



Technical Data Notebook

Upper Rawhide Wash Floodplain Delineation Study (FCD 98-12)

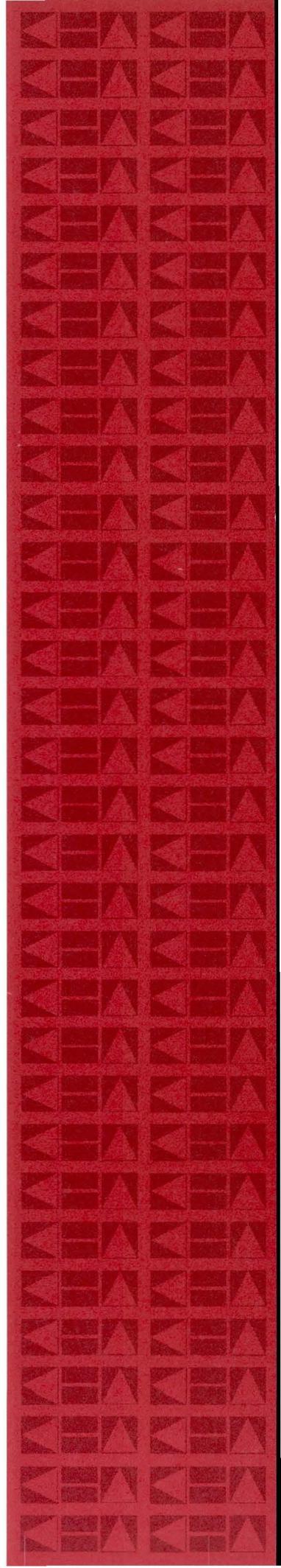
Volume 1 of 4

Prepared for:
Flood Control District of Maricopa County

Kimley-Horn and Associates, Inc.
March, 2002
KHA Project #091131.02



Kimley-Horn
and Associates, Inc.





Kimley-Horn
and Associates, Inc.

March 12, 2002

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

Mr. Richard Harris, P.E.
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85003

Re: Upper Rawhide Wash Flood Insurance Study
FCD 98-12
KHA No. 091131002

Dear Richard,

For this final submittal we are including the final TDNs, Volumes 1-4 for the study, and the final mylars. The mylars and all four volumes have been sealed with the date of March 11, 2002 in order to minimize confusion for future users as to which is the final versus which is a draft. The following changes were made since the draft final submittal.

- Volume 1 was updated to include the FEMA approval of the study.
- Volume 2 – no substantial changes.
- Volume 3- no substantial changes.
- Volume 4- no substantial changes.

The final invoice and an invoice for release of retainage, in addition to any final forms required to close out the project, will follow by the end of the week.

Richard, we have enjoyed working with you and thank you for the effort you expended in wrapping this project up. We look forward to future opportunities to work together.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Doug Plasencia, P.E.
Project Manager

DJP:ske

■
TEL 602 944 5500
FAX 602 944 7423

Technical Data Notebook

Upper Rawhide Wash Floodplain Delineation Study

FCD 98-12

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Flood Control District of MC Library
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Phoenix, AZ 85009

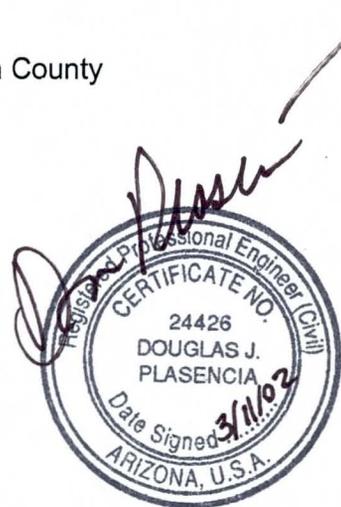
Volume 1 of 4

Prepared For:

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

Prepared By:

Kimley-Horn and Associates, Inc.
Suite 250
7600 N. 15th Street
Phoenix, Arizona 85020
(602) 944-5500



KHA 091131.02
March, 2002

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1.1 PURPOSE

This floodplain delineation study has been undertaken at the request of the City of Scottsdale through the Flood Control District of Maricopa County (FCDMC) to develop Flood Insurance Study (FIS) watershed hydrology for the Upper Rawhide Wash in Scottsdale, Arizona. The study reflects current land use conditions and makes use of more detailed topographic mapping than was available for the original study.

1.2 AUTHORITY

The FCDMC retained the services of Kimley-Horn and Associates, Inc. for the delineation of the floodplain limits of the Upper Rawhide Wash. This report includes all supporting technical documentation for the floodplain delineation. The client contact for the study is as follows:

Project Manager: Mr. Richard Harris, P.E.,
Project Manager
Flood Control District of Maricopa County
2801 W. Durango
Phoenix, AZ 85009
(602) 506-1501

1.3 LOCATION

The project consists of approximately twelve (12) river miles of the Upper Rawhide Wash and four (4) of its major tributaries. The watershed is approximately 14 square miles. The study area is located as follows: (see Figure 1-1 and Figure 1-2).

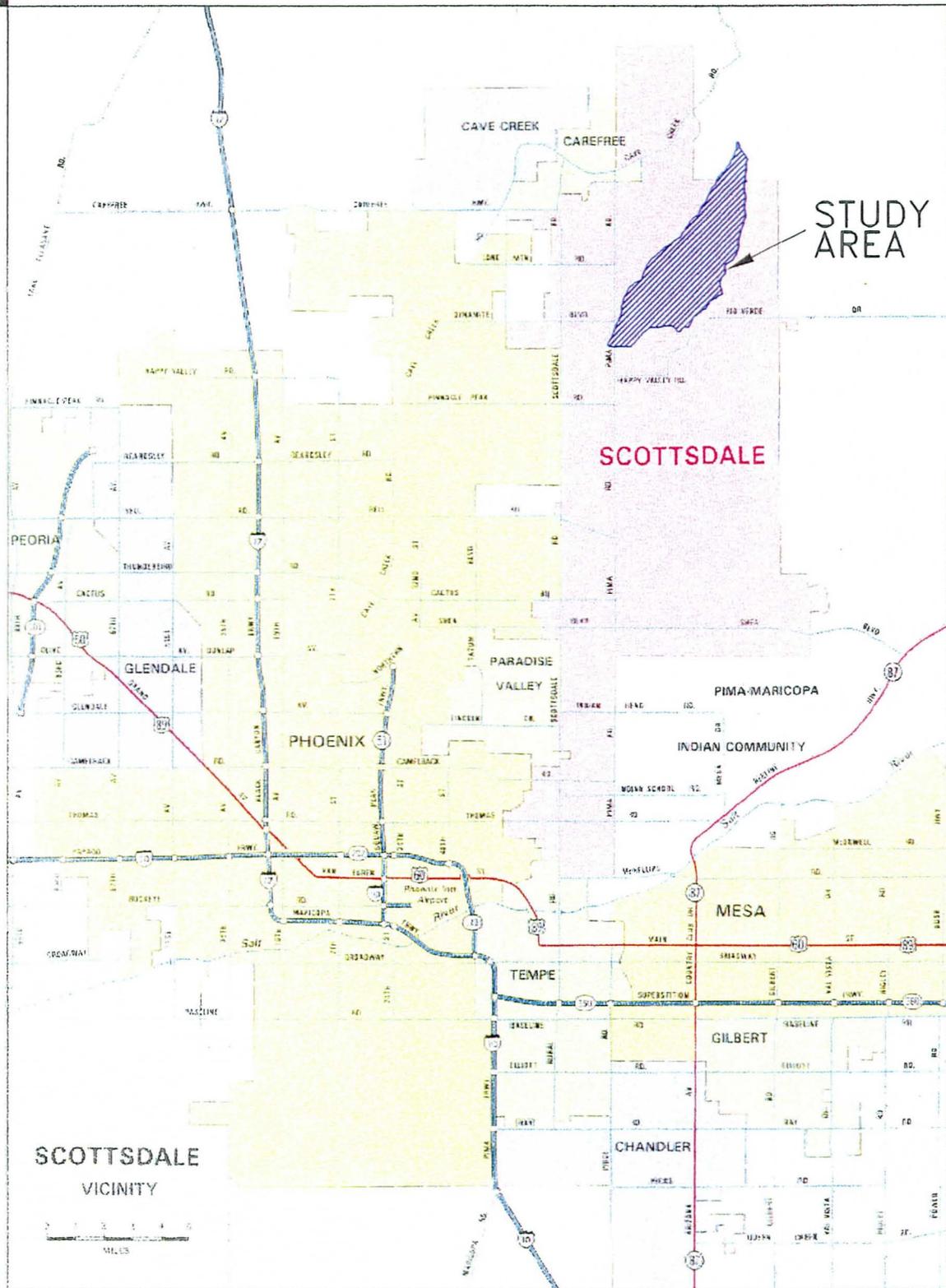
Rawhide Wash (main stem): Starting at the current FIS limit of detailed study for Wash 4D (Rawhide Wash approximately 1,800 feet south of Dynamite Boulevard) and extending upstream approximately 6.9 miles to the Tonto National Forest Boundary/City of Scottsdale corporate boundary from Township 5 North, Range 4 East to Township 6 North, Range 5 East.

Tributary 1 (RW20): Starting at its confluence with Rawhide Wash and extending upstream approximately 1.1 miles to the south section line of Section 16 (Lone Mountain Road alignment), Township 5 North, Range 5 East.

Tributary 2 (RW17): Starting at its confluence with Tributary RW18 and extending upstream approximately 1.1 miles to the east section line of Section 9 (112th Street alignment), Township 5 North, Range 5 East.

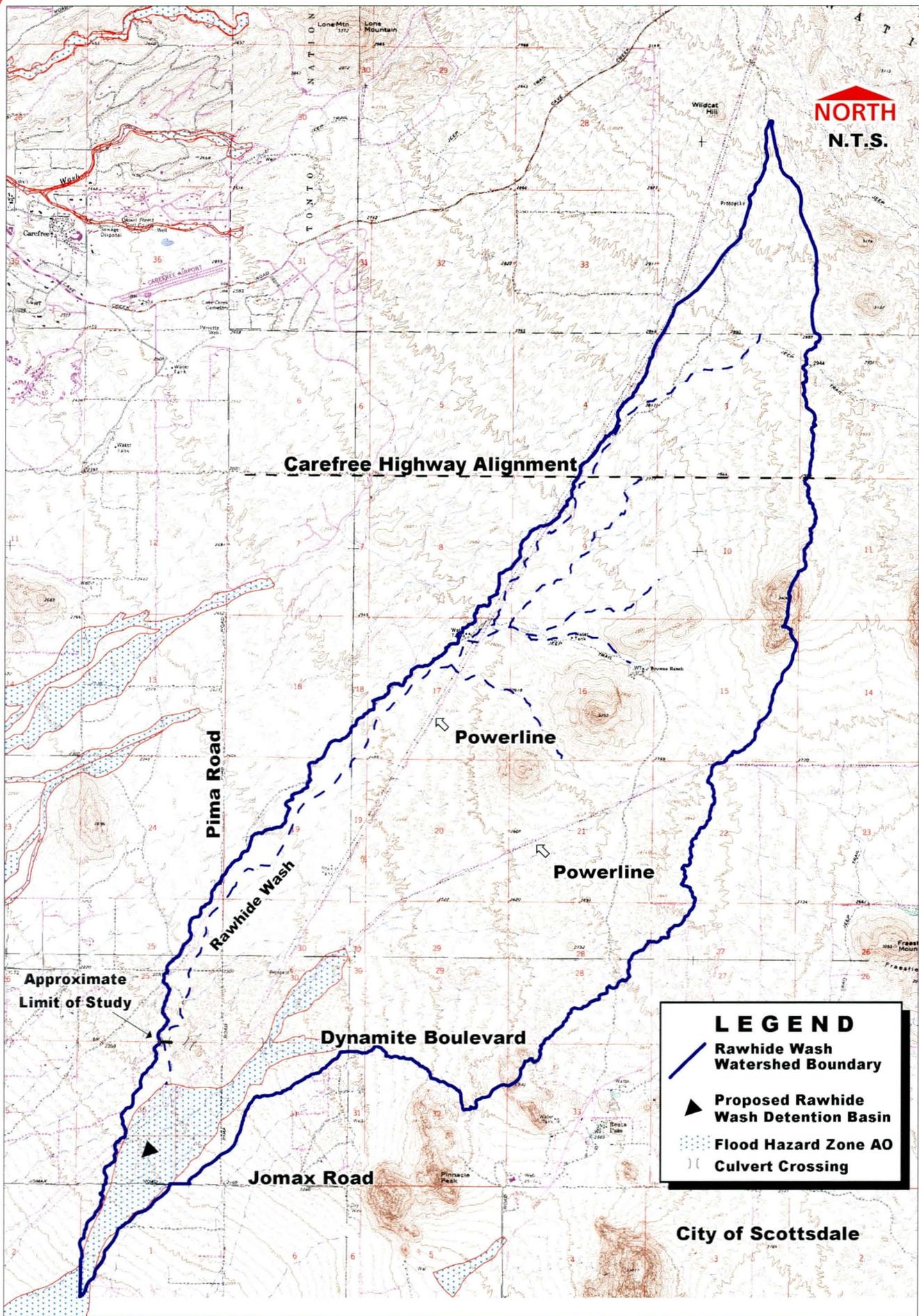
Tributary 3 (RW16): Starting at its confluence with Tributary RW18 and extending upstream approximately 1.6 miles to the north section line of Section 9 (Carefree Highway alignment), Township 5 North, Range 5 East.

Tributary 4 (RW18): Starting at its confluence with Rawhide Wash and extending upstream approximately 1.3 miles to a confluence located approximately 1,100 feet west of the east section line of Section 16 (112th Street alignment), Township 5 North, Range 5 East.



Kimley-Horn
and Associates, Inc.

FIGURE 1-1 VICINITY MAP



Carefree Highway Alignment

Pima Road

Powerline

Powerline

Rawhide Wash

Approximate Limit of Study

Dynamite Boulevard

Jomax Road

LEGEND

-  Rawhide Wash Watershed Boundary
-  Proposed Rawhide Wash Detention Basin
-  Flood Hazard Zone AO
-  Culvert Crossing

City of Scottsdale

1.4 METHODOLOGY USED FOR HYDROLOGY AND HYDRAULICS

1.4.1 Hydrology

The hydrology for this project was completed using the methodology outlined in the Maricopa County Drainage Design Manual. The computer programs used were the District's Drainage Design Menu System (DDMS) and the U.S. Army Corps of Engineers HEC-1 modeling program. The Green and Ampt methodology was used for estimation of rainfall losses and the Clark Unit Hydrograph procedure was used to determine the runoff hydrographs.

1.4.2 Hydraulics

The U. S. Army Corps of Engineers HEC-RAS, Version 2.2, with SNET 2.2.1, was used to conduct the hydraulic modeling. The version of HEC-RAS used for this study supports one-dimensional, steady flow, water surface profile calculations. This version also supports only fixed channel bed conditions and does not have sediment transport capabilities.

1.5 ACKNOWLEDGMENTS

Special thanks to those individuals who helped in the preparation of this report.

Representatives from the Flood Control District of Maricopa County:

Richard Harris, P.E., Project Manager

Afshin Ahouraiyan, Hydrologist

Marta Dent, HIS

Representatives from the City of Scottsdale:

Collis Lovely, Drainage Planner

1.6 STUDY RESULTS

A review of the results indicates a reasonable water surface profile for Rawhide Wash, Tributary 1, Tributary 2, Tributary 3, and Tributary 4 using the estimated "n" values considering what was anticipated based on general field observations. A review of calculated flow velocities in each hydraulic model indicates that they fall in a reasonable range that one would anticipate given the physical characteristics of the study area.

Table 2-1: Form SSA1-97

| Study Documentation Abstract for FEMA Submittals | Initial Study <input checked="" type="checkbox"/> | Restudy | CLOMR | LOMR | Other |
|---|--|---------|--|------|-------|
| SECTION 2.1: Study Documentation for FEMA Submittals | | | | | |
| 2.1.1 | Date Study Accepted | | | | |
| 2.1.2 | Study Contractor Contact Address Phone Internal Reference Number | | Kimley-Horn and Associates, Inc. Doug Plasencia, P.E. (Project Manager) 7600 North 15 th Street, Suite 250 Phoenix, AZ 85020 (602) 944-5500 091131.02 | | |
| 2.1.3 | FEMA Technical Review Contractor Contact(s) Address Phone Internal Reference Number | | | | |
| 2.1.4 | FEMA Regional Reviewer Phone | | | | |
| 2.1.5 | State Technical Reviewer Phone | | | | |
| 2.1.6 | Local Technical Reviewer Phone | | David Boggs, Flood Control District of Maricopa County (602) 506-1501 | | |
| 2.1.7 | Reach Description | | T5N, R4E to T6N, R5E: FIRM Map No. 04013C0820E, Panel 820 of 4350; FIRM Map No. 04013C0850D, Panel 850 of 4350; FIRM Map No. 04013C1235E, Panel 1235 of 4350; FIRM Map No. 04013C1255E, Panel 1255 of 4350 | | |
| 2.1.8 | USGS Quad Sheet(s) with original photo date & latest photo revision date | | Cave Creek (1981) Curry's Corner (1982) Wildcat Hill (1981) McDowell Peak (1982) | | |
| 2.1.9 | Unique Conditions and Problems | | None | | |
| 2.1.10 | Coordination of Q's Discharges (Agency, Date, Comments) | | None | | |
| SECTION 2.2: FEMA Forms | | | | | |

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

- CLOMR A letter from 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 FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)
- Other Describe: New Study

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

- Physical Change
- Improved Methodology/Data
- Floodway Revision
- Other Describe: New Study

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Rawhide Wash

3. Project Name/Identifier: Upper Rawhide Wash Delineation Study

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

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

| Community No. | Community Name | State | Map No. | Panel No. | Effective Date |
|---------------|---------------------|-------|---------|-----------|----------------|
| Ex: 480301 | Katy, City | TX | 480301 | 0005D | 02/08/83 |
| 480287 | Harris County | TX | 48201C | 0220G | 09/28/90 |
| 045012 | Scottsdale, City of | AZ | 04013C | 0820E | 12/03/93 |
| | | | | 0850D | 04/15/88 |
| | | | | 1235E | 12/03/93 |
| | | | | 1255E | 12/03/93 |

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

| <u>Types of Flooding</u> | | <u>Structures</u> | |
|--|--|--|--|
| <input checked="" type="checkbox"/> Riverine | | <input type="checkbox"/> Channelization | |
| <input type="checkbox"/> Coastal | | <input type="checkbox"/> Levee/Floodwall | |
| <input type="checkbox"/> Alluvial fan | | <input checked="" type="checkbox"/> Bridge/Culvert | |
| <input type="checkbox"/> Shallow Flooding (e.g. Zones AO and AH) | | <input type="checkbox"/> Dam | |
| <input type="checkbox"/> Lakes | | <input type="checkbox"/> Fill | |
| <input type="checkbox"/> Other (describe) | | <input type="checkbox"/> Other (describe) | |

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
 Yes No

Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? Yes No N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? Yes No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for performing overseeing compliance with the maintenance and operation plans of the

(Name)

flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. Yes No N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. Yes No Fee amount: \$

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt.
 Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

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



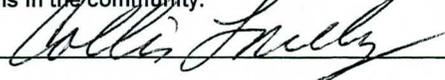
Signature of Revision Requester

Richard Harris, P.E., Project Manager
 Printed Name and Title of Revision Requester

Maricopa County Flood Control District
 Company Name

Telephone No.: (602)506-4528 Date: 6/7/2001

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



Signature of Community Official

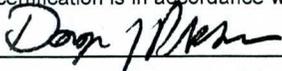
Collis Lovely, Public Works Planner
 Printed Name and Title of Community Official

City of Scottsdale
 Community Name

Telephone No.: (480) 312-7852 Date: 6/7/2001

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2



Signature

Doug Plasencia, P.E., Vice President
 Printed Name and Title of Revision Requester

Registr. No. 24426 Expires (Date) 12/31/02 State AZ

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

| Form Name and (Number) | Required if |
|--|---|
| <input checked="" type="checkbox"/> Hydrologic (3) | new or revised discharges |
| <input checked="" type="checkbox"/> Hydraulic (4) | new or revised water-surface elevations |
| <input type="checkbox"/> Mapping (5) | floodplain/floodway changes |
| <input type="checkbox"/> Channelization (6) | channel is modified |
| <input checked="" type="checkbox"/> Bridge/Culvert (7) | addition/revision of bridge/culvert |
| <input type="checkbox"/> Levee/Floodwall (8) | addition/revision of levee/floodwall |
| <input type="checkbox"/> Coastal (9) | new or revised coastal elevations |
| <input type="checkbox"/> Coastal Structures (10) | addition/revision of coastal structure |
| <input type="checkbox"/> Dam (11) | addition/revision of dam |
| <input type="checkbox"/> Alluvial Fan (12) | structures proposed on alluvial fan |

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

1. REASON FOR NEW HYDROLOGIC ANALYSIS

- No existing analysis Improved data Changed physical condition of watershed
 Alternative methodology Proposed Conditions (CLOMR) Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, please provide a diskette with the input files for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: Yes No Diskettes provided: Yes No

2. METHODOLOGY FOR NEW ANALYSIS

| Indicate Method | Required Data | Data Included |
|---|--|---|
| <input type="checkbox"/> Statistical Analysis of Gage Records | Form 3 - Attachment A | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input checked="" type="checkbox"/> Regional Regression Equations | Form 3 - Attachment C | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| <input checked="" type="checkbox"/> Precipitation/Runoff Model | Form 3 - Attachment D | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| <input checked="" type="checkbox"/> Other | Back-up computations and supporting data | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. Yes No Not Required

If Yes, attach evidence of approval. Approval attached. If No, attach explanation. Explanation attached.

4. COMPARISON OF BASE FLOOD DISCHARGES

Location: _____ Drainage Area (SqMi) _____ FIS(cfs) _____ Revised (cfs) _____

N/A

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. Explanation Included Explanation Not Required

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. Data Attached Data Not Available

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ATTACHMENT A: STATISTICAL ANALYSIS OF GAGE RECORDS

Gaging Station:

Gage Location (latitude and longitude):

| | | FIS: | | Revised: | |
|-----|--|------------------------------|-----------------------------|------------------------------|-----------------------------|
| 1. | Number of years of data Systematic Historical | | | | |
| 2. | Homogeneous data | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. | Data adjustments | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. | Number of high outliers Low outliers Zero events | | | | |
| 5. | Generalized skew | | | | |
| 6. | Station skew | | | | |
| 7. | Adopted skew | | | | |
| 8. | Probability distribution used (justify if log-Pearson III was not used) | | | | |
| 9. | Transfer equations to ungaged sites If Yes, specify method | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10. | Expected probability* | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 11. | Comparison of results with other analyses If Yes, describe comparison | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 12. | Attach analysis including plot of flood-frequency curve. Analysis Attached? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | | |

*FEMA does not accept expected probability analyses for the purpose of reflecting flood hazard information in a FIS.

If any data are not available, indicate by N/A.

ATTACHMENT B: CONFIDENCE LIMITS EVALUATION

Stream:

Select one location for Confidence Limits Evaluation (*describe location*):

| 1. | Discharges for selected location: Exceedence Probability | FIS: | Revised: |
|----|---|-----------|-----------|
| | 10% (10-year) | _____ cfs | _____ cfs |
| | 2% (50-year) | _____ cfs | _____ cfs |
| | 1% (100-year) | _____ cfs | _____ cfs |
| | 0.2% (500-year) | _____ cfs | _____ cfs |

2. 1% Annual Chance (Base) Flood Confidence Intervals

| | |
|--------------------------|---------------------|
| 90% Confidence Interval: | 5% limit _____ cfs |
| | 95% limit _____ cfs |
| 50% Confidence Interval: | 25% limit _____ cfs |
| | 75% limit _____ cfs |

3. If the discharge of the base flood in the FIS is beyond the 50% confidence interval but within the 90% confidence interval, does the base flood elevation change by 1.0 foot or more? Yes No

An example of confidence limits analysis can be found in Appendix 9 of Bulletin 17B.

4. Confidence Limits Analysis Attached? Yes No

ATTACHMENT C: REGIONAL REGRESSION EQUATIONS

Bibliographical Reference:

Arizona Department of Transportation Highway Drainage Design Manual Hydrology, March 1993, p 10-5 - 10-15.

(Attach a copy of title page, table of contents, and pertinent pages including equations.)

- 2. Gaged or ungaged stream: Upper Rawhide Wash
- 3. Hydrologic region(s): 12 & 13
Attach backup map.
- 4. Provide parameters, values, and source of data used to define parameters.

- | | FIS: | | Revised: | |
|--------------------------------------|------------------------------|-----------------------------|---|--|
| 5. Urbanized conditions calculations | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 6. Percent of watershed urbanization | | | <u>N/A</u> | |
| 7. Is the watershed controlled? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 8. Comparison with other analyses | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

If the answer to 5, 7, or 8 is Yes, explain methodology below. If data are not available, indicate with N/A.

Comments

Compared to two previous studies. (SEE SECTION 4 OF REPORT)

- 9. Attach computation and supporting maps, delineating the watershed boundary and drainage area divides.

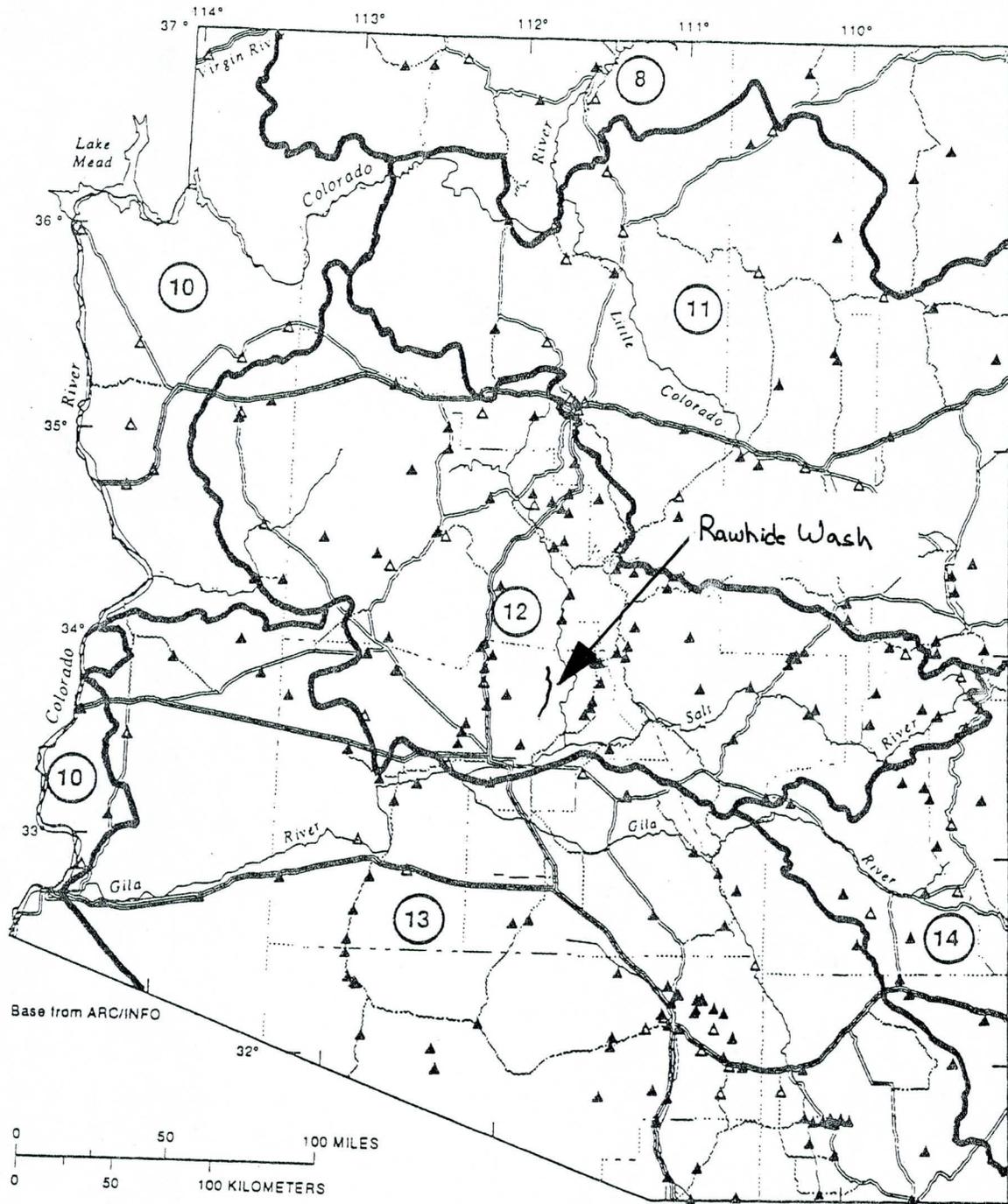
Computation and Supporting Maps provided? Yes No

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

| | FIS: | Revised: |
|--|---|---|
| 1. Method or model used: | | <u>HEC-1</u> |
| Version: | | <u>4.1</u> |
| Date: | | <u>July, 1997</u> |
| 2. Source of rainfall depth: | | <u>NOAA Atlas 2, Vol VIII</u> |
| 3. Source of rainfall distribution: | | <u>FCD of Maricopa County</u> |
| 4. Rainfall duration: | | <u>24hr</u> |
| 5. Areal adjustment to precipitation (%): | | <u>0.928 (Section 4 of Report)</u> |
| 6. Maximum overland flow length | | <u>N/A (Section 4 of Report)</u> |
| 7. Hydrograph development method: | | <u>Clark Unit Hydrograph</u> |
| 8. Loss rate method: | | <u>Green and Ampt</u> |
| Source of soils information: | | <u>City of Scottsdale</u> |
| Source of land use information: | | <u>City of Scottsdale General Plan</u> |
| 9. Channel routing method: | | <u>Normal Depth</u> |
| 10. Reservoir routing: | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 11. Baseflow considerations: If Yes, explain below how baseflow was determined: | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 12. Snowmelt considerations: | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 13. Model calibration: If Yes, explain below how calibration was performed | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 14. Future land use condition: If Yes, explain why below | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 15. Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides. | | |
| Information and Maps provided? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | |

NOTE: FEMA policy is to base flooding on existing conditions.

FIGURE 10-9
FLOOD REGIONS IN ARIZONA



| EXPLANATION | | | | | |
|---|---------------------------|---|--------------------|---|----------------------------|
|  | BOUNDARY OF FLOOD REGIONS |  | INTERSTATE HIGHWAY |  | GAGING STATION |
|  | 11 FLOOD-REGION NUMBER |  | U.S. HIGHWAY |  | Station relation undefined |
| | |  | STATE HIGHWAY | | |

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? Yes

Downstream Limit: SEE SECTION 1 OF REPORT

Upstream Limit: SEE SECTION 1 OF REPORT

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:

Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:

Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model Natural File Name _____ Floodway File Name _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model Natural File Name _____ Floodway File Name _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model Natural File Name _____ Floodway File Name _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model Natural File Name _____ Floodway File Name _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. Natural Floodway

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Starting Watersurface Elevation

| Reach | Program | Note |
|--------------|-----------|--|
| Rawhide Wash | Main.prj | Normal Depth S=0.035 |
| Tributary 1 | Trib1.prj | Fixed watersurface elevation from Rawhide Wash |
| Tributary 2 | Trib2.prj | Fixed watersurface elevation from Rawhide Wash |
| Tributary 3 | Trib3.prj | Fixed watersurface elevation from Tributary 2 |
| Tributary 4 | Trib4.prj | Fixed watersurface elevation from Tributary 2 |

| Tributary # | Station | | | | Distance between Stations (ft) | Distance from "Below" to Confluence (ft) | Calculated Starting WSEL |
|-------------|-----------------------|-----------|-----------------------|-----------|--------------------------------|--|--------------------------|
| | Below Confluence (ft) | WSEL (ft) | Above Confluence (ft) | WSEL (ft) | | | |
| 1 | 11.626 | 2560.02 | 11.72 | 2568.04 | 496.32 | 175 | 2562.8 |
| 2 | 11.908 | 2584.08 | 11.992 | 2590.01 | 443.52 | 70 | 2585.0 |
| 3 | 0.256 | 2606.62 | 0.343 | 2612.19 | 459.36 | 143 | 2608.4 |
| 4 | 0.256 | 2606.62 | 0.343 | 2612.19 | 459.36 | 72 | 2607.5 |

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

This is a Manual Digital submission. *Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance as possible.*

1. MAPPING CHANGES

1. A topographic workmap must be submitted showing the following information (check N/A when not applicable):

- | | | | |
|---|---|-----------------------------|---|
| a. Revised approximate 100-year floodplain boundaries (Zone A)..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| b. Revised detailed 100- and 500-year floodplain boundaries. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| c. Revised floodway boundaries..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| d. Location and alignment of all cross sections with stationing control indicated. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| e. Stream alignments, road alignments and dam alignments. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| f. Current community boundaries. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| g. Effective 100- year floodplain and floodway boundaries from FIRM/FBFM reduced or enlarged to the scale of the topographic workmap..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Tie-ins between the effective and revised 100-, 500-year and floodway boundaries..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| h. The requester's property boundaries and community easements..... | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| i. The signed certification of a registered professional engineer..... | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| j. Location and description of reference marks..... | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| k. Vertical datum (example: NGVD, NAVD)..... | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| l. Coastal zone designations tie into adjacent areas not being revised..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| m. Location and alignment of all coastal transects used to revise the coastal analyze..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| n. V-zone has been delineated to extend landward to the heel of the primary frontal dune..... | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |

If any items are marked No or N/A please attach an explanation.

2. What is the source and date of the updated topographic information (example: orthophoto maps, July 1985; filed survey, May 1979, beach profile, June 1987 etc.)? Digital Topo Maps produced by photogrammetric methods from aerial photography obtained September - November 1993 by Michael Baker, Jr., Inc. SEE SECTION 3 OF REPORT

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

Effective FIS Scale N/A Contour Interval N/A

Revision Request Scale 1" = 200' Contour Interval 1' and 2'

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

4. Attach an annotated FIRM/FBFM at the scale of the effective FIRM/FBFM showing the revised 100- and 500-year floodplain and the floodway boundaries and how they tie into those shown on the effective FIRM/FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies. FIRM/FBFM attached? Yes No

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. EARTH FILL PLACEMENT

1. The fill is: Existing Proposed
2. Has fill been/will be placed in the regulatory floodway? Yes No
If Yes, please attach completed Riverine Hydraulic Analysis Form (Form 4).
3. Has fill been/will be placed in floodway fringe (*area between the floodway and 100-year floodplain boundaries*)? Yes No
If Yes, then complete A, B, C, and D below.
- a. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? Yes No
If Yes, justify steeper slopes
- b. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? (*Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.*)
 Yes No
If No, describe erosion protection provided
- c. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test Method or acceptable equivalent method? Yes No
- d. Can structures conceivably be constructed on the fill at any time in the future? Yes No
If Yes, attach certification of fill compaction (item 3c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer in accordance with Subparagraph 65.5(a)(6) of the NFIP regulations.
- Fill certification attached Yes No
4. Has fill been/will be placed in a V zone? Yes No
If Yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall?
 Yes No
If Yes, attach the Coastal Structures Form (Form 10).

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Culvert

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

Cross-Section 8.000 (Dynamite Road)

3. This revision reflects (check one of the following):

- New bridge/culvert not modeled in the FIS
 Modified bridge/culvert previously modeled in the FIS
 New analysis of bridge/culvert previously modeled in the FIS

4. 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 structure(s). (Attach justification)

Justification attached Yes No N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

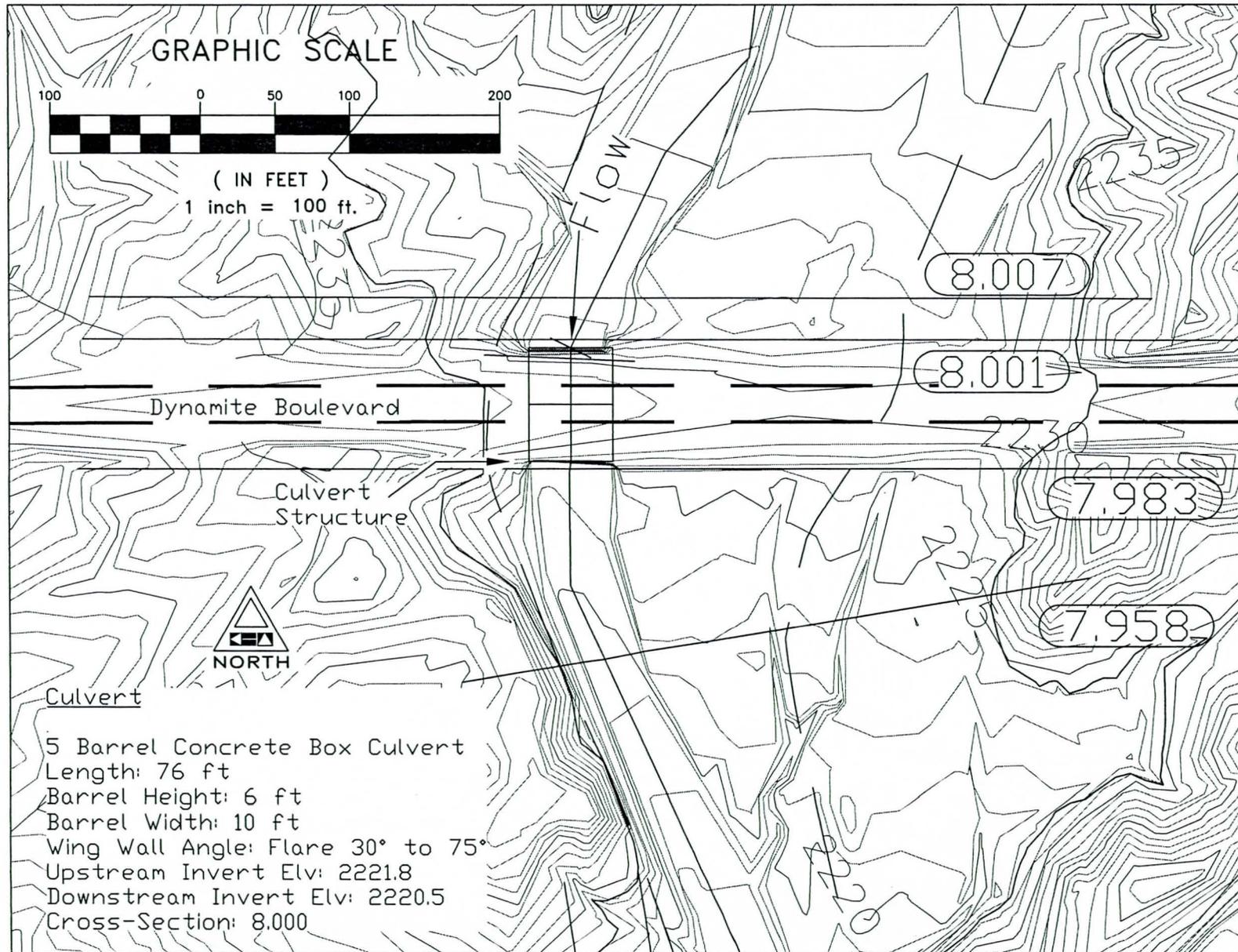
Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- Dimensions (height, width, span, radius, length)
- Shape (culverts only)
- Material
- Beveling or Rounding
- Wing Wall Angle
- 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
- Skew Angle
- Cross-Section Locations
- Distances Between Cross Sections
- Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

- Estimated sediment load
- Method used to estimate sediment transport
- Method used to estimate scour and/or deposition
- Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport



5 Barrel Concrete Box Culvert
 Length: 76 ft
 Barrel Height: 6 ft
 Barrel Width: 10 ft
 Wing Wall Angle: Flare 30° to 75°
 Upstream Invert Elv: 2221.8
 Downstream Invert Elv: 2220.5
 Cross-Section: 8.000

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Bridge #1

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

Cross-Section 8.920

3. This revision reflects (check one of the following):

- New bridge/culvert not modeled in the FIS
- Modified bridge/culvert previously modeled in the FIS
- New analysis of bridge/culvert previously modeled in the FIS

4. 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 structure(s). (Attach justification)

Justification attached Yes No N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

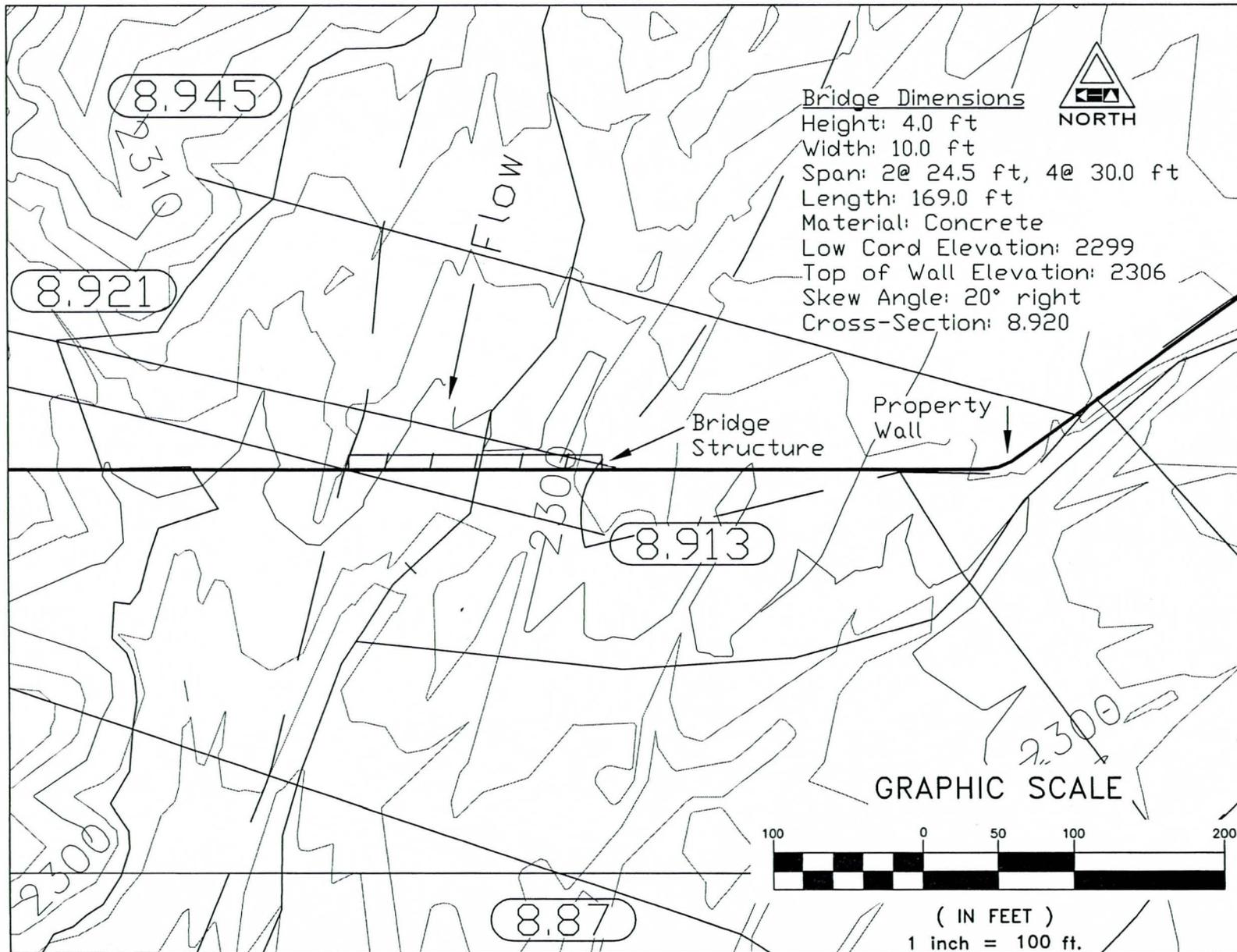
Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- Dimensions (height, width, span, radius, length)
- Shape (culverts only)
- Material
- Beveling or Rounding
- Wing Wall Angle
- 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
- Skew Angle
- Cross-Section Locations
- Distances Between Cross Sections
- Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

- Estimated sediment load
- Method used to estimate sediment transport
- Method used to estimate scour and/or deposition
- Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport



PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: City of Scottsdale

Flooding Source: Rawhide Wash

Project Name/Identifier: Upper Rawhide Wash Floodplain Delineation Study

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Bridge #2

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

Cross-Section 9.152

3. This revision reflects (check one of the following):

- New bridge/culvert not modeled in the FIS
 Modified bridge/culvert previously modeled in the FIS
 New analysis of bridge/culvert previously modeled in the FIS

4. 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 structure(s). (Attach justification)

Justification attached Yes No N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

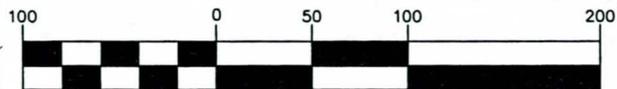
- Dimensions (height, width, span, radius, length)
- Shape (culverts only)
- Material
- Beveling or Rounding
- Wing Wall Angle
- Low Chord Elevations - Upstream and Downstream
- Top of Road Elevations - Upstream and Downstream
- Structure Invert Elevations - Upstream and Downstream
- Stream Invert Elevations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

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

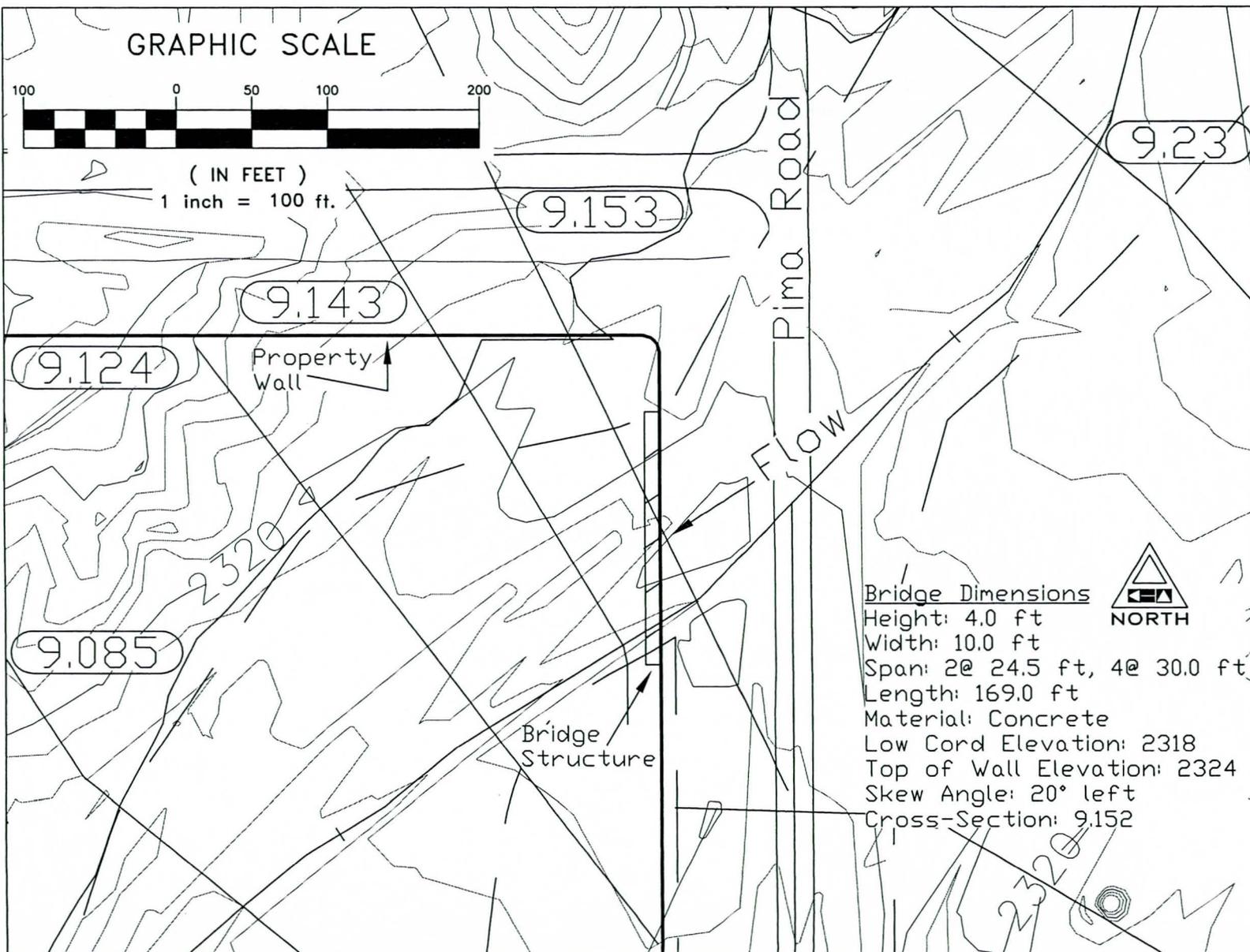
- Estimated sediment load
- Method used to estimate sediment transport
- Method used to estimate scour and/or deposition
- Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

GRAPHIC SCALE



(IN FEET)

1 inch = 100 ft.



Bridge Dimensions

- Height: 4.0 ft
- Width: 10.0 ft
- Span: 2@ 24.5 ft, 4@ 30.0 ft
- Length: 169.0 ft
- Material: Concrete
- Low Cord Elevation: 2318
- Top of Wall Elevation: 2324
- Skew Angle: 20° left
- Cross-Section: 9.152



Refer to Volume 2 of 4 for Technical Data Notebook Section 3 – Survey and Mapping Information.

Refer to Volume 3 of 4 for Technical Data Notebook Section 4 – Hydrology.

Refer to Volume 4 of 4 for Technical Data Notebook Section 5 – Hydraulics.

Not part of this study

Refer to Volume 4 of 4 for Technical Data Notebook Section 7 - Draft FIS Report Data.

A.1 DATA COLLECTION SUMMARY

A.2 REFERENCED DOCUMENTS

A.1 DATA COLLECTION SUMMARY

The following items were used for purposes of our study:

- 1) FIRM (Flood Insurance Rate Map) Community-Panel # 04013C0820E, # 04013C0850D, # 04013C1235E # 04013C1255E
- 2) FIS (Flood Insurance Study) Maricopa County, Arizona and Incorporated Areas, Volumes 1-12, Federal Emergency Management Agency, September 30, 1995.

A.2 REFERENCED DOCUMENTS

- 1) U.S. Geological Survey, Water Resources Division, "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona," April 1991.
- 2) U.S. Geological Survey, "Verification of Roughness Coefficients for Select Natural and Constructed Channels in Arizona", Professional Paper-1584, 1998.
- 3) Federal Emergency Management Agency, "Flood Insurance Study Guidelines and Specifications for Study Contractors, FEMA 37", January 1995.
- 3) Flood Control District of Maricopa County, Engineering Division, "Drainage Design Manual for Maricopa County, Arizona Volume I Hydrology", 1995.
- 4) Flood Control District of Maricopa County, Engineering Division, "Drainage Design Manual for Maricopa County, Arizona Volume II Hydraulics", 1996.
- 5) Soil Conservation Service "Urban Hydrology for Small Watersheds, Technical Release 55," June 1986.
- 6) Chow, Ven Te, "Open Channel Hydraulics," (Manning's n), 1959.
- 7) U.S. Army Corps of Engineers, Hydrologic Engineering Center, "HEC-RAS River Analysis System User's Manual," Version 2.2, September 1998.
- 8) U.S. Army Corps of Engineers, Hydrologic Engineering Center, "HEC-1 Flood Hydrograph Package User's Manual," Version 4.0, September 1990.
- 9) B.N. Aldridge and J.M. Garret, "Roughness Coefficients for Stream Channels in Arizona," United States Department of the Interior Geological Survey, February, 1973

APPENDIX B General Documentation & Correspondence

B.1 SPECIAL PROBLEM REPORTS

B.2 CONTACT (TELEPHONE) REPORTS

B.3 MEETING MINUTES OR REPORTS

B.4 GENERAL CORRESPONDENCE

B.5 CONTRACT SCOPE

B.1 SPECIAL PROBLEM REPORT



FILE
091131002
RAWHIDE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

2801 West Durango Street - Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

COVER SHEET

TO: Bob Eichenger or John Ahern

Company or Department: Kimley - Horn Fax # 602 944-7423

FROM: David Boggs

Number of pages being sent including Cover Sheet Two

Comments: Here's the letter from COS with our "go ahead".
A recent inventory of GIS submittals shows 0% from
Upper Rawhide Wash. Can you advise when you expect
some GIS to be submitted - for our planning / serv
scheduling.
Thanks DB



• "Most Livable City" U.S. Conference of Mayors •

Attn: Bob Eickenger
John Ahearn

February 18, 2000

David Boggs
Flood Control District Maricopa County
2801 W. Durango
Phoenix, AZ 85009

Re: Upper Rawhide FPDS Hydrology

Dear Mr. Boggs:

This letter is to inform you of our approval of the use of the 24 hour peak flow values (or six hour which ever is larger) generated in the hydrologic modeling by Kimley Horn and Associates for the floodplain mapping of the Upper Rawhide Wash. One exception is at the breakout identified at CP012. Because of the unstable nature of our alluvial sand bed channels we don't feel confident that the hydraulic section assumed by Kimley Horn will be stable over time. For floodplain mapping purposes we prefer to make the conservative assumption that 100% of the flow stays within the Rawhide watershed and is routed through reach R030-1.

There also is the potential for a future capital improvement project to completely cutoff the flow split to the west with a structural flood control measure. The city would like to keep this floodplain management option open by assuming all the flow stays in the main Rawhide channel.

If you have any questions, please ask and we will be more than happy to assist you.

Sincerely,

Collis J. Lovely
Public Works Planner, Drainage and Flood Control

c: Dave Meinhart, Senior Public Works Planner, Acting Floodplain Manager

P:\Transportation\Planning\Lovely\upperawhidehydro

| | |
|---------------------------------|--------|
| FLOOD CONTROL DISTRICT RECEIVED | |
| FEB 28/2000 | |
| CHENG. | P & PM |
| PIO | REG |
| ADMIN | PWLMGT |
| FINANCE | FILE |
| O & M | |
| ENGR | |
| REMARKS | DBB |

CITY OF SCOTTSDALE • TRANSPORTATION DEPARTMENT • 7447 E. INDIAN SCHOOL RD., SUITE 205 • SCOTTSDALE, ARIZONA • 85251
PHONE (480) 312-7696 • FAX (480) 312-4000



FLOOD CONTROL DISTRICT

OF MARICOPA COUNTY

2801 West Durango Street · Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

COVER SHEET

TO: Douglas Placencia

Company
or Department: Kimley-Horne + Assoc

⁶⁰²
Fax # 944-7423

FROM: David Boggs

Number of pages being sent including Cover Sheet: 2

Comments: Doug, attached is COS's official
OK for the hydrology for Upper Rawhide. I thought
you already had a copy of this. All we are
doing is checking the HEZ-1 input/out diskette
you submitted for conformity to the Q's in your
spreadsheet w/ + w/o diversion. There's no reason
to delay HEZ-RAS for reasons of Q's. Again I
must check w/ Marta (on Monday) about HIS submittal.
If you want to pursue this further, immediately,
call Ed Raleigh.



• "Most Livable City" U.S. Conference of Mayors •

February 18, 2000

David Boggs
Flood Control District Maricopa County
2801 W. Durango
Phoenix, AZ 85009

Re: Upper Rawhide FPDS Hydrology

Dear Mr. Boggs:

This letter is to inform you of our approval of the use of the 24 hour peak flow values (or six hour which ever is larger) generated in the hydrologic modeling by Kimley Horn and Associates for the floodplain mapping of the Upper Rawhide Wash. One exception is at the breakout identified at CP012. Because of the unstable nature of our alluvial sand bed channels we don't feel confident that the hydraulic section assumed by Kimley Horn will be stable over time. For floodplain mapping purposes we prefer to make the conservative assumption that 100% of the flow stays within the Rawhide watershed and is routed through reach R030-1.

There also is the potential for a future capital improvement project to completely cutoff the flow split to the west with a structural flood control measure. The city would like to keep this floodplain management option open by assuming all the flow stays in the main Rawhide channel.

If you have any questions, please ask and we will be more than happy to assist you.

Sincerely,

Collis J. Lovely
Public Works Planner, Drainage and Flood Control

c: Dave Meinhart, Senior Public Works Planner, Acting Floodplain Manager

| | |
|---------------------------------|--------|
| FLOOD CONTROL DISTRICT RECEIVED | |
| FEB 28/2000 | |
| CHENG | P & PM |
| PIO | REG |
| ADMIN | PWLMGT |
| FINANCE | FILE |
| COM | |
| ENGR | |
| REMARKS | DBB |

P:\Transportation\Planning\Lovely\upperawhlidehydro



Please review and provide direction by February 25th so we can continue with our floodplain analysis.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

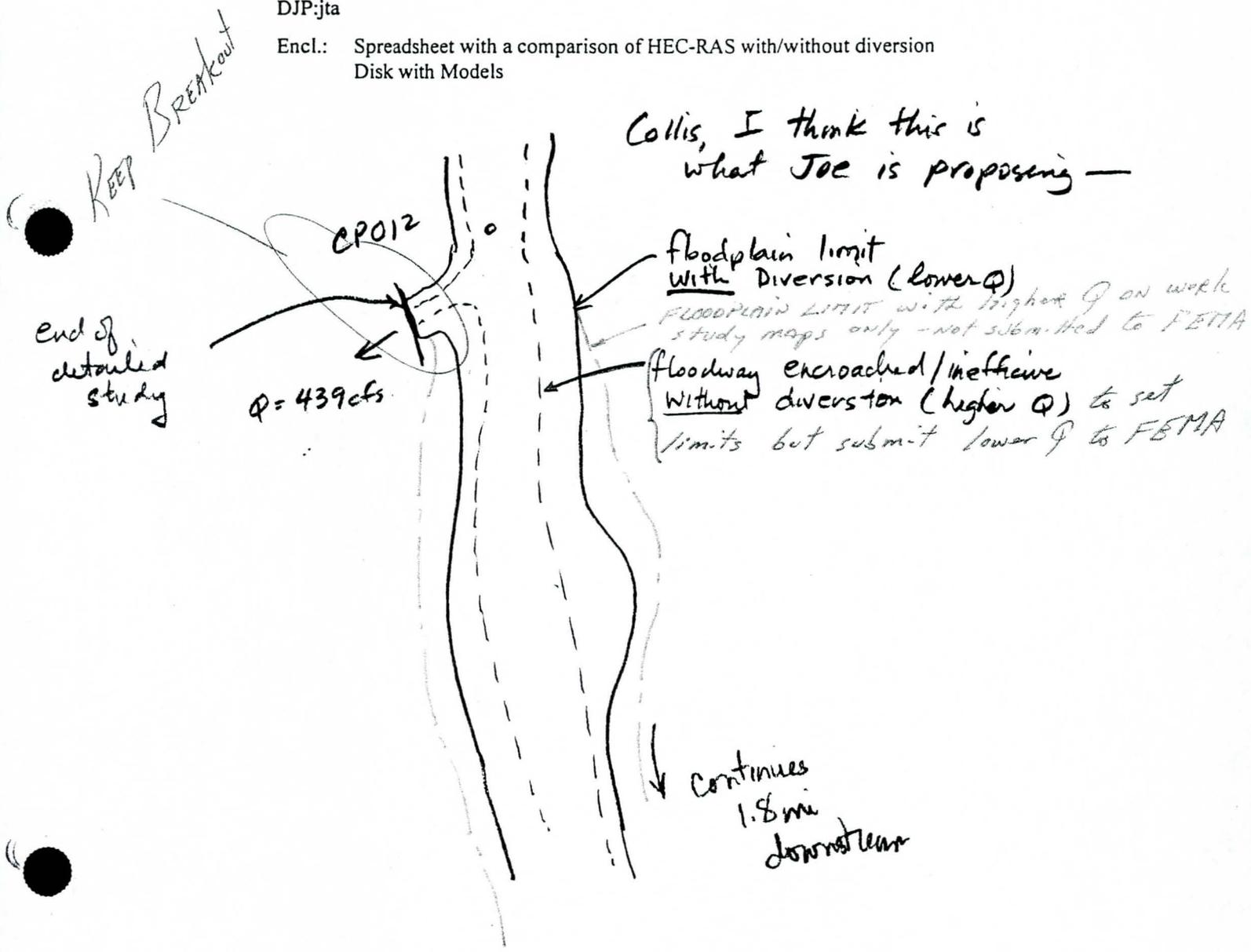
KIMLEY-HORN AND ASSOCIATES, INC.

Doug Plasencia

Doug Plasencia, P.E.
Project Manager

DJP:jta

Encl.: Spreadsheet with a comparison of HEC-RAS with/without diversion
Disk with Models





Kimley-Horn
and Associates, Inc.

February 22, 2000

Mr. David Boggs, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131002

Dear David:

As directed, we have modified the existing 100 yr. 24 hour HEC-1 model by removing the diversion (Approximately 439 cfs) at CP012. The results of the revised discharge values were then incorporated in the mainstem Rawhide Wash HEC-RAS model. The discharge values and the water surface elevations were then compared to the original HEC-RAS model (with diversion) and presented in the enclosed table. Note that the HEC-RAS models have not been through a detailed review and need further analysis prior to submission for a detailed review by the District. These models are meant to show the difference in water surface elevations that are associated with the removal of the diversion in the original HEC-1 model.

Several field reconnaissance visits by KHA engineers verified the potential for the breakout/diversion at CP012. Unlike other potential breakouts/diversions investigated during the field reconnaissance visits, this breakout leaves the Upper Rawhide Wash watershed.

Based on review of the HEC-RAS models, changes are limited to roughly a 1.8 mile reach. The change in water surface varies from negligible to 0.7 feet. However the most dramatic changes in water surface occurred in sections that were entrenched in what most likely will be the floodway, with minimal expansion of water surface width. Note that final ineffective flow areas are still being developed, but the general trend was clear.

Recommendations:

- 1) If the city of Scottsdale wants to use "better local data" to manage the floodplain we will locate the ineffective flow areas considering these higher flow rates such that the city can utilize hydraulics based on the non-breakout Q's.
- 2) We believe that in this case it is bad engineering practice to model a future condition that could lead to not disclosing the existence of the breakout flood hazard. Due to FEMA rules regarding future conditions it would be difficult to report both conditions, i.e. not violate the principals of future conditions and disclose the existing conditions breakout. As such we recommend that we finish the FEMA deliverables with the breakout in place. We also will develop our HEC-RAS model in a manner that would allow the City of Scottsdale to insert Q's for their localized management needs.

■
TEL 602 944 5500
FAX 602 944 7423



Kimley-Horn
and Associates, Inc.

Please review and provide direction by February 25th so we can continue with our floodplain analysis.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read "Doug Plasencia", with a long horizontal flourish extending to the right.

Doug Plasencia, P.E.
Project Manager

DJP:jta

Encl.: Spreadsheet with a comparison of HEC-RAS with/without diversion
Disk with Models

Upper Rawhide Wash Floodplain Study - FCD 98-12
 Comparison of discharge and water surface elevations - mainstem only (no tribs)
 With and without diversion at cross section 13.964 mainstem Rawhide Wash

HEC-RAS Plan: 100 yr River: Rawhide Wash

| Reach | River Sta | With Diversion Q Total (cfs) | Without Diversion Q Total (cfs) | Difference (cfs) | With Diversion W.S. Elev (ft) | Without Diversion W.S. Elev (ft) | Difference (ft) | With Diversion Top Width (ft) | Without Diversion Top Width (ft) | Difference (ft) |
|-----------------|-----------|------------------------------------|---------------------------------------|---------------------|-------------------------------------|--|--------------------|-------------------------------------|--|--------------------|
| Above Pima Road | 15.29 | 484 | 484 | 0 | 2914.61 | 2914.61 | 0 | 199.29 | 199.29 | 0 |
| Above Pima Road | 15.195 | 484 | 484 | 0 | 2904.24 | 2904.24 | 0 | 318.91 | 318.91 | 0 |
| Above Pima Road | 15.101 | 484 | 484 | 0 | 2894.57 | 2894.57 | 0 | 248.62 | 248.62 | 0 |
| Above Pima Road | 15.006 | 484 | 484 | 0 | 2884.63 | 2884.63 | 0 | 169.8 | 169.8 | 0 |
| Above Pima Road | 14.911 | 484 | 484 | 0 | 2872.48 | 2872.48 | 0 | 261.93 | 261.93 | 0 |
| Above Pima Road | 14.818 | 484 | 484 | 0 | 2868.29 | 2868.29 | 0 | 337.05 | 337.05 | 0 |
| Above Pima Road | 14.817 | 867 | 867 | 0 | 2866.19 | 2866.19 | 0 | 389.63 | 389.63 | 0 |
| Above Pima Road | 14.816 | 867 | 867 | 0 | 2862.46 | 2862.46 | 0 | 321.78 | 321.78 | 0 |
| Above Pima Road | 14.722 | 867 | 867 | 0 | 2850.76 | 2850.76 | 0 | 322.81 | 322.81 | 0 |
| Above Pima Road | 14.627 | 1111 | 1111 | 0 | 2840.86 | 2840.86 | 0 | 303.05 | 303.05 | 0 |
| Above Pima Road | 14.6 | 1111 | 1111 | 0 | 2839.47 | 2839.47 | 0 | 227.69 | 227.69 | 0 |
| Above Pima Road | 14.532 | 1111 | 1111 | 0 | 2832.6 | 2832.6 | 0 | 397.78 | 397.78 | 0 |
| Above Pima Road | 14.438 | 1111 | 1111 | 0 | 2824 | 2824 | 0 | 86.13 | 86.13 | 0 |
| Above Pima Road | 14.343 | 1111 | 1111 | 0 | 2812.25 | 2812.25 | 0 | 171.5 | 171.5 | 0 |
| Above Pima Road | 14.248 | 1111 | 1111 | 0 | 2802.43 | 2802.43 | 0 | 322.09 | 322.09 | 0 |
| Above Pima Road | 14.2 | 1111 | 1111 | 0 | 2797.71 | 2797.71 | 0 | 201.63 | 201.63 | 0 |
| Above Pima Road | 14.154 | 1111 | 1111 | 0 | 2790.82 | 2790.83 | 0.01 | 379.78 | 380.09 | 0.31 |
| Above Pima Road | 14.059 | 1111 | 1111 | 0 | 2781.38 | 2781.36 | -0.02 | 216.52 | 214.55 | -1.97 |
| Above Pima Road | 13.964 | 731 | 1170 | 439 | 2770.93 | 2771.21 | 0.28 | 274.35 | 292.69 | 18.34 |
| Above Pima Road | 13.869 | 731 | 1170 | 439 | 2761.6 | 2762.06 | 0.46 | 132.9 | 335.1 | 202.2 |
| Above Pima Road | 13.775 | 731 | 1170 | 439 | 2751.41 | 2751.77 | 0.36 | 132.64 | 149.43 | 16.79 |
| Above Pima Road | 13.68 | 731 | 1170 | 439 | 2741.11 | 2741.48 | 0.37 | 145.27 | 161.13 | 15.86 |
| Above Pima Road | 13.585 | 731 | 1170 | 439 | 2731.78 | 2732.21 | 0.43 | 104.02 | 116.05 | 12.03 |
| Above Pima Road | 13.491 | 731 | 1170 | 439 | 2722.83 | 2723.54 | 0.71 | 54.94 | 60.74 | 5.8 |
| Above Pima Road | 13.396 | 731 | 1170 | 439 | 2713.4 | 2714.04 | 0.64 | 58.59 | 68.21 | 9.62 |
| Above Pima Road | 13.301 | 731 | 1170 | 439 | 2705.7 | 2706.26 | 0.56 | 68.57 | 74.13 | 5.56 |
| Above Pima Road | 13.207 | 731 | 1170 | 439 | 2695.74 | 2696.26 | 0.52 | 103.13 | 116.57 | 13.44 |
| Above Pima Road | 13.112 | 731 | 1170 | 439 | 2688.07 | 2688.41 | 0.34 | 106.38 | 116.41 | 10.03 |
| Above Pima Road | 13 | 731 | 1170 | 439 | 2678.68 | 2678.94 | 0.26 | 265.33 | 269.66 | 4.33 |
| Above Pima Road | 12.923 | 731 | 1170 | 439 | 2671.9 | 2672.21 | 0.31 | 143.5 | 345.45 | 201.95 |
| Above Pima Road | 12.828 | 731 | 1170 | 439 | 2662.52 | 2662.71 | 0.19 | 353.16 | 359.95 | 6.79 |
| Above Pima Road | 12.73 | 731 | 1170 | 439 | 2654.83 | 2655.14 | 0.31 | 372.17 | 377.16 | 4.99 |
| Above Pima Road | 12.65 | 731 | 1170 | 439 | 2651.14 | 2651.44 | 0.3 | 158.74 | 172.85 | 14.11 |
| Above Pima Road | 12.638 | 731 | 1170 | 439 | 2647.82 | 2648.27 | 0.45 | 133.67 | 152 | 18.33 |
| Above Pima Road | 12.544 | 731 | 1170 | 439 | 2639.61 | 2639.88 | 0.27 | 172.2 | 197.43 | 25.23 |
| Above Pima Road | 12.449 | 731 | 1170 | 439 | 2631.78 | 2632.21 | 0.43 | 177.76 | 205.53 | 27.77 |
| Above Pima Road | 12.364 | 731 | 1170 | 439 | 2627.45 | 2628.21 | 0.76 | 50.25 | 91.48 | 41.23 |
| Above Pima Road | 12.354 | 731 | 1170 | 439 | 2623.79 | 2624.49 | 0.7 | 62.46 | 239.7 | 177.24 |
| Above Pima Road | 12.3 | 731 | 1170 | 439 | 2617.89 | 2618.49 | 0.6 | 118.96 | 305.63 | 186.67 |
| Above Pima Road | 12.2 | 731 | 1170 | 439 | 2614.42 | 2614.72 | 0.3 | 370.57 | 390.33 | 19.76 |
| Above Pima Road | 12.19 | 731 | 1170 | 439 | 2608.74 | 2609.03 | 0.29 | 265.22 | 273.44 | 8.22 |
| Above Pima Road | 12.08 | 731 | 1170 | 439 | 2602.03 | 2602.16 | 0.13 | 319.32 | 326.43 | 7.11 |
| Above Pima Road | 11.995 | 5666 | 5666 | 0 | 2596.88 | 2596.88 | 0 | 427.38 | 427.38 | 0 |
| Above Pima Road | 11.9 | 5666 | 5666 | 0 | 2590.87 | 2590.87 | 0 | 572.78 | 572.78 | 0 |
| Above Pima Road | 11.881 | 6445 | 6446 | 1 | 2584.1 | 2584.1 | 0 | 359.49 | 359.34 | -0.15 |
| Above Pima Road | 11.793 | 6445 | 6446 | 1 | 2580.73 | 2580.74 | 0.01 | 187.66 | 187.91 | 0.25 |
| Above Pima Road | 11.786 | 6445 | 6446 | 1 | 2576 | 2576 | 0 | 338.81 | 338.81 | 0 |
| Above Pima Road | 11.691 | 6445 | 6446 | 1 | 2568.1 | 2568.1 | 0 | 595.44 | 595.45 | 0.01 |
| Above Pima Road | 11.597 | 6600 | 6601 | 1 | 2560.02 | 2560.02 | 0 | 309.2 | 309.27 | 0.07 |
| Above Pima Road | 11.502 | 6600 | 6601 | 1 | 2552.11 | 2552.11 | 0 | 448.47 | 448.48 | 0.01 |
| Above Pima Road | 11.44 | 6600 | 6601 | 1 | 2545.14 | 2545.13 | -0.01 | 338.71 | 338.58 | -0.13 |
| Above Pima Road | 11.4 | 6600 | 6601 | 1 | 2540.01 | 2539.99 | -0.02 | 570.82 | 570.45 | -0.37 |
| Above Pima Road | 11.313 | 6600 | 6601 | 1 | 2533.68 | 2533.71 | 0.03 | 353.81 | 353.33 | -0.48 |
| Above Pima Road | 11.218 | 6600 | 6601 | 1 | 2525.21 | 2525.19 | -0.02 | 305.34 | 304.27 | -1.07 |
| Above Pima Road | 11.123 | 6600 | 6601 | 1 | 2515.83 | 2515.83 | 0 | 300.15 | 300.06 | -0.09 |
| Above Pima Road | 11.05 | 6600 | 6601 | 1 | 2510.07 | 2510.08 | 0.01 | 416.44 | 416.45 | 0.01 |
| Above Pima Road | 10.995 | 6600 | 6601 | 1 | 2504.52 | 2504.49 | -0.03 | 524.23 | 523.54 | -0.69 |
| Above Pima Road | 10.934 | 6600 | 6601 | 1 | 2497.37 | 2497.43 | 0.06 | 281.74 | 282.47 | 0.73 |
| Above Pima Road | 10.839 | 6755 | 6756 | 1 | 2489.05 | 2489.05 | 0 | 428.25 | 428.23 | -0.02 |

#1

#2

#3

#4

Upper Rawhide Wash Floodplain Study - FCD 98-12
 Comparison of discharge and water surface elevations - mainstem only (no tribis)
 With and without diversion at cross section 13.964 mainstem Rawhide Wash

HEC-RAS Plan: 100 yr River: Rawhide Wash

| Reach | River Sta | With Diversion Q Total (cfs) | Without Diversion Q Total (cfs) | Difference (cfs) | With Diversion W.S. Elev (ft) | Without Diversion W.S. Elev (ft) | Difference (ft) | With Diversion Top Width (ft) | Without Diversion Top Width (ft) | Difference (ft) |
|-----------------|-----------|---------------------------------------|--|---------------------|--|---|--------------------|--|---|--------------------|
| Above Pima Road | 10.8 | 6755 | 6756 | 1 | 2483.79 | 2483.8 | 0.01 | 248.65 | 248.68 | 0.03 |
| Above Pima Road | 10.744 | 6755 | 6756 | 1 | 2478.93 | 2478.93 | 0 | 311.38 | 311.35 | -0.03 |
| Above Pima Road | 10.65 | 6755 | 6756 | 1 | 2470.16 | 2470.16 | 0 | 458.62 | 458.64 | 0.02 |
| Above Pima Road | 10.555 | 6755 | 6756 | 1 | 2460.58 | 2460.58 | 0 | 343.5 | 343.5 | 0 |
| Above Pima Road | 10.46 | 7150 | 7150 | 0 | 2450.69 | 2450.69 | 0 | 388.31 | 388.31 | 0 |
| Above Pima Road | 10.366 | 7150 | 7150 | 0 | 2441.86 | 2441.86 | 0 | 867.91 | 867.91 | 0 |
| Above Pima Road | 10.271 | 7150 | 7150 | 0 | 2434.37 | 2434.37 | 0 | 386.18 | 386.18 | 0 |
| Above Pima Road | 10.176 | 7150 | 7150 | 0 | 2425.98 | 2425.98 | 0 | 472.33 | 472.33 | 0 |
| Above Pima Road | 10.12 | 7150 | 7150 | 0 | 2422.79 | 2422.79 | 0 | 395.95 | 395.95 | 0 |
| Above Pima Road | 10.082 | 7150 | 7150 | 0 | 2416.66 | 2416.66 | 0 | 427.31 | 427.31 | 0 |
| Above Pima Road | 10.03 | 7150 | 7150 | 0 | 2410.33 | 2410.33 | 0 | 345.88 | 345.88 | 0 |
| Above Pima Road | 9.91 | 7150 | 7150 | 0 | 2403.04 | 2403.04 | 0 | 424.63 | 424.63 | 0 |
| Above Pima Road | 9.892 | 7150 | 7150 | 0 | 2397.22 | 2397.22 | 0 | 380.66 | 380.66 | 0 |
| Above Pima Road | 9.798 | 7150 | 7150 | 0 | 2389.2 | 2389.2 | 0 | 460.02 | 460.02 | 0 |
| Above Pima Road | 9.723 | 7150 | 7150 | 0 | 2384.51 | 2384.51 | 0 | 337.9 | 337.9 | 0 |
| Above Pima Road | 9.703 | 7150 | 7150 | 0 | 2378.36 | 2378.36 | 0 | 690.92 | 690.92 | 0 |
| Above Pima Road | 9.585 | 7150 | 7150 | 0 | 2368.66 | 2368.66 | 0 | 967.74 | 967.74 | 0 |
| Above Pima Road | 9.513 | 7150 | 7150 | 0 | 2358.45 | 2358.45 | 0 | 1052.98 | 1052.98 | 0 |
| Above Pima Road | 9.419 | 7150 | 7150 | 0 | 2350.89 | 2350.89 | 0 | 1009.44 | 1009.44 | 0 |
| Above Pima Road | 9.37 | 7150 | 7150 | 0 | 2347.6 | 2347.6 | 0 | 1097.54 | 1097.54 | 0 |
| Above Pima Road | 9.324 | 7150 | 7150 | 0 | 2340.54 | 2340.54 | 0 | 1050.07 | 1050.07 | 0 |
| Above Pima Road | 9.229 | 7150 | 7150 | 0 | 2335.49 | 2335.49 | 0 | 1350 | 1350 | 0 |
| Above Pima Road | 9.157 | 7150 | 7150 | 0 | 2329.19 | 2329.19 | 0 | 868.97 | 868.97 | 0 |
| Pima/Dixileta | 9.13 | 4530 | 4530 | 0 | 2321.59 | 2321.59 | 0 | 315.8 | 315.8 | 0 |
| Pima/Dixileta | 9.125 | Bridge | Bridge | | | | | | | |
| Pima/Dixileta | 9.12 | 4530 | 4530 | 0 | 2320.46 | 2320.46 | 0 | 274.56 | 274.56 | 0 |
| Pima/Dixileta | 9.1 | 4530 | 4530 | 0 | 2319.47 | 2319.47 | 0 | 364.05 | 364.05 | 0 |
| Pima/Dixileta | 9.06 | 4530 | 4530 | 0 | 2315.37 | 2315.37 | 0 | 457.84 | 457.84 | 0 |
| Pima/Dixileta | 8.98 | 4530 | 4530 | 0 | 2310.71 | 2310.71 | 0 | 569.58 | 569.58 | 0 |
| Pima/Dixileta | 8.93 | 4530 | 4530 | 0 | 2305.34 | 2305.34 | 0 | 564.31 | 564.31 | 0 |
| Pima/Dixileta | 8.901 | 4530 | 4530 | 0 | 2302.54 | 2302.54 | 0 | 337.58 | 337.58 | 0 |
| Pima/Dixileta | 8.897 | Bridge | Bridge | | | | | | | |
| Pima/Dixileta | 8.893 | 4530 | 4530 | 0 | 2300.51 | 2300.51 | 0 | 246.63 | 246.63 | 0 |
| Below Pima Road | 8.851 | 7150 | 7150 | 0 | 2297.99 | 2297.99 | 0 | 650.54 | 650.54 | 0 |
| Below Pima Road | 8.803 | 7150 | 7150 | 0 | 2293.76 | 2293.76 | 0 | 699.64 | 699.64 | 0 |
| Below Pima Road | 8.754 | 7150 | 7150 | 0 | 2289.06 | 2289.06 | 0 | 709.81 | 709.81 | 0 |
| Below Pima Road | 8.66 | 7150 | 7150 | 0 | 2280.58 | 2280.58 | 0 | 678.38 | 678.42 | 0.04 |
| Below Pima Road | 8.565 | 7153 | 7154 | 1 | 2272.19 | 2272.19 | 0 | 469.8 | 469.79 | -0.01 |
| Below Pima Road | 8.47 | 7153 | 7154 | 1 | 2265.74 | 2265.75 | 0.01 | 506.91 | 506.98 | 0.07 |
| Below Pima Road | 8.42 | 7153 | 7154 | 1 | 2262.09 | 2262.09 | 0 | 465.48 | 465.49 | 0.01 |
| Below Pima Road | 8.376 | 7153 | 7154 | 1 | 2256.83 | 2256.82 | -0.01 | 359.39 | 358.3 | -1.09 |
| Below Pima Road | 8.277 | 7157 | 7158 | 1 | 2251.41 | 2251.41 | 0 | 370.92 | 370.9 | -0.02 |
| Below Pima Road | 8.186 | 7157 | 7158 | 1 | 2244.12 | 2244.12 | 0 | 345.37 | 345.29 | -0.08 |
| Below Pima Road | 8.092 | 7157 | 7158 | 1 | 2237.7 | 2237.7 | 0 | 353.63 | 353.64 | 0.01 |
| Below Pima Road | 8.01 | 7157 | 7158 | 1 | 2232.64 | 2232.65 | 0.01 | 431.69 | 431.72 | 0.03 |
| Below Pima Road | 8 | 7157 | 7158 | 1 | 2232.56 | 2232.56 | 0 | 514.78 | 514.84 | 0.06 |
| Below Pima Road | 7.992 | Culvert | Culvert | | | | | | | |
| Below Pima Road | 7.984 | 7157 | 7158 | 1 | 2230.01 | 2230.01 | 0 | 448.47 | 448.47 | 0 |
| Below Pima Road | 7.964 | 7157 | 7158 | 1 | 2226.39 | 2226.39 | 0 | 290.54 | 290.54 | 0 |
| Below Pima Road | 7.89 | 7319 | 7320 | 1 | 2220.53 | 2220.53 | 0 | 414.77 | 414.78 | 0.01 |
| Below Pima Road | 7.801 | 7319 | 7320 | 1 | 2217.57 | 2217.57 | 0 | 287.07 | 287.06 | -0.01 |
| Below Pima Road | 7.795 | 7319 | 7320 | 1 | 2211.96 | 2211.96 | 0 | 449.58 | 449.6 | 0.02 |
| Below Pima Road | 7.702 | 7319 | 7320 | 1 | 2205.06 | 2205.06 | 0 | 676.52 | 676.52 | 0 |
| Below Pima Road | 7.651 | 7319 | 7320 | 1 | 2200.01 | 2200.01 | 0 | 723.65 | 723.62 | -0.03 |

Notes #1 - Flow is out of channel by 0.05 ft.
 #2 - #4 The "No Diversion" water surface elevation is .2 ft to .5 ft over the top of the banks.
 May want to adjust model to force water surface into overbank

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(3 November 1999 comments)**

091131002
RAWHIDE WASH
HYDROLOGY RESPONSES
mailed to David
11/9/99

Comments from the Flood Control District of Maricopa County:

1. The velocity used to calculate the NSTPS for R030-1 is low compared to other subbasins with similar distance of travel. Hence the NSTPS value is quite high for this subbasin. A verification and explanation is needed.

The Q routed in reach R030-1 is lower than most other routing reaches resulting in a low velocity. The routing path length is 10,780 ft. The next few longest paths have flow rates several times larger than this one, hence the higher velocities and lower NSTPS values. See attached copies of FlowMaster calculations of selected cross sections and refer to Hydrology submittal #2 (12-21-98). Hydrology submittal #2 contained the routing cross sections for each reach and was approved on 12-28-99.

| Reach | Length [ft] | Q [cfs] | Velocity [ft/s] | NSTPS |
|--------|-------------|---------|-----------------|-------|
| R030-1 | 10,780 | 431 | 3.08 | 29 |
| R043-1 | 7,504 | 4,516 | 8.17 | 8 |
| R064-1 | 7,694 | 1,446 | 7.89 | 8 |

Worksheet

Worksheet for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R030-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|-----------|----------------|
| Slope | 0.018000 ft/ft |
| Discharge | 431.00 cfs |

Options

| | |
|---------------------------------|--------------------------|
| Current Roughness Method | Improved Lotter's Method |
| Open Channel Weighting Method | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method |

Results

| | |
|-------------------------|-----------------------|
| Mannings Coefficient | 0.035 |
| Water Surface Elevation | 2,680.42 ft |
| Elevation Range | 2,680.00 to 2,684.00 |
| Flow Area | 140.0 ft ² |
| Wetted Perimeter | 352.30 ft |
| Top Width | 352.25 ft |
| Actual Depth | 0.42 ft |
| Critical Elevation | 2,680.38 ft |
| Critical Slope | 0.025054 ft/ft |
| Velocity | 3.08 ft/s |
| Velocity Head | 0.15 ft |
| Specific Energy | 2,680.57 ft |
| Froude Number | 0.86 |
| Flow Type | Subcritical |

Calculation Messages:
Flow is divided.

Roughness Segments

| Start Station | End Station | Mannings Coefficient |
|---------------|-------------|----------------------|
| 4+28 | 9+92 | 0.035 |

Natural Channel Points

| Station (ft) | Elevation (ft) |
|--------------|----------------|
| 4+28 | 2,684.00 |
| 4+97 | 2,680.00 |
| 7+53 | 2,680.00 |
| 7+80 | 2,682.00 |
| 8+35 | 2,680.00 |
| 8+68 | 2,680.00 |
| 8+97 | 2,680.00 |
| 9+92 | 2,684.00 |

Title: untitled

k:\civil\09113102\drainage\hec-1\3102r8-6.fm2
11/04/99 11:26:12 AM © Haestad Methods, Inc.

Kimley-Horn and Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

FlowMaster v6.0 [614e]
Page 1 of 1

Cross Section for R030-1

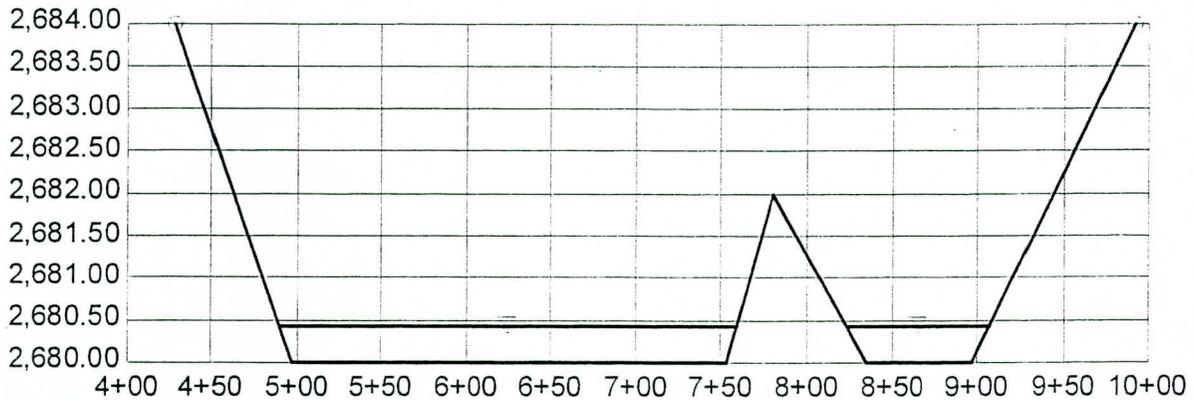
Cross Section for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R030-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Section Data

| | |
|-------------------------|----------------------|
| Mannings Coefficient | 0.035 |
| Slope | 0.018000 ft/ft |
| Water Surface Elevation | 2,680.42 ft |
| Elevation Range | 2,680.00 to 2,684.00 |
| Discharge | 431.00 cfs |



V:50.0
H:1
NTS

Worksheet

Worksheet for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R043-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|-----------|----------------|
| Slope | 0.018000 ft/ft |
| Discharge | 4,516.00 cfs |

Options

| | |
|---------------------------------|--------------------------|
| Current Roughness Method | Improved Lotter's Method |
| Open Channel Weighting Method | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method |

Results

| | |
|-------------------------|-----------------------|
| Mannings Coefficient | 0.035 |
| Water Surface Elevation | 2,477.99 ft |
| Elevation Range | 2,476.00 to 2,486.00 |
| Flow Area | 552.9 ft ² |
| Wetted Perimeter | 322.00 ft |
| Top Width | 321.58 ft |
| Actual Depth | 1.99 ft |
| Critical Elevation | 2,478.11 ft |
| Critical Slope | 0.014673 ft/ft |
| Velocity | 8.17 ft/s |
| Velocity Head | 1.04 ft |
| Specific Energy | 2,479.03 ft |
| Froude Number | 1.10 |
| Flow Type | Supercritical |

Calculation Messages:
Flow is divided.

Roughness Segments

| Start Station | End Station | Mannings Coefficient |
|---------------|-------------|----------------------|
| 2+63 | 9+73 | 0.035 |

Natural Channel Points

| Station (ft) | Elevation (ft) |
|--------------|----------------|
| 2+63 | 2,486.00 |
| 3+49 | 2,482.00 |
| 3+81 | 2,476.00 |
| 4+50 | 2,482.00 |
| 5+22 | 2,476.00 |
| 7+56 | 2,476.00 |
| 8+47 | 2,482.00 |
| 9+73 | 2,486.00 |

Title: untitled

k:\-civil\09113102\drainage\hec-1\3102r8-6.fm2
11/04/99 11:25:31 AM © Haestad Methods, Inc.

Kimley-Horn and Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

FlowMaster v6.0 [614e]
Page 1 of 1

Cross Section for R043-1

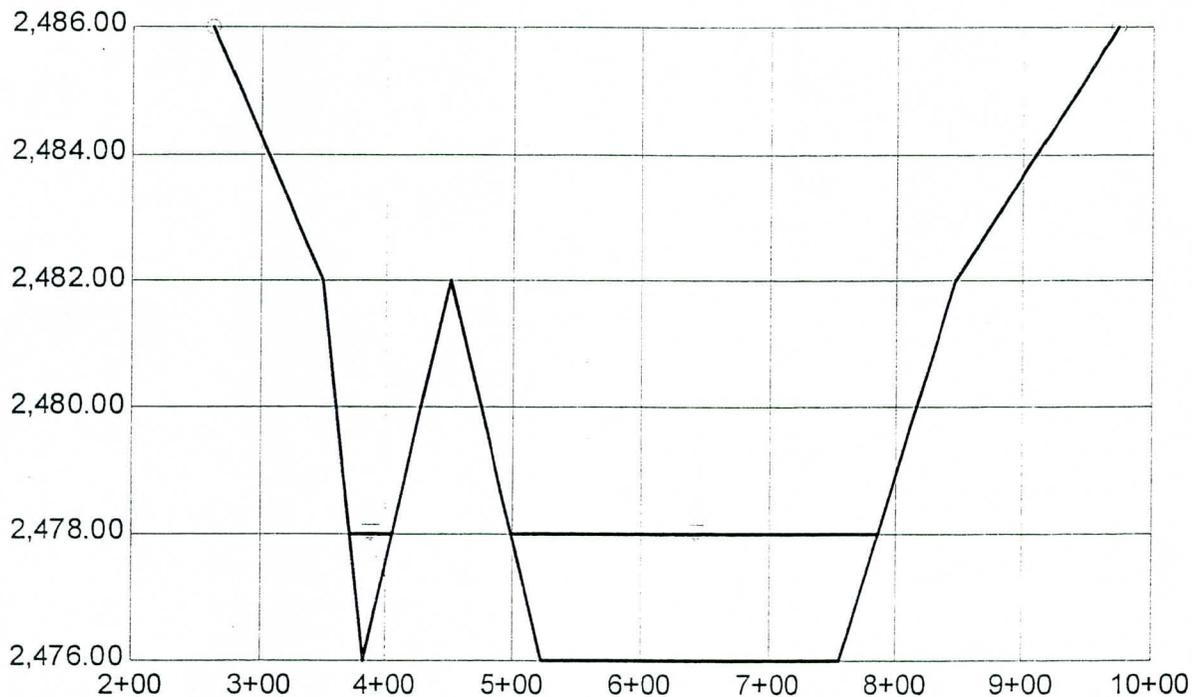
Cross Section for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R043-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Section Data

| | |
|-------------------------|----------------------|
| Mannings Coefficient | 0.035 |
| Slope | 0.018000 ft/ft |
| Water Surface Elevation | 2,477.99 ft |
| Elevation Range | 2,476.00 to 2,486.00 |
| Discharge | 4,516.00 cfs |



V:50.0
H:1
NTS

Title: untitled

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11/04/99 11:25:43 AM © Haestad Methods, Inc.

Kimley-Horn and Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

FlowMaster v6.0 [614e]
Page 1 of 1

Worksheet

Worksheet for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R064-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|-----------|----------------|
| Slope | 0.023000 ft/ft |
| Discharge | 1,446.00 cfs |

Options

| | |
|---------------------------------|--------------------------|
| Current Roughness Method | Improved Lotter's Method |
| Open Channel Weighting Method | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method |

Results

| | |
|-------------------------|-----------------------|
| Mannings Coefficient | 0.035 |
| Water Surface Elevation | 2,322.47 ft |
| Elevation Range | 2,319.00 to 2,325.00 |
| Flow Area | 183.2 ft ² |
| Wetted Perimeter | 135.01 ft |
| Top Width | 134.13 ft |
| Actual Depth | 3.47 ft |
| Critical Elevation | 2,322.67 ft |
| Critical Slope | 0.015923 ft/ft |
| Velocity | 7.89 ft/s |
| Velocity Head | 0.97 ft |
| Specific Energy | 2,323.43 ft |
| Froude Number | 1.19 |
| Flow Type | Supercritical |

Roughness Segments

| Start Station | End Station | Mannings Coefficient |
|---------------|-------------|----------------------|
| 0+00 | 2+05 | 0.035 |

Natural Channel Points

| Station (ft) | Elevation (ft) |
|--------------|----------------|
| 0+00 | 2,323.00 |
| 0+76 | 2,321.00 |
| 1+02 | 2,319.00 |
| 1+11 | 2,319.00 |
| 1+17 | 2,320.00 |
| 1+18 | 2,321.00 |
| 1+68 | 2,323.00 |
| 2+05 | 2,325.00 |

Cross Section

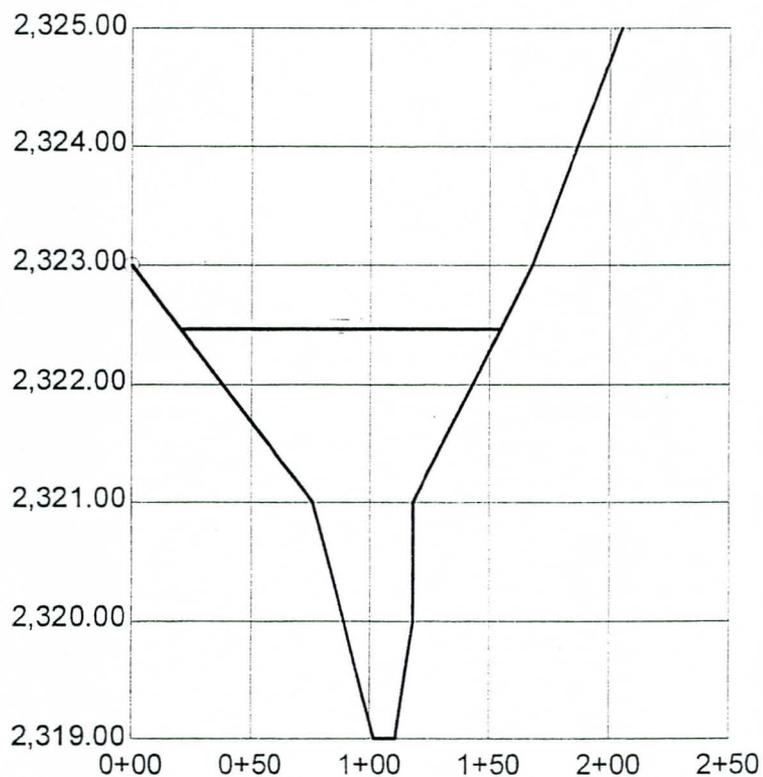
Cross Section for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | R064-1 8-pt |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Section Data

| | |
|-------------------------|----------------------|
| Mannings Coefficient | 0.035 |
| Slope | 0.023000 ft/ft |
| Water Surface Elevation | 2,322.47 ft |
| Elevation Range | 2,319.00 to 2,325.00 |
| Discharge | 1,446.00 cfs |



V:50.0
H:1
NTS

2. An explanation is needed as to the reason for choosing of the constant values m and b for the K_b calculations for applications that are related to type B of table 5.1 of the Drainage Design Manual, whereas the area is mainly of brushy alluvial fans, a type C classification.

As discussed in the Drainage Design Manual, selection of these parameters is quite subjective. Early in the development of the hydrology, discussions were held on parameter estimates. These discussions indicated that we should be considering a Type B condition more consistent with a desert rangeland due to the large size of the watershed. It was pointed out at that time that with the District methods, large basins will overestimate T_c due to depth of flow on the watershed vs. roughness. If we were modeling small basins, a Type C would be more reflective of conditions. Following these meetings, the parameters were directly reviewed on other occasions.

Due to the dendritics of the watershed a somewhat faster response is anticipated. Moving to a Type C would lengthen the T_c , which would lower the discharge. This would appear to be inconsistent with meeting the concerns of the City of Scottsdale.

According to Figure 5.5 of the Drainage Design Manual, a watershed size of 9,000 acres such as this would have a K_b of 0.027 for Type B and 0.055 for Type C. See the attached table for the composite K_b values for each basin. The average K_b for our model using Type B is 0.049 (on the high end of that range) while the average if we had used Type C would be 0.094. Type B gives results consistent with Figure 5.5 for a watershed of this size..

Further, due to the subjectivity of the method, and results, a change is not warranted.

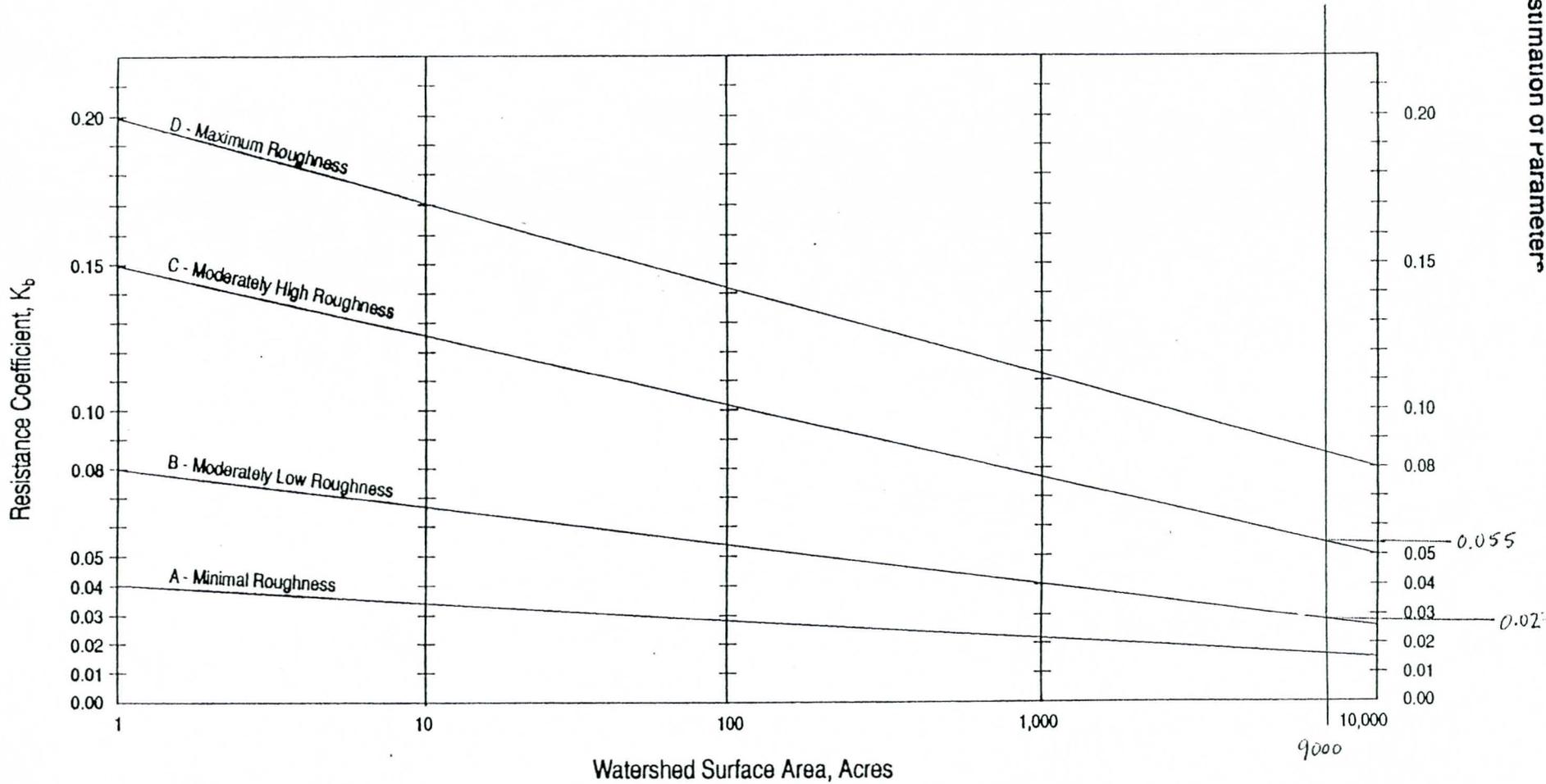


Figure 5.5
Resistance Coefficient " K_b " as a Function of Watershed Size and Surface Roughness Characteristics

| Basin ID | DDMS Kb Type B | Type C |
|----------|----------------|--------|
| 005 | 0.047 | 0.089 |
| 010 | 0.048 | 0.092 |
| 012 | 0.049 | 0.093 |
| 015 | 0.048 | 0.077 |
| 017 | 0.040 | 0.097 |
| 020 | 0.051 | 0.083 |
| 022 | 0.043 | 0.090 |
| 024 | 0.047 | 0.080 |
| 026 | 0.041 | 0.094 |
| 030 | 0.049 | 0.091 |
| 032 | 0.049 | 0.117 |
| 034 | 0.050 | 0.093 |
| 036 | 0.052 | 0.095 |
| 038 | 0.062 | 0.098 |
| 040 | 0.048 | 0.092 |
| 041 | 0.058 | 0.110 |
| 042 | 0.048 | 0.092 |
| 043 | 0.049 | 0.093 |
| 044 | 0.039 | 0.076 |
| 046 | 0.055 | 0.104 |
| 048 | 0.059 | 0.111 |
| 051 | 0.052 | 0.100 |
| 053 | 0.056 | 0.106 |
| 055 | 0.047 | 0.091 |
| 058 | 0.038 | 0.074 |
| 060 | 0.043 | 0.083 |
| 062 | 0.043 | 0.083 |
| 064 | 0.046 | 0.088 |
| 066 | 0.072 | 0.135 |
| 068 | 0.050 | 0.095 |
| 070 | 0.043 | 0.082 |

| | | |
|---------|-------|-------|
| Average | 0.049 | 0.094 |
| High | 0.072 | 0.135 |
| Low | 0.038 | 0.074 |

3. An explanation is also needed as to the reason behind the flows for some of the subbasins being lower for the future conditions compared to the existing conditions analysis.

There are three basins (out of 31) in the 100 yr, 6 hr model only, where the existing conditions runoff is greater than the future conditions. Two basins differ by 3 cfs and one by 4 cfs or less than a 2% change. This can be attributed most likely to the iterations of the HEC-1 algorithm and are not significant.

| Location | 100 yr, 6 hr | | | 100 yr, 24 hr | | |
|-----------|-------------------------|-----------------------|---|-------------------------|-----------------------|---|
| | Peak Discharge Existing | Peak Discharge Future | Future - Existing (negative indicates existing greater) | Peak Discharge Existing | Peak Discharge Future | Future - Existing (negative indicates existing greater) |
| | [cfs] | [cfs] | | [cfs] | [cfs] | |
| Basin 005 | 289 | 293 | 4 | 484 | 558 | 74 |
| Basin 010 | 230 | 233 | 3 | 395 | 456 | 61 |
| CP010 | 518 | 525 | 7 | 867 | 1001 | 134 |
| Basin 012 | 194 | 191 | -3 | 344 | 395 | 51 |
| CP012 | 697 | 702 | 5 | 1111 | 1288 | 177 |
| Basin 030 | 194 | 199 | 5 | 297 | 347 | 50 |
| CP030A | 552 | 559 | 7 | 731 | 870 | 139 |
| Basin 015 | 1021 | 1039 | 18 | 1766 | 2136 | 370 |
| Basin 017 | 165 | 172 | 7 | 286 | 335 | 49 |
| CP022A | 1163 | 1188 | 25 | 1875 | 2280 | 405 |
| Basin 020 | 803 | 834 | 31 | 1458 | 1695 | 237 |
| Basin 022 | 231 | 250 | 19 | 340 | 411 | 71 |
| CP022B | 996 | 1048 | 52 | 1633 | 1952 | 319 |
| CP022 | 2138 | 2211 | 73 | 3445 | 4140 | 695 |
| Basin 024 | 1273 | 1313 | 40 | 2481 | 2861 | 380 |
| Basin 026 | 202 | 216 | 14 | 309 | 365 | 56 |
| CP026A | 1388 | 1439 | 51 | 2481 | 2959 | 478 |
| CP026 | 3421 | 3558 | 137 | 5412 | 6290 | 878 |
| CP030 | 3599 | 3743 | 144 | 5666 | 6604 | 938 |
| Basin 034 | 264 | 275 | 11 | 444 | 518 | 74 |
| Basin 036 | 261 | 278 | 17 | 463 | 536 | 73 |
| CP036 | 477 | 502 | 25 | 648 | 799 | 151 |
| Basin 038 | 178 | 186 | 8 | 323 | 374 | 51 |
| CP038A | 638 | 670 | 32 | 855 | 1051 | 196 |
| Basin 032 | 26 | 26 | 0 | 55 | 63 | 8 |
| CP038 | 4204 | 4382 | 178 | 6445 | 7552 | 1107 |
| Basin 040 | 282 | 285 | 3 | 529 | 614 | 85 |
| CP040 | 4373 | 4553 | 180 | 6600 | 7739 | 1139 |

| Location | 100 yr, 6 hr | | | 100 yr, 24 hr | | |
|-----------|----------------|----------------|-------------------|----------------|----------------|-------------------|
| | Peak Discharge | Peak Discharge | Future - Existing | Peak Discharge | Peak Discharge | Future - Existing |
| | [cfs] | [cfs] | | [cfs] | [cfs] | |
| Basin 041 | 48 | 48 | 0 | 97 | 111 | 14 |
| Basin 042 | 306 | 306 | 0 | 579 | 661 | 82 |
| CP042 | 4581 | 4763 | 182 | 6755 | 7965 | 1210 |
| Basin 043 | 145 | 145 | 0 | 253 | 293 | 40 |
| CP043 | 4646 | 4828 | 182 | 6720 | 7958 | 1238 |
| Basin 044 | 1234 | 1251 | 17 | 2207 | 2544 | 337 |
| Basin 046 | 97 | 97 | 0 | 191 | 221 | 30 |
| CP046 | 5319 | 5529 | 210 | 7150 | 8681 | 1531 |
| Basin 048 | 53 | 53 | 0 | 108 | 123 | 15 |
| Basin 051 | 112 | 118 | 6 | 192 | 226 | 34 |
| CP051 | 5380 | 5598 | 218 | 7153 | 8676 | 1523 |
| Basin 053 | 93 | 98 | 5 | 175 | 203 | 28 |
| CP053 | 5403 | 5624 | 221 | 7157 | 8678 | 1521 |
| Basin 055 | 213 | 223 | 10 | 338 | 403 | 65 |
| CP055 | 5564 | 5789 | 225 | 7319 | 8903 | 1584 |
| Basin 058 | 1483 | 1555 | 72 | 2569 | 3079 | 510 |
| Basin 060 | 500 | 540 | 40 | 764 | 934 | 170 |
| Basin 062 | 614 | 703 | 89 | 1056 | 1340 | 284 |
| CP062 | 1084 | 1195 | 111 | 1707 | 2103 | 396 |
| Basin 064 | 396 | 417 | 21 | 694 | 841 | 147 |
| CP064 | 2817 | 2999 | 182 | 4244 | 5229 | 985 |
| Basin 066 | 5 | 5 | 0 | 10 | 12 | 2 |
| CP066 | 2817 | 3000 | 183 | 4243 | 5228 | 985 |
| Basin 068 | 219 | 215 | -4 | 421 | 480 | 59 |
| CP068 | 7977 | 8305 | 328 | 9990 | 12252 | 2262 |
| Basin 070 | 462 | 459 | -3 | 833 | 981 | 148 |
| CP070 | 8079 | 8412 | 333 | 9940 | 12242 | 2302 |

Comments from the City of Scottsdale:

4. ...We are comfortable with the downstream six hour Q100 of approximately 8100 cfs. This compares reasonably well with 9100 cfs from the corrected WRA/Greiner model. We would like to see 9134 cfs, shown in the comparisons made on p. 4-13 rather than the 10,456 currently shown.

What was submitted was final - while we understand the request for the change it does not warrant a re-submittal.

5. One typo suggestion is the subbasin #066 in Fig. 4-1 needs a leader pointing to its location on the map.

This omission of an arrow pointing to the subbasin has been corrected on our electronic files and does not warrant a re-submittal, please draw the arrow in.

6. My only other concern that I would like you to look at is the magnitude of the Q100 6 hr values at CP012 and the upstream subbasins. They seem extremely low and will be used as the Q100 for floodplain mapping purposes. The basin area is 1.05 sm. with a Q = 697 cfs. As a comparison basin 24 has an area 1.02 sm., and a Q100 = 1273 cfs. I think this needs to have a good reason for a difference like this.

As previously discussed we are of the opinion that the variation between concentration point CP012 (three joint basins) and basin 024 are related to dramatic variations in soil and slope. In order to alleviate the continued concern, we combined the three basins at CP012 into a single basin called 51012. Our results are as follows:

Model 51012

File: 51012.out

A one basin HEC-1 model was created that combined basins 005, 010 and 012 (the three subbasins that are combined at CP012). The soils distributions, land use, flow path length and slope were re-calculated based on this combined basin. Parameters used in this analysis are attached.

Result: $Q_{100} = 853$ cfs

Model 51012-soil24

File: 51012-soil24.out

The soil distribution of basin 024 was applied to the combined basin. The new distribution was entered into Model 51012 to create this model.

Result: $Q_{100} = 935$ cfs

Model 51012-soil-slope24

File: 51012-soil-slope24.out

The flow path length and slope of basin 024 was applied to the combined basin. The new distribution was entered into Model 51012-soil to create this model.

Result: $Q_{100} = 1278$ cfs

Conclusion: This demonstrates that our original assumptions are valid and we see no need to further investigate this issue. Further, we do not recommend converting to a single basin at CP012 because there are three distinct watercourses, with sufficient variability to warrant three basins.

FLOOD HYDROGRAPH PACKAGE (HEC-1)
JUL 1997
VERSION 4.1

DATE 04NOV99 TIME 15:51:49

U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXXX XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

1 ID DDM MCUHP1 Upper Rawhide Wash - Existing Conditions 100 yr, 6 hr storm

This is a one basin model combining URW basins 005, 010 and 012

Flood Control District of Maricopa County
Upper Rawhide Wash Floodplain Delineation Study
FCD98-12

EXISTING CONDITIONS HYDROLOGY

100 yr, 6 hr storm event
Prepared by Kimley-Horn and Associates, Inc.
KHA Job No. 091131.02

November 1999

This hydrology represents conditions of the Upper Rawhide Wash and its tributaries in existing conditions.

There are two existing flow splits at CP062 and CP066, they will be cut off and routed 100% to the dam site as part of the dam project. This model accounts for the proposed diversion works with Rawhide Wash Dam.

Input parameters for the model were determined using the Flood Control District of Maricopa County's (FCDMC) Drainage Design Menu System (DDMS).

The values entered into DDMS were based on the following:

Rainfall depths Point precipitation values were determined using the isopluvial maps in the FCDMC Hydrology Manual

Rainfall excess The Green and Ampt Methodology was used for estimation of rainfall losses. Digital soil maps for the City of Scottsdale were used to determine soil distributions.

Existing land use conditions were determined from the City of Scottsdale General Plan digital zoning map and aerial photos.

Unit hydrographs The Clark Unit Hydrograph methodology was applied. City of Scottsdale digital topographic mapping with 1' and 2' contour intervals was used.

Routing Normal Depth Channel Routing was used with 8 point cross sections approximated from the BOSS River Modeling System.

*DIAGRAM

IT 5 750
IO 3

HEC-1 INPUT

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

```

4      IN      15
      * DDM ***** Updated *****

5      KK      51012
6      KM      SUB-BASIN 51012
7      KM      6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
8      KM      THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
9      KM      L = 2.50 Kb = .041 Adj. Slope = 146.0
10     BA      1.048
11     IN      15
12     KM      RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
13     PB      3.201
14     KM      THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93
15     PC      .000 .015 .020 .030 .047 .061 .074 .088 .102 .116
16     PC      .131 .148 .171 .218 .300 .470 .672 .799 .870 .914
17     PC      .946 .960 .973 .987 1.000
18     LG      .150 .390 5.800 .170 3.000
19     UC      .600 .425
20     UA      0      3      5      8      12      20      43      75      90      96
21     UA      100
22     ZZ

```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

5 51012

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUL 1997 *
* VERSION 4.1 *
* RUN DATE 04NOV99 TIME 15:51:49 *
*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****

```

DDM MCUHP1 Upper Rawhide Wash - Existing Conditions 100 yr, 6 hr storm

OUTPUT CONTROL VARIABLES

```

IPRNT      3 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE

```

IT HYDROGRAPH TIME DATA

```

NMIN      5 MINUTES IN COMPUTATION INTERVAL
IDATE     1 0 STARTING DATE
ITIME     0000 STARTING TIME
NQ        750 NUMBER OF HYDROGRAPH ORDINATES
NDDATE    3 0 ENDING DATE
NDTIME    1425 ENDING TIME
ICENT     19 CENTURY MARK

```

```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 62.42 HOURS

```

ENGLISH UNITS

```

DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-Feet
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

```

5 KK

```

*****
* 51012 *
*****

```

```

SUB-BASIN 51012
6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
L = 2.50 Kb = .041 Adj. Slope = 146.0
RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93

```

TIME DATA FOR INPUT TIME SERIES

```

JXMIN      15 TIME INTERVAL IN MINUTES
JXDATE     1 0 STARTING DATE
JXTIME     0 STARTING TIME

```

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 1.05 SUBBASIN AREA

PRECIPITATION DATA

STORM 3.20 BASIN TOTAL PRECIPITATION

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 |
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 | .01 | .00 |
| .01 | .01 | .01 | .01 | .01 | .01 | .01 | .02 | .02 | .03 |
| .03 | .03 | .06 | .06 | .06 | .07 | .07 | .07 | .04 | .04 |
| .04 | .02 | .02 | .02 | .01 | .01 | .01 | .01 | .01 | .01 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | | | | | | | | |

18 LG GREEN AND AMPT LOSS RATE
STRTL .15 STARTING LOSS
DTH .39 MOISTURE DEFICIT
PSIF 5.80 WETTING FRONT SUCTION
XKSAT .17 HYDRAULIC CONDUCTIVITY
RTIMP 3.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC .60 TIME OF CONCENTRATION
R .43 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

UNIT HYDROGRAPH PARAMETERS

CLARK TC= .60 HR, R= .43 HR
SNYDER TP= .51 HR, CP= .74

UNIT HYDROGRAPH

32 END-OF-PERIOD ORDINATES

| | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| 27. | 76. | 131. | 292. | 674. | 983. | 993. | 874. | 726. | 596. |
| 490. | 402. | 330. | 271. | 223. | 183. | 150. | 124. | 102. | 83. |
| 69. | 56. | 46. | 38. | 31. | 26. | 21. | 17. | 14. | 12. |
| 10. | 8. | | | | | | | | |

HYDROGRAPH AT STATION 51012

TOTAL RAINFALL = 3.20, TOTAL LOSS = 1.78, TOTAL EXCESS = 1.43

| PEAK FLOW (CFS) | TIME (HR) | MAXIMUM AVERAGE FLOW | | | | |
|--------------------|--------------|----------------------|-------|-------|----------|-------|
| | | 6-HR | 24-HR | 72-HR | 62.42-HR | |
| 853. | 4.42 | 160. | 40. | 15. | 15. | |
| | | (INCHES) | 1.417 | 1.419 | 1.419 | 1.419 |
| | | (AC-FT) | 79. | 79. | 79. | 79. |

CUMULATIVE AREA = 1.05 SQ MI

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 | 51012 | 853. | 4.42 | 160. | 40. | 15. | 1.05 | | |

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


```

4      IN      15
      * DDM ***** Updated *****

5      KK      51012
6      KM      SUB-BASIN 51012
7      KM      6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
8      KM      THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
9      KM      L = 2.50 Kb = .041 Adj. Slope = 146.0
10     BA      1.048
11     IN      15
12     KM      RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
13     PB      3.201
14     KM      THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93
15     PC      .000 .015 .020 .030 .047 .061 .074 .088 .102 .116
16     PC      .131 .148 .171 .218 .300 .470 .672 .799 .870 .914
17     PC      .946 .960 .973 .987 1.000
18     LG      .150 .380 6.400 .140 12.000
19     UC      .583 .412
20     UA      0 3 5 8 12 20 43 75 90 96
21     UA      100
22     ZZ

```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
5 51012

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUL 1997 *
* VERSION 4.1 *
* RUN DATE 04NOV99 TIME 15:57:02 *
*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****

```

DDM MCUHP1 Upper Rawhide Wash - Existing Conditions 100 yr, 6 hr storm

OUTPUT CONTROL VARIABLES

```

IPRNT 3 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

```

IT

HYDROGRAPH TIME DATA

```

NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 750 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 3 0 ENDING DATE
NDTIME 1425 ENDING TIME
ICENT 19 CENTURY MARK

```

```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 62.42 HOURS

```

ENGLISH UNITS

```

DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

```

5 KK

```

*****
* 51012 *
*****

```

```

SUB-BASIN 51012
6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
L = 2.50 Kb = .041 Adj. Slope = 146.0
RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93

```

TIME DATA FOR INPUT TIME SERIES

```

JXMIN 15 TIME INTERVAL IN MINUTES
JXDATE 1 0 STARTING DATE
JXTIME 0 STARTING TIME

```

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 1.05 SUBBASIN AREA

PRECIPITATION DATA

STORM 3.20 BASIN TOTAL PRECIPITATION

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 |
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 | .01 | .00 |
| .01 | .01 | .01 | .01 | .01 | .01 | .02 | .02 | .02 | .03 |
| .03 | .03 | .06 | .06 | .06 | .07 | .07 | .07 | .04 | .04 |
| .04 | .02 | .02 | .02 | .01 | .01 | .01 | .01 | .01 | .01 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | | | | | | | | |

18 LG GREEN AND AMPT LOSS RATE
STRTL .15 STARTING LOSS
DTH .38 MOISTURE DEFICIT
PSIF 6.40 WETTING FRONT SUCTION
XKSAT .14 HYDRAULIC CONDUCTIVITY
RTIMP 12.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC .58 TIME OF CONCENTRATION
R .41 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= .58 HR, R= .41 HR
SNYDER TP= .50 HR, CP= .76

UNIT HYDROGRAPH
31 END-OF-PERIOD ORDINATES

| | | | | | | | | | |
|------|------|------|------|------|-------|-------|------|------|------|
| 29. | 80. | 143. | 332. | 740. | 1029. | 1010. | 873. | 713. | 582. |
| 475. | 388. | 316. | 258. | 211. | 172. | 141. | 115. | 94. | 76. |
| 62. | 51. | 42. | 34. | 28. | 23. | 18. | 15. | 12. | 10. |
| 8. | | | | | | | | | |

HYDROGRAPH AT STATION 51012

TOTAL RAINFALL = 3.20, TOTAL LOSS = 1.53, TOTAL EXCESS = 1.67

| PEAK FLOW (CFS) | TIME (HR) | MAXIMUM AVERAGE FLOW | | | |
|--------------------|--------------|----------------------|-------|-------|----------|
| | | 6-HR | 24-HR | 72-HR | 62.42-HR |
| 935. | 4.42 | 187. | 47. | 18. | 18. |
| | | (INCHES) 1.660 | 1.667 | 1.667 | 1.667 |
| | | (AC-FT) 93. | 93. | 93. | 93. |

CUMULATIVE AREA = 1.05 SQ MI

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 | 51012 | 935. | 4.42 | 187. | 47. | 18. | 1.05 | | |

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


```

3      IO      3
4      IN      15
      * DDM ***** Updated *****

5      KK      51012
6      KM      SUB-BASIN 51012
7      KM      6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
8      KM      THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
9      KM      L = 1.56 Kb = .041 Adj. Slope = 355.0
10     BA      1.048
11     IN      15
12     KM      RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
13     PB      3.201
14     KM      THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93
15     PC      .000 .015 .020 .030 .047 .061 .074 .088 .102 .116
16     PC      .131 .148 .171 .218 .300 .470 .672 .799 .870 .914
17     PC      .946 .960 .973 .987 1.000
18     LG      .150 .380 6.400 .140 12.000
19     UC      .338 .154
20     UA      0      3      5      8      12      20      43      75      90      96
21     UA      100
22     ZZ

```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
5 51012

```

{***} RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUL 1997 *
*   VERSION 4.1 *
* RUN DATE 04NOV99 TIME 16:01:41 *
*****

```

```

*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****

```

DDM MCUHP1 Upper Rawhide Wash - Existing Conditions 100 yr, 6 hr storm

OUTPUT CONTROL VARIABLES

```

IPRNT      3 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE

```

IT

HYDROGRAPH TIME DATA

```

NMIN      5 MINUTES IN COMPUTATION INTERVAL
IDATE      1 0 STARTING DATE
ITIME      0000 STARTING TIME
NQ         750 NUMBER OF HYDROGRAPH ORDINATES
NDDATE     3 0 ENDING DATE
NDTIME     1425 ENDING TIME
ICENT      19 CENTURY MARK

```

```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 62.42 HOURS

```

ENGLISH UNITS

```

DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT

```

5 KK

```

*****
* 51012 *
*****

```

```

SUB-BASIN 51012
6-HOUR RAINFALL, PATTERN NO. 2.93 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .928
L = 1.56 Kb = .041 Adj. Slope = 355.0
RAINFALL DEPTH OF 3.45 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.93

```

11 IN

TIME DATA FOR INPUT TIME SERIES

```

JXMIN      15 TIME INTERVAL IN MINUTES
JXDATE     1 0 STARTING DATE
JXTIME     0 STARTING TIME

```

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 1.05 SUBBASIN AREA

PRECIPITATION DATA

14 PI STORM 3.20 BASIN TOTAL PRECIPITATION

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 |
| .01 | .01 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .01 | .01 | .00 |
| .01 | .01 | .01 | .01 | .01 | .01 | .01 | .02 | .02 | .03 |
| .03 | .03 | .06 | .06 | .06 | .07 | .07 | .07 | .07 | .04 |
| .04 | .02 | .02 | .02 | .01 | .01 | .01 | .01 | .01 | .01 |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| .00 | .00 | | | | | | | | |

18 LG GREEN AND AMPT LOSS RATE
STRIL .15 STARTING LOSS
DTH .38 MOISTURE DEFICIT
PSIF 6.40 WETTING FRONT SUCTION
XKSAT .14 HYDRAULIC CONDUCTIVITY
RTIMP 12.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC .34 TIME OF CONCENTRATION
R .15 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= .34 HR, R= .15 HR
SNYDER TP= .29 HR, CP= .99

UNIT HYDROGRAPH
13 END-OF-PERIOD ORDINATES
111. 400. 1518. 2254. 1623. 941. 541. 310. 178. 102.
59. 34. 19.

*** *** *** *** ***

HYDROGRAPH AT STATION 51012

TOTAL RAINFALL = 3.20, TOTAL LOSS = 1.53, TOTAL EXCESS = 1.67

| PEAK FLOW (CFS) | TIME (HR) | MAXIMUM AVERAGE FLOW | | | |
|--------------------|--------------|----------------------|-------|-------|----------|
| | | 6-HR | 24-HR | 72-HR | 62.42-HR |
| 1278. | 4.17 | 188. | 47. | 18. | 18. |
| | | (INCHES) 1.666 | 1.669 | 1.669 | 1.669 |
| | | (AC-FT) 93. | 93. | 93. | 93. |

CUMULATIVE AREA = 1.05 SQ MI

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 | 51012 | 1278. | 4.17 | 188. | 47. | 18. | 1.05 | | |

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

| Basin | Area (acres) | Soil Type - Area in Acres | | | | | | | | | |
|-------|-----------------|---------------------------|-------|-------|----|----|----|----|----|------|-----|
| | | 6 | 33 | 61 | 63 | 72 | 90 | 93 | 96 | 121 | 122 |
| 005 | 267 | | 13.8 | 219.9 | | | | | | 33.3 | |
| 010 | 214 | | 97.7 | 84.6 | | | | | | 31.7 | |
| 012 | 190 | | 172.2 | | | | | | | 17.7 | |

| | | | | | | | | | | |
|----------------------|-------|--|-----|-----|--|--|--|--|----|--|
| Total | 671 | | 284 | 304 | | | | | 83 | |
| Area mi ² | 1.048 | | | | | | | | | |

| | | | | | | | | | | |
|----------------|--|-----|-------|-------|------|--|------|------|-----|--|
| Basin 24 soils | | 6.3 | 313.7 | 109.6 | 99.6 | | 43.8 | 97.9 | 0.1 | |
|----------------|--|-----|-------|-------|------|--|------|------|-----|--|

| DDMS Input Data | | | | | | | |
|-----------------|--------------------|---------|----------------|-------------------|--------------------|--------------------|---------------------|
| Basin ID | Basin Area | | Top Elev. (ft) | Bottom Elev. (ft) | Travel Length (ft) | Travel Length (mi) | Basin Slope (ft/mi) |
| | (mi ²) | (acres) | | | | | |
| 51012 | 1.048 | 671 | 3140 | 2774 | 13200 | 2.50 | 146 |

Land Use 100% Desert 15

| | | | | | | | |
|-----|-------|-----|------|------|------|------|-----|
| 024 | 1.020 | 653 | 3237 | 2684 | 8234 | 1.56 | 355 |
|-----|-------|-----|------|------|------|------|-----|

Soils Table (by Percent)

| Basin ID | Basin Area (acres) | Soil Type - Area in Acres | | | | | | | | | |
|----------|--------------------|---------------------------|-----|-----|-----|-----|----|-----|-----|-------|-----|
| | | 6 | 33 | 61 | 63 | 72 | 90 | 93 | 96 | 121 | 122 |
| 005 | 267 | | 5% | 82% | | | | | 12% | | |
| 010 | 214 | | 46% | 40% | | | | | 15% | | |
| 012 | 190 | | 91% | | | | | | 9% | | |
| 015 | 812 | | 32% | 59% | | 0% | | 1% | 8% | | |
| 017 | 137 | 6% | 37% | 14% | | 6% | | | 36% | | |
| 020 | 487 | | | 54% | 19% | 15% | | 1% | 10% | 0% | |
| 022 | 243 | | 1% | 38% | | 18% | | 2% | 34% | 8% | |
| 024 | 653 | | 1% | 47% | 16% | 15% | | 7% | 15% | 0.01% | |
| 026 | 173 | 0% | 4% | | | 71% | | 0% | 11% | 13% | |
| 030 | 228 | 4% | 39% | 35% | | 17% | | 1% | 5% | | |
| 032 | 21 | 44% | | 52% | | | | 5% | | | |
| 034 | 191 | | 7% | 43% | 2% | 41% | | 4% | 3% | | |
| 036 | 161 | | | 19% | 6% | 48% | | | 16% | 10% | |
| 038 | 117 | | | 54% | | 43% | | | 1% | 2% | |
| 040 | 211 | 13% | 1% | 78% | 5% | 2% | | | | 0% | |
| 041 | 41 | 36% | 2% | 62% | | | | | | | |
| 042 | 208 | 2% | | 78% | 18% | 2% | | | | | |
| 043 | 183 | 25% | 22% | 37% | | | | | | | 17% |
| 044 | 896 | 5% | 4% | 76% | 8% | 1% | | | 4% | | 2% |
| 046 | 71 | 49% | | 12% | | | | | 39% | | |
| 048 | 35 | 56% | | | | | | | 44% | | |
| 051 | 104 | 3% | 37% | 20% | | | | | 40% | | |
| 053 | 60 | 23% | | | | | | | 77% | | |
| 055 | 233 | 0% | 44% | 25% | 7% | | | | 23% | | |
| 058 | 1123 | 5% | 0% | 83% | 4% | 0% | | | 8% | | |
| 060 | 499 | | | 82% | 13% | | | | 6% | | |
| 062 | 467 | 2% | | 71% | 21% | | | | 6% | | |
| 064 | 304 | 16% | 1% | 35% | 8% | | | | 40% | | |
| 066 | 4 | 75% | | | | | | | 30% | | |
| 068 | 159 | 22% | 14% | | | | | 20% | 33% | | 11% |
| 070 | 508 | 22% | 6% | 2% | | | 6% | 4% | 14% | | 48% |

Soil Descriptions

| FCDMC Soil Number | NRCS Soil Code | XKSAT | Rock Outcropping | Soil Definition |
|-------------------|----------------|-------|------------------|---|
| 43 | 6 | 0.620 | 0 | Anthony-Arizo complex |
| 70 | 33 | 0.230 | 0 | Eba very gravelly loam, 1 to 8 percent slopes |
| 98 | 61 | 0.150 | 0 | Gran-Wickenburg complex, 1 to 10 percent slopes |
| 100 | 63 | 0.140 | 25 | Gran-Wickenburg-Rock outcrop complex, 1 to 7 percent slopes |
| 109 | 72 | 0.090 | 30 | Lehmans-Rock outcrop complex, 8 to 65 percent slopes |
| 127 | 90 | 0.390 | 0 | Momoli gravelly sandy loam, 1 to 5 percent slopes |
| 130 | 93 | 0.330 | 0 | Nickel-Cave complex, 8 to 30 percent slopes |
| 133 | 96 | 0.070 | 0 | Pinaleno-Tres Hermanos complex, 1 to 10 percent slopes |
| 158 | 121 | 0.120 | 0 | Tres Hermanos-Anthony complex, 1 to 5 percent slopes |
| 159 | 122 | 0.330 | 0 | Vado gravelly sandy loam, 1 to 5 percent slopes |

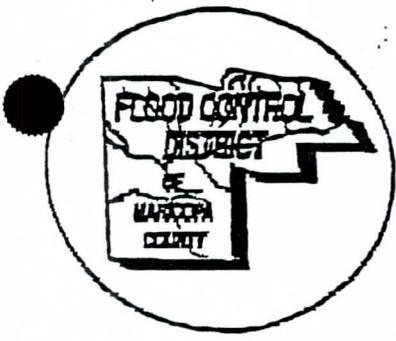
7. My other concern still persists regarding the inconsistency of the values when comparing peaks and volumes between the 6-hour and 24-hour events, I wonder if there is something wrong with the distribution pattern for the 24 hour storm?? Maybe this is something the district might want to check out in case (it) is something in your methods. A 24-hour event is approximately 1/3 greater than a 6-hour rain and you would expect with this being the only difference input the Qs and at least the volumes would be consistently approximately 1/3 greater, they are not.

While not directly an issue that we control and is part of the District methods, we suspect that the variability is in fact related to the interaction of the rainfall distribution with the rainfall runoff process. We had previously mentioned this at a meeting, but do not see this as a problem. First, direct comparison between the 6- and 24-hour events, except for absolute magnitude is somewhat misleading. The 6-hour storms and variable patterns tend to recognize the "local" nature of the event, while the 24-hour pattern seems to be somewhat more reflective of a general storm. In essence, when making estimates using the 24-hour storms this variability in intensity, duration, and timing is best reflected by the fact that both methods are run and the absolute peak often is used as the design Q.

If one would observe that the larger rainfall depth always resulted in the larger peak, there would be no need to run the lower rainfall event. This does make sense when thinking about the spatial variability in rainfall for longer vs. shorter duration storms.

SM

091131002
ROUTE WAS



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

2801 West Durango Street · Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

COVER SHEET

TO: Bob Eichenberger, P.E.

Company or Department: Kimley-Horn & Associates Fax # (602) 944-7423

FROM: David B. Papp, PE

Number of pages being sent including Cover Sheet Three

Comments: Please see attached comments on latest hydrology technical data notebook for Existing + Future Conditions. These represent reviews by both the District and the City of Scottsdale.



Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897

November 4, 1999

MEMO TO: Bob Elchenger, Kimley Horn & Associates

FROM: David B. Boggs, P. E.

SUBJECT: Upper Rawhide Wash Floodplain Delineation Study

The subject technical reports were reviewed for analysis of the present and future conditions. The following are issues that the District needs to be addressed by Kimley Horn and Associates.

- 1- The velocity used to calculate the NSTPS for R030-1 is low compared to other subbasins with similar distance of travel. Hence the NSTPS value is quite high for this subbasin. A verification and explanation is needed.
- 2- An explanation is needed as to the reason for choosing of the constant values m and b for the Kb calculations for applications that are related to type B of table 5.1 of the Drainage Design Manual, whereas the area is mainly of brushy alluvial fans, a type C classification.
- 3- An explanation is also needed as to the reason behind the flows for some of the subbasins being lower for the future conditions compared to the existing conditions analysis.

Should there be a need to modify the Kb values and the NSTPS values, the final Qs could also change. Therefore the hydrology analysis is not approved at this time, until the consultant addresses the above comments.

The City of Scottsdale adds the following comments for your necessary action:

I have completed my review and discussed with Bill Erickson and Dave Meinhart. We are comfortable with the downstream six hour Q100 of approximately 8100 cfs. This compares reasonably well with 9100 cfs from the corrected WRA/Griener model.

We would like to see 9134 cfs, shown in the comparisons made on p. 4-13 rather than the 10,456 currently shown.

We believe the KHA precip. total of 3.45 to be more accurate than the 3.66 used in the WRA/Griener model, and the corrected Griener model also includes the correction of the total drainage area used in the aerial reduction factor for precip.. This was found to be in error, the total basin area was never adjusted to 13.81 sm.. from the original 9.70 sm.. in the

WRA/FEMA model.

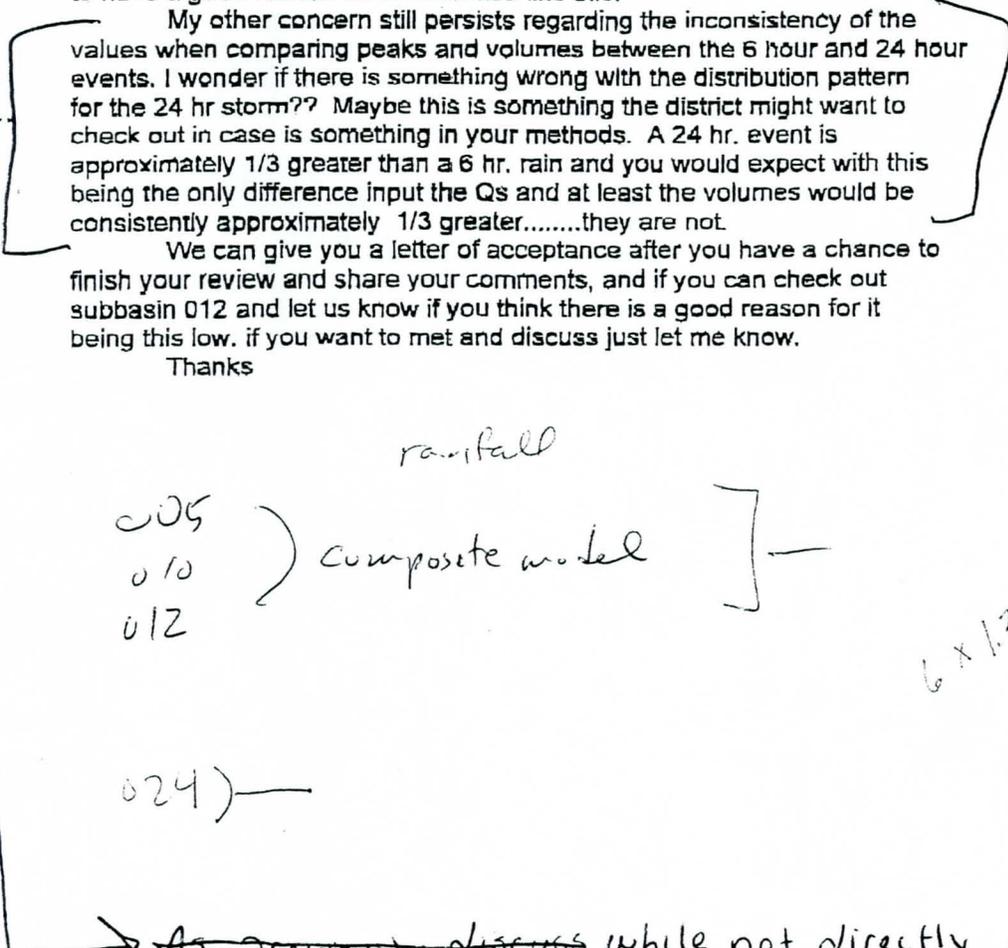
One typo suggestion is the subbasin #066 in Fig. 4-1 needs a leader pointing to its location on the map. this apparently was an oversight as all the other exhibits have this leader(arrow?).

My only other concern that I would like you to look at is the magnitude of the Q100 6 hr. values at CP012 and the upstream subbasins. They seem extremely low and will be used as the Q100 for floodplain mapping purposes. The basin area is 1.05 sm., with a Q = 697 cfs. As a comparison basin 24 has an area = 1.02 sm., and a Q100 = 1273 cfs. I think this needs to have a good reason for a difference like this.

My other concern still persists regarding the inconsistency of the values when comparing peaks and volumes between the 6 hour and 24 hour events. I wonder if there is something wrong with the distribution pattern for the 24 hr storm?? Maybe this is something the district might want to check out in case is something in your methods. A 24 hr. event is approximately 1/3 greater than a 6 hr. rain and you would expect with this being the only difference input the Qs and at least the volumes would be consistently approximately 1/3 greater.....they are not.

We can give you a letter of acceptance after you have a chance to finish your review and share your comments, and if you can check out subbasin 012 and let us know if you think there is a good reason for it being this low. if you want to met and discuss just let me know.

Thanks



6 x 1.33 = 24hr

As previously discuss while not directly an issue that we control and is part of the District methods, we suspect that the variability is ~~a factor~~ in fact related to the interaction of the rainfall distribution with the rainfall runoff process. ~~This~~ we had previously mentioned this at a meeting, but do not see this a problem. First direct comparability between the ~~6~~ 6 and 24 hour events, except for absolute magnitude is somewhat misleading. The six hour storms and variable patterns tend to recognize the "local" nature ^{of the event} while the



*Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897*

2903102
~~2903102~~
comes

DATE : 09-21-99

MEMO TO: Bob Eichenger, P.E., Kimley-Horn & Associates, Inc

FROM : David B. Boggs, P.E., Sr. Civil Engineer *David B. Boggs*

SUBJECT: Upper Rawhide Wash Flood Delineation Study

The City of Scottsdale and the District have agreed on the hydrology for the subject study, providing the consultant provide the following items:

- 1- Correct the XKSAT values for basin 015. Provide the input Drainage Design Menu System files with the corrected values and provide the corrected HEC-1 model. Change the report to reflect these changes.
- 2- Provide to the District the HEC-1 model, with the added Concentration point at subbasin 042. The report *and the exhibits* should be adjusted to reflect this new concentration point.

With these changes the District and the City of Scottsdale will approve the hydrology portion of the study, and we can finalize the Qs to be used for the floodplain delineation.

If you have any questions, please call me at 602-506-4528.

Please submit the revised project completion schedule as soon as possible.

Thank you for your cooperation to advance this study to its next phase.

Cc: Collis Lovely

August 6, 1999

Mr. David Boggs
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear David:

We enclose the responses to the City of Scottsdale's comments on the final hydrology for the Upper Rawhide Wash.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger, P.E.
Project Engineer

RAE:lsm

Encl: Comment responses

Transmittal

Date: August 6, 1999 Job No: 091131.02 (FCD 98-12)

To: Afshin Ahouraiyan

Flood Control District of Maricopa County

2801 W. Durango

Phoenix, AZ 85009

Re: Upper Rawhide Wash Hydrology

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| 3 | 8/6/99 | 1 | Technical Data Notebook - Final |
| 3 | 8/6/99 | 1 | Technical Data Notebook Supplement - Future Build-out Conditions - Final |
| 1 | 8/6/99 | 5 | Responses to City of Scottsdale final review comments of 6/25/99 |
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Remarks _____

Afshin, _____

For your review. If you need more information, please give me a call.

Please insert the figures G-1 to G-10 from the previous submittal if not included here.

Laurie _____

Copy to File; David Boggs Signed _____

Bob Eichinger

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(25 June 1999 comments)**

Comments from Collis Lovely, City of Scottsdale:

1. **Fig. 1-2** Please relocate the words "Rawhide Wash" between "▲" symbol and stream 4D to properly reflect the actual location of the main stem.

The words "Rawhide Wash" have been relocated in place of the words "Stream 4D".

2. **P. 1, Sec. 1.1** Please add the following "at the request of the City of Scottsdale through the FCDMC."

*The first sentence of the paragraph in Section 1.1 has been revised to read as follows:
"This floodplain delineation study has been undertaken at the request of the City of Scottsdale through the Flood Control District of Maricopa County (FCDMC) to develop Flood Insurance Study (FIS) watershed hydrology for the Upper Rawhide Wash in Scottsdale, Arizona."*

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Explanations and/or corrections to eliminate the inconsistencies are necessary. Compare basins 10, 12, 30, and 40. Look at Basins 46, 48, 53, 66, and 68 for Q6 vs. Q24.

The variations in discharge for the same basin area is a function of the physiographic characteristics of the watershed. There are several different land types, slopes and soil types in this watershed, resulting in differing flow rates for the same size basin. For example, the contributing area to CP012 and the area of basin 024 are both one square mile. The difference in the peak flows are due to steeper slopes of basin 024, and the soil types. The runoff hydrograph for basin 024 also peaks one half hour before that of CP012. The higher runoff from basin 024 is as expected due to these differences.

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Figures G6 - G10 were added to show all of the information on one map. Figures G1-G5 are as the District requested.

12. **G6-10** These are excellent exhibits.

Thank you for the comment.

13. **Summary of Overall Results**

Results are consistently low compared to previous studies, as well as the regression equation (R.E.) results. Results are 32% lower than previous studies and **67% to 58% lower than R.E. results.**

The significant differences for Basins 05, 15, 22, 030, 44, 55, 58, 60, 62, 64, 68, and 70 warrant investigation into why these peak values are so much lower than the R.E. results.

Extremely long travel lengths within (basins □ above), numerous watersheds could explain some of the inconsistencies and/or low values. Also, the steeper slopes in watersheds around Goldie Brown Ranch could be a factor in the inconsistencies. All the inconsistencies need to be checked for possible coding or input errors and evaluated if not input error, and specific reasons provided in the report that explains them.

The results of the verification analysis using the USGS and ADOT methodology indicate reasonable agreement between the HEC-1 model results and the regression models. The results are within the confidence limits of the regressions. Variations between the regression expected values and the HEC-1 results may be explained by differing site conditions relating to soils, land slope, drainage area, vegetation cover, land use, etc.

Keep in mind that regression analysis is in essence a third methodology to estimate flood peaks. There is no reason to assume that the numbers will be the same as the modeled peaks. The regression equations are developed from relatively few stream gages in the state and put into a Log Pearson III distribution. The Log Pearson III method was a statistical distribution agreed to by a committee as reasonably representing the statistical distribution of stream runoff data for the nation. The reason for the agreement was driven by a desire at the federal level to achieve repeatable results. Subsequent to that time individuals continue to remind us that perhaps there are better distributions than LPIII. Within LPIII, dependent on the length of record, the confidence intervals can range from being very tight, to providing intervals of ± 200% or more. This is indicative of the short records and the flashy ephemeral nature of southwest watercourses. Finally, investigators have taken this LPIII derived data, applied linear and multiple regressions and have developed estimates with unknown published coefficients of determination, and published 100-year standard errors of the mean ranging from 39% to 48% for the data utilized in the regression analysis.

Finally, with respect to previous work performed on the watershed, keep in mind that these methods were based on using kinematic wave methods on an upland watershed. The rainfall method used in the Greiner investigation was based on using the PH record of the HEC-1, which results in one of the most conservative rainfall distributions used within the state of Arizona. While the kinematic wave method in upland watersheds provides the ability to closely check input, in essence we (and for that matter many other hydrologists) are of the opinion that kinematic wave methods in upland watersheds do not work because they violate the premise of directly connected impervious areas. Kinematic wave methods are much better suited for urban environments. The net result is that the kinematic wave methods tend to result in very quick and non-attenuated hydrographs that are conservative, yet difficult to justify.

In closing there is nothing that we can do within the current scoped methods, that will allow us to achieve agreement with the previous work. The models have been checked and rechecked and the assertion by the City that we continue to add concentration points or check input will not resolve the issues of methods. With regard to internal agreement within the model, the variations pointed out by the City relate to different watershed types and are not due to modeling error.

As for the FCDMC methods we are of the opinion that they are more representative of the watershed conditions within Maricopa County as compared to those employed in Scottsdale. We understand the policy concern that Scottsdale has regarding the differing discharges, but this is not an issue that we can resolve by continuing to change the model.

As a further check we put the Greiner hypothetical rainfall distribution into our model, with the 100-yr rainfall of 3.66 in. This resulted in a watershed Qpeak for the KHA model of 10,424 cfs as compared to Greiner's Qpeak of 10,456 cfs.

Transmittal

Date: May 26, 1999 Job No: 091131.02 (FCD 98-12)

To: Collis Lovely

7447 E. Indian School Rd.

Suite 205

Scottsdale, AZ 85251

Re: Upper Rawhide Wash Hydrology

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| 1 | 5/26/99 | 1 | TDN - Hydrology Supplement - Future Build-out Conditions - Final |
| 1 | 5/26/99 | 3 | Final Hydrology review comments and responses |
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Remarks Final Project Hydrology per scope of work.

Three copies have been sent to the District per the scope. This copy is for your use.

If you need more information, please give me a call.

Laurie

Copy to File Signed _____

Laurie Marin

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(May 3, 1999 comments)**

Comments from Afshin Ahouriyani, FCDMC:

1. *Mr. Collis Lovely's review comments dated April 19, 1999, should be addressed.*
See following pages.
2. *Subbasin 024 was to be adjusted to include the flows in the upper part of subbasin 026. This has not been done yet. All the parameters need to be adjusted with the change.*
Subbasin 024 and 026 have been modified. Hydrologic parameters have all been updated accordingly.
3. *For easier review by FEMA, include the elevation values used for the routing and time of concentration calculations on the final figures submitted in the Technical data notebook.*
The elevation values have been added.
4. *The subbasin boundary between basins 58 and 64 needs to be re-investigated.*
The subbasin boundary was investigated and it is correct as is. The flow path of basin 064 was changed to reflect the longest flow path.
5. *For time of concentration calculations, if the subbasins share a concentration point, the low elevations for these basins have to be the same. An example is basins 026 and 022. Please check for other such locations and adjust the elevation values accordingly.*
The elevations at flow path ends have been adjusted.
6. *For routing calculations, if the subbasins share a concentration point, the low elevation of the upper subbasin should be the same as the high elevation for the lower subbasin. Examples where this is not done are routings from CP038 to CP040 and CP040 and CP042. Please adjust other such cases accordingly.*
The elevations at routing reach ends have been adjusted.
7. *Please include a map with the topographic information showing the subbasins' boundaries, longest flow paths for the time of concentrations, and flow paths for routing reaches.*

The map requested has been included as Figures G6 – G10.

8. *On all the figures, add a symbol to show where subbasins 032 and 066 are located.*

Symbols have been added to clarify the locations of subbasins 032 and 066.

9. *Provide all the hard copies of the back up data, such as the DDMS files used for the hydrology analysis in the technical data notebook.*

All DDMS files have been included.

Comments from Collis Lovely, City of Scottsdale:

1. *Fig. G-2: add C.P. #'s; and add routing reaches to show connections.*

Figure G-2 is as requested by the Flood Control District of Maricopa County. We have also included additional 600 scale figures in the final submittal, with all watershed information including the topography for the entire study area.

2. *Fig. G-3: Add C.P. #'s*

Figure G-3 is as requested by the Flood Control District of Maricopa County. We have also included additional 600 scale figures in the final submittal, with all watershed information including the topography for the entire study area.

3. *Figures G1-3: Add symbol to I.D. the split flow at C.P. 012*

A symbol has been added to show where the flow splits.

4. *Pg. 6 of 8: Assume 100% of diversion stays in Rawhide Basin*

The existing conditions 100 year, 24 hour flow at the split is 1049 cfs, with the split determined by a rating curve of the cross section at the diversion. While for purposes of floodplain delineation, assuming no split in the existing condition model may be slightly more conservative. We are concerned about the management ramifications of not documenting this split. In general, we have identified an area where a small amount of flow is leaving the Rawhide watershed, for the adjacent watershed. Those using this work for design purposes may incorrectly assume no transfer of flow, leading to potential design problems. As such, we believe it is prudent to continue to assume the flow split.

Under the future conditions model, we would be much more willing to assume a somewhat hypothetical split that would direct most or all the water through Rawhide Wash, because we are not being tied to FEMA criteria.

5. *Pg. 4 of 8: LOB and ROB n-values should be higher than channel maybe .045.*

The LOB and ROB n-values have all been adjusted.

6. *Pg. 3 of 8: What is the basis for determining Basins 060 – 070 have on 10% vegetative cover – explain.*

Ten percent vegetative cover was determined from field observations.

7. Pg. 1 – HEC-1: Future Conditions Hydrology. HEC-1 printouts: complete the statement “ is not to be used for.....?”

“This future conditions hydrology is not to be used for floodplain delineation.”

8. G-1 & Text Need to I.D. the two splits at C.P. 062 and 066 and state that they will be cutoff and 100% routed to the dam site as part of the dam project. Your existing condition model is really existing plus the dam and associated improvements. I think these need to be pointed out so people will understand the situation.

Comments have been added to the model for clarification.

Memorandum

TO: Afshin Ahouraiyan
cc: Pedro Calza, Amir Motamedi
FROM: Doug Plasencia
DATE: February 17, 1999
RE: Upper Rawhide Wash Hydrology Verification
Contract: FCD 98-12
KHA JOB NO.: 091131.02

In the Draft Technical Data Notebook for Upper Rawhide Wash, we provided for verification of the hydrology using the regional regression equations of ADOT. What we found was a dramatic difference, especially in the smaller watersheds, between our estimated values and those of the ADOT regression.

Upon further review, we realized that we had inadvertently used results for small watersheds that had already been areally and temporally reduced based on the larger 14 square mile watershed. Further, due to a miscommunication, we reported the 6-hour versus the 24-hour results.

To rectify this situation, we switched to the 100-year, 24-hour storm event, which resulted in an ultimate peak of 8,050 cfs at the outlet. Still somewhat lower than the previous work of Ward, but clearly more consistent with these results.

The next step was to perform the verification using peak flow rates from the small watershed based on non-reduced rainfall and distributions.

The net result is that the KHA-Upper Rawhide Wash Hydrology is quite consistent with the regional regression equations of ADOT and the USGS, and we are confident that the results are reflective of the watershed conditions. We believe that the primary difference between our work and the previous work is the use of Kinematic Wave routing versus the use of a Unit Hydrograph approach. It has been our experience that the Kinematic Wave method is best applied in urban street settings, and that in natural settings the overland flow velocities that one can roughly estimate from the model routing, is very fast leading to high peak flow estimations.

Based on FCD review comments and these findings, we will modify the final TDN.



Transmittal

Date: January 11, 1999 Job No: 091131.02 (FCD 98-12)

To: Afshin Ahouraiyan

Flood Control District of Maricopa County

2801 W. Durango

Phoenix, AZ 85009

Re: Upper Rawhide Wash Hydrology

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| 1 | 1/4/99 | 2 | Routing Cross Section modeled in FlowMaster |
| 1 | 1/4/99 | 7 | DDMS Input Data – Existing and Future Build-out Conditions models |
| 1 | 1/8/99 | 9 | HEC-1 output file (e3102-6.out) 100 yr, 6 hr – Existing conditions |
| 1 | 1/8/99 | 9 | HEC-1 output file (e3102-24.out) 100 yr, 24 hr – Existing Conditions |
| 1 | 1/7/99 | 1 | HEC-1 output file (d3102-6.out) 100 yr, 6 hr – Future Build-out Conditions |
| 1 | 1/8/99 | 9 | HEC-1 output file (d3102-24.out) 100 yr, 24 hr – Future Build-out Conditions |
| 1 | 1/7/99 | 1 | Future Build-out Conditions Zoning Map |

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Afshin, _____

For your review. The cross section for routing from 005 to CP010 is included. It was the same in BOSS and FlowMaster. If you need more information, please give me a call.

Laurie _____

Copy to File: Pedro Calza Signed _____

Laurie Marin

Submittal #1

| Comment # | Comment | Action Taken |
|-----------|--|--|
| 1 | The following minor changes should be made to the DDMS input data table, i) Change the basin area units from Acres to Square miles, ii) Basin Slope percentages to feet/mile, iii) Make sure the corrected percent impervious areas for each subbasin is shown on the table. | i, ii - the table has been revised iii - Sample areas were examined with the DDMS default %impervious values calculated using soil types and land use. From these comparisons, we opted to use the default DDMS values as being representative. |
| 2 | Checking the length measurements, there is a discrepancy between the FCD and KHA's values. Although the differences are less than 10%, however, a request is made that the consultant re-measures the lengths. | The flow paths were originally created and measured in AutoCAD. All lengths have been rechecked and are accurate. |
| 3 | The top elevation used for basin 005 should be 3140 not 3150. | The elevation has been revised. |

Submittal #2

| Comment # | Comment | Action Taken |
|-----------|--|---|
| 1 | Correct the high elevation point for the routing reach CP065 to CP070 from 2163 to 2184. | The elevation has been revised. |
| 2 | There is no routing between basin 005 and basin 010, a distance of 1000 feet. There is however a routing reach for a distance of 784 (feet) between CP050 to CP055. Either an explanation is needed as to why there is a routing reach for a length of 784 feet and not the 1000 feet, or the routing reach between basins 005 and 010 should be added to the HEC-1 model. | A routing reach between basins 005 and 010 has been added. |
| 3 | Looking at the schematics of the HEC-1 model, unless there is a need to find the flows at the current location of basin 030, it is recommended that basin 030 be extended to CP035. This will eliminate the routing R035-1. Based on this change, the parameters for basin 030 needs to be adjusted accordingly. | The concentration point CP030 is located at a confluence and is needed for the hydraulic modelling. |



*Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897*

12-28-98

MEMO TO: Pedro Calza

FROM: Afshin Houraiyan

SUBJECT: Upper Rawhide Wash Flood Delineation Study FCD 98-12

Kimley-Horn and Associates have made two hydrology submittals. The first dealt with the basin parameters and the second one with routing parameters and a preliminary HEC-1 run. The following are comments on both submittals.

For the first submittals:

- 1- The following minor changes should be made to the DDMS input data table, i) Change the basin area units from Acres to Square miles, ii) Basin Slope percentages to feet/mile iii) Make sure the corrected percent impervious areas for each subbasin is shown on the table.
- 2- Checking the length measurements, there is discrepancy between the FCD and KHA's values. Although the differences are less than 10%, however, a request is made that the consultant re-measures the lengths.
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For the second submittal:

- 1- Correct the High elevation point for the routing reach CP065 to CP070 from 2163 to 2184.
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- 3- Looking at the schematics of the HEC-1 model, unless there is a need to find the flows at the current location of basin 030, it is recommended that basin 030 be extended to CP035. This will eliminate the routing R035-1. Based on this change, the parameters for basin 030 needs to be adjusted accordingly. The rest of the HEC-1 model is correct and approved.

There are no other comments on the two submittals. If you have any questions please call me at ext. 64519.



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N. 16th Street
Phoenix, Arizona
85020

August 6, 1999

Mr. David Boggs
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear David:

We enclose the responses to the City of Scottsdale's comments on the final hydrology for the Upper Rawhide Wash.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger, P.E.
Project Engineer

RAE:lsm

Encl: Comment responses

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(25 June 1999 comments)**

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Results are consistently low compared to previous studies, as well as the regression equation (R.E.) results. Results are 32% lower than previous studies **and 67% to 58% lower than R.E. results.**

The significant differences for Basins 05, 15, 22, 030, 44, 55, 58, 60, 62, 64, 68, and 70 warrant investigation into why these peak values are so much lower than the R.E. results.

Extremely long travel lengths within (basins □ above), numerous watersheds could explain some of the inconsistencies and/or low values. Also, the steeper slopes in watersheds around Goldie Brown Ranch could be a factor in the inconsistencies. All the inconsistencies need to be checked for possible coding or input errors and evaluated if not input error, and specific reasons provided in the report that explains them.

The results of the verification analysis using the USGS and ADOT methodology indicate reasonable agreement between the HEC-1 model results and the regression models. The results are within the confidence limits of the regressions. Variations between the regression expected values and the HEC-1 results may be explained by differing site conditions relating to soils, land slope, drainage area, vegetation cover, land use, etc.

Keep in mind that regression analysis is in essence a third methodology to estimate flood peaks. There is no reason to assume that the numbers will be the same as the modeled peaks. The regression equations are developed from relatively few stream gages in the state and put into a Log Pearson III distribution. The Log Pearson III method was a statistical distribution agreed to by a committee as reasonably representing the statistical distribution of stream runoff data for the nation. The reason for the agreement was driven by a desire at the federal level to achieve repeatable results. Subsequent to that time individuals continue to remind us that perhaps there are better distributions than LP III. Within LP III, dependent on the length of record, the confidence intervals can range from being very tight, to providing intervals of ± 200% or more. This is indicative of the short records and the flashy ephemeral nature of southwest watercourses. Finally, investigators have taken this LP III derived data, applied linear and multiple regressions and have developed estimates with unknown published coefficients of determination, and published 100-year standard errors of the mean ranging from 39% to 48% for the data utilized in the regression analysis.

Finally, with respect to previous work performed on the watershed, keep in mind that these methods were based on using kinematic wave methods on an upland watershed. The rainfall method used in the Greiner investigation was based on a using the PH record of the HEC-1, which results in one of the most conservative rainfall distributions used within the state of Arizona. While the kinematic wave method in upland watersheds provides the ability to closely check input, in essence we (and for that matter many other hydrologists) are of the opinion that kinematic wave methods in upland watersheds do not work because they violate the premise of directly connected impervious areas. Kinematic wave methods are much better suited for urban environments. The net result is that the kinematic wave methods tend to result in very quick and non-attenuated hydrographs that are conservative, yet difficult to justify.

In closing there is nothing that we can do within the current scoped methods, that will allow us to achieve agreement with the previous work. The models have been checked and rechecked and the assertion by the City that we continue to add concentration points or check input will not resolve the issues of methods. With regard to internal agreement within the model, the variations pointed out by the City relate to different watershed types and are not due to modeling error.

As for the FCDMC methods we are of the opinion that they are more representative of the watershed conditions within Maricopa County as compared to those employed in Scottsdale. We understand the policy concern that Scottsdale has regarding the differing discharges, but this is not an issue that we can resolve by continuing to change the model.

As a further check we put the Greiner hypothetical rainfall distribution into our model, with the 100-yr rainfall of 3.66 in. This resulted in a watershed Q_{peak} for the KHA model of 10,424 cfs as compared to Greiner's Q_{peak} of 10,456 cfs.



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Fax Transmittal

To: Afshin Ahouraiyan Fax: No.: 602-506-4601
 Firm/Location: FCDMC Job: No.: 091131.02
 From: Laurie Marin Date: August 5, 1999
 Original coming by mail: Yes: No: X

If you have any problems, please call 602-944-5500 and ask for: Patti
 Total number of pages, including cover sheet: 8

Comments:

Afshin,

Here are our final comment responses from the COS comments. Also included is the revised.
hydrology verification section of the report. We will put the comment responses in a letter to you
tomorrow. Laurie

Engineering
Planning
and
Environmental
Consultants

This facsimile is intended for the addressee named herein and may contain information that is confidential. If you are not the intended recipient or the employee or agent responsible for delivery to the addressee, you are hereby notified that any review, dissemination, disclosure, or copying of this communication is strictly prohibited. If you have received this facsimile in error, please immediately notify us by telephone, and return the original facsimile to us at the address above via the U.S. Postal Service. Thank you.

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(25 June 1999 comments)**

Comments from Collis Lovely, City of Scottsdale:

1. **Fig. 1-2** Please relocate the words "Rawhide Wash" between "▲" symbol and stream 4D to properly reflect the actual location of the main stem.

The words "Rawhide Wash" have been relocated in place of the words "Stream 4D".

2. **P. 1, Sec. 1.1** Please add the following "at the request of the City of Scottsdale through the FCDMC."

The first sentence of the paragraph in Section 1.1 has been revised to read as follows: "This floodplain delineation study has been undertaken at the request of the City of Scottsdale through the Flood Control District of Maricopa County (FCDMC) to develop Flood Insurance Study (FIS) watershed hydrology for the Upper Rawhide Wash in Scottsdale, Arizona."

3. **Sec. 4.2.1** Last sentence: These tributaries have been I.D'd in the previous FEMA Study. Need to identify them by FEMA number, and include them here for future reference.

The last sentence of the third paragraph has been revised to read: "This element is a tributary diversion channel that diverts storm water flows from FEMA tributary streams 4A and 4B located east of the basin to the basin site."

4. **Sec. 4.3.1** This is a good clear statement about the split. However, we need to add a statement of caution in regard to the potential instability of this split over time. The distribution of flow could change in the future as peak flows and/or sedimentation change the channel cross section characteristics and the rating curve.

We have added the following sentence after Table 4-2: "The rating curve could change in the future as peak flows and/or sedimentation change the channel cross section characteristics and distribution of flow."

5. **Table 4-3** Peaks for areas > 1.0 sq. mi. within acceptable ranges, however, 6 hr. peaks for areas < 1.0 sq. mi. below acceptable minimum values. There are significant inconsistencies between areas with the same basin area size; and between 6 hr. vs. 24 hr. values.

For example: Basin 12 needs to be checked, as well as Basin 024. Both are 1.0 sq. mi. in size. The CSM ranges from 650 and 999 for 6hr and 1,245 to 2,434 for 24hr. Need to correct or provide explanation why?

The exceedingly low peak values for the small <1.0 sq. mi. basins may not be adversely affecting the larger downstream peaks; but, it along with the inconsistencies, don't give one a lot of confidence in any of the model results.

Explanations and/or corrections to eliminate the inconsistencies are necessary. Compare basins 10, 12, 30, and 40. Look at Basins 46, 48, 53, 66, and 68 for Q6 vs. Q24.

The variations in discharge for the same basin area is a function of the physiographic characteristics of the watershed. There are several different land types, slopes and soil types in this watershed, resulting in differing flow rates for the same size basin. For example, the contributing area to CP012 and the area of basin 024 are both one square mile. The difference in the peak flows are due to steeper slopes of basin 024, and the soil types. The runoff hydrograph for basin 024 also peaks one half hour before that of CP012. The higher runoff from basin 024 is as expected due to these differences.

6. **Table 4.5** Add last column from Table 4.6 and you can eliminate Table 4.6.
We chose to leave the tables as they are to separate the Region 12 and Region 13 calculations.
7. **Table 4-7** Need to add the comparison with the Regression Equation Results for the two regions (for basin area sizes of 14.06 and 13.81 sq. mi.).
The FCDMC requested that we include USGS regression data and that should address your comment.
8. **Table 4-6** This is incomplete in that it does not compare any basin Q's over 1.76 sq. mi. in size. Please add comps at C.P. 12, 22, 26, 30, 36, 38, 40, 42, 46, 51, 62, 64, 68, and 70.
We feel that by looking at individual subbasin results that we are providing the best comparisons. In our experience the problems between methods is related to subbasins. Performing regression analyses on combined areas will mean mixing different land uses and topography and will introduce more skew in the results.
9. **Figure G-2** Did you forget to put in the routing paths? They are in the legend. It would make sense to show them on the map so that it is complete.
The routing paths are shown on Figure G-3: Routing Paths per FCDMC instructions. The legend is consistent for all of the Figures G-1 to G-5.
10. **G-2 & G-7** Basin 42 should have C.P. where it joins main stem of Rawhide Wash. As is, this is an erroneous assumption for Q peak for Basin 42, and the Q in the main stem. This can be seen on G-7.
Based on previous review meetings Basins 042 and 044 were split to show additional definition. We could split and redefine subbasins ad infinitum and the results of the hydrology would not be significantly impacted.

11. **Fig. G-3** Please combine this with G-2 so everything is one map, or provide a third map? As it is, it does not allow one to check or understand the routing sequences.

Figures G6 - G10 were added to show all of the information on one map. Figures G1-G5 are as the District requested.

12. **G6-10** These are excellent exhibits.

Thank you for the comment.

13. **Summary of Overall Results**

Results are consistently low compared to previous studies, as well as the regression equation (R.E.) results. Results are 32% lower than previous studies and **67% to 58% lower than R.E. results.**

The significant differences for Basins 05, 15, 22, 30, 44, 55, 58, 60, 62, 64, 68, and 70 warrant investigation into why these peak values are so much lower than the R.E. results.

Extremely long travel lengths within (basins □ above), numerous watersheds could explain some of the inconsistencies and/or low values. Also, the steeper slopes in watersheds around Goldie Brown Ranch could be a factor in the inconsistencies. All the inconsistencies need to be checked for possible coding or input errors and evaluated if not input error, and specific reasons provided in the report that explains them.

The results of the verification analysis using the USGS and ADOT methodology indicate reasonable agreement between the HEC-1 model results and the regression models. The results are within the confidence limits of the regressions. Variations between the regression expected values and the HEC-1 results may be explained by differing site conditions relating to soils, land slope, drainage area, vegetation cover, land use, etc.

Keep in mind that regression analysis is in essence a third methodology to estimate flood peaks. There is no reason to assume that the numbers will be the same as the modeled peaks. The regression equations are developed from relatively few stream gages in the state and put into a Log Pearson III distribution. The Log Pearson III method was a statistical distribution agreed to by a committee as reasonably representing the statistical distribution of stream runoff data for the nation. The reason for the agreement was driven by a desire at the federal level to achieve repeatable results. Subsequent to that time individuals continue to remind us that perhaps there are better distributions than LP III. Within LP III, dependent on the length of record, the confidence intervals can range from being very tight, to providing intervals of ± 200% or more. This is indicative of the short records and the flashy ephemeral nature of southwest watercourses. Finally, investigators have taken this LP III derived data, applied linear and multiple regressions and have developed estimates with unknown published coefficients of determination, and published 100-year standard errors of the mean ranging from 39% to 48% for the data utilized in the regression analysis.

Finally, with respect to previous work performed on the watershed, keep in mind that these methods were based on using kinematic wave methods on an upland watershed. The rainfall method used in the Greiner investigation was based on using the PH record of the HEC-1, which results in one of the most conservative rainfall distributions used within the state of Arizona. While the kinematic wave method in upland watersheds provides the ability to closely check input, in essence we (and for that matter many other hydrologists) are of the opinion that kinematic wave methods in upland watersheds do not work because they violate the premise of directly connected impervious areas. Kinematic wave methods are much better suited for urban environments. The net result is that the kinematic wave methods tend to result in very quick and non-attenuated hydrographs that are conservative, yet difficult to justify.

In closing there is nothing that we can do within the current scoped methods, that will allow us to achieve agreement with the previous work. The models have been checked and rechecked and the assertion by the City that we continue to add concentration points or check input will not resolve the issues of methods. With regard to internal agreement within the model, the variations pointed out by the City relate to different watershed types and are not due to modeling error.

As for the FCDMC methods we are of the opinion that they are more representative of the watershed conditions within Maricopa County as compared to those employed in Scottsdale. We understand the policy concern that Scottsdale has regarding the differing discharges, but this is not an issue that we can resolve by continuing to change the model.

As a further check we put the Greiner hypothetical rainfall distribution into our model, with the 100-yr rainfall of 3.66 in. This resulted in a watershed Q_{peak} for the KHA model of 10,424 cfs as compared to Greiner's Q_{peak} of 10,456 cfs.

4.5.2 Verification of Results

Indirect Verification Methods

We have provided for verification of the hydrology for Upper Rawhide Wash by using the regional regression equations from the Arizona Department of Transportation. We conducted the verification using peak flow rates based on non-reduced rainfall and distributions for the existing conditions 100-year, 24-hour storm. We used the non-reduced rainfall for comparison with the peak subbasin discharges as computed using the region 12 and region 13 regression equations. A summary of the computations is in Appendix D.8.

Table D.8.1 is a summary of the HEC-1 peak discharges for the 100-year 24-hour with areal reduction. Table D.8.2 is a summary of the HEC-1 peak discharges for the 100-year 24-hour with no areal reduction. Both tables are for existing project conditions and provide a unit discharge for each subbasin in cfs per square mile.

Table D.8.3 summarizes the computation using the ADOT regression equations for indirect method No 2 (see page 10-5 ADOT highway drainage manual). Indirect method No. 2 provides a regression equation for the 100-year peak discharge and a regression equation for the maximum recorded discharge. A review of Table D.8.3 indicates fair agreement between the HEC-1 peak discharges and the ADOT indirect method 100-year discharge on a subbasin by subbasin comparison. Examination of the concentration points result in somewhat of a scatter of results. This is due to the fact that the HEC-1 model accounts for routing and summation of hydrographs for determination of peak discharges while the ADOT method only uses watershed area.

We have plotted on ADOT figures 10-3 and 10-4 the 100-year HEC-1 peak discharges for subbasins from 0.1 to 2.0 square miles and for 1.0 to 20 square miles, respectively. On figure 10-3, the plotted subbasins are well within the 75% tolerance limit lines about the 100-year discharge line. On figure 10-4, the plotted subbasins are mainly located at the upper 75% tolerance limit. These plots indicate that the HEC-1 peak discharges are within reasonable expectations and agreement with previous studies conducted in Arizona.

Our next step for hydrology verification was to follow ADOT indirect method No. 3 using regional regression equations. Table D.8.4 provides a summary of the data required to use the regression equations presented in the ADOT manual. The Upper Rawhide Wash watershed is located in near the boundaries of regions 12 and 13. Therefore, we computed the 100-year peak discharge using the regression equations for both regions 12 and 13.

The results of the computations are plotted by subbasin area and 100-year discharge for region

12 on figures 10-20 and 10-21. Examination of the plotted data points on figure 10-20 indicates that most of the points are outside the "cloud of common values". This indicates that the Upper Rawhide Wash may not be similar to the drainage area sites with characteristics that fall within this cloud of common values. However, the drainage area versus peak discharge plotted values in figure 10-21 are relatively consistent with the regression line. We then plotted the 100-year discharge for region 13 on figure 10-22. We observe the same consistency in figure 10-22 as observed in figure 10-21. The plotted data points are clustered fairly well around the regression line and follow the trend of the regression.

Finally, we plotted the subbasin drainage area versus peak discharge on the USGS figures 41 and 42 from their report titled "Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States" (USGS Open file report 93-419). These figures are the same as the ADOT figures 10-20 and 10-21, but ADOT did not include the bounding limits as shown in the USGS figures. A review of the plots on figures 41 and 42 indicate that the regression results for the subbasins fall within the envelope curves and the 100-year peak discharge relationship for the regions 12 and 13.

The results of the verification analysis using the ADOT methodology indicates reasonable agreement between the HEC-1 model results and the regression results, particularly when plotted on the regression curves. Variations may be explained by differing site conditions relating to soils, land slope, drainage area, vegetation cover, land use, etc.

Comparison with Previous Models of the Watershed

The results of this study were compared to two other models - the General Drainage Plan for North Scottsdale, Arizona by Water Resources Associates, Inc. (WRA) completed in 1988 and revised in 1989; and the Scottsdale Desert Greenbelt, Rawhide Wash Hydrologic Report done by Greiner, Inc. and the City of Scottsdale in 1994. The Greiner hydrology was based on the WRA hydrology and followed the same methodology.

The draft TDN completed by Kimley-Horn and Associates, Inc. (KHA) and dated January 1999 contained a detailed comparison of KHA's preliminary results and the above models. After subsequent discussions with the Flood Control District of Maricopa County and the City of Scottsdale review comments were incorporated and this report reflects the final results. Adjustments were made to the vegetative cover, subbasins and concentration points were added and flow paths were adjusted. A comparison of final flow values for this study are in Table 4-5.

Table 4-5: Comparison of Final Flows to WRA & Greiner Models

| | Drainage Area | 100 yr, 6 hr | |
|--------------|--------------------|--------------|--------------|
| | | Q | Time to peak |
| | [mi ²] | [cfs] | [hr] |
| KHA | 14.06 | 6896 | 5.3 |
| Greiner | 13.81 | 10456 | 3.9 |
| % difference | | 34% | |

The differences in the methodologies used for the WRA & Greiner studies and the KHA study are as follows:

Table 4-6: HEC-1 Methodology Comparison (KHA vs. WRA & Greiner)

| <i>Method</i> | <i>KHA</i> | <i>WRA & Greiner</i> |
|------------------------------|---|--------------------------|
| <i>Rainfall Distribution</i> | FCDMC Point rainfall | Hypothetical Storm |
| <i>Losses</i> | Green and Ampt | SCS Curve Number |
| <i>Unit Hydrograph</i> | Clark - Time of concentration from DDMS - Papadakis | Kinematic wave method |

The variation of flow results between our work and that done by others is primarily related to the Clark Unit Hydrograph vs. Kinematic Wave Routing and perhaps to a lesser degree the difference in rainfall distribution. We are of the opinion that the Clark Unit Hydrograph better represents natural watersheds, and that the District's rainfall distributions are more representative of a high intensity desert storm.

As a further check we put the Greiner hypothetical rainfall distribution into our model, with the 100-yr rainfall of 3.66 in. This resulted in a watershed Qpeak for the KHA model of 10,424 cfs as compared to Greiner's Qpeak of 10,456 cfs.

FILE 09/13/99

June 25, 1999

TO: Pedro Calza, Flood Control District of Maricopa County
FROM: Collis Lovely, Drainage Planner
CC: Laurie Marin, Kimley-Horn and Associates
RE: Review Comments on 5/26/99 Hydrology Report-Upper Rawhide FPDS

- Fig. 1-2** Please relocate the words "Rawhide Wash" between " " symbol and stream 4D to properly reflect the actual location of the main stem.
- P. 1, Sec. 1.1** Please add the following "at the request of the City of Scottsdale through the FCDMC."
- Sec. 4.2.1** Last sentence: These tributaries have been I.D'd in the previous FEMA Study. Need to identify them by FEMA number, and include them here for future reference.
- Sec. 4.3.1** This is a good clear statement about the split. However, we need to add a statement of caution in regard to the potential instability of this split over time. The distribution of flow could change in the future as peak flows and/or sedimentation change the channel cross section characteristics and the rating curve.
- Table 4-3** Peaks for areas > 1.0 sq. mi. within acceptable ranges, however, 6 hr. peaks for areas < 1.0 sq. mi. below acceptable minimum values. There are significant inconsistencies between areas with the same basin area size; and between 6 hr. vs. 24 hr. values.
- For example: Basin 12 needs to be checked, as well as Basin 024. Both are 1.0 sq. mi. in size. The CSM ranges from 650 and 999 for 6hr, and 1,245 to 2,434 for 24hr. Need to correct or provide explanation why?
- The exceedingly low peak values for the small <1.0 sq. mi. basins may not be adversely affecting the larger downstream peaks; but, it along with the inconsistencies, don't give one a lot of confidence in any of the the model results.

Explanations and/or corrections to eliminate the inconsistencies are necessary. Compare basins 10, 12, 30, and 40. Look at Basins 46, 48, 53, 66, and 68 for Q₆ vs. Q₂₄.

- Table 4.5** Add last column from Table 4.6 and you can eliminate Table 4.6.
- Table 4-7** Need to add the comparison with the Regression Equation Results for the two regions (for basin area sizes of 14.06 and 13.81 sq. mi.).
- Table 4-6** This is incomplete in that it does not compare any basin Q's over 1.76 sq. mi. in size. Please add comps at C.P. 12, 22, 26, 30, 36, 38, 40, 42, 46, 51, 62, 64, 68, and 70.
- Figure G-2** Did you forget to put in the routing paths? They are in the legend. It would make sense to show them on the map so that it is complete.
- G-2 & G-7** Basin 42 should have C.P. where it joins main stem of Rawhide Wash. As is, this is an erroneous assumption for Q peak for Basin 42, and the Q in the main stem. This can be seen on G-7.
- Fig. G-3** Please combine this with G-2 so everything is one map, or provide a third map? As it is, it does not allow one to check or understand the routing sequences.
- G6-10** These are excellent exhibits.
- Summary of Overall Results** Results are consistently low compared to previous studies, as well as the regression equation (R.E.) results. Results are 32% lower than previous studies **and 67% to 58% lower than R.E. results.**

The significant differences for Basins 05, 15, 22, 030, 44, 55, 58, 60, 62, 64, 68, and 70 warrant investigation into why these peak values are so much lower than the R.E. results.

Extremely long travel lengths within (basins above), numerous watersheds could explain some of the inconsistencies and/or low values. Also, the steeper slopes in watersheds around Goldie Brown Ranch could be a factor in the inconsistencies.

All the inconsistencies need to be checked for possible coding or input errors and evaluated if not input error, and specific reasons provided in the report that explains them.



FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

HYDROLOGY
091131.02

BOARD OF DIRECTORS
Jan Brewer
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox

May 3, 1999

Mr. Doug Plasencia, P.E.
Kimley-Horn and Associates
7600 North 15th Street
Phoenix, Arizona 85020

Subject: Upper Rawhide Wash Hydrology Submittal

Dear Doug:

The District has received the subject HEC-1 model and the back up data. The following comments should be addressed:

1. Mr. Collis Lovely's review comments dated April 19, 1999, should be addressed.
2. Subbasin 024 was to be adjusted to include the flows in the upper part of subbasin 026. This has not been done yet. All the parameters need to be adjusted with the change.
3. For easier review by FEMA, include the elevation values used for the routing and time of concentration calculations on the final figures submitted in the Technical data notebook.
4. The subbasin boundary between basins 58 and 64 needs to be re-investigated.
5. For time of concentration calculations, if the subbasins share a concentration point, the low elevations for these basins have to be the same. An example is basins 026 and 022. Please check for other such locations and adjust the elevation values accordingly.
6. For routing calculations, if the subbasins share a concentration point, the low elevation of the upper subbasin should be the same as the high elevation for the lower subbasin. Examples where this is not done are routings from CP038 to CP040 and CP040 to CP042. Please adjust other such cases accordingly.
7. Please include a map with the topographic information showing the subbasins' boundaries, longest flow paths for the time of concentration calculations, and flow paths for routing reaches.
8. On all the figures, add a symbol to show where subbasins 032 and 066 are located.
9. Provide all the hard copies of the back up data, such as the DDMS files used for the hydrology analysis in the technical data notebook.

This letter should serve as our final comments on the hydrology analysis of this project, conditional to all the above mentioned points being adjusted accordingly.

If you have any questions on this matter, please feel free to contact me at 506-4519.

Sincerely,

A. Afshin

Afshin Ahouraiyan

**Flood Control District
Of Maricopa County
Upper Rawhide Wash Hydrology Submittal
(May 3, 1999 comments)**

Comments from Afshin Ahouriyani, FCDMC:

1. *Mr. Collis Lovely's review comments dated April 19, 1999, should be addressed.*

See following pages.

2. *Subbasin 024 was to be adjusted to include the flows in the upper part of subbasin 026. This has not been done yet. All the parameters need to be adjusted with the change.*

Subbasin 024 and 026 have been modified. Hydrologic parameters have all been updated accordingly.

3. *For easier review by FEMA, include the elevation values used for the routing and time of concentration calculations on the final figures submitted in the Technical data notebook.*

The elevation values have been added.

4. *The subbasin boundary between basins 58 and 64 needs to be re-investigated.*

The subbasin boundary was investigated and it is correct as is. The flow path of basin 064 was changed to reflect the longest flow path.

5. *For time of concentration calculations, if the subbasins share a concentration point, the low elevations for these basins have to be the same. An example is basins 026 and 022. Please check for other such locations and adjust the elevation values accordingly.*

The elevations at flow path ends have been adjusted.

6. *For routing calculations, if the subbasins share a concentration point, the low elevation of the upper subbasin should be the same as the high elevation for the lower subbasin. Examples where this is not done are routings from CP038 to CP040 and CP040 and CP042. Please adjust other such cases accordingly.*

The elevations at routing reach ends have been adjusted.

7. *Please include a map with the topographic information showing the subbasins' boundaries, longest flow paths for the time of concentrations, and flow paths for routing reaches.*

The map requested has been included as Figures G6 – G10.

8. *On all the figures, add a symbol to show where subbasins 032 and 066 are located.*

Symbols have been added to clarify the locations of subbasins 032 and 066.

9. *Provide all the hard copies of the back up data, such as the DDMS files used for the hydrology analysis in the technical data notebook.*

All DDMS files have been included.

Comments from Collis Lovely, City of Scottsdale:

1. *Fig. G-2: add C.P. #'s; and add routing reaches to show connections.*

Figure G-2 is as requested by the Flood Control District of Maricopa County. We have also included additional 600 scale figures in the final submittal, with all watershed information including the topography for the entire study area.

2. *Fig. G-3: Add C.P. #'s*

Figure G-3 is as requested by the Flood Control District of Maricopa County. We have also included additional 600 scale figures in the final submittal, with all watershed information including the topography for the entire study area.

3. *Figures G1-3: Add symbol to I.D. the split flow at C.P. 012*

A symbol has been added to show where the flow splits.

4. *Pg. 6 of 8: Assume 100% of diversion stays in Rawhide Basin*

The existing conditions 100 year, 24 hour flow at the split is 1049 cfs, with the split determined by a rating curve of the cross section at the diversion. While for purposes of floodplain delineation, assuming no split in the existing condition model may be slightly more conservative. We are concerned about the management ramifications of not documenting this split. In general, we have identified an area where a small amount of flow is leaving the Rawhide watershed, for the adjacent watershed. Those using this work for design purposes may incorrectly assume no transfer of flow, leading to potential design problems. As such, we believe it is prudent to continue to assume the flow split.

Under the future conditions model, we would be much more willing to assume a somewhat hypothetical split that would direct most or all the water through Rawhide Wash, because we are not being tied to FEMA criteria.

5. *Pg. 4 of 8: LOB and ROB n-values should be higher than channel maybe .045.*

The LOB and ROB n-values have all been adjusted.

6. *Pg. 3 of 8: What is the basis for determining Basins 060 – 070 have on 10% vegetative cover – explain.*

Ten percent vegetative cover was determined from field observations.

7. *Pg. 1 – HEC-1: Future Conditions Hydrology. HEC-1 printouts: complete the statement “ is not to be used for.....?”*

“This future conditions hydrology is not to be used for floodplain delineation.”

8. *G-1 & Text Need to I.D. the two splits at C.P. 062 and 066 and state that they will be cutoff and 100% routed to the dam site as part of the dam project. Your existing condition model is really existing plus the dam and associated improvements. I think these need to be pointed out so people will understand the situation.*

Comments have been added to the model for clarification.

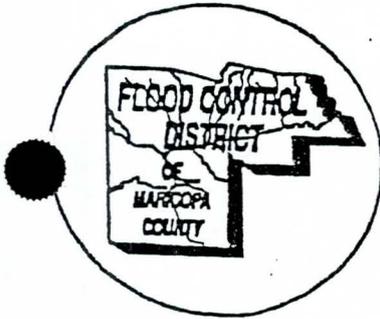
091131.02
CORRESPONDENCE

**REVIEW OF DRAFT FIELD RECONNAISSANCE REPORT
FOR FLOOD DELINEATION STUDY
FCD CONTRACT NO. 98-12**

**BY
R.W. CRUFF, P.E.
MARCH 4, 1999**

I do not have any significant comments on the Field Reconnaissance Report. I might disagree with some of the N-values, but without going in the field, it would be only nitpicking, as I believe that we wouldn't disagree in final by more than + or -0.005. It looks to me like they have done a very professional job of looking at the N-values and documenting their work.

Plax file
09/13/02
Hydrology



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

2801 West Durango Street · Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

COVER SHEET

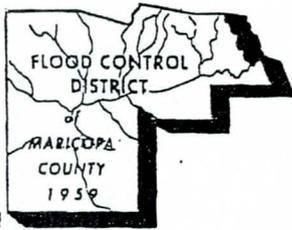
TO: Doug Plasencia or Laurie Marin

Company or Department: Kimley-Horn & Associates Fax # 944-7423

FROM: Afshin Ahouraiyan

Number of pages being sent including Cover Sheet: 3

Comments: Here are the comments Laurie & I discussed.
Will talk to you later,
Afshin



FLOOD CONTROL DISTRICT

of

Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Jan Brewer
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox

May 3, 1999

Mr. Doug Plasencia, P.E.
Kimley-Horn and Associates
7600 North 15th Street
Phoenix, Arizona 85020

Subject: Upper Rawhide Wash Hydrology Submittal

Dear Doug:

The District has received the subject HEC-1 model and the back up data. The following comments should be addressed:

1. Mr. Collis Lovely's review comments dated April 19, 1999, should be addressed.
2. Subbasin 024 was to be adjusted to include the flows in the upper part of subbasin 026. This has not been done yet. All the parameters need to be adjusted with the change.
3. For easier review by FEMA, include the elevation values used for the routing and time of concentration calculations on the final figures submitted in the Technical data notebook.
4. The subbasin boundary between basins 58 and 64 needs to be re-investigated.
5. For time of concentration calculations, if the subbasins share a concentration point, the low elevations for these basins have to be the same. An example is basins 026 and 022. Please check for other such locations and adjust the elevation values accordingly.
6. For routing calculations, if the subbasins share a concentration point, the low elevation of the upper subbasin should be the same as the high elevation for the lower subbasin. Examples where this is not done are routings from CP038 to CP040 and CP040 to CP042. Please adjust other such cases accordingly.
7. Please include a map with the topographic information showing the subbasins' boundaries, longest flow paths for the time of concentration calculations, and flow paths for routing reaches.
8. On all the figures, add a symbol to show where subbasins 032 and 066 are located.
9. Provide all the hard copies of the back up data, such as the DDMS files used for the hydrology analysis in the technical data notebook.

This letter should serve as our final comments on the hydrology analysis of this project, conditional to all the above mentioned points being adjusted accordingly.

If you have any questions on this matter, please feel free to contact me at 506-4519.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan

Memo

To: Laurie Marin FAX #: 944-7423
 From: Collis Lovely, Public Works/Drainage Planner
 CC: Afshin Ahouraiyan FCD MC. FAX #: 506-4601
 Review Date: 4/19/99
 Re: Title: Upper Rawhide Wash Hydrology - 8 Miscel. Submittals
 Author: Kimley-Horn Assoc. Inc. - Laurie Marin Date: 4/13/99

| Page/Sheet # | Comments | Response |
|--------------|---|---|
| Fig. G-2 | Add C.P. #'s ; and | |
| " | Add routing reaches to show connections. | |
| Fig. G-3 | Add C.P. #'s | |
| Figs G-3 | Add symbol to I.D. the split flow at CP.012 | |
| p.6 of 8 | Assume 100% of Diversion stays in Rawhide Basin | |
| b.4 of 8 | LOB and ROB n-values should be higher than channel, maybe .045. | change |
| p.3 of 8 | What is the basis for determining Basins 060-070 have on 10% vegetative cover - explain. | |
| p.1 -HEC-1 | Future Cond. Hydrol. HEC-1 printouts, complete the statement "is not to be used for...?" | ✓ |
| G-1 + text ? | Need to I.D. the two splits at C.P. 62 + 66 and state that they will be cutoff and 100% routed to the dam site as part of the dam project. Your existing condition model is really existing plus the dam and associated improvements. I think these need to be pointed out so people will understand the situation. | ok - ch acts for proposed div works w/ R/W |
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B.2 CONTACT (TELEPHONE) REPORTS



Memorandum To File

Prepared By: BOB EICHINGER

Project No.: 091131.02

Date: 8/23/99

Copies To: DOUG P ✓

Subject: RAWHIDE WASH FLOODPLAIN STUDY

LAURIE M ✓

Notes: DAVID BOGGS CALLED 9:00 AM. FCD MET w/ CITY OF SCOTSDALE LAST WEEK TO DISCUSS KHA HYDROLOGY FOR RAWHIDE WASH. JOE TRAM IS TAKING OVER FOR PEDRO IN THE INTERIM. DAVID ALERTED ME THAT THE FCD WAS GOING TO BE MORE SCRUTINIOUS AND DETAILED THAN WAS IN THE PAST. IN TERMS OF HYDROLOGY - CITY CONVINCED FCD THAT SUBBASIN 042 NEEDS TO BE ^{SUBDIVIDED} ~~SEPT~~ INTO TWO FURTHER SUBBASINS. JOE WILL DISCUSS HYDROLOGY WITH AFSHIN TODAY. DAVID SAID CROSS SECTIONS USED IN ROUTING REACHES ARE VERY WIDE - ~~CAUSES~~ GROSSLY ATTENUATES FLOW PEAKS. MAY NEED TO ITERATE CROSS SECTIONS WITH CROSS SECTIONS IN HECRAS MODEL. DAVID MENTIONED THAT CROSS SECTIONS MAY NOT BE ORIENTED PERPENDICULAR TO FLOW - BUT THE SECTIONS WERE REVIEWED BY THE DISTRICT (MISS CRUFF). I MENTIONED THE SECTIONS WERE ALSO REVIEWED BY THE CITY AND CITY COMMENTS INCORPORATED. DAVID SAID HE WOULD PROBABLY SEE THE FLOW PATTERN BETTER WITH AN INITIAL FLOODPLAIN MAP. I SAID KHA ALREADY SUBMITTED AN INITIAL FLOODPLAIN SUBMITTAL EARLIER THIS YEAR. WE ARE WAITING FOR FCD COMMENTS. DAVID THOUGHT AN APPROACH MAY BE (A) REALIGN SOME OF THE X-SECTIONS OR CUT NEW ONES (B) ITERATE AGAIN ON HYDROLOGY - REDEFINE ROUTING REACHES. FCD (JOE AND DAVID) MAY MAKE A FIELD TRIP TO RAWHIDE WASH. JOE MAY ASK FOR A COMPARISON OF VARIATION BETWEEN 6 VS 24 HOURS STORMS BY SUBBASINS BASED ON DIFFERENCE IN % RATIO.



Memorandum To File

Prepared By: BOB EICHTWAGER Project No.: 091131.02

Date: JAN 13 1999 Copies To: DJP, JTA

12:15
AM

Subject: CONSTANTINE PROPERTY UPPER RAWHIDE WASH
(944-8260)

Notes: MR. SHAKIR GUSHGARI OF SKY ENTERPRISES CALLED REGARDING THE CONSTANTINE PROPERTY. SHAKIR IS A CIVIL ENGINEER RETAINED BY CONSTANTINE WHICH IS THE PROPERTY ON RAWHIDE WASH WITH THE WALLED COMPOUND AT PIMA ROAD. COLLIS LOVELY (CITY SCOTSDALE) REFERRED SHAKIR TO ME. SHAKIR STATED THAT THE CONSTANTINES WOULD NOT ALLOW KHA TO VISIT HIS PROPERTY FOR THE PURPOSES OF THE FLOOD STUDY. HOWEVER SHAKIR HAS OFFERED TO PROVIDE KHA WHATEVER INFORMATION HE MAY HAVE. I ASKED FOR SITE GRADING PLANS (AS-BUILT) AND AERIAL PHOTO. SHAKIR SAID HE HAD DESIGN SURVEY BUT NO AS-BUILTS OR AERIAL PHOTO. HE WILL PROVIDE KHA THE SITE GRADING PLANS. HE SAID THE SITE WAS CONSTRUCTED ACCORDING TO THE SITE GRADING PLANS.

HE WILL HAVE THE PLANS TO KHA BY THIS FRIDAY.



Memorandum To File

Prepared By: BOB EICHNGER

Project No.: 051131.02
UPPER RAWHIDE

Date: JAN 11 1999

Copies To: _____

Subject: MAILING LIST FROM COS

DJP

Notes: I CALLED PEDRO AT FCD. WE DISCUSSED COS
LARGE MAILING LIST FOR UPPER RAWHIDE. COS
LIST IS FOR ENTIRE WATERSHED AND NOT ADJACENT
TO FLOODPLAIN DELINEATION. PEDRO SAID OK TO REDUCE
LIST TO PROPERTY OWNERS ADJACENT TO DELINEATION -
NOT ENTIRE WATERSHED.

COS LETTER TO INCLUDE IN MAILER IS OK WITH
PEDRO. IT IS COS LETTER AND CONTENT OF
LETTER IS THEIR RESPONSIBILITY.

KAA IS TO REDUCE # OF MAILING LIST TO ADJACENT
TO FLOODPLAIN. ENCLOSE COS LETTER AS IS.



Memorandum To File

Prepared By: BOB EICHINGER

Project No.: 091131.02

Date: 4/10/98 4:10 PM

Copies To: FILE

Subject: UPPER RANSHIDE WASH

Notes: DOUG + I CALLED SCOTT OGDEN TO DISCUSS THE TOPOGRAPHIC MAPPING FILES AND WHAT WE WERE DOING TO MANAGE FILE SIZE FOR USE IN HYDRAULIC MODELING. WE EXPLAINED TO SCOTT THAT THE 3-D TOPO FILES WERE SO LARGE THEY COULDN'T EFFECTIVELY BE USED FOR MODELING. KHA THEREFORE REDUCED FILE SIZES BY FILTERING OUT, THROUGH SOFTWARE, UNNEEDED POINTS, WHILE STILL MAINTAINING TOPO RESOLUTION. KHA TESTED THE FILTERING OF DATA POINTS BY PLOTTING 7 CROSS-SECTIONS WITH ORIGINAL TOPO DATA AND WITH REDUCED DATA POINTS. FROM EXAMINATION THE X-SECTIONS DID NOT VARY AND RETAINED CROSS SECTION SHAPE BETWEEN THE ORIGINAL TOPO AND THE X-SECTIONS PLOTTED WITH THE REDUCED DATA.

SCOTT BELIEVED THAT THIS WAS A SUITABLE APPROACH AND SOUNDED LIKE THE PROCEDURE TO TAKE.

B.3 MEETING MINUTES OF REPORTS



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

December 22, 1998

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear Pedro:

We have enclosed the minutes of the progress meeting held at your offices on December 17, 1998.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

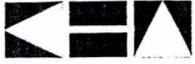

Doug Plasencia, P.E.
Associate

DJP:rae

Encl: Meeting Minutes for Progress Meeting No. 5

■
TEL 602 944 5500
FAX 602 944 7423

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**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12**

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Dec. 17, 1998

Meeting No.: 5 – Progress Meeting

Meeting Time: 3:00 PM

Meeting Place: Flood Control District of Maricopa County

Attendees: FCD – Scott Ogden, Pedro Calza, Russ Cruff
KHA – Doug Plasencia, Bob Eichinger,

Item No.

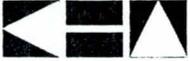
1. Scott's last day is Friday, December 18, 1998. Pedro will take over as District P.M. and Russ Cruff will be reviewing hydraulics portion of project.
2. Doug submitted November invoice. Included bullet points of items completed and percent completes. Reviewed accomplished tasks.
3. Topo for project acquired from City (question from Pedro).
4. Other December accomplishments: Afshin approved watershed boundaries, we had one minor revision to subbasin boundary, discussed subbasin parameters, working model by end of Dec/early Jan
5. Schedule: 120 days from NTP to get draft TDN hydrology
6. Discussion Items:
 - a. Field Survey: not done yet. Waiting for Scottsdale to provide mailing list for right of entry letters.
 - b. Have not reviewed race car driver's property. – map per recognized improvements.
 - c. KHA has design plans for this property, but no grading plans inside. Possible that some flow may skirt around block wall to south wash.
 - d. KHA is master planning Goldie Brown Ranch. Master plan drainage report states that the FCD is conducting an FIS presently. Master drainage plan to conform to FCD study. No competing hydrology.
 - e. Public involvement meetings are to be removed from KHA scope of work. This is a request from the City of Scottsdale. Doug estimated effort for these two meetings.
 - f. Doug contacted Michael Baker regarding '88 datum versus '29 datum. KHA will conduct study in '88 and provide tables and annotations in '29. District requested KHA to obtain letter from Michael Baker confirming approach. Doug



also estimated the additional effort for this work. Becomes a push with the effort for the two public meetings. District Ok'd and is agreeable. Still need to make a change order however.

- g. Future conditions hydrology- no assumed retention/detention
- h. Administrative- Pedro Hydrology – Afshin Hydraulics – Russ
- i. Let Pedro know if City of Scottsdale is responsive with mailing list.

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received in writing by KHA 7 days after receipt of these meeting minutes.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

November 2, 1998

Mr. W. Scott Ogden, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear Scott:

Kimley-Horn and Associates, Inc. is pleased to begin the floodplain delineation for Upper Rawhide Wash. We understand that the notice-to-proceed and project begin date is Monday, October 19, 1998, and that the project duration is 450 calendar days.

We have enclosed the minutes of the project kickoff meeting held at your offices on October 21, 1998.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger

for Douglas J. Plasencia, P.E.
Associate

DJP:rae

Encl: Meeting Minutes for Project Kickoff Meeting

■
TEL 602 944 5500
FAX 602 944 7423

KA-CIVIL\09113102\CORRESPOND\KO-MEETING.RTF



Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Oct. 21, 1998

Meeting No.: 1 - Project Kick-off

Meeting Time: 9:00 AM

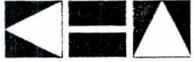
Meeting Place: Flood Control District

Attendees: FCD – Scott Ogden, Afshin Ahouraiyan, Marta Dent, Pedro Calza
KHA - Bob Eichinger, Jon Ahern, Laurie Marin
City of Scottsdale – Collis Lovely

Handouts: Meeting Agenda (attached)

Item No.

1. Rename project to "Upper Rawhide Wash Floodplain Delineation Study". The purpose of the new name is to distinguish this project from the Rawhide Wash Detention Basin Project.
2. TASK 7 - HIS DATA
 - 2.1 KHA to submit files based on Scottsdale's city grid coordinates.
 - 2.2 Datum conversion. Discussion regarding conducting study based on NAVD 88 and then converting to NGVD 29. Scott requested issue to be further discussed with Doug Placencia and Bob Eichinger.
 - 2.3 KHA did attend GIS training conducted by the FCD. ID names need to be identical.
 - 2.4 FCD recommends setting up a prototype.
 - 2.5 Use of Excel spreadsheets to populate tables for comma delimited files
3. TASK 1 – COORDINATION
 - 3.1 Schedule – KHA to prepare schedule using MS Project 4.0
 - 3.2 Public meetings are on hold per request from City of Scottsdale
 - 3.3 City of Scottsdale Rawhide Wash detention basin study contacts:
Public Information Officer: Natalie Wood
Desert Greenbelt PM: Marc Landiseidel
Rawhide Wash Detention Basin: Collis Lovely
 - 3.4 Use Letter to affected property owners, no public meetings
 - 3.5 FCD to change order out of contract – no public meetings
 - 3.6 Coordination is very important
 - 3.7 Legal Ads: FCD provided a go-by legal advertisement. Run in Scottsdale Tribune and AZ Republic. Call Dan Carroll for approval of text. Run ads on Wednesdays (less expensive).
 - 3.8 FCD provided invoice and progress report go-bys.



Kimley-Horn
and Associates, Inc.

4. TASK 3 – TOPOGRAPHIC MAPPING
City of Scottsdale to obtain grading and drainage plans for culvert crossing of Rawhide on west side of Pima Road. Some additional topo of this site may be required.
5. TASK 4 – FIELD SURVEY
Important to get field survey started as soon as possible. Submit location map of cross sections to pick up in the field to the FCD.
6. TASK 5 – HYDROLOGY
 - 6.1 Scott to prepare list of names of attendees for coordination meeting with Detention Basin study.
 - 6.2 FCD prepared CD with topographic ¼ section dgn, DTM files by ¼ section, soils map, zoning maps (from City of Scottsdale), and streets map (from City of Scottsdale).
 - 6.3 Other studies – Greiner Study – FCD may have provided to KHA previously, KHA to check.
 - 6.4 City of Scottsdale review comments are to be addressed and incorporated in the final TDN's
 - 6.5 Main stem capacity checks
 - 6.6 Hydrology is to be completed by end of Jan. or mid Feb 1999. Hydrology to be used by HDR in the detention basin study.
7. TASK 6 – HYDRAULICS
Pretty straight forward. Look at culvert crossing at Pima Road
8. TASK 8 – DELIVERABLES
Very important to the District
9. QUESTIONS
 - 9.1 Afshin to consider using CN's versus Green-Ampt for losses.
 - 9.2 FCD to supply raster images of project site if needed by KHA

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received in writing by KHA 7 days after receipt of these meeting minutes.



Kimley-Horn
and Associates, Inc.

UPPER RAWHIDE WASH
FLOODPLAIN DELINEATION STUDY

Contract FCD 98-12
KHA Job No. 091131.02

AGENDA FOR
HYDROLOGY MEETING #1

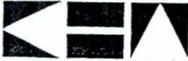
19 November 1998 Kimley-Horn and Associates, Inc. 1:00 PM

- 1) Introductions
- 2) Comments from District and/or City of Scottsdale
- 3) Project Overview
 - Project Manager – Doug Plasencia
- 4) Hydrology methodology
 - Hydrologist – Laurie Marin
- 5) Project schedule
 - Project Engineer – Bob Eichinger
- 6) Discussion

UPPER RAWHIDE WASH
FLOODPLAIN DELINEATION STUDY

SIGN-IN SHEET FOR
HYDROLOGY MEETING #1
November 19, 1998 1:00 PM

| | Name | Address | Phone | Fax |
|----|-------------------|------------------------|----------|----------|
| 1 | Pedro Calza | Flood Control | 506-1501 | |
| 2 | Afshin Ahouraiyan | FCDMC | 506-4519 | 506-4601 |
| 3 | Dennis Richards | Tetra Tech ISG | 491-1393 | 491-1396 |
| 4 | Bill Jenkins | ADWR, Flood Mitigation | 417-2445 | 417-2423 |
| 5 | Mike Greenslade | ADWR, Dam Safety | 417-2445 | 417-2423 |
| 6 | Jon Fuller | JEF, H&G, INC. | 752-2124 | 839-2193 |
| 7 | Jon Ahern | KHA | | |
| 8 | L. Steve Miller | HDR | 508-6636 | 508-6606 |
| 9 | Mike Heaton | HDR | 508-6625 | 508-6606 |
| 10 | W. Scott Ogden | FCDMC | 506-4071 | 506-4601 |
| 11 | Jonn E. Rodriguez | FCDMC | 506-8782 | 506-4601 |
| 12 | Ray Acuna | City of Phoenix | 262-4960 | |
| 13 | Bob Eichinger | KHA | 944-5500 | 944-7423 |
| 14 | Laurie Marin | KHA | 944-5500 | 944-7423 |
| 15 | Collis Lovely | C.O.S. | 994-7852 | 7971 |
| 16 | Doug Plasencia | KHA | 944-5500 | 944-7423 |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

November 30, 1998

Mr. W. Scott Ogden, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

**Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02**

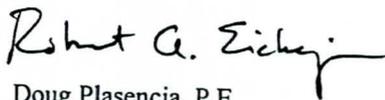
Dear Scott:

We have enclosed the minutes of the Hydrology meeting held at our offices on November 19, 1998.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

for 

Doug Plasencia, P.E.
Associate

DJP:rae

Encl: Meeting Minutes for Hydrology Meeting

■
TEL 602 944 5500
FAX 602 944 7423

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**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12**

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Nov. 19, 1998

Meeting No.: 2 - Hydrology

Meeting Time: 1:00 PM

Meeting Place: Kimley-Horn and Associates, Inc.

Attendees: FCD – Scott Ogden, Afshin Ahouraiyan, John Rodriguez, Pedro Calza
KHA – Doug Plasencia, Bob Eichinger, Laurie Marin, Jon Ahern,
City of Scottsdale – Collis Lovely
HDR – Steven Miller, Mike Heaton
Tetra Tech – Dennis Richards
ADWR – Mike Greenslade, Bill Jenkins
City of Phoenix – Ray Acuna
Jon E. Fuller H & G, Inc. – Jon Fuller

Handouts: Meeting Agenda (attached)

Item No.

1. Introduction
 - 1.1 Introduction of all participants
 - 1.2 Approximate boundaries of hydrologic study illustrated on exhibit map
 - 1.3 Dynamite Road north to Forest Service Land (floodplain delineation)
2. Comments from the FCD
 - 2.1 Coordination important between projects in the area
 - 2.2 Rawhide Wash Detention Basin - HDR
 - 2.3 Desert Greenbelt - Tetra Tech
 - 2.4 Upper Rawhide Wash Floodplain Delineation – KHA
3. Hydrology Methodology
 - 3.1 Rainfall distribution 100yr 24-hour estimated using SCS type II rainfall distribution
 - 3.2 Rainfall Excess – Green and Amp Methodology
 - 3.3 Unit Hydrograph – Clark Unit Hydrograph
 - 3.4 Will also use soils maps and land use maps provided by the FCD
 - 3.5 Additional Concentration points to be added near Dynamite Road and east of Pima (to account for hydrologic split flow)



3.6 Open Discussion on Methodology

- 3.6.1 Collis Lovely (City of Scottsdale) voiced concerns about changing methods from the current Ward model (Curve Number) in the area. Had a previous difficult time with acceptance of the model by FEMA and now that it is accepted may want to stick with the same methods. FCD stated that KHA is to use District methodology (Green/Ampt, etc).
- 3.6.2 John Fuller expressed some concerns about using the existing "in ground" conditions and not using the zoning map to estimate the land use parameters for the HEC-1 model and the production of Existing Conditions discharge values. FCD stated that the existing hydrology will be based on District methods and procedures.
- 3.6.3 Steven Miller (HDR) was looking for consensus on the acceptance of hydrology and some standardization of the discharge values. Expressed concern that publishing differing discharges may confuse the general public in his highly public project. FCD stated that the Upper Rawhide Wash hydrology is being developed for a floodplain delineation study. KHA is to use FCD methods and procedures for the Upper Rawhide Wash study.

4. Project Schedule

- 4.1 Mid. December preliminary HEC-1 results to the FCD for review
- 4.2 Mid. January TDN Draft to the FCD for review

5. Direction

- 5.1 Five Additional concentration points added
- 5.2 Existing Hydrologic model to be based on "in ground conditions" not zoning per FCD.
- 5.3 FCD guidelines, methods, and procedures to be followed through the project

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received in writing by KHA 7 days after receipt of these meeting minutes.



Kimley-Horn
and Associates, Inc.

UPPER RAWHIDE WASH
FLOODPLAIN DELINEATION STUDY

Contract FCD 98-12
KHA Job No. 091131.02

AGENDA FOR
HYDROLOGY MEETING #1

19 November 1998 Kimley-Horn and Associates, Inc. 1:00 PM

- 1) Introductions
- 2) Comments from District and/or City of Scottsdale
- 3) Project Overview
 - Project Manager – Doug Plasencia
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 - Project Engineer – Bob Eichinger
- 6) Discussion

UPPER RAWHIDE WASH
FLOODPLAIN DELINEATION STUDY

SIGN-IN SHEET FOR
HYDROLOGY MEETING #1
November 19, 1998 1:00 PM

| | Name | Address | Phone | Fax |
|----|-------------------|------------------------|----------|----------|
| 1 | PEDRO CALZA | FLOOD CONTROL | 506-1501 | |
| 2 | Afshin Ahouraiyan | FCDMC | 506-4519 | 506-4601 |
| 3 | DENNIS RICHARDS | TETRA TECH ISG | 491-1393 | 491-1396 |
| 4 | Bill Jenkins | ADWR, Flood Mitigation | 417-2445 | 417-2423 |
| 5 | Mike Greenstade | ADWR, Dam Safety | " | " |
| 6 | Jon Fuller | JEF, H&H, Inc | 752-2124 | 839-2195 |
| 7 | Jon Ahem | KHA | | |
| 8 | L. STEVE MILLER | HDR | 508-6636 | 508-6606 |
| 9 | Mike Heaton | HDR | 506-6625 | 506-6606 |
| 10 | W. Scott Ogden | FCDMC | 506-4071 | 506-4601 |
| 11 | JOHN E. RODRIGUEZ | FCDMC | 506-8782 | " " |
| 12 | Ray Acuña | City of Phx | 962-4960 | |
| 13 | BOB EICHENBERG | KIMLEY-HORN ASSOCIATES | 944-5500 | 944-7423 |
| 14 | LAURIE MARIN | " | " | 944-7423 |
| 15 | Colles Lovely | C.O.S. | 994-7852 | 7971 |
| 16 | Doug Plasencia | KHA | 944-5500 | 944-7423 |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

MEETING REMINDER

| | | | | |
|------------|-------------------|----------|-----------------|----------|
| To: | Scott Ogden | 506 4601 | Ray Acuna | 262 7322 |
| | Afshin Ahouraiyan | | Jon Fuller | 839 2193 |
| | Pedro Calza | | Dennis Richards | 491 1396 |
| | Amir Motamedi | | Ot Chatupon | 542 4668 |
| | John Rodriguez | | ClydeAnderson | |
| | John Benoist | 417 2423 | Mike Heaton | 508 6606 |
| | Mike Greenslade | | Steve Miller | |
| | Bill Jenkins | | Collis Lovely | 994 7971 |
| | John Linkswiler | | | |

From: Doug Plasencia/Bob Eichinger

UPPER RAWHIDE WASH HYDROLOGY COORDINATION MEETING

DATE: Thursday, November 19, 1998

TIME: 1:00 pm to 3:00 pm

PLACE: Kimley-Horn and Associates
7600 North 15th Street, Suite 250
Phoenix, AZ

Please call Pat Crawford at 944 5500 if you cannot attend. Thank you.

■
TEL 602 944 5500
FAX 602 944 7423

Mr. Ray Acuna X
Floodplain Administrator
City of Phoenix
Phoenix, AZ 85003-1611
200 W WASHINGTON ST, FL

Mr. Jon Ahern MM
Project Hydraulic Engineer
Kimley-Horn and Associates
7600 N. 15th Ave., Suite 250
Phoenix, AZ 85020

Clyde Anderson
Dept

msg
w/ Doug
✓ attendance

[Redacted] X
Project Hydrologist
Flood Control District of Maricopa Cou
2801 West Durango Street
Phoenix, AZ 85009-6399

RE: Rawhide
Detention Basin 7/10/2002

Mr. Clyde Anderson X
Arizona State Land Department
Phoenix, AZ 85007
1016 W ADAMS - DRAINAGE ENT
542-3500 (W)
542-4668 (F)

Mr. John Benoist X
Chief - Dam Safety 500 N 3 ST
Arizona Department of Water Resources
Phoenix, AZ 85004
417-2445 (W)
4172423 (F)

optional
attendee

* REPLACEMENT: YES
DENNIS RICHARDS 491-1393 (W)
491-1396 (Fax)
Simons, L& Associates
4600 S. Mill Ave, Suite 200
Tempe, AZ 85282

OUT
17TH-20TH
SUB? YES

obtain address
phone
by
email

Mr. Pedro Calza X
Chief
Flood Control District of Maricopa Count
2801 West Durango Street
Phoenix, AZ 85009-6399
506-4692 (W)
506-4601 (Fax)

YES
THUR 1p-3p

[Redacted] X
Arizona State Land Department
Phoenix, AZ 85007 - ENG DIV
1016 W ADAMS
542-3508 (W)
542-4668 (F)

[Redacted] X
Project Engineer
Kimley-Horn and Associates
7600 N. 15th Ave., Suite 250
Phoenix, AZ 85020
944-5500 (W)
997-9764 (Fax)
beichinger@phx.kimley-horn.co

OPEN TIME

[Redacted] X
Principal
JEF Hydrology and Geomorphology
Tempe, AZ 85283
752-2124 (W) THUR
839 2193 P

TUES - NOT
WED - NOT

5235 J KYRENE
205

Upper Rawhide Wash Address List

✓ **Mr. Mike Greenslade**
Arizona Department of Water Resources 417-2445 (W)
Phoenix, AZ 417 2423 (F)
DAM SAFETY -
500 N 3 STR 85004

✓ **Mr. Mike Heaton**
Project Manager 508-6625 (W) YES - 11/19
HDR 508 6606 (F)
2141 E. HIGHLAND #250 85016

✓ **Mr. Bill Jenkins**
Arizona Department of Water Resources 417-2445 (W) - YES
Phoenix, AZ 85004 417 2423 (F)
DAM SAFETY
500 N 3 STR

✓ **[Redacted]**
Project Manager 417-2445 (W) OK - THURS
Arizona Department of Water Resources 417 2433 (F)
Phoenix, AZ 85004
500 N 3 STR
DAM SAFETY

(msc) **[Redacted]**
Public Works Planner 994-7852 (W)
City of Scottsdale 994-7971 (Fax)
Drainage and Flood Control - Transportat
7447 E. Indian School Road, Suite 205 clovely@ci.scottsdale.az.us
Scottsdale, AZ 85251

✓ **Ms. Laura Marin** OPEN TUE - WED PM - THURS
Project Hydrologist 944-5500 (W)
Kimley-Horn and Associates 997-9764 (Fax)
7600 N. 15th Ave., Suite 250
Phoenix, AZ 85020 lmarin@phx.kimley-horn.com

✓ **Mr. Steve Miller**
Project Manager 508-6625 (W) YES - 11/19
HDR 2141 E. HIGHLAND #250 508 6606 (F)
PHOENIX, AZ 85016

(msc) **Mr. Amir Motamedi**
Cheif 506-4871 (W)
Flood Control District of Maricopa Count 506-4601 (Fax)
2801 West Durango Street
Phoenix, AZ 85009-6399

✓ **Mr. [Redacted]** OPEN P TUES - WED PM - THURS 11/19 1-3
Project Manager 506-4071 (W)
Flood Control District of Maricopa Count 506-4601 (Fax)
2801 West Durango Street
Phoenix, AZ 85009-6399 wso@mail.maricopa.gov

✓ **Ms. Diana Plasencia** 1P-3P - 11/19
Project Manager 944-5500 (W)
Kimley-Horn and Associates 997-9764 (Fax)
7600 N. 15th Ave., Suite 250
Phoenix, AZ 85020 dplasencia @phx.kimley-horn.co

Upper Rawhide Wash Address List

✓ **Mr. John Rodriguez** X

Project Manager

506-8782 (W)

(possibility)

Flood Control District of Maricopa Count 506-4601 (Fax)

2801 West Durango Street

Phoenix, AZ 85009-6399

November 2, 1998



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Fax Transmittal

To: See Below Fax: No.: _____
 Firm/Location: _____ Job: No.: 091131.02
 From: Doug Plasencia/Bob Eichinger Date: November 3, 1998
 Original coming by mail: Yes: X No: _____

If you have any problems, please call 602-944-5500 and ask for: Pat

Total number of pages, including cover sheet: 3

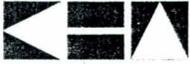
Comments:

A hydrology coordination meeting has been scheduled for the Upper Rawhide Wash Project.
Meeting memorandum and map follows. Thank you.

| | | | |
|---------------------------|----------|------------------------------------|----------|
| Scott Ogden, FCDMC | 506 4601 | Dennis Richard, Simons, Li & Asso. | 491 1396 |
| Afshin Houraiyan, FCDMC | " | Ottozawa Chatupon, State Land Dept | 542 4668 |
| Pedro Calza, FCDMC | " | Clyde Anderson, State Land Dept | " |
| Amir Motamedi, FCDMC | " | Mike Heaton, HDR | 508 6606 |
| John Rodriguez, FCDMC | " | Steve Miller, HDR | " |
| John Benoist, ADWR | 417 2423 | Collis Lovely, COS | 994 7971 |
| Mike Greenslade, ADWR | " | | |
| Bill Jenkins, ADWR | " | | |
| John Linkswiler, ADWR | " | | |
| Ray Acuna, COP | 262 7322 | | |
| Jon Fuller, JEF Hydrology | 839 2193 | | |

Engineering
Planning
and
Environmental
Consultants

This facsimile is intended for the addressee named herein and may contain information that is confidential. If you are not the intended recipient or the employee or agent responsible for delivery to the addressee, you are hereby notified that any review, dissemination, disclosure, or copying of this communication is strictly prohibited. If you have received this facsimile in error, please immediately notify us by telephone, and return the original facsimile to us at the address above via the U.S. Postal Service. Thank you.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

*Memorandum
via Facsimile*

To: Scott Ogden, FCDMC Ray Acuna, COP
 Afshin Ahouraiyan, FCDMC Jon Fuller, JEF Hydrology
 Pedro Calza, FCDMC Dennis Richards, Simons, Li & Associates
 Amir Motamedi, FCDMC Ottozawa Chatupon, State Land Dept
 John Rodriguez, FCDMC Clyde Anderson, State Land Dept
 John Benoist, ADWR Mike Heaton, HDR
 Mike Greenslade, ADWR Steve Miller, HDR
 Bill Jenkins, ADWR Collis Lovely, COS
 John Linkswiler, ADWR

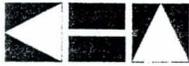
From: Doug Plasencia, Kimley-Horn and Associates

Date: November 3, 1998

Subj: Upper Rawhide Wash Hydrology Coordination Meeting

The hydrology coordination meeting for the Upper Rawhide Wash Study is set for Thursday, November 19th from 1:00 p.m to 3:00 p.m., at the office of Kimley-Horn (directions are attached). I hope you will be able to attend, please call Pat Crawford at 944-5500 if you cannot. Thank you.

■
TEL 602 944 5500
FAX 602 944 7423



Kimley-Horn
and Associates, Inc.

100 COPY

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

June 23, 1999

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear Pedro:

We enclose the minutes of the project coordination meeting held at your offices at 9 am on June 17, 1999.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert G. Eichinger

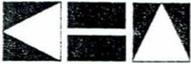
bar Doug Plasencia, P.E.
Associate

DJP:rae

Encl: Coordination Meeting Minutes - 6/17/99

■
TEL 602 944 5500
FAX 602 944 7423

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: June 17, 1999

Coordination Meeting

Meeting Time: 9:00 AM

Meeting Place: Flood Control District

Attendees: FCDMC – Pedro Calza, Afshin Ahouraiyan, David Boggs
KHA – Bob Eichinger

Handouts: None

Item No. 1 – FCD requests KHA to look at the 100-year 24-hour...seems to be adding flow in several routing reaches. Appears to be only happening in the 24-hour model. KHA will replace sections in the Hydrology TDN with the revisions.

Item No. 2 – FCD requests to add comments in HECRAS model whether flowrates are 6-hour or 24-hour. Add comments to HECRAS model regarding correspondence between HEC-1 model concentration points.

Item No. 3 – Make a note in HEC-1 model regarding flow split going to proposed detention basin site.

Item No. 4 – FCD contacted City of Scottsdale (Collis Lovely) to provide comments on HEC-1 and HECRAS by June 21.

Item No. 5 – David Boggs new project manager for Upper Rawhide Wash (506-4601)

Item No. 6. – KHA to provide District with copy of n-value report with revised base n-values.

Item No. 7 – Base Mapping: Baker did photogrammetrics/analyses. McClain-Habor is the aerial flight south of Dixileta in 1993 and north of Dixileta in 1998.

Item No. 8 – Sign off on base mapping....FCD looking to get Baker to sign the base mapping. Keep track of this...may effect project schedule.

Item No. 9 – FCD discussed warning messages of supercritical flow. KHA to check energy grades, and perhaps conduct sensitivity on n-values, add cross-sections if necessary, varying flowrates (if necessary).



Item No. 10 – HEC-1 peak flow don't match HECRAS flowrates. KHA to revise for next submittal.

Items No. 11 – Verification of HEC-1 results.....FCD requests additional information to provide confidence in results....KHA previously conducted cloud of values and regression analysis....KHA to incorporate the analysis into verification section of TDN.

Item No. 12 – FCD examined several cross sections where flow may be crossing from one side of a cross section to the other side of the next downstream cross section. KHA to review the flow distribution of the output.

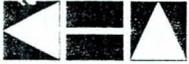
Item No. 13 – FEMA submittal according to project schedule was to be at the end of June. Actual schedule may be at end of July. KHA to check revised dates of contract including the requested 30-day extension.

Item No. 14 – City of Scottsdale has a different floodplain regulation than District. Scottsdale regulations state cannot encroach into floodplain.

Item No. 15 – FCD requested that the key map be plotted on full size plan sheet. KHA to check scope of work.

Item No. 16 – FCD to visit project site to familiarize project with new PM. Requested that KHA attend. KHA will check scope of work and budget for additional field visits.

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

September 14, 1999

Mr. David Boggs, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131.02

Dear David:

We enclose the minutes of the project coordination meeting held at your offices at 2 pm on August 31, 1999.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

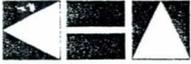
Doug Plasencia, P.E.
Associate

DJP:rae

Encl: Coordination Meeting Minutes – August 31, 1999

■
TEL 602 944 5500
FAX 602 944 7423

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: August 31, 1999 Coordination Meeting :Floodplain Submittal

Meeting Time: 2:00 pm

Meeting Place: Flood Control District

Attendees: FCDMC – David Boggs
 KHA – Bob Eichinger, Jon Ahern

Handouts: None

Item No. 1 – FCD met with City of Scottsdale on August 23. Reviewed COS floodplain comments and markups on KHA initial floodplain mapping.

Item No. 2 – COS marked on mapping a new house north of Dynamite west of Pima. House footprint may be in floodplain. FCD has images available. KHA to check in-house Landis mapping for structures in the area marked by COS.

Item No. 3 – FCD provided markups of KHA initial floodplain mapping. Includes COS comments. KHA to review redlines and respond to comments. FCD redlines included suggested revisions to cross section locations and alignments and potential breakouts. KHA borrowed FCD and COS redlines to make copies.

Item No. 4 – District responses on COS hydrology comments have not been sent to COS. David to check with Joe Tram and/or Afshin.

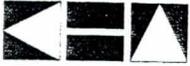
Item No. 5 – FCD to follow up with COS to address COS acceptance of KHA hydrology.

Item No. 6 – FCD discussed potential flow breakouts as indicated on the redlines.

ACTION:

1. KHA to review FCD cross section comments. Set-up follow up meeting with FCD to discuss cross section revisions.
2. KHA to review COS hydrology comments regarding peak flows for 6-hour versus 24-hour.
3. Aim is to incorporate revised cross sections, accepted flows, and resubmit initial floodplain model.
4. KHA to evaluate breakout potential at three locations.

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

September 23, 1999

Mr. David Boggs, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131.02

Dear David:

We enclose the minutes of the project coordination meeting held at your offices at 10 am on September 13, 1999.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

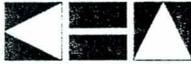
Doug Plasencia, P.E.
Associate

DJP:rae

Encl: Coordination Meeting Minutes – September 13, 1999
List of proposed modification to existing cross section

■
TEL 602 944 5500
FAX 602 944 7423

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: September 13, 1999 Coordination Meeting: Floodplain Submittal

Meeting Time: 10:00 am

Meeting Place: Flood Control District

Attendees: FCDMC – David Boggs
 KHA – Bob Eichinger, Jon Ahern

Handouts: None

The purpose of this meeting was (1) to review the proposed revisions to the existing cross sections submitted with the preliminary floodplain mapping, and (2) to come to agreement between KHA and FCD on the revisions to be incorporated for the cross sections. This meeting is a follow up to the August 31, 1999 meeting at the Flood Control District of Maricopa County (FCDMC).

On the meeting dated August 31, 1999, KHA received two sets of cross section markups, one from the City of Scottsdale (COS) and the other from the FCDMC.

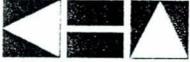
Item No. 1 – KHA prepared a revised cross section plan set and brought this set to use as a base for discussion. FCD and KHA reviewed each and every cross section on the KHA revised cross section plan set. During the review additional markups were added to the KHA plan set. A complete list of agreed upon existing cross sections to be revised is attached to these minutes.

Item No.2 – A potential breakout of the main wash between cross sections 14.248 and 14.911 was annotated, in the cross section review plan sets, by MCFCD and COS. This is an area of concern because the potential breakout flows could combine with the flows from Tributary 4 to the south.

Item No.3 – Several additional flow breakout areas were annotated on the reviewed plan sets by MCFCD and COS. These will be investigated by KHA during evaluation of the preliminary 100 year floodplain analysis. These potential flow breakouts are along the main washes where the flows returning to the main wash within several cross sections. These areas will be reviewed by KHA

ACTION:

1. Cross Sections will be modified as listed on the attached list and the floodplain will be mapped with the approved discharge values. Modification to existing cross sections will be checked, again, for compliance with FEMA guidelines. A



Kimley-Horn
and Associates, Inc.

- revised floodplain map and cross sections will be resubmitted for MCFCD approval.
2. A potential break out will be analyzed at the north end of the main wash between cross sections 14.248 and 14.911. If it is determined that a break out occurs then KHA will develop a rating curve and modify the HEC-1 model's, if necessary prior to finalizing the Hydrology. If the findings are inconclusive then KHA will discuss with the MCFCD about a Zone A designation.
 3. Cross sections in areas of potential flow breakouts will be extended to accurately depict a potential flow breakout. If it is determined by KHA that a flow breakout does not occur, than the cross sections will be trimmed to an appropriate length.
 4. For areas where a flow breakout is inconclusive, KHA will discuss with the MCFCD about designating the area as a Zone A.
 5. KHA will modify the HEC-1 models if required for any flow breakouts. MCFCD staff will review HEC-1 output after all modifications and corrections are completed by KHA. The MCFCD will also review/address variations in Q_p for subbasins of similar size between 6-hr and 24-hr rainfall events. The MCFCD (Afshin) may request KHA to assist in this exercise, as necessary.

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.

Cross Section Review List Rawhide Wash Floodplain Study

Submitted as part of the meeting minutes dated September 13, 1999

| Wash | Cross Section Number | Action | Note |
|------|----------------------|---|-------------------------|
| Main | 7.701 | Revise Cross Section Length and/or Orientation | |
| Main | 7.801 | Revise Cross Section Length and/or Orientation | |
| Main | 7.964 | Revise Cross Section Length and/or Orientation | |
| Main | 8.01 | Revise Cross Section Length and/or Orientation | |
| Main | 8.186 | Revise Cross Section Length and/or Orientation | |
| Main | 8.277 | Revise Cross Section Length and/or Orientation | |
| Main | 8.376 | Revise Cross Section Length and/or Orientation | |
| Main | 8.565 | Revise Cross Section Length and/or Orientation | |
| Main | 8.803 | Revise Cross Section Length and/or Orientation | |
| Main | 8.902 | Revise Cross Section Length and/or Orientation | |
| Main | 8.903 | Revise Cross Section Length and/or Orientation | |
| Main | 9.419 | Revise Cross Section Length and/or Orientation | Potential breakout area |
| Main | 9.513 | Revise Cross Section Length and/or Orientation | Potential breakout area |
| Main | 9.585 | Revise Cross Section Length and/or Orientation | Potential breakout area |
| Main | 9.723 | Revise Cross Section Length and/or Orientation | |
| Main | 9.798 | Trim Cross Section Ends | |
| Main | 9.8 | New Cross Section to be Added Cross Section to be Added | |
| Main | 9.81 | New Cross Section to be Added | |
| Main | 9.987 | Delete Existing Cross Section | |
| Main | 10.012 | Delete Existing Cross Section | |
| Main | 10.082 | Revise Cross Section Length and/or Orientation | |
| Main | 10.176 | Trim Cross Section Ends | |
| Main | 10.271 | Trim Cross Section Ends | |
| Main | 10.46 | Trim Cross Section Ends | |
| Main | 10.555 | Trim Cross Section Ends | |
| Main | 10.744 | Revise Cross Section Length and/or Orientation | |
| Main | 10.8 | New Cross Section to be Added | |
| Main | 10.839 | Revise Cross Section Length and/or Orientation | |
| Main | 10.934 | Revise Cross Section Length and/or Orientation | |
| Main | 10.995 | New Cross Section to be Added | |
| Main | 11 | New Cross Section to be Added | |
| Main | 11.029 | Delete Existing Cross Section | |
| Main | 11.123 | Revise Cross Section Length and/or Orientation | |
| Main | 11.218 | Revise Cross Section Length and/or Orientation | |
| Main | 11.313 | Revise Cross Section Length and/or Orientation | |
| Main | 11.407 | Revise Cross Section Length and/or Orientation | |
| Main | 11.502 | Trim Cross Section Ends | |
| Main | 11.691 | Revise Cross Section Length and/or Orientation | |
| Main | 11.786 | Trim Cross Section Ends | Potential Breakout Area |
| Main | 11.881 | Trim Cross Section Ends | Potential Breakout Area |
| Main | 11.976 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 11.999 | New Cross Section to be Added | |
| Main | 12.07 | Revise Cross Section Length and/or Orientation | |
| Main | 12.09 | Revise Cross Section Length and/or Orientation | |
| Main | 12.165 | Revise Cross Section Length and/or Orientation | |
| Main | 12.26 | Revise Cross Section Length and/or Orientation | |
| Main | 12.27 | New Cross Section to be Added | |

| | | | |
|--------|--------|--|-------------------------|
| Main | 12.354 | Trim Cross Section Ends | |
| Main | 12.364 | Trim Cross Section Ends | |
| Main | 12.449 | Trim Cross Section Ends | |
| Main | 12.544 | Trim Cross Section Ends | |
| Main | 12.638 | Trim Cross Section Ends | |
| Main | 12.65 | New Cross Section to be Added | |
| Main | 12.733 | Revise Cross Section Length and/or Orientation | |
| Main | 12.828 | Trim Cross Section Ends | |
| Main | 12.923 | Trim Cross Section Ends | |
| Main | 13 | Trim Cross Section Ends | |
| Main | 13.112 | Trim Cross Section Ends | |
| Main | 13.207 | Trim Cross Section Ends | |
| Main | 13.301 | Trim Cross Section Ends | |
| Main | 13.396 | Trim Cross Section Ends | |
| Main | 13.491 | Trim Cross Section Ends | |
| Main | 13.585 | Trim Cross Section Ends | |
| Main | 13.667 | Delete Existing Cross Section | |
| Main | 13.775 | Trim Cross Section Ends | |
| Main | 13.869 | Revise Cross Section Length and/or Orientation | |
| Main | 13.964 | Trim Cross Section Ends | |
| Main | 14.059 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.154 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.248 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.343 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.438 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.532 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.627 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.722 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.816 | Revise Cross Section Length and/or Orientation | Potential Breakout Area |
| Main | 14.911 | Revise Cross Section Length and/or Orientation | |
| Main | 15.101 | Revise Cross Section Length and/or Orientation | |
| | | | |
| Trib 1 | 0.237 | Trim Cross Section Ends | |
| Trib 1 | 0.284 | Trim Cross Section Ends | |
| Trib 1 | 0.378 | Trim Cross Section Ends | |
| Trib 1 | 0.473 | Trim Cross Section Ends | |
| Trib 1 | 0.477 | New Cross Section to be Added | |
| Trib 1 | 0.567 | Trim Cross Section Ends | |
| Trib 1 | 0.662 | Trim Cross Section Ends | |
| Trib:1 | 0.757 | Trim Cross Section Ends | |
| Trib 1 | 0.851 | Trim Cross Section Ends | |
| Trib 1 | 0.946 | Trim Cross Section Ends | |
| Trib 1 | 1.041 | Trim Cross Section Ends | |
| | | | |
| Trib 2 | 0.476 | Trim Cross Section Ends | |
| Trib 2 | 0.665 | Revise Cross Section Length and/or Orientation | |
| Trib 2 | 0.854 | Revise Cross Section Length and/or Orientation | |
| Trib 2 | 0.949 | Revise Cross Section Length and/or Orientation | |
| Trib 2 | 1.138 | Trim Cross Section Ends | |
| | | | |
| Trib 3 | 0.273 | Trim Cross Section Ends | |
| Trib 3 | 0.379 | Revise Cross Section Length and/or Orientation | |
| Trib 3 | 0.568 | Trim Cross Section Ends | |
| Trib 3 | 0.663 | Revise Cross Section Length and/or Orientation | |
| Trib 3 | 0.758 | Revise Cross Section Length and/or Orientation | |

| Trib 4 | 0.0947 | Trim Cross Section Ends | |
|--------|--------|--|--|
| Trib 4 | 0.189 | Trim Cross Section Ends | |
| Trib 4 | 0.195 | Trim Cross Section Ends | |
| Trib 4 | 0.284 | Trim Cross Section Ends | |
| Trib 4 | 0.379 | Trim Cross Section Ends | |
| Trib 4 | 0.568 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 0.663 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 0.852 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 0.947 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 1.048 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 1.231 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 1.42 | Revise Cross Section Length and/or Orientation | |
| Trib 4 | 1.515 | Revise Cross Section Length and/or Orientation | |
| | | | |

January 10, 2000

Mr. David Boggs, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131002

Dear David:

We enclose the minutes of the revised cross section alignment review meeting held at our office at 9:30 am on January 7, 2000.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Doug Plasencia, P.E.
Project Manager

DJP:rae

Encl: Coordination Meeting Minutes – January 7, 2000
Revised Cross Section List from January 7, 2000 Coordination Meeting

Cross Section Review List Rawhide Wash Floodplain Study

Submitted as part of the meeting minutes dated January 7, 2000

| Wash | Cross Section Number | Action |
|-------------|----------------------|--|
| Main | 8.092 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 8.186 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 8.200 NEW | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | Constatine Property | Add cross sections along west side of fence to accurately model flows around and through property |
| Main | 9.15 NEW | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 9.513 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 10.46 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 11.313 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 10.8 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 11.9 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 12.449 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 12.52 NEW | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 13.112 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 13.68 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Main | 14.438 | Cross section revision not needed when reviewed with approx. floodplain limits. Existing cross sections to be trimmed after review of new floodplain limits. |
| Main | 14.532 | Cross section revision not needed when reviewed with approx. floodplain limits. Existing cross sections to be trimmed after review of new floodplain limits. |
| Main | 14.6 | Cross section revision not needed when reviewed with approx. floodplain limits. Existing cross sections to be trimmed after review of new floodplain limits. |
| Main | 14.627 | Cross section revision not needed when reviewed with approx. floodplain limits. Existing cross sections to be trimmed after review of new floodplain limits. |
| Main | 14.722 | Cross section revision not needed when reviewed with approx. floodplain limits. Existing cross sections to be trimmed after review of new floodplain limits. |
| Tributary 1 | 0.095 | Cross section to be revised as noted |
| Tributary 1 | 0.189 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 1 | 0.567 | Cross section revision not needed when reviewed with approx. floodplain limits |

Cross Section Review List Rawhide Wash Floodplain Study

Submitted as part of the meeting minutes dated January 7, 2000

| Wash | Cross Section Number | Action |
|-------------|----------------------|---|
| Tributary 1 | 0.57 NEW | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 2 | 0.244 | Cross section to be revised as noted |
| Tributary 3 | 0.298 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 3 | 0.32 New | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 3 | 0.693 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.0947 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.284 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.532 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.677 | Cross section to be revised as noted |
| Tributary 4 | 0.867 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.9 NEW | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 0.962 | Cross section revision not needed when reviewed with approx. floodplain limits |
| Tributary 4 | 1.5 New | Cross section revision not needed when reviewed with approx. floodplain limits |
| | Note: | <p>The District and KHA concurred or not-concurred with the suggested revisions from the City. The District marked on the City red-lines which cross-sections that will be added or revised and which ones will not be changed per City comments. KHA concurred with District markup.</p> |



Kimley-Horn
and Associates, Inc.

January 18, 2000

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

Mr. David Boggs, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131002

Dear David:

We enclose the minutes of the revised cross section alignment review meeting held at our office at 9:30 am on January 7, 2000.

If you have any questions, please contact Bob Eichinger or me at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

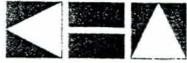
Doug Plasencia, P.E.
Project Manager

DJP:rae

Encl: Coordination Meeting Minutes – January 7, 2000
Revised Cross Section List from January 7, 2000 Coordination Meeting

■
TEL 602 944 5500
FAX 602 944 7423

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Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: January 7, 2000 Revised cross section alignment review meeting

Meeting Time: 9:30 am

Meeting Place: Kimley-Horn and Associates

Attendees: District – David Boggs, P.E.
 KHA – Bob Eichinger, P.E., Jon Ahern, P.E.

Handouts: None

Item No. 1 – KHA and District reviewed the cross section markups from City of Scottsdale (COS). These markups were located on four plots that were submitted to the District on December 3, 1999, in association with the resubmittal of the cross section alignment in accordance with Rawhide Wash FCD Scope of Work task 6 item 6.6.b.

Item No. 2 – Each cross section was reviewed for its adherence to FEMA standards and its associated application to the technical correctness of the floodplain study. The attached list addresses each cross section that was red-lined by the COS. Each cross section is listed by their associated wash and cross section number. The table notes the action to be taken for each cross section.

Item No. 3 – The District and KHA agreed that this meeting and results of cross section revisions from Item No. 2 above constitutes final cross section location and alignment approval from the District.

ACTION:

1. KHA to send the draft meeting minutes to the District for concurrence.
2. KHA will proceed with the floodplain mapping submittal using hydrology developed by KHA and directed by District in email memorandum dated December 20, 1999 and the final cross sections from Item No. 2 above

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.

Cross Section Review List Rawhide Wash Floodplain Study

Submitted as part of the meeting minutes dated January 7, 2000

| Wash | Cross Section Number | Action |
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Cross Section Review List Rawhide Wash Floodplain Study

Submitted as part of the meeting minutes dated January 7, 2000

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| | Note: | <p>The District and KHA concurred or not-concurred with the suggested revisions from the City. The District marked on the City red-lines which cross-sections that will be added or revised and which ones will not be changed per City comments. KHA concurred with District markup.</p> |

**Memorandum
via Facsimile**

To: Scott Ogden, FCDMC
Afshin Ahouraiyan, FCDMC

From: Doug Plasencia, Kimley-Horn and Associates

Date: December 14, 1998

Subj: Upper Rawhide Wash Hydrology Coordination Meeting #2
FCD-98-12
KHA 091131.02

The following are the points that we were asked to address from our Hydrology Coordination Meeting #2 with Afshin on Wednesday, December 9, 1998.

- Modify the subbasin delineation of basins 012 and 015 per the markup provided by Afshin.
- Investigate the possibility of flow crossing Jomax east of Pima Road and impacting the study area downstream of that location.
- There is a flow split at concentration point 012 (CP012) with some flow leaving the study area. It was agreed that this would be modelled using a rating curve diversion. Bob did a field walk in that area last week and he reported that it is an approximate 50/50 split.
- Bob asked about further subdividing basins 020 and 025 and putting a concentration point upstream of CP025 to the east. He said from field observations that the flows may combine about 800 feet upstream of the existing CP025. It was agreed that we would not change the subbasins. For the hydraulic modelling in that area Bob would use the combined flow rates from 020 and 025 for the 800 feet and then use the flow rate from the individual basin hydrographs for 020 and 025 upstream of that point.

March 4, 1999

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear Pedro:

We enclose the minutes of the project coordination meeting held at your offices at 4 pm on February 22, 1998.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Doug Plasencia, P.E.
Associate

DJP:lsm

Encl: Coordination Meeting Minutes No. 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Feb. 22, 1998 Coordination Meeting No.4

Meeting Time: 4:00 PM

Meeting Place: Flood Control District

Attendees: FCDMC – Pedro Calza, Amir Motamedi, Afshin Ahouraiyan
 COS – Collis Lovely
 KHA – Doug Plasencia, Bob Eichinger, Laurie Marin

Handouts: None

Item No. 1 - HEC-1 Model evaluation

We discussed differences between our model and the Greiner Model such as:

The rainfall values used by KHA were evaluated by the District and the City of Scottsdale and found to be correct.

KHA was asked to consider making the following changes to the existing and future conditions HEC-1 models. These changes are to be done incrementally to see the effect that each modification has on the models:

1. Further subdivide basins 060, 055, 025, 020, 015, 045, and 040 to be closer to the previous FEMA model.
2. Incorporate JD records into the models.
3. Reduce the vegetative cover values - no cover should be greater than 15% based on previous studies by the City of Scottsdale.

KHA is going to check the meeting minutes from Hydrology Meeting #1 for directions given to KHA. In the event this work is deemed by KHA to be excessive or out of scope KHA is to notify the District. It was noted that KHA had followed in all cases directions and review comments from the District's Project Manager and reviewers, and that these comments have arisen as a result of the City of Scottsdale not being sent materials for interim reviews. KHA will provide Scottsdale with review packets, with Scottsdale's comments to be sent to the District.

Item No. 2 - Hydraulics

KHA indicated that the hydraulics were going on hold until such time that review comments are received, and critical hydrology issues are resolved.

For floodplain mapping we should look at both the 6-hr and 24-hr storms and use the highest flows.

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.

Outline of Meeting of June 17, 1999
Rawhide Wash FDS
Kimley-Horne Engineers

09/13/02

Rawhide

Minutes of

Meeting

Notes
David
From
Boggs

Present:

Kimley Horne:

Robert A. Eichinger, P.E.

Flood Control District:

Pedro Calza, P.E.

David Boggs, P.E.

Afshin Ahouraiyan

Topics Discussed:

Although the contract with Kimley-Horne runs until Feb. 2000, the submittal to FEMA is likely to be delayed from June 1999 to July, 1999; however no contract variations would be required.

The HEC-RAS output was noted to contain a lot of warning messages, indicating the energy equation could not be solved and critical flow was assumed. Although the average slope is a steep 1.7% for the main Rawhide wash, it was noted that supercritical flow was uncommon for long desert washes. Kimley Horne agreed to further investigate the causes of this, including (but not limited to): (a) increasing number of x-sections, (b) varying "n" values, (c) varying Q's—to check sensitivity to various input parameters vis a vis supercritical flow conditions.

The wording of the Technical notebook in comparing Qs from the HEC-1 model to regional regression Qs needs revision. Laurie Marin will be contacted to provide more reasonable comparisons, which give congruous results, within reason.

The Corps of Engineers studied this area and got significantly higher Qs. (For info only)

The Qs use in HEC-RAS were neither the 6-hr nor the 24 hr Qp's from the hydrology report. The consultant will re-issue the Technical notebook with final hydrologic input parameters and output Q's, as well as note in the HEC-RAS input Q table both CP# and whether 6 or 24-hr rainfall events yield higher Qps.

Problems in getting survey data sealed by a registered land surveyor will be handled by the District.

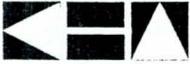
City of Scottsdale should be consulted jointly with FCD in finalizing HEC-1 runs, especially "n" value selection, which COS found on the high side.

Several anomalies were noted in the HEC-1 routing (in which flows increased), especially at CPs 53 and 36, basin 60 and between CP62 and R64-2. The consultant will investigate and explain.

HEC-1 CPs should be referenced on the HEC-RAS input Q table.

Collis Lovely (COS) was reviewing the submission and promised comments by Monday June 21, 1999.

The Consultant will submit revised materials (indicated above) by July 6, 1999.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

March 4, 1999

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No.: 091131.02

Dear Pedro:

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Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Doug Plasencia, P.E.
Associate

DJP:lsm

Encl: Coordination Meeting Minutes No. 4



Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
UPPER RAWHIDE WASH FLOODPLAIN DELINEATION
FCD 98-12

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Feb. 22, 1998 Coordination Meeting No.4

Meeting Time: 4:00 PM

Meeting Place: Flood Control District

Attendees: FCDMC – Pedro Calza, Amir Motamedi, Afshin Houraiyan
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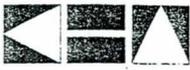


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For floodplain mapping we should look at both the 6-hr and 24-hr storms and use the highest flows.

These are the minutes of the meeting as understood by KHA. We request that any revisions be provided to KHA within seven days, or these minutes will be considered final.



Memorandum

TO: ~~AFSHIN~~ Afshin Ahouraiyan
cc: Pedro Calza
FROM: BOB Bob Eichinger
DATE: June 30, 1999
RE: Upper Rawhide Wash Hydrology Verification
Contract: FCD 98-12
KHA JOB NO.: 091131.02

As a follow-up on the meeting we had on June 17th we recomputed the regression analysis originally conducted and transmitted to you on February 17, 1999.

We have provided for verification of the hydrology for Upper Rawhide Wash by using the regional regression equations from the Arizona Department of Transportation. We conducted the verification using peak flow rates from the based on non-reduced rainfall and distributions for the existing conditions 100-year, 24-hour storm. We used the non-reduced rainfall for comparison with the peak subbasin discharges as computed using the region 12 and region 13 regression equations. A summary of the computations is attached to this memorandum.

Table 1 is a summary of the HEC-1 peak discharges for the 100-year 24-hour with areal reduction. Table 2 is a summary of the HEC-1 peak discharges for the 100-year 24-hour with no areal reduction. Both tables are for existing project conditions and provide a unit discharge for each subbasin in cfs per square mile.

Table 3 summarizes the computation using the ADOT regression equations for indirect method No 2 (see page 10-5 ADOT highway drainage manual). Indirect method No. 2 provides an regression equation for the 100-year peak discharge and a regression equation for the maximum recorded discharge. A review of Table 3 indicates fair agreement between the HEC-1 peak discharges and the ADOT indirect method 100-year discharge on a subbasin by subbasin comparison. Examination of the concentration points there is somewhat of a scatter of results. This is due to the fact that the HEC-1 model accounts for routing and summation of hydrographs for determination of peak discharges while the ADOT method only uses watershed area.



We have plotted on ADOT figures 10-3 and 10-4 the 100-year HEC-1 peak discharge for subbasins from 0.1 to 2.0 square miles and for 1.0 to 20 square miles, respectively. On figure 10-3, the plotted subbasins are well within the 75% tolerance limit lines about the 100-year discharge line. On figure 10-4, the plotted subbasins are mainly located at the upper 75% tolerance limit. These plots indicate that the HEC-1 peak discharges are within reasonable expectations and agreement with previous studies conducted in Arizona.

Our next step for hydrology verification was to follow ADOT indirect method No. 3 using regional regression equations. Table 4 provides a summary of the data required to use the regression equations presented in the ADOT manual. The Upper Rawhide Wash watershed is located in near the boundaries of regions 12 and 13. Therefore, we computed the 100-year peak discharge using the regression equations for regions 12 and 13.

The results of the computations are plotted by subbasin area and 100-year discharge for region 12 on figures 10-20 and 10-21. Examination of the plotted data points on figure 10-20 indicates that most of the points are outside the "cloud of common values". This indicates that the Upper Rawhide Wash may not be similar to the drainage area sites with characteristics that fall within this cloud of common values. However, the drainage area versus peak discharge plotted values in figure 10-21 are relatively consistent with the regression line. We then plotted the 100-year discharge for region 13 on figure 10-22. We observe the same consistency in figure 10-22 as observed in figure 10-21. The plotted data points are clustered fairly well around the regression line and follow the trend of the regression.

Finally, we plotted the subbasin drainage area versus peak discharge on the USGS figures 41 and 42 from their report titled "Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States" (USGS Open file report 93-419). These figures are the same as the ADOT figures 10-20 and 10-21, but ADOT did not include the bounding limits as shown in the USGS figures. A review of the plots on figures 41 and 42 indicate that the regression results for the subbasins fall within the envelope curves and the 100-year peak discharge relationship for the regions 12 and 13.

The results of the verification analysis using the ADOT methodology indicates reasonable agreement between the HEC-1 model results and the regression results, particularly when plotted on the regression curves. Variations may be explained by differing site conditions relating to soils, land slope, drainage area, vegetation cover, land use, etc.

The primary peak discharge was calculated using HEC-1.

With areal reduction factor for entire watershed

TABLE 1.

| Basin Name | Basin Area | HEC-1 Q _{100,24} | Q _{100/A} |
|------------|--------------------|------------------------------|------------------------|
| | [mi ²] | [cfs] | [cfs/mi ²] |
| Basin 005 | 0.42 | 482 | 1148 |
| Basin 010 | 0.34 | 394 | 1159 |
| CP010 | 0.75 | 860 | 1147 |
| Basin 012 | 0.30 | 343 | 1143 |
| CP012 | 1.05 | 1086 | 1034 |
| Basin 030 | 0.35 | 296 | 846 |
| CP030A | 1.40 | 685 | 489 |
| Basin 015 | 1.27 | 1748 | 1376 |
| Basin 017 | 0.22 | 285 | 1295 |
| CP022A | 1.48 | 1830 | 1236 |
| Basin 020 | 0.76 | 1447 | 1904 |
| Basin 022 | 0.38 | 340 | 895 |
| CP022B | 1.14 | 1576 | 1382 |
| CP022 | 2.62 | 3350 | 1279 |
| Basin 024 | 1.02 | 2483 | 2434 |
| Basin 026 | 0.27 | 307 | 1137 |
| CP026A | 1.29 | 2288 | 1774 |
| CP026 | 3.91 | 5286 | 1352 |
| CP030 | 5.32 | 5541 | 1042 |
| Basin 034 | 0.30 | 443 | 1477 |
| Basin 036 | 0.25 | 461 | 1844 |
| CP036 | 0.55 | 632 | 1149 |
| Basin 038 | 0.18 | 323 | 1794 |
| CP038A | 0.73 | 856 | 1173 |
| Basin 032 | 0.03 | 54 | 1800 |
| CP038 | 6.08 | 6270 | 1031 |
| Basin 040 | 0.33 | 527 | 1597 |
| CP040 | 6.41 | 6323 | 986 |
| Basin 042 | 0.67 | 802 | 1197 |
| CP042 | 7.08 | 6341 | 896 |
| Basin 044 | 1.40 | 2209 | 1578 |
| Basin 046 | 0.11 | 191 | 1736 |
| CP046 | 8.59 | 6501 | 757 |
| Basin 048 | 0.06 | 107 | 1783 |
| Basin 051 | 0.16 | 191 | 1194 |
| CP051 | 8.81 | 6470 | 734 |
| Basin 053 | 0.09 | 175 | 1944 |
| CP053 | 8.91 | 6459 | 725 |
| Basin 055 | 0.37 | 336 | 908 |
| CP055 | 9.27 | 6631 | 715 |
| Basin 058 | 1.76 | 2537 | 1441 |
| Basin 060 | 0.78 | 763 | 978 |
| Basin 062 | 0.73 | 1045 | 1432 |
| CP062 | 1.51 | 1696 | 1123 |
| Basin 064 | 0.47 | 695 | 1479 |
| CP064 | 3.74 | 4163 | 1113 |
| Basin 066 | 0.01 | 10 | 1000 |
| CP066 | 3.74 | 4164 | 1113 |
| Basin 068 | 0.25 | 419 | 1676 |
| CP068 | 13.27 | 8975 | 676 |
| Basin 070 | 0.79 | 829 | 1049 |
| CP070 | 14.06 | 8904 | 633 |

With no areal reduction factor for upper reaches

TABLE 2.

| Basin Name | Basin Area | HEC-1 Q _{100,24} | Q _{100/A} |
|------------|--------------------|------------------------------|------------------------|
| | [mi ²] | [cfs] | [cfs/mi ²] |
| Basin 005 | 0.42 | 528 | 1257 |
| Basin 010 | 0.34 | 433 | 1274 |
| CP010 | 0.75 | 944 | 1259 |
| Basin 012 | 0.30 | 378 | 1260 |
| CP012 | 1.05 | 1200 | 1143 |
| Basin 030 | 0.35 | 326 | 931 |
| CP030A | 1.40 | 763 | 545 |
| Basin 015 | 1.27 | 1920 | 1512 |
| Basin 017 | 0.22 | 312 | 1418 |
| CP022A | 1.48 | 2016 | 1362 |
| Basin 020 | 0.76 | 1580 | 2079 |
| Basin 022 | 0.38 | 373 | 982 |
| CP022B | 1.14 | 1726 | 1514 |
| CP022 | 2.62 | 3680 | 1405 |
| Basin 024 | 1.02 | 2704 | 2651 |
| Basin 026 | 0.27 | 335 | 1241 |
| CP026A | 1.29 | 2604 | 2019 |
| CP026 | 3.91 | 5708 | 1460 |
| CP030 | 5.32 | 6019 | 1131 |
| Basin 034 | 0.30 | 485 | 1617 |
| Basin 036 | 0.25 | 502 | 2008 |
| CP036 | 0.55 | 706 | 1284 |
| Basin 038 | 0.18 | 352 | 1956 |
| CP038A | 0.73 | 949 | 1300 |
| Basin 032 | 0.03 | 59 | 1967 |
| CP038 | 6.08 | 6836 | 1124 |
| Basin 040 | 0.33 | 579 | 1755 |
| CP040 | 6.41 | 6957 | 1085 |
| Basin 042 | 0.67 | 883 | 1318 |
| CP042 | 7.08 | 7053 | 996 |
| Basin 044 | 1.40 | 2422 | 1730 |
| Basin 046 | 0.11 | 210 | 1909 |
| CP046 | 8.59 | 7302 | 850 |
| Basin 048 | 0.06 | 118 | 1967 |
| Basin 051 | 0.16 | 209 | 1306 |
| CP051 | 8.81 | 7278 | 826 |
| Basin 053 | 0.09 | 191 | 2122 |
| CP053 | 8.91 | 7279 | 817 |
| Basin 055 | 0.37 | 370 | 1000 |
| CP055 | 9.27 | 7442 | 803 |
| Basin 058 | 1.76 | 2785 | 1582 |
| Basin 060 | 0.78 | 837 | 1073 |
| Basin 062 | 0.73 | 1145 | 1568 |
| CP062 | 1.51 | 1862 | 1233 |
| Basin 064 | 0.47 | 762 | 1621 |
| CP064 | 3.74 | 4653 | 1244 |
| Basin 066 | 0.01 | 11 | 1100 |
| CP066 | 3.74 | 4653 | 1244 |
| Basin 068 | 0.25 | 460 | 1840 |
| CP068 | 13.27 | 10209 | 769 |
| Basin 070 | 0.79 | 919 | 1163 |
| CP070 | 14.06 | 10164 | 723 |

Upper Reachside Wash
FCD 98-12
09/13/02

Verification with USGS Data for Arizona

1. The 100-year secondary peak discharge estimate by equation 10-1 and Qmax by equation 10-2.

TABLE 3.

| Basin Name | Basin Area | HEC-1 Q ₁₀₀ | USGS Q ₁₀₀ | USGS Q _{MAX} |
|------------|--------------------|------------------------|-----------------------|-----------------------|
| | [mi ²] | [cfs] | [cfs] | [cfs] |
| Basin 005 | 0.42 | 528 | 532 | 216 |
| Basin 010 | 0.34 | 433 | 475 | 190 |
| CP010 | 0.75 | 944 | 728 | 310 |
| Basin 012 | 0.30 | 378 | 444 | 175 |
| CP012 | 1.05 | 1200 | 873 | 381 |
| Basin 030 | 0.35 | 326 | 482 | 193 |
| CP030A | 1.40 | 763 | 1019 | 456 |
| Basin 015 | 1.27 | 1920 | 967 | 429 |
| Basin 017 | 0.22 | 312 | 375 | 145 |
| CP022A | 1.48 | 2016 | 1050 | 472 |
| Basin 020 | 0.76 | 1580 | 733 | 312 |
| Basin 022 | 0.38 | 373 | 504 | 203 |
| CP022B | 1.14 | 1726 | 912 | 401 |
| CP022 | 2.62 | 3680 | 1430 | 672 |
| Basin 024 | 1.02 | 2704 | 859 | 375 |
| Basin 026 | 0.27 | 335 | 419 | 164 |
| CP026A | 1.29 | 2604 | 975 | 433 |
| CP026 | 3.91 | 5708 | 1775 | 862 |
| CP030 | 5.32 | 6019 | 2096 | 1043 |
| Basin 034 | 0.30 | 485 | 444 | 175 |
| Basin 036 | 0.25 | 502 | 402 | 157 |
| CP036 | 0.55 | 706 | 615 | 255 |
| Basin 038 | 0.18 | 352 | 337 | 128 |
| CP038A | 0.73 | 949 | 717 | 304 |
| Basin 032 | 0.03 | 59 | 128 | 42 |
| CP038 | 6.08 | 6836 | 2253 | 1133 |
| Basin 040 | 0.33 | 579 | 467 | 186 |
| CP040 | 6.41 | 6957 | 2318 | 1171 |
| Basin 042 | 0.67 | 883 | 685 | 289 |
| CP042 | 7.08 | 7053 | 2446 | 1245 |
| Basin 044 | 1.40 | 2422 | 1019 | 456 |
| Basin 046 | 0.11 | 210 | 258 | 94 |
| CP046 | 8.59 | 7302 | 2715 | 1404 |
| Basin 048 | 0.06 | 118 | 186 | 65 |
| Basin 051 | 0.16 | 209 | 316 | 119 |
| CP051 | 8.81 | 7278 | 2752 | 1426 |
| Basin 053 | 0.09 | 191 | 232 | 83 |
| CP053 | 8.91 | 7279 | 2769 | 1436 |
| Basin 055 | 0.37 | 370 | 497 | 200 |
| CP055 | 9.27 | 7442 | 2829 | 1472 |
| Basin 058 | 1.76 | 2785 | 1153 | 525 |
| Basin 060 | 0.78 | 837 | 743 | 317 |
| Basin 062 | 0.73 | 1145 | 717 | 304 |
| CP062 | 1.51 | 1862 | 1062 | 478 |
| Basin 064 | 0.47 | 762 | 565 | 232 |
| CP064 | 3.74 | 4653 | 1733 | 838 |
| Basin 066 | 0.01 | 11 | 71 | 21 |
| CP066 | 3.74 | 4653 | 1733 | 838 |
| Basin 068 | 0.25 | 460 | 402 | 157 |
| CP068 | 13.27 | 10209 | 3434 | 1838 |
| Basin 070 | 0.79 | 919 | 748 | 320 |
| CP070 | 14.06 | 10164 | 3543 | 1905 |

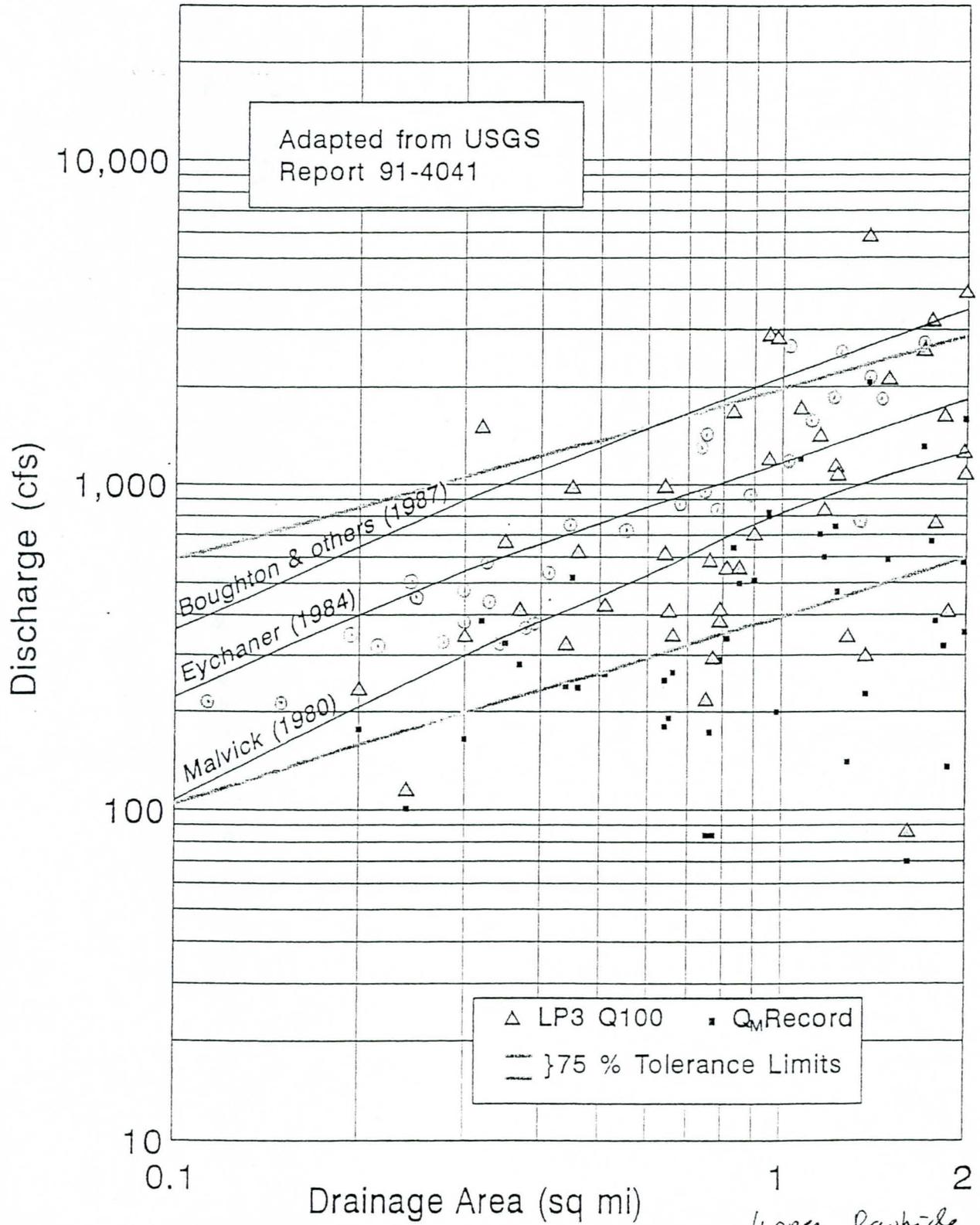
2. Plot the 100-year primary peak discharge (HEC-1) estimate on the copy of Figures 10-3 to 10-6.

See attached figures.

Upper Rawhide Wash
FCD 98-12
091131.02

FIGURE 10-3

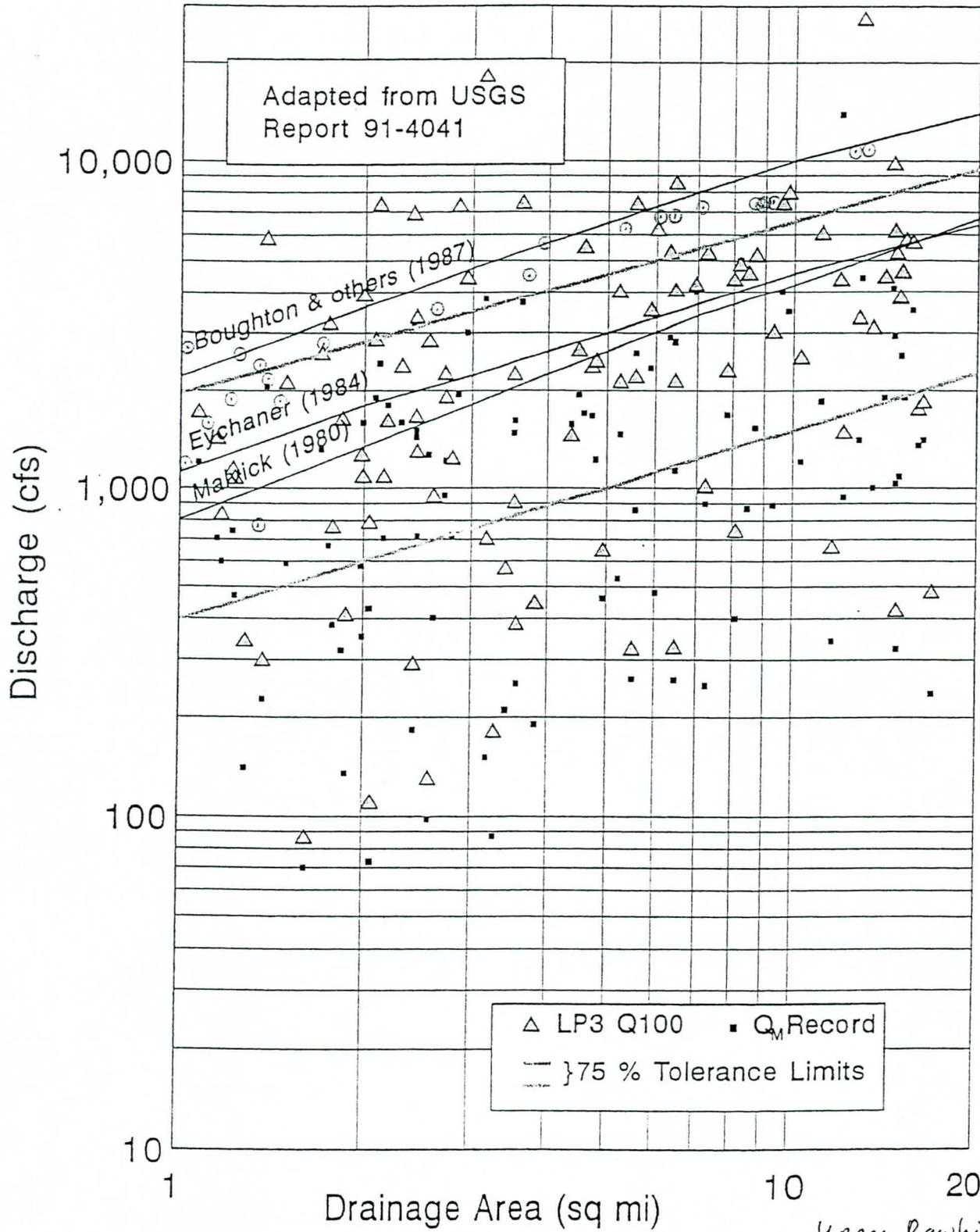
100-YEAR PEAK DISCHARGE BY LP3 ANALYSIS (LP3 Q100) AND
MAXIMUM RECORDED DISCHARGE (Q_M RECORD) vs. DRAINAGE AREA
FOR 0.1 TO 2.0 SQUARE MILES



Upper Rawhide Wash
FCD 98-12
091131.02

FIGURE 10-4

100-YEAR PEAK DISCHARGE BY LP3 ANALYSIS (LP3 Q100) AND
MAXIMUM RECORDED DISCHARGE (Q_M RECORD) vs. DRAINAGE AREA
FOR 1 TO 20 SQUARE MILES



Upper Rawhide Wash
FCD 98-12
091131.07

Verification with Regional Regression Equations

TABLE 4.

| Basin Name | Basin Area | HEC-1 Q ₁₀₀ | Mean Basin Elevation |
|------------|--------------------|------------------------|----------------------|
| | [mi ²] | [cfs] | [ft] |
| Basin 005 | 0.42 | 528 | 3003 |
| Basin 010 | 0.34 | 433 | 2989 |
| Basin 012 | 0.30 | 378 | 2872 |
| Basin 030 | 0.35 | 326 | 2823 |
| Basin 015 | 1.27 | 1920 | 2680 |
| Basin 017 | 0.22 | 312 | 2847 |
| Basin 020 | 0.76 | 1580 | 2778 |
| Basin 022 | 0.38 | 373 | 2961 |
| Basin 024 | 1.02 | 2704 | 2927 |
| Basin 026 | 0.27 | 335 | 2702 |
| Basin 034 | 0.30 | 485 | 2578 |
| Basin 036 | 0.25 | 502 | 2740 |
| Basin 038 | 0.18 | 352 | 2812 |
| Basin 032 | 0.03 | 59 | 2878 |
| Basin 040 | 0.33 | 579 | 2693 |
| Basin 042 | 0.67 | 883 | 2688 |
| Basin 044 | 1.40 | 2422 | 2680 |
| Basin 046 | 0.11 | 210 | 2312 |
| Basin 048 | 0.06 | 118 | 2276 |
| Basin 051 | 0.16 | 209 | 2342 |
| Basin 053 | 0.09 | 191 | 2272 |
| Basin 055 | 0.37 | 370 | 2365 |
| Basin 058 | 1.76 | 2785 | 2636 |
| Basin 060 | 0.78 | 837 | 2588 |
| Basin 062 | 0.73 | 1145 | 2502 |
| Basin 064 | 0.47 | 762 | 2421 |
| Basin 066 | 0.01 | 11 | 2276 |
| Basin 068 | 0.25 | 460 | 2254 |
| CR068 | 13.27 | 10209 | 2662 |
| Basin 070 | 0.79 | 919 | 2210 |
| CR070 | 14.06 | 10164 | 2588 |

See attached. Plotted the above values on the ADOT Curves for Regions 12 and 13.

There is no "cloud of common values" plot for Region 13 in the ADOT manual.

Verification with USGS Curves from "Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States" Open-File Report 93-419

The peak discharge values vs. drainage area are plotted on the USGS curves.

Upper Rawhide Wash
FCO 98-12
091131.02

TABLE 10-6

(6)

FLOOD MAGNITUDE-FREQUENCY RELATIONS FOR
THE CENTRAL ARIZONA REGION (R12)

Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; and ELEV, mean basin elevation, in feet divided by 1,000.

| Recurrence interval, in years | Equation | Average standard error of model, in percent |
|-------------------------------|---|---|
| 2 | $Q = 41.1 \text{ AREA}^{0.629}$ | 102 |
| 5 | $Q = 238 \text{ AREA}^{0.687} \text{ ELEV}^{-0.358}$ | 64 |
| 10 | $Q = 479 \text{ AREA}^{0.661} \text{ ELEV}^{-0.398}$ | 47 |
| 25 | $Q = 942 \text{ AREA}^{0.630} \text{ ELEV}^{-0.383}$ | 34 |
| 50 | $\text{LOG } Q = 7.36 - 4.17 \text{ AREA}^{-0.08} - 0.440 \text{ LOG ELEV}$ | 30 |
| 100 | $\text{LOG } Q = 6.55 - 3.17 \text{ AREA}^{-0.11} - 0.454 \text{ LOG ELEV}$ | 31 |

Upper Rawhide Wash
FCN 98-12
091131.02

FIGURE 10-20

⑦

SCATTER DIAGRAM OF INDEPENDENT VARIABLES FOR R12 REGRESSION EQUATION

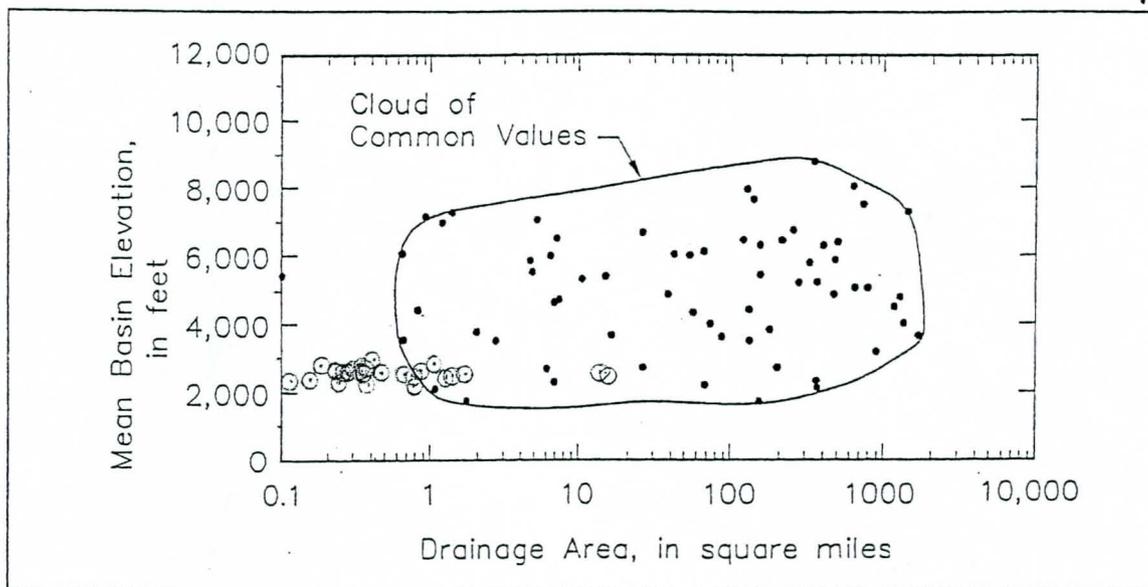
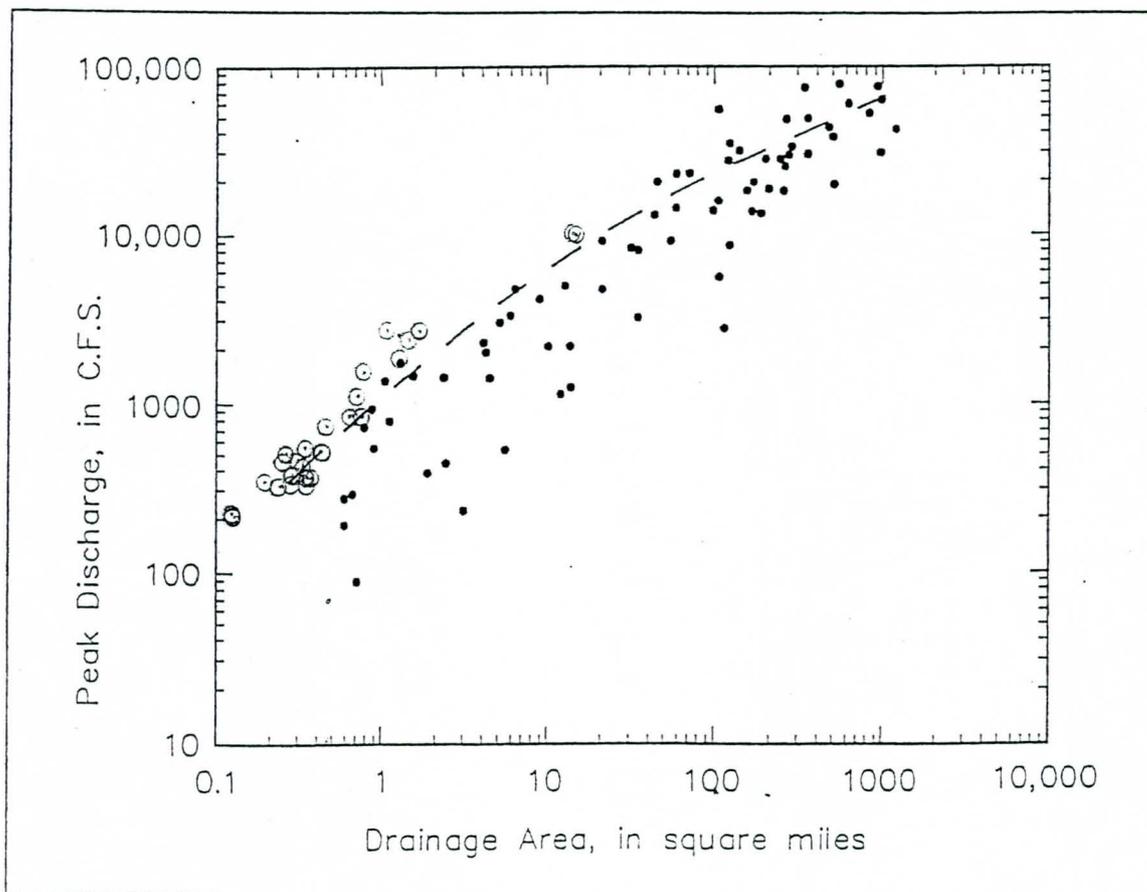


FIGURE 10-21

Q_{100} DATA POINTS AND 100-YEAR PEAK DISCHARGE RELATION FOR R12



Upper Rawhide was
FCO 98-12
091131.02

TABLE 10-7

FLOOD MAGNITUDE-FREQUENCY RELATIONS FOR
THE SOUTHERN ARIZONA REGION (R13)

Equations: Q, peak discharge, in cubic feet per second; and AREA, drainage area, in square miles.

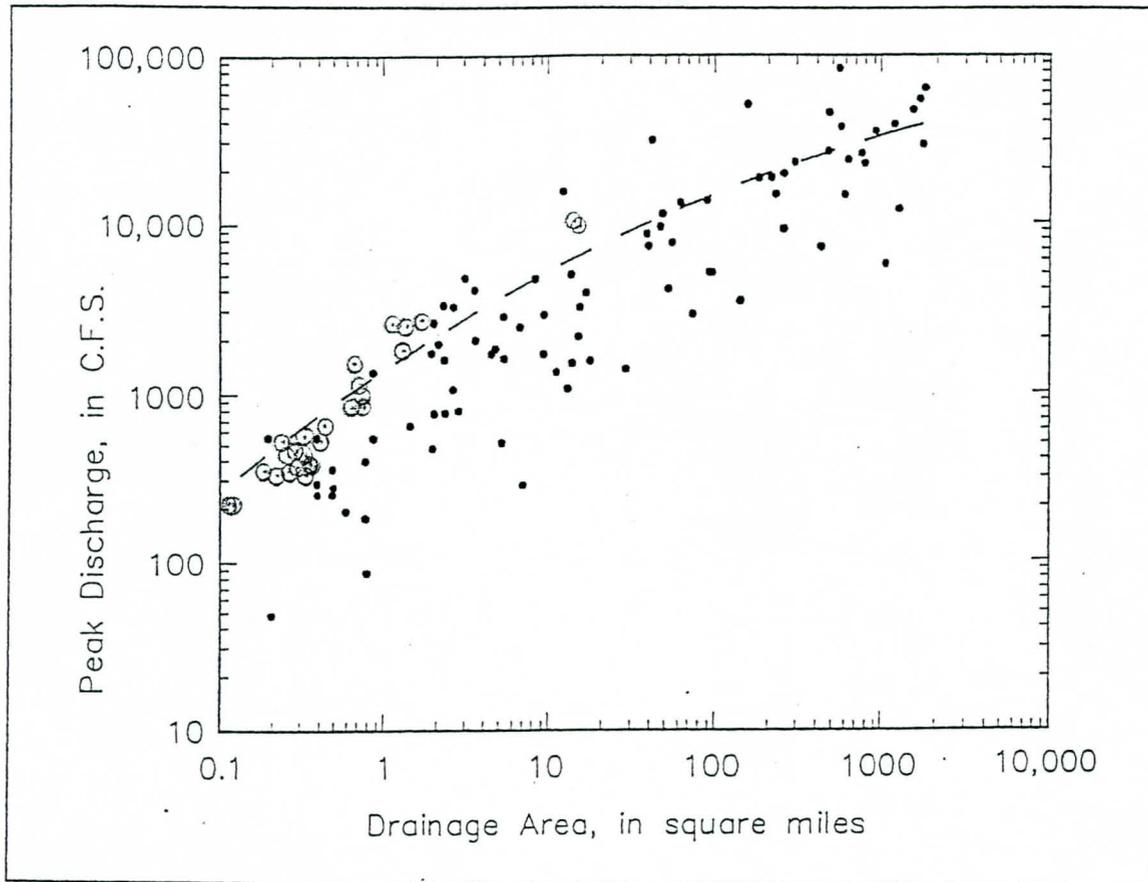
| Recurrence interval, in years | Equation | Average standard error of model, in percent |
|-------------------------------|--|---|
| 2 | $\text{LOG } Q = 6.38 - 4.29 \text{ AREA}^{-0.06}$ | 55 |
| 5 | $\text{LOG } Q = 5.78 - 3.31 \text{ AREA}^{-0.08}$ | 38 |
| 10 | $\text{LOG } Q = 5.68 - 3.02 \text{ AREA}^{-0.09}$ | 35 |
| 25 | $\text{LOG } Q = 5.64 - 2.78 \text{ AREA}^{-0.10}$ | 37 |
| 50 | $\text{LOG } Q = 5.57 - 2.59 \text{ AREA}^{-0.11}$ | 41 |
| 100 | $\text{LOG } Q = 5.52 - 2.42 \text{ AREA}^{-0.12}$ | 46 |

Upper Raashide Wash
FCD 98-12
091131.02

(9)

FIGURE 10-22

Q₁₀₀ DATA POINTS AND 100-YEAR PEAK DISCHARGE RELATION FOR R13



Upper Rawhide Wash
PCD 78-12
091131.02

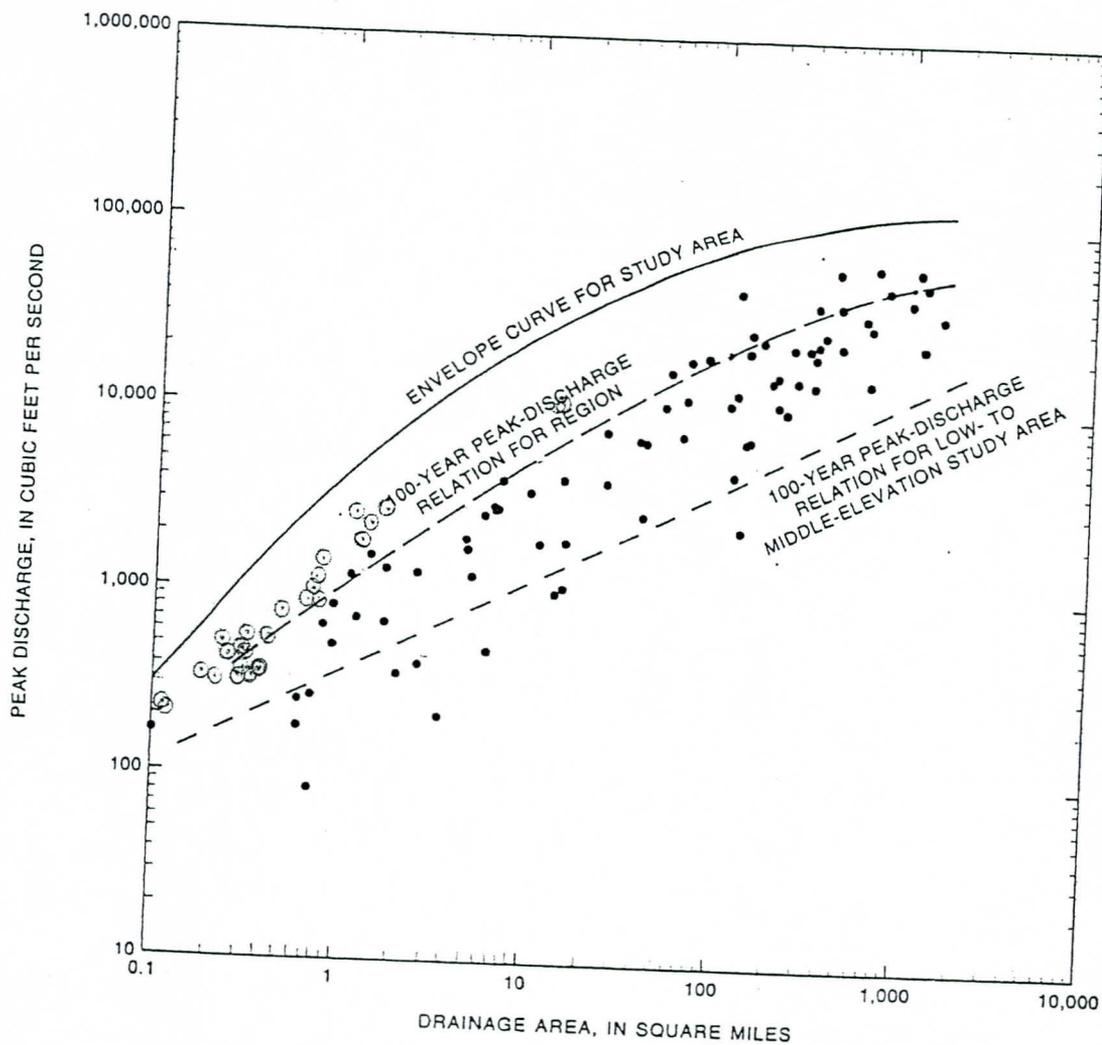


Figure 41. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Central Arizona Region 12.

Upper Rawhide Wash
FCW 98-12
091131.02

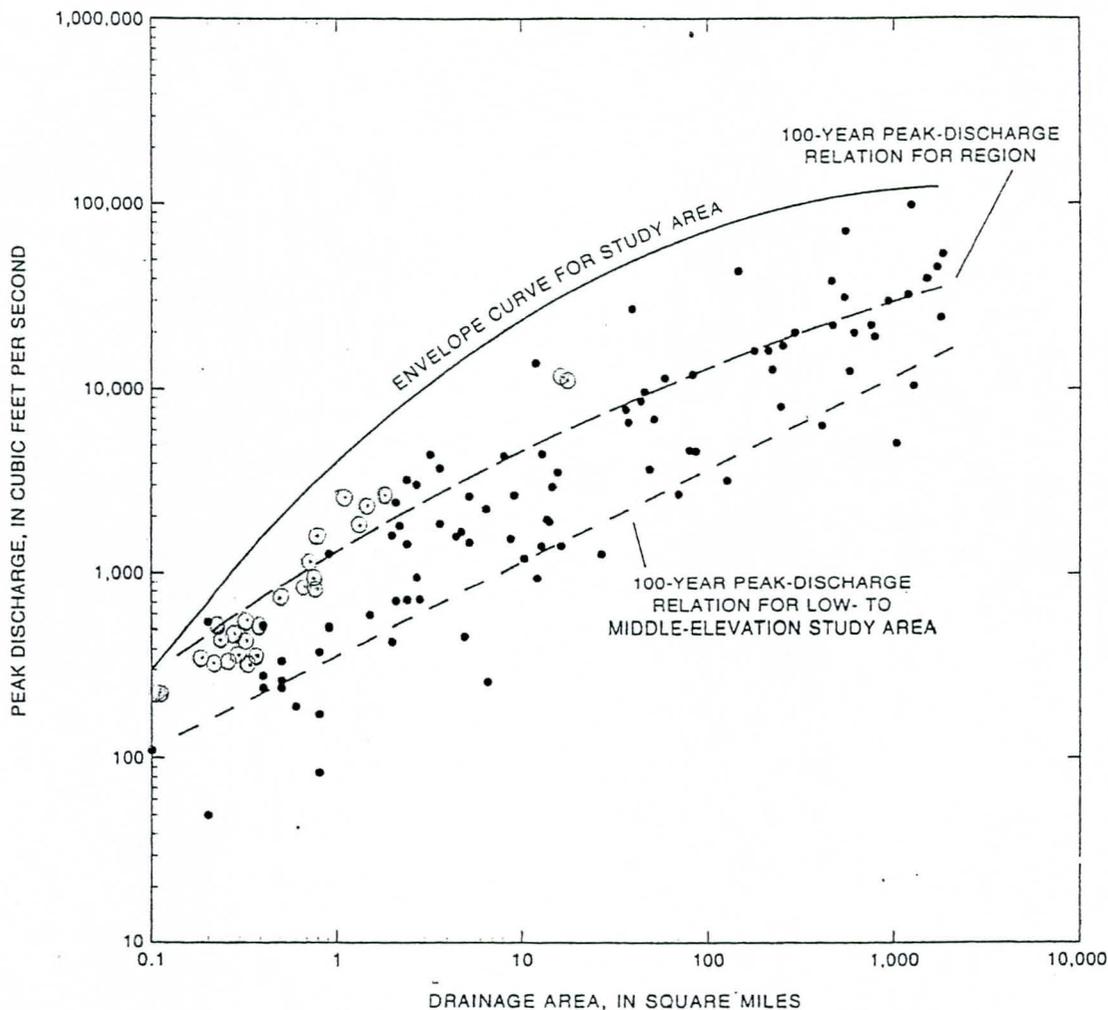


Figure 42. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Southern Arizona Region 13.

Table 17. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Southern Arizona Region 13

Equation: Q, peak discharge, in cubic feet per second; and AREA, drainage area, in square miles. Data were based on 73 stations. Average number of years of systematic record is 21.

| Recurrence interval, in years | Equation | Average standard error of prediction, in percent | Equivalent years of record |
|-------------------------------|---|--|----------------------------|
| 2 | $Q=10^{(6.38-4.29\text{AREA}^{-0.06})}$ | 57 | 2.0 |
| 5 | $Q=10^{(5.78-3.31\text{AREA}^{-0.08})}$ | 40 | 6.25 |
| 10 | $Q=10^{(5.68-3.02\text{AREA}^{-0.09})}$ | 37 | 11.1 |
| 25 | $Q=10^{(5.64-2.78\text{AREA}^{-0.10})}$ | 39 | 15.0 |
| 50 | $Q=10^{(5.57-2.59\text{AREA}^{-0.11})}$ | 43 | 15.9 |
| 100 | $Q=10^{(5.52-2.42\text{AREA}^{-0.12})}$ | 48 | 16.1 |

Upper Rawhide Wash
 FCD 98-12
 091131.02



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

*File
Phase*

Fax Transmittal

To: Scott Ogden, Afshin Ahouraiyan Fax: No.: 506.4601
 Firm/Location: _____ Job: No.: 291131.02
 From: Laurie Marin Date: December 14, 1998
 Original coming by mail: Yes: No:

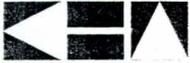
If you have any problems, please call 602-944-5500 and ask for: Pat
 Total number of pages, including cover sheet: 2

Comments:

 Revised meeting minutes – added last two bullet points per Afshin’s request.

*Engineering
Planning
and
Environmental
Consultants*

This facsimile is intended for the addressee named herein and may contain information that is confidential. If you are not the intended recipient or the employee or agent responsible for delivery to the addressee, you are hereby notified that any review, dissemination, disclosure, or copying of this communication is strictly prohibited. If you have received this facsimile in error, please immediately notify us by telephone, and return the original facsimile to us at the address above via the U.S. Postal Service. Thank you.



**Memorandum
via Facsimile**

To: Scott Ogden, FCDMC
Afshin Ahouraiyan, FCDMC

From: Doug Plasencia, Kimley-Horn and Associates

Date: December 14, 1998

Subj: Upper Rawhide Wash Hydrology Coordination Meeting #2
FCD 98-12
KHA 091131.02

The following are the points that we were asked to address from our Hydrology Coordination Meeting #2 with Afshin on Wednesday, December 9, 1998.

- Modify the subbasin delineation of basins 012 and 015 per the markup provided by Afshin.
- Investigate the possibility of flow crossing Jomax east of Pima Road and impacting the study area downstream of that location.
- There is a flow split at concentration point 012 (CP012) with some flow leaving the study area. It was agreed that this would be modelled using a rating curve diversion. Bob did a field walk in that area last week and he reported that it is an approximate 50/50 split.
- Bob asked about further subdividing basins 020 and 025 and putting a concentration point upstream of CP025 to the east. He said from field observations that the flows may combine about 800 feet upstream of the existing CP025. It was agreed that we would not change the subbasins. For the hydraulic modelling in that area Bob would use the combined flow rates from 020 and 025 for the 800 feet and then use the flow rate from the individual basin hydrographs for 020 and 025 upstream of that point.



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Fax Transmittal

Pl.
FILE

To: Scott Ogden, Afshin Ahouraiyan Fax: No.: 506.4601
 Firm/Location: FCDMC Job: No.: FCD 98-12; KHA 091131.02
 From: Laurie Marin Date: December 14, 1998
 Original coming by mail: Yes: No: X

If you have any problems, please call 602-944-5500 and ask for: Pat

Total number of pages, including cover sheet: 2

Comments:

Upper Rawhide Wash – Hydrology Meeting #2

Engineering
Planning
and
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Consultants

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**Memorandum
via Facsimile**

To: Scott Ogden, FCDMC
Afshin Ahouraiyan, FCDMC

From: Doug Plasencia, Kimley-Horn and Associates

Date: December 14, 1998

Subj: Upper Rawhide Wash Hydrology Coordination Meeting #2
FCD 98-12
KHA 091131.02

The following are the points that we were asked to address from our Hydrology Coordination Meeting #2 with Afshin on Wednesday, December 9, 1998.

- Per Afshin, Bob will modify the subbasin delineation of basins 012 and 015 per the markup provided by Afshin.
- Investigate the possibility of flow crossing Jomax east of Pima Road and impacting the study area downstream of that location.

B.4 GENERAL CORRESPONDENCE



Federal Emergency Management Agency

Washington, D.C. 20472

FEB 13 2002

| | |
|---|---------|
| FLOOD CONTROL DISTRICT RECEIVED | |
| FEB 19 '02 | |
| IC-3&M | FINANCE |
| PO | LANDS |
| ADVN | IC & M |
| REP | PERM |
| <input checked="" type="checkbox"/> ENG | FILE |
| IC-3&M | ROUTED |
| ADVN | ROUTED |
| REP | ROUTED |
| ENG | ROUTED |

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 01-09-1199P

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 Civic Center Boulevard
Scottsdale, AZ 85251

Community: City of Scottsdale
Community No.: 045012
Panels Affected: 04013C0820 F, 0850 E, and
1235 F

Effective Date of **JUN 05 2002**
This Revision:

102-I-A-C

Dear Mayor Manross:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated September 11, 2001, Mr. Richard P. Harris, P.E., Project Manager, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise the FIRM and FIS report to show the effects of new detailed hydrologic and hydraulic analyses and a new floodplain delineation study along upper Rawhide Wash from approximately 1,800 feet downstream of Dynamite Boulevard to approximately 5,200 feet upstream of Carefree Highway alignment; along Tributary 1 to Rawhide Wash (Tributary 1) from just upstream to approximately 5,700 feet upstream of its confluence with Rawhide Wash; along Tributary 2 to Rawhide Wash (Tributary 2) from just upstream to approximately 7,500 feet upstream of its confluence with Rawhide Wash; along Tributary 3 to Rawhide Wash (Tributary 3) from just upstream to approximately 3,900 feet upstream of its confluence with Tributary 2; and along Tributary 4 to Rawhide Wash (Tributary 4) from just upstream to approximately 7,700 feet upstream of its confluence with Tributary 2.

All data required to complete our review of this request were submitted with letters from Mr. Harris.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM and FIS report to establish elevations and floodplain and floodway boundary delineations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along the studied reaches of upper Rawhide Wash and Tributaries 1 through 4 to Rawhide Wash. The affected areas were previously designated Zone X (unshaded), areas of minimal flood hazard outside the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood. As a result of the new study, Base Flood Elevations (BFEs), floodway boundary delineations, and SFHAs were added to the FIRM. The scale of effective FIRM Panel 04013C0850 E was changed from 1:2,000 to 1:1,000. As a result of the more detailed scale, the area previously shown on effective FIRM Panel 04013C0850 E was divided into new FIRM Panels 04013C0830 E, 04013C0835 E, 04013C0840 E, and 04013C0845 E. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C0820 F, 04013C0830 E, 04013C0840 E, and 04013C1235 F; Profile Panels 1166P through 1180P; and affected portions of the Summary of Discharges Table and Floodway Data Table. This Letter of Map Revision (LOMR) hereby revises the

above-referenced panels of the effective FIRM and the affected portions of the FIS report, all dated July 19, 2001.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

| Location | Existing BFE (feet)* | Modified BFE (feet)* |
|--|-------------------------|-------------------------|
| Rawhide Wash: | | |
| Approximately 240 feet upstream of Dynamite Boulevard | None | 2,233 |
| Approximately 6,000 feet upstream of Dynamite Boulevard | None | 2,318 |
| Approximately 37,400 feet upstream of Dynamite Boulevard | None | 2,888 |
| Tributary 1: | | |
| Approximately 350 feet upstream of confluence with Rawhide Wash | None | 2,568 |
| Approximately 5,400 feet upstream of confluence with Rawhide Wash | None | 2,668 |
| Tributary 2: | | |
| Approximately 1,100 feet upstream of confluence with Rawhide Wash | None | 2,601 |
| Approximately 7,300 feet upstream of confluence with Rawhide Wash | None | 2,698 |
| Tributary 3: | | |
| Approximately 1,400 feet upstream of confluence with Tributary 2 | None | 2,628 |
| Approximately 3,400 feet upstream of confluence with Tributary 2 | None | 2,658 |
| Tributary 4: | | |
| Approximately 800 feet upstream of confluence with Tributary 2 | None | 2,618 |
| Approximately 7,600 feet upstream of confluence with Tributary 2 | None | 2,736 |

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the proposed modified BFEs will be given in the *Arizona Republic* on or about February 28 and March 7, 2002. A copy of this notification is enclosed. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Republic*, any interested party may request that FEMA reconsider the determination made by this

LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

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

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

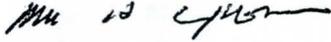
This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

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

Mr. Jack Eldridge
Chief, Community Mitigation Programs Branch
Federal Emergency Management Agency, Region IX
The Presidio of San Francisco, Building 105
San Francisco, CA 94129-1250
(415) 923-7184

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,



Max H. Yuan, P.E., Project Engineer
Hazards Study Branch
Federal Insurance and
Mitigation Administration

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Federal Insurance and
Mitigation Administration

Enclosures

cc: Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of
Maricopa County

Ms. Lynn Thomas, P.E.
Manager
Floodplain Management Branch
Flood Control District of
Maricopa County

Mr. Collis J. Lovely
Public Works Planner
City of Scottsdale

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE CITY OF SCOTTSDALE, MARICOPA COUNTY, ARIZONA, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On July 19, 2001, the Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the City of Scottsdale, Maricopa County, Arizona, through issuance of a Flood Insurance Rate Map (FIRM). The Federal Insurance and Mitigation Administration has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

New detailed hydrologic and hydraulic analyses and a new floodplain delineation study were performed along upper Rawhide Wash from approximately 1,800 feet downstream of Dynamite Boulevard to approximately 5,200 feet upstream of Carefree Highway alignment; along Tributary 1 to Rawhide Wash from just upstream to approximately 5,700 feet upstream of its confluence with Rawhide Wash; along Tributary 2 to Rawhide Wash from just upstream to approximately 7,500 feet upstream of its confluence with Rawhide Wash; along Tributary 3 to Rawhide Wash from just upstream to approximately 3,900 feet upstream of its confluence with Tributary 2 to Rawhide Wash; and along Tributary 4 to Rawhide Wash from just upstream to approximately 7,700 feet upstream of its confluence with Tributary 2 to Rawhide Wash. This has resulted in establishment of regulatory floodways, SFHAs, and BFEs for the studied reaches of upper Rawhide Wash and the above-mentioned Tributaries. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

| Location | Existing BFE (feet)* | Modified BFE (feet)* |
|--|-------------------------|-------------------------|
| Rawhide Wash: | | |
| Approximately 240 feet upstream of Dynamite Boulevard | None | 2,233 |
| Approximately 6,000 feet upstream of Dynamite Boulevard | None | 2,318 |
| Approximately 37,400 feet upstream of Dynamite Boulevard | None | 2,888 |
| Tributary 1 to Rawhide Wash: | | |
| Approximately 350 feet upstream of confluence with Rawhide Wash | None | 2,568 |
| Approximately 5,400 feet upstream of confluence with Rawhide Wash | None | 2,668 |
| Tributary 2 to Rawhide Wash: | | |
| Approximately 1,100 feet upstream of confluence with Rawhide Wash | None | 2,601 |
| Approximately 7,300 feet upstream of confluence with Rawhide Wash | None | 2,698 |

Tributary 3 to Rawhide Wash:

| | | |
|---|------|-------|
| Approximately 1,400 feet upstream of confluence with Tributary 2 to Rawhide Wash | None | 2,628 |
| Approximately 3,400 feet upstream of confluence with Tributary 2 to Rawhide Wash | None | 2,658 |

Tributary 4 to Rawhide Wash:

| | | |
|---|------|-------|
| Approximately 800 feet upstream of confluence with Tributary 2 to Rawhide Wash | None | 2,618 |
| Approximately 7,600 feet upstream of confluence with Tributary 2 to Rawhide Wash | None | 2,736 |

*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Federal Insurance and Mitigation Administration must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Federal Insurance and Mitigation Administration reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Federal Insurance and Mitigation Administration's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 Civic Center Boulevard
Scottsdale, AZ 85251

Table 3. Summary of Discharges

| <u>Flooding Source and Location</u> | <u>Drainage Area (Square Miles)</u> | <u>Peak Discharges (Cubic Feet per Second)</u> | | | |
|--|---|--|------------------------------------|-----------------|------------------------------------|
| | | <u>10-Year</u> | <u>50-Year</u> | <u>100-Year</u> | <u>500-Year</u> |
| Rawhide Wash | | | | | |
| South of Tonto National Forest Boundary | 0.80 | -- ¹ | -- ¹ | 867 | -- ¹ |
| South of Tonto National Forest Boundary At Diversion | 1.10 1.40 | -- ¹ -- ¹ | -- ¹ -- ¹ | 1,111 731 | -- ¹ -- ¹ |
| Upstream of confluence with Tributary 2, 3, and 4 | 5.30 | -- ¹ | -- ¹ | 5,666 | -- ¹ |
| Downstream of confluence with Tributary 2, 3, and 4 | 6.10 | -- ¹ | -- ¹ | 6,445 | -- ¹ |
| Confluence with Tributary 1 | 6.40 | -- ¹ | -- ¹ | 6,600 | -- ¹ |
| 96 th Street Alignment | 6.80 | -- ¹ | -- ¹ | 6,755 | -- ¹ |
| Downstream of Lone Mountain Alignment | 8.60 | -- ¹ | -- ¹ | 7,150 | -- ¹ |
| Downstream of Via Dona Road | 8.80 | -- ¹ | -- ¹ | 7,153 | -- ¹ |
| At Dynamite Boulevard | 8.90 | -- ¹ | -- ¹ | 7,157 | -- ¹ |
| Downstream of Dynamite Boulevard | 9.30 | -- ¹ | -- ¹ | 7,319 | -- ¹ |
| Tributary 1 | | | | | |
| ..Approximately 5,600 feet Upstream of confluence with Rawhide Wash | 0.60 | -- ¹ | -- ¹ | 648 | -- ¹ |
| Tributary 2 | | | | | |
| ..Approximately 7,400 feet Upstream of confluence with Rawhide Wash | 1.30 | -- ¹ | -- ¹ | 2,481 | -- ¹ |
| Tributary 3 | | | | | |
| ..Approximately 3,800 feet Upstream of confluence with Tributary 2 | 1.10 | -- ¹ | -- ¹ | 1,633 | -- ¹ |
| Tributary 4 | | | | | |
| ..Approximately 7,700 feet Upstream of confluence with Tributary 2 | 1.30 | -- ¹ | -- ¹ | 1,766 | -- ¹ |
| ..Approximately 4,000 feet Upstream of confluence with Tributary 2 | 1.50 | -- ¹ | -- ¹ | 1,875 | -- ¹ |

REVISED TO
REFLECT LOMR
DATED JUN 05 2002

¹Not computed

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | |
|-----------------|-----------------------|--------------|-------------------------|---------------------------------|------------------------------------|------------------|---------------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQ. FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | (FEET NGVD) | | |
| | | | | | | WITHOUT FLOODWAY | WITH FLOODWAY | INCREASE |
| Rawhide Wash | | | | | | | | |
| A | 180 | 339 | 1,048 | 6.98 | 2,203.3 | 2,203.3 | 2,204.1 | 0.8 |
| B | 882 | 108 | 590 | 12.41 | 2,215.8 | 2,215.8 | 2,216.5 | 0.7 |
| C | 1114 | 101 | 553 | 13.24 | 2,219.0 | 2,219.0 | 2,219.3 | 0.3 |
| D | 1737 | 250 | 1,728 | 4.14 | 2,230.8 | 2,230.8 | 2,231.3 | 0.5 |
| E | 2899 | 186 | 758 | 9.44 | 2,244.3 | 2,244.3 | 2,244.3 | 0.0 |
| F | 3627 | 165 | 665 | 10.75 | 2,255.1 | 2,255.1 | 2,255.5 | 0.5 |
| G | 5211 | 518 | 1,168 | 6.12 | 2,278.7 | 2,278.7 | 2,278.8 | 0.0 |
| H | 6521 | 159 | 981 | 4.64 | 2,298.6 | 2,298.6 | 2,299.5 | 0.9 |
| I | 7049 | 274 | 769 | 5.91 | 2,308.7 | 2,308.7 | 2,309.7 | 0.9 |
| J | 7735 | 159 | 902 | 5.05 | 2,318.7 | 2,318.7 | 2,319.5 | 0.8 |
| K | 8194 | 222 | 713 | 10.02 | 2,327.4 | 2,327.4 | 2,328.1 | 0.7 |
| L | 9409 | 687 | 1,219 | 5.87 | 2,350.2 | 2,350.2 | 2,350.3 | 0.0 |
| M | 10792 | 578 | 1,346 | 5.31 | 2,376.7 | 2,376.7 | 2,376.9 | 0.2 |
| N | 11373 | 382 | 920 | 7.77 | 2,386.0 | 2,386.0 | 2,386.1 | 0.1 |
| O | 11874 | 335 | 1,039 | 6.88 | 2,396.1 | 2,396.1 | 2,396.1 | 0.0 |
| P | 12561 | 348 | 884 | 8.09 | 2,408.7 | 2,408.7 | 2,408.7 | 0.0 |
| Q | 13416 | 477 | 1,119 | 6.39 | 2,424.4 | 2,424.4 | 2,424.4 | 0.0 |
| R | 13818 | 386 | 845 | 8.47 | 2,432.6 | 2,432.6 | 2,432.6 | 0.0 |
| S | 14208 | 500 | 1,035 | 6.91 | 2,440.3 | 2,440.3 | 2,440.3 | 0.0 |
| T | 14710 | 390 | 861 | 8.30 | 2,449.0 | 2,449.0 | 2,449.0 | 0.0 |
| U | 16532 | 249 | 703 | 9.61 | 2,482.0 | 2,482.0 | 2,482.0 | 0.0 |
| V | 17271 | 298 | 862 | 7.65 | 2,496.5 | 2,496.5 | 2,496.7 | 0.1 |
| W | 17683 | 519 | 1,139 | 5.79 | 2,502.5 | 2,502.5 | 2,502.6 | 0.1 |
| X | 18358 | 277 | 872 | 7.57 | 2,513.7 | 2,513.7 | 2,513.7 | 0.0 |
| Y | 19304 | 282 | 840 | 7.86 | 2,531.7 | 2,531.7 | 2,531.9 | 0.2 |
| Z | 19705 | 337 | 774 | 8.53 | 2,538.2 | 2,538.2 | 2,538.6 | 0.3 |
| AA | 20344 | 264 | 835 | 7.91 | 2,550.3 | 2,550.3 | 2,550.8 | 0.4 |
| AB | 21785 | 123 | 613 | 10.51 | 2,573.9 | 2,573.9 | 2,574.5 | 0.6 |
| AC | 22334 | 220 | 1,039 | 6.20 | 2,582.3 | 2,582.3 | 2,582.4 | 0.1 |

¹Feet Above Confluence with Stream 4D

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FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

REVISED TO
REFLECT LOMR
DATED JUN 05 2002

FLOODWAY DATA

RAWHIDE WASH

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | |
|--------------------------|-----------------------|--------------|----------------------------|---------------------------------|------------------------------------|------------------|---------------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | WITH FLOODWAY | INCREASE |
| | | | | | (FEET NGVD) | | | |
| Rawhide Wash (Cont'd) | | | | | | | | |
| AD | 23174 | 297 | 836 | 6.78 | 2,595.2 | 2,595.2 | 2,595.3 | 0.1 |
| AE | 23517 | 258 | 309 | 2.37 | 2,599.8 | 2,599.8 | 2,599.9 | 0.1 |
| AF | 23945 | 191 | 198 | 3.69 | 2,607.0 | 2,607.0 | 2,607.1 | 0.1 |
| AG | 24483 | 43 | 90 | 8.1 | 2,616.0 | 2,616.0 | 2,616.6 | 0.6 |
| AH | 24826 | 63 | 120 | 6.11 | 2,622.0 | 2,622.0 | 2,622.1 | 0.1 |
| AI | 25391 | 140 | 167 | 4.37 | 2,631.2 | 2,631.2 | 2,631.2 | 0.0 |
| AJ | 26917 | 373 | 314 | 2.33 | 2,653.1 | 2,653.1 | 2,653.1 | 0.0 |
| AK | 27836 | 143 | 160 | 4.58 | 2,670.1 | 2,670.1 | 2,670.1 | 0.0 |
| AL | 28480 | 257 | 211 | 3.46 | 2,680.6 | 2,680.6 | 2,680.6 | 0.0 |
| AM | 28829 | 103 | 119 | 6.16 | 2,686.2 | 2,686.2 | 2,686.2 | 0.0 |
| AN | 30867 | 59 | 99 | 7.39 | 2,721.1 | 2,721.1 | 2,721.1 | 0.0 |
| AO | 32366 | 133 | 142 | 5.15 | 2,749.7 | 2,749.7 | 2,749.7 | 0.0 |
| AP | 32868 | 150 | 199 | 5.58 | 2,760.2 | 2,760.2 | 2,760.2 | 0.0 |
| AQ | 33596 | 348 | 251 | 4.43 | 2,774.5 | 2,774.5 | 2,774.5 | 0.0 |
| AR | 34784 | 288 | 281 | 3.95 | 2,796.3 | 2,796.3 | 2,796.3 | 0.0 |
| AS | 35339 | 166 | 184 | 6.04 | 2,808.2 | 2,808.2 | 2,808.5 | 0.3 |
| AT | 35925 | 73 | 140 | 7.94 | 2,820.8 | 2,820.8 | 2,820.8 | 0.0 |
| AU | 36838 | 232 | 248 | 4.48 | 2,837.4 | 2,837.4 | 2,837.5 | 0.1 |
| AV | 37424 | 336 | 282 | 3.07 | 2,849.2 | 2,849.2 | 2,849.2 | 0.0 |
| AW | 38945 | 138 | 100 | 4.85 | 2,883.4 | 2,883.4 | 2,883.4 | 0.0 |
| AX | 40376 | 173 | 161 | 3.00 | 2,912.0 | 2,912.0 | 2,912.0 | 0.0 |

¹Feet Above Confluence with Stream 4D

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FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

REVISED TO
REFLECT LOMR

DATED JUN 05 2002

FLOODWAY DATA

RAWHIDE WASH

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | | |
|-----------------|-----------------------|--------------|----------------------------|---------------------------------|------------------------------------|------------------|---------|---------------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | | WITH FLOODWAY | INCREASE |
| | | | | | | (FEET NGVD) | | | |
| Tributary 1 | | | | | | | | | |
| A | 502 | 126 | 117 | 5.52 | 2,571.8 | 2,573.8 | 2,573.8 | 0.0 | 0.0 |
| B | 797 | 145 | 139 | 4.67 | 2,577.3 | 2,577.3 | 2,577.3 | 0.0 | 0.0 |
| C | 993 | 67 | 95 | 6.79 | 2,583.3 | 2,583.3 | 2,583.3 | 0.0 | 0.0 |
| D | 1257 | 79 | 107 | 6.05 | 2,588.2 | 2,588.2 | 2,588.2 | 0.0 | 0.0 |
| E | 1500 | 83 | 103 | 6.31 | 2,593.1 | 2,593.1 | 2,593.2 | 0.0 | 0.0 |
| F | 1991 | 206 | 153 | 4.24 | 2,602.7 | 2,602.7 | 2,602.8 | 0.0 | 0.0 |
| G | 2228 | 129 | 118 | 5.48 | 2,607.3 | 2,607.3 | 2,607.3 | 0.0 | 0.0 |
| H | 2439 | 167 | 147 | 4.41 | 2,611.2 | 2,611.2 | 2,611.2 | 0.0 | 0.0 |
| I | 2825 | 197 | 137 | 4.74 | 2,619.0 | 2,619.0 | 2,619.0 | 0.0 | 0.0 |
| J | 3004 | 206 | 164 | 3.95 | 2,622.8 | 2,622.8 | 2,622.8 | 0.0 | 0.0 |
| K | 3216 | 85 | 98 | 6.60 | 2,626.4 | 2,626.4 | 2,626.4 | 0.0 | 0.0 |
| L | 3543 | 209 | 139 | 4.65 | 2,632.9 | 2,632.9 | 2,632.9 | 0.0 | 0.0 |
| M | 4013 | 99 | 109 | 5.97 | 2,641.6 | 2,641.6 | 2,641.6 | 0.0 | 0.0 |
| N | 4509 | 88 | 113 | 5.71 | 2,651.5 | 2,651.5 | 2,651.5 | 0.0 | 0.0 |
| O | 5016 | 61 | 91 | 7.09 | 2,661.2 | 2,661.2 | 2,661.2 | 0.0 | 0.0 |
| P | 5512 | 48 | 88 | 7.37 | 2,669.8 | 2,669.8 | 2,669.8 | 0.0 | 0.0 |
| Q | 5681 | 69 | 96 | 6.78 | 2,672.3 | 2,672.3 | 2,672.3 | 0.0 | 0.0 |

¹Feet Above Confluence with Rawhide Wash

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FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

REVISED TO FLOODWAY DATA

REFLECT LOMR

DATED JUN 05 2002 TRIBUTARY 1 TO RAWHIDE WASH

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | |
|-----------------|-----------------------|--------------|----------------------------|---------------------------------|------------------------------------|------------------|---------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | | INCREASE |
| | | | | | | WITH FLOODWAY | | |
| | | | | | | (FEET NGVD) | | |
| Tributary 2 | | | | | | | | |
| A | 1352 | 144 | 333 | 7.45 | 2,604.9 | 2,604.9 | 2,604.9 | 0.0 |
| B | 1811 | 130 | 380 | 6.53 | 2,610.4 | 2,610.4 | 2,610.5 | 0.0 |
| C | 2049 | 160 | 360 | 6.89 | 2,613.3 | 2,613.3 | 2,613.4 | 0.1 |
| D | 2519 | 406 | 639 | 3.88 | 2,619.2 | 2,619.2 | 2,619.3 | 0.0 |
| E | 2925 | 370 | 413 | 6.01 | 2,625.5 | 2,625.5 | 2,625.5 | 0.0 |
| F | 3200 | 367 | 511 | 4.85 | 2,630.5 | 2,630.5 | 2,630.5 | 0.0 |
| G | 3532 | 337 | 417 | 5.94 | 2,635.8 | 2,635.8 | 2,635.8 | 0.0 |
| H | 4029 | 517 | 564 | 4.40 | 2,644.9 | 2,644.9 | 2,644.9 | 0.0 |
| I | 4425 | 536 | 523 | 4.75 | 2,651.4 | 2,651.4 | 2,651.4 | 0.0 |
| J | 4683 | 540 | 610 | 4.07 | 2,655.4 | 2,655.4 | 2,655.4 | 0.0 |
| K | 5132 | 235 | 354 | 7.01 | 2,663.8 | 2,663.8 | 2,663.8 | 0.0 |
| L | 5539 | 315 | 435 | 5.71 | 2,670.5 | 2,670.5 | 2,670.5 | 0.0 |
| M | 6035 | 156 | 305 | 8.15 | 2,679.3 | 2,679.3 | 2,679.3 | 0.0 |
| N | 6537 | 239 | 355 | 6.99 | 2,686.7 | 2,686.7 | 2,686.7 | 0.0 |
| O | 7038 | 383 | 417 | 5.95 | 2,694.2 | 2,694.2 | 2,694.2 | 0.0 |
| P | 7482 | 497 | 498 | 4.98 | 2,700.5 | 2,700.5 | 2,700.5 | 0.0 |

¹Feet Above Confluence with Rawhide Wash

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FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

**REVISED TO
REFLECT LOMR
DATED JUN 05 2002**

FLOODWAY DATA

TRIBUTARY 2 TO RAWHIDE WASH

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | | |
|-----------------|-----------------------|--------------|----------------------------|---------------------------------|------------------------------------|------------------|---------|---------------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | | WITH FLOODWAY | INCREASE |
| | | | | | | (FEET NGVD) | | | |
| Tributary 3 | | | | | | | | | |
| A | 1500 | 192 | 304 | 5.38 | 2,629.7 | 2,629.7 | 2,629.7 | 0.0 | |
| B | 1848 | 347 | 418 | 3.90 | 2,633.7 | 2,633.7 | 2,633.7 | 0.0 | |
| C | 2307 | 248 | 275 | 5.93 | 2,639.4 | 2,639.4 | 2,639.4 | 0.0 | |
| D | 2614 | 238 | 272 | 6.01 | 2,645.8 | 2,645.8 | 2,645.8 | 0.0 | |
| E | 3004 | 169 | 277 | 5.89 | 2,652.1 | 2,652.1 | 2,652.1 | 0.0 | |
| F | 3348 | 307 | 312 | 5.24 | 2,657.3 | 2,657.3 | 2,657.3 | 0.0 | |
| G | 3585 | 225 | 268 | 6.09 | 2,661.9 | 2,661.9 | 2,661.9 | 0.0 | |
| H | 3881 | 348 | 348 | 4.69 | 2,667.3 | 2,667.3 | 2,667.3 | 0.0 | |

¹Feet Above Confluence with Tributary 2

| | | | |
|--------------------------------|---|--|--|
| T A B L E 5 | FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY, AZ AND INCORPORATED AREAS | REVISED TO REFLECT LOMR DATED JUN 05 2002 | FLOODWAY DATA TRIBUTARY 3 TO RAWHIDE WASH |
| | | | |

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER-SURFACE ELEVATION | | | | |
|-----------------|-----------------------|--------------|----------------------------|---------------------------------|------------------------------------|------------------|---------|---------------|----------|
| CROSS SECTION | DISTANCE ¹ | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | | WITH FLOODWAY | INCREASE |
| | | | | | | (FEET NGVD) | | | |
| Tributary 4 | | | | | | | | | |
| A | 502 | 260 | 313 | 5.99 | 2,614.2 | 2,614.2 | 2,614.2 | 0.0 | |
| B | 808 | 146 | 268 | 7.00 | 2,618.8 | 2,618.8 | 2,618.9 | 0.1 | |
| C | 1082 | 77 | 205 | 9.16 | 2,623.8 | 2,623.8 | 2,623.9 | 0.0 | |
| D | 1500 | 212 | 324 | 5.78 | 2,631.2 | 2,631.2 | 2,631.3 | 0.1 | |
| E | 1917 | 196 | 276 | 6.80 | 2,638.3 | 2,638.3 | 2,638.6 | 0.3 | |
| F | 2228 | 138 | 247 | 7.58 | 2,643.7 | 2,643.7 | 2,643.7 | 0.0 | |
| G | 2492 | 339 | 430 | 4.36 | 2,647.6 | 2,647.6 | 2,647.6 | 0.0 | |
| H | 2793 | 286 | 314 | 5.97 | 2,653.5 | 2,653.5 | 2,653.5 | 0.0 | |
| I | 3004 | 318 | 352 | 5.33 | 2,657.4 | 2,657.4 | 2,657.4 | 0.0 | |
| J | 3342 | 451 | 363 | 5.16 | 2,664.5 | 2,664.5 | 2,664.5 | 0.0 | |
| K | 3543 | 363 | 340 | 5.52 | 2,669.2 | 2,669.2 | 2,669.2 | 0.0 | |
| L | 4044 | 295 | 360 | 5.21 | 2,677.8 | 2,677.8 | 2,677.8 | 0.0 | |
| M | 4546 | 308 | 309 | 5.72 | 2,686.1 | 2,686.1 | 2,686.1 | 0.0 | |
| N | 5042 | 130 | 270 | 6.54 | 2,696.1 | 2,696.1 | 2,696.1 | 0.0 | |
| O | 5444 | 222 | 300 | 5.89 | 2,701.7 | 2,701.7 | 2,701.7 | 0.0 | |
| P | 5792 | 200 | 344 | 5.13 | 2,709.3 | 2,709.3 | 2,709.7 | 0.3 | |
| Q | 6046 | 280 | 361 | 4.89 | 2,713.2 | 2,713.2 | 2,713.2 | 0.0 | |
| R | 6479 | 211 | 282 | 6.27 | 2,719.4 | 2,719.4 | 2,719.4 | 0.0 | |
| S | 6801 | 309 | 443 | 3.99 | 2,724.2 | 2,724.2 | 2,724.3 | 0.1 | |
| T | 7165 | 335 | 408 | 4.33 | 2,729.4 | 2,729.4 | 2,729.4 | 0.0 | |
| U | 7434 | 205 | 269 | 6.56 | 2,733.7 | 2,733.7 | 2,733.7 | 0.0 | |
| V | 7704 | 390 | 451 | 3.92 | 2,737.5 | 2,737.5 | 2,737.5 | 0.0 | |

¹Feet Above Confluence with Tributary 2

| | | |
|--------------------------------|--|----------------------|
| T A B L E 5 | REVISSED TO REFLECT LOMR DATED JUN 05 2002 | FLOODWAY DATA |
| | FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY, AZ AND INCORPORATED AREAS | |



NATIONAL FLOOD INSURANCE PROGRAM FEMA MAP COORDINATION CONTRACTOR

October 9, 2001

| | |
|---|---------|
| FLOOD CONTROL DISTRICT RECEIVED | |
| OCT 15 '01 | |
| CH & GV | FINANCE |
| PIO | LANDS |
| ADN | O & M |
| REG | P & PM |
| <input checked="" type="checkbox"/> ENG | FILE |
| CONTRACTS | |
| ROUTINE | |

RPH

Mr. Richard P. Harris, P.E.
 Project Manager
 Engineering Division
 Flood Control District of Maricopa County
 2801 West Durango Street
 Phoenix, AZ 85009

IN REPLY REFER TO:
 Case No.: 01-09-1199P
 Community: City of Scottsdale, AZ
 Community No.: 045012
 316-ACK.FEX

Dear Mr. Harris:

This responds to your request dated September 11, 2001, that the Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

| | |
|-------------------------|--|
| Identifier: | Upper Rawhide Wash Floodplain Delineation Study |
| Flooding Sources: | Rawhide Wash and Tributaries 1 through 4 to Rawhide Wash |
| FIRM Panel(s) Affected: | 04013C0820 F, 0850 E, 1235 F, and 1255 F |

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request is based on flood hazard information meant to improve upon that shown on the flood map or within the flood study, and does not partially or wholly incorporate manmade modifications within the Special Flood Hazard Area, no fees will be assessed for our review.

We have completed an inventory of the items you submitted. We have received the required data to begin a detailed technical review of your request. If additional data are required, we will inform you within 60 days of the date of this letter.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP

Baker reviewer
Irwan (703) 960 8800
e-mail

3601 Eisenhower Avenue, Suite 600, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

(1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,



Monther S. Madanat, Director
Engineering Division
Michael Baker Jr., Inc.

cc: Mr. Collis J. Lovely
Public Works Planner
Drainage and Flood Control
City of Scottsdale

Ms. Shanna Yager
Engineering Division
Flood Control District of Maricopa County

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency
Management

Mr. Jon Ahern, P.E.
Kimley-Horn and Associates, Inc.

September 11, 2001

Pernille Buch-Pedersen, Regional Manager
Baker Civil
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Community: City of Scottsdale, Arizona
Community Nos.: 045012
Flooding Sources: Upper Rawhide Wash and Tributaries 1-4
FIRM Panels Affected: 0820E, 0850D, 1235E, 1255E

Dear Ms. Buch-Pedersen:

I have enclosed a study of the Upper Rawhide Wash and Tributaries 1 through 4. Although no previous floodplain boundaries have been mapped for these washes, adjacent future development is anticipated. The supporting Technical Data Notebook includes a copy of the work maps. Please review and process a Letter of Map Revision for the studied portions of these washes.

If you have any questions, please contact me at (602) 506-4528.

Sincerely,



Richard P. Harris, P.E.
Project Manager
Engineering Division

Enclosures

Copies to: Mr. Max Yuan, P.E., Project Engineer
Hazards Study Branch, Mitigation Directorate
Federal Emergency Management Agency
500 C Street SW
Washington, D.C. 20472-0001

Mr. Collis J. Lovely
Public Works Planner
City of Scottsdale
Drainage and Flood Control
P.O. Box 1000
7447 E. Indian School Road, Suite 205
Scottsdale, Arizona 85252

Ms. Terri Miller
Community Assistance Program Coordinator
Arizona Division of Emergency Management
5636 E. McDowell Road
Phoenix, AZ 85008

Mr. Jon Ahern, P.E.
Kimley-Horn and Associates, Inc.
7600 N, 15th Street
Suite 250
Phoenix, Arizona 85020

Coord:

TMM  EAR 

LEGEND

- SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR 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 shallow fan flooding; velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- OTHER FLOOD AREAS**
- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood.
- OTHER AREAS**
- ZONE X** Area determined to be outside 500-year floodplain.
- ZONE D** Area in which flood hazards are undetermined.
- UNDEVELOPED COASTAL BARRIERS**
- Identified 1983
- Identified 1990
- Otherwise Protected Areas
- Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- Base Flood Elevation Line: Elevation in Feet. See Map Index for Elevation Datum.
- Cross Section Line
- Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum. Elevation Reference Mark.
- River Mile
- Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

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, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AI, A30, AH, AG, AR, V, VE and VI-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

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 Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and/or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-650).

For community map revision history prior to countywide mapping, see Section E.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

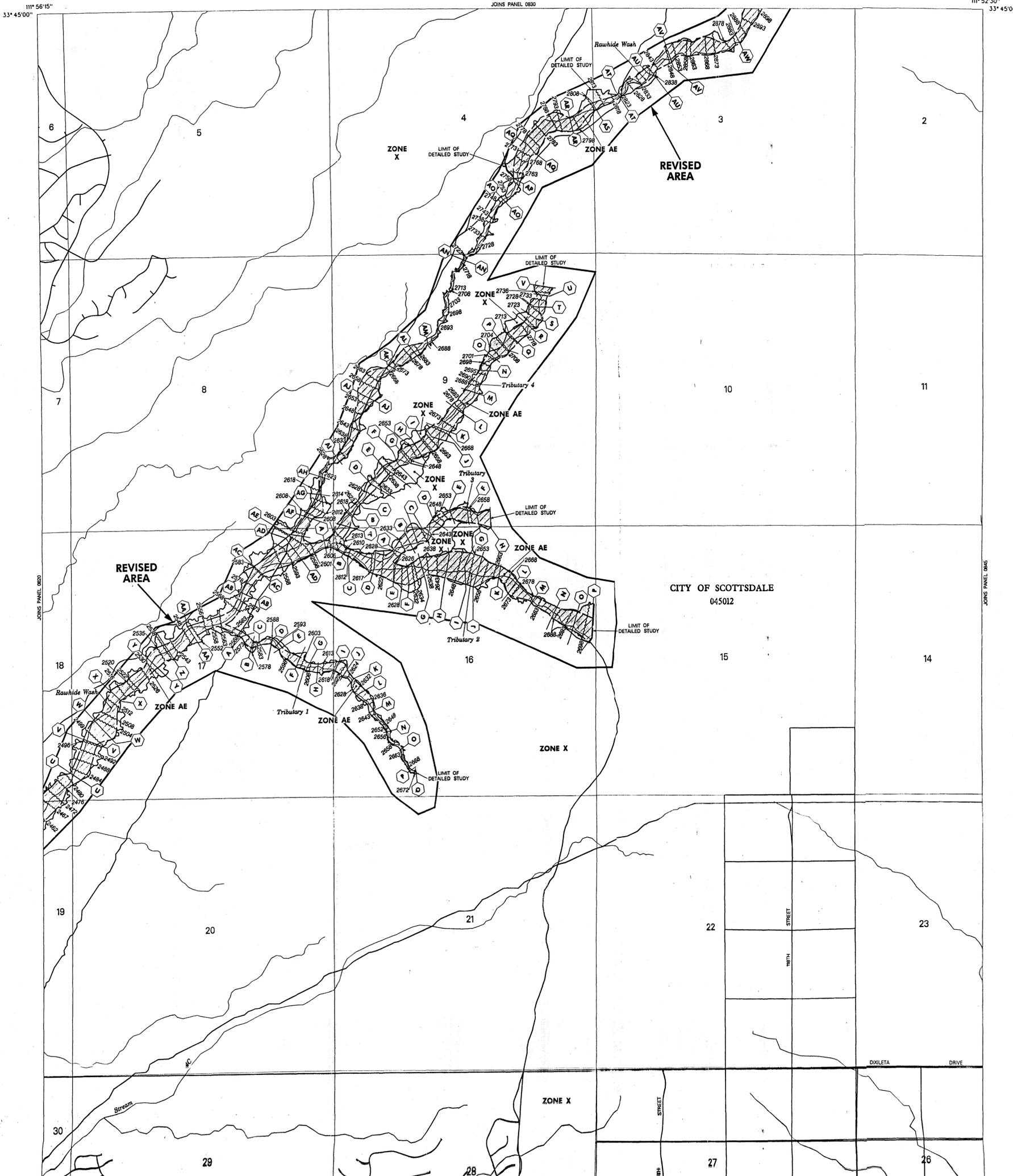
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1998

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
DECEMBER 3, 1999

Map revised July 19, 2001 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 update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6820.

APPROXIMATE SCALE IN FEET
1000 0 1000



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 840 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

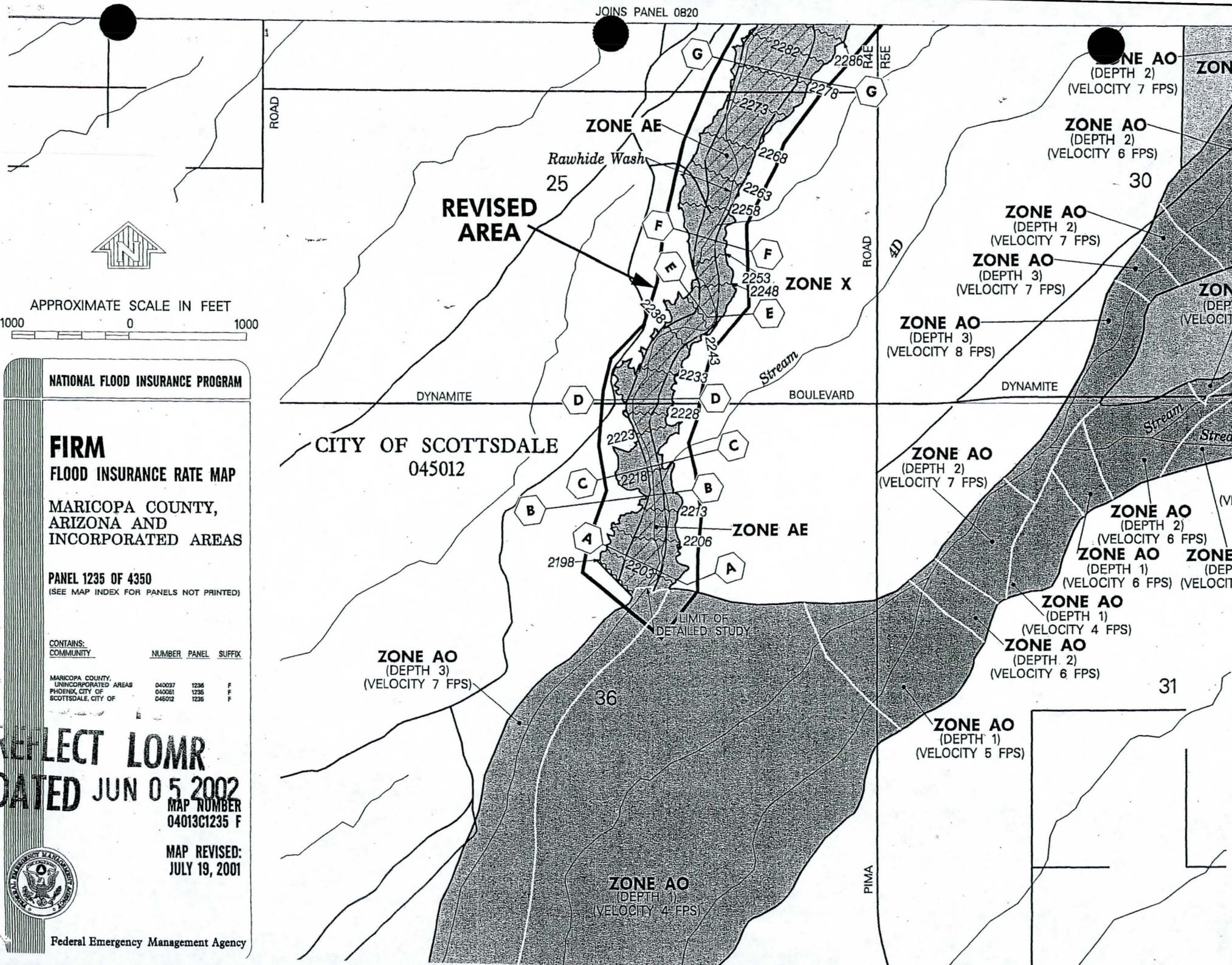
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX

MARICOPA COUNTY UNINCORPORATED AREAS 040227 840 E
PHOENIX CITY OF 040281 840 E
SCOTTSDALE CITY OF 046012 840 E

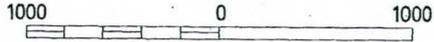
REVISED TO REFLECT LOMR DATED JUN 05 2002

MAP NUMBER 04013C0840 E
MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency



APPROXIMATE SCALE IN FEET



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 1235 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---------------------------------------|--------|-------|--------|
| MARICOPA COUNTY, UNINCORPORATED AREAS | 040097 | 1235 | F |
| PHOENIX, CITY OF | 040061 | 1235 | F |
| SCOTTSDALE, CITY OF | 046012 | 1235 | F |

**REFLECT LOMR
DATED JUN 05 2002**
MAP NUMBER
04013C1235 F

MAP REVISED:
JULY 19, 2001



Federal Emergency Management Agency

(DEPTH 1)
(VELOCITY 5 FPS)

ZONE AO
(DEPTH 2)
(VELOCITY 7 FPS)

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN
TOWNSHIP 5 NORTH, RANGE 4 EAST AND TOWNSHIP 5 NORTH,
RANGE 5 EAST.

ZONE AO
(DEPTH 2)
(VELOCITY 6 FPS)

CITY OF SCOTTSDALE
045012



APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 820 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:
COMMUNITY

NUMBER PANEL SUFFIX

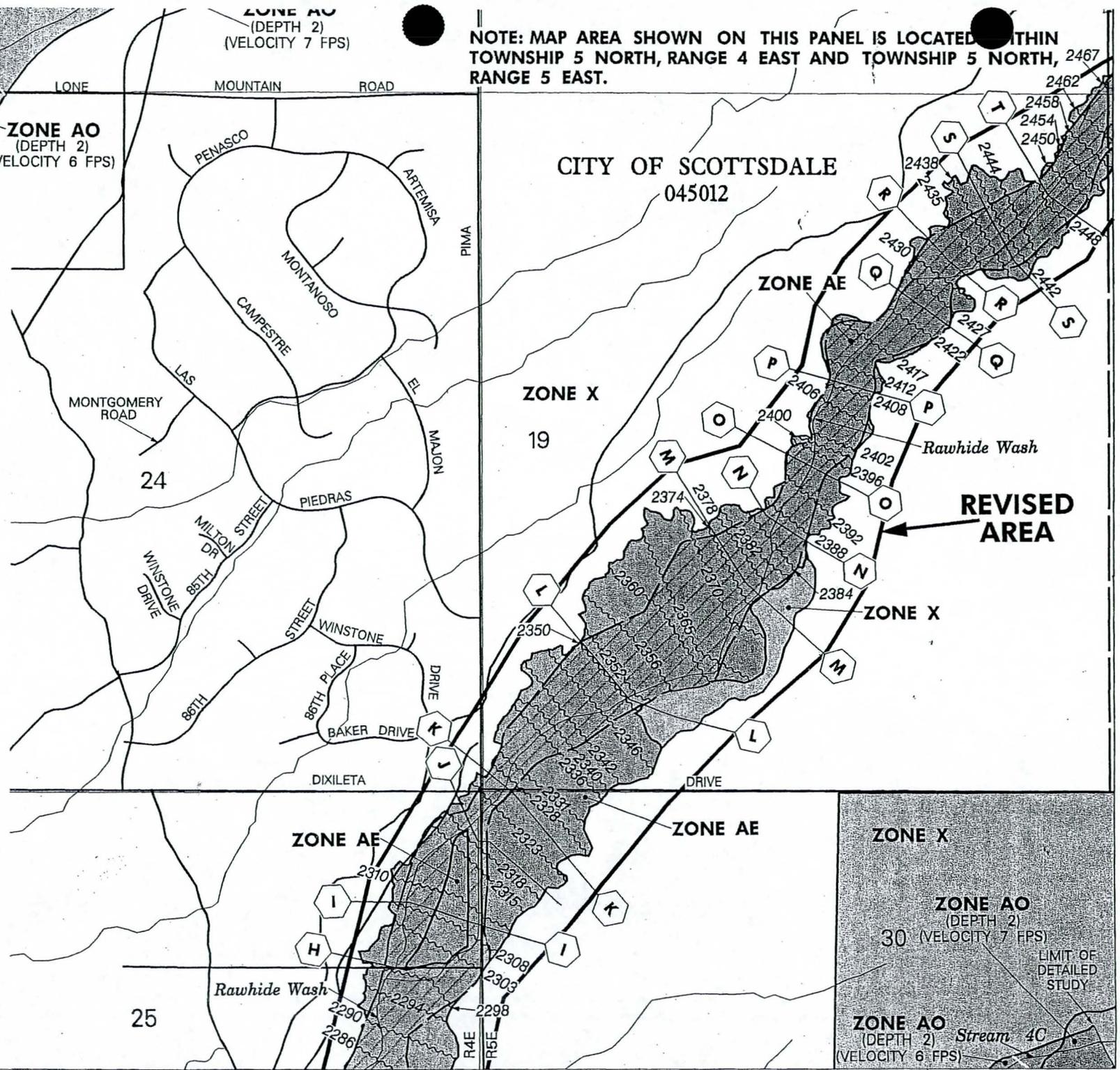
**REVISED TO
REFLECT LOMR
DATED JUN 05 2002**

MAP NUMBER
04013C0820 F

MAP REVISED:
JULY 19, 2001



Federal Emergency Management Agency

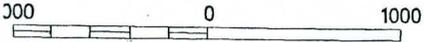


ZONE X
ZONE AO
(DEPTH 2)
30 (VELOCITY 7 FPS)
LIMIT OF
DETAILED
STUDY
ZONE AO
(DEPTH 2) Stream 4C
(VELOCITY 6 FPS)

CITY OF SCOTTSDALE
045012



APPROXIMATE SCALE IN FEET



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 830 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:
COMMUNITY

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|--------------------------------------|--------|-------|--------|
| CAREFREE, TOWN OF | 040128 | 0830 | E |
| MARICOPA COUNTY UNINCORPORATED AREAS | 040037 | 0830 | E |
| SCOTTSDALE, CITY OF | 045012 | 0830 | E |

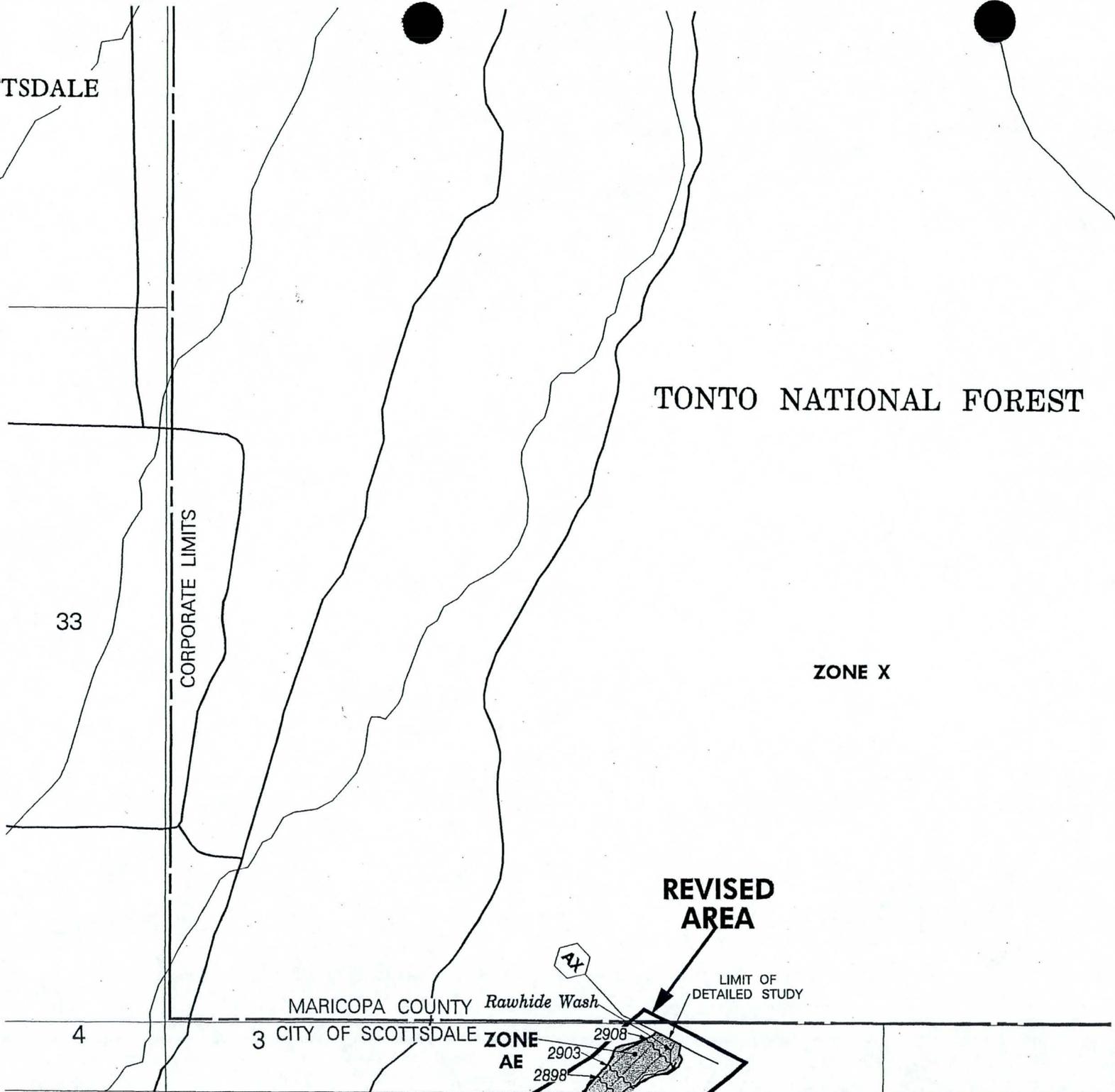
**REVISED TO
REFLECT LOMR
DATED JUN 05, 2002**

MAP NUMBER
04013C0830 E

MAP REVISED:
JULY 19, 2001



Federal Emergency Management Agency



ELEVATION IN FEET (NGVD)

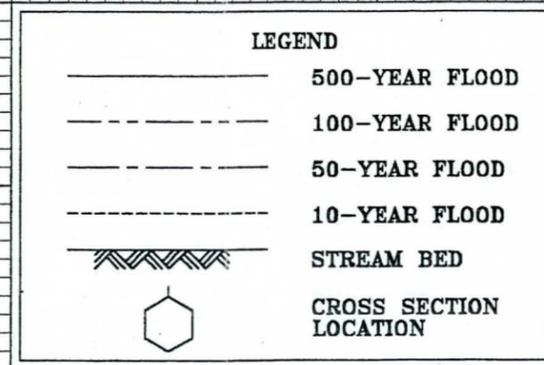
2300
2280
2260
2240
2220
2200
2180
2160

LIMIT OF DETAILED STUDY

DYNAMITE BOULEVARD

0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH STREAM 4D



REVISED TO

FLOOD PROFILES

REFLECT LOMR
DATED JUN 05 2004

RAWHIDE WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

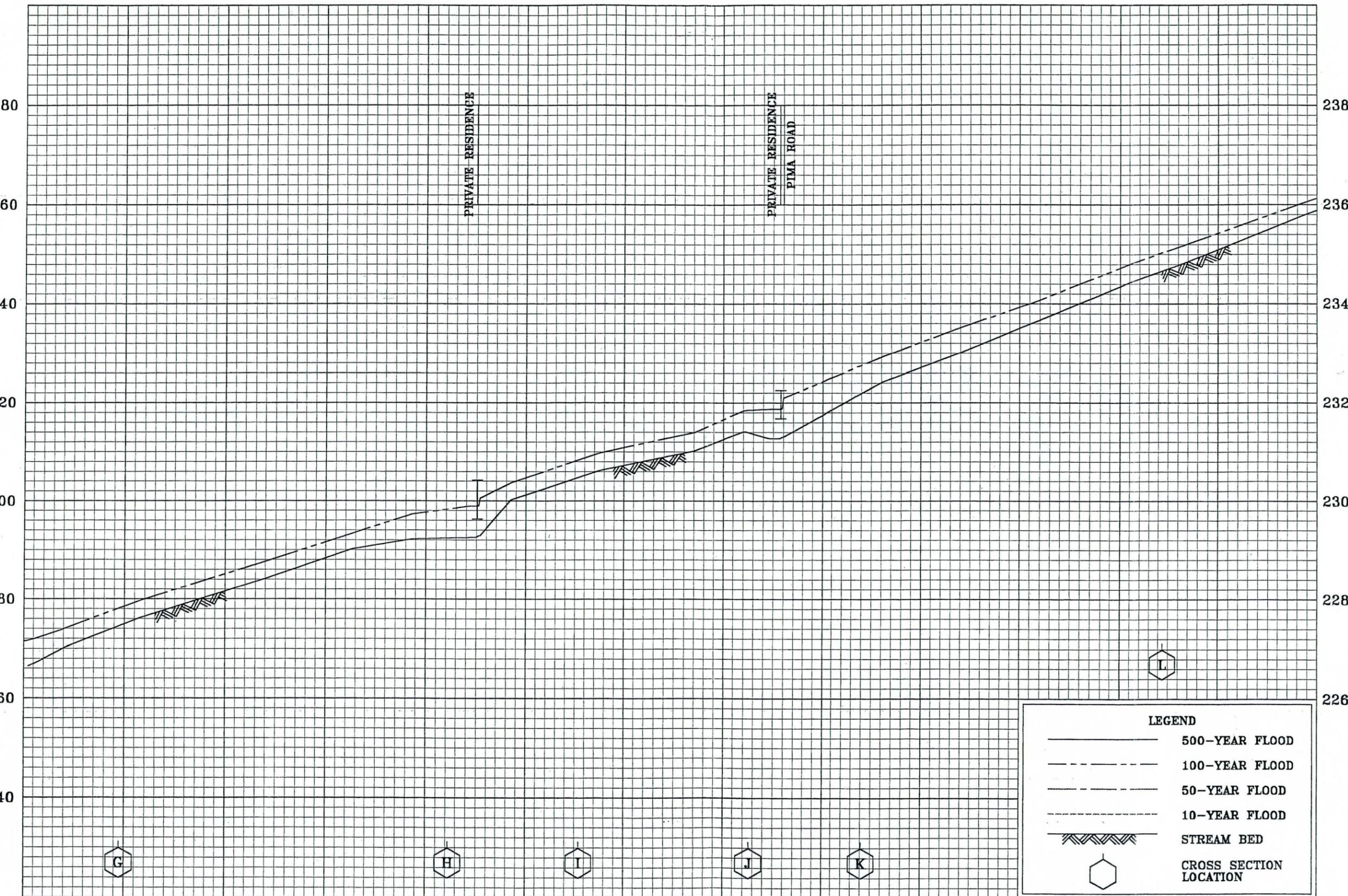
AND INCORPORATED AREAS

1166P

ELEVATION IN FEET (NGVD)

2380
2360
2340
2320
2300
2280
2260
2240

2380
2360
2340
2320
2300
2280
2260



STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH STREAM 4D

| LEGEND | |
|--------|------------------------|
| | 500-YEAR FLOOD |
| | 100-YEAR FLOOD |
| | 50-YEAR FLOOD |
| | 10-YEAR FLOOD |
| | STREAM BED |
| | CROSS SECTION LOCATION |

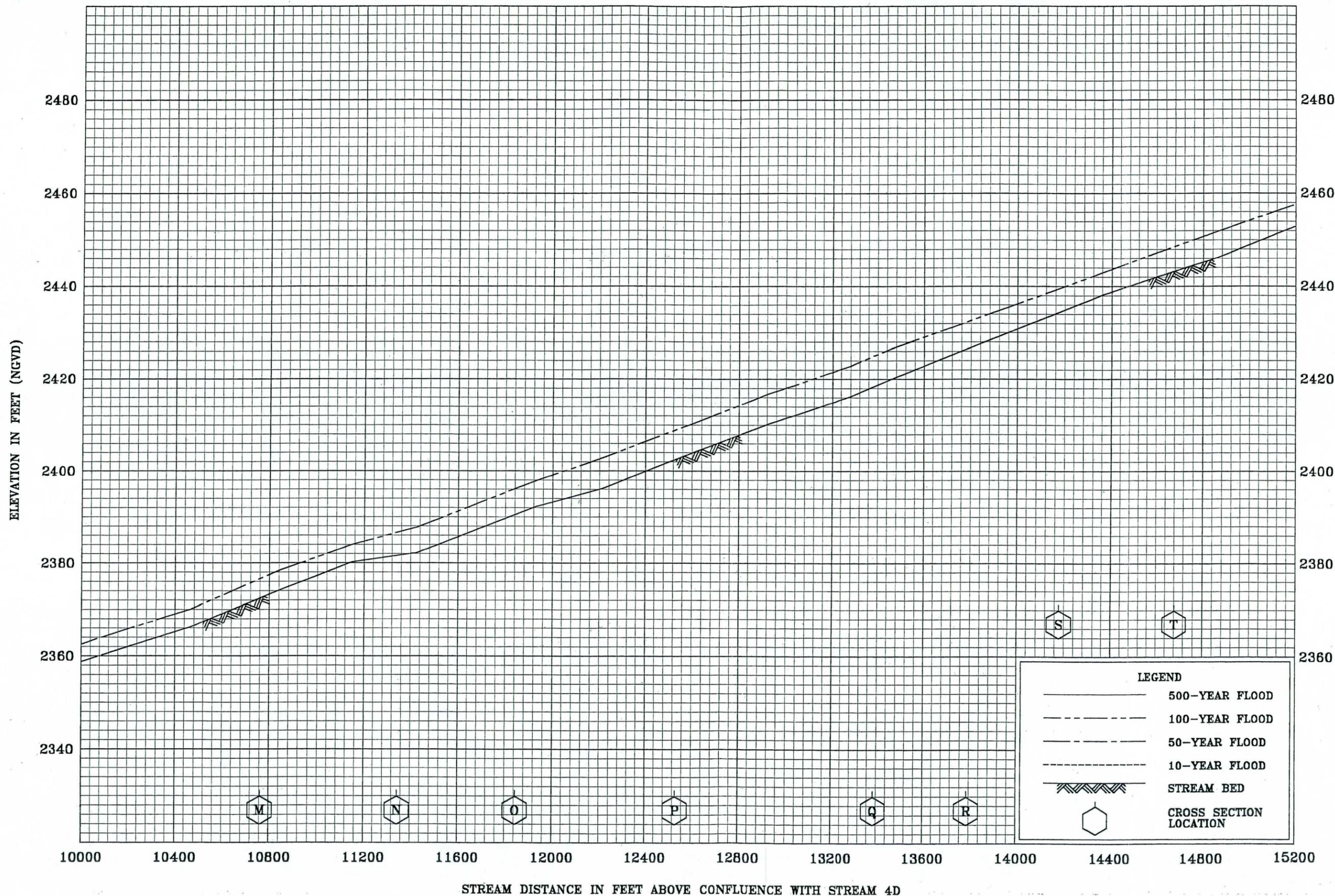
REVISED TO
REFLECT LOWR
DATED JUN 05 2002

FLOOD PROFILES

RAWHIDE WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

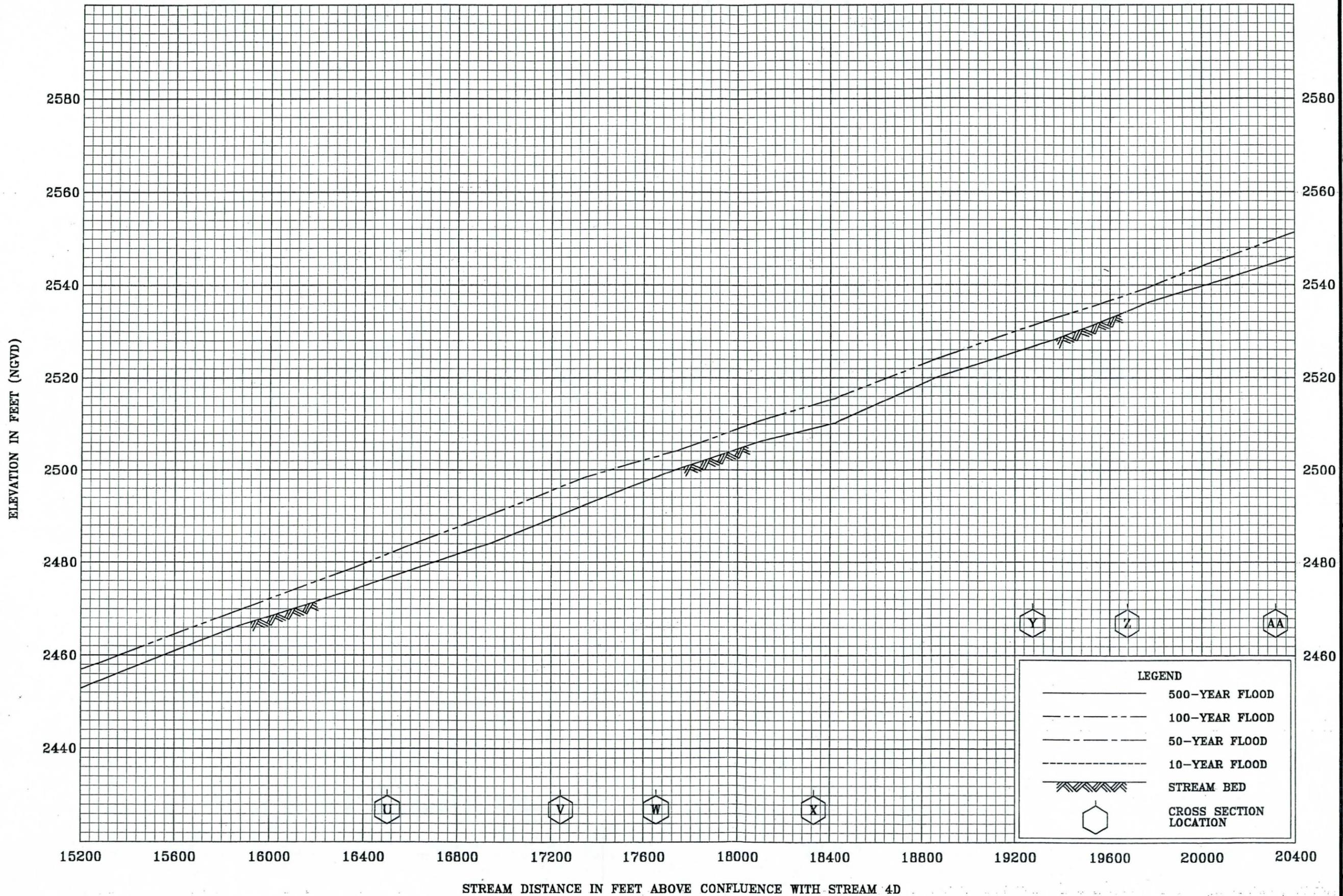
1167P



FLOOD PROFILES
REVISED TO
 RAWHIDE WASH
REFLECT LOMR
 DATED JUN 05 2002

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

1168P

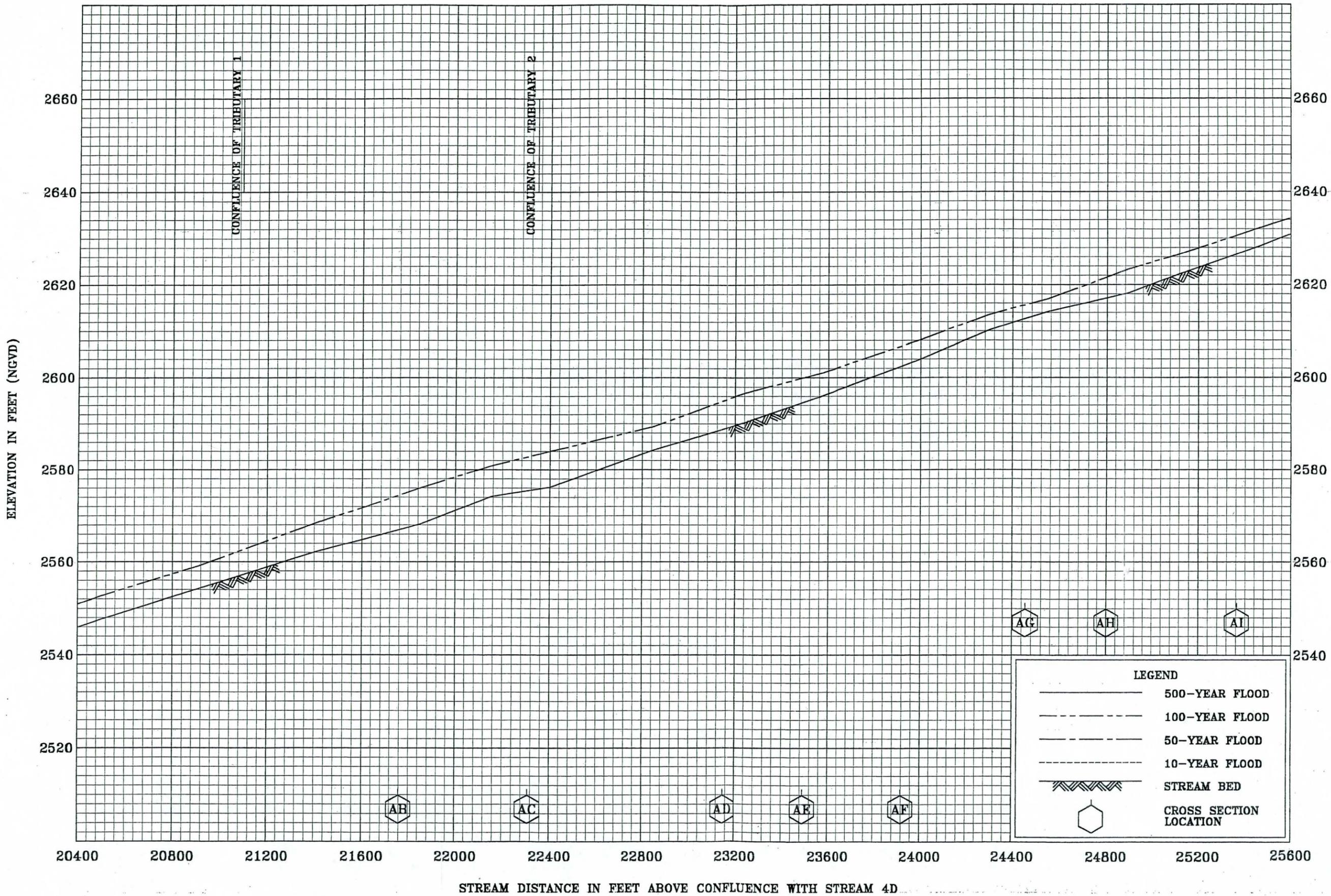


REVISED TO
 REFLECT LOMK
 DATED JUN 05 2002

FLOOD PROFILES
 RAWHIDE WASH

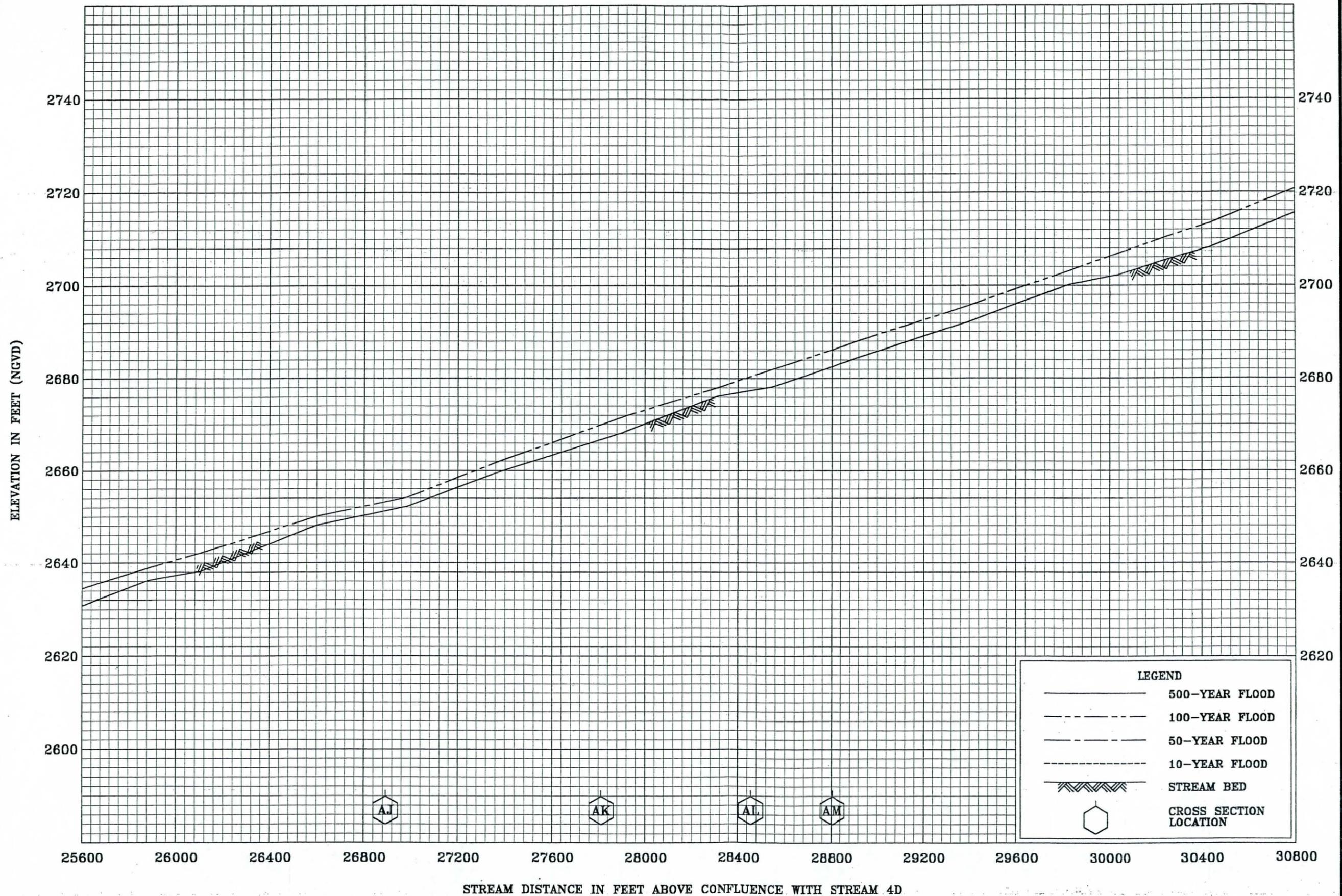
FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

1169P



FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS
 1170P

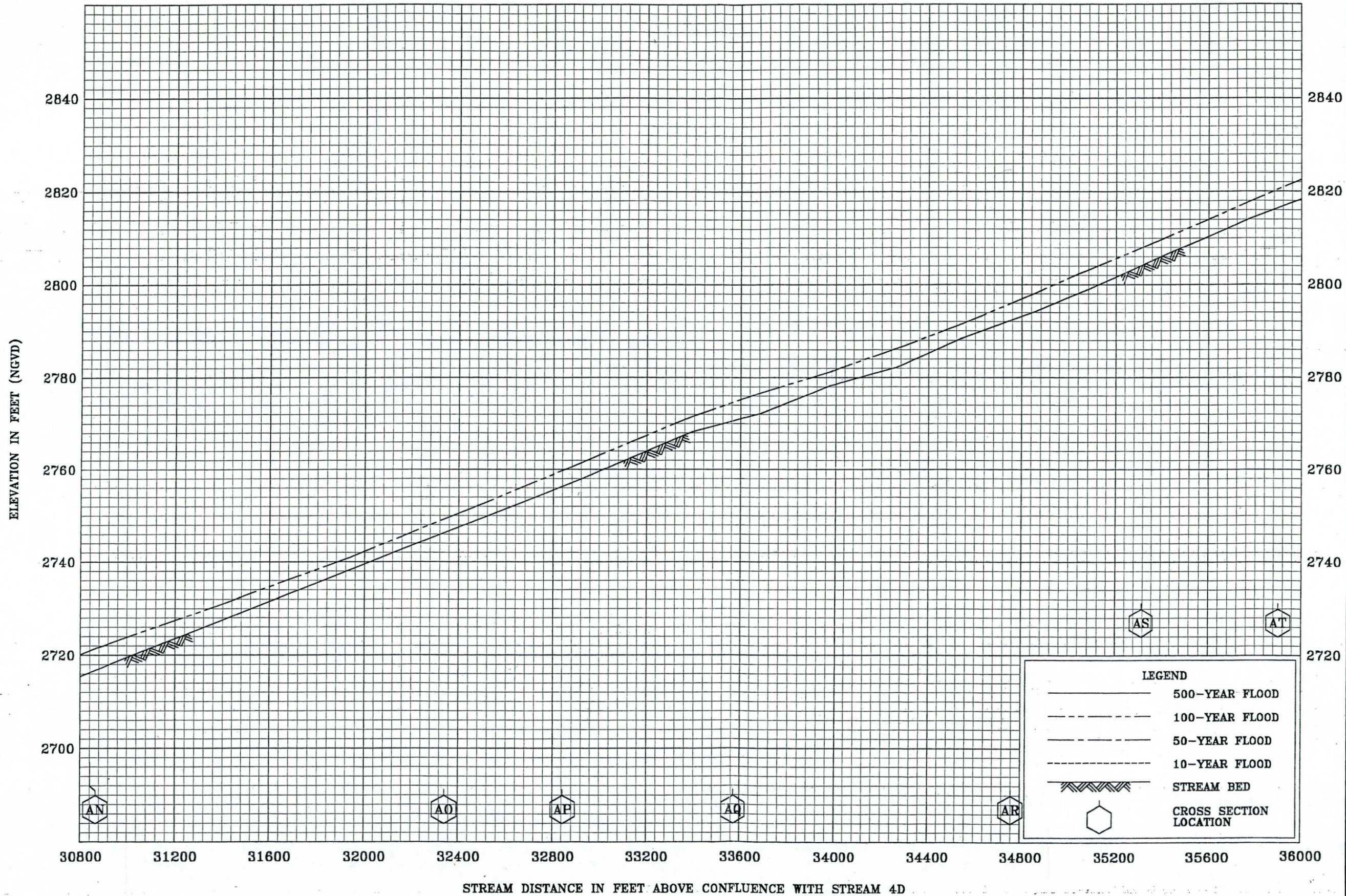
FLOOD PROFILES
 RAWHIDE WASH
 REFLECT LOMR
 DATED JUN 05 2002
 REVISED TO



REVISED TO
 FLOOD PROFILES
 RAWHIDE WASH
 REFLECT LOWR
 DATED JUN 05 2012

FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

1171P



FLOOD PROFILES

FEDERAL EMERGENCY MANAGEMENT AGENCY

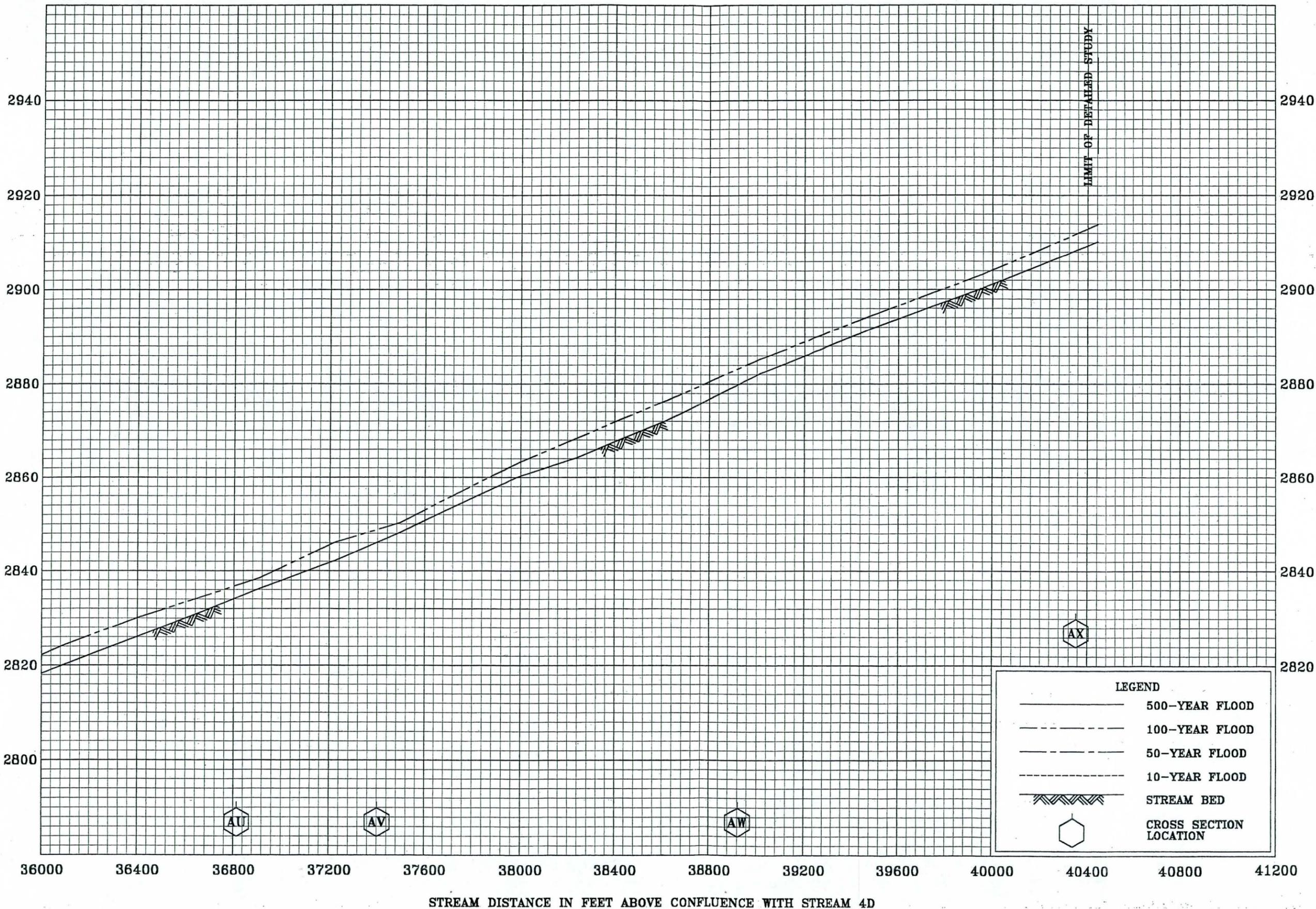
1172P

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

REVISED TO
REFLECT LOMR
RAWHIDE WASH

DATED JUN 05 2002

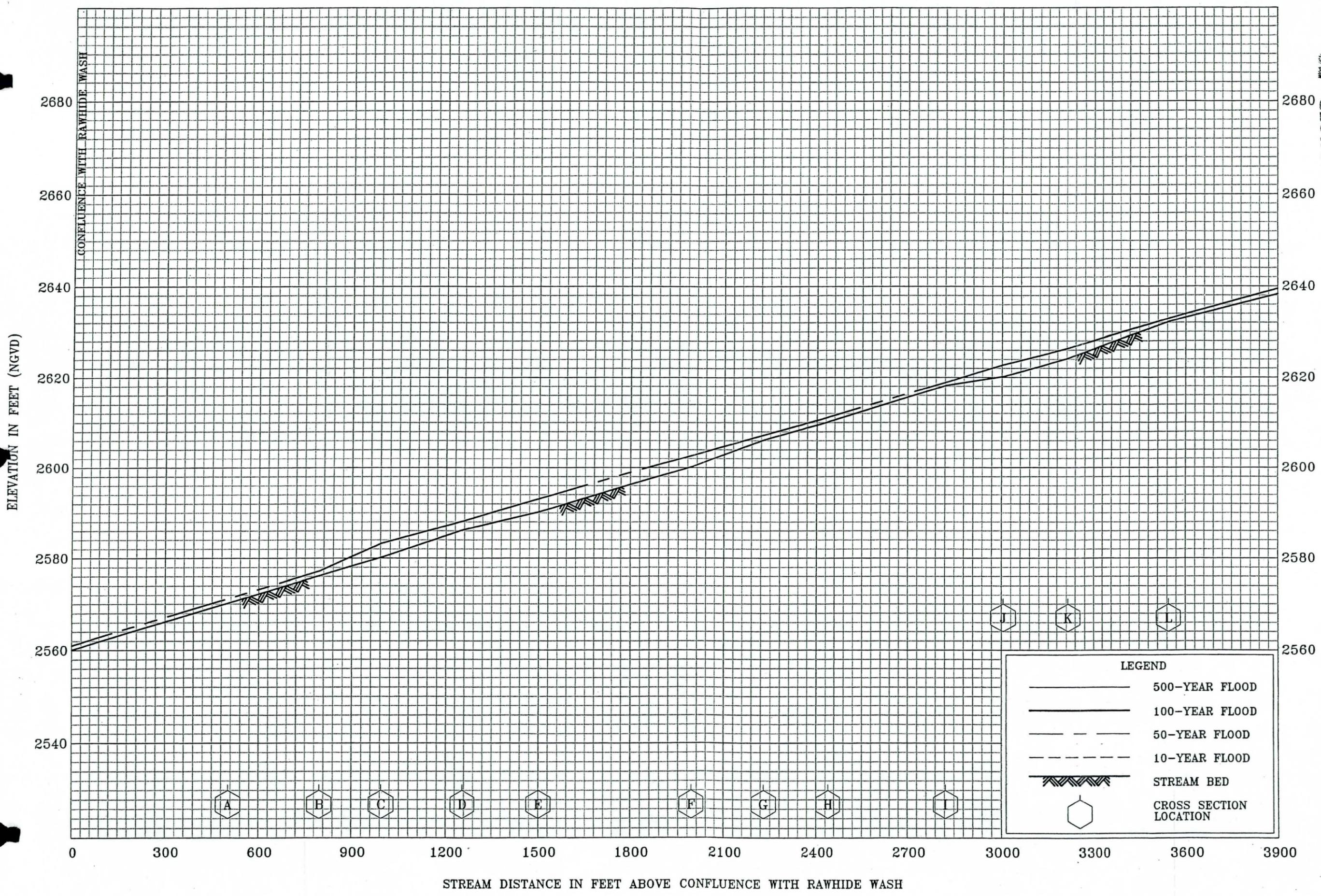
ELEVATION IN FEET (NGVD)



REVISED TO
 FLOOD PROFILES
 REFLECT LOWR
 RAWHIDE WAS
 DATED JUN 05 2002

FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

1173P



REVISED TO
 REFLECT LOMR
 DATED JUN 05 2002

FLOOD PROFILES
 TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

1174P

ELEVATION IN FEET (NGVD)

2760

2740

2720

2700

2680

2660

2640

2620

2760

2740

2720

2700

2680

2660

2640

3900 4200 4500 4800 5100 5400 5700 6000 6300 6600 6900 7200 7500 7800

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH RAWHIDE WASH

LIMIT OF DETAILED STUDY

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

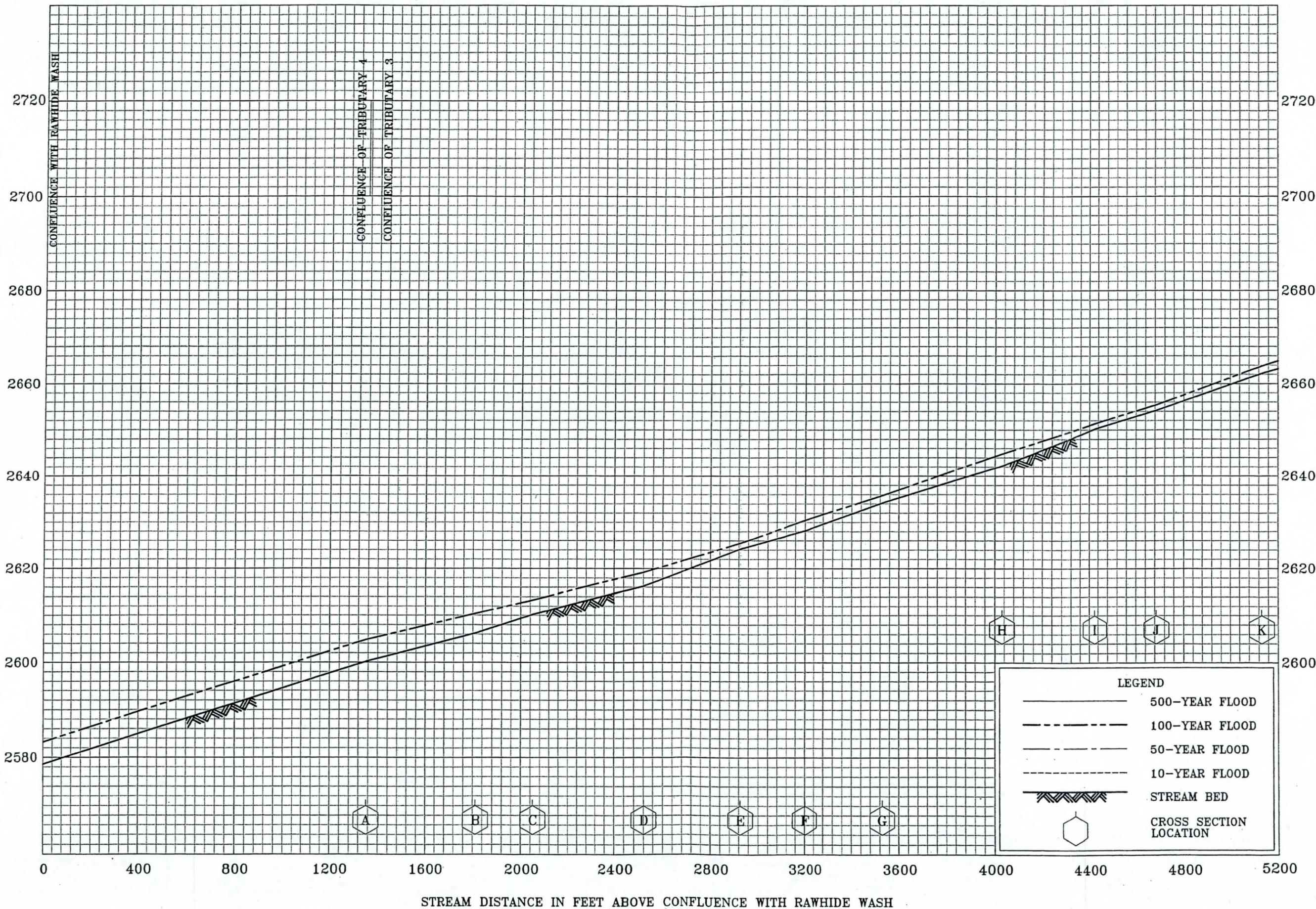
REVISED TO
REFLECT LOMR
DATED JUN 05 2002

FLOOD PROFILES
TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1175P

ELEVATION IN FEET (NGVD)



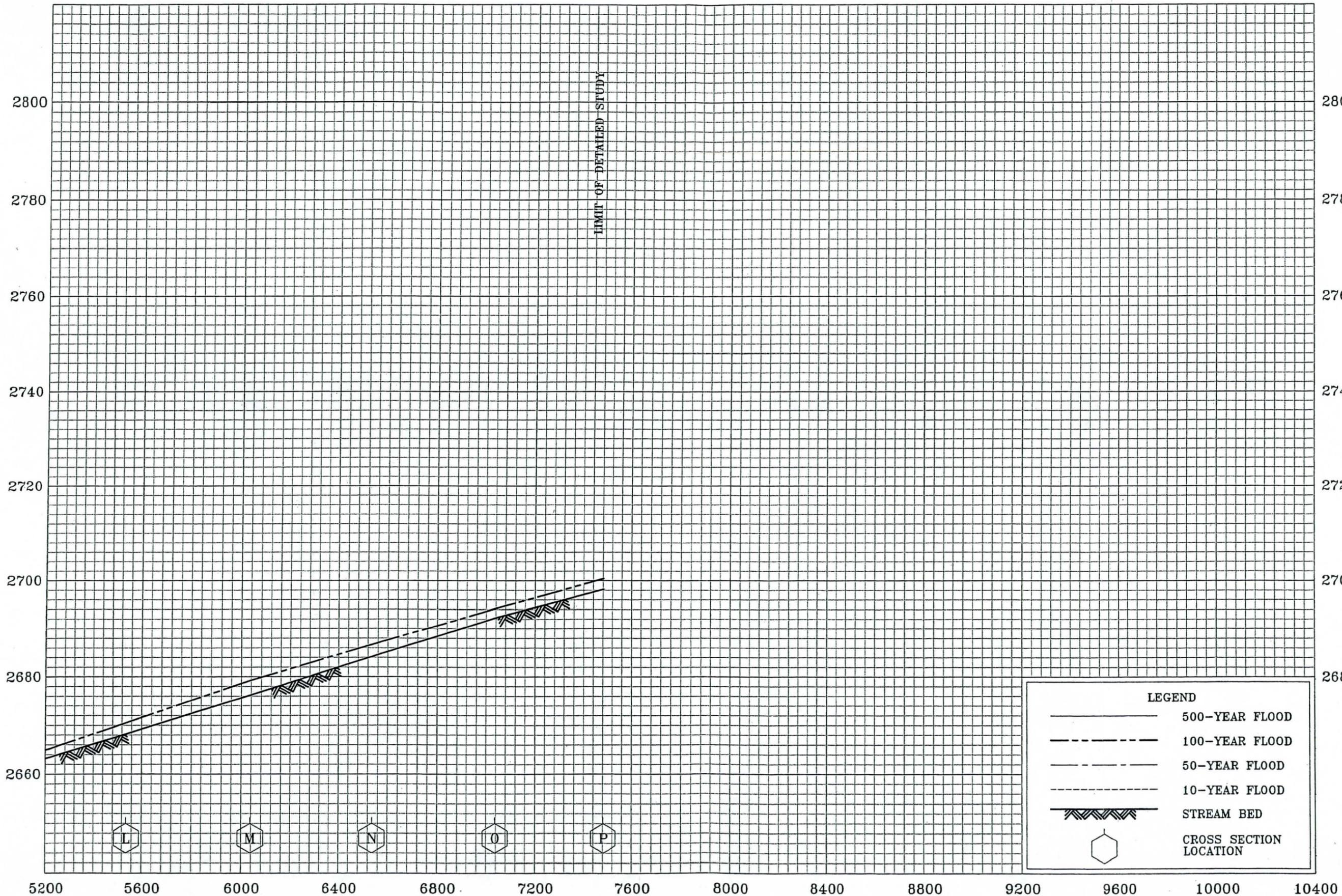
REVISED TO
REFLECT LOMR
DATED JUN 05 2002

FLOOD PROFILES
TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1176P

ELEVATION IN FEET (NGVD)



STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH RAWHIDE WASH

REVISED TO
REFLECT LOMR
DATED JUN 05 2002

FLOOD PROFILES

TRIBUTARY 2

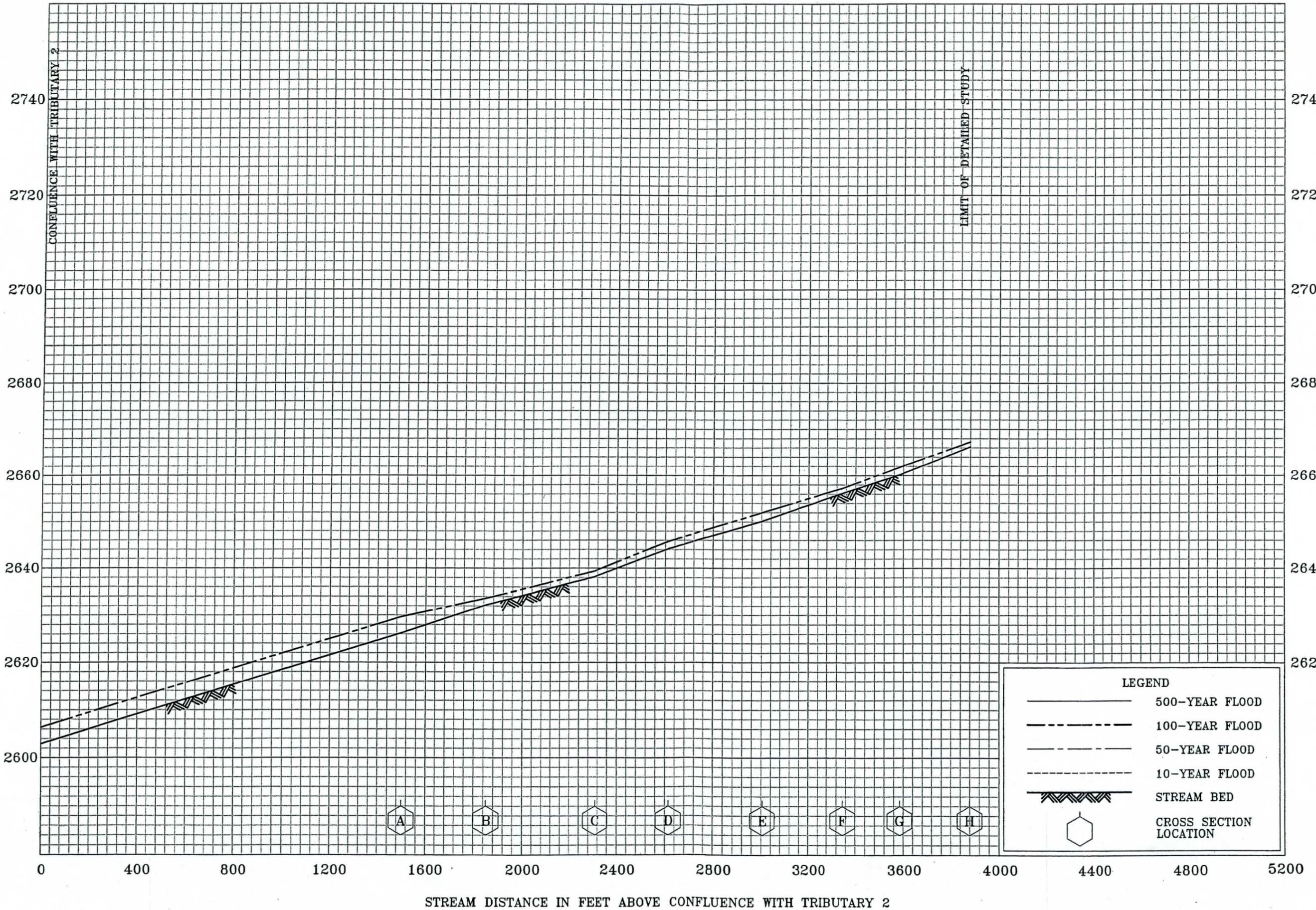
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1177P

ELEVATION IN FEET (NGVD)



FEDERAL EMERGENCY MANAGEMENT AGENCY
 MARICOPA COUNTY, AZ
 AND INCORPORATED AREAS

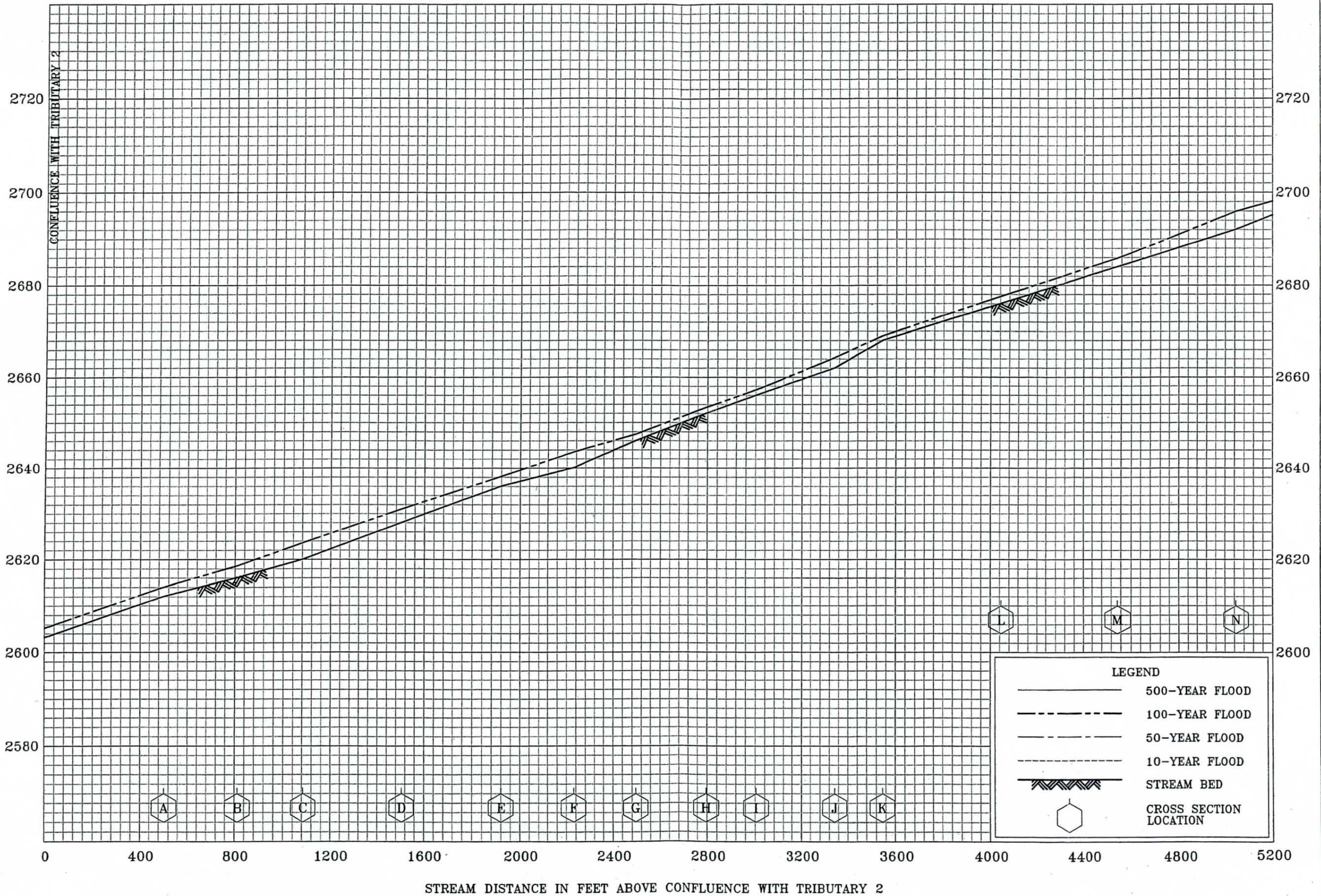
FLOOD PROFILES

TRIBUTARY 3

REVISED TO
 REFLECT LOMR
 DATED JUN 05 2002

1178P

ELEVATION IN FEET (NGVD)



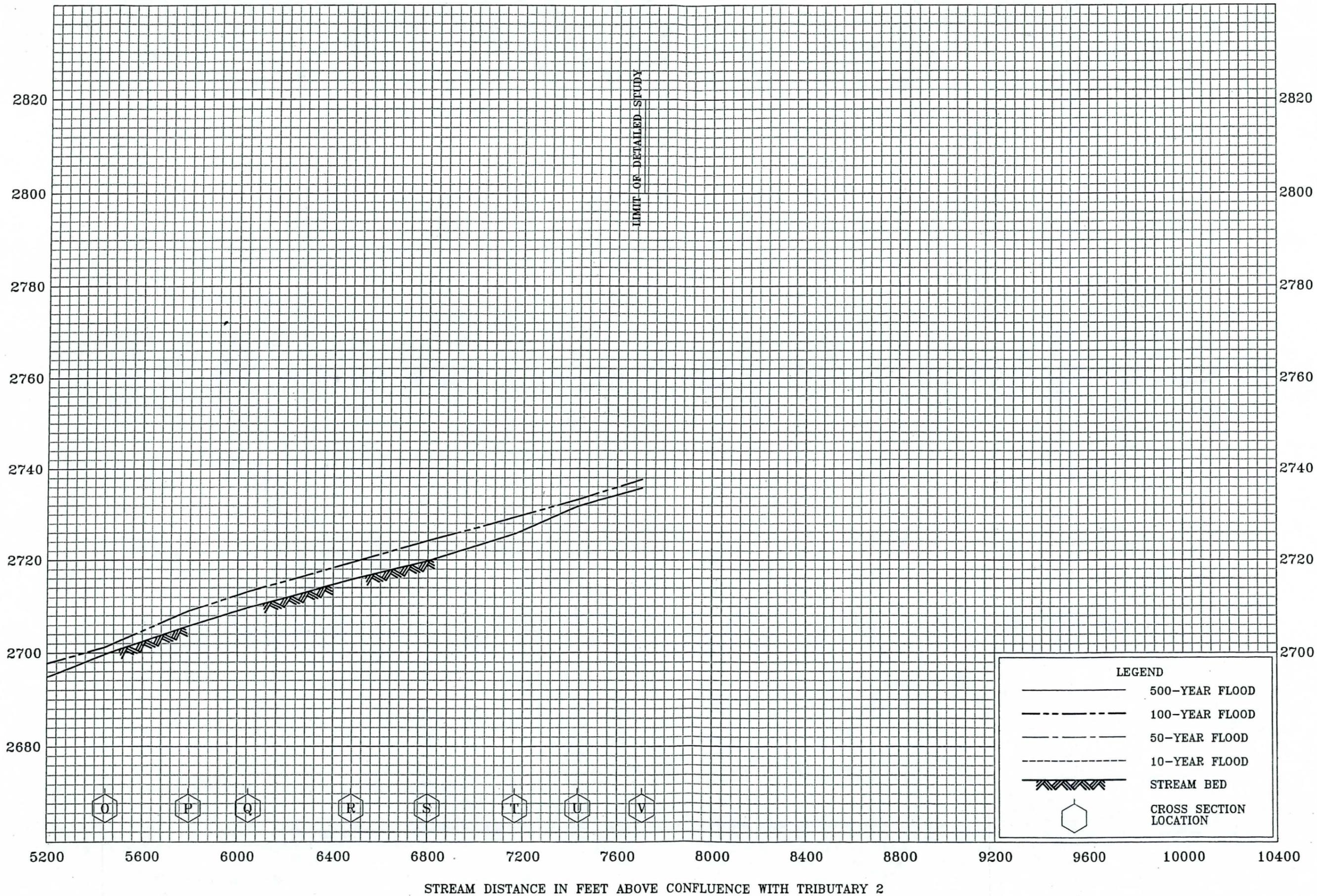
REVISED TO
REFLECT LOWR
DATED JUN 05 2002

FLOOD PROFILES
TRIBUTARY 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1179P

ELEVATION IN FEET (NGVD)



REVISED TO
REFLECT LOMR
DATED JUN 05 2002

FLOOD PROFILES
TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1180P



NATIONAL FLOOD INSURANCE PROGRAM FEMA MAP COORDINATION CONTRACTOR

October 9, 2001

| | |
|---|---------|
| FLOOD CONTROL DISTRICT RECEIVED | |
| OCT 15 '01 | |
| CH & GM | FINANCE |
| PIO | ISLANDS |
| ADMIN | O & M |
| REG | P & PM |
| <input checked="" type="checkbox"/> ENG | FILE |
| CONTRACTS | |
| ROUTED | RPH |

Mr. Richard P. Harris, P.E.
 Project Manager
 Engineering Division
 Flood Control District of Maricopa County
 2801 West Durango Street
 Phoenix, AZ 85009

IN REPLY REFER TO:
 Case No.: 01-09-1199P
 Community: City of Scottsdale, AZ
 Community No.: 045012
 316-ACK.FEX

Dear Mr. Harris:

This responds to your request dated September 11, 2001, that the Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

| | |
|-------------------------|--|
| Identifier: | Upper Rawhide Wash Floodplain Delineation Study |
| Flooding Sources: | Rawhide Wash and Tributaries 1 through 4 to Rawhide Wash |
| FIRM Panel(s) Affected: | 04013C0820 F, 0850 E, 1235 F, and 1255 F |

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request is based on flood hazard information meant to improve upon that shown on the flood map or within the flood study, and does not partially or wholly incorporate manmade modifications within the Special Flood Hazard Area, no fees will be assessed for our review.

We have completed an inventory of the items you submitted. We have received the required data to begin a detailed technical review of your request. If additional data are required, we will inform you within 60 days of the date of this letter.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP

Irwan (703) 960 8800
e-mail

(1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,



Monther S. Madanat, Director
Engineering Division
Michael Baker Jr., Inc.

cc: Mr. Collis J. Lovely
Public Works Planner
Drainage and Flood Control
City of Scottsdale

Ms. Shanna Yager
Engineering Division
Flood Control District of Maricopa County

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency
Management

Mr. Jon Ahern, P.E.
Kimley-Horn and Associates, Inc.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

January 13, 1999

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12
KHA No. : 091131.02

Dear Pedro:

Kimley-Horn and Associates, Inc. is transmitting to you one copy each of the Affidavits of Publication pursuant to Task 1.5 of the Scope of Work for the above referenced project. The legal advertising was placed in two newspapers, the Arizona Republic and the Scottsdale Tribune. The Republic ran the advertisement on November 4th and 11th while the Tribune ran the advertisement on November 11th and 18th of 1998.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Douglas J. Plasencia, P.E.
Associate

DJP:rae

Encl: Affidavits of Publication – Arizona Republic and Scottsdale Tribune

THE Tribune

Legal Advertising

120 W. First Avenue Mesa, Arizona 85210

Affidavit of Publication

P.O. Number: NONE. UPPER RAWHIDE WASH

Invoice Number: 602554

Price: \$70.93

STATE OF ARIZONA
County of Maricopa

I, Dianna Nedd, Legal Clerk, acknowledge
that the attached ad was published
in a newspaper of general circulation.
The dates of the publication are as follows:
November 11, 18, 1998

The Tribune (Scottsdale Edition)

Dianna Nedd

Legal Clerk

Subscribed and sworn to me on this date:
November 18, 1998

Donna J. Klotz

Notary Public



**ANNOUNCEMENT OF
FLOOD HAZARD STUDY**

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-401) as amended, and the Disaster Protection Act of 1973 (P.L. 93-234) is funding a detailed study of flood hazard areas in the City of Scottsdale, Arizona, for Upper Rawhide Wash and four (4) of its major tributaries, from Dynamite Boulevard on the south, to the extension of Carefree Highway on the north. The study is being performed for the Flood Control District by Kimley-Horn and Associates, Inc.

The purpose of this study is to examine and evaluate flood hazard areas which are developed or which are likely to be developed and to determine flood elevations of those areas. Flood elevations will be used by Maricopa County to carry out floodplain management objectives of the National Flood Insurance Program. They will also be used as the basis for determining appropriate flood insurance premium rates applicable for building and their contents.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of the study. Such information should be addressed to Mr. Scott Ogden, Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, Arizona 85009, telephone (602) 506-1501.

November 18, 1998/602554

THE ARIZONA REPUBLIC

ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in the City of Scottsdale, Arizona, for Upper Rawhide Wash and four (4) of its major tributaries, from Dynamite Boulevard on the south, to the extension of Carefree highway on the north. The study is being performed for the Flood Control District by Kinney-Horn and Associates, Inc.

The purpose of this study is to examine and evaluate flood hazard areas which are developed or which are likely to be developed and to determine flood elevations for those areas. Flood elevations will be used by Maricopa County to carry out floodplain management objectives of the National Flood Insurance Program. They will also be used as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of the study. Such information should be addressed to Mr. Scott Ogden, Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, Arizona 85009, telephone (602) 506-1501.

STATE OF ARIZONA }
COUNTY OF MARICOPA } SS.

TOM BIANCO, being first duly sworn, upon oath deposes and says: That he is the legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic/Northeast Zone

November 4, 11, 1998

T. Bianco

Sworn to before me this
16 day of
November A.D. 1998



Brenda Windahl

Notary Public

091131002
RAWHIDE WASH
Come to the

Date: 12/20/99 7:59 AM
Sender: Jon Ahern
To: Bob Eichinger; Doug Plasencia
Priority: Normal
Receipt requested
Subject: Re:FW: Rawhide Wash
FYI,

Received form David Boggs on 12/20/99 (today).

Reply Separator
Subject: FW: Rawhide Wash
Author: MIME:dbb@mail.maricopa.gov
Date: 12/20/1999 9:46 AM

Let's go ahead with the floodway HEC-RAS runs using your Qs, on the strength of this email. I guess a letter will follow. Maybe it IS stlly, but we don't want to get burned again. The last "silly" situation cost us an extra \$9,500 in contract variations.

DBB

> -----Original Message-----
> From: Lovely, Collis [SMTP:clovely@ci.scottsdale.az.us]
> Sent: Friday, December 17, 1999 9:23 AM
> To: 'David Boggs - FCDX'
> Subject: RE: Rawhide Wash
>> This is silly, I don't want to hold anyone up, we are happy with the 100
> yr
> Q's on the main wash. I will draft a letter with our approval so the
> consultant can proceed, with reservations if necessary. I will plan on
> doing this Monday if I don't here from your sooner.
>>> -----
>> From: David Boggs - FCDX[SMTP:dbb@mail.maricopa.gov]
>> Sent: Wednesday, December 15, 1999 7:50 AM
>> To: 'clovely@ci.scottsdale.az.us'
>> Cc: Joe Tram - FCDX; Ed Raleigh - FCDX; Afshin Ahouraiyan - FCDX
>> Subject: Rawhide Wash
>> Importance: High
>>>> Collis:
>>>> I mailed you today KHA's 4 maps of the topo with newly-aligned cross
>> sections based on our review. I was mistaken that there are no new
>> hydraulic runs. As I recall, we have put all HEC-RAS runs on hold until
> we
>> get a written ok from Scottsdale on the Qs to be used. As soon as we
> get
>> that letter from you, we can proceed.
>>>> Thanks,

> > > > David
> >



ENVELOPE.TXT

091131002
RAWHIDE WASH

Date: 1/20/00 1:55 PM
Sender: Jimmy Nguyen
To: Bob Eichinger
Priority: Normal
Subject: Fwd:FW: Channel Bank Station Selection in Open Channels

Forward Header

Subject: FW: Channel Bank Station Selection in Open Channels
Author: MIME:dbb@mail.maricopa.gov
Date: 01/20/2000 9:09 AM

This message was not delivered to
beichenger@phx.kimley-horn.com TFS Admin was informed with a
copy of this
message
Sender was informed with a copy of this message

Bob/John:

Attached is a DRAFT of a document were are preparing on HEC-
2/RAS staion
location, orientation, and n-value selection. Although it's
still being
revised, Joe Tram though you ought to get a copy, especially so
you can
follow the composite "n" methodology and avoid potential
pitfalls in
computing the WSE's for Rawhide.

Afshin is still working with Collis to resolve Collis's
problems with Qp100
for subbasin 012 in the HEC-1 model. In the meantime, let's
continue to get
the floodway run out asap with the Q's we've agreed to so far.
Head's up
that if Qp-100 goes from 600 to 1200 cfa, cross sections may
have to be
UN-trimmed or widened. We want to avoid a stalemate in which
COS cannot
accept the FEMA submittal at all costs (or at least up to the
ceiling of
contract variations).

Thanks,

David

> -----Original Message-----
> From: David Boggs - FCDX > Sent: Tuesday, December 28,
1999 3:06 PM
> To: Joe Tram - FCDX; Tim Murphy - FCDX; Kathryn Gross- FCDX;
Russ Cruff
> - FCDX
> Cc: Ed Raleigh - FCDX
> Subject: Channel Bank Station Selection in Open Channels
> > I have made some editorial changes to Russ's document. If
you could, I'd
> appreciate if you could take a look & see if you think it
reads better. I

> tried not to alter the meaning; however, I think there is
scope to amplify
> some of the examples or--as Mike suggested--"walk through"
some sample
> calcs.
> > David
> > > <<xchannel.doc>> > >



ENVELOPE.TXT



XCHANNEL.DOC

From: Laurie Marin [lmarin@imap3.asu.edu]
Sent: Tuesday, September 14, 1999 9:47 AM
To: Afshin Ahouraiyan (E-mail)
Cc: Plasencia, Doug; Eichinger, Bob; Ahern, Jon
Subject: Rawhide Hydrology

Afshin,

I repaired the DDMS and re-ran the model. The flow from basin 015 increased from 499 cfs to 1021 cfs. This week Jon is reviewing a couple of possible flow split locations David Boggs wanted him to check that may or may not change the hydrology, then I will wrap this up.

Laurie

Marin, Laurie

091131.02

To: Afshin Ahouraiyan (E-mail)
Subject: Jomax & Pima

~~091~~ Corina

Afshin,

I plotted out the topo for the intersection of Jomax and Pima at a larger scale and Bob and I looked at it. Some flows do cross Pima and some cross Jomax east of my existing drainage basin boundary, but they do not end up at the apex concentration point. Therefore, we are going to leave the boundaries as is.

Laurie



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Received

Transmittal

Date: February 16, 1999 Job. No: 091131.02

To: Pedro Calza

Flood Control District of Maricopa County

2801 West Durango

Phoenix, Arizona 85009

RE: Upper Rawhide Wash Floodplain Delineation Study FCD 98-12

We are sending you

Attached Under separate cover via _____ the following items:

Shop Drawings Prints/Plans Samples Specifications Change

Other: Report

| Copies | Date | No. | Description |
|--------|---------|-----|---|
| 1 | Feb, 99 | | Draft Field Reconnaissance Study – Upper Rawhide Wash |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Engineering
Planning
and
Environmental
Consultants

These are transmitted as checked below:

For your use Approved as submitted Resubmit _____ copies for approval

As requested Approved as noted Submit _____ copies for distribution

For review and comment Returned for corrections Return _____ corrected prints

Remarks Pedro and Russ: We have broken the mainstem and tributaries into reaches of similar
Wash characteristics and manning's n-values. There are ten reaches on the mainstem of Rawhide and
Two reaches each on each tributary. The draft field recon report is submitted pursuant to section
6.6.a of the scope of work. At this point the scope of work states that the field recon report and the
Cross section locations, alignment, and channel centerline must be approved by the District prior
To preparation of the floodplain model. We have submitted the channel cross section locations,
Alignment, and channel centerline location on Feb. 9, 1999. If you have any questions on either of
These two submittals, please call and we can arrange for a project progress meetings on these issues.

Copy to File Signed Bob Eichinger *RAB*



Kimley-Horn
and Associates, Inc.

Suite 250
7600 N. 15th Street
Phoenix, AZ 85020

TEL 602 944 5500
FAX 602 944 7423

Transmittal

Date: February 9, 1999 Job. No: 091131.02 KHA, FCD 98-12

To: Pedro Calza

Flood Control District of Maricopa County

2810 W. Durango

Phoenix, Arizona 85009

Attn: Russ Cruff, P.E.

We are sending you

Attached Under separate cover via _____ the following items:

Shop Drawings Prints/Plans Samples Specifications Change

Other: _____

| Copies | Date | No. | Description |
|--------|--------|-----|--|
| 1 | 2/7/98 | | Location of Cross Sections, Upper Rawhide Wash |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | |
|------------------------|---------|
| FLOOD CONTROL DISTRICT | |
| RECEIVED | |
| FEB 09 1999 | |
| CHENG | 1 28 PM |
| PIO | |
| ADMIN | |
| FINANCE | |
| G & M | |
| ENGR | |
| REMARKS | PAC |

These are transmitted as checked below:

- For your use Approved as submitted Resubmit _____ copies for approval
 As requested Approved as noted Submit _____ copies for distribution
 For review and comment Returned for corrections Return _____ corrected prints

Remarks Attached are plots of proposed location and alignment of the cross sections and channel for Rawhide Wash, Tributary 1, Tributary 2, Tributary 3, and Tributary 4. This Submittal is in accordance with Rawhide Wash FCD Scope of work task 6 item 6.6.b.

Please, if possible, review and return to KHA by 2/16/99

Copy to File Signed Bob Eichinger
Bob Eichinger

**REVIEW OF CROSS SECTION ALIGNMENT AND LOCATION
RAWHIDE WASH AND TRIBUTARIES 1, 2, 3, AND 4
FOR FLOOD DELINEATION STUDY
FCD CONTRACT NO. 98-12**

BY

**R.W. CRUFF, P.E.
FEBRUARY 10, 1999**

I have the following comments:

1. The only adjustment in alignment that I might make would be for sections 27.5, 45, and 46. (See the maps.) Even these are probably minor.
2. I believe that you will need to be consistent in how far the sections are extended. An example is the right bank of sections 68 and 71, where they are not consistent with sections 69 and 70.



Kimley-Horn
and Associates, Inc.

■
Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

December 21, 1998

Mr. Pedro Calza
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: **Upper Rawhide Wash Floodplain Delineation Study FCD 98-12**
KHA No.: 091131.02

Dear Pedro:

Kimley-Horn and Associates, Inc. is forwarding to you our Data Collection Summary Report for the above referenced project. This report is pursuant to the scope of work Section 2.2.

If you have any questions, please contact me or Bob Eichinger at 944-5500.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Douglas J. Plasencia, P.E.
Associate

DJP:rae

Encl: Data Collection Summary Report

■
TEL 602 944 5500
FAX 602 944 7423

K:\CIVIL\09113102\REPORTS\DATA COLLECTION TRANS.RTF

Upper Rawhide Wash Floodplain Delineation Study

FCD 98-12

Data Collection Summary Sheet

| Data Number | Title | Description | Author | Source | Format | Date Collected |
|-------------|--|--|--|---|--|----------------|
| 1 | General Drainage Plan for North Scottsdale, Arizona | Drainage Plan Report | Water Resources Associates, Inc. | Bob Eichinger, KHA | Report | 9/30/98 |
| 2 | FEMA's Original Work Maps | Work Maps | Various | Collis Lovely, City of Scottsdale | Loose sheets, copies of previous model work maps | 11/19/98 |
| 3 | Rawhide Wash Detention Basin Feasibility Study | Final Report | CH2M Hill; AGRA Earth & Environmental; SWCA Environmental, Inc.; Larson, Voss & Associates | Bob Eichinger, KHA | Report | 9/30/98 |
| 4 | Scottsdale Desert Greenbelt Rawhide Wash Hydrologic Report | Hydrologic Report | Greiner, Inc.; City of Scottsdale | Flood Control District of Maricopa County | Report | 11/19/98 |
| 5 | Upper Rawhide Wash Floodplain Delineation Study CD w/ various graphics files | Topographic ¼ section DGN files; DTM files by ¼ section; Soils Map (from FCDMC); Zoning Map (from COS); Streets Map (from COS) | Flood Control District of Maricopa County | Flood Control District of Maricopa County | CD | 10/22/98 |
| 6 | Maricopa County Highway Department, Plans for the Construction of Dynamite Blvd. – Scottsdale Rd. (72 nd St.) to Pima Rd., Project No. 68189, As Built 12/85. | Roadway profile and bridge plans | Adam, Hamlyn, Anderson, Consulting Engineers Inc., Phoenix, Arizona | Maricopa County Highway Department | Plan Set (1,2,8,17 of 18) | 12/11/98 |
| 7 | Constantine residence, Grading and Drainage Plans, Scottsdale Arizona, December 1997 | Grading and Drainage plans for 40 acre residence at the south west corner of Dixileta Boulevard and Pima Road. | Pinnacle Engineering, 8711 E. Pinnacle Peak Rd, Scottsdale, Arizona | Collis Lovely, City of Scottsdale | Plan Set (1-6 of 6, S-1 and S-2) | 11/19/98 |
| 8 | United States Department of the Interior Geological Survey, 7.5 Minute Quadrangle, Arizona – Maricopa Co. Meadowell Peak | Topographic Quadrangle Map | United States Department of the Interior Geological Survey | Wide World of Maps | 7.5 minute quadrangle map | 11/1/98 |
| 9 | United States Department of the Interior Geological Survey, 7.5 Minute Quadrangle, Arizona – Maricopa Co. Wildcat Hill | Topographic Quadrangle Map | United States Department of the Interior Geological Survey | Wide World of Maps | 7.5 minute quadrangle map | 11/1/98 |
| 10 | United States Department of the Interior Geological Survey, 7.5 Minute Quadrangle, Arizona – Maricopa Co. Cave Creek Arizona | Topographic Quadrangle Map | United States Department of the Interior Geological Survey | Wide World of Maps | 7.5 minute quadrangle map | 11/1/98 |
| 11 | United States Department of the Interior Geological Survey, 7.5 Minute Quadrangle, Arizona – Maricopa Co. Currys Corner | Topographic Quadrangle Map | United States Department of the Interior Geological Survey | Wide World of Maps | 7.5 minute quadrangle map | 11/1/98 |

| Data Number | Title | Description | Author | Source | Format | Date Collected |
|-------------|--|---|--------------------|-----------------------------------|--------|----------------|
| 12 | Environmental Design Element – General Plan Scottsdale Arizona; Adopted March 17, 1992 | Environmental Design section of the Scottsdale General Plan | City of Scottsdale | Collis Lovely, City of Scottsdale | Report | 11/21/98 |
| 13 | Approved Environmentally Sensitive Land Ordinance, Feb 19, 1991 | Ordinance | City of Scottsdale | Collis Lovely, City of Scottsdale | Report | 11/21/98 |

B.5 CONTRACT SCOPE

SCOPE OF WORK

RAWHIDE WASH FLOODPLAIN DELINEATION STUDY

Contract FCD 98-12

SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION FOR RAWHIDE WASH
FCD 98-12

GENERAL

The project consists of approximately **twelve (12) river miles** of floodplain delineations for **Rawhide Wash and four (4) of its major tributaries**, and the development of revised hydrology for an approximately 13.8 square mile watershed. The limits of the delineation for each Rawhide Wash and each tributary are shown on **Exhibit "A"** and are described as follows:

Rawhide Wash (main stem): Starting at the current FIS limit of detailed study for Wash 4D (Rawhide Wash approximately 1,800 feet south of Dynamite Boulevard) and extending upstream approximately 6.9 miles to the Tonto National Forest Boundary/ City of Scottsdale corporate boundary.

Tributary RW20: Starting at its confluence with Rawhide Wash and extending upstream approximately 1.1 miles to the south section line of Section 16 (Lone Mountain Road alignment), Township 5 North, Range 5 East.

Tributary RW18: Starting at its confluence with Rawhide Wash and extending upstream approximately 1.3 miles to a confluence located approximately 1,100 feet west of the east section line of Section 16 (112th Street alignment), Township 5 North, Range 5 East.

Tributary RW17: Starting at its confluence with Tributary RW18 and extending upstream approximately 1.1 miles to the east section line of Section 9 (112th Street alignment), Township 5 North, Range 5 East.

Tributary RW16: Starting at its confluence with Tributary RW18 and extending upstream approximately 1.6 miles to the north section line of Section 9 (Carefree Highway alignment), Township 5 North, Range 5 East.

The existing FIS watershed hydrology will be revised and updated to reflect current land uses and sub-basin delineations shall be updated to reflect more detailed topographic mapping. The Consultant will develop the hydrology using the U.S. Army Corps of Engineer's HEC-1 computer model. The floodplain and floodway delineations shall be accomplished using the HEC-RAS computer model, if appropriate. The Consultant must use sound engineering judgement in the development of the hydrologic and hydraulic models. The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA prior to the finalization of this contract. Additionally, the watershed hydrology must be reviewed and accepted by ADWR and the City of Scottsdale prior to finalization of this contract. All work under this scope will be completed within 450 calendar days from the date of Notice to Proceed, including 60 days for District reviews, 60 days for ADWR and City of Scottsdale reviews, and 90 days for FEMA reviews.

TASK 1 - COORDINATION

- 1.1 The Consultant shall submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 14 days of Notice To Proceed. The Consultant shall update this project schedule when appropriate.
- 1.2 The Consultant shall participate in regular coordination meetings (at least once every four weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The Consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.
- 1.3 The Consultant shall submit a quarterly estimation of the projected billing within 14 days of Notice to Proceed. Thereafter, this estimation will be updated and submitted to the District's project manager at least 10 days prior to the end of each quarter.
- 1.4 The Consultant shall submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:
 - a. A brief description of the work accomplished by task during the reporting month.
 - b. Percent (%) completed for the month and percent (%) cumulative completed for each task.
 - c. A brief description of projected work for the following month.
 - d. A description of any problems encountered.
- 1.5 The Consultant is responsible for placing legal advertising at the beginning of the study, notifying the public of the study in two media sources. One ad will be run in a widely circulated newspaper two separate times, with approximately one week between runs. The ad must also be run two times in a local newspaper that serves the area being studied. After the ads are run, the Consultant will supply the District with original affidavits of publication from each newspaper, for each day that the ad ran.
- 1.6 The Consultant shall notify all property owners and obtain any necessary Rights of Entry for the study area. The Consultant shall furnish the District with a list of all the property owners notified and a sample Right of Entry letter.
- 1.7 The Consultant shall meet with officials from the local public works department. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.

- 1.8 The District shall plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the purpose and scope of the study. The second meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. The Consultant/District shall be responsible for the preparation of the graphic displays for these meetings. One representative from the Consultant shall attend one of the meetings. The Consultant shall respond to the public's comments and make revisions to the study if necessary.
- 1.9 Consultant/District Performance Evaluations will be performed. An informal evaluation will be performed at the completion of the hydrologic analysis. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.
- 1.10 The District shall pay all review fees. A written request for such fees shall be delivered to the District project manager no less than 30 calendar days prior to the desired date of receipt.

TASK 2 - DATA COLLECTION

- 2.1 The Consultant shall collect and review pertinent data from the District, the City of Scottsdale, and other outside sources. Data to be collected shall include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, current FIS data, and other pertinent information.
- 2.2 A written report summarizing the data collected shall be submitted to the District for information purposes. A preliminary draft of this report is due within 90 days of Notice to Proceed.

TASK 3 - TOPOGRAPHIC MAPPING

- 3.1 The District and/or City of Scottsdale shall provide aerial mapping at a scale of 1 inch = 200 feet, with 1- or 2-foot contour intervals for the entire watershed except that portion within the Tonto National Forest boundary. Digital Terrain Model data in the form of mass points and break lines, if available, will also be supplied if requested.

TASK 4 - FIELD SURVEY

- 4.1 Ground Control for Floodplain Delineations:
 - 4.1.1 All survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This includes, but is not limited to, the establishment of "permanent" elevation reference marks (ERMs), field control, and verification of mapping derived cross sections by ground survey methods.

- 4.1.2 All surveys shall use the City of Scottsdale Grid System, as presented in the "Land Survey System Manual, Horizontal and Vertical Datum," City of Scottsdale Land Survey Unit, latest revision, as a basis for horizontal and vertical control. The Consultant shall obtain the most recent distribution of this manual from the City of Scottsdale and provide a copy in the Technical Data Notebook. A minimum of one "permanent" Elevation Reference Marks (ERMs) shall be established per mile of floodplain delineation. Existing monuments such as brass caps or similar "permanent" survey monuments shall preferably be used for ERMs. Where additional monuments are needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labeled on appropriate maps and described in a manner that allows them to be readily located in the field. A conversion factor, including documentation of how it was derived, shall be provided by the Consultant to allow conversion of the NAVD 88 elevations established by the City of Scottsdale, to NGVD 29 elevations. The derived conversion factor shall be clearly indicated on the work study maps and documented in the Technical Data Notebook.
- 4.2 The Consultant shall field survey one cross section per mile of delineation for comparison to a cross section taken from the mapping at an identical location. The results for each cross section comparison shall be plotted and reviewed by the Consultant and the District. Copies of the comparison plots shall be included in Technical Data Notebook.
- 4.3 Field surveys of bridges, culverts, and hydraulic structures are to be obtained by the Consultant when as-built plans are not available or when changes significant to the HEC-RAS modeling, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into 11"x 17" (maximum size) drawings for inclusion in the Technical Data Notebook. The information presented in the drawing should be in a format appropriate for use in the HEC-RAS model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 88 NAVD.
- 4.4 All survey notes, level loops, and other survey data shall be included in the Technical Data Notebook. Notes shall be sufficiently annotated with adequate diagrams of surveyed structures and supplemental descriptions.
- 4.5 Contingent upon an established need and agreement between the Consultant and the District, field surveys shall be conducted to locate habitable or insurable structures found to lie within the new floodplain limits. The Consultant shall submit a man-hour fee estimate to the District's project manager for written approval prior to conducting any survey and HIS compilation work under this task. The data for all structures surveyed shall be compiled and delivered per the District's "HIS Data Delivery Specifications," Rev 3.1, June 1, 1998, page CP-360. The fee for all survey and HIS compilation work performed under this task shall be paid on a case-by-case basis. The total cost to the District for all survey and HIS work performed under this task shall not exceed \$5,000.

TASK 5 - HYDROLOGY

- 5.1 The Consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1990 Version 4.0, to develop **existing condition** and **future build-out condition** hydrologic models for the watershed. The **future build-out condition** is defined as a fully developed watershed with no onsite retention and land uses defined by the current City of Scottsdale General Plan and related Natural Area Open Space (NAOS) requirements. Sub-basins are to be identified using appropriate hydrologic judgement to provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basins shall be delineated to sufficiently detail peak discharges at structures, major road crossings, confluences, and at boundary lines. An appropriate time step and number of ordinates shall be selected to allow complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations or assumptions used in developing sub-basin and routing parameters shall be documented in the Technical Data Notebook. Field surveys may be required for HEC-1 modeling purposes.
- 5.2 Five meetings associated with five tasks, and two field trips shall be held with the Flood Control District staff at the following milestones:
- a. One field trip at the start of the project to scope out the critical points of the watershed and problem areas.
 - b. Hydrology Meeting Number 1 – This meeting shall be a coordination meeting at the beginning of Task 5 to discuss concerns regarding the watershed hydrology and establish continuity and communication between this study and the Rawhide Wash Detention Basin project. The Consultant and District shall arrange for and participate in a coordination meeting to be convened at the District, and shall invite a representative from each of the following entities:

City of Scottsdale
Arizona Department of Water Resources
Arizona State Land Department
HDR Engineering (Consultant for Rawhide Wash Detention Basin Project)
 - c. Hydrology Meeting Number 2 – This meeting shall take place as soon as basic data are gathered and the sub-basins have been preliminarily delineated. Sample HEC-1 parameter estimations shall also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.
 - d. Hydrology Meeting Number 3 – This meeting shall take place after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.
 - e. Hydrology Meeting Number 4 – This meeting shall take place to review comments to the preliminary HEC-1 results and draft section of the Technical Data Notebook. A copy of the draft Technical Data Notebook section with a digital copy of the HEC-1 models must be delivered two weeks prior to the meeting.

5.3 The specific hydrologic techniques to be used in this study are:

- a. Rainfall Depth: Point precipitation values shall be determined using the information and procedures described in the "Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydrology."
- b. Rainfall Distribution: Peak discharges and peak volumes for the 100-year, 6-hour storm shall be estimated using the District's Distribution(s). Peak discharges and peak volumes for the 100-year, 24-hour storm shall be estimated using the SCS Type II rainfall distribution.
- c. Areal Reduction: The point precipitation values shall be aerial reduced for critical concentration points. Areal reduction for the 6-hour rainfall duration shall be applied using the curves in the "Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydrology." NOAA HYDRO-40 shall be used with the 24-hour rainfall reduction. Copies can be obtained from the District.
- d. Rainfall Excess: The Green and Ampt methodology shall be utilized for estimation of rainfall losses. The Lotus spreadsheet and procedures, provided by the District, shall be used to determine composite parameter values for each sub-basin. Future condition land use elements shall be obtained from the City of Scottsdale General Plan and the impact of the North Scottsdale Natural Area Open Space (NAOS) requirements shall be considered.
- e. Unit Hydrograph: The Clark and/or S-Graph method shall be used following the procedures outlined in the "Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydrology." The choices in methodology shall be at the discretion of the Consultant, with consent from the District.
- f. Time of Concentration and S-Graph Lag Equation: The Papadakis method shall be used with the Clark unit hydrograph, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, shall be used with the appropriate S-graph (Phoenix mountain or Phoenix Valley).
- g. Channel Routing: Channel routing shall be accomplished using either the Muskingum-Cunge or the Normal-Depth option of HEC-1. The choice of methodology shall be at the discretion of the Consultant, with consent from the District. Average cross sections shall be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections shall be taken to ensure that routing reaches are reasonable and representative of field conditions.

The HEC-1 routing parameters for the reaches modeled using HEC-RAS shall incorporate HEC-RAS cross sections if appropriate. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

- h. Reservoir Routing: Detailed analysis of structures and ponding areas shall be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures shall be estimated using appropriate hydraulic methodology.
 - i. Channel Transmission Losses: Attempts shall be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge so and explain how the peaks and volumes of flow are affected by not including the transmission losses.
- 5.4 The District shall provide appropriate references to facilitate parameter estimation.
- 5.5 Output of the computer model shall be reviewed to see if the peak flows and volumes are realistic. Flows will be tested for reasonableness using approximate methods, including ADWR regional regression equations, District's unit discharge relationships, and agreement with other hydrologic studies in the area.
- 5.6 Every attempt must be made to recover historic stream gage data and use it to compare with the results obtained by the hydrologic model. Major differences must be discussed in the final report.
- 5.7 It is required that the Consultant obtains the approval of the District at each of the following steps:
 - a. Soil maps, watershed boundary maps, and land use maps.
 - b. HEC-1 parameter estimation.
 - c. HEC-1 flow diagram and input parameters.
 - d. HEC-1 results.
- 5.8 The **existing condition** hydrology shall be included in the project Technical Data Notebook as described in Task 8. The **future build-out condition** hydrology shall be documented in a separately bound supplement to the Technical Data Notebook, with supporting data for the future condition modeling. Results of the revised HEC-1 modeling shall be compared by text discussion and tabular summary to the results of previous studies for the watershed.
- 5.9 Once the comments of Task 5.2.e have been addressed, the Consultant shall submit three (3) draft final copies of the Technical Data Notebook and three (3) draft final copies of the future build-out condition supplement to the District. The Technical Data Notebook shall include an abbreviated Table of Contents, Sections 1, 2 (as applicable to the hydrology), and 4, plus all pertinent appendices and maps. The District will then submit those documents to the Arizona Department of Water Resources (ADWR) and the City of Scottsdale for their review. The draft final documents shall be delivered to District within 120 calendar days from the contract Notice to Proceed date. Included in that schedule shall be an allowance of 30 calendar days for interim reviews by the District.

- 5.10 HIS submittals pertinent to Task 5 must be reviewed and approved prior to finalizing the Floodplain Delineation Task (Task 6).

TASK 6 - FLOODPLAIN DELINEATION

- 6.1 Floodplain delineations must be obtained using the U.S. Army Corps of Engineers HEC-RAS computer model, version 2.1, October 1997, and methodologies acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The Consultant shall prepare the study using the guidelines established in FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors, January, 1995, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.
- 6.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA and the Arizona Department of Water Resources.
- 6.3 The delineation study shall be based on the final results of the hydrologic study. The Consultant and the District shall agree to peak discharges used in the HEC-RAS model.
- 6.4 The Consultant is to make refinements to the HEC-RAS model based on review of the model results by the District, ADWR, FEMA, and the Technical Evaluation Contractor. The Consultant shall review the HEC-RAS model results for reasonableness. Adjustment to the input parameters for obtaining the most realistic results is normal to the scope.
- 6.5 Floodways are to be determined using equal conveyance encroachment method 4 to start with, but only encroachment method 1 will be used in the final analysis. For subcritical flow profiles, the floodway encroachment shall approach the one-foot maximum rise in water surface elevation as closely as possible. For supercritical flow profiles, the one-foot maximum rise shall be based on the energy grade line and not the water surface elevation.
- 6.6 The Consultant must obtain District approval at each of the following steps:
- a. Field reconnaissance report and estimation of Manning's "n" values.
 - b. Proposed location and alignment of the cross sections and channel centerline.
 - c. Floodplain (natural) delineation.
 - d. Floodway delineation using equal conveyance encroachment.
 - e. Floodway delineation using encroachment method 1.
 - f. Finalization of Hydraulics section in Technical Data Notebook.

6.7 Field Reconnaissance

- 6.7.1 The Consultant shall conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees, culverts, bridges, or other flood control structures; and measurement of bridge dimensions.
- 6.7.2 Mannings "n" values are to be determined using the methodology in the USGS report, "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona," April 1991. Copies of the report are available through the District.
- 6.7.3 A draft portion of the Technical Data Notebook documenting the field reconnaissance results shall be submitted to the District for review and approval prior to beginning the HEC-RAS modeling. The draft section shall present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The draft section shall also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values shall be displayed on reduced scale mapping and included in the final Technical Document Notebook.

6.8 Cross Sections

- 6.8.1 The location and alignment of cross sections and channel centerline shall be submitted for the District's review and approval prior to generating the cross section geometric data. Cross section stationing shall be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise, and shall extend the full width of the area inundated by 100-year floodwaters. Identification of cross sections shall be in river miles, increasing upstream. The stationing shall tie into the specified river mile of the existing FEMA studies. Cross section orientations may need to be altered after running the HEC-RAS model to ensure that sections are perpendicular to flow per FEMA criteria.
- 6.8.2 All cross sections shall be plotted using a pen, laser, or electrostatic plotter. The cross section plots shall show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews.
- 6.8.3 Cross section plots are limited to one plot at the following three stages of work:
- (a.) A plot of digitized "GR" data, STCHL, STCHR, and centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model;

- (b.) A plot of each cross section for the completed floodplain model which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model; and,
- (c.) A plot of each cross section for the final floodplain/floodway model that shows method 1 encroachments and encroached (floodway) water surface, in addition to data covered in items (a.) and (b.).

The cross sections generated under item 6.8.3(c.) will be included as part of the final Technical Data Notebook.

- 6.9 Bridges and culverts must be modeled in compliance with HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge shall be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.
- 6.10 For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-1 model, which shall provide the District with water surface elevations. If appropriate, the Consultant shall identify in the ponded floodplains a floodway. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds, versus the creation of two independent ponds.
- 6.11 Flood zones must be determined according to FEMA criteria and clearly labeled on the final drawings.
- 6.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.
- 6.13 The study hydraulic analyses and floodplain/floodway results shall be included in the project Technical Data Notebook as described in Task 8. HIS submittals pertinent to Task 6, must be reviewed and approved prior to submittal of the FEMA review package.

TASK 7 - HIS DATA

Delivery of digital study data for population of the District's Hydrologic Information System (HIS) database shall comply with the District's "HIS Data Delivery Specifications," Rev 3.1, June 1, 1998 (HIS Manual). The Consultant shall follow the CADD Data Delivery Specifications within the HIS Manual and provide CADD standard DXF format files created from either AutoCAD or MicroStation, and all required ASCII text file supplements.

The following themes shall be delivered according to District HIS specifications:

| Name | Appendix C Page No. | Description |
|----------------|---------------------|--|
| NDXPRJ | CP-40 | Shows the map sheet boundaries of the project |
| PRJ | CP-60 | Defines the boundary of the project <i>entire Drainage area</i> |
| STRCT | CP-360 | Structures like building footprints (if any occur in the floodplain) |
| DQ | CP-410 | Data Quality of Data: Scale, date, Vertical Datum, Projection |
| PRJDAT | CP-430 | Contractor name, Project Name, Project ID |
| FPBLN | CP-520 | Floodway center line |
| FPCTLFCD | CP-523 | Elevation Reference Marks <i>Sunny</i> |
| FPSRFFCD | CP-535 | Surface Water Elevation |
| FPXFCD | CP-540 | Cross sections used in HEC-RAS |
| FPZNFCD | CP-550 | Floodplain Zones |
| HEC-RAS OUTPUT | CP-599 | HEC-RAS model output file specifications and deliverable. |
| BRIDGE | CP-608 | Bridges, including any headwalls or wing walls |
| CULVERT | CP-612 | Culverts, including any headwalls or wing walls |
| DRNBSN | CP-920 | Drainage basins |
| DRNPTH | CP-930 | Drainage Path |
| RIVER | CP-960 | Washes or streams in the area (if any) |

This is a comprehensive listing of possible features. If there are no features collected under one of the categories mentioned, then the theme does not need to be delivered.

All required HIS submittals must be reviewed and accepted prior to finalizing the Technical Data Notebook for submittal to FEMA (Task 8.1).

TASK 8 - DELIVERABLES

8.1 **HIS Data Submittal** – Prior to the FEMA submittal, the Consultant shall complete and deliver all final study HIS data per Task 7, and obtain District approval of substantial compliance with the “HIS Data Delivery Specifications,” Rev 3.1, June 1, 1998.

8.2 **FEMA Submittal** - The Consultant will submit the following items to the District for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

8.2.1 Original Affidavits of Publication.

8.2.2 Two (2) complete blueline sets of the work study drawings. The drawings shall be 24" X 36" in size and shall incorporate or reproduce the standard District sheet layout for floodplain delineation work study drawings at a plan scale of 1 inch = 200 feet. Topographic base mapping shall be provided by the District and incorporated in the drawings. Planimetrics for all structures, roadways, and major drainage features shall be incorporated to the extent they are provided by the District. Planimetric location of additional culverts and/or bridges along the study reach that were not provided by the District, but identified by the Consultant, shall be incorporated in the drawing. In the event that supplementary survey is authorized from contingency funds for the location of building footprints, this information shall be incorporated in the drawing. In areas where USGS quadrangles serve as the base mapping, the quadrangle(s) shall be incorporated into the drawing. A cover sheet shall be provided with the project title and number, date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. At a minimum, each drawing sheet shall include: floodplain and floodway boundaries; annotated cross section locations with floodplain and floodway elevations; wash/channel thalweg with river mile or other modeling stationing identified; flood zone designations; north arrow, text and bar scale, and index map; section corners, quarter corners, and township/range lines; corporate or other entity boundaries; current (and proposed if appropriate) streets and highways with names; State Plane Coordinate System index marks with northing and easting annotation; Elevation Reference Marks (ERMs) with description and elevation included; and a "NOTES" section in the map border explaining the proper means to convert between NGVD 29 elevations and NAVD 88 elevations. All drawings shall be signed and sealed by persons of appropriate professional registration(s) and each registrant shall provide a specific statement as to what service they performed.

8.2.3 Two (2) complete copies of the Technical Data Notebook, including HEC-1 and HEC-RAS digital input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA1-97) using the *ADWR/FEMA Submittals* outline. The notebook shall be organized as specified by the District, following SSA1-97 format. This submittal will also include the separately bound, future condition hydrology supplemental Technical Data Notebook specified in Section 5.

8.2.4 Three (3) sets of complete survey notes shall be submitted in a notebook separate from the Technical Data Notebook.

8.2.5 One (1) final copy of the future build-out condition hydrology supplement to the project Technical Data Notebook.

8.3 **Final Submittal** - The following products are considered deliverables for the final submittal to the District after FEMA approval is issued.

8.3.1 One (1) complete set of sealed mylars and four (4) complete sets of sealed blue-line work study drawings (see Task 8.2.2 for specifications). All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.3.2 Four (4) complete copies of the Technical Data Notebook including HEC-1 and HEC-RAS input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA1-97) using the *ADWR/FEMA Submittals* outline. The notebook shall be organized as specified by the District, following SSA1-97 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies, and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-1 model, the HEC-RAS model, and/or the final Technical Data Notebook. If revisions necessitate resubmitting the future condition hydrology supplement, then copies of that revised document shall be submitted also.

8.3.3 Four (4) final copies of the future build-out condition hydrology supplement to the project Technical Data Notebook.

Specific deviations from this scope of work shall not be undertaken without the specific written concurrence from the Flood Control District.

Not part of this submittal.