DEADMAN WASH
FLOODPLAIN DELINEATION STUDY
FCD 90-65

TECHNICAL DATA NOTEBOOK
HYDRAULIC ANALYSIS

VOLUME 1 OF 2

PREPARED FOR

FLOOD CONTROL DISTRICT
of
Maricopa County

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

PREPARED BY

HNTB

HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

July, 1992
Revised December, 1992
Revised April, 1995

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF
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June 16, 1995

Mr. Timothy M. Murphy
Project Manager
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 W. Durango Street
Phoenix, Arizona 85009

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2801 W. Durango
Phoenix, AZ 85009

RE: Deadman Wash Floodplain Delineation Study
Final Submittal
Maricopa County Contract No. FCD 90-65
HNTB Job Number: 15081

Dear Mr. Murphy:

Enclosed are six copies of our FEMA approved Final Technical Data Notebook - Hydrology and Hydraulic Analysis for the Deadman Wash Floodplain Delineation Study. In addition, we are also submitting six copies of Floodplain Delineation Maps with original mylars, and the roadway as-built plans used in the project.

If you have any questions or need additional information regarding the above, please give me a call.

Very truly yours,

HOWARD NEEDLES TAMMEN & BERGENDOFF, INC.

Bailang Sun

Bailang G. Sun, P.E.
Project Manager

Enclosures

DEADMAN5.LTR

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Registered Professional Engineer (Civil)
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Date Signed 6/16/95
ARIZONA, U. S. A.

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C. Cross Section Plots

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Stream Number 4 - Sheet No. 10P and 11P
Stream Numbers 7 & 8 - Sheet No. 12P

2. Flood Boundary and Floodway Maps (Under Separate Cover)

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STUDY DOCUMENTATION ABSTRACT							
INITIAL STUDY	X	RESTUDY		LOMR		OTHER	

SECTION 1: GENERAL INFORMATION		
1 A	COMMUNITY	Maricopa County, Arizona
1 B	COMMUNITY NUMBER	040037
1 C	COUNTY	Maricopa
1 D	STATE	Arizona
1 E	DATE STUDY ACCEPTED	Pending
1 F	STUDY CONTRACTOR	HOWARD NEEDLES TAMMEN & BERGENDOFF
	CONTACTS	Mr. Richard M. Wells, P.E. Mr. B. Gary Sun, P.E.
	ADDRESS	Two Renaissance Square 40 North Central, Suite 1100 Phoenix, Arizona 85004
	PHONE	(602) 528-4300
	SUBCONSULTANTS	Aerial Mapping Company, Inc. McEwen Global Positioning Systems Project Engineering Consultants, Ltd. GIS Consultants of Arizona, Ltd.
1 G	TECH. REVIEWER (FEMA)	PENDING
	PHONE	
1 H	FEMA REGIONAL REVIEWER	PENDING
	PHONE	
1 I	STATE REVIEWER	Mr. David E. Creighton, Jr., P.E. Arizona Department of Water Resources
	PHONE	(602) 542-1541
1 J	LOCAL REVIEWER	Mr. Timothy M. Murphy Flood Control District of Maricopa County(FCDMC)
	PHONE	(602)506-1501
1 K	RIVER OR STREAM NAME	Deadman Wash and its Tributaries

STUDY DOCUMENTATION ABSTRACT		
1 L	REACH DESCRIPTION	a. Deadman Wash, New River to future 22nd Avenue alignment (Approximately 10.5 miles)
		b. Unnamed Tributary of Deadman Wash, Confluence with Deadman Wash to 29th Avenue (Approximately 1.5 miles)
		c. Unnamed Tributary of Deadman Wash, Confluence with Deadman Wash to I-17 East Rest Area (Approximately 1 mile)
1 M	STUDY TYPE	Deadman Wash and two Unnamed Tributaries of Deadman Wash - Riverine Type. Detailed Study
SECTION 2: MAPPING INFORMATION		
2 A	USGS QUAD SHEETS	a. Daisy Mountain: 1981 Photo Revised, 1962 Photo Date, 40' Contour Interval (CI), 20' Supplementary Contour Interval (SCI)
		b. New River SE: 1981 Photo Revised, 1962 Photo Date, 40' CI, 20' SCI
		c. Biscuit Flat: 1981 Photo Revised, 1962 Photo Date, 20' CI, 10' SCI
		d. New River: 1981 Photo Revised, 1962 Photo Date, 20' CI, 10' SCI
2 B	MAPPING FOR HYDROLOGIC STUDY	
	TYPE/SOURCE	USGS 7.5 Minutes Quadrangle Maps
	SCALE	1"=2,000'
	DATE	1964 & 1965, Photo Revised 1981
2 C	MAPPING FOR HYDRAULIC STUDY	
	TYPE/SOURCE	Aerial Mapping by Aerial Mapping Company, Inc.
	SCALE	1"=200' with 2' CI or 4' CI
	DATE	October 11, 1991
SECTION 3: HYDROLOGY		
3 A	MODEL OR METHOD USED (including vendor and version description)	U.S. Army Corps of Engineers' HEC-1 Model, Version 4.0, dated September 1, 1990, as implemented by Haestad Methods, Inc.
3 B	STORM DURATION	6-Hour and 24-Hour Storms
3 C	HYETOGRAPH TYPE	*6 Hour Storm: FCDMC Distributions* 24 Hour Storm: SCS Type II Distribution

STUDY DOCUMENTATION ABSTRACT		
3 D	FREQUENCIES DETERMINED	100 - Year
3 E	LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership)	Deadman Wash near New River, AZ, USGS Station No. 09513820, Just west of I-17, 20 Years of Record
3 F	RAINFALL AMOUNTS AND REFERENCE	3.37 inches for a 6-Hour Storm 4.38 inches for a 24-Hour Storm Hydrologic Design Manual for Maricopa County, Arizona by FCDMC
3 G	UNIQUE CONDITIONS AND PROBLEMS	a. A Flow Split Exists at 1 mile north of Carefree Highway b. There are a number of Stock Tanks and the dam structures would likely fail during a 100-Year Storm Event
3 H	COORDINATION OF Q'S (agency, date, comments)	
SECTION 4: HYDRAULICS		
4 A	MODEL OR METHOD USED (including vendor and version description)	U.S. Army Corps of Engineers' HEC-2 Model, Version 4.6.2, dated May 1991, as implemented by Haestad Methods, Inc.
4 B	REGIME	Subcritical Flow
4 C	FREQUENCIES FOR WHICH PROFILES WERE COMPUTED	100 Year
4 D	METHOD OF FLOODWAY CALCULATION	Encroachment Method 1
4 E	UNIQUE CONDITIONS AND PROBLEMS	

DEADMAN WASH
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HYDRAULIC ANALYSIS

SECTION 4: HYDRAULIC ANALYSIS
AND
SECTION 4.1: Method Description

SECTION 4: HYDRAULIC ANALYSIS

4.1 Method Description

4.1.1 Purpose of Study

The purpose of this floodplain delineation study is to investigate the existence and severity of flood hazards for the Deadman Wash watershed area, in an unincorporated part of Maricopa County. This report identifies existing and potential 100-year flood hazards and provides valuable hydraulic data for future developments and improvements in the watershed.

This hydraulic analysis report is a part of the study contract for the Deadman Wash Floodplain Delineation Study, Contract No. FCD 90-65. This report consists of **Section 4** of the **Technical Data Notebook (TDN)**, which is organized in a sequence according to the documentation index numbering system in the Instructions for Organizing and Submitting Technical Documentation for Flood Studies, developed by the Arizona Department of Water Resources (ADWR), Engineering Division, dated August 1990 and revised September 1991 (Reference 1). **Sections 6 and 7** in the **TDN** are also included in this report for a list of references and cross-referencing, respectively.

4.1.2 Area Studied

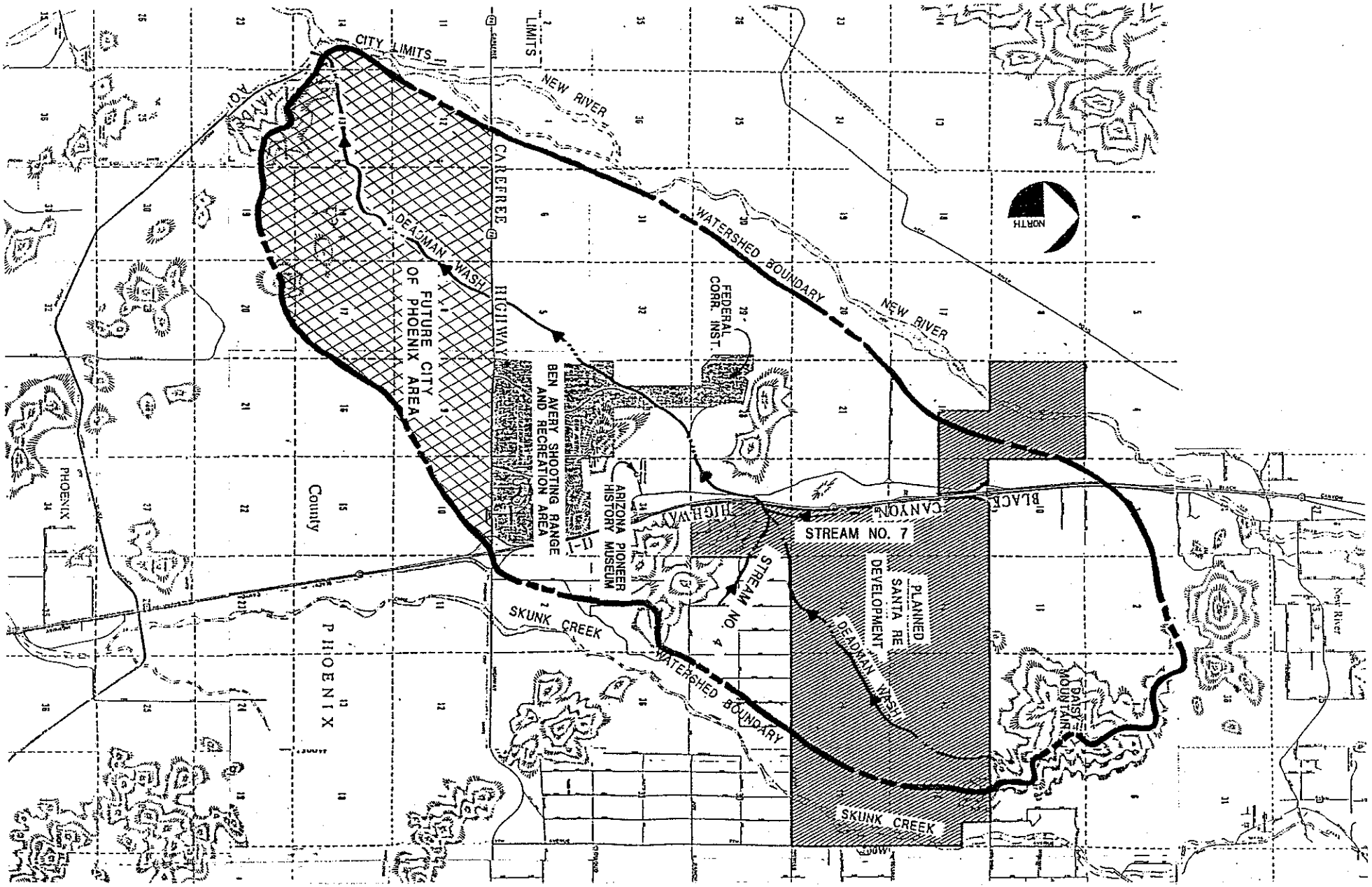
Scope of Study

The study area is located in northeastern Maricopa County, Arizona, and is shown in **Figure 1 - Vicinity Map**. This floodplain delineation study covers areas of planned development and proposed drainage improvements within the Deadman Wash watershed. Study reaches selected for detailed hydraulic analysis are as follows:

1. Deadman Wash - from New River to future 22nd Avenue alignment in Section 24, T6N, R2E, approximately 10.5 miles in length.

2. Unnamed Tributary - Stream Number 4 from the confluence (just east of I-17 to 1.5 miles upstream at future 29th Avenue).

3. Unnamed Tributaries - Stream Numbers 7 and 8 from the confluence to 1 mile upstream near I-17 East Rest Area.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DEADMAN WASH FLOODPLAIN DELINEATION STUDY
MARICOPA COUNTY

GRAPHIC SCALE IN MILES

1 0 1 2 3

VICINITY MAP

FIGURE 1

Community Description

Maricopa County, encompassing a total area of 9,238 square miles, is located in the south central portion of Arizona. The incorporated communities within the county cover an area in excess of 100 square miles, and an additional 3,330 square miles are government lands. A large portion of the remaining county land is undeveloped. The 1990 population of Maricopa County was 2.1 million.

Terrain in Maricopa County varies from rugged mountains to plains and deserts. Numerous small, intermittent streams and washes traverse the county. Major streams in the county are the Gila, Salt, Agua Fria, New and Hassayampa Rivers. The residential, industrial, and agricultural developments are concentrated along these major streams and are continuing to grow. The climate in Maricopa County consists of mild, short winters and long, hot summers.

The study area is predominantly desert and undeveloped lands. There is some existing residential development east of I-17 between Desert Hills Drive and Irvine Road which consists of single family lots in excess of 1 acre in size. A future development of the planned community Santa Re was proposed in the east portion of the study watershed (Figure 1 & Reference 9). A County park, Ben Avery Shooting Range and Recreation Area, is located just west of I-17. The Arizona Pioneer History Museum, Federal Correctional Institute and a trailer park are also situated just west of I-17.

A future City of Phoenix area, approximately 7 square miles, was designated in the watershed south of Carefree Highway. An area master drainage study was performed to identify flood hazards and provide conceptual design of drainage channels, storm drains and roadway crossings (Reference 8). Five Carefree Highway crossing structures were proposed including a bridge structure to replace the existing dip section. This master plan also included lined channels, box culverts, and storm drains in the proposed arterial roadway alignments south of Carefree Highway.

Principal Flood Problems

A large portion of Maricopa County has experienced destructive floods. The principal flood hazards result from channel flows with erosive velocities and substantial sediment in steep mountains, and from overland sheet flows on alluvial slopes with inundation, and channel shifting and migration. Although most of the precipitation falls during the summer and winter seasons in the county, the flooding may occur any time of the year.

Deadman Wash, a tributary of the New River, originates at the Daisy Mountain and flows southwesterly for approximately 13 miles to its confluence with the New River. It drains an area of approximately 34 square miles. Flood hazards for the east portion of the watershed result from flows with high velocities and substantial debris in rugged mountain slopes. The central and south portions of the watershed consist of wide, flat floodplain and relatively small channels, and experience overland sheet flooding, inundation, and channel migration.

Three major drainage crossings exist along the Deadman Wash. Two bridges have been constructed on Deadman Wash to carry the I-17 northbound and southbound traffic. Two tributaries join Deadman Wash just upstream of the northbound bridge. Vegetation is very dense at these bridge locations. A pipe culvert crossing at Joy Ranch Road near the Federal Correctional Institute has experienced severe bank erosion and stream bed scour. The roadway was inundated and impassible in past floods. No drainage culvert structure was constructed on Deadman Wash at the Carefree Highway crossing. A dip section on the Deadman Wash main channel crosses Carefree Highway. A small culvert crossing on the tributary, Stream Number 12, is located just 2,000 feet east of this dip section.

Deadman Wash becomes a wide, shallow, and not well-defined channel, approximately 3,400 feet north of the Carefree Highway. The overland flow occurs on a wide, flat floodplain area and the majority of flow crosses the Carefree Highway through a dip section. The sheet flow flooding will continue downstream toward the Snodgrass Tank, which is located just 0.5 mile from the confluence with the New River. The dam and levee structure for Snodgrass Tank creates a significant constriction to the stormwaters. The 106 feet wide spillway just north of the tank is able to convey the 100-year flow without overtopping the levee. However, there is a significant backwater effect upstream of the levee. Refer to **Section 4.5.1** for detailed discussion on Snodgrass Tank levee.

Flood Protection Measures

No flood protection measures exist in the study area. There are at least 17 stock tanks presented in the Deadman Wash watershed. The dam and dike structures for these tanks were not considered in the hydraulic analyses due to the lack of proper maintenance. One exception was the dam and levee structure for the Snodgrass Tank near the New River. Based on field observations, this structure is structurally sound and will impound floodwater with an adequate freeboard for a 100-year storm.

4.1.3 Hydrologic Analyses

The watershed hydrology was developed utilizing procedures and methodologies described in the Hydrologic Design Manual for Maricopa County, Arizona (Manual), by Flood Control District of Maricopa County, dated September 1, 1990 (Reference 2). The hydrologic analysis was performed using the U.S. Army Corps of Engineers' (USCE) HEC-1 computer program, version 4.0, dated September 1990, as implemented by Haestad Methods, Inc (Reference 3).

The HEC-1 modeling was developed for the current watershed conditions using the S-graph method, Green-Ampt infiltration losses, normal depth routing, storage routing, and hydrograph diversion. The summary of peak discharges at key locations are listed in **Table 1**. The results of hydrologic analysis are described in **Section 3** of **TDN** (under a separate cover), by HNTB, dated May 1992 and revised October 1992.

4.1.4 Hydraulic Analyses

The hydraulic analyses of this delineation study was in accordance with the procedures outlined in the Flood Insurance Study Guidelines and Specifications for Study Contractors, FEMA 37, developed by the Federal Emergency Management Agency (FEMA), dated March, 1991 (Reference 18). Standard hydraulic methods were utilized to determine the 100-year recurrence flood hazards for this floodplain delineation study. This study was based on the current conditions of the reaches on the streams studied. The water surface profiles were performed using the U.S. Army Corps of Engineers' (USCE) HEC-2 computer program, version 4.6.2, dated May 1991, as implemented by Haestad Methods, Inc (Reference 7). Profiles were calculated for the Deadman Wash and its two tributaries (Stream Numbers 4 and 7). Floodplain and floodway boundaries, and flood hazard zones for insurance application were also determined. Existing drainage structures were modeled in HEC-2 to obtain floodplain and floodway data. No channel improvements and scour analysis were included in this study.

Cross-section data for this study were digitized from topographic maps made from aerial survey flown in October, 1991 by Aerial Mapping Company, Inc. (Reference 13). The topographic maps for the study reaches were furnished with a scale of 1" = 200' and contour intervals of 2' or 4'. The contour interval of 4' was used on topographic maps for the study reaches east of I-17, while a contour interval of 2' was used for the reaches west of I-17. Additional cross-section data were obtained from field surveys and as-built plans for the roadway crossings and bridges. Locations of cross sections used in the hydraulic analyses are shown on **Exhibit 1 - Flood Profiles** at the end of this report. These cross sections are also shown on **Exhibit 2 - Flood Boundary and Floodway Maps.**

Table 1

Summary of Peak Discharges at Key Locations

Flooding Source and Location	Drainage Area (square miles)	100-Year Peak Discharges (cfs)
Deadman Wash		
At New River	34.01	9,600
At unnamed tributary (Stream No. 14)	33.34	9,670
At unnamed tributary (Stream No. 11)	26.63	9,570
At unnamed tributary (Stream No. 12)	19.36	9,110
At Carefree Highway*	19.07	9,510
At unnamed tributary (Stream No. 9)	18.04	9,510
At Joy Ranch Road	14.99	9,680
At I-17	12.72	9,440
At unnamed tributary (Stream No. 4)	6.33	6,220
At unnamed tributary (Stream No. 3)	4.70	4,480
At unnamed tributary (Stream No. 2)	3.75	3,650
At 31st Avenue (Stream No. 1)	2.49	2,770
At Future 29th Avenue	1.21	1,840
At Future 22nd Avenue	0.52	1,020
Unnamed Tributary (Stream No. 4)		
At I-17	1.63	1,760
At Irvine Road	1.26	1,660
At 29th Avenue	0.56	770
Unnamed Tributary (Stream No. 7 & 8)		
At I-17	6.30	4,300
At I-17 East Rest Area	4.76	3,170

* Discharge shown included potential sheet flow flooding from the Deadman Wash tributary (Stream No. 12).

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HYDRAULIC ANALYSIS

SECTION 4.2: Parameter Estimation

4.2 Parameter Estimation

4.2.1 Manning's n Values

Manning's roughness coefficients were selected based on the results of field observations and engineering judgment. These values were estimated in accordance with the procedures outlined in the Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, prepared by the U.S. Geological Survey (USGS) for FCDMC, dated April 1991 (Reference 12). In addition, aerial photographs, existing topographic maps, and the current SCS soils maps were also utilized in Manning's n estimation. Manning's n values for Deadman Wash were estimated ranging from .038 to .075 for the channel and from .065 to .095 for the overbanks. **Table 2** shows the Manning's n values estimated for each cross section channel and overbanks.

In general, channel bed material is cobbles and boulders with scattered vegetation, and was assigned a base value of 0.030 to 0.050. Channel banks have dense growth of brush and small trees, and the overbank areas are more sparse brush and bushes. Manning's n values were assigned to segments of cross sections with multiple or braided channels, and were modeled in the HEC-2 models using NH cards. The photographs, included immediately following **Table 2**, illustrate the estimated Manning's n values in the study reaches. **Appendix A** , included in Volume 2 of 2 of this report, presents the Manning's n determination report for this delineation study, which includes a detailed description of the Manning's n values estimation with more photographs. **Figure 2** shows the study limits and the estimated Manning's n values used along the study reaches.

4.2.2 Expansion and Contraction Coefficients

For most of the study reaches, the contraction and expansion coefficients were selected as 0.1 and 0.3, respectively. The values were increased to 0.3 and 0.5 at the breach near Snodgrass Tank and the existing drainage structures. For the I-17 northbound and southbound bridges, values of 0.6 and 0.8 were used to compute additional losses associated with skewed piers and channel bends. The expansion and contraction coefficients used are also presented in **Table 2**.

Table 2
Cross Section Roughness Coefficient Values

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to 22nd Avenue

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
0.092	–	0.060	–	0.1	0.3	NH cards used
0.159	–	0.060	–	0.1	0.3	NH cards used
0.219	–	0.060	–	0.1	0.3	NH cards used
0.299	–	0.060	–	0.1	0.3	NH cards used
0.382	0.085	0.065	0.085	0.3	0.5	
0.516	0.065	0.040	0.065	0.3	0.5	
0.618	0.065	0.038	0.065	0.3	0.5	
0.721	0.065	0.038	0.065	0.1	0.3	
0.803	0.065	0.038	0.065	0.1	0.3	
0.909	0.065	0.038	0.065	0.1	0.3	
0.988	0.065	0.038	0.065	0.1	0.3	
1.079	0.065	0.038	0.065	0.1	0.3	
1.199	0.065	0.038	0.065	0.1	0.3	
1.313	–	0.038	–	0.1	0.3	NH cards used
1.419	0.065	0.038	0.065	0.1	0.3	
1.527	0.065	0.038	0.065	0.1	0.3	
1.620	–	0.038	–	0.1	0.3	NH cards used
1.717	–	0.038	–	0.1	0.3	NH cards used
1.811	–	0.048	–	0.1	0.3	NH cards used
1.909	0.065	0.048	0.065	0.1	0.3	
2.004	0.065	0.048	0.065	0.1	0.3	
2.060	0.065	0.048	0.065	0.1	0.3	
2.142	0.065	0.048	0.065	0.1	0.3	
2.233	0.065	0.048	0.065	0.1	0.3	
2.326	0.065	0.055	0.065	0.1	0.3	
2.406	0.065	0.055	0.065	0.1	0.3	
2.500	0.065	0.055	0.065	0.1	0.3	
2.595	0.065	0.055	0.065	0.1	0.3	
2.689	0.065	0.055	0.065	0.1	0.3	
2.777	0.065	0.055	0.065	0.1	0.3	
2.872	0.065	0.055	0.065	0.1	0.3	
2.947	0.065	0.055	0.065	0.1	0.3	
3.023	0.065	0.055	0.065	0.1	0.3	
3.117	0.065	0.055	0.065	0.1	0.3	
3.201	0.065	0.055	0.065	0.1	0.3	
3.284	0.065	0.055	0.065	0.1	0.3	
3.347	0.065	0.048	0.065	0.1	0.3	
3.385	0.065	0.048	0.065	0.1	0.3	
3.481	0.065	0.048	0.065	0.1	0.3	
3.546	0.065	0.048	0.065	0.1	0.3	

Table 2
Cross Section Roughness Coefficient Values

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to 22nd Avenue

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
3.639	0.016	0.016	0.016	0.1	0.3	at Carefree Hwy
3.651	0.065	0.048	0.065	0.1	0.3	
3.701	0.065	0.048	0.065	0.1	0.3	
3.804	0.065	0.048	0.065	0.1	0.3	
3.881	0.065	0.048	0.065	0.1	0.3	
3.957	0.065	0.048	0.065	0.1	0.3	
4.019	0.065	0.048	0.065	0.1	0.3	
4.058	0.065	0.048	0.065	0.1	0.3	
4.146	0.065	0.048	0.065	0.1	0.3	
4.197	0.065	0.048	0.065	0.1	0.3	
4.262	0.065	0.048	0.065	0.1	0.3	
4.333	0.065	0.048	0.065	0.1	0.3	
4.390	0.080	0.065	0.080	0.1	0.3	at Split flow levee
4.492	0.080	0.065	0.080	0.1	0.3	
4.567	0.080	0.065	0.080	0.1	0.3	
4.662	–	0.065	–	0.1	0.3	NH cards used
4.756	–	0.065	–	0.1	0.3	NH cards used
4.850	–	0.065	–	0.1	0.3	NH cards used
4.943	–	0.065	–	0.1	0.3	NH cards used
5.034	–	0.065	–	0.1	0.3	NH cards used
5.113	–	0.065	–	0.1	0.3	NH cards used
5.189	–	0.065	–	0.1	0.3	NH cards used
5.284	–	0.065	–	0.1	0.3	NH cards used
5.379	–	0.065	–	0.1	0.3	NH cards used
5.473	–	0.065	–	0.1	0.3	NH cards used
5.552	–	0.065	–	0.1	0.3	NH cards used
5.646	0.080	0.065	0.080	0.1	0.3	
5.741	0.080	0.065	0.080	0.1	0.3	
5.835	0.080	0.065	0.080	0.1	0.3	
5.928	–	0.055	–	0.1	0.3	NH cards used
6.021	0.070	0.055	0.070	0.1	0.3	
6.108	0.070	0.055	0.070	0.1	0.3	
6.205	0.070	0.055	0.070	0.1	0.3	
6.280	0.070	0.055	0.070	0.3	0.5	near Joy Ranch Road
6.328	0.070	0.055	0.070	0.3	0.5	
6.423	0.070	0.055	0.070	0.3	0.5	
6.539	0.070	0.055	0.070	0.3	0.5	

Table 2
Cross Section Roughness Coefficient Values

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to 22nd Avenue

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
6.654	0.070	0.055	0.070	0.1	0.3	
6.751	0.080	0.065	0.080	0.1	0.3	at CF Tank
6.849	0.080	0.065	0.080	0.1	0.3	
6.945	0.080	0.065	0.080	0.1	0.3	
7.042	0.080	0.065	0.080	0.1	0.3	
7.133	0.080	0.065	0.080	0.1	0.3	
7.228	0.080	0.065	0.080	0.1	0.3	
7.323	0.080	0.065	0.080	0.1	0.3	
7.417	0.080	0.065	0.080	0.1	0.3	
7.513	0.080	0.065	0.080	0.1	0.3	
7.587	0.080	0.065	0.080	0.1	0.3	
7.663	0.070	0.055	0.070	0.1	0.3	
7.738	0.070	0.055	0.070	0.6	0.8	bridge constriction
7.766	0.095	0.080	0.095	0.6	0.8	
7.769	0.095	0.013	0.095	0.6	0.8	at SB I–17 bridge
7.778	0.095	0.013	0.095	0.6	0.8	
7.785	0.095	0.080	0.095	0.6	0.8	between bridges
7.792	0.095	0.013	0.095	0.6	0.8	at NB I–17 bridge
7.800	0.095	0.013	0.095	0.6	0.8	
7.812	0.095	0.075	0.095	0.3	0.5	
7.872	–	0.075	–	0.1	0.3	NH cards used
7.921	–	0.075	–	0.1	0.3	NH cards used
8.016	–	0.075	–	0.1	0.3	NH cards used
8.111	0.095	0.075	0.095	0.1	0.3	
8.187	0.095	0.075	0.095	0.1	0.3	
8.278	0.095	0.075	0.095	0.1	0.3	
8.373	0.080	0.065	0.080	0.1	0.3	
8.485	0.080	0.065	0.080	0.1	0.3	
8.574	–	0.065	–	0.1	0.3	NH cards used
8.670	–	0.065	–	0.1	0.3	NH cards used
8.763	–	0.065	–	0.1	0.3	NH cards used
8.853	–	0.065	–	0.1	0.3	NH cards used
8.939	–	0.065	–	0.1	0.3	NH cards used
9.021	–	0.065	–	0.1	0.3	NH cards used
9.114	–	0.065	–	0.1	0.3	NH cards used
9.210	–	0.065	–	0.1	0.3	NH cards used
9.304	–	0.065	–	0.1	0.3	NH cards used
9.400	0.080	0.065	0.080	0.1	0.3	
9.492	0.090	0.070	0.090	0.1	0.3	
9.586	0.090	0.070	0.090	0.1	0.3	

Table 2
Cross Section Roughness Coefficient Values

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to 22nd Avenue

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
9.682	0.090	0.070	0.090	0.1	0.3	
9.776	0.090	0.070	0.090	0.1	0.3	
9.872	0.090	0.070	0.090	0.1	0.3	
9.966	0.090	0.070	0.090	0.1	0.3	
10.058	0.090	0.070	0.090	0.1	0.3	
10.151	0.090	0.070	0.090	0.1	0.3	
10.230	0.090	0.070	0.090	0.1	0.3	
10.325	0.090	0.070	0.090	0.1	0.3	
10.419	0.090	0.070	0.090	0.1	0.3	
10.544	0.090	0.070	0.090	0.1	0.3	at 22nd Avenue

Table 2
Cross Section Roughness Coefficient Values

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash tributary (Stream No. 4) from the mouth to future 29th Avenue alignment

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
0.000	0.095	0.075	0.095	0.1	0.3	
0.054	–	0.075	–	0.1	0.3	NH cards used
0.145	–	0.075	–	0.1	0.3	NH cards used
0.231	0.060	0.048	0.060	0.1	0.3	
0.327	0.060	0.048	0.060	0.1	0.3	
0.423	0.060	0.048	0.060	0.1	0.3	
0.520	0.060	0.048	0.060	0.1	0.3	
0.592	0.060	0.048	0.060	0.1	0.3	at unnamed tank
0.782	0.058	0.040	0.058	0.1	0.3	at 33rd Avenue
0.876	0.058	0.040	0.058	0.1	0.3	at Irvine Road
0.971	0.058	0.040	0.058	0.1	0.3	
1.072	0.058	0.040	0.058	0.1	0.3	
1.172	0.058	0.040	0.058	0.6	0.8	
1.272	0.058	0.040	0.058	0.6	0.8	
1.367	0.058	0.040	0.058	0.6	0.8	
1.436	0.058	0.040	0.058	0.6	0.8	at 29th Avenue

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash tributary (Stream No. 7 & 8) from the mouth to I–17 East Rest Area

SECNO	XNL	XNCH	XNR	CCHV	CEHV	Remarks
0.025	0.095	0.075	0.095	0.3	0.5	bridge constriction
0.075	–	0.060	–	0.1	0.3	NH cards used
0.080	–	0.060	–	0.1	0.3	NH cards used
0.170	0.095	0.060	0.095	0.1	0.3	
0.266	0.095	0.060	0.095	0.1	0.3	
0.323	–	0.070	–	0.1	0.3	NH cards used
0.403	–	0.070	–	0.1	0.3	NH cards used
0.482	0.085	0.070	0.085	0.1	0.3	
0.591	0.085	0.070	0.085	0.1	0.3	
0.700	0.085	0.070	0.085	0.1	0.3	
0.805	0.085	0.070	0.085	0.1	0.3	
0.903	0.085	0.070	0.085	0.1	0.3	
1.002	0.085	0.070	0.085	0.1	0.3	at I–17 East Rest Area

PHOTO NO. 1
Deadman Wash, RM 4.6
Looking upstream along left overbank area.

"n" = .080

PHOTO NO. 2
Deadman Wash, RM 6.3
Looking upstream from the downstream face of Joy Ranch Road pipe culverts.

"n" = .055 for channel.
"n" = .070 for left and right overbanks.

PHOTO NO. 3
Deadman Wash, RM 7.6
Looking downstream from 1,000 feet west of I-17.

"n" = .065 for channel.
"n" = .080 for left and right overbanks.

PHOTO NO. 4
Deadman Wash, RM 7.75
Looking downstream from the I-17 southbound bridge.

"n" = .055 for channel.
"n" = .070 for overbanks.

PHOTO NO. 5
Deadman Wash, RM 7.75
Looking upstream from the I-17 southbound bridge. The skwed southbound bridge piers introduce additional losses.

"n" = .080 for channel.
"n" = .095 for overbanks.

PHOTO NO. 6
Deadman Wash, RM 7.79

Looking upstream from the middle of I-17 bridges.

"n" = .080 for channel.
"n" = .095 for overbanks.

PHOTO NO. 7
Deadman Wash tributary, Stream No. 4, RM 0.2
Looking downstream along right overbank area.

"n" = .060

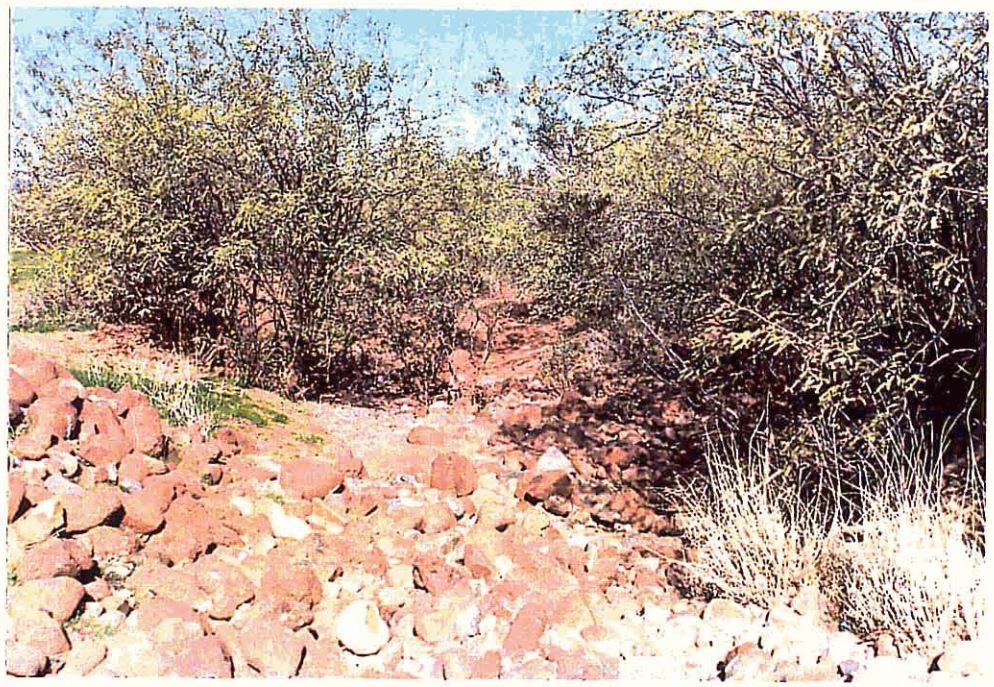

PHOTO NO. 8
Deadman Wash tributary, Stream No. 4, RM 0.9
Looking upstream from Irvine Road.

"n" = .040 for channel.
"n" = .058 for overbanks.

PHOTO NO. 9
Deadman Wash tributary, Stream No. 7, RM 1.2
Typical channel and banks (Looking upstream).

"n" = .070 for channel.
"n" = .085 for overbanks.

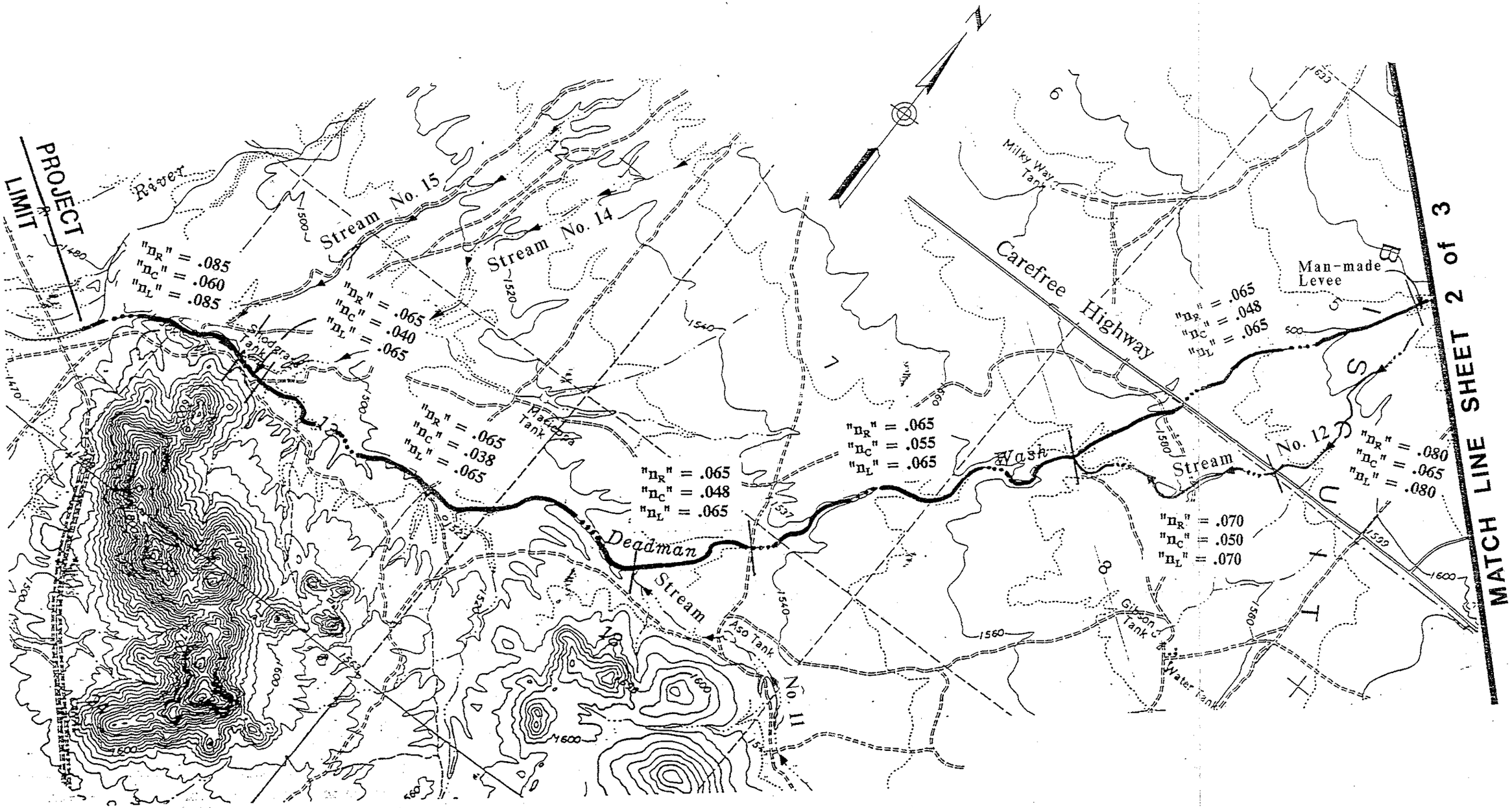

FIGURE 2

Study Reaches
For
Deadman Wash Floodplain Delineation Study

Sheet 1 of 3

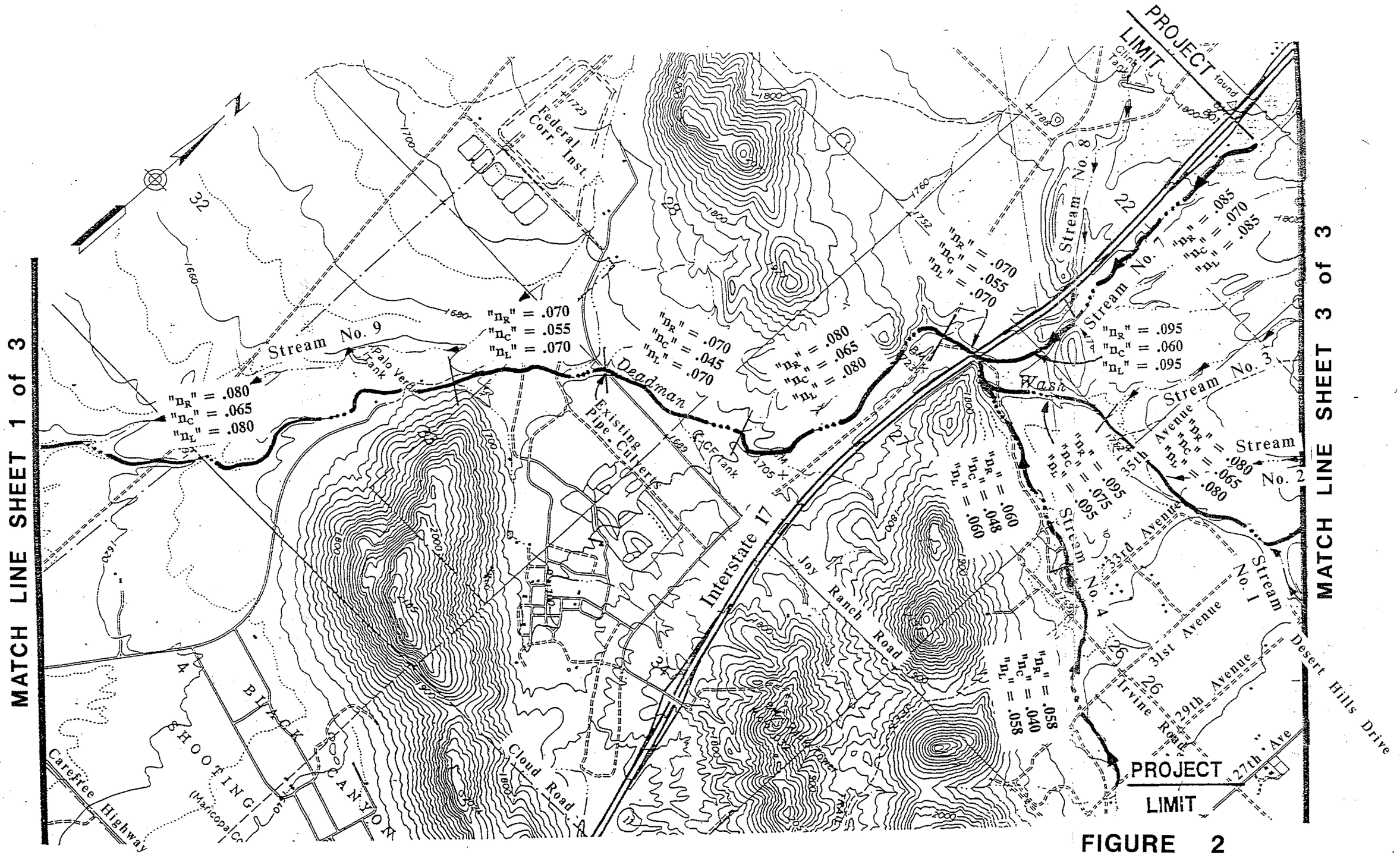

FIGURE 2

Study Reaches
For
Deadman Wash Floodplain Delineation Study
Sheet 2 of 3

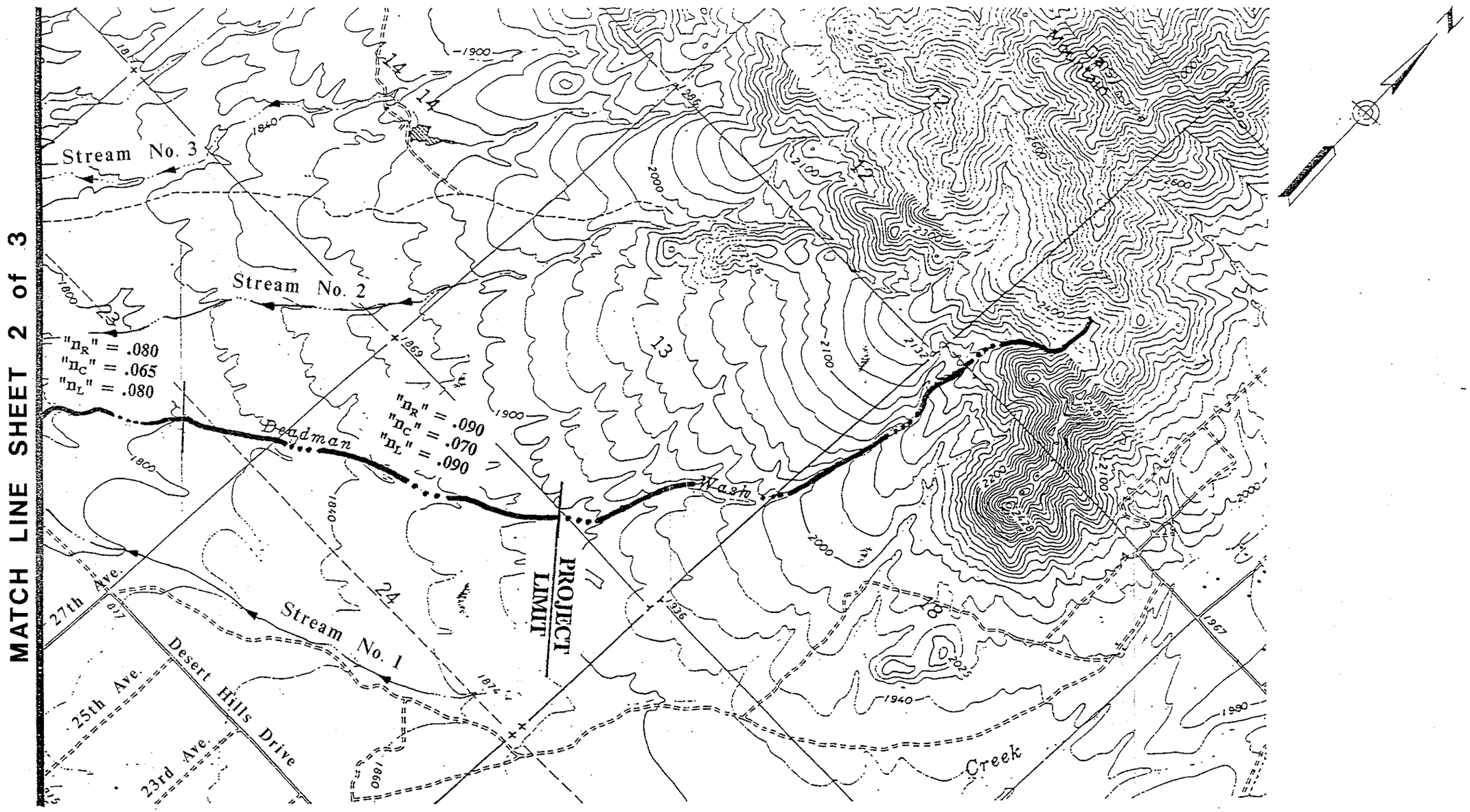

FIGURE 2

Study Reaches
For
Deadman Wash Floodplain Delineation Study

Sheet 3 of 3

DEADMAN WASH
FLOODPLAIN DELINEATION STUDY

FCD 90-65

TECHNICAL DATA NOTEBOOK
HYDRAULIC ANALYSIS

SECTION 4.3: Cross-Section Description

4.3 Cross-Section Description

Cross section locations were taken at approximately every 500 feet along the thalweg unless intermediate sections were required. The cross section number was labeled according to distance in miles along the thalweg from the confluence. The basis of cross section labeling for Deadman Wash is Mile 0.000 at the confluence with the New River. For its tributaries, the cross section labeling is Mile 0.000 at the confluence with the Deadman Wash.

Each cross section was oriented such that it is normal to the direction of flow across the entire channel and floodplain. Cross sections will be bent or doglegged as required. Each cross section's geometric data will cover at least the entire 100-year floodplain.

Significant grade changes along a cross section were digitized from left to right looking downstream. The geometric data were recorded in accordance with HEC-2 format. The positional accuracy of these data is to the nearest one foot horizontally and to the nearest 0.5 vertically. The channel station center line (thalweg) was designated as Station 10,000 in compiling cross section geometric data. Some of cross sections have multiple or braided channels, especially in the split flow area and the area just east of I-17. A segment of Stream Number 4 in the study reach consists of a highly braided channel.

4.3.1 Channel and Overbanks

The digitized cross section data at the selected locations were provided by Aerial Mapping Company, Inc. in a HEC-2 input format. These data were processed by HNTB to set up the HEC-2 models. The channel left and right bank stations, channel and overbank reach lengths, and Manning's n values for channel and overbanks were entered into the models.

A total of 162 cross sections were taken for the study reaches. Ten of these cross sections were field verified with ground survey and are included in **Appendix A - Survey Field Notes** under a separate cover of the **TDN** for **Hydrology**, Volume 2 of 2, by HNTB, dated May 1992 and revised October 1992.

Adjustments were made to the cross section data for ineffective areas, multiple channels, and ponding areas. The ET cards were used in natural profile runs to reflect the ineffective or ponding areas identified on topographic maps. The NH cards were used to simulate the multiple channels or at the confluence of washes.

Table 2 in **Section 4.2.1** presents the Manning's n values used to channel and overbanks for each cross section. **Table 3** shows the reach lengths used in the HEC-2 models for each cross section's channel and overbanks. The channel length was determined by the distance along the thalweg. The overbank length was determined based on the distance between sections measuring through the centroid of the overbank areas. These overbank area limits were delineated based on the preliminary HEC-2 runs. **Appendix B - HEC-2 Output**, included in Volume 2 of 2 of this report, shows input parameters and the results of hydraulic analyses.

Final cross sections were plotted and included in **Appendix C - Cross Section Plots** in Volume 2 of 2 in this report. These plots showed water surface profiles, Manning's n values, bridge geometry, effective flow areas, and encroachment.

4.3.2 Bridges, Culverts and Constriction

Two bridges have been constructed on Deadman Wash to carry I-17 traffic flow. These bridges create minor constriction to the flood waters. Additional constriction is generated by the southbound bridge skewed piers and channel bends just east of the northbound bridge. There are four pipe culverts with headwalls exist at the Joy Ranch Road crossing. No structure was constructed on Deadman Wash at the Carefree Highway crossing. The opening through the dam and levee structure at Snodgrass Tank creates significant constriction to the stormwaters upstream. The contraction and expansion coefficients were increased at these locations to simulate the constriction. No drainage structures exist along study reaches of the tributaries studied.

Table 3
Cross Section Locations and Reach Lengths

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to future 22nd Avenue

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
0.092	0.092	0	0	0	HEC–1 point C10Y
0.159	0.159	340	354	400	confluence with Stream 15
0.202	0.202	210	227	240	
0.299	0.299	520	512	400	
0.382	0.382	400	438	550	
0.516	0.516	680	708	750	Snodgrass Tank
0.618	0.618	600	539	490	confluence with Stream 14
0.721	0.721	400	544	400	
0.803	0.803	470	433	285	
0.909	0.909	450	560	460	
0.988	0.988	410	417	410	
1.079	1.079	420	480	500	
1.199	1.199	650	634	630	
1.313	1.313	560	602	450	
1.419	1.419	570	560	440	
1.527	1.527	450	570	550	
1.620	1.620	400	491	510	
1.717	1.717	470	512	450	
1.811	1.811	630	496	240	
1.909	1.909	517	517	480	confluence with Stream 11
2.004	2.004	502	502	502	
2.060	2.060	370	296	230	
2.142	2.142	200	433	400	
2.233	2.233	500	480	450	
2.326	2.326	500	491	400	
2.406	2.406	410	422	410	
2.500	2.500	410	496	500	
2.595	2.595	502	502	502	
2.689	2.689	400	496	550	
2.777	2.777	440	465	420	
2.872	2.872	570	502	330	
2.947	2.947	320	396	420	
3.023	3.023	290	401	460	
3.117	3.117	360	496	320	
3.209	3.209	380	486	270	
3.284	3.284	320	396	440	confluence with Stream 12
3.347	3.347	350	333	200	
3.385	3.385	215	201	215	
3.481	3.481	450	507	550	
3.546	3.546	400	343	300	

Table 3
Cross Section Locations and Reach Lengths

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to future 22nd Avenue

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
3.639	3.639	650	491	440	S. edge Carefree Hwy
3.651	3.651	63	63	63	N. edge Carefree Hwy
3.710	3.710	110	312	240	
3.804	3.804	400	496	520	
3.881	3.881	380	407	420	
3.957	3.957	400	401	400	
4.019	4.019	350	327	320	
4.058	4.058	190	206	210	
4.146	4.146	440	465	465	
4.197	4.197	280	269	265	
4.262	4.262	400	343	300	
4.333	4.333	370	375	370	downstream side of levee
4.390	4.390	290	301	301	
4.492	4.492	500	539	500	split flow starts
4.567	4.567	370	396	396	confluence with Stream 9
4.662	4.662	390	502	430	
4.756	4.756	520	496	470	
4.850	4.850	520	496	480	
4.943	4.943	500	491	430	
5.034	5.034	420	480	540	
5.113	5.113	417	417	320	
5.189	5.189	410	401	340	
5.284	5.284	310	502	250	
5.379	5.379	400	502	590	
5.473	5.473	530	496	480	
5.552	5.552	540	417	250	
5.646	5.646	270	496	480	
5.741	5.741	520	502	480	
5.835	5.835	496	496	450	
5.928	5.928	500	491	440	
6.021	6.021	480	491	580	
6.108	6.108	380	459	420	
6.205	6.205	310	512	512	
6.280	6.280	660	396	340	
6.328	6.328	265	253	235	FEMA Section #1
6.423	6.423	540	502	330	FEMA Section #2
6.539	6.539	400	612	600	FEMA Section #3

Table 3
Cross Section Locations and Reach Lengths

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to future 22nd Avenue

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
6.654	6.654	595	607	570	roadway overtopping
6.751	6.751	485	512	500	CF Tank ignored
6.849	6.849	370	517	520	
6.945	6.945	695	507	375	
7.042	7.042	650	512	360	unnamed tank ignored
7.133	7.133	430	480	440	pond area ignored
7.228	7.228	502	502	502	pond area ignored
7.323	7.323	540	502	450	
7.417	7.417	490	496	500	
7.513	7.513	550	507	507	
7.587	7.587	290	391	391	
7.663	7.663	280	401	430	
7.738	7.738	370	396	410	
7.766	7.766	110	148	160	
7.769	7.769	17	17	17	dm. face I–17 SB bridge
7.778	7.778	45	45	45	up. face I–17 SB bridge
7.785	7.785	38	38	38	section between bridges
7.792	7.792	35	35	35	dm. face I–17 NB bridge
7.800	7.800	44	44	44	up. face I–17 NB bridge
7.812	7.812	64	64	64	confluence with Stream 7
7.872	7.872	280	317	330	
7.921	7.921	310	259	120	
8.016	8.016	510	502	470	confluence with Stream 4
8.111	8.111	502	502	502	
8.187	8.187	401	401	401	
8.278	8.278	430	480	510	
8.373	8.373	510	502	480	confluence with Stream 3
8.485	8.485	500	591	600	confluence with Stream 2
8.574	8.574	500	470	400	
8.670	8.670	507	507	480	
8.763	8.763	510	491	440	
8.853	8.853	440	475	520	
8.939	8.939	440	454	430	
9.021	9.021	510	433	310	confluence with Stream 1
9.114	9.114	400	491	470	
9.210	9.210	530	507	400	
9.304	9.304	430	496	580	
9.400	9.400	500	507	507	
9.492	9.492	400	486	540	
9.586	9.586	550	496	450	future 29th Ave. alignment

Table 3
Cross Section Locations and Reach Lengths

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash from New River to future 22nd Avenue

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
9.682	9.682	480	507	510	
9.776	9.776	490	496	480	
9.872	9.872	510	507	480	
9.966	9.966	470	496	520	
10.058	10.058	490	486	440	
10.151	10.151	440	491	500	
10.230	10.230	460	417	340	
10.325	10.325	470	502	550	
10.419	10.419	510	496	420	
10.544	10.544	650	660	650	future 22nd Ave. alignment

Table 3
Cross Section Locations and Reach Lengths

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash Tributary (Stream No. 4) from the mouth to future 29th Avenue

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
0.000	0.000	0	0	0	just upstream I–17 bridge
0.054	0.054	310	283	250	
0.145	0.145	480	480	480	
0.231	0.231	440	455	475	
0.327	0.327	490	507	495	
0.423	0.423	507	507	430	
0.520	0.520	480	512	560	
0.592	0.592	385	380	350	unnamed tank ignored
0.782	0.782	930	1,003	950	at 33rd Ave.
0.876	0.876	400	496	560	at Irvine Road
0.971	0.971	495	502	505	
1.072	1.072	550	528	480	
1.172	1.172	520	528	490	
1.272	1.272	530	502	490	
1.367	1.367	490	502	502	
1.436	1.436	360	364	360	future 29th Ave. alignment

Project: Deadman Wash Floodplain Delineation Study
Stream: Deadman Wash Tributary (Stream No. 7 & 8) from the mouth to I–17 East Rest Area

SECNO	Distance (Miles)	XLOBL (ft)	XLCH (ft)	XLOBR (ft)	Remarks
0.025	0.025	0	0	0	just upstream I–17 bridge
0.075	0.075	350	264	200	
0.080	0.080	26	26	26	
0.170	0.170	540	475	430	
0.266	0.266	510	507	500	
0.323	0.323	301	301	320	
0.403	0.403	480	422	300	confluence with Stream No. 8
0.482	0.482	390	417	420	
0.591	0.591	560	576	560	
0.700	0.700	525	576	576	
0.805	0.805	545	554	554	
0.903	0.903	485	517	420	
1.002	1.002	450	523	520	at I–17 East Rest Area

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SECTION 4.4: Calibration

4.4 Calibration

Calibration is a major task for the hydraulic analysis in order to obtain reasonable results. Since no observed data were available for the study reaches, the effort was concentrated on the verification of critical input parameters for HEC-2 models. The verification was accomplished by examining the key output variables which may affect the accuracy of the results. These key variables include computed water surface elevation, top width, velocity, flow distribution, energy slope, and any warning messages. In addition, topographic maps, aerial photographs and field observations were utilized to verify the results.

The initial floodplain boundaries were plotted on topographic maps. Cross section and computed flood profiles were also plotted and reviewed. Dramatic changes of any key variables between cross sections were carefully examined. In addition, ineffective flow areas, ponding areas, and obstructions were identified on topographic maps. The results of the output analysis were incorporated into the HEC-2 models by calibrating the input parameters. These parameters include overbank reach length, contraction and expansion coefficients, and ineffective area parameters.

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SECTION 4.5: Special Problems and Solutions

4.5 Special Problems and Solutions

4.5.1 Snodgrass Tank Levee

Problem:

The dam and levee structure of Snodgrass Tank near the New River creates a significant constriction to the floodwater. There is a opening through the levee, approximately 106 feet wide, located just north of the tank. It appears that the floodwater will pond behind the dam and levee structure and breach through the opening. It will require a detailed analysis to determine whether or not this structure will be stable during a 100-year flood event.

Solution:

The ineffective flow areas were identified for SECNO 0.382 and SECNO 0.618. ET cards were used to model these ineffective flow areas. The contraction and expansion coefficients of 0.3 and 0.5 were assigned to simulate the abrupt contraction and expansion caused by the levee. Cross-section geometric data at the tank (SECNO 0.516) were taken along the dam and levee structure in order to simulate any levee overtopping during a 100-year storm event.

Discussion:

The flow runs through the levee opening with a velocity of 13.6 feet per second and the water surface elevation is 1494.2 feet. There is approximately six feet of freeboard provided by this structure. Immediately upstream of the structure the water surface elevation is approximately 2 feet higher with the structure in place than without it. Therefore, the delineation upstream of this structure considered the structure as being stable and in place during a 100-year storm event. The floodplain limits downstream of the structure were virtually the same with or without the structure in place. Due to the lack of proper maintenance on the structure, it does not provide any flood protection to downstream areas.

4.5.2 Split Flow Caused by Diversion Structure

Problem:

A split flow occurs at approximately 4,200 feet north of Carefree Highway between Deadman Wash and an unnamed tributary - Stream No. 12. This flow split is caused by a man-made levee functioning as a diversion structure. This levee is approximately 700 feet long.

Deadman Wash becomes a wide and shallow channel from just downstream of the diversion structure to the confluence with Stream Number 12. There is no drainage structure constructed on Deadman Wash. Deadman Wash crosses the Carefree Highway through a dip section, approximately 1,000 feet long. The Deadman Wash tributary, Stream Number 12, has a narrow, and well-defined channel, approximately 1.5 mile long. There is a corrugated arch pipe across the highway. Significant amount of silt is present in this pipe. An equivalent pipe size of 68 inches was used in the HEC-2 analysis to reflect the siltation in the pipe.

Overland flow exists upstream of the split flow location and the levee diverts the left overbank flow into the Stream Number 12. This diversion flow crosses the Carefree Highway and re-joins the main channel approximately 1,700 feet south of the highway. There is no physical barrier between the main channel and this tributary. The overbank flows spread over a wide and flat floodplain area between these two streams. The floodplain width varies from 1,000 feet to 2,500 feet. The existence of any island conditions on this floodplain area must be examined and evaluated.

Solution:

A detailed hydraulic analysis of this sheet flow flooding area was conducted to determine whether the flow distribution at each cross section is appropriate. The following approach was taken to solve this problem.

Step 1: *An initial HEC-2 run was made with proper peak discharges in reaches. The existing pipe on Stream Number 12 was not simulated. A review of the preliminary results indicated dramatic shifts in flows between cross sections from one stream to the other. The computed floodplain limits were as wide as 2,200 feet.*

Step 2: *An approximate watershed boundary between these streams was delineated. The man-made diversion structure should provide a 55-45 flow split according to the results of Hydrology Report for this project under a separate cover. The overland sheet flow usually has a random path, and may split and form multiple channels. In order to identify reasonable flow split throughout this reach, the HEC-2 tributary stream profile computations were performed. Separate profiles were simulated for Deadman Wash and Stream Number 12 using ET cards to specify the effective flow area for each stream. The special culvert method was also used to model the existing pipe on this tributary due to the incised stream channel upstream.*

Step 3: *The model was calibrated through a trial-and-error process until the energy grade line values along the watershed boundary are within an approximately 0.5 feet tolerance based on the assumed flow split ratios.*

Discussion:

The overflow occurs upstream of the split flow location with approximately 61 percent of the flow on the left overbank area. The flow split reduces to 45 percent to Stream Number 12 through the levee. The floodplain consists of multiple channels and it makes the floodplain delineation in this reach more difficult. The existing dip section on Carefree Highway has the capacity to drain all the 100-year flood (9,110 cfs) with a water depth of 2.4 feet. The review of topography indicated that roadway overtopping occurs in the vicinity of the pipe culvert on the tributary. The split ratio becomes a 68-32 flow split south of Carefree Highway.

The results showed that the existing culvert has a capacity of 212 cfs during a 100-year storm event. **Table 4** presents the energy grade line comparison between Deadman Wash and Stream Number 12. It should be noted that the unsteady flow condition occurs just upstream of Carefree Highway. A large portion of overbank flows on Stream Number 12 will not turn southwesterly and travel 1,200 feet to the dip section. Therefore, the dip section will not drain all the 100-year flow on the floodplain. Apparently, some of overland flows from Stream Number 12 will spill over the highway prior to reaching the dip section. However, any physical changes or obstruction made to this area may carry the entire overland flow through the dip section. The flow distribution was not sensitive to SECNO 3.957, because it showed that a 90 percent of total flow of 9,110 cfs can be drained on the Stream Number 12 floodplain without significant increase on the energy grade line.

Any future drainage improvements in the vicinity of Deadman Wash crossing at Carefree Highway must include and cover the entire split and sheet flow area.

4.5.3 Roadway Overtopping at Joy Ranch Road

Problem:

The existing structure at Joy Ranch Road consists of two 72-inch, 60-inch and 48 inch reinforced concrete pipe. This structure experienced sever bank erosion and stream bed scour. The roadway was inundated and impassible in past floods. It is evident that the flow breaks out of the winding channel upstream of this structure and overtops the roadway.

Table 4
Summary of Split Flow Analysis Caused by the Levee
North of Carefree Highway

SECNO	Distance from Mouth (miles)		Discharge (cfs)		CWSEL (feet)		EG (feet)		EG Difference (feet)	Remarks
	Deadman	Tributary	Deadman	Tributary	Deadman	Tributary	Deadman	Tributary		
3.284	3.284	N/A	9,110	N/A	1572.08	N/A	1572.40	N/A	N/A	Stream number 12 mouth
3.347	3.347	0.074	6,200	2,910	1573.78	1574.06	1574.28	1574.28	0	
3.385	3.385	0.149	6,200	2,910	1575.20	1575.62	1575.63	1575.92	−0.29	
3.481	3.481	0.245	6,200	2,910	1578.68	1578.53	1579.12	1578.91	0.21	
3.546	3.546	0.34	6,200	2,910	1581.58	1581.29	1581.88	1581.44	0.44	
0.434	N/A	0.434	N/A	2,910	N/A	1583.24	N/A	1583.33	N/A	
0.529	N/A	0.529	N/A	2,910	N/A	1586.60	N/A	1586.89	N/A	
0.624	N/A	0.624	N/A	2,910	N/A	1590.19	N/A	1590.33	N/A	
3.651	3.651	0.717	6,200	2,910	1586.44	1594.37	1586.87	1594.38	−7.51	roadway overflow occurs
3.710	3.710	N/A	6,200	N/A	1588.88	N/A	1589.05	N/A	N/A	
3.804	3.804	N/A	5,230	N/A	1591.82	N/A	1591.98	N/A	N/A	
3.881	3.881	0.776	5,230	4,280	1595.05	1594.21	1595.21	1594.48	0.73	
3.957	3.957	0.813	5,230	4,280	1598.14	1597.27	1598.32	1597.37	0.95	Not senstive to flow distri.
4.019	4.019	0.905	5,230	4,280	1600.65	1600.14	1600.81	1600.29	0.52	
4.058	4.058	0.978	5,230	4,280	1602.11	1602.32	1602.32	1602.41	−0.09	
4.146	4.146	1.053	5,230	4,280	1605.48	1604.70	1605.68	1604.82	0.86	Data fluctuation
4.197	4.197	1.134	5,230	4,280	1607.33	1607.19	1607.63	1607.34	0.29	
4.262	4.262	1.229	5,230	4,280	1610.12	1610.34	1610.45	1610.57	−0.12	
4.333	4.333	1.303	5,230	4,280	1612.35	1612.42	1612.54	1612.60	−0.06	
4.390	4.390	1.366	5,230	4,280	1614.28	1614.04	1614.61	1614.39	0.22	
4.492	4.492	N/A	9,510	N/A	1617.83	N/A	1618.02	N/A	N/A	Spilt flow starts

Solution:

The roadway overtopping was analyzed using the split flow option in HEC-2 model. The split flow occurs from SECNO 6.467 to SECNO 6.654 and returns on SECNO 6.280 just downstream of the structure. The roadway grades between SECNO 6.467 and SECNO 6.654 were input to the HEC-2 model to calculate the amount of breakout. In addition, the special culvert method was used to model only the twin 72-inch pipes and roadway weir flow on top of the structure. It was determined that only the twin 72-inch pipes will be functioning hydraulically during a major flood due to concern of the debris and siltation clogging the two smaller pipes. In order to obtaining a better floodplain delineation in this reach, three FEMA's cross sections (SECNO 6.328, 6.423 and 6.539) were used to ignore this pipe culvert structure in the final HEC-2 model DM4-FEMA.HC2.

Discussion:

There is a roadway overtopping of 1,270 cfs, approximately 13 percent of total flow occurring just upstream of this drainage structure. The culverts have a capacity of 740 cfs, approximately 8 percent of the flow drained by the structure. The culvert outlet velocity is only about 9 feet per second. However, the roadway overflow, approximately 79 percent of the total flow, has a water depth of 2 feet, which will create roadway closure, bank erosion and steam bed erosion.

Results of the final DM4-FEMA.HC2 model showed that a better and smooth delineation of floodplain boundaries and floodway limits were obtained in this highly meandering reach.

4.5.4 I-17 Bridges

Problem:

There are two 4-span I-17 bridges provided for the northbound and southbound traffic. The opening width of these bridges is 128 feet with three 2-feet wide piers. Two tributaries join Deadman Wash just upstream of I-17 with channel bends. The southbound bridge piers have been constructed with a skew angle to the flow, which will introduce additional constriction losses. The incoming Deadman Wash channel to the northbound bridge is skewed approximately 30 degrees. Vegetation is very dense through these bridges. It should be noted that the southbound bridge was constructed approximately four feet lower than the northbound bridge. It also appears that these bridges may have the capacity to convey a 100-year flood. However, the downstream channel is relatively shallow and narrow. Hence, overland flow is expected for the area downstream of the I-17 bridges.

Solution:

The special bridge method was selected to determine the class of flow through these bridges. The bridges were modeled separately. The contraction and expansion coefficients of 0.6 and 0.8 were used through the bridge sections. A 100 percent clogging factor was applied to the piers. No adjustments have been made to the cross section data for the skewed incoming channels, because there is a relatively well-define channel approaching the northbound bridge with two tributaries tying into the Deadman Wash.

Discussion:

Class A flow was determined for the southbound bridge with 0.8 feet of freeboard. The flow type of this bridge will become a pressure flow with any minor obstruction, because the energy grade line is about 0.3 feet below the bridge low cord elevation. Class A low flow was determined for the northbound bridge, which means that the flow is in a subcritical flow regime. The northbound bridge has approximately 3.7 feet of freeboard. No significant backwater effect to the upstream areas was caused by these bridges. The downstream channel only has a capacity to convey 56 percent of the total flow with a channel velocity of 9 feet per second. The overland flow occurs immediately downstream of the I-17 bridges.

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SECTION 4.6: Floodway Management and Insurance Applications

4.6 Floodway Management and Insurance Application

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound floodplain management measures.

4.6.1 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 as the base flood for purposes of floodplain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For the study reaches of Deadman Wash the flood boundaries of the 100-year flood has been delineated using the flood elevations determined at each cross section. The boundaries between cross sections were interpolated using the topographic maps.

4.6.2 Floodway Modeling

Encroachments on floodplains such as structures and fill, reduce flood-carrying capacity, increase flood heights and velocities and increase 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, 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 floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain area, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood height. The federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction assuming stable channels with rigid boundaries. Because of the dynamic nature of the Deadman Wash, the usual dividing lines between floodway and floodway fringes are not permanent. There is some risk of flooding and bank scour at any location within the 100-year boundary.

As shown on the **Flood Boundary and Floodway Maps** (under a separate cover), the floodway widths were determined at cross sections used in the HEC-2 models. Between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year floodplain are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe 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 one foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in **Figure 3 - Floodway Schematic.**

The initial floodway limits for Deadman Wash and its tributaries were determined using Method 6, which is to optimize a 1.0 feet target difference in energy grade line elevations between natural and floodway profiles. These initial computed floodway limits were delineated on topographic maps. Adjustments were made to encroachment stations using Method 1 in floodway models until reasonable floodway boundaries were obtained. A maximum of a 1.0 feet difference were met on energy grade line elevations for the final floodway widths. Backwater effect from New River and Deadman Wash was not considered in these models because flood peaks do not coincide. The results of these computations are tabulated in **Table 5** at selected cross sections for the study reaches of Deadman Wash and its two tributaries.

From **Table 5**, the floodway widths were modified from cross section "AK" to "BA" to include the floodplain area between Deadman Wash and Stream Number 12. These modifications were made to reflect the dynamic nature of the sheet flow flooding characteristics.

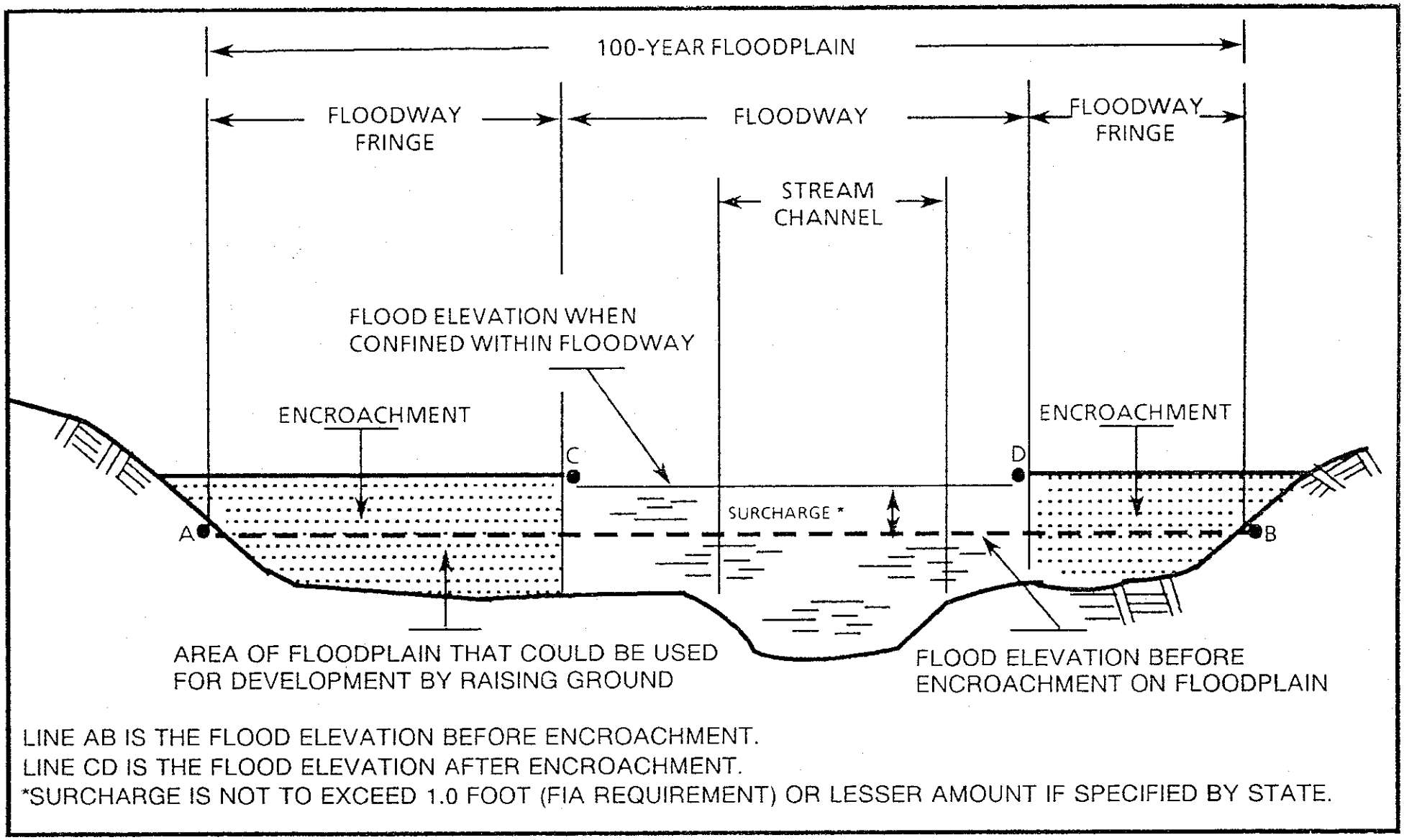

Figure 3 - Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH** (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Deadman Wash								
A	0.092	267	1,039	9.2	1482.7	1482.7	1483.0	0.3
B	0.159	322	1,957	4.9	1486.6	1486.6	1487.6	1.0
C	0.202	372	2,730	3.5	1487.6	1487.6	1488.5	0.9
D	0.299	390	2,325	4.1	1488.6	1488.6	1489.4	0.8
E	0.382	264	1,866	5.1	1490.2	1490.2	1491.2	1.0
F	0.516	110	787	12.2	1494.2	1494.2	1494.9	0.7
G	0.618	480	2,893	3.3	1498.9	1498.9	1499.1	0.2
H	0.721	655	3,285	2.9	1499.4	1499.4	1499.8	0.4
I	0.803	524	2,339	4.1	1499.8	1499.8	1500.5	0.7
J	0.909	731	2,713	3.6	1501.3	1501.3	1502.3	1.0
K	0.988	637	2,180	4.4	1503.3	1503.3	1504.0	0.7
L	1.079	717	2,451	3.9	1505.8	1505.8	1506.4	0.6
M	1.199	518	1,823	5.3	1509.0	1509.0	1509.3	0.3
N	1.313	568	2,258	4.3	1511.8	1511.8	1512.3	0.5
O	1.419	402	1,394	6.9	1514.4	1514.4	1514.8	0.4
P	1.527	349	1,762	5.5	1518.0	1518.0	1518.9	0.9
Q	1.620	456	1,656	5.8	1520.6	1520.6	1521.3	0.7
R	1.717	684	1,821	5.3	1523.5	1523.5	1524.3	0.8
S	1.811	930	3,052	3.2	1526.1	1526.1	1527.1	1.0
T	1.909	612	1,882	5.1	1528.5	1528.5	1529.2	0.7
U	2.004	730	1,699	5.6	1532.9	1532.9	1533.5	0.6
V	2.060	690	2,203	4.3	1535.1	1535.1	1536.0	0.9
W	2.142	606	2,040	4.7	1537.1	1537.1	1537.7	0.6
X	2.233	622	1,977	4.8	1540.2	1540.2	1540.8	0.6
Y	2.326	590	2,166	4.4	1543.0	1543.0	1543.9	0.9
Z	2.406	670	1,880	5.1	1545.7	1545.7	1546.5	0.8

* River Miles Above Confluence With New River

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA

DEADMAN WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Deadman Wash								
AA	2.500	811	2,454	3.9	1549.2	1549.2	1550.1	0.9
AB	2.595	684	1,796	5.3	1552.7	1552.7	1553.4	0.7
AC	2.689	637	2,781	3.4	1555.3	1555.3	1556.0	0.7
AD	2.777	414	1,494	6.4	1556.7	1556.7	1557.5	0.8
AE	2.872	412	1,884	5.1	1560.2	1560.2	1561.0	0.8
AF	2.947	439	1,710	5.6	1562.2	1562.2	1563.0	0.8
AG	3.023	447	1,827	5.2	1564.6	1564.6	1565.4	0.8
AH	3.117	351	1,582	6.0	1567.1	1567.1	1568.0	0.9
AI	3.209	357	1,706	5.6	1570.0	1570.0	1570.7	0.7
AJ	3.284	271	1,819	5.0	1572.1	1572.1	1573.0	0.9
AK	3.347	558	1,094	5.7	1573.8	1573.8	1574.6	0.8
AL	3.385	625	1,449	4.3	1575.2	1575.2	1575.9	0.7
AM	3.481	890	960	6.5	1578.7	1578.7	1579.0	0.3
AN	3.546	1,640	1,540	4.0	1581.6	1581.6	1582.5	0.9
AO	3.639	2,420	847	7.3	1585.3	1585.3	1585.6	0.3
AP	3.651	2,460	1,076	5.8	1586.4	1586.4	1586.7	0.3
AQ	3.710	2,580	1,609	3.9	1588.9	1588.9	1589.4	0.5
AR	3.804	2,560	1,124	4.7	1591.8	1591.8	1592.6	0.8
AS	3.881	2,260	1,494	3.5	1595.1	1595.1	1596.0	0.9
AT	3.957	2,140	1,201	4.4	1598.1	1598.1	1598.6	0.5
AU	4.019	2,040	1,296	4.0	1600.6	1600.6	1601.4	0.8
AV	4.058	1,850	1,196	4.4	1602.1	1602.1	1602.9	0.8
AW	4.146	1,600	1,206	4.3	1605.5	1605.5	1606.2	0.7
AX	4.197	1,190	1,056	5.0	1607.3	1607.3	1607.9	0.6
AY	4.262	940	1,055	5.0	1610.1	1610.1	1610.5	0.4
AZ	4.333	900	1,492	3.5	1612.3	1612.3	1612.7	0.4

* River Miles Above Confluence With New River
** Width Has Been Increased For Split Flow Area From Sections "AK" to "BA"

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA

DEADMAN WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Deadman Wash								
BA	4.390	785	967	5.4	1614.3	1614.3	1614.6	0.3
BB	4.492	533	2,423	3.9	1617.8	1617.8	1618.6	0.8
BC	4.567	417	1,782	5.3	1620.2	1620.2	1621.0	0.8
BD	4.662	691	2,713	3.5	1623.2	1623.2	1623.8	0.6
BE	4.756	780	2,322	4.1	1625.7	1625.7	1626.3	0.6
BF	4.850	830	2,192	4.3	1628.8	1628.8	1629.7	0.9
BG	4.943	685	2,458	3.9	1632.0	1632.0	1632.9	0.9
BH	5.034	1,074	2,341	4.1	1635.6	1635.6	1636.5	0.9
BI	5.113	1,162	2,926	3.3	1638.4	1638.4	1639.2	0.8
BJ	5.189	1,273	2,214	4.3	1640.7	1640.7	1641.7	1.0
BK	5.284	1,100	3,212	3.0	1643.6	1643.6	1644.4	0.8
BL	5.379	800	2,060	4.6	1646.9	1646.9	1647.7	0.8
BM	5.473	820	2,564	3.7	1650.8	1650.8	1651.7	0.9
BN	5.552	777	2,550	3.7	1653.1	1653.1	1654.0	0.9
BO	5.646	698	2,883	3.3	1655.6	1655.6	1656.3	0.7
BP	5.741	580	1,996	4.8	1658.2	1658.2	1658.6	0.4
BQ	5.835	556	2,133	4.5	1662.0	1662.0	1662.4	0.4
BR	5.928	430	1,831	5.2	1664.3	1664.3	1665.0	0.7
BS	6.021	267	1,283	7.4	1667.6	1667.6	1668.4	0.8
BT	6.108	410	1,842	5.1	1671.4	1671.4	1672.1	0.7
BU	6.205	580	1,964	4.8	1673.9	1673.9	1674.7	0.8
BV	6.280	484	1,623	6.0	1678.1	1678.1	1678.8	0.7
BW	6.328	710	2,725	3.6	1680.4	1680.4	1681.0	0.6
BX	6.423	610	1,609	6.0	1683.6	1683.6	1683.7	0.1
BY	6.539	580	2,083	4.6	1687.5	1687.5	1688.4	0.9
BZ	Not Used							

* River Miles Above Confluence With New River
** Width Has Been Increased For Split Flow Area From Sections "AK" to "BA"

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA

DEADMAN WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Deadman Wash								
CA	6.654	362	1,633	5.9	1691.6	1691.6	1692.3	0.7
CB	6.751	400	1,998	4.9	1695.8	1695.8	1696.4	0.8
CC	6.849	542	2,341	4.2	1698.5	1698.5	1699.3	0.8
CD	6.945	480	2,148	4.5	1702.0	1702.0	1702.7	0.7
CE	7.042	380	2,001	4.9	1704.8	1704.8	1705.6	0.8
CF	7.133	372	2,214	4.4	1706.9	1706.9	1707.8	0.9
CG	7.228	340	2,502	3.9	1708.5	1708.5	1709.3	0.8
CH	7.323	180	850	11.5	1711.1	1711.1	1711.3	0.2
CI	7.417	220	1,859	5.3	1717.3	1717.3	1718.3	1.0
CJ	7.513	285	1,182	8.3	1720.9	1720.9	1721.5	0.6
CK	7.587	464	2,122	4.7	1725.3	1725.3	1726.0	0.7
CL	7.663	395	1,755	5.7	1727.4	1727.4	1727.9	0.5
CM	7.738	318	1,557	6.1	1729.6	1729.6	1730.4	0.8
CN	7.766	125	1,164	8.1	1730.8	1730.8	1731.5	0.7
CO	7.785	152	1,336	7.1	1731.8	1731.8	1732.3	0.5
CP	7.812	210	1,627	5.8	1733.1	1733.1	1733.4	0.3
CQ	7.872	546	2,518	3.7	1735.3	1735.3	1735.5	0.2
CR	7.921	600	2,737	3.4	1736.0	1736.0	1736.2	0.2
CS	8.016	250	1,055	5.9	1738.5	1738.5	1739.0	0.5
CT	8.111	285	1,606	3.9	1742.6	1742.6	1743.3	0.7
CU	8.187	286	1,291	4.8	1745.5	1745.5	1745.9	0.4
CV	8.278	370	1,603	3.9	1748.9	1748.9	1749.6	0.7
CW	8.373	230	958	4.7	1752.1	1752.1	1752.9	0.8
CX	8.485	270	900	4.1	1756.9	1756.9	1757.2	0.3
CY	8.574	380	876	4.2	1760.6	1760.6	1760.9	0.3
CZ	8.670	440	1,118	3.3	1764.1	1764.1	1765.0	0.9

* River Miles Above Confluence With New River

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA

DEADMAN WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Deadman Wash								
DA	8.763	420	1,109	3.3	1767.5	1767.5	1768.0	0.5
DB	8.853	230	735	5.0	1771.8	1771.8	1772.1	0.3
DC	8.939	318	993	3.7	1775.2	1775.2	1776.1	0.9
DD	9.021	320	697	4.0	1778.6	1778.6	1779.1	0.5
DE	9.114	405	782	3.5	1783.8	1783.8	1784.1	0.3
DF	9.210	376	747	3.7	1788.5	1788.5	1789.2	0.7
DG	9.304	380	738	3.8	1794.9	1794.9	1795.8	0.9
DH	9.400	230	614	4.5	1801.8	1801.8	1802.5	0.7
DI	9.492	210	672	4.1	1807.3	1807.3	1808.2	0.9
DJ	9.586	160	461	4.0	1813.8	1813.8	1814.0	0.2
DK	9.682	170	398	4.6	1819.8	1819.8	1820.7	0.9
DL	9.776	210	489	3.8	1827.8	1827.8	1828.4	0.6
DM	9.872	192	434	4.2	1834.4	1834.4	1835.2	0.8
DN	9.966	109	332	5.5	1842.9	1842.9	1843.4	0.5
DO	10.058	132	354	5.2	1850.9	1850.9	1851.7	0.8
DP	10.151	180	559	3.3	1855.9	1855.9	1856.3	0.4
DQ	10.230	110	259	7.1	1862.0	1862.0	1862.3	0.3
DR	10.325	90	327	5.6	1871.9	1871.9	1872.5	0.6
DS	10.419	70	231	7.9	1881.3	1881.3	1881.6	0.3
DT	10.544	61	221	4.6	1893.8	1893.8	1894.7	0.9

* River Miles Above Confluence With New River

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA

DEADMAN WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Stream No. 4								
A	0.231	120	444	4.0	1742.4	1742.4	1742.9	0.5
B	0.327	180	350	5.0	1745.6	1745.6	1745.9	0.3
C	0.423	206	457	3.9	1750.2	1750.2	1750.8	0.6
D	0.520	85	249	7.1	1754.9	1754.9	1755.3	0.4
E	0.592	105	243	7.2	1763.7	1763.7	1764.1	0.4
F	0.782	205	751	2.2	1767.2	1767.2	1768.1	0.9
G	0.876	120	269	6.2	1768.9	1768.9	1769.4	0.5
H	0.971	100	373	4.4	1772.3	1772.3	1773.0	0.7
I	1.072	100	215	7.7	1776.3	1776.3	1776.8	0.5
J	1.172	135	430	3.9	1779.9	1779.9	1780.7	0.8
K	1.272	180	392	4.2	1781.9	1781.9	1782.3	0.4
L	1.367	120	351	4.7	1784.6	1784.6	1784.8	0.2
M	1.436	135	438	3.8	1785.7	1785.7	1786.5	0.8

* River Miles Above Confluence With Deadman Wash

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA
DEADMAN WASH
TRIBUTARY – STREAM NO. 4

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Stream No. 7								
A	0.170	200	980	4.4	1737.4	1737.4	1738.2	0.8
B	0.266	178	754	5.7	1740.9	1740.9	1741.7	0.8
C	0.323	180	866	5.0	1744.1	1744.1	1744.8	0.7
D	0.403	430	1,649	2.6	1745.5	1745.5	1746.4	0.9
E	0.482	246	426	7.4	1750.8	1750.8	1750.7	−0.1
F	0.591	190	801	4.0	1758.7	1758.7	1759.0	0.3
G	0.700	180	656	4.8	1762.7	1762.7	1763.3	0.6
H	0.805	130	445	7.1	1770.0	1770.0	1770.5	0.5
I	0.903	264	825	3.8	1776.3	1776.3	1777.0	0.7
J	1.002	136	494	6.4	1781.5	1781.5	1782.4	0.9

* River Miles Above Confluence With Deadman Wash

Table 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MARICOPA COUNTY, AZ
AND UNINCORPORATED AREAS

FLOODWAY DATA
DEADMAN WASH
TRIBUTARY – STREAM NO. 7

4.6.3 Insurance Application

Flood insurance zones and zone numbers are assigned based on the type of flood hazard resulting from the hydraulic analyses. Appropriate flood insurance rate zones were delineated on **Exhibit 2 - Flood Boundary and Floodway Map** (under a separate cover). Zone AE is designated to the entire study reaches of Deadman Wash and its tributaries.

The flood insurance rate zones are designated according to the following criteria:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs derived from the 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 with a constant water-surface elevation (usually areas of ponding) where average depths are between 1 and 3 feet. The BFEs 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). The depth should be averaged along the cross section and then along the direction of flow to determine the extent of the zone. Average depths derived form the detailed hydraulic analyses are shown within this zone. Typically, alluvial fan flood hazards are shown as Zone AO on the Flood Insurance Rate Map (FIRM).

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

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

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible. Zone D designation may not be used in Flood Insurance Studies unless otherwise approved by the Regional PO.

DEADMAN WASH
FLOODPLAIN DELINEATION STUDY

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SECTION 4.7: Final Results and Computer Runs

4.7 Final Results and Computer Runs

Floodplain and floodway delineations were performed using the USCE HEC-2 computer model for Deadman Wash and its two tributaries. The delineations for Deadman Wash was conducted from the confluence with New River to future 22nd Avenue alignment, approximately 10.5 miles in length. No delineations were made to the remaining 2.5 miles of Deadman Wash from future 22nd Avenue to the headwater. Stream Numbers 4 and 7 were delineated approximately 1.5 and 1.0 miles upstream from their confluences with Deadman Wash, respectively. In addition, flood insurance zones were also determined for the above study streams.

For simplicity, a total of six Hec-2 models were developed for this study including four models for Deadman Wash and one model for each tributary studied. The results indicated that the stream channel does not have adequate capacity to carry a 100-year flow. In general, only approximately 30 percent of the 100-year flow will be contained in the Deadman Wash main channel. Because the Deadman Wash consists of relatively narrow channels and broad floodplains, special attention was paid to the split flow, roadway overtopping, ineffective flow and sheet flow flooding areas throughout the study reaches.

The results showed that a wide floodplain exists wherever the major tributary joins the Deadman Wash due to inadequate capacity in the main channel. The dam and levee structure at Snodgrass Tank creates significant constriction to the floodwaters. The floodwaters breach through a 106-foot opening just north of the tank with a velocity of 13.6 feet per section. This structure will be stable because there is approximately six feet freeboard provided during a 100-year flood event.

The existing Carefree Highway dip section will drain only 68 percent of the 100-year flow (9,110 cfs). Approximately 30 percent of the 100-year flow will spill over the highway between the dip section and Stream Number 12. The existing CMP pipe on Stream Number 12 will drain only 2 percent of total flow. There are no island conditions existing between Deadman Wash and Stream Number 12 at the split flow reach during a 100-year flood. Although separate floodway limits were determined for Deadman Wash and Stream Number 12, the floodway limits in this split flow reach were modified to include the area between these streams due to the dynamic nature of sheet flow flooding. Special consideration should be made to future drainage structures at the Deadman Wash crossing. Because of the shallow channel and flat floodplain, drainage improvements will be required for the entire split flow area including the Stream Number 12 floodplain. Channelization and erosion protection must be provided in this area such that no adverse impacts will occur to upstream and downstream areas caused by the construction of the Deadman Wash drainage crossing.

The existing pipe culvert at Joy Ranch Road consists of twin 72-inch, 60-inch and 48-inch reinforced concrete pipes. Approximately 13 percent of total flow will overtop the roadway before reaching this structure. This structure will drain only 8 percent of the flow. The remaining flow will spill over the roadway at the crossing. A water depth of 2 feet overtopping the roadway will create roadway closure, bank erosion and stream bed scour. Based upon the FEMA's comment of ignoring the existing pipe culvert, results of the final HEC-2 model (DM4-FEMA.HC2) showed a better delineation of the 100-year floodplain boundaries and floodway limits in this reach.

The existing I-17 northbound and southbound bridges have the capacity to drain the 100-year flood. Class A low flow was determined for both bridges, which means that the flow is in a subcritical flow regime. The water under the southbound bridge almost impinges the bridge low cord (only six inches of freeboard), while a 4.5 feet of freeboard is computed for the northbound bridge. These bridges will not create significant backwater to upstream areas. The overland flow occurs immediately downstream of these bridges due to the shallow and narrow stream channel.

Overland flow also occurs along two tributaries, Stream Numbers 4 and 7, due to inadequate channel capacity. Braided channels and flat floodplain exist for Stream Number 4. The 33rd Avenue and Irvine Road will be impassible during a 100-year flood because there is no existing drainage structures on Stream Number 4. Stream Number 7 and 8 channel is relatively well-defined and runs between I-17 embankments and hillslopes. The 100-year flood elevations are at least 3 feet below the I-17 roadway graded in study reaches. It should be noted that Stream No. 8 (as defined in TDN Section 3 - Hydrology) from the confluence with Stream No.7 to I-17 northbound bridge was renamed to Stream No. 7 in TDN Section 4 for simplicity of floodplain delineation of these two short study reaches on these streams.

The flood insurance zone for the study reaches along Deadman Wash and its tributaries were designated to be Zone AE.

DEADMAN WASH
FLOODPLAIN DELINEATION STUDY

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SECTION 4.8: Final Modeling Results on Diskette

Table 6
List of HEC-2 Models

Input File	SECNO From	SECNO To	Description
DM1FW.HC2	0.092	3.209	New River to the confluence with Stream No. 12.
DM2FW.HC2	3.209	4.662	Confluence with Stream No. 12 to the confluence with Stream No. 9.
DM3FW.HC2	4.662	6.021	Confluence with Stream No. 9 to 1,800' downstream of Joy Ranch Road Pipe Culverts.
DM4-FEMA.HC2	6.021	10.544	1,800' downstream of Joy Ranch Road to 22nd Avenue alignment with FEMA Cross Sections.
STRM4FW.HC2	0.000	1.436	Deadman Wash tributary - Stream No. 4.
STRM7FW.HC2	0.025	1.002	Deadman Wash tributary - Stream No. 7.

TABLE.6

DEADMAN WASH
FLOODPLAIN DELINEATION STUDY

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HYDRAULIC ANALYSIS

SECTION 6: REFERENCE MATERIALS

SECTION 6: REFERENCE MATERIALS

6.5 Referenced Technical Papers and Documents

6.5.1 References

1. Arizona Department of Water Resources, "Instructions for Organizing and Submitting Technical Documentation for Flood Studies," Engineering Division, August 1991, revised September 1991.

2. Flood Control District of Maricopa County, "Hydrologic Design Manual for Maricopa County, Arizona," September 1, 1990.

3. Haestad Methods, Inc., "HEC-1 Flood Hydrograph Package, User's Manual and Computer Model, Version 4.0," developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center, September 1990.

4. National Weather Service, "NOAA Technical Memorandum NWS Hydro-40, Depth-Area Ratios in the Semi-Arid Southwest United States," August 1984.

5. Federal Highway Administration, "HY-8 Culvert Hydraulics Computer Program, Version 1.1," 1985.

6. Federal Highway Administration, "Hydraulic Design of Highway Culverts," Hydraulic Design Series No. 5, September 1985.

7. Haestad Methods, Inc., "HEC-2 Water Surface Profiles, User's Manual and Computer Model, Version 4.6.2," developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center, May 1991.

8. Sea, Inc., "Deadman's Wash Area Drainage Master Study for City of Phoenix", Volumes 1 and 2," September 1990.

9. Coe & Van Loo Consultants, Inc., "Santa Re - Conceptual Master Drainage Report, Maricopa County," April 1991.

10. Soil Conservation Service, "Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona," April 1986.

11. Bureau of Reclamation, "Flood Hydrology Manual," U.S. Department of the Interior, first edition, 1989.

12. Flood Control District of Maricopa County, "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona," prepared by U.S. Geological Survey, April 1991.

13. Aerial Mapping Company, Inc., Topographic maps, Scale 1" = 200', 2' contour intervals and 4' contour intervals, 1991.

14. Topographic Maps for Santa Re, Scale 1" = 200', 2' contour intervals, undated (aerial company name unknown).

15. Soil Conservation Service, "National Engineering Handbook, Section 4, Hydrology," March, 1985.

16. Creighton, David E., Jr., "Cyclic Streamflow Test for Validity of Randomness," in Hydraulic/Hydrology of Arid Lands, ASCE, Hydraulics Division, Proc International Symposium, New York, N.Y., 1990.

17. U.S. Geological Survey, "Basin Characteristics and Streamflow Statistics in Arizona, as of 1989," Water-Resources Investigations Report 91-4041.

18. Federal Emergency Management Agency, "Flood Insurance Study Guidelines and Specifications for Study Contractors," FEMA 37, March, 1991.

6.5.2 As-Built Plans

1. Arizona Department of Transportation, As-Built Plans.

   a. Phoenix-Cordes Junction, Maricopa County I-17-1(56), dated 2-1-65.

   b. Phoenix Cordes Junction, Maricopa County I-17-1(57), dated 1-10-67.

   c. Phoenix Cordes Junction, Maricopa County I-17-1(61), dated 6-12-69.

2. Maricopa County Highway Department, As-Built Plans.

   a. Black Mountain Road (Now Carefree Highway west of I-17), Ridge Route to U.S. 69, Maricopa County, dated 8-13-65.

   b. Carefree Road (East of I-17) Black Canyon Freeway to Cave Creek, Maricopa County, dated 8-23-74.

DMTDNS6

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SECTION 7: CROSS-REFERENCING AND LABELING INFORMATION

SECTION 7.1: Other Studies Impacted

SECTION 7: CROSS-REFERENCING AND LABELING INFORMATION

7.1 Other Studies Impacted

No existing FEMA studies are available for this watershed. Two other drainage studies in the watershed would be affected by the results of this study. The Deadman's Wash Area Drainage Master Study by Sea, Inc. was only a conceptual master drainage plan for the City of Phoenix. The other study is the Santa Re Conceptual Master Drainage Report for a portion of Deadman Wash watershed east of I-17 by the CVL. Since both studies were not a standard FEMA flood study, the hydrology of this project should be used as a guide for any future improvements in the watershed. Refer to **Section 3.3 - Calibration** for a discussion of the results of this study as compared with the above studies.

The New River floodplain delineation from New River Dam Reservoir to Rock Spring's by the CVL, dated April 1988 was used in the hydraulic analysis portion of this project.

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SECTION 7.2: Key to Cross-Section Labeling

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	A	0.092		
	B	0.159		
	C	0.202		
	D	0.299		
	E	0.382		
	F	0.516		
	G	0.618		
	H	0.721		
	I	0.803		
	J	0.909		
	K	0.988		
	L	1.079		
	M	1.199		
	N	1.313		
	O	1.419		
	P	1.527		
	Q	1.620		
	R	1.717		
	S	1.811		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	T	1.909		
	U	2.004		
	V	2.060		
	W	2.142		
	X	2.233		
	Y	2.326		
	Z	2.406		
	AA	2.500		
	AB	2.595		
	AC	2.689		
	AD	2.777		
	AE	2.872		
	AF	2.947		
	AG	3.023		
	AH	3.117		
	AI	3.209		
	AJ	3.284		
	AK	3.347		
	AL	3.385		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	AM	3.481		
	AN	3.546		
	AO	3.639		
		3.648		
	AP	3.651		
	AQ	3.710		
	AR	3.804		
	AS	3.881		
	AT	3.957		
	AU	4.019		
	AV	4.058		
	AW	4.146		
	AX	4.197		
	AY	4.262		
	AZ	4.333		
	BA	4.390		
	BB	4.492		
	BC	4.567		
	BD	4.662		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992
Revised Date: April 15, 1995

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	BE	4.756		
	BF	4.850		
	BG	4.943		
	BH	5.034		
	BI	5.113		
	BJ	5.189		
	BK	5.284		
	BL	5.379		
	BM	5.473		
	BN	5.552		
	BO	5.646		
	BP	5.741		
	BQ	5.835		
	BR	5.928		
	BS	6.021		
	BT	6.108		
	BU	6.205		
	BV	6.280		
	BW	6.328		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992
Revised Date: April 15, 1995

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	BX	6.423		
	BY	6.539		
	BZ	Not Used		
	CA	6.654		
	CB	6.751		
	CC	6.849		
	CD	6.945		
	CE	7.042		
	CF	7.133		
	CG	7.228		
	CH	7.323		
	CI	7.417		
	CJ	7.513		
	CK	7.587		
	CL	7.663		
	CM	7.738		
	CN	7.766		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
		7.769		
		7.778		
	CO	7.785		
		7.792		
		7.800		
	CP	7.812		
	CQ	7.872		
	CR	7.921		
	CS	8.016		
	CT	8.111		
	CU	8.187		
	CV	8.278		
	CW	8.373		
	CX	8.485		
	CY	8.574		
	CZ	8.670		
	DA	8.763		
	DB	8.853		
	DC	8.939		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Stream Name: Deadman Wash
Run Date: October 16, 1992

Prepared By: B. Gary Sun, HNTB

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	DD	9.021		
	DE	9.114		
	DF	9.210		
	DG	9.304		
	DH	9.400		
	DI	9.492		
	DJ	9.586		
	DK	9.682		
	DL	9.776		
	DM	9.872		
	DN	9.966		
	DO	10.058		
	DP	10.151		
	DQ	10.230		
	DR	10.325		
	DS	10.419		
	DT	10.544		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Prepared By: B. Gary Sun, HNTB

Stream Name: Deadman Wash Tributary - Stream Number 4
Run Date: October 16, 1992

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
		0.000		
		0.054		
		0.145		
	A	0.231		
	B	0.327		
	C	0.423		
	D	0.520		
	E	0.592		
	F	0.782		
	G	0.876		
	H	0.971		
	I	1.072		
	J	1.172		
	K	1.272		
	L	1.367		
	M	1.436		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Prepared By: B. Gary Sun, HNTB

Stream Name: Deadman Wash Tributary - Stream Number 7
Run Date: October 16, 1992

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
		0.025		
		0.075		
		0.080		
	A	0.170		
	B	0.266		
	C	0.323		
	D	0.403		
	E	0.482		
	F	0.591		
	G	0.700		
	H	0.805		
	I	0.903		
	J	1.002		

KEY TO CROSS-SECTION (XS) LABELING

Community Name: N/A
County: Maricopa County
State: Arizona

Prepared By: B. Gary Sun, HNTB

Stream Name: Deadman Wash Tributary - Stream Number 12
Run Date: October 16, 1992

Field Survey Section No.	XS Letter Draft FIS	Computer Stationing	XS Letter Final FIS	EPA Reach No.
	STR12-1	0.434		
	STR12-2	0.529		
	STR12-3	0.624		

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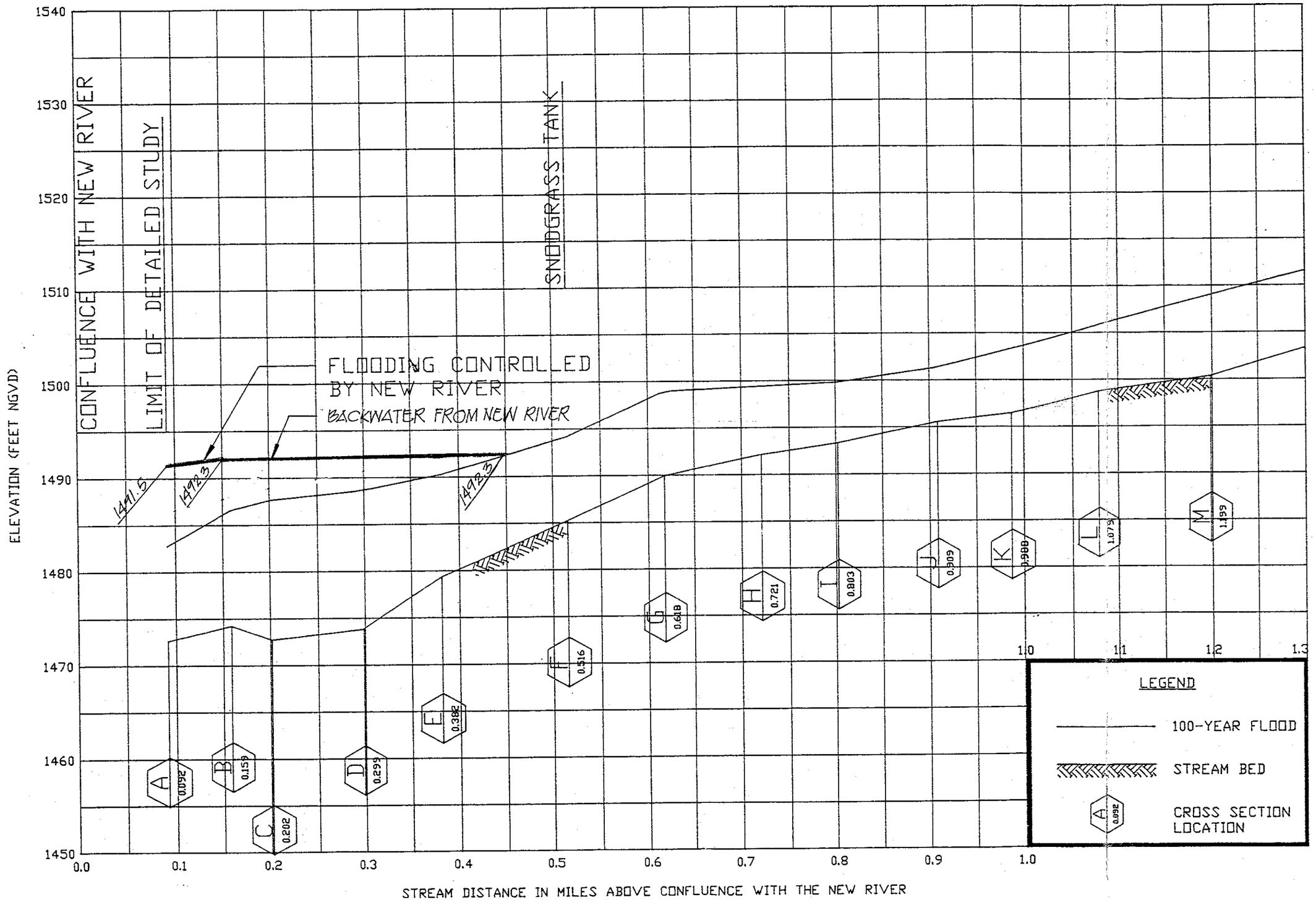


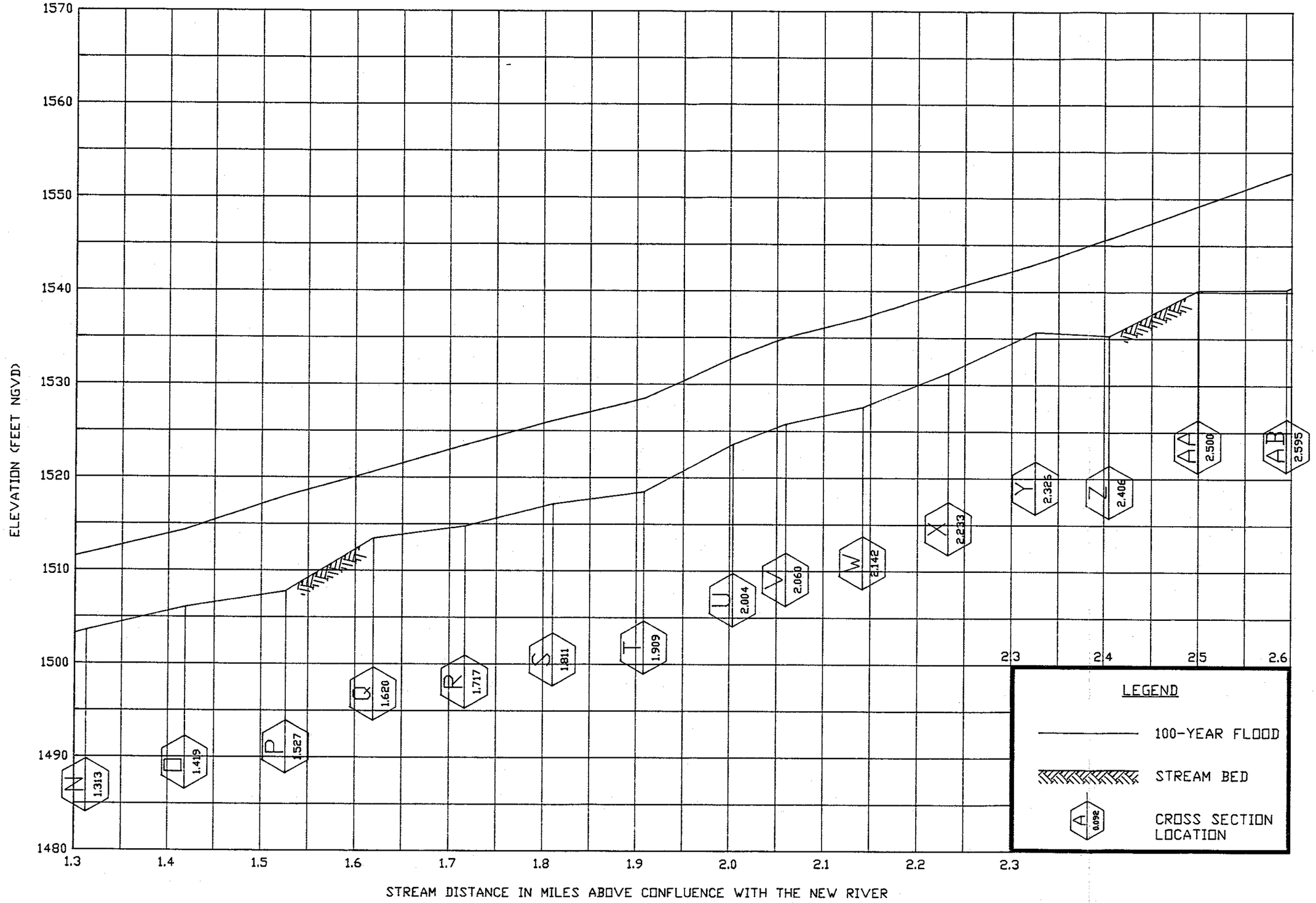
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

01P



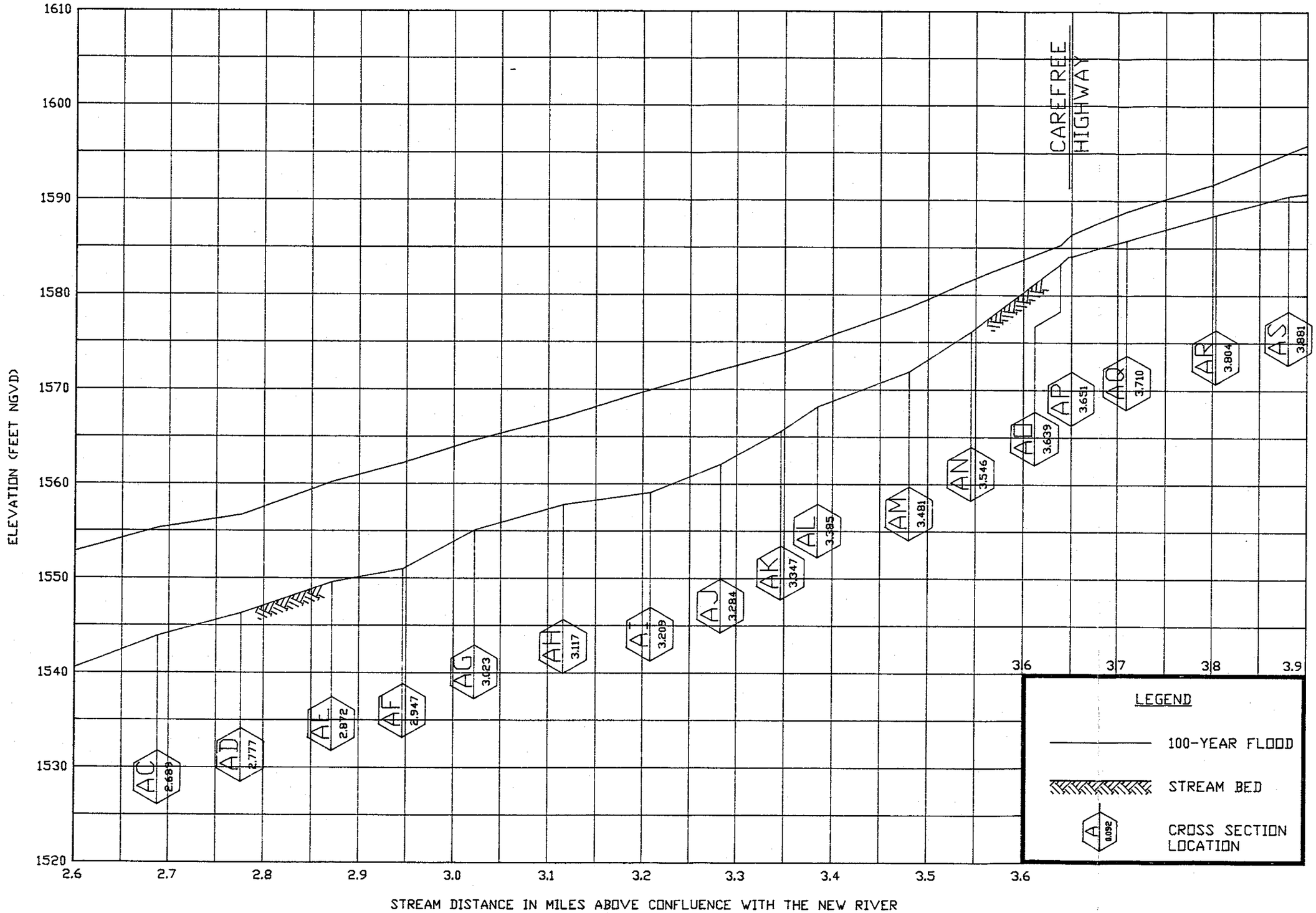
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

02P



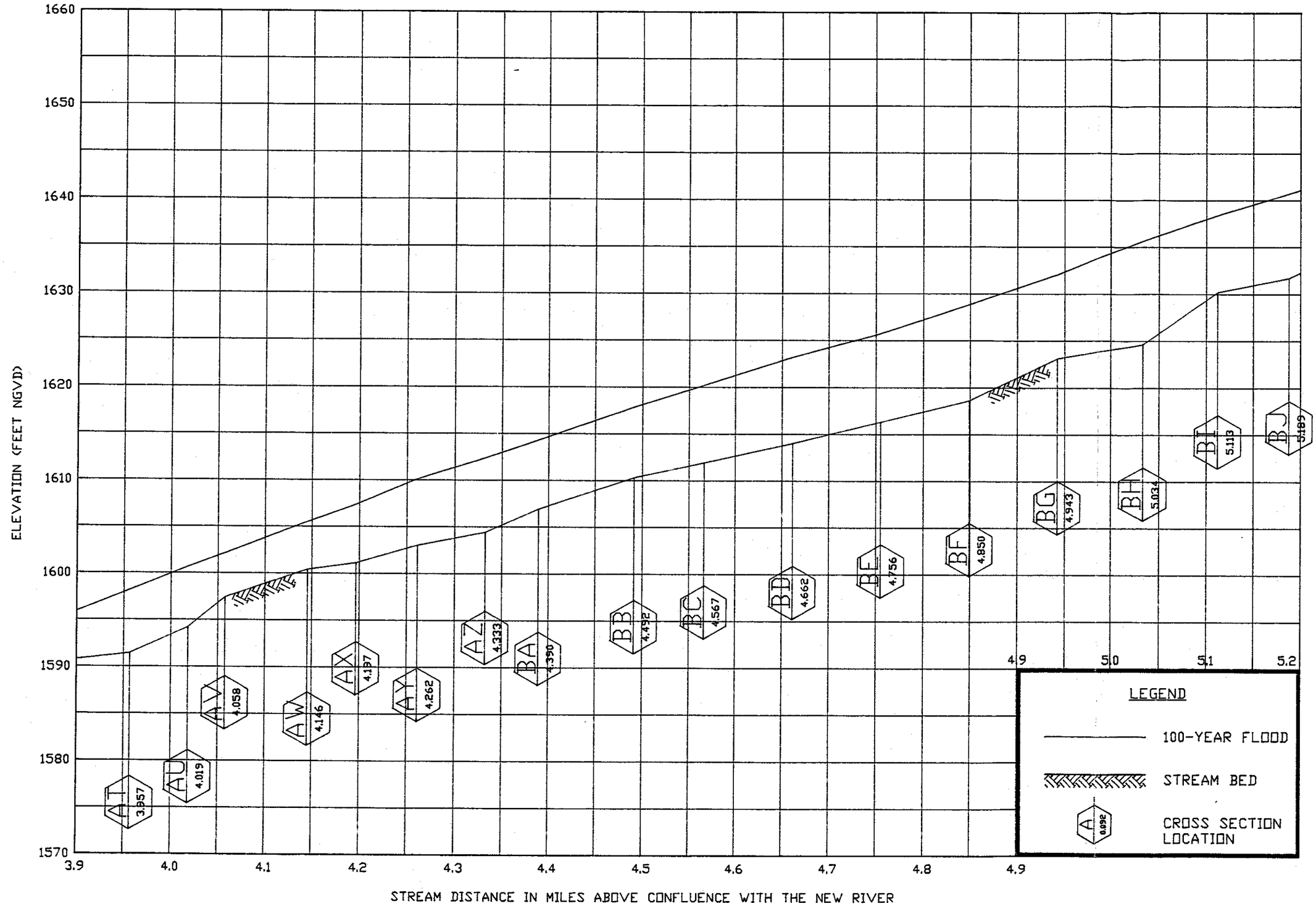
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

03P



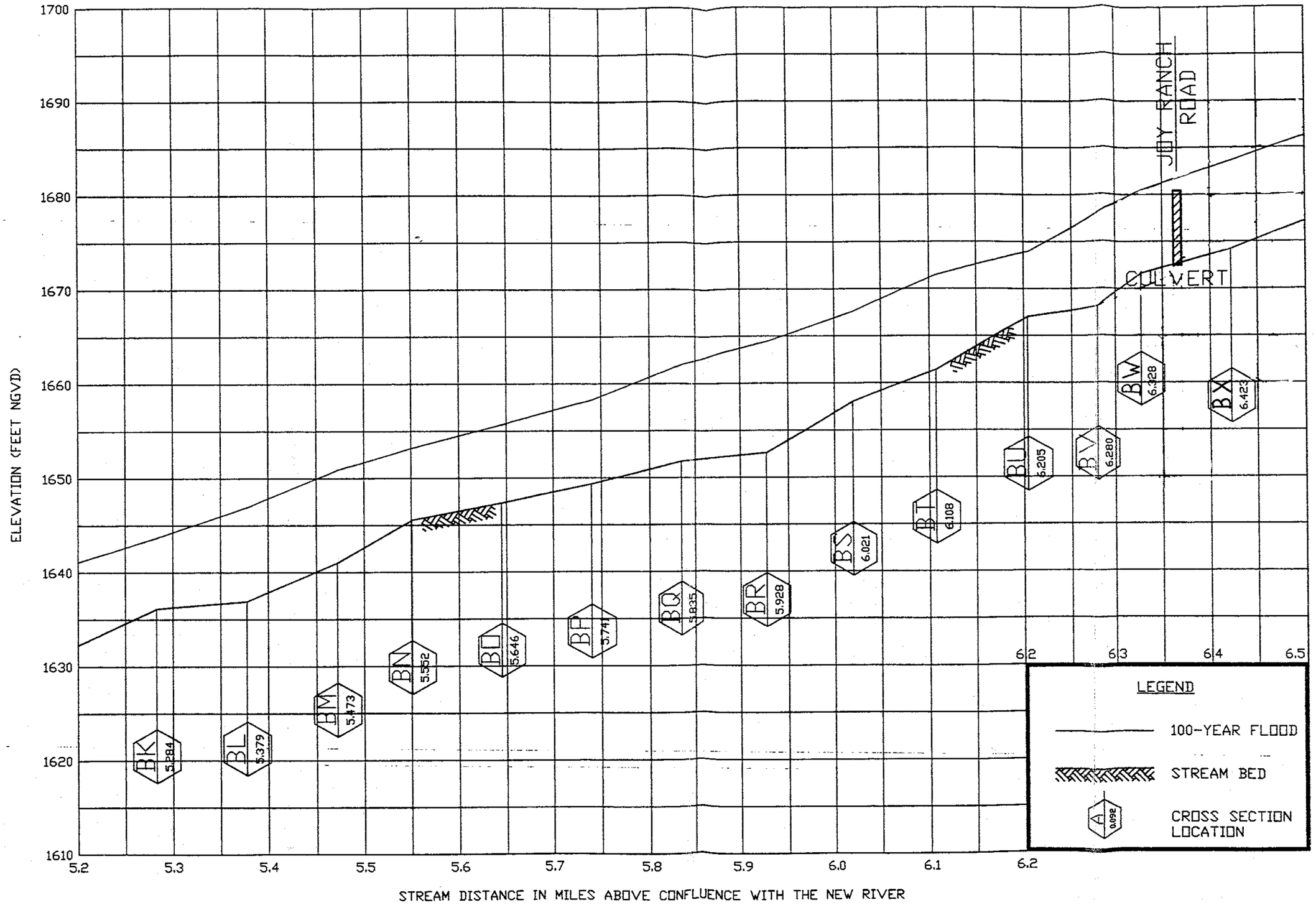
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

04P



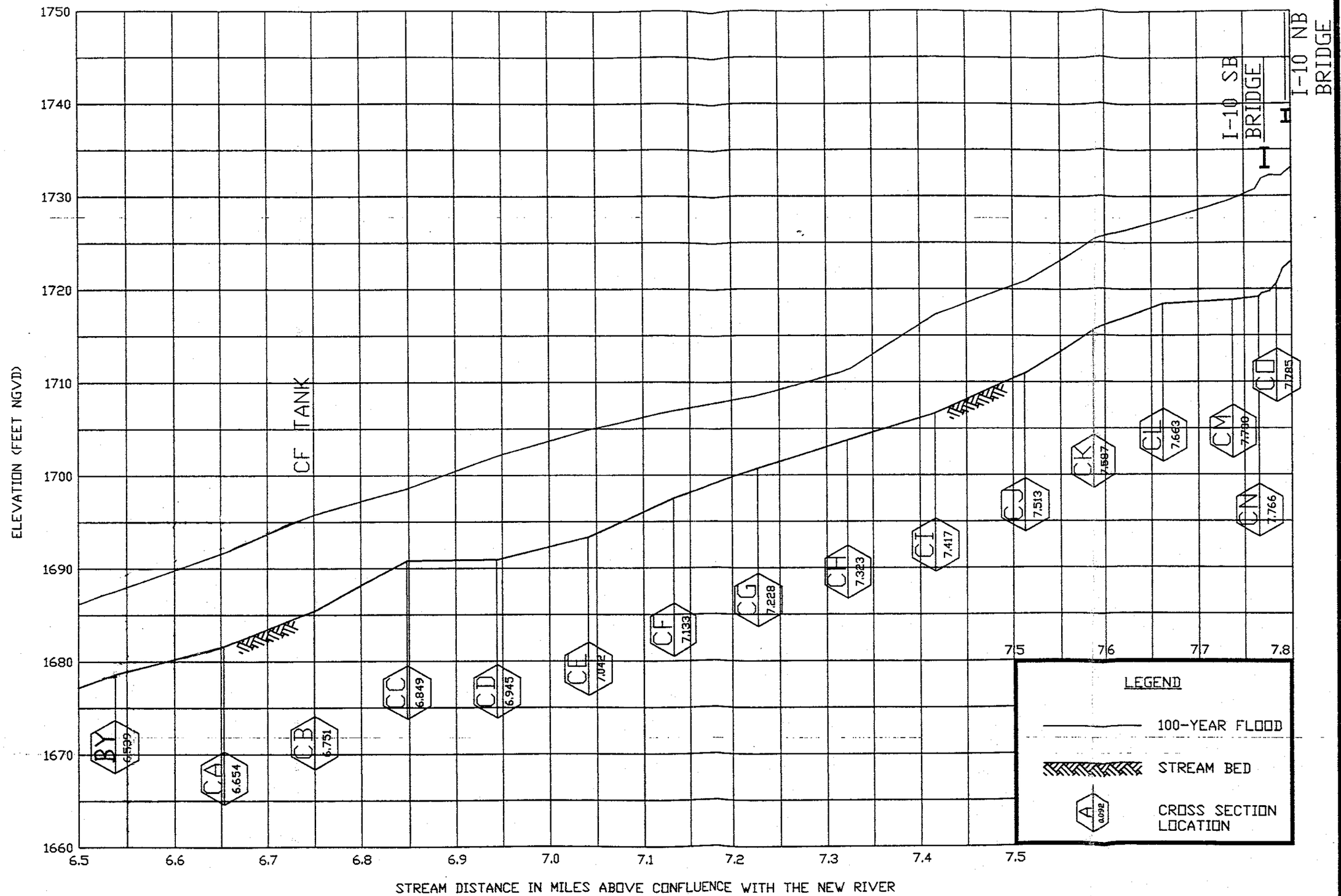
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

05P



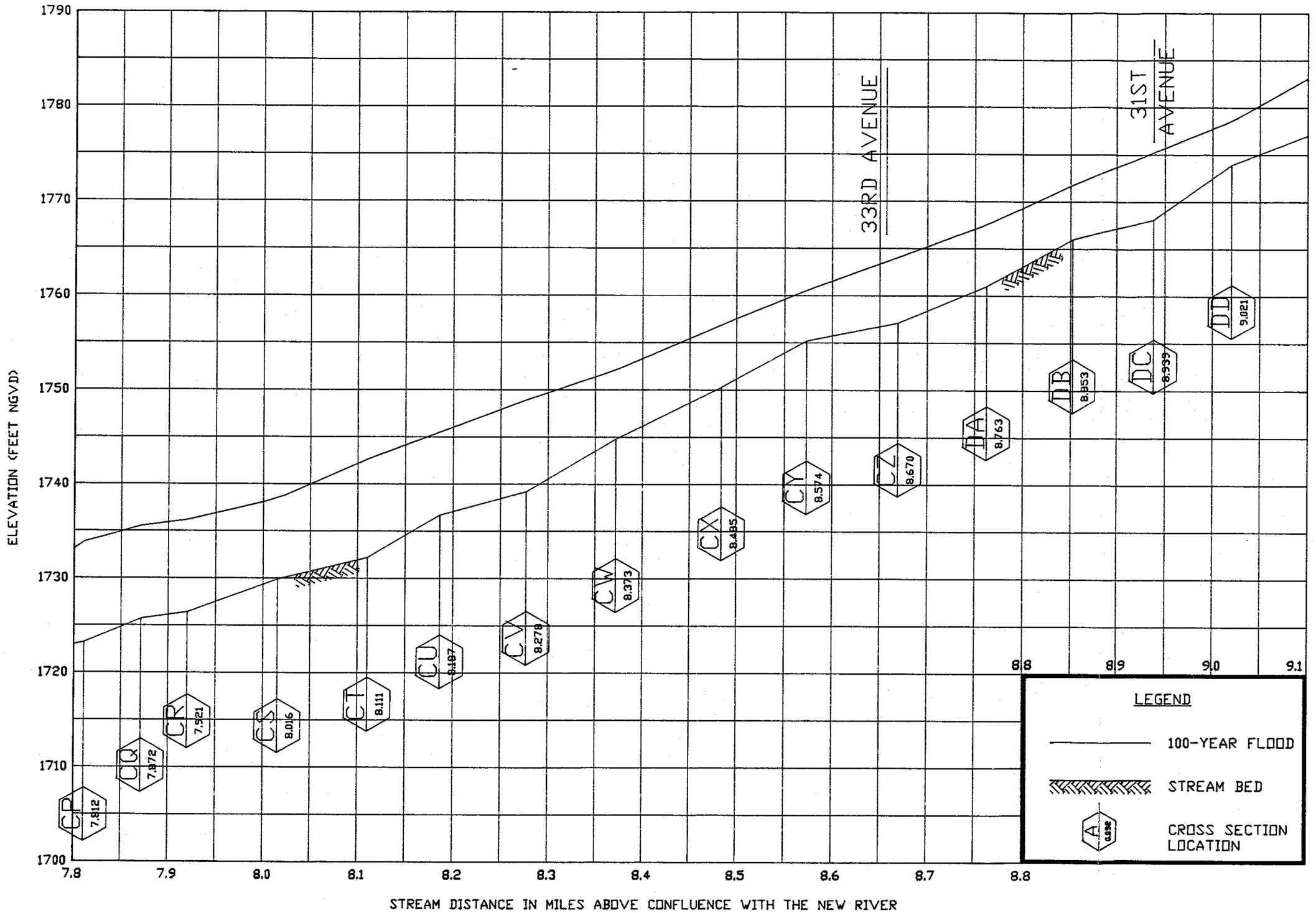
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

06P



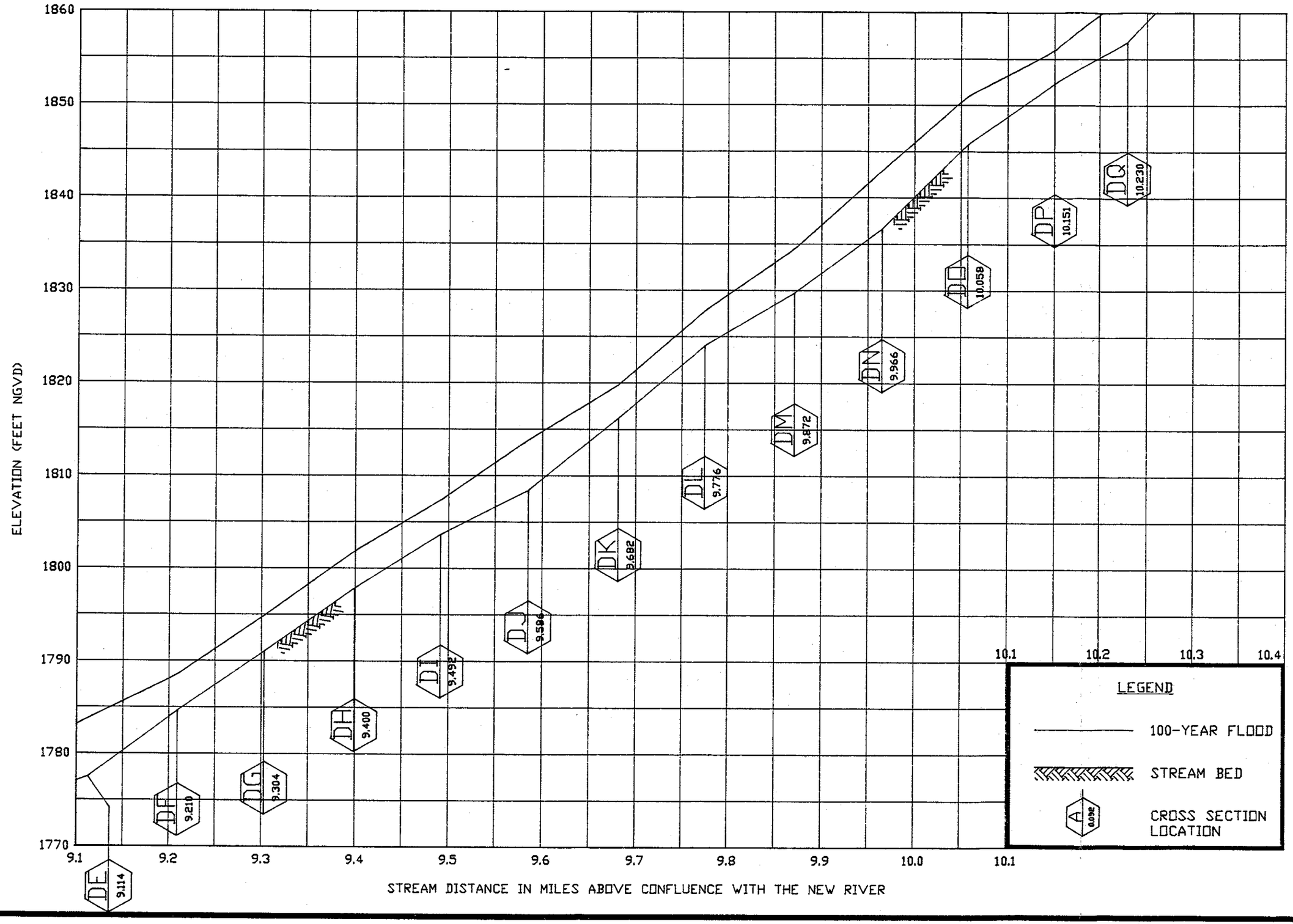
FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

07P



FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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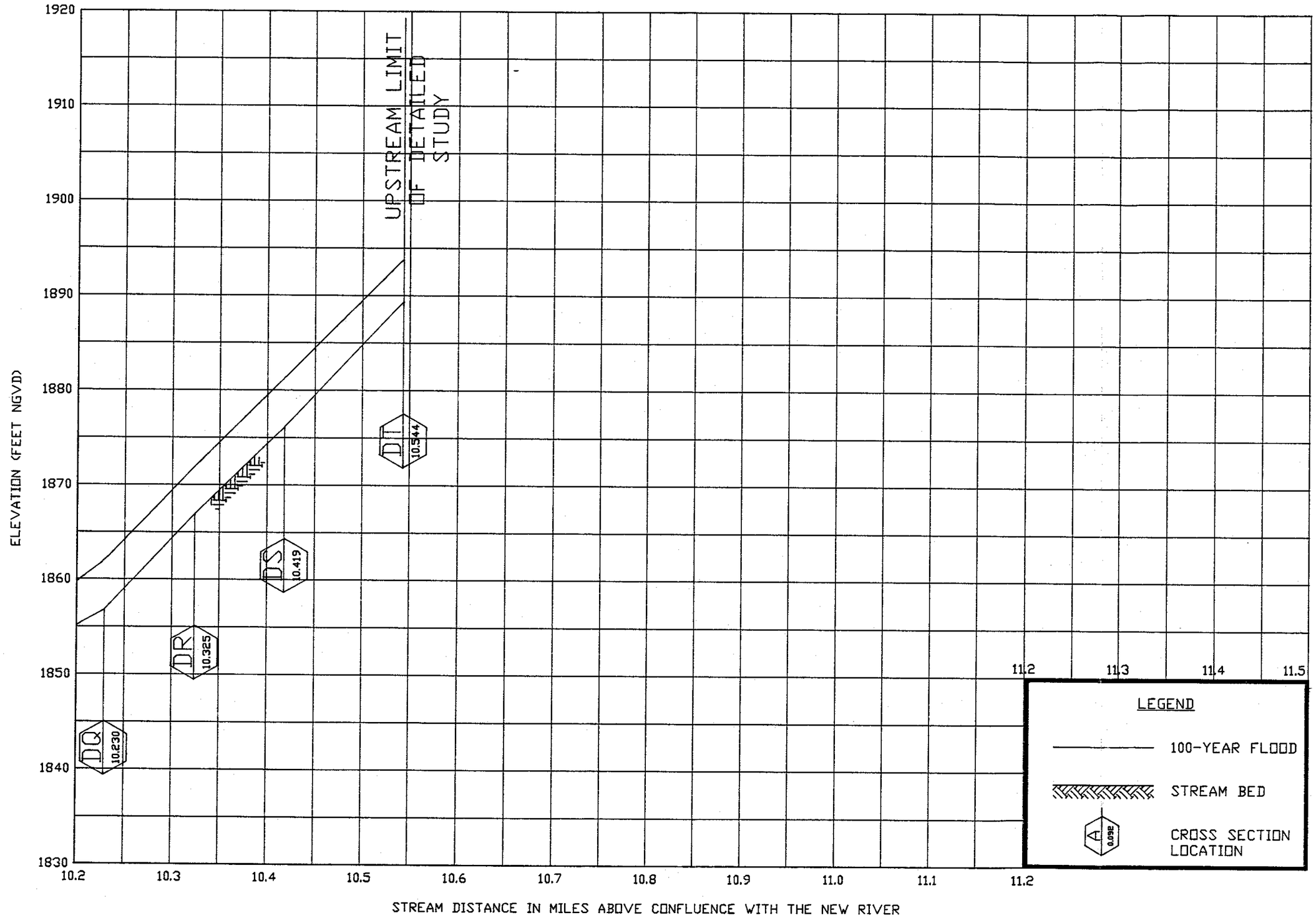
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

08P

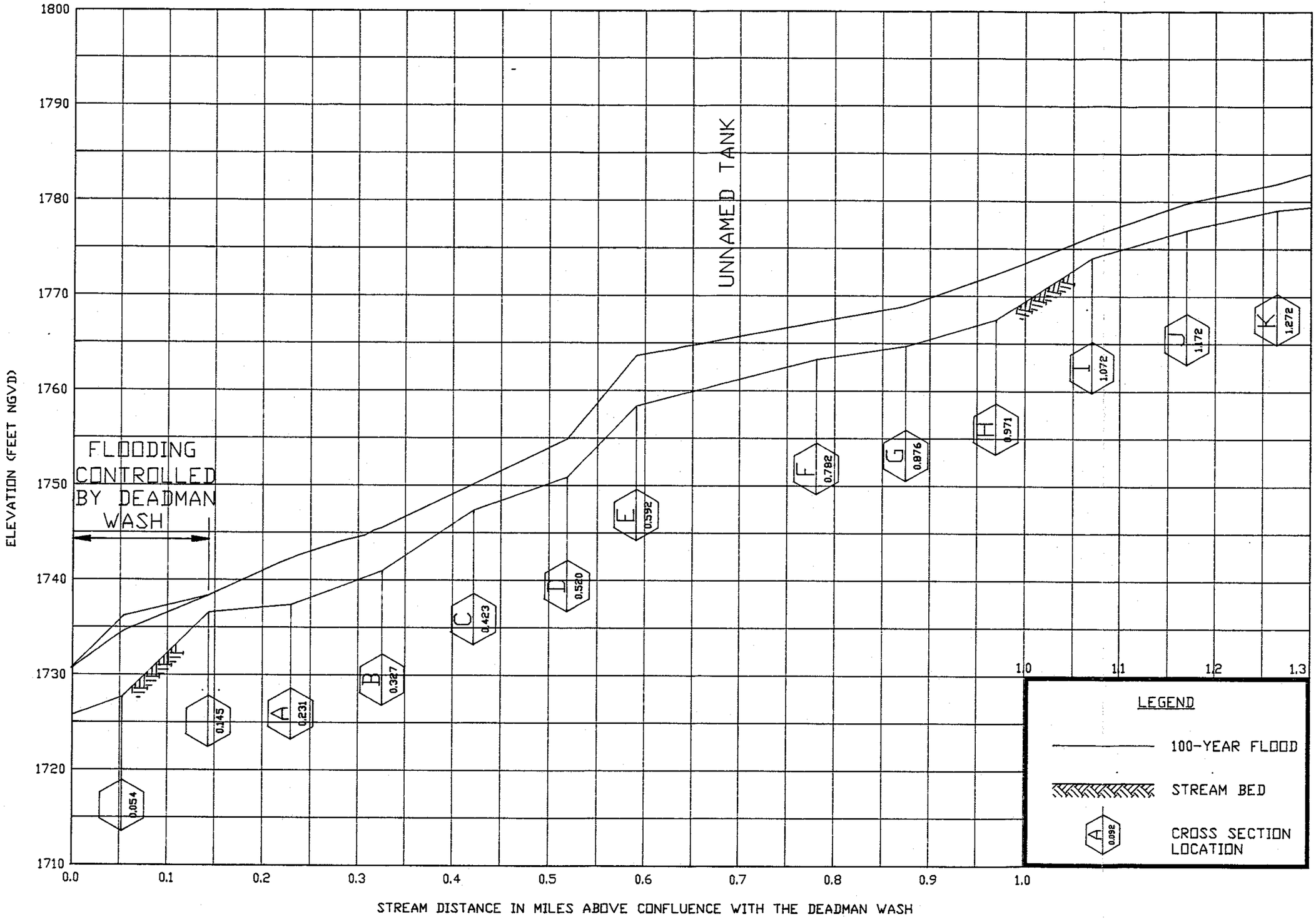


FLOOD PROFILES

DEADMAN WASH

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

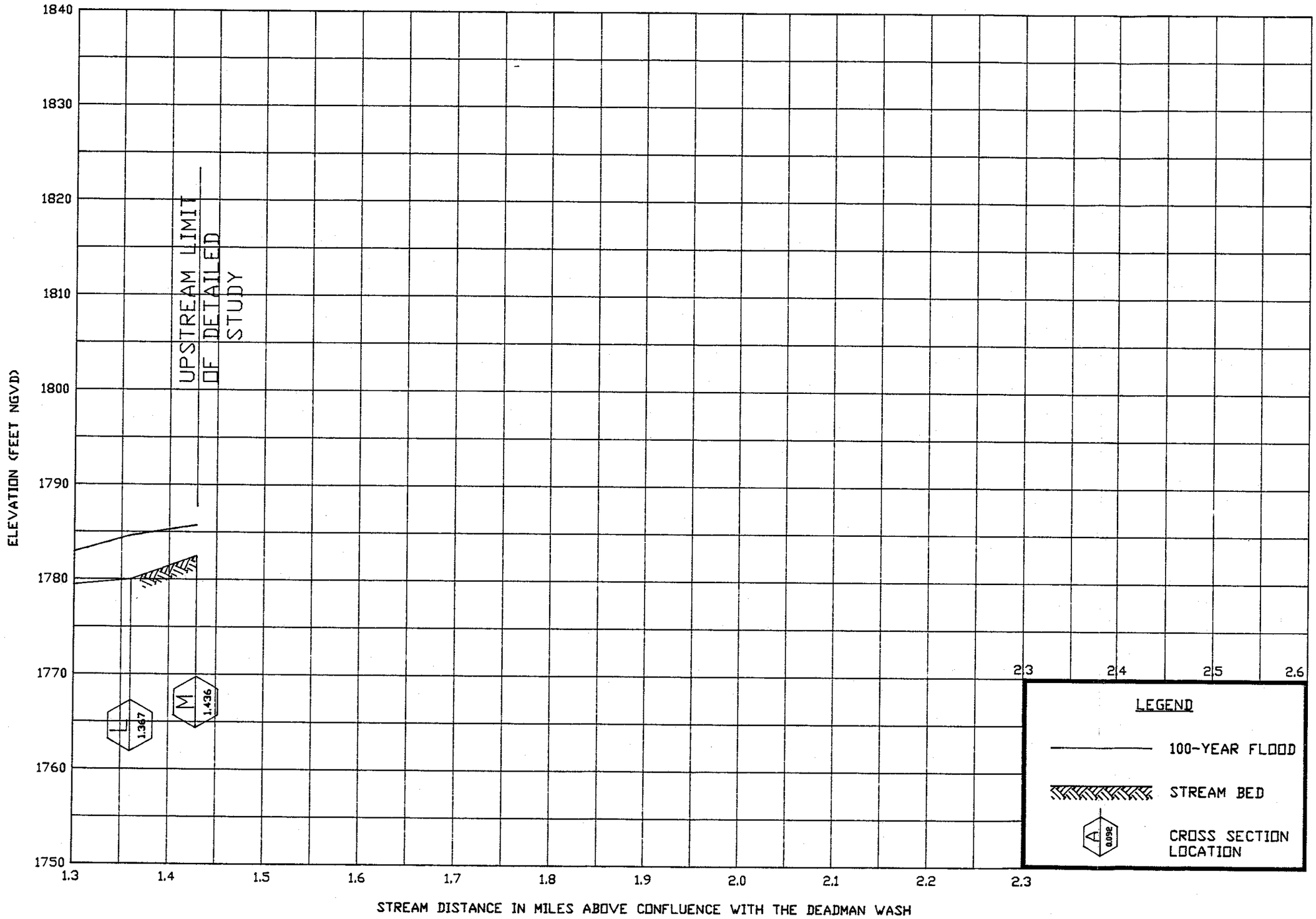


FLOOD PROFILES

DEADMAN WASH TRIBUTARY - STREAM NO. 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

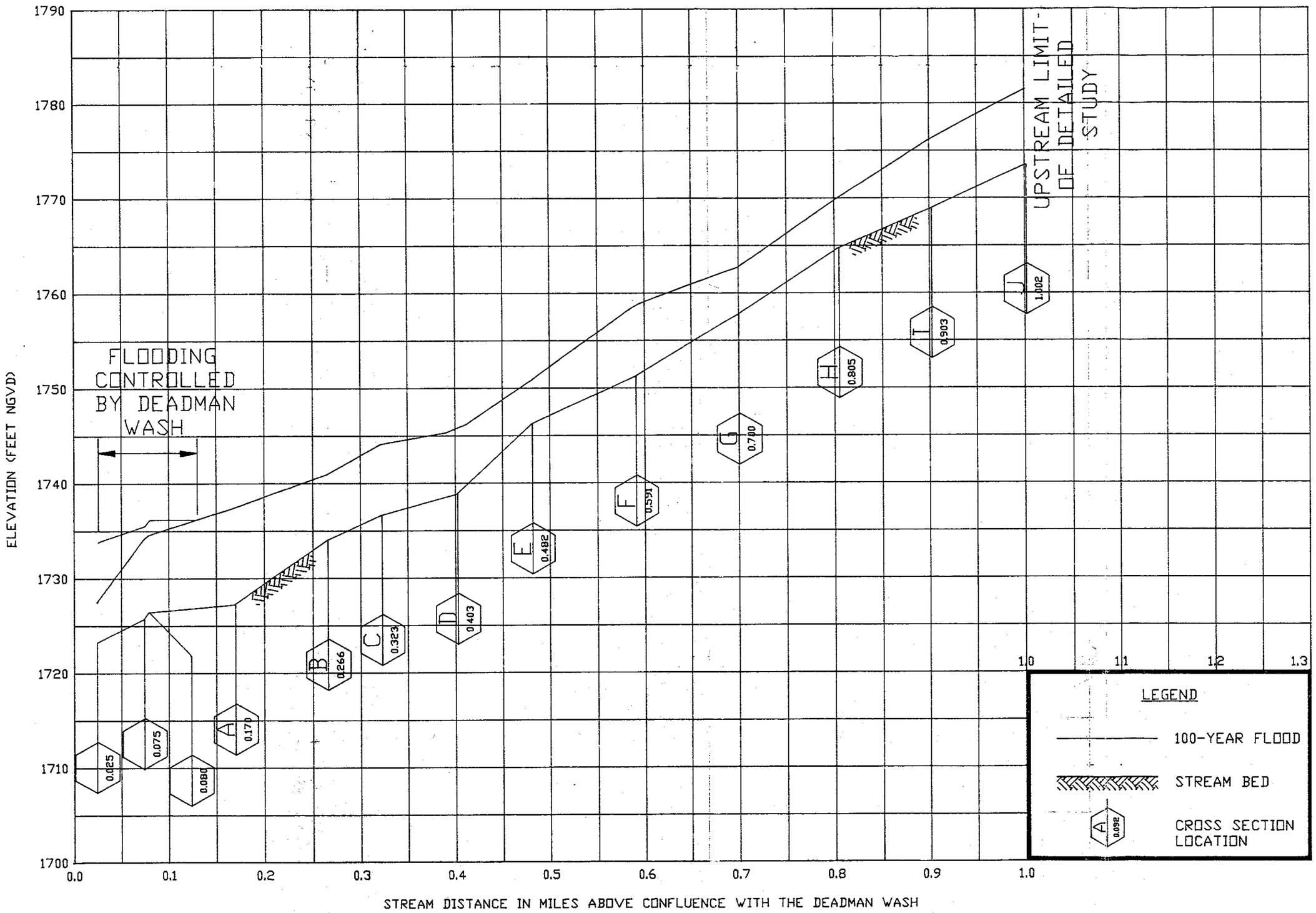


FLOOD PROFILES

DEADMAN WASH TRIBUTARY - STREAM NO. 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS



FLOOD PROFILES

DEADMAN WASH TRIBUTARY - STREAM NO. 7

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HNTB
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

Federal Emergency Management Agency

Washington, D.C. 20472

FEB 23 1995 FCD 90-65

DEADMAN WASH

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 95-09-196P

Mr. Ron Nevitt
Floodplain Administration
Flood Control District of
Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Community: Maricopa County, Arizona
Community Nos.: 040037, 040050, and 040051

106

Dear Mr. Nevitt:

This is in response to a facsimile transmittal dated February 16, 1995, from Mr. Bailang G. Sun, P.E., Project Manager, Howard Needles Tammen & Bergendoff (HNTB), regarding the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. With his February 16 facsimile transmittal, Mr. Sun submitted additional data in support of your November 5, 1993, request for a revision to the effective FIS report and 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 analyses of Deadman Wash from approximately 4,700 feet upstream of its confluence with the New River to approximately 14,600 feet upstream of Interstate Highway 17, Stream No. 4 from its confluence to approximately 7,600 feet upstream of its confluence with Deadman Wash, and Stream No. 7 from its confluence to approximately 5,300 feet upstream of its confluence with Deadman Wash. Deadman Wash, Stream No. 4, and Stream No. 7 were previously unstudied.

All data required to review this revision were submitted with your November 5 letter; with a letter dated December 27, 1994, from Mr. Tim Murphy, Hydrologist, Flood Control District of Maricopa County; and a letter dated February 14, 1995, from Mr. Sun and his February 16 facsimile transmittal.

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.

- Volumes 1 and 2 of the report entitled "Deadman Wash Floodplain Delineation Study, FCD 90-65, Technical Data Notebook Hydrology," prepared by HNTB, dated July 1992, revised December 1992

- Volumes 1 and 2 of the report entitled "Deadman Wash Floodplain Delineation Study, FCD 90-65, Technical Data Notebook Hydraulic Analysis," prepared by HNTB, dated July 1992, revised December 1992

- Report entitled "Deadman Wash Floodplain Delineation Study, FCD 90-65, FEMA Forms RSD-1," prepared by Flood Control District of Maricopa County, undated

- Sheets 1 through 13 of the topographic work maps entitled "Flood Control District of Maricopa County, Floodplain Delineation Study of Deadman Wash, F.C.D. Contract No. 90-65," prepared by HNTB, undated

We will include this information in our next physical map revision of the FIRM for 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: The Honorable Ken Forgia
Mayor, City of Peoria

The Honorable Skip Rimsza
Mayor, City of Phoenix

The Honorable Tom Rawles
Chairperson, Maricopa County
Board of Supervisors

Mr. Tim Murphy
Hydrologist
Flood Control District of
Maricopa County

Mr. Bailang G. Sun, P.E.
Project Manager
HNTB