The District has adopted a chart to describe the general relationship between peak discharges and watershed size for Maricopa County (Ref. 17). This relationship is based on Log-Pearson Type 3 (LP3) regression curve analysis using USGS streamflow and statistical data taken from 314 continuous or partial-record gage stations throughout Arizona, and is a function of drainage area. The peak discharges from the HEC-1 output were plotted on the chart for comparison, and as shown in Figure 4, lie within the 75<sup>th</sup> percentile confidence limits. Detailed results are included in Appendix D.7.

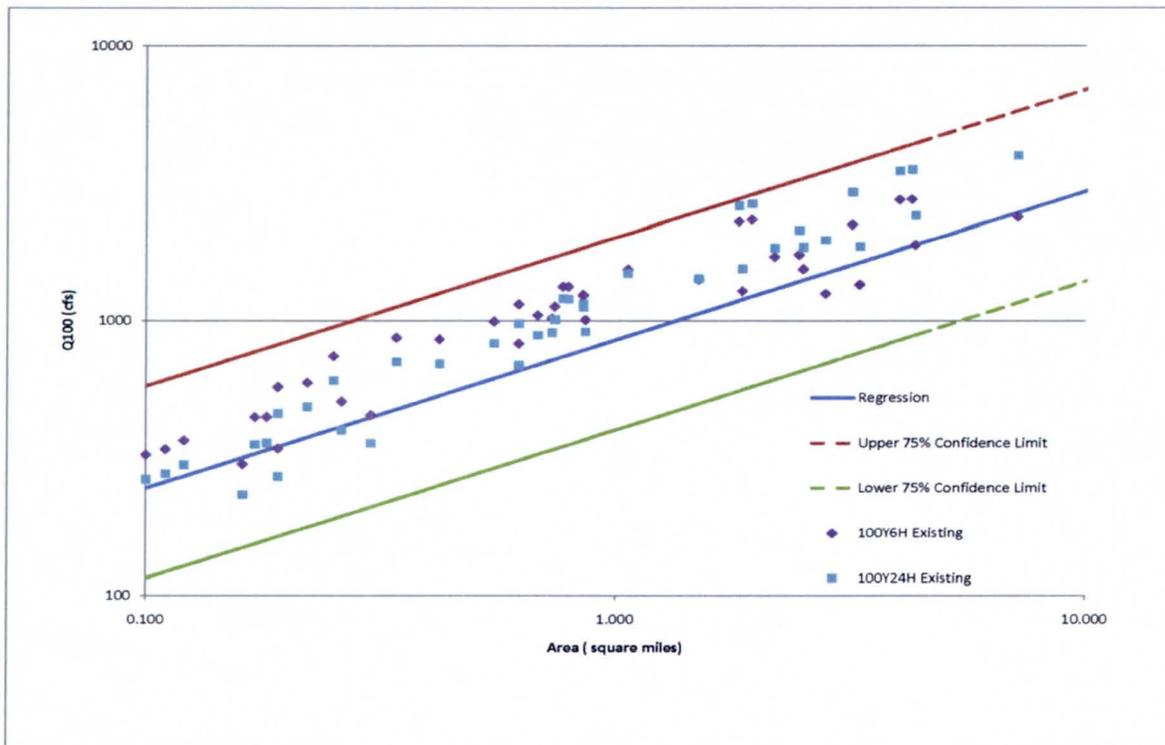


FIGURE 4 – COMPARISON OF 100-YR HEC-1 OUTPUT WITH USGS DATA FOR ARIZONA

### 4.5.2.2 Regional Regression Equations

The USGS has developed regional regression equations for each region of the country. Within regional input variables are average watershed elevation and drainage area. Using detailed topographic mapping, the average elevation for the project area is 2227.8 feet (NAVD88).

Figures 5-7 show comparisons of the 10-Year, 50-Year, and 100-Year results, for the project area respectively. Based on the comparison, the HEC-1 output results are significantly higher than the regional regression results for the 10-year event, but are reasonably close for the 50-year and 100-year events. Detailed results are included in Appendix D.7.

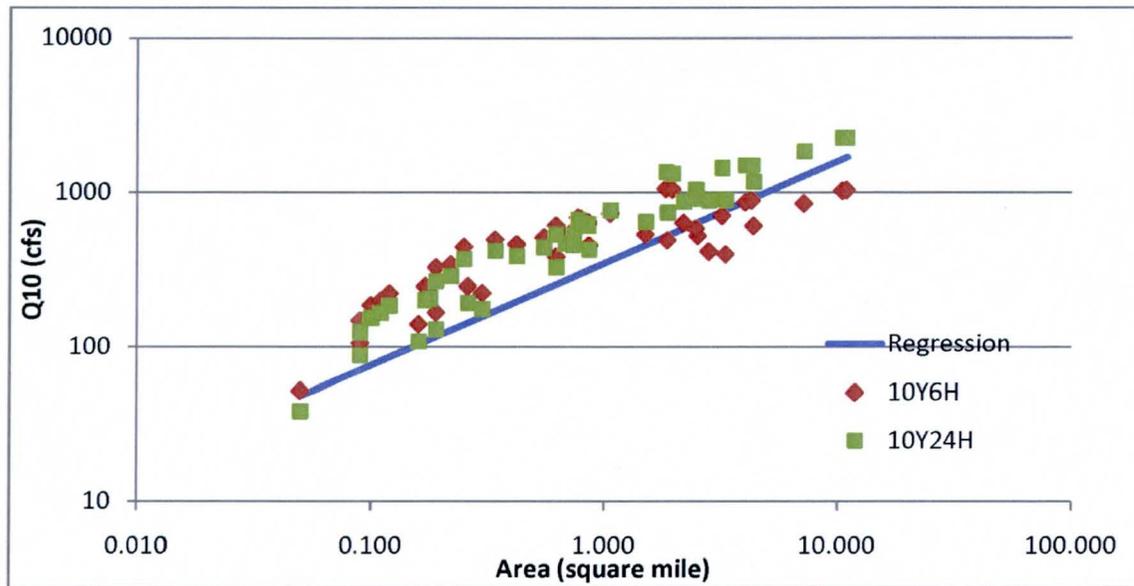


FIGURE 5 – COMPARISON OF 10-YR HEC-1 OUTPUT WITH USGS REGIONAL REGRESSION EQUATIONS

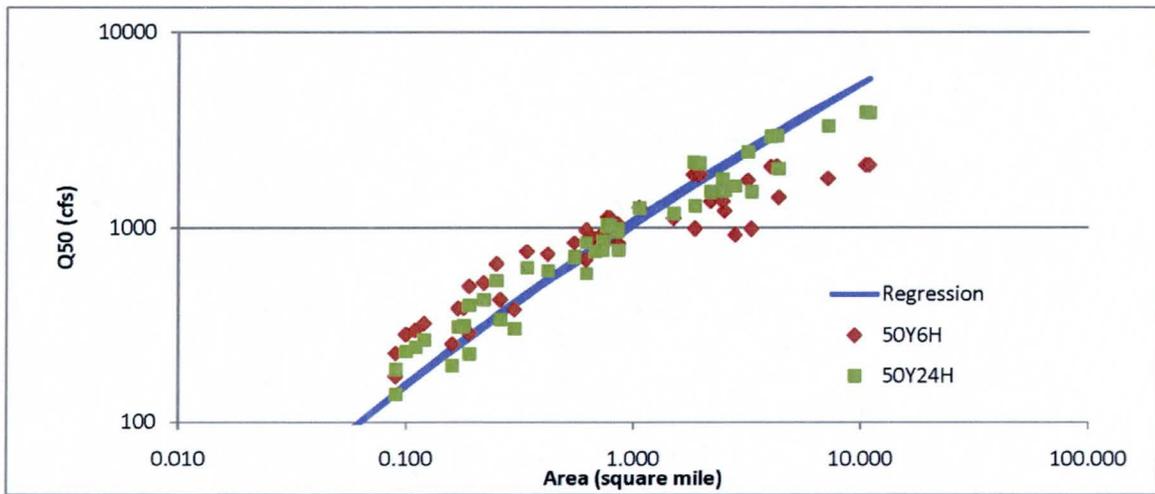


FIGURE 6 – COMPARISON OF 50-YR HEC-1 OUTPUT WITH USGS REGIONAL REGRESSION EQUATIONS

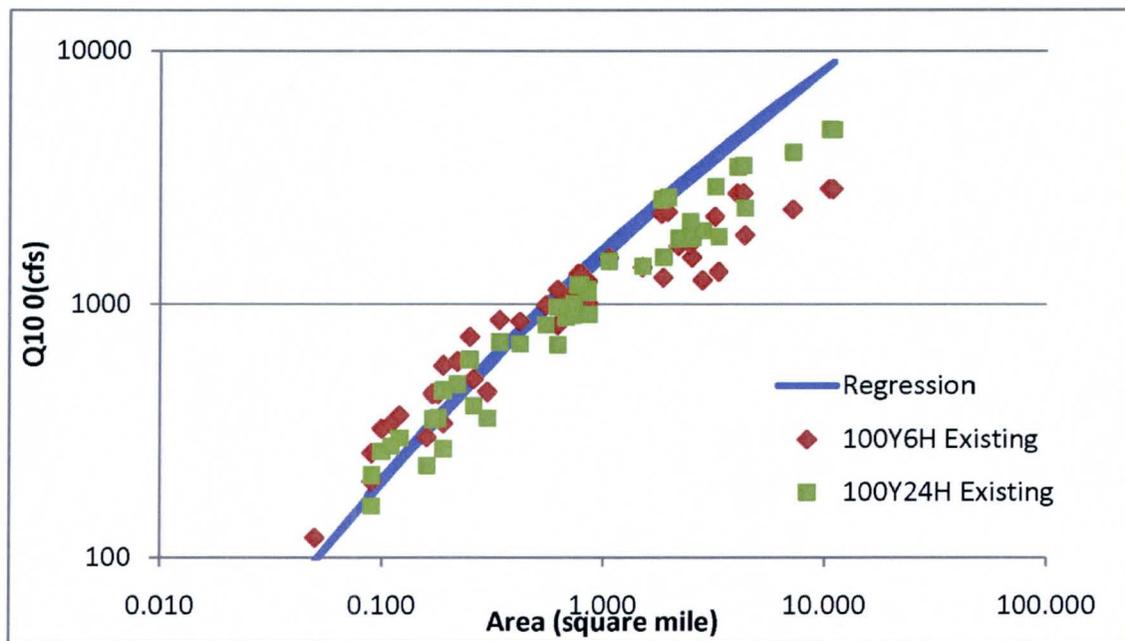


FIGURE 7 – COMPARISON OF 100-YR HEC-1 OUTPUT WITH USGS REGIONAL REGRESSION EQUATIONS

## 5 Hydraulics

### 5.1 Method Description

The effective Zone "AE" floodplain along the Phase 2 washes was previously delineated in the WADMS-94 using HEC-2 hydraulic models. However, for this study, these existing condition wash delineations were updated using the US Army Corps of Engineers computer program, HEC-RAS version 4.1 (Ref. 35).

The downstream boundary conditions for Amir Wash Watershed, Wash P, Blue Tank Wash, Wash N, Powder House Wash Watershed, Wash AF and Calamity Wash are summarized in Table 9 below.

**Table 9 – HEC-RAS Reach Boundary Conditions**

Reach	Downstream Boundary Condition	Boundary Value	U.S. Joining Wash - D.S. Wash
Amir Wash Reach 1	Junction	5	Amir Wash T3- Amir Wash R.2
Amir Wash Reach 2	Junction	6	Amir Wash T2- Amir Wash R.3
Amir Wash Reach 3	Junction	2	Amir Wash T1- Amir Wash R.4
Amir Wash Reach 4	Normal Depth	S = 0.0055	N/A
Amir Wash Tributary 1	Junction	2	Amir Wash R.3- Amir Wash R.4
Amir Wash Tributary 2	Junction	6	Amir Wash R.2- Amir Wash R.3
Amir Wash Tributary 3	Junction	5	Amir Wash R.1- Amir Wash R.2
Wash P	Normal Depth	S = 0.0233	N/A
Blue Tank	Normal Depth	S = 0.0225	N/A
Wash N	Normal Depth	S = 0.0354	N/A
Powder House Wash Reach 1	Junction	6	Powder House T.2 - Powder House R.2
Powder House Wash Reach 2	Junction	8	Powder House T1 - Powder House R.3
Powder House Wash Reach 3	Junction	13	Powder House R.3 - Powder House R.4
Powder House Wash Reach 4	Normal Depth	S = 0.021	N/A
Powder House Wash Tributary 1	Junction	8	Powder House R.2 - Powder House R.3
Powder House Wash Tributary 2	Junction	6	Powder House R.1 - Powder House R.2
Side Channel	Junction	13	Powder House R.3 - Powder House R.4
Calamity Wash Reach 1	Normal Depth	S = 0.0243	N/A
Wash AF Reach 1	Junction	S = 0.03	N/A

## 5.2 Work Study Maps

Work study maps are prepared for the Phase 2 East Tributary Washes at 1"=200-foot scale, and are included with this report.

## 5.3 Parameter Estimation

### 5.3.1 Roughness Coefficients

Manning's roughness coefficients ('n'-values) were chosen based on values presented in the Districts *Drainage Design Manual for Maricopa County, Volume II – Hydraulics* (Ref. 16) and the USGS *Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channels* (Ref. 31). The range of 'n' values is summarized in Table 10. To give a representation of different segments of the study area, photographs and 'n'-value calculations are included in Appendix G.

**Table 10 – HEC-RAS Manning's Roughness Coefficients**

Location	Roughness Coefficient
Channel Banks	0.019-0.10
Channel Bottom	0.015-0.064
Concrete Culverts	0.013
CMP Culverts	0.024

### 5.3.2 Expansion and Contraction Coefficients

Expansion and contraction coefficients are based on values presented in the District's *Hydraulics Drainage Design Manual* (Ref. 16). Contraction and expansion values of 0.3 and 0.1 were used for cross-sections without dramatic differences. For cross sections before and after culverts (Cross- Sections 2, 3 and 4), dramatic contraction and expansion cause a greater energy loss; therefore, 0.5 and 0.3 were used for the expansion and contraction coefficients, respectively.

### 5.3.3 Entrance Loss Coefficients

Culvert entrance loss coefficients were based on values presented in the HEC-RAS *Hydraulic Reference Manual*, dated March 2008 (Ref. 36). The coefficients chosen are summarized in Table 11.

**Table 11 – Entrance Loss Coefficients**

Culvert ID	Wash Name	River Station	Road Crossing	Material	Shape	Entrance Type	Entrance Loss Coefficient
AMI 100	Amir Wash	0.411	US 93	Concrete	Box	Headwall	0.5
AMI 300	Amir Wash	0.825	Access Road	Concrete	Bridge	Mitered to Slope	0.5
CAL 100	Calamity Wash	0.059	US 60	Concrete	Bridge	Headwall	0.5
AF 100	Wash AF	0.148	US 60	Concrete	Box	Headwall	0.5

### 5.4 Cross-Section Description

HEC-RAS geometry data is obtained from the two-foot contour interval topographic mapping provided by the District, dated 2004. HRC provided supplemental ground survey where required, as documented in the Survey Report (Ref. 26). Elevations for the study are on the NAVD88 vertical datum.

Cross-sections were located along the washes such that the distance between two consecutive sections is approximately 500-feet. Cross-sections were placed perpendicular to the flow paths as much as possible. Additional cross-sections were provided upstream and downstream of culvert crossings, based on placement recommendations in the *HEC-RAS Hydraulic Reference Manual* (Ref. 36). HEC-RAS Cross-Section plots are located in Appendix E.5.4.

## 5.5 Modeling Considerations

### 5.5.1 Hydraulic Jump

All models were run with the subcritical regime mode to obtain conservative water surface elevations. The locations of hydraulic jumps were not determined.

### 5.5.2 Culverts and Bridges

There are two culverts and two bridges within the Phase 2 East Tributaries study area. The dimensions for these crossings were obtained from the field survey prepared by HRC. The box culvert and three bridges were added to the HEC-RAS model. Three of these structures were previously modeled in the WADMS-94. Refer to Table 12 for the summary. Also, refer Appendix C for the field survey information.

**Table 12 – Culvert Summary**

Culvert ID	Wash Name	River Station	Road Crossing	Material	Shape	Size	Length
AMI 100*	Amir Wash	0.411	US 93	Concrete	Box	3-10-ft x 10-ft	57.7'
AMI 300	Amir Wash	0.825	Access Road	Concrete	Bridge	21-ft wide by 4.7-ft high	20.12'
CAL 100*	Calamity Wash	0.059	US 60	Concrete	Bridge	191-ft span	80'
AF 100*	Wash AF	0.148	US 60	Concrete	Box	5.5-ft x 7 -ft	118.2'

Note: \*Culverts modeled in WADMS-94 study.

### 5.5.3 Levees and Dikes

There were no dikes modeled as part of this study. There were two areas that used levees to reflect the hydraulic condition of the washes in the study area described below:

#### 5.5.3.1 Amir Wash Farm Fields

The downstream end of Amir Wash just upstream of US 93 is conveyed through a channel on the southern edge of some low lying farm fields. The WADMS-94 maps the fields and this channel as approximate as the

channel overflows into the fields during large storm events. Cross-sections upstream of the fields show the potential for flows continuing onto the agricultural fields, but cross-sections along the farm fields show the channel capable of carrying the full flow. To model this, a levee was added in the HEC-RAS model to the bank of the channel at two cross section locations (RS 0.711 and RS 0.625), enabling the channel to be mapped as detailed with a floodway using the full flow. The farm fields north of the channel are mapped as approximate.

#### **5.5.3.2 Powder House Wash Confluence with the Hassayampa River**

Powder House Wash HEC-RAS model includes a large low lying area in the right overbank, separate from the main channel. A levee was placed at this location to contain smaller flows in the channel segment and to more accurately model the location. This does not affect the floodplain as the Hassayampa floodplain controls with a higher water surface elevation at this cross-section and in particular in the low section of the cross-section. The floodway was adjusted on the left bank to match the controlling floodway from the Hassayampa River.

#### **5.5.4 Islands and Flow Splits**

The landform within the study area is generally mountainous and some of the washes do not have the capacity to convey the 100-year flow within the top of banks. In addition, street culvert crossings are not large enough to convey the 100-year storm event. As a result, it is possible for flow splits to occur causing islands to be formed within the floodplains. Three flow splits/islands were modeled in Powder House Wash

Watershed as described below. Refer to the Floodplain Work Maps located at the back of this report for floodplain split/island locations.

#### **5.5.4.1 Upstream Powder House Removed Island**

Along Reach 2 of Powder House Wash, the ground is very flat, causing the wash to expand between Cross-Sections 1.744 and 1.538. Cross-Section 1.65 includes an island in the left overbank area. Adjusting the Cross-Section would cause the island to shift near the channel centerline. Thus the cross-section alignment was not revised, showing an island in the far left overbank. The floodplain was delineated without the island to the extents determined from the model.

#### **5.5.4.2 El Recreo Drive Flow Split**

Powder House Wash crosses El Recreo Road just south of its intersection with Constellation Road through a low flow crossing. In larger storms, flows can overtop the low flow crossing and travel south along Constellation Road. To model this, a split reach (Side Channel) was added to the HEC-RAS model. Split flows were determined through an optimized junction which balanced the energy grade lines between Cross-Section 0.391, along Powder House Wash, and Cross-Section 0.202, along the Side Channel. The split flows were determined in an optimized model (HEC-RAS Model named: Opt\_PowderHouseWash.prj) and then used in the main HEC-RAS model. See Appendix E for calculations.

#### **5.5.4.3 Powder House Wash/Constellation Road Split**

After crossing El Recreo Drive, Powder House Wash is conveyed through a dirt channel parallel to Constellation Road. About 600-feet downstream of the El Recreo Drive crossing there is a low point in the right bank, allowing flow to split from the main channel and flow onto Constellation Road (Side Channel). As observed in the field, Powder House Wash conveys large amounts of through this dirt channel, causing the capacity in the channel at this location and the conveyance of this split to vary significantly between storms. Thus the full flow for Powder House Wash was used in both Powder House Wash and the Side Channel downstream of this potential split to ensure that the worst case scenario was mapped in the floodplain.

#### **5.5.5 Ineffective Flow Areas**

Ineffective flow is modeled upstream and downstream of roadway culverts and BNSF Railroad crossings up to the elevation of the top of the roadway/railroad. In locations where the 100-year flow overtops the roadway, it was noted that the ineffective areas had a unreasonable impact on the energy grade lines of most or all of the flow profiles in the HEC-RAS model. At these locations, ineffective flow areas were removed. Ineffective flow modeled upstream and downstream of the railroad crossing, at culverts and at some other cross-sections is based upon recommended guidelines in the HEC-RAS Manual (Ref. 36).

### **5.5.6 Supercritical Flow**

All models were run with the subcritical regime mode to obtain conservative water surface elevations. There are no reaches of supercritical flow modeled as part of this study.

## **5.6 Floodway Modeling**

Floodway modeling was performed on previously studied washes; including, Amir Wash Reaches 1-4, Wash P, Blue Tank Wash, Powder House Wash Reach 1-4, Powder House Wash Tributaries 1-2, and Powder House Wash Side Channel. The WADMS-94 included partial floodway modeling for Calamity Wash. Floodway calculations and delineations were only performed for the same extents as the WADMS-94. No floodway modeling was performed on Amir Wash Tributaries 1-3, Wash N, or Wash AF.

Floodways were modeled by first limiting encroachments to the bank stations using Encroachment Method #4. This was followed by further refinement using Encroachment Method #1. Encroachment limits were modified as necessary to optimize the floodway WSE.

Additional parameters on the encroachment stations include:

- Floodway WSE is to be no greater than 1-foot above the floodplain WSE.
- Floodway WSE is to have no negative surcharge.
- The floodway delineation is to be generally smooth and consistent within segments of the wash.

## **5.7 Problems Encountered During the Study**

### **5.7.1 Special Problems and Solutions**

There are no problem areas found within the study area.

### **5.7.2 Modeling Warning and Error Messages**

Though there are many modeling warning and error messages associated with HEC-RAS, these do not affect the accuracy of the results. Warnings and error messages include: Check-RAS NT, Check-RAS XS, Check-RAS Structures and Check-RAS Floodway. Refer to Appendix E.5.6 for the summary of the warning and error messages.

### **5.8 Calibration**

No hydraulic modeling calibration was performed as part of this study.

### **5.9 Final Results**

#### **5.9.1 Hydraulic Analysis Results**

Floodplains were delineated using the HEC-RAS 4.1 computer program (Ref. 35). Resulting floodplain delineations are shown on the Work Maps (included in this report).

The 100-year HEC-1 flows used in the HEC-RAS models are summarized in Table 13 with the full HEC-1 output located in Appendix D.6. The flows used for each reach are pro-rated or taken directly from selected concentration points in the HEC-1 model. Refer to Exhibits 6.C1-6.E1 for the locations of pro-rated flows and Appendix E for a full HEC-RAS flow summary table. The HEC-RAS results for the 100-year peak flows are summarized in Table 14. HEC-RAS output reports, tables, and cross-sections are included in Appendix E.5.

The 10-, 50-, 100- and the 500-year, flow summary table used in the HEC-RAS model are included in Appendix E.5.3.

**Table 13 – 100-Year Flows Used for HEC-RAS Modeling**

River / Reach Name	HEC-1 ID	100-Year Peak Discharge (cfs)
Amir Wash - Reach 1	C1A	805
Amir Wash - Reach 2	C2A	1041
Amir Wash - Reach 3	C2	1415
Amir Wash - Reach 4	C3	1827
Amir Wash - Tributary 1	AM31	201
Amir Wash - Tributary 2	AM21	453
Amir Wash - Tributary 3	AM11	9*
	AM11	128*
	AM11	446
Blue Tank Wash - Reach 1	BTC4	4899
Wash N - Reach 1	N01	166*
	N01	594
	NC1	865
Wash P - Reach 1	PC2	1239
Powder House Wash - Reach 1	PH01	1143
Powder House Wash - Reach 2	PHC2	1527
Powder House Wash - Reach 3	PHC3	2610
Powder House Wash - Reach 4	PHC4	2652
Powder House Side Channel - Reach 1	PHC4	640*
	PHC4	2652**
Powder House Trib 1 - Reach 1	PH21	342
Powder House Trib 2 - Reach 1	PH11	300
Wash AF - Reach 1	AFC1	881
Calamity Wash - Reach 1	CLC1	2926
	CLC2	3183*
	CLC2	3498
	CLC3	3544

Note: \*Pro-rated flow (Refer to Exhibits 6.B2-6.C3)

\*\*Flow split (Refer to Appendix E.5)

**Table 14 – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Amir Wash - Reach 1</b>		
2.874	805	2268.31
2.79	805	2262.82
2.692	805	2257.74
2.618	805	2251.03
<b>Amir Wash - Reach 2</b>		
2.482	1041	2242.29
2.404	1041	2238.02
2.318	1041	2232.48
2.221	1041	2225.37
2.115	1041	2217.56
2.033	1041	2211.52
1.933	1041	2204.94
1.864	1041	2200.37
<b>Amir Wash - Reach 3</b>		
1.822	1415	2198.26
1.796	1415	2195.64
<b>Amir Wash - Reach 4</b>		
1.717	1827	2189.16
1.606	1827	2181.65
1.564	1827	2178.83
1.497	1827	2173.78
1.427	1827	2168.23
1.387	1827	2164.11
1.317	1827	2158.34
1.249	1827	2153.59
1.188	1827	2148.69
1.122	1827	2144.88
1.102	1827	2142.43
1.025	1827	2139.07
0.986	1827	2135.71
0.935	1827	2128.41
0.868	1827	2123.37
0.838	1827	2123.1
0.83	1827	2123.08
0.825	Bridge	
0.823	1827	2120.07
0.806	1827	2117.26
0.711	1827	2109.18
0.625	1827	2102.54
0.528	1827	2094.27

**Table 14 (Continued) – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Amir Wash - Reach 4 (Continued)</b>		
0.443	1827	2093.07
0.42	1827	2093.32
0.415	1827	2092.72
0.411	Culvert	
0.399	1827	2089.19
0.376	1827	2088
0.332	1827	2087.12
<b>Amir Wash Tributary 1 - Reach 1</b>		
0.666	201	2271.68
0.549	201	2258.44
0.437	201	2241.74
0.266	201	2217.46
0.153	201	2203.94
0.076	201	2196.33
<b>Amir Wash Tributary 2 - Reach 1</b>		
0.853	453	2261.95
0.751	453	2253.07
0.593	453	2238.19
0.524	453	2233.3
0.434	453	2226.24
0.358	453	2220.45
0.276	453	2215.68
0.179	453	2209.85
0.09	453	2202.96
<b>Amir Wash Tributary 3 - Reach 1</b>		
0.727	9	2307.33
0.649	9	2295.2
0.575	9	2287.73
0.503	128	2281.95
0.383	446	2274.76
0.28	446	2265.89
0.166	446	2257.35
0.09	446	2250.74
0.049	446	2247.97
<b>Blue Tank Wash - Reach 1</b>		
1.046	4899	2175.36
0.984	4899	2168.27
0.879	4899	2156.49
0.786	4899	2147.91
0.716	4899	2139.53

**Table 14 (Continued) – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Blue Tank Wash - Reach 1 (Continued)</b>		
0.66	4899	2132.75
0.588	4899	2123.51
0.477	4899	2109.48
0.41	4899	2101.08
0.335	4899	2091.79
0.275	4899	2084.8
0.206	4899	2077.49
<b>Wash N - Reach 1</b>		
1.461	166	2280.28
1.393	166	2269.17
1.326	166	2260.44
1.282	166	2255.14
1.238	166	2246.6
1.199	166	2240.34
1.119	166	2229.1
1.043	594	2218.45
0.966	594	2208.22
0.908	594	2200.15
0.861	594	2192.94
0.779	594	2179.95
0.715	594	2169.08
0.651	865	2157.99
0.56	865	2139.57
0.471	865	2122.04
0.369	865	2102.48
0.275	865	2084.8
0.202	865	2072.85
0.153	865	2064.87
0.138	865	2057.35
<b>Wash P - Reach 1</b>		
0.458	1239	2136.34
0.433	1239	2133.5
0.398	1239	2129.34
0.362	1239	2123.78
0.318	1239	2118.5
0.269	1239	2112.27
0.231	1239	2107.51
0.201	1239	2103.01
0.176	1239	2100.05
0.154	1239	2096.54

**Table 14 (Continued) – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Wash AF - Reach 1</b>		
0.92	881	2152.58
0.88	881	2141.99
0.844	881	2137.28
0.798	881	2131.13
0.747	881	2119.16
0.7	881	2113.33
0.667	881	2106.21
0.605	881	2096.73
0.572	881	2091.28
0.516	881	2078.24
0.486	881	2073.71
0.46	881	2070.3
0.381	881	2059.45
0.304	881	2047.76
0.257	881	2041.75
0.226	881	2040.5
0.18	881	2040.37
0.158	881	2040.35
0.148	Culvert	
0.135	881	2030.05
0.122	881	2027
<b>Calamity Wash - Reach 1</b>		
2.422	2926	2360.57
2.351	2926	2352.78
2.305	2926	2347.92
2.262	2926	2344.15
2.245	2926	2342.24
2.201	3183	2336.57
2.148	3183	2330.72
2.1	3183	2324.68
2.054	3183	2312.07
2.006	3183	2295.65
1.957	3183	2277.06
1.871	3183	2263.12
1.778	3183	2249.71
1.685	3183	2236.86
1.59	3183	2225.19
1.493	3498	2212.97
1.391	3498	2202.35

**Table 14 (Continued) – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Calamity Wash - Reach 1 (Continued)</b>		
1.311	3498	2192.28
1.217	3498	2182.23
1.12	3498	2171.55
1.026	3498	2155.75
0.943	3498	2145.79
0.902	3498	2140.33
0.82	3544	2130.23
0.775	3544	2120.91
0.736	3544	2116.94
0.639	3544	2102.1
0.558	3544	2094.64
0.463	3544	2081.36
0.366	3544	2069.91
0.274	3544	2056.46
0.174	3544	2043.77
0.083	3544	2031.62
0.069	3544	2031.66
0.059	Bridge	
0.049	3544	2027.68
0.027	3544	2021.36
<b>Powder House Wash - Reach 1</b>		
2.09	1143	2284.47
2.031	1143	2274.28
1.97	1143	2266.78
1.935	1143	2262.13
1.911	1143	2258.93
1.881	1143	2253.33
1.846	1143	2249.36
1.82	1143	2246.99
<b>Powder House Wash - Reach 2</b>		
1.744	1527	2234.26
1.65	1527	2219.86
<b>Powder House Wash - Reach 3</b>		
1.538	2610	2208.93
1.496	2610	2203.8
1.456	2610	2198.13
1.423	2610	2194.58
1.367	2610	2187.88
1.285	2610	2180.46
1.217	2610	2173.84

**Table 14 (Continued) – HEC-RAS Results for 100-Year Event**

Note: Elevations shown are on the NAVD88 Datum.

River Station (RS)	Peak Discharge (cfs)	Water Surface Elevation (ft)
<b>Powder House Wash - Reach 3 (Continued)</b>		
1.169	2610	2166.52
1.085	2610	2158.45
0.988	2610	2146.57
0.888	2610	2135.73
0.793	2610	2124.73
0.691	2610	2112.95
0.585	2610	2101.35
0.492	2610	2089.16
0.432	2610	2082.37
<b>Powder House Wash - Reach 4</b>		
0.391	2610	2077.7
0.352	2610	2075.3
0.319	2610	2068.41
0.279	2610	2065.3
0.241	2652	2062.37
0.199	2652	2059.86
<b>Powder House Wash - Side Channel</b>		
0.202	640	2077.86
0.162	640	2071.06
0.129	640	2066.97
0.089	640	2061.55
0.051	2652	2058.96
<b>Powder House Wash - Reach 5</b>		
0.158	2652	2052.61
0.116	2652	2049.61
<b>Powder House Wash Tributary 2 - Reach 1</b>		
0.231	300	2278.63
0.188	300	2270.35
0.141	300	2261.71
0.093	300	2251.52
0.065	300	2248.59
<b>Powder House Wash Tributary 1 - Reach 1</b>		
0.331	342	2260.22
0.296	342	2255.65
0.262	342	2251.5
0.19	342	2237.08
0.179	342	2235.41
0.166	342	2233.36
0.105	342	2224.58

### 5.9.2 Verification of Results

The majority of the proposed floodplain delineations are similar to the effective FEMA delineation. However, variations are due to the increase in the 100-year flow rates, updated topography, revised 'n' values, land use changes and updated modeling techniques.

**6 Erosion and Sediment Transport**

Erosion and Sediment Transport are not covered under the Scope of this study.

## 7 Draft FIS Report Data

### 7.1 Summary of Discharges

The draft summary of discharges is provided in Table 15.

**Table 15 – Summary of Discharges**

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10-Year	50-Year	100- Year	500- Year
<b>Amir Wash</b>					
At Vulture Mine Road	1.12	423	833	1041	1592
Upstream of Amir Wash Tributary 1	1.5	644	1176	1415	2144
Upstream of Amir Wash Tributary 3	0.68	377	664	805	1165
Confluence with the Hassayampa River	2.18	870	1526	1827	2585
<b>Amir Wash Tributary 1</b>					
Upstream of Confluence with Amir Wash	0.09	106	171	201	275
<b>Amir Wash Tributary 2</b>					
Upstream of Confluence with Amir Wash	0.3	223	377	453	646
<b>Amir Wash Tributary 3</b>					
Confluence with Amir Wash	0.045	247	384	446	602
<b>Blue Tank Wash</b>					
Confluence with the Hassayampa River	10.89	2250	3878	4899	7407
<b>Wash N</b>					
Confluence with the Hassayampa River	0.34	495	751	865	1177
<b>Wash P</b>					
Confluence with the Hassayampa River	0.85	622	1044	1239	1737
<b>Powder House Wash</b>					
Upstream of Powder House Tributary 1	1.06	764	1265	1527	2240
Upstream of Powder House Tributary 2	0.62	610	972	1143	1576

**Table 15 (Continued) – Summary of Discharges**

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10-Year	50-Year	100- Year	500- Year
<b>Powder House Wash (Continued)</b>					
Upstream of Constellation Road Split	1.83	1352	2164	2610	3670
Confluence with the Hassayampa River	1.95	1320	2143	2652	3675
<b>Powder House Wash Tributary 1</b>					
Confluence with Powder House Wash	0.19	167	285	342	495
<b>Powder House Wash Tributary 2</b>					
Confluence with Powder House Wash	0.16	140	251	300	436
<b>Wash AF</b>					
Confluence with the Hassayampa River	0.31	520	769	881	1162
<b>Calamity Wash</b>					
Confluence with the Hassayampa River	4.28	1497	2965	3544	4984

## 7.2 Floodway Data

Floodway delineation was conducted only where floodway had been determined previously in the WADMS-94. As a result there is no floodway delineation in Amir Wash Tributaries 1-3, Powder House Wash Tributaries 1-2, Wash N, Wash AF and Calamity Wash upstream of Cross-Section 2.245. Resulting floodway data is provided in Table 16.

Table 16 – Floodway Data Summary

Cross-Section	Distance <sup>1</sup>	Floodway			Base Flood Water Surface Elevation			
		Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory	Without Floodway	With Floodway	Increase
<b>Amir Wash / Reach 1</b>								
2.874	2.874	45.64	97.66	8.24	2268.31	2268.31	2268.83	0.52
2.790	2.790	79.68	143.83	5.6	2262.82	2262.82	2263.52	0.70
2.692	2.692	28.32	84.14	9.6	2257.74	2257.74	2257.75	0.01
2.618	2.618	90.00	153.41	5.3	2251.03	2251.03	2251.80	0.77
<b>Amir Wash / Reach 2</b>								
2.482	2.482	59.65	140.53	7.4	2242.29	2242.29	2242.51	0.22
2.404	2.404	42.31	113.44	9.2	2238.02	2238.02	2238.39	0.37
2.318	2.318	140.00	179.28	5.8	2232.48	2232.48	2232.53	0.05
2.221	2.221	120.53	177.31	5.9	2225.37	2225.37	2225.37	0.00
2.115	2.115	46.00	115.24	9.0	2217.56	2217.56	2218.20	0.64
2.033	2.033	72.40	140.80	7.4	2211.52	2211.52	2211.55	0.03
1.933	1.933	55.63	121.09	8.6	2204.94	2204.94	2204.97	0.03
1.864	1.864	56.17	165.55	6.3	2200.37	2200.37	2201.16	0.79
<b>Amir Wash / Reach 3</b>								
1.822	1.822	30.00	122.73	11.5	2198.26	2198.26	2198.39	0.13
1.796	1.796	73.00	165.58	8.6	2195.64	2195.64	2195.68	0.04
<b>Amir Wash / Reach 4</b>								
1.717	1.717	60.22	185.21	9.9	2189.16	2189.16	2189.86	0.70
1.606	1.606	60.91	195.66	9.3	2181.65	2181.65	2182.60	0.95
1.564	1.564	60.04	183.93	9.9	2178.83	2178.83	2179.59	0.76
1.497	1.497	69.85	215.15	8.5	2173.78	2173.78	2174.46	0.68
1.427	1.427	124.92	269.75	6.8	2168.23	2168.23	2168.74	0.51
1.387	1.387	227.00	324.98	5.9	2164.11	2164.11	2164.98	0.87
1.317	1.317	130.15	263.30	6.9	2158.34	2158.34	2159.20	0.86
1.249	1.249	75.18	205.71	8.9	2153.59	2153.59	2154.53	0.94
1.188	1.188	114.03	251.17	7.3	2148.69	2148.69	2149.65	0.96
1.122	1.122	70.06	197.61	9.3	2144.88	2144.88	2145.80	0.92
1.102	1.102	71.52	223.44	8.2	2142.43	2142.43	2143.18	0.75
1.025	1.025	43.60	165.37	11.1	2139.07	2139.07	2139.07	0.00
0.986	0.986	25.00	137.58	13.3	2135.71	2135.71	2135.73	0.02
0.935	0.935	30.83	153.09	11.9	2128.41	2128.41	2128.60	0.19
0.868	0.868	136.50	497.73	3.7	2123.37	2123.37	2123.67	0.30
0.838	0.838	63.50	1057.87	4.1	2123.10	2123.10	2123.54	0.44

Table 16 (Continued) – Floodway Data Summary

Cross-Section	Distance <sup>1</sup>	Floodway			Base Flood Water Surface Elevation			
		Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory	Without Floodway	With Floodway	Increase
<b>Amir Wash / Reach 4 (Continued)</b>								
0.830	0.830	65.00	1031.23	4.2	2123.08	2123.08	2123.52	0.44
0.823	0.823	105.00	649.07	2.8	2120.07	2120.07	2120.77	0.70
0.806	0.806	26.53	144.18	12.7	2117.26	2117.26	2117.48	0.22
0.711	0.711	29.22	149.96	12.2	2109.18	2109.18	2109.35	0.17
0.625	0.625	35.29	153.38	11.9	2102.54	2102.54	2102.56	0.02
0.528	0.528	76.86	333.51	5.5	2094.27	2094.27	2094.29	0.02
0.443	0.443	97.19	383.09	4.8	2093.07	2093.07	2093.08	0.01
0.420	0.420	395.00	1815.88	1.0	2093.32	2093.32	2093.32	0.00
0.415	0.415	42.00	331.24	5.9	2092.72	2092.72	2092.72	0.00
0.399	0.399	43.00	165.68	11.0	2089.19	2089.19	2089.25	0.06
0.376	0.376	282.93	733.46	2.5	2088.00	2088.00	2088.50	0.50
0.332	0.332	265.59	469.55	3.9	2087.12	2087.12	2087.49	0.37
<b>Wash P / Reach 1</b>								
0.458	0.458	70.00	169.12	7.3	2136.34	2136.34	2137.12	0.78
0.433	0.433	47.32	130.47	9.5	2133.50	2133.50	2133.90	0.40
0.398	0.398	76.12	170.74	7.3	2129.34	2129.34	2129.66	0.32
0.362	0.362	96.69	165.32	7.5	2123.78	2123.78	2124.06	0.28
0.318	0.318	83.77	158.65	7.8	2118.50	2118.50	2118.53	0.03
0.269	0.269	55.46	137.65	9.0	2112.27	2112.27	2112.82	0.55
0.231	0.231	60.00	152.80	8.1	2107.51	2107.51	2108.50	0.99
0.201	0.201	60.00	152.85	8.1	2103.01	2103.01	2103.71	0.70
0.176	0.176	51.49	134.86	9.2	2100.05	2100.05	2100.18	0.13
0.154	0.154	99.27	175.39	7.1	2096.54	2096.54	2097.04	0.50
<b>Blue Tank Wash / Reach 1</b>								
1.046	1.046	227.00	651.99	7.5	2175.36	2175.36	2176.31	0.95
0.984	0.984	170.00	514.90	9.5	2168.27	2168.27	2168.75	0.48
0.879	0.879	180.00	558.22	8.8	2156.49	2156.49	2156.96	0.47
0.786	0.786	121.92	486.24	10.1	2147.91	2147.91	2148.78	0.87
0.716	0.716	150.00	575.24	8.5	2139.53	2139.53	2140.37	0.84
0.660	0.660	123.30	491.94	10.0	2132.75	2132.75	2133.67	0.92
0.588	0.588	150.00	552.80	8.9	2123.51	2123.51	2124.18	0.67
0.477	0.477	180.00	577.16	8.5	2109.48	2109.48	2110.46	0.98
0.410	0.410	240.00	636.04	7.7	2101.08	2101.08	2101.85	0.77
0.335	0.335	274.50	660.38	7.4	2091.79	2091.79	2092.28	0.49

Table 16 (Continued) – Floodway Data Summary

Cross-Section	Distance <sup>1</sup>	Floodway			Base Flood Water Surface Elevation			
		Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory	Without Floodway	With Floodway	Increase
<b>Blue Tank Wash / Reach 1 (Continued)</b>								
0.275	0.275	336.00	831.47	5.9	2084.80	2084.80	2085.79	0.99
0.206	0.206	225.00	629.33	7.8	2077.49	2077.49	2077.92	0.43
<b>Powder House Wash / Reach 1</b>								
2.090	2.090	44.03	121.42	9.4	2284.47	2284.47	2284.50	0.03
2.031	2.031	186.69	218.79	5.2	2274.28	2274.28	2274.30	0.02
1.970	1.970	153.89	185.59	6.2	2266.78	2266.78	2266.78	0.00
1.935	1.935	126.18	194.11	5.9	2262.13	2262.13	2262.15	0.02
1.911	1.911	162.80	248.68	4.6	2258.93	2258.93	2258.94	0.01
1.881	1.881	154.95	196.66	5.8	2253.33	2253.33	2253.34	0.01
1.846	1.846	138.70	246.63	4.6	2249.36	2249.36	2249.36	0.00
1.820	1.820	40.46	119.00	9.6	2246.99	2246.99	2247.03	0.04
<b>Powder House Wash / Reach 2</b>								
1.744	1.744	500.31	423.14	3.6	2234.26	2234.26	2234.28	0.02
1.650	1.650	308.66	317.66	4.8	2219.86	2219.86	2219.87	0.01
<b>Powder House Wash / Reach 3</b>								
1.538	1.538	57.00	230.28	11.3	2208.93	2208.93	2209.05	0.12
1.496	1.496	46.43	234.01	11.2	2203.80	2203.80	2204.16	0.36
1.456	1.456	88.00	290.62	9.0	2198.13	2198.13	2198.78	0.65
1.423	1.423	78.00	277.53	9.4	2194.58	2194.58	2195.56	0.98
1.367	1.367	69.00	263.67	9.9	2187.88	2187.88	2188.42	0.54
1.285	1.285	48.40	235.69	11.1	2180.46	2180.46	2181.16	0.70
1.217	1.217	46.00	230.27	11.3	2173.84	2173.84	2174.60	0.76
1.169	1.169	168.60	358.44	7.3	2166.52	2166.52	2167.33	0.81
1.085	1.085	75.00	276.01	9.5	2158.45	2158.45	2159.12	0.67
0.988	0.988	100.00	292.80	8.9	2146.57	2146.57	2147.37	0.80
0.888	0.888	90.00	298.90	8.7	2135.73	2135.73	2136.22	0.49
0.793	0.793	80.00	275.06	9.5	2124.73	2124.73	2125.17	0.44
0.691	0.691	49.36	220.35	11.8	2112.95	2112.95	2113.75	0.80
0.585	0.585	130.00	361.90	7.2	2101.35	2101.35	2101.36	0.01
0.492	0.492	66.00	246.39	10.6	2089.16	2089.16	2089.38	0.22
0.432	0.432	45.33	213.16	12.2	2082.37	2082.37	2082.85	0.48
<b>Powder House Wash / Reach 4</b>								
0.391	0.391	47.25	239.39	10.9	2077.70	2077.70	2078.67	0.97
0.352	0.352	32.51	191.12	13.7	2075.30	2075.30	2076.18	0.88

Table 16 (Continued) – Floodway Data Summary

Cross-Section	Distance <sup>1</sup>	Floodway			Base Flood Water Surface Elevation			
		Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory	Without Floodway	With Floodway	Increase
<b>Powder House Wash / Reach 4 (Continued)</b>								
0.319	0.319	137.79	338.12	7.7	2068.41	2068.41	2069.30	0.89
0.279	0.279	124.88	326.00	8.0	2065.30	2065.30	2066.19	0.89
0.241	0.241	93.92	350.50	7.6	2062.37	2062.37	2063.08	0.71
0.199	0.199	45.57	216.23	12.3	2059.86	2059.86	2060.22	0.36
<b>Powder House Wash / Reach 5</b>								
0.158	0.158	100.71	278.50	9.52	2052.61	2052.61	2053.47	0.86
0.116	0.116	115.00	312.68	8.5	2049.61	2049.61	2050.54	0.93
<b>Powder House Wash Tributary 2 / Reach 1</b>								
0.231	1.841	73.35	58.53	5.1	2278.63	2278.63	2278.63	0.00
0.188	1.798	45.88	52.95	5.7	2270.35	2270.35	2270.37	0.02
0.141	1.751	75.80	69.77	4.3	2261.71	2261.71	2261.73	0.02
0.093	1.703	58.78	57.31	5.2	2251.52	2251.52	2251.52	0.00
0.065	1.675	20.64	42.97	7.0	2248.59	2248.59	2248.65	0.06
<b>Powder House Wash Tributary 1 / Reach 1</b>								
0.331	1.869	22.64	44.46	7.7	2260.22	2260.22	2260.28	0.06
0.296	1.834	24.48	45.79	7.5	2255.65	2255.65	2255.69	0.04
0.262	1.800	18.70	40.45	8.5	2251.50	2251.50	2251.52	0.02
0.190	1.728	44.34	59.86	5.7	2237.08	2237.08	2237.11	0.03
0.179	1.717	73.45	74.37	4.6	2235.41	2235.41	2235.43	0.02
0.166	1.704	94.36	77.87	4.4	2233.36	2233.36	2233.40	0.04
0.105	1.643	209.04	111.59	3.1	2224.58	2224.58	2224.59	0.01
<b>Powder House Wash - Side Channel / Reach 1</b>								
0.202	0.202	30.01	72.30	8.9	2077.86	2077.86	2078.25	0.39
0.162	0.162	60.00	91.83	7.0	2071.06	2071.06	2071.14	0.08
0.129	0.129	30.00	71.94	8.9	2066.97	2066.97	2067.43	0.46
0.089	0.089	35.00	76.68	8.4	2061.55	2061.55	2061.69	0.14
0.051	0.051	54.42	230.76	11.5	2058.96	2058.96	2059.59	0.63

Table 16 (Continued) – Floodway Data Summary

Cross-Section	Distance <sup>1</sup>	Floodway			Base Flood Water Surface Elevation			
		Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory	Without Floodway	With Floodway	Increase
					(Feet NAVD88)			
<b>Calamity Wash / Reach 1</b>								
2.245	2.245	84.61	310.12	9.4	2342.24	2342.24	2342.24	0.00
2.201	2.201	43.00	239.22	13.3	2336.57	2336.57	2336.60	0.03
2.148	2.148	31.00	212.32	14.7	2330.72	2330.72	2331.01	0.29
2.100	2.100	18.00	162.02	17.1	2324.68	2324.68	2324.88	0.20
2.054	2.054	40.00	230.76	13.6	2312.07	2312.07	2312.13	0.06
2.006	2.006	16.00	166.80	18.2	2295.65	2295.65	2295.85	0.20
1.957	1.957	25.00	198.17	16.0	2277.06	2277.06	2277.07	0.01
1.871	1.871	46.82	230.31	12.9	2263.12	2263.12	2263.16	0.04
1.778	1.778	84.00	205.95	9.9	2249.71	2249.71	2250.66	0.95
1.685	1.685	135.00	149.20	8.7	2236.86	2236.86	2237.82	0.96
1.590	1.590	115.00	232.52	8.9	2225.19	2225.19	2225.62	0.43
1.493	1.493	130.00	216.42	9.0	2212.97	2212.97	2213.87	0.90
1.391	1.391	75.28	179.18	10.8	2202.35	2202.35	2202.89	0.54
1.311	1.311	75.00	171.21	10.6	2192.28	2192.28	2192.89	0.61
1.217	1.217	45.10	251.58	13.4	2182.23	2182.23	2182.65	0.42
1.120	1.120	34.50	235.41	14.8	2171.55	2171.55	2171.59	0.04
1.026	1.026	79.20	311.90	11.2	2155.75	2155.75	2155.75	0.00
0.943	0.943	66.00	290.03	11.9	2145.79	2145.79	2146.64	0.85
0.902	0.902	75.00	192.24	10.9	2140.33	2140.33	2140.84	0.51
0.820	0.820	46.45	263.53	13.5	2130.23	2130.23	2130.26	0.03
0.775	0.775	70.00	292.83	11.6	2120.91	2120.91	2121.01	0.10
0.736	0.736	44.00	258.38	13.7	2116.94	2116.94	2116.94	0.00
0.639	0.639	61.30	287.76	12.3	2102.10	2102.10	2102.10	0.00
0.558	0.558	144.00	299.75	8.7	2094.64	2094.64	2094.64	0.00
0.463	0.463	66.10	267.77	11.6	2081.36	2081.36	2081.43	0.07
0.366	0.366	36.00	238.06	14.6	2069.91	2069.91	2070.00	0.09
0.274	0.274	40.00	247.87	14.1	2056.46	2056.46	2056.46	0.00
0.174	0.174	43.00	256.69	13.8	2043.77	2043.77	2043.78	0.01
0.083	0.083	84.10	316.02	11.2	2031.62	2031.62	2031.63	0.01
0.069	0.069	98.94	515.39	6.9	2031.66	2031.66	2031.66	0.00
0.049	0.049	101.17	373.32	10.3	2027.68	2027.68	2027.70	0.02
0.027	0.027	260.00	326.76	6.7	2021.36	2021.36	2022.34	0.98

<sup>1</sup> Miles above confluence with outlet wash

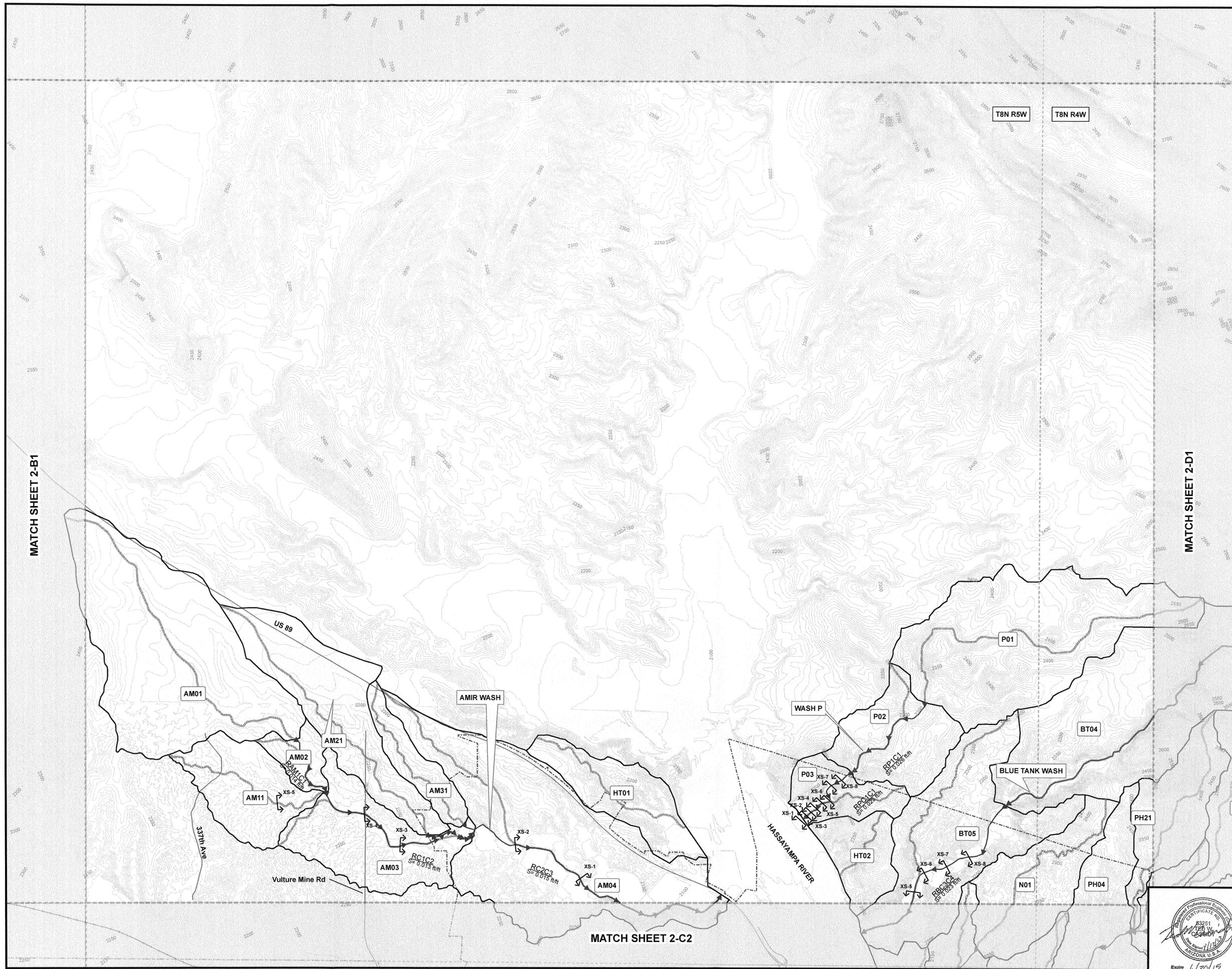
### **7.3 Annotated Flood Insurance Rate Map**

Annotated Flood Insurance Rate Maps, covering Map Panels numbered 04013C0235G, 04103C0251H, 04013C0252H, 04013C0254H, and 04013C0253H are shown in Figure 8A-8K, following this section.

### **7.4 Flood Profiles**

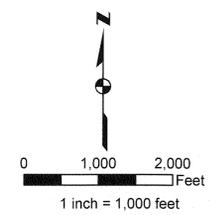
Flood profiles for the 10-, 50-, 100-, and 500-year floods are provided in Appendix E.5.5.





**LEGEND**

-  Phase 2 Watershed Boundary
-  Sub-basin ID
-  City Boundary
-  TC Flow Path
-  Railroad
-  Township and Range
-  Streets
-  Routing Reach
-  Routing Reach HEC1 ID  
Reach 100yr Velocity & Slope
-  Storm Drain
-  Cross Sections for Routing Reach 'n' Values
-  Elevation in Feet



Notes:  
 1) See FCD 2009-C030 - Phase 2 East Field Reconnaissance Report for cross section photographs and Mannings 'n' value calculations.

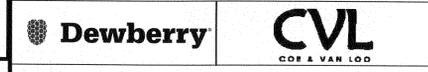
Reference:  
 Wickenburg Topographic Mapping, dated 12/16/2004, provided by FCDMC in 2010  
 Yavapai County Mapping, USGS Points dated 6/2010  
 Taken from National Elevation Dataset on 8/31/2010

**INDEX MAP**

	A	B	C	D	E	F
1	2-A1	2-B1	2-C1	2-D1	2-E1	2-F1
2	2-A2	2-B2	2-C2	2-D2	2-E2	2-F2
3	2-A3	2-B3	2-C3	2-D3	2-E3	
4			2-C4	2-D4	2-E4	



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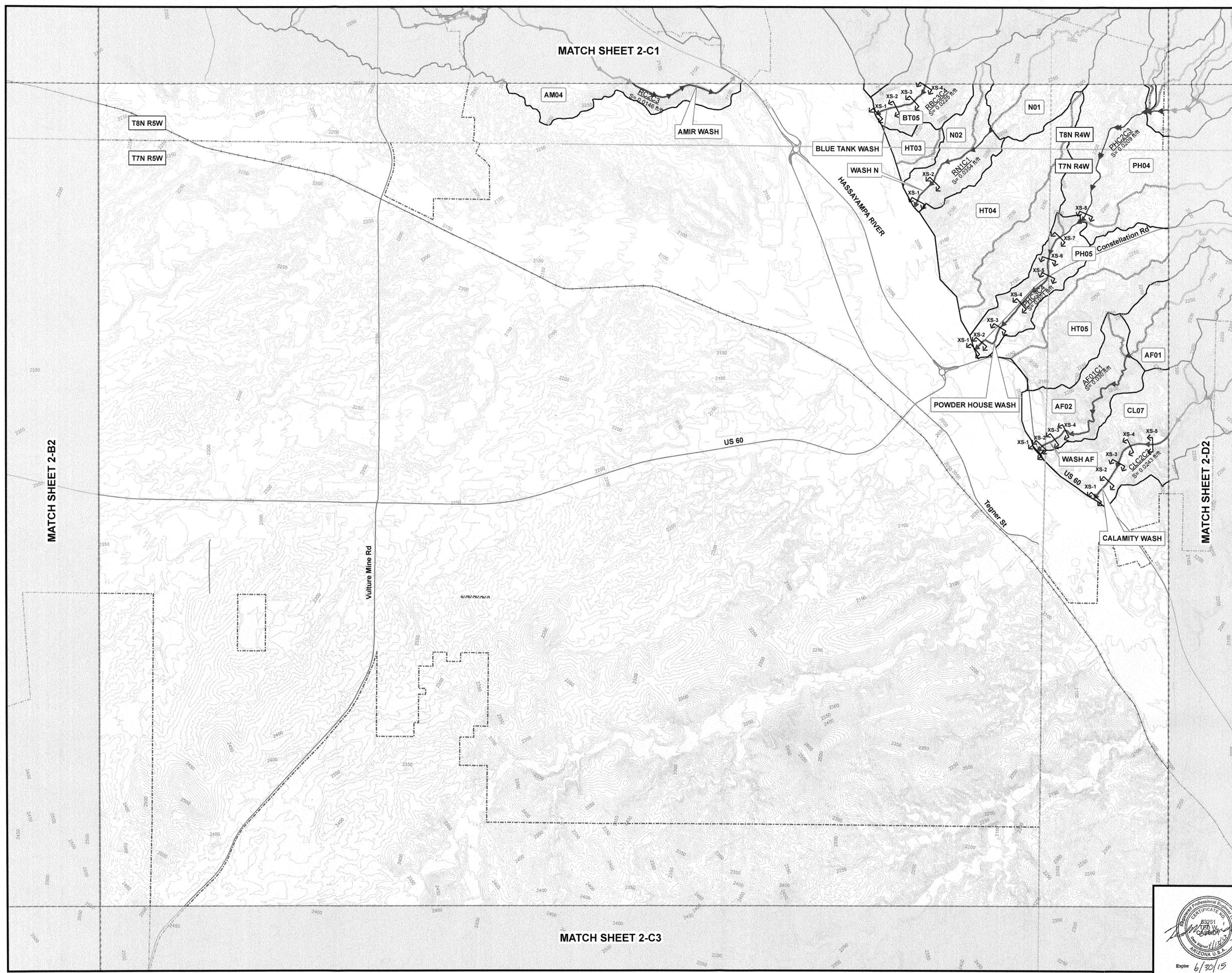


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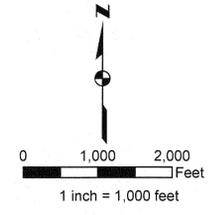
ROUTING MAP  
 EXHIBIT 2-C1





**LEGEND**

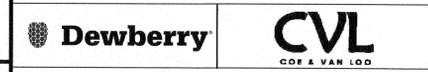
- Phase 2 Watershed Boundary
- Sub-basin ID
- City Boundary
- TC Flow Path
- Railroad
- Township and Range
- Streets
- Routing Reach
- Routing Reach HEC1 ID  
Reach 100yr Velocity & Slope
- Storm Drain
- Cross Sections for Routing Reach 'n' Values
- Elevation in Feet



*Notes:*  
 1) See FCD 2009-C030 - Phase 2 East Field Reconnaissance Report for cross section photographs and Mannings 'n' value calculations.  
*Reference:*  
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**INDEX MAP**

	A	B	C	D	E	F
1	2-A1	2-B1	2-C1	2-D1	2-E1	2-F1
2	2-A2	2-B2	2-C2	2-D2	2-E2	2-F2
3	2-A3	2-B3	2-C3	2-D3	2-E3	
4			2-C4	2-D4	2-E4	

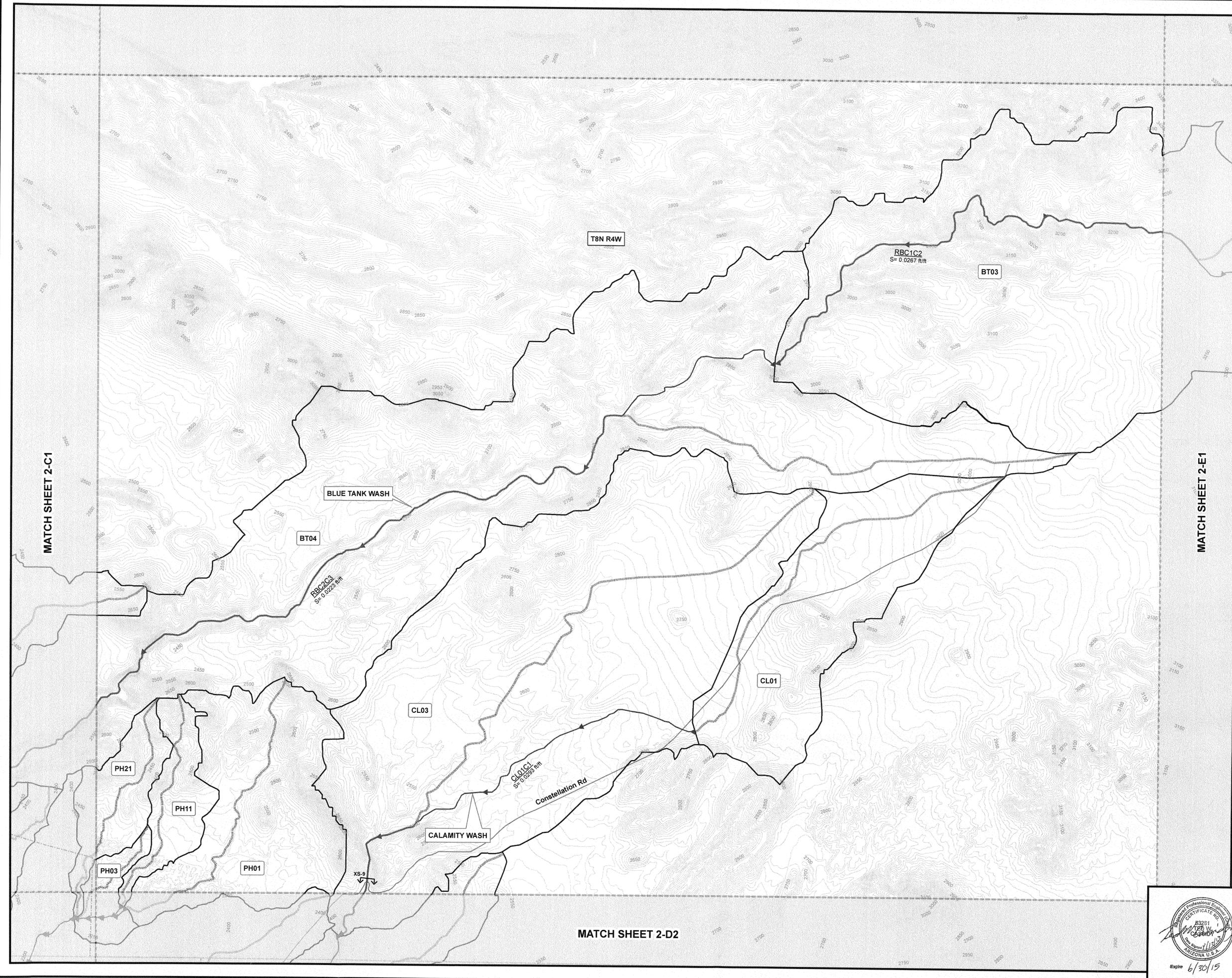


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 PHASE 2 EAST

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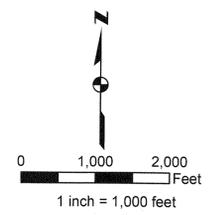
ROUTING MAP  
 EXHIBIT 2-C2





**LEGEND**

- Phase 2 Watershed Boundary
- Sub-basin ID
- City Boundary
- TC Flow Path
- Railroad
- Township and Range
- Streets
- Routing Reach
- Routing Reach HEC1 ID  
Reach 100yr Velocity & Slope  
RBC1C1  
V= 9.16 fps  
S= 0.014 ft/ft
- Storm Drain
- Cross Sections for Routing Reach 'n' Values
- Elevation in Feet



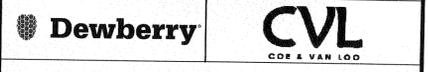
Notes:  
 1) See FCD 2009-C030 - Phase 2 East Field Reconnaissance Report for cross section photographs and Mannings 'n' value calculations.  
 Reference:  
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**INDEX MAP**

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2	2-A2	2-B2	2-C2	2-D2	2-E2	2-F2
3	2-A3	2-B3	2-C3	2-D3	2-E3	
4			2-C4	2-D4	2-E4	



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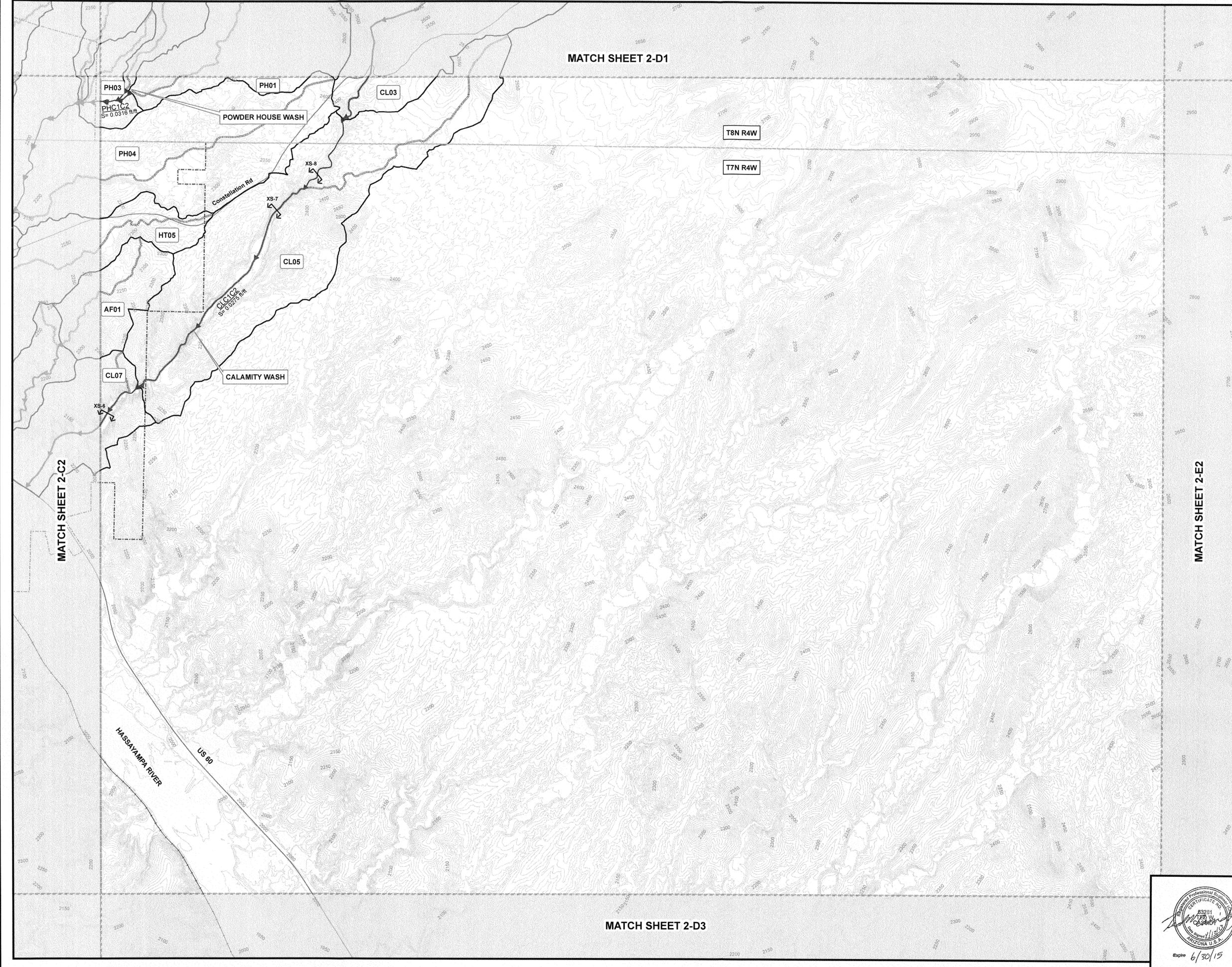


WICKENBURG  
 AREA DRAINAGE MASTER STUDY / PLAN  
 PHASE 2 EAST

F.C.D. Contract No. 2009-C030

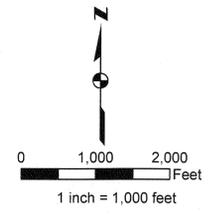
ROUTING MAP  
 EXHIBIT 2-D1





**LEGEND**

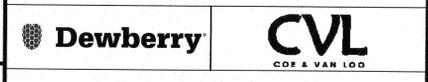
- Phase 2 Watershed Boundary
- Sub-basin ID
- City Boundary
- TC Flow Path
- Railroad
- Township and Range
- Streets
- Routing Reach
- Routing Reach HEC1 ID  
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*Notes:*  
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3	2-A3	2-B3	2-C3	2-D3	2-E3	
4			2-C4	2-D4	2-E4	

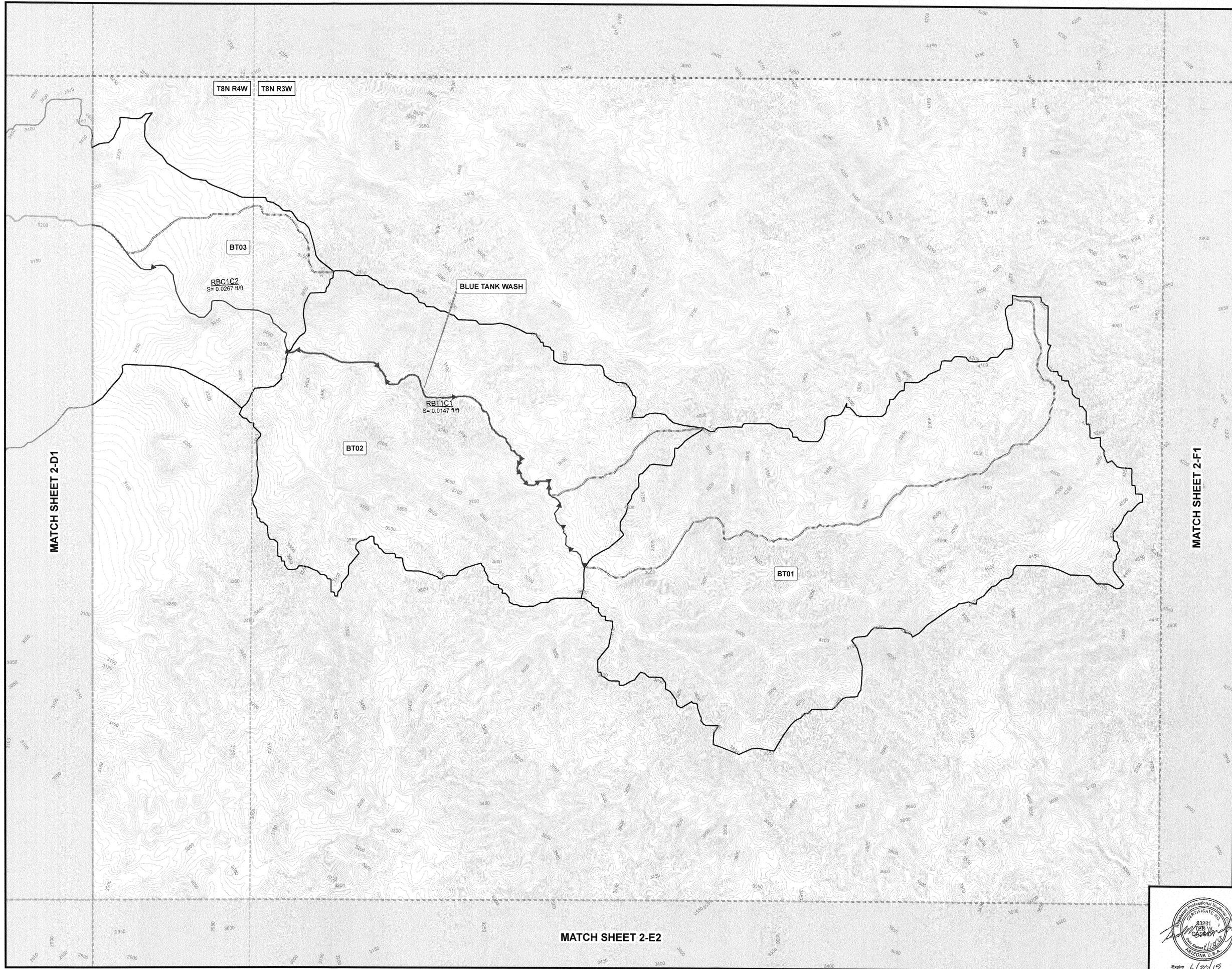


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 PHASE 2 EAST

F.C.D. Contract No. 2009-C030

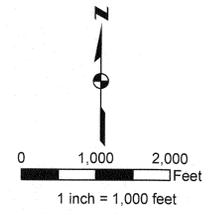
ROUTING MAP  
 EXHIBIT 2-D2





**LEGEND**

- Phase 2 Watershed Boundary
- Sub-basin ID
- City Boundary
- TC Flow Path
- Railroad
- Township and Range
- Streets
- Routing Reach
- Routing Reach HEC1 ID  
Reach 100yr Velocity & Slope
- Storm Drain
- Cross Sections for Routing Reach 'n' Values
- Elevation in Feet

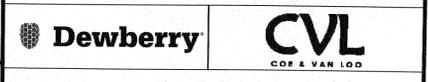


*Notes:*  
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3	2-A3	2-B3	2-C3	2-D3	2-E3	
4			2-C4	2-D4	2-E4	



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 PHASE 2 EAST

F.C.D. Contract No. 2009-C030

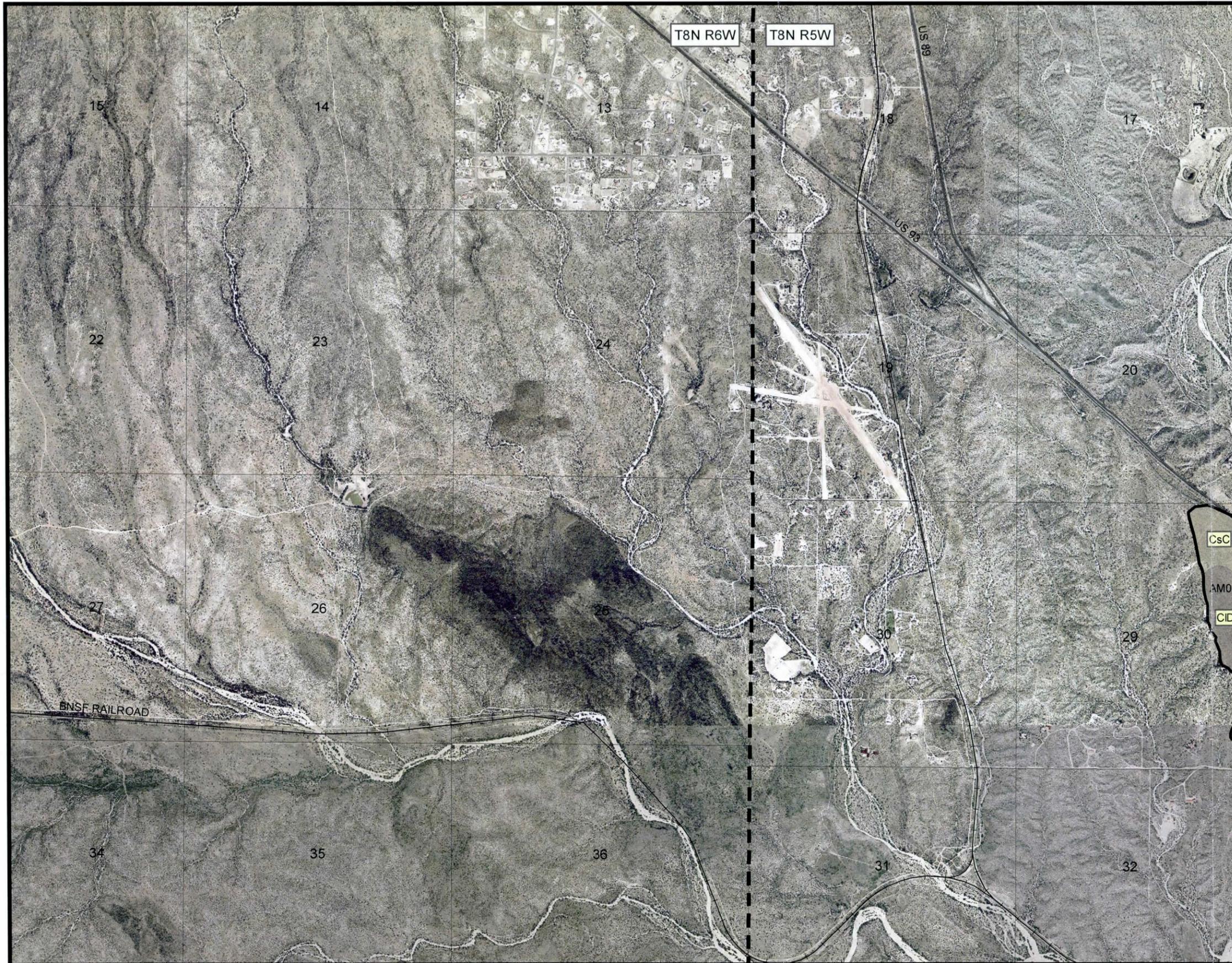
ROUTING MAP  
 EXHIBIT 2-E1



MATCH SHEET 2-E2

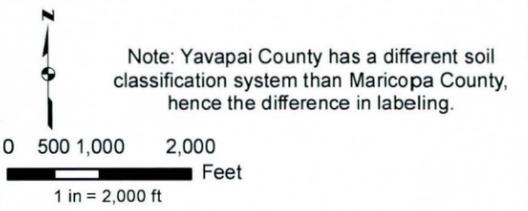
MATCH SHEET 2-D1

MATCH SHEET 2-F1



**Legend**

- Watershed Boundary
- CL01** Sub-basin ID
- Flow Line
- Streets
- Railroad
- Section Line and ID
- Township and Range
- 6 Anthony-Arizo complex
- 7 Anthony-Arizo complex, low precipitation
- 8 Arizo cobbly sandy loam
- 17 Cellar-Rock outcrop complex
- 24 Continental clay loam
- 28 Continental-Ohaco complex
- 36 Eba-Continental complex
- 38 Eba-Continental-Cave association
- 43 Eba-Pinaleno complex
- 54 Gila fine sandy loams
- 62 Gran-Wickenburg complex
- 64 Gran-Wickenburg-Rock outcrop
- 73 Lehmans-Rock outcrop complex
- 94 Nickel-Cave complex
- 97 Pinaleno-Tres Hermanos complex
- CsC Cave-Continental Gravelly Sandy Loam
- CID Continental Gravelly Sandy Loam



MATCH SHEET 3-C1

MATCH SHEET 3-A1

**INDEX MAP**

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	

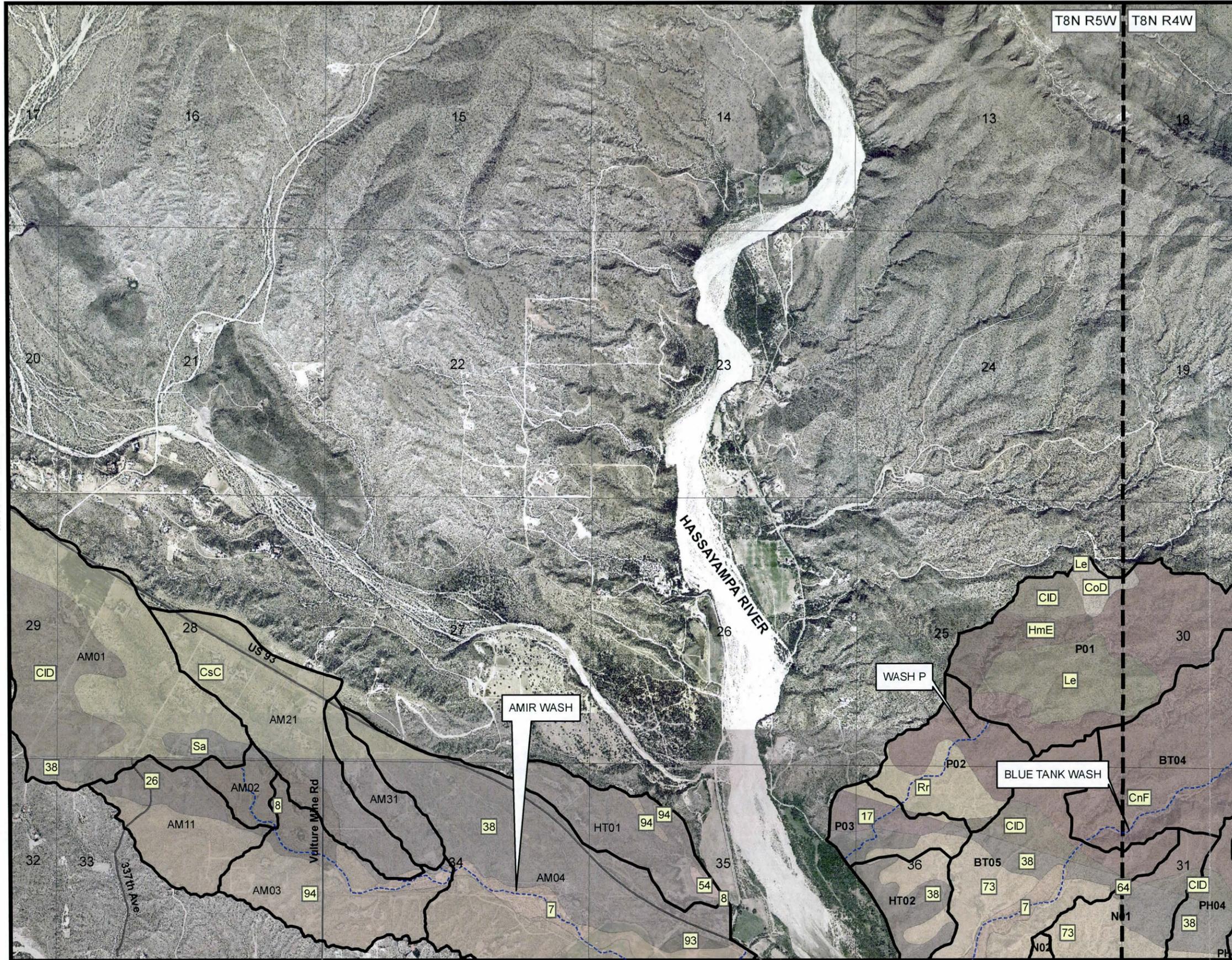


WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

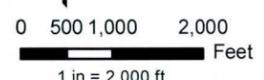
SOILS MAP  
EXHIBIT 3-B1

MATCH SHEET 3-B2



**Legend**

- Watershed Boundary
  - CL01 Sub-basin ID
  - Flow Line
  - Streets
  - Railroad
  - Section Line and ID
  - Township and Range
  - 7 Anthony-Arizo complex, low precipitation
  - 8 Arizo cobbly sandy loam
  - 17 Cellar-Rock outcrop complex
  - 38 Eba-Continental-Cave association
  - 54 Gila fine sandy loams
  - 64 Gran-Wickenburg-Rock outcrop
  - 73 Lehmans-Rock outcrop complex
  - 94 Nickel-Cave complex
  - CID Cave Continental Gravelly Sandy Loam
  - CnF Cellar Very Rocky Sandy Loam
  - CoD Cellar Chiricahua Complex
  - CsC Continental Gravelly Sandy Loam
  - Le Lehmans Gravelly Clay Loam
  - HmE House Mountain Soils
  - Sa Sandy & Gravelly Alluvial Land
  - Rr Rock Land, Low Rainfall
  - 120 Tres Hermanos gravelly sandy loams
- Note: Yavapai County has a different soil classification system than Maricopa County, hence the difference in labeling.



**INDEX MAP**

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	



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WICKENBURG  
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PHASE 2 EAST

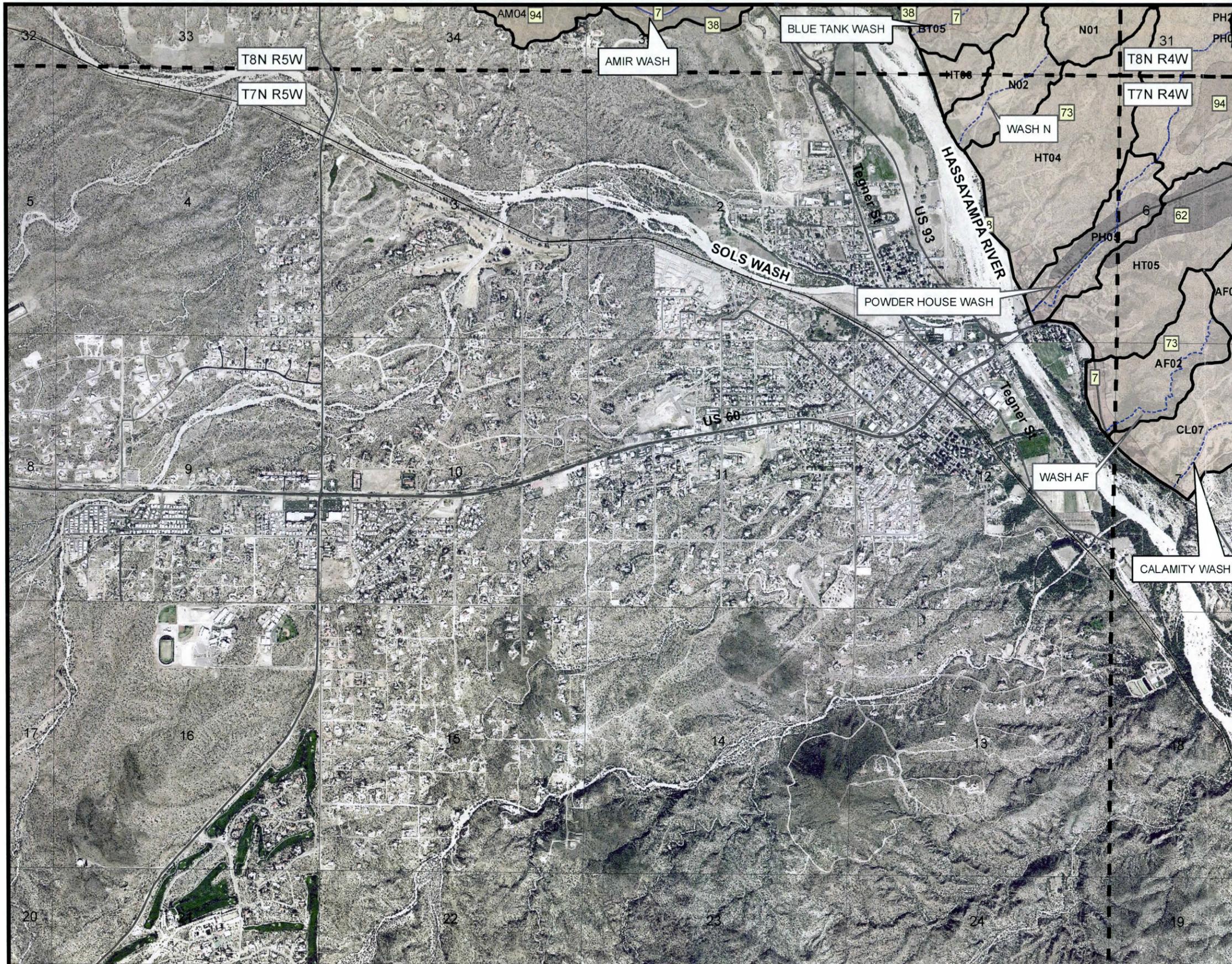
F.C.D. Contract No. 2009-C030

SOILS MAP  
EXHIBIT 3-C1

MATCH SHEET 3-B1

MATCH SHEET 3-D1

MATCH SHEET 3-C2



Legend

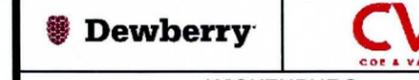
- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- 11 Section Line and ID
- Township and Range
- 6 Anthony-Arizo complex
- 7 Anthony-Arizo complex, low precipitation
- 8 Arizo cobbly sandy loam
- 17 Cellar-Rock outcrop complex
- 24 Continental clay loam
- 28 Continental-Ohaco complex
- 36 Eba-Continental complex
- 38 Eba-Continental-Cave association
- 43 Eba-Pinaleno complex
- 54 Gila fine sandy loams
- 62 Gran-Wickenburg complex
- 64 Gran-Wickenburg-Rock outcrop
- 73 Lehmans-Rock outcrop complex
- 94 Nickel-Cave complex
- 97 Pinaleno-Tres Hermanos complex
- 105 Rock outcrop-Lehmans complex
- 120 Tres Hermanos gravelly sandy loams

Note: Yavapai County has a different soil classification system than Maricopa County, hence the difference in labeling.

0 500 1,000 2,000 Feet  
1 in = 2,000 ft

INDEX MAP

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	



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PHASE 2 EAST

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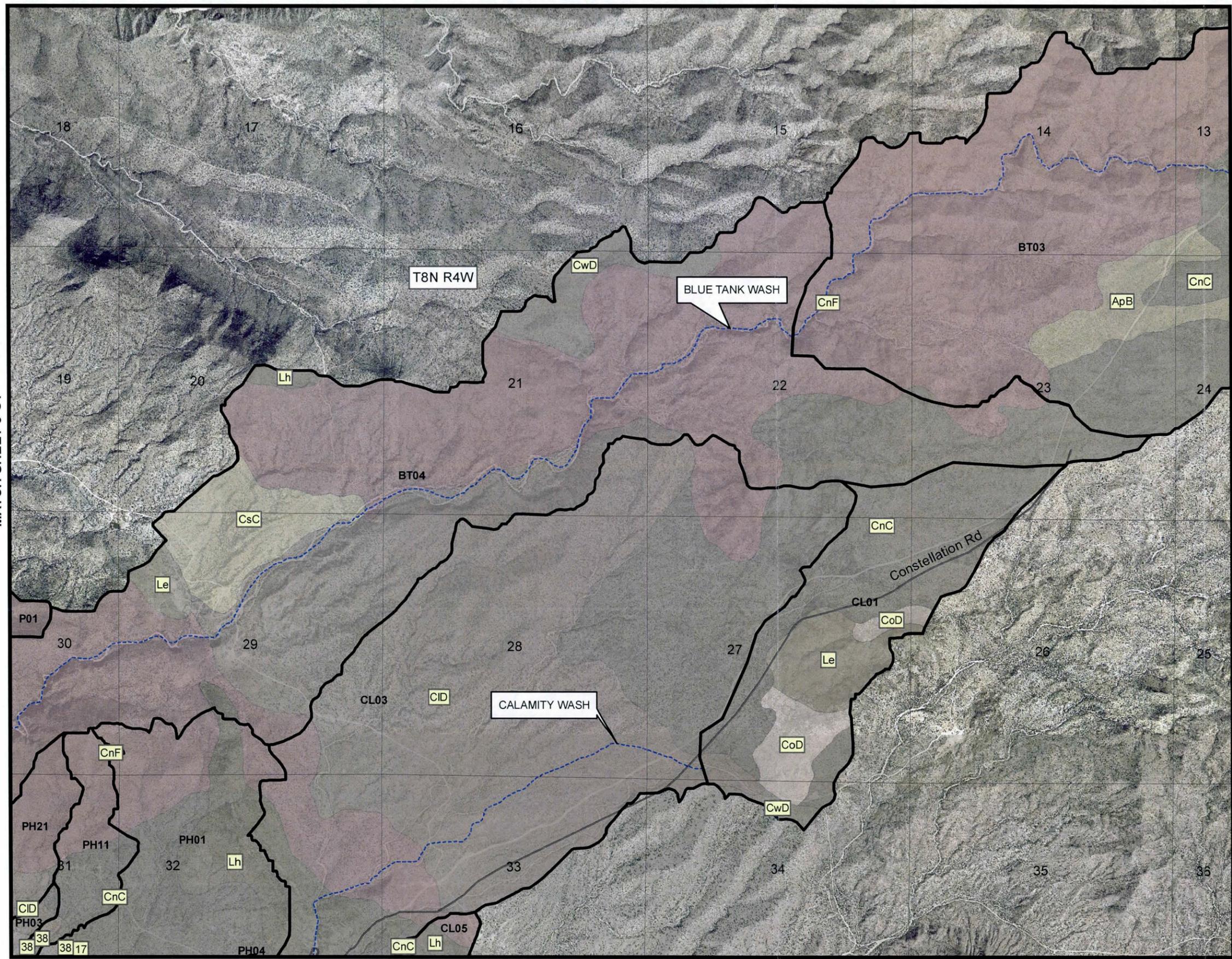
SOILS MAP  
EXHIBIT 3-C2

MATCH SHEET 3-B2

MATCH SHEET 3-D2

MATCH SHEET 3-C1

MATCH SHEET 3-E1



**Legend**

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- 11 Section Line and ID
- Township and Range
- 6 Anthony-Arizo complex
- 7 Anthony-Arizo complex, low precipitation
- 8 Arizo cobbly sandy loam
- 17 Cellar-Rock outcrop complex
- 24 Continental clay loam
- 28 Continental-Ohaco complex
- 36 Eba-Continental complex
- 38 Eba-Continental-Cave association
- ApB Anthony Gravelly Sandy Loam
- CID Cave Continental Gravelly Sandy Loam
- CnC Cellar Very Rocky Sandy Loam 2-15% Slopes
- CnF Cellar Very Rocky Sandy Loam 15-60% Slopes
- CoD Cellar Chiricahua Complex
- CsC Continental Gravelly Sandy Loam
- CwD Continental Soils
- Le Lehmans Gravelly Clay Loam
- Ln Lehmans Extremely Rocky Clay Loam

Note: Yavapai County has a different soil classification system than Maricopa County, hence the difference in labeling.

0 500 1,000 2,000 Feet  
1 in = 2,000 ft

**INDEX MAP**

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	



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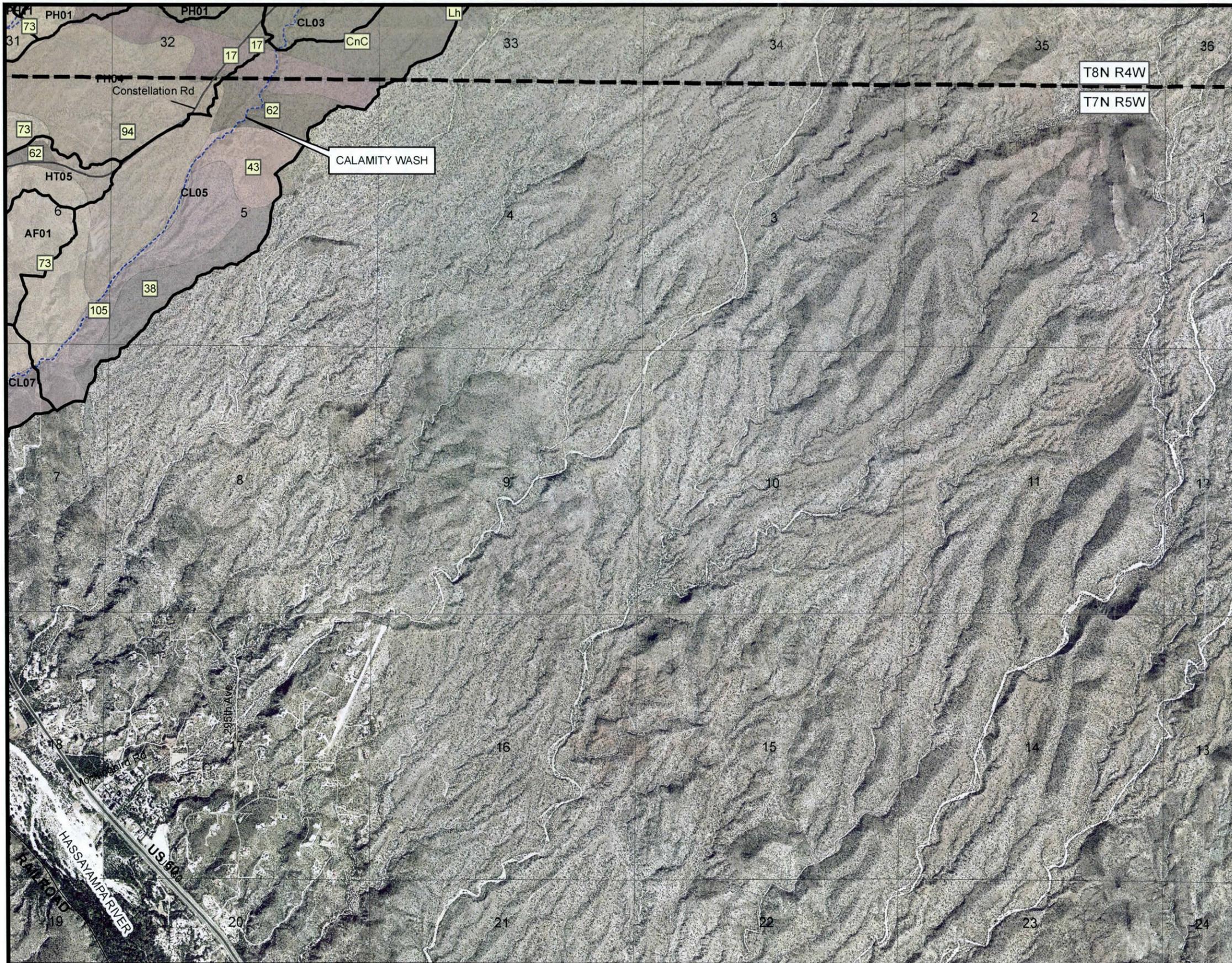


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AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

SOILS MAP  
EXHIBIT 3-D1

MATCH SHEET 3-D2



**Legend**

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Section Line and ID
- Township and Range
- 6 Anthony-Arizo complex
- 7 Anthony-Arizo complex, low precipitation
- 8 Arizo cobbly sandy loam
- 17 Cellar-Rock outcrop complex
- 24 Continental clay loam
- 28 Continental-Ohaco complex
- 36 Eba-Continental complex
- 38 Eba-Continental-Cave association
- 43 Eba-Pinaleno complex
- 54 Gila fine sandy loams
- 62 Gran-Wickenburg complex
- 64 Gran-Wickenburg-Rock outcrop
- 73 Lehmans-Rock outcrop complex
- 94 Nickel-Cave complex
- 97 Pinaleno-Tres Hermanos complex
- CnC Cellar Very Rocky Sandy Loam Rock
- Lh Lehmans Extremely Rocky Clay

Note: Yavapai County has a different soil classification system than Maricopa County, hence the difference in labeling.

0 500 1,000 2,000  
Feet  
1 in = 2,000 ft

**INDEX MAP**

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	



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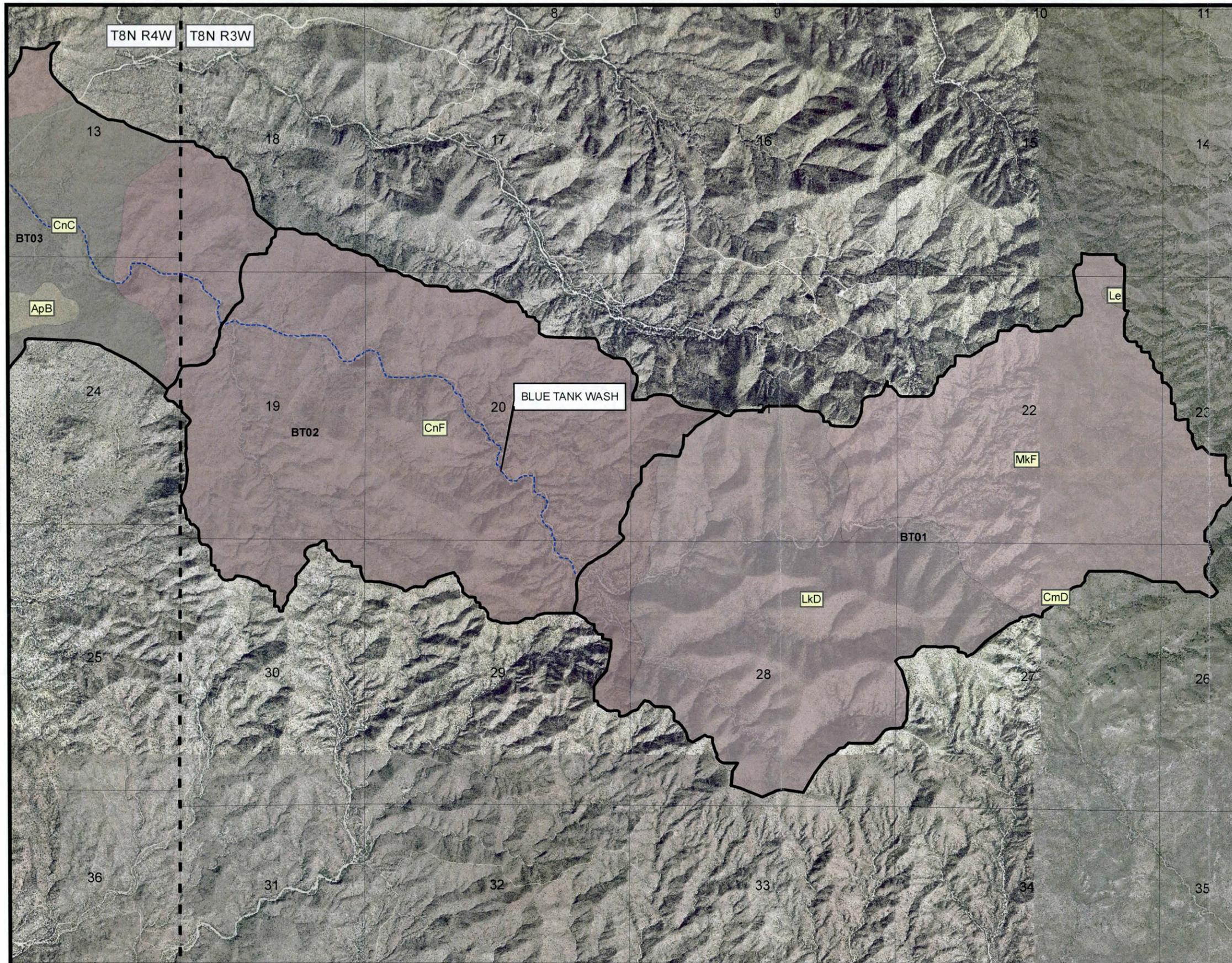
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PHASE 2 EAST

F.C.D. Contract No. 2009-C030

SOILS MAP  
EXHIBIT 3-D2

MATCH SHEET 3-C2

MATCH SHEET 3-E2



MATCH SHEET 3-D1

MATCH SHEET 3-F1

MATCH SHEET 3-E2

**Legend**

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Section Line and ID
- Township and Range
- 6 Anthony-Arizo complex
- 7 Anthony-Arizo complex, low precipitation
- 8 Arizo cobbly sandy loam
- 17 Cellar-Rock outcrop complex
- 24 Continental clay loam
- 28 Continental-Ohaco complex
- 36 Eba-Continental complex
- 38 Eba-Continental-Cave association
- 43 Eba-Pinaleno complex
- 54 Gila fine sandy loams
- ApB Anthony Gravelly Sandy Loam
- CmD Cellar Very Gravelly Sandy Loam
- CnC Cellar Very Rocky Sandy Loam 2 to 15% Slopes
- CnF Cellar Very Rocky Sandy Loam 15 to 60% Slopes
- Le Lehmans Gravelly Clay Loam
- LkD Lonti Gravelly Sandy Loam
- MkF Moano Very Rocky Loam

Note: Yavapai County has a different soil classification system than Maricopa County, hence the difference in labeling.

0 500 1,000 2,000  
1 in = 2,000 ft

**INDEX MAP**

	A	B	C	D	E	F
1	3-A1	3-B1	3-C1	3-D1	3-E1	3-F1
2	3-A2	3-B2	3-C2	3-D2	3-E2	3-F2
3	3-A3	3-B3	3-C3	3-D3	3-E3	
4			3-C4	3-D4	3-E4	

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**

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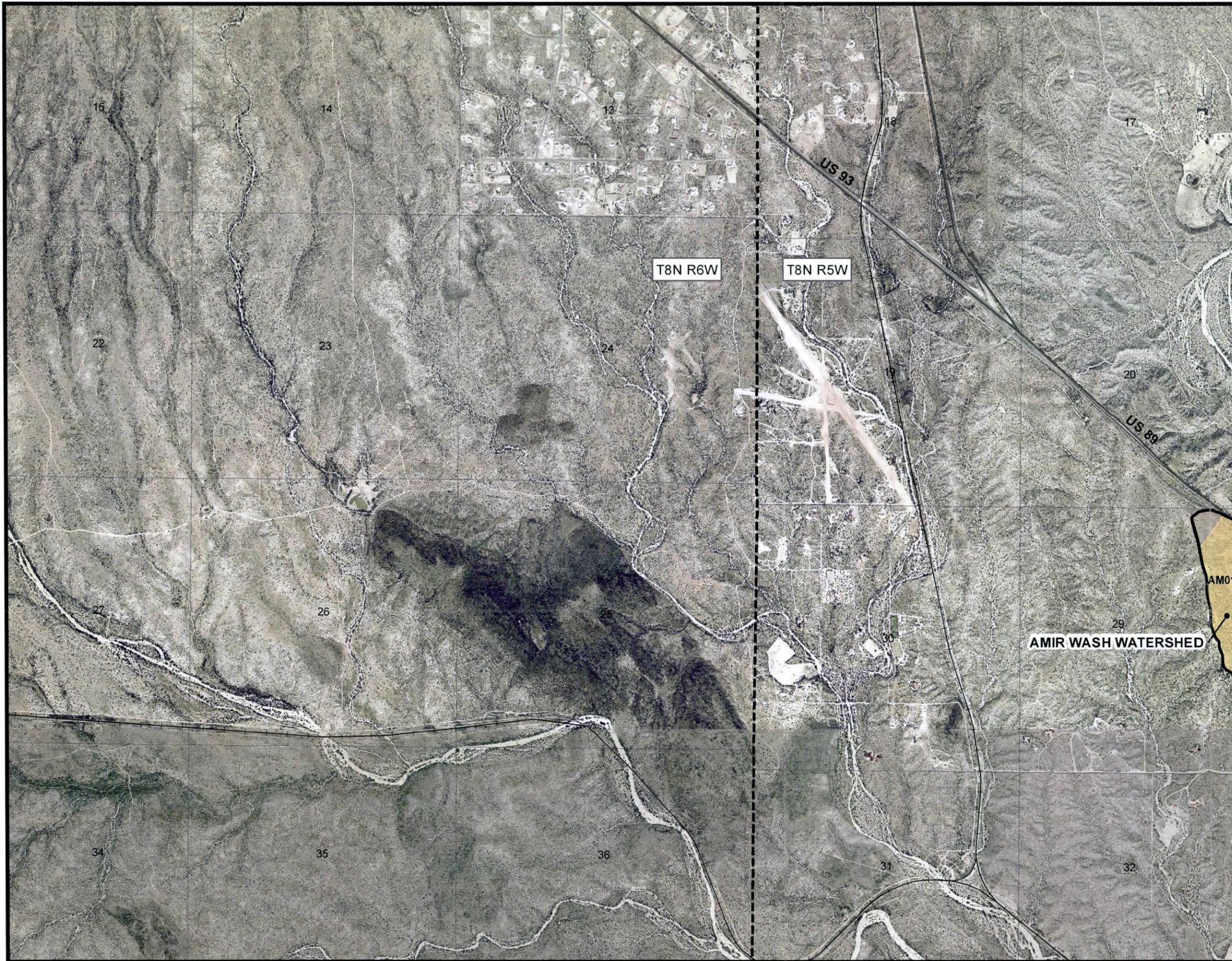
**Dewberry** **CVL**  
*COE & VAN LOO*

WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

SOILS MAP  
EXHIBIT 3-E1

MATCH SHEET 4-A1

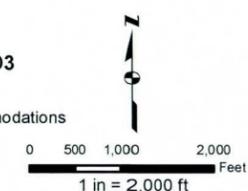


MATCH SHEET 4-B2

MATCH SHEET 4-C1

**Legend**

- Watershed Boundary
- CL01** Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
- Light Industrial
- Medical/Nursing Home
- Medium Density Residential
- Mixed Use
- Office Low Rise
- Other Employment
- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accommodations
- Vacant
- Water



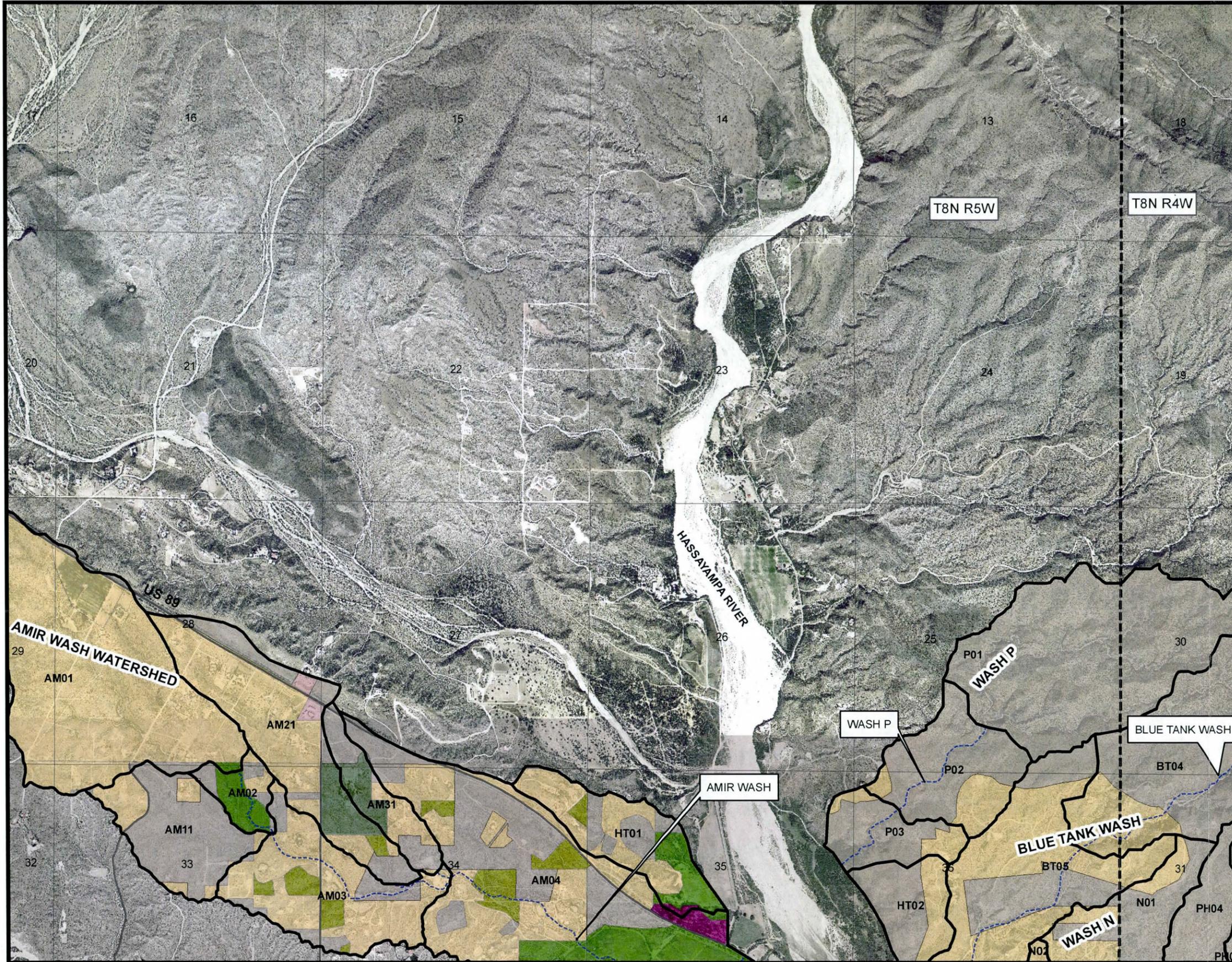
**INDEX MAP**

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	



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 F.C.D. Contract No. 2009-C030

EXISTING LAND USE MAP  
 EXHIBIT 4-B1



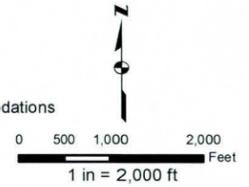
MATCH SHEET 4-B1

MATCH SHEET 4-D1

MATCH SHEET 4-C2

**Legend**

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
- Light Industrial
- Medical/Nursing Home
- Medium Density Residential
- Mixed Use
- Office Low Rise
- Other Employment
- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accomodations
- Vacant
- Water



**INDEX MAP**

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	



**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY**



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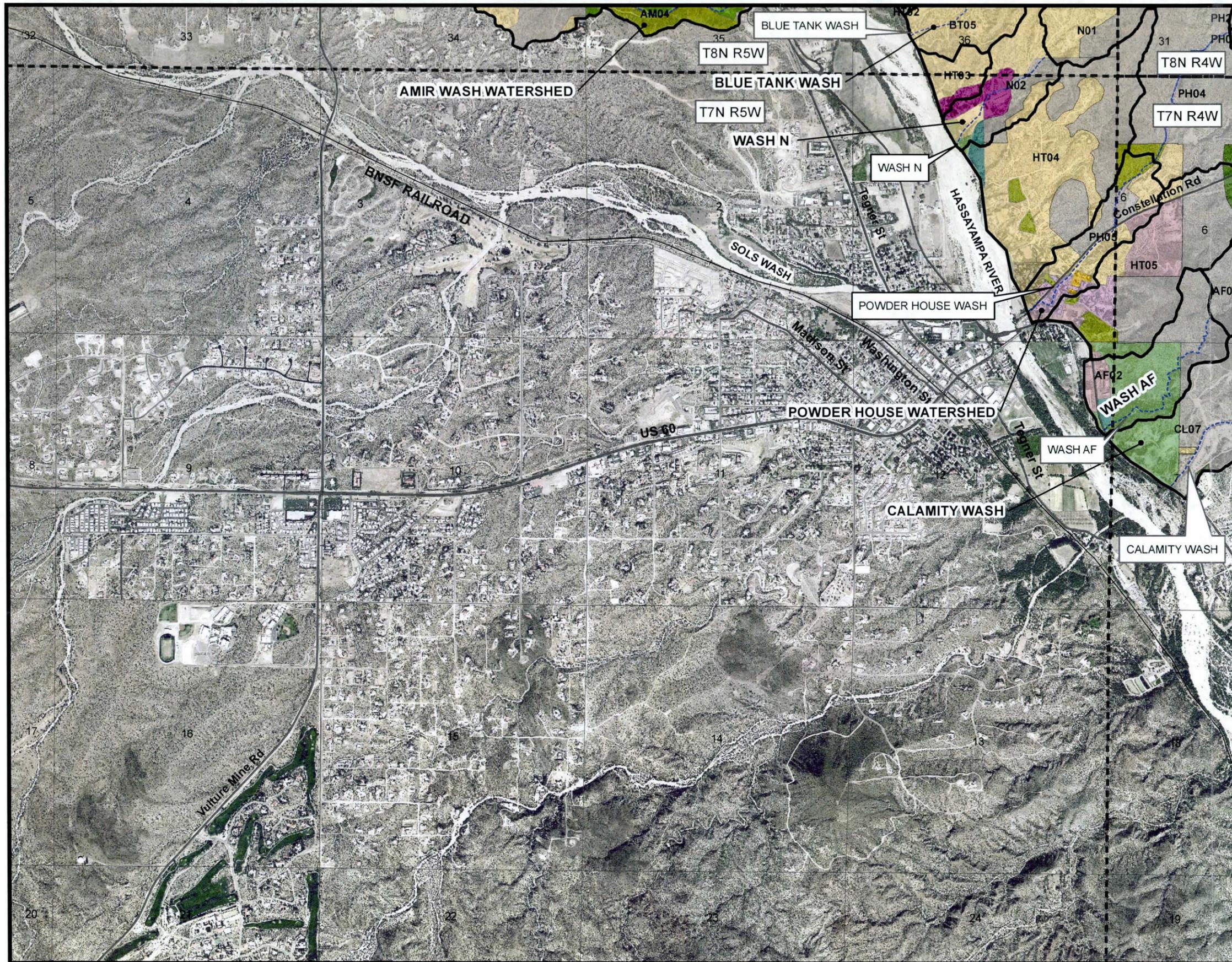
**Dewberry**



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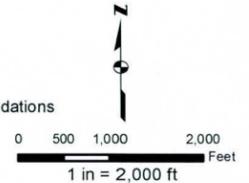
F.C.D. Contract No. 2009-C030

EXISTING LAND USE MAP  
EXHIBIT 4-C1



Legend

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- 11 Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
- Light Industrial
- Medical/Nursing Home
- Medium Density Residential
- Mixed Use
- Office Low Rise
- Other Employment
- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accomodations
- Vacant
- Water



MATCH SHEET 4-B2

MATCH SHEET 4-D2

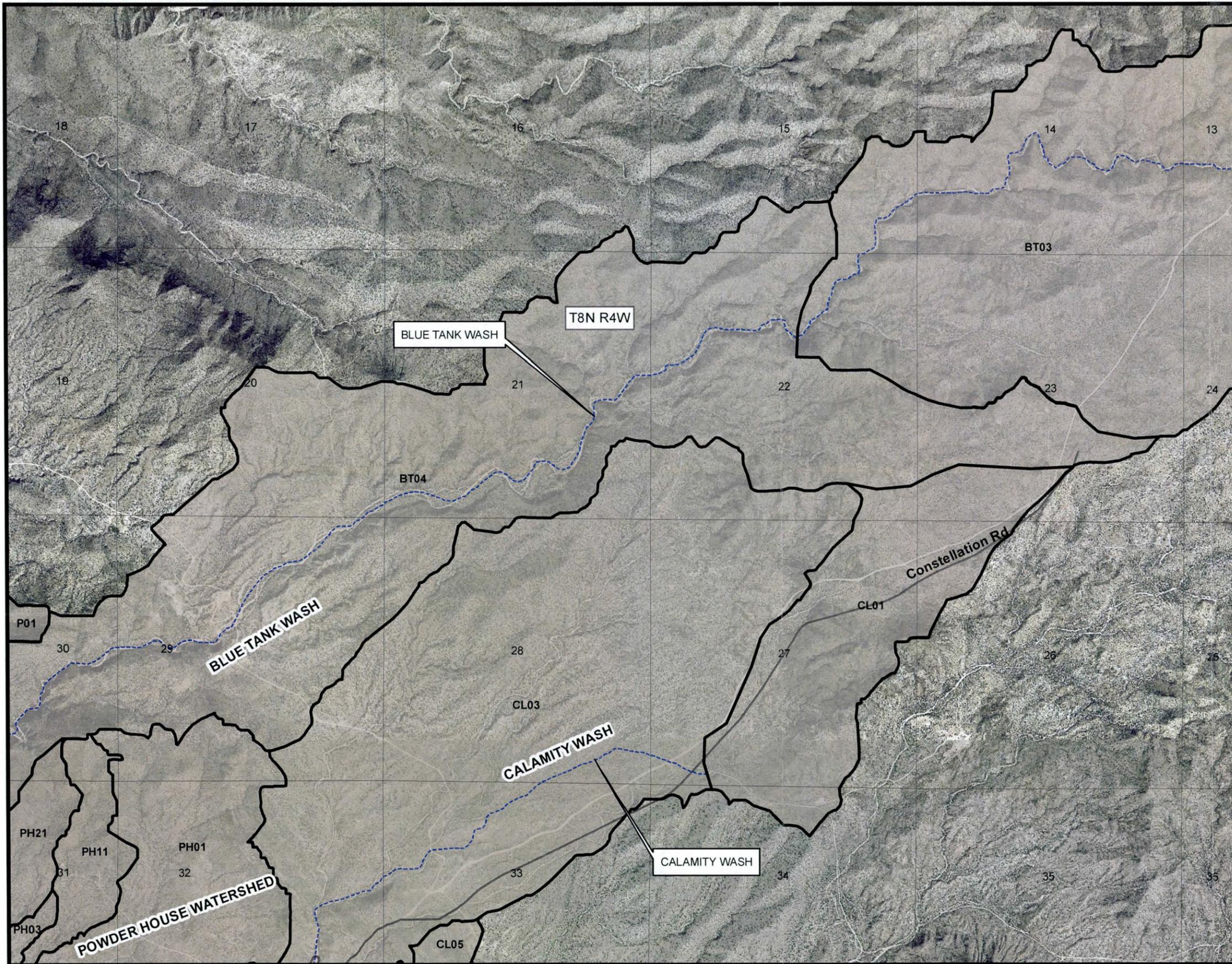
INDEX MAP

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	



WICKENBURG  
 AREA DRAINAGE MASTER STUDY / PLAN  
 F.C.D. Contract No. 2009-C030

EXISTING LAND USE MAP  
 EXHIBIT 4-C2



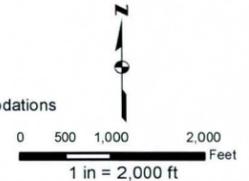
MATCH SHEET 4-C1

MATCH SHEET 4-E1

MATCH SHEET 4-D2

**Legend**

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- 11 Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
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- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accomodations
- Vacant
- Water



**INDEX MAP**

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	

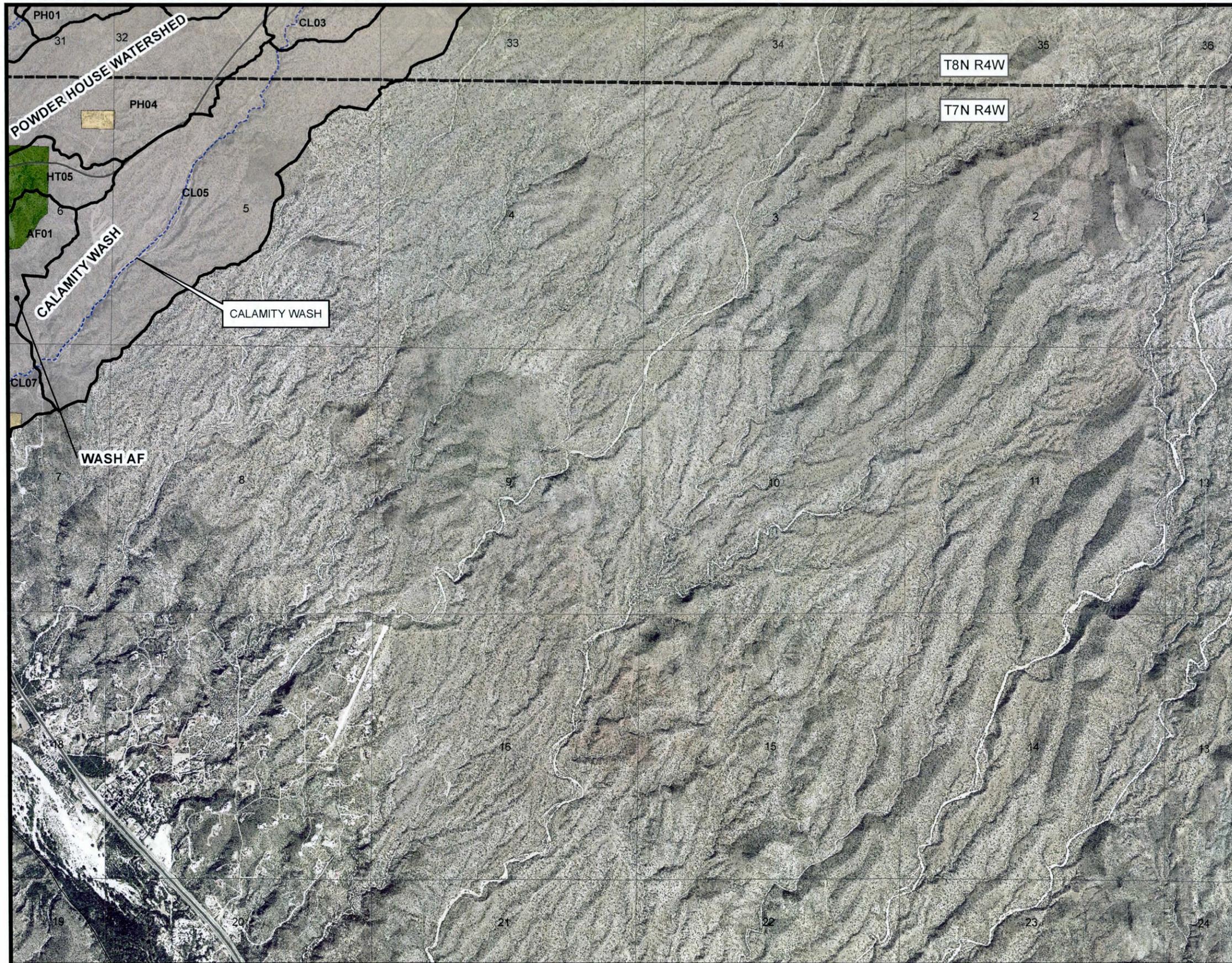


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AREA DRAINAGE MASTER STUDY / PLAN  
F.C.D. Contract No. 2009-C030

EXISTING LAND USE MAP  
EXHIBIT 4-D1

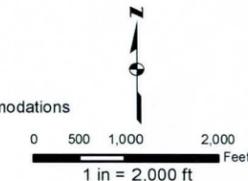


MATCH SHEET 4-C2

MATCH SHEET 4-E2

Legend

- Watershed Boundary
- CL01 Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
- Light Industrial
- Medical/Nursing Home
- Medium Density Residential
- Mixed Use
- Office Low Rise
- Other Employment
- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accomodations
- Vacant
- Water



INDEX MAP

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	

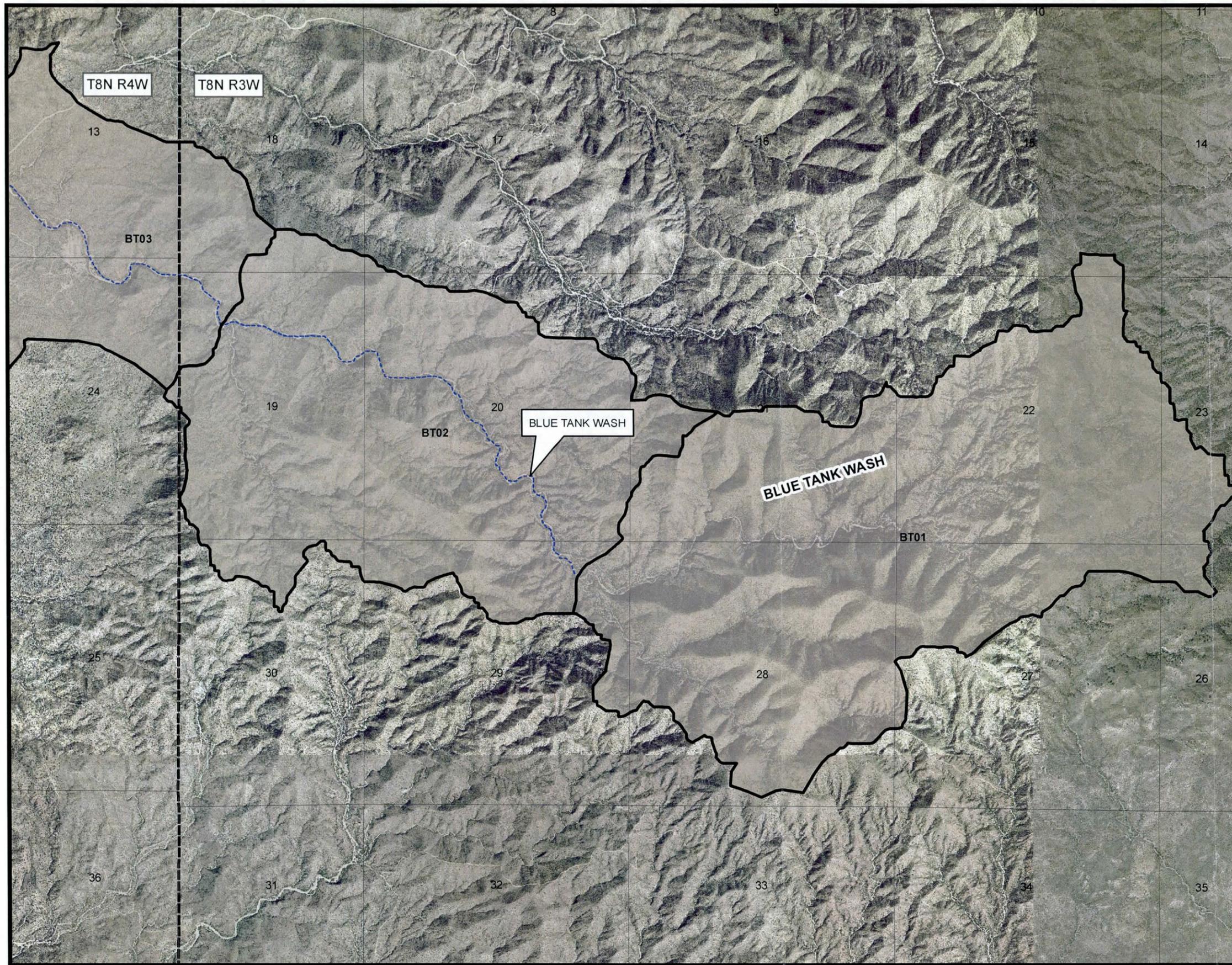


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AREA DRAINAGE MASTER STUDY / PLAN  
F.C.D. Contract No. 2009-C030

EXISTING LAND USE MAP  
EXHIBIT 4-D2



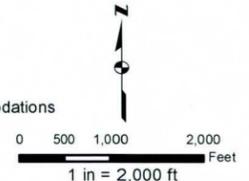
MATCH SHEET 4-D1

MATCH SHEET 4-F1

MATCH SHEET 4-E2

**Legend**

- Watershed Boundary
- CL01** Sub-basin ID
- Flow Line
- Streets
- Railroad
- Township and Range
- Section Line and ID
- Active Open Space
- Agriculture
- Airport
- Cemetery
- Community Commercial
- Developing Employment Generating
- Developing Residential
- Educational
- Golf Courses
- Large Lot Residential
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- Medical/Nursing Home
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- Passive Open Space
- Public/Special Event/Military
- Religious Institutions
- Rural Residential
- Small Lot Residential
- Specialty Commercial
- Tourist and Visitor Accomodations
- Vacant
- Water



**INDEX MAP**

	A	B	C	D	E	F
1	4-A1	4-B1	4-C1	4-D1	4-E1	4-F1
2	4-A2	4-B2	4-C2	4-D2	4-E2	4-F2
3	4-A3	4-B3	4-C3	4-D3	4-E3	
4			4-C4	4-D4	4-E4	



**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY**

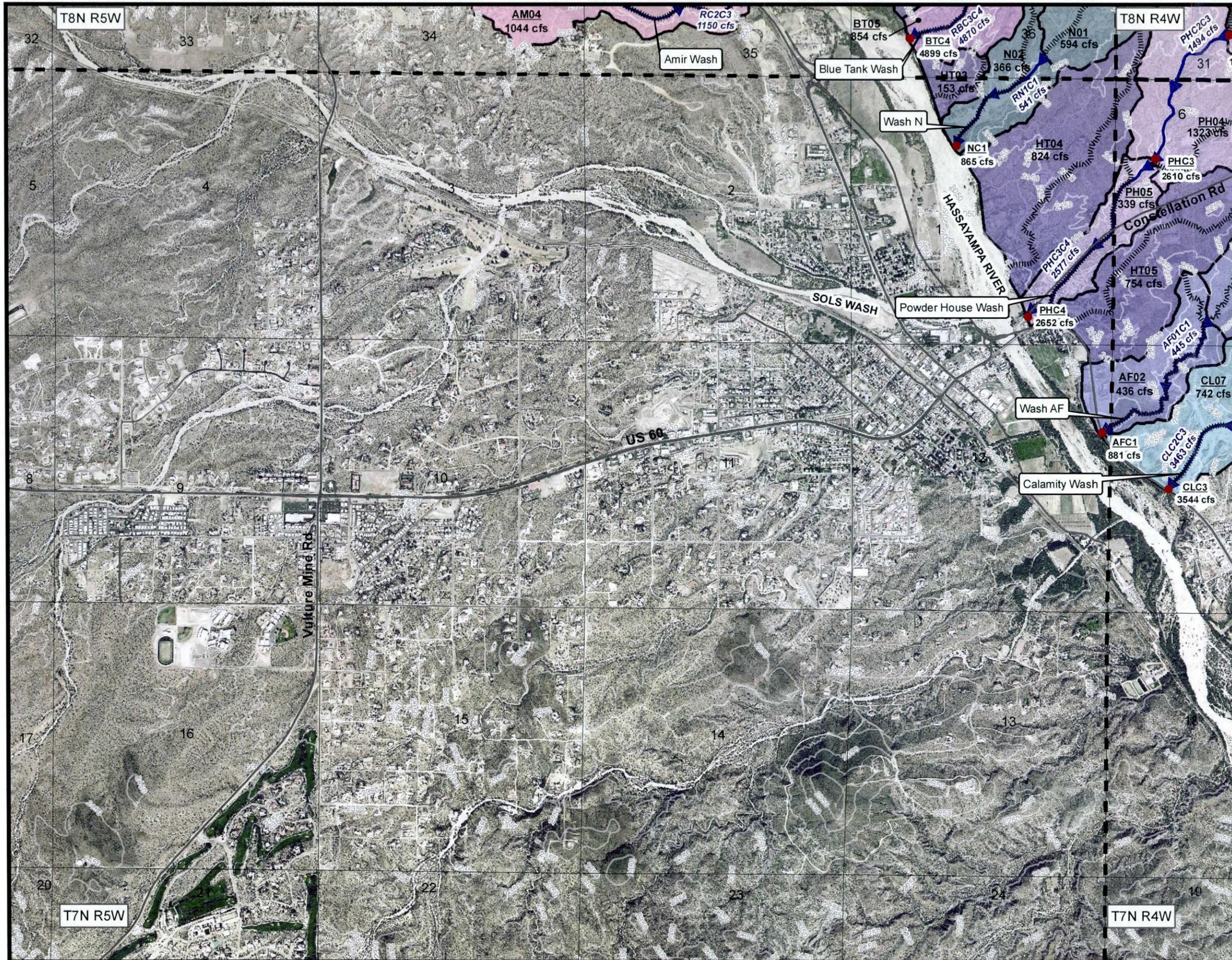
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AREA DRAINAGE MASTER STUDY / PLAN  
F.C.D. Contract No. 2009-C030  
EXISTING LAND USE MAP  
EXHIBIT 4-E1



MATCH SHEET 5-C1



MATCH SHEET 5-C3

LEGEND

- Amir Wash Subbasins
- Blue Tank Wash Subbasins
- Calamity Wash Subbasins
- Powderhouse Wash Subbasins
- Wash AF Subbasins
- Wash N Subbasins
- Hassayampa Tributaries
- Subbasin ID
- Subbasin 100-yr Q (cfs)
- C3 Concentration Point
- RC6C7 Routing Reach ID
- Routing Reach
- Flow Path
- Railroad
- Township and Range
- Streets
- Section Line and ID
- Elevation in Feet

Note: The larger flow from the 6-hr or 24-hr HEC-1 model was used for the peak flow.

**INDEX MAP**

	A	B	C	D	E	F
1	5-A1	5-B1	5-C1	5-D1	5-E1	5-F1
2	5-A2	5-B2	5-C2	5-D2	5-E2	5-F2
3	5-A3	5-B3	5-C3	5-D3	5-E3	
4			5-C4	5-D4	5-E4	

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**

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**Dewberry** **CVL**  
COE & VAN LOO

WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

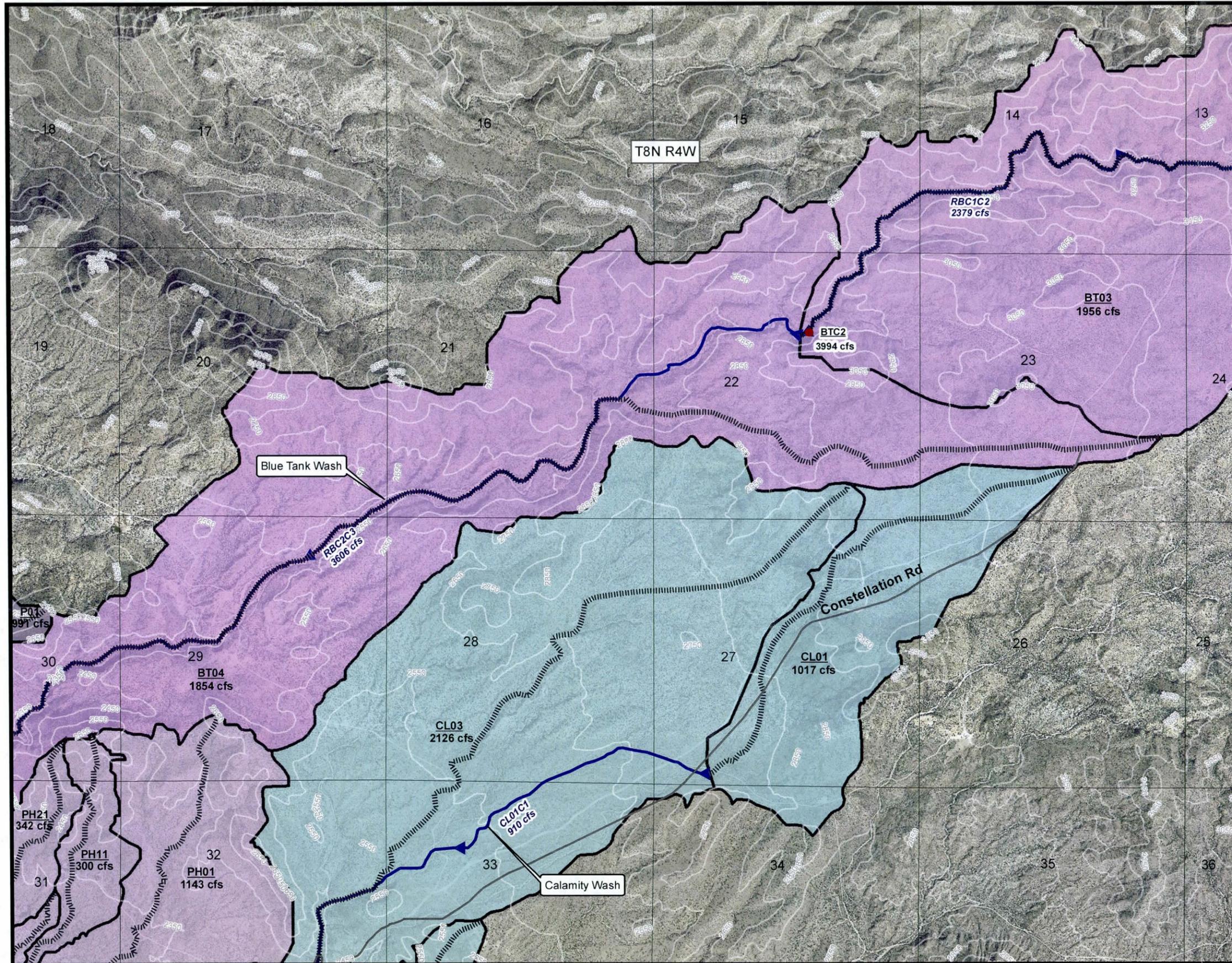
FLOW MAP  
EXHIBIT 5-C2

MATCH SHEET 5-B2

MATCH SHEET 5-D2

MATCH SHEET 5-C1

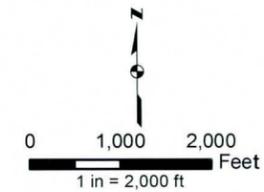
MATCH SHEET 5-E1



MATCH SHEET 5-D2

**LEGEND**

-  Blue Tank Wash Subbasins
-  Calamity Wash Subbasins
-  Powderhouse Wash Subbasins
-  Wash AF Subbasins
-  Wash N Subbasins
-  Wash P Subbasins
-  Hassayampa Tributaries
-  AF03 Subbasin ID
-  430 cfs Subbasin 100-yr Q (cfs)
-  C3 Concentration Point
-  RC6C7 Routing Reach ID
-  Routing Reach
-  Flow Path
-  Railroad
-  Township and Range
-  Streets
-  Section Line and ID
-  2000 Elevation in Feet



Note: The larger flow from the 6-hr or 24-hr HEC-1 model was used for the peak flow.

**INDEX MAP**

	A	B	C	D	E	F
1	5-A1	5-B1	5-C1	5-D1	5-E1	5-F1
2	5-A2	5-B2	5-C2	5-D2	5-E2	5-F2
3	5-A3	5-B3	5-C3	5-D3	5-E3	
4			5-C4	5-D4	5-E4	



**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**



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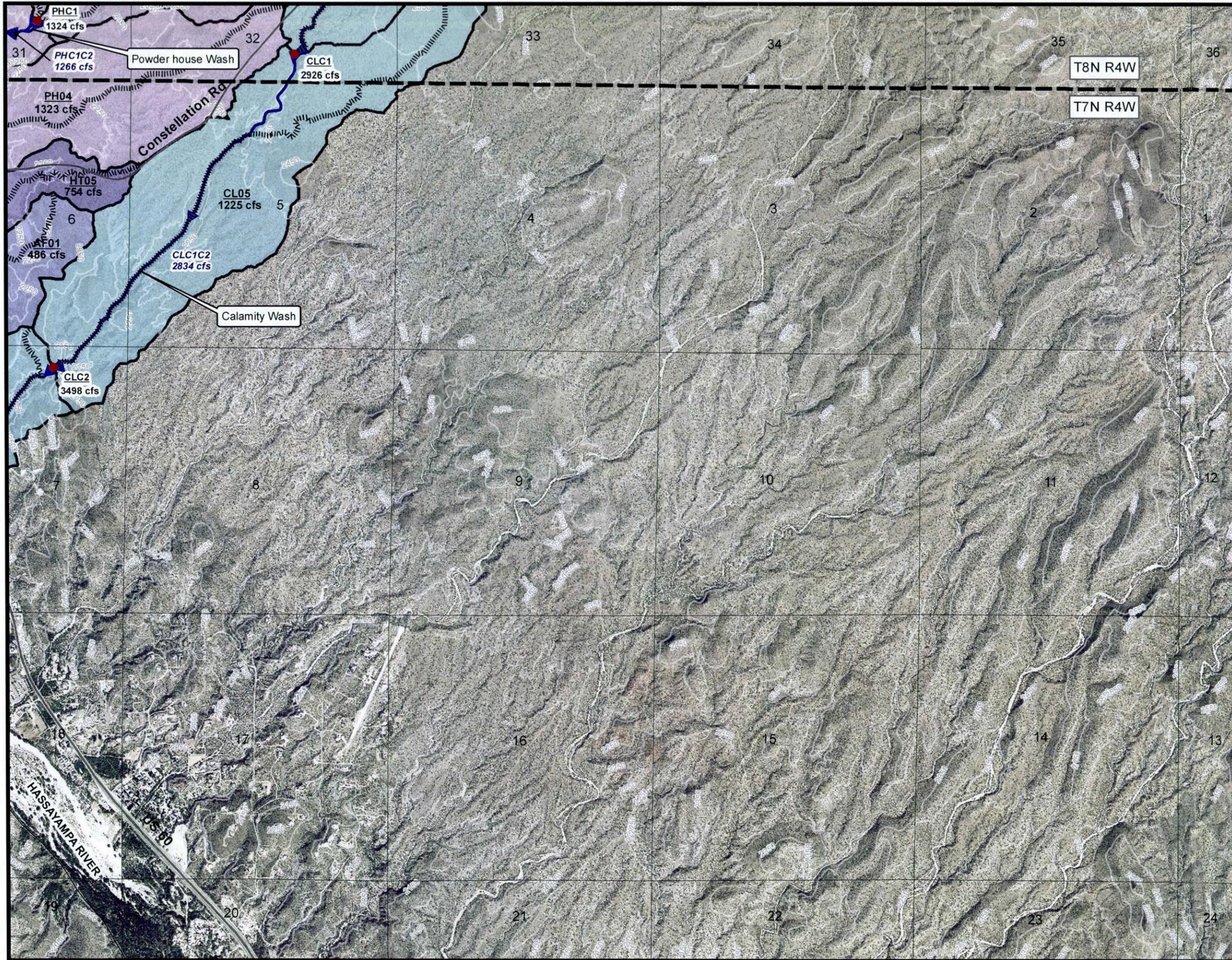
**Dewberry**



WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

FLOW MAP  
EXHIBIT 5-D1

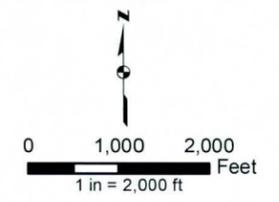


MATCH SHEET 5-C2

MATCH SHEET 5-E2

**LEGEND**

- Blue Tank Wash Subbasins
- Calamity Wash Subbasins
- Powderhouse Wash Subbasins
- Wash AF Subbasins
- Wash N Subbasins
- Wash P Subbasins
- Hassayampa Tributaries
- C3 Concentration Point
- RC6C7 Routing Reach ID
- Routing Reach
- Flow Path
- Railroad
- Township and Range
- Streets
- Section Line and ID
- Elevation in Feet



Note: The larger flow from the 6-hr or 24-hr HEC-1 model was used for the peak flow.

**INDEX MAP**

	A	B	C	D	E	F
1	5-A1	5-B1	5-C1	5-D1	5-E1	5-F1
2	5-A2	5-B2	5-C2	5-D2	5-E2	5-F2
3	5-A3	5-B3	5-C3	5-D3	5-E3	
4			5-C4	5-D4	5-E4	



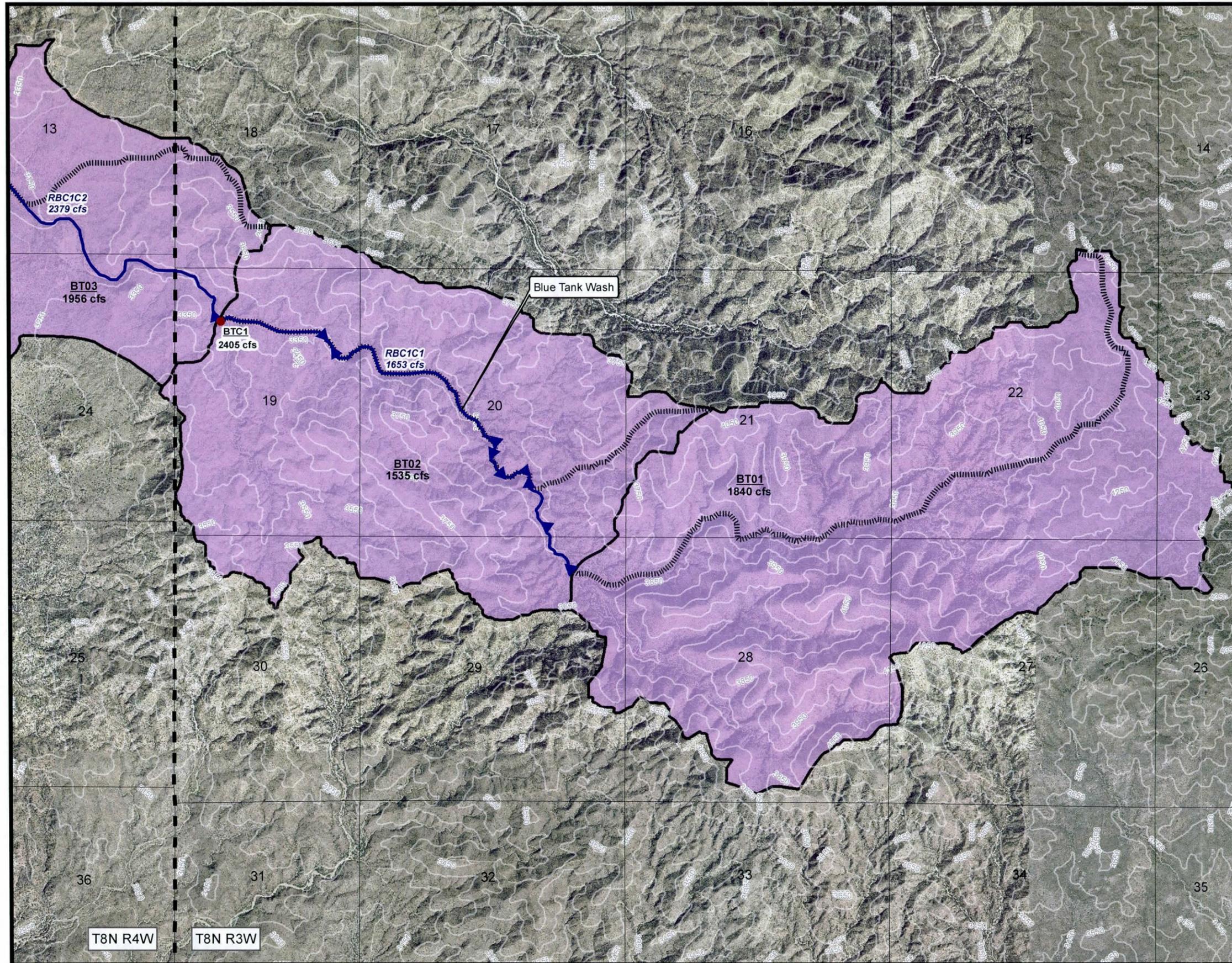
WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

F.C.D. Contract No. 2009-C030

FLOW MAP  
EXHIBIT 5-D2

MATCH SHEET 5-D1

MATCH SHEET 5-F1



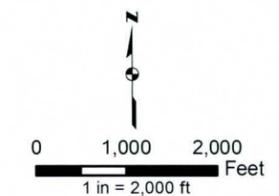
T8N R4W

T8N R3W

MATCH SHEET 5-E2

### LEGEND

- Blue Tank Wash Subbasins
- Calamity Wash Subbasins
- Powderhouse Wash Subbasins
- Wash AF Subbasins
- Wash N Subbasins
- Wash P Subbasins
- BT01**  
430 cfs  
Subbasin ID  
Subbasin 100-yr Q (cfs)
- C3**  
Concentration Point
- RC6C7**  
Routing Reach ID
- Routing Reach
- Railroad
- Flow Path
- Township and Range
- Streets
- 11**  
Section Line and ID
- 2000  
Elevation in Feet



Note: The larger flow from the 6-hr or 24-hr HEC-1 model was used for the peak flow.

### INDEX MAP

	A	B	C	D	E	F
1	5-A1	5-B1	5-C1	5-D1	5-E1	5-F1
2	5-A2	5-B2	5-C2	5-D2	5-E2	5-F2
3	5-A3	5-B3	5-C3	5-D3	5-E3	
4			5-C4	5-D4	5-E4	



**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY**



**Hoskin-Ryan Consultants, Inc.**  
CREATING ENGINEERING SOLUTIONS



**Dewberry**



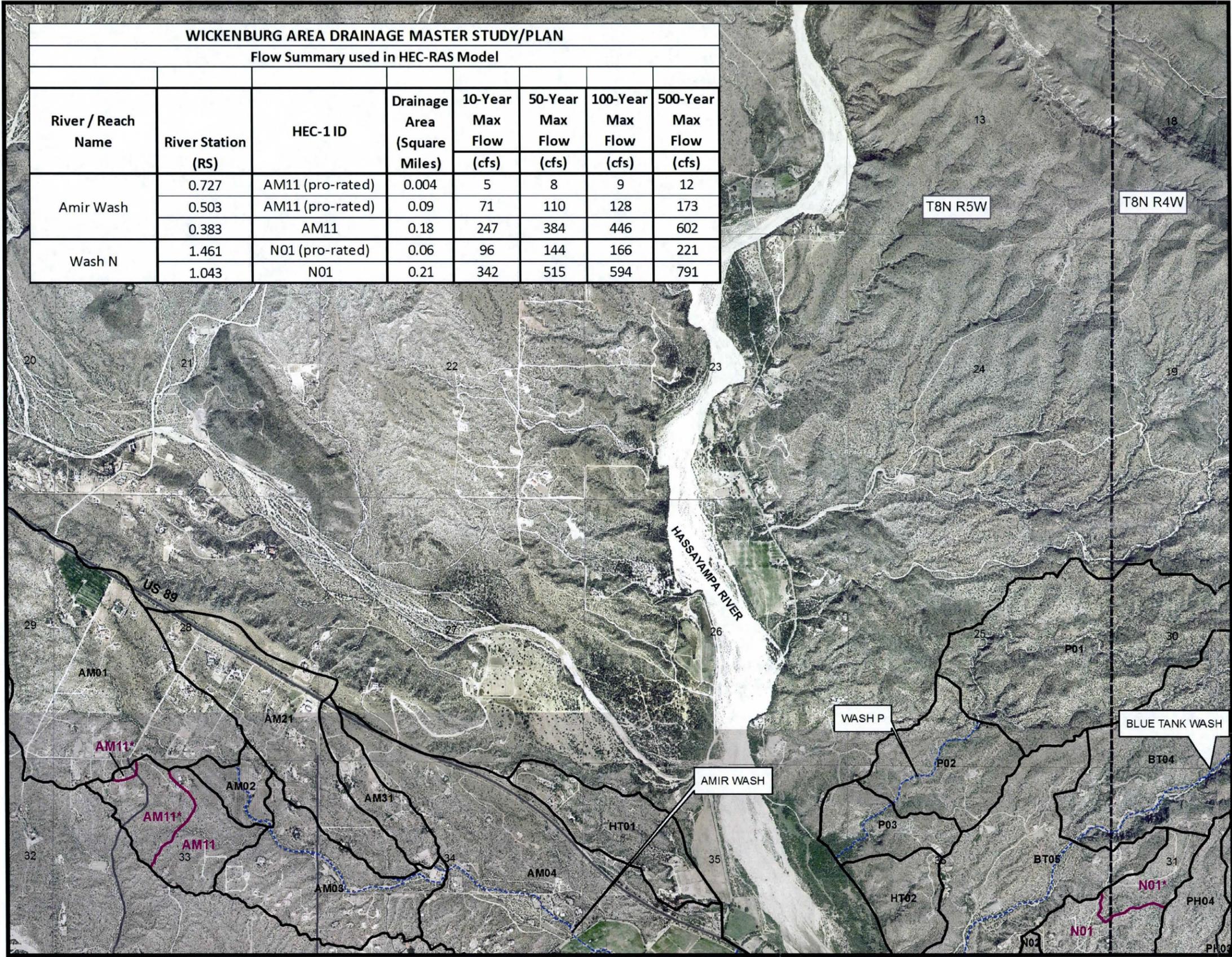
**CVL**  
COE & VAN LOO

WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN  
PHASE 2 EAST

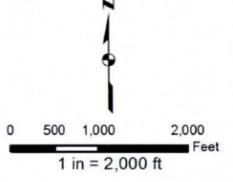
F.C.D. Contract No. 2009-C030

FLOW MAP  
EXHIBIT 5-E1

WICKENBURG AREA DRAINAGE MASTER STUDY/PLAN							
Flow Summary used in HEC-RAS Model							
River / Reach Name	River Station (RS)	HEC-1 ID	Drainage Area (Square Miles)	10-Year Max Flow (cfs)	50-Year Max Flow (cfs)	100-Year Max Flow (cfs)	500-Year Max Flow (cfs)
Amir Wash	0.727	AM11 (pro-rated)	0.004	5	8	9	12
	0.503	AM11 (pro-rated)	0.09	71	110	128	173
	0.383	AM11	0.18	247	384	446	602
Wash N	1.461	N01 (pro-rated)	0.06	96	144	166	221
	1.043	N01	0.21	342	515	594	791



- Legend**
- Sub-Basin Boundary
  - Prorated Sub-Basin Boundary
  - Flow Line
  - CL01** Sub-basin ID
  - CL01\*** Sub-basin ID (Pro-Rated)
  - CL01** Sub-basin ID (not Pro-Rated)
  - Township and Range
  - Streets
  - Section Line and ID
  - Railroad



Note: The flow from the 6-hr HEC-1 model was used for the peak flow.

**INDEX MAP**

	A	B	C	D	E	F
1	6-A1	6-B1	6-C1	6-D1	6-E1	6-F1
2	6-A2	6-B2	6-C2	6-D2	6-E2	6-F2
3	6-A3	6-B3	6-C3	6-D3	6-E3	
4			6-C4	6-D4	6-E4	

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Hoskin-Ryan Consultants, Inc. creative engineering solutions

Dewberry

CVL COE & VAN LOO

WICKENBURG AREA DRAINAGE MASTER STUDY / PLAN

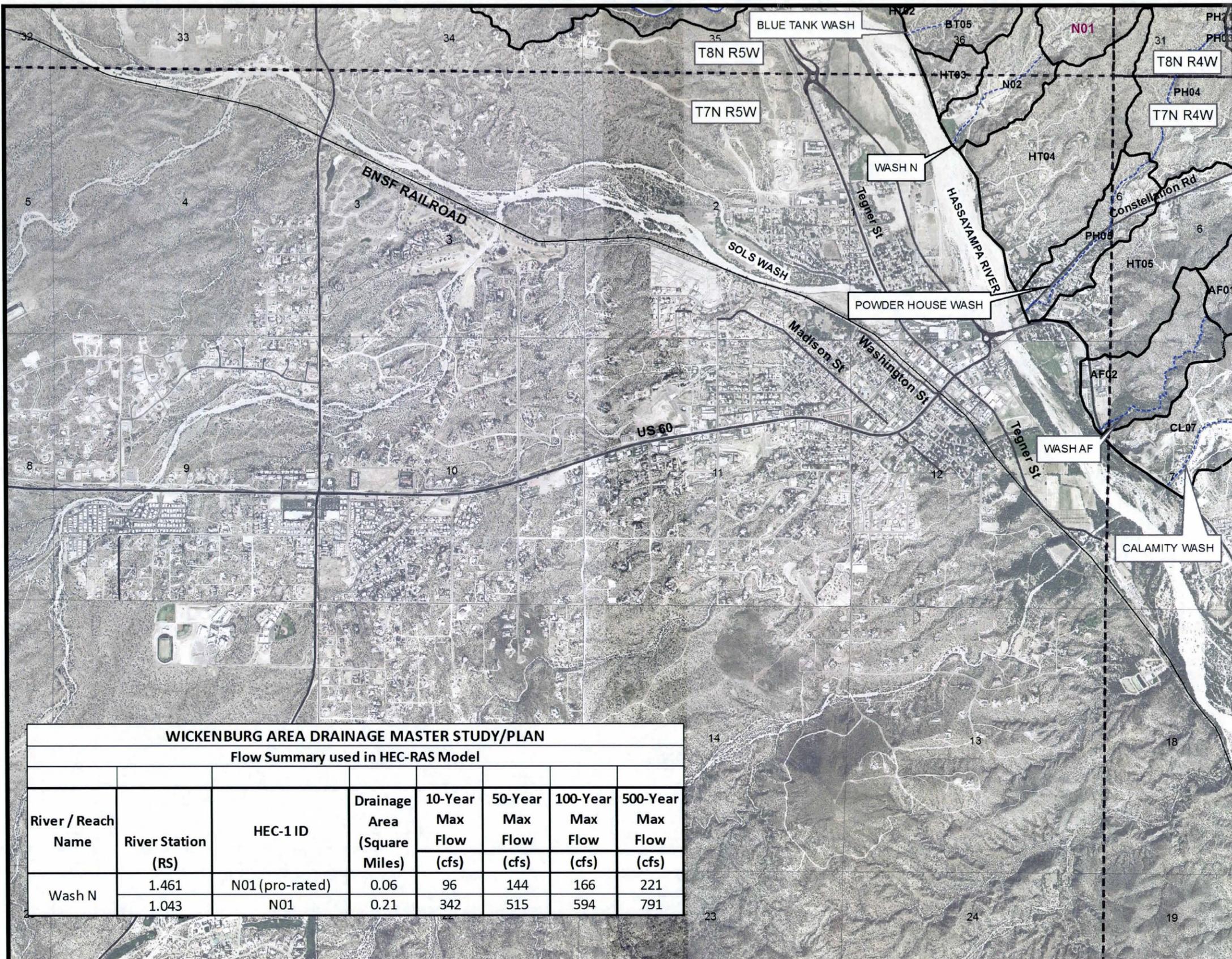
F.C.D. Contract No. 2009-C030

PRORATED FLOW MAP EXHIBIT 6-C1

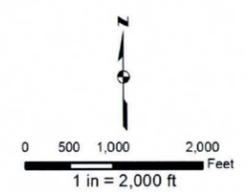
MATCH SHEET 6-B1

MATCH SHEET 6-D1

MATCH SHEET 6-C2



- Legend**
- Sub-Basin Boundary
  - Prorated Sub-Basin Boundary
  - Flow Line
  - Sub-basin ID
  - Sub-basin ID (Pro-Rated)
  - Sub-basin ID (not Pro-Rated)
  - Township and Range
  - Streets
  - Section Line and ID
  - Railroad



Note: The flow from the 6-hr HEC-1 model was used for the peak flow.

**INDEX MAP**

	A	B	C	D	E	F
1	6-A1	6-B1	6-C1	6-D1	6-E1	6-F1
2	6-A2	6-B2	6-C2	6-D2	6-E2	6-F2
3	6-A3	6-B3	6-C3	6-D3	6-E3	
4			6-C4	6-D4	6-E4	

WICKENBURG AREA DRAINAGE MASTER STUDY/PLAN							
Flow Summary used in HEC-RAS Model							
River / Reach Name	River Station (RS)	HEC-1 ID	Drainage Area (Square Miles)	10-Year	50-Year	100-Year	500-Year
				Max Flow (cfs)	Max Flow (cfs)	Max Flow (cfs)	Max Flow (cfs)
Wash N	1.461	N01 (pro-rated)	0.06	96	144	166	221
	1.043	N01	0.21	342	515	594	791

MATCH SHEET 6-B2

MATCH SHEET 6-D2



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*creative engineering solutions*



WICKENBURG  
AREA DRAINAGE MASTER STUDY / PLAN

F.C.D. Contract No. 2009-C030

PRORATED FLOW MAP  
EXHIBIT 6-C2



## **Appendix A:References**

### **A.1 References**

**(Included in CD)**



## **Appendix B: General Documentation and Correspondence**

### **B.1 Special Problem Reports**

*Note: There are no Special Problem Reports.*

- B.2 Contact Reports** (Included in CD)
- B.3 Meeting Minutes** (Included in CD)
- B.4 General Correspondence** (Included in CD)
- B.5 Contract Documents** (Included in CD)
- B.6 Public Notification** (Included in CD and report)
- B.7 FEMA Correspondence** (Included in report)

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**B.6 PUBLIC NOTIFICATION**



# Flood Control District of Maricopa County

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

[www.fcd.maricopa.gov](http://www.fcd.maricopa.gov)

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

## NOTICE OF INTENT TO REVISE FLOODPLAIN/FLOODWAY DELINEATIONS WITHIN THE TOWN OF WICKENBURG AND UNINCORPORATED MARICOPA COUNTY

The Flood Control District of Maricopa County (District) invites all interested persons to attend a public meeting where the Phase 2 results of the revised Wickenburg Area Drainage Master Study (ADMS) will be presented. Floodplain/floodway delineations were performed in this phase which revised the current floodplain/floodway boundaries within the drainage areas contributing to the various washes within and surrounding the Town of Wickenburg. Based on property ownership records, your property is near or within one of the recently revised floodplain/floodways.

The public meeting will be held at the Wickenburg Community Center on Thursday, August 30, 2012 from 5:30 p.m. to 7:30 p.m. with a short presentation at 6:00. You will have an opportunity to review the revised floodplain/floodway boundaries and speak with project team members from the District and its consultants.

The revised delineations include the establishment of 16.6 new linear miles of new Zone AE floodplains with Base Flood Elevations; the revision of 8.8 linear miles of Zone A floodplains to Zone AE floodplains with Base Flood Elevations; and the revision of 52 linear miles of floodplain and floodway widths and Base Flood Elevations (increases and decreases) for areas with previously delineated Zone AE floodplains and floodways.

The floodplain reaches impacted are:

- Hartman Wash: revised floodplain/floodway from Sols Wash to 9.9 miles upstream.
- Hartman Wash Tributary 1: Revised the Zone AE floodplain/floodway from confluence with Hartman Wash to 0.2 miles upstream of the confluence with Hartman Wash. Established a new Zone AE floodplain (no floodway) from 0.2 miles upstream of the confluence with Hartman Wash to 1.5 miles upstream of the confluence with Hartman Wash.
- Hartman Wash Tributary 2: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Hartman Wash to 1.4 miles upstream of the confluence with Hartman Wash.
- Hartman Wash Split: Revised Zone AE floodplain/floodway from confluence with Hartman Wash to 0.4 miles upstream of the confluence with Hartman Wash.
- Hartman Wash Breakout: Revised Zone AE floodplain from the Union Pacific Railroad upstream 0.2 miles to divergence with Hartman Wash.

(continued)

- Flying E Wash: Revised the Zone AE floodplain/floodway from the confluence with Sols Wash to 5.3 miles upstream of the confluence with Sols Wash.
- Flying E Wash Tributary 1: Established a new Zone AE floodplain (no floodway) from the confluence with Flying E Wash to 1.2 miles upstream of confluence with Flying E Wash.
- Flying E Wash Tributary 2: Established a new Zone AE floodplain (no floodway) from the confluence with Flying E Wash to 1.3 miles upstream of the confluence with Flying E Wash.
- Flying E Wash Tributary 3: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Flying E Wash to 1.8 miles upstream of the confluence with Flying E Wash.
- Yucca Flat Wash: Revised the Zone AE floodplain/floodway from the confluence with Flying E Wash to 2.9 miles upstream of the confluence with Flying E Wash. Revised the Zone A floodplain to Zone AE floodplain (no floodway) from 2.9 miles upstream of the confluence with Flying E Wash to 4.8 miles upstream of the confluence with Flying E Wash.
- Yucca Flat Wash Tributary 1: Established a new Zone AE floodplain (no floodway) from the confluence with Yucca Flat Wash to 1.0 miles upstream of confluence with Yucca Flat Wash.
- Twin Peaks Wash: Revised the Zone AE floodplain/floodway from the confluence with Yucca Flat Wash to 2.2 miles upstream of the confluence with Yucca Flat Wash. Established a new Zone AE floodplain (no floodway) from 2.2 miles upstream of the confluence with Yucca Flat Wash to 4.8 miles upstream of the confluence with Yucca Flat Wash.
- Holly Wash: Revised the Zone AE floodplain/floodway from the confluence with Flying E Wash to 1.9 miles upstream of the confluence with Flying E Wash. Revised the Zone A floodplain to Zone AE floodplain (no floodway) from 1.9 miles upstream of the confluence with Flying E Wash to 2.8 miles upstream of the confluence with Flying E Wash.
- Casandro Wash: Revised the Zone AE floodplain/floodway from the Union Pacific Railroad to 2.8 miles upstream of the confluence with Sols Wash. Established a new Zone AE floodplain (no floodway) from 2.8 miles upstream of the confluence with Sols Wash to 3.8 miles upstream of the confluence with Sols Wash.
- Casandro Wash South Branch: Revised the Zone AE floodplain/floodway from the confluence with Casandro Wash to 1.0 miles upstream of the confluence with Casandro Wash.
- Casandro Wash Val Vista Split: Established new Zone AE floodplain (no floodway) from the confluence with Casandro Wash to 0.1 mile upstream of the confluence with Casandro Wash.
- Sols Wash Tributary 1: Established a new Zone AE floodplain (no floodway) from the confluence with Sols Wash to 0.9 miles upstream of the confluence with Sols Wash.
- Sols Wash Tributary 2: Established a new Zone AE floodplain (no floodway) from the confluence with Sols Wash to 1.3 miles upstream of the confluence with Sols Wash.

(continued)

- Amir Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 2.5 miles upstream of the confluence with the Hassayampa River.
- Amir Wash Tributary 1(formerly Tributary to Amir Wash): Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.7 miles upstream of the confluence with Amir Wash.
- Amir Wash Tributary 2: Established a new Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.9 miles upstream of the confluence with Amir Wash.
- Amir Wash Tributary 3: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.7 miles upstream of the confluence with Amir Wash.
- Wash AG: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 0.8 miles upstream of the confluence with the Hassayampa River.
- Cemetery Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 6.2 miles upstream of the confluence with the Hassayampa River. Revised the Zone A floodplain to Zone AE floodplain (no floodway) from 6.2 miles upstream of the confluence with the Hassayampa River to 7.9 miles upstream of the confluence with the Hassayampa River.
- Cemetery Wash Tributary R: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Cemetery Wash to 0.4 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R1: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 2.5 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R2: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 2.9 miles upstream of the confluence with Cemetery Wash. Established new Zone AE floodplain (no floodway) from 2.9 miles upstream of the confluence with Cemetery Wash to 4.7 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R2a: Established a new Zone AE floodplain (no floodway) from the confluence with Cemetery Wash Tributary R2 to 0.8 miles upstream of the confluence with Cemetery Wash Tributary R2.
- Cemetery Wash Tributary R3: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 0.9 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R4: Established new Zone AE floodplain (no floodway) from the confluence with Cemetery Wash to 1.5 miles upstream of the confluence with Cemetery Wash.
- Wash Q: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.1 miles upstream of the confluence with the Hassayampa River.
- Wash P: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 0.3 miles upstream of the confluence with the Hassayampa River.

(continued)

- Blue Tank Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.0 miles upstream of the confluence with the Hassayampa River.
- Wash N: Revised the Zone A floodplain to detailed Zone AE floodplain (no floodway) from the confluence with the Hassayampa River to 0.7 miles upstream of the confluence with the Hassayampa River. Established a new Zone AE floodplain (no floodway) from 0.7 miles upstream of the confluence with the Hassayampa River to 1.3 miles upstream of the confluence with the Hassayampa River.
- Powderhouse Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.9 miles upstream of the confluence with the Hassayampa River.
- Powderhouse Wash Tributary 1: Revised the Zone AE floodplain/floodway from the confluence with Powderhouse Wash to 0.3 miles upstream of the confluence with Powderhouse Wash.
- Powderhouse Wash Tributary 2: Revised the Zone AE floodplain/floodway from the confluence with Powderhouse Wash to 0.2 miles upstream of the confluence with Powderhouse Wash.
- Powderhouse Wash Split: Revised the Zone AE floodplain/floodway from confluence with Powderhouse Wash to 0.3 miles upstream at the divergence with Powderhouse Wash.
- Wash AF: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with the Hassayampa River to 0.9 miles upstream of the confluence with the Hassayampa River.
- Calamity Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 2.2 miles upstream of the confluence with the Hassayampa River. Established a new Zone AE floodplain (no floodway) from 2.2 miles upstream of the confluence with the Hassayampa River to 2.4 miles upstream of the confluence with the Hassayampa River.

The District's delineation study will be submitted for approval to the Federal Emergency Management Agency (FEMA), who will use the study data to update the Flood Insurance Rate Maps. Once the data is submitted, FEMA's approval period may be approximately one year; however, the incorporation of the new floodplain boundaries and data onto the Flood Insurance Rate Maps will take place at a later date to be determined by FEMA. In the interim, the District and other jurisdictions may use the data as the "best available information" for floodplain management. Changes in flood insurance rating and federal mandatory purchase requirements will not become effective until after the study is approved by FEMA and the new Flood Insurance Rate Maps become effective. The District, however, recommends that property owners financially protect their buildings and contents with flood insurance.

If you have any questions about the revised floodplain/floodway boundaries, please contact Kathryn Gross, Senior Hydrologist, at (602) 506-4837 or [kag@mail.maricopa.gov](mailto:kag@mail.maricopa.gov); or Greg Jones, Regional Area Planning Manager, at (602) 506-5537 or [glj@mail.maricopa.gov](mailto:glj@mail.maricopa.gov).

# Wickenburg Area Drainage Master Study/Plan

## Introduction

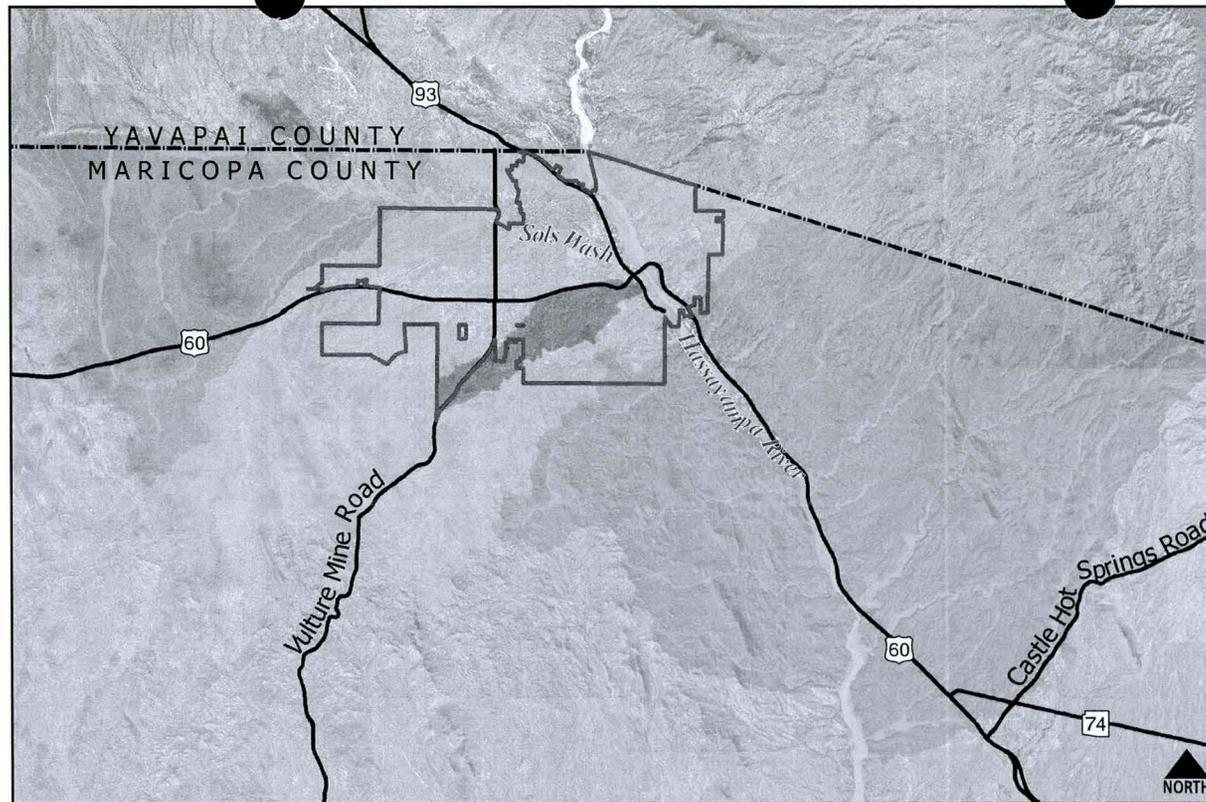
The Flood Control District of Maricopa County (District), in partnership with the Town of Wickenburg, is updating the original 1994 Wickenburg Area Drainage Master Study (ADMS). The current study is identifying known and potential flooding and erosion hazards in the Wickenburg area in three phases.

## Phase 1

This portion of the study identified the current floodplain and flood hazards for Sunset Wash and Sunnycove Wash. The study results were completed in 2011 and approved by the Federal Emergency Management Agency (FEMA) in a Letter of Map Revision (LOMR) for the studied area. This LOMR is anticipated to become effective on August 24, 2012 and provides the most up-to-date picture of the flood risks along Sunset Wash and Sunnycove Wash. The area affected by the LOMR primarily includes the main town area, and some of the drainage area contributing to the Sunnycove and Sunset dams and downstream to the Hassayampa River. Interested parties may view the updated floodplains via the "Current 100-Year FEMA Effective and Preliminary Floodplain Maps" link in the Maps section at [www.fcd.maricopa.gov](http://www.fcd.maricopa.gov). Changes in floodplain boundaries can affect local building and federal flood insurance requirements.

## Phase 2

The District began Phase 2 in February 2011, and has completed floodplain delineations and flood hazard assessments along approximately 80 linear miles of washes within the Town of Wickenburg as well as drainage areas in the



Map not to scale.

surrounding areas that contribute to washes in town. The Public Meeting listed in this brochure will feature maps of updated floodplain boundaries for public review and comment. Representatives from the District and its consulting firm will discuss the study and answer questions. Local residents and business owners are encouraged to attend to learn about the study and how flood risks have changed since the last study was completed 20 years ago. Once the final floodplain boundaries have been determined, they will be sent to FEMA for updating Flood Insurance Rate Maps. Changes in floodplain boundaries can affect local building and federal flood insurance requirements.

## LEGEND

-  Wickenburg Town Boundary
-  Existing Floodplain
-  Phase 1
-  Phase 2
-  Phase 3

## Phase 3 and Beyond

Other areas outside of the Town of Wickenburg will be studied in Phase 3, which will start in fall 2012 with a target completion date at the end of 2013. After the three phases of the ADMS are completed, an Area Drainage Master Plan (ADMP) may be conducted to recommend structural flood control facilities such as channels and basins, or non-structural methods such as development codes, to help reduce and manage flooding.

### Public Meeting

Thursday, August 30, 2012

5:30–7:30 p.m.

Brief Presentation: 6:00 p.m.

Wickenburg Community Center

160 North Valentine Street

### Your Input Counts

This Public Meeting is being held to help residents and business owners understand the proposed changes in floodplain boundaries, and the potential effect on specific properties and the community. Property owners are encouraged to share their knowledge of flooding in the area. Please bring flooding photos to the Public Meeting to be scanned for use in the District's data collection efforts. Interested parties may stay updated by visiting the District's Web site at [www.fcd.maricopa.gov/ads/WickenburgADMS.htm](http://www.fcd.maricopa.gov/ads/WickenburgADMS.htm).

### Contact

Gregory L. Jones, P.E., AICP

602-506-5537

[glj@mail.maricopa.gov](mailto:glj@mail.maricopa.gov)

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



August 2012

## Wickenburg Area Drainage Master Study/Plan



## Public Meeting Notification

Updated Floodplain Boundaries

**Maricopa County Supervisor:**

Max Wilson, District 4

**Town of Wickenburg:**

Kelly Blunt, Mayor

[www.fcd.maricopa.gov](http://www.fcd.maricopa.gov)

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50302030	PO BOX 961089	FORT WORTH	TX	76161	
APN 50538018B	580 S MARIPOSA ST	WICKENBURG	AZ	85390	
APN 50513002	598 EL RECREO DR	WICKENBURG	AZ	85390	
APN 50542101D	32908 MANRAD DR	WICKENBURG	AZ	85390	
APN 50514009	610 JACK BURDEN RD SP 1	WICKENBURG	AZ	85390	
APN 50514007A	25042 NELLIE GAIL RD	LAGUNA HILLS	CA	92653-5824	
APN 50536019	PO BOX 21329	WICKENBURG	AZ	85358	
APN 50547005A	570 YAQUI DR	WICKENBURG	AZ	85390	
APN 50551107	PO BOX 893	WICKENBURG	AZ	85358	
APN 50549078	400 S CATALINA AVE	REDONDO BEACH	CA	90277	
APN 50549089	PO BOX 2399	WICKENBURG	AZ	85358	
APN 50540225	2580 W PINTO PL	WICKENBURG	AZ	85390	
APN 50301034	1616 WEST ADAMS	PHOENIX	AZ	85007	
APN 50552030	1 SANTA FE PLAZA 5200 E SHEILA ST	LOS ANGELES	CA	90040	
APN 50513033B	430 CONSTELLATION RD	WICKENBURG	AZ	85390	
APN 50542117	4530 E TIERRA BUENA LN	PHOENIX	AZ	85032	
APN 50542109	1521 WEST DOBBINS ROAD	PHOENIX	AZ	85041	
APN 50542121B	5625 N 12TH AVE	PHOENIX	AZ	85013	
APN 50528001F	790 JAVELINA DR	WICKENBURG	AZ	85390	
APN 50531063	278 MOHAVE	WICKENBURG	AZ	85390-2219	
APN 50542018C	PO BOX 1477	WICKENBURG	AZ	85390	
APN 50504119T	PO BOX 1232	EAGLE	CO	81631	
APN 50531050	PO BOX 532	WICKENBURG	AZ	85358	
APN 50540175	2065 HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50541119	255 N AZTEC TRL	WICKENBURG	AZ	85390-3320	
APN 50501016	55835 STONEHEDGE RANCH RD	WICKENBURG	AZ	85390	
APN 50537047	PO BOX 423	WICKENBURG	AZ	85358	
APN 50503024F	PO BOX 1137	WICKENBURG	AZ	85358	
APN 50501018J	532 STONEHEDGE RANCH RD	WICKENBURG	AZ	85390	
APN 50542101A	51205 N 330TH AVE	WICKENBURG	AZ	85390	
APN 50531042	PO BOX 956	WICKENBURG	AZ	85358	
APN 50531052	515 W WICKENBURG WAY	WICKENBURG	AZ	85390	
APN 50551116	3041 CHICHICOI LN	PRESCOTT	AZ	86305	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50538019H	4040 W AUGUST AVE	PHOENIX	AZ	85021	
APN 50541120	4255 BLACK MOUNTAIN RD	WICKENBURG	AZ	85390	
APN 50530033	PO BOX 2518	WICKENBURG	AZ	85358	
APN 50530073C	440 AMERICA ST	WICKENBURG	AZ	85390	
APN 50540253	PO BOX 20776	WICKENBURG	AZ	85358	
APN 50528001E	780 JAVELINA DR	WICKENBURG	AZ	85390	
APN 50542038	00 S MAMRAD DR	WICKENBURG	AZ	85390	
APN 50527059	600 DESERT CANYON RD	WICKENBURG	AZ	85390	
APN 50501002T	5825 W MONTE CRISTO	GLENDALE	AZ	85306	
APN 50538018G	56558 RANCHO CASITAS RD	WICKENBURG	AZ	85390	
APN 50537108	PO BOX 2509	WICKENBURG	AZ	85358	
APN 50540318	91 CRAWFORD ST PO BOX 9	RONALD	WA	98940	
APN 50503023M	1214 NORTH FORTY	WICKENBURG	AZ	85390	
APN 50549071	311 W CENTER ST	WICKENBURG	AZ	85390	
APN 50534061E	15637 W JOMAX	SUN CITY WEST	AZ	85387	
APN 50547156D	875 YAQUI DR	WICKENBURG	AZ	85390	
APN 50501012A	PO BOX 3465	WICKENBURG	AZ	85358	
APN 50549106	11 N LINCOLN	WICKENBURG	AZ	85390	
APN 50512024A	490 N CONSTELLATION RD	WICKENBURG	AZ	85390	
APN 50541113	1418 PUEBLO DR	BOUNDER CITY	NV	89005	
APN 50513009A	666 EL RECREO DR	WICKENBURG	AZ	85390	
APN 50501003J	1335 JACK BURDEN RD	WICKENBURG	AZ	85390	
APN 50503016F	56605 N 329TH AVE	WICKENBURG	AZ	85390	
APN 50537105A	PO BOX 20597	WICKENBURG	AZ	85358	
APN 50541118A	PO BOX 20730	WICKENBURG	AZ	85358-0730	
APN 50534020	840 W AMERICA ST	WICKENBURG	AZ	85390	
APN 50512002T	485 EL RECREO DR	WICKENBURG	AZ	85390	
APN 50503016P	601 S GROVE RD	SPOKANE	WA	99224	
APN 50542106	PO BOX 1206	WICKENBURG	AZ	85358	
APN 50528008B	660 S KELLIS RD	WICKENBURG	AZ	85390	
APN 50528007C	PO BOX 143	WICKENBURG	AZ	85358	
APN 50537101	2425 E CAMELBACK RD #600	PHOENIX	AZ	85016	
APN 50538050D	PO BOX 2147	WICKENBURG	AZ	85358	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50503050	1206 NORTH FORTY	WICKENBURG	AZ	85390	
APN 50538103	2171 ARNOLD DISTRICT RD	BRANDON	VT	05733	
APN 50531064	PO BOX 2340	WICKENBURG	AZ	85358	
APN 50534060B	PO BOX 1180	WICKENBURG	AZ	85358	
APN 50528001A	825 S MARIPOSA DR	WICKENBURG	AZ	85390	
APN 50544077	6775 N HIGHWAY 83	HARTLAND	WI	53029	
APN 50549111	PO BOX 375	WICKENBURG	AZ	85358	
APN 50531087	556 N JACKSON ST	WICKENBURG	AZ	85390	
APN 50531154A	573 SKID RD	LOPEZ ISLAND	WA	98261	
APN 50540165	4040 PIEDMONT DR SP 368A	HIGHLAND	CA	92346	
APN 50542083D	1325 STEINWAY DR	WICKENBURG	AZ	85390	
APN 50549116B	PO BOX 894	WICKENBURG	AZ	85358	
APN 50532060C	648 E VIA CORTE DR	WICKENBURG	AZ	85390	
APN 50551072A	869 PHILLIPS ST	VISTA	CA	92083-7108	
APN 50547173	PO BOX 2246	WICKENBURG	AZ	85358	
APN 50544002C	1551 S VULTURE MINE RD	WICKENBURG	AZ	85390	
APN 50549110	64 W LINCOLN	WICKENBURG	AZ	85390	
APN 50512024B	550 N CONSTELLATION RD	WICKENBURG	AZ	85390	
APN 50542082E	3137 E ROCK WREN RD	PHOENIX	AZ	85048	
APN 50540171	2145 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50504112	PO BOX 1166	WICKENBURG	AZ	85358	
APN 50549072A	138 S JACKSON ST	WICKENBURG	AZ	57219	
APN 50535002F	340 N MARIPOSA DR	WICKENBURG	AZ	85390	
APN 50540064	2044 W SMOKETREE DR	WICKENBURG	AZ	85390	
APN 50543004K	23203 N 23RD PL	PHOENIX	AZ	85024	
APN 50551052	4200 HIGHWAY 180	EAST MINERAL WELLS	TX	76067	
APN 50551094F	176 S MESQUITE ST	WICKENBURG	AZ	85390	
APN 50543005M	419 N OXBOW DR	WICKENBURG	AZ	85390-1386	
APN 50542098	16 HIGHLAND WAY	SCARSDALE	NY	10583	
APN 50542063A	1470 W JONES RD	WICKENBURG	AZ	85390	
APN 50542005A	15651 N 27TH ST #126	PHOENIX	AZ	85032	
APN 50540034B	PO BOX 2213	WICKENBURG	AZ	85358	
APN 50542101C	PO BOX 20422	WICKENBURG	AZ	85358	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50532038A	380 N CUCURACHA ST	WICKENBURG	AZ	85390	
APN 50527060	590 LOST CANYON RD	WICKENBURG	AZ	85390	
APN 50542046	PO BOX 931	WICKENBURG	AZ	85358	
APN 50536012	780 SAHUARO DR	WICKENBURG	AZ	85390	
APN 50513034	PO BOX 5847	SUN CITY WEST	AZ	85376	
APN 50529029D	PO BOX 2046	WICKENBURG	AZ	85358	
APN 50513008	658 N EL RECREO DR	WICKENBURG	AZ	85390	
APN 50527005E	10 W PALMOA SOLITA LN	WICKENBURG	AZ	85390	
APN 50542075F	1070 S OCOTILLO DR	WICKENBURG	AZ	85390	
APN 50547169	1867 AGUILA DR	WICKENBURG	AZ	85390	
APN 50540335	3950 E METELLAN NO 3	MESA	AZ	85205	
APN 50547230A	1905 N VISTA DR	WICKENBURG	AZ	85390	
APN 50542078A	1205 S 325TH AVE	WICKENBURG	AZ	85390	
APN 50531119	PO BOX 1766	WICKENBURG	AZ	85358	
APN 50537065B	50 EAST NORTH TEMPLE RM 2225	SALT LAKE CITY	UT	84150	
APN 50537114	3123 CALHOUN WY	STOCKTON	CA	95219	
APN 50543004F	25 E AMARANTH DR	WICKENBURG	AZ	85390	
APN 50537110	1710 W CAMINO DR	WICKENBURG	AZ	85390	
APN 50539006A	111 HEKILI ST A	KAILUA	HI	96734	
APN 50537129	PO BOX 160	WICKENBURG	AZ	85358	
APN 50547180	1745 N AGUILA DR	WICKENBURG	AZ	85398	
APN 50547007C	590 YAQUI DR	WICKENBURG	AZ	43081	
APN 50540240	12606 KNIGHTBRIDGE DRIVE	WOODBIDGE	VA	22192	
APN 50547002A	PO BOX 907	YARNELL	AZ	85362	
APN 50534022	PO BOX 1360	WICKENBURG	AZ	85358	
APN 50542054C	1910 DUFF RD	WICKENBURG	AZ	85390	
APN 50547150	825 YAQUI	WICKENBURG	AZ	85390	
APN 50538095	83 S FLAGSTONE PASS CIR	THE WOODLANDS	TX	77381	
APN 50538101	PO BOX 4349	PALM SPRINGS	CA	92263	
APN 50551053	PO BOX 278	WICKENBURG	AZ	85358	
APN 50504115B	8905 HWY F	ARPIN	WI	54410	
APN 50540249	PO BOX 1272	BAGDAD	AZ	86321	
APN 50538083	PO BOX 20039	WICKENBURG	AZ	85390	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50531040	2730 E SAN TAN ST	CHANDLER	AZ	85225	
APN 50527057	620 W DESERT CANYON RD	WICKENBURG	AZ	85390	
APN 50540373	120 EXCHANGE ST	PORTLAND	ME	04101	
APN 50541183	37950 N VULTURE MINE RD	WICKENBURG	AZ	85390	
APN 50511015C	455 E THURBER RD	WICKENBURG	AZ	85390	
APN 50537080	380 N VULTURE MINE RD	WICKENBURG	AZ	85390	
APN 50538002	PO BOX 3730	JACKSON	WY	83001	
APN 50542032A	PO BOX 1896	WICKENBURG	AZ	85358	
APN 50551121	311 SYLVAN RD	WICKENBURG	AZ	85390	
APN 50541191	400 N JEFFERSON ST C4	WICKENBURG	AZ	85390	
APN 50513031J	PO BOX 2452	WICKENBURG	AZ	85358	
APN 50551056	101 S MESQUITE ST	WICKENBURG	AZ	85390	
APN 50547178	1765 AUILA DR	WICKENBURG	AZ	85390	
APN 50542054D	1907 DUFF RD	WICKENBURG	AZ	85390	
APN 50528014F	PO BOX 21	CAMP VERDE	AZ	86322	
APN 50549122	8 MOUNTAIN VILLA D3	CHAMPION	PA	15622	
APN 50513007	6945 W HAVEN AVE	PHOENIX	AZ	85035	
APN 50540325	2405 HIGRIDGE RD	WICKENBURG	AZ	85390	
APN 50528014G	705 W AGUA DR	WICKENBURG	AZ	85390	
APN 50540250	136 BREEZY HILL RD	KINGSTON	NY	12401	
APN 50540174	2085 HIGHRIDGE	WICKENBURG	AZ	85390	
APN 50537089	PO BOX 21570	WICKENBURG	AZ	85358	
APN 50543004L	10 W VIA TORTUGA	WICKENBURG	AZ	85390	
APN 50527054A	650 DESERT CANYON RD	WICKENBURG	AZ	85390	
APN 50540255	2955 SILVER SPUR DR	WICKENBURG	AZ	85390	
APN 50540169	2185 HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50542124F	1410 S 323RD AVE	WICKENBURG	AZ	85390	
APN 50551106	2084 MEADOW BROOK RD	ALTADENA	CA	91001	
APN 50504044	2105 W BROKEN ARROW DR	WICKENBURG	AZ	85390	
APN 50537111	1730 PALOS VERDES DR	WICKENBURG	AZ	85390	
APN 50529001D	635 ELLSI RD	WICKENBURG	AZ	85390	
APN 50542018A	1853 VISTA DR	WICKENBURG	AZ	85390	
APN 50536018	PO BOX 761	WICKENBURG	AZ	85358	



APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50538100	1550 CALLE SIMPATICO	WICKENBURG	AZ	85390	
APN 50542009A	6040 E MAIN ST UNIT A100 125	MESA	AZ	85205-8928	
APN 50541110	PO BOX 300	WICKENBURG	AZ	85358	
APN 50549118B	500 W WICKENBURG WAY	WICKENBURG	AZ	85390	
APN 50541181	PO BOX 3804	CAREFREE	AZ	85377	
APN 50541120	4255 S BLACK MOUNTAIN RD	WICKENBURG	AZ	85390-4011	
APN 50541120	4255 S BLACK MOUNTAIN RD	WICKENBURG	AZ	85390	
APN 50542031C	51106 N 323RD ST	WICKENBURG	AZ	85390-3313	
APN 50503051B	PO BOX 3643	WICKENBURG	AZ	85358	
APN 50539013T	1915A E KATELLA AVE	ORANGE	CA	92867	
APN 50503051D	PO BOX 10	WICKENBURG	AZ	85358	
APN 50527064	550 S DESERT CANYON RD	WICKENBURG	AZ	85390	
APN 50540173	2105 HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50541030	4040 MT BAKER HWY	EVERSON	WA	98247	
APN 50542008G	32817 W LURAY RD	WICKENBURG	AZ	85390	
APN 50541031	22090 LINDY LN	CUPERTINO	CA	95014	
APN 50527112A	395 COTTONWOOD LN	WICKENBURG	AZ	85390	
APN 50511001G	55203 THURBER RD	WICKENBURG	AZ	85390-2522	
APN 50504119U	1489 THRASHER LN	WICKENBURG	AZ	85390	
APN 50542099A	10790 MNT ANTERO WY	PARKER	CO	80138	
APN 50534052D	540 WEST ROAD 3	WICKENBURG	AZ	85390	
APN 50542072B	1910 MANRAD DR	WICKENBURG	AZ	85390	
APN 50527059	PO BOX 20573	WICKENBURG	AZ	85390	
APN 50503031B	14196 W PICCADILLY AVE	GOODYEAR	AZ	85338	
APN 50503031A	PO BOX 458	WICKENBURG	AZ	85358	
APN 50547166D	1892 VISTA DR	WICKENBURG	AZ	85390	
APN 50528010C	435 S PALO VERDE DR	WICKENBURG	AZ	85390	
APN 50541125	22875 S 214TH ST	QUEEN CREEK	AZ	85142	
APN 50531124	680 W LA GOLONDRINA DR	WICKENBURG	AZ	85390	
APN 50540037F	PO BOX 1982	WICKENBURG	AZ	85358	
APN 50504132	PO BOX 21300	WICKENBURG	AZ	85358	
APN 50531062	PO BOX 1766	WICKENBURG	AZ	85358	
APN 50549114	PO BOX 20788	WICKENBURG	AZ	85358	















APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50534023	4922 FOX LAKE RD	SMITHVILLE	OH	44677	
APN 50551036A	PO BOX 1117	WICKENBURG	AZ	85358	
APN 50532032C	750 W LA PALOMA DR	WICKENBURG	AZ	85390	
APN 50540123	600 SMOKETREE DR	WICKENBURG	AZ	85390	
APN 50547130M	505 N MADISON ST	CARTHAGE	IL	62321	
APN 50551094E	166 S MESQUITE ST	WICKENBURG	AZ	85390	
APN 50541115A	PO BOX 352	GERALDINE	MT	59440	
APN 50542062	1050 S SAGUARO DR	WICKENBURG	AZ	85901-1339	
APN 50540167	2225 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50549080	46 N JACKSON ST	WICKENBURG	AZ	85390	
APN 50527053A	PO BOX 21	WICKENBURG	AZ	85358	
APN 50543009K	12903 W JADESTONE DR	SUN CITY	AZ	85375-3241	
APN 50537081	PO BOX 429	WICKENBURG	AZ	85358	
APN 50547174	1815 W AGUILA	WICKENBURG	AZ	85390	
APN 50540465	11024 N 28TH DR STE 170	PHOENIX	AZ	85029	
APN 50387005	50 CONGRESS ST RM 800	BOSTON	MA	02109	
APN 50513031K	PO BOX 33184	PHOENIX	AZ	85067	
APN 50547003A	9127 N HORIZON TRAIL	FOUNTAIN HILLS	AZ	85268	
APN 50549072A	500 3RD ST	BRISTOL	SD	57219	
APN 50529001B	PO BOX 74	WICKENBURG	AZ	85358	
APN 50537107	310 W QUAIL RUN	WICKENBURG	AZ	85390	
APN 50540164	2305 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50504023B	PO BOX 1404	WICKENBURG	AZ	85358	
APN 50527004H	225 W TURTLEBACK LN	WICKENBURG	AZ	85390	
APN 50513031H	651 N CONSTELLATION RD	WICKENBURG	AZ	85390	
APN 50540343	120 N ROUND UP DR	WICKENBURG	AZ	85390	
APN 50540334	8234 HOUGH RD	ALMONT	MI	48003	
APN 50537102	PO BOX 1787	WICKENBURG	AZ	85390	
APN 50540254	2905 N SILVER SPUR DR	WICKENBURG	AZ	85390	
APN 50527004C	PO BOX 2197	WICKENBURG	AZ	85358	
APN 50552028	PO BOX 1418	WICKENBURG	AZ	85358	
APN 50503018	56511 US HIGHWAY 89 93 STE 5	WICKENBURG	AZ	85390-3499	
APN 50501003A	510 N TEGNER ST UNIT 3	WICKENBURG	AZ	85390-3421	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50502008Y	19920 W VERDE HILLS DR	WICKENBURG	AZ	85390	
APN 50501020C	515 E CAREFREE HWY NO 850	PHOENIX	AZ	85085	
APN 50538050C	840 S MARIPOSA DR	WICKENBURG	AZ	85390	
APN 50541002C	2201 E CAMELBACK RD 202	PHOENIX	AZ	85016	
APN 50531041	2630 W COLUMBINE DR	PHOENIX	AZ	85029	
APN 50542102B	1350 MANRAD	WICKENBURG	AZ	85390	
APN 50540162	6827 W AVENIDA DEL REY	PEORIA	AZ	85383	
APN 50527061	580 DESERT CANYON RD	WICKENBURG	AZ	85390	
APN 50540221	23012 W COCOPAH ST	BUCKEYE	AZ	85326	
APN 50528003C	635 PALO VERDE DR	WICKENBURG	AZ	85390-1394	
APN 50501018C	17903 HIGHWAY 14	SUNDANCE	WY	82729	
APN 50531053	129 W MOHAVE	WICKENBURG	AZ	85390	
APN 50547130Q	PO BOX 1262	WICKENBURG	AZ	85358	
APN 50534024	715 KELLIS RD	WICKENBURG	AZ	85390	
APN 50534019	830 AMERICA ST	WICKENBURG	AZ	85390	
APN 50532040F	PO BOX 905	CONGRESS	AZ	85332	
APN 50538018K	815 OASIS DR	WICKENBURG	AZ	85390	
APN 50530036A	17 S OXBOW	WICKENBURG	AZ	85358	
APN 50545004B	501 S TEGNER ST	WICKENBURG	AZ	85390	
APN 50529002A	680 N HEIGHTS RD	WICKENBURG	AZ	85390	
APN 50527071	310 LOST CANYON RD	WICKENBURG	AZ	85390	
APN 50527115A	695 S KELLIS RD	WICKENBURG	AZ	85390	
APN 50531146	PO BOX 5638	PLAYA DEL REY	CA	90296	
APN 50532081	153 N JEFFERSON ST	WICKENBURG	AZ	85390	
APN 50540019C	PO BOX 663	WICKENBURG	AZ	85358	
APN 50533029K	600 WHIPPLE CT	WICKENBURG	AZ	85390	
APN 50551108	269 SYLVAN RD	WICKENBURG	AZ	85390	
APN 50543005J	PO BOX 2815	WICKENBURG	AZ	85358	
APN 50541012C	PO BOX 21240	WICKENBURG	AZ	85358	
APN 50531115A	PO BOX 162	AGUILA	AZ	85320	
APN 50512025	530 CONSTELLATION RD	WICKENBURG	AZ	85390	
APN 50543005R	PO BOX 21210	WICKENBURG	AZ	85390	
APN 50543005N	340 E VIA TORTUGA	WICKENBURG	AZ	85390	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50541019	4020 INDUSTRIAL WAY	WICKENBURG	AZ	85390	
APN 50503024E	PO BOX 177	PINEDALE	WY	82941	
APN 50541106	5145 BLACK MONTAIN RD	WICKENBURG	AZ	85390	
APN 50541006Q	4081 N INDUSTRIAL RD	WICKENBURG	AZ	85390	
APN 50540007G	PO BOX 21138	WICKENBURG	AZ	85358	
APN 50540323	PO BOX 463	CONGRESS	AZ	85332	
APN 50541184	21112 N 74TH PL	SCOTTSDALE	AZ	85255	
APN 50505006C	1215 EASY ST	WICKENBURG	AZ	85390	
APN 50501017	55825 E STONEHEDGE RANCH RD	WICKENBURG	AZ	85390	
APN 50531118A	PO BOX 1512	WICKENBURG	AZ	85358	
APN 50540177	2025 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50542018B	1851 VISTA DR	WICKENBURG	AZ	85390	
APN 50531080	389 NAVAJO ST	WICKENBURG	AZ	85390	
APN 50513001	9634 N 24TH ST	PHOENIX	AZ	85028	
APN 50542103B	PO BOX 20307	WICKENBURG	AZ	85358	
APN 50538096	1545 CALLE SIMPATICO	WICKENBURG	AZ	85390	
APN 50547172	1835 N AGUILA DR	WICKENBURG	AZ	85390	
APN 50549121A	85 GRAND ST	WICKENBURG	AZ	85390	
APN 50551150	150 PARK ST	WICKENBURG	AZ	85390	
APN 50535002S	PO BOX 21108	WICKENBURG	AZ	85358	
APN 50540214	PO BOX 21238	WICKENBURG	AZ	85390	
APN 50540224	2600 W PINTO PL	WICKENBURG	AZ	85390	
APN 50505028B	PO BOX 20867	WICKENBURG	AZ	85358	
APN 50503023U	1540 CHEROKEE LN	WICKENBURG	AZ	85390	
APN 50540342	PO BOX 20998	WICKENBURG	AZ	85358	
APN 50538094	1565 E CALLE SIMPATICO	WICKENBURG	AZ	85390	
APN 50502007C	1655 N TEGNER ST	WICKENBURG	AZ	85390	
APN 50540010	2201 E CAMELBACK RD STE 202	PHOENIX	AZ	85016	
APN 50541108	8602 W CAVALIER DR	GLENDALE	AZ	85305	
APN 50513037	PO BOX 1902	WICKENBURG	AZ	85358	
APN 50502005B	PO BOX 129	WICKENBURG	AZ	85358	
APN 50527005A	PO BOX 771	WICKENBURG	AZ	85358	
APN 50502022	PO BOX 10966	TEMPE	AZ	85284	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50502023	PO BOX 10966	TEMPE	AZ	85284	
APN 50540176	2045 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50539002A	375 S VULTURE MINE RD	WICKENBURG	AZ	85390	
APN 50536006	PO BOX 1670	DURANGO	CO	81302	
APN 50543011	4535 E HEARN RD	PHOENIX	AZ	85032	
APN 50504007	PO BOX 81169	PHOENIX	AZ	85068	
APN 50540218	2705 W PALOMINO DR	WICKENBURG	AZ	85390	
APN 50532036C	701 CORPORATE CENTER DR	RALEIGH	NC	27607	
APN 50543025	3476 STATEVIEW BLVD MAC X7801-014	FORT MILL	SC	29715	
APN 50538050A	1025 LOS ALTOS DR	WICKENBURG	AZ	85390	
APN 50551111A	296 S JEFFERSON ST	WICKENBURG	AZ	85390	
APN 50540024D	2001 W VAL VISTA DR	WICKENBURG	AZ	85358	
APN 50551119A	9 SYLVAN LN	WICKENBURG	AZ	85390	
APN 50547179	PO BOX 461	WICKENBURG	AZ	85358	
APN 50541195	PO BOX 131	WICKENBURG	AZ	85358	
APN 50542113C	1550 W PHOTOVIEW DR	WICKENBURG	AZ	85390	
APN 50541122	PO BOX 1448	WICKENBURG	AZ	85358	
APN 50537078	PO BOX 1357	WICKENBURG	AZ	85358	
APN 50534055B	1012 BETHANY RD	BURBANK	CA	91504	
APN 50501002Y	1590 LITTLE STONEHEDGE RANCH RD	WICKENBURG	AZ	85390	
APN 50541169	PO BOX 131	WICKENBURG	AZ	85358	
APN 50547130P	1735 N AGUILA DR	WICKENBURG	AZ	85390	
APN 50540124	540 W SMOKETREE	WICKENBURG	AZ	85390	
APN 50513004	PO BOX 1422	WICKENBURG	AZ	85358	
APN 50538086	PO BOX 3705	JACKSON HOLE	WY	83001-3705	
APN 50090443	15568 W DURANGO ST	GOODYEAR	AZ	85338	
APN 50503023P	56002 N HIGHWAY 89 93	WICKENBURG	AZ	85390	
APN 50528014D	20229 S ATHENS DR	OREGON CITY	OR	97045	
APN 50539007C	PO BOX 80949	PHOENIX	AZ	85060	
APN 50537064A	PO BOX 447	CONGRESS	AZ	85332	
APN 50502054	6912 E JOAN DE ARC	SCOTTSDALE	AZ	85254	
APN 50543003L	PO BOX 421	SALOME	AZ	85348	
APN 50537048C	PO BOX 2065	WICKENBURG	AZ	85358	

APN	Owner Address	Owner City	Owner State	Owner Zip	Country
APN 50542126	89 SPRUCE DR	MIDDLETOWN	NJ	07748	
APN 50528014H	PO BOX 2019	WICKENBURG	AZ	85358-2019	
APN 50547171	510 W SAVAGE ST	WICKENBURG	AZ	85390	
APN 50503022G	2707 CAMPBELL RD NW TRLR 6	ALBUQUERQUE	NM	87104-3128	
APN 50541111	PO BOX 900	MONTE RIO	CA	95462	
APN 50504119V	6115 W CORRINE DR	GLENDALE	AZ	85304	
APN 50531050	189 MOHAVE ST	WICKENBURG	AZ	85358	
APN 50536022	1020 W WICKENBURG WAY	WICKENBURG	AZ	85390	
APN 50505028R	1420 W COUNTRY CLUB DR	WICKENBURG	AZ	85390	
APN 50505028P	PO BOX 939	PARK CITY	UT	84060	
APN 50528011C	155 N TEGNER ST STE A	WICKENBURG	AZ	85390-3427	
APN 50528011C	155 N TEGNER ST STE A	WICKENBURG	AZ	85390-3427	
APN 50544082	40 W YAVAPAI ST	WICKENBURG	AZ	85390	
APN 50542095	PO BOX 207	MT VERNON	OR	97865	
APN 50547011A	PO BOX 8	WICKENBURG	AZ	85358	
APN 50501020G	405 STONEHEDGE RACH RD	WICKENBURG	AZ	85390	
APN 50530043	PO BOX 161	WICKENBURG	AZ	85358	
APN 50540129	655 W SMOKETREE ST	WICKENBURG	AZ	85390	
APN 50543007A	1325 PEONY LN	PLYMOUTH	MN	55447	
APN 50530040	441 S OXBOW	WICKENBURG	AZ	85390	
APN 50387004S	13840 N DESERT HARBOR DR APT 158	PEORIA	AZ	85381	
APN 50542091B	51323 N 329TH AVE	WICKENBURG	AZ	85390	
APN 50541114	2795 SADDLERIDGE WY	WICKENBURG	AZ	85390	
APN 50530041	550 PALM DR NO 75	WICKENBURG	AZ	85390	
APN 50528013D	PO BOX 2764	WICKENBURG	AZ	85358	
APN 50540327	185 THREE CROSSES RD	WICKENBURG	AZ	85390	
APN 50528013A	515 W WICKENBURG WAY	WICKENBURG	AZ	85390	
APN 50528013E	51020 HIGHWAY 60/89 STE B	WICKENBURG	AZ	85390	
APN 50512002R	525 CONSTELLATION RD	WICKENBURG	AZ	85390-1508	
APN 50540128	645 SMOKETREE ST	WICKENBURG	AZ	85390	
APN 50504023E	56848 N VULTURE MINE RD	WICKENBURG	AZ	85358	
APN 50537125	11415 N 288TH ST	VALLEY	NE	68064	
APN 50535005	PO BOX 3553	WICKENBURG	AZ	85358	

<b>APN</b>	<b>Owner Address</b>	<b>Owner City</b>	<b>Owner State</b>	<b>Owner Zip</b>	<b>Country</b>
APN 50538099A	PO BOX 232	WICKENBURG	AZ	85358	
APN 50540163	2325 W HIGHRIDGE RD	WICKENBURG	AZ	85390	
APN 50551057	123 S MESQUITE ST	WICKENBURG	AZ	85390	
APN 50540217	2695 W PALOMINO	WICKENBURG	AZ	85390	
APN 50542084	1400 S 325TH AVE	WICKENBURG	AZ	85390-3349	
APN 50531092	401 E WICKENBURG WY NO 58	WICKENBURG	AZ	85390	
APN 50543004M	90 E VIA TORTUG	WICKENBURG	AZ	85390	

**AFFIDAVIT OF PUBLICATION  
FLOODWAY REVISIONS/WICKENBURG**

01

# Arizona Business Gazette

The business resource

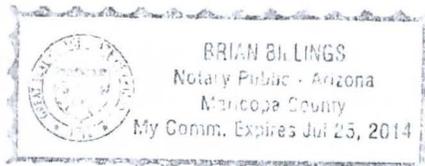
PO BOX 194  
Phoenix, Arizona 85001-0194  
(602) 444-7315 FAX (602) 444-7364

STATE OF ARIZONA }  
COUNTY OF MARICOPA } SS.

Manny Vargas, being first duly sworn, upon oath deposes and says: That he is the Legal Ad Rep of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

8/16/2012

Sworn to before me this  
16TH day of  
AUGUST 2012



*[Handwritten Signature]*

*[Handwritten Signature]*

Notary Public

**Legal Notice for Floodplain/Floodway Revisions on Multiple Washes within the Town of Wickenburg and Unincorporated Maricopa County, AZ**

The Flood Control District of Maricopa County (District), in cooperation with the Town of Wickenburg, in accordance with the National Flood Insurance Program regulation 65.7(b)(1), hereby gives notice of the District's intent to revise the floodplain/floodway generally located within Township 7 North, Range 6 West, Sections 13, 14, 23, 24, 25, 26, 27, 34, 35, and Township 7 North, Range 5 West, Sections 1-5, 7-22, 27-33, and Township 7 North, Range 4 West, Sections 5, 6, 7, 18; and Township 8 North Range 5 West, Sections 33-35. Specifically, the floodplain/floodway was revised along the following reaches:

- Amir Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 2.5 miles upstream of the confluence with the Hassayampa River.
- Amir Wash Tributary 1 (formerly Tributary to Amir Wash): Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.7 miles upstream of the confluence with Amir Wash.
- Amir Wash Tributary 2: Established a new Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.5 miles upstream of the confluence with Amir Wash.
- Amir Wash Tributary 3: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Amir Wash to 0.7 miles upstream of the confluence with Amir Wash.
- Wash AG: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 0.8 miles upstream of the confluence with the Hassayampa River.
- Cemetery Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 6.2 miles upstream of the confluence with the Hassayampa River. Revised the Zone A floodplain to Zone AE floodplain (no floodway) from 6.2 miles upstream of the confluence with the Hassayampa River to 7.9 miles upstream of the confluence with the Hassayampa River.
- Cemetery Wash Tributary R: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with Cemetery Wash to 0.4 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R1: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 2.5 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R2: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 2.9 miles upstream of the confluence with Cemetery Wash. Established new Zone AE floodplain (no floodway) from 2.9 miles upstream of the confluence with Cemetery Wash to 4.7 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R2a: Established a new Zone AE floodplain (no floodway) from the confluence with Cemetery Wash Tributary R2 to 0.8 miles upstream of the confluence with Cemetery Wash Tributary R2.
- Cemetery Wash Tributary R2: Revised the Zone AE floodplain/floodway from the confluence with Cemetery Wash to 0.9 miles upstream of the confluence with Cemetery Wash.
- Cemetery Wash Tributary R4: Established new Zone AE floodplain (no floodway) from the confluence with Cemetery Wash to 1.5 miles upstream of the confluence with Cemetery Wash.
- Q: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.1 miles upstream of the confluence with the Hassayampa River.
- Wash P: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 0.3 miles upstream of the confluence with the Hassayampa River.
- Blue Task Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.0 miles upstream of the confluence with the Hassayampa River.
- Wash N: Revised the Zone A floodplain to detailed Zone AE floodplain (no floodway) from the confluence with the Hassayampa River to 0.7 miles upstream of the confluence with the Hassayampa River. Established a new Zone AE floodplain (no floodway) from 0.7 miles upstream of the confluence with the Hassayampa River to 1.1 miles upstream of the confluence with the Hassayampa River.
- Powderhouse Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 1.9 miles upstream of the confluence with the Hassayampa River.
- Powderhouse Wash Tributary 1: Revised the Zone AE floodplain/floodway from the confluence with Powderhouse Wash to 0.3 miles upstream of the confluence with Powderhouse Wash.
- Powderhouse Wash Tributary 2: Revised the Zone AE floodplain/floodway from the confluence with Powderhouse Wash to 0.2 miles upstream of the confluence with Powderhouse Wash.
- Powderhouse Wash Split: Revised the Zone AE floodplain/floodway from the confluence with Powderhouse Wash to 0.3 miles upstream of the confluence with Powderhouse Wash.
- Wash AE: Revised the Zone A floodplain to Zone AE floodplain (no floodway) from the confluence with the Hassayampa River to 0.9 miles upstream of the confluence with the Hassayampa River.
- Calamity Wash: Revised the Zone AE floodplain/floodway from the confluence with the Hassayampa River to 2.2 miles upstream of the confluence with the Hassayampa River. Established a new Zone AE floodplain (no floodway) from 2.2 miles upstream of the confluence with the Hassayampa River to 2.4 miles upstream of the confluence with the Hassayampa River.

A public meeting to present these floodplain/floodway delineations will be held at the Wickenburg Community Center, 160 N. Valentine St., Wickenburg, at 5:30 p.m. on Thursday, August 30, 2012.

Maps and detailed analysis of the revised floodplain and floodway can be reviewed at the Flood Control District of Maricopa County, 2801 W. Durango St., Phoenix, AZ 85009. Interested persons may contact Ms. Kathryn Gross at (602) 506-4837 or by email at kag@mail.maricopa.gov for additional information. Published August 16, 2012.

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## **B.7 FEMA CORRESPONDENCE**



## **Appendix C: Survey Field Notes**

The *Wickenburg Area Drainage Master Study/Plan Phase 2 Survey Report*, prepared by Hoskin-Ryan Consultants, Inc. is included as Appendix C. ***(Included in CD)***



## **Appendix D: Hydrologic Analysis Supporting Documentation**

**D.1 Precipitation Data** (Included in CD)

**D.2 Physical Parameter Calculations** (Included in CD)

**D.3 Hydrograph Routing Data** (Included in CD)

**D.4 Reservoir Routing Data**

*Note: Not necessary for this study*

**D.5 Flow Splits and Diversions Data**

*Note: Not necessary for this study*

**D.6 Hydrologic Calculations** (Included in CD, 100 yr 6 and 24hr Summary tables  
included in report)

**D.7 Verification** (Included in CD)

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## **D.6 HYDROLOGIC CALCULATIONS**

AM100Y6H

INTERPOLATED HYDROGRAPH AT HT01

PEAK FLOW (CFS)	TIME (HR)	(CFS)	6-HR	MAXIMUM 24-HR	AVERAGE FLOW 72-HR	166.58-HR
445.	4.17	35.	35.	9.	3.	1.
		(INCHES) (AC-FT)	1.944 17.	1.945 17.	1.945 17.	1.945 17.
CUMULATIVE AREA =			0.17 SQ MI			

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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	AM01	826.	4.33	99.	25.	8.	0.62		
ROUTED TO	RAM1C1	803.	4.42	99.	25.	8.	0.62		
HYDROGRAPH AT	AM02	120.	4.08	7.	2.	1.	0.05		
2 COMBINED AT	C1A	805.	4.42	104.	26.	9.	0.68		
HYDROGRAPH AT	AM11	446.	4.17	38.	10.	3.	0.18		
2 COMBINED AT	C1	1004.	4.25	137.	34.	11.	0.86		
ROUTED TO	RC1C2	887.	4.50	137.	34.	11.	0.86		
HYDROGRAPH AT	AM03	508.	4.17	42.	10.	3.	0.26		
2 COMBINED AT	C2A	1041.	4.42	170.	42.	14.	1.12		
HYDROGRAPH AT	AM21	453.	4.33	52.	13.	4.	0.30		
HYDROGRAPH AT	AM31	201.	4.17	17.	4.	1.	0.09		
3 COMBINED AT	C2	1402.	4.33	222.	56.	19.	1.50		
ROUTED TO	RC2C3	1150.	4.58	222.	56.	19.	1.50		
HYDROGRAPH AT	AM04	1044.	4.33	126.	32.	11.	0.68		
2 COMBINED AT	C3	1699.	4.42	321.	80.	27.	2.18		
HYDROGRAPH AT	HT01	445.	4.17	35.	9.	3.	0.17		

\*\*\* NORMAL END OF HEC-1 \*\*\*

XKSAT 0.17 HYDRAULIC CONDUCTIVITY  
 RTIMP 8.00 PERCENT IMPERVIOUS AREA  
 133 UI INPUT UNITGRAPH, 12 ORDINATES, VOLUME = 1.00  
 0.0 93.0 330.0 357.0 202.0 121.0 74.0 44.0 27.0 16.0  
 9.0 9.0

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HYDROGRAPH AT STATION HT01  
 TRANSPOSITION AREA 0.0 SQ MI  
 TOTAL RAINFALL = 4.41, TOTAL LOSS = 2.68, TOTAL EXCESS = 1.73  
 PEAK FLOW TIME  
 + (CFS) (HR) 6-HR MAXIMUM AVERAGE FLOW 166.58-HR  
 + 356. 12.17 (CFS) 29. 8. 3. 1.  
 (INCHES) 1.627 1.729 1.729 1.729  
 (AC-FT) 14. 15. 15. 15.  
 CUMULATIVE AREA = 0.17 SQ MI

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HYDROGRAPH AT STATION HT01  
 TRANSPOSITION AREA 0.5 SQ MI  
 TOTAL RAINFALL = 4.39, TOTAL LOSS = 2.67, TOTAL EXCESS = 1.72  
 PEAK FLOW TIME  
 + (CFS) (HR) 6-HR MAXIMUM AVERAGE FLOW 166.58-HR  
 + 354. 12.17 (CFS) 29. 8. 3. 1.  
 (INCHES) 1.613 1.715 1.715 1.715  
 (AC-FT) 14. 15. 15. 15.  
 CUMULATIVE AREA = 0.17 SQ MI

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HYDROGRAPH AT STATION HT01  
 TRANSPOSITION AREA 5.0 SQ MI  
 TOTAL RAINFALL = 4.30, TOTAL LOSS = 2.63, TOTAL EXCESS = 1.67  
 PEAK FLOW TIME  
 + (CFS) (HR) 6-HR MAXIMUM AVERAGE FLOW 166.58-HR  
 + 345. 12.17 (CFS) 28. 7. 2. 1.  
 (INCHES) 1.568 1.668 1.668 1.668  
 (AC-FT) 14. 15. 15. 15.  
 CUMULATIVE AREA = 0.17 SQ MI

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INTERPOLATED HYDROGRAPH AT HT01  
 PEAK FLOW TIME  
 + (CFS) (HR) 6-HR MAXIMUM AVERAGE FLOW 166.58-HR  
 + 354. 12.17 (CFS) 29. 8. 3. 1.  
 (INCHES) 1.615 1.716 1.717 1.717  
 (AC-FT) 14. 15. 15. 15.  
 CUMULATIVE AREA = 0.17 SQ MI

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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	AM01	688.	12.33	81.	20.	7.	0.62		
ROUTED TO	RAM1C1	671.	12.42	81.	20.	7.	0.62		
HYDROGRAPH AT	AM02	89.	12.08	5.	1.	0.	0.05		
2 COMBINED AT	C1A	683.	12.42	86.	22.	7.	0.68		
HYDROGRAPH AT	AM11	358.	12.17	32.	8.	3.	0.18		
2 COMBINED AT	C1	910.	12.25	117.	29.	10.	0.86		
ROUTED TO									

+		RC1C2	775.	12.50	117.	AM100Y24H 29.	10.	0.86
+	HYDROGRAPH AT	AM03	399.	12.17	34.	9.	3.	0.26
+	2 COMBINED AT	C2A	951.	12.42	150.	38.	13.	1.12
+	HYDROGRAPH AT	AM21	357.	12.33	42.	11.	4.	0.30
+	HYDROGRAPH AT	AM31	160.	12.17	14.	4.	1.	0.09
+	3 COMBINED AT	C2	1415.	12.25	204.	52.	17.	1.50
+	ROUTED TO	RC2C3	1102.	12.58	204.	52.	17.	1.50
+	HYDROGRAPH AT	AM04	885.	12.33	105.	27.	9.	0.68
+	2 COMBINED AT	C3	1827.	12.42	307.	79.	26.	2.18
+	HYDROGRAPH AT	HT01	354.	12.17	29.	8.	3.	0.17

\*\*\* NORMAL END OF HEC-1 \*\*\*

EAST100Y6H

HYDROGRAPH AT STATION		DUMMY		
TRANSPPOSITION AREA		30.0 SQ MI		
PEAK FLOW	TIME	6-HR	MAXIMUM AVERAGE FLOW	166.58-HR
(CFS)	(HR)		24-HR	72-HR
+ 3963.	4.42	(CFS)		
		987.	250.	83.
		(INCHES)	1,190	1,208
		(AC-FT)	489.	497.
			497.	497.
		CUMULATIVE AREA =	7.71 SQ MI	
***	***	***	***	***

INTERPOLATED HYDROGRAPH AT		DUMMY		
TRANSPPOSITION AREA		30.0 SQ MI		
PEAK FLOW	TIME	6-HR	MAXIMUM AVERAGE FLOW	166.58-HR
(CFS)	(HR)		24-HR	72-HR
+ 5218.	4.42	(CFS)		
		1220.	308.	103.
		(INCHES)	1,472	1,488
		(AC-FT)	605.	612.
			612.	612.
		CUMULATIVE AREA =	7.71 SQ MI	

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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	P01	991.	4.25	109.	27.	9.	0.55		
+	ROUTED TO	RP1C1	951.	4.33	109.	27.	9.	0.55		
+	HYDROGRAPH AT	P02	573.	4.08	49.	12.	4.	0.19		
+	2 COMBINED AT	PC1	1123.	4.17	153.	38.	13.	0.74		
+	ROUTED TO	RPC1C2	1113.	4.25	153.	38.	13.	0.74		
+	HYDROGRAPH AT	P03	325.	4.08	24.	6.	2.	0.10		
+	2 COMBINED AT	PC2	1239.	4.17	175.	44.	15.	0.85		
+	HYDROGRAPH AT	BT01	1534.	4.67	351.	89.	30.	2.51		
+	ROUTED TO	RBT1C1	1439.	5.00	351.	89.	30.	2.51		
+	HYDROGRAPH AT	BT02	1277.	4.50	240.	61.	20.	1.86		
+	2 COMBINED AT	BTC1	1878.	4.83	519.	132.	44.	4.36		
+	ROUTED TO	RBC1C2	1853.	5.00	519.	132.	44.	4.36		
+	HYDROGRAPH AT	BT03	1248.	4.58	279.	71.	24.	2.80		
+	2 COMBINED AT	BTC2	2380.	4.67	711.	182.	61.	7.17		
+	ROUTED TO	RBC2C3	2304.	5.25	710.	182.	61.	7.17		
+	HYDROGRAPH AT	BT04	1347.	4.83	372.	96.	32.	3.31		
+	2 COMBINED AT	BTC3	2867.	5.17	958.	247.	82.	10.47		
+	ROUTED TO	RBC3C4	2858.	5.33	958.	247.	82.	10.47		
+	HYDROGRAPH AT	BT05	854.	4.25	91.	23.	8.	0.42		
+	2 COMBINED AT	BTC4	2863.	5.33	1015.	261.	87.	10.89		
+	HYDROGRAPH AT	N01	594.	4.17	54.	14.	5.	0.22		
+	ROUTED TO	RN1C1	541.	4.25	54.	14.	5.	0.22		
+	HYDROGRAPH AT	N02	366.	4.17	34.	8.	3.	0.12		

## EAST100Y6H

+	2 COMBINED AT	NC1	865.	4.17	88.	22.	7.	0.34
+	HYDROGRAPH AT	PH01	1143.	4.25	136.	34.	11.	0.62
+	HYDROGRAPH AT	PH11	300.	4.17	27.	7.	2.	0.16
+	2 COMBINED AT	PHC1	1324.	4.25	158.	40.	13.	0.79
+	ROUTED TO	PHC1C2	1266.	4.33	158.	40.	13.	0.79
+	HYDROGRAPH AT	PH21	342.	4.17	31.	8.	3.	0.19
+	HYDROGRAPH AT	PH03	260.	4.08	20.	5.	2.	0.09
+	3 COMBINED AT	PHC2	1527.	4.25	200.	50.	17.	1.06
+	ROUTED TO	PHC2C3	1494.	4.33	200.	50.	17.	1.06
+	HYDROGRAPH AT	PH04	1323.	4.25	160.	40.	13.	0.77
+	2 COMBINED AT	PHC3	2283.	4.33	335.	84.	28.	1.83
+	ROUTED TO	PHC3C4	2253.	4.42	335.	84.	28.	1.83
+	HYDROGRAPH AT	PH05	339.	4.08	29.	7.	2.	0.11
+	2 COMBINED AT	PHC4	2321.	4.42	359.	90.	30.	1.95
+	HYDROGRAPH AT	AF01	486.	4.17	45.	11.	4.	0.16
+	ROUTED TO	AF01C1	445.	4.17	45.	11.	4.	0.16
+	HYDROGRAPH AT	AF02	436.	4.17	41.	10.	3.	0.15
+	2 COMBINED AT	AFC1	881.	4.17	85.	21.	7.	0.31
+	HYDROGRAPH AT	CL01	1017.	4.33	127.	32.	11.	0.73
+	ROUTED TO	CL01C1	910.	4.50	127.	32.	11.	0.73
+	HYDROGRAPH AT	CL03	1730.	4.58	340.	86.	29.	2.46
+	2 COMBINED AT	CLC1	2228.	4.58	430.	108.	36.	3.19
+	ROUTED TO	CLC1C2	2144.	4.67	430.	108.	36.	3.19
+	HYDROGRAPH AT	CL05	1225.	4.33	184.	46.	15.	0.85
+	2 COMBINED AT	CLC2	2750.	4.67	575.	145.	48.	4.03
+	ROUTED TO	CLC2C3	2682.	4.75	574.	145.	48.	4.03
+	HYDROGRAPH AT	CL07	742.	4.17	68.	17.	6.	0.25
+	2 COMBINED AT	CLC3	2757.	4.75	630.	159.	53.	4.28
+	4 COMBINED AT	DUMMY	4439.	4.50	1050.	265.	88.	6.88
+	HYDROGRAPH AT	HT02	383.	4.08	26.	6.	2.	0.11
+	HYDROGRAPH AT	HT03	153.	4.08	11.	3.	1.	0.04
+	HYDROGRAPH AT	HT04	824.	4.17	91.	23.	8.	0.34
+	HYDROGRAPH AT	HT05	754.	4.25	88.	22.	7.	0.35
+	5 COMBINED AT	DUMMY	5218.	4.42	1220.	308.	103.	7.71

EAST100Y24H

(INCHES)	2.107	2.442	2.444	2.444
(AC-FT)	39.	45.	45.	45.

CUMULATIVE AREA = 0.35 SQ MI

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 \*  
 384 KK \* DUMMY \* COMBINE  
 \*  
 \*\*\*\*\*

385 HC HYDROGRAPH COMBINATION ICOMP 5 NUMBER OF HYDROGRAPHS TO COMBINE

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PEAK FLOW	TIME	HYDROGRAPH AT STATION	DUMMY	MAXIMUM AVERAGE FLOW	
+ (CFS)	(HR)	TRANSPOSITION AREA	0.0 SQ MI	24-HR	72-HR
		6-HR			166.58-HR
+ 6938.	12.33	(CFS)			
		(INCHES)	1448.	412.	137.
		(AC-FT)	1,747.	1,986.	1,989.
			718.	817.	818.
		CUMULATIVE AREA =	7.71 SQ MI		

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PEAK FLOW	TIME	HYDROGRAPH AT STATION	DUMMY	MAXIMUM AVERAGE FLOW	
+ (CFS)	(HR)	TRANSPOSITION AREA	5.0 SQ MI	24-HR	72-HR
		6-HR			166.58-HR
+ 6699.	12.33	(CFS)			
		(INCHES)	1398.	398.	133.
		(AC-FT)	1,686.	1,920.	1,922.
			693.	789.	790.
		CUMULATIVE AREA =	7.71 SQ MI		

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PEAK FLOW	TIME	HYDROGRAPH AT STATION	DUMMY	MAXIMUM AVERAGE FLOW	
+ (CFS)	(HR)	TRANSPOSITION AREA	10.0 SQ MI	24-HR	72-HR
		6-HR			166.58-HR
+ 6460.	12.33	(CFS)			
		(INCHES)	1348.	384.	128.
		(AC-FT)	1,626.	1,853.	1,856.
			668.	762.	763.
		CUMULATIVE AREA =	7.71 SQ MI		

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PEAK FLOW	TIME	HYDROGRAPH AT STATION	DUMMY	MAXIMUM AVERAGE FLOW	
+ (CFS)	(HR)	TRANSPOSITION AREA	30.0 SQ MI	24-HR	72-HR
		6-HR			166.58-HR
+ 5985.	12.33	(CFS)			
		(INCHES)	1248.	357.	119.
		(AC-FT)	1,506.	1,721.	1,724.
			619.	708.	709.
		CUMULATIVE AREA =	7.71 SQ MI		

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PEAK FLOW	TIME	INTERPOLATED HYDROGRAPH AT	DUMMY	MAXIMUM AVERAGE FLOW	
+ (CFS)	(HR)			24-HR	72-HR
		6-HR			166.58-HR
+ 6550.	12.33	(CFS)			
		(INCHES)	1367.	389.	130.
		(AC-FT)	1,648.	1,878.	1,881.
			678.	772.	773.
		CUMULATIVE AREA =	7.71 SQ MI		

1

RUNOFF SUMMARY  
 FLOW IN CUBIC FEET PER SECOND  
 TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	EAST100Y24H AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT									
+		P01	827.	12.25	93.	25.	8.	0.55		
+	ROUTED TO									
+		RP1C1	791.	12.33	93.	25.	8.	0.55		
+	HYDROGRAPH AT									
+		P02	459.	12.08	45.	14.	5.	0.19		
+	2 COMBINED AT									
+		PC1	1006.	12.17	137.	40.	13.	0.74		
+	ROUTED TO									
+		RPC1C2	991.	12.25	137.	40.	13.	0.74		
+	HYDROGRAPH AT									
+		P03	264.	12.08	21.	6.	2.	0.10		
+	2 COMBINED AT									
+		PC2	1146.	12.17	158.	46.	15.	0.85		
+	HYDROGRAPH AT									
+		BT01	1840.	12.67	377.	103.	34.	2.51		
+	ROUTED TO									
+		RBT1C1	1653.	12.92	377.	103.	34.	2.51		
+	HYDROGRAPH AT									
+		BT02	1535.	12.42	264.	79.	26.	1.86		
+	2 COMBINED AT									
+		BTC1	2405.	12.83	638.	182.	61.	4.36		
+	ROUTED TO									
+		RBC1C2	2379.	13.00	638.	182.	61.	4.36		
+	HYDROGRAPH AT									
+		BT03	1956.	12.58	371.	111.	37.	2.80		
+	2 COMBINED AT									
+		BTC2	3994.	12.67	988.	287.	96.	7.17		
+	ROUTED TO									
+		RBC2C3	3606.	13.17	988.	287.	96.	7.17		
+	HYDROGRAPH AT									
+		BT04	1854.	12.83	457.	132.	44.	3.31		
+	2 COMBINED AT									
+		BTC3	4910.	13.00	1402.	408.	136.	10.47		
+	ROUTED TO									
+		RBC3C4	4870.	13.17	1401.	408.	136.	10.47		
+	HYDROGRAPH AT									
+		BT05	694.	12.25	78.	22.	7.	0.42		
+	2 COMBINED AT									
+		BTC4	4899.	13.17	1471.	427.	143.	10.89		
+	HYDROGRAPH AT									
+		N01	485.	12.17	48.	14.	5.	0.22		
+	ROUTED TO									
+		RN1C1	443.	12.25	48.	14.	5.	0.22		
+	HYDROGRAPH AT									
+		N02	298.	12.17	31.	9.	3.	0.12		
+	2 COMBINED AT									
+		NC1	708.	12.17	78.	23.	8.	0.34		
+	HYDROGRAPH AT									
+		PH01	974.	12.25	121.	36.	12.	0.62		
+	HYDROGRAPH AT									
+		PH11	232.	12.17	22.	7.	2.	0.16		
+	2 COMBINED AT									
+		PHC1	1195.	12.25	143.	42.	14.	0.79		
+	ROUTED TO									
+		PHC1C2	1122.	12.33	143.	42.	14.	0.79		
+	HYDROGRAPH AT									
+		PH21	270.	12.17	27.	8.	3.	0.19		
+	HYDROGRAPH AT									
+		PH03	213.	12.08	18.	5.	2.	0.09		
+	3 COMBINED AT									
+		PHC2	1480.	12.25	187.	55.	18.	1.06		
+	ROUTED TO									
+		PHC2C3	1464.	12.33	187.	55.	18.	1.06		
+	HYDROGRAPH AT									
+		PH04	1200.	12.25	141.	39.	13.	0.77		
+	2 COMBINED AT									
+		PHC3	2610.	12.33	327.	93.	31.	1.83		

## EAST100Y24H

+	ROUTED TO	PHC3C4	2577.	12.42	327.	93.	31.	1.83
+	HYDROGRAPH AT	PH05	277.	12.08	25.	8.	3.	0.11
+	2 COMBINED AT	PHC4	2652.	12.42	352.	101.	34.	1.95
+	HYDROGRAPH AT	AF01	396.	12.17	41.	12.	4.	0.16
+	ROUTED TO	AF01C1	364.	12.17	41.	12.	4.	0.16
+	HYDROGRAPH AT	AF02	355.	12.17	37.	11.	4.	0.15
+	2 COMBINED AT	AFC1	718.	12.17	77.	23.	8.	0.31
+	HYDROGRAPH AT	CL01	902.	12.33	114.	32.	11.	0.73
+	ROUTED TO	CL01C1	805.	12.50	114.	32.	11.	0.73
+	HYDROGRAPH AT	CL03	2126.	12.50	365.	100.	33.	2.46
+	2 COMBINED AT	CLC1	2926.	12.50	478.	131.	44.	3.19
+	ROUTED TO	CLC1C2	2834.	12.67	478.	131.	44.	3.19
+	HYDROGRAPH AT	CL05	1118.	12.33	165.	47.	16.	0.85
+	2 COMBINED AT	CLC2	3498.	12.58	642.	178.	59.	4.03
+	ROUTED TO	CLC2C3	3463.	12.67	642.	178.	59.	4.03
+	HYDROGRAPH AT	CL07	604.	12.17	61.	18.	6.	0.25
+	2 COMBINED AT	CLC3	3544.	12.67	702.	196.	65.	4.28
+	4 COMBINED AT	DUMMY	5588.	12.50	1187.	336.	112.	6.88
+	HYDROGRAPH AT	HT02	313.	12.08	23.	6.	2.	0.11
+	HYDROGRAPH AT	HT03	124.	12.08	10.	3.	1.	0.04
+	HYDROGRAPH AT	HT04	674.	12.17	82.	25.	8.	0.34
+	HYDROGRAPH AT	HT05	617.	12.25	78.	23.	8.	0.35
+	5 COMBINED AT	DUMMY	6550.	12.33	1367.	389.	130.	7.71

\*\*\* NORMAL END OF HEC-1 \*\*\*



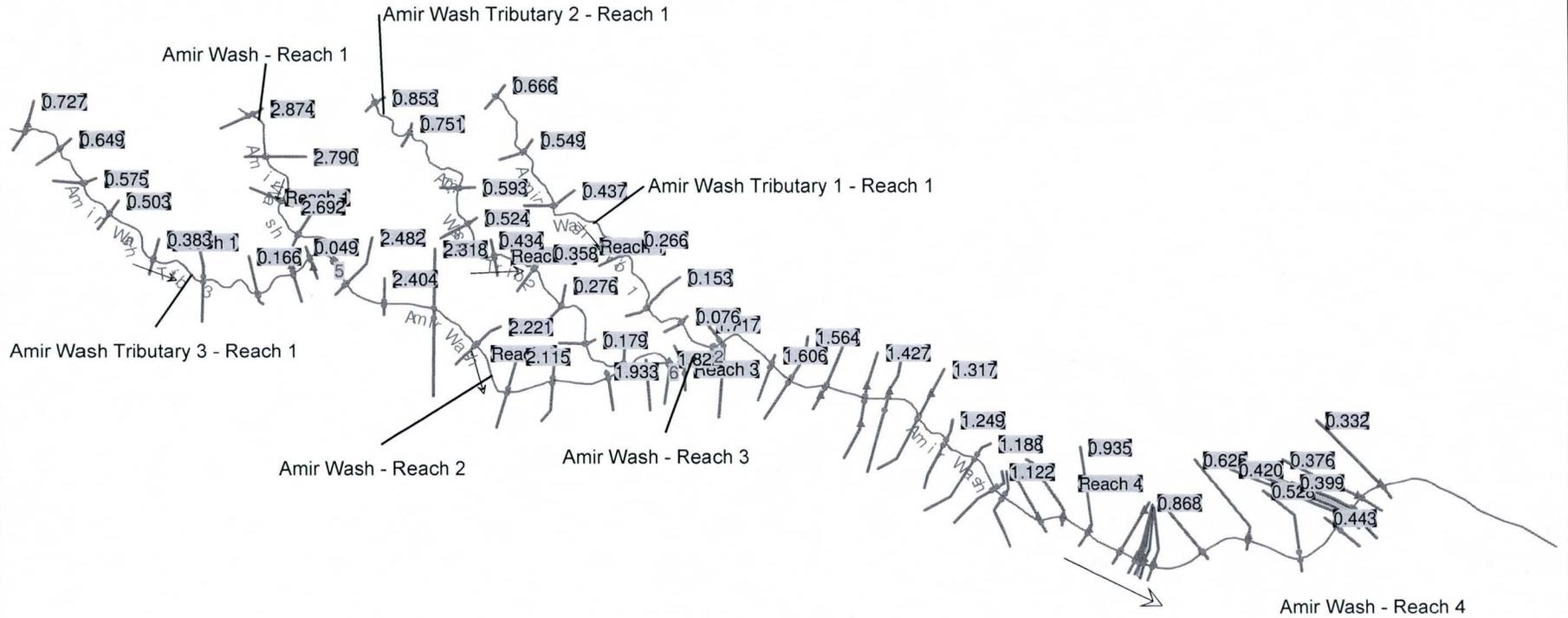
## **Appendix E: Hydraulic Analysis Supporting Documentation**

- E.1 Roughness Coefficient Estimation    *(Included in CD)***
- E.2 Cross-Section Plots**  
*Note: HEC-RAS cross-section plots are located in Appendix E.5.*
- E.3 Expansion and Contraction Coefficients    *(Included in CD)***
- E.4 Analysis of Structures                    *(Included in CD)***
- E.5 Hydraulic Calculations**
  - E.5.1 Schematic                    *(Included in CD and report)***
  - E.5.2 Report                        *(Included in CD)***
  - E.5.3 Summary Tables            *(Included in CD and report)***
  - E.5.4 Cross-Sections             *(Included in CD)***
  - E.5.5 Flood Profiles             *(Included in CD)***
  - E.5.6 Modeling Warning and Error Messages    *(Included in CD)***

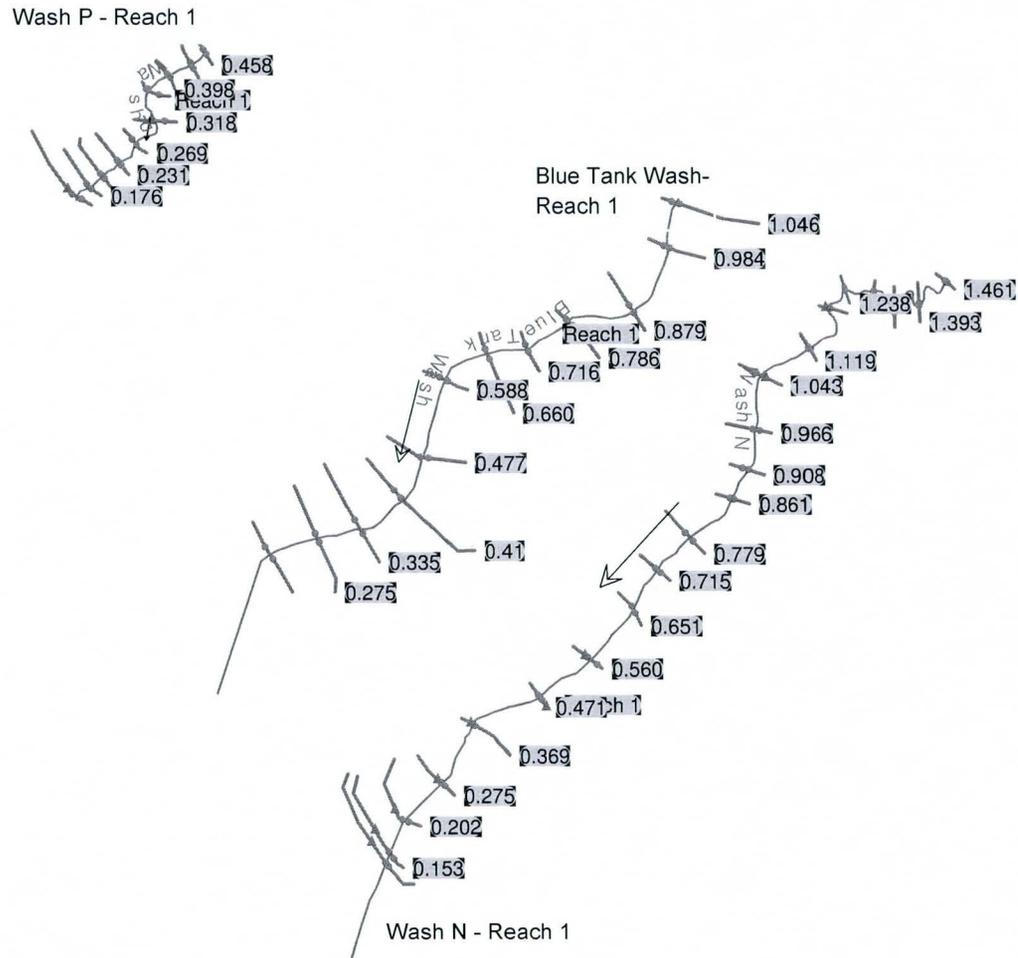
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**E.5.1 SCHEMATIC**

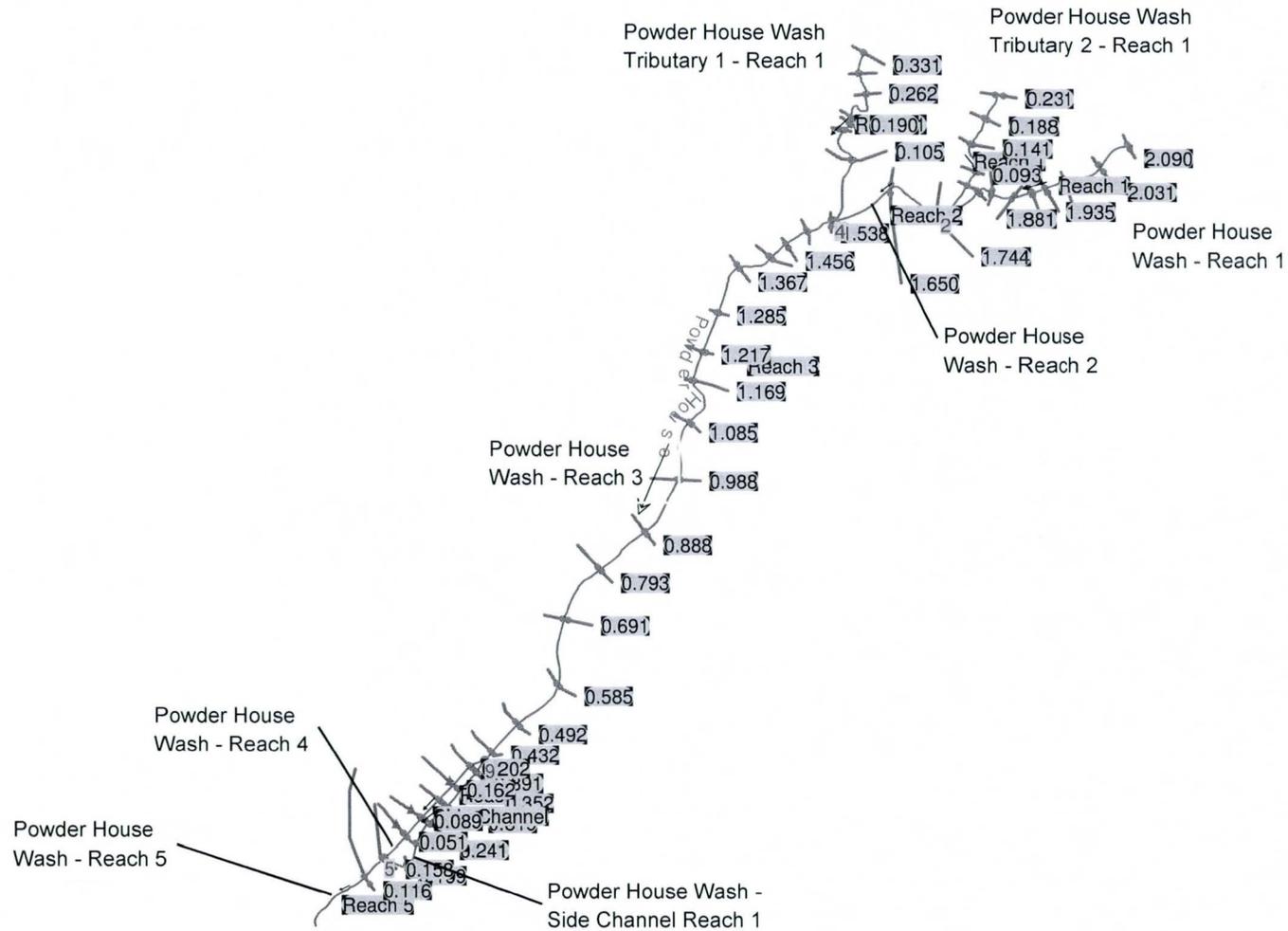
# 100- year HEC-RAS Model Schematic for Amir Wash Watershed



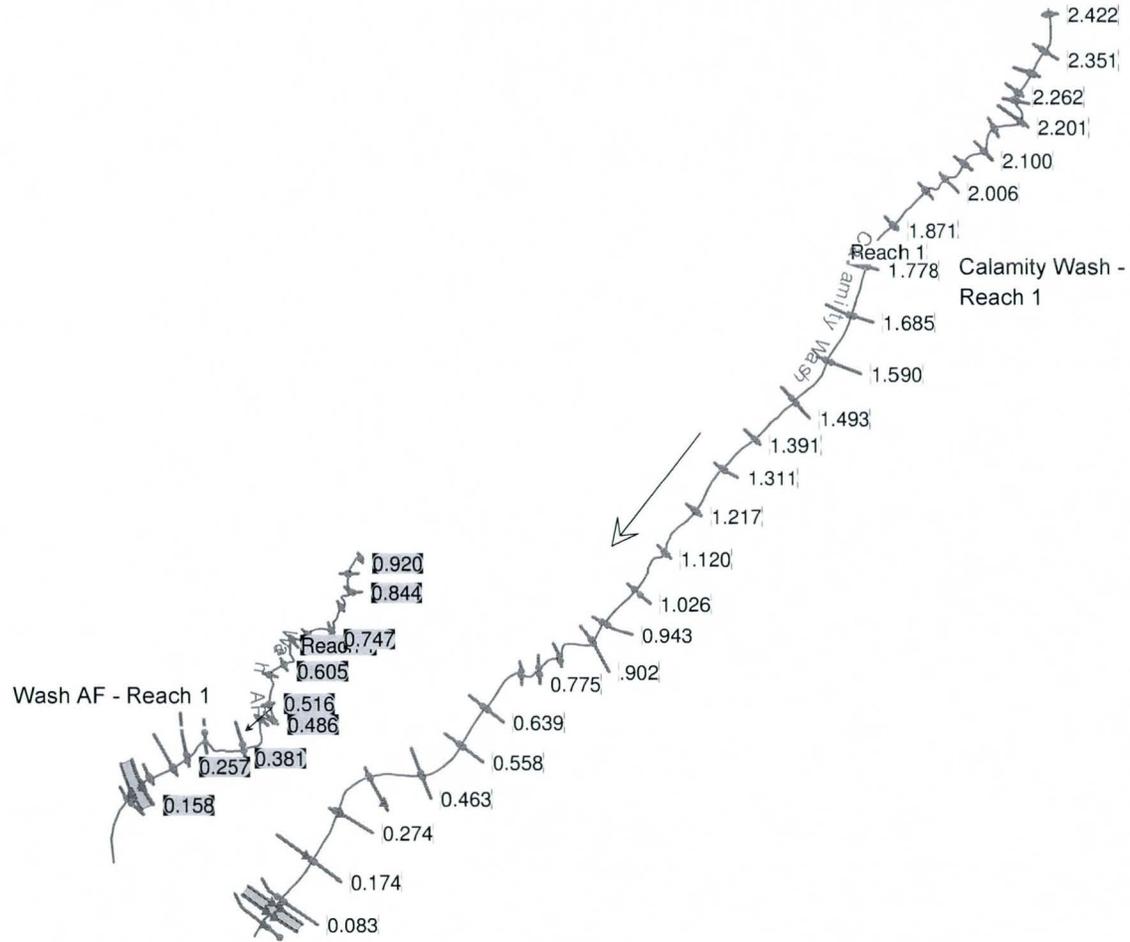
# 100- year HEC-RAS Model Schematic for Wash P, Blue Tank Wash and Wash N



# 100 - Year HEC-RAS Model Schematic for Powder House Wash Watershed



# 100 - Year HEC-RAS Model Schematic for Calamity Wash and Wash AF



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### **E.5.3 SUMMARY TABLES**

**WICKENBURG AREA DRAINAGE MASTER STUDY/PLAN**  
**Flow Summary used in HEC-RAS Model**

River / Reach Name	River Station (RS)	HEC-1 ID	Drainage Area (Square Miles)	10-Year, 6-Hour (cfs)	10-Year, 24-Hour (cfs)	10-Year Max (cfs)	50-Year, 6-Hour (cfs)	50-Year, 24-Hour (cfs)	50-Year Max Flow (cfs)	100-Year, 6-Hour (cfs)	100-Year, 24-Hour (cfs)	100-Year Max Flow (cfs)	500-Year, 6-Hour (cfs)	500-Year, 24-Hour (cfs)	500-Year Max Flow (cfs)
Amir Wash - Reach 1	2.874	C1A	0.68	377	328	377	664	573	664	805	683	805	1165	956	1165
Amir Wash - Reach 2	2.482	C2A	1.12	404	423	423	833	779	833	1041	951	1041	1592	1404	1592
Amir Wash - Reach 3	1.822	C2	1.50	534	644	644	1114	1176	1176	1402	1415	1415	2144	2041	2144
Amir Wash - Reach 4	1.717	C3	2.18	634	870	870	1361	1526	1526	1699	1827	1827	2561	2585	2585
Amir Wash Trib 1 - Reach 1	0.666	AM31	0.09	106	88	106	171	138	171	201	160	201	275	215	275
Amir Wash Trib 2 - Reach 1	0.853	AM21	0.30	223	176	223	377	301	377	453	357	453	646	497	646
Amir Wash Trib 3 - Reach 1	0.727	AM11 (pro-rated)	0.05	62	52	62	96	78	96	112	90	112	151	118	151
	0.503	AM11 (pro-rated)	0.09	124	103	124	192	156	192	223	179	223	301	236	301
	0.383	AM11	0.18	247	206	247	384	311	384	446	358	446	602	472	602
Powder House Wash - Reach 1	2.090	PH01	0.62	610	534	610	972	838	972	1143	974	1143	1576	1359	1576
Powder House Wash - Reach 2	1.744	PHC2	1.06	728	764	764	1265	1257	1265	1527	1480	1527	2240	2191	2240
Powder House Wash - Reach 3	1.538	PHC3	1.83	1053	1352	1352	1874	2164	2164	2283	2610	2610	3285	3670	3670
Powder House Wash - Reach 4	0.391	PHC3	1.83	1053	1352	1352	1874	2164	2164	2283	2610	2610	3285	3670	3670
	0.241	PHC4	1.95	1044	1320	1320	1872	2143	2143	2321	2652	2652	3297	3675	3675
Powder House Wash - Reach 5	0.158	PHC4	1.95	1044	1320	1320	1872	2143	2143	2321	2652	2652	3297	3675	3675
Powder House Wash - Side Channel	0.202	Split Flow	N/A	N/A	175	175	N/A	440	440	N/A	640	640	N/A	1123	1123
	0.051	PHC4	1.95	1044	1320	1320	1872	2143	2143	2321	2652	2652	3297	3675	3675
Powder House Wash Tributary 1 - Reach 1	0.331	PH21	0.19	167	130	167	285	223	285	342	270	342	495	402	495
Powder House Wash Tributary 2 - Reach 1	0.231	PH11	0.16	140	108	140	251	194	251	300	232	300	436	350	436
Blue Tank Wash - Reach 1	1.046	BTC4	10.89	1032	2250	2250	2094	3878	3878	2863	4899	4899	5236	7407	7407
Wash N- Reach 1	1.461	N01 (pro-rated)	0.06	96	81	96	144	119	144	166	136	166	221	183	221
	1.043	N01	0.22	342	288	342	515	424	515	594	485	594	791	655	791
	0.651	NC1	0.34	495	418	495	751	620	751	865	708	865	1177	955	1177
Wash P - Reach 1	0.458	PC2	0.85	622	608	622	1044	980	1044	1239	1146	1239	1737	1598	1737
Calamity Wash - Reach 1	2.422	CLC1	3.19	708	1436	1436	1746	2448	2448	2228	2926	2926	3447	4203	4203
	2.201	CLC1 & CLC2 (pro-rated)	3.57	777	1464	1464	1886	2668	2668	2463	3183	3183	3801	4511	4511
	1.493	CLC2	4.03	862	1498	1498	2057	2937	2937	2750	3498	3498	4233	4888	4888
	0.82	CLC3	4.28	887	1497	1497	2073	2965	2965	2757	3544	3544	4353	4984	4984
Wash AF - Reach 1	0.92	AFC1	0.31	520	434	520	769	631	769	881	718	881	1162	959	1162

HEC-RAS Plan: All Flows River: Amir Wash Reach: Reach 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	2.874 104	100yr	805.00	2266.43	2268.31	2268.31	2268.97	0.009908	7.55	149.05	126.07	1.04
Reach 1	2.874 104	FW	805.00	2266.43	2268.83	2268.83	2269.88	0.008989	8.24	97.66	45.64	0.99
Reach 1	2.790 105	100yr	805.00	2260.71	2262.82	2262.82	2263.20	0.008479	7.57	255.94	289.52	0.98
Reach 1	2.790 105	FW	805.00	2260.71	2263.52	2263.52	2264.40	0.008153	9.19	143.83	79.68	1.02
Reach 1	2.692 103	100yr	805.00	2254.06	2257.74	2257.74	2258.34	0.003511	7.36	231.32	200.67	0.70
Reach 1	2.692 103	FW	805.00	2254.06	2257.75	2257.75	2259.34	0.007841	10.25	84.14	28.32	0.97
Reach 1	2.618 102	100yr	805.00	2248.14	2251.03	2251.03	2251.52	0.009104	7.70	205.18	208.98	1.01
Reach 1	2.618 102	FW	805.00	2248.14	2251.80	2251.80	2252.60	0.006810	8.44	153.41	90.00	0.93

HEC-RAS Plan: All Flows River: Amir Wash Reach: Reach 2

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 2	2.482 92	100yr	1041.00	2239.08	2242.29	2242.29	2242.97	0.005624	7.91	233.61	161.71	0.85
Reach 2	2.482 92	FW	1041.00	2239.08	2242.51	2242.51	2243.70	0.007071	9.35	140.53	59.65	0.97
Reach 2	2.404 91	100yr	1041.00	2234.95	2238.02	2238.02	2238.71	0.006049	7.76	219.14	151.95	0.87
Reach 2	2.404 91	FW	1041.00	2234.95	2238.39	2238.39	2239.74	0.007775	9.38	113.44	42.31	0.98
Reach 2	2.318 184	100yr	1041.00	2230.87	2232.48	2232.48	2233.00	0.009249	6.43	232.00	251.17	0.98
Reach 2	2.318 184	FW	1041.00	2230.87	2232.53	2232.53	2233.17	0.010084	6.86	179.28	140.00	1.03
Reach 2	2.221 115	100yr	1041.00	2221.46	2225.37	2225.37	2226.10	0.004192	7.39	221.42	188.24	0.75
Reach 2	2.221 115	FW	1041.00	2221.46	2225.37	2225.37	2226.25	0.004898	7.86	177.31	120.53	0.79
Reach 2	2.115 114	100yr	1041.00	2215.06	2217.56	2217.56	2218.31	0.009267	8.07	176.17	121.54	1.04
Reach 2	2.115 114	FW	1041.00	2215.06	2218.20	2218.20	2219.48	0.007991	9.09	115.24	46.00	1.01
Reach 2	2.033 113	100yr	1041.00	2208.56	2211.52	2211.52	2212.59	0.007133	8.54	138.29	72.41	0.95
Reach 2	2.033 113	FW	1041.00	2208.56	2211.55	2211.55	2212.58	0.006780	8.41	140.80	72.40	0.93
Reach 2	1.933 112	100yr	1041.00	2201.57	2204.94	2204.94	2206.15	0.007959	8.82	119.35	55.62	0.99
Reach 2	1.933 112	FW	1041.00	2201.57	2204.97	2204.97	2206.14	0.007624	8.70	121.09	55.63	0.97
Reach 2	1.864 111	100yr	1041.00	2197.05	2200.37	2200.37	2201.08	0.005265	7.40	205.69	179.85	0.82
Reach 2	1.864 111	FW	1041.00	2197.05	2201.16		2201.83	0.003087	6.67	165.55	56.17	0.64

HEC-RAS Plan: All Flows River: Amir Wash Reach: Reach 3

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 3	1.822	110	100yr	1415.00	2194.10	2198.26	2198.26	2198.99	0.004104	8.17	345.82	244.12	0.72
Reach 3	1.822	110	FW	1415.00	2194.10	2198.39	2198.39	2200.45	0.010084	11.53	122.73	30.00	1.00
Reach 3	1.796	423	100yr	1415.00	2192.36	2195.64	2195.64	2196.20	0.005948	6.74	331.62	305.76	0.80
Reach 3	1.796	423	FW	1415.00	2192.36	2195.68	2195.68	2196.81	0.009938	8.55	165.58	73.00	1.00

HEC-RAS Plan: All Flows River: Amir Wash Reach: Reach 4

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 4	1.717 109	100yr	1827.00	2186.59	2189.16	2189.16	2189.98	0.008838	8.56	327.98	410.34	0.98
Reach 4	1.717 109	FW	1827.00	2186.59	2189.86	2189.86	2191.37	0.009126	9.86	185.21	60.22	0.99
Reach 4	1.606 108	100yr	1827.00	2178.56	2181.65	2181.65	2182.61	0.009999	9.55	288.25	145.10	1.05
Reach 4	1.606 108	FW	1827.00	2178.56	2182.60	2182.60	2184.22	0.008082	10.60	195.66	60.91	1.00
Reach 4	1.564 107	100yr	1827.00	2176.09	2178.83	2178.83	2179.37	0.007167	7.54	450.35	362.92	0.88
Reach 4	1.564 107	FW	1827.00	2176.09	2179.59	2179.59	2181.12	0.009324	9.93	183.93	60.04	1.00
Reach 4	1.497 179	100yr	1827.00	2170.60	2173.78	2173.78	2174.31	0.006692	8.29	489.59	466.53	0.87
Reach 4	1.497 179	FW	1827.00	2170.60	2174.46	2174.46	2175.94	0.009734	10.99	215.15	69.85	1.04
Reach 4	1.427 1500	100yr	1827.00	2165.63	2168.23	2168.23	2168.82	0.009400	8.31	403.86	745.90	1.00
Reach 4	1.427 1500	FW	1827.00	2165.63	2168.74	2168.74	2169.79	0.009536	9.62	269.75	124.92	1.04
Reach 4	1.387 180	100yr	1827.00	2163.32	2164.11	2163.91	2164.30	0.014606	4.00	527.12	837.60	0.98
Reach 4	1.387 180	FW	1827.00	2163.32	2164.98	2164.98	2165.66	0.013377	7.41	308.42	240.00	1.10
Reach 4	1.317 181	100yr	1827.00	2156.89	2158.34	2158.31	2158.68	0.016097	8.00	476.17	600.48	1.21
Reach 4	1.317 181	FW	1827.00	2156.89	2159.20	2159.20	2160.24	0.015027	10.71	263.30	130.15	1.26
Reach 4	1.249 118	100yr	1827.00	2151.50	2153.59	2153.59	2154.15	0.010436	7.94	387.15	323.23	1.00
Reach 4	1.249 118	FW	1827.00	2151.50	2154.53	2154.53	2155.93	0.009795	9.98	205.71	75.18	1.03
Reach 4	1.188 117	100yr	1827.00	2146.11	2148.69	2148.69	2149.07	0.009937	7.19	489.89	536.65	0.95
Reach 4	1.188 117	FW	1827.00	2146.11	2149.65	2149.65	2150.73	0.009303	9.29	251.17	114.03	0.99
Reach 4	1.122 116	100yr	1827.00	2142.72	2144.88	2144.88	2145.38	0.009562	7.50	421.58	379.68	0.95
Reach 4	1.122 116	FW	1827.00	2142.72	2145.80	2145.80	2147.22	0.010283	9.82	197.61	70.06	1.03
Reach 4	1.102	100yr	1827.00	2139.08	2142.43		2142.66	0.003407	5.34	640.91	515.23	0.59
Reach 4	1.102	FW	1827.00	2139.08	2143.18		2144.31	0.006660	8.71	223.44	71.52	0.85
Reach 4	1.025 119	100yr	1827.00	2135.05	2139.07	2139.07	2140.60	0.007336	10.24	201.05	484.91	0.93
Reach 4	1.025 119	FW	1827.00	2135.05	2139.07	2139.07	2140.97	0.009845	11.05	165.37	43.60	1.00
Reach 4	0.986 120	100yr	1827.00	2130.05	2135.71	2135.71	2138.24	0.007597	12.92	152.45	585.64	0.97
Reach 4	0.986 120	FW	1827.00	2130.05	2135.73	2135.73	2138.46	0.011119	13.28	137.58	25.00	1.00
Reach 4	0.935 121	100yr	1827.00	2121.51	2128.41	2128.41	2130.93	0.006226	13.44	169.02	425.06	0.92
Reach 4	0.935 121	FW	1827.00	2121.51	2128.60	2128.60	2131.25	0.008757	13.56	153.09	30.83	0.91
Reach 4	0.868 122	100yr	1827.00	2116.48	2123.37	2122.12	2123.56	0.000757	4.65	893.07	524.20	0.32
Reach 4	0.868 122	FW	1827.00	2116.48	2123.67	2122.10	2124.02	0.001203	5.52	497.73	136.50	0.37
Reach 4	0.838 123	100yr	1827.00	2114.35	2123.10	2119.45	2123.44	0.000672	5.09	474.06	537.45	0.32
Reach 4	0.838 123	FW	1827.00	2114.35	2123.54	2119.44	2123.88	0.000615	5.04	441.52	130.00	0.30
Reach 4	0.830 124	100yr	1827.00	2113.86	2123.08	2119.13	2123.39	0.001136	4.82	475.34	554.18	0.30
Reach 4	0.830 124	FW	1827.00	2113.86	2123.52	2119.13	2123.84	0.001033	4.76	439.00	130.00	0.29
Reach 4	0.825		Bridge									
Reach 4	0.823 125	100yr	1827.00	2113.77	2120.07	2119.11	2120.07	0.000029	0.61	3319.76	470.55	0.04
Reach 4	0.823 125	FW	1827.00	2113.77	2120.77	2119.11	2120.90	0.000961	3.48	649.07	105.00	0.24
Reach 4	0.806 126	100yr	1827.00	2111.89	2117.26	2117.26	2119.42	0.012498	12.20	170.25	492.34	0.94
Reach 4	0.806 126	FW	1827.00	2111.89	2117.48	2117.33	2119.97	0.018173	12.67	144.18	26.53	0.96
Reach 4	0.711 127	100yr	1827.00	2103.40	2109.18	2109.18	2111.73	0.015096	12.85	145.81	29.99	0.97
Reach 4	0.711 127	FW	1827.00	2103.40	2109.35	2109.18	2111.75	0.014673	12.47	149.96	29.22	0.93
Reach 4	0.625 128	100yr	1827.00	2097.13	2102.54	2102.54	2104.79	0.015123	12.04	153.94	36.45	0.98
Reach 4	0.625 128	FW	1827.00	2097.13	2102.56	2102.56	2104.80	0.015991	12.02	153.38	35.29	0.98
Reach 4	0.528 129	100yr	1827.00	2089.56	2094.27		2094.74	0.003150	5.49	334.32	79.55	0.46
Reach 4	0.528 129	FW	1827.00	2089.56	2094.29		2094.75	0.003197	5.49	333.51	76.86	0.46
Reach 4	0.443 130	100yr	1827.00	2087.06	2093.07		2093.50	0.002394	5.51	382.66	97.18	0.42
Reach 4	0.443 130	FW	1827.00	2087.06	2093.08		2093.51	0.002387	5.51	383.09	97.19	0.42
Reach 4	0.420 131	100yr	1827.00	2085.30	2093.32		2093.34	0.000121	1.60	2223.51	611.12	0.10
Reach 4	0.420 131	FW	1827.00	2085.30	2093.32		2093.34	0.000138	1.72	1815.88	395.00	0.11
Reach 4	0.415 132	100yr	1827.00	2084.93	2092.72	2089.15	2093.28	0.001886	6.04	309.02	131.93	0.38
Reach 4	0.415 132	FW	1827.00	2084.93	2092.72	2089.15	2093.28	0.001886	6.04	309.02	50.71	0.38

HEC-RAS Plan: All Flows River: Amir Wash Reach: Reach 4 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 4	0.411		Culvert									
Reach 4	0.399 133	100yr	1827.00	2084.24	2089.19	2089.19	2091.31	0.013548	11.79	163.23	43.12	0.97
Reach 4	0.399 133	FW	1827.00	2084.24	2089.25	2089.25	2091.31	0.012976	11.63	165.68	43.00	0.95
Reach 4	0.376 134	100yr	1827.00	2083.28	2088.00	2087.84	2088.12	0.001676	4.12	874.31	455.93	0.34
Reach 4	0.376 134	FW	1827.00	2083.28	2088.50	2088.01	2088.64	0.001748	4.21	733.46	282.93	0.33
Reach 4	0.332 135	100yr	1827.00	2082.84	2087.12	2087.07	2087.43	0.005505	6.30	693.80	752.00	0.59
Reach 4	0.332 135	FW	1827.00	2082.84	2087.49	2087.23	2087.93	0.005507	6.75	469.55	265.59	0.60

HEC-RAS Plan: All Flows River: Amir Wash Trib 1 Reach: Reach 1 Profile: 100yr

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.666	1735	100yr	201.00	2269.36	2271.68	2271.68	2272.37	0.009870	7.04	36.75	33.78	0.92
Reach 1	0.549	1498	100yr	201.00	2256.05	2258.44	2258.44	2259.15	0.012000	6.81	30.86	25.17	0.98
Reach 1	0.437	197	100yr	201.00	2239.76	2241.74	2241.74	2242.47	0.012649	6.84	29.92	23.01	1.00
Reach 1	0.266	1497	100yr	201.00	2215.41	2217.46	2217.46	2218.08	0.011216	6.42	35.28	34.76	0.94
Reach 1	0.153	196	100yr	201.00	2201.40	2203.94	2203.94	2204.69	0.011814	7.01	30.00	22.47	0.98
Reach 1	0.076	1499	100yr	201.00	2194.42	2196.33	2196.33	2197.02	0.012677	6.74	31.38	24.42	0.99

HEC-RAS Plan: All Flows River: Amir Wash Trib 2 Reach: Reach 1 Profile: 100yr

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.853	392	100yr	453.00	2259.16	2261.95	2261.95	2262.80	0.008552	8.13	75.95	50.46	0.91
Reach 1	0.751	391	100yr	453.00	2250.90	2253.07	2253.07	2253.83	0.011490	8.25	76.96	51.97	1.02
Reach 1	0.593	390	100yr	453.00	2235.27	2238.19	2238.19	2239.06	0.008022	8.03	74.87	50.94	0.88
Reach 1	0.524	388	100yr	453.00	2231.28	2233.30	2233.30	2234.01	0.014520	8.48	84.90	87.49	1.12
Reach 1	0.434	395	100yr	453.00	2223.27	2226.24	2226.24	2227.14	0.009174	7.79	66.16	45.22	0.91
Reach 1	0.358	394	100yr	453.00	2217.58	2220.45	2220.45	2220.96	0.010928	6.78	97.15	94.33	0.94
Reach 1	0.276	393	100yr	453.00	2212.38	2215.68	2215.68	2216.23	0.006819	6.99	108.66	100.30	0.78
Reach 1	0.179	386	100yr	453.00	2206.69	2209.85	2209.85	2210.45	0.006256	7.00	102.52	96.51	0.77
Reach 1	0.090	424	100yr	453.00	2200.74	2202.96	2202.96	2203.58	0.012531	7.83	97.75	127.10	1.04

HEC-RAS Plan: All Flows River: Wash P Reach: Reach 1

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.458	1182	100yr	1239.00	2133.53	2136.34	2136.34	2137.09	0.011346	8.91	248.26	160.40	1.14
Reach 1	0.458	1182	FW	1239.00	2133.53	2137.12	2137.12	2138.36	0.008553	9.72	169.12	70.00	1.05
Reach 1	0.433	1055	100yr	1239.00	2130.57	2133.50	2133.50	2134.18	0.006470	7.79	285.24	200.12	0.89
Reach 1	0.433	1055	FW	1239.00	2130.57	2133.90	2133.90	2135.30	0.008470	9.50	130.47	47.32	1.01
Reach 1	0.398	1054	100yr	1239.00	2127.23	2129.34	2129.34	2130.32	0.013388	10.09	186.32	98.68	1.26
Reach 1	0.398	1054	FW	1239.00	2127.23	2129.66	2129.66	2130.81	0.011614	10.37	170.74	76.12	1.20
Reach 1	0.362	1053	100yr	1239.00	2121.59	2123.78	2123.78	2124.49	0.010997	7.31	203.27	147.76	1.08
Reach 1	0.362	1053	FW	1239.00	2121.59	2124.06	2124.06	2124.93	0.009379	7.49	165.32	96.69	1.01
Reach 1	0.318	1052	100yr	1239.00	2116.16	2118.50	2118.50	2119.18	0.008155	7.00	213.88	144.50	0.90
Reach 1	0.318	1052	FW	1239.00	2116.16	2118.53	2118.53	2119.48	0.010285	7.81	158.65	83.77	1.00
Reach 1	0.269	1051	100yr	1239.00	2109.82	2112.27	2112.27	2113.09	0.010343	8.31	212.68	130.13	1.05
Reach 1	0.269	1051	FW	1239.00	2109.82	2112.82	2112.82	2114.07	0.009581	9.00	137.65	55.46	1.01
Reach 1	0.231	1050	100yr	1239.00	2105.59	2107.51	2107.51	2108.00	0.015007	7.82	316.64	282.71	1.06
Reach 1	0.231	1050	FW	1239.00	2105.59	2108.50	2108.50	2109.82	0.012402	9.68	152.80	60.00	1.04
Reach 1	0.201	1049	100yr	1239.00	2100.29	2103.01	2103.01	2103.49	0.010709	7.36	305.10	328.12	0.92
Reach 1	0.201	1049	FW	1239.00	2100.29	2103.71	2103.71	2105.01	0.012151	9.59	152.85	60.00	1.03
Reach 1	0.176	1047	100yr	1239.00	2096.76	2100.05	2100.05	2100.55	0.008658	6.67	322.30	304.42	0.74
Reach 1	0.176	1047	FW	1239.00	2096.76	2100.18	2100.18	2101.49	0.016730	9.19	134.86	51.49	1.00
Reach 1	0.154	1046	100yr	1239.00	2094.91	2096.54	2096.54	2097.17	0.021825	7.25	215.05	543.48	1.08
Reach 1	0.154	1046	FW	1239.00	2094.91	2097.04	2097.04	2097.90	0.016487	7.72	175.39	99.27	0.99

HEC-RAS Plan: All Flows River: Blue Tank Wash Reach: Reach 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	1.046 1177	100yr	4899.00	2172.17	2175.36	2175.36	2176.10	0.009700	10.29	919.31	531.31	1.08
Reach 1	1.046 1177	FW	4899.00	2172.17	2176.31	2176.31	2177.63	0.008466	11.69	651.99	227.00	1.06
Reach 1	0.984 1066	100yr	4899.00	2165.95	2168.27	2168.27	2169.60	0.018579	12.24	558.31	222.77	1.45
Reach 1	0.984 1066	FW	4899.00	2165.95	2168.75	2168.75	2170.36	0.016696	13.23	514.90	170.00	1.42
Reach 1	0.879 1065	100yr	4899.00	2153.29	2156.49	2156.49	2157.69	0.012296	11.56	653.68	274.83	1.23
Reach 1	0.879 1065	FW	4899.00	2153.29	2156.96	2156.96	2158.52	0.011206	12.25	558.22	180.00	1.20
Reach 1	0.786 1064	100yr	4899.00	2143.76	2147.91	2147.91	2149.22	0.008961	11.43	648.11	240.58	1.08
Reach 1	0.786 1064	FW	4899.00	2143.76	2148.78	2148.78	2150.77	0.008012	12.54	486.24	121.92	1.06
Reach 1	0.716 1063	100yr	4899.00	2134.83	2139.53	2139.53	2140.89	0.008163	12.09	704.56	243.96	1.09
Reach 1	0.716 1063	FW	4899.00	2134.83	2140.37	2140.37	2142.23	0.007027	12.81	575.24	150.00	1.05
Reach 1	0.660 1176	100yr	4899.00	2127.81	2132.75	2132.75	2133.73	0.006326	9.99	888.88	421.28	0.92
Reach 1	0.660 1176	FW	4899.00	2127.81	2133.67	2133.67	2135.64	0.007098	11.91	491.94	123.30	0.98
Reach 1	0.588 1062	100yr	4899.00	2119.31	2123.51	2123.51	2124.81	0.008826	11.61	687.76	252.23	1.08
Reach 1	0.588 1062	FW	4899.00	2119.31	2124.18	2124.18	2126.00	0.008218	12.58	552.80	150.00	1.08
Reach 1	0.477 1061	100yr	4899.00	2106.36	2109.48	2109.48	2110.35	0.013825	10.58	797.84	455.31	1.16
Reach 1	0.477 1061	FW	4899.00	2106.36	2110.46	2110.46	2112.03	0.012773	12.62	577.16	180.00	1.18
Reach 1	0.41 1060	100yr	4899.00	2098.01	2101.08	2101.08	2101.81	0.014805	9.94	909.17	605.49	1.17
Reach 1	0.41 1060	FW	4899.00	2098.01	2101.85	2101.85	2103.15	0.013077	11.40	636.04	240.00	1.16
Reach 1	0.335 1175	100yr	4899.00	2088.47	2091.79	2091.79	2092.64	0.010929	9.46	854.92	484.57	1.09
Reach 1	0.335 1175	FW	4899.00	2088.47	2092.28	2092.28	2093.50	0.009853	10.19	660.38	274.50	1.06
Reach 1	0.275 1059	100yr	4899.00	2081.11	2084.80	2084.80	2085.60	0.008543	10.13	996.30	587.53	1.06
Reach 1	0.275 1059	FW	4899.00	2081.11	2085.79	2085.79	2086.89	0.006089	10.45	831.47	336.00	0.94
Reach 1	0.206 1057	100yr	4899.00	2073.61	2077.49	2077.49	2078.44	0.005641	9.24	870.48	444.48	0.89
Reach 1	0.206 1057	FW	4899.00	2073.61	2077.92	2077.92	2079.29	0.005789	10.15	629.33	225.00	0.92

HEC-RAS Plan: All Flows River: Wash N Reach: Reach 1 Profile: 100yr

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	1.461	2502	100yr	166.00	2278.64	2280.28	2280.28	2280.81	0.014717	6.00	31.65	33.82	0.94
Reach 1	1.393	2501	100yr	166.00	2266.81	2269.17	2269.17	2269.89	0.014260	6.94	26.56	22.06	0.96
Reach 1	1.326	2500	100yr	166.00	2258.64	2260.44	2260.44	2260.81	0.016268	6.20	43.45	56.79	0.98
Reach 1	1.282	2499	100yr	166.00	2252.59	2255.14	2255.14	2255.94	0.013396	7.41	25.65	18.30	0.95
Reach 1	1.238	2498	100yr	166.00	2245.15	2246.60	2246.60	2247.08	0.016220	5.65	31.52	36.88	0.96
Reach 1	1.199	2497	100yr	166.00	2238.27	2240.34	2240.34	2240.95	0.015320	6.35	27.82	25.40	0.96
Reach 1	1.119	2496	100yr	166.00	2226.95	2229.10	2229.10	2229.56	0.009528	5.87	39.76	49.75	0.79
Reach 1	1.043	2491	100yr	594.00	2216.82	2218.45	2218.45	2219.06	0.019071	6.37	97.27	91.85	0.95
Reach 1	0.966	2492	100yr	594.00	2206.45	2208.22	2208.22	2208.92	0.017265	6.92	94.40	71.90	0.98
Reach 1	0.908	2505	100yr	594.00	2198.03	2200.15	2200.15	2200.82	0.014380	7.05	102.52	80.25	0.97
Reach 1	0.861	2493	100yr	594.00	2191.51	2192.94	2192.94	2193.61	0.022028	7.79	99.50	77.65	1.17
Reach 1	0.779	2494	100yr	594.00	2177.88	2179.95	2179.95	2180.45	0.015597	5.80	111.00	116.04	0.95
Reach 1	0.715	2495	100yr	594.00	2167.90	2169.08	2169.08	2169.58	0.024872	6.64	112.91	117.07	1.18
Reach 1	0.651	1077	100yr	865.00	2156.67	2157.99	2157.99	2158.55	0.026131	7.12	154.34	149.21	1.22
Reach 1	0.560	1076	100yr	865.00	2137.69	2139.57	2139.57	2140.23	0.017754	6.62	137.92	149.87	0.97
Reach 1	0.471	1075	100yr	865.00	2118.97	2122.04	2122.04	2122.67	0.009157	7.07	176.80	147.37	0.82
Reach 1	0.369	1074	100yr	865.00	2098.56	2102.48	2102.48	2103.23	0.006653	7.81	150.30	99.57	0.83
Reach 1	0.275	1073	100yr	865.00	2082.80	2084.80	2084.80	2085.16	0.012121	6.47	205.80	254.89	1.00
Reach 1	0.202	1072	100yr	865.00	2071.81	2072.85	2072.85	2073.13	0.019300	5.42	213.58	389.97	0.96
Reach 1	0.153	1174	100yr	865.00	2062.82	2064.87	2064.87	2065.59	0.018543	7.35	157.32	523.16	1.02
Reach 1	0.138	1071	100yr	865.00	2056.78	2057.35	2057.35	2057.69	0.035405	4.20	191.94	432.66	1.13

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Reach 1

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	2.090	1161	100yr	1143.00	2281.26	2284.47	2284.47	2285.88	0.013443	9.52	120.19	44.03	1.01
Reach 1	2.090	1161	FW	1143.00	2281.26	2284.50	2284.50	2285.88	0.013004	9.43	121.42	44.03	0.99
Reach 1	2.031	1162	100yr	1143.00	2272.18	2274.28	2274.28	2274.87	0.015587	7.01	216.33	186.70	1.00
Reach 1	2.031	1162	FW	1143.00	2272.18	2274.30	2274.30	2274.87	0.015061	6.93	218.79	186.69	0.98
Reach 1	1.970	964	100yr	1143.00	2265.30	2266.78	2266.78	2267.44	0.027300	7.96	185.33	153.87	1.28
Reach 1	1.970	964	FW	1143.00	2265.30	2266.78	2266.78	2267.44	0.027177	7.95	185.59	153.89	1.27
Reach 1	1.935	963	100yr	1143.00	2259.75	2262.13	2262.13	2262.89	0.012984	7.89	191.43	126.18	0.96
Reach 1	1.935	963	FW	1143.00	2259.75	2262.15	2262.15	2262.89	0.012463	7.78	194.11	126.18	0.94
Reach 1	1.911	2449	100yr	1143.00	2255.49	2258.93	2258.93	2259.62	0.006768	8.23	247.24	162.80	0.87
Reach 1	1.911	2449	FW	1143.00	2255.49	2258.94	2258.94	2259.62	0.006664	8.19	248.68	162.80	0.86
Reach 1	1.881	1163	100yr	1143.00	2251.91	2253.33	2253.33	2253.99	0.020747	8.50	196.25	154.95	1.35
Reach 1	1.881	1163	FW	1143.00	2251.91	2253.34	2253.34	2253.99	0.020602	8.48	196.66	154.95	1.34
Reach 1	1.846	962	100yr	1143.00	2246.86	2249.36	2249.04	2249.82	0.007355	6.88	249.89	144.59	0.87
Reach 1	1.846	962	FW	1143.00	2246.86	2249.36	2249.03	2249.81	0.007529	6.80	246.63	138.70	0.86
Reach 1	1.820	961	100yr	1143.00	2243.48	2246.99	2246.99	2248.53	0.008529	10.00	117.62	40.46	0.99
Reach 1	1.820	961	FW	1143.00	2243.48	2247.03	2247.03	2248.53	0.008226	9.89	119.00	40.46	0.98

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Reach 2

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 2	1.744	1164	100yr	1527.00	2232.26	2234.26	2234.26	2234.67	0.010958	7.03	417.53	500.31	1.01
Reach 2	1.744	1164	FW	1527.00	2232.26	2234.28	2234.28	2234.67	0.010569	6.94	423.14	500.31	0.99
Reach 2	1.650	969	100yr	1527.00	2218.07	2219.86	2219.86	2220.38	0.016984	7.05	312.55	307.05	0.99
Reach 2	1.650	969	FW	1527.00	2218.07	2219.87	2219.87	2220.38	0.016248	6.94	317.66	308.66	0.97

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Reach 3

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 3	1.538 959	100yr	2610.00	2204.76	2208.93	2208.93	2210.76	0.007604	11.09	259.63	76.73	0.99
Reach 3	1.538 959	FW	2610.00	2204.76	2209.05	2209.05	2211.04	0.008946	11.33	230.28	57.00	0.99
Reach 3	1.496 958	100yr	2610.00	2198.53	2203.80	2203.80	2206.12	0.008715	13.82	255.30	57.99	1.10
Reach 3	1.496 958	FW	2610.00	2198.53	2204.16	2204.16	2206.81	0.008457	14.26	234.01	46.43	1.09
Reach 3	1.456 957	100yr	2610.00	2194.55	2198.13	2198.13	2199.51	0.012686	11.45	318.68	119.98	1.20
Reach 3	1.456 957	FW	2610.00	2194.55	2198.78	2198.78	2200.45	0.010190	11.80	290.62	88.00	1.12
Reach 3	1.423 1160	100yr	2610.00	2191.58	2194.58	2194.58	2195.53	0.011094	10.41	425.32	211.70	1.12
Reach 3	1.423 1160	FW	2610.00	2191.58	2195.56	2195.56	2197.37	0.009861	12.08	277.53	78.00	1.11
Reach 3	1.367 956	100yr	2610.00	2183.79	2187.88	2187.88	2189.23	0.008073	10.82	348.29	125.27	1.00
Reach 3	1.367 956	FW	2610.00	2183.79	2188.42	2188.42	2190.33	0.007937	11.78	263.67	69.00	1.01
Reach 3	1.285 955	100yr	2610.00	2175.77	2180.46	2180.46	2182.31	0.011556	14.12	286.09	79.54	1.22
Reach 3	1.285 955	FW	2610.00	2175.77	2181.16	2181.16	2183.55	0.012776	14.78	235.69	48.40	1.18
Reach 3	1.217 954	100yr	2610.00	2168.98	2173.84	2173.84	2175.68	0.008767	12.80	291.24	81.97	1.08
Reach 3	1.217 954	FW	2610.00	2168.98	2174.60	2174.60	2177.24	0.008471	14.01	230.27	46.00	1.09
Reach 3	1.169 1159	100yr	2610.00	2164.73	2166.52	2166.52	2167.11	0.020539	9.08	444.78	286.00	1.36
Reach 3	1.169 1159	FW	2610.00	2164.73	2167.33	2167.33	2168.38	0.018866	11.84	358.44	168.60	1.41
Reach 3	1.085 953	100yr	2610.00	2154.86	2158.45	2158.45	2159.86	0.012763	12.29	324.42	119.35	1.23
Reach 3	1.085 953	FW	2610.00	2154.86	2159.12	2159.12	2160.98	0.011087	13.05	276.01	75.00	1.18
Reach 3	0.988 1086	100yr	2610.00	2144.36	2146.57	2146.57	2147.72	0.021307	11.47	326.07	153.24	1.47
Reach 3	0.988 1086	FW	2610.00	2144.36	2147.37	2147.37	2148.91	0.016128	12.63	292.80	100.00	1.35
Reach 3	0.888 1085	100yr	2610.00	2132.19	2135.73	2135.73	2136.99	0.010824	11.24	358.53	144.50	1.13
Reach 3	0.888 1085	FW	2610.00	2132.19	2136.22	2136.22	2137.88	0.009970	11.93	298.90	90.00	1.11
Reach 3	0.793 1084	100yr	2610.00	2121.04	2124.73	2124.73	2126.22	0.009042	11.30	309.32	116.10	1.12
Reach 3	0.793 1084	FW	2610.00	2121.04	2125.17	2125.17	2126.95	0.008240	11.75	275.06	80.00	1.09
Reach 3	0.691 1083	100yr	2610.00	2108.94	2112.95	2112.95	2114.09	0.008886	10.01	362.91	149.32	0.92
Reach 3	0.691 1083	FW	2610.00	2108.94	2113.75	2113.75	2116.02	0.010756	12.18	220.35	49.36	1.01
Reach 3	0.585 1082	100yr	2610.00	2095.60	2101.35	2101.35	2102.82	0.003884	10.53	382.72	150.32	0.80
Reach 3	0.585 1082	FW	2610.00	2095.60	2101.36	2101.36	2102.83	0.004555	10.50	361.90	130.00	0.79
Reach 3	0.492 1081	100yr	2610.00	2085.06	2089.16	2089.16	2090.54	0.007476	10.18	331.07	130.78	0.95
Reach 3	0.492 1081	FW	2610.00	2085.06	2089.38	2089.38	2091.26	0.008265	11.15	246.39	66.00	1.01
Reach 3	0.432 1080	100yr	2610.00	2077.90	2082.37	2082.37	2083.39	0.005068	9.50	473.75	218.87	0.81
Reach 3	0.432 1080	FW	2610.00	2077.90	2082.85	2082.85	2085.18	0.009213	12.24	213.16	45.33	1.00

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Reach 4

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W. S. Elev (ft)	Crit W. S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 4	0.391	3598	100yr	2610.00	2073.53	2077.70	2077.70	2079.27	0.010262	13.29	330.73	105.12	1.16
Reach 4	0.391	3598	FW	2610.00	2073.53	2078.67	2078.67	2081.36	0.010257	15.31	239.39	47.25	1.20
Reach 4	0.352	1509	100yr	2610.00	2069.75	2075.30	2075.30	2076.68	0.005542	11.09	386.52	130.86	0.87
Reach 4	0.352	1509	FW	2610.00	2069.75	2076.18	2076.18	2079.08	0.009685	13.66	191.12	32.51	0.99
Reach 4	0.319	1078	100yr	2610.00	2066.30	2068.41	2068.36	2069.27	0.016509	10.00	403.90	229.77	1.29
Reach 4	0.319	1078	FW	2610.00	2066.30	2069.30	2069.30	2070.57	0.012315	10.87	338.12	137.79	1.15
Reach 4	0.279	2983	100yr	2610.00	2062.92	2065.30	2065.30	2066.13	0.013537	10.08	443.80	256.94	1.20
Reach 4	0.279	2983	FW	2610.00	2062.92	2066.19	2066.19	2067.62	0.011715	11.39	326.00	124.88	1.14
Reach 4	0.241	3613	100yr	2652.00	2058.71	2062.37	2061.41	2062.88	0.003640	6.47	524.70	182.02	0.66
Reach 4	0.241	3613	FW	2652.00	2058.71	2063.08	2062.25	2063.97	0.004181	7.57	350.50	93.92	0.69
Reach 4	0.199	3611	100yr	2652.00	2054.45	2059.86	2059.86	2061.67	0.007194	11.51	289.91	84.97	0.97
Reach 4	0.199	3611	FW	2652.00	2054.45	2060.22	2060.22	2062.57	0.008181	12.29	216.23	45.57	0.99

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Reach 5

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 5	0.158	1068	100yr	2652.00	2050.56	2052.61	2052.61	2053.25	0.003735	8.49	440.59	347.93	1.16
Reach 5	0.158	1068	FW	2652.00	2050.56	2053.47	2053.47	2054.90	0.003271	10.27	278.50	100.71	1.14
Reach 5	0.116	3612	100yr	2652.00	2046.85	2049.61	2049.61	2049.62	0.000027	0.96	3066.76	1010.18	0.11
Reach 5	0.116	3612	FW	2652.00	2047.03	2050.54	2050.54	2051.80	0.002720	10.86	312.68	115.00	1.04

HEC-RAS Plan: Basic Plan File River: Powder House Reach: Side Channel

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Side Channel	0.202	1079	100yr	640.00	2075.75	2077.86	2077.86	2078.45	0.002079	7.20	127.95	114.20	0.89
Side Channel	0.202	1079	FW	640.00	2075.75	2078.25	2078.25	2079.47	0.002986	8.85	72.30	30.01	1.00
Side Channel	0.162	2981	100yr	640.00	2069.53	2071.06	2071.06	2071.72	0.002771	6.61	101.04	202.56	0.97
Side Channel	0.162	2981	FW	640.00	2069.53	2071.14	2071.14	2071.90	0.002961	6.97	91.83	60.00	0.99
Side Channel	0.129	2982	100yr	640.00	2064.82	2066.97	2066.97	2067.49	0.002037	6.92	133.35	119.13	0.88
Side Channel	0.129	2982	FW	640.00	2064.82	2067.43	2067.43	2068.66	0.002957	8.90	71.94	30.00	1.01
Side Channel	0.089	1091	100yr	640.00	2059.28	2061.55	2061.55	2062.18	0.001946	7.04	123.01	275.91	0.87
Side Channel	0.089	1091	FW	640.00	2059.28	2061.69	2061.69	2062.77	0.002888	8.35	76.68	35.00	0.99
Side Channel	0.051	1090	100yr	2652.00	2054.97	2058.96	2058.96	2059.95	0.001586	9.46	394.37	385.91	0.86
Side Channel	0.051	1090	FW	2652.00	2054.97	2059.59	2059.59	2061.75	0.002306	12.09	230.76	54.42	1.02

HEC-RAS Plan: Basic Plan File River: Powder House Tr1 Reach: Reach 1

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.331	1167	100yr	342.00	2257.36	2260.22	2260.22	2261.33	0.012973	8.58	43.04	22.64	0.96
Reach 1	0.331	1167	FW	342.00	2257.36	2260.28	2260.28	2261.33	0.011853	8.34	44.46	22.64	0.92
Reach 1	0.296	970	100yr	342.00	2252.76	2255.65	2255.65	2256.68	0.012635	8.26	44.94	24.48	0.95
Reach 1	0.296	970	FW	342.00	2252.76	2255.69	2255.69	2256.68	0.011997	8.13	45.79	24.48	0.92
Reach 1	0.262	1169	100yr	342.00	2248.19	2251.50	2251.50	2252.64	0.015076	8.59	40.02	18.70	1.00
Reach 1	0.262	1169	FW	342.00	2248.19	2251.52	2251.52	2252.64	0.014579	8.50	40.45	18.70	0.99
Reach 1	0.190	966	100yr	342.00	2234.71	2237.08	2237.08	2237.79	0.011074	7.11	58.49	44.33	0.88
Reach 1	0.190	966	FW	342.00	2234.71	2237.11	2237.11	2237.79	0.010423	6.97	59.86	44.34	0.85
Reach 1	0.179	2448	100yr	342.00	2233.33	2235.41	2235.41	2235.92	0.012564	6.30	72.92	73.44	0.89
Reach 1	0.179	2448	FW	342.00	2233.33	2235.43	2235.43	2235.91	0.011900	6.19	74.37	73.45	0.87
Reach 1	0.166	1170	100yr	342.00	2232.23	2233.36	2233.36	2233.80	0.017164	5.84	74.46	94.36	0.99
Reach 1	0.166	1170	FW	342.00	2232.23	2233.40	2233.40	2233.80	0.015056	5.59	77.87	94.36	0.93
Reach 1	0.105	2447	100yr	342.00	2223.35	2224.58	2224.58	2224.82	0.020289	5.62	109.40	208.20	1.05
Reach 1	0.105	2447	FW	342.00	2223.35	2224.59	2224.59	2224.82	0.019158	5.51	111.59	209.04	1.02

HEC-RAS Plan: Basic Plan File River: Powder House Tr2 Reach: Reach 1

Reach	River Sta		Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.231	1166	100yr	300.00	2277.51	2278.63	2278.63	2279.04	0.019412	5.17	58.42	73.35	1.01
Reach 1	0.231	1166	FW	300.00	2277.51	2278.63	2278.63	2279.04	0.019296	5.16	58.53	73.35	1.00
Reach 1	0.188	965	100yr	300.00	2268.59	2270.35	2270.35	2270.95	0.014630	6.44	52.20	45.88	0.95
Reach 1	0.188	965	FW	300.00	2268.59	2270.37	2270.37	2270.95	0.014028	6.35	52.95	45.88	0.94
Reach 1	0.141	1168	100yr	300.00	2259.89	2261.71	2261.71	2262.15	0.013508	5.99	68.34	75.80	0.91
Reach 1	0.141	1168	FW	300.00	2259.89	2261.73	2261.73	2262.15	0.012738	5.87	69.77	75.80	0.89
Reach 1	0.093	967	100yr	300.00	2250.07	2251.52	2251.52	2252.02	0.018122	6.05	57.05	58.78	1.02
Reach 1	0.093	967	FW	300.00	2250.07	2251.52	2251.52	2252.02	0.017865	6.03	57.31	58.78	1.01
Reach 1	0.065	2450	100yr	300.00	2245.21	2248.59	2248.59	2249.72	0.011641	9.21	41.54	20.64	0.93
Reach 1	0.065	2450	FW	300.00	2245.21	2248.65	2248.65	2249.71	0.010627	8.93	42.97	20.64	0.90

HEC-RAS Plan: All Flows River: Wash AF Reach: Reach 1 Profile: 100yr

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.920 1103	100yr	881.00	2147.52	2152.58	2152.58	2154.17	0.007153	12.78	124.61	40.72	1.06
Reach 1	0.880 1156	100yr	881.00	2136.59	2141.99	2141.99	2143.64	0.005481	10.86	108.20	40.17	0.93
Reach 1	0.844 1155	100yr	881.00	2133.34	2137.28	2137.28	2138.85	0.006543	10.30	97.80	36.24	0.99
Reach 1	0.798 1102	100yr	881.00	2124.58	2131.13	2131.13	2133.06	0.005588	12.06	103.34	30.28	0.92
Reach 1	0.747 1154	100yr	881.00	2115.08	2119.16	2119.16	2120.42	0.005960	9.54	120.97	55.44	0.94
Reach 1	0.700 1101	100yr	881.00	2107.04	2113.33	2113.33	2115.22	0.005199	11.91	106.09	32.97	0.92
Reach 1	0.667 1153	100yr	881.00	2100.74	2106.21	2106.21	2107.91	0.005562	11.07	105.60	35.31	0.93
Reach 1	0.605 1100	100yr	881.00	2089.08	2096.73	2096.73	2099.00	0.005708	12.82	93.47	24.33	0.92
Reach 1	0.572 1152	100yr	881.00	2084.68	2091.28	2091.28	2093.30	0.005890	11.79	92.24	27.70	0.93
Reach 1	0.516 1099	100yr	881.00	2073.59	2078.24	2078.24	2079.91	0.005835	10.89	102.90	36.11	0.96
Reach 1	0.486 1151	100yr	881.00	2070.60	2073.71	2073.71	2074.92	0.006611	9.04	111.35	52.03	0.96
Reach 1	0.460 1218	100yr	881.00	2067.13	2070.30	2070.30	2071.56	0.006626	9.39	112.74	49.55	0.97
Reach 1	0.381 1098	100yr	881.00	2057.40	2059.45	2059.45	2060.02	0.005539	6.52	203.41	224.63	0.83
Reach 1	0.304 2476	100yr	881.00	2046.49	2047.76	2047.76	2048.21	0.019666	5.98	194.79	219.35	0.95
Reach 1	0.257 1097	100yr	881.00	2040.45	2041.75	2041.75	2042.22	0.028822	6.94	199.59	265.31	1.14
Reach 1	0.226 1158	100yr	881.00	2035.73	2040.50		2040.51	0.000082	0.90	1403.20	302.34	0.08
Reach 1	0.180 1096	100yr	881.00	2031.64	2040.37		2040.47	0.000184	2.67	402.14	75.43	0.17
Reach 1	0.158 1095	100yr	881.00	2027.76	2040.35	2033.54	2040.43	0.000301	2.45	520.84	165.95	0.14
Reach 1	0.148 1183		Culvert									
Reach 1	0.135 1157	100yr	881.00	2025.51	2030.05	2030.05	2031.94	0.017351	11.05	79.74	85.84	1.00
Reach 1	0.122 1094	100yr	881.00	2025.46	2027.00	2027.00	2027.49	0.020975	6.40	179.29	200.51	0.95

HEC-RAS Plan: All Flows River: Calamity Wash Reach: Reach 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	2.422 1147	100yr	2926.00	2355.26	2360.57	2360.57	2362.56	0.008264	11.89	289.44	77.88	0.95
Reach 1	2.422 1147	FW	2926.00	2355.26	2360.57	2360.57	2362.56	0.008264	11.89	289.44	77.88	0.95
Reach 1	2.351 1146	100yr	2926.00	2347.90	2352.78	2352.78	2354.84	0.008810	11.68	267.55	69.38	0.97
Reach 1	2.351 1146	FW	2926.00	2347.90	2352.78	2352.78	2354.84	0.008810	11.68	267.55	69.38	0.97
Reach 1	2.305 1145	100yr	2926.00	2342.93	2347.92	2347.92	2350.11	0.008686	11.98	256.94	62.68	0.98
Reach 1	2.305 1145	FW	2926.00	2342.93	2347.92	2347.92	2350.11	0.008686	11.98	256.94	62.68	0.98
Reach 1	2.262 1144	100yr	2926.00	2338.39	2344.15	2344.15	2346.52	0.007836	12.87	264.29	60.25	0.96
Reach 1	2.262 1144	FW	2926.00	2338.39	2344.15	2344.15	2346.52	0.007836	12.87	264.29	60.25	0.96
Reach 1	2.245 1505	100yr	2926.00	2336.05	2342.24	2342.24	2344.11	0.007346	11.73	310.12	84.61	0.90
Reach 1	2.245 1505	FW	2926.00	2336.05	2342.24	2342.24	2344.11	0.007346	11.73	310.12	84.61	0.90
Reach 1	2.201 1143	100yr	3183.00	2330.67	2336.57	2336.57	2339.00	0.007943	12.78	275.13	62.64	0.96
Reach 1	2.201 1143	FW	3183.00	2330.67	2336.60	2336.60	2339.35	0.010712	13.31	239.22	43.00	0.99
Reach 1	2.148 998	100yr	3183.00	2323.32	2330.72	2330.72	2333.46	0.007732	13.94	271.51	55.78	0.95
Reach 1	2.148 998	FW	3183.00	2323.32	2331.01	2331.01	2334.48	0.008419	14.96	216.27	31.00	1.00
Reach 1	2.100 1506	100yr	3183.00	2312.38	2324.68	2324.68	2329.40	0.008628	18.20	213.70	28.98	0.97
Reach 1	2.100 1506	FW	3183.00	2312.38	2324.88	2324.88	2330.39	0.009267	19.09	186.47	18.00	1.00
Reach 1	2.054 997	100yr	3183.00	2305.76	2312.07	2312.07	2314.59	0.007785	13.10	272.68	58.82	0.96
Reach 1	2.054 997	FW	3183.00	2305.76	2312.13	2312.13	2315.07	0.008475	13.77	234.43	40.00	1.00
Reach 1	2.006 1507	100yr	3183.00	2284.08	2295.65	2295.65	2300.10	0.007345	17.68	221.74	28.93	0.94
Reach 1	2.006 1507	FW	3183.00	2284.08	2295.85	2295.85	2301.43	0.008270	19.00	174.81	16.00	1.00
Reach 1	1.957 996	100yr	3183.00	2266.53	2277.06	2277.06	2281.07	0.011526	16.07	199.27	26.27	1.00
Reach 1	1.957 996	FW	3183.00	2266.53	2277.07	2277.07	2281.08	0.011479	16.06	198.85	25.00	0.99
Reach 1	1.871 995	100yr	3183.00	2256.45	2263.12	2263.12	2265.98	0.008305	13.70	244.97	46.82	0.98
Reach 1	1.871 995	FW	3183.00	2256.45	2263.16	2263.16	2265.98	0.008109	13.60	246.96	46.82	0.97
Reach 1	1.778 994	100yr	3183.00	2246.26	2249.71	2249.71	2251.22	0.013424	11.62	355.71	119.06	1.15
Reach 1	1.778 994	FW	3183.00	2246.26	2250.66	2250.66	2252.55	0.010199	12.06	321.14	84.00	1.05
Reach 1	1.685 993	100yr	3183.00	2234.53	2236.86	2236.86	2237.66	0.018978	9.76	488.07	294.98	1.25
Reach 1	1.685 993	FW	3183.00	2234.53	2237.82	2237.82	2239.22	0.014374	11.19	368.13	135.00	1.17
Reach 1	1.590 992	100yr	3183.00	2221.77	2225.19	2225.19	2226.21	0.009809	9.68	477.53	219.47	0.98
Reach 1	1.590 992	FW	3183.00	2221.77	2225.62	2225.62	2227.14	0.010216	10.78	356.35	115.00	1.02
Reach 1	1.493 991	100yr	3498.00	2210.26	2212.97	2212.97	2213.93	0.015988	9.92	492.37	249.81	1.18
Reach 1	1.493 991	FW	3498.00	2210.26	2213.87	2213.87	2215.38	0.012579	11.06	387.22	130.00	1.11
Reach 1	1.391 990	100yr	3498.00	2197.85	2202.35	2202.35	2204.41	0.012032	13.26	335.07	86.30	1.14
Reach 1	1.391 990	FW	3498.00	2197.85	2202.89	2202.89	2205.18	0.010818	13.63	323.46	75.28	1.10
Reach 1	1.311 989	100yr	3498.00	2187.71	2192.28	2192.28	2193.75	0.009913	12.01	430.54	143.58	1.03
Reach 1	1.311 989	FW	3498.00	2187.71	2192.89	2192.89	2195.12	0.010776	13.72	330.86	75.00	1.10
Reach 1	1.217 988	100yr	3498.00	2176.06	2182.23	2182.23	2184.59	0.008228	13.02	314.86	70.25	0.98
Reach 1	1.217 988	FW	3498.00	2176.06	2182.65	2182.65	2185.57	0.008344	13.77	260.91	45.10	0.99
Reach 1	1.120 987	100yr	3498.00	2163.17	2171.55	2171.55	2175.01	0.010085	14.94	234.86	35.65	1.00
Reach 1	1.120 987	FW	3498.00	2163.17	2171.59	2171.59	2175.02	0.009901	14.86	235.85	34.50	0.99
Reach 1	1.026 986	100yr	3498.00	2151.02	2155.75	2155.75	2157.56	0.008936	10.93	339.46	100.79	0.97
Reach 1	1.026 986	FW	3498.00	2151.02	2155.75	2155.75	2157.70	0.009380	11.21	313.38	79.20	0.99
Reach 1	0.943 985	100yr	3498.00	2141.31	2145.79	2145.79	2147.06	0.009051	10.41	472.17	189.66	0.96
Reach 1	0.943 985	FW	3498.00	2141.31	2146.64	2146.64	2148.88	0.009126	12.02	295.01	66.00	1.00
Reach 1	.902 1106	100yr	3498.00	2136.52	2140.33	2140.33	2141.77	0.011048	11.73	428.93	151.78	1.07
Reach 1	.902 1106	FW	3498.00	2136.52	2140.84	2140.84	2143.01	0.011527	13.05	320.11	75.00	1.12
Reach 1	0.820 984	100yr	3544.00	2124.08	2130.23	2130.23	2132.76	0.007930	13.01	295.09	61.08	0.97
Reach 1	0.820 984	FW	3544.00	2124.08	2130.26	2130.26	2133.07	0.010683	13.45	263.53	46.45	1.00
Reach 1	0.775 1508	100yr	3544.00	2115.60	2120.91	2120.91	2122.94	0.006456	11.72	336.44	85.81	0.99
Reach 1	0.775 1508	FW	3544.00	2115.60	2121.01	2121.01	2123.22	0.006559	12.00	304.35	70.00	1.00
Reach 1	0.736 983	100yr	3544.00	2110.48	2116.94	2116.94	2119.76	0.005960	13.56	275.04	53.68	0.98
Reach 1	0.736 983	FW	3544.00	2110.48	2116.94	2116.94	2119.85	0.006651	13.71	259.68	44.00	0.99

HEC-RAS Plan: All Flows River: Calamity Wash Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	0.639 982	100yr	3544.00	2096.47	2102.10	2102.10	2104.40	0.006321	12.22	299.28	70.41	0.99
Reach 1	0.639 982	FW	3544.00	2096.47	2102.10	2102.10	2104.45	0.006428	12.31	288.50	61.30	1.00
Reach 1	0.558 981	100yr	3544.00	2088.30	2094.48	2094.48	2096.26	0.004001	10.96	403.25	168.83	0.81
Reach 1	0.558 981	FW	3544.00	2088.30	2094.51	2094.51	2096.27	0.004277	10.89	399.00	155.00	0.80
Reach 1	0.463 980	100yr	3544.00	2075.26	2081.36	2081.36	2083.90	0.004870	12.98	299.90	66.09	0.96
Reach 1	0.463 980	FW	3544.00	2075.26	2081.43	2081.43	2083.90	0.004651	12.80	304.77	66.10	0.95
Reach 1	0.366 979	100yr	3544.00	2061.93	2069.91	2069.91	2072.69	0.004668	13.92	360.10	204.92	0.94
Reach 1	0.366 979	FW	3544.00	2061.93	2070.00	2070.00	2073.42	0.005226	14.85	243.28	36.00	0.99
Reach 1	0.274 978	100yr	3544.00	2049.49	2056.46	2056.46	2059.21	0.004680	13.60	293.86	146.58	0.95
Reach 1	0.274 978	FW	3544.00	2049.49	2056.46	2056.46	2059.61	0.005722	14.26	252.19	40.00	1.00
Reach 1	0.174 977	100yr	3544.00	2036.90	2043.77	2043.77	2046.30	0.009513	13.09	309.52	99.88	0.94
Reach 1	0.174 977	FW	3544.00	2036.90	2043.78	2043.78	2046.74	0.013118	13.81	256.69	43.00	1.00
Reach 1	0.083 976	100yr	3544.00	2027.46	2031.62	2031.62	2033.58	0.010482	11.24	316.49	84.10	1.00
Reach 1	0.083 976	FW	3544.00	2027.46	2031.63	2031.63	2033.58	0.010395	11.21	317.31	84.10	1.00
Reach 1	0.069 975	100yr	3544.00	2025.46	2031.91	2029.83	2032.58	0.002583	6.58	539.12	104.64	0.49
Reach 1	0.069 975	FW	3544.00	2025.46	2031.91	2029.82	2032.58	0.002583	6.58	539.12	104.64	0.49
Reach 1	0.059 222		Bridge									
Reach 1	0.049 2451	100yr	3544.00	2025.46	2029.82	2029.82	2031.59	0.011741	10.71	334.01	96.01	0.99
Reach 1	0.049 2451	FW	3544.00	2025.46	2029.82	2029.82	2031.59	0.011741	10.71	334.01	96.01	0.99
Reach 1	0.027 973	100yr	3544.00	2017.89	2021.36	2021.36	2021.61	0.006280	5.26	1018.09	566.99	0.66
Reach 1	0.027 973	FW	3544.00	2018.16	2022.34	2022.34	2023.34	0.011732	8.76	532.04	260.00	0.94



## **Appendix F: Erosion and Sediment Transport Supporting Documentation**

*Note: Erosion and Sediment Transport analysis is not covered by the scope of this study.*



## **Appendix G: Field Reconnaissance Report**

The *Wickenburg Area Drainage Master Study/Plan Phase 2 East Field Reconnaissance Report*, prepared by Hoskin-Ryan Consultants, Inc. is included as Appendix G. ***(Included in CD)***

**NOTES TO USERS**

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

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

Coastal Base Flood Elevations shown on this map apply only to areas of 0.1 National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

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

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3191

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (801) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:8000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

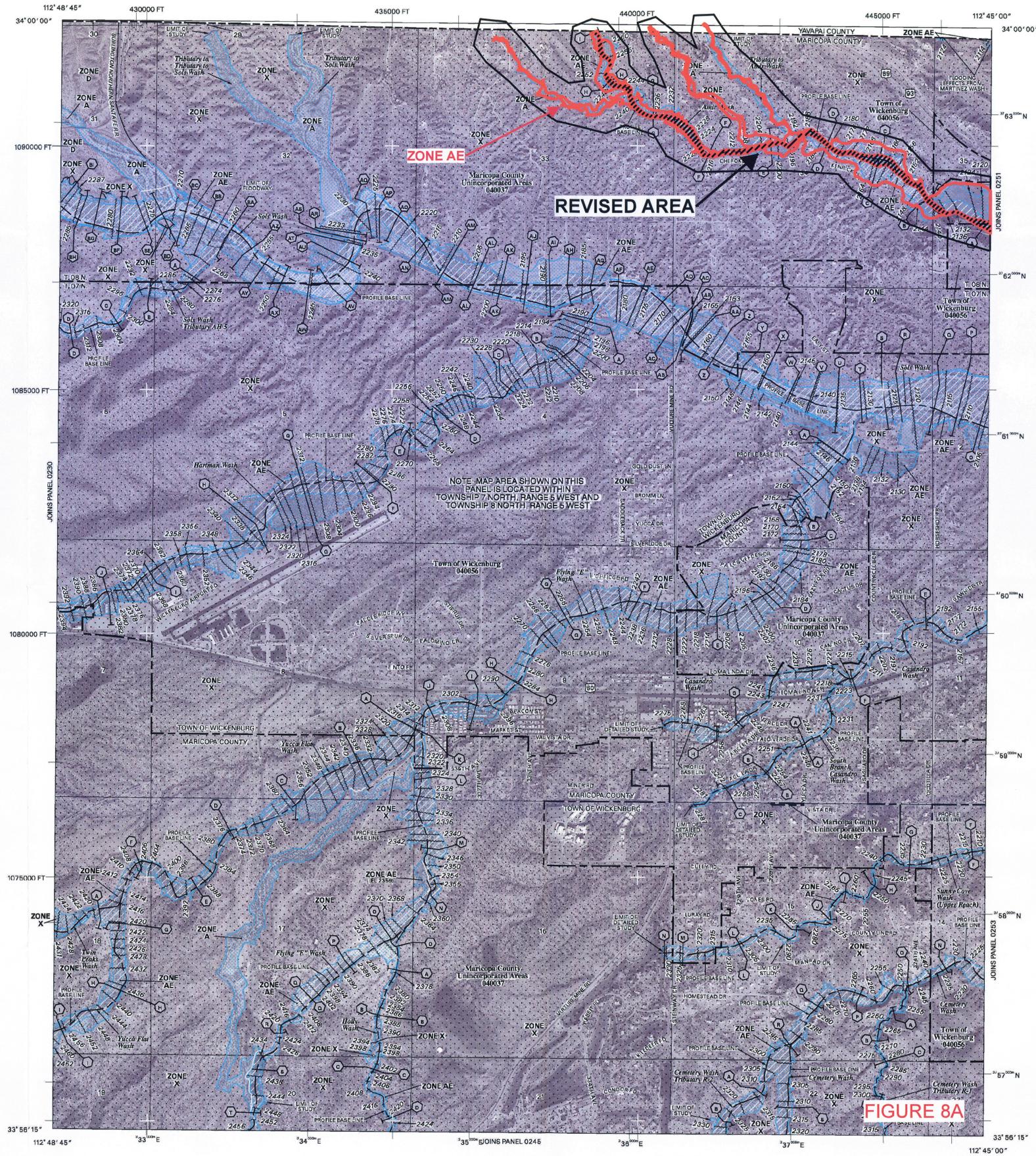
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to those new stream channel configurations. As a result,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

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

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

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

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-338-2627) or visit the FEMA website at <http://www.fema.gov>.



**LEGEND**

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, ARS, 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 discontinued. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE ARS** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

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

**OTHER FLOOD AREAS**

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

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

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

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

\* Referenced to the National Geodetic Vertical Datum of 1929

① ① Cross section line  
② ② Transect line

112° 07' 08" 33' 28" 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.

78° 00' 00" 1000-meter Universal Transverse Mercator grid tick values zone 12.

876000 FT 5000-foot grid tick values; Arizona State Plane coordinate system, central zone (PIPSZONF 3178) NAD83 (Transverse Mercator)

XDV2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)

\* M15 River Mile

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index

**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**  
April 16, 1988

**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
September 29, 1989, July 19, 2001

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

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

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

**MAP SCALE 1" = 1000'**

0 1000 2000 FEET

0 300 600 METERS

**NFP** **PANEL Q235G**

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

**PANEL 235 OF 4350**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**COMMUNITY:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0235	G
WICKENBURG, TOWN OF	040056	0235	G

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

**MAP NUMBER D4013C0235G**

**MAP REVISED**

**SEPTEMBER 30, 2005**

Federal Emergency Management Agency

**FIGURE 8A**

**NOTES TO USERS**

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

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

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

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

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

The projection used in the preparation of this map was Arizona State Plane Zone 3170 (Central Arizona). The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3191

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

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:5000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

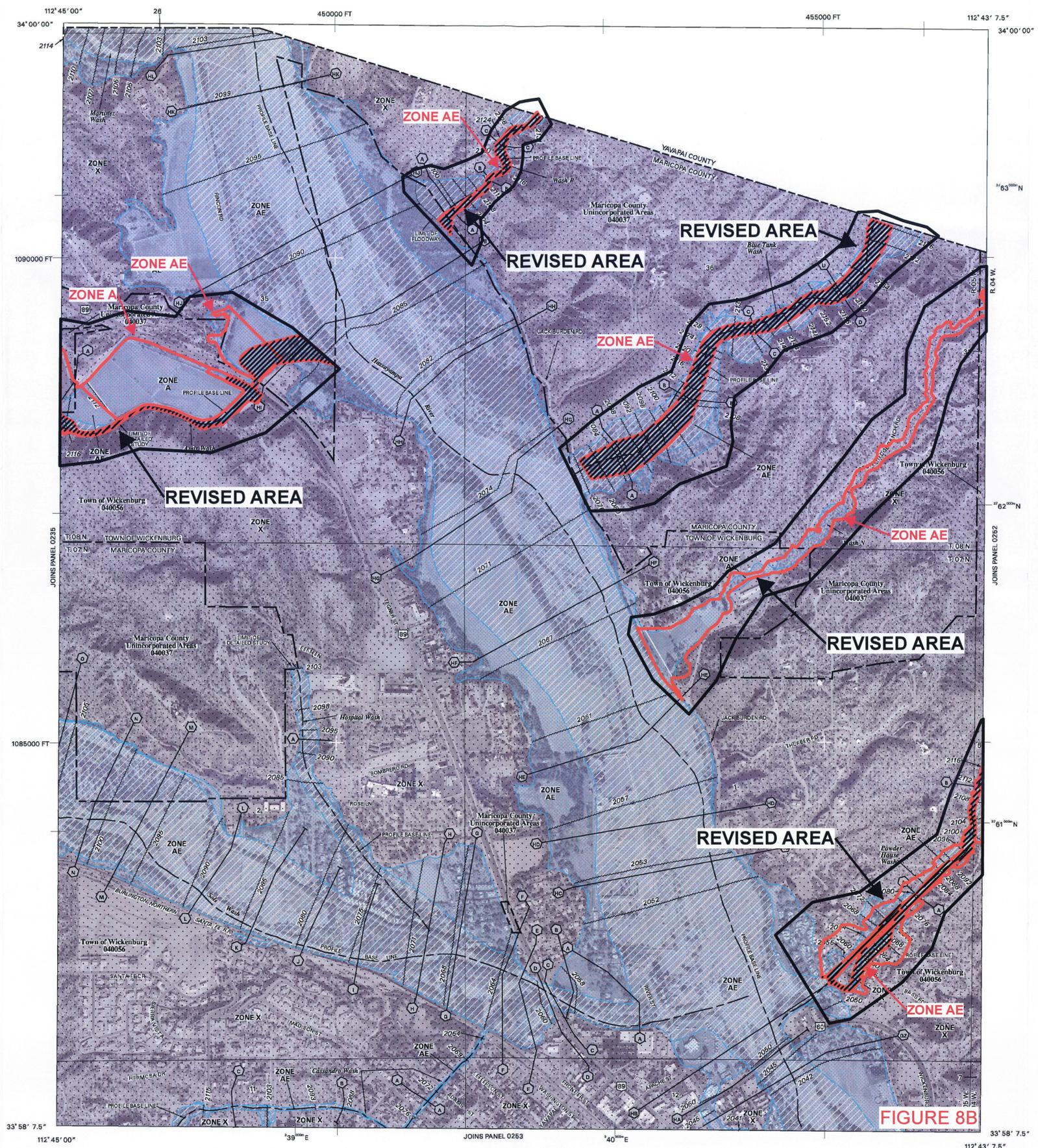
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

Contact the FEMA Map Service Center at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9622 and its website at <http://www.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-338-2627) or visit the FEMA website at <http://www.fema.gov>.



**LEGEND**

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

**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 identified. Zone AR indicates that the former flood control system is being removed; provide protection from the 1% annual chance of greater flood.

**ZONE ARB** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); no 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** Area of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot and with storage 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, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Base Flood Elevation line and value; elevation in feet\*
- Base Flood Elevation value where uniform within zone; elevation in feet\*

\* Referenced to the National Geodetic Vertical Datum of 1929

- A-A Cross section line
- 2-2 Transverse line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.

- 76°±E 1000-meter Universal Transverse Mercator grid tick values zone 12.
- 875000 FT 5000-foot grid tick values; Arizona State Plane coordinate system, central zone (FIPS ZONE 317) NAD83 (Transverse Mercator)
- DV2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- MLS River Mile

**MAP REPOSITORY**

Refer to Repository Listing on Map Index

**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**

April 18, 1988

**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**

September 29, 1989, September 4, 1991, July 19, 2001

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

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

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-438-6426.

**MAP SCALE 1" = 500'**

250 0 500 1000 FEET

150 0 150 300 METERS

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0251H**

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

**PANEL 251 OF 4350**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0251H	H
WICKENBURG, TOWN OF	040056	0251H	H

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

**MAP NUMBER 04013C0251H**

**MAP REVISED**

**SEPTEMBER 30, 2005**

Federal Emergency Management Agency

**FIGURE 8B**

**NOTES TO USERS**

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

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

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.3 National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

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

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3181

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

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:8000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

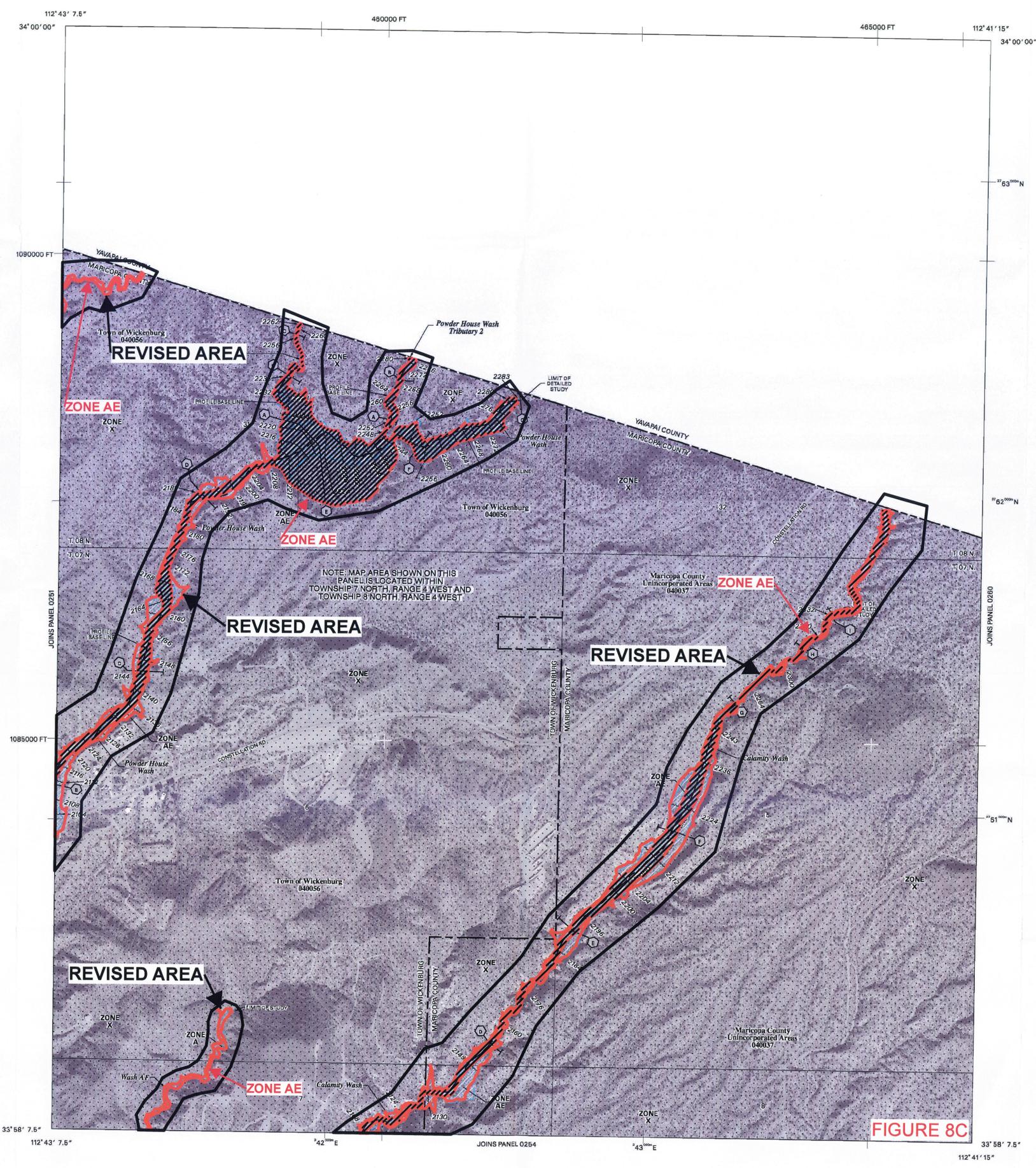
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

Contact the FEMA Map Service Center at 1-800-358-9618 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-336-2827) or visit the FEMA website at <http://www.fema.gov>.



**LEGEND**

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, AV, 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 when 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 determined. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE AV** 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 D** Areas determined to be outside the 0.2% annual chance floodplain.

**UNDETERMINED AREAS** 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  
Zone O boundary  
CBRS and OPA boundary  
Boundary dividing Special Flood Hazard Areas, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.  
Base Flood Elevation line and value: elevation in feet\*  
Base Flood Elevation value where uniform within zone; elevation in feet\*

\* Referenced to the National Geodetic Vertical Datum of 1929

⊗ Cross section line  
⊙ Transsect line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.  
476° E 1000-meter Universal Transverse Mercator grid tick values zone 12  
875000 FT 5000-foot grid tick values: Arizona State Plane coordinates system, central zone (FIPS ZONE 3176) NAD83 (Transverse Mercator)  
⊕ DV2313 Bench mark (see explanation in Notes to Users section of the FIRM panel)  
• M.S. River Mile

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index  
**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**  
April 16, 1988  
**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
September 28, 1989, September 4, 1991, July 19, 2001  
September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add rivers and other previously issued Letters of Map Revision, and to incorporate changes to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.  
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 1-800-338-9620.

**MAP SCALE 1" = 500'**  
250 0 500 1000 FEET  
160 0 160 300 METERS

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL O252H**

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

**PANEL 252 OF 4350**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	252	H
WICKENBURG, TOWN OF	040056	252	H

Notes to Users: The Map Numbers 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 04013C0252H**  
**MAP REVISED**  
**SEPTEMBER 30, 2005**  
Federal Emergency Management Agency

**FIGURE 8C**

**NOTES TO USERS**

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

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

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

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

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

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

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1986, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3191

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

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:8500 using HARN for control. Aerial photography is dated December 2009 to December 2002.

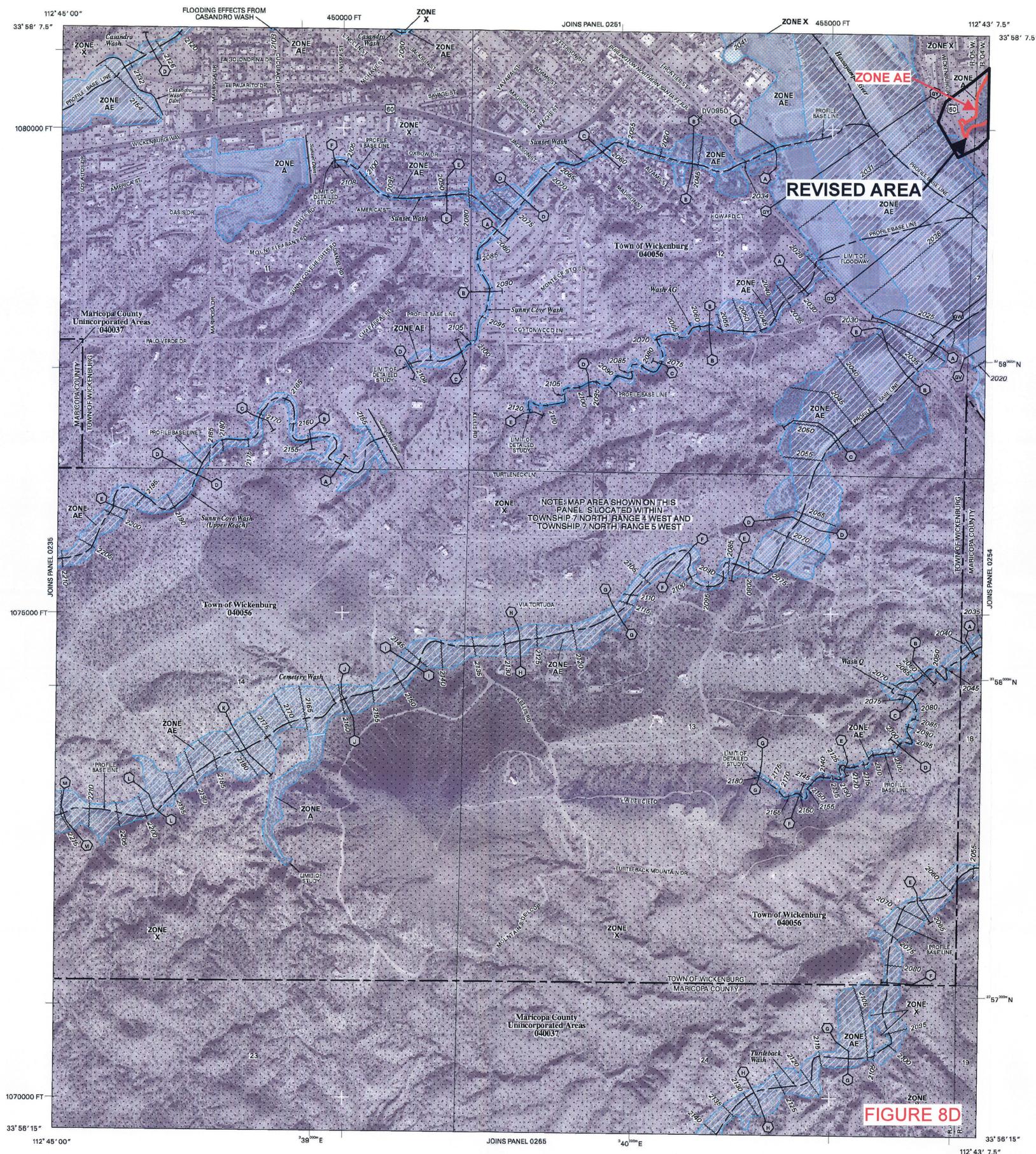
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

Contact the FEMA Map Service Center at 1-800-358-9619 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov>.

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



**LEGEND**

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled 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, AO, AR, AH, 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 steep flow on sloping terrain); average depths determined.

**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently determined. Zone AR indicates that the former flood control system is to be repaired to provide protection from the 1% annual chance or greater flood.

**ZONE AR9** Area is 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, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.  
Base Flood Elevation line and value; elevation in feet\*  
Base Flood Elevation value where uniform within zone; elevation in feet\*  
\* Referenced to the National Geodetic Vertical Datum of 1929

112° 07' 08", 33° 26' 41"  
76°00"E  
875000 FT  
5000-foot grid tick values; Arizona State Plane coordinate system, central zone (FIPS ZONE 3176) NAD83 (Transverse Mercator)  
D/V2313  
M.S.

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index  
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP  
April 15, 1988  
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL  
September 28, 1989; September 4, 1991; July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.  
For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.  
To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-838-6620.

**MAP SCALE 1" = 500'**  
0 250 500 1000 FEET  
0 150 300 METERS

**NFIP**

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0253H**

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

**PANEL 253 OF 4350**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0253	H
WICKENBURG, TOWNSHIP	040055	0253	H

Notice to User: The Map Numbers 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 04013C0253H**

**MAP REVISED**

**SEPTEMBER 30, 2005**

Federal Emergency Management Agency

**FIGURE 8D**

**NOTES TO USERS**

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1928 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The projection used in the preparation of this map was Arizona State Plane Zone 3178 (central Arizona). The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3191

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

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:8000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

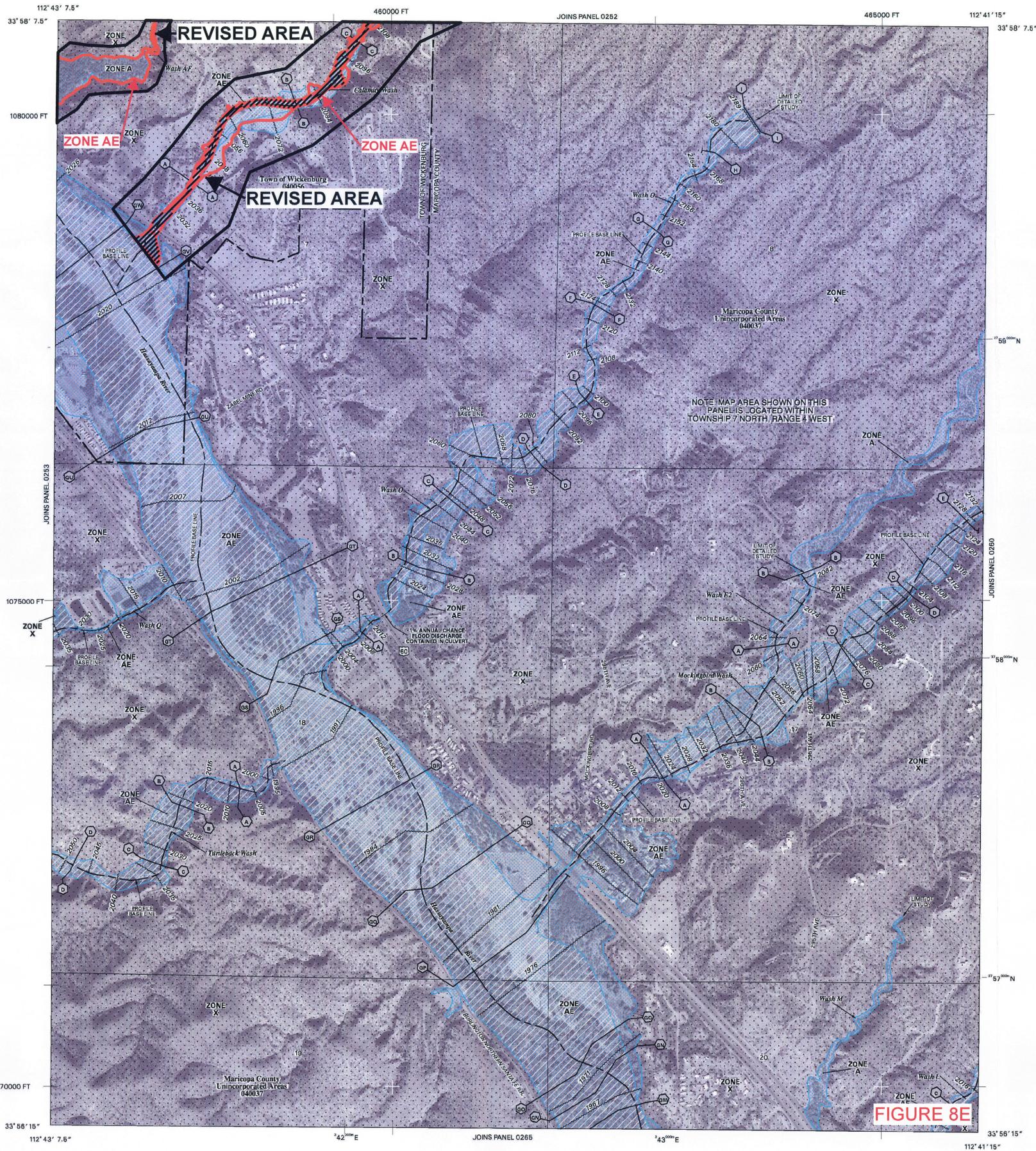
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

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

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-335-2627) or visit the FEMA website at <http://www.fema.gov>.



**LEGEND**

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

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

**ZONE A** No Base Flood Elevations determined.

**ZONE AE** Base Flood Elevations determined.

**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently determined. Zone AR indicates that the former flood control system is being retained to provide protection from the 1% annual chance or greater flood.

**ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

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

**OTHER FLOOD AREAS**

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

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

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

1% annual chance floodplain boundary  
0.2% annual chance floodplain boundary  
Floodway boundary  
Zone D boundary  
CBRS and OPA boundary  
Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.  
Base Flood Elevation line and value; elevation in feet\*  
Bench mark (see explanation in Notes to Users section of this FIRM panel)  
River Mile

\* Referenced to the National Geodetic Vertical Datum of 1929

○ Cross section line  
— Transsect line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.  
78mE 1000-meter Universal Transverse Mercator grid tick values zone 12.  
875000 FT 5000-foot grid tick values; Arizona State Plane coordinate system, central zone (FIPS:Zone 3178) NAD83 (Transverse Mercator)  
XD2313 Bench mark (see explanation in Notes to Users section of this FIRM panel)  
M.S. River Mile

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index  
**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**  
April 15, 1988  
**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
September 28, 1989; September 4, 1991; July 19, 2001  
September 30, 2005 to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change flood designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.  
For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.  
To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-838-5620.

**MAP SCALE 1" = 500'**  
250 0 500 1000 FEET  
150 0 150 300 METERS

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0254H**

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

**PANEL 254 OF 4350**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	940087	0254	H
WICKLBURG, TOWN OF	940089	0254	H

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 04013C0254H**

**MAP REVISED SEPTEMBER 30, 2005**

Federal Emergency Management Agency

**FIGURE 8E**