FLOOD CONTROL
DISTRICT
of
MARICOPA
COUNTY
1959

RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY

FCD 93-06

TECHNICAL DATA NOTEBOOK HYDRAULICS

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009
(602) 506-1501

Prepared By:

BURGESS & NIPLE, INC.
5025 East Washington Street
Phoenix, AZ 85034
(602) 244-8100

Project No. 15183

August 1995

FLOOD CONTROL
DISTRICT
of
MARICOPA
COUNTY
1959

RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY

FCD 93-06

TECHNICAL DATA NOTEBOOK HYDRAULICS

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009
(602) 506-1501

Prepared By:

BURGESS & NIPLE, INC.
5025 East Washington Street
Phoenix, AZ 85034
(602) 244-8100

Project No. 15183

August 1995

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
18055
LARRY D.
CULLER
Date Signed 9/7/95
ARIZONA, U.S.A.

Larry D. Culler

TABLE OF CONTENTS

Page
INTRODUCTION 1
Purpose of Study 1
Coordination and Acknowledgements 1
AREA STUDIED 2
Scope of Study 2
Community Description 2
Principal Flood Problems 4
Flood Protection Measures 4
ENGINEERING METHODS 4
Hydrologic Analyses 4
Hydraulic Analyses 5
FLOODPLAIN MANAGEMENT APPLICATIONS 6
Flood Boundaries 6
Floodways 7
INSURANCE APPLICATION 8
OTHER STUDIES 9
LOCATION OF DATA 9
ELEVATION REFERENCE MARKS 10
FLOOD PROFILES 11

STUDY DOCUMENTATION

1. General Documentation and Correspondence Section 1
2. Mapping and Survey Information Section 2
3. Hydrologic Analysis Section 3
4. Hydraulic Analysis Section 4
6. Reference Materials Section 6
7. Cross Referencing and Labeling Information Section 7

TABLE OF CONTENTS (Continued)

FIGURES

	Page
Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	7

TABLES

Table 1 - Summary of Discharges	5

EXHIBITS

Exhibit 1	-	Flood Profiles	11
Exhibit "A"	-	Sub-Basin Delineation and Flow Path Map	Section 2.4
Exhibit "B"	-	Drainage Sub-Basin Soils Map Unit Data	Section 2.4
Exhibit "C"	-	HEC-1 Flood Routing and Schematic Diagram	Section 2.4
Exhibit 2	-	Flood Boundary and Hydraulic Analysis Maps	Section 2.5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RIO VERDE-NORTH
FLOODPLAIN DELINEATION STUDY

INTRODUCTION

Purpose of Study

The purpose of this Floodplain Delineation Study is to investigate the existence and severity of flood hazards in the vicinity of Rio Verde in northeastern Maricopa County, for the following:

- Un-named Wash A from its confluence with the Verde River to the west line of Section 25, T5N, R6E.
- Un-named Wash A South from its confluence with Wash A to its split from Wash A at River Mile 1.586.
- Un-named Wash F from its confluence with the Verde River to the west line of Section 30, T5N, R7E.
- Un-named Wash I from its confluence with the Verde River to the west line of Section 30, T5N, R7E.

The area studied is located in unincorporated areas of Maricopa County, Arizona.

Coordination and Acknowledgements

References used in this study are described in Section 6 of Study Documentation.

The rainfall distribution for the 6-hour duration storm is that suggested in Reference 13. The 24-hour rainfall distribution used for this study is the SCS Type II.

The hydrology and the Technical Data Notebook-Hydrology for this study were prepared by Wood, Patel & Associates, Inc.

The study was publicized in local print media, with no subsequent response from the public. Intermediate review meetings have been held between personnel of Burgess & Niple; Wood, Patel & Associates; the Flood Control District of Maricopa County; and the Arizona Department of Water Resources.

This study has been coordinated with a concurrent study titled Rio Verde-South, which is located adjacent to the southerly boundary of this study.

AREA STUDIED

Scope of Study

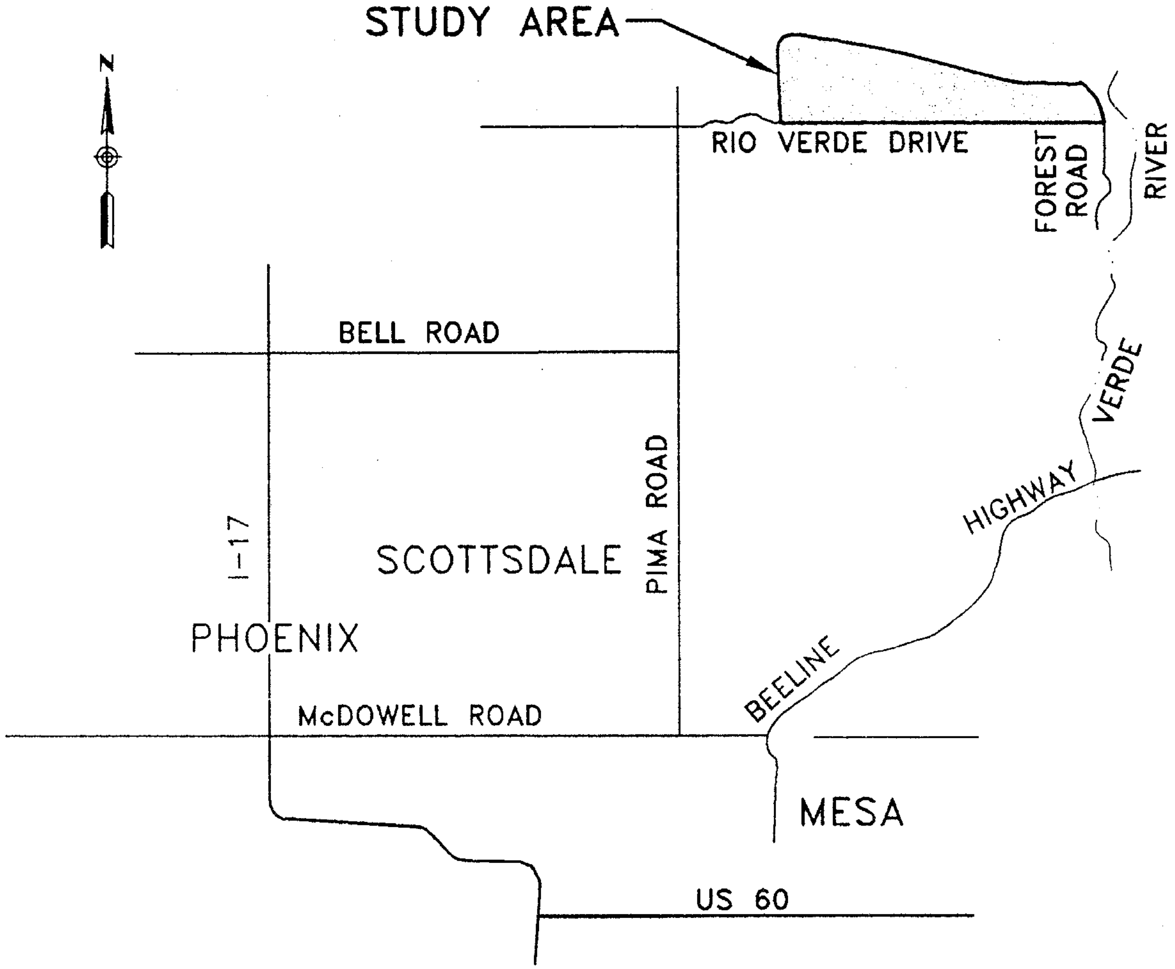
Areas selected for study were based upon potential for future development. This floodplain delineation study covers unincorporated areas of Maricopa County, as described below:

- Un-named Wash A from its confluence with the Verde River (River Mile 0.00) to the west line of Section 25, T5N, R6E (River Mile 2.494)
- Un-named Wash A South from its confluence with Wash A (River Mile 0.00) to its split from Wash A at Wash A River Mile 1.586 (River Mile 0.896)
- Un-named Wash F from its confluence with the Verde River (River Mile 0.00) to the west line of Section 30, T5N, R7E (River Mile 0.961)
- Un-named Wash I from its confluence with the Verde River (River Mile 0.00) to the west line of Section 30, T5N, R7E (River Mile 0.625)

The study area is shown in Figure 1.

Community Description

Maricopa County has a total area of 9,238 square miles and is located in the south central region of Arizona. Total Maricopa County population in 1990 was 2,122,101. The area is experiencing rapid population growth, having grown from 1,509,262 in 1980.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RIO VERDE-NORTH FLOODPLAIN DELINEATION STUDY
MARICOPA COUNTY

VICINITY MAP

FIGURE 1

Terrain in Maricopa County varies from mountains to plains. Numerous small, intermittent streams and washes traverse the county. Major streams include the Gila, Salt, Verde, Agua Fria, New and Hassayampa Rivers.

The area is located within the Sonoran Desert with mild, short winters and long, hot summers.

Principal Flood Problems

Storms during summer months generally originate in the Gulf of Mexico area and tend to be intense and of short duration. Storms at other times of the year generally originate in the Pacific Ocean and tend to be gentler rains of longer duration. Flooding may occur at any time of the year.

Flood hazards along the streams result when the channels overflow and inundate development which may occur along the streams.

Flood Protection Measures

No flood protection measures exist within the study area.

ENGINEERING METHODS

Hydrologic Analyses

The watershed was modeled using the U.S. Army, Corps of Engineers HEC-1 computer program. The program (Version 4.0.1E) is dated May, 1991. Modeling was accomplished using the SCS Unit Hydrograph; Initial and Uniform Losses; and routing, combining and diversion of sub-basin hydrographs. Derivation of input data, assumptions and procedures used in preparation of the computer model are discussed in the accompanying Hydrology Technical Data Notebook prepared by Wood, Patel & Associates, Inc.

Peak discharge - drainage area relationships for the 100-year, 24-hour storm are shown in Table 1.

Table 1
Summary of Discharges

Flooding Source and Location	Drainage Area (sq.miles)	Peak Discharge 100-Year (cfs)
Un-named Wash A		
At the Verde River	5.39	1,140
Below Wash A South @ RM 0.658	5.29	1,160
Above Wash A South @ RM 0.820	1.70	595
Below Wash A South split @ RM 1.367	3.33	540
Above Wash A South split @ RM 1.472	3.33	1,080
At RM 2.403	3.92	1,110
At RM 2.494	3.92	1,270
Un-named Wash A South		
At Wash A	3.58	585
Below Wash A split	3.33	540
Un-named Wash F		
At the Verde River	2.11	610
At RM 0.961		610
Un-named Wash I		
At the Verde River	4.96	1,530
At RM 0.076	4.73	1,350
At RM 0.625	4.01	1,350

Hydraulic Analyses

Standard hydraulic methods were used to determine 100-year recurrence interval flood hazards for this study. Analyses reported herein reflect current conditions of the streams.

Cross sections for the backwater analysis are digitized from aerial mapping at 1:2400 scale with a contour interval of 2 feet (Reference 1). Locations of selected cross sections used in the hydraulic analysis are shown in the Flood Profiles (Exhibit 1). Cross section locations are also shown on the Flood Boundary Maps (Exhibit 2). Mannings "n" values were obtained during a field reconnaissance May 9, 1994. Values ranged from 0.02 to 0.08.

Flood profiles are drawn showing computed water surface elevations to an accuracy of 0.5 feet for a flood of 100-year frequency. Water surface elevations for Un-named Wash A, Un-named Wash A South, Un-named Wash F and Un-named Wash I are computed through the use of the Department of the Army, Corps of Engineers HEC-2 Water Surface Profiles computer program as implemented by Dodson and Associates, Inc. in their May 1991 Version 4.6.2 of ProHEC2. Starting elevations were obtained using critical depth. Elevations used are referenced to the National Geodetic Vertical Datum of 1929. Locations of Elevation Reference Marks used in this study are shown on the maps (Exhibit 2) and are described in the Elevation Reference Marks Table.

FLOODPLAIN MANAGEMENT APPLICATIONS

This study has been performed to meet the standards of the National Flood Insurance Program as defined by Reference 12.

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound floodplain management programs. This study, therefore, includes a flood boundary map designed to assist communities in developing sound floodplain management measures.

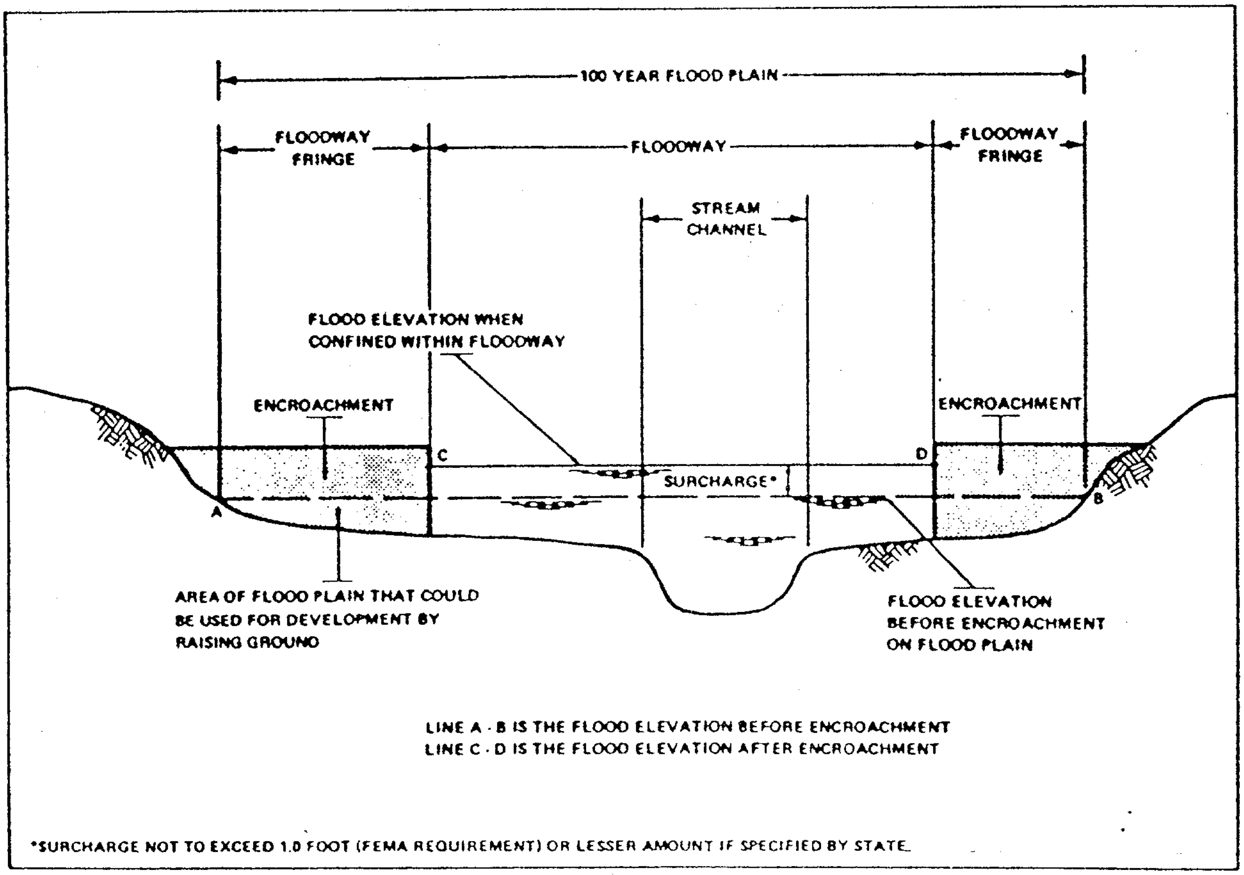
Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency (FEMA) as the base flood for purposes of floodplain management measures. The boundary of the 100-year flood has been delineated using flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2400 with a contour interval of 2 feet (Reference 1).

The boundary of the 100-year flood is shown on the Flood Boundary Maps (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Due to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

Floodways

Encroachment on floodplains, such as artificial fill, reduces the flood carrying capacity, increases flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that are to be kept free of encroachment in order that the 100-year flood can be carried without substantial increase in flood heights. Minimum federal standards limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown below in Figure 2.



FLOODWAY SCHEMATIC
Figure 2

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the floodplain 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.

Flows in the washes included in this study are in the supercritical regime and velocity conditions are such that normal encroachment analyses are inappropriate. Furthermore, Wash A, between Section 0.700 and Section 1.557, and Wash A South are relatively small channels with limited capacity. A substantial part of the 100-year flow is conveyed as shallow overbank flow, producing floodways that are very wide with large areas of shallow flooding. Therefore, flooding is shown as Zone AE with no floodway calculated.

INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A:	Zone A is the flood insurance rate zone that corresponds to 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. No base flood elevations or depths are shown within this zone.
Zone AE:	Zone AE is the flood insurance rate zone that corresponds to 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot based flood elevations derived from detailed hydraulic analyses are shown at selected intervals within this zone.
Zone AH:	Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO: Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X: Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

OTHER STUDIES

The floodplain delineation study for Rio Verde-South is adjacent to the southerly boundary of this study and is currently being prepared. The two studies have been coordinated.

LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study may be obtained from the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, Arizona 85009.

ELEVATION REFERENCE MARKS (ERM)
FOR MARICOPA COUNTY
FLOOD CONTROL DISTRICT
RIO VERDE-NORTH

ERM#1 ERM EL = 1571.265

This station is located approximately 0.17 miles east of Forest Road and approximately 65 feet south of the graded road to the Box Bar Ranch. The mark is a brass cap stamped U.S. Coast and Geodetic Survey.

ERM#2 ERM EL = 1544.580

This station is located at Section Corner (29, 30, 31, 32). The mark is a brass cap.

ERM#3 ERM EL = 1655.995

This station is located at Section Corner (25, 30, 31, 36). The mark is a one inch iron pin.

ERM#4 ERM EL = 1803.815

This station is located at the west quarter corner of Section 25. The mark is a brass cap.

ERM#5 ERM EL = 1810.205

This station is located at Section Corner (23, 24, 25, 26). The mark is a brass cap.

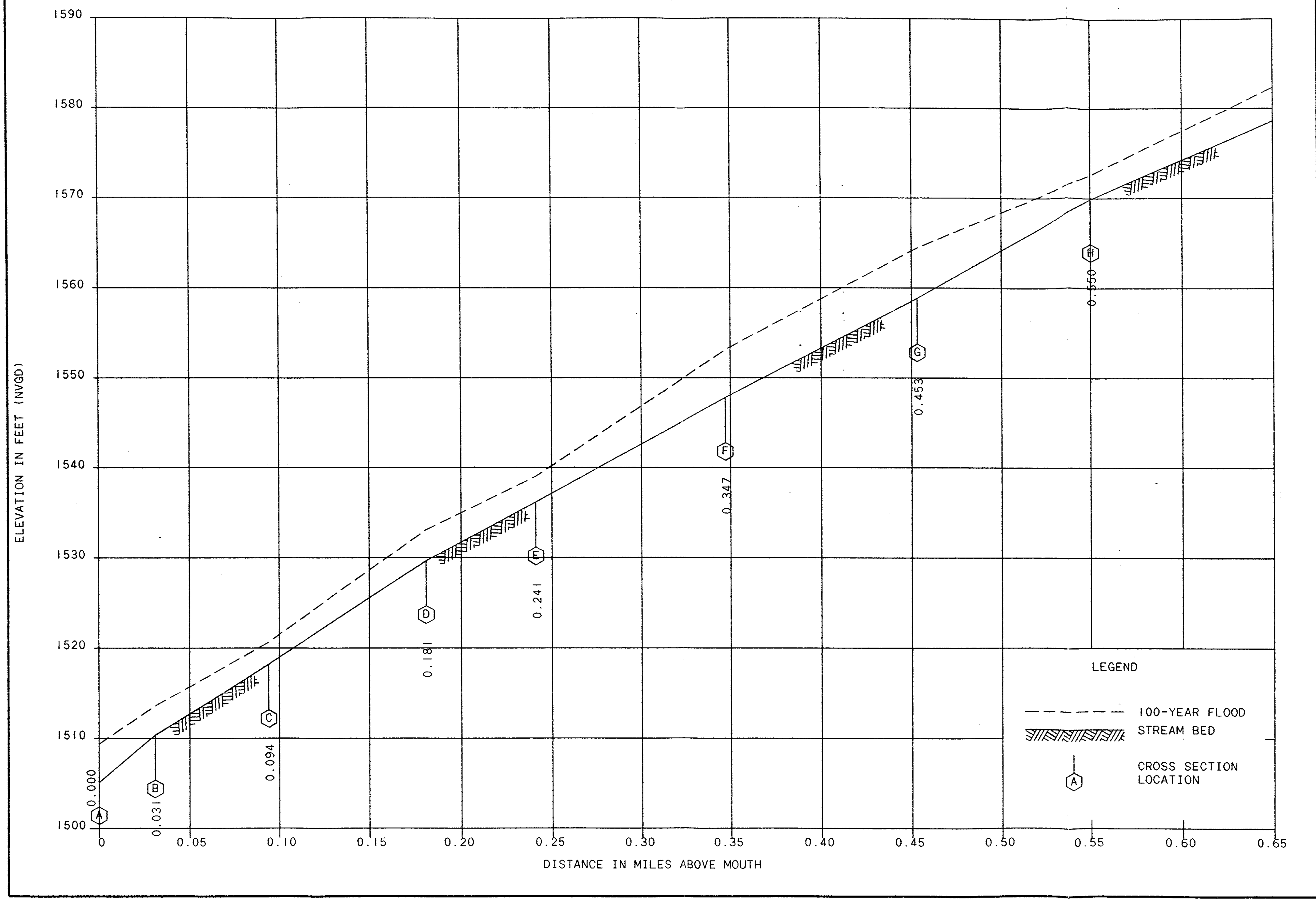
ERM#14 ERM EL = 1571.387

This station is located approximately 0.22 miles north along the graded Forest Service road from its intersection with Forest Road and Rio Verde Drive, thence east approximately 0.16 miles from the graded Forest Service road. The mark is a brass cap stamped "1572 PHNX".

ERM#15 ERM EL = 1591.660

This station is located approximately 0.45 miles south of the north line of Section 30 and approximately 40 feet east of the graded Forest Service road. The mark is a one half inch iron pin.

FLOOD PROFILES



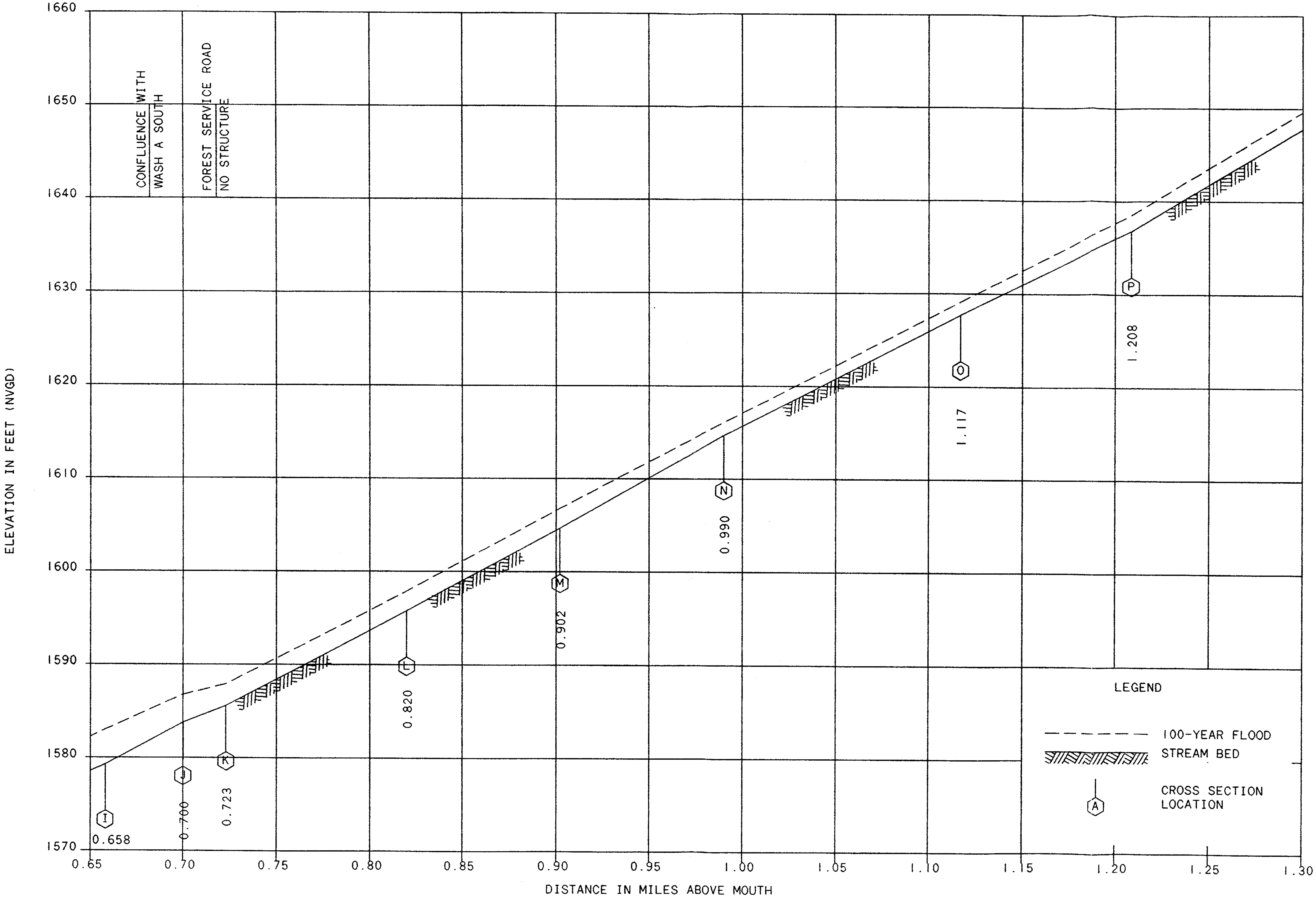
FLOOD PROFILES

WASH A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS



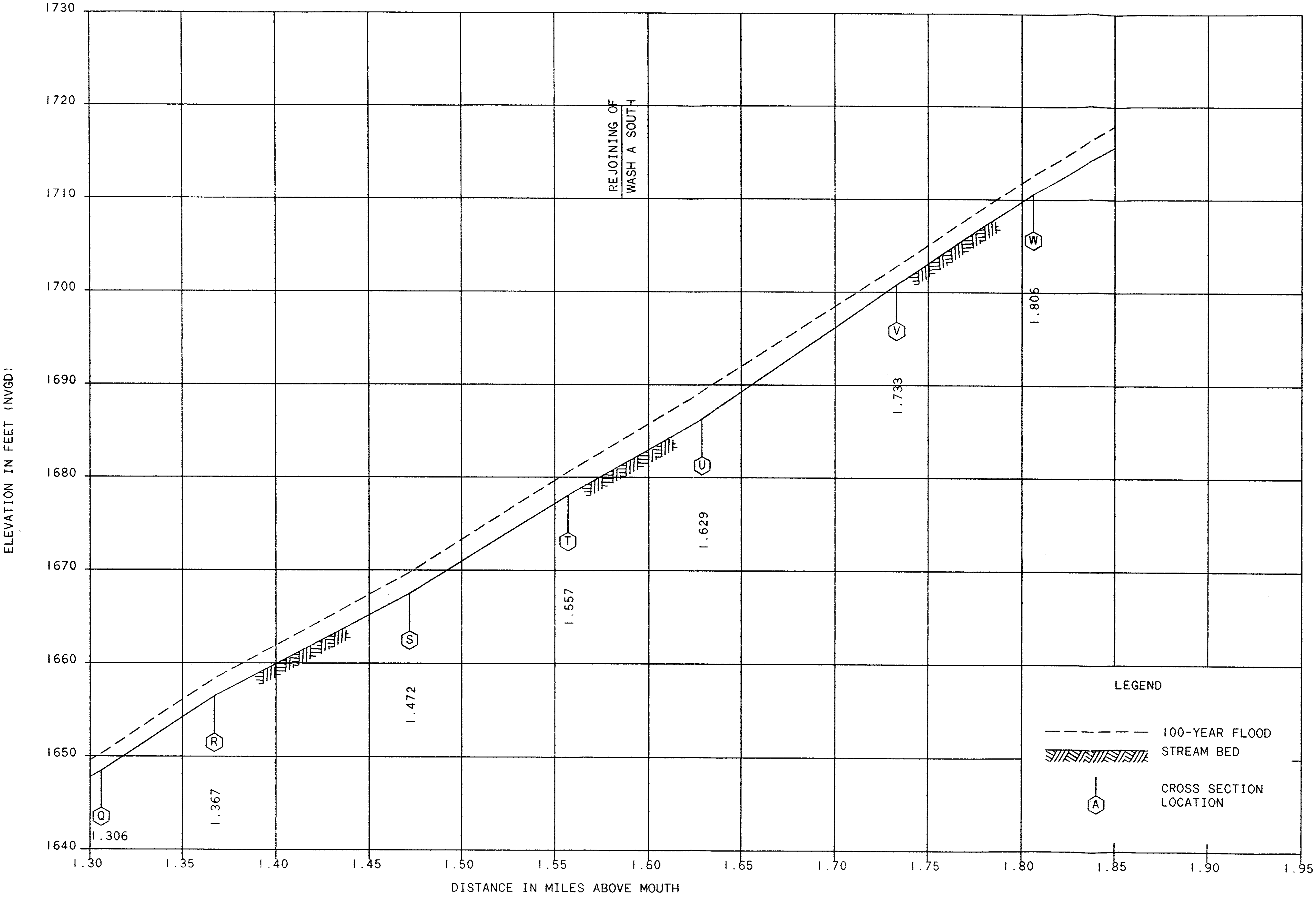
FLOOD PROFILES

WASH A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS

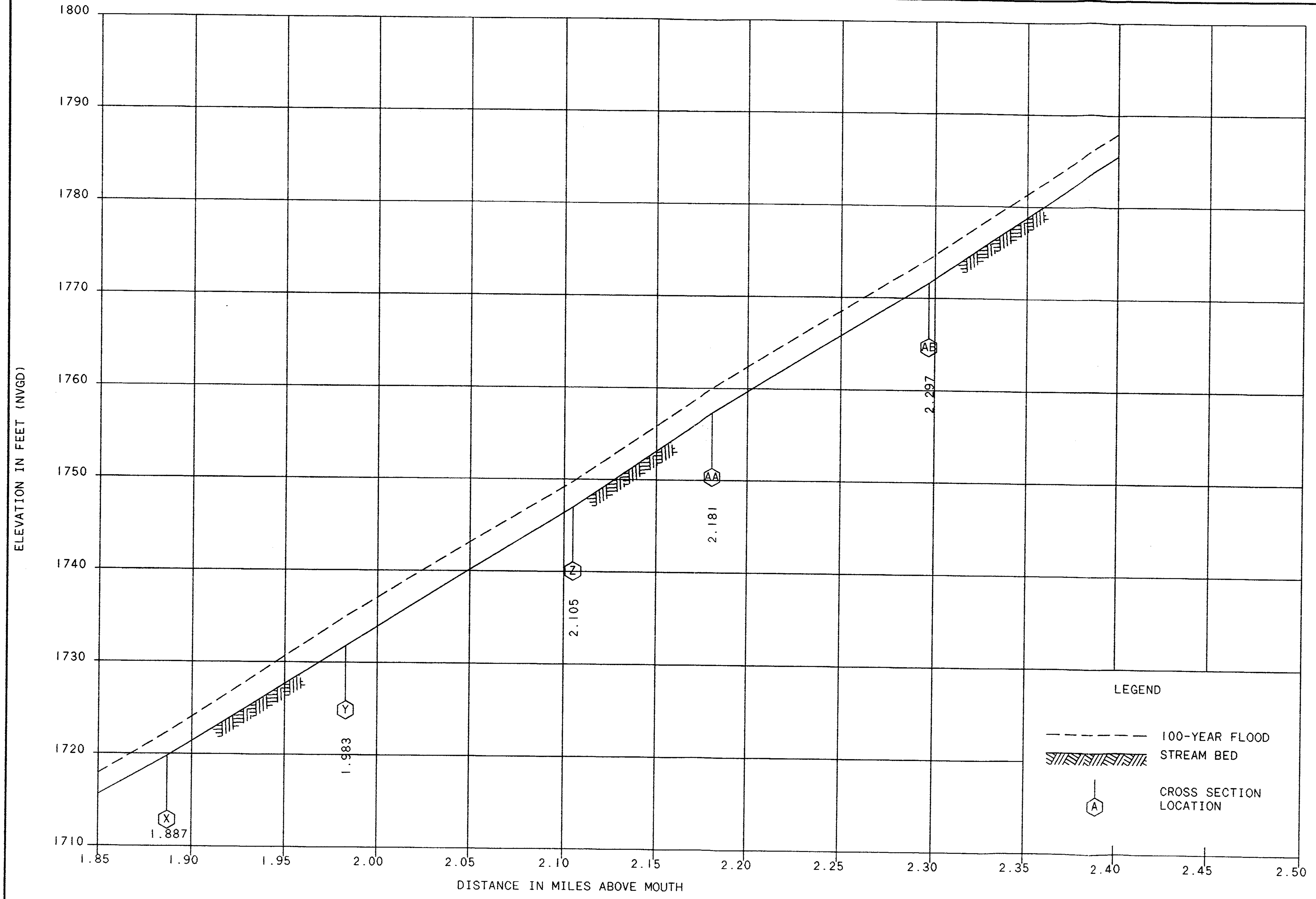


FLOOD PROFILES

WASH A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS



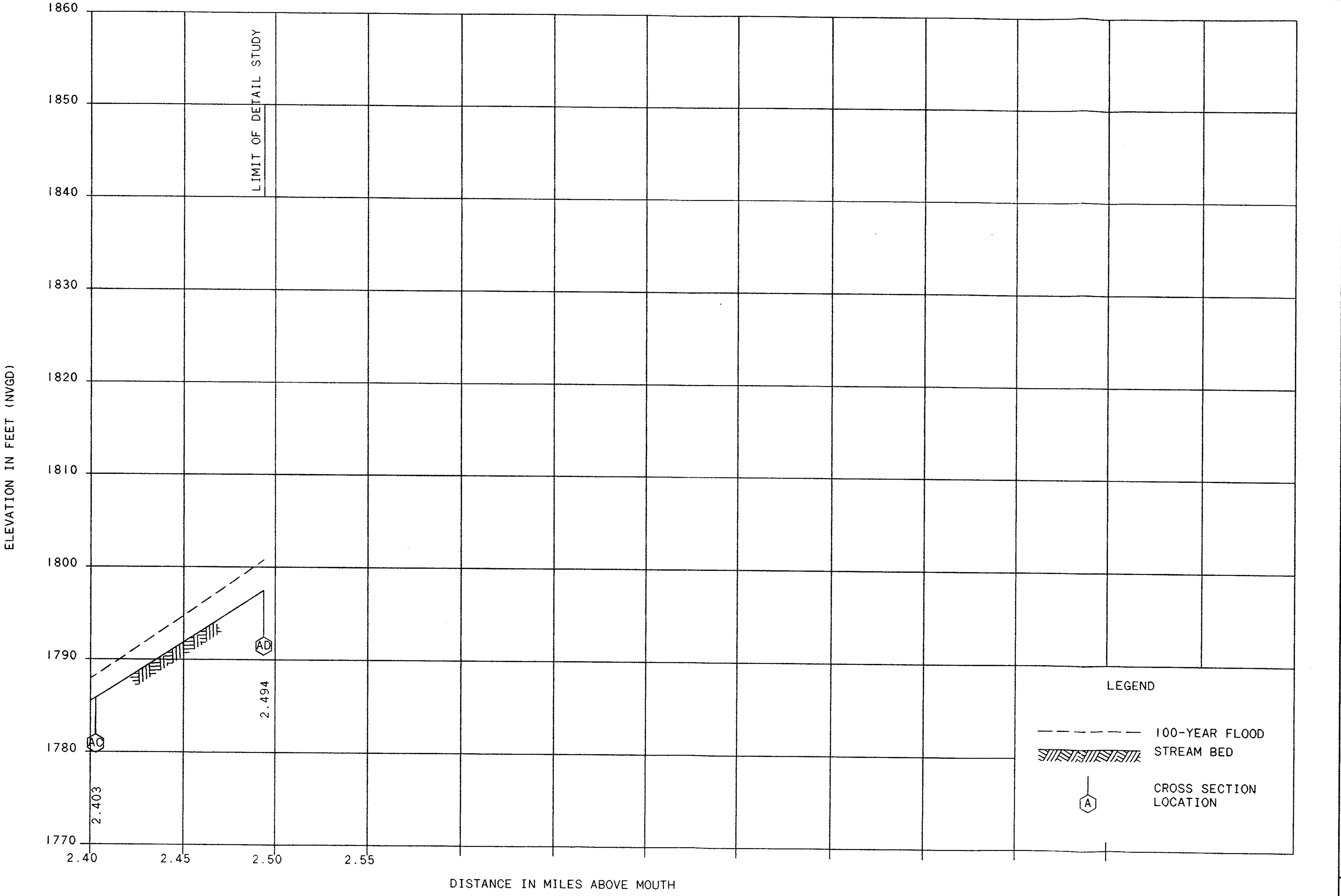
FLOOD PROFILES

WASH A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS



FLOOD PROFILES

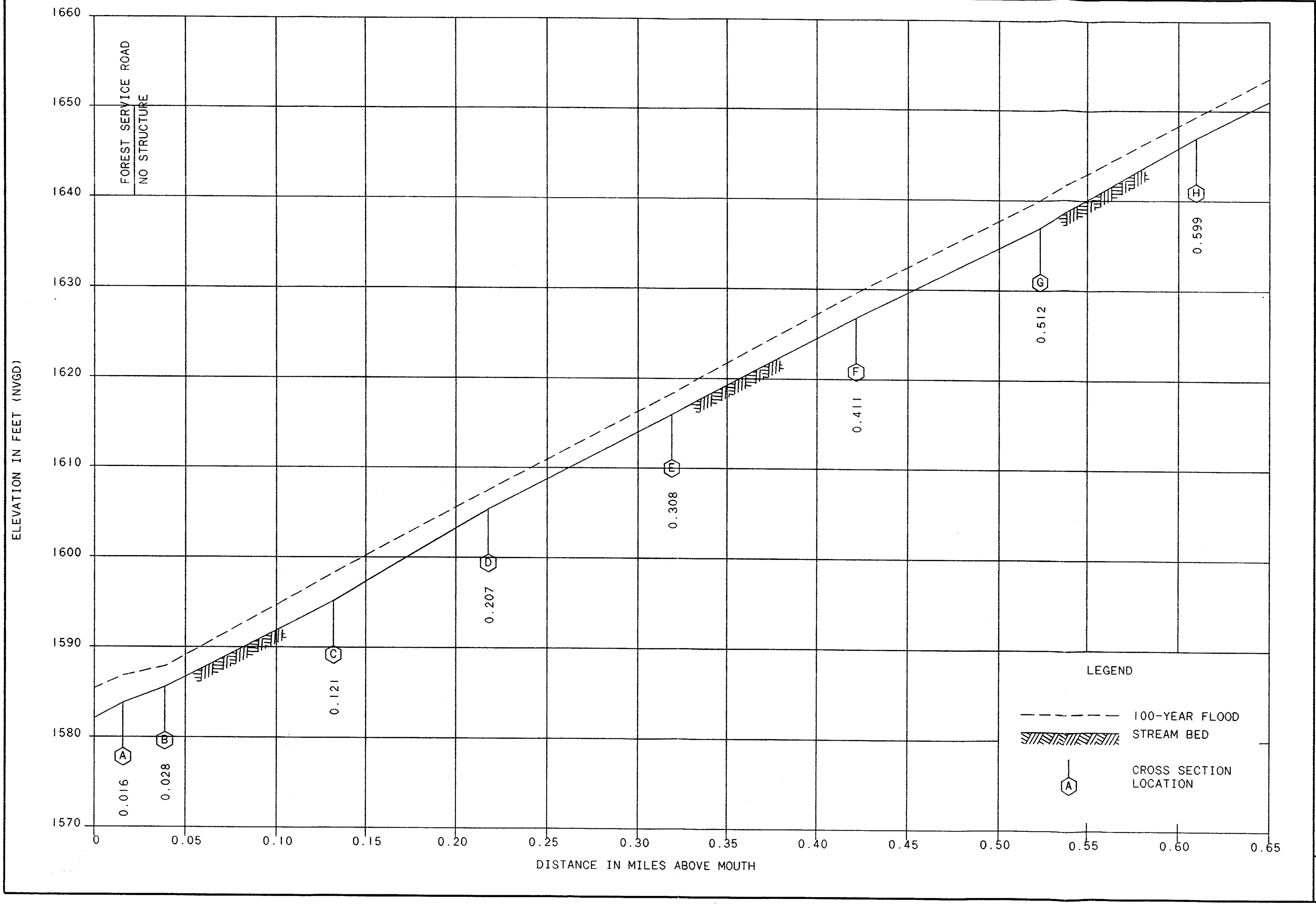
WASH A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS

ARCHITECTS



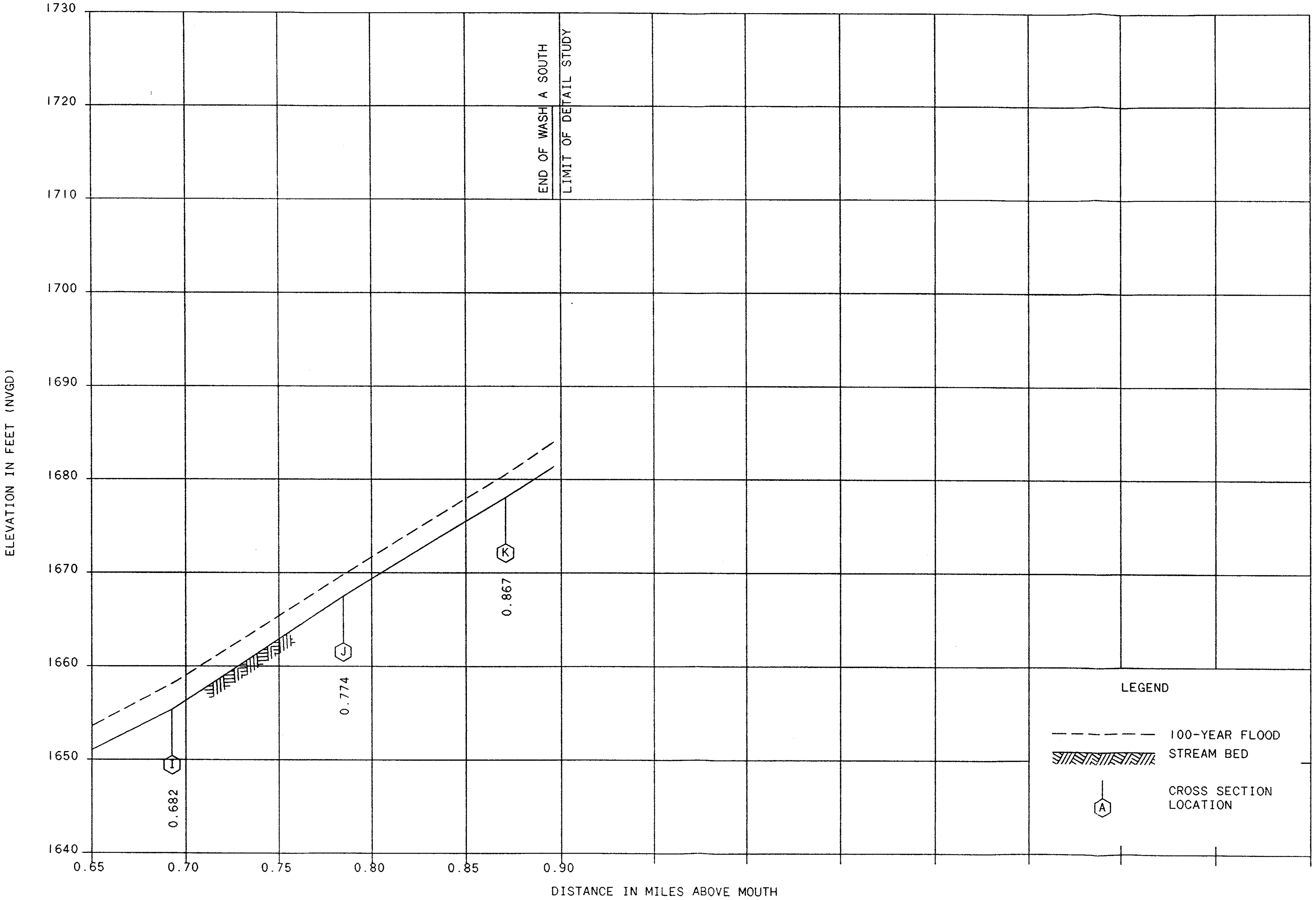
FLOOD PROFILES

WASH A SOUTH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS



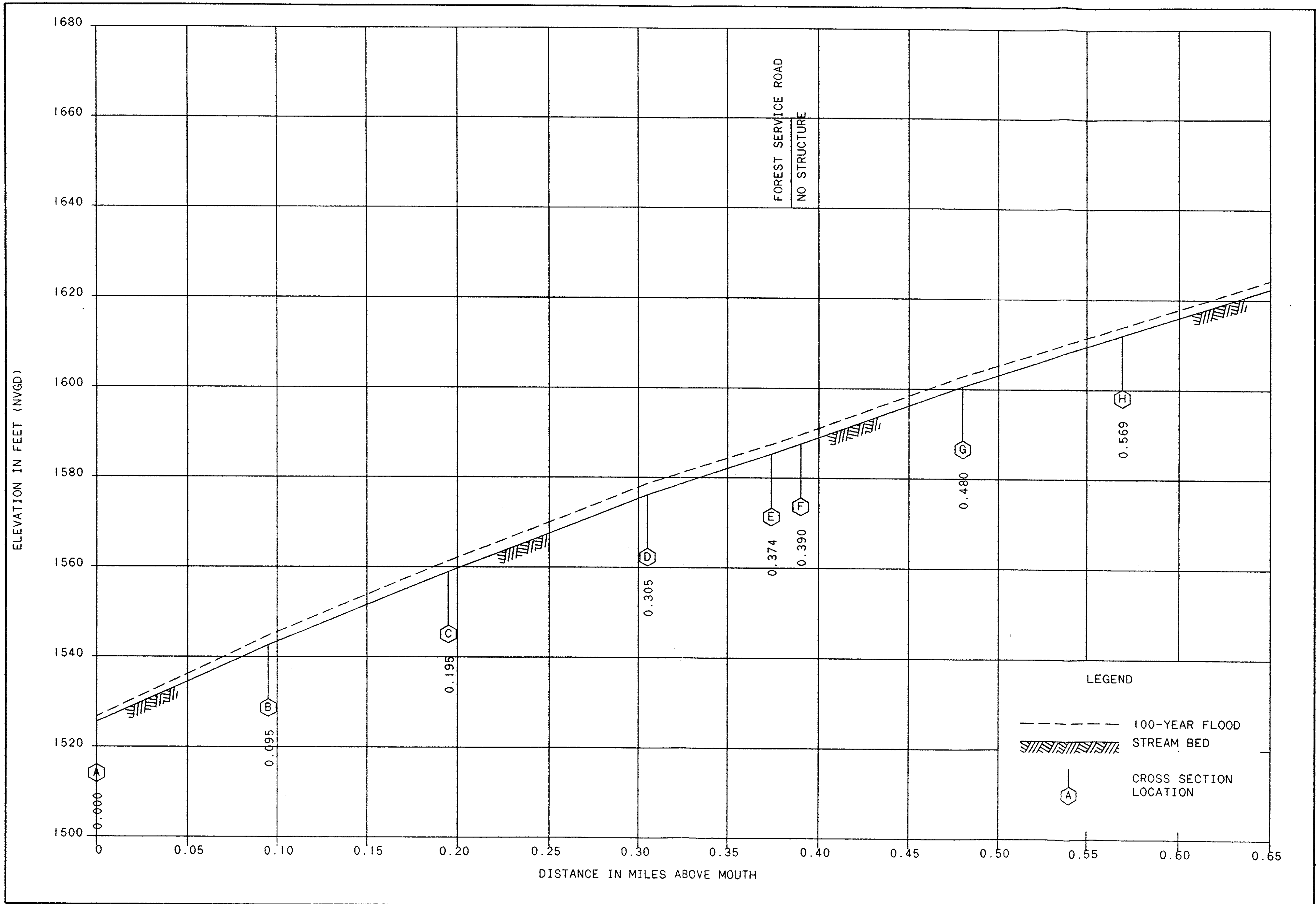
FLOOD PROFILES

WASH A SOUTH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS



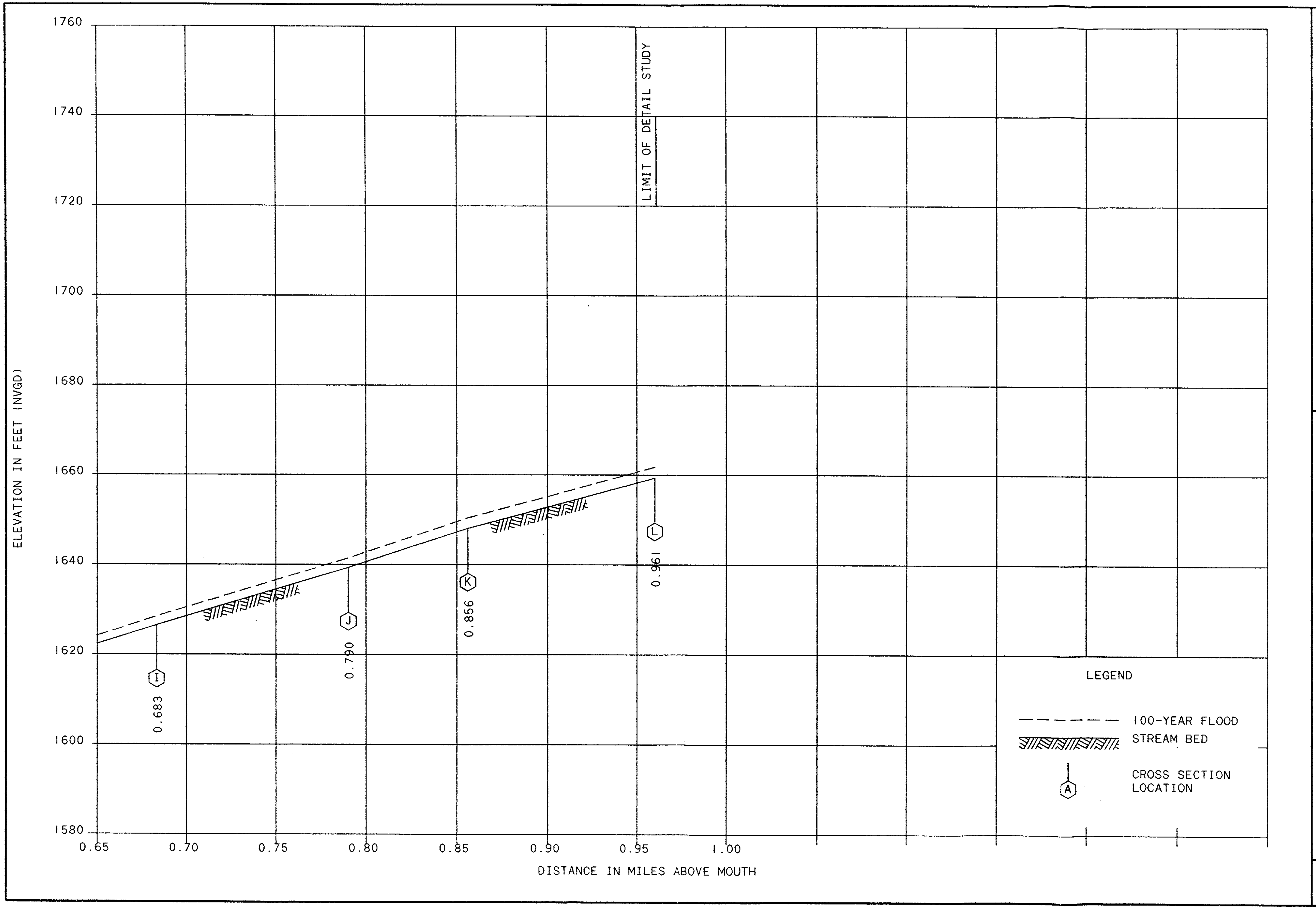
FLOOD PROFILES

WASH F

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS



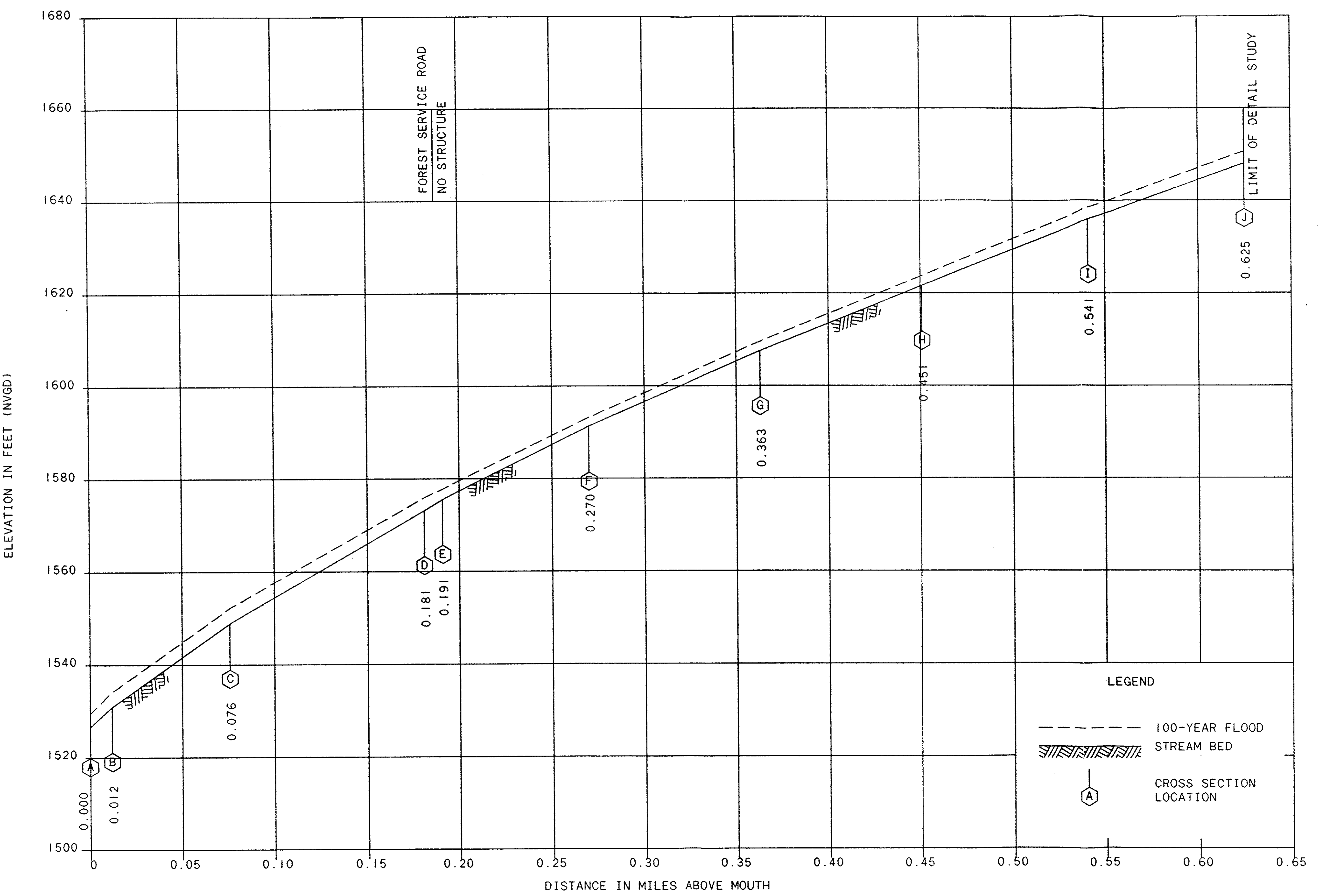
FLOOD PROFILES

WASH F

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS
& NIPLE

ENGINEERS
ARCHITECTS



FLOOD PROFILES

WASH I

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BURGESS & NIPLE

ENGINEERS ARCHITECTS

FLOOD CONTROL
DISTRICT
of
MARICOPA
COUNTY
1959

RIO VERDE - NORTH
FLOODPLAIN DELINEATION STUDY

FCD 93-06

SECTION 1: General Documentation and Correspondence

Community: Maricopa County, Arizona

NFIP Community Number: 040037

County: Maricopa

State: Arizona

Date Study Accepted by FEMA: Pending

Study Contractor: Burgess & Niple, Inc.

Attn: Mr. Larry D. Culler, P.E.
5025 East Washington Street, Suite 212
Phoenix, Arizona 85034
(602) 244-8100
FCD Contract 93-06

Subconsultants: Aerial Mapping Company, Inc.
Chastain-Skillman, Inc.
Wood, Patel & Associates, Inc.

FEMA Technical Reviewer: Pending

FEMA Regional Reviewer: Pending

State Reviewer: Mr. James R. Morris, P.E.
(602) 542-1541

Local Reviewer: Mr. Pedro Calza
(602) 506-1501

River or Stream Name:

- Un-named Wash A
- Un-named Wash A South
- Un-named Wash F
- Un-named Wash I

Reach Description: The following areas are included on FIRM panel numbers 0875 and 1300.

- Un-named Wash A from its confluence with the Verde River to the west line of Section 25, T5N, R6E. (Approximately 2.5 miles)

- Un-named Wash A South from its confluence with Wash A to its split from Wash A at River Mile 1.586. (Approximately 0.9 miles)

- Un-named Wash F from its confluence with the Verde River to the west line of Section 30, T5N, R7E. (Approximately 0.9 miles)

- Un-named Wash I from its confluence with the Verde River to the west line of Section 30, T5N, R7E. (Approximately 0.6 miles)

Study Type:	Un-named Wash A, Un-named Wash A South, Un-named Wash F, Un-named Wash I - Detailed riverine using HEC-2.

SECTION 1: General Documentation and Correspondence

1.2 Contact (Telephone) Reports

CONVERSATION RECORD

Job No. 15183 Job Name MCFCD Rio Verde Date 4/8/94

By R. Cullen Time

With Frank Brown (McLaughlin Kmetty Engineers)

☑ By Telephone ☑ Incoming ☐ Outgoing Telephone No. ( )

☐ Visit, Site City

Regarding:

Conversation Items: Richard Cook called Frank Brown to discuss mapping sheet layout and numbering. Frank wants Sheet 1 for title sheet; mapping sheets will start with Sheet 2. Frank wants sheets to be numbered from downstream to upstream.

Action Required:

Action Taken:

MKE

McLaughlin Kmetty Engineers, Ltd.

3501 North 16th Street Phoenix, Arizona 85016-6419 (602) 248-7702 FAX (602) 248-7851

LETTER OF TRANSMITTAL

Date: 02-15-94

Job No.: 89-407.003

To:
Burgess & Niple, Inc.
5025 East Washington Street, Suite 212
Phoenix, Arizona 85034

Attention: Mr. Russ Cruff

Re: Contract No. FCD 93-07
Rio Verde South

WE ARE SENDING YOU X ATTACHED ___ VIA ____________

Original:	Copies	Date	Description
1			Original Affidavit of Publication on December 22, 1993 and
			December 29, 1993, THE TIMES OF FOUNTAIN HILLS.

Remarks:

TO ____________

SIGNED Esther Kmetty

PUBLIC NOTICE

PUBLIC NOTICE
YOUR RIGHT TO KNOW
ANNOUNCEMENT OF FLOOD HAZARD STUDY

The flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in the Rio Verde Area and surrounding vicinity, Arizona.

The study is being performed for the Flood Control District by Burgess & Niple Engineers and McLaughlin Kmetty Engineers.

The purpose of this study is to examine and evaluate flood hazards in areas which are developed or likely to be developed and to determine flood elevations for those areas. These flood elevations will be used by Maricopa County to carry out floodplain management and by the Federal Emergency Agency to determine flood insurance rates under the National Flood Insurance Program.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of study. Such information should be addressed to Ms. Cathy Regester or Mr. Magnus Jolayemi, Flood Control District of Maricopa County, 2801 W. Durango Street, Phoenix, Arizona 85009, telephone (602) 506-1501.

Published FH Times
12/22 & 12/29/93

AFFIDAVIT OF PUBLICATION

The Times
OF FOUNTAIN HILLS AND RIO VERDE, ARIZONA

A publication of Western States Publishers, Inc.

STATE OF ARIZONA }
COUNTY OF MARICOPA } ss.

L. ALAN CRUIKSHANK, being first duly sworn, upon oath deposes and says: That he is the publisher of

THE TIMES OF FOUNTAIN HILLS AND RIO VERDE

a newspaper of general circulation in the County of Maricopa and the State of Arizona, published at Fountain Hills, Arizona, and that the copy hereto attached is a true copy of the advertisement as published weekly in The Times of Fountain Hills and Rio Verde on the following dates:

December 22, 1993
December 29, 1993

Sworn to before me this

4th day of

February A.D. 19 94

Notary Public

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 2-2-94
JOB NO. 15183
RE: FCD 93-06

TO Magnus Jolaini
Flood Control District of Maricopa County
2801 W. Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings
☐ Copy of letter
☐ Prints
☐ Change order
☐ Plans
☐ ______
☐ Samples
☐ Specifications

COPIES	DATE	NO.	DESCRIPTION
1			Summary of Data Collection

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☒ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______
☐ Resubmit ____ copies for approval
☐ Submit ____ copies for distribution
☐ Return ____ corrected prints

REMARKS ______

COPY TO ______

SIGNED Russ Griff

If enclosures are not as noted, kindly notify us at once.

RIO VERDE NORTH - FDS

FCD 93-06

SUMMARY OF DATA COLLECTION

Burgess & Niple, Inc.
5025 East Washington Street
Phoenix, Arizona 85034
602-244-8100

Project No. 15183

February 1994

The Rio Verde - North study is located within T.5.N., Ranges 6 and 7.E., and can be found on U.S. Geological Survey 7 1/2 minute maps Bartlett Dam, Arizona and Fort McDowell, Arizona. The drainage from which the hydrology will be developed is also located within Townships 5 and 6.N. and R.5.E., and is also found on 7 1/2 minute maps for Wildcat Hill, Arizona and McDowell Peak, Arizona.

FEMA FIRM Panels 0875 and 1300 of 4350 would cover the study area, with Panels 0850 and 1260 covering portions of the upstream drainage basin. Of these panels, only 1300 has areas showing previous delineations, and these are south of this study area. Panel 0875 has not been printed.

Contacts for the surveying portion of this study and the Rio Verde-South study, were made with:

James Young
U.S. Forest Service
P.O. Box 5348
2324 E. McDowell Rd.
Phoenix, AZ 85010
602-225-5200

Louie Hood, Planning Coordinator
Fort McDowell Indian Community
P.O. Box 17779
Fountain Hills, AZ 85269
602-837-3678

Bob Malone, Street Sup't
Homeowners Association
602-471-7240
Golf Course (602-471-7010)
(Betty Bayne, Pres., 602-471-7105)

Bob Brethower
Ranch Superintendent
602-471-7104

During the data collection for the hydrology and hydraulics phases, the following contacts were made.

Bobby Wallace
U.S. Geological Survey, WRD
Phoenix Subdistrict
1545 W. University Dr.
Tempe, AZ
602-379-3086

Terry Brennan
U.S. Forest Service
Tonto National Forest
2324 E. McDowell Rd.
Phoenix, AZ 85016
602-225-5200

David Creighton
Arizona Dept. of Water Resources
Engineering Division
15 South 15th Avenue
Phoenix, AZ 85007
602-542-1541

Grant Loomis
U.S. Forest Service
Tonto National Forest
Carefree Ranger District
602-225-5253

Harry Milsap U.S. Soil Conservation Service	George Lopez-Cepero Arizona Dept. of Transportation
602-280-8783	602-255-7481

Steve Tucker
Flood Control Dist. of Maricopa Co.
2801 W. Durango
Phoenix, AZ 85009
602-506-1501

The files of the Flood Control District of Maricopa County were also searched. These contacts and file searches have not turned up any studies specifically aimed at or within the study area. Two studies:

1. "Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States", U.S. Geological Survey open-file report, by Thomas, Hjalmarson and Waltemeyer. It is being printed and should available in March 1994.

2. "Arizona Highway Drainage Design Manual", dated March 1993 and prepared by George Sabol.

These studies recently developed flood-frequency relations for Arizona. They may be useful in evaluating the hydrology developed for the study area.

The Flood Control District also supplied the HEC-I model that they developed during the review of the Scottsdale Alluvial Fan Study. The area of this study is directly to the west of the Rio Verde Study area. Thus, the two areas may be similar.

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

COMMUNICATION RECORD

(602) 957-3149
FAX 955-3765

COMPANY	FCDMC	JOB #	93031.00
NAME	Steve Tucker	PROJECT	Rio Verde North F.I.S.
ADDRESS		SUBJECT	studies, flow data, soil data
PHONE	506-1501	DATE	1/13/94

☐ MEETING ☑ CONVERSATION ☐ MEMO

1:40 pm.	Asked if Steve knew of any hydrology studies, flood plain studies, flow data or soils data for project study area.	Steve said he is not aware of any study or data to the North of Rio Verde Drive. Studies have been done to the south of that road, however. Steve said he would check with several others to see if they know of any pertinent data. Will call back with answer.
4:40 pm		Called back - no one else knows of any available data within study area.

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Regis

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

COMMUNICATION RECORD

(602) 957-3149
FAX 955-3765

COMPANY	USGS	JOB #	93031.00
NAME		PROJECT	Rio Verde North FIS
ADDRESS		SUBJECT	studies / flow data / Soil data
PHONE	379-3109	DATE	1/13/94

☐ MEETING ☑ CONVERSATION ☐ MEMO

2:30	pm	Asked about studies, flow data within FIS limits	USGS has no pertinent data on this area. However, ASU Geology department has maps showing slopes, groundwater, H2O chemistry and possibly more info for area of interest.

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Regis

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

COMMUNICATION RECORD

(602) 957-3149
FAX 955-3765

COMPANY ADOT
JOB # 93031.00
NAME George Lopez-Cepero
PROJECT Rio Verde North FIS
ADDRESS
SUBJECT studies / flow data / soil data
PHONE 255-7481
DATE 1/13/94

☐ MEETING ☑ CONVERSATION ☐ MEMO

3:40	pm	Asked about studies, flow data within FIS limits	George knows of no studies or data used by ADOT in FIS study area. Closest they have is along Pima Rd (Loop 101) alignment.

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Regis

W 1048[illegible]

/

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

COMMUNICATION RECORD

(602) 957-3149
FAX 955-3765

COMPANY	Tonto National Forest	JOB #	93031.00
NAME	Grant Loomis	PROJECT	Rio Verde North F.I.S.
ADDRESS	Caretree Ranger District	SUBJECT	studies / flow data / soil data
PHONE	225-5253	DATE	1/13/94

☐ MEETING ☑ CONVERSATION ☐ MEMO

3:05	pm	Asked about studies, flow data within EIS limits	Grant doesn't know of any studies or data other than Rio Verde Unit 2 subdivision (drainage report).

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Ragis

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

COMMUNICATION RECORD

(602) 957-3149
FAX 955-3765

COMPANY SCS
JOB # 93031.00
NAME Harry Milsap
PROJECT Rio Verde North FIS
ADDRESS
SUBJECT studies / flow data / soil data
PHONE 280-8783
DATE

☐ MEETING ☑ CONVERSATION ☐ MEMO

10:20 am	Asked about soil data, flow data, studies within FIS limits	Harry knows of no available data within FIS boundaries or in general region of Rio Verde.

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Ragis

[illegible]

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

(602) 957-3149
FAX 955-3765

COMMUNICATION RECORD

COMPANY ADWR
JOB # 93031.00
NAME Dave Creighton
PROJECT Rio Verde North FIS
ADDRESS
SUBJECT data on soils/ flows
PHONE 542-1541
DATE

☐ MEETING ☑ CONVERSATION ☐ MEMO

3:55 pm. I asked about any available soils or flow data within or near FIS study limits.

Dave knew of no other data available for the study area specifically. He mentioned USGS Streamflow Data publication for '92 as well as new (preliminary) USGS report "Methods for Estimating Magnitude and Frequency of Flows in the Southwestern United States" by Thomas, Hjalmarson, & Waltemeyer. ~~as~~

PLEASE REPORT ANY DISCREPANCY OR OMISSION

FROM Tony Regis

W 104838

PAGE 1 OF 2

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

DATE 1/13/94
TIME 1:50 pm.

COMPANY: FCDMC
ATTENTION: STEVE TUCKER
FAX NO.: 506-4601

FROM: TONY REGIS FAX NO.(602)234-1322
PROJECT: RIO VERDE NORTH F.I.S. JOB NO. 93031.00
SUBJECT: STUDIES, FLOW DATA

COMMENTS:

HERE IS THE STUDY LOCATION MAP FOR THE RIO VERDE NORTH F.I.S. THAT WE DISCUSSED. THANK YOU FOR YOUR HELP.

Tony

CC:

Public Notice

INVOICE NO. [illegible]

Ad agency accepting bids from Arizona-based hispanic marketing companies for development of specialized programs. Send company profile to: EvansGroup, 2390 E. Camelback, Ste. 325, Phx. AZ 85016 Attn: AS. Profiles must be received no later than 4PM, Jan. 14th, 1994. Bid packets will be forwarded upon request. No calls accepted.

Published: . Arizona Republic, December 29, 1993; January 2,9, 1994.

INVOICE NO. 93653

ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County, under authority of the National Flood Insurance act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in The Rio Verde Area and surrounding vicinity, Arizona.

The study is being performed for the Flood Control District by Burgess & Niple Engineers and McLaughlin Kmetty Engineers.

The purpose of this study is to examine and evaluate flood hazard in areas which are developed or which are likely to be developed and to determine flood elevations for, those areas. These flood elevations will be used by Maricopa County to carry out floodplain management and by the Federal Emergency Management Agency to determine flood insurance rates under the National Flood Insurance Program.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be addressed to Ms. Cathy Regester or Mr. Magnus Jolayemi, Flood Control District of Maricopa County, 2801 W. Durango Street, Phoenix, AZ 85009, telephone (602) 506-1501.

Published: Arizona Republic, December 29, January 5, 1993.

BURGESS & NIPLE

ENGINEERS
ARCHITECTS

To: Ash Patel
Date: 1-11-94
From: Russ Cruff
Job Number: 15183
Subject: Visit to ADWR
Sect. No. / Act.: 941.4

Memorandum

Burgess & Niple, Limited
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
602 244-1915 Fax

I met with Dave Creighton of ADWR. He does not know of any studies within our project area. He did point out that the latest flood frequency methods were extracted from a U.S.G.S. preliminary report, "Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States", by Thomas, Hjalmarson, and Waltemeyer by George Sabol and used in his Mar. 1993 report "Arizona Highway Drainage Design Manual." These reports should probably be reviewed to see if the final hydrology for our study gives reasonably comparable results

The U.S.G.S. report is expected to be available in March 1994. I have asked that we be put on the mailing list to receive a copy.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
Suite 212
5025 East Washington Street
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

FAX COVER SHEET

Date: 12/30/93

Job Number: 15183

Re: Rio Verde

TO: Magnus Jolayemi
MCFCO

FAX PHONE NUMBER:

We are sending you 2 additional pages, not counting this cover sheet.
If all pages are not received, please call us as soon as possible.

COMMENTS:

Signed: James E Mischler

BUR SS & NIPLE, INC. - COMPUTA N SHEET

JOB NO. 15183 JOB NAME Rio Verde F/S SHEET ____ OF ____ SHEETS

SUBJECT ____ PREPARED BY Mischler DATE 12/30/93

____ CHECKED BY ____ DATE ____

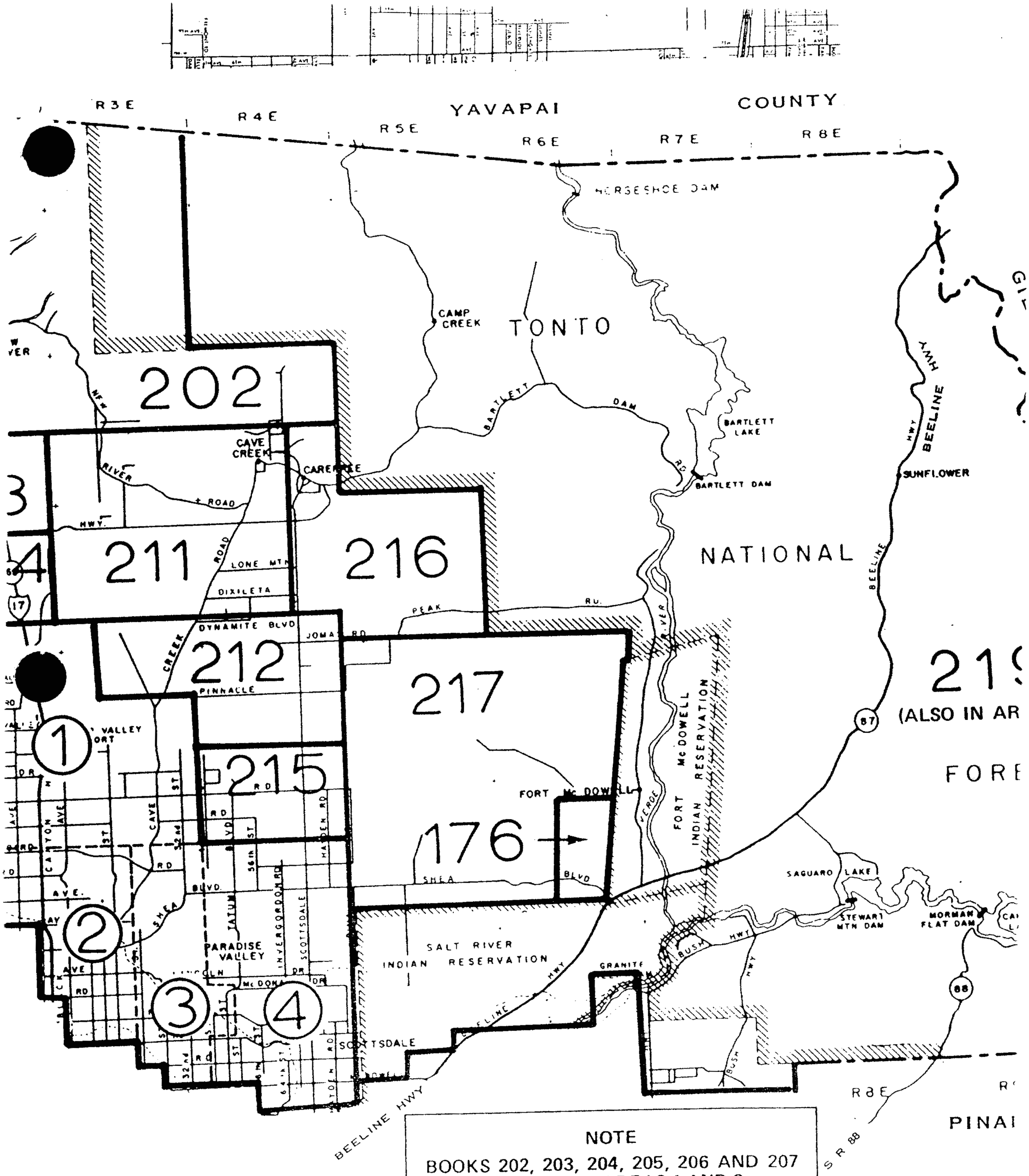
Contacts for Rio Verde Survey:

James Young
US Forest Service
P.O. Box 5348
2324 E. McDowell Rd.
Phx AZ 85010
(602) 225-5200

Louie Hood, Planning Coordinator
Fort McDowell Indian Community
P.O. Box 17779
Fountain Hills, AZ 85269
(602) 837-3678

Bob Malone, Street Sup't
Homeowners Assoc. (Betty Bayne, President - Ph. # 471-7105)
471-7240
Golf Course - 471-7010

Bob Brethower
Ranch Superintendent
471-7104



NOTE

BOOKS 202, 203, 204, 205, 206 AND 207 ARE REPEATED IN AREAS 1 AND 2.

BOOKS 115, 121, 125 AND 219 ARE REPEATED IN AREAS 2 AND 3.

SECTION 1: General Documentation and Correspondence

1.3 Meeting Minutes & Reports

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

REVIEW COMMENT FOR RIOVERDE NORTH
BY
MAGNUS R. JOLAYEMI
3/13/1995

SUBJECT: FLOODPLAIN DELINEATION STUDY, RIOVERDE NORTH
BY BURGESS & NIPLE INC.

I have reviewed the subject Preliminary Report for Rioverde North Study. And here are my review comments:

1) ON theTopo Maps, all Elevation Reference Marks(ERM), Section Corners, Street Names, and Street Alignments need to be in bold letters for quick reference.

2) Two sets of completed FEMA Forms to be submitted in a separate notebook.

3) For FEMA submittal, see section 8 deliverables

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

REVIEW COMMENT FOR RIOVERDE NORTH
BY
MAGNUS R. JOLAYEMI
11/30/1994

SUBJECT: FLOODPLAIN DELINEATION STUDY, RIOVERDE NORTH
BY BURGESS & NIPLE INC.

I have reviewed the subject Draft of Floodways for Rioverde North Study. And here are my review comments:

I) GENERAL COMMENT:

Engineer need to show section, and quarter section comers on the Topo Map.

Need to highlight the Elevation Bench Marks.

Provide description and location for the EBM,s based on the National Geodetic vertical Datum of 1929.

Index map need to include firm panel, and the washes for quick reference.

Legend should include the following symbols: structures, utility poles, section comers, dirt roads, and paved roads.

II) Engineer need to modify the ET stations inorder to remove the negative rise WSEL in the following cross-sections:

1) Wash A: section 0.347 and 0.453

2) Wash F: section 0.095

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

MEETING MINUTES

Date:	July 29, 1994 10:30 a.m.
Location:	Flood Control District Maricopa County, Arizona
Subject:	15183 (FCD 93-06) Rio Verde North Review Special Problems and Supercritical HEC-2 Model
Attendees:	Pedro Calza, Flood Control District, Maricopa County (FCDMC) Magnus Jolayemi, FCDMC Larry Culler, Burgess & Niple (B&N) Stanley Johnson, B&N

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

Items Discussed

1. Determination of Manning's roughness coefficient "n" calculation sheets need to be included in the final report. A calculation sheet is needed for representative areas, such as where the channel "n" is: 0.035, 0.040, and 0.055.

2. Only data pertaining to Wash F and I was reviewed. However, the same comments would be applicable to Wash A and Wash A South.

   A. Reduce "n" values that are the same and beside each other to one "n" value.

   B. Modify each section length so X3 encroachment cards can be eliminated in natural profile runs.

   C. Relook at cross section bank stations using the Corps of Engineers (COE) definition for channel and change the bank stations as needed to comply with the COE's definition.

3. On Special Problem No. 34, rewrite first sentence to read "... Cross Sections 0.181 and 0.191 to confine the flow to Wash I." It was agreed that the bank station as shown on Cross Sections 0.181 and 0.191 is correct.

4. If an island is less than 1.0 foot above the 100-year flood elevation, the island will not be delineated on the flood maps because the 1.0 foot height is less than the accuracy of the maps. The island will be designated a shaded zone X and called out as a community designated flood hazard area. A "Special Problem" to cover all cross sections that have an island less than 1.0 foot above the 100-year flood elevation will be included stating the above.

   If the height is greater than 1.0 foot and the area is being shown as an island, then a photograph of the island must be included along with an explanation of why it is being shown as an island. The COE's definition of an island needs to be looked at to make sure the area would be considered an island. The COE's definition deals with bank stability. A possible example of an island is shown on Wash F, Cross Section 0.683.

5. All "n" values need to be checked to see if they need to be changed due to depth of flooding.

6. It was agreed that due to the Washs' flow being supercritical, when the study is submitted to the Federal Emergency Management Agency (FEMA), the flooding will be shown as Zone AE with no floodway calculated. However, a floodway for each Wash will be calculated and given to the County. The floodway will be calculated assuming each Wash has the full flow in the channel.

   The Luke ~~West(?)~~ Wash study is a good reference to use for this study as it also shows flooding as being Zone AE with no floodway calculated. The County can supply the study for B&N's use.

7. New cross section geometry should be obtained for any cross section whose alignment needs to be altered.

8. The floodway line symbol on the flood maps will be used to delineate the floodway limits and will supersede the 100-year floodplain line symbol if both the floodway and floodplain are at the same location.

copy: Mr. Pedro Calza, Flood Control District, Maricopa County
Mr. Magnus Jolayemi, Flood Control District, Maricopa County
Mr. Larry Culler, Burgess & Niple
Mr. Stanley Johnson, Burgess & Niple
Mr. Larry Woodlan, Burgess & Niple

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
REVIEW COMMENT FOR RIO VERDE NORTH FIS
BY
MAGNUS R. JOLAYEMI, 6/27/94

SUBJECT: **FIS OF RIO VERDE NORTH**
BY BURGESS & NIPLE INC.

I have reviewed the subject preliminary Rio verde North. And here are my review comments:

I) General Comments:

a)The Consultant will develop the computer model using the Corps of Engineer's HEC-2

b)The cross-sections are to be labeled using standard engineering stationing converted to the distance in river miles.

c)I feel NH instead of NC card in the split flow area will be more appropriate.

d)Flow breaks out occur in several locations along Wash A. This problem areas need to be addressed or resolved.

II) SPECIFIC COMMENTS:

1) Wash I
-In Section ~~3~~625 ineffective flow area Need to be blocked out.

2) Wash F
-In cross-sections 095 & 195, does .055 N-value seems reasonable for the channel?
-Cross-sections 481 & 570, I think the right and left banks N-values are turned around.

3) Wash A South
-Sections 016 & 028 the channels are in the wrong Wash.
-121 Need to contain the right overbank.
-308 .02 may not be a reasonable N-value for right overbank.
-774 Why is .08 used in the channel.
-865 We need to contain the flow at the left over bank.

4) Wash A
-The following break out area need to be contained or addressed: 000, 455, 551, 902, 1559, 1736, and 1808
-In the following sections I feel NH card will be more appropriate:821, 902, 990, 1118, and 1209
-Ineffective flow area for cross-sections:1631, 1736, 1889, 1986, 2115, 2190, 2412, 2484, and 2502

III) Preliminary Performance Evaluations

PAGE 1 OF 2

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

DATE 5/20/94
TIME 8:20 am.

COMPANY: BURGESS & NIPLE
ATTENTION: LARRY CULLER, P.E.
FAX NO.: 244-1915

FROM: TONY REGIS
FAX NO.(602)234-1322
PROJECT: RIO VERDE - NORTH FPDS
JOB NO. 93031
SUBJECT: RESPONSE TO MEETING COMMENTS

COMMENTS:

LARRY, ATTACHED IS A CLARIFICATION OF ONE ITEM FROM SANDY STORY'S MEETING COMMENTS.

ALSO, I AM CURRENTLY UPDATING THE HEC-1 MODEL ACCORDING TO THOSE COMMENTS AND WILL SEND YOU THE TOPO WORK MAP WITH FLOWS AT THE DESIRED CONCENTRATION POINTS BY 5:00 TODAY.

Tony

CC:

FAX TRANSMITTAL # of pages 1

To:	SANDY STORY	From:	TONY REGIS
Co:	FCDMC	Co.	Wood/Patel
Dept.		Phone #	(602) 234-1344
Fax #	506-4601	Fax #	(602) 234-1322

May 20, 1994

Ms. Sandy Story
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re: **Rio Verde - North FPDS**
5/18/94 meeting comments

Dear Sandy:

Wood/Patel would like to clarify one item of the meeting comments in the FCDMC Interoffice Memo dated 5/19/94. Specifically, item number 3, which reads "Please supply the District with the sensitivity analyses previously done by Wood/Patel, which indicate that a minimal amount of flow contributes to the deleted concentration points," implies that flows were computed at all of the concentration points proposed by Burgess & Niple. Actually, "sensitivity studies" were not performed. Instead, rough drainage areas were scaled off of the 1"=400' work map, and we found that the sub-basins contributing to the deleted concentration points were very small, i.e., less than 30 acres. These areas are very insignificant compared to the overall wash drainage area (on the order of 4 square miles). From this, we concluded that flows would change very little as a result of adding the concentration points in question.

Informal sensitivity trials were performed to test the effect of varying the percentage of flow diversions in the upper part of the watershed. We found that variations of 10 to 20 percent in the flow split proportions did not have a significant effect on watershed outflows at the Verde River.

Sincerely yours,

WOOD, PATEL & ASSOCIATES, INC.

Tony Regis

Tony Regis, EIT
Hydrologist

cc: Larry Culler, P.E., Burgess & Niple

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

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

5/19/94

COVER SHEET

TO: Mr Larry Culler, P E

Company or Department: B & M **Fax #** 244-1915

FROM: Magnus Ojolayemi

Number of pages being sent including Cover Sheet: 6

Comments: Here is the revised Review Comment as per our phone Conversation.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Interoffice Memorandum

To: MRJ

From: SS

Subject: Review Comments - Rio Verde North

Date: 5/19/94

The Watershed Management Branch has reviewed the "Rio Verde - North Floodplain Delineation Study Preliminary Hydrology Model Submittal". The HEC-1 methodology and sub-basin parameters were found to be reasonable. As a result of the meeting held yesterday (5/18/94 @ 3:00pm) we realize that a few changes in watershed boundaries and concentration points will be made to account for split flow locations. However, we do have several comments concerning the report. They are as follows:

1. Please set up the report in the format of the ADWR TDN. An outline of those standards was handed out in the kick-off meeting.

2. Please include more tables as listed in the FCD's list of required material for Flood Delineation Studies (this does not have to include all the tables listed). This information was also handed out in the kick-off meeting.

3. Please include reference material and calculations for rainfall depths and distributions.

4. Please include reference material and calculations for the soils information, which includes the extrapolation of the soils not included in the SCS soil survey.

5. Please include the information for estimating the vegetative cover and cross sections.

6. Please include the loss parameter spreadsheets.

7. Please entitle the split flow information "Special Problems/Solutions" as indicated in the ADWR TDN.

8. Please include a location map in the written report.

9. Please include a list of references.

10. Please clean up Plates 1-3 by including a legend.

If you or the consultants have questions or need any other information, please feel free to call me.

Divider

2.3 Survey field notes; identify datum (horizontal and vertical), when survey was started and completed. Document who is the professional responsible for field work.

Actual survey field notes are to be under separate cover sealed by a registered land surveyor.

Divider

2.4 Watershed maps, hydrologic analysis maps to be reduced on to an 11" x 17" fold out or 81/2" x 11". Community name/location, street names, current corporate limits and data that is applicable to the study area are to be included on the reduced maps. All reduced maps must meet the TDN documentation standards as specified in section III of SSA 1-90.

Full size watershed maps are to be referenced to TDN Section 3 - Hydrology.

Divider

2.5 Map of watershed boundaries identifying study area and floodplain delineations reduced on 8 1/2" X 11" or 11" x 17" fold out sheets.

Full size hydraulic maps are to be under separate cover.

Divider

2.6 Red lined FIRMs, showing new floodplain limits and floodway if scale allows.

Divider

2.7 Community Maps; can be incorporated into 2.4 or 2.5.

Divider

2.8 Misc. maps to be referenced to appendix B.

Tabbed Divider

****Sections 6,7, and 8 to be included under this cover.**

Taken from the ADWR TDN OUTLINE

SECTION 3: HYDROLOGIC ANALYSIS

Under separate cover. Unless instructed otherwise.

The final hydrologic report should include, but is not limited to the following sections and documentation using ADWR standards:

3.1 Method Description
Figure - Location Map (maximum size 11"x 17" at the appropriate scale)

3.2 Parameter Estimation
    3.2.1 Drainage Area Boundary
        3.2.2.1 Watershed Sub-Basin Parameters
            General
            Soils Parameters
            Watershed Delineation and Areas
            Land Use Characteristics
            Lag Times
            S-Graphs
            Table - Summary of Green & Ampt

Parameters
Table - Soil Loss Calculations
Table - Land Use
Table - Slopes/Slope Adjustments
Table - Sub-Basin Lag Time/Time of Concentration
Table - Sub-Basin Parameters
3.2.2.2 Reach Route Parameters

General
Field Reconnaissance
Hydraulic Computations
Channel Infiltration Losses
Table - Reach Route Data
Table - Reach Route Channel Infiltration Loss Data

3.2.2.3 Storage Route Parameters
General
Field Reconnaissance
Hydraulic Computations
Surface Area Computations
Percolation Loss
Major Structures
3.2.3 Statistical parameters

3.2.4 Precipitation

3.2.4.1 Rainfall Distribution
3.2.4.2 Precipitation Data
3.2.4.3 Aerial Precipitation Reduction
Table - Aerial Precipitation Reduction Data
3.2.5 Gage Data
3.2.5.1 General
3.2.5.2 Streamflow Gaging Stations
3.2.5.3 Precipitation Gaging Stations
3.3 Calibration

3.4 Special Problems and Solutions

3.5 Final Results
3.5.1 General
3.5.2 Discussion of Results
3.5.2.1 General
3.5.2.2 Comparison of Results With Previous Studies/Historical Floods
Table - Summary of Peak Flows compared to previous studies
3.5.2.3 Summary of Results
Table - 100-Year, 24-Hour Results
Table - 100-Year, 6-Hour Results
Table - Summary of Peak Flows at Key Locations on the Watershed
3.6 Final Modeling Results on Diskette(s)

Section 2: Mapping & Survey Information

**ADWR-TDN Form on mapping*

2.1 Description of mapping, map control and any other survey information used in study. Narrative description of mapping and survey information used in study.

2.2 Index of maps.

2.3 Survey field notes

Identify datum (horizontal and vertical), when survey was done, who is the professional responsible for field work.

***Under separate cover; clear and concise survey notes with sketches, notations should meet requirements of State Technical Board.*

**Professional certification on survey notes*
**Datum, date of topography, scale, contour intervals.*
**Index map of the work maps-8 1/2" x 11"*
**Location map with ERMs identified*
**Flight map*

**General Watershed map of the study area no larger than 11" x 17", to scale.*
**General flood plain map of the study area no larger than 11" x 17", to scale.*

***These are to be presented as an overview exhibit of the study boundaries, total basin, and flood plains. The consultant may combine the two maps displaying both basin divisions and flood plains or present individual maps.*

*Taken from
[illegible]R-TDN
October 25, 1993

Section 3: Hydrology Analysis

**ADWR-TDN Hydrology Form.*
**General watershed map of the study area on larger that 11" x 17" - to scale, showing subbasin distribution and concentration points.*

3.1 Method description.

Narrative description of hydrologic method or model, include model name, date, and source with watersheds analyzed by computer programs.

3.2 Parameter estimation.

This section and its subsections should include all calculations used to develop the hydrology.

3.2.1 Drainage area Boundaries

3.2.2 Physical parameters

Sheets for all other physical hydrologic parameters, time of concentration, lag, hydro CN number, channel, percolation loss estimation, N values used in hydro studies, transect, etc.

3.2.3 Statistical parameters

Narrative discussion of data record and information available on precipitation, runoff and discharge for region and watershed used for assessment of adequacy and applicability of record under WRS Bulletin 17B, (March 1982), Discuss factors that effect the reasonableness of frequency analysis.

3.2.4 Precipitation

Narrative discussion with supporting data analyzing historic precipitation records in or adjacent to watershed in relation to watershed size, historic flooding, type of storm, extent, duration and distribution pattern. Relate hypothetical model design precipitation and distribution from stated reference source to historic record and statistical parameters.

3.2.5 Gage Data

Identify and discuss locations of any NWS, USGS or other agency gage stations in or adjacent to the region and watershed in relation to historic precipitation, watershed runoff and statistical parameters.

3.3 Calibration.

Narrative discussion should describe what calibration was accomplished or attempted.

3.4 Special problems/solutions.

Narrative discussion of any *special problems during the study and alternatives / final solutions.*

3.5 Final results/computer runs.

Include output discharge volumes, times, water surface elevations and peak flows. Results are to be presented in tabular form as well as discussed in narrative text. Full input and output listings of all models should be included.

3.6 *Final input files on diskette(s).*

* *Soil tables, Watershed work maps,*

Section 4: Hydraulic Analysis ✓

**ADWR-TDN Form for hydraulics*

**General overview map of study area with flood plain delineations identified, no larger 11" x 17" - to scale.*

4.1 Method description.

Narrative of the detail water profile model used as well as an explanation of how the starting WSEL was determined.

4.2 Parameter estimation.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

MEETING MINUTES

Date:	May 9, 1994	
Time:	3:00 P.M.	
Location:	FCDMC	
Project No.:	15183 (FCD 93-06)	
Project Name:	Rio Verde-North	
Subject:	Review Cross Section Locations	
Attendees:	<u>FCDMC</u>	<u>Burgess & Niple</u>
	Magnus Jolayemi Pedro Calza	Larry Culler Stan Johnson Russ Cruff

ITEMS DISCUSSED:

1. The method used in cross section selection.
2. The reason for making very wide cross section for "WASH A" above Forest Road.
3. The starting and ending point for each wash.
4. FCDMC personnel agreed with the selected sections.
5. Gave copy of maps (1" = 200') with cross section locations to MCFCD.

copy:
Magnus Jolayemi
Larry Culler
Stan Johnson
Pedro Calza

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

MEETING MINUTES

Date:	May 9, 1994	
Time:	7:00 A.M.	
Location:	Study Area	
Project No.:	15183 (FCD 93-06)	
Project Name:	Rio Verde-North	
Subject:	Select Manning's "n" Values	
Attendees:	FCDMC	Burgess & Niple
	Magnus Jolayemi	Larry Culler Stan Johnson Russ Cruff

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

ITEMS DISCUSSED:

The day was spent in the field reviewing the stream reaches to be studied. Photographs were taken and "n" values selected at locations along the stream reaches.

It was decided to designate the southern stream "WASH A", the middle stream "WASH F", and the northern stream "WASH I".

copy: Magnus Jolayemi
Larry Culler
Stan Johnson

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

MEETING MINUTES

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

Date:	May 6, 1994	
Time:	1:00 P.M.	
Location:	Adobe Room, FCDMC	
Project No.:	15183 (FCD 93-06)	
Project Name:	Rio Verde-North	
Subject:	Select Stream Reaches for Delineation	
Attendees:	FCDMC	Burgess & Niple
	Magnus Jolayemi Ted Lehman	Larry Culler Stan Johnson Russ Cruff

ITEMS DISCUSSED:

1. Presented maps showing location of possible stream reaches for study.

2. Discussed the various options. Magnus wanted the end of reaches to be at roads, section lines or some other physical feature.

3. It was agreed to study the following:

   A. Stream which ends at concentration points 90 and 100, from Verde River upstream about 0.7 miles to section line along east side of Section 25.

   B. Stream which ends in concentration points 210, from Verde River upstream about 1.0 mile to section line along east side of Section 25.

   C. Stream which ends in concentration point 190, from Verde River upstream to the split at Forest Road north of the intersection with Rio Verde Drive about 0.7 miles. Then up both channels of the split to the start upstream end of split (about 0.85 miles in each reach). Then from beginning of split, upstream to section line between Section 25 and 26.

copy:
Magnus Jolayemi
Ted Lehman
Larry Culler
Stan Johnson

MEETING MINUTES

RECEIVED
APR - 5 1994
BURGESS & NIPLE, INC.

DATE: March 29, 1994

TIME: 9:00 a.m.

LOCATION: Guadalupe Room, FCDMC

PROJECT NO.: 93031.00

PROJECT NAME: Rio Verde - North
Floodplain Delineation Study, Hydrology

SUBJECT: Preliminary Hydrology Coordination Review

ATTENDEES:

Burgess & Niple:
Russ Cruff, P.E.
Larry D. Culler, P.E.
Larry J. Woodlan., P.E.

FCDMC:
Sandy Story

Wood/Patel:
Ash Patel, P.E.
Tony Regis, Hydrologist AJR

ITEMS DELIVERED TO FCDMC:

- Preliminary working HEC-1 model package, sub-basin drainage map, soil parameters

ITEMS DELIVERED TO BURGESS & NIPLE:

- Preliminary working HEC-1 model package, sub-basin drainage map, soil parameters

ITEMS DISCUSSED:

1. Wood/Patel's project progress is on schedule.

2. The Wood/Patel working HEC-1 model submitted to B&N and FCDMC contains finalized precipitation and sub-basin data. Storage routing, channel routing, and flow split data have all been approximated for this HEC-1 model. The model output should be disregarded, however, because of the uncertainties in the application of the Clark unit hydrograph.

cc: All Attendees
Magnus Jolayemi, FCDMC
Cathy Regester, FCDMC

MEETING MINUTES

DATE: March 29, 1994

TIME: 9:00 a.m.

LOCATION: Guadalupe Room, FCDMC

PROJECT NO.: 93031.00

PROJECT NAME: Rio Verde - North and Rio Verde - South
Floodplain Delineation Study, Hydrology

SUBJECT: Preliminary Hydrology Coordination Review

ATTENDEES:

Burgess & Niple:
Russ Cruff, P.E.
Larry D. Culler, P.E.
Larry J. Woodlan., P.E.

FCDMC:
Sandy Story

George V. Sabol Consulting Engineers, Inc.
George Sabol, PhD, P.E.
Tom Loomis, P.E.

McLaughlin Kmetty Engineers, Ltd.
Frank Brown, P.E.

Wood/Patel:
Ash Patel, P.E.
Tony Regis, Hydrologist AJR

ITEMS DISCUSSED:

1. Mr. Sabol stated that in his research, he found that the combination of S-graph # 18 (which he researched for FCDMC) and a Kn value of 0.020 may be applicable to the conditions found in this watershed. He stated that this may be preferable in lieu of using other S-graphs or the Clark unit hydrograph. Mr. Sabol suggested that while the Clark unit hydrograph is appropriate for many watersheds, it may be unsuitable for sub-basins in which the time of concentration is significantly greater than the duration of rainfall excess. In those cases, an S-graph may be more appropriate.

2. Mr. Sabol acknowledged that the results of the test HEC-1 model by Wood/Patel that uses the Phoenix Valley S-graph unit hydrograph and a Kn value of 0.055 agrees fairly well with the S-graph # 18 model with a Kn value of 0.020.

3. Preliminary HEC-1 results by Wood/Patel indicate that the Clark unit hydrograph does indeed produce flows lower than those produced using the S-graphs. This is often the case, and the Clark method may be more appropriate for smaller (and urban) sub-basins.

4. FCDMC may prefer to use a District-approved unit hydrograph rather than the S-graph # 18. Sandy will discuss this issue with Amir Motamedi, Pedro Calza, and Joe Tram within the next day to decide whether to recommend the alternate S-graph # 18.

5. Burgess & Niple, Wood/Patel, McLaughlin Kmetty, George Sabol, and FCDMC all concur on the proposed south watershed boundary of the Rio Verde - North hydrology study. Further analysis and inspection of detailed topographic maps may require minor changes due to flow breakouts.

6. SCS soil survey data is not available adjacent to the Verde River. Mr. Loomis stated that it is possible to estimate soil groups using aerial photographs. He suggested meeting soon with SCS to determine soil groups in those areas.

7. Mr. Sabol suggested that we consider eliminating channel routing when lengths are less than a minimum value, say 800 or 1000 feet. This will be addressed as the study progresses.

8. Mr. Loomis stated that it would be appropriate to model routing reaches using a composite cross section representing one or several channels, since routed flows may be contained in more than one wash.

9. Topographic mapping is expected to be completed by April 18 for the Rio Verde - North study area, and by April 30 for the south study area.

cc: All Attendees
Magnus Jolayemi, FCDMC
Cathy Regester, FCDMC

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

To: File
Date: 3/8/94
From: L. Cueller
Job Number: 15183
Subject: MCFCD Rio Verde
Sect. No. / Act.:

Memorandum

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
602 244-1915 Fax

Larry Woodlan, Russ Cruff and I met with Pedro Calza and Magnus Jolayemi, in our office to review progress.

MEETING MINUTES

RECEIVED
FEB 24 1994
BURGESS & NIPLE, INC.

DATE: February 22, 1994

PROJECT NO.: 93031.00

NAME: Rio Verde - North
Flood Insurance Study

SUBJECT: Preliminary Hydrology Coordination Review

ATTENDEES:

Burgess & Niple:
Russ Cruff, P.E.
Larry Culler, P.E.
Larry Woodlan., P.E.

McLaughlin Kmetty Engineers, Ltd.
Geza Kmetty, P.E.

George V. Sabol Consulting Engineers, Inc.
George Sabol, PhD, P.E.

Wood/Patel:
Ash Patel, P.E.
Tony Regis, Hydrologist ATR

ITEMS DELIVERED TO BURGESS & NIPLE:

- Revised Master Drainage Plan - Tonto Verde by Brooks, Hersey & Assoc.
- Final Drainage Report - Tonto Verde Master Plan by Wiley & Assoc.

ITEMS RECEIVED FROM BURGESS & NIPLE:

- Gila Bend Area Floodplain Delineation Study Technical Data Notebook - Hydrology

ITEMS DISCUSSED:

1. According to Russ, streams 5 and 6 of the Scottsdale Alluvial Fan Study by FCDMC may be applicable to the Rio Verde North Study for comparison purposes.

George suggested that a third S-graph unit hydrograph (called the piedmont S-graph) being considered by FCDMC may be appropriate for use in this study.

3. George stated that, in general, S-graphs are usually better suited for use in very large watersheds (on the order of 100 square miles); they tend to give larger flows than the Clark unit hydrograph. However, all three unit hydrograph methods (Clark, Phoenix Valley, and Phoenix Mountain) will be considered for use in this study.

4. Russ and George will review the Wood/Patel test model; a meeting will be scheduled in approximately one or two weeks with FCDMC to discuss conclusions and select methodology for the hydrologic study. Russ also suggested that a computer diskette with the test results be submitted to Sandy Story, FCDMC, for the review of input.

cc: All Attendees
Magnus Jolayemi, FCDMC
Sandy Story, FCDMC

SECTION 1: General Documentation and Correspondence

1.4 General Correspondence

CONVERSATION RECORD

Job No. 15183 Job Name Rio Verde North Floodplain Delineation Study Date 6/27/95

By L. Cullen Time

With Frank Brown

☑ By Telephone ☐ Incoming ☑ Outgoing Telephone No. ( )

☐ Visit, Site City

Regarding: FAX Transmittal Dated 6/22/95

Conversation Items: Discussed the questions with Blair Meggitt.

ERM 12 Is Point 47 described in Book 171, Page 9. The brass cap is a Witness Corner to a Meander Corner.

ERM 16 is T.BM 56 described in Book 171, Page 16. Blair feels we should not use that point as an ERM since it is not a real solid point. I told Frank this and we agreed to eliminate it.

~~Action Required:~~ ~~Action Taken:~~

ERM 17 is a brass cap and is TBM "B" described in Book 169, Page 58.

MKE

McLaughlin Kmetty Engineers, Ltd.

3501 North 16th Street Phoenix, Arizona 85016-6419 (602) 248-7702 FAX (602) 248-7851

GEZA E. KMETTY
RONALD C McLAUGHLIN
HALFORD E. ERICKSON
WILLIAM R. KENDALL
RALPH L. TOREN
TERRENCE P. KENYON
RICHARD E. McLAUGHLIN

Date 22 JUN 95

Page 1 of 2
INCL. this page

From Frank Brown

Transmitted to Fax Number 244-1915

To Mr. Larry Culler

Company Burgess & Niple

Comments

Larry,

please review & approve the wording for these benchmarks. The data for ERM #12 and 16 & 17 is incomplete - would you supply this?

Thanks.

Job # 89-407.003

NOTE: If this transmission is incomplete, please call
(602) 248-7702

Admin\FaxForm.000

BURGESS
& NIPLE

ENGINEERS

ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

FAX COVER SHEET

Date: 6/19/95

Job Number:

Re: Rio Verde North Floodplain Delineation Study

TO: Frantz Brown
McLaughlin Kmetty Engineers

FAX PHONE NUMBER: 248-7851

We are sending you 2 additional pages, not counting this cover sheet.
If all pages are not received, please call us as soon as possible.

COMMENTS:

Attached are the ERM descriptions shown on the 5 maps for Rio Verde North, per your request by telephone, this date.

Signed: Larry D. Cullen

Federal Emergency Management Agency
Washington, D.C. 20472

MAY 09 1995

RECEIVED
MAY 15 1995
BURGESS & NIPLE, INC.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 95-09-446P

Mr. Ron Nevitt
Program Manager, NFIP
Regulatory Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Community: Maricopa County, Arizona
Community No.: 040037

106

FEMA letter

Dear Mr. Nevitt:

This is in response to your April 20, 1995, facsimile transmittal regarding the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas.

You requested that we revise the FIS report and FIRM to show the effects of detailed hydrologic and hydraulic analysis of Unnamed Wash A, from its confluence with the Verde River to approximately 13,170 feet upstream of the confluence; Unnamed Wash F, from its confluence with the Verde River to approximately 5,070 feet upstream of the confluence; Unnamed Wash I, from its confluence with the Verde River to approximately 3,300 feet upstream of the confluence; and Unnamed Wash A South, from its confluence with Unnamed Wash A to its split from Unnamed Wash A, approximately 4,580 feet upstream of its confluence. Unnamed Washes A, A South, F, and I were previously unstudied.

All data required to review this revision request were submitted with your April 20, 1995, facsimile and with a letter from you dated April 3, 1995.

We have completed our review of the data submitted and have determined that the items listed below represent the best available data for the flooding sources listed above.

- Report entitled "Rio Verde - North Floodplain Delineation Study, FCD 93-06, Technical Data Notebook Hydraulics," prepared by Burgess & Niple, Inc., dated March 1995

- Report entitled "Rio Verde - North Floodplain Delineation Study, FCD 93-06, Technical Data Notebook Hydrology," prepared by Burgess & Niple, Inc. and Wood, Patel, & Associates, Inc., dated October 1994

- Report entitled "Field Survey Notes, Rio Verde North Floodplain Delineation Study, FCD 93-06, Wash A, Wash A South, Wash F, Wash I," prepared by Burgess & Niple, Inc., dated March 1995

- Sheets 1 through 6 of the topographic work maps entitled "Flood Control District of Maricopa County, Flood Delineation Study of Rio Verde North, F.C.D. Contract No. 93-06," prepared by Burgess & Niple, Inc., dated August 1994

- Map entitled "Flood Control District of Maricopa County, Rio Verde - North F.P.D.S., Sub-Basin Delineation and Flow Path Map. Exhibit A," prepared by Wood, Patel & Associates. Inc., dated June 22, 1994, and revised September 28, 1994
- Map entitled "Flood Control District of Maricopa County, Rio Verde - North F.P.D.S., Soil Map Unit Data, Exhibit B," prepared by Wood. Patel & Associates, Inc., dated June 22, 1994, and revised September 28, 1994
- Map entitled "Flood Control District of Maricopa County, Rio Verde - North F.P.D.S., HEC-1 Schematic Diagram, Exhibit C," prepared by Wood, Patel & Associates, Inc., dated June 22, 1994, and revised September 28, 1994.

Thank you for providing this information for our use in updating the effective FIRM. We will include this information in our next physical map revision of the FIRM for the Maricopa County, Arizona and Incorporated Areas. The tentative date for the next preliminary FIRM is fall 1996. In the interim, your community may use these data in its floodplain management programs.

If you have any questions regarding this matter, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Ms. Terri Miller
State Coordinator, NFIP
Arizona Department of Water Resources

Mr. Larry D. Culler
Burgess & Niple, Inc.

Federal Emergency Management Agency
Washington, D.C. 20472

April 21, 1995

RECEIVED
APR 27 1995
BURGESS & NIPLE, INC.

Mr. Ron Nevitt
Program Manager, NFIP
Regulatory Division
Flood Control District of Maricopa County
2801 West Durango Street, Fifth Floor
Phoenix, Arizona 85009

IN REPLY REFER TO:
Case No.: 95-09-446P
Community: Maricopa County, Arizona
and Incorporated Areas
Community No.: 040037
316-ACK

Dear Mr. Nevitt:

This is in response to your request dated April 3, 1995, for a revision to the Flood Insurance Rate Map (FIRM) for the above-referenced community. Pertinent information about the request is listed below.

Identifier:	Rio Verde North Floodplain Delineation Study
Flooding Source:	Unnamed Washes A, A South, F, and I
FIRM Panels Affected:	04013C0875 D and 04013C1300 E

As you may know, the Federal Emergency Management Agency (FEMA) has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request is based solely on the incorporation of more detailed information, no fees will be assessed for our review.

We have completed an inventory of the items that you submitted. We have received all of the data we require to begin a detailed technical review of your request. If additional data are required, we will inform you within 30 days of the date of this letter.

Please direct all and questions concerning your request to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Mr. Massoud Rezakhani
(703) 317-6239

When you write us about your request, you must include the case number referenced above in your letter.

If you have any questions concerning FEMA policy, or the National Flood Insurance Program in general, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Michael Buckley

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Ms. Terri Miller
State Coordinator, NFIP
Arizona Department of Water Resources

Mr. Larry D. Culler
Burgess & Niple, Inc.

FLOOD CONTROL DISTRICT
of
Maricopa County
2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

RECEIVED
APR 05 1995
BURGESS & NIPLE, INC.

April 3, 1995

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate
Federal Emergency Management Agency
Washington, D. C. 20472

Attn: Mr. John Magnotti:

Re: LOMR Request Washes A, A (South),
F and I.
FCD Contract No. FCD93-06
FIRM Map Panels 875 (not in print), 1300

Dear Mr. Buckley:

This is a request for a LOMR for the above referenced washes which are tributaries to the Verde River in the rapidly developing Rio Verde Community located in the unincorporated area of Maricopa County.

Enclosed is the flood insurance study by Burgess & Niple, Inc., done under contract with the Flood Control District. Included with the study is a copy of annotated FIRM map panel 1300 approximating the flood hazard boundaries. Map panel 875 which is not in print, is also included in this study.

A pre-study public meeting to acquaint residents of the area with the proposed study and to obtain local input was held on January 14, 1994.

The following information is submitted in support of the LOMR:

1. FEMA Application Forms Booklet with annotated FIRM panel 1300.

2. Hydraulics Technical Data Notebook with HEC-2 disk.

3. Hydrology Technical Data Notebook with HEC-1 disk.

4. Field Survey Notes Notebook.

Should additional information be required, please contact either Mr. Larry D. Culler of Burgess and Niple, Inc., or Mr. Magnus Jolayemi, Project Manager of this office.

Sincerely,

Ron Nevitt

Ron Nevitt,
Program Manager, NFIP
Regulatory Division

Enclosures

Copy to: Terri Miller, State Coordinator, NFIP
Arizona Department of Water Resources
Larry D. Culler, Burgess & Niple, Inc.

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 3/29/95	JOB NO.
RE: Rio Verde North Floodplain Delineation Study	

TO Magnus Jolayemi
FCD of Maricopa County

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ____________

COPIES	DATE	NO.	DESCRIPTION
2			Current FIRM with new floodplain limits shown in red. (FIRM 1300)
2			Copies of same map to include in the reports submitted on 3/24/95

THESE ARE TRANSMITTED:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for correction ☐ Return _____ corrected prints
☐ For review and comment ☐ ____________

REMARKS You requested these by telephone, this date.

COPY TO ____________

SIGNED Larry W. Culler

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 3/27/95	JOB NO.
RE: Rio Verde North Floodplain Delineation Study	

TO Magnus Jolayemi
FCD of Maricopa County

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☑ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1			Set of Flood Boundary Maps (6 Sheets)

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☑ As requested
☐ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS You requested these by telephone on 3/24/95.

COPY TO ______

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Mr. Magnus Jolayemi
Flood Control District
of Maricopa County
2801 W. Durango
Phoenix, AZ 85009

Re: Rio Verde North
Floodplain Delineation Study
FCD 93-06

March 24, 1995

Dear Mr. Jolayemi:

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

Submitted herewith are two copies each of the Hydraulics and Hydrology Technical Data Notebooks, for your submission to FEMA.

Included are:

Three copies of Field Survey Notes
Two copies of FEMA Forms
Two copies of HEC-2 Input/Output Files
for Supercritical Profiles

If you have any questions, please call me at (602) 244-8100. It has been a pleasure working with you and, as always, we remain available to answer questions during the FEMA review.

Very truly yours,

Larry D. Culler

Larry D. Culler, PE

LDC:cg
Enclosure

copy: Pedro Calza
Ash Patel
Larry Woodlan

1912

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
Suite 212
5025 East Washington Street
Phoenix, Arizona 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 3/6/95 JOB NO

RE: Rio Verde North Floodplain Delineation Study

TO Magnus Jolayemi
FCD of Maricopa County

WE ARE SENDING YOU ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Draft Report

COPIES	DATE	NO.	DESCRIPTION
1	3/95		Technical Data Notebook -
			Hydraulics
1			Extra copy of Flood Boundary Maps

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for corrections
☐ ______
☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS This is for your review and approval.

COPY TO Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once

FLOOD CONTROL DISTRICT
of
Maricopa County
2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

RECEIVED
OCT 19 1994
BURGESS & NIPLE, INC.

October 18, 1994

Mr. Larry Culler, P.E.
Regional Consultant
Burgess & Niple, Inc.
5025 E. Washington St., Ste. 212
Phoenix, Arizona 85034

SUBJECT: Hydrology Report for Rio Verde North FDS (FCD 93-06)

Dear Mr. Culler:

We have reviewed the hydrology report submitted by Wood, Patel & Associates, Inc., for the above-referenced study and have no review comments to offer.

We would like to make clear that since the hydraulics portion for both the North and South studies is still in progress, this hydrology is tentatively accepted, as long as there is no further breakout of flow into either study area. The hydrology report will not be considered complete until the delineation is approved by FEMA.

If you have any questions or comments, please call me.

Sincerely,

Magnus R. Jolayemi
Hydrologist

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 10/4/94	JOB NO.
RE: Rio Verde North Floodplain Delineation Study	

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ________

COPIES	DATE	NO.	DESCRIPTION
1	10/94		Technical Data Notebook - Hydrology

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ________

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS ________

COPY TO Ash Patel
Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 10/4/94 JOB NO.

RE: Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	9/23/94		Transmittal letter from George V. Sabol Consulting Engineers to Wood, Patel & Assoc.

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☑ For your information
☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS

COPY TO Cathy Regester w/attachment
Sandy Story w/attachment
Larry Wobelan

SIGNED Larry D. Cullers

If enclosures are not as noted, kindly notify us at once.

FAX TRANSMITTAL

# of pages 1	
To: LARRY CULLER	From: TONY REGIS
Co: BURGESS & NIPLE	Co. Wood/Patel
Dept	Phone # (602) 234-1344
Fax # 244-1915	Fax # (602) 234-1322

TRANSMITTAL

: WOOD PATEL
1500 E. MISSOURI AVE SUITE 203
PHX AZ 85014
C/O TONY REGIS

RECEIVED
SEP 26 1994
WOOD, PATEL & ASSOCIATES

FROM: *George V. Sabol Consulting Engineers, Inc.*
7950 East Acoma Drive, Suite 211
Scottsdale, Arizona 85260-6962
(602) 483-3368 FAX (602) 483-3990

DATE: 9/23/94

PROJECT No./Name: 46 / RIO VERDE SOUTH FIS

SUBJECT: HYDROGRAPH CROSSING INTO NORTH STUDY AREA

ENCLOSED ARE THE FOLLOWING

DISKETTE CONTAINING HYDROGRAPH DATA FOR THE 100-YR. 6 & 24-HR STORMS

COPY OF 200 SCALE 2' CI MAPPING SHOWING LOCATION OF DIVERSION

REMARKS

COPIES

SIGNED Mike Gulick

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 9/19/94 JOB NO.

RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐ ____________

COPIES	DATE	NO.	DESCRIPTION
1	9/15/94		Transmittal letter from Wood, Patel & Assoc. to George V. Sabol Consulting Engineers

THESE ARE TRANSMITTED:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution
☐ As requested ☐ Returned for correction ☐ Return ____ corrected prints
☐ For review and comment ☑ For your information

REMARKS ____________

Cathy Regester w/attachment
COPY TO Larry Woodlaw **SIGNED** Larry D. Culler

If enclosures are not as noted, kindly notify us at once.

WOOD, PATEL & ASSOC INC.

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203
Phoenix, AZ 85014
(602) 234-1344 • FAX 234-1322

LETTER OF TRANSMITTAL

DATE: September 15, 1994	JOB NO. 93031.00
ATTENTION: Tom Loomis, P.E.	
RE: Rio Verde - North FPDS hydrology coordination	

RECEIVED
SEP 16 1994
BURGESS & NIPLE, INC.

TO:

George V. Sabol Consulting Engineers, Inc.
7950 E. Acoma Dr. Suite 211
Scottsdale, AZ 85260-6962

WE ARE SENDING YOU ■ Attached ☐ Under separate cover via PICK-UP the following items:

☐ Shop drawings ☐ Prints ■ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ■ Other_(Files)

COPIES	DATE	NO.	DESCRIPTION
1	9/15/94		11" x 17" copy of portion of drainage map and HEC-1 schematic
1	9/15/94		One 5 1/4" diskette containing output hydrographs for divert operation
			171D for 6-hour and 24-hour storms

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Approved as noted
■ For your use ☐ As requested ☐ For review and comment

REMARKS:

Tom, this divert operation represents the flow breakout from Burgess & Niple's HEC-2 model. Note that the NMIN value for both models is 5 minutes. From inspection of an aerial photo, it appears that a portion of this flow lost from the north watershed may re-enter the north watershed at a point about 3800 or 4000 feet east of the diverted flow, as shown on the sketch. If this is indeed the case, please forward these hydrographs to us, along with those for any other inflows into the north watershed. If you have any questions, please call. Thank you!

[illegible]Y TO: Larry Culler (B&N)
Sandy Story (FCDMC)

SIGNED: Anthony J. Regis, P.E.

FORMS\TRANSMIT.GEN

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Mr. Frank Brown
McLaughlin Kmetty Engineers, Ltd.
3501 North 16th Street
Phoenix, AZ 85016

Re: Rio Verde North
Floodplain Delineation Study

August 25, 1994

Dear Mr. Brown:

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

During a phone conversation, this date, we discussed a flow breakout included in the HEC-2 model for Rio Verde North. The breakout occurs at Section 2.494 of Wash A and discharges 210 cfs to Rio Verde South.

Enclosed is a print of Sheet 5 of the maps for Rio Verde North, which shows the location of the flow breakout.

Very truly yours,

Larry D. Culler

Larry D. Culler, PE

copy: Magnus Jolayemi
Cathy Regester
Sandy Story

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 8/25/94 JOB NO.

RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	8/24/94		Transmittal letter from Wood, Patel & Assoc. to George V. Sabol Consulting Engineers

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☑ For your information
☐ Resubmit ____ copies for approval
☐ Submit ____ copies for distribution
☐ Return ____ corrected prints

REMARKS ______

COPY TO Cathy Regester w/attachment
Sandy Story w/attach
Larry Woodman

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

WOOD, PATEL & ASSOC , INC.

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203
Phoenix, AZ 85014
(602) 234-1344 • FAX 234-1322

LETTER (TRANSMITTAL

DATE: August 24, 1994

JOB NO. 93031.00

ATTENTION: Tom Loomis, P.E.

RE: Rio Verde - North FPDS hydrology coordination

TO:
George V. Sabol Consulting Engineers, Inc.
7950 E. Acoma Dr. Suite 211
Scottsdale, AZ 85260-6962

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via PICK-UP the following items:

- ☐ Shop drawings
- ☐ Copy of letter
- ☐ Prints
- ☐ Change Order
- ☐ Plans
- ☒ Other (Files)
- ☐ Samples
- ☐ Specifications

COPIES	DATE	NO.	DESCRIPTION
1	8/24/94		11"x17" copy of portion of drainage map and HEC-1 schematic
1	8/24/94		One 5 1/4" diskette containing TAPE21 files for divert operation 165DR
			for 6-hour and 24-hour storms

THESE ARE TRANSMITTED as checked below:

- ☐ For approval
- ☒ For your use
- ☐ Approved as submitted
- ☒ As requested
- ☐ Approved as noted
- ☐ For review and comment

REMARKS:

Note that the NMIN value for both files is 5 minutes.

COPY TO: Larry Culler, P.E., Burgess & Niple

SIGNED: Anthony J. Regis, P.E.

FORMS\TRANSMIT.GEN

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 8/24/94	JOB NO.
RE:	
Rio Verde North Floodplain Delineation Study	

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via_______the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ____________

COPIES	DATE	NO.	DESCRIPTION
1	8/94		Special Problems and Supercritical HEC-2 Model

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ____________

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS This is a resubmittal and should supersede the previous submission dated July 20, 1994. We have addressed your comments received during the review meeting on July 29, 1994. This submission includes flood profiles and maps which are nearer to the final form.

COPY TO Larry Woodcam

SIGNED Larry D. Cullom

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 7/20/94
JOB NO.
RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
Flood Control District of Maricopa
County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ 400 and 200 scale maps

COPIES	DATE	NO.	DESCRIPTION

THESE ARE TRANSMITTED:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☑ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for correction ☐ Return _____ corrected prints
☐ For review and comment ☐ ______________

REMARKS Enclosed are two maps which may help to explain the question of channel connectivity in Wash F, that came up during your meeting with Larry Woodlan on July 7, 1994. One is a copy from our 400 scale map which shows the entire area in question. Orange is channels; green is the divide. The second is the four [illegible]rners of sheets 3, 4, 5 and 6 of the aerial mapping, taped together.

COPY TO ______________

SIGNED Larry D. Culler

If enclosures are not as noted, kindly notify us at once.

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 7/20/94
JOB NO.
RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	7/94		Special Problems and Supercritical HEC-2 Model

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS We have scheduled a meeting for July 29 to review this submittal.

COPY TO Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 6/28/94 JOB NO.

RE:
Rio Verde South
Floodplain Delineation
Study.

TO Frank Brown
McLaughlin Kmetty Engineers
3501 North 16th Street
Phoenix, AZ 85016

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Cross sections

COPIES	DATE	NO.	DESCRIPTION
1			Mapping Quality Control Sections
			1 through 3 and 5 through 7 for
			Rio Verde South

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______
☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS These sections were reviewed with Magnus Jolayemi yesterday. Magnus is providing copies to Cathy Regester.

COPY TO Magnus Jolayemi
Cathy Regester
Larry Woodlan

SIGNED Larry D Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 6/27/94
JOB NO.
RE:
Rio Verde
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings
☐ Copy of letter
☐ Prints
☐ Change order
☐ Plans
☑ Cross Sections
☐ Samples
☐ Specifications

COPIES	DATE	NO.	DESCRIPTION
1			Mapping Quality Control Sections
			1 through 3 and 5 through 10 for
			Rio Verde North and South

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☑ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ________
☐ Resubmit ____ copies for approval
☐ Submit ____ copies for distribution
☐ Return ____ corrected prints

REMARKS ________

COPY TO Cathy Regester
Frank Brown
Larry Woodlon

SIGNED Larry D. Cullers

If enclosures are not as noted, kindly notify us at once.

BURGESS & NIPLE

ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 6/17/94 JOB NO. 15183

RE: RIO VERDE STUDY

TO MAGNUS R. JOLAYEMI

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1			FIELD SURVEY NOTES
1			COMPUTER DISK AERIAL MAPPING
			CROSS-SECTIONS NORTH STUDY

THESE ARE TRANSMITTED:

☐ For approval
☒ For your use
☐ As requested
☐ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS ______

COPY TO LARRY CULLER

SIGNED Larry J. Woolley

If enclosures are not as noted, kindly notify us at once.

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 6/17/94 JOB NO.

RE: Rio Verde Floodplain Delineation Study.

TO Geza Kmetty
McLaughlin Kmetty Engineers
3501 North 16th Street
Phoenix, AZ 85016

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Field Survey Notes

COPIES	DATE	NO.	DESCRIPTION
1			Field Books 169, 170, 171 and 172

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ________
☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS Please call if you have any questions. These notes cover both Rio Verdes North and South.

COPY TO Magnus Jolayemi
Cathy Regester
Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 6/14/94 JOB NO.

RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ____________

COPIES	DATE	NO.	DESCRIPTION
1			Initial HEC-2 Model

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ____________

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS ____________

COPY TO Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 5/20/94
JOB NO.
RE:
Rio Verde North
Floodplain Delineation
Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via_______the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ __________

COPIES	DATE	NO.	DESCRIPTION
1			Information required to propose names for Washes A, F and I

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ __________
☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS __________

COPY TO Larry Woodlaw

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

Box Bar Wash: stream, 16.9 km (10.5 mi.) long, heads at 33°46'12"N, 111°49'35"W, flows east to the Verde River, 3.8 km (2.4 mi.) N of the Fort McDowell Indian Reservation boundary; Maricopa Co., Arizona; Sec. 29, T5N, R7E, Gila and Salt River Mer.; 33°45'15"N, 111°39'36"W; USGS Map - Fort McDowell 1:24,000.

1. Proposal: proposed new name needed for county flood control project

2. Map: Fort McDowell, McDowell Peak and Wildcat Hill 1:24000

3. Proposer: Burgess & Niple, Inc. (Phoenix, AZ)

4. Administrative Area: None

5. BGN Action: Not applicable

6. Names Associated With Feature:
   Local Usage: Not applicable
   Published: Not applicable
   Historical:
   Legal:

7. Other Factors: named for Box Bar Ranch near wash at Verde River

Granite Mountain Wash: stream, 16.4 km (10.2 mi.) long, heads at 33°47'07"N, 111°48'46"W, flows east to the Verde River, 4.9 km (3.0 mi.) N of the Fort McDowell Indian Reservation boundary; Maricopa Co., Arizona; Sec. 30, T5N, R7E, Gila and Salt River Mer.; 33°45'01"N, 111°40'01"W; USGS Map - Bartlett Dam 1:24,000.

1. Proposal: proposed new name needed for county flood control project

2. Map: Fort McDowell, McDowell Peak, Bartlett Dam and Wildcat Hill 1:24000

3. Proposer: Burgess & Niple, Inc. (Phoenix, AZ)

4. Administrative Area: None

5. BGN Action: Not applicable

6. Names Associated With Feature:
Local Usage: Not applicable
Published: Not applicable
Historical:
Legal:

7. Other Factors: named for Peak near head of wash

Model A Tank Wash: stream, 12.6 km (7.8 mi.) long, heads at 33°46'10"N, 111°48'05"W, flows east to the Verde River, 5.5 km (3.4 mi.) N of the Fort McDowell Indian Reservation boundary; Maricopa Co., Arizona; Sec. 30, T5N, R7E, Gila and Salt River Mer.; 33°44'37"N, 111°40'19"W; USGS Map - Bartlett Dam 1:24,000.

1. Proposal: proposed new name needed for county flood control project

2. Map: Bartlett Dam and Wildcat Hill 1:24000

3. Proposer: Burgess & Niple, Inc. (Phoenix, AZ)

4. Administrative Area: None

5. BGN Action: Not applicable

6. Names Associated With Feature:
   Local Usage: Not applicable
   Published: Not applicable
   Historical:
   Legal:

7. Other Factors: named for Model A Tank near wash

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 5/20/94
JOB NO.
RE: Rio Verde North Floodplain Delineation Study

TO Magnus Jolayemi
FCD of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings
☐ Copy of letter
☐ Prints
☐ Change order
☐ Plans
☑ Draft report
☐ Samples
☐ Specifications

COPIES	DATE	NO.	DESCRIPTION
2			Draft Report on Manning's "n" Values

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☑ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______
☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS ______

COPY TO Larry Woodlaw

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 5/9/94 JOB NO.

RE: Rio Verde South - Floodplain Delineation Study

TO Geza Kmetty
McLaughlin Kmetty Engineers, Ltd.
3501 North 16th Street
Phoenix, AZ 85016

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Photo transparencys

COPIES	DATE	NO.	DESCRIPTION
1		2-8	Original Mylars of photo transparencys for Rio Verde South

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS ______

COPY TO Magnus Jolayemo
C. Kathy Regester
Larry Waldon

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
1106 North Beeline Highway
Payson, AZ 85541
602 474-5313
Fax 602 474-3511

LETTER OF TRANSMITTAL

DATE 5-3-94	JOB NO. 15183
RE: RIO VERDE FLOOD	
DELINEATION STUDY	

TO FRANK BROWN
MCLAUGHLIN KMETTY ENGINEERS

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
/			AERIAL CONTROL MAP W/PT#'S ON QUAD. MAP
/			" " LIST W/PT#'S, DESCRIPTION, POINT ELEV.
			& PANEL ELEV'S (ON USGS DATUM)
/			FIELD BOOKS - VERTICAL RUNS - (UNCONVERTED TO USGS DATUM)
/			GPS CONTROL DESCRIPTION SHEETS FOR HZ. CONTROL
/			ON-SITE QUALITY CONTROL SECTION PRINTOUT
			(ON USGS DATUM)
/			AERIAL MAPS - REDLINED W/AERIAL CONTROL, X-SEC'S, ERM'S & SECTION LINES

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☑ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS ______

Magnus Jolayemi
COPY TO P FILE Cathy Regester SIGNED
L. CULLER Larky Woodlan

If enclosures are not as noted, kindly notify us at once.

BURGESS & NIPLE
ENGINEERS ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 4/26/94
JOB NO.
RE: Rio Verde North - Floodplain Delineation Study

TO Magnus Jolayemi
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐

COPIES	DATE	NO.	DESCRIPTION
1	4/25/94		Transmittal letter from Wood, Patel & Assoc. with the preliminary hydrology model.

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS Note that Sandy Story received the same material for review.

COPY TO Larry Woodlan

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 4/20/94 JOB NO.

RE: Rio Verde North - Floodplain Delineation Study

TO Pedro Calza
Floodplain Branch Manager
Hydrology Division
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	4/25/94		Letter from Wood, Patel & Assoc. transmitting the preliminary hydrology model.

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______
☐ Resubmit ______ copies for approval
☐ Submit ______ copies for distribution
☐ Return ______ corrected prints

REMARKS Note that Sandy Story received the same material for review.

COPY TO Larry Woodlan

SIGNED Larry D. Cullum

If enclosures are not as noted, kindly notify us at once.

WOOD, PATEL & ASSOC INC.

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203
Phoenix, AZ 85014
(602) 234-1344 • FAX 234-1322

LETTER C TRANSMITTAL

DATE: April 25, 1994
JOB NO. 93031
ATTENTION: Larry D. Culler, P.E.
RE: Rio Verde - North Floodplain Delineation Study
Preliminary Hydrology Model

TO:
Burgess & Niple, Inc.
5025 East Washington Street
Phoenix, AZ 85034

WE ARE SENDING YOU ■ Attached ☐ Under separate cover via PICK-UP the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ■ Other (Files)

COPIES	DATE	NO.	DESCRIPTION
1			Bound report, "Rio Verde - North Floodplain Delineation Study
			Preliminary Hydrology Model Submittal, April 21, 1994
			(report contains one 5 - 1/4" diskette and three 24" x 36" prints)

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Approved as noted
☐ For your use ☐ As requested ■ For review and comment

REMARKS:

This report contains the preliminary HEC-1 models for the 100-year, 6-hour and the 100-year, 24-hour storms using the Phoenix Valley S-graph Unit Hydrograph. It contains preliminary plates and tables that will be incorporated into the Technical Data Notebook after final revisions to the model are made. If you have any questions, please call.

TO: Sandy Story (FCDMC)

SIGNED: Anthony J. Regis

FORMS\TRANSMIT.GEN

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 4/20/94	JOB NO.
RE: Rio Verde North & South – Floodplain Delineation Study	

TO Cathy Regester
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via_______the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Mapping and Auto CAD files

COPIES	DATE	NO.	DESCRIPTION
1		2-8	Prints of topographic work maps for Rio Verde South
1		1-5	Auto CAD digital files of topographic work maps for Rio Verde South
1		1-2	Digital files of breakline data for Rio Verde South
1		2-6	Prints of topographic work maps for Rio Verde North

THESE ARE TRANSMITTED:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☑ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for correction ☐ Return _____ corrected prints
☐ For review and comment ☐ __________

REMARKS __________

COPY TO Magnus Folayemi
Geza Kmetty
Kathy Woodlan

SIGNED Larry D. Culler

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 4/20/94
JOB NO.
RE: Rio Verde North & South - Floodplain Delineation Study

TO Magnus Jolayemi
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via_______the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Mapping and Auto CAD Files

COPIES	DATE	NO.	DESCRIPTION
1		2-6	Prints of topographic work maps for Rio Verde North
1		1-4	Auto CAD digital files of topographic work maps for Rio Verde North
1		1-2	Digital files of breakline data for Rio Verde North
1		2-8	Prints of topographic work maps for Rio Verde South

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ _______________
☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS _______________

COPY TO Cathy Regester
Geza Kmetty
Larry Woodlaw

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

BURGESS
& NIPLE,
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 4/19/94
JOB NO.
RE: Rio Verde South – Floodplain Delineation Study

TO Geza Kmetty
McLaughlin Kmetty Engineers, Ltd.
3501 North 16th Street
Phoenix, AZ 85016

WE ARE SENDING YOU: ☑ Attached ☐ Under separate cover via_______the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ Mapping and Auto CADD Files

COPIES	DATE	NO.	DESCRIPTION
1		2-8	Original Mylars of topographic work maps for Rio Verde South
1		1-5	Auto CADD digital files of topographic work maps for Rio Verde South
1		1-2	Digital files of breakline data for Rio Verde South

THESE ARE TRANSMITTED:

☐ For approval
☑ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ __________
☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS __________

COPY TO Magnus Jolayemi
Cathy Regester
Larry Woodlam

SIGNED Larry D. Cullen

If enclosures are not as noted, kindly notify us at once.

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

Darrel E. Wood, P.E., R.L.S.
Ashok C. Patel, P.E., R.L.S.
James S. Campbell, P.E.
Jay N. Vaughn, R.L.S.
Gordon Wark, P.E.
Jeffrey J. Holzmeister, P.E.

COMMUNICATION RECORD

DATE: April 1, 1994

PROJECT NO: 93031.00

PROJECT NAME: Rio Verde - North Floodplain Delineation Study, Hydrology

SUBJECT: Hydrology Method, Input

Input Received from Sandy Story

Wood/Patel - Burgess & Niple, have submitted preliminary results of hydrology using various methods. The district has received the data submitted and concluded that the Phoenix Valley S-graph be utilized for the subject study.

RECEIVED
APR - 5 1994
BURGESS & NIPLE, INC.

CC:

Burgess & Niple:
Russ Cruff, P.E.
Larry D. Culler, P.E.
Larry J. Woodlan, P.E.

FCDMC:
Sandy Story
Magnus Jolayemi
Cathy Regester

George V. Sabol Consulting Engineers, Inc.
George Sabol, PhD, P.E.
Tom Loomis, P.E.

McLaughlin Kmetty Engineers, Ltd.
Frank Brown, P.E.

GENCOR\93031-00.404

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Mr. Geza Kmetty
McLaughlin Kmetty Engineers, Ltd.
3501 N. 16th Street
Phoenix, Arizona 85016-6419

Re: FCD93-06 Rio Verde South

March 25, 1994

Dear Mr. Kmetty:

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

Enclosed are copies of quality control cross sections, a quality control cross section disc, and offsite cross sections. This information is for your use on the referenced project.

If you have any questions regarding this matter, please feel free to contact us at your convenience.

Respectfully,

Larry J Woodlan

Larry J. Woodlan, P.E.
President

LJW:cg
Enclosures

copy: Larry Culler

MEMORANDUM

To: Ash Patel, Wood, Patel & Associates, Inc. (W&P)
Russ Cruff, Burgess & Niple, Inc.
Geza Kmetty, McLaughlin Kmetty Engineers, Ltd.

From: G.V. Sabol, GVSCE

Subject: Rio Verde (North & South) FIS

Date: 21 March 1994

I reviewed the preliminary hydrology study results that were provided at our coordination meeting of 22 February 1994. I have used the HEC-1 files that were provided to also evaluate an additional S-graph and various values of K_n. The rainfall distribution that was used in our evaluation is the FCDMC 6-hour storm as defined in the hydrology manual. The results of our study are included for your review and consideration.

The S-graph that was used is S-graph #18, Indian Bend Wash, June 1972, from the <u>S-Graph Study</u> (November 1987). That S-graph was recommended for consideration for use with alluvial fans and distributed flow situations (herein called peidmonts) in a technical memorandum to FCDMC dated 31 March 1993 (Attachment A).

A range of K_n was used from a high of 0.055 to a low of 0.015. A value of 0.055 was used by W&P in its preliminary study. An evaluation of K_n values was recently performed for the FCDMC (Attachment B), and K_n values from 0.015 to 0.03 are suggested for use with peidmont watersheds.

The results of the GVSCE study results and the W&P study results are tabulated below for the various unit hydrographs.

Unit Hydrograph	Peak Discharge, in cfs, at concentration points		
	15 C	25 C	35 C
(1)	(2)	(3)	(4)
Clark	1,027	1,176	1,594
Phx. Mtn. (K_n=.055)	1,098	1,224	1,715
Phx. Valley (K_n=.055)	1,313	1,512	2,198
#18 (K_n=.055)	900	1,007	1,352
#18 (K_n=.030)	1,243	1,283	1,693
#18 (K_n=.025)	1,331	1,335	1,765
#18 (K_n=.020)	1,454	1,394	1,817
#18 (K_n=.015)	1,561	1,450	2,095

A value of K_n = 0.020 is generally recommended for peidmonts in Attachment B, and the results using S-graph #18 along with K_n = 0.020 are reasonably similar to the results for the Phoenix Valley S-graph with K_n = 0.055 and to the LP3 Q100 regression results as reported in the W&P summary sheet.

I suggest that we meet with the FCDMC to discuss these results and to determine if there is consensus agreement as to the unit hydrograph approach that should be considered for use in the Rio Verde (North & South) FIS.

It is noted, however, that the results contained herein are only for a preliminary study using the HEC-1 models that were provided to us by W&P. As we begin our hydrology study, we will be undertaking more extensive evaluations on our own, and those evaluations could lead to different recommendations than have been considered at this time.

In addition to the above, I recommend that we also consider entering into a discussion with the FCDMC staff as to the other model issues for Rio Verde, such as, flow splits and channel routing. These may be more critical than selection of unit hydrograph procedure. I would like to discuss the modeling concept, in general, for this peidmont with the FCDMC before embarking on our hydrology study. I suspect that you share my interest in this regard.

A diskette of the HEC-1 files for our study is included with this memorandum.

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE 2-24-94
JOB NO. 15183
RE: FCD-06

TO Magnus Jolayemi
Flood Control District of Maricopa County

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☒ Reports

COPIES	DATE	NO.	DESCRIPTION
1	May 93		Revised Master Drainage Plan - Tonto Verde by Brooks, Hersey & Assoc.
1	Aug. 92		Final Drainage Report - Tonto Verde Master Plan by Wiley & Assoc.

THESE ARE TRANSMITTED:

☐ For approval
☐ For your use
☐ As requested
☐ For review and comment
☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______
☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

REMARKS We are returning these to you.

COPY TO ______

SIGNED Russ Cruff

If enclosures are not as noted, kindly notify us at once.

~~PAGE 1 OF 2~~

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

DATE 1/19/94
TIME

COMPANY: McLAUGHLIN KMETTY ENGINEERS
ATTENTION: Frank Brown
FAX NO.: (602) 248-7851

FROM: TONY REGGIS FAX NO.(602)234-1322
PROJECT: RIO VERDE NORTH F.I.S. JOB NO. 93031.00
SUBJECT: SOUTH WATERSHED BOUNDARY

COMMENTS:

HERE IS OUR PRELIMINARY WATERSHED DELINEATION, BASED ON FIELD OBSERVATION, AND INSPECTION OF AERIAL PHOTOS AND TOPO MAPS. ALONG THE SOUTHERN BOUNDARY, I HAVE INDICATED WITH ARROWS POSSIBLE FLOW BREAKOUTS ENTERING YOUR STUDY AREA AS WELL AS LOCATIONS WHERE FLOW FROM THE SOUTH MAY ENTER OUR STUDY AREA. PLEASE REVIEW THIS BOUNDARY AND LET US KNOW ANY COMMENTS OR QUESTIONS YOU MAY HAVE. THANK YOU.

Tony

CC: JIM MISCHLER, BURGESS & NIPLE

MKE

LETTER OF TRANSMITTAL

McLaughlin Kmetty Engineers, Ltd.
501 North 16th Street, Phoenix AZ 85016-6419
-7702 FAX 248-7851

Burgess + Mple

DATE 1-12-94 JOB NO 89-407.003
ATTENTION Mr. Jim Mischler
RE:
Rio Verde

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via pick-up the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐

COPIES	DATE	DESCRIPTION
1	5-JAN-94	Original Affadavit of Az. Republic Legal
		Ad run for both Rio Verde North + South

REMARKS For your separate submittal to FCDMC.

COPY TO

SIGNED: Frank Edward Brown

If enclosures are not as noted, kindly notify us at once.

INVOICE NO. 93653

ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County, under authority of the National Flood Insurance act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in The Rio Verde Area and surrounding vicinity, Arizona.

The study is being performed for the Flood Control District by Burgess & Niple Engineers and McLaughlin Kmetty Engineers.

The purpose of this study is to examine and evaluate flood hazard in areas which are developed or which are likely to be developed and to determine flood elevations for those areas. These flood elevations will be used by Maricopa County to carry out floodplain management and by the Federal Emergency Management Agency o determine flood insurance rates under the ational Flood Insurance Program.

his announcement is intended to notify all inerested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be addressed to Ms. Cathy Regester or Mr. Magnus Jolayemi, Flood Control District of Maricopa County, 2801 W. Durango Street, Phoenix, AZ 85009, telephone (602) 506-1501.

Published: *Arizona Republic, December 29, January 5, 1993.*

AFFIDAVIT OF PUBLICATION

RECEIVED JAN 1 1 1994

The Arizona Republic/The Phoenix Gazette

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

JOAN LOHR, being first duly sworn, upon oath deposes and says: That she is the legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic and The Phoenix Gazette, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic
~~The Phoenix Gazette~~

DECEMBER 22, 1993, JANUARY 5, 1994

Joan Lohr

Sworn to before me this

5TH day of

JANUARY A.D. 19 94

Notary Public

OFFICIAL SEAL
THOMAS F. BIANCO
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires Mar. 19, 1997

Fax Cover Sheet

FLOOD CONTROL DISTRICT
Of
Maricopa County

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

To: James Mischler P.E.

Company or Dept: B & N, Inc. Fax # 244-1915

From: Magnus Tolayenii

Number of Pages Being Sent Including Cover Sheet: 3

If there are any problems, please call (602) 506-1501.

Comments: Please Review and Contact me if you have any question. If not we plan to see you on Monday.

RIO VERDE NORTH

"KICK-OFF" MEETING 1/10/94
AGENDA

INTRODUCTION

- FCD Staff
- Consultant & Subconsultant
- Coordination with Subconsultant/GIS

GENERAL

- Length /Time of Study (460 days) - Submittal to FEMA approximately March 1995
- Information available from FCD

TASK 1 - COORDINATION

- Legal Advertising
- First Public Meeting - Scheduled for January 19, 1994, 7-9 PM at the Association Community Center
- Project Schedule
- Monthly Progress Report and Invoice
- Quarterly Estimation of Billing
- Quality Control and Floodplain Review Checklist
- Evaluation Forms

TASK 2 - DATA COLLECTION

- FEMA FIS Documentation Dec. 1993
- FEMA Forms - July 1993 Forms provided

TASK 3 - TOPOGRAPHIC MAPPING

- Right of Entry Letter
- Ground Control at 1983 NAD
- Topo Map at 2-ft CI, Scale of 1" = 200-ft, and Spot Elevation 1-ft CI
- NGVD of 1929 with conversion factor to NAVD 1988
- Aerial Photo (South Study Deliverable)

TASK 4 - FIELD SURVEY

TASK 5 - HYDROLOGY

TASK 6 - FLOODPLAIN AND FLOODWAY DELINEATION

- 5 River Miles of delineation
- Washes to delineate (Names)

TASK 7 - FINAL PRODUCTS

- HEC-2 README File(s)
- HEC-2 File Name - Show on delineation sheet
- Survey Notes - Do not need to be in separate notebook
- Q with each cross section
- Final Report Format and Sheet layout

OTHERS - Open floor for any concerns !!!

WOOD, PATEL & ASSOCI S, INC.
Civil Engineers, Hydrologists, Land Surveyors
1550 East Missouri Suite 203
PHOENIX, ARIZONA 85014
(602) 234-1344
FAX 234-1322

LETTE OF TRANSMITTAL

DATE 1/4/94	JOB NO. 93031.00
ATTENTION Sandy Story	
RE:	
Rio Verde North, FIS	
HYDROLOGY -	
Soil Data for Watershed	

Flood Control District of Maricopa Co.
2801 W Durango
Phoenix, AZ 85009

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☒ plate 1

COPIES	DATE	NO.	DESCRIPTION
1	1/4/94		Index to Mapsheets, Aguila-Carefree Area, Soil Map
			plate 1 Depicting approximate Watershed Boundary

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return ____ corrected prints
☒ For review and comment ☐ ________
☐ FOR BIDS DUE ________ 19 ____ ☐ PRINTS RETURNED AFTER LOAN TO US

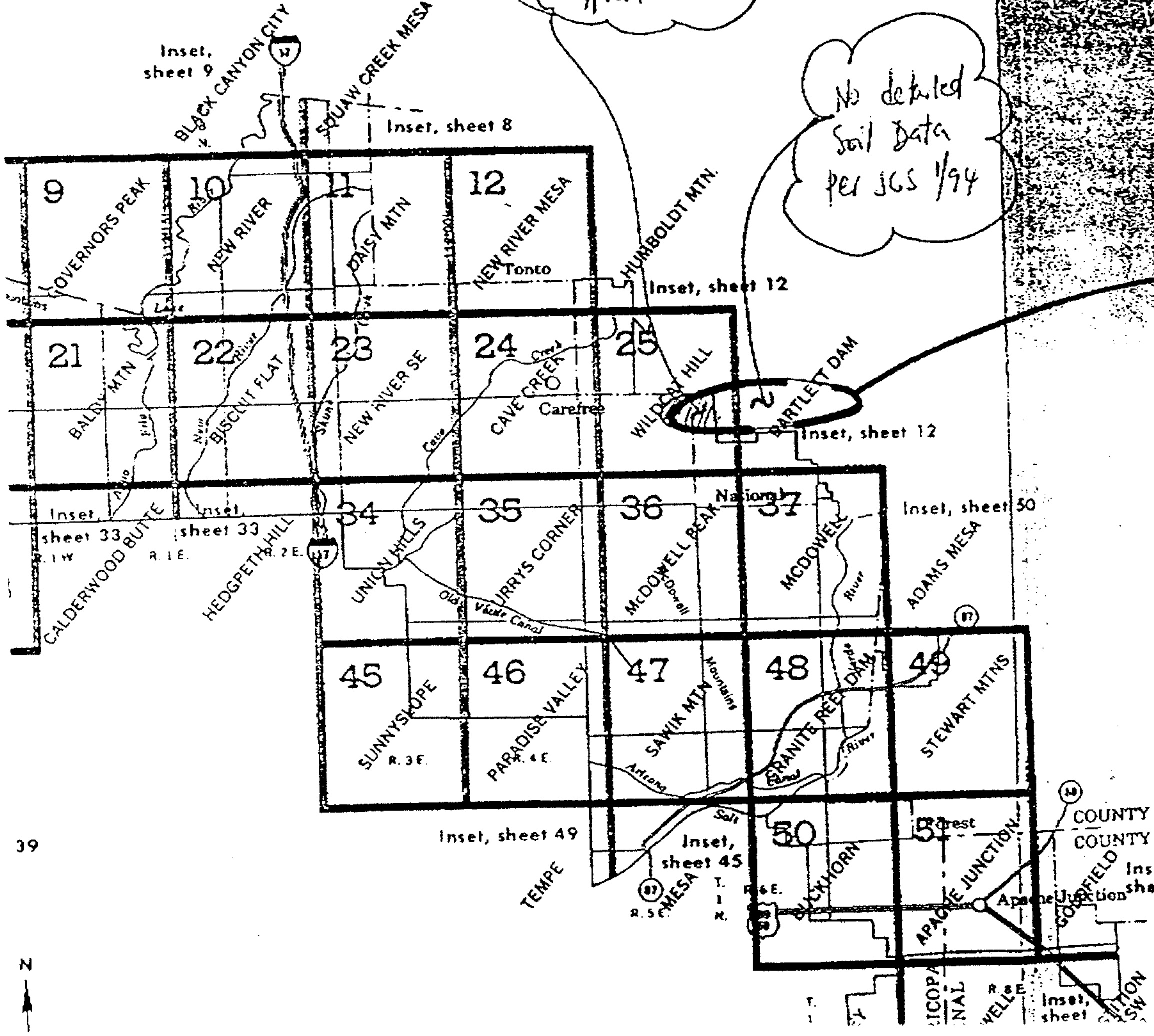
REMARKS Please note that only about 35% of Watershed is covered by the detailed Soil Map Data by SCS.

Per SCS field office, no detailed work is done for the easterly part of watershed (Part in Wild cat Hill, & All of Bartlett Dam. This part, however, is covered by "General Soil Map, Maricopa County 1973"

Please provide direction as to whether the General Soil Map will be acceptable for the easterly area. Thanks!

COPY TO Jim Mischler PE, Burgess-Niple

SIGNED:



Detailed Soil Data Available

No detailed Soil Data per SCS 1/94

Approx. Watershed Boundary.

Rio Verde North

Wood/Patel

plate 1

INDEX TO MAP SHEET

AGUILA-CAREFREE AREA

PARTS OF MARICOPA AND PINAL C

ARIZONA

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE December 29, 1993 JOB NO. 15183

RE: Rio Verde, North & South
Aerial Mapping

TO Mr. Magnus Tolayemi
Flood Control District of Maricopa County
2801 W. Durango
Phoenix AZ

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1 ea.			Contact prints, Rio Verde north & south
1 ea.			Diapositives, Rio Verde north & south

THESE ARE TRANSMITTED:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution
☒ As requested ☐ Returned for correction ☐ Return ____ corrected prints
☐ For review and comment ☐ ______

REMARKS These items are submitted per scope of work items 6.1.1 and 6.1.4

COPY TO Ms. Cathy Regester

SIGNED James E Mischler

If enclosures are not as noted, kindly notify us at once

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

LETTER OF TRANSMITTAL

DATE December 29, 1993 JOB NO. 15183
RE: Rio Verde South

TO Mr. Frank Brown
McLaughlin Kmetty Engineers, Ltd.
3501 N. 16th Street
Phoenix AZ 85016

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1ea.			Aerial mapping contact prints, Rio Verde South watershed.

THESE ARE TRANSMITTED:

☐ For approval
☒ For your use
☐ As requested
☐ For review and comment

☐ Approved as submitted
☐ Approved as noted
☐ Returned for correction
☐ ______

☐ Resubmit ____ copies for approval
☐ Submit ____ copies for distribution
☐ Return ____ corrected prints

REMARKS ______

COPY TO Ms. Cathy Regester
Mr. Magnus Jolayem

SIGNED James E Mueller

If enclosures are not as noted, kindly notify us at once.

MKE

McLaughlin Kmetty Engineers, Ltd.

3501 North 16th Street Phoenix, Arizona 85016-6419 (602) 248-7702 FAX (602) 248-7851

GEZA E. KMETTY
RONALD C McLAUGHLIN
HALFORD E. ERICKSON
WILLIAM R. KENDALL
RALPH L. TOREN
TERRENCE P. KENYON
RICHARD E. McLAUGHLIN

Date 12-10-93

Page 1 of 2
INCL. this page

From Frank Brown

Transmitted to Fax Number 244-1915

To Mr. Jim Mischler

Company Burgess & Niple PHx office

Comments Pleas review this legal ad and call me today with your comments.

Job # 89-407.003

NOTE: If this transmission is incomplete, please call
(602) 248-7702

Admin\FaxForm.000

PUBLIC NOTICE
YOUR RIGHT TO KNOW

ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in The Rio Verde Area, Arizona.

The study is being performed for the Flood Control District by Burgess & Niple Engineers and McLaughlin Kmetty Engineers.

The purpose of this study is to examine and evaluate flood hazard areas which are developed or which are likely to be developed and to determine flood elevations for those areas. Flood elevations will be used by Maricopa County to carry out floodplain management objectives of the National Flood Insurance Program. They will also be used as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be addressed to Ms. Cathy Regester or Ms. Sandy Story, Flood Control District of Maricopa County, 2801 W. Durango Street, Phoenix, AZ 85009, telephone (602) 506-1501.

Published in ____________________ on ____________.

SECTION 1: General Documentation and Correspondence

1.5 Contract Scope of Work

FLO CONTROL DISTRICT OF MARICOPA C NTY

Contract Change Order No. 93-06

Date: 1 / 13 / 1994 FCD Contract No./Name: Rio Verde

To: Burgess & Niple, Engineers Inc. Contractor/Consultant.

You are hereby directed to make the herein described changes from the plans and specifications or do the following described work not included in the plans and specifications on the above-mentioned project.

Changes requested by: Magnus R. Jolayemi

Provide description of work to be done, estimate of quantities, and prices to be paid. Segregate between additional work at contract price, agreed price, and actual cost. Unless otherwise stated, rates for rental of equipment on actual cost work cover only such time as equipment is actually used and no allowance will be made for idle times.

* (1) Estimate of increases and/or decreases in contract items at contract prices.
** (2) Estimate of extra work at agreed price and/or actual cost.

Sheet No. 1 of 1

Bid Item No.	Description	Estimated Quantity	As-Built Quantity	Difference + or -	Unit Price	Difference + or -

Request a change order to Contract FCD 93-06

The change order is required because of the District requirement for the topographic data in a Digital Terrain Model format instead of directly compiled contour information as originally proposed in the scope of work. *The scope of work shall be modified per the Aerial Mapping Co. Inc. proposal dated January 10, 1994, Option 3.* JEM DEA
We hereby respectfully request a change order from $245,000 to $259,999

We, the undersigned Contractor/Consultant, having given careful consideration to the change(s) proposed, hereby agree, if this proposal is approved, that we will provide all equipment, furnish all material (except as may otherwise be noted above), and perform all services necessary for the work above specified, and we will accept as full payment therefor the prices shown above.

By reason of this proposed change 0 days extension of time will be allowed.
Total new contract amount through this Change Order No. 1 $259,999

Contractor/Consultant:
Burgess & Niple, Inc.
5025 East Washington Street
Phoenix, AZ 85034

By: James E Mischler | Donn E Abegglen
Title: Vice President | Vice President
Date: 1/14/94 | 1/14/94

Recommended by:
Date: 1/14/94

Approved by:
Chief Engineer and General Manager
Date: 2/2/94

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Burgess & Niple, Inc.
Suite 212
5025 East Washington Street
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

FAX COVER SHEET

Date: 1/11/94

Job Number: 15183

Re: Rio Verde FIS

TO: Magnus Jolayemi
Flood Control District of Maricopa Co.

FAX PHONE NUMBER: 506-4601

We are sending you 2 additional pages, not counting this cover sheet.
If all pages are not received, please call us as soon as possible.

COMMENTS: Aerial Mapping Co.'s proposal for a DTM model is attached. As discussed, several options are presented. Burgess & Niple prefers either the current scope or options 1 or 3. We do not recommend option 2. In our previous discussions regarding impact on schedule, I was in error. Additional time required varies from 4-10 weeks.

Signed: James E Mickle

RECEIVED
JAN 12 19
BURGESS & NIPLE, INC.

company, inc.
3141 west clarendon avenue, phoenix, arizona 85017, (602) 263-5728 fax (602) 263-0165
Gerald E. Francis - President
Richard D. Cook, R.L.S. - Executive Vice President

January 10, 1994

To: Mr. Jim Mischler. P.E.
Burgess & Niple, Ltd.
5025 East Washington Street, Suite 212
Phoenix, AZ 85034

Re: Digital Terrain Models for the Rio Verde FIS.

We, at Aerial Mapping Company, Inc. are pleased to present this proposal for certified professional photogrammetric services on the above project. We could provide the topographic data for this study in a Digital Terrain format instead of directly compiled contour information. These additional fees are representative for this project only, due to the broken terrain found in this area.

The Rio Verde study area is comprised of two parts. The first is the town of Rio Verde, a developed urban setting including streets, washes and a golf course. The remainder is open desert, extensively cut by many braided washes of various sizes. The washes range from small eroded channels to deep, vertically cut banks and wide bottoms. The ridges between these washes are further cut by eroded side channels leading to the larger drains.

Although FEMA guidelines require that cross sections be accurate within 1.0 ft vertically. In order to accurately provide a Digital Terrain Model sufficient for interpolation of 2′ contours, any rapid vertical change in the ground surface of over 0.5′ must be defined by breakline information. The 25′ base grid will not accurately show these breaks. With extensive breakline information, a DTM can be produced that will allow cross sections meeting FEMA guidelines to be extracted any place in the DTM.

Aerial Mapping Company, Inc., has determined that the costs involved in extracting selected HEC-2 cross sections from a DTM of this magnitude is many times that required to read photogrammetric cross sections. We propose to provide photogrammetric cross sections instead of extracting them from the Digital Terrain Model.

Option 1

AMCI will collect a grid of mass point data on 25′ intervals throughout the Project area. We will collect sufficient additional breakline data to be able to extract FEMA quality cross section information at any location. Extensive breaklines along all ridges, washes, erosion gullies and other breaks are required to provide a DTM model that can conform to the FEMA guidelines for cross sections. AMCI will provide photogrammetrically read cross sections at the locations designated by your firm and according to the existing contract. Our fee for providing DTM data to meet these requirements will be an additional Fifty-four Thousand Dollars ($54,000.00) above the current contract amount.

Option 2

AMCI will collect a grid of mass point data on 25′ intervals throughout the Project area. We will collect additional breakline data along major ridges, washes and significant breaks. Minor ridge lines, gullies and small erosion features will not have breakline data collected. The resulting DTM map will meet National Map Accuracy Standards for a 1" = 200' 2' CI product. This method will not allow cross sections to be extracted to FEMA accuracies at any given location. AMCI will provide photogrammetrically read cross sections at the locations designated by your firm and according to the existing contract. Our fee for providing DTM data meeting these requirements will be an additional Twenty-seven Thousand Dollars ($27,000.00) above the current contract amount.

Option 3

AMCI is producing standard digitized contour information as provided under the current contract. We are also providing digitized breakline information along the flow lines of the major streams and washes. Extra breakline information will be necessary for the creation of a DTM capable of computing topograpic maps which will meet National Map Accuraccy Standards. The urban areas and golf courses within the Project will need additional digitized breaklines. Also, the sandy bottomed incised washes would need top and toe breaklines digitized from the existing photography. Our fee for providing the additional breaklines in the urban areas and major washes will be Sixteen Thousand Two Hundred Dollars ($16,200.00).

Aerial Mapping Company, Inc. is not computing a DTM under the current scope of work. The additional breakline data will assist the County in creating a Digital Terrain Model from the existing contour information. The resulting DTM may not produce the same contour information as provided by Aerial Mapping Company, but the resulting DTM should be mass representative and be able to recreate a topographic map that meets National Map Accuracy Standards.

Schedule Adjustment

The increased work required for the above options will extend the delivery dat of the topographic mapping by the following schedule:

Option 1 Ten additional weeks will be needed for delivery of the mapping information using the methodology of Option 1.

Option 2 Six additional weeks will be needed for delivery of the mapping information using the methodology of Option 2.

Option 3 Four additional weeks will be needed for delivery of the mapping information using the methodology of Option 3

Sincerely yours,

Richard D. Cook, R.L.S.
Executive Vice President
Aerial Mapping Company, Inc.

RC/rgp \docs\riovdtm

RECEIVED
DEC 28 1993
BURGESS & NIPLE, INC.

CONTRACT FOR CONSULTANT SERVICES

FLOODPLAIN DELINEATION STUDIES

FCD 93-06

Pursuant to the provisions of the Arizona Revised Statutes Section 48-3603, the Board of Directors has the authority to enter into contracts.

The Flood Control District of Maricopa County, Arizona, hereinafter called the "DISTRICT", is desirous of having certain professional services performed in connection with Rio Verde North Floodplain Delineation study, hereinafter called the "PROJECT" and as more fully described in Exhibit A, Scope of Work, attached; and

BURGESS & NIPLE, INC., hereinafter called "CONSULTANT", is desirous of performing said services;

THEREFORE, the parties hereto mutually agree as follows:

SECTION I - SERVICES OF THE CONSULTANT

The CONSULTANT, under the general supervision of the Chief, Hydrology Division shall prepare studies, reports, surveys, plans, drawings, specifications and cost estimates as are necessary for the PROJECT and according to the directions and designated standards of the DISTRICT and in accordance with Exhibit A. It is understood and agreed that the DISTRICT's authorized representative shall be the Chief, Hydrology Division or his duly authorized representative, hereinafter called the "AGENT" and that he/she shall be the sole contact for administering this contract.

The CONSULTANT shall meet periodically with the AGENT so as to keep the DISTRICT informed of the progress of the work in accordance with the schedule defined in Exhibit A.

The CONSULTANT shall promptly advise the AGENT of any factors, which may develop during the PROJECT, that would likely result in construction or design costs in excess of budgetary constraints.

SECTION II - PERIOD OF SERVICE

The CONSULTANT shall complete all work per the schedule provided in Exhibit A, Scope of Work within 360 calendar days after receipt of the Notice to Proceed, exclusive of DISTRICT review time. The DISTRICT is expected to require up to 100 calendar days for review time, for a total contract time period of 460 calendar days. Should extension of this contract period be necessary, and any such extension(s) continue the date of contract expiration for a time period of more than one year

12/29/93

from the date of contract execution, adjustment(s) of the consultant's fee(s) may, upon agreement by both the DISTRICT and the CONSULTANT, be made in accordance with the Consumer Price Index for Urban Consumers, Western Division published by the U.S. Department of Labor, Bureau of Labor Statistics, using the published edition coinciding with the initial contract expiration date. Any such fee adjustment shall only apply to the extended contract time period.

SECTION III - PAYMENTS TO THE CONSULTANT

The CONSULTANT shall be paid for work under this Contract a lump sum fee of $245,000.00 plus any adjustments that have been approved in writing in accordance with the Maricopa County Procurement Code.

The DISTRICT shall pay the CONSULTANT upon completion of the work as accepted by the DISTRICT, except that progress payments may be made as billed by the CONSULTANT based on approved monthly progress reports subject to the limitations set forth in Exhibit A, Scope of Work. Ten percent of all contract payments made on an interim basis shall be retained by the DISTRICT as insurance of proper performance of the contract or, at the option of the CONSULTANT, a substitute security may be provided by the CONSULTANT in an authorized form pursuant to procedures established by the DISTRICT. The CONSULTANT is entitled to all interest from any such substitute security.

When the contract is fifty percent (50%) completed, one-half (1/2) of the amount retained will be paid to the CONSULTANT provided the CONSULTANT is making satisfactory progress on the contract and there is no specific cause or claim requiring a greater amount to be retained. After the contract is fifty percent (50%) completed, no more than five percent (5%) of the amount of any subsequent progress payments shall be retained providing the CONSULTANT is making satisfactory progress on the project, except if at any time the DISTRICT determines satisfactory progress is not being made, ten percent (10%) retention shall be reinstated for all progress payments made under the contract subsequent to the determination.

If the CONSULTANT desires a partial payment in accordance with the provisions above, the CONSULTANT will complete and forward, a DISTRICT provided form, indicating payment distribution to MBE/WBE firms.

Any retention monies shall be paid or substitute security returned or released, as applicable, to the CONSULTANT within forty-five (45) calendar days after: (1) Completion of the work in Exhibit A through the submittal of District accepted/approved documents to FEMA, (2) receipt of a completed "Certificate of Substantial Performance" form, (3) the CONSULTANT's statement that no project disputes exist; and (4) invoicing for any retained monies has been received by the DISTRICT. Upon acceptance and approval of the project by FEMA and the completion of all final work required by the DISTRICT, the CONSULTANT shall submit a final Certificate of Performance and its invoice for any sums remaining due and payable under this Contract.

SECTION IV - THE DISTRICT'S RESPONSIBILITIES

The DISTRICT shall furnish the CONSULTANT, at no cost to the CONSULTANT, the following information or services for this PROJECT:

A. One copy of on-hand maps, records, survey ties, bench marks or other data pertinent to the PROJECT. This does not, however, relieve the CONSULTANT of the responsibility of searching records for additional information, for requesting specific information or for verification of that information provided. The DISTRICT does not warrant the accuracy or comprehensiveness of any such information.

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

B. All available information and data relative to policies, standards, criteria, and studies, etc. impacting the PROJECT as identified by the CONSULTANT.

C. Availability of staff for consultation with the CONSULTANT during the performance of studies and plan development in order to identify the problems, needs, and other functional aspects of the PROJECT.

D. Examination of documents submitted by the CONSULTANT and rendering of decisions pertaining thereto promptly, to avoid unreasonable delay in the progress of the work by the CONSULTANT. The DISTRICT will keep the CONSULTANT advised concerning the progress of the DISTRICT's review of work.

SECTION V - ALTERATION IN SCOPE OF WORK

Any alteration in the scope of work that will result in a substantial change in the nature of the PROJECT so as to materially increase or decrease the contract fee will require negotiation of an amendment to the contract to be executed by the DISTRICT and the CONSULTANT. No work shall commence on the change until the contract amendment has been approved by the DISTRICT and the CONSULTANT has been notified to proceed by the AGENT. It is distinctly understood and agreed that no claim for extra work done or materials furnished by the CONSULTANT will be allowed by the DISTRICT except as provided herein, nor shall the CONSULTANT do any work or furnish any materials not covered by this agreement unless such work is first authorized in writing in accordance with the Maricopa County Procurement Code. Any such work or materials furnished by the CONSULTANT 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.

SECTION VI - RECORDS

Records of the CONSULTANT's payroll expense pertaining to this PROJECT and records of accounts between the DISTRICT and the CONSULTANT shall be kept on a generally recognized accounting basis and shall be available upon request to the DISTRICT or its authorized representative for audit during normal business hours. The records shall be subject to audit by appropriate grantor agency if the PROJECT is funded all or in part by a grant.

SECTION VII - PROJECT COMPLETION

If during the course of this contract situations arise which prevent completion within the allotted time, an extension may be granted by the AGENT.

SECTION VIII - TERMINATION

The DISTRICT may terminate this contract at any time upon reimbursement to the CONSULTANT of expenses which include reasonable charges for time and material for the percentage of work satisfactorily completed and turned over to the DISTRICT.

The DISTRICT reserves the right to postpone, terminate or abandon this PROJECT for the CONSULTANT's failure to complete the PROJECT on time, or failure to comply with the provisions of the contract. The DISTRICT also reserves the right to terminate any or all parts of this contract for its own convenience as the DISTRICT may determine at its sole discretion.

The DISTRICT hereby gives notice that pursuant to A.R.S. Section 38-511 "A" this contract may be cancelled without penalty or further obligation within three years after execution if any person significantly involved in initiation, negotiation, securing, drafting, or creating a contract on behalf of the DISTRICT is, at anytime while the contract or any extension of the contract is in effect, an employer, agent, or any other party to the contract in any capacity or a consultant to any other party of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the Chief Engineer and General Manager is received by all of the parties of the contract. In addition, the DISTRICT may recoup any fee for commission paid or due to any person significantly involved in initiation, negotiation, securing, drafting, or creating the contract on behalf of the DISTRICT from any other party to the contract arising as a result of the contract.

The CONSULTANT may terminate this contract in the event of nonpayment of fees as specified in Section III, PAYMENTS TO THE CONSULTANT.

SECTION IX - OWNERSHIP OF DOCUMENTS

All original documents including, but not limited to studies, reports, tracings, drawings, physical and computer models, estimates, field notes, investigations, design analyses, calculations, computer software, and specifications, prepared in the performance of this Contract are to be and remain the property of the DISTRICT and are to be delivered to the AGENT before final payment is made to the CONSULTANT. The DISTRICT reserves the right to reuse the documents as it sees fit. However, the DISTRICT will not reuse, alter, or modify these documents without noting such alterations, modifications, or intent of their reuse, and will hold the CONSULTANT harmless from any claims arising from the reuse, alteration, or modification of the documents. The CONSULTANT may retain reproducible copies of all such documents delivered to the DISTRICT.

SECTION X - COMPLIANCE WITH LAWS

The CONSULTANT is required to comply with all Federal, State and local laws, local ordinances and regulations. The CONSULTANT's signature on this contract certifies compliance with the provisions of the I-9 requirements of the Immigration Reform and Control Act of 1986 for all personnel that the CONSULTANT and any subconsultants employ to complete this PROJECT. It is understood that the DISTRICT shall conduct itself in accordance with the provisions of the Maricopa County Procurement Code.

SECTION XI - GENERAL CONSIDERATIONS

A. Prior to beginning the work, the CONSULTANT shall furnish the DISTRICT for approval the names of its key employees, and of its sub-consultants and their key employees to be used on this PROJECT. Any subsequent changes are subject to the written approval of the DISTRICT.

The CONSULTANT in replacing a MBE/WBE subcontractor should attempt to contract with another MBE/WBE.

B. The failure of either party to enforce any of the provisions of this Contract or to require performance of the other party of any of the provisions hereof shall not be construed to be a waiver of such provisions, nor shall it affect the validity of this Contract or any part thereof, or the right of either party to thereafter enforce each and every provision.

C. The CONSULTANT shall be responsible for the cost of any additional design, field layout, testing, construction and supervision necessary to correct those errors or omissions attributable to the CONSULTANT and for any damage incurred by the DISTRICT as a result of additional construction costs caused by such CONSULTANT errors or omissions.

D. The fact that the DISTRICT has accepted or approved the CONSULTANT's work shall in no way relieve the CONSULTANT's responsibility.

E. It is mutually understood and agreed that this Contract shall be governed by the laws of the State of Arizona, both as to interpretation and performance. Any action at law, suit in equity, or judicial proceeding for the enforcement of this Contract, or any provision thereof, shall be instituted only in the courts of the State of Arizona.

SECTION XII - SUCCESSORS AND ASSIGNS

This Contract shall not be assigned by either party without prior written approval of the other except that the CONSULTANT may use 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 the CONSULTANT; and it shall extend to and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

SECTION XIII - NO KICK-BACK CERTIFICATION

The CONSULTANT warrants that no person has been employed or retained to solicit or secure this Contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors/Supervisors or any employee of the DISTRICT has any interest, financially or otherwise, in the CONSULTANT firm.

For breach or violation of this warranty, the DISTRICT 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.

SECTION XIV - ANTI-DISCRIMINATION PROVISION

The Flood Control District of Maricopa County will endeavor to ensure in every way possible that minority and women-owned business enterprises shall have every opportunity to participate in providing professional services, purchased goods, and contractual services to the Flood Control District of Maricopa County without being discriminated against on the grounds of race, religion, sex, age, or national origin.

The CONSULTANT agrees not to discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, or handicap and further agrees not to engage in any unlawful employment practices. The CONSULTANT further agrees to insert the foregoing provisions in all subcontracts hereunder.

SECTION XV - AMENDMENTS

This Contract may be amended by mutual written agreement of the DISTRICT and the CONSULTANT.

SECTION XVI - INDEMNIFICATION AND INSURANCE

A. The CONSULTANT shall provide and maintain the following minimum insurance requirements:

1. Professional Liability. The CONSULTANT shall show evidence of maintaining continuous insurance for the past three (3) years with a minimum coverage limit of $1,000,000.00 each claim and/or in the aggregate.

The CONSULTANT shall provide and maintain Professional Liability Insurance with a minimum single limit of $1,000,000.00 for each claim made and an aggregate limit of $1,000,000.00 for all claims made through this contract's completion date or the policy's life, whichever is longer.

2. Commercial General Liability. Commercial general liability insurance with a minimum single limit of $1,000,000.00 for each coverage/occurrence. The policy shall include coverage for bodily injury and personal injury, broad form property damage and blanket contractual coverage.

3. Automobile Liability. Automobile liability insurance, with an individual single limit for bodily injury and property damage of no less than $1,000,000.00, each occurrence, with respects to CONSULTANT's vehicles (whether owned, hired, non-owned), assigned to or used in the performance of this contract.

4. Workers' Compensation Insurance. This insurance shall be maintained during the life of the contract.

5. Additional Insured. The policies, except professional liability and workers' compensation, required by this section shall name the DISTRICT as Additional Insured, and shall specify that insurance afforded the CONSULTANT shall be primary insurance, and that any insurance coverage carried by the DISTRICT or its employees shall be excess coverage, and not contributory coverage to that provided by the CONSULTANT. No policy issued under this contract shall lapse, be cancelled, allowed to expire, or be materially changed to affect the coverage available to the DISTRICT without thirty (30) days written notice to the DISTRICT.

6. DISTRICT approved documentation outlining the coverages specified in this section shall be filed with the DISTRICT prior to issuance of the Notice to Proceed.

B. The CONSULTANT agrees to indemnify and save harmless the DISTRICT, any of its departments, agencies, officers, or employees 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 out of the CONSULTANT's wanton, willful or negligent acts, errors or omissions in the performance of work under this Contract, and any wanton, willful or negligent acts, errors or omissions by any subconsultant or other agent used by the CONSULTANT in the performance of work under this Contract.

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

BURGESS & NIPLE, INC.

James E Mischler Larry J Woodlan
Principal

James E. Mischler Larry J. Woodlan
Printed Name

Vice President President
Title

Date: November 11, 1993

86-0143433
Federal Tax Identification Number

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:

Neil S. Erwin, P.E.
Chief Engineer and General Manager

Date: ____________

ACCEPTED AND APPROVED:

Jim Bruner
Chairman, Board of Directors

ATTEST:
Fran McCarroll
Clerk of the Board

Date: DEC 08 1993

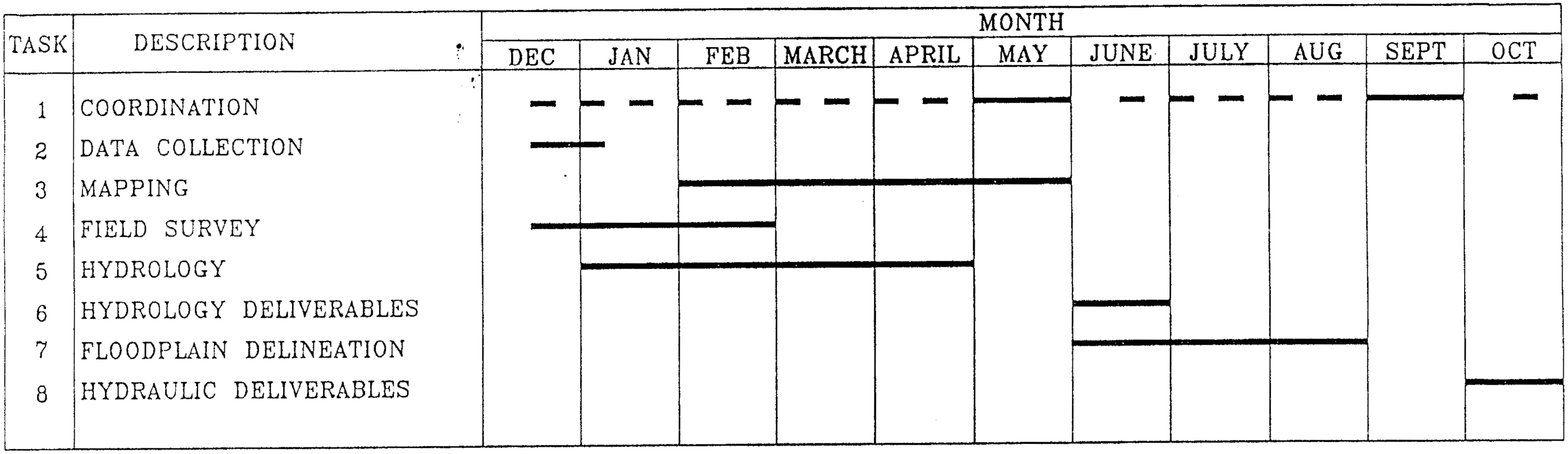
LEGAL REVIEW

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.

Julie M. Lemmon
General Counsel, District

Date: 11/17/93

SCHEDULE
CONTRACT 93-06
RIO VERDE NORTH
FLOODPLAIN DELINEATION STUDY



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

AGENDA FORM

CB0584

Contract/Lease for ☐ NEW ☐ RENEWAL ☐ AMENDMENT ☐ CANCELLATION
(for existing, record Encumbrance No. below)

OW.ORG. NO. 6900 DEPARTMENT: Flood Control District CONTROL NUMBER: FCD-1519

ENCUMBRANCE NO. C594-5-036 AGENCY: ________ CONTROL NUMBER: PW-321

1. BRIEF DESCRIPTION OF PROPOSAL AND REQUESTED BOARD ACTION: It is requested that the Board of Directors award Contract FCD 93-06 to Burgess & Niple, Inc. for the Rio Verde North Floodplain Delineation Study, for a lump sum amount of $245,000. The study will consist of the development of approximately 15.8 square miles of watershed hydrology and the development of 5 river miles of floodplain and floodway delineation.

The Flood Control Advisory Board recommended that the Board of Directors approve this request to perform the subject floodplain delineation study during its meeting of January 20, 1993.

2. COMPLIANCE WITH MARICOPA COUNTY PROCUREMENT CODE 5 (article), MC1-509 (paragraph), ________ Procurement Officer

SOLE SOURCE JUSTIFICATION ________

3. CONTINUED FROM MEETING OF ________

DISCUSSED IN MEETING OF ________

4. ☐ **THIS DEPARTMENT WILL CAUSE PUBLICATION**

☐ **CLERK OF THE BOARD TO CAUSE PUBLICATION**

5. MOTION: It is moved that the Flood Control District of Maricopa County Board of Directors . . . award Contract FCD 93-06 to Burgess & Niple, Inc. for the Rio Verde North Floodplain Delineation Study. The study will be for a lump sum amount of $245,000.

6. FINANCIAL: ☒ Expenditure ☐ Revenue ☒ Budgeted ☐ Contingency ☐ Budget Amendment ☐ Transfer ☐ Grant or other

$ 245000.00 FY93-94 (Total) FLOOD (Fund) ________ Financial Officer 11-19-93 (Date)

7. PERSONNEL: ________ Personnel Director ________ Date

8. FLOOD CONTROL DISTRICT: ________ Action Recommended by 11/16/93 Date

9. MATERIALS MANAGEMENT:

A. ________ Materials Management Director [illegible] Date

B. ________ W/MBE Representative 11/18/93 Date

10. LEGAL: 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 Board of Directors.

Julie M. Lemmon General Counsel 11/17/93 Date

11. OTHER: ________ Signature ________ Date

12. APPROVED FOR AGENDA: ________ Approving Official 11-18-93 Date

13. OTHER: ________ Signature ________ Date

14. BOARD OF DIRECTORS: Action taken:
☒ Approved ☐ Amended ☐ Disapproved ☐ Deleted

Continued to: ________ (Date and type of meeting)

________ Clerk of the Board 12/5/93 Date

15. RECOMMENDATION OF COUNTY MANAGER:
☑ Approve ☐ Disapprove

Comments:

Roy R Pederson County Manager ________ Date

6910-001 R5-90

SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION AND TOPOGRAPHIC MAPPING
FOR RIO VERDE - NORTH

FCD 93-06

GENERAL

The study will consist of the development of approximately 15.8 square miles of watershed hydrology as shown on Exhibit 1 and as approximately defined as that area which lies between the Verde River in the East, 112th street in the West, Lone Mountain Road in the North, and Rio Verde Drive in the south.. Also, the consultant shall prepare 10.5 square miles of Controlled Topographic Mapping as shown on Exhibit 2, including a portion of the Rio Verde South study area. Placement of elevation reference marks (ERM's) and preparation of the ARC-INFO Base Maps for both the North and South study areas shall be considered a part of this scope.

The consultant will develop the hydrology using the Corps of Engineer's HEC-1 computer model, and 5 river miles of floodplain and floodway delineations using the HEC-2 computer model. The consultant must use sound engineering judgement in the development of the hydrologic and hydraulic models. The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA prior to the finalization of this contract. All work under this Scope will be completed within 460 calendar days from the date of Notice to Proceed, including 100 days for District reviews.

MAPPING & HYDROLOGY

TASK 1 - COORDINATION

1.1The consultant will submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 14 days of Notice To Proceed. The consultant shall update this project schedule when appropriate.

1.2The consultant shall participate in regular coordination meetings (at least every three weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.

1.3The consultant shall submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:

1.3.1A description of the work accomplished by task during the reporting month.

1.3.2 Percent (%) completed for the month and percent (%) cumulative completed for each task.

1.3.3 A brief description of the work to be accomplished the following month.

1.3.4 A description of any problems encountered.

1.4 The consultant will notify the property owners and obtain necessary Rights of Entry for the study area. The District will assist the consultant as may be necessary to complete this task. The consultant will furnish the District with a list of the property owners notified and a sample Right of Entry letter.

1.5 The consultant shall meet with the community, neighborhood associations, and local officials. The purpose of these meetings is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and the current corporate limits.

1.6 The District will plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the purpose and scope of the study. The second meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. One representative from the consultant will attend each of the meetings. The consultant will respond to the comments from the public and make revisions to the study if necessary.

1.7 Prior to finalizing of the hydrologic analysis, the consultant will submit hydrologic maps, HEC-1 model, and hydrologic report to ADWR and other governmental agency reviewers through the District. The consultant will respond to questions by the reviewers and make modifications to the hydrologic maps, HEC-1 model, and hydrologic report if necessary.

1.8 The consultant will submit delineation maps, hydraulics report, and HEC-2 model, to ADWR, FEMA for review by the Technical Evaluation Contractor (TEC), and other governmental agency reviewers through the District. The consultant will respond to questions by the reviewers and make modifications to the delineation maps, hydraulics report, and HEC-2 model as required.

1.9 The consultant will complete and submit applicable Application/Certification Forms required by FEMA for Physical Map Revisions.

1.10 Two consultant/District Performance Evaluation will be performed, the first will be half way to completion and the second will be upon the completion of the project.

1.11 The consultant will submit a quarterly estimation of the projected billing within 14 days of Notice to proceed. Thereafter, this estimation will be updated and submitted to the District's project manager at lease 10 days prior to the end of each quarter.

TASK 2 - DATA COLLECTION

2.1 The consultant will collect and review pertinent data from the District and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

2.2 A written report summarizing the data collected will be submitted to the District for information purposes. A preliminary draft of this report is due within 90 days of Notice to Proceed.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 An aerial survey subcontractor shall be retained by the consultant as part of this contract. The consultant shall coordinate all the aerial surveying work with the aerial surveying subcontractor to ensure that the specifications of the aerial surveying work are met. The consultant is responsible for ensuring that the topographic mapping covers the area of the proposed delineation. Quality control on surveys will be per the latest edition of FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors.

3.2 Digital contour and planimetric data developed for this study shall be delivered according to the attached HIS specifications.

3.3 Prepare topographic mapping to a 2-foot contour interval, with a scale of 1 inch = 200 feet, with spot elevations and/or 1-foot contours on all section line and mid-section line roads.

3.4 Ground Control:

3.4.1 The consultant shall provide all survey control using 1983 NAD.

3.4.2 The consultant shall systematically set panel points and establish horizontal and vertical control throughout the areas to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into the State Plane Coordinate System. Field control shall be sufficient to readily allow for compilation of maps by the aerial survey contractor at the desired map scale and contour interval, and will be based on the National Geodetic Vertical Data of 1929 (NGVD) with a conversion factor to NAVD 1988.

3.4.3 The horizontal and vertical control points shall be located and marked by the consultant. The controls for the aerial mapping shall be in sufficient numbers and shall be in locations which will be compatible with the accuracy of the mapping requirements. The controls shall be of at least third order accuracy. Section corners, quarter corners, and mid-section points shall be used for control points wherever possible.

3.5 The consultant shall provide permanent non-erasable topographic mylars of the work study drawings. The drawings shall be 24" X 36" in size, with a scale of 1 inch = 200 feet and a contour interval of 2 feet for all mapping with the exception of section line roads which will have spot elevations or a contour interval of 1 foot. A cover sheet will be provided with the project title, date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each drawing shall include the floodplain and floodway delineations and a minimum of a north arrow, scale, section corners and quarter corners, current and proposed streets and highway names, State Plane Coordinate System, major drainage features, corporate boundaries, cross section lines, channel station center line, index map, and description and elevation of ERM's, and reference marks used in ground control. A note explaining the proper means to convert the NGVD 29 elevations to NAVD 88 elevations shall be included in "NOTES" in the map border. See Exhibit 3 for how the drawings are to be laid out. The mapping will have an accuracy such that ninety percent (90%) of all contours shall be within one-half contour of the true elevations and the remaining ten percent (10%) of the contours shall not be in error by more than one contour interval.

3.6 Hydrologic work maps should be at a scale of 1 inch = 2000 feet (or larger scale if available) and shall include: reproducible transparent overlay maps of existing drainage patterns, subwatersheds; major flow paths; and general topographic maps.

TASK 4 - FIELD SURVEY

4.1 Prepare topographic mapping to a 2 foot contour interval with a scale of 1 inch = 200 feet, with spot elevations or 1 foot contours on all section line and mid-section line roads, for floodplain/floodway delineation areas as identified in Task 6 or FEMA criteria, whichever is more stringent.

4.2 Ground Control for Floodplain Delineations:

4.2.1 All topographic mapping and survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in the latest edition of FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors. This would include, but is not limited to: the establishment of "permanent" elevation reference marks (ERM's); field control; and verification of profiles by the ground survey profile procedure.

4.2.2 Horizontal and Vertical Control: Systematically set panel points and establish horizontal and vertical control throughout the area to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into State Plane Coordinate System 1983 NAD. Field control shall be sufficient, at least one "permanent" point per mile, such point(s) being used as Elevation Reference Marks (ERMs). Surveys will be based on National Geodetic Vertical Datum (1929 NGVD), per FEMA guidelines. A conversion factor including documentation of how it was derived, will be provided by the consultant to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in TDN section 2 of the final report. "Permanent" survey points shall consist of existing monumentation, such as brass caps or similar survey monuments. Where additional monumentation is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labelled on available maps and described in a manner which allow them to be readily located in the field.

4.2.3 All aerial targets are to be removed following completion of the topographic mapping.

4.3 The consultant shall verify the accuracy of the mapping by the procedures called for in FEMA Document 37 or other methods approved by FEMA. This shall include the verification of cross sections used in the floodplain delineation.

4.4 Field surveys or "as-built" plans of all bridges, culverts, and hydraulic structures are to be obtained by the consultant. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the final report. The information presented in the drawing should be in a format appropriate for use in the HEC-2 model. Field surveys or "as-built" plans of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD.

TASK 5 - HYDROLOGY

5.1 The hydrologic study of the watershed will be delivered to the District under separate cover from the hydraulic analysis. The consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1991 Version, to develop a hydrologic model for the area. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations, or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for the hydrology report. Field surveys may need to be taken for HEC-1 modeling purposes.

5.2 It is required that the consultant obtain the approval of the District at each of the following steps:

5.2.1 Soil maps, watershed boundary maps, and land use maps.

5.2.2 HEC-1 parameter estimation.

5.2.3 HEC-1 flow diagram and input parameters.

5.2.4 HEC-1 results.

5.3 Four meetings associated with four tasks, and two field trips shall be held with the Flood Control District staff at the following milestones:

5.3.1 One field trip at the start of the project to scope out the critical points of the watershed and problem areas.

5.3.2 Meeting number 1 as soon as basic data are gathered and the sub-basins have been delineated. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.

5.3.3 Meeting number 2 after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.

5.3.4 Meeting number 3 after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and the copy of the HEC-1 on a floppy disc, compatible with the Districts computer, must be delivered two weeks prior to the meeting. .

5.3.5 Meeting number 4 to review comments by the District. A second field trip may be scheduled for the same day so the results obtained could be discussed.

5.4 Using appropriate hydrologic judgement and the methods and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I, sub-basins are to be identified that provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin break-downs will be done in sufficient detail to provide peak discharges at structures, major road crossings, confluences, the study limits, and other intermediate points.

5.5 The specific hydrologic techniques to be used in this study are:

5.5.1 Rainfall Depth: Point precipitation values will be determined using the information and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology.

Rainfall Distribution: Peak discharges and peak volumes will be estimated for both the 100-year 6-hour storm and the 100-year 24-hour storm. Peak discharges and peak volumes for the 100-year 6-hour storm will be estimated using the District's Distribution(s). Peak discharges and peak volumes for the 100-year 24-hour storm will be estimated using the SCS Type II rainfall distribution.

5.5.2 Areal Reduction: The point precipitation values will be areally reduced for critical concentration points. Areal reduction for the 6 hour rainfall duration will be applied using the curves in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology. NOAA HYDRO-40 will be used with the 24 hour rainfall reduction. Copies can be obtained from the District.

5.5.3 Rainfall Excess: The Green and Ampt methodology will be utilized for estimation of rainfall losses. The Lotus spreadsheet and procedures, provided by the District, will be used to determine composite parameter values for each sub-basin.

5.5.4 Unit Hydrograph: The Clark and S-Graph method should be used following the procedures outlined in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology. The choices in methodology will be to the discretion of the consultant, with consent from the District.

5.5.5 Time of Concentration and S-Graph Lag Equation: The Papadakis method should be used with the Clark unit hydrograph, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, should be used with the appropriate S-graph (Phoenix mountain or Phoenix Valley).

5.5.6 Channel Routing: Channel routing will be accomplished using either the Muskingum-Cunge or the Normal-Depth option of HEC-1. The choice of methodology will be at the discretion of the consultant, with consent from the District. Average cross sections will be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections will be taken to ensure that routing reaches are reasonable and representative of field conditions.

The HEC-1 routing parameters for the reaches modeled using HEC-2 will be adjusted after the HEC-2 cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

5.5.7 Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

5.5.8 Channel Transmission Losses: Attempts should be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge so and explain how the peaks and volumes of flow are affected by not including the transmission losses.

5.6 The District will provide appropriate references to facilitate parameter estimation.

5.7 Output of the computer model should be reviewed to see if the peak flows and volumes are realistic. Adjustments to input for obtaining the most realistic results is normal to the scope.

5.8 Every attempt must be made to recover historic stream gage data and use it to compare with the results obtained by the hydrologic model. Major differences must be discussed in the final report.

5.9.1 The final hydrologic report should include, but is not limited to the following sections and documentation using ADWR standards:

- 3.1 Method Description
  - Figure - Location Map (maximum size 11" x 17" at the appropriate scale)
- 3.2 Parameter Estimation
  - 3.2.1 Drainage Area Boundary
    - 3.2.2.1 Water Sub-Basin Parameters
      - General
      - Soils Parameters
      - Watershed Delineation and Areas
      - Land Use Characteristics
      - Lag Times
      - S-Graphs
      - Table - Summary of Green & Ampt Parameters
      - Table - Soil Loss Calculations
      - Table - Land Use
      - Table - Slopes/Slope Adjustments
      - Table - Sub-Basin Lag Time/Time of Concentration
      - Table - Sub-Basin Parameters
    - 3.2.2.2 Reach Route Parameters
      - General
      - Field Reconnaissance
      - Hydraulic Computations
      - Channel Infiltration Losses
      - Table - Reach Route Data
      - Table - Reach Route Channel Infiltration Loss Data
    - 3.2.2.3 Storage Route Parameters
      - General
      - Field Reconnaissance
      - Hydraulic Computations
      - Surface Area Computations
      - Percolation Loss
      - Major Structures
    - 3.2.3 Statistical Parameters
    - 3.2.4 Precipitation
    - 3.2.4.1 Rainfall Distribution
    - 3.2.4.2 Precipitation Data
    - 3.2.4.3 Aerial Precipitation Reduction
      - Table - Aerial Precipitation Reduction Data
  - 3.2.5 Gage Data
    - 3.2.5.1 General
    - 3.2.5.2 Streamflow Gaging Stations
    - 3.2.5.3 Precipitation Gaging Stations

- 3.3 Calibration
- 3.4 Special Problems and Solutions
- 3.5 Final Results
  - 3.5.1 General
  - 3.5.2 Discussion of Results
    - 3.5.2.1 General
    - 3.5.2.2 Comparison of Results With Previous Studies/Historical Floods
      Table - Summary of Peak Flows compared to previous studies
    - 3.5.2.3 Summary of Results
      Table - 100-year, 24-Hour Results
      Table - 100-year, 6-Hour Results
      Table - Summary of Peak Flows at Key Locations on the Watershed
- 3.6 Final Modeling Results on Diskette(s)
- 3.7 Appendices

5.9.2 Tables and Figures for the appendices:

5.9.2.1 Topographic base map(s) showing the sub-basins, routing reaches, Tc flow paths or lag flow paths, major man-made structures, and references (i.e. street names, Township, Range, Section, etc.) at a scale of 1 inch = 2000 feet.

5.9.2.2 Soils map(s) at the same scale as the base map.

5.9.2.3 Land use map(s) at the same scale as above.

5.9.2.4 Schematic map for the HEC-1 showing the sub-basins (area, Tc), the flow paths, the routing reaches (length, slope, friction, width, velocities, transmission losses, etc.), order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate).

5.9.2.5 Pertinent data on all the structures in the watershed (such as spillway elevation, rating curves, etc.).

5.9.2.6 One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.

5.10 As part of the final products, the consultant will supply the hydrologic data in conformance with the attached HIS Data Delivery Specifications.

Specific deviations from this hydrologic scope shall not be undertaken without the specific written concurrence from the Flood Control District.

HYDROLOGY DELIVERABLES

TASK 6

6.1 Mapping:

6.1.1 One complete set of 9" x 9" contact prints of the aerial stereo photographs sequentially numbered and catalogued.

6.1.2 One complete set of contour maps, blueline, draft copy for Flood Control District reference during the project, delivered immediately following the topographic mapping

6.1.3 One complete set of contour maps (within the aerial mapping area) at 1" = 200' scale in a reproducible form (mylar).

6.1.4 One (1) complete set of 9" X 9" film diapositives of the aerial stereo photographs sequentially numbered and catalogued.

6.1.5 One (1) complete set of transparent overlays of photo-mylars. Sheet size, numbering, and layout shall correspond to the delineation work maps.

6.2 The Consultant will produce six (6) copies of a final Hydrology report as outlined in Task 5, and a copy of the HEC -1 model input/output.

6.3 Tabular list of control point (ERMS) used with descriptions, elevations and coordinates.

6.4 Documentation for this study will be as outlined in "Instructions for Organizing and Submitting Technical Documentation for Flood Studies" as required by ADWR.

6.5 Original Affidavits of Publication

6.6 Digitized Topographic data, Hydrology boundaries, Soil, and etc. in conformance with the attached HIS Specifications.

6.7 Two (2) sets of completed FEMA forms, as specified in Task 1.9 will be submitted in a separate notebook from the Final Report.

FLOODPLAIN AND FLOODWAY DELINEATION

TASK 7: Delineation

7.1 Floodplain and floodway delineations must be obtained using the U.S. Army Corps of Engineers HEC-2 Water Surface Profiles computer model, version 4.6.2, May 1991, and methodology acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The consultant will prepare the study using the guidelines established in the latest edition of FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.

7.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA and the Arizona Department of Water Resources.

7.3 The delineation study shall be based on the final results of the hydrologic study as directed by the District.

7.4 The consultant is to make adjustments to the HEC-2 model based on review of the model results by the District, FEMA, and the Technical Evaluation Contractor. Adjustments to the input parameters for obtaining the most realistic results is normal to the scope.

7.5 The consultant will prepare working maps and models of the 100-year floodplain and floodway during the course of the hydraulic modeling analysis for review by the District at progress and milestone meetings. Floodways are to be determined using equal conveyance encroachment methods to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment is to be as near the one foot maximum rise in energy gradient elevation as possible.

7.6 The consultant must obtain District approval at each of the following steps:

7.6.1 Field reconnaissance report and estimation of Manning's "n" values.

7.6.2 Proposed location and alignment of the cross sections and channel centerline.

7.6.3 Floodplain (natural) delineation.

7.6.4 Floodway delineation using equal conveyance encroachment.

7.6.5 Floodway delineation using encroachment method 1.

7.7 Field Reconnaissance

7.7.1 The consultant will conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of

Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

7.7.2 Mannings "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.

7.7.3 A draft report on the field reconnaissance will be submitted to the District for review and approval prior to beginning the HEC-2 modeling. The report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values will be displayed on reduced scale mapping include in the report. The final report will be included in section 4 of the Technical Data Notebook.

7.8 Cross-Sections

7.8.1 The location and alignment of cross sections and channel centerline will be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing will be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by flood waters. Identification of cross sections will be in river miles, increasing upstream. The stationing will tie into the specified river mile of the existing FEMA studies. Cross section orientation may need to be altered after running of HEC-2 model to make sure that they are perpendicular to flow per FEMA criteria.

7.8.2 All cross sections will be plotted using a pen, laser, or electrostatic plotter. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews.

7.8.3 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, centerline (station

10,000) to be used as a check of input data and for working sections during compilation of the floodplain model; (b.) a plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" value, and computer generated encroachments to be used as working sections for development of the floodway model; (c.) a plot of the final floodway model cross sections which will show Type 1 encroachments and encroached water surface, in addition to data covered in items (a.) and (b.). These cross sections will be submitted as part of the Section 4.7 of the Technical Data Notebook. .

7.9 Bridges and culverts must be modeled in compliance with HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-2 modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.

7.10 For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-2 model, which will provide the District with water surface elevations.

7.11 Flood zones must be determined according to FEMA criteria and clearly labelled on the final drawings.

7.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.

7.13 The consultant will submit delineation maps, hydraulics report, and HEC-2 model, to FEMA for review by FEMA, the Technical Evaluation Contractor (TEC), and any other govermental agency reviewers through the District. The consultant will respond to questions by the reviewers and make modifications to the delineation maps, hydraulics report, and HEC-2 model as required.

7.14 An additional HEC-2 model, reflecting a supercritical flow regime, will be prepared for those Washes displaying supercritical flow conditions. The HEC-2 input/output data and diskettes for the supercritical models will be submitted under a separate cover.

HYDRAULIC DELIVERABLES

8.1 FEMA Submittal: The consultant will submit the following items to the District for review by FEMA, ADWR, and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

8.1.1 Two (2) complete sets of blueline topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.1.2 Two (2) complete copies of the Final Report, including HEC-1 and HEC-2 input/output files on diskettes, as outlined below: The Final Report will reflect all work performed under Phase I and Phase II of this contract.

8.1.3.1 Introduction
 - A. Purpose of study
 - B. Authority for study
 - C. Coordination and acknowledgments

8.1.3.2 Area Studied
 - A. Location of study
 - B. Community description
 - C. Principal flood problems
 - D. Flood protection measures

8.1.3.3 Engineering methods
 - A. Hydrologic analyses
 - B. Hydraulic analyses

8.1.3.4 Floodplain Management applications
 - A. Flood boundaries
 - B. Floodways

8.1.3.5 Insurance applications and CRS summary

8.1.3.6 Other studies

8.1.3.7 Location of data

8.1.3.8 Bibliography

8.1.3.9 Technical Data Notebook

A. Study Documentation Abstract

B. Technical Documentation

8.2.3 Two (2) sets of complete HEC-2 input/output data, with files on computer diskette, for supercritical profiles.

8.1.4 Three (3) sets of complete survey notes will be submitted in a notebook separate from the Final Report.

8.1.5 Two (2) sets of completed FEMA forms, as specified in Task 1.9 will be submitted in a seperate notebook from the Final Report.

8.2 Final Submittal: The following products are considered deliverables for the final submittal to the District after FEMA and ADWR approval is issued

8.2.1 One (1) complete set of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.2.2 Digitized topographic data and floodplain/floodway boundaries in conformance with the attached HIS Specifications.

8.2.3 Four (4) complete copies of the Final Report including HEC-1 and HEC-2 input/output files on diskettes. The format of the Notebook shall follow the outline specified in Task 7 of floodplain/floodway delineation. This submittal of the Technical Data Notebook shall include any correspondence with the reviewing agencies and shall incorporate any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-1 model, the HEC-2 model, and/or the Technical Data Notebook.

FLOOD CONTROL DISTRICT
of
Maricopa County

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

BOARD OF DIRECTORS
Betsey Bayless
James D. Bruner
Ed King
Tom Rawles
Mary Rose Garrido Wilcox

Neil S. Erwin, P.E., Chief Engineer and General Manager

RECEIVED
DEC 27 1993
BURGESS & NIPLE, INC.

DEC 21 1993

Mr. James E. Mischler, P.E.
Vice President
Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, Arizona 85034

SUBJECT: Contract FCD 93-06, Rio Verde Area North Floodplain Delineation

Dear Mr. Mischler:

This letter will serve as confirmation of the December 9, 1993 verbal Notice To Proceed for the work under the above-referenced contract that was approved by the Board of Directors on December 8, 1993.

A fully executed contract will be forwarded to you, upon receipt from the Board. If you have any questions, please contact Magnus Jolayemi at 506-1501.

Sincerely,

Leanna Cumberland
Chief, Contracting Branch

SECTION 2: Mapping and Surveying Information

SECTION 2: Mapping and Surveying Information

2.1 General

Hydrologic Mapping

The base mapping used for Exhibits "A", "B", and "C" was prepared using mosaicked AutoCAD files of the Unites Sates Geological Survey (USGS) 7.5 minute quadrangle maps. The following are the USGS quadrangle maps used for this study:

Bartlett Dam - 1964, 1962 photo date, 40' contour interval (CI)
Fort McDowell - 1964, 1962 photo date, photo revised 1974, 20' (CI)
McDowell Peak - 1965, 1962 photo date, photo revised 1982, 20' (CI)
Wildcat Hill - 1965, 1962 photo date, photo revised 1981, 20' (CI)

Hydraulic Mapping

Mapping at a scale of 1:2400 with a 2-foot contour interval was prepared by Aerial Mapping Company, Inc. under subcontract to Burgess & Niple, Inc. Digitized cross sections at locations selected by Burgess & Niple were also provided by Aerial Mapping Company, Inc. The Aerial Mapping Company job number is 93168 and the flight date was December 22, 1993.

Mapping Control

Standard field survey methods were used to establish control for aerial mapping. A Topcon GTS-4 Total Station was used. Chastain-Skillman, Inc. was employed to provide horizontal control for selected locations using satellite global positioning tied to the National Geodetic Control Net.

Vertical control was based on the U.S.C. & G.S. third order control survey. Adjusted field elevations are on NGVD 1929 datum.

Horizontal control was placed on the Arizona State Plane Coordinate System on NAD 1983 datum.

Five cross sections were obtained by both field and aerial mapping methods. Location of the sections is shown on the Flood Boundary Maps (Exhibit 2).

Field surveys were made between October 1993 and January 1994. Field crews included the following personnel:

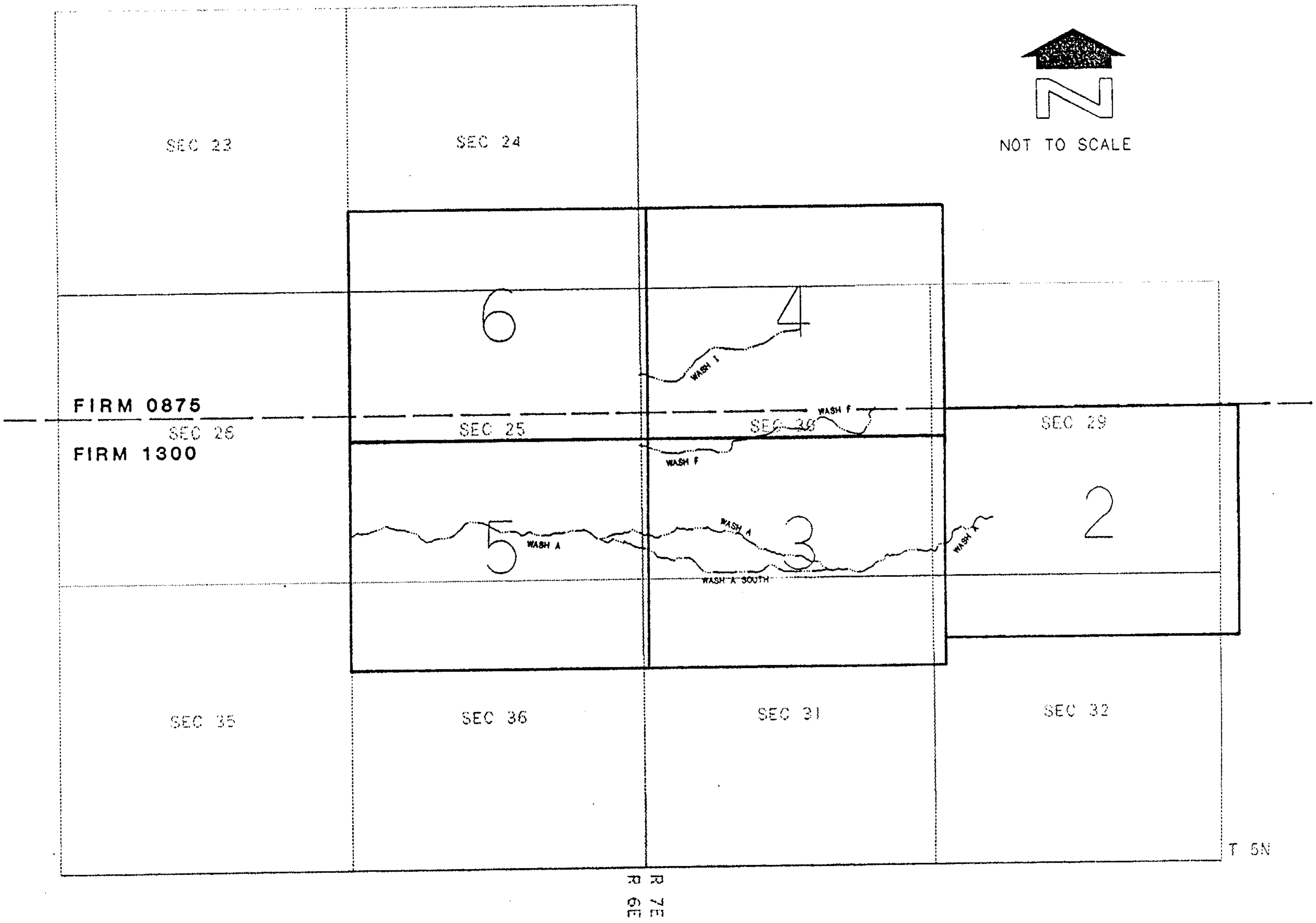
- Paul Culver
- Richard Dudley
- Keith Griggeory
- Chip Simpson

Following are copies of the field books.

SECTION 2: Mapping and Surveying Information

2.2 Index of Maps

INDEX MAP


NOT TO SCALE
SEC 23
SEC 24
SEC 26
SEC 25
SEC 30
SEC 29
SEC 35
SEC 36
SEC 31
SEC 32
FIRM 0875
FIRM 1300
6
4
5
3
2
WASH I
WASH F
WASH F
WASH A
WASH A
WASH A SOUTH
WASH A
T 5N
R 6E
R 7E

SECTION 2: Mapping and Surveying Information

2.3 Survey Field Notes

LIETZ
SINCE 1882

169 FULL

LIETZ
SINCE 1882

MINING TRANSIT BOOK

No. 8152-20

Book #1

Page	Name Job#	Data
1 —	15183 Rio Verde	Elev, Circuit
1		BM "Mooren" USC&GS
3		PT #12 P/K
4		PT #3 1" IP
7		PT #13 P/K
9 & 10		PT #4 Rebar w/Plastic Cap
12 & 13		PT #14 BC
15 & 16		PT #10 BC
18		PT #16 ½" IP
21 & 22		PT #15 ½" IP
23		TBM "A" Near Sec. 25, 30, 24 19
25		PT #17 ½ IP
30-31		PT #9 ½ IP
32		PT #8 ½ IP
35		✓ In BM "Mooren
38		PT #20 ½ IP
40 & 41		PT #19 ½ IP
44		PT #18 ½ IP
48 - 49		PT #21 BC
52 - 53		PT #22 BC
58		TBM "B" BC SC ¼ 5-36
59		PT #25
60		PT # ~~26~~ 60
64		PT #23
65	Rio Verde	PT BC @ Intersec. Arroyo Way & Avenida Del Rey

Page	Name Job # 15183	Data
	Rio Verde	
65		∇BM { PT BC Poco Rio Dr. & Avenida Del Rey
67		∇BM { TP Sewer MH North edge @ intersec. Poco Rio Dr. & Medolica La.
68		∇BM { TP BC Ariz HWY Dept. @ intersec. Forest Rd (FT McDowell) & Tonto Trail
69		PT #27 ½' IP
70		PT #24 BC T5N R7E S-31 & S-36
72		PT #28 ½" IP
74		PT #29 ½ IP
75		PT #2 BC
76		✓ BM "Moorer"
77	Rio Verde	PT #26 ½" IP
78	Rio Verde	{ E.R.M. Set Brass Cap. Set in Conc. Elev.

LEVEL EQUATION THIS
BOOK = -6.545'

RIO VERDE
FLOOD STUDY
Job #No. 15183

Date: 10/21/93
Crew:
R Dudley [illegible]
C Simpson & [illegible]
Equip. Level Wild NA2
Rod Nedo 13'
Weather: Clear & Warm
Temp. 85°

ELEVATION CIRCUIT

			2,17	
TP Nail			1,23	1604.905
			0.295	
	10,51			
	9.485	1606.135		
	8 455			
			2.715	
TP Nail			1,80	1596.65
			0,88	
	9,56			
	8.64	1598.45		
	7.715			
			2.465	
TP Nail			1,51	1589,81
			0.55	
	9,87			
	8,88	1591,32		
	7,89			
			4,63	
TP Nail			3,80	1582.44
			2.97	
	9,31			
B.M.	8.43	1586.24		1577.81
	7.555			
	B.S.	H.I.	F.S.	ELEV.

B.M. "MOOREN" U.S.G. & G.S.
Δ STA. 1983 NAD

ELEVATION CIRCIT

	10.595			
	9.60	1640.55		
	8.61			
			2.52	
TP Nail			1.53	1630.95
			0.54	
	10.97			
	9.98	1632.48		
	8.995			
			2.37	
TP Nail			1.375	1622.50
			0.385	
	11.06			
	10.06	1623.875		
	9.07			
			2.14	
TP Nail			1.17	1613.815
			0.205	
	11.065			
	10.08	1614.985		
	9.09			
TP Nail				1604.905
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

			1.985	
TP Nail			1.14	1663.045
			0.29	
	10.89			
	9.93	1664.185		
	8.97			
			2.125	
TP Nail			1.165	1654.255
			0.205	
	10.705			
	9.76	1655.42		
	8.815			
			2.135	
TP Nail			1.19	1645.66
			0.245	
	9.80			
	8.80	1646.85		
	7.795			
			3.03	
Point # 12			2.50	1638.05
			1.97	
		1640.55		
	B.S.	HI	F.S.	Elev

Point # 12 P/K nail w/Shiner T5N R7E 31 Sec.

ELEVATION CIRCUIT

Point #3			8.925 8.60 8.27	1662.54	Point #3 IP 1" T5N R7E Sec. 31
Ground near Point #3			7.22 side shot	1663.92	Ground Shot near Point #3
E. End Panel			7.48 side shot	1663.66	East End of Panel (Ground shot)
N. End Panel			5.84 side shot	1665.30	North End of Panel (Ground shot)
W. End Panel			6.71 side shot	1664.43	West End of Panel (Ground Shot)
S. End Panel			5.82 side shot	1665.32	South End of Panel (Ground shot
	8.66 8.095 7.53	1671.14			
				1663.045	
	B.S.	H.I.	F.S.	Elev	

ELEVATION CIRCUIT

			1.57	
T.P. Nail			0.845	1725.305
			0.12	
	9.30			
	8.42	1726.15		
	7.54			
			2.53	
T.P. Nail			1.585	1717.73
			0.64	
	11.22			
	10.255	1719.315		
	9.295			
			1.94	
T.P. Nail			1.09	1709.06
			0.24	
	11.31			
	10.34	1710.15		
	9.365			
			2.01	
T.P. Nail			1.16	1699.81
			0.31	
		1700.97		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	11.55			
	10.61	1761.935		
	9.67			
			1.795	
TP Nail			0.95	1751.325
			0.10	
	10.895			
	9.96	1752.275		
	9.03			
			2.435	
Point #13			1.77	1742.315
			1.10	
	9.95			
	9.205	1744.085		
	8.46			
			2.285	
TP Nail			1.37	1734.88
			0.455	
	11.88			
	10.945	1736.25		
	10.01			
				1725.305
	B.S.	H.I.	F.S.	Elev.

Point #13 P/K w/shiner

ELEVATION CIRCUIT

			1.72	
TP Nail			0.945	1789.745
			0.17	
	10.855			
	9.91	1790.69		
	8.97			
			1.83	
TP Nail			1.075	1780.78
			0.325	
	12.46			
	11.52	1781.855		
	10.585			
			2.22	
TP Nail			1.34	1770.335
			0.46	
	11.565			
	10.62	1771.675		
	9.68			
			1.63	
TP Nail			0.88	1761.055
			0.13	
		1761.935		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

Ground Near Point #4			7.05 side Shot	~~1802.92~~	Ground shot Near Point #4
E. End Panel			6.72 Side Shot	1803.25	East end of Panel (Ground shot
N. End Panel			4.57 Side Shot	1805.40	North end of Panel (Ground shot)
W. End Panel			6.78 side Shot	1803.19	West end of Panel (Ground shot)
S. End Panel			5.49 Side Shot	1804.48	South end of Panel (Ground shot)
	11.545 10.585 9.625	1809.97			
T.P. Nail			1.66 0.87 0.08	1799.385	
	11.46 10.51 9.565	1800.255			
				1789.745	
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

	B. S.	H. I.	F. S.	Elev.
			6.71	
TP Nail			5.81	1811.22
			4.90	
	5.665			
	4.71	1817.03		
	3.755			
			3.965	
TP Nail			3.13	1812.32
			2.295	
	6.095			
	5.29	1815.45		
	4.49			
			3.93	
TP Nail			3.03	1810.16
			2.13	
	11.38			
	10.48	1813.19		
	9.58			
			7.64	
+ Point # 4			7.26	1802.71
			6.89	
		1809.97		

Date: 10/25/03
Crew: R [illegible], R.H.
C Simpson [illegible]
Equip: Level Wild N-A-1
Rod Wedge 13'
Weather: Partly cloudy
Temp: 85°

Point #4 (Plastic Cap Tag Tabor ½" Rebar 1985?)
T5N R6E (Sec. 25 26 35 36)

ELEVATION CIRCUIT

	8.215			
	7.44	1816.56		
	6.67		7.95	
TP No. 1			7.05	1809.12
			6.15	
	5.55			
	4.62	1816.17		
	3.69			
			6.52	
TP No. 1			5.735	1811.55
			4.95	
	5.96			
	5.38	1817.285		
	4.80			
			5.11	
TP No. 1			4.235	1811.905
			3.365	
	5.555			
	4.92	1816.14		
	4.29			
				1811.22
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

Ground Near Point #14			5.94 side shot	1809.575	Ground Shot Near Point #14
E. End Panel			6.23 side shot	1809.285	East end of Panel (Ground Shot)
N. End Panel			5.44 side shot	1810.025	North end of Panel (Ground Shot)
W. End Panel			5.86 side shot	1809.655	East end of Panel (Ground Shot)
S. End Panel			6.41 side shot	1809.105	South end of Panel (Ground Shot)
	6.13 5.11 4.09	1815.515			
TP No. 1			6.94 6.155 5.37	1810.405	
		1816.56			
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

	6.74			
	5.69	1820.01		
	4.64			
			6.63	
TP Nail			5.63	1814.32
			4.63	
	6.16			
	5.72	1819.95		
	5.28			
			6.44	
TP Nail			5.45	1814.23
			4.46	
	6.82			
	5.74	1819.68		
	4.66			
			5.00	
TP Nail			4.185	1813.94
			3.37	
	8.595			
	7.765	1818.125		
	6.94			
			6.125	
Point #14			5.155	1810.36
			4.185	
	B.S.	H.I.	F.S.	Elev.

Point #14 (BC 1/4 Cor of Sec 25a2
T5N R6E) 1962

ELEVATION CIRCUIT

			5.875	
TP No. 1			5.035	1817.50
			4.195	
	3.795			
	3.39	1822.535		
	2.98			
			2.67	
over Night TP Nail in Tree			2.54	1819.145
			2.41	
	6.60			
	6.21	1821.685		
	5.82			
			5.185	
TP No. 1			4.285	1815.475
			3.39	
	6.16			
	5.45	1819.76		
	4.74			
			6.745	
TP No. 1			5.70	1814.31
			4.65	
		1820.01		
	B. S.	H. I.	F. S.	Elev.

60D Nail
10/25/93

Date: 10/26/93
Crew
R. Dudley [illegible]
C. Simpson
Equip. [illegible]
NA-?
Rod No. [illegible]
Weather: Clear –
Warm
Temp 85°

ELEVATION CURCUIT

W. End Panel			5.09 side shot	1816.85	West end of Panel (Ground Shot)
S. End Panel			6.40 side shot	1815.54	South end of Panel (Ground Shot)
	8.54				
	8.335	1821.94			
	8.13				
			6.84		
TP Nail			6.335	1813.605	
			5.83		
	3.23				
	2.905	1819.94			
	2.58				
			6.97		
TP Nail			6.07	1817.035	
			5.18		
	6.455				
	5.605	1823.105			
	4.755				
				1817.50	
	B.S.	H.I	F.S.	Elev.	

ELEVATION CIRCUIT

			11.40		
TP No. 1			10.515	1802.57	
			9.625		
	1.89				
	1.30	1813.085			
	0.71				
			11.96		
TP No. 1			11.055	1811.785	
			10.15		
	6.55				
	6.09	1822.84			
	5.62				
			5.35		
Point #10			5.19	1816.75	Point #10 (BC Sec. 23, 24, 26, 25 T5N R6E) 1962
			5.03		
Ground Near Point #10			6.41 Side Shot	1815.53	Ground Shot Near Point #10
E. End Panel			7.19 Side Shot	1814.75	East end of Panel (Ground Shot)
N. End Panel			5.87 Side Shot	1816.07	North end of Panel (Ground Shot)
		1821.94			
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

	4.05			
	3.68	1781.07		
	3.31			
			9.525	
TP Nail			8.435	1777.39
			7.345	
	1.54			
	0.87	1785.825		
	0.21			
			11.36	
TP Nail			10.49	1784.955
			9.615	
	2.28			
	1.56	1795.445		
	0.84			
			10.725	
TP Nail			9.655	1793.885
			8.585	
	1.75			
	0.97	1803.54		
	0.19			
				1802.57
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.	
Point #16			11.46 10.61 9.75	1762.855	Point #16 (½"IP (Flush with the Ground IP)
E. End Panel			10.89 side shot	1062.575	East end of Panel (Ground shot)
N. End Panel			11.01 side shot	1762.455	North end of Panel (Ground shot)
W. End Panel			10.56 side shot	1762.905	West end of Panel (Ground shot)
S. End Panel			10.87 side shot	1762.595	South end of Panel (Ground shot
	4.05 3.41 2.77	1773.465			
TP Nail			12.05 11.015 9.98	1770.055	
		1781.07			

ELEVATION CIRCUIT

	1.98			
	1.40	1740.25		
	0.82			
			12.16	
TP Nail			11.12	1738.85
			10.08	
	1.82			
	1.16	1749.97		
	0.50			
			10.73	
TP Nail			9.78	1748.81
			8.83	
	2.19			
	1.45	1758.59		
	0.71			
			10.675	
TP Nail			9.87	1757.14
			9.065	
	4.385			
	4.155	1767.01		
	3.925			
				1762.855
	B.S.	HI	F.S.	Elev.

ELEVATION CIRCUIT

			13.05	
			12.16	1701.81
			11.27	
	3.07			
	2.30	1713.97		
	1.525			
			11.83	
TP nail			10.88	1711.67
			9.93	
	2.365			
	1.56	1722.55		
	0.75			
			11.00	
TP nail			10.115	1720.99
			9.23	
	2.225			
	1.47	1731.105		
	0.715			
			11.485	
TP nail			10.615	1729.635
			9.745	
		1740.25		
	BS	H.I.	F.S.	Elev

ELEVATION CIRCUIT.

	B.S.	HI	F.S.	Elev.	
W. End Panel			3.94 side shot	1687.82	West end of Panel (Ground Shot)
S End Panel			5.26 side shot	1686.50	South end of Panel (Ground Shot)
	7.08				
	6.74	1691.76			
	6.40				
			9.47		
TP Nail			9.20	1685.02	
			8.925		
	1.98				
	1.12	1694.22			
	0.26				
			10.46		
TP Nail			9.53	1693.10	
			8.60		
	1.53				
	0.82	1702.63			
	0.115				
				1701.81	

㉒

ELEVATION CIRCUIT

			12.335		
T.P. No. 1			11.385	1675.77	
			10.435		
	1.67				
	1.00	1687.155			
	0.33				
			7.055		
T.P. No. 1			6.335	1686.155	
			5.615		
	6.05				
	5.51	1692.49			
	4.97				
			4.90		
PT#15			4.78	1686.98	Point #15 (½" IP Flush w/ Ground
			4.665		
E. End Panel			5.37 side shot	1686.39	East end of Panel (Ground shot)
N. End Panel			4.93 side shot	1686.83	North end of Panel (Ground shot)
		1691.76			
	B.S.	HI.	F.S.	Elev.	

(23)

ELEVATION CIRCUIT

	2.335			
	2.12	1664.11		
	1.91			
			10.00	
TP No. 1			9.40	1661.99
			8.80	
	4.24			
	3.67	1671.39		
	3.10			
			6.04	
TBm "A"			5.74	1667.72
			5.44	
	3.93			
F	3.63	1673.46		
	3.33			
			8.695	
E TP [illegible]			8.275	1669.83
			7.855	
	2.79			
N	2.335	1678.105		
	1.88			
				1675.77
	B.S.	H.I.	F.S.	Elev.

TBm "A" Spike nail in N. Face of 12" Dia. Polaverde Tree (about 350'± N. of Sec. 25, 30, 24, 19 T5N R$\overset{6}{7}$E)

ELEVATION CIRCUIT

(24)

			8.955	
			8,10	1641.395
			7.25	
	2.28			
	1.885	1649.495		
	1.49			
			7.22	
TP nail			6.48	1647.61
			5.73	
	9.395			
	8.92	1654.09		
	8.445			
			10.135	
TP nail			9.20	1645.17
			8.26	
	2.57			
	2.015	1654.37		
	1.46			
			12.87	
TP nail			11.755	1652.355
			10.64	
		1664.11		
	B.S.	H.I.	F.S.	Elev

ELEVATION CIRCUIT

			10.965		
			10.30	1634.05	
			9.64		
	5.44				
	4.79	1644.35			
	4.145				
			6.45		
Point #17			6.30	1639.56	Point #17 C 1/2" IP.
			6.16		Flush w/ Ground
E. end Panel			7.25 side shot	1638.61	East end of Panel C Ground shot
N. end Panel			7.40 side shot	1638.46	North end of Panel C Ground shot
W. end Panel			6.24 side shot	1639.62	West end of Panel C Ground shot
S. end Panel			6.86 side shot	1639.00	South end of Panel C Ground shot
	4.895				
	4.465	1645.86			
	4.035				
				1641.395	
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

	3.995			
	3.665	1617.925		
	3.335			
			7.595	
TP Over night TP			7.38	1614.26
			7.16	
	3.81			
	3.61	1621.64		
	3.41			
			11.08	
TP [illegible]			10.615	1618.03
			10.145	
	5.10			
	4.36	1628.645		
	3.615			
			11.46	
TP Nail			10.905	1624.285
			10.35	
	1.63			
	1.14	1635.19		
	0.645			
				1634.05
	B.S.	H.I.	F.S.	Elev.

Date: 10/25/93
Crew: R Dudley
C Simpson
Equip: Level Wild NA-2
Rod Wild
Weather: Partly Cloudy
Windy Cool
[illegible]

Over night TP 10/26/93
Spike nail in mesquite S of Rd 30' ±

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			9.60	
TP Nail			8.87	1582.155
			8.14	
	2.465			
	1.83	1591.025		
	1.19			
			9.54	
TP Nail			8.63	1589.195
			7.725	
	2.73			
	2.42	1597.825		
	2.11			
			12.32	
TP Nail			11.95	1595.405
			11.58	
	1.92			
	1.37	1607.355		
	0.815			
			12.79	
TP Nail			11.94	1605.985
			11.085	
		1617.925		

ELEVATION CIRCUIT

	2.15			
	1.735	1601.54		
	1.32			
			10.82	
T.P. [illegible]			10.095	1599.805
			9.37	
	8.79			
	8.35	1609.90		
	7.91			
			0.845	
T.P. [illegible]			0.545	1601.55
			0.245	
	10.90			
	10.68	1602.095		
	10.465			
			1.14	
T.P. [illegible]			0.915	1591.415
			0.69	
	10.84			
	10.175	1592.33		
	9.51			
				1582.155
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			1.42	
			1.045	1586.125
			0.67	
	11.33			
	10.80	1587.17		
	10.275			
			8.915	
TP Nail			8.23	1576.37
			7.54	
	3.49			
	2.87	1584.60		
	2.25			
			11.91	
TP Nail			11.28	1581.73
			10.65	
	1.96			
	1.75	1593.01		
	1.54			
			10.81	
TP Nail			10.28	1591.26
			9.75	
		1601.54		

ELEVATION CIRCUIT

W. End Panel			5.42 Side Shot	1597.775	West end of Panel (Ground shot)
S. End Panel			5.28 Side Shot	1597.915	South end of Panel (Ground shot)
	8.325				
	8.12	1603.195			
	7.91				
			1.62		
TP Nail			1.195	1595.075	
			0.77		
	7.86				
	6.975	1596.27			
	6.09				
			7.965		
TP Nail			7.13	1589.295	
			6.30		
	10.62				
	10.30	1596.425			
	9.985				
				1586.125	
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

	BS.	H.I	F.S.	Elev.	
			2.95		
TP Nail			2.405	1601.465	
			1.86		
	11.25				
	10.61	1603.87			
	9.965				
			10.55		
TP Nail			9.505	1593.26	
			8.46		
	5.065				
	4.56	1602.765			
	4.06				
			5.115		
PT #9			4.99	1598.205	Point #9 (½" IP
			4.87		Flush w/Ground
E. end Panel			5.51 side shot	1597.685	East end of Panel (Ground shot
N end Panel			5.42 side shot	1597.775	North end of Panel (Ground shot)
		1603.195			

ELEVATION CIRCUIT

	7.29			
	6.53	1599.12		
	5.775			
			6.24	
PT#8			5.915	1592.59
			5.59	
	6.385			
	5.955	1598.505		
	5.525			
			9.13	
TP			8.22	1592.55
			7.31	
	8.32			
	7.57	1600.77		
	6.82			
			10.12	
TP			9.30	1593.20
			8.475	
	1.53			
	1.035	1602.50		
	0.545			
				1601.465
	B.S.	H.I.	F.S.	Elev.

Point #8 (½" IP { Acr Flat 13

Flush w/Ground

ELEVATION CIRCUIT

			5.765	
TP Nail			4.755	1592.805
			3.745	
	5.51			
	4.51	1597.56		
	3.51			
			6.375	
TP Nail			5.36	1593.05
			4.35	
	8.72			
	7.75	1598.41		
	6.78			
			5.15	
TP Nail			4.12	1590.66
			3.10	
	3.50			
	2.50	1594.78		
	1.50			
			7.91	
TP Nail			6.84	1592.28
			5.77	
		1599.12		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	3.26			
	2.365	1587.375		
	1.47			
			10.69	
TP No. 1			9.105	1585.01
			8.12	
	1.67			
	1.14	1594.115		
	0.61			
			5.74	
TP No. 1			4.68	1592.975
			3.62	
	4.98			
	3.915	1597.655		
	2.85			
			6.88	
TP No. 1			5.89	1593.74
			4.895	
	7.835			
	6.825	1599.63		
	5.81			
				1592.805
	B.S.	HI	F.S.	Elev.

ELEVATION CIRCUIT

			6.36	
BC USC&GS Mooren			5.94	1577.71
			5.52	
	4.74			
	4.34	1583.65		
	3.95			
			8.87	
TP Nail			8.07	1579.305
			7.26	
		1587.375		
	B.S.	H.I	F.S.	Elev.

BM (BC) "Mooren" USC&GS
Δ Sta 1983 NAD
Elev. 1577.81 (0.10 Low)
Page #1
10/27/93
Crew: R Dudley
C. Simpson

ELEVATION CIRCUIT

	7.46			
	6.455	1750.145		
	5.445			
			7.30	
TP Nail			6.36	1743.69
			5.42	
	7.425			
	6.745	1750.05		
	6.065			
			6.81	
TP Nail			5.97	1743.305
			5.135	
	6.35			
	5.415	1749.275		
	4.48			
			5.03	
TP Nail			4.06	1743.86
			3.09	
	6.41			
	5.605	1747.92		
	4.80			
				1742.315
	B.S.	H.I.	F.S.	Elev.

Date: 11/1/93

Crew: R Dudley ☆ A
K Briggsend

Equip: Level Wild NA-2

Rod Nedo 13'

Weather:
Few high thin
Clouds, warm
(Cool in the morning)
Temp. 80°

Point #13 P/k a Shiner Page #7

ELEVATION CIRCUIT

			6.31	
TP nail			5.94	1745.90
			5.575	
	5.925			
	5.18	1751.84		
	4.43			
			5.915	
TP nail			5.14	1746.66
			4.37	
	7.69			
	6.97	1751.80		
	6.255			
			6.975	
TP nail			6.42	1744.83
			5.865	
	6.315			
	5.88	1751.25		
	5.45			
			5.895	
TP nail			4.775	1745.37
			3.655	
		1750.145		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.	
			8.64		
TY			8.19	1741.08	
			7.74		
	4.075				
	3.765	1749.27			
	3.455				
			5.63		
PT# 20			5.315	1745.505	Point #20 C ½" IP Flush w/Ground
			5.005		
E. End Panel			5.67 side shot	1745.15	East end of Panel C Ground shot
N. End Panel			4.60 side shot	1746.22	North end of Panel C Ground Shot
W. End Panel			4.92 side shot	1745.90	West end of Panel C Ground Shot
S. End Panel			5.78 side shot	1745.04	South end of Panel C Ground Shot
	5.16				
	4.92	1750.82			
	4.675				
				1745.90	

ELEVATION CIRCUIT

	3.26			
	2.63	1722.235		
	2.00			
			12.02	
TP Nail			11.02	1719.605
			10.015	
	3.45			
	2.56	1730.625		
	1.67			
			9.805	
TP Nail			9.20	1728.065
			8.595	
	3.455			
	3.14	1737.265		
	2.82			
			10.805	
TP Nail			9.89	1734.125
			8.98	
	3.32			
	2.935	1744.015		
	2.55			
				1741.08
	B.S.	H.I.	F.S.	Elev

ELEVATION CIRCUIT

E. End Panel			9.20 side shot	1696.665	East End of Panel (Ground Shot)
N. End Panel			9.28 side shot	1696.585	North End of Panel (Ground Shot)
W. End Panel			8.74 side shot	1697.125	West End of Panel (Ground Shot)
S. End Panel			9.09 side shot	1696.775	South End of Panel (Ground Shot)
	2.975				
	2.33	1705.865			
	1.69				
			10.41		
TP No. 1			9.545	1703.535	
			8.68		
	2.82				
	2.29	1713.08			
	1.765				
			12.515		
TP No. 1			11.445	1710.79	
			10.37		
		1722.235			
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

			10.09	
TP Nail			9.26	1680.015
			8.435	
	3.725			
	3.065	1689.275		
	2.405			
			9.70	
TP Nail			8.905	1686.21
			8.095	
	1.61			
	1.00	1695.115		
	0.39			
			9.565	
TP Nail			8.78	1694.115
			7.99	
	6.80			
	6.20	1702.895		
	5.60			
			9.948	
PT #19			9.17	1696.695
			8.39	
		1705.865		
	B.S.	H.I.	F.S.	Elev.

Point #19 (½" IP
Flush w/ Ground

ELEVATION CIRCUIT

	2.93			
	2.47	1658.62		
	2.01			
			10.18	
TP nail			9.30	1656.15
			8.425	
	2.905			
	2.29	1665.45		
	1.68			
			11.995	
TP nail			11.015	1663.16
			10.03	
	2.97			
	2.275	1674.175		
	1.58			
			11.77	
TP nail			10.70	1671.90
			9.63	
	3.10			
	2.585	1682.60		
	2.065			
				1680.015
	B.S.	H.I	F,S.	Elev.

ELEVATION CIRCUIT

	4.98			
	4.525	1641.485		
	4.07			
			9.51	
TP Nail			8.82	1636.96
			8.125	
	3.01			
	2.47	1645.78		
	1.935			
			9.45	
TP Nail			8.69	1643.31
			7.93	
	4.51			
	3.81	1652.00		
	3.11			
			11.36	
TP Nail			10.43	1648.19
			9.50	
		1658.62		
	B.S.	H.I	F.S.	Elev.

ELEVATION CIRCUIT

	3.25				
	2.67	1632.42			
	2.085				
			9.72		
T.P.			8.685	1629.75	
			7.655		
	4.23				
	3.895	1638.435			
	3.56				
			7.28		
PT #18 -			6.945	1634.54	Point #18 (½" I.P. Flush w/ Ground
			6.605		
E. End Panel			7.32 s.d. sht	1634.165	East End of Panel (Ground shot
N. End Panel			7.52 s.d.	1633.965	North End of Panel (Ground shot
W. End Panel			6.40 s.d. sht	1635.085	West End of Panel (Ground shot
S. End Panel			6.42 s.d. sht	1635.065	South End of Panel (Ground shot
		1641.485			
	B.S.	H.I.	F.S.	Elev.	

ELEVATION CIRCUIT

			11.78	
TP Nail			10.86	1601.525
			9.94	
	3.73			
	3.075	1612.385		
	2.42			
			9.59	
TP Nail			8.735	1609.31
			7.88	
	5.49			
	4.885	1618.045		
	4.28			
			11.805	
TP Nail			11.12	1613.16
			10.44	
	2.635			
	1.91	1624.28		
	1.19			
			10.96	
TP Nail			10.05	1622.37
			9.14	
		1632.42		
	B.S.	H.I.	F.S.	Elev

ELEVATION CIRCUIT

11/1/93

	B.S.	HI	F.S.	Elev	
PT#8			6.08		
			5.78	1592.655	E.O.C. .065 Hi.
			5.48		
	5.645				
	5.255	1598.435			
	4.87				
			8.345		
TP Nail			7.68	1593.18	
			7.01		
	6.77				
	5.805	1600.86			
	4.835				
			8.08		
TP Nail			7.495	1595.055	
			6.91		
	1.495				
	1.025	1602.55			
	0.55				
				1601.525	

Point #8C 1/2" IP
Elev. 1592.59

✓ 0.065 High
(Page # ~~34~~ 32)

ELEVATION CIRCUIT

	7.23			
	6.16	1804.31		
	5.085			
			6.72	
TP Nail			5.67	1798.15
			4.615	
	4.415			
	3.35	1803.82		
	2.29			
			8.12	
TP Nail			6.97	1800.47
			5.82	
	5.04			
	3.92	1807.44		
	2.80			
			6.05	
TP Nail			4.93	1803.52
			3.81	
	6.635			
	5.74	1808.45		
	4.84			
				1802.71
	B.S.	H.I.	F.S.	Elev

Point #4 (Rebar w/ Plastic Cap Pg 9an

Date: 11/2/93

Crew
R Dudley, ⌂ ⊼
K Griggeory ⊄

Equip: Level
Wild NA-2
Rod Nedo
13'

Weather
Clear, little breeze
Warm
Cool in the
morning
Temp 80°

ELEVATION CIRCUIT

PT#21 Ground Shot Near PT			4.95 Side Shot	1799.88
	6.045			
	5.79	1804.83		
	5.54			
			4.62	
TP Nail			3.62	1799.04
			2.615	
	4.365			
	3.30	1802.66		
	2.235			
			6.30	
TP Nail			5.07	1799.36
			3.84	
	8.255			
	7.12	1804.43		
	5.99			
			8.05	
TP Nail			7.00	1797.31
			5.95	
		1804.31		
	B.S.	HI	F.S.	Elev

Point #21 (Ground Shot)
Near Point

ELEVATION CIRCUIT

			6.85	
TP No. 1			5.73	1792.945
			4.61	
	4.66			
	3.57	1798.675		
	2.48			
			7.23	
TP No. 1			6.18	1795.105
			5.135	
	7.77			
	6.745	1801.285		
	5.72			
			10.27	
TP No. 1			9.84	1794.54
			9.405	
	4.13			
	3.855	1804.38		
	3.58			
			4.53	
PT #21 BC			4.305	1800.525
			4.085	
		1804.83		
	B.S.	HI	F.S.	Elev

Point #21 BC { T5N R6E 1/4 S35/S36 }
1959

ELEVATION CIRCUIT

B.S	H.I.	F.S.	Elev
12.86			
12.26	1806.375		
11.66			
		1.725	
		1.22	1794.115
		0.715	
13.01			
12.035	1795.335		
11.06			
		5.525	
		4.37	1783.30
		3.21	
2.25			
1.31	1787.67		
0.37			
		10.70	
		9.585	1786.36
		8.47	
4.075			
3.00	1795.945		
1.925			
			1792.945

ELEVATION CIRCUIT

			2.515	
TP No. 1			2.075	1783.305
			1.635	
	9.19			
	8.27	1785.38		
	7.355			
			12.92	
TP No. 1			12.39	1777.11
			11.86	
	2.065			
	1.745	1789.50		
	1.43			
			12.86	
TP No. 1			12.17	1787.755
			11.48	
	1.33			
	1.08	1799.925		
	0.83			
			8.23	
TP No. 1			7.53	1798.845
			6.83	
		1806.325		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

Ground shot Near PT #22			6.34 Side shot	1796.065
E. End Panel			7.57 Side shot	
N. End Panel			5.85 Side shot	
W. End Panel			4.54 Side shot	
S. End of Panel			8.04 Side shot	
	9.81			
	9.23	1802.405		
	8.65			
			1.875	
TP Nail			1.03	1793.175
			0.18	
	11.365			
	10.90	1794.205		
	10.43			
				1783.305
	B.S.	HI.	F.S.	Elev.

Point #22 (Ground shot near Point)

East End of Panel
(Ground shot

North End of Panel
(Ground shot

West End of
Panel (Ground shot

South End of
Panel (Ground Shot

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			10.96	
TP No. 1			10.51	1775.845
			10.065	
	3.72			
	3.49	1786.355		
	3.26			
			12.455	
TP No. 1			12.10	1782.865
			11.75	
	2.73			
	1.79	1794.965		
	0.85			
			11.11	
TP No. 1			10.64	1793.125
			10.175	
	6.69			
	6.40	1803.815		
	6.105			
			5.17	
PT #22			4.99	1797.415
			4.805	
		1802.405		

Point #22 BC (SC T5N | R6E S-35 | S-36 1919

ELEVATION CIRCUIT

	11.865			
	11.765	1791.395		
	11.665			
			1.915	
TP Nail			1.80	1779.63
			1.69	
	11.61			
	11.44	1781.43		
	11.265			
			1.26	
TP Nail			0.87	1769.99
			0.475	
	5.26			
	4.74	1770.86		
	4.225			
			12.695	
TP Nail			12.325	1766.12
			11.955	
	3.005			
	2.60	1778.445		
	2.19			
				1775.845
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			11.545	
			11.21	1787.94
TP No. 1			10.87	
	1.10			
	0.99	1799.15		
	0.875			
			12.94	
TP Rock			12.485	1798.16
			12.03	
	10.55			
	9.90	1810.645		
	9.25			
			1.025	
TP No. 1			0.93	1800.745
			0.83	
	11.545			
	11.39	1801.675		
	11.23		1.195	
TP No. 1			1.11	1790.285
			1.025	
		1791.395		

B.S. H.I. F.S. Elev.

ELEVATION CIRCUIT

	1.235			
	1.01	1758.175		
	0.79			
			11.175	
T.P.			10.735	1757.165
			10.295	
	1.435			
	1.19	1767.90		
	0.94			
			10.87	
T.P.			10.315	1766.71
			9.76	
	0.77			
	0.52	1777.025		
	0.275			
			12.41	
T.P.			12.12	1776.505
			11.83	
	0.875			
	0.685	1788.625		
	0.495			
				1787.94
	B.S	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

			10.66	
TP Nail			9.71	1721.17
			8.76	
	2.285			
	1.355	1730.88		
	0.42			
			11.16	
TP Rock			10.12	1729.525
			9.08	
	3.01			
	2.325	1739.645		
	1.645			
			11.62	
TP Rock			11.255	1737.32
			10.89	
	0.965			
	0.60	1748.575		
	0.24			
			10.495	
TP Rock			10.20	1747.975
			9.91	
		1758.175		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	10,125			
	9,28	1743,045		
	8,435			
			3.53	
TP Nail			2.66	1733.765
			1.79	
	10,05			
	9,285	1736.425		
	8.52			
			3.285	
TP Rock			2.875	1727.14
			2.465	
	10.72			
	10.485	1730.015		
	10.05			
			4.23	
BC ¼ TBm B			4.15	1719.53
			4.07	
	2.66			
	2.51	1723.68		
	2.36			
				1721.17
	B.S.	H.I	F.S.	Elev.

Date 11-3-93

TBm "B" BC (SC ¼ 5-36)

ELEVATION CIRCUIT

			10.32		
TP N.			9.32	1738.37	
			8.315		
	7.50				
	6.50	1747.69			
	5.50				
			6.79		
TP Nail	-		6.085	1741.19	
			5.38		
	4.12				
	3.81	1747.275			
	3.505				
			5.24		
PT #25			4.24	1743.465	Point #25 (½" IP
			3.245		Flush w/Ground
	8.22				
	7.34	1747.705			
	6.465				
			3.49		
TP Nail	-		2.68	1740.365	
			1.875		
		1743.045			
	B.S.	H I	F.S.	Elev.	

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
	7.76			
	6.74	1741.17		
	5.715			
			6.30	
PT# ~~26~~ 60 Δ Hub			6.04	1734.43
			5.78	
	6.20			
	-5.93	1740.47		
	5.66			
			4.22	
T.P. No. 1			3.45	1734.54
			2.675	
	7.345			
	-6.255	1737.99		
	5.165			
			10.30	
T.P. No. 1 -			9.085	1731.735
			7.87	
	3.51			
	-2.45	1740.82		
	1.39			
				1738.37

60 ~~TACK~~

Point # ~~26~~ (½" IP

Flush w/ Ground

ELEVATION CIRCUIT

			12.07	
TP Nail			11.005	1706.945
			9.94	
	2.88			
	2.50	1717.95		
	2.12			
			12.02	
TP Nail			11.065	1715.45
			10.105	
	2.885			
	2.51	1726.515		
	2.13			
			10.64	
TP Nail			9.45	1724.005
			8.265	
	4.955			
	3.435	1733.455		
	1.915			
			12.14	
TP Nail			11.15	1730.02
			10.165	
		1741.17		
	B.S	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	4.56			
	4.17	1695.79		
	3.78			
			7.27	
TP Nail			6.33	1691.62
			5.39	
	3.735			
	3.295	1697.95		
	2.855			
			10.185	
TP Nail			9.39	1694.655
			8.59	
	5.50			
	5.29	1704.045		
	5.08			
			10.82	
TP Nail			10.10	1698.755
			9.38	
	2.71			
	1.91	1708.855		
	1.115			
				1706.945
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev
			6.74	
TP Nail			5.73	1680.64
			4.715	
	5.92			
	4.775	1686.37		
	3.63			
			8.645	
TP Nail			7.60	1681.595
			6.555	
	4.88			
	3.75	1689.195		
	2.62			
			10.37	
TP			9.00	1685.445
			7.63	
	7.43			
	6.095	1694.445		
	4.765			
			8.43	
TP			7.44	1688.35
			6.45	
		1695.79		

ELEVATION CIRCUIT

			6.23	
PT#23			5.935	1660.675
			5.64	
PT#23 Ground shot			6.65 side shot	1659.96
	3.465			
	3.125	1666.61		
	2.785			
			9.85	
TP Rock			9.03	1663.485
			8.21	
	2.49			
	1.545	1672.515		
	0.60			
			11.80	
SP 1			10.94	1670.97
			10.085	
	2.105			
	1.27	1681.91		
	0.435			
				1680.64
	BS.	H.I.	F.S.	Elev.

SC
T5N

R6E	R7E
5-36	5-31

1919

PT#23 BCC

PT#23 Ground shot

ELEVATION CIRCUIT

	B.S.	HI	F.S.	Elev.	
	3.48				
	2.235	1661.99			
	0.99				
			4.26		
▽b BC			3.21	1659.755	▽r BC ℄@ inter-sec. Poco Rio Dr Avenida Del Ray
			2.160		
	11.04				
	9.94	1662.965			
	8.835				
			5.18		
▽r Bc			4.015	1653.025	▽B BC ℄@ intersec. Arroyo Way Avenida Del Ray
			2.85		
	1.77				
	1.38	1657.04			
	0.99				
			7.90		
▽r acc 11			7.465	1655.66	
			7.025		
	3.10				
	2.45	1663.125			Date 11/4/97
	1.805				
				1660.675	

ELEVATION CIRCUIT

			10.25	
TP Rock			9.24	1631.68
			8.225	
	2.415			
	1.315	1640.92		
	0.215			
			10.75	
TP Sewer			9.63	1639.605
			8.51	
	2.70			
	1.51	1649.235		
	0.32			
			10.005	
TP [illegible]			9.04	1647.725
			8.08	
	3.93			
	3.515	1656.765		
	3.10			
			9.65	
TP post			8.74	1653.25
			7.83	
		1661.99		
	B.S.	HI	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I	F.S	Elev
	2.97			
	1.905	1609.57		
	0.84			
			11.125	
TP PK			9.925	1607.665
			8.73	
	1.84			
	1.05	1617.59		
	0.26			
			9.03	
TP Sewer			8.06	1616.54
			7.09	
	2.75			
	1.55	1624.60		
	0.35			
			11.24	
TP PK			9.97	1623.05
			8.695	
	2.42			
	1.34	1633.02		
	0.26			
				1631.68

TP Sewer MH North edge
@ interse Poco Rio Dr. & Medelice La

ELEVATION CIRCUIT

	B.S	H.I	F.S	Elev
			9.29	
TP PK			8.48	1584.51
			7.675	
	2.32			
	1.97	1592.99		
	1.625			
			8.17	
TP [illegible]			7.865	1591.02
			5.96	
	3.19			
	1.995	1598.085		
	0.80			
			8.01	
TP BC			6.45	1596.09
			4.885	
	5.28			
	3.99	1602.54		
	2.70			
			12.385	
TP PK			11.02	1598.55
			9.65	
		1609.57		

TP BC Ariz. Hwy Dept @ intersec.
Forest Rd (Ft McDowell) & Tonto Trail

ELEVATION CIRCUIT

	4.09			
	3.25	1580.42		
	2.41			
			10.215	
TP PK			9.09	1577.17
			7.96	
	2.90			
	1.755	1586.26		
	0.61			
			6.845	
TP PK			6.435	1584.505
			6.02	
	7.665			
	6.875	1590.94		
	6.09			
			7.71	
PT 27			6.925	1584.065
			6.14	
	6.89			
	6.48	1590.99		
	6.07			
				1584.51
	B.S.	HI	F.S.	Elev.

PT #27 (½" IP
Flush w/Ground

ELEVATION CIRCUIT

	4.51			
	3.755	1567.205		
	3.00			
			7.25	
PT #24 BC			6.57	1563.45
			5.89	
PT #24 Ground Shot			7.48 side shot	1562.54
	4.09			
	3.41	1570.02		
	2.725			
			8.555	
TP Nail			7.71	1566.61
			6.87	
	4.23			
	3.20	1574.32		
	2.17			
			10.16	
TP Nail			9.30	1571.12
			8.44	
		1580.42		
	B.S.	HI	F.S.	Elev.

PT #24 BC

SC
T5N | R7E
S-31 | S-32
1963

PT #24 Ground Shot

ELEVATION CIRCUIT

				7.365	
	TP Nail			6.13	1558.225
				4.895	
		9.30			
0		8.03	1564.355		
		6.76			
				8.46	
1 6	TP Nail			7.41	1556.325
				6.365	
		4.02			
		2.995	1563.735		
		1.97			
				7.43	
	TP Nail			6.13	1560.74
				4.83	
		4.61			
		3.235	1566.87		
		1.86			
				4.33	
	TP Nail			3.57	1563.635
				2.805	
			1567.205		
		B.S	HI	F.S	Elev.

ELEVATION CIRCUIT

	2.87			
	2.56	1557.295		
	2.25			
			5.225	
PT#28			4.205	1554.735
			3.19	
	5.275			
	4.33	1558.94		
	3.39			
			5.355	
TP No. 1			4.17	1554.61
			2.99	
	6.45			
	5.075	1558.78		
	3.70			
			9.655	
TP No. 1			8.655	1553.705
			7.655	
	4.87			
	4.135	1562.36		
	3.40			
				1558.225
	B-S	H.I.	F.S	Elev.

Point #28 (½" IP
Flush w/Ground

ELEVATION CIRCUIT

			5.70	
TP No. 1			4.92	1548.805
			4.14	
	7.76			
	6.66	1553.725		
	5.555			
			7.325	
TP No. 1			6.36	1547.065
			5.39	
	3.69			
	2.99	1553.425		
	2.285			
			7.30	
TP No. 1			6.07	1550.435
			4.835	
	6.62			
	5.355	1556.505		
	4.085			
			6.585	
TP No. 1			6.145	1551.15
			5.70	
		1557.295		
	B.S	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	HI	F.S.	Elev.
	4.04			
	3.305	1558.335		
	2.57			
			4.24	
IP #29			3.94	1555.03
			3.64	
	7.48			
	7.12	1558.97		
	6.76			
			1.74	
TP No. 1			0.975	1551.85
			0.21	
	8.48			
	7.52	1552.825		
	6.56			
			6.98	
TP No. 1			6.11	1545.305
			5.24	
	3.26			
	2.61	1551.415		
	1.96			
				1548.805

Point #29 (½" IP
Flush w/Ground

ELEVATION CIRCUIT

	9.92			
	9.29	1560.415		
	8.655			
			10.295	
PT # ~~1~~ BC 2			9.65	1551.125
			9.00	
PT # ~~1~~ 2 BC	Ground shot		9.97	1550.805
			Side shot	
	10.53			
	9.47	1560.775		
	8.41			
			3.37	
TP nail			2.265	1551.305
			1.16	
	4.225			
	3.23	1553.57		
	2.23			
			8.83	
TP nail			7.995	1550.34
			7.16	
		1558.335		
	B.S.	HI	F.S.	Elev.

Point #2 BC C

Point # ~~1~~ 2 (Ground shot

T5N R7E
S-30 | S-29
S-31 | S-32
1963

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			5.02	
PT#1			4.815	1577.75
			4.61	
	6.80			
	6.63	1582.565		
	6.46			
			2.56	
TP No 1			1.65	1575.935
			0.745	
	10.24			
	9.07	1577.585		
	7.90			
			2.705	
TP No 1			1.54	1568.515
			0.375	
	12.48			
	11.46	1570.055		
	10.44			
			3.035	
TP No 1			1.82	1558.595
			0.61	
		1560.415		

PT #1 BM "Moore" USC&GS
Δ Sta 1983 NAD from
Page #1 Elev. 1577.81
✓ 0.06 Low 11/4/93
Richard
Keith

ELEVATION CIRCUIT

PT#60			12.47	1734.43
	2.105	1746.90		
PT#26			2.265	1744.795
PT#60	12.63	1747.06		1734.43
	B.S	H.I.	F.S	Elev.

PT#60 ✓ Flat

PT#26 ½" IP Flush w/Ground

PT#60 ½" IP Flush w/Ground
From Page 60

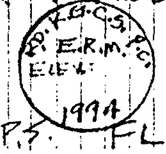
ELEVATION CIRCUIT

ELEV. NOT ADJUSTED

	B.S.	HI	F.S.	Elev.	
		END	RUN		
POINT #9			4.83	1598.205	E.OL. FLAT
		1603.035			
	3.73		3.785	1599.305	
		1603.09			
POINT #9	4.885			1598.205	

T.O.B.

E.R.M., SET BRASS DISC ON TOP OF CONC. PILLAR 1' ABOVE N.G. DISC MKD. →



12' WEST OF PANEL #9

POINT #9 - ½" I.P.S. FLUSH W/ GROUND

LIETZ
SINCE 1882

170

LIETZ
SINCE 1882

MINING TRANSIT BOOK

No. 8152-20

Page	Proj.	Remarks
2-3	Rio Verde 15183	PT #30 ½ IP
9		PT #33 ½ IP
15		PT #31 ½ IP Near BC Bend Bm
17		P.T. #32 ½ IP
20		PT #~~40~~ 58 ½" IP TBm
22		PT #~~39~~ 59 ½ IP TBm
25		PT #42 ½ IP
27		PT #41 ½ IP
30		PT #38 ½ IP
31		PT #40 ½ IP
[illegible]		PT #39 ½ IP
39		PT #~~37~~ 61 ½ IP TBm
41		PT 37 ½ IP
42		PT 53 P/K Nail
35		PT 54 BC
37		PT 36 BC
40		TBm 57 TBm
44		PT 62 IP
46		PT 63 BC
47		PT 35 BC
48	Void	~~PT 66 ½" IP X-Sect.~~
49	Void	~~PT 67 ½ IP X-Sect.~~
50	Void	~~PT 68 P/K X-Sect.~~
51	Rio Verde 15183 Void	~~PT 69 P/K X-Sect.~~

ELEVATION CIRCUIT

Proj: Rio Verde, Ariz.
Proj # 15183

Date: 11/9/93
Crew: R Dudley Fx ⊼
K Geys α

Weather: clear
& warm

ELEVATION CIRCUIT

		8.36	
		7.16	1612.96
		5.965	
3.79			
3.20	1620.12		
2.61			
		12.38	
		11.63	1616.92
		10.885	
5.06			
4.27	1628.55		
3.48			
		11.49	
		10.96	1624.28
		10.425	
2.11			
1.645	1635.24		
1.175			
		11.55	
		10.81	1633.595
		10.07	
5.48			
4.845	1644.405		1639.56
4.21			
B.S.	H.I.	FS	Elev.

Point #17 ½" IP @ Elev 1639.56

ELEVATION CIRCUIT

	B.S	H.I.	FS	Elev.	
W. End Panel			8.81 [illegible]	1591.385	West End of Panel (Ground shot
S. End Panel			10.74 [illegible]	1589.455	South End of Panel (Ground shot
	5.66				
	5.27	1600.195			
	4.87				
			12.83		
TP Nail			12.605	1594.925	
			12.38		
	1.44				
	1.305	1607.53			
	1.165				
			12.47		
TP			11.625	1606.225	
			10.78		
	5.55				
	4.89	1617.85			
	4.23				
				1612.96	

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.		
				1.50		
TP No 1				1.36	1606.23	
				1.22		
	12.88					
	12.66	1607.59				
	12.44					
			6.00			
TP No 1			5.62	1594.93		
			5.24			
	10.33					
	10.035	1600.55				
	9.74					
			9.955			
PT # 30			9.68	1590.515		PT # 30 (½" IP Flush w/ Ground
			9.41			
E. End Panel			11.50 side shot	1588.695		East End of Panel (Ground shot)
N. End Panel			11.32 side shot	1588.875		North End of Panel (Ground shot)
		1600.195				

ELEVATION CIRCUIT

8.98			
-8.605	1635.59		
8.23			
		2.67	
-		1.56	1626.985
		0.455	
12.35			
11.605	1628.545		
10.86			
		4.495	
-		3.94	1616.94
		3.39	
9.14			
7.91	1620.88		
6.675			
		5.585	
-		4.91	1612.97
		4.24	
12.495			
-11.65	1617.88		
10.80			
			1606.23
B.S	H.I.	FS	Elev

ELEVATION CIRCUIT

	B.S.	HI	F.S	Elev.
			5.55	
PT # 17			4.915	1639.585
			4.28	
	11.62			
	10.88	1644.50		
	10.14			
			2.27	
Nail TP			1.97	1633.62
			1.665	
		1635.59		

11/9/93

Point #17 (½" IP Elev. 1639.56.
✓ 0.025 High (From page #1)

ELEVATION CIRCUIT

	4.30			
	3.51	1585.94		
	2.715			
			8.60	
TP No. 1			8.005	1582.43
			7.41	
	5.11			
	4.44	1590.435		
	3.77			
			8.46	
TP No. 1			8.07	1585.995
			7.675	
	3.01			
	2.58	1594.065		
	2.15			
			10.48	
TP No. 1			9.515	1591.485
			8.55	
	3.62			
	2.795	1601.00		
	1.97			
Pt #9				1598.205
	B.S.	H.I.	F.S.	Elev.

PB/
11/9/93

Point #9 (½" IP) Elev. 1598.205

ELEVATION CIRCUIT

TP Nail			8.99 8.57 8.15	1554.735
	3.02 2.52 2.015	1563.305		
TP Stake			8.13 7.75 7.365	1560.785
TP N	1.10 0.955 0.81	1568.535		
TP Nail			9.505 9.255 9.005	1567.58
TP Nail	1.74 1.67 1.60	1576.835		
TP Nail			11.075 10.775 10.475	1575.165
PT#9		1585.94		
	B.S.	H.S.	F.S.	Elev

ELEVATION CIRCUIT

	2.65			
	2.17	1533.925		
	1.695			
			11.53	
TP Nail			10.82	1531.755
			10.115	
	2.28			
	1.75	1542.575		
	1.215			
			9.68	
TP Stake			9.10	1540.825
			8.515	
	1.645			
	1.10	1549.925		
	0.55			
			9.065	
TP Nail			8.68	1548.825
			8.295	
	3.15			
	2.77	1557.505		
	2.40			
				1554.935
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

			4.485	
PT # 33			3.83	1518.80
			3.175	
	4.765			
	4.205	1522.63		
	3.705			
			4.225	
TP Nail			3.14	1518.425
			2.06	
	6.445			
	5.56	1521.565		
	4.68			
			12.635	
TP Nail			11.84	1516.005
			11.05	
	1.68			
	1.155	1527.845		
	0.63			
			7.495	
TP Nail			7.235	1526.69
			6.97	
		1533.925		
	B.S.	H.I.	F.S.	Elev.

Point # 33 (½" IP
Flush w/ Ground
(River bottom)

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
	8.475			
	8.08	1534.77		
	7.68			
			1.28	
TP nail			0.755	1526.69
			0.23	
	12.235			
	11.44	1527.445		
	10.64			
			6.38	
TP nail			5.52	1516.005
			4.66	
	3.735			
	3.105	1521.525		
	2.475			
			5.675	
TP nail in tree			5.06	1518.42
			4.44	
	5.52			
	4.68	1523.48		
	3.84			
				1518.80

start
11/1/83
PRD

11/4/83 PD

TP (Nail in cottonwood tree)
Over night Turn

ELEVATION CIRCUIT

			3.035	
TP			2.67	1554.735
			2.305	
	8.975			
	8.58	1557.405		
	8.18			
			1.43	
TP			0.88	1548.825
			0.335	
	9.46			
	8.88	1549.705		
	8.295			
			2.205	
TP Stake			1.68	1540.825
			1.15	
	11.47			
	10.755	1542.505		
	10.04			
			3.365	
TP 1			3.02	1531.75
			2.67	
		1534.77		
	B.S.	HI	F.S.	Elev

ELEVATION CIRCUIT

	11.645			
	11.20	1586.365		
	10.75			
			0.985	
T.P.			0.905	1575.165
			0.82	
	8.725			
	8.49	1576.07		
	8.25			
			1.05	
T.P.			0.905	1567.58
			0.765	
	8.09			
	7.70	1568.485		
	7.315			
			2.855	
T.P.			2.35	1560.785
			1.845	
	8.82			
	8.40	1563.135		
	7.98			
				1554.735
	B.S.	HI	FS	Elev

ELEVATION CIRCUIT

			2.98	
PT #9			2.07	1598.215
			1.16	
	9.68			
	8.795	1600.285		
	7.905			
			4.43	
TP Nail			4.14	1591.49
			3.845	
	10.17			
	9.63	1595.63		
	9.09			
			5.32	
[illegible]			4.65	1586.60
			3.975	
	8.81			
	8.215	1590.65		
	7.62			
			4.58	
TP Nail			3.93	1582.435
			3.285	
		1586.365		
	B.S.	HI	F.S.	Elev

Point # 9 (½" IP) Elev. 1598.205

✓ 0.01 High 11/10/93

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev
	4.88			
	4.365	1588.645		
	3.85			
			8.68	
[illegible]			7.445	1584.78
			6.21	
	7.26			
	6.32	1591.725		
	5.38			
			6.67	
[illegible]			5.525	1585.405
			4.38	
	2.325			
	1.50	1590.93		
	0.68			
			8.415	
[illegible]			7.61	1589.43
			6.81	
	5.365			
PT #8	4.45	1597.04		1592.59
	3.54			

Point #8 (½" IP) Elev. 1592.59

ELEVATION CIRCUIT

			7.10	
			6.705	1570.11
			6.31	
	3.92			
	3.40	1576.815		
	2.88			
			8.47	
T.P. No. 2			7.72	1573.415
			6.975	
	4.66			
	4.21	1581.135		
	3.76			
			6.70	
Pt # 31			6.275	1576.925
			5.85	
	3.79			
	3.035	1583.20		
	2.28			
			9.24	
T.P. No. 1			8.48	1580.165
			7.715	
		1588.645		
	B.S.	HI	F.S.	Elev.

Point #31 (½" IP) Elev 1576.925
Flush w/ Ground

ELEVATION CIRCUIT

	4.305			
	3.98	1560.19		
	3.65			
			8.69	
TP No 1			7.99	1556.21
			7.285	
	3.05			
	2.28	1564.20		
	1.515			
			9.60	
TP No 1			8.86	1561.92
			8.12	
	5.965			
	5.045	1570.78		
	4.125			
			8.93	
TP No 1			8.045	1565.735
			7.165	
	4.105			
	3.67	1573.78		
	3.235			
				1570.14
	B.S	HI	F.S	Elev

ELEVATION CIRCUIT

			4.385	
TP Nail			3.84	1565.985
			3.32	
	8.51			
	7.905	1569.825		
	7.30			
			2.915	
TP Nail			2.155	1561.92
			1.395	
	8.61			
	7.86	1564.075		
	7.115			
			4.59	
TP Nail			4.325	1556.215
			4.06	
	8.605			
	7.90	1560.54		
	7.195			
			8.19	
PT# 32			7.55	1552.64
			6.91	
		1560.19		
	B.S	HI	F.S.	Elev

Point #32 (1/2" IP) Elev. 1552.64
Flush w/ Ground.

ELEVATION CIRCUIT

	6.70			
	5.85	1591.205		
	5.00			
			4.19	
TP Nail			3.555	1585.355
			2.92	
	11.11			
	10.01	1588.91		
	8.915			
			3.735	
TP			2.925	1578.90
			2.11	
	9.40			
	8.73	1581.825		
	8.055			
			3.19	
TP Nail			2.015	1573.095
			0.84	
	9.79			
	9.125	1575.11		
	8.46			
				1565.985
	B.S.	HI	F.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H I	F.S.	Elev.
			5.265	
PT # 8			4.45	1592.595
			3.63	
	5.98			
	5.73	1597.045		
	5.475			
			4.495	
TP No. 1			3.91	1591.315
			3.33	
	10.19			
	9.42	1595.225		
	8.655			
			6.48	
TP No. 1			5.40	1585.805
			4.32	
		1591.205		

Point #8 (½" IP) Elev. 1592.59
✓ 0.005 Adj

ELEVATION CIRCUIT

PT #58 ~~40~~ TBM			4.25	
			3.915	1691.365
			3.58	
	10.08			
	9.17	1695.28		
	8.255			
			6.93	
TP Nail			5.95	1686.11
			4.97	
	9.19			
	8.46	1692.06		
	7.73			
			1.96	
TP Nail			1.12	1683.60
			0.275	
	12.04			
	11.01	1684.72		
	9.98			
			1.57	
TP Nail			0.81	1673.71
			0.05	
	12.60			
	11.98	1674.52		1662.54
	11.365			
	B.S.	HT	F.S	Elev.

Point #~~40~~ 58 ½" IP TBM
Flush w/ Ground

Date 11/16/93
R Dudley ☐ T
Dan

Point #3 (1" IP) T5N R7E Sec. 31
Elev. 1662.54

ELEVATION CIRCUIT

	5.73			
	4.88	1692.575		
	4.025			
			5.435	
TP nail			4.075	1687.695
			2.715	
	4.20			
	3.13	1691.77		
	2.055			
			3.25	
TP overnight Turn			2.51	1688.64
			1.77	
	7.23			
	6.445	1691.15		
	5.66			
			10.62	
TP nail			9.83	1684.705
			9.04	
	3.69			
	3.17	1694.535		
	2.655			
				1691.365
	B.S.	H.I.	F.S.	Elev.

start 11/17/93

11/12/93

TP (over night turn) in Power Pole
East face 60D nail

ELEVATION CIRCUIT

			12.64	
[illegible]			11.715	1683.97
			10.79	
	3,18.5			
	2.21	1695.685		
	1.23			
			3.06	
PT# ~~39~~ 59 ∇BM			2.065	1693.475
			1.07	
	11.455			
	9.875	1695.54		
	8.295			
			7.81	
[illegible]			6.72	1685.665
			5.63	
	7.79			
	6.77	1692.385		
	5.75			
			8.34	
TP Nail			6.96	1685.615
			5.58	
		1692.575		
	B.S.	HI	F.S.	Elev

Point #~~39~~ 59 (½" IP, ∇BM
Flush w/Ground

∇ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
	3.13			
	2.45	1662.19		
	1.775			
			12.60	
TP No. 1			11.55	1659.74
			10.495	
	5.365			
	4.22	1671.29		
	3.07			
			12.59	
TP No. 1			11.64	1667.07
			10.685	
	3.23			
	2.455	1678.71		
	1.675			
			11.89	
TP No. 1			11.005	1676.255
			10.12	
	4.27			
	3.29	1687.26		
	2.315			
				1683.97

ELEVATION CIRCUIT

			10.20	
TP nail	-		8.955	1629.03
			7.71	
	3.125			
	2.47	1637.985		
	1.82			
			9.44	
TP nail	-		8.245	1635.515
			7.055	
	2.895			
	2.345	1643.76		
	1.80			
			12.71	
TP nail	-		12.10	1641.415
			11.49	
	3.12			
	2.165	1653.515		
	1.21			
			12.04	
TP nail	-		10.84	1651.35
			9.645	
		1662.19		/
	B.S	HI.	T.S.	Elev.

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
	5.59			
	4.46	1630.90		
	3.33			
			2.49	
TP No. 1			1.29	1626.44
			0.09	
	10.51			
	9.43	1627.73		
	8.35			
			7.43	
PT 42			7.04	1618.30
			6.65	
	4.385			
	3.94	1625.34		
	3.49			
			9.19	
TP No. 1			8.58	1621.49
			7.97	
	1.64			
	0.95	1629.98		
	0.26			
				1629.03

Point #42 (½" IP
Flush w/ Ground

ELEVATION CIRCUIT

			9.295	
TP Nail			8.615	1616.985
			7.935	
	5.785			
	5.125	1625.60		
	4.46			
			7.635	
TP Nail			6.86	1620.475
			6.09	
	2.265			
	1.50	1627.335		
	0.73			
			10.025	
TP			8.93	1625.835
			7.83	
	10.095			
	8.92	1634.765		
	7.75			
			6.245	
TP Nail			5.055	1625.845
			3.865	
		1630.70		
	B.S.	H.I.	F.S.	Elev.

ELEVATION CIRCUIT

	8.83			
	8.00	1632.89		
	7.17			
			5.095	
T.P.			4.285	1624.89
			3.475	
	9.04			
	8.15	1629.175		
	7.265			
			3.415	
TP nail			2.625	1621.025
			1.835	
	8.90			
	8.275	1623.65		
	7.655			
			5.94	
PT# 41			5.55	1615.375
			5.16	
	4.52			
	3.94	1620.925		
	3.36			
				1616.985
	B.S.	H.I.	F.S.	Elev.

Point #41 C ½" IP
Flush w/Ground

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
			2.125	
PT #12			1.42	1638.03
			0.71	
	6.65			
	5.925	1639.45		
	5.20			
			4.52	
TP nail			3.615	1633.525
			2.71	
	8.68			
	7.88	1637.14		
	7.085			
			4.68	
TP nail			3.63	1629.26
			2.58	
		1632.89		

Point #12 (P/K Nail w/ Shiner)
(Pavement) Rio Verde Dr. Elev. 1638.05
0.02 low

ELEVATION CIRCUIT

			1.06	
T.P. nail			0.84	1698.195
			0.62	
	12.53			
	12.25	1699.035		
	11.975			
			0.82	
T.P. nail			0.655	1686.785
			0.49	
	12.13			
	11.82	1687.44		
	11.515			
			2.855	
T.P. nail			1.915	1675.62
			0.98	
	10.49			
	9.08	1677.535		
	7.67			
			3.035	
T.P. nail			2.05	1668.455
			1.06	
	10.85			
PT # 23 BC	9.83	1670.505		1660.675
	8.81			
	B.S.	H.I.	F.S.	Elev.

Point #23 BC (

S C
T 5 N
R6E | R7E
S.36 | S.31
1919

Elev. 1660.675

ELEVATION CIRCUIT

	B.S.	HI	F.S.	Elev.
		1691.82		
	1.97			
TP No. 1			11.475	1689.85
		1701.325		
	1.36			
TP No. 1			11.77	1699.965
		1711.735		
	0.28			
			4.03	
Pt #38			3.86	1711.455
			3.695	
	6.925			
	-6.795	1715.315		
	6.665			
			2.39	
TP No. 1			2.21	1708.52
			2.03	
	12.95			
	-12.535	1710.73		
	12.12			
				1698.195

Sherrod 11/17/93

Point #38 (½" IP
Flush w/ Ground

ELEVATION CIRCUIT

End Circuit

Point #23 BC			7.58	1660.66
		1668.24		
	0.27			
TP Nail			9.17	1667.97
		1677.14		
	0.43			
TP Wall			7.41	1676.71
		1684.12		
	3.235			
TP ~~Nail~~ Rock			10.935	1680.885
		1691.82		
	B.S.	H.I.	F.S.	Elev

Point # 23 BC
Elev. 1660.675

✓ 0.015 Low

ELEVATION CIRCUIT

	B.S.	H.I.	F.S.	Elev.
	2.65	1661.48		
TP P/K			5.735	1658.83
		1664.565		
	11.12			
TP P/K			5.31	1653.445
		1658.755		
	8.295			
TP P/K			3.685	1650.46
		1654.145		
	5.845			
Point #53			5.885	1648.30
		1654.185		
	3.725			
TP P/K			9.07	1650.46
		1659.53		
	4.71			
TP P/K			9.76	1654.82
		1664.58		
	8.15			
TP P/K			6.03	1656.43
		1662.46		
TP BC	2.705			1659.755

Point #53 P/K Nail in Center of Cul-De-Sack of Stirrup Ln. (Location 360'± E. of intersec. of Stirrup Ln. & Avenida Del Ray) P/K Nail

(From Book #1 Page 65)

TPBC @ Intersec. Poco Rio Dr. & Avenida Del Ray

ELEVATION CIRCUIT

		End Circuit		
TP BC			1.73	1659.75
		1661.48		
	B.S.	H.I.	F.S.	Elev.

TP BC @ Intersec. of Poco Rio Dr. a
Avenida Del Ray
✓ 0.005 Low

ELEVATION CIRCUIT

TP Rock			8.06	1647.72
		1655.78		
	2.445			
TP [illegible]			4.11	1653.335
		1657.445		
	5.62			
TP P/K			6.81	1651.825
		1658.635		
	0.89			
TP P/K			7.20	1657.745
		1664.945		
	6.04			
TP P/K			1.155	1658.905
		1660.06		
	8.555			
TP P/K			6.11	1651.505
		1657.615		
	3.835			
TP P/K			5.005	1653.78
		1658.785		
TP P/K	5.095		1.71	1653.69
		1655.40		
Point #53	7.10			1648.30
	B.S.	H I	F.S.	Elev.

From Page 32
Point #53 P/K No: 1

ELEVATION CIRCUIT

		1660.15		
	1.24			
TP P/K			6.085	1658.91
		1664.995		
	6.475			
TP P/K			0.14	1658.52
		1658.66		
	6.84			
TP P/K			5.635	1651.82
		1657.455		
	4.12			
TP Nail			2.39	1653.335
		1655.725		
	7.29			
TP P/K			1.025	1648.435
		1649.46		
	9.315			
Point #54			9.35	1640.145
		1649.495		
	1.775			
				1647.72
	B.S.	H.I.	F.S.	Elev.

Point #54 B.C. (Location 280'± E.
of intersec. Via Hermosa & Vado CT)
(Point 2)

End of Circuit

Point #53			7.29	1648.31
		1655.60		
	2.235			
TP PK			6.775	1653.365
		1660.14		
	6.905			
TP PK			4.18	1653.235
		1657.415		
	5.905			
TP PK			8.64	1651.51
		1660.15		
	B.S	HI	FS	Elev.

Point #53 ✓ 0.01 High

Levels Cont.

	B.S.	HI	F.S.	Elev	
	2.565	1657.33			
T.P.			6.23	1654.765	
		1660.995			GOS USGAOS 1919
	4.64				
Point #36 BC			4.675	1656.355	Point #36 BC (T4N R6E/R7E S-1 | S-6 S-7 | S-12
Ground shot @ Point #36			5.65	1655.38	Ground Shot for Point #36 (Near point)
		1661.03			
	5.84				
TP Nail			2.11	1655.19	
		1657.30			
	4.18				
TP P/K			4.31	1653.12	
		1657.43			
	6.305				
TP			5.73	1651.125	
		1656.855			
	9.105				
TP Nail			2.64	1647.75	
		1650.39			
Point #54	10.245			1640.145	Point #54 BC (From page #35
	B.S.	HI	F.S.	Elev	

End of Circuit

Point #54			10.13	1640.15
		1650.28		
	2.945			
TP No. 1			9.955	1647.335
		1657.29		
	6.16			
TP P/K			6.37	1651.13
		1657.50		
	4.38			
TP P/K			4.21	1653.12
		1657.33		
	B.S	HI	FS	Elev

Point #54 BC ✓ 0.005 High

Levels Cont.

END RUN

PANEL PT. #36			5.13	1656.355	E.D.C. FLAT
		1661.485			
T.P. NAIL	5.765		6.98	1655.72	
		1662.70			
T.P. NAIL	3.59		9.005	1659.11	
		1668.115			
T.P. NAIL	3.39		10.38	1664.725	
		1675.105			
	2.44				
			↑RETURN LEVELS		
PANEL 61 PT. ~~37~~	▽BM		2.50	1672.665	
		1675.165			
T.P. NAIL	7.525		2.78	1667.64	
		1670.42			
T.P. NAIL	8.02		3.68	1662.40	
		1666.08			
T.P. NAIL	9.775		5.51	1656.305	
		1661.815			
Point #36 BC	5.46			1656.355	
	B.S.	HI	FS	Elev.	

P.O.B. Point #36 BC

PANEL PT #~~37~~ 61, ½" I.P. ~~TAG~~ ▽BM
FLUSH W/GROUND

Point #36 BC (From Page #37

	B.S.	HI	F.S.	Elev
PT 36BC			4.50	1656.365
		1660.865		
TP Nail	5.795		4.29	1655.07
		1659.36		
TP Rock	9.445		2.55	1649.915
		1652.465		
TP nail	10.35		3.45	1642.115
		1645.565		
TP nail	5.34		8.52	1640.225
		1648.745		
T.B.M. #57	8.77		9.01	1639.975
		1648.985		
T.P. NAIL	8.76		5.18	1640.225
		1645.405		
T.P. NAIL	6.34		9.645	1639.065
		1648.71		
T.P. NAIL	3.12		11.005	1645.59
		1656.595		
T.P NAIL	2.125		6.18	1654.47
		1660.65		
POINT #36 B.C.	4.295			1656.355

Point #36 BC ✓ 0.01 High

T.B.M. #57, ½" I.P./TAG
FLUSH W/GROUND

Point #36 BC

Level Cont.

PT# 58			4.13	1691.365
		1695.495		
	4.395			
PT# 40			4.425	1691.10
		1695.525		
PT#58	4.16			1691.365
	BS	HI	F.S.	Elev.

PT #58 T. Flat.

PT #40 ½" IP Flush w/ Ground

PT #58 ½" IP From Page #20

Level Cont.

PT#59			3.99	1693.48	Point #59 ✓ 0.005 High
		1697.46			
	3.60				
PT#39			3.65	1693.87	Point #39 ½" IP Flush w/Ground
		1697.52			
PT#59	4.045			1693.475	PT#59 ½" IP Flush w/Ground From Page #22
	BS	HI	FS	Elev.	

Level Cont

	BS	HI	FS	Elev	
PT#61			6.88	1672.665	Point 61 ½ IP ✓ Flat
		1679.545			
	3.52				
PT#37			3.465	1676.025	Point #37 ½" IP Flush w/Ground
		1679.49			
PT#61	6.825			1672.665	Point #61 ½" IP From Page 39

Level Cont.

TP nail			0.13	1634.125	
		1634.255			
TP nail	10.225		0.21	1624.03	
		1624.24			
TP nail	10.665		0,27	1613.575	
		1613.845			
TP nail	10,35		4.63	1603.495	
		1608.125			
TP nail	4.43		3.855	1603.695	
		1607.55			
Point #62	7.20		7.445	1600.35	Point #62 ½" IP Flush w/Ground
		1607.795			
TP nail	4.10		4.73	1603.695	
		1608.425			
TP nail	4,93		10.54	1603.495	
		1614.035			
TP nail	0.455		11.17	1613.58	
		1624.75			
TP nail	0.13		9.93	1624.62	
		1634.55			
TP nail	0.41		9.375	1634.14	
		1643.515			
TBM #57	3.54			1639.975	Point #57 ½" IP (From pg. 40 TBM
	B.S	HI	F.S.	Elev.	

PT #57			3.44	1639.965	Point #57 ▽BM ✓0.01 Low
		1643.405			
	9.28			1634.125	
	BS	HI	F.S.	Elev	

Levels Cont.

PT #62			5.00	1600.345	Point #62 ✓ 0.005 Low
		1605.345			
TP No. 1	11.23		0.14	1594.115	
		1594.255			
TP No. 1	10.745		0.625	1583.51	
		1584.135			
TBM BC PT #63	5.355		6.26	1578.78	Point #63 BC TBM
		1585.04			
TP No. 1	0.80		10.605	1584.24	
		1594.845			
TP No. 1	0.09		10.56	1594.755	
		1605.315			
	4.965			1600.35	Point #62 ½" IP (From Pg. 44)
	B.S.	HI	F.S.	Elev	

Levels Cont.

PT # 35			5.175	1547.17
		1552.345		
TP Nail	3.90		2.21	1548.445
		1550.655		
TP Nail	4.595		7.745	1546.06
		1553.805		
TP Nail	0.15		9.83	1553.655
		1563.485		
TP Nail	0.94		9.92	1562.545
		1572.465		
TP Nail	2.335		6.93	1570.13
		1577.06		
TP Nail	3.085		5.745	1573.975
		1579.72		
PT # 63	0.94			1578.78
	BS	HI	F.S	Elev

✓ 0.03 High

Point # 35 BC (BC is @ West End of Panel Leg) T4N R9E

5-6	5 5
5-7	5 8

1963

Point #63 TBM (From Pg. 48

Level Cont.

VOID

PT#54			9.54	1640.145
		1649.685		
TP nail	1.10		7.715	1648.585
		1656.30		
TP nail	2.06		6.14	1654.24
		1660.38		
PT#66	3.195		3.385	1657.185
		1660.57		
TP nail	6.33		2.08	1654.24
		1656.32		
TP nail	7.74		1.01	1648.58
		1649.59		
PT#54	9.445			1640.145
	B.S.	HI	F.S.	Elev.

Point #54 ✓ Flat

Point #66 1/4" IP X-sect (South Point)
Pipe Flush w/Ground

PT#54 BC (From Page #35

Levels Cont'd.

VOID

	B.S.	HI	F.S.	Elev	
PT #66			3.60	1657.19	Point #66 + 0.005 High
T Point	2.84	1660.79	2.24	1657.95	
PT #67	4.63	1660.19	4.81	1655.56	Point #67 ½" IP X-Sect. (North Point Pipe Flush w/Ground
T Point	2.42	1660.37	2.99	1657.95	
PT #66	3.755	1660.94		1657.185	Point #66 ½" IP (From Pg. 48

Level Cont

PT #54			1.085	1640.16
		1641.245		
TP Nail	9.505		2.92	1631.74
		1634.66		
TP Nail	9.90		1.86	1624.76
		1626.62		
TP Nail	8.265		2.22	1618.355
		1620.575		
TP Nail	8.90		3.71	1611.675
		1615.385		
PT #68	8.19		8.36	1607.195
		1615.555		
TP Nail	3.88		8.935	1611.675
		1620.61		
TP Nail	2.255		7.95	1618.355
		1626.305		
TP Nail	1.55		9.68	1624.755
		1634.435		
TP Nail	2.71		9.34	1631.725
		1641.065		
PT #54	0.92			1640.145
	B.S.	HI	F.S.	Elev.

Point #54 ✓ 0.015 High

VOID

Point #68 PK X-Sect. (South Point
(Paint)
Location 150'± West of intersec.
of Downy La & Whitewing Dr.

Point #54 (From Pg. #35

Level Cont.

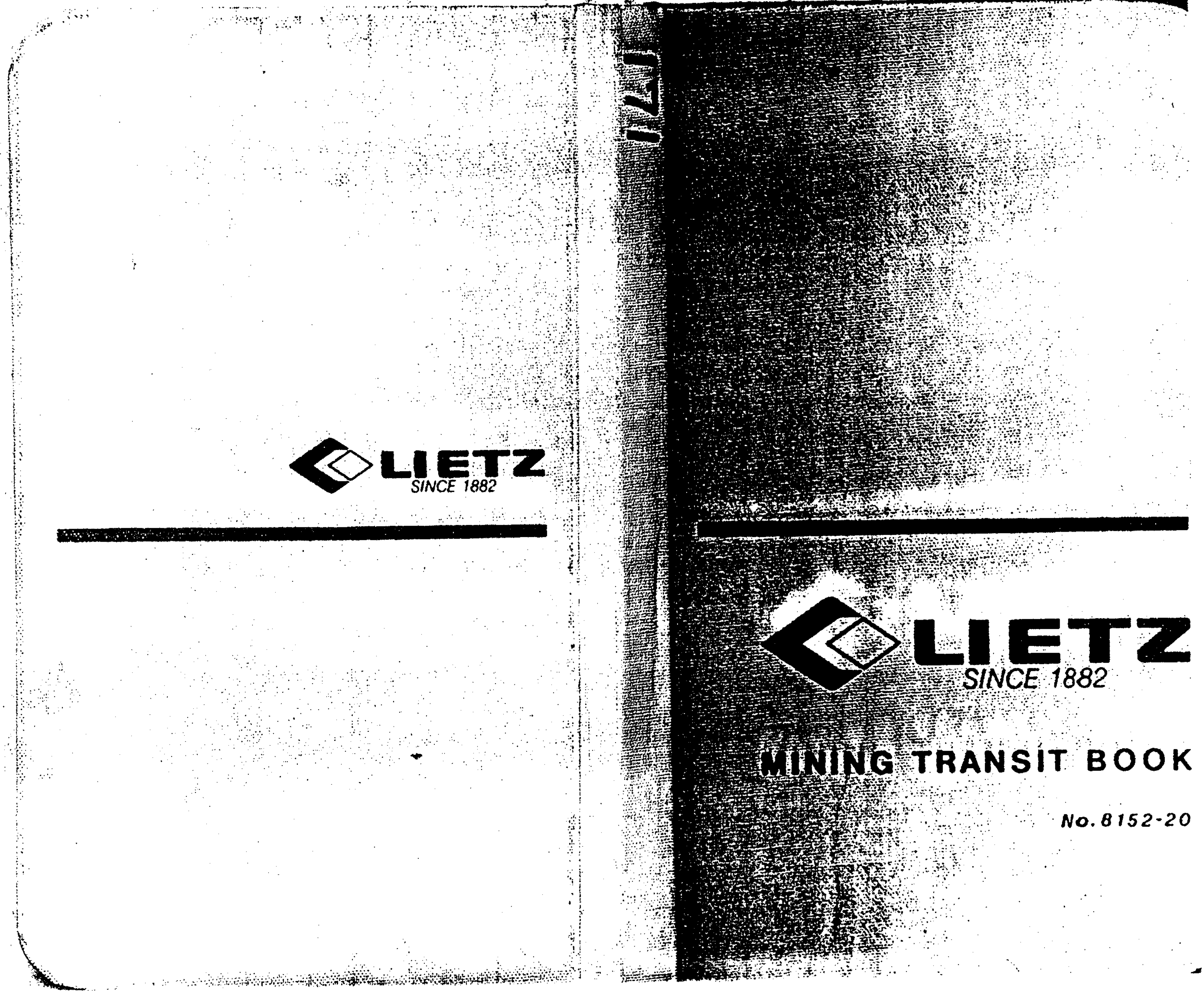
PT#68			6.71	1607.185
		1613.895		
TP nail	5.72		4.03	1608.175
		1612.205		
PT#69	4.70		4.87	1607.505
		1612.375		
TP nail	4.195		4.99	1608.18
		1613.17		
PT#68	5.975			1607.195
	B.S.	HI	F.S.	Elev.

VOID

Point #68 ∠ 0.01 Low

Point #69 P/K X-Sect. (North Point (Run A)
Location 200'± West of intersec.
of Danny Ln & Avenida Del Ray

Point #68 P/K X-Sect (From Pg 50



LIETZ
SINCE 1882

LIETZ

LIETZ
SINCE 1882

MINING TRANSIT BOOK

No. 8152-20

Page	Proj.	Remarks	1	2
3	15183 Rio Verde	PT #44 ½ IP		
5	. .	PT #50 ½ IP ▽BM		
7	. .	PT #45 ½ IP		
8	. .	PT #29 ½ IP		
9	. .	PT #47 BC		
11		PT #46 ½ IP		
13		PT #34 ½ IP		
14		PT #51 ½ IP ▽BM		
14		PT #49 ½ IP		
16		PT #56 ½ IP ▽BM		
18		PT #48 ½ IP		
20		PT #52 P/K No. 1		
17		PT #35 BC		
22		PT #64 IP		
23		PT #65 IP		
21		PT #55 P/K		5
25 - 26		PT BM Asher Ranch BC (USGS) (For Bench Correction)		
27		PT BM Asher BC (USGS) (Straightened up BC)		
28		TBM #85		
29	15182	PT #84 (Panel)		

Proj #15183

RIO VERDE
FLOOD STUDY

EQUATION FACTOR
THIS BOOK = -6.545

LEVELS CONT'

		1568.28			
T.P.	11.34		0.13	1556.94	
		1557.07			
T.P.	11.38		1.31	1545.69	
		1547.00			
T.P.	11.46		2.98	1535.54	
		1538.52	RETURN LEVELS		
PANEL 44	8.29		8.21	1530.23	ADJ. 1530.24
		1538.44			
T.P.	1.90		10.38	1536.54	
		1546.92			
T.P.	1.23		11.41	1545.69	
		1557.10			
T.P.	0.16		11.26	1556.94	
		1568.20			
T.P.	3.30		9.75	1564.90	
		1574.65			
T.P.	0.44		7.95	1574.21	
		1582.16			
B.M.	4.35			1577.81	
	B.S.	H.I.	F.S.	ELEV.	

12/7/93 3

⊼ P.A. CULVER
T K. GREGOR
φ C. GILLISON

55° WINDY

PT. #44 1/2" I.P./TAG FLUSH
W/ GROUND

B.M. "MOORE" U.S.C. & G.S.
△ STA. 1983 NAD

	B.S.	H.I.	F.S.	ELEV.	
		END RUN			
B.M.			4.74	1577.795	E.O.C. .015 low
		1582.535			
T.P.	8.335		0.96	1574.20	
		1575.16			
T.P.	10.26		3.38	1564.90	
		1568.28			

< P.O.B. "MOOREN"

H.I. FROM PREV. PG.

LEVELS CONT.

	B.S.	H.I.	F.S.	ELEV.		
Pt.#44			2.50	1530.24	E.O.C. FLAT	P.O.B. PANEL PT. #44
		1532.74				
T.P.	12.205		0.785	1520.535		
		1521.32				
T.P.	10.62		5.50	1510.70		
		1516.20	RETURN LEVELS			
Pt.#50	1.30		0.35	1514.90		T.B.M. #50 1/2" I.P.
		1515.25				
T.P.	4.55		10.635	1510.70		
		1521.335				
T.P.	0.80		12.345	1520.535		
		1532.88				
Pt.#44	2.64			1530.24		PANEL PT. #44, 1/2" I.P./TAG

TRIG. LEVELS FROM PT #50
TO PT. #43

⊼ @ 50
H.I. 5.54
P. H.

VERT. DIFF. FROM #50, EL=1514.90
TO T.P. #1000

D.
R.

D.
R.

D SLOPE DIST. =
D Z∢ =

R SLOPE DIST. =
R Z∢

		1533.22		
T.P.	7.285		2.70	1525.935
		1528.635		
PANEL #45	5.25		5.205	1523.385
		1528.59		
T.P.	6.09		1.505	1522.50
		1524.005		
T.P.	10.18		3.68	1513.825
		1517.505		
T.P.	7.18		2.98	1510.325
		1513.305		
T.P.	10.75		5.47	1502.555
		1508.025		
T.P.	6.34		7.06	1501.685
		1508.745		
T.P.	3.08		7.175	1505.665
		1512.84		
T.P.	4.31		7.32	1508.53
		1515.85		
T.P.	5.29		8.54	1510.56
		1519.10		
T.B.M.	4.20			1514.90
	B.S.	H.I.	F.S.	ELEV.

PANEL PT. # 45, 1/2" I.P./TAG

T.B.M. #50, 1/2" I.P.

8

		END	RUN		
PANEL #29			2.13	1555.10	F.O.C. .07 HI.
		1557.23			
T.P.	6.54		2.52	1550.69	
		1551.21			
T.P.	8.40		1.45	1542.81	
		1544.26			
T.P.	8.04		1.06	1536.32	
		1537.28			
T.P.	7.24		3.18	1530.04	
		1533.22			
	B.S.	H.I.	F.S.	ELEV.	

PANEL PT. #29. 1/2" I.P./TAG

H.I. FROM PREV. PG.

LEVELS CONT.

		1546.21		
T.P.	7.625		4.11	1538.585
		1542.695		
T.P.	6.835		4.025	1535.86
		1539.885		
		RETURN	LEVELS	
PANEL	5.05		5.28	1534.835
		1540.115		
T.P.	3.66		6.165	1536.455
		1542.62		
T.P.	5.36		7.45	1537.26
		1544.71		
T.P.	2.40		8.64	1542.31
		1550.95		
T.P.	3.44		8.01	1547.51
		1555.52		
T.P.	1.865		8.065	1553.655
		1561.72		
T.P.	2.43		6.83	1559.29
		1566.12		
PT.#24	2.67			1563.45
	B.S.	H.I.	F.S.	ELEV.

9

T 5N
R 7 E

PANEL PT.# 47, B.C. S32 | WC
NOTE: PANEL MATERIAL | MC
0.80' LOWER THAN CAP
1963

PANEL PT. #24 TOP B.C.

S.C.
T5N | S
S32 | S
1963

		END RUN			
Pt.#2A			3.04	1563.445	E.O.G .005 LOW
		1566.485			
T.P.	6.19		3.47	1560.295	
		1563.765			
T.P.	8.84		1.51	1554.925	
		1556.435			
T.P.	8.925		3.23	1547.51	
		1550.74			
T.P.	7.84		3.31	1542.90	
		1546.21			
	B.S.	H.I.	F.S.	ELEV.	

P.O.B. PT. #2A

H.I. FROM PREV. PG.

11

LEVELS CONT.

▲ RETURN LEVELS

	B.S.	H.I.	F.S.	ELEV.
PANEL #46	4.92	1510.33	4.995	1505.41
T.P.	1.95	1510.405	13.08	1508.455
T.P.	4.70	1521.505	7.865	1516.805
T.P.	1.04	1524.67	12.025	1523.63
T.P.	2.065	1535.655	7.12	1533.59
T.P.	9.515	1540.71	12.01	1531.195
T.P.	4.76	1543.205	2.42	1533.415
T.P.	4.525	1540.365	11.725	1536.34
T.P.	9.49	1548.065	9.15	1538.575
T.P.	2.805	1547.725	11.86	1544.92
PANEL #28	2.045	1556.78		1554.735

PANEL PT.# , 1/2" I.P./TAG PT #46
FLUSH W/ GROUND

PANEL PT. #28 , 1/2" I.P./TAG

PANEL #28			1.71	1554.735	E.O.C. FLAT
		1556.445			
T.P.	11.52		3.70	1544.[illegible]	
		1548.6[illegible]			
T.P.	9.13		6.085	1539.495	
		15[illegible]			
T.P.	2.545		4.27	1543.035	
		1547.305			
T.P.	12.77		5.55	1534.575	
		15[illegible]			
T.P.	1.72		[illegible].785	1538.345	
		1541.35			
T.P.	12.28		11.57	1529.07	
		1540.64			
T.P.	7.465		1.56	1533.175	
		1534.736			
T.P.	12.97		0.95	1521.765	
		15[illegible]15			
T.P.	5.80		4.13	1516.912	
		1521.045			
T.P.	12.99		2.275	1508.055	
		1510.33			
	B.S.	H.I.	F.S.	ELEV.	

P.O.B. PANEL #28, 1/2" I.P.

H.I. FROM PREV. PG.

LEVELS CONT.

PT. #24			3.605	1563.45	E.O.C. FLAT	P.O.B. PT. #24
		1567.055				
T.P.	3.63		5.15	1563.425		
		1568.575				
T.P.	8.015		8.16	1560.56		
		1568.72				
T.P.	6.45		5.67	1562.27		
		1567.94	RETURN LEVELS			
PANEL #34	8.26		8.425	1559.68		PANEL PT. #34, 1/2" I.P./TAG FLUSH W/GROUND
		1568.105				
T.P.	5.83		6.48	1562.275		
		1568.755				
T.P.	7.77		8.33	1560.985		
		1569.315				
T.P.	5.32		5.405	1563.915		
		1569.40				
PT. #24	5.95			1563.45		PANEL PT. #24, TOP B.C.
	B.S.	H.I.	F.S.	ELEV.		

12/9/93

LEVELS CONT.

		1531.915			
T.P.	5.045		4.53	1526.87	
		1531.40	RETURN LEVELS		
PANEL #49	5.94		6.125	~~1525.46~~	ADJ. 1525.47
		1531.585			
T.P.	4.715		4.95	1526.87	
		1531.82			
T.P	4.205		4.20	1527.615	
		1531.815			
T.B.11	1.82		7.50	1529.995	
		1537.495			
T.P.	1.945		8.66	1535.55	
		1544.21			
T.P.	2.38		5.81	1541.83	
		1547.64			
T.P.	2.07		9.56	1545.57	
		1555.13			
T.P.	1.27 ✓		9.72 ✓	1553.86 ✓	
		1563.58			
PANEL #34	3.90 ✓			1559.68	
	B.S.	H.I.	F.S.	ELEV.	

PANEL PT #49, ½" I.P. W/TAG
FLUSH W/GROUND

T.B.11 #51, ½" I.P.

PANEL PT. #34, ½" I.P./TAG FLUSH
W/GROUND

		END	RUN			
PANEL #34			2.19	1559.66	E.O.C. .02' LOW	P.O.B. PANEL PT #34
		1561.85				
T.P.	10.47		0.31	1551.38		
		1551.69				
T.P.	9.295		3.055	1542.395		
		1545.45				
T.P.	9.90		1.95	1535.55		
		1537.50				
T.P.	7.505		1.83	1529.995		
		1531.825				
T.P.	4.205		4.295	1527.62		
		1531.915				
	B.S.	H.I.	F.S.	ELEV.		

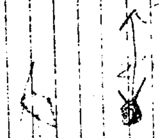
LEVELS CONT.

TP Nail			2.345	1533.98
		1536.325		
	7.525			
TP Nail			1.57	1528.80
		1530.37		
	9.375			
TP Nail			5.58	1520.995
		1526.575		
	7.20			
TP Nail			3.385	1519.375
		1522.76		
	9.075			
TBM 56			7.805	1513.685
		1521.49		
	3.26			
TP Nail			7.48	1518.23
		1525.71		
	4.075			
TP Nail			8.245	1521.635
		1529.88		
PANEL #49	4.41			1525.47
	B.S.	H.I.	F.S.	Elev.

16

12/9/93

R. DUDLEY
Rod: T. K. GRASSEDFF
P.C. SIMPSON



TBM #56 Concrete Slab (Spike Nail Flush in the North Part of the Slab.) Broder Resv. to the N. 5'±)

PANEL PT. #49 1/2" I.P./TAG FLUSH W/ GROUND

		END RUN		
Panel #35			5.24	1547.14
		1552.38		
	6.86			
TP nail			2.58	1545.52
		1548.10		
	8.52			
TP nail			2.65	1539.58
		1542.23		
	8.25			
F				1533.98
	B.S.	HI	F.S.	Elev

(B.C. is @ West End of Panel Leg.)

Point # 35 BC (U.S. CADASTRAL Survey, Bureau of Land Man.

T 4N R 7E

S-6	S-5
S-7	S-8

{ BC in concret

1965

West side of FT McDowell Rd

LEVELS CONT.

Point #48			5.805	1529.31
		1535.115		
	4.365			
TP No 1			6.715	1530.75
		1537.465		
	5.63			
TP Nail			3.305	1531.835
		1535.14		
	5.96			
TP Nail			5.78	1529.18
		1534.96		
	6.205			
TP Nail			3.805	1528.755
		1532.56		
	8.785			
TP Nail			8.315	1523.725
		1532.09		
	1.57			
TP Nail			8.11	1530.52
		1538.63		
Pt. #51	8.635			1529.995
	B.S.	HI	F.S.	Elev.

Point #48 ½" IP
Flush w/ Ground

Pt. #51 T.B.M. ½" I.P.

End of Circuit

TBm Point #51			8.525	1530.00
		1538.525		
	8.565			
TP Nail			1.75	1529.96
		1531.71		
	5.40			
TP Nail			10.87	1526.31
		1537.18		
	7.395			
TP Nail			6.59	1529.785
		1536.375		
	8.23			
TP Nail			7.04	1528.145
		1535.185		
	4.39			
TP Nail			6.605	1530.795
		1537.40		
	6.29			
TP Nail			3.94	1531.11
		1535.05		
Point #48	5.74			1529.31
	B.S.	H.I.	F.S	Elev.

TBm Point #51 check 0.005 High

Point #48

Levels Cont.

	B.S.	H I	F.S.	Elev.	
		End of	Circuit		
TP			6.00	1616.54	✓ Flat
	3.765	1622.54			
Point #52			3.835	1618.775	Point #52 Plk Nail in middle Rd 125'± N/W of Poco Rio Dr. & Medelice La.
TP	6.07	1622.61		1616.54	(From Book #1 Page 67) TP @ The Intersec. Poco Rio Dr. & Medelice La. (Sewer MH North edge

Levels Contd.

PT#35			4.75	1547.135	Point #35 ✓ 0.005 Low
		1551.885			
TP Nail	4.02		9.05	1547.865	
		1556.915			
TP Nail	0.985		10.06	1555.93	
		1565.99			
TP Nail	2.51		7.77	1563.48	
		1571.25			
PT#55	2.855		2.64	1568.395	Point #55 P/K (Location @ the intersec of FT McDowell Rd & N. Forest Rd)
		1571.035			
TP Nail	7.555		2.40	1563.48	
		1565.88			
TP Nail	9.95		0.85	1555.93	
		1556.78			
TP Nail	8.91		4.18	1547.87	
		1552.05			
PT#35	4.91			1547.14	Point #35 BC (From Pg. 17
	B.S	H.I	FS	Elev.	

Levels Cont.

PT #35			6.49	1547.14	Point #35 ✓ Flat
		1553.63			
TP Nail	10.875		2.30	1542.755	
		1545.055			
TP Nail	7.315		2.88	1537.74	
		1540.62			
PT #64	7.85		8.07	1532.77	Point #64 ½" IP (Flush w/Ground)
		1540,84			
TP Nail	3,10		7.31	1537.74	
		1545.05			
TP Nail	2.29		10.73	1542.76	
		1553.49			
PT #35	6.35			1547.14	Point #35 BC (From Pg 17
	B.S.	HI	F.S.	Elev.	

Levels Cont.

Pt #56			4.07	1513.665	Point #56 ✓ 0.02 Low
		1517.735			
TP point	9.01		5.85	1508.725	
		1514.575			
TP ~~[illegible]~~ point	8.11		7.385	1506.465	
		1513.85			
TP point	8.915		5.21	1504.935	
		1510.145			
Pt #65	5.10		5.37	1505.045	Point #65 (1/2" IP) ▽ Flush w/Ground
		1510.415			
TP point	5.47		8.61	1504.945	
		1513.555			
TP ~~point~~ point	7.08		8.11	1506.475	
		1514.585			
TP point	5.845		8.915	1508.74	
		1517.655			
Pt #56 ▽BM	3.97			1513.685	Point #56 ▽BM (From Pg. 16
	B.S.	H.I	F.S.	Elev	

B.S.	H.I.	F.S.	Elev

BENCH CORRELATION
TO RIO VERDE PROJECT
↑ RETURN LEVELS ↑

PANEL #4	12.80	1808.965	9.405	1796.165
T.P.	4.14	1805.57	9.305	1801.41
T.P.	1.895	1810.715	10.61	1808.82
T.P.	0.79	1819.43	11.31	1818.64
T.P	0.105	1829.95	5.165	1829.845'
T.P.	4.62	1835.01	12.70	1830.39
T.P.	1.58	1843.09	11.40	1841.51
T.P.	1.91	1852.91	9.76	1851.00
B.M.	2.31	1860.76		1858.45
	B.S.	H.I.	F.S.	Elev

12/28/93 25
~~TC~~ P.A. CULVER
⊼ K. GREGGEOR
PANEL #4, FD. 1/2" RB. & C. SIMPSON
W/ PLASTIC CAP MKD. "R. DUDLEY
TABOR 19857" @
POSSIBLE N.W. COR. SEC. 34,
5N. ~ 6E.

B.M. ASHERS RANCH, 3 MI. W. OF;
2.2 MI. W. OF VERDE RIVER RD;
10 FT. N. OF RD.; STANDARD IRON
POST W/ BRONZE CAP STAMPED
"1859 PHNX" ELEV.= 1858.45'

END RUN

B.M.			2.385	1858.45
		1860.835		
T.P.	7.005		0.705	1853.83
		1854.535		
T.P.	9.11		1.49	1845.425
		1846.915		
T.P.	12.17		1.43	1834.745
		1836.175		
T.P.	7.42		8.225	1833.755
		1836.15		
T.P.	9.225		0.335	1827.755
		1828.09		
T.P.	10.745		0.945	1817.345
		1818.29		
T.P.	10.185			1808.105
			0.86	
		1808.965		
	B.S.	HI	F.S.	Elev.

P.O.B., E.O.C. FLAT

H.I. FROM PREV. PG.

BENCH CORRELATIONS TO
RIO VERDE PROJECT

12/28/93

THIS IS A ✓ ONLY

DO NOT USE!
SEE PA.C.

	B.S.	H.I.	F.S.	ELEV.
P.O.B.			3.88	1571.39
PANEL 31	4.815	1575.27	4.90	1570.455
B.M.	3.965	1575.355		1571.39

P.O.B. E.O.C. FLAT

PANEL #: 1/2" I.P./TAG
(1577.025 ADJ. ELEV.)

B.M.: ASHERS .5 MI. N.W. OF @ CROSSROADS STANDARD IRON POST W/ U.S.G.S. BRONZE CAP STAMPED "1512 PHNX." NOTE: BENT OVER STRAIGHTENED TO UPRIGHT POSITION, ELEV. = 1571.387'

		END	RUN		E.O.C.
TBM "A"			4.555	1667.72	FLAT
TP/NAIL	5.37	1672.275	4.355	1666.905	
T.BM/NAIL	6.80	1671.26	6.765	1664.46	
TP/NAIL	4.545	1671.225	5.63	1666.68	
TBM "A"	4.59	1672.31		1667.72	
	B.S.	H.I.	F.S.	ELEV.	

P.O.B.

T.BM. #85, 60 D NAIL SET IN S,
FACE OF DEAD MOSQUITE TREE @
± 75 FT. N. OF PT# 84 (MISSING BC

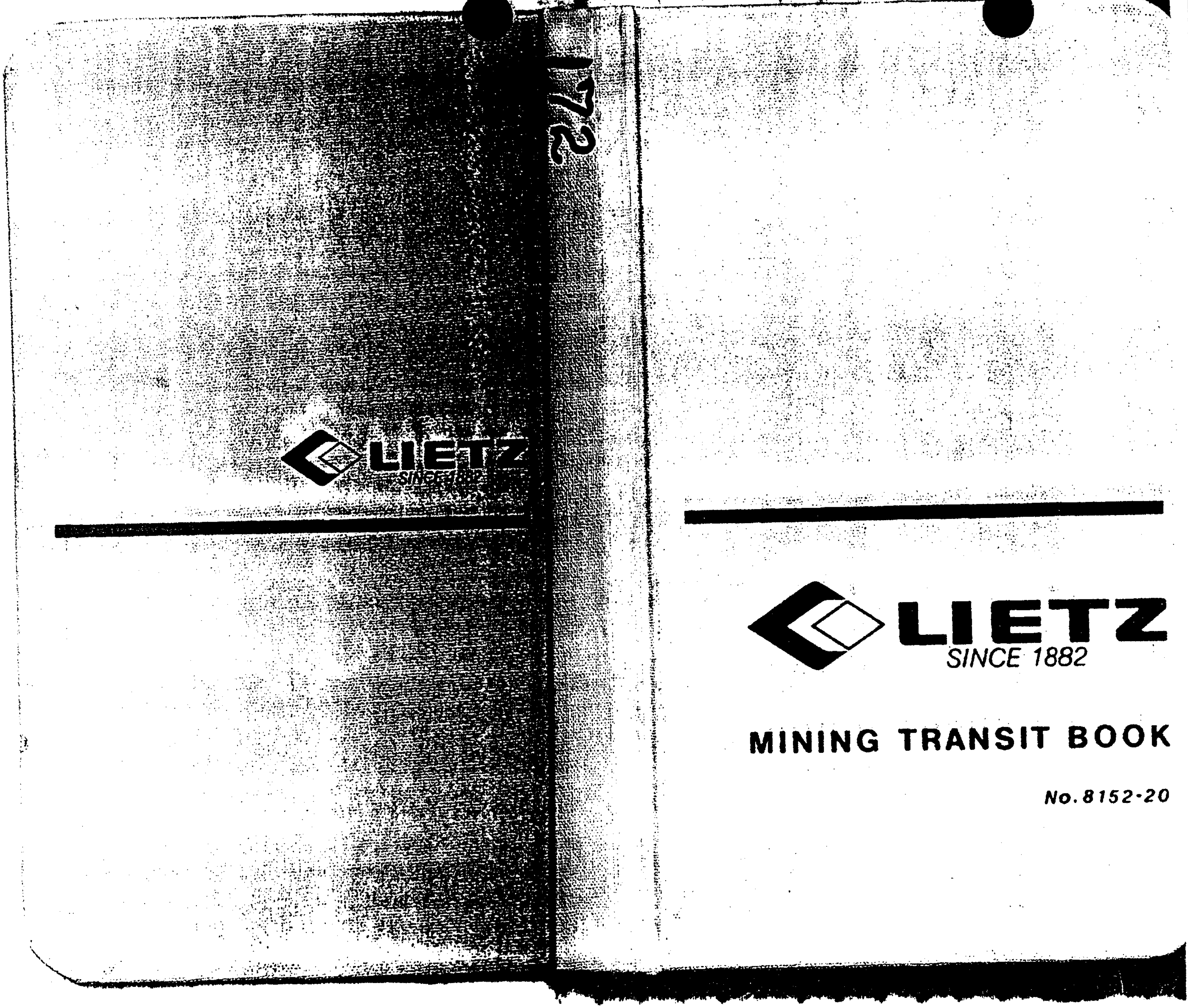
TBM "A", SPIKE NAIL IN N. FACE
OF 12" PALO VERDE TREE @
± 350 N. OF SEC. 25, 30, 24, 19 (POINT 84)

	B.S.	H.I.	F.S.	ELEV.	
		END	RUN		
T.B.M. #85			3.42	1664.46	E.O.C. FLAT
		1667.88			
PANEL #84	5.965		6.005	1661.915	
		1667.92			
T.B.M. #85	3.46			1664.46	

P.O.B.

PANEL PT #84, MISSING BRASS CAP
SEC. CORN. 25, 30, 24, 19 T5N R 6/7 E

TBM. #85, 60D NAIL SET IN
S. FACE OF DEAD MOSQUITE
TREE @ ± 75 FT N. PT. #84



LIETZ
SINCE 1882

172

LIETZ
SINCE 1882

MINING TRANSIT BOOK

No. 8152-20

Page	Proj. 15183	Remarks
3	Rio Verde	PT#66 X-Sect. #1
4	" "	PT#67 X-Sect. #1
5	" "	PT#68 X-Sect. #2
6	" "	PT #69 X-Sect. #2
7	" "	PT #73 X-Sect. #3
8	" "	PT #72 X-Sect. #3
9	" "	PT #71 X-Sect. #5
10	" "	PT #70 X-Sect. #5
11	" "	PT #200 For Data Collector (P/K/Tag) middle X-Sect. #5
12	" "	PT #76 X-Sect #6
13	" "	PT #77 X-Sect #7
14	" "	PT #78 X-Sect #7
15	" "	PT #79 X-Sect #8
16	" "	PT #82 X-Sect #9
17	" "	PT #81 X-Sect #10
18	15183	PT #80 X-Sect #10

2

LEVELS TO "X" SECTION
CONTROL POINTS
RIO VERDE PROJECT
15183

LEVELS TO "X" SECTION 1

PT#54			9.54	1640.145
		1649.685		
TP	1.10		7.715	1648.585
		1656.30		
TP No. 1	2.06		6.14	1654.24
		1660.38		
PT#66	3.195		3.385	1657.185
		1660.57		
TP No. 1	6.33		2.08	1654.24
		1656.32		
TP No. 1	7.74		1.01	1648.58
		1649.59		
PT#54	9.445			1640.145
	B.S.	HI.	F.S.	Elev.

Point #54 ✓ Flat

Point #66 ½" IP X-Sect (South Point
Pipe Flush w/Ground

PT #54 BC

LEVELS TO "X" SECTION 1

PT#66			3.60	1657.19	Point #66 ✓ 0.005 High
		1660.79			
TP No. 1	2.84		2.24	1657.95	
		1660.19			
PT #67	4.63		4.81	1655.56	Point #67 ½" IP X-Sect, (North Point) Pipe Flush w/Ground
		1660.39			
TP [illegible]	2.42		2.99	1657.95	
		1660.94			
PT#66	3.755			1657.185	Point #66 ½" IP X-Sect
	BS	HI	FS	Elev.	

LEVELS TO "X" SECTION 2

PT#54			1.085	1640.16
		1641.245		
TP Nail	9.505		2.92	1631.74
		1634.66		
TP Nail	9.90		1.86	1624.76
		1626.62		
TP Nail	8.265		2.22	1618.355
		1620.575		
TP Nail	8.90		3.71	1611.675
		1615.385		
PT#68	8.19		8.36	1607.195
		1615.555		
TP	3.88		8.935	1611.675
		1620.61		
TP Nail	2.255		7.95	1618.355
		1626.305		
TP Nail	1.55		9.68	1624.755
		1634.435		
TP Nail	2.71		9.34	1631.725
		1641.065		
PT#54	0.92			1640.145
	B.S.	HI	F.S.	Elev.

Point #54 ← 0.015 High

Point #68 P/K X-Sect (South Point Pvm't

Location 150± West of intersection of Dawning Ln & White Wing Dr.

Point #54

LEVELS TO "X" SECTION 2

PT#68			6.71	1607.185
		1613.895		
T.P.	5.72		4.03	1608.175
		1612.205		
PT 69	4.70		4.87	1607.505
		1612.375		
T.P.	4.195		4.99	1608.18
		1613.17		
PT#68	5.975			1607.195
	B.S.	HI	F.S.	Elev.

Point #68 ✓ 0.01 Low

Point #69 Punch P/K X-Sect (North Point)
Located 200'± West of intersect of Danny Lane Avenida Del [illegible]

Point #68 X-Sect

LEVELS TO "X" SECTION 3

		END	RUN		
PT. #52			8.37	1618.78	E.D.C. .005 HIGH
		1627.15			
T.P. P/K	7.42		8.11	1624.73	
		1632.84			
T.P. P/K	5.41		7.405	1627.43	
		1634.835			
PT. #13	2.30		2.40	1632.535	
		1634.935			
T.P. P/K	7.51		5.47	1627.425	
		1632.895			
T.P. P/K	8.17		2.325	1624.725	
		1627.05			
PT #52	8.275			1618.775	
	B.S.	H.I.	F.S.	Elev.	

P.O.B.

POINT #73, ½" I.P. SET SOUTH END OF GOLF COURSE FOR "X" SECTION.

POINT #52 P/K in MIDDLE RD. 125 ± N.W. OF POCO RIO FR. MEDELICE LN.

LEVELS TO "X" SECTION 3 CONT.

P.O.B			6.335	1632.525	P.O.B. E.O.C. .01' LOW
T.P.	1.29	1638.86	11.87	1629.57'	
		RETURN LEVELS			
PANEL #72	2.18	1641.44	1.81	1639.26	PANEL #72, 1/2" I.P. FLUSH
T.P.	11.495	1641.07	8.69	1629.575	
PANEL 73	5.73	1638.865		1632.535	P.#73
	B.S.	H.I.	F.S.	ELEV.	

LEVELS TO "X" SECTION 5
N. END

12/29/93 9

PAC
RD
KG
CS

B.M. P.O.B.			9.02	1577.805
		1586.825		
T.P.	1.73		10.275	1585.095'
	RETURN LEVELS			
		1595.37		
PANEL #	1.755		1.815	1593.615
		1595.43		
T.P.	10.33		1.81	1585.10
		1586.91		
B.M.	9.10			1577.81
	B.S.	H.I.	F.S.	ELEV.

P.O.B. (E.O.C. .005 LOW)

PANEL # 71, P.K./TAG @ INTER.
RIO VERDE & FT. McDOWELL RDS.

B.M. "MOOREN" U.S.G. & G.S.
Δ STA.

LEVELS TO "X" SECTION 5, S. END

12/29/93

			END RUN			
P.O.B.			2.445	1596.15		P.O.B. (E.O.C. FLAT)
		1598.595 RETURN	LEVELS			
PANEL 70	2.98		3.07	1595.615		PANEL 70, P.K./TAG
		1598.685				
T.B.M.	2.535			1596.15	ADJ. ELEV.	T.B.M. AZ. HWY. DEPT. B.C. @ INTER. FT. MCDOWELL (FOREST) & TONTO TRAIL (NOTE: ELEV. BACKED IN FROM MOORE!!)
	B.S.	H.I.	F.S.	ELEV.		

LEVELS TO "X" SECTION 5 (MIDDLE)

		END	RUN		
PT #200 For Data Collector MIDPOINT PK/TAG			4,745		
			3,57	1595.36	NO CLOSURE
			2.40		
		1598.93			
	7.73		8,81		
TP/NAIL	6.62		7.42	1592.31	
	5.51		6.04		
		1599.73			
	4.63		4.39		
TP/NAIL	3.265		2.80	1596.465	
	1.905		1.215		
		1599.265			
	5.57		6.51		
T.P./P.K.	3.91		5.235	1595.355	
	2.25		3.96		
		1600.59			
	8.25				
PANEL 71	6.975			1593.615	
	5.705				
	B.S.	H.I.	F.S.	ELEV.	

P.K./TAG @ APPROX. MIDDLE "X"
SEC. 5 PT #200 For Data Collector

PANEL #71

LEVELS TO "X" SECTION "6"

NOTE! TRIG. ELEV. TO S. END "X" SEC 6, PT. #75 ELEV. = 1810.42

END RUN

PT#21			4.78	1800.52	E.O.C. .005 LOW	P.O.B.
		1805.30				
TP/NAIL	10.04		3.67	1795.26		
		1798.93				
TP/NAIL	6.625		5.05	1792.305		
		1797.355				
PANEL #76	8.675		8.665	1788.69		PANEL #76, 1/2" I.P. EAST OF DIRT ROAD
		1797.345				
TP/NAIL	5.035		6.525	1792.31		
		1798.83				
TP/NAIL	3.57		9.99	1795.26		
		1805.25				
PT.#21	4.725			1800.525		pt.#21 B.C., 1/4 COR. SEC. [illegible], T5N~R6E
	B.S.	H.I.	F.S.	ELEV.		

LEVELS TO "X" SECTION 7
(S.END)

		END	RUN			
PT.21			2.14	1800.52	E.O.C. .005 LOW	P.O.B.
		1802.66				
TP/NAIL	3.305		4.47	1799.355		
		1803.825				
PANEL #77	5.525		5.54	1798.30		PANEL PT #77, ½" I.P.C. E. SIDE OF DIRT ROAD
		1803.84				
TP/NAIL	4.485		3.245	1799.355		
		1802.60				
PT.21	2.075			1800.525		B.C. PT.#21, ¼ COR. S35 & S36 T5N ~ R6E
	B.S.	H.I.	F.S.	ELEV.		

LEVELS TO "X" SECTION 7
N. END

	B.S.	H.I.	F.S.	ELEV.	
		END RUN			
P.O.B.			6.74	1798.29	P.O.B. , E.O.C. .01 LOW
		1805.03			
T.P.	7.05		6.54	1797.98	
		1804.52			
		RETURN LEVELS			
PANEL 78	2.94		2.84	1801.58	PANEL # 78, 1/2" I.P./TAG
		1804.42			
T.P.	6.44		7.03	1797.98	
		1805.01			
PANEL 77	6.71			1798.30	PANEL 77

LEVELS TO "X" SECTION 8
(SOUTH END)

	B.S.	H.I.	F.S.	ELEV.	
P.O.B.			1.825	1819.145'	P.O.B. E.O.C. FLAT
T.P.	7.05	1820.97	8.22	1813.92	
		RETURN LEVELS			
PANEL 79	8.38	1822.14	8.45	1813.76	PANEL 79, ½" I.P.
T.P.	8.285	1822.21	7.09	1813.925	
T.B.M.	1.87	1821.015		1819.145	60D NAIL IN PALO VERDE TR.

LEVELS TO "X" SECTION 9

12/31/93
P.A. CULVER
R. DUDLEY
K. GAGGTOR

NOTE: TRIG. ELEV. TO S. END "X" SEC. 9
ELEV. = 1601.855
PANEL 83

END

	B.S.	H.I.	F.S.	ELEV.	
P.O.B.			4.42	1598.205	P.O.B., E.O.C. FLAT
PANEL 82	5.47	1602.625	5.53	1597.155	PANEL PT. 82, 1/2" I.P., N. END "X" SECTION 9
PANEL 9	4.48	1602.685		1598.205	PANEL #9, 1/2" I.P.

LEVELS TO "X" SECTION 10

End Run

PT#4			6.87	1802.71	EO C Flat	POB
		1809.58				
TP/Nail	6.01		6.455	1803.57		
		1810.025				
PT#81	6.435		6.54	1803.59		Panel #81 ½" I.P. w/Tag - C Approx 500 ft North of PT#4
		1810.13				
TP/nail	6.56		6.04	1803.57		
		1809.61				
PT#4	6.90			1802.71		PT. #4, PLASTIC CAP (TABOR)
	B.S.	H.I.	F.S.	ELEV.		

Level To "X" section 10

		▽End Run			
P▽#81			6.41	1803.595 EOR 0.005 ft.	P.o.T.
		1810.005			
P▽#80	3.885		3.95	1806.12	Panel #80 1/2" IP w/Tag @ Approx. 700 ft North of PT#4
		1810.07			
P▽#81	6.48			1803.59	Panel #81 1/2" IP w/Tag @ Approx. 500 ft North of P▽#4
	B.S.	H.I.	F.S.	Elev.	

SECTION 2: Mapping and Surveying Information

2.4 Watershed and Hydrologic Analysis Maps
2.5 Hydraulic Analysis Maps
2.6 FIRM/FHBM Draft Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Interoffice Memorandum

SUBJECT : Rio Verde North Floodplain Delineation Study (FCD 93-06)

TO : Whom it may concern **FROM :** HMushtaq **DATE :** August 20, 1996

VIA : PACalza

The Mylar maps/work maps of the above mentioned project are revised as explained in the attached letter from the consultant, Burgess and Niple, Inc. The revisions are effective as of the date of this memorandum.

Should you have further questions, please do not hesitate to contact me at 506-1501.

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS

Mr. Hasan Mushtaq
Flood Control District of
Maricopa County
2801 W. Durango
Phoenix, AZ 85009

Re: Rio Verde North
Floodplain Delineation Study
FCD 93-06

FLOOD CONTROL DISTRICT
RECEIVED
AUG 15 1996

CHIEF		P & PM
DEP		REG
ADMIN		LMGT
FINANCE		FILE
C & M		
ENGR		

REMARKS

August 15, 1996

Dear Mr. Mushtaq:

Burgess & Niple, Inc.
5025 East Washington Street
Suite 212
Phoenix, AZ 85034
602 244-8100
Fax 602 244-1915

Returned herewith are the original hydraulic analysis maps received with your letter dated August 13, 1996. We received only one set of maps. Maps showing the floodway were not included.

The original Mylar maps have been revised to correct the flow values on Wash A and on the first two cross sections on Wash I. The flood elevations shown on the maps are correct and are in agreement with the HEC-2 files. The HEC-2 files in the final Technical Data Notebook are correct.

The Initial HEC-2 Model was submitted for review on May 20, 1994. We submitted Special Problems and Supercritical HEC-2 Model on July 20, 1994 and resubmitted a revised version of that package on August 24, 1994. The August 24 submission was the first that included work maps showing flood elevations and flows. At this time the maps and HEC-2 model were in agreement except for the previously mentioned error on Wash I.

Flows in the HEC-2 model for Wash A were subsequently changed to account for outflows to Rio Verde South and inflows from Rio Verde South to Rio Verde North, resulting from coordination with McLaughlin Kmetty Engineers, Ltd. Flows on the maps were not revised.

Therefore, the maps were not correct in the following, subsequent submissions:

November 3, 1994	-	Floodways
March 6, 1995	-	Technical Data Notebook for District review
March 24, 1995	-	Technical Data Notebook for FEMA submission
October 9, 1995	-	Final Technical Data Notebook and Floodways

Enclosed also are two sets of prints of the revised hydraulics analysis maps and two sets of prints of the revised floodway maps.

If you have additional questions, please call me at (602) 244-8100.

Very truly yours,

Larry D. Culler

Larry D. Culler, PE

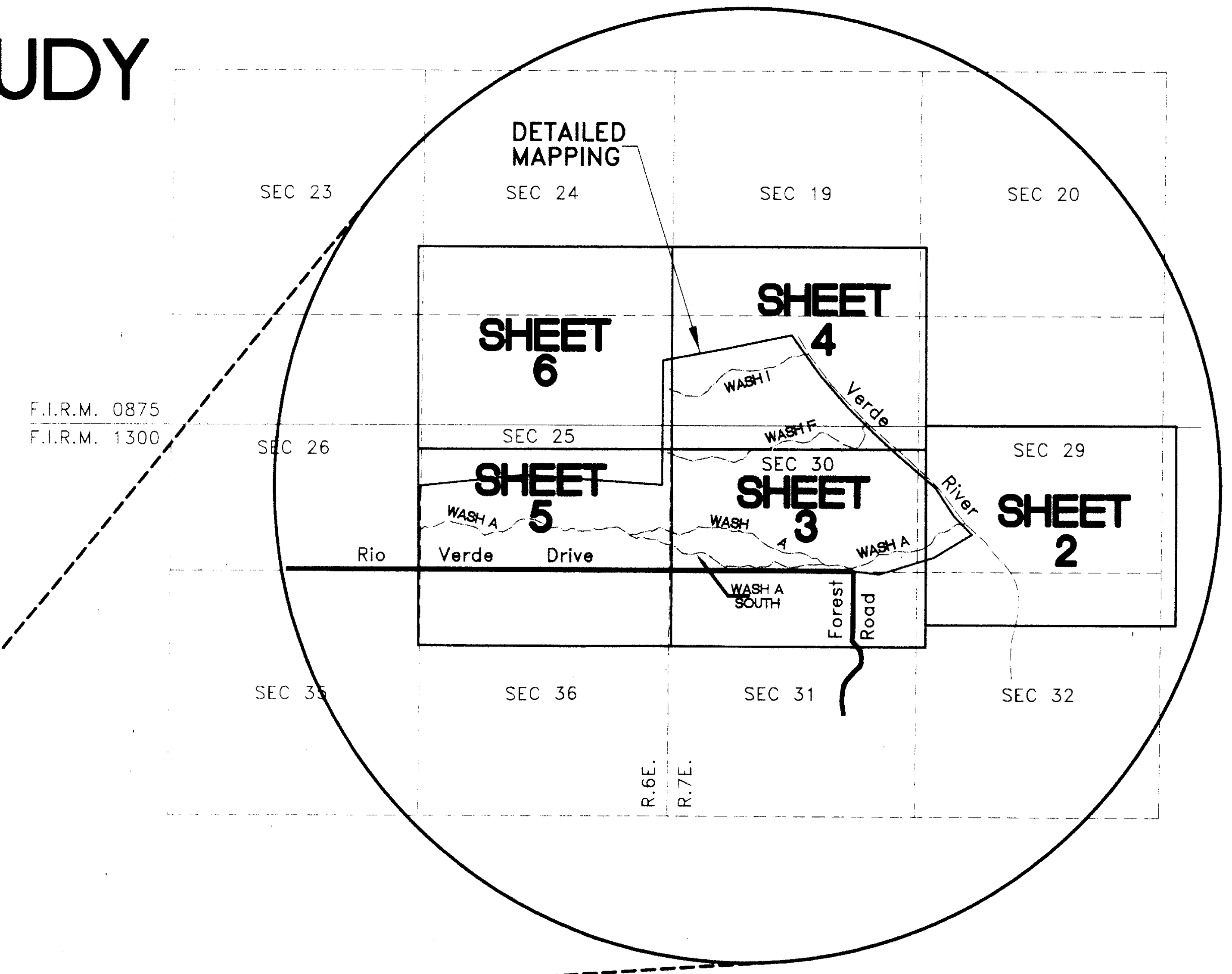
LDC:pr

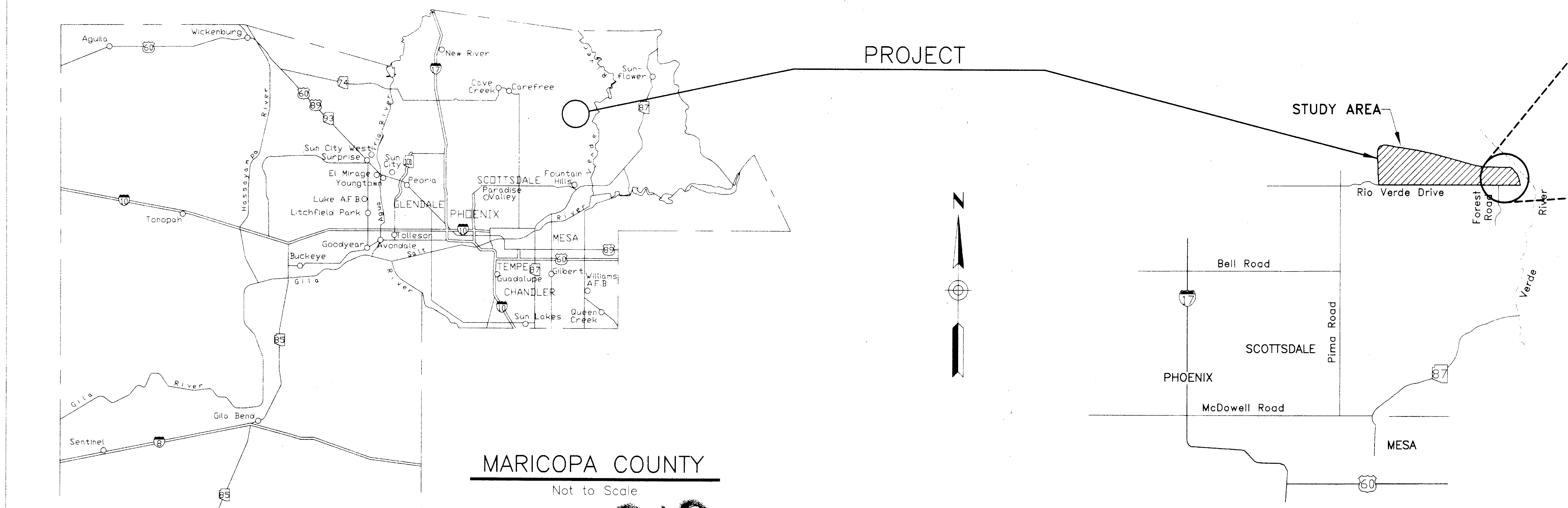
Enclosures

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

UN-NAMED WASH A
UN-NAMED WASH A SOUTH
UN-NAMED WASH F
UN-NAMED WASH I

RIO VERDE - NORTH
FLOODPLAIN DELINEATION STUDY
FCD 93-06





MARICOPA COUNTY
Not to Scale

318

VICINITY MAP
Not to Scale

AERIAL MAPPING COMPANY, INC.
FLOWN DECEMBER 22, 1993
STUDY DATE: AUGUST 1995

10/9/95

BURGESS & NIPLE
ENGINEERS
ARCHITECTS

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	▬▬▬
SECTION CORNER	○
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — M13.0
CROSS SECTION	(A) FD=100 Yr WSE (A)
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	~~1221~~
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	☐
UTILITY POLES	■ ■
PAVED ROADS	═══
DIRT ROADS	- - -

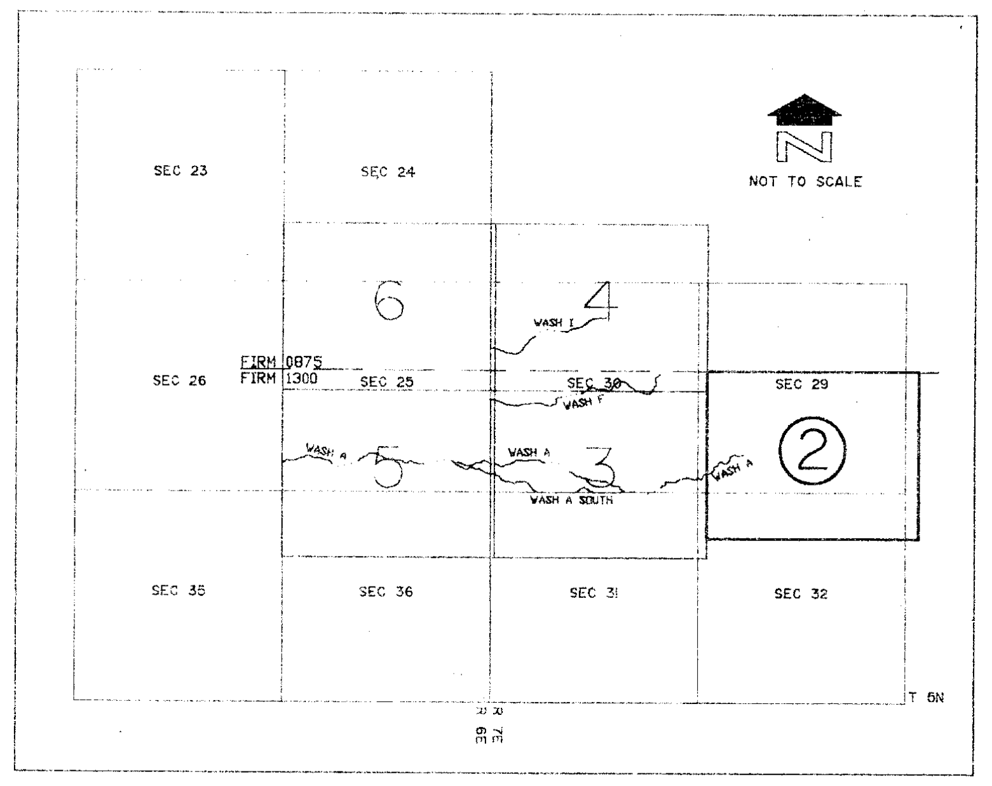
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#2	*ERM EL = 1544.580*	*This station is located at Section Corner (29,30,31,32). The mark is a brass cap.*

NOTES

INDEX MAP



200 0' 200 400

SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:
DATE

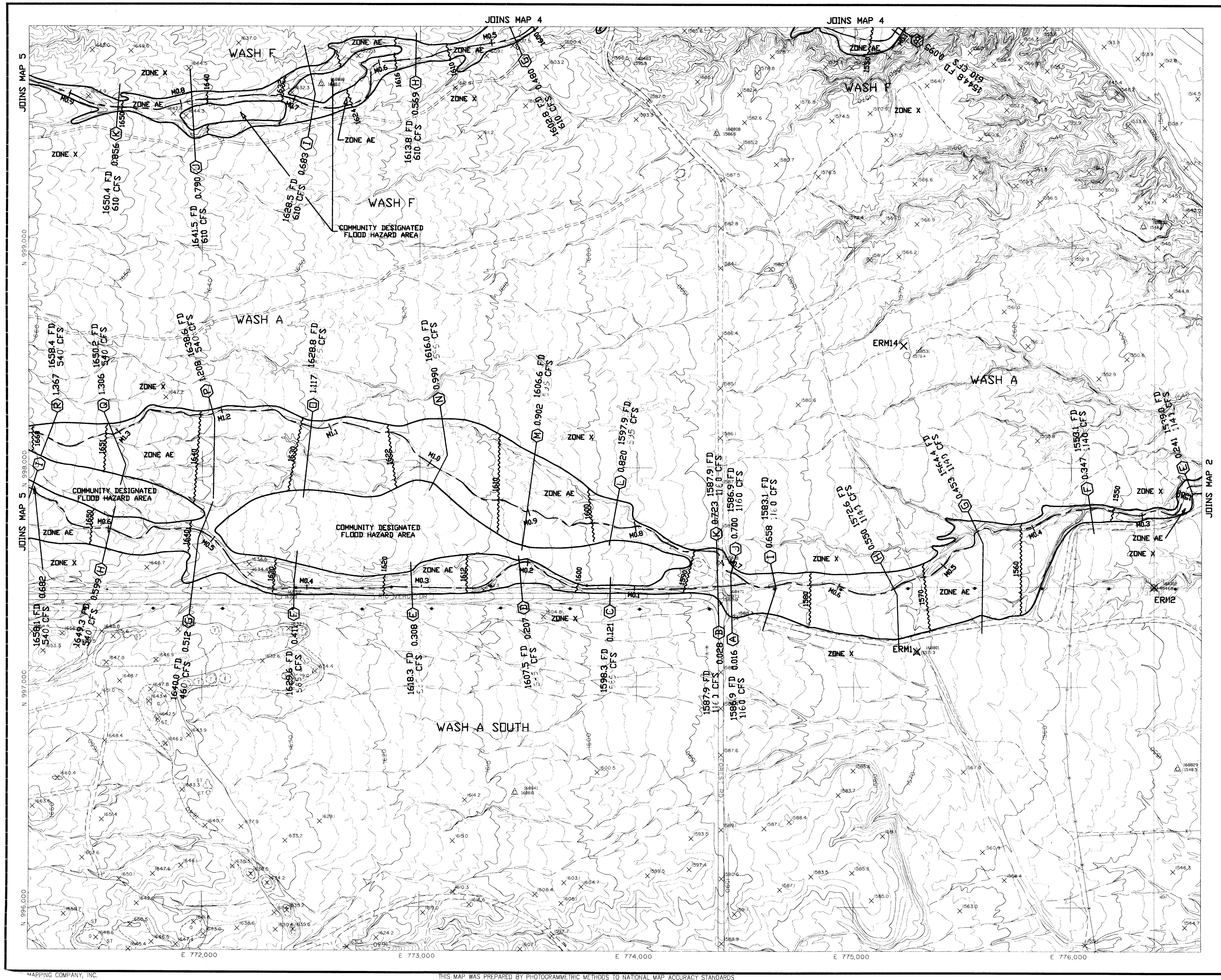
APPROVED BY:
DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 2 OF 6

AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION CORNER	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	A FD=100 Yr WSE A
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	■ ■
PAVED ROADS	
DIRT ROADS	

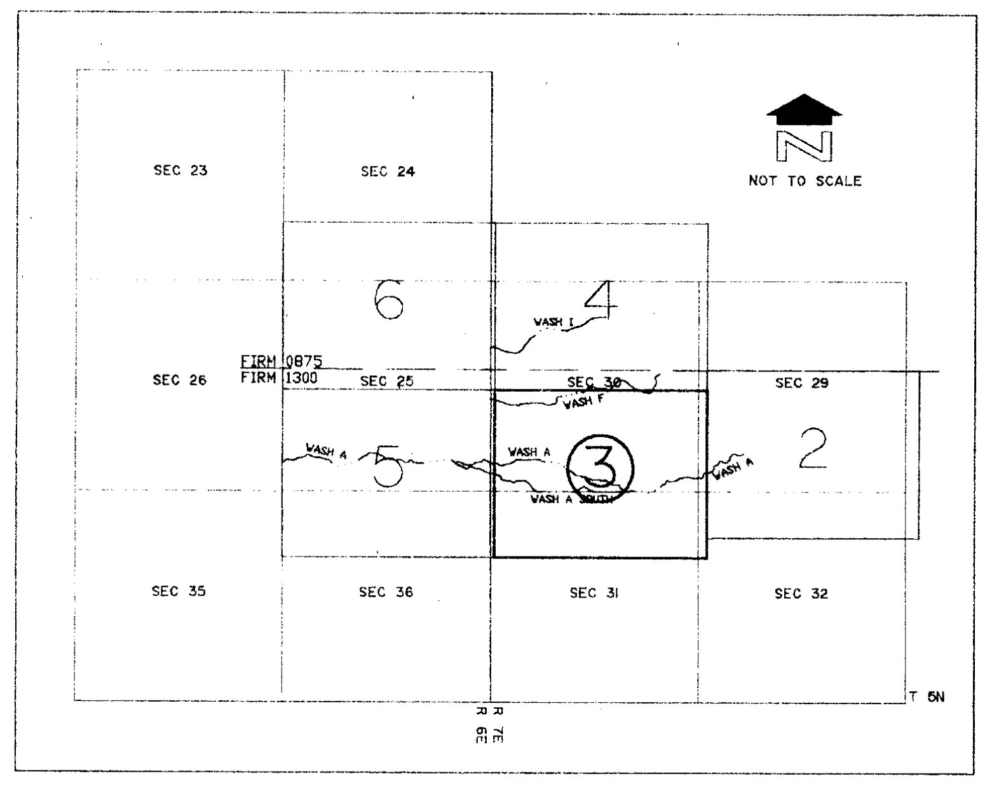
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#1	*ERM EL = 1571.265*	*This station is located approximately 0.17 miles east of Forest Road to th Box Bar Ranch. The mark is a brass cap stamped U.S. Coast and Geodetic Survey.*
ERM#2	*ERM EL = 1544.580*	*This station is located at Section Corner (29,30,31,32). The mark is a brass cap.*
ERM#14	*ERM EL = 1571.387*	*This station is located approximately 0.22 miles north along the graded Forest Service road from its intersection with Forest Road and Rio Verde Drive, thence east approximately 0.16 miles from the graded Forest Service road. The mark is a brass cap stamped "1572 PHNX".*

NOTES

INDEX MAP



200 0' 200 400

SCALE: 1"= 200'

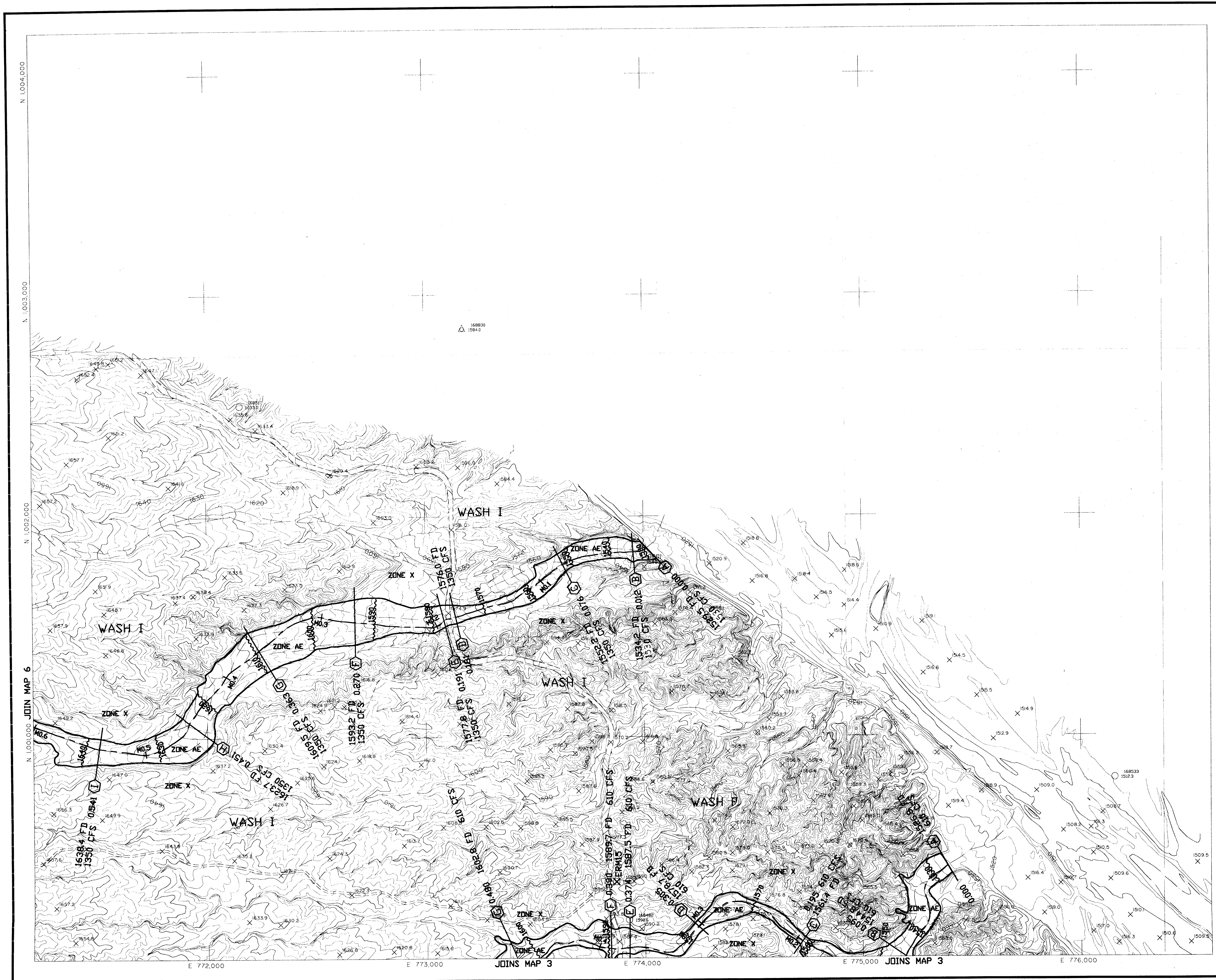
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN	L.E.C.	5/94	RECOMMENDED BY: DATE
DESIGN CHK.	C.E.J.	5/94	APPROVED BY: DATE
PLANS	L.D.C.	5/94	CHIEF ENGINEER AND GENERAL MANAGER
PLANS CHK.	C.E.J.	5/94	
SUBMITTED BY:		DATE:	SHEET 3 OF 6

MAPPING COMPANY, INC.
HOTOGRAMMETRY

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	━━━
SECTION CORNER	○
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — — M13.0
CROSS SECTION	(A) FD=100 Yr WSE (A)
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	~1221~
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	▭
UTILITY POLES	■ ■
PAVED ROADS	═
DIRT ROADS	╌

ELEVATION REFERENCE MARKS

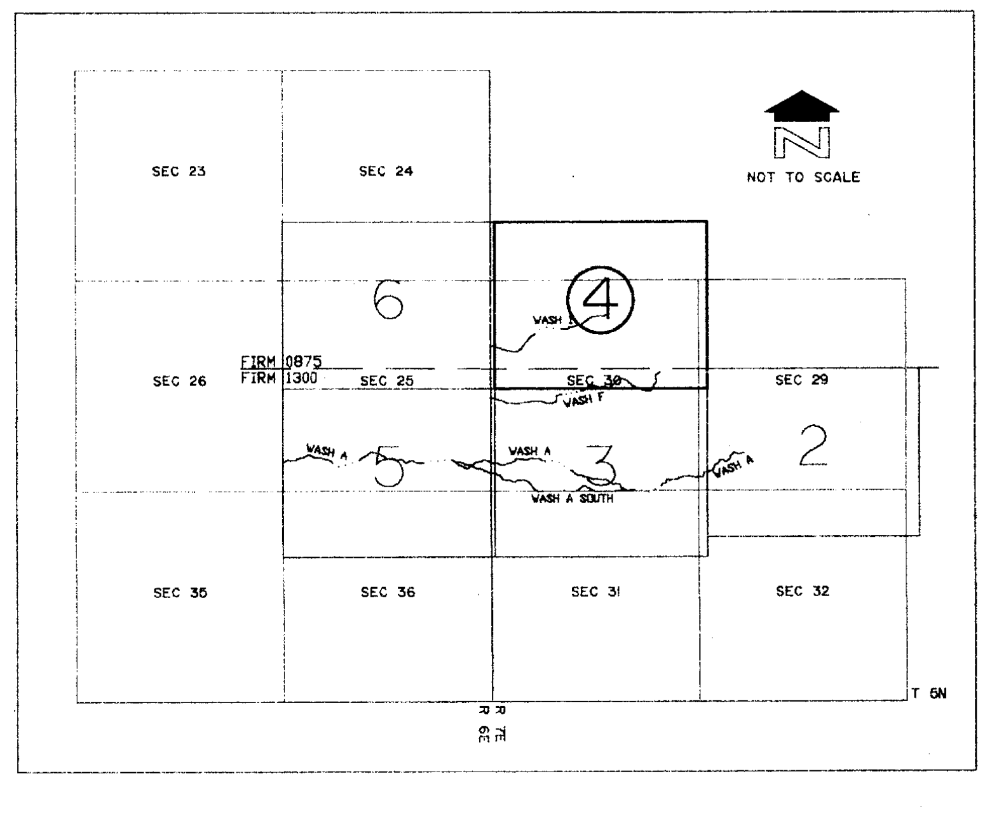
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#15	*ERM EL = 1591.660*	

This station is located approximately 0.45 miles south of the north line of Section 30 and appooximately 40 feet east of the graded Forest Service road. The mark is a one half inch iron pin.

NOTES

INDEX MAP



200 0' 200 400
SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

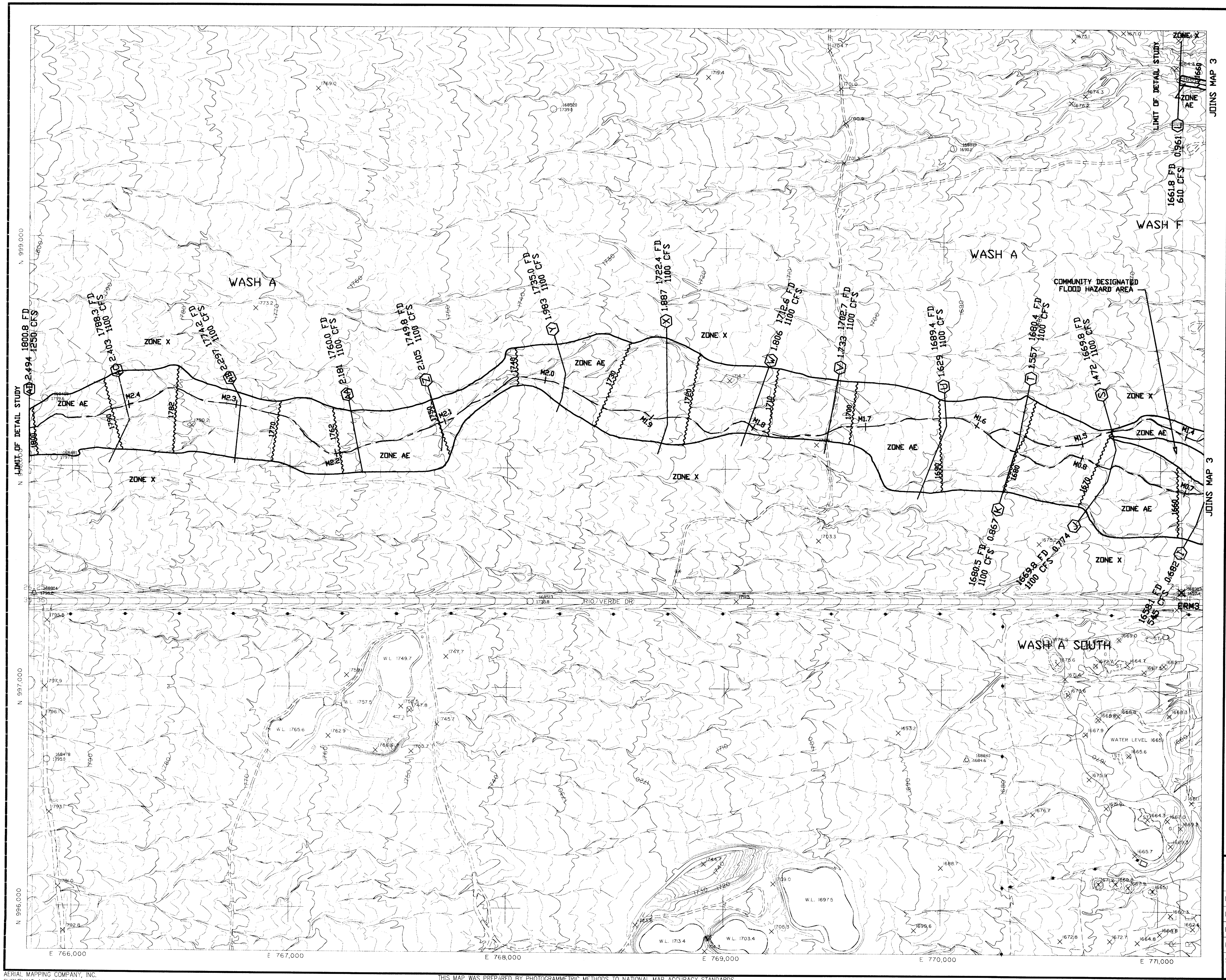
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 4 OF 6



AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY BURGESS AND NIPLE, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	▬
SECTION CORNER	○
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	A FD=100 Yr WSE A
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	■ ■
PAVED ROADS	
DIRT ROADS	

ELEVATION REFERENCE MARKS

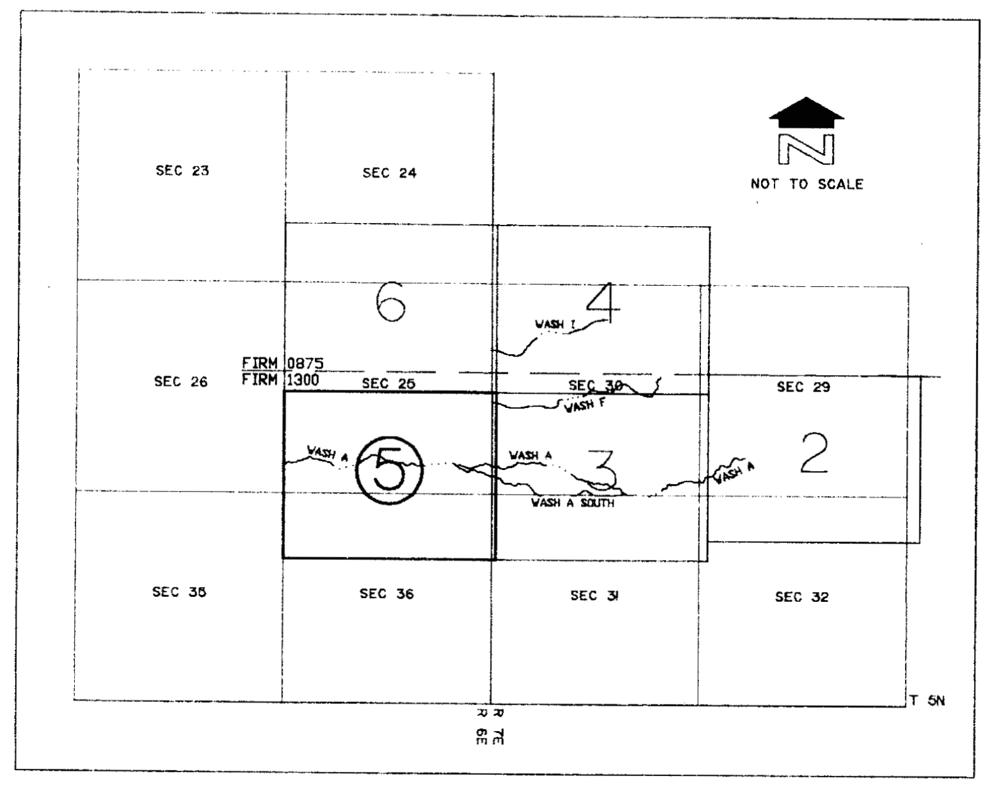
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#3	*ERM EL = 1655.995*	

This station is located at Section Corner (25,30,31,36). The mark is a one inch iron pin.

NOTES

INDEX MAP



200 0' 200 400
SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

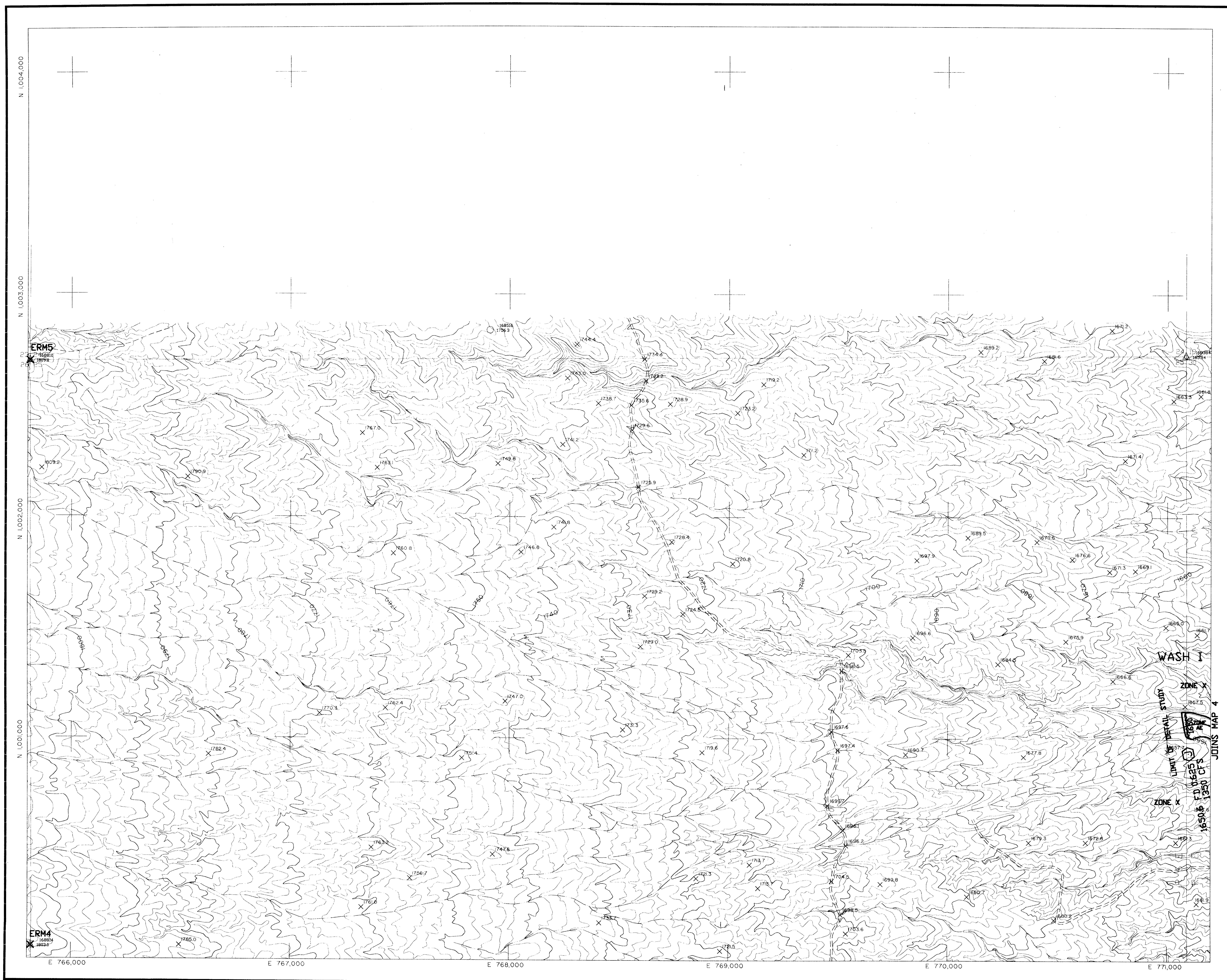
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:
DATE

APPROVED BY:
DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 5 OF 6



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION CORNER	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	A FD=100 Yr WSE A
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	
PAVED ROADS	
DIRT ROADS	

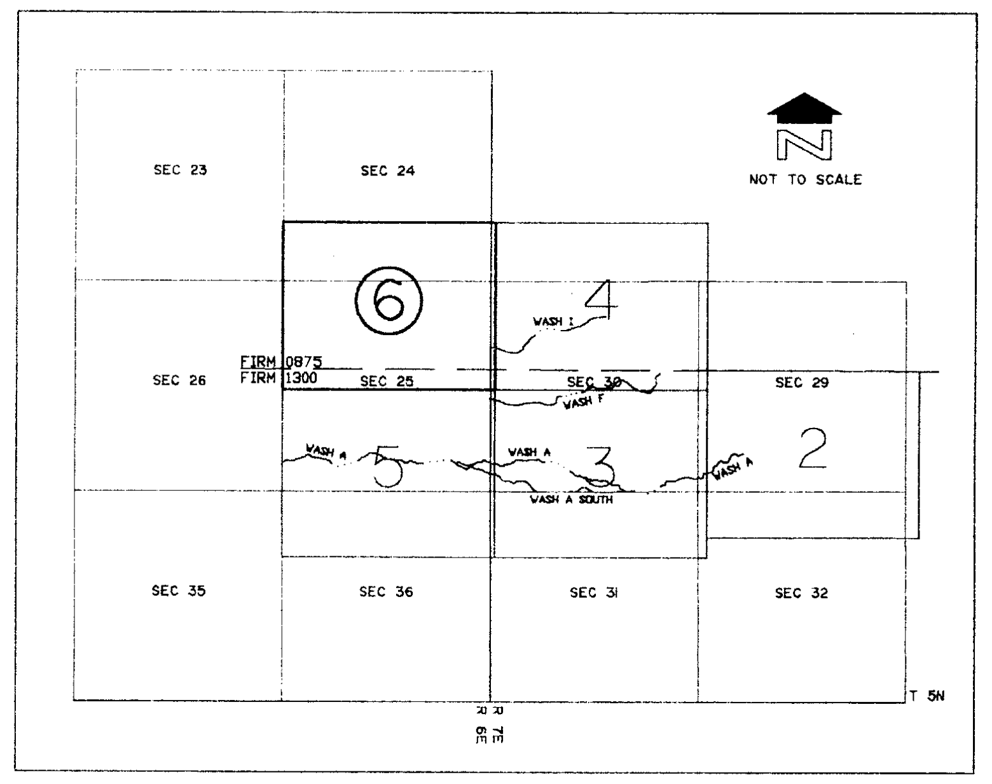
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#4	*ERM EL = 1803.815*	*This station is located at the west quarter corner of Section 25. The mark is a brass cap.*
ERM#5	*ERM EL = 1810.205*	*This station is located at Section Corner (23,24,25,26). The mark is a brass cap.*

NOTES

INDEX MAP



200 0' 200 400

SCALE: 1"= 200'

CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:
DATE

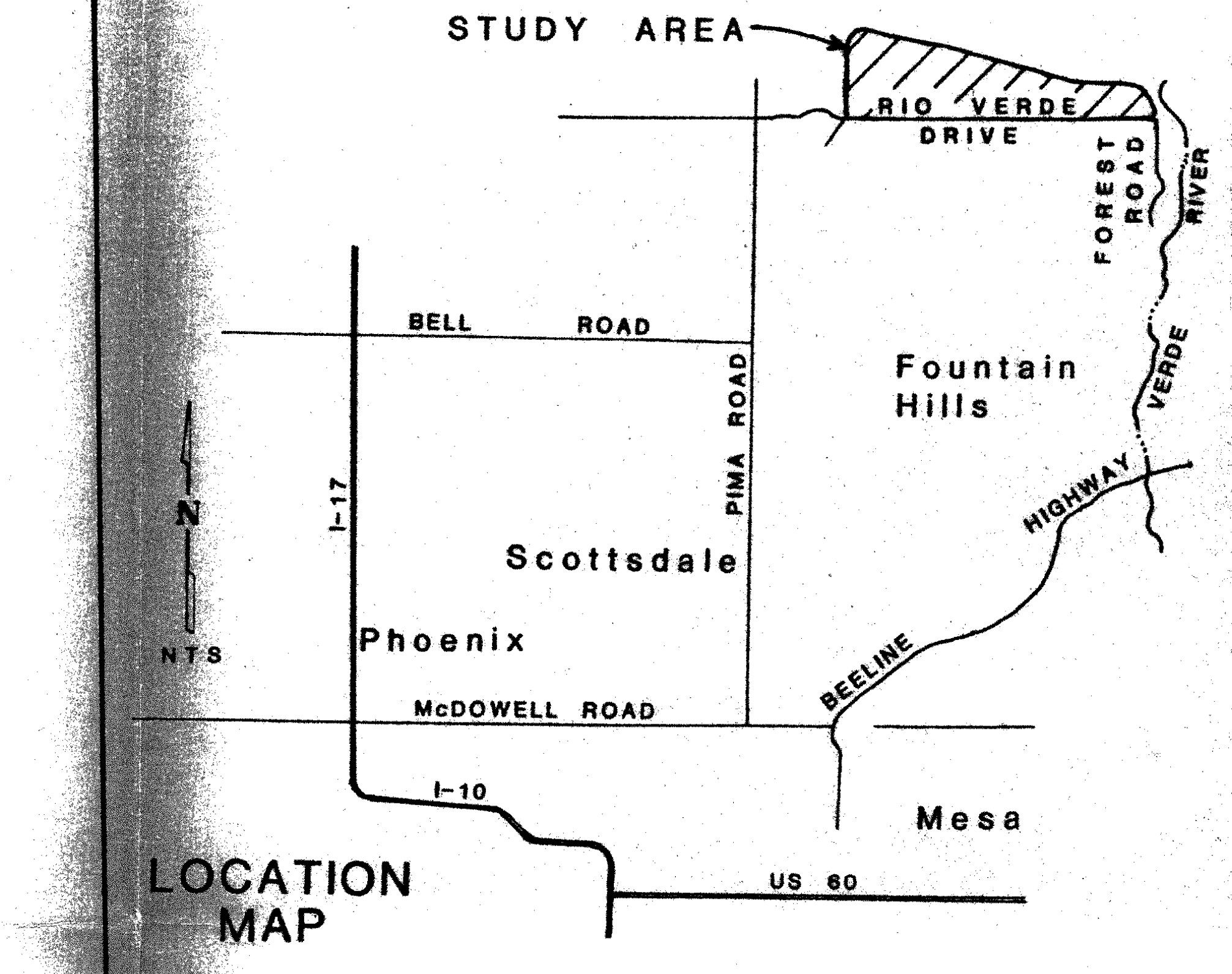
APPROVED BY:
DATE

CHIEF ENGINEER AND GENERAL MANAGER

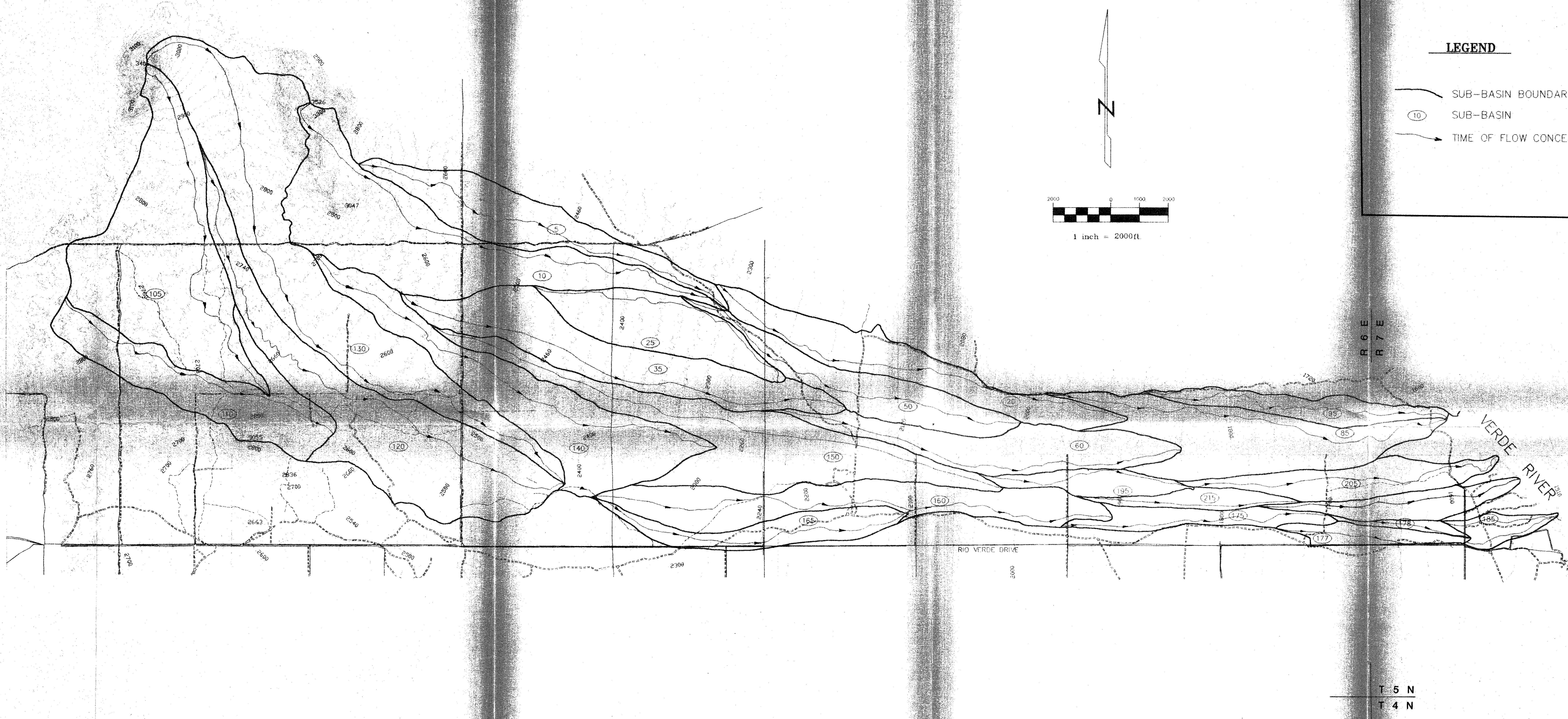
SHEET 6 OF 6

AERIAL MAPPING COMPANY,, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



LOCATION MAP



LEGEND

SUB-BASIN BOUNDARY

(10) SUB-BASIN

TIME OF FLOW CONCENTRATION FLOW PATH

REVISED 9/28/94

WOOD,PATEL & ASSOC., INC.
1550 EAST MISSOURI, SUITE 203
PHOENIX, ARIZONA (602)234-1344

	BY	DATE
DESIGN	AJR	6-22-94
DESIGN CHK	ACP	6-22-94
PLANS	JWC	6-22-94
PLANS CHK	AJR	6-22-94

SUBMITTED BY:
DATE:

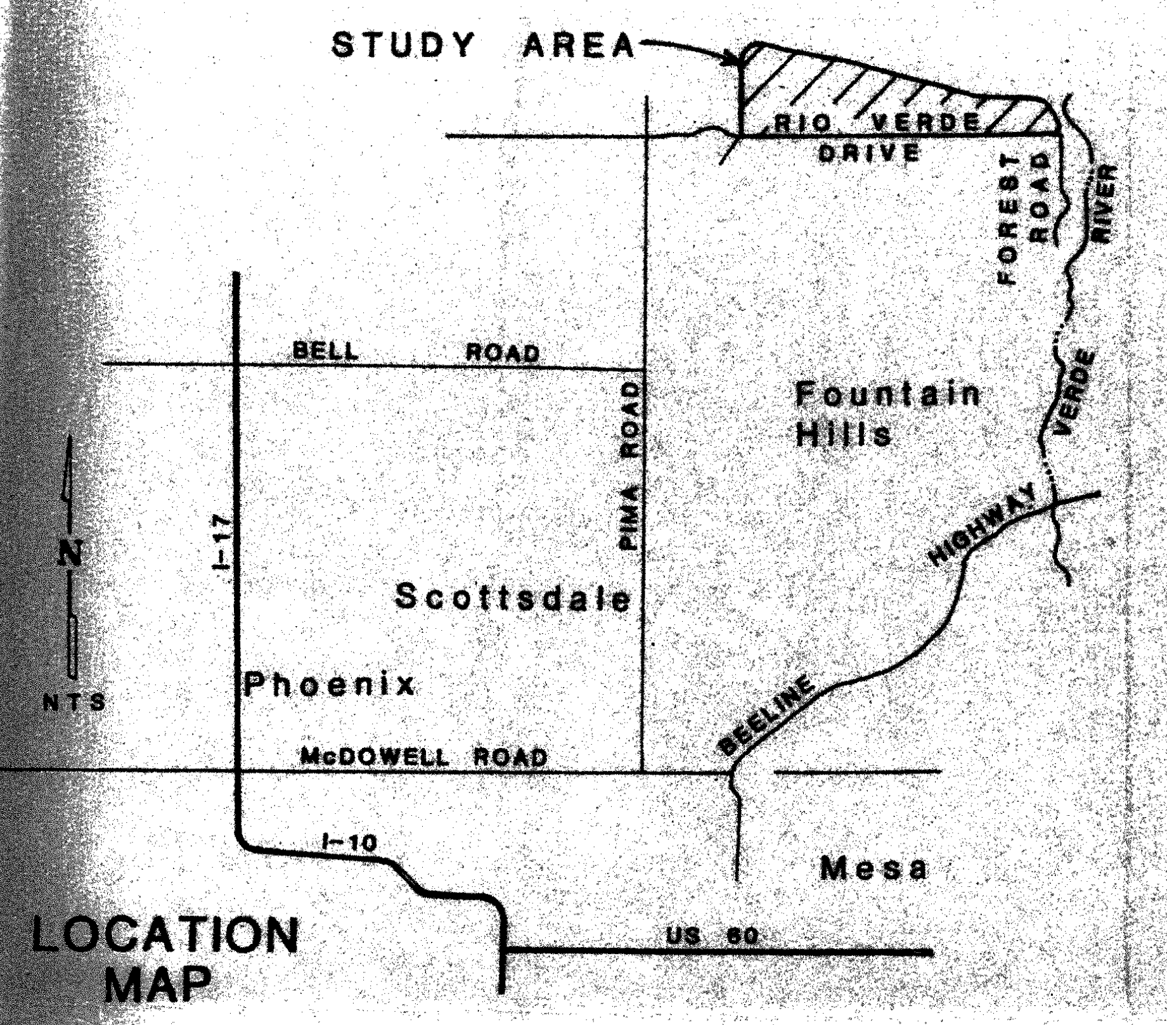
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RIO VERDE – NORTH F.P.D.S.

SUB–BASIN DELINEATION
AND FLOW PATH MAP

RECOMMENDED BY:
DATE:
APPROVED BY:
DATE:
CHIEF ENGINEER AND GENERAL MANAGER

EXHIBIT
A



LOCATION MAP

LEGEND

4	SECTION NUMBER
⁓	SUB-BASIN BOUNDARY
(10)	SUB-BASIN
96	SOIL MAP UNIT
⁓	SOIL MAP UNIT BOUNDARY

REVISED 9/28/94

WOOD, PATEL & ASSOC., INC. 1550 EAST MISSOURI, SUITE 203 PHOENIX, ARIZONA (602)234-1344		
DESIGN	BY AJR	DATE 6-22-94
DESIGN CHK	ACP	6-22-94
PLANS	JWC	6-22-94
PLANS CHK	AJR	6-22-94
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RIO VERDE – NORTH F.P.D.S.

SOIL MAP UNIT DATA

RECOMMENDED BY: DATE:

APPROVED BY: DATE:

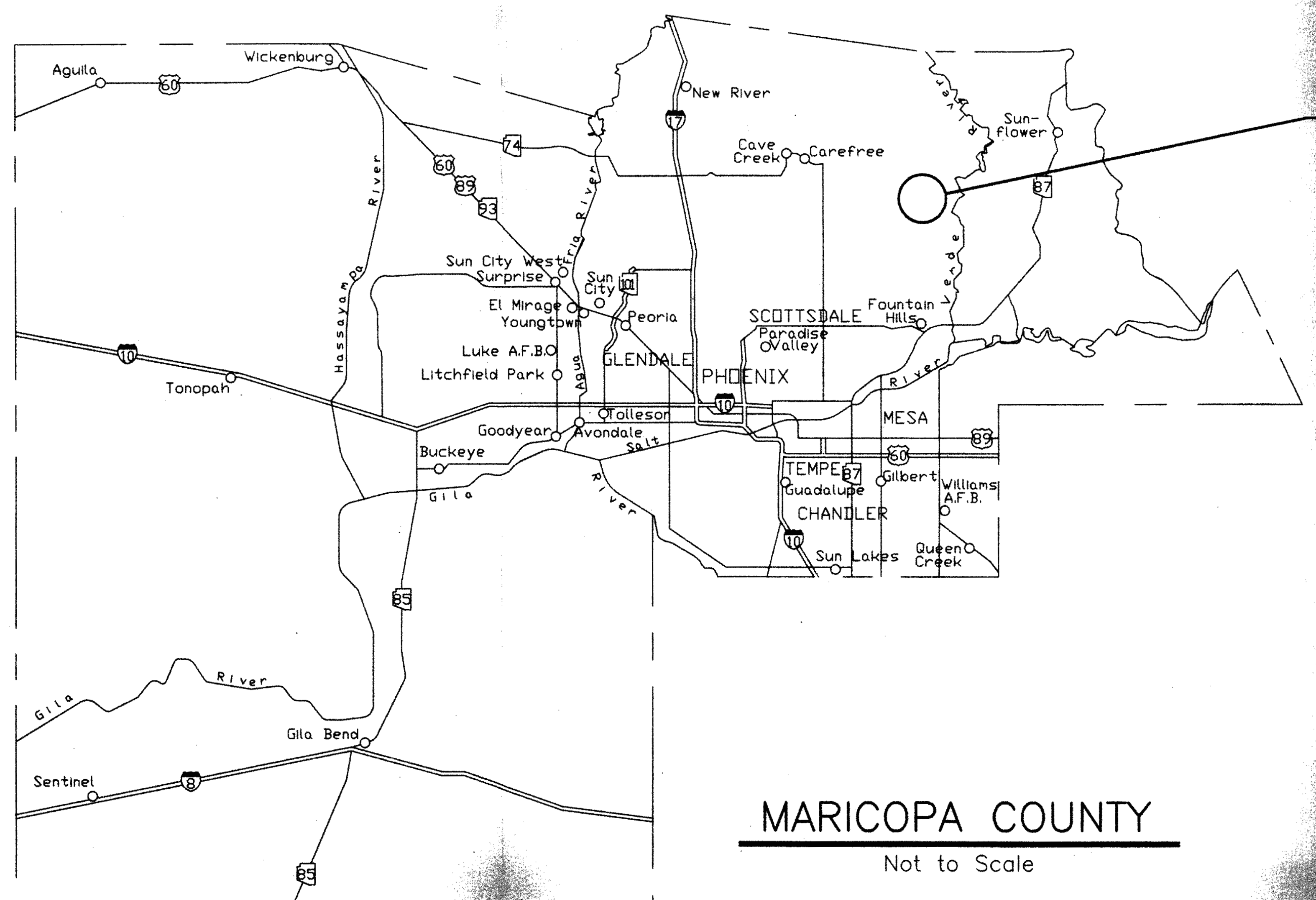
CHIEF ENGINEER AND GENERAL MANAGER

EXHIBIT B

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

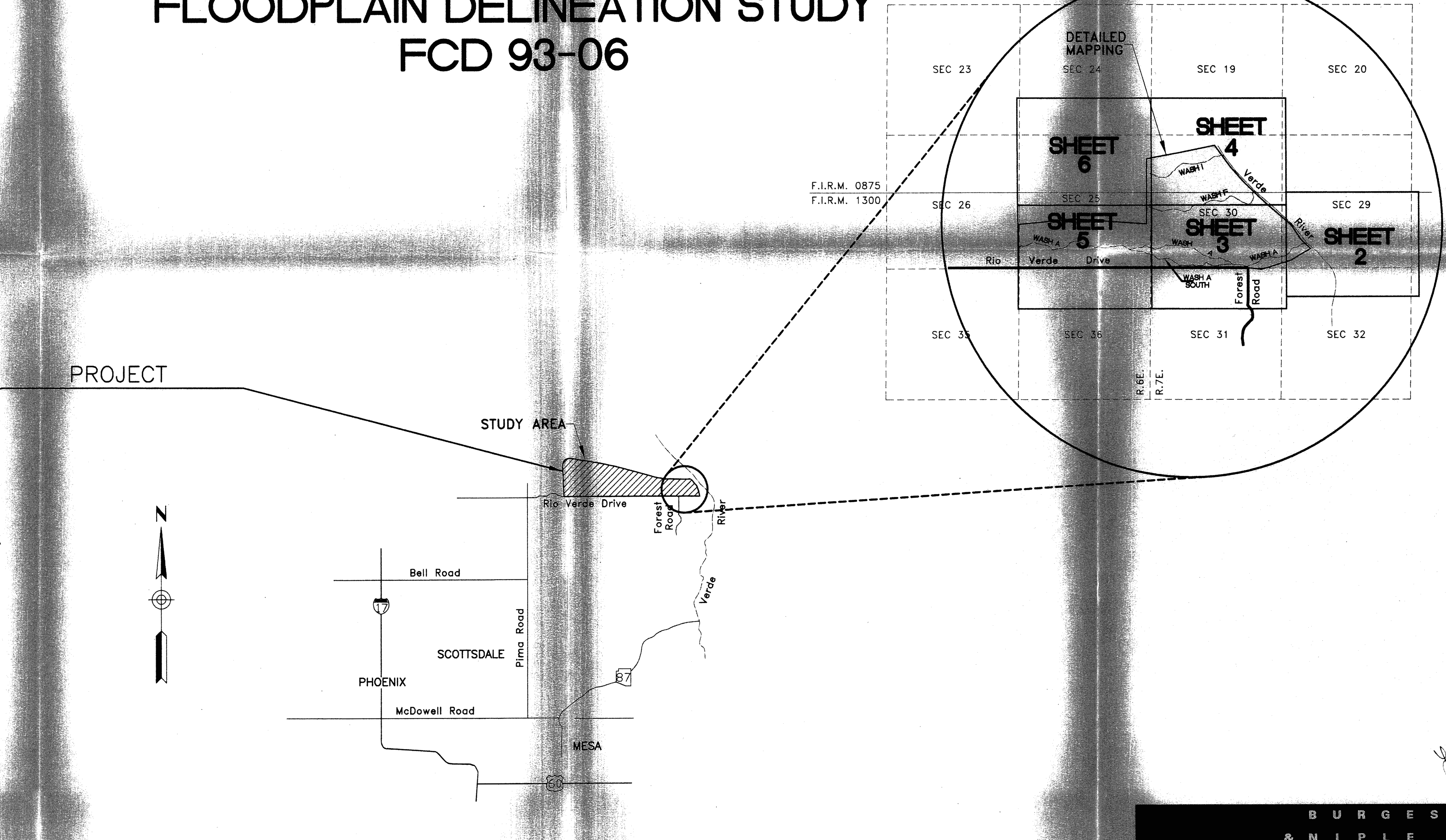
UN-NAMED WASH A
UN-NAMED WASH A SOUTH
UN-NAMED WASH F
UN-NAMED WASH I

RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY
FCD 93-06



MARICOPA COUNTY

Not to Scale



VICINITY MAP

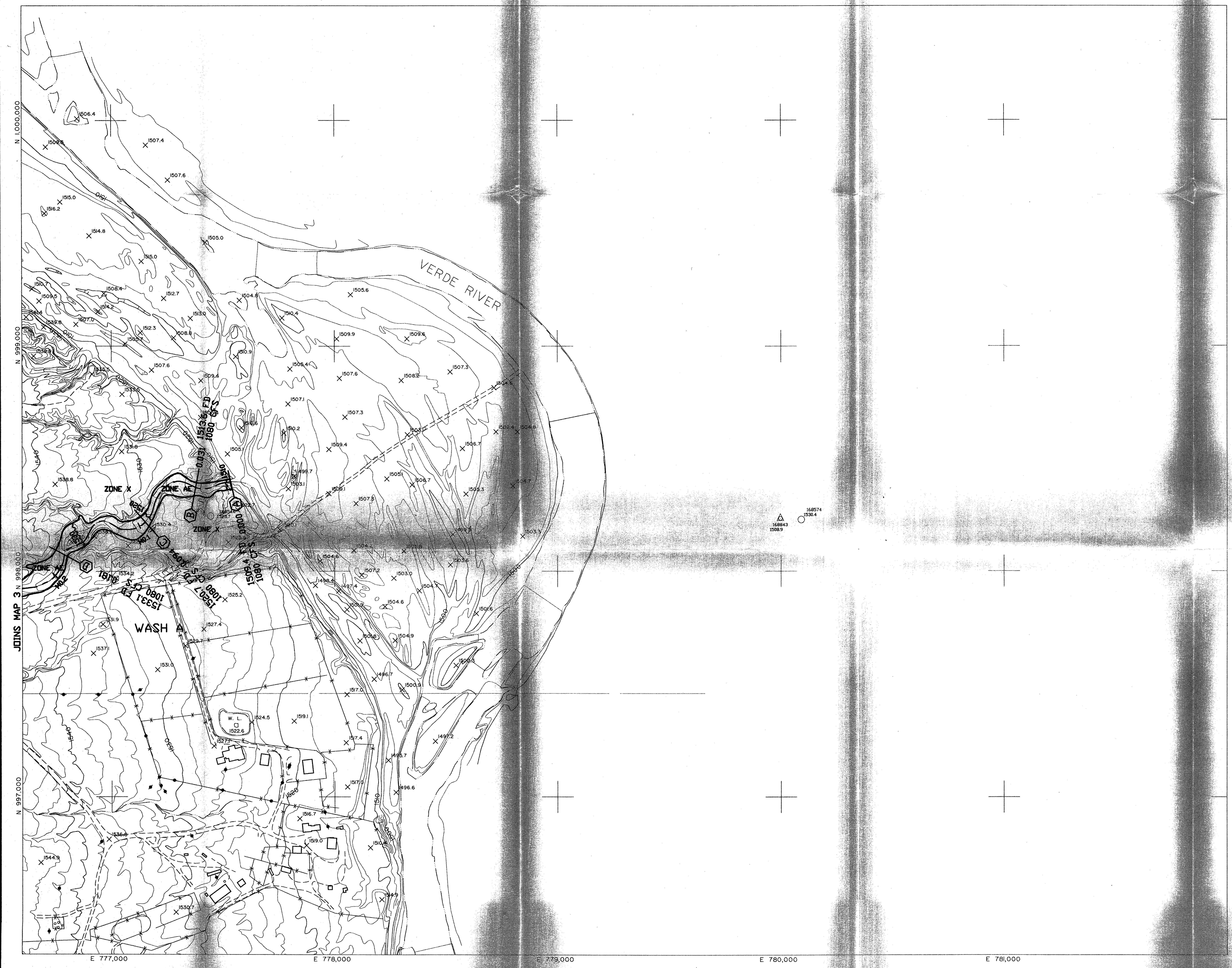
Not to Scale

AERIAL MAPPING COMPANY, INC.
FLOWN DECEMBER 22, 1993
STUDY DATE: AUGUST 1995

LARRY D. CULLER
Date Signed 10/9/95

Larry D. Culler

BURGESS
& NIPLE
ENGINEERS
ARCHITECTS



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION CORNER	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	A FD=100 Yr WSE A
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	■ ■
PAVED ROADS	
DIRT ROADS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

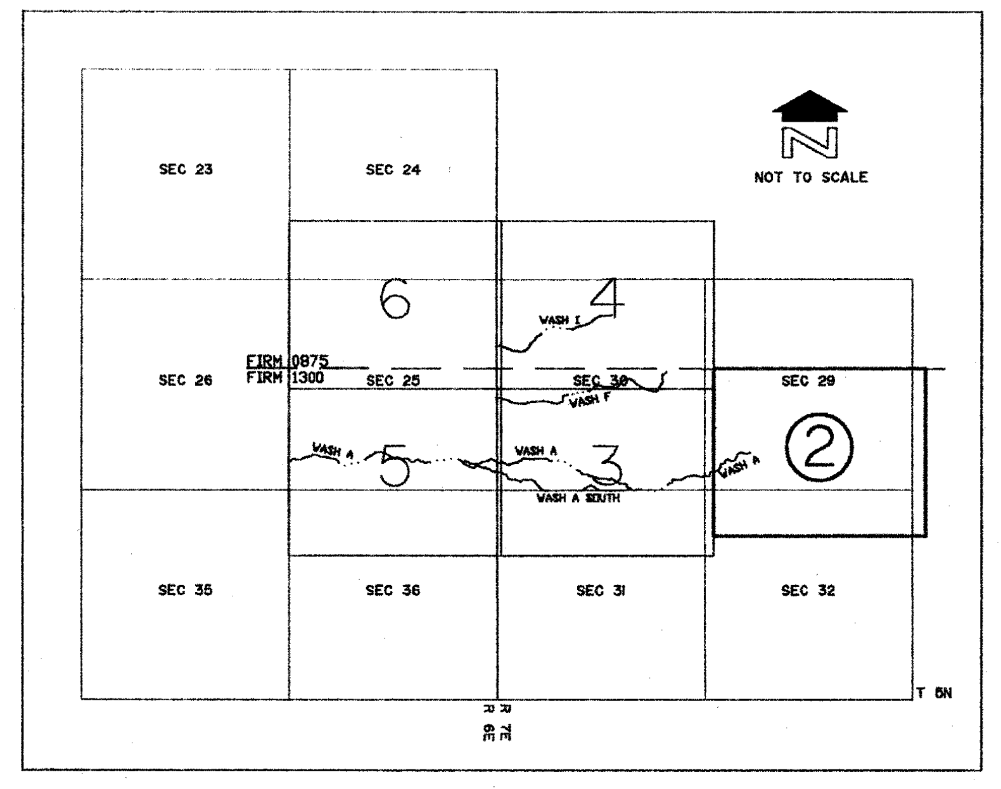
I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#2	*ERM EL = 1544.580*	*This station is located at Section Corner (29,30,31,32). The mark is a brass cap.*

NOTES

9/29/95

12/6/95

INDEX MAP



SCALE: 1"= 200'

CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C	8/94
DESIGN CHK.	S.E.J	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:

DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:

DATE

APPROVED BY:

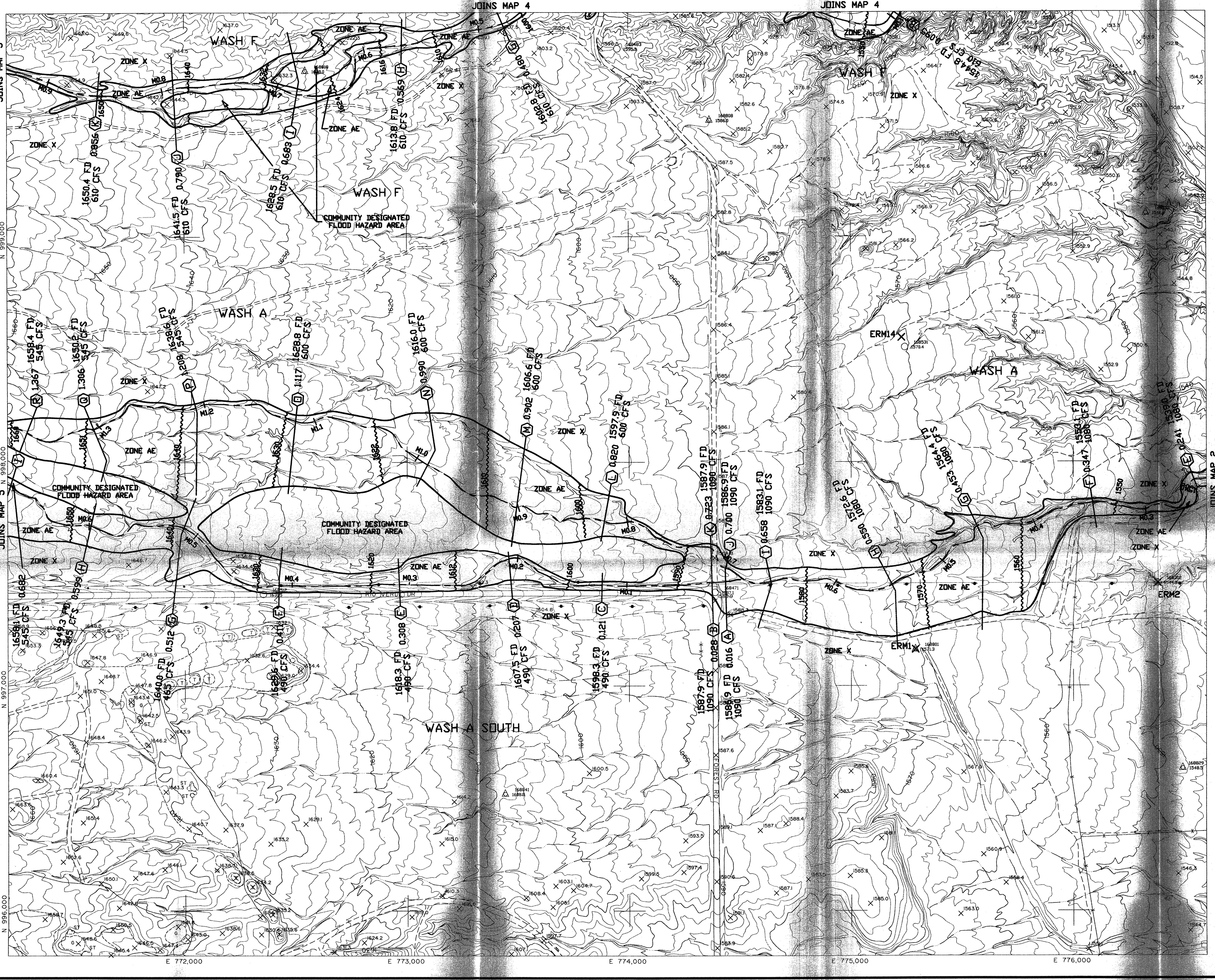
DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 2 OF 6

AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY BURGESS AND NIPLE, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	——
SECTION CORNER	○
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	(A) FD=100 Yr WSE (A)
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	● ●
PAVED ROADS	═
DIRT ROADS	- - -

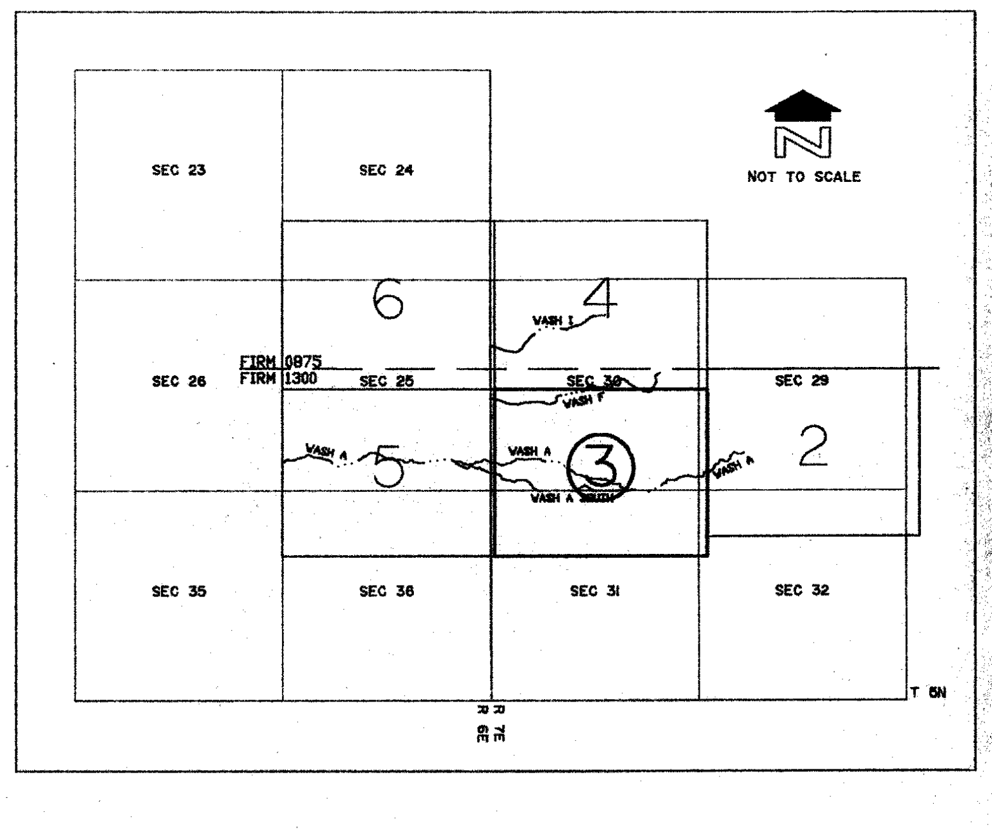
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL
GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#1	*ERM EL = 1571.265*	*This station is located approximately 0.17 miles east of Forest Road to th Box Bar Ranch. The mark is a brass cap stamped U.S. Coast and Geodetic Survey.*
ERM#2	*ERM EL = 1544.580*	*This station is located at Section Corner (29,30,31,32). The mark is a brass cap.*
ERM#14	*ERM EL = 1571.387*	*This station is located approximately 0.22 miles north along the graded Forest Service road from its intersection with Forest Road and Rio Verde Drive, thence east approximately 0.16 miles from the graded Forest Service road. The mark is a brass cap stamped "1572 PHNX".*

NOTES

INDEX MAP



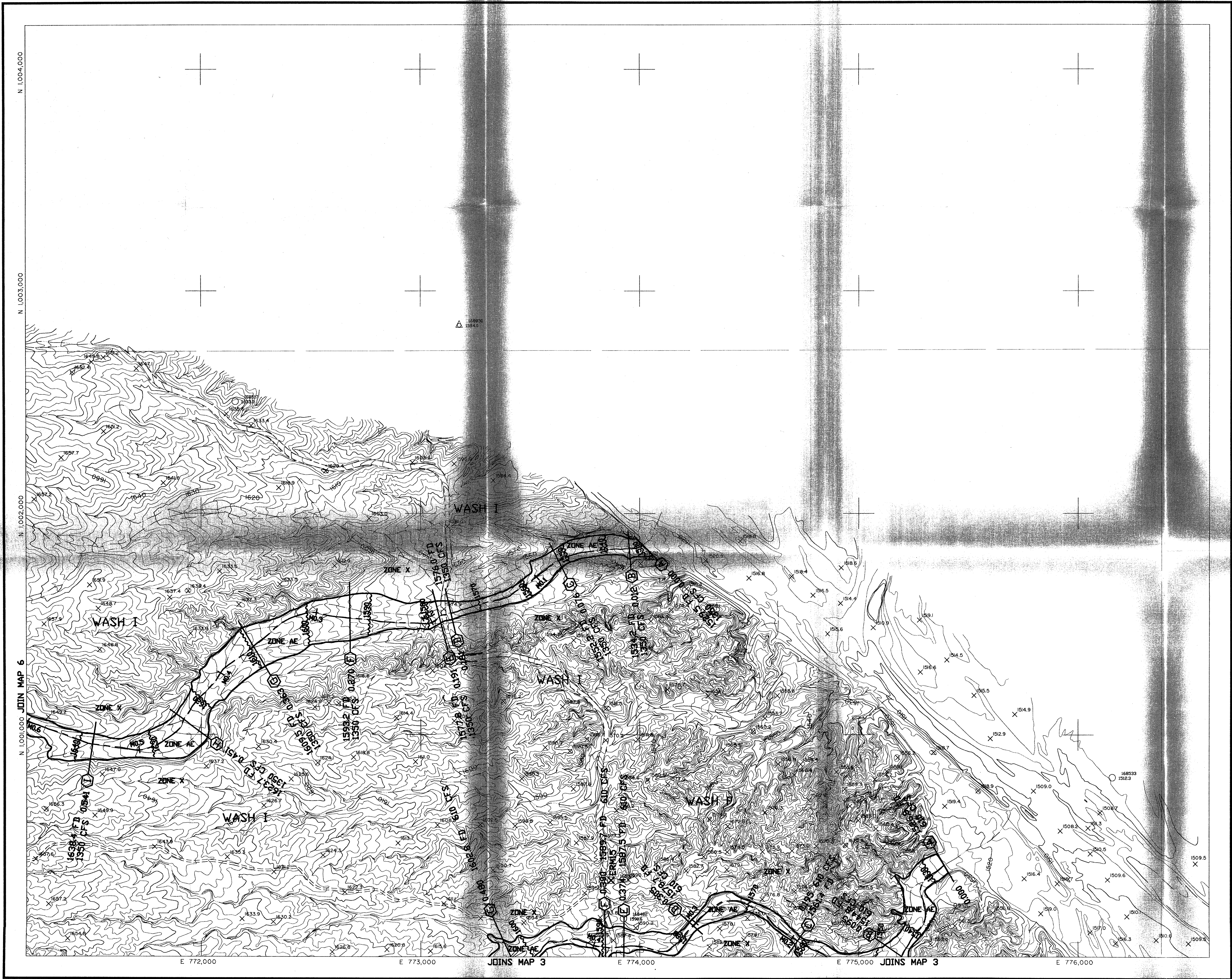
200 0' 200 400
SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RECOMMENDED BY: DATE
APPROVED BY: DATE
CHIEF ENGINEER AND GENERAL MANAGER
SHEET 3 OF 6



AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	———
SECTION CORNER	—○—
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — — M13.0
CROSS SECTION	Ⓐ FD=100 Yr WSE Ⓐ
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	~~1221~~
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	◻
UTILITY POLES	• •
PAVED ROADS	═══
DIRT ROADS	- - -

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#15	*ERM EL = 1591.660*	

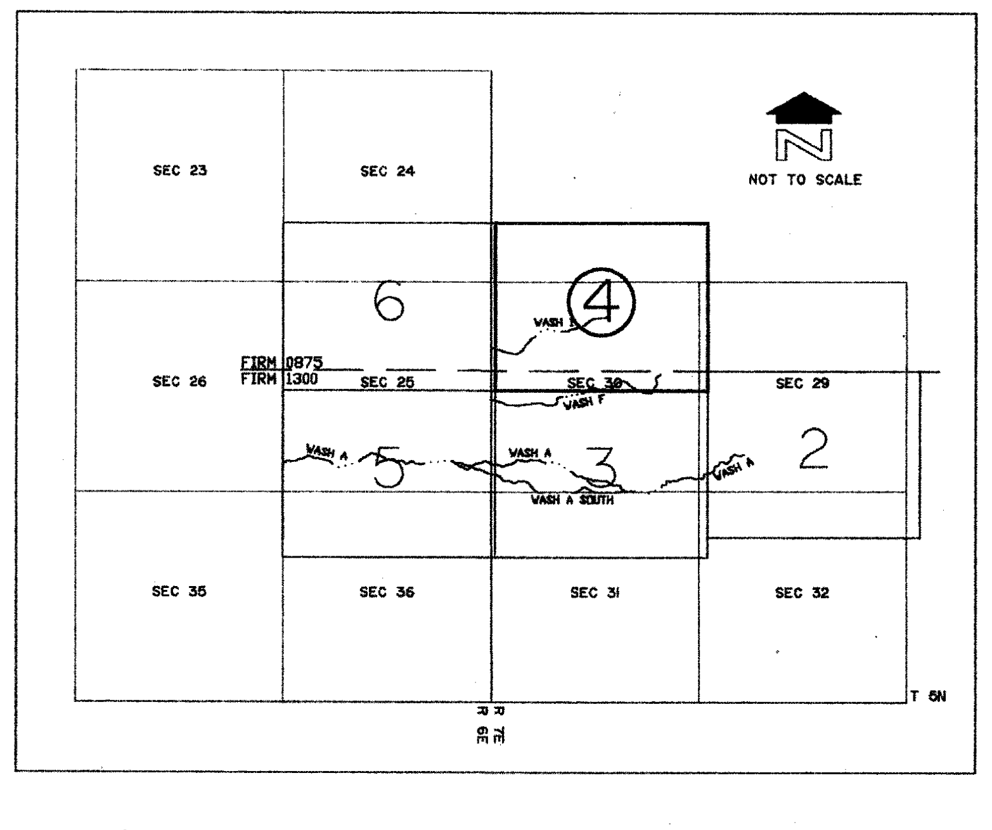
This station is located approximately 0.45 miles south of the north line of Section 30 and appooximately 40 feet east of the graded Forest Service road. The mark is a one half inch iron pin.

NOTES

9/29/95

10/6/95

INDEX MAP



200 0' 200 400

SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY: DATE:

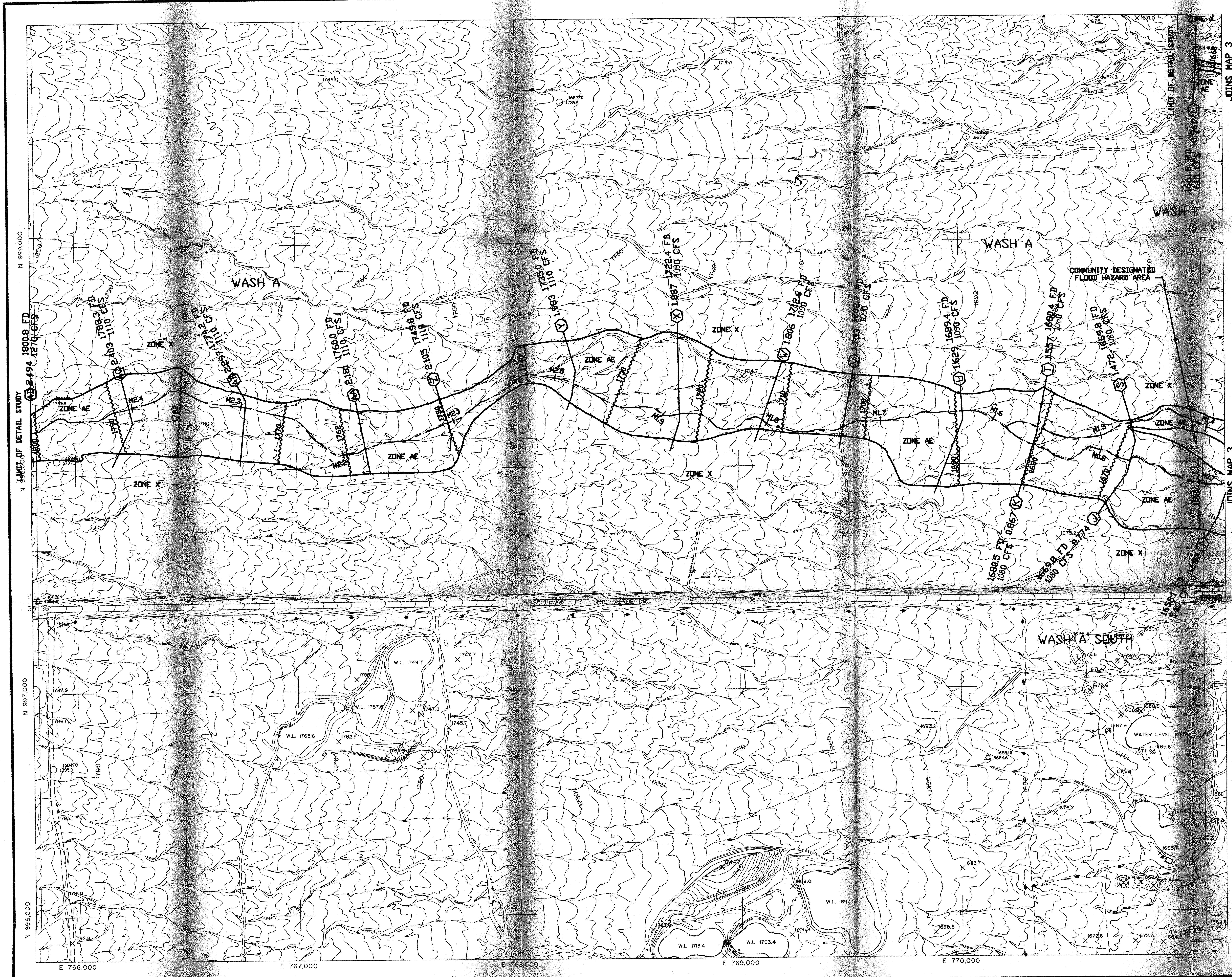
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 4 OF 6



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	▬▬▬
SECTION CORNER	○
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — M13.0
CROSS SECTION	(A) FD=100 Yr WSE (A)
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	
UTILITY POLES	● ●
PAVED ROADS	═══
DIRT ROADS	- - -

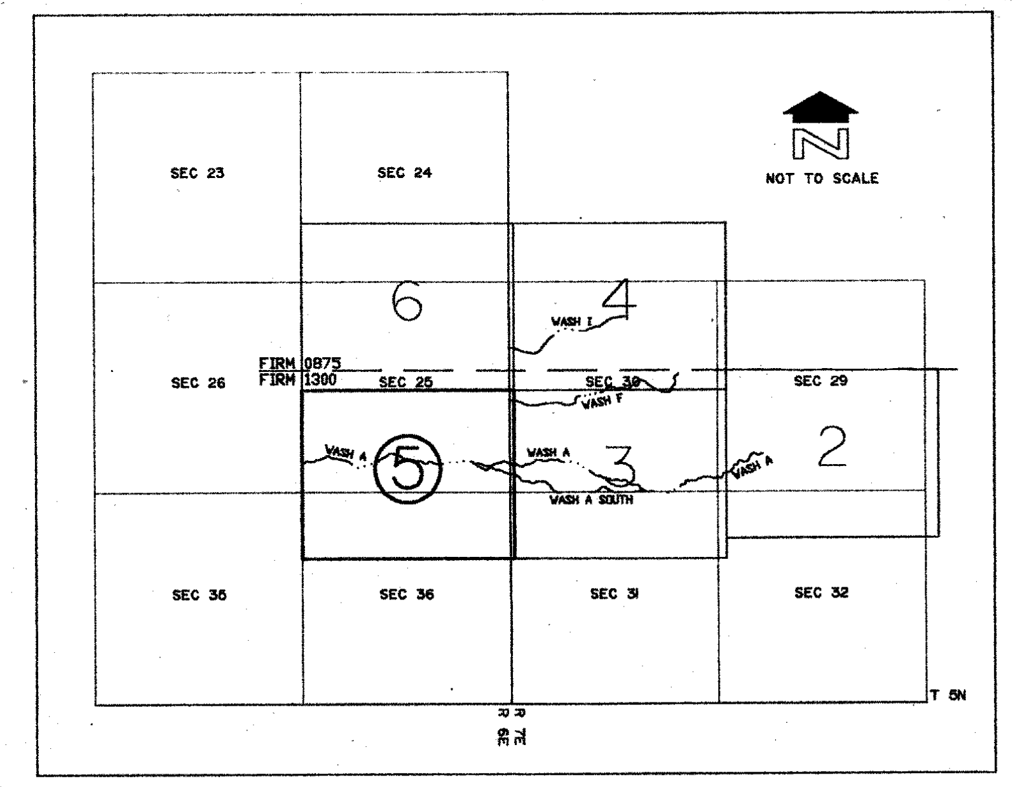
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM#3	*ERM EL = 1655.995*	*This station is located at Section Corner (25,30,31,36). The mark is a one inch iron pin.*

NOTES

INDEX MAP



200 0' 200 400

SCALE: 1"= 200'

CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:

DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

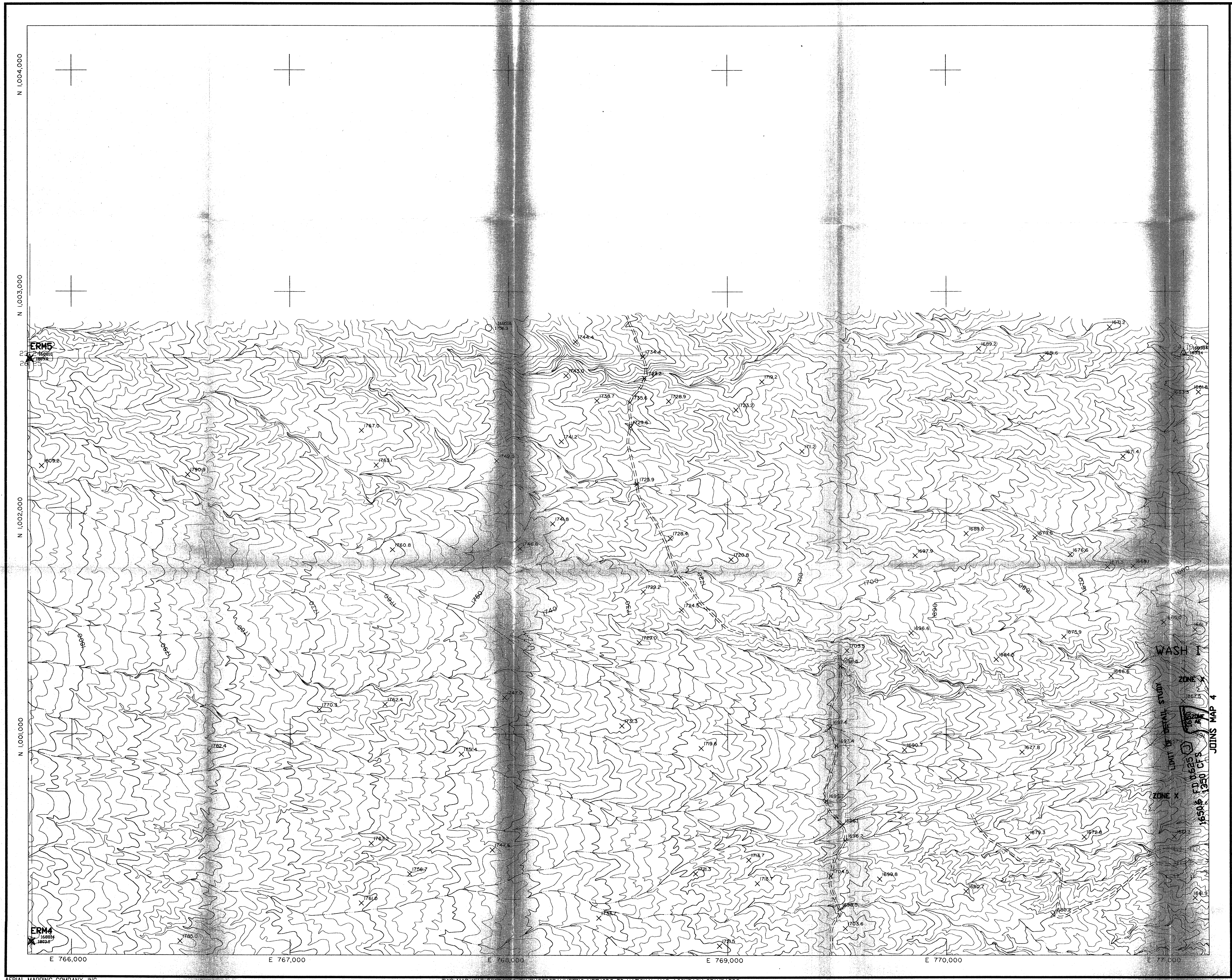
APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 5 OF 6

AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

RIO VERDE NORTH

F.C.D. CONTRACT NO. 93-06

LEGEND

100-YR FLOODPLAIN BOUNDARY	▬
SECTION CORNER	—○—
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — — M13.0
CROSS SECTION	A FD=100 Yr WSE A
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	~1221~
ZONE DESIGNATIONS	ZONE AE
STRUCTURES	▭
UTILITY POLES	● ●
PAVED ROADS	═
DIRT ROADS	- - -

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

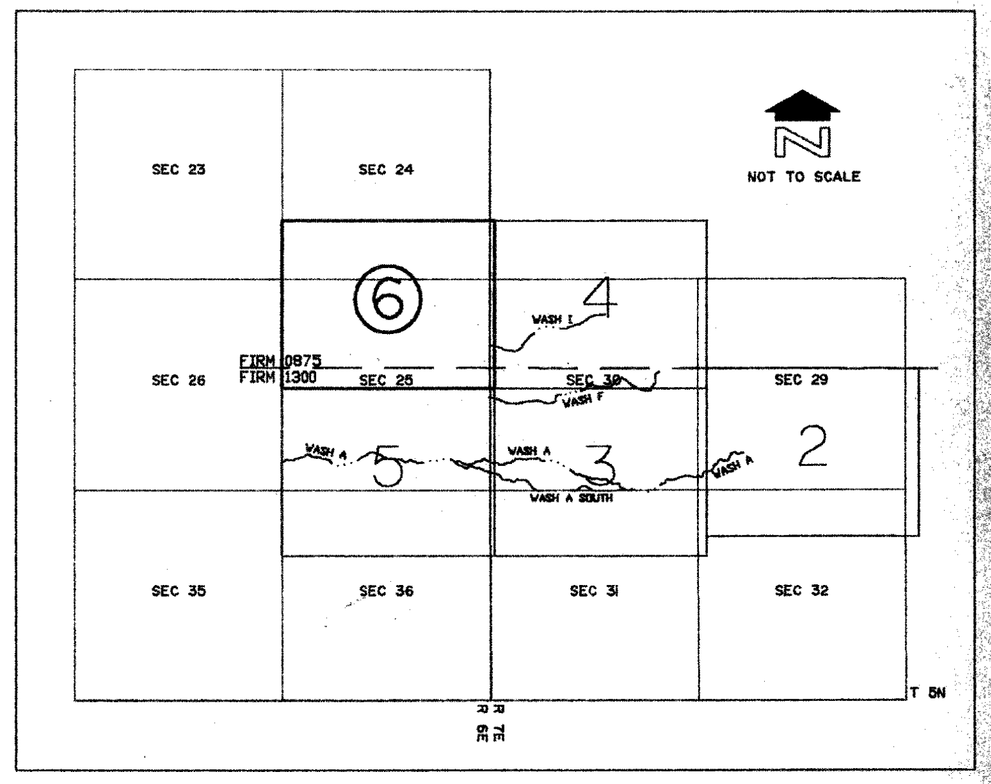
I.D. NUMBER — ELEVATION (FT) — DESCRIPTION/LOCATION

ERM#4 ERM EL = 1803.815
This station is located at the west quarter corner of Section 25. The mark is a brass cap.

ERM#5 ERM EL = 1810.205
This station is located at Section Corner (23,24,25,26). The mark is a brass cap.

NOTES

INDEX MAP



200 0' 200 400
SCALE: 1"= 200'
CONTOUR INTERVAL = 2' FEET

BURGESS & NIPLE

	BY	DATE
DESIGN	L.D.C.	8/94
DESIGN CHK.	S.E.J.	8/94
PLANS	L.D.C.	8/94
PLANS CHK.	S.E.J.	8/94

SUBMITTED BY:
DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

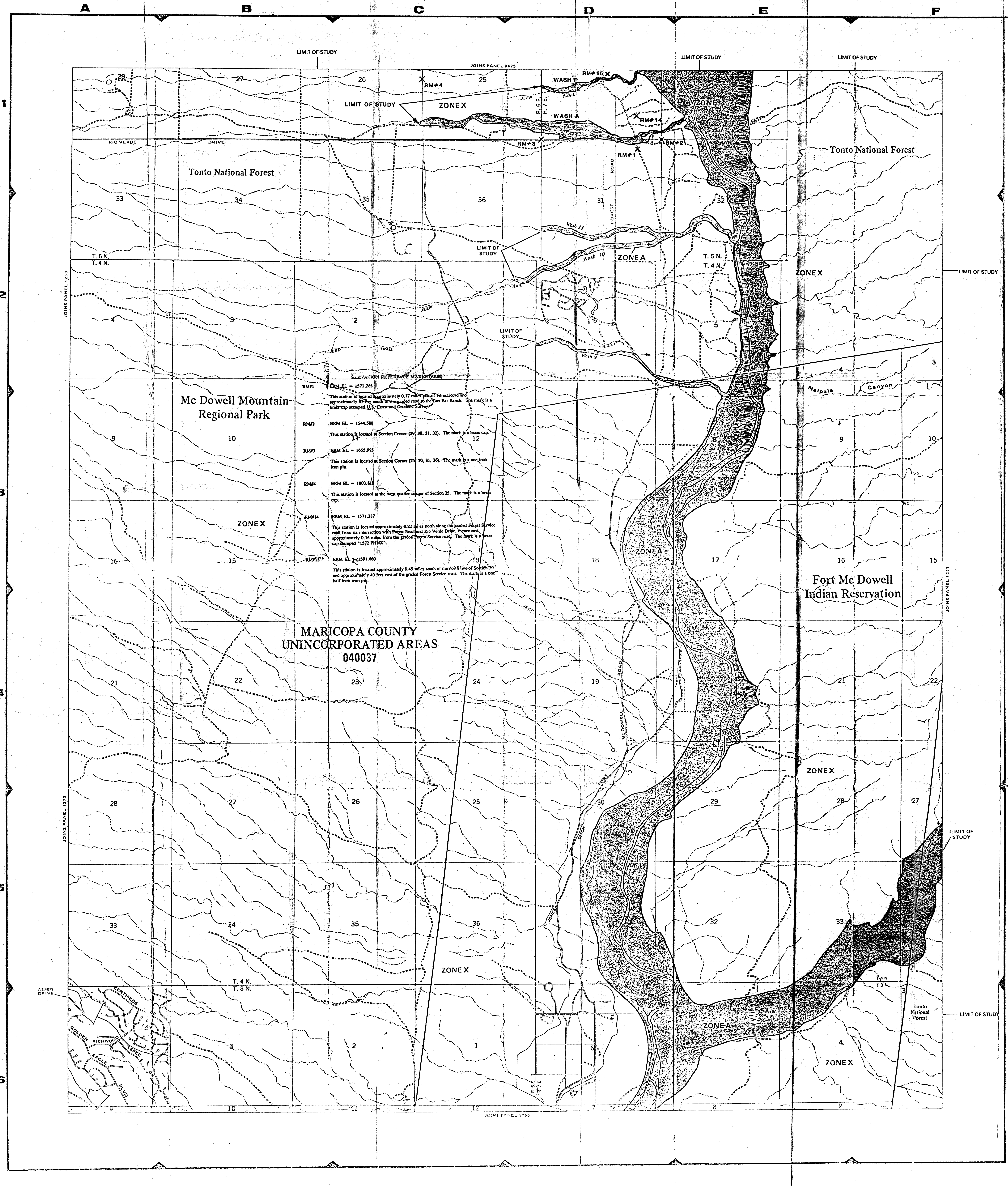
APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 6 OF 6

AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 12-22-1993

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY BURGESS AND NIPLE, INC.



ELEVATION REFERENCE MARKS (ERM)

RM#1 ERM EL = 1571.265

This station is located approximately 0.17 miles east of Forest Road and approximately 65 feet south of the graded road to the Box Bar Ranch. The mark is a brass cap stamped U.S. Coast and Geodetic Survey.

RM#2 ERM EL = 1544.580

This station is located at Section Corner (29, 30, 31, 32). The mark is a brass cap.

RM#3 ERM EL = 1655.995

This station is located at Section Corner (25, 30, 31, 36). The mark is a one inch iron pin.

RM#4 ERM EL = 1803.818

This station is located at the west quarter corner of Section 25. The mark is a brass cap.

RM#14 ERM EL = 1571.387

This station is located approximately 0.22 miles north along the graded Forest Service road from its intersection with Forest Road and Rio Verde Drive, thence east approximately 0.16 miles from the graded Forest Service road. The mark is a brass cap stamped "1572 PHNX".

RM#15 ERM EL = 1591.660

This station is located approximately 0.45 miles south of the north line of Section 30 and approximately 40 feet east of the graded Forest Service road. The mark is a one half inch iron pin.

LEGEND

▨ **SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD**

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE A0	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

▨ **FLOODWAY AREAS IN ZONE AE**

▨ **OTHER FLOOD AREAS**

ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

☐ **OTHER AREAS**

ZONE X	Areas determined to be outside 500-year flood plain.
ZONE D	Areas in which flood hazards are undetermined.

———	Flood Boundary
— — —	Floodway Boundary
- —— —— -	Zone D Boundary
▨	Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
~~513~~~	Base Flood Elevation Line; Elevation in Feet*
(D)———(D)	Cross Section Line
(EL 987)	Base Flood Elevation in Feet Where Uniform Within Zone*
RM7 X	Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

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

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 1300 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	1300	E

MAP NUMBER
04013C1300 E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency

FLOOD CONTROL
DISTRICT
of
MARICOPA
COUNTY
1959

RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY

FCD 93-06

TECHNICAL DATA NOTEBOOK HYDROLOGY

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10512
ASHOK C.
PATEL
Date Signed 10/3/94
ARIZONA, U.S.A.

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009
(602) 506-1501

Prepared By:

Prime Consultant:

BURGESS & NIPLE, INC.
5025 East Washington Street
Phoenix, AZ 85034
(602) 244-8100

Project No. 15183

Associate Consultant:

WOOD, PATEL & ASSOCIATES, INC.
1550 East Missouri, Suite 203
Phoenix, AZ 85014
(602) 234-1344

Project No. 93031.00

October 1994

TABLE OF CONTENTS

SECTION 3: Hydrologic Analysis

Page

3.1 Hydrologic Method Description 3-1

Location Map 3-2

3.2 Parameter Estimation 3-3

3.2.1 Drainage Area Boundaries 3-3

3.2.2 Physical Parameters 3-5

3.2.2.1 Watershed Sub-Basin Parameters 3-5

General 3-5
Soils Parameters 3-5
Watershed Delineation and Areas 3-7
Land Use Characteristics 3-8
Lag Times 3-11
S-Graphs 3-11
Sample Calculation of Sub-Basin Parameters 3-12

Table S-1 - DTHETA and PSIF Interpolation Table Using XKSAT . . . . Tabbed

Table S-2 - Summary of Soil Loss Parameters by SCS Map Unit . . . . Tabbed

Table S-3 - Sub-Basin Surface Loss and Lag Time Parameters . . . . Tabbed

Table S-4 - Loss Parameters by Sub-Basin . . . . Tabbed

Table S-5 - Summary of Sub-Basin Parameters . . . . Tabbed

Table S-6 - Areas for Concentration Points . . . . Tabbed
Downstream from Flow Diversions

TABLE OF CONTENTS (Continued)

Page

3.2.2.2 Reach Route Parameters 3-47

General 3-47
Field Reconnaissance 3-47
Hydraulic Computations 3-48
Channel Infiltration Losses 3-49
Table R-1 - Reach Route Physical Data . . . . Tabbed
Table R-2 - Reach Route Hydraulic Data . . . . Tabbed

3.2.3 Statistical Parameters 3-53

3.2.4 Precipitation 3-53

3.2.4.1 Rainfall Distributions 3-53

3.2.4.2 Precipitation Data 3-53

Figure P-1 - Isopluvials for 100-Year 6-Hour Precipitation 3-54

Figure P-2 - Isopluvials for 100-Year 24-Hour Precipitation 3-55

3.2.4.3 Areal Precipitation Reduction 3-56

3.2.5 Gage Data 3-56

3.2.5.1 General 3-56

TABLE OF CONTENTS (Continued)

Page

3.3 Calibration 3-57

3.3.1 General 3-57

3.3.5 Summary 3-59

Table C-1 - HEC-1 vs. Log-Pearson III Regression Analysis 3-60

Figure C-1 - HEC-1 vs. Log-Pearson III Analysis 3-61

3.4 Special Problems and Solutions 3-62

3.4.1 Channel Flow Splits 3-62

3.4.1.1 Discussion of Problem 3-62

3.4.1.4 Summary 3-64

Table D-1 - Flow Split Data . . . . Tabbed

3.4.6 HEC-1 Warnings and Errors 3-87

3.4.6.1 General 3-87

TABLE OF CONTENTS (Continued)

Page

3.5 Final Results 3-88

  3.5.1 General 3-88

  3.5.2 Discussion of Results 3-88

    3.5.2.1 General 3-88

    3.5.2.2 Comparison of Results With Previous Studies 3-88

    3.5.2.3 Applicability of the Hydrologic Models for Other Uses 3-88

    3.5.2.4 Summary of HEC-1 Nomenclature 3-90

  3.5.3 Table F-1 - Summary of Peak Discharges at Key Locations on the Watershed . . . . Tabbed

  3.5.4 Table F-2 - 100-Year 6-Hour HEC-1 Results . . . . Tabbed

  3.5.5 Table F-3 - 100-Year 24-Hour HEC-1 Results . . . . Tabbed

  3.5.6 HEC-1 Output . . . . Tabbed
    100-Year 6-Hour Storm HEC-1 Output
    100-Year 24-Hour Storm HEC-1 Output

3.6 HEC-1 Input/Output on Diskettes . . . . Tabbed

TABLE OF CONTENTS (Continued)

LIST OF TABLES

Page

Table S-1 - DTHETA and PSIF Interpolation Table Using XKSAT . . . . Tabbed

Table S-2 - Summary of Soil Loss Parameters by SCS Map Unit . . . . Tabbed

Table S-3 - Sub-Basin Surface Loss and Lag Time Parameters . . . . Tabbed

Table S-4 - Loss Parameters by Sub-Basin . . . . Tabbed

Table S-5 - Summary of Sub-Basin Parameters . . . . Tabbed

Table S-6 - Areas for Concentration Points Downstream from Flow Diversions . . . . Tabbed

Table R-1 - Reach Route Physical Data . . . . Tabbed

Table R-2 - Reach Route Hydraulic Data . . . . Tabbed

Table C-1 - HEC-1 vs. Log-Person III Regression Analysis 3-60

Table D-1 - Flow Split Data . . . . Tabbed

Table F-1 - Summary of Peak Discharges at Key Locations on the Watershed . . . . Tabbed

Table F-2 - 100-Year 6-Hour HEC-1 Results . . . . Tabbed

Table F-3 - 100-Year 24-Hour HEC-1 Results . . . . Tabbed

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

Page

Figure P-1 - Isopluvials for 100-Year 6-Hour Precipitation 3-54

Figure P-2 - Isopluvials for 100-Year 24-Hour Precipitation 3-55

Figure C-1 - HEC-1 vs. Log-Pearson III Analysis 3-61

SECTION 3: Hydrologic Analysis

REFER TO SEPARATE HYDROLOGY

TECHNICAL DATA NOTEBOOK

SECTION 4: Hydraulic Analysis

4.1 Method Description

Water surface elevations for Un-named Washes A, A South, F and I are computed through the use of the Department of the Army, Corps of Engineers HEC-2 Water Surface Profiles computer program as implemented by Dodson and Associates, Inc. in their May 1991 version of ProHEC2. Starting elevations were obtained using critical depth. Elevations used are referenced to the National Geodetic Vertical Datum of 1929.

Following completion of reproducible topographic mapping, stream thalwegs were sketched on work prints. Cross section locations spaced at about 1,000 feet were selected. Criteria for selection included:

- Represent the local stream reach
- Orient perpendicular to the predicted 100-year floodplain
- Avoid inclusion of non-effective areas such as tributary washes
- Include the entire predicted 100-year floodplain
- Check the accuracy of topographic mapping and digitized cross sections at the two locations surveyed in the field.

At confluences and other areas where it was anticipated that flow may not be fully two dimensional, "broken back" cross sections where selected to reflect the predicted flow pattern.

Cross section labeling represents each section's distance upstream of the mouth, measured in miles along the thalweg.

Digitized cross sections at the locations selected as described above were provided by Aerial Mapping Co., Inc. Sections were processed by Burgess & Niple to develop section plots. For each cross section, station 10,000 represents the intersection with the thalweg as delineated by Burgess & Niple on the topographic mapping.

Cross section plots were reviewed in conjunction with aerial photographs and topographic mapping to determine if the sections were representative of the reach. Adjustments were made to remove non-effective areas, bank stations were selected, and Manning's "n" values were assigned.

Predicted overbank flow lines were sketched on the work maps, and flow lengths were scaled along these lines and the thalweg.

Results of the initial HEC-2 run were reviewed to determine if sections were representative of the reach. Further adjustments were made to remove non-effective flow areas.

SECTION 4: Hydraulic Analysis

4.2 Parameter Estimation

Report on Manning's "n" Values

RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY

FCD 93-06

Wash A
Wash A South
Wash F
Wash I

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

Burgess & Niple, Inc.
5025 East Washington Street
Phoenix, Arizona 85034
(602) 244-8100

March 1995

On May 9, 1994, engineers from Burgess & Niple, Inc. and the Flood Control District of Maricopa County made a reconnaissance field trip to select Manning's "n" values for use in backwater modeling of Wash A from its mouth at the Verde River to the east line of Section 26, T.5N., R.6E; Wash F from its mouth at the Verde River to the east line of Section 25, T.5N., R.6E; and Wash I from its mouth at the Verde River to the east line of Section 25, T.5N., R.6E.

Manning's "n" values were selected based on visual observations for the channel and overbanks using, as a guide, the report "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona", U.S. Geological Survey. A copy of pertinent portions of the report is included in the Appendix of this report. Examples of the method used to establish "n" values for the channel bottom are shown below for Cross Sections 0.241 and 0.658 on Wash A. These correspond to Photo Sites K and J, respectively.

Using Equation 7 from the above reference:

$$n = (n_b + n_1 + n_2 + n_3) \times \text{adjustment for meander}$$

Section 0.241:

$$n = (0.025 + 0.002 + 0.000 + 0.000) \times 1.15 = 0.031$$

Use 0.03

Section 0.658:

$$n = (0.025 + 0.005 + 0.002 + 0.005) \times 1.15 = 0.043$$

Use 0.04

The following report illustrates with photos the selected Manning's "n" values. The picture sites shown on the photos are also shown on the maps at the end of this report.

In general, the channel bottoms range from clear to moderately clear of vegetation and were assigned coefficients of 0.020 to 0.035. Channel banks and bars are more heavily vegetated, with coefficients up to 0.08 for the immediate side slopes and 0.07 to 0.08 in the overbank areas.

Roughness coefficients have been assigned to sub-elements of individual cross-sections based upon the field reconnaissance and comparison with aerial photographs. Roughness coefficients are included in the HEC-2 computer model by use of NC or NH cards.

Photo No. 1 (3-3) - Looking downstream at Site X
"n" = 0.035 for channel

Photo No. 2 (3-5) - Looking downstream at Site X
"n" = 0.080 for left overbank

Photo No. 3 (2-33) - Looking upstream at Site C
"n" = 0.035 for channel

Photo No. 4 (2-34) - Looking upstream at Site C
"n" = 0.070 for left overbank

Photo No. 5 (2-31) - Looking upstream at Site F
"n" = 0.040 for channel

Photo No. 6 (2-32) - Looking upstream at Site F
"n" = 0.070 for left overbank

Photo No. 7 (2-24) - Looking upstream at Site I
"n" = 0.040 for channel

Photo No. 8 (2-28) - Looking downstream at Site J
"n" = 0.040 for channel

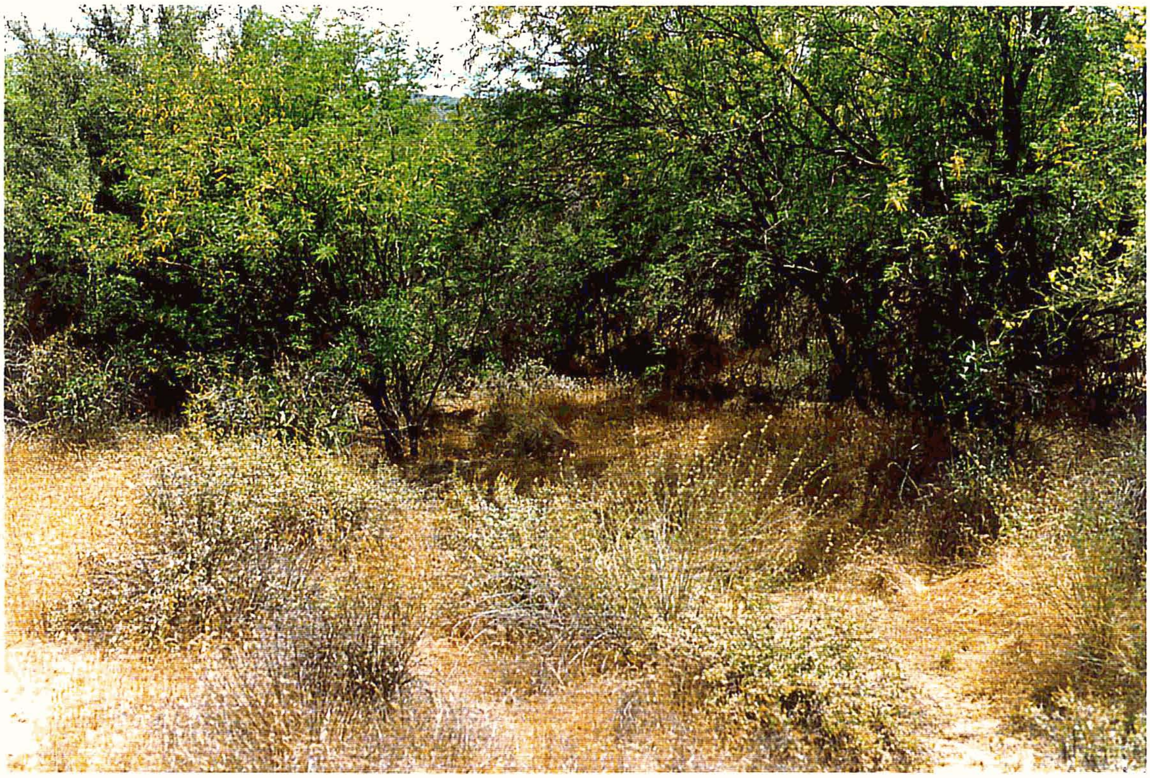


Photo No. 9 (2-30) - Looking downstream at Site J
"n" = 0.080 for right overbank

Photo No. 10 (2-22) - Looking downstream at Site K
"n" = 0.030 for channel

Photo No. 11 (2-23) - Looking downstream at Site K
"n" = 0.060 for left overbank

Photo No. 12 (2-21) - Looking upstream at Site L
"n" = 0.035 for channel

Photo No. 13 (2-19) - Looking downstream at Site P
"n" = 0.035 for channel

Photo No. 14 (2-20) - Looking downstream at Site P
"n" = 0.070 for left overbank

Photo No. 15 (2-13) - Looking downstream at Site M
"n" = 0.040 for channel

Photo No. 16 (2-14) - Looking downstream at Site M
"n" = 0.080 for left overbank

Photo No. 17 (2-10) - Looking upstream at Site N
"n" = 0.040 for channel

Photo No. 18 (2-12) - Looking upstream at Site O
"n" = 0.055 for channel

Photo No. 19 (2-1) - Looking downstream at Site V
"n" = 0.040 for channel

Photo No. 20 (2-2) - Looking downstream at Site V
"n" = 0.070 for right overbank

Photo No. 21 (2-7) - Looking downstream at Site S
"n" = 0.035 for channel

Photo No. 22 (2-8) - Looking upstream at Site R
"n" = 0.035 for channel

APPENDIX

ESTIMATED MANNING'S ROUGHNESS COEFFICIENTS FOR STREAM CHANNELS AND FLOOD PLAINS IN MARICOPA COUNTY, ARIZONA

By

B.W. Thomsen and H.W. Hjalmarson

ABSTRACT

A procedure for the estimation of Manning's roughness coefficient (*n*) was applied to channels and flood plains of streams in Maricopa County with different roughness factors. Manning's roughness coefficients that ranged from 0.025 to 0.200 were estimated at 16 sites. Roughness coefficients were estimated by comparison of site characteristics with published photographs and descriptions of channels and flood plains where *n* values were verified for other studies. The base value of *n* and the values for surface irregularities, obstructions, and vegetation that affect the total *n* value are described and presented in tables, cross sections of channels, and photographs. All sites are readily accessible to facilitate field inspection of roughness factors by hydrologists and engineers for definition of Manning's *n*. Subdivision of channel cross sections was based mostly on changes of channel geometry and to a lesser degree on the basis of large changes of vegetation density.

INTRODUCTION

Computations of flow in open channels require evaluation of roughness characteristics of the channel. Roughness coefficients represent the resistance to flow and cannot be quantitatively determined by direct measurement or calculation. Values of roughness coefficients have been computed for many artificial surfaces and typical natural channels and have been verified for selected channel sites. Characteristics of natural channels and the factors that affect channel roughness vary greatly, however, and the combinations of these factors are numerous. Selection of roughness coefficients for natural channels, therefore, requires judgment and skill that is acquired mainly through experience.

The purpose of this report is to illustrate recommended techniques for estimating roughness coefficients for 16 sites on streams in Maricopa County, Arizona (fig. 1). The sites are readily accessible for field inspection of roughness factors by hydrologists and engineers working on flood-engineering studies, bridge design, or other hydraulic computations. A wide range of channel-roughness characteristics from 0.025 to 0.200 can be observed at the sites. The techniques are based on the work of Chow (1959), Barnes (1964), Aldridge and Garrett (1973), and Arcement and Schneider (1984) and are adapted for the desert channels of the study area. The adaptations were based on the experience of the authors in river hydraulics in the deserts of the southwestern United States. The resulting

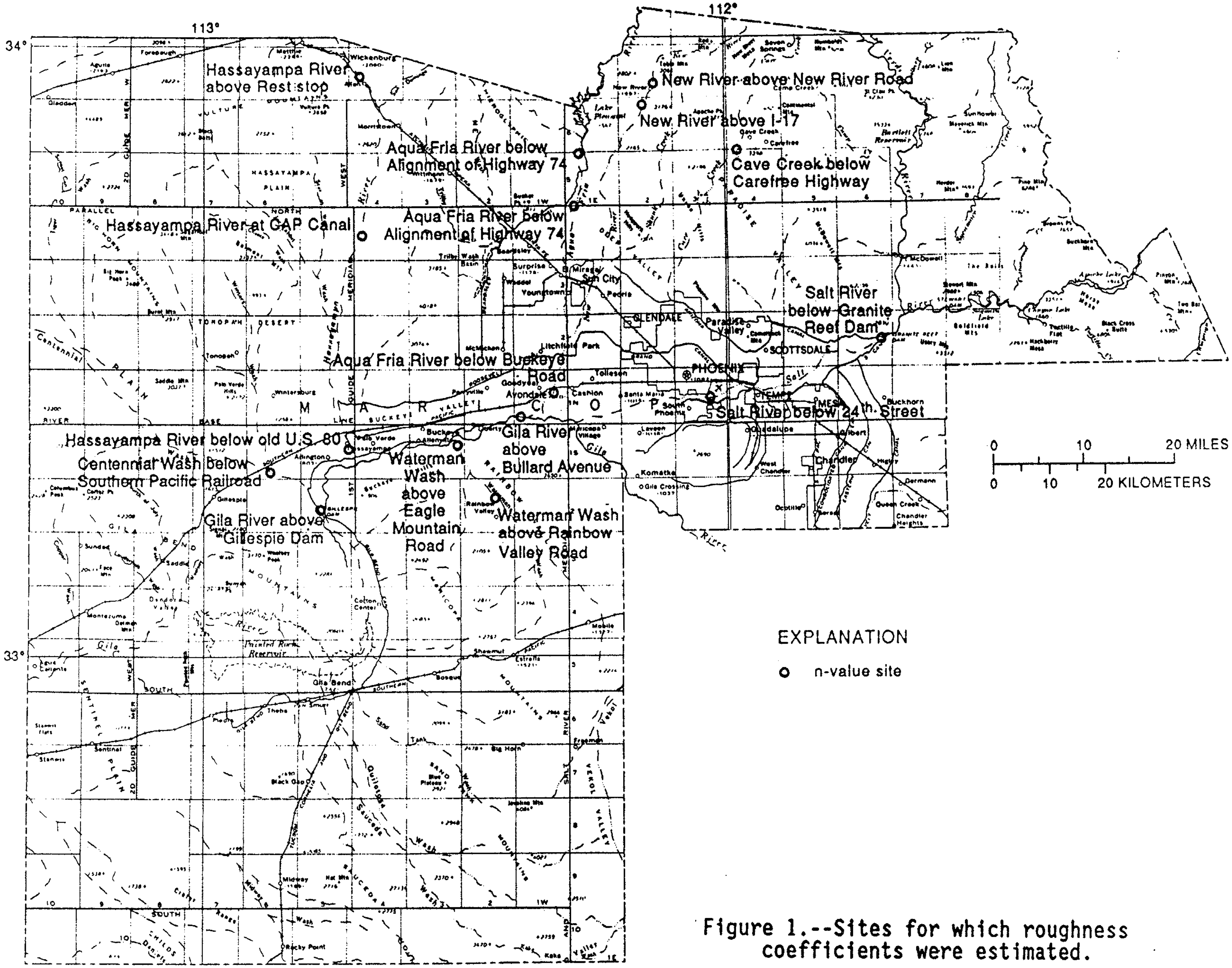


Figure 1.--Sites for which roughness coefficients were estimated.

estimates should not be used as verified values of roughness coefficients. The Flood Control District of Maricopa County furnished maps and channel data and was the cooperator in the study.

The total *n* value is determined by using a base *n* for the channel or flood plain and applying adjustments for various roughness components such as vegetation and obstructions to flow. Where there are distinct segments of different channel roughness in a channel section or subsection, the *n* values for the segments are weighted by area or wetted perimeter to determine the total *n* value. Where there is an unequal distribution of velocity across a channel, the channel cross section was subdivided into sections of more uniform velocity distribution on the basis of changes in channel geometry and roughness.

MANNING EQUATION

The Manning equation in the following form is commonly used to compute discharge in natural channels:

$$Q = \frac{1.486}{n} A R^{2/3} S_e^{1/2}, \qquad (1)$$

where

Q = discharge, in cubic feet per second,

A = cross-section area of channel, in square feet,

R = hydraulic radius, A/P (P, wetted perimeter, in feet), in feet,

S_e = energy gradient, and

n = roughness coefficient.

The equation was developed for conditions of uniform flow in which the water-surface profile and energy gradient are parallel to the streambed and the area, depth, and velocity are constant throughout the reach. The equation was assumed to be valid for nonuniform reaches if the energy gradient is modified to reflect only the losses resulting from boundary friction (Barnes, 1967). The modified energy gradient is called the friction slope. Use of the Manning equation in discharge computations generally involves the concept of channel conveyance. Conveyance, *K*, is defined as

$$K = \frac{1.486}{n} A R^{2/3} \qquad (2)$$

and is a measure of the carrying capacity of the channel. Where the conveyance concept is used, Manning's equation is reduced to

$$Q = KS^{1/2}, \tag{3}$$

where S is the friction slope. The friction slope for a reach of nonuniform channel can be expressed as

$$S = \frac{h_f}{L}, \tag{4}$$

where

h_f = energy loss resulting from boundary friction in the reach and

L = length of the reach.

The main components of h_f are the difference in water-surface elevation and the difference in velocity head at the ends of the reach.

Velocity-Head Coefficient

The velocity-head coefficient is not directly used for the estimate of channel roughness in this report. Several of the cross sections, however, are subdivided on the basis of velocity-head considerations, and a Manning's roughness coefficient is estimated for each of the subsections. A basic understanding of the velocity-head coefficient, therefore, is necessary for the estimation of channel roughness coefficients for channels with irregularly shaped cross sections and varying distribution of vegetation across the channels.

Roughness factors and nonuniformities in channel geometry cause the velocity in a given cross section of channel to vary from point to point. As a result of nonuniform distribution of velocities, the true velocity head (h_V) generally is greater than the value computed from the expression

$$h_V = \frac{V^2}{2g}, \tag{5}$$

where

V = mean velocity in the cross section and

g = acceleration of gravity.

The ratios of the true velocity head to the velocity head computed on the basis of the mean velocity is the velocity-head coefficient, alpha. For a reasonably straight channel with uniformly shaped cross section, the effect of nonuniform velocity distribution on the computed velocity head is small and, for convenience in the absence of a more suitable method, the coefficient is assumed to be unity (Chow, 1959). A detailed study of the velocity-head coefficient, alpha, in natural channels showed a significant correlation between alpha and channel roughness for channels without overbank flow. Variation in the horizontal distribution of velocity had a greater effect on the value of alpha than variation in the vertical. Computed values of alpha at 894 sites in a variety of settings ranged from 1.03 to 4.70, and the median value for trapezoidal channels was 1.40 (Hulsing and others, 1966). In the computation of water-surface profiles in open channels, the value of alpha is assumed to be 1.0 if the section is not subdivided (Davidian, 1984). In subdivided channel cross sections, the value of alpha is computed as

$$\alpha = \frac{\Sigma(k_i^3/a_i^2)}{K_T^3/A_T^2}, \tag{6}$$

where

k_i = conveyance of individual subsections,

a_i = area of individual subsections,

K_T = conveyance of entire cross section, and

A_T = area of entire cross section.

Channel n Values

The Manning roughness coefficient, *n*, is a measure of the flow resistance or relative roughness of a channel or overflow area. The flow resistance is affected by many factors including bed material, cross-section irregularities, depth of flow, vegetation, channel alignment, channel shape, obstructions, suspended material, and bedload. In general, all factors that cause turbulence and retard flow tend to increase the roughness coefficient (Jarrett, 1984). Channel roughness also is directly related to channel slope (Riggs, 1976; Jarrett, 1984). The relation of roughness to slope results partly from the interrelation between channel slope and bed-material particle size. For similar bed material, however, channels with low gradients have lower roughness coefficients than channels with high gradients (Jarrett, 1984). The direct relation between channel roughness and channel slope is not evident in low-gradient channels where high roughness coefficients result from vegetation. Roughness coefficients as great as 0.20 have been verified for channels with low gradients and dense vegetation (Arcement and Schneider, 1984). For vegetation that will bend under the force of flowing water, the relation between roughness and gradient can be inversely related. Steep slopes cause greater velocities that bend and flatten vegetation if depths of flow are sufficient, resulting in lower *n* values. Because of the relation between channel slope and size of bed material, the effect of slope on *n* values is considered in the selection of base *n* values.

A common method of selecting the roughness coefficient, *n*, is to first select a base value of *n* for the bed material (table 1). The base values of *n* are for a straight uniform channel of a given bed material. Cross-section irregularities, channel alignment, obstructions, vegetation, and other factors that increase roughness are accounted for by adding increments of roughness to the base value of *n*. Ranges of adjustments for the factors that may add to channel roughness are shown in table 2.

Many alluvial channels in Maricopa County have bed material that moves during floodflow. In addition to the changing channel geometry of these channels, the roughness coefficient may change during floodflow because of the changing form of the channel bed in parts of the channel cross section (Davidian, 1984). Bedforms, such as dunes, antidunes, and plane bed have been observed during large floods. Within a few minutes, dunes can appear, disappear, and reappear at different locations across a large stream channel. The Manning roughness coefficient can double or triple when the bedform changes from plane to dunes. A method of defining reliable values of Manning's *n* for unstable alluvial channels is not available. A plane bedform is common during large floods, and for this report, plane-bed conditions are assumed where the roughness coefficient is related to the size of the channel material and not the form of the channel bed. Plane-bed conditions were assumed for nearly all indirect measurements of peak discharge where the slope-area method was used.

Table 1.--*Base values of Manning's n for stable channels*

[Modified from Aldridge and Garrett, 1973, table 1]

Channel material	Size of bed material		Base *n* values	
	Millimeters	Inches	Benson and Dalrymple (1967)[1]	Chow (1959)[2]
Concrete..............	-------	--------	0.012-0.018	0.011
Rock cut..............	-------	--------	-----------	.025
Firm soil.............	-------	--------	.025- .032	.020
Coarse sand...........	1-2	--------	.026- .035	-----
Fine gravel...........	-------	--------	-----------	.024
Gravel................	2-64	0.08-2.5	.028- .035	-----
Coarse gravel.........	-------	--------	-----------	.028
Cobble................	64-256	2.5-10.0	.030- .050	-----
Boulder...............	>256	>10.0	.040- .070	-----

[1] Straight uniform channel.

[2] Smoothest channel attainable in indicated material.

Table 2.--*Adjustment factors for the determination of overall Manning's n values*

[Modified from Chow, 1959]

Channel conditions	Manning's n adjustment[1]	Example
Degree of irregularity:		
Smooth	0.000	Smoothest channel attainable in given bed material.
Minor	.001- .005	Channels with slightly eroded or scoured side slopes.
Moderate	.006- .010	Channels with moderately sloughed or eroded side slopes.
Severe	.011- .020	Channels with badly sloughed banks; unshaped, jagged, and irregular surfaces of channels in rock.
Effects of obstruction[2]:		
Negligible	.000- .004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
Minor	.005- .015	Obstructions occupy 5 to 15 percent of the cross-sectional area and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved smooth-surfaced objects than are used for sharp-edged angular objects.
Appreciable	.020- .030	Obstructions occupy from 15 to 50 percent of the cross-sectional area or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
Severe	.040- .060	Obstructions occupy more than 50 percent of the cross-sectional area or the space between obstructions is small enough to cause turbulence across most of the cross section.
Vegetation:		
Small	.002- .010	Dense growths of flexible turf grass, such as Bermuda, or weeds where the average depth of flow is at least two times the height of the vegetation; supple tree seedlings such as willow, cottonwood, arrow weed, or saltcedar where the average depth of flow is at least three times the height of the vegetation.
Medium	.010- .025	Grass or weeds where the average depth of flow is from one to two times the height of the vegetation; moderately dense stemmy grass, weeds, or tree seedlings where the average depth of flow is from two to three times the height of the vegetation; moderately dense brush, similar to 1- to 2-year-old saltcedar in the dormant season, along the banks and no significant vegetation along the channel bottoms where the hydraulic radius exceeds 2 feet.
Large	.025- .050	Turf grass or weeds where the average depth to flow is about equal to the height of vegetation; small trees intergrown with some weeds and brush where the hydraulic radius exceeds 2 feet.

See footnotes at end of table.

Table 2.--*Adjustment factors for the determination of overall Manning's n values*--Continued

Channel conditions	Manning's n adjustment[1]	Example
Vegetation—Continued:		
Very large	.050- .100	Turf grass or weeds where the average depth of flow is less than half the height of vegetation; small bushy trees intergrown with weeds along side slopes of dense cattails growing along channel bottom; trees intergrown with weeds and brush.
Variations in channel cross section:		
Gradual	.000	Size and shape of cross sections change gradually.
Alternating	.001- .005	Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.
Alternating	.010- .015	Large and small cross sections alternate frequently, or the main flow frequently shifts from side to side owing to changes in cross-sectional shape.
Degree of meadering[3]:		
Minor	1.00	Ratio of the meander length to the straight length of the channel reach is 1.0 to 1.2.
Appreciable	1.15	Ratio of the meader length to the straight length of channel is 1.2 to 1.5.
Severe	1.30	Ratio of the meander length to the straight length of channel is greater than 1.5.

[1] Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (table 1) before multiplying by the adjustment for meander.

[2] Conditions considered in other steps must not be reevaluated or duplicated in this section.

[3] Adjustment values apply to flow confined in the channel and do not apply where downvalley flow crosses meanders. The adjustment is a multiplier.

For floodflows in sand channels with moveable beds, roughness mainly is a function of the size of the bed material as shown in the following table (Benson and Dalrymple, 1967, p. 22).

Median grain size, in millimeters	Manning's *n*	Median grain size, in millimeters	Manning's *n*
0.2	0.012	0.6	.023
.3	.017	.8	.025
.4	.020	1.0	.026
.5	.022		

The above *n* values are for upper-regime flow that is common during floods. Where these *n* values are used, the assumed flow regime should be confirmed (Benson and Dalrymple, 1967, p. 24). Stream channels in Maricopa County commonly are sandy in the low-flow part of the channel where flows are common. Higher parts of the channel beds and the channel banks commonly are stabilized by gravel, cobbles, and boulders, and (or) to some extent by vegetation.

Depth of flow must be considered in selection of *n* values. The effects of roughness elements on and near the channel bottom tend to diminish as the depth of flow increases. The effect of vegetation on *n* values depends greatly on the depth of flow and to some extent on the flexibility of the vegetation. If the flow is of sufficient depth to submerge and (or) flatten the vegetation, *n* values will be lowered. Density of vegetation below the high-water level and the alignment of vegetation in relation to direction of flow also affect *n* values. If the vegetation is aligned in rows along the direction of flow, less vegetation is in contact with higher velocity flow. The roughness of aligned vegetation tends to be less than the roughness of nonaligned vegetation.

Generally an *n* value is selected for a cross section that is representative of a reach of channel. If two or more cross sections are being considered, the reach that applies to a given section extends halfway to the next section. In this study, channel data including maps showing cross-section locations were furnished by Maricopa County Flood Control District. A cross section for each of the 16 sites was selected on the basis of the following criteria: (1) cross section should be located so that visual inspection is reasonably convenient; (2) cross section should be within a reach that is minimally affected by roads, bridges, and other structures that may obstruct floodflow; and (3) cross section should contain roughness elements typical of the reach. Widths of the cross sections range from a few hundred feet to a few thousand feet. Some sections have a distinct main channel and overflow areas; others are one large trapezoidal section.

Components of Manning's n

The general procedure for determining *n* values was to first select a base value of *n* for the bed material (table 1) followed by selection of *n*-value adjustments for channel irregularities and alignment, obstructions, vegetation, and other factors (table 2). In this procedure, the value of *n* was computed by

$$n = n_b + n_1 + n_2 + n_3, \tag{7}$$

where

n_b = base value of *n* for a straight uniform channel,

n_1 = value for surface irregularities,

n_2 = value for obstruction, and

n_3 = value for vegetation.

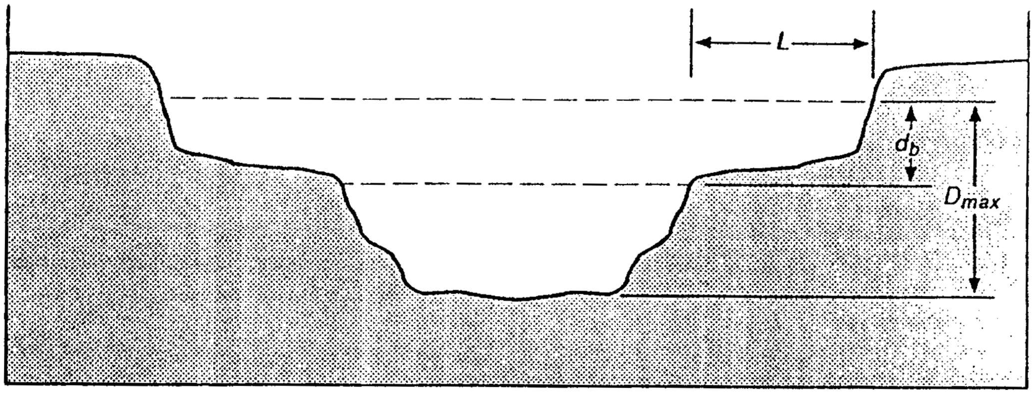
The major adjustments to the base value of *n* used in this report are for cross-section characteristics. Other adjustments for the reach characteristics between cross sections that include changes in shape and size of cross sections and channel meandering are not given. Procedures for evaluating the adjustment factors for the reach characteristics are given in several publications including Chow (1959), Aldridge and Garrett (1973), Jarrett (1985a, b), and Arcement and Schneider (1989).

SUBDIVISION OF CROSS SECTIONS

Sections with distinct changes in shape were divided into subsections, and *n* values were determined separately for each subsection. Subdivision location primarily was based on major breaks in cross-sectional geometry. Cross sections were subdivided if main channel depth was more than twice the depth at the stream edge of the overflow area (fig. 2). Subdivision also commonly was made where the depth of the overflow at the stream edge is nearly half the depth of the main channel and the width of the overflow area is at least five times the depth of the overflow area (fig. 2). Values of *n* for overflow areas commonly were estimated from table 2.

For sections or subsections with a nonuniform distribution of vegetation, a composite *n* was computed by using weighted values for segments having different roughness. Where sections were divided into segments of equal roughness, dividing lines were selected to parallel the general flow line and to represent the average contact between segments of different roughness. Composite *n* values were computed by using weighted values of either area (*A*) or wetted perimeter (*P*). Weighting was done by estimating area or wetted perimeter for each portion of channel and assigning weighting factors that were proportional to the total area or wetted perimeter. The general rule for deciding which weighting method to use is as follows: Use area weighting where vegetation is dense and occupies a distinct part of the cross section. Use wetted-perimeter weighting where the roughness factor for each segment is the result of low-lying boundary material.

Where overflow areas are cultivated fields, *n* values are for fields without crops. Values of *n* for fields with crops can be based on the work of Chow (1959). Fields of mature cotton plants are comparable to dense brush in summer; defoliated cotton to medium to dense brush in winter (fig. 3). Fields of alfalfa are comparable to field crops with *n* value depending on height of the crop and depth of water (table 3). The value of *n* generally varies with the stage of submergence of the vegetation. In all instances, *n* values associated with cultivated fields will change with time.



Subdivide if D_{max} is greater than or equal to $2d_b$

Subdivide if D_{max} is approximately equal to $2d_b$
and if L/d_b is equal to or greater than 5

L = width of flood plain
d_b = depth of flow on flood plain, in feet
D_{max} = maximum depth of flow in cross section, in feet

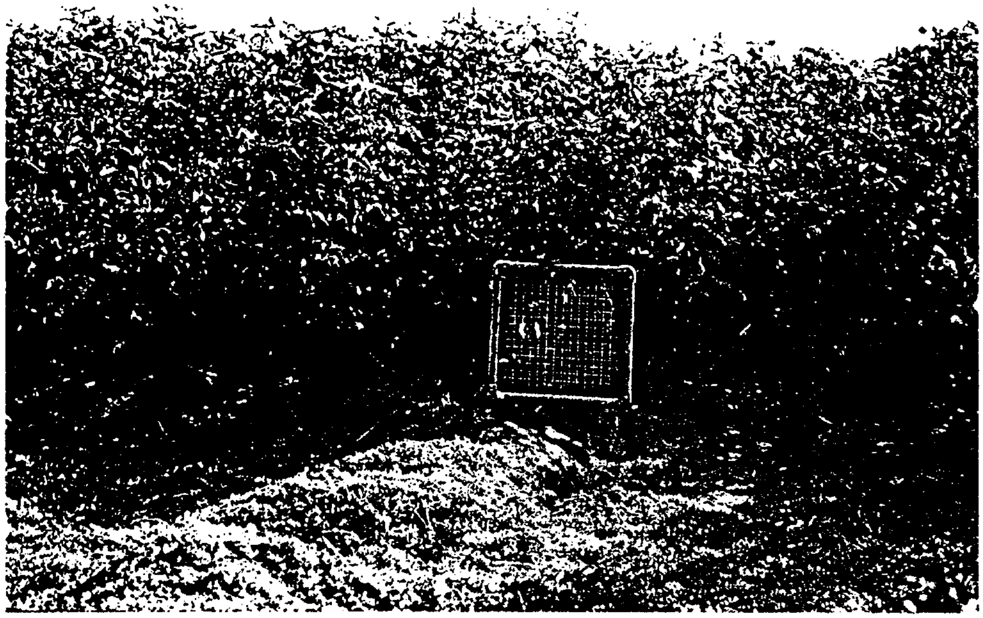
Modified from Davidian (1984)

Figure 2.--Subdivision criteria commonly used for streams in Maricopa County, Arizona.

Table 3.--*Values of Manning's n for flood plains*

[Modified from Chow, 1959]

Description	Minimum	Normal	Maximum
Pasture, no brush:			
Short grass.....	0.025	0.030	0.035
High grass.....................................	.030	.035	.050
Cultivated areas:			
No crop..	.020	.030	.040
Mature row crops...............................	.025	.035	.045
Mature field crops.............................	.030	.040	.050
Brush:			
Scattered brush, heavy weeds...................	.035	.050	.070
Light brush and trees, in winter...............	.035	.050	.060
Light brush and trees, in summer...............	.040	.060	.080
Medium to dense brush, in winter...............	.045	.070	.110
Medium to dense brush, in summer...............	.070	.100	.160
Trees:			
Dense willows, summer, straight................	.110	.150	.200
Cleared land with tree stumps, no sprouts.......	.030	.040	.050
Same as above, but heavy growth off sprouts.....	.050	.060	.080
Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches.......	.080	.100	.120
Same as above, but with flood stage reaching branches............................	.100	.120	.160



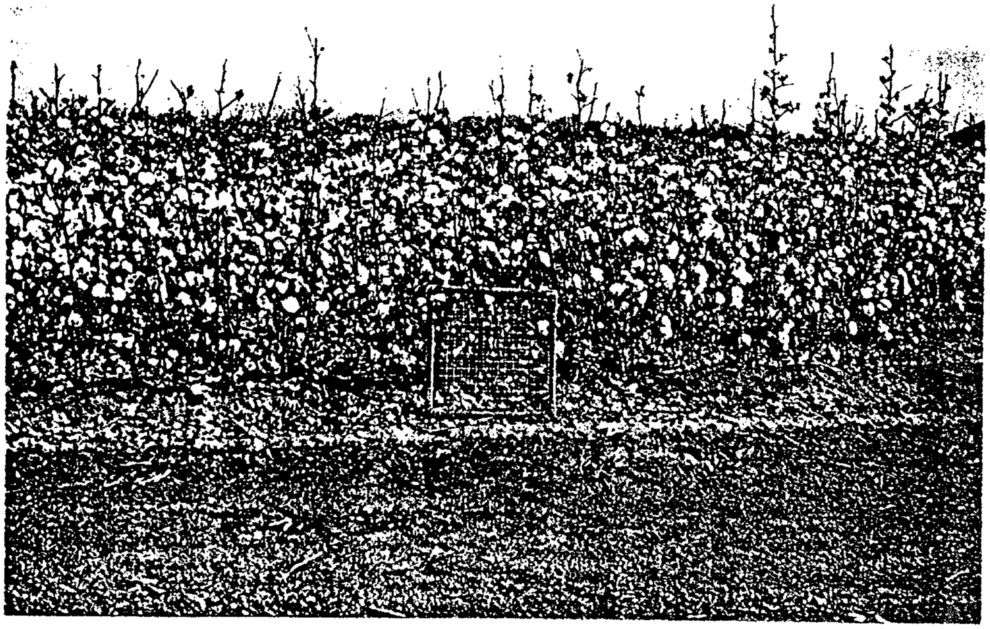


Figure 3.--Cotton fields at different seasons.

SITE INFORMATION

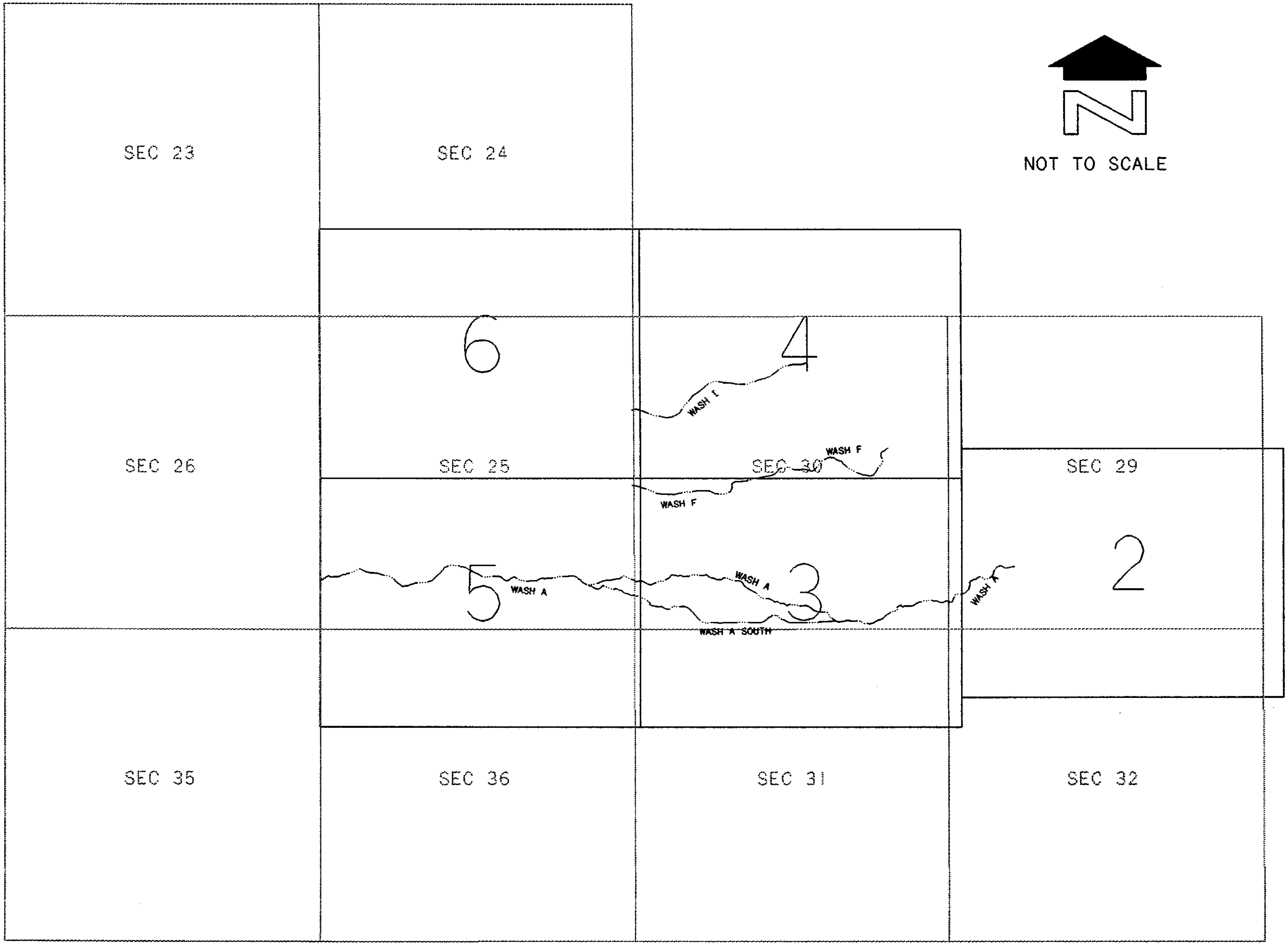
The following sets of site information consist of a description of the site, a table showing values of *n* for sections and subsections of the channel for the 10-year and 100-year floods, channel cross sections, and photographs (tables 4-19; figs. 4-35). Photographs of the 16 sites taken during the spring and summer of 1989 include an overview showing the location of the cross section; additional photographs show major items that affect the *n* value. The frame of the square grid shown in several photographs is 1.5 ft outside dimension on a side with an internal square of 1 ft on a side and grid spacing of 1 in. Cross-section diagrams show approximate elevations of the 10-year and 100-year flood levels, appropriate subdivisions, selected *n* values, and the approximate location and height of the vegetation. The approximate flood elevations were computed from conveyance-slope computations using cross-section geometry furnished by Flood Control District of Maricopa County.

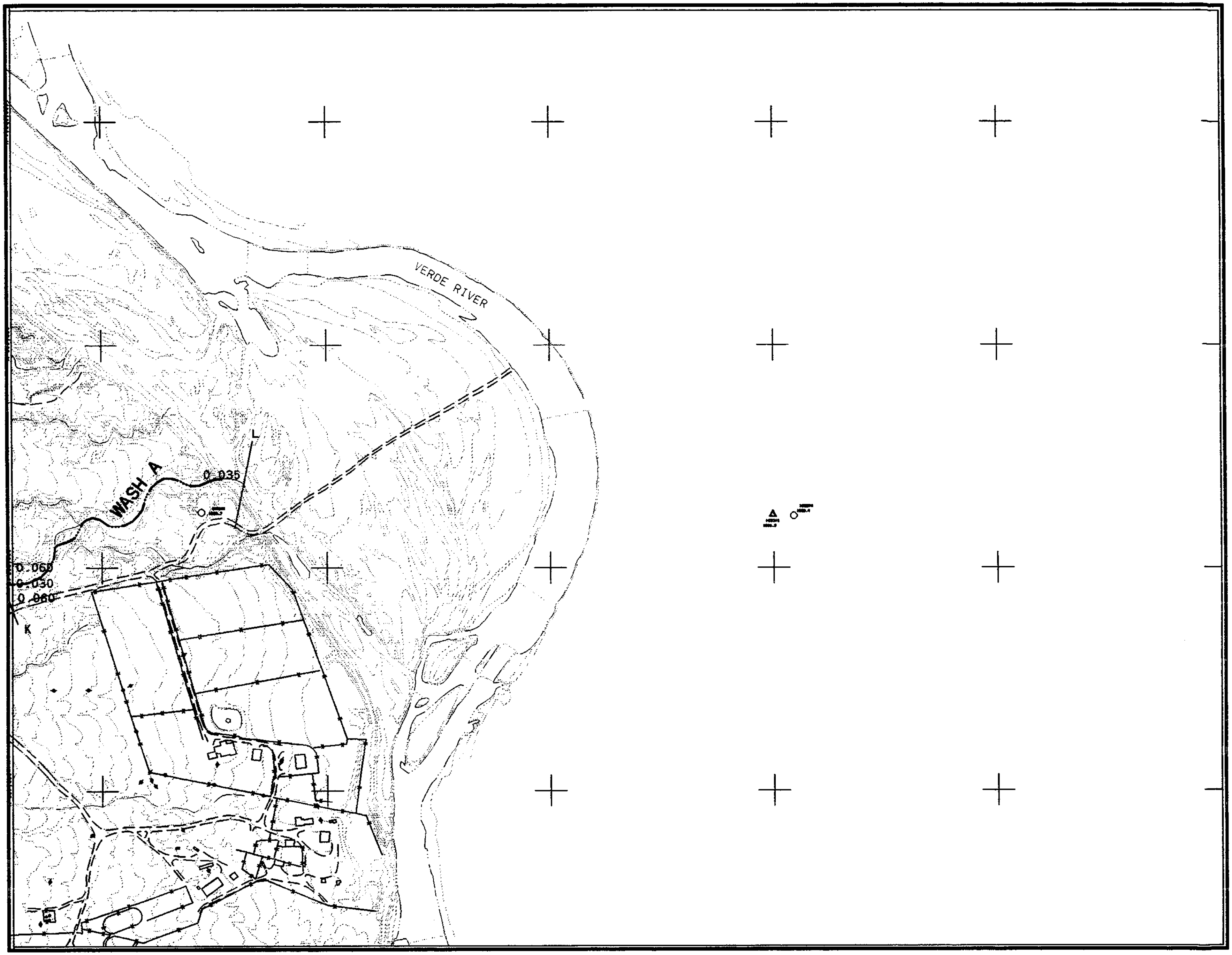
The photographs were taken from different locations on the ground and from an aircraft. For most sites, a photograph of typical bed material is included. The photographs of the channel and flood plain can be used for comparison of field conditions with photographs of channels and flood plains where *n* values have been verified (Arcement and Schneider, 1989; Chow, 1959; Barnes,1964; Aldridge and Garrett, 1973). Several of the photographs and descriptions refer to the horizontal stationing of the cross section.

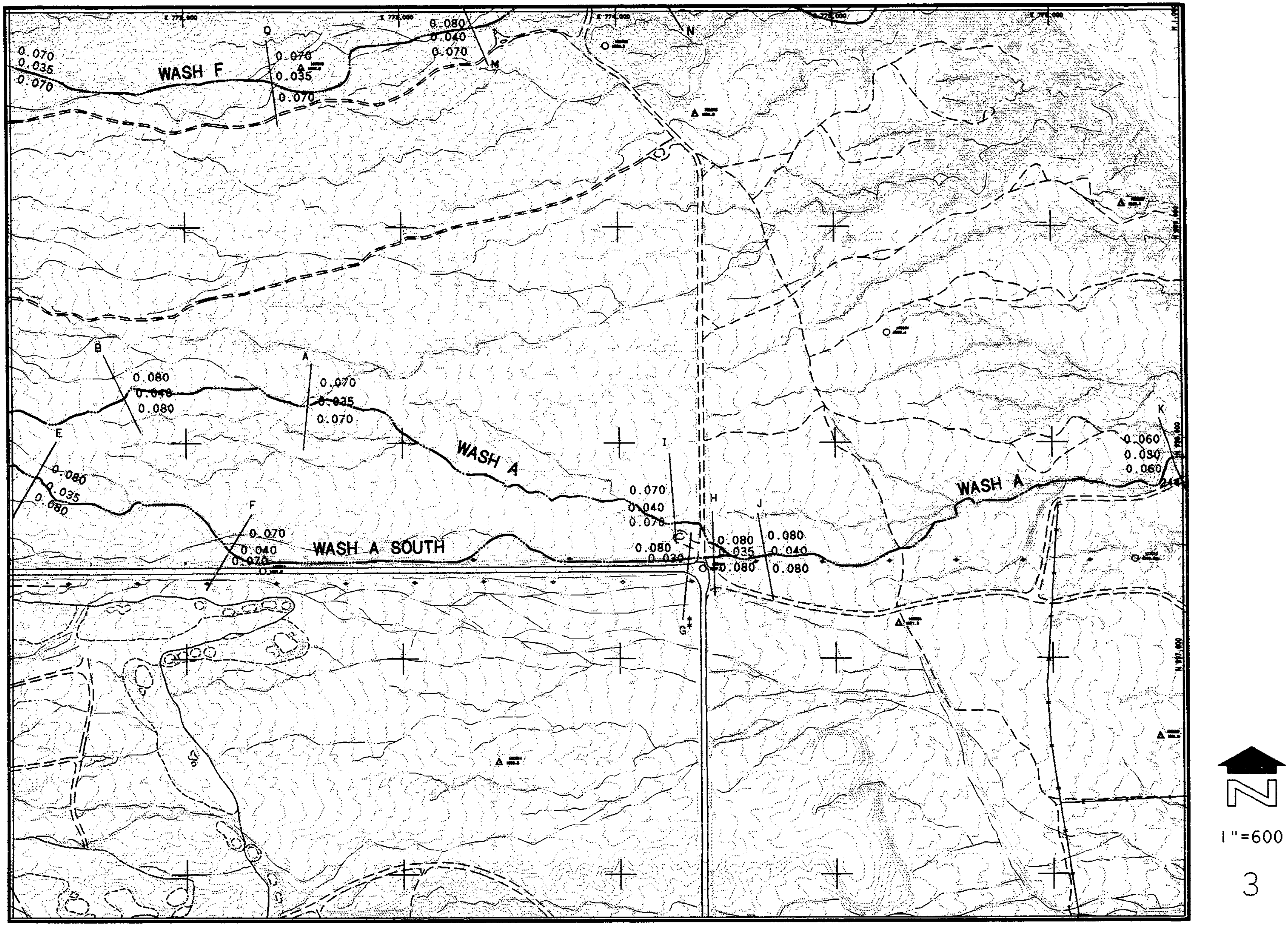
The description of each site includes the location of the channel cross section, the description of the channel, the basis for subdivision of the cross section, and the evaluation of the estimated *n* value. Changes in channel geometry and type and distribution and density of vegetation are described. The area or wetted-perimeter basis for weighting of *n* for portions of sections and subsections is defined. The channel cross section and the photographs should be used in conjunction with the site description to assess how *n* was defined.

The table shows the components of the roughness coefficient for the 10-year and 100-year floods that were estimated for the sections and subsections. The total *n* values are the sum of the base value of *n* for a straight uniform channel (n_b); surface irregularities (n_1); obstruction (n_2); and vegetation (n_3). Dashes indicate that a roughness coefficient of zero was used. Where portions of sections and subsections were used, the part of the section or subsection used for the estimate of the composite *n* is listed under "Portion of area or wetted perimeter of subsection from left end." Where portions of sections or subsections were not used, values for portions and weighted and composite values were not listed. The sum of the parts for each portion of the section and (or) subsection is equal to 1. The composite value of *n* for the sections and subsections is the sum of the weighted *n* values for each portion.

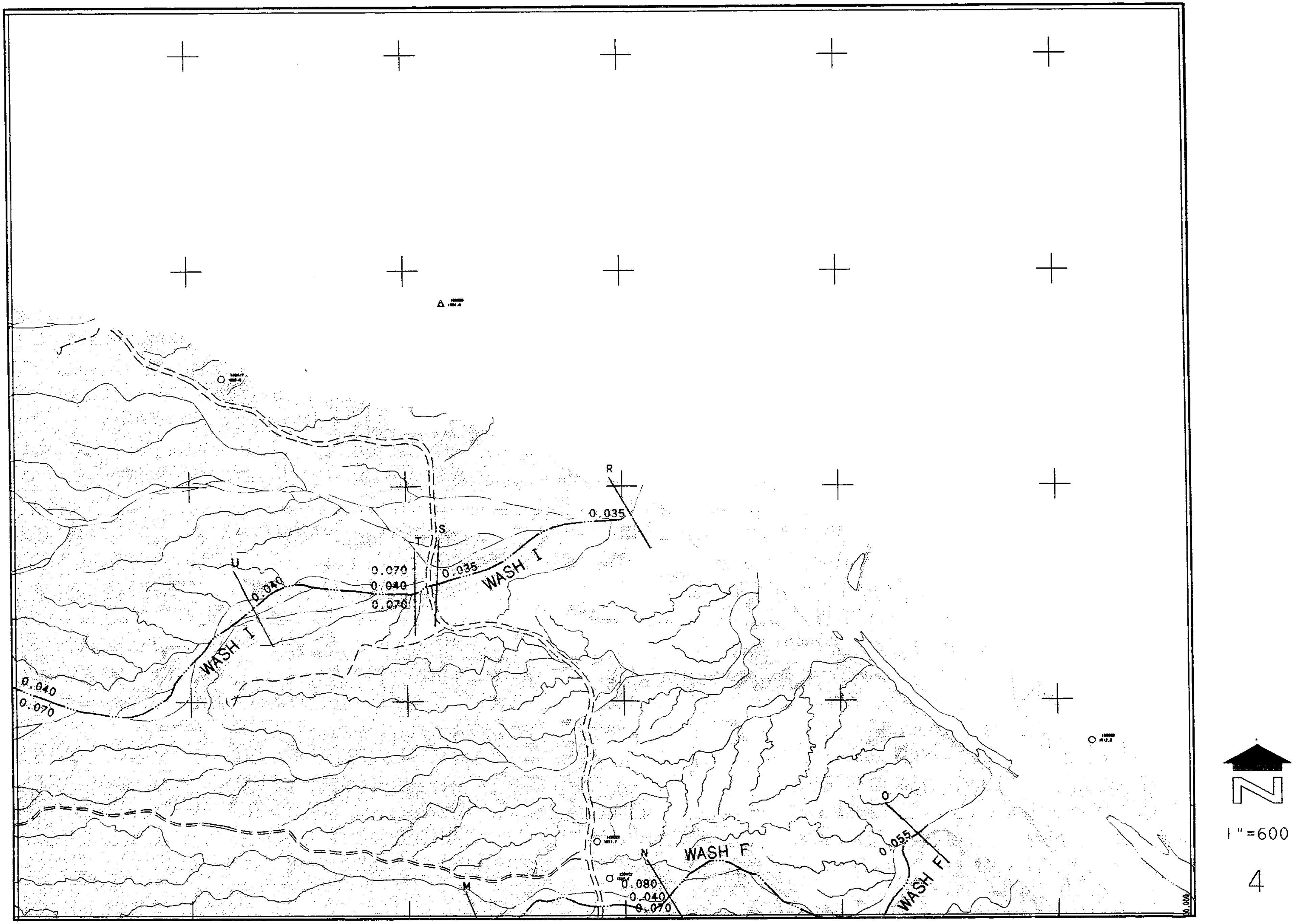
INDEX MAP


N
NOT TO SCALE
SEC 23
SEC 24
SEC 26
6
4
WASH I
SEC 25
SEC 30
WASH F
SEC 29
WASH F
2
5
WASH A
WASH A
3
WASH A
WASH A SOUTH
SEC 35
SEC 36
SEC 31
SEC 32

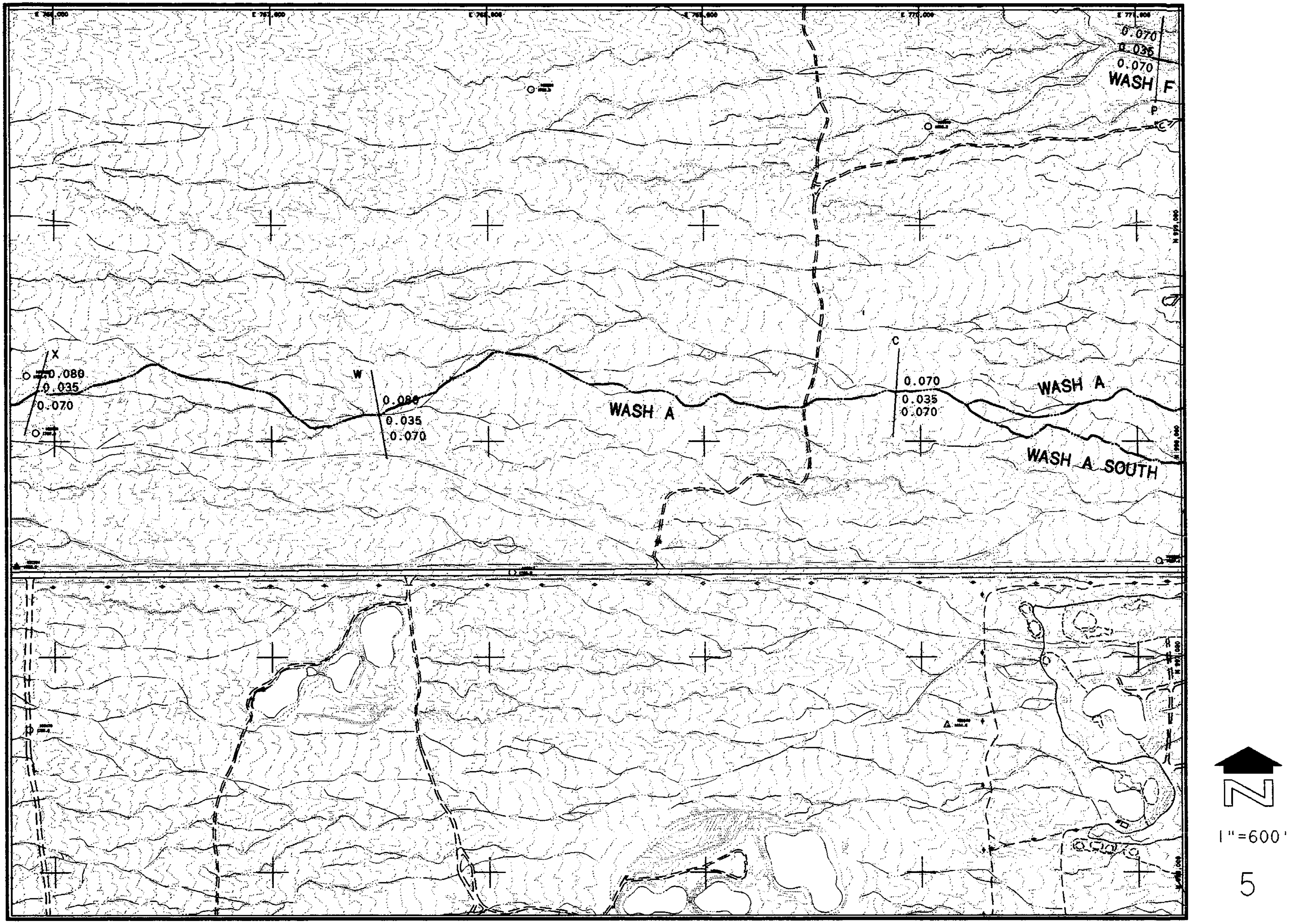

VERDE RIVER
WASH A
0.035
L
0.060
0.030
0.060
K
N
1"=600'

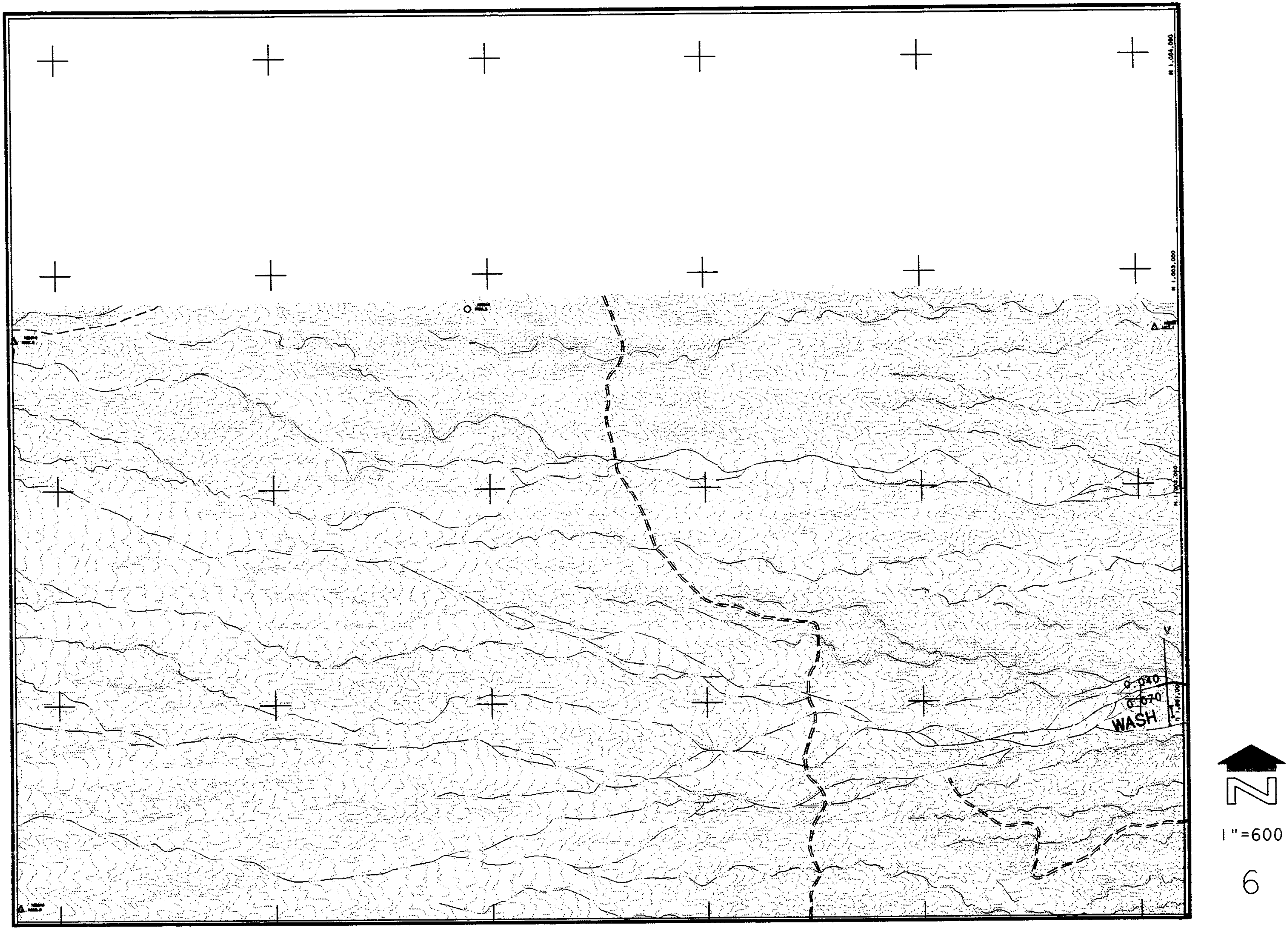

WASH F
WASH A
WASH A
WASH A SOUTH
O
N
M
0.070
0.035
0.070
0.070
0.035
0.070
0.080
0.040
0.070
B
0.080
0.040
0.080
A
0.070
0.035
0.070
E
0.080
0.035
0.080
F
0.070
0.040
0.070
I
0.070
0.040
0.070
0.080
0.030
G
H
0.080
0.035
0.080
J
0.080
0.040
0.080
K
0.060
0.030
0.060
1"=600'

3


R
0.035
S
T
U
0.070
0.040
0.070
0.035
WASH I
0.040
WASH I
0.040
0.070
O
0.055
WASH F
N
WASH F
0.080
0.040
0.070
M
1"=600'

4


E 770,000
0.070
0.035
0.070
WASH F
P
X
0.080
0.035
0.070
W
0.080
0.035
0.070
WASH A
C
0.070
0.035
0.070
WASH A
WASH A SOUTH
N
1"=600'


N 1,004,000
N 1,003,000
N 1,002,000
N 1,001,000
V
0.040
0.070
WASH
I
N
1"=600'

6

SECTION 4: Hydraulic Analysis

4.3 Cross Section Description

Following completion of reproducible topographic mapping, stream thalwegs were sketched on work prints. Cross section locations spaced at about 1,000 feet were selected. Criteria for selection included:

- Represent the local stream reach
- Orient perpendicular to the predicted 100-year floodplain
- Avoid inclusion of non-effective areas such as tributary washes
- Include the entire predicted 100-year floodplain
- Check the accuracy of topographic mapping and digitized cross sections at the two locations surveyed in the field.

At confluences and other areas where it was anticipated that flow may not be fully two dimensional, "broken back" cross sections where selected to reflect the predicted flow pattern.

Cross section labeling represents each section's distance upstream of the mouth, measured in miles along the thalweg.

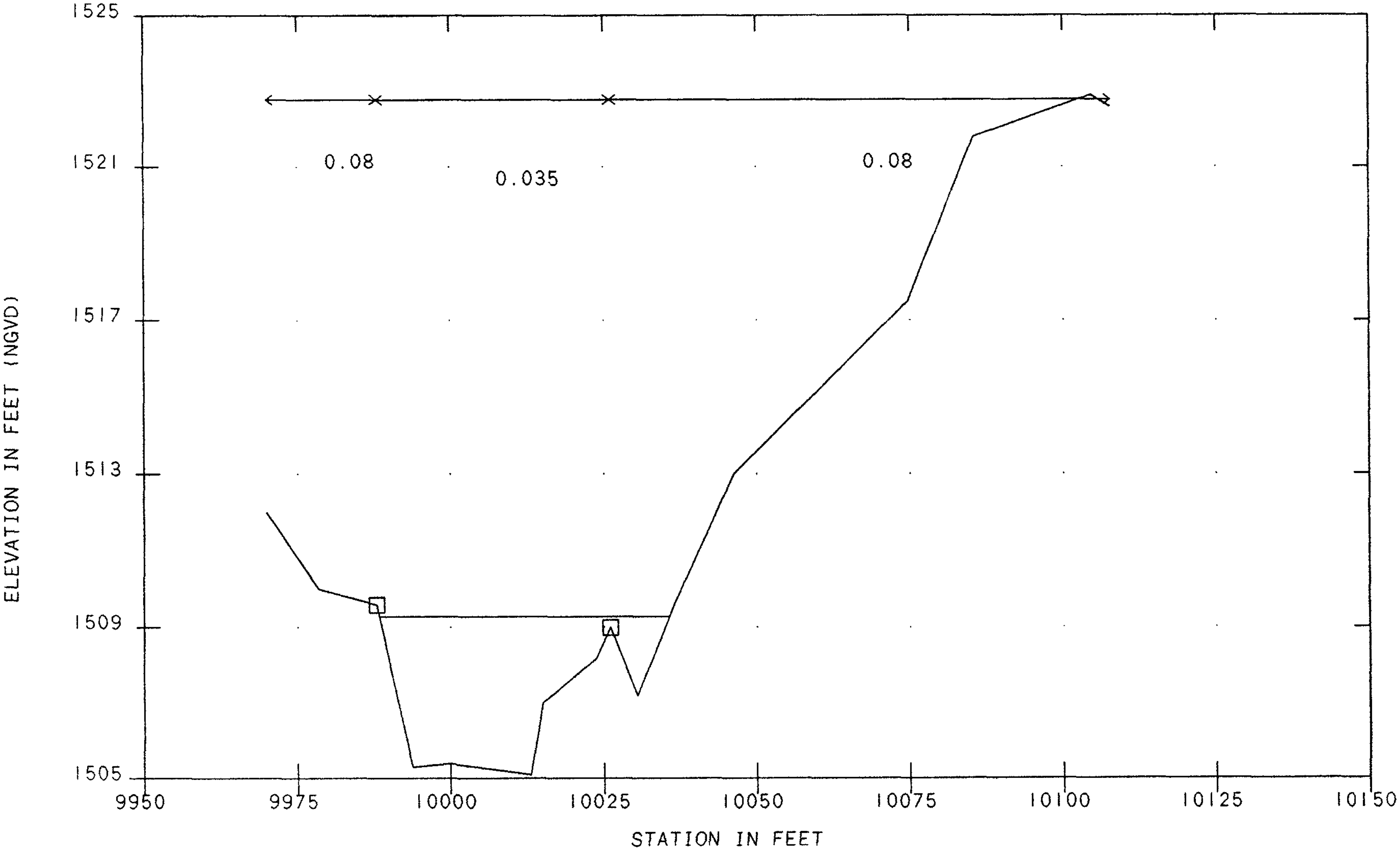
Digitized cross sections at the locations selected as described above were provided by Aerial Mapping Co., Inc. Sections were processed by Burgess & Niple to develop section plots. For each cross section, station 10,000 represents the intersection with the thalweg as delineated by Burgess & Niple on the topographic mapping.

Cross section plots were reviewed in conjunction with aerial photographs and topographic mapping to determine if the sections were representative of the reach. Adjustments were made to remove non-effective areas, bank stations were selected, and Manning's "n" values were assigned.

Results of the initial HEC-2 run were reviewed to determine if sections were representative of the reach. Further adjustments were made to remove non-effective flow areas.

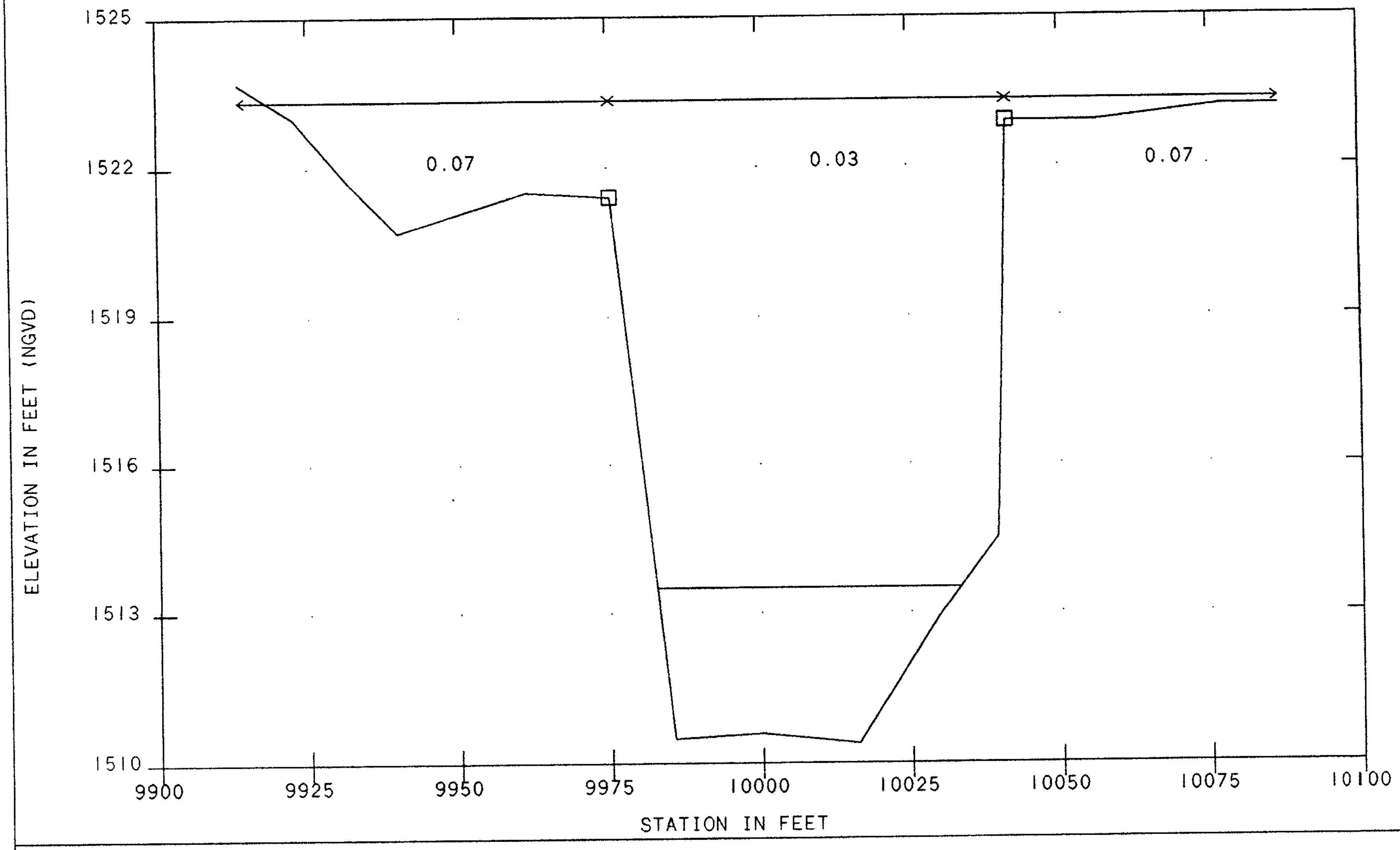
Following are copies of cross sections showing bank stations, 100 year water surface elevation, and Manning's "n" values.

WASH A



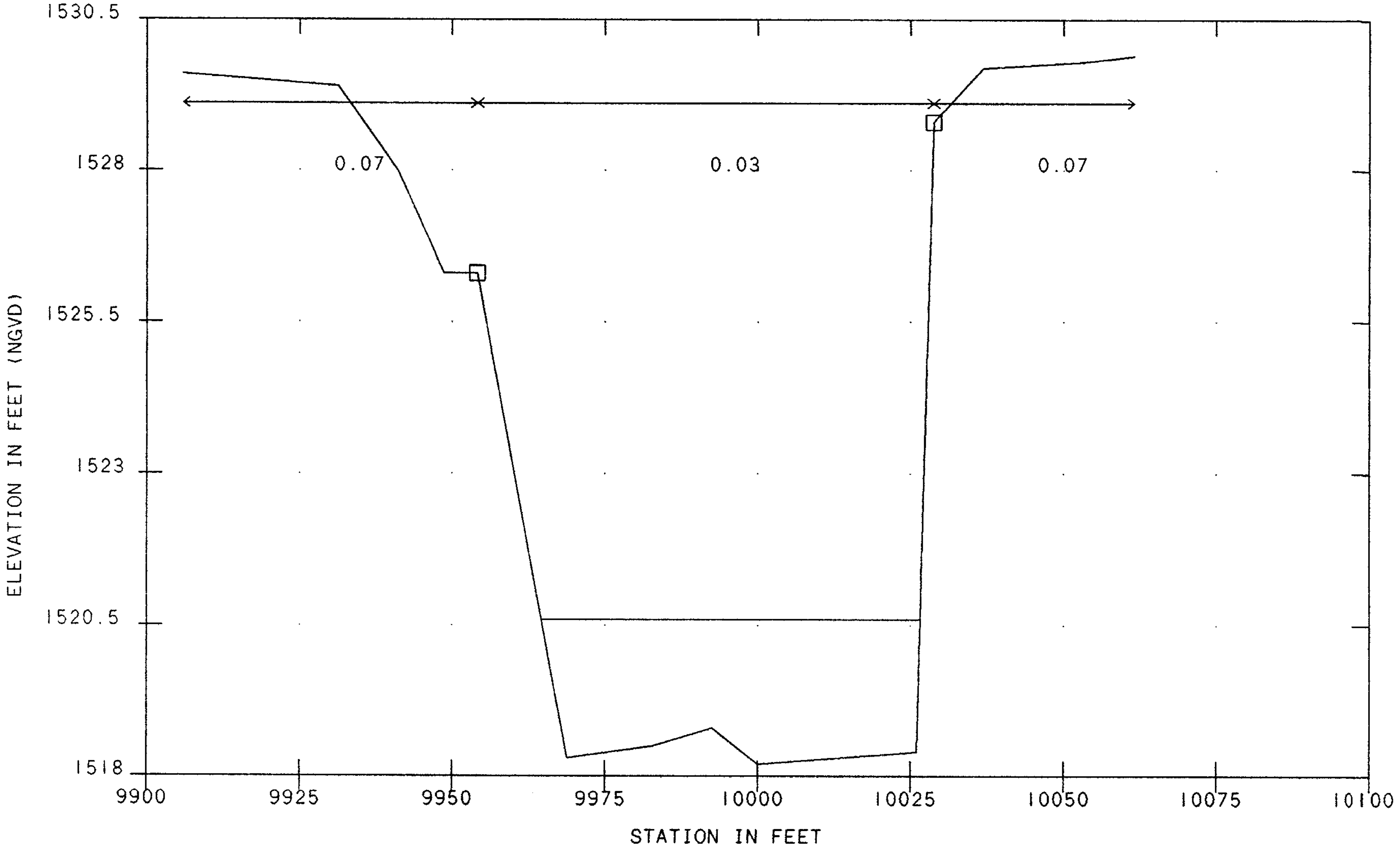
SECTION : 0.000

WASH A AUGUST 19, 1994



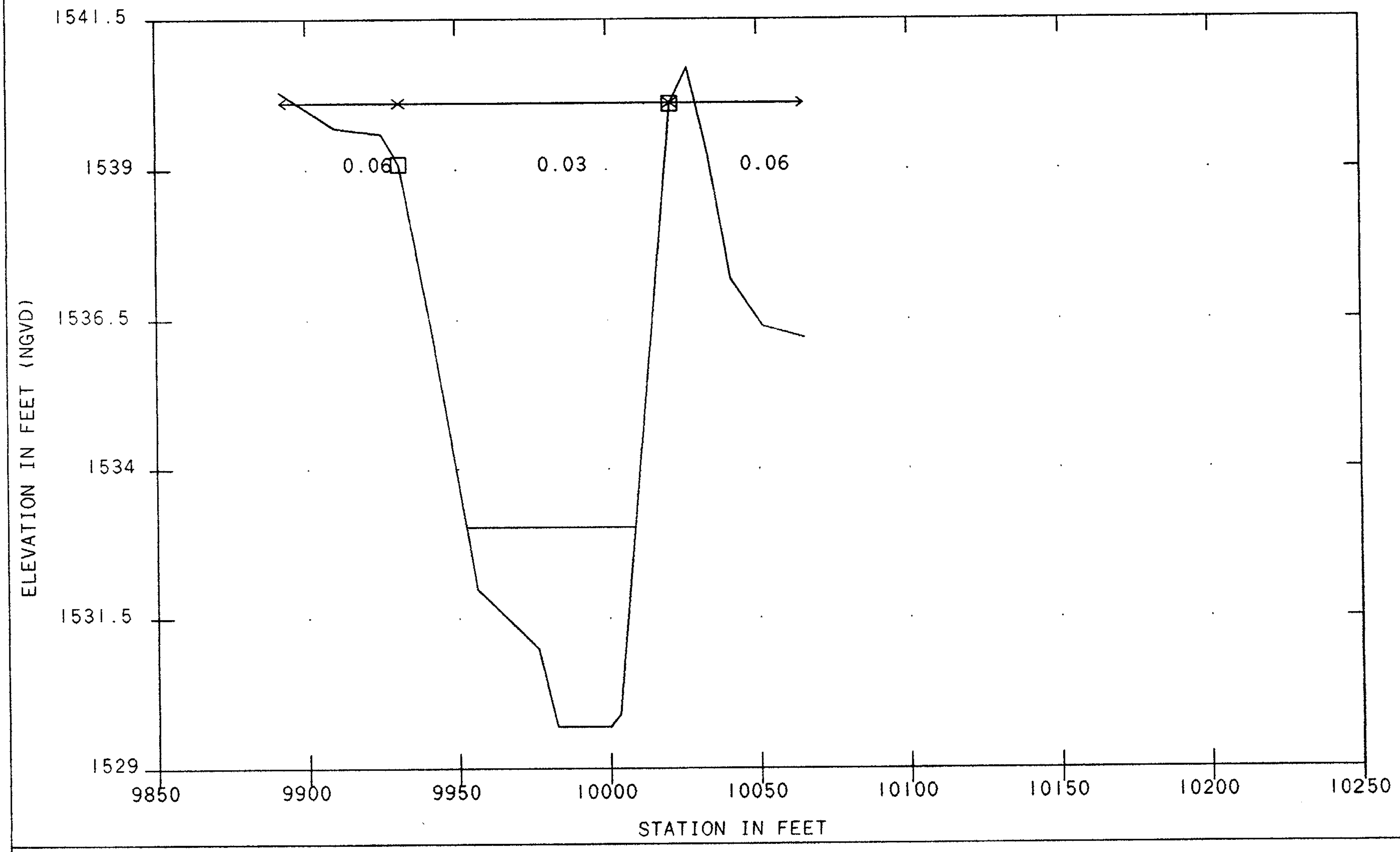
SECTION : 0.031

WASH A AUGUST 19, 1994



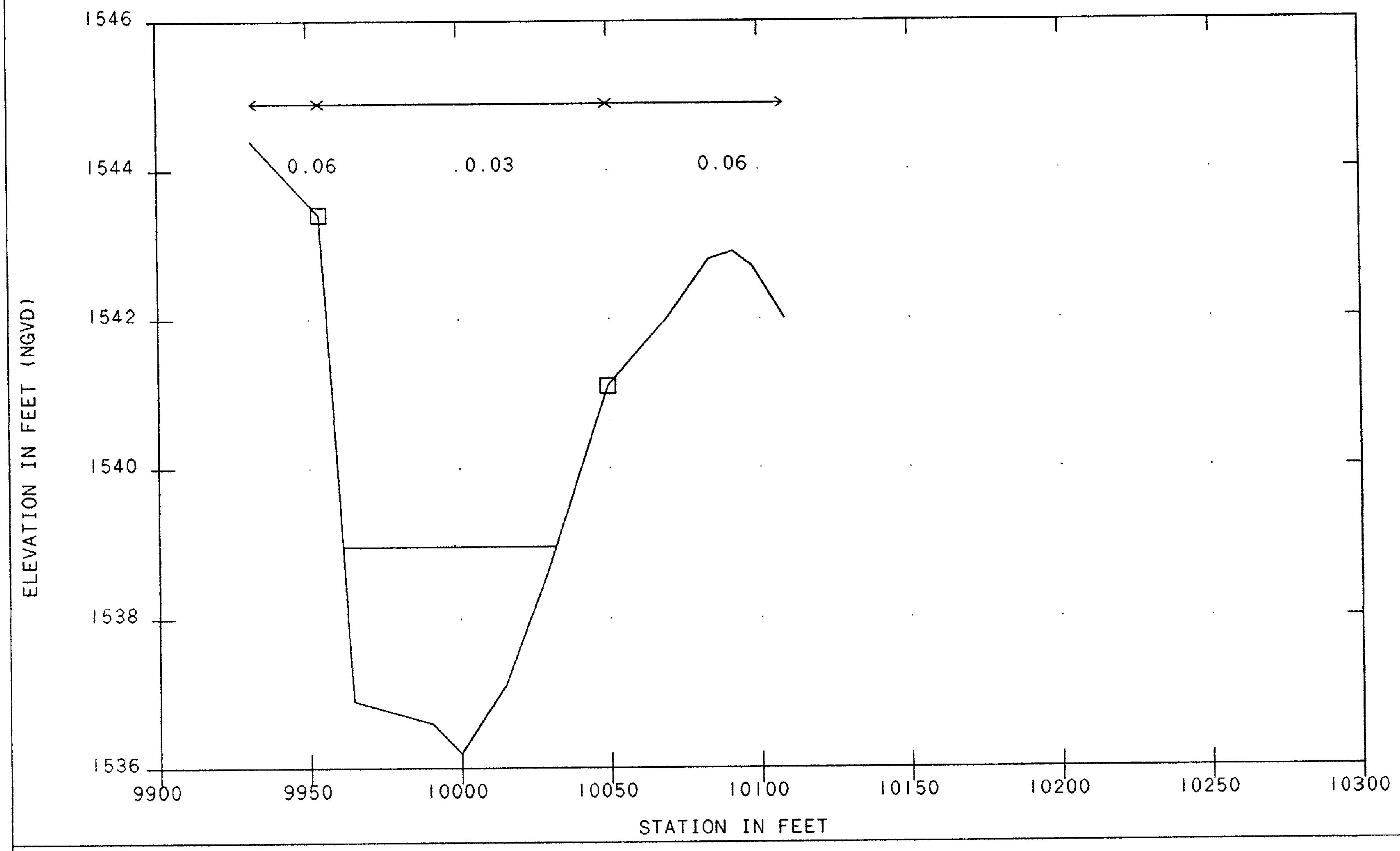
SECTION : 0.094

WASH A AUGUST 19, 1994



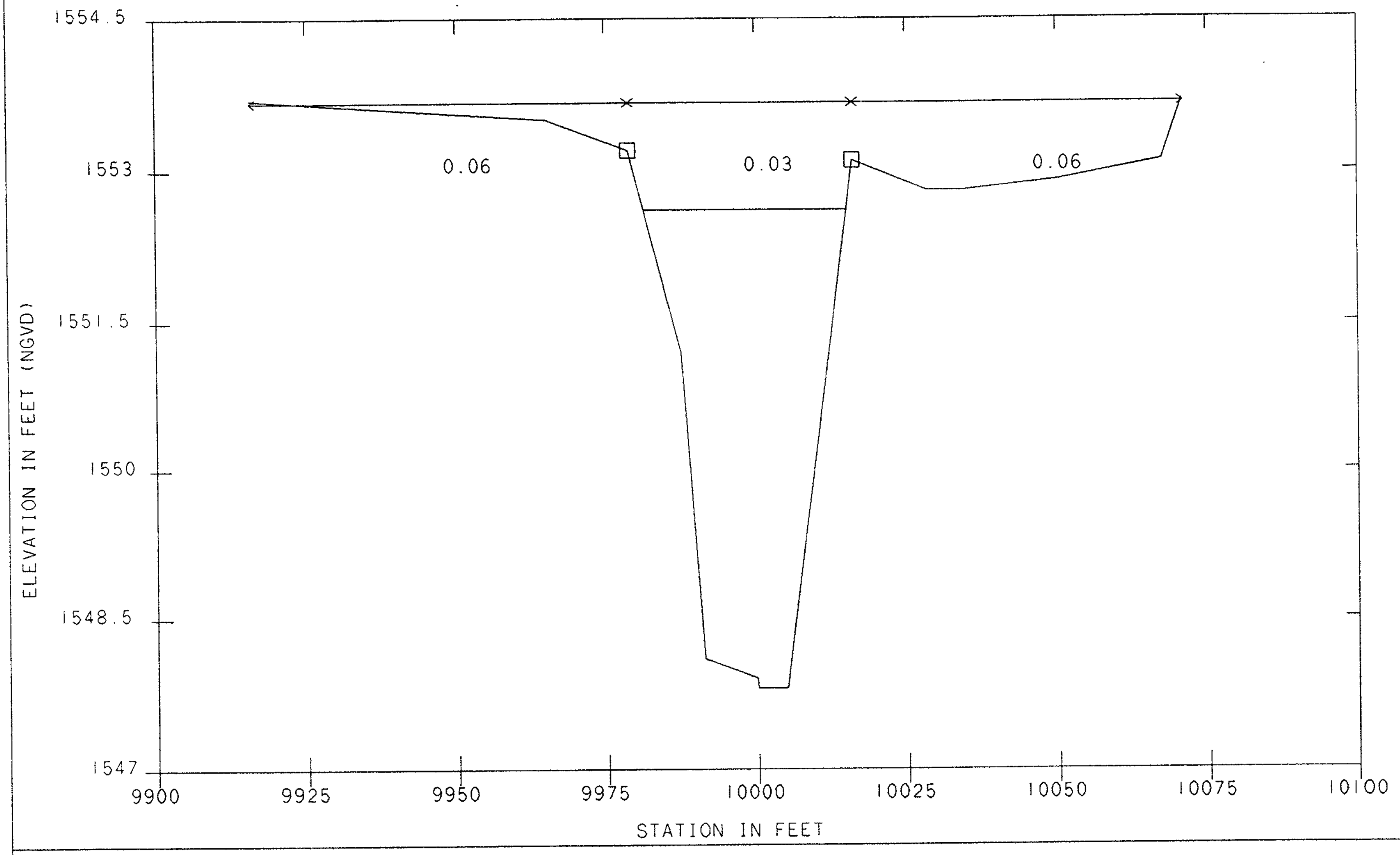
SECTION : 0.181

WASH A AUGUST 19, 1994



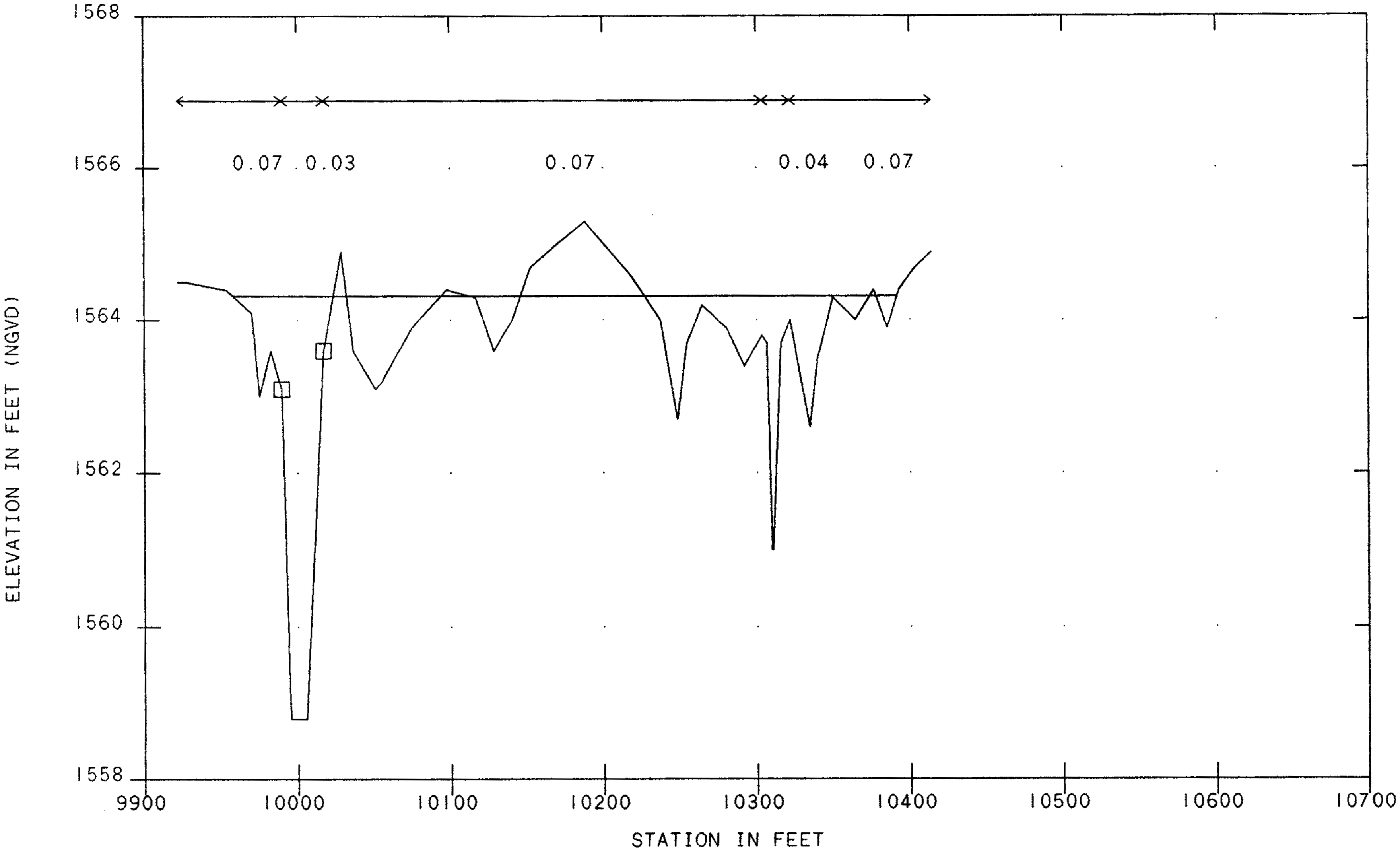
SECTION : 0.241

WASH A AUGUST 19, 1994



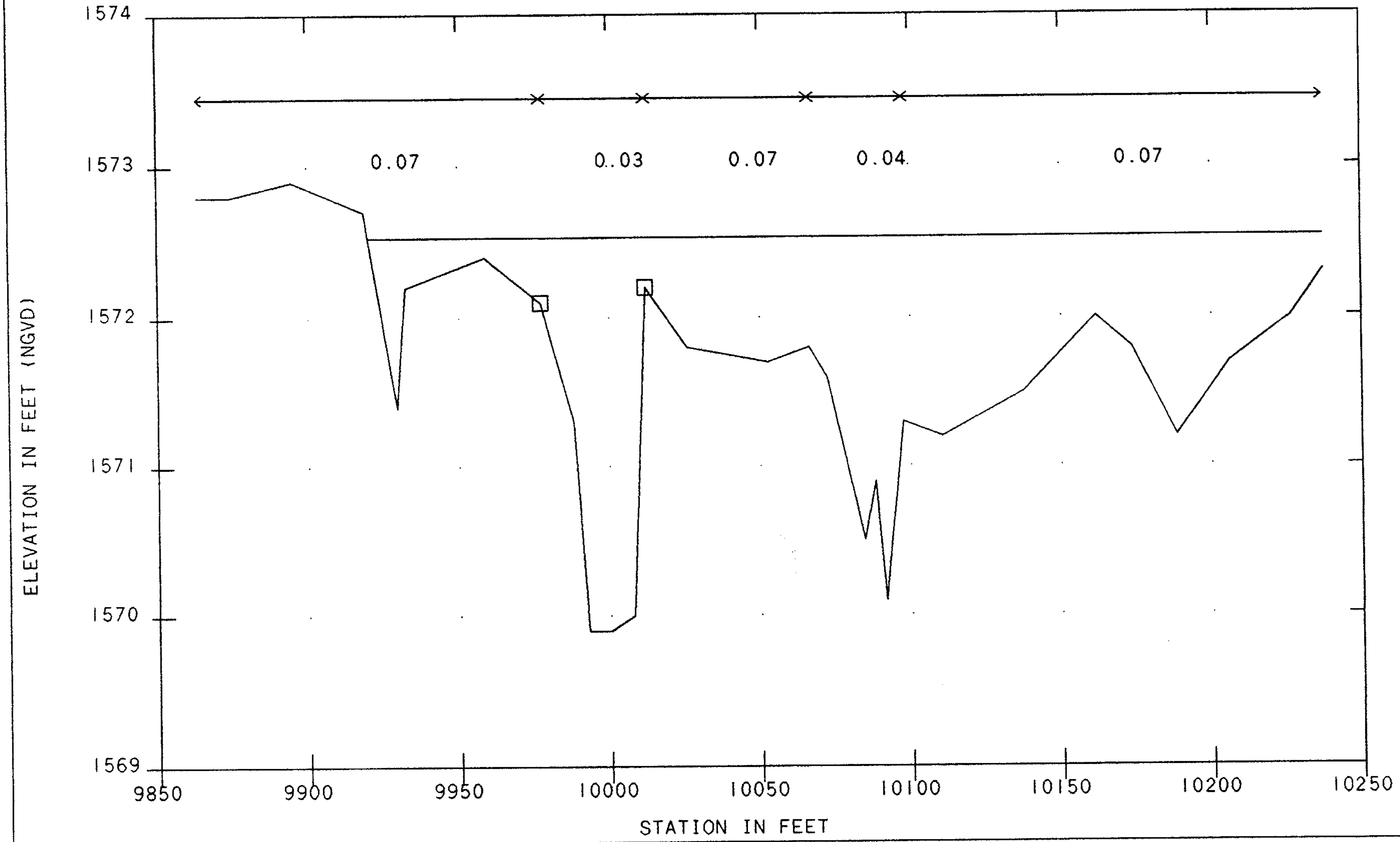
SECTION : 0.347

WASH A AUGUST 19, 1994



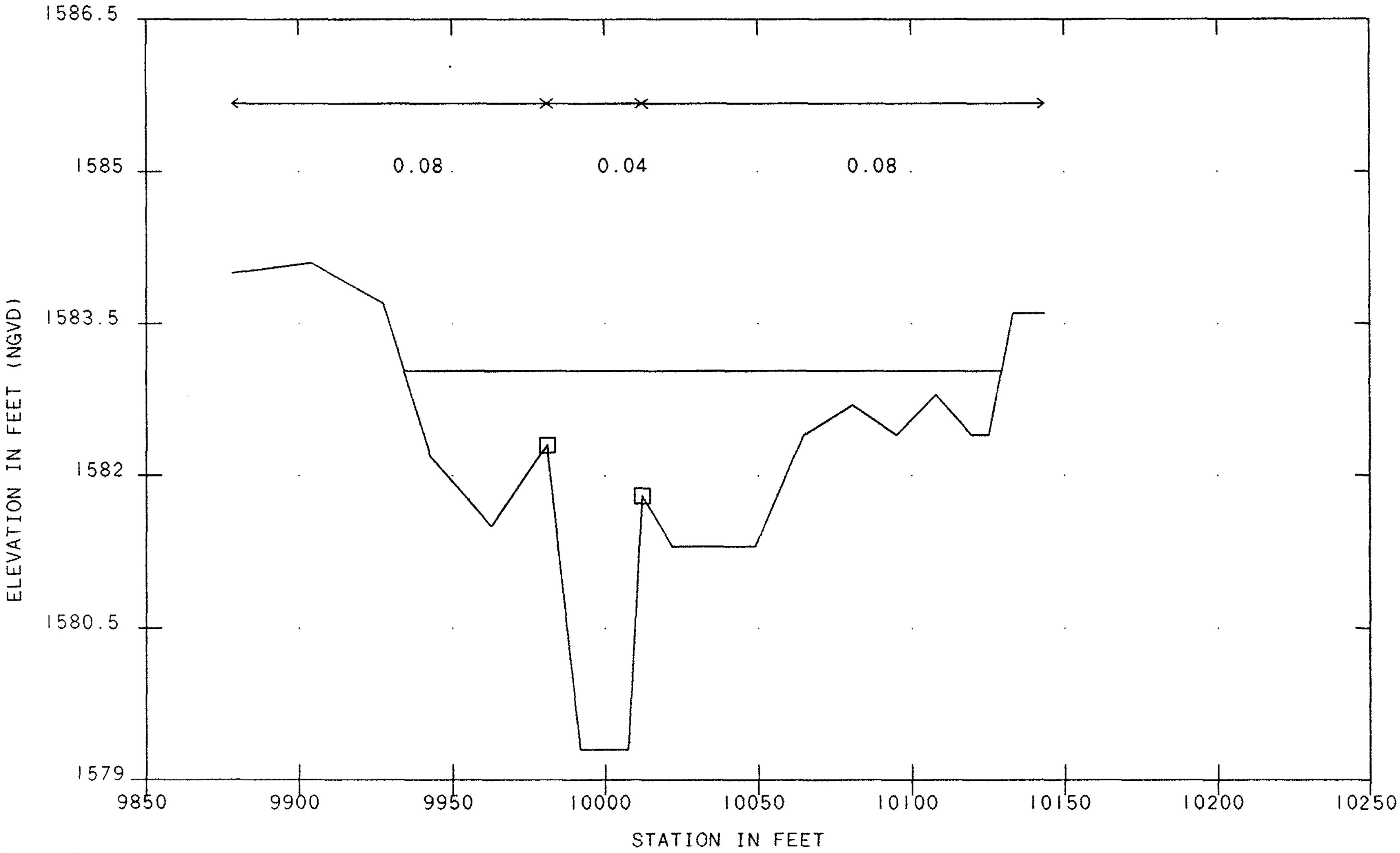
SECTION : 0.453

WASH A AUGUST 19, 1994



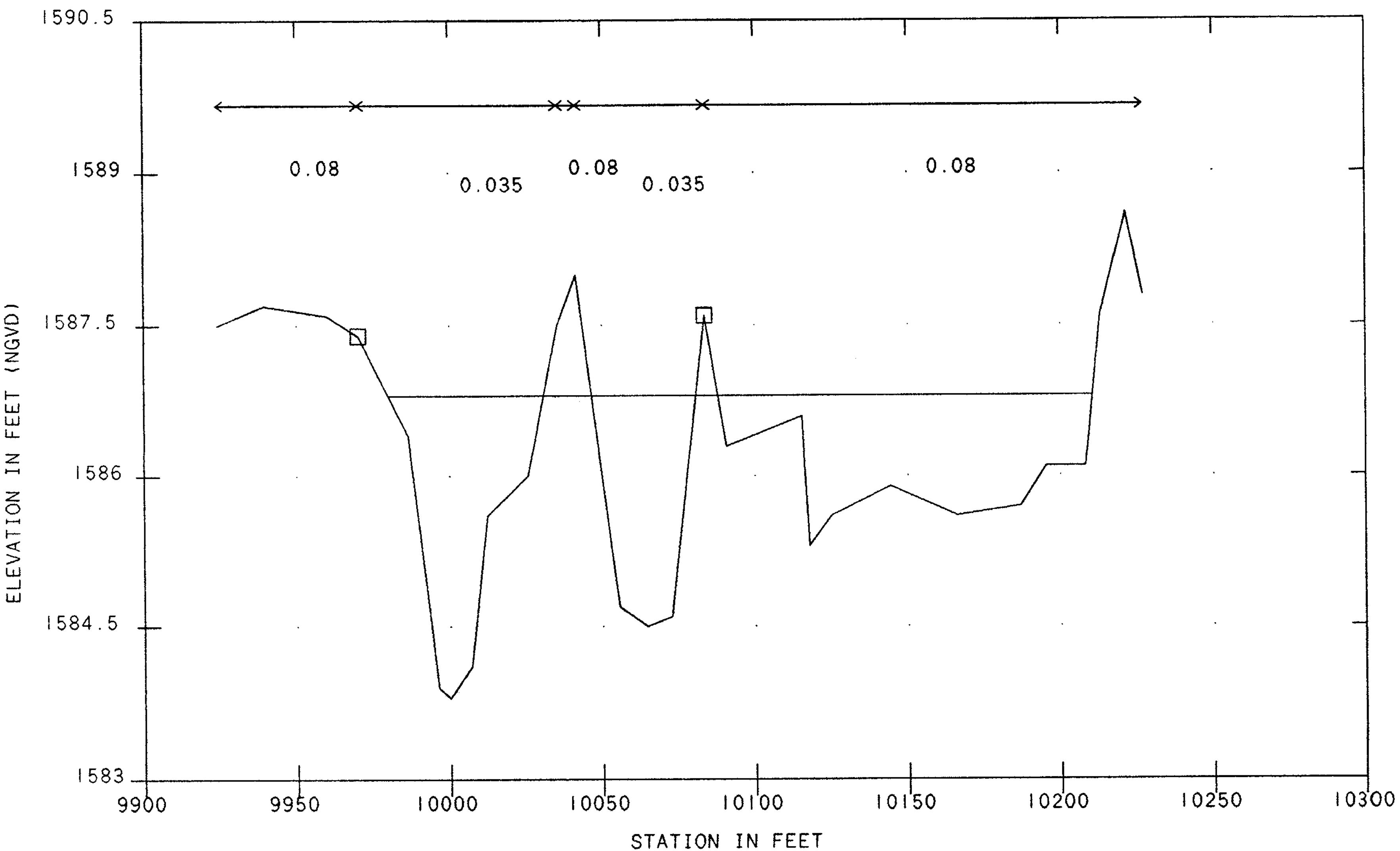
SECTION : 0.550

WASH A AUGUST 19, 1994



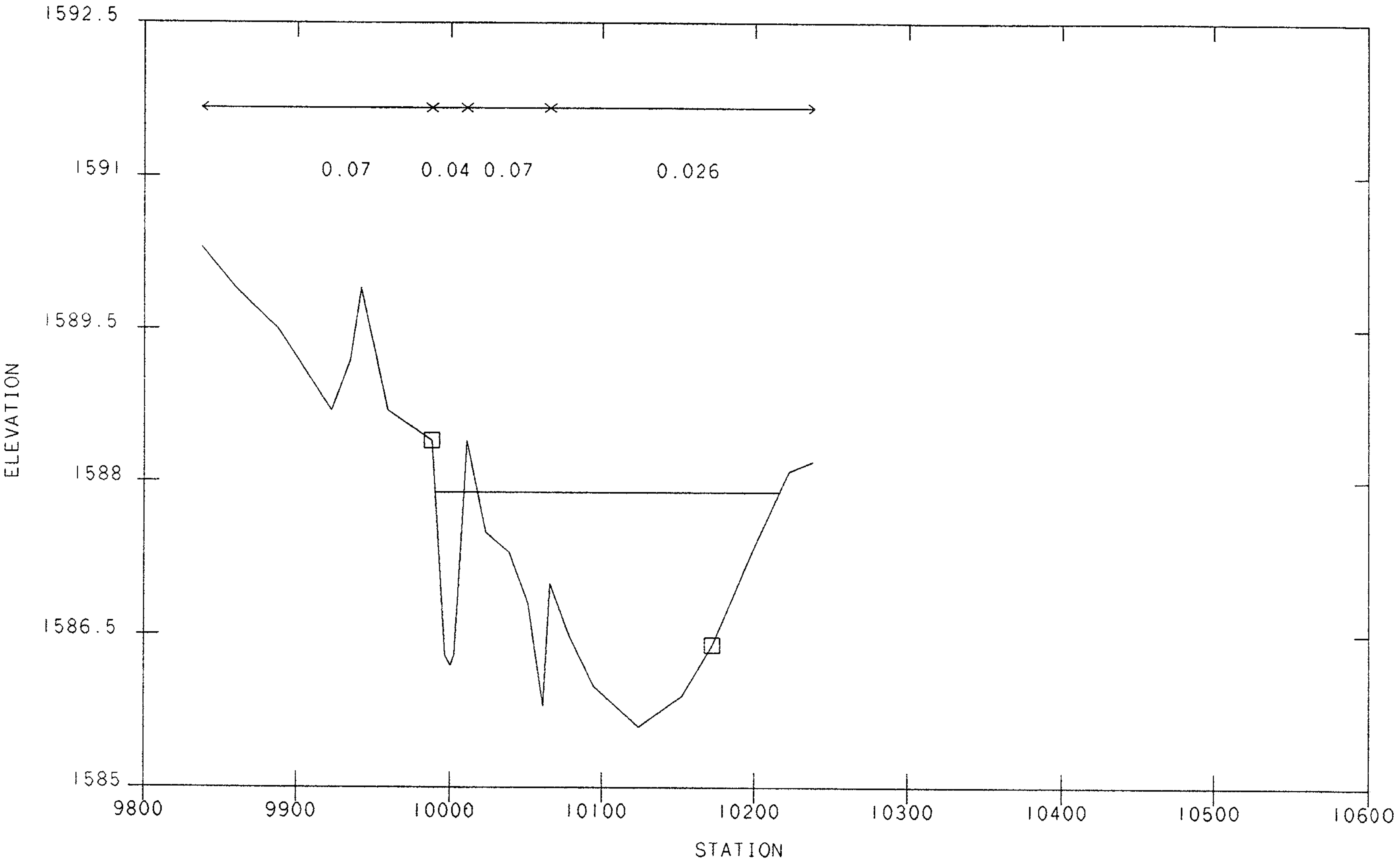
SECTION : 0.658

WASH A AUGUST 19, 1994



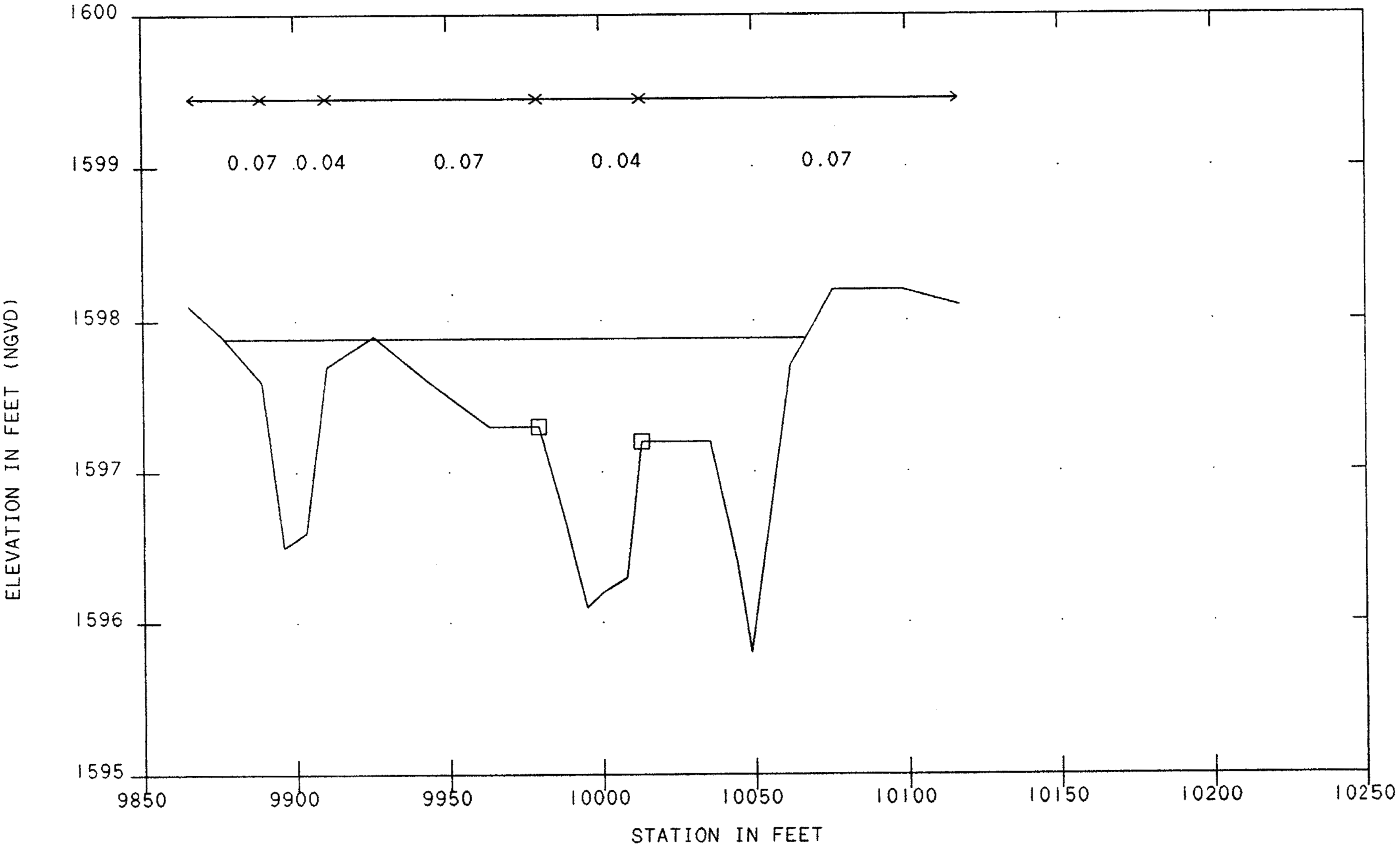
SECTION : 0.700

WASH A AUGUST 19, 1994



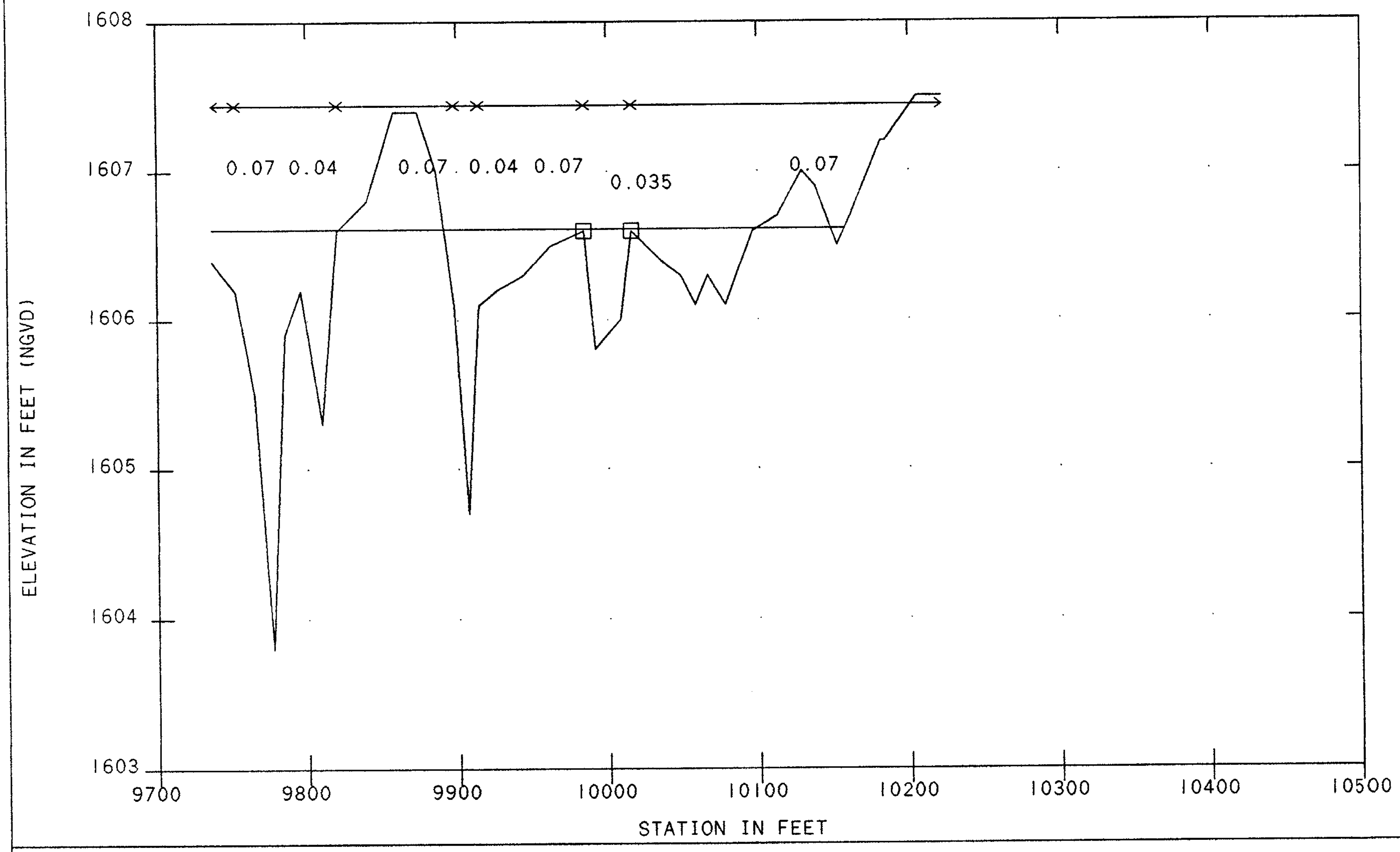
SECTION : 0.723

WASH A AUGUST 19, 1994



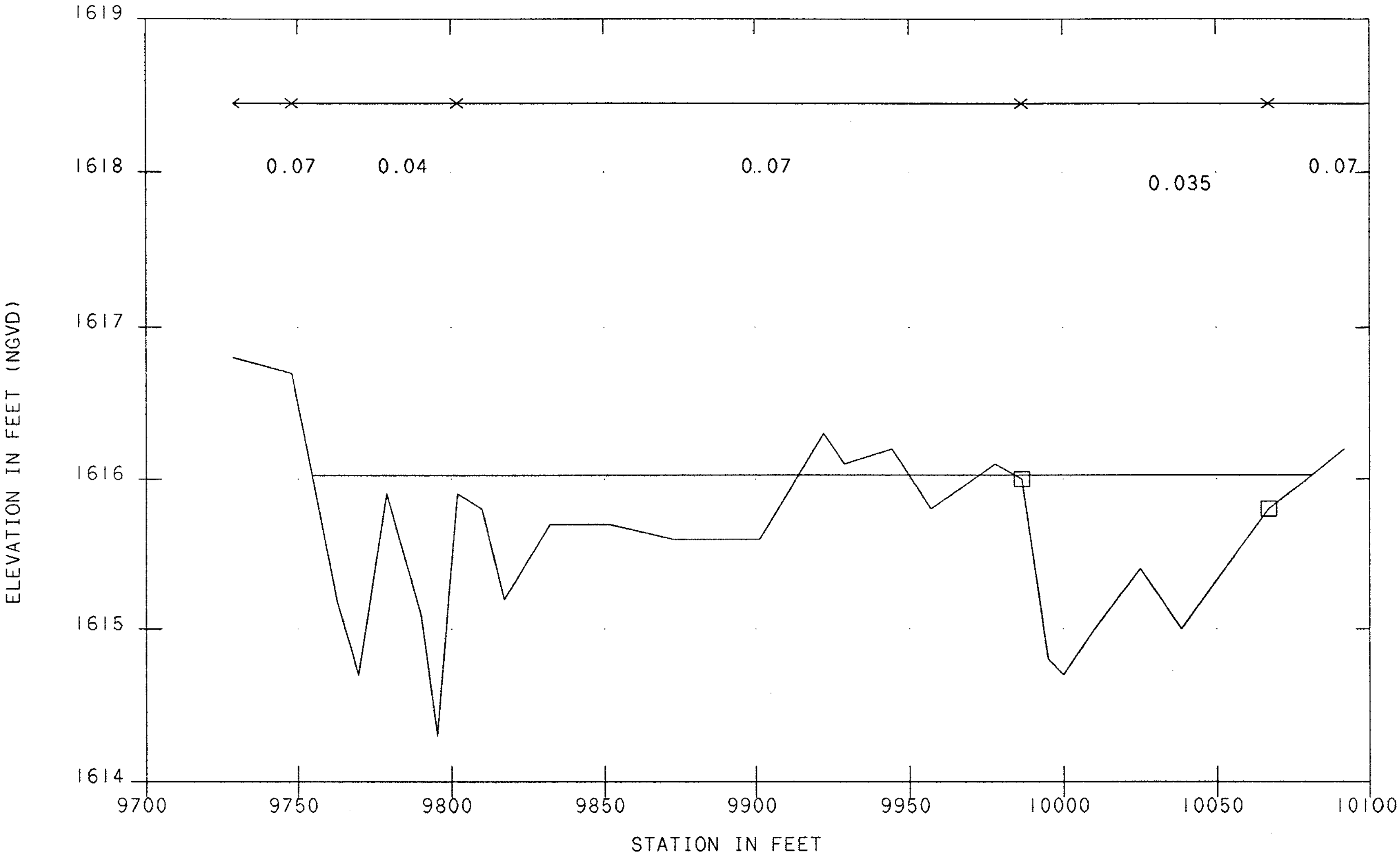
SECTION : 0.820

WASH A AUGUST 19, 1994



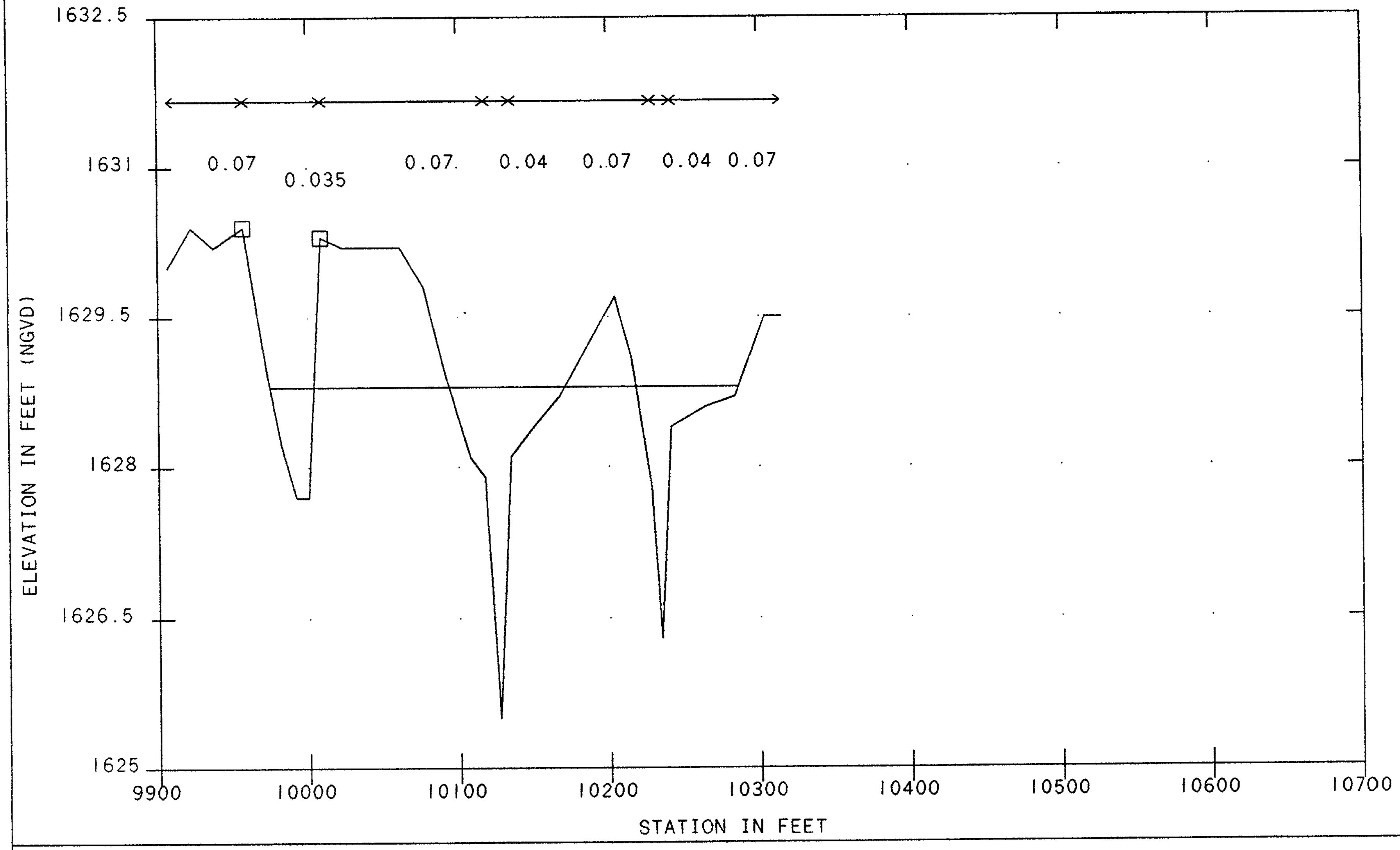
SECTION : 0.902

WASH A AUGUST 19, 1994



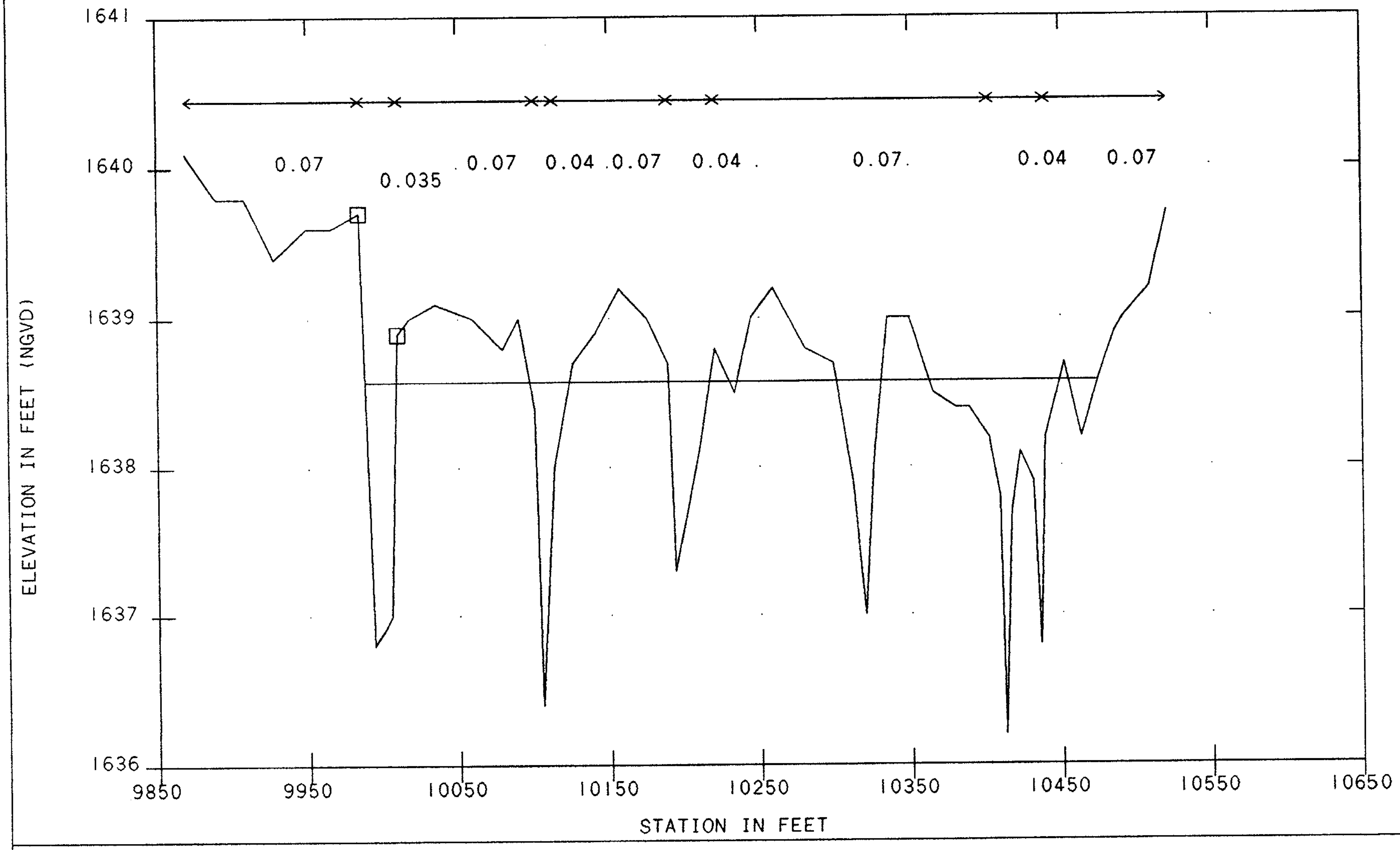
SECTION : 0.990

WASH A AUGUST 19, 1994



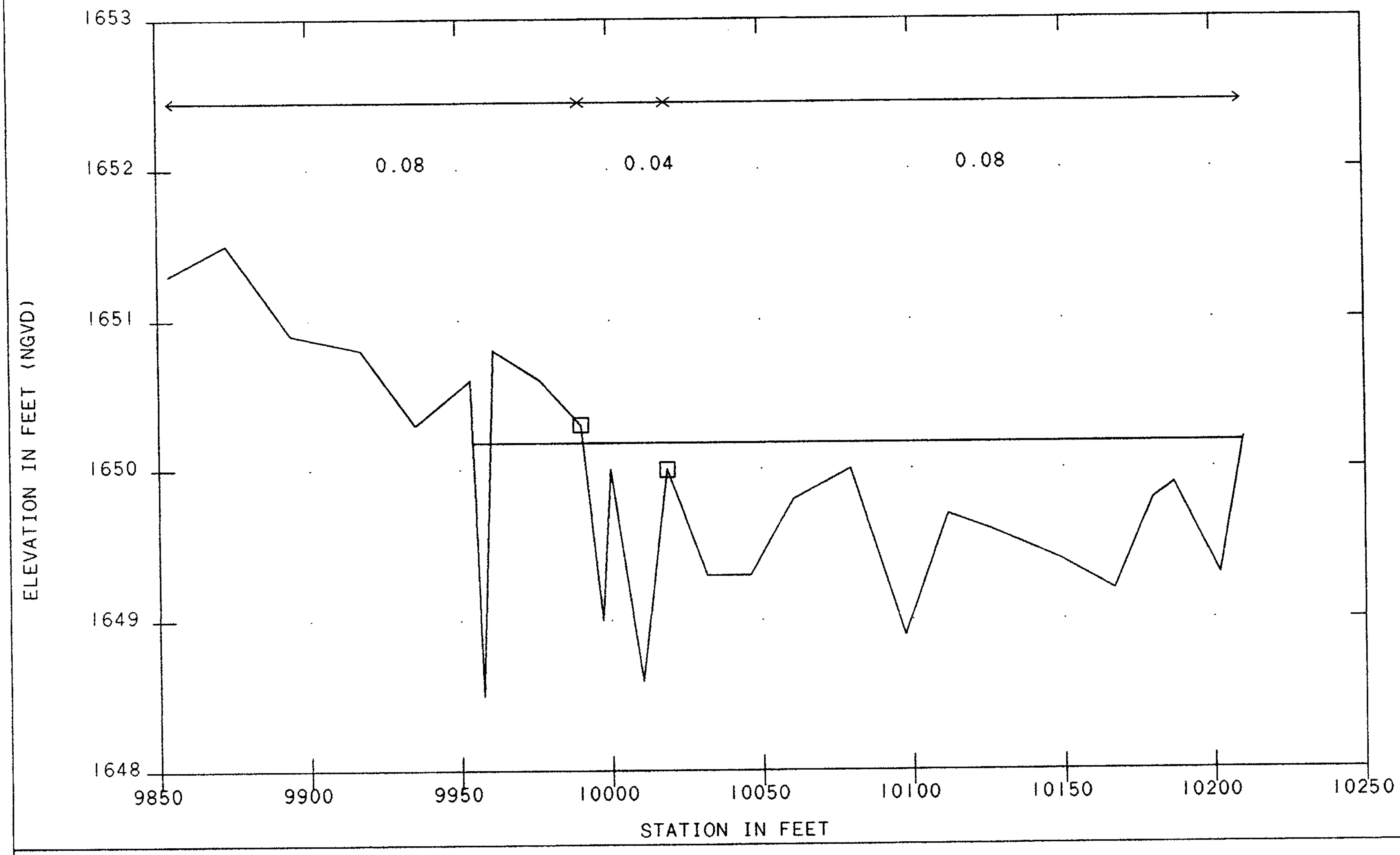
SECTION : 1.117

WASH A AUGUST 19, 1994



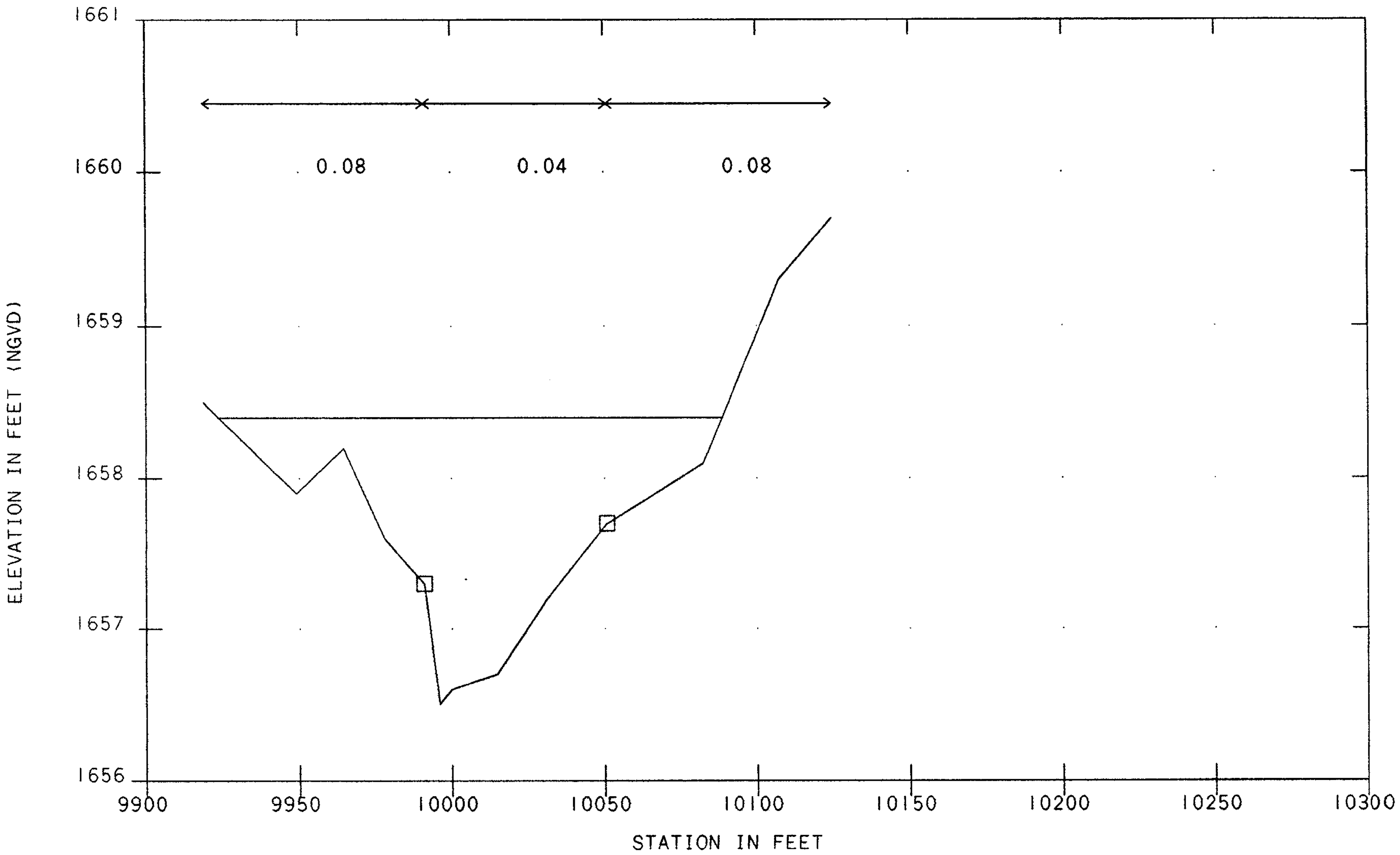
SECTION : 1.208

WASH A AUGUST 19, 1994



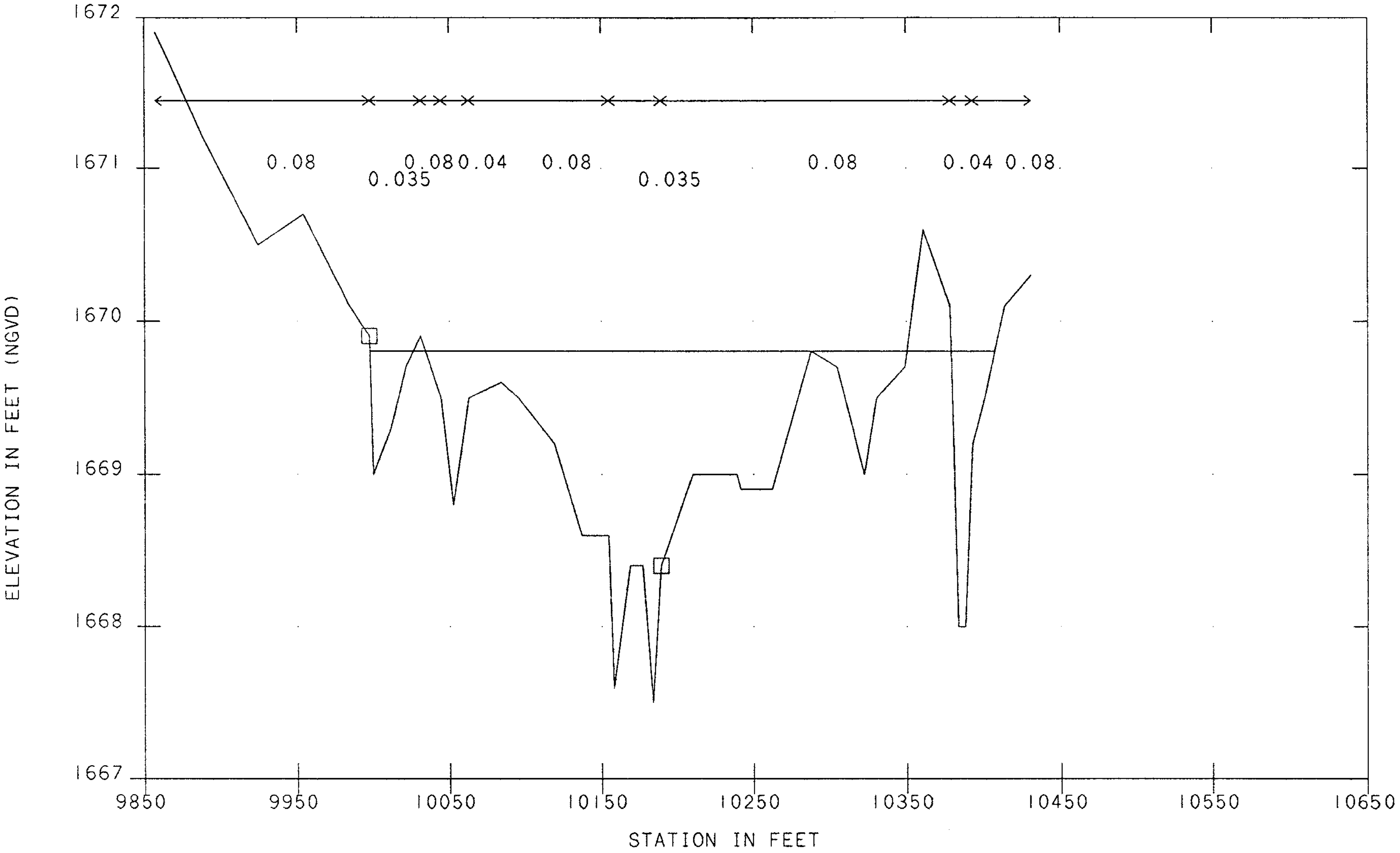
SECTION : 1.306

WASH A AUGUST 19, 1994



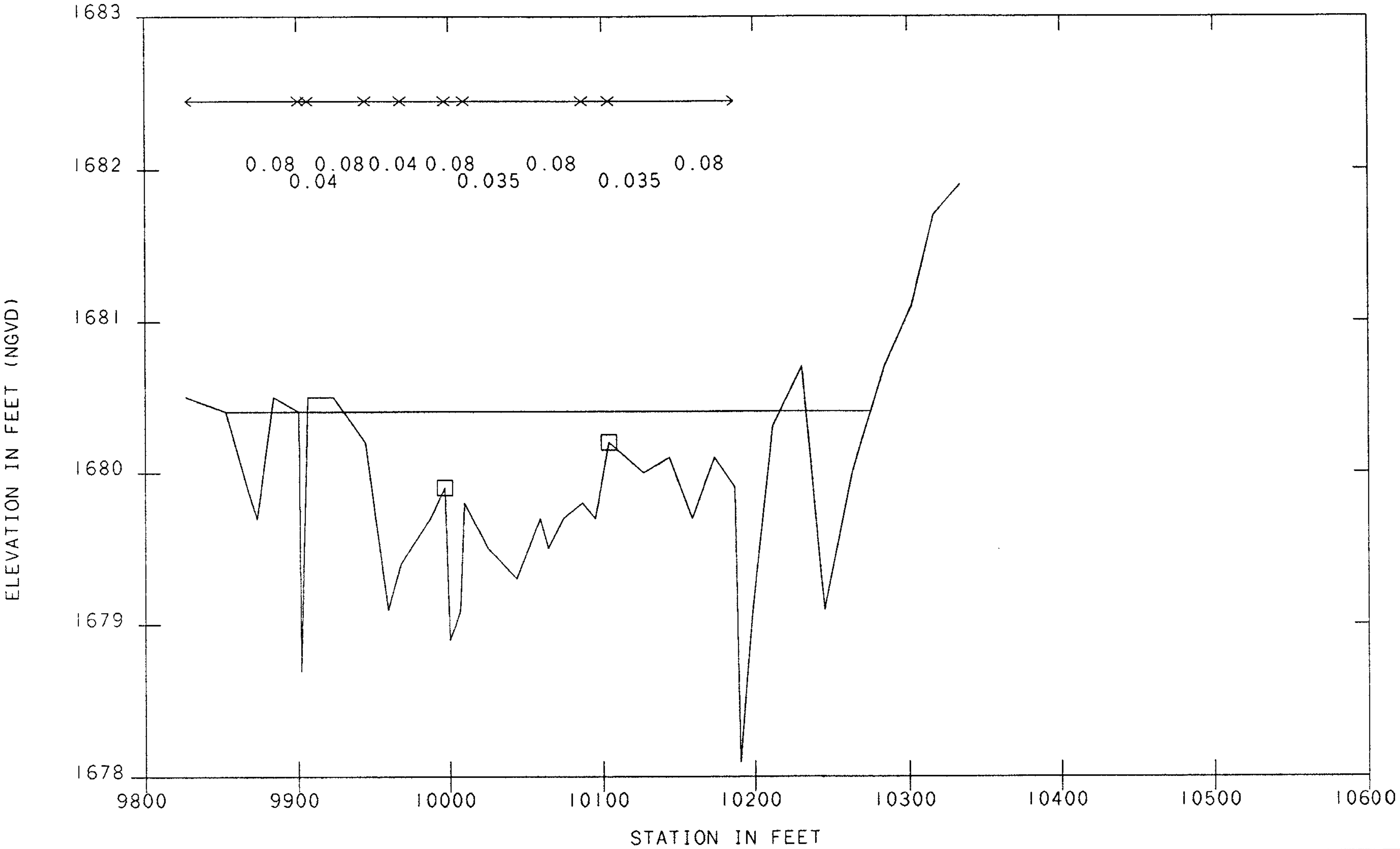
SECTION : 1.367

WASH A AUGUST 19, 1994



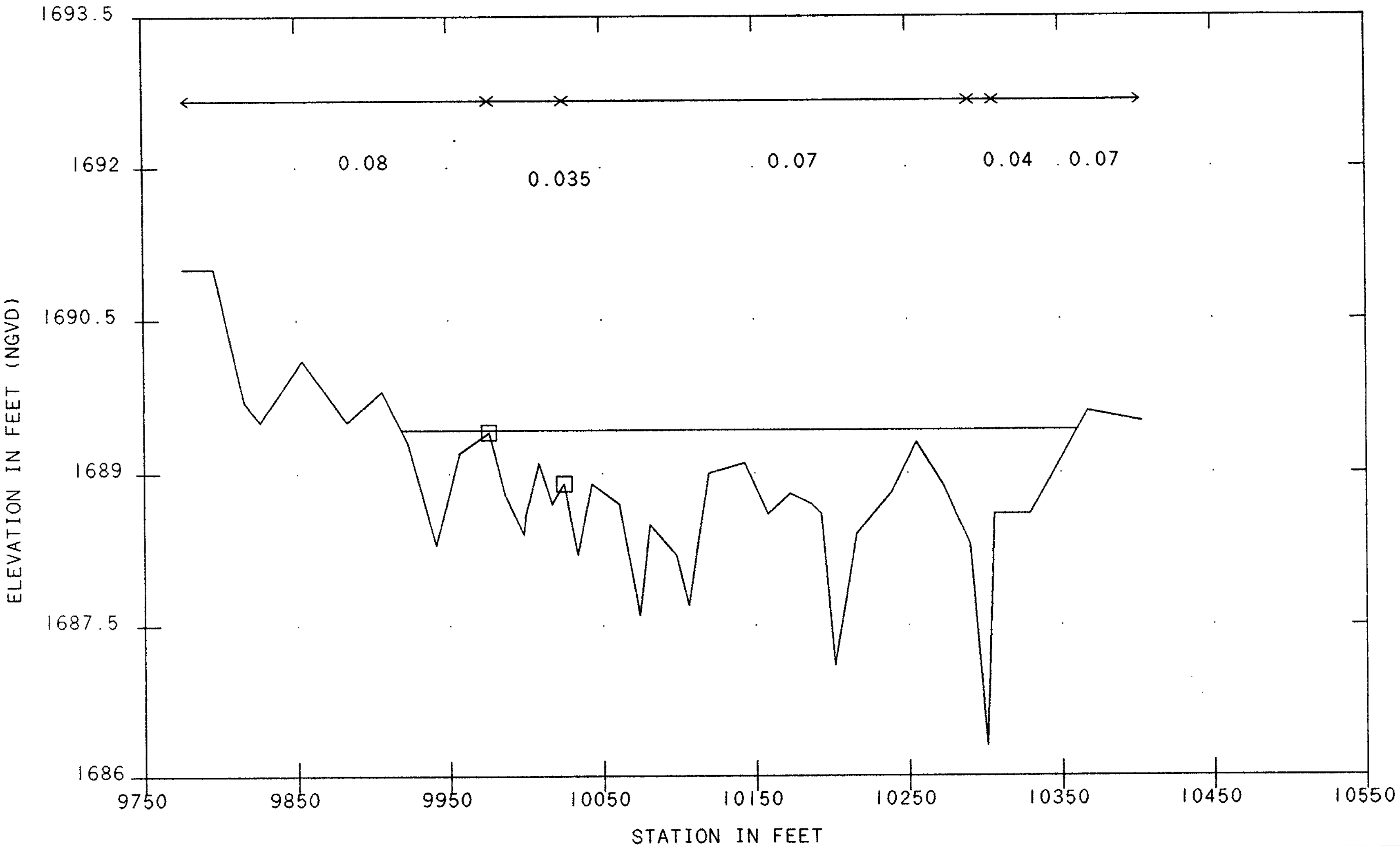
SECTION : 1.472

WASH A   AUGUST 19, 1994



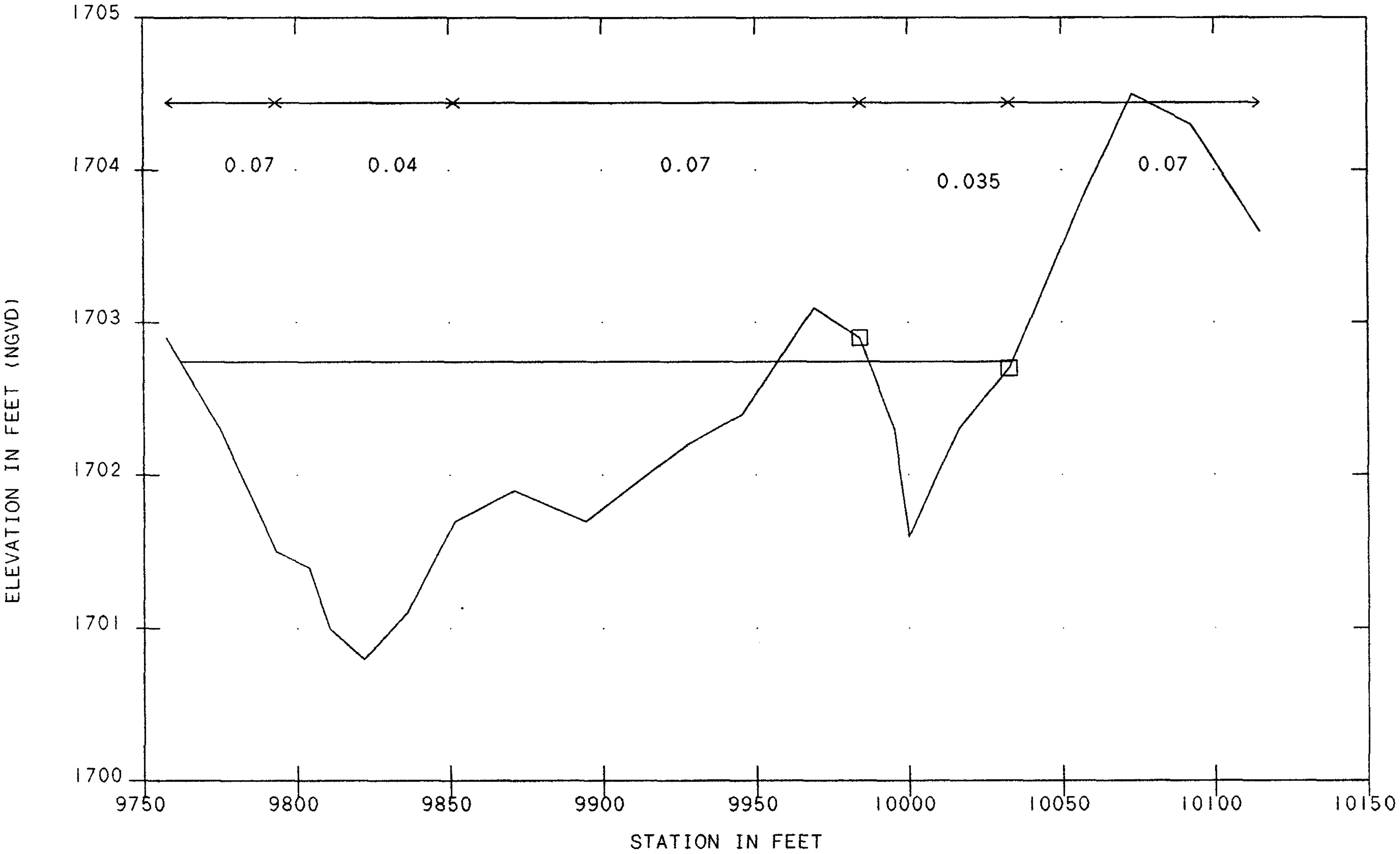
SECTION : 1.557

WASH A AUGUST 19, 1994



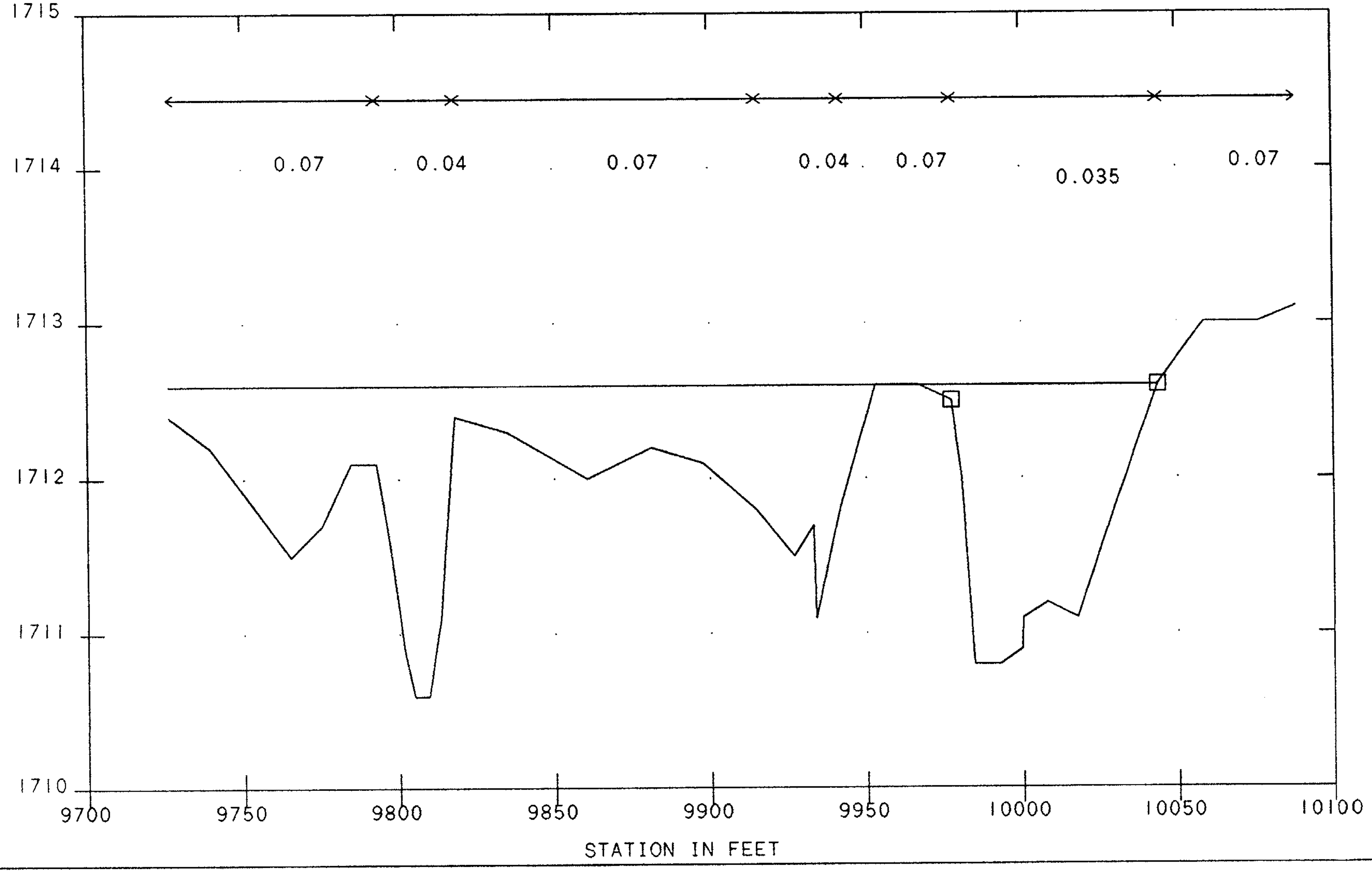
SECTION : 1.629

WASH A AUGUST 19, 1994



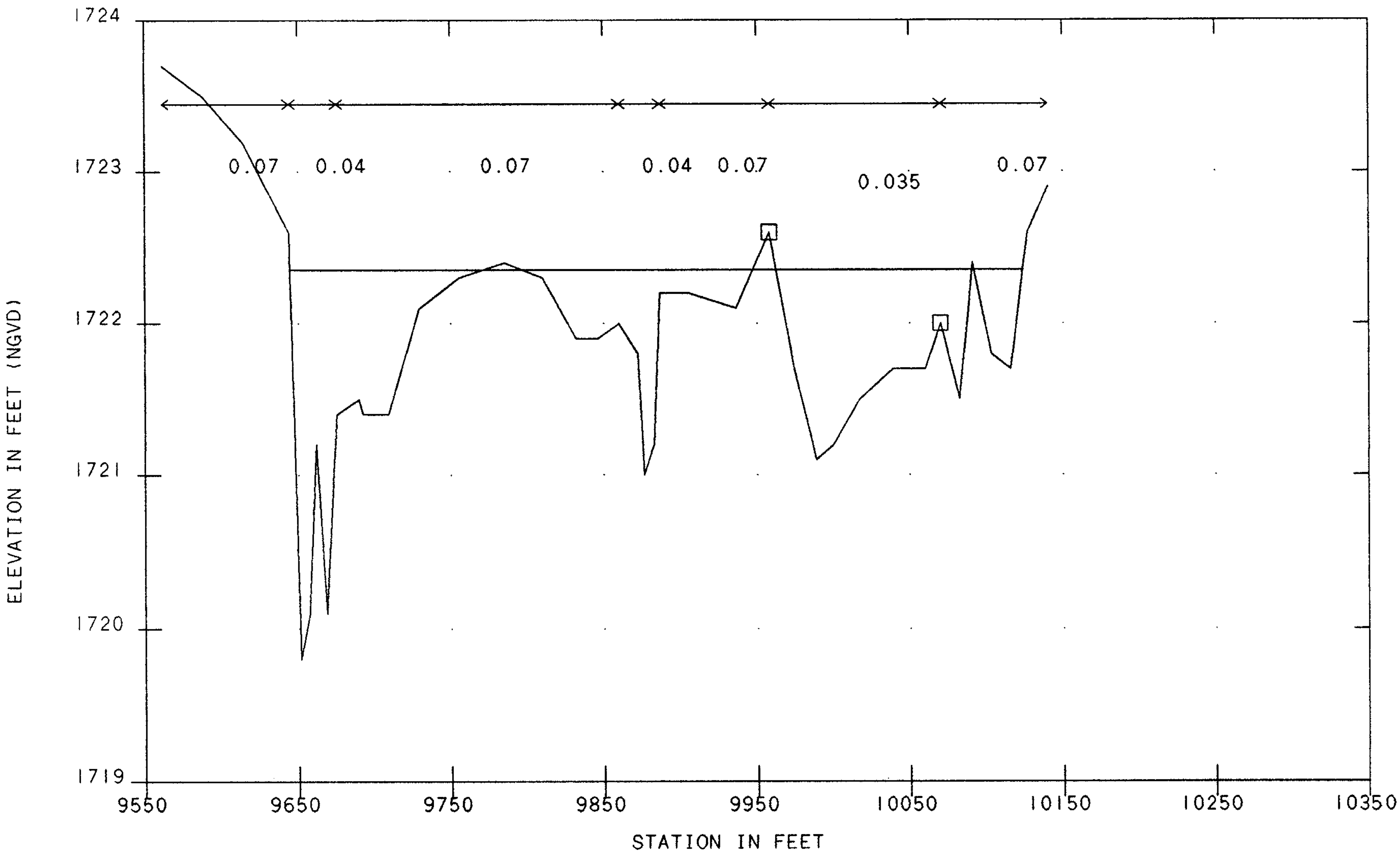
SECTION : 1.733

WASH A AUGUST 19, 1994



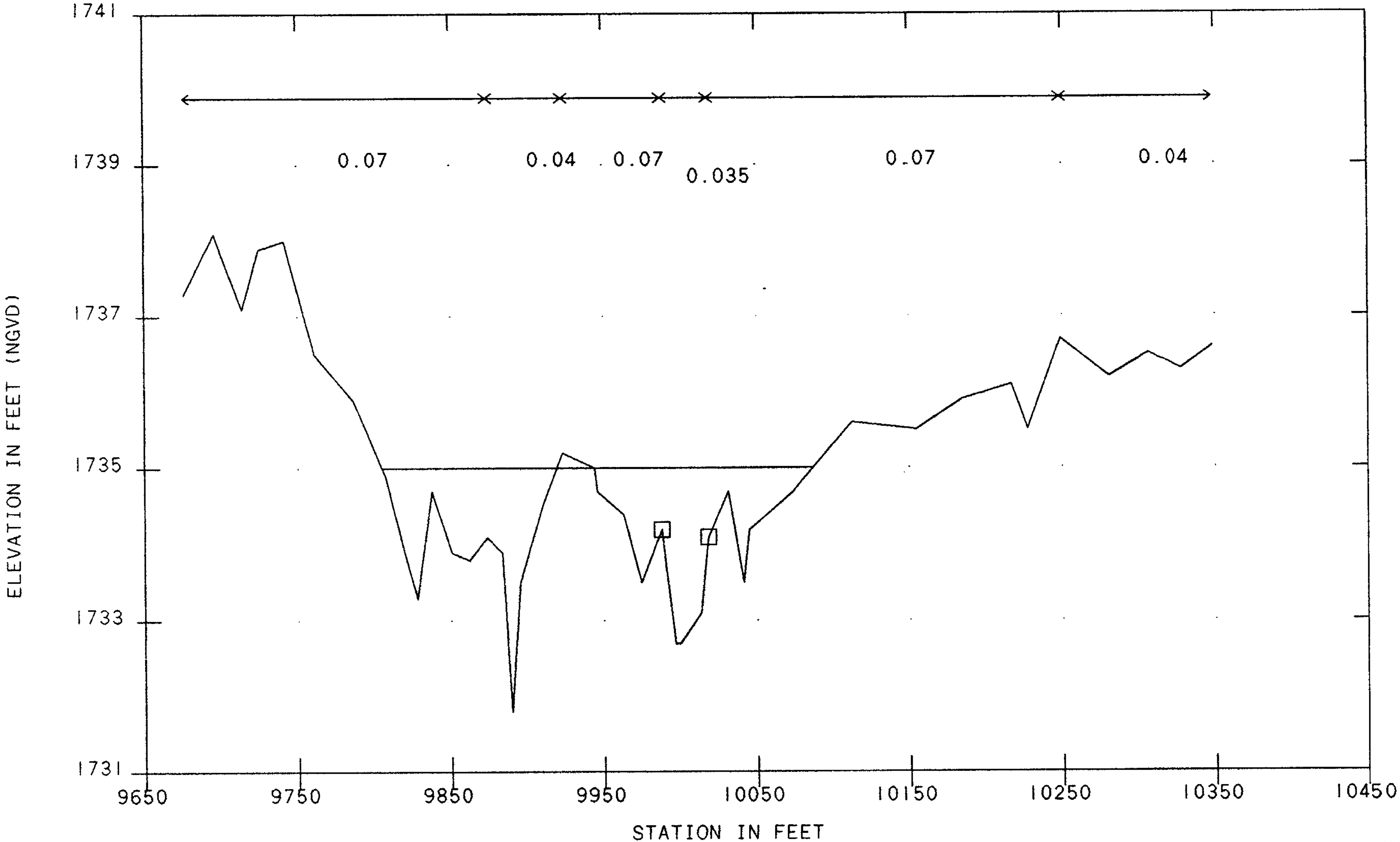
SECTION : 1.806

WASH A AUGUST 19, 1994



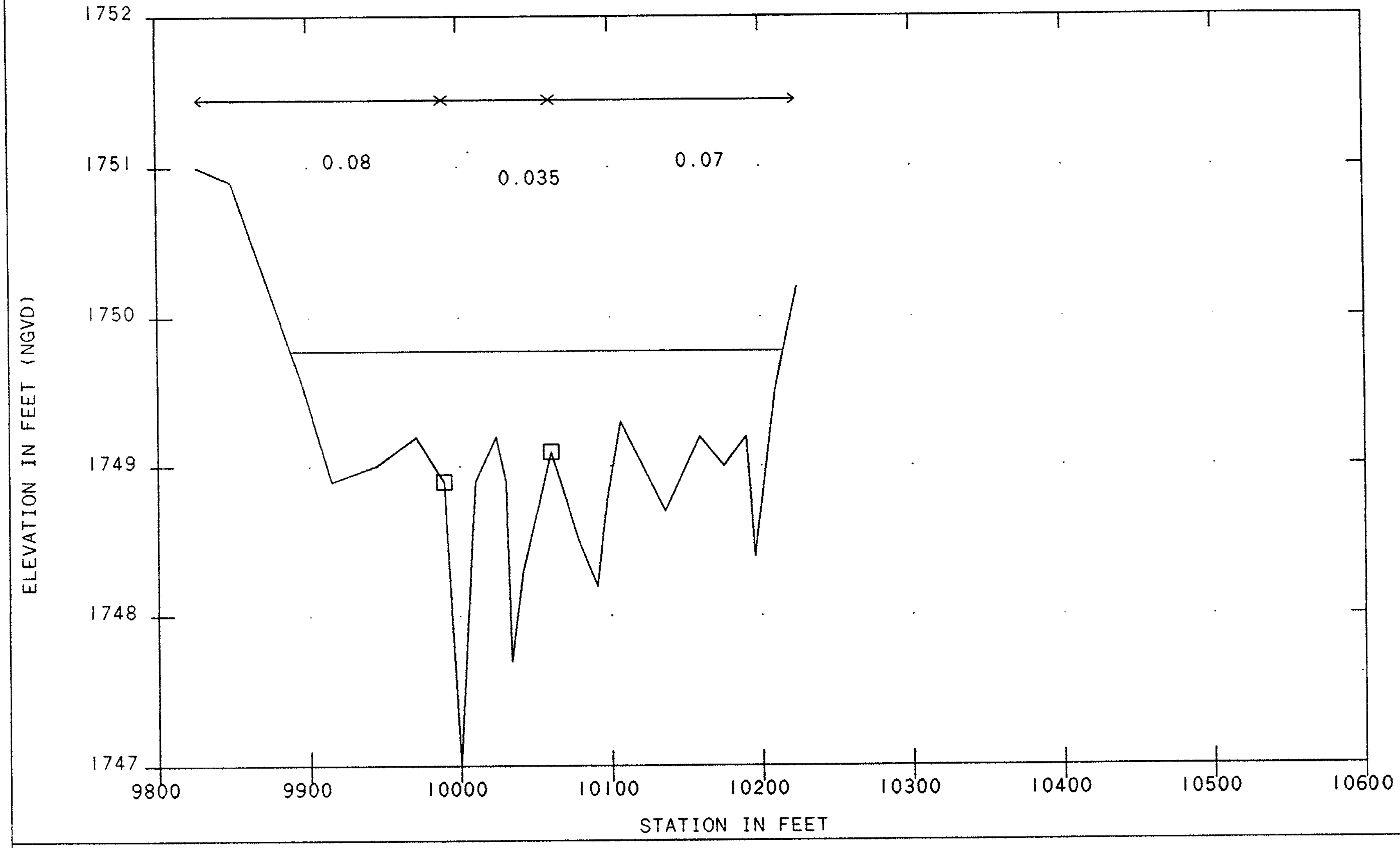
SECTION : 1.887

WASH A AUGUST 19, 1994



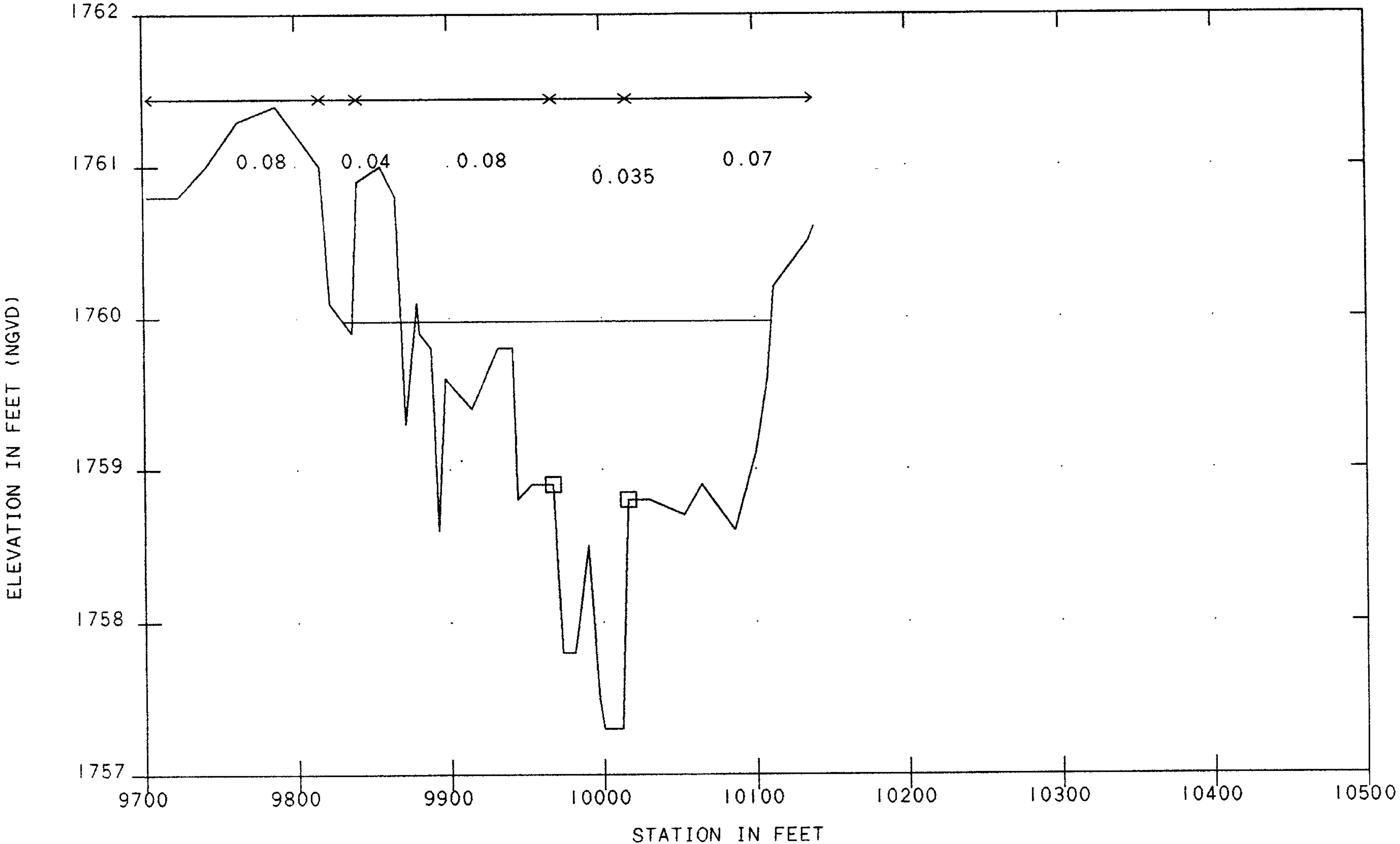
SECTION : 1.983

WASH A AUGUST 19, 1994



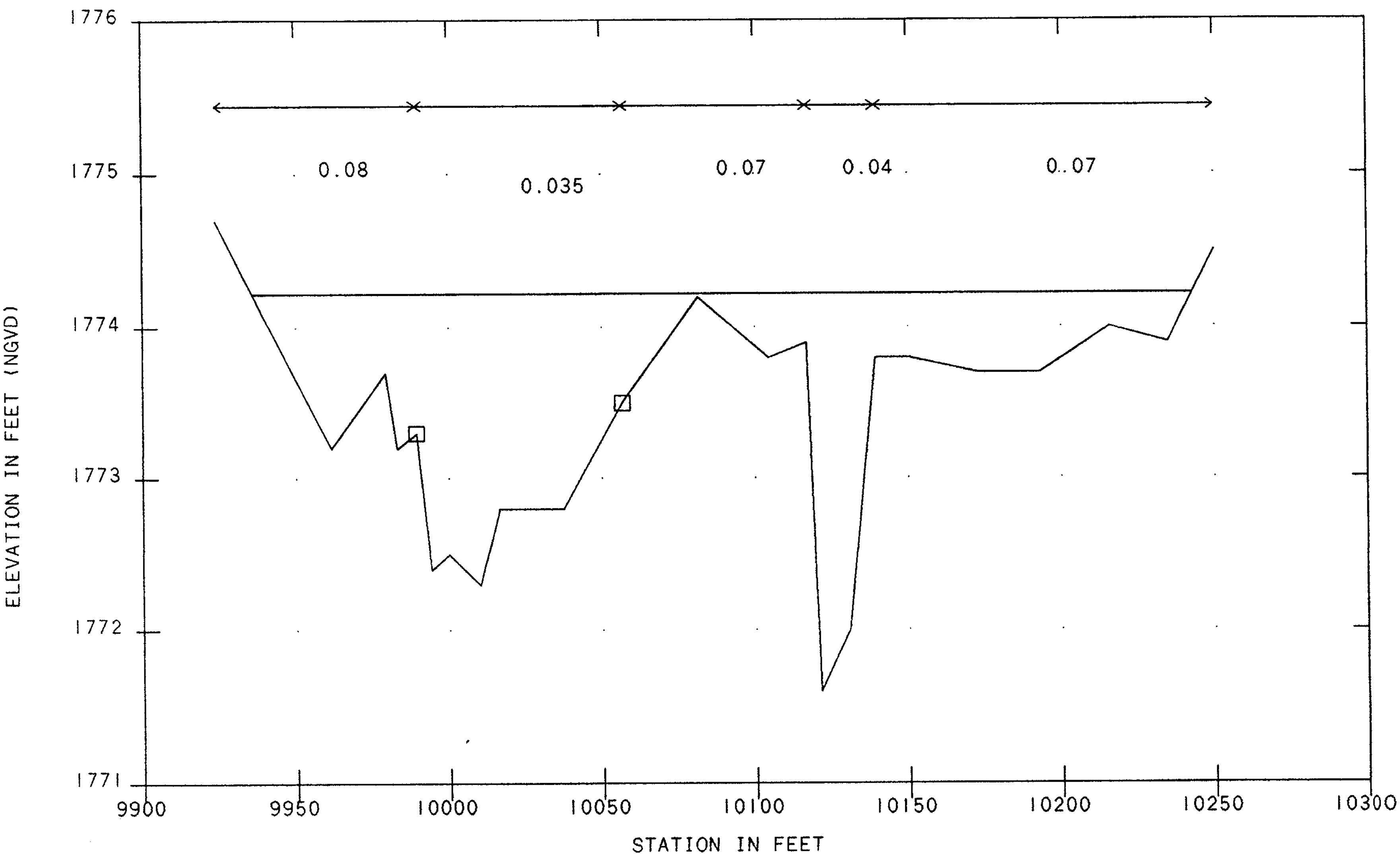
SECTION : 2.105

WASH A AUGUST 19, 1994



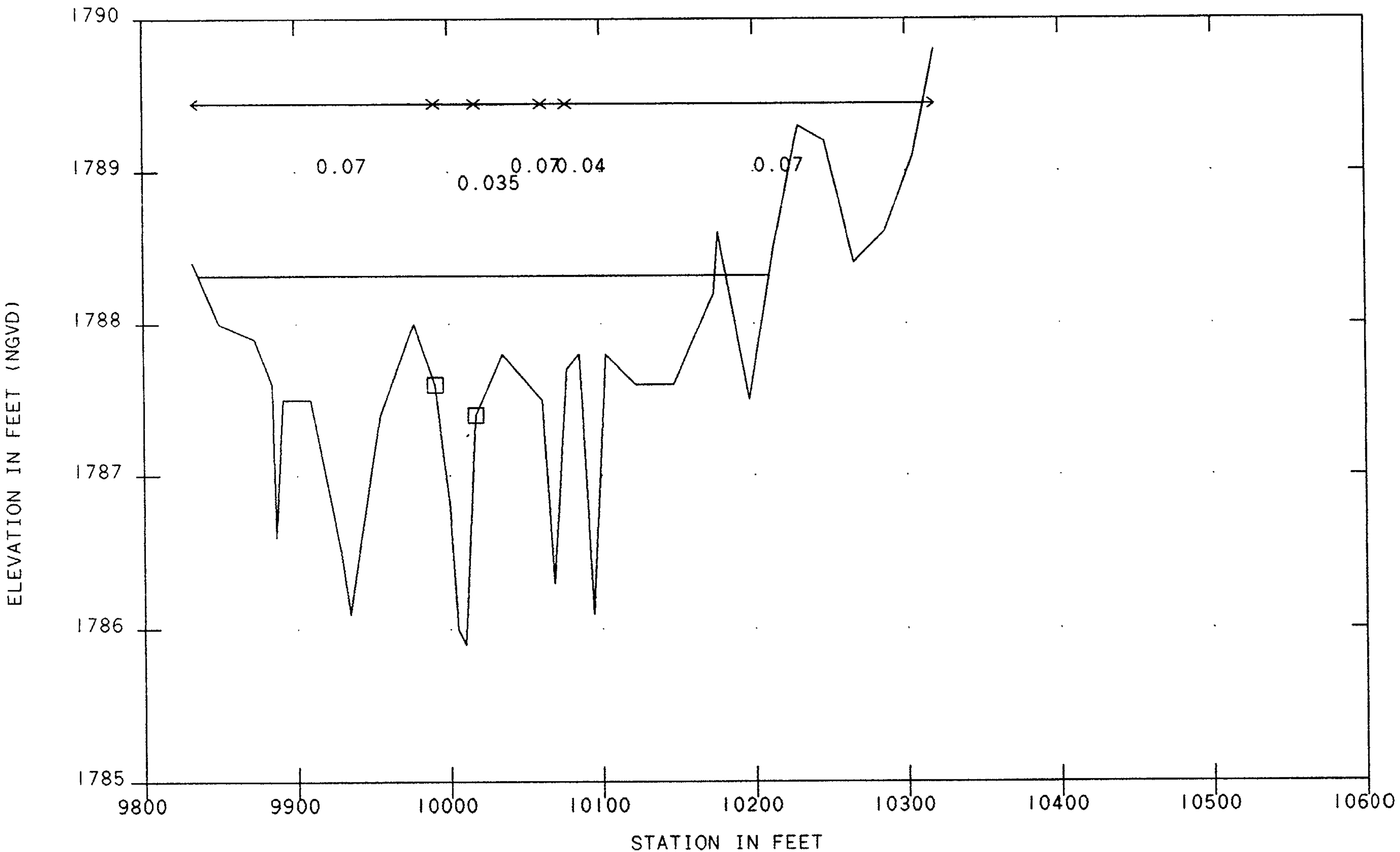
SECTION : 2.181

WASH A AUGUST 19, 1994



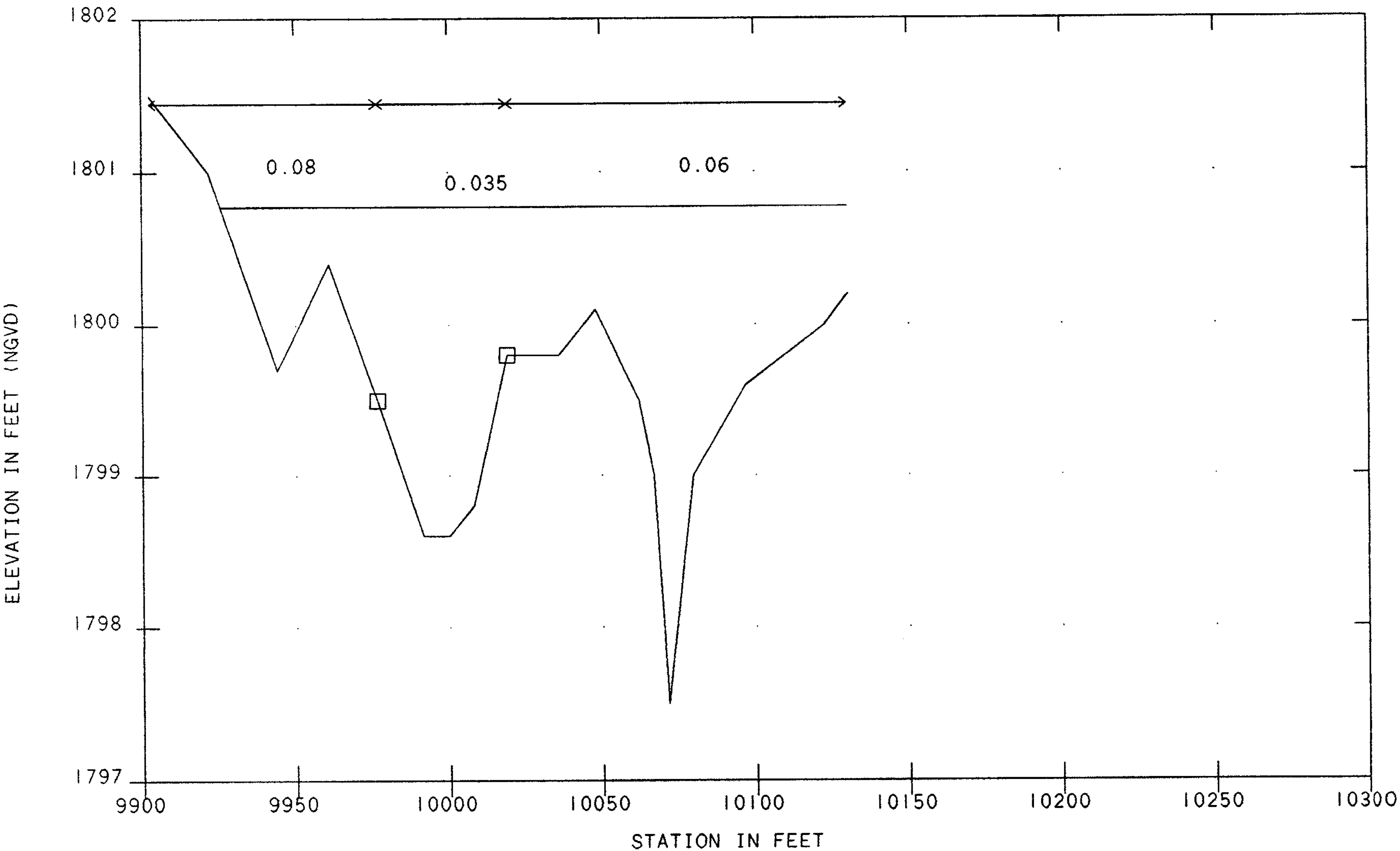
SECTION : 2.297

WASH A AUGUST 19, 1994



SECTION : 2.403

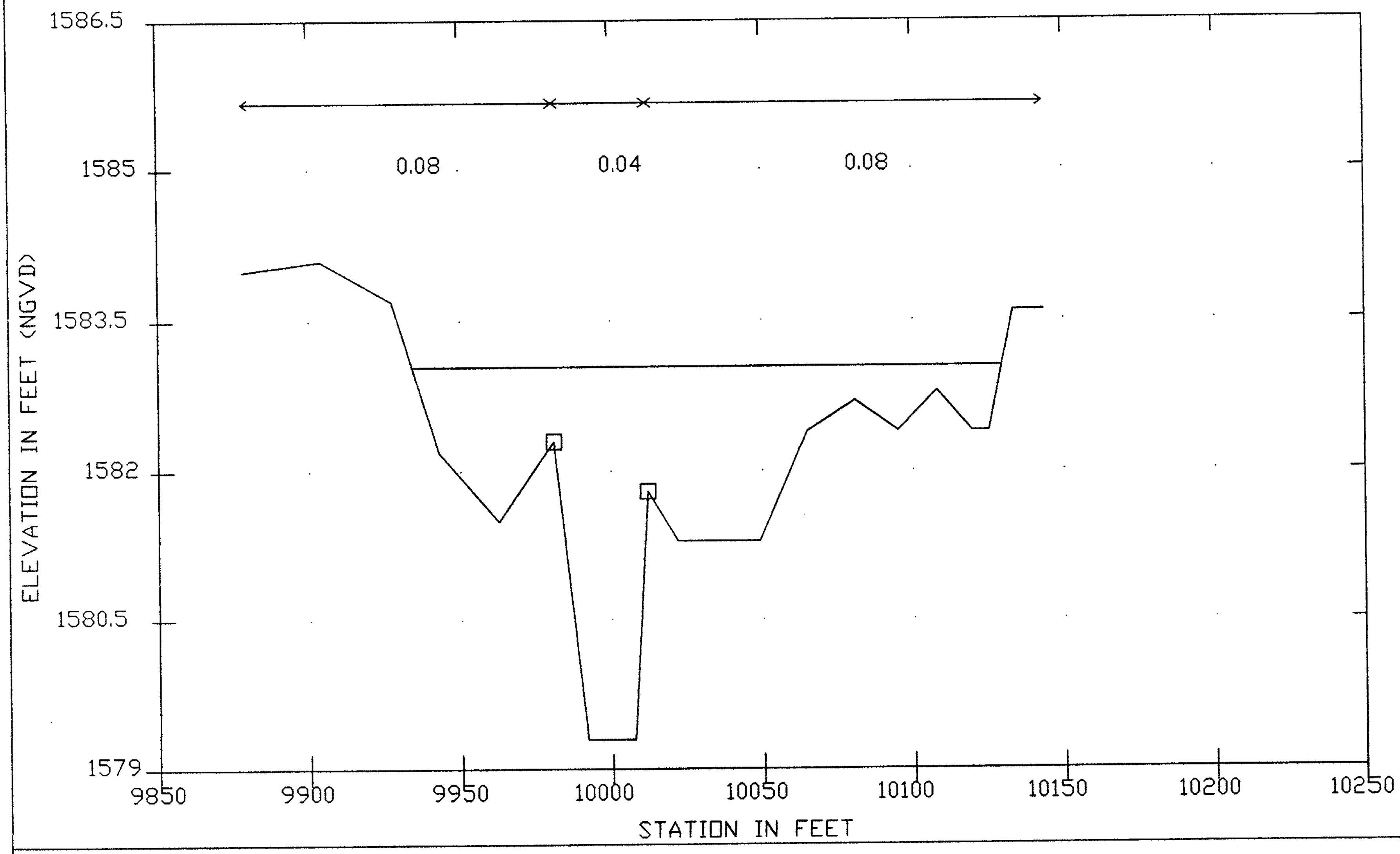
WASH A AUGUST 19, 1994



SECTION : 2.494

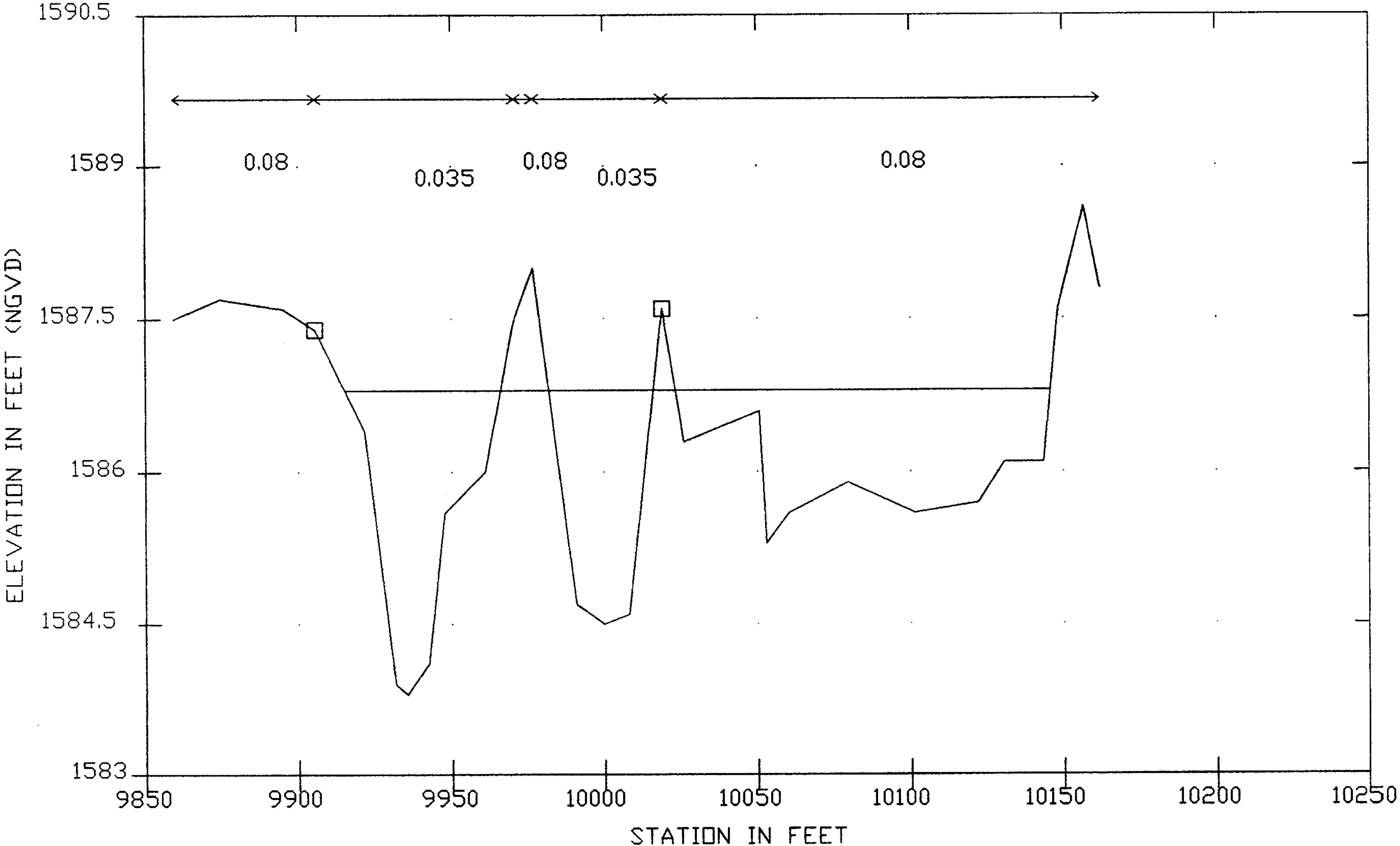
WASH A AUGUST 19, 1994

WASH A SOUTH



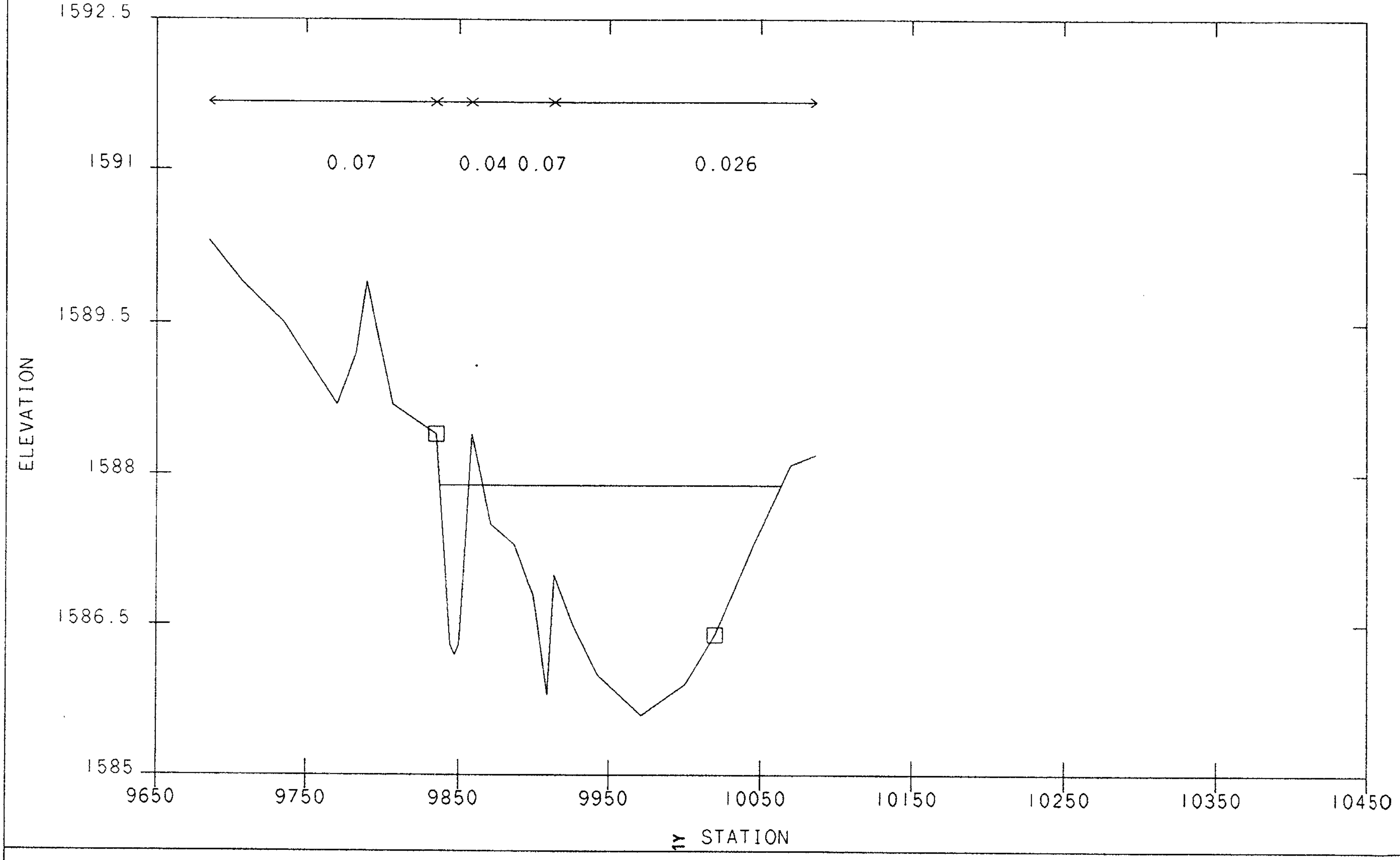
SECTION : 0.658

WASH A SOUTH AUGUST 19, 1994



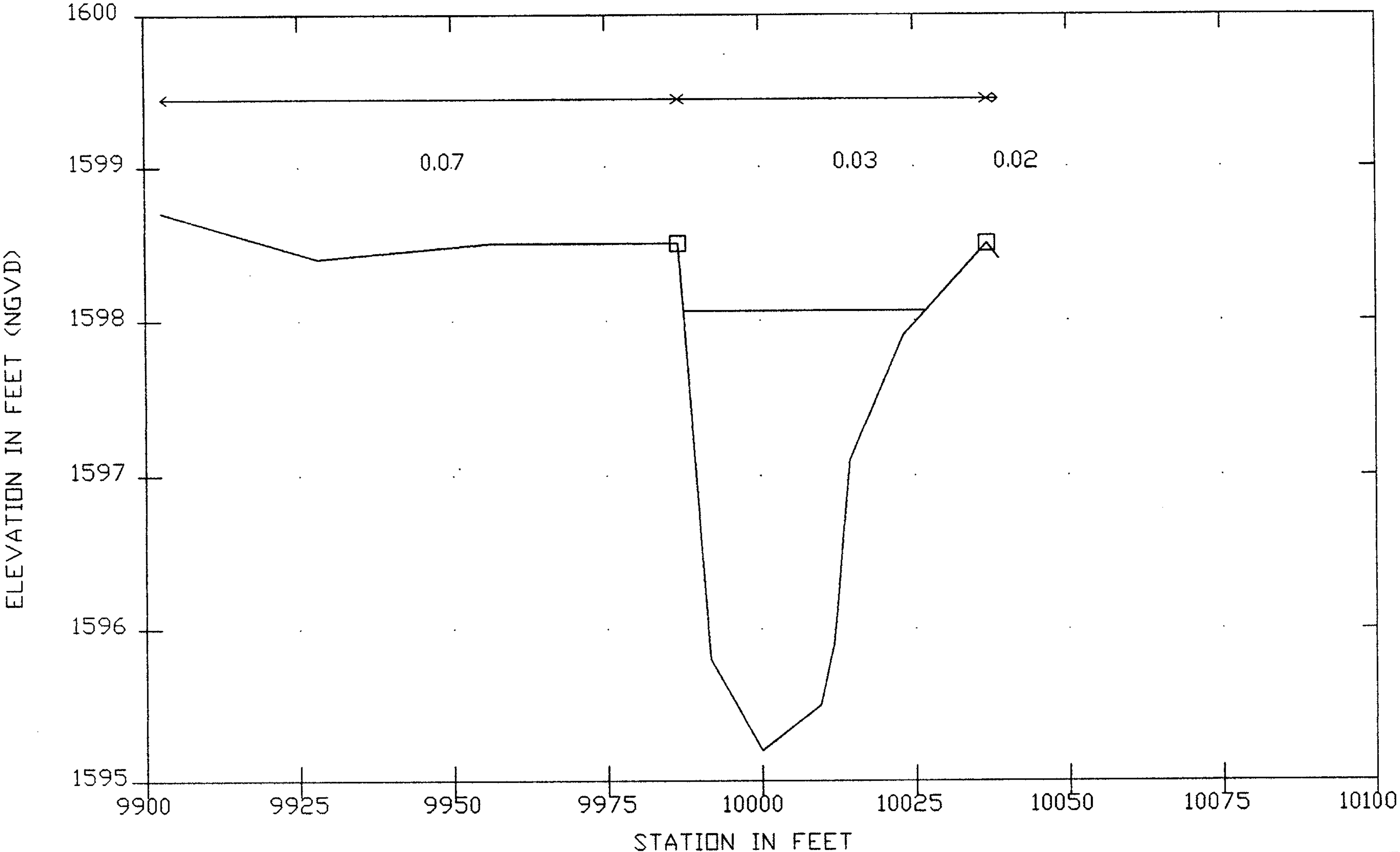
SECTION : 0.016

WASH A SOUTH AUGUST 19, 1994



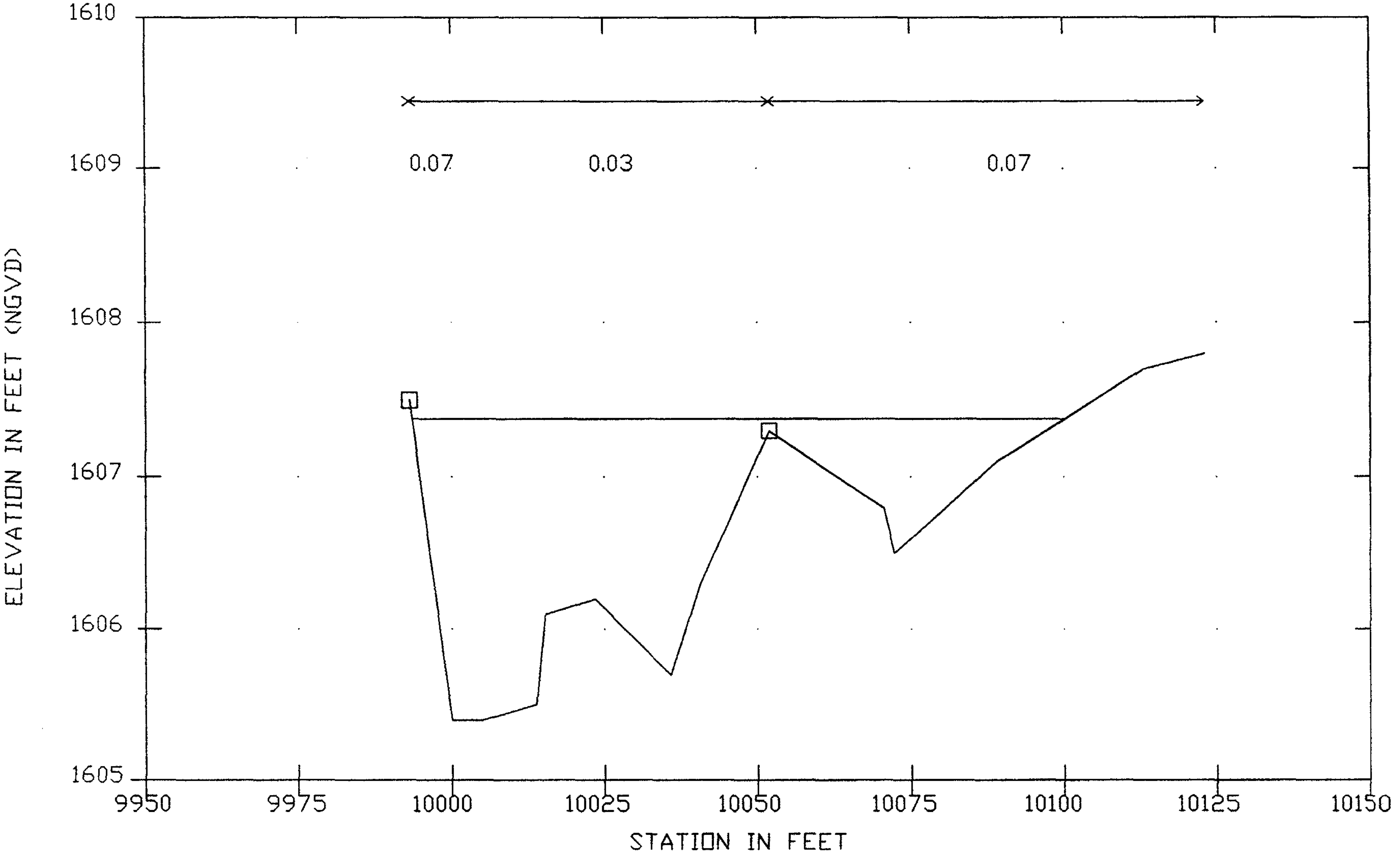
SECTION : 0.028

WASH A SOUTH AUGUST 19, 1994



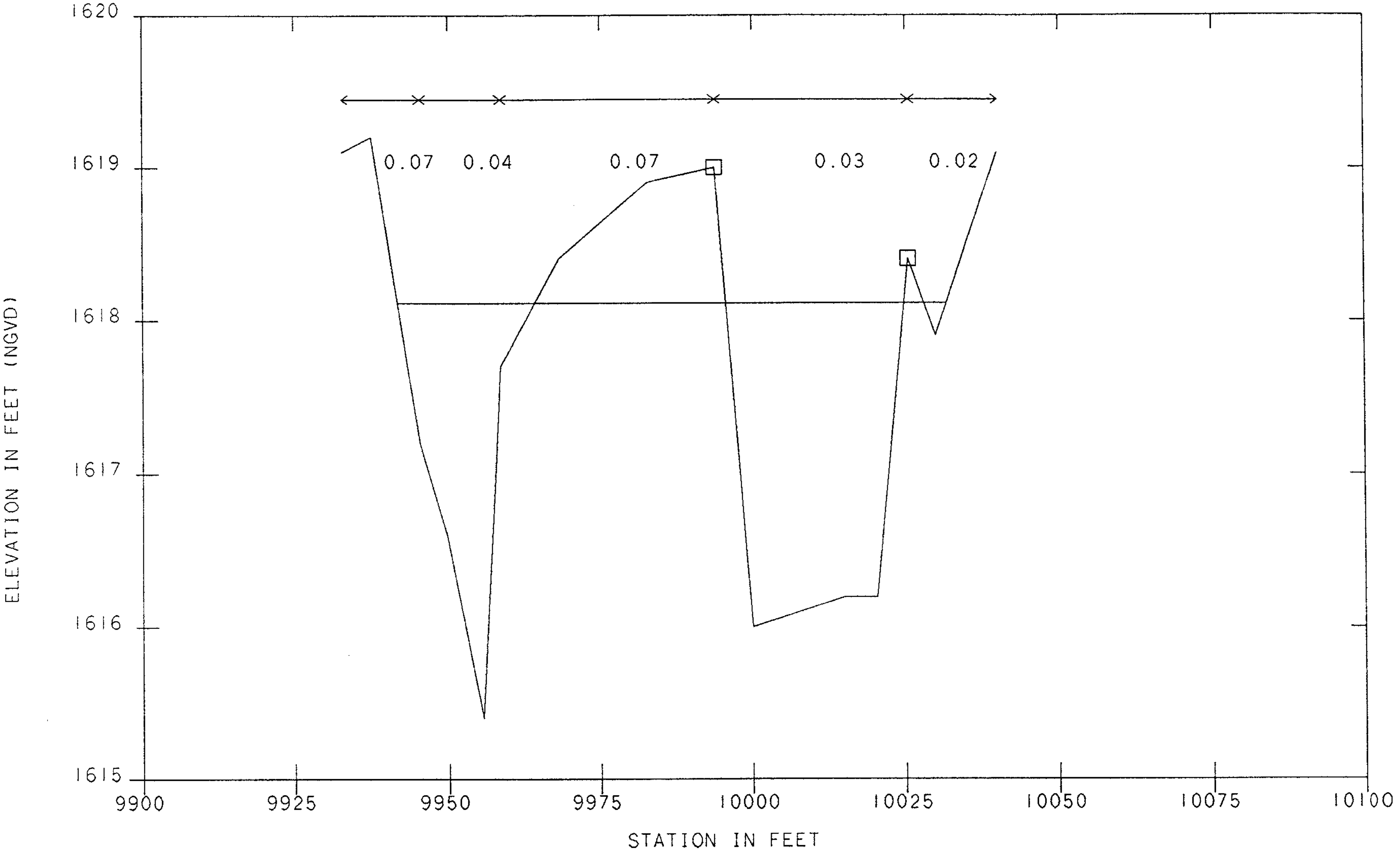
SECTION : 0.121

WASH A SOUTH AUGUST 19, 1994



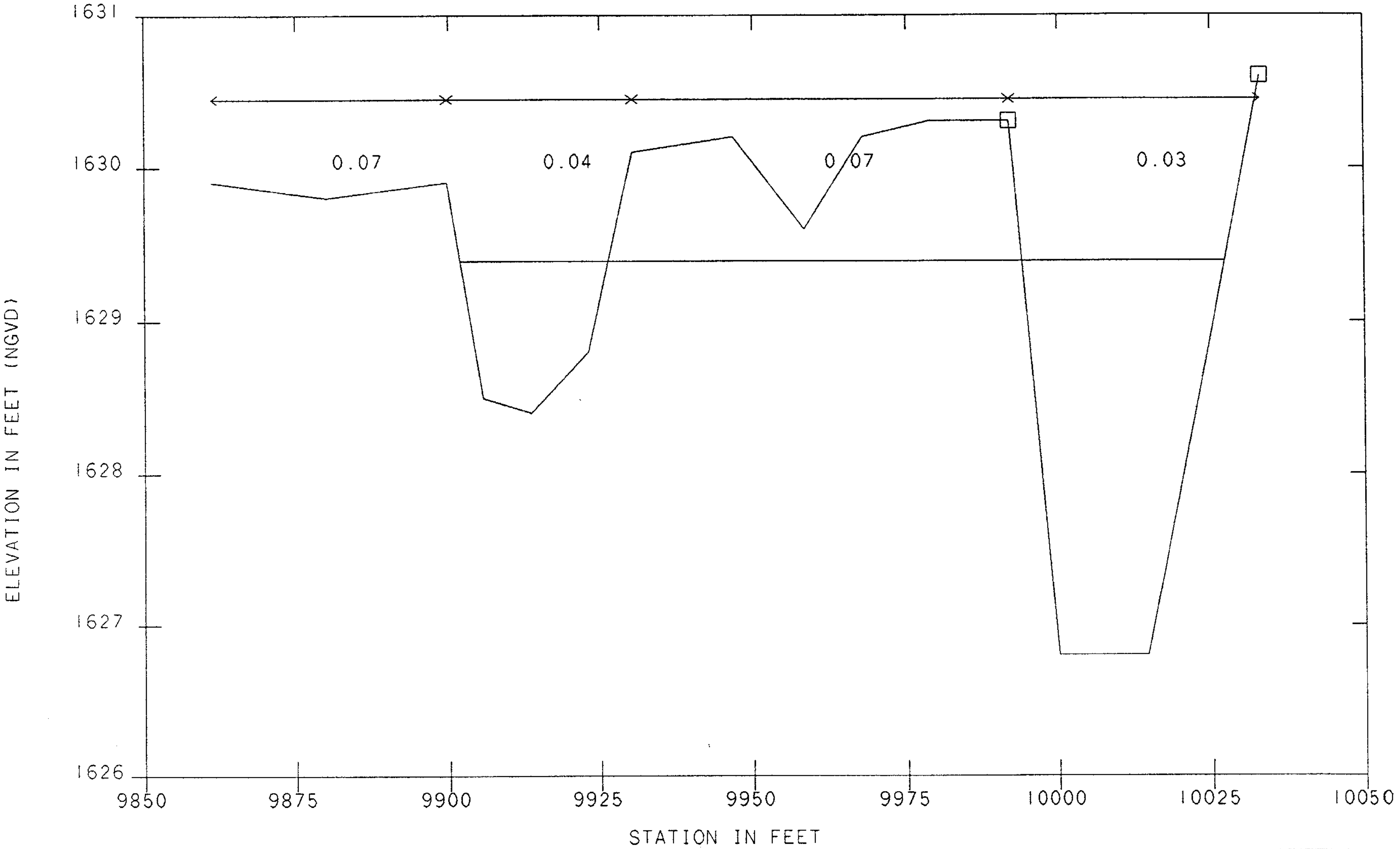
SECTION : 0.207

WASH A SOUTH AUGUST 19, 1994



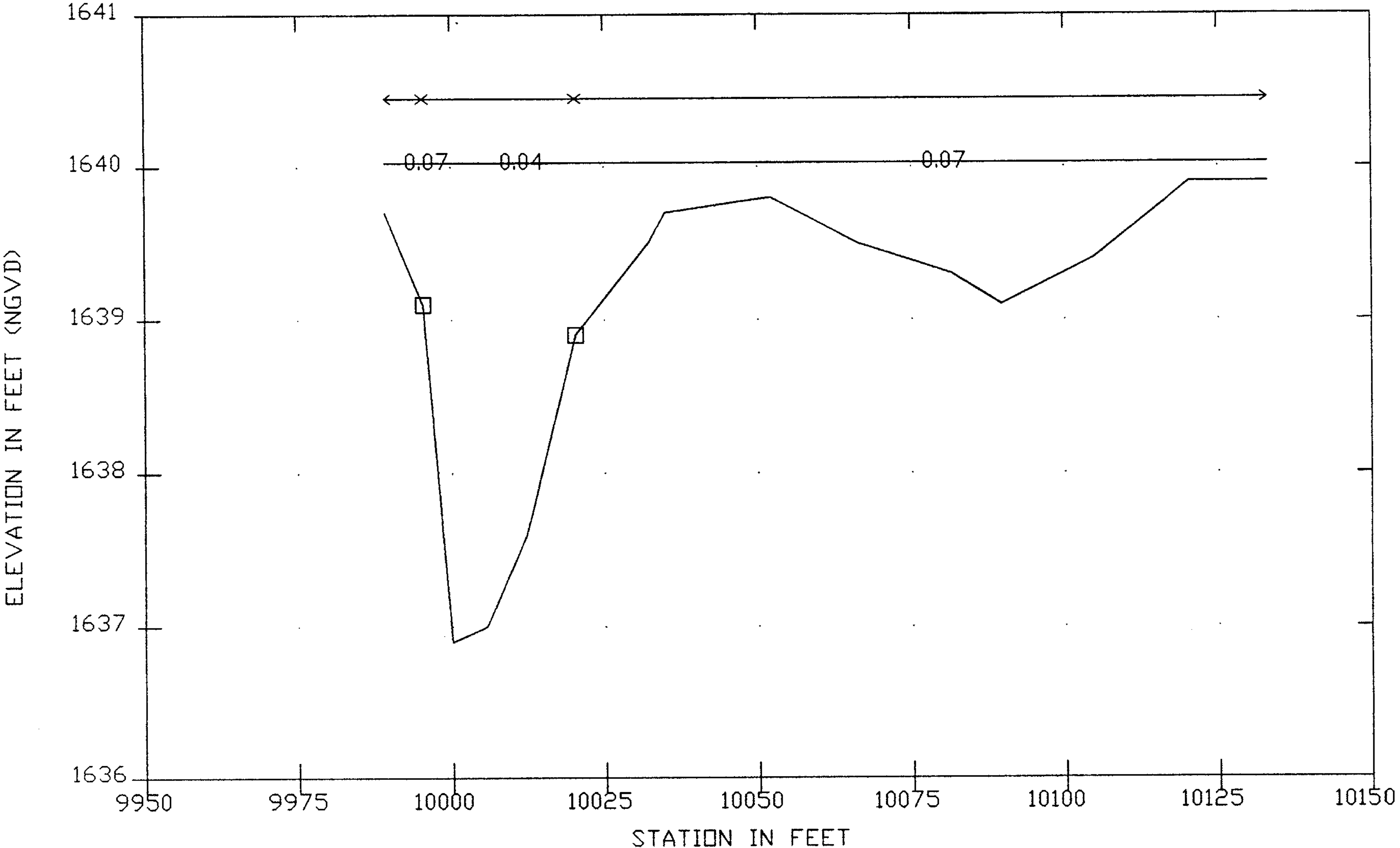
SECTION : 0.308

WASH A SOUTH AUGUST 19, 1994



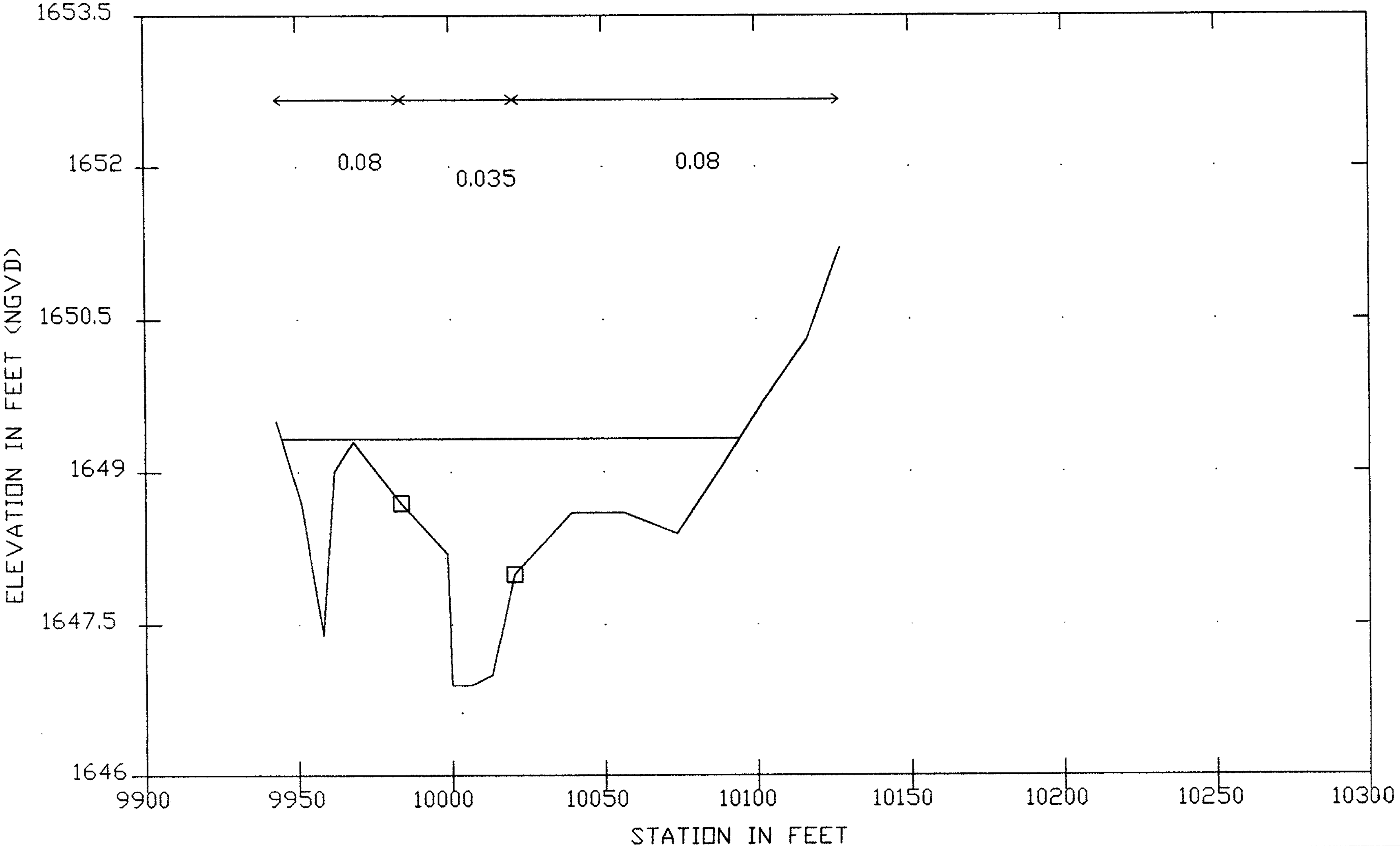
SECTION : 0.411

WASH A SOUTH AUGUST 19, 1994



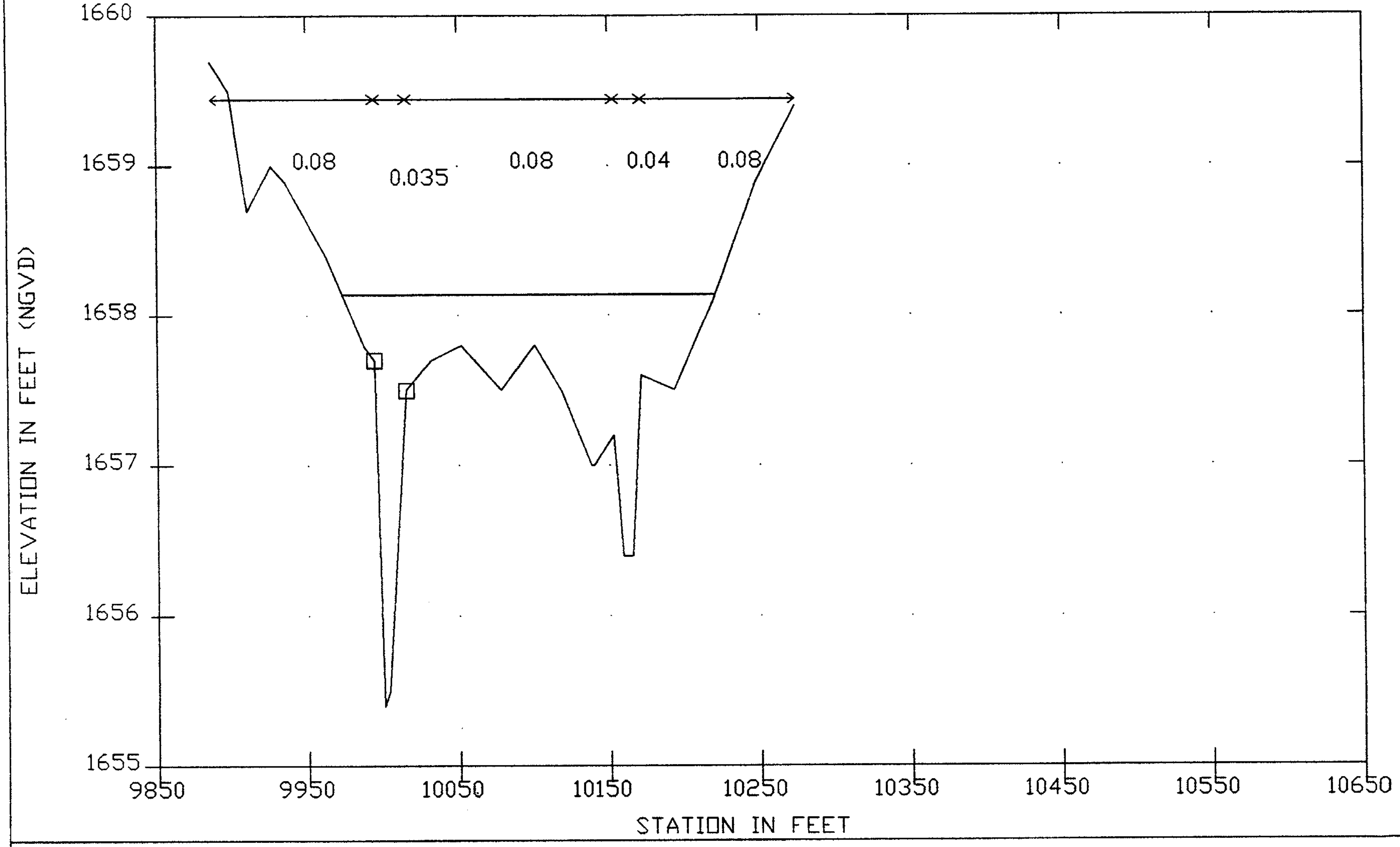
SECTION : 0.512

WASH A SOUTH AUGUST 19, 1994



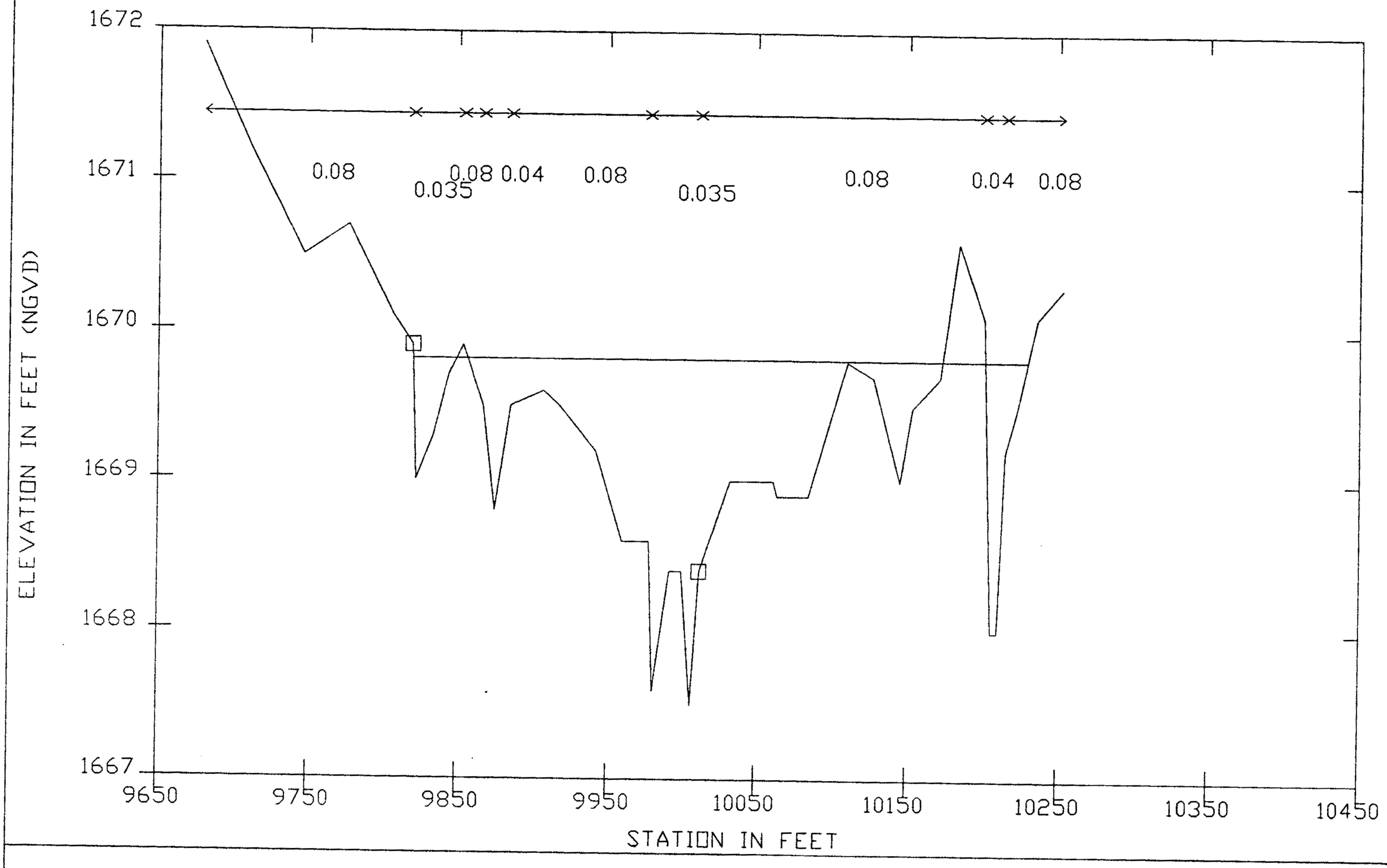
SECTION : 0.599

WASH A SOUTH AUGUST 19, 1994



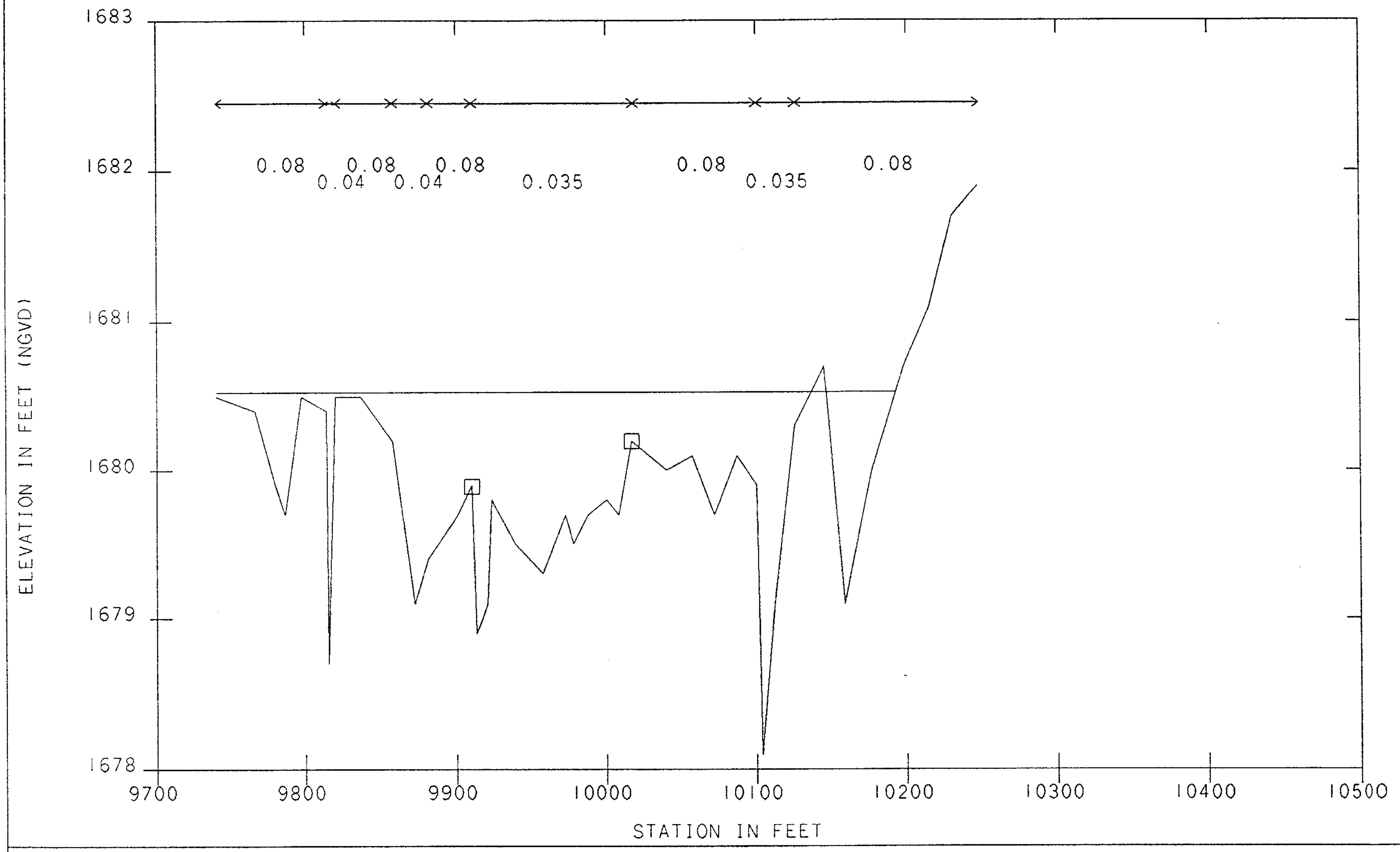
SECTION : 0.682

WASH A SOUTH   AUGUST 19, 1994



SECTION : 0.774

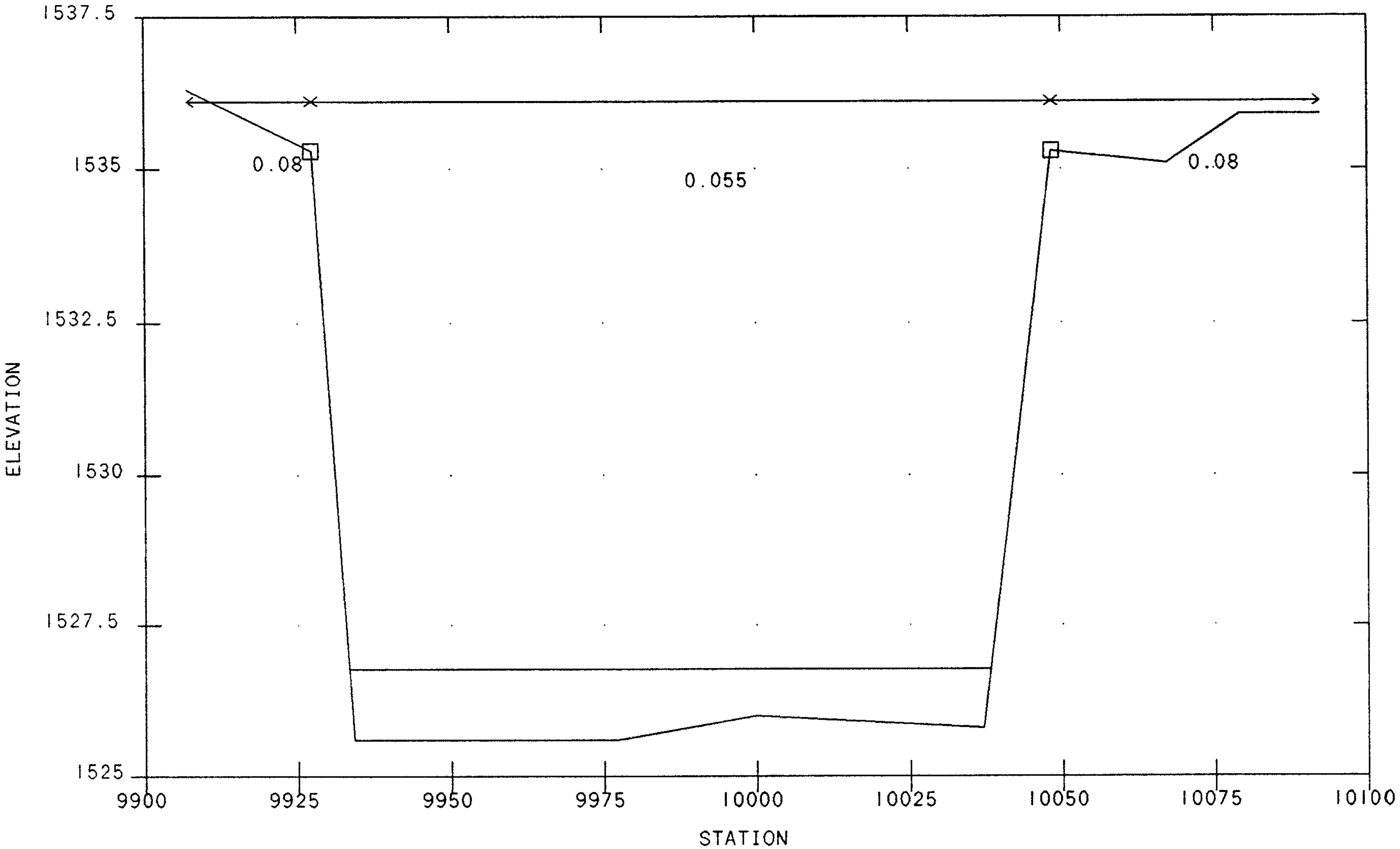
WASH A SOUTH   AUGUST 19, 1994



SECTION : 0.867

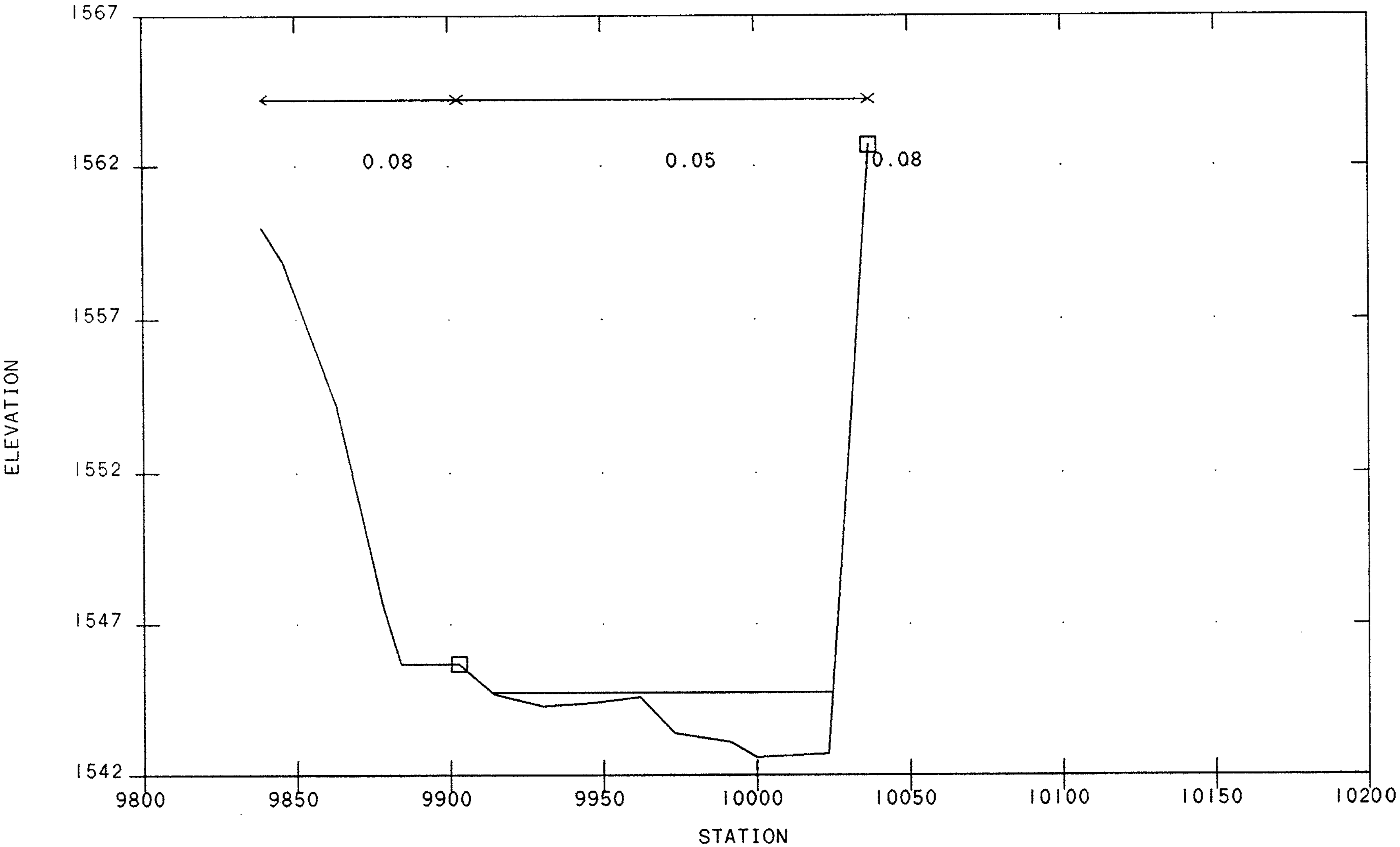
WASH A SOUTH   AUGUST 19, 1994

WASH F



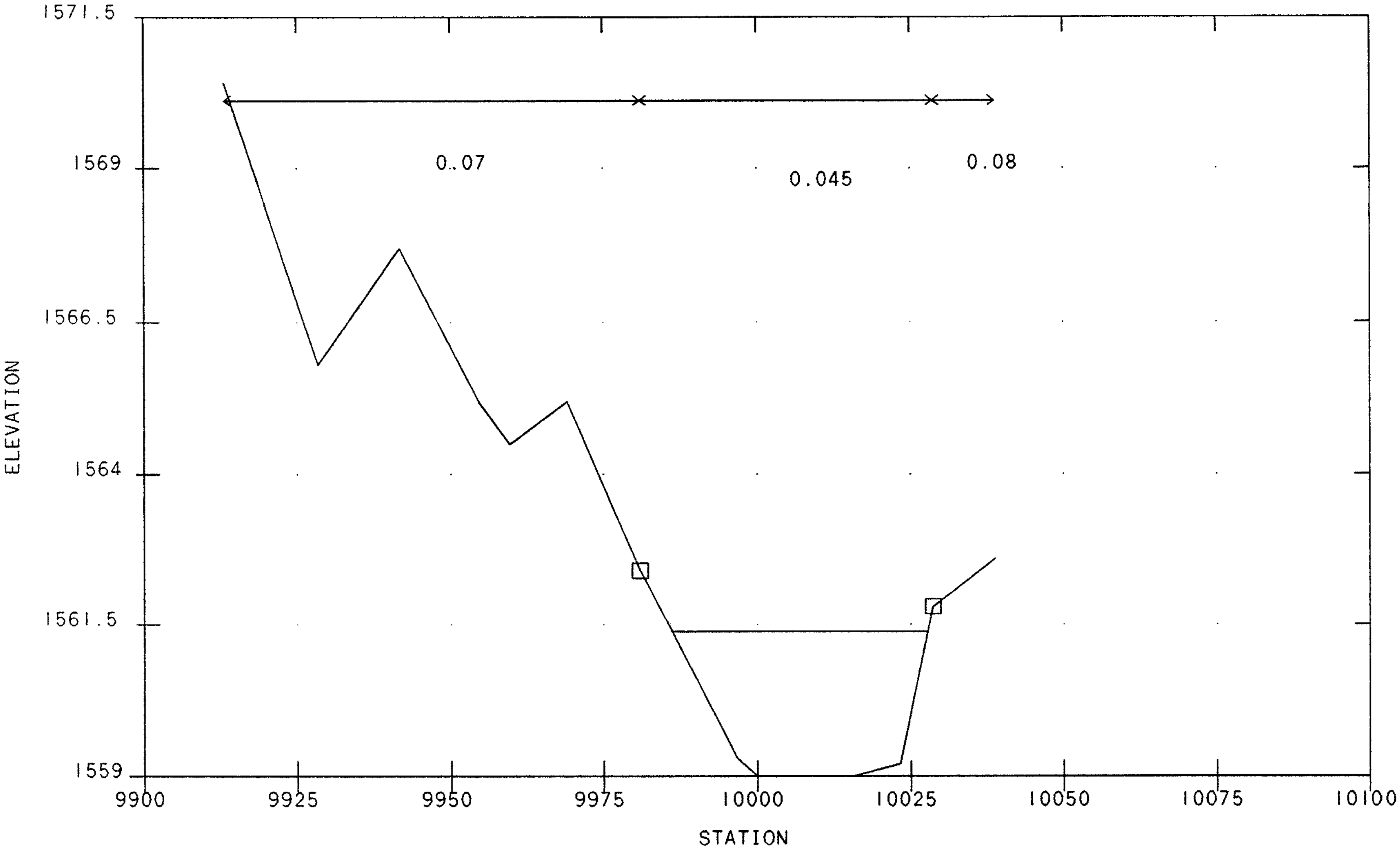
SECTION : 0.000

WASH F AUGUST 19, 1994



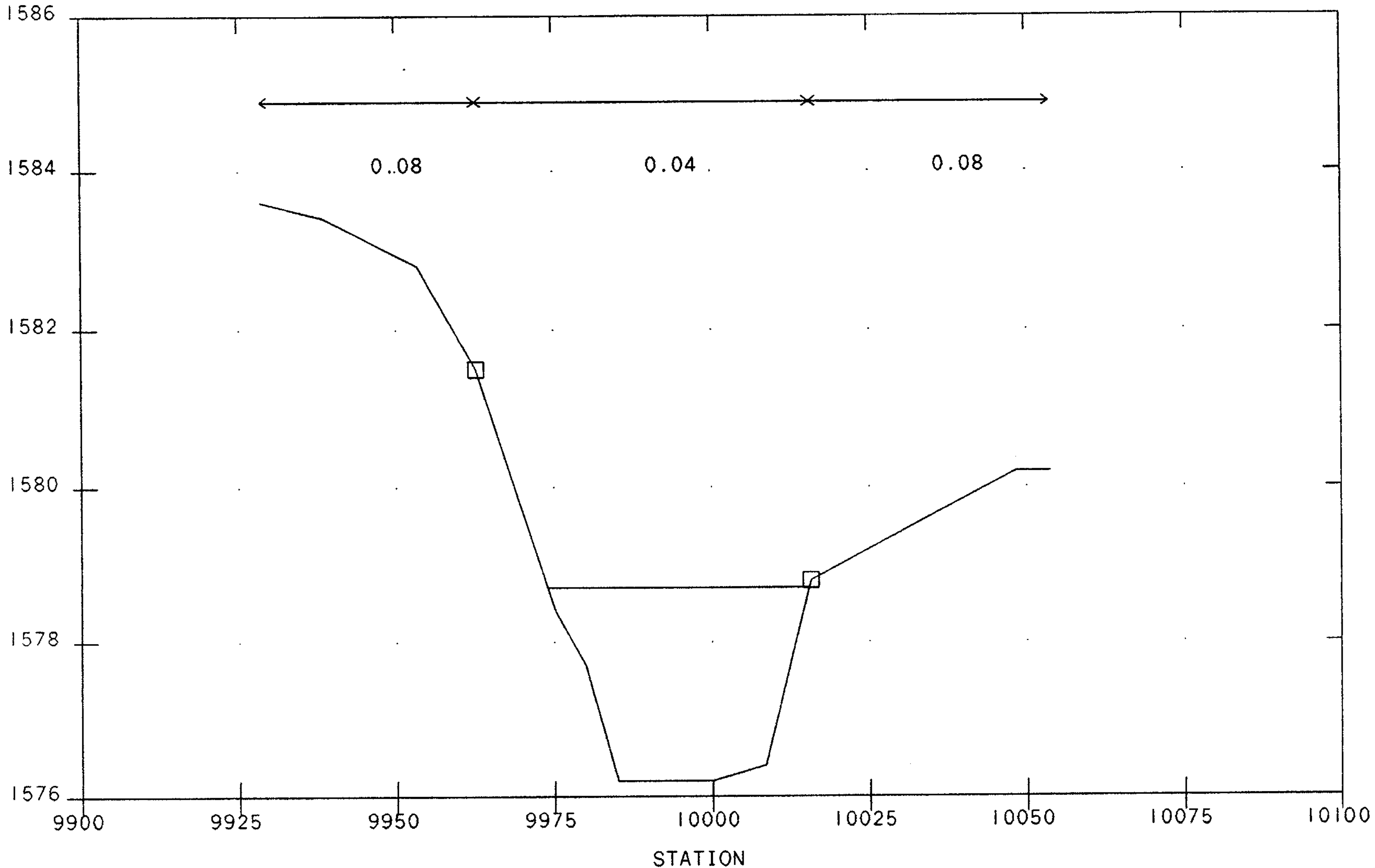
SECTION : 0.095

WASH F AUGUST 19, 1994



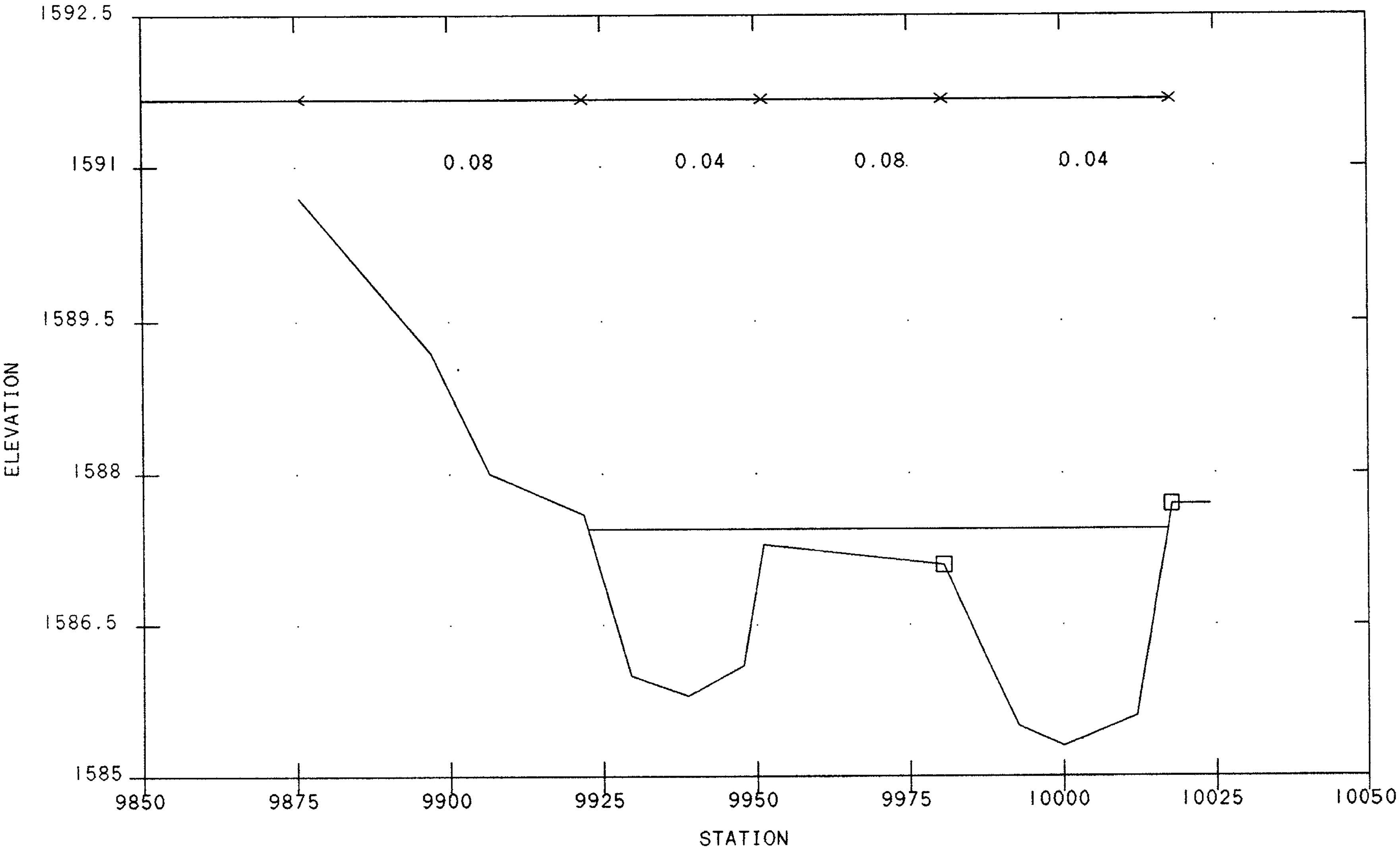
SECTION : 0.195

WASH F AUGUST 19, 1994



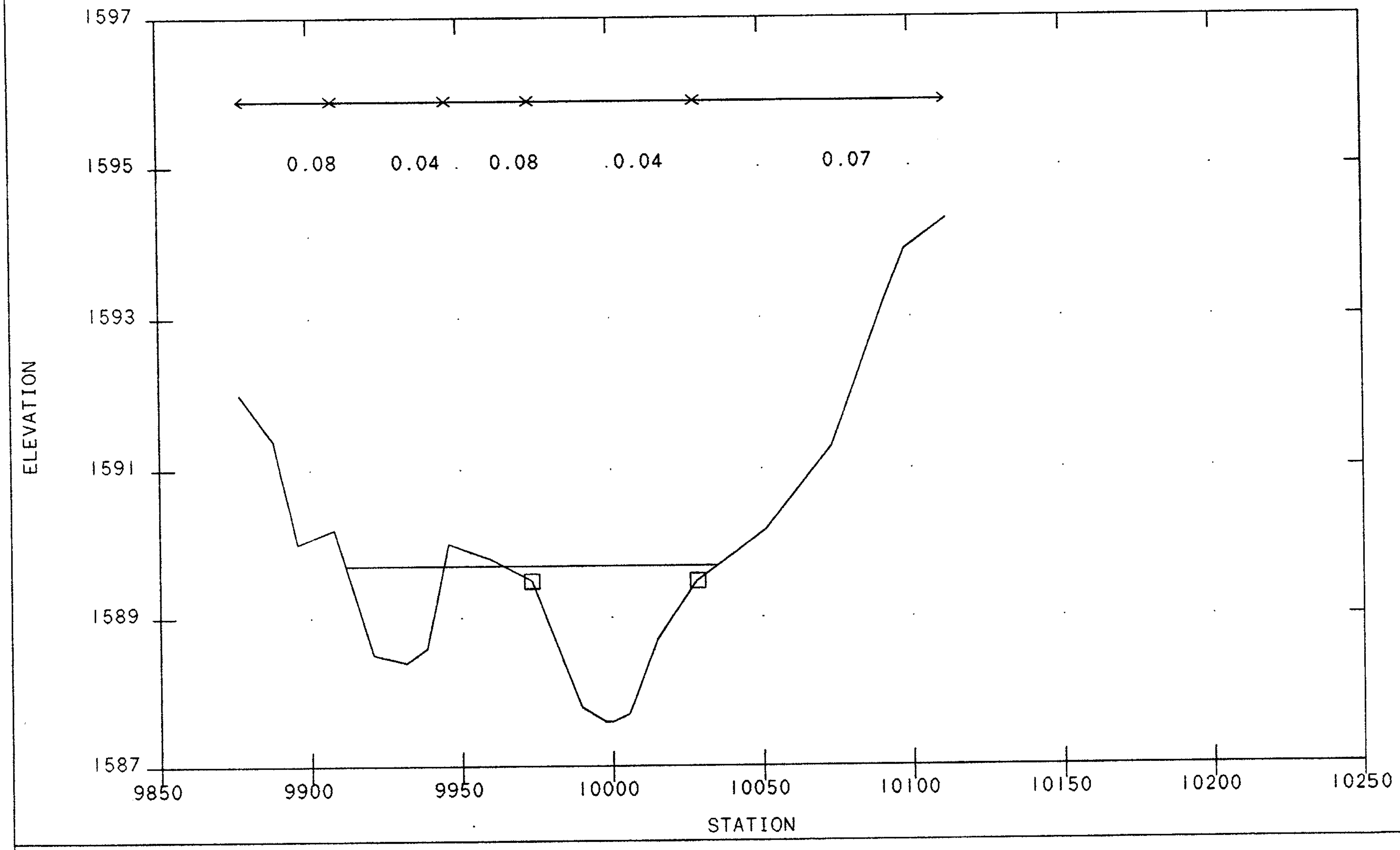
SECTION : 0.305

WASH F AUGUST 19, 1994



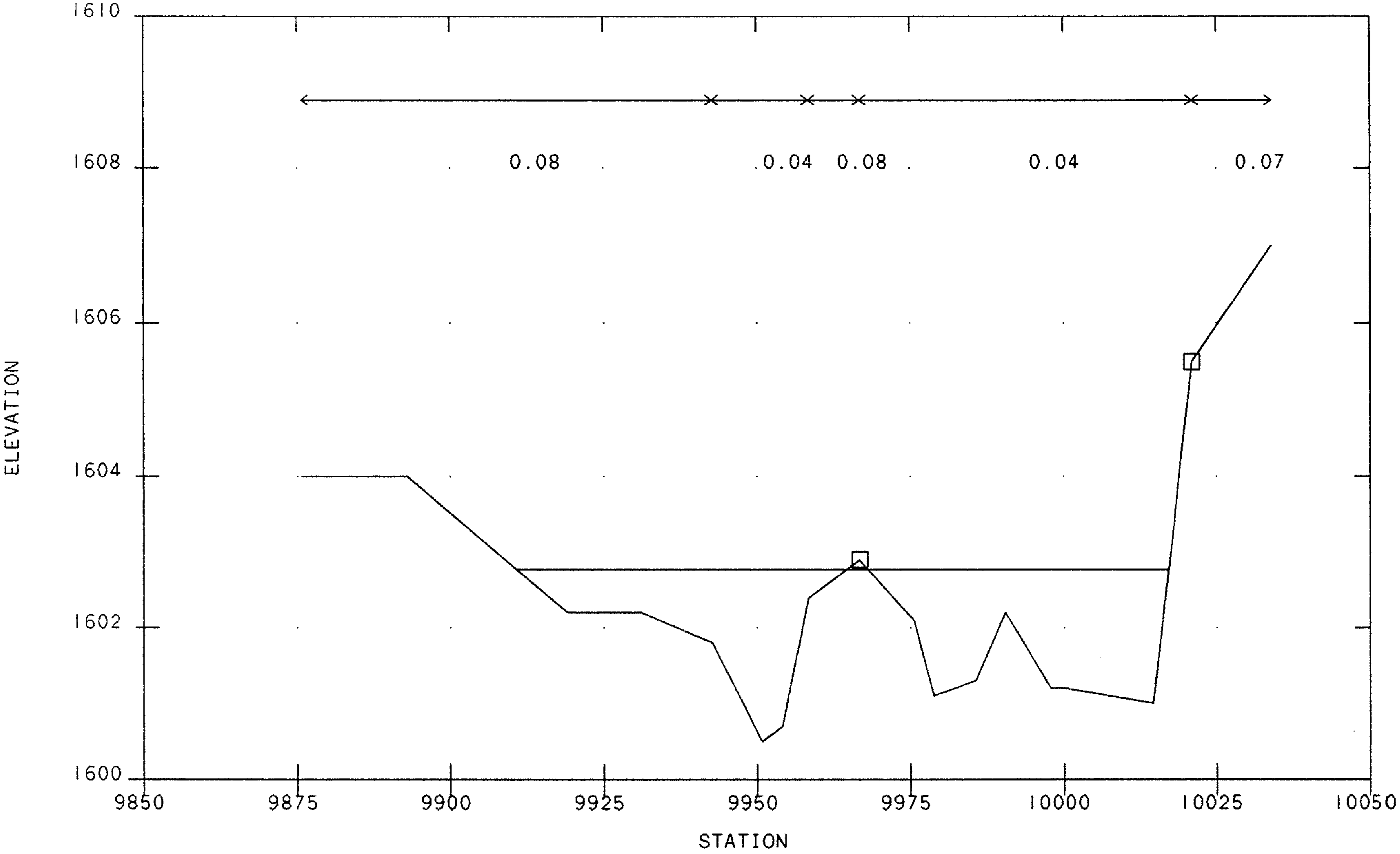
SECTION : 0.374

WASH F AUGUST 19, 1994



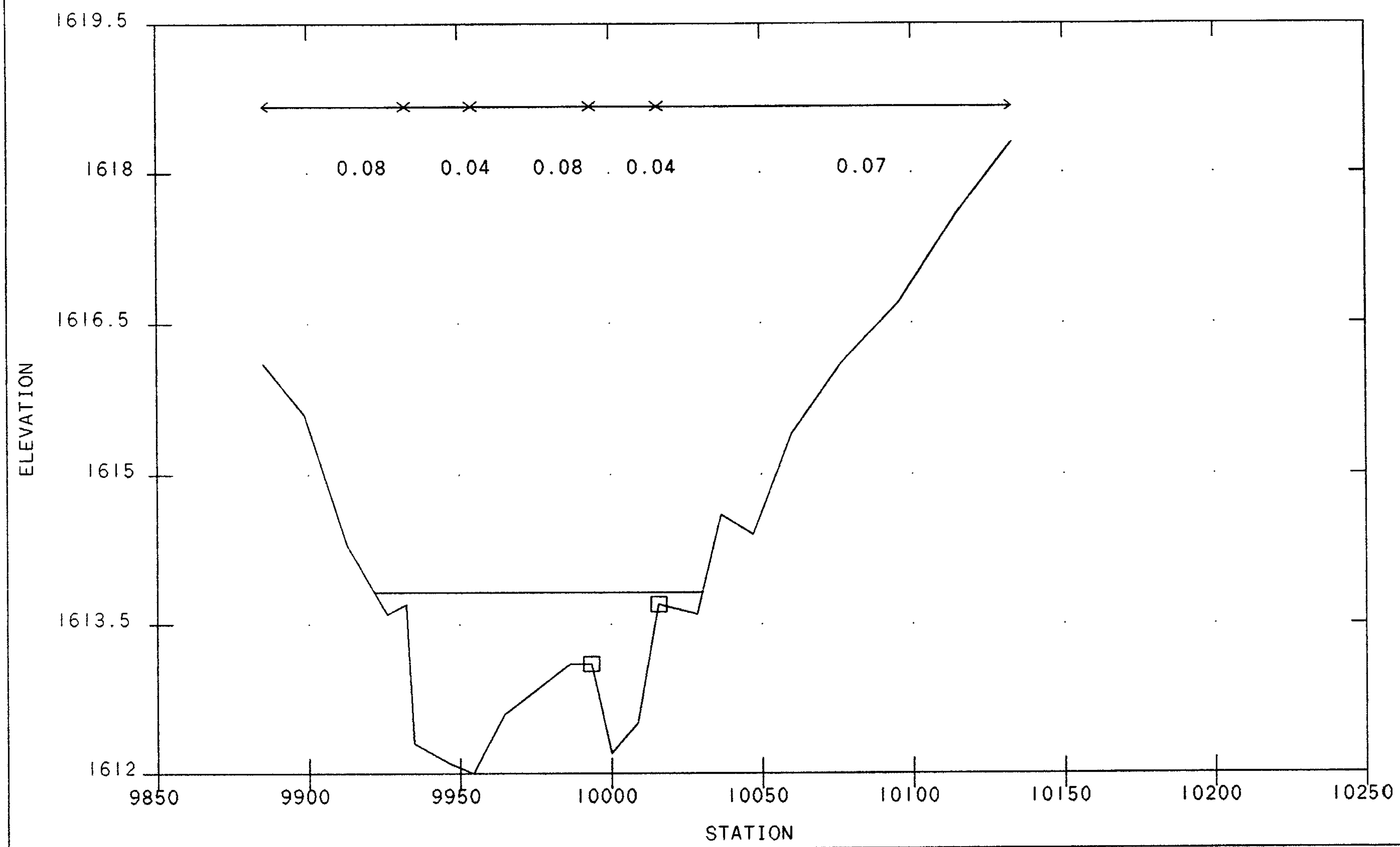
SECTION : 0.390

WASH F AUGUST 19, 1994



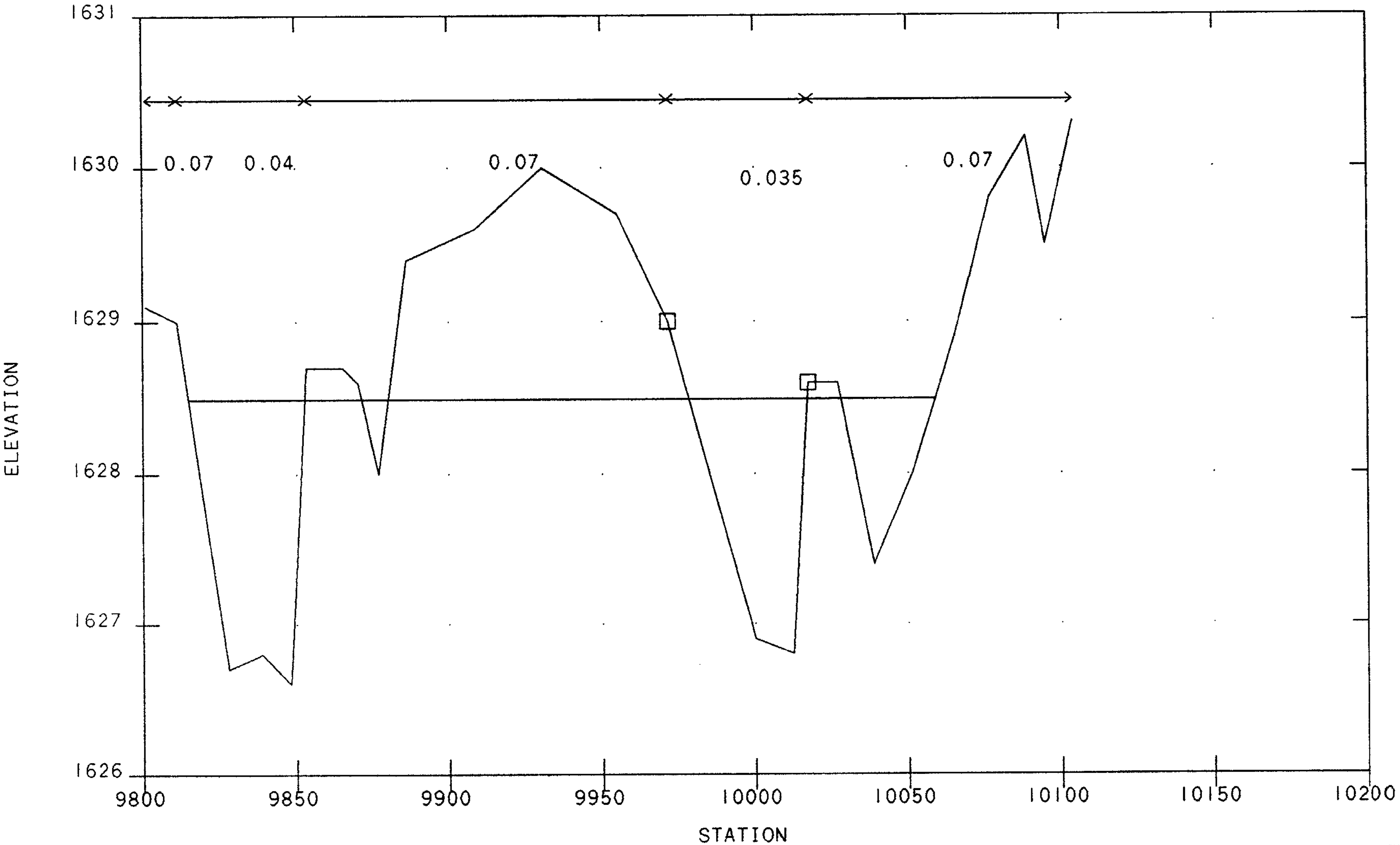
SECTION : 0.480

WASH F   AUGUST 19, 1994



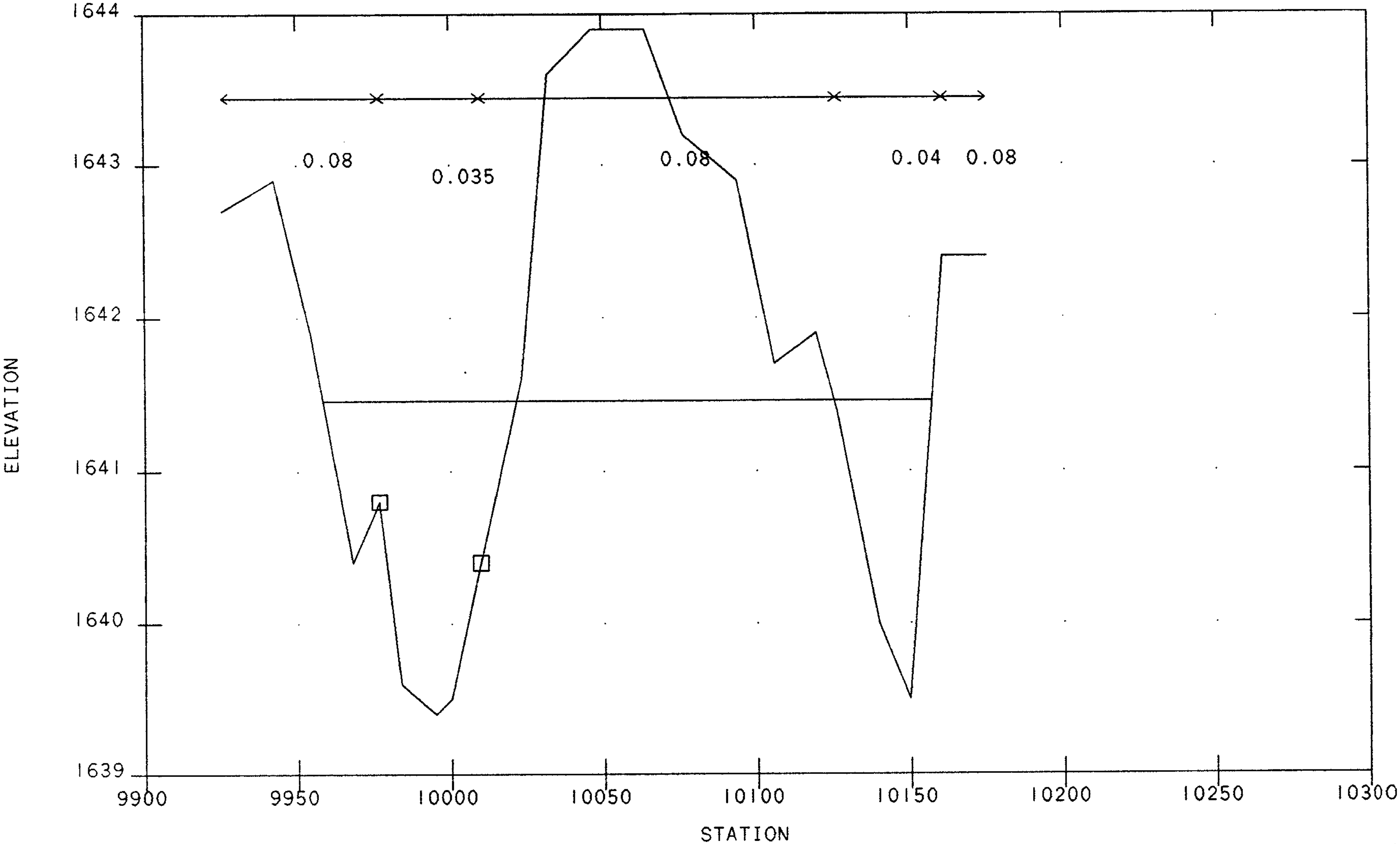
SECTION : 0.569

WASH F AUGUST 19, 1994



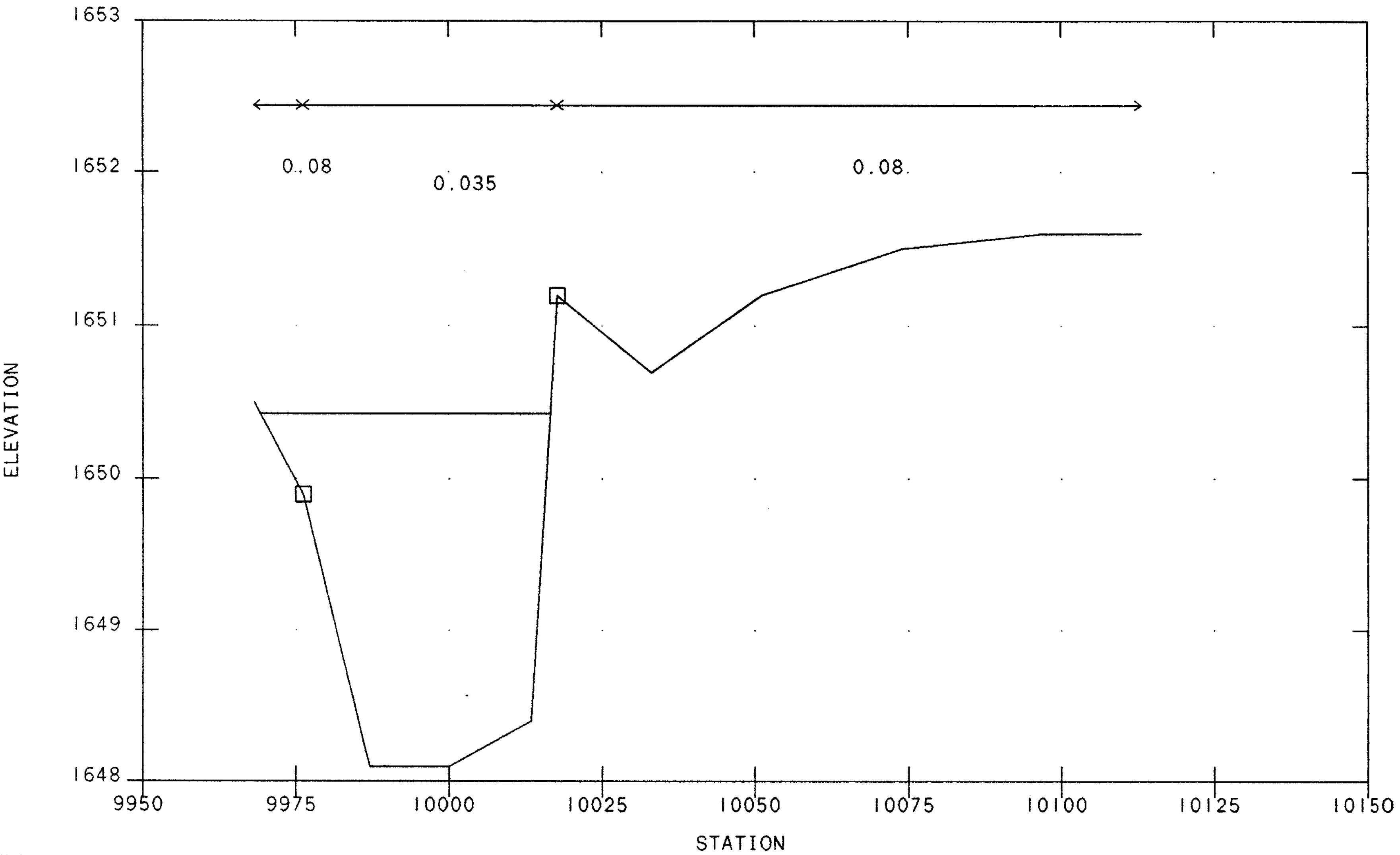
SECTION : 0.683

WASH F AUGUST 19, 1994



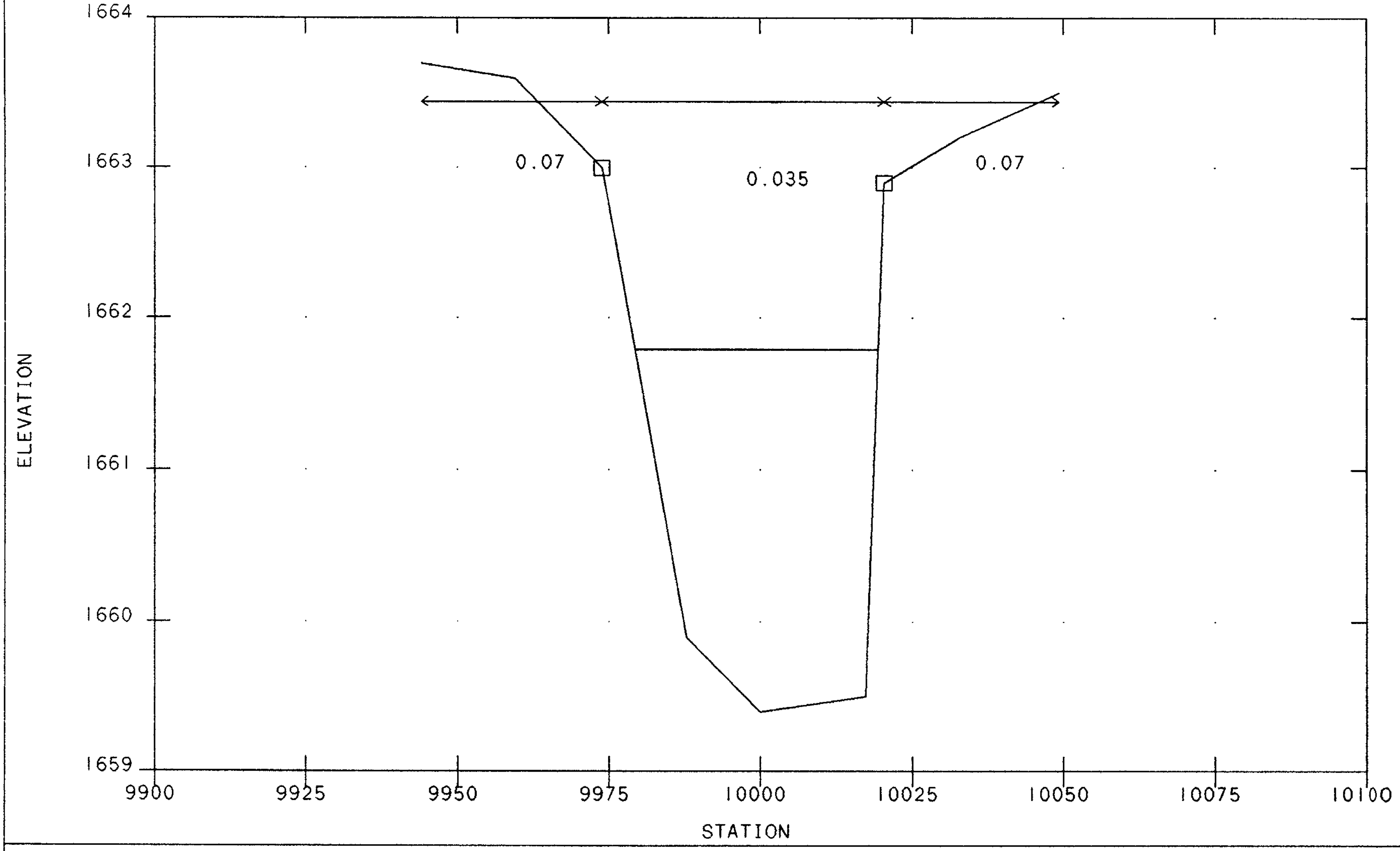
SECTION : 0.790

WASH F AUGUST 19, 1994



SECTION : 0.856

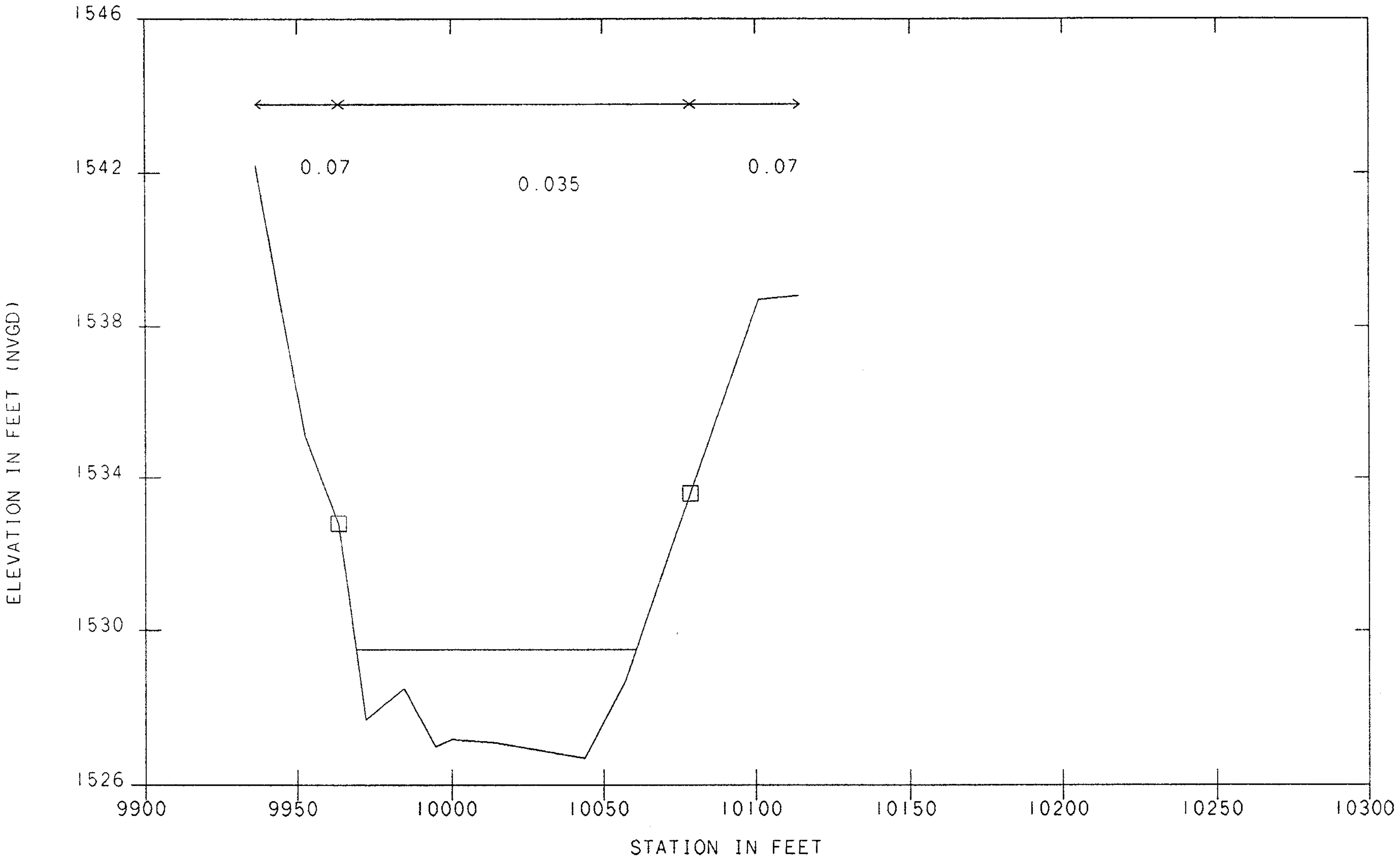
WASH F AUGUST 19, 1994



SECTION : 0.961

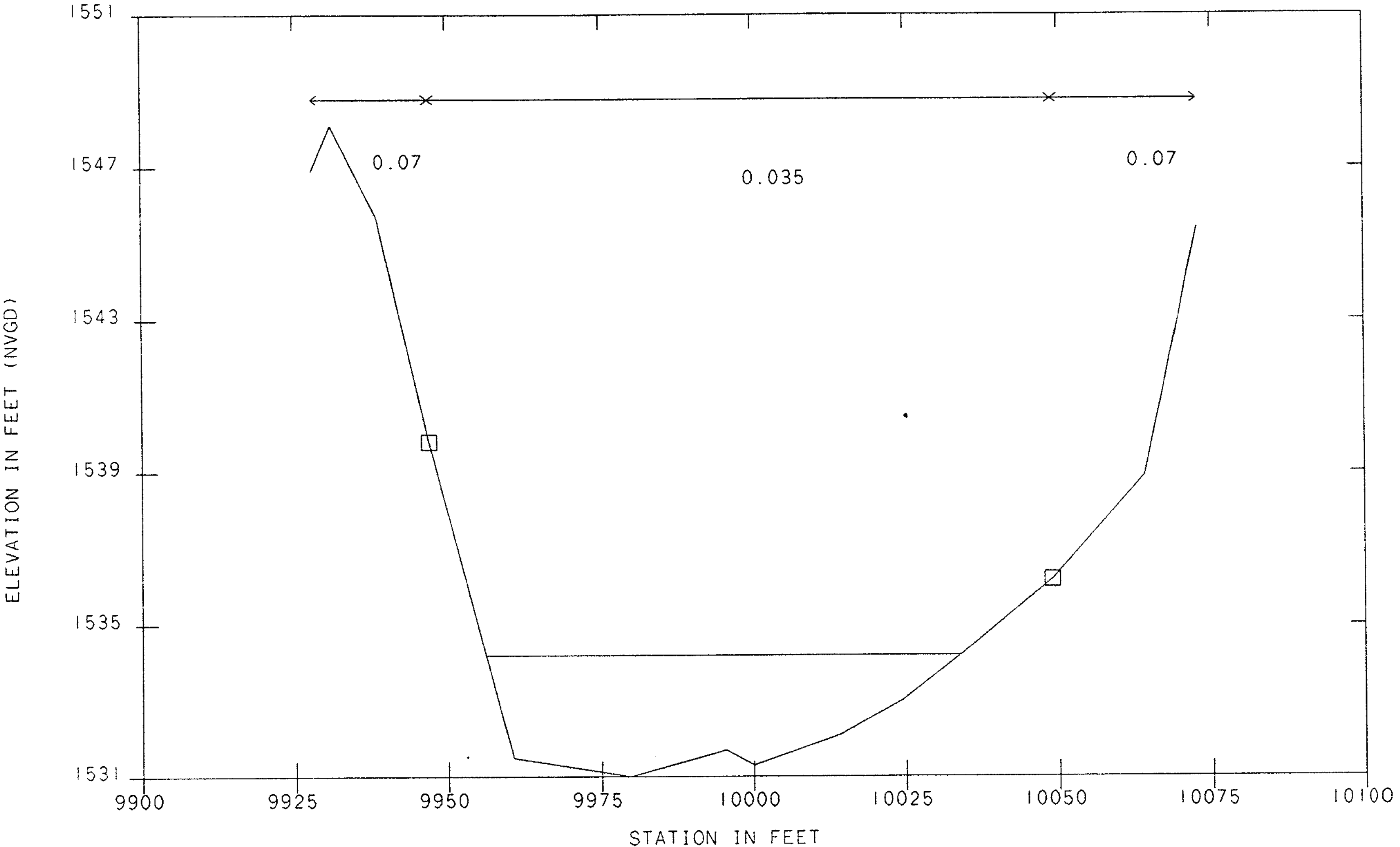
WASH F AUGUST 19, 1994

WASH I



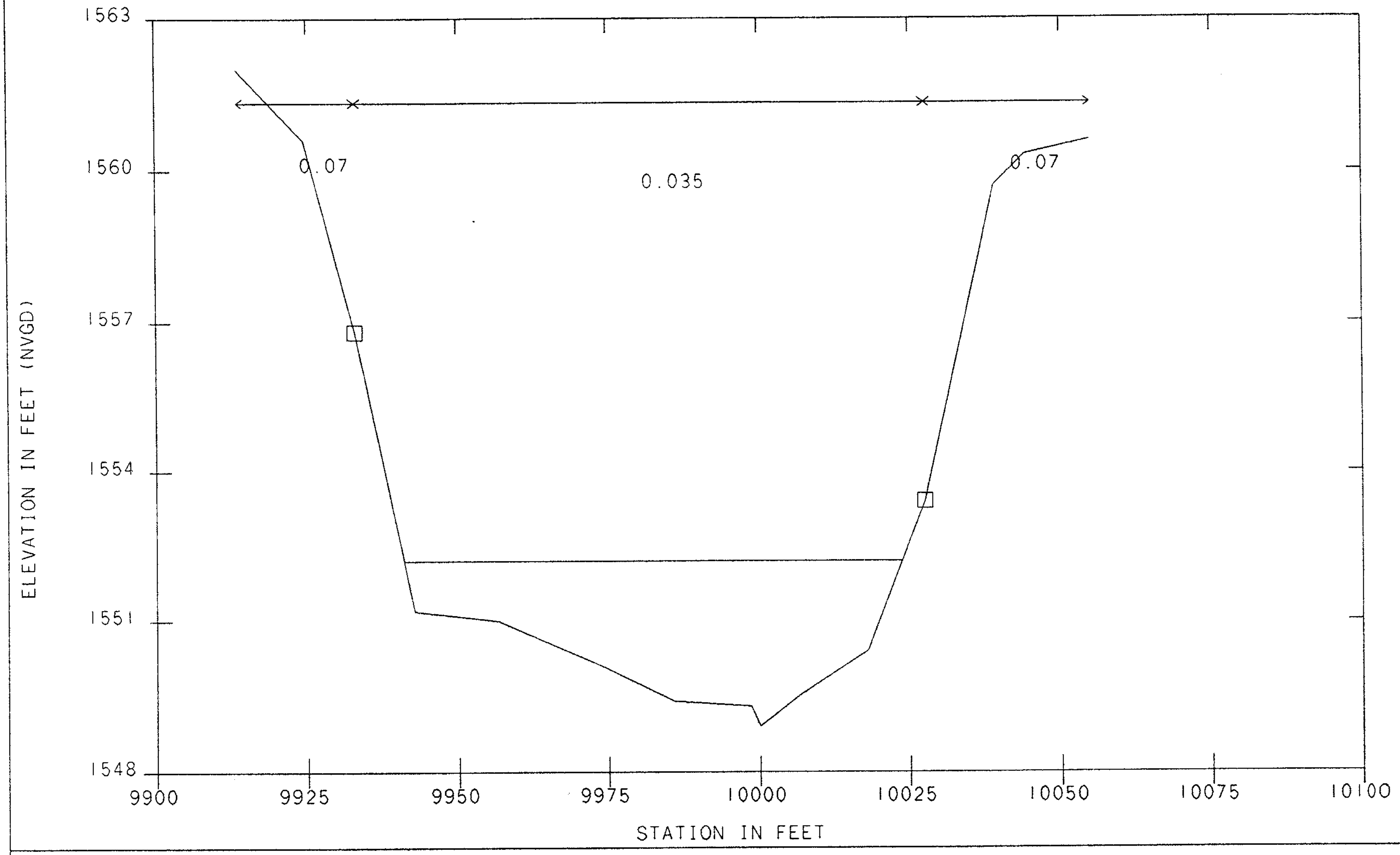
SECTION : 0.000

WASH I AUGUST 19, 1994



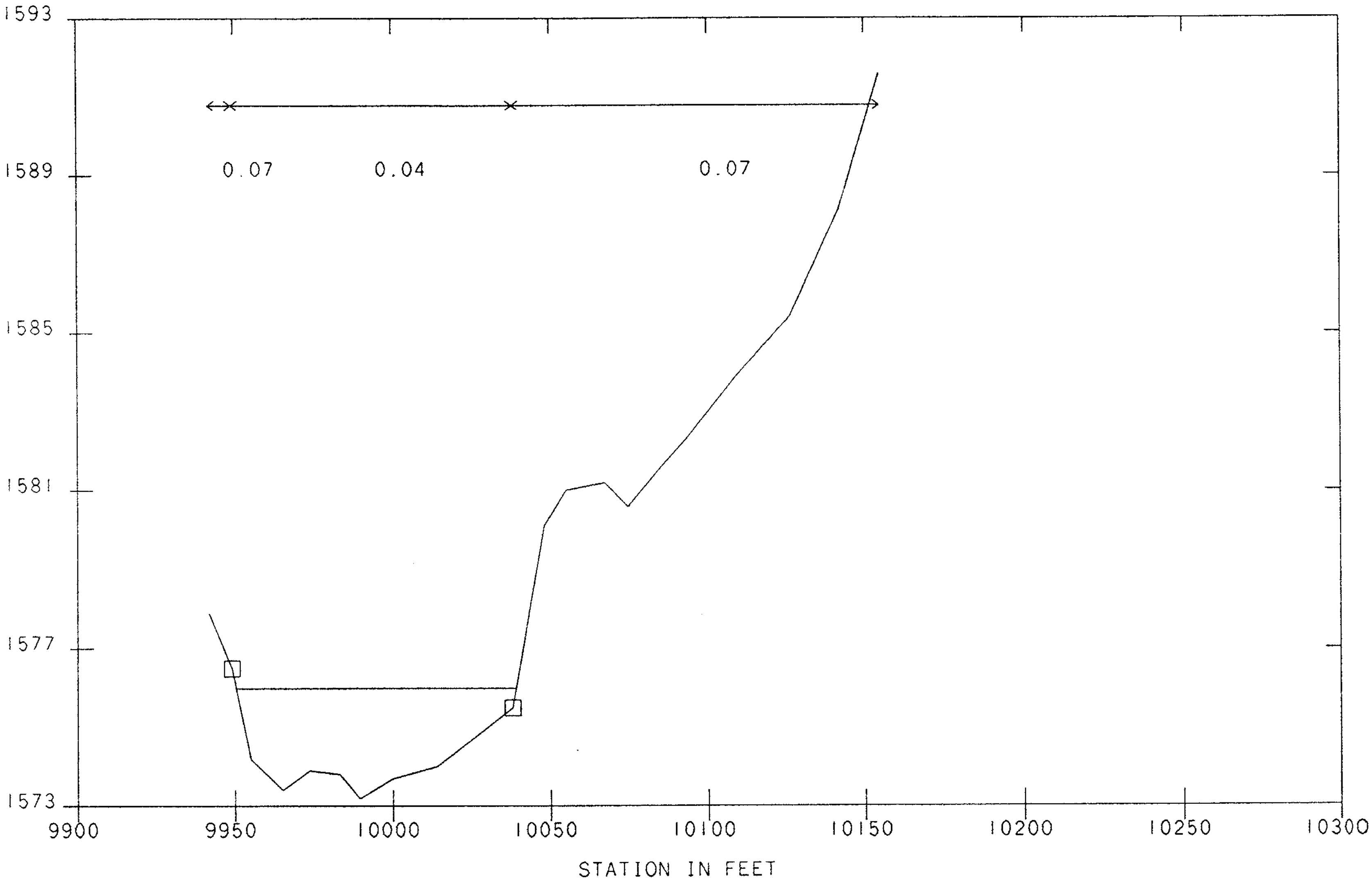
SECTION : 0.012

WASH I AUGUST 19, 1994



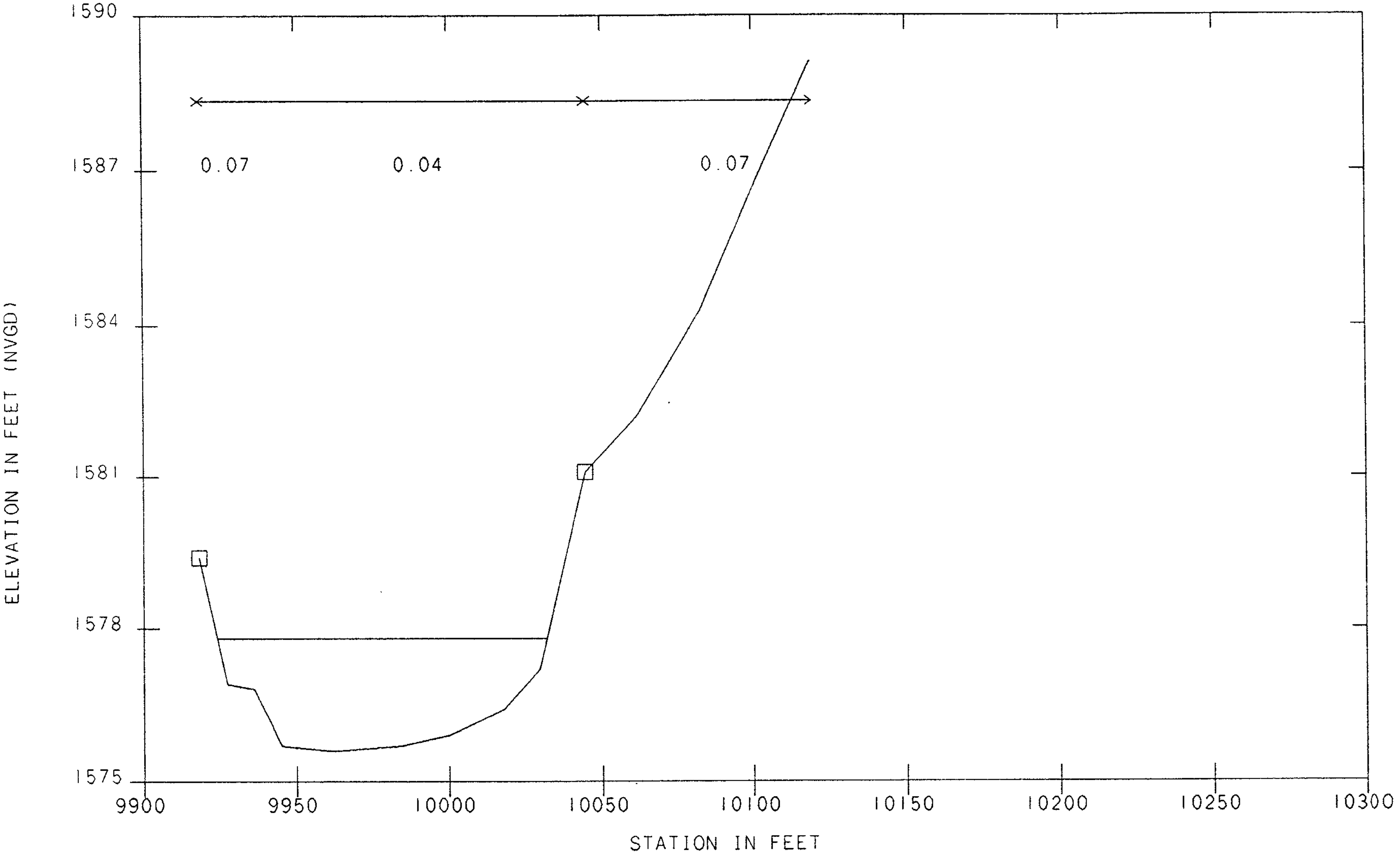
SECTION : 0.076

WASH I AUGUST 19, 1994



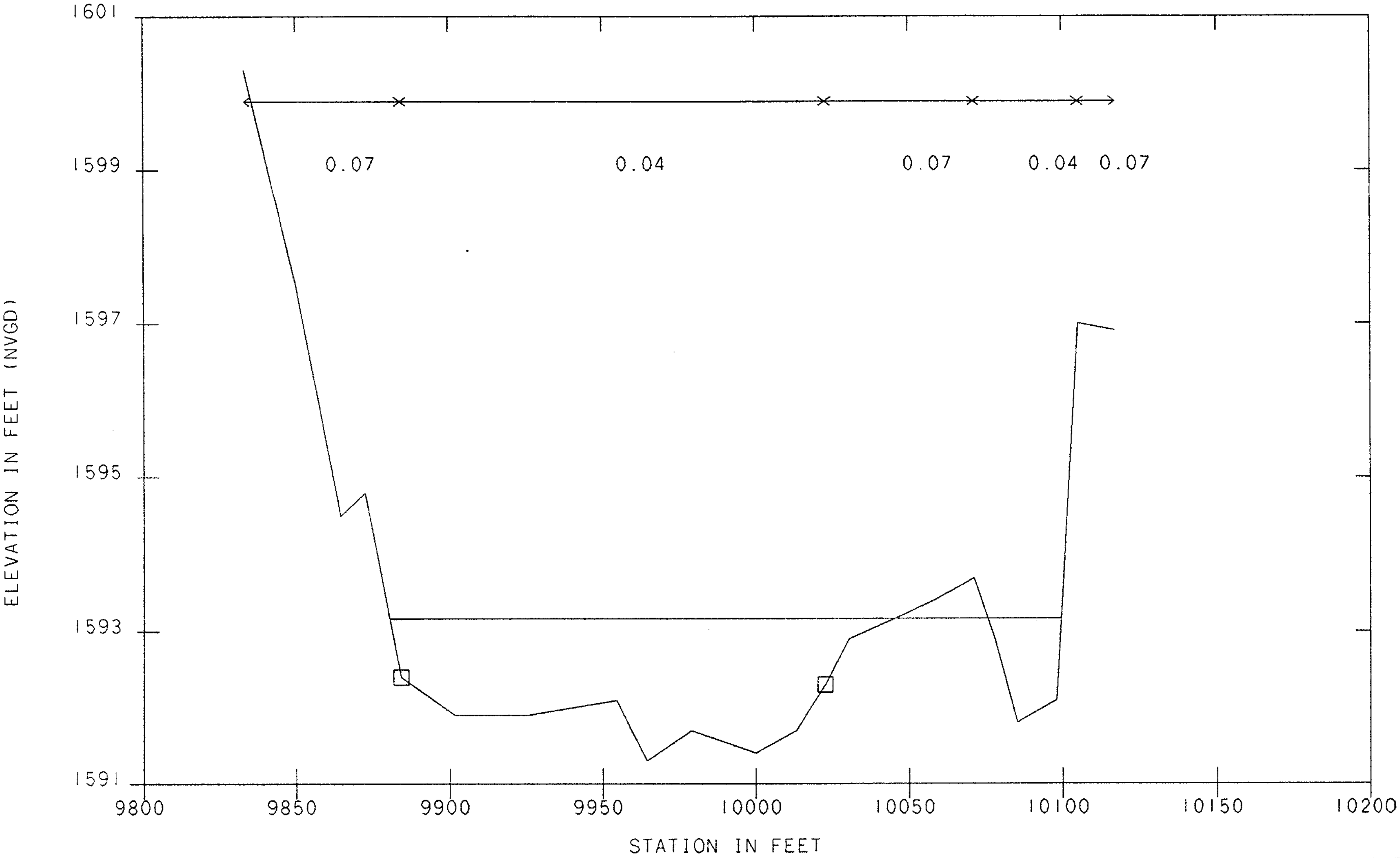
SECTION : 0.181

WASH I AUGUST 19, 1994



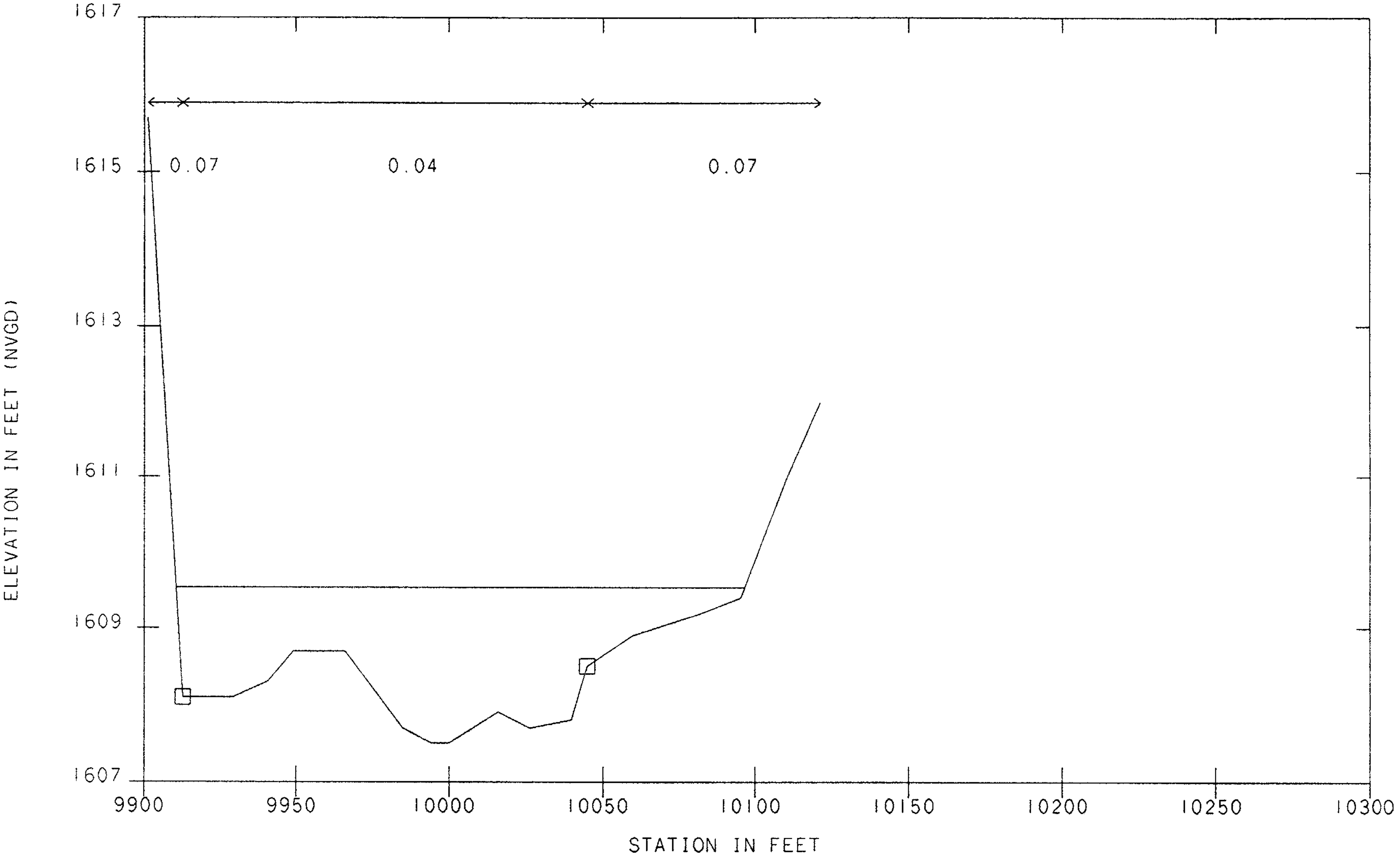
SECTION : 0.191

WASH I AUGUST 19, 1994



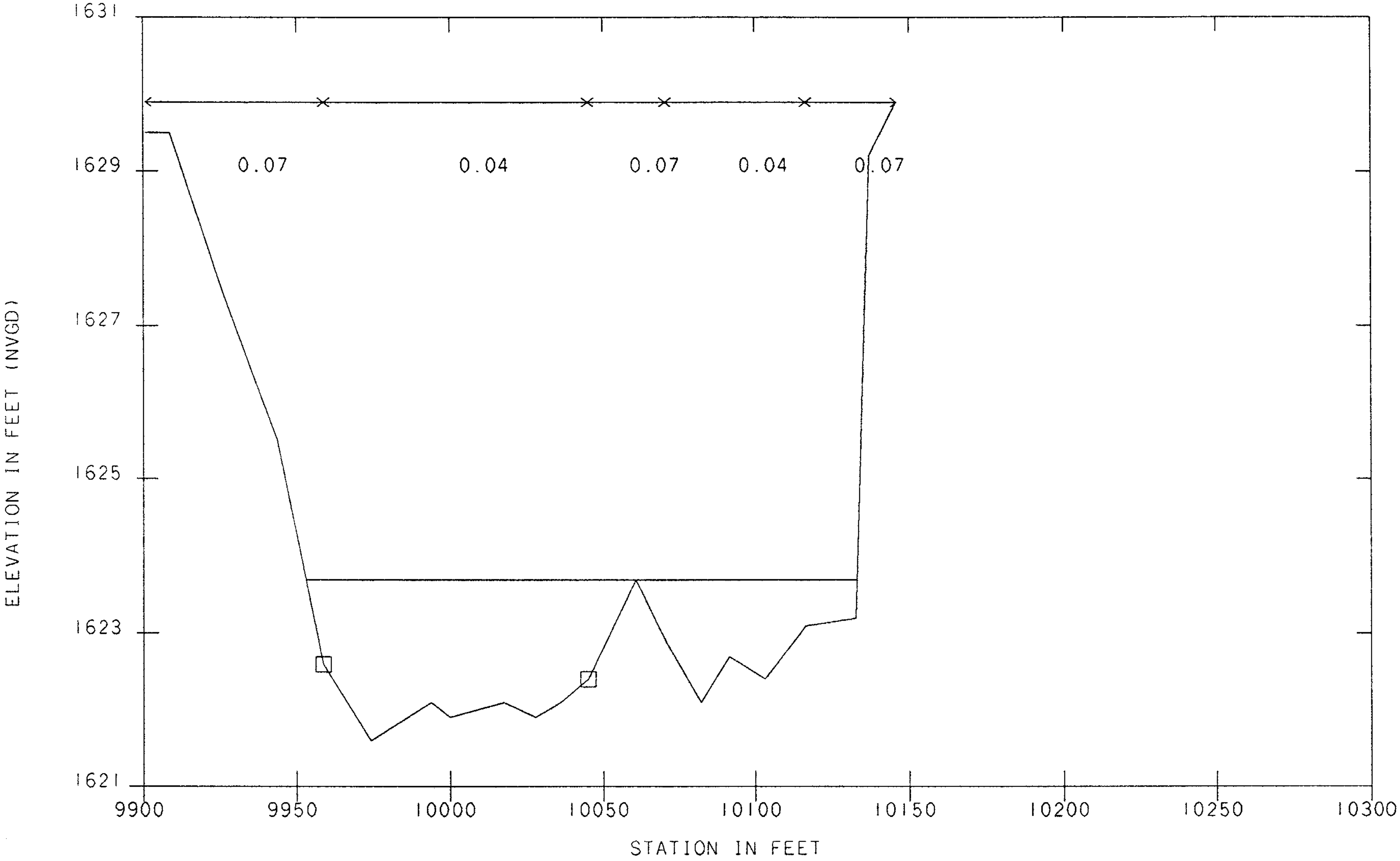
SECTION : 0.270

WASH I AUGUST 19, 1994



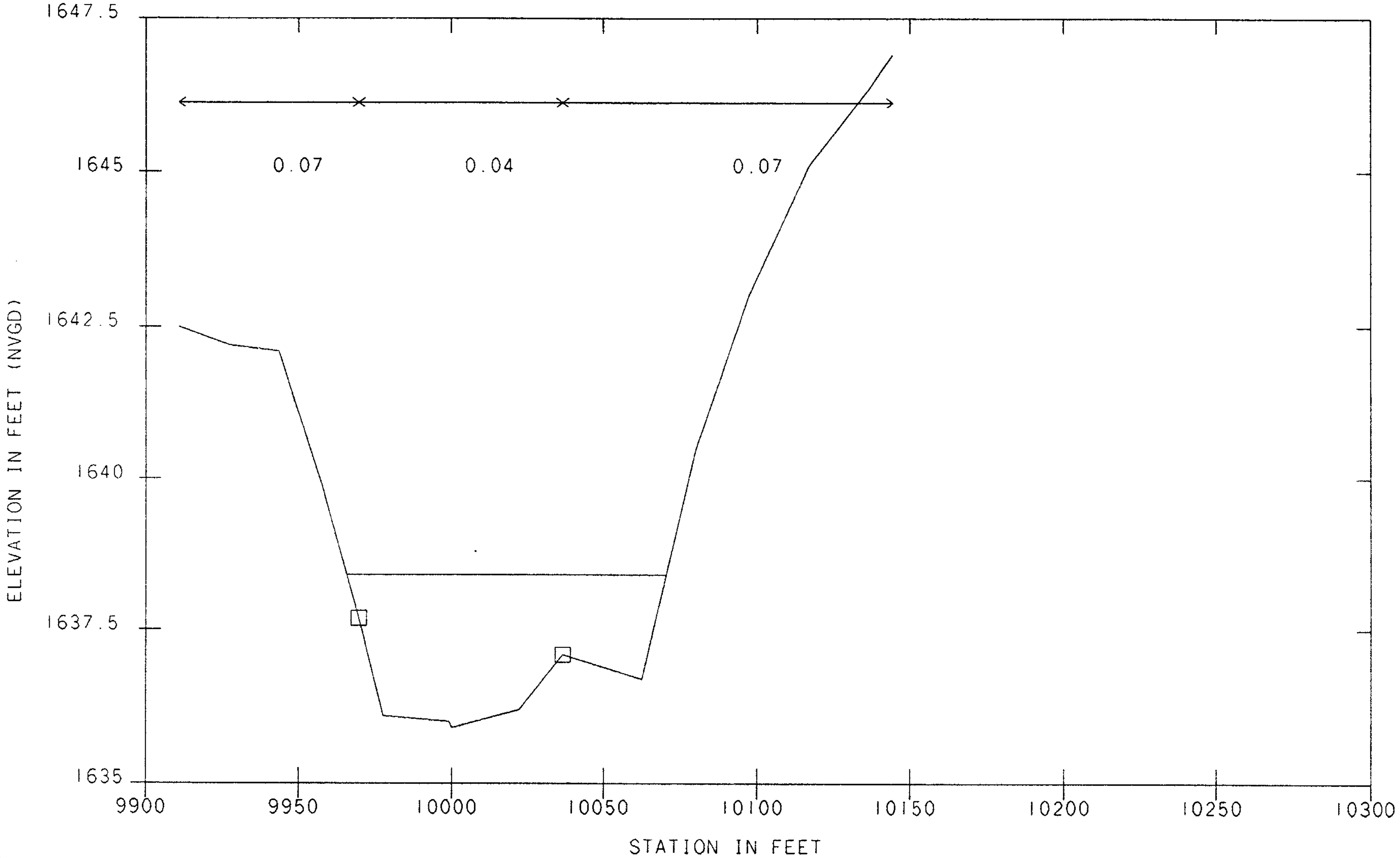
SECTION : 0.363

WASH I AUGUST 19, 1994



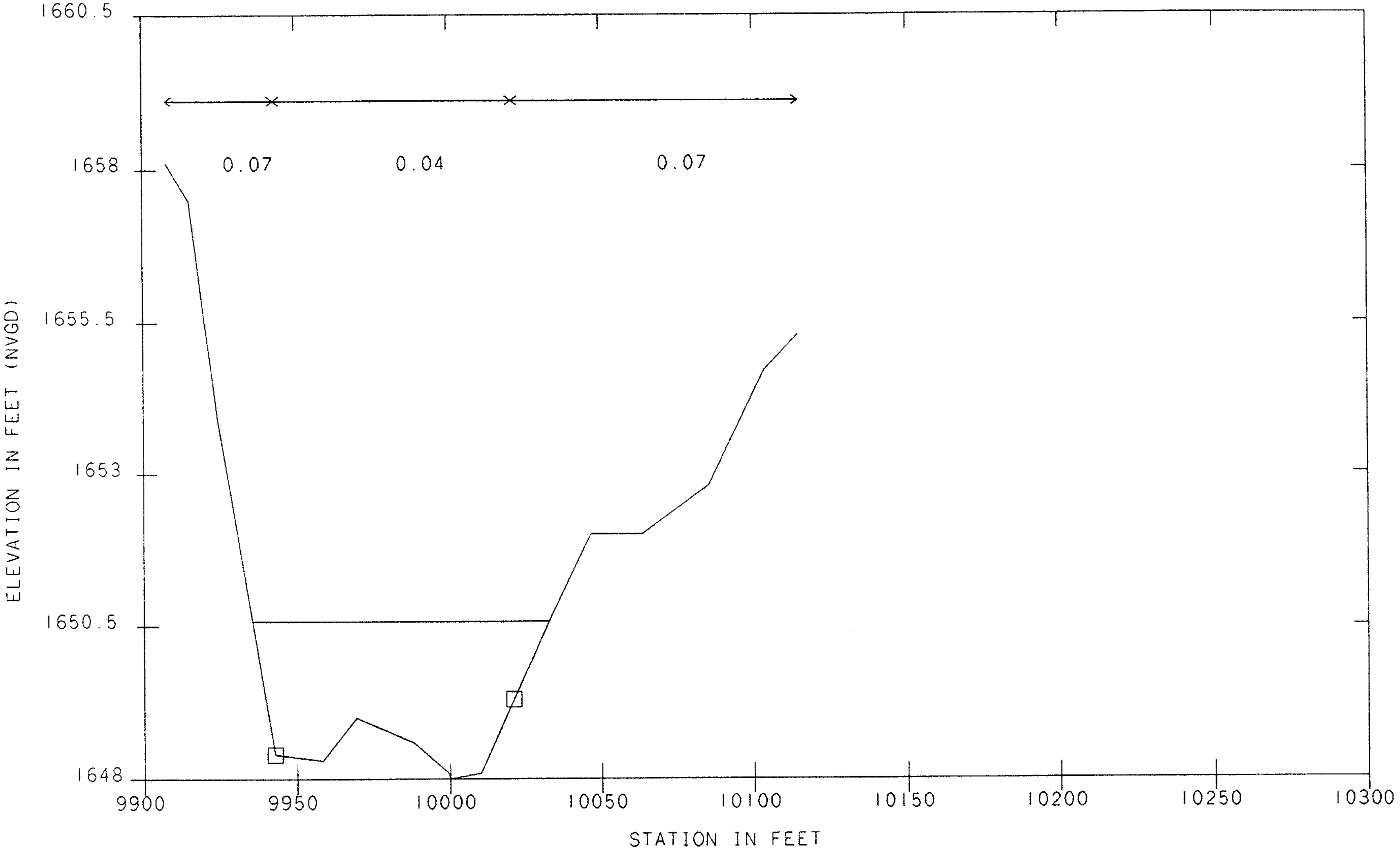
SECTION : 0.451

WASH I AUGUST 19, 1994



SECTION : 0.541

WASH I AUGUST 19, 1994



SECTION : 0.625

WASH I AUGUST 19, 1994

SECTION 4: Hydraulic Analysis

4.5 Special Problems/Solutions

SPECIAL PROBLEMS - GENERAL

Special Problem No. 1

Split flows appear on the cross sections at several locations. Where not specifically discussed as a special problem, the average height of the ground on small islands formed by the split flow is less than 1 foot above the 100-year flood elevation, or the island is very small. Since the height of most of these islands is less than the accuracy of the mapping, they are shown as being flooded.

SPECIAL PROBLEMS

Wash A

Special Problem No. 1A

<u>**Wash A, Breakout at Cross Section 2.494**</u> (see the Hydraulic Analysis Maps, Sheet 5 of 6)

Wash A overtops its drainage divide to the south (right overbank) and discharges flow to the adjacent watershed. Rating curves for Cross Section 2.494 and the south drainage divide were developed, plotted, and added together to determine the flow that remains in Wash A. Approximately 220 cubic feet per second (cfs) is diverted from Wash A and does not re-enter Wash A. Therefore, all discharges in Wash A below Cross Section 2.494 were decreased by 220 cfs. At the Wash A and Wash A South split, where 50 percent of the flow goes into each wash, the decreased flow of 220 cfs was also divided equally between Wash A and Wash A South. (Refer to the supporting calculations at the end of this section.)

Of the 220 cfs leaving Wash A, 160 cfs leaves below Cross Section 2.494 and 60 cfs leaves at Cross Section 2.494. Therefore, the discharge at Cross Section 2.494 is 1,330 cfs minus 60 cfs, or 1,270 cfs.

Special Problem No. 2A

<u>**Wash A, Cross Section 2.105**</u> (see Sheet 5 of 6)

A small wash ends just downstream of this cross section in Wash A's channel, causing a split flow condition downstream of this cross section. This small wash runs parallel to Wash A and has other small washes entering which contribute to its flow. The small wash also splits in several locations. The small wash does re-enter Wash A via Wash A South just above Cross Sections 0.599 and 0.411.

Since the small wash conveys a portion of Wash A flow, that amount of flow was determined. Rating curves for Cross Section 2.105 and at the location where the flooding of the small wash separates from Wash A were developed, plotted, and added together to determine the flow that remains in Wash A and the flow that leaves Wash A. Approximately 60 cfs is diverted from Wash A and re-enters Wash A South at Cross Sections 0.599 and 0.411. Since this discharge is less than 6 percent of the total flow and causes a depth of flooding in the small channel of less than 1 foot and since the small wash receives flow from other washes and has split flow in several locations, the flooded area along the wash will not be determined. In addition, the flow in Wash A will not be reduced to account for this small amount of split flow that leaves Wash A. (Refer to the supporting calculations at the end of this section.)

Special Problem No. 3A

Wash A and Wash A South Confluence Area (see Sheet 5 of 6)

Although the low flow confluence of Wash A and Wash A South occurs at Wash A River Mile 1.586, the discharge is changed from the value below the confluence to the value above the confluence at Cross Section 1.472. Cross sections upstream of this point include geometry of both Wash A and Wash A South because flow overtops the ridge separating the two washes. Therefore, the total flow was used at those cross sections. Cross sections downstream of Cross Section 1.472 include only the flow from the respective washes.

Special Problem No. 4A

Wash A and Wash A South Confluence Area (see Sheet 3 of 6)

Although the low flow confluence of Wash A and Wash A South occurs at Wash A River Mile 0.682, the discharge is not changed from the value below the confluence to the value above the confluence until Cross Section 0.820. Cross sections downstream of this point include geometry of both Wash A and Wash A South because flow overtops the ridge separating the two washes in this area. Therefore, the total flow was used at this cross section. Cross sections upstream of Cross Section 0.821 include only the flow from the respective washes.

Special Problem No. 5A

Wash A, Cross Section 0.550 (see Sheet 3 of 6)

Water in Wash A overtops its drainage divide to the south (right overbank). Wash A therefore conveys a portion of the flow to the adjacent watershed. A rating curve for the divide was developed, and the flow diverted is estimated to be about 30 cfs, which is less than 3 percent of the total flow. Because the flow is small and the depth of flow at the divide is less than 0.3 feet (which is less than the accuracy of the map), it is assumed that no flow is being diverted. The flooded area will just extend to the watershed divide. (Refer to the supporting calculations at the end of the section.)

SPECIAL PROBLEMS
WASH A SOUTH

Special Problem No. 1AS

Wash A South, Cross Section 0.512 (see Sheet 3 of 6)

Water in Wash A South overtops its drainage divide to the north (left overbank). Therefore, Wash A South conveys a portion of the flow to the adjacent watershed of Wash A.

Water in Wash A South also overtops the divide to the south which separates Wash A South and Tributary 2 of Wash A South.

Rating curves for Cross Section 0.512, the north divide, and the south divide were developed, plotted, and added together to determine the flow that remains in Wash A South and the flow that leaves the channel of Wash A South. Approximately 80 cfs is diverted from Wash A South's channel with 55 cfs going to Wash A to the north and 25 cfs going south to Tributary 2 of Wash A South. Therefore, 55 cfs will be added to Wash A Cross Sections 0.820 through 1.208, and 80 cfs will be subtracted from Wash A South Cross Section 0.512. As Tributary 2, which receives the 25 cfs from Wash A South, rejoins Wash A South at the next downstream cross section (Cross Section 0.411), flows at Wash A South Cross Sections 0.121 through 0.411 will be reduced by only 55 cfs. (Refer to the supporting calculations at the end of this section.)

SPECIAL PROBLEMS
WASH F

Special Problem No. F1

Wash F, Cross Section 0.790 (see Sheet 3 of 6)

At this cross section, the flow is split between flow in Wash F and flow in a small channel just right of Wash F. Since the flow is not split in the cross section upstream or downstream, there was insufficient detail to warrant further calculation with respect to the flow or the profile in the split channel.

Special Problem No. F2

Wash F, Cross Section 0.683 (see Sheet 3 of 6)

At this cross section, the flow is split between flow in Wash F and flow in a small channel just left of Wash F. Since the flow is not split in the cross section upstream or downstream, there was insufficient detail to warrant further calculation with respect to the flow or the profile in the split channel.

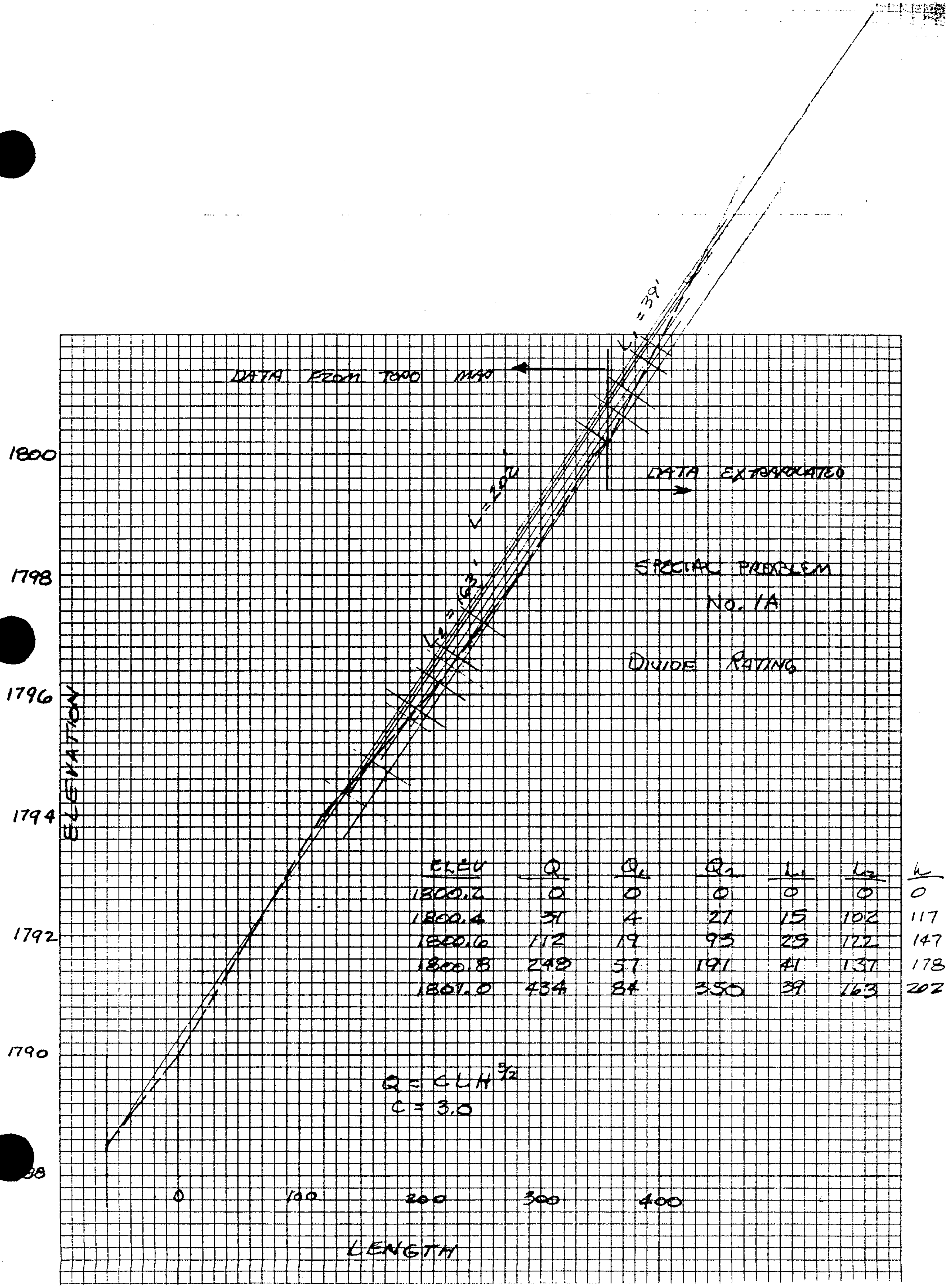
Special Problem No. F3

Wash F, Cross Section 0.480 (see Sheet 4 of 6)

This cross section location crosses a channel that does not contribute any flow to Wash F. Because of the cross section location, effective flow contours were included in the model to represent the actual flow conditions of Wash F at this location.

SUPPORTING CALCULATIONS

SPECIAL PROBLEM NO. 1A



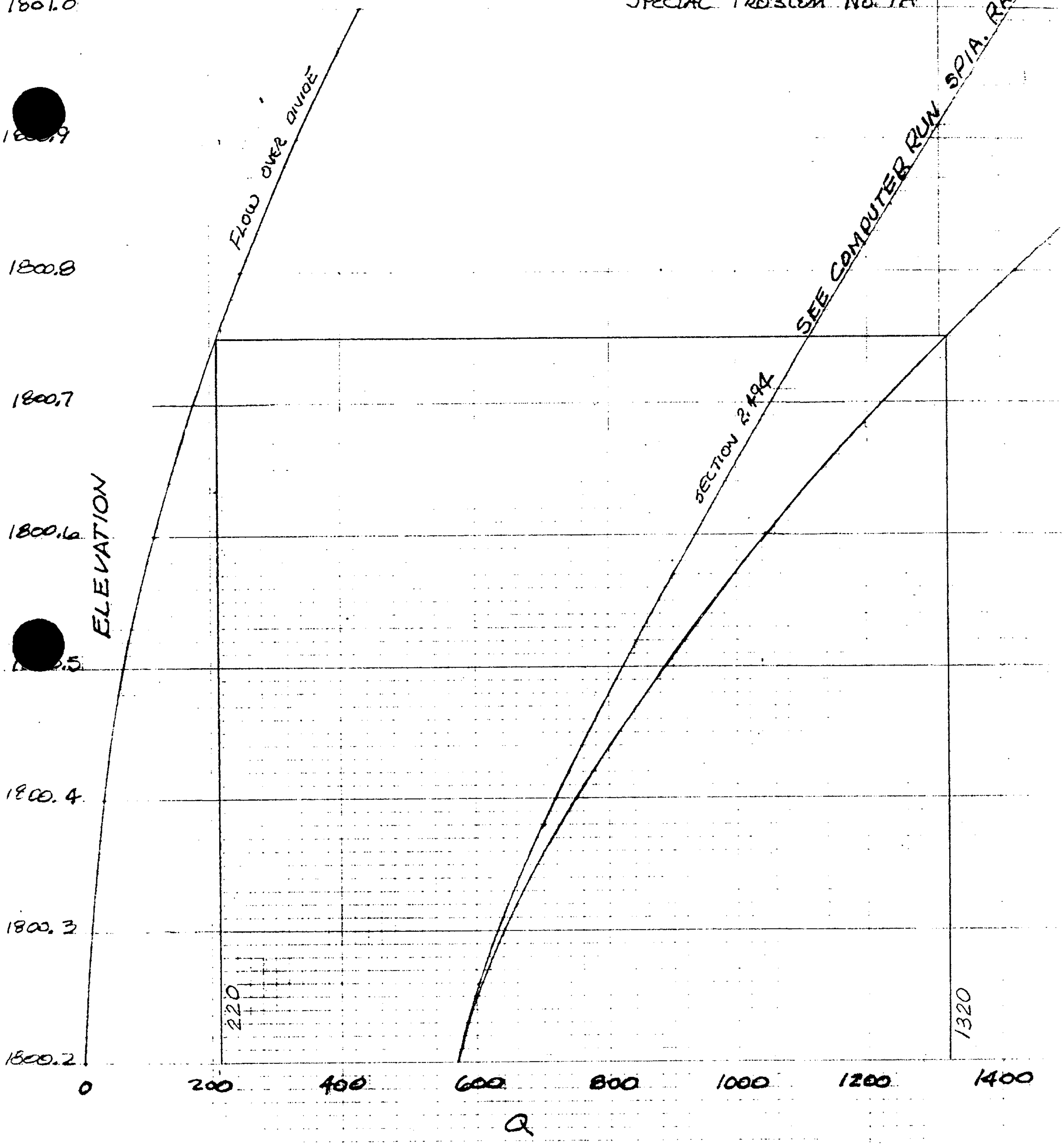
SPECIAL PROBLEM
No. 1A

DIVIDE RATING

ELEV	Q	Q_1	Q_2	L_1	L_2	L
1800.2	0	0	0	0	0	0
1800.4	31	4	27	15	102	117
1800.6	112	19	93	25	122	147
1800.8	248	57	191	41	137	178
1801.0	434	84	350	39	163	202

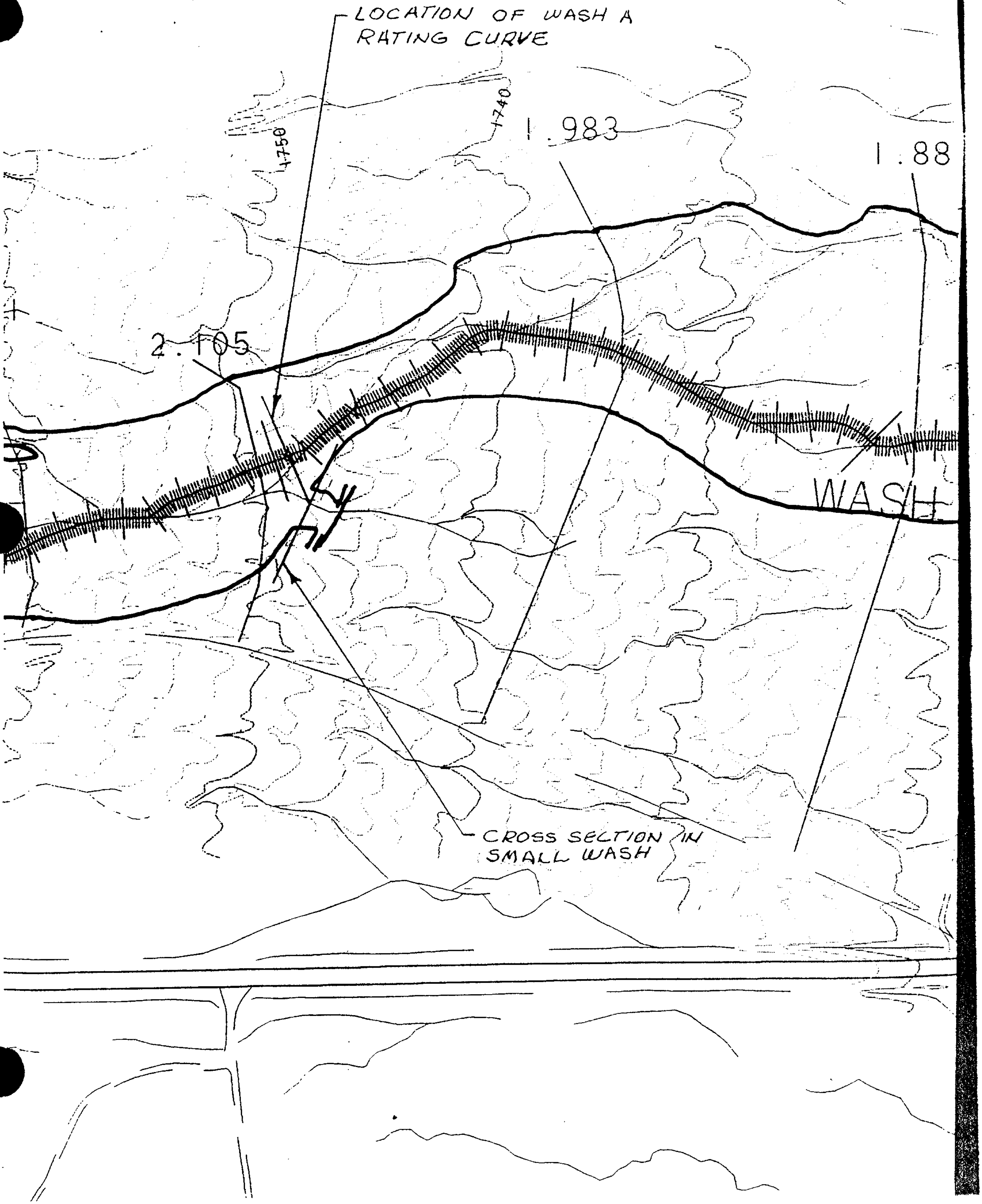
$Q = CLH^{3/2}$
$C = 3.0$

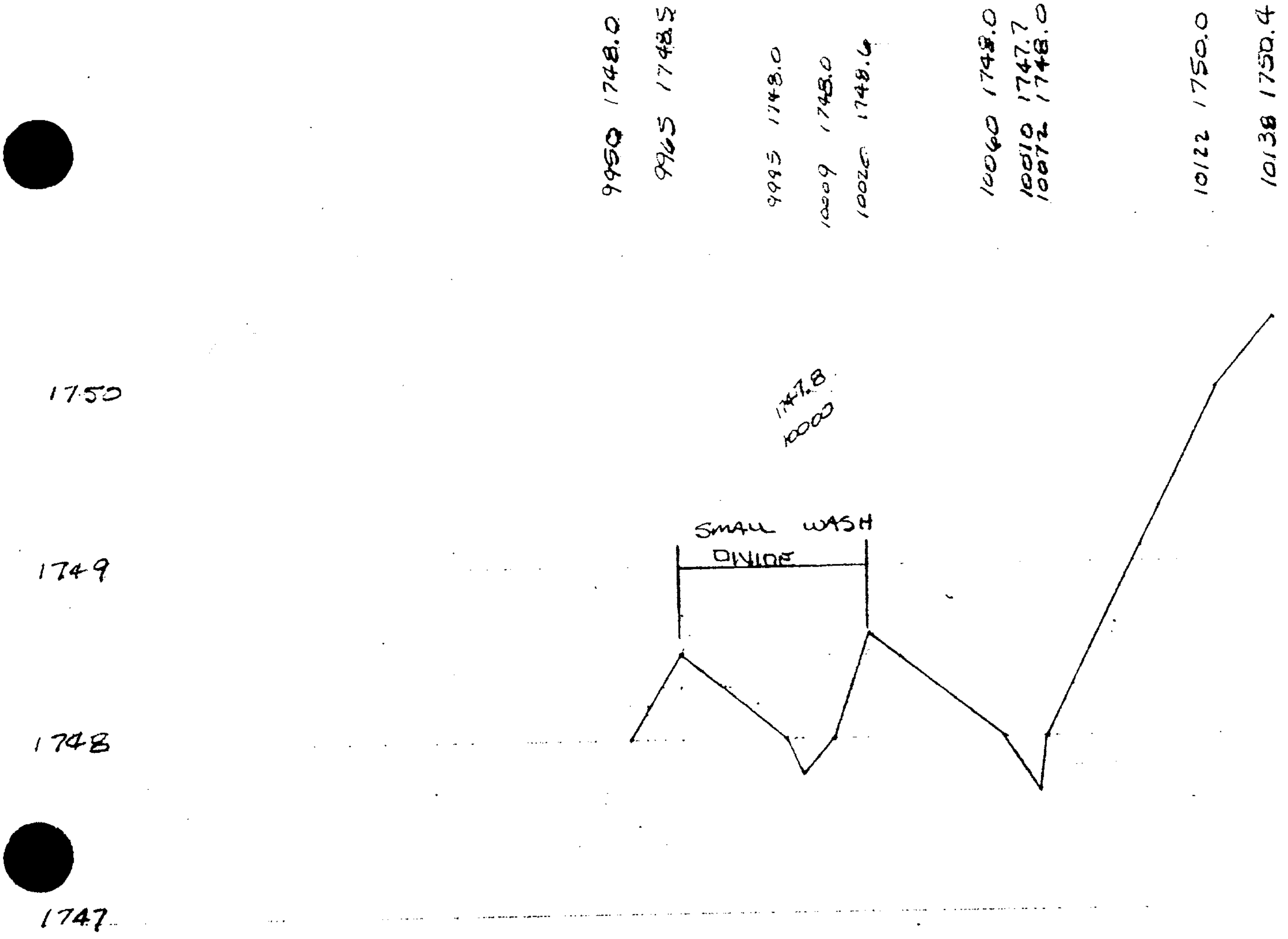
SPECIAL PROBLEM No. 1A



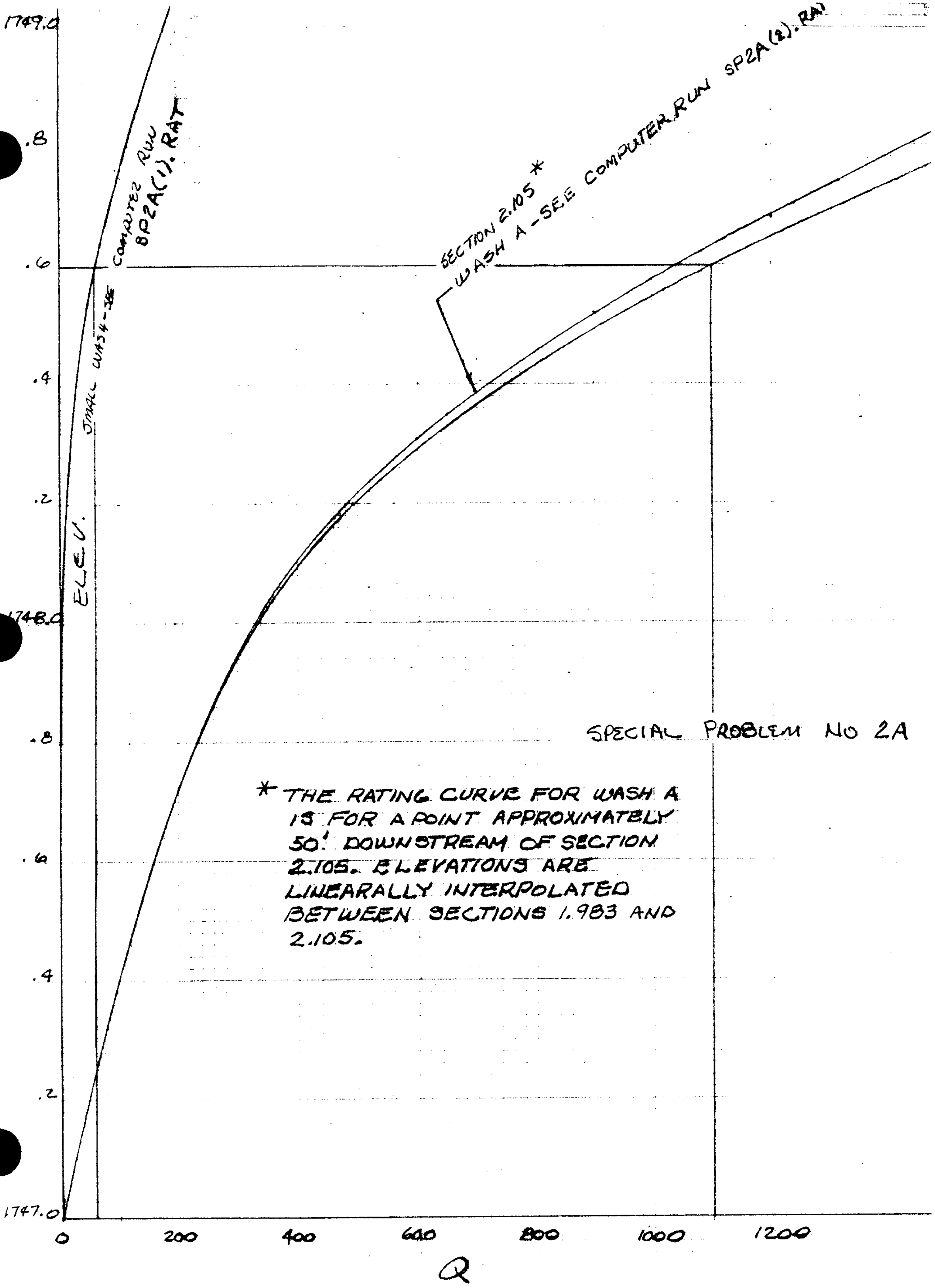
SPECIAL PROBLEM NO. 2A

SPECIAL PROBLEM NO. 2A





SPECIAL PROBLEM No 2A

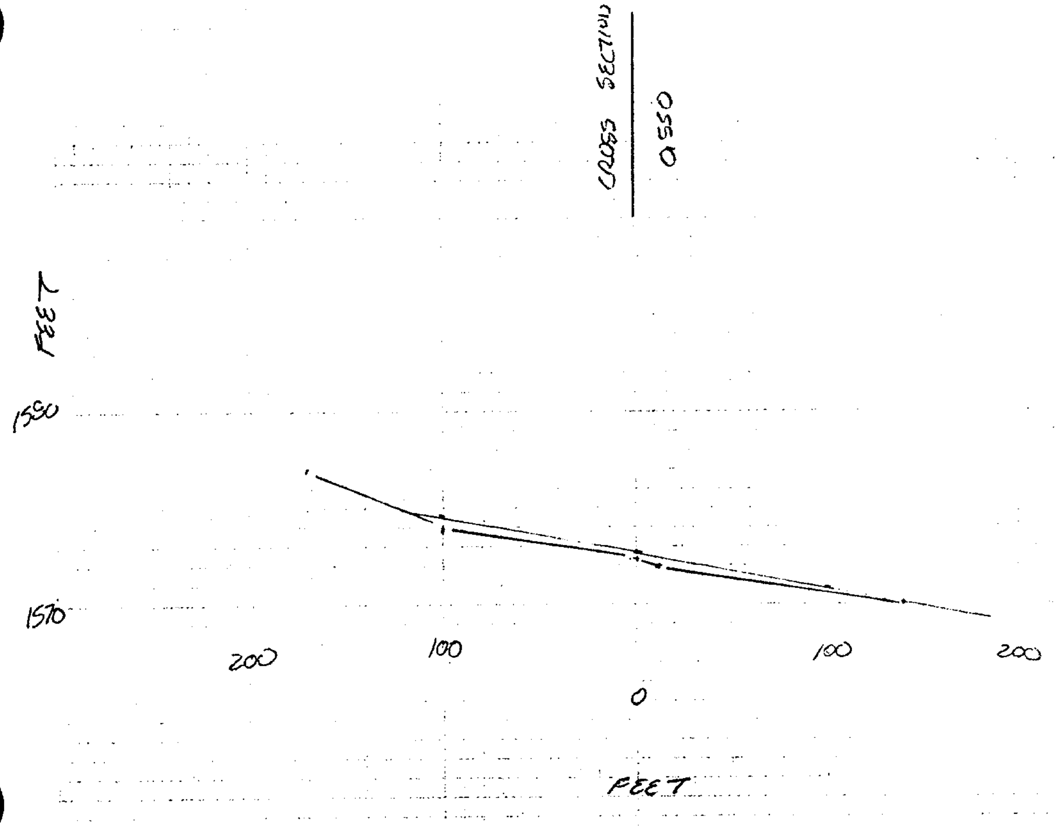


SPECIAL PROBLEM NO 2A

* THE RATING CURVE FOR WASH A IS FOR A POINT APPROXIMATELY 50' DOWNSTREAM OF SECTION 2.105. ELEVATIONS ARE LINEARALLY INTERPOLATED BETWEEN SECTIONS 1.983 AND 2.105.

SPECIAL PROBLEM NO. 5A

RIGHT OVERBANK DIVIDE



AVE H = 0.15

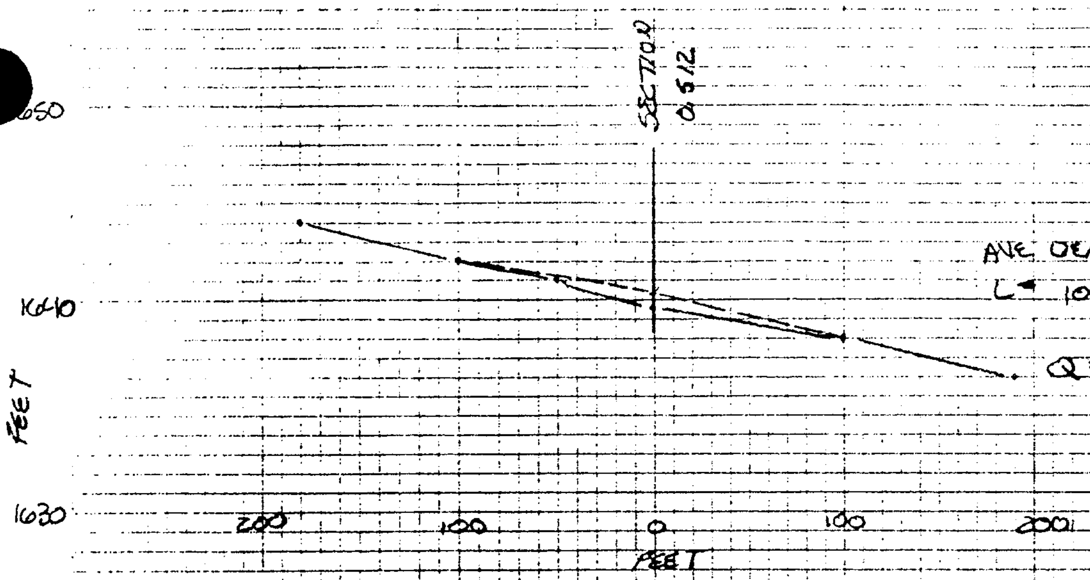
AVE L = 180

$Q = CLH^{3/2} = (3.0)(180)(0.15)^{3/2} \approx 31$ cfs = 3% of flow

Special Problem No. 5A

SPECIAL PROBLEM NO. 1AS

LEFT OVERBANK GUIDE

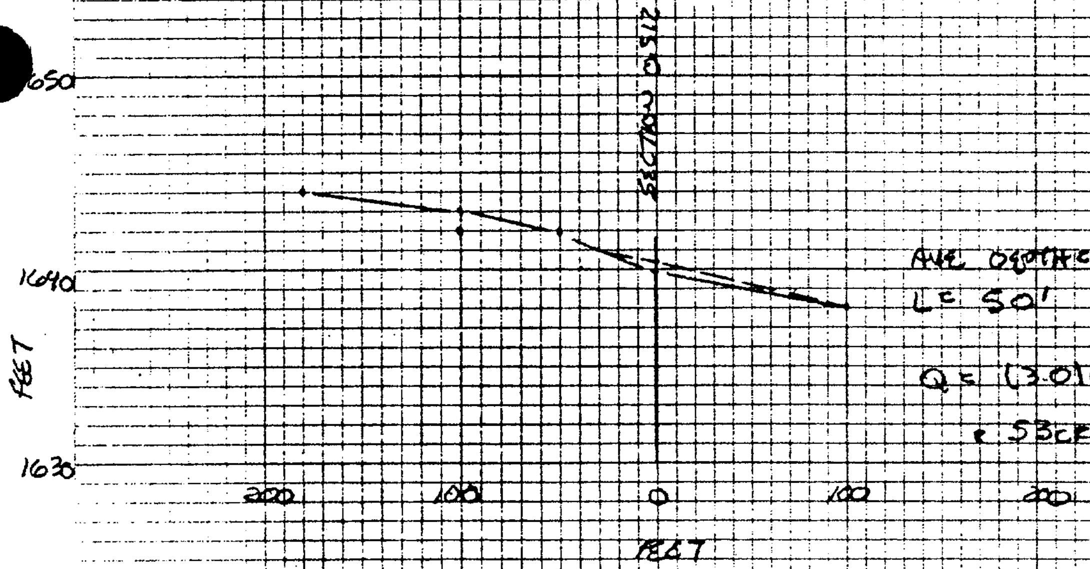


AVE DEPTH 0.5'
L = 100'

$Q = (3.0)(100)(0.5)^{3/2}$

$= 100$ CFS

RIGHT OVERBANK GUIDE



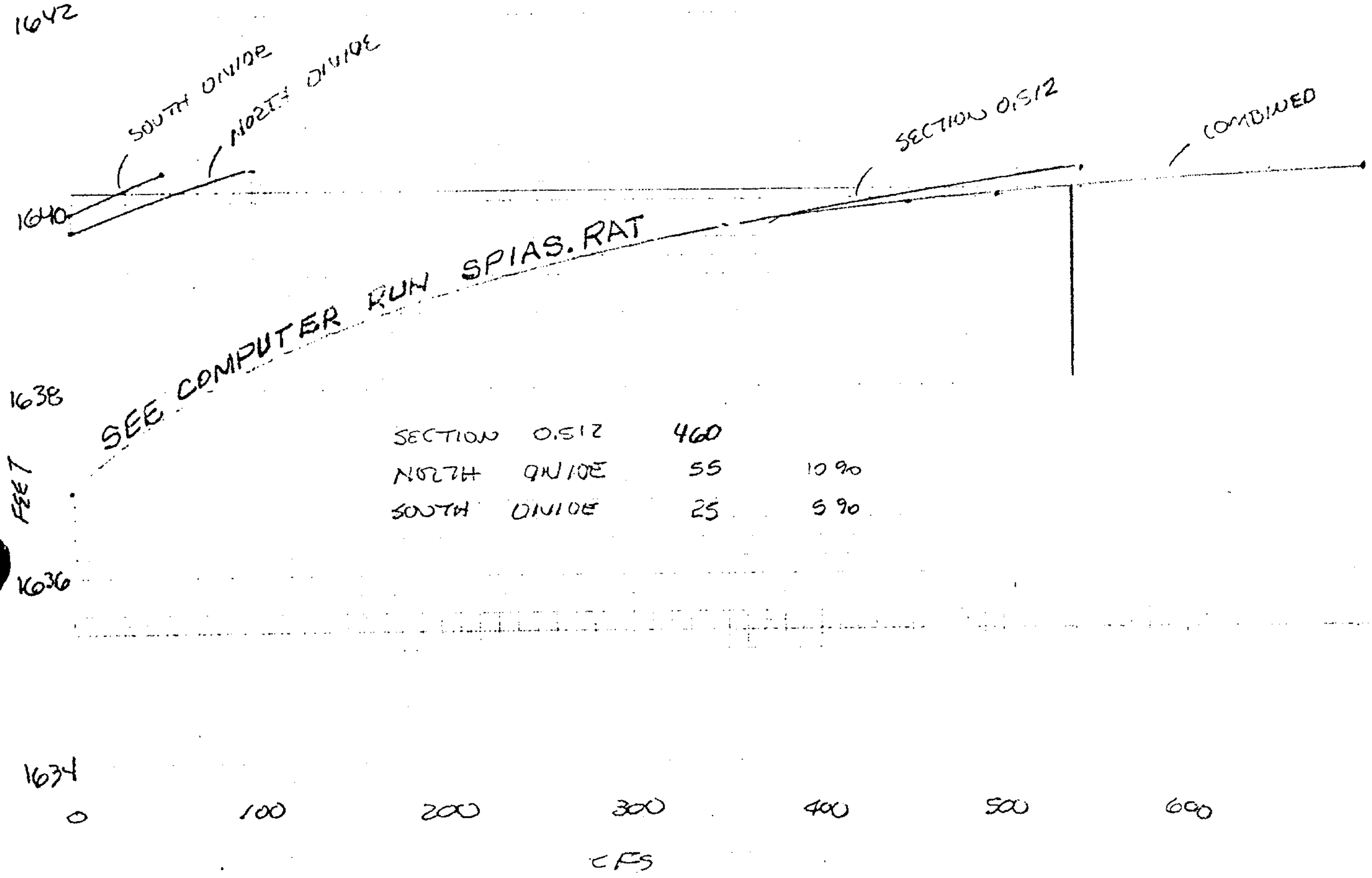
AVE DEPTH 0.5'
L = 50'

$Q = (3.0)(50)(0.5)^{3/2}$

$= 53$ CFS

SPECIAL PROBLEM NO. 1AS

RATING CURVE AT
SECTION 0.512
WASH A SOUTH



SEE COMPUTER RUN SPIAS.RAT

SECTION 0.512	460	
NORTH DIVIDE	55	10 %
SOUTH DIVIDE	25	5 %

SPECIAL PROBLEM
No. 1AS

SPECIAL PROBLEMS

KEY TO COMPUTER OUTPUT

Letter	Input File	Output File	Description	Special Problem
A	SP1A.RAT	SP1A.OH2	Wash A Breakout Flow Section 2.502	1A
B	SP2A(1).RAT	SP2A(1).OH2	Wash A Small Wash Split Flow near Section 2.105	2A
C	SP2A(2).RAT	SP2A(2).OH2	Wash A Rating Curve for Section 2.105	2A
D	SP1AS.RAT	SP1AS.0H2	Wash A South Breakout Flow, Section 0.512	1AS

```
1*********************************************        *************************************
 *  HEC-2 WATER SURFACE PROFILES              *        * U.S. ARMY CORPS OF ENGINEERS      *
 *                                            *        * HYDROLOGIC ENGINEERING CENTER     *
 *  Version   4.6.2; May 1991                 *        * 609 SECOND STREET, SUITE D        *
 *                                            *        * DAVIS, CALIFORNIA 95616-4687      *
 *  RUN DATE    19AUG94    TIME    10:39:19   *        *       (916) 756-1104              *
 **********************************************        *************************************




                                       X     X  XXXXXXX   XXXXX            XXXXX
                                       X     X  X        X     X          X     X
                                       X     X  X        X                      X
                                       XXXXXXX  XXXX     X         XXXXX   XXXXX
                                       X     X  X        X                X
                                       X     X  X        X     X          X
                                       X     X  XXXXXXX   XXXXX           XXXXXXX
1
   19AUG94      10:39:19                                                                        PAGE    1


                                                                          THIS RUN EXECUTED 19AUG94    10:39:19

  ************************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
  ************************************


  T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
  T2       RIO VERDY NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
  T3       WASH A                    L. CULLER - (602)244-8100
  T4       JOB 15183    PR15183\ETC\WASHA\SP1A.RAT      RUN 1
  T5       RATING CURVE FOR BREAKOUT FLOW AT SECTION 2.502
  T6       SPECIAL PROBLEM NO. 1A

  J1   ICHECK     INQ      NINV      IDIR      STRT     METRIC    HVINS      Q       WSEL       FQ

                   2                            -1                                1774

  J2   NPROF     IPLOT     PRFVS     XSECV     XSECH      FN      ALLDC     IBW     CHNIM    ITRACE

         1                  -1                                                                15


  J3   VARIABLE CODES FOR SUMMARY PRINTOUT

         38        42         1         43         26         51         4          8         53         54
         13        15        40

QT        5         600         700         900        1200        1310
NC                                       .1          .3
NH        5         .08      9989.4        .035     10056.7         .07     10116.9         .04     10139.3         .07
NH   10250.
X1    2.297          25      9989.4     10056.7         625         575         612
GR   1774.7     9924.09      1774.7      9924.1      1774.0      9941.4      1773.2      9961.6      1773.7      9979.3
GR   1773.2      9983.0      1773.3      9989.4      1772.4      9994.2      1772.5     10000.0      1772.3     10010.2
GR   1772.8     10016.7      1772.8     10037.5      1773.5     10056.7      1774.2     10081.6      1773.8     10104.5
GR   1773.9     10116.9      1771.6     10121.2      1772.0     10130.7      1773.8     10139.3      1773.8     10150.4
GR   1773.7     10173.1      1773.7     10193.1      1774.0     10215.8      1773.9     10234.7      1774.5     10250.0

NH        5         .07      9990.9        .035     10017.4         .07     10061.0         .04     10077.4         .07
NH   10319.
X1    2.403          39      9990.9     10017.4         530         550         560
X3                                       9832.6
GR   1788.4     9832.57      1788.4     9832.58      1788.4     9832.59      1788.4      9832.6      1788.0      9849.9
GR   1787.9      9872.8      1787.6      9883.9      1786.6      9886.4      1787.5      9891.2      1787.5      9909.2
GR   1786.5      9928.8      1786.1      9934.4      1787.0      9948.5      1787.4      9954.6      1788.0      9977.2  .
GR   1787.6      9990.9      1786.8     10000.0      1786.0     10005.1      1785.9     10010.1      1787.4     10017.4
GR   1787.8     10035.3      1787.5     10061.2      1786.3     10068.9      1787.7     10077.4      1787.8     10085.6
GR   1786.1     10094.3      1787.8     10103.2      1787.6     10122.6      1787.6     10147.5      1788.2     10173.9
GR   1788.6     10176.7      1787.5     10196.6      1788.5     10213.0      1789.3     10229.3      1789.2     10246.8
GR   1788.4     10265.6      1788.6     10285.7      1789.1     10304.6      1789.8     10319.0         0.0         0.0
1
   19AUG94      10:39:19                                                                        PAGE    2


NC      .08         .06        .035         0.1         0.3
X1    2.494          21      9976.7     10019.1         445         425         480
X3                                       9902.7
GR   1801.5     9902.67      1801.5     9902.68      1801.5     9902.69      1801.5      9902.7      1801.0      9921.9
GR   1799.7      9944.1      1800.4      9961.0      1799.5      9976.7      1798.6      9991.6      1798.6     10000.0
GR   1798.8     10008.1      1799.8     10019.1      1799.8     10036.1      1800.1     10048.0      1799.5     10062.1
GR   1799.0     10066.8      1797.5     10071.5      1799.0     10079.7      1799.6     10096.8      1800.0     10122.6
GR   1800.2     10130.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
1
   19AUG94      10:39:19                                                                        PAGE    3

      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST
```

```
*PROF 1
0
CCHV=      .100 CEHV=     .300
1490 NH CARD USED
*SECNO 2.297

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED
     2.297      2.31   1773.91   1773.91   1774.00   1774.24       .33       .00       .00   1773.30
     600.0      24.8     376.3     198.9      20.4      75.4      48.5        .0        .0   1773.50
       .00      1.21      4.99      4.11      .080      .035      .042      .000   1771.60   9943.69
   .011884      625.      612.      575.         0         9         0       .00    240.30  10234.94


FLOW DISTRIBUTION FOR SECNO=      2.30          CWSEL=   1773.91

STA=    9944.    9983.    9989.   10057.   10121.   10131.   10139.   10235.
  PER Q=      3.0      1.1     62.7      3.9     22.2      5.8      1.2
   AREA=     16.2      4.2     75.4      9.0     20.0      8.7     10.7
    VEL=      1.1      1.5      5.0      2.6      6.7      4.0       .7
  DEPTH=       .4       .7      1.1       .1      2.1      1.0       .1

1490 NH CARD USED
*SECNO 2.403

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9832.6   10319.0  TYPE=      1  TARGET=    -9832.600
     2.403      2.05   1787.95   1787.95       .00   1788.26       .31      7.71       .00   1787.60
     600.0     202.9     221.8     175.3      77.2      34.3      69.5       2.0       3.5   1787.40
       .04      2.63      6.47      2.52      .070      .035      .054      .000   1785.90   9860.94
   .016707      530.      560.      550.         4        12         0       .00    314.15  10204.01


FLOW DISTRIBUTION FOR SECNO=      2.40          CWSEL=   1787.95

1
   19AUG94      10:39:19                                                                                          PAGE    4


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


STA=    9861.    9891.    9929.    9934.    9949.    9991.   10017.   10061.   10069.   10077.   10094.   10103.   10163.
  PER Q=      3.0     10.4      5.9     11.3      3.1     37.0      4.2      6.6      6.2      4.2      4.0      3.3
   AREA=      9.0     26.8      9.3     19.8     12.4     34.3     14.1      8.1      8.1     10.4      8.9     16.4
    VEL=      2.0      2.3      3.8      3.4      1.5      6.5      1.8      4.9      4.6      2.4      2.7      1.2
  DEPTH=       .3       .7      1.7      1.4       .3      1.3       .3      1.1      1.0       .6      1.0       .3

STA=   10163.   10204.
  PER Q=       .6
   AREA=      3.5
    VEL=      1.0
  DEPTH=       .1

CCHV=      .100 CEHV=     .300
*SECNO 2.494

3265 DIVIDED FLOW

3280 CROSS SECTION      2.49 EXTENDED       .03 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9902.7   10130.0  TYPE=      1  TARGET=    -9902.700
     2.494      2.73   1800.23   1800.23       .00   1800.67       .44      7.63       .04   1799.50
     600.0      11.5     348.1     240.5      10.4      53.9      74.8       3.7       6.0   1799.80
       .06      1.10      6.46      3.21      .080      .035      .060      .000   1797.50   9935.05
   .016844      445.      480.      425.        12        11         0       .00    187.88  10130.00


FLOW DISTRIBUTION FOR SECNO=      2.49          CWSEL=   1800.23

STA=    9935.    9977.   10019.   10062.   10072.   10080.   10097.   10123.   10130.
  PER Q=      1.9     58.0      4.8     10.0     13.6      8.1      3.4       .1
   AREA=     10.4     53.9     16.7     13.9     16.2     15.9     11.1      1.0
    VEL=      1.1      6.5      1.7      4.3      5.0      3.1      1.8       .8
  DEPTH=       .3      1.3       .4      1.5      2.0       .9       .4       .1

1
   19AUG94      10:39:19                                                                                          PAGE    5


T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDY NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH A                   L. CULLER - (602)244-8100
T4      JOB 15183   PR15183\ETC\WASHA\SP9WASHA.R    RUN  1
T5      SPECIAL PROBLEM NO. 9

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                 3                            -1                                    1774.
```

```
 J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

        2                  -1                                                                    15
1
     19AUG94      10:39:19                                                                              PAGE     6

     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


 *PROF 2
0
 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 2.297

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED
      2.297      2.34   1773.94   1773.94   1774.00   1774.35       .41       .00       .00   1773.30
      700.0      30.7     437.7     231.6      22.0      77.8      53.2        .0        .0   1773.50
        .00      1.39      5.62      4.35      .080      .035      .042      .000   1771.60   9942.79
    .014491      625.      612.      575.         0         4         0       .00    254.81  10235.85


 FLOW DISTRIBUTION FOR SECNO=      2.30           CWSEL=    1773.94

 STA=     9943.     9983.     9989.    10057.    10121.    10131.    10139.    10236.
   PER Q=       3.3       1.1      62.5       4.0      21.6       5.8       1.6
    AREA=      17.6       4.4      77.8      10.4      20.4       9.0      13.4
     VEL=       1.3       1.8       5.6       2.7       7.4       4.5        .8
   DEPTH=        .4        .7       1.2        .2       2.1       1.0        .1

 1490 NH CARD USED
 *SECNO 2.403

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9832.6   10319.0  TYPE=      1  TARGET=     -9832.600
      2.403      2.15   1788.05   1788.05       .00   1788.35       .30      8.28       .01   1787.60
      700.0     236.2     242.9     220.9      91.2      36.9      86.2       2.3       3.7   1787.40
        .04      2.59      6.57      2.56      .070      .035      .055      .000   1785.90   9847.61
    .015590      530.      560.      550.        11        10         0       .00    338.90  10205.67


 FLOW DISTRIBUTION FOR SECNO=      2.40           CWSEL=    1788.05
1
     19AUG94      10:39:19                                                                              PAGE     7

     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


 STA=     9848.     9891.     9929.     9934.     9949.     9977.     9991.    10017.    10061.    10069.    10077.    10094.    10103.
   PER Q=       3.4      10.6       5.4      10.5       3.3        .5      34.7       5.6       6.4       6.1       4.3       3.9
    AREA=      13.0      30.6       9.8      21.2      13.2       3.5      36.9      18.5       8.9       9.0      12.1       9.8
     VEL=       1.8       2.4       3.8       3.5       1.7       1.1       6.6       2.1       5.1       4.8       2.5       2.8
   DEPTH=        .3        .8       1.8       1.5        .5        .3       1.4        .4       1.2       1.1        .7       1.1

 STA=    10103.    10148.    10206.
   PER Q=       3.8       1.5
    AREA=      18.1       9.8
     VEL=       1.5       1.1
   DEPTH=        .4        .2

 CCHV=      .100 CEHV=      .300
 *SECNO 2.494

 3265 DIVIDED FLOW

 3280 CROSS SECTION       2.49 EXTENDED        .14 FEET

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9902.7   10130.0  TYPE=      1  TARGET=     -9902.700
      2.494      2.84   1800.34   1800.34       .00   1800.81       .47      7.31       .05   1799.50
      700.0      17.5     395.5     287.1      14.4      58.4      86.5       4.2       6.4   1799.80
        .06      1.21      6.77      3.32      .080      .035      .060      .000   1797.50   9933.24
    .016656      445.      480.      425.        13        11         0       .00    194.09  10130.00


 FLOW DISTRIBUTION FOR SECNO=      2.49           CWSEL=    1800.34

 STA=     9933.     9977.    10019.    10048.    10067.    10072.    10080.    10097.    10123.    10130.
   PER Q=       2.5      56.5       3.9       4.7       7.1      12.6       8.3       4.2        .3
    AREA=      14.4      58.4      13.7      12.7       9.8      17.1      17.7      13.8       1.7
     VEL=       1.2       6.8       2.0       2.6       5.1       5.2       3.3       2.1       1.2
   DEPTH=        .3       1.4        .5        .7       2.1       2.1       1.0        .5        .2
```

```
1
   19AUG94       10:39:19                                                                                    PAGE     8

 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDY NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                      L. CULLER - (602)244-8100
 T4      JOB 15183   PR15183\ETC\WASHA\SP9WASHA.R    RUN  1
 T5      SPECIAL PROBLEM NO. 9

 J1   ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

                  4                                -1                                        1774.

 J2   NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

        3                    -1                                                                          15
1
   19AUG94       10:39:19                                                                                    PAGE     9

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *PROF 3
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 2.297

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED
         2.297       2.50   1774.10    1774.10    1774.00    1774.55        .45        .00        .00    1773.30
         900.0       49.1     549.9      301.1       29.3       87.9       77.5         .0         .0    1773.50
           .00       1.67      6.25       3.88       .080       .035       .045       .000    1771.60    9939.05
       .015217       625.      612.       575.          0          7          0        .00     290.91   10239.68


 FLOW DISTRIBUTION FOR SECNO=       2.30           CWSEL=    1774.10

 STA=     9939.     9979.     9989.    10057.    10121.    10131.    10139.    10216.    10240.
   PER Q=      3.8       1.7      61.1       4.7      19.3       5.8       3.4        .3
    AREA=     21.5       7.8      87.9      17.6      21.8      10.3      24.6       3.2
     VEL=      1.6       1.9       6.3       2.4       8.0       5.1       1.3        .7
   DEPTH=       .5        .8       1.3        .3       2.3       1.2        .3        .1

 1490 NH CARD USED
 *SECNO 2.403

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9832.6    10319.0  TYPE=       1   TARGET=     -9832.600
         2.403       2.29   1788.19    1788.19        .00    1788.52        .33       8.64        .01    1787.60
         900.0      305.0     288.3      306.7      110.7       40.5      109.4        2.9        4.0    1787.40
           .04       2.76      7.12       2.80       .070       .035       .055       .000    1785.90    9841.84
       .016196       530.      560.       550.          9         10          0        .00     355.13   10207.85


 FLOW DISTRIBUTION FOR SECNO=       2.40           CWSEL=    1788.19
1
   19AUG94       10:39:19                                                                                    PAGE    10

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL    .   XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 STA=     9842.     9891.     9929.     9934.     9949.     9977.     9991.    10017.    10061.    10069.    10077.    10094.    10103.
   PER Q=      4.1      10.7       4.8       9.6       3.8        .8      32.0       7.0       6.1       5.9       4.3       3.8
    AREA=     19.2      35.6      10.6      23.1      17.0       5.3      40.5      24.4       9.9      10.1      14.3      11.0
     VEL=      1.9       2.7       4.1       3.7       2.0       1.4       7.1       2.6       5.5       5.3       2.7       3.1
   DEPTH=       .4        .9       1.9       1.6        .6        .4       1.5        .6       1.3       1.2        .8       1.2

 STA=    10103.    10148.    10208.
   PER Q=      4.8       2.2
    AREA=     24.0      15.7
     VEL=      1.8       1.3
   DEPTH=       .5        .3

 CCHV=      .100 CEHV=      .300
 *SECNO 2.494
 3280 CROSS SECTION       2.49 EXTENDED        .33 FEET

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9902.7    10130.0  TYPE=       1   TARGET=     -9902.700
         2.494       3.03   1800.53    1800.53        .00    1801.05        .52       7.27        .06    1799.50
         900.0       34.5     483.9      381.6       23.2       66.7      108.4        5.2        6.8    1799.80
           .06       1.48      7.25       3.52       .080       .035       .060       .000    1797.50    9929.88
```

```
  .015962      445.      480.      425.        14         11         0        .00     200.12  10130.00

 FLOW DISTRIBUTION FOR SECNO=      2.49          CWSEL=    1800.53

 STA=     9930.     9977.    10019.    10036.    10062.    10072.    10080.    10097.    10123.    10130.
   PER Q=       3.8      53.8       3.5       4.6       8.7      11.2       8.4       5.3        .6
    AREA=      23.2      66.7      12.5      17.3      16.8      18.7      21.1      18.9       3.2
     VEL=       1.5       7.3       2.5       2.4       4.7       5.4       3.6       2.5       1.7
   DEPTH=        .5       1.6        .7        .7       1.8       2.3       1.2        .7        .4

1
  19AUG94      10:39:19                                                                              PAGE    11


 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDY NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                  L. CULLER - (602)244-8100
 T4      JOB 15183    PR15183\ETC\WASHA\SP9WASHA.R    RUN  1
 T5      SPECIAL PROBLEM NO. 9

 J1   ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

                  5                                -1                                         1774.

 J2   NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

        4                    -1                                                                          15
1
  19AUG94      10:39:19                                                                              PAGE    12


     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *PROF 4
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 2.297
 3720 CRITICAL DEPTH ASSUMED
      2.297       2.72   1774.32    1774.32    1774.00    1774.81       .49        .00        .00   1773.30
     1200.0       80.7     697.5      421.7       41.3      103.1     118.9         .0         .0   1773.50
        .00       1.95      6.76       3.55       .080       .035      .048       .000    1771.60   9933.47
    .014406       625.      612.       575.          0          7         0        .00     311.95  10245.43

 FLOW DISTRIBUTION FOR SECNO=      2.30          CWSEL=    1774.32

 STA=     9933.     9979.     9989.    10057.    10121.    10131.    10139.    10193.    10245.
   PER Q=       4.9       1.9      58.1       6.1      16.5       5.7       4.6       2.3
    AREA=      31.2      10.1     103.1      31.7      23.9      12.2      31.1      19.9
     VEL=       1.9       2.2       6.8       2.3       8.3       5.6       1.8       1.4
   DEPTH=        .7       1.0       1.5        .5       2.5       1.4        .6        .4

 1490 NH CARD USED
 *SECNO 2.403

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9832.6    10319.0  TYPE=       1  TARGET=      -9832.600
      2.403       2.46   1788.36    1788.36        .00    1788.73       .38       8.53        .01   1787.60
     1200.0      409.1     350.0      440.9      137.1       45.1     141.1        3.7        4.3   1787.40
        .03       2.99      7.77       3.12       .070       .035      .056       .000    1785.90   9834.38
    .016707       530.      560.       550.         10         10         0        .00     370.25  10210.68

 FLOW DISTRIBUTION FOR SECNO=      2.40          CWSEL=    1788.36
1
  19AUG94      10:39:19                                                                              PAGE    13


     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 STA=     9834.     9886.     9909.     9929.     9934.     9949.     9977.     9991.    10017.    10061.    10069.    10077.    10094.
   PER Q=       3.3       4.9       7.5       4.3       8.6       4.4       1.2      29.2       8.4       5.7       5.6       4.3
    AREA=      22.0      21.7      26.6      11.5      25.5      22.0       7.7      45.1      31.9      11.2      11.5      17.2
     VEL=       1.8       2.7       3.4       4.4       4.1       2.4       1.9       7.8       3.2       6.1       5.8       3.0
   DEPTH=        .4       1.0       1.4       2.1       1.8        .8        .6       1.7        .7       1.5       1.4       1.0

 STA=    10094.    10103.    10148.    10211.
   PER Q=       3.6       5.8       3.3
    AREA=      12.5      31.7      24.9
     VEL=       3.4       2.2       1.6
   DEPTH=       1.4        .7        .4

 CCHV=      .100 CEHV=      .300
 *SECNO 2.494
 3280 CROSS SECTION      2.49 EXTENDED       .57 FEET
```

```
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9902.7   10130.0  TYPE=       1  TARGET=     -9902.700
     2.494       3.27   1800.77   1800.77       .00   1801.38       .61      7.38        .07   1799.50
    1200.0       64.4     612.0     523.6      34.8      76.7     134.6       6.6        7.2   1799.80
       .06       1.85      7.97      3.89      .080      .035      .060      .000    1797.50   9925.85
   .016031       445.      480.      425.        15        11         0       .00     204.15  10130.00

 FLOW DISTRIBUTION FOR SECNO=      2.49           CWSEL=   1800.77

 STA=    9926.     9961.     9977.    10019.    10036.    10062.    10072.    10080.    10097.    10123.    10130.
   PER Q=      3.2       2.2      51.0       4.2       5.7       8.0       9.9       8.5       6.4        .9
    AREA=     21.9      12.9      76.7      16.5      23.4      19.0      20.7      25.1      25.0       4.9
     VEL=      1.7       2.1       8.0       3.1       2.9       5.1       5.7       4.1       3.1       2.3
   DEPTH=       .6        .8       1.8       1.0        .9       2.0       2.5       1.5       1.0        .7

1
   19AUG94      10:39:19                                                                                       PAGE    14


 T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2       RIO VERDY NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3       WASH A                       L. CULLER - (602)244-8100
 T4       JOB 15183   PR15183\ETC\WASHA\SP9WASHA.R   RUN  1
 T5       SPECIAL PROBLEM NO. 9

 J1   ICHECK     INQ       NINV      IDIR      STRT      METRIC     HVINS      Q        WSEL       FQ

                  6                              -1                                   1774.

 J2   NPROF     IPLOT     PRFVS     XSECV     XSECH      FN        ALLDC     IBW      CHNIM      ITRACE

       15                  -1                                                                    15



1
   19AUG94      10:39:19                                                                                       PAGE    15


      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


 *PROF 5
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 2.297
 3720 CRITICAL DEPTH ASSUMED
      2.297      2.76   1774.36   1774.36   1774.00   1774.89       .54       .00        .00   1773.30
     1310.0      90.5     754.7     464.8      43.5     105.7     126.2        .0         .0   1773.50
        .00      2.08      7.14      3.68     .080.      .035      .049      .000    1771.60   9932.52
    .015525      625.      612.      575.         0        10         0       .00     313.88  10246.41

 FLOW DISTRIBUTION FOR SECNO=      2.30           CWSEL=   1774.36

 STA=    9933.     9979.     9989.    10057.    10117.    10121.    10131.    10139.    10193.    10246.
   PER Q=      5.0       1.9      57.6       3.3       3.1      16.1       5.6       4.9       2.6
    AREA=     33.0      10.5     105.7      27.2       6.9      24.3      12.5      33.2      22.0
     VEL=      2.0       2.4       7.1       1.6       5.8       8.7       5.9       1.9       1.5
   DEPTH=       .7       1.0       1.6        .5       1.6       2.6       1.5        .6        .4

 1490 NH CARD USED
 *SECNO 2.403

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=     9832.6   10319.0  TYPE=       1  TARGET=     -9832.600
      2.403      2.52   1788.42   1788.42       .00   1788.81       .39      8.88        .01   1787.60
     1310.0     447.7     371.2     491.1     146.3      46.6     152.1       3.9        4.3   1787.40
        .03      3.06      7.97      3.23      .070      .035      .056      .000    1785.90   9832.60
    .016793      530.      560.      550.        11        10         0       .00     376.57  10267.32

 FLOW DISTRIBUTION FOR SECNO=      2.40           CWSEL=   1788.42

1
   19AUG94      10:39:19                                                                                       PAGE    16


      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


 STA=    9833.     9886.     9909.     9929.     9934.     9949.     9977.     9991.    10017.    10061.    10069.    10077.    10094.
   PER Q=      3.6       5.0       7.4       4.1       8.4       4.5       1.3      28.3       8.8       5.6       5.5       4.3
    AREA=     25.2      23.1      27.8      11.9      26.3      23.6       8.5      46.6      34.5      11.7      12.0      18.2
     VEL=      1.9       2.8       3.5       4.5       4.2       2.5       2.0       8.0       3.3       6.3       6.0       3.1
   DEPTH=       .5       1.0       1.4       2.1       1.9        .8        .6       1.8        .8       1.5       1.4       1.1
```

```
STA=   10094.   10103.   10148.   10212.
  PER Q=      3.5      6.1      3.7
   AREA=     13.1     34.3     28.3
    VEL=      3.5      2.3      1.7
  DEPTH=      1.5       .8       .4

CCHV=     .100 CEHV=      .300
*SECNO 2.494
3280 CROSS SECTION      2.49 EXTENDED       .65 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9902.7   10130.0  TYPE=       1  TARGET=    -9902.700
     2.494      3.35   1800.85   1800.85       .00   1801.49       .64      7.39       .07   1799.50
    1310.0      76.5     657.5     576.0      38.9      80.2     143.5       7.0       7.3   1799.80
       .05      1.97      8.20      4.01      .080      .035      .060      .000   1797.50   9924.47
   .016002      445.      480.      425.        15        11         0       .00    205.53  10130.00


FLOW DISTRIBUTION FOR SECNO=      2.49          CWSEL=    1800.85

STA=    9924.    9961.    9977.   10019.   10036.   10062.   10072.   10080.   10097.   10123.   10130.
  PER Q=      3.5      2.4     50.2      4.4      6.0      7.8      9.5      8.5      6.7      1.0
   AREA=     24.8     14.1     80.2     17.8     25.5     19.7     21.3     26.5     27.1      5.5
    VEL=      1.8      2.2      8.2      3.2      3.1      5.2      5.9      4.2      3.2      2.4
  DEPTH=       .7       .9      1.9      1.0      1.0      2.1      2.6      1.5      1.0       .7

1
   19AUG94      10:39:19                                                                                PAGE    17


                                                                                    THIS RUN EXECUTED 19AUG94    10:39:22
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
**************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WASH A

SUMMARY PRINTOUT

      SECNO     ELMIN     CWSEL         Q        VCH     DIFWSX    TOPWID     DEPTH      SSTA      ENDST      QLOB      QROB     ELTRD

*     2.297   1771.60   1773.91    600.00       4.99       .00    240.30      2.31   9943.69  10234.94     24.76    198.92       .00
*     2.297   1771.60   1773.94    700.00       5.62       .00    254.81      2.34   9942.79  10235.85     30.71    231.57       .00
*     2.297   1771.60   1774.10    900.00       6.25       .00    290.91      2.50   9939.05  10239.68     49.05    301.09       .00
*     2.297   1771.60   1774.32   1200.00       6.76       .00    311.95      2.72   9933.47  10245.43     80.73    421.73       .00
*     2.297   1771.60   1774.36   1310.00       7.14       .00    313.88      2.76   9932.52  10246.41     90.51    464.81       .00

*     2.403   1785.90   1787.95    600.00       6.47     14.04    314.15      2.05   9860.94  10204.01    202.89    175.30       .00
*     2.403   1785.90   1788.05    700.00       6.57     14.11    338.90      2.15   9847.61  10205.67    236.18    220.89       .00
*     2.403   1785.90   1788.19    900.00       7.12     14.09    355.13      2.29   9841.84  10207.85    305.01    306.68       .00
*     2.403   1785.90   1788.36   1200.00       7.77     14.04    370.25      2.46   9834.38  10210.68    409.14    440.89       .00
*     2.403   1785.90   1788.42   1310.00       7.97     14.06    376.57      2.52   9832.60  10267.32    447.68    491.15       .00

*     2.494   1797.50   1800.23    600.00       6.46     12.28    187.88      2.73   9935.05  10130.00     11.47    240.46       .00
*     2.494   1797.50   1800.34    700.00       6.77     12.28    194.09      2.84   9933.24  10130.00     17.45    287.06       .00
*     2.494   1797.50   1800.53    900.00       7.25     12.35    200.12      3.03   9929.88  10130.00     34.50    381.61       .00
*     2.494   1797.50   1800.77   1200.00       7.97     12.41    204.15      3.27   9925.85  10130.00     64.43    523.58       .00
*     2.494   1797.50   1800.85   1310.00       8.20     12.43    205.53      3.35   9924.47  10130.00     76.51    576.04       .00
1
   19AUG94      10:39:19                                                                                PAGE    18


 SUMMARY OF ERRORS AND SPECIAL NOTES


CAUTION SECNO=       2.297  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.297  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.297  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.297  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.297  PROFILE=  5  CRITICAL DEPTH ASSUMED

CAUTION SECNO=       2.403  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.403  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.403  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.403  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.403  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.403  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.403  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.403  PROFILE=  4  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.403  PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.403  PROFILE=  5  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       2.494  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.494  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.494  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.494  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.494  PROFILE=  3  CRITICAL DEPTH ASSUMED
```

```
CAUTION SECNO=      2.494  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.494  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.494  PROFILE=  4  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.494  PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.494  PROFILE=  5  MINIMUM SPECIFIC ENERGY
```

```
1********************************************                                          **************************************
 *  HEC-2 WATER SURFACE PROFILES             *                                          *  U.S. ARMY CORPS OF ENGINEERS      *
 *                                           *                                          *  HYDROLOGIC ENGINEERING CENTER     *
 *  Version    4.6.2;  May 1991              *                                          *  609 SECOND STREET, SUITE D        *
 *                                           *                                          *  DAVIS, CALIFORNIA 95616-4687      *
 *  RUN DATE    19AUG94    TIME   10:39:40   *                                          *       (916) 756-1104               *
 ********************************************                                           **************************************



                                             X     X  XXXXXXX   XXXXX              XXXXX
                                             X     X  X        X     X            X     X
                                             X     X  X        X                        X
                                             XXXXXXX  XXXX     X         XXXXX     XXXXX
                                             X     X  X        X                  X
                                             X     X  X        X     X            X
                                             X     X  XXXXXXX   XXXXX             XXXXXXX
1
    19AUG94       10:39:40                                                                                PAGE     1


                                                                                     THIS RUN EXECUTED 19AUG94     10:39:40

 ************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2; May 1991
 ************************************


 T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2       RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3       WASH A                       L. CULLER - (602)244-8100
 T4       JOB 15183    PR15183\ETC\WASHA\SP2A(1).RAT    RUN  1
 T5       RATING CURVE FOR SPLIT FLOW AT SMALL WASH NEAR SECTION 2.105
 T6       SPECIAL PROBLEM NO. 2A

 J1   ICHECK     INQ       NINV       IDIR       STRT       METRIC     HVINS       Q         WSEL       FQ

                   2                             .0311                                      1750

 J2   NPROF      IPLOT     PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

        1                    -1                                                                        15


 J3   VARIABLE CODES FOR SUMMARY PRINTOUT

        38         42          1         43          26          51          4          8          53          54
        13         15         40

 QT        5         50        100        200        300        400
 NC      .07        .07        .04        0.1        0.3
 X1    0.000          5     9995.0    10000.0
 GR   1748.5     9965.0     1748.0     9995.0     1747.8     10000.0     1748.0     10009.0     1748.6     10020.0
1
    19AUG94       10:39:40                                                                                PAGE     2


     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *PROF 1

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3280 CROSS SECTION        .00 EXTENDED        .04 FEET

 3720 CRITICAL DEPTH ASSUMED
       .000        .74    1748.54    1748.54    1750.00    1748.72        .17        .00        .00    1748.00
       50.0       11.5       35.1        3.4        8.7        9.0        2.7         .0         .0    1748.00
        .00       1.32       3.91       1.26       .070       .040       .070       .000    1747.80    9965.00
    .020111         0.         0.         0.          0         18          0        .00      53.91   10018.91


 FLOW DISTRIBUTION FOR SECNO=        .00          CWSEL=    1748.54

 STA=     9965.      9995.    10009.    10019.
   PER Q=      23.0       70.2       6.7
    AREA=       8.7        9.0       2.7
     VEL=       1.3        3.9       1.3
   DEPTH=        .3         .6        .3

1
    19AUG94       10:39:40                                                                                PAGE     3

 T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2       RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3       WASH A                       L. CULLER - (602)244-8100
 T4       JOB 15183    PR15183\ETC\WASHA\SP14A.RAT     RUN   I
 T5       RATING CURVE FOR SPLIT FLOW AT SMALL WASH NEAR SECTION 2.105
 T6       SPECIAL PROBLEM 14
```

```
J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
                3                           .0311                                   1750
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
      2                   -1                                                                  15
1
   19AUG94      10:39:40                                                                              PAGE    4

      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 2

CCHV=     .100 CEHV=      .300
*SECNO  .000
3280 CROSS SECTION        .00 EXTENDED        .25 FEET

3720 CRITICAL DEPTH ASSUMED
      .000       .95   1748.75   1748.75   1750.00   1749.02       .27       .00       .00   1748.00
     100.0      30.3      60.5       9.3      14.9      11.9       4.9        .0        .0   1748.00
       .00      2.03      5.10      1.89      .070      .040      .070      .000   1747.80   9965.00
   .023548        0.        0.        0.         0        18         0       .00     55.00  10020.00

FLOW DISTRIBUTION FOR SECNO=        .00           CWSEL=    1748.75

STA=     9965.     9995.    10009.    10020.
  PER Q=      30.3      60.5       9.3
   AREA=      14.9      11.9       4.9
    VEL=       2.0       5.1       1.9
  DEPTH=        .5        .8        .4
1
   19AUG94      10:39:40                                                                              PAGE    5

T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH A                    L. CULLER - (602)244-8100
T4      JOB 15183    PR15183\ETC\WASHA\SP14A.RAT     RUN    I
T5      RATING CURVE FOR SPLIT FLOW AT SMALL WASH NEAR SECTION 2.105
T6      SPECIAL PROBLEM 14

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
                4                           .0311                                   1750
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
      3                   -1                                                                  15
1
   19AUG94      10:39:40                                                                              PAGE    6

      SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 3

CCHV=     .100 CEHV=      .300
*SECNO  .000
3280 CROSS SECTION        .00 EXTENDED        .56 FEET

3720 CRITICAL DEPTH ASSUMED
      .000      1.26   1749.06   1749.06   1750.00   1749.47       .41       .00       .00   1748.00
     200.0      70.8     106.3      23.0      24.4      16.3       8.4        .0        .0   1748.00
       .00      2.90      6.53      2.74      .070      .040      .070      .000   1747.80   9965.00
   .025289        0.        0.        0.         0        11         0       .00     55.00  10020.00

FLOW DISTRIBUTION FOR SECNO=        .00           CWSEL=    1749.06

STA=     9965.     9995.    10009.    10020.
  PER Q=      35.4      53.1      11.5
   AREA=      24.4      16.3       8.4
    VEL=       2.9       6.5       2.7
  DEPTH=        .8       1.2        .8
1
   19AUG94      10:39:40                                                                              PAGE    7

T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH A                    L. CULLER - (602)244-8100
T4      JOB 15183    PR15183\ETC\WASHA\SP14A.RAT     RUN    I
T5      RATING CURVE FOR SPLIT FLOW AT SMALL WASH NEAR SECTION 2.105
T6      SPECIAL PROBLEM 14

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
```

```
                 5                    .0311                          1750
 J2  NPROF     IPLOT     PRFVS     XSECV     XSECH .    FN       ALLDC     IBW      CHNIM      ITRACE

      4                   -1                                                                   15
1
    19AUG94      10:39:40                                                                              PAGE      8

      SECNO      DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL       OLOSS     L-BANK ELEV
      Q          QLOB      QCH       QROB      ALOB      ACH       AROB      VOL      TWA       R-BANK ELEV
      TIME       VLOB      VCH       VROB      XNL       XNCH      XNR       WTN      ELMIN     SSTA
      SLOPE      XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR    TOPWID    ENDST


 *PROF 4

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3280 CROSS SECTION         .00 EXTENDED        .81 FEET

 3720 CRITICAL DEPTH ASSUMED
      .000        1.51   1749.31   1749.31   1750.00   1749.86       .55       .00       .00   1748.00
     300.0       112.5     150.4      37.1      31.8      19.7      11.1        .0        .0   1748.00
       .00        3.54      7.62      3.34      .070      .040      .070      .000   1747.80   9965.00
   .026580          0.        0.        0.         0        19         0       .00     55.00  10020.00


 FLOW DISTRIBUTION FOR SECNO=        .00          CWSEL=    1749.31

 STA=     9965.     9995.    10009.    10020.
   PER Q=      37.5      50.1      12.4
    AREA=      31.8      19.7      11.1
     VEL=       3.5       7.6       3.3
   DEPTH=       1.1       1.4       1.0

1
    19AUG94      10:39:40                                                                              PAGE      9


 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                     L. CULLER - (602)244-8100
 T4      JOB 15183    PR15183\ETC\WASHA\SP14A.RAT     RUN   I
 T5      RATING CURVE FOR SPLIT FLOW AT SMALL WASH NEAR SECTION 2.105
 T6      SPECIAL PROBLEM 14

 J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                 6                            .0311                                 1750

 J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN       ALLDC     IBW      CHNIM      ITRACE

      15                  -1                                                                   15


1
    19AUG94      10:39:40                                                                              PAGE     10

      SECNO      DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL       OLOSS     L-BANK ELEV
      Q          QLOB      QCH       QROB      ALOB      ACH.      AROB      VOL      TWA       R-BANK ELEV
      TIME       VLOB      VCH       VROB      XNL       XNCH      XNR       WTN      ELMIN     SSTA
      SLOPE      XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR    TOPWID    ENDST


 *PROF 5

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3280 CROSS SECTION         .00 EXTENDED       1.04 FEET

 3720 CRITICAL DEPTH ASSUMED
      .000        1.74   1749.54   1749.54   1750.00   1750.20       .66       .00       .00   1748.00
     400.0       155.1     193.4      51.5      38.6      22.9      13.6        .0        .0   1748.00
       .00        4.02      8.45      3.79      .070      .040      .070      .000   1747.80   9965.00
   .026845          0.        0.        0.         0        15         0       .00     55.00  10020.00


 FLOW DISTRIBUTION FOR SECNO=        .00          CWSEL=    1749.54

 STA=     9965.     9995.    10009.    10020.
   PER Q=      38.8      48.4      12.9
    AREA=      38.6      22.9      13.6
     VEL=       4.0       8.4       3.8
   DEPTH=       1.3       1.6       1.2
1
    19AUG94      10:39:40                                                                              PAGE     11


                                                                  THIS RUN EXECUTED 19AUG94     10:39:41

 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 **************************************
```

```
NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WASH A

SUMMARY PRINTOUT

        SECNO     ELMIN     CWSEL        Q       VCH    DIFWSX   TOPWID    DEPTH     SSTA     ENDST     QLOB      QROB     ELTRD

*        .000   1747.80   1748.54     50.00     3.91      .00     53.91      .74  9965.00  10018.91    11.51      3.37      .00
*        .000   1747.80   1748.75    100.00     5.10      .00     55.00      .95  9965.00  10020.00    30.28      9.26      .00
*        .000   1747.80   1749.06    200.00     6.53      .00     55.00     1.26  9965.00  10020.00    70.76     22.97      .00
*        .000   1747.80   1749.31    300.00     7.62      .00     55.00     1.51  9965.00  10020.00   112.49     37.12      .00
*        .000   1747.80   1749.54    400.00     8.45      .00     55.00     1.74  9965.00  10020.00   155.05     51.51      .00

1
   19AUG94       10:39:40                                                                               PAGE    12


  SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO=        .000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=        .000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=        .000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=        .000  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=        .000  PROFILE=  5  CRITICAL DEPTH ASSUMED
```

```
1*********************************************                        ***************************************
 *  HEC-2 WATER SURFACE PROFILES               *                      *  U.S. ARMY CORPS OF ENGINEERS       *
 *                                             *                      *  HYDROLOGIC ENGINEERING CENTER      *
 *  Version    4.6.2;  May 1991                *                      *  609 SECOND STREET, SUITE D         *
 *                                             *                      *  DAVIS, CALIFORNIA 95616-4687       *
 *  RUN DATE    19AUG94     TIME   10:39:56    *                      *        (916) 756-1104               *
 **********************************************                       ***************************************


                                          X     X  XXXXXXX   XXXXX            XXXXX
                                          X     X  X        X     X          X     X
                                          X     X  X        X                      X
                                          XXXXXXX  XXXX     X       XXXXX     XXXXX
                                          X     X  X        X                X
                                          X     X  X        X     X          X
                                          X     X  XXXXXXX   XXXXX           XXXXXXX

1
   19AUG94       10:39:56                                                                                PAGE     1


                                                                                THIS RUN EXECUTED 19AUG94     10:39:56

 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 **************************************


 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                    L. CULLER - (602)244-8100
 T4      JOB 15183   PR15183\ETC\WASHA\SP2A(2).RAT   RUN  1
 T5      RATING CURVE FOR SECTION 2.105
 T6      SPECIAL PROBLEM NO. 2A

 J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

                  2                                -1                                        1712

 J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

       1                     -1                                                                          15


 J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       38         42          1         43         26         51          4          8         53         54
       13         15         40

QT         5         600         650         900        1200        1310
NC                                         0.1         0.3
NH         7         .07      9644.0         .04      9675.2         .07      9860.0         .04      9886.7         .07
NH    9958.2        .035     10070.3         .07     10140.5
X1     1.887          39      9958.2     10070.3         415         400         428
GR    1723.7      9561.7      1723.5      9588.3      1723.2      9613.8      1722.6      9644.0      1719.8      9651.4
GR    1720.1      9657.0      1721.2      9661.7      1720.1      9668.3      1721.4      9675.2      1721.5      9689.8
GR    1721.4      9692.3      1721.4      9709.0      1722.1      9729.6      1722.3      9755.5      1722.4      9785.4
GR    1722.3      9810.3      1721.9      9832.1      1721.9      9846.2      1722.0      9860.0      1721.8      9872.4
GR    1721.0      9876.3      1721.2      9882.6      1722.2      9886.7      1722.2      9905.6      1722.1      9936.4
GR    1722.6      9958.2      1721.7      9974.6      1721.1      9988.8      1721.2     10000.0      1721.5     10017.5
GR    1721.7     10039.0      1721.7     10060.4      1722.0     10070.3      1721.5     10082.8      1722.4     10091.5
GR    1721.8     10103.3      1721.7     10116.2      1722.6     10127.2      1722.9     10140.5

NH         6         .07      9874.2         .04      9923.5         .07      9988.0        .035     10018.5         .07
NH    10249.         .04     10348.6
X1     1.983          42      9988.0     10018.5         525         505         507
GR    1737.3      9676.1      1738.1      9695.6      1737.1      9713.9      1737.9      9725.1      1738.0      9741.3
GR    1736.5      9761.2      1735.9      9786.6      1734.9      9807.5      1734.0      9818.6      1733.3      9828.2
GR    1734.7      9837.9      1733.9      9850.9      1733.8      9862.6      1734.1      9874.2      1733.9      9883.6
GR    1731.8      9889.8      1733.5      9895.3      1734.5      9910.0      1735.2      9923.5      1735.0      9944.4
GR    1734.7      9946.0      1734.4      9963.1      1733.5      9974.9      1734.2      9988.0      1732.7      9996.9
GR    1732.7     10000.0      1733.1     10013.4      1734.1     10018.5      1734.7     10031.5      1733.5     10041.3
GR    1734.2     10045.0      1734.7     10074.2      1735.6     10112.9      1735.5     10154.9      1735.9     10184.5
1
    19AUG94       10:39:56                                                                                PAGE     2


GR    1736.1     10217.0      1735.5     10227.4      1736.7     10249.0      1736.2     10280.8      1736.5     10306.2
GR    1736.3     10327.7      1736.6     10348.6

NC       .08         .07        .035         0.1         0.3
X1     2.105          25      9989.7     10060.7         675         655         644
GR    1751.0      9826.6      1750.9      9849.4      1749.6      9894.0      1748.9      9914.6      1749.0      9944.2
GR    1749.2      9971.3      1748.9      9989.7      1747.0     10000.0      1748.9     10010.4      1749.2     10024.4
GR    1748.9     10030.7      1747.7     10034.1      1748.3     10041.7      1749.1     10060.7      1748.5     10078.6
GR    1748.2     10090.7      1748.8     10097.9      1749.3     10106.8      1748.7     10135.7      1749.2     10159.0
GR    1749.0     10175.1      1749.2     10190.0      1748.4     10195.3      1749.5     10209.2      1750.2     10224.0
1
    19AUG94       10:39:56                                                                                PAGE     3

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST
```

```
 *PROF 1
0
 CCHV=     .100 CEHV=     .300
 1490 NH CARD USED
 *SECNO 1.887

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED
      1.887      2.23   1722.03   1722.03   1712.00   1722.33       .30       .00       .00   1722.60
      600.0     396.7     191.0      12.3      84.3      50.3       9.8        .0        .0   1722.00
        .00      4.70      3.80      1.25      .044      .035      .070      .000   1719.80   9645.49
    .020522      415.      428.      400.         0        31         0       .00    284.54  10120.29


 FLOW DISTRIBUTION FOR SECNO=      1.89          CWSEL=    1722.03

 STA=     9645.     9651.     9657.     9662.     9668.     9675.     9690.     9709.     9876.     9883.     9886.    10070.    10120.
   PER Q=      6.0      16.9       7.0      10.0       9.2       3.0       4.5       3.8       5.0        .7      31.8       2.0
    AREA=      6.6      11.7       6.5       9.1       8.9       8.5      12.1      13.6       5.9       1.4      50.3       9.8
     VEL=      5.5       8.7       6.5       6.6       6.2       2.1       2.2       1.7       5.1       2.9       3.8       1.2
   DEPTH=      1.1       2.1       1.4       1.4       1.3        .6        .6        .1        .9        .4        .5        .2

 1490 NH CARD USED
 *SECNO 1.983

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
      1.983      2.76   1734.56   1734.56       .00   1734.99       .42      9.37       .04   1734.20
      600.0     292.5     288.2      19.3      87.2      42.8      13.4       1.7       2.9   1734.10
        .03      3.35      6.73      1.45      .051      .035      .070      .000   1731.80   9811.67
    .016112      525.      507.      505.        15        11         0       .00    204.47  10066.14


 FLOW DISTRIBUTION FOR SECNO=      1.98          CWSEL=    1734.56

 STA=     9812.     9828.     9863.     9884.     9890.     9895.     9910.     9988.    10019.    10066.
   PER Q=      4.1       5.6       5.1      11.5      12.3       4.4       5.7      48.0       3.2
    AREA=     10.7      17.4      12.4      10.6      10.5       8.3      17.3      42.8      13.4
     VEL=      2.3       1.9       2.5       6.5       7.0       3.2       2.0       6.7       1.4
   DEPTH=       .6        .5        .6       1.7       1.9        .6        .2       1.4        .3

1
    19AUG94       10:39:56                                                                                          PAGE      4


       SECNO       DEPTH       CWSEL       CRIWS       WSELK       EG          HV          HL          OLOSS       L-BANK ELEV
       Q           QLOB        QCH         QROB        ALOB        ACH         AROB        VOL         TWA         R-BANK ELEV
       TIME        VLOB        VCH         VROB        XNL         XNCH        XNR         WTN         ELMIN       SSTA
       SLOPE       XLOBL       XLCH        XLOBR       ITRIAL      IDC         ICONT       CORAR       TOPWID      ENDST


 CCHV=     .100 CEHV=     .300
 *SECNO 2.105
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
      2.105      2.47   1749.47   1749.47       .00   1749.78       .31     10.88       .01   1748.90
      600.0      51.4     378.1     170.5      37.5      69.4      83.5       4.2       6.8   1749.10
        .07      1.37      5.45      2.04      .080      .035      .070      .000   1747.00   9897.97
    .017142      675.      644.      655.        11         9         0       .00    310.79  10208.76


 FLOW DISTRIBUTION FOR SECNO=      2.11          CWSEL=    1749.47

 STA=     9898.     9944.     9990.    10061.    10079.    10091.    10098.    10136.    10159.    10195.    10209.
   PER Q=      4.8       3.8      63.0       4.2       6.7       3.1       4.7       3.6       3.9       2.2
    AREA=     20.0      17.5      69.4      11.9      13.5       6.9      17.1      12.0      14.8       7.2
     VEL=      1.4       1.3       5.4       2.1       3.0       2.7       1.6       1.8       1.6       1.8
   DEPTH=       .4        .4       1.0        .7       1.1       1.0        .5        .5        .4        .5

1
    19AUG94       10:39:56                                                                                          PAGE      5


 T1        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2        RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3        WASH A                            L. CULLER - (602)244-8100
 T4        JOB 15183   PR15183\ETC\WASHA\SP3A(2).RAT     RUN  1
 T5        SPECIAL PROBLEM NO. 3A

 J1    ICHECK      INQ         NINV        IDIR        STRT        METRIC      HVINS       Q           WSEL        FQ

                     3                                   -1                                             1712

 J2    NPROF       IPLOT       PRFVS       XSECV       XSECH       FN          ALLDC       IBW         CHNIM       ITRACE

          2                     -1                                                                                  15
1
    19AUG94       10:39:56                                                                                          PAGE      6


       SECNO       DEPTH       CWSEL       CRIWS       WSELK       EG          HV          HL          OLOSS       L-BANK ELEV
       Q           QLOB        QCH         QROB        ALOB        ACH         AROB        VOL         TWA         R-BANK ELEV
       TIME        VLOB        VCH         VROB        XNL         XNCH        XNR         WTN         ELMIN       SSTA
       SLOPE       XLOBL       XLCH        XLOBR       ITRIAL      IDC         ICONT       CORAR       TOPWID      ENDST
```

```
 *PROF 2
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 1.887

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED
      1.887      2.29   1722.09   1722.09   1712.00   1722.37       .29       .00       .00   1722.60
      650.0     417.2     217.0      15.8      91.7      55.5      11.9        .0        .0   1722.00
        .00      4.55      3.91      1.33      .045      .035      .070      .000   1719.80   9645.36
    .019313      415.      428.      400.         0        31         0       .00    292.17  10120.91


 FLOW DISTRIBUTION FOR SECNO=      1.89          CWSEL=   1722.09

 STA=    9645.    9651.    9657.    9662.    9668.    9675.    9690.    9709.    9876.    9883.    9886.   10070.   10121.
   PER Q=      5.7     15.7      6.7      9.5      8.8      3.1      4.6      4.5      4.9       .7     33.4      2.4
    AREA=      6.9     12.0      6.7      9.5      9.2      9.3     13.0     17.3      6.2      1.6     55.5     11.9
     VEL=      5.4      8.6      6.5      6.5      6.2      2.2      2.3      1.7      5.1      2.9      3.9      1.3
   DEPTH=      1.1      2.1      1.4      1.4      1.3       .6       .7       .1      1.0       .4       .5       .2

 1490 NH CARD USED
 *SECNO 1.983

 3265 DIVIDED FLOW

 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
      1.983      2.83   1734.63   1734.63       .00   1735.05       .42      8.87       .04   1734.20
      650.0     321.7     304.3      24.1      96.4      44.9      16.6       1.9       3.0   1734.10
        .03      3.34      6.77      1.45      .051      .035      .070      .000   1731.80   9810.83
    .015335      525.      507.      505.        20        11         0       .00    218.12  10070.12


 FLOW DISTRIBUTION FOR SECNO=      1.98          CWSEL=   1734.63

 STA=    9811.    9828.    9863.    9884.    9890.    9895.    9910.    9988.   10019.   10070.
   PER Q=      4.2      5.9      5.5     11.1     11.8      4.8      6.2     46.8      3.7
    AREA=     11.9     19.6     13.8     11.0     10.9      9.3     19.9     44.9     16.6
     VEL=      2.3      2.0      2.6      6.5      7.0      3.4      2.0      6.8      1.5
   DEPTH=       .7       .6       .7      1.8      2.0       .6       .3      1.5       .3

1
    19AUG94      10:39:56                                                                                          PAGE     7


     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

 CCHV=      .100 CEHV=      .300
 *SECNO 2.105
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
      2.105      2.51   1749.51   1749.51       .00   1749.83       .32     10.48       .01   1748.90
      650.0      59.6     401.7     188.6      41.5      72.5      90.0       4.6       7.1   1749.10
        .07      1.44      5.54      2.10      .080      .035      .070      .000   1747.00   9896.68
    .016721      675.      644.      655.        11         9         0       .00    312.71  10209.39


 FLOW DISTRIBUTION FOR SECNO=      2.11          CWSEL=   1749.51

 STA=    9897.    9944.    9990.   10061.   10079.   10091.   10098.   10136.   10159.   10195.   10209.
   PER Q=      5.1      4.1     61.8      4.3      6.5      3.1      5.0      3.7      4.2      2.2
    AREA=     22.0     19.5     72.5     12.7     14.0      7.3     18.8     13.0     16.4      7.8
     VEL=      1.5      1.4      5.5      2.2      3.0      2.8      1.7      1.9      1.7      1.9
   DEPTH=       .5       .4      1.0       .7      1.2      1.0       .5       .6       .5       .6

1
    19AUG94      10:39:56                                                                                          PAGE     8


 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                       L. CULLER - (602)244-8100
 T4      JOB 15183   PR15183\ETC\WASHA\SP3A(2).RAT    RUN  1
 T5      SPECIAL PROBLEM NO. 3A

 J1   ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                 4                                -1                                   1712

 J2   NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

         3                  -1                                                                   15

1
    19AUG94      10:39:56                                                                                          PAGE     9


     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST
```

```
*PROF 3
0
CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO 1.887

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED
     1.887      2.47   1722.27   1722.27   1712.00   1722.55       .28       .00       .00   1722.60
     900.0     534.5     332.7      32.8     126.7      74.3      20.0        .0        .0   1722.00
       .00      4.22      4.48      1.64      .046      .035      .070      .000   1719.80   9644.88
   .017876      415.      428.      400.         0        34         0       .00    392.59  10123.12


FLOW DISTRIBUTION FOR SECNO=      1.89          CWSEL=  1722.27

STA=   9645.     9651.    9657.    9662.    9668.    9675.    9690.    9709.    9846.    9876.    9883.    9944.   10070.
 PER Q=     4.9      12.5      5.7      8.0      7.5      3.3      4.7      3.5      3.6      4.5      1.2     37.0
  AREA=     8.0      13.0      7.6     10.7     10.5     11.9     16.5     21.2     12.3      7.3      7.7     74.3
   VEL=     5.5       8.7      6.7      6.8      6.5      2.5      2.6      1.5      2.6      5.5      1.4      4.5
 DEPTH=     1.2       2.3      1.6      1.6      1.5       .8       .9       .2       .4      1.2       .1       .7

STA=  10070.    10116.   10123.
 PER Q=     3.4        .3
  AREA=    18.1       2.0
   VEL=     1.7       1.2
 DEPTH=      .4        .3

1490 NH CARD USED
*SECNO 1.983

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.983      3.05   1734.85   1734.85       .00   1735.33       .48      8.61       .06   1734.20
     900.0     462.6     385.9      51.5     128.4      51.6      29.0       2.6       3.8   1734.10
       .03      3.60      7.48      1.78      .053      .035      .070      .000   1731.80   9808.14
   .015559      525.      507.      505.        15        11         0       .00    243.97  10080.59


1
   19AUG94      10:39:56                                                                                          PAGE   10


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


FLOW DISTRIBUTION FOR SECNO=      1.98          CWSEL=  1734.85

STA=   9808.     9828.    9851.    9863.    9884.    9890.    9895.    9910.    9975.    9988.   10019.   10045.   10081.
 PER Q=     4.5       3.6      3.4      6.5      9.8     10.2      5.7      3.8      3.8     42.9      3.8      1.9
  AREA=    15.9      15.4     11.7     18.4     12.4     12.1     12.5     16.9     13.1     51.6     16.9     12.1
   VEL=     2.6       2.1      2.6      3.2      7.1      7.6      4.1      2.0      2.6      7.5      2.1      1.4
 DEPTH=      .8        .7      1.0       .9      2.0      2.2       .8       .3      1.0      1.7       .6       .3

CCHV=      .100 CEHV=      .300
*SECNO 2.105
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     2.105      2.67   1749.67   1749.67       .00   1750.05       .38     10.81       .01   1748.90
     900.0      99.7     522.6     277.7      56.6      83.8     113.8       6.1       8.1   1749.10
       .07      1.76      6.24      2.44      .080      .035      .070      .000   1747.00   9891.69
   .017508      675.      644.      655.        12         9         0       .00    321.04  10212.74


FLOW DISTRIBUTION FOR SECNO=      2.11          CWSEL=  1749.67

STA=   9892.     9944.    9990.   10061.   10079.   10091.   10107.   10136.   10159.   10190.   10209.   10213.
 PER Q=     6.0       5.1     58.1      4.4      6.0      4.1      4.6      4.2      3.8      3.8       .0
  AREA=    29.9      26.7     83.8     15.5     15.9     13.9     19.3     16.7     17.6     14.6       .3
   VEL=     1.8       1.7      6.2      2.6      3.4      2.7      2.1      2.3      1.9      2.3       .5
 DEPTH=      .6        .6      1.2       .9      1.3       .9       .7       .7       .6       .8       .1

1
   19AUG94      10:39:56                                                                                          PAGE   11


T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH A                   L. CULLER - (602)244-8100
T4      JOB 15183   PR15183\ETC\WASHA\SP3A(2).RAT   RUN  1
T5      SPECIAL PROBLEM NO. 3A

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                 5                            -1                                    1712

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      4                  -1                                                                  15

1
   19AUG94      10:39:56                                                                                          PAGE   12


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
```

```
     Q           QLOB        QCH         QROB        ALOB        ACH         AROB        VOL         TWA         R-BANK ELEV
     TIME        VLOB        VCH         VROB        XNL         XNCH        XNR         WTN         ELMIN       SSTA
     SLOPE       XLOBL       XLCH        XLOBR       ITRIAL      IDC         ICONT       CORAR       TOPWID      ENDST

   *PROF 4
0

   CCHV=      .100 CEHV=      .300
   1490 NH CARD USED
   *SECNO 1.887

   3265 DIVIDED FLOW

   3720 CRITICAL DEPTH ASSUMED
       1.887       2.60    1722.40     1722.40     1712.00     1722.72         .32         .00         .00     1722.60
      1200.0      689.8      457.8        52.4       162.4        88.7        27.0          .0          .0     1722.00
         .00       4.25       5.16        1.94        .048        .035        .070        .000     1719.80     9644.53
     .019363       415.       428.        400.           0          20           0         .00      467.79    10124.75

   FLOW DISTRIBUTION FOR SECNO=      1.89          CWSEL=    1722.40

   STA=    9645.     9651.     9657.     9662.     9668.     9675.     9690.     9709.     9832.     9872.     9883.     9949.    10070.
     PER Q=      4.4      10.7       5.1       7.2       6.8       3.3       4.7       3.7       3.7       5.9       2.2      38.2
      AREA=      8.9      13.7       8.2      11.5      11.4      13.9      19.1      27.8      19.5      12.1      16.3      88.7
       VEL=      5.9       9.4       7.4       7.4       7.1       2.9       2.9       1.6       2.3       5.8       1.6       5.2
     DEPTH=      1.3       2.4       1.7       1.7       1.6        .9       1.0        .2        .5       1.2        .2        .8

   STA=   10070.    10116.    10125.
     PER Q=      4.0        .4
      AREA=     24.0       3.0
       VEL=      2.0       1.5
     DEPTH=       .5        .3

   1490 NH CARD USED
   *SECNO 1.983

   3265 DIVIDED FLOW

   7185 MINIMUM SPECIFIC ENERGY
   3720 CRITICAL DEPTH ASSUMED
       1.983       3.28    1735.08     1735.08         .00     1735.60         .52        8.77         .06     1734.20
      1200.0      635.1      470.7        94.3       165.4        58.7        44.7         3.2         4.4     1734.10
         .03       3.84       8.01        2.11        .054        .035        .070        .000     1731.80     9803.67
     .015006       525.       507.        505.          19          11           0         .00      272.59    10090.69

1
     19AUG94       10:39:56                                                                                               PAGE    13

     SECNO       DEPTH       CWSEL       CRIWS       WSELK       EG          HV          HL          OLOSS       L-BANK ELEV
     Q           QLOB        QCH         QROB        ALOB        ACH         AROB        VOL         TWA         R-BANK ELEV
     TIME        VLOB        VCH         VROB        XNL         XNCH        XNR         WTN         ELMIN       SSTA
     SLOPE       XLOBL       XLCH        XLOBR       ITRIAL      IDC         ICONT       CORAR       TOPWID      ENDST

   FLOW DISTRIBUTION FOR SECNO=      1.98          CWSEL=    1735.08

   STA=    9804.     9828.     9851.     9863.     9874.     9884.     9890.     9895.     9910.     9975.     9988.    10019.    10041.
     PER Q=      4.9       4.3       3.6       3.1       4.1       8.7       8.9       6.4       5.0       4.0      39.2       3.5
      AREA=     21.1      20.7      14.4      13.1      10.2      13.8      13.4      15.9      26.5      16.2      58.7      18.5
       VEL=      2.8       2.5       3.0       2.8       4.8       7.5       8.0       4.8       2.3       3.0       8.0       2.3
     DEPTH=       .9        .9       1.2       1.1       1.1       2.2       2.4       1.1        .4       1.2       1.9        .8

   STA=   10041.    10074.    10091.
     PER Q=      4.1        .2
      AREA=     23.1       3.2
       VEL=      2.1        .9
     DEPTH=       .7        .2

   CCHV=      .100 CEHV=      .300
   *SECNO 2.105
   7185 MINIMUM SPECIFIC ENERGY
   3720 CRITICAL DEPTH ASSUMED
       2.105       2.82    1749.82     1749.82         .00     1750.29         .47       10.96         .00     1748.90
      1200.0      151.2      662.9       385.9        72.2        94.7       137.6         7.6         9.0     1749.10
         .06       2.09       7.00        2.81        .080        .035        .070        .000     1747.00     9886.39
     .018691       675.       644.        655.          13           9           0         .00      329.61    10216.00

   FLOW DISTRIBUTION FOR SECNO=      2.11          CWSEL=    1749.82

   STA=    9886.     9944.     9971.     9990.    10061.    10079.    10091.    10107.    10136.    10159.    10190.    10209.    10216.
     PER Q=      6.7       3.3       2.5      55.2       4.5       5.6       4.2       5.0       4.5       4.4       4.0        .1
      AREA=     38.4      19.6      14.2      94.7      18.3      17.8      16.4      23.7      20.3      22.4      17.5       1.1
       VEL=      2.1       2.0       2.1       7.0       2.9       3.8       3.0       2.5       2.6       2.3       2.7        .9
     DEPTH=       .7        .7        .8       1.3       1.0       1.5       1.0        .8        .9        .7        .9        .2

1
     19AUG94       10:39:56                                                                                               PAGE    14

   T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
   T2       RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
   T3       WASH A                      L. CULLER - (602)244-8100
   T4       JOB 15183    PR15183\ETC\WASHA\SP3A(2).RAT     RUN  1
   T5       SPECIAL PROBLEM NO. 3A

   J1   ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
```

```
                6                             -1                                           1712
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
      15                  -1                                                                   15


1
     19AUG94       10:39:56                                                                               PAGE    15

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 *PROF 5
0
 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO 1.887

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED
       1.887       2.62    1722.42    1722.42    1712.00    1722.78        .36        .00        .00    1722.60
      1310.0      750.5      500.9       58.6      168.1       90.7       28.0         .0         .0    1722.00
         .00       4.46       5.52       2.09       .048       .035       .070       .000    1719.80    9644.48
     .021585       415.       428.       400.          0         20          0        .00     469.29   10124.98

 FLOW DISTRIBUTION FOR SECNO=       1.89            CWSEL=    1722.42

 STA=    9644.    9651.    9657.    9662.    9668.    9675.    9690.    9709.    9785.    9872.    9883.    9950.   10070.
   PER Q=      4.3     10.5      5.0      7.0      6.7      3.3      4.7      3.1      4.6      5.8      2.3     38.2
    AREA=      9.1     13.8      8.3     11.7     11.5     14.1     19.4     21.5     28.9     12.3     17.6     90.7
     VEL=      6.2     10.0      7.8      7.9      7.6      3.1      3.1      1.9      2.1      6.2      1.7      5.5
   DEPTH=      1.3      2.5      1.8      1.8      1.7      1.0      1.0       .3       .3      1.2       .3       .8

 STA=   10070.   10116.   10125.
   PER Q=      4.1       .4
    AREA=     24.8      3.2
     VEL=      2.2      1.6
   DEPTH=       .5       .4

 1490 NH CARD USED
 *SECNO 1.983

 3265 DIVIDED FLOW

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
       1.983       3.36    1735.16    1735.16        .00    1735.69        .53       9.13        .05    1734.20
      1310.0      699.1      499.3      111.6      179.7       61.2       50.7        3.4        4.5    1734.10
         .03       3.89       8.16       2.20       .054       .035       .070       .000    1731.80    9801.97
     .014717       525.       507.       505.         11         11          0        .00     287.82   10094.18

1
     19AUG94       10:39:56                                                                               PAGE    16

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 FLOW DISTRIBUTION FOR SECNO=       1.98            CWSEL=    1735.16

 STA=    9802.    9828.    9851.    9863.    9874.    9884.    9890.    9895.    9910.    9975.    9988.   10019.   10041.
   PER Q=      5.0      4.4      3.6      3.2      4.2      8.3      8.5      6.5      5.5      4.1     38.1      3.8
    AREA=     23.2     22.5     15.4     14.1     10.9     14.4     13.8     17.1     31.0     17.2     61.2     20.4
     VEL=      2.8      2.6      3.1      2.9      5.0      7.6      8.1      5.0      2.3      3.1      8.2      2.4
   DEPTH=       .9      1.0      1.3      1.2      1.2      2.3      2.5      1.2       .5      1.3      2.0       .9

 STA=   10041.   10074.   10094.
   PER Q=      4.4       .3
    AREA=     25.7      4.6
     VEL=      2.2      1.0
   DEPTH=       .8       .2

 CCHV=      .100 CEHV=      .300
 *SECNO 2.105
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
       2.105       2.88    1749.88    1749.88        .00    1750.37        .49      10.88        .00    1748.90
      1310.0      171.3      712.3      426.5       78.0       98.7      146.3        8.1        9.2    1749.10
         .06       2.19       7.21       2.91       .080       .035       .070       .000    1747.00    9884.46
     .018810       675.       644.       655.         14          9          0        .00     332.73   10217.19

 FLOW DISTRIBUTION FOR SECNO=       2.11            CWSEL=    1749.88

 STA=    9884.    9944.    9971.    9990.   10061.   10079.   10091.   10107.   10136.   10159.   10190.   10209.   10217.
   PER Q=      7.0      3.5      2.6     54.4      4.5      5.5      4.2      5.2      4.6      4.5      4.0       .1
    AREA=     41.7     21.1     15.2     98.7     19.3     18.5     17.3     25.4     21.6     24.1     18.6      1.5
     VEL=      2.2      2.2      2.2      7.2      3.1      3.9      3.2      2.7      2.8      2.5      2.8      1.0
```

```
DEPTH=      .7       .8       .8      1.4      1.1      1.5      1.1       .9       .9       .8      1.0       .2
1
  19AUG94       10:39:56                                                                                PAGE   17


                                                                    THIS RUN EXECUTED 19AUG94    10:40:00
 **************************************
 HEC-2 WATER SURFACE PROFILES

 Version    4.6.2;  May 1991
 **************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WASH A

SUMMARY PRINTOUT

        SECNO     ELMIN     CWSEL        Q        VCH.    DIFWSX    TOPWID     DEPTH      SSTA      ENDST      QLOB      QROB      ELTRD

*       1.887   1719.80   1722.03    600.00      3.80       .00    284.54      2.23   9645.49   10120.29    396.71     12.28       .00
*       1.887   1719.80   1722.09    650.00      3.91       .00    292.17      2.29   9645.36   10120.91    417.21     15.83       .00
*       1.887   1719.80   1722.27    900.00      4.48       .00    392.59      2.47   9644.88   10123.12    534.48     32.84       .00
*       1.887   1719.80   1722.40   1200.00      5.16       .00    467.79      2.60   9644.53   10124.75    689.78     52.40       .00
*       1.887   1719.80   1722.42   1310.00      5.52       .00    469.29      2.62   9644.48   10124.98    750.54     58.56       .00

*       1.983   1731.80   1734.56    600.00      6.73     12.53    204.47      2.76   9811.67   10066.14    292.50     19.33       .00
*       1.983   1731.80   1734.63    650.00      6.77     12.54    218.12      2.83   9810.83   10070.12    321.66     24.08       .00
*       1.983   1731.80   1734.85    900.00      7.48     12.58    243.97      3.05   9808.14   10080.59    462.56     51.54       .00
*       1.983   1731.80   1735.08   1200.00      8.01     12.68    272.59      3.28   9803.67   10090.69    635.05     94.27       .00
*       1.983   1731.80   1735.16   1310.00      8.16     12.75    287.82      3.36   9801.97   10094.18    699.08    111.58       .00

*       2.105   1747.00   1749.47    600.00      5.45     14.90    310.79      2.47   9897.97   10208.76     51.39    170.50       .00
*       2.105   1747.00   1749.51    650.00      5.54     14.88    312.71      2.51   9896.68   10209.39     59.64    188.62       .00
*       2.105   1747.00   1749.67    900.00      6.24     14.82    321.04      2.67   9891.69   10212.74     99.72    277.72       .00
*       2.105   1747.00   1749.82   1200.00      7.00     14.74    329.61      2.82   9886.39   10216.00    151.20    385.94       .00
*       2.105   1747.00   1749.88   1310.00      7.21     14.71    332.73      2.88   9884.46   10217.19    171.28    426.46       .00
1
  19AUG94       10:39:56                                                                                PAGE   18


  SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO=       1.887   PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.887   PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.887   PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.887   PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.887   PROFILE=  5  CRITICAL DEPTH ASSUMED

CAUTION SECNO=       1.983   PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.983   PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       1.983   PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.983   PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       1.983   PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=       1.983   PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.983   PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       1.983   PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.983   PROFILE=  4  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       1.983   PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       1.983   PROFILE=  5  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       2.105   PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.105   PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.105   PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.105   PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.105   PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.105   PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.105   PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.105   PROFILE=  4  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       2.105   PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       2.105   PROFILE=  5  MINIMUM SPECIFIC ENERGY
```

```
1*******************************************           ***************************************
 *  HEC-2 WATER SURFACE PROFILES            *           *  U.S. ARMY CORPS OF ENGINEERS        *
 *                                          *           *  HYDROLOGIC ENGINEERING CENTER       *
 *  Version    4.6.2;  May 1991             *           *  609 SECOND STREET, SUITE D          *
 *                                          *           *  DAVIS, CALIFORNIA 95616-4687        *
 *  RUN DATE    19AUG94     TIME    10:40:20 *          *       (916) 756-1104                 *
 ********************************************           ***************************************


                          X     X  XXXXXXX   XXXXX           XXXXX
                          X     X  X        X     X         X     X
                          X     X  X        X                     X
                          XXXXXXX  XXXX     X          XXXXX   XXXXX
                          X     X  X        X                 X
                          X     X  X        X     X           X
                          X     X  XXXXXXX   XXXXX            XXXXXXX
1
   19AUG94       10:40:20                                                           PAGE    1


                                                          THIS RUN EXECUTED 19AUG94     10:40:20

 **********************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 **********************************

 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH AS                    L. CULLER - (602)244-8100
 T4      JOB 15183   PR15183\ETC\WASHA\SP1AS.RAT      RUN  1
 T5      RATING CURVE FOR BREAKOUT FLOW AT CROSS SECTION 0.512
 T6      SPECIAL PROBLEM NO. 1AS

 J1   ICHECK     INQ       NINV      IDIR      STRT     METRIC    HVINS      Q        WSEL       FQ

                   2                             -1                                    1629

 J2   NPROF     IPLOT     PRFVS     XSECV     XSECH       FN      ALLDC      IBW      CHNIM     ITRACE

        1                  -1                                                                   15

 J3   VARIABLE CODES FOR SUMMARY PRINTOUT

        38        42         1         43        26        51         4         8        53        54
        13        15        40

 QT        5       250       300       350       450       500
 NC      .07       .02       .04       0.1       0.3
 NH        5       .07    9899.7       .04    9930.3       .07    9991.8       .03   10032.9       .02
 NH   10049.
 X1    0.411        27    9991.8   10032.9       545       565       544
 X3                                 9899.7
 GR   1630.9    9711.1    1630.8    9726.8    1630.6    9736.1    1630.5    9750.6    1630.2    9774.6
 GR   1630.3    9786.9    1630.3    9803.9    1629.5    9820.4    1629.7    9843.0    1627.7    9849.5
 GR   1629.9    9861.1    1629.8    9880.0    1629.9    9899.7    1628.5    9905.6    1628.4    9913.5
 GR   1628.8    9923.0    1630.1    9930.3    1630.2    9946.7    1629.6    9958.3    1630.2    9967.8
 GR   1630.3    9978.6    1630.3    9991.8    1626.8   10000.0    1626.8   10014.5    1629.0   10025.3
 GR   1630.6   10032.9    1630.4   10049.0       0.0       0.0       0.0       0.0       0.0       0.0

 NH        5       .07    9995.4       .04   10020.3       .07   10206.5       .04   10237.4       .07
 NH   10317.
 X1    0.512        36    9995.4   10020.3       470       515       533
 X3                                 9989.3             10119.8
 GR   1639.7    9989.3    1639.1    9995.4    1636.9   10000.0    1637.0   10005.6    1637.6   10012.2
 GR   1638.9   10020.3    1639.5   10032.3    1639.7   10034.9    1639.8   10052.1    1639.5   10066.2
 GR   1639.3   10081.7    1639.1   10089.8    1639.4   10104.7    1639.9   10120.3    1639.9   10133.1
 GR   1639.7   10149.7    1639.2   10162.4    1638.5   10176.8    1638.3   10183.9    1638.7   10194.7
 GR   1638.2   10201.1    1638.7   10206.5    1637.3   10211.9    1637.6   10221.3    1637.5   10229.7
 GR   1638.6   10237.4    1638.7   10242.8    1638.6   10250.9    1638.4   10263.0    1638.3   10271.4
 GR   1637.4   10282.4    1637.2   10287.2    1638.0   10290.9    1638.5   10296.1    1639.0   10304.4
1
   19AUG94       10:40:20                                                           PAGE    2


 GR   1638.9   10317.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
1
   19AUG94       10:40:20                                                           PAGE    3


      SECNO     DEPTH     CWSEL     CRIWS     WSELK      EG        HV        HL       OLOSS     L-BANK ELEV
      Q         QLOB      QCH       QROB      ALOB       ACH       AROB      VOL      TWA       R-BANK ELEV
      TIME      VLOB      VCH       VROB      XNL        XNCH      XNR       WTN      ELMIN     SSTA
      SLOPE     XLOBL     XLCH      XLOBR     ITRIAL     IDC       ICONT     CORAR    TOPWID    ENDST

  *PROF 1
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO   .411
```

```
3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9899.7   10049.0  TYPE=       1  TARGET=    -9899.700
      .411      1.86   1628.66   1628.66   1629.00   1629.26       .60       .00       .00   1630.30
     250.0       3.0     247.0        .0       2.5      39.6        .0        .0        .0   1630.60
       .00      1.19      6.24       .00      .040      .030      .000      .000   1626.80   9904.92
   .010279      545.      544.      565.         0        10         0       .00     42.82  10023.64


FLOW DISTRIBUTION FOR SECNO=       .41         CWSEL=   1628.66

STA=    9905.    9914.     9920.   10025.
  PER Q=       .9       .3     98.8
   AREA=      1.7       .8     39.6
    VEL=      1.3      1.0      6.2
  DEPTH=       .2       .1      1.4

1490 NH CARD USED
*SECNO  .512

3265 DIVIDED FLOW

3280 CROSS SECTION        .51 EXTENDED        .23 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9989.3   10119.8  TYPE=       1  TARGET=      130.500
      .512      2.23   1639.13   1639.13       .00   1639.85       .72      7.58       .04   1639.10
     250.0        .0     249.6        .4        .0      36.5        .5        .5        .4   1638.90
       .02       .03      6.84       .68      .070      .040      .070      .000   1636.90   9995.13
   .021015      470.      533.      515.         4        11         0       .00     32.04  10091.10


1
   19AUG94      10:40:20                                                                                          PAGE    4

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


FLOW DISTRIBUTION FOR SECNO=       .51         CWSEL=   1639.13

STA=    9995.    10020.    10025.   10091.
  PER Q=     99.9       .1       .0
   AREA=     36.5       .5       .0
    VEL=      6.8       .7       .0
  DEPTH=      1.5       .1       .0
1
   19AUG94      10:40:20                                                                                          PAGE    5

T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH AS                  L. CULLER - (602)244-8100
T4      JOB 15183   PR15183\ETC\WASHA\SP30AS.RAT     RUN   I
T5      RATING CURVE FOR BREAK OUT FLOW AT CROSS SECTION 0.599
T6      SPECIAL PROBLEM 30

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                 3                            -1                                    1629

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      2                  -1                                                                    15
1
   19AUG94      10:40:20                                                                                          PAGE    6

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


 *PROF 2
0

CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO  .411

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9899.7   10049.0  TYPE=       1  TARGET=    -9899.700
      .411      2.08   1628.88   1628.88   1629.00   1629.47       .59       .00       .00   1630.30
     300.0      11.3     288.7        .0       6.4      45.8        .0        .0        .0   1630.60
       .00      1.78      6.30       .00      .040      .030      .000      .000   1626.80   9904.00
   .009282      545.      544.      565.         0        10         0       .00     49.02  10024.71


FLOW DISTRIBUTION FOR SECNO=       .41         CWSEL=   1628.88
```

```
STA=    9904.    9906.    9914.    9923.    9923.   10025.
  PER Q=       .1      2.3      1.4       .0     96.2
   AREA=       .3      3.4      2.7       .0     45.8
    VEL=      1.2      2.0      1.5       .0      6.3
  DEPTH=       .2       .4       .3       .0      1.5

1490 NH CARD USED
*SECNO  .512

3265 DIVIDED FLOW

3280 CROSS SECTION        .51 EXTENDED        .63 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=       9989.3   10119.8  TYPE=       1  TARGET=       130.500
      .512        2.63   1639.53   1639.53       .00   1640.09       .56      5.66       .00   1639.10
     300.0          .8     286.4      12.8        .9      46.5      13.0        .7        .8   1638.90
       .02         .84      6.16       .99      .070      .040      .070      .000   1636.90   9991.06
   .012358        470.      533.      515.         7        11         0       .00     85.35  10108.67


1
   19AUG94       10:40:20                                                                         PAGE    7


      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG        HV        HL        OLOSS     L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC       ICONT     CORAR     TOPWID    ENDST


FLOW DISTRIBUTION FOR SECNO=       .51          CWSEL=   1639.53

STA=    9991.    9995.   10020.   10032.   10082.   10090.   10105.   10109.
  PER Q=       .3     95.5      1.5       .4      1.0      1.4       .0
   AREA=       .9     46.5      3.9      2.0      2.7      4.1       .3
    VEL=       .8      6.2      1.1       .6      1.1      1.0       .4
  DEPTH=       .2      1.9       .3       .0       .3       .3       .1

1
   19AUG94       10:40:20                                                                         PAGE    8


T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2       RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3       WASH AS                      L. CULLER - (602)244-8100
T4       JOB 15183    PR15183\ETC\WASHA\SP30AS.RAT     RUN   I
T5       RATING CURVE FOR BREAK OUT FLOW AT CROSS SECTION 0.599
T6       SPECIAL PROBLEM 30

J1   ICHECK     INQ       NINV       IDIR       STRT       METRIC     HVINS      Q         WSEL       FQ

                  4                              -1                                        1629

J2   NPROF      IPLOT     PRFVS      XSECV      XSECH      FN         ALLDC      IBW       CHNIM      ITRACE

        3                   -1                                                                         15
1
   19AUG94       10:40:20                                                                         PAGE    9


      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG        HV        HL        OLOSS     L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH       AROB      VOL       TWA       R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH      XNR       WTN       ELMIN     SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC       ICONT     CORAR     TOPWID    ENDST


 *PROF 3
0
CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .411

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=       9899.7   10049.0  TYPE=       1  TARGET=     -9899.700
      .411        2.25   1629.05   1629.05   1629.00   1629.66       .61       .00       .00   1630.30
     350.0        21.5     328.5        .0       9.7      50.9        .0        .0        .0   1630.60
       .00        2.20      6.46       .00      .040      .030      .000      .000   1626.80   9903.30
   .008970        545.      544.      565.         0         4         0       .00     51.86  10025.52


FLOW DISTRIBUTION FOR SECNO=       .41          CWSEL=   1629.05

STA=    9903.    9906.    9914.    9923.    9924.   10033.
  PER Q=       .3      3.3      2.5       .0     93.9
   AREA=       .6      4.7      4.2       .2     50.9
    VEL=      1.5      2.5      2.1       .9      6.5
  DEPTH=       .3       .6       .4       .1      1.7

1490 NH CARD USED
*SECNO  .512

3265 DIVIDED FLOW

3280 CROSS SECTION        .51 EXTENDED        .83 FEET
```

```
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9989.3   10119.8  TYPE=       1   TARGET=       130.500
       .512       2.83    1639.73    1639.73       .00    1640.26       .52       5.15        .01    1639.10
      350.0        2.1      315.4       32.5       2.0       51.6      26.6         .8        1.0    1638.90
        .03       1.04       6.11       1.22      .070       .040      .070       .000    1636.90    9989.30
    .010565       470.       533.       515.         9         11         0        .00     111.25   10115.10


1
     19AUG94      10:40:20                                                                                    PAGE    10


      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 FLOW DISTRIBUTION FOR SECNO=        .51           CWSEL=    1639.73

 STA=     9989.     9995.    10020.    10082.    10105. . 10115.
   PER Q=       .6      90.1       4.4       4.5        .3
    AREA=      2.0      51.6      13.3      11.5       1.7
     VEL=      1.0       6.1       1.2       1.4        .7
   DEPTH=       .3       2.1        .2        .5        .2

1
     19AUG94      10:40:20                                                                                    PAGE    11

 T1         FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2         RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3         WASH AS                        L. CULLER - (602)244-8100
 T4         JOB 15183   PR15183\ETC\WASHA\SP30AS.RAT     RUN   I
 T5         RATING CURVE FOR BREAK OUT FLOW AT CROSS SECTION 0.599
 T6         SPECIAL PROBLEM 30

 J1   ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

                   5                               -1                                        1629

 J2   NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

         4                    -1                                                                        15

1
     19AUG94      10:40:20                                                                                    PAGE    12

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 *PROF 4
0

 CCHV=      .100 CEHV=      .300
 1490 NH CARD USED
 *SECNO  .411

 3265 DIVIDED FLOW

 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9899.7   10049.0  TYPE=       1   TARGET=     -9899.700
       .411       2.51    1629.31    1629.31   1629.00    1629.98       .67        .00        .00    1630.30
      450.0       43.9      406.1         .0      15.6       59.2        .0         .0         .0    1630.60
        .00       2.81       6.86        .00      .040       .030      .000       .000    1626.80    9902.20
    .008963       545.       544.       565.         0          7         0        .00      56.29   10026.76

 FLOW DISTRIBUTION FOR SECNO=        .41           CWSEL=    1629.31

 STA=     9902.     9906.     9914.     9923.     9926.    10033.
   PER Q=       .6       4.8       4.2        .2      90.2
    AREA=      1.4       6.8       6.7        .7      59.2
     VEL=      1.9       3.2       2.8       1.4       6.9
   DEPTH=       .4        .9        .7        .3       1.8

 1490 NH CARD USED
 *SECNO  .512
 3280 CROSS SECTION        .51 EXTENDED       1.08 FEET

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED

 3470 ENCROACHMENT STATIONS=      9989.3   10119.8  TYPE=       1   TARGET=       130.500
       .512       3.08    1639.98    1639.98       .00    1640.51       .53       4.99        .01    1639.10
      450.0        5.1      370.0       74.9       3.6       57.8      50.5        1.1        1.1    1638.90
        .03       1.43       6.40       1.48      .070       .040      .070       .000    1636.90    9989.30
    .009962       470.       533.       515.        11          8         0        .00     130.50   10119.80

 FLOW DISTRIBUTION FOR SECNO=        .51           CWSEL=    1639.98

1
     19AUG94      10:40:20                                                                                    PAGE    13
```

```
      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

  STA=     9989.      9995.     10020.     10032.     10082.     10105.     10120.
    PER Q=      1.1       82.2        3.8        5.0        6.7        1.2
     AREA=      3.6       57.8        9.4       18.7       17.3        5.1
      VEL=      1.4        6.4        1.8        1.2        1.8        1.0
    DEPTH=       .6        2.3         .8         .4         .8         .3

1
     19AUG94      10:40:20                                                                                      PAGE    14

  T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
  T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
  T3      WASH AS                  L. CULLER - (602)244-8100
  T4      JOB 15183   PR15183\ETC\WASHA\SP30AS.RAT     RUN   I
  T5      RATING CURVE FOR BREAK OUT FLOW AT CROSS SECTION 0.599
  T6      SPECIAL PROBLEM 30

  J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

                 6                                -1                                          1629

  J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

       15                   -1                                                                           15



1
     19AUG94      10:40:20                                                                                      PAGE    15

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

  *PROF 5
 0
  CCHV=      .100 CEHV=      .300
  1490 NH CARD USED
  *SECNO   .411

  3265 DIVIDED FLOW

  3720 CRITICAL DEPTH ASSUMED

  3470 ENCROACHMENT STATIONS=      9899.7    10049.0  TYPE=       1  TARGET=     -9899.700
         .411       2.61    1629.41    1629.41    1629.00    1630.12        .71        .00        .00    1630.30
        500.0       55.5      444.5         .0       18.1       62.6         .0         .0         .0    1630.60
          .00       3.06       7.10        .00       .040       .030       .000       .000    1626.80    9901.76
      .009169       545.       544.       565.          0         10          0        .00      58.06   10027.26

  FLOW DISTRIBUTION FOR SECNO=        .41           CWSEL=     1629.41

  STA=     9902.      9906.      9914.      9923.      9926.     10033.
    PER Q=       .7        5.3        4.8         .3       88.9
     AREA=      1.8        7.6        7.7        1.1       62.6
      VEL=      2.1        3.5        3.1        1.6        7.1
    DEPTH=       .5        1.0         .8         .3        1.9

  1490 NH CARD USED
  *SECNO   .512
  3280 CROSS SECTION        .51 EXTENDED       1.17 FEET

  7185 MINIMUM SPECIFIC ENERGY
  3720 CRITICAL DEPTH ASSUMED

  3470 ENCROACHMENT STATIONS=      9989.3    10119.8  TYPE=       1  TARGET=       130.500
         .512       3.17    1640.07    1640.07        .00    1640.62        .55       5.09        .02    1639.10
        500.0        6.4      397.5       96.0        4.1       60.0       59.2        1.2        1.1    1638.90
          .03       1.57       6.62       1.62       .070       .040       .070       .000    1636.90    9989.30
      .010166       470.       533.       515.         11         11          0        .00     130.50   10119.80

  FLOW DISTRIBUTION FOR SECNO=        .51           CWSEL=     1640.07
1
     19AUG94      10:40:20                                                                                      PAGE    16

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

  STA=     9989.      9995.     10020.     10032.     10082.     10105.     10120.
    PER Q=      1.3       79.5        4.1        6.2        7.3        1.6
     AREA=      4.1       60.0       10.4       23.0       19.3        6.5
      VEL=      1.6        6.6        1.9        1.4        1.9        1.2
    DEPTH=       .7        2.4         .9         .5         .8         .4
```

```
1
   19AUG94       10:40:20                                                                                        PAGE    17


                                                                     THIS RUN EXECUTED 19AUG94     10:40:21
 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
 **************************************


 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

 WASH AS

 SUMMARY PRINTOUT

          SECNO      ELMIN      CWSEL         Q        VCH     DIFWSX    TOPWID     DEPTH      SSTA     ENDST      QLOB      QROB     ELTRD

 *         .411    1626.80    1628.66    250.00       6.24        .00     42.82      1.86   9904.92  10023.64      3.04       .00       .00
 *         .411    1626.80    1628.88    300.00       6.30        .00     49.02      2.08   9904.00  10024.71     11.31       .00       .00
 *         .411    1626.80    1629.05    350.00       6.46        .00     51.86      2.25   9903.30  10025.52     21.47       .00       .00
 *         .411    1626.80    1629.31    450.00       6.86        .00     56.29      2.51   9902.20  10026.76     43.90       .00       .00
 *         .411    1626.80    1629.41    500.00       7.10        .00     58.06      2.61   9901.76  10027.26     55.52       .00       .00

 *         .512    1636.90    1639.13    250.00       6.84      10.46     32.04      2.23   9995.13  10091.10       .00       .37       .00
 *         .512    1636.90    1639.53    300.00       6.16      10.65     85.35      2.63   9991.06  10108.67       .78     12.78       .00
 *         .512    1636.90    1639.73    350.00       6.11      10.69    111.25      2.83   9989.30  10115.10      2.12     32.50       .00
 *         .512    1636.90    1639.98    450.00       6.40      10.68    130.50      3.08   9989.30  10119.80      5.09     74.86       .00
 *         .512    1636.90    1640.07    500.00       6.62      10.66    130.50      3.17   9989.30  10119.80      6.42     96.05       .00
1
   19AUG94       10:40:20                                                                                        PAGE    18


  SUMMARY OF ERRORS AND SPECIAL NOTES

 CAUTION SECNO=        .411   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .411   PROFILE=  2   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .411   PROFILE=  3   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .411   PROFILE=  4   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .411   PROFILE=  5   CRITICAL DEPTH ASSUMED

 CAUTION SECNO=        .512   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .512   PROFILE=  1   MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=        .512   PROFILE=  2   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .512   PROFILE=  2   MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=        .512   PROFILE=  3   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .512   PROFILE=  3   MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=        .512   PROFILE=  4   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .512   PROFILE=  4   MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=        .512   PROFILE=  5   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=        .512   PROFILE=  5   MINIMUM SPECIFIC ENERGY
```

SECTION 4: Hydraulic Analysis

4.6 Floodway Modeling

Flows in the washes included in this study are in the supercritical regime and velocity conditions are such that normal encroachment analyses are inappropriate. Furthermore, Wash A, between Section 0.700 and Section 1.557, and Wash A South are relatively small channels with limited capacity. A substantial part of the 100-year flow is conveyed as shallow overbank flow, producing floodways that are very wide with large areas of shallow flooding. Therefore, flooding is shown as Zone AE with no floodway calculated.

SECTION 4: Hydraulic Analysis

4.7 Final Results

Wash A Natural Profile	A
Wash A South Natural Profile	B
Wash F Natural Profile	C
Wash I Natural Profile	D

WASH A

```
1*********************************************           **************************************
 *  HEC-2 WATER SURFACE PROFILES               *           *  U.S. ARMY CORPS OF ENGINEERS       *
 *                                             *           *  HYDROLOGIC ENGINEERING CENTER      *
 *  Version    4.6.2;  May 1991                *           *  609 SECOND STREET, SUITE D         *
 *                                             *           *  DAVIS, CALIFORNIA 95616-4687       *
 *  RUN DATE    20OCT94     TIME    14:13:41   *           *           (916) 756-1104            *
***********************************************           **************************************




                              X      X  XXXXXXX   XXXXX                XXXXX
                              X      X  X        X     X              X     X
                              X      X  X        X                          X
                              XXXXXXX   XXXX     X           XXXXX     XXXXX
                              X      X  X        X                    X
                              X      X  X        X     X              X
                              X      X  XXXXXXX   XXXXX               XXXXXXX
1
    20OCT94       14:13:41                                                                PAGE     1



                                                                THIS RUN EXECUTED 20OCT94     14:13:41

 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;   May 1991
 **************************************


 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH A                    L. CULLER - (602)244-8100
 T4      JOB 15183    PR15183\ETC\WASHA\WASHA.IH2     RUN    1

 J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC     HVINS      Q        WSEL      FQ

                  2                            -1                                      1507

 J2  NPROF      IPLOT     PRFVS     XSECV     XSECH      FN        ALLDC      IBW      CHNIM     ITRACE

       -1                   -1                                                                   15


 J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       38         42         1         43         26         51         4         8          53         54
       13         15         40

 QT         1       1140
 NC       .08        .08      .035       0.1        0.3
 X1     0.000         16    9988.0   10026.0
 GR    1512.0     9970.0    1510.0    9978.5     1509.6     9988.0    1505.3    9993.9     1505.4   10000.0
 GR    1505.1    10013.1    1507.0   10015.0     1508.2    10023.8    1509.0   10026.0     1507.2   10030.4
 GR    1509.6    10036.4    1513.0   10046.3     1517.5    10074.7    1521.8   10085.4     1522.9   10104.7
 GR    1522.6    10107.8       0.0       0.0        0.0        0.0       0.0       0.0        0.0       0.0

 NC       .07        .07       .03       0.1        0.3
 X1     0.031         15    9975.4   10041.4        160        180       164
 GR    1523.7     9913.6    1523.0    9922.8     1521.7     9931.9    1520.7    9940.1     1521.5    9961.5
 GR    1521.4     9975.4    1510.5    9985.4     1510.6    10000.0    1510.4   10016.2     1512.9   10029.5
 GR    1514.5    10039.4    1522.9   10041.4     1522.9    10056.3    1523.2   10077.3     1523.2   10086.8

 X1     0.094         14    9954.2   10028.8        340        290       333
 GR    1529.6     9905.9    1529.4    9931.4     1528.0     9941.1    1526.3    9948.7     1526.3    9954.2
 GR    1518.3     9968.9    1518.5    9982.9     1518.8     9992.5    1518.2   10000.0     1518.4   10026.0
 GR    1528.8    10028.8    1529.7   10036.9     1529.8    10053.3    1529.9   10061.5        0.0       0.0

 NC       .06        .06       .03       0.1        0.3
 X1     0.181         16    9930.9   10021.1        440        450       459
 GR    1540.3     9891.4    1539.7    9909.8     1539.6     9925.1    1539.1    9930.9     1536.4    9941.3
 GR    1532.0     9956.3    1531.0    9976.3     1529.7     9982.4    1529.7   10000.0     1529.9   10003.3
 GR    1540.1    10021.1    1540.7   10026.8     1539.2    10033.7    1537.2   10040.9     1536.4   10051.5
 GR    1536.2    10065.4       0.0       0.0        0.0        0.0       0.0       0.0        0.0       0.0
1
    20OCT94       14:13:41                                                                PAGE     2


 X1     0.241         13    9953.7   10049.6        305        315       317
 GR    1544.4     9931.2    1543.4    9953.7     1536.9     9964.3    1536.6    9990.6     1536.2   10000.0
 GR    1537.1    10014.7    1538.6   10028.9     1541.1    10049.6    1542.0   10069.3     1542.8   10083.6
 GR    1542.9    10091.4    1542.7   10097.8     1542.0    10108.3       0.0       0.0        0.0       0.0

 X1     0.347         15    9978.9   10016.1        505        545       560
 GR    1553.7     9915.7    1553.6    9940.1     1553.5     9965.2    1553.2    9978.9     1551.2    9987.4
 GR    1548.1     9991.0    1547.9    9999.8     1547.8    10000.0    1547.8   10004.9     1553.1   10016.1
 GR    1552.8    10028.4    1552.8   10034.5     1552.9    10050.3    1553.1   10067.5     1553.7   10071.0

 NC       .07        .07       .03       0.1        0.3
 NH         5        .07    9989.7       .03    10017.0        .07   10303.4       .04    10321.6       .07
 NH    10414.
 X1     0.453         45    9989.7   10017.0        535        525       560
 GR    1564.5     9922.2    1564.5    9927.5     1564.4     9954.1    1564.1    9970.4     1563.0    9975.6
 GR    1563.6     9982.8    1563.1    9989.7     1558.8     9995.3    1558.8   10000.0     1558.8   10005.9
 GR    1563.6    10017.0    1564.9   10028.6     1563.6    10036.3    1563.1   10051.1     1563.2   10055.5
 GR    1563.9    10074.9    1564.4   10097.6     1564.3    10116.6    1563.6   10128.3     1564.0   10140.3
```

```
GR  1564.7   10152.9    1565.0   10169.7    1565.3   10188.1    1564.6   10218.2    1564.0   10237.6
GR  1562.7   10248.5    1563.7   10254.8    1564.2   10264.8    1563.9   10280.5    1563.4   10292.1
GR  1563.8   10303.4    1563.7   10306.9    1561.0   10309.9    1561.0   10310.5    1563.7   10315.7
GR  1564.0   10321.6    1562.6   10334.3    1563.5   10339.9    1564.3   10349.8    1564.0   10364.5
GR  1564.4   10376.5    1563.9   10385.1    1564.4   10392.7    1564.7   10403.9    1564.9   10414.0

          A MINOR FLOW BREAKOUT OCCURS AT THE RIGHT END OF SECTION 0.550. THE
          ESTIMATED BREAKOUT FLOW IS SMALL AND THE FLOW IN WASH A IS NOT REDUCED.
          (SEE SPECIAL PROBLEM NO. 5A)


NH       5       .07    9977.4       .03   10012.2       .07   10066.4       .04   10097.5       .07
NH  10237.
X1   0.550        29    9977.4   10012.2       495       460       512
GR  1572.8    9863.3    1572.8    9874.0    1572.9    9894.8    1572.7    9918.7    1571.4    9929.4
GR  1572.2    9932.4    1572.4    9958.9    1572.1    9977.4    1571.3    9988.2    1569.9    9992.9
GR  1569.9   10000.0    1570.0   10007.9    1572.2   10012.2    1571.8   10026.1    1571.7   10052.8
GR  1571.8   10066.4    1571.6   10072.3    1570.5   10084.5    1570.9   10088.2    1570.1   10091.5
GR  1571.3   10097.5    1571.2   10110.5    1571.5   10137.5    1572.0   10161.8    1571.8   10173.3
GR  1571.2   10188.5    1571.7   10206.2    1572.0   10226.4    1572.3   10237.0

QT       1      1160
NC     .08       .08       .04       0.1       0.3
X1   0.658        20    9981.0   10012.2       530       575       570
GR  1584.0    9878.2    1584.1    9904.0    1583.7    9927.5    1582.2    9942.8    1581.5    9962.7
GR  1582.3    9981.0    1579.3    9991.9    1579.3   10000.0    1579.3   10007.5    1581.8   10012.2
GR  1581.3   10022.0    1581.3   10049.1    1582.4   10064.8    1582.7   10080.7    1582.4   10095.0
GR  1582.8   10108.0    1582.4   10119.6    1582.4   10125.2    1583.6   10133.3    1583.6   10143.6

          THE CONFLUENCE WITH WASH A SOUTH IS AT RIVER MILE 0.682. THE DISCHARGE
          IS NOT CHANGED FROM THE VALUE BELOW THE CONFLUENCE TO THE VALUE ABOVE
          THE CONFLUENCE UNTIL SECTION 0.820. (SEE SPECIAL PROBLEM NO. 4A)

1
   20OCT94      14:13:41                                                                   PAGE     3


NC     .08       .08      .035       0.1       0.3
NH       5       .08    9970.2      .035   10035.4       .08   10041.5      .035   10083.7       .08
NH  10227.
X1   0.700        28    9970.2   10083.7       195       190       222
GR  1587.5    9924.0    1587.7    9939.3    1587.6    9960.1    1587.4    9970.2    1586.4    9986.5
GR  1583.9    9996.3    1583.8   10000.0    1584.1   10007.0    1585.6   10012.4    1586.0   10025.7
GR  1587.5   10035.4    1588.0   10041.5    1584.7   10055.6    1584.5   10064.7    1584.6   10072.7
GR  1587.6   10083.7    1586.3   10090.8    1586.6   10115.4    1585.3   10117.7    1585.6   10125.1
GR  1585.9   10144.3    1585.6   10166.1    1585.7   10187.0    1586.1   10195.6    1586.1   10208.3
GR  1587.6   10213.0    1588.6   10221.6    1587.8   10227.0       0.0       0.0       0.0       0.0

          FOREST SERVICE ROAD IS AT RIVER MILE 0.718 (LOW CROSSING, NO STRUCTURE)


NC     .07       .07       .04       0.1       0.3
NH       4       .07    9987.7       .04   10010.8       .07   10066.0      .026   10238.6
X1   0.723        25    9987.7   10172.2       125        90       121
GR  1590.3    9837.8    1589.9    9859.9    1589.5    9887.8    1588.7    9922.6    1589.2    9934.9
GR  1589.9    9942.0    1588.7    9959.0    1588.4    9987.7    1586.3    9996.9    1586.2   10000.0
GR  1586.3   10002.7    1588.4   10010.8    1587.5   10023.5    1587.3   10039.2    1586.8   10051.8
GR  1585.8   10061.7    1587.0   10066.0    1586.5   10078.5    1586.0   10094.9    1585.6   10124.2
GR  1585.9   10152.4    1586.4   10172.2    1587.3   10198.0    1588.1   10222.0    1588.2   10238.6

QT       1       595
NC     .07       .07       .04       0.1       0.3
NH       5       .07    9888.9       .04    9910.2       .07    9979.3       .04   10013.1       .07
NH  10117.
X1   0.820        24    9979.3   10013.1       485       520       512
GR  1598.1    9865.2    1597.9    9876.1    1597.6    9888.9    1596.5    9895.9    1596.6    9903.2
GR  1597.7    9910.2    1597.9    9925.5    1597.6    9943.5    1597.3    9963.3    1597.3    9979.3
GR  1596.7    9987.6    1596.1    9994.8    1596.2   10000.0    1596.3   10008.1    1597.2   10013.1
GR  1597.2   10025.4    1597.2   10035.5    1596.4   10044.2    1595.8   10048.7    1597.7   10061.9
GR  1598.2   10075.9    1598.2   10092.5    1598.2   10098.5    1598.1   10117.0

NH       7       .07    9752.3       .04    9820.2       .07    9898.0       .04    9914.2       .07
NH  9984.2      .035   10015.8       .07   10222.0
X1   0.902        38    9984.2   10015.8       420       420       433
GR  1606.7    9736.9    1606.2    9752.3    1605.5    9764.8    1603.8    9776.9    1605.9    9785.3
GR  1606.2    9795.8    1605.3    9809.9    1606.6    9820.2    1606.8    9840.3    1607.4    9858.3
GR  1607.4    9874.0    1607.0    9886.1    1606.1    9898.0    1604.7    9906.7    1606.1    9914.2
GR  1606.2    9926.1    1606.3    9944.0    1606.5    9962.3    1606.6    9984.2    1605.8    9991.6
GR  1605.9   10000.0    1606.0   10008.6    1606.6   10015.8    1606.4   10035.4    1606.3   10048.6
GR  1606.1   10058.1    1606.3   10066.4    1606.1   10078.2    1606.6   10096.7    1606.7   10112.9
GR  1607.0   10129.2    1606.9   10137.8    1606.5   10152.2    1606.7   10161.4    1607.2   10181.0
GR  1607.2   10184.2    1607.5   10205.6    1607.5   10222.0

NC     .07       .07       .04       0.1       0.3
NH       5       .07    9748.1       .04    9802.1       .07    9986.4      .035   10066.8       .07
NH  10109.
1
   20OCT94      14:13:41                                                                   PAGE     4

X1   0.990        28    9986.4   10066.8       455       455       465
GR  1616.8   9728.69    1616.8    9728.7    1616.7    9748.1    1615.2    9762.7    1614.7    9769.9
GR  1615.9    9779.1    1615.1    9790.2    1614.3    9795.4    1615.9    9802.1    1615.8    9810.0
GR  1615.2    9817.3    1615.7    9832.2    1615.7    9851.8    1615.6    9872.9    1615.6    9901.2
GR  1616.3    9922.2    1616.1    9928.9    1616.2    9944.3    1615.8    9956.9    1616.1    9977.8
GR  1616.0    9986.4    1614.8    9995.0    1614.7   10000.0    1615.0   10010.0    1615.4   10025.0
GR  1615.0   10038.4    1615.8   10066.8    1616.2   10091.2    1616.1   10109.0

          AN ADDITIONAL 55 CFS FROM WASH A SOUTH ENTERS WASH A AT CROSS SECTION
          1.117. (SEE SPECIAL PROBLEM NO. 1AS)
```

```
NC       .07       .07      .035       0.1       0.3
NH         7       .07    9957.1      .035   10009.0       .07   10117.6       .04   10134.8       .07
NH    10228.       .04   10241.1       .07   10315.0
X1     1.117        30    9957.1   10009.0       655       605       671
GR    1630.0    9906.7    1630.4    9922.7    1630.2    9937.6    1630.4    9957.1    1628.9    9973.4
GR    1628.2    9982.5    1627.7    9991.9    1627.7   10000.0    1630.3   10009.0    1630.2   10023.4
GR    1630.2   10042.1    1630.2   10061.5    1629.8   10077.3    1628.9   10091.9    1628.1   10108.0
GR    1627.9   10117.6    1625.5   10127.0    1628.1   10134.8    1628.3   10144.8    1628.7   10167.0
GR    1629.2   10185.5    1629.7   10204.1    1629.1   10214.9    1627.8   10228.0    1626.3   10234.1
GR    1628.4   10241.1    1628.6   10264.2    1628.7   10283.6    1629.5   10303.4    1629.5   10315.0

QT         1       540
NH         9       .07    9984.3      .035   10009.7       .07   10100.4       .04   10113.2       .07
NH    10189.       .04   10220.3       .07   10402.2       .04   10439.3       .07   10520.8
X1     1.208        56    9984.3   10009.7       475       435       480
GR    1640.1    9869.2    1639.8    9889.4    1639.8    9907.9    1639.4    9927.4    1639.6    9948.7
GR    1639.6    9965.9    1639.7    9984.3    1636.8    9993.7    1636.9   10000.0    1637.0   10005.2
GR    1638.9   10009.7    1639.0   10017.7    1639.1   10035.1    1639.0   10059.7    1638.8   10079.3
GR    1639.0   10090.1    1638.4   10100.4    1636.4   10104.6    1638.0   10113.2    1638.7   10125.8
GR    1638.9   10140.3    1639.2   10156.7    1639.0   10175.0    1638.7    10189.    1637.3   10193.5
GR    1638.1   10209.3    1638.8   10220.3    1638.5   10233.3    1639.0   10244.8    1639.2   10259.3
GR    1638.8   10280.5    1638.7   10299.4    1637.9   10311.7    1637.0   10319.7    1638.0   10325.6
GR    1638.2   10327.0    1639.0   10335.0    1639.0   10349.6    1638.5   10365.1    1638.4   10380.6
GR    1638.4   10389.1    1638.2   10402.2    1637.8   10409.2    1636.2   10412.2    1637.7   10416.7
GR    1638.1   10422.7    1637.9   10431.4    1636.8   10435.7    1638.2   10439.3    1638.7   10452.5
GR    1638.2   10463.5    1638.6   10475.0    1638.9   10485.3    1639.0   10491.7    1639.2   10509.0
GR    1639.7   10520.8

NC       .08       .08       .04       0.1       0.3
X1     1.306        27    9990.4   10018.8       500       445       517
GR    1651.3    9853.7    1651.5    9872.8    1650.9    9894.3    1650.8    9917.4    1650.3    9935.3
GR    1650.6    9953.7    1648.5    9957.5    1650.8    9961.3    1650.6    9976.9    1650.3    9990.4
GR    1649.0    9997.3    1650.0   10000.0    1648.6   10010.4    1650.0   10018.8    1649.3   10031.8
GR    1649.3   10046.3    1649.8   10060.6    1650.0   10079.7    1648.9   10097.6    1649.7   10111.9
GR    1649.6   10125.7    1649.4   10148.9    1649.2   10166.7    1649.8   10179.7    1649.9   10186.8
GR    1649.3   10202.1    1650.2   10210.1
1
   20OCT94       14:13:41                                                                                  PAGE      5


NC       .08       .08       .04       0.1       0.3
X1     1.367        14    9991.0   10050.8       295       385       322
GR    1658.5   9918.79    1658.5    9918.8    1657.9    9949.1    1658.2    9964.5    1657.6    9978.0
GR    1657.3    9991.0    1656.5    9996.0    1656.6   10000.0    1656.7   10015.0    1657.2   10031.4
GR    1657.7   10050.8    1658.1   10082.4    1659.3   10107.3    1659.7   10124.7

          THE CONFLUENCE WITH WASH A SOUTH IS AT RIVER MILE 1.586. THE DISCHARGE
          IS CHANGED FROM THE VALUE BELOW THE CONFLUENCE TO THE VALUE ABOVE THE
          AT CROSS SECTION 1.472. (SEE SPECIAL PROBLEM NO. 3A)

QT         1      1080
NH         9       .08    9997.7      .035   10031.3       .08   10044.5       .04   10062.8       .08
NH    10155.      .035   10189.1       .08   10377.8       .04   10392.2       .08   10430.5
X1     1.472        40    9997.7   10189.1       545       655       554
GR    1671.9    9857.1    1671.2    9888.6    1670.5    9924.1    1670.7    9954.2    1670.1    9984.9
GR    1669.9    9997.7    1669.0   10000.0    1669.3   10011.9    1669.7   10021.4    1669.9   10031.3
GR    1669.5   10044.5    1668.8   10052.4    1669.5   10062.8    1669.6   10084.3    1669.5   10095.2
GR    1669.2   10119.1    1668.6   10137.2    1668.6   10155.0    1667.6   10158.2    1668.4   10169.0
GR    1668.4   10177.3    1667.5   10183.7    1668.4   10189.1    1669.0   10209.9    1669.0   10238.9
GR    1668.9   10241.5    1668.9   10262.1    1669.8   10287.8    1669.7   10304.8    1669.0   10322.4
GR    1669.5   10330.5    1669.7   10348.7    1670.6   10360.8    1670.1   10377.8    1668.0   10382.9
GR    1668.0   10387.1    1669.2   10392.2    1669.5   10400.3    1670.1   10413.1    1670.3   10430.5

NC       .08       .08      .035       0.1       0.3
NH        11       .08    9900.8       .04    9906.8       .08    9944.9       .04    9968.1       .08
NH    9997.0      .035   10010.0       .08   10086.7      .035   10104.0       .08   10186.7       .04
NH    10212.       .08   10334.1
X1     1.557        41    9997.0   10104.0       400       490       449
GR    1680.6    9827.0    1680.4    9852.9    1679.9    9866.7    1679.7    9873.1    1680.5    9884.2
GR    1680.4    9900.8    1678.7    9902.1    1680.5    9906.8    1680.5    9923.8    1680.2    9944.9
GR    1679.1    9959.4    1679.4    9968.1    1679.7    9987.6    1679.9    9997.0    1678.9   10000.0
GR    1679.0   10004.0    1679.1   10007.2    1679.8   10010.0    1679.5   10025.4    1679.3   10044.0
GR    1679.7   10059.3    1679.5   10064.5    1679.7   10074.1    1679.8   10086.7    1679.7   10095.2
GR    1680.2   10104.0    1680.0   10126.8    1680.1   10143.9    1679.7   10158.7    1680.1   10173.6
GR    1679.9   10186.7    1678.1   10190.1    1679.1   10198.5    1680.3   10212.0    1680.7   10231.1
GR    1679.1   10245.3    1680.0   10263.1    1680.7   10284.3    1681.1   10301.7    1681.7   10316.4
GR    1681.9   10334.1

QT         1      1090
NC       .08       .07      .035       0.1       0.3
NH         5       .08    9976.1      .035   10024.9       .07   10290.3       .04   10306.4       .07
NH    10403.
X1     1.629        42    9976.1   10024.9       415       330       380
GR    1691.0    9776.0    1691.0    9795.8    1689.7    9815.3    1689.5    9825.7    1690.1    9853.6
GR    1689.5    9883.0    1689.8    9905.9    1689.3    9922.9    1688.3    9941.1    1689.2    9957.0
GR    1689.4    9976.1    1688.8    9986.4    1688.4    9998.7    1688.6   10000.0    1689.1   10008.6
GR    1688.7   10017.0    1688.9   10024.9    1688.2   10033.7    1688.9   10042.8    1688.9   10043.0
GR    1688.7   10060.8    1687.6   10074.0    1688.5   10080.8    1688.2   10098.0    1687.7   10106.1
GR    1689.0   10119.5    1689.1   10143.2    1688.6   10158.1    1688.8   10172.5    1688.7   10186.5
GR    1688.6   10193.3    1687.1   10201.7    1688.4   10216.4    1688.8   10238.5    1689.3   10255.7
GR    1688.9   10272.1    1688.3   10290.3    1686.3   10301.0    1688.6   10306.4    1688.6   10329.5
GR    1689.6   10367.5    1689.5   10403.0
1
   20OCT94       14:13:41                                                                                  PAGE      6


NC       .07       .07      .035       0.1       0.3
```

```
NH         5       .07    9793.3       .04    9851.5       .07    9984.3      .035   10032.8       .07
NH    10115.
X1     1.733        23    9984.3   10032.8       490       510       549
GR    1702.9   9757.59    1702.9    9757.6    1702.3    9775.1    1701.5    9793.3    1701.4    9803.8
GR    1701.0    9810.5    1700.8    9821.9    1701.1    9835.8    1701.7    9851.5    1701.9    9871.2
GR    1701.7    9894.3    1702.2    9927.6    1702.4    9945.8    1703.1    9969.2    1702.9    9984.3
GR    1702.3    9995.3    1701.6   10000.0    1702.3   10016.3    1702.7   10032.8    1703.8   10056.4
GR    1704.5   10073.0    1704.3   10092.7    1703.6   10115.0

NH         7       .07    9792.9       .04    9818.3       .07    9915.1       .04    9941.6       .07
NH    9977.5      .035   10043.9       .07   10088.2
X1     1.806        39    9977.5   10043.9       385       370       385
GR    1712.7   9726.18    1712.7   9726.19    1712.7    9726.2    1712.2    9739.4    1711.9    9750.6
GR    1711.5    9765.2    1711.7    9775.0    1712.1    9784.7    1712.1    9792.9    1711.6    9797.0
GR    1710.9    9801.7    1710.6    9804.9    1710.6    9809.6    1711.1    9813.4    1712.4    9818.3
GR    1712.3    9835.0    1712.0    9860.5    1712.2    9881.2    1712.1    9897.9    1711.8    9915.1
GR    1711.5    9927.1    1711.7    9933.2    1711.1    9933.9    1711.8    9941.6    1712.6    9953.3
GR    1712.6    9966.9    1712.5    9977.5    1712.0    9980.8    1710.8    9984.5    1710.8    9992.7
GR    1710.9    9999.9    1711.1   10000.0    1711.2   10007.9    1711.1   10017.5    1711.8   10029.3
GR    1712.6   10043.9    1713.0   10058.8    1713.0   10076.0    1713.1   10088.2

NH         7       .07    9644.0       .04    9675.2       .07    9860.0       .04    9886.7       .07
NH    9958.2      .035   10070.3       .07   10140.5
X1     1.887        39    9958.2   10070.3       415       400       428
GR    1723.7    9561.7    1723.5    9588.3    1723.2    9613.8    1722.6    9644.0    1719.8    9651.4
GR    1720.1    9657.0    1721.2    9661.7    1720.1    9668.3    1721.4    9675.2    1721.5    9689.8
GR    1721.4    9692.3    1721.4    9709.0    1722.1    9729.6    1722.3    9755.5    1722.4    9785.4
GR    1722.3    9810.3    1721.9    9832.1    1721.9    9846.2    1722.0    9860.0    1721.8    9872.4
GR    1721.0    9876.3    1721.2    9882.6    1722.2    9886.7    1722.2    9905.6    1722.1    9936.4
GR    1722.6    9958.2    1721.7    9974.6    1721.1    9988.8    1721.2   10000.0    1721.5   10017.5
GR    1721.7   10039.0    1721.7   10060.4    1722.0   10070.3    1721.5   10082.8    1722.4   10091.5
GR    1721.8   10103.3    1721.7   10116.2    1722.6   10127.2    1722.9   10140.5

QT         1      1110
NH         6       .07    9874.2       .04    9923.5       .07    9988.0      .035   10018.5       .07
NH    10249.       .04   10348.6
X1     1.983        42    9988.0   10018.5       525       505       507
GR    1737.3    9676.1    1738.1    9695.6    1737.1    9713.9    1737.9    9725.1    1738.0    9741.3
GR    1736.5    9761.2    1735.9    9786.6    1734.9    9807.5    1734.0    9818.6    1733.3    9828.2
GR    1734.7    9837.9    1733.9    9850.9    1733.8    9862.6    1734.1    9874.2    1733.9    9883.6
GR    1731.8    9889.8    1733.5    9895.3    1734.5    9910.0    1735.2    9923.5    1735.0    9944.4
GR    1734.7    9946.0    1734.4    9963.1    1733.5    9974.9    1734.2    9988.0    1732.7    9996.9
GR    1732.7   10000.0    1733.1   10013.4    1734.1   10018.5    1734.7   10031.5    1733.5   10041.3
GR    1734.2   10045.0    1734.7   10074.2    1735.6   10112.9    1735.5   10154.9    1735.9   10184.5
GR    1736.1   10217.0    1735.5   10227.4    1736.7   10249.0    1736.2   10280.8    1736.5   10306.2
GR    1736.3   10327.7    1736.6   10348.6

          A SPLIT FLOW CONDITION OCCURS JUST DOWNSTREAM OF SECTION 2.105.
          FLOW EXITS INTO A SMALL WASH WHICH ENDS
          IN WASH A CHANNEL JUST DOWNSTREAM.
          RATING CURVES FOR THIS SECTION AND THE SMALL WASH WERE DEVELOPEDED AND
          ADDED TOGETHER TO DETERMINE THAT APPROXIMATELY 60 CFS LEAVES AT THIS
1
  20OCT94       14:13:41                                                                    PAGE     7

          LOCATION.  DUE TO THE DISCHARGE BEING LESS THAN 6 PERCENT OF THE TOTAL
          FLOW THERE WAS NO FLOW REDUCTION IN WASH A DISCHARGE. (SEE SPECIAL
          PROBLEM  NO. 2A)

NC       .08       .07      .035       0.1       0.3
X1     2.105        25    9989.7   10060.7       675       655       644
GR    1751.0    9826.6    1750.9    9849.4    1749.6    9894.0    1748.9    9914.6    1749.0    9944.2
GR    1749.2    9971.3    1748.9    9989.7    1747.0   10000.0    1748.9   10010.4    1749.2   10024.4
GR    1748.9   10030.7    1747.7   10034.1    1748.3   10041.7    1749.1   10060.7    1748.5   10078.6
GR    1748.2   10090.7    1748.8   10097.9    1749.3   10106.8    1748.7   10135.7    1749.2   10159.0
GR    1749.0   10175.1    1749.2   10190.0    1748.4   10195.3    1749.5   10209.2    1750.2   10224.0

NH         5       .08    9815.9       .04    9840.0       .08    9967.8      .035   10016.8       .07
NH    10139.
X1     2.181        39    9967.8   10016.8       390       370       401
GR    1760.8    9702.6    1760.8    9723.4    1761.0    9741.6    1761.3    9762.5    1761.4    9787.6
GR    1761.0    9815.9    1760.1    9821.8    1759.9    9836.1    1760.9    9840.0    1761.0    9855.3
GR    1760.8    9864.9    1759.3    9871.0    1760.1    9878.6    1759.9    9880.5    1759.8    9888.1
GR    1758.6    9892.5    1759.6    9897.4    1759.4    9914.7    1759.8    9932.3    1759.8    9941.7
GR    1758.8    9944.6    1758.9    9953.8    1758.9    9967.8    1757.8    9973.5    1757.8    9981.3
GR    1758.5    9990.7    1757.5    9997.2    1757.3   10000.0    1757.3   10012.0    1758.8   10016.8
GR    1758.8   10030.3    1758.7   10053.2    1758.9   10064.8    1758.6   10086.2    1759.1   10100.2
GR    1759.6   10108.2    1760.2   10112.6    1760.5   10135.0    1760.6   10139.0       0.0       0.0

NH         5       .08    9989.4      .035   10056.7       .07   10116.9       .04   10139.3       .07
NH    10250.
X1     2.297        25    9989.4   10056.7       625       575       612
GR    1774.7   9924.09    1774.7    9924.1    1774.0    9941.4    1773.2    9961.6    1773.7    9979.3
GR    1773.2    9983.0    1773.3    9989.4    1772.4    9994.2    1772.5   10000.0    1772.3   10010.2
GR    1772.8   10016.7    1772.8   10037.5    1773.5   10056.7    1774.2   10081.6    1773.8   10104.5
GR    1773.9   10116.9    1771.6   10121.2    1772.0   10130.7    1773.8   10139.3    1773.8   10150.4
GR    1773.7   10173.1    1773.7   10193.1    1774.0   10215.8    1773.9   10234.7    1774.5   10250.0

NH         5       .07    9990.9      .035   10017.4       .07   10061.2       .04   10077.4       .07
NH    10319.
X1     2.403        39    9990.9   10017.4       530       550       560
GR    1788.4   9832.57    1788.4   9832.58    1788.4   9832.59    1788.4    9832.6    1788.0    9849.9
GR    1787.9    9872.8    1787.6    9883.9    1786.6    9886.4    1787.5    9891.2    1787.5    9909.2
GR    1786.5    9928.8    1786.1    9934.4    1787.0    9948.5    1787.4    9954.6    1788.0    9977.2
GR    1787.6    9990.9    1786.8   10000.0    1786.0   10005.1    1785.9   10010.1    1787.4   10017.4
GR    1787.8   10035.3    1787.5   10061.2    1786.3   10068.9    1787.7   10077.4    1787.8   10085.6
GR    1786.1   10094.3    1787.8   10103.2    1787.6   10122.6    1787.6   10147.5    1788.2   10173.9
GR    1788.6   10176.7    1787.5   10196.6    1788.5   10213.0    1789.3   10229.3    1789.2   10246.8
GR    1788.4   10265.6    1788.6   10285.7    1789.1   10304.6    1789.8   10319.0       0.0       0.0
```

A FLOW BREAKOUT OCCURS AT SECTION 2.494. FLOW EXITS ON THE RIGHT SIDE. RATING CURVES FOR THIS SECTION AND THE WATERSHED DIVIDE WERE DEVELOPED AND ADDED TOGETHER TO DETERMINE THAT APPROXIMATELY 220 CFS LEAVES WASH A. 160 CFS LEAVES BELOW THE SECTION AND 60 CFS LEAVES AT THE SECTION. THEREFORE THE DISCHARGE FOR SECTION 2.494 HAS BEEN REDUCED FROM 1330 CFS TO 1270 CFS AND THE DISCHARGE FOR THE NEXT DOWNSTREAM SECTION 2.403 HAS BEEN REDUCED FROM 1330 CFS TO 1110 CFS. (SEE SPECIAL PROBLEM NO. 1A)

```
1                                                                                                                                        PAGE    8
   20OCT94       14:13:41



QT         1        1270
NC       .08         .06        .035         0.1         0.3
X1     2.494          21      9976.7     10019.1         445         425         480
GR    1801.5     9902.67      1801.5     9902.68      1801.5     9902.69      1801.5      9902.7      1801.0      9921.9
GR    1799.7      9944.1      1800.4      9961.0      1799.5      9976.7      1798.6      9991.6      1798.6     10000.0
GR    1798.8     10008.1      1799.8     10019.1      1799.8     10036.1      1800.1     10048.0      1799.5     10062.1
GR    1799.0     10066.8      1797.5     10071.5      1799.0     10079.7      1799.6     10096.8      1800.0     10122.6
GR    1800.2     10130.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0


1                                                                                                                                        PAGE    9
   20OCT94       14:13:41

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *PROF 1
0

 CCHV=     .100 CEHV=     .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
       .000      4.29    1509.39    1509.39    1507.00    1510.83       1.44        .00        .00    1509.60
     1140.0        .0     1113.6       26.4         .0      114.2       11.7         .0         .0    1509.00
        .00       .00       9.75       2.26       .000       .035       .080       .000    1505.10    9988.29
    .013052        0.         0.         0.          0         16          0        .00      47.59   10035.88


 FLOW DISTRIBUTION FOR SECNO=       .00           CWSEL=    1509.39

 STA=     9988.   10026.   10030.   10036.
   PER Q=     97.7      1.2      1.1
    AREA=    114.2      5.7      6.0
     VEL=      9.8      2.4      2.1
   DEPTH=      3.0      1.3      1.1

 CCHV=     .100 CEHV=     .300
 *SECNO  .031
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
       .031      3.21    1513.61    1513.61        .00    1514.86       1.25       1.89        .02    1521.40
     1140.0        .0     1140.0         .0         .0      127.0         .0         .5         .2    1522.90
        .01       .00       8.97        .00       .000       .030       .000       .000    1510.40    9982.55
    .010230      160.       164.       180.         20         15          0        .00      51.33   10033.88


 FLOW DISTRIBUTION FOR SECNO=       .03           CWSEL=    1513.61

 STA=     9983.   10041.
   PER Q=    100.0
    AREA=    127.0
     VEL=      9.0
   DEPTH=      2.5

 *SECNO  .094
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
1                                                                                                                                        PAGE   10
   20OCT94       14:13:41

      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
       .094      2.47    1520.67    1520.67        .00    1521.78       1.10       3.50        .01    1526.30
     1140.0        .0     1140.0         .0         .0      135.2         .0        1.5         .6    1528.80
        .02       .00       8.43        .00       .000       .030       .000       .000    1518.20    9964.54
    .010802      340.       333.       290.         20         15          0        .00      62.07   10026.61


 FLOW DISTRIBUTION FOR SECNO=       .09           CWSEL=    1520.67

 STA=     9965.   10029.
   PER Q=    100.0
    AREA=    135.2
     VEL=      8.4
   DEPTH=      2.2
```

```
CCHV=     .100 CEHV=      .300
*SECNO  .181
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     .181       3.41   1533.11   1533.11        .00   1534.28       1.17       4.82        .02   1539.10
   1140.0         .0    1140.0        .0         .0     131.3         .0        2.9        1.2   1540.10
      .03        .00      8.68       .00       .000      .030       .000       .000    1529.70   9952.50
  .010231       440.      459.      450.        20.        11          0        .00      56.41  10008.91


FLOW DISTRIBUTION FOR SECNO=        .18           CWSEL=    1533.11

STA=     9953.   10021.
  PER Q=     100.0
   AREA=     131.3
    VEL=       8.7
  DEPTH=       2.3

*SECNO  .241
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     .241       2.84   1539.04   1539.04        .00   1540.05       1.01       3.33        .02   1543.40
   1140.0         .0    1140.0        .0         .0     141.6         .0        3.9        1.7   1541.10
      .04        .00      8.05       .00       .000      .030       .000       .000    1536.20   9960.81
  .010815       305.      317.      315.         20        15          0        .00      71.73  10032.54


1
    20OCT94       14:13:41                                                                             PAGE     11

     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


FLOW DISTRIBUTION FOR SECNO=        .24           CWSEL=    1539.04

STA=     9961.   10050.
  PER Q=     100.0
   AREA=     141.6
    VEL=       8.1
  DEPTH=       2.0

*SECNO  .347

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     .347       5.29   1553.09   1553.09        .00   1554.44       1.35       5.16        .10   1553.20
   1140.0         .0    1133.5       6.5         .0     121.2        8.6        5.6        2.7   1553.10
      .06        .00      9.36       .75       .000      .030       .060       .000    1547.80   9979.38
  .007942       505.      560.      545.         20        17          0        .00      86.32  10066.30


FLOW DISTRIBUTION FOR SECNO=        .35           CWSEL=    1553.09

STA=     9979.    10016.     10028.    10035.    10050.    10066.
  PER Q=      99.4         .1         .1        .3        .1
   AREA=     121.2        1.7        1.7       3.7       1.5
    VEL=       9.4         .6        1.0        .8        .5
  DEPTH=       3.3         .1         .3        .2        .1

CCHV=     .100 CEHV=      .300
1490 NH CARD USED
*SECNO  .453

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1
    20OCT94       14:13:41                                                                             PAGE     12

     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


     .453       5.63   1564.43   1564.43        .00   1565.10        .67       2.95        .07   1563.10
   1140.0       28.3     863.2     248.5       23.2     115.0      181.5        8.4        5.5   1563.60
      .08       1.22      7.51      1.37       .070      .030       .061       .000    1558.80   9946.43
  .003787       535.      560.      525.         20         8          0        .00     364.63  10393.78


FLOW DISTRIBUTION FOR SECNO=        .45           CWSEL=    1564.43

STA=     9946.     9990.    10017.    10056.    10140.    10281.    10310.    10316.    10340.    10394.
  PER Q=       2.5      75.7       3.0       3.2       3.3       3.9       4.2       3.3        .9
   AREA=      23.2     115.0      26.7      38.0      34.9      27.0      12.9      25.5      16.6
    VEL=       1.2       7.5       1.3        .9       1.1       1.6       3.7       1.5        .6
```

```
 DEPTH=       .5      4.2       .7       .4       .2       .9      2.2      1.1       .3

1490 NH CARD USED
*SECNO  .550
3280 CROSS SECTION       .55 EXTENDED       .27 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    .550      2.67  1572.57   1572.57       .00  1573.02       .45      2.92       .02  1572.10
  1140.0      25.2    490.3     624.5      21.0     64.6     222.2      11.9       9.1  1572.20
     .11      1.20     7.59      2.81      .070     .030      .058      .000   1569.90  9919.78
 .010597      495.     512.      460.        20       13         0       .00    317.22 10237.00

FLOW DISTRIBUTION FOR SECNO=       .55          CWSEL=   1572.57

STA=    9920.    9977.   10012.   10053.   10072.   10085.   10088.   10092.   10098.   10111.   10138.   10162.   10189.
  PER Q=      2.2     43.0      4.7      3.4      8.2      3.5      3.6      5.6      4.0      7.2      3.3      4.4
   AREA=     21.0     64.6     29.8     16.3     18.5      6.9      6.8     11.2     17.1     32.9     19.9     23.9
    VEL=      1.2      7.6      1.8      2.4      5.0      5.8      6.1      5.7      2.6      2.5      1.9      2.1
  DEPTH=       .4      1.9       .7       .8      1.5      1.9      2.1      1.9      1.3      1.2       .8       .9

STA=   10189.   10206.   10237.
  PER Q=      4.1      2.7
   AREA=     19.8     19.0
    VEL=      2.4      1.6
  DEPTH=      1.1       .6
1
   20OCT94       14:13:41                                                                                      PAGE    13

     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


CCHV=     .100 CEHV=     .300
*SECNO  .658
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    .658      3.81  1583.11   1583.11       .00  1583.81       .70      6.13       .08  1582.30
  1160.0     110.0    779.2     270.8      51.3     96.6     119.0      15.6      12.5  1581.80
     .14      2.14     8.07      2.28      .080     .040      .080      .000   1579.30  9933.54
 .010918      530.     570.      575.        11       11         0       .00    196.44 10129.98

FLOW DISTRIBUTION FOR SECNO=       .66          CWSEL=   1583.11

STA=    9934.    9963.    9981.   10012.   10022.   10049.   10065.   10120.   10130.
  PER Q=      5.3      4.2     67.2      3.4     12.2      3.8      3.2       .7
   AREA=     29.2     22.1     96.6     15.3     49.0     19.7     29.3      5.7
    VEL=      2.1      2.2      8.1      2.6      2.9      2.3      1.3      1.4
  DEPTH=      1.0      1.2      3.1      1.6      1.8      1.3       .5       .5

CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .700

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    .700      3.06  1586.86   1586.86       .00  1587.42       .57      2.63       .01  1587.40
  1160.0        .0    909.1     250.9        .0    135.4     112.6      16.8      13.4  1587.60
     .15       .00     6.72      2.23      .000     .035      .080      .000   1583.80  9979.07
 .014010      195.     222.      190.        10       16         0       .00    209.66 10210.67

FLOW DISTRIBUTION FOR SECNO=       .70          CWSEL=   1586.86

STA=    9979.   10035.   10084.   10125.   10144.   10166.   10187.   10208.   10211.
  PER Q=     43.0     35.3      3.9      4.3      4.9      5.4      3.0       .1
   AREA=     77.1     58.2     23.3     21.2     24.1     25.2     17.8       .9
    VEL=      6.5      7.0      1.9      2.4      2.4      2.5      2.0      1.1
  DEPTH=      1.5      1.7       .6      1.1      1.1      1.2       .8       .4
1
   20OCT94       14:13:41                                                                                      PAGE    14

     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .723

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.07

    .723      2.29  1587.89       .00       .00  1588.14       .25       .69       .03  1588.40
  1160.0        .0   1062.3      97.7        .0    259.0      32.2      17.5      13.9  1586.40
     .16       .00     4.10      3.04      .000     .027      .026      .000   1585.60  9989.92
 .003255      125.     121.       90.         3        0         0       .00    216.73 10215.77
```

```
FLOW DISTRIBUTION FOR SECNO=        .72          CWSEL=   1587.89

STA=     9990.   10018.   10066.   10172.   10198.   10216.
  PER Q=      3.7      3.9     83.9      7.8       .7
   AREA=     20.0     41.6    197.4     26.9      5.3
    VEL=      2.2      1.1      4.9      3.4      1.4
  DEPTH=      1.1       .9      1.9      1.0       .3

CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO  .820

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .820      2.09   1597.89   1597.89       .00   1598.29       .40      2.60       .04   1597.30
     595.0     149.8     295.4     149.8      44.5      46.1      48.4      20.0      16.3   1597.20
       .19      3.37      6.41      3.09      .048      .040      .070      .000   1595.80   9876.62
   .019804      485.      512.      520.        20        12         0       .00    188.87  10067.16


FLOW DISTRIBUTION FOR SECNO=        .82          CWSEL=   1597.89

STA=     9877.    9896.    9903.    9910.    9979.   10013.   10025.   10044.   10049.   10062.   10067.
  PER Q=      4.8     10.4      3.7      6.3     49.6      3.3      7.7      5.9      8.2       .1
   AREA=      7.6      9.8      5.2     21.9     46.1      8.5     16.4      8.0     15.0       .5
    VEL=      3.7      6.3      4.2      1.7      6.4      2.3      2.8      4.4      3.2       .6
  DEPTH=       .4      1.3       .7       .3      1.4       .7       .9      1.8      1.1       .1

1
   20OCT94      14:13:41                                                                              PAGE   15


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

1490 NH CARD USED
*SECNO  .902

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .902      2.82   1606.62   1606.62       .00   1606.89       .28      7.03       .01   1606.60
     595.0     507.2      59.9      28.0     115.2      17.6      23.8      21.5      18.7   1606.60
       .21      4.40      3.40      1.18      .042      .035      .070      .000   1603.80   9739.42
   .014098      420.      433.      420.         6        11         0       .00    300.75  10157.63

FLOW DISTRIBUTION FOR SECNO=        .90          CWSEL=   1606.62

STA=     9739.    9765.    9777.    9785.    9796.    9810.    9820.    9907.    9914.    9962.    9984.   10016.   10078.
  PER Q=      6.4     27.5     15.8      3.0      8.2      3.9      9.2      7.6      3.5       .1     10.1      3.8
   AREA=     12.3     23.8     14.9      6.0     12.2      6.9     12.4      9.1     16.1      1.5     17.6     18.2
    VEL=      3.1      6.9      6.3      3.0      4.0      3.4      4.4      5.0      1.3       .4      3.4      1.2
  DEPTH=       .5      2.0      1.8       .6       .9       .7       .1      1.2       .3       .1       .6       .3

STA=    10078.   10158.
  PER Q=       .9
   AREA=      5.6
    VEL=      1.0
  DEPTH=       .1

CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO  .990

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .990      1.72   1616.02   1616.02       .00   1616.34       .32      7.87       .01   1616.00
     595.0     251.3     342.6       1.0      81.0      64.2       1.5      23.1      21.7   1615.80
       .24      3.10      5.34       .71      .049      .035      .070      .000   1614.30   9754.72
   .021345      455.      465.      455.        5.        14         0       .00    276.67  10080.18


1
   20OCT94      14:13:41                                                                              PAGE   16


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=        .99          CWSEL=   1616.02

STA=     9755.    9770.    9779.    9790.    9795.    9802.    9832.    9873.    9901.    9986.   10067.   10080.
  PER Q=      9.0      4.8      3.4      7.5      5.2      4.5      3.6      3.5       .8     57.6       .2
   AREA=     11.0      6.6      5.8      6.9      6.2     13.6     14.1     11.9      5.1     64.2      1.5
    VEL=      4.9      4.3      3.5      6.5      5.0      2.0      1.5      1.7       .9      5.3       .7
  DEPTH=       .7       .7       .5      1.3       .9       .5       .3       .4       .1       .8       .1

CCHV=      .100 CEHV=      .300
```

```
1490 NH CARD USED
*SECNO 1.117

3265 DIVIDED FLOW

     1.117      3.30   1628.80   1628.78       .00   1629.19       .40     12.83       .02   1630.40
     595.0        .0     100.7     494.3        .0      21.3      96.6      25.0      25.0   1630.30
       .28       .00      4.72      5.11      .000      .035      .044      .000   1625.50   9974.70
   .018866      655.      671.      605.         8        17         0       .00    174.07  10286.08


FLOW DISTRIBUTION FOR SECNO=      1.12          CWSEL=   1628.80

STA=    9975.   10009.   10118.   10127.   10135.   10167.   10234.   10241.   10286.
  PER Q=     16.9      4.4     27.2     20.5      3.6     14.6     10.8      1.9
   AREA=     21.3     12.6     19.7     15.6     12.7     15.9     10.2     10.0
    VEL=      4.7      2.1      8.2      7.8      1.7      5.5      6.4      1.2
  DEPTH=       .7       .1      2.1      2.0       .4       .2      1.5       .2

1490 NH CARD USED
*SECNO 1.208

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.208      2.37   1638.57   1638.57       .00   1638.88       .31      7.50       .01   1639.70
     540.0        .0     165.3     374.7        .0      27.2     104.3      26.3      27.0   1638.90
       .31       .00      6.07      3.59      .000      .035      .045      .000   1636.20   9987.97
   .014949      475.      480.      435.         5        14         0       .00    212.83  10474.11


1
   20OCT94      14:13:41                                                                            PAGE   17


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


FLOW DISTRIBUTION FOR SECNO=      1.21          CWSEL=   1638.57

STA=    9988.   10010.   10105.   10113.   10209.   10320.   10326.   10409.   10412.   10417.   10431.   10436.   10439.
  PER Q=     30.6      4.3     12.1     12.7      6.0      3.1      3.7      4.9      8.2      5.4      4.9      3.2
   AREA=     27.2      5.2     11.8     19.2     14.3      6.3     12.2      4.7      7.3      9.0      5.2      3.8
    VEL=      6.1      4.5      5.5      3.6      2.3      2.7      1.6      5.6      6.0      3.3      5.1      4.5
  DEPTH=      1.3       .1      1.4       .2       .1      1.1       .1      1.6      1.6       .6      1.2      1.1

STA=   10439.   10474.
  PER Q=       .8
   AREA=      5.3
    VEL=       .8
  DEPTH=       .2

CCHV=      .100 CEHV=      .300
*SECNO 1.306

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.306      1.67   1650.17   1650.17       .00   1650.48       .31     11.42       .00   1650.30
     540.0      15.7     148.9     375.4       4.8      21.9     120.6      27.8      29.3   1650.00
       .34      3.25      6.80      3.11      .080      .040      .080      .000   1648.50   9954.47
   .047056      500.      517.      445.        11        16         0       .00    224.58  10209.86


FLOW DISTRIBUTION FOR SECNO=      1.31          CWSEL=   1650.17

STA=    9954.    9960.   10019.   10032.   10046.   10061.   10098.   10112.   10126.   10149.   10167.   10180.   10202.
  PER Q=      2.9     27.6      3.3      8.6      4.8      9.4      8.5      3.5      9.0     10.6      5.0      5.3
   AREA=      4.8     21.9      6.8     12.7      8.9     18.2     12.5      7.2     15.6     15.5      8.8     11.1
    VEL=      3.2      6.8      2.6      3.7      2.9      2.8      3.7      2.6      3.1      3.7      3.1      2.6
  DEPTH=       .8       .8       .5       .9       .6       .5       .9       .5       .7       .9       .7       .5

STA=   10202.   10210.
  PER Q=      1.4
   AREA=      3.4
    VEL=      2.3
  DEPTH=       .4

1
   20OCT94      14:13:41                                                                            PAGE   18


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


CCHV=      .100 CEHV=      .300
*SECNO 1.367

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.79

     1.367      1.89   1658.39   1658.36       .00   1658.82       .43      8.31       .04   1657.30
     540.0      48.3     468.6      23.1      30.9      83.5      16.8      28.9      30.8   1657.70
       .36      1.56      5.62      1.38      .080      .040      .080      .000   1656.50   9923.77
   .014676      295.      322.      385.        12         8         0       .00    164.88  10088.66
```

```
FLOW DISTRIBUTION FOR SECNO=       1.37          CWSEL=   1658.39

STA=    9924.    9949.    9965.    9978.    9991.   10051.   10082.   10089.
  PER Q=      1.1      1.1      1.8      5.0     86.8      4.2       .1
   AREA=      6.3      5.4      6.8     12.4     83.5     15.8       .9
    VEL=       .9      1.1      1.4      2.2      5.6      1.4       .6
  DEPTH=       .3       .4       .5      1.0      1.4       .5       .2

1490 NH CARD USED
*SECNO 1.472

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59

     1.472      2.28   1669.78   1669.77       .00   1670.12       .34     11.29       .01   1669.90
    1080.0        .0     733.8     346.2        .0     137.7     115.4      31.5      34.5   1668.40
       .39       .00      5.33      3.00      .000      .035      .066      .000   1667.50   9997.99
   .023326      545.      554.      655.        10        11         0       .00    368.26  10406.45


FLOW DISTRIBUTION FOR SECNO=       1.47          CWSEL=   1669.78

STA=    9998.   10035.   10045.   10063.   10155.   10189.   10210.   10239.   10262.   10331.   10387.   10392.   10406.
  PER Q=      3.7       .1      4.5     10.4     49.2      6.3      5.1      5.0      3.7      7.9      3.5       .6
   AREA=     11.3      1.4     11.7     55.4     57.9     22.6     22.9     20.5     24.0     14.9      6.1      4.4
    VEL=      3.6       .8      4.2      2.0      9.2      3.0      2.4      2.6      1.7      5.7      6.3      1.5
  DEPTH=       .4       .1       .6       .6      1.7      1.1       .8       .9       .4       .3      1.2       .3

1
   20OCT94       14:13:41                                                                                          PAGE    19


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 1.557

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3720 CRITICAL DEPTH ASSUMED
     1.557      2.29   1680.39   1680.39       .00   1680.72       .34     13.94       .00   1679.90
    1080.0     267.7     411.8     400.5      58.7      87.7      85.4      34.0      38.3   1680.20
       .42      4.56      4.69      4.69      .054      .056      .054      .000   1678.10   9853.28
   .041567      400.      449.      490.        20         5         0       .00    360.24  10274.79


FLOW DISTRIBUTION FOR SECNO=       1.56          CWSEL=   1680.39

STA=    9853.    9907.    9959.    9968.    9988.    9997.   10010.   10087.   10104.   10159.   10190.   10199.   10212.
  PER Q=      4.6      6.2      7.5      5.1      1.4     13.9     19.3      4.9      3.5      6.3     15.4      5.0
   AREA=     15.1     11.9      9.9     16.3      5.5     15.6     62.9      9.2     19.5     17.0     15.0      9.3
    VEL=      3.3      5.6      8.2      3.4      2.7      9.7      3.3      5.7      2.0      4.0     11.1      5.9
  DEPTH=       .3       .2      1.1       .8       .6      1.2       .8       .5       .4       .5      1.8       .7

STA=   10212.   10263.   10275.
  PER Q=      6.5       .3
   AREA=     22.4      2.3
    VEL=      3.2      1.3
  DEPTH=       .4       .2

CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 1.629

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59

     1.629      3.13   1689.43       .00       .00   1689.60       .16      8.85       .02   1689.40
    1090.0      41.8     113.5     934.7      25.0      29.2     290.1      36.4      41.6   1688.90
       .45      1.67      3.89      3.22      .080      .035      .062      .000   1686.30   9918.53
   .016722      415.      380.      330.         8         0         0       .00    442.47  10360.99


FLOW DISTRIBUTION FOR SECNO=       1.63          CWSEL=   1689.43

1
   20OCT94       14:13:41                                                                                          PAGE    20


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


STA=    9919.    9957.    9976.   10025.   10043.   10074.   10098.   10106.   10120.   10173.   10202.   10216.   10239.
  PER Q=      3.7       .1     10.4      3.6      7.1      7.8      3.9      3.8      4.8      7.5      8.8      4.1
   AREA=     22.5      2.5     29.2     15.7     28.2     27.9     12.0     14.5     28.1     28.1     24.7     18.3
    VEL=      1.8       .6      3.9      2.5      2.7      3.1      3.6      2.9      1.9      2.9      3.9      2.4
  DEPTH=       .6       .1       .6       .9       .9      1.2      1.5      1.1       .5      1.0      1.7       .8

STA=   10239.   10290.   10301.   10306.   10330.   10361.
  PER Q=      4.9     16.4      7.0      4.3      1.8
   AREA=     27.0     22.8     10.7     19.1     13.0
```

```
    VEL=       2.0      7.9      7.2      2.4      1.5
  DEPTH=        .5      2.1      2.0       .8       .4

CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO 1.733

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.733      1.94   1702.74   1702.74       .00   1703.17       .44     10.27       .08   1702.90
    1090.0     997.7      92.3        .0     184.4      22.1        .0      39.6      45.6   1702.70
       .48      5.41      4.17       .03      .048      .035      .070      .000   1700.80   9762.40
   .025338      490.      549.      510.         4        14         0       .00    240.85  10033.56


FLOW DISTRIBUTION FOR SECNO=      1.73          CWSEL=   1702.74

STA=    9762.    9793.    9804.    9811.    9822.    9836.    9852.    9871.    9894.    9928.    9957.   10033.
  PER Q=       4.5      8.7      7.4     17.0     19.8     13.8      5.5      6.4      6.9      1.6      8.5
   AREA=      18.0     13.5     10.3     20.9     24.8     21.0     18.4     21.6     26.2      9.8     22.1
    VEL=       2.7      7.0      7.9      8.9      8.7      7.2      3.2      3.2      2.9      1.8      4.2
  DEPTH=        .6      1.3      1.5      1.8      1.8      1.3       .9       .9       .8       .3       .5

1490 NH CARD USED
*SECNO 1.806

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1
   20OCT94      14:13:41                                                                                 PAGE   21


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


     1.806      1.99   1712.59   1712.59       .00   1713.03       .44      8.63       .00   1712.50
    1090.0     578.4     511.6        .0     152.5      77.3        .0      41.5      48.0   1712.60
       .50      3.79      6.62       .00      .050      .035      .000      .000   1710.60   9729.09
   .019966      385.      385.      370.         5         8         0       .00    299.87  10043.72


FLOW DISTRIBUTION FOR SECNO=      1.81          CWSEL=   1712.59

STA=    9729.    9765.    9785.    9802.    9805.    9810.    9813.    9861.    9915.    9927.    9934.    9942.    9978.
  PER Q=       4.6      4.1      5.5      4.2      7.1      4.6      3.9      5.2      5.2      3.3      4.6       .7
   AREA=      21.1     16.4     13.4      5.9      9.4      6.6     19.4     28.5     11.3      6.9      8.8      5.0
    VEL=       2.4      2.7      4.5      7.9      8.3      7.6      2.2      2.0      5.0      5.2      5.7      1.5
  DEPTH=        .6       .8       .8      1.8      2.0      1.7       .4       .5       .9      1.0      1.1       .1

STA=    9978.   10044.
  PER Q=      46.9
   AREA=      77.3
    VEL=       6.6
  DEPTH=       1.2

1490 NH CARD USED
*SECNO 1.887

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.887      2.55   1722.35   1722.35       .00   1722.66       .31      8.27       .01   1722.60
    1090.0     633.4     411.9      44.7     146.9      82.9      24.1      43.8      51.5   1722.00
       .52      4.31      4.97      1.85      .047      .035      .070      .000   1719.80   9644.67
   .019404      415.      428.      400.        11        11         0       .00    432.65  10124.10


FLOW DISTRIBUTION FOR SECNO=      1.89          CWSEL=   1722.35

1
   20OCT94      14:13:41                                                                                 PAGE   22


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


STA=    9645.    9651.    9657.    9662.    9668.    9675.    9690.    9709.    9832.    9872.    9883.    9947.   10070.
  PER Q=       4.6     11.4      5.3      7.5      7.1      3.3      4.7      3.2      3.3      6.0      1.8     37.8
   AREA=       8.6     13.4      8.0     11.2     11.0     13.1     18.0     22.0     17.3     11.5     12.8     82.9
    VEL=       5.8      9.3      7.2      7.3      7.0      2.7      2.8      1.6      2.1      5.6      1.5      5.0
  DEPTH=       1.3      2.4      1.7      1.7      1.6       .9       .9       .2       .4      1.1       .2       .8

STA=   10070.   10116.   10124.
  PER Q=       3.8       .3
   AREA=      21.5      2.6
    VEL=       1.9      1.4
  DEPTH=        .5       .3

1490 NH CARD USED
*SECNO 1.983
```

```
3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.983      3.22   1735.02   1735.02       .00   1735.52       .51      8.83       .06   1734.20
    1110.0     583.0     446.2      80.7     154.2      56.7      40.0      46.8      55.6   1734.10
       .55      3.78      7.87      2.02      .054      .035      .070      .000   1731.80   9805.08
   .015197      525.      507.      505.        19        11         0       .00    259.87  10087.77


FLOW DISTRIBUTION FOR SECNO=      1.98          CWSEL=   1735.02

STA=    9805.    9828.    9851.    9863.    9874.    9884.    9890.    9895.    9910.    9975.    9988.   10019.   10041.
  PER Q=      4.8      4.1      3.6      3.0      4.0      8.9      9.2      6.2      4.7      4.0     40.2      3.3
   AREA=     19.5     19.2     13.6     12.4      9.5     13.4     13.0     14.9     23.4     15.3     56.7     17.0
    VEL=      2.7      2.4      2.9      2.7      4.6      7.4      7.9      4.6      2.2      2.9      7.9      2.2
  DEPTH=       .8       .8      1.2      1.1      1.0      2.2      2.4      1.0       .4      1.2      1.9       .7

STA=   10041.   10074.   10088.
  PER Q=      3.8       .1
   AREA=     20.8      2.1
    VEL=      2.0       .8
  DEPTH=       .6       .2

CCHV=     .100 CEHV=     .300
1
   20OCT94       14:13:41                                                                                  PAGE    23

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 2.105
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     2.105      2.78   1749.78   1749.78       .00   1750.22       .44     10.93       .01   1748.90
    1110.0     135.5     621.2     353.3      67.7      91.7     130.8      50.9      60.1   1749.10
       .59      2.00      6.78      2.70      .080      .035      .070      .000   1747.00   9887.89
   .018336      675.      644.      655.        13         9         0       .00    327.20  10215.08


FLOW DISTRIBUTION FOR SECNO=      2.11          CWSEL=   1749.78

STA=    9888.    9944.    9971.    9990.   10061.   10079.   10091.   10107.   10136.   10159.   10190.   10209.   10215.
  PER Q=      6.5      3.2      2.5     56.0      4.5      5.7      4.2      4.9      4.4      4.2      3.9       .1
   AREA=     35.9     18.4     13.4     91.7     17.5     17.3     15.7     22.5     19.3     21.0     16.7       .8
    VEL=      2.0      1.9      2.0      6.8      2.8      3.6      2.9      2.4      2.5      2.2      2.6       .8
  DEPTH=       .6       .7       .7      1.3      1.0      1.4      1.0       .8       .8       .7       .9       .1

1490 NH CARD USED
*SECNO 2.181

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     2.181      2.69   1759.99   1759.99       .00   1760.57       .58      5.36       .04   1758.90
    1110.0      89.9     762.7     257.3      56.9     105.3     106.0      53.4      62.6   1758.80
       .61      1.58      7.24      2.43      .080      .035      .070      .000   1757.30   9829.98
   .010626      390.      401.      370.         9         8         0       .00    247.10  10111.03


FLOW DISTRIBUTION FOR SECNO=      2.18          CWSEL=   1759.99

STA=    9830.    9932.    9968.   10017.   10030.   10053.   10065.   10086.   10100.   10111.
  PER Q=      3.0      5.1     68.7      3.5      6.4      3.0      6.0      3.4       .8
   AREA=     27.5     29.4    105.3     16.0     28.3     13.8     26.4     15.9      5.6
    VEL=      1.2      1.9      7.2      2.5      2.5      2.5      2.5      2.4      1.5
  DEPTH=       .3       .8      2.1      1.2      1.2      1.2      1.2      1.1       .5

1490 NH CARD USED
*SECNO 2.297
7185 MINIMUM SPECIFIC ENERGY
1
   20OCT94       14:13:41                                                                                  PAGE    24

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3720 CRITICAL DEPTH ASSUMED
     2.297      2.63   1774.23   1774.23       .00   1774.73       .50      7.72       .01   1773.30
    1110.0      69.5     659.1     381.4      36.3      97.0     101.9      56.8      66.4   1773.50
       .64      1.91      6.79      3.74      .080      .035      .047      .000   1771.60   9935.72
   .015762      625.      612.      575.        13         5         0       .00    307.40  10243.11


FLOW DISTRIBUTION FOR SECNO=      2.30          CWSEL=   1774.23

STA=    9936.    9979.    9989.   10057.   10121.   10131.   10139.   10193.   10243.
  PER Q=      4.5      1.8     59.4      5.5     17.5      5.7      3.9      1.7
   AREA=     27.2      9.2     97.0     25.8     23.1     11.4     26.3     15.3
    VEL=      1.8      2.2      6.8      2.3      8.4      5.6      1.7      1.3
  DEPTH=       .6       .9      1.4       .4      2.4      1.3       .5       .3

1490 NH CARD USED
```

```
*SECNO 2.403

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      2.403       2.42   1788.32    1788.32        .00   1788.69        .37       8.96        .01   1787.60
     1110.0      387.3     338.2      384.5      131.2      44.1      134.1       60.3       70.6   1787.40
        .67       2.95      7.68       2.87       .070      .035       .060       .000    1785.90   9836.01
    .016811       530.      560.       550.         10        10          0        .00     367.06  10210.07

FLOW DISTRIBUTION FOR SECNO=       2.40          CWSEL=    1788.32

STA=    9836.    9886.    9909.    9929.    9934.    9949.    9977.    9991.   10017.   10061.   10069.   10077.   10094.
  PER Q=      3.2      5.0      7.7      4.5      9.1      4.4      1.1     30.5      5.9      6.0      5.8      4.4
   AREA=     20.1     20.9     25.9     11.3     25.0     20.9      7.1     44.1     30.3     10.9     11.2     16.6
    VEL=      1.7      2.6      3.3      4.4      4.0      2.3      1.8      7.7      2.2      6.0      5.7      2.9
  DEPTH=       .4       .9      1.3      2.0      1.8       .7       .5      1.7       .7      1.4      1.3      1.0

STA=   10094.   10103.   10148.   10210.
  PER Q=      3.7      5.8      3.1
   AREA=     12.2     30.0     22.8
    VEL=      3.4      2.1      1.5
  DEPTH=      1.4       .7       .4

1
   20OCT94      14:13:41                                                                                   PAGE    25

    SECNO       DEPTH       CWSEL       CRIWS       WSELK       EG          HV          HL          OLOSS       L-BANK ELEV
    Q           QLOB        QCH         QROB        ALOB        ACH         AROB        VOL         TWA         R-BANK ELEV
    TIME        VLOB        VCH         VROB        XNL         XNCH        XNR         WTN         ELMIN       SSTA
    SLOPE       XLOBL       XLCH        XLOBR       ITRIAL      IDC         ICONT       CORAR       TOPWID      ENDST

CCHV=     .100 CEHV=      .300
*SECNO 2.494
3280 CROSS SECTION       2.49 EXTENDED        .58 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      2.494       3.28   1800.78    1800.78        .00   1801.45        .67       7.72        .09   1799.50
     1270.0       69.4     645.6      555.0       35.5      77.4      136.3       63.1       73.5   1799.80
        .69       1.95      8.34       4.07       .080      .035       .060       .000    1797.50   9925.58
    .017343       445.      480.       425.         14        14          0        .00     204.42  10130.00

FLOW DISTRIBUTION FOR SECNO=       2.49          CWSEL=    1800.78

STA=    9926.    9961.    9977.   10019.   10036.   10062.   10072.   10080.   10097.   10123.   10130.
  PER Q=      3.2      2.2     50.8      4.3      5.8      8.0      9.8      8.5      6.5      1.0
   AREA=     22.4     13.1     77.4     16.7     23.8     19.1     20.8     25.4     25.4      5.1
    VEL=      1.8      2.2      8.3      3.2      3.1      5.3      6.0      4.2      3.2      2.4
  DEPTH=       .6       .8      1.8      1.0       .9      2.0      2.5      1.5      1.0       .7

1
   20OCT94      14:13:41                                                                                   PAGE    26


                                                                         THIS RUN EXECUTED 20OCT94     14:13:55
***************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
***************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WASH A

SUMMARY PRINTOUT

         SECNO     ELMIN     CWSEL         Q        VCH    DIFWSX    TOPWID     DEPTH      SSTA     ENDST      QLOB      QROB     ELTRD

*         .000   1505.10   1509.39   1140.00       9.75       .00     47.59      4.29   9988.29  10035.88       .00     26.42       .00

*         .031   1510.40   1513.61   1140.00       8.97      4.22     51.33      3.21   9982.55  10033.88       .00       .00       .00

*         .094   1518.20   1520.67   1140.00       8.43      7.07     62.07      2.47   9964.54  10026.61       .00       .00       .00

*         .181   1529.70   1533.11   1140.00       8.68     12.44     56.41      3.41   9952.50  10008.91       .00       .00       .00

*         .241   1536.20   1539.04   1140.00       8.05      5.93     71.73      2.84   9960.81  10032.54       .00       .00       .00

*         .347   1547.80   1553.09   1140.00       9.36     14.05     86.32      5.29   9979.38  10066.30       .00      6.50       .00

*         .453   1558.80   1564.43   1140.00       7.51     11.34    364.63      5.63   9946.43  10393.78     28.31    248.47       .00

*         .550   1569.90   1572.57   1140.00       7.59      8.14    317.22      2.67   9919.78  10237.00     25.18    624.54       .00

*         .658   1579.30   1583.11   1160.00       8.07     10.54    196.44      3.81   9933.54  10129.98    110.01    270.78       .00

*         .700   1583.80   1586.86   1160.00       6.72      3.75    209.66      3.06   9979.07  10210.67       .00    250.91       .00

*         .723   1585.60   1587.89   1160.00       4.10      1.04    216.73      2.29   9989.92  10215.77       .00     97.75       .00
```

```
 *     .820   1595.80   1597.89    595.00      6.41     10.00    188.87     2.09   9876.62  10067.16    149.85    149.76      .00
 *     .902   1603.80   1606.62    595.00      3.40      8.73    300.75     2.82   9739.42  10157.63    507.18     27.96      .00
 *     .990   1614.30   1616.02    595.00      5.34      9.40    276.67     1.72   9754.72  10080.18    251.34      1.04      .00
      1.117   1625.50   1628.80    595.00      4.72     12.78    174.07     3.30   9974.70  10286.08       .00    494.26      .00
 *    1.208   1636.20   1638.57    540.00      6.07      9.77    212.83     2.37   9987.97  10474.11       .00    374.65      .00
 *    1.306   1648.50   1650.17    540.00      6.80     11.60    224.58     1.67   9954.47  10209.86     15.75    375.38      .00
1
   20OCT94      14:13:41                                                                                   PAGE    27

       SECNO     ELMIN     CWSEL         Q       VCH    DIFWSX    TOPWID    DEPTH     SSTA     ENDST      QLOB      QROB     ELTRD
 *    1.367   1656.50   1658.39    540.00      5.62      8.22    164.88     1.89   9923.77  10088.66     48.28     23.11      .00
 *    1.472   1667.50   1669.78   1080.00      5.33     11.39    368.26     2.28   9997.99  10406.45       .00    346.16      .00
 *    1.557   1678.10   1680.39   1080.00      4.69     10.61    360.24     2.29   9853.28  10274.79    267.65    400.55      .00
 *    1.629   1686.30   1689.43   1090.00      3.89      9.04    442.47     3.13   9918.53  10360.99     41.76    934.70      .00
 *    1.733   1700.80   1702.74   1090.00      4.17     13.30    240.85     1.94   9762.40  10033.56    997.71       .00      .00
 *    1.806   1710.60   1712.59   1090.00      6.62      9.85    299.87     1.99   9729.09  10043.72    578.39       .00      .00
 *    1.887   1719.80   1722.35   1090.00      4.97      9.76    432.65     2.55   9644.67  10124.10    633.42     44.65      .00
 *    1.983   1731.80   1735.02   1110.00      7.87     12.67    259.87     3.22   9805.08  10087.77    583.02     80.74      .00
 *    2.105   1747.00   1749.78   1110.00      6.78     14.76    327.20     2.78   9887.89  10215.08    135.49    353.31      .00
 *    2.181   1757.30   1759.99   1110.00      7.24     10.21    247.10     2.69   9829.98  10111.03     89.94    257.33      .00
 *    2.297   1771.60   1774.23   1110.00      6.79     14.24    307.40     2.63   9935.72  10243.11     69.53    381.38      .00
 *    2.403   1785.90   1788.32   1110.00      7.68     14.09    367.06     2.42   9836.01  10210.07    387.28    384.50      .00
 *    2.494   1797.50   1800.78   1270.00      8.34     12.46    204.42     3.28   9925.58  10130.00     69.37    554.99      .00
1
   20OCT94      14:13:41                                                                                   PAGE    28


  SUMMARY OF ERRORS AND SPECIAL NOTES

 CAUTION SECNO=       .000  PROFILE=  1  CRITICAL DEPTH ASSUMED

 CAUTION SECNO=       .031  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .031  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .031  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .094  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .094  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .094  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .181  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .181  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .181  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .241  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .241  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .241  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .347  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .347  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .347  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .453  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .453  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .453  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .550  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .550  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .550  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .658  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .658  PROFILE=  1  MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .700  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .700  PROFILE=  1  MINIMUM SPECIFIC ENERGY

 WARNING SECNO=       .723  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

 CAUTION SECNO=       .820  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .820  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .820  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .902  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .902  PROFILE=  1  MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .990  PROFILE=  1  CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .990  PROFILE=  1  MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=      1.208  PROFILE=  1  CRITICAL DEPTH ASSUMED
```

```
CAUTION SECNO=      1.208  PROFILE=  1  MINIMUM SPECIFIC ENERGY
1
   20OCT94      14:13:41                                                               PAGE    29


CAUTION SECNO=      1.306  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.306  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.367  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.472  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.557  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.557  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      1.629  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.733  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.733  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      1.806  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.806  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      1.887  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.887  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      1.983  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.983  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      2.105  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.105  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      2.181  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.181  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      2.297  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.297  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      2.403  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.403  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      2.494  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.494  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```

WASH A SOUTH

```
1**********************************************                  ****************************************
 *  HEC-2 WATER SURFACE PROFILES               *                  *   U.S. ARMY CORPS OF ENGINEERS       *
 *                                             *                  *   HYDROLOGIC ENGINEERING CENTER      *
 *  Version   4.6.2;  May 1991                 *                  *   609 SECOND STREET, SUITE D         *
 *                                             *                  *   DAVIS, CALIFORNIA 95616-4687       *
 *  RUN DATE    20OCT94    TIME   15:22:31     *                  *          (916) 756-1104              *
 **********************************************                  ****************************************



                                 X     X  XXXXXXX   XXXXX               XXXXX
                                 X     X  X        X     X             X     X
                                 X     X  X        X                         X
                                 XXXXXXX  XXXX     X           XXXXX    XXXXX
                                 X     X  X        X                   X
                                 X     X  X        X     X             X
                                 X     X  XXXXXXX   XXXXX              XXXXXXX
1
   20OCT94       15:22:31                                                                         PAGE     1


                                                                  THIS RUN EXECUTED 20OCT94     15:22:31

 ****************************************
  HEC-2 WATER SURFACE PROFILES

  Version     4.6.2;  May 1991
 ****************************************


T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH A SOUTH              L. CULLER - (602)244-8100
T4      JOB 15183     PR15183\ETC\WASHA\WASHAS2.IH2          RUN 1

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS      Q         WSEL      FQ

                 2                             -1                                   1507

J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1                   -1                                                                   15


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

      38        42         1        43        26        51         4         8        53        54
      13        15        40

QT       1      1160
NC     .08       .08       .04       0.1       0.3
X1   0.658        20    9981.0   10012.2
GR  1584.0    9878.2    1584.1    9904.0    1583.7    9927.5    1582.2    9942.8    1581.5    9962.7
GR  1582.3    9981.0    1579.3    9991.9    1579.3   10000.0    1579.3   10007.5    1581.8   10012.2
GR  1581.3   10022.0    1581.3   10049.1    1582.4   10064.8    1582.7   10080.7    1582.4   10095.0
GR  1582.8   10108.0    1582.4   10119.6    1582.4   10125.2    1583.6   10133.3    1583.6   10143.6

        THE CONFLUENCE WITH WASH A IS AT RIVER MILE 0.000. THE DISCHARGE IS NOT
        CHANGED FROM THE VALUE BELOW THE CONFLUENCE TO THE VALUE ABOVE THE
        CONFLUENCE UNTIL SECTION 0.121. (SEE SPECIAL PROBLEM NO. 4A)


NC     .08       .08      .035       0.1       0.3
NH       5       .08    9905.5      .035    9970.7       .08    9976.8      .035   10019.0       .08
NH  10162.
X1   0.016        28    9905.5   10019.0       195       190       222
GR  1587.5    9859.3    1587.7    9874.6    1587.6    9895.4    1587.4    9905.5    1586.4    9921.8
GR  1583.9    9931.6    1583.8    9935.3    1584.1    9942.3    1585.6    9947.7    1586.0    9961.0
GR  1587.5    9970.7    1588.0    9976.8    1584.7    9990.9    1584.5   10000.0    1584.6   10008.0
GR  1587.6   10019.0    1586.3   10026.1    1586.6   10050.7    1585.3   10053.0    1585.6   10060.4
GR  1585.9   10079.6    1585.6   10101.4    1585.7   10122.3    1586.1   10130.9    1586.1   10143.6
GR  1587.6   10148.3    1588.6   10156.9    1587.8   10162.0       0.0       0.0       0.0       0.0

        FOREST SERVICE ROAD IS AT RIVER MILE 0.022 (LOW CROSSING, NO STRUCTURE)

1
   20OCT94       15:22:31                                                                         PAGE     2



NC     .08       .02       .03       0.1       0.3
NH       4       .07    9835.3       .04    9858.4       .07    9913.6      .026   10086.2
X1   0.028        25    9835.3   10019.8       125        90       121
GR  1590.3    9685.4    1589.9    9707.5    1589.5    9735.4    1588.7    9770.2    1589.2    9782.5
GR  1589.9    9789.6    1588.7    9806.6    1588.4    9835.3    1586.3    9844.5    1586.2    9847.6
GR  1586.3    9850.3    1588.4    9858.4    1587.5    9871.1    1587.3    9886.8    1586.8    9899.4
GR  1585.8    9909.3    1587.0    9913.6    1586.5    9926.1    1586.0    9942.5    1585.6    9971.8
GR  1585.9   10000.0    1586.4   10019.8    1587.3   10045.0    1588.1   10069.6    1588.2   10086.2

QT       1       585
NC     .07       .02       .03       0.1       0.3
X1   0.121        16    9986.8   10036.9       525       490       491
GR  1598.7   9902.67    1598.7   9902.68    1598.7   9902.69    1598.7    9902.7    1598.4    9928.1
GR  1598.5    9956.2    1598.5    9979.6    1598.5    9986.8    1595.8    9991.8    1595.2   10000.0
GR  1595.5   10009.5    1595.9   10011.8    1597.1   10014.4    1597.9   10023.2    1598.5   10036.9
GR  1598.4   10038.9       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
```

```
NC        .07        .07        .03        0.1        0.3
X1      0.207         16     9993.2    10051.9        445        415        454
GR     1607.6    9993.18     1607.6    9993.19     1607.6     9993.2     1605.4    10000.0     1605.4    10005.0
GR     1605.5    10013.9     1606.1    10015.4     1606.2    10023.5     1605.7    10035.9     1606.3    10040.7
GR     1607.3    10051.9     1606.8    10070.6     1606.5    10072.3     1607.1    10089.0     1607.7    10112.9
GR     1607.8    10123.1

NC        .07        .02        .03        0.1        0.3
NH          5        .07     9945.4        .04     9958.5        .07     9993.8        .03    10025.4        .07
NH     10040.
X1      0.308         18     9993.8    10025.4        505        505        533
GR     1619.1    9932.77     1619.1    9932.78     1619.1    9932.79     1619.1     9932.8     1619.2     9937.5
GR     1617.2     9945.4     1616.6     9949.8     1615.4     9955.6     1617.7     9958.5     1618.4     9968.2
GR     1618.9     9982.9     1619.0     9993.8     1616.0    10000.0     1616.2    10014.9     1616.2    10020.2
GR     1618.4    10025.4     1617.9    10029.8     1619.1    10040.0

NH          4        .07     9899.7        .04     9930.3        .07     9991.8        .03    10032.9
X1      0.411         16     9991.8    10032.9        545        565        544
GR     1629.9     9861.1     1629.8     9880.0     1629.9     9899.7     1628.5     9905.6     1628.4     9913.5
GR     1628.8     9923.0     1630.1     9930.3     1630.2     9946.7     1629.6     9958.3     1630.2     9967.8
GR     1630.3     9978.6     1630.3     9991.8     1626.8    10000.0     1626.8    10014.5     1629.0    10025.3
GR     1630.6    10032.9

       FLOW BREAKOUTS OCCUR AT BOTH ENDS OF SECTION 0.512. RATING CURVES FOR
       THIS SECTION AND BOTH DIVIDES WERE DEVELOPED AND SUMMED TO DETERMINE
       THAT 55 CFS AND 25 CFS EXITS WASH A SOUTH ON THE LEFT AND RIGHT SIDES,
       RESPECTIVELY. THE LEFT SIDE BREAKOUT ENTERS WASH A. THE FLOW IN WASH A
       SOUTH IS REDUCED TO 465 CFS. (SEE SPECIAL PROBLEM NO. 1AS)

1
   20OCT94      15:22:31                                                                               PAGE     3


QT          1        460
NC        .07        .07        .04        0.1        0.3
X1      0.512         15     9995.4    10020.3        470        515        533
GR     1639.7     9989.3     1639.1     9995.4     1636.9    10000.0     1637.0    10005.6     1637.6    10012.2
GR     1638.9    10020.3     1639.5    10032.3     1639.7    10034.9     1639.8    10052.1     1639.5    10066.2
GR     1639.3    10081.7     1639.1    10089.8     1639.4    10104.7     1639.9    10120.3     1639.9    10133.1

QT          1        540
NC        .08        .08       .035        0.1        0.3
X1      0.599         19     9983.7    10020.5        495        440        459
GR     1649.5    9942.89     1649.5     9942.9     1648.7     9951.1     1647.4     9958.1     1649.0     9961.8
GR     1649.3     9968.2     1648.7     9983.7     1648.2     9998.7     1646.9    10000.0     1646.9    10006.3
GR     1647.0    10013.1     1648.0    10020.5     1648.6    10039.4     1648.6    10056.5     1648.4    10073.8
GR     1649.0    10087.6     1649.7    10102.5     1650.3    10116.3     1651.2    10127.4

NH          5        .08     9994.3       .035    10015.3        .08    10153.2        .04    10171.4        .08
NH     10274.
X1      0.682         29     9994.3    10015.3        415        410        438
GR     1659.7    9886.27     1659.7    9886.28     1659.7    9886.29     1659.7     9886.3     1659.5     9898.4
GR     1658.7     9910.5     1659.0     9926.3     1658.9     9935.4     1658.4     9962.9     1657.8     9987.5
GR     1657.7     9994.3     1655.4    10000.0     1655.5    10003.5     1657.5    10015.3     1657.7    10032.0
GR     1657.8    10052.2     1657.5    10078.3     1657.8    10100.8     1657.5    10118.1     1657.0    10138.1
GR     1657.0    10140.2     1657.2    10153.2     1656.4    10159.2     1656.4    10165.5     1657.6    10171.4
GR     1657.5    10193.6     1658.1    10219.4     1658.9    10248.5     1659.4    10274.0

       THE CONFLUENCE WITH WASH A IS AT RIVER MILE 0.896. THE DISCHARGE IS
       CHANGED FROM THE VALUE BELOW THE CONFLUENCE TO THE VALUE ABOVE THE
       CONFLUENCE AT CROSS SECTION 0.774. (SEE SPECIAL PROBLEM  NO. 3A)


QT          1       1080
NH          9        .08     9820.4       .035     9854.0        .08     9867.2        .04     9885.5        .08
NH     9977.7       .035    10011.8        .08    10200.5        .04    10214.9        .08    10253.2
X1      0.774         40     9820.4    10011.8        565        505        486
GR     1671.9     9679.8     1671.2     9711.3     1670.5     9746.8     1670.7     9776.9     1670.1     9807.6
GR     1669.9     9820.4     1669.0     9822.7     1669.3     9834.6     1669.7     9844.1     1669.9     9854.0
GR     1669.5     9867.2     1668.8     9875.1     1669.5     9885.5     1669.6     9907.0     1669.5     9917.9
GR     1669.2     9941.8     1668.6     9959.9     1668.6     9977.7     1667.6     9980.9     1668.4     9991.7
GR     1668.4    10000.0     1667.5    10006.4     1668.4    10011.8     1669.0    10032.6     1669.0    10061.6
GR     1668.9    10064.2     1668.9    10084.8     1669.8    10110.5     1669.7    10127.5     1669.0    10145.1
GR     1669.5    10153.2     1669.7    10171.4     1670.6    10183.5     1670.1    10200.5     1668.0    10205.6
GR     1668.0    10209.8     1669.2    10214.9     1669.5    10223.0     1670.1    10235.8     1670.3    10253.2

NC        .08        .08       .035        0.1        0.3
NH         11        .08     9814.1        .04     9820.1        .08     9858.2        .04     9881.4        .08
NH     9910.3       .035     9923.3        .08    10000.0       .035    10017.3        .08    10100.0        .04
NH     10125.        .08    10247.4
X1      0.867         41     9910.3    10017.3        400        490        454
GR     1680.6     9740.3     1680.4     9766.2     1679.9     9780.0     1679.7     9786.4     1680.5     9797.5
GR     1680.4     9814.1     1678.7     9815.4     1680.5     9820.1     1680.5     9837.1     1680.2     9858.2
GR     1679.1     9872.7     1679.4     9881.4     1679.7     9900.9     1679.9     9910.3     1678.9     9913.3
GR     1679.0     9917.3     1679.1     9920.5     1679.8     9923.3     1679.5     9938.7     1679.3     9957.3
GR     1679.7     9972.6     1679.5     9977.8     1679.7     9987.4     1679.8    10000.0     1679.7    10008.5
1
   20OCT94      15:22:31                                                                               PAGE     4

GR     1680.2    10017.3     1680.0    10040.1     1680.1    10057.2     1679.7    10072.0     1680.1    10086.9
GR     1679.9    10100.0     1678.1    10103.4     1679.1    10111.8     1680.3    10125.0     1680.7    10144.4
GR     1679.1    10158.6     1680.0    10176.4     1680.7    10197.6     1681.1    10215.0     1681.7    10229.7
GR     1681.9    10247.4


1
   20OCT94      15:22:31                                                                               PAGE     5
```

```
 SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
 Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
 TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
 SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*PROF 1
0
CCHV=    .100 CEHV=     .300
*SECNO  .658
3720 CRITICAL DEPTH ASSUMED
   .658      3.78    1583.08    1583.08    1507.00    1583.81       .73        .00        .00    1582.30
 1160.0     108.4      784.4      267.2       50.2       95.8     116.2         .0         .0    1581.80
    .00      2.16       8.18       2.30       .080       .040      .080       .000    1579.30    9933.78
.011351        0.         0.         0.          0         22         0        .00     196.03   10129.82

FLOW DISTRIBUTION FOR SECNO=       .66           CWSEL=   1583.08

STA=    9934.     9963.     9981.    10012.    10022.    10049.    10065.    10120.    10130.
  PER Q=      5.2       4.1      67.6       3.4      12.1       3.8       3.1        .6
   AREA=     28.5      21.7      95.8      15.0      48.3      19.4      28.0       5.4
    VEL=      2.1       2.2       8.2       2.6       2.9       2.3       1.3       1.4
  DEPTH=      1.0       1.2       3.1       1.5       1.8       1.2        .5        .5

CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .016

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   .016      3.06    1586.86    1586.86        .00    1587.42       .57       2.69        .02    1587.40
 1160.0        .0      909.2      250.8         .0      135.3     112.5        1.2         .9    1587.60
    .01       .00       6.72       2.23       .000       .035      .080       .000    1583.80    9914.38
.014028      195.       222.       190.          9         16         0        .00     209.64   10145.97

FLOW DISTRIBUTION FOR SECNO=       .02           CWSEL=   1586.86

STA=    9914.     9971.    10019.    10060.    10080.    10101.    10122.    10144.    10146.
  PER Q=     43.0      35.3       3.9       4.3       4.9       5.4       3.0        .1
   AREA=     77.1      58.2      23.3      21.2      24.1      25.2      17.8        .9
    VEL=      6.5       7.0       1.9       2.4       2.4       2.5       2.0       1.1
  DEPTH=      1.5       1.7        .6       1.1       1.1       1.2        .8        .4
1
  200CT94       15:22:31                                                                                PAGE    6

 SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
 Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
 TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
 SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .028

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.07

   .028      2.29    1587.89        .00        .00    1588.14       .25        .69        .03    1588.40
 1160.0        .0     1064.0       96.0         .0      259.1      31.7        1.9        1.5    1586.40
    .02       .00       4.11       3.03       .000       .027      .026       .000    1585.60    9837.52
.003262      125.       121.        90.          3          0         0        .00     216.61   10063.24

FLOW DISTRIBUTION FOR SECNO=       .03           CWSEL=   1587.89

STA=    9838.     9866.     9914.    10020.    10045.    10063.
  PER Q=      3.7       3.9      84.0       7.6        .7
   AREA=     20.0      41.6     197.5      26.3       5.4
    VEL=      2.2       1.1       4.9       3.4       1.5
  DEPTH=      1.1        .9       1.9       1.0        .3

CCHV=    .100 CEHV=     .300
*SECNO  .121

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   .121      3.08    1598.28    1598.28        .00    1599.21       .94       2.30        .21    1598.50
  585.0        .0      585.0         .0         .0       75.3        .0        4.0        2.9    1598.50
    .04       .00       7.77        .00       .000       .030      .000       .000    1595.20    9987.21
.012611      525.       491.       490.         20         11         0        .00      44.61   10031.82

FLOW DISTRIBUTION FOR SECNO=       .12           CWSEL=   1598.28

STA=    9987.    10037.
  PER Q=    100.0
   AREA=     75.3
    VEL=      7.8
  DEPTH=      1.7
```

```
1
   20OCT94      15:22:31                                                                                   PAGE    7

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


CCHV=      .100 CEHV=      .300
*SECNO  .207
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .207      2.13   1607.53   1607.53       .00   1608.13       .60      5.16       .03   1607.60
     585.0        .0     546.1      38.9        .0      85.0      26.3       4.9       3.7   1607.30
       .06       .00      6.43      1.48      .000      .030      .070      .000   1605.40   9993.42
   .010356      445.      454.      415.        4.        19         0       .00    112.65  10106.07


FLOW DISTRIBUTION FOR SECNO=       .21          CWSEL=   1607.53

STA=     9993.   10052.   10071.   10072.   10089.   10106.
  PER Q=      93.4      2.0       .5      3.6       .5
   AREA=      85.0      8.9      1.5     12.2      3.7
    VEL=       6.4      1.3      2.0      1.7       .8
  DEPTH=       1.5       .5       .9       .7       .2

CCHV=      .100 CEHV=      .300
1490 NH CARD USED
*SECNO  .308

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .308      2.92   1618.32   1618.32       .00   1619.12       .79      5.71       .06   1619.00
     585.0     155.1     428.6       1.2      30.1      55.3       1.6       6.1       4.8   1618.40
       .08      5.16      7.75       .80      .041      .030      .070      .000   1615.40   9940.96
   .011309      505.      533.      505.        15        11         0       .00     63.54  10033.40


FLOW DISTRIBUTION FOR SECNO=       .31          CWSEL=   1618.32

STA=     9941.    9945.    9950.    9956.    9959.    9967.   10025.   10030.   10033.
  PER Q=        .6      5.3     15.7      4.3       .5     73.3       .1       .1
   AREA=       2.5      6.3     13.5      5.1      2.7     55.3       .8       .8
    VEL=       1.5      5.0      6.8      4.9      1.0      7.8       .8       .8
  DEPTH=        .6      1.4      2.3      1.8       .3      1.8       .2       .2
1
   20OCT94      15:22:31                                                                                   PAGE    8

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


1490 NH CARD USED
*SECNO  .411

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .411      2.76   1629.56   1629.56       .00   1630.35       .79      5.68       .00   1630.30
     585.0      75.8     509.2        .0      22.0      67.7        .0       7.2       5.6   1630.60
       .10      3.45      7.52       .00      .040      .030      .000      .000   1626.80   9901.12
   .009664      545.      544.      565.         8         9         0       .00     60.61  10027.97


FLOW DISTRIBUTION FOR SECNO=       .41          CWSEL=   1629.56

STA=     9901.    9906.    9914.    9923.    9927.   10033.
  PER Q=       1.0      5.9      5.6       .5     87.0
   AREA=       2.4      8.8      9.1      1.6     67.7
    VEL=       2.4      3.9      3.6      1.9      7.5
  DEPTH=        .5      1.1      1.0       .4      2.0

CCHV=      .100 CEHV=      .300
*SECNO  .512
3280 CROSS SECTION        .51 EXTENDED        .32 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .512      3.12   1640.02   1640.02       .00   1640.53       .51      5.08       .03   1639.10
     460.0       5.5     372.5      82.1       3.8      58.7      55.6       8.5       6.8   1638.90
       .13      1.45      6.34      1.47      .070      .040      .070      .000   1636.90   9989.30
   .009594      470.      533.      515.        20         8         0       .00    143.80  10133.10


FLOW DISTRIBUTION FOR SECNO=       .51          CWSEL=   1640.02

STA=     9989.    9995.   10020.   10032.   10035.   10052.   10066.   10082.   10090.   10105.   10120.   10133.
  PER Q=       1.2     81.0      3.9       .3       .9      1.2      3.1      2.6      4.3      1.3       .2
   AREA=       3.8     58.7      9.8      1.1      4.6      5.2      9.6      6.6     11.4      5.7      1.5
    VEL=       1.5      6.3      1.8      1.2       .9      1.1      1.5      1.8      1.7      1.1       .5
  DEPTH=        .6      2.4       .8       .4       .3       .4       .6       .8       .8       .4       .1
```

```
1
   20OCT94      15:22:31                                                                                         PAGE    9

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


CCHV=     .100 CEHV=     .300
*SECNO  .599
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .599      2.42   1649.32   1649.32       .00   1649.84       .52      5.13       .00   1648.70
     540.0      38.2     399.5     102.3      21.0      60.2      55.4       9.8       8.3   1648.00
       .15      1.82      6.64      1.85      .080      .035      .080      .000   1646.90   9944.75
   .012984      495.      459.      440.         9        19         0       .00    149.65  10094.40


FLOW DISTRIBUTION FOR SECNO=      .60          CWSEL=   1649.32

STA=    9945.    9951.    9958.    9962.    9968.    9984.   10021.   10039.   10057.   10074.   10088.   10094.
  PER Q=       .4      4.0      1.7       .1       .9     74.0      7.6      3.9      4.9      2.4       .1
   AREA=      2.0      8.9      4.1      1.1      5.0     60.2     19.3     12.3     14.2      8.5      1.1
    VEL=      1.0      2.5      2.2       .6      1.0      6.6      2.1      1.7      1.9      1.5       .6
  DEPTH=       .3      1.3      1.1       .2       .3      1.6      1.0       .7       .8       .6       .2

1490 NH CARD USED
*SECNO  .682
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .682      2.74   1658.14   1658.14       .00   1658.50       .36      5.25       .02   1657.70
     540.0       4.2     251.5     284.3       5.0      37.8     130.0      11.3      10.2   1657.50
       .18       .85      6.66      2.19      .080      .035      .062      .000   1655.40   9973.66
   .011676      415.      438.      410.        11         8         0       .00    247.11  10220.77


FLOW DISTRIBUTION FOR SECNO=      .68          CWSEL=   1658.14

STA=    9974.    9994.   10015.   10052.   10101.   10138.   10153.   10159.   10166.   10171.   10194.   10221.
  PER Q=       .8     46.6      3.8      5.5      8.0      6.1      7.2     11.8      5.4      3.4      1.6
   AREA=      5.0     37.8     16.8     23.7     26.2     15.9      8.0     10.9      6.7     13.0      8.7
    VEL=       .9      6.7      1.2      1.2      1.7      2.1      4.8      5.8      4.3      1.4      1.0
  DEPTH=       .2      1.8       .5       .5       .7      1.1      1.3      1.7      1.1       .6       .3

1490 NH CARD USED
*SECNO  .774
1
   20OCT94      15:22:31                                                                                         PAGE   10

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .774      2.30   1669.80   1669.80       .00   1670.13       .33      8.64       .00   1669.90
    1080.0        .0     732.2     347.8        .0     140.7     118.4      13.7      13.7   1668.40
       .21       .00      5.20      2.94      .000      .036      .066      .000   1667.50   9820.64
   .022139      565.      486.      505.         9        10         0       .00    372.57  10229.50


FLOW DISTRIBUTION FOR SECNO=      .77          CWSEL=   1669.80

STA=    9821.    9857.    9867.    9886.    9978.   10012.   10033.   10062.   10085.   10145.   10210.   10215.   10229.
  PER Q=      3.8       .1      4.6     10.6     48.7      6.3      5.2      5.0      3.0      8.6      3.5       .6
   AREA=     11.8      1.5     12.0     56.9     58.5     23.0     23.3     20.9     20.6     19.8      6.1      4.7
    VEL=      3.5       .8      4.2      2.0      9.0      3.0      2.4      2.6      1.6      4.7      6.1      1.5
  DEPTH=       .4       .2       .7       .6      1.7      1.1       .8       .9       .3       .3      1.2       .3

CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .867

3265 DIVIDED FLOW

      .867      2.43   1680.53       .00       .00   1680.75       .22     10.60       .01   1679.90
    1080.0     274.5     407.6     397.9      77.4     103.4     108.5      16.6      18.0   1680.20
       .24      3.55      3.94      3.67      .055      .057      .056      .000   1678.10   9749.01
   .024061      400.      454.      490.         1         0         0       .00    433.92  10192.53


FLOW DISTRIBUTION FOR SECNO=      .87          CWSEL=   1680.53

STA=    9749.    9815.    9873.    9881.    9901.    9910.    9923.   10000.   10017.   10072.   10100.   10103.   10112.
  PER Q=      3.1      8.8      7.0      5.1      1.5     12.9     19.3      5.6      4.7      3.1      3.4     13.4
   AREA=     18.6     21.6     11.2     19.2      6.9     17.5     74.1     11.8     27.5     16.4      5.2     16.2
    VEL=      1.8      4.4      6.8      2.8      2.3      7.9      2.8      5.1      1.8      2.0      7.1      8.9
  DEPTH=       .3       .4      1.3      1.0       .7      1.3      1.0       .7       .5       .6      1.5      1.9

STA=   10112.   10125.   10176.   10193.
  PER Q=      5.2      6.6       .5
   AREA=     11.0     27.9      4.3
```

```
     VEL=        5.1        2.6        1.2
   DEPTH=         .8         .5         .3
1
   20OCT94       15:22:31                                                                        PAGE    11


                                                                     THIS RUN EXECUTED 20OCT94     15:22:35
 *************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 *************************************

 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

 WASH A SOUTH

 SUMMARY PRINTOUT

         SECNO     ELMIN     CWSEL        Q        VCH    DIFWSX    TOPWID     DEPTH     SSTA     ENDST     QLOB      QROB      ELTRD

 *        .658   1579.30   1583.08   1160.00      8.18       .00    196.03      3.78   9933.78  10129.82   108.41    267.22      .00

 *        .016   1583.80   1586.86   1160.00      6.72      3.77    209.64      3.06   9914.38  10145.97      .00    250.82      .00

 *        .028   1585.60   1587.89   1160.00      4.11      1.04    216.61      2.29   9837.52  10063.24      .00     96.05      .00

 *        .121   1595.20   1598.28    585.00      7.77     10.39     44.61      3.08   9987.21  10031.82      .00       .00      .00

 *        .207   1605.40   1607.53    585.00      6.43      9.25    112.65      2.13   9993.42  10106.07      .00     38.86      .00

 *        .308   1615.40   1618.32    585.00      7.75     10.80     63.54      2.92   9940.96  10033.40   155.12      1.24      .00

 *        .411   1626.80   1629.56    585.00      7.52     11.24     60.61      2.76   9901.12  10027.97    75.77       .00      .00

 *        .512   1636.90   1640.02    460.00      6.34     10.46    143.80      3.12   9989.30  10133.10     5.49     82.05      .00

 *        .599   1646.90   1649.32    540.00      6.64      9.30    149.65      2.42   9944.75  10094.40    38.23    102.29      .00

 *        .682   1655.40   1658.14    540.00      6.66      8.82    247.11      2.74   9973.66  10220.77     4.24    284.28      .00

 *        .774   1667.50   1669.80   1080.00      5.20     11.67    372.57      2.30   9820.64  10229.50      .00    347.79      .00

          .867   1678.10   1680.53   1080.00      3.94     10.72    433.92      2.43   9749.01  10192.53   274.53    397.89      .00
1
   20OCT94       15:22:31                                                                        PAGE    12


  SUMMARY OF ERRORS AND SPECIAL NOTES

 CAUTION SECNO=       .658   PROFILE=  1   CRITICAL DEPTH ASSUMED

 CAUTION SECNO=       .016   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .016   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 WARNING SECNO=       .028   PROFILE=  1   CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

 CAUTION SECNO=       .121   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .121   PROFILE=  1   PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .121   PROFILE=  1   20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .207   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .207   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .308   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .308   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .411   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .411   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .512   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .512   PROFILE=  1   PROBABLE MINIMUM SPECIFIC ENERGY
 CAUTION SECNO=       .512   PROFILE=  1   20 TRIALS ATTEMPTED TO BALANCE WSEL

 CAUTION SECNO=       .599   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .599   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .682   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .682   PROFILE=  1   MINIMUM SPECIFIC ENERGY

 CAUTION SECNO=       .774   PROFILE=  1   CRITICAL DEPTH ASSUMED
 CAUTION SECNO=       .774   PROFILE=  1   MINIMUM SPECIFIC ENERGY
```

WASH F

```
1*********************************************                                    ***************************************
 * HEC-2 WATER SURFACE PROFILES              *                                    * U.S. ARMY CORPS OF ENGINEERS        *
 *                                           *                                    * HYDROLOGIC ENGINEERING CENTER       *
 * Version    4.6.2;  May 1991               *                                    * 609 SECOND STREET, SUITE D          *
 *                                           *                                    * DAVIS, CALIFORNIA 95616-4687        *
 * RUN DATE    09AUG94     TIME   13:35:20   *                                    *       (916) 756-1104                *
 *********************************************                                    ***************************************


                                                   X     X  XXXXXXX   XXXXX            XXXXX
                                                   X     X  X        X     X          X     X
                                                   X     X  X        X                      X
                                                   XXXXXXX  XXXX     X        XXXXX    XXXXX
                                                   X     X  X        X                X
                                                   X     X  X        X     X          X
                                                   X     X  XXXXXXX   XXXXX           XXXXXXX
1
   09AUG94      13:35:20                                                                                         PAGE    1


                                                                                    THIS RUN EXECUTED 09AUG94    13:35:20
 ************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 ************************************

 T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT FCD 93-06
 T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
 T3      WASH F              (NATURAL)         L. CULLER - (602)244-8100
 T4      JOB 15183    PR15183\ETC\WASHF\WASHF.IH2     RUN   1

 J1   ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                   2                            -1                                    1507

 J2   NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

       -1                  -1                                                                    15

 J3   VARIABLE CODES FOR SUMMARY PRINTOUT

        38        42         1        43        26        51         4         8        53        54
        13        15        40

 QT      1       610
 NC     .08      .08      .055       0.1       0.3
 X1    .000       12    9927.4   10048.4
 GR  1536.3   9907.1    1536.3    9907.1    1535.3    9927.4    1525.6    9934.2    1525.6    9958.8
 GR  1525.6   9977.2    1526.0   10000.0    1525.8   10037.0    1535.3   10048.4    1535.1   10067.3
 GR  1535.9  10079.2    1535.9   10092.3

 NC     .08      .08      .050       0.1       0.3
 X1    .095       15    9902.9   10037.2       540       490       502
 GR  1560.0   9838.9    1558.9    9845.8    1554.2    9863.2    1547.6    9878.2    1545.7    9883.9
 GR  1545.7   9902.9    1544.7    9914.3    1544.3    9930.0    1544.4    9945.8    1544.6    9962.0
 GR  1543.4   9973.3    1543.1    9991.6    1542.6   10000.0    1542.7   10023.3    1562.7   10037.2

 NC     .07      .08      .045       0.1       0.3
 X1    .195       13    9981.0   10028.7       425       575       528
 GR  1570.4   9913.2    1565.8    9928.4    1567.7    9941.7    1565.2    9954.6    1564.5    9959.7
 GR  1565.2   9969.1    1562.4    9981.0    1559.3    9996.7    1559.0   10000.0    1559.0   10015.7
 GR  1559.2  10023.3    1561.8   10028.7    1562.6   10038.9

 NC     .08      .08       .04       0.1       0.3
 X1    .305       13    9962.7   10015.7       610       530       581
 GR  1583.6   9928.6    1583.4    9938.6    1582.8    9953.4    1581.5    9962.7    1578.4    9975.3
 GR  1577.7   9980.0    1576.2    9985.1    1576.2   10000.0    1576.4   10008.4    1578.8   10015.7
 GR  1579.6  10034.2    1580.2   10048.4    1580.2   10053.8
1
   09AUG94      13:35:20                                                                                         PAGE    2


 NH       5      .08    9921.9       .04    9951.2       .08    9980.6       .04   10017.8       .07
 NH  10024.
 X1    .374       16    9980.6   10017.8       340       385       364
 GR  1590.7   9875.6    1589.2    9897.0    1588.0    9906.6    1587.6    9921.9    1586.0    9929.5
 GR  1585.8   9938.8    1586.1    9947.9    1587.3    9951.2    1587.2    9965.0    1587.1    9980.6
 GR  1586.2   9987.3    1585.5    9992.7    1585.3   10000.0    1585.6   10011.9    1587.7   10017.8
 GR  1587.7  10024.0

        FOREST SERVICE ROAD IS AT RIVER MILE 0.385 (LOW CROSSING, NO STRUCTURE)

 NH       5      .08    9907.9       .04    9945.9       .08    9973.5       .04   10028.5       .07
 NH  10112.
 X1    .390       22    9973.5   10028.5        85        85        85
 GR  1592.0  9876.69    1592.0    9876.7    1591.4    9887.7    1590.0    9895.7    1590.2    9907.9
 GR  1588.5   9920.7    1588.4    9931.5    1588.6    9938.5    1590.0    9945.9    1589.8    9959.9
 GR  1589.5   9973.5    1587.8    9989.7    1587.6    9997.8    1587.6   10000.0    1587.7   10005.5
 GR  1588.7  10015.1    1589.5   10028.5    1590.2   10051.6    1591.3   10073.4    1593.2   10091.1
 GR  1593.9  10098.1    1594.3   10112.0
```

```
         SECTION 0.480 CONTOURS ARE ALTERED FROM STA. 9875.8 TO STA. 9919.2
         TO REFLECT EFFECTIVE FLOW CONDITIONS - SEE SPECIAL PROBLEM NO. 30

NH         5       .08    9942.7       .04    9958.4       .08    9966.8       .04   10021.0       .07
NH    10034.
X1      .480        20    9966.8   10021.0       470       450       475
GR    1604.0    9875.8    1604.0    9880.5    1604.0    9890.0    1604.0    9893.0    1602.2    9919.2
GR    1602.2    9931.1    1601.8    9942.7    1600.5    9950.8    1600.7    9954.1    1602.4    9958.4
GR    1602.9    9966.8    1602.1    9975.6    1601.1    9978.9    1601.3    9985.7    1602.2    9990.5
GR    1601.2    9997.9    1601.2   10000.0    1601.0   10014.5    1605.5   10021.0    1607.0   10034.0

NH         5       .08    9932.4       .04    9954.3       .08    9993.5       .04   10015.8       .07
NH    10133.
X1      .569        25    9993.5   10015.8       435       480       470
GR    1616.1   9885.07    1616.1   9885.08    1616.1   9885.09    1616.1    9885.1    1615.6    9898.7
GR    1614.3    9912.7    1613.6    9926.1    1613.7    9932.4    1612.3    9934.9    1612.1    9946.6
GR    1612.0    9954.3    1612.6    9964.9    1613.1    9986.3    1613.1    9993.5    1612.2   10000.0
GR    1612.5   10008.7    1613.7   10015.8    1613.6   10028.6    1614.6   10036.5    1614.4   10047.2
GR    1615.4   10060.0    1616.1   10076.7    1616.7   10095.8    1617.6   10115.2    1618.3   10133.0

         SECTION 0.683 FLOODED AREA IS BEING SHOWN AS SPLIT FLOODED AREA
         WITHOUT THE FLOW OR THE PROFILE BEING CALCULATED FOR THE SPLIT CHANNEL
         SEE SPECIAL PROBLEM NO. 29

NH         5       .07    9811.2       .04    9853.5       .07    9971.5      .035   10017.5       .07
NH    10104.
X1      .683        30    9971.5   10017.5     · 510       590       602
GR    1629.1   9801.07    1629.1   9801.08    1629.1   9801.09    1629.1    9801.1    1629.0    9811.2
GR    1626.7    9827.9    1626.8    9838.9    1626.6    9848.1    1628.7    9853.5    1628.7    9865.5
GR    1628.6    9870.4    1628.0    9877.0    1629.4    9886.4    1629.6    9908.8    1630.0    9930.7
GR    1629.7    9955.0    1629.0    9971.5    1627.9    9986.6    1627.0    9998.8    1626.9   10000.0
1                                                                                                   PAGE     3
   09AUG94      13:35:20


GR    1626.8   10012.6    1628.6   10017.5    1628.6   10027.2    1627.4   10038.9    1628.0   10051.4
GR    1628.9   10065.2    1629.8   10076.8    1630.2   10088.7    1629.5   10094.9    1630.3   10104.0

         SECTION 0.790 FLOODED AREA IS BEING SHOWN AS SPLIT FLOODED AREA
         WITHOUT THE FLOW OR THE PROFILE BEING CALCULATED FOR THE SPLIT CHANNEL
         SEE SPECIAL PROBLEM NO. 28

NH         5       .08    9976.7      .035   10009.7       .08   10126.2       .04   10160.6       .08
NH    10175.
X1      .790        22    9976.7   10009.7       550       560       565
GR    1642.7    9925.6    1642.9    9942.6    1641.9    9954.4    1640.4    9968.0    1640.8    9976.7
GR    1639.6    9983.8    1639.4    9995.0    1639.5   10000.0    1640.4   10009.7    1641.6   10023.1
GR    1643.6   10032.2    1643.9   10046.8    1643.9   10064.1    1643.2   10076.4    1642.9   10093.8
GR    1641.7   10105.9    1641.9   10119.6    1641.4   10126.2    1640.0   10139.7    1639.5   10149.7
GR    1642.4   10160.6    1642.4   10175.0

NC       .08       .08      .035        .1        .3
X1      .856        12    9976.2   10017.7       340       355       348
GR    1650.5   9968.19    1650.5    9968.2    1649.9    9976.2    1648.1    9987.1    1648.1   10000.0
GR    1648.4   10013.4    1651.2   10017.7    1650.7   10033.1    1651.2   10051.0    1651.5   10073.9
GR    1651.6   10096.7    1651.6   10113.1       0.0       0.0       0.0       0.0       0.0       0.0

NC       .07       .07      .035       0.1       .03
X1      .961         9    9973.9   10020.4       550       555       549
GR    1663.7    9944.1    1663.6    9959.6    1663.0    9973.9    1659.9    9987.9    1659.4   10000.0
GR    1659.5   10017.4    1662.9   10020.4    1663.2   10032.5    1663.5   10049.3


1                                                                                                   PAGE     4
   09AUG94      13:35:20

     SECNO        DEPTH        CWSEL        CRIWS        WSELK      EG          HV          HL          OLOSS       L-BANK ELEV
     Q            QLOB         QCH          QROB         ALOB  .    ACH         AROB        VOL         TWA         R-BANK ELEV
     TIME         VLOB         VCH          VROB         XNL        XNCH        XNR         WTN         ELMIN       SSTA
     SLOPE        XLOBL        XLCH         XLOBR        ITRIAL     IDC         ICONT       CORAR       TOPWID      ENDST


 *PROF 1
0

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
       .000       1.18    1526.78      1526.78      1507.00    1527.29        .51         .00         .00     1535.30
      610.0         .0      610.0           .0           .0      106.2         .0          .0          .0     1535.30
        .00        .00       5.74          .00         .000       .055       .000        .000     1525.60     9933.38
    .044912         0.         0.           0.            0         44          0         .00      104.79    10038.17

 FLOW DISTRIBUTION FOR SECNO=       .00          CWSEL=    1526.78

 STA=     9933.    10048.
   PER Q=     100.0
    AREA=     106.2
     VEL=       5.7
   DEPTH=       1.0

 CCHV=      .100 CEHV=      .300
 *SECNO  .095
       .095       2.15    1544.75          .00          .00    1545.17        .42       17.88         .01     1545.70
      610.0         .0      610.0           .0           .0      117.2         .0         1.3         1.2     1562.70
```

```
        .03        .00       5.20        .00       .000       .050       .000       .000    1542.60    9913.66
    .028929       540.       502.       490.          6          0          0        .00     111.06   10024.73

  FLOW DISTRIBUTION FOR SECNO=       .09          CWSEL=    1544.75

  STA=     9914.   10037.
    PER Q=     100.0
     AREA=     117.2
      VEL=       5.2
    DEPTH=       1.1

  CCHV=      .100 CEHV=      .300
  *SECNO   .195

  3301 HV CHANGED MORE THAN HVINS

1
    09AUG94       13:35:20                                                                                  PAGE      5

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


  7185 MINIMUM SPECIFIC ENERGY
  3720 CRITICAL DEPTH ASSUMED
       .195       2.39    1561.39    1561.39        .00    1562.33        .95      14.10        .16    1562.40
      610.0         .0      610.0         .0         .0       78.2         .0        2.5        2.2    1561.80
        .05        .00       7.81        .00       .000       .045       .000       .000    1559.00    9986.14
    .024733       425.       528.       575.          4          8          0        .00      41.70   10027.84

  FLOW DISTRIBUTION FOR SECNO=       .19          CWSEL=    1561.39

  STA=     9986.   10029.
    PER Q=     100.0
     AREA=      78.2
      VEL=       7.8
    DEPTH=       1.9

  CCHV=      .100 CEHV=      .300
  *SECNO   .305
  7185 MINIMUM SPECIFIC ENERGY
  3720 CRITICAL DEPTH ASSUMED
       .305       2.50    1578.70    1578.70        .00    1579.66        .95      12.75        .00    1581.50
      610.0         .0      610.0         .0         .0       77.8         .0        3.5        2.7    1578.80
        .07        .00       7.84        .00       .000       .040       .000       .000    1576.20    9974.06
    .019601       610.       581.       530.          4          8          0        .00      41.34   10015.41

  FLOW DISTRIBUTION FOR SECNO=       .31          CWSEL=    1578.70

  STA=     9974.   10016.
    PER Q=     100.0
     AREA=      77.8
      VEL=       7.8
    DEPTH=       1.9

  1490 NH CARD USED
  *SECNO   .374
  7185 MINIMUM SPECIFIC ENERGY
  3720 CRITICAL DEPTH ASSUMED
       .374       2.15    1587.45    1587.45        .00    1588.05        .60       6.76        .04    1587.10
      610.0      223.2      386.8         .0       43.1       57.6         .0        4.2        3.3    1587.70
        .08       5.18       6.71        .00       .041       .040       .000       .000    1585.30    9922.60
    .018027       340.       364.       385.         10         15          0        .00      94.50   10017.10

1
    09AUG94       13:35:20                                                                                  PAGE      6

       SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
       Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
       TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
       SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

  FLOW DISTRIBUTION FOR SECNO=       .37          CWSEL=    1587.45

  STA=     9923.     9930.     9939.     9948.     9951.     9965.     9981.    10018.
    PER Q=       3.3      15.8      14.7       1.6        .4        .9      63.4
     AREA=       5.0      14.4      13.7       2.5       2.8       4.7      57.6
      VEL=       4.0       6.7       6.5       4.0        .9       1.1       6.7
    DEPTH=        .7       1.6       1.5        .8        .2        .3       1.6

  1490 NH CARD USED
  *SECNO   .390

  3265 DIVIDED FLOW

  7185 MINIMUM SPECIFIC ENERGY
  3720 CRITICAL DEPTH ASSUMED
       .390       2.11    1589.71    1589.71        .00    1590.25        .55       1.60        .00    1589.50
      610.0      163.8      445.8         .5       31.7       71.9         .7        4.4        3.5    1589.50
        .09       5.17       6.20        .65       .040       .040       .070       .000    1587.60    9911.62
    .019558        85.        85.        85.          7          8          0        .00     103.91   10035.32
```

```
FLOW DISTRIBUTION FOR SECNO=       .39          CWSEL=   1589.71

STA=    9912.    9921.    9932.    9939.    9944.    9974.   10029.   10035.
  PER Q=      3.3     13.5      8.2      1.8       .1     73.1       .1
   AREA=      5.5     13.6      8.4      3.2      1.0     71.9       .7
    VEL=      3.7      6.0      5.9      3.5       .6      6.2       .7
  DEPTH=       .6      1.3      1.2       .6       .0      1.3       .1

1490 NH CARD USED
*SECNO  .480

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .480      2.27   1602.77   1602.77       .00   1603.31       .54      9.86       .00   1602.90
     610.0     236.0     374.0        .0      44.9      59.8        .0       5.6       4.6   1605.50
       .11      5.25      6.26       .00      .046      .040      .000      .000   1600.50   9910.85
   .022233      470.      475.      450.        11         8         0       .00    102.68  10017.06

1
   09AUG94      13:35:20                                                                                      PAGE    7

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=       .48          CWSEL=   1602.77

STA=    9911.    9943.    9951.    9954.    9958.    9965.   10021.
  PER Q=      6.0     16.4     10.9      5.2       .2     61.3
   AREA=     18.2     13.1      7.2      5.3      1.2     59.8
    VEL=      2.0      7.6      9.3      6.0       .9      6.3
  DEPTH=       .6      1.6      2.2      1.2       .2      1.2

1490 NH CARD USED
*SECNO  .569
      .569      1.82   1613.82   1613.81       .00   1614.35       .54     11.04       .00   1613.10
     610.0     436.2     171.2       2.6      78.6      25.6       2.4       6.7       5.7   1613.70
       .13      5.55      6.68      1.07      .053      .040      .070      .000   1612.00   9921.78
   .027123      435.      470.      480.         6        15         0       .00    108.60  10030.38

FLOW DISTRIBUTION FOR SECNO=       .57          CWSEL=   1613.82

STA=    9922.    9947.    9954.    9965.    9986.    9994.   10016.   10030.
  PER Q=     28.3     20.1     10.7     10.3      2.1     28.1       .4
   AREA=     22.7     13.7     16.2     20.9      5.2     25.6      2.4
    VEL=      7.6      9.0      4.0      3.0      2.5      6.7      1.1
  DEPTH=       .9      1.8      1.5      1.0       .7      1.1       .2

1490 NH CARD USED
*SECNO  .683

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .683      1.89   1628.49   1628.49       .00   1629.02       .53     11.66       .00   1629.00
     610.0     331.0     242.4      36.6      54.1      41.6      17.6       8.0       7.1   1628.60
       .16      6.12      5.83      2.08      .040      .035      .070      .000   1626.60   9814.88
   .017379      510.      602.      590.         4         8         0       .00    116.25  10058.95

FLOW DISTRIBUTION FOR SECNO=       .68          CWSEL=   1628.49

STA=    9815.    9828.    9839.    9848.    9853.    9880.   10018.   10051.   10059.
  PER Q=      8.7     22.3     19.5      3.4       .4     39.7      5.7       .3
   AREA=     11.7     19.2     16.5      4.6      2.1     41.6     15.7      1.9
    VEL=      4.5      7.1      7.2      4.5      1.1      5.8      2.2      1.1
  DEPTH=       .9      1.7      1.8       .9       .1      1.1       .5       .2
1
   09AUG94      13:35:20                                                                                      PAGE    8

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

1490 NH CARD USED
*SECNO  .790

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .790      2.06   1641.46   1641.46       .00   1642.09       .63      8.85       .03   1640.80
     610.0      22.5     400.3     187.2      12.6      55.6      40.8       9.5       8.5   1640.40
       .18      1.79      7.20      4.58      .080      .035      .042      .000   1639.40   9958.40
   .014450      550.      565.      560.         4         8         0       .00     94.78  10157.06

FLOW DISTRIBUTION FOR SECNO=       .79          CWSEL=   1641.46

STA=    9958.    9968.    9977.   10010.   10022.   10140.   10150.   10157.
```

```
SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO=       .000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=       .195  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .195  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .305  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .305  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .374  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .374  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .390  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .390  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .480  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .480  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .683  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .683  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .790  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .790  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .856  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .856  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .961  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .961  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```

```
   PER Q=      1.2        2.5       65.6        1.5        6.2       17.9        5.1
    AREA=      5.1        7.5       55.6        6.3       10.3       17.1        7.2
     VEL=      1.5        2.0        7.2        1.5        3.7        6.4        4.3
   DEPTH=       .5         .9        1.7         .5         .1        1.7        1.0

 CCHV=      .100 CEHV=      .300
*SECNO  .856
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     .856      2.33    1650.43    1650.43        .00    1651.37        .94       5.02        .09    1649.90
    610.0       1.7      608.3         .0        1.9       78.0         .0       10.2        9.0    1651.20
      .19       .92       7.80        .00       .080       .035       .000       .000    1648.10    9969.13
  .014324      340.       348.       355.          3          8          0        .00      47.39   10016.52


 FLOW DISTRIBUTION FOR SECNO=       .86          CWSEL=    1650.43

 STA=     9969.     9976.    10018.
   PER Q=       .3      99.7
    AREA=      1.9      78.0
     VEL=       .9       7.8
   DEPTH=       .3       1.9

 CCHV=      .100 CEHV=      .030
1
   09AUG94       13:35:20                                                                                PAGE     9


      SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
      Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
      TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
      SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


*SECNO  .961
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     .961      2.39    1661.79    1661.79        .00    1662.76        .97       8.08        .00    1663.00
    610.0        .0      610.0         .0         .0       77.1         .0       11.2        9.6    1662.90
      .21       .00       7.91        .00       .000       .035       .000       .000    1659.40    9979.36
  .015136      550.       549.       555.          4          8          0        .00      40.07   10019.42


 FLOW DISTRIBUTION FOR SECNO=       .96          CWSEL=    1661.79

 STA=     9979.    10020.
   PER Q=    100.0
    AREA=     77.1
     VEL=      7.9
   DEPTH=      1.9

1
   09AUG94       13:35:20                                                                                PAGE    10



                                                                      THIS RUN EXECUTED 09AUG94     13:35:21
 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;  May 1991
 **************************************

 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

 WASH F

 SUMMARY PRINTOUT

          SECNO      ELMIN     CWSEL        Q          VCH      DIFWSX     TOPWID      DEPTH      SSTA      ENDST       QLOB       QROB      ELTRD

 *         .000    1525.60   1526.78     610.00       5.74        .00     104.79       1.18    9933.38   10038.17       .00        .00       .00

           .095    1542.60   1544.75     610.00       5.20      17.98     111.06       2.15    9913.66   10024.73       .00        .00       .00

 *         .195    1559.00   1561.39     610.00       7.81      16.63      41.70       2.39    9986.14   10027.84       .00        .00       .00

 *         .305    1576.20   1578.70     610.00       7.84      17.32      41.34       2.50    9974.06   10015.41       .00        .00       .00

 *         .374    1585.30   1587.45     610.00       6.71       8.75      94.50       2.15    9922.60   10017.10     223.19       .00       .00

 *         .390    1587.60   1589.71     610.00       6.20       2.25     103.91       2.11    9911.62   10035.32     163.78       .46       .00

 *         .480    1600.50   1602.77     610.00       6.26      13.07     102.68       2.27    9910.85   10017.06     235.98       .00       .00

           .569    1612.00   1613.82     610.00       6.68      11.04     108.60       1.82    9921.78   10030.38     436.20      2.62       .00

 *         .683    1626.60   1628.49     610.00       5.83      14.68     116.25       1.89    9814.88   10058.95     330.97     36.61       .00

 *         .790    1639.40   1641.46     610.00       7.20      12.97      94.78       2.06    9958.40   10157.06      22.48    187.21       .00

 *         .856    1648.10   1650.43     610.00       7.80       8.97      47.39       2.33    9969.13   10016.52       1.72       .00       .00

 *         .961    1659.40   1661.79     610.00       7.91      11.36      40.07       2.39    9979.36   10019.42       .00        .00       .00

1
   09AUG94       13:35:20                                                                                PAGE    11
```

WASH I

```
1********************************************                    ****************************************
 *  HEC-2 WATER SURFACE PROFILES             *                    *  U.S. ARMY CORPS OF ENGINEERS        *
 *                                           *                    *  HYDROLOGIC ENGINEERING CENTER       *
 *  Version   4.6.2;  May 1991               *                    *  609 SECOND STREET, SUITE D          *
 *                                           *                    *  DAVIS, CALIFORNIA 95616-4687        *
 *  RUN DATE    09AUG94     TIME   13:31:10  *                    *       (916) 756-1104                 *
 ********************************************                    ****************************************


                                    X     X  XXXXXXX   XXXXX              XXXXX
                                    X     X  X        X     X            X     X
                                    X     X  X        X                        X
                                    XXXXXXX  XXXX     X         XXXXX     XXXXX
                                    X     X  X        X                  X
                                    X     X  X        X     X            X
                                    X     X  XXXXXXX   XXXXX             XXXXXXX
1
   09AUG94      13:31:10                                                                    PAGE     1


                                                                     THIS RUN EXECUTED 09AUG94     13:31:10
 *************************************
  HEC-2 WATER SURFACE PROFILES

  Version    4.6.2;   May 1991
 *************************************


T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY - CONTRACT 93-06
T2      RIO VERDE NORTH FLOODPLAIN DELINEATION STUDY BY BURGESS & NIPLE, INC.
T3      WASH I                   (NATURAL)          L. CULLER - (602)244-8100
T4      JOB 15183    PR15183\ETC\WASHI\WASHI.IH2     RUN    1

J1   ICHECK     INQ       NINV       IDIR       STRT     METRIC      HVINS        Q         WSEL        FQ

                  2                              -1                                         1507

J2   NPROF      IPLOT     PRFVS      XSECV      XSECH       FN        ALLDC      IBW       CHNIM      ITRACE

       -1                   -1                                                                         15

J3   VARIABLE CODES FOR SUMMARY PRINTOUT

       38         42         1          43          26          51          4           8          53          54
       13         15         40

QT        1       1530
NC      .07        .07       .035        0.1         0.3
X1     .000         13     9963.4    10078.5
GR   1542.2     9936.4     1535.1     9952.6      1532.8      9963.4      1527.7      9972.2      1528.5      9984.6
GR   1527.0     9994.7     1527.2    10000.0      1527.1     10014.7      1526.7     10043.7      1528.7     10057.2
GR   1533.6    10078.5     1538.7    10100.9      1538.8     10114.2

X1     .012         14     9947.0    10048.9          45         110          63
GR   1546.9     9927.9     1548.1     9931.0      1545.7      9938.5      1539.8      9947.0      1531.5      9960.7
GR   1531.0     9979.7     1531.7     9995.5      1531.3     10000.0      1532.1     10014.1      1533.0     10024.3
GR   1534.4    10035.5     1536.2    10048.9      1538.9     10063.9      1545.4     10072.6

QT        1       1350
X1     .076         15     9932.9    10027.5         360         340         338
GR   1562.0     9913.6     1560.6     9924.5      1556.8      9932.9      1551.2      9942.6      1551.0      9956.6
GR   1550.1     9974.1     1549.4     9985.8      1549.3      9998.5      1548.9     10000.0      1549.5     10006.5
GR   1550.4    10018.0     1553.4    10027.5      1559.7     10039.0      1560.3     10044.1      1560.6     10054.9

NC      .07        .07        .04        0.1         0.3
X1     .181         25     9949.2    10038.0         535         560         554
GR   1577.9    9941.86     1577.9    9941.87      1577.9     9941.88      1577.9     9941.89      1577.9      9941.9
GR   1576.5     9949.2     1574.2     9955.0      1573.4      9965.1      1573.9      9973.6      1573.8      9983.2
GR   1573.2     9989.5     1573.7    10000.0      1574.0     10014.1      1574.8     10027.0      1575.5     10038.0
GR   1580.1    10048.1     1581.0    10055.0      1581.2     10067.2      1580.6     10074.5      1581.5     10084.1
GR   1582.3    10093.1     1583.9    10109.1      1585.4     10126.3      1588.1     10141.7      1591.6     10154.8
1
   09AUG94      13:31:10                                                                    PAGE     2

        FOREST SERVICE ROAD IS AT RIVER MILE 0.187 (LOW CROSSING, NO STRUCTURE)

X1     .191         16     9918.2    10044.5          45          45          53
GR   1579.4    9918.19     1579.4     9918.2      1576.9      9927.4      1576.8      9936.2      1575.7      9945.2
GR   1575.6     9961.9     1575.7     9984.4      1575.9     10000.0      1576.4     10017.9      1577.2     10029.6
GR   1581.1    10044.5     1582.2    10061.5      1584.3     10082.7      1586.9     10101.9      1589.1     10118.9
GR   1589.1    10119.4        0.0        0.0         0.0         0.0         0.0         0.0         0.0         0.0

NH        5        .07     9884.3        .04     10022.5         .07     10071.2         .04     10104.9         .07
NH   10117.
X1     .270         22     9884.3    10022.5         390         420         417
GR   1600.3     9833.0     1597.5     9850.0      1594.5      9864.5      1594.8      9872.5      1592.4      9884.3
GR   1591.9     9901.7     1591.9     9925.5      1592.1      9954.5      1591.3      9964.5      1591.7      9979.0
GR   1591.4    10000.0     1591.7    10013.1      1592.3     10022.5      1592.9     10030.3      1593.2     10046.8
GR   1593.4    10057.9     1593.7    10071.2      1592.9     10078.0      1591.8     10085.2      1592.1     10097.9
GR   1597.0    10104.9     1596.9    10117.0
```

```
NC      .07        .07        .04        0.1        0.3
X1     .363         20     9912.8    10044.9        515        445        491
GR   1615.7    9901.18     1615.7    9901.19     1615.7     9901.2     1608.1     9912.8     1608.1     9929.2
GR   1608.3     9940.8     1608.7     9949.2     1608.7     9966.3     1607.7     9985.1     1607.5     9994.3
GR   1607.5    10000.0     1607.9    10015.9     1607.7    10026.3     1607.8    10039.8     1608.5    10044.9
GR   1608.9    10059.8     1609.2    10082.2     1609.4    10095.3     1611.0    10110.5     1612.0    10121.3

NH        5        .07     9958.7        .04    10045.1        .07    10070.4        .04    10116.4        .07
NH   10146.
X1     .451         22     9958.7    10045.1        505        440        465
GR   1629.5     9900.9     1629.5     9900.9     1629.5     9908.7     1627.4     9926.2     1625.5     9943.8
GR   1622.6     9958.7     1621.6     9974.2     1622.1     9993.9     1621.9    10000.0     1622.1    10017.5
GR   1621.9    10027.9     1622.1    10036.1     1622.4    10045.1     1623.7    10060.8     1622.9    10070.4
GR   1622.1    10082.1     1622.7    10091.5     1622.4    10103.1     1623.1    10116.4     1623.2    10132.7
GR   1629.2    10137.1     1629.9    10146.0

NC      .07        .07        .04        0.1        0.3
X1     .541         16     9969.7    10036.7        415        540        475
GR   1642.5     9911.0     1642.2     9927.6     1642.1     9943.5     1639.9     9957.6     1637.7     9969.7
GR   1636.1     9977.6     1636.0     9999.2     1635.9    10000.0     1636.2    10022.2     1637.1    10036.7
GR   1636.7    10062.6     1640.5    10080.0     1643.0    10097.0     1645.1    10116.8     1646.3    10136.0
GR   1646.9    10144.3        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0

NH        3        .07     9942.9        .04    10021.1        .07    10114.6
X1     .625         18     9942.9    10021.1        445        445        444
GR   1658.1    9907.99     1658.1     9908.0     1657.5     9915.4     1653.9     9924.6     1648.4     9942.9
GR   1648.3     9958.4     1649.0     9969.4     1648.6     9988.2     1648.1     9999.5     1648.0    10000.0
GR   1648.1    10010.0     1649.3    10021.1     1650.7    10033.9     1652.0    10046.6     1652.0    10063.5
GR   1652.8    10085.4     1654.7    10103.3     1655.3    10114.6


1
  09AUG94      13:31:10                                                                      PAGE    3


     SECNO     DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q         QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME      VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE     XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 *PROF 1
0

 CCHV=     .100 CEHV=     .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
       .000      2.81    1529.51    1529.51    1507.00    1530.55       1.04        .00        .00    1532.80
     1530.0        .0     1530.0         .0         .0      186.9         .0         .0         .0    1533.60
        .00       .00       8.18        .00       .000       .035       .000       .000    1526.70    9969.08
    .014543        0.         0.         0.          0         22          0        .00      91.63   10060.71


 FLOW DISTRIBUTION FOR SECNO=       .00          CWSEL=    1529.51

 STA=    9969.   10079.
   PER Q=    100.0
    AREA=    186.9
     VEL=      8.2
   DEPTH=      2.0

 *SECNO  .012
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
       .012      3.21    1534.21    1534.21        .00    1535.36       1.15        .89        .03    1539.80
     1530.0        .0     1530.0         .0        .0·      177.8         .0         .3         .1    1536.20
        .00       .00       8.60        .00       .000       .035       .000       .000    1531.00    9956.23
    .013840       45.        63.       110.         20          8          0        .00      77.75   10033.98


 FLOW DISTRIBUTION FOR SECNO=       .01          CWSEL=    1534.21

 STA=    9956.   10049.
   PER Q=    100.0
    AREA=    177.8
     VEL=      8.6
   DEPTH=      2.3

 *SECNO  .076
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
1
  09AUG94      13:31:10                                                                      PAGE    4


     SECNO     DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q         QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME      VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE     XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 3720 CRITICAL DEPTH ASSUMED
       .076      3.31    1552.21    1552.21        .00    1553.24       1.03       4.82        .01    1556.80
     1350.0        .0     1350.0         .0         .0      165.7         .0        1.6         .7    1553.40
        .01       .00       8.15        .00       .000       .035       .000       .000    1548.90    9940.86
    .014775      360.       338.       340.         20          8          0        .00      82.87   10023.72


 FLOW DISTRIBUTION FOR SECNO=       .08          CWSEL=    1552.21
```

```
STA=    9941.   10028.
  PER Q=     100.0
   AREA=     165.7
    VEL=       8.1
  DEPTH=       2.0

CCHV=      .100 CEHV=      .300
*SECNO  .181
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .181       2.80    1576.00    1576.00        .00    1576.98        .99       9.29        .00    1576.50
    1350.0         .0     1349.7         .3         .0      169.4         .3        3.7        1.8    1575.50
       .03        .00       7.97       1.09       .000       .040       .070       .000    1573.20    9950.47
   .019207       535.       554.       560.         20         15          0        .00      88.62   10039.09


FLOW DISTRIBUTION FOR SECNO=        .18          CWSEL=    1576.00

STA=    9950.   10038.   10039.
  PER Q=     100.0        .0
   AREA=     169.4        .3
    VEL=       8.0       1.1
  DEPTH=       1.9        .2

*SECNO  .191
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .191       2.20    1577.80    1577.80        .00    1578.66        .86       1.04        .01    1579.40
    1350.0         .0     1350.0         .0         .0      181.6         .0        3.9        2.0    1581.10
       .03        .00       7.43        .00       .000       .040       .000       .000    1575.60    9924.07
   .020048        45.        53.        45.         20         15          0        .00     107.83   10031.91


1
   09AUG94       13:31:10                                                                            PAGE     5

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

FLOW DISTRIBUTION FOR SECNO=        .19          CWSEL=    1577.80

STA=    9924.   10045.
  PER Q=     100.0
   AREA=     181.6
    VEL=       7.4
  DEPTH=       1.7

1490 NH CARD USED
*SECNO  .270

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .270       1.87    1593.17    1593.17        .00    1593.79        .62       8.41        .02    1592.40
    1350.0        2.3     1212.8      134.8        1.5      187.3       29.1        5.9        3.4    1592.30
       .05       1.58       6.48       4.64       .070       .040       .042       .000    1591.30    9880.51
   .020276       390.       417.       420.          3         15          0        .00     188.48   10099.43


FLOW DISTRIBUTION FOR SECNO=        .27          CWSEL=    1593.17

STA=    9881.     9884.    10023.    10098.    10099.
  PER Q=        .2      89.8       9.8        .2
   AREA=       1.5     187.3      28.2        .8
    VEL=       1.6       6.5       4.7       3.1
  DEPTH=        .4       1.4        .4        .5

CCHV=      .100 CEHV=      .300
*SECNO  .363
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .363       2.04    1609.54    1609.54        .00    1610.19        .65       9.54        .01    1608.10
    1350.0        3.3     1291.3       55.5        1.6      195.1       26.6        8.3        5.4    1608.50
       .07       2.08       6.62       2.09       .070       .040       .070       .000    1607.50    9910.61
   .018876       515.       491.       445.          4          8          0        .00     185.99   10096.60


FLOW DISTRIBUTION FOR SECNO=        .36          CWSEL=    1609.54
1
   09AUG94       13:31:10                                                                            PAGE     6

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


STA=    9911.     9913.    10045.    10060.    10082.    10095.    10097.
  PER Q=        .2      95.6       2.4       1.5        .3        .0
   AREA=       1.6     195.1      12.5      10.9       3.1        .1
    VEL=       2.1       6.6       2.6       1.8       1.1        .0
  DEPTH=        .7       1.5        .8        .5        .2        .1
```

```
1490 NH CARD USED
*SECNO  .451

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .451      2.10   1623.70   1623.70       .00   1624.34       .64      8.41       .00   1622.60
    1350.0       5.8    1018.9     325.3       3.1     145.9      75.2      10.7       7.4   1622.40
       .09      1.86      6.98      4.33      .070      .040      .044      .000   1621.60   9953.06
   .017589      505.      465.      440.         4         8         0       .00    179.97  10133.07

FLOW DISTRIBUTION FOR SECNO=       .45          CWSEL=   1623.70

STA=    9953.    9959.   10045.   10082.   10092.   10103.   10116.   10133.
  PER Q=       .4     75.5      7.8      5.3      5.3      4.4      1.2
   AREA=      3.1    145.9     28.0     12.2     13.3     12.6      9.0
    VEL=      1.9      7.0      3.7      5.9      5.4      4.8      1.9
  DEPTH=       .5      1.7       .8      1.3      1.1       .9       .5

CCHV=     .100 CEHV=     .300
*SECNO  .541
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .541      2.52   1638.42   1638.42       .00   1639.37       .95      8.66       .09   1637.70
    1350.0       2.0    1183.1     164.9       1.4     143.2      46.0      13.0       9.0   1637.10
       .11      1.42      8.26      3.58      .070      .040      .070      .000   1635.90   9965.76
   .018026      415.      475.      540.         4        11         0       .00    104.70  10070.46

FLOW DISTRIBUTION FOR SECNO=       .54          CWSEL=   1638.42

STA=    9966.    9970.   10037.   10063.   10070.
  PER Q=       .1     87.6     10.9      1.3
   AREA=      1.4    143.2     39.3      6.7
    VEL=      1.4      8.3      3.8      2.5
  DEPTH=       .4      2.1      1.5       .9

1
   09AUG94      13:31:10                                                                         PAGE    7

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

1490 NH CARD USED
*SECNO  .625
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .625      2.58   1650.58   1650.58       .00   1651.57       .99      8.00       .01   1648.40
    1350.0      23.2    1310.9      15.8       7.9     162.0       7.5      14.9      10.0   1649.30
       .13      2.93      8.09      2.11      .070      .040      .070      .000   1648.00   9935.64
   .017986      445.      444.      445.        10         8         0       .00     97.18  10032.82

FLOW DISTRIBUTION FOR SECNO=       .63          CWSEL=   1650.58

STA=    9936.    9943.   10021.   10033.
  PER Q=      1.7     97.1      1.2
   AREA=      7.9    162.0      7.5
    VEL=      2.9      8.1      2.1
  DEPTH=      1.1      2.1       .6

1
   09AUG94      13:31:10                                                                         PAGE    8


                                                                                   THIS RUN EXECUTED 09AUG94    13:31:11
*************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
*************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WASH I

SUMMARY PRINTOUT

       SECNO     ELMIN     CWSEL         Q       VCH    DIFWSX    TOPWID     DEPTH      SSTA     ENDST      QLOB      QROB     ELTRD

*       .000   1526.70   1529.51   1530.00      8.18       .00     91.63      2.81   9969.08  10060.71       .00       .00       .00

*       .012   1531.00   1534.21   1530.00      8.60      4.70     77.75      3.21   9956.23  10033.98       .00       .00       .00

*       .076   1548.90   1552.21   1350.00      8.15     18.00     82.87      3.31   9940.86  10023.72       .00       .00       .00

*       .181   1573.20   1576.00   1350.00      7.97     23.79     88.62      2.80   9950.47  10039.09       .00       .29       .00

*       .191   1575.60   1577.80   1350.00      7.43      1.81    107.83      2.20   9924.07  10031.91       .00       .00       .00

*       .270   1591.30   1593.17   1350.00      6.48     15.37    188.48      1.87   9880.51  10099.43      2.31    134.84       .00
```

```
 *    .363   1607.50   1609.54   1350.00      6.62     16.37    185.99      2.04   9910.61  10096.60      3.27     55.46      .00
 *    .451   1621.60   1623.70   1350.00      6.98     14.16    179.97      2.10   9953.06  10133.07      5.78    325.31      .00
 *    .541   1635.90   1638.42   1350.00      8.26     14.72    104.70      2.52   9965.76  10070.46      2.01    164.86      .00
 *    .625   1648.00   1650.58   1350.00      8.09     12.17     97.18      2.58   9935.64  10032.82     23.22     15.84      .00
1
  09AUG94       13:31:10                                                                                        PAGE     9


  SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO=       .000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=       .012  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .012  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       .012  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=       .076  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .076  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       .076  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=       .181  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .181  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       .181  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=       .191  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .191  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=       .191  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=       .270  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .270  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .363  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .363  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .451  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .451  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .541  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .541  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .625  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .625  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```

SECTION 4: Hydraulic Analysis

4.8 Project Input Data File on Diskettes

KEY TO COMPUTER FILES

Input File	Output File	Description
SP1A.RAT	SP1A.OH2	Special Problem 1A
SP2A(1).RAT	SP2A(1).OH2	Special Problem 2A
SP2A(2).RAT	SP2A(2).OH2	Special Problem 2A
SP1AS.RAT	SP1AS.0H2	Special Problem 1AS
WASHA.IH2	WASHA.OUT	Wash A
WASHAS2.IH2	WASHAS2.OUT	Wash A South
WASHF.IH2	WASHF.0H2	Wash F
WASHI.IH2	WASHI.0H2	Wash I

SECTION 6: Reference Materials

SECTION 6: Reference Materials

6.5 Bibliography

SECTION 6: Reference Materials

6.5 Bibliography

1. Aerial Mapping Company, Inc., 1993. Topographic Maps, Scale 1:2400, Contour interval 2 feet.
2. Arizona Department of Transportation, Report Number FHWA-AZ93-281, Highway Drainage Design Manual Hydrology, Final Report, March 1993.
3. Arizona Department of Water Resources, Engineering Division, Flood Management Section, September 1990. Instructions for Organizing and Submitting Technical Documentation for Flood Study.
4. Brooks, Hersey & Associates, Inc. for Rio Verde Services, Inc., Revised Master Drainage Plan, Tonto Verde, May 1993.
5. Chow, Maidment and Mays, 1988. Applied Hydrology.
6. Creighton, David E. Cyclic Streamflow Test for Validity of Randomness, Arizona Department of Water Resources, undated.
7. Dodson & Associates, Inc., 1991. ProHEC-2 User's Manual and Program Reference.
8. Federal Emergency Management Agency, March, 1991. Flood Insurance Study Guidelines and Specifications for Study Contractors.
9. Flood Control District of Maricopa County, June 1, 1992. Hydrologic Design Manual for Maricopa County.
10. Hoggan, Daniel H., 1989. Computer-Assisted Floodplain Hydrology & Hydraulics.
11. National Weather Service, August, 1984. NOAA Technical Memorandum NWS Hydro-40, Depth-Area Ratios in the Semi-Arid Southwest United States.
12. U.S. Army, Corps of Engineers, September, 1990. HEC-1 Flood Hydrograph Package Users Manual.
13. U.S. Army, Corps of Engineers, January, 1981. HEC-2 Water Surface Profiles Users Manual.
14. U.S. Army, Corps of Engineers, April, 1982. Hydrologic Analysis of Ungaged Watersheds Using HEC-1.
15. U.S. Department of Agriculture, Soil Conservation Service, Preliminary. Soil Survey of Aguila-Carefree Area, Parts of Maricopa County and Pinal Counties, Arizona.
16. U.S. Department of Agriculture, Soil Conservation Service, 1973. General Soil Map of Maricopa County.
17. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1973. Precipitation-Frequency Atlas of the Western United States, Volume VIII-Arizona.
18. U.S. Geological Survey, 1991. Basin Characteristics and Streamflow Statistics in Arizona as of 1989. Water-Resources Investigations Report 91-4041.
19. U.S. Geological Survey, 1991. Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona.

SECTION 7: Cross-Referencing & Labeling Information

SECTION 7: Cross-Referencing & Labeling Information

7.1 Other Studies Impacted

SECTION 7.1: Other Studies Impacted

There are no detailed studies of record for this watershed. The floodplain delineation study for Rio Verde-South is adjacent to the southerly boundary of this study area and is currently being prepared. The two studies have been coordinated.

SECTION 7: Cross-Referencing & Labeling Information

7.2 Key to Cross Section Labeling

KEY TO CROSS-SECTION (XS) LABELING

Prepared By:
SC: Larry D. Culler
TEC:

Community Name: Maricopa County
State: Arizona

Date Prepared:
SC: March 1995
TEC:

Stream Name: Un-named Wash A
Run Date: October 20, 1994

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS
	A	0.000	
	B	0.031	
	C	0.094	
	D	0.181	
	E	0.241	
	F	0.347	
	G	0.453	
	H	0.550	
	I	0.658	
	J	0.700	
	K	0.723	
	L	0.820	
	M	0.902	
	N	0.990	
	O	1.117	
	P	1.208	
	Q	1.306	
	R	1.367	
	S	1.472	
	T	1.557	
	U	1.629	
	V	1.733	
	W	1.806	
	X	1.887	
	Y	1.983	
	Z	2.105	
	AA	2.181	
	AB	2.297	
	AC	2.403	
Pts. 80-81		2.476	
	AD	2.494	

KEY TO CROSS-SECTION (XS) LABELING

Prepared By:
SC: Larry D. Culler
TEC:

Community Name: Maricopa County
State: Arizona

Date Prepared:
SC: March 1995
TEC:

Stream Name: Un-named Wash A South
Run Date: October 20, 1994

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS
	A	0.016	
	B	0.028	
	C	0.121	
	D	0.207	
	E	0.308	
	F	0.411	
	G	0.512	
	H	0.599	
	I	0.682	
	J	0.774	
	K	0.867	

KEY TO CROSS-SECTION (XS) LABELING

Prepared By:
SC: Larry D. Culler
TEC:

Community Name: Maricopa County
State: Arizona

Date Prepared:
SC: March 1995
TEC:

Stream Name: Un-named Wash F
Run Date: August 9, 1994

Field Survey Section No.	**XS Letter Draft FIS**	**Computer Stationing**	**XS Letter Final FIS**
	A	0.000	
	B	0.095	
	C	0.195	
	D	0.305	
Pts. 82-83	E	0.374	
	F	0.390	
	G	0.480	
	H	0.569	
	I	0.683	
	J	0.790	
	K	0.856	
	L	0.961	

KEY TO CROSS-SECTION (XS) LABELING

Prepared By:
SC: Larry D. Culler
TEC:

Community Name: Maricopa County
State: Arizona

Date Prepared:
SC: March 1995
TEC:

Stream Name: Un-named Wash I
Run Date: August 9, 1994

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS
	A	0.000	
	B	0.012	
	C	0.076	
	D	0.181	
	E	0.191	
	F	0.270	
	G	0.363	
	H	0.451	
	I	0.541	
	J	0.625	