CELLA BARR ASSOCIATES
2075 North Sixth Avenue
Tucson, Arizona 85705
(602) 624-7401

Letter of Transmittal

To: Mr. Doug Plasencia, Hydrologist
Flood Control District of Maricopa County
3335 W. Durango Street
Phoenix, AZ 85009

Date: December 17, 1986
Our Job No.: 40915-01-30/03800-03-78
Your Job No.:

Project Name/Description: Sols Wash - Wickenburg, Maricopa County

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

We Are Sending You:
- ☐ Plans/Prints
- ☐ Specifications
- ☐ Report(s)
- ☐ Other

Deliver By:
- ☐ Our Messenger
- ☒ Mail
- ☐ Express-it
- ☐ Federal Express
- ☐ Other

Quantity	Date	Description
1	12-17	Package submitted to Michael Baker Jr., Engineers

For Your:
- ☐ Information/Request
- ☐ Review & Return
- ☐ Review & Comment
- ☐ Approval
- ☐ Signature
- ☒ File

Remarks/Response: Most of the information submitted to Michael Baker Jr., Engineers consists of originals. However, we sent mylar reproductions of the aerial photography. Your package contains the originals of this information per your request. We have asked that the results of our study be incorporated onto the new Maricopa County Maps prior to their finalization by FEMA.

Copies To:

CELLA BARR ASSOCIATES

By: James H. Nelson

TABLE OF CONTENT

1. History Page

2. Correspondance

3. Area History

4. Hydrologic/Hydraulic Analysis

5. List of Tables/Figures

6. Flood profiles/Cpmputer Printouts

HISTORY PAGE

The project includes a 9.3 mile re-study of the Sols Wash, Wickenburg, Maricopa County. Cella Barr Associates (CBA) under contract number EMW-85-C-1909 with FEMA carried out the study. This project has a CBA number file number of 40915-01-75 and 03800-03-78. James Nelson of CBA and Doug Plasencia of Flood Control District were the contact people between the two organizations. This project was accepted by FEMA on ( ).

Flood Control District Contract #: 86-3.

Input file is in directory, under filename .

Output file is in directory, under filename .

Maps are found in drawer # (including mylars).

CONTRACT FOR ENGINEERING SERVICES
Sols Wash
CONTRACT FCD 86-3

WHEREAS, The Flood Control District of Maricopa County, Arizona, hereinafter called the DISTRICT, is desirous of having certain professional services performed in connection with the topographic mapping and floodplain delineation for Sols Wash, an ephemeral stream in and about Wickenburg, Arizona; and,

WHEREAS, Cella Barr Associates, Phoenix, Arizona, hereinafter called the ENGINEER, is desirous of performing said services;

NOW, THEREFORE, the parties hereto mutually agree as follows:

The ENGINEER shall provide for the hydrology, topographic mapping and all pertinent input and output to develop a mapped, two district floodplain utilizing the U.S. Army Corp of Engineers, H.E.C. 2 computer model, in accordance with the attached scope of work and and technical service outline labeled EXHIBIT "A", made a part hereof.

The fee for this contract is $57,702.00 plus a contingent amount of $8000.00 for work required beyond the scope of work presented in EXHIBIT A, as approved by the Chief Engineer and General Manager of the DISTRICT, for a total contract amount not to exceed $65,702.00. Progress payments may be made on certification of the ENGINEER, and approved by the Chief Engineer and General Manager of the DISTRICT on ninety percent (90%) of work completed at the time of request. The final 10% of the contract will be released following the DISTRICT being notified of the acceptance of the floodplain delineation by the Federal Emergency Management Agency.

The ENGINEER agrees during the execution of this contract that no clients other than the DISTRICT, the Federal Emergency Management Agency or The Town of Wickenburg, will be retained within the area of the 100-year floodplain for Sols Wash without expressed written authority from the Chief Engineer and General Manager of the District.

It is agreed that the work required in EXHIBIT A, will be completed in approximately 16 weeks following the issuance of the Notice to Proceed, exclusive of review time by others, and that delays beyond this period will be documented by the ENGINEER and time extension(s) will be requested in writing.

Whenever an alteration in the character of the work results in a substantial change in the scope of the work and thereby materially increasing or decreasing the cost of the performance, the work will be performed in accordance with the contract and as directed; provided, however, that before such work is started, a contract change order or supplemental agreement shall be executed by the DISTRICT and the ENGINEER, such change order not to be effective until approved by the DISTRICT. Additions to, modifications, or

deletions from the project provided herein may be made and the compensation to be paid to the ENGINEER may be adjusted accordingly by mutual agreement of the contracting parties. It is distinctly understood and agreed that no claim for extra work done or materials furnished by the ENGINEER will be allowed by the DISTRICT except as provided herein, nor shall the ENGINEER do any work or furnish any materials not covered by this agreement unless such work is first authorized in writing by the Chief Engineer and General Manager of the DISTRICT. Any such work or materials furnished by the ENGINEER without such written authorization first being given shall be at his own risk, cost, and expense, and he hereby agrees that without such written authorization he will make no claim for compensation for such work or materials furnished.

The ENGINEER agrees to indemnify and save harmless the DISTRICT from all suits, including attorney's fees and costs of litigation, actions, loss, damage, expense, cost or claims, of any character or any nature arising solely out of the engineer or the engineer's subcontractors negligent performance of the work done in fulfillment of this contract.

All documents, including original drawings, estimates, specifications, field notes and data are and remain the property of the DISTRICT. The ENGINEER may retain a set of reproducible record prints of drawings and copies of other documents.

DISTRICT may terminate this Contract at any time upon reimbursement to the ENGINEER of expenses which include reasonable charges for time and material.

ENGINEER at his option may terminate this Contract in the event of nonpayment of fees as specified herein.

This Contract shall not be assigned by either party without prior written approval of the other except that ENGINEER may utilize in the performance of this Contract without prior approval of the DISTRICT, personnel or services of its related entities and affiliated companies as if they were an integral part of ENGINEER.

IN WITNESS WHEREOF, the parties herein have executed this Contract in duplicate.

ENGINEER
CELLA BARR ASSOCIATES

Date: 14 Feb 1986

FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY, ARIZONA

Chairman, Board of Directors

Date: MAR 17 1986

RECOMMENDED BY:

Chief Engineer and General Manager,
DISTRICT

Date: 2-19-86

ATTEST:

Clerk of the Board

Date: MAR 17 1986

Approved as to form and within the powers and authority granted under the laws of the State of Arizona to the Flood Control District of Maricopa County.

General Counsel, DISTRICT

Date: 2-7-86

NO KICK-BACK CERTIFICATION

The ENGINEER warrants that no person has been employed or retained to solicit or secure this Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors of the Flood Control District of Maricopa County, Arizona, or any employee of the Flood Control District of Maricopa County, Arizona, has any interest, financially or otherwise, in the Consulting Engineer firm.

For breach or violation of this warranty, the Flood Control District of Maricopa County, Arizona, shall have the right to annul this Contract without liability, or at its discretion to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

Signed: James R. Burke

Date: 14 Feb 1986

Distribution:

Board of Directors
Consulting Engineer
Flood Control District Files

5062 North 19th Avenue
Phoenix, Arizona 85015
(602) 242-2999

EXHIBIT A

CELLA BARR ASSOCIATES

January 20, 1986

FLOOD CONTROL DISTRICT
RECEIVED
JAN 22 '86

	CH ENG		HYDRO
	ASST		LMgt
	ADMIN		SUSP
	C & O		FILE
	ENGR		DESTROY
	FINANCE	1	RGN
REMARKS			

Flood Control District of Maricopa County
3335 West Durango Street
Phoenix, AZ 85009

Attention: Mr. D.E. Sagramoso, P.E.

Re: Floodplain/Floodway Delineation for Sols Wash
Maricopa County, Arizona
CBA File No. 40915-01-00

Gentlemen:

This letter is in response to the meeting held on January 20, 1986, between members of your staff, Mr. Nick Karen, Mr. Dave Johnson, and Mr. Joe Tram, Mr. Doug Plasencia, and representatives for Cella Barr Associates (CBA); Mr. Dick Norton and Mr. Paul Hoskin, regarding the above study.

This proposal is the result of two earlier correspondence with your office and an earlier meeting with members of your staff. The purpose of this letter is to summarize and finalize those earlier correspondence and meetings.

The purpose of the study is to provide an extension of our Special Flood Hazard Area delineation for Sols Wash (Wickenburg, AZ) to include all of the upstream reach within unincorporated Maricopa County. As explained earlier, we are currently preparing a re-study of Sols Wash within the Town of Wickenburg under contract with the Federal Emergency Management Agency (FEMA).

We have been in contact with FEMA's Project Officer for Region IX, Mr. Ray Lenaburg, and he has indicated that he has no objection to this proposed effort. Further, it appears that the new delineations within the County may be performed following new criteria recently adopted by FEMA. This new criteria will allow us to simply delineate the extent of the 100-year floodplain, 500-year floodplain and designated floodway, plus appropriate profiles and data tables. Computation of the 10-year and 50-year flood profiles is no longer required. Our proposal has been based on this assumption. Our current contract with FEMA, however, calls for a detailed study to be performed under the criteria set forth per the former guidelines and specifications and thus, 10-year and 50-year flood profiles will still be developed for Sols Wash within the Town of Wickenburg. The result of this disparity will be that different flood zones may exist on either side of the corporate boundaries, however, floodplain and floodway boundaries as well as flood profiles will match.

Proposed Scope Of Work As Follows:

1. TOPOGRAPHIC MAPPING

Acquire 200 foot horizontal scale, 2-foot contour interval, final drafted, topographic mapping of Sols Wash and adjacent floodplain areas from the confluence with the Hassayampa River to the County line (see attached map). Obtain photo-mylar coverage of the same areas and at the same scale as the topographic mapping. Make cross-section field surveys to verify mapping accuracy to FEMA standards.

2. TECHNICAL EVALUATION

Hydrology

Members of the District's staff have determined that the hydrology performed under our contract with FEMA is sufficiently accurate to be used in this study. No further hydrology is anticipated, however, a magnetic tape of the TR-20 computer model input data will be furnished along with reproducible copies of all text and maps used in the final hydrologic report.

Hydraulics/Flood Boundary Delineation

Develop 100-year and 500-year flood profiles and designated floodway for reach of Sols Wash within the County. Refine hydraulics for the reach within the Town of Wickenburg utilizing upgraded topography. All hydraulic analysis to be performed using the HEC-2 computer program.

Profiles/Floodway Data

Prepare flood profiles and floodway data tables.

Final Documents

Prepare a separate submittal of hydrologic and hydraulic data in support of a Map Revision for that portion of Sols Wash located within Maricopa County. It is envisioned that this information will be submitted to FEMA for review at the same time as the draft Flood Insurance Study Report is submitted for the Town of Wickenburg. The submittal of the County study will be made as a Request for a letter of Map Revision. CBA will then follow through with FEMA until final approval is obtained for the map revision.

Our proposal and cost estimate has been based upon the following assumptions:

1. The proposal represents all work that is not included under our present contract with FEMA. The study reach and mapping limits for Sols Wash encompass two miles within the Town of Wickenburg and seven miles within unincorporated Maricopa County. Work not presently completed for Sols Wash within the Town of Wickenburg will be chargeable to our FEMA contract. Additional work necessary within the Town of Wickenburg is related to the new topography and includes the coding of new cross-sections and reach lengths. Actual floodplain delineation and profiles will be chargeable to our FEMA contract.

2. During the research and reconnaissance stage, the land surveyor will pre-mark the points to be paneled thereby saving crew time. He will also look at the overall horizontal control network in order to save crew time in locating traverse points.

   The site will be pre-paneled for the controlled overflight. Two two-man crews, each with trucks, will be used to accomplish this task in the shortest possible time. This task will be scheduled at a time when weather conditions will allow the aerial photography to be taken the following day. We estimate that 17 horizontal and vertical control panels will be required.

   A three-man crew will run a closed traverse through all horizontal panel points with side shots to the vertical control points as an added position check.

   Vertical control will be established using a two-man crew. Because of the rugged terrain and inaccessibility, it is anticipated that some form of all terrain vehicle or ATC will be required for the more remote areas. The crew will measure and photograph all pertinent railway culvert crossing (15 estimated) as they run their bench levels. The vertical control crew will set temporary bench marks along the railroad for later use in taking cross sections for checking mapping accuracy.

3. The mapping accuracy will be checked according to FEMA standards which require a minimum of one cross-section per stereo model, in this case 15 cross-sections. These cross-sections must cross at least 20 contours or a distance to exceed 10 inches at the map scale, in this case 2,000 feet in length. These cross-sections will be checked in the office against the aerial mapping.

4. Mapping will be located according to the State Plan Co-ordinate system. A sufficient number of section corners will be located in order to project the Section and Township lines onto the final draft manuscripts.

5. In addition to Mr. Ron Behnke, our principal and supervisor of surveys, we have two registered land surveyors, Mr. Roy Smith and Mr. Curt Chapman who will coordinate field crews and in-office computations.

6. Our accounting procedures have not yet been completed for our new computer systems, but discussion with the head of the computer department indicates that connect time may be charged at $15.00/hour and CPU time at $300.00/hour. Assuming a 40 hour connect time and 3 hours of CPU time, we estimate computer charges will not exceed $1,500.00.

Attached with this letter you will find a detailed breakdown of our expected fees by task and expense item. Billing rates represented for each personnel classification are average hourly rates, however, our billings will reflect actual hourly rates for specific individuals assigned to the project. The total cost will not exceed $57,702, as shown on the attached summary, and is based on the above assumptions, if the field conditions are less severe, then we will make every effort to reflect the resulting savings in the total invoice to the Flood Control District of Maricopa County.

We estimate, given a Notice to Proceed by February 3, 1986 that we will receive preliminary contour mapping by mid March 1986 and final maps and cross-sections by the beginning of April 1986. Study completion including submittal to FEMA should be accomplished by the end of May.

Thank you for providing us with this opportunity to be of service to the Flood Control District of Maricopa County. If you have any further questions, please feel free to contact us.

Sincerely,

CELLA BARR ASSOCIATES

Richard R. Norton, P.E.
Project Manager

Paul W.R. Hoskin
Project Engineer

RRN/ej

Enclosures

SBA

COST ESTIMATE FOR SOLS WASH FLOODPLAIN DELINEATION
(Revised 1/20/86)
RRN-126

TASK	MANHOURS	FEE*	
1. TOPOGRAPHIC MAPPING			
Field Surveys:			
Survey Supervisor	32	$ 1,760	
Land Surveyor	80	2,640	
Draftsman	18	432	
Survey Crew Member	580	13,920	
Total	710	$ 18,752	
Direct Costs			
Per Diem		2,950	
Subcontracts			
Cooper Aerial Survey		$ 11,100	
Total Topographic Mapping			$32,802
2. TECHNICAL EVALUATION			
Reconnaissance			
Principal/ProjectManager	2	150	
Project Engineer	16	768	
Engineer/Hydrologist	16	480	
Total	34	1,398	

Hydrology (No hydrology to be performed)

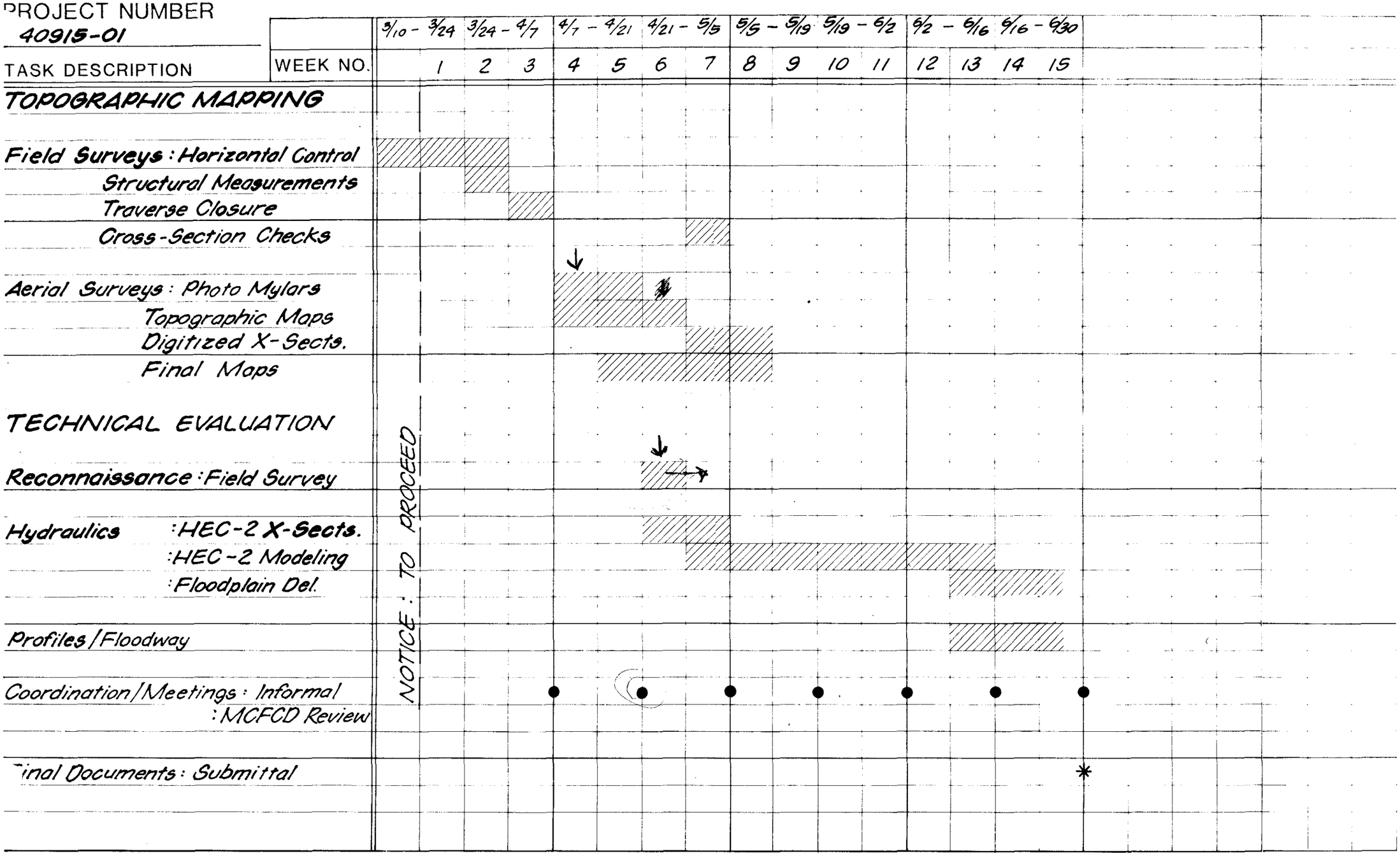
Sols Wash Cost Estimate
Revised 1/20/86
RRN-126

Hydraulics/Flood Boundary Delineation			
Principal/Project Manager	10	$ 750	
Project Engineer	130	6,240	
Engineer/Hydrologist	285	8,550	
Total	425	15,540	
Profiles/Floodway Data			
Principal/Project Manager	2	150	
Project Engineer	8	384	
Engineer/Hydrologist	40	1,200	
Draftsman	24	576	
Total	74	2,310	
Final Documents			
Principal/Project Manager	8	600	
Project Engineer	16	768	
Draftsman	4	96	
Clerical	16	288	
Total	44	1,752	
Coordination/Meetings			
Principal/Project Manager	8	600	
Project Engineer	20	960	
Engineer/Hydrologist	8	240	
Total	36	1,800	
Direct Costs			
Reproductions		300	
Computer		1,500	
2 Magnetic Tapes		200	
Travel		100	
Total		2,100	
Total Technical Evaluation			$24,900
TOTAL ESTIMATED FEE			$57,702

PROJECT NAME
SOLS WASH FLOODPLAIN

PROJECT NUMBER
40915-01

PROJECT DESIGN SCHEDULE



LEGEND

CBA WORK

CLIENT REVIEW

MEETINGS

CLIENT APPROVAL:
PLEASE REVIEW PROJECT DESIGN SCHEDULE. MAKE ANY NECESSARY CHANGES. SIGN ONE COPY AND RETURN TO CBA.

NOTES:

WORK TIME:
112 DAYS

REVIEW TIME:
7 DAYS

CELLA BARR ASSOCIATES
5062 N. 19th Avenue.
Phoenix, Arizona 85015
(602) 242-2999

FLOOD CONTROL DISTRICT of Maricopa County

3335 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 262-1501

D. E. Sagramoso, P.E., Chief Engineer and General Manager

40915-01-30 E
03800-03-78

RECEIVED OCT 24 1986

BOARD of DIRECTORS
George L. Campbell, Chairman
Carole Carpenter
Tom Freestone
Fred Koory, Jr.
Ed Pastor

OCT 22 1986

RECEIVED OCT 24 1986 TO JHN FROM HPS

Mr. Doug Rosecranz
Cella Barr Associates
5062 North 19th Ave.
Phoenix, Arizona 85015

Re: Sols Wash Delineation, FCD 86-3

Mr. Rosecranz:

Following review of the revisions to the Flood Insurance Study, we feel the revisions adequately addressed our initial concerns. During our "final" review of the drawings, one potentially significant, but easily corrected problem came to light. Due to the braided nature of Sols Wash, high velocity, high discharge flows impinge on the outer banks of the wash at various locations. The floodway as presently mapped would allow in certain locations for these areas to be blocked if developed. Please have this modified and prepare the submittal to be sent to FEMA. If you should have any questions pertaining to this matter, please contact us for clarification.

Sincerely,

Doug Plasencia
Hydrologist

2075 North Sixth Avenue
Tucson, Arizona 85705
(602) 624-7401

CELLA BARR ASSOCIATES

December 18, 1986

Mr. Dave Greenwood
Michael Baker Jr., Engineers
1420 King Street, 6th Floor
Alexandria, Virginia 22314

Re: Draft FIS Submittal, Wickenburg, Arizona (Sols Wash); and
Re-Study for Upstream Extension of Sols Wash within
Unincorporated Maricopa County, Arizona
CBA File Nos. 40915-01-75; 03800-03-78

Dear Mr. Greenwood:

This letter and accompanying information is the draft FIS submittal (re-study) for a 9.3 mile reach of Sols Wash, extending upstream from the Hassayampa River within the Town of Wickenburg and unincorporated Maricopa County to the Maricopa County line in the State of Arizona.

CBA is under contract with the Federal Emergency Management Agency (FEMA) to perform a re-study of Sols Wash within the Town of Wickenburg, Arizona (Contract No. EMW-85-C-1909). The re-study for the Town of Wickenburg, Arizona was initiated in early 1985 and work was completed through initial hydraulic analyses by late 1985. Under the FEMA contract, the re-study criteria was to be based upon the "Guidelines and Specifications for Study Contractors" (Guidelines) dated September, 1982. Available topographic mapping at 300 scale with a contour interval of 5 feet was being utilized for the re-study.

Early in 1986, the Flood Control District of Maricopa County (District) requested CBA to prepare a proposal to extend the re-study of Sols Wash upstream from the Town of Wickenburg to the Maricopa County line (a distance of 6.7 additional stream miles). As a part of the study effort the District agreed to include upgraded topographic mapping to cover the reaches of Sols Wash within unincorporated Maricopa County and also the Town of Wickenburg. We have acquired new mapping as a part of our contract with the District at 200 scale with a contour interval of 2 feet. Per our earlier discussions with Mr. Ray Lenaburg, our FEMA Project Officer, the re-study of Sols Wash within the Town of Wickenburg has been updated by utilizing the more current and more detailed topographic mapping, however, FEMA has not incurred any costs over and above that which would have been required under the original study scope.

During a June, 1986 telephone conversation with Mr. Ray Lenaburg, we discussed some of the mapping presentation problems which would occur if we utilized the new "Guidelines and Specifications for Study Contractors" dated September, 1985 for the portion of the study reach of Sols Wash within Maricopa County and then attempted to interface with the re-study of Sols Wash within Wickenburg, which was to be performed utilizing the September, 1982 version of the Guidelines. During the conversation, Mr. Lenaburg suggested that we use the September, 1982 version of the Guidelines for the composite study to allow flood zone determinations and designations to be compatible at corporate boundaries. Thus, the procedure used in preparing the work maps, profiles and tables has been identical for both the Maricopa County re-study and the Wickenburg re-study to provide for a consistent mapping procedure and zone designation for the composite study reach of Sols Wash under investigation within both jurisdictional areas.

Maps, profiles, and tables for the composite study reach of Sols Wash are included with this submittal for ease of review with respect to interfacing the Maricopa County study with the Wickenburg re-study. this composite package is being provided as such per instructions of Mr. Lenaburg. The following is a list of the information being provided with this LOMR request:

1. Reproducible mylar work maps for Sols Wash at 200 scale showing locations of cross-sections utilized in hydraulic analyses, flood zones, floodway boundaries, section corners, elevation reference marks (ERMs) and water surface elevations. Some of the information contained on these work maps was per special request of the District.

2. Prints of aerial photographs at 200 scale with individual sheet coverage identical to that presented on the work maps. These aerial photographs include the locations of drainage structures which were surveyed in the field and photographs which were taken during the reconnaissance effort.

3. A watershed and reach map indicating drainage concentration points along the study reach of Sols Wash and discharges which were utilized in the hydraulic analyses. These discharges were established per the TR-20 hydrologic analysis which was performed as a part of the re-study for the Town of Wickenburg, Arizona.

4. Hydrologic Analysis of Sols Wash, Report dated November, 1985.

5. "Draft" Flood Insurance Study Report for the Town of Wickenburg, Arizona restudy with certification.

6. HEC-2 runs for the 10-, 50-, 100-, and 500-year discharges and floodway. Due to the length of the study reach the HEC-2 analyses have been subdivided into 5 subreaches.

7. Water surface profiles for the 10-, 50-, 100-, 500-year flood discharges.

8. Flood insurance zone data table.

9. Floodway data table.

10. Table of elevation reference marks (ERMs).

11. Field survey notes relevant to measurement of existing drainage structures.

12. Photographs of drainage structures and significant features identified on the aerial photographs described per item 2 above.

13. Letter from the District to Cella Barr Associates authorizing same to submit this information.

<u>It is our understanding that a set of revised flood maps have recently been issued in preliminary form by FEMA for Unincorporated Maricopa County, Arizona. We and the District respectfully request that this submitted technical information be incorporated onto the revised maps prior to their finalization</u>.

We thank you for your input, assistance and cooperation in the processing of this information. If you have any questions or comments regarding this submittal, please do not hesitate to call.

Sincerely,

CELLA BARR ASSOCIATES

James H. Nelson
Vice President

xc: Mr. Ray Lenaburg, FEMA, Region IX Project Officer
Mr. Doug Placencia, Flood Control District of Maricopa County
Mr. Skip Blunt, Town of Wickenburg
Ms. Carol Bracht, Dames & Moore
Mr. Doug Rosecrans
Mr. Hung-Peng Shiao, CBA
Mr. John S. Wise, CBA

Enclosures

HPS:JHN-161:dmr

DRAFT FLOOD INSURANCE STUDY
TOWN OF WICKENBURG, ARIZONA
MARICOPA COUNTY
FOR
FEDERAL EMERGENCY MANAGEMENT AGENCY

December 18, 1986
CBA File No. 03800-03-78
JHN-128/F0586

CELLA BARR ASSOCIATES
2075 North Sixth Avenue
Tucson, Arizona 85705

TOWN OF WICKENBURG, ARIZONA

FLOOD INSURANCE STUDY

FEMA CONTRACT NO. EMW-85-C-1909

December 18, 1986

This is to certify that all work accomplished in the conduct of this study was done in accordance with the Statement of Work and General Provision of Contract EMW-85-C-1909, and all amendments thereto, together with all such modifications, either written or oral, as the Project Officer and/or the Contracting Officer or their representatives have directed, as such modifications affect this contract, and that all such work has been accomplished in accordance with sound and accepted engineering practice within the contract provision for respective phases of the work.

Signed: John S. Wise

John S. Wise, P.E.
Assistant Vice President
Cella Barr Associates

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FIGURES

Figure 1 - Location Map 4

Figure 2 - Floodway Schematic 17

1.0 INTRODUCTION

1.1 *Purpose of Study*

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Wickenburg, Arizona, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 *Authority and Acknowledgements*

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Cella Barr Associates, for the Federal Emergency Management Agency, under Contract No. EMW-85-C-1909. This study was completed in December, 1986.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, the Federal Emergency Management Agency, and the Town of Wickenburg on December 12, 1984.

Results of the hydrologic analyses were coordinated with PRC Toupes, Town of Wickenburg, Maricopa County, the U.S. Geological Survey (USGS), the Soil Conservation Service (SCS), the U.S. Army Corps of Engineers (COE), and the Arizona Department of Water Resources.

On August 13, 1986, the results of the study were reviewed at the final community coordination meeting attended by representatives of the study contractor, the Federal Emergency Management Agency, and the Town of Wickenburg. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Wickenburg, Arizona. The area of study is shown on the Vicinity Map (Figure 1).

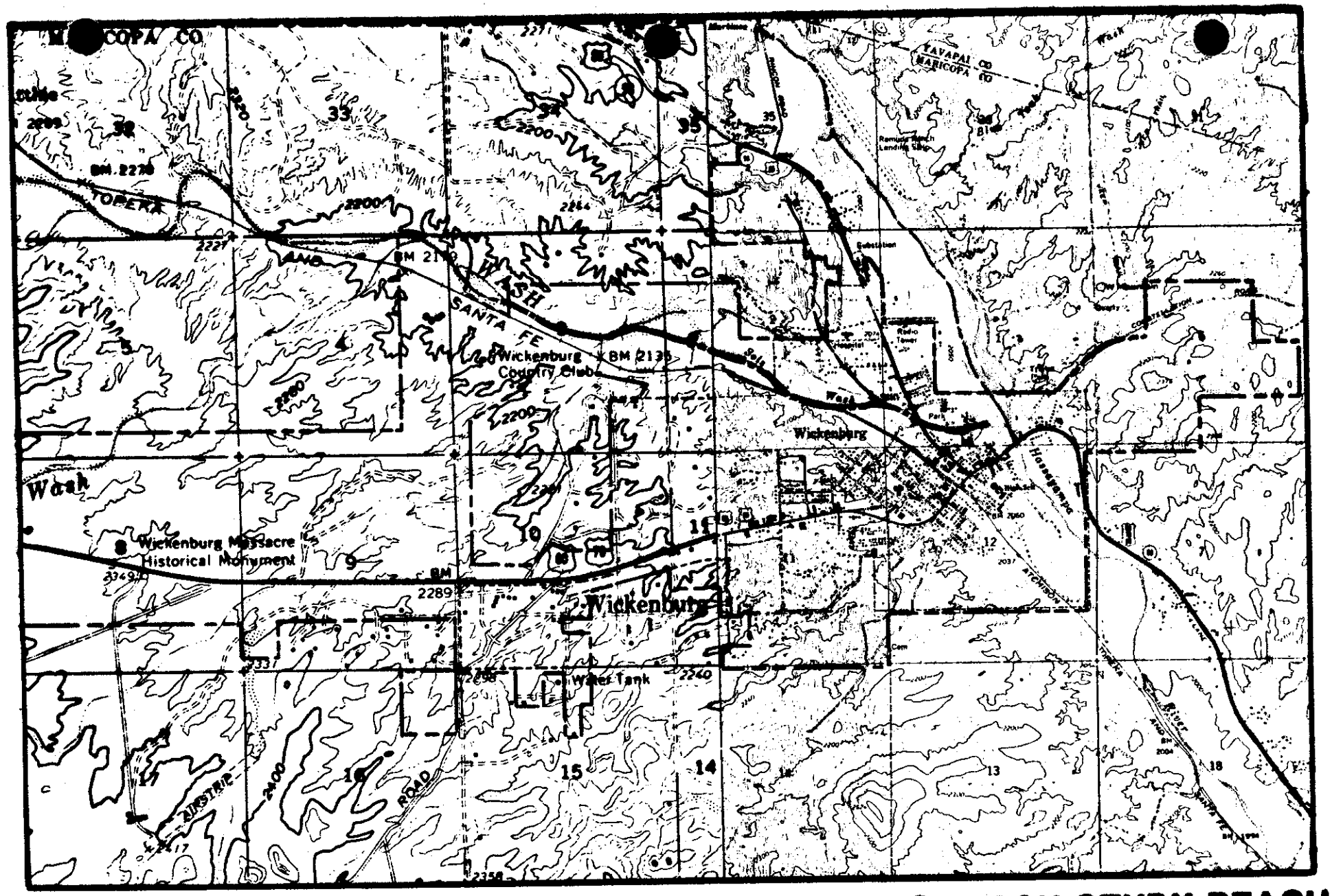
This Flood Insurance Study is a re-study, and re-examines hydrologic and hydraulic conditions for Sols Wash which were previously examined in the original Flood Insurance Study (Reference 1). Sols Wash was studied by detailed methods. All other study streams identified in the original Town of Wickenburg Flood Insurance Study (Reference 1) will remain unchanged. The area studied was selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through 1991, a period of five years.

During the course of this study, Maricopa County contracted the Study Contractor to extend the study reach of Sols Wash (as a separate map revision) from the current study limit within town limits upstream to the County Corporate Boundary. Information extending Sols Wash to the town limits is included with this re-study, based on the before referenced Maricopa County map revision project.

2.2 Community Description

The Town of Wickenburg, located in the north central part of Maricopa County, lies about 50 miles northwest of the City of Phoenix in south central Arizona.

The Town of Wickenburg was named for Henry Wickenburg, an Austrian immigrant born in 1820. He arrived in Arizona in 1862 and in 1963 he discovered the Vulture Gold Mine, about



LEGEND

STUDY REACH

TOWN OF WICKENBURG CORPORATE LIMITS

SOLS WASH STUDY REACH

TOWN OF WICKENBURG , ARIZONA

ten miles south of the present City. This mine became one of the richest in Arizona's territorial history. With profits from the Vulture Mines, Henry Wickenburg established a ranch near the present site of the Town of Wickenburg. The name of Wickenburg was first used by James Moore while writing Governor John N. Goodwin; Moore headed his letters "Wickenburg Ranch," and the name was used thereafter. As the Vulture Mines developed, so did Wickenburg, which reached a population of 500 persons in 1870. The population of the Wickenburg area was about 1,000 in 1940, about 3,000 in 1970 (Reference 2), and was last tabulated in 1980, with an estimate of 3,720 people.

Today, Wickenburg is famous as a retirement and dude ranch center. The town is served by the Wickenburg Municipal Airport, U.S. Highways 70 and 89, the Atchison, Topeka and Santa Fe Railroad (AT&SF), and by bus service.

The majority of the town is built above the floodplain elevation, but some trailer parks are located within the floodway fringe of Sols Wash. Some residential and commercial buildings are located in the Hassayampa River floodplain. The general terrain of the open space in Wickenburg is rolling hills. Flat developable land is scarce; therefore, the undeveloped floodplain land will come under increasing demand. The Hassayampa River, of which Sols Wash is a tributary, is the principal water course through the Town of Wickenburg. The watershed for both the Hassayampa River and Sols Wash is located in northwestern Maricopa and southern Yavapai Counties. The watershed eventually drains to the Gila River. U.S.G.S. gaging station 95155 is located upstream of Wickenburg on the Gila River and has a drainage area of approximately 417 square miles, which is characterized by rugged mountain terrain ranging in elevation from roughly 2,300 feet to 7,700 feet, National Geodetic Vertical Datum of 1929. The average

stream gradient for this drainage area is about 2.6 percent or 137 feet per mile. The drainage area contributing to U.S.G.S. gaging station 95165 on the Gila River downstream of Wickenburg consists of a total of 774 square miles. The 357 square miles contributing downstream of gaging station 95155 consists of mildly sloping desert-type terrain and rolling hills bordered by a fringe of poorly defined mountains and foothills. Sols Wash is a part of this 357 square mile watershed and has a drainage area of 144 square miles at its confluence with the Hassayampa River. The stream gradient for Sols Wash is about 1.2 percent, or 65 feet per mile. The average Gila River stream gradient at gage 95165 is 0.5 percent, or 24 feet per mile. The change in channel slope is constant with the change of topographic conditions of the drainage area found between gaging stations. For drainage subareas and peak discharge concentration points, the study reach for Sols Wash extends from River Street to the town limits. The headwaters for the stream originate in the Date Creek Mountains to the west of the town. The development along Sols Wash currently consists of light residential with some mobile home park(s). Anticipated future development is expected to consist primarily of single family homes. Sols Wash consists of two main channels paralleling one another, divided by an island approximately three to five feet high. The channels begin to diverge in the upper reaches of the watershed, and converge at the downstream end of the watershed, just east of the confluence with Hospital Wash.

The climate in these drainage basins varies with latitude and elevation. Wickenburg is in an arid, sub-tropical climatic zone characterized by hot summers, mild winters, and infrequent rain fall. Extremes in temperatures recorded in Wickenburg are 10 degrees F and 117 degrees F. The average maximum temperature is 82.7 degrees F; the average minimum temperature is 46.8 degrees F (Reference 3). The mean

annual precipitation in the area ranges from 11 inches in the lower desert to about 30 inches in the higher mountains, and averages about 18 inches over the total area.

Vegetation varies with latitude and elevation. In the northern portion of this watershed, which is mountainous, heavy forest can be found with chaparral cover prevailing as elevations decline. In the central region, chaparral growth predominates with juniper, palo verde, mesquite and scrub oak trees also present. The southern portion is best characterized by typical desert terrain which is sparse and includes cacti and other desert shrubs. In general, vegetation in the basin is sparse. Cacti, along with other desert shrubs, grow throughout the region on the fairly level areas. A few stunted trees, including juniper, palo verde, mesquite, ironwood and scrub oak, exist among the shrubs. The vegetation tends to be thicker along, and adjacent to, the stream courses. Perennial grasses form a small portion of the vegetation; however, a good cover of annual grasses develops after winter rains.

2.3 *Principal Flood Problems*

During the summer months, tropical storms or their remains are an important source of rainfall and runoff in Arizona. These storms are responsible for some of the most devastating floods throughout the area. The probability that tropical storms will produce even more damage in the future is high. A study of the frequency of tropical storms estimated the highest annual probability of tropical storms for the southwestern United States as 10 percent (Reference 4).

Damaging floods on the Hassayampa River, the main drainage way in the area, are known to have occurred in Wickenburg as early as 1890. Large floods have occurred in 1916, 1919,

1921, 1923, 1925, 1927, 1935, 1937, 1938, 1951, 1958, 1963 and 1970. The flood of September, 1970 had the largest recorded peak discharge since records were instituted in 1916. The peak discharge of this flood is estimated to have been 58,000 cubic feet per second (cfs). The flood of 1890, however, was a worse disaster in terms of loss of life. In addition, the local newspaper reports that severe local storms and floods have occurred in the town in 1945, 1953, 1955, 1957 and 1959.

The Highway 89 bridge over Sols Wash and the Highway 60 bridge over the Hassayampa River are the major man-made obstructions to the floodwater from these water-courses. During floods, brush growing in floodways can impede floodflows, thus causing backwater and increased flood heights. Brush may be washed out and carried downstream to collect on bridges and culverts, creating a damming effect and raised water-surface elevations. In general, obstructions restrict flood flows and cause overbank flows, unpredictable areas of flooding, destruction of or damage to bridges and culverts, and increased velocity of flow immediately downstream of these structures.

In addition, an earth embankment constructed across Sols Wash directs flow into a channel leading out of the drainage area. This structure is located adjacent to Sols Tank and intercepts a drainage area of approximately 58 square miles. Based on field measurements and normal depth calculations, it is expected that a discharge exceeding 4,000 cfs will overtop portions of the structure and eventually contribute to its failure. The United States Geological Survey quadrangle map titled "Congress SW, Arizona" dated 1969, shows the earth embankment structure. Inquiries to Maricopa County, Yavapai County, SCS, and the Town of Wickenburg have failed to reveal the public agency or firm responsible for its construction or design

specifications for the structure. Because of the many unknowns and probable failure of the structure in a 100-year event, all hydrologic computations in this study include this 58 square mile area.

2.4 *Flood Protection Measures*

Flood control dams were constructed in 1976 by the Soil Conservation Service The FCD on both Sunny Cove and Sunset Washes. Both dams are earthfill structures with ungated outlets and are designed to control all flows up to and including a 100-year flood. The Sunny Cover Dam has a drainage area of 1.35 square miles while Sunset Dam has a drainage area of 0.60 square miles. The TR-20 computer input for this study does not account for these structures for three reasons. First, these structures, which control only 1.95 square miles of the total drainage area, will have a very minimal effect at gaging station 95165, with a watershed area of 774 square miles. Second, these structures do not contribute directly or indirectly to Sols Wash, the tributary being analyzed for hydrology in this study. Third, the majority of the historical flood flows which have been utilized in the statistical analysis to establish a discharge-frequency relationship at gaging station 95165 occurred prior to the existence of these structures.

The Town of Wickenburg presently has a floodplain ordinance which prohibits any new construction within the 50-year floodplain of any flooding source within the community.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100- or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100- and 500-year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equalled or exceeded during any one year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of this study's completion. The analyses reported herein reflect current conditions in the watersheds of the flooding sources. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for Sols Wash.

The original Flood Insurance Study (Reference 1), performed in 1975 by the U.S. Army Corps of Engineers (COE), computed

a discharge-frequency curve for Sols Wash using a derivation of the discharge-frequency curve developed for the Indian Bend Wash in the Phoenix-Scottsdale area.

In an earlier study, the SCS developed a TR-20 model for the Sols Wash watershed. Curve numbers for this study were adjusted downward to reflect the effects of channel infiltration.

In 1981, PRC Toups Engineering performed a hydrologic analysis (Reference 5) of both Sols Wash and the Hassayampa River for the Town of Wickenburg. Using stream gauge data available for the Hassayampa River, both upstream and downstream of the confluence with Sols Wash, discharge-frequency curves were developed using a Log-Pearson Type III distribution. The results from this analysis were used to calibrate a TR-20 model developed for the watersheds of the Hassayampa River and Sols Wash. A limited number of sub-watersheds were used in the model and, in particular, only two sub-basins were used to model the entire Sols Wash Watershed.

As a result of the above studies which yielded peak discharges significantly less than the original Flood Insurance Study, the Town of Wickenburg requested a re-study.

The Soil Conservation Service's (SCS) computer model, TR-20, was selected to be used to estimate the 10-, 50-, 100- and 500-year peak discharges for various concentration points along Sols Wash. The TR-20 model utilizes the method of analysis described in detail in the SCS National Engineering Handbook Section 4, Hydrology, 1972. This method allows for the prediction of surface water runoff, for an individual watershed, using rainfall duration and intensity data. The TR-20 model provides a convenient means of predicting the

results of storm runoff from multiple watersheds. The storm runoff for individual watersheds is computed and an outflow hydrograph simulated. Individual hydrographs may then be routed and combined to obtain the cumulative downstream effect(s) (References 6, 7, 8, 9, 10, 11, 12, 13 and 14).

The precipitation frequencies for the area were obtained from isopluvial maps prepared by the U.S. Weather Bureau (Miller, et. al., 1973). The SCS Type II rainfall distribution was used to model the rainfall which was adjusted using an areal reduction based upon the total drainage area. Such reduction is necessary to convert from the point areal rainfall amount. Using soils maps of the area, prepared by the SCS, and from site investigation, runoff curve numbers were selected, based upon recent information developed by the SCS. Time of concentrations for steep and incised washes were computed using the Kirpich equation. For gently sloping alluvial plains, much of which occur on the upper northwest portion of the drainage basin, travel velocities were estimated assuming broad sheet flow and utilizing Manning's equation.

Since there is no gauging station on Sols Wash, and therefore no accurate record of historic floods, there is no means to provide calibration of the rainfall-runoff model and only a comparison with earlier studies is possible.

The discharge estimates obtained from the TR-20 analysis for this study, compare well with the results from both the SCS and PRC Toups. The discharge-frequency curve developed by the COE for the 1977 Flood Insurance Study has a steeper slope and results in a much larger 100-year peak discharge than the other studies. The SCS, PRC and CBA studies each employed the TR-20 model which might explain, in part, the closeness of the results although the TR-20 is quite sensitive to changes in time of concentration and each model employed different input parameters.

The calibration of the TR-20 model, by PRC, using streamflow data from the Hassayampa River, lends further credence to each of the study results. Therefore, results from the TR-20 model utilized in this re-study of Sols Wash will be employed in the hydraulic analysis. The Summary of Discharges is incorporated in the attached "Hydrologic Analysis for Sols Wash for FEMA" by Cella Barr Associates, November 1985.

3.2 *Hydraulic Analyses*

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the backwater analyses were obtained from topographic maps, at a scale of 1 inch = 200 feet and 2-foot contour intervals, prepared specifically for this project by Cooper Aerial Survey, flown in March, 1986 (Reference 15). Culvert and bridge data were obtained from the topographic maps and were field-checked to verify structural geometry. Locations of selected cross-sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). Sols Wash included a floodway analysis (Section 4.2), therefore selected cross-section locations are also shown on the Flood Boundary and Floodway Maps (Exhibit 2).

Detailed methods were used to determine the water-surface elevations for the various frequency floods using the U.S. Army Corps of Engineers HEC-2 step backwater computer program (Reference 16).

Hydraulic roughness factors (Manning's "n") used in the hydraulic computations, were chosen by engineering judgment and based on field observations of the streams and floodplain areas. Roughness values ranged from .025 to .045 for the channels and from .05 to 1.0 for the overbank areas.

Starting water-surface elevations were computed using the slope area method at cross-sections downstream from the study reach.

Flood profiles were drawn showing computer water-surface elevations to an accuracy of 0.5 foot for the 100-year flood.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps, and are described in the attached Tables.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing floodplain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps (Reference 15).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increased flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain

development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (see attached Tables).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

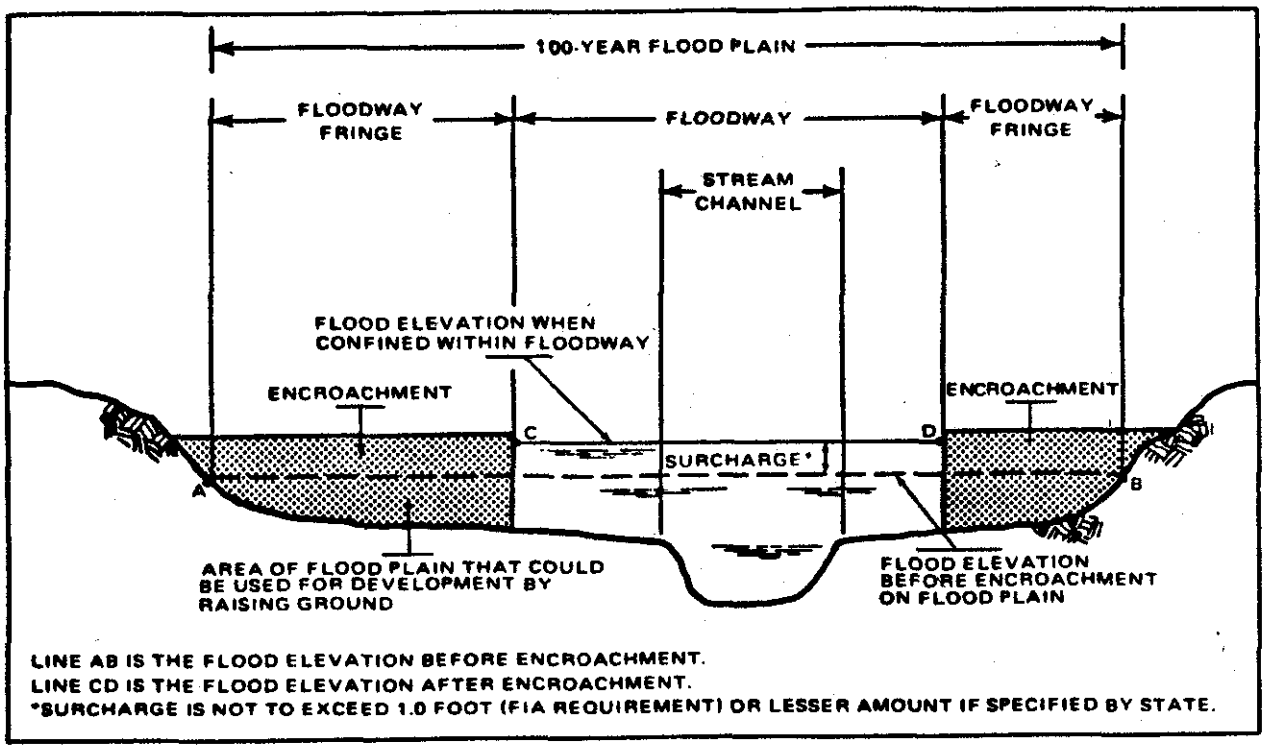


Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the incorporated areas of Sols Wash, Wickenburg, Arizona.

5.1 Reach Determinations

Reaches are defined as sections of floodplain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the incorporated areas of Wickenburg, Arizona, are shown on the Flood Profiles and summarized in the attached Tables.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage

relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 *Flood Insurance Zones*

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zones A1 through A30 - Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHF's.

Zone B - Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- and 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C - Areas of minimal flooding; not subdivided.

Flood elevation differences, FHF's, flood insurance zones, and base flood elevations for Sols Wash are summarized in the attached tables.

5.4 *Flood Insurance Rate Map Description*

The flood Insurance Rate Map for the incorporated areas of the Town of Wickenburg, Arizona is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

A Flood Insurance Study for the Town of Wickenburg (Reference 1) has been published, and contains a detailed analysis for Sols Wash. This re-study determined new frequency flows, and determined associated profiles, flood boundary and floodway maps, and flood insurance rate maps.

Other studies available with respect to flooding in the Town of Wickenburg, specifically Sols Wash, have been reviewed in preparation of this report and include Floodplain Information - Hassayampa River in the Vicinity of Wickenburg, Arizona (Reference 17); Floodplain Information Study for Maricopa County, Arizona - Wickenburg Report Volume IV (Reference 18); and, Flood Hazard Boundary Maps, Arizona (Reference 19).

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein supersedes all previous determinations and Flood Insurance Rate Maps for Sols Wash.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, FEMA Region IX, Presidio of San Francisco, San Francisco, California 94129.

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CELLA BARR ASSOCIATES

HYDROLOGIC ANALYSIS OF SOLS WASH,
INCORPORATED TOWN OF WICKENBURG, ARIZONA
FOR
FEDERAL EMERGENCY MANAGEMENT AGENCY

NOV 20 1985

NOVEMBER, 1985
CBA FILE NO. 03800-03

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APPENDICES

A. PRECIPITATION FREQUENCIES
B. CURVE NUMBERS AND TIME OF CONCENTRATIONS
C. TR-20 RESULTS

1.0 INTRODUCTION

Cella Barr Associates (CBA) has been contracted, by the Federal Emergency Management Agency (FEMA), to perform a detailed Flood Insurance Study of Sols Wash, for the incorporated Town of Wickenburg, Arizona. The results from this study will supersede an existing Flood Insurance Study, performed by the U.S. Army Corps of Engineers in 1977. The hydrology for Sols Wash has been analyzed by various authorities with conflicting results, as discussed later.

The purpose of this report is to re-evaluate the 100-year peak discharge proposed for use in the Flood Insurance Study for Sols Wash near Wickenburg, Arizona, and to solicit review comments, if any. Peak discharges for the 10, 50, 100 and 500-year events have been developed and are summarized in this report. These discharges are proposed for use in determining water surface elevations as well as the corresponding flood hazard factors to be employed in accordance with the Flood Insurance Study Guidelines and Specifications.

2.0 STUDY LOCATION

The Town of Wickenburg is located approximately 53 miles northwest of Phoenix, Arizona, on U.S. Highway 60 (Figure 1). The area of study for the hydraulic analysis is a 1.5 mile reach of Sols Wash, extending upstream from the confluence with the Hassayampa River to the corporate limits (Figure 2). The area covered by this hydrologic analysis however, encompasses a drainage area of approximately 146 square miles extending northwest into the Date Creek Mountains, within both Maricopa and Yavapai Counties.

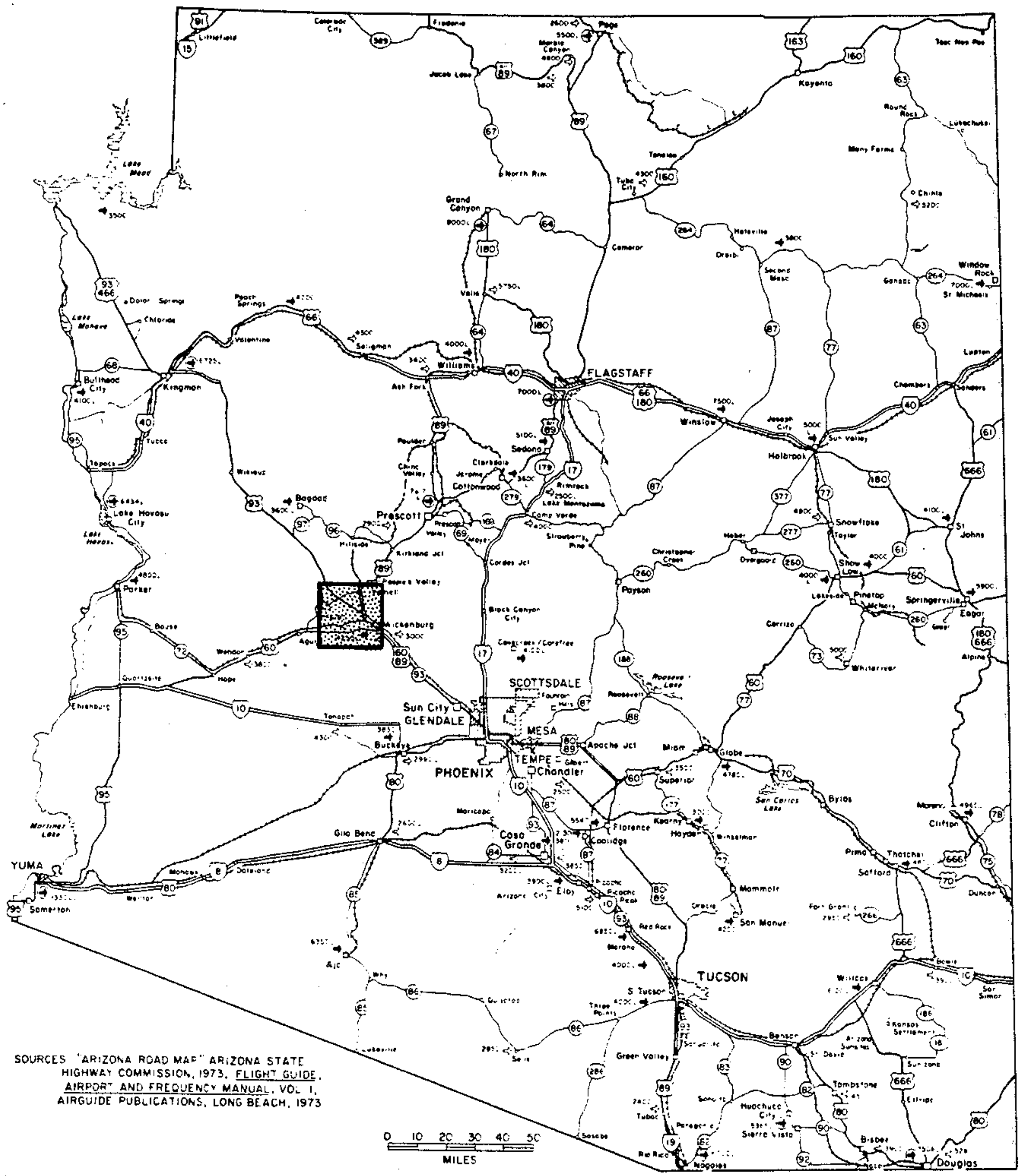
This area is characterized by broad, featureless, valleys between north trending mountains. The topography consists of a series of hills, mountains, alluvial fans and plains. Elevations range from a high of 4,920 feet in the Date Creek Mountains to a low of only 2,030 feet at the mouth of Sols Wash where it joins the Hassayampa River. The resulting slopes vary from less than 1 to over 14 percent.

The climate of this locale is primarily semi-desert with the annual precipitation averaging 11 inches and occurring predominantly in the summer or winter. The summer rains are associated with moist air that enters the state from the Gulf of Mexico producing moderate to intense afternoon and evening thundershowers (Sellers and Hill, 1973). Winter precipitation, however, originates from the Pacific Ocean and is much less severe.

There are marked differences in vegetation within relatively short distances because of a wide variation in soils, elevation, precipitation and temperature. Typical desert vegetation, found at the lower elevations near Wickenburg include: creosote bush, palo verde and several varieties of cacti. The intermediate elevations are characterized by: grass, chaparral, pinyon, pine and juniper; while, the higher elevations are marked predominantly by the presence of oak and chaparral woodland.

Figure 1: Location Map.

FIGURE 1: LOCATION MAP
WICKENBURG FLOOD INSURANCE STUDY



DENOTES AREA OF STUDY

Figure 2: Study Reaches.

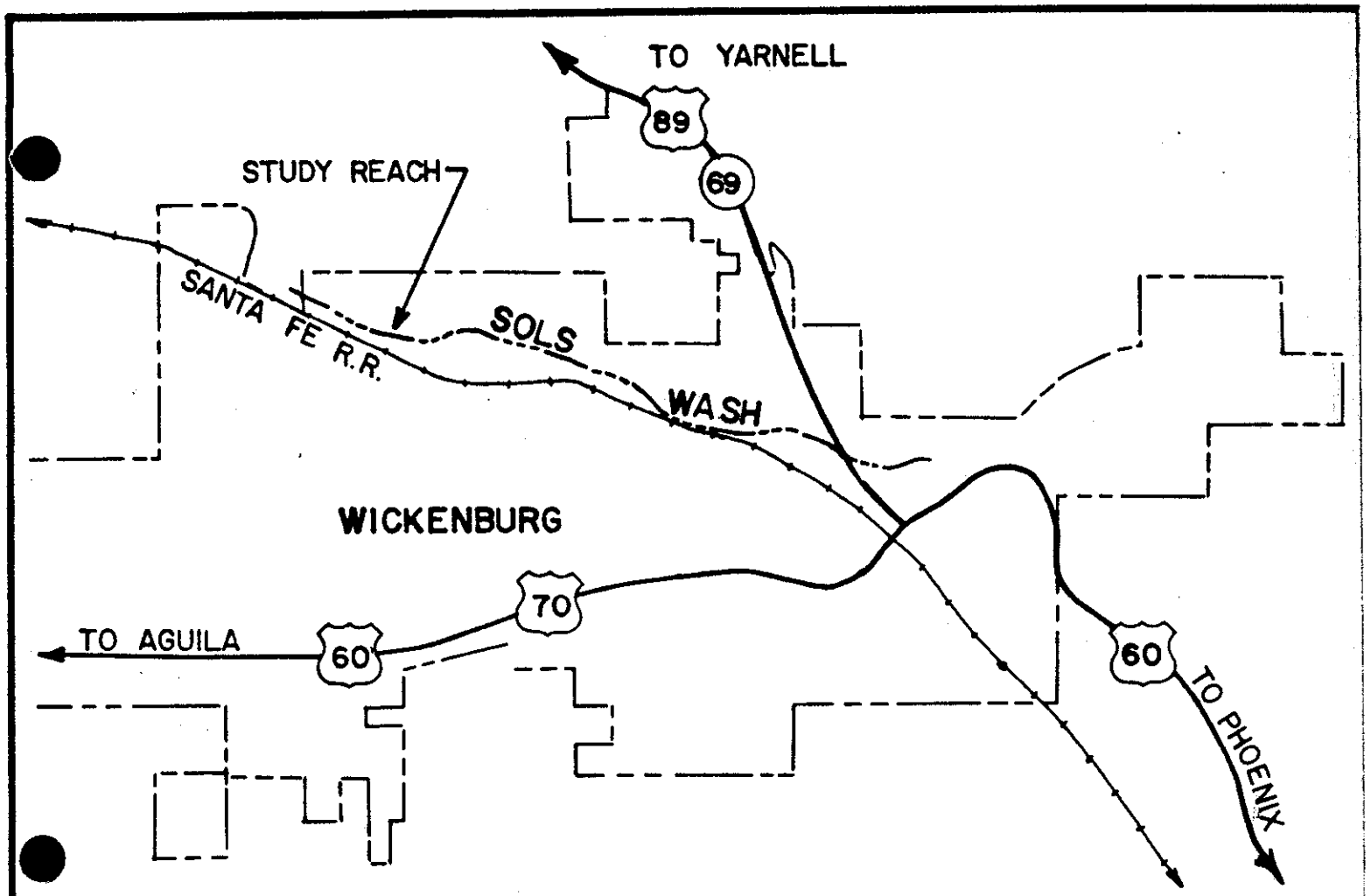


FIGURE 2:

VICINITY MAP

N

N.T.S.

3.0 SOILS

The geology of this region is composed primarily of igneous rocks which have exerted a strong influence on the soil development. Therefore, the types, ages, and physical properties of the soil changes throughout the basin in accordance with the sediments that have eroded off the adjacent mountains. Within the two counties there are approximately five (5) major soil classifications, which are:

1) Anthony - Mohave sandy loams (ArA); 1-3% slope; Group B;
2) Cave - Continental gravelly sandy loams (CID); 2-30% slope; Group C and D;
3) Latene - Mohave complex (Lc); 0-3% slope; Group B;
4) Vekol - Mohave complex (Vm); Group B; and finally
5) Cellar - Lehmans - Rock Outcrop Association; 5-60% slope; Group C and D (SCS, 1976 and 1973).

These soils can be divided into two general types; those found on the gentle sloping plains and alluvial fans, and those found in the mountains and low hills. The soils of the plains and alluvial fans are predominantly gravelly, sandy loams. In some locations, caliche is found just below the surface. In the mountains and hilly areas, the soils are generally very shallow underlain by rock outcrops of granite and volcanics. Bedrock is often found just below the surface, covered by a thin layer of cobbles and stones.

4.0 PREVIOUS STUDIES

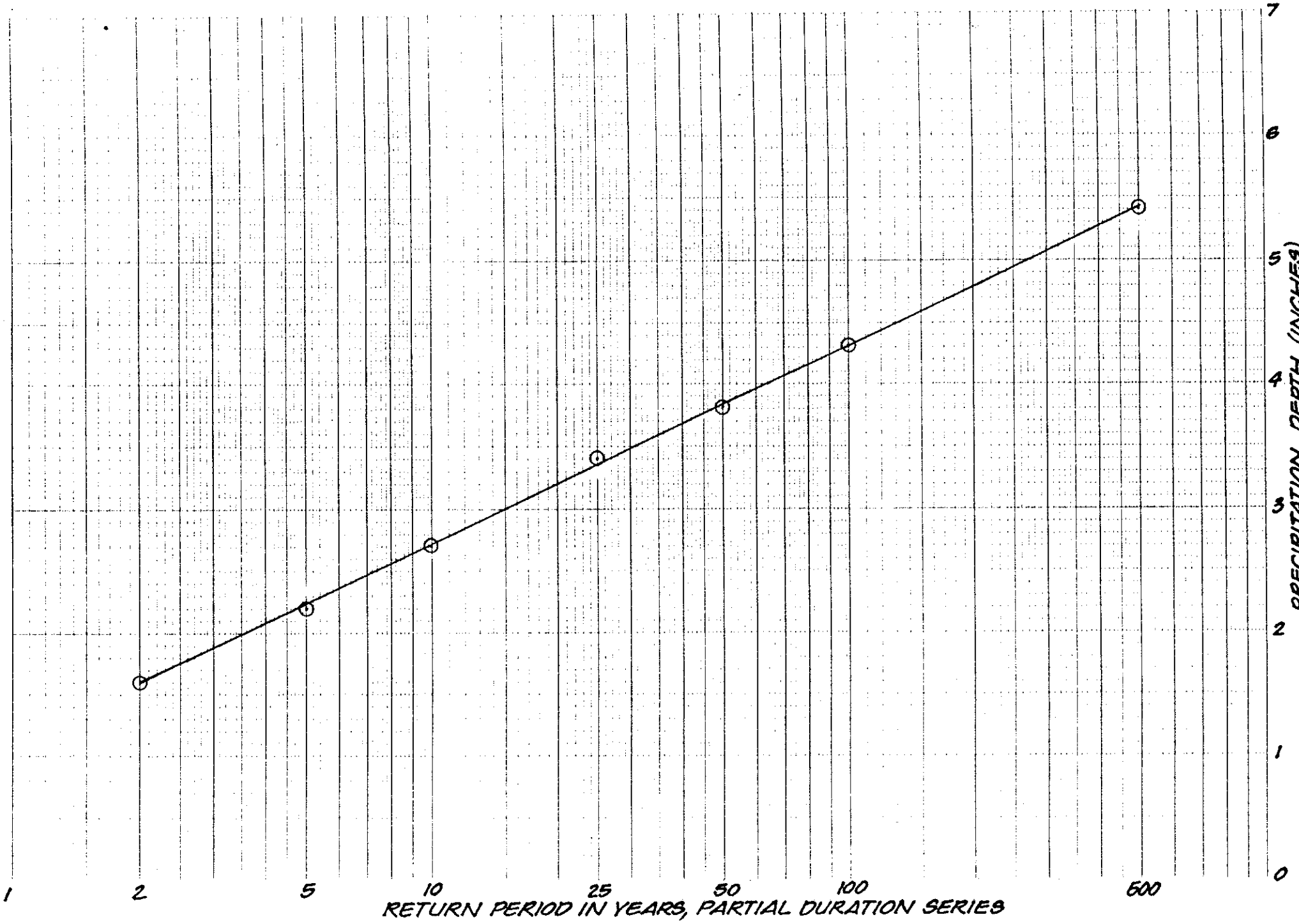
The original Flood Insurance Study, performed in 1975 by the U.S. Army Corps of Engineers (C.O.E.), computed a discharge-frequency curve for Sols Wash using a derivation of the discharge-frequency curve developed for the Indian Bend Wash in the Phoenix-Scottsdale area.

In an earlier study, the SCS developed a TR-20 model for the Sols Wash watershed, the results of which are presented in Table 1. Curve numbers for this study were adjusted downward to reflect the effects of channel infiltration.

In 1981, PRC Toups Engineering, performed a hydrologic analysis of both Sols Wash and the Hassayampa River, for the Town of Wickenburg. Using stream gauge data available for the Hassayampa River, both upstream and downstream of the confluence with Sols Wash, discharge-frequency curves were developed using a Log-Pearson Type III distribution. The results from this analysis were used to calibrate a TR-20 model developed for the watersheds of the Hassayampa River and Sols Wash. A limited number of sub-watersheds were used in the model and, in particular, only two sub-basins were used to model the entire Sols Wash Watershed.

The results of each one of these hydrology studies are summarized in Table 1 along with the results from this study.

PRECIPITATION DEPTH — RETURN PERIOD
(PARTIAL-DURATION SERIES)



5.0 METHODOLOGY

The Soil Conservation Service's (SCS) computer model, TR-20, was used to estimate the 10-, 50-, 100- and 500-year peak discharges for various concentration points along Sols Wash. The TR-20 model utilizes the method of analysis described in detail in the SCS National Engineering Handbook Section 4, Hydrology, 1972. This method allows the prediction of surface water runoff, for an individual watershed, using rainfall duration and intensity data. The TR-20 model provides a convenient means of predicting the results of storm runoff from multiple watersheds. The storm runoff for individual watersheds is computed and an outflow hydrograph simulated. Individual hydrographs may then be routed and combined to obtain the cumulative downstream effect(s).

The drainage areas and tributaries contributing to flows in each study reach are shown in Figure 3 and are numbered in accordance with the TR-20 model. Individual control points and program sequencing are illustrated in Figure 4 and are shown schematically in Figure 5.

The precipitation frequencies for the area were obtained from isopluvial maps prepared by the U.S. Weather Bureau (Miller, et.al., 1973) and the resulting analysis is presented in Appendix A. The SCS Type II rainfall distribution was used to model the rainfall which was adjusted using an areal reduction based upon the total drainage area. Such reduction is necessary to convert from the point areal rainfall amount. Using soils maps of the area, prepared by the SCS, and from site investigation, runoff curve numbers were selected, based upon recent information developed by the SCS, and are listed in Appendix B. Time of concentrations for steep and incised washes were computed using the Kirpich equation as shown below:

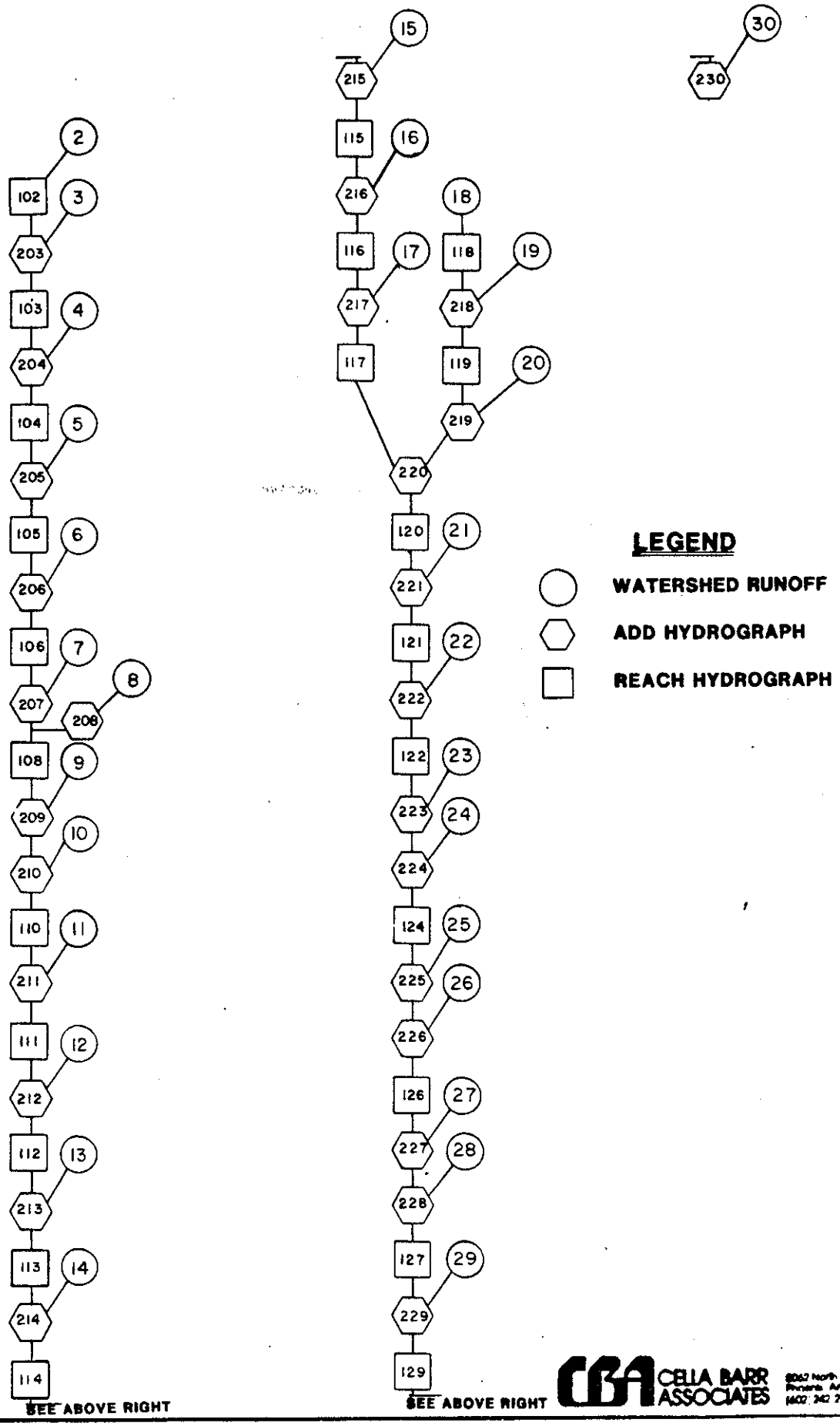
$$T_c = \frac{L^{1.15}}{7700\ H^{0.38}}$$

where: T_c = Time of Concentration (hours)
L = Length of Drainage Area (feet)
H = Change in Elevation (feet).

For gently sloping alluvial plains, much of which occur on the upper northwest portion of the drainage basin, travel velocities were estimated assuming broad sheet flow and utilizing Manning's equation.

FIGURE 5: TR-20 CODING SCHEMATIC

FIGURE 5: SOLS WASH TR-20 CODING SCHEMATIC



6.0 RESULTS

Results from the TR-20 model for the entire Sols Wash drainage basin are presented in Appendix C for the 2-, 10-, 50-, 100- and 500-year storm events. The model was run using the input parameters summarized in Appendix B which were based upon field investigation and guidelines established by the SCS.

For comparative purposes, the results of all the preceeding studies, and results from this study are summarized in Table 1, for the discharge point of Sols Wash at its confluence with the Hassayampa River. As a further comparison, results from each of the studies are plotted in the form of discharge-frequency curves in Figure 6.

Since there is no gauging station on Sols Wash, and therefore no accurate record of historic floods, there is no means to provide calibration of the rainfall-runoff model and only a comparison with earlier studies is possible.

The discharge estimates obtained from the TR-20 analysis for this study, compare well with the results from both the SCS and PRC Toups. The discharge-frequency curve developed by the COE for the 1977 Flood Insurance Study has a steeper slope and results in a much larger 100-year peak discharge than the other studies. The SCS, PRC and CBA studies each employed the TR-20 model which might explain, in part, the closeness of the results although the TR-20 is quite sensitive to changes in time of concentration and each model employed different input parameters.

The calibration of the TR-20 model, by PRC, using streamflow data from the Hassayampa River, lends further credence to each of the study results. It is thus proposed that the results from the CBA study, as detailed hereon and summarized in Table 1, be employed in the hydraulic analysis.

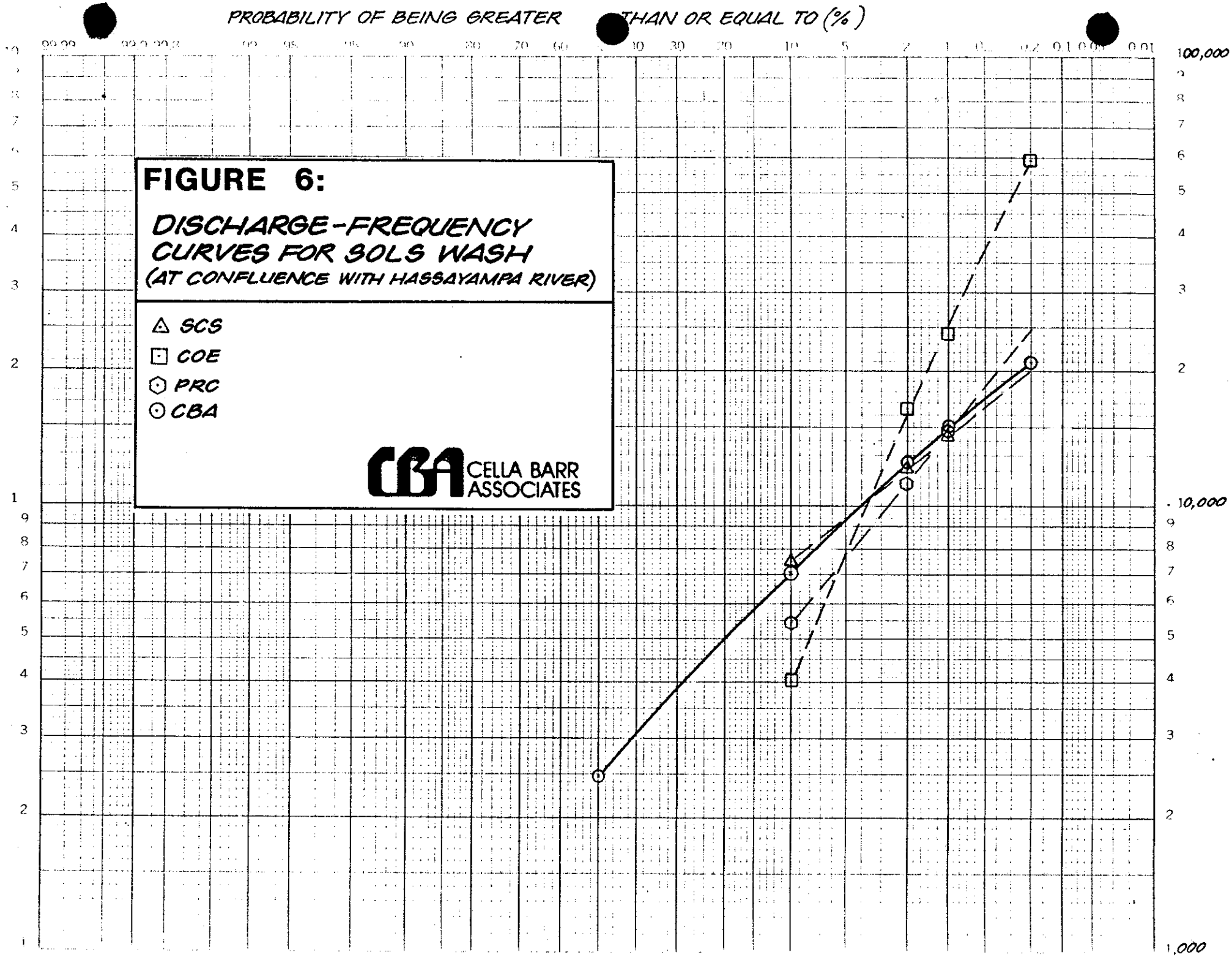
TABLE 1

COMPARISON OF DISCHARGES

FLOODING SOURCE	METHOD	PEAK DISCHARGES (cfs) 10-year	50-year	100-year	500-year
Sols Wash at confluence w/ Hassayampa					
	PRC[1]	5,400	11,200	14,700	-
	COE[2]	4,000	16,500	24,000	59,000
	SCS[3]	7,500	12,100	14,400	-
	CBA[4]	7,000	12,500	15,000	20,800

1. See report by PRC Toups (1981).
2. See hydrology by U.S. Army Corps of Engineers for July, 1977 Flood Insurance Study.
3. 10- and 50-year values extrapolated using 100- and 25-year discharges (See report by PRC Toups).
4. See Appendix C.

FIGURE 6: DISCHARGE-FREQUENCY CURVES
SOLS WASH


PROBABILITY OF BEING GREATER THAN OR EQUAL TO (%)
FIGURE 6:
DISCHARGE-FREQUENCY CURVES FOR SOLS WASH
(AT CONFLUENCE WITH HASSAYAMPA RIVER)
SCS
COE
PRC
CBA
CELLA BARR ASSOCIATES
100,000
10,000
1,000

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APPENDIX A:

PRECIPITATION FREQUENCIES

Return Period (Years)	Precipitation Values (inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.4	1.4	1.6	1.6
5	1.9	1.9	2.2	2.2
10	2.2	2.2	2.7	2.7
25	2.7	2.6	3.4	3.3
50	3.1	3.0	3.8	3.8
100	3.4	3.4	4.2	4.3

500-Year Precip. determined from extrapolation

Apply areal reduction of 0.92 based upon D.A. = 145 mi²

APPENDIX B:

CURVE NUMBERS AND TIME OF CONCENTRATIONS

Sub-basin Characteristics.

Area No.	Area (mi^2)	Drainage Length (feet)	Max. Elev. (feet)	Min. Elev. (feet)	Curve No.	Tc (hours)
2	10.3	50,000	4,920	2,715	77	6.74
3	4.9	37,200	4,920	2,710	77	5.82
4	5.4	42,900	4,360	2,680	77	6.25
5	13.2	46,000	4,920	2,655	77	6.19
6	13.9	54,500	4,539	2,645	77	8.82
7	2.7	20,000	2,820	2,610	77	3.65
8	2.1	24,000	2,995	2,615	77	4.76
9	4.2	46,400	3,477	2,565	77	9.13
10	1.0	9,600	2,680	2,585	77	1.50
11	16.3	58,000	3,200	2,435	77	11.50
12	1.8	18,400	2,630	2,400	77	3.65
13	0.7	8,100	2,450	2,380	77	0.51
14	10.2	38,400	3,043	2,380	88	5.10
15	4.1	34,400	2,785	2,375	85	5.17
16	7.1	44,800	3,080	2,315	88	3.46
17	0.9	10,400	3,066	2,315	88	0.70
18	9.2	60,400	3,100	2,380	77	9.07
19	7.5	37,000	2,840	2,290	85	5.40
20	0.8	12,000	2,450	2,230	88	0.90
21	3.0	24,000	2,635	2,260	88	1.63
22	1.2	12,800	2,450	2,235	88	0.93
23	4.5	28,400	2,678	2,170	88	1.31
24	6.8	46,400	3,225	2,170	88	2.73
25	3.0	25,200	2,690	2,125	88	2.10
26	9.1	44,000	3,382	2,125	88	4.70
27	1.2	11,500	2,125	2,060	88	0.62
28	0.4	8,000	2,244	2,060	88	0.63
29	1.6	19,200	2,525	2,050	88	1.70
30	0.1	2,500	2,050	2,035	88	0.17

APPENDIX C:

TR-20 RESULTS

1 SOLS WASH, TOWN OF WICKENBURG FLOOD INSURANCE STUDY
0 TR-20 HYDROLOGY
PROGRAM DATE - FEB. 14, 1974 S/360
PASS= 1

EXECUTIVE CONTROL CARD OPERATION LIST

LISTING OF DATA IN CORE

0 0 SOLS WASH, TOWN OF WICKENBURG FLOOD INSURANCE STUDY

VELOCITY INCREMENT
1 CTABLE 0.2000

8	0.0000	0.0800	0.1800	0.2500	0.3200
8	0.3700	0.4100	0.4500	0.4900	0.5100
8	0.5400	0.5700	0.5900	0.6100	0.6300
8	0.6500	0.6600	0.6700	0.6900	0.7000
8	0.7100	0.7200	0.7300	0.7400	0.7500
8	0.7600	0.7700	0.7700	0.7800	0.7900
8	0.7900	0.8000	0.8100	0.8100	0.8200
8	0.8200	0.8300	0.8300	0.8400	0.8400
8	0.8400	0.8500	0.8500	0.8600	0.8600
8	0.8600	0.8600	0.8700	0.8700	0.8700
8	0.8800	0.8800	0.8800	0.8900	0.8900
8	0.8900	0.8900	0.8900	0.8900	0.9000
8	0.9000	0.9000	0.9000	0.9000	0.9100
8	0.9100	0.9100	0.9100	0.9100	0.9100
8	0.9200	0.9200	0.9200	0.9200	0.9200
8	0.9200	0.9200	0.9200	0.9300	0.9300

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 102 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	105.0000	85.0000
8	2.0000	666.0000	340.0000
8	3.0000	1964.0000	765.0000
8	4.0000	4229.0000	1360.0000
8	5.0000	7668.0000	2125.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 103 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	185.0000	84.0000
8	2.0000	598.0000	176.0000
8	3.0000	1200.0000	276.0000
8	4.0000	1980.0000	384.0000
8	5.0000	2940.0000	500.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA

```
2 XSECTN   104              1.0000

                        ELEVATION   DISCHARGE    END AREA
8                          0.0000      0.0000      0.0000
8                          1.0000    208.0000     88.0000
8                          2.0000    688.0000    192.0000
8                          3.0000   1413.0000    312.0000
8                          4.0000   2387.0000    448.0000
8                          5.0000   3620.0000    600.0000
8                          6.0000   6080.0000   1200.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   105              1.0000

                        ELEVATION   DISCHARGE    END AREA
8                          0.0000      0.0000      0.0000
8                          1.0000    208.0000     88.0000
8                          2.0000    688.0000    192.0000
8                          3.0000   1413.0000    312.0000
8                          4.0000   2387.0000    448.0000
8                          5.0000   3620.0000    600.0000
8                          6.0000   6080.0000   1200.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   106              1.0000

                        ELEVATION   DISCHARGE    END AREA
8                          0.0000      0.0000      0.0000
8                          1.0000    388.0000    180.0000
8                          2.0000   1223.0000    360.0000
8                          3.0000   2386.0000    540.0000
8                          4.0000   3827.0000    720.0000
8                          5.0000   5512.0000    900.0000
8                          6.0000   7175.0000   1600.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   108              1.0000

                        ELEVATION   DISCHARGE    END AREA
8                          0.0000      0.0000      0.0000
8                          1.0000   1156.0000    500.0000
8                          1.5000   2269.0000    750.0000
8                          2.0000   3660.0000   1000.0000
8                          2.5000   5301.0000   1250.0000
8                          3.5000   7130.0000   2050.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   110              1.0000

                        ELEVATION   DISCHARGE    END AREA
8                          0.0000      0.0000      0.0000
8                          1.0000    430.0000    180.0000
8                          2.0000   1494.0000    420.0000
8                          3.0000   3208.0000    720.0000
8                          4.0000   5641.0000   1080.0000
8                          5.0000   8866.0000   1500.0000
8                          6.0000  14300.0000   2300.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   111              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                         0.0000      0.0000      0.0000
8                         1.0000    430.0000    180.0000
8                         2.0000   1494.0000    420.0000
8                         3.0000   3208.0000    720.0000
8                         4.0000   5641.0000   1080.0000
8                         5.0000   8866.0000   1500.0000
8                         6.0000  14300.0000   2300.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   112              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                         0.0000      0.0000      0.0000
8                         1.0000    430.0000    180.0000
8                         2.0000   1494.0000    420.0000
8                         3.0000   3208.0000    720.0000
8                         4.0000   5641.0000   1080.0000
8                         5.0000   8866.0000   1500.0000
8                         6.0000  14300.0000   2300.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   115              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                         0.0000      0.0000      0.0000
8                         1.0000    430.0000    180.0000
8                         2.0000   1494.0000    420.0000
8                         3.0000   3208.0000    720.0000
8                         4.0000   5641.0000   1080.0000
8                         5.0000   8866.0000   1500.0000
8                         6.0000  14300.0000   2300.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   116              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                         0.0000      0.0000      0.0000
8                         1.0000    430.0000    180.0000
8                         2.0000   1494.0000    420.0000
8                         3.0000   3208.0000    720.0000
8                         4.0000   5641.0000   1080.0000
8                         5.0000   8866.0000   1500.0000
8                         6.0000  14300.0000   2300.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   117              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                         0.0000      0.0000      0.0000
8                         1.0000    430.0000    180.0000
8                         2.0000   1494.0000    420.0000
8                         3.0000   3208.0000    720.0000
```

8	4.0000	5641.0000	1080.0000
8	5.0000	8866.0000	1500.0000
8	6.0000	14300.0000	2300.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 116 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	974.0000	300.0000
8	2.0000	3079.0000	600.0000
8	3.0000	6025.0000	900.0000
8	4.0000	9689.0000	1200.0000
8	5.0000	13994.0000	1500.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 119 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	974.0000	300.0000
8	2.0000	3079.0000	600.0000
8	3.0000	6025.0000	900.0000
8	4.0000	9689.0000	1200.0000
8	5.0000	13994.0000	1500.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 120 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	974.0000	300.0000
8	2.0000	3079.0000	600.0000
8	3.0000	6025.0000	900.0000
8	4.0000	9689.0000	1200.0000
8	5.0000	13994.0000	1500.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 121 1.0000

	ELEVATION	DISCHARGE	END AREA
8	0.0000	0.0000	0.0000
8	1.0000	974.0000	300.0000
8	2.0000	3079.0000	600.0000
8	3.0000	6025.0000	900.0000
8	4.0000	9689.0000	1200.0000
8	5.0000	13994.0000	1500.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 122 1.0000

	ELEVATION	DISCHARGE	END AREA
8	2210.0000	0.0000	0.0000
8	2211.0000	370.0000	130.0000
8	2212.0000	1620.0000	335.0000
8	2213.0000	3550.0000	570.0000

8	2214.0000	6280.0000	840.0000
8	2215.0000	9625.0000	1135.0000
8	2216.0000	15115.0000	1670.0000
8	2217.0000	22280.0000	1770.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 124 1.0000

	ELEVATION	DISCHARGE	END AREA
8	2134.0000	0.0000	0.0000
8	2135.0000	345.0000	160.0000
8	2136.0000	2340.0000	645.0000
8	2137.0000	6830.0000	1325.0000
8	2138.0000	13570.0000	2125.0000
8	2139.0000	22670.0000	3040.0000
8	2140.0000	34230.0000	4070.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 125 1.0000

	ELEVATION	DISCHARGE	END AREA
8	2075.0000	0.0000	0.0000
8	2076.0000	185.0000	55.0000
8	2077.0000	610.0000	120.0000
8	2078.0000	1390.0000	245.0000
8	2079.0000	2625.0000	400.0000
8	2080.0000	4370.0000	575.0000
8	2081.0000	7105.0000	910.0000
8	2082.0000	11610.0000	1605.0000
8	2083.0000	20250.0000	2505.0000
8	2084.0000	29100.0000	3445.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 126 1.0000

	ELEVATION	DISCHARGE	END AREA
8	2075.0000	0.0000	0.0000
8	2076.0000	185.0000	55.0000
8	2077.0000	610.0000	120.0000
8	2078.0000	1390.0000	245.0000
8	2079.0000	2625.0000	400.0000
8	2080.0000	4370.0000	575.0000
8	2081.0000	7105.0000	910.0000
8	2082.0000	11610.0000	1605.0000
8	2083.0000	20250.0000	2505.0000
8	2084.0000	29100.0000	3445.0000

9 ENDTBL

XSECTN NO. DRAINAGE AREA
2 XSECTN 127 1.0000

	ELEVATION	DISCHARGE	END AREA
8	2075.0000	0.0000	0.0000
8	2076.0000	185.0000	55.0000
8	2077.0000	610.0000	120.0000
8	2078.0000	1390.0000	245.0000
8	2079.0000	2625.0000	400.0000
8	2080.0000	4370.0000	575.0000
8	2081.0000	7105.0000	910.0000

```
8                    2082.0000  11610.0000   1605.0000
8                    2083.0000  20250.0000   2505.0000
8                    2084.0000  29100.0000   3445.0000
9 ENDTBL
```

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN   129              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                      2075.0000      0.0000      0.0000
8                      2076.0000    185.0000     55.0000
8                      2077.0000    610.0000    120.0000
8                      2078.0000   1390.0000    245.0000
8                      2079.0000   2625.0000    400.0000
8                      2080.0000   4370.0000    575.0000
8                      2081.0000   7105.0000    910.0000
8                      2082.0000  11610.0000   1605.0000
8                      2083.0000  20250.0000   2505.0000
8                      2084.0000  29100.0000   3445.0000
9 ENDTBL
```

```
                    TIME INCREMENT
4 DIMHYD.

8              0.0000     0.0300     0.1000     0.1900     0.3100
8              0.4700     0.6600     0.8200     0.9300     0.9900
8              1.0000     0.9900     0.9300     0.8600     0.7800
8              0.6800     0.5600     0.4600     0.3900     0.3300
8              0.2800     0.2410     0.2070     0.1740     0.1470
8              0.1260     0.1070     0.0910     0.0770     0.0660
8              0.0550     0.0470     0.0400     0.0340     0.0290
8              0.0250     0.0210     0.0180     0.0150     0.0130
8              0.0110     0.0090     0.0080     0.0070     0.0060
8              0.0050     0.0040     0.0030     0.0020     0.0010
8              0.0000     0.0000     0.0000     0.0000     0.0000
9 ENDTBL

  COMPUTED PEAK K FACTOR =  484.00
```

```
                    TIME INCREMENT
5 RAINFL 2                0.0208

8              0.0000     0.0050     0.0110     0.0160     0.0220
8              0.0280     0.0350     0.0410     0.0480     0.0560
8              0.0630     0.0710     0.0800     0.0890     0.0980
8              0.1090     0.1200     0.1330     0.1470     0.1630
8              0.1810     0.2040     0.2350     0.2830     0.6630
8              0.7350     0.7720     0.7990     0.8200     0.8380
8              0.8540     0.8680     0.8800     0.8910     0.9020
8              0.9120     0.9210     0.9290     0.9370     0.9450
8              0.9520     0.9590     0.9650     0.9720     0.9780
8              0.9840     0.9890     0.9950     1.0000     1.0000
9 ENDTBL
1                   STANDARD CONTROL INSTRUCTIONS
```

```
6 RUNOFF 1   2       4      10.3000     77.0000      6.74001 0 0 1 0 1
6 REACH  3 102   4   1    3000.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1   3       2       4.9000     77.0000      5.82001 0 0 1 0 1
6 ADDHYD 4 203   2 1 5                                    1 0 0 1 0 1
6 RUNOFF 1   4       1       5.4000     77.0000      6.25001 0 0 1 0 1
```

```
6 REACH  3 103   5   2    3400.0000      0.0000      0.00001 0 0 1 0 1
6 ADDHYD 4 204   2 1 6                                     1 0 0 1 0 1
6 REACH  3 104   6   1    4000.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1   5       2      13.2000     77.0000      6.19001 0 0 1 0 1
6 ADDHYD 4 205   1 2 3                                     1 0 0 1 0 1
6 REACH  3 105   3   1    2000.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1   6       2      13.9000     77.0000      8.82001 0 0 1 0 1
6 ADDHYD 4 206   1 2 3                                     1 0 0 1 0 1
6 REACH  3 106   3   1    7800.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1   7       2       2.7000     77.0000      3.65001 0 0 1 0 1
6 ADDHYD 4 207   1 2 3                                     1 0 0 1 0 1
6 RUNOFF 1   8       2       2.1000     77.0000      4.76001 0 0 1 0 1
6 ADDHYD 4 208   3 2 4                                     1 0 0 1 0 1
6 REACH  3 108   4   1    4800.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1   9       2       4.2000     77.0000      9.13001 0 0 1 0 1
6 ADDHYD 4 209   1 2 4                                     1 0 0 1 0 1
6 RUNOFF 1  10       2       1.0000     77.0000      1.50001 0 0 1 0 1
6 ADDHYD 4 210   2 4 3                                     1 0 0 1 0 1
6 REACH  3 110   3   1   23000.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  11       2      16.3000     77.0000     11.50001 0 0 1 0 1
6 ADDHYD 4 211   1 2 3                                     1 0 0 1 0 1
6 REACH  3 111   3   1    5600.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  12       2       1.8000     77.0000      3.65001 0 0 1 0 1
6 ADDHYD 4 212   1 2 3                                     1 0 0 1 0 1
6 REACH  3 112   3   1    4400.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  13       2       0.7000     77.0000      0.51001 0 0 1 0 1
6 ADDHYD 4 213   1 2 3                                     1 0 0 1 0 1
6 RUNOFF 1  14       2      10.2000     88.0000      5.10001 0 0 1 0 1
6 ADDHYD 4 214   3 2 4                                     1 0 0 1 0 1
6 RUNOFF 1  15       2       4.1000     85.0000      5.17001 0 0 1 0 1
6 ADDHYD 4 215   4 2 3                                     1 0 0 1 0 1
6 REACH  3 115   3   1    9200.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  16       2       7.1000     88.0000      3.46001 0 0 1 0 1
6 ADDHYD 4 216   1 2 3                                     1 0 0 1 0 1
6 REACH  3 116   3   1    1500.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  17       2       0.9000     88.0000      0.70001 0 0 1 0 1
6 ADDHYD 4 217   1 2 3                                     1 0 0 1 0 1
6 REACH  3 117   3   1    6200.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  18       2       9.2000     77.0000      9.07001 0 0 1 0 1
6 REACH  3 118   2   3    8400.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  19       4       7.5000     85.0000      5.40001 0 0 1 0 1
6 ADDHYD 4 218   3 4 5                                     1 0 0 1 0 1
6 REACH  3 119   5   2    2800.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  20       3       0.8000     88.0000      0.90001 0 0 1 0 1
6 ADDHYD 4 219   2 3 4                                     1 0 0 1 0 1
6 ADDHYD 4 220   4 1 2                                     1 0 0 1 0 1
6 REACH  3 120   2   3    1700.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  21       4       3.0000     88.0000      1.63001 0 0 1 0 1
6 ADDHYD 4 221   3 4 5                                     1 0 0 1 0 1
6 REACH  3 121   5   1    3200.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  22       2       1.2000     88.0000      0.93001 0 0 1 0 1
6 ADDHYD 4 222   1 2 3                                     1 0 0 1 0 1
6 REACH  3 122   3   1    6600.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  23       2       4.5000     88.0000      1.31001 0 0 1 0 1
6 ADDHYD 4 223   1 2 3                                     1 0 0 1 0 1
6 RUNOFF 1  24       1       6.8000     88.0000      2.73001 0 0 1 0 1
6 ADDHYD 4 224   1 3 4                                     1 0 0 1 0 1
6 REACH  3 124   4   1    5000.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  25       2       3.0000     88.0000      2.10001 0 0 1 0 1
6 ADDHYD 4 225   1 2 3                                     1 0 0 1 0 1
6 RUNOFF 1  26       4       9.1000     88.0000      4.70001 0 0 1 0 1
6 ADDHYD 4 226   3 4 5                                     1 0 0 1 0 1
6 REACH  3 126   5   1    7600.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  27       2       1.2000     88.0000      0.62001 0 0 1 0 1
6 ADDHYD 4 227   1 2 3                                     1 0 0 1 0 1
6 RUNOFF 1  28       2       0.4000     88.0000      0.28001 0 0 1 0 1
```

```
6 ADDHYD 4 228   3 2 1                                  1 0 0 1 0 1
6 REACH  3 127   1   2     800.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  29       3       1.6000     88.0000      1.70001 0 0 1 0 1
6 ADDHYD 4 229   3 2 1                                  1 0 0 1 0 1
6 REACH  3 129   1   2    1700.0000      0.0000      0.00001 0 0 1 0 1
6 RUNOFF 1  30       3       0.1000     88.0000      0.17001 0 0 1 0 1
6 ADDHYD 4 230   3 2 1                                  1 0 0 1 0 1
  ENDATA


END OF LISTING
                                                                                    PASS=  1
1
EXECUTIVE CONTROL CARD          OPERATION  INCREM,    MAIN TIME INCREMENT=  0.10
EXECUTIVE CONTROL CARD          OPERATION  COMPUT,    FROM XSECTN/STRUCT   2/  0     TO XSECTN/STRUCT 230/  0
        STARTING TIME=  0.00    RAIN DEPTH=  1.48    RAIN DURATION= 24.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1        STORM NO.= 1

  ENDCMP
                                                                                    PASS=  2
1
EXECUTIVE CONTROL CARD          OPERATION  COMPUT,    FROM XSECTN/STRUCT   2/  0     TO XSECTN/STRUCT 230/  0
        STARTING TIME=  0.00    RAIN DEPTH=  2.49    RAIN DURATION= 24.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1        STORM NO.= 2

  ENDCMP
                                                                                    PASS=  3
1
EXECUTIVE CONTROL CARD          OPERATION  COMPUT,    FROM XSECTN/STRUCT   2/  0     TO XSECTN/STRUCT 230/  0
        STARTING TIME=  0.00    RAIN DEPTH=  3.51    RAIN DURATION= 24.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1        STORM NO.= 3

  ENDCMP
                                                                                    PASS=  4
1
EXECUTIVE CONTROL CARD          OPERATION  COMPUT,    FROM XSECTN/STRUCT   2/  0     TO XSECTN/STRUCT 230/  0
        STARTING TIME=  0.00    RAIN DEPTH=  3.97    RAIN DURATION= 24.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1        STORM NO.= 4

  ENDCMP
                                                                                    PASS=  5
1
EXECUTIVE CONTROL CARD          OPERATION  COMPUT,    FROM XSECTN/STRUCT   2/  0     TO XSECTN/STRUCT 230/  0
        STARTING TIME=  0.00    RAIN DEPTH=  4.97    RAIN DURATION= 24.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1        STORM NO.= 5


  ENDCMP
1SUMMARY TABLE 1
```

0 ALT	STORM	ID	DA SQ-MI.	RAIN TBLE	AMC	DELTA-T HRS.	TZERO HRS.	PRECIP IN.	PRECIP DURATION	PEAK-Q CFS	PEAK-TIME	PEAK-ELEV	RUNOFF IN.	CSM
1	1	2	10.30	2	2	0.10	0.00	1.48	24.00	129.80	17.35	0.00	0.19	12.60
1	1	102	10.30	2	2	0.10	0.00	1.48	24.00	128.41	18.06	1.04	0.19	12.47
1	1	3	4.90	2	2	0.10	0.00	1.48	24.00	64.88	16.89	0.00	0.20	13.24
1	1	203	15.20	2	2	0.10	0.00	1.48	24.00	188.01	17.78	0.00	0.19	12.37
1	1	4	5.40	2	2	0.10	0.00	1.48	24.00	71.56	17.14	0.00	0.20	13.25
1	1	103	15.20	2	2	0.10	0.00	1.48	24.00	187.72	18.17	1.01	0.19	12.35
1	1	204	20.60	2	2	0.10	0.00	1.48	24.00	255.81	17.91	0.00	0.19	12.42
1	1	104	20.60	2	2	0.10	0.00	1.48	24.00	255.63	18.36	1.10	0.19	12.41
1	1	5	13.20	2	2	0.10	0.00	1.48	24.00	176.90	17.00	0.00	0.20	13.40
1	1	205	33.80	2	2	0.10	0.00	1.48	24.00	423.84	17.89	0.00	0.19	12.54
1	1	105	33.80	2	2	0.10	0.00	1.48	24.00	423.69	18.07	1.45	0.19	12.54
1	1	6	13.90	2	2	0.10	0.00	1.48	24.00	142.33	19.58	0.00	0.18	10.24
1	1	206	47.70	2	2	0.10	0.00	1.48	24.00	563.53	18.16	0.00	0.19	11.81
1	1	106	47.70	2	2	0.10	0.00	1.48	24.00	560.65	19.09	1.21	0.19	11.75
1	1	7	2.70	2	2	0.10	0.00	1.48	24.00	48.84	14.98	0.00	0.20	18.09
1	1	207	50.40	2	2	0.10	0.00	1.48	24.00	583.68	19.03	0.00	0.19	11.58
1	1	8	2.10	2	2	0.10	0.00	1.48	24.00	32.18	15.54	0.00	0.20	15.32
1	1	208	52.50	2	2	0.10	0.00	1.48	24.00	604.41	18.99	0.00	0.19	11.51
1	1	108	52.50	2	2	0.10	0.00	1.48	24.00	603.11	19.55	0.52	0.18	11.49
1	1	9	4.20	2	2	0.10	0.00	1.48	24.00	42.47	18.83	0.00	0.18	10.11
1	1	209	56.70	2	2	0.10	0.00	1.48	24.00	645.23	19.54	0.00	0.18	11.38
1	1	10	1.00	2	2	0.10	0.00	1.48	24.00	31.77	13.09	0.00	0.20	31.77

1	1	210	57.70	2	2	0.10	0.00	1.48	24.00	651.14	19.53	0.00	0.18	11.29
1	1	110	57.70	2	2	0.10	0.00	1.48	24.00	646.79	22.02	1.20	0.17	11.21
1	1	11	16.30	2	2	0.10	0.00	1.48	24.00	147.70	21.69	0.00	0.16	9.06
1	1	211	74.00	2	2	0.10	0.00	1.48	24.00	793.23	21.93	0.00	0.17	10.72
1	1	111	74.00	2	2	0.10	0.00	1.48	24.00	792.20	22.51	1.34	0.16	10.71
1	1	12	1.80	2	2	0.10	0.00	1.48	24.00	32.56	14.98	0.00	0.20	18.09
1	1	212	75.80	2	2	0.10	0.00	1.48	24.00	802.20	22.49	0.00	0.16	10.58
1	1	112	75.80	2	2	0.10	0.00	1.48	24.00	801.39	22.94	1.35	0.16	10.57
1	1	13	0.70	2	2	0.10	0.00	1.48	24.00	42.36	12.24	0.00	0.20	60.51
1	1	213	76.50	2	2	0.10	0.00	1.48	24.00	804.21	22.93	0.00	0.16	10.51
1	1	14	10.20	2	2	0.10	0.00	1.48	24.00	514.80	15.68	0.00	0.56	50.47
1	1	214	86.70	2	2	0.10	0.00	1.48	24.00	934.64	22.59	0.00	0.21	10.78
1	1	15	4.10	2	2	0.10	0.00	1.48	24.00	153.59	15.89	0.00	0.43	37.46
1	1	215	90.80	2	2	0.10	0.00	1.48	24.00	980.97	22.50	0.00	0.22	10.80
1	1	115	90.80	2	2	0.10	0.00	1.48	24.00	979.42	23.35	1.52	0.21	10.79
1	1	16	7.10	2	2	0.10	0.00	1.48	24.00	480.52	14.23	0.00	0.57	67.68
1	1	216	97.90	2	2	0.10	0.00	1.48	24.00	1046.08	23.23	0.00	0.24	10.69
1	1	116	97.90	2	2	0.10	0.00	1.48	24.00	1045.87	23.36	1.58	0.24	10.68
1	1	17	0.90	2	2	0.10	0.00	1.48	24.00	187.51	12.27	0.00	0.57	208.35
1	1	217	98.80	2	2	0.10	0.00	1.48	24.00	1052.62	23.39	0.00	0.24	10.65
1	1	117	98.80	2	2	0.10	0.00	1.48	24.00	1051.86	23.92	1.58	0.23	10.65
1	1	18	9.20	2	2	0.10	0.00	1.48	24.00	93.00	18.74	0.00	0.18	10.11
1	1	118	9.20	2	2	0.10	0.00	1.48	24.00	92.70	19.67	0.10	0.18	10.08
1	1	19	7.50	2	2	0.10	0.00	1.48	24.00	265.98	15.73	0.00	0.43	35.46
1	1	218	16.70	2	2	0.10	0.00	1.48	24.00	313.57	15.85	0.00	0.29	18.78
1	1	119	16.70	2	2	0.10	0.00	1.48	24.00	313.20	16.26	0.32	0.29	18.75
1	1	20	0.80	2	2	0.10	0.00	1.48	24.00	142.11	12.42	0.00	0.57	177.63
1	1	219	17.50	2	2	0.10	0.00	1.48	24.00	326.66	16.13	0.00	0.30	18.67
1	1	220	116.30	2	2	0.10	0.00	1.48	24.00	1372.49	16.33	0.00	0.24	11.80
1	1	120	116.30	2	2	0.10	0.00	1.48	24.00	1371.82	16.47	1.19	0.24	11.80
1	1	21	3.00	2	2	0.10	0.00	1.48	24.00	357.39	12.90	0.00	0.57	119.13
1	1	221	119.30	2	2	0.10	0.00	1.48	24.00	1430.67	16.37	0.00	0.25	11.99
1	1	121	119.30	2	2	0.10	0.00	1.48	24.00	1429.46	16.62	1.22	0.25	11.98
1	1	22	1.20	2	2	0.10	0.00	1.48	24.00	209.87	12.42	0.00	0.57	174.89
1	1	222	120.50	2	2	0.10	0.00	1.48	24.00	1447.91	16.60	0.00	0.25	12.02
1	1	122	120.50	2	2	0.10	0.00	1.48	24.00	1446.51	17.02	2211.86	0.25	12.00
1	1	23	4.50	2	2	0.10	0.00	1.48	24.00	622.38	12.75	0.00	0.57	138.31
1	1	223	125.00	2	2	0.10	0.00	1.48	24.00	1516.30	16.96	0.00	0.26	12.13
1	1	24	6.80	2	2	0.10	0.00	1.48	24.00	552.28	13.63	0.00	0.57	81.22
1	1	224	131.80	2	2	0.10	0.00	1.48	24.00	1745.67	13.50	0.00	0.28	13.24
1	1	124	131.80	2	2	0.10	0.00	1.48	24.00	1733.70	13.89	2135.70	0.27	13.15
1	1	25	3.00	2	2	0.10	0.00	1.48	24.00	297.38	13.30	0.00	0.57	99.13
1	1	225	134.80	2	2	0.10	0.00	1.48	24.00	1984.17	13.78	0.00	0.28	14.72
1	1	26	9.10	2	2	0.10	0.00	1.48	24.00	486.25	15.28	0.00	0.56	53.43
1	1	226	143.90	2	2	0.10	0.00	1.48	24.00	2366.71	13.89	0.00	0.30	16.45
1	1	126	143.90	2	2	0.10	0.00	1.48	24.00	2359.10	14.25	2078.78	0.29	16.39
1	1	27	1.20	2	2	0.10	0.00	1.48	24.00	270.11	12.22	0.00	0.57	225.09
1	1	227	145.10	2	2	0.10	0.00	1.48	24.00	2390.94	14.24	0.00	0.30	16.49
1	1	28	0.40	2	2	0.10	0.00	1.48	24.00	126.83	12.02	0.00	0.57	317.07
1	1	228	145.50	2	2	0.10	0.00	1.48	24.00	2400.37	14.24	0.00	0.30	16.50
1	1	127	145.50	2	2	0.10	0.00	1.48	24.00	2398.63	14.27	2078.82	0.30	16.49
1	1	29	1.60	2	2	0.10	0.00	1.48	24.00	182.46	12.94	0.00	0.57	114.05
1	1	229	147.10	2	2	0.10	0.00	1.48	24.00	2486.32	14.22	0.00	0.30	16.90
1	1	129	147.10	2	2	0.10	0.00	1.48	24.00	2483.62	14.30	2078.89	0.30	16.88
1	1	30	0.10	2	2	0.10	0.00	1.48	24.00	36.36	11.97	0.00	0.56	363.57
1	1	230	147.20	2	2	0.10	0.00	1.48	24.00	2485.88	14.30	0.00	0.30	16.89
1	2	2	10.30	2	2	0.10	0.00	2.49	24.00	531.25	17.27	0.00	0.71	51.58
1	2	102	10.30	2	2	0.10	0.00	2.49	24.00	529.30	17.58	1.76	0.71	51.39
1	2	3	4.90	2	2	0.10	0.00	2.49	24.00	273.43	15.98	0.00	0.72	55.80
1	2	203	15.20	2	2	0.10	0.00	2.49	24.00	780.59	16.87	0.00	0.71	51.35
1	2	4	5.40	2	2	0.10	0.00	2.49	24.00	289.40	16.14	0.00	0.72	53.59
1	2	103	15.20	2	2	0.10	0.00	2.49	24.00	779.70	17.13	2.30	0.71	51.30
1	2	204	20.60	2	2	0.10	0.00	2.49	24.00	1064.22	17.07	0.00	0.71	51.66
1	2	104	20.60	2	2	0.10	0.00	2.49	24.00	1062.93	17.33	2.52	0.71	51.60
1	2	5	13.20	2	2	0.10	0.00	2.49	24.00	715.11	16.86	0.00	0.72	54.18
1	2	205	33.80	2	2	0.10	0.00	2.49	24.00	1767.24	17.01	0.00	0.71	52.29

1	2	105	33.80	2	2	0.10	0.00	2.49	24.00	1765.61	17.12	3.36	0.71	52.24
1	2	6	13.90	2	2	0.10	0.00	2.49	24.00	570.09	18.15	0.00	0.68	41.01
1	2	206	47.70	2	2	0.10	0.00	2.49	24.00	2306.10	17.21	0.00	0.70	48.35
1	2	106	47.70	2	2	0.10	0.00	2.49	24.00	2302.52	17.79	2.93	0.70	48.27
1	2	7	2.70	2	2	0.10	0.00	2.49	24.00	215.73	14.41	0.00	0.73	79.90
1	2	207	50.40	2	2	0.10	0.00	2.49	24.00	2396.51	17.70	0.00	0.70	47.55
1	2	8	2.10	2	2	0.10	0.00	2.49	24.00	139.31	15.48	0.00	0.73	66.34
1	2	208	52.50	2	2	0.10	0.00	2.49	24.00	2487.84	17.63	0.00	0.70	47.39
1	2	108	52.50	2	2	0.10	0.00	2.49	24.00	2483.81	18.09	1.58	0.69	47.31
1	2	9	4.20	2	2	0.10	0.00	2.49	24.00	170.51	18.77	0.00	0.68	40.60
1	2	209	56.70	2	2	0.10	0.00	2.49	24.00	2650.91	18.11	0.00	0.69	46.75
1	2	10	1.00	2	2	0.10	0.00	2.49	24.00	153.11	12.89	0.00	0.73	153.11
1	2	210	57.70	2	2	0.10	0.00	2.49	24.00	2670.57	18.10	0.00	0.69	46.28
1	2	110	57.70	2	2	0.10	0.00	2.49	24.00	2661.37	19.72	2.68	0.67	46.12
1	2	11	16.30	2	2	0.10	0.00	2.49	24.00	554.80	19.78	0.00	0.62	34.04
1	2	211	74.00	2	2	0.10	0.00	2.49	24.00	3216.48	19.74	0.00	0.66	43.47
1	2	111	74.00	2	2	0.10	0.00	2.49	24.00	3212.63	20.14	3.00	0.65	43.41
1	2	12	1.80	2	2	0.10	0.00	2.49	24.00	143.82	14.41	0.00	0.73	79.90
1	2	212	75.80	2	2	0.10	0.00	2.49	24.00	3250.43	20.12	0.00	0.65	42.88
1	2	112	75.80	2	2	0.10	0.00	2.49	24.00	3246.21	20.41	3.02	0.65	42.85
1	2	13	0.70	2	2	0.10	0.00	2.49	24.00	214.26	12.17	0.00	0.73	306.08
1	2	213	76.50	2	2	0.10	0.00	2.49	24.00	3257.80	20.41	0.00	0.65	42.59
1	2	14	10.20	2	2	0.10	0.00	2.49	24.00	1304.03	14.94	0.00	1.36	127.85
1	2	214	86.70	2	2	0.10	0.00	2.49	24.00	3695.96	20.16	0.00	0.73	42.63
1	2	15	4.10	2	2	0.10	0.00	2.49	24.00	437.77	15.14	0.00	1.16	106.77
1	2	215	90.80	2	2	0.10	0.00	2.49	24.00	3866.64	19.93	0.00	0.75	42.58
1	2	115	90.80	2	2	0.10	0.00	2.49	24.00	3863.46	20.52	3.27	0.74	42.55
1	2	16	7.10	2	2	0.10	0.00	2.49	24.00	1219.85	14.20	0.00	1.37	171.81
1	2	216	97.90	2	2	0.10	0.00	2.49	24.00	4064.41	20.38	0.00	0.79	41.52
1	2	116	97.90	2	2	0.10	0.00	2.49	24.00	4063.71	20.47	3.35	0.78	41.51
1	2	17	0.90	2	2	0.10	0.00	2.49	24.00	477.05	12.24	0.00	1.37	530.06
1	2	217	98.80	2	2	0.10	0.00	2.49	24.00	4081.02	20.47	0.00	0.79	41.31
1	2	117	98.80	2	2	0.10	0.00	2.49	24.00	4078.95	20.85	3.36	0.78	41.28
1	2	18	9.20	2	2	0.10	0.00	2.49	24.00	373.96	18.65	0.00	0.68	40.65
1	2	118	9.20	2	2	0.10	0.00	2.49	24.00	372.30	19.30	0.38	0.67	40.47
1	2	19	7.50	2	2	0.10	0.00	2.49	24.00	758.42	15.68	0.00	1.16	101.12
1	2	218	16.70	2	2	0.10	0.00	2.49	24.00	980.74	15.85	0.00	0.89	58.73
1	2	119	16.70	2	2	0.10	0.00	2.49	24.00	979.79	16.24	1.00	0.88	58.67
1	2	20	0.80	2	2	0.10	0.00	2.49	24.00	360.80	12.38	0.00	1.37	451.00
1	2	219	17.50	2	2	0.10	0.00	2.49	24.00	1007.48	16.15	0.00	0.91	57.57
1	2	220	116.30	2	2	0.10	0.00	2.49	24.00	4736.08	20.52	0.00	0.80	40.72
1	2	120	116.30	2	2	0.10	0.00	2.49	24.00	4735.70	20.60	2.56	0.80	40.72
1	2	21	3.00	2	2	0.10	0.00	2.49	24.00	913.59	12.86	0.00	1.37	304.53
1	2	221	119.30	2	2	0.10	0.00	2.49	24.00	4797.70	20.56	0.00	0.81	40.22
1	2	121	119.30	2	2	0.10	0.00	2.49	24.00	4797.16	20.71	2.58	0.81	40.21
1	2	22	1.20	2	2	0.10	0.00	2.49	24.00	536.04	12.38	0.00	1.37	446.70
1	2	222	120.50	2	2	0.10	0.00	2.49	24.00	4820.11	20.70	0.00	0.82	40.00
1	2	122	120.50	2	2	0.10	0.00	2.49	24.00	4819.23	20.98	2213.46	0.81	39.99
1	2	23	4.50	2	2	0.10	0.00	2.49	24.00	1593.75	12.63	0.00	1.37	354.17
1	2	223	125.00	2	2	0.10	0.00	2.49	24.00	4905.51	20.92	0.00	0.83	39.24
1	2	24	6.80	2	2	0.10	0.00	2.49	24.00	1410.38	13.60	0.00	1.37	207.41
1	2	224	131.80	2	2	0.10	0.00	2.49	24.00	5100.11	13.13	0.00	0.86	38.70
1	2	124	131.80	2	2	0.10	0.00	2.49	24.00	5058.16	21.11	2136.61	0.85	38.38
1	2	25	3.00	2	2	0.10	0.00	2.49	24.00	754.28	13.27	0.00	1.37	251.43
1	2	225	134.80	2	2	0.10	0.00	2.49	24.00	5784.05	13.42	0.00	0.87	42.91
1	2	26	9.10	2	2	0.10	0.00	2.49	24.00	1224.29	14.62	0.00	1.36	134.54
1	2	226	143.90	2	2	0.10	0.00	2.49	24.00	6650.91	13.60	0.00	0.90	46.22
1	2	126	143.90	2	2	0.10	0.00	2.49	24.00	6644.65	13.88	2080.83	0.89	46.18
1	2	27	1.20	2	2	0.10	0.00	2.49	24.00	683.66	12.19	0.00	1.37	569.71
1	2	227	145.10	2	2	0.10	0.00	2.49	24.00	6725.38	13.86	0.00	0.90	46.35
1	2	28	0.40	2	2	0.10	0.00	2.49	24.00	311.02	12.00	0.00	1.37	777.56
1	2	228	145.50	2	2	0.10	0.00	2.49	24.00	6747.86	13.86	0.00	0.90	46.39
1	2	127	145.50	2	2	0.10	0.00	2.49	24.00	6745.27	13.88	2080.87	0.90	46.36
1	2	29	1.60	2	2	0.10	0.00	2.49	24.00	467.93	12.85	0.00	1.37	292.46
1	2	229	147.10	2	2	0.10	0.00	2.49	24.00	7018.54	13.81	0.00	0.90	47.71
1	2	129	147.10	2	2	0.10	0.00	2.49	24.00	7013.38	13.86	2080.97	0.90	47.68

1	2	30	0.10	2	2	0.10	0.00	2.49	24.00	86.74	11.96	0.00	1.37	867.37
1	2	230	147.20	2	2	0.10	0.00	2.49	24.00	7018.85	13.86	0.00	0.90	47.68
1	3	2	10.30	2	2	0.10	0.00	3.51	24.00	1081.15	16.24	0.00	1.40	104.97
1	3	102	10.30	2	2	0.10	0.00	3.51	24.00	1076.08	16.93	2.32	1.39	104.47
1	3	3	4.90	2	2	0.10	0.00	3.51	24.00	563.20	15.95	0.00	1.42	114.94
1	3	203	15.20	2	2	0.10	0.00	3.51	24.00	1603.09	16.61	0.00	1.40	105.47
1	3	4	5.40	2	2	0.10	0.00	3.51	24.00	595.83	16.11	0.00	1.41	110.34
1	3	103	15.20	2	2	0.10	0.00	3.51	24.00	1601.45	16.83	3.51	1.40	105.36
1	3	204	20.60	2	2	0.10	0.00	3.51	24.00	2179.31	16.75	0.00	1.40	105.79
1	3	104	20.60	2	2	0.10	0.00	3.51	24.00	2177.56	16.98	3.78	1.40	105.71
1	3	5	13.20	2	2	0.10	0.00	3.51	24.00	1472.77	15.96	0.00	1.41	111.57
1	3	205	33.80	2	2	0.10	0.00	3.51	24.00	3616.11	16.86	0.00	1.40	106.99
1	3	105	33.80	2	2	0.10	0.00	3.51	24.00	3614.70	16.94	5.00	1.40	106.94
1	3	6	13.90	2	2	0.10	0.00	3.51	24.00	1158.51	18.12	0.00	1.34	83.35
1	3	206	47.70	2	2	0.10	0.00	3.51	24.00	4727.29	17.00	0.00	1.38	99.10
1	3	106	47.70	2	2	0.10	0.00	3.51	24.00	4723.03	17.38	4.53	1.38	99.02
1	3	7	2.70	2	2	0.10	0.00	3.51	24.00	450.14	14.39	0.00	1.43	166.72
1	3	207	50.40	2	2	0.10	0.00	3.51	24.00	4917.16	17.29	0.00	1.38	97.56
1	3	8	2.10	2	2	0.10	0.00	3.51	24.00	286.74	15.46	0.00	1.43	136.54
1	3	208	52.50	2	2	0.10	0.00	3.51	24.00	5112.64	17.17	0.00	1.39	97.38
1	3	108	52.50	2	2	0.10	0.00	3.51	24.00	5108.93	17.53	2.44	1.38	97.31
1	3	9	4.20	2	2	0.10	0.00	3.51	24.00	344.22	18.75	0.00	1.33	81.96
1	3	209	56.70	2	2	0.10	0.00	3.51	24.00	5447.13	17.54	0.00	1.37	96.07
1	3	10	1.00	2	2	0.10	0.00	3.51	24.00	322.49	12.84	0.00	1.44	322.49
1	3	210	57.70	2	2	0.10	0.00	3.51	24.00	5483.79	17.53	0.00	1.37	95.04
1	3	110	57.70	2	2	0.10	0.00	3.51	24.00	5470.61	18.84	3.93	1.34	94.81
1	3	11	16.30	2	2	0.10	0.00	3.51	24.00	1118.53	19.74	0.00	1.24	68.62
1	3	211	74.00	2	2	0.10	0.00	3.51	24.00	6534.10	18.96	0.00	1.32	88.30
1	3	111	74.00	2	2	0.10	0.00	3.51	24.00	6530.83	19.26	4.28	1.31	88.25
1	3	12	1.80	2	2	0.10	0.00	3.51	24.00	300.09	14.39	0.00	1.43	166.72
1	3	212	75.80	2	2	0.10	0.00	3.51	24.00	6610.16	19.23	0.00	1.31	87.21
1	3	112	75.80	2	2	0.10	0.00	3.51	24.00	6607.49	19.46	4.30	1.31	87.17
1	3	13	0.70	2	2	0.10	0.00	3.51	24.00	448.94	12.14	0.00	1.43	641.34
1	3	213	76.50	2	2	0.10	0.00	3.51	24.00	6625.85	19.46	0.00	1.31	86.61
1	3	14	10.20	2	2	0.10	0.00	3.51	24.00	2197.69	14.93	0.00	2.26	215.46
1	3	214	86.70	2	2	0.10	0.00	3.51	24.00	7503.96	19.05	0.00	1.42	86.55
1	3	15	4.10	2	2	0.10	0.00	3.51	24.00	776.07	15.12	0.00	2.01	189.29
1	3	215	90.80	2	2	0.10	0.00	3.51	24.00	7860.72	18.92	0.00	1.45	86.57
1	3	115	90.80	2	2	0.10	0.00	3.51	24.00	7855.41	19.39	4.69	1.43	86.51
1	3	16	7.10	2	2	0.10	0.00	3.51	24.00	2038.81	14.18	0.00	2.27	287.16
1	3	216	97.90	2	2	0.10	0.00	3.51	24.00	8245.75	19.24	0.00	1.49	84.23
1	3	116	97.90	2	2	0.10	0.00	3.51	24.00	8244.55	19.31	4.81	1.49	84.21
1	3	17	0.90	2	2	0.10	0.00	3.51	24.00	795.11	12.23	0.00	2.27	883.45
1	3	217	98.80	2	2	0.10	0.00	3.51	24.00	8274.10	19.31	0.00	1.50	83.75
1	3	117	98.80	2	2	0.10	0.00	3.51	24.00	8270.87	19.62	4.82	1.49	83.71
1	3	18	9.20	2	2	0.10	0.00	3.51	24.00	756.52	18.60	0.00	1.34	82.23
1	3	118	9.20	2	2	0.10	0.00	3.51	24.00	754.16	19.21	0.77	1.32	81.97
1	3	19	7.50	2	2	0.10	0.00	3.51	24.00	1334.78	15.66	0.00	2.00	177.97
1	3	218	16.70	2	2	0.10	0.00	3.51	24.00	1810.30	16.00	0.00	1.62	108.40
1	3	119	16.70	2	2	0.10	0.00	3.51	24.00	1809.52	16.21	1.40	1.62	108.35
1	3	20	0.80	2	2	0.10	0.00	3.51	24.00	601.97	12.36	0.00	2.27	752.46
1	3	219	17.50	2	2	0.10	0.00	3.51	24.00	1852.10	16.13	0.00	1.65	105.83
1	3	220	116.30	2	2	0.10	0.00	3.51	24.00	9661.24	19.32	0.00	1.51	83.07
1	3	120	116.30	2	2	0.10	0.00	3.51	24.00	9660.53	19.38	3.99	1.51	83.07
1	3	21	3.00	2	2	0.10	0.00	3.51	24.00	1526.81	12.85	0.00	2.27	508.94
1	3	221	119.30	2	2	0.10	0.00	3.51	24.00	9766.75	19.35	0.00	1.53	81.87
1	3	121	119.30	2	2	0.10	0.00	3.51	24.00	9766.08	19.47	4.02	1.53	81.86
1	3	22	1.20	2	2	0.10	0.00	3.51	24.00	895.95	12.36	0.00	2.27	746.63
1	3	222	120.50	2	2	0.10	0.00	3.51	24.00	9805.69	19.47	0.00	1.53	81.38
1	3	122	120.50	2	2	0.10	0.00	3.51	24.00	9804.36	19.70	2215.02	1.53	81.36
1	3	23	4.50	2	2	0.10	0.00	3.51	24.00	2666.76	12.62	0.00	2.27	592.61
1	3	223	125.00	2	2	0.10	0.00	3.51	24.00	9954.38	19.67	0.00	1.55	79.64
1	3	24	6.80	2	2	0.10	0.00	3.51	24.00	2360.03	13.59	0.00	2.27	347.06
1	3	224	131.80	2	2	0.10	0.00	3.51	24.00	10241.73	19.55	0.00	1.59	77.71
1	3	124	131.80	2	2	0.10	0.00	3.51	24.00	10239.87	19.80	2137.51	1.58	77.69
1	3	25	3.00	2	2	0.10	0.00	3.51	24.00	1257.62	13.26	0.00	2.27	419.21

1	3	225	134.80	2	2	0.10	0.00	3.51	24.00	10432.66	13.32	0.00	1.60	77.39
1	3	26	9.10	2	2	0.10	0.00	3.51	24.00	2074.24	14.54	0.00	2.26	227.94
1	3	226	143.90	2	2	0.10	0.00	3.51	24.00	11820.23	13.41	0.00	1.64	82.14
1	3	126	143.90	2	2	0.10	0.00	3.51	24.00	11788.14	13.73	2082.02	1.63	81.92
1	3	27	1.20	2	2	0.10	0.00	3.51	24.00	1138.23	12.18	0.00	2.27	948.53
1	3	227	145.10	2	2	0.10	0.00	3.51	24.00	11926.64	13.71	0.00	1.64	82.20
1	3	28	0.40	2	2	0.10	0.00	3.51	24.00	511.12	11.99	0.00	2.28	1277.79
1	3	228	145.50	2	2	0.10	0.00	3.51	24.00	11964.07	13.70	0.00	1.64	82.23
1	3	127	145.50	2	2	0.10	0.00	3.51	24.00	11960.09	13.73	2082.04	1.64	82.20
1	3	29	1.60	2	2	0.10	0.00	3.51	24.00	787.28	12.84	0.00	2.27	492.05
1	3	229	147.10	2	2	0.10	0.00	3.51	24.00	12451.65	13.67	0.00	1.65	84.65
1	3	129	147.10	2	2	0.10	0.00	3.51	24.00	12444.03	13.74	2082.10	1.64	84.60
1	3	30	0.10	2	2	0.10	0.00	3.51	24.00	140.69	11.96	0.00	2.27	1406.89
1	3	230	147.20	2	2	0.10	0.00	3.51	24.00	12452.53	13.74	0.00	1.64	84.60
1	4	2	10.30	2	2	0.10	0.00	3.97	24.00	1362.78	16.24	0.00	1.74	132.31
1	4	102	10.30	2	2	0.10	0.00	3.97	24.00	1354.45	16.79	2.53	1.74	131.50
1	4	3	4.90	2	2	0.10	0.00	3.97	24.00	708.93	15.93	0.00	1.76	144.68
1	4	203	15.20	2	2	0.10	0.00	3.97	24.00	2019.02	16.54	0.00	1.74	132.83
1	4	4	5.40	2	2	0.10	0.00	3.97	24.00	749.98	16.10	0.00	1.75	138.89
1	4	103	15.20	2	2	0.10	0.00	3.97	24.00	2016.81	16.75	4.04	1.74	132.68
1	4	204	20.60	2	2	0.10	0.00	3.97	24.00	2743.06	16.67	0.00	1.74	133.16
1	4	104	20.60	2	2	0.10	0.00	3.97	24.00	2740.98	16.88	4.29	1.74	133.06
1	4	5	13.20	2	2	0.10	0.00	3.97	24.00	1857.70	15.95	0.00	1.75	140.73
1	4	205	33.80	2	2	0.10	0.00	3.97	24.00	4545.27	16.73	0.00	1.75	134.48
1	4	105	33.80	2	2	0.10	0.00	3.97	24.00	4544.57	16.82	5.38	1.74	134.45
1	4	6	13.90	2	2	0.10	0.00	3.97	24.00	1453.99	18.11	0.00	1.68	104.60
1	4	206	47.70	2	2	0.10	0.00	3.97	24.00	5945.22	16.92	0.00	1.72	124.64
1	4	106	47.70	2	2	0.10	0.00	3.97	24.00	5942.13	17.29	5.26	1.72	124.57
1	4	7	2.70	2	2	0.10	0.00	3.97	24.00	567.58	14.38	0.00	1.78	210.22
1	4	207	50.40	2	2	0.10	0.00	3.97	24.00	6187.82	17.17	0.00	1.72	122.77
1	4	8	2.10	2	2	0.10	0.00	3.97	24.00	360.40	15.45	0.00	1.78	171.62
1	4	208	52.50	2	2	0.10	0.00	3.97	24.00	6439.36	17.04	0.00	1.72	122.65
1	4	108	52.50	2	2	0.10	0.00	3.97	24.00	6433.04	17.40	3.12	1.71	122.53
1	4	9	4.20	2	2	0.10	0.00	3.97	24.00	431.27	18.72	0.00	1.66	102.68
1	4	209	56.70	2	2	0.10	0.00	3.97	24.00	6858.70	17.41	0.00	1.71	120.96
1	4	10	1.00	2	2	0.10	0.00	3.97	24.00	407.02	12.83	0.00	1.79	407.02
1	4	210	57.70	2	2	0.10	0.00	3.97	24.00	6903.29	17.40	0.00	1.71	119.64
1	4	110	57.70	2	2	0.10	0.00	3.97	24.00	6888.02	18.64	4.39	1.68	119.38
1	4	11	16.30	2	2	0.10	0.00	3.97	24.00	1401.26	19.73	0.00	1.55	85.97
1	4	211	74.00	2	2	0.10	0.00	3.97	24.00	8209.59	18.75	0.00	1.65	110.94
1	4	111	74.00	2	2	0.10	0.00	3.97	24.00	8205.94	19.03	4.80	1.64	110.89
1	4	12	1.80	2	2	0.10	0.00	3.97	24.00	378.39	14.38	0.00	1.78	210.22
1	4	212	75.80	2	2	0.10	0.00	3.97	24.00	8306.79	19.00	0.00	1.64	109.59
1	4	112	75.80	2	2	0.10	0.00	3.97	24.00	8303.63	19.22	4.83	1.63	109.55
1	4	13	0.70	2	2	0.10	0.00	3.97	24.00	565.16	12.14	0.00	1.78	807.37
1	4	213	76.50	2	2	0.10	0.00	3.97	24.00	8325.46	19.22	0.00	1.64	108.82
1	4	14	10.20	2	2	0.10	0.00	3.97	24.00	2612.81	14.93	0.00	2.68	256.16
1	4	214	86.70	2	2	0.10	0.00	3.97	24.00	9418.70	18.84	0.00	1.76	108.64
1	4	15	4.10	2	2	0.10	0.00	3.97	24.00	936.09	15.12	0.00	2.41	228.31
1	4	215	90.80	2	2	0.10	0.00	3.97	24.00	9862.04	18.71	0.00	1.79	108.61
1	4	115	90.80	2	2	0.10	0.00	3.97	24.00	9856.61	19.15	5.18	1.77	108.55
1	4	16	7.10	2	2	0.10	0.00	3.97	24.00	2417.41	14.17	0.00	2.69	340.48
1	4	216	97.90	2	2	0.10	0.00	3.97	24.00	10336.64	18.94	0.00	1.84	105.58
1	4	116	97.90	2	2	0.10	0.00	3.97	24.00	10335.68	19.02	5.27	1.84	105.57
1	4	17	0.90	2	2	0.10	0.00	3.97	24.00	941.57	12.22	0.00	2.70	1046.19
1	4	217	98.80	2	2	0.10	0.00	3.97	24.00	10369.97	19.02	0.00	1.84	104.96
1	4	117	98.80	2	2	0.10	0.00	3.97	24.00	10367.45	19.32	5.28	1.83	104.93
1	4	18	9.20	2	2	0.10	0.00	3.97	24.00	948.22	18.59	0.00	1.67	103.07
1	4	118	9.20	2	2	0.10	0.00	3.97	24.00	945.83	19.18	0.97	1.64	102.81
1	4	19	7.50	2	2	0.10	0.00	3.97	24.00	1606.83	14.95	0.00	2.41	214.24
1	4	218	16.70	2	2	0.10	0.00	3.97	24.00	2214.13	16.02	0.00	1.98	132.58
1	4	119	16.70	2	2	0.10	0.00	3.97	24.00	2213.34	16.20	1.59	1.98	132.54
1	4	20	0.80	2	2	0.10	0.00	3.97	24.00	713.16	12.35	0.00	2.70	891.45
1	4	219	17.50	2	2	0.10	0.00	3.97	24.00	2262.57	16.12	0.00	2.01	129.29
1	4	220	116.30	2	2	0.10	0.00	3.97	24.00	12118.23	19.03	0.00	1.86	104.20
1	4	120	116.30	2	2	0.10	0.00	3.97	24.00	12117.11	19.09	4.56	1.86	104.19

1	4	21	3.00	2	2	0.10	0.00	3.97	24.00	1810.00	12.84	0.00	2.70	603.33
1	4	221	119.30	2	2	0.10	0.00	3.97	24.00	12244.33	19.06	0.00	1.88	102.63
1	4	121	119.30	2	2	0.10	0.00	3.97	24.00	12243.31	19.17	4.59	1.88	102.63
1	4	22	1.20	2	2	0.10	0.00	3.97	24.00	1061.94	12.36	0.00	2.70	884.95
1	4	222	120.50	2	2	0.10	0.00	3.97	24.00	12289.49	19.16	0.00	1.88	101.99
1	4	122	120.50	2	2	0.10	0.00	3.97	24.00	12287.63	19.38	2215.48	1.88	101.97
1	4	23	4.50	2	2	0.10	0.00	3.97	24.00	3161.68	12.61	0.00	2.69	702.60
1	4	223	125.00	2	2	0.10	0.00	3.97	24.00	12464.37	19.36	0.00	1.91	99.71
1	4	24	6.80	2	2	0.10	0.00	3.97	24.00	2798.78	13.58	0.00	2.70	411.59
1	4	224	131.80	2	2	0.10	0.00	3.97	24.00	12816.76	19.24	0.00	1.95	97.24
1	4	124	131.80	2	2	0.10	0.00	3.97	24.00	12815.33	19.46	2137.89	1.94	97.23
1	4	25	3.00	2	2	0.10	0.00	3.97	24.00	1489.72	13.25	0.00	2.70	496.57
1	4	225	134.80	2	2	0.10	0.00	3.97	24.00	12944.70	19.41	0.00	1.96	96.03
1	4	26	9.10	2	2	0.10	0.00	3.97	24.00	2467.70	14.54	0.00	2.68	271.18
1	4	226	143.90	2	2	0.10	0.00	3.97	24.00	14283.94	13.36	0.00	2.00	99.26
1	4	126	143.90	2	2	0.10	0.00	3.97	24.00	14238.26	13.67	2082.30	1.99	98.95
1	4	27	1.20	2	2	0.10	0.00	3.97	24.00	1347.52	12.17	0.00	2.70	1122.94
1	4	227	145.10	2	2	0.10	0.00	3.97	24.00	14413.30	13.65	0.00	2.00	99.33
1	4	28	0.40	2	2	0.10	0.00	3.97	24.00	602.80	11.99	0.00	2.70	1507.01
1	4	228	145.50	2	2	0.10	0.00	3.97	24.00	14459.18	13.65	0.00	2.00	99.38
1	4	127	145.50	2	2	0.10	0.00	3.97	24.00	14443.66	13.68	2062.33	2.00	99.27
1	4	29	1.60	2	2	0.10	0.00	3.97	24.00	933.88	12.84	0.00	2.70	583.68
1	4	229	147.10	2	2	0.10	0.00	3.97	24.00	15057.10	13.62	0.00	2.01	102.36
1	4	129	147.10	2	2	0.10	0.00	3.97	24.00	15034.90	13.69	2062.40	2.01	102.21
1	4	30	0.10	2	2	0.10	0.00	3.97	24.00	165.27	11.96	0.00	2.69	1652.75
1	4	230	147.20	2	2	0.10	0.00	3.97	24.00	15044.96	13.69	0.00	2.01	102.21
1	5	2	10.30	2	2	0.10	0.00	4.97	24.00	2014.72	16.23	0.00	2.53	195.60
1	5	102	10.30	2	2	0.10	0.00	4.97	24.00	2000.45	16.66	3.02	2.53	194.22
1	5	3	4.90	2	2	0.10	0.00	4.97	24.00	1045.63	15.90	0.00	2.56	213.39
1	5	203	15.20	2	2	0.10	0.00	4.97	24.00	2981.20	16.48	0.00	2.54	196.13
1	5	4	5.40	2	2	0.10	0.00	4.97	24.00	1106.14	16.09	0.00	2.55	204.84
1	5	103	15.20	2	2	0.10	0.00	4.97	24.00	2978.36	16.65	5.04	2.53	195.94
1	5	204	20.60	2	2	0.10	0.00	4.97	24.00	4048.46	16.56	0.00	2.54	196.53
1	5	104	20.60	2	2	0.10	0.00	4.97	24.00	4045.63	16.74	5.17	2.53	196.39
1	5	5	13.20	2	2	0.10	0.00	4.97	24.00	2743.96	15.94	0.00	2.55	207.88
1	5	205	33.80	2	2	0.10	0.00	4.97	24.00	6704.98	16.43	0.00	2.54	198.37
1	5	105	33.80	2	2	0.10	0.00	4.97	24.00	6703.63	16.55	6.25	2.54	198.33
1	5	6	13.90	2	2	0.10	0.00	4.97	24.00	2137.05	18.09	0.00	2.44	153.74
1	5	206	47.70	2	2	0.10	0.00	4.97	24.00	8774.94	16.73	0.00	2.51	183.96
1	5	106	47.70	2	2	0.10	0.00	4.97	24.00	8764.64	17.21	6.96	2.50	183.75
1	5	7	2.70	2	2	0.10	0.00	4.97	24.00	838.09	14.37	0.00	2.59	310.40
1	5	207	50.40	2	2	0.10	0.00	4.97	24.00	9120.12	17.11	0.00	2.50	180.95
1	5	8	2.10	2	2	0.10	0.00	4.97	24.00	535.11	14.74	0.00	2.58	254.81
1	5	208	52.50	2	2	0.10	0.00	4.97	24.00	9486.46	17.01	0.00	2.51	180.69
1	5	108	52.50	2	2	0.10	0.00	4.97	24.00	9475.11	17.38	4.78	2.49	180.48
1	5	9	4.20	2	2	0.10	0.00	4.97	24.00	632.09	16.66	0.00	2.42	150.50
1	5	209	56.70	2	2	0.10	0.00	4.97	24.00	10105.50	17.38	0.00	2.49	178.23
1	5	10	1.00	2	2	0.10	0.00	4.97	24.00	601.37	12.81	0.00	2.59	601.37
1	5	210	57.70	2	2	0.10	0.00	4.97	24.00	10166.23	17.38	0.00	2.49	176.19
1	5	110	57.70	2	2	0.10	0.00	4.97	24.00	10146.35	18.51	5.24	2.45	175.85
1	5	11	16.30	2	2	0.10	0.00	4.97	24.00	2055.29	19.72	0.00	2.26	126.09
1	5	211	74.00	2	2	0.10	0.00	4.97	24.00	12086.05	18.60	0.00	2.41	163.33
1	5	111	74.00	2	2	0.10	0.00	4.97	24.00	12081.69	18.86	5.59	2.39	163.27
1	5	12	1.80	2	2	0.10	0.00	4.97	24.00	558.73	14.37	0.00	2.59	310.40
1	5	212	75.80	2	2	0.10	0.00	4.97	24.00	12226.68	18.83	0.00	2.40	161.30
1	5	112	75.80	2	2	0.10	0.00	4.97	24.00	12222.66	19.03	5.62	2.39	161.25
1	5	13	0.70	2	2	0.10	0.00	4.97	24.00	831.57	12.13	0.00	2.59	1187.96
1	5	213	76.50	2	2	0.10	0.00	4.97	24.00	12252.15	19.03	0.00	2.39	160.16
1	5	14	10.20	2	2	0.10	0.00	4.97	24.00	3527.16	14.92	0.00	3.61	345.80
1	5	214	86.70	2	2	0.10	0.00	4.97	24.00	13759.72	18.69	0.00	2.53	158.70
1	5	15	4.10	2	2	0.10	0.00	4.97	24.00	1292.35	15.11	0.00	3.31	315.21
1	5	215	90.80	2	2	0.10	0.00	4.97	24.00	14378.20	18.53	0.00	2.57	158.35
1	5	115	90.80	2	2	0.10	0.00	4.97	24.00	14371.61	18.95	6.01	2.55	158.28
1	5	16	7.10	2	2	0.10	0.00	4.97	24.00	3248.66	14.17	0.00	3.63	457.56
1	5	216	97.90	2	2	0.10	0.00	4.97	24.00	15032.28	18.74	0.00	2.63	153.55
1	5	116	97.90	2	2	0.10	0.00	4.97	24.00	15030.60	18.81	6.13	2.62	153.53

1	5	17	0.90	2	2	0.10	0.00	4.97	24.00	1262.13	12.22	0.00	3.63	1402.37
1	5	217	98.80	2	2	0.10	0.00	4.97	24.00	15075.20	18.80	0.00	2.63	152.58
1	5	117	98.80	2	2	0.10	0.00	4.97	24.00	15070.72	19.09	6.14	2.62	152.54
1	5	18	9.20	2	2	0.10	0.00	4.97	24.00	1390.48	18.56	0.00	2.43	151.14
1	5	118	9.20	2	2	0.10	0.00	4.97	24.00	1388.79	19.06	1.20	2.40	150.96
1	5	19	7.50	2	2	0.10	0.00	4.97	24.00	2227.25	14.90	0.00	3.31	296.97
1	5	218	16.70	2	2	0.10	0.00	4.97	24.00	3151.80	15.99	0.00	2.81	188.73
1	5	119	16.70	2	2	0.10	0.00	4.97	24.00	3150.64	16.15	2.02	2.80	188.66
1	5	20	0.80	2	2	0.10	0.00	4.97	24.00	958.23	12.34	0.00	3.63	1197.78
1	5	219	17.50	2	2	0.10	0.00	4.97	24.00	3214.66	16.09	0.00	2.84	183.70
1	5	220	116.30	2	2	0.10	0.00	4.97	24.00	17582.60	18.86	0.00	2.65	151.18
1	5	120	116.30	2	2	0.10	0.00	4.97	24.00	17580.96	18.91	5.83	2.65	151.17
1	5	21	3.00	2	2	0.10	0.00	4.97	24.00	2430.77	12.83	0.00	3.63	810.26
1	5	221	119.30	2	2	0.10	0.00	4.97	24.00	17749.26	18.88	0.00	2.68	148.78
1	5	121	119.30	2	2	0.10	0.00	4.97	24.00	17747.67	18.97	5.87	2.67	148.77
1	5	22	1.20	2	2	0.10	0.00	4.97	24.00	1425.57	12.35	0.00	3.63	1187.98
1	5	222	120.50	2	2	0.10	0.00	4.97	24.00	17807.85	18.97	0.00	2.68	147.78
1	5	122	120.50	2	2	0.10	0.00	4.97	24.00	17805.30	19.16	2216.38	2.67	147.76
1	5	23	4.50	2	2	0.10	0.00	4.97	24.00	4246.12	12.61	0.00	3.63	943.58
1	5	223	125.00	2	2	0.10	0.00	4.97	24.00	18037.20	19.13	0.00	2.71	144.30
1	5	24	6.80	2	2	0.10	0.00	4.97	24.00	3761.53	13.58	0.00	3.63	553.17
1	5	224	131.80	2	2	0.10	0.00	4.97	24.00	18517.59	18.96	0.00	2.75	140.50
1	5	124	131.80	2	2	0.10	0.00	4.97	24.00	18515.83	19.16	2138.54	2.74	140.48
1	5	25	3.00	2	2	0.10	0.00	4.97	24.00	2003.40	13.05	0.00	3.63	667.80
1	5	225	134.80	2	2	0.10	0.00	4.97	24.00	18690.50	19.10	0.00	2.76	138.65
1	5	26	9.10	2	2	0.10	0.00	4.97	24.00	3334.51	14.54	0.00	3.62	366.43
1	5	226	143.90	2	2	0.10	0.00	4.97	24.00	19929.08	18.43	0.00	2.82	138.49
1	5	126	143.90	2	2	0.10	0.00	4.97	24.00	19926.23	18.72	2082.96	2.81	138.47
1	5	27	1.20	2	2	0.10	0.00	4.97	24.00	1805.54	12.17	0.00	3.63	1504.62
1	5	227	145.10	2	2	0.10	0.00	4.97	24.00	19985.61	18.71	0.00	2.81	137.74
1	5	28	0.40	2	2	0.10	0.00	4.97	24.00	802.90	11.99	0.00	3.64	2007.24
1	5	228	145.50	2	2	0.10	0.00	4.97	24.00	20004.97	18.71	0.00	2.82	137.49
1	5	127	145.50	2	2	0.10	0.00	4.97	24.00	20004.62	18.73	2082.97	2.81	137.49
1	5	29	1.60	2	2	0.10	0.00	4.97	24.00	1255.33	12.83	0.00	3.63	784.58
1	5	229	147.10	2	2	0.10	0.00	4.97	24.00	20843.17	13.55	0.00	2.82	141.69
1	5	129	147.10	2	2	0.10	0.00	4.97	24.00	20821.75	13.61	2083.06	2.82	141.55
1	5	30	0.10	2	2	0.10	0.00	4.97	24.00	218.76	11.96	0.00	3.62	2187.59
1	5	230	147.20	2	2	0.10	0.00	4.97	24.00	20835.84	13.61	0.00	2.82	141.55

1SUMMARY TABLE 3

DISCHARGE,CFS

	Q1 (2-Yr)	Q2 (10-Yr)	Q3 (50-Yr)	Q4 (100-Yr)	Q5 (500-Yr)	Q6	Q7	Q8	Q9	Q10
OXSEC/STRUC NO. 2										
ALTERNATE 1	129.80	531.25	1081.15	1362.78	2014.72	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 3										
ALTERNATE 1	64.88	273.43	563.20	708.93	1045.63	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 4										
ALTERNATE 1	71.56	289.40	595.83	749.98	1106.14	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 5										
ALTERNATE 1	176.90	715.11	1472.77	1857.70	2743.96	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 6										
ALTERNATE 1	142.33	570.09	1158.51	1453.99	2137.05	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 7										
ALTERNATE 1	48.84	215.73	450.14	567.58	838.09	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 8										
ALTERNATE 1	32.18	139.31	286.74	360.40	535.11	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 9										
ALTERNATE 1	42.47	170.51	344.22	431.27	632.09	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 10										
ALTERNATE 1	31.77	153.11	322.49	407.02	601.37	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 11										
ALTERNATE 1	147.70	554.80	1118.53	1401.26	2055.29	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 12										
ALTERNATE 1	32.56	143.82	300.09	378.39	558.73	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 13										

ALTERNATE 1	42.36	214.26	448.94	565.16	831.57	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 14										
ALTERNATE 1	514.80	1304.03	2197.69	2612.81	3527.16	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 15										
ALTERNATE 1	153.59	437.77	776.07	936.09	1292.35	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 16										
ALTERNATE 1	480.52	1219.85	2038.81	2417.41	3246.66	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 17										
ALTERNATE 1	187.51	477.05	795.11	941.57	1262.13	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 18										
ALTERNATE 1	93.00	373.96	756.52	948.22	1390.48	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 19										
ALTERNATE 1	265.98	758.42	1334.78	1606.83	2227.25	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 20										
ALTERNATE 1	142.11	360.80	601.97	713.16	958.23	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 21										
ALTERNATE 1	357.39	913.59	1526.81	1810.00	2430.77	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 22										
ALTERNATE 1	209.87	536.04	895.95	1061.94	1425.57	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 23										
ALTERNATE 1	622.38	1593.75	2666.76	3161.68	4246.12	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 24										
ALTERNATE 1	552.28	1410.38	2360.03	2798.78	3761.53	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 25										
ALTERNATE 1	297.38	754.28	1257.62	1489.72	2003.40	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 26										
ALTERNATE 1	486.25	1224.29	2074.24	2467.70	3334.51	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 27										
ALTERNATE 1	270.11	683.66	1138.23	1347.52	1805.54	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 28										
ALTERNATE 1	126.83	311.02	511.12	602.80	802.90	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 29										
ALTERNATE 1	182.48	467.93	787.28	933.88	1255.33	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO. 30										
ALTERNATE 1	36.36	86.74	140.69	165.27	218.76	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.102										
ALTERNATE 1	128.41	529.30	1076.08	1354.45	2000.45	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.103										
ALTERNATE 1	187.72	779.70	1601.45	2016.81	2978.36	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.104										
ALTERNATE 1	255.63	1062.93	2177.56	2740.98	4045.63	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.105										
ALTERNATE 1	423.69	1765.61	3614.70	4544.57	6703.63	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.106										
ALTERNATE 1	560.65	2302.52	4723.03	5942.13	8764.64	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.109										
ALTERNATE 1	603.11	2483.81	5108.93	6433.04	9475.11	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.110										
ALTERNATE 1	646.79	2661.37	5470.61	6888.02	10146.35	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.111										
ALTERNATE 1	792.20	3212.63	6530.83	8205.94	12081.69	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.112										
ALTERNATE 1	801.39	3248.21	6607.49	8303.63	12222.66	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.115										
ALTERNATE 1	979.42	3863.46	7855.41	9856.61	14371.61	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.116										
ALTERNATE 1	1045.87	4063.71	8244.55	10335.68	15030.60	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.117										
ALTERNATE 1	1051.86	4078.95	8270.87	10367.45	15070.72	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.118										
ALTERNATE 1	92.70	372.30	754.16	945.83	1388.79	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.119										
ALTERNATE 1	313.20	979.79	1809.52	2213.34	3150.64	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.120										
ALTERNATE 1	1371.82	4735.70	9660.53	12117.11	17590.96	0.00	0.00	0.00	0.00	0.00
OXSEC/STRUC NO.121										

ALTERNATE 1 OXSEC/STRUC NO.122	1429.46	4797.16	9766.08	12243.31	17747.67	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.124	1446.51	4819.23	9804.36	12287.63	17805.30	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.126	1733.70	5058.16	10239.87	12815.33	18515.83	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.127	2359.10	6644.65	11788.14	14238.26	19926.23	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.129	2398.63	6745.27	11960.09	14443.66	20004.62	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.203	2483.62	7013.38	12444.03	15034.90	20821.75	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.204	188.01	780.59	1603.09	2019.02	2981.20	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.205	255.81	1064.22	2179.31	2743.06	4048.46	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.206	423.84	1767.24	3616.11	4545.27	6704.98	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.207	563.53	2306.10	4727.29	5945.22	8774.94	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.208	583.68	2396.51	4917.16	6187.82	9120.12	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.209	604.41	2487.84	5112.64	6439.36	9486.46	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.210	645.23	2650.91	5447.13	6858.70	10105.50	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.211	651.14	2670.57	5483.79	6903.29	10166.23	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.212	793.23	3216.48	6534.10	8209.59	12086.05	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.213	802.20	3250.43	6610.16	8306.79	12226.68	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.214	804.21	3257.80	6625.85	8325.46	12252.15	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.215	934.64	3695.96	7503.96	9418.70	13759.72	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.216	980.97	3866.64	7860.72	9862.04	14378.20	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.217	1046.08	4064.41	8245.75	10336.64	15032.28	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.218	1052.62	4081.02	8274.10	10369.97	15075.20	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.219	313.57	980.74	1810.30	2214.13	3151.80	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.220	326.66	1007.48	1852.10	2262.57	3214.66	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.221	1372.49	4736.08	9661.24	12118.23	17582.60	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.222	1430.67	4797.70	9766.75	12244.33	17749.26	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.223	1447.91	4820.11	9805.69	12289.49	17807.85	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.224	1516.30	4905.51	9954.38	12464.37	18037.20	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.225	1745.67	5100.11	10241.73	12816.76	18517.59	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.226	1984.17	5784.05	10432.66	12944.70	18690.50	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.227	2366.71	6650.91	11820.23	14283.94	19929.08	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.228	2390.94	6725.38	11926.64	14413.30	19985.61	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.229	2400.37	6747.86	11964.07	14459.18	20004.97	0.00	0.00	0.00	0.00	0.00
ALTERNATE 1 OXSEC/STRUC NO.230	2486.32	7018.54	12451.65	15057.10	20843.17	0.00	0.00	0.00	0.00	0.00

ALTERNATE	1	2485.88	7018.35	12452.53	15044.96	20835.84	0.00	0.00	0.00	0.00	0.00	6Y

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NO CONNECTION

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
A	0.030	1287	3909	3.8	2040.7	2040.1	0.6
B	0.130	545	2274	6.6	2047.2	2047.1	0.1
C	0.220	250	1223	12.3	2052.8	2052.8	0.0
D	0.360	215	1166	12.9	2058.2	2058.2	0.0
E	0.40	143	1016	14.8	2058.5	2058.3	0.2
F	0.42	163	1119	13.4	2059.4	2059.4	0.0
G	0.47	548	2092	7.2	2061.8	2061.6	0.2
H	0.50	795	2490	6.0	2063.6	2063.6	0.0
I	0.60	715	1997	7.2	2067.8	2067.7	0.1
J	0.69	639	1895	7.6	2071.0	2070.7	0.3
K	0.79	535	1561	9.2	2075.2	2074.9	0.3
L	0.90	681	1840	7.8	2079.3	2078.8	0.5

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Town of Wickenburg, Arizona
Maricopa County, Arizona

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
M	1.00	850	1843	7.8	2084.0	2084.0	0.0
N	1.12	880	1954	7.4	2088.4	2088.4	0.0
O	1.30	1120	2049	7.0	2097.0	2097.0	0.0
P	1.40	1250	2103	6.9	2101.1	2101.1	0.0
Q	1.49	1084	2184	6.6	2106.4	2105.9	0.5
R	1.59	1003	2192	6.6	2111.0	2111.0	0.0
S	1.68	1090	2166	6.7	2115.9	2115.9	0.0
T	1.82	740	1811	8.0	2122.5	2122.5	0.0
U	1.87	670	1925	7.5	2126.6	2126.4	0.2
V	1.97	597	1832	7.9	2130.8	2130.5	0.3
W	2.06	730	1924	6.7	2135.2	2135.1	0.1
X	2.17	534	1795	7.2	2141.1	2140.7	0.4

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY

Flood Insurance Study
Town of Wickenburg, Arizona
Maricopa County, Arizona

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
Y	2.25	289	1367	9.5	2145.6	2145.5	0.1
Z	2.37	305	1371	9.4	2150.3	2149.9	0.4
AA	2.46	402	1604	8.1	2153.7	2153.3	0.4
AB	2.58	508	1747	7.4	2158.8	2158.7	0.1
AC	2.69	490	1582	8.2	2163.0	2163.0	0.0
AD	2.73	396	1341	9.7	2166.3	2166.2	0.1
AE	2.78	635	2037	6.3	2168.3	2168.2	0.1
AF	2.88	420	1594	8.0	2172.0	2171.7	0.3
AG	2.97	402	1523	8.4	2176.0	2175.9	0.1
AH	3.07	379	1354	9.5	2180.5	2180.5	0.0

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Town of Wickenburg, Arizona
Maricopa County, Arizona

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
AI	3.18	480	1608	8.0	2184.4	2183.8	0.6
AJ	3.27	602	1783	7.0	2187.4	2186.9	0.5
AK	3.35	922	2163	5.8	2190.2	2189.8	0.4
AL	3.46	380	1249	10.0	2195.0	2194.5	0.5
AM	3.56	403	1646	7.6	2199.5	2199.5	0.0
AN	3.66	564	1869	6.7	2204.5	2204.5	0.0
AO	3.79	447	1467	8.5	2209.6	2209.6	0.0
AP	3.93	331	1435	8.7	2216.1	2215.8	0.3
AQ	4.07	398	1465	8.5	2222.4	2222.4	0.0
AR	4.16	444	1545	8.1	2225.2	2224.5	0.7
AS	4.20	350	1209	10.3	2227.6	2227.3	0.3
AT	4.31	681	1490	8.2	2233.3	2233.3	0.0

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY

Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
AU	4.338	281	1272	9.6	2234.4	2234.0	0.4
AV	4.344	290	1384	8.8	2235.1	2235.1	0.0
AW	4.41	345	1443	8.5	2239.5	2239.2	0.3
AX	4.53	640	2095	5.8	2242.6	2241.7	0.9
AY	4.60	425	1545	7.9	2245.2	2245.2	0.0
AZ	4.70	309	1128	10.9	2249.0	2248.8	0.2
BA	4.79	214	1012	12.1	2253.5	2253.5	0.0
BB	4.87	306	1385	8.8	2256.3	2255.9	0.4
BC	4.98	304	1151	10.5	2259.9	2259.8	0.1
BD	5.08	321	1209	10.0	2263.3	2263.1	0.2
BE	5.17	344	1162	10.4	2267.6	2267.4	0.2
BF	5.27	446	1499	8.1	2273.0	2273.0	0.0

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY

Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
BG	5.35	601	1958	5.3	2275.7	2275.3	0.4
BH	5.47	646	1710	6.1	2279.4	2279.2	0.2
BI	5.58	497	1531	6.8	2283.0	2282.8	0.2
BJ	5.65	527	1539	6.7	2284.8	2284.7	0.1
BK	5.74	450	1248	8.3	2288.0	2287.8	0.2
BL	5.85	220	927	11.2	2291.3	2291.3	0.0
BM	5.92	442	1202	8.6	2295.5	2295.5	0.0
BN	6.01	364	1461	7.1	2298.2	2298.1	0.1
BO	6.09	278	1100	9.4	2301.3	2300.8	0.5
BP	6.21	295	1186	8.7	2305.6	2305.4	0.2
BQ	6.31	231	1050	9.9	2307.6	2307.6	0.0
BR	6.40	287	1252	8.3	2310.2	2310.1	0.1

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
BS	6.5	287	1097	9.5	2315.5	2315.4	0.1
BT	6.61	409	1413	7.3	2318.5	2318.2	0.3
BU	6.69	308	1027	10.1	2320.4	2320.4	0.0
BV	6.76	304	1234	8.4	2322.8	2322.7	0.1
BW	6.88	396	1394	7.4	2327.0	2326.9	0.1
BX	6.99	305	1275	8.1	2330.8	2330.2	0.6
BY	7.13	236	1124	9.2	2336.0	2335.8	0.2
BZ	7.21	150	907	11.4	2338.4	2337.8	0.6
CA	7.30	201	1025	10.1	2341.1	2341.1	0.0
CB	7.44	415	1309	7.9	2345.5	2345.5	0.0
CC	7.53	249	1000	10.4	2349.4	2348.7	0.7
CD	7.579	67	608	17.1	2352.7	2352.7	0.0

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
CE	7.59	67	707	14.7	2354.2	2353.7	0.5
CF	7.63	300	2455	4.2	2359.2	2359.2	0.0
CG	7.72	275	1975	5.3	2359.5	2359.5	0.0
CH	7.82	176	860	12.1	2359.7	2359.7	0.0
CI	7.884	353	1170	8.9	2364.8	2364.8	0.0
CJ	7.891	340	2763	3.8	2368.6	2368.6	0.0
CK	7.92	222	2452	4.2	2368.7	2368.7	0.0
CL	8.00	481	4377	2.4	2369.1	2369.0	0.1
CM	8.10	781	4340	2.4	2369.1	2369.0	0.1
CN	8.19	657	2457	4.2	2369.2	2369.1	0.1
CO	8.29	476	1560	6.6	2370.0	2370.0	0.0
CP	8.40	300	1215	8.5	2372.5	2372.4	0.1

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	distance (mi.) *	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F. P. S.)	WITH FLOODWAY n.g.v.d.	WITHOUT FLOODWAY n.g.v.d.	increase (FT.)
CQ	8.48	259	1050	9.4	2376.2	2376.2	0.0
CR	8.57	480	1922	5.1	2379.6	2379.3	0.3
CS	8.67	596	1503	6.6	2380.9	2380.8	0.1
CT	8.76	681	1503	6.3	2383.4	2383.3	0.1
CU	8.86	638	1476	5.6	2386.5	2386.2	0.3
CV	8.947	308	922	9.0	2392.0	2391.9	0.1
CW	8.953	549	2121	3.9	2394.8	2393.8	1.0
CX	9.060	246	1056	7.9	2395.1	2394.4	0.7
CY	9.160	485	1364	6.1	2396.8	2396.8	0.0
CZ	9.250	363	1115	7.5	2401.7	2401.4	0.3

*Miles above confluence with Hassayampa River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Flood Insurance Study
Maricopa County, Arizona
(Unincorporated Areas)

FLOODWAY DATA

SOLS WASH

CROSS-SECTION LETTER	STREAM MILE STATION
A	0.03
B	0.13
C	0.22
D	0.36
E	0.40
F	0.42
G	0.47
H	0.50
I	0.60
J	0.69
K	0.79
L	0.90
M	1.00
N	1.12
O	1.30
P	1.40
Q	1.49
R	1.59
S	1.68
T	1.82
U	1.87
V	1.97
W	2.06
X	2.17
Y	2.25
Z	2.37
AA	2.46
AB	2.58
AC	2.69
AD	2.73
AE	2.78
AF	2.88
AG	2.97
AH	3.07
AI	3.18
AJ	3.27
AK	3.35
AL	3.46
AM	3.56
AN	3.66
AO	3.79
AP	3.93
AQ	4.07
AR	4.16
AS	4.20
AT	4.31
AU	4.338
AV	4.344
AW	4.41
AX	4.53
AY	4.60
AZ	4.70

CROSS-SECTION LETTER	STREAM MILE STATION
BA	4.79
BB	4.87
BC	4.98
BD	5.08
BE	5.17
BF	5.27
BG	5.35
BH	5.47
BI	5.58
BJ	5.65
BK	5.74
BL	5.85
BM	5.92
BN	6.01
BO	6.09
BP	6.21
BQ	6.31
BR	6.40
BS	6.50
BT	6.61
BU	6.69
BV	6.76
BW	6.88
BX	6.99
BY	7.13
BZ	7.21
CA	7.30
CB	7.44
CC	7.53
CD	7.579
CE	7.59
CF	7.63
CG	7.72
CH	7.82
CI	7.884
CJ	7.891
CK	7.92
CL	8.00
CM	8.10
CN	8.19
CO	8.29
CP	8.40
CQ	8.48
CR	8.57
CS	8.67
CT	8.76
CU	8.86
CV	8.947
CW	8.953
CX	9.06
CY	9.16
CZ	9.25

REV- 6/87

FLOODING SOURCE IN STREAM MILES	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
0.030 - 1.46		-2.00	-0.51	0.93	020	A4	
1.46 - 2.06		-1.00	-0.29	0.55	010	A2	
2.06 - 3.27		-1.63	-0.47	0.91	015	A3	
3.27 - 4.58		-2.00	-0.48	0.82	020	A4	
4.58 - 4.69		-0.56	-0.17	0.45	005	A1	
4.69 - 5.35		-1.83	-0.51	0.91	020	A4	
5.35 - 7.30		-2.22	-0.58	1.03	020	A4	
7.30 - 7.66		-3.64	-0.97	2.18	035	A7	
7.66 - 7.74		-6.07	-2.08	4.36	060	A12	
7.74 - 7.87		-3.53	-1.35	3.79	035	A7	
7.87 - 8.19		-5.23	-1.12	1.60	050	A10	
8.19 - 8.76		-2.02	-0.55	1.18	020	A4	
8.76 - 8.83		-0.48	-0.11	0.66	005	A1	
8.83 - 9.18		-2.02	-0.69	0.83	020	A4	
9.18 - 9.25		-1.27	-0.28	0.91	015	A3	

1 FLOOD INSURANCE RATE PANEL
2 WEIGHTED AVERAGE
3 ROUNDED TO THE NEAREST FOOT- SEE MAP

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF WICKENBURG, ARIZONA
AND MARICOPA COUNTY, ARIZONA
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

SOLS WASH

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
REACH 1 (Stream Mile 3.07 - 9.25)		1.77	0.62	-1.71	005	A1	Varies

1 FLOOD INSURANCE RATE PANEL
2 WEIGHTED AVERAGE
3 ROUNDED TO THE NEAREST FOOT - SEE MAP

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Maricopa County
(Unincorporated Areas)

FLOOD INSURANCE ZONE DATA

SOLS WASH

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
REACH 1 (Stream Mile 0.030 - 3.07)		1.30	0.45	-1.24	005	A1	Varies

1 FLOOD INSURANCE RATE PANEL
2 WEIGHTED AVERAGE
3 ROUNDED TO THE NEAREST FOOT - SEE MAP

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Town of Wickenburg, Arizona
Maricopa County

FLOOD INSURANCE ZONE DATA

SOLS WASH

SOLS WASH - REQUEST FOR LOMR
TABLE OF ELEVATION REFERENCE MARKS (ERMS)
CBA FILE NO. 40915-01-75

RM 1 Elev. 20833.61. Chiselled + on top of concrete bank at Northeast corner of wooden railroad bridge, .1 mile east of railroad mile post 139.

RM 2 Elev. 2112.89. Top of bolt in wingwall, Southeast corner of railroad bridge, approximately .5+ mile east of railroad mile post 138.

RM 3 Elev. 2138.36. PK nail set Southeast corner of headwall railroad bridge, approximately .1 mile east of railroad mile post 138.

RM 4 Elev. 2160.54. Chiselled X in Southeast corner of concrete headwall of concrete box culvert, approximately 500 feet east of Vulture Mine Road.

RM 5 Elev. 2190.64. Chiselled X on concrete retaining wall southeast corner of railroad bridge, 25 feet west of railroad mile post 137.

RM 6 Elev. 2236.02. Chiselled X on top of concrete headwall northwest corner of railroad bridge at railroad mile post 136.

RM 7 Elev. 2269.75. U.S.C & G.S. brass cap in headwall north end of box culvert, approximately 1/2 mile east of railroad mile post 135, stamped "P-24, 1933" north side of railroad track.

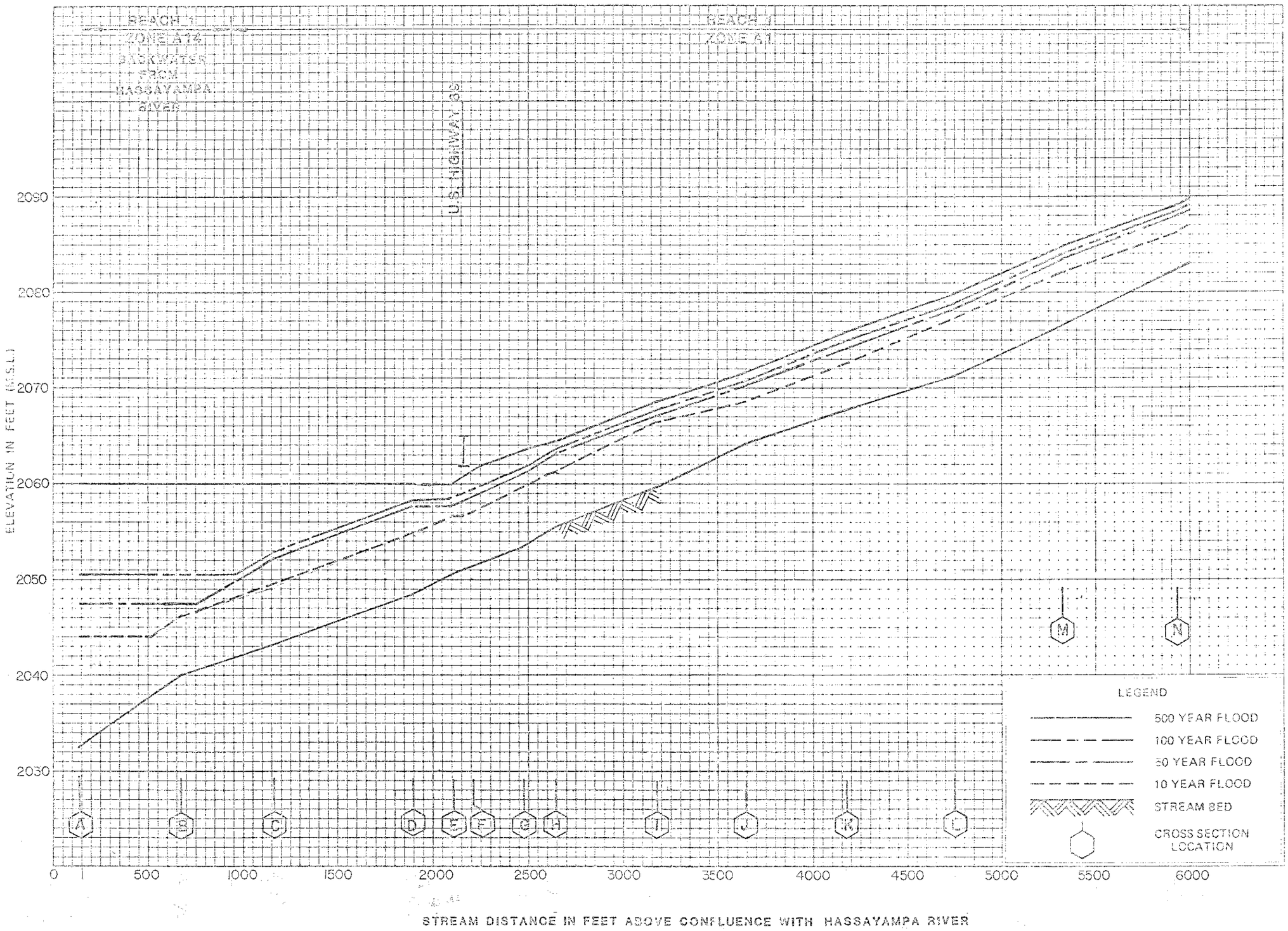
RM 8 Elev. 2288.83. U.S.C. & G.S. brass cap in center of headwall north end of concrete box culvert, approximately 250 feet east of railroad mile post 135 at Matthie junction stamped "S-24 1933."

RM 9 Elev. 2321.82. 1/2-inch iron pin in ground at base of post marked "railroad junction 1 mile." (Matthie Junction)

RM 10 Elev. 2349.71. U.S.C. & G.S. brass cap on top of concrete headwall northwest corner of railroad bridge, approximately 250 feet east of mile post 2, stamped "T-24 1933."

RM 11 Elev. 2392.18. Chiselled X in concrete wingwall southwest corner of railroad bridge, approximately .1 mile west of railroad mile post 3.

MLC-01



FLOOD PROFILES

SOUTH WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WICKENBURG,
ARIZONA
(Maricopa County)

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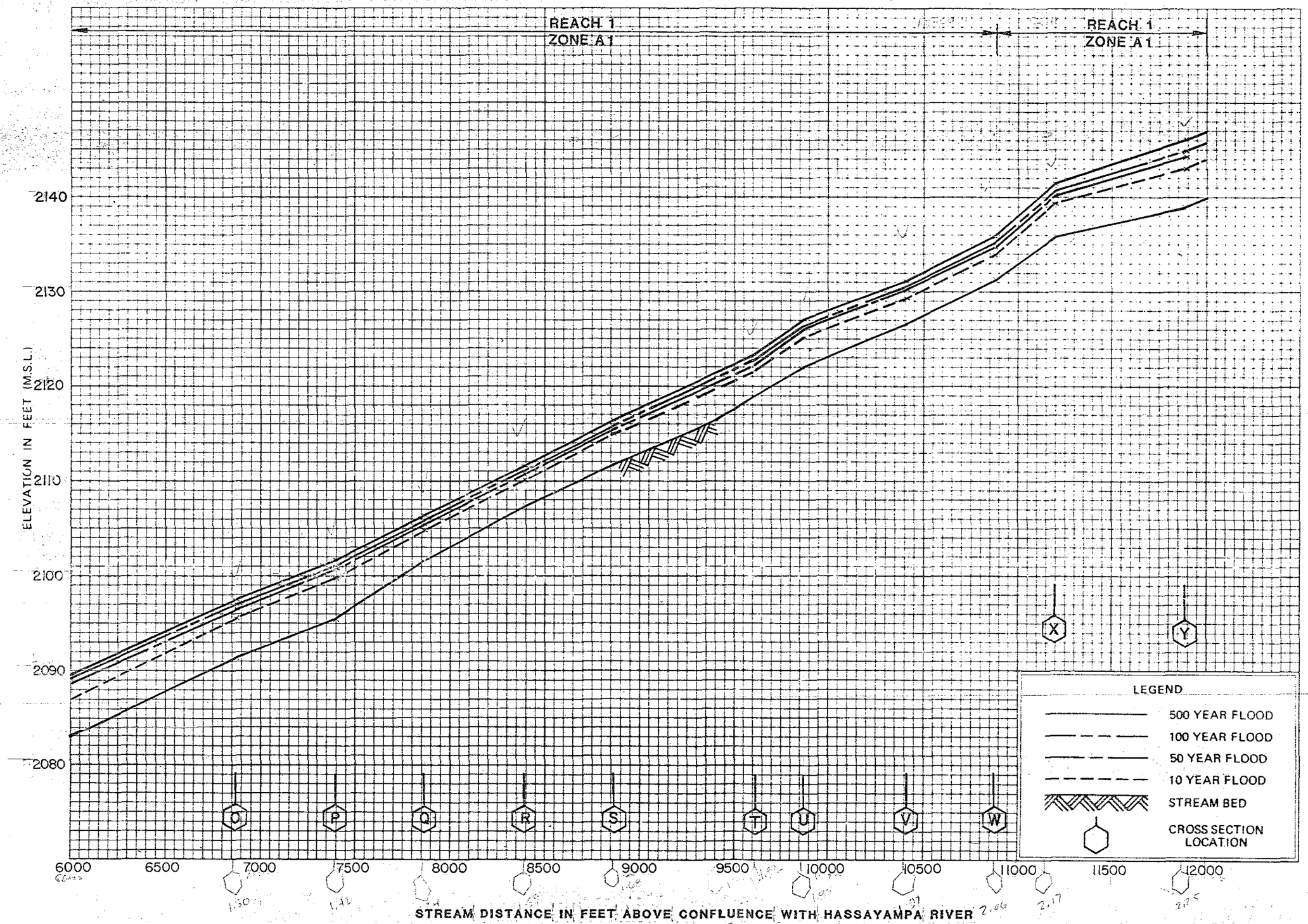
40915-01



FLOOD PROFILES

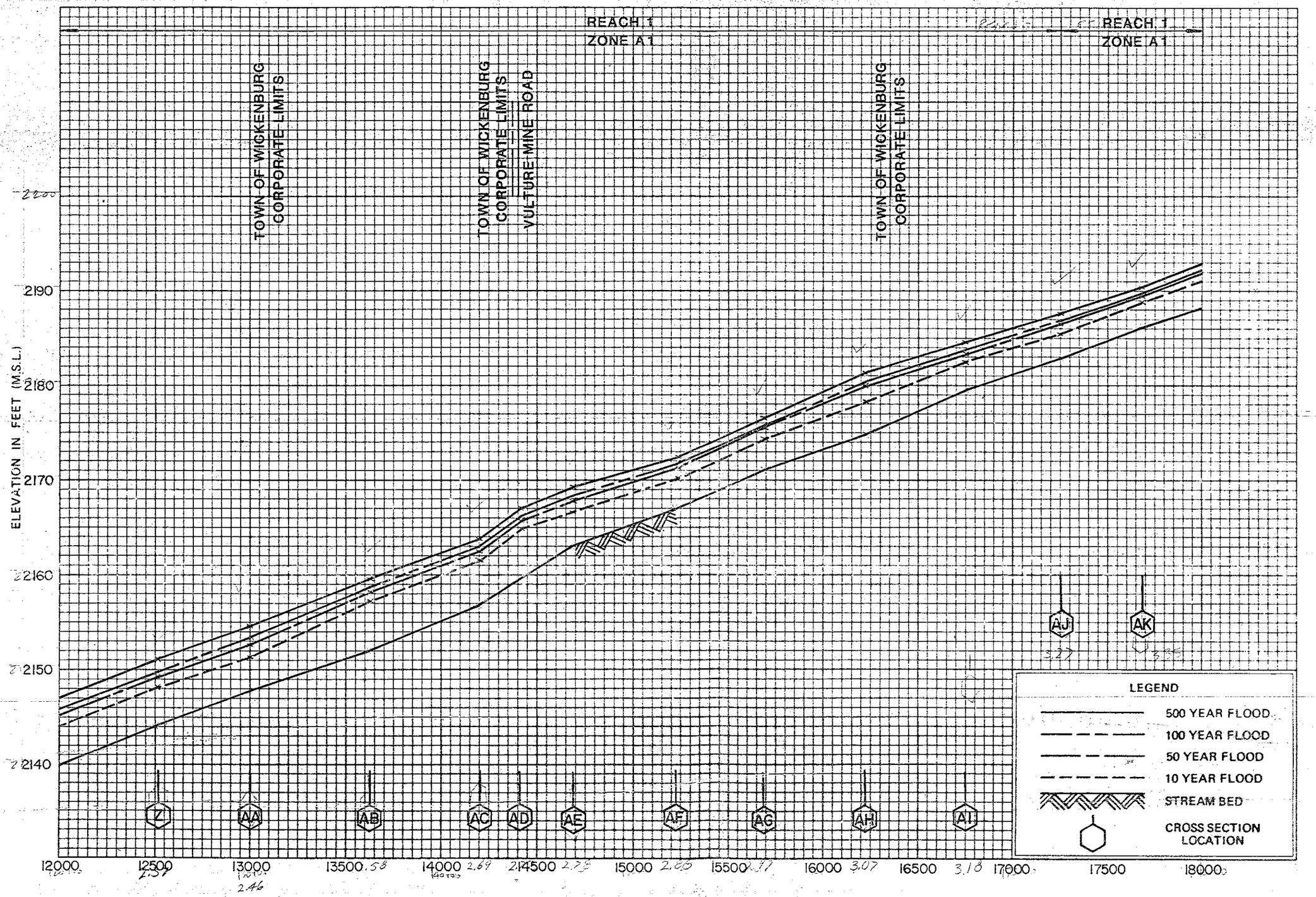
SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WICKENBURG,
ARIZONA
(Maricopa County)

2/9

40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
TOWN OF WICKENBURG
AND MARICOPA COUNTY
(Unincorporated Areas)

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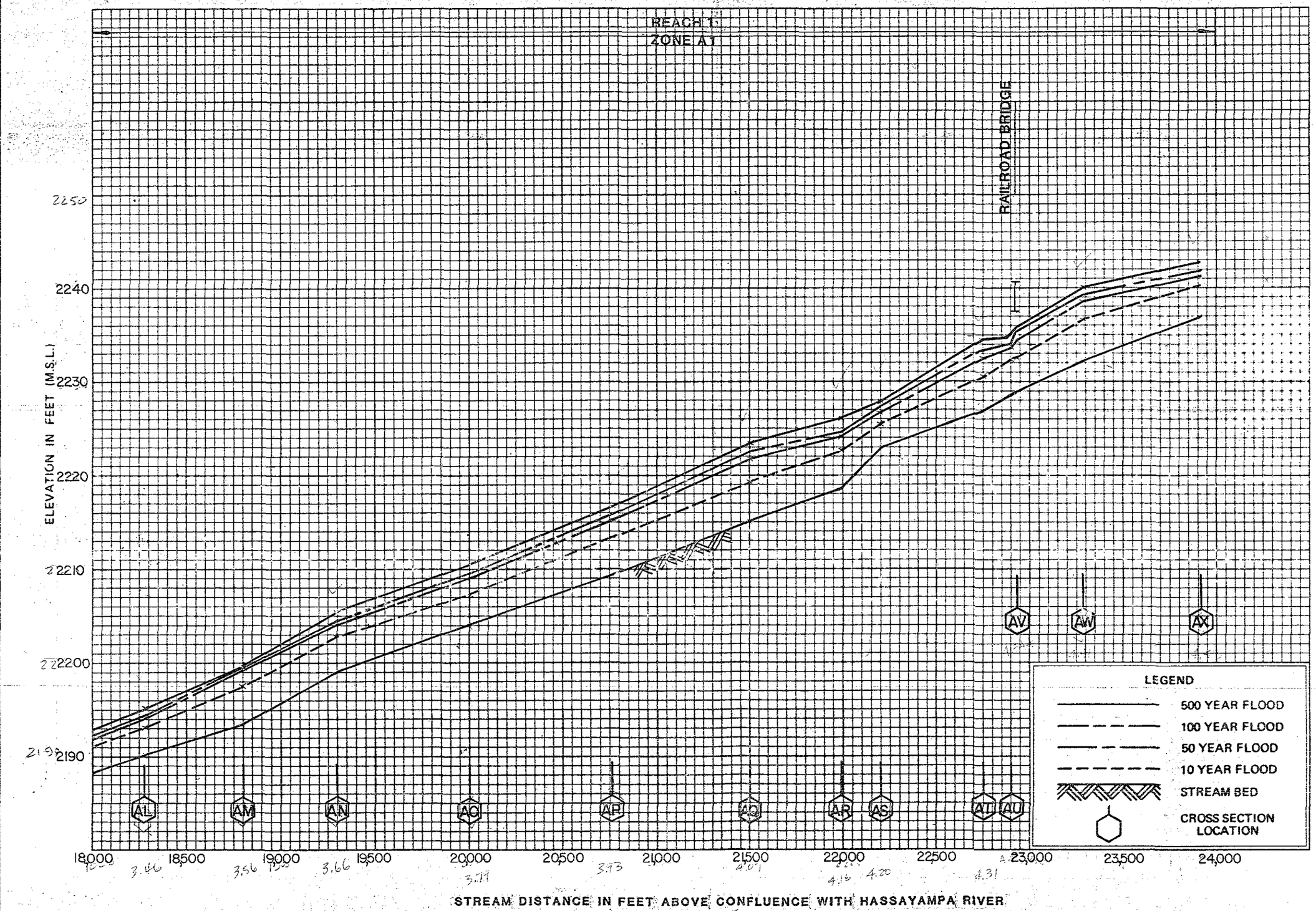
90915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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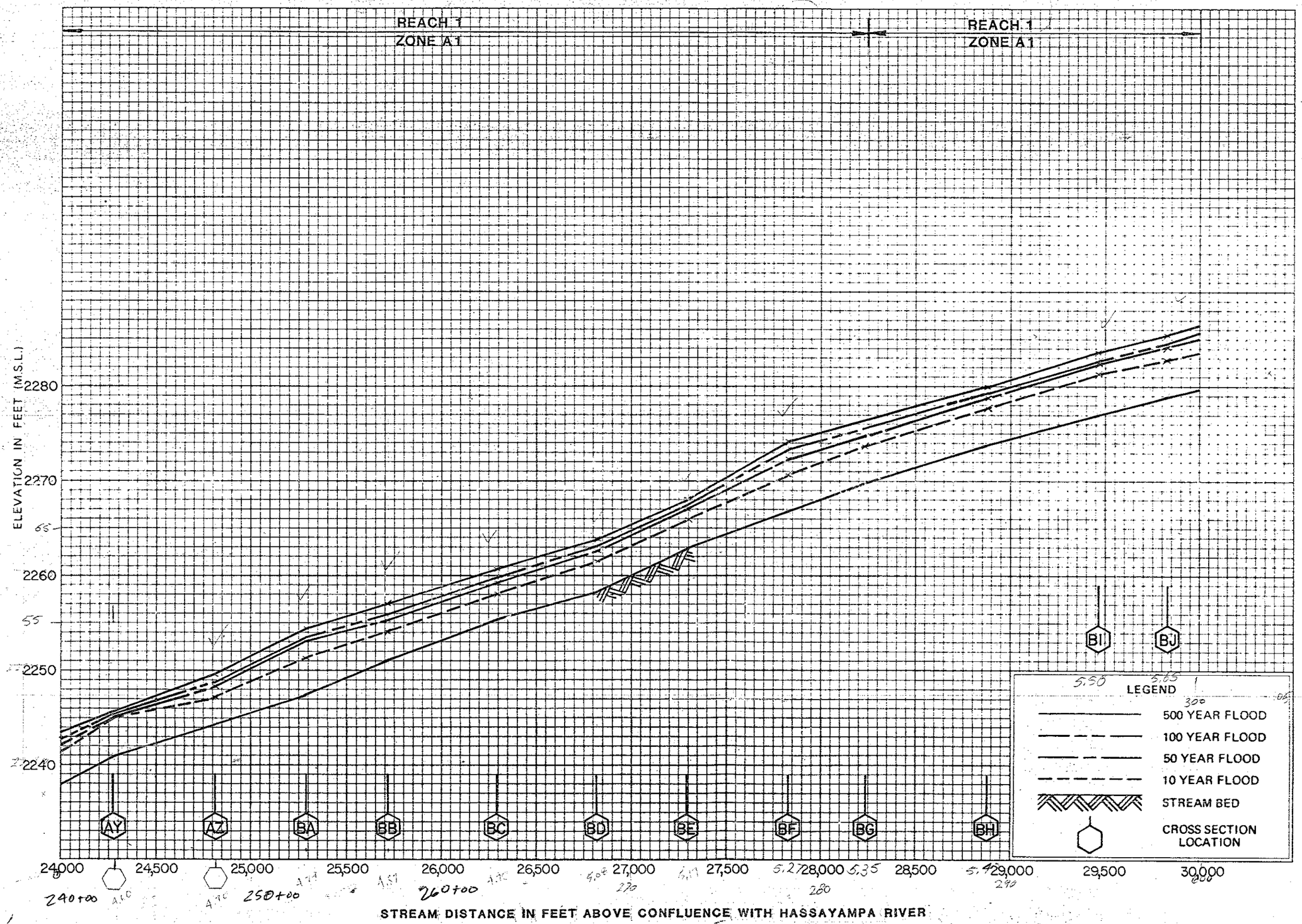
40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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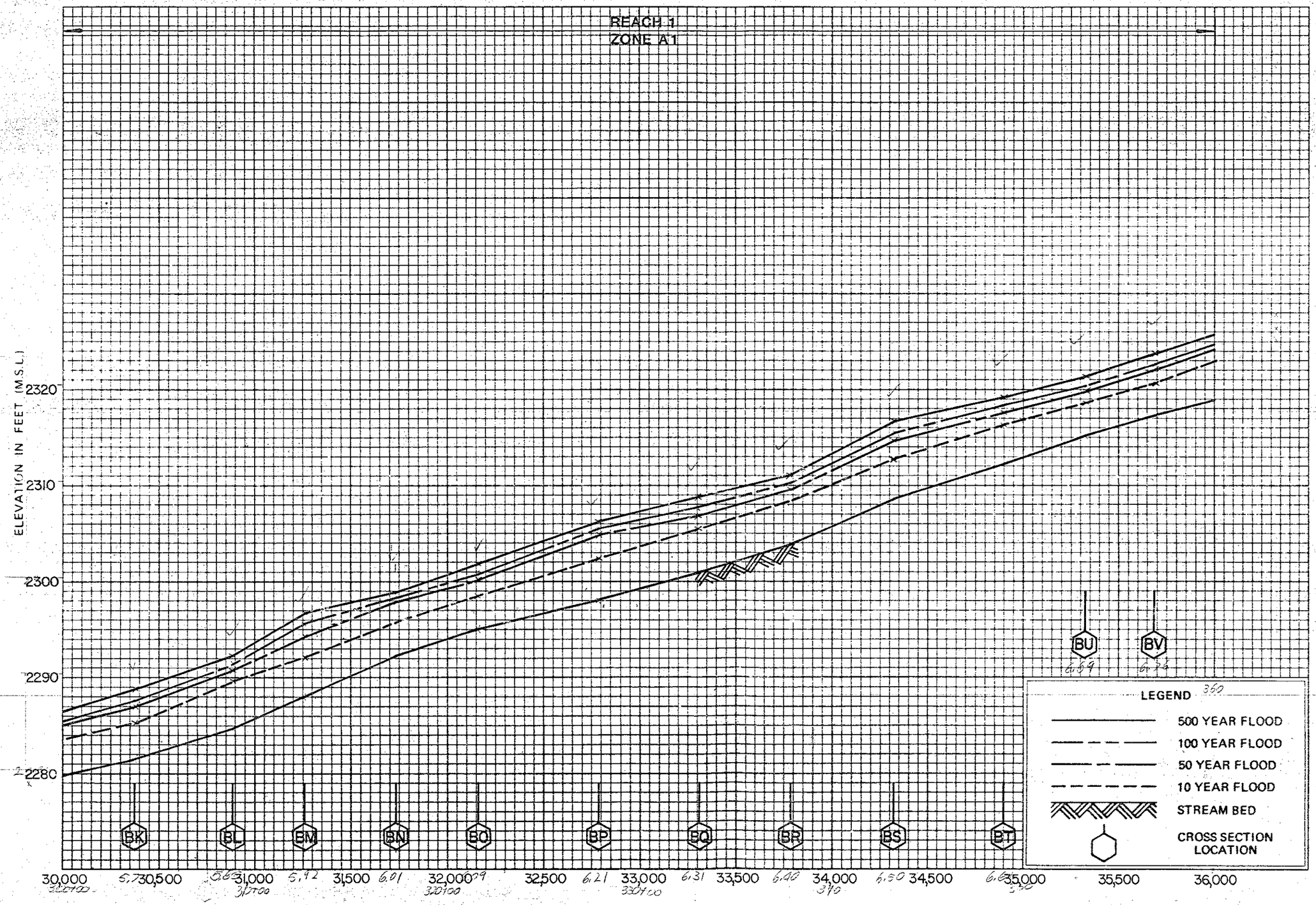
40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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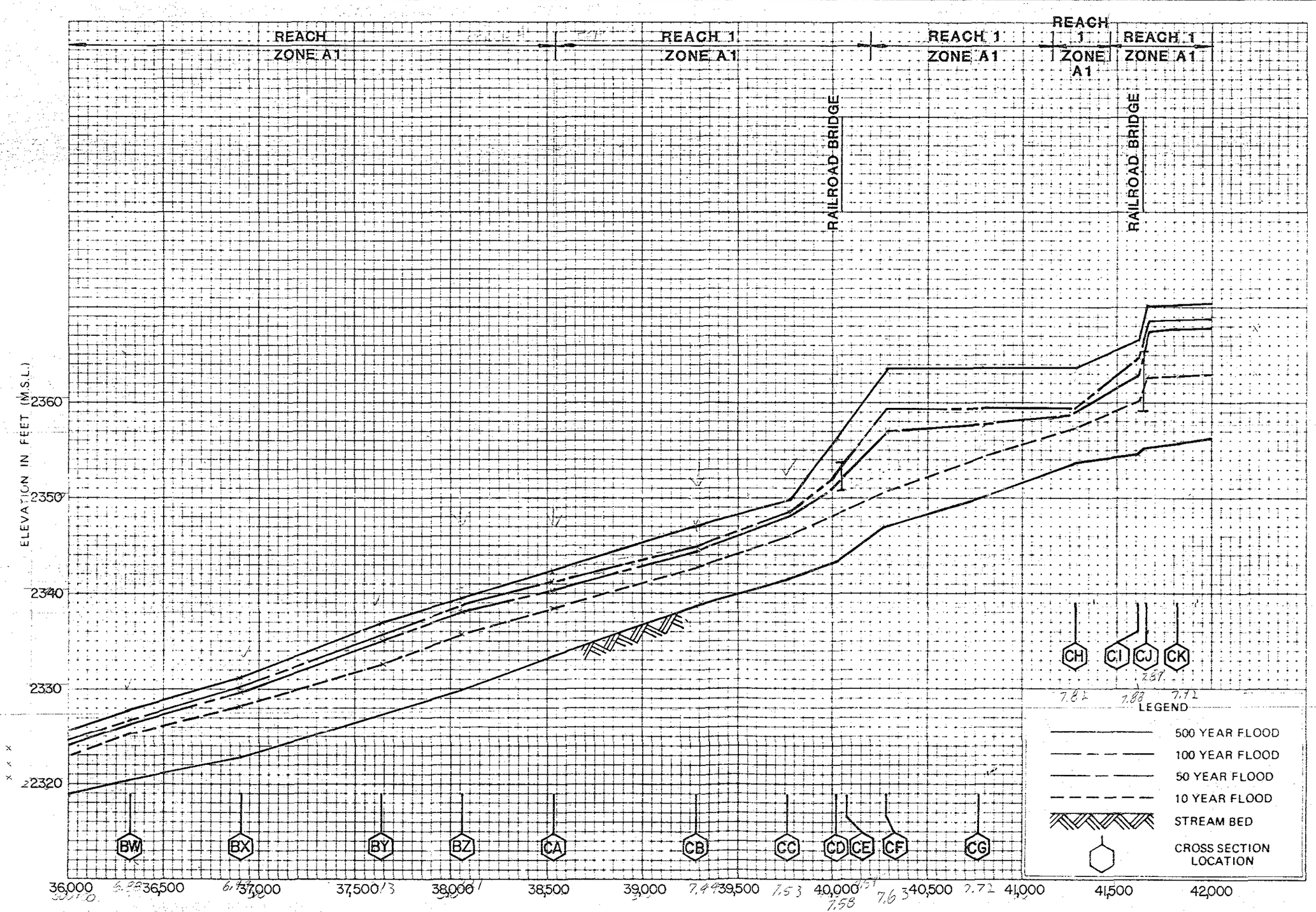
40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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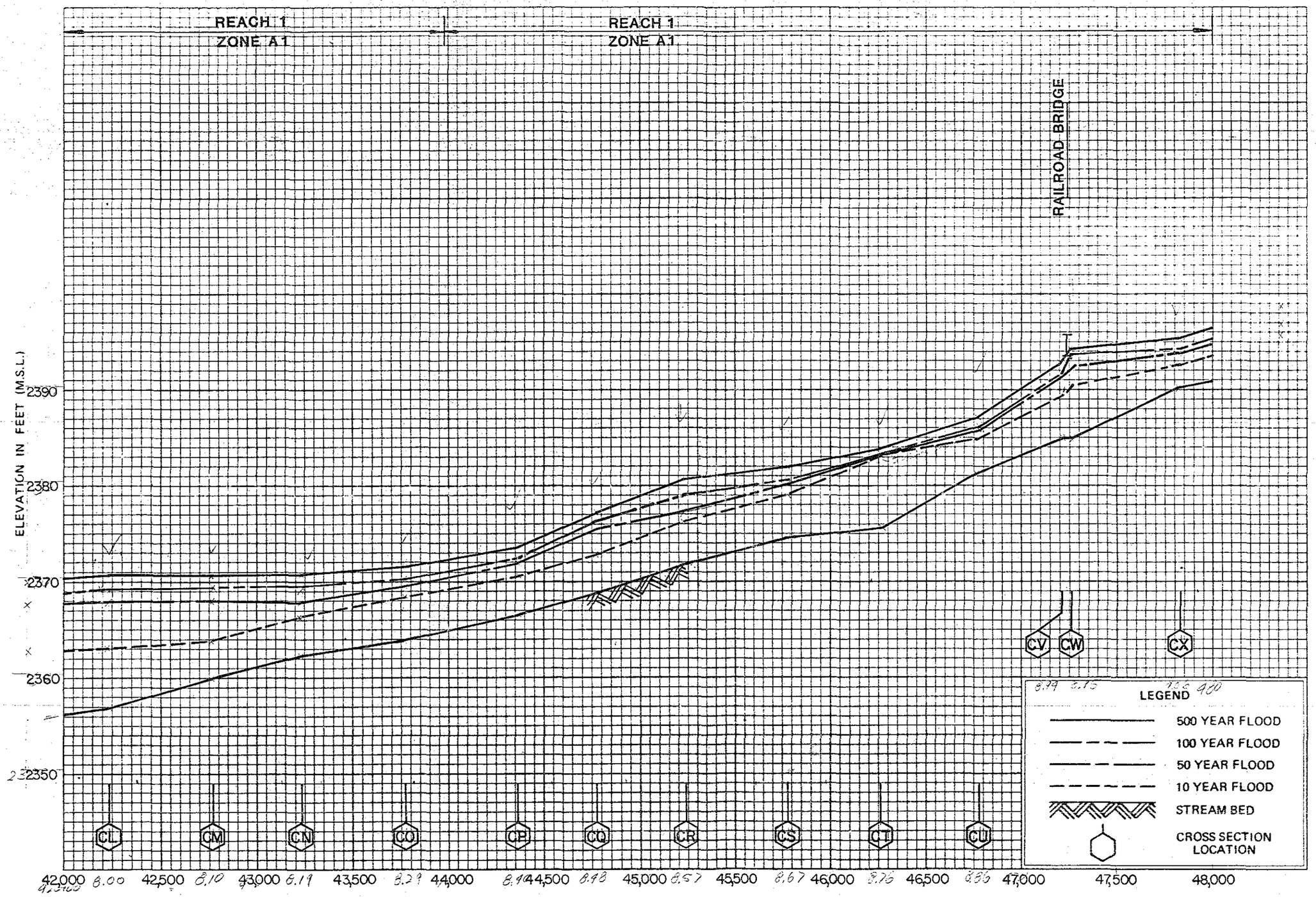
40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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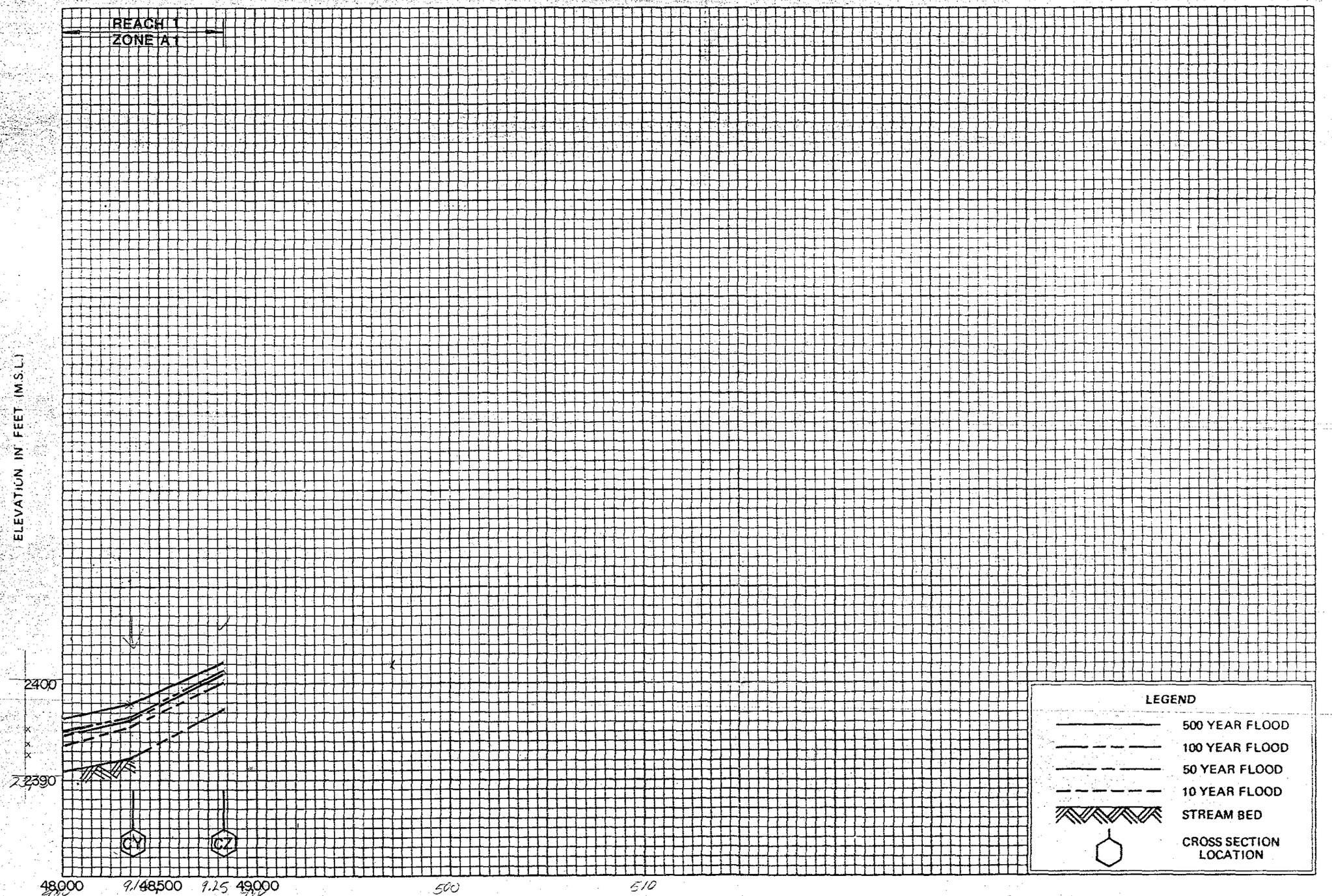
40915-01



FLOOD PROFILES

SOLS WASH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

MARICOPA COUNTY
(Unincorporated Areas)

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40915-01

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