FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

INDIAN BEND WASH FLOODPLAIN DELINEATION STUDY

Salt River to 40th Street
FCD 93-05

HYDRAULICS REPORT
VOLUME 1 OF 2

NOVEMBER 1997

sla Simons, Li & Associates, Inc.

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INDIAN BEND WASH
FROM
SALT RIVER CONFLUENCE TO 40TH STREET

DOCUMENTATION IN SUPPORT OF A REQUEST FOR LETTER OF MAP REVISION

Prepared for:

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November 1997

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Registered Professional Engineer (Civil) CERTIFICATE NO. 21560 DENNIS L. RICHARDS Date Signed 11/3/97 ARIZONA, U.S.A.

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INDIAN BEND WASH FROM
SALT RIVER CONFLUENCE TO 40TH STREET

1.0 INTRODUCTION

1.1 Purpose of Study

This Floodplain Delineation Study provides floodplain elevations in areas adjacent to Indian Bend Wash (IBW) from the Salt River confluence to 40th street. The study area lies entirely within Maricopa County, Arizona. IBW passes through the communities of Phoenix, Scottsdale, Tempe, and Paradise Valley. This study consists of Hydraulic analyses necessary to determine 100-year flood elevations and to map regulatory floodplain and floodway boundaries for the area. The location of the project is shown in Figure 1.

1.2 Conversion Table

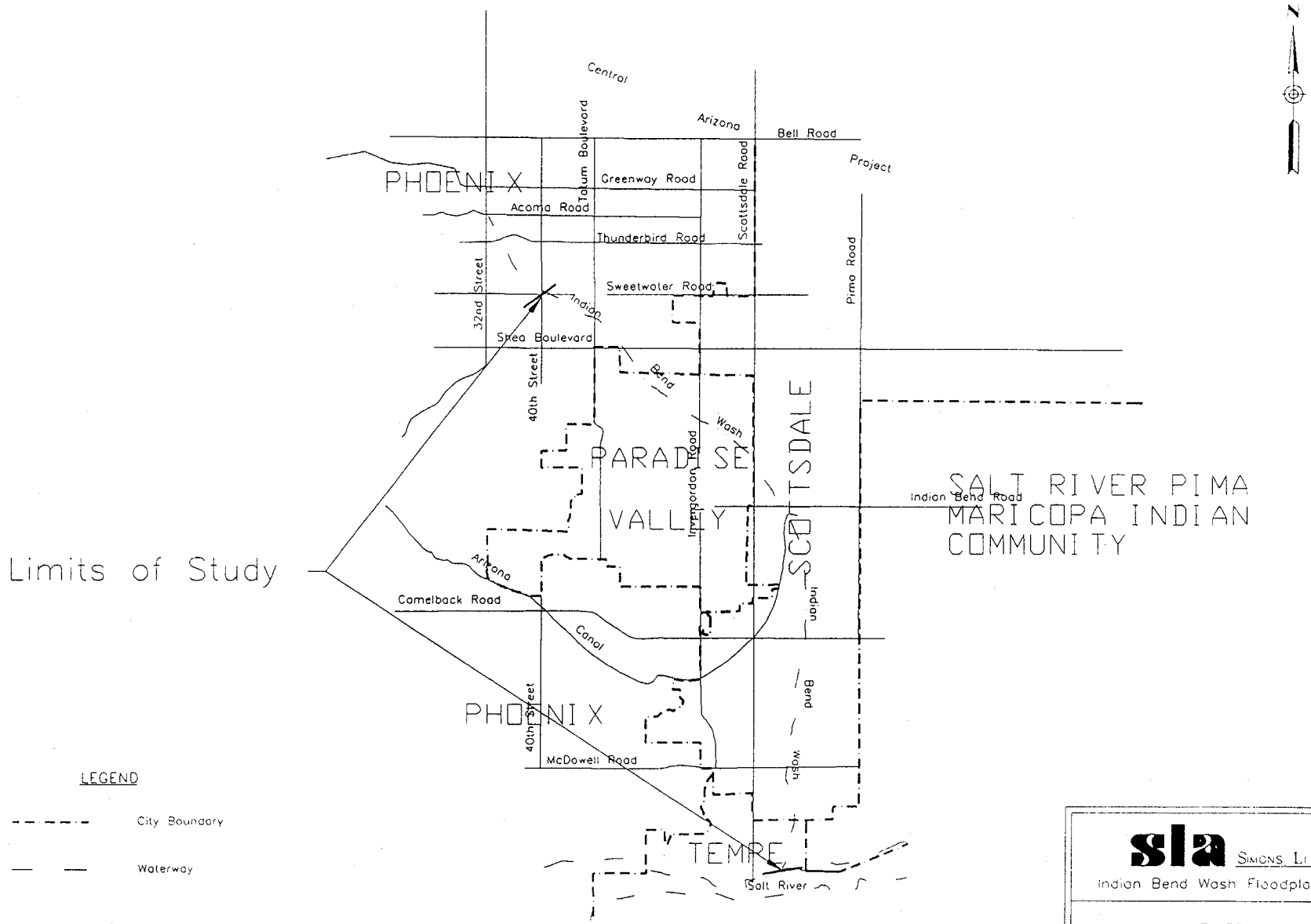
Table 1 below provides the conversion factors necessary for changing the units on all volume, area, and length measurements (e.g., elevations, velocities, etc.) from English to metric.

Table 1 English to Metric Conversion Factors

Measurement	English Units	Conversion Factor	Metric Units
Area	Sq. Mi. Acres Sq. Ft.	259.008 0.4047 0.0929	Hectares Hectares mM2
Length	Miles Feet	1.61 0.3048	Kilometers Meters
Volume	Ft3 Gal.	0.0283 3.79	m3 l
Velocity	ft/sec	0.3048	m/sec

1.3 Authority for Study

Under Federal and Arizona law, communities participating in the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA) are obligated to perform floodplain management and oversight of floodplain uses, such as land development, gravel mining, and others. It is by this authority that projects, such as the IBW Flood Delineation Study, are conducted to define floodplains and ensure that activities within flood hazard areas are regulated in accordance with FEMA requirements.



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Indian Bend Wash Floodplain Delineation Study

SITE MAP

Figure 1

The overall authority for this study is in the provisions of the National Flood Insurance Act of 1968 (PL 90-448) and the Flood Disaster Protection Act of 1983 (PL 93-234). This study was funded and administered by the Flood Control District of Maricopa County (FCD).

1.4 Coordination and Acknowledgments

The FCD specified the limits of this delineation study and assisted in the selection of the detailed hydrologic and hydraulic methods used to determine flood flow elevations. The FCD has administered previous flood insurance studies within and adjacent to the study area and provided available hydrologic and hydraulic information on those studies.

This study was completed in consultation with the City of Phoenix, City of Scottsdale, City of Tempe, Town of Paradise Valley and the Arizona Department of Water Resources.

2.0 AREA STUDIED

2.1 Scope of Study

The primary element of the scope was to delineate the 100-year floodplain and floodway for the IBW.

SLA project engineers conducted a site reconnaissance of IBW to collect data to be used in the determination of the Manning's "n" values and verification of structures in the wash. Photographs of typical land cover and channel reaches were taken during the field reconnaissance. An "n-Value Determination Report" was prepared using the data gathered from the field trip (1).

The most current topographic mapping available (Baker 1993) was supplied by the City of Scottsdale. The 100-year floodplain and floodway delineations were developed using the HEC-2 computer model.

2.2 Community Description

Figure 1 illustrates the location of IBW relative to the communities of Phoenix, Paradise Valley, Scottsdale, and Tempe. The watershed is highly developed urban and suburban with mixed land uses located entirely within Maricopa County, Arizona. IBW originally had a total drainage area of 206 square miles to its confluence with the Salt River. In 1975, construction of the Central Arizona Project (CAP) Canal and the dikes associated with this project, isolated the upper portion of the watershed. The CAP dikes impound all runoff from the north. This has resulted in a reduction of the total IBW drainage area by 43 percent to approximately 102 square miles (2). The U.S. Army Corps of Engineers has estimated that these dikes will reduce the estimated Standard Project Flood discharge from 62,000 cfs to 39,000 cfs at Indian Bend Road.

Indian Bend Wash was converted to a greenbelt area through the City of Scottsdale in 1985. This multi use project conveys flood flows and provides recreational amenities including open space, grass, golf courses, sports fields, hiking, bicycling, picnic areas, boating and many other quality of life features. The greenbelt project conveys flood flows from its inlet at Indian Bend Road to its outlet near the Salt River. The inlet is an earthen channel from Indian Bend Road south to McDonald Drive. The outlet channel is an earthen excavated channel from McKellips Road south to the Salt River. The inlet channel collects flows above the Arizona Canal, conveys them across the canal, and discharges into the greenbelt floodway. A siphon passes water in the Arizona Canal under Indian Bend Wash. East of the Wash, an interceptor channel collects and disposes of floodwaters that pond behind the north bank of the Arizona Canal. West of the Wash, a series of collectors, side channels, and underground pipes collect floodwaters and prevents ponding and overtopping of the canal bank. In addition to the greenbelt, numerous detention basins have been constructed within the drainage area as development has occurred.

2.3 Principal Flood Problems

The City of Scottsdale expressed a general concern that the currently effective FIS depicts areas adjacent to Indian Bend Wash as being in the floodplain when in fact they are not.

2.4 Flood Protection Measures

None are proposed as part of this study.

3.0 ENGINEERING METHODS

3.1 Hydrologic Analysis

The 100-year discharges used for Indian Bend Wash were taken from the FEMA Flood Insurance Study(FIS) for Maricopa County, Arizona. & Incorporated Areas, Volume 1 of 12, revised September 1995. Table 2 summarizes the discharges.

Table 2 Summary of Discharges

100-Year Discharges for Indian Bend Wash	
Reach	**Discharge (cfs)**
36th Street to Cactus Road	6000
Cactus Road to Scottsdale Road	9000
Scottsdale Road to Indian Bend Road	16000
Indian Bend Road to Indian School Road	17000
Indian School Road to Salt River	20000

3.2 Hydraulic Analysis

3.2.1 Work Map Delineation

Water surface profiles were developed using the U.S. Army Corps' of Engineers HEC-2 computer program (Version 4.6.2) (4). Water surface profiles were determined for the 100-year floodplain and floodway. The hydraulic analysis conducted for this delineation reflects existing conditions of IBW at the time of mapping for the study.

The cross section data and topographic mapping for the study reach of IBW, were developed from a digital terrain model (DTM) prepared by Michael Baker Jr., Inc. The DTM is based on aerial photography taken September, October, and November 1993.

Cross sections were drawn approximately perpendicular to the anticipated flow paths in the channel and overbanks. The cross-sections were labeled using standard engineering stationing with the distance in river miles above the confluence with the Salt River. The station of each cross-section is determined by measuring the distance above the confluence along the IBW channel centerline (thalweg).

The cross sections are defined by data points oriented left to right looking downstream. Each data point consists of an elevation and corresponding station number with the hydraulic baseline assigned a station number of 10,000 feet at each cross section. Each cross section station number is defined

relative to the hydraulic baseline with stations less than 10,000 to the left, and greater than 10,000 to the right.

Cross-sections were taken at representative locations. At the culverts and bridges extra cross-sections were taken immediately upstream and downstream to define the frequent changes in geometry through the openings. Locations of selected cross-sections used in this study are shown on the Flood Boundary and Floodway maps. Cross-section plots at selected locations are also included in the technical documentation.

3.2.2 Roughness Coefficient

Roughness coefficients (Manning's "n") for IBW were derived from field observation, aerial photos, and by the methodology presented in "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" (5). An "n-Value Determination Report" was prepared and submitted separately by Simons, Li & Associates to document roughness coefficients used for this study (1). A copy of this report is provided in Section 4.2 of the study documentation.

3.2.3 Effective and Ineffective Flow Area

Ineffective flow areas were defined, as appropriate, on the overbank areas and to model expanding and contracting flows. Flow was expanded at a rate of 4:1 and contracted at a rate of 1:1 relative to the flowline. The expansion and contraction coefficients used in the model were 0.4 and 0.2, respectively, as documented in Section 4.2.2 of the study documentation.

3.2.4 Simulation of Flow Through Structures

The HEC-2 computer program provides three options for computing losses through a bridge. First, the losses can be computed externally and input directly into the program. Secondly, the normal bridge routine may be used. Finally, the special bridge routine may be used. The normal bridge routine is used when friction losses are the predominant consideration. Then, the standard step method is used for computing losses through bridges. The special bridge routine is used when combinations of low or pressure flow with weir flow occur at the bridge. The special bridge routine will determine the class of low flow based on a trapezoidal approximation of a bridge opening with piers.

The HEC-2 computer program provides a special culvert routine for computing losses through culverts. The special culvert routine is similar to the special bridge routine except that the Federal Highway Administration's (FHWA) standard equations for culvert hydraulics are used to compute losses through the structure.

3.2.5 HEC-2 Computer Model Set Up

HEC-2 models were developed for subcritical flow profile computations. The 100-year water-surface elevation at the confluence of Indian Bend Wash and the Salt River (elevation 1167.3 ft.) was

used as the starting water-surface elevation. This information was taken from the effective Flood Insurance Study water-surface profiles for the Salt River (September 30, 1995). Baseline stationing begins at the confluence of IBW with the Salt River, located approximately 700 feet upstream of Scottsdale Road along the hydraulic baseline of the Salt River.

The bridges on Indian Bend Wash were modeled using the special bridge routine of the HEC-2 Model. Bridge dimensions were obtained from as-built plans and field verified during the field reconnaissance survey.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The State of Arizona and Maricopa County have floodplain management programs and ordinances which are intended to promote sound land use planning. These activities include regulating development in flood hazard areas and promoting appropriate uses of floodplains. These management objectives will be enhanced by the publication of floodplain maps based on the analyses conducted for the IBW Study.

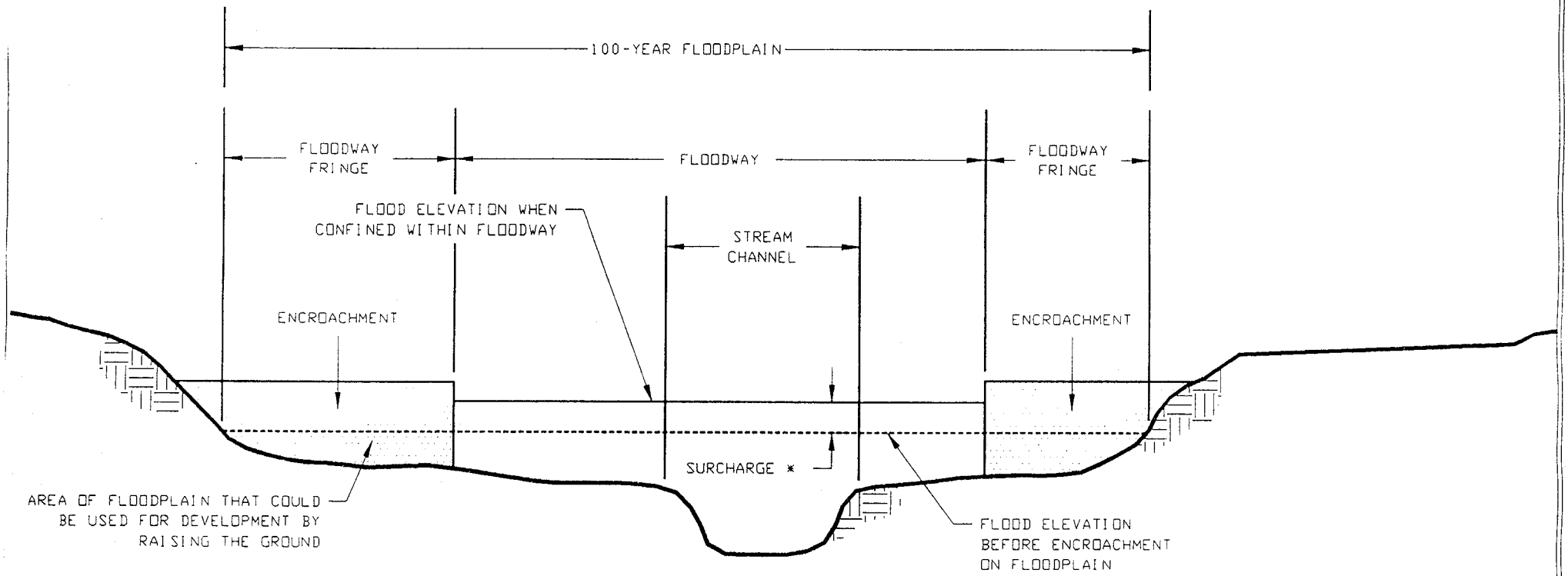
4.1 Flood Boundaries

The one percent annual risk, or 100-year flood event, has been adopted by FEMA as the national standard for floodplain management. A 100-year floodplain has been delineated on 1" = 200' scale topographic maps with one- and two-foot contours. The floodplain extent was identified at each cross section and then interpolated between cross sections. The resulting floodplain boundaries are compared to the currently effective floodplain boundaries shown in Exhibit 2.

4.2 Floodways

The floodway concept is used to define the amount of floodplain encroachment that is considered acceptable for development. The principle is that limited encroachment is likely to have an insignificant effect on all but the severest flood events. A floodway consists of the main channel of a stream plus sufficient overbank area to convey the 100-year flood without increasing flood heights by more than a specified depth. Federal standards limit the increase to one foot; however, some jurisdictions have much stricter standards. Normally, the floodway is determined by encroaching on the floodplain to reduce the conveyance by equal amounts on each side. The encroachment is increased gradually until the maximum allowable increase in depth is achieved. The typical relationship between the floodway, floodway fringe, and the floodplain are shown in Figure 2.

The floodway presented in this study was determined on the basis of maximizing its width while staying within the limits of the floodplain at all locations. In areas of shallow overbank flooding, the floodway limit was located at the top of the main channel bank. The resulting hydraulics are tabulated in Tables 3 and 4 for selected cross-sections. A comparison between the currently effective floodway boundaries and the proposed floodway boundaries are provided as Exhibit 3.



LINE A-B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C-D IS THE FLOOD ELEVATION AFTER ENCROACHMENT

* SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

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Indian Bend Wash Floodplain Delineation Study

FLOODWAY SCHEMATIC

Figure 2

FLOODING SOURCE		FLOODWAY			WATER SURFACE ELEVATION[2]		
CROSS SECTION	DISTANCE[1]	WIDTH (ft)	SECTION AREA (sq ft)	MEAN VELOCITY (ft/s)	WITH FLOODWAY (ft)	WITHOUT FLOODWAY (ft)	DIFFERENCE (ft)
A	11,026	626	2451	8.2	1200.5	1200.1	0.4
B	12,200	453	3266	6.1	1204.6	1204.4	0.2
C	12,700	417	3165	6.3	1205.3	1204.9	0.4
D	13,700	370	3406	5.9	1206.6	1206.2	0.4
E	14,437	356	3363	5.9	1209.7	1210.0	-0.3
F	15,627	571	3481	5.7	1215.4	1214.6	0.8
G	16,627	582	3704	5.4	1217.1	1216.4	0.7
H	17,937	652	2838	7.0	1219.7	1219.1	0.6
I	18,672	660	3210	6.2	1222.8	1222.3	0.5
J	19,602	305	1952	10.2	1224.0	1223.9	0.1
K	20,860	574	4179	4.8	1228.1	1227.8	0.3
L	22,110	566	4119	4.9	1229.3	1228.9	0.4
M	23,310	591	3571	5.6	1231.0	1230.5	0.5
N	24,126	497	2764	7.2	1232.9	1232.9	0.0
O	25,440	626	6769	2.5	1241.0	1240.6	0.4
P	26,262	934	5301	3.2	1241.2	1240.7	0.5
Q	29,258	379	3117	4.2	1246.4	1245.8	0.6
R	30,258	319	2716	4.7	1247.0	1246.3	0.7
S	31,391	905	3680	4.6	1254.8	1254.3	0.5
T	32,391	537	3124	3.8	1255.9	1255.5	0.4
U	33,621	455	1258	9.5	1260.2	1260.2	0.0
V	34,889	926	3438	4.9	1264.1	1263.9	0.2

[1] Feet above confluence with Salt River

[2] 1988 Datum

TABLE 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SIMONS, LI & ASSOCIATES, INC.

FLOODWAY DATA

INDIAN BEND WASH

FLOODING SOURCE		FLOODWAY			WATER SURFACE ELEVATION[2]		
CROSS SECTION	DISTANCE[1]	WIDTH (ft)	SECTION AREA (sq ft)	MEAN VELOCITY (ft/s)	WITH FLOODWAY (ft)	WITHOUT FLOODWAY (ft)	DIFFERENCE (ft)
W	42,666	1031	3521	4.5	1286.5	1286.1	0.4
X	44,166	1018	3442	4.6	1291.6	1290.8	0.8
Y	46,947	554	3511	4.6	1297.3	1296.4	0.9
Z	48,282	665	3745	2.4	1301.5	1301.0	0.5
AA	48,598	680	2207	4.1	1301.6	1301.1	0.5
AB	48,998	710	1670	5.4	1302.5	1302.2	0.3
AC	49,927	786	2205	4.1	1306.5	1306.4	0.1
AD	50,804	860	2652	3.4	1308.3	1308.2	0.1
AE	51,707	625	2224	4.0	1310.2	1310.0	0.2
AF	52,631	694	2117	4.3	1315.3	1314.7	0.6
AG	53,631	360	1274	7.1	1318.2	1318.1	0.1
AH	54,443	598	2208	4.1	1320.2	1319.7	0.5
AI	54,533	639	2192	4.1	1320.2	1319.9	0.3
AJ	54,591	643	2380	3.8	1320.3	1320.3	0.0
AK	55,133	471	2028	4.4	1320.6	1320.6	0.0
AL	55,588	430	1019	8.8	1321.3	1321.4	-0.1
AM	56,538	544	2597	3.5	1325.8	1325.4	0.4
AN	57,518	573	1123	8.0	1327.3	1327.3	0.0
AO	57,994	608	2207	4.1	1330.0	1329.5	0.5
AP	58,396	669	2136	4.2	1330.7	1329.9	0.8
AQ	58,494	681	2085	4.3	1331.9	1331.8	0.1
AR	58,987	561	1493	6.0	1333.4	1332.7	0.7

[1] Feet above confluence with Salt River

[2] 1988 Datum

TABLE 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SIMONS, LI & ASSOCIATES, INC.

FLOODWAY DATA

INDIAN BEND WASH

FLOODING SOURCE		FLOODWAY			WATER SURFACE ELEVATION[2]		
CROSS SECTION	DISTANCE[1]	WIDTH (ft)	SECTION AREA (sq ft)	MEAN VELOCITY (ft/s)	WITH FLOODWAY (ft)	WITHOUT FLOODWAY (ft)	DIFFERENCE (ft)
AS	59,937	579	1541	5.8	1337.0	1336.5	0.5
AT	60,916	496	1554	5.8	1339.8	1339.5	0.3
AU	61,881	273	973	9.2	1344.1	1343.9	0.2
AV	62,345	333	1310	6.9	1346.5	1346.0	0.5
AW	63,220	377	1400	6.4	1347.6	1347.1	0.5
AX	64,249	244	1519	5.9	1350.6	1350.1	0.5
AY	65,251	233	1290	7.0	1351.9	1351.5	0.4
AZ	65,748	182	770	11.7	1356.3	1355.7	0.6
BA	67,165	349	1677	5.4	1361.7	1361.2	0.5
BB	68,987	420	1874	4.8	1367.9	1367.4	0.5
BC	69,950	164	741	12.2	1369.6	1369.4	0.2
BD	70,867	348	1320	6.8	1374.0	1373.7	0.3
BE	74,520	269	1267	7.1	1384.1	1383.3	0.8
BF	76,079	308	1537	3.9	1386.5	1386.3	0.2

[1] Feet above confluence with Salt River

[2] 1988 Datum

TABLE 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SIMONS, LI & ASSOCIATES, INC.

FLOODWAY DATA

INDIAN BEND WASH

FLOODING SOURCE		FLOODWAY			WATER SURFACE ELEVATION[2]		
CROSS SECTION	DISTANCE[1]	WIDTH (ft)	SECTION AREA (sq ft)	MEAN VELOCITY (ft/s)	WITH FLOODWAY (ft)	WITHOUT FLOODWAY (ft)	DIFFERENCE (ft)
Indian Bend Wash Low Flow Channel							
O	25440	626	6769	2.5	1241.1	1240.3	0.8
P	26,262	154	848	4.0	1241.0	1240.4	0.6
Q	29,258	167	469	8.7	1248.5	1248.5	0.0
R	30,258	204	807	5.2	1251.8	1251.7	0.0
S	31391	905	3680	4.6	1254.8	1254.3	0.5
T	32,193	245	579	8.8	1256.5	1257.0	-0.5
U	33,621	411	1091	4.7	1261.3	1261.3	0.0
V	34,889	926	3436	4.9	1264.1	1263.9	0.2

[1] Feet above confluence with Salt River

[2] 1988 Datum

TABLE 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SIMONS, LI & ASSOCIATES, INC.

FLOODWAY DATA

INDIAN BEND WASH

5.0 INSURANCE APPLICATION

Flood insurance studies are distributed to agents of the insurance, banking and finance industry for their use in assessing rates to be imposed for providing flood insurance. For flood insurance rating purposes, flood insurance zone designations are assigned within the study area based on the methods and results of the hydraulic analysis. The zones assigned in the IBW study are Zone AE and Zone X.

Zone AE:

Zone AE is the flood insurance rate zone for 100-year floodplains that are determined by detailed hydraulic methods. Whole-foot base flood elevations derived from the analysis 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 of depths are shown within this zone.

6.0 OTHER STUDIES

Flood insurance studies of adjacent areas were examined and taken into account in conducting this floodplain delineation study. These studies are documented in various FEMA FIRM Panels (Ref.6-12) and FIS summaries (Ref. 13-18). Other related sources of information are listed in Section 6.1 of the accompanying Technical Documentation.

7.0 LOCATION OF DATA

Information and pertinent data used in the preparation of this study is on file at the Flood Control District of Maricopa County, Engineering Department, at 2801 West Durango Street, Phoenix, Arizona, 85009.

8.0 BIBLIOGRAPHY

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3. Drainage Design Manual for Maricopa County, Arizona, Volume I Hydrology (1995 Revision), Special Projects Branch, Hydrology Division, Flood Control District of Maricopa County.

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7. FEMA, "FIRM; Maricopa County & Incorporated Areas, Panel 1680 of 4350," September 29, 1989

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9. FEMA, "FIRM; Maricopa County & Incorporated Areas, Panel 1690 of 4350," April 15, 1988

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12. FEMA, "FIRM; Maricopa County & Incorporated Areas, Panel 2170 of 4350," September 4, 1991

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14. FEMA, "FIS City of Phoenix, AZ. Maricopa County," June 1, 1984

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17. FEMA, "FIS Maricopa County, AZ. Unincorporated Areas," May 1979

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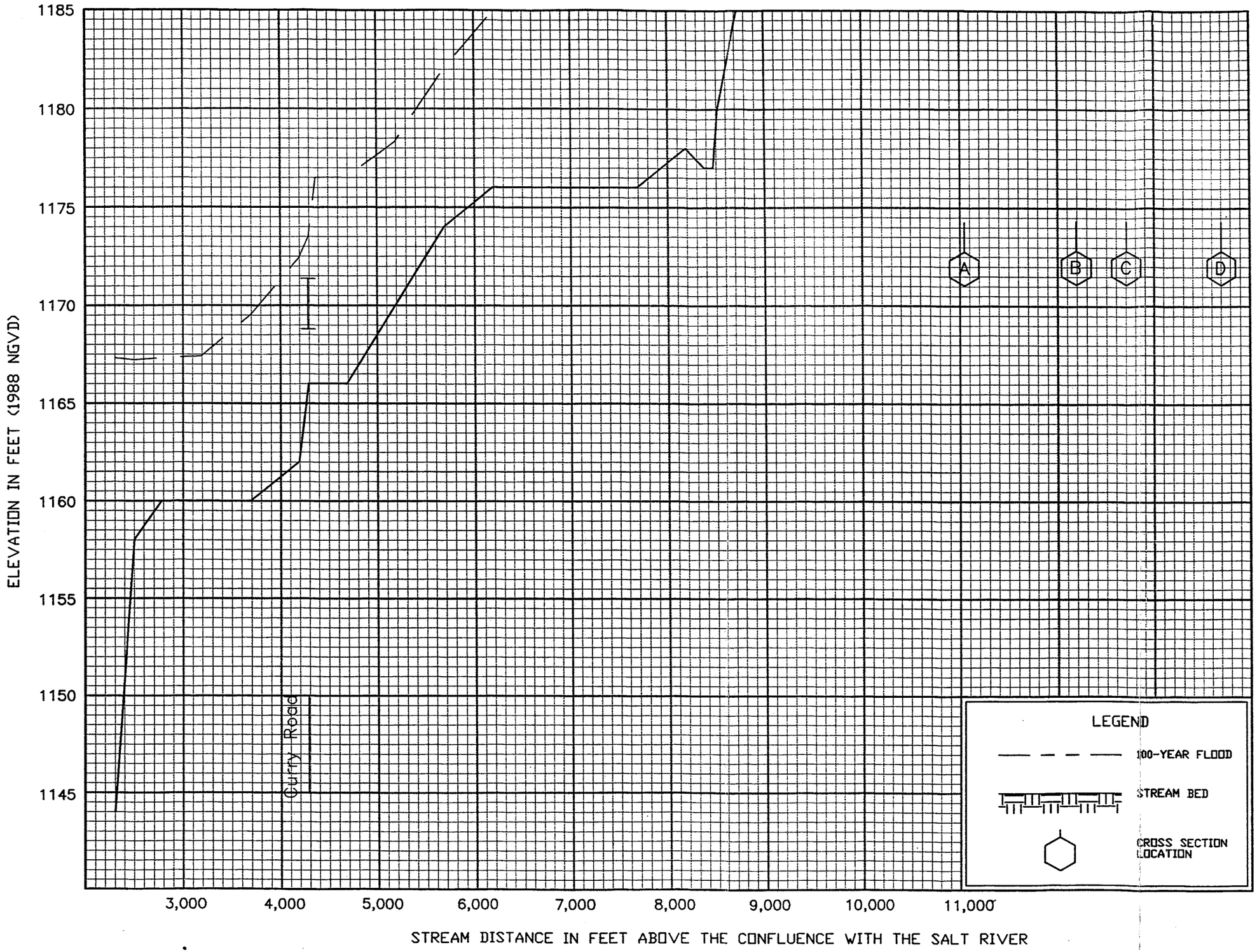
INDIAN BEND WASH
FLOODPLAIN/FLOODWAY

FCD 93-05

EXHIBIT 1: FLOOD PROFILES



FLOOD PROFILES

INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 1

FLOOD PROFILES

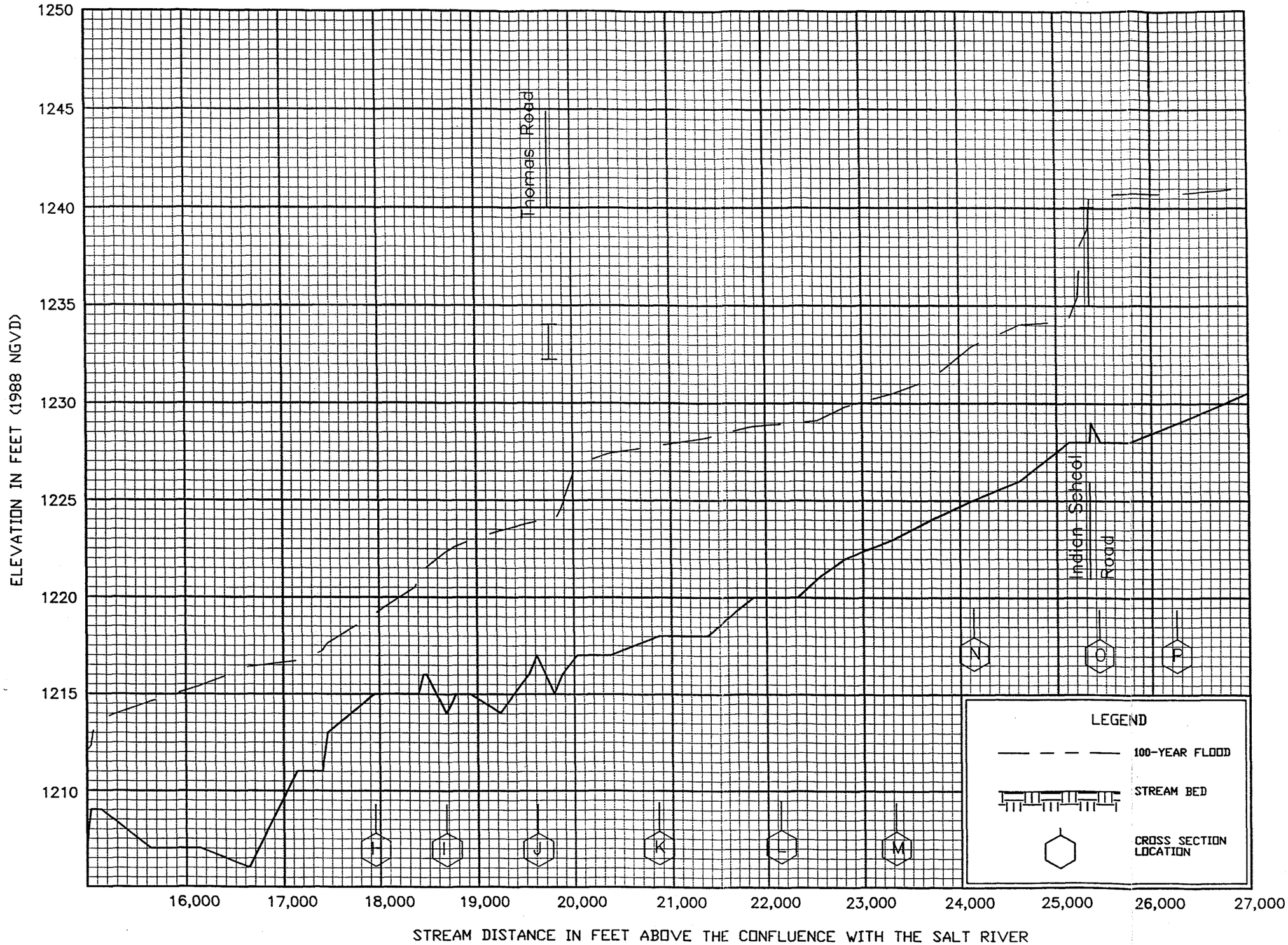
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 2



FLOOD PROFILES

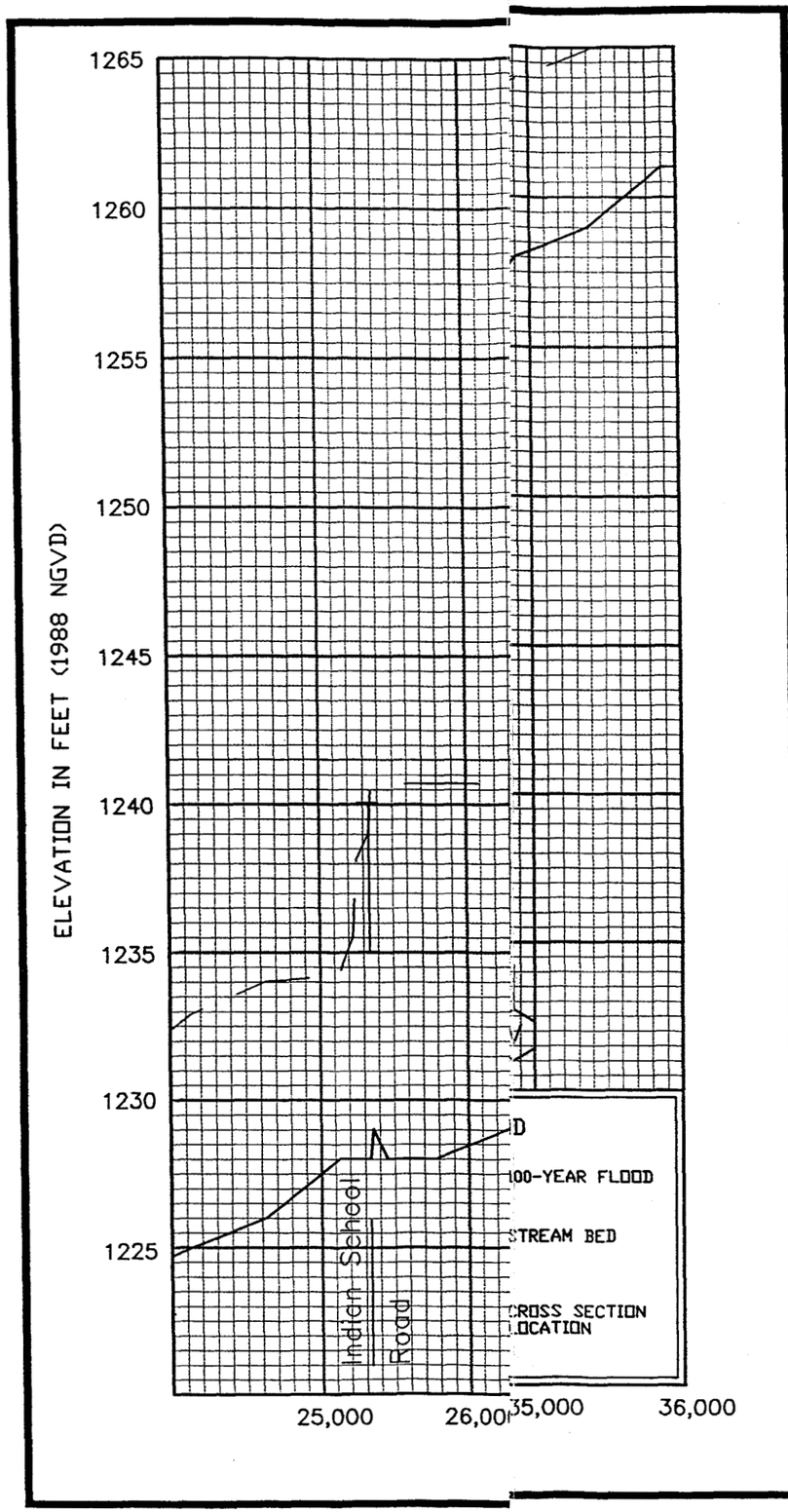
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 3



FLOOD PROFILES

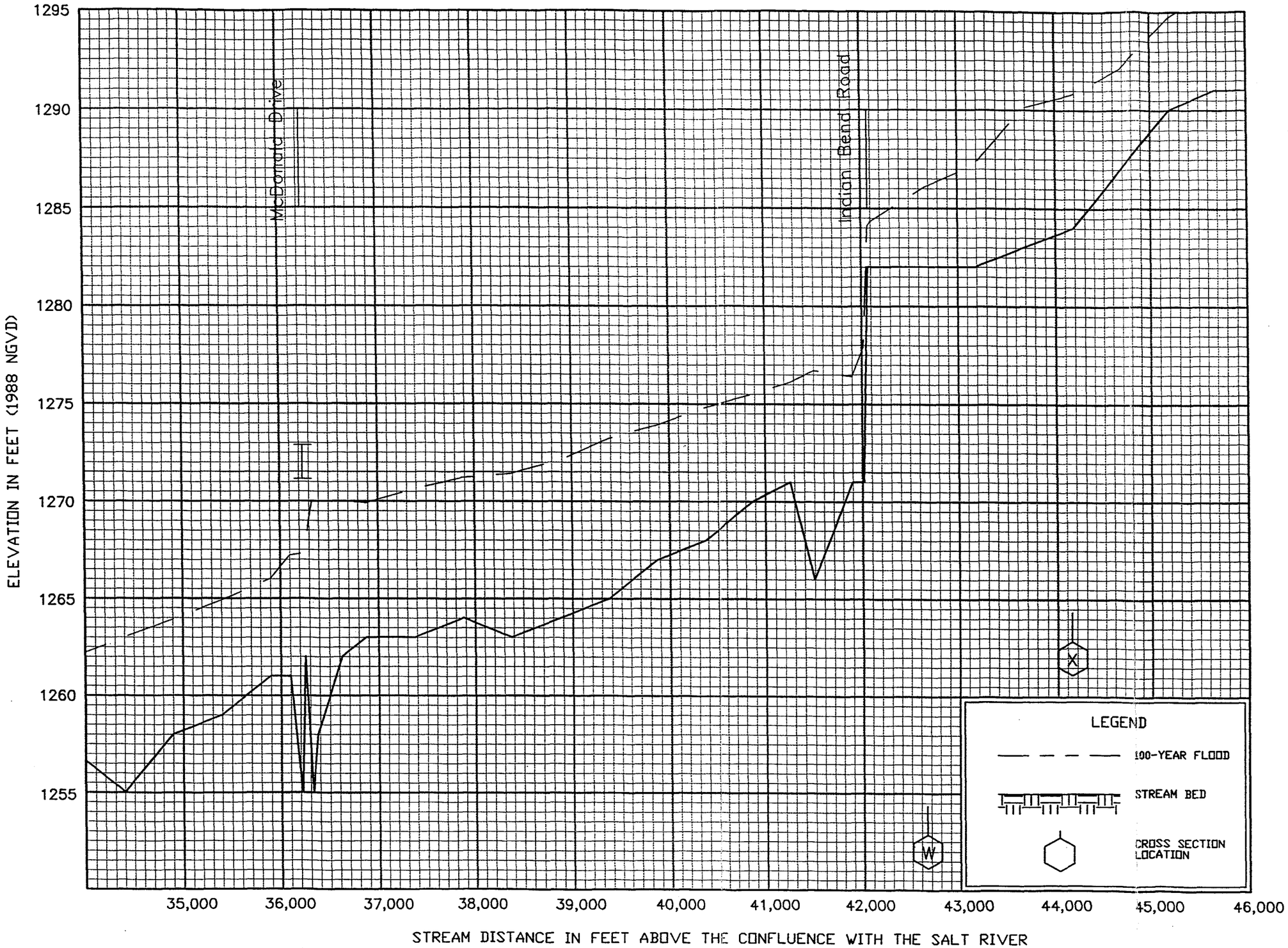
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET4



FLOOD PROFILES

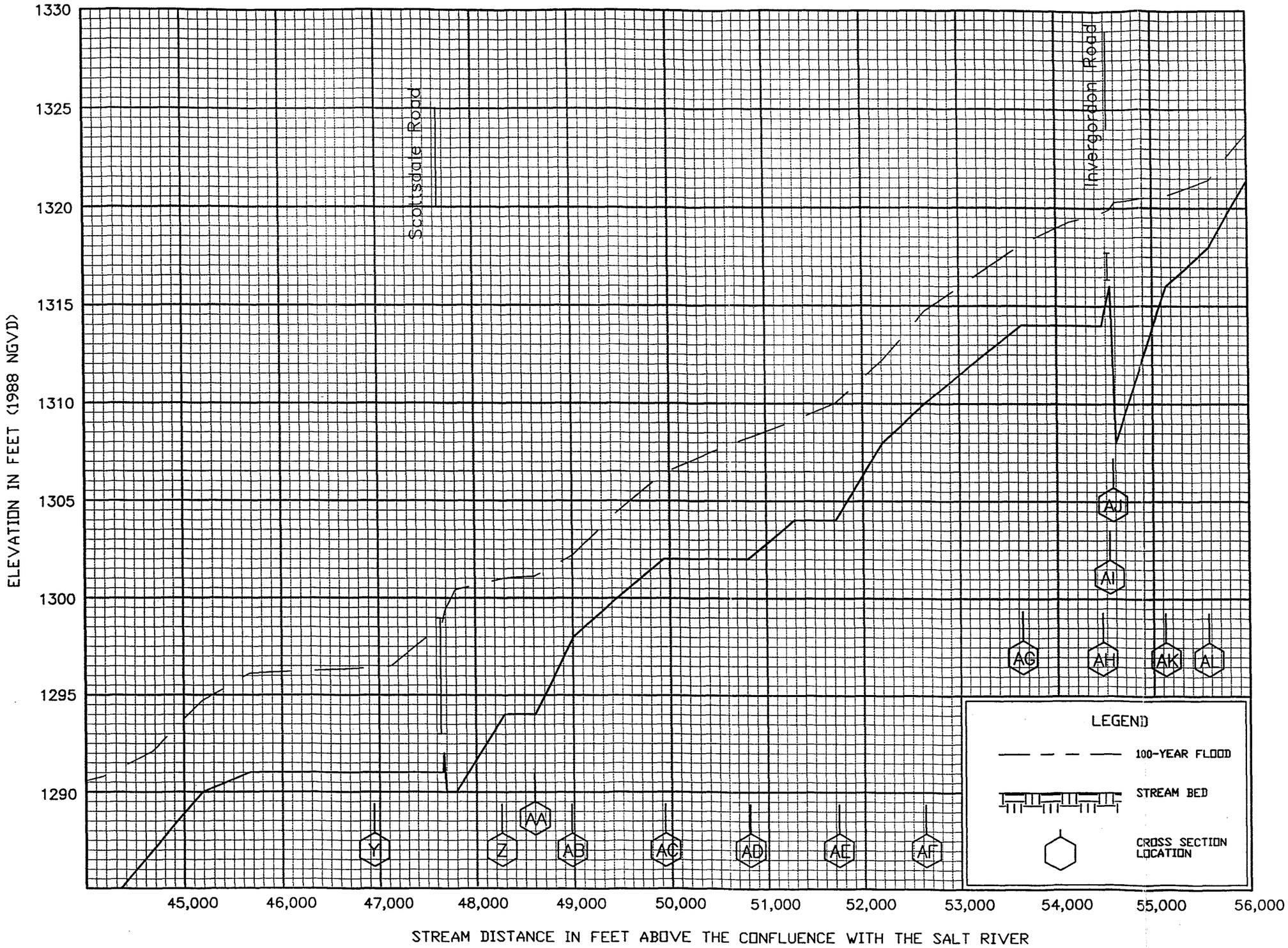
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 5



FLOOD PROFILES

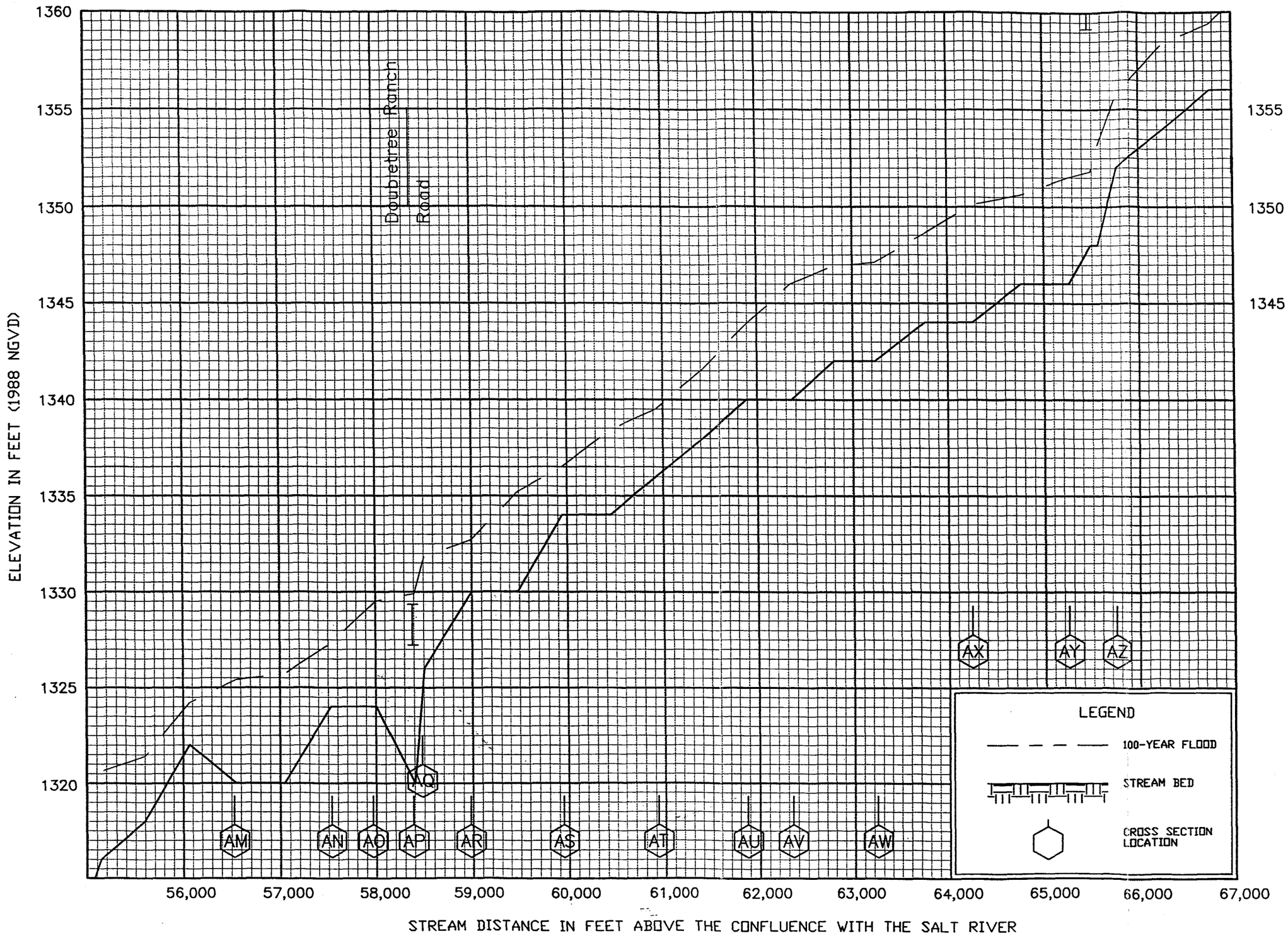
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 6



FLOOD PROFILES

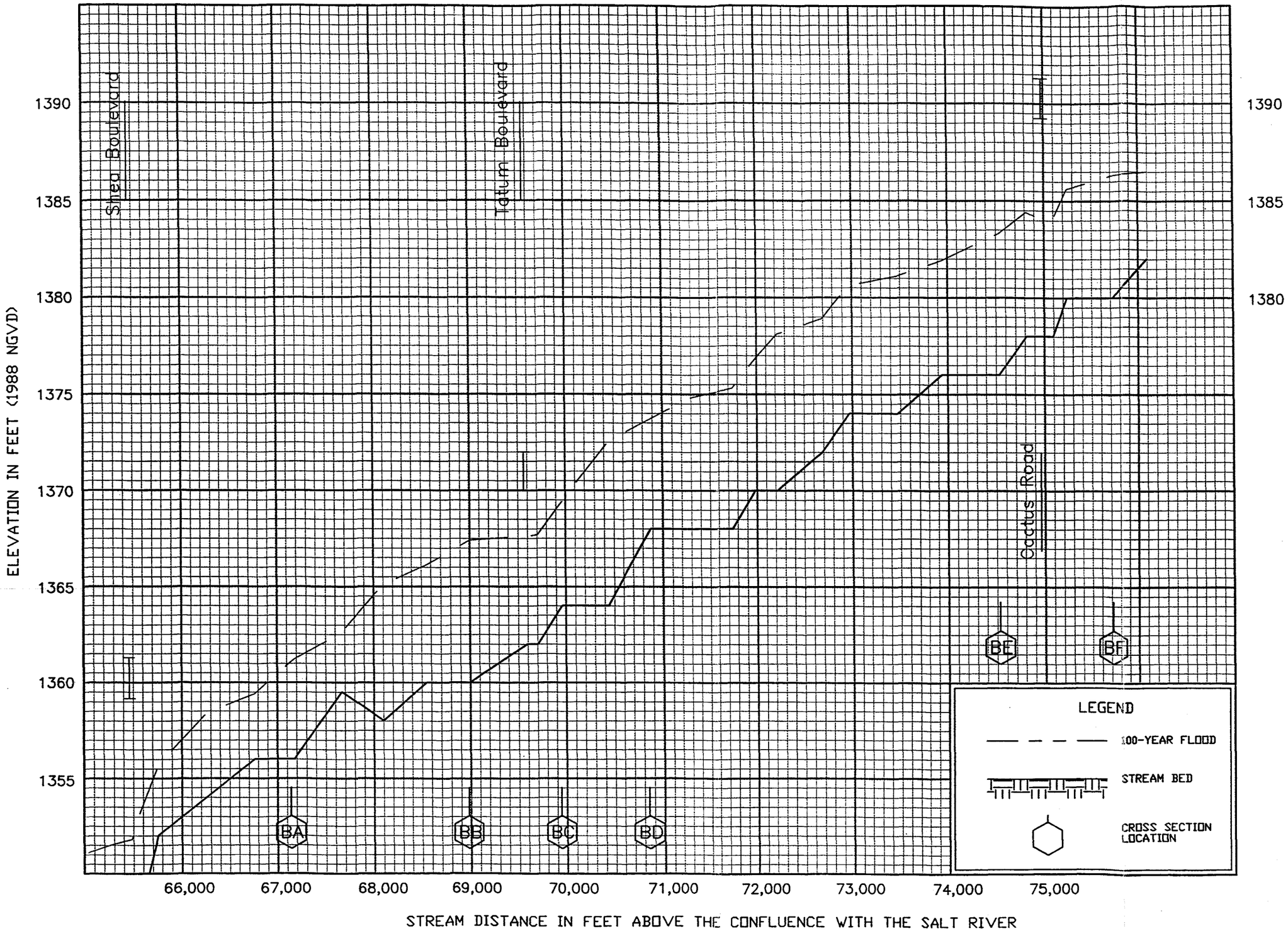
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 7



FLOOD PROFILES

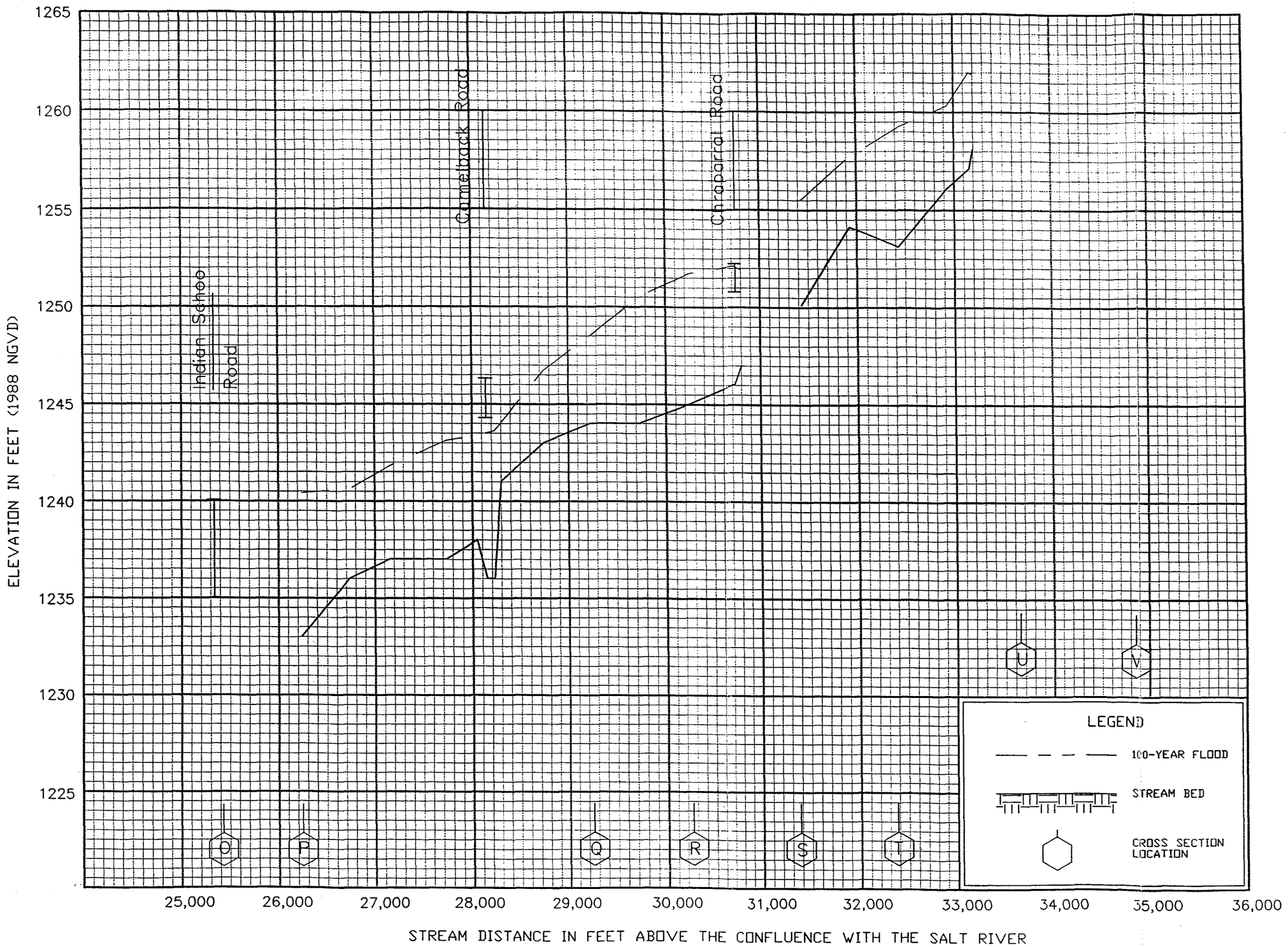
INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

SHEET 8



FLOOD PROFILES

INDIAN BEND WASH - LOW FLOW CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

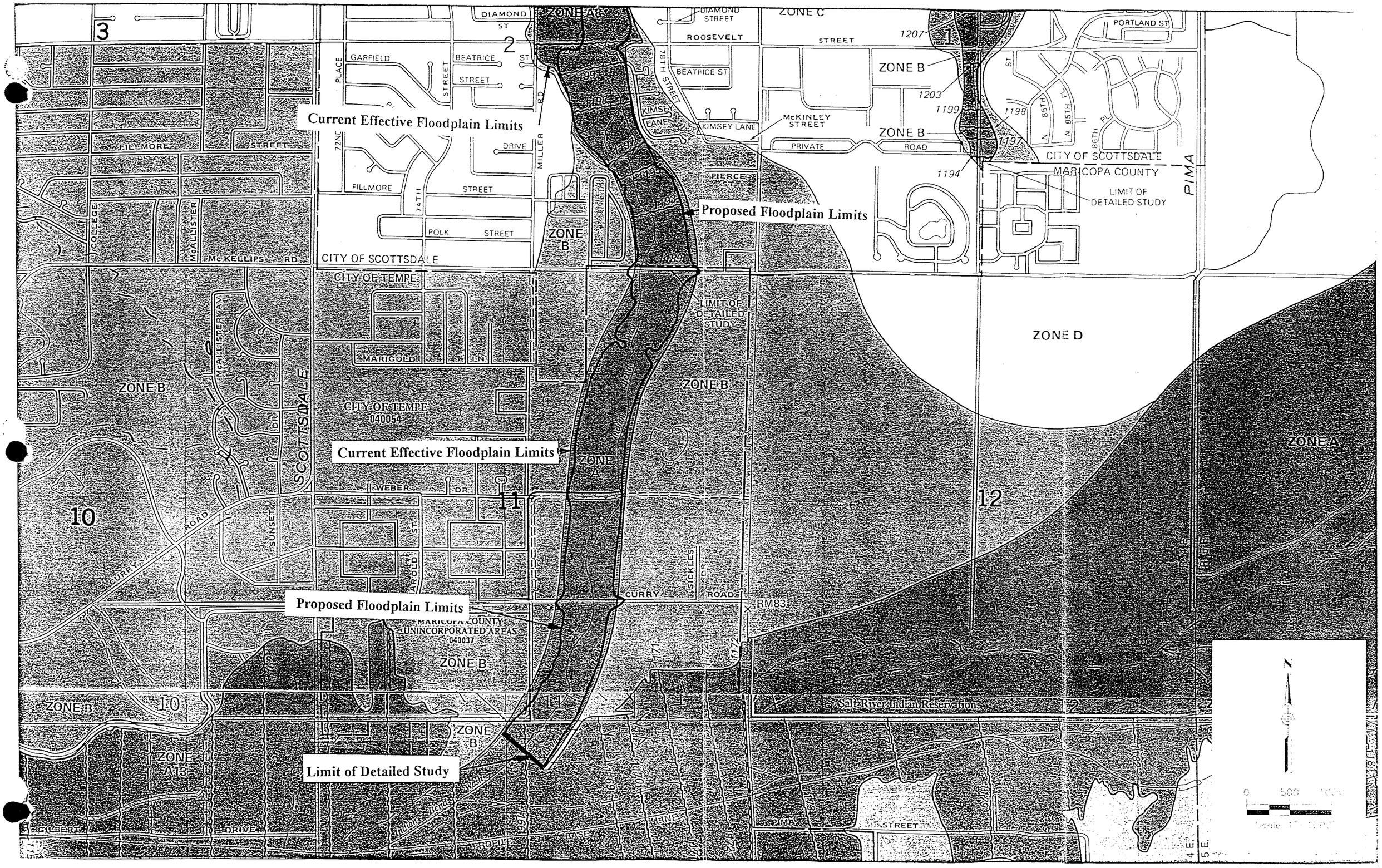
(FLOOD CONTROL DISTRICT)

SHEET 9

INDIAN BEND WASH
FLOODPLAIN/FLOODWAY

FCD 93-05

EXHIBIT 2: PROPOSED FLOODPLAIN MAP


Current Effective Floodplain Limits
Proposed Floodplain Limits
Current Effective Floodplain Limits
Proposed Floodplain Limits
Limit of Detailed Study
LIMIT OF DETAILED STUDY
LIMIT OF DETAILED STUDY
ZONE A8
ZONE C
ZONE B
ZONE B
ZONE B
ZONE B
ZONE B
ZONE B
ZONE B
ZONE A
ZONE A
ZONE A13
ZONE D
CITY OF SCOTTSDALE
CITY OF TEMPE
CITY OF TEMPE
040054
MARICOPA COUNTY
UNINCORPORATED AREAS
040037
MARICOPA COUNTY
PIMA
Salt River Indian Reservation
DIAMOND ST
DIAMOND STREET
ROOSEVELT STREET
PORTLAND ST
GARFIELD
BEATRICE ST
BEATRICE STREET
KIMSEY LANE
McKINLEY STREET
PRIVATE ROAD
PIERCE ST
FILLMORE STREET
POLK STREET
McKELLIPS RD
MARIGOLD LN
WEBER DR
CURRY ROAD
RM83
PIMA STREET
GILBERT DRIVE
MILLER RD
74TH STREET
78TH STREET
72ND PLACE
COLLEGE AV
McALLISTER AV
McALLISTER DR
SUNSET ROAD
ARNOLD ST
SICKLES DR
N 85TH PL
N 86TH PL
86TH PL
1207
1203
1199
1198
1197
1194
1193
1192
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1172
1173
1174
1175
1176
1177
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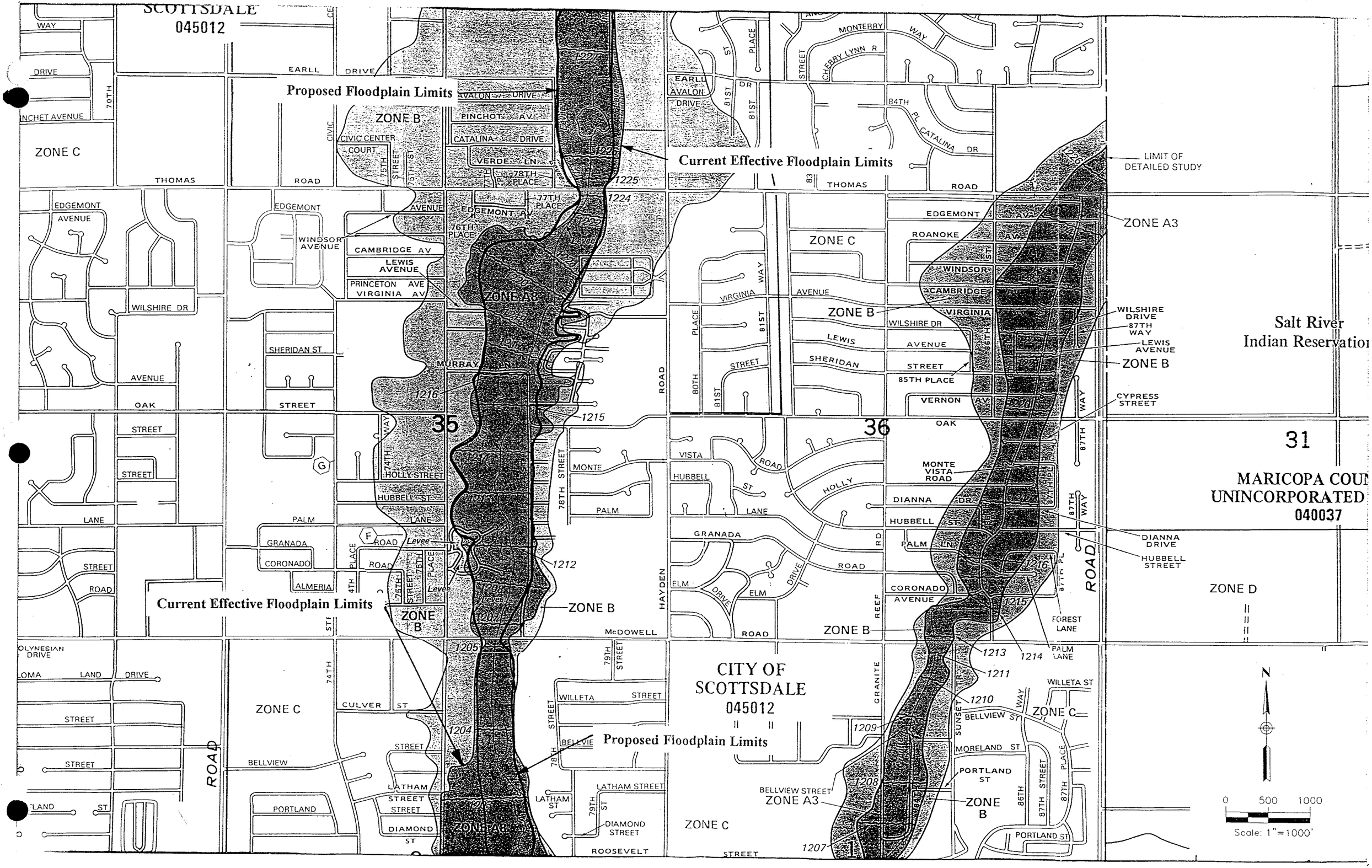


Exhibit 2 Sheet 2 of 7

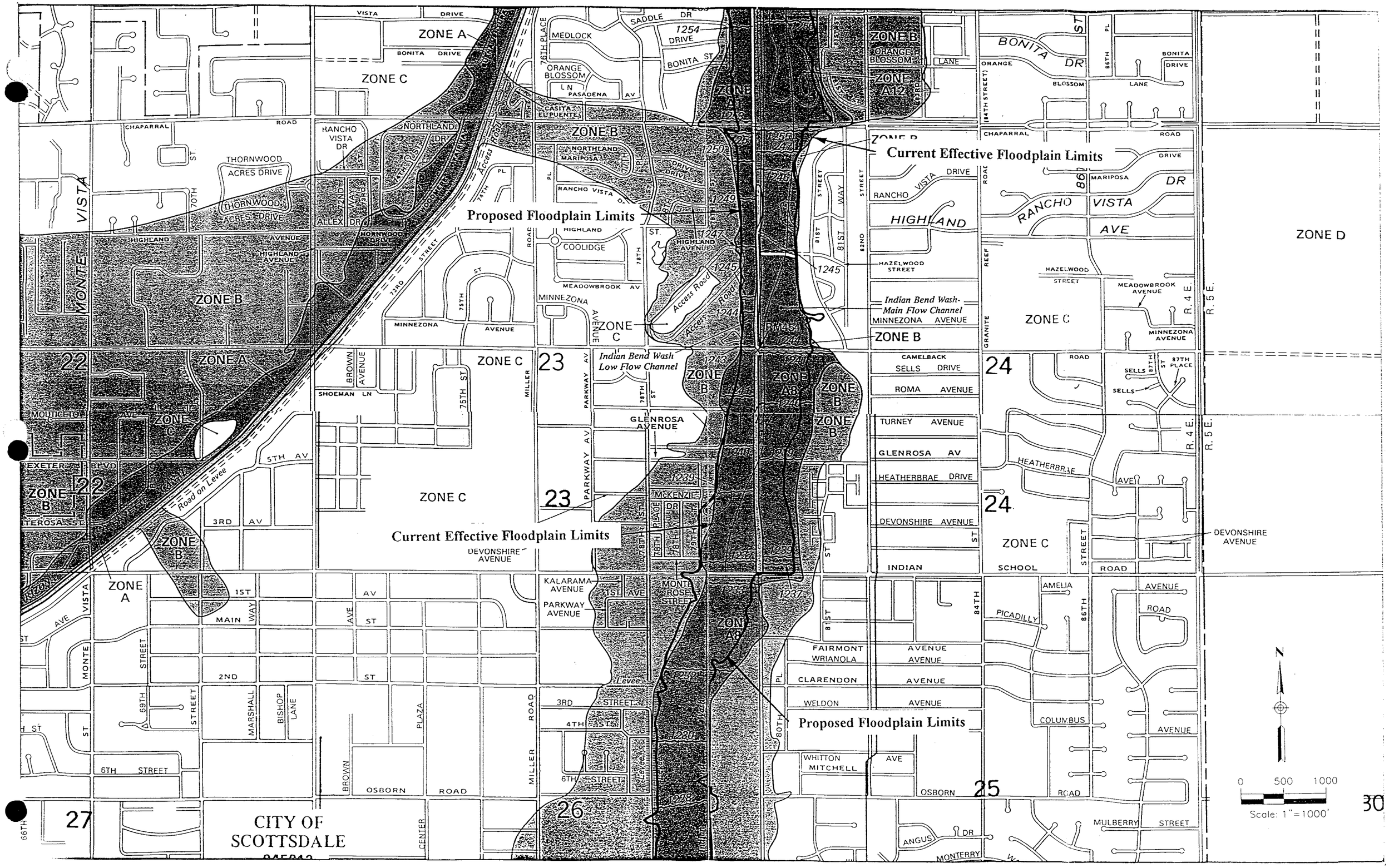


Exhibit 2 Sheet 3 of 7

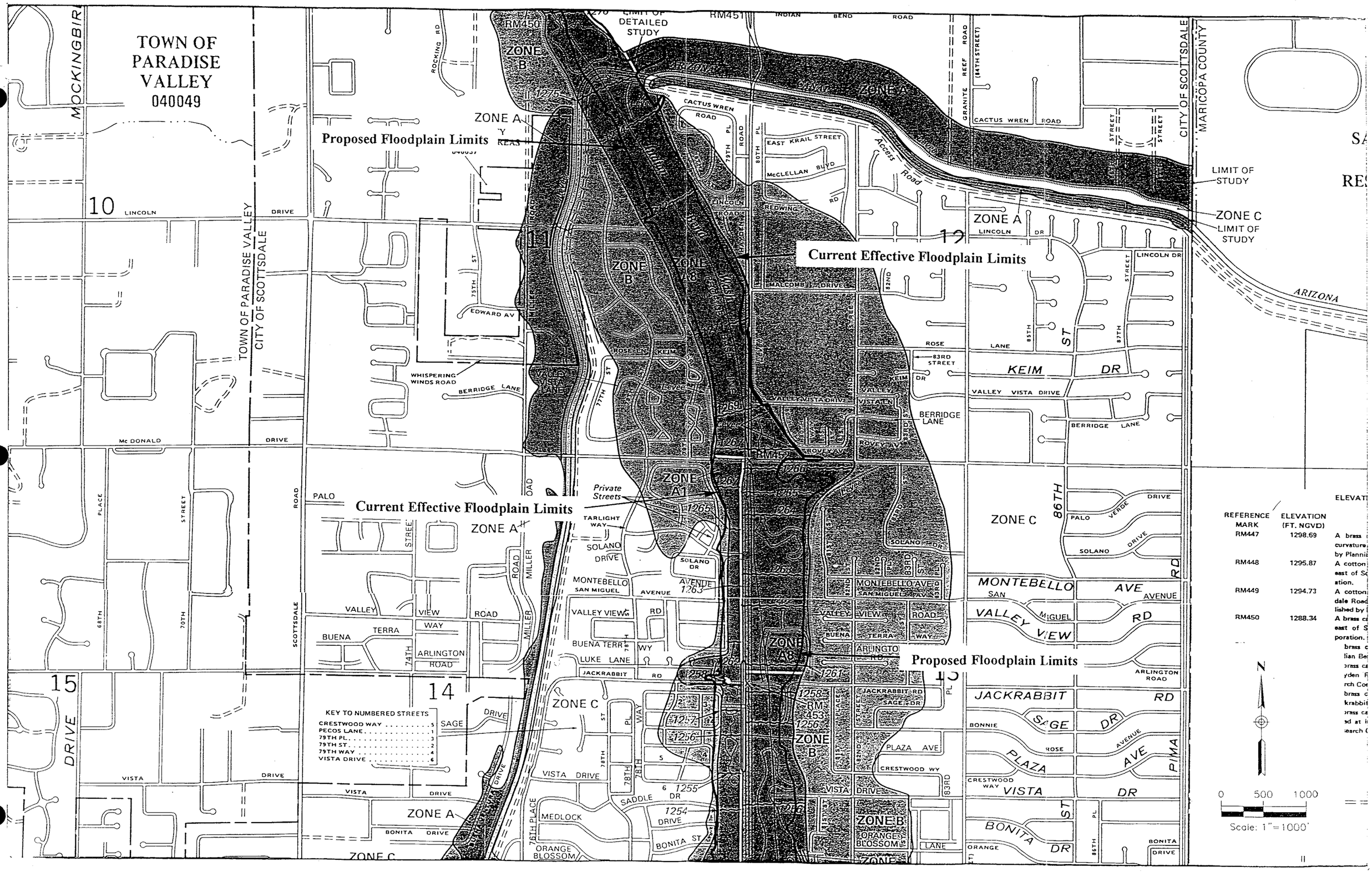


Exhibit 2 Sheet 4 of 7

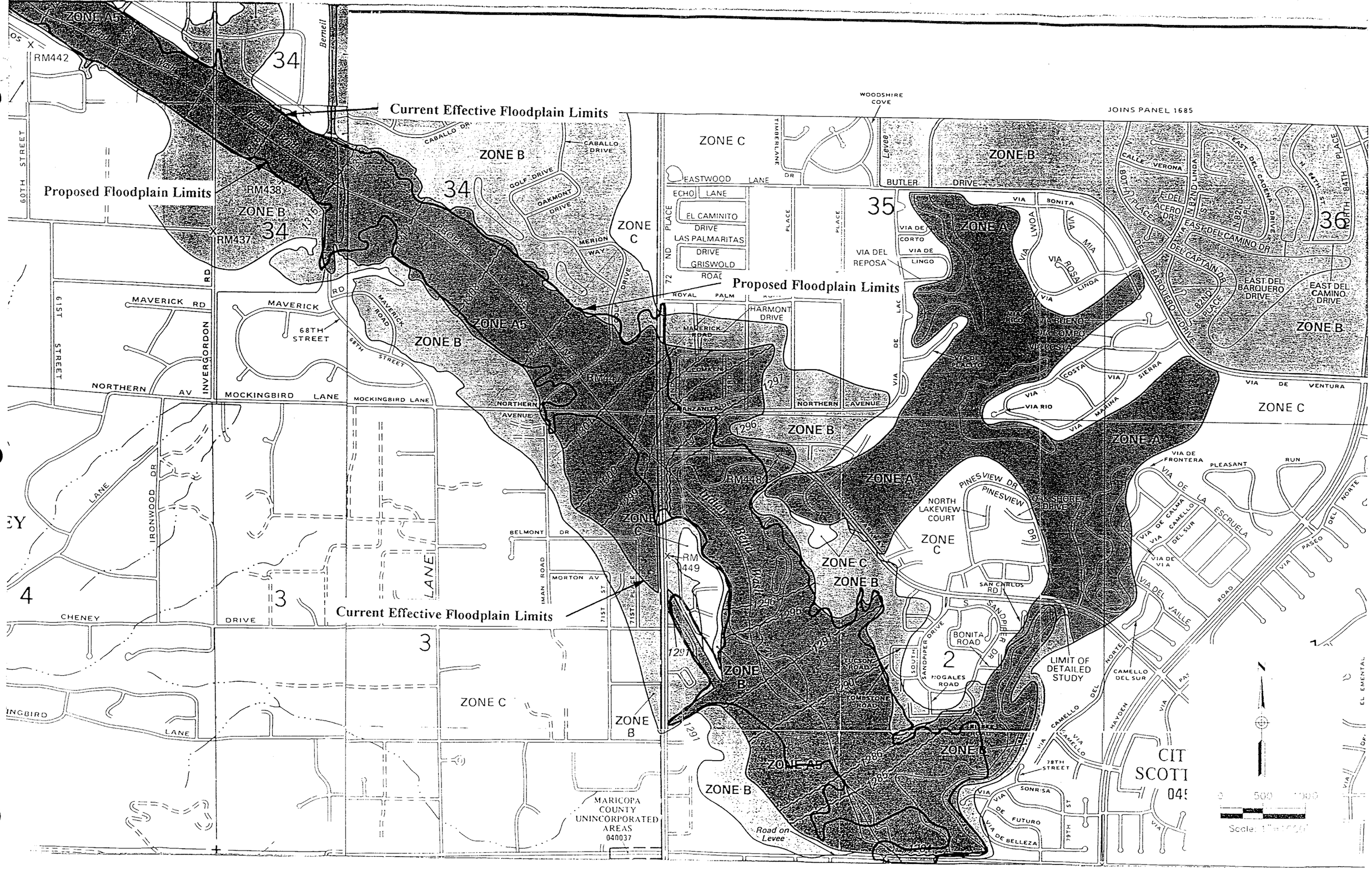
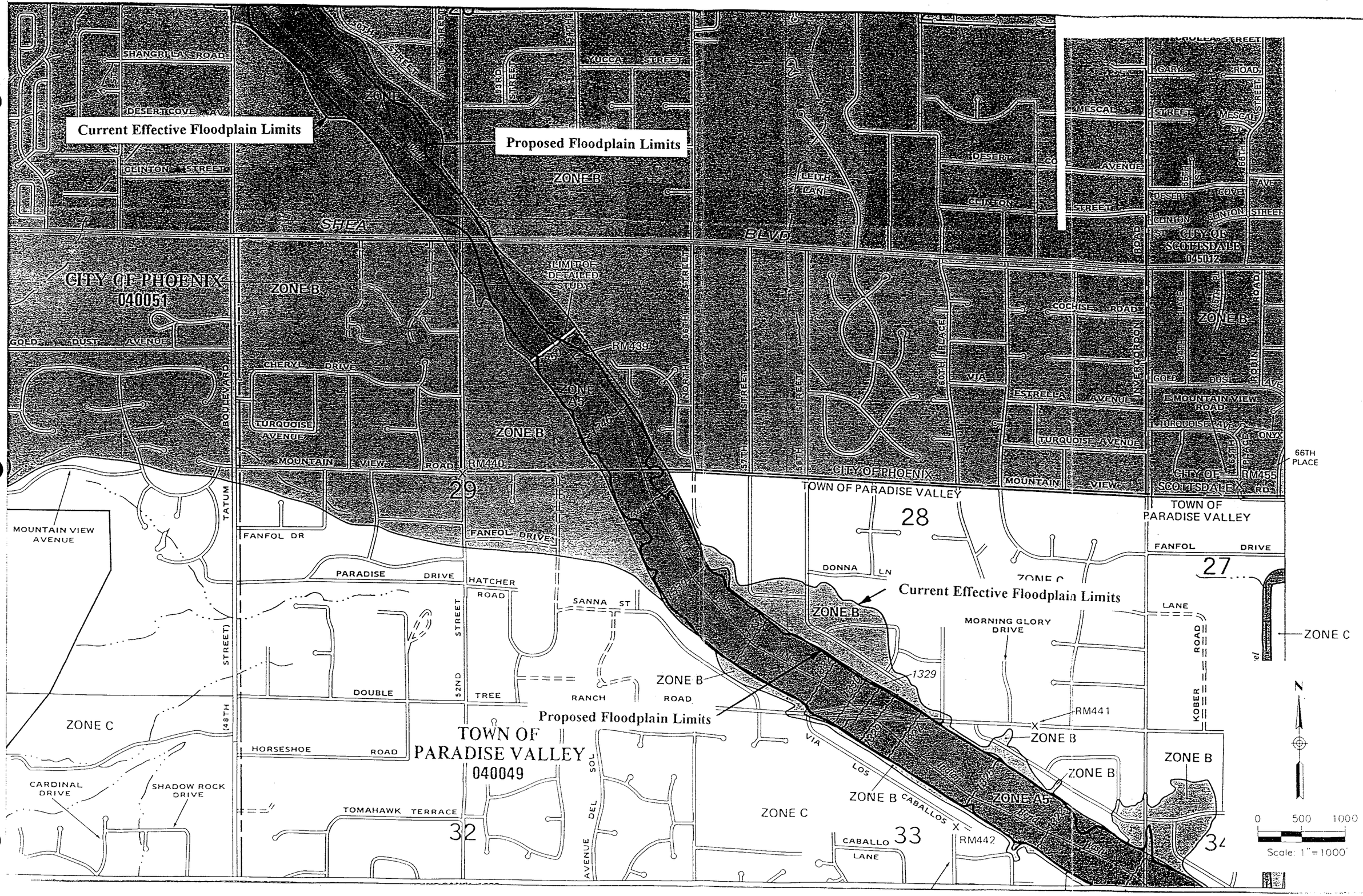


Exhibit 2 Sheet 5 of 7


Current Effective Floodplain Limits
Proposed Floodplain Limits
SHANGRI LA ROAD
DESERT COVE AV
CLINTON STREET
YUCCA STREET
ZONE A
ZONE B
SHEA BLVD
CITY OF PHOENIX
040051
LIMIT OF DETAILED STUDY
RM439
ZONE A6
GOLD DUST AVENUE
CHERYL DRIVE
TURQUOISE AVENUE
MOUNTAIN VIEW ROAD
RM440
29
CITY OF PHOENIX
TOWN OF PARADISE VALLEY
28
MESCAL STREET
DESERT COVE AVENUE
CLINTON STREET
CITY OF SCOTTSDALE
045012
COCHISE ROAD
VIA ESTRELLA
INVERGORDON
E MOUNTAIN VIEW ROAD
TURQUOISE AVENUE
ONYX
66TH PLACE
CITY OF SCOTTSDALE
RM455
TOWN OF PARADISE VALLEY
FANFOL DRIVE
27
MOUNTAIN VIEW AVENUE
TATUM BOULEVARD
FANFOL DR
PARADISE DRIVE
HATCHER ROAD
SANNA ST
DONNA LN
ZONE C
Current Effective Floodplain Limits
ZONE B
MORNING GLORY DRIVE
LANE
KOBER ROAD
1329
ZONE C
ZONE B
DOUBLE TREE RANCH ROAD
52ND STREET
Proposed Floodplain Limits
RM441
ZONE B
ZONE C
48TH STREET
HORSESHOE ROAD
TOWN OF PARADISE VALLEY
040049
VIA LOS CABALLOS
ZONE B
ZONE B
ZONE B
ZONE A5
CARDINAL DRIVE
SHADOW ROCK DRIVE
TOMAHAWK TERRACE
32
DEL SOL AVENUE
ZONE C
CABALLO LANE
33
RM442
34
N
0 500 1000
Scale: 1" = 1000'

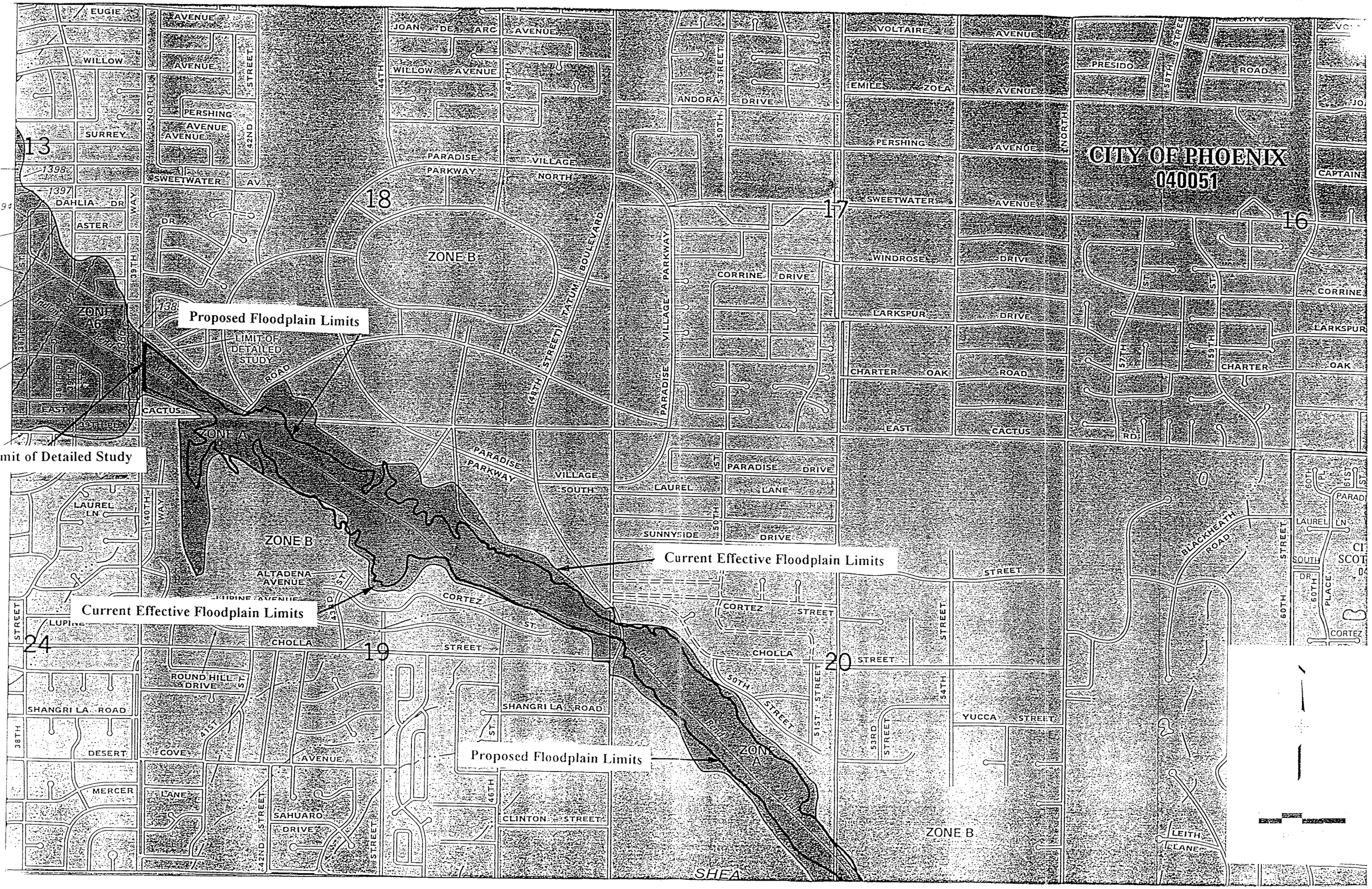


Exhibit 2 Sheet 7 of 7

INDIAN BEND WASH
FLOODPLAIN/FLOODWAY

FCD 93-05

EXHIBIT 3: PROPOSED FLOODWAY MAP

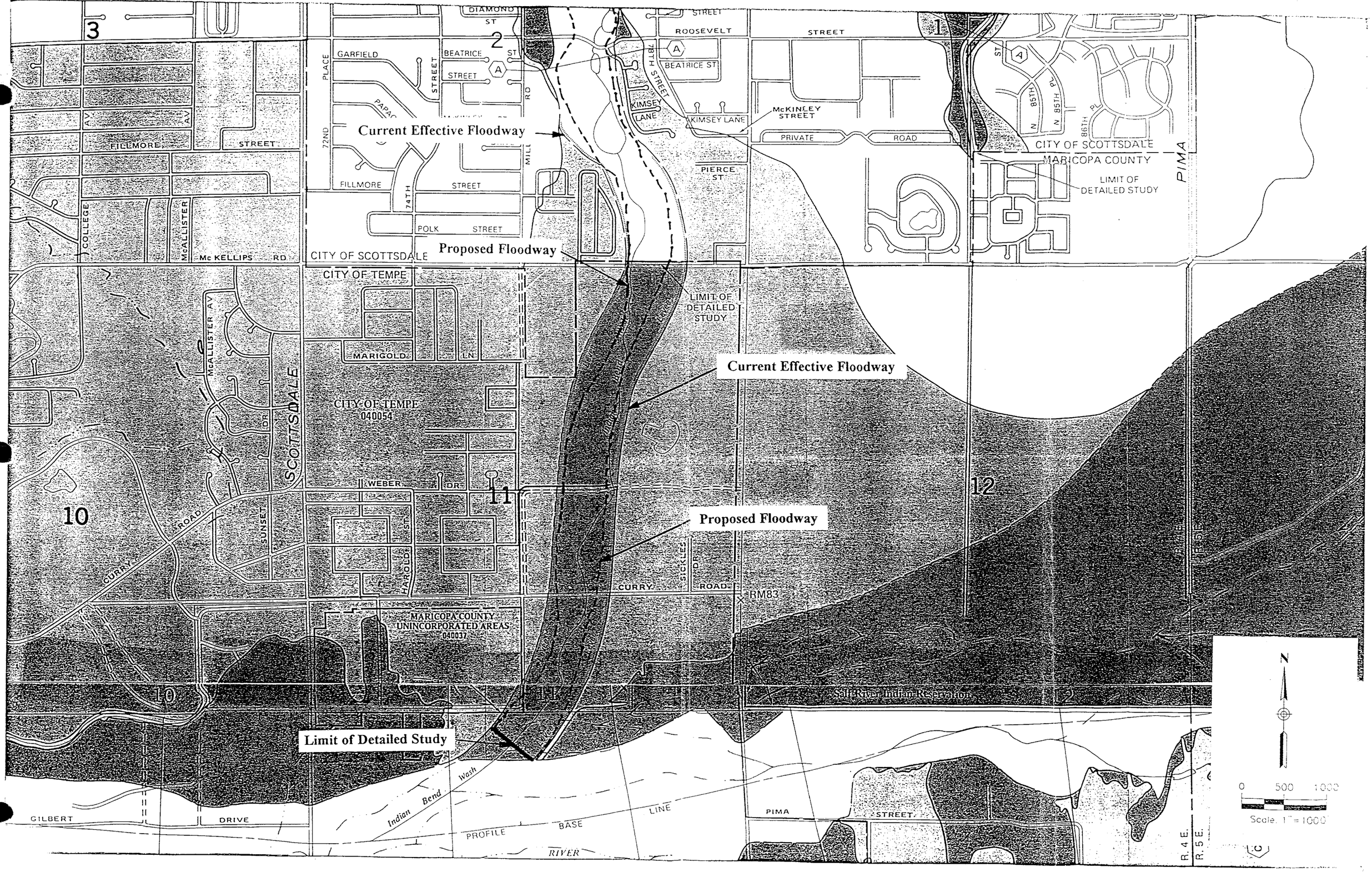


Exhibit 3 Sheet 1 of 7

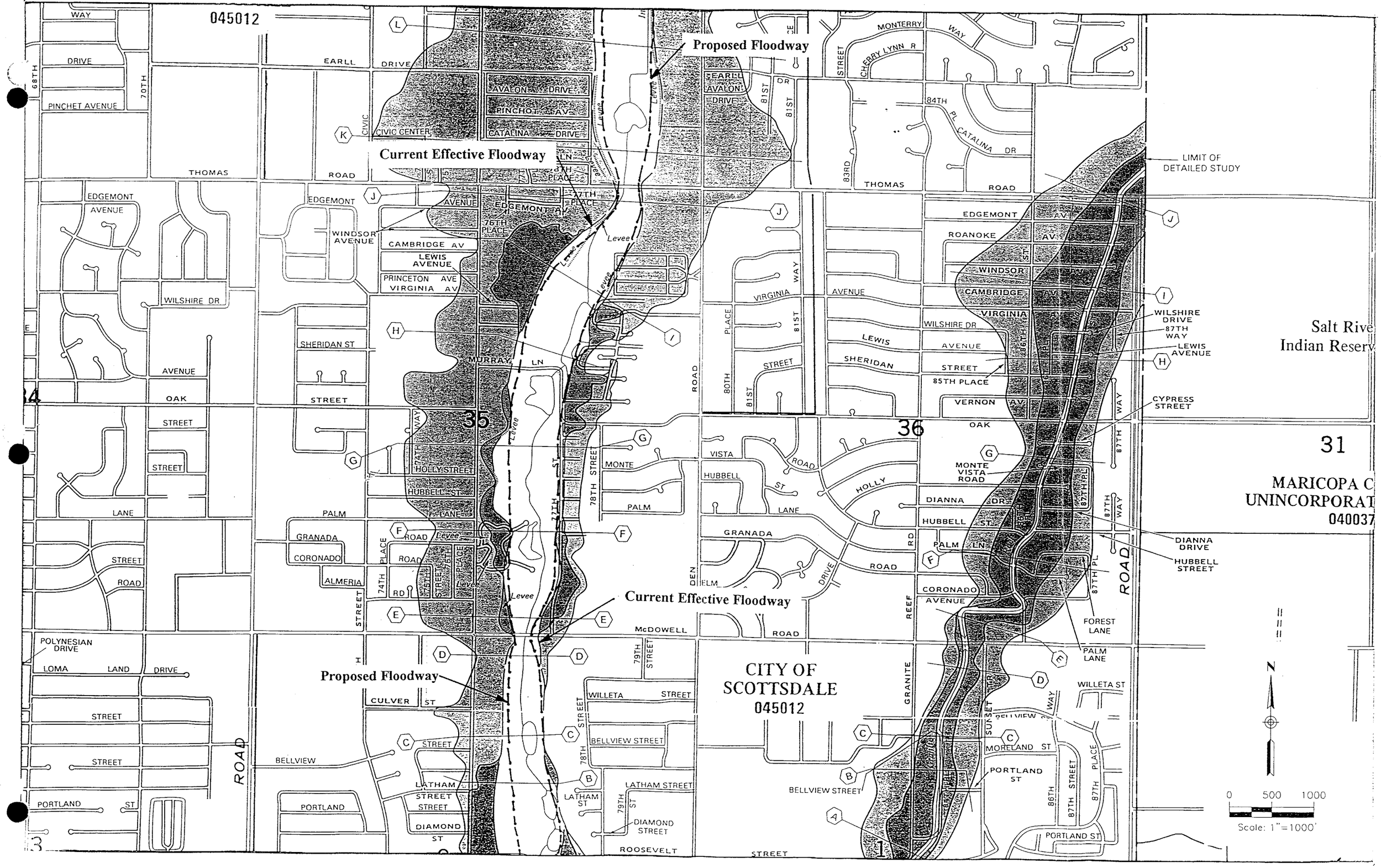


Exhibit 3 Sheet 2 of 7

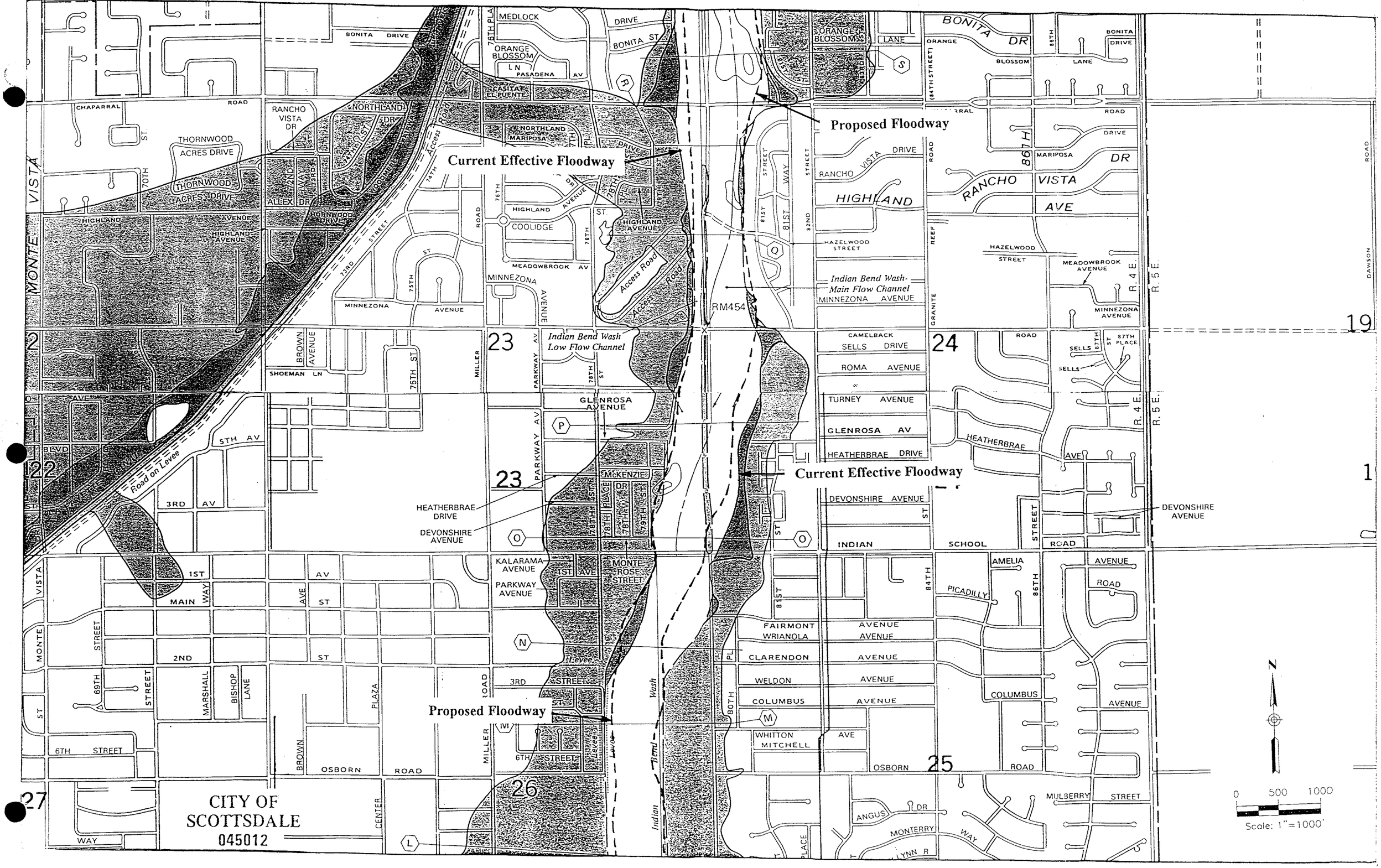


Exhibit 3 Sheet 3 of 7

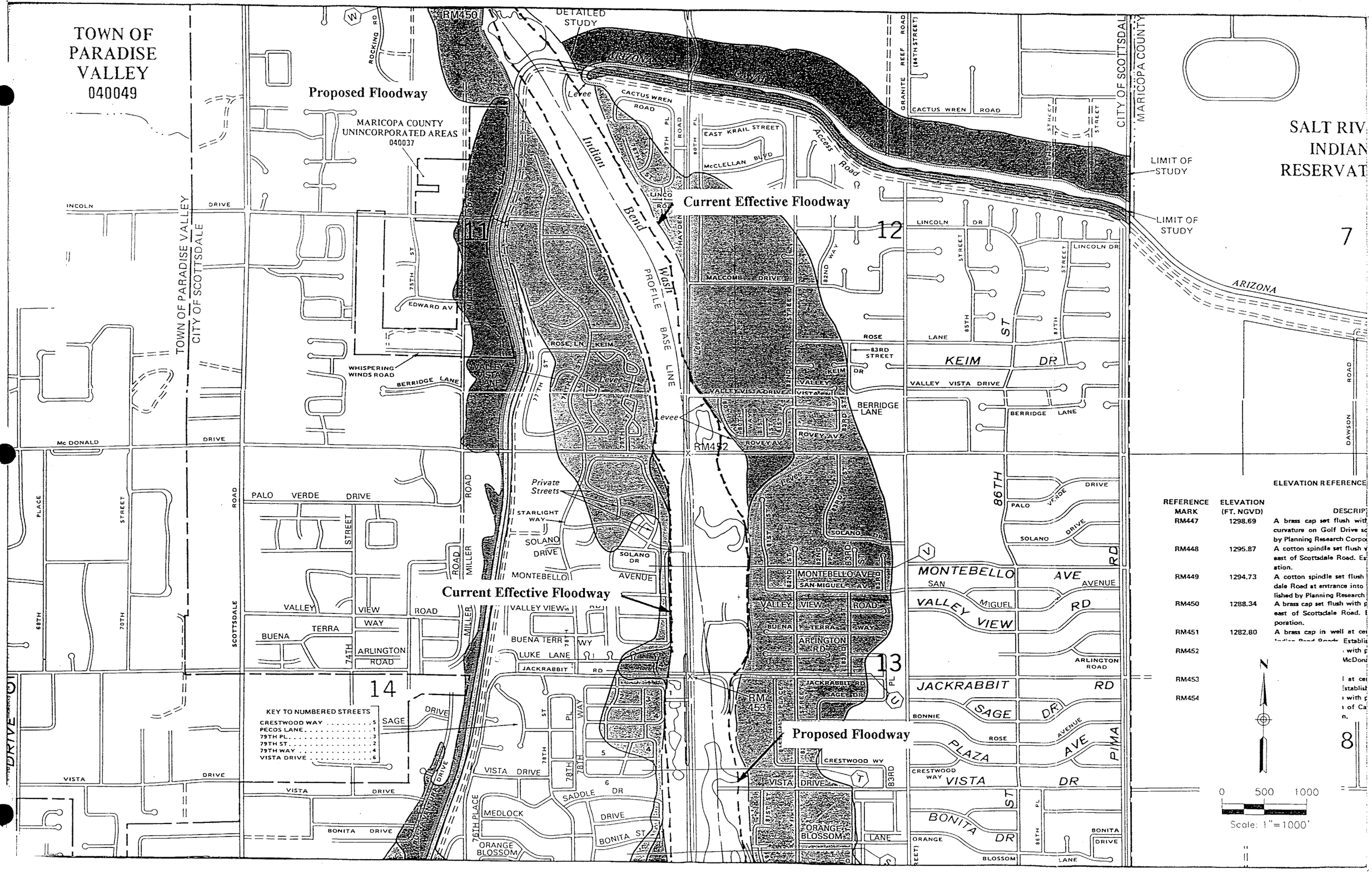


Exhibit 3 Sheet 4 of 7

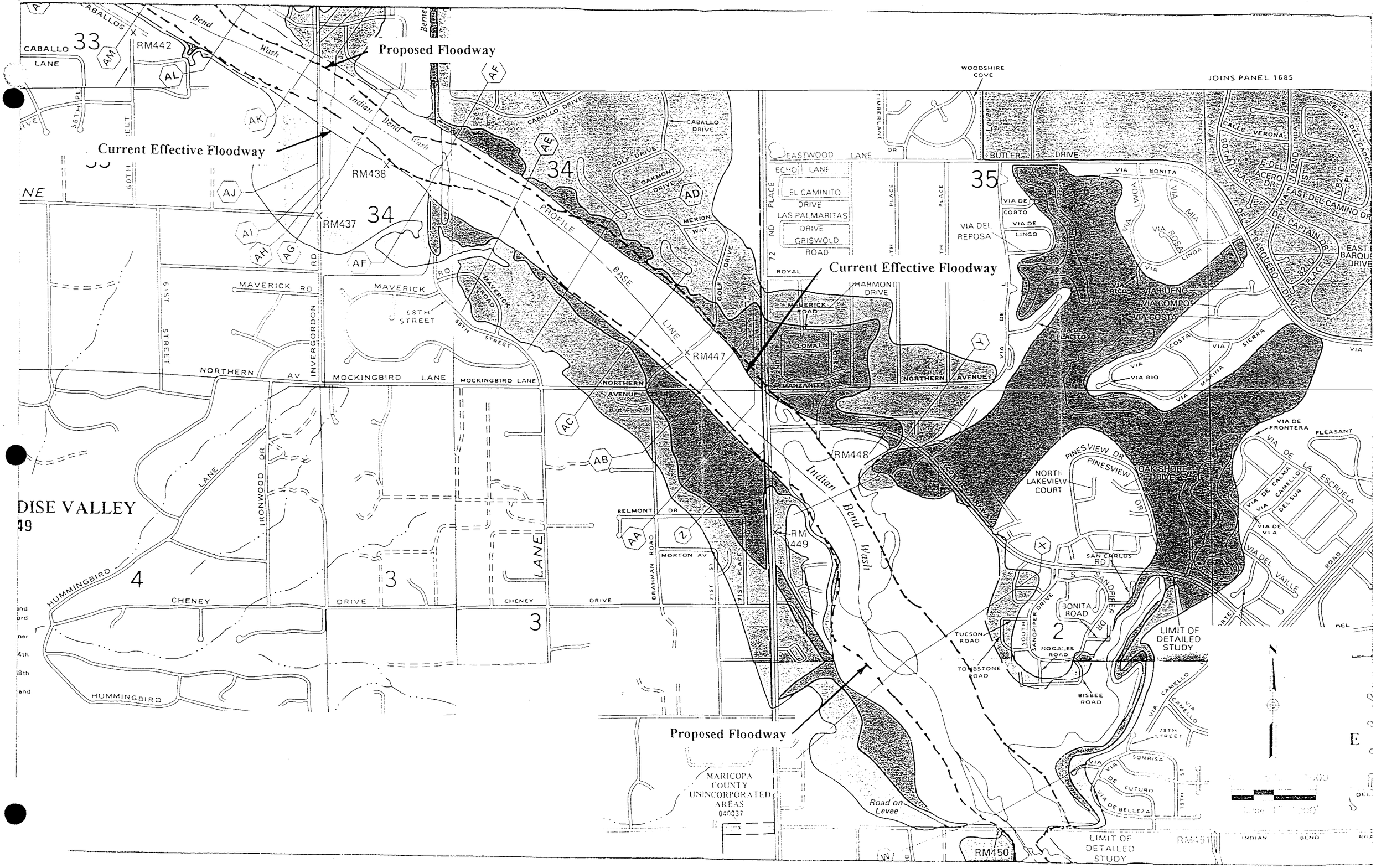


Exhibit 3 Sheet 5 of 7

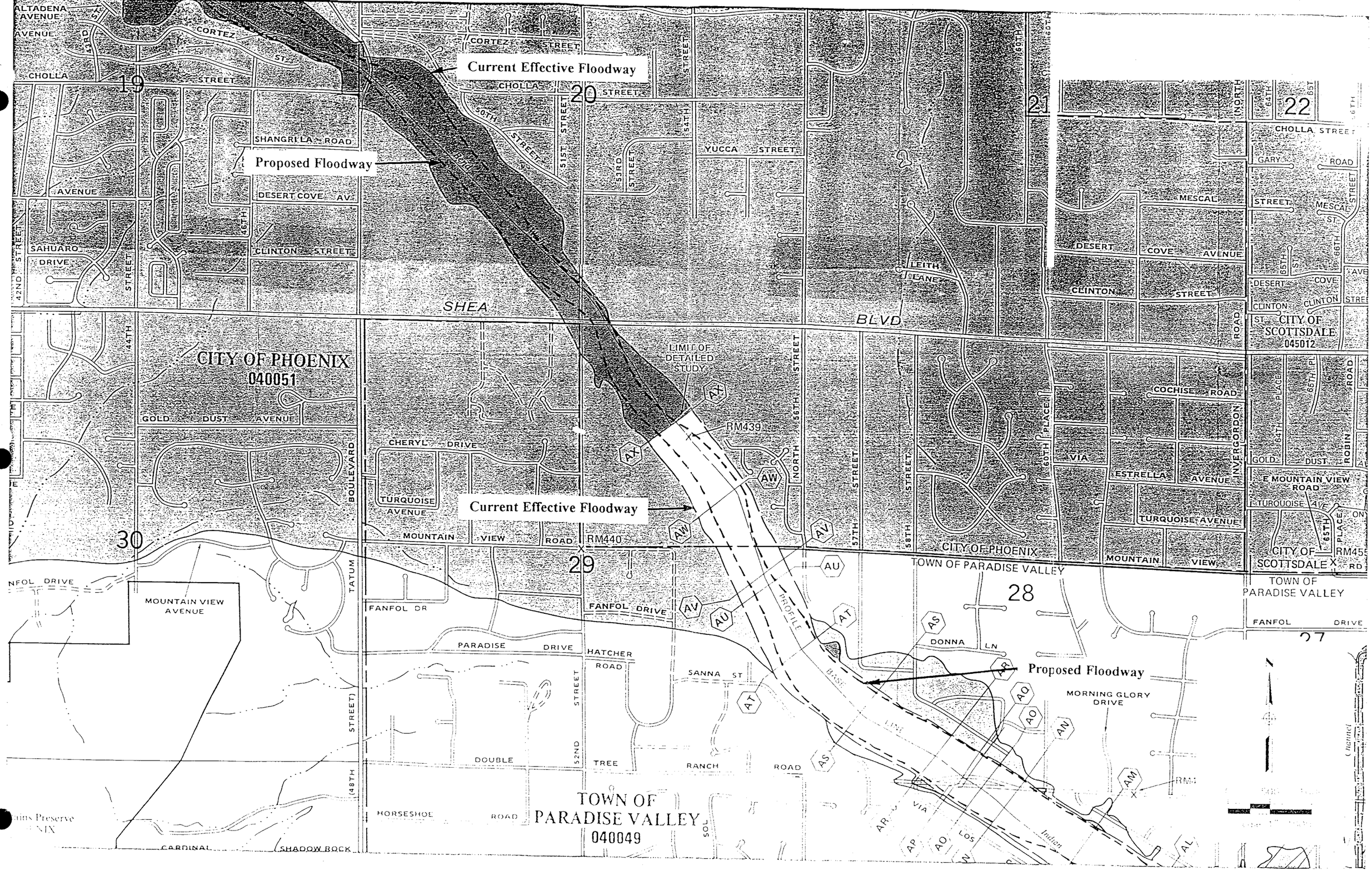


Exhibit 3 Sheet 6 of 7

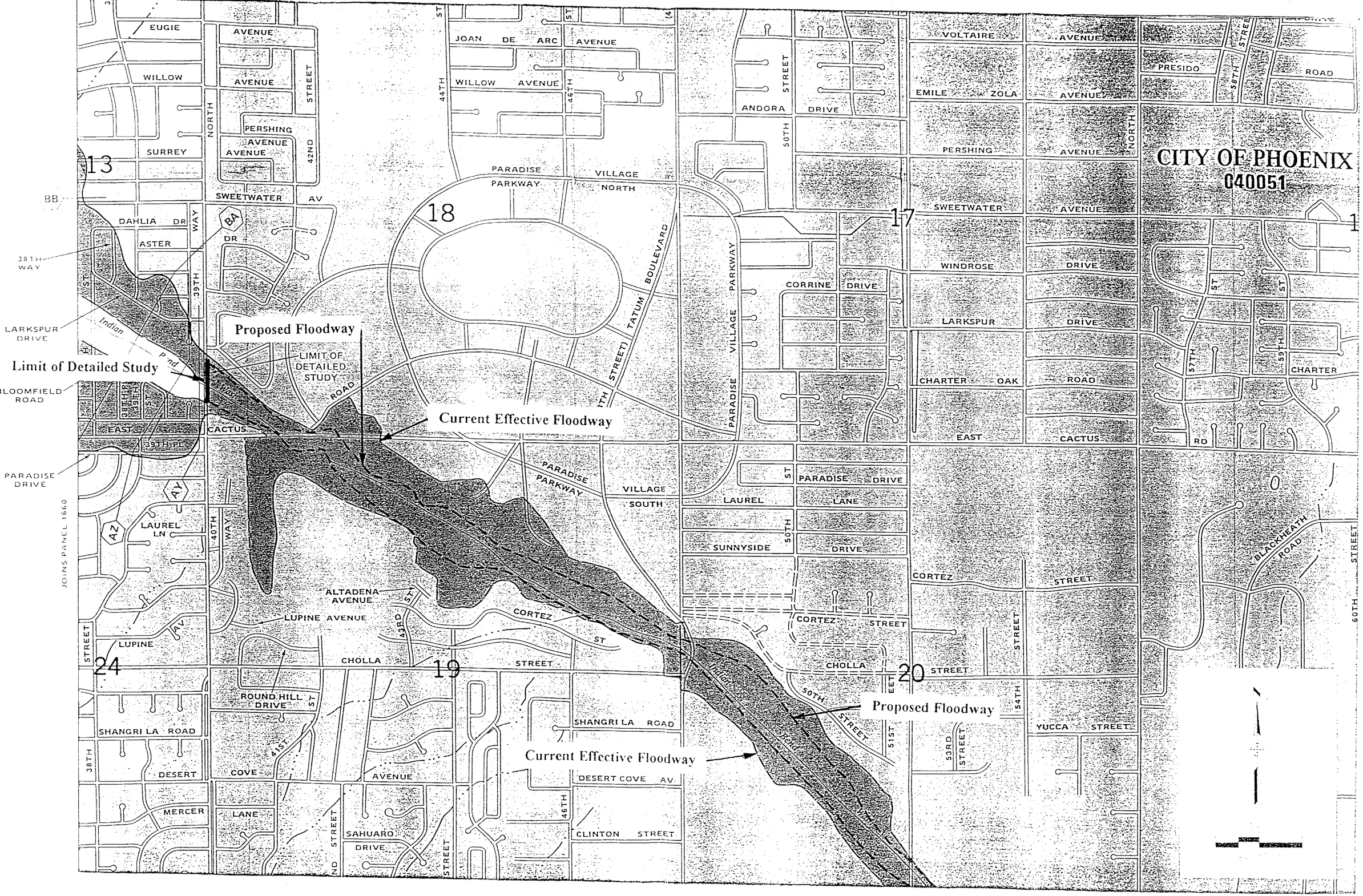


Exhibit 3 Sheet 7 of 7

9.0 APPENDIX (STATE STANDARD I-90)

9.1 Study Documentation Abstract

STUDY DOCUMENTATION ABSTRACT		INITIAL STUDY		RESTUDY		LOMR	X	OTHER	
SECTION 1: GENERAL INFORMATION									
1A	COMMUNITY	City of Phoenix, City of Scottsdale, City of Tempe, and Town of Paradise Valley							
1B	COMMUNITY NUMBER	040051, 045021, 040054, 040049							
1C	COUNTY	Maricopa							
1D	STATE	Arizona							
1E	DATE STUDY ACCEPTED								
1F	STUDY CONTRACTOR CONTRACT(S) ADDRESS PHONE	Simons, Li & Associates, Inc. (SLA) Dennis Richards, P.E. 4600 South Mill Avenue, Suite 200 Tempe, AZ 85282 (602)491-1393							
1G	TECH REVIEWER (FEMA) PHONE								
1H	FEMA REGIONAL REVIEWER PHONE								
1I	STATE REVIEWER PHONE	Arizona Department of Water Resources (602) 417-2400							
1J	LOCAL REVIEWER PHONE	Flood Control District of Maricopa County Afshin Ahouraiyan (602) 506-1501							
1K	RIVER OR STREAM NAME	Indian Bend Wash							
1L	REACH DESCRIPTION	40th Street to confluence with the Salt River							
1K	STUDY TYPE	LOMR							
SECTION 2: MAPPING INFORMATION									
2A	USGS QUAD SHEET(S)	Sunnyslope, Arizona 7.5 Minute Paradise Valley, Arizona 7.5 Minute Tempe, Arizona 7.5 Minute							
2B	MAPPING FOR HYDROLOGIC STUDY TYPE/SOURCE SCALE DATE	USGS QUAD 7.5 Minute 1982							
2C	MAPPING FOR HYDRAULIC STUDY TYPE/SOURCE SCALE DATE	Michael Baker Jr. Inc., Quater Section Maps, NGVD 88 1' = 100' 1' CI and 2' CI November 1993							

STUDY DOCUMENTATION ABSTRACT		
SECTION 3: HYDROLOGY		
3A	MODEL OR METHOD USED (including vendor and version description)	
3B	STORM DURATION	
3C	HYETOGRAPH	
3D	FREQUENCIES DETERMINED	
3E	LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership)	
3F	RAINFALL AND REFERENCE	
3G	UNIQUE CONDITIONS AND PROBLEMS	
3H	COORDINATION OF Q'S (agency, date, comments)	
SECTION 4: HYDRAULICS		
4A	MODEL OR METHOD USED (including vendor and version description)	May, 1991 HEC-2 Simons, Li & Associates, Inc. (SLA) 4600 South Mill Avenue, Suite 200 Tempe, AZ 85282
4B	REGIME	Subcritical
4C	FREQUENCIES FOR WHICH PROFILE WERE COMPUTED	100-Year
4D	METHOD OF FLOODWAY CALCULATION	Method 1
4E	UNIQUE CONDITIONS AND PROBLEMS	SEE ATTACHED REPORT
ADDITIONAL STUDY INFORMATION		
ITEM		DESCRIPTION/DISCUSSION

9.2 Technical Documentation

SECTION 1: General Description and Correspondence

SECTION 1: General Description and Correspondence

1.2 Contact (Telephone) Reports

RECORD OF CONVERSATION

SIMONS, LI & ASSOCIATES, INC.

DATE: 6-17-97
RECORDED BY: B. Bergendahl
TALKED WITH: Afshin A., Hasan M.

PROJECT NAME/NO.: IBW / PA2-WC-16
OWNER/CLIENT: Scottsdale / FCD
OF: FCD

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☐ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED: Spoke with Afshin and Hasan about locating the floodway limits within the channel banks vs. on the channel banks. After some discussion, FCD directed SLA to locate the floodway coincident with the 100-yr. water surface within the banks. This would be accepted by FEMA. If Scottsdale chooses to prevent development from encroaching within the channel, they can do this administratively.

cc: Dennis, Jeang, File

☒ INFORMATION ☒ ACTION

:\rwp60d\forms\roc

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 6/10/97 PROJECT NAME/NO.: IBW MC-16

RECORDED BY: Liang Xu OWNER/CLIENT: MCFCD

TALKED WITH: Afshin Ahouraiyan OF

NATURE OF CONVERSATION:

TELEPHONE: INCOMING [X] OUTGOING [ ]

MEETING: OFFICE [ ] SITE [ ]

ITEMS DISCUSSED: I talked with Afshin from FCD about the flow we will use in HEC-2 model. He suggested the following numbers based on HEC-1 model and consulting with Scottsdale city.

Location	Q (cfs)
32nd street	4,500
40th street	5,000
Cactus Road	7,000
Tatum Blvd	8,500
Shea Blvd — 56th street	10,500
60th street — Invergordon Road	11,500
Bernell channel	14,500
Scottsdale Road — Con. of Ari. Canal	15,000
Con. of Arizonal Canal — Salt River	19,000

Liang.

cc: Dennis [X] INFORMATION [ ] ACTION

ADMIN\FORMS.SLA\RECORD.S-1

AZ-MC-16

RECORD OF CONVERSATION

SIMONS, LI & ASSOCIATES, INC.

DATE: 2/12/97 PROJECT NAME/NO.: MC-16/IBW

RECORDED BY: Mike Tenuk OWNER/CLIENT:

TALKED WITH: AFSHIN OF:

NATURE OF CONVERSATION:

INCOMING ☐ OFFICE ☐

TELEPHONE: MEETING:

OUTGOING ☑ SITE ☐

ITEMS DISCUSSED:

1. Anticipated Date of Hydrology/HEC-1 Review Comments:
   - AFSHIN told me he will try and get SLA the comments on hydrology by the end of February.
   - He also has someone reviewing the HEC-2 X-section locations.

2. FEMA Effective Model Search:
   - He thought that the District did in fact receive something from FEMA indicating that the model we were provided is the only existing model for IBW. He was to try & find it and get us a copy.

3. Cheney Estates: - He recommended we call Terry Miller with ADWR. She would know status of LOMR

SR-51 CLOMR Meeting: AFSHIN Suggested ADOT be included.

cc: Dennis
Bart
FILE

☑ INFORMATION ☐ ACTION

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 9 DEC 96 PROJECT NAME/NO.: IBW (MC-16)

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: AFSHIN OF FCDMC

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☐ OUTGOING ☒

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

1. BRW/BAKER Post Project Work Map for SR-51 HEC-1 Model. Afshin said that neither BRW or Baker have an updated workmap. They apparently used the pre-project workmap and did not update it to reflect the revised modeling. The only sub-basins that were divided further were sub basin 6 & 28.
AFSHINS DIRECTION WAS TO USE THE PRE-PROJECT WORK MAP!!

2. The FEMA literature search for effective IBW models has resulted in matches in zones X – AZ thru Paradise Valley Map only. The District will be acquiring the data for these areas. For areas upstream & downstream of Paradise Valley, Afshin wants us to submit CLOMR as if no effective model exists.

3. He received a call from City of Scottsdale. They are concerned over a number of areas adjacent to the wash that are currently in the floodplain that "should not be". He is going to try & arrange a conference call to discuss these areas.

cc: Dennis
Liang, Kaan

☒ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.5-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 16 OCT 96 PROJECT NAME/NO.: IBW/MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: FCDMC

TALKED WITH: AFSHIN OF FCDMC

NATURE OF CONVERSATION: Hydrology

INCOMING ☐ OFFICE ☑ FCD

TELEPHONE: MEETING:

OUTGOING ☐ SITE ☐

ITEMS DISCUSSED: SUMMARY OF ITEMS DISCUSSED:

1. AFSHIN gave direction not to incorporate HDR HEC-1 Model. He does not think it will affect the mapping.

AFSHIN (& myself) do not believe the TR 20 Model (Baker) is correct between 40TH st. & Shea. This reach includes drainage contribution from at least 1/3 of the entire basin, but the Q's increase only by about 2,410 cfs (from 10,360 to 12,770). This does not seem reasonable. AFSHIN believes that Baker did something to the model to get the discharges lower in order to approximate the FIS discharges. In any event, the HEC-1 model appears to be producing more reasonable results.

3. AFSHIN made a committment to get SLA approval on the COS hydrology by 1 Nov 96.

4. AFSHIN recommended that SLA keep developing model for any areas not recently modeled including the small area north of K-H Doubletree model.

cc: ☐ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.5-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 16 OCT 96 PROJECT NAME/NO.: IBW / MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: FCDMC

TALKED WITH: AFSHIN & Val-Tec OF FCDMC

NATURE OF CONVERSATION: IBW Discharges to Shea Blvd / HEC-1 Model

TELEPHONE: INCOMING ☐ OUTGOING ☐

MEETING: OFFICE ☒ @ FCDMC SITE ☐

ITEMS DISCUSSED:

Val-Tec would like to submit a LOMR for a property to be developed adjacent to IBW. They have performed new survey & developed a HEC-2 model from Cactus to Tatum. They are primarily interested in what discharge(s) to use through this reach to be consistent w/ the IBW Floodplain Delineation study.

I explained that the discharges we are using are from HEC-1 Model completely developed by others (Baker/BRW) downstream to 40TH ST.; or based on a TR-20 model developed by others that was converted to a HEC-1 Model by SLA (40TH ST to Shea). We do not have the backup information to support the BRW Model, specifically a work map. In addition, the converted TR20 → HEC-1 model have significantly different discharges between Cactus & Shea. Ultimately, the discharge SLA uses will need to be approved by the District.

CC: ☐ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 10 OCT 96 PROJECT NAME/NO.: IBW/ MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: Dave Schaub OF BRW

NATURE OF CONVERSATION: Work Maps for Sub-Basin/Delineations for HEC-1.

TELEPHONE: INCOMING ☐ OUTGOING ☒

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

I asked Dave if they had work maps which showed the sub-basin delineations, routings, schematics

Dave said that BRW used a Baker HEC-1 model which incorporated the design features.

~~[illegible]~~

∴ Sometime between the TR 20 model & the BRW Report Baker has developed a HEC-1 model and SLA does not have any backup on it. We only have the BRW HEC-1 which they got from Baker. ~~to me~~ Dave was going to look into it & get back ~~with it~~

Talked to Dave on 18 OCT 96. He is going to get us report, work map etc for Baker Post Project HEC-1 Model

MT

CC: Liang

☒ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 10 OCT 96 PROJECT NAME/NO.: IBW/ MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: Dave Schaub OF BRW

NATURE OF CONVERSATION: Work Maps for Sub-Basin/Delineations for HEC-1.

TELEPHONE: INCOMING ☐ OUTGOING ☒

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

I asked Dave if they had work maps which showed the sub-basin delineations, routings, schematics.

Dave said that BRW used a Baker HEC-1 model which incorporated the design features.

~~BRW SLA does not~~

∴ Sometime between the TR 20 model & the BRW Report Baker has developed a HEC-1 model and SLA does not have any backup on it. We only have the BRW HEC-1 which they got from Baker. ~~to me~~ Dave was going to look into it & get back ~~with it~~

cc: Liang

☒ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 10/8/96 PROJECT NAME/NO.: IBW / MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: AFSHIN OF FCDMC

NATURE OF CONVERSATION: Mapping of Floodplain between Cactus & Tatum

TELEPHONE: INCOMING ☒ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED: AFSHIN spoke to Val-Tec. They are preparing to submit a LOMR for IBW between Cactus & Tatum. They have new topography that has just been surveyed & are planning on using discharges through this reach that will be interpolated from the FIS's for this area.

AFSHIN has set up a meeting at his office on Wednesday Oct 16 @ 9:00 am for SLA to meet w/ him & Val-Tec to ensure what they are doing is consistent w/ what SLA will be doing.

AFSHIN is concerned that the discharges Val-Tec intends on using are not the same as SLA will use through the same reach.

For the CLOMR, SLA has used the BRW Discharges for SR-51 which were developed from Baker's original work on SR-51. SLA has also converted the Baker TR-20 Model to a HEC-1 Model

cc: Dennis ☒ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 10/8/96 PROJECT NAME/NO.: MC-16 / IBW

RECORDED BY: MIKE TERNAK OWNER/CLIENT:

TALKED WITH: FCDMC OF

NATURE OF CONVERSATION: Gaged Data for IBW to present

TELEPHONE: INCOMING ☐ OUTGOING ☒

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

STEVE WATERS: FCD only has 3 gages currently being operated (McKellips, Sweetwater & Indian Bend Road)
The Shea gage does not exist any more.
To obtain this information, FAX a request to Ted Lehmann and/or Steve Waters. Describe exactly what information we want (Peaks, Volumes, etc.).
FAX # 506-8055 ~ Peaks associated w/ all events.

I asked him for a POC w/ USGS for additional data that USGS may have. He referred me to Bert Dute (Dave or Dude?) @ 379-3103 X-239
I called him and:
Bert is going to send us all gaged peak flow records since 1975 (Completion of CAP levees) to the present

CC:

☒ ~~INFORMATION~~ ☐ ACTION

ADMIN\FORMS.SLA\RECORD.5-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 7 OCT 96 PROJECT NAME/NO.: IBW / MC-16

RECORDED BY: Mike Turnak OWNER/CLIENT: MC

TALKED WITH: Denise OF Val-Tec

NATURE OF CONVERSATION: LOMR for IBW Cactus to Tatum.

INCOMING ☒ OFFICE ☐

TELEPHONE: 265-6417 MEETING:

OUTGOING ☐ SITE ☐

ITEMS DISCUSSED: Val-Tec is submitting a LOMR for IBW from Cactus to Tatum. This LOMR is based on new 1' Contour interval mapping they have had surveyed for their client (WestCor). They would like to compare water depth's @ 40TH ST. for Discharges they have used 9,000 cfs @ Cactus, 16,000 cfs @ Scottsdale Road & linearly interpolated in between.

I informed her to coordinate w/ FCDMC (AFSHIN) prior to submitting.

Per Kaar:

IBW @ T-Bird Published WSE = 1401.75
IBW @ T-Bird SLA = 1401.4
IBW @ 40TH ST Published = 1385.7
IBW @ 40TH ST BRW = 1385.09*

* All water is contained w/in new channel u/s of 40TH ST. SLA has not computed any WSE's D/S of 40TH ST.

Recommend they use the FIS stady WSE @ Tatum and let it (HEC-2) iterate the new WSE as it moves U/S

cc:

☐ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 4 OCT 96 PROJECT NAME/NO.: IBW / MC-16

RECORDED BY: Mike Teresak OWNER/CLIENT: MC

TALKED WITH: AFSHIN OF FC District

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☒ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

I. ITEMS DISCUSSED: AFSHIN informed me that the District is going to pay the fee & request that the FEMA Technical Library in Alexandria perform a search to look for the effective IBW models that are missing. I am not optomistic they will find anything more than we already have, which is partial hard copies of multiple & floodway runs.

Without this information we cannot duplicate or tie into the effective FIS which is a standard requirement for a CLOMR submittal & part of a complete submittal package. This potentially impacts all 3 CLOMRs for 1) SR-51, 2) Scottsdale Road Bridge & 3) IBW Delineation.

II. There are also some potential problems we have identified in the BRW HEC-2 model for IBW channelization for SR-51

III. I would like to meet with you to discuss how we could best handle these issues in order to finalize & mail the SR-51 CLOMR

cc: Dennis ☐ INFORMATION ☑ ACTION III.

ADMIN\FORMS.SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 1 OCT 96 PROJECT NAME/NO.: MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: FEMA Project Library OF

NATURE OF CONVERSATION: Effective Model for FIS @ SR-51.

INCOMING ☐ OFFICE ☐

TELEPHONE: (703) 960-9125 MEETING:

OUTGOING ☑ SITE ☐

ITEMS DISCUSSED: I requested a copy of the current effective model(s) for the subject FIS.

The procedure is as follows:

1. Put Request in writing
2. Include a check for $90.00 as the initial fee for 2 Hours worth of research. Additional time costs more, however, 2 hours should cover it. Additional time fee is $33.00/hour.
3. It takes 8 days.
4. Make Check Payable to the "National Flood Insurance Progr.
5. Mail Request & check to:

FEMA Project Library
c/o Michael Baker, Jr., Inc.
3601 Eisenhower Ave. Ste 600
Alexandria, Virginia 22304

CC:

☒ INFORMATION ☐ ACTION

ADMIN\FORMS\SLA\RECORD.S-1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 19 SEP 96 PROJECT NAME/NO.: MC-16

RECORDED BY: Mike Tennah OWNER/CLIENT: FCD of MC

TALKED WITH: AFSHIN H. OF " "

NATURE OF CONVERSATION: CLOMR for SR-51 & HEC-1 Model

TELEPHONE: INCOMING ☐ OUTGOING ☒

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

1. I let AFSHIN know that the floodplain mapping for the revised FIRM/CLOMR would be ready in the morning. He said he would send a runner over or come pick it up himself. I need to call him in morning when ready.

2. I told him we did not have any current soils or land use mapping. He was going to get us the most current soils/land use, covering the entire watershed, on an auto-cad format.

3. I told him we would be submitting the HEC-1 Model of watershed to Scottsdale Road w/ a "Draft" working copy of the hydrologic base map.

4. I asked about detention basins in the area between Baker's work & COS. He said yes there is some large detention basins & he would like those incorporated into the model before we submit.

cc:

☒ INFORMATION ☐ ACTION

ADMIN/FORMS SLAIRECORD.6.1

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 16 ~~AUG~~ SEP 96 PROJECT NAME/NO.: IBW / MC-16

RECORDED BY: Mike Ternak OWNER/CLIENT: FCD

TALKED WITH: AFSHIN H. OF FCD

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☒ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

1. AFSHIN REQUESTED STATUS OF SR-51 CLOMR MAPPING FOR THEIR BRIEFING. I INFORMED HIM WE WOULD BE COMPLETING OUR ANALYSIS ON WEDNESDAY, 18 SEP 96 & WOULD GET HIM THE RESULTS ON WED OR THURSDAY. THEIR BRIEFING IS ON MONDAY 23 SEP (Dick Persault).

2. I asked status of Scottsdale Hydrology, when we might receive approved model. AFSHIN said he has many comments that need to be addressed and it might be some time.

3. He requested a copy of our comprehensive HEC-1 model upstream of Scottsdale Road. He would like to review it and provide us comments in advance of our submitting the overall hydrology report. Included in this material he would like to review is Base mapping, soil maps, etc.

cc:

☒ INFORMATION ☐ ACTION

ADMIN\FORMS SLA\RECORD.S-1

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

Communication Contact Report

DATE: 8-14-96

PROJECT: INDIAN BEND WASH PROJECT NO.: AZ-MC-16

RECORDED BY: DENNIS RICHARDS BY PHONE: ✓ IN PERSON: ___

TALKED WITH: AFSHIN AHOURAIYAN TELEPHONE NO.: 506-1501

SUBJECT: MEETING ON MONDAY AUGUST 19 AT FLOOD CONTROL DISTRICT TO DISCUSS HYDROLOGY. FCD WILL BRIEF US ON SCOTTSDALE HYDROLOGY AND WOULD LIKE TO FIND OUT SLA'S PROGRESS ON UPSTREAM HYDROLOGY. MEETING IS AT 9 AM.

ACTION REQUIRED:

ACTION TAKEN:

ORIGINAL TO: ~~MIKE~~ FILE CC: MIKE

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: MARCH 3, 1995 PROJECT NAME/NO.: PAZ-MC-16

RECORDED BY: DENNIS RICHARDS OWNER/CLIENT: FCD

TALKED WITH: BARBARA HOKANSOW JOHN HALL REAL ESTATE

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☒ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED: BARBARA HOKANSOW (948-0550) CALLED REGARDING THE INDIAN BEND WASH STUDY. SHE STATED THAT EVANS, KUHN & ASSOCIATES HAD PREPARED ELEVATION CERTIFICATES IN 1992 FOR PARK VIEW VILLAS AT 111 N. MILLER ROAD. THE PERSON TO CONTACT IS NIKKI POUSSAN (921-7500) OF CAPITAL CONSULTANTS MANAGEMENT. THEY WANT TO KNOW IF CERTIFICATES CAN BE INCLUDED IN THE IBW RE-STUDY.

BARBARA WAS REFERRED TO SLA BY PEDRO CALZA. SHE STATED MR. ERICKSON, CITY OF SCOTTSDALE, HAD NOT RESPONDED TO THE HOMEOWNERS REQUEST.

96 Units for + South of McDowell North of Roosevelt St. East side of Miller
3/8/95 per Nikki Poussan

cc: BOB
FILE

☐ INFORMATION ☒ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

HC-MC-16
Indian Bend Wash

Simons, Li & Associates, Inc

RECORD OF CONVERSATION

Date: 12-23-94 Project No. PAZ MC 16

Recorded By: TIM MORRISON Client: FCD OF MC

Talked With: GARRY EATON Of MICHAEL BAKER JR.

Telephone: Incoming XX Outgoing __ Meeting: Office __ Site __

Items Discussed :

Subsequent to the initial HEC-2 runs for the Indian Bend Wash from the Salt River upstream to the Thomas Road bridge the estimated water surface elevations at McKellips Road were not within a reasonable range. This was evident in that: (1) the estimated water surface elevations were well above those in the effective flood insurance study adjusted from NGVD 1929 to NAVD 1988; and (2) the water surface upstream of Mckellips Road was at the top of the levee.

Investigation of the topo revealed that the area between map 10-46 and 11-46 (McKellips Road) was not a perfect fit. Subsequent to discussions with the City of Scottsdale, Michael Baker Jr., Inc. was contacted regarding the mapping.

Garry Eaton stated that the tie between 10-46 (2' contour mapping) and 11-46 (1' contour mapping) was not properly performed although he felt both maps satisfy the mapping standards for their respective scale.

Garry Eaton said he would send an updated map 10-46 for our use and to the client within the next few days.

Information XX Action __

FYI

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: DEC. 15 1994 PROJECT NAME/NO.: AZ-MC-16

RECORDED BY: BOB EICHINGER OWNER/CLIENT: FLOOD CONTROL

TALKED WITH: JIM PHIPPS OF FLOOD CONTROL

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☒ OUTGOING ☐

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED: JIM WOULD LIKE SLA TO ATTEND AND PROVIDE SUPPORT FOR A PRESENTATION ON IBW STUDY TO CITY SCOTTSDALE "NEIGHBORHOOD ENHANCEMENT COMMISSION". THE PRESENTATION IS SCHEDULED FOR 5:00 PM WED JAN 4. 2nd FLOOR CIVIC CENTER CONF ROOM.

JIM WOULD LIKE SLA TO ASSIST IN PROVIDING/MAKING A BOARD SHOWING WATERSHED AND IBW.

cc: DENNIS
FILE

☐ INFORMATION ☒ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

SECTION 1: General Description and Correspondence

1.3 Meeting Minutes or Reports

AZ-MC-16 MEETING 6-09-97

HIS DELIVERABLE BY SLA - CHANGES BY ~~SLA~~ FCD

SUBMIT FORMS AS LOMR - CHECKING WITH SCOTTSDALE AND CITY OF SCOTTSDALE

SQUAW PEAK — 40TH TO ACOMA — CLOMR

1. CHECK ON CULVERT INFORMATION FROM RAY ACUNA

OUTLINE TASKS FOR 2 PROJECTS

1.) IBW
2.) CLOMR

CULVERT AT SWEETWATER IS 6" HIGHER THAN SHOWN ACCORDING TO RAY ACUÑA

ATTENDEES: D.L. RICHARDS
LIANG XU
AFSHIN AHOURAIYAN
HASAN MUSHTAQ

IBW Floodplain Delineation
Coordination Meeting 19AUG96

AFSHIN, Dennis Richards, Mike Ternak

1. From Storm Drain Master Plan for COS
Basin 24:

- Basin 210 does not consider detention & other improvements. This needs to be field verified and incorporated into the model.

- There is no hydrology west of Basin 210 to approximately 56TH St.

2. From Baker Rpt, No Hydrology east of study is approved except for Double Tree Ranch.

3. Double Tree Ranch Study "Kaminski Hubbard" - Nov 95 is <u>approved</u> by the District.

4. Scottsdale is not using the County DDM, but rather using the COS Manual

5. Afshin believes the area between "DT Ranch Study" & Cheney Drive may be included in COS study. However, they did not change the slope of sub-basins (ie. The mountainous areas are the same as the other basin

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

April 19, 1995

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

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH
FCD 93-05

Dear Pedro:

We enclose two (2) copies of the minutes of meeting held on April 19, 1995 at 9:30 a.m. at the Flood Control District Offices. The purpose of the meeting was to discuss the progress of the City of Scottsdale's Storm Water Master Plan.

If you have any questions regarding these minutes or the meeting, please call.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards

Dennis L. Richards, P.E.
Vice President

Enclosure

DLR/RAE/kb

(PAZ-MC-16)

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4600 South Mill Avenue, Suite 200
Tempe, Arizona 85282-6759
602/491-1393 Fax: 602/491-1396

MEETING MINUTES

PROJECT: PAZ-MC-16

DATE: April 19, 1995 TIME: 9:30 a.m.

LOCATION: Flood Control District of Maricopa County Offices

SUBJECT: City of Scottsdale Storm Water Master Plan

ATTENDEES: Pedro Calza, FCD
Afshin Ahouraiyan, FCD
Bill Erickson, COS
Dennis Richards, SLA
Bob Eichinger, SLA

Items Discussed:

1. FCD received from ADOT 30% submittal of Squaw Peak Parkway Shea Boulevard to Thunderbird RAM-600-2-514.

2. City of Scottsdale waiting for base mapping from Michael Baker. Mapping may be available in June. City extended Boyle's contract to January, 1996. City stated Boyle may be able to complete Storm Water Master Plan from Doubletree Ranch Road to CAP in 90 days from receiving mapping. City will attempt to deliver mapping and hydrology to FCD in September.

3. Floodplain delineation study put on hold until City can deliver Master Plan hydrology to FCD in September. FCD directed SLA to submit letter of request for extending the project schedule to January, 1996.

4. Master Plan hydrology to be delivered by City to FCD in September will have been reviewed and approved by the City.

A2-MC-66

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

MEETING ATTENDANCE ROSTER

Project: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Project No.: FCD 93-05

Date: APRIL 19 1995 Time: 9:30 AM

Location: FLOOD CONTROL DISTRICT OF MARICOPA COUNTY NEW RIVER ROOM

NAME	ORGANIZATION	TELEPHONE
BOB EICHINGER	SIMONS, LI + ASSOCIATES, INC.	491-1393
PEDRO CALZA	FCDMC	506-4697
Afshin Ahouraiyan	FCDMC	506-4519
DENNIS RICHARDS	SIMONS, LI & ASSOCIATES	491-1393
BILL ERICKSON	City of SCOTTSDALE	994-7652

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February 15, 1995

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

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH
FCD 93-05

Dear Pedro:

We enclose two (2) copies of the minutes of meeting held at the District's offices on February 7, 1995 to discuss the above referenced project. The purpose of the meeting was to update the District on the status of the project.

Per your request, we have revised the project schedule. The revision reflects an anticipated completion date of mid-May, 1995 for the City of Scottsdale's hydrology for their Storm Water Master Plan.

Once SLA received the completed and City approved Master Plan hydrology, we project to complete the IBW hydrology within four (4) months. This time frame includes periodic reviews by the District. The revised schedule shows FEMA submittal by October, 1995.

If you have any questions, please call.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards, P.E.
Vice President

DLR/RAE/kb

Enclosure

(PAZ-MC-16)

INDIAN BEND WASH FLOODPLAIN DELINEATION
CONTRACT NO. FCD 93-05

MEETING AGENDA

February 7, 1995

I. Introduction

II. Work Completed to Date

- Draft Data Collection Report, June 1994
- As-builts obtained for structure crossings
- Preliminary HEC-1 Model for Squaw Peak Area, Conversion of TR20 Model
- Field Reconnaissance of Study Reach

III. On-going Tasks

- Data Collection, Retention/Detention Basins - City of Phoenix
- Hydrology
  - SRPMIC Contributing Watershed
  - City of Tempe Contributing Watershed
  - Doubletree Ranch Study
- Floodplain Delineation
  - Field Reconnaissance Report and estimation of Manning's "n" values
  - Location and alignment of cross-sections

IV. Progress Report - Scottsdale Stormwater Master Plan

V. ERM Elevations/Descriptions

VI. Project Schedule

VII. Other

SIMONS, LI & ASSOCIATES, INC.
4600 South Mill Avenue, Suite 200
Tempe, Arizona 85282-6759
602/491-1393 Fax: 602/491-1396

MEETING MINUTES

PROJECT: Floodplain Delineation for Indian Bend Wash
FCD 93-05
SLA Project No. PAZ-MC-16

DATE: February 7, 1995 TIME: 9:00 am

LOCATION: Flood Control District of Maricopa County
2801 West Durango Street, Phoenix, AZ 85009

SUBJECT: Project Update and Coordination

ATTENDEES: Jim Bond, City of Tempe (COT)
Bill Erickson, City of Scottsdale (COS)
Pedro Calza, Flood Control District (FCD)
Afshin Ahouraiyan, FCD
Dave Meinhart, FCD
Dennis Richards, Simons, Li & Assoicates, Inc. (SLA)
Bob Eichinger, SLA
Tim Morrision, SLA

City of Scottsdale Mapping. City provided to SLA DTM of IBW. COS will check with Baker Engineers regarding elevation reference marks (ERM's). SLA obtained from COS survey elevation equation between NAVD 88/NGVD 29. Baker sent revised quarter section map to SLA after SLA notified Baker of mapping discrepancy of quarter section map south of McKellips. Baker to send revisions to FCD and COS. COS has preliminary runoff estimated up to Doubletree Ranch Road. COS is receiving one map at a time north of Doubletree Ranch Road. Anticipated delivery of mapping to COS up to Central Arizona Project will be in March.

Work Completed to Date. Draft data collection report submitted to FCD in June, 1994. SLA will update at final submittal. As-built plans have been obtained for all structure crossings by SLA. SLA submitted preliminary HEC-1 model for Squaw Peak subbasin. SLA has completed field reconnaissance of IBW for study of "n" values.

On-Going Tasks. SLA's review of PVSP study and field visits have found several detention basins in Phoenix. SLA will obtain as-builts for these basins. Hydrology for SRPMIC will be based on SLA's Outer Loop hydrology models. Work on hold until Boyle's study is available for Pima/Shea. City of Tempe contributing watershed is relatively minor and work will begin on this area during the week of February 13.

City of Tempe will have minimal involvement with floodplain delineation study. COT

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

January 26, 1995

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

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH
FCD 93-05

Dear Pedro:

We enclose two (2) copies of minutes of the meeting held at the District Offices on January 25, 1995, at 9:00 am, to discuss the above referenced project. The meeting focused on the conversion of the Squaw Peak Highway TR20 hydrology model of Indian Bend Wash to a HEC-1 model of the same subwatershed.

If you have any questions regarding the meeting or submitted materials, please call Bob Eichinger.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards

Dennis L. Richards, P.E.
Vice President

DLR/RAE/kb

Enclosure

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MEETING MINUTES

Project: Floodplain Delineation for Indian Bend Wash

Project No.: FCD 93-05

Meeting Date: January 25, 1995 Time: 9:00 am

Meeting Place: Flood Control District of Maricopa County

Attendees: Afshin Ahouraiyan, FCD
Bob Eichinger, Simons, Li & Associates, Inc.

****

Items Discussed:

1. SLA submitted a preliminary HEC-1 hydrology model developed from the existing conditions TR20 model of Indian Bend Wash from the Squaw Peak Highway Final Hydrology Report. Included in the submittal was a watershed map of IBW to Shea Boulevard. The map indicated subbasins, concentration points, and routing reach locations.

2. SLA and FCD discussed the hydrologic backup data obtained by SLA from Michael Baker and AN-West which was used to develop the TR20 Model.

3. SLA submitted subbasin parameters (basin area, curve number, time of concentration) and routing reach parameter (length, slope, section) spreadsheets used for input into the HEC-1 model.

4. FCD stated that a review of the submitted materials will be conducted and will take approximately two weeks.

5. FCD will contact City of Scottsdale to check if new City basin reports are available from the City's Storm Water Master Plan. FCD will also ask if mapping is available for Scottsdale between the Arizona Canal and the Central Arizona Project.

6. FCD will provide SLA topographic mapping of the watershed developed for the Doubletree Ranch Road improvements project. This mapping was recently completed.

MINUTES OF MEETING

Project: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Project No: FCD 93-05

Date: August 4, 1994 Time: 2:00 p.m.

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

ATTENDEES:

Pedro Calza, FCD
Rat Acuña, City of Phoenix
Dennis Richards, SLA
Bob Eichinger, SLA

ITEMS DISCUSSED:

1. Jim Phipps (FCD - Public Information Officer) suggests public meeting to present IBW FIS. Pedro suggests waiting until study has generated a minimal product for presentation. Ray will discuss merits of public meeting with Jim Phipps.

2. FCD, City of Phoenix, and SLA discussed whether a CLOMR may be appropriate to submit to FEMA based on concept designs for Squaw Peak Highway. Pedro stated FCD has never submitted CLOMR based on concept design, only on design plans. Pedro has contacted Baker (Virginia) to discuss feasibility of submitting CLOMR based on concept design. Ray wants to start CLOMR process up-front instead of at the end of the Squaw Peak Highway project. CLOMR application will reflect only that area of IBW and Squaw Peak Highway within City of Phoenix. Ray is encouraging ADOT that CLOMR needs to be processed by ADOT. City of Phoenix will obtain concept design of Squaw Peak from ADOT. FCD will continue discussions with FEMA (Baker, VA). SLA may develop CLOMR as part of IBW FIS/Squaw Peak Highway.

3. SLA submitted revised project schedule to FCD.

4. SLA mailed IBW FIS letters to Paradise Valley (Bill Meade) and City of Tempe (Lee Quaas). SLA will follow-up to arrange meetings to discuss project with these individuals. SLA to contact FCD when meetings arranged.

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

MEETING ATTENDANCE ROSTER

Project: FLOODPLAIN DELINEATION FBW

Project No.: FCD 93-05

Date: 8/4/94 Time: 2:00 PM

Location: FLOOD CONTROL DISTRICT

NAME	ORGANIZATION	ADDRESS	TELEPHONE	FAX NO.
PEDRO CALZA	FCD	2801 W DURANGO	506-1501	506-4601
Ray Acuña	City of Phoenix	200W Wash...	262-4026	
DENNIS RICHARDS	SIMONS, LI & ASSOC	4600 S. MILL AVE.	491-1393	491-1396
BOB EICHINGER	SIMONS, LI + ASSOC			

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

July 21, 1994

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

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH
FCD 93-05

Dear Pedro:

We have enclosed one (1) copy of minutes of the meeting held at the Flood Control District on July 19, 1994 at 10:00 a.m. to discuss the above referenced project.

If you have any questions or comments, please call.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Engineer

Enclosure

RAE/rav

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MINUTES OF MEETING

Project: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Project No: FCD 93-05

Date: July 21, 1994 Time: 10:00 a.m.

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

ATTENDEES:

See attached meeting sign-in sheet.

ITEMS DISCUSSED:

1. SLA summarized the areas of the IBW watershed that have existing hydrology studies/models. These areas include Squaw Peak Highway (Michael Baker, TR20); Pima-Shea and Hayden-Shea (Boyle, HEC-1); Tatum Boulevard (Kaminski-Hubbard, HEC-1); Pima Freeway/Outer Loop (Simons, Li & Associates, HEC-1); Paradise Valley-Scottsdale-Phoenix Drainage Study (Collar, Williams, White; SCS Method I); City of Scottsdale Storm Water Master Plan (Boyle, HEC-1 under development).

2. Areas without hydrologic models include IBW south of McKellips (Tempe), and portions of Paradise Valley, Scottsdale, and Phoenix west of Invergordon. SLA and FCD discussed these areas and agreed they need to have a hydrologic model developed according to FCD criteria.

3. SLA and FCD discussed hydrologic methods to be applied for the development of models for the identified areas without existing models. These methods are described in the Scope of Work.

4. SLA provided to the District a list of deliverables that the FCD is to furnish SLA under the Scope of Work. These are:

   a. Lotus spreadsheet and procedures for soils
   b. Soils data map (GIS files)
   c. Parameter estimation references
   d. Base maps - digital mapping

5. Requested items from FCD are:
   a. Land use map (GIS files)
   b. 100 year HEC-1 models City of Scottsdale Storm Water Master Plan
   c. Hydrologic schematics for City of Scottsdale models.

MEETING AGENDA

Projects: Floodplain Delineation for Indian Bend Wash

Project No.: FCD 93-05 SLA: AZ-MC-16

Date: July 19, 1994 Time: 10:00 a.m.

Location: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Item	Topic
1.	Existing hydrology studies/models
2.	Areas without hydrologic models
3.	Basis of Hydrologic Analysis

- Apply HEC-1 entire watershed
- 100 year, 6-hour and 24-hour existing conditions
- 6-hour duration FCD methodology
- 24-hour duration SCS Type II
- SCS Curve Number (Rainfall Excess)
- Unit Hydrograph: Clark or S-graph

4. FCD deliverables to consultant

- Lotus spreadsheet and procedures to be used to determine composite parameter values for each subbasin (5.7.d.)
- Soils data maps (GIS files) (5.7.d.)
- Land Use?
- References to facilitate parameter estimation (5.8)
- Base maps (5.5) digital mapping
- 100-year HEC-1 models from City of Scottsdale Storm Water Master Plan (disks)
- Hydrologic schematics for City of Scottsdale models

c:\wp51\mc-16\ma071994.101

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

Meetings

MEETING ATTENDANCE ROSTER

Project: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Project No.: FCD 93-05

Date: JULY 19, 1994 Time: 10:00

Location: FCD OFFICES - ADOBE ROOM

NAME	ORGANIZATION	ADDRESS	TELEPHONE	FAX NO.
PEDRO CALZA	FCD		506-1501	506-1506
Afshin Ahouraiyan	FCD		506-1501	
BOB EICHINGER	SIMONS, LI ASSOC		491-1393	491-1396
Chris Pauley	Simons, Li & Assoc.		491-1393	491-1396

4600 South Mill Avenue, Suite 190 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
An Equal Opportunity Employer

Contract FCD 93-05
Indian Bend Wash
Floodplain Delineation Restudy
Kickoff Meeting

Wednesday, March 30, 1994

AGENDA

1. Personnel Assignments
   Jan Opstein - Project Hydrologist
   Afshin Ahouraiyan - Hydrology Coordination & Review
   Dave Meinhart - FCD laison with City of Scottsdale (COS)

   Bill Erickson - COS Contact - 994-7652
   Boyle Eng. - Fred Synder - 943-6800 IBW Hydrology
   Baker Eng. out of VA - Dick McDonald or Gary Eaton
   (412) 495-7711 - Topography
   Greiner Eng. - 275-1220 Land Survey

2. Public Meetings and Public Information distribution.

3. Newspaper Add

4. Monthly Reports

5. Billing Procedures
   Notice of Substantial Completion
   Notice of Final Completion

6. Bar Chart of Project Schedule - Adjustments to project schedule must go through a "change order" for time extensions.

7. FCD hydraulic check list
   FCD hydrology check list

8. Mapping

9. FEMA Check list

10. Deliverables

AGENDA

NEIGHBORHOOD ENHANCEMENT COMMISSION
Wednesday, January 4, 1994
5:00 P.M.
One Civic Center Conf. Room
2nd Floor
One Civic Center Building
7447 E. Indian School Road
Scottsdale, Arizona

1. Call to Order and Approval of December 7, 1994 Minutes.

2. Presentation and discussion on the upcoming Indian Bend Wash Restudy--Greg Crossman, Drainage Planner, City of Scottsdale--Jim Phipps, Public Information Coordinator, Flood Control District--Robert Eichinger, Consultant, Simons Li & Associates.

3. Update on current neighborhood enhancement activities:
   - o Village Grove Entry Feature
   - o Coronado Heights Neighborhood Signs
   - o Southwest Village Neighborhood Meeting
   - o Homeowner Association/ Organization List
   - o Neighborhood Assessment Survey

4. Announcements and public comment (not for Commission discussion).

5. Next meeting date and future agenda items.

6. Adjournment.

For additional information contact Raun Keagy, Citizen Services at 994-2373.

SECTION 1: General Description and Correspondence

1.4 General Correspondence

SECTION 1: General Description and Correspondence

1.4.1. Community

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

Transmittal Letter

To: Town of Paradise Valley Date: 3 Oct 96

6401 E. Lincoln Dr.

Paradise Valley, AZ 85253

Attention: Bill Mead Project Number: PAZ-MC-16

Enclosed please find:

Copies	of
1	Floodway & Flood Boundary Worksheet for FIRM's
1	Copies of current effective FIRM's showing Floodways and Zone AS (Floodway)
1	ADEQ Definition of Floodway

- ☐ Forwarded
- ☐ Returned
- ☐ Prints
- ☐ Originals
- ☐ Reports
- ☐ Disks
- ☐ For Approval
- ☑ As Requested
- ☑ For Your Use
- ☐ For Your Files
- ☐ Mail
- ☐ Express Courier
- ☐ Hand Delivered

Remarks I hope this information helps you identify the floodway relative to the specific lot you are concerned with.

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

MICHAEL TERNAK, P.E.
Senior Engineer/Planner

4600 S. MILL AVENUE
SUITE 200
TEMPE, ARIZONA 85282

TELEPHONE:
(602) 491-1393
FAX 491-1396

h, CA • Tempe, AZ • Tucson, AZ
npe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
Equal Opportunity Employer

RECEIVED MAY 2 2 1996

Transportation Department

7447 E. Indian School Road, Suite 205
Scottsdale, Arizona 85251
Phone: (602)994-7696 • FAX: (602)994-7971

LETTER OF TRANSMITTAL

TO: SIMONS, Li + Assoc.
4600 S. Mill Ave
Suite 200
Tempe, AZ 85282

DATE	PROJECT NO.
5/20/96	
ATTENTION: TIM MORRISON	
SUBJECT: IBW - Remapping Study.	

THE FOLLOWING ITEMS ARE TRANSMITTED:

☒ Attached
☐ Under Separate Cover via _____

COPIES	DATE	NO.	DESCRIPTION
1		1 sheet	Composite Floodplain Map

☐ At Your Request
☐ For Your Approval
☐ For Corrections
☐ For Your Review
☐ For Your Action
☒ For Your Use
☐ For Your Information
☐ Return Corrected Prints
☐ Return Check Prints

REMARKS: These are the areas we are particularly concerned about. Most should not be in an "A" or "AE" zone, they are up on ~~raised~~ fill. The entire "A" zone area in McCormick Ranch was mapped from a proposed grading plan which has had significant changes. As-builts + LOMR where never obtained or submitted for one reason or another on many of the circled areas.

COPY TO: Bill E., Dave M., Alex M. SIGNED BY: Collis
994-7852

TO00100 (5/93)

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

Transmittal Letter

To: City of Scottsdale
3939 Civic Center Blvd.
Scottsdale, AZ 85251

Date: April 3, 1995
Indian Bend Wash

Attention: Mr. Greg Crossman, P.E.

Project Number: PAZ-MC-16

Enclosed please find:

Copies	of
1	Indian Bend Wash Display Board
1	September, 1991 Flood Insurance Study

X Forwarded	X Prints	☐ For Approval	☐ Mail
☐ Returned	☐ Originals	☐ As Requested	☐ Express Courier
	☐ Reports	X For Your Use	X Hand Delivered
	☐ Disks	☐ For Your Files	

Remarks:

From Kristi Bigelow
for ROBERT A. EICHINGER, P.E.

Newport Beach, CA • Tempe, AZ • Tucson, AZ

4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
An Equal Opportunity Employer

August 5, 1994

Mr. William Mead, P.E.
Town Engineer
Town of Paradise Valley
6401 E. Lincoln Drive
Paradise Valley, Arizona 85253

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Dear Mr. Mead:

Simons, Li & Associates, Inc. (SLA) is conducting a Flood Insurance Study (FIS) of Indian Bend Wash on behalf of the Flood Control District of Maricopa County. The limits of the study begin at the confluence of Indian Bend Wash with the Salt River and terminate approximately sixteen (16) miles upstream at 32nd Street and Acoma Drive within the City of Phoenix. The purpose of the FIS is to delineate the 100-year floodplain and floodway of Indian Bend Wash through the study reach.

The Flood Control District and SLA would like to meet with you at your convience to discuss the project objectives, and to receive your input as well as your support. Our intent is to keep the Town of Paradise Valley informed as to the progress of the study and to present study results. Mr. Robert Eichinger of SLA will be contacting you shortly to schedule a meeting.

If you have any questions or need additional information regarding this study, please feel free to contact us.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards, P.E.
Vice President

DLR/RAE/rav

cc: Mr. Pedro Calza,
Flood Control District of Maricopa County

c:\wp51\mc-16\L080394.101

August 3, 1994

Mr. Lee Quaas
City of Tempe
P.O. Box 5002
Tempe, Arizona 85281

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

Dear Mr. Quaas:

Simons, Li & Associates, Inc. (SLA) is conducting a Flood Insurance Study (FIS) of Indian Bend Wash on behalf of the Flood Control District of Maricopa County. The limits of the study begin at the confluence of Indian Bend Wash with the Salt River and terminate approximately sixteen (16) miles upstream at 32nd Street and Acoma Drive within the City of Phoenix. The purpose of the FIS is to delineate the 100-year floodplain and floodway of Indian Bend Wash through the study reach.

The Flood Control District and SLA would like to meet with you at your convience to discuss the project objectives, and to receive your input as well as your support. Our intent is to keep the City of Tempe informed as to the progress of the study and to present study results. Mr. Robert Eichinger of SLA will be contacting you shortly to schedule a meeting.

If you have any questions or need additional information regarding this study, please feel free to contact us.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards, P.E.
Vice President

DLR/RAE/rav

cc: Mr. Pedro Calza,
Flood Control District of Maricopa County

c:\wp51\mc-16\L080394.102

SECTION 1: General Description and Correspondence

1.4.2. State Coordinator

Arizona Department of Transportation

206 South Seventeenth Avenue • Phoenix, Arizona 85007-3213

Jane Dee Hull
Governor

INTERMODAL TRANSPORTATION DIVISION

Larry S. Bonine
Director

GEODESY SERVICE
1739 WEST JACKSON, MAIL DROP 203P
PHOENIX, ARIZONA 85007
GEODESY DESK (602) 255-8566
RON HENDERSON (602) 255-8567
CONNIE BROWN (602) 255-8563

FAX (602) 407-3291

FACSIMILE TRANSMISSION

DATE: MAR 10, 1998

TO: BART BERGENDAHL

FROM: Ron Henderson
255-8567

FAX: ( ) 491-1396

TOTAL Number of Pages Sending (including this page): 11

ADDITIONAL COMMENTS:

THE VERTICAL CONTROL FOR JOB 3075 WAS BASED ON JOB 3006. JOB 3006 HAS a NOTE: BASIS OF DATUM AS -- ADOT CONST. & CONSULTANTS VALUES HELD FIXED ON PROJECT. VALUES OBTAINED FROM KENNETH McKELVY OF JEFFERSON FIELD OFFICE. CURRENT PHONE NUMBER IS 255 8114 at 48th St Field office.

I have enclosed USC&GS GVN which is in these Projects. Datum is Defined as NGVD 29 IN 1963 AND SAME IN 1995. To my Knowledge NGVD 29 is the DATUM.

Ronald Henderson

These elevati[illegible]e based on a [illegible]lementary adju[illegible]nt of 1949.

H MARK	ADJUSTED (Meters)	ELEVATION (Feet)
7	369.952	1213.751
7 RESET 1968		1204.027
7	363.810	1193.600
7	362.024	1187.740
7	359.964	1180.982
7	356.709	1170.303
7	354.932	1164.473
7	357.309	1172.271

LINE 108
(Second-order)

This line follows various county [illegible] track roads SW from Serape to the [illegible]. of line 109.

The field work (L-12560) was done [illegible] June 1948 by a party supervised by [illegible]. Brown, Jr.

These elevations are based on a [illegible]pplementary adjustment of 1949.

NCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)
15.93 (USIIS)	370.393	1215.198
276	369.745	1213.072
276	365.896	1200.444
276	365.648	1199.630
276	363.571	1192.816
276	358.944	1177.635
276	361.407	1185.716
276	361.724	1186.756

LINE 109
(Second-order)

This line follows a county road [illegible] to Sacaton, then continues NW and [illegible] along county roads to the end of [illegible]he quad.

The field work (L-12560) was don[illegible] in June 1948 by a party supervised [illegible] E.B. Brown, Jr.

These elevations are based on a supplementary adjustment of 1949.

BENCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)
Z 275	386.921	1269.423
D 275	383.942	1259.650
A 276	391.280	1283.724
B 276	386.746	1268.849
C 276	383.206	1257.235
D 276	379.805	1246.077
E 276	378.267	1241.031
F 276	373.476	1225.312
*G 276	370.728	1216.297
*H 276	367.821	1206.759
J 276	365.345	1198.636
K 276	366.596	1202.740
L 276	363.922	1193.967
1197.20 (USRS)	364.768	1196.743
Y 275	360.450	1182.576
X 275	357.866	1174.099
W 275	354.886	1164.322
V 275	354.229	1162.166
U 275	352.559	1156.687
T 275	349.984	1148.239

LINE 110
(Second-order)

This line follows the Baseline Road W from Peterson to the end of the quad.

GUN

The field work (L-12552) was done in June 1948 by a party supervised by E.B. Brown, Jr.

These elevations are based on a supplementary adjustment of 1949.

BENCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)
D 273	361.354	1185.542
*C 273	367.316	1205.103
E 273 (USRS)	370.691	1216.175
*B 273	368.720	1209.709
A 273	371.124	1217.596

This line [illegible] E and NE to the end of the quad.

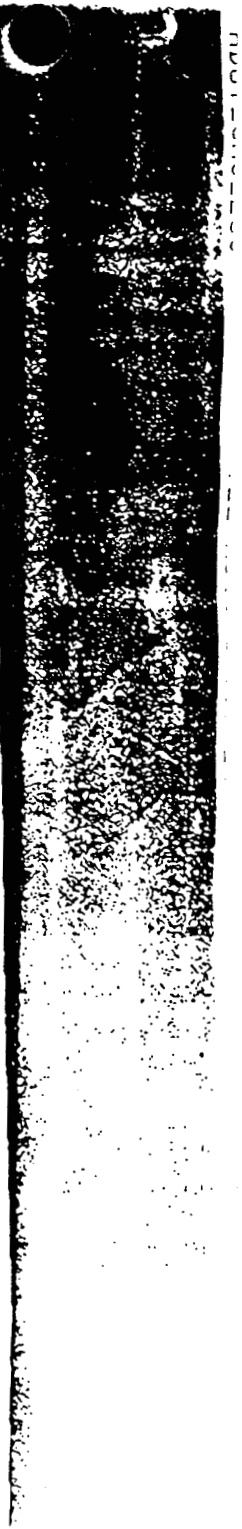
The field work (L-19162) was done in April 1963 by a party supervised by C.A. Annis and in cooperation with the Arizona Highway Department.

These elevations are based on a supplementary adjustment of 1963.

BENCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)
TT 4 3 (CORP. OF ENG)	354.695	1163.695
PALM RM 1	351.180	1152.163
PALM	351.092	1151.874
PALM RM 2	351.017	1151.628
BERT AZI	358.438	1175.975
BERT 2		1165.934
BERT 3		1165.822
BERT 3 RM 5		1166.008
BERT 3 RM 6		1165.046
NOLE AZI	361.110	1184.742
NOLE	358.352	1175.693
NOLE RM 2	358.331	1175.624
NOLE RM 1	358.323	1175.598
PLAD 2 RM 2		1185.429
PLAD 2		1186.129
PLAD 2 RM 1		1185.936
PLAD AZI		1179.403
GOLF RM 2	387.029	1269.778
GOLF	387.151	1270.178
GOLF RM 1	387.353	1270.841
TTS 3 CORP of ENGR.	391.362	1283.993
GUN RM 2	400.429	1313.741
GUN	400.803	1314.968
GUN RM 1	401.041	1315.749
BATON RM 2	389.883	1279.141
BATON	389.830	1278.967
BATON RM 1	389.628	1278.305
BATON AZI	391.284	1283.738
CURB AZI	381.339	1251.110
CURB RM 2	379.786	1246.015
CURB	379.533	1245.185
CURB RM 1	379.610	1245.437
~~SCOTT RM 2~~	373.723	1226.123
~~SCOTT~~	373.596	1225.706
~~SCOTT RM 1~~	373.561	1225.591

PUBLISHED NGVD 29 USC&GS

NATIONAL OCEANIC A[illegible]
ABSTRACT OF PRECISE LEVELING



CURVE DATA

DELTA	RADIUS	TANGENT	LENGTH	PC/PRC	PI	CC	PT/PCC
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
18°23'34.0"	2700.00'	437.13'	866.74'	1053	1059	1050	1055
19°37'38.2"	2500.00'	432.44'	856.40'	1413	1419	1410	1415
27°54'38.1"	1200.00'	298.20'	584.56'	1415	1429	1420	1425
23°38'45.0"	1575.00'	329.69'	650.00'	1425	1439	1430	1435
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
10°52'40.5"	3250.00'	309.45'	617.03'	1513	1319	1310	1315
144°08'57.8"	50.00	154.57'	125.79'	1513	1519	1510	1515

CONTROL LINES

LINE	BEARING	LENGTH
NORTH BANK CONTROL LINE		
~~[illegible]~~	~~S 31°01'[illegible] E~~	~~[illegible]~~
~~[illegible]~~	~~N 36°11'44.6" E~~	649.69'
~~[illegible]~~	~~S 70°08'55.7" E~~	409.58'
~~[illegible]~~	~~N 37°53'32.5" E~~	~~[illegible]~~
[illegible]-1053	N 48°23'46.9" E	712.39'
[illegible]-1069	N 30°00'12.9" E	121.50'
[illegible]-1413	N 74°38'32.5" E	85.78'
[illegible]	S 85°43'49.3" E	--
[illegible]	N 66°21'32.6" E	--
[illegible]-1449	S 89°59'42.5" E	105.27'

LINE	BEARING	LENGTH
SOUTH BANK CONTROL LINE		
~~1209-1213~~	~~S 35°49'26.7" E~~	~~1410.59'~~
1215-1223	N 88°07'39.2" E	1650.51'
1225-1233	S 66°[illegible] E	220.40'
1235	N 62°55'30.5" E	--
~~[illegible]-259~~	~~N 35°55'29.3" E~~	~~2107.[illegible]~~
SOUTH OVERBANK CONTROL LINE		
~~[illegible]-1149~~	~~S 72°53'01.0" E~~	~~1652.77'~~
1159-1163	N 05°19'18.8" W	170.00'
1165-1179	N 31°45'4[illegible] E	562.20'
~~[illegible]~~	~~N82°59'05.5" E~~	~~[illegible]~~

LINE	BEARING	LENGTH
EAST BANK CONTROL LINE		
[illegible]	N 38°47'30.2" E	--
[illegible]-1329	N 27°54'49.7" E	126.29'

BENCH MARK LOCATIONS

NO	GROUND X	GROUND Y	ADOT/TEMPE ELEVATION	DESCRIPTION
174	297359.7527	283837.0774	1167.70	B.C. In Handwell at centerline Scottsdale Rd 200'+ N. Intersection of 1st St (Rim of Handwell Panel Pt)
176	294712.9767	283804.4622	1200.70	Ground elevation at Panel pt
405	293172.5415	282434.2339	1161.73	Survey Monument Handwell
408	297156.2607	285683.7876	1158.80	P.K. nail 200'+ W of Scottsdale Rd and 850'+ S of Gilbert Dr
410	297165.9472	287050.4694	1159.94	60d nail 200'+ W of Scottsdale Road w/painted panel In Go-Kart Track Parking Lot 2 miles+ S of Curry Road
516	291863.3738	287545.3622	1190.86	P.K. nail In E. Median 800'+ N of Curry on Mill Avenue
517	292858.4872	284591.7010	1148.72	1/2" Rebar Flush w/ground 50'+ of N fence Tempe Beach Park 200'+ W. of Old Mill Bridge
518	297356.0121	282069.3745	1163.44	C.O.T. B.C. In Handwell at centerline Rural Rd and 6th St Elevation at Rim (Panel Pt)
519	297338.6774	287821.8127	1173.99	C.O.T. B.C. In Concrete flush w/pavement at Curry Road and Scottsdale Road.
520	302620.6565	282709.6071	1172.95	P.K. nail centerline McClintock 0.5 miles N of University Ave
527	294798.2291	286314.7598	1161.90	1/2" Rebar Flush w/ground In Access Road/S. Bank of Irrigation Canal near S. border Papago Park. (Panel Pt)

SECTION 1: General Description and Correspondence

1.4.3. Other Agencies

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

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

COVER SHEET

TO: Bart Bergendahl

Company or Department: SLA & Associates **Fax #** 491-1396

FROM: Afshin Ahouraiyan

Number of pages being sent including Cover Sheet: 2

Comments: Good afternoon Bart: I got a call from Baker Engineers having the following question on the IBW CLOMR. Give me a call to discuss these before calling Baker. 1) What version of AutoCad (Release 13) was used for the drawings 2) Re-submit the maps with better written contour elevation information. Not able to read the contour numbers from the map 3) Why are X3 cards used for cross sections 5000, 4800, 4646 4) Eliminate the extended cross section messages for X-sections 9930 & 9731. Problem [illegible]

The name of the individual @ Baker reviewing the CLOMR is James Stitzel Phone # 703-960-8800 ext 5262.

Attached is the copy of letter coming to you re. His deliverables for the LOMR.

Give me a call when you get this fax & we'll discuss the issues. Thanks,
Afshin

RECEIVED APR 1 3 1998
AZ-MC-16

FLOOD CONTROL DISTRICT
of
Maricopa County

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

BOARD OF DIRECTORS
Betsey Bayless
Jan Brewer
Fulton Brock
Don Stapley
Mary Rose Garrido Wilcox

APR 9 1998

Ms. Pernille Buch-Pedersen
Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

RE: INDIAN BEND WASH LOMR , Case No. 98-09-253P

Dear Ms. Buch-Pedersen:

This is in response to Mr. Matthew B. Miller's letter, dated February 17, 1998, transmitting a revised HEC-2 model and requesting additional data for your review of the above referenced LOMR, and a March 12, 1998, transmittal from Erin Lawrence of Baker Engineers containing a modification of the previously revised HEC-2 model for our review and concurrence.

The revised HEC-2 model slightly modifies the floodway limits at several locations to reduce or eliminate negative surcharges ranging from 0.1 to 1.0 feet. We concur with these revisions.

The longitudinal profile for the Papago Freeway Bridge on Plan Drawing Nos. S-9.2 through S-9.4 shows the low-chord is above the design water-surface and top of the levees on both sides of Indian Bend Wash. The levees provide 4.7 to 4.8 feet of freeboard for the base flood at this location; therefore, the water surface will not contact the bridge superstructure. The reviewer may have mistaken the bottom of the pier caps, shown on the detail sheets, as the low-chord of the bridge.

Unlike the other bridges in the HEC-2 model, the Papago Freeway Bridge was not modeled using the special bridge routine. This bridge was incorporated into the HEC-2 model by defining the individual piers with GR points in cross-sections 0.437, 0.475, and 0.491. Since the low-chord elevation for this bridge is above the top of the levees and the levees provide 4.7 to 4.8 feet of freeboard at this location, a BT card is not required to account for the energy losses. The resulting water-surface elevations are the same as those produced by the normal bridge routine. Plots of these cross-sections are enclosed for your information.

Also enclosed is a copy of Plan Sheet No. 157, which contains bench mark elevations and locations for the bridge project, and correspondence from the Arizona Department of Transportation which indicates these bench marks are based on NGVD datum of 1929.

If you have any questions or require additional information on the above, please do not hesitate to contact me at (602)-506-4519.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan

Enclosures

Copy to: Ms. Terri Miller
State Coordinator, National Flood Insurance Program
Arizona Department of Water Resources
500 North 3rd Street, Phoenix, Arizona 85004

Mr. Raymond Acuna, P.E., Floodplain Manager
City of Phoenix
200 W. Washington, 5th floor, Phoenix, Arizona 85004

Mr. William Erickson, Drainage Planner
City of Scottsdale, Transportation Planning
7447 E. Indian School Road, Scottsdale, Arizona 85251

Mr. William Mead, P.E., Town Engineer
Town of Paradise Valley
6401 East Lincoln Drive, Paradise Valley, Arizona 85253

Mr. Howard Hargis, P.E., City Engineer
City of Tempe, Public Works Department
P.O. Box 5002, 31 East Fifth Street, Tempe, Arizona 85280

Mr. Dennis Richards, P.E., Vice President
Simons, Li and Associates, Inc.
4600 South Mill Avenue, Suite 200, Tempe, Arizona 85282

RECEIVED MAY 2 7 1997

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
Jan Brewer
Fulton Brock
Don Stapley
Mary Rose Garrido Wilcox

MAY 2 2 1997

Dennis L Richards
Simons, Li & Associates, Inc.
4600 S. Mill Avenue
Suite 200
Tempe, Arizona 85282

Subject : Review of the HEC-2 submittal for the Floodplain Delineation Study for Indian Bend Wash (FCD 93-05).

Dear Mr. Richards :

A review of the HEC-2 modeling, submitted for the Floodplain Delineation Study for Indian Bend Wash, is completed. Please find the following review comments on the above mentioned project.

(1) Cross sections should be identified with no more than three (3) decimal points. The starting cross section, X1 0.4372, at the toe of the grade control structure, should be identified as "0.437" instead of "0.4372".

(2) Cross sections X1 12.69 and X1 13.54 are located too far upstream from their respective critical depth cross sections (X1 12.6 and 12.45 respectively). Please investigate if additional cross sections are required.

(3) All throughout the HEC-2 modeling, the contraction and expansion coefficients have values that are different than the values suggested in the HEC-2 manual. It is suggested that a proper justification for such deviation be included in the Hydraulic Analysis Report of the Technical Data Notebook.

(4) Left channel bank stations are outside the BT data for the following cross sections : 0.791, 2.652, 3.78, 5.372, 6.893 and 9.15. Please revise the BT data to include the left channel bank stations.

(5) The values of ELLC (X2.4) and ELTRD (X2.5) are not on the BT records for the following cross sections : 0.791, 1.57, 2.652, 3.78, 4.87, 5.372, 5.9, 6.893, 9.15, 10.41 and 11.17. It is recommended that the BT records are revised to include the correct ELLC and ELTRD values.

(6) Several cross sections generated "cross section extended" messages in the output. The GR data needs to be extended or reduced, whichever may be the case, to eliminate the cross section extended messages.

Should additional information be required, please do not hesitate to contact me at (602) 506-1501.

Sincerely,

Hasan Mushtaq, P.E.
Engineering Division

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

DATE: 1 OCT 96

TEL #: (602) 491-1393
FAX #: (602) 491-1396

TO: AFSHIN AHOURAIYAN FROM: Mike Ternak

FAX #: 506-4601

OF PAGES (includes this cover page): 2

PROJECT NO.: MC-16 IBW DELINEATION / SRSI CLOMR

SUBJECT: Current Effective FIS Model

The attached information explains procedures for obtaining the model from FEMA library.

4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
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FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009

(602) 506-1501

LETTER OF TRANSMITTAL

DATE 09-20-96	JOB NO
ATTENTION Mike Turner	
RE IBW FDS	

TO SLA

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

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Soil & land use data, autocad format (1 diskette
			& separate file)
			1

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19 _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Prepared in NAD27. If any problem, let me know.
Afshin Abourayan

COPY TO File.

SIGNED: A. Abourayan

6910-009 R8-93

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

PAZ-MC 16

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

October 2, 1995

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

RE: FLOODPLAIN DELINEATION FOR INDIAN BEND WASH – FCD 93-05
"n" VALUE DETERMINATION REPORT

Dear Pedro:

We have enclosed one (1) copy of the revised pages of the "n" Value Determination Report for the above referenced project. This report is pursuant to our Scope of Work Sections 6.3 and 6.4. and will be included in the Technical Data Notebook, Section 4.2.1. These revisions and method of resubmittal are pursuant to written and verbal comments from the District.

If you have any questions or comments, please call Tim Morrison or myself.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards

Dennis L. Richards, P.E.
Vice President

enclosure

DLR/TDM/kb

(PAZ-MC-16)

4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
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MC-16
IBW

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
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Mary Rose Garrido Wilcox

RECEIVED SEP 2 6 1995

September 22, 1995

Mr. Tim Morrison, P.E.
Simons, Li & Associates
4600 South Mill Avenue, Suite 190
Tempe, Arizona 85282

Dear Mr. Morrison:

This letter is in regard to your revisions of September 22, 1995, to the "n" value report.

In item 1.ii, an error in the addition of "n" value components has occurred. The new total "n" value should be 0.039, not 0.029 as noted in the letter.

In item 1.iii, it is recommended that the n_2 value added to the high flow channel should be 0.005, making the total "n" value for this cross-section 0.040.

We have no other comments for this submittal. After the above corrections are made, a final "n" value report should be delivered to the District. If you have any questions, please call me at 506-1501.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan
Hydrologist

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
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September 18, 1995

RECEIVED SEP 2 0 1995

Mr. Tim Morrison, P.E.
Simons, Li & Associates
4600 South Mill Avenue, Suite 190
Tempe, Arizona 85282

Dear Mr. Morrison:

The following are comments on the draft "n" value determination report. These comments deal mainly with the non-assignment of obstruction (n_2) values.

1. The following cross-sections should be reevaluated for the n_2 value.

   i. Cross Section 3.977 .

   ii. The low flow channel for cross-section 5.966.

   iii. The high flow channel for cross-section 6.40.

   iv. Cross-section 7.837, to account for the hotel piers.

   v. The tree trunks could be considered an obstruction, depending on the depth of flow at cross-section 9.564.

2. It is more appropriate to include page 41 as part of the information provided for cross-section 6.96.

3. On page 78, cross-section 0.947 is typed incorrectly as 0.974. Make this correction to the table.

I have no other comments for this submittal. If you have any questions, please call me at 506-1501.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan
Hydrologist

AZ - MC - 16

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
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Mary Rose Garrido Wilcox

RECEIVED SEP 2 0 1995

September 18, 1995

Mr. Dennis Richards, P.E.
Simons, Li & Associates
4600 South Mill Avenue, Suite 190
Tempe, Arizona 85282

Dear Mr. Richards:

Enclosed please find a copy of a plan for a mitigation project on Indian Bend Wash by Shea Blvd. The City of Phoenix in conjunction with the Corps of Engineers is the responsible party for this project. Also enclosed is a copy of the Flood Control District's response to this project.

If you have any questions, please call me at 506-1501.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan
Hydrologist

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

Transmittal Letter

To: FLOOD CONTROL DISTRICT Date: SEPTEMBER 14, 1995

Attention: PEDRO CALZA Project Number: PAZ-MC-16

Enclosed please find:

Copies	of
1	CHANGE ORDER No. 1, CONTRACT FCD 93-05

- [x] Forwarded
- [ ] Returned
- [ ] Prints
- [x] Originals
- [ ] Reports
- [ ] Disks
- [x] For Approval
- [ ] As Requested
- [ ] For Your Use
- [ ] For Your Files
- [ ] Mail
- [ ] Express Courier
- [x] Hand Delivered

Remarks

From Dennis L. Richards

Newport Beach, CA • Tempe, AZ • Tucson, AZ
4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
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RECEIVED MAR 0 9 1994
AZ-MC-16

FLOOD CONTROL DISTRICT
of
Maricopa County

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

BOARD OF DIRECTORS
Betsey Bayless
James D. Bruner
Ed King
Tom Rawles
Mary Rose Garrido Wilcox

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

March 4, 1994

Mr. Dennis L. Richards
Vice President
Simons, Li & Associates, Inc.
4600 South Mill Avenue, Suite 190
Tempe, Arizona 85285

SUBJECT: Contract FCD 93-05, Indian Bend Wash Floodplain Delineation

Dear Mr. Richards:

This letter will serve as confirmation of the March 3, 1994 verbal Notice To Proceed for the work under the above-referenced contract that was approved by the Board of Directors on March 2, 1994.

A fully executed contract will be forwarded to you, upon receipt from the Board. If you have any questions regarding work under the contract, please contact Jan Opstein at 506-1501.

Sincerely,

Leanna Cumberland
Chief, Contracting Branch

FLOOD CONTROL DISTRICT

of

Maricopa County

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

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

BOARD OF DIRECTORS
[illegible]

August 2, 1993

Mr. Dennis L. Richards, P.E.
Simons, Li & Associates
4600 South Mill Avenue, Suite 200
Tempe, Arizona 85282

SUBJECT: Notice of Selection for Contract FCD 93-05
Indian Bend Wash Floodplain Delineation Study

Dear Mr. Richards:

Your firm has been selected for performing the work in the above referenced project.

Additional information will be forthcoming regarding Schedule, Scope of Work, and Fee Negotiations.

If you have any questions, please contact Jorge Garre or Jan Opstein at 506-1501.

Sincerely,

Leanna Cumberland
Chief, Contracting Branch

SECTION 1: General Description and Correspondence

1.4.4. FEMA Regional Office

SECTION 1: General Description and Correspondence

1.4.5. FEMA Washington

AZ-MC-"

FLOOD CONTROL DISTRICT
RECEIVED
JUN 09 '94

CHENG		P & PM	
DEP		HYDRO	
ADMIN		LMGT	
FINANCE		FILE	
C&O		RGN	
ENGR			

REMARKS

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 93-09-815P

The Honorable Paul Johnson
Mayor, City of Phoenix
251 West Washington Street
Phoenix, Arizona 85003

Community: City of Phoenix, Arizona
Map Number: 04013C1680 E
Effective Date of This Revision: JUN 07 1994

102-D

Dear Mayor Johnson:

This is in response to a request for a revision to the Flood Insurance Study (FIS) and National Flood Insurance Program (NFIP) maps for your community. Specifically, this responds to a letter dated March 16, 1994, from Mr. Len Erie, P.E., Erie & Associates, Inc., regarding the effective FIS report and Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. With his letter, Mr. Erie submitted additional data in support of his September 9, 1993, request for a Letter of Map Revision (LOMR). Mr. Erie requested that we revise the effective FIRM and FIS report to show the effects of a channelization project along Indian Bend Wash from approximately 300 feet upstream to approximately 1,800 feet downstream of Shea Boulevard. A Conditional Letter of Map Revision was issued for this project on April 1, 1993.

All of the data required to complete our review of this request were submitted with Mr. Erie's letters dated September 9 and November 5, 1993. All fees necessary to process this LOMR, a total of $1,260, have been received.

We have completed our review of the submitted data and the flood data shown on the effective FIRM, and have revised the FIRM to modify the floodplain and floodway boundary delineations of a flood having a 1-percent probability of being equaled or exceeded in any given year (base flood) along Indian Bend Wash. As a result of the channelization project, the 100-year flood will be contained within the identified channel banks from approximately 200 feet upstream to approximately 1,800 feet downstream of Shea Boulevard. The Special Flood Hazard Area has been reduced along the remainder of the revised reach.

The modifications are shown on the enclosed annotated copy of FIRM Panel 04013C1680 E, Flood Profile Panel 215P, and the Floodway Data Table for Indian Bend Wash from the FIS report. This LOMR hereby revises this panel of the effective FIRM dated September 29, 1989, and Flood Profile Panel 215P and the Floodway Data Table in the FIS report dated December 3, 1993.

Please note that a LOMR was issued on the same date as this LOMR to revise this FIRM panel within the Town of Paradise Valley, Arizona, to reflect this channelization project.

The revisions are effective as of the date of this letter; however, a review of the determination made by this LOMR and any requests to alter this determination should be made within 30 days. Any request to alter the determination must be based on scientific or technical data.

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 is fall 1994. In the interim, your community may utilize these data in its floodplain management programs.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this letter, while acceptable to the Federal Emergency Management Agency (FEMA), must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This response to your request is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all proposed floodplain developments, including this request, and for ensuring that necessary permits required by Federal or State law have been received. With knowledge of local conditions and in the interest of safety, State and community officials may set higher standards for construction, or may limit development in floodplain areas. If the State of Arizona or your community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence.

The basis of this LOMR is a channel-modification project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the channel modification rests with your community.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for the new data. We encourage you to disseminate the information reflected by this LOMR widely throughout the community, so that interested persons, such as property owners, insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to give consideration to preparing an article for publication in your community's local newspaper. This article should describe the changes that have been made and the assistance your community will give in providing the data and interpreting the NFIP maps.

The map as listed above and as revised by this letter will be used for all flood insurance policies and renewals issued for your community.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and is in accordance with the

National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria are the minimum requirements and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM, Flood Boundary and Floodway Map, and FIS report to which the regulations apply and the modifications made by this LOMR.

Should you have any questions regarding this matter, please contact the Division Director, Mitigation Division of FEMA in San Francisco, California, at (415) 923-7175, or Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-3445.

Sincerely,

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

Enclosures

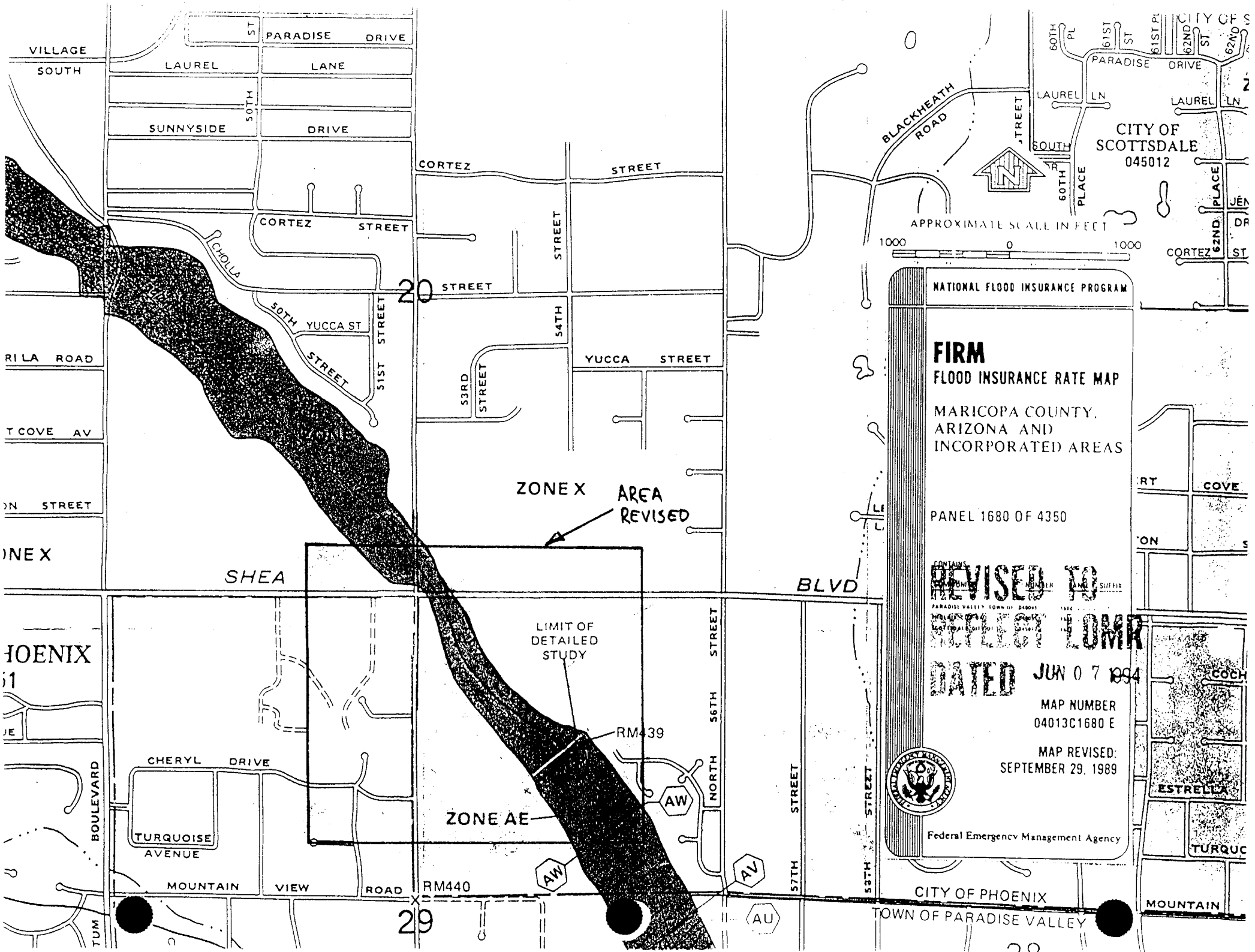
cc: The Honorable David Hann
Mayor, Town of Paradise Valley

Mr. Raymond U. Acuña, P.E.
Floodplain Management Engineer
City of Phoenix Street Transportation
Department

Mr. Keith Coleman
Trammell-Crow Residential

Mr. Len Erie, P.E.
Erie & Associates, Inc.

Mr. Ron Nevitt
Floodplain Representative
Flood Control District
of Maricopa County


VILLAGE
SOUTH
PARADISE DRIVE
LAUREL LANE
SUNNYSIDE DRIVE
50TH ST
CORTEZ STREET
CHOLLA
50TH STREET
YUCCA ST
51ST STREET
53RD STREET
54TH STREET
YUCCA STREET
20 STREET
RI LA ROAD
T COVE AV
ON STREET
ONE X
ZONE X
AREA REVISED
SHEA BLVD
HOENIX
51
LIMIT OF DETAILED STUDY
RM439
ZONE AE
AW
AV
AU
NORTH 56TH STREET
57TH STREET
53RD STREET
CHERYL DRIVE
TURQUOISE AVENUE
BOULEVARD
MOUNTAIN VIEW ROAD
RM440
29
CITY OF PHOENIX
TOWN OF PARADISE VALLEY
MOUNTAIN
BLACKHEATH ROAD
60TH PL
61ST ST
61ST PL
62ND ST
62ND PL
PARADISE DRIVE
LAUREL LN
SOUTH 60TH PLACE
CITY OF SCOTTSDALE
045012
APPROXIMATE SCALE IN FEET
1000 0 1000
CORTEZ
COVE
ESTRELLA
TURQUO
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
PANEL 1680 OF 4350
REVISED TO REFLECT LOMR
DATED JUN 0 7 1994
MAP NUMBER
04013C1680 E
MAP REVISED:
SEPTEMBER 29, 1989
Federal Emergency Management Agency

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Indian Bend Wash (Cont'd)								
AA	48,748	710	2,880	5.6	1,300.3	1,300.3	1,300.8	0.5
AB	49,328	740	3,496	4.6	1,301.3	1,301.3	1,302.2	0.9
AC	50,331	800	2,855	5.6	1,303.8	1,303.8	1,304.6	0.8
AD	51,282	710	3,289	4.9	1,307.6	1,307.6	1,307.6	0.0
AE	52,282	760	2,894	5.5	1,310.0	1,310.0	1,310.2	0.2
AF	53,341	725	2,291	7.0	1,314.6	1,314.6	1,314.6	0.0
AG	54,344	688	3,321	4.8	1,317.7	1,317.7	1,317.9	0.2
AH	54,925	780	3,171	5.0	1,318.7	1,318.7	1,318.8	0.1
AI	55,099	706	2,060	7.8	1,319.0	1,319.0	1,319.1	0.1
AJ	55,105	746	2,330	6.9	1,319.2	1,319.2	1,319.2	0.0
AK	55,348	652	3,999	4.0	1,320.1	1,310.1	1,320.1	0.0
AL	56,298	648	1,797	8.9	1,321.7	1,321.7	1,321.7	0.0
AM	57,301	637	3,412	4.7	1,325.3	1,325.3	1,325.3	0.0
AN	58,304	652	1,719	8.4	1,327.1	1,327.1	1,327.1	0.0
AO	58,674	684	3,049	4.8	1,329.2	1,329.2	1,329.2	0.0
AP	58,954	666	2,159	6.7	1,329.4	1,329.4	1,329.4	0.0
AQ	58,959	595	1,779	8.2	1,329.4	1,329.4	1,329.4	0.0
AR	59,360	670	1,807	8.0	1,331.5	1,331.5	1,331.5	0.0
AS	60,364	651	2,387	6.1	1,336.5	1,336.5	1,336.5	0.0
AT	61,472	629	2,622	5.5	1,339.4	1,339.4	1,339.4	0.0
AU	62,317	659	1,683	8.6	1,342.8	1,342.8	1,342.8	0.0
AV	62,476	645	2,303	6.3	1,344.1	1,344.1	1,344.1	0.0
AW	63,479	658	3,408	4.3	1,346.2	1,346.2	1,346.2	0.0
AX	100 - YEAR		FLOOD		CONTAINED		IN	CHANNEL

[1]Feet Above Confluence With Salt River

REVISED TO REFLECT LOMR DATED JUN 0 7 1994

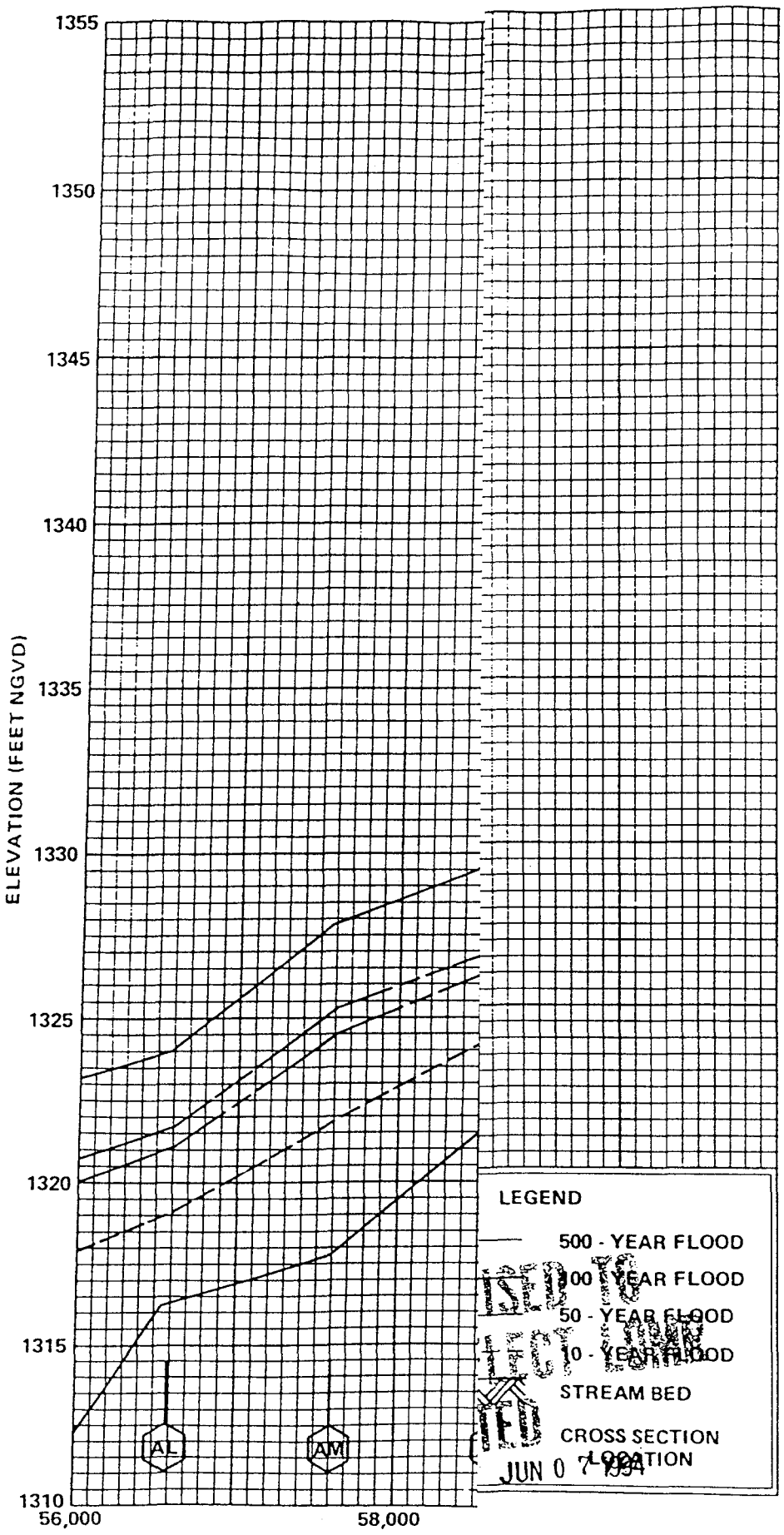
TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

INDIAN BEND WASH



JUN 0 7 1994

FLOOD PROFILES

INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

SECTION 1: General Description and Correspondence

1.4.6. FEMA Technical Consultant

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 98-09-253P

The Honorable Don Stapley
Chairperson, Maricopa County
Board of Supervisors
301 West Jefferson, 10th Floor
Phoenix, Arizona 85003

Community: Maricopa County, Arizona
Community No.: 040037
Panels Affected: 04013C2160 D and 2170 E
Effective Date of This Revision: MAY 1 5 1998

102-I-A-C

Dear Mr. Stapley:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated December 29, 1997, Mr. Afshin Ahouraiyan, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise the FIRM and FIS report to show the effects of a detailed hydraulic study and more detailed topographic information for Indian Bend Wash from its confluence with the Salt River to 40th Street.

All data required to complete our review of this request were submitted with letters from Mr. Ahouraiyan.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and FIS report. We have revised the FIRM and FIS report to modify the floodplain boundary delineations and zone designations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along Indian Bend Wash. As a result of the modifications, base flood elevations (BFEs) for Indian Bend Wash were added; the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, decreased; and a regulatory floodway was added. The modifications are shown on the enclosed annotated copies of FIRM Panel(s) 04013C2160 D dated April 15, 1988, and 04013C2170 E dated September 4, 1991; Profile Panel(s) 211P; and affected portions of the Floodway Data Table. This Letter of Map Revision (LOMR) hereby revises the above-referenced panel(s) of the effective FIRM and the affected portions of the FIS report dated September 30, 1995.

Because this revision request also affects the Cities of Tempe, Scottsdale, and Phoenix and the Town of Paradise Valley, separate LOMRs for those communities were issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panel(s) as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Approximately 3,000 feet upstream of confluence of Salt River	None	1,166

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the proposed modified BFEs will be given in the *Arizona Republic* on or about June 11 and June 18, 1998. A copy of this notification is enclosed. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Republic*, a citizen may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs presented in this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We are processing a revised FIRM and FIS report for Maricopa County and Incorporated Areas; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the FIRM and FIS report were submitted to your community for review on December 24, 1997. We will incorporate the modifications made by this LOMR into the countywide FIRM and FIS report before they become effective.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development, and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

The basis of this LOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and culvert rests with your community.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Dorothy M. Lacey
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
The Presidio of San Francisco, Building 105
San Francisco, California 94129-1250
(415) 923-7177

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the CCO for your community at the telephone number cited above. If you have any technical questions regarding this LOMR, please contact Mr. Mike Grimm of our staff in Washington, DC, either by telephone at (202) 646-2878 or by facsimile at (202) 646-4596.

Sincerely,

for Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosure(s)

cc: See attached

cc: The Honorable Neil Giuliano
Mayor, City of Tempe

The Honorable Sam Kathryn Campana
Mayor, City of Scottsdale

The Honorable Marvin Davis
Mayor, Town of Paradise Valley

The Honorable Skip Rimsza
Mayor, City of Phoenix

Mr. Afshin Ahouraiyan
Engineering Division
Flood Control District of Maricopa County

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

Mr. Raymond U. Acuña, P.E.
Floodplain Manager
City of Phoenix

Mr. William Mead, P.E.
Town Engineer
Town of Paradise Valley

Mr. William Erickson
Drainage Planner
Transportation Planning Department
City of Scottsdale

Mr. Howard Hargis, P.E.
City Engineer
Public Works Department
City of Tempe

Mr. Dennis Richards, P.E.
Vice President
Simons, Li and Associates, Inc.

RECEIVED APR 2 1 1998
PAZ-MC-16

Federal Emergency Management Agency

Washington, D.C. 20472

April 21, 1998

Mr. Afshin Ahouraiyan
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

IN REPLY REFER TO:
Case No.: 98-09-253P
Communities: Cities of Paradise Valley, Phoenix, Scottsdale, and Tempe, Arizona
Community Nos.: 040049, 040051, 045012, and 040054

316-AD/ACK

Dear Mr. Ahouraiyan:

This acknowledges receipt of additional data in support of your request for a Letter of Map Revision for the above-referenced community. Pertinent information about the request is listed below.

Identifier:	Floodplain Delineation for Indian Bend Wash
Flooding Source:	Indian Bend Wash
FIRM Panel(s) Affected:	04013C1680 F, 1690 E, 1695 F, 2160 D, and 2170 E
FBFM Panel(s) Affected:	04013C2160

Our review of the data submitted indicates we have the minimum data needed to continue our evaluation. If we need additional data to complete our evaluation, or if delays are encountered, we will notify you in writing within 30 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions about the status of your request, please call our Technical Evaluation Contractor, Michael Baker Jr., Inc. The Revisions Coordinator for your state, Ms. Pernille Buch-Pedersen, may be reached at (703) 317-6224.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

cc: Ms. Terri Miller
State Coordinator
National Flood Insurance Program
Arizona Department of Water Resources

Mr. Raymond U. Acuña, P.E.
Floodplain Manager
City of Phoenix

Mr. William Mead, P.E.
Town Engineer
Town of Paradise Valley

Mr. William Erickson
Drainage Planner
Transportation Planning
City of Scottsdale

Mr. Howard Hargis, P.E.
City Engineer
Public Works Department
City of Tempe

Mr. Dennis Richards, P.E. ✓
Vice President
Simons, Li & Associates, Inc.

AZ-MC-16

RECEIVED FEB 23 1998

Federal Emergency Management Agency

Washington, D.C. 20472

FEB 17 1998

Mr. Afshin Ahouraiyan
Engineering Division
Flood Control District
of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

IN REPLY REFER TO:
Case No.: 98-09-253P
Communities: Cities of Paradise Valley, Phoenix, Scottsdale, and Tempe, Arizona
Community Nos.: 040049, 040051, 045012, and 040054

316-AD

Dear Mr. Ahouraiyan:

This is in reference to your December 29, 1997, request for a Letter of Map Revision for the above-referenced communities. In our earlier letter to you, we indicated additional data might be required to complete our review of the request. The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed below.

- The submitted topographic work map entitled "Floodplain Delineation Study for Indian Bend Wash," prepared by Simons, Li & Associates, Inc., dated September 19, 1997, indicates that the elevations shown are based on the North American Vertical Datum of 1988 (NAVD). The submitted revised conditions HEC-2 hydraulic computer model uses NAVD elevations. The effective Flood Insurance Study (FIS) for Indian Bend Wash was performed using elevations based on the National Geodetic Vertical Datum of 1929 (NGVD). Therefore, we have revised the HEC-2 model to use NGVD elevations. A copy of the revised HEC-2 model is enclosed. Please note that the floodplain boundary delineations shown on the submitted work map will not change as a result of the revised HEC-2 model. We corrected several negative surcharges in the revised HEC-2 model that resulted in minor changes to the floodway boundary delineations. Please advise in writing whether you concur with this model.

- The submitted HEC-2 model entitled "IBWH2.*," prepared by Simons, Li & Associates, Inc., did not include the low-chord and top-of-road elevations for the Papago Freeway bridge over Indian Bend Wash. From the submitted as-built plans it appears that the low chord is lower than the base flood elevation (BFE) and may cause an increase in BFEs at the upstream face of the bridge. Please include the Papago Freeway bridge in the HEC-2 model to determine the effects, if any, of the bridge on the BFEs, and revise the submitted topographic map accordingly. Note that no datum is referenced in the submitted as-built plans for the bridge. Please provide the datum referenced in the as-built plans.

Please send the required data directly to our Technical Evaluation Contractor at the following address:

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

Attention: Ms. Pernille Buch-Pedersen
(703) 317-6224

For identification purposes, you must include the case number referenced above on all correspondence. If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the revised fee schedule that became effective on October 1, 1996. A copy of the notice summarizing the revised fee schedule, which was published in the *Federal Register*, is enclosed for your information.

If you have any questions regarding this matter, please contact Mr. Mike Grimm of our staff in Washington, DC, either by telephone at (202) 646-2878 or by facsimile at (202) 646-4596.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosure(s)

cc: Ms. Terri Miller
State Coordinator
National Flood Insurance Program
Arizona Department of Water Resources

Mr. Raymond U. Acuña, P.E.
Floodplain Manager
City of Phoenix

Mr. William Mead, P.E.
Town Engineer
Town of Paradise Valley

Mr. William Erickson
Drainage Planner
Transportation Planning
City of Scottsdale

Mr. Howard Hargis, P.E.
City Engineer
Public Works Department
City of Tempe

Mr. Dennis Richards, P.E. ✓
Vice President
Simons, Li & Associates, Inc.

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

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

COVER SHEET

TO: Dennis Richards

Company or Department: SLA **Fax #** 491-1396

FROM: Afshin Ahouraiyan

Number of pages being sent including Cover Sheet: 3

Comments: Attached are copies of FCD letter of request for a search & their response. Their cover sheet explains what area is covered by their search. Any questions, please call 506-1501. Thanks,

Afshin

Baker

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

(703) 960-8800
FAX (703) 960-9125

FAX TRANSMITTAL COVER SHEET

DATE: 12.10.96

TO: MR. AFSHIN AHOURAIYAN

FIRM: FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FAX #: (602) 506 - 4601

FROM: VENKATRAJ VENKATALAH

FIRM: MICHAEL BAKER, JR., INC.

THIS FAX CONSISTS OF 3 PAGES, INCLUDING THIS SHEET.

SPECIAL INSTRUCTIONS:

INVOICE

1. TEMPE, AZ - APPROX. STUDY. NO DATA AVAILABLE
2. SCOTTSDALE, AZ. - DETAILED STUDY. DATA ON MICROFICHE DO NOT MATCH
3. PARADISE VALLEY, AZ. - DATA AVAILABLE (MATCH X-SECS. ~~Z~~ - AX)
4. SCOTTSDALE, AZ. - DETAILED STUDY, DATA ON MICROFICHE DO NOT MATCH

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
Ed King
Tom Rawles
Don Stapley
Mary Rose Garrido Wilcox

October 4, 1996

FEMA Project Library
c/o Michael Baker, Jr. Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

To whom it may concern:

The Flood Control District of Maricopa County (District) is requesting that a library search be done for the Indian Bend Wash (IBW) Flood Insurance Study models (diskette format preferred). This request is for the entire reach of IBW starting at its outfall at Salt River and moving upstream through the Cities of Tempe, Scottsdale and Paradise Valley, ending at 32nd Street in City of Phoenix.

Per the CLOMR procedures, the current effective models should be included with the new submittal. However, none of the jurisdictions have a copy of the Flood Insurance Study models, which include the HEC-1 and HEC-2 models.

Enclosed is our check for $90 to begin this search. If you have any questions on this request, please feel free to contact me at (602)-506-1501.

Sincerely,

A. Ahouraiyan

Afshin Ahouraiyan

cc: File

Baker

Michael Baker Jr., Inc.
4301 Dutch Ridge Road
Beaver, PA 15009
(412) 495-7711
FAX (412) 495-4001

Letter of Transmittal

To: Simon Li Associates
4600 South Mill Avenue, Suite 200
Tempe, AZ 85282`

S.O. No. 20835-000-0000-00100
Project: Scottsdale Indian Bend Wash
Date: December 28, 1994

Attn: Tim Morison

We Are forwarding the following: ■ Attached ❑ Under Separate Cover

NO. COPIES	TITLE OR DESCRIPTION
1	3 1/2" DOS diskette containing the contour design file for sheet 1046 of the Indian Bend Wash mapping. Replaces original submittal that did not tie correctly with sheet 1146.

THESE ARE TRANSMITTED as checked below:

■	As requested	❑	No exceptions taken	❑	Revise and resubmit
❑	For review and comment	❑	Rejected - See remarks	❑	Submit specified items
❑	For your information	❑	Proceed subject to corrections noted	❑	_____

GENERAL COMMENTS:

Michael Baker Jr., Inc.

By: Gary D. Eaton

Title: Supervisor Mapping Service

Page 1 of 1

Shipped: ☑UPS
__①next day
✓②2nd day

☐Federal Express
__①priority
__②standard
__③economy

SECTION 1: General Description and Correspondence

1.4.7. Copy of Public Notice

INVOICE NO. 94338

ANNOUNCEMENT OF FLOOD HAZARD STUDY

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

Indian Bend Wash from the confluence of the Salt River (Tempe) to 32nd Street and Acoma Road (Phoenix).

The study is being performed for the Flood Control District by Simons, Li & Associates, Inc. (SLA) of Tempe, Arizona.

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

This announcement is intended to notify all ested persons of the commencement of this so that they may have an opportunity to any relevant facts and technical data con- ning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be furnished to Mr. Pedro Calza, Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, telephone (602) 506-1501, for Simons, Li & Associates, Inc.'s use in performing the study.

Published: Arizona Republic, June 15,22, 1994.

AFFIDAVIT OF PUBLICATION

RECEIVED SEP 1 9 1996

THE ARIZONA REPUBLIC
THE PHOENIX GAZETTE

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

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

The Arizona Republic The Phoenix Gazette
June 15, 22, 1994

Sworn to before me this
17TH day of
September A.D. 1996

OFFICIAL SEAL
DEBBIE WILSON
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires Jan. 9, 1999

Notary Public

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT FCDMC JOB NO. AZ-MC-16 PAGE 1/1
PROJECT IBW FIS DATE CHECKED DATE 6/23/94
DETAIL Announcement of Study CHECKED BY COMPUTED BY

4 The Arizona Republic/THE PHOENIX GAZETTE Wednesday, June 22, 1994

INVOICE NO. 94338

ANNOUNCEMENT OF FLOOD HAZARD STUDY

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

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This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical date concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be furnished to Mr. Pedro Calza, Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009; telephone (602) 506-1501, for Simons, Li & Associates, Inc.'s use in performing the study.

Published: Arizona Republic, June 15,22, 1994.

RECORD OF CONVERSATION

Simons, Li & Associates, Inc.

DATE: 13 SEP 96 PROJECT NAME/NO.: MC - 16

RECORDED BY: Mike Ternak OWNER/CLIENT: MC

TALKED WITH: AZ Rep/Gazette Legal Advertisement OF (TOM)
271-7315

NATURE OF CONVERSATION:

TELEPHONE: INCOMING ☐ OUTGOING ☑

MEETING: OFFICE ☐ SITE ☐

ITEMS DISCUSSED:

Requested Affadavit of Publication for Announcement of Flood Hazard Study Ad from Jun 15 & 22, 1994.

Tom collected all info & was going to get back w/ me

CC:

☑ INFORMATION ☐ ACTION

ADMIN\FORMS.SLA\RECORD.S-1

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT FLOOD CONTROL MC
PROJECT IBW
DETAIL ANNOUNCEMENT
SCOTTSDALE PROGRESS

JOB NO. 2-MC-16
DATE CHECKED
CHECKED BY

PAGE
DATE 6/24/94
COMPUTED BY KAB

ANNOUNCEMENT OF FLOOD HAZARD STUDY

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

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Pub June 16 & 23, 1994
S-565446

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT FLOOD CONTROL MC
PROJECT IBW
DETAIL ANNOUNCEMENT
SCOTTSDALE PROGRESS

JOB NO. 12-MC-16
DATE CHECKED
CHECKED BY

PAGE
DATE 6/24/94
COMPUTED BY PAE

ANNOUNCEMENT OF FLOOD HAZARD STUDY

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

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This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be furnished to Mr. Pedro Calza, Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, telephone (602) 506-1501, for Simons, Li & Associates, Inc.'s use in performing the study.

Pub June 16 & 23, 1994
S-565446

FILE: HE-MC-16

Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

June 10, 1994

Tribune Newspapers
P.O. Box 1547
Mesa, Arizona 85211

Attn: Legal Department

RE: LEGAL AD #565446 FOR SIMONS, LI & ASSOCIATES, INC.

Dear Legal Department:

Enclosed is a check for $50.92 as payment for publication of the attached advertisement in the Scottsdale Progress. The advertisement needs to run twice in the paper over a week apart.

Additionally, we would request an Affidavit of Publication be forwarded to us after the ad runs. Please include a copy of the ad, the run dates and an indication of the distribution area (i.e. zones, zip codes or cities) with the affidavit.

If you have any questions I can be reached at 491-1393. Thank you for your assistance.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Christopher J. Pauley

Christopher J. Pauley

CJP

attachments: SLA Check #2104
Announcement Of Flood Hazard Study

4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
An Equal Opportunity Employer

2104

SIMONS LI & ASSOCIATES, INC.
4600 S. MILL AVE. 491-1393
TEMPE, AZ 85282

91-265/1221

JUNE 13, 1994

PAY TO THE ORDER OF TRIBUNE NEWSPAPERS $ 50 92

Fifty and 92/100 DOLLARS

CITIBANK
CITIBANK (ARIZONA)
64 EAST BROADWAY
TEMPE, ARIZONA 85282-1391

FOR AZ-MC-16

Dennis L. Richards

⑈002104⑈ ⑆122102653⑆ ⑈6405401053⑈

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants
4600 S. MILL AVENUE
SUITE 200
TEMPE, ARIZONA 85282

29 USA

Tribune Newspapers
P.O. Box 1547
Mesa, Arizona 85211
Attn: Legal Department

Tribune
NEWSPAPERS

June 9, 1994

Simons, Li & Associates, Inc.
Attn: Chris Pauley
4600 South Mill Avenue, Suite 200
Tempe, AZ - 85282

RECEIVED

Re: ANNOUNCEMENT OF FLOOD HAZARD STUDY
Ad #565446

Dear Tribune Newspapers Legal Advertising Customer:

We have completed the necessary typesetting of your legal advertisement.

In order to accommodate your publising requirements, Tribune Newspapers requires prepayment in the form of cash, check, money order or Visa/Mastercard, no later than the 24 day of June, 19 94.

The cost of your advertisement is listed below according to your choice of publication.

Publication	Ad Cost
Mesa/Gilbert	
Tempe	
Chandler	
Scottsdale	$50.92

Payment sent under separate cover letter via reg. mail on 6/13/94 CJP

Should you have any questions, please feel free to contact Tribune Newspapers Legal Advertising Dept. at 898-6591.

spoke w/ Connie @ 8:30 on 6/16
- rcvd pymt on 6/15/94
- ad will run on 6/16 & 6/23
CJP

Sincerely,

Connie Richmond

Connie Richmond
Legal Advertising Department

Please Detach & Remit With Payment

To: Tribune Newspapers
Legal Advertising Dept.
P. O. Box 1547
Mesa, AZ - 85211

Attn: Connie
Legal Dept.

Ad No. 565446

Check ____ Cash ____

Visa ____ Mastercard ____

If you wish to pay for your advertising using your Visa, Mastercard or Amer. Express PLEASE SIGN BELOW.

Card No. _____ Exp. Date _____

Name as it appears on card _____

SIGNATURE _____

AZ-MC-16

Community

Study focusing on wash

Has development hurt Indian Bend?

By Herb Whitney
Staff writer

The Flood Control District of Maricopa County has begun an 18-month study to evaluate what physical changes — if any — have occurred to the Indian Bend Wash because of urban development.

"We want to find out the amount of water feeding into the wash, and how long it takes the wash to convey floodwaters to the Salt River," said Pedro Calza, a county flood plain branch manager who is overseeing the study.

"We were asked by the various cities involved to measure the cumulative effect of possible changes along the whole wash."

The 15-mile-long Indian Bend Wash is a natural rainwater drainage that flows in roughly a north-south direction through Phoenix (4½ miles), Paradise Valley (2½), Scottsdale (7 miles) and Tempe (1 mile), where it meets the Salt River.

The upstream portion begins in northeast Phoenix, near 32nd Street and Acoma Road.

The mapping of the wash is based on information gathered in the 1960s and

See FLOOD, Page 4

FLOOD

From Page 1

'70s by the U.S. Army Corps of Engineers when it made improvements to its southern portion in Scottsdale, Calza said.

"Since then we have no comprehensive study of the whole system," he said. "Scottsdale and Phoenix have made some improvements, and ADOT (the Arizona Department of Transportation) has built a bridge in Tempe at the wash's confluence with the Salt.

"None of this has ever been looked at. We want to know how all the construction is affecting the wash, how all the little bits from the different cities are impacting the whole system."

The study also will determine the hazards and boundaries of a 100-year peak flood and will be submitted to the Federal Emergency Management Agency for use in flood insurance rate maps.

"A 100-year flood means there's a 1 percent chance of water reaching the designated level in any given year," Calza said.

The Squaw Peak Parkway, under construction in north Phoenix, could be affecting the wash, Calza said.

"The Squaw Peak may have changed the amount of water coming off the northern portion of the watershed. It may have changed the flow."

Calza thinks urban development near the wash probably hasn't had a major effect because "it was over-designed by the engineers."

The study, which will cost $209,000, will evaluate such physical changes as channel modifications, storm drain installations and land subsidence.

Scottsdale, which has begun a hydrologic study of the wash within its borders, will supply information to the county to aid in its overall evaluation, Calza said.

With the help of the Corps of Engineers, Scottsdale developed the Indian Bend Wash greenbelt in the '60s and '70s as a string of city parks that does double-duty as a major wash in rainy weather.

On Oct. 6, floodwaters stormed through the wash and caused $60,500 in damage to three parks — Chaparral, Indian School and Eldorado.

It also damaged several pedestrian bridges and the man-made shoreline at two city lakes.

Still, the wash worked "extremely well" — considering as much as 3.7 inches of rain fell in northern Scottsdale in a few hours, a city report said.

The Arizona Republic/THE PHOENIX GAZETTE Friday, August 12, 1994

Has growth hurt Indian Bend Wash?

Flood district starts damage assessment

By Herb Whitney
Staff writer

The Flood Control District of Maricopa County has begun an 18-month study to evaluate what physical changes — if any — have occurred to the Indian Bend Wash because of urban development.

"We want to find out the amount of water feeding into the wash, and how long it takes the wash to convey floodwaters to the Salt River," said Pedro Calza, a county flood plain branch manager who is overseeing the study.

"We were asked by the various cities involved to measure the cumulative effect of possible changes along the whole wash."

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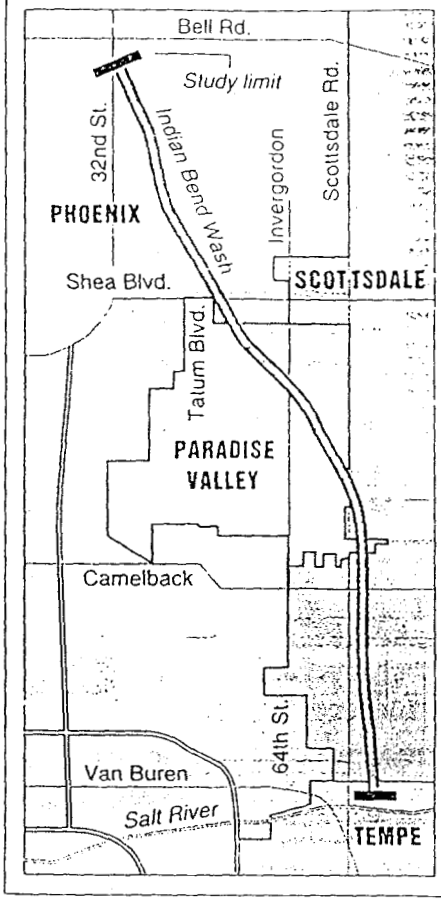
The upstream portion begins in northeast Phoenix, near 32nd Street and Acoma Road.

The existing mapping of the wash is based on information gathered in the 1960s and '70s by the U.S. Army Corps of Engineers when it made improvements to its southern portion in Scottsdale, Calza said.

"Since then we have no comprehensive study of the whole system," he said.

See FLOOD, Page 2

Flood plan study



FLOOD

From Page 1

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vers his wheelchair into his living room to greet his visitors. The two visitors, Carol and Hazel Strand of Scottsdale, hand containers of hot baked chicken, potatoes, and bags of fruit and rolls to Brown and his wife, Margaret.

It is Thursday morning, but the Browns greet volunteers from Scottsdale's home-delivered meal program with the same warmth every weekday.

"The Browns are an inspiration to us," said Hazel Strand, who, along day a week.

"They're beautiful as far as we are concerned," said Brown, returning the compliment. Brown said he and his wife were once volunteers for their church's home-delivered meals program, but now require the service themselves.

The program is funded by the Area Agency on Aging and private donations and is coordinated by the Tempe Community Action Agency. Volunteers deliver about 80 meals — prepared by Marriott staff at Arizona dinators say they need more people like the Strands so they can help more people like the Browns. But, in the hot summer months, volunteers are hard to come by.

"The caseload has grown so great that our routes are getting longer and longer, and this time of year it's hard to get volunteers," said Scottsdale resident Carla — her legal name is simply Carla — a staff member at the Concord Community Center in north

Please see **Meals** / A5

tank and an armored personnel carrier near a hospital and a school. That would make it nearly impossible for NATO planes to try to hit the weapons because of the danger of hitting civilians.

It was not immediately known whether the tank targeted was the one Holloway referred to.

U.N. officers had previously demanded from the Serb military that they immediately return the weapons, but negotiations dragged on, apparently without result.

Please see **Serbs** / A5

What happens in a 100-year flood?

Yearlong, $209,000 county study to examine Scottsdale's greenbelt

Mark J. Scarp
Tribune writer

A comprehensive engineering study of the Indian Bend Wash is under way. The goal: To find out exactly how much floodwater Scottsdale's signature greenbelt will hold during a big "100-year" flood.

City officials examining drainage throughout Scottsdale have called in the Maricopa County Flood Control District to study the 15-mile wash's flood-control system, first proposed in 1969 and built in stages over the next 35 years.

The $209,000, yearlong study will assess how modifications to the channel, new storm drainage systems and changes to the land have affected the wash, said the district's project manager, Pedro Calza.

"My understanding is that there does not exist one comprehensive model for the wash, just little bits and pieces put together over the years," Calza said.

County engineers will use computer models to define the limits of flooding on the wash and smaller washes and gullies that feed into it, he said.

The system of parks created in the seven-mile stretch of the wash through Scottsdale has been considered a significant engineering innovation that has boosted the city's image.

Created as an alternative to an original U.S. Army Corps of Engineers plan to build a concrete channel through Scottsdale that would have been 140 feet wide and 25 feet deep, the wash's "greenbelt" has been often imitated elsewhere.

Federal authorities have hailed the greenbelt as an innovative solution to the problem of urban life in a floodplain.

The wash, which begins near 32nd Street and Bell Road in Phoenix, runs through 4.5 miles of Phoenix, 2.6 miles of Paradise Valley, 7 miles of Scottsdale and 1 mile of Tempe before emptying into the Salt River.

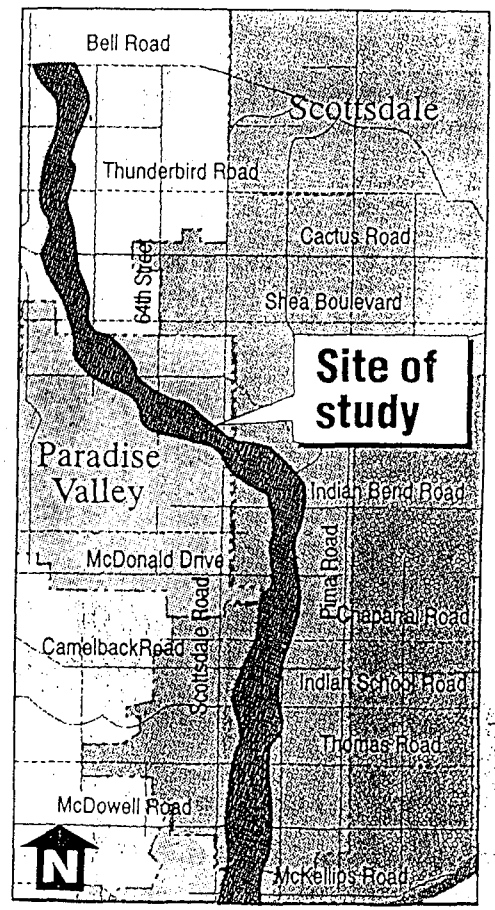
While menacing, a storm that dumped up to five inches of rain in parts of Scottsdale Oct. 6 and tied up traffic for several hours was too small to be considered a "100-year" storm, he said.

The city is moving forward with plans to duplicate the Indian Bend Wash's success in flood control and recreation in northern areas of the city.

City public works planner Collis Lovely said plans are being prepared for the Desert Greenbelt project on McDowell Mountain Ranch as well as examining drainage in Scottsdale south of the Central Arizona Project canal.

While last year's flooding was not the reason for the study, which was planned for other reasons, it did have one effect on city officials, Lovely said.

"The October flood woke everybody up that Indian Bend Wash is a flood plain," he said.



Tribune

SECTION 1: General Description and Correspondence

1.5. Contract Documents

FLOOD CONTROL DISTRICT
of
Maricopa County

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

BOARD OF DIRECTORS
Betsey Bayless
James D. Bruner
Ed King
Tom Rawles
Mary Rose Garrido Wilcox

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

MAR 0 8 1994

March 4, 1994

Mr. Dennis L. Richards
Vice President
Simons, Li & Associates, Inc.
4600 South Mill Avenue, Suite 190
Tempe, Arizona 85285

SUBJECT: Contract FCD 93-05, Indian Bend Wash Floodplain Delineation

Dear Mr. Richards:

This letter will serve as confirmation of the March 3, 1994 verbal Notice To Proceed for the work under the above-referenced contract that was approved by the Board of Directors on March 2, 1994.

A fully executed contract will be forwarded to you, upon receipt from the Board. If you have any questions regarding work under the contract, please contact Jan Opstein at 506-1501.

Sincerely,

Leanna Cumberland
Chief, Contracting Branch

hho

INFO: JMO

File: FCD 93-05

SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION
FOR INDIAN BEND WASH

GENERAL

The project consists of approximately 16 river miles of floodplain and floodway delineations for Indian Bend Wash from the confluence of the Salt River to 32nd Street and Acoma Road, as shown on Exhibit 1. The consultant will be required to assess existing hydrology and historical hydrology for completeness and develop a hydrology model using HEC-1 for 6 square miles of watershed for those areas not covered in the existing hydrology. These models are to be compiled into one working hydrology model for determination of the floodplain delineation.

The consultant will develop the floodplain and floodway delineations using the HEC-2 computer model. The consultant must use sound engineering judgement in the compilation of the hydrologic and development of the hydraulic models. The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA prior to the finalization of this contract.

All work under this Scope will be completed within 400 calendar days from the date of Notice to Proceed, including 100 days for District reviews. This schedule is based on all topographic mapping for Indian Bend Wash from the confluence of the Salt River to 32nd Street and Acoma Road being furnished to the consultant by June 15, 1994. If all mapping is not furnished to the consultant by stated date, the calendar days to complete this Scope will be increased by one day for each day that delivery of mapping extends beyond June 15, 1994.

TASK 1 - COORDINATION

1.0.0 The consultant will submit an estimated project budget broken out quarterly for billing and a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 14 days of Notice To Proceed. The consultant shall update this project schedule when appropriate.

1.1.0 The consultant shall participate in regular coordination meetings (at least every three weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.

1.2.0 The consultant shall submit to the District's Project Manager, monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:

1.2.1. A description of the work accomplished by task during the reporting month.

1.2.2. Percent (%) completed for the month and percent (%) cumulative completed for each task.

1.2.3 A brief description of the work to be accomplished the following month.

1.2.4 A description of any obstacles encountered, such as mapping delays, aerial flight delays, mapping delays, etc., that may delay the project schedule.

1.3.0 The consultant is responsible for placing the legal advertising at the beginning of the study, notifying the public of the study. The ad will be run in a widely circulated newspaper two times, with approximately one week between runs. The ad must also be run two times in a local newspaper that serves the area being studied. After the ad is run the consultant will supply the District with the original affidavits of publication

from the newspaper(s) for each day that the ad ran. A copy of the affidavits of publication is to be included in the ADWR Technical Document Notebook SSA 1-90 (TDN), section 1.4.7.

1.4.0 The consultant will notify all property owners and obtain any necessary Rights of Entry for the study area. The District will assist the consultant as may be necessary to complete this task. The consultant will furnish the District with a list of all the property owners notified and a sample Right of Entry letter. Copies of the mailing list and right of entry letter are to be included in TDN section 1.4.7.

1.5.0 The consultant shall meet with officials from the City of Scottsdale, Town of Paradise Valley, City of Phoenix, Tempe and ADWR. The purpose of this meeting is to identify local flooding problems, land subsidence and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and obtain the current corporate limits. Meetings are to be documented and included in the FEMA submittal.

1.6.0 The District will plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the purpose and scope of the study. The second meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. One representative from the consultant will attend each of the meetings. The consultant will respond to the comments from the public and make revisions to the study if necessary.

1.7.0 The consultant shall complete and submit all applicable Applications/Certification forms required by FEMA for a Physical Map Revision. This is to be compiled under separate cover.

1.8.0 There will be two informal evaluations (Consultant/District Performance Evaluation) to be performed upon completion of the HEC-1 model and upon completion of the floodplain natural profile model for IBW (informal). Two formal evaluations are to be conducted, one upon approval of the hydrology model and the other at final draft of the floodplain mapping.

TASK 2 - DATA COLLECTION

2.1.0 The consultant will collect and review pertinent data from the District, City of Scottsdale, City of Phoenix, Town of Paradise Valley, Tempe and ADWR. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; land subsidence; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

2.2.0 A written report summarizing the data collected will be submitted to the District for information purposes. A preliminary draft of this report is due within 90 days of Notice to Proceed. The final report is to be included in the TDN section VI.

TASK 3 - TOPOGRAPHIC MAPPING

To be provided by the Flood Control District of Maricopa County.

TASK 4 - FIELD SURVEY

4.0.0 Field surveys or "as-builts" of all bridges, culverts, and hydraulic structures are to be obtained by the consultant. This information should be compiled in tabular format for inclusion in the final report. The information presented in the drawing should be in a format appropriate for use in the HEC-2 model. Field survey or "as-built" plans of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1988 NAVD.

4.1.0 The consultant will compile ERM marks and present elevations and description in tabular format to be included into the TDN Section 2.1 for FEMA submittal. Note: it is the responsibility of the Consultant to compile and present the ERM data in tabular format from the provided survey.

4.2.0 The consultant will compile and present all hydraulic structures within the delineated flood hazard area in plan view to include skew angle, cross section location, distances between cross sections, and length of structure. In addition, present the up and downstream faces of the structure with the road profile to consist of low cord elevation, invert, top of road, and ineffective flow areas. Each plan view shall be placed on a sheet no larger than 11" x 17" to be included into the TDN Section 4.3 for FEMA submittal.

TASK 5 - HYDROLOGY

The hydrologic study of the watershed will be delivered to the District under separate cover from the hydraulic analysis. The hydrologic study area shall be all the area contributing to the Indian Bend Wash south of the Central Arizona Project Aqueduct. Most of the contributing areas have been studied before. The consultant should review the hydrology work for these existing projects and utilize them so that the total watershed will have a consistent hydrological model. These models should be carefully reviewed to make sure that all the contributing areas and side channels to Indian Bend Wash have been taken into consideration.

The consultant shall be in close contact with the FCD staff while reviewing the above mentioned projects. Meetings should be scheduled as needed, such that the FCD staff would have enough time to review the comments made by the consultant on these reviews.

<u>The following tasks needs to be done for the areas that have no existing hydrology models.</u>

5.1 The consultant shall use the 1991 U.S. Army Corps of Engineers computer program HEC-1, 4.01 Version, to develop a hydrologic model for the area. The methods and procedures in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology will also be used. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations, or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for the hydrology report. Field surveys will need to be taken for hydrologic modeling purposes.

5.2 Hydrologic models shall be developed for the 100-year, 6-hour and 24-hour existing conditions.

5.3 It is required that the consultant obtain the approval of the District at each of the following steps:

a. Soil maps, watershed boundary maps, and land use maps.
b. HEC-1 parameter estimation.
c. HEC-1 flow diagram and input parameters.
d. HEC-1 results.

5.4 Four meetings associated with four tasks, and two field trips shall be held with the Flood Control District staff at the following milestones:

a. One field trip at the start of the project to scope out the critical points of the watershed and problem areas.

b. Meeting number 1 as soon as basic data are gathered and the sub-basins have been delineated. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.

c. Meeting number 2 after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.

d. Meeting number 3 after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and the copy of the HEC-1 on a floppy disc, compatible with the Districts computer, must be delivered two weeks prior to the meeting.

e. Meeting number 4 to review comments by the District one week after the consultant has received the review comments. The District will require a minimum of two weeks to review the report and the model. A second field trip may be scheduled for the same day so the results obtained can be discussed.

5.5 The consultant will develop the hydrologic base maps using the mapping supplied by the City of Scottsdale. For those areas not covered by the supplied mapping, U.S. Geological Survey (USGS) topographical quadrangle maps will be used. An overall watershed drainage basin map with sheet index will be prepared at a scale of 1 inch =2000 feet.

5.6 Using appropriate hydrologic judgement, sub-basins are to be identified that provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin break-downs will be done in sufficient detail to provide peak discharges at structures, major road crossings, confluences, at the study boundary limits, and at other intermediate points. The District will provide a map showing some of the critical concentration points to be considered as a minimum.

5.7 The specific hydrologic techniques to be used in this study are:

a. Rainfall Depth: Point precipitation values will be determined using the information and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology.

b. Rainfall Distribution: Peak discharges and peak volumes for the 100-year storm shall be consistent with City of Scottsdale's final hydrology analysis.

c. Areal Reduction: The point precipitation values will be areally reduced for critical concentration points. Areal reduction for the 6 hour rainfall duration will be applied using the curves in the Drainage Design Manual for Maricopa County, Arizona:Volume I, Hydrology. NOAA HYDRO-40 will be used with the 24 hour rainfall reduction. Copies can be obtained from the District.

d. Rainfall Excess: The SCS methodology will be utilized for estimation of rainfall losses. The Lotus spreadsheet and procedures, provided by the District, will be used to determine composite parameter values for each sub-basin. The soil data maps will be provided to the consultant by the FCD as a form of GIS files to be used for soil calculations.

e. Unit Hydrograph: The Clark and S-Graph method should be used following the procedures outlined in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology. The choices in methodology will be at the recommendation of the consultant, with approval from the District.

f. Time of Concentration and S-Graph Lag Equation: The Papadakis method should be used with the Clark unit hydrograph, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, should be used with the appropriate S-graph (Phoenix mountain or Phoenix Valley).

g. Channel Routing: Channel routing will be accomplished using either the Muskingum-Cunge or the Normal-Depth or the Kinematic Wave option of HEC-1. The choice of methodology will be at the discretion of the consultant, with consent from the District. Average cross sections will be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections will be taken to ensure that routing reaches are reasonable and representative of field conditions. The HEC-1 routing parameters for the reaches modeled using HEC-2 will be adjusted after the HEC-2 cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

h. Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

i. Channel Transmission Losses: Attempts should be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge so and explain how the peaks and volumes of flow are affected by not including the transmission losses.

5.8 The District will provide appropriate references to facilitate parameter estimation.

5.9 The consultant shall review the hydrologic model's result for accuracy and reasonableness. Adjustments to input for obtaining the most realistic results is normal to the scope.

5.10 Every attempt must be made to recover historic stream gage data and use it to compare with the results obtained by the hydrologic model. Major differences must be discussed in the final report.

5.11 The final hydrologic report should include the following sections and documentation using ADWR standards (as a minimum):

a. Scope of the study.

b. Description of the watershed.

c. Previous studies and reports.

d. Methodology.

e. Assumptions.

f. Results.

g. Comparison of the results with other studies and/or stream gages.

h. Conclusion.

i. List of references and agencies contacted.

5.11.1 Tables and Figures for the main Text:

a. Location map (maximum size 11"x 17") at the appropriate scale.

b. Table showing the flow peaks and volumes at critical concentration points for different rainfall events.

c. Table showing the critical peaks and volumes for major concentration points as compared to previous studies (where available).

d Table(s) showing the major parameters for all sub-basins (slope, area, soil loss calculations, friction, total rainfall, time of concentration or lag, major structures, etc.).

5.11.2 Tables and Figures for the appendices:

a. Topographic base map(s) showing the sub-basins, routing reaches, Tc flow paths or lag flow paths, major man-made structures, and references (i.e. street names, Township, Range, Section, etc.) at the scales defined in Task 5.5.

b. Soils map(s) at the same scale as the base map.

c. Land use map(s) at the same scale as above.

d. Schematic map for the HEC-1 showing the sub-basins (area, Tc), the flow paths, the routing reaches (length, slope, friction, width, velocities, transmission losses, etc.), order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate).

e. Pertinent data on all the structures in the watershed (such as spillway elevation, rating curves, etc.)

f. One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.

5.12 As part of the final products the consultant will supply the hydrologic data in conformance with District's HIS Data delivery Specifications.

Specific deviations from this hydrologic scope shall not be undertaken without the specific written concurrence from the Flood Control District.

TASK 6 - FLOODPLAIN AND FLOODWAY DELINEATION

6.0.0 Floodplain and floodway delineations must be obtained using the U.S. Army Corps of Engineers HEC-2 Water Surface Profiles computer model, version 4.6.2, May 1991, and methodology acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The consultant will prepare the study and delineation of flood hazard area using the latest FEMA Document 37, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.

6.1.0 The delineation study shall be based on the final results of the hydrologic study as determined in the hydrologic analysis.

6.2.0 The consultant will prepare working maps and models of the 100-year floodplain and floodway during the course of the hydraulic modeling analysis for review by the District at progress and milestone meetings. Floodways are to be determined using equal conveyance encroachment methods to start with, but only encroachment method 1 will be used in the final analysis.

6.3.0 The consultant must obtain District approval at each of the following steps:

6.3.1 Field reconnaissance report and estimation of Manning's "n" values.

6.3.2. Proposed location and alignment of the cross sections and channel centerline.

6.3.3 Floodplain (natural) delineation.

6.3.4 Floodway delineation using equal conveyance encroachment.

6.3.5 Floodway delineation using encroachment method 1.

6.4.0 The consultant will conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

6.4.1 Mannings "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.

6.4.2 A draft report on the field reconnaissance will be submitted to the District for review and approval prior to beginning the HEC-2 modeling. The report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values will be displayed on reduced scale mapping included in the report. The final report will be included in the Final Hydraulics portion of the FEMA submittal, TDN section 4.2.

6.5.0 The location and alignment of cross sections and channel centerline will be annotated on the draft maps and submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing will be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise. Identification of cross sections will be in river miles, increasing upstream. Cross section orientation may need to be altered after running the HEC-2 model to make sure that they are perpendicular to flow per FEMA criteria.

6.5.1 All cross sections are to be plotted to engineering scale. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews..

6.5.2 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model; (b.) a plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model; (c.) a plot of the final floodway model cross sections which will show Type 1 encroachments, and encroached water surface. These final plot cross sections will be submitted as part of the final hydraulic portion of the FEMA submittal (TDN section 4.3).

6.6.0 Bridges, culverts, and other hydraulic structures must be modeled in compliance with HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-2 modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures. Hydraulic structures in plan view or as-builts to be included in TDN section 4.3.

6.7.0 For floodplains identified as ponding areas, it is preferable to obtain a water-surface-elevation or depth of pond to provide the District with a regulatory base flood elevation If appropriate, the consultant shall identify in the ponded floodplains a regulatory floodway. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds, versus the creation of two independent ponds.

6.8.0 Flood zones must be determined according to FEMA criteria and clearly labelled on the final draft maps.

6.9.0 A conversion table with the conversion equations shall be included for; total area of the floodplain and floodway in square miles and hectares; and total length of river miles to be determined in river miles and kilometers, to be included as part of the narrative submittal.

6.10.0 Adjustments to the input parameters for obtaining the most realistic results is normal to the scope. The consultant will make the appropriate revisions to the HEC-2 model based on review of the model results by the District, City of Scottsdale, City of Phoenix, Town of Paradise Valley, Tempe, FEMA, and FEMA's Technical Evaluation Contractor (TEC).

TASK 7 - FEMA SUBMITTAL

7.0.0 The consultant will submit the following items through the District for review by FEMA's TEC. All of the following products are considered deliverables for the FEMA submittal:

7.1.0 Original Affidavits of Publication

7.2.0 Two (2) complete sets of blue line topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by person(s) of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

7.3.0 Three (3) Final sets of the survey notes.

7.4.0 Two (2) complete copies of ADWR TDN, including HEC-1 and HEC-2 input/output files on diskette. When possible print data on both sides of the paper for example, HEC-2 input/output; HEC-2 input/output; cross sections, etc.

7.5.0 The narrative format is outlined below:

I. Introduction
   - A. Purpose of study
   - B. Conversion equations table of english units to metric units on all volume, elevations, velocities, area, feet and length.
   - C. Authority for study
   - D. Coordination and acknowledgments
   - E. Public notification and contact

II. Area Studied
   - A. Scope of study
   - B. Community description
   - C. Principal flood problems
   - D. Flood protection measures

III. Engineering methods
   - A. Hydrologic analyses
   - B. Hydraulic analyses

IV. Floodplain Management applications (current and future)
   - A. Flood boundaries
   - B. Floodways
   - C. Hydraulic Structures

V. Insurance applications and CRS summary

VI. Other studies

VII. Location of data

*Note: The above documentation is to be a summary of what is included in the submitted report. Conversion equations and CRS summary shall each be on one sheet.

VIII. Bibliography

IX. Appendix (State Standard 1-90)

A. Study Documentation Abstract

B. Technical Documentation

7.1.0 Under separate cover two (2) sets of completed FEMA Application/Certification Forms for a Physical Map Revision.

TASK 8 - FINAL SUBMITTAL

8.0.0 Final Submittal: The flowing products are considered deliverables for the final submittal to the District after FEMA approval.

8.0.1 Digitized topographic data and floodplain/floodway boundaries in conformance with the District's HIS Specifications.

8.0.2 Five (5) additional hard copies of the completed TDN (excluding the survey notes).

8.0.3 Upon FEMA approval the consultant will incorporate all final correspondence and coordination meetings regarding FEMA's TEC, and other municipalities into the final report.

SECTION 2: Mapping and Survey and Information

SECTION 2: Mapping and Survey and Information

2.3 Survey Field Notes

sla Simons, Li & Associates, Inc.
Water Resources & Civil Engineering Consultants

April 11, 1996

Mr. Bill Erickson
City of Scottsdale
7447 East Indian School Road
Scottsdale, Arizona 85251

RE: REFERENCE MARK FOR INDIAN BEND WASH

Dear Mr. Erickson:

At our March 20, 1996, meeting you requested information regarding proposed reference marks. Presently two options appear the most feasible:

1. Utilize existing reference marks converted to NGVD 88. Commonly, the reference marks on the FIRM panels are either destroyed or relocated ever time. Survey crews would have to verify the existence of listed reference marks at the appropriate level of accuracy.

2. Utilize bench marks used for the control on the current topographic data set for the project.

Please let us know what is preferred by the City of Scottsdale. Should you have any questions or comment please contact either myself or Tim Morrison.

Sincerely,

SIMONS, LI & ASSOCIATES, INC.

Dennis L. Richards

Dennis L. Richards, P.E.
Vice President

cc: Pedro Calza, FCDMC
Afshin Ahouraiyan, FCDMC

DLR/TDM/hlk

[PAZ-MC-16]
rwp60d:mc-16.1

4600 South Mill Avenue, Suite 200 • Tempe, AZ 85282 • Phone: (602) 491-1393 • Fax: (602) 491-1396
An Equal Opportunity Employer

FAX SHEET

HDR

Memorandum

Date: 4-8-96

Number of Pages (includes cover page) 1

To: Tim Morrison FAX Number: 491-1396

Firm: Simons, Li & Associates

City: State:

From: HDR ENGINEERING, INC., PHOENIX

Name: Doug Emmons Dept. 044:

Telephone: (602) 248-6600 FAX (602) 265-6472 Job Number:

[redacted]

TYPE/SOURCE: ADOT PHOTO/MAPPING

DATE: SPRING 1995

DATUM: ADOT Adjusted Ground Grid

If you need more specific info contact

Lowell Heaton 255-7258 (ADOT Photo/Mapping)

NGVD 29

Bob Philps
255 8566
will provide datum @ location

NGVD + 0.6 m = NAVD

[redacted]

If you do not receive all of the pages, please call (602) 248-6600 as soon as possible.

HDR Engineering, Inc.

Suite 205
5353 N. 16th Street
Phoenix, Arizona
85016-3226

Telephone: (602) 248-6600
FAX Number: (602) 265-6472
Ext. 6621

Simons, Li & Associates, Inc.

RECORD OF CONVERSATION

Date: 12-23-94 Project No. PAZ MC 16

Recorded By: TIM MORRISON Client: FCD OF MC

Talked With: GARRY EATON Of MICHAEL BAKER JR.

Telephone: Incoming XX Outgoing __ Meeting: Office __ Site __

Items Discussed :

Subsequent to the initial HEC-2 runs for the Indian Bend Wash from the Salt River upstream to the Thomas Road bridge the estimated water surface elevations at McKellips Road were not within a reasonable range. This was evident in that: (1) the estimated water surface elevations were well above those in the effective flood insurance study adjusted from NGVD 1929 to NAVD 1988; and (2) the water surface upstream of Mckellips Road was at the top of the levee.

Investigation of the topo revealed that the area between map 10-46 and 11-46 (McKellips Road) was not a perfect fit. Subsequent to discussions with the City of Scottsdale, Michael Baker Jr., Inc. was contacted regarding the mapping.

Garry Eaton stated that the tie between 10-46 (2' contour mapping) and 11-46 (1' contour mapping) was not properly performed although he felt both maps satisfy the mapping standards for their respective scale.

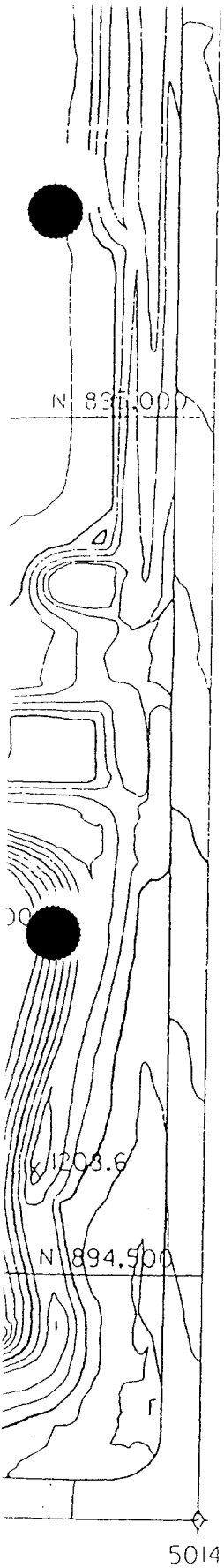
Garry Eaton said he would send an updated map 10-46 for our use and to the client within the next few days.

Information XX Action __

Garry Eaton / Dick McDonald MBJr. 412 495 4364

City of Scottsdale, Hoyt 994-7792

cpt 787



Quarter Section No. 12-47

NW Quarter
1 Section
T1N R4E

This map was produced by Photogrammetric Methods from aerial photography obtained in September, October and November 1993. The accuracy of this map meets 'Map Accuracy Standards' as stated by U.S.O.M.B. and as published by The American Society of Photogrammetry.

Horizontal accuracy : not more than 10 percent of points tested shall be in error by more than 1/40 inch at map scale.

Vertical accuracy : not more than 10 percent of elevations tested shall be in error more than one half the contour interval.

Horizontal Datum :
Grid values are based on the Arizona State Plane Coordinate, Central Zone, North American Datum, 1983 Adjustment modified to a local project datum.

Vertical Datum :
Elevations are based on the North American Vertical Datum, 1988 Adjustment.

Prepared by
MICHAEL BAKER, JR., INC.
Consulting Engineers
Beaver, Pennsylvania

Baker
Michael Baker Jr., Inc.

Quarter Section No. 12-47

Greiner

SCOTTSDALE GIS - PHASE II
Aerial Mapping Control

Area:

- County, Two-Foot Contour Interval

Horizontal:

- NAD 83, Modified State Plane Ground, Central Zone
- *Note:* All Horizontal Control Converted to Ground Coordinates by the City of Scottsdale

Vertical:

- NAVD 88, Modified City of Scottsdale Datum
- *Note:* All Vertical Control Converted to NAVD 88 by Greiner
- *Note:* All Vertical Control (Elevations) to Actual Target

General Notes:

1. Differential Elevations (Greiner)
2. GPS Elevations (City of Scottsdale)
3. GPS Elevations (Greiner)
4. GPS Horizontal (City of Scottsdale)
5. GPS Horizontal (Greiner)

Greiner

AREA - COUNTY, 2-FOOT C.I.

Aerial Control Name	GPS Name	Northing	Easting	Elevation	Note
101		883,539.0199	697,064.0139	1,166.95	3, 5
102		887,711.9369	697,044.2964	1,177.95	3, 5
103		883,668.1295	702,317.2211	1,176.31	3, 5
104		887,742.2092	702,168.3250	1,180.25	3, 5
201		944,706.9022	667,973.4105	1,426.47	3, 5
202		950,011.7460	667,934.9609	1,475.61	3, 5
203		954,056.5600	667,915.0282	1,428.63	3, 5
204		944,750.2384	670,612.4868	1,412.54	3, 5
205		950,042.7945	670,581.0792	1,411.93	3, 5
206		954,077.1801	670,566.4543	1,425.47	3, 5
207		942,191.9974	675,905.3469	1,397.61	3, 5
208		944,792.3731	675,889.3303	1,387.81	3, 5
209		950,159.4753	675,862.7231	1,408.18	3, 5
210		954,128.4521	675,839.6283	1,429.90	3, 5
211		936,905.6173	681,369.7175	1,386.80	3, 5
212		942,158.1152	681,351.0156	1,372.53	3, 5
213		947,648.4375	681,355.3600	1,396.13	3, 5
214		934,248.0335	684,008.2231	1,357.26	3, 5
215		932,102.1649	686,625.7110	1,348.28	3, 5
216		936,868.1753	686,621.1568	1,346.80	3, 5
217		942,157.5458	686,626.1326	1,368.65	3, 5
218		944,800.3270	686,614.3282	1,381.73	3, 5
219		928,738.3096	691,842.1927	1,334.49	3, 5
220		931,382.2128	691,849.2572	1,318.92	3, 5
221	3283	936,670.8651	691,860.7684	1,341.92	2, 4
222	3282	939,314.2832	691,863.2804	1,357.78	2, 4

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
21080
ROBERT J.
PECHA
Date Signed 10-14-97
ARIZONA, U.S.A.

BK1421 S. COUNTY AREA

PANEL #	TYPE	DESC.
	VERT.	SET PK. NAIL
	VERT.	C.O.T. B/C FLUSH
	VERT.	C.O.T. B/C FLUSH
101	GPS	C.O.T. B/C IN H/H
103	GPS	MARICOPA COUNTY B/C IN HH
	VERT	C.O.T. B/C FLUSH
	VERT	SET CHISLED "X" IN CONC.
	VERT	SET PK NAIL

PANEL POINTS

REMARKS

SET "Y" PANEL ON McCLINTOCK ±2000' SOUTH OF McKELLIPS & BIG SURF ENTRANCE

SET "Y" PANEL MILLER RD. & CURRY

SET "Y" PANEL MILLER RD. & VALERIE DR.

SET "Y" PANEL ON RURAL RD. @ RIO SALADO PRKWY. (NORTH MOST OF CAPS. ±12' [illegible]

SET "Y" PANEL @ ½ OF McCLINTOCK & RIO SALADO ½ KWY.

SET "Y" PANEL IN MEDIAN ON RIO SALADO 0.5 MI. EAST OF SCOTTSDALE Rd.

SET "Y" ON BRIDGE IN MEDIAN ON McCLINTOCK 0.35 MI NORTH OF RIO SALADO PRKWY.

SET "Y" ON ℄ RURAL Rd. IN MEDIAN 0.375 MI. NORTH OF RIO SALADO PRKWY.

8-9-93 SUNNY, HOT NECHERO, MIHELICH

BK. 1427 S. COUNTY AREA

PANEL #	GPS #	TYPE	DESC	PANEL PT'S	REMARKS
102					RURAL RD. ± 3/4 mi. S/O McKelly
104					McCLINTOCK ± 3/4 mi. S/O McKellips

BK 1427 N. COUNTY AREA

PANEL PANEL POINTS (2)

Panel #		Type	Desc.	Remarks
203		GPS	C.O.P. B/c FLUSH	SET "Y" PANEL 28TH ST. & NISBET RD.
202	VERT.	GPS	C.O.P. B/c FLUSH	SET "Y" PANEL 28TH ST. & T-BIRD RD.
		VERT.	M.C.E.D. B/c IN H/H	SET "Y" PANEL 28TH ST. & SWEETWATER
201		GPS	C.O.P. B/c IN H/H	SET "Y" PANEL 28TH ST. & CACTUS RD.
204	GPS	VERT.	C.O.P. B/c IN H/H	SET "Y" PANEL 32ND ST. & CACTUS RD.
		VERT.	C.O.P. B/c IN H/H	EXIST. "Y" PANEL 32ND ST. & SWEETWATER
205		VERT.	C.O.P. B/c IN H/H	SET "Y" PANEL 32ND ST. & T-BIRD RD.
		VERT.	SET PK NAIL	SET "Y" PANEL ON 32ND ST.
206		GPS	C.O.P. B/c FLUSH	SET "Y" PANEL 32ND ST. & NISBET RD.
		VERT.	C.O.P. B/c FLUSH	SET "Y" PANEL 36TH ST. & NISBET RD. (NORTH MOST OF (2) CAPS ± 15' APART)
		VERT.	C.O.P. B/c FLUSH	SET "Y" PANEL 36TH ST. & ACOMA DR.

Bk. 1427 N. County Area

Panel Points

Panel #	Type	Desc.	Remarks
	GPS	C.O.P. B/c Flush	Exist. "+" Panel 36TH ST. & Voltaire Dr
	Vert.	C.O.P. B/c in H/H	Set "Y" Panel 36TH ST. & Sweetwater
	GPS	C.O.P. B/c Flush	Set "Y" Panel 36TH ST. & Sunnyside We
207	GPS	C.O.P. B/c ~~Flush~~ in H/H	Exist. "+" Panel 40TH ST. & Cholla St. (West most of (2) caps ± 4' Apa
208	Vert.	C.O.P. B/c in H/H	Set "Y" Panel 40TH ST. & Cactus Rd.
	Vert.	C.O.P. B/c in H/H.	Set "Y" Panel 40TH ST. & Sweetwater
209	GPS	Set P.K. nail	Set "Y" Panel 40TH ST. & T-Bird Rd.
210	GPS	C.O.P. B/c Flush	Set "Y" Panel 40TH ST. & Nisbet Rd.
	GPS	Set P.K. nail	Set "Y" Panel on conc. median West of Int. 44TH ST. & Par. Vill. Pkwy.
	Vert.	End P.K. nail	Exist. "+" Panel on Paradise Valley Parkw ± 800' South of Cactus Rd.

BK. 1427 N. COUNTY AREA PANEL POINTS (4)

PANEL #	TYPE	DESC	REMARKS
	VERT.	C.O.P. B/C FLUSH	SET 'Y' PANEL 44TH ST. & CHOLLA ST.
	GPS	C.O.P. B/C IN POTHOLE	SET 'Y' PANEL TATUM & GOLD DUST
212	VERT.	C.O.P. B/C IN H/H	SET 'Y' PANEL TATUM & CHOLLA ST.
211	GPS	M.C.H.P. B/C IN H/H	SET 'Y' PANEL TATUM & MTN. VIEW
213	GPS	C.O.P. B/C IN H/H	SET 'Y' PANEL TATUM & PAR. VILL PKWY
218	GPS	C.O.P. B/C IN H/H	SET 'Y' PANEL 56TH ST & CACTUS
221	EXIST. GPS	C.O.S. B/C (DEPRESS)	SET 'Y' PANEL INVERGORDON & MTN. VIEW
222	EXIST. GPS	C.O.S. B/C IN H/H	SET 'Y' PANEL INVERGORDON (64TH ST.) & SHE

8-3-93
T. PRICE
SUNNY, HOT

BK 1427 N. COUNTY AREA

PANEL PANEL POINTS (5)

PANEL #		TYPE		DESC		REMARKS
		GPS	C.O.P.	B/C	FLUSH	SET "Y" PANEL 52ND ST & CACTUS RD ±10' NORTH OF B/C IN H/H
		VERT.	C.O.P.	B/C	FLUSH	SET "Y" PANEL 52ND ST & CHOLLA ST.
		VERT.	C.O.P.	B/C	IN H/H	SET "Y" PANEL 52ND ST. & SHEA BLVD
		VERT.	T.O.P.V	B/C	FLUSH	SET "Y" PANEL 52ND ST. & MTN. VIEW RD.
214		GPS	M.C.H.D.	B/C	~~FLUSH~~ (DEPRESS)	SET "Y" PANEL 52ND ST. & DOUBLE TREE
215		GPS	M.C.H.D.	B/C	FLUSH	SET "Y" PANEL 56TH ST & CABALLO DR.
		VERT.	UNMARKED	B/C	IN H/H	SET "Y" PANEL 56TH ST. & DOUBLE TREE
216		VERT.	UNMARKED	B/C	FLUSH	SET "Y" PANEL 56TH ST. & MTN. VIEW RD.
		VERT.	C.O.P.	B/C	IN H/H	SET "Y" PANEL 56TH ST. & SHEA BLVD.
217	VERT	~~GPS~~	C.O.P.	B/C	IN H/H	EXIST. "Y" PANEL 56TH ST. & CHOLLA ST.
		GPS	C.O.P.	B/C	FLUSH	SET "Y" ±400 W. OF 60TH PL. ON MTN. VIEW

BK. 1427 N. COUNTY AREA

PANEL # TYPE DESC

-	VERT	T.O.P.V.	B/C	FLUSH
	GPS	A.D.O.T.	ALUM. CAP IN	P/H
219	GPS	5/8"	IRON BAR IN	H/H
220	VERT	T.O.P.V.	B/C	FLUSH
-	VERT	M.C.H.D.	B/C IN	P/H
	VERT	G.L.O.	B/C IN	H/H
	VERT	T.O.P.V.	B/C IN	H/H
	GPS	T.O.P.V.	B/C	FLUSH

PANEL POINTS

(6)

REMARKS

EXIST "Y" ± 300' W. OF 60TH ST. ON DOUBLE TREE

SET "Y" ± 400' W. OF MORNING GLORY ON MOCKINGBIRD

SET "Y" PANEL INVERGORDON & NORTHERN

SET "Y" PANEL INVERGORDON & CALLE BRUYIRA

SET "Y" PANEL INVERGORDON & DOUBLE TREE

SET "Y" ± 1/2 MI. W. OF SCOTTS RD. ON DOUBLE TREE

SET "Y" MOCKINGBIRD LN. & NORTHERN AVE.

SET "Y" MOCKINGBIRD LN. & CHENEY DR.

8-4-93
T. PRICE
SUNNY, HOT

SECTION 3: Hydrologic Analysis

Discharges provided by the Flood Control District of Maricopa County.

100-Year Discharges for Indian Bend Wash	
Reach	**Discharge (cfs)**
36th Street to Cactus Road	6000
Cactus Road to Scottsdale Road	9000
Scottsdale Road to Indian Bend Road	16000
Indian Bend Road to Indian School Road	17000
Indian School Road to Salt River	20000

SECTION 4: Hydraulic Analysis

SECTION 4: Hydraulic Analysis

4.1. Method Description

SECTION 4

HYDRAULIC ANALYSIS

4.1 Method Description

The water surface profile through the project reach was determined using the U.S. Army Corps of Engineers HEC-2 Water Surface Profile Model, Version 4.6, May 1991. The channel geometry was defined with topographic mapping developed by Baker Engineering in 1993 for the City of Scottsdale.

HEC-2 models were developed for subcritical profile computations. The 100-yr water-surface elevation at the confluence of Indian Bend Wash and the Salt River was used as the starting water-surface elevation. Baseline stationing begins at the confluence with the Salt River located approximately 700 feet upstream of Scottsdale Road along the hydraulic baseline of the Salt River.

The 100-year discharges used for Indian Bend Wash were taken from the FEMA Flood Insurance Study (FIS) for Maricopa County, Arizona. & Incorporated Areas, Volume 1 of 12, revised September, 1995. The following table summarizes the discharges.

100-Year Discharges for Indian Bend Wash	
Reach	**Discharge (cfs)**
36th Street to Cactus Road	6000
Cactus Road to Scottsdale Road	9000
Scottsdale Road to Indian Bend Road	16000
Indian Bend Road to Indian School Road	17000
Indian School Road to Salt River	20000

All cross-sections were reviewed and encroachment stations inserted to comply with HEC-2's limitations and maintain reasonable section-to-section conveyance continuity. The ineffective flow encroachments were determined for the 100-year flood event and may not be applicable for different frequency flood events.

SECTION 4: Hydraulic Analysis

4.2. Parameter Estimation

SECTION 4: Hydraulic Analysis

4.2.1. Manning's n-Value

"n" VALUE DETERMINATION REPORT

FLOODPLAIN DELINEATION FOR INDIAN BEND WASH

FCD 93-05

Submitted to:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009

Submitted by:

SIMONS, LI & ASSOCIATES, INC.
4600 S. Mill Avenue, Suite 200
Tempe, Arizona 85282
(602) 491-1393

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24007
TIMOTHY D.
MORRISON
Date Signed 10-2-95
ARIZONA, U.S.A.

OCTOBER, 1995
FINAL

Registered Professional Engineer (Civil)
CERTIFICATE NO.
21560
DENNIS L.
RICHARDS
Date Signed 10/2/95
ARIZONA, U.S.A.

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24007 TIMOTHY D. MORRISON Date Signed 10-2-95 ARIZONA, U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 21560 DENNIS L. RICHARDS Date Signed 10/2/95 ARIZONA, U.S.A.

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24007 TIMOTHY D. MORRISON Date Signed 10-2-95 ARIZONA, U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 21560 DENNIS L. RICHARDS Date Signed 10/2/95 ARIZONA, U.S.A.

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
24007
TIMOTHY D.
MORRISON
Date Signed 10-2-95
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
21560
DENNIS L.
RICHARDS
Date Signed 10/2/95
ARIZONA, U.S.A.

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I. Introduction

This report was prepared pursuant to "Scope of Work, Flood Control District of Maricopa County, Floodplain Delineation for Indian Bend Wash" (FCD 93-05), Sections 6.3 and 6.4. Specifically addressed in this report are the results of the field reconnaissance conducted over the full study reach. This report will be incorporated into the Technical Data Notebook, Section 4.2.1.

The purpose of this report is to present the results of a detailed analysis to define Manning's "n" values (roughness coefficients) for Indian Bend Wash from its confluence with the Salt River (City Of Tempe) upstream approximately 16 miles to 32nd Street and Acoma Road (City of Phoenix).

Section II presents the methodology utilized to estimate the Manning's "n" values and digitally prepare cross sections used for analysis.

Section IV presents recommended Manning's "n" values for use in the NH records required by the HEC-2 computer program. Additionally, expansion and contraction coefficients are presented.

Appendix A presents a photographic record of hydraulic structures in Indian Bend Wash. Included are all bridges, drops and other features that effect channel hydraulics.

Appendix B presents the topographic mapping with proposed cross section locations for orientation purposes only. Appendix B provides a plan view perspective of each cross section presented in Section IV, Summary.

Appendix C presents the proposed cross sections for the Indian Bend Wash Floodplain Delineation.

II. Methodology

Values for the Manning's roughness coefficient, "n", may be assigned for conditions that exist at the time of a specific flow event, for average conditions over a range in stage, or for anticipated conditions at the time of some future flow event. The Manning's "n" values developed in this study for the Indian Bend Wash were developed for the 100-year peak flood discharges.

Several sources of data were utilized to develop the "n" values presented in this report. The information available included: 1) aerial photos by Landiscor Aerial Photo, Inc. of Arizona at 1" = 1200', January 4, 1994; 2) ground level photographs of the study reach; and 3) the effective Flood Insurance Study. The ground level photographs were obtained during a field reconnaissance trip conducted over a several week period in November and December of 1994.

The "n" value assigned to a stream reach should represent the factors that tend to impact or impede flow. The procedure used to develop the "n" value for the detailed hydraulic model assigns an "n" value horizontally for the subdivided segments of a specific cross section. The hydraulic model (HEC-2) then computes the average "n" value for the specific section. The Manning's "n" values are placed in the HEC-2 data file in the NH record. The values for

Manning's "n" were compiled based on the methods presented in "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" (USGS, 1991) and "Open Channel Hydraulics" (Chow, 1959; Section 5).

The method of determining n values is as follows: 1) select a base value of n for the bed material; 2) select n-value adjustments for channel irregularities and alignment, obstructions, and vegetation; and 3) the sum of the values is the n value for that portion of the cross section. The sum of the values is reflected and defined in the following equation:

$$n = n_b + n_1 + n_2 + n_3 + n_4$$

where;

n =
n_b = base value of n for a straight uniform channel,
n_1 = value for surface irregularities,
n_2 = value for obstruction,
n_3 = value for vegetation, and
n_4 = cross section variation (per Chow, 1959)

The confluence point of Indian Bend Wash with the Salt River has been identified as Station 0.0 for this study. The point was taken from the thalweg confluence depicted on the effective Flood Insurance Rate Map for the Salt River. On all cross sections, the thalweg is identified as Station 10,000 in feet. All cross section identifiers are in river miles measured along the Indian Bend Wash thalweg.

Contraction and expansion coefficients were estimated based on Section 3.2 of the "HEC-2 Water Surface Profiles User's Manual" (USACOE, 1990). For a typical channel reach a contraction coefficient of 0.2 and expansion coefficient of 0.4 was used. Cross sections in the vicinity of a bridge use a contraction coefficient of 0.3 and an expansion coefficient of 0.5.

III. DETAILED ANALYSES

In the detailed analyses that follow, each reach is presented with the following information:

Reach: provides a detailed description of the reach including the political boundaries, and the geologic and man-made features that define the reach.

Cross Section: provides a typical cross section for the reach. Some reaches will have more than one cross section if significant variation is encountered. Cross sections are identified by their distance, in river miles, upstream of the confluence of Indian Bend Wash and the Salt River.

Location of Cross Section: the physical site of the cross section within the reach being studied.

Description of Channel: includes the channel geometry, physical features, channel bed composition, structures, and vegetation of the cross section and the portion of the reach represented by the cross section.

100-Year "n" Value Calculations: present the computations used to determine the "n" value for individual segments of the cross section.

REACH

From the Indian Bend Wash grade control structure at the Salt River upstream to Curry Road. This reach is entirely within the City of Tempe. Included in this reach are the Red Mountain Freeway and the Curry Road bridge. The reach is presented in plan view within Appendix B.

CROSS SECTION 0.568

LOCATION OF CROSS SECTION

Cross section 0.568 is located just upstream of the roller compacted concrete grade control structure and approximately 1000 feet downstream (south) of Curry Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

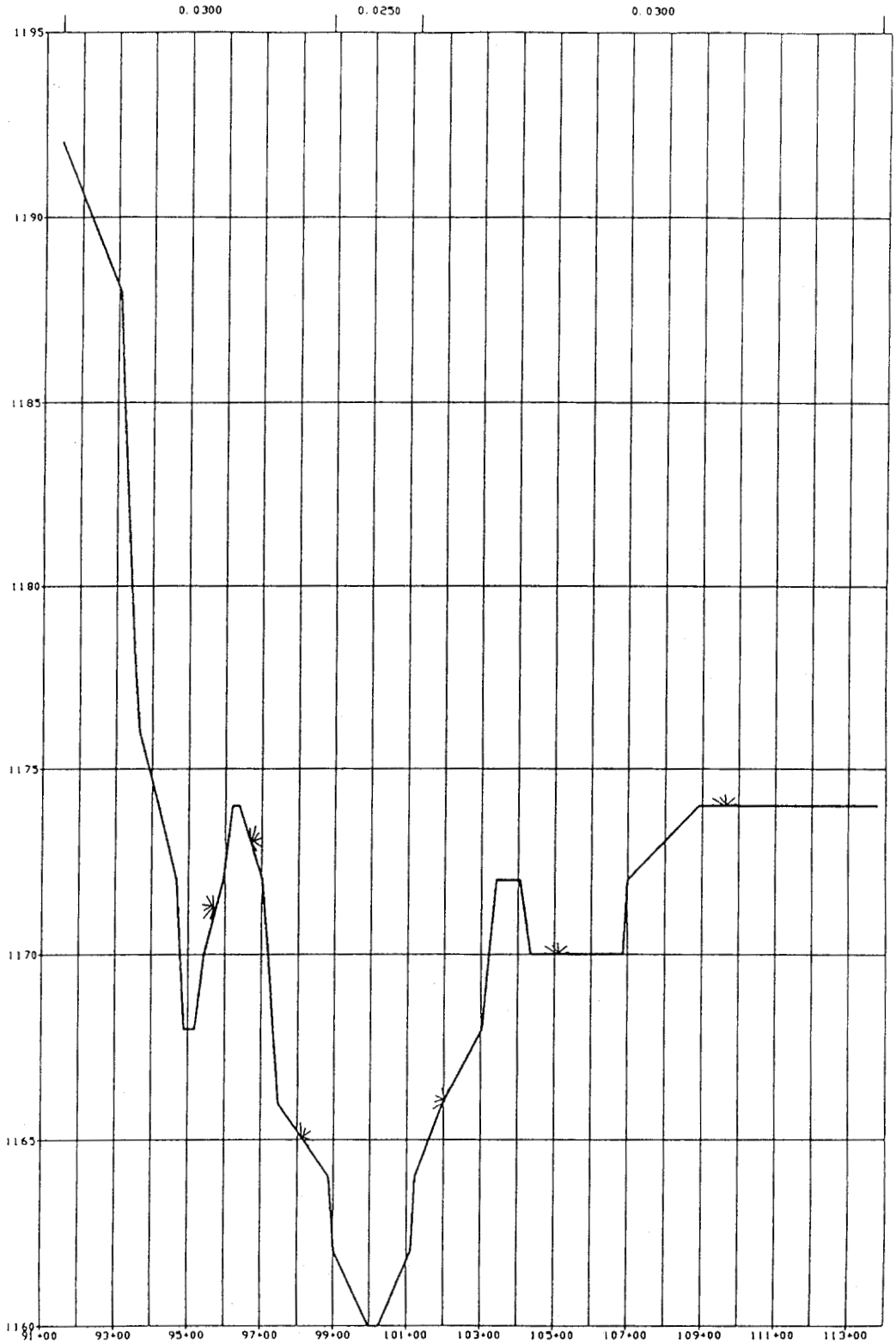
The channel is a constructed compound section with a low flow pilot channel. Vegetation is sparse and medium cobbles are the dominant channel bed material in the pilot channel. The Red Mountain Freeway has a bridge with piers set into the grade control structure. These piers are parallel to flow, with the Freeway alignment on a skew over the grade control structure. No backwater is estimated to occur due to the piers, as the flow passes through critical depth at the upstream sill of the grade control structure.

The channel has few irregularities or variations of cross section, few obstructions, sparse vegetation and minor meandering. Channel bed and banks have been assigned a "n" value of 0.03.

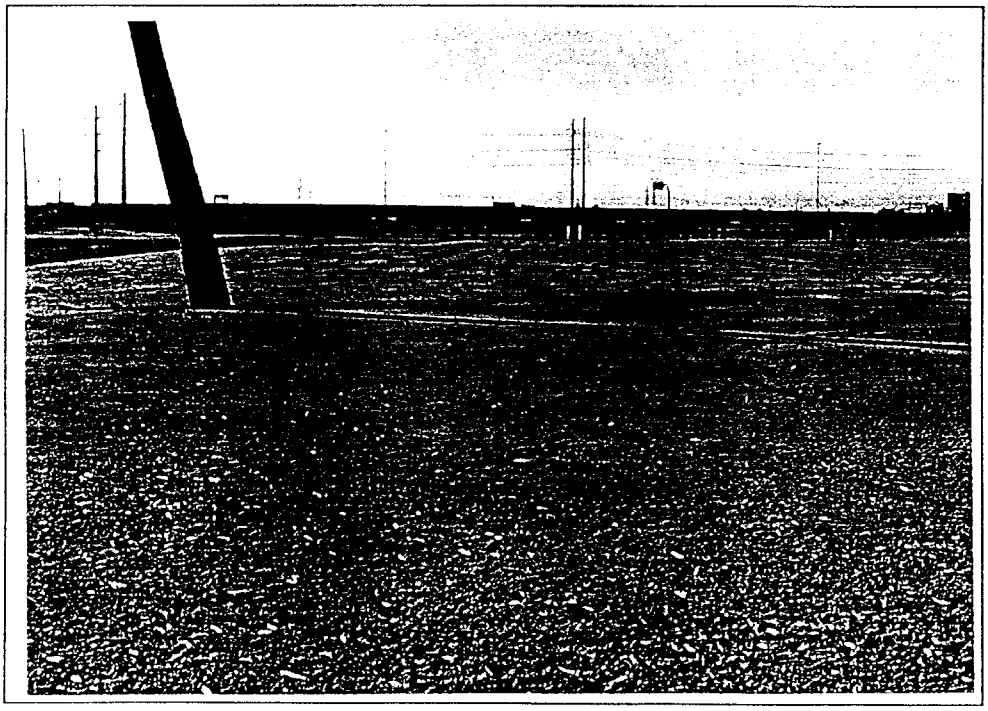
100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Pilot Channel	$n_b = 0.025$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**
Overbank of Compound Section	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**

CROSS SECTION 0.568



Photograph 3.1
Photo looking upstream at cross section 0.568



Photograph 3.2
Photo looking downstream from cross section 0.758 at reach including cross section 0.568

REACH

From Curry Road upstream to McKellips Road. This reach is entirely within the City of Tempe From Curry Road to McKellips Road. At McKellips Road, the City of Tempe adjoins the City of Scottsdale. The reach is presented in plan view within Appendix B

CROSS SECTION 0.947

LOCATION OF CROSS SECTION

Cross section 0.947 is located just upstream of Curry Road within the Rio Salado Golf Course. This golf course extends from Curry Road upstream to McKellips Road. Cross section locations are presented in Appendix B.

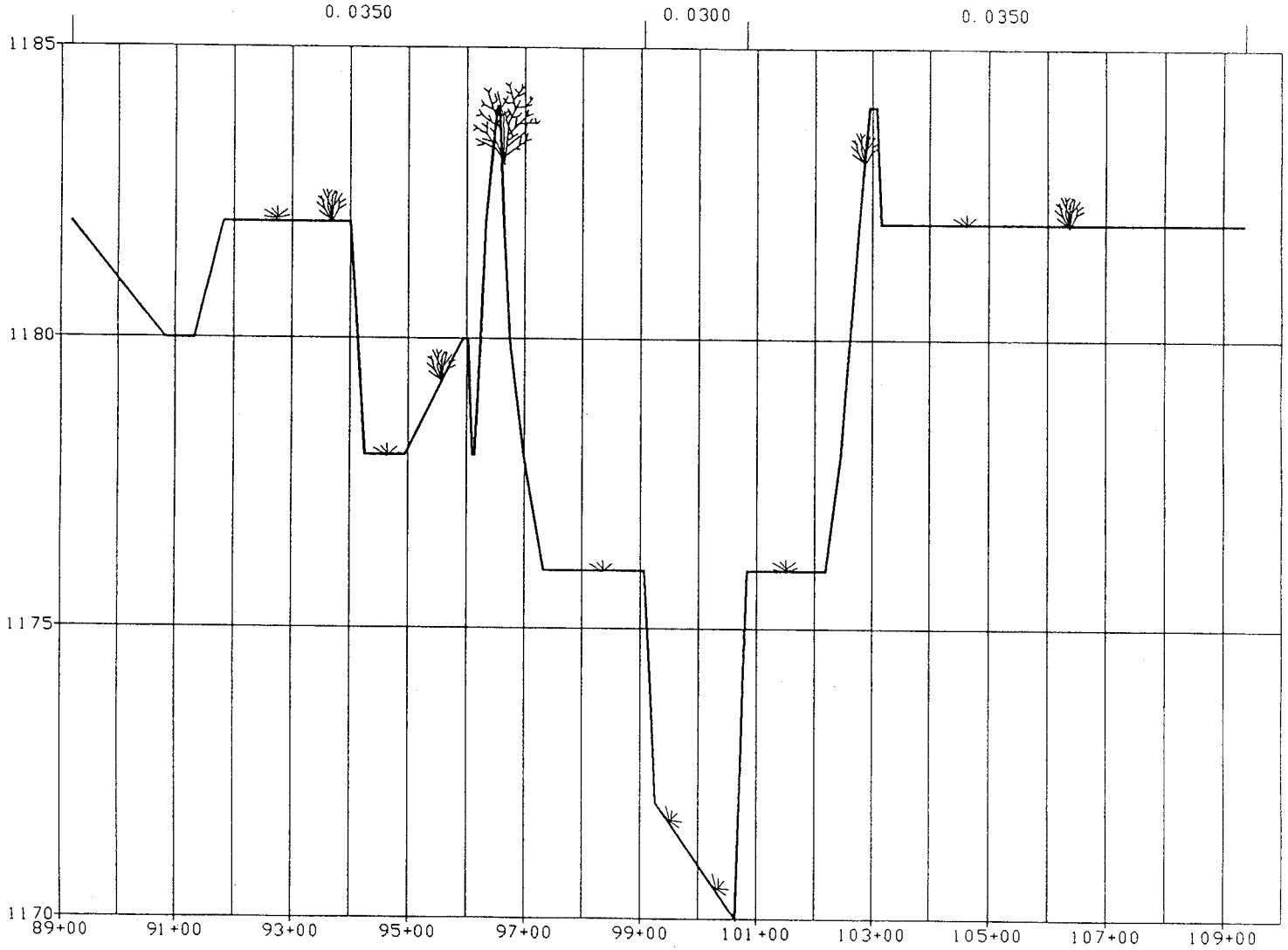
DESCRIPTION OF CHANNEL

The channel is a constructed compound section with a pilot channel containing some grade control structures (low flow only with grouted cobble). Vegetation consists of grass (in fairways and putting greens) and some shrubs.

The channel is relatively uniform with gradually changing elevation, few obstructions, maintained grassy areas and minor meandering. Channel banks and bed have similar hydraulic characteristics and have been assigned a "n" value of 0.03.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Pilot Channel	$n_b = 0.02$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.030**
Overbank of Compound Section	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**



CROSS SECTION 0.947

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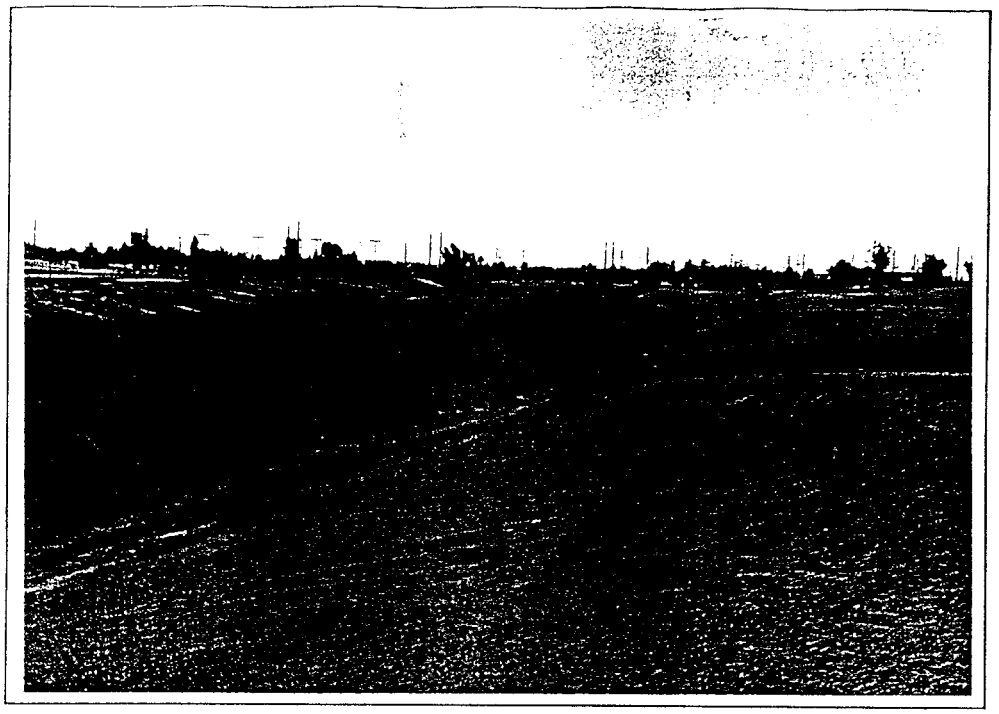


Photograph 3.3
Looking downstream in the vicinity of cross section 0.947

Photograph 3.4
Looking upstream at the right overbank area
in the vicinity of cross section 0.947

REACH

From McKellips Road upstream to Roosevelt Street. This reach encompasses the McKellips Lake Park and is entirely within the City of Scottsdale. Included in this reach are the McKellips Road bridge, McKellips Lake, and the Roosevelt Street low water crossing. The reach is presented in plan view within Appendix B

CROSS SECTION 1.77

LOCATION OF CROSS SECTION

Cross section 1.77 is located approximately 1050 feet upstream of McKellips Road. The cross section crosses one of the two lakes that dominate this reach. Cross section locations are presented in Appendix B.

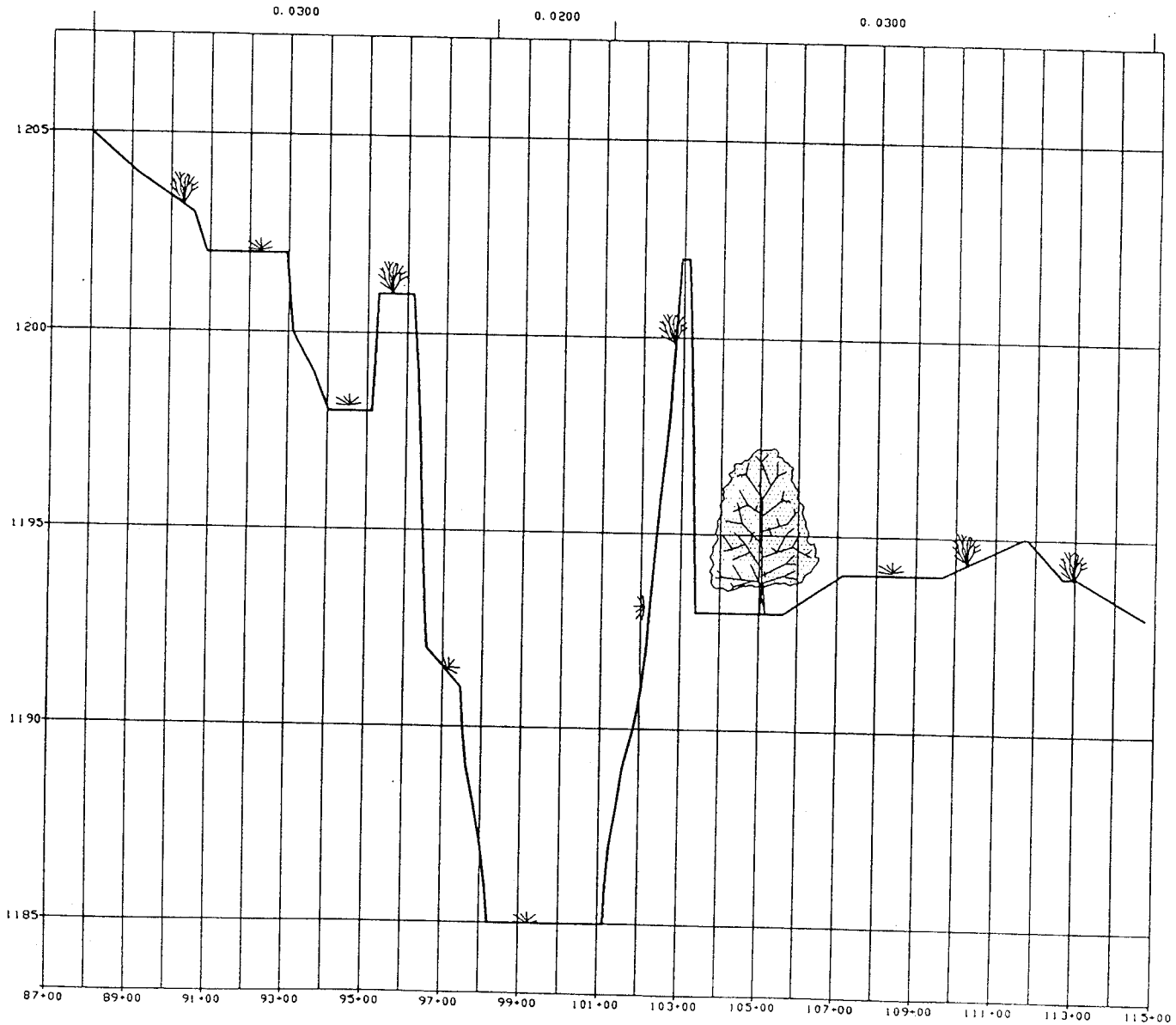
DESCRIPTION OF CHANNEL

The channel is comprised of two sequential lakes separated by a steep drop structure approximately at the center of the reach. The upper lake will pond to an elevation controlled by the drop (where flow passes through critical to supercritical). The lower (downstream) lake is also controlled by the lake's concrete edge just upstream of the McKellips Road bridge.

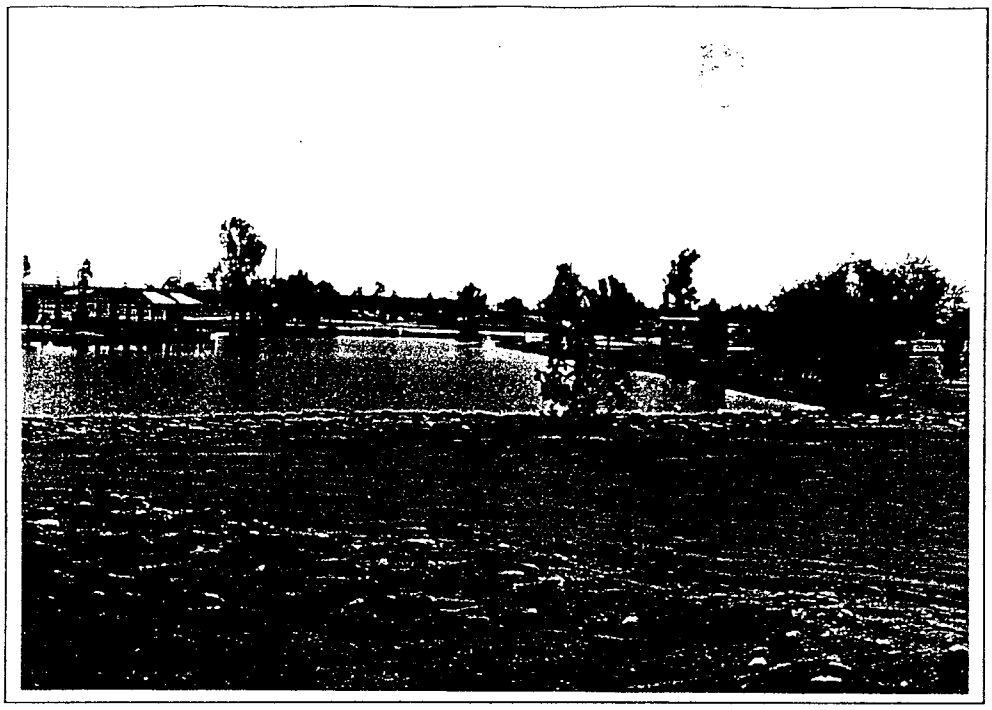
The constructed channel lakes have few obstructions with the exception of control features. Vegetation, meandering, and variation in channel cross section have little effect on the Manning's "n" value due to the broad cross section, lakes, and control features. Overbanks are unobstructed and lined with maintained grass and have been assigned a Manning's "n" value of 0.03. That portion of the lake above the effective flow level has been assigned a Manning's "n" value of 0.02.

100-YEAR N-VALUE CALCULATIONS

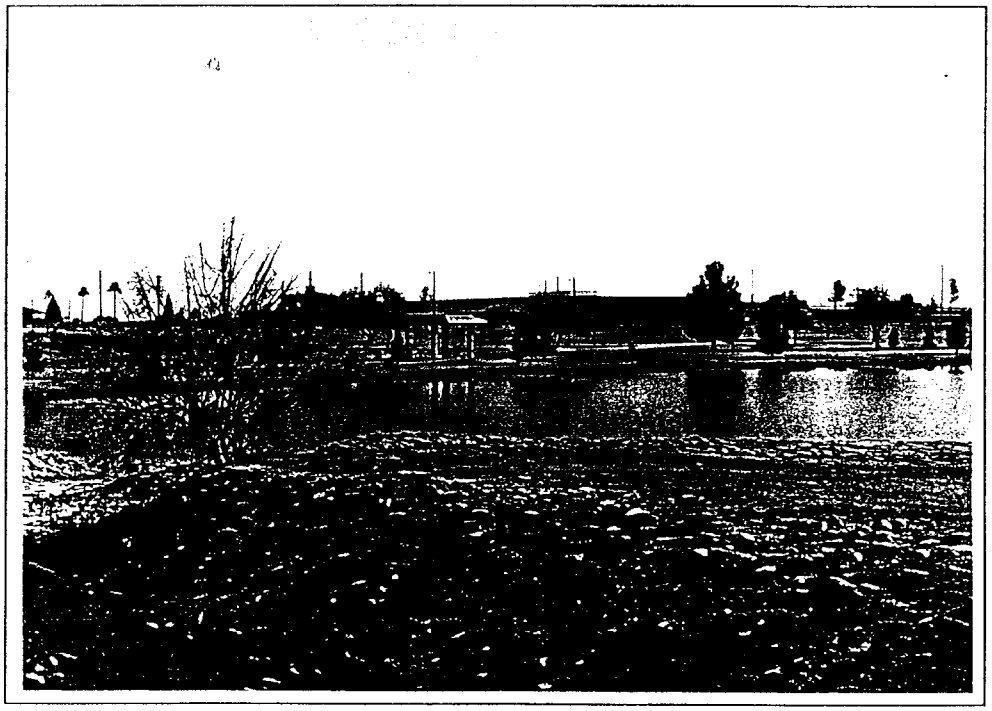
Portion of Cross Section	Components	"n" Total
Lake Shore and Park Areas	$n_b = 0.02$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**
Lake		**0.020**



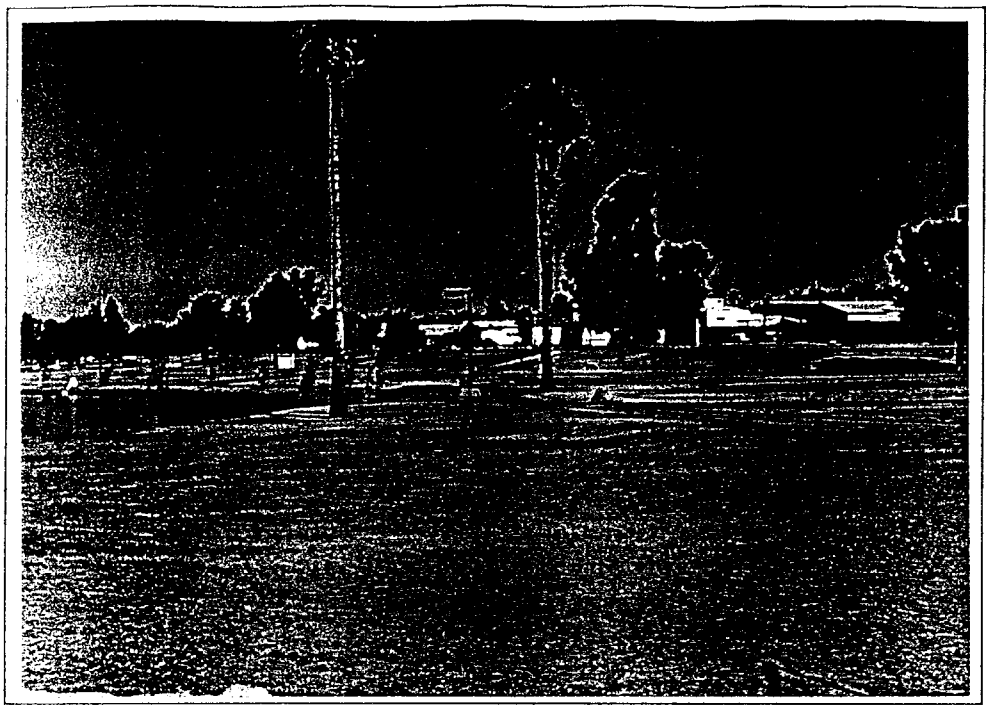
CROSS SECTION 1.77



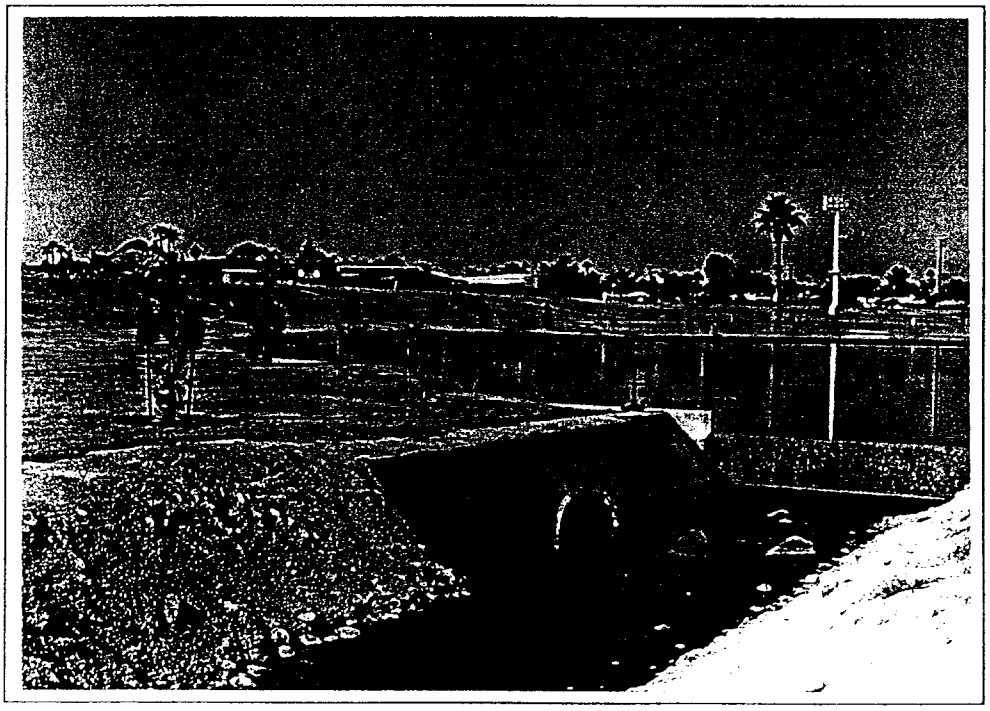
Photograph 3.5
Looking downstream from grade control structure toward center line of Indian Bend Wash near cross section 1.77



Photograph 3.6
Looking downstream from grade control structure toward left overbank of Indian Bend Wash near cross section 1.77



Photograph 3.7
Looking upstream from grade control structure upstream of cross section 1.77 at Indian Bend Wash left bank area



Photograph 3.8
Looking upstream from grade control structure upstream of cross section 1.77 at Indian Bend Wash right bank area

REACH

From Roosevelt Street upstream to McDowell Road entirely within the City of Scottsdale. This reach encompasses a portion of the Vista del Camino Park. This reach includes the McDowell bridge. The reach is presented in plan view within Appendix B

CROSS SECTION 2.462

LOCATION OF CROSS SECTION

Cross section 2.462 is located approximately 835 feet downstream from the McDowell Road bridge. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

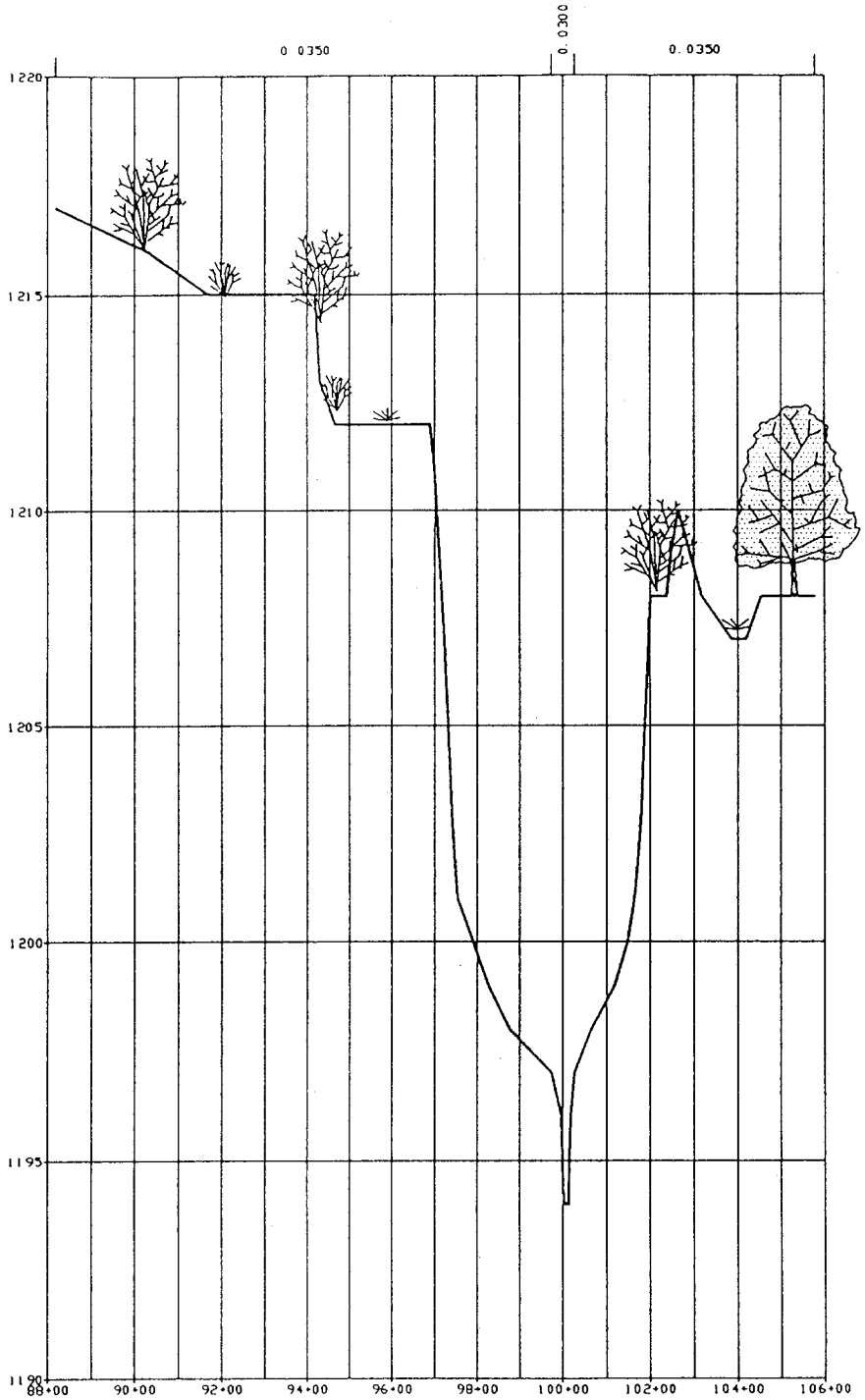
The channel is a constructed compound section with a low flow pilot channel and higher flow overbank areas. The higher flow overbanks are grassy with small trees (trimmed of branches below five feet above the ground). The pilot channel connects small ponds along the reach.

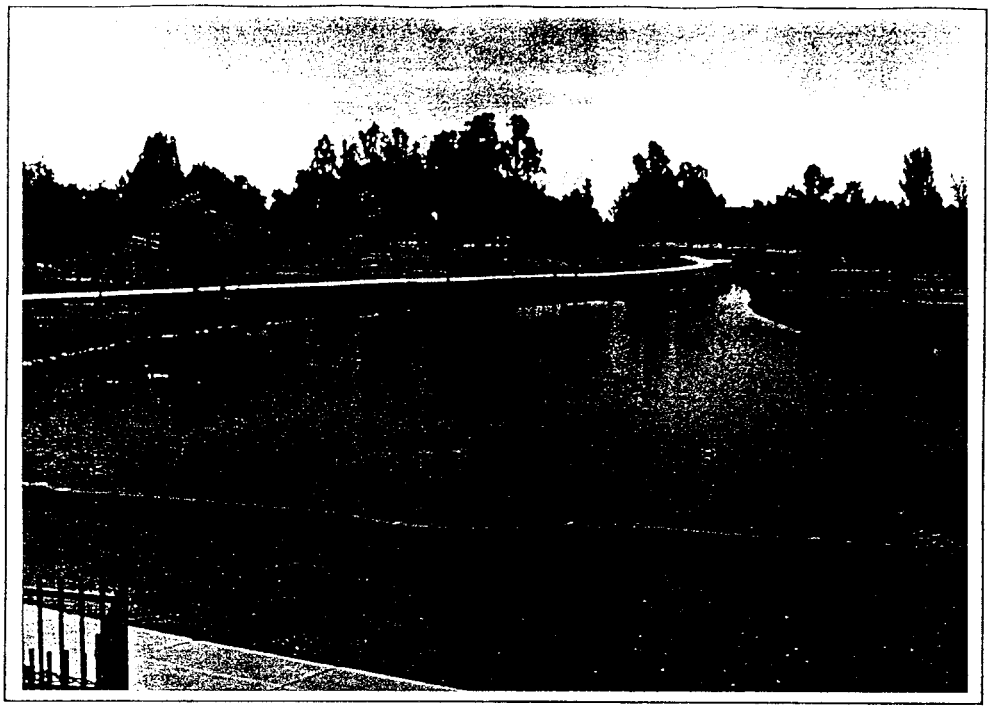
The channel is relatively regular with some variation in cross section primarily due to the occasional pond. Obstructions consist of some maintained trees found in grassy channel bank areas. Channel areas with smooth grass and some trees have be assigned a Manning's "n" value of 0.035. Smooth areas with maintained grass have been assigned a Manning's "n" value of 0.03.

100-YEAR N-VALUE CALCULATIONS

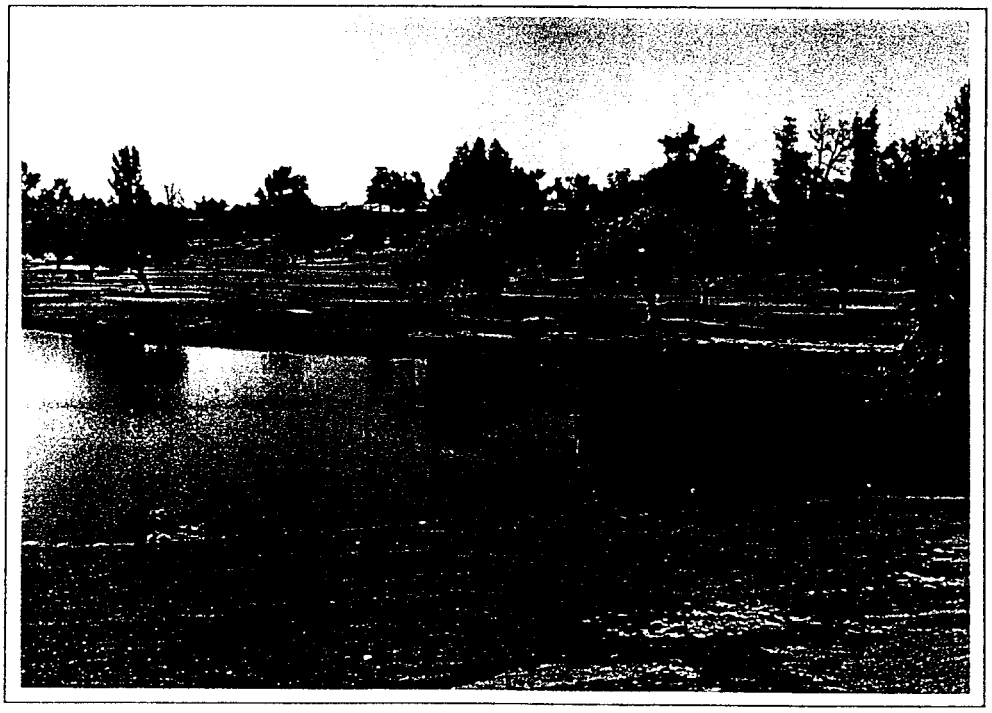
Portion of Cross Section	Components	"n" Total
Short Grass with Some Trees	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.035**
Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**

CROSS SECTION 2.462





Photograph 3.9
Looking downstream at cross section 2.462
from McDowell Road bridge over Indian Bend Wash



Photograph 3.10
Looking downstream at right bank area of cross section 2.462
from McDowell Road bridge over Indian Bend Wash

REACH

From McDowell Road upstream to Murray Lane entirely within the City of Scottsdale. The reach encompasses Eldorado Park and the McDowell Exhibit Plaza. This reach includes the sill structure upstream of the McDowell Road bridge, the McDowell Exhibit Plaza, and the Murray Lane low water crossing. The reach is presented in plan view within Appendix B

CROSS SECTION 3.125

LOCATION OF CROSS SECTION

Cross section 3.125 is located approximately 2500 feet upstream (north) of McDowell Road and 650 feet downstream (south) of Murray Lane. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is a constructed compound section with a small pilot channel. The broad overbank areas are utilized for soccer and baseball fields. The overbank areas are grassy with pruned and maintained trees along the pilot channel. Recreation facilities have break-away fences.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Short Grass with Some Trees	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.035**
Pavement		**0.020**
Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**
Grass and Dense Trees	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.020$	
	$n_4 = 0$	**0.045**

CROSS SECTION 3.22

LOCATION OF CROSS SECTION

Cross section 3.22 is located at the small pond found just downstream (south) of Murray Lane. Cross section locations are presented in Appendix B. The reach is presented in plan view within Appendix B

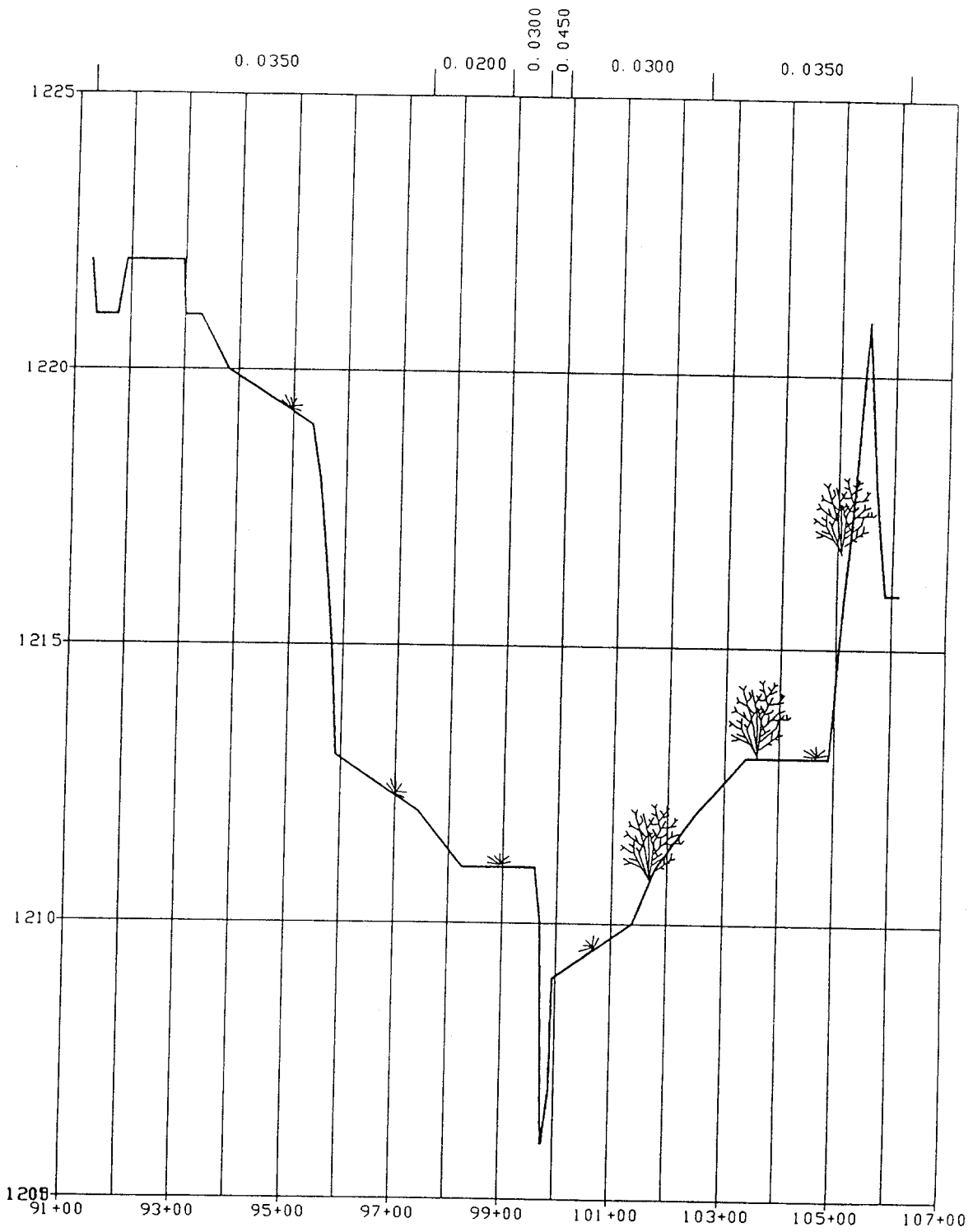
DESCRIPTION OF CHANNEL

The channel is a constructed compound section with a low flow pilot channel that connects small ponds. Left bank areas are smooth grass lined fields. The centerline area is a small pond with a constant water surface elevation during dry periods. The right channel bank area is sparsely vegetated and contains some facilities for the pond such as a parking lot and work shop.

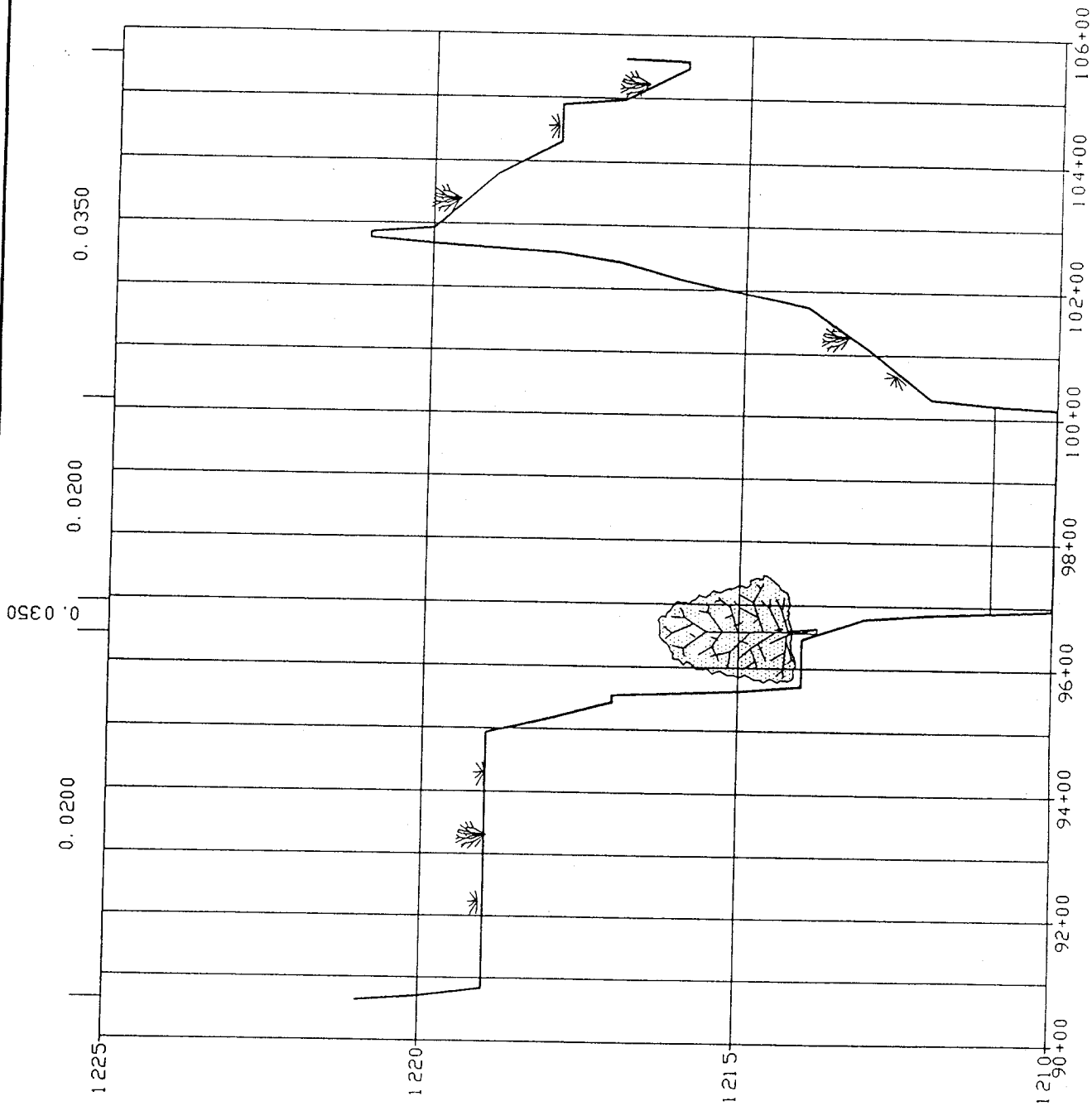
100-YEAR N-VALUE CALCULATIONS

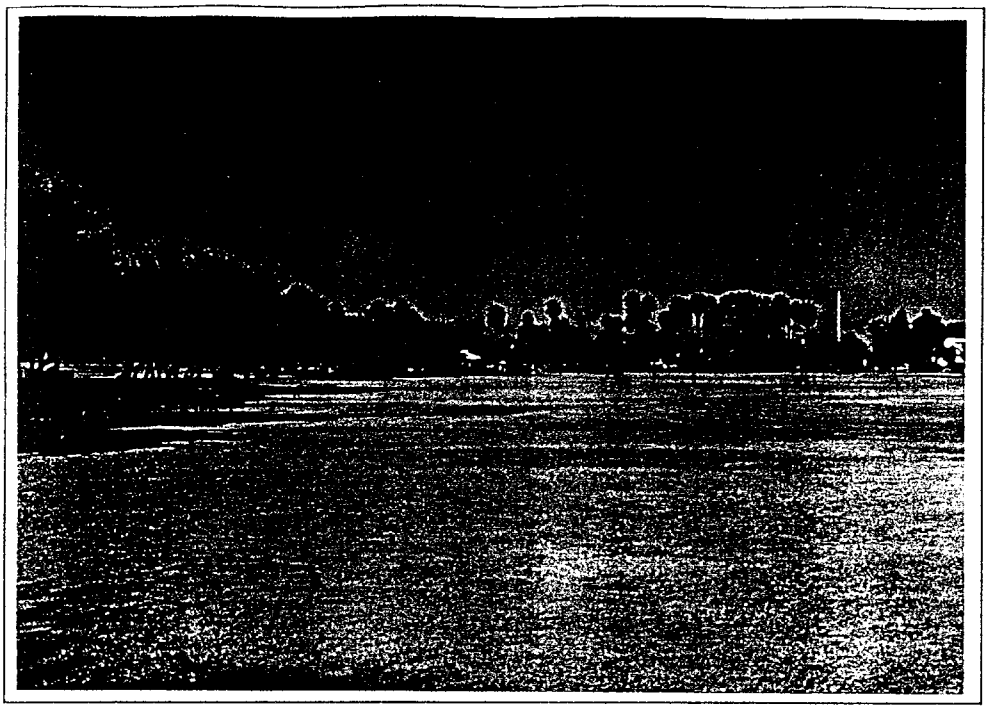
Portion of Cross Section	**Components**	**"n" Total**
Pavement		**0.020**
Short Grass with Some Trees	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.035**

CROSS SECTION 3.125



CROSS SECTION 3.22





Photograph 3.11
Looking upstream at the left bank area of cross section 3.125

Photograph 3.12
Looking downstream at channel centerline from Murray Road
toward cross section 3.22

REACH

From Murray Lane upstream to Thomas Road and encompasses the Coronado Golf Course. The reach is presented in plan view within Appendix B

CROSS SECTION 3.409

LOCATION OF CROSS SECTION

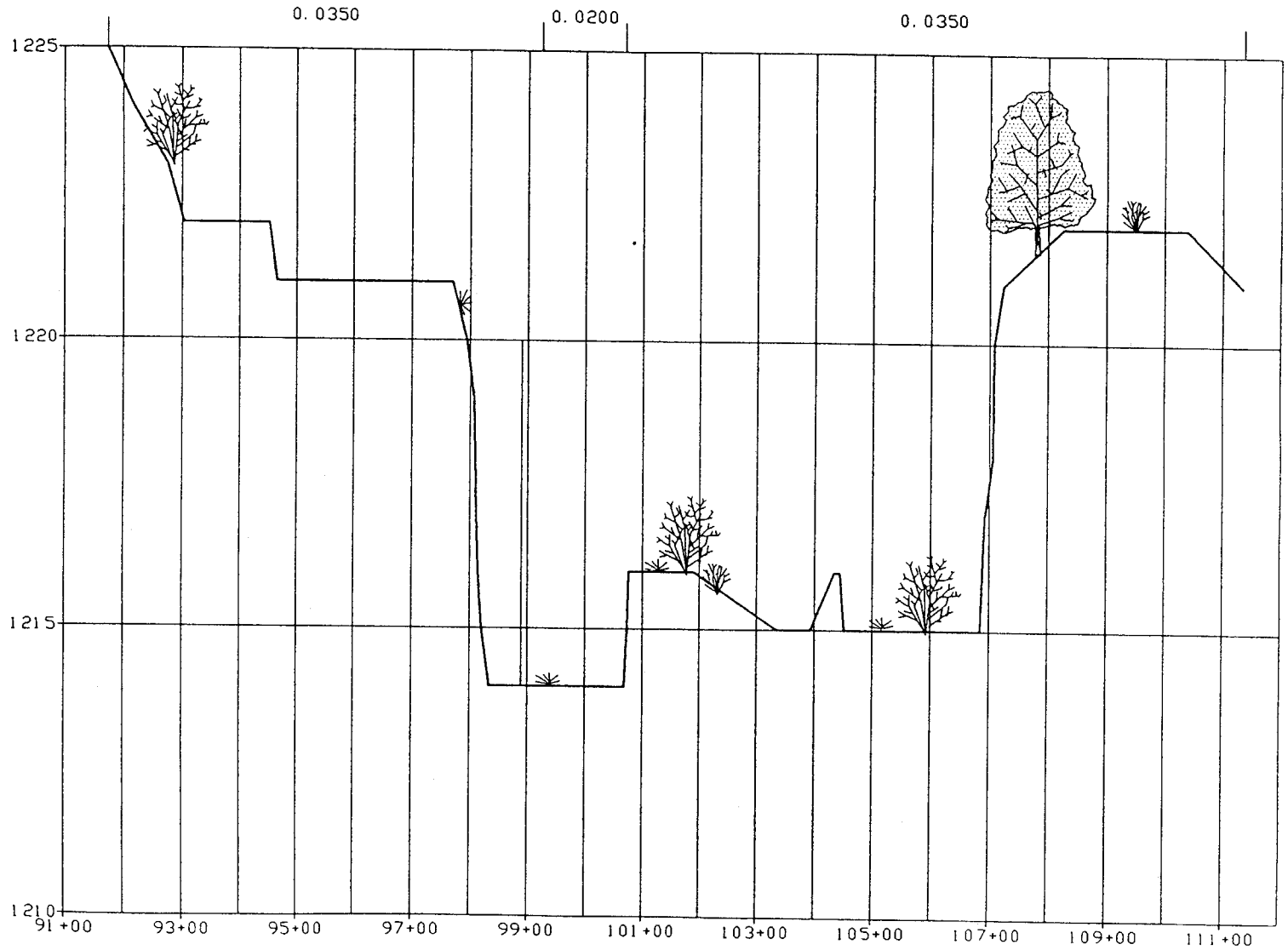
Cross section 3.409 is located in the reach from Murray Lane upstream to Thomas Road. The cross section is approximately 2,000 feet downstream of the Thomas Road bridge. Cross sections locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is a constructed compound section with a small pilot channel that connects a series of small ponds. The overbank areas serve as fairways and putting greens for the Coronado Golf Course. The cross section is broad with some vegetation and few obstructions to flow. Transitions from cross section to cross section are relatively gradual.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Short Grass with Some Trees	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.035**
Lake		**0.020**



CROSS SECTION 3.409

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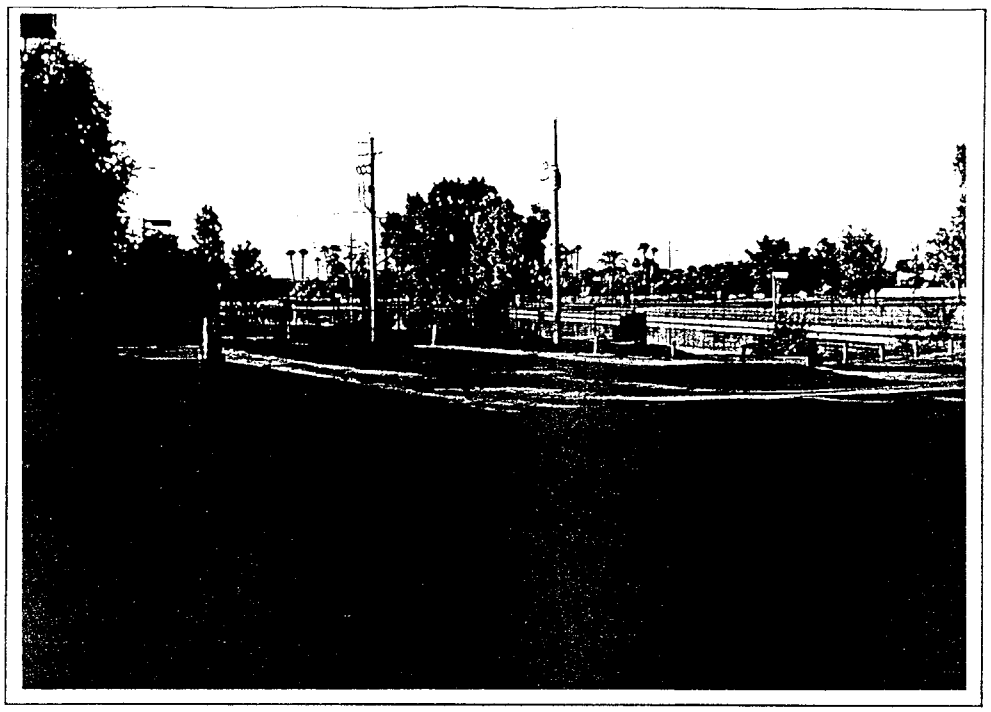
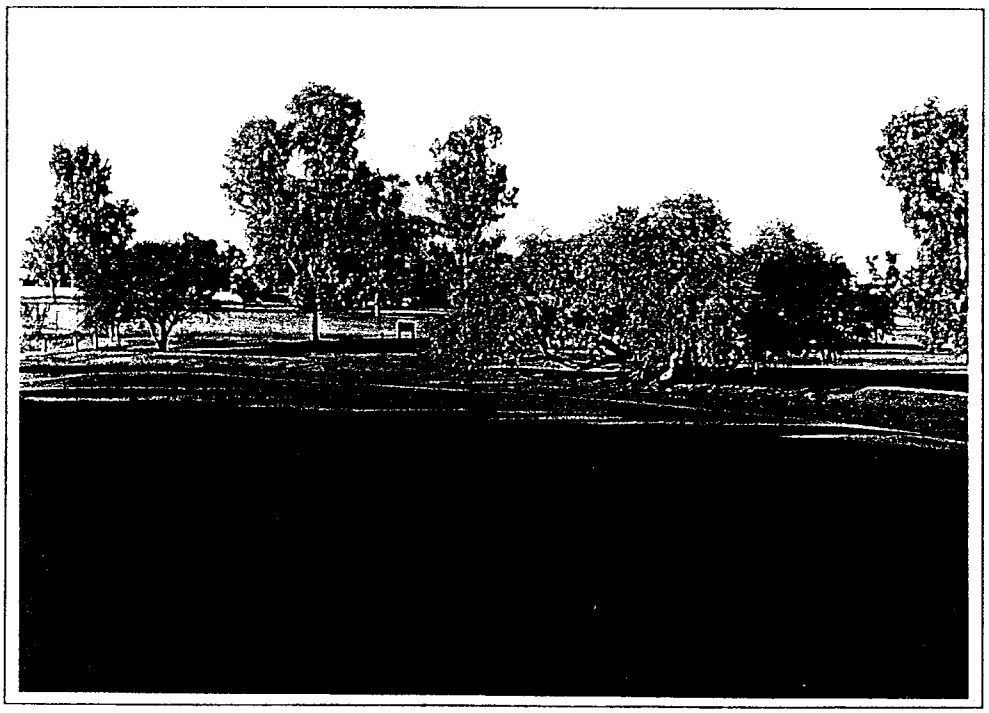


Photograph 3.13
Looking downstream at left channel bank area near cross section 3.409



Photograph 3.14
Looking downstream across the channel from near cross section 3.409
left channel bank area

REACH

From Thomas Road upstream to Indian School Road. This reach encompasses the Continental Golf Club and Osborn Park. This reach includes the Thomas Road bridge and the Osborn Road low water crossing. The reach is presented in plan view within Appendix B

CROSS SECTION 3.977

LOCATION OF CROSS SECTION

Cross section 3.977 is located approximately 1500 feet downstream (south) of Osborn Road and approximately 1000 feet upstream from Thomas Road. Cross section locations are presented in Appendix B.

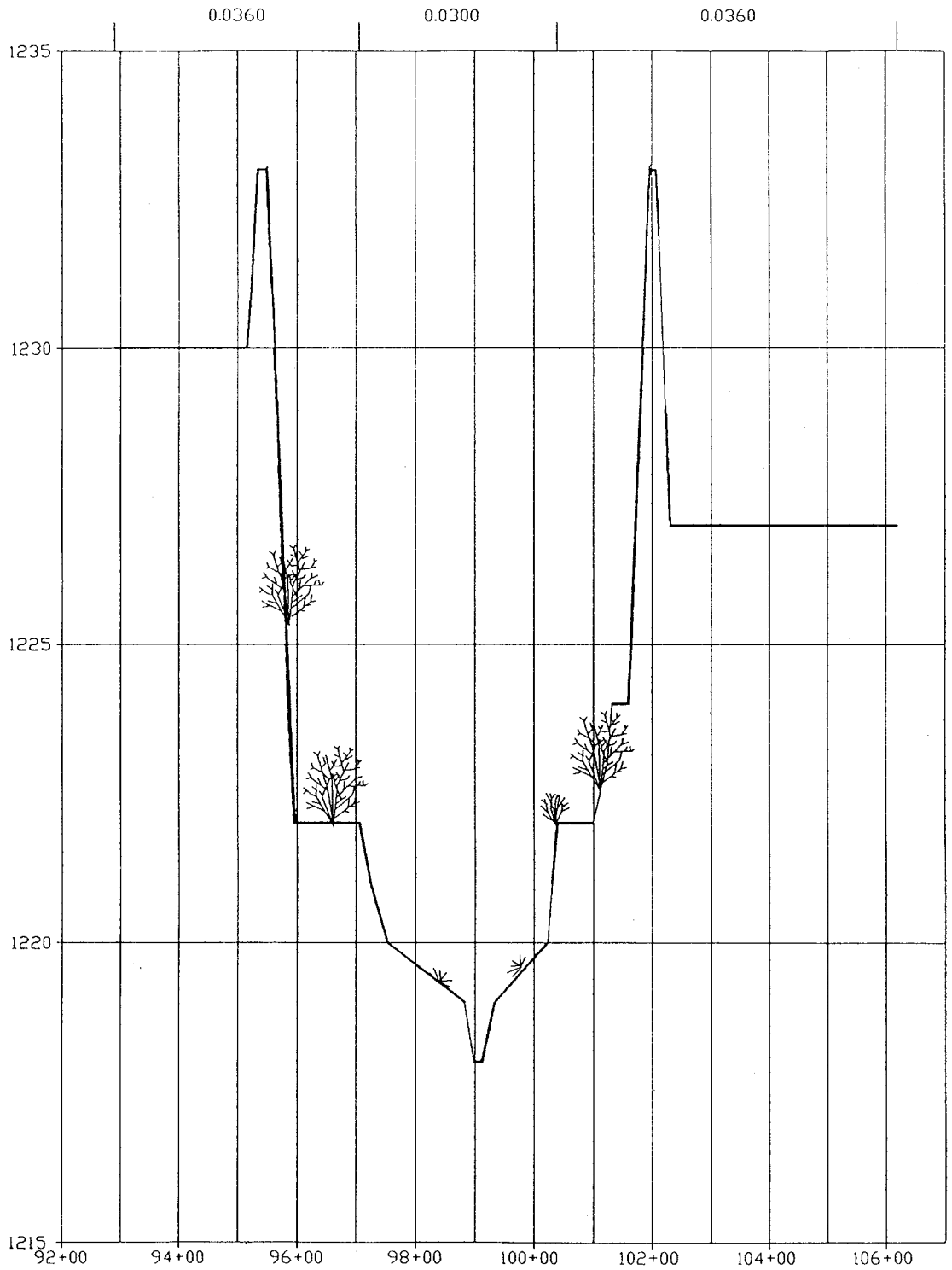
DESCRIPTION OF CHANNEL

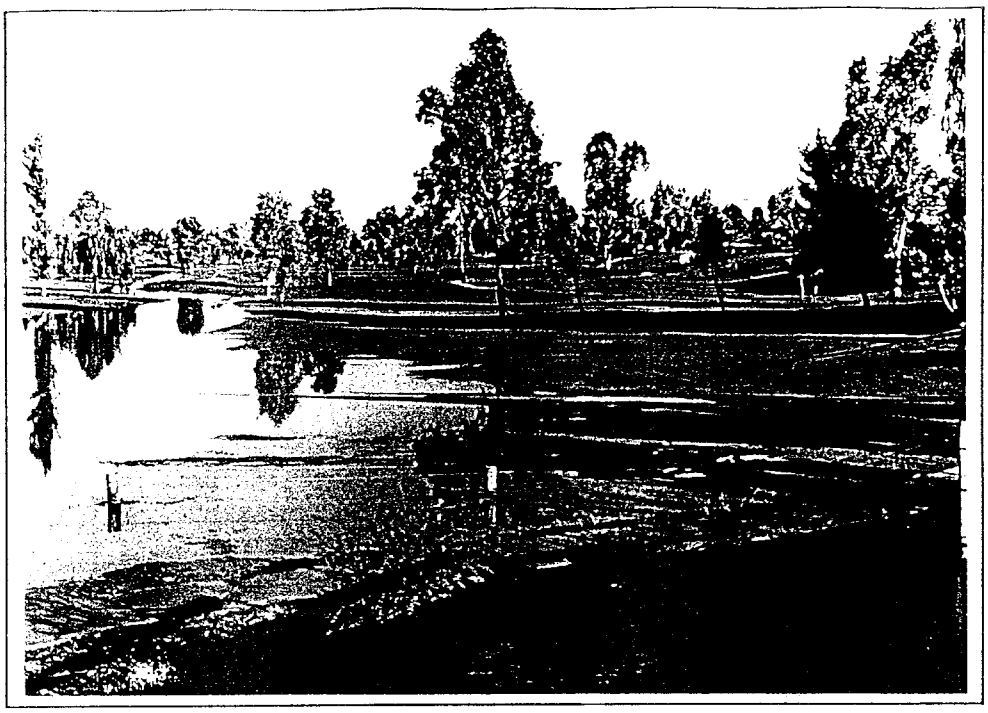
The channel is a constructed compound section with a low flow pilot channel that connects a series of small ponds. The channel overbank and ponds form the fairways and putting greens for the Continental Golf Course. The cross sections through this reach are broad with maintained vegetation.

100-YEAR N-VALUE CALCULATIONS

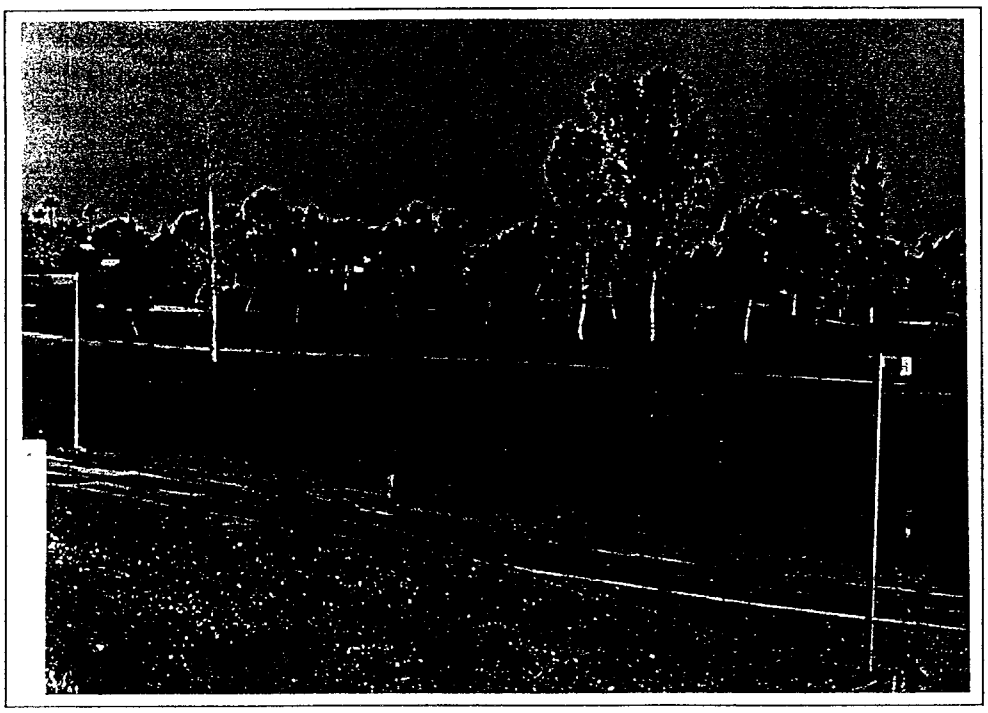
Portion of Cross Section	Components	"n" Total
Short Grass with Some Trees	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0.001$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.036**
Pilot Channel Area, Grass Without Trees	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.030**

CROSS SECTION 3.977





Photograph 3.15
Looking upstream from Thomas Road toward cross section 3.977
at Indian Bend Wash centerline



Photograph 3.16
Looking upstream from Thomas Road toward cross section 3.977
at Indian Bend Wash right channel bank area

REACH

From Indian School Road to Camelback Road. This reach encompasses Indian School Park. Included in this reach are the Indian School Road bridge and box culvert, and the low flow bridge at Camelback Road. The reach is presented in plan view within Appendix B

CROSS SECTION 5.205

LOCATION OF CROSS SECTION

Approximately one quarter mile north of Indian School Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

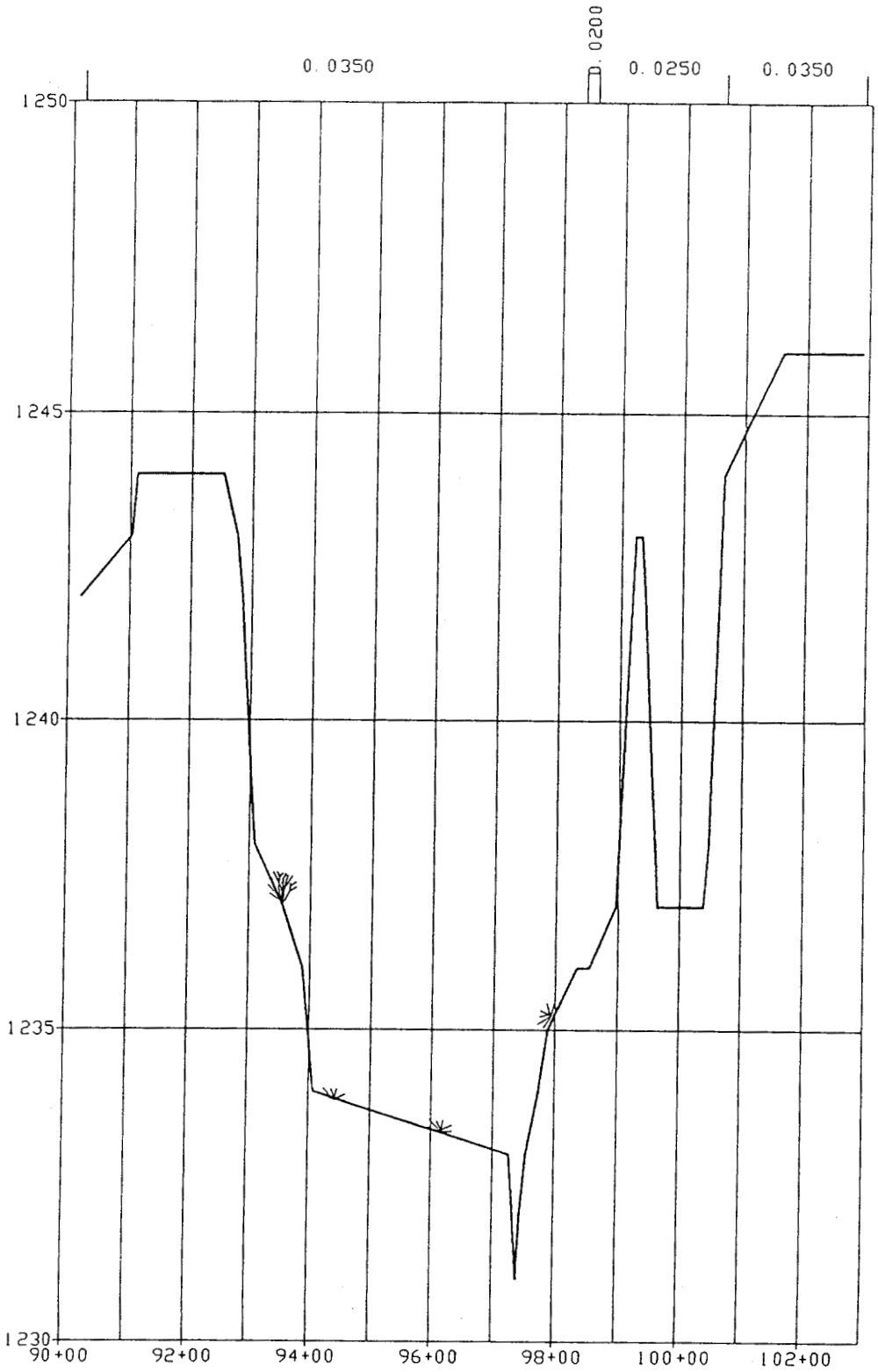
Indian Bend Wash is comprised of two hydraulically separate channels: 1) a low flow channel found in the right (west) portion of the cross section; and 2) a high flow channel in the left (east of Hayden Road) portion of the cross section. The flows that combine at Indian School Road are the result of a constructed split flow that begins at McDonald Drive approximately two miles upstream. The low flow channel is a grass lined constructed channel with an invert that varies in width.

The high flow channel is a broad, constructed channel that is utilized for soccer fields and other activities associated with the Indian Bend Wash Greenbelt.

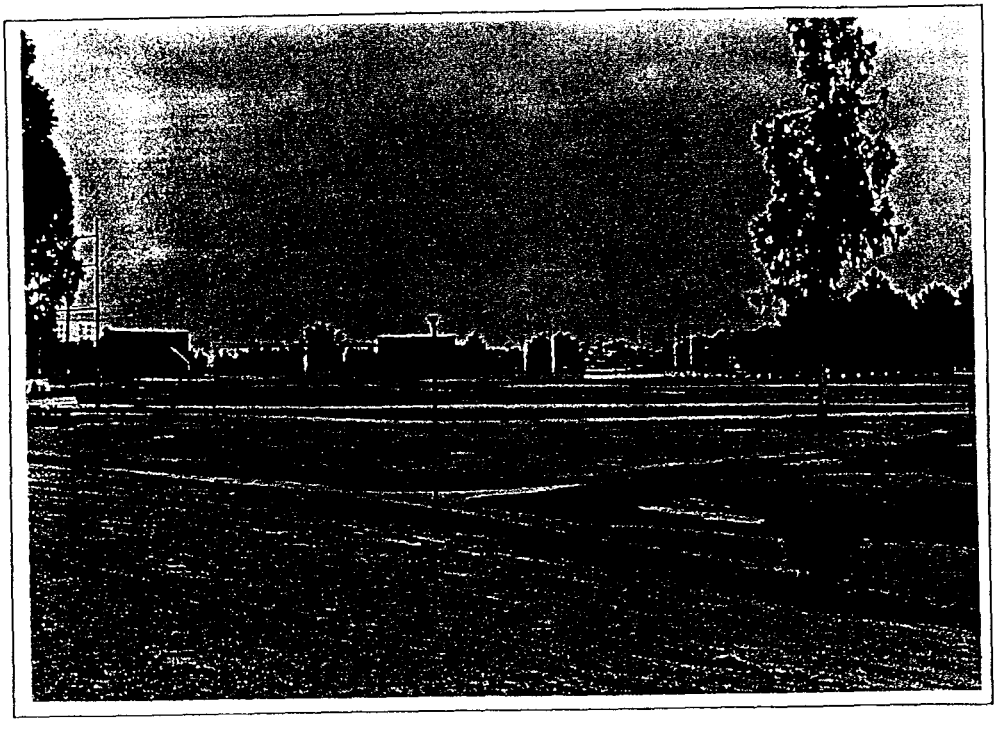
100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Low-Flow Channel/ Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**
Pavement		**0.020**
High-Flow Channel/ Short Grass with Some Facilities	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**

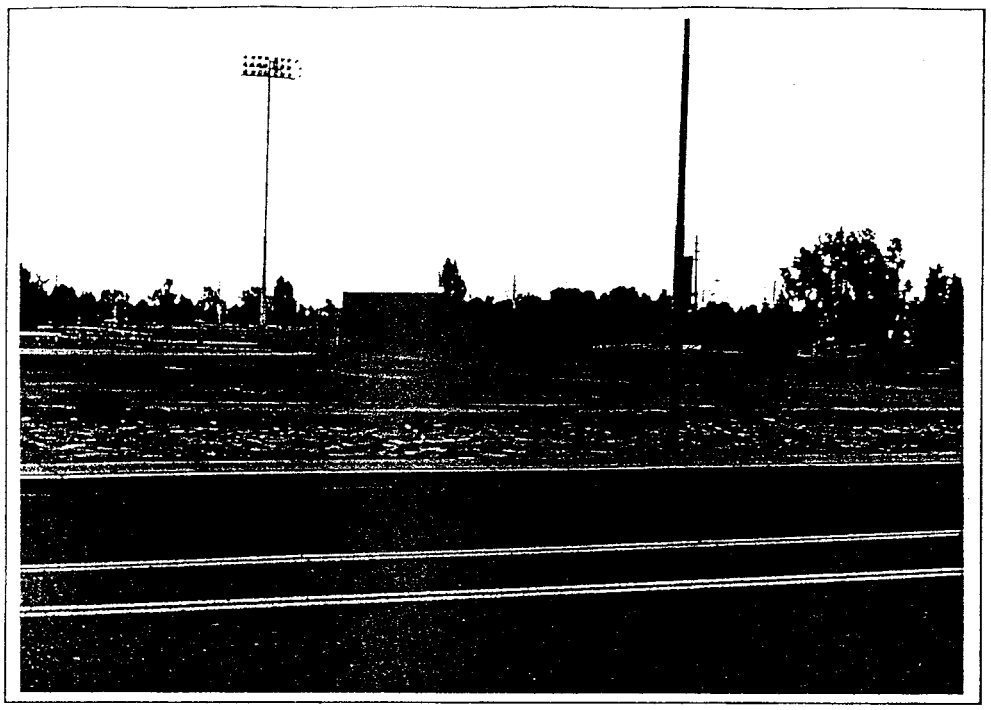
CROSS SECTION 5.205



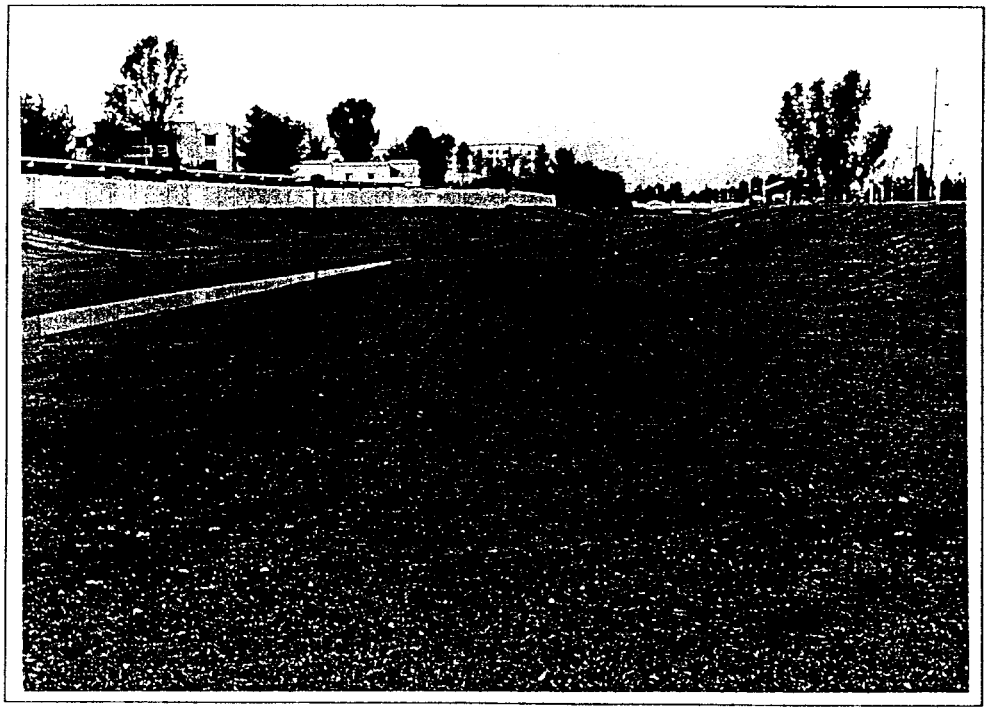
Photograph 3.17
Looking downstream across Hayden Road from high-flow channel toward lake at Indian School Road



Photograph 3.18
Looking upstream at high flow channel just upstream from Indian School Road



Photograph 3.19
Looking downstream at the high-flow channel from Camelback Road



Photograph 3.20
Looking upstream at low-flow channel just north of Indian School Road
Note: Camelback Road bridge in background

REACH

From Camelback Road to Chaparral Road. This reach encompasses the Villa Monterey Golf Course. Included in this reach is the low flow bridge at Chaparral Road. The reach is presented in plan view within Appendix B

CROSS SECTION 5.587

LOCATION OF CROSS SECTION

Approximately 1,000 feet north of Camelback Road. Cross section locations are presented in Appendix B.

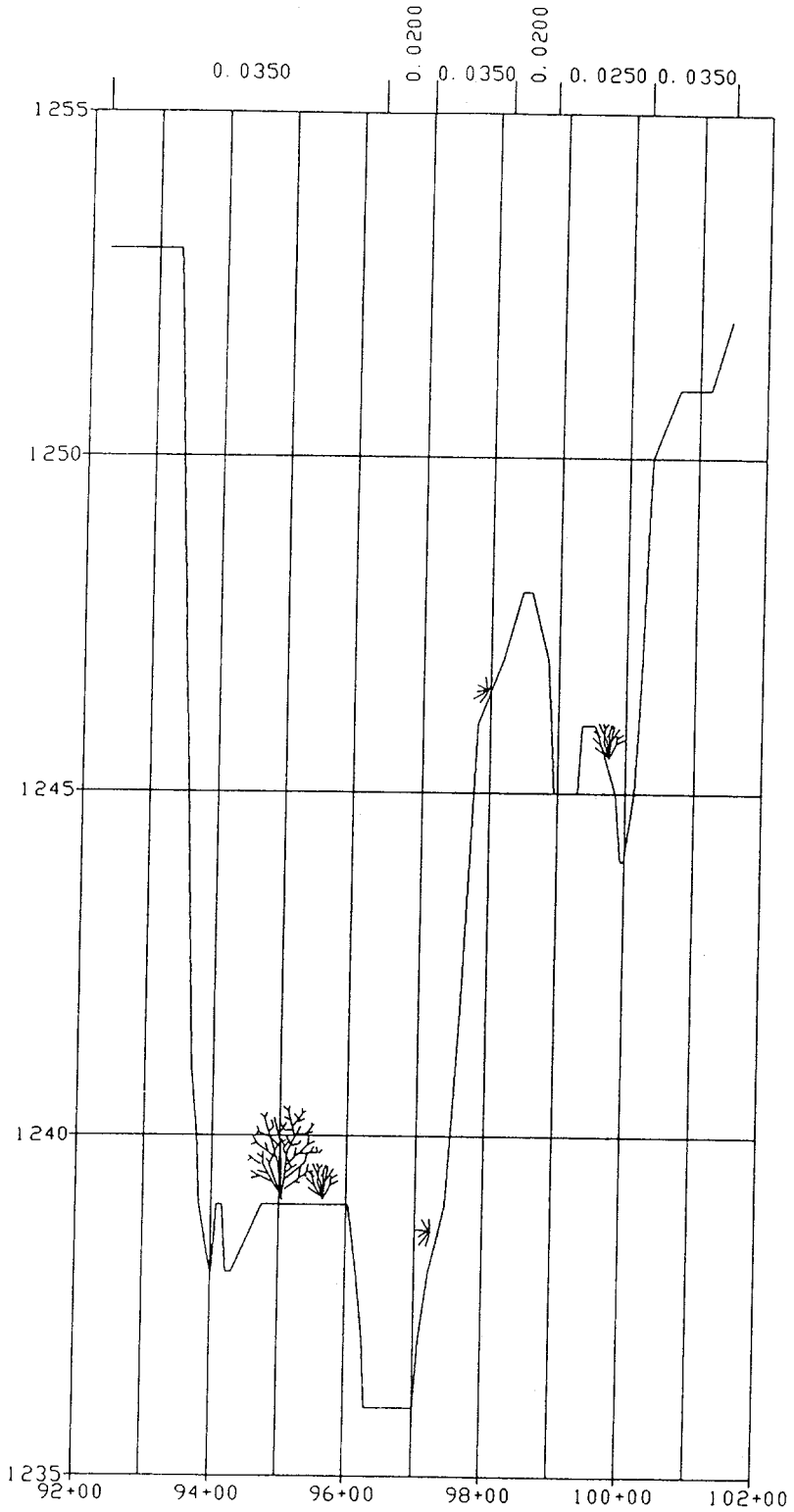
DESCRIPTION OF CHANNEL

This reach is hydraulically similar to the reach just downstream. The low flow channel found on the right side of the cross section (west of Hayden Road) conveys the frequent flows. The high flow channel found on the left side of the cross section conveys flows in excess of the low flow channel capacity. The low flow channel is a constructed grass lined channel. The high flow channel is a broad constructed section that contains golf course uses, small ponds and City park facilities.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
High-Flow Channel/ Short Grass with Some Irregularity	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.035**
Lake		**0.020**
Pavement		**0.020**
Low-Flow Channel/ Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**

CROSS SECTION 5.587



Photograph 3.21
Looking upstream from Camelback Road at the high-flow channel

Photograph 3.22
Looking downstream from Chaparral Road at the high-flow channel

REACH

From Chaparral Road to Jackrabbit Road. This reach encompasses the southern portion of the Chaparral Park. The reach is entirely within the City of Scottsdale. The reach is presented in plan view within Appendix B

CROSS SECTION 5.966

LOCATION OF CROSS SECTION

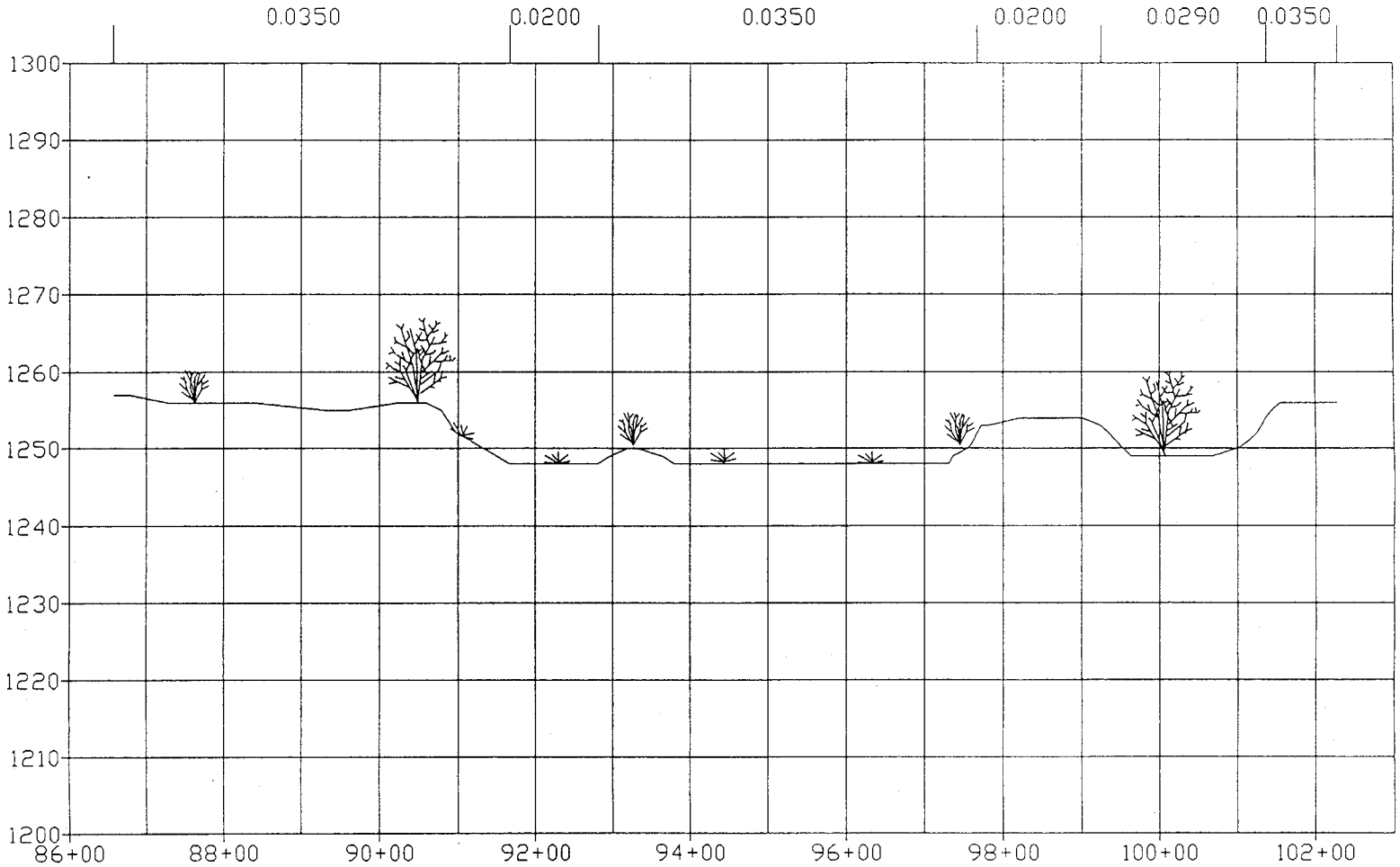
Approximately 300 feet north (upstream) of Chaparral Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

This reach is hydraulically similar to the reach just downstream. The low flow channel found on the right side of the cross section (west of Hayden Road) conveys the frequent flows. The high flow channel found on the left side of the cross section conveys flows in excess of the low flow channel capacity. The low flow channel is a constructed grass lined channel. The high flow channel is a broad constructed section that contains golf course uses, small ponds and City park facilities.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
High-Flow Channel/ Bank Areas Around Lake	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**
Lake		**0.020**
Pavement		**0.020**
Low-Flow Channel/ Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.004$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.029**



CROSS SECTION 5.966

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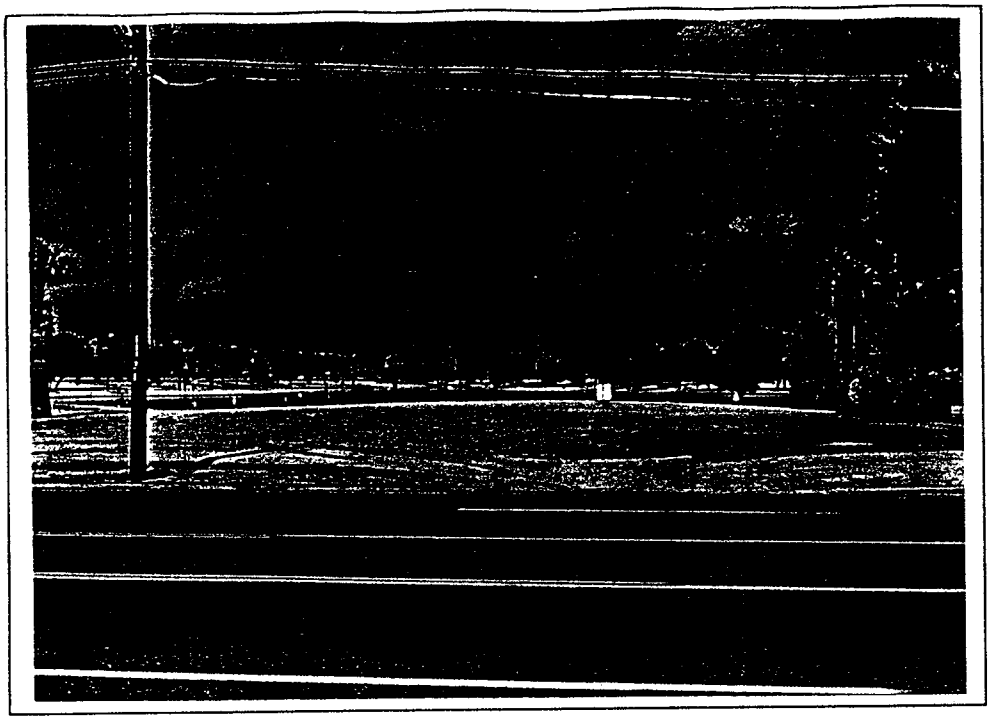
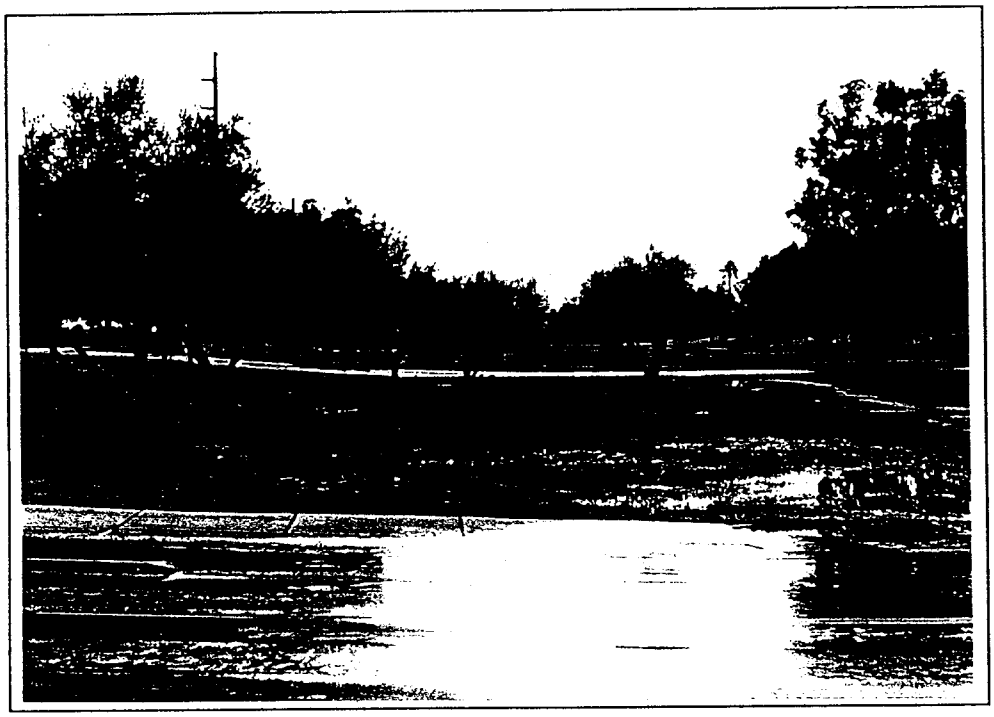


Photograph 3.23
Looking upstream from Chaparral Road at high-flow channel



Photograph 3.24
Looking downstream from Jackrabbit Road at low-flow channel

REACH

From Jackrabbit Road to McDonald Road. This reach encompasses the northern portion Chaparral Park and is entirely within the City of Scottsdale. This reach includes the McDonald Road bridge. The reach is presented in plan view within Appendix B

CROSS SECTION 6.40

LOCATION OF CROSS SECTION

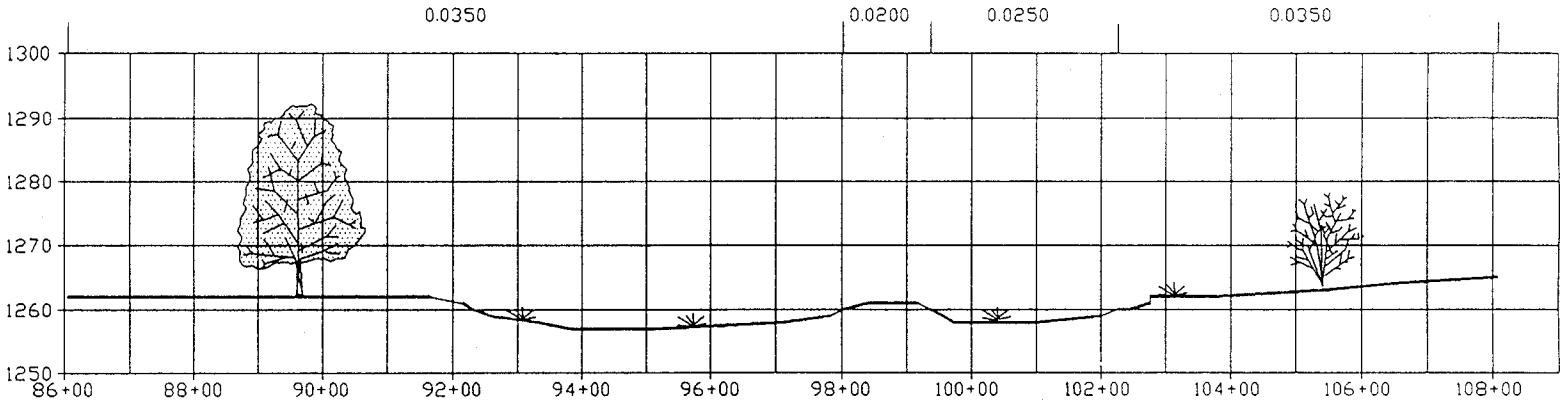
Just upstream of the Jackrabbit Road alignment. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

This reach is hydraulically similar to the reach just downstream. A portion of this reach has the low-flow and high-flow channel hydraulically connected during large events. The low flow channel (west of Hayden Road) conveys the frequent events, and is composed of a grass lined trapezoidal channel. The high flow channel is a broad grass lined section that contains golf course and open space uses.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
High-Flow Channel/ Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**
Pavement		**0.020**
Low-Flow Channel/ Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**



CROSS SECTION 6.40

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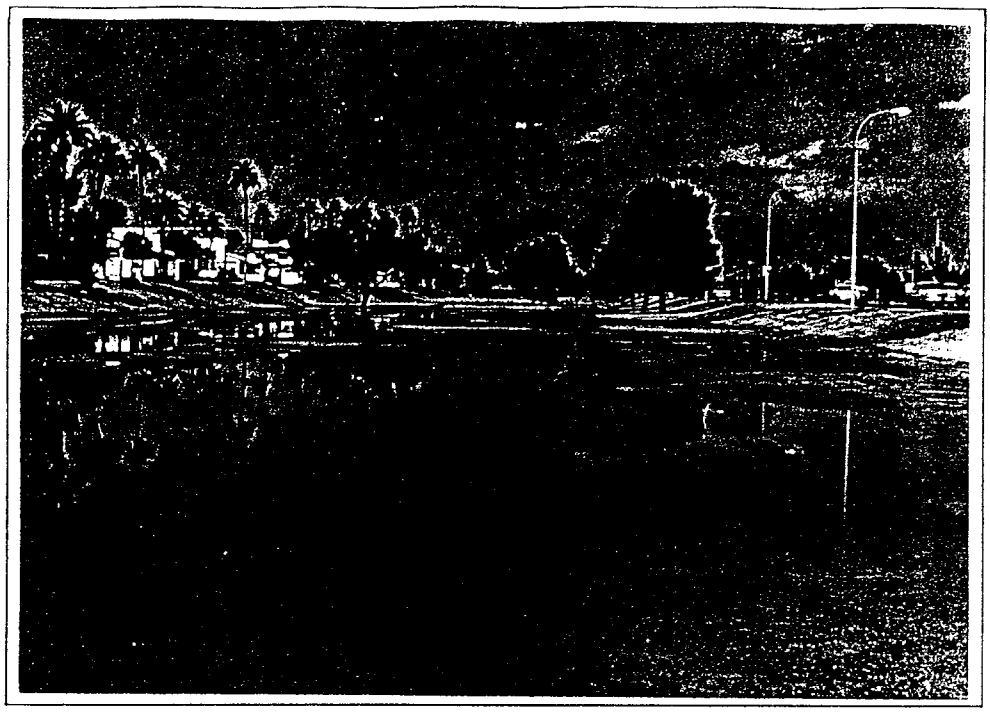
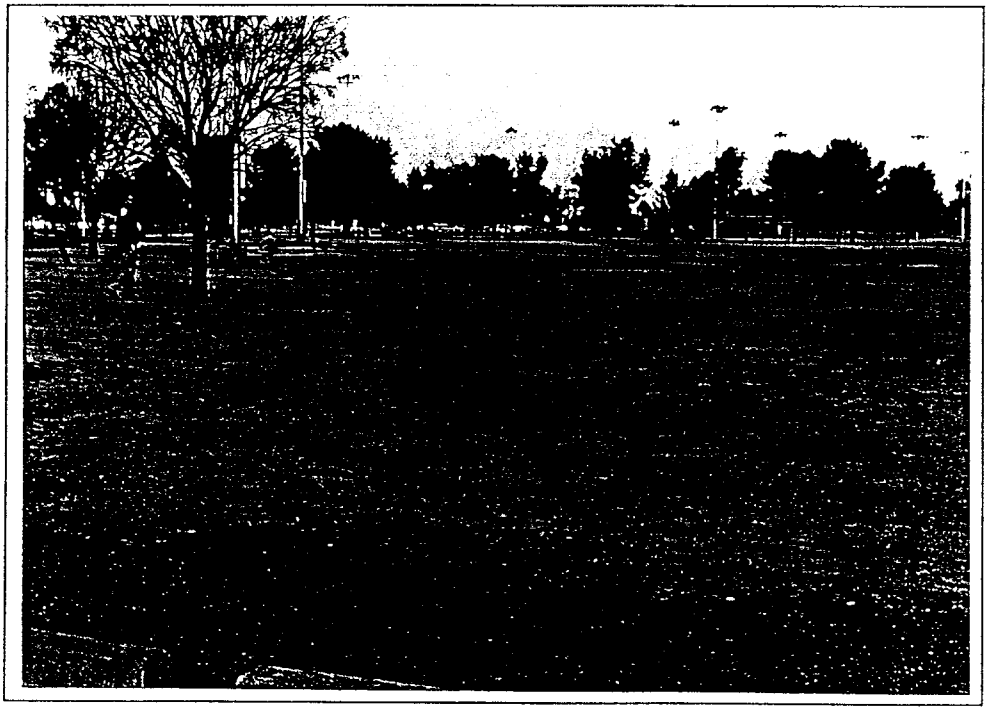


Photograph 3.25
Looking upstream from Jackrabbit Road at low-flow channel,
west side of Hayden Road



Photograph 3.26
Looking upstream from Jackrabbit Road at high-flow channel,
east of Hayden Road

REACH

From McDonald Road to the Arizona Canal. This reach is entirely within the City of Scottsdale. The reach is presented in plan view within Appendix B

CROSS SECTION 6.96

LOCATION OF CROSS SECTION

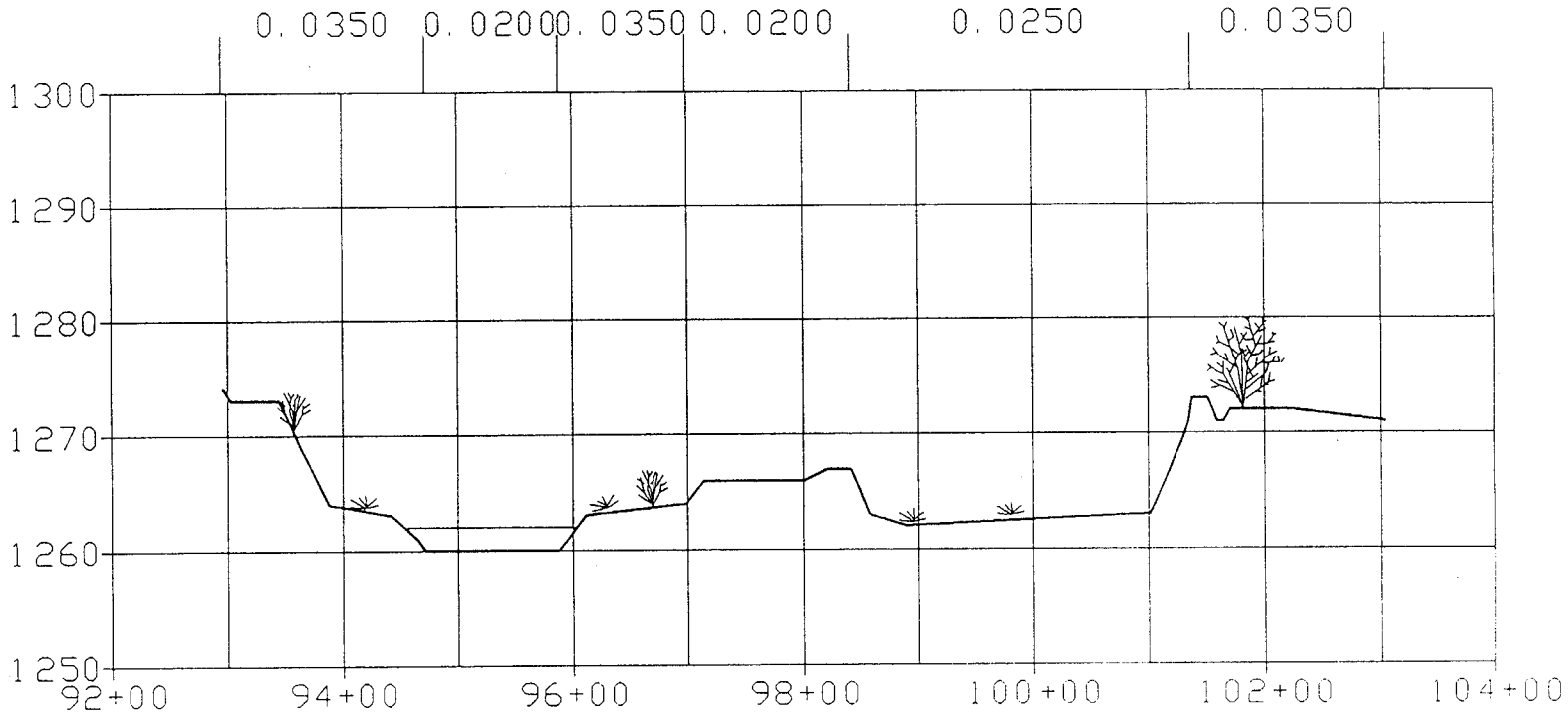
Just upstream of McDonald Road in the area where flow is designed to top Hayden Road during large events. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The southern portion of this reach includes an area where flows are designed to top Hayden Road and weir into the high-flow channel during large events. The channel is a grass-lined trapezoidal section. Flows that enter the high-flow channel is eventually combined with the low-flow discharge at Indian School Road. At Camelback Road, Chaparral Road, and Jackrabbit Road, the two channels are hydraulically connected during the 100-year flood.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Channel Bank Areas with Some Trees	$n_b = 0.020$ $n_1 = 0.005$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0.005$	**0.035**
Lake		**0.020**
Pavement		**0.020**
Low-Flow Channel/ Short Grass	$n_b = 0.020$ $n_1 = 0$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0$	**0.025**



CROSS SECTION 6.96

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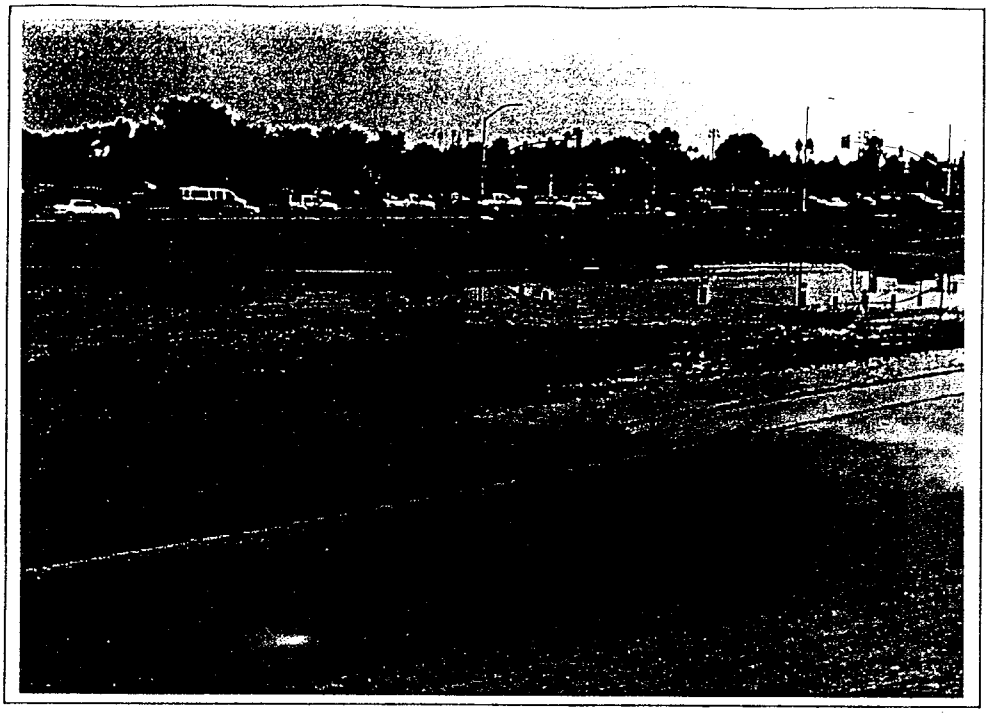
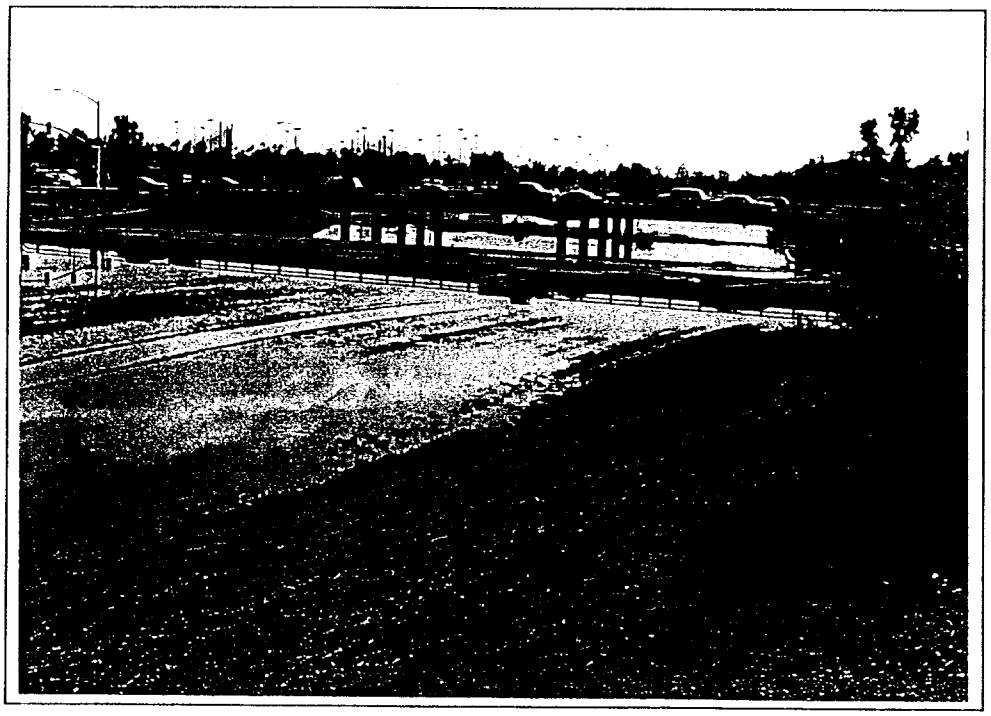
Photograph 3.27
Looking downstream at high-flow channel just south of McDonald Road

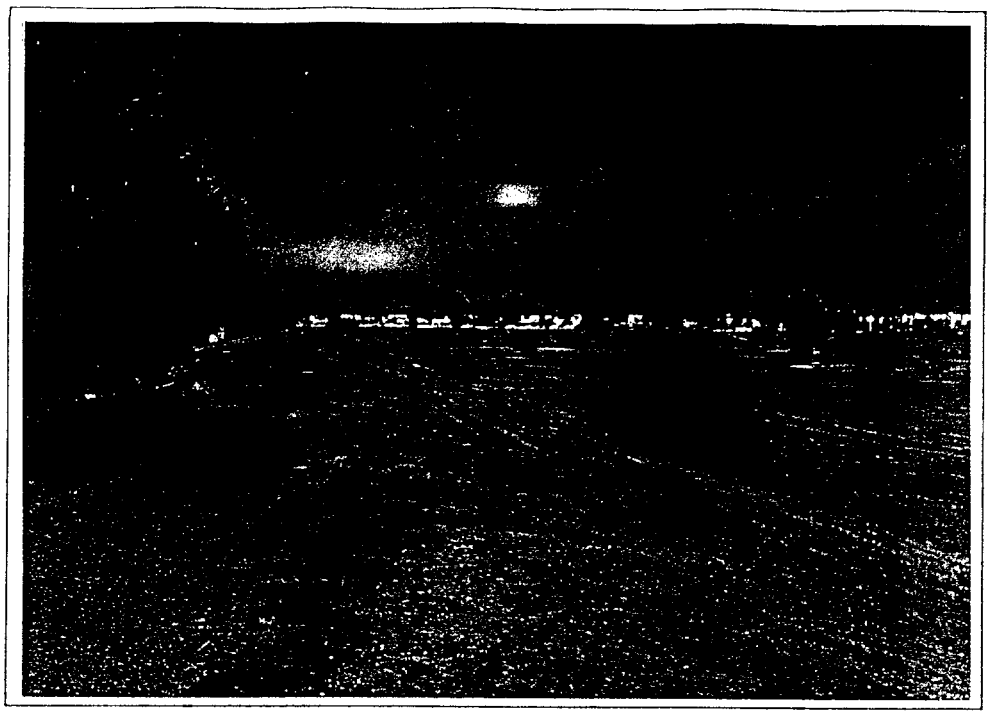
Photograph 3.28
Looking east along the south side of McDonald Road at facilities constructed in high-flow channel



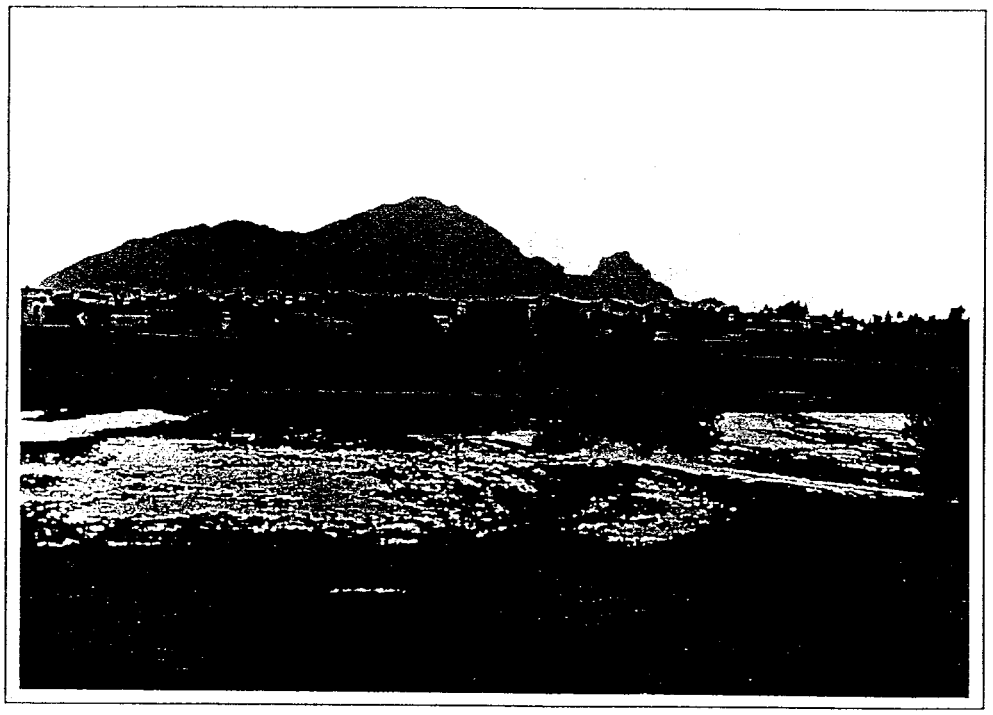
Photograph 3.29
Looking east across Indian Bend Wash at Hayden Road where flows weir over during large event



Photograph 3.30
Looking downstream at McDonald Road and trapezoidal channel



Photograph 3.31
Looking upstream at Indian Bend Wash just upstream from McDonald Road



Photograph 3.32
Looking west across Indian Bend Wash near the Arizona Canal

REACH

From the Arizona Canal to Indian Bend Road. This reach is entirely within the City of Scottsdale. This reach includes the drop at Indian Bend Road and a Hotel on piers. The reach is presented in plan view within Appendix B

CROSS SECTION 7.837

LOCATION OF CROSS SECTION

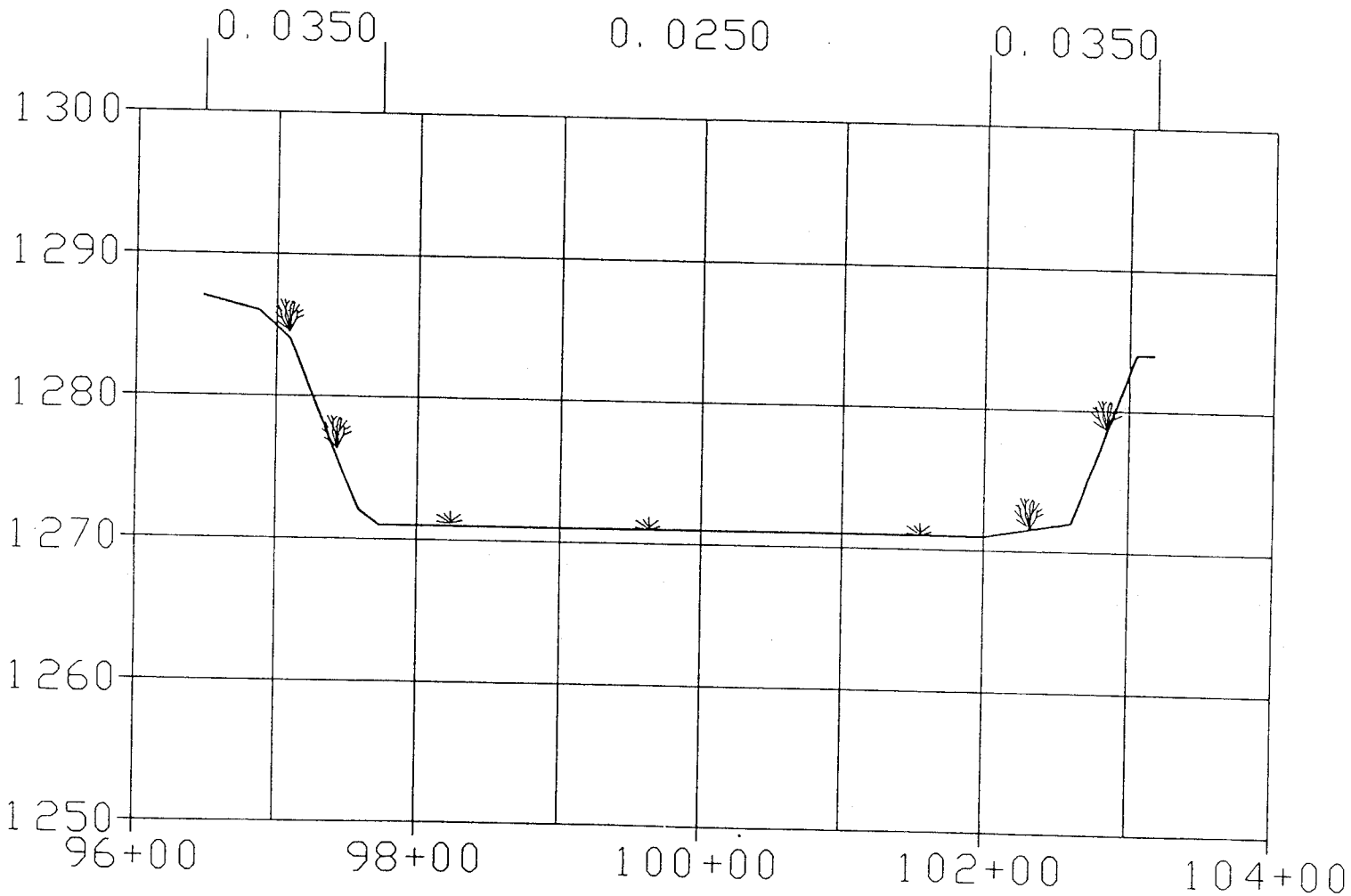
Approximately 860 feet upstream of the Arizona Canal outflow into Indian Bend Wash. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is an earth lined trapezoidal section. Vegetation is sparse consisting of grass and small shrubs. At one location a hotel has been constructed on piers into a portion of the channel.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Channel Bank Areas with Small Shrubs	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.010$	
	$n_4 = 0.005$	**0.035**
Channel Invert	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**



CROSS SECTION 7.837

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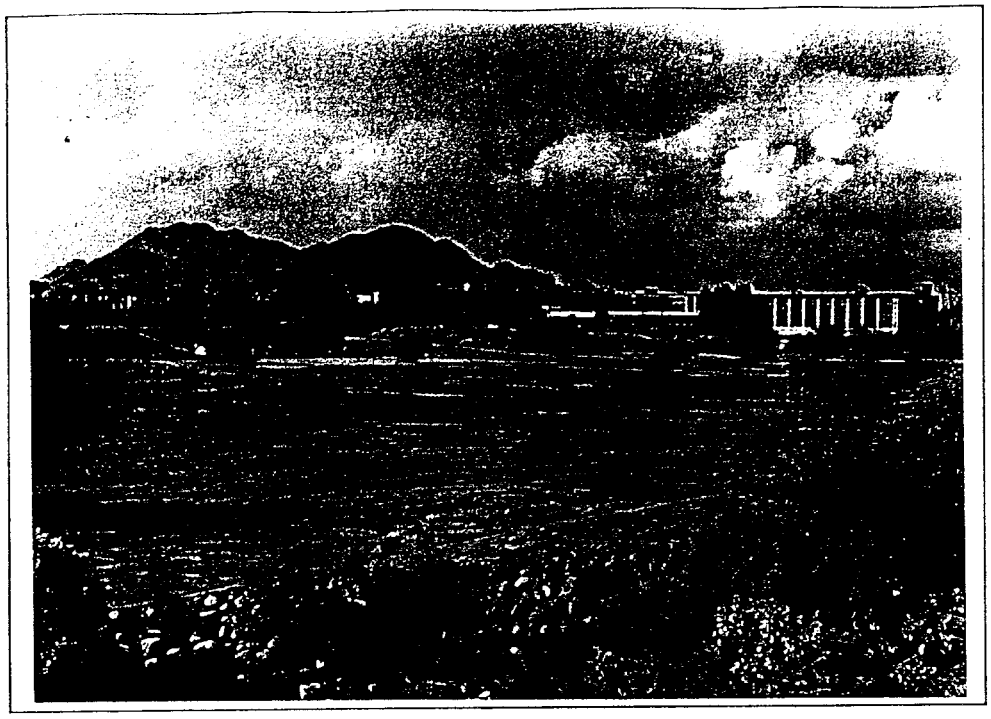
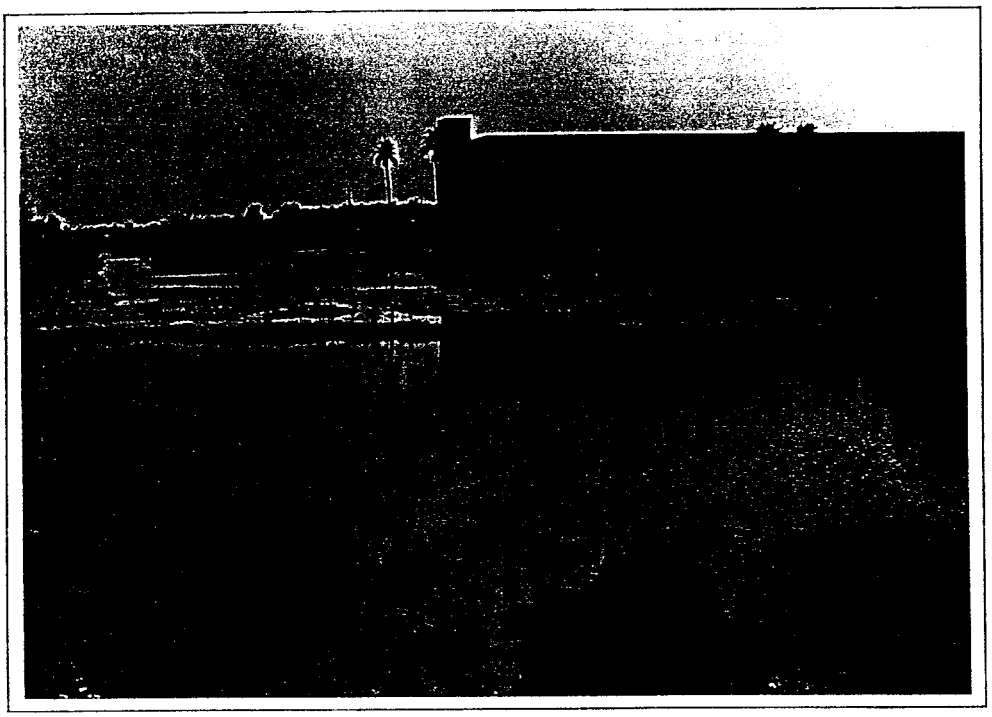


Photograph 3.33
Looking west across Indian Bend Wash just upstream from the Arizona Canal



Photograph 3.34
Looking south (downstream) from Indian Bend Road at the channel centerline

REACH

From Indian Bend Road upstream to Scottsdale Road. The reach is entirely within the City of Scottsdale, although Scottsdale Road is a boundary between the City of Scottsdale and the Town of Paradise Valley. The reach encompasses the McCormick Ranch Golf Course. This reach includes the Scottsdale Road box culvert. The reach is presented in plan view within Appendix B

CROSS SECTION 8.333

LOCATION OF CROSS SECTION

Approximately 1,500 feet upstream of Indian Bend Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

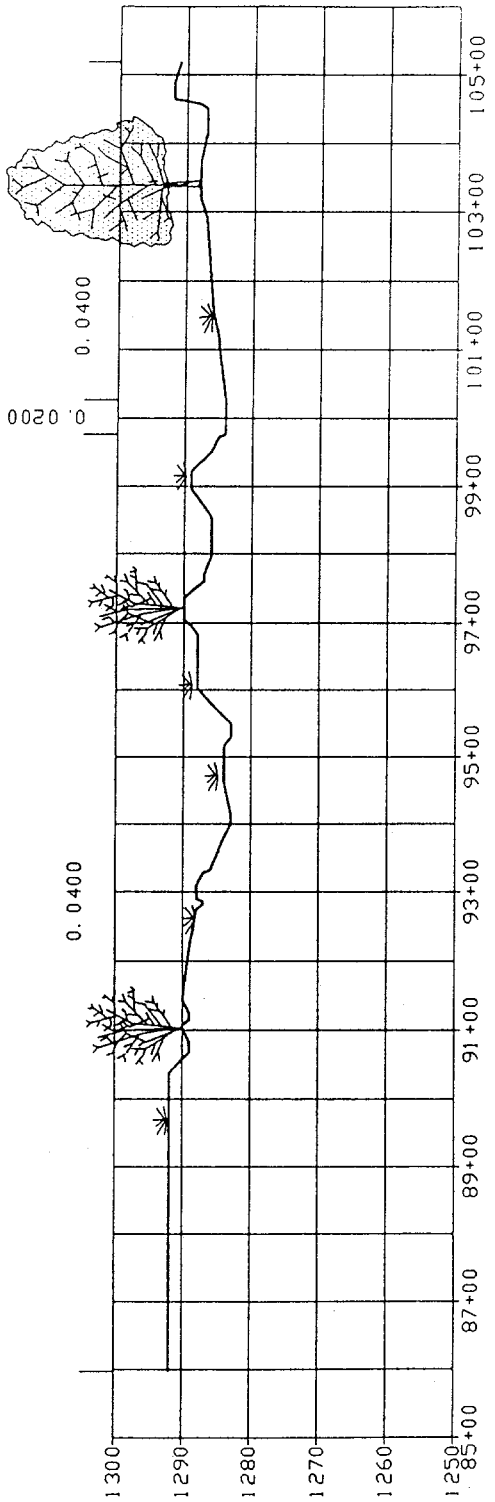
The cross sections of this reach are typical of golf course uses. A small pilot channel defines the thalweg and connects a series of sequential lakes. The topography is flat to gently rolling. Vegetation is comprised mostly of short trimmed grass and small pruned trees.

100-YEAR N-VALUE CALCULATIONS

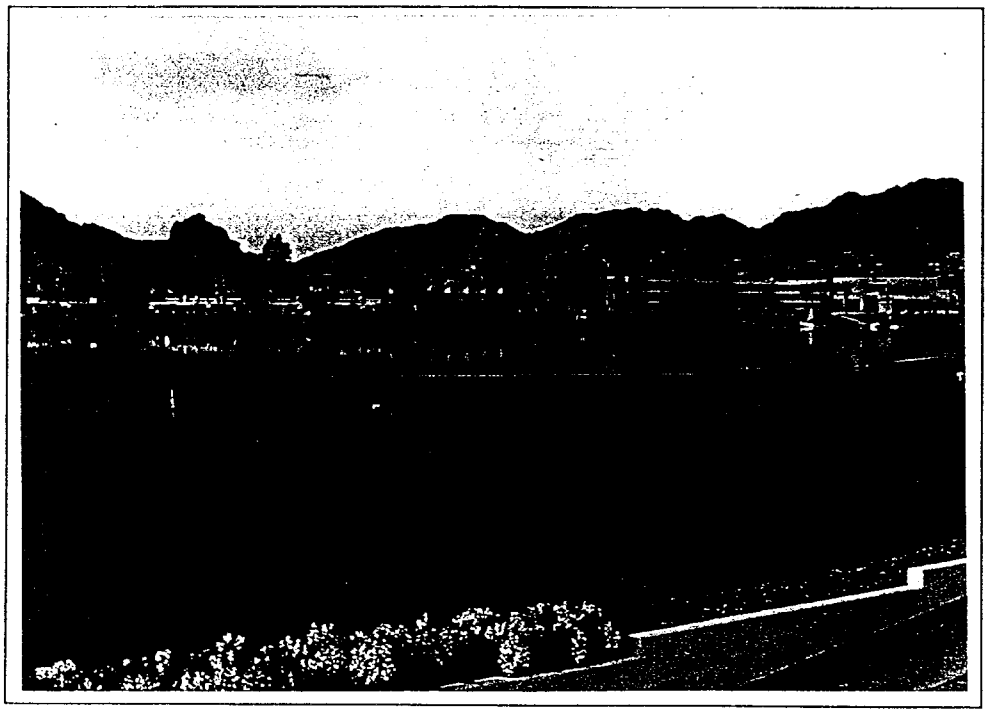
Portion of Cross Section	Components	"n" Total
Rolling Golf Course Areas with Short Grass and Pruned Trees	$n_b = 0.020$	
	$n_1 = 0.010$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.040**
Lake		**0.020**
Fairways	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**

Portion of Cross Section	Components	"n" Total
Channel Banks Along Lakes with Few Trees and Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.010$	
	$n_4 = 0$	**0.030**

CROSS SECTION 8.333



Photograph 3.35
Looking upstream from Indian Bend Road at Indian Bend Wash centerline



Photograph 3.36
Looking west across Indian Bend Wash from the McCormick Golf Course
between Indian Bend and Scottsdale Roads

REACH

From Scottsdale Road upstream to the Camelback Country Club. This reach is entirely within the Town of Paradise Valley. The reach is presented in plan view within Appendix B

CROSS SECTION 9.223

LOCATION OF CROSS SECTION

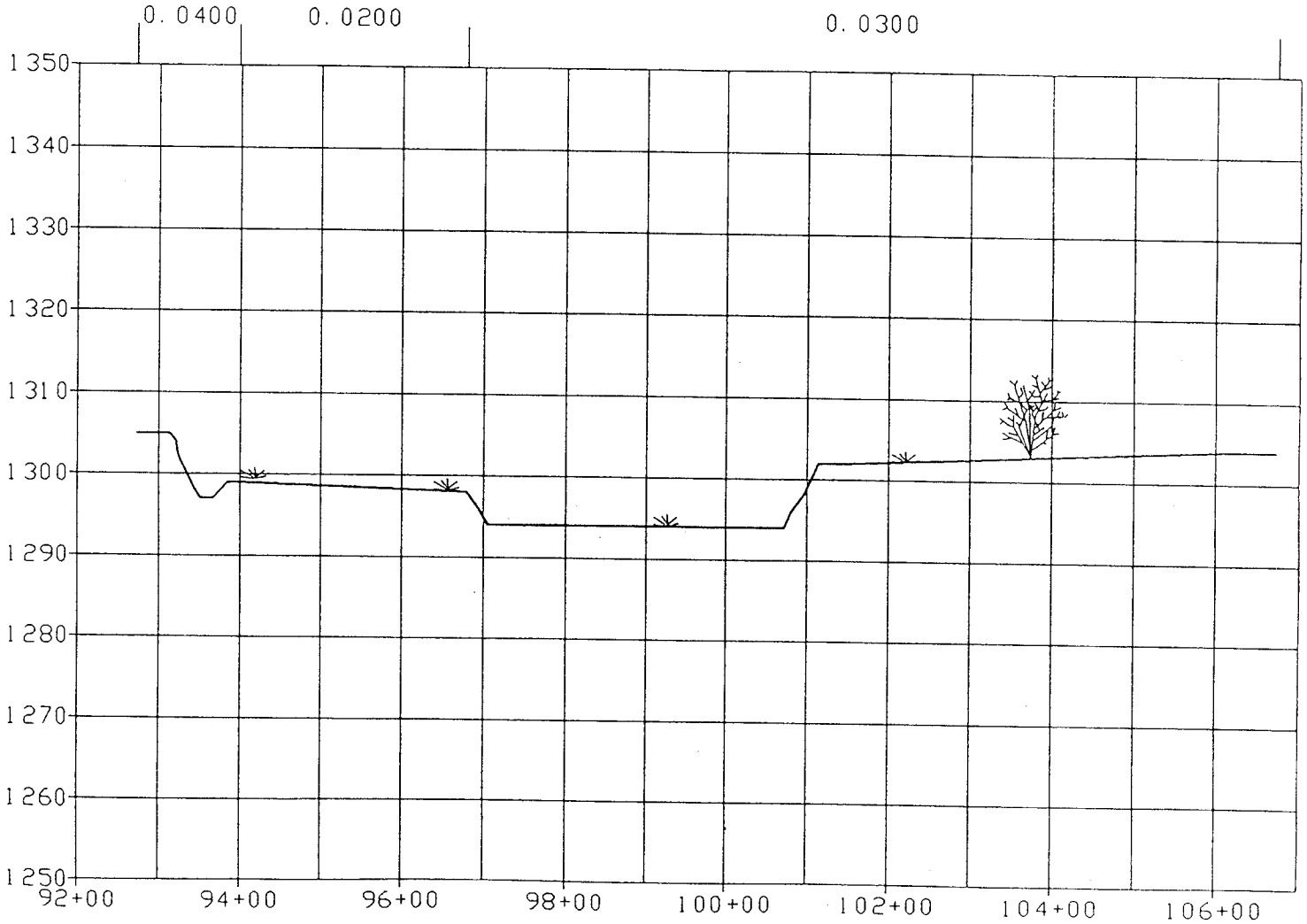
Approximately 500 feet upstream of Scottsdale Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

This portion of Indian Bend Wash is a short trapezoidal channel section. Vegetation is comprised of short maintained grass.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	**Components**	**"n" Total**
Along Scottsdale Road	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.040**
Pavement		**0.020**
Trapezoidal Channel Area	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.030**



CROSS SECTION 9.223

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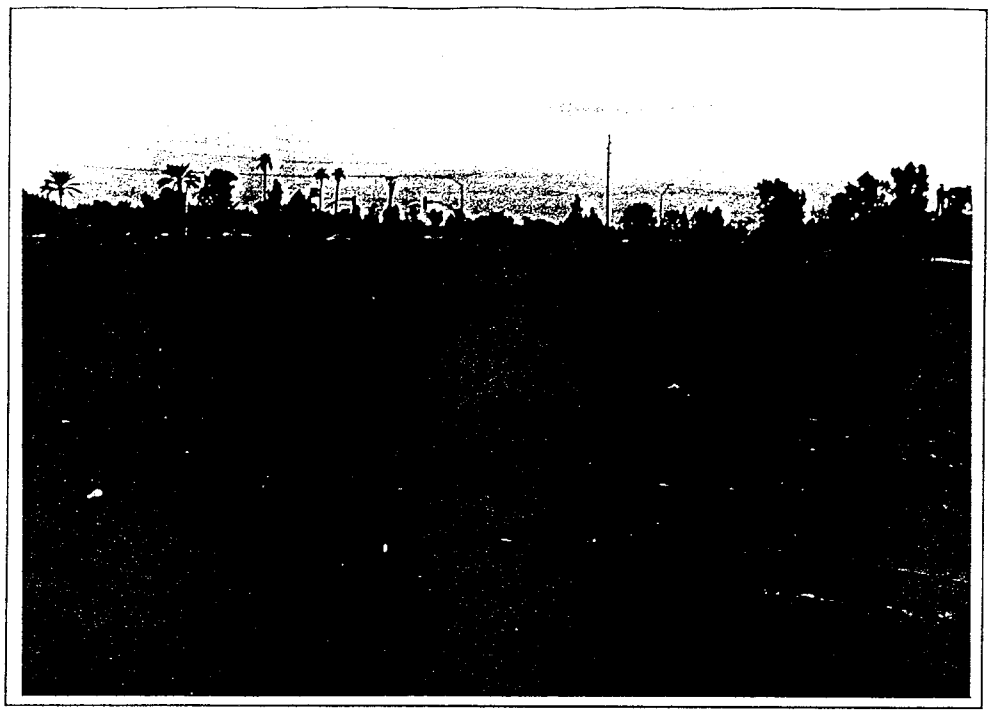


Photograph 3.37
Looking south from the upstream end of the reach
adjacent to Cheney Estates.
Note: Scottsdale Road in the background

REACH

From the southern (downstream) end of Camelback Country Club to the Mountain View Road alignment. This reach encompasses a majority of the Camelback Country Club and is entirely within the Town of Paradise Valley. This reach includes the Invergordon Road and Double Tree Road low water crossings. The reach is presented in plan view within Appendix B

CROSS SECTION 9.564

LOCATION OF CROSS SECTION

Approximately 745 feet upstream of Golf Drive within the Camelback Country Club. Cross section locations are presented in Appendix B.

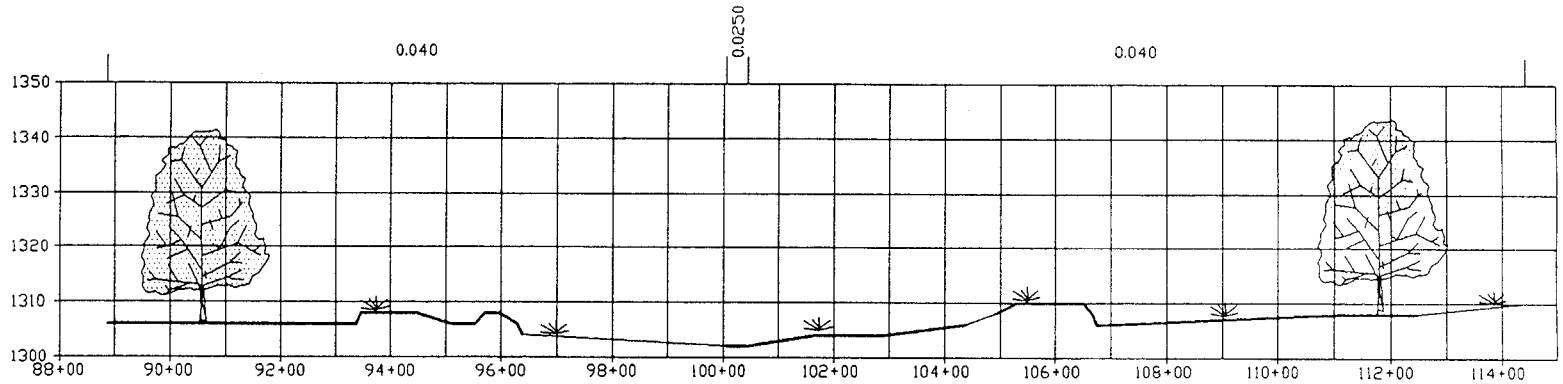
DESCRIPTION OF CHANNEL

The channel through this area is a broad bowl shaped channel with a low-flow pilot channel that conveys the frequent flows. Numerous small ponds are connected by the low-flow portion of the channel. Gold course uses such as fairways, putting greens, and lakes comprise the entire reach. Vegetation is short maintained grass and some pruned trees. Topography varies from smooth gradual contours on the fairways to slightly rolling features in other areas.

100-YEAR N-VALUE CALCULATIONS

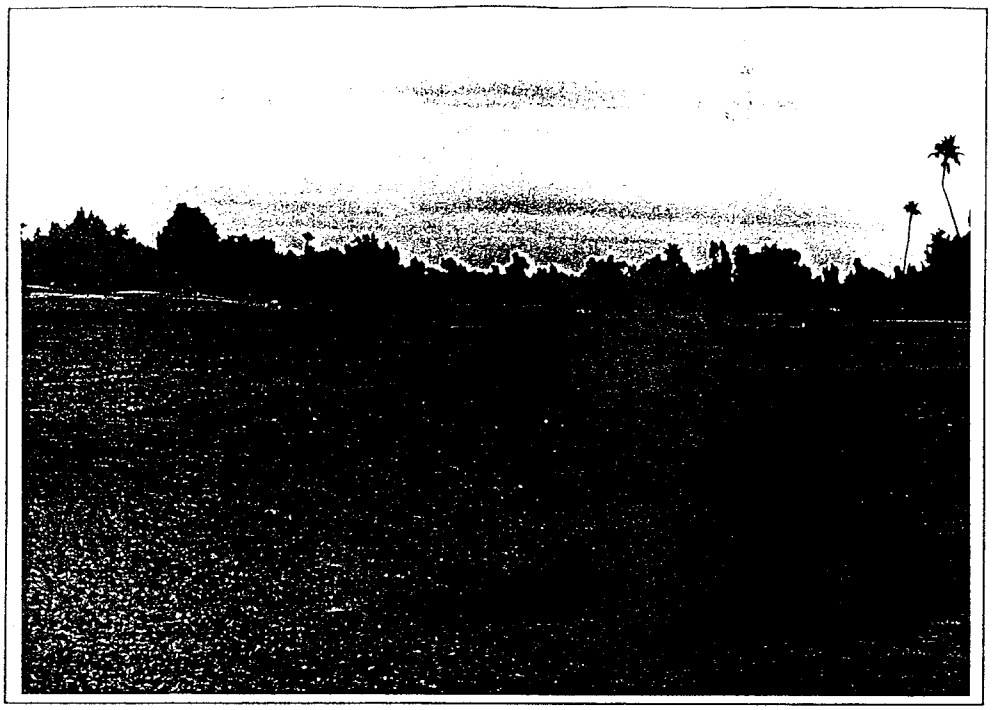
Portion of Cross Section	Components	"n" Total
Regular Topography with Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**
Irregular Topography with Short Grass and Some Trees	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0.005$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.040**

CROSS SECTION 9.564

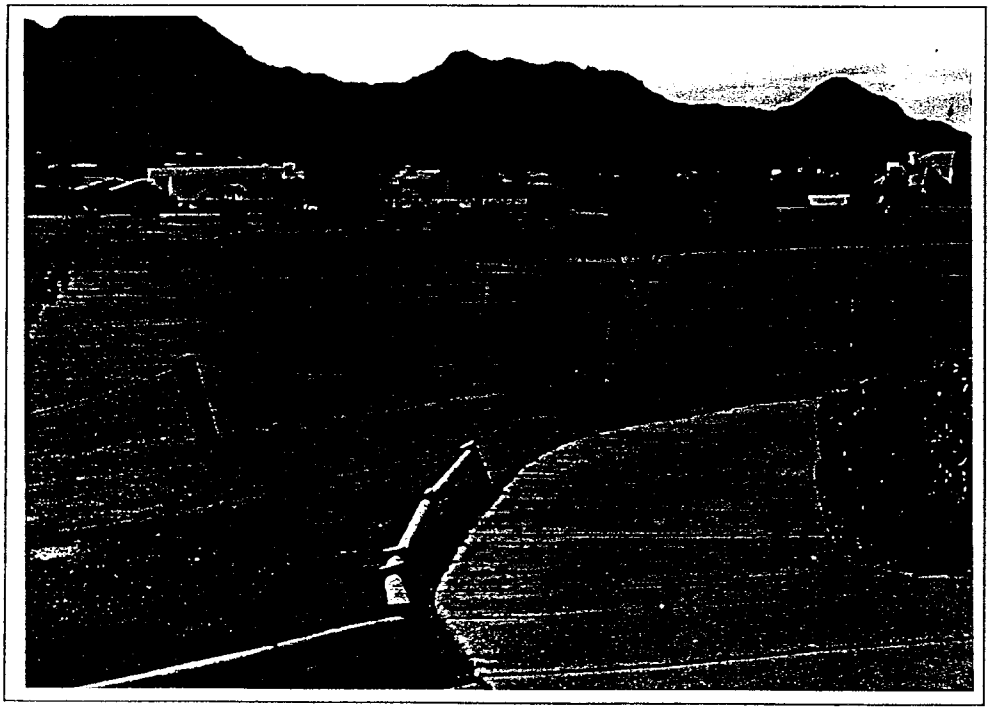


Photograph 3.38
Looking downstream near cross section 9.564

Photograph 3.39
Looking upstream near cross section 9.564



Photograph 3.40
Looking downstream from Invergordon Road at Indian Bend Wash centerline



Photograph 3.41
Looking across Indian Bend Wash from the left bank area
just upstream of Invergordon Road

REACH

From the Mountain View Road alignment to Shea Boulevard. This reach is within the City of Phoenix with the exception of the southwest corner of Shea Boulevard and 52nd Street. The reach is presented in plan view within Appendix B

CROSS SECTION 12.22

LOCATION OF CROSS SECTION

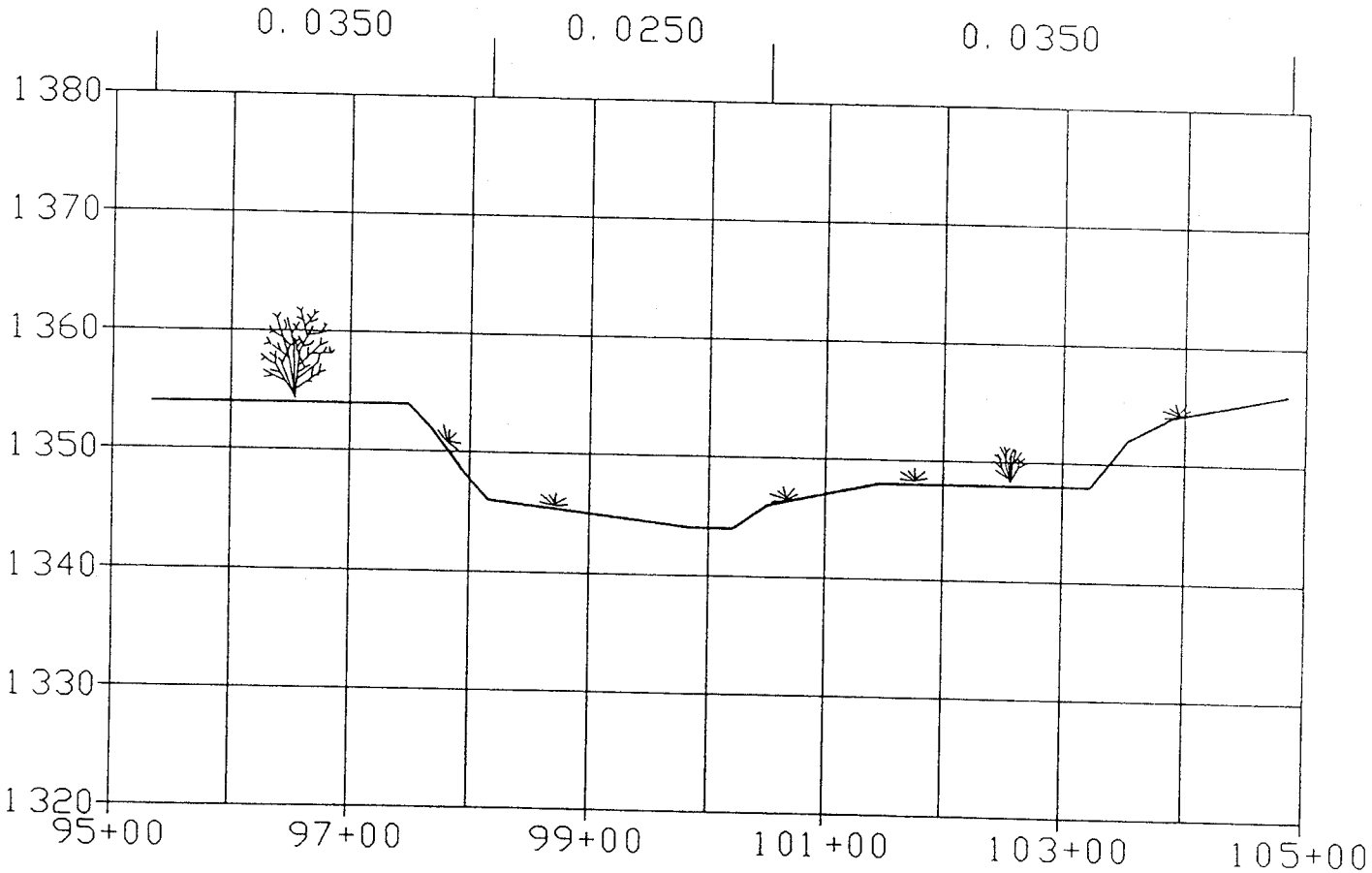
Approximately 1,700 feet downstream of Shea boulevard. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is a broad constructed trapezoidal section with various golf course uses present. Features include golf course fairways, putting greens, and a low flow channel area.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Regular Topography with Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**
Irregular Topography with Short Grass and Some Trees	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**



CROSS SECTION 12.22

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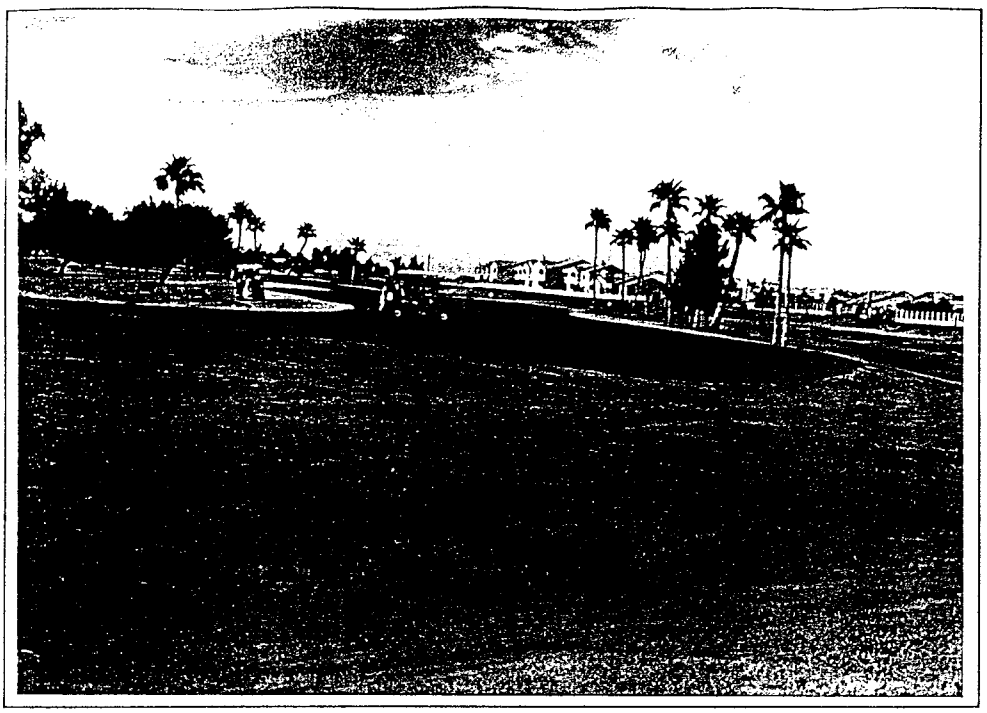


Photograph 3.42
Looking upstream near the north end of Camelback Country Club
just south of Shea Boulevard

Photograph 3.43
Looking downstream from near Shea Boulevard
at the centerline of Indian Bend Wash

REACH

From Shea Boulevard to Tatum Boulevard. This reach is within the City of Phoenix and encompasses the southern portion of the Stone Creek Golf Course. This reach includes the Shea Boulevard bridge and the Tatum Boulevard bridge. The reach is presented in plan view within Appendix B

CROSS SECTION 12.97

LOCATION OF CROSS SECTION

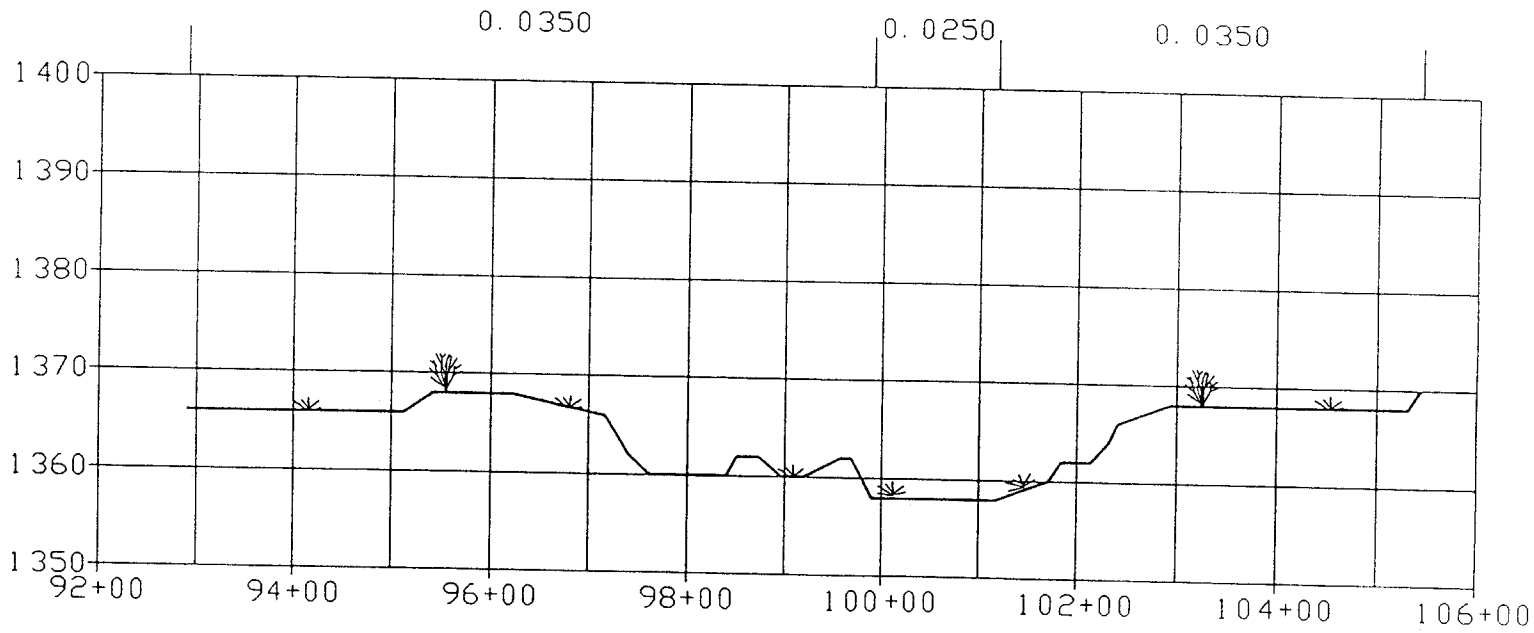
Approximately 2,200 feet upstream of Shea boulevard, between Tatum Boulevard and Shea Boulevard. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is a broad constructed trapezoidal section with various golf course uses. The topography is gently rolling with a small low-flow channel that connects a series of small ponds. The vegetation is comprised of short maintained grass.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Regular Topography with Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**
Irregular Topography with Short Grass and Some Trees	$n_b = 0.020$	
	$n_1 = 0.005$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0.005$	**0.035**



CROSS SECTION 12.97

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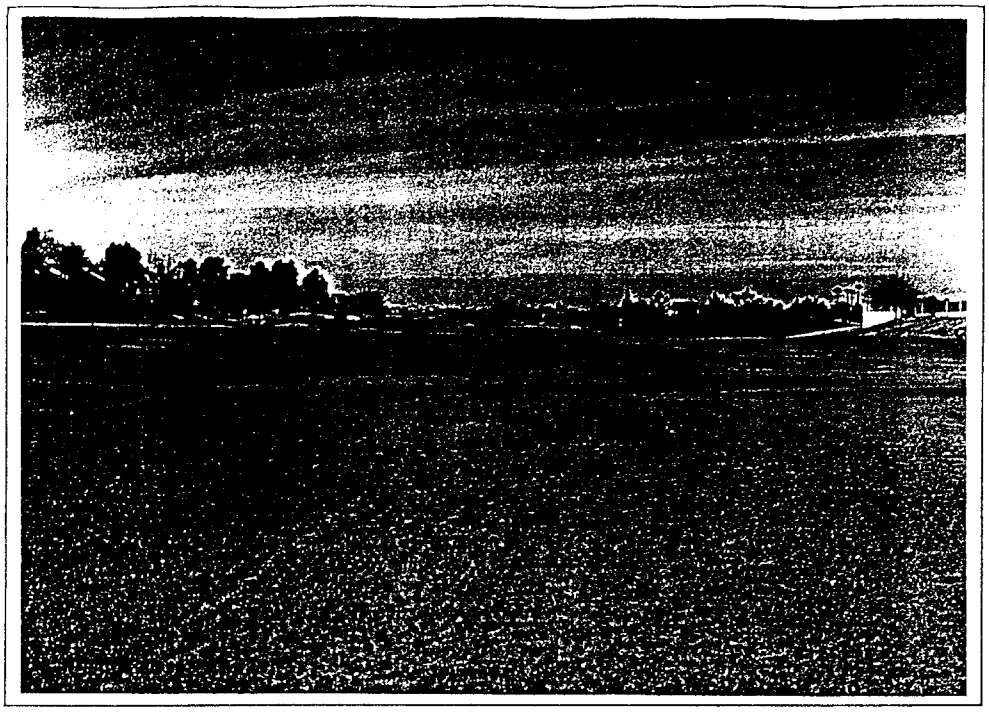


Photograph 3.44
Looking upstream from Shea Boulevard at the centerline of Indian Bend Wash

Photograph 3.45
Looking north across Indian Bend Wash just downstream of Tatum Boulevard

REACH

From Tatum Boulevard to Cactus Road. This reach is within the City of Phoenix and encompasses the northern portion of the Stone Creek Golf Course. This reach includes the Cactus Road bridge. The reach is presented in plan view within Appendix B

CROSS SECTION 13.83

LOCATION OF CROSS SECTION

Approximately 1,200 feet upstream of Tatum Boulevard. Cross section locations are presented in Appendix B.

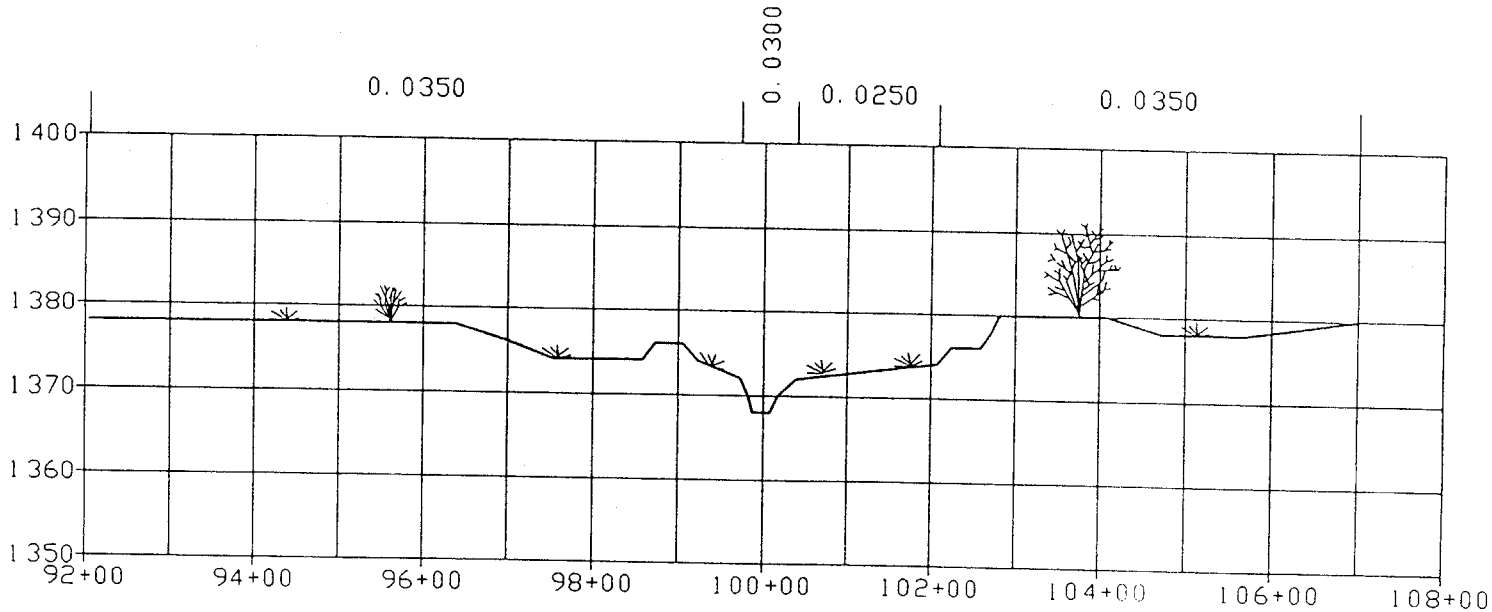
DESCRIPTION OF CHANNEL

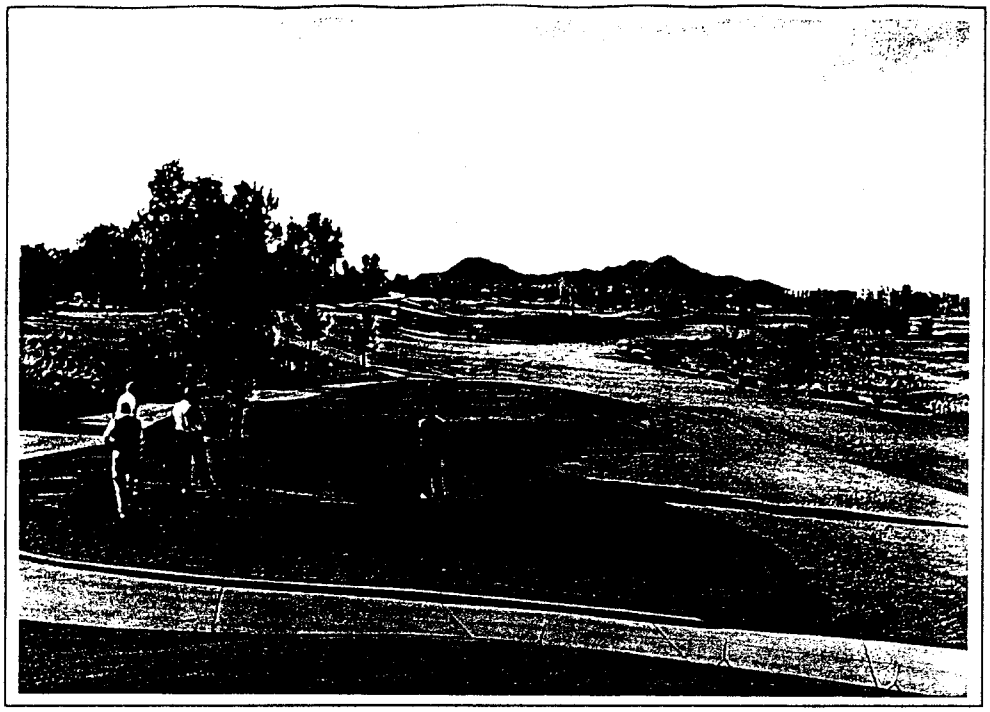
The channel is hydraulically similar to the reach downstream. The channel is a broad constructed trapezoidal section with various golf course uses present. Features include golf course fairways, putting greens, and a low flow channel area.

100-YEAR N-VALUE CALCULATIONS

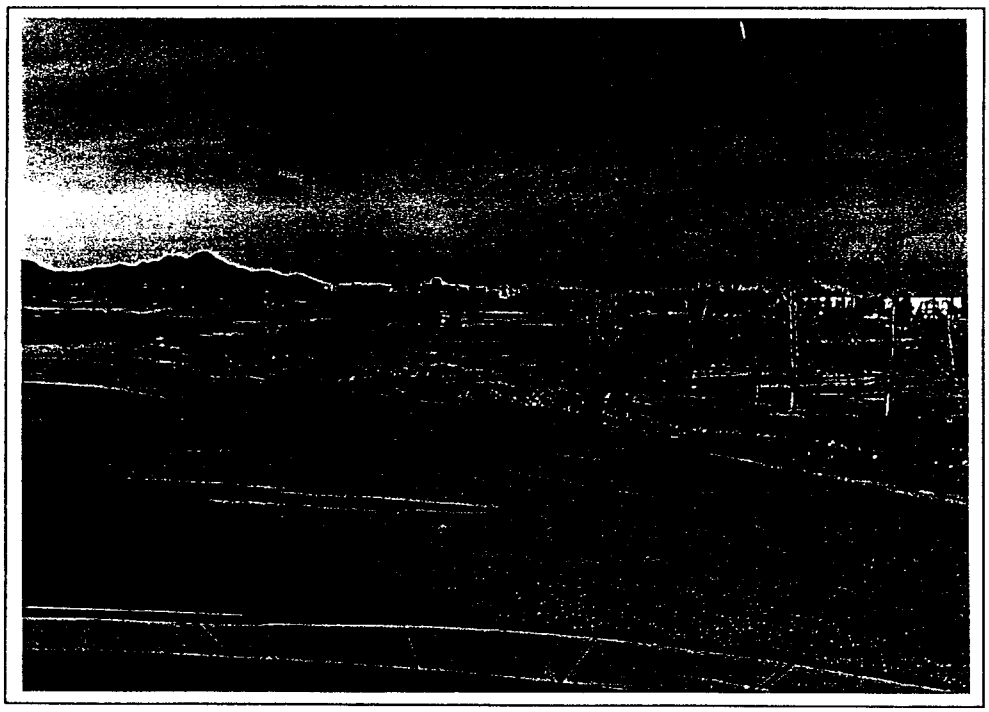
Portion of Cross Section	Components	"n" Total
Regular Topography with Short Grass	$n_b = 0.020$ $n_1 = 0$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0$	**0.025**
Irregular Topography with Short Grass and Some Trees	$n_b = 0.020$ $n_1 = 0.005$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0.005$	**0.035**
Low Flow Channel	$n_b = 0.025$ $n_1 = 0$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0$	**0.030**

CROSS SECTION 13.83

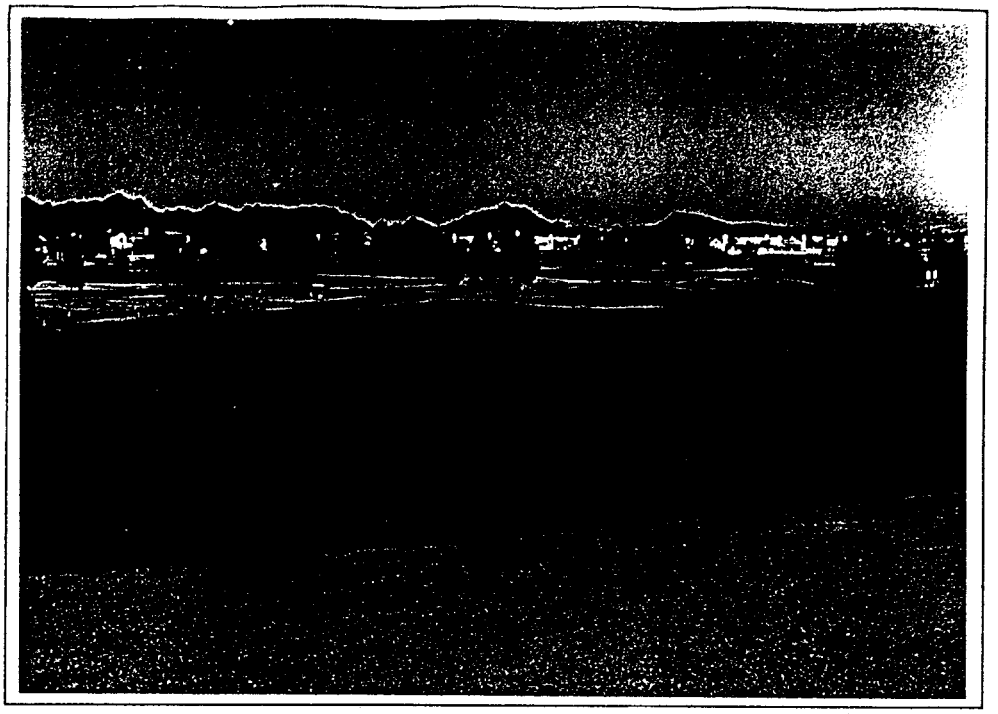




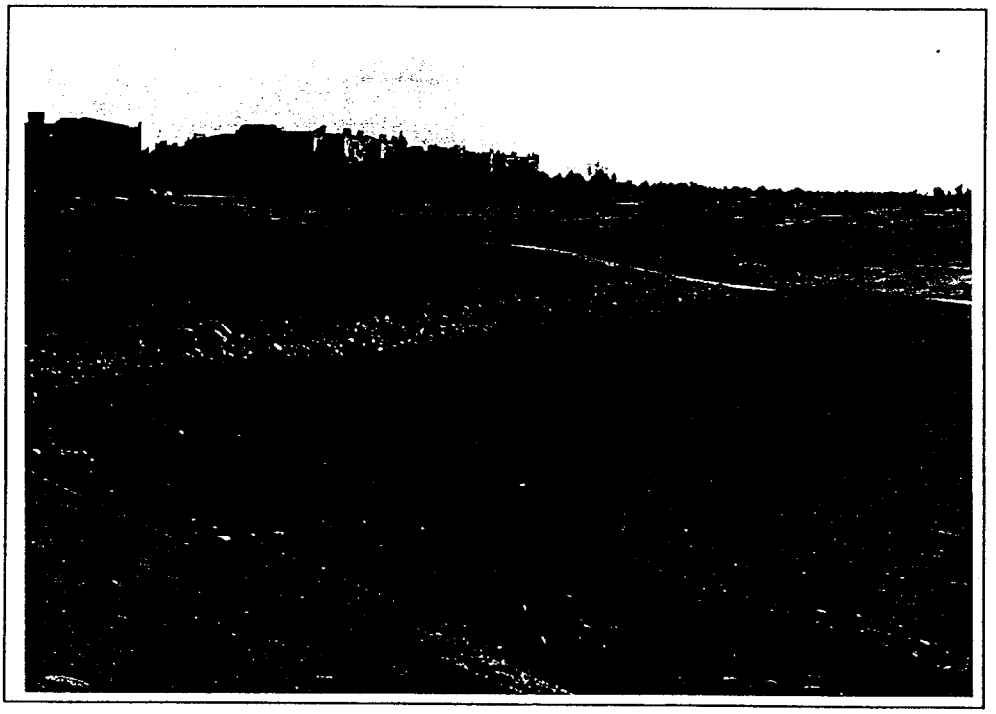
Photograph 3.46
Looking upstream from Tatum Boulevard at the centerline of Indian Bend Wash



Photograph 3.47
Looking upstream from Tatum Boulevard at the right bank area of Indian Bend Wash



Photograph 3.48
Looking across Indian Bend Wash from the right bank
between Tatum Boulevard and Cactus Road



Photograph 3.49
Looking downstream from the Cactus Road bridge
at Indian Bend Wash centerline

REACH

From Cactus Road to 36th Street. This reach is entirely within the City of Phoenix and includes the Sweetwater Road low water crossing. The reach is presented in plan view within Appendix B

CROSS SECTION 15.06

LOCATION OF CROSS SECTION

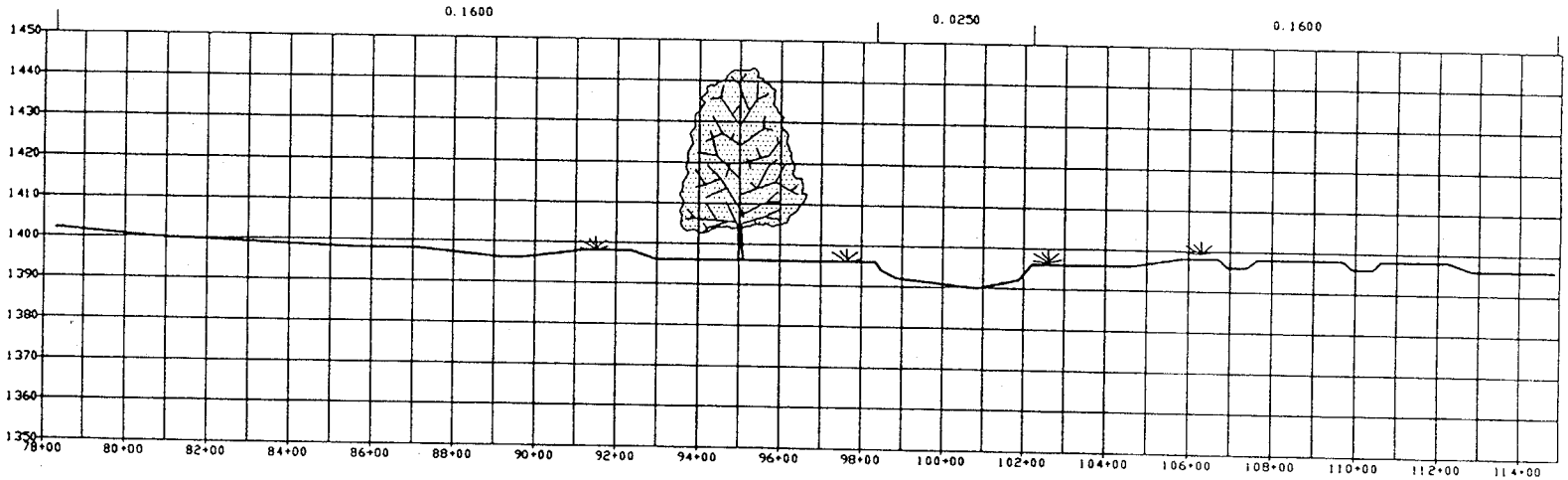
Approximately 500 feet downstream of 36th Street between 36th Street and Cactus Road. Cross section locations are presented in Appendix B.

DESCRIPTION OF CHANNEL

The channel is a broad trapezoidal section with few contours and sparse vegetation. Vegetation consists of short grass and some small trees. The cross section is regular and varies only slightly.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Grass Trapezoidal Section	$n_b = 0.020$ $n_1 = 0$ $n_2 = 0$ $n_3 = 0.005$ $n_4 = 0$	**0.025**
Pavement Areas		**0.020**
Residential Housing Areas	$n_b = 0.020$ $n_1 = 0.02$ $n_2 = 0.06$ $n_3 = 0.05$ $n_4 = 0.01$	**0.16**



CROSS SECTION 15.06

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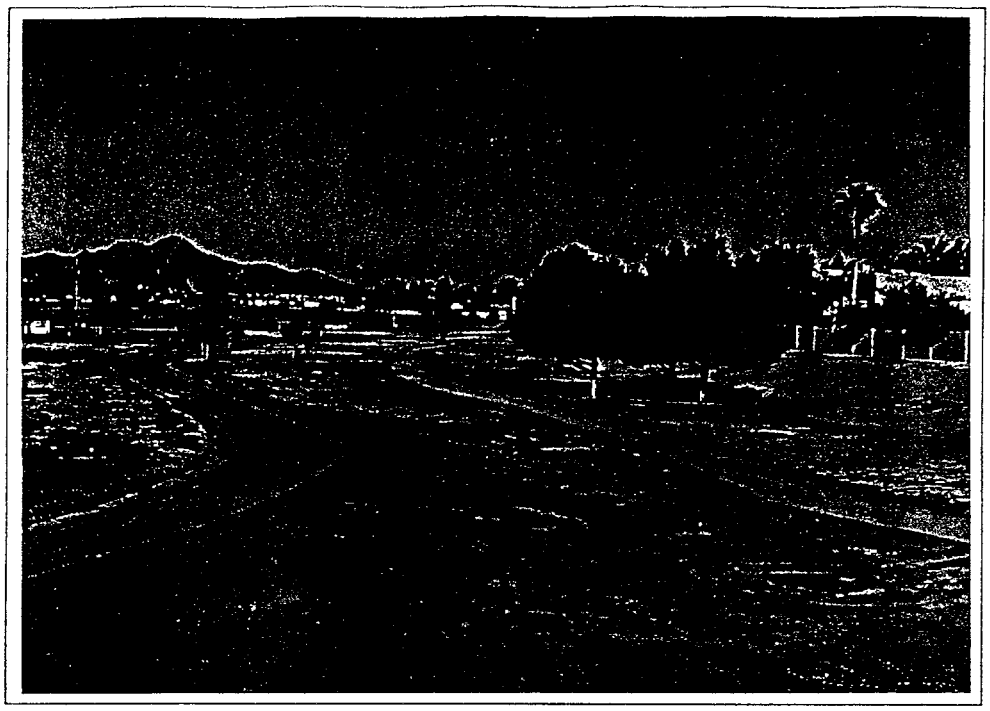
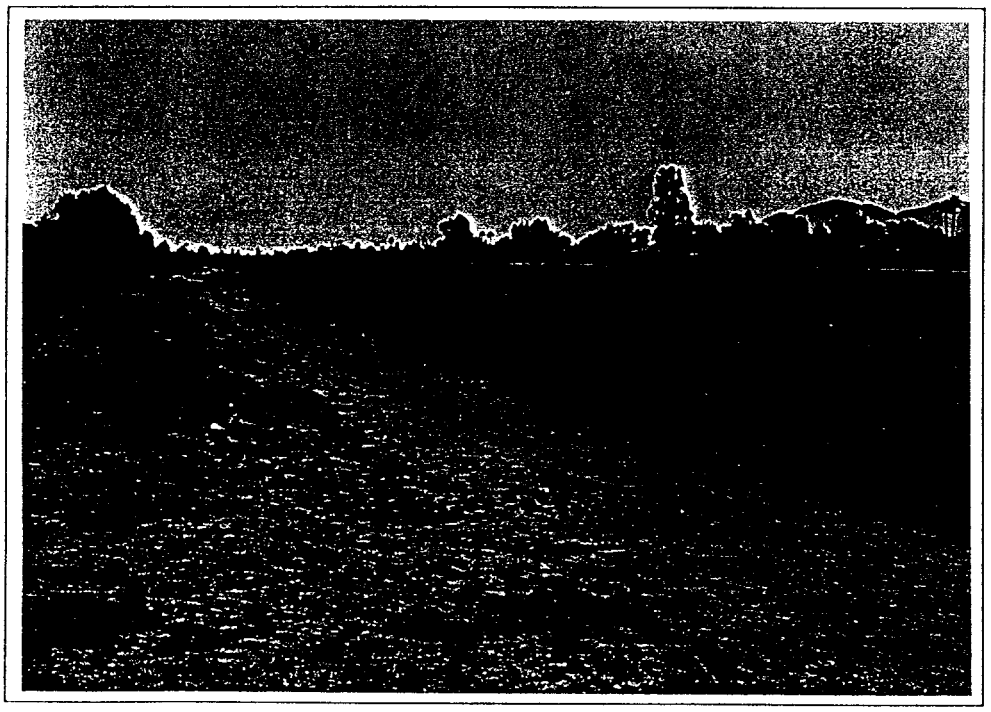


Photograph 3.50
Looking upstream from Cactus Road at the centerline of Indian Bend Wash



Photograph 3.51
Looking downstream from near 36th Street at Indian Bend Wash centerline

REACH

From 36th Street to 32nd Street at Acoma Road. This reach is entirely within the City of Phoenix. The upper portion of the reach encompasses a portion of Venturoso Park. The reach is presented in plan view within Appendix B

CROSS SECTION 16.05

LOCATION OF CROSS SECTION

At Hearn Road between 32nd Street and 36th Street. Cross section locations are presented in Appendix B.

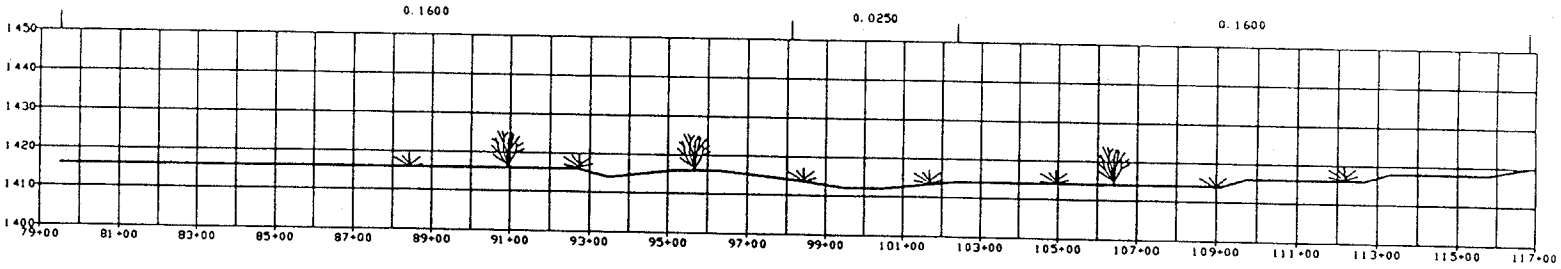
DESCRIPTION OF CHANNEL

The channel is a sparsely vegetated broad trapezoidal section. Few obstructions exist with the exception of several low water crossings. Very little variation between sections is present.

100-YEAR N-VALUE CALCULATIONS

Portion of Cross Section	Components	"n" Total
Regular Topography with Short Grass	$n_b = 0.020$	
	$n_1 = 0$	
	$n_2 = 0$	
	$n_3 = 0.005$	
	$n_4 = 0$	**0.025**
Residential Housing Areas	$n_b = 0.020$	
	$n_1 = 0.02$	
	$n_2 = 0.06$	
	$n_3 = 0.05$	
	$n_4 = 0.01$	**0.16**

CROSS SECTION 16.05



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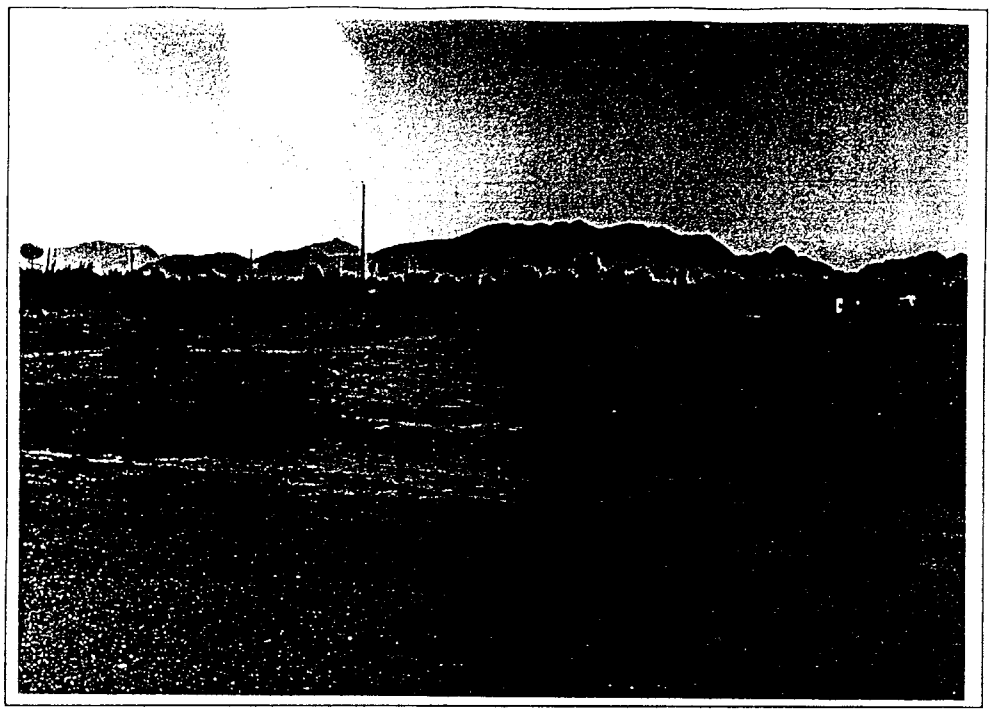
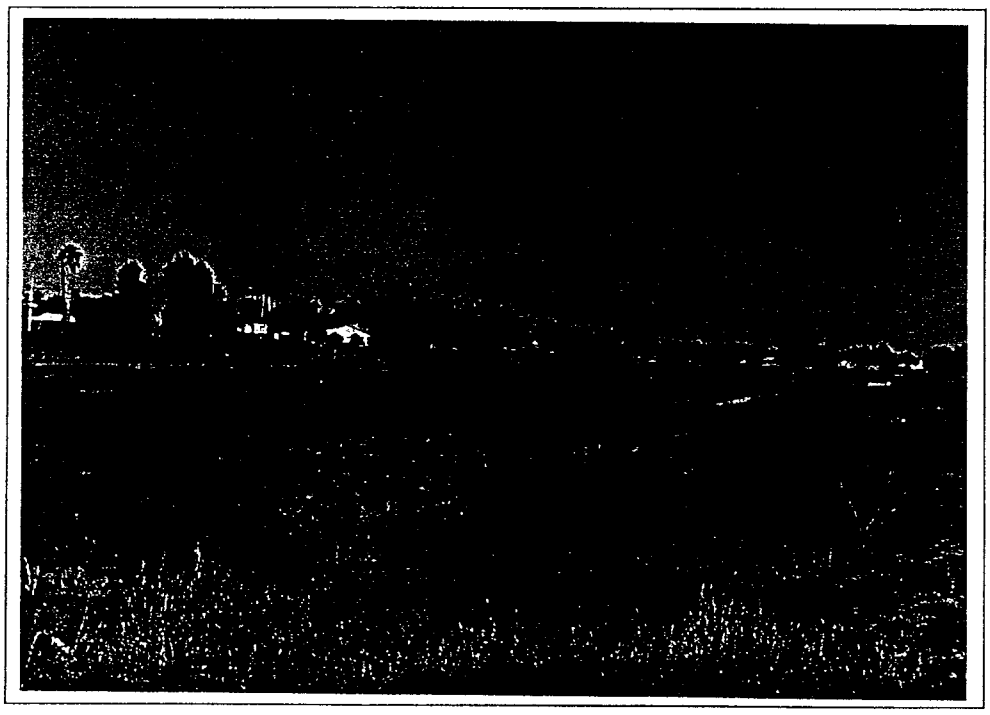
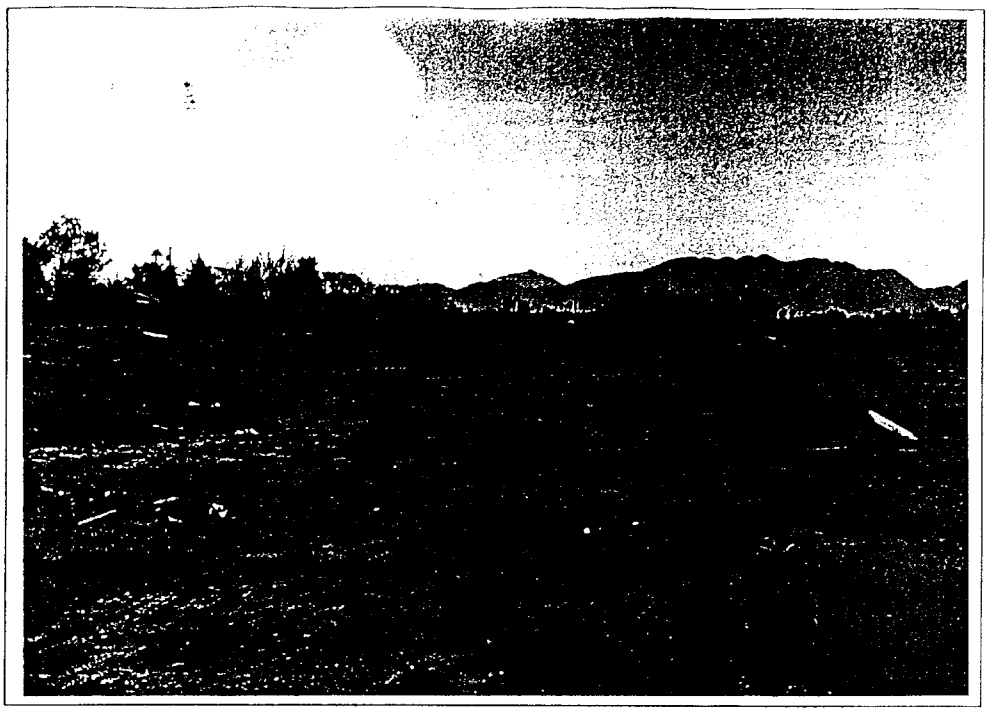


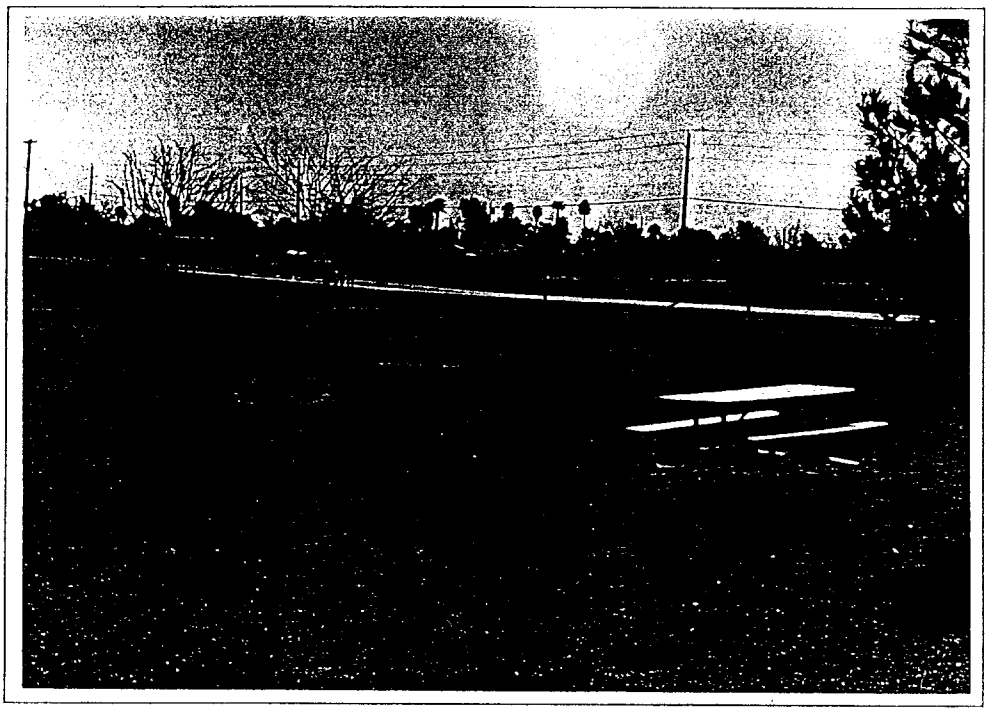
Photograph 3.52
Looking downstream from Presidio Road at Indian Bend Wash centerline
(approximately ¼ mile north of Sweetwater Road)



Photograph 3.53
Looking upstream from Presidio Road at Indian Bend Wash centerline



Photograph 3.54
Looking downstream from Thunderbird Road at Indian Bend Wash centerline



Photograph 3.55
Looking downstream from Venturoso Park near 32nd Street and Acoma Road

IV. SUMMARY

Section III presents the detailed information and recommended "n" values for use in HEC-2 analysis. The detailed results include: 1) recommended Manning's "n" values based on proposed NH records to be placed in HEC-2 computer data input files; 2) photographic documentation of floodplain characteristics; 3) determination of channel bank stations; 4) field observation of possible overflow areas; and 5) field measurement of hydraulic structures dimensions.

In the following summary table, each cross section is presented with its associated "n" value to be used on the NH record. Appendix B presents the cross sections in plan view and Appendix D graphically presents each cross sections.

The following information is included in the Summary Table:

SEC NO:	Section number measured in miles upstream from the confluence of Indian Bend Wash with the Salt River
STA:	Station within the cross section
"n":	Mannings "n" value for that portion of the cross section
CCHV:	Contraction Coefficient
CEHV:	Expansions Coefficient

SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
0.437											0.2	0.4	
0.475	10713	0.045									0.2	0.4	
0.491	9221	0.030	9811	0.030	10627	0.030					0.2	0.4	
0.568	9885	0.030	10122	0.030	11377	0.030					0.2	0.4	
0.663	9885	0.030	10122	0.030	11377	0.030					0.2	0.4	
0.758	9923	0.035	10099	0.030	11420	0.035					0.3	0.5	
0.776	11323	0.020									0.3	0.5	Curry Road Bridge
0.791	10996	0.020									0.3	0.5	
0.852	9928	0.035	10089	0.030	10940	0.035					0.2	0.4	
0.947	9906	0.035	10083	0.030	10936	0.035					0.2	0.4	
1.040	9911	0.035	10127	0.030	11460	0.035					0.2	0.4	
1.136	9772	0.035	10007	0.030	11382	0.035					0.2	0.4	
1.231	9937	0.035	10147	0.030	11633	0.035					0.2	0.4	
1.326	9903	0.035	10107	0.030	12184	0.030					0.2	0.4	
1.420	9886	0.035	10127	0.030	11470	0.030					0.3	0.5	
1.515	9945	0.035	10103	0.030	11279	0.035					0.3	0.5	
1.554	11491	0.020									0.3	0.5	McKellips Road Bridge
1.570	11373	0.020									0.3	0.5	
1.582	9966	0.030	10053	0.020	11483	0.030					0.3	0.5	
1.610	9772	0.030	10098	0.020	11414	0.030					0.2	0.4	
1.705	9956	0.030	10083	0.020	11452	0.030					0.2	0.4	
1.770	9819	0.030	10114	0.020	11476	0.030					0.2	0.4	
1.787	9806	0.030	10119	0.020	11380	0.030					0.2	0.4	
1.794	10185	0.035	10237	0.030	11530	0.035					0.2	0.4	
1.799	9954	0.035	9998	0.030	11413	0.030					0.2	0.4	
1.827	10024	0.035	10055	0.031	11237	0.035					0.2	0.4	
1.894	9904	0.030	10216	0.020	11028	0.030					0.2	0.4	
1.990	9953	0.035	9986	0.030	10500	0.035	10942	0.050			0.2	0.4	
2.047	9973	0.035	10050	0.030	10336	0.035	10862	0.510			0.2	0.4	
2.080	10032	0.035	10074	0.030	10454	0.035	10821	0.050			0.2	0.4	Near Roosevelt Street
2.178	9979	0.035	10037	0.030	10932	0.035					0.2	0.4	
2.273	9972	0.035	10115	0.030	10778	0.035					0.2	0.4	
2.367	9974	0.035	10093	0.021	10693	0.035					0.2	0.4	
2.462	9973	0.035	10026	0.030	10578	0.035					0.2	0.4	
2.557	9908	0.035	10076	0.020	10655	0.035					0.3	0.5	
2.610	9770	0.035	10019	0.020	10300	0.035					0.3	0.5	
2.620	9813	0.035	10012	0.020	10467	0.035					0.3	0.5	
2.629	9820	0.035	10035	0.020	10480	0.035					0.3	0.5	McDowell Road Bridge
2.652	9818	0.035	10034	0.020	10447	0.035					0.3	0.5	
2.653	9818	0.035	10034	0.020	10447	0.035					0.3	0.5	

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SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
2.658	10438	0.020									0.3	0.5	
2.662	10438	0.020									0.3	0.5	
2.663	9746	0.035	10025	0.020	10436	0.035					0.3	0.5	
2.700	10048	0.035	10139	0.050	10202	0.030	10289	0.020	10604	0.035	0.3	0.5	
	10704	0.035									0.3	0.5	
2.746	9854	0.035	9963	0.020	10109	0.050	10287	0.035	10387	0.020	0.3	0.4	
2.770	9728	0.035	9792	0.020	9934	0.035	10071	0.051	10312	0.035	0.3	0.4	
	10413	0.020	10697	0.035							0.3	0.4	
2.775	9733	0.035	9785	0.020	9915	0.035	10091	0.050	10326	0.035	0.3	0.4	
	10408	0.020	10714	0.035							0.3	0.4	
2.780	9709	0.035	9792	0.020	9967	0.035	10016	0.045	10276	0.035	0.3	0.4	
	10388	0.020	10721	0.035							0.3	0.4	
2.790	9704	0.035	9893	0.020	10011	0.045	10727	0.035			0.3	0.4	
2.810	9887	0.035	10016	0.020	10078	0.045	10794	0.035			0.3	0.4	
2.820	9803	0.035	9841	0.020	9961	0.035	9990	0.045	10810	0.035	0.3	0.4	
2.827	9809	0.035	9922	0.020	9997	0.035	10024	0.045	10218	0.020	0.3	0.4	
	10800	0.035									0.3	0.4	
2.841	10010	0.035	10047	0.045	10280	0.020	10801	0.035			0.3	0.4	
2.936	9865	0.020	10042	0.030	10063	0.045	10743	0.035			0.3	0.4	
3.030	9553	0.035	9690	0.020	9994	0.030	10045	0.045	10562	0.030	0.3	0.4	
3.125	9743	0.035	9887	0.020	9985	0.030	9994	0.045	10249	0.030	0.3	0.4	
	10613	0.035									0.3	0.4	
3.220	9645	0.020	9695	0.035	10016	0.020	10561	0.035			0.3	0.4	
3.270	9509	0.035	9762	0.020	10599	0.035					0.3	0.4	
3.280	10791	0.035									0.3	0.4	
3.409	9924	0.035	10068	0.020	11135	0.035					0.3	0.4	
3.488											0.3	0.4	
3.490	9898	0.035	10310	0.030	11335	0.035					0.3	0.4	
3.504	9966	0.030	10354	0.035	11333	0.030					0.3	0.4	
3.510	10208	0.035	11338	0.030							0.3	0.4	
3.548	9890	0.035	10067	0.030	11325	0.035					0.3	0.4	
3.590	9822	0.035	9986	0.030	11375	0.035					0.3	0.4	
3.600	9773	0.035	10001	0.030	11393	0.035					0.3	0.4	
3.660	9772	0.035	9998	0.030	11349	0.035					0.3	0.4	
3.710	9690	0.035	9995	0.030	11516	0.035					0.3	0.4	
3.730	9672	0.035	10076	0.030	11542	0.035					0.3	0.5	
3.760	11554	0.020									0.3	0.5	Thomas Road Bridge
3.780	11583	0.020									0.3	0.5	
3.811	11586	0.035									0.3	0.5	
3.883	11632	0.035									0.3	0.5	

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SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
3.977	9706	0.036	10039	0.030	10620	0.036					0.3	0.4	
4.072	9843	0.036	10171	0.030	10469	0.036					0.3	0.4	
4.167	9744	0.036	9990	0.020	10461	0.036					0.3	0.4	
4.220	9736	0.036	10017	0.030	10371	0.036					0.3	0.4	
4.250	9623	0.036	9979	0.020	10597	0.036					0.3	0.4	
4.290	9617	0.036	10007	0.031	10465	0.036					0.3	0.4	
4.356	9646	0.036	10122	0.030	10393	0.036					0.3	0.4	
4.451	9598	0.036	10096	0.030	10623	0.036					0.3	0.4	
4.546	10228	0.036	10457	0.030	11001	0.036					0.3	0.4	
4.640	10213	0.036	10329	0.030	10767	0.036					0.3	0.4	
4.735	10023	0.036	10426	0.030	11096	0.036					0.3	0.4	
4.830	9502	0.036	10091	0.020	10690	0.036					0.5	0.5	
4.850	9295	0.036	9421	0.020	9968	0.035	10010	0.020	10665	0.036	0.5	0.5	
4.855	10661	0.020									0.5	0.5	
4.870	10576	0.020									0.5	0.5	
4.873	9286	0.035	9466	0.020	9908	0.030	10348	0.020	10653	0.035	0.5	0.5	
4.892	9282	0.035	9419	0.020	9479	0.030	9875	0.020	10083	0.025	0.5	0.5	
	10673	0.035									0.5	0.5	
4.924	9295	0.035	9409	0.020	9496	0.030	9863	0.020	9932	0.030	0.2	0.4	
	10215	0.025	10705	0.035							0.2	0.4	
4.952	9303	0.035	9447	0.020	9487	0.030	9638	0.020	9888	0.030	0.2	0.4	
	10026	0.025	10655	0.035							0.2	0.4	
4.990	9485	0.035	9491	0.020	9937	0.035	10086	0.025	10302	0.035	0.2	0.4	
5.110	9785	0.035	9884	0.020	10104	0.025	10133	0.035			0.2	0.4	
5.205	9834	0.035	9853	0.020	10063	0.025	10290	0.035			0.2	0.4	
5.300	9736	0.035	9869	0.020	10044	0.025	10235	0.035			0.2	0.4	
5.357	9794	0.035	9903	0.020	10054	0.025	10290	0.035			0.3	0.5	
5.360	10861	0.020									0.3	0.5	
5.372	10809	0.020									0.3	0.5	
5.385	9610	0.035	9672	0.020	9795	0.035	9889	0.020	10045	0.025	0.3	0.5	
	10161	0.035									0.2	0.4	
5.492	9481	0.035	9604	0.020	9791	0.035	9835	0.020	9991	0.025	0.2	0.4	
	10105	0.035									0.2	0.4	
5.587	9630	0.035	9701	0.020	9818	0.035	9884	0.020	10023	0.025	0.2	0.4	
	10146	0.035									0.2	0.4	
5.682	9443	0.035	9523	0.020	9790	0.035	9905	0.020	10025	0.025	0.2	0.4	
	10079	0.035									0.2	0.4	
5.777	9784	0.035	9889	0.020	10034	0.025	10190	0.035			0.2	0.4	
5.867	9446	0.035	9524	0.020	9790	0.035	9914	0.020	10098	0.025	0.2	0.4	
	10679	0.035									0.2	0.4	

SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
5.871	9769	0.035	9916	0.020	10096	0.025	10686	0.035			0.3	0.5	
5.886	10744	0.020									0.3	0.5	
5.900	10774	0.020									0.3	0.5	Chaparral Road
5.925	9771	0.035	9933	0.020	10090	0.025	10218	0.035			0.3	0.5	
5.996	9167	0.035	9281	0.020	9767	0.035	9924	0.020	10136	0.029	0.2	0.4	
	10228	0.035									0.2	0.4	
6.060	10138	0.035									0.2	0.4	
6.155	9296	0.035	9724	0.020	9862	0.035	9915	0.020	10166	0.029	0.2	0.4	
	10268	0.035									0.2	0.4	
6.250	9564	0.035	9664	0.020	9871	0.035	9931	0.020	10297	0.029	0.2	0.4	
6.345	9396	0.035	9861	0.030	9926	0.020	10159	0.025	10409	0.035	0.2	0.4	
6.390	10887	0.020									0.2	0.4	
6.400	9801	0.030	9937	0.020	10225	0.025	10808	0.035			0.2	0.4	
6.440	10887	0.020									0.2	0.4	
6.530	9891	0.035	9947	0.020	10101	0.025	10309	0.035			0.2	0.4	
6.630	9872	0.035	9927	0.020	10069	0.025	10109	0.035			0.2	0.4	
6.723	9856	0.035	9944	0.020	10066	0.025	10193	0.035			0.2	0.4	
6.820	9778	0.035	9849	0.020	10116	0.025	10186	0.035			0.2	0.4	
6.856	9647	0.050	9827	0.020	10115	0.025	10245	0.035			0.2	0.4	
6.879	9622	0.050	9878	0.020	10110	0.025	10374	0.035			0.3	0.5	
6.880	10670	0.020									0.3	0.5	
6.893	9660	0.035	9898	0.020	10168	0.025	10768	0.035			0.3	0.5	
6.910	9668	0.035	9870	0.020	10117	0.025	10288	0.035			0.2	0.4	
6.960	9472	0.035	9588	0.020	9699	0.035	9841	0.020	10137	0.025	0.2	0.4	
	10304	0.035									0.2	0.4	
7.008	9828	0.020	10367	0.025							0.2	0.4	
7.102	9822	0.020	10559	0.025							0.2	0.4	
7.197	9782	0.035	10241	0.025	10440	0.035					0.2	0.4	
7.290											0.2	0.4	
7.390	9676	0.035	10277	0.025	10461	0.035					0.2	0.4	
7.481	9679	0.035	10233	0.025	10338	0.035					0.2	0.4	
7.576	9739	0.035	10216	0.025	10512	0.035					0.2	0.4	
7.670	9674	0.035	10197	0.025	10347	0.350					0.2	0.4	
7.765	9743	0.035	10208	0.025	10393	0.035					0.2	0.4	
7.837	9773	0.035	10201	0.025	10317	0.035					0.2	0.4	
7.883	9842	0.035	10111	0.020	10414	0.035					0.2	0.4	
7.995	9854	0.035	10189	0.025	10430	0.035					0.3	0.5	
7.979	10486	0.020									0.3	0.5	
7.988	11074	0.020									0.3	0.5	
7.992	11175	0.020									0.3	0.5	

SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
8.144											0.2	0.4	
8.239	9223	0.040	9425	0.030	9542	0.020	10046	0.040	10130	0.020	0.2	0.4	
	10813	0.040									0.2	0.4	
8.333	9976	0.040	10027	0.020	10519	0.040					0.2	0.4	
8.428	9981	0.040	10037	0.020	10174	0.040	10705	0.030			0.2	0.4	
8.523	10005	0.040	10063	0.020	10411	0.040	10457	0.020	11140	0.030	0.2	0.4	
8.656	9957	0.040	9997	0.020	10443	0.040	10695	0.030			0.2	0.4	
8.752	9273	0.040	9483	0.030	10231	0.020	10278	0.030	10366	0.040	0.2	0.4	
	11044	0.030									0.2	0.4	
8.996	9246	0.030	10212	0.020	10367	0.031					0.2	0.4	
9.123	11418	0.020									0.2	0.4	
9.132	11214	0.020									0.2	0.4	
9.139	10763	0.020									0.3	0.5	
9.223	9398	0.020	9679	0.020	10672	0.030					0.3	0.5	
9.283	9387	0.020	9964	0.035	10516	0.030					0.2	0.4	
9.375	8998	0.020	11111	0.030							0.2	0.4	
9.470	11415	0.030									0.2	0.4	
9.564	10005	0.040	10043	0.025	11444	0.040					0.2	0.4	
9.578	9980	0.040	10018	0.025	10836	0.040					0.2	0.4	
9.659	9937	0.040	10042	0.025	11219	0.040					0.2	0.4	
9.754	9971	0.040	10058	0.025	11424	0.040					0.2	0.4	
9.849	9909	0.040	10092	0.025	11148	0.040					0.2	0.4	
9.943	9953	0.040	10093	0.025	11228	0.040					0.2	0.4	
10.040	9886	0.040	10147	0.025	10910	0.040					0.2	0.4	
10.130	9846	0.040	10235	0.025	11131	0.040					0.2	0.4	
10.230	9830	0.040	10103	0.025	10642	0.040					0.2	0.4	
10.320	9789	0.040	10353	0.025	10680	0.040					0.2	0.4	
10.380	10441	0.020									0.2	0.4	
10.400	10450	0.020									0.2	0.4	Invergordon Road
10.410	10754	0.025									0.2	0.4	
10.510	9864	0.040	10160	0.025	10267	0.040					0.2	0.4	
10.610	9776	0.040	10348	0.025	10887	0.040					0.2	0.4	
10.700	9925	0.040	10094	0.020	10667	0.040					0.2	0.4	
10.800	9819	0.040	10109	0.020	10723	0.040					0.2	0.4	
10.890	9855	0.040	10015	0.025	10478	0.040					0.2	0.4	
10.990	9929	0.040	10125	0.025	10686	0.040					0.2	0.4	
11.080	9959	0.040	10226	0.020	11197	0.040					0.2	0.4	
11.150	9952	0.040	10113	0.020	11137	0.040					0.2	0.4	Doubletree Road
11.170	9953	0.040	10142	0.025	10644	0.040					0.2	0.4	
11.270	9879	0.040	10130	0.025	10625	0.040					0.2	0.4	

SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
11.360	9816	0.040	10190	0.025	10903	0.040					0.2	0.4	
11.460	9947	0.040	10137	0.025	10820	0.040					0.2	0.4	
11.550	9744	0.040	9940	0.025	10473	0.040					0.2	0.4	
11.650	9855	0.035	10117	0.025	10564	0.035					0.2	0.4	
11.740	9909	0.035	10180	0.025	10938	0.035					0.2	0.4	
11.840	9862	0.035	10130	0.025	10602	0.035					0.2	0.4	
11.930	9969	0.035	10130	0.025	10419	0.020	10781	0.035			0.2	0.4	
12.030	9957	0.035	10290	0.025	10757	0.035					0.2	0.4	
12.120	9816	0.035	10050	0.025	10485	0.035					0.2	0.4	
12.220	9810	0.035	10050	0.025	10480	0.035					0.2	0.4	
12.310	9829	0.025									0.2	0.4	
12.410	10336	0.025									0.2	0.4	
12.500	10582	0.020									0.2	0.4	
12.540	10786	0.020									0.3	0.5	Shea Boulevard
12.560	10569	0.025									0.3	0.5	
12.600	10364	0.025									0.2	0.4	
12.690	9794	0.035	10007	0.020	10288	0.035					0.2	0.4	
12.780	9909	0.035	10015	0.020	10462	0.035					0.2	0.4	
12.880	9990	0.035	10117	0.025	10543	0.035					0.2	0.4	
12.970	9975	0.035	10050	0.025	1044	0.035					0.2	0.4	
13.070	9847	0.035	10053	0.025	10296	0.035					0.2	0.4	
13.160	9624	0.035	9723	0.025	9917	0.035	10142	0.025	10638	0.035	0.2	0.4	
13.250	1088	0.020									0.3	0.5	
13.380	10271	0.020									0.3	0.5	Tatum Boulevard
13.400	9926	0.035	10048	0.025	10207	0.035					0.3	0.5	
13.450	9835	0.035	10030	0.030	10186	0.025	10356	0.035			0.3	0.5	
13.540	9925	0.035	10115	0.030	10608	0.035					0.2	0.4	
13.640	9912	0.035	10108	0.030	10648	0.035					0.2	0.4	
13.730	9973	0.035	10039	0.030	10207	0.025	10701	0.035			0.2	0.4	
13.830	9948	0.035	10111	0.030	10844	0.025					0.2	0.4	
13.920	9821	0.035	9988	0.030	10484	0.025	10686	0.035			0.2	0.4	
14.020	9837	0.035	10060	0.030	10256	0.020	11011	0.035			0.2	0.4	
14.110	9922	0.035	10031	0.030	10992	0.035					0.2	0.4	
14.210	9954	0.035	10093	0.030	10887	0.035					0.2	0.4	
14.300	9921	0.035	10285	0.030	11028	0.035					0.2	0.4	
14.390	10397	0.020									0.3	0.5	
14.440	10240	0.020									0.3	0.5	
14.470	10174	0.025									0.3	0.5	Cactus Road
14.490	10479	0.025									0.3	0.5	
14.580	9568	0.160	10418	0.025	10683	0.160					0.3	0.5	

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Water Resources & Civil Engineering Consultants

SEC NO	STA	n	STA	n	STA	n	STA	n	STA	n	CCHV	CEHV	REMARKS
14.660	9600	0.160	10043	0.025	10847	0.160					0.3	0.5	
14.750	9814	0.160	10232	0.025	11359	0.160					0.2	0.4	40th Street
14.850	9822	0.160	10238	0.025	11742	0.160					0.2	0.4	
14.960	9834	0.160	10220	0.025	11490	0.160					0.2	0.4	GR Pt Spot Elv-Chnnl
15.060	9710	0.160	10117	0.025	11494	0.160					0.2	0.4	
15.150	9801	0.160	10232	0.250	12189	0.160					0.2	0.4	
15.250	9563	0.160	11723	0.020							0.2	0.4	36th Street
15.320	9526	0.160	11761	0.020							0.2	0.4	
15.330	9679	0.160	10562	0.025	11759	0.160					0.2	0.4	
15.333	9243	0.160	10367	0.025	11384	0.160					0.2	0.4	
15.440	9593	0.160	10329	0.025	11351	0.160					0.2	0.4	
15.530	9917	0.160	10504	0.025	11371	0.160					0.2	0.4	
15.630	9800	0.160	10335	0.025	11518	0.160					0.2	0.4	
15.720	9514	0.160	10782	0.020	11900	0.160					0.2	0.4	
15.810	9654	0.160	10822	0.025	11933	0.160					0.2	0.4	
15.820	9824	0.160	10305	0.025	11975	0.160					0.2	0.4	
15.910	9812	0.160	10257	0.025	11780	0.160					0.2	0.4	
15.980	9810	0.160	10239	0.025	11680	0.160					0.2	0.4	
16.050	9609	0.160	10073	0.025	11505	0.160					0.2	0.4	
16.100	9863	0.160	10270	0.025	1511	0.160					0.2	0.4	
16.190	10364	0.025	10880	0.160							0.2	0.4	
16.290	9871	0.160	10351	0.025	10605	0.160					0.2	0.4	

6043
3340
3227
2794
1883

16.33

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APPENDIX A

PHOTOGRAPHIC RECORD OF HYDRAULIC STRUCTURES

APPENDIX A

Photographic Record of Hydraulic Structures

Photo A.1	Indian Bend Wash Grade Control Structure at the Salt River
Photo A.2	Red Mountain Freeway Bridge Over the Indian Bend Wash Grade Control Structure
Photo A.3	Curry Road Bridge
Photo A.4	McKellips Road Bridge
Photo A.5	Drop Between Lakes at Station 1.80
Photo A.6	Roosevelt Street Low Water Crossing
Photo A.7	McDowell Road Bridge Over Indian Bend Wash
Photo A.8	McDowell Road Bridge Upstream Sill
Photo A.9	Thomas Road Bridge Over Indian Bend Wash
Photo A.10	Osborn Road Low Water Crossing
Photo A.11	Indian School Road Bridge
Photo A.12	Indian School Road Box Culvert Near Bridge in Photo A.11
Photo A.13	Pedestrian Underpass Under Hayden Road Connecting High Flow and Low Flow Channels
Photo A.14	Camelback Road Bridge over the Indian Bend Wash Low-Flow Channel
Photo A.15	Chaparral Road Bridge Over the Indian Bend Wash Low-Flow Channel
Photo A.16	McDonald Road Bridge
Photo A.17	Hotel Constructed on Piers Just Downstream from Indian Bend Road
Photo A.18	Indian Bend Road Drop Structure
Photo A.19	Scottsdale Road Bridge
Photo A.20	Grade Control Upstream of Scottsdale Road
Photo A.21	Low-Water Crossing at Invergordon Road
Photo A.22	Low-Water Crossing at Double Tree Road

Photo A.23	Shea Boulevard Bridge
Photo A.24	Shea Boulevard Bridge
Photo A.25	Tatum Boulevard Bridge
Photo A.26	Cactus Road Bridge
Photo A.27	Cactus Road Bridge
Photo A.28	Sweetwater Road Low-Water Crossing

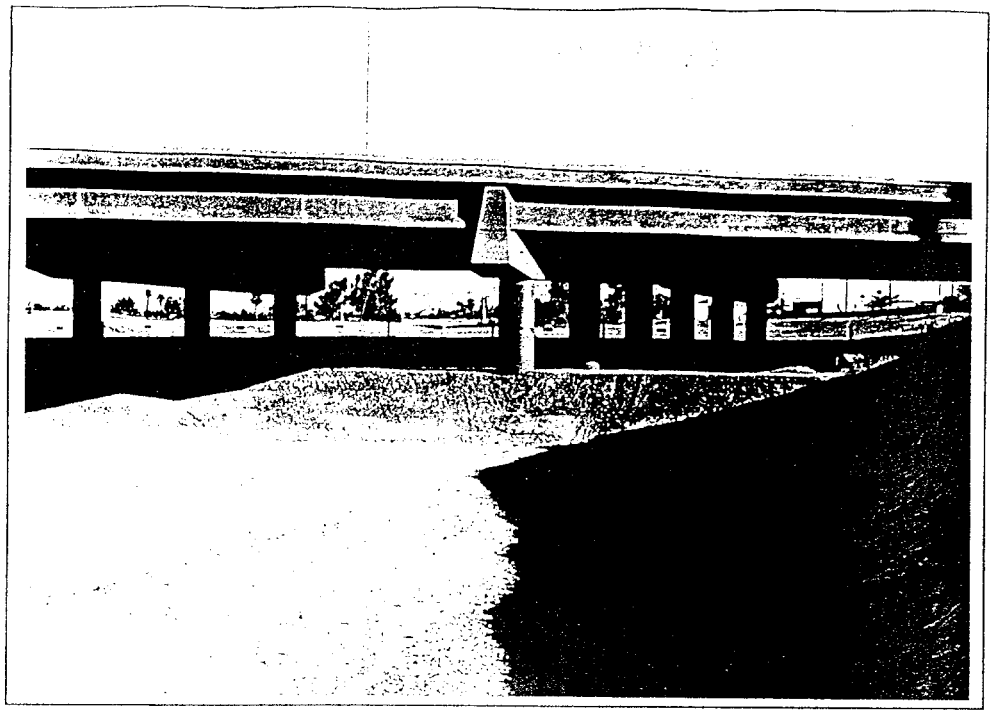


Photo A.1
Indian Bend Wash Grade Control Structure at the Salt River,
Looking North at the Toe of the Structure

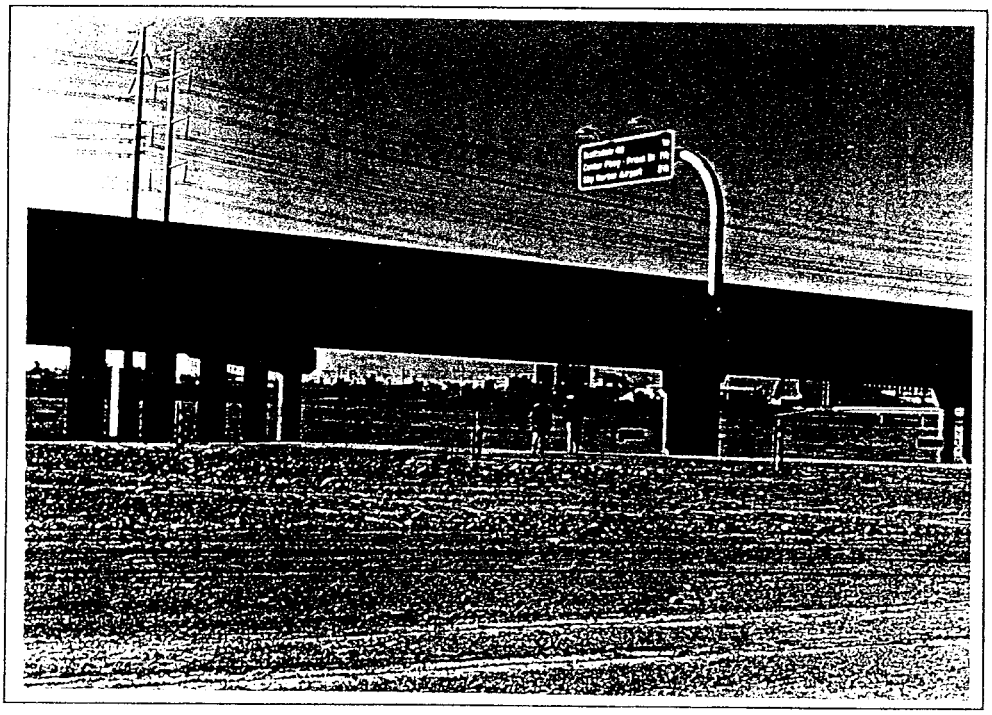


Photo A.2
Red Mountain Freeway Bridge Over the Indian Bend Wash Grade
Control Structure, Looking South at Top of Sill

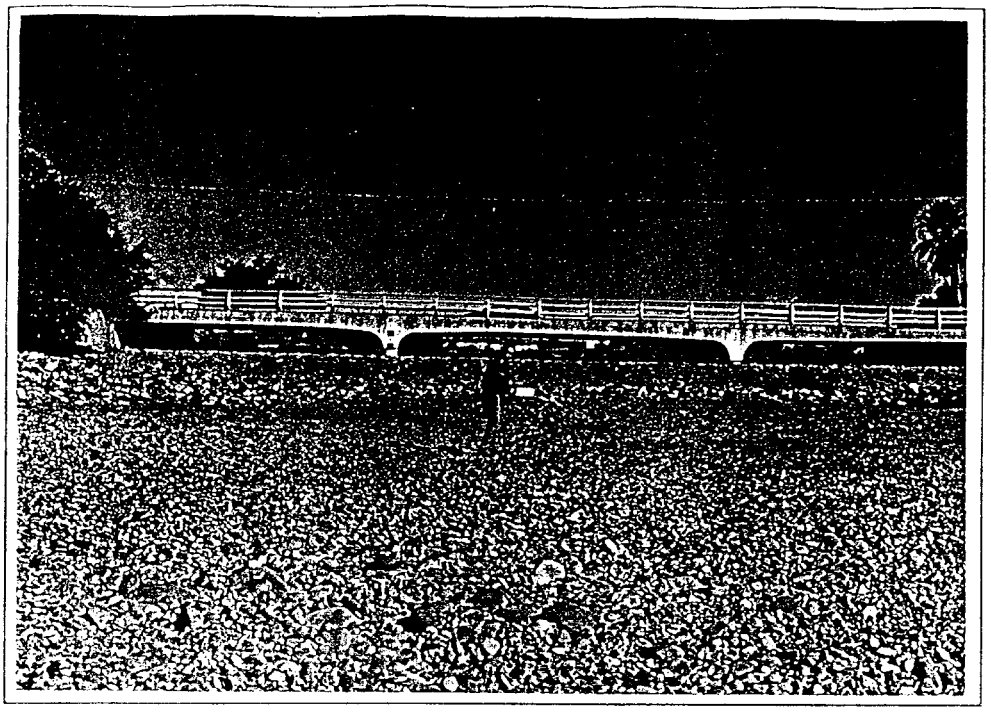


Photo A.3
Curry Road Bridge, Looking North at Downstream Side of Bridge

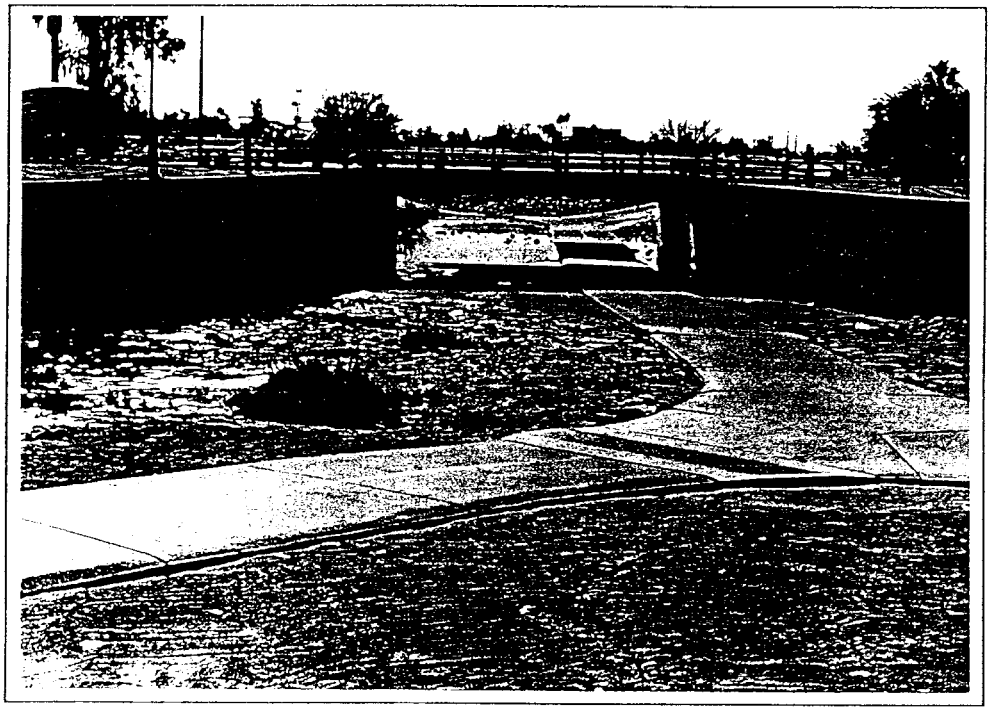


Photo A.4
McKellips Road Bridge, Looking South at Upstream Side of Bridge

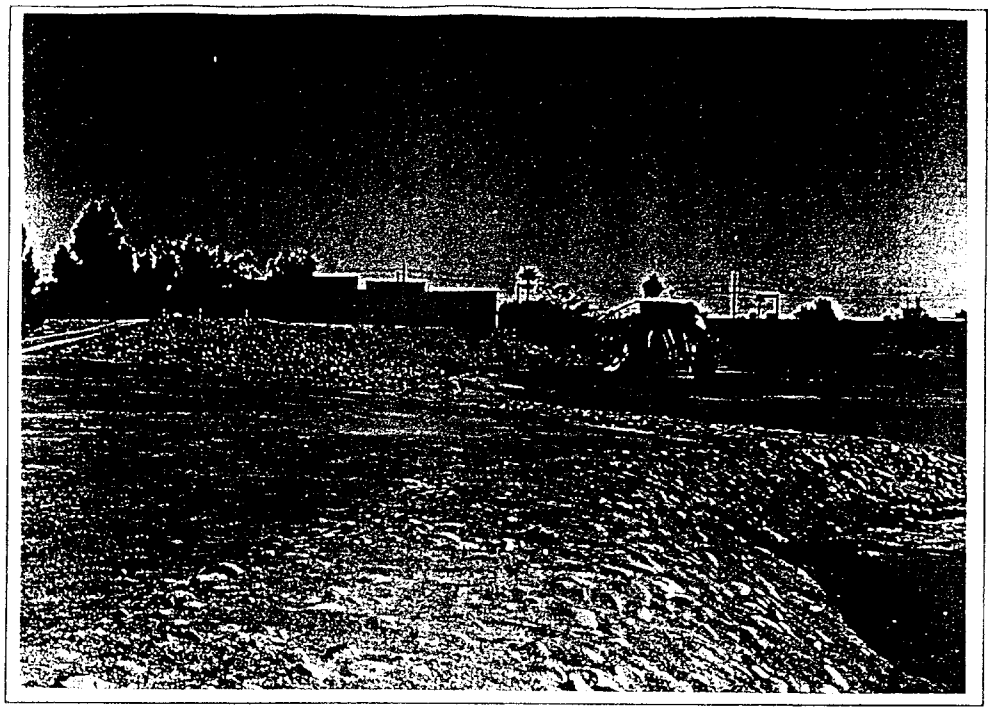


Photo A.5
Drop Between Lakes at Station 1.80, Looking East

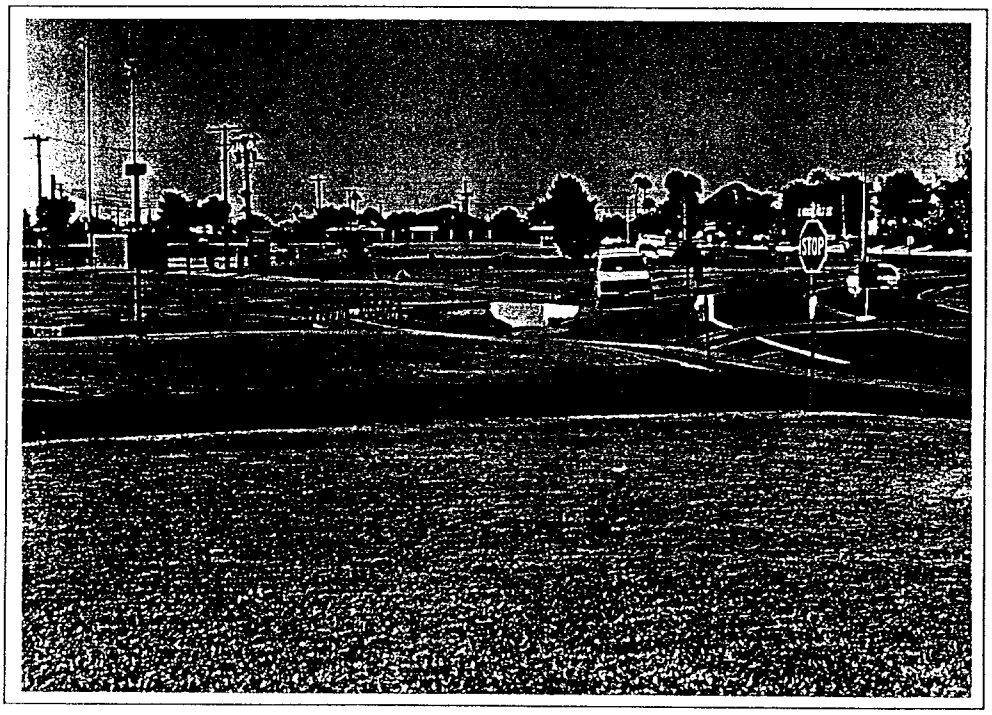


Photo A.6
Roosevelt Street Low Water Crossing, Looking West From Left Bank Area

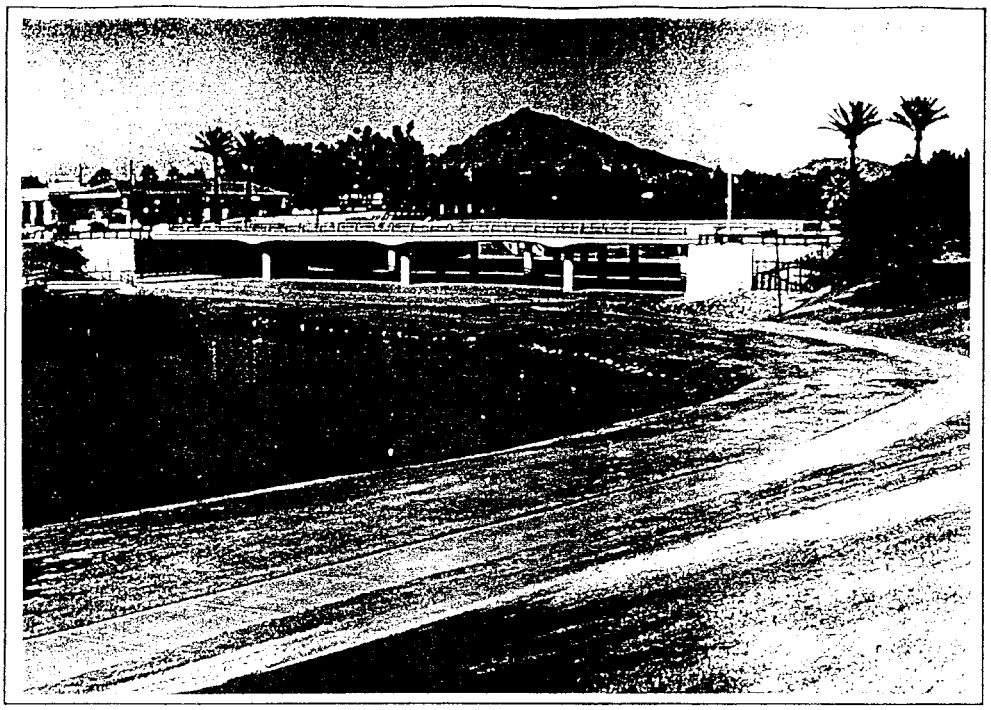


Photo A.7
McDowell Road Bridge Over Indian Bend Wash,
Looking Northwest at Downstream Side of Bridge

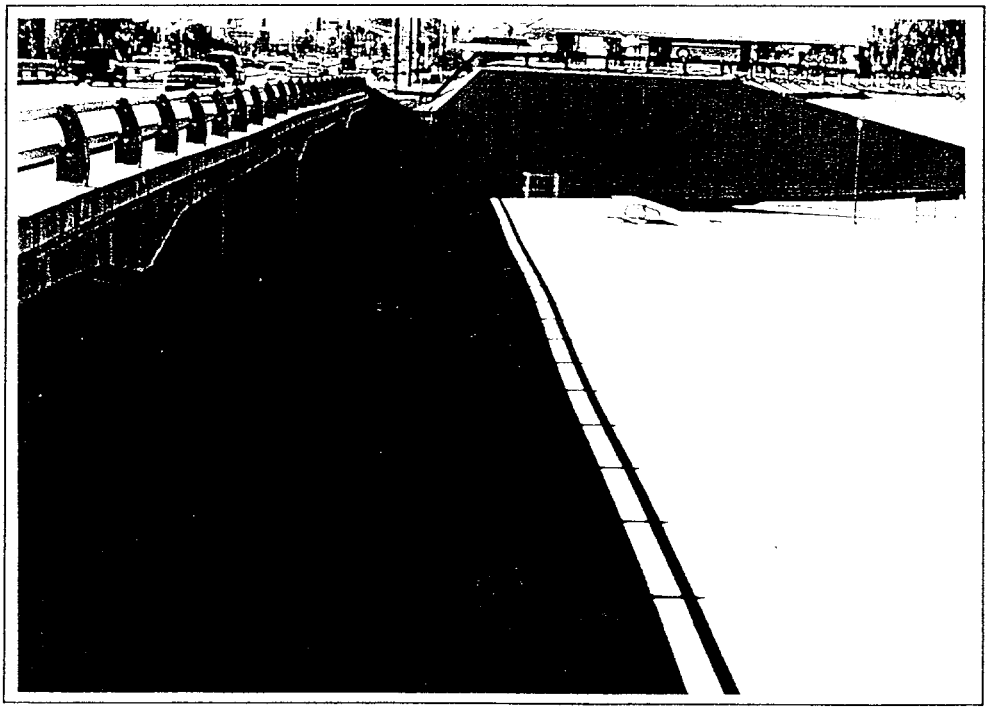


Photo A.8
Sill Structure Upstream of McDowell Road Bridge, Looking West

Photo A.9
Thomas Road Bridge Over Indian Bend Wash,
Looking North at Downstream Side of Bridge

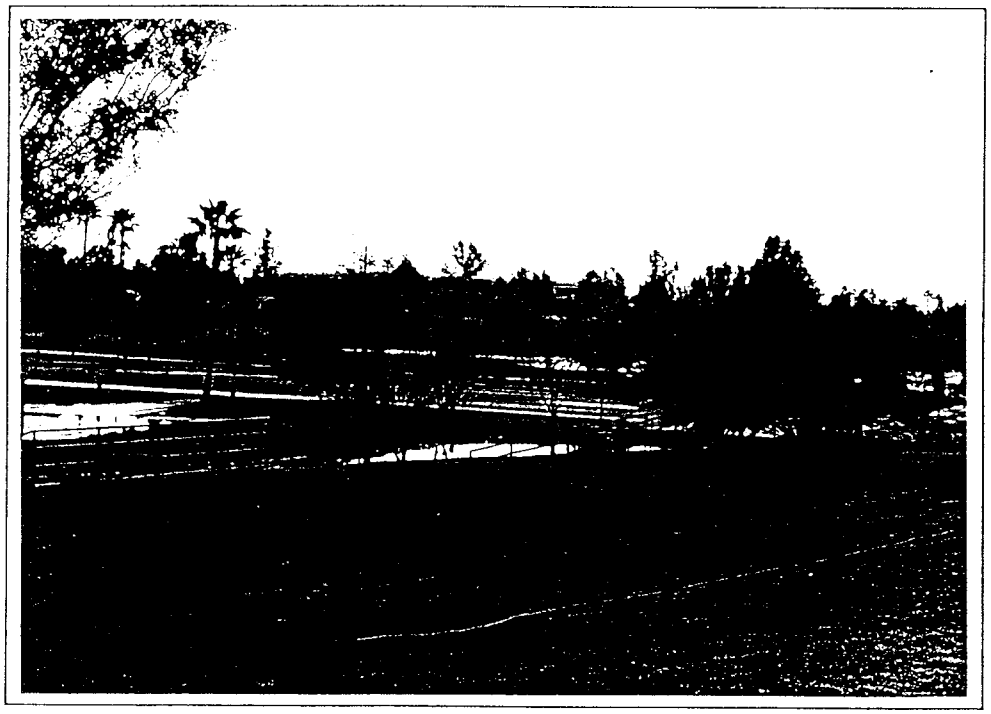


Photo A.10
Osborn Road Low Water Crossing, Looking Southeast Across Indian Bend Wash

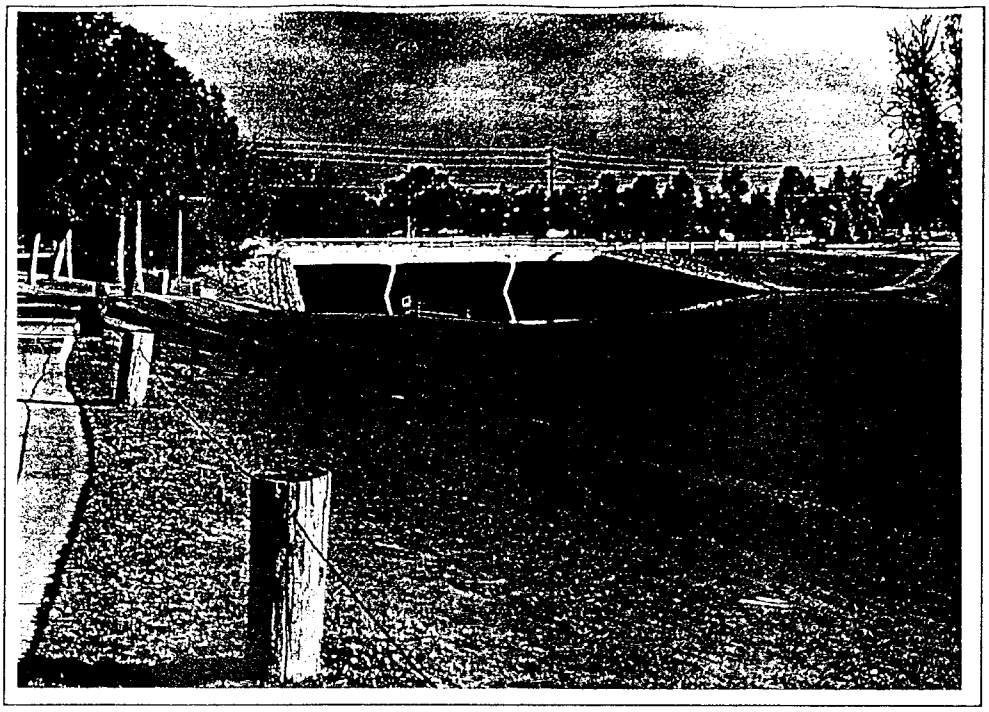


Photo A.11
Indian School Road Bridge, Looking North at Downstream Side of Bridge

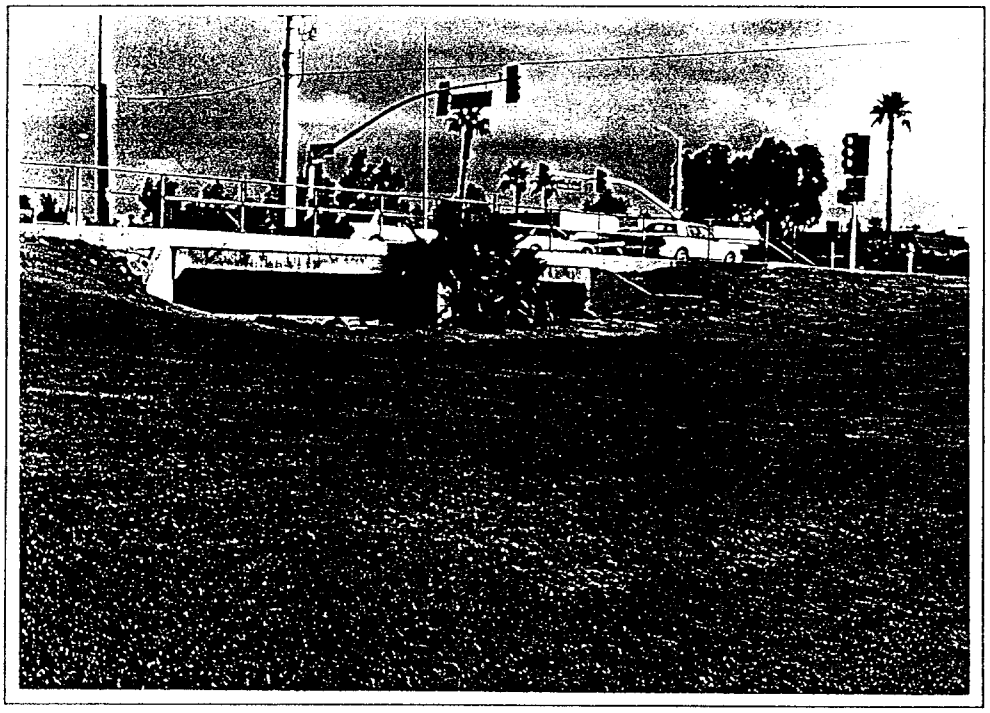


Photo A.12
Indian School Road Box Culvert, Looking Northeast at Downstream Side

Photo A.13
Pedestrian Underpass Under Hayden Road Connecting High Flow and Low Flow Channels, Looking West From High Flow Channel Side

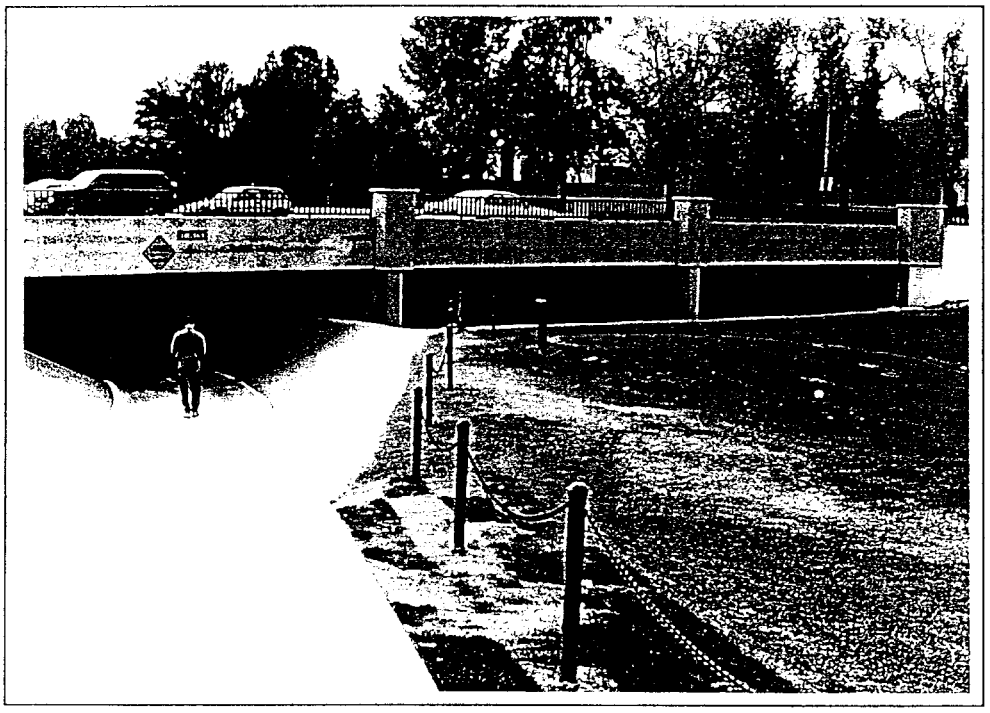


Photo A.14
Camelback Road Bridge Over the Indian Bend Wash Low-Flow Channel, Looking South at Upstream Side of Bridge

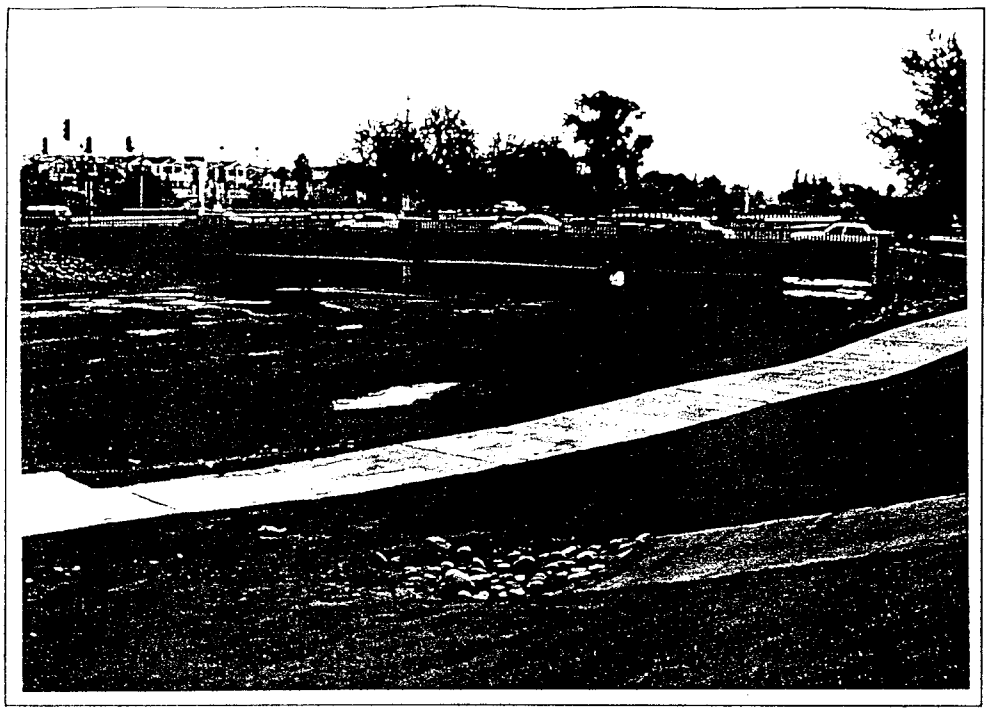


Photo A.15
Chaparral Road Bridge Over the Indian Bend Wash Low-Flow Channel,
Looking Southeast at Upstream Side of Bridge

Photo A.16
McDonald Road Bridge, Looking South at Upstream Side of Bridge

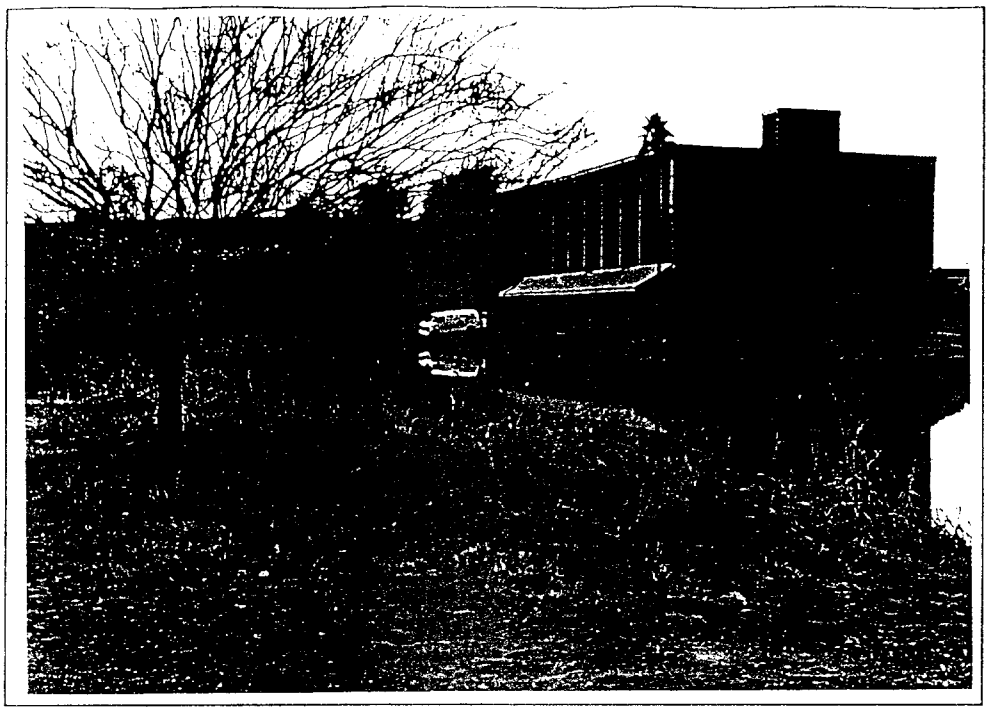


Photo A.17
Hotel Constructed on Piers Just Downstream from Indian Bend Road,
Looking Northwest from Left Bank

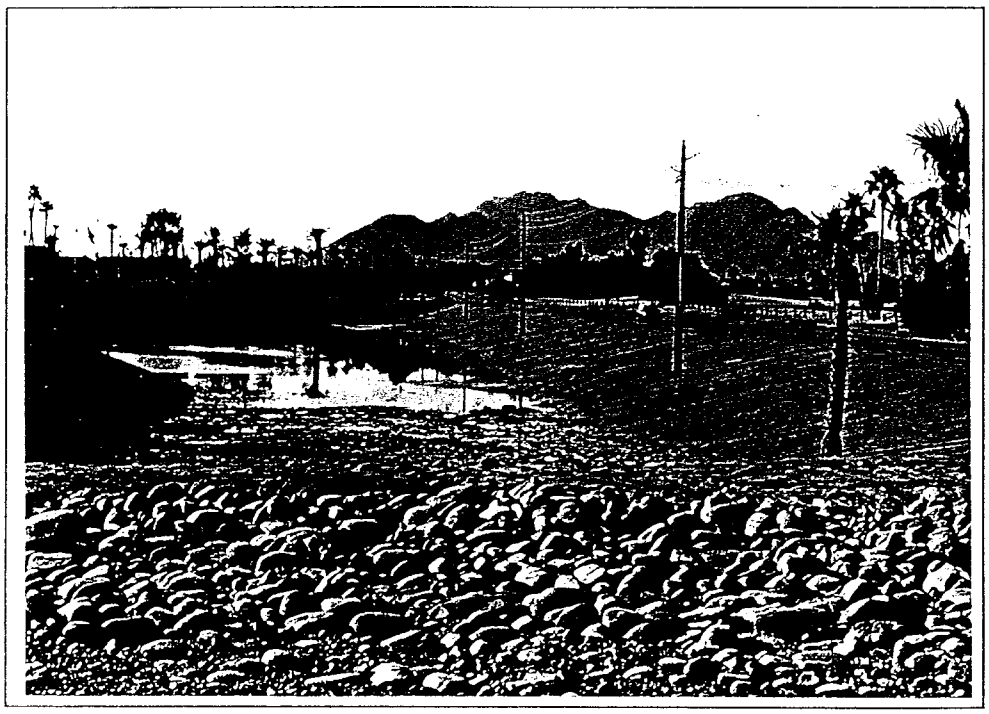


Photo A.18
Indian Bend Drop Structure, Looking West at Downstream Side of Drop

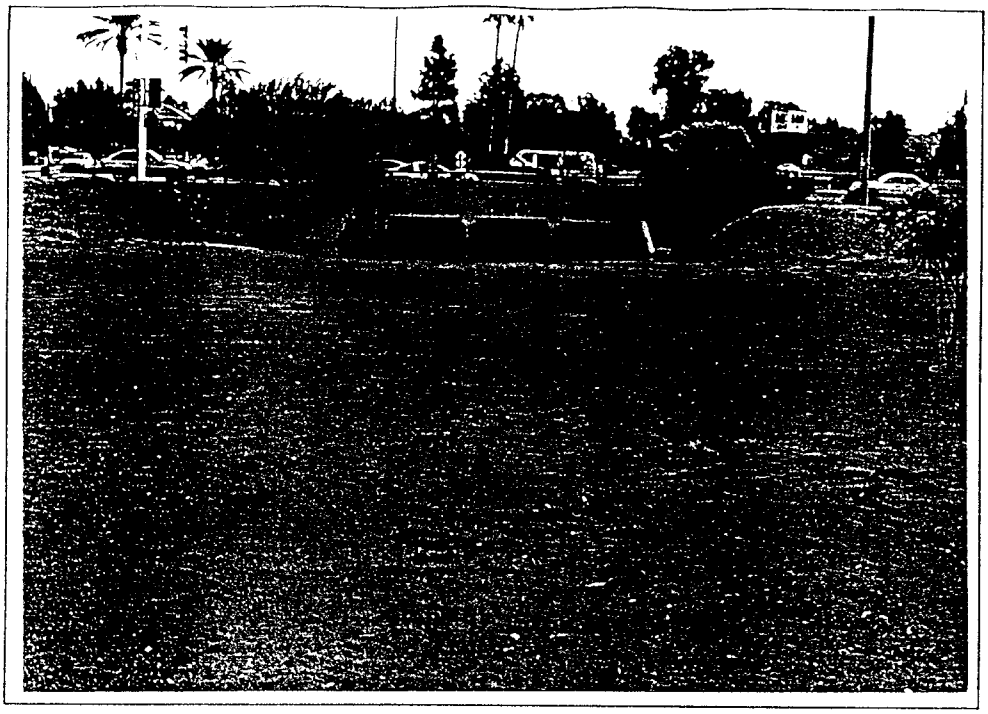


Photo A.19
Scottsdale Road Bridge, Looking East at Upstream Side of Box Culvert

Photo A.20
Grade Control Upstream of Scottsdale Road, Looking West

Photo A.21
Low-Water Crossing at Invergordon Road, Looking North at Box Culvert

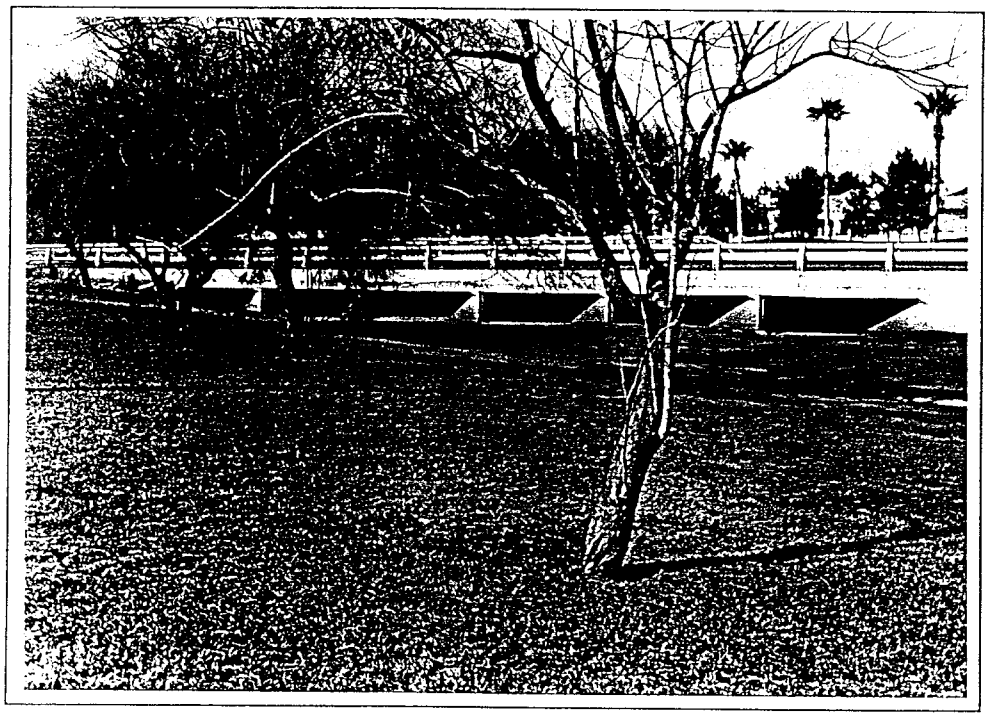


Photo A.22
Low-Water Crossing at Double Tree Road, Looking North at Box Culvert

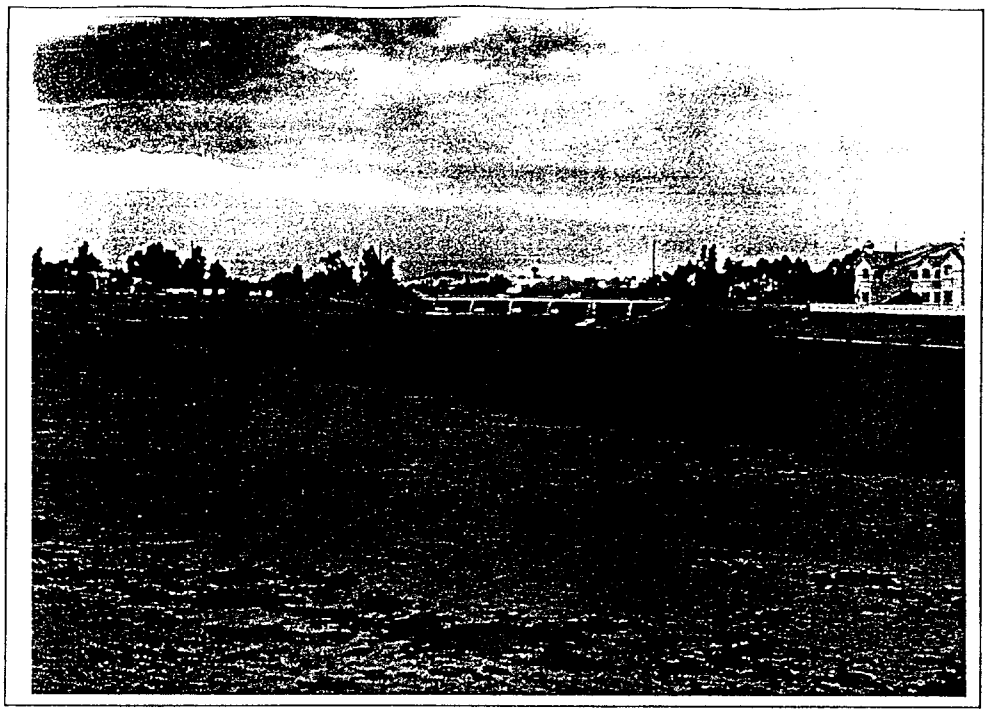


Photo A.23
Shea Boulevard Bridge, Looking Northwest at Downstream Side of Bridge

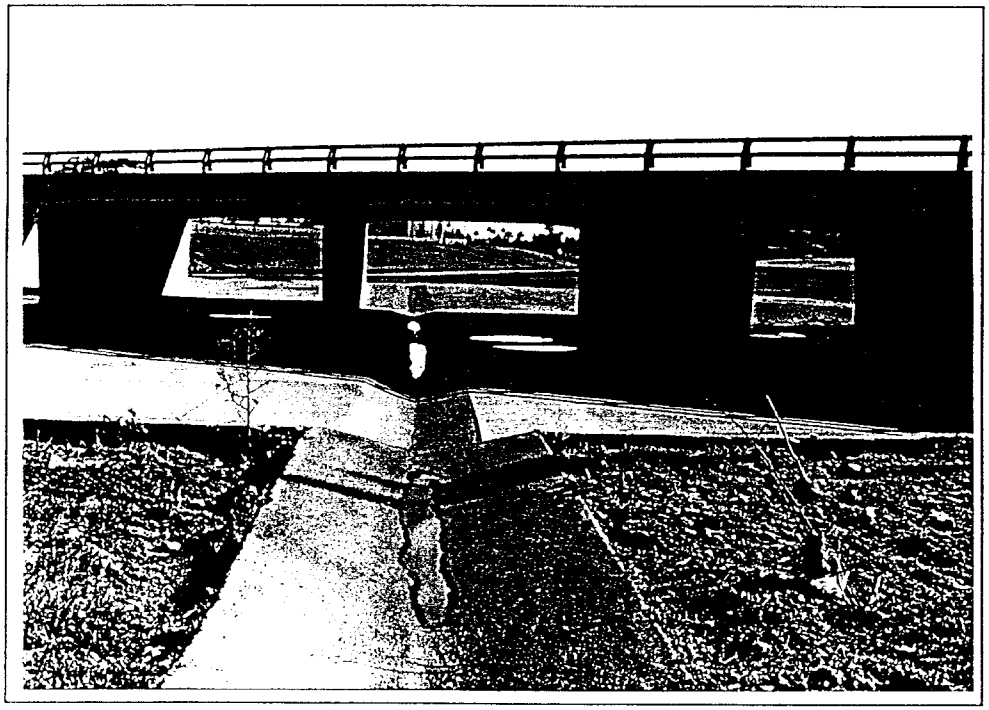


Photo A.24
Shea Boulevard Bridge, Looking South at Upstream side of Bridge

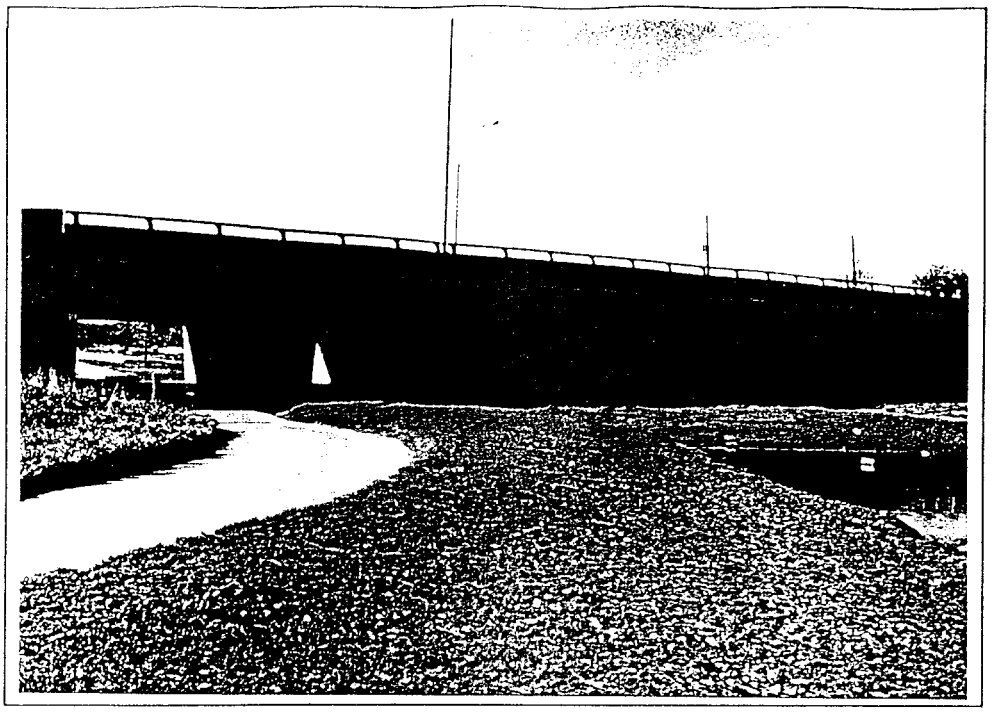


Photo A.25
Tatum Boulevard Bridge, Looking at Downstream Side of Bridge

Photo A.26
Cactus Road Bridge, Looking at Downstream Side of Bridge From Left Bank Area

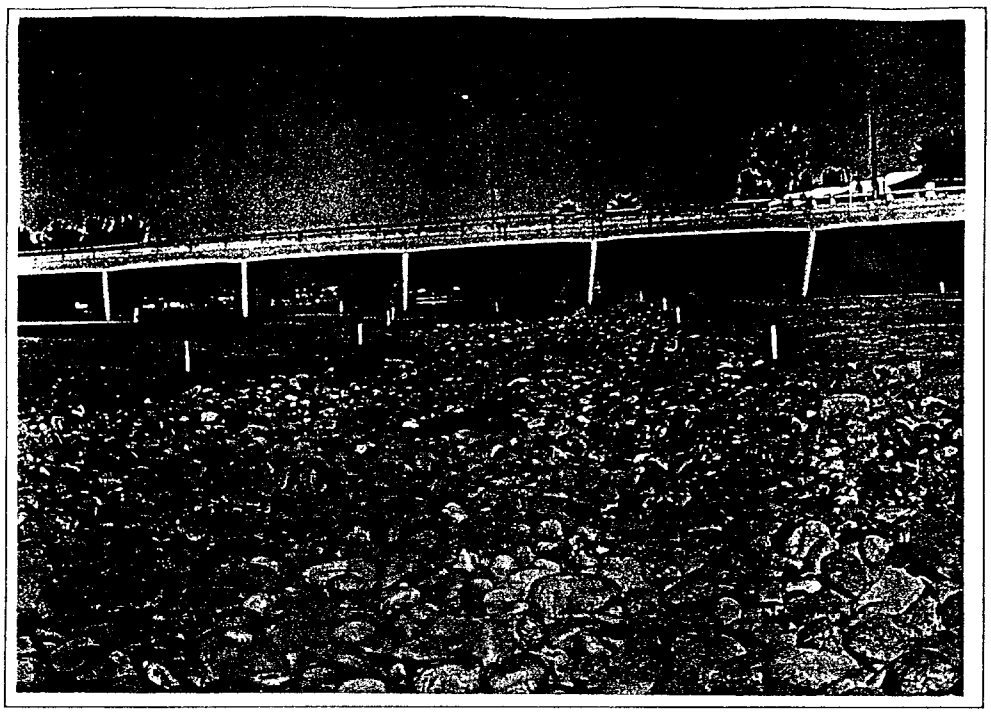


Photo A.27
Cactus Road Bridge, Looking Upstream Just Downstream From Bridge

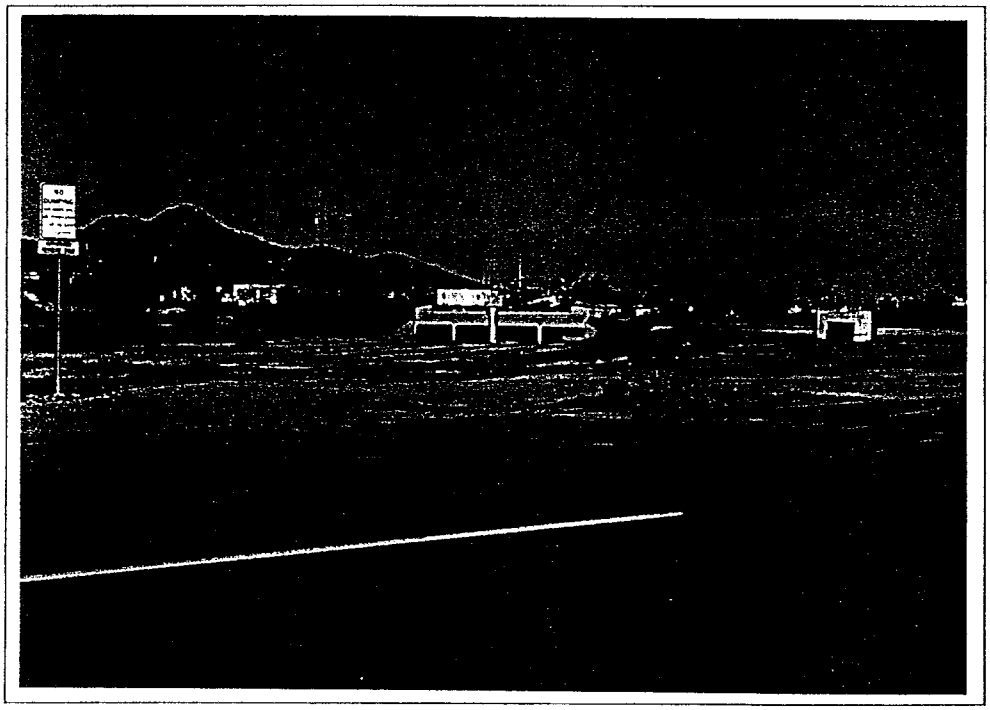
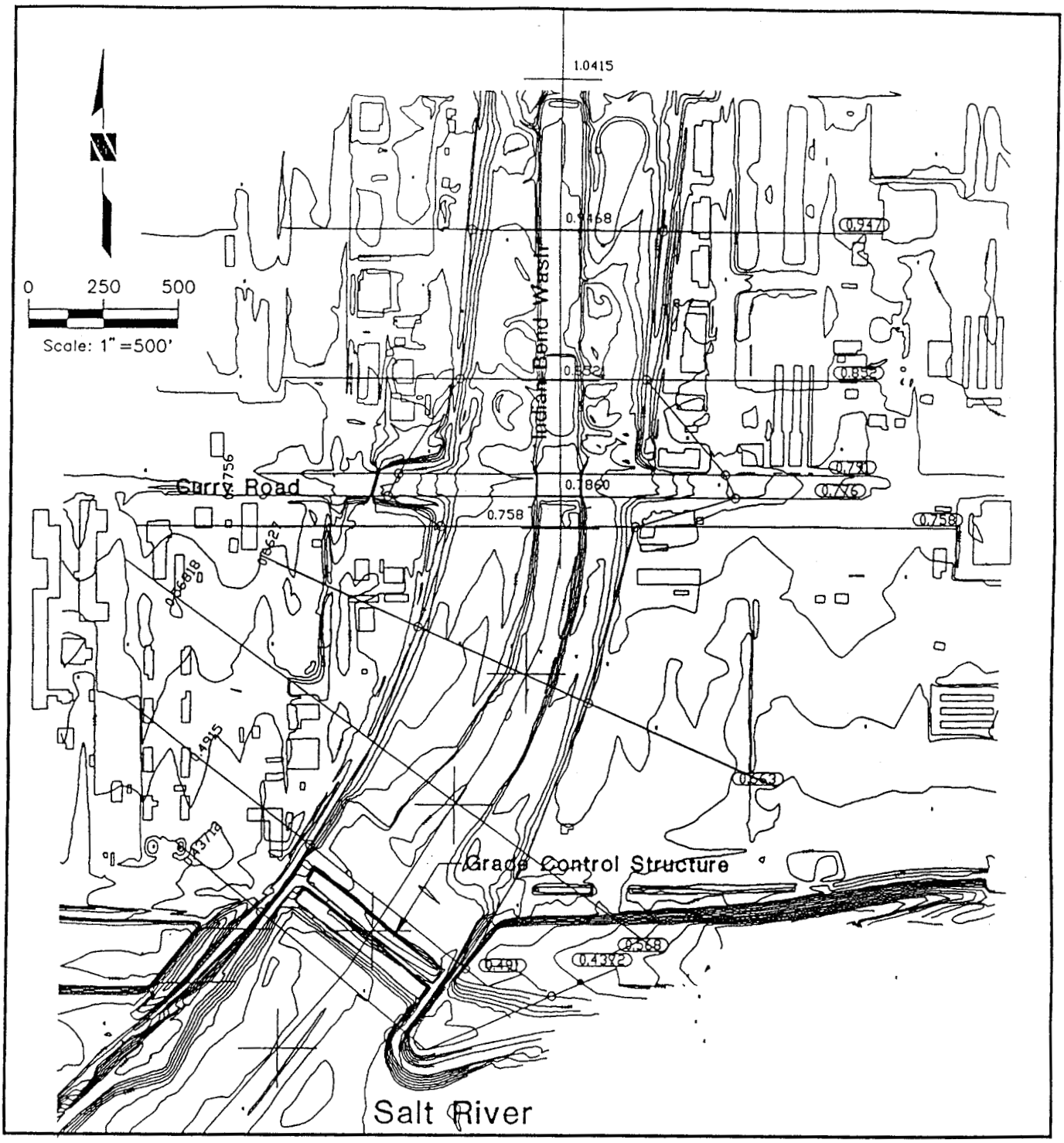


Photo A.28
Sweetwater Road Low Water Crossing, Looking Upstream from 36th Street

APPENDIX B

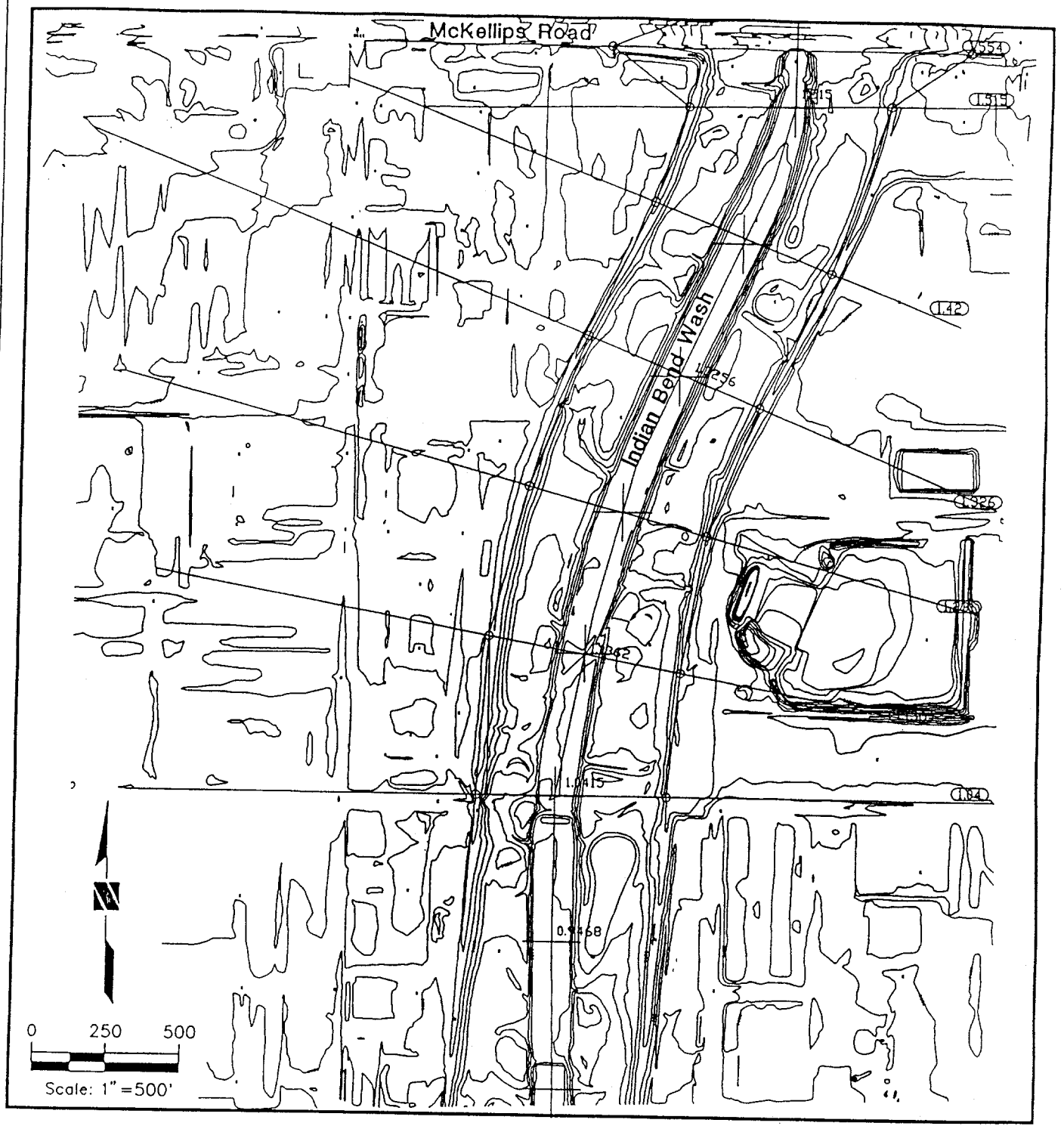
INDIAN BEND WASH FLOODPLAIN DELINEATION PROPOSED CROSS SECTION LOCATIONS FOR ORIENTATION PURPOSES ONLY

Indian Bend Wash at Curry Road



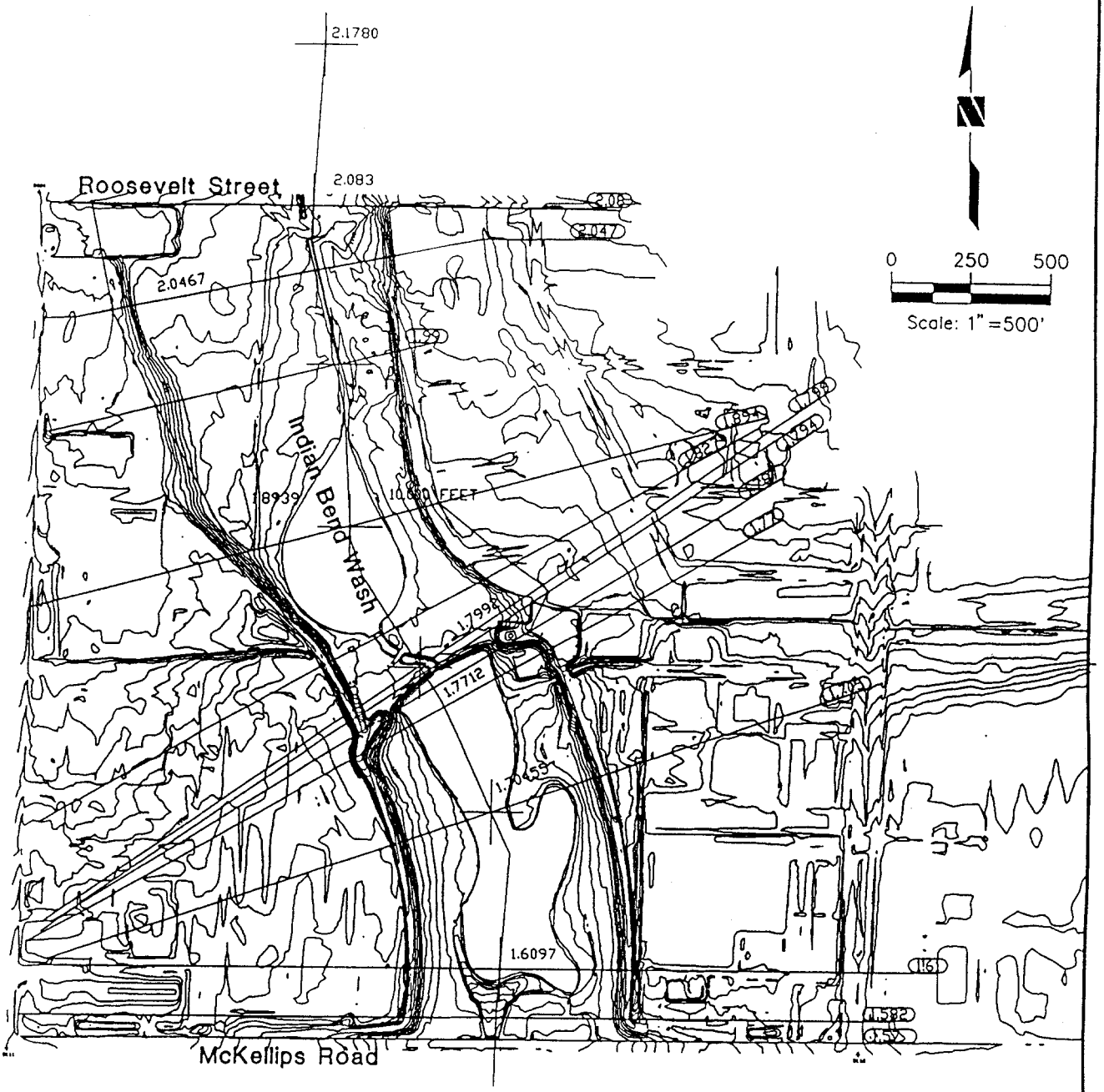
STATION 0.437 TO 0.947

McKellips Road



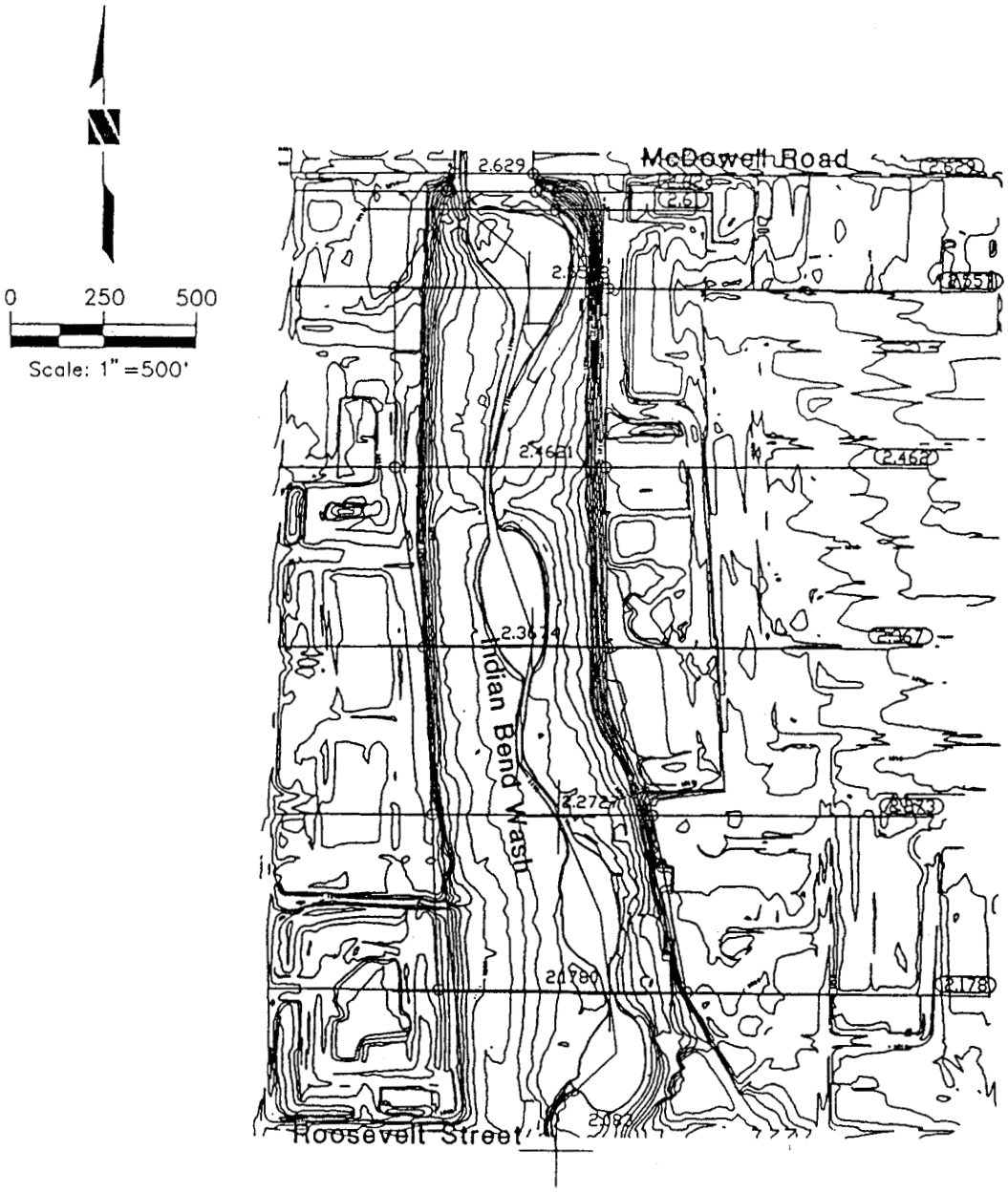
STATION 1.04 TO 1.554

McKellips Road to Mid-Section Roosevelt Street



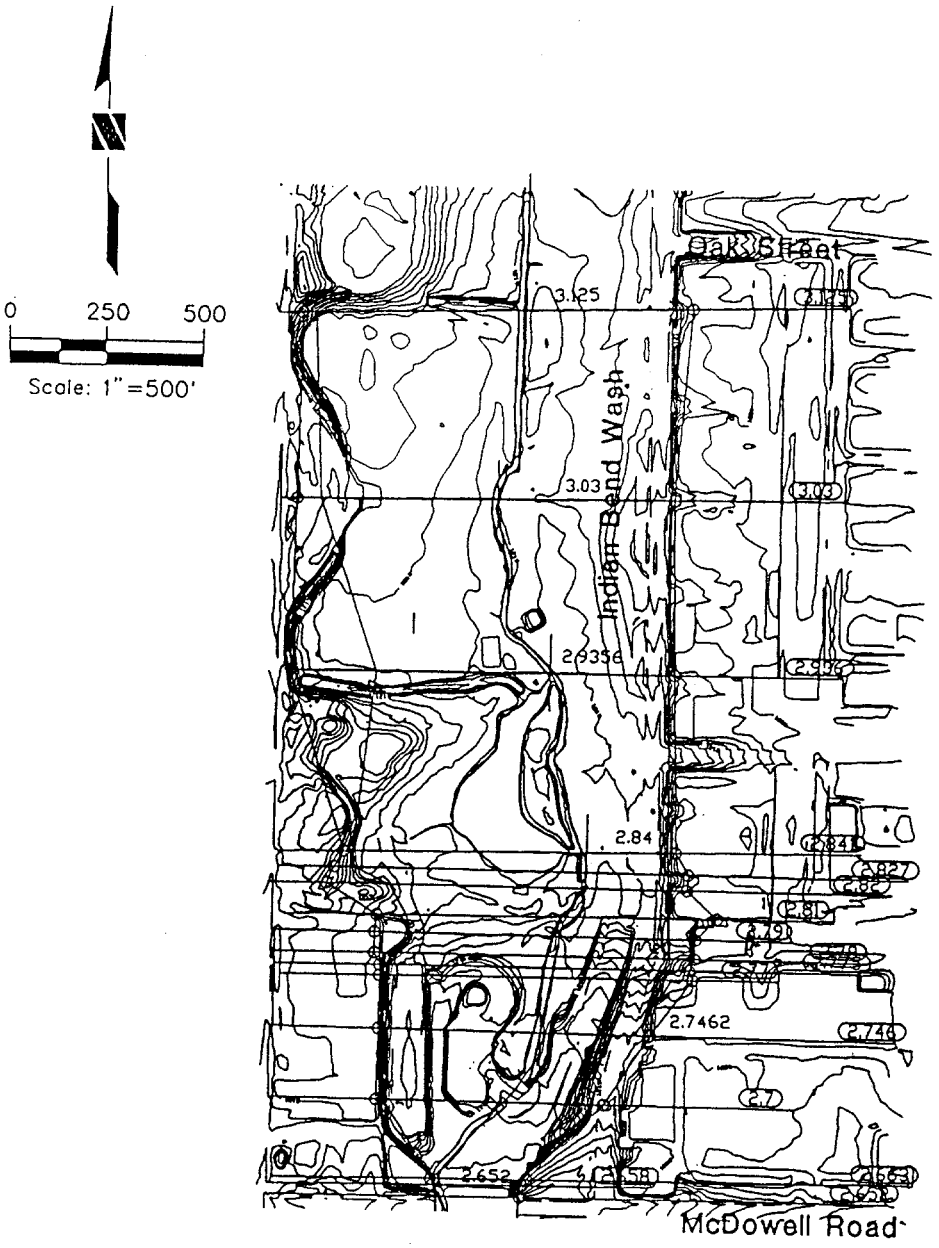
STATION 1.57 TO 2.08

Roosevelt Street to McDowell Road



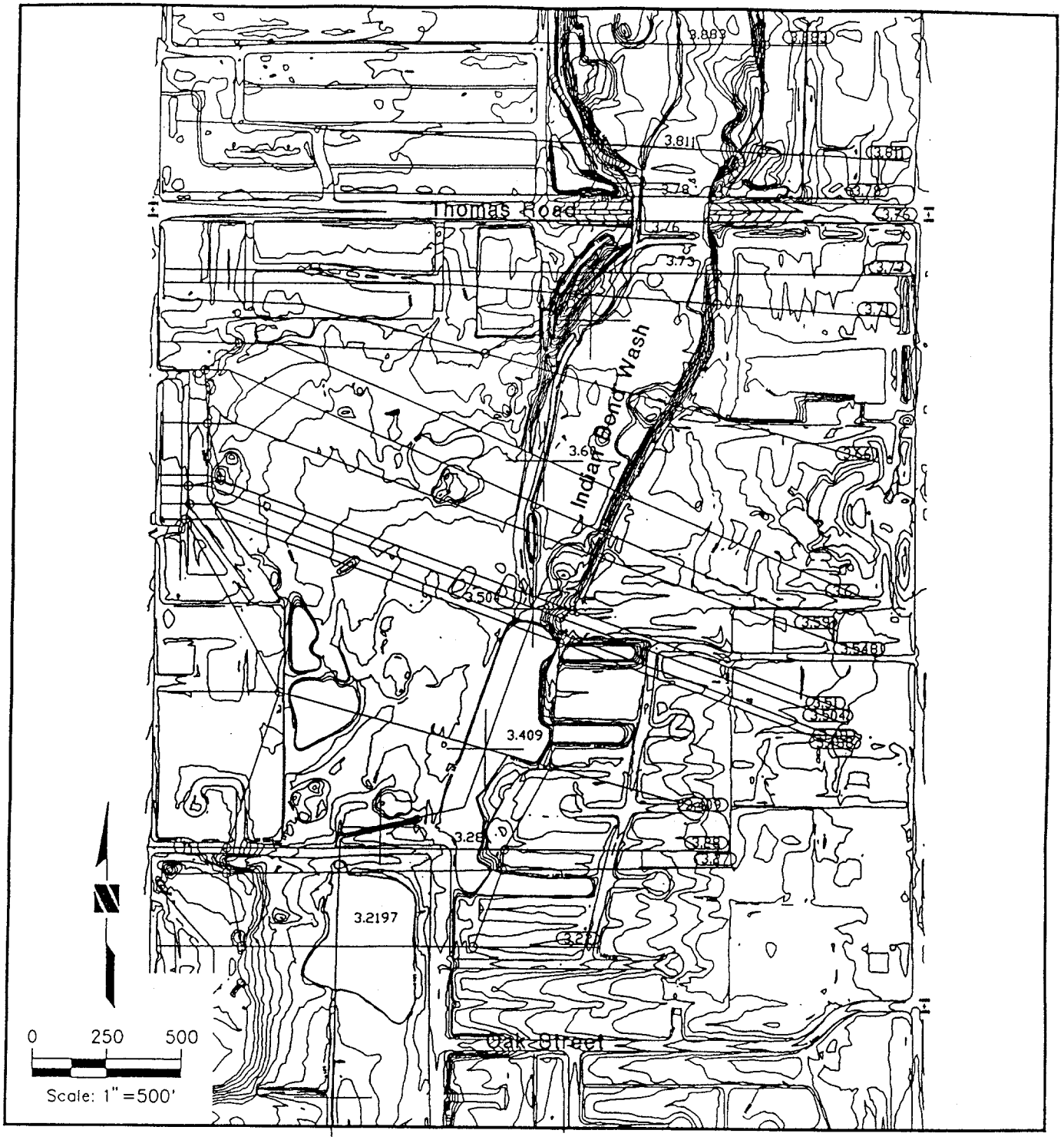
STATION 2.178 TO 2.629

McDowell Road to Mid-Section



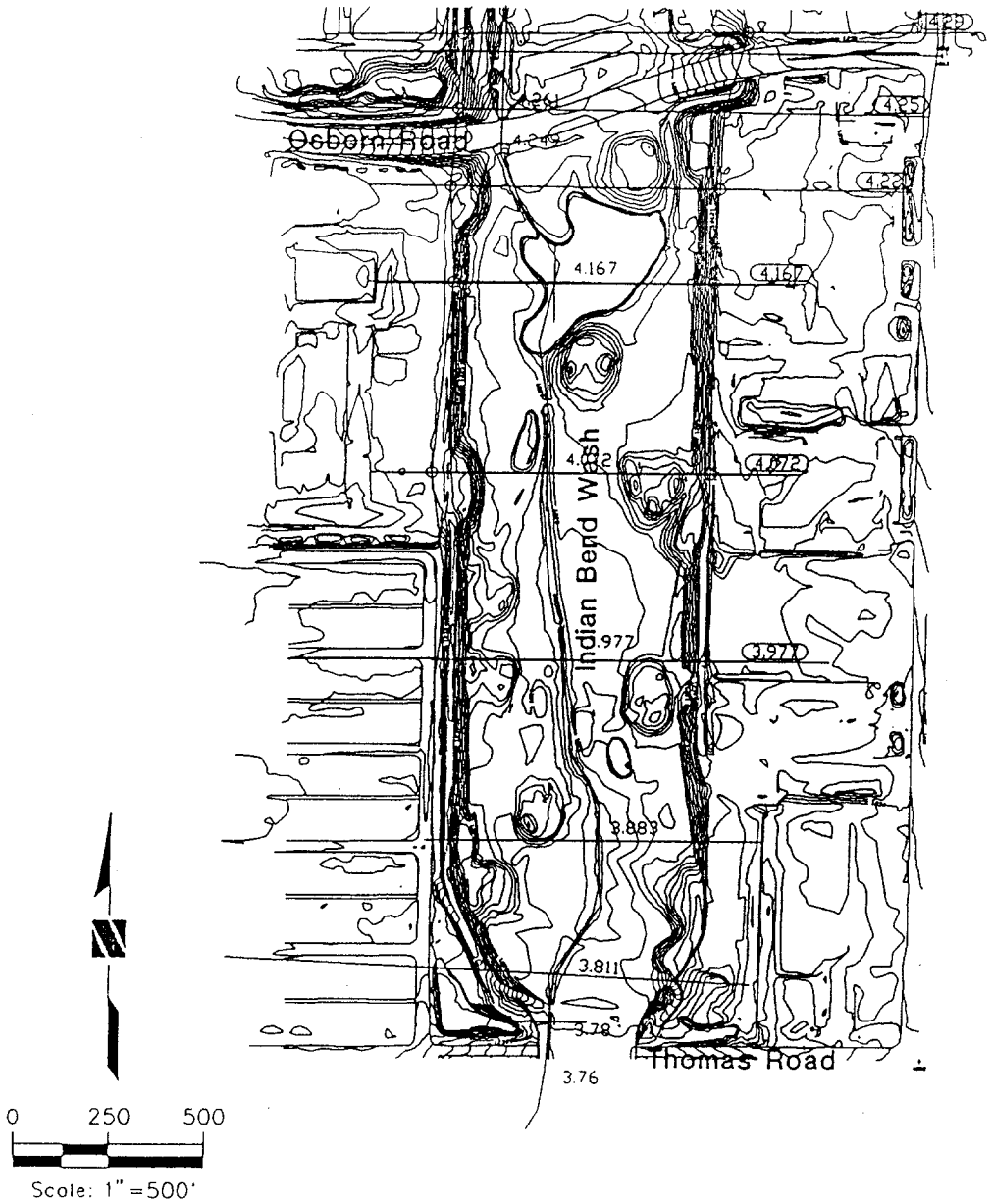
STATION 2.652 TO 3.125

Murray Lane to Thomas Road

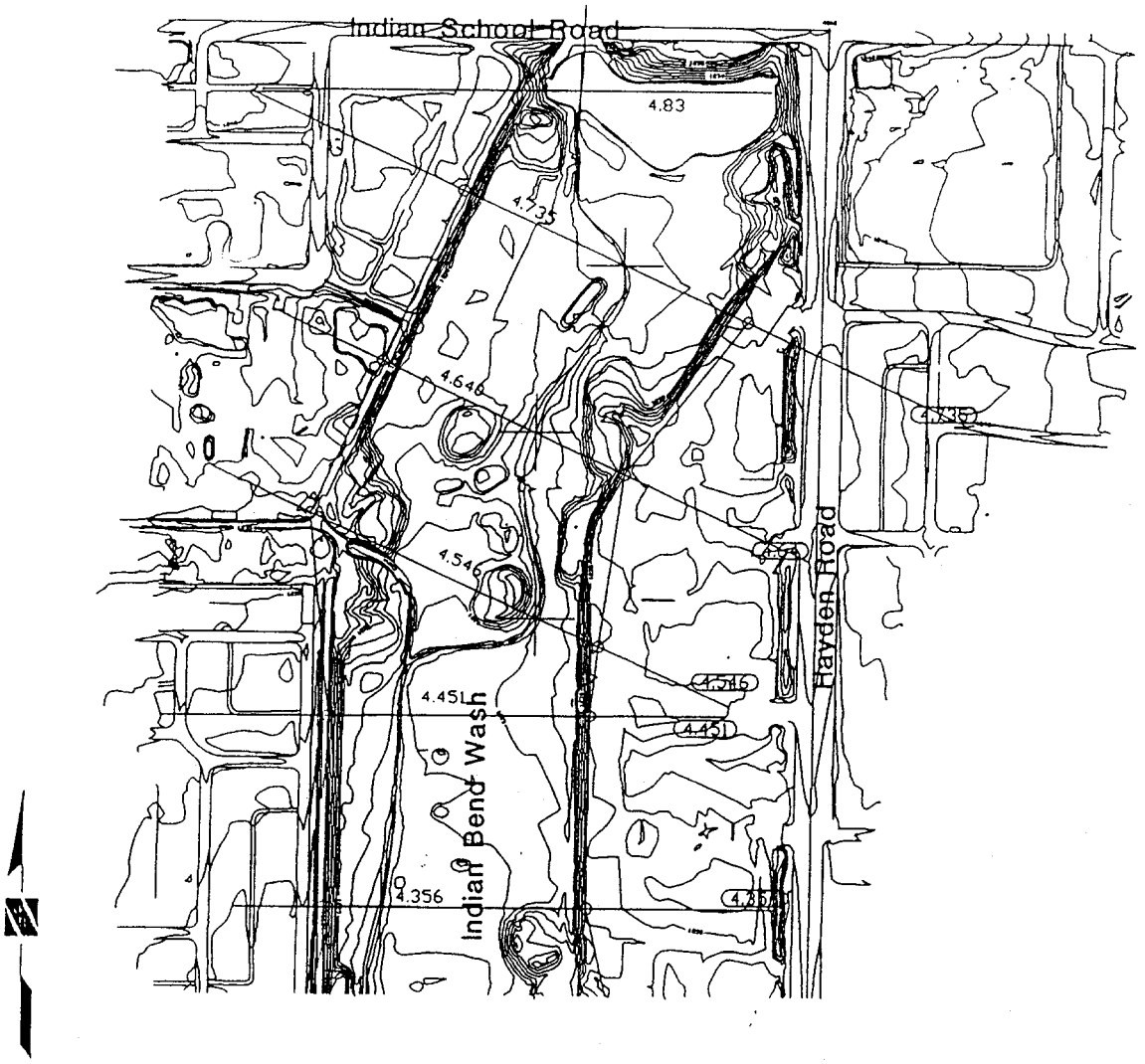


STATION 3.22 TO 3.883

Thomas Road to Osborn Road

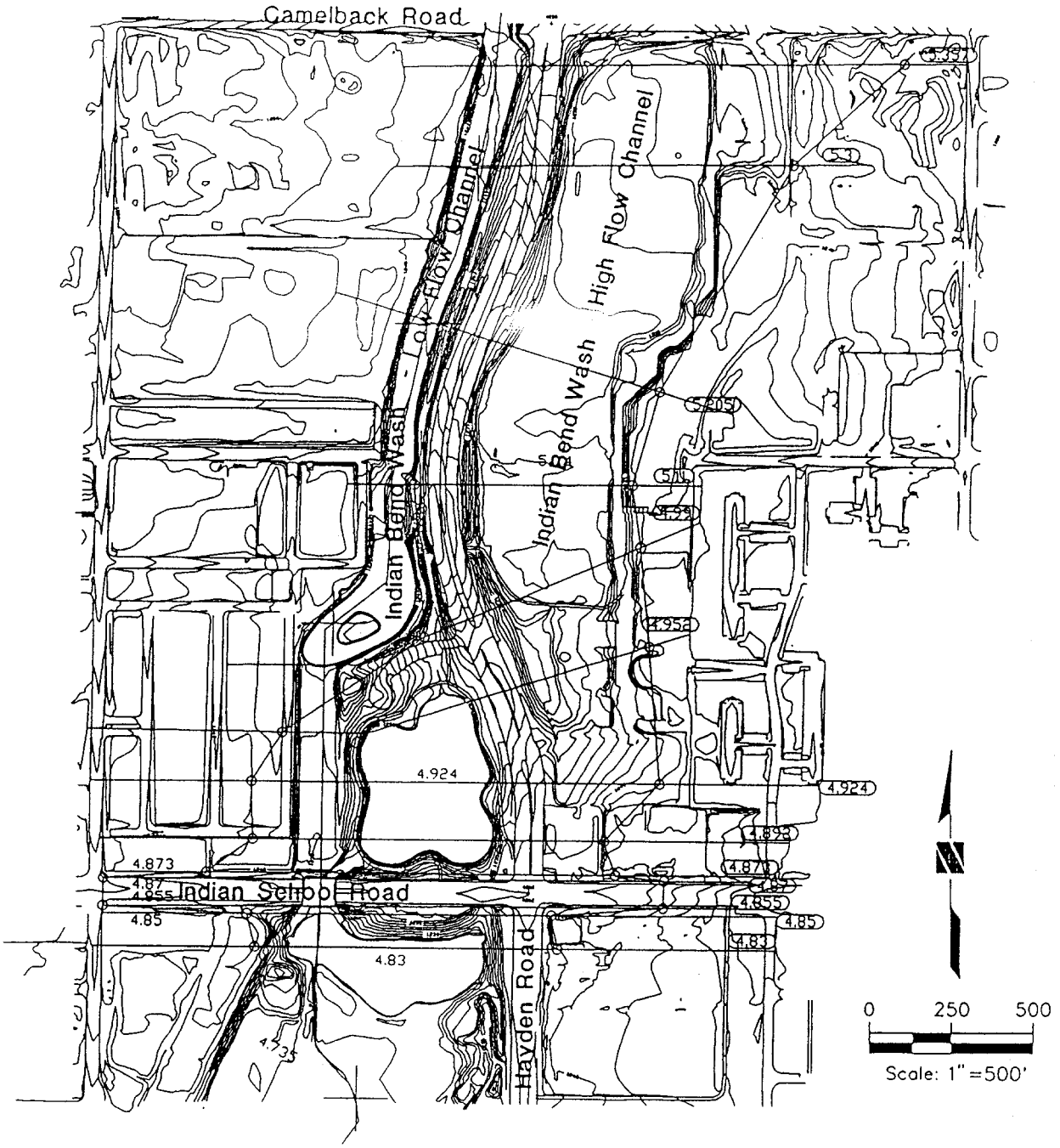

Osborn Road
4.167
4.167
4.167

Osborn Road to Indian School Road



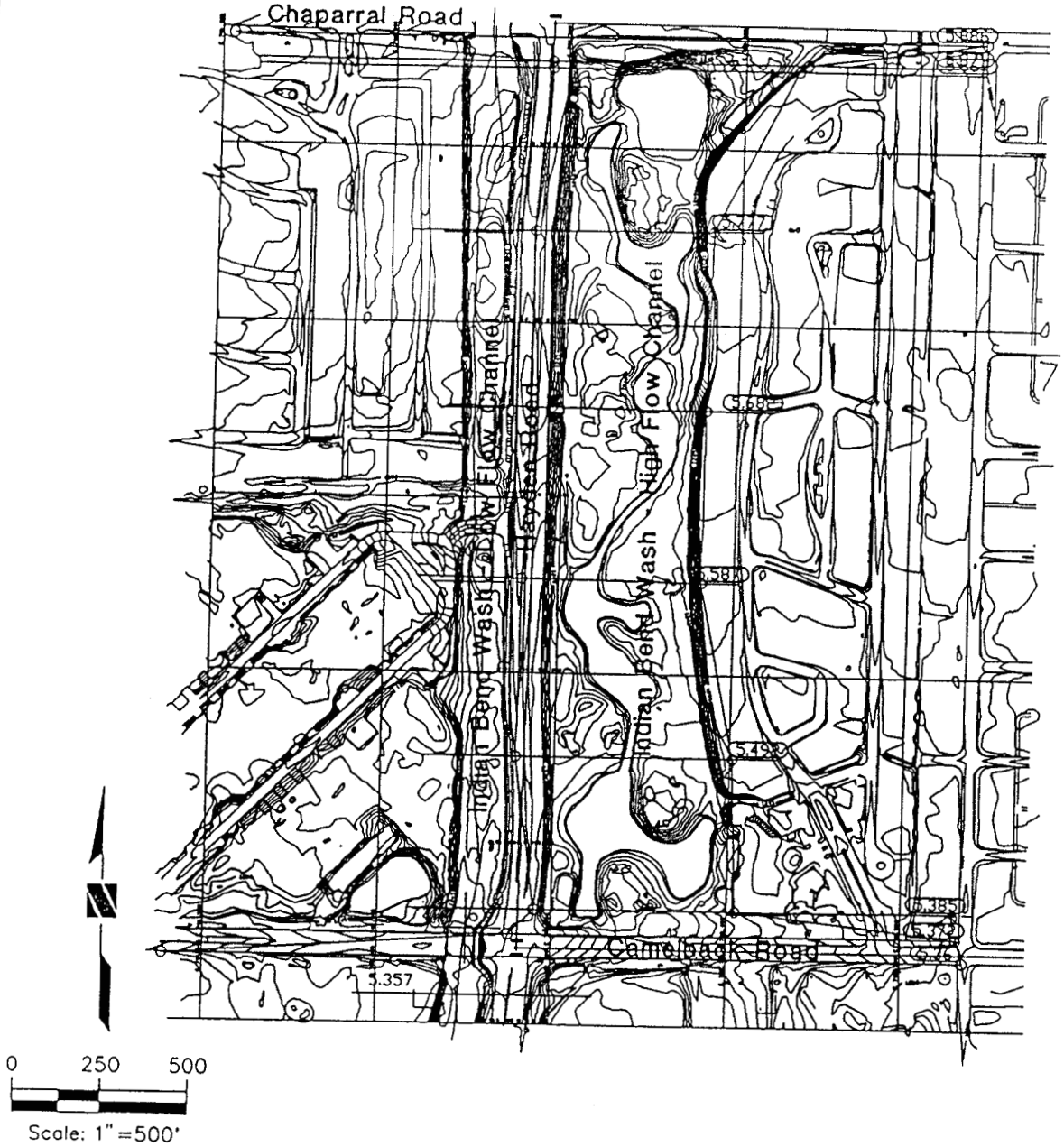
STATION 4.356 TO 4.735

Indian School Road to Camelback Road



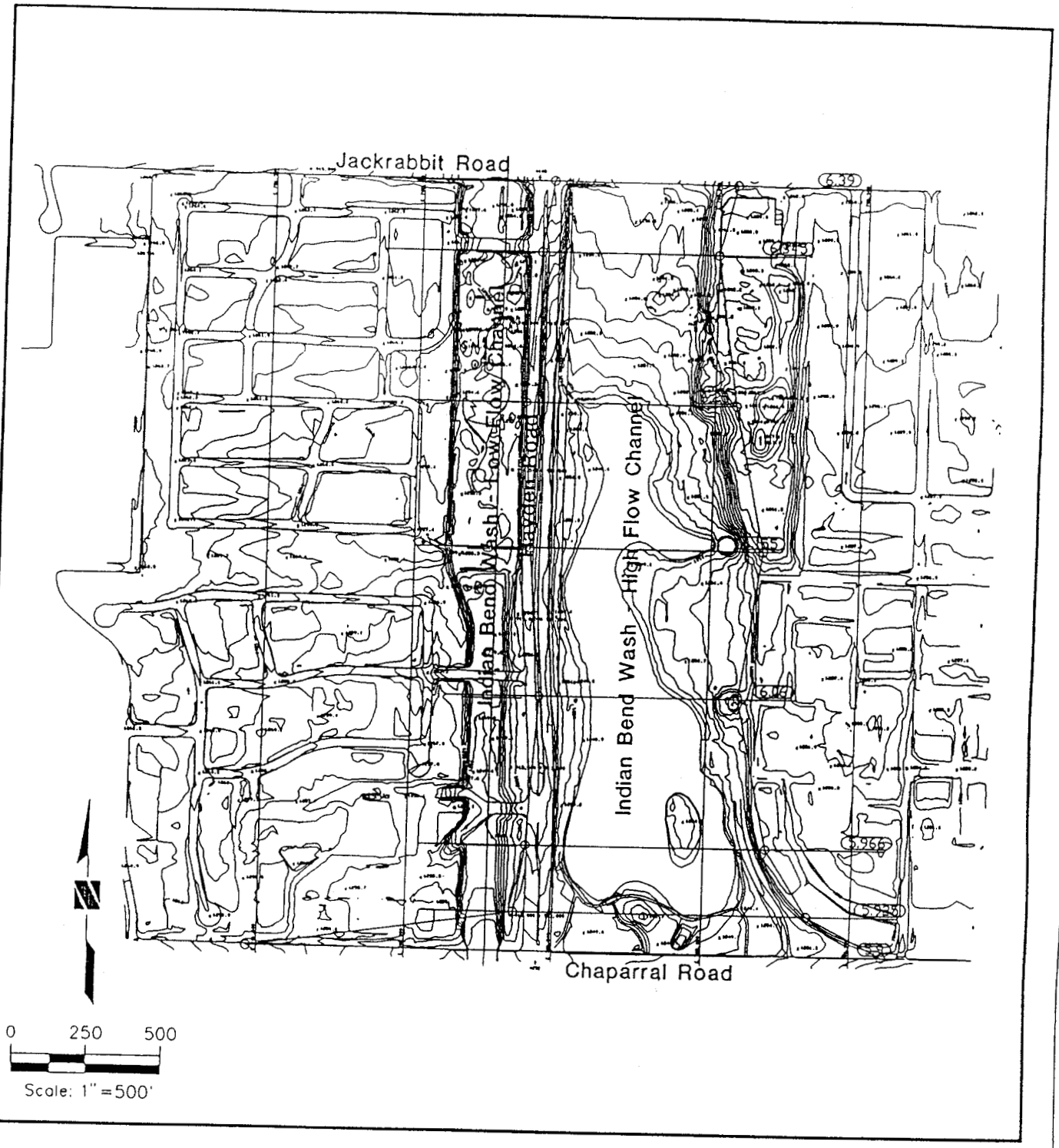
STATION 4.83 TO 5.357

Camelback Road to Chaparral Road



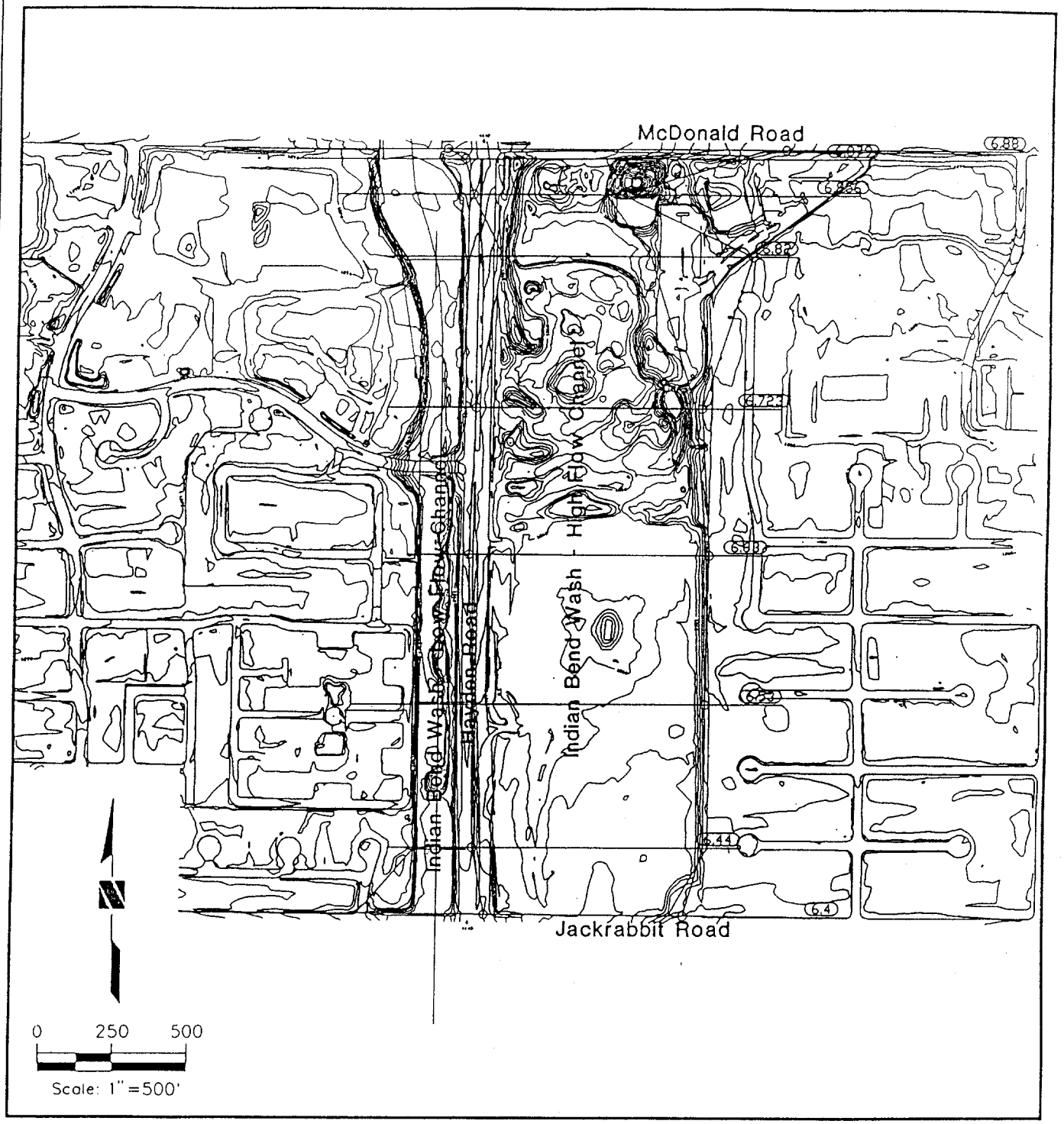
STATION 5.372 TO 5.886

Chaparral Road to Jackrabbit Road



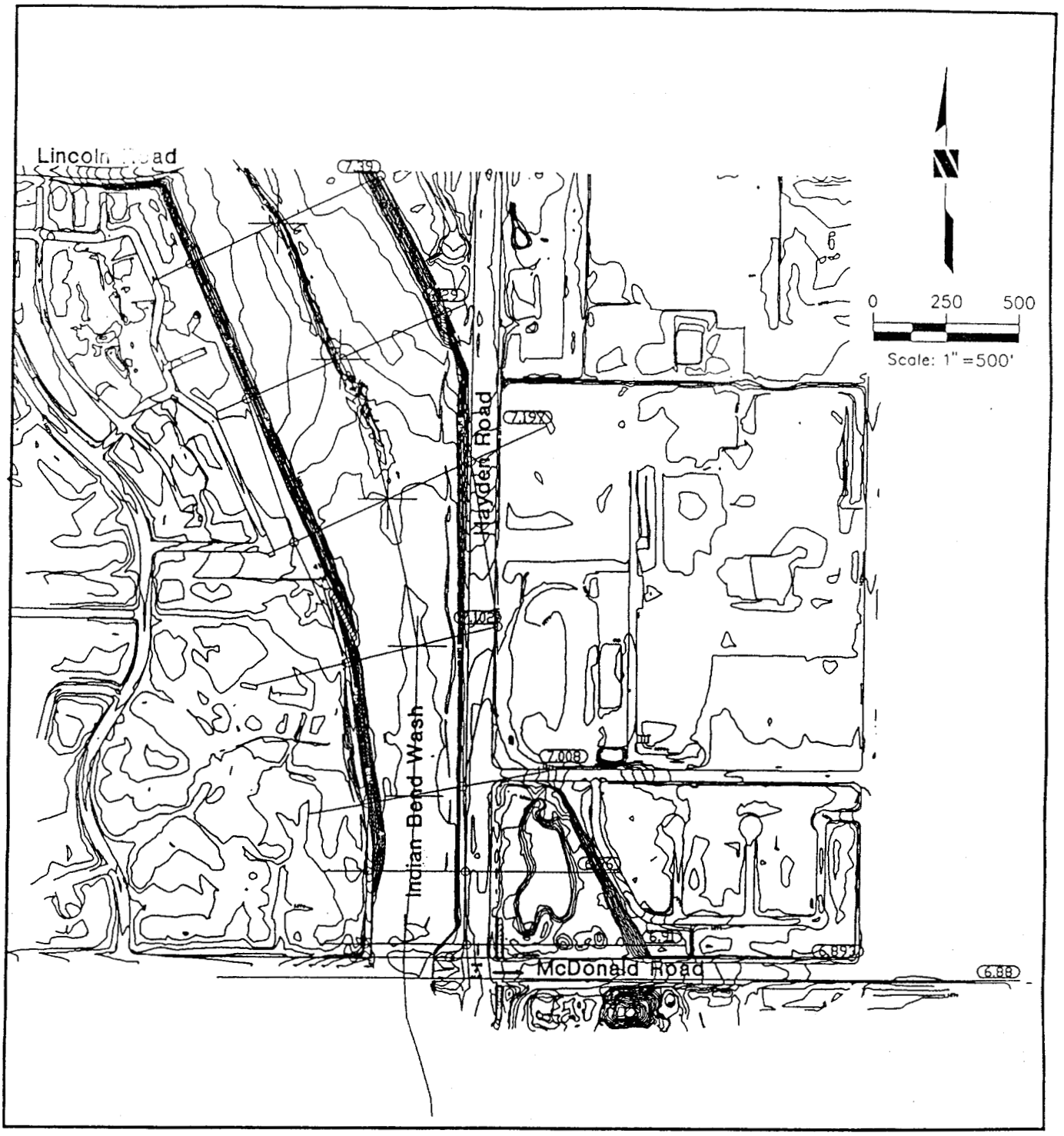
STATION 5.9 TO 6.39

Jackrabbit Road to McDonald Drive



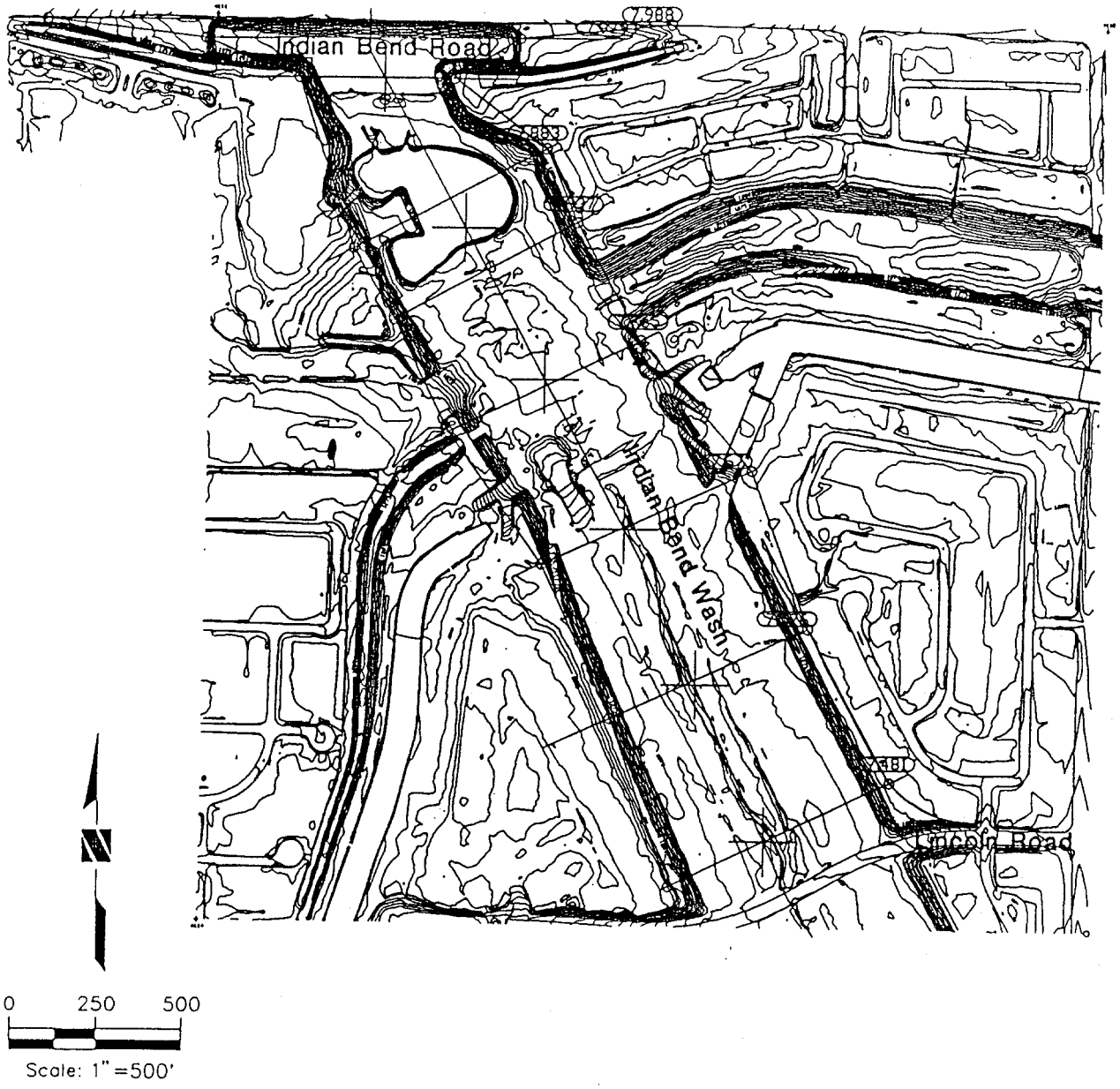
STATION 6.4 TO 6.88

McDonald Drive to Lincoln Drive



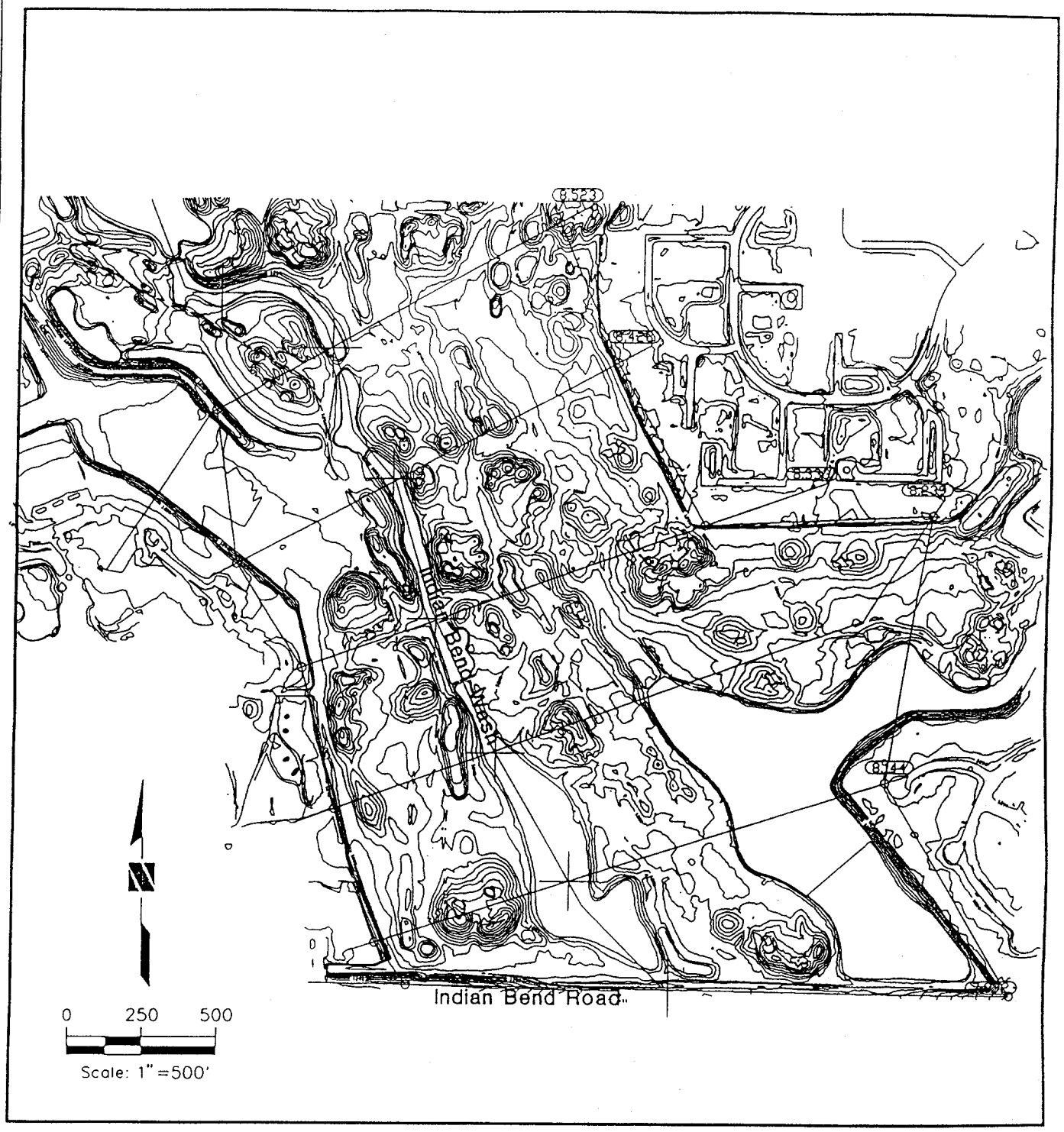
STATION 6.88 TO 7.39

Lincoln Drive to Indian Bend Road



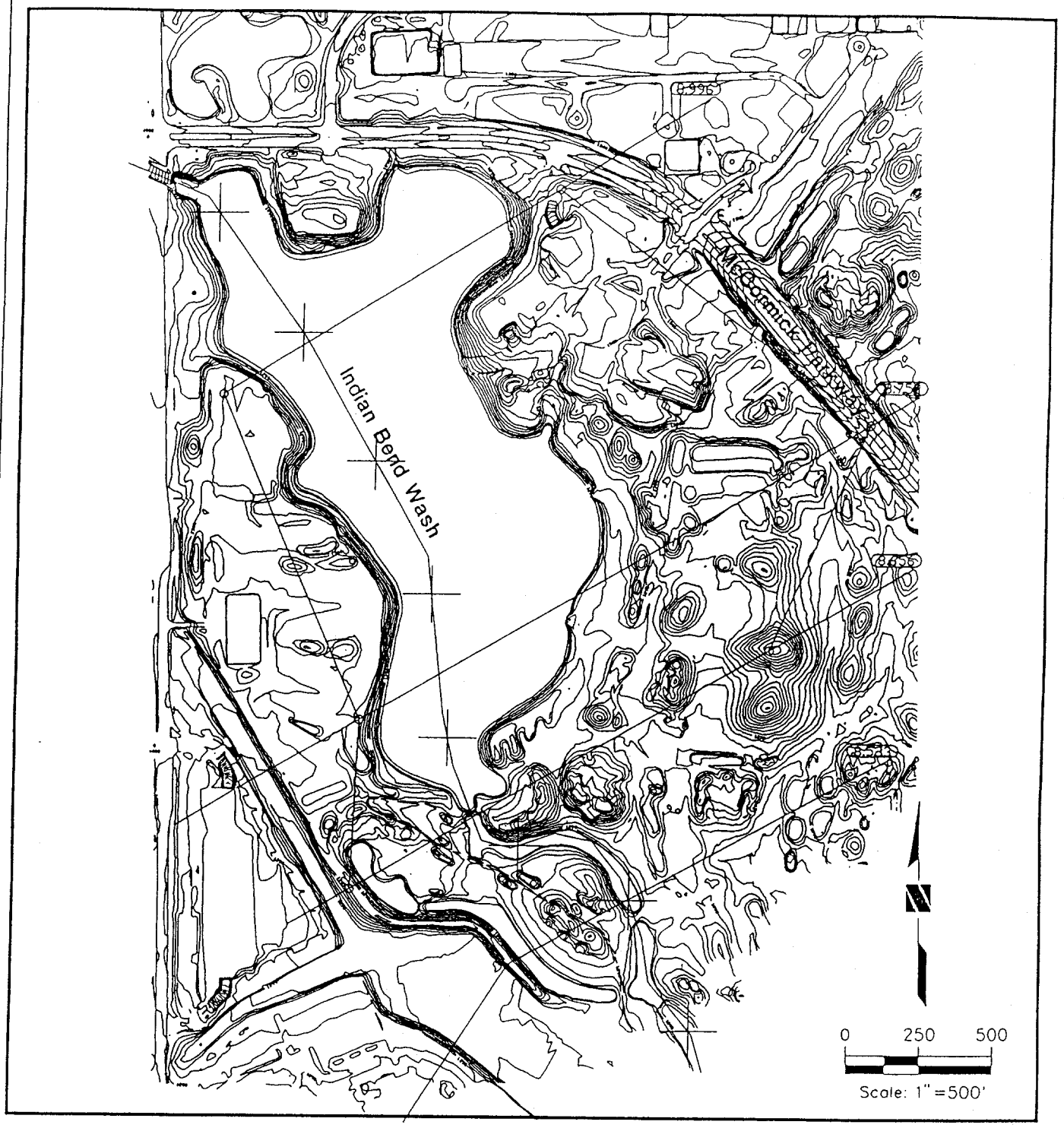
STATION 7.481 TO 7.988

Indian Bend Road



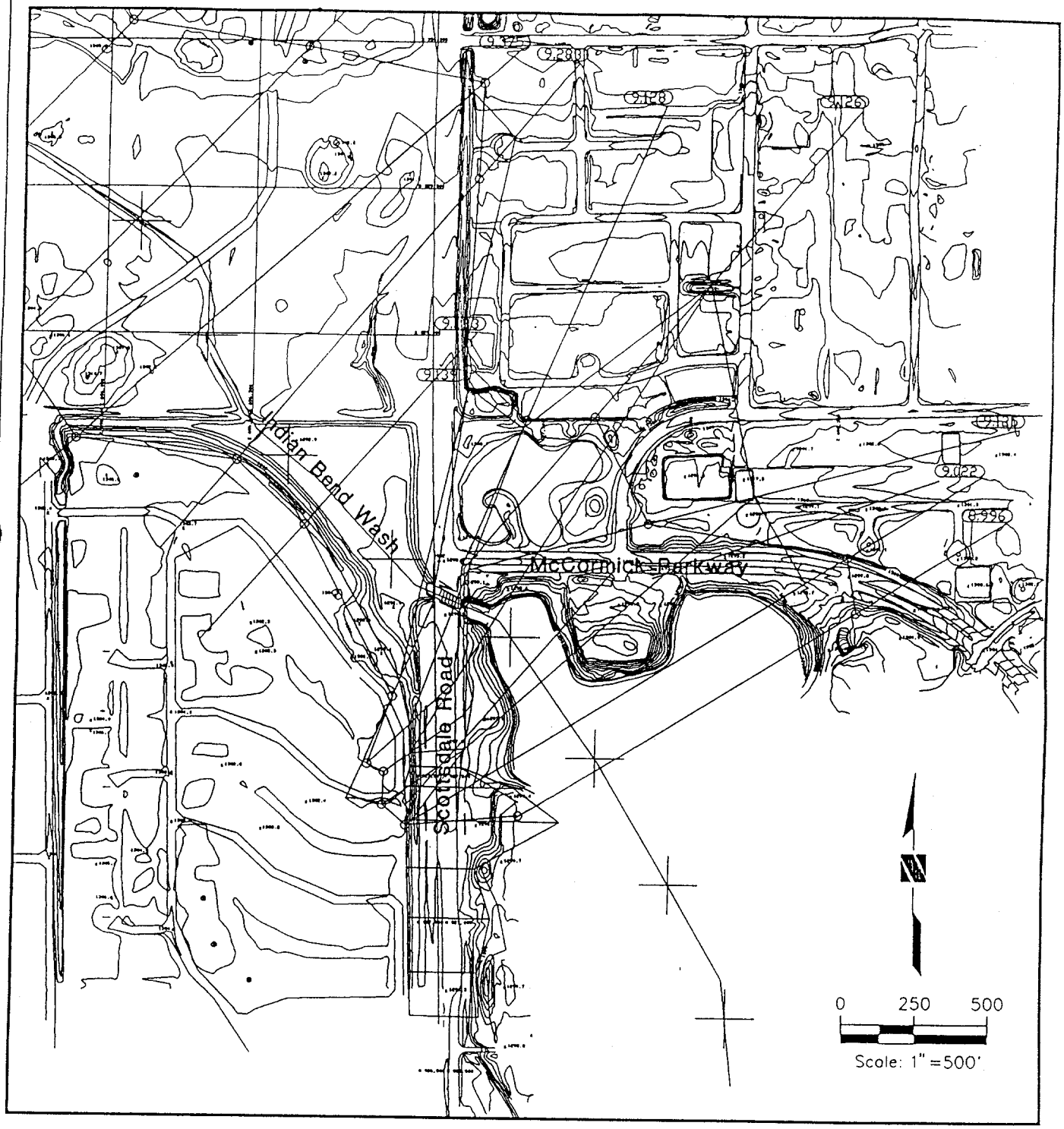
STATION 7.992 TO 8.523

Scottsdale Road at McCormick Parkway



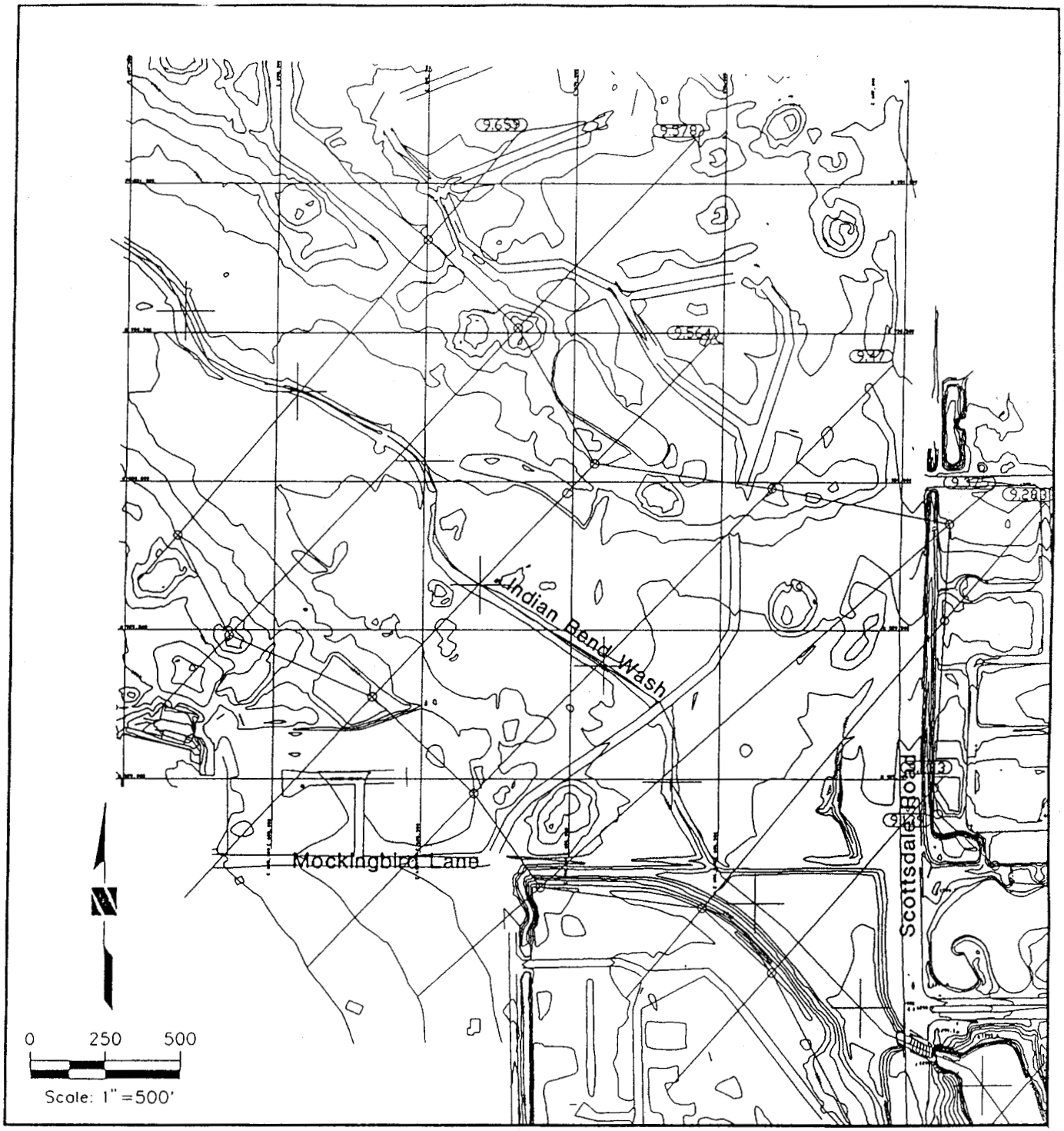
STATION 8.656 TO 8.996

Scottsdale Road at Golf Drive



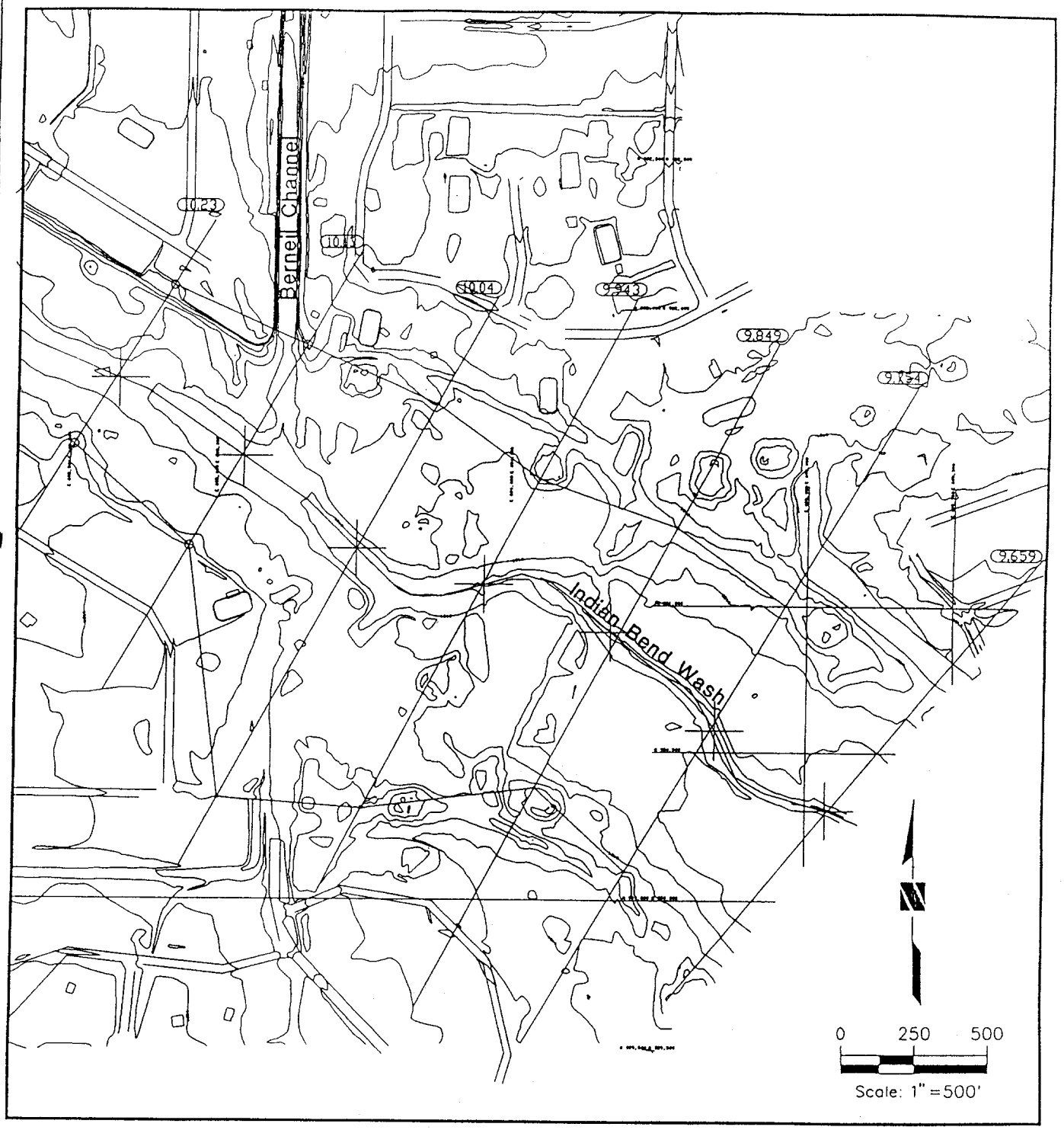
STATION 8.996 TO 9.375

Camelback Country Club



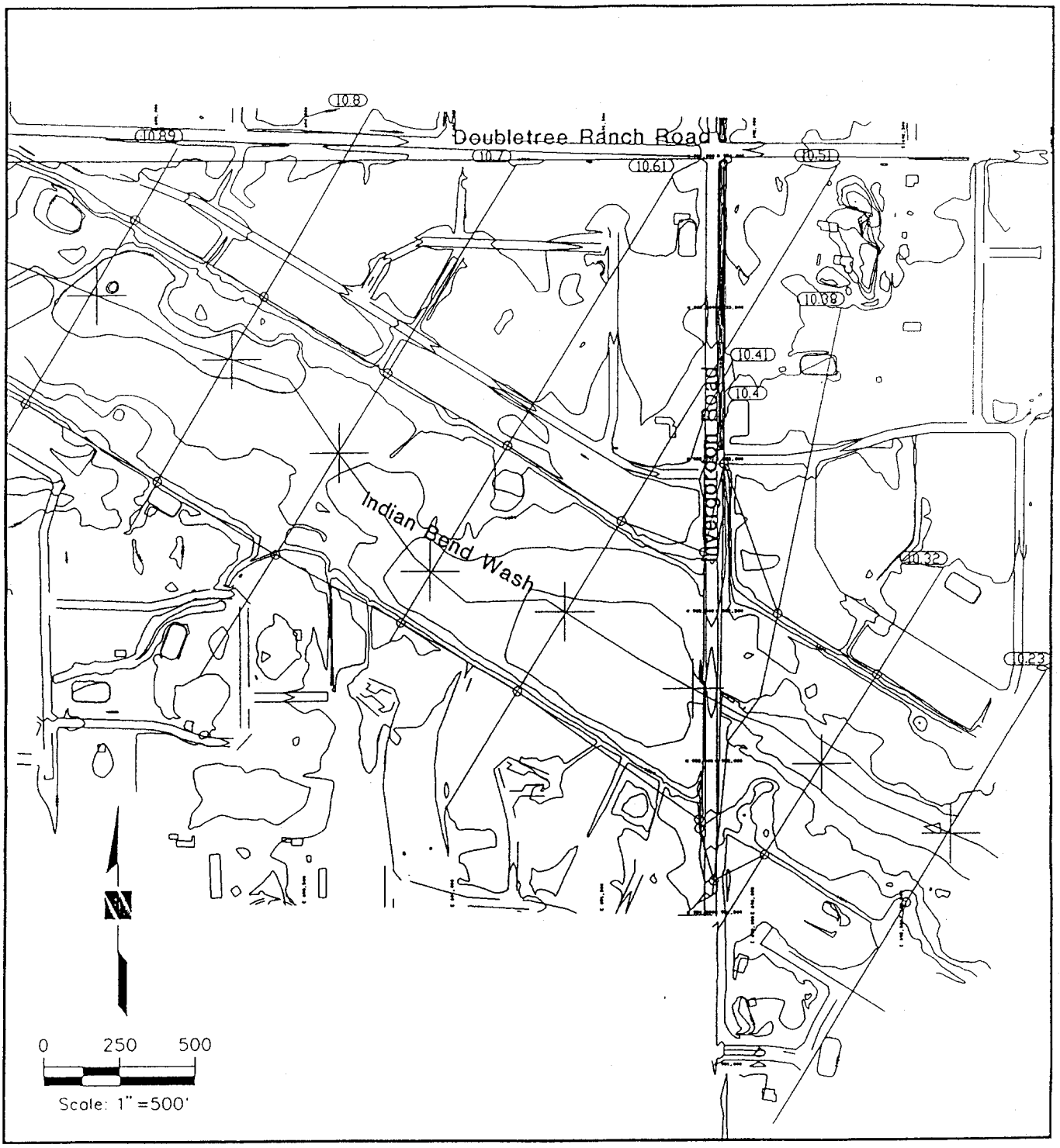
STATION 9.137 TO 9.659

Invergordon Road



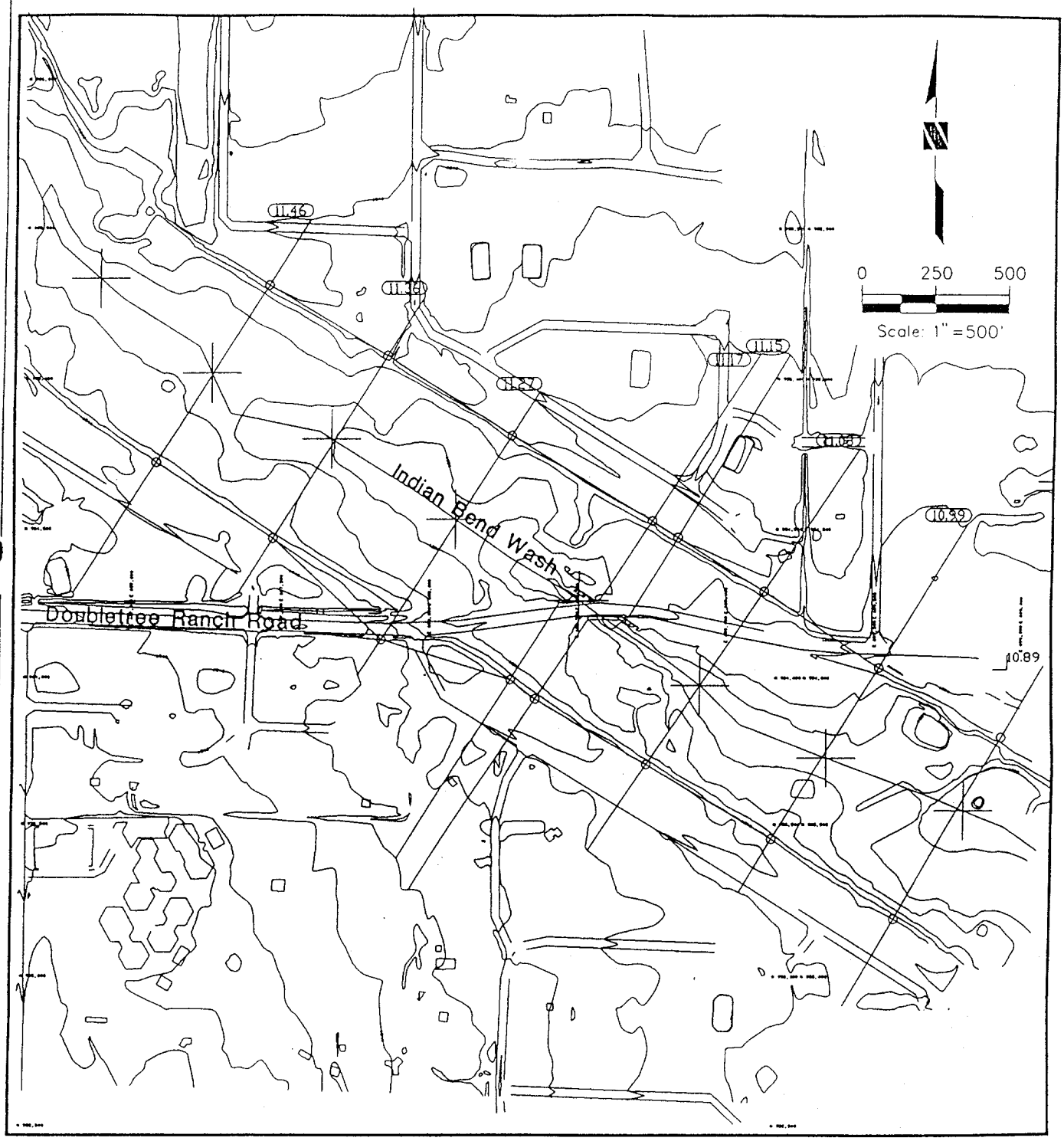
STATION 9.659 TO 10.23

Invergordon Road to Doubletree Ranch Road



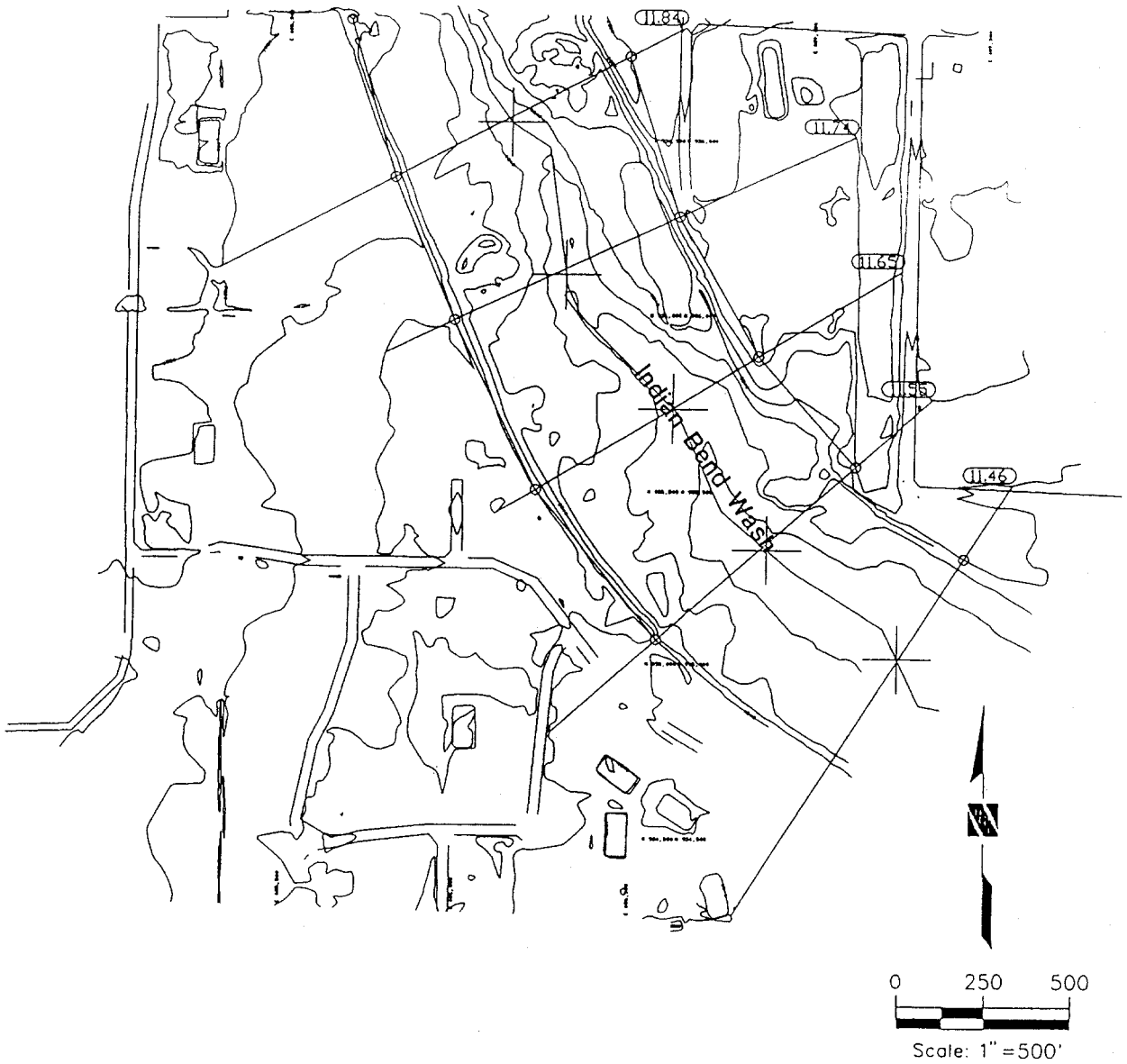
STATION 10.23 TO 10.89

Doubletree Ranch Road



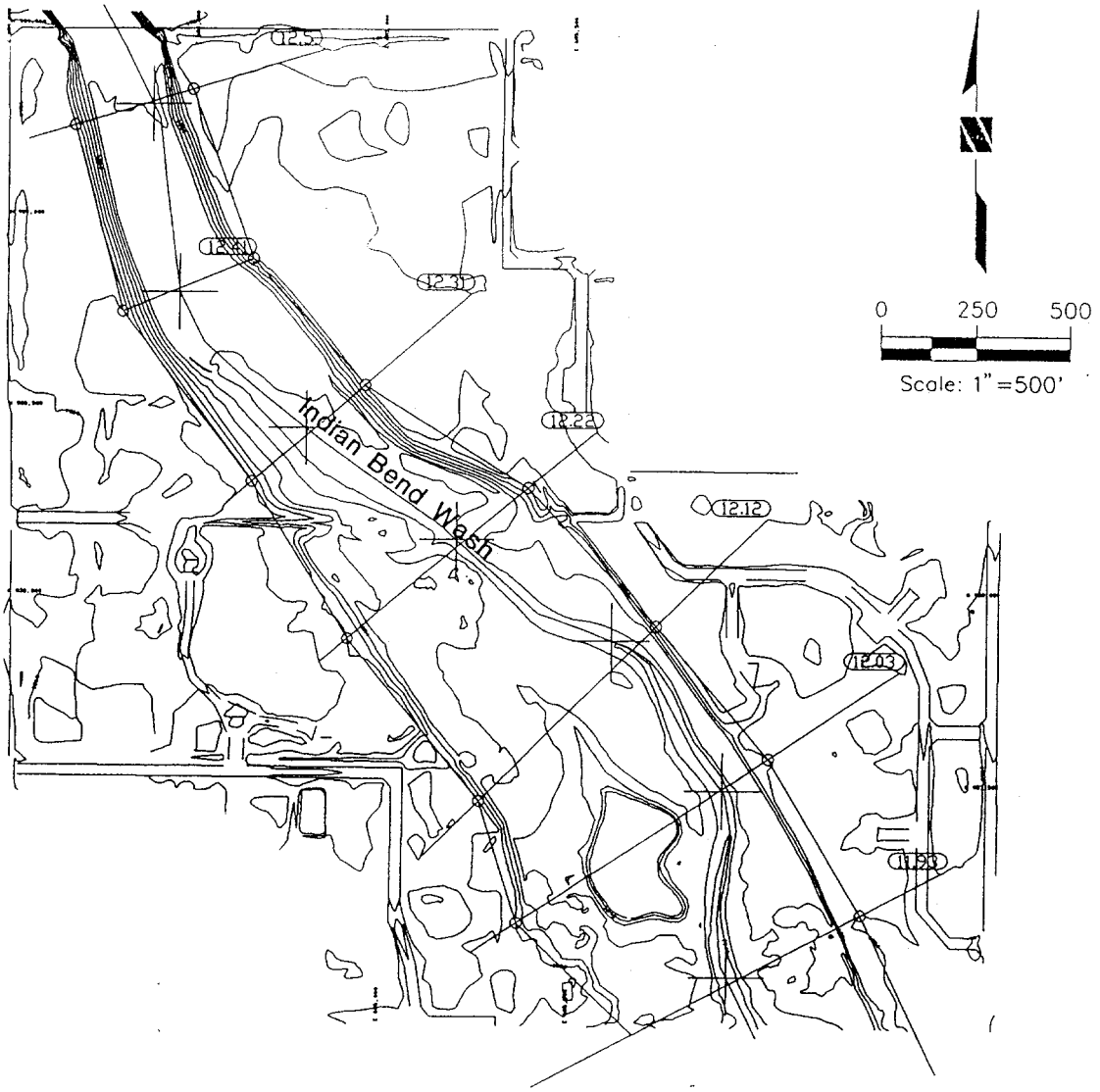
STATION 10.89 TO 11.46

Mountain View Road



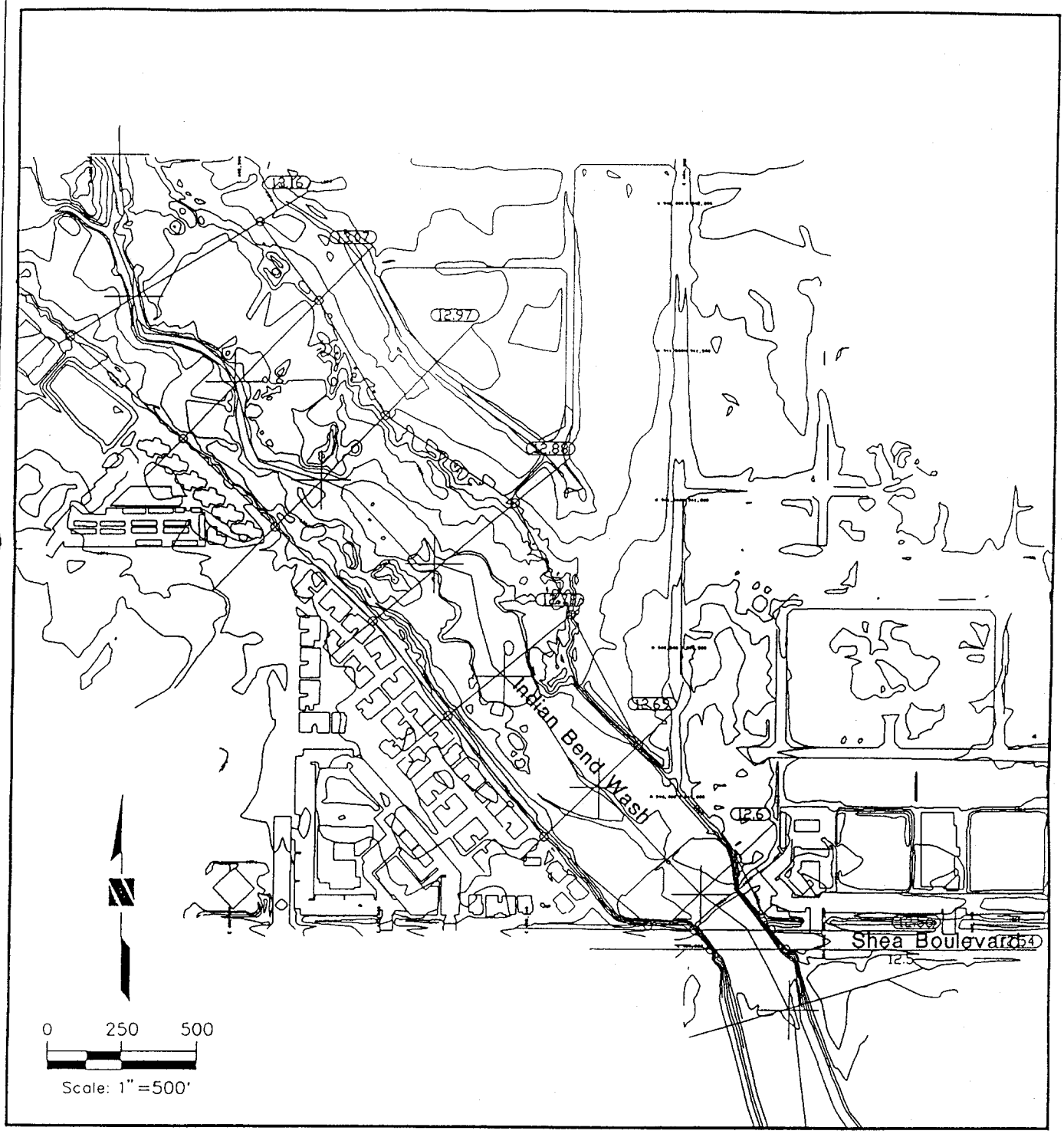
STATION 11.48 TO 11.84

Mountain View Road to Shea Boulevard

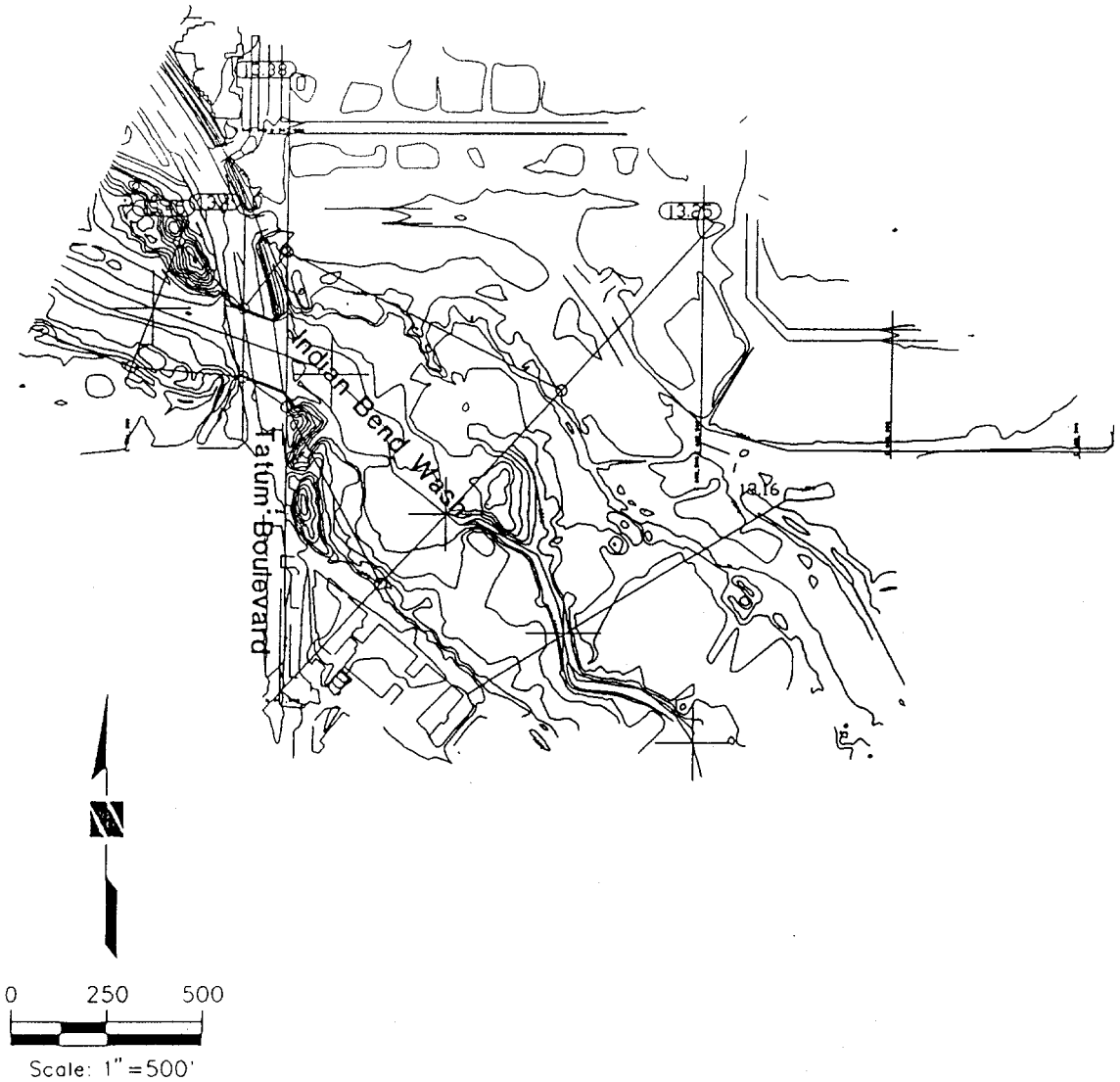


STATION 11.93 TO 12.5

Shea Boulevard

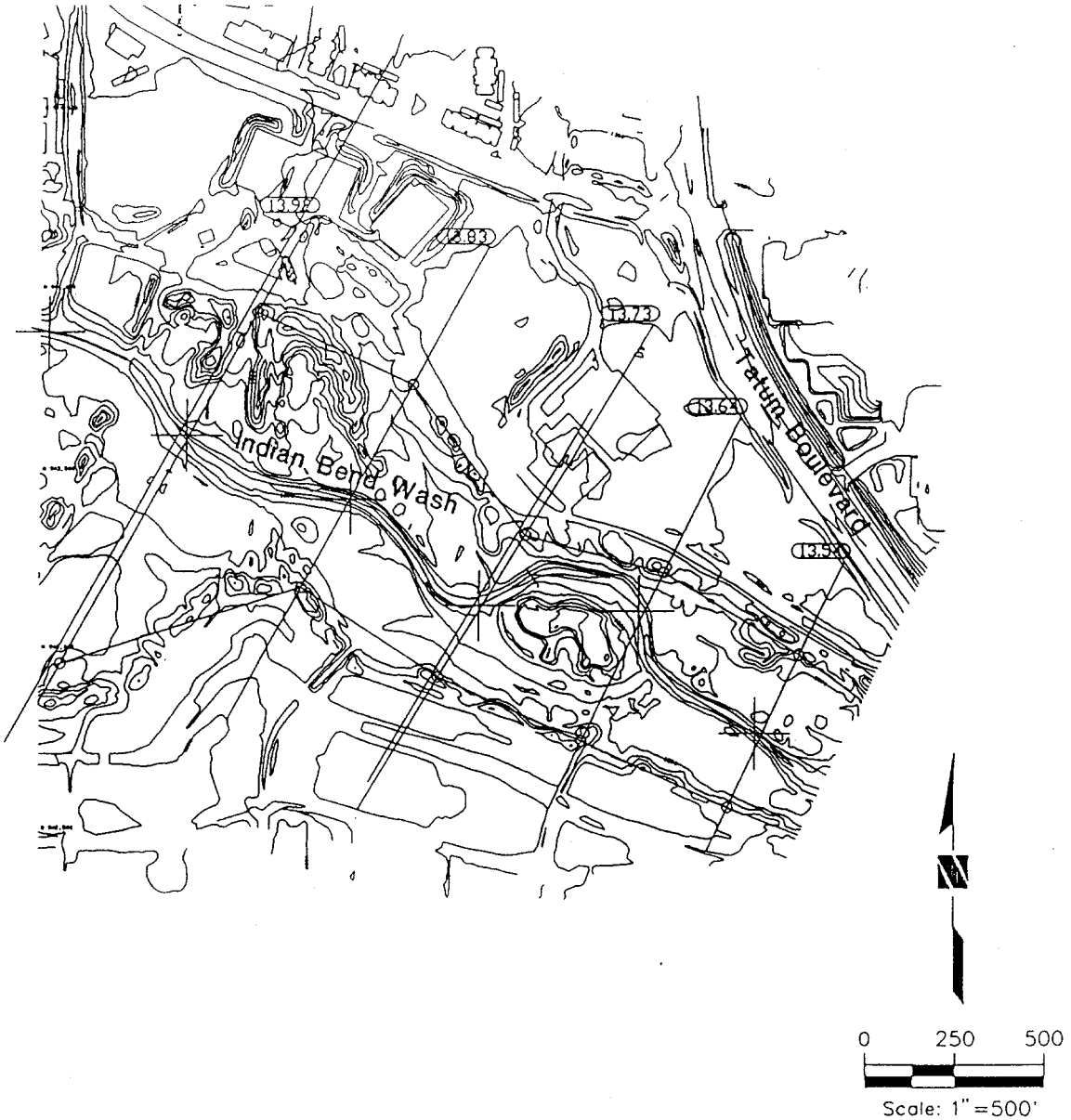


STATION 12.54 TO 13.16



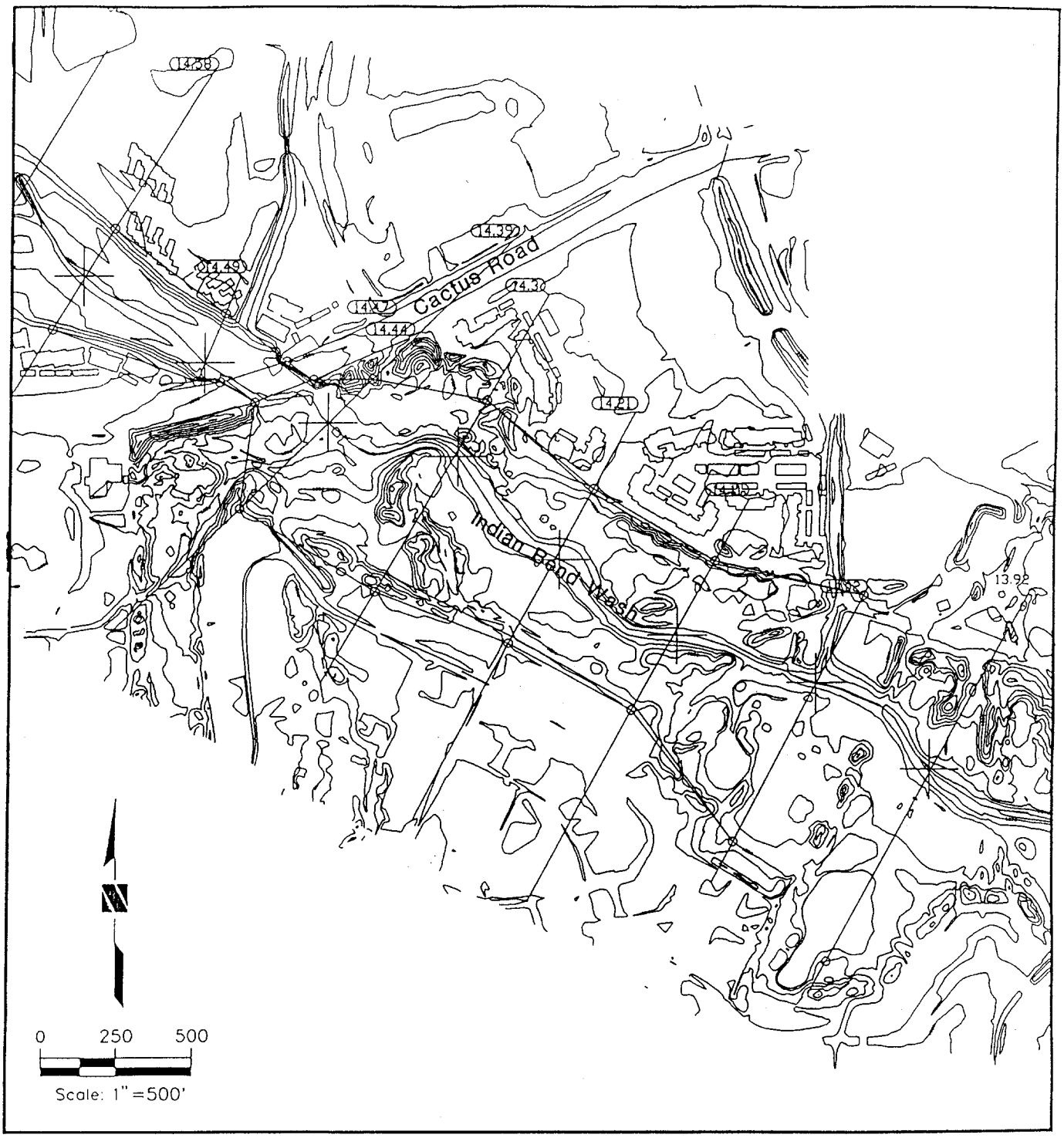
STATION 13.16 TO 13.45

Tatum Boulevard at Copper Springs Golf Course



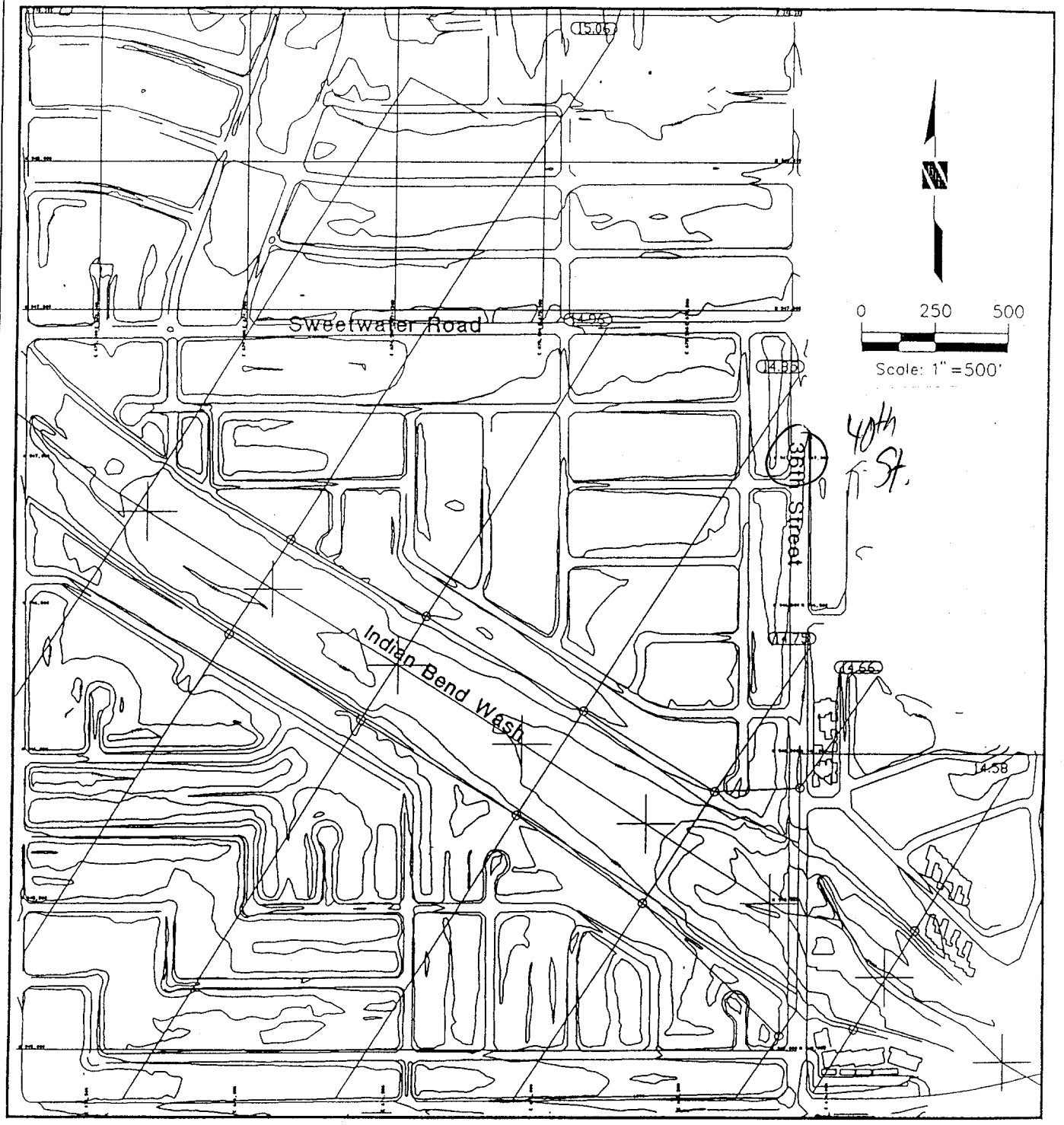
STATION 13.54 TO 13.92

Cactus Road



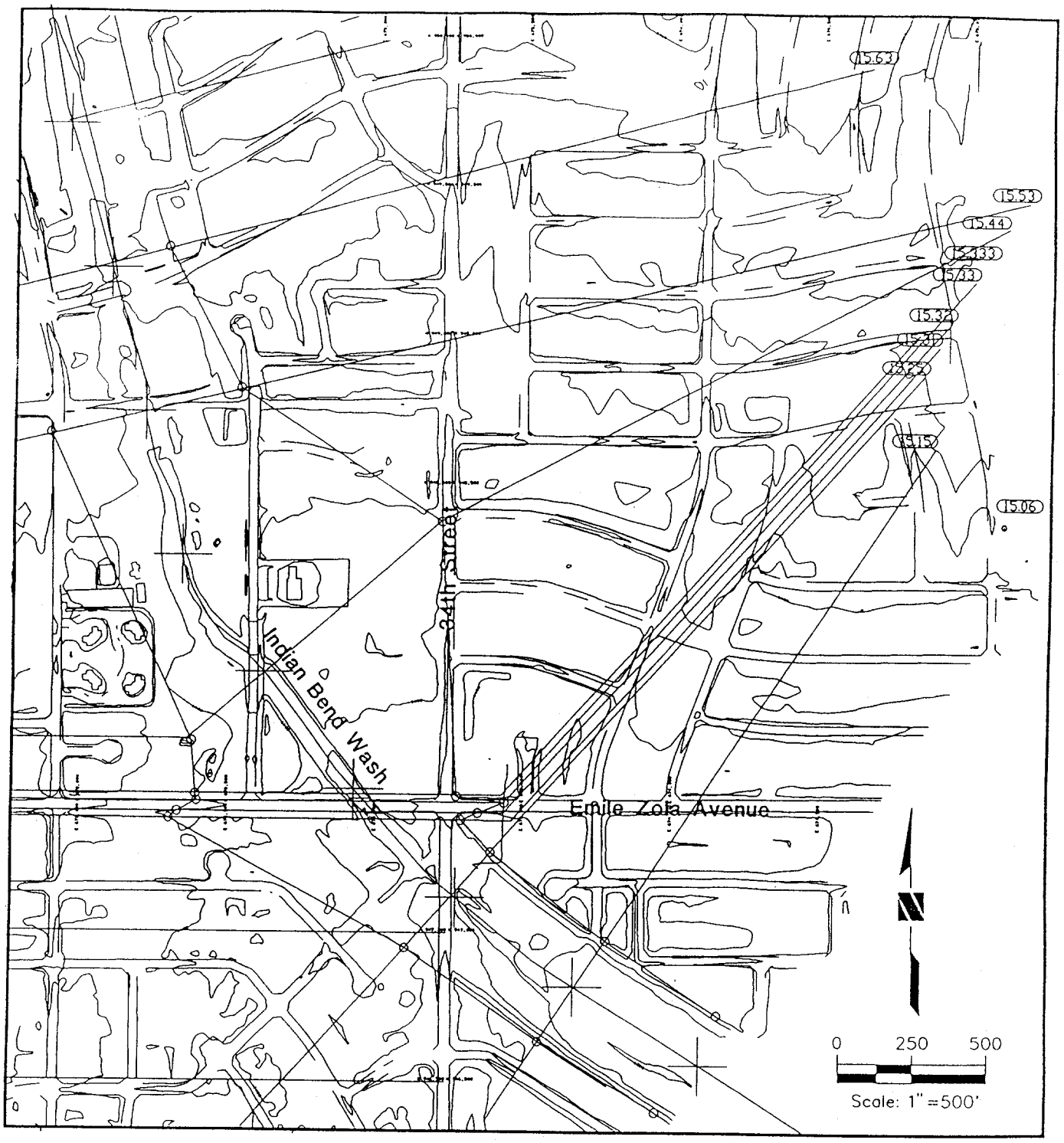
STATION 13.92 TO 14.58

36th Street to Sweetwater Road



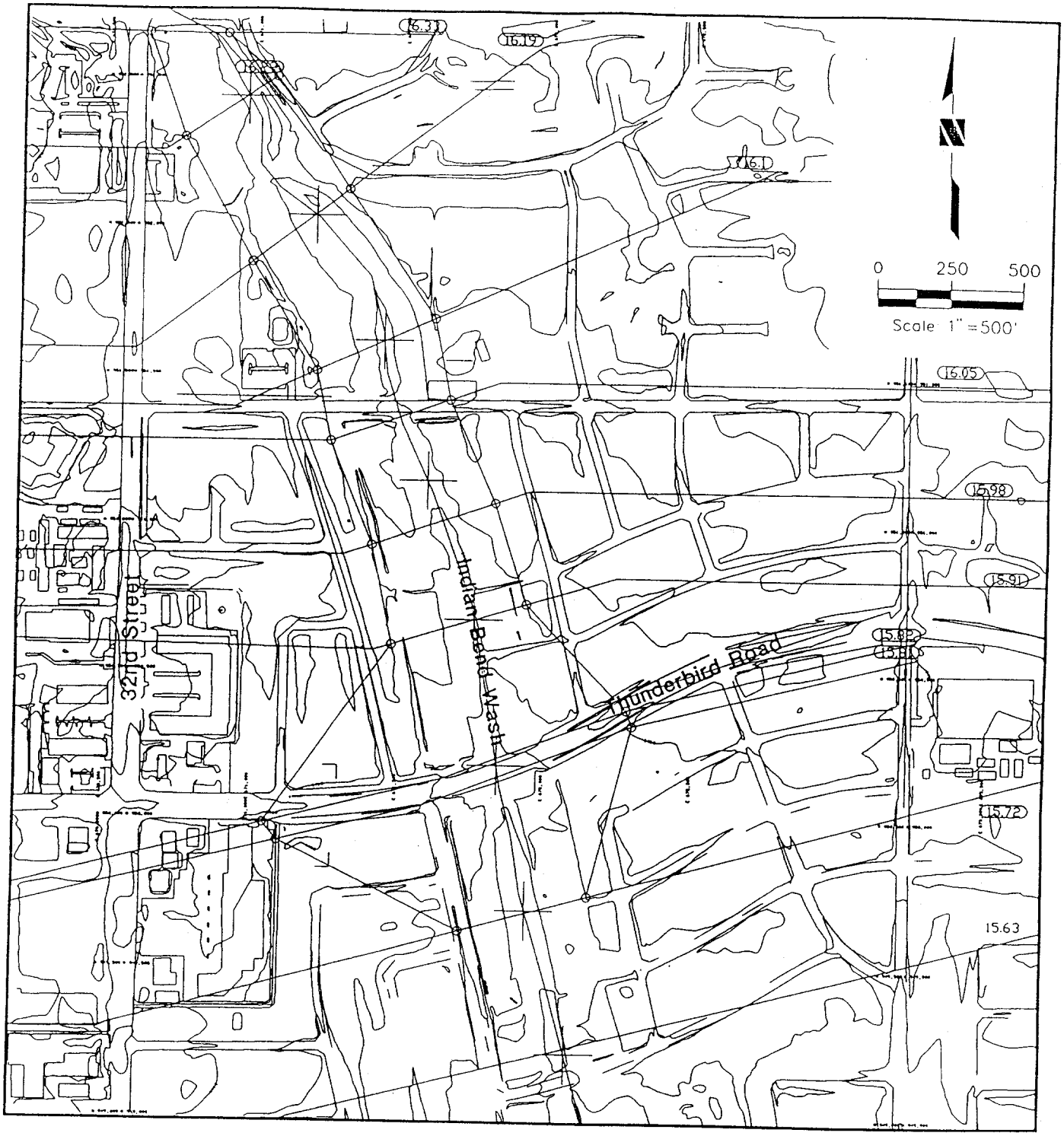
STATION 14.58 TO 15.06

34th Street at Emile Zola Avenue



STATION 15.06 TO 15.63

Thunderbird Road at 32nd Street



STATION 15.63 TO 16.33

APPENDIX C

CROSS SECTIONS OF INDIAN BEND WASH

APPENDIX C

I. INTRODUCTION

This appendix was prepared pursuant to "Scope of Work Flood Control District of Maricopa County Floodplain Delineation for Indian Bend Wash" (FCD 93-05), Section 6.5 and is intended to be included in the Technical Data Notebook as Section 4.3 (Cross Section Description).

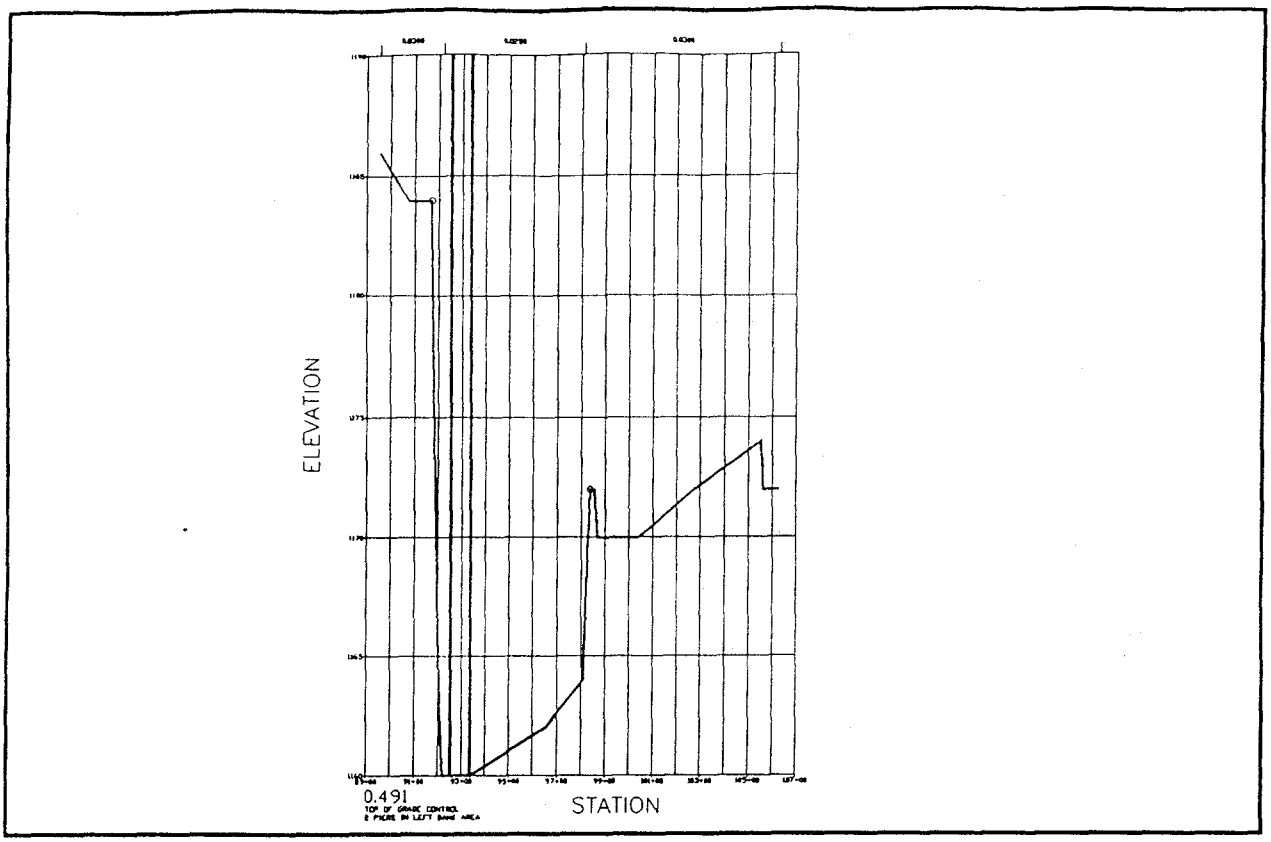
The topographic mapping for the Indian Bend Wash floodplain delineation, in digital form, was used to delineate the wash thalweg. This was accomplished in a Digital Terrain Model (DTM) within the AutoCADD environment. The thalweg centerline line represents a cross section station (GR and X component) of 10,000 feet.

Cross sections are labeled in river miles upstream from the confluence of Indian Bend Wash with the Salt River. Cross sections are spaced approximately 500 feet apart, with closer spacing at critical locations such as bridges. Criteria for cross section selection include: 1) representative of local stream reach; 2) oriented perpendicular to flow; 3) avoid inclusion of non-effective flow areas; and 4) include the predicted 100-year floodplain.

Cross section plots were reviewed in conjunction with aerial photographs, topographic mapping and ground level photographs to determine if the sections were representative of the local stream reach. Bank stations were assigned based on the low-flow or pilot channels along many of the reaches.

Section II of this report presents the individual cross sections for the Indian Bend Wash Floodplain Delineation.

II. CROSS SECTIONS



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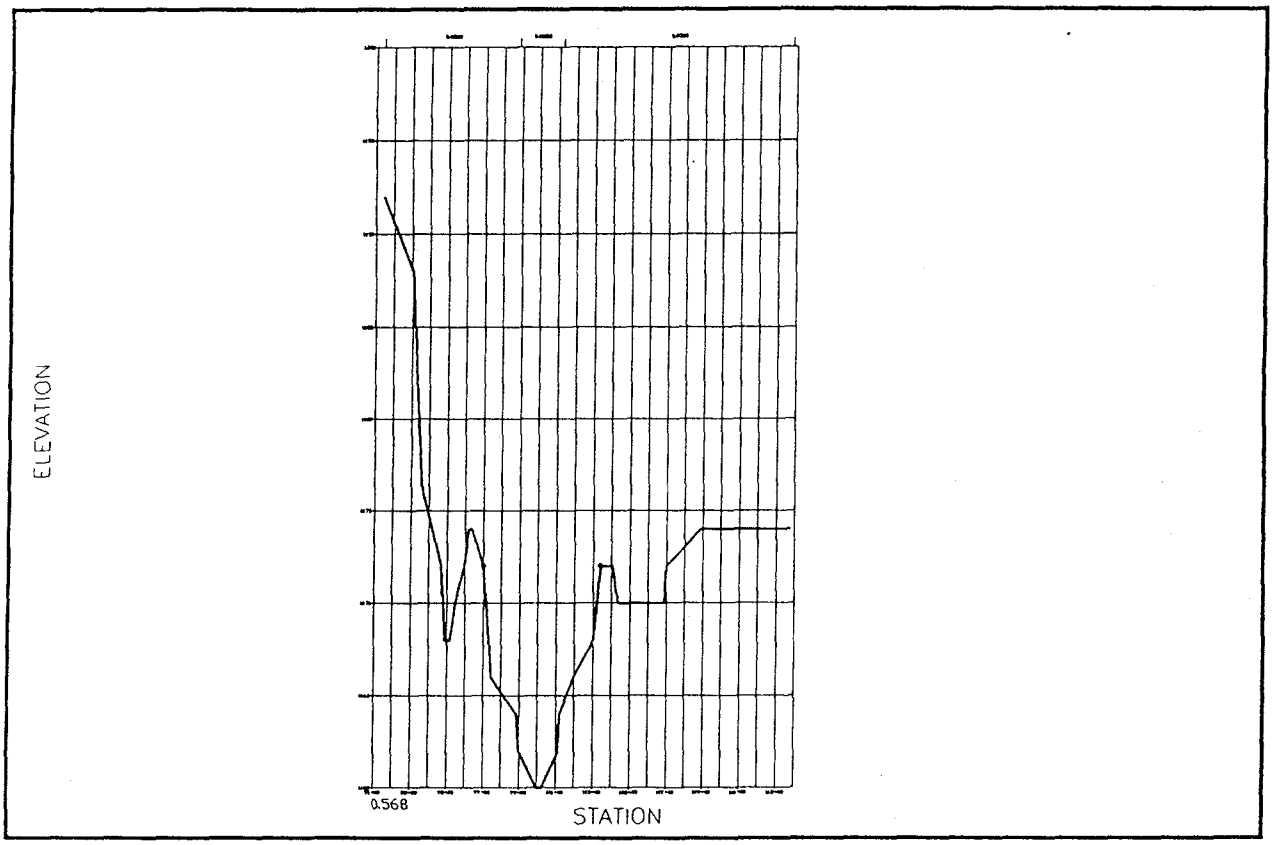

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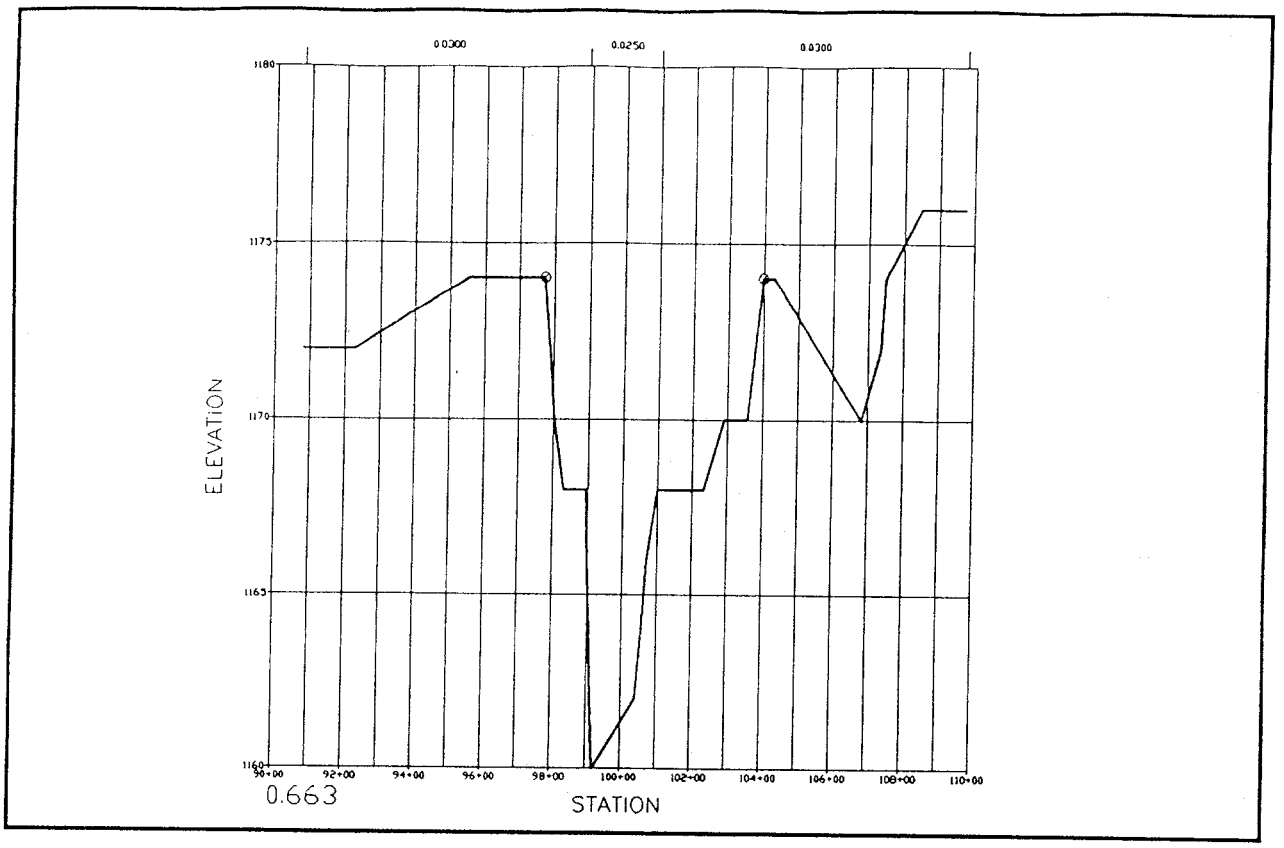

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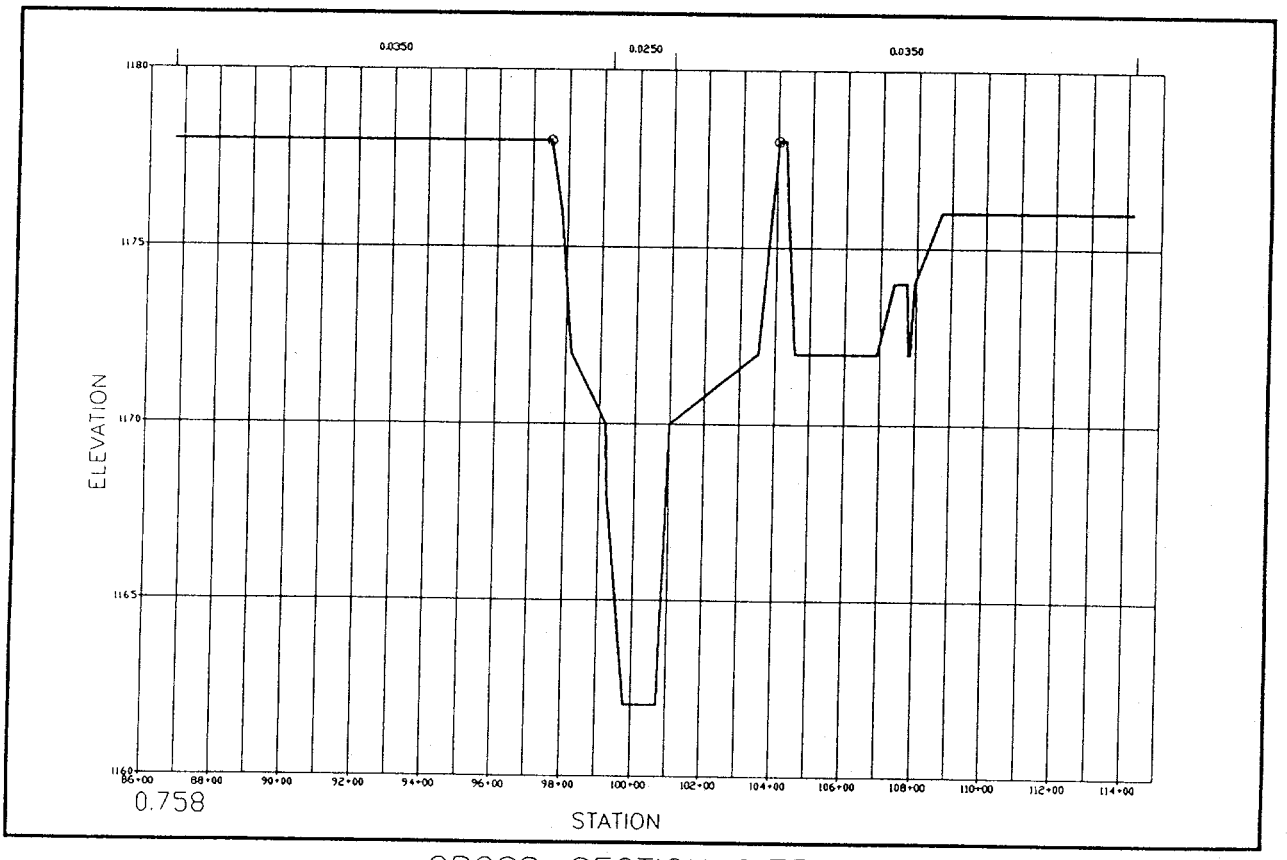

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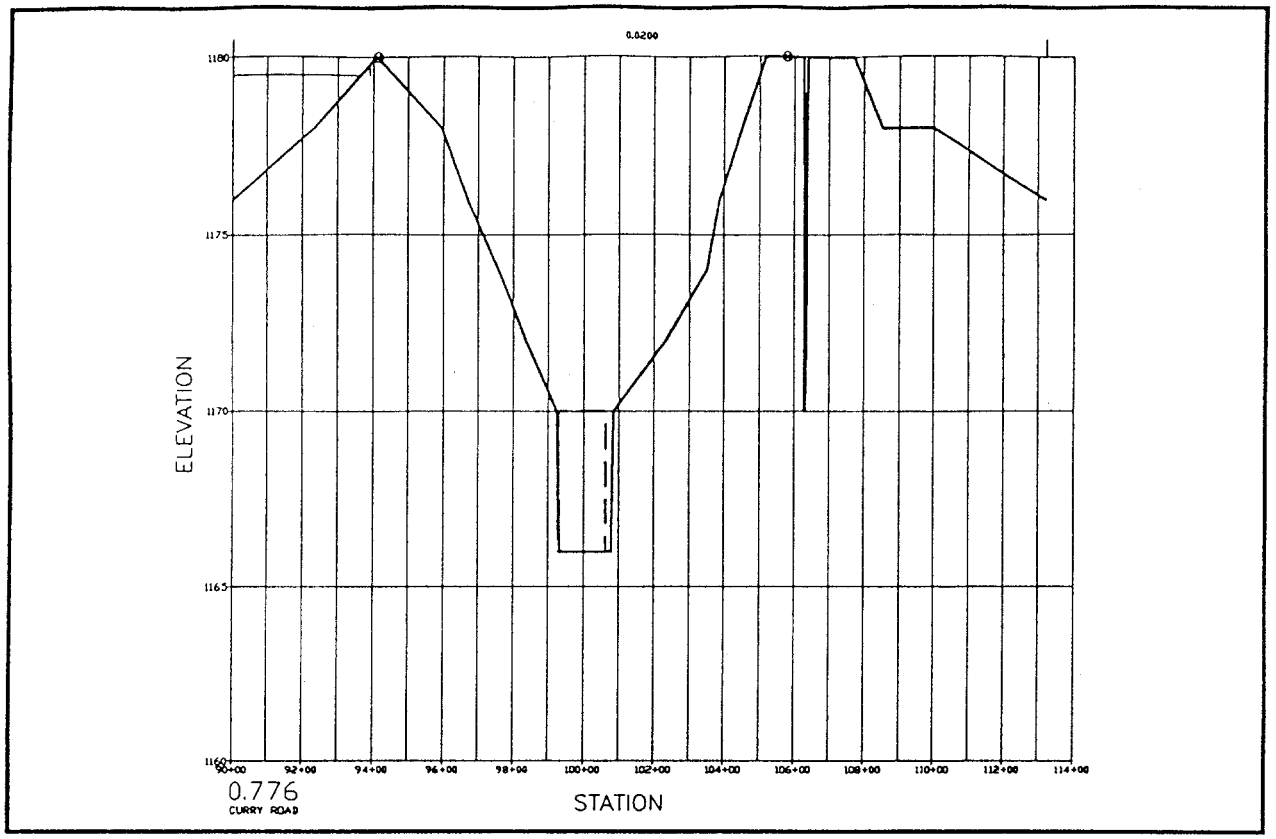

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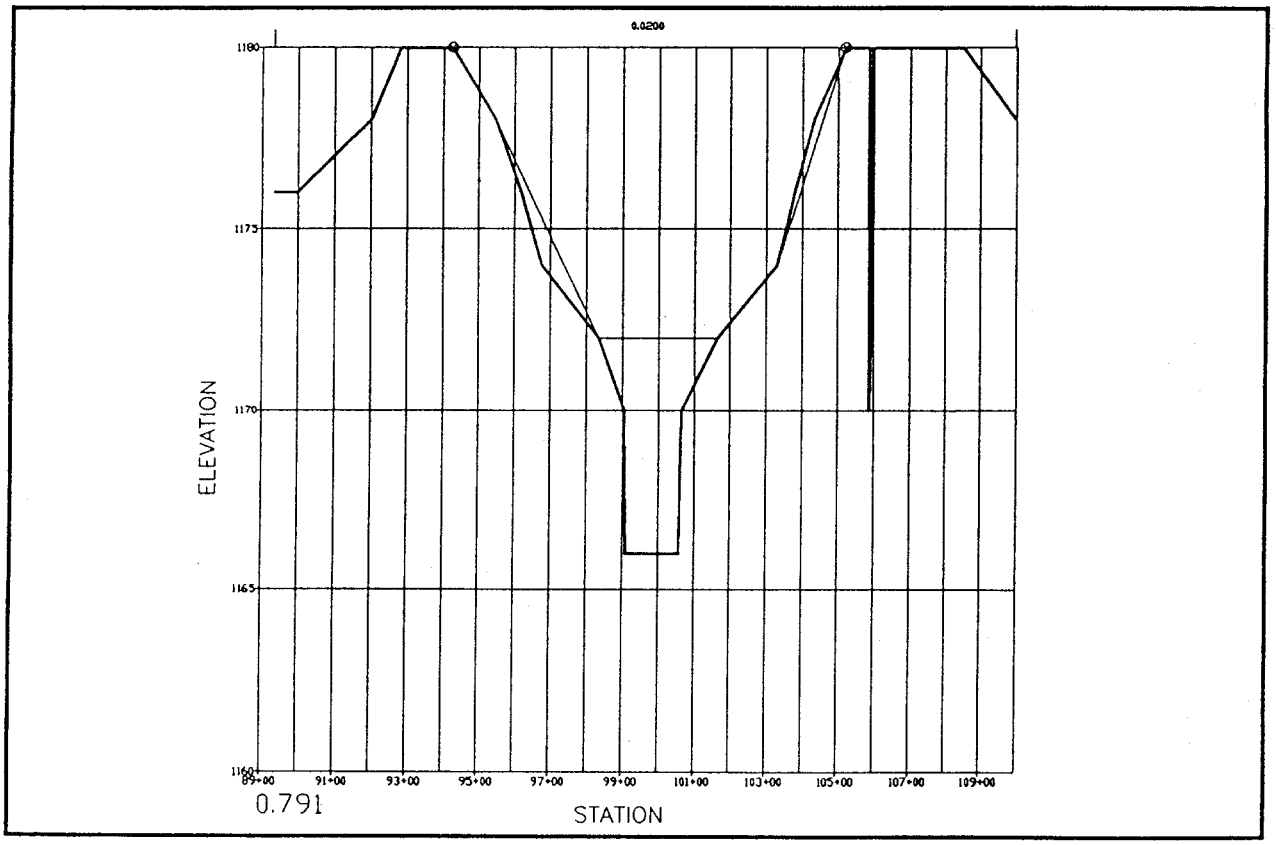

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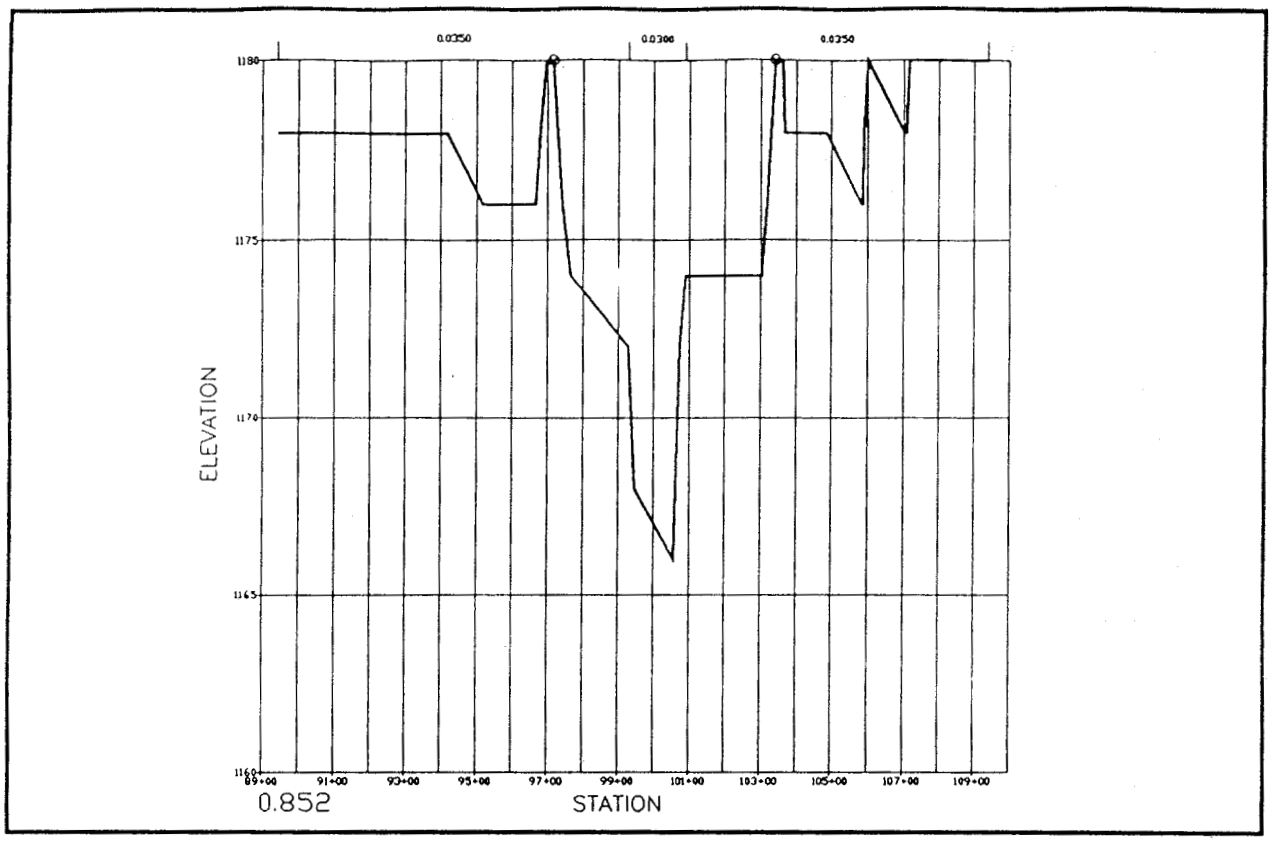

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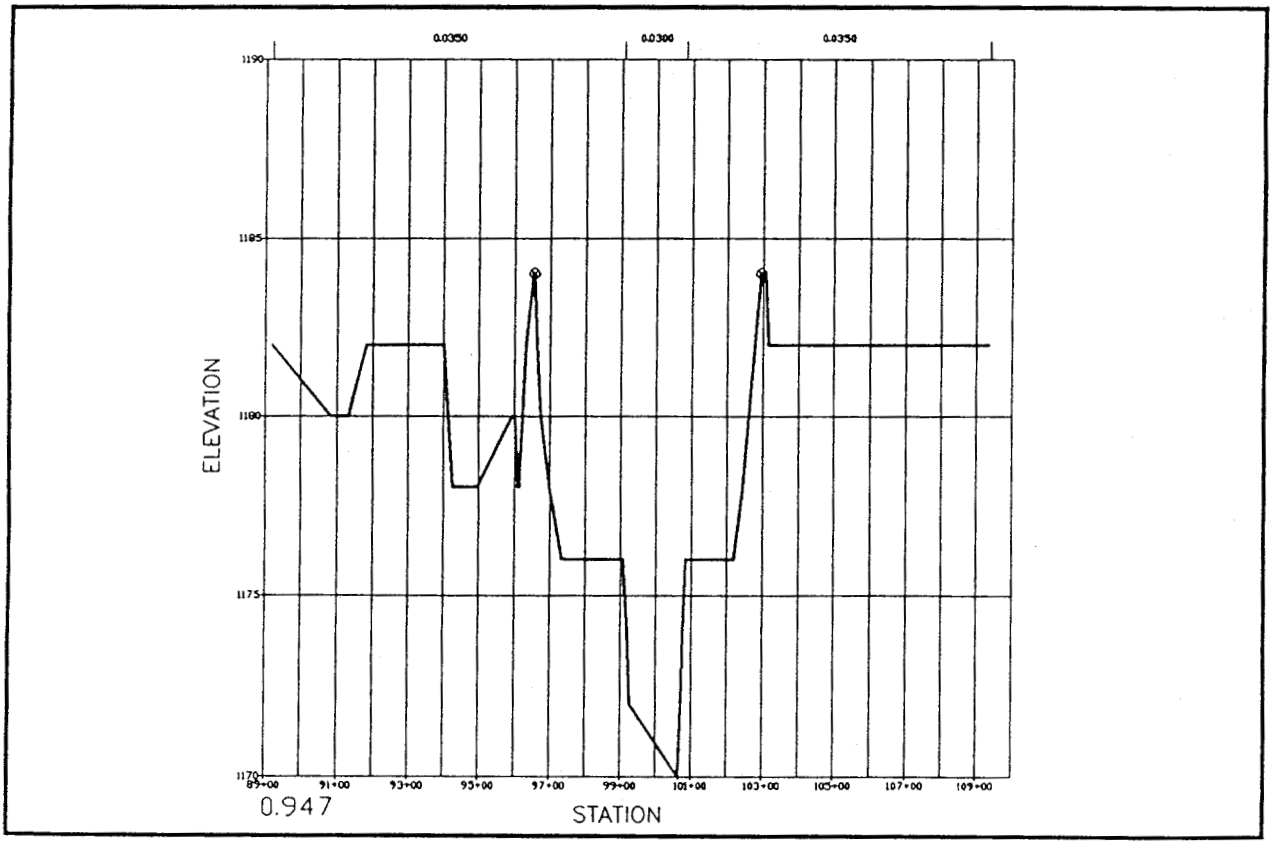

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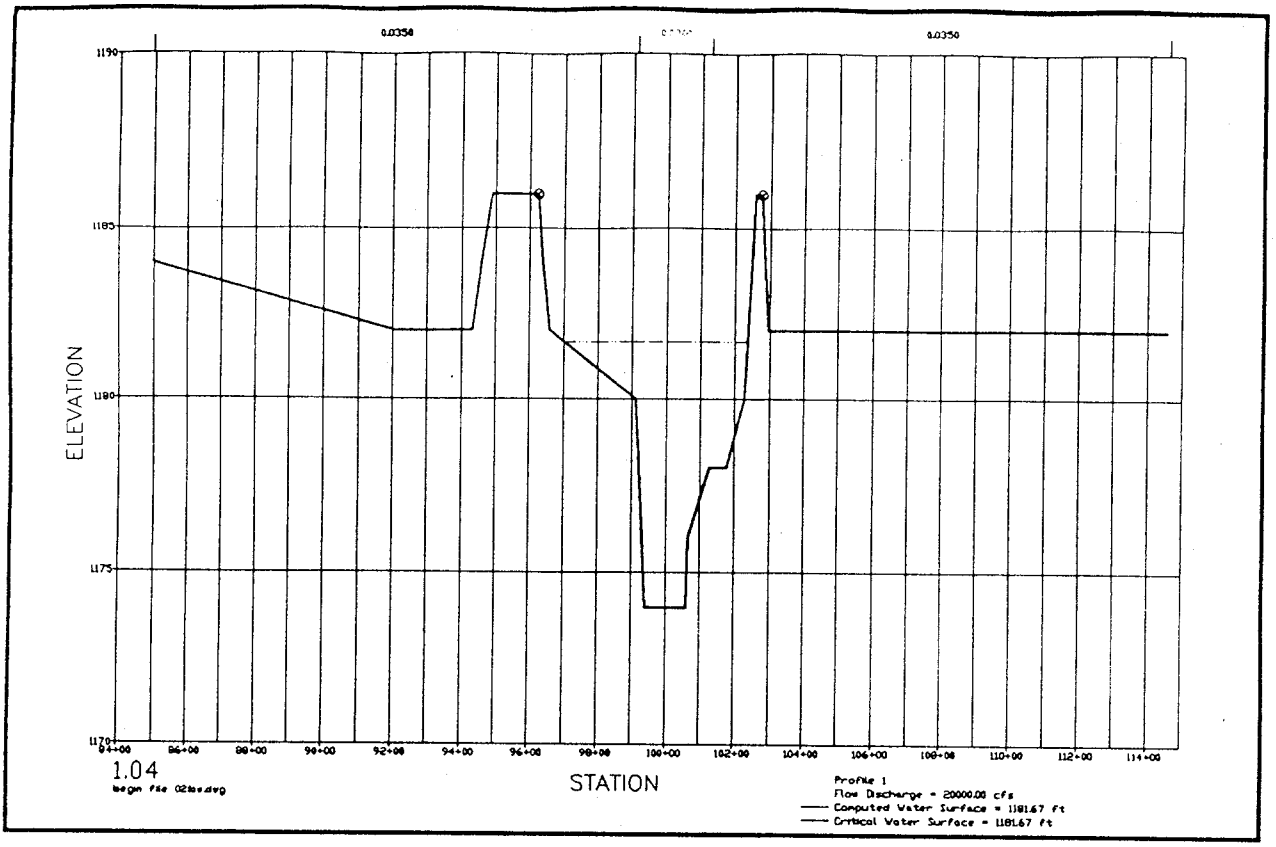

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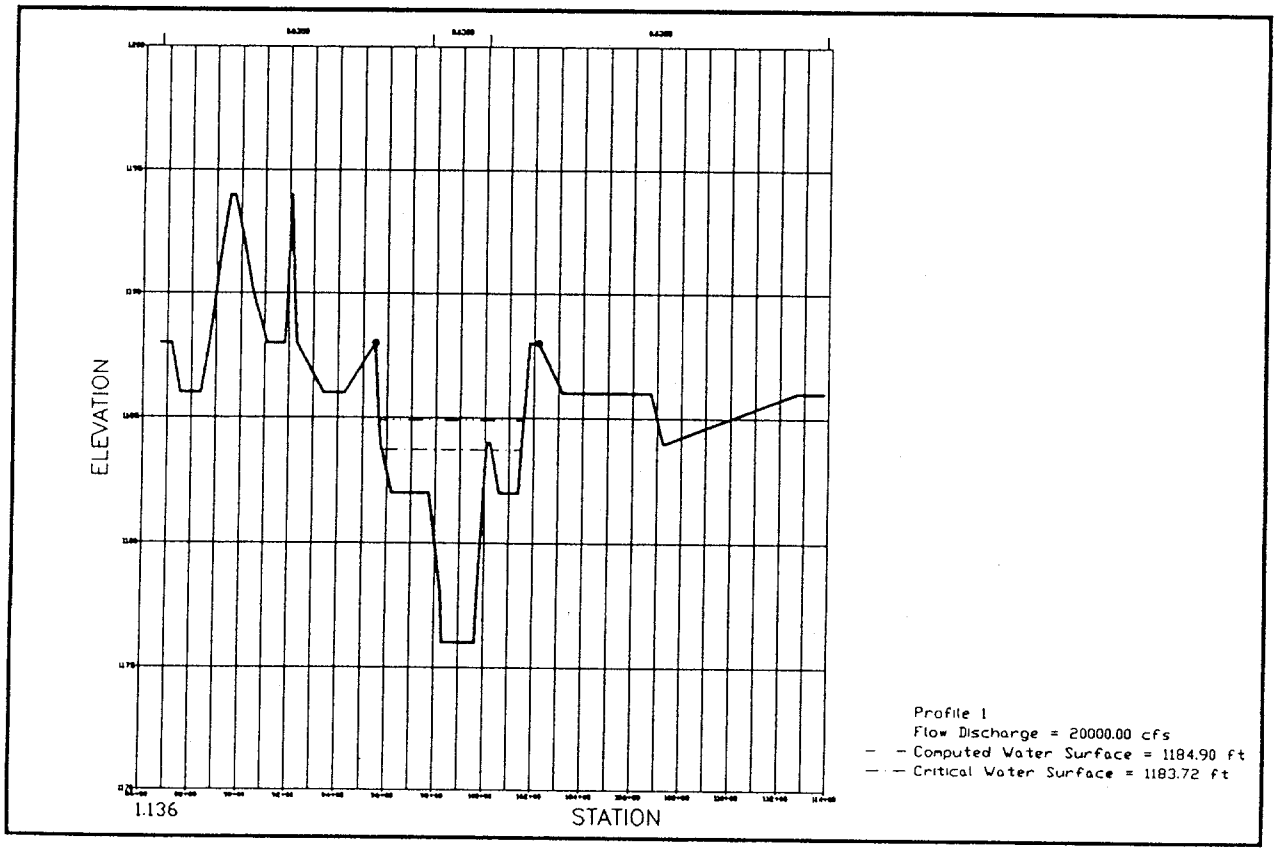

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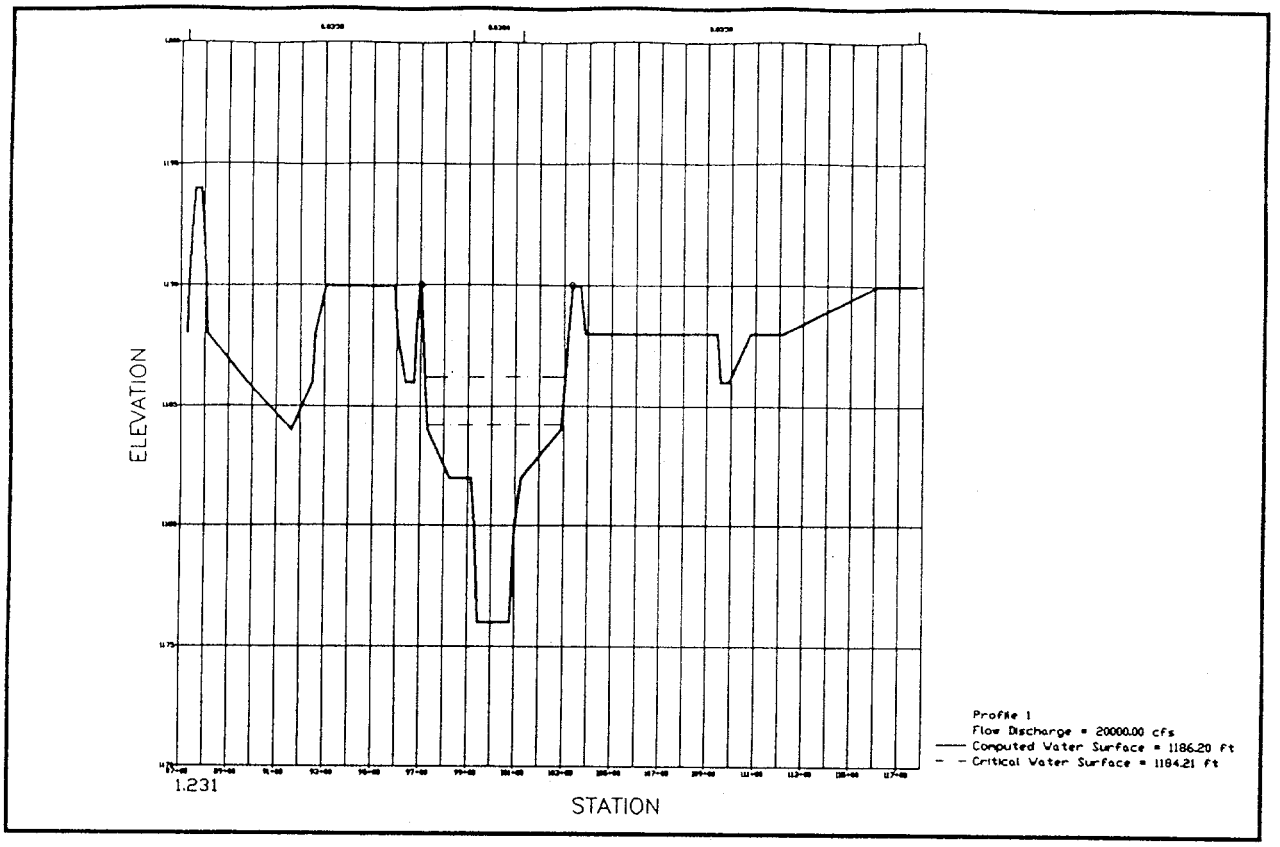

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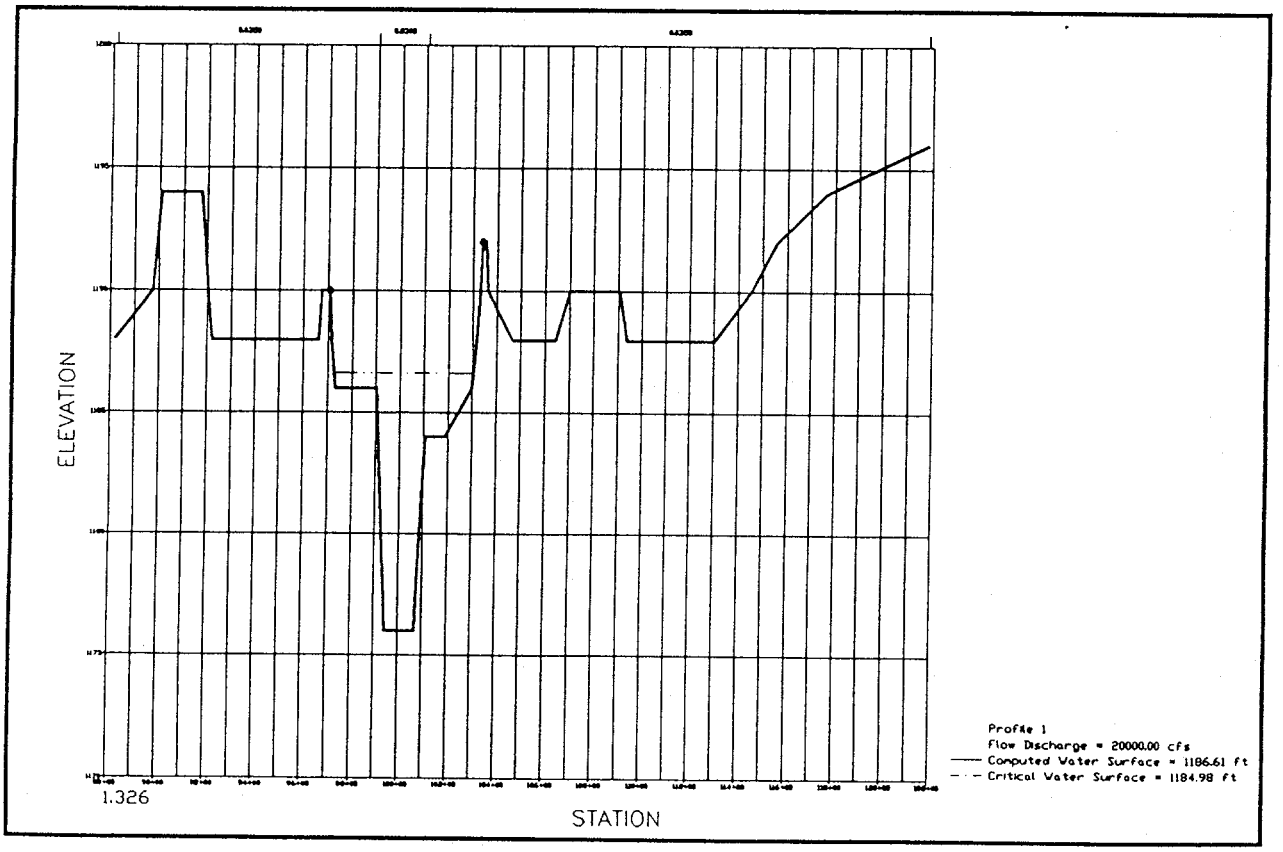

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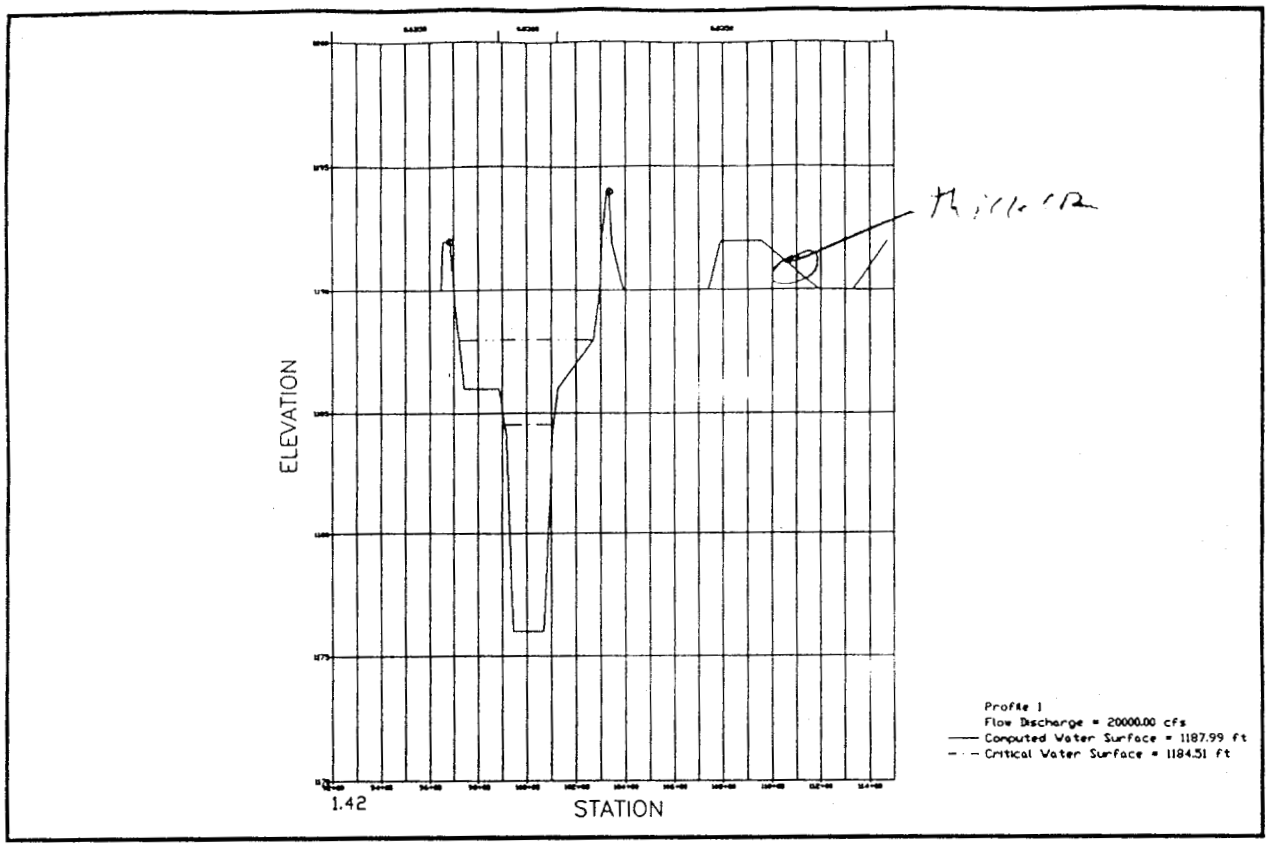

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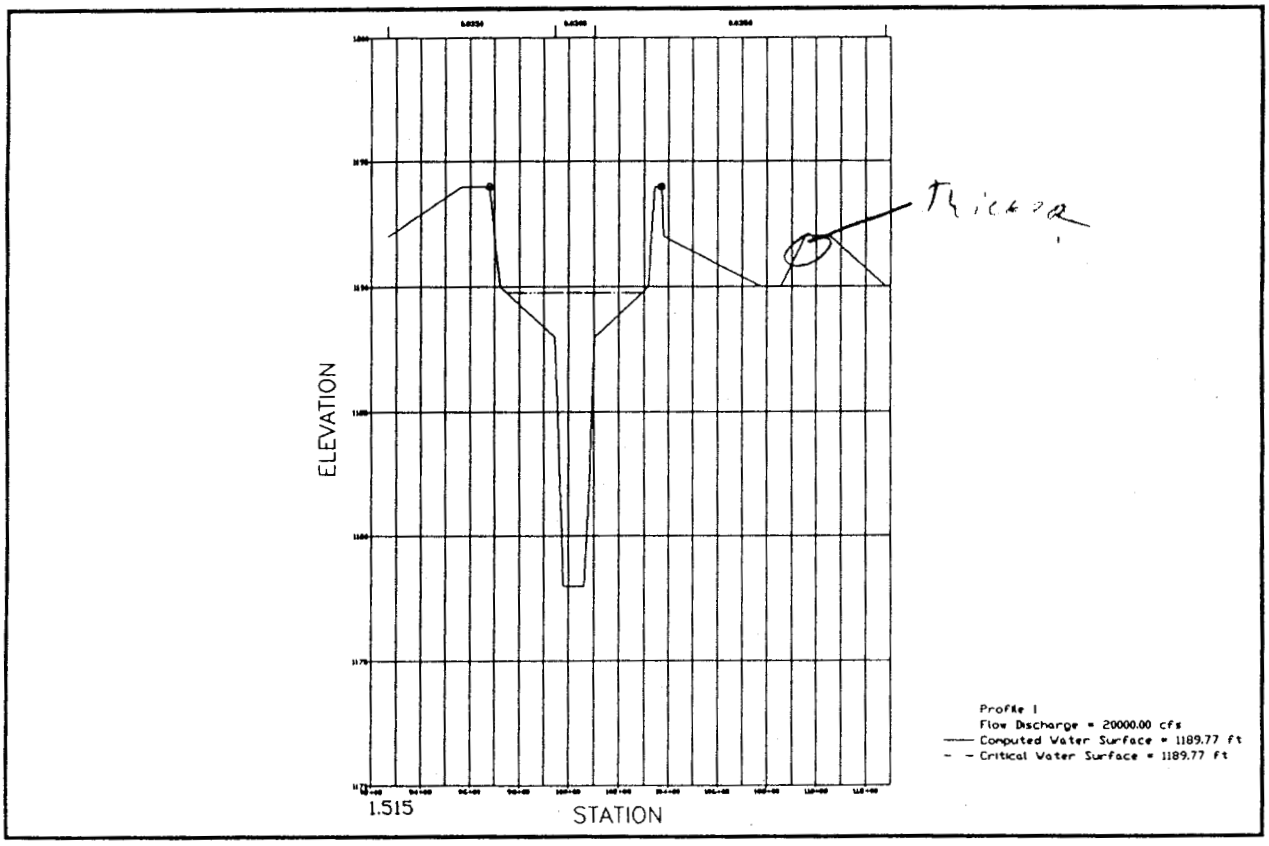

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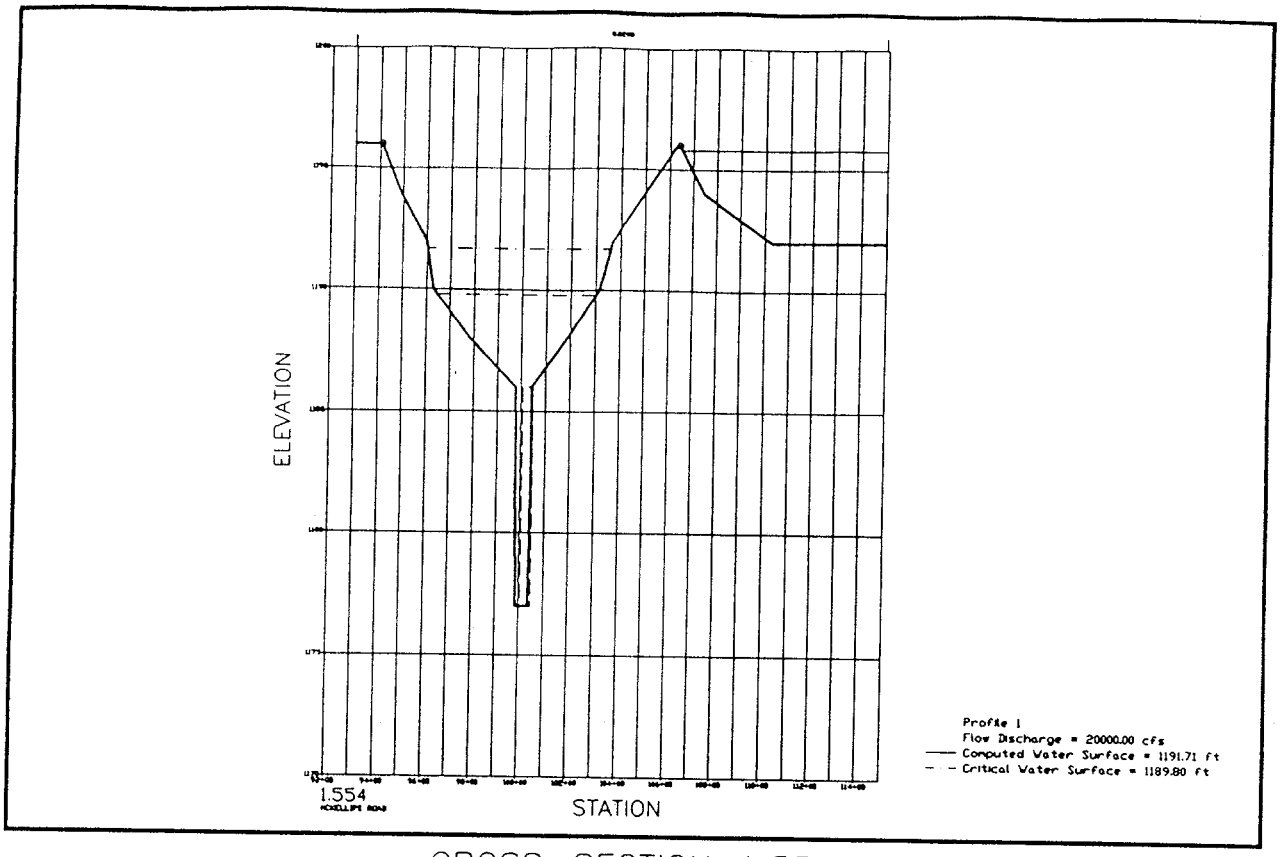

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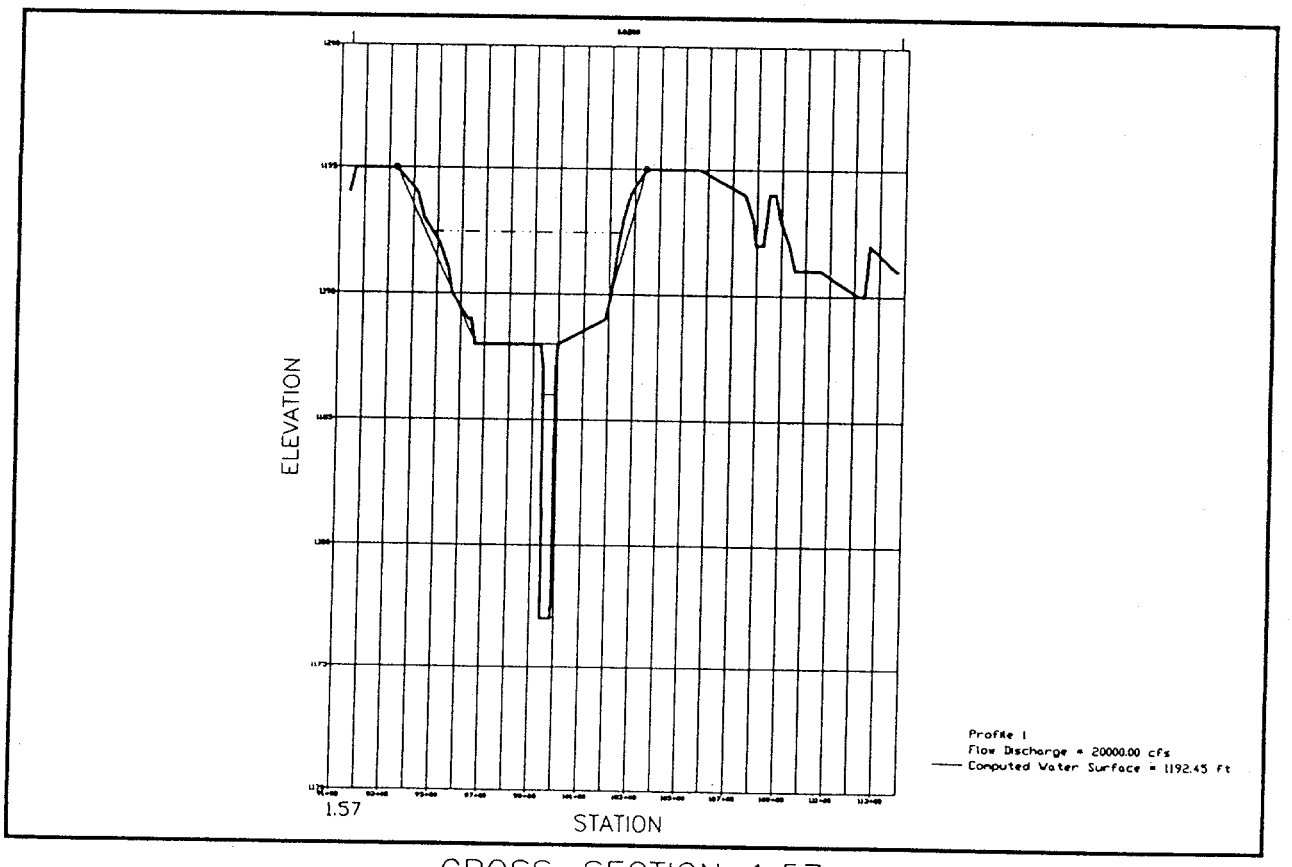

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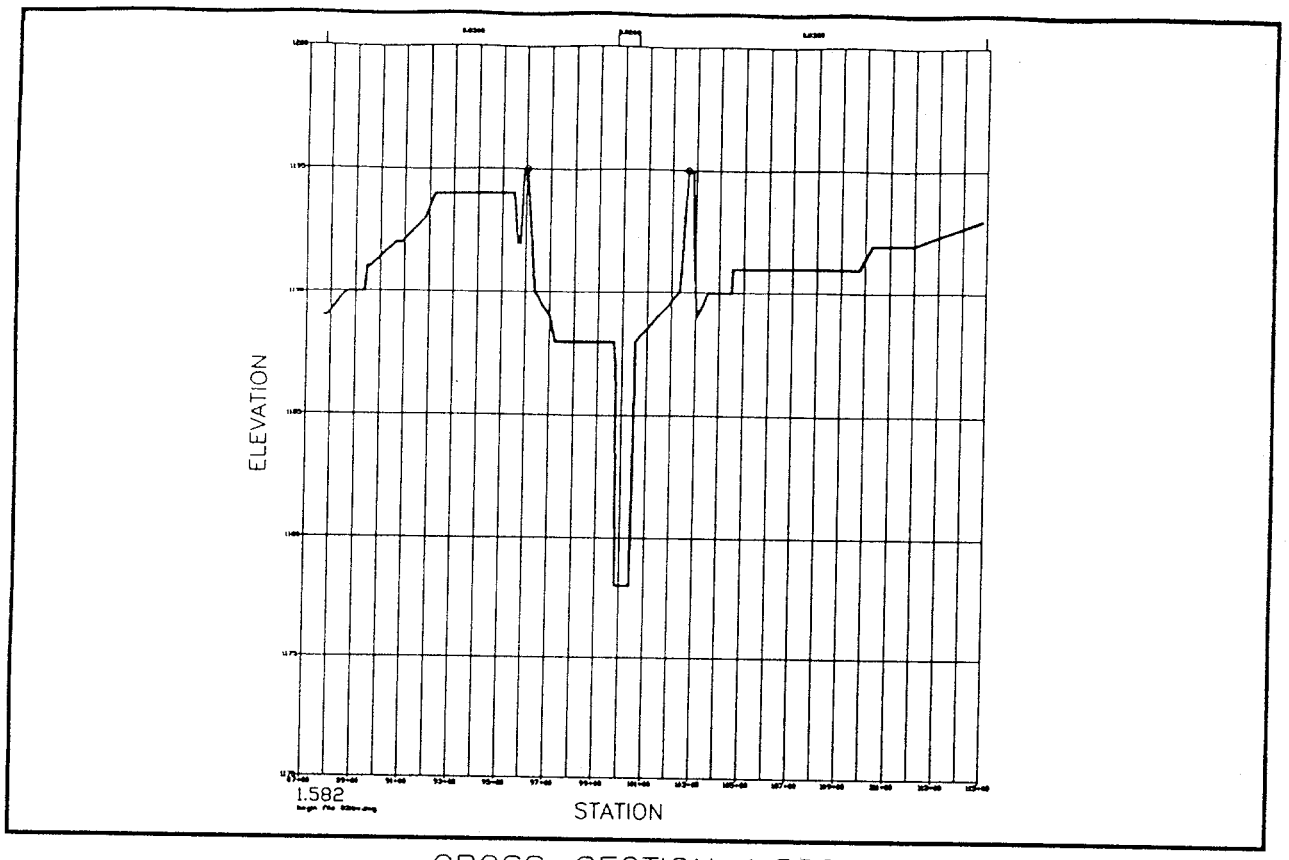

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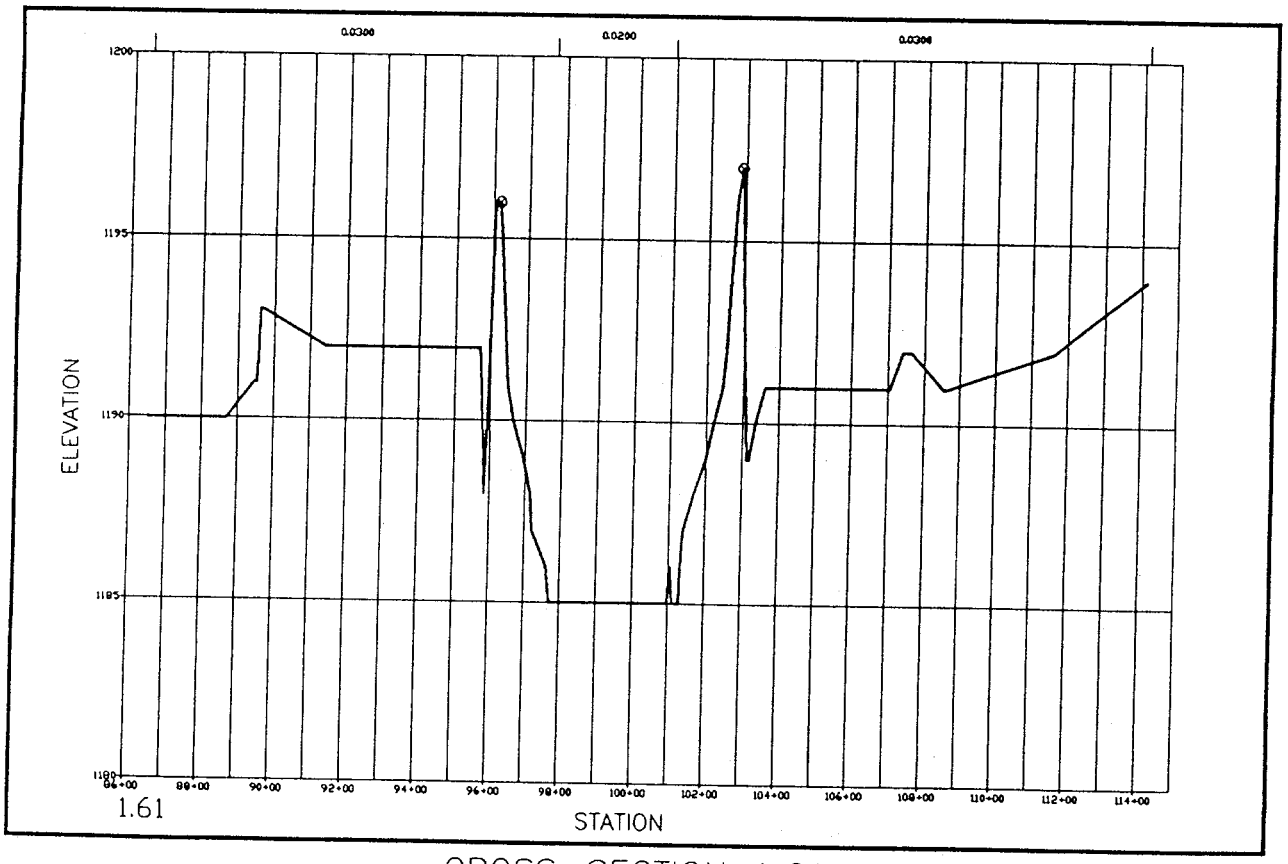

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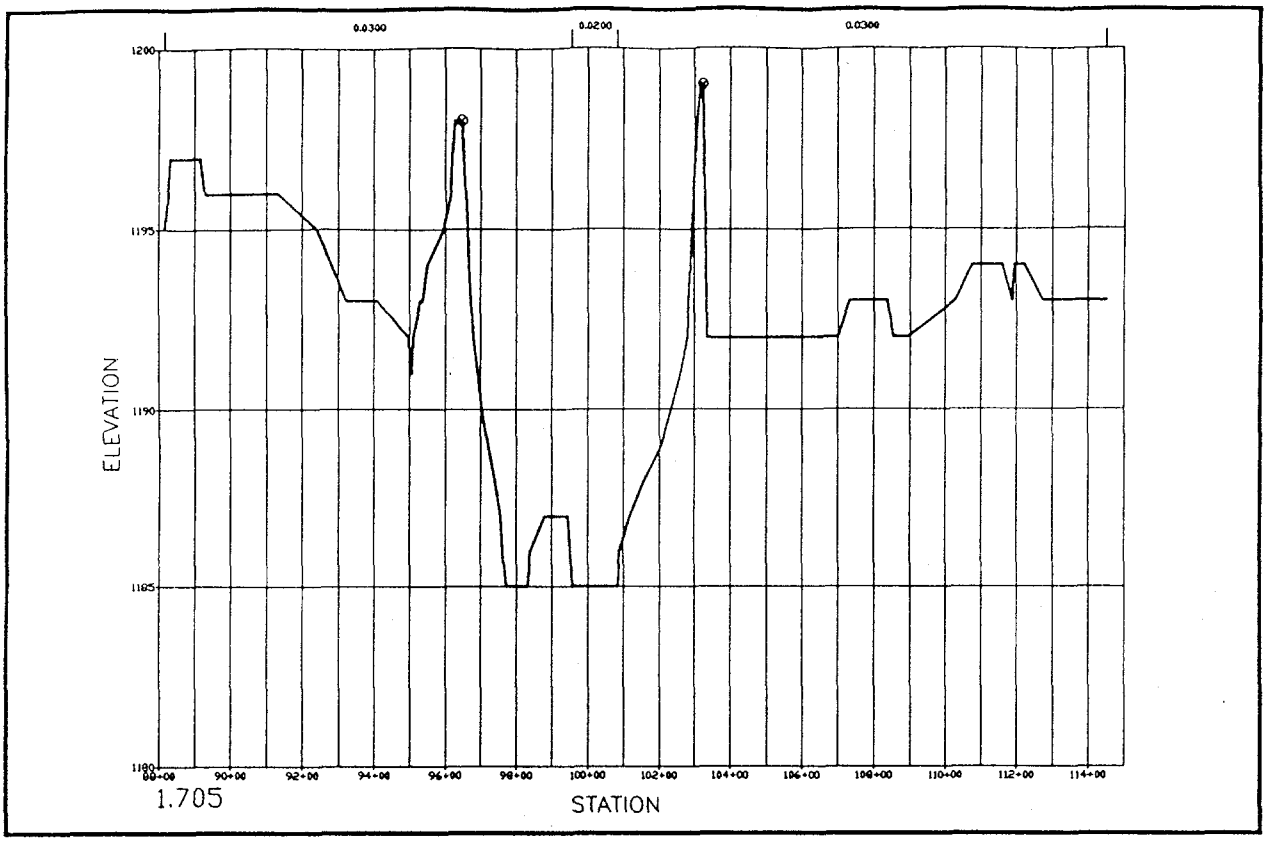

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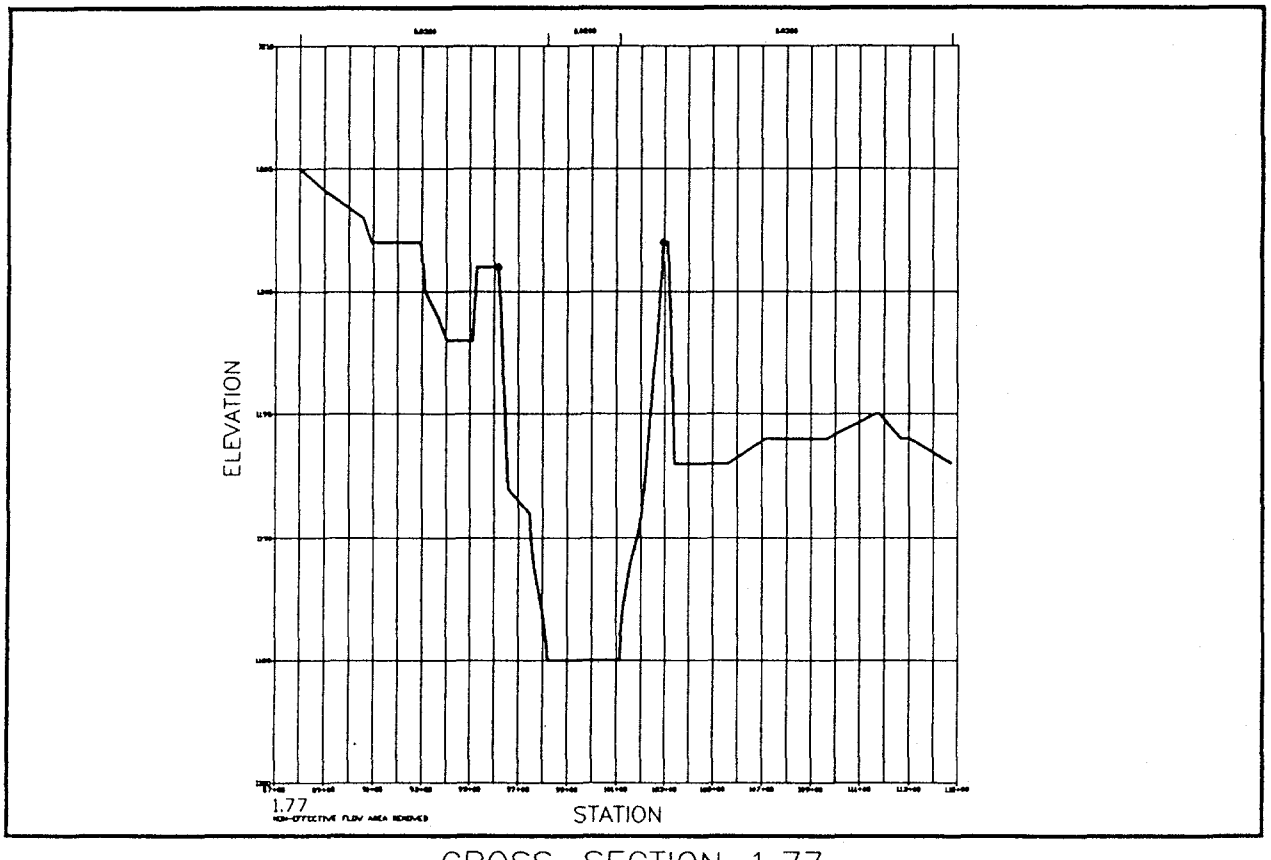

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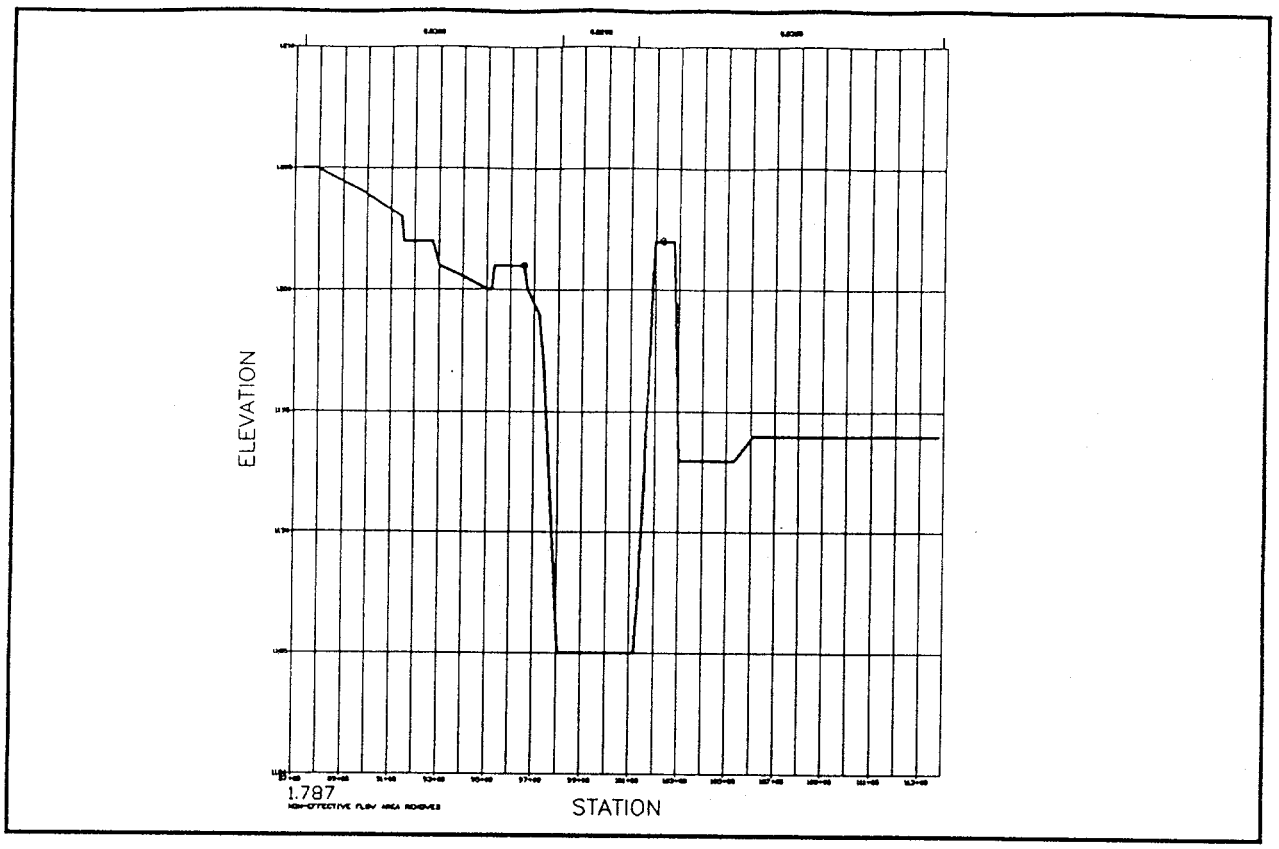

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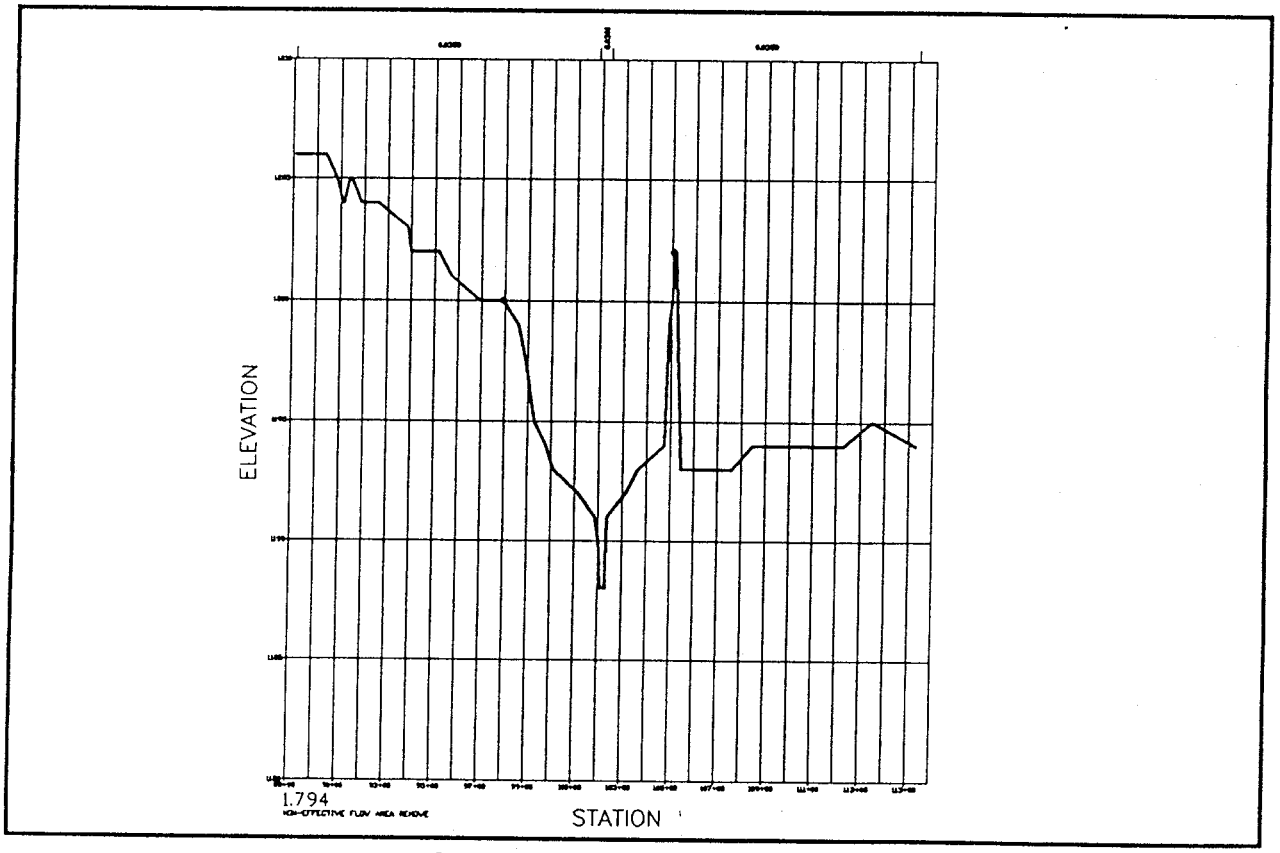

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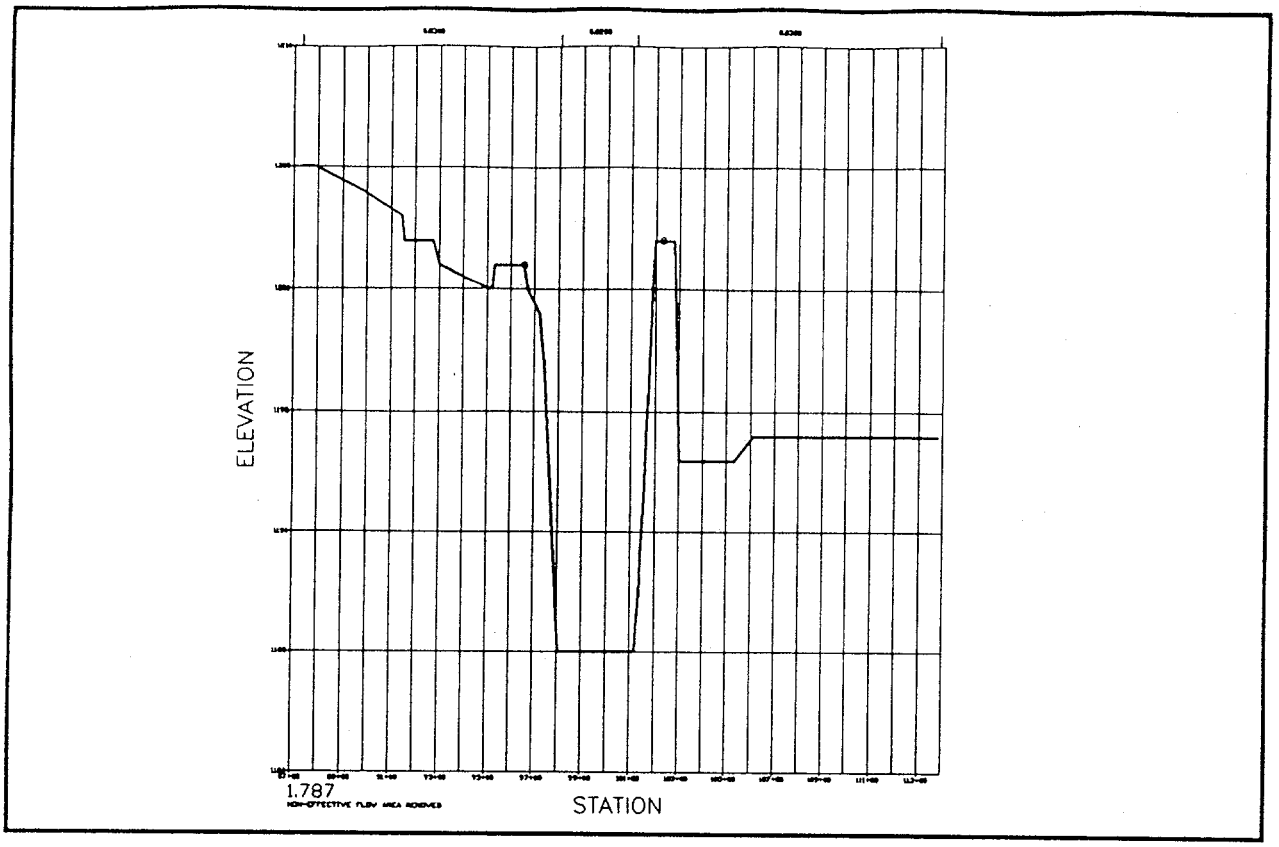

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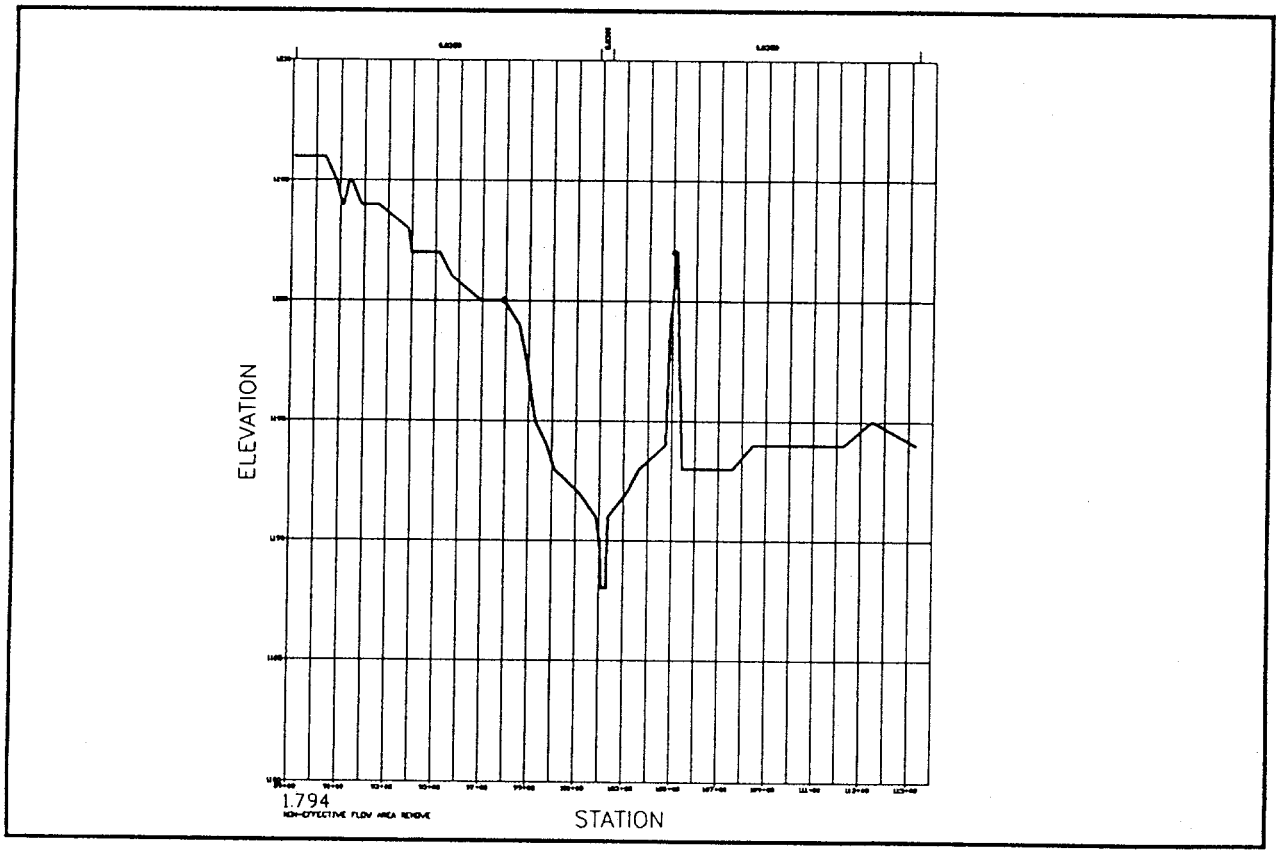

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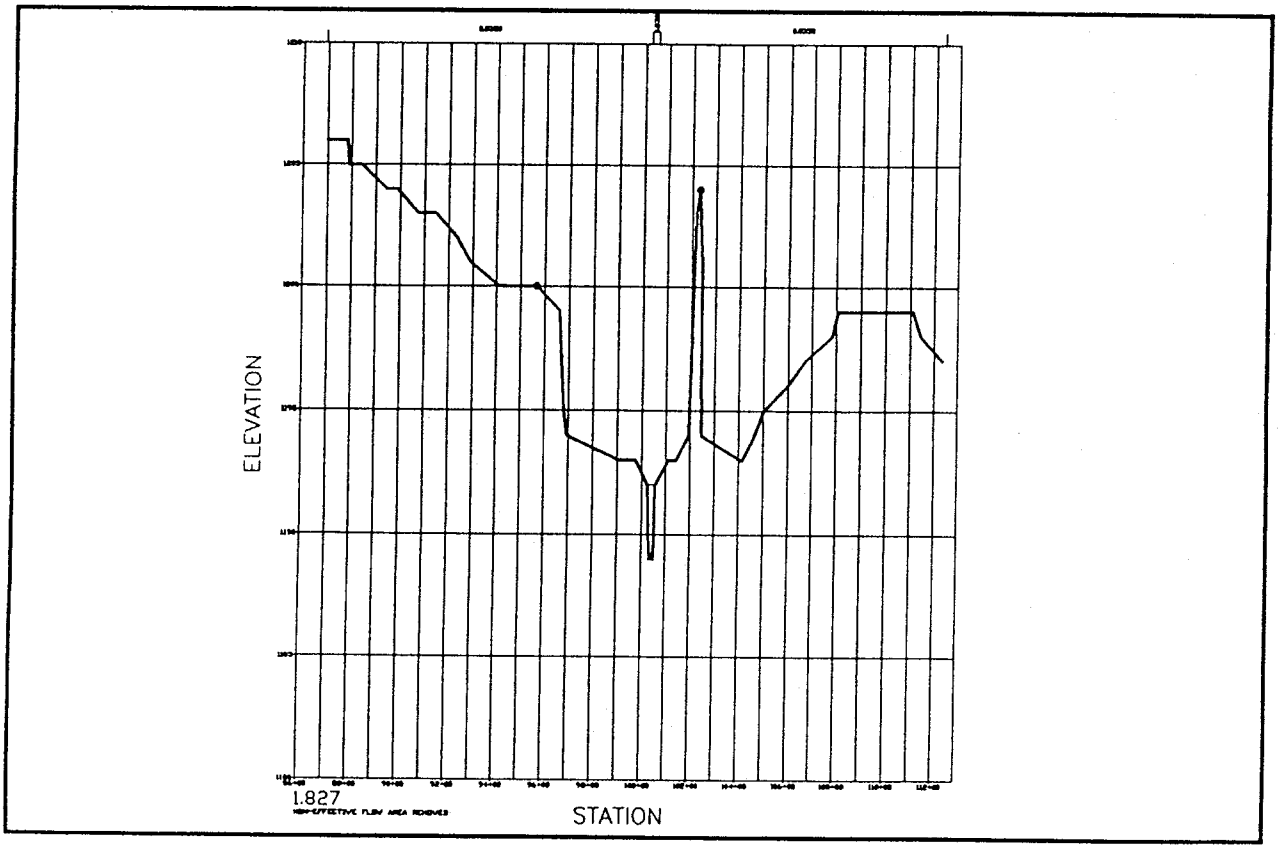

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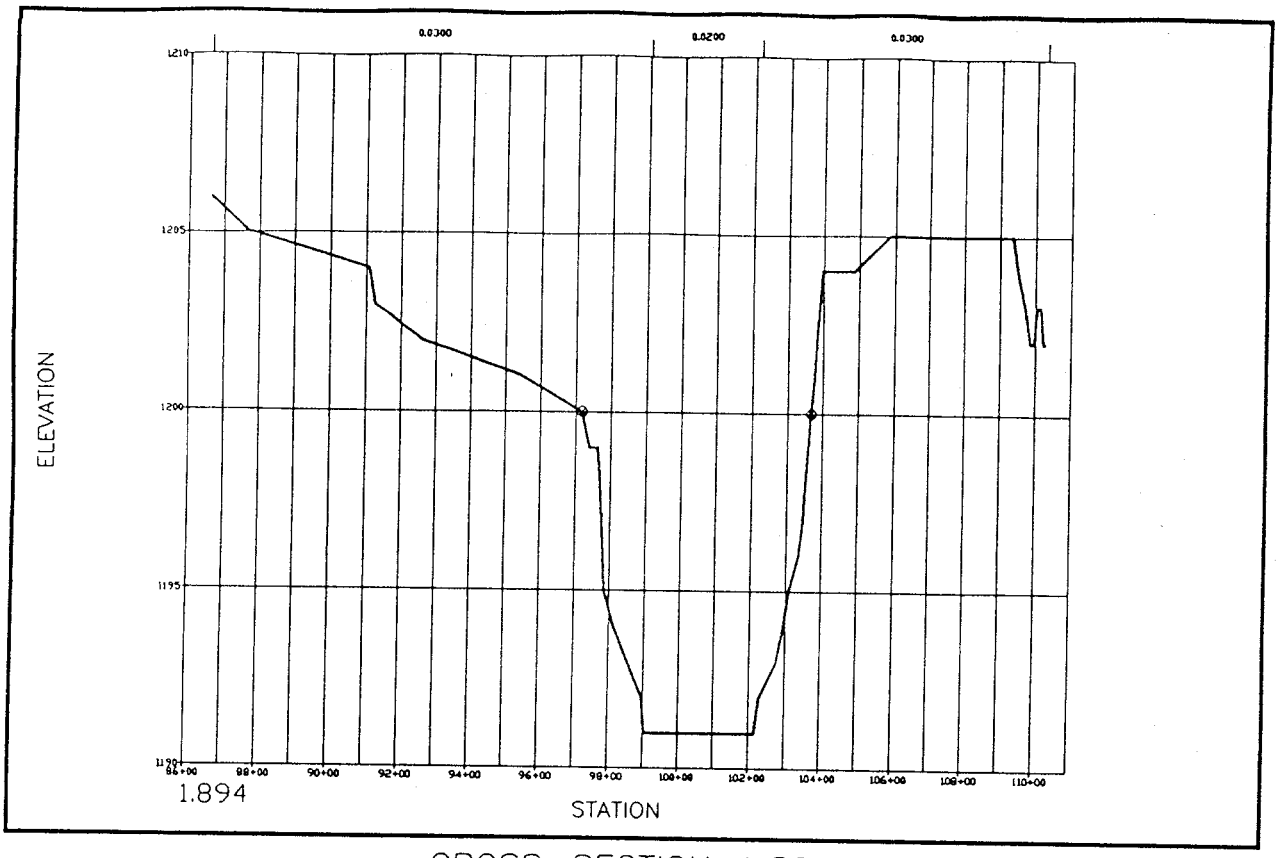

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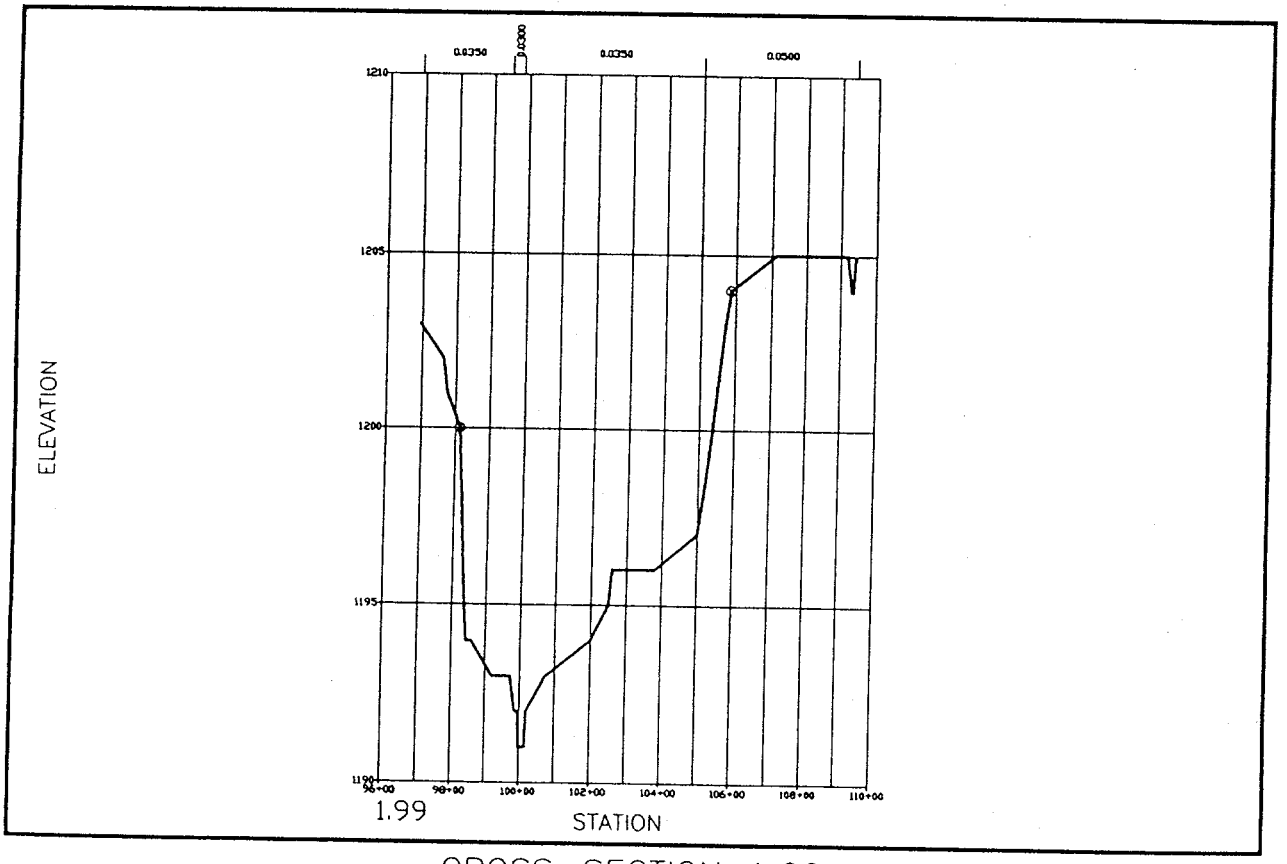

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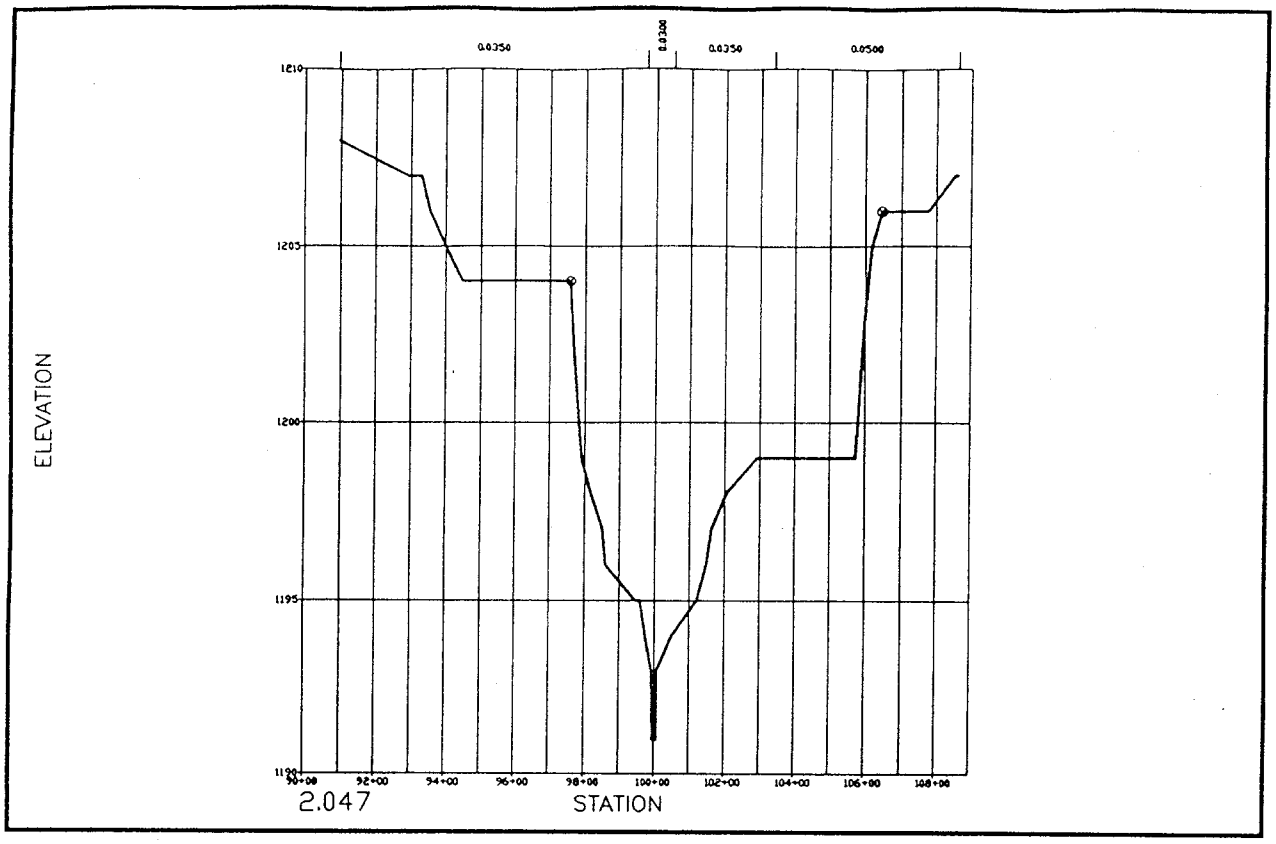

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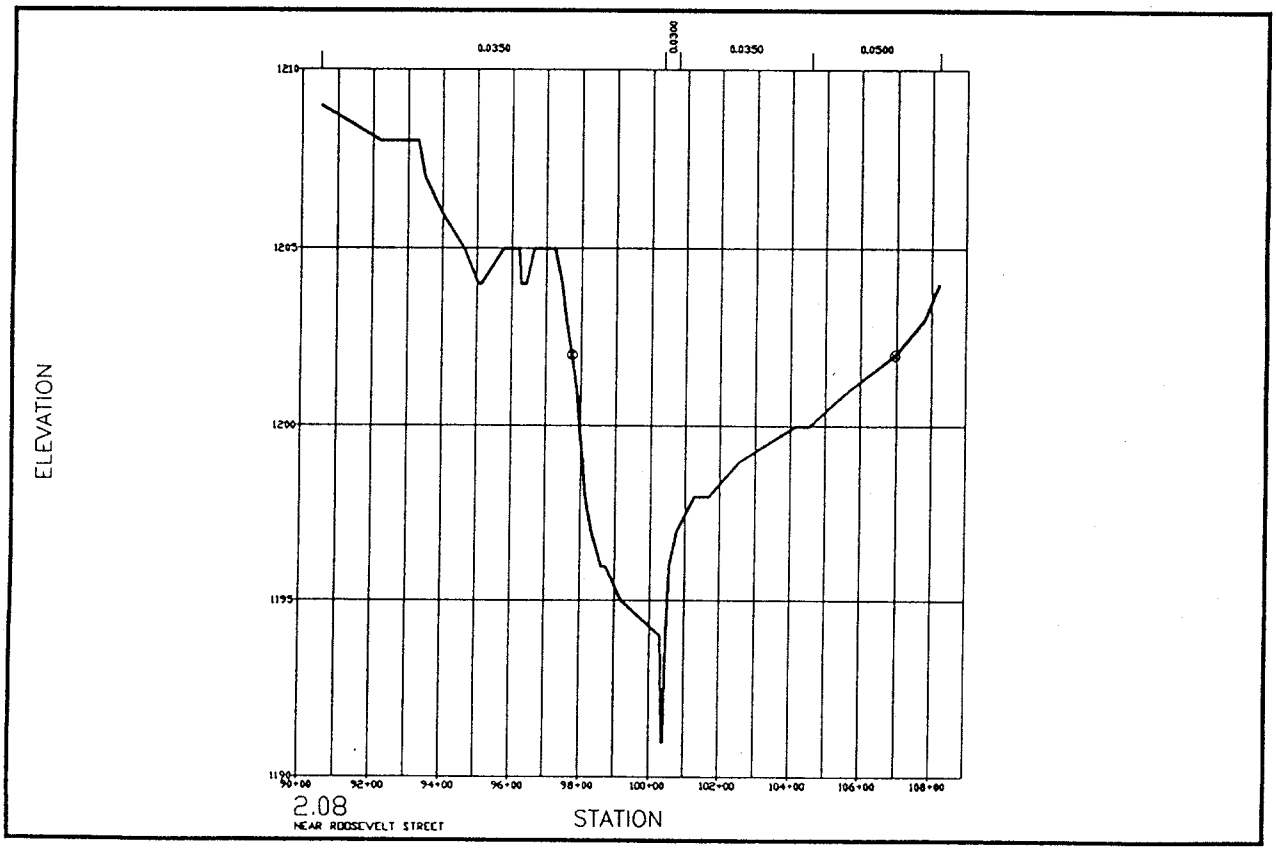

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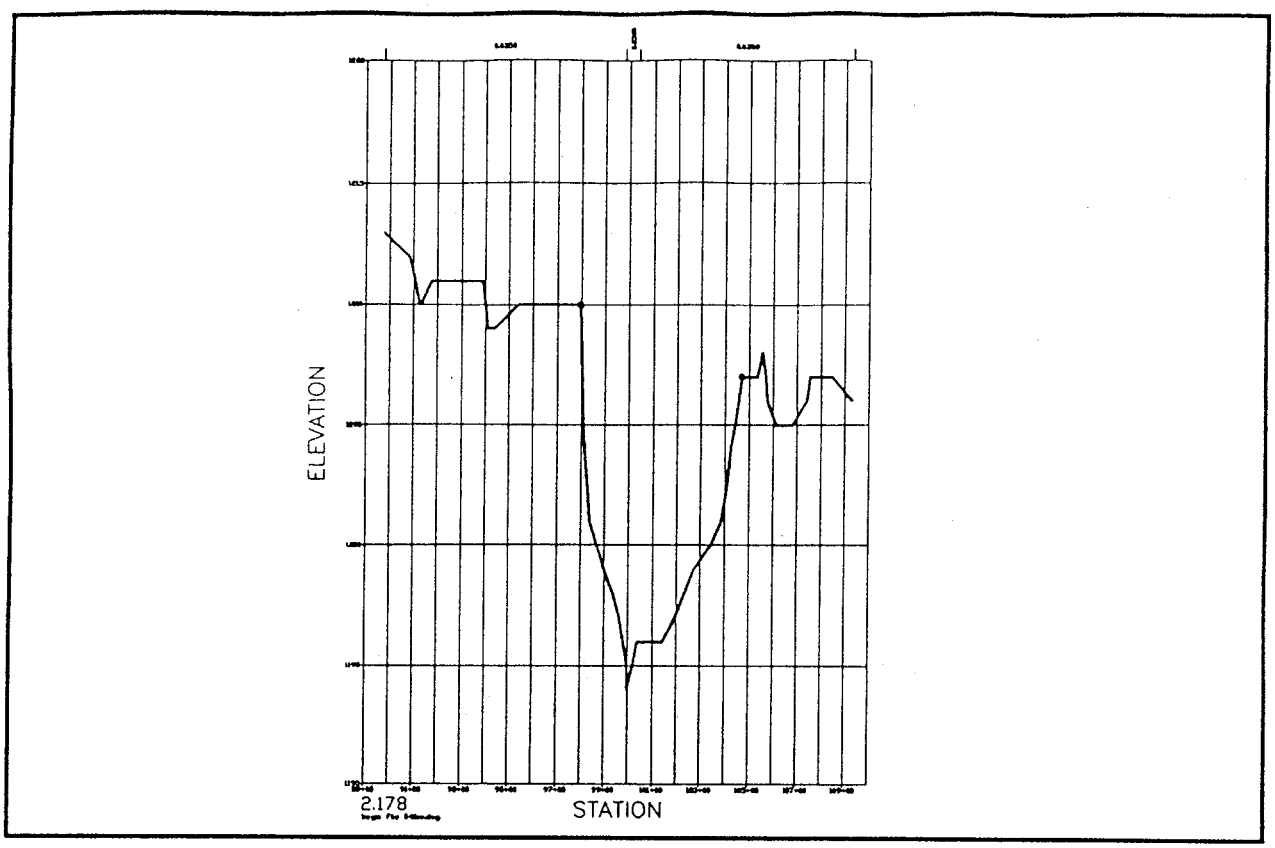

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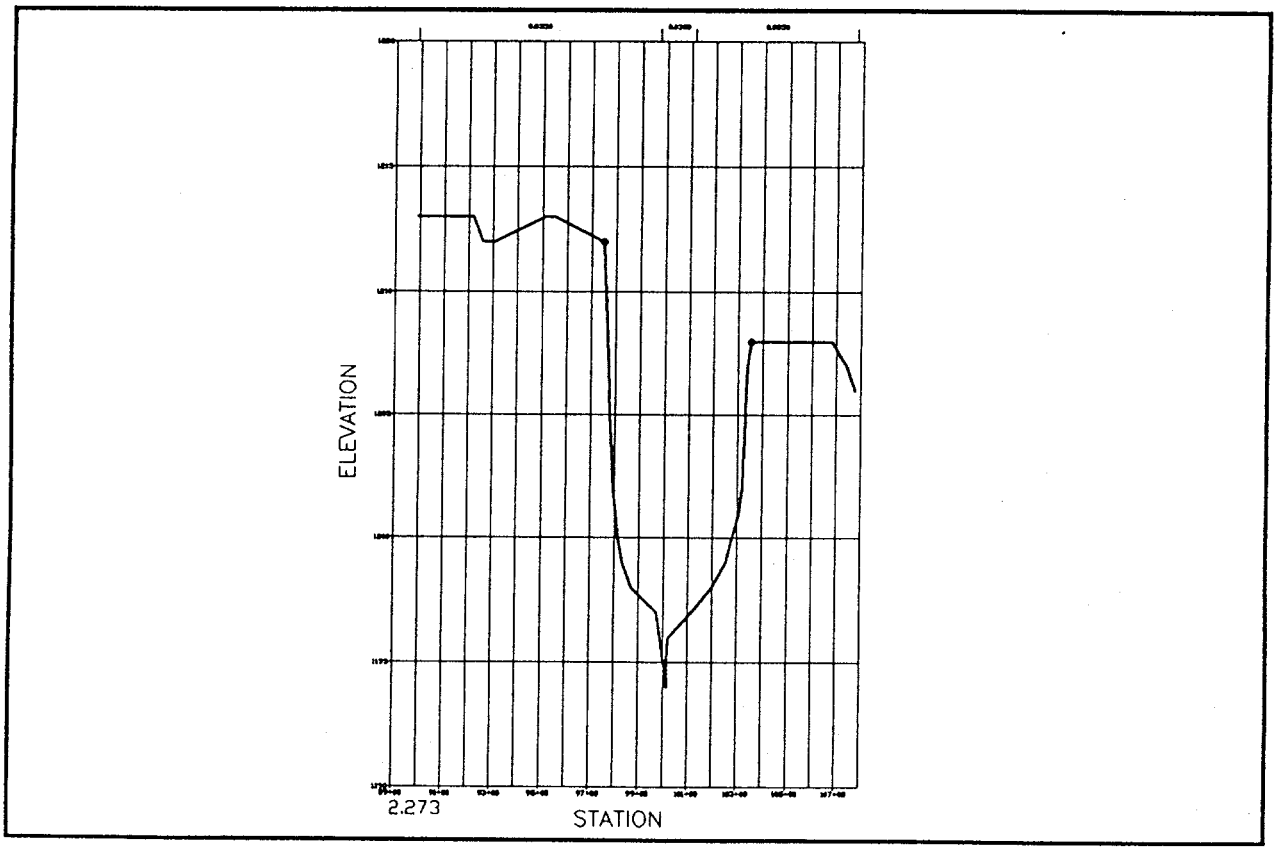

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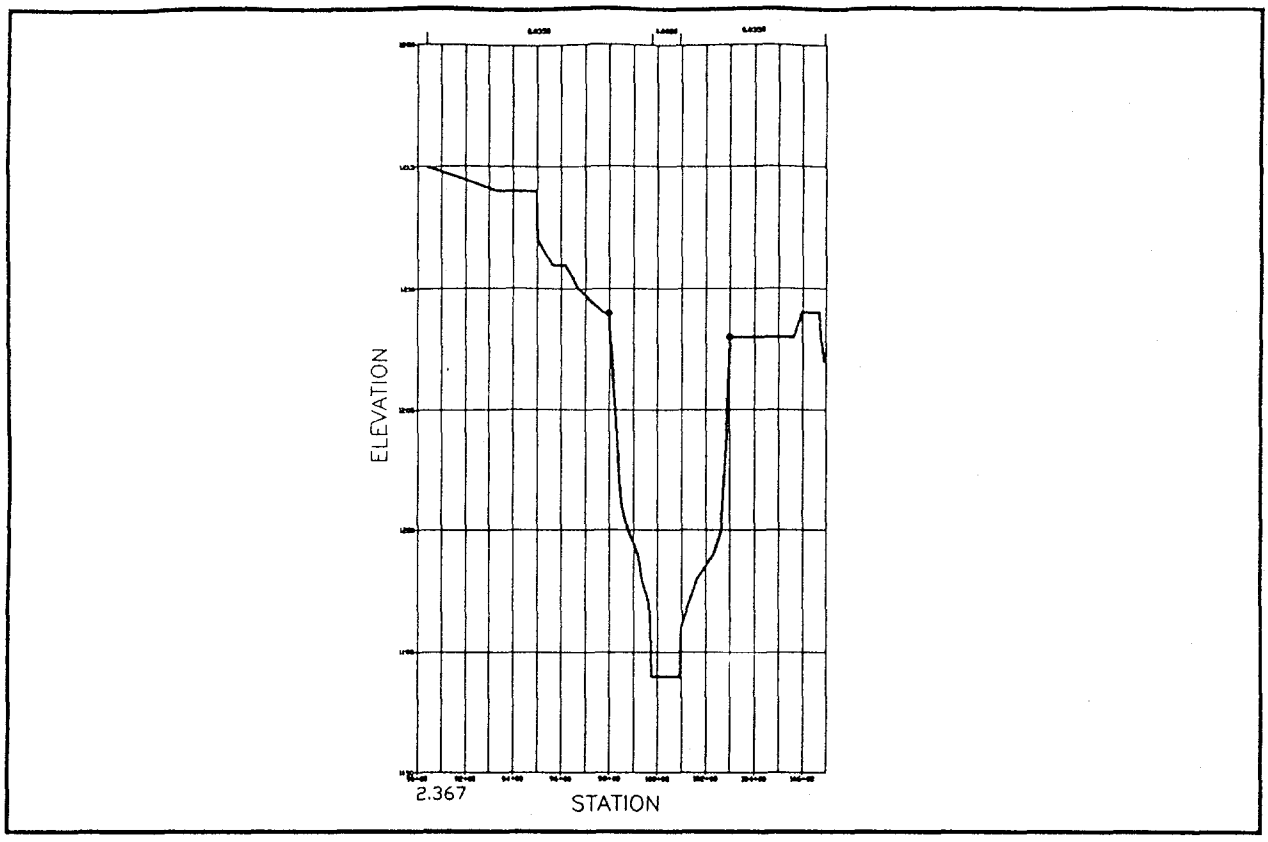

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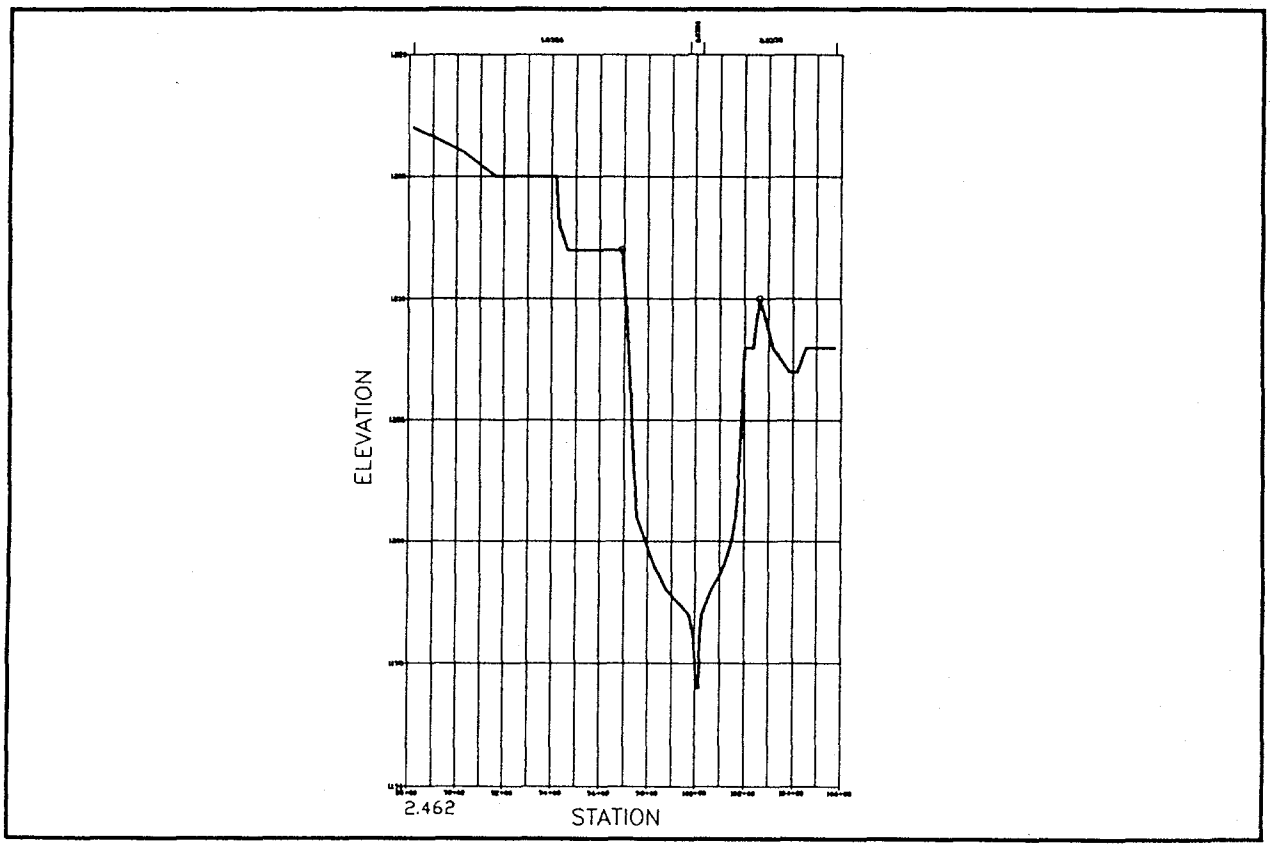

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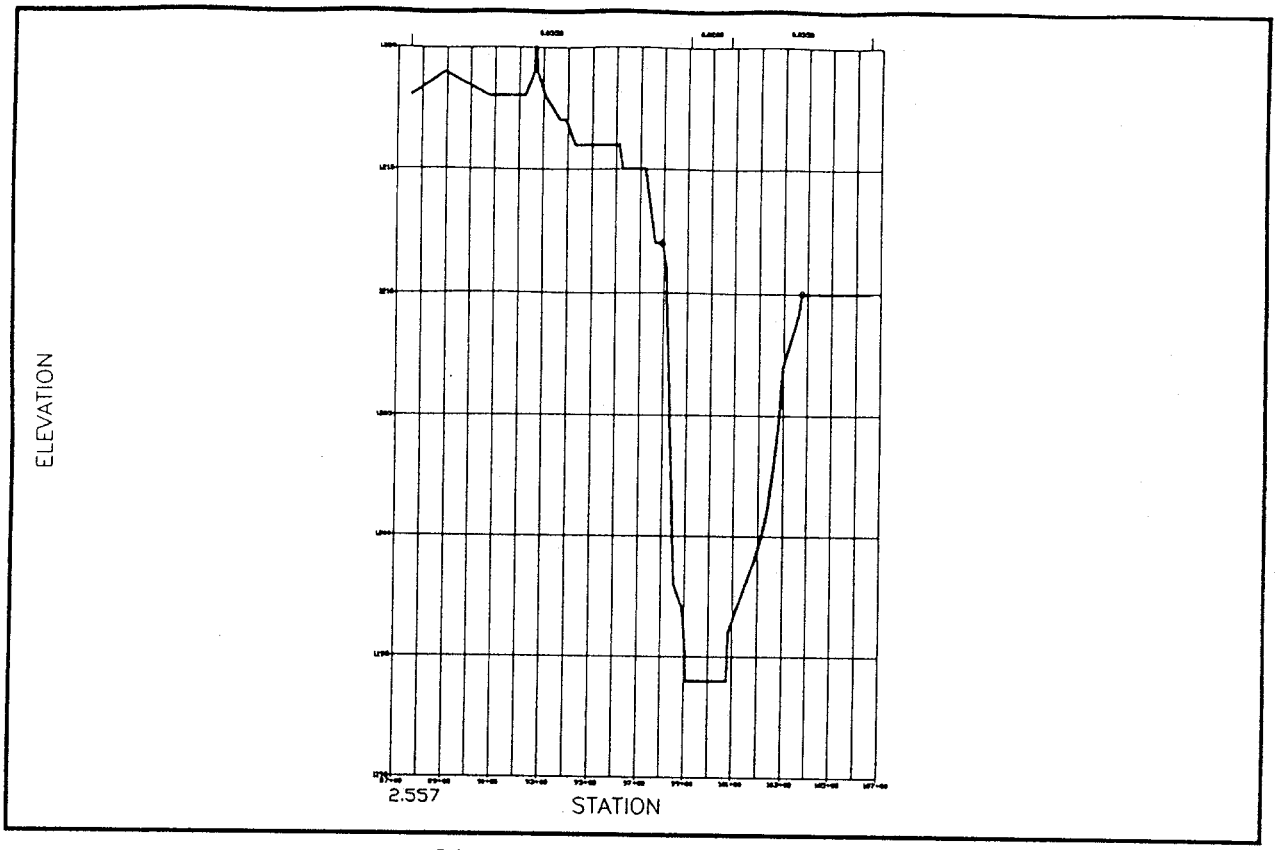

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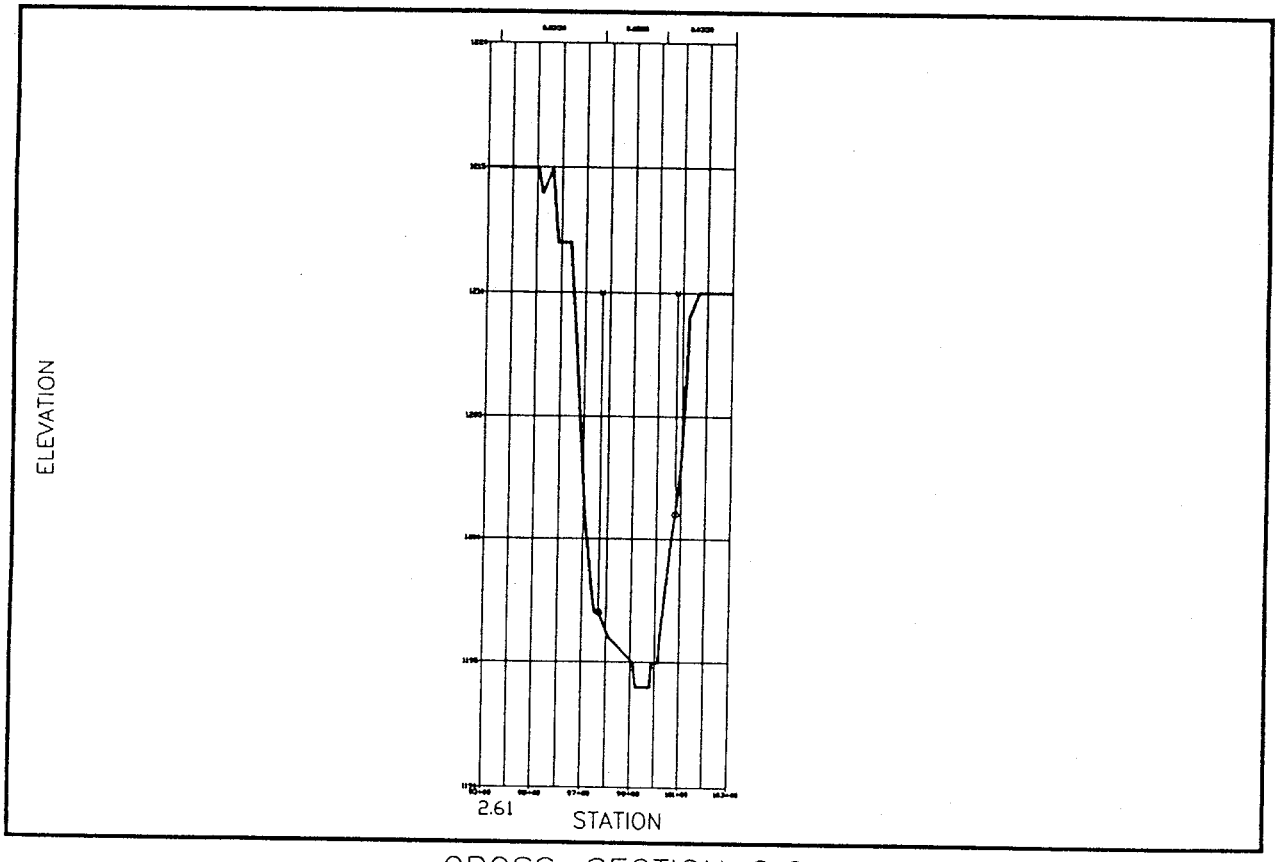

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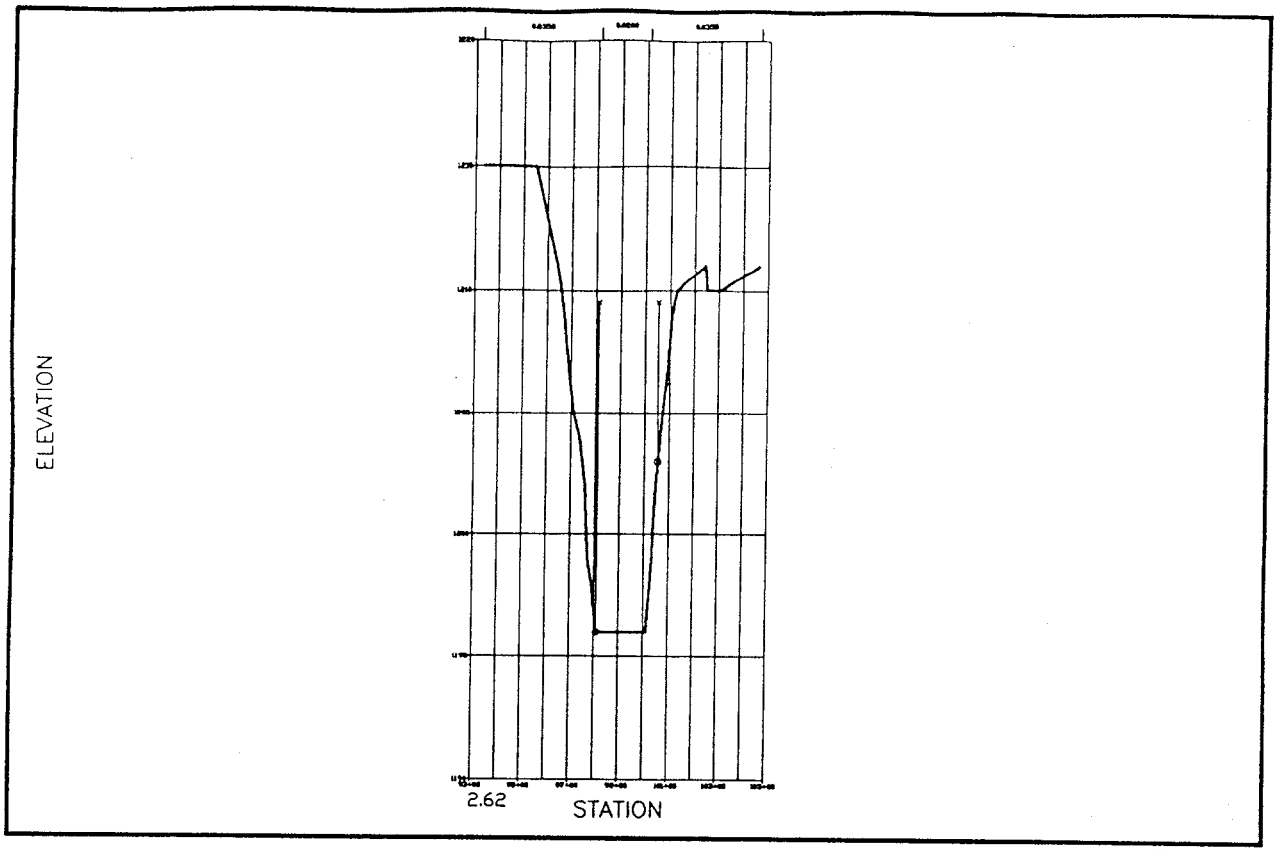

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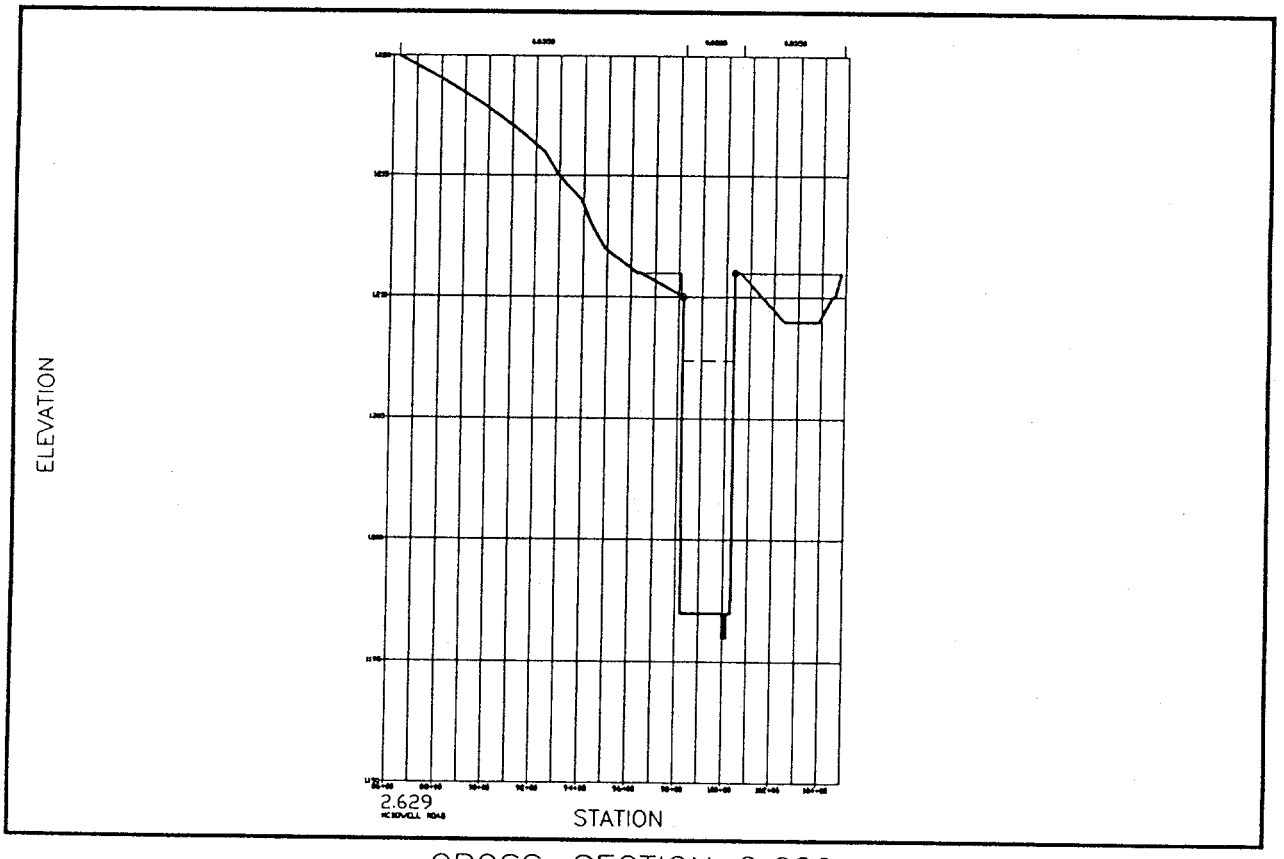

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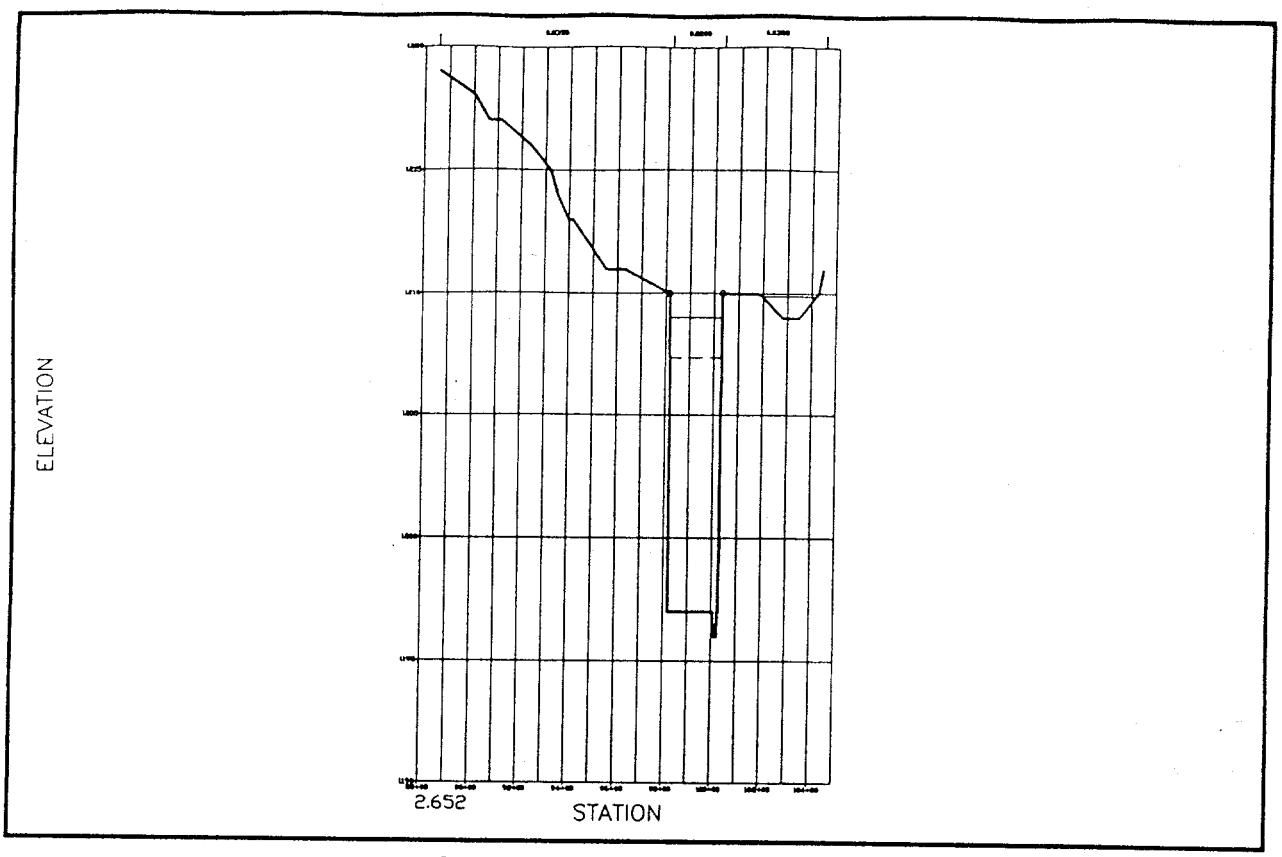

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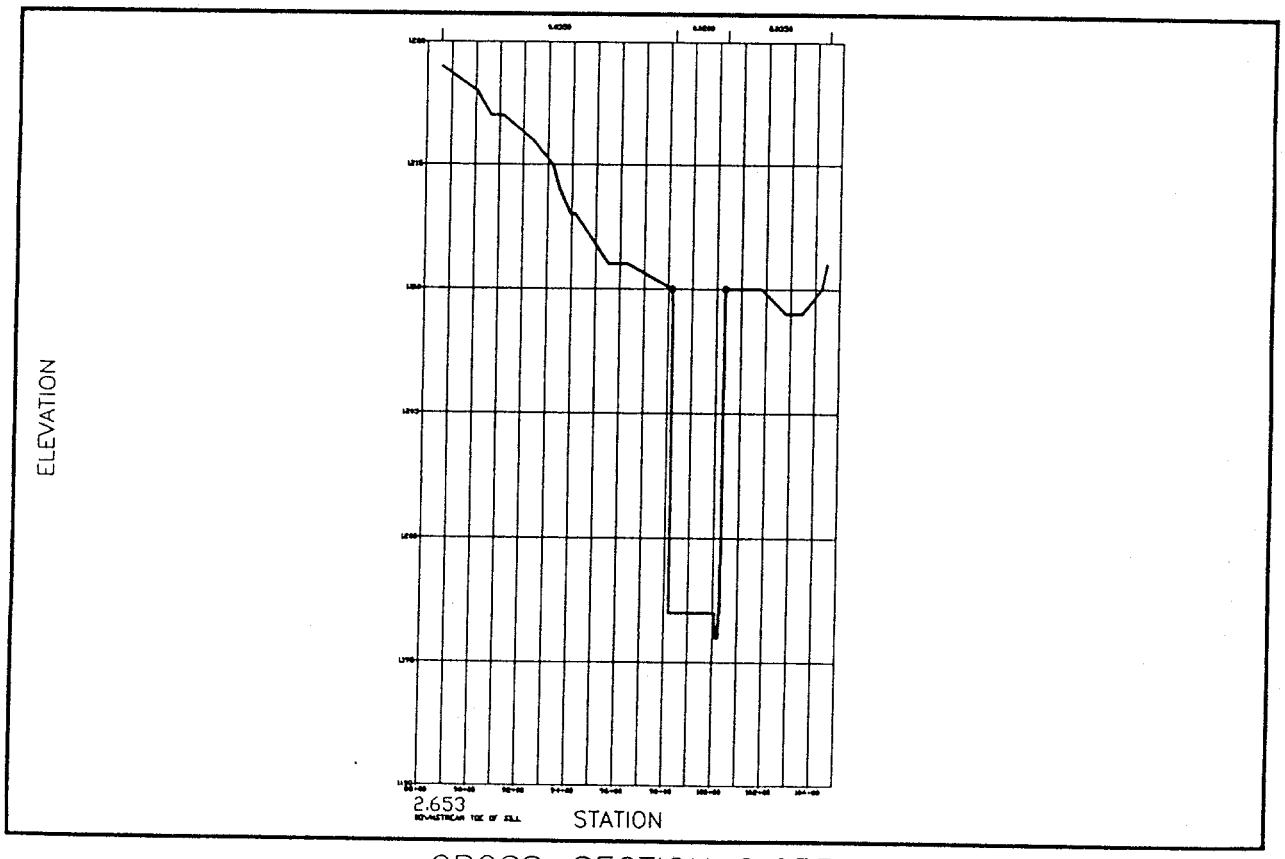

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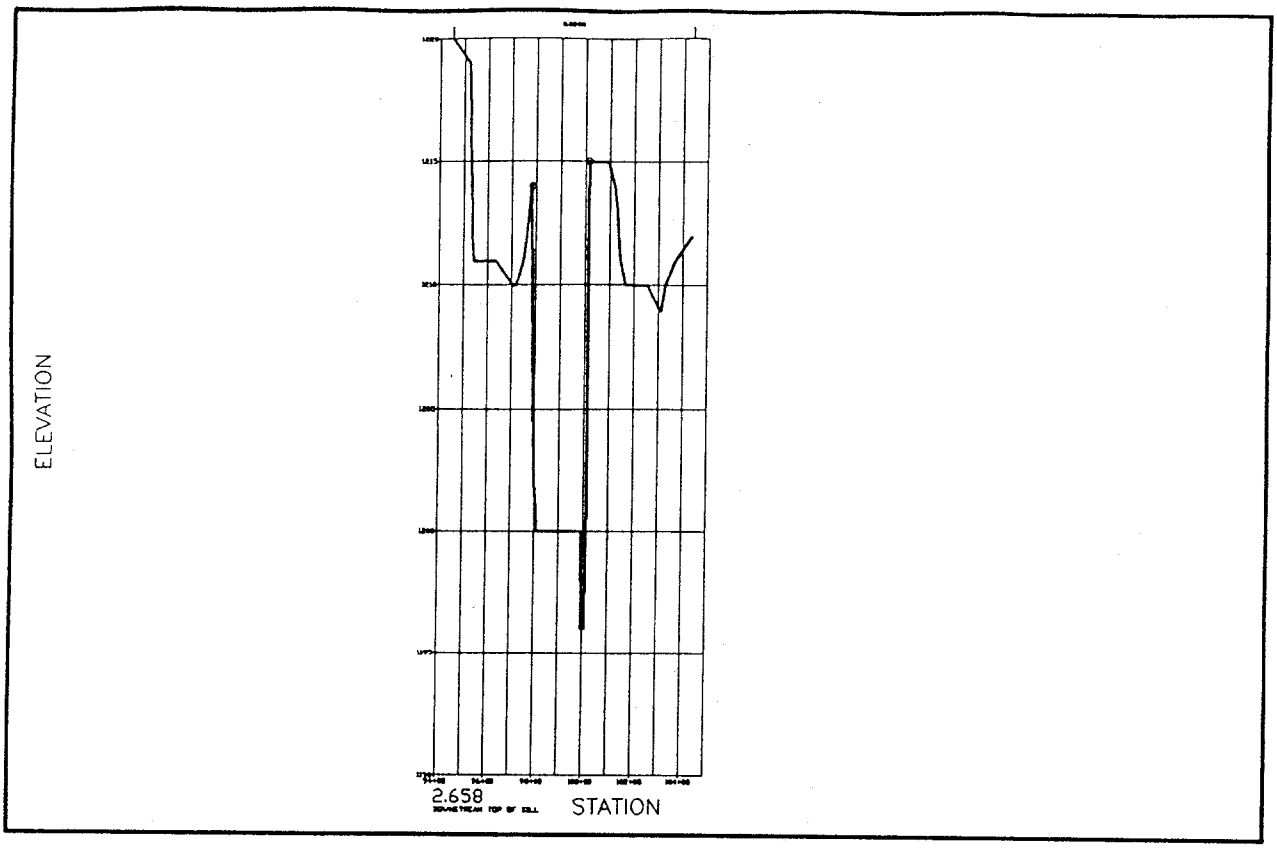

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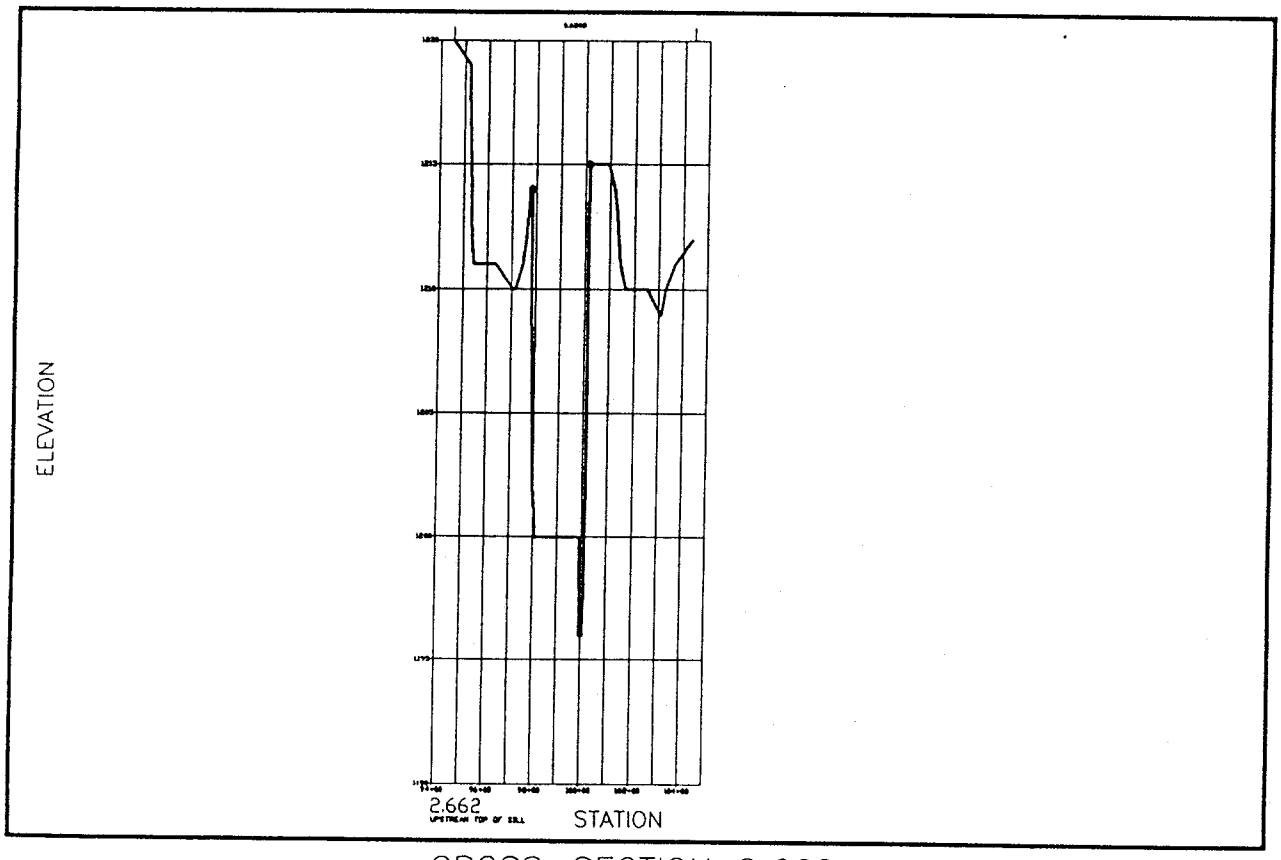

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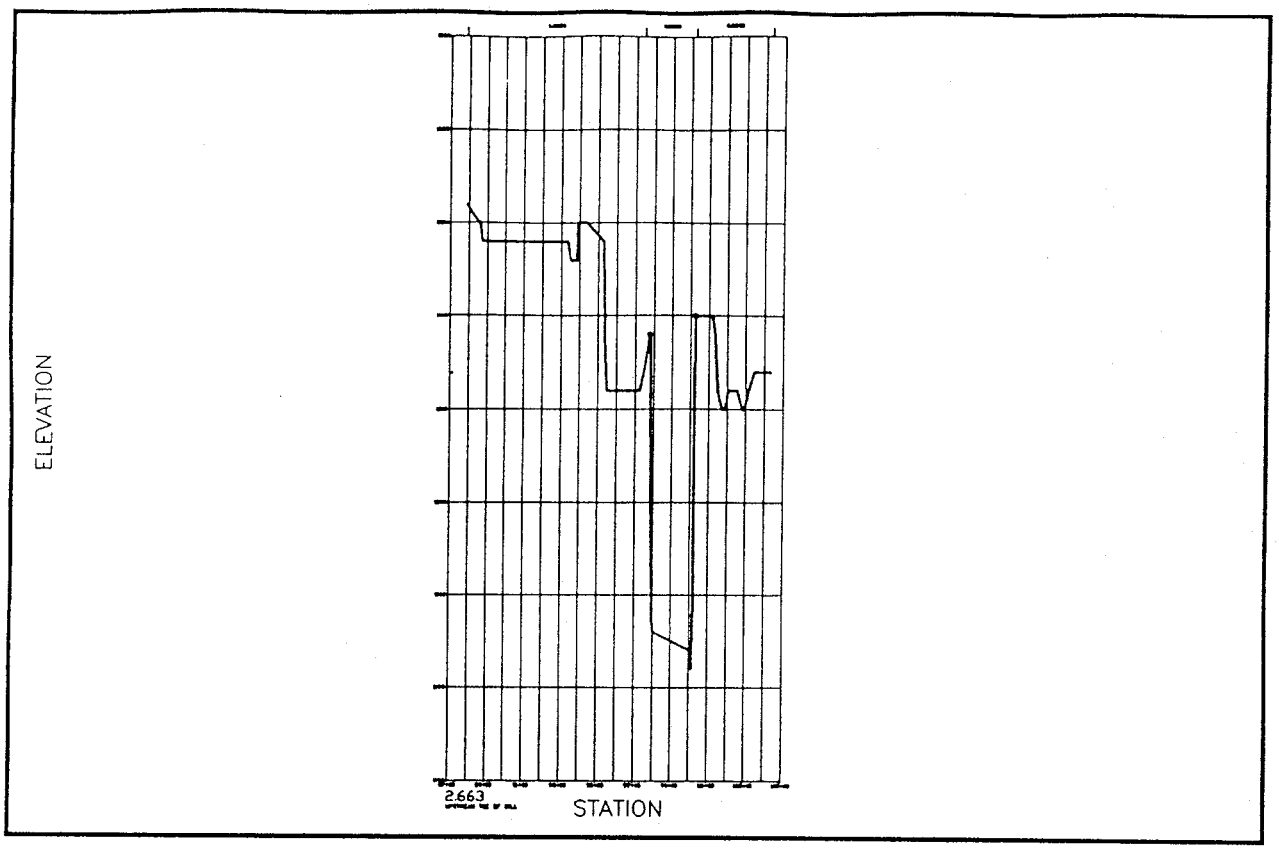

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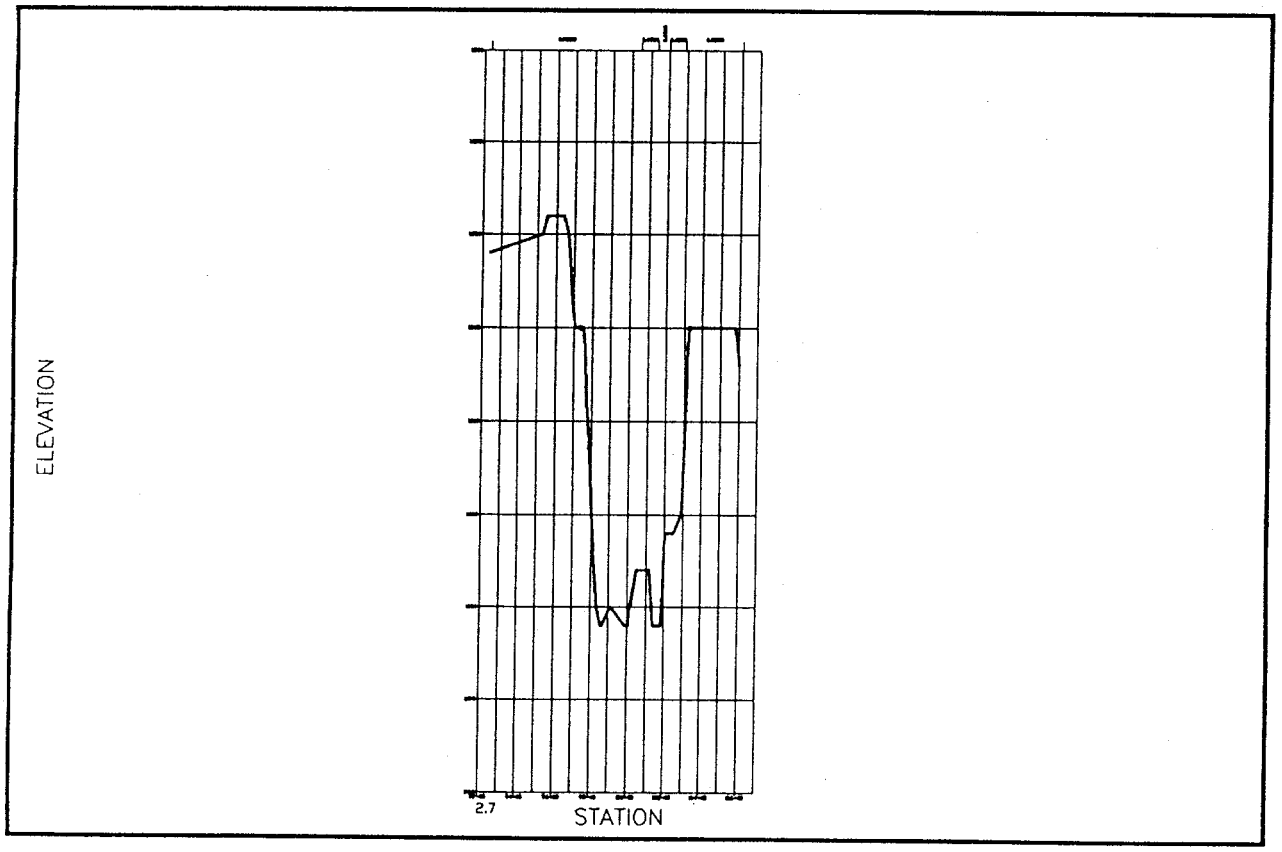

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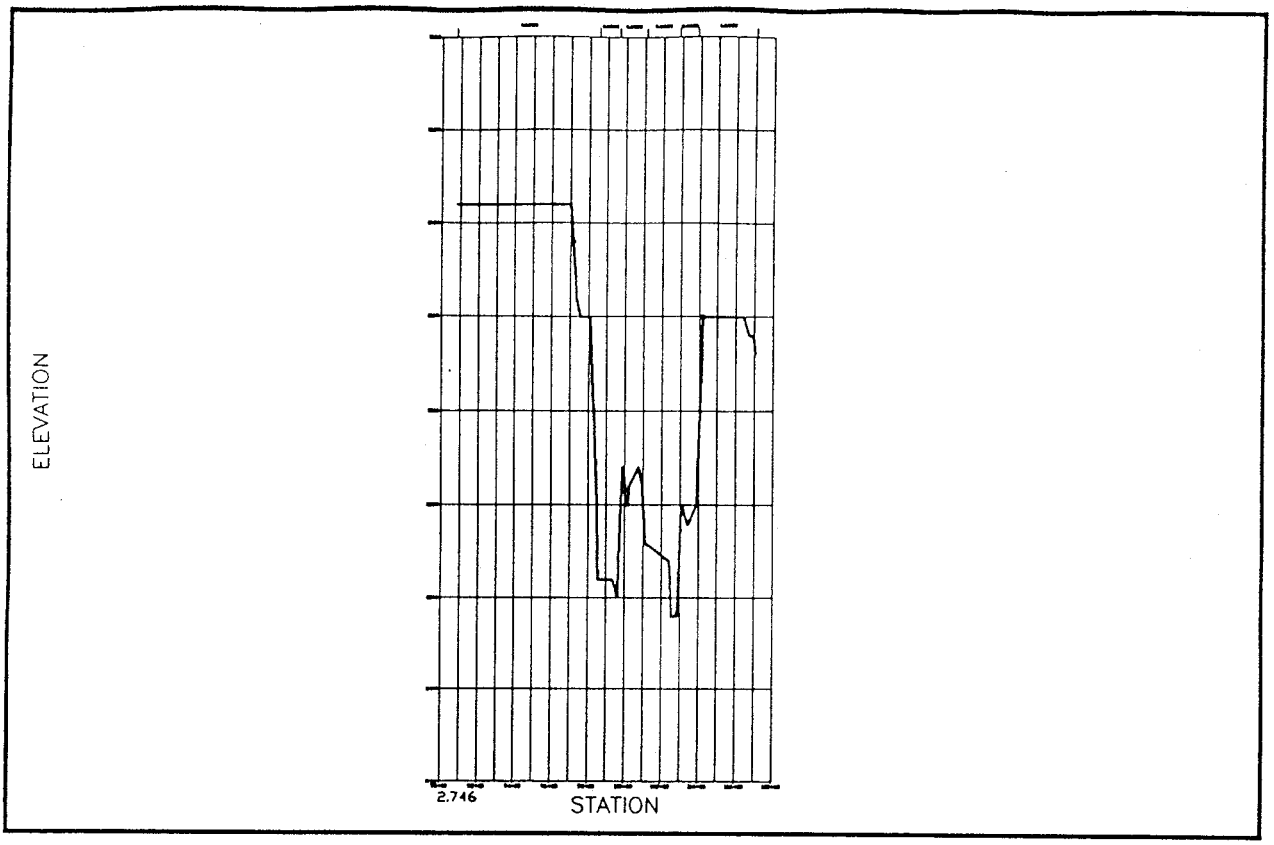

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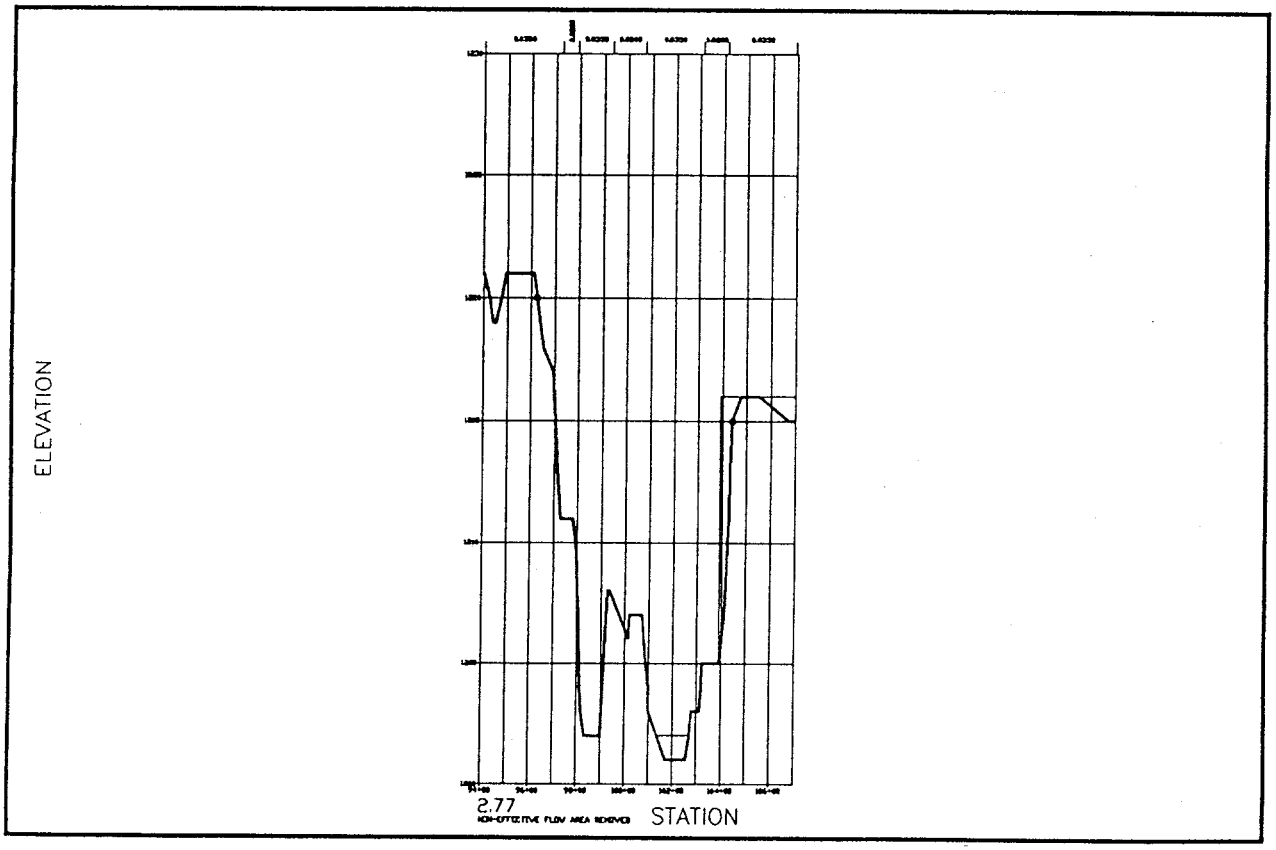

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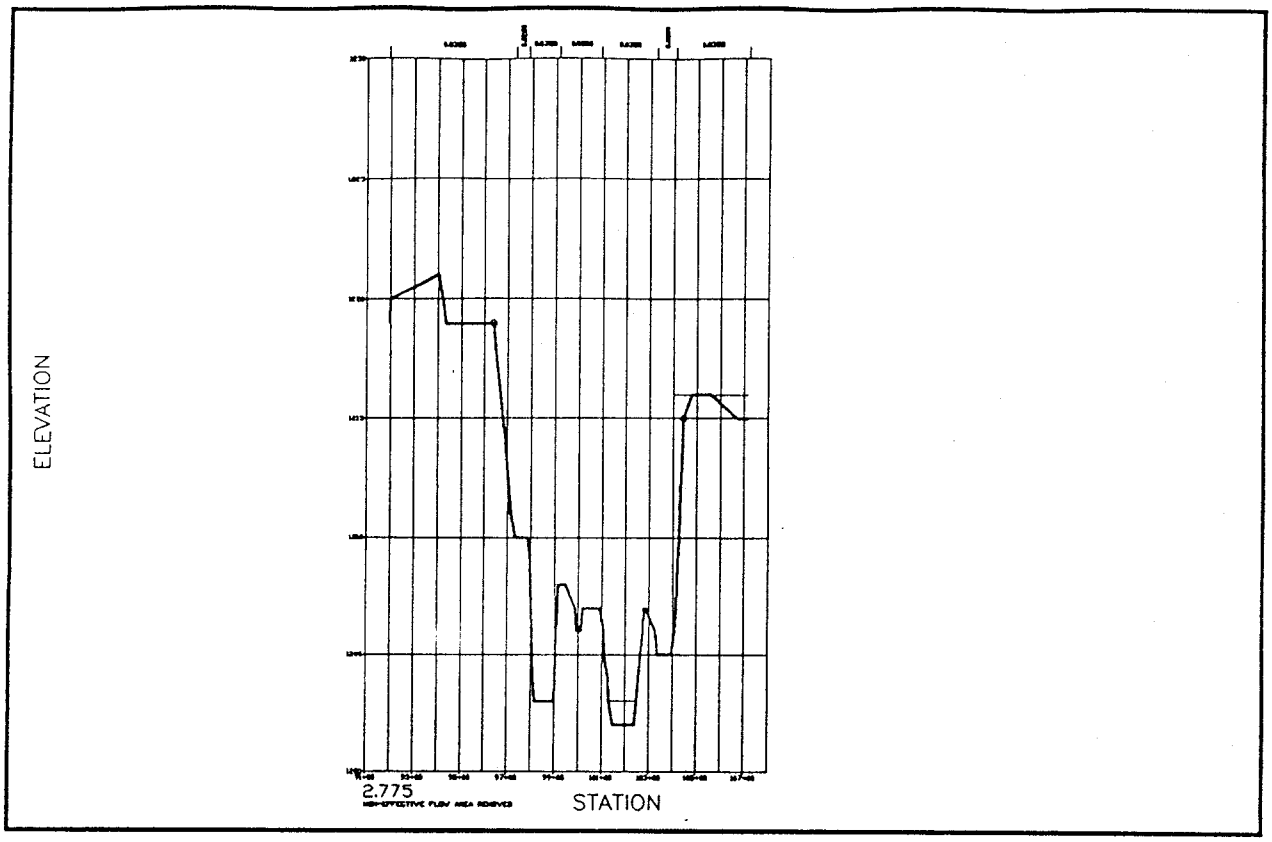

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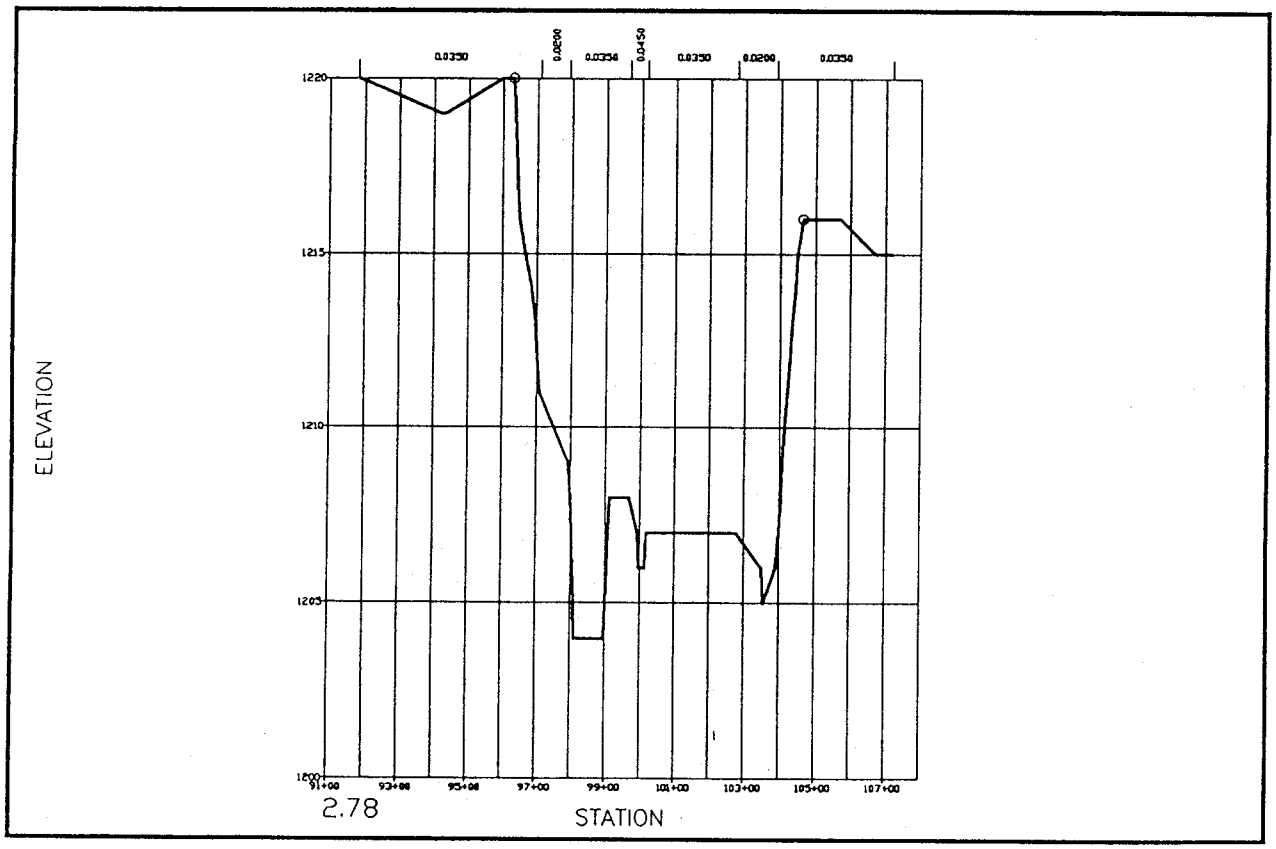

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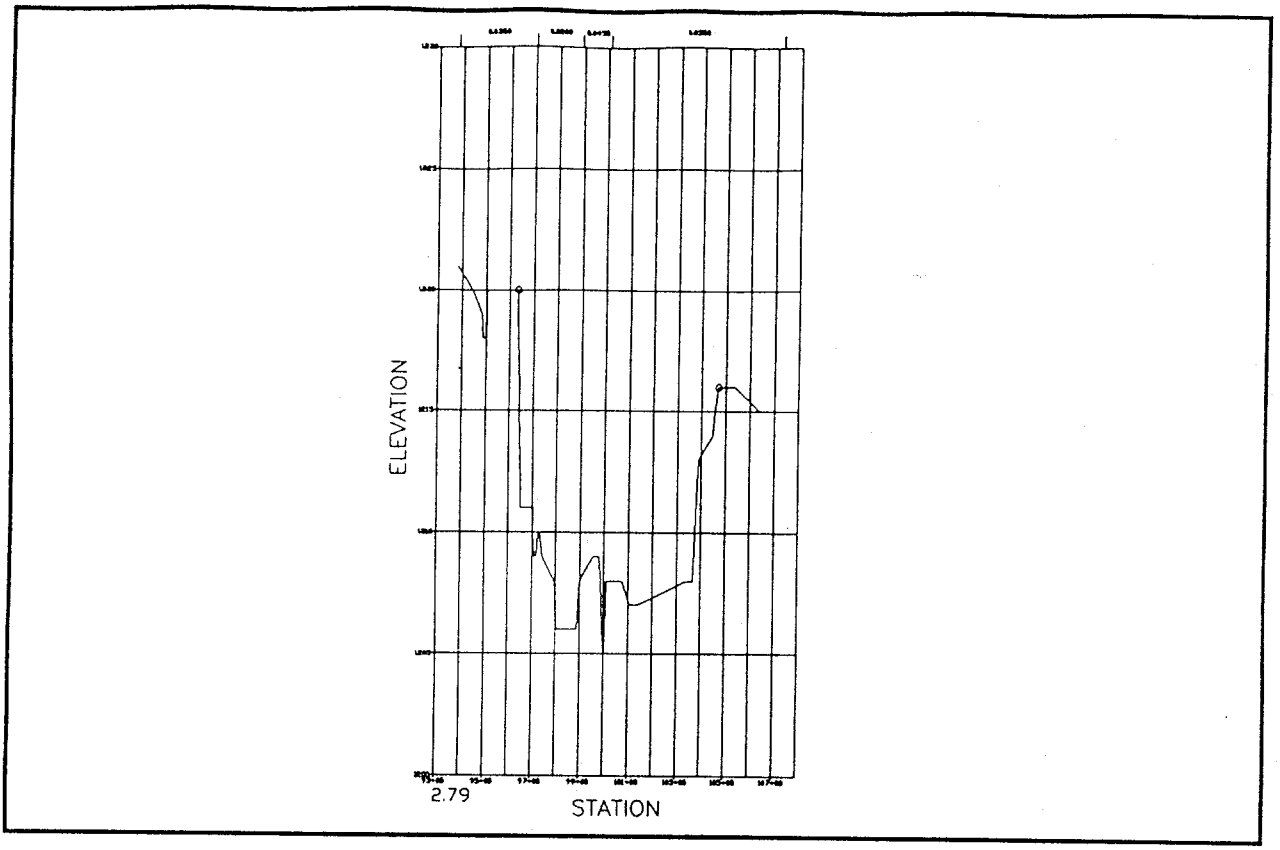

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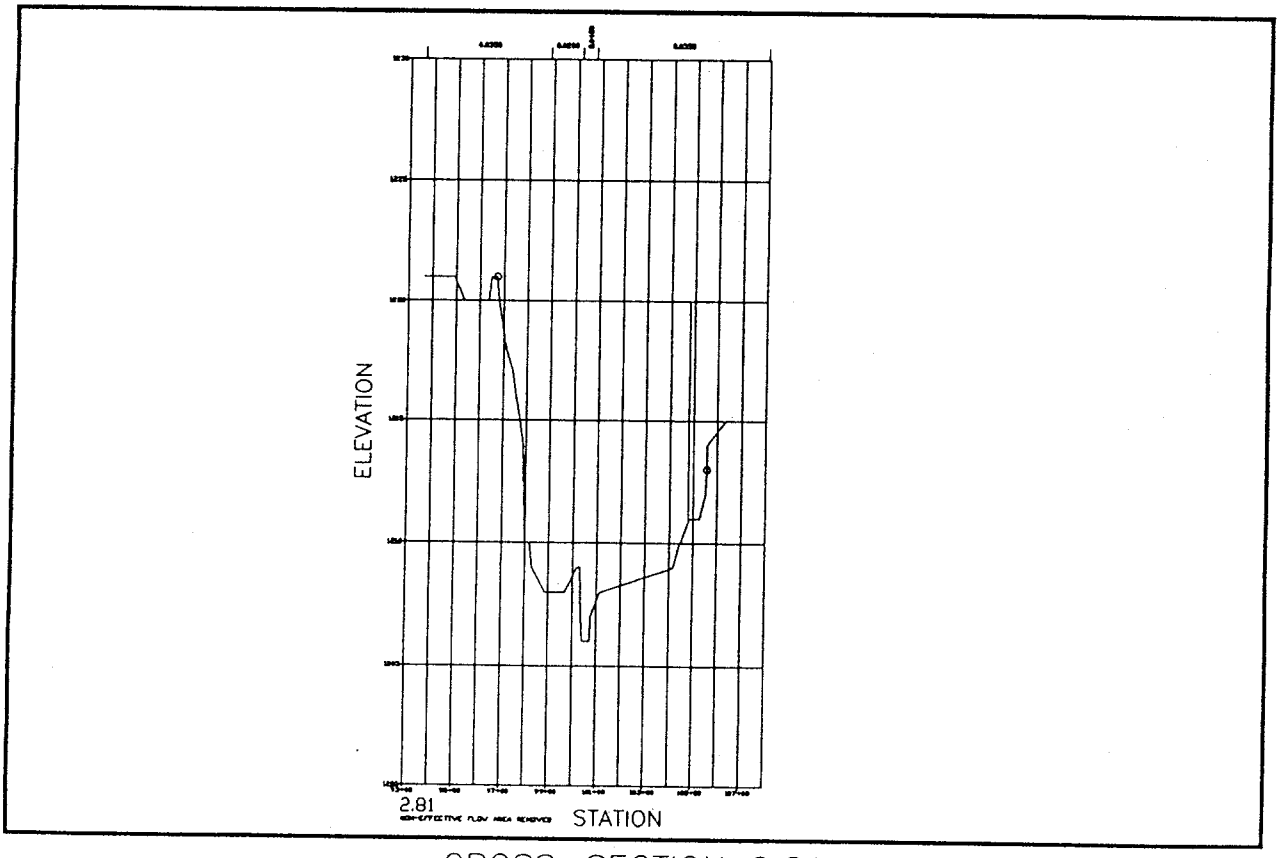

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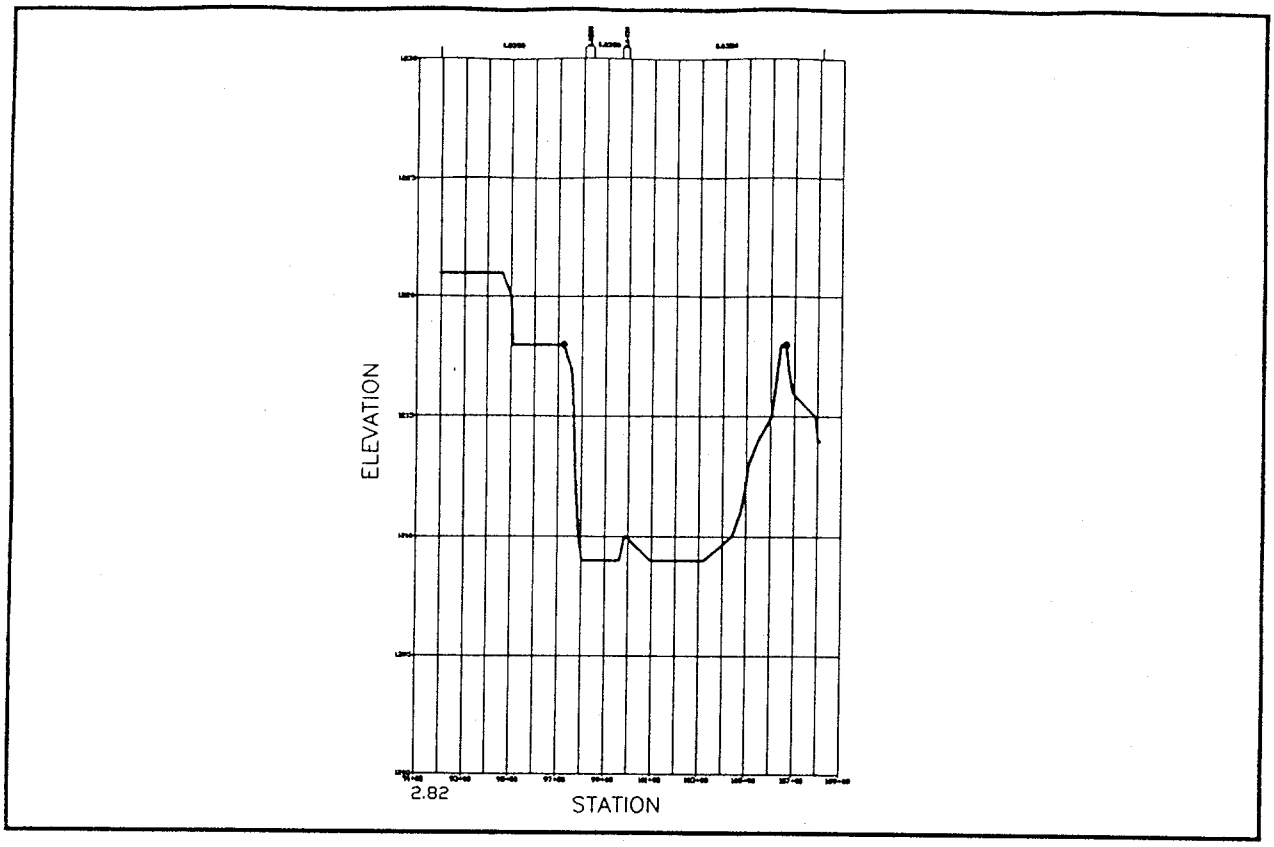

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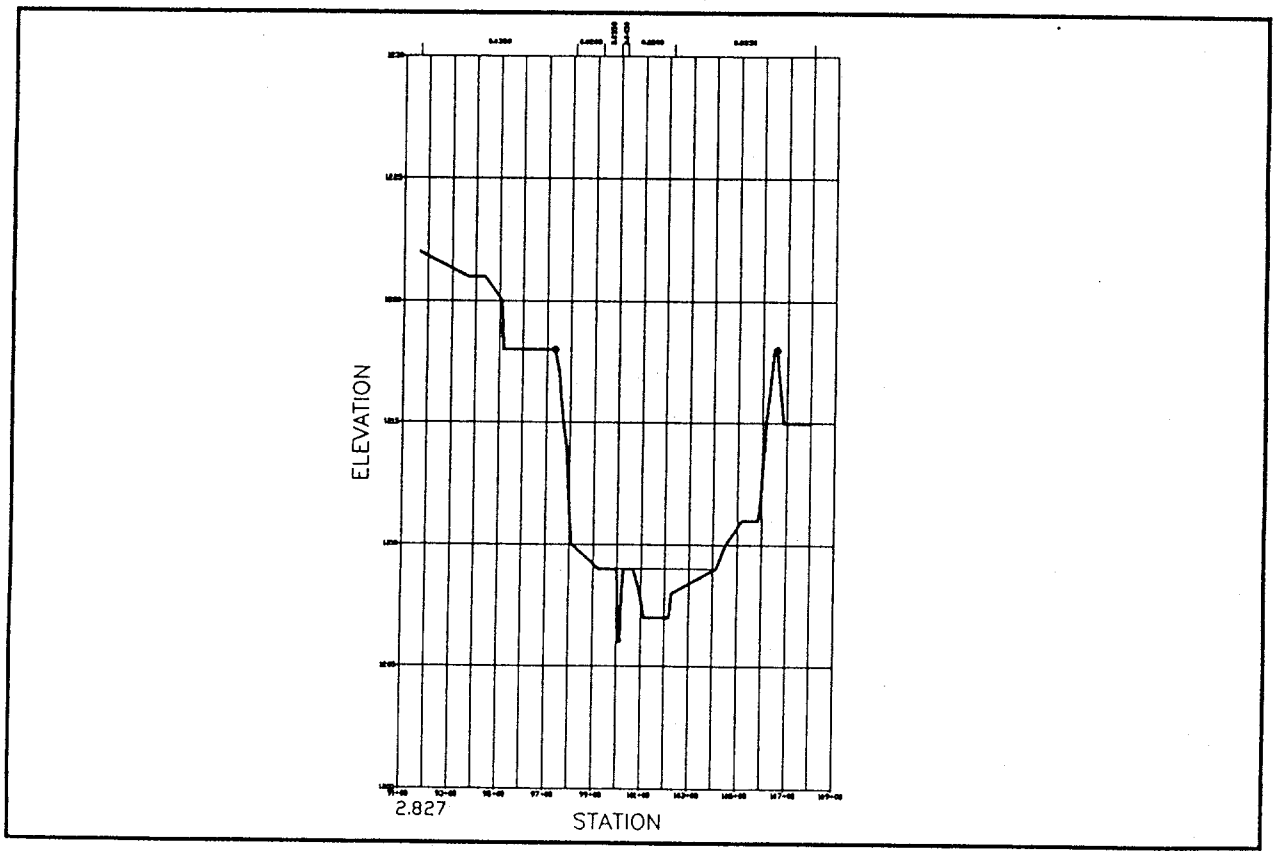

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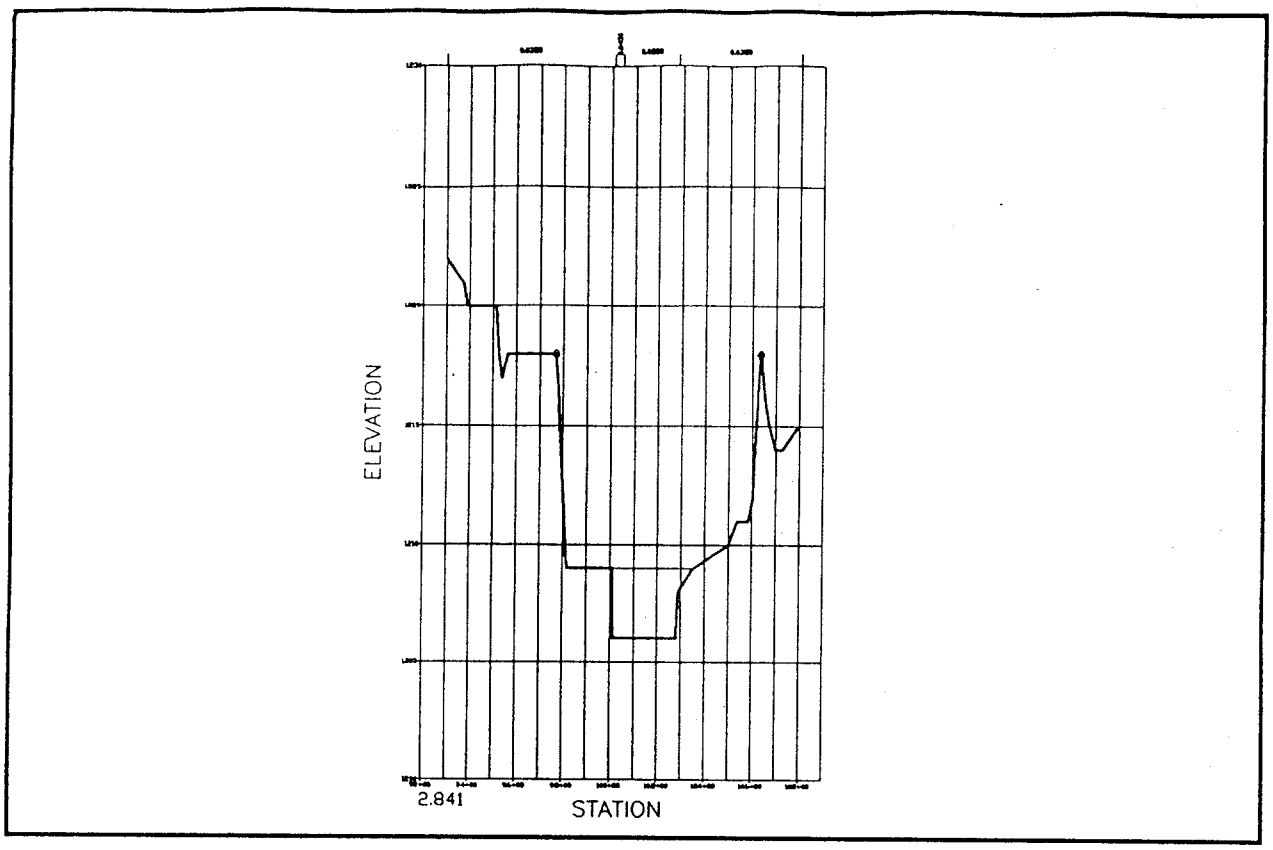

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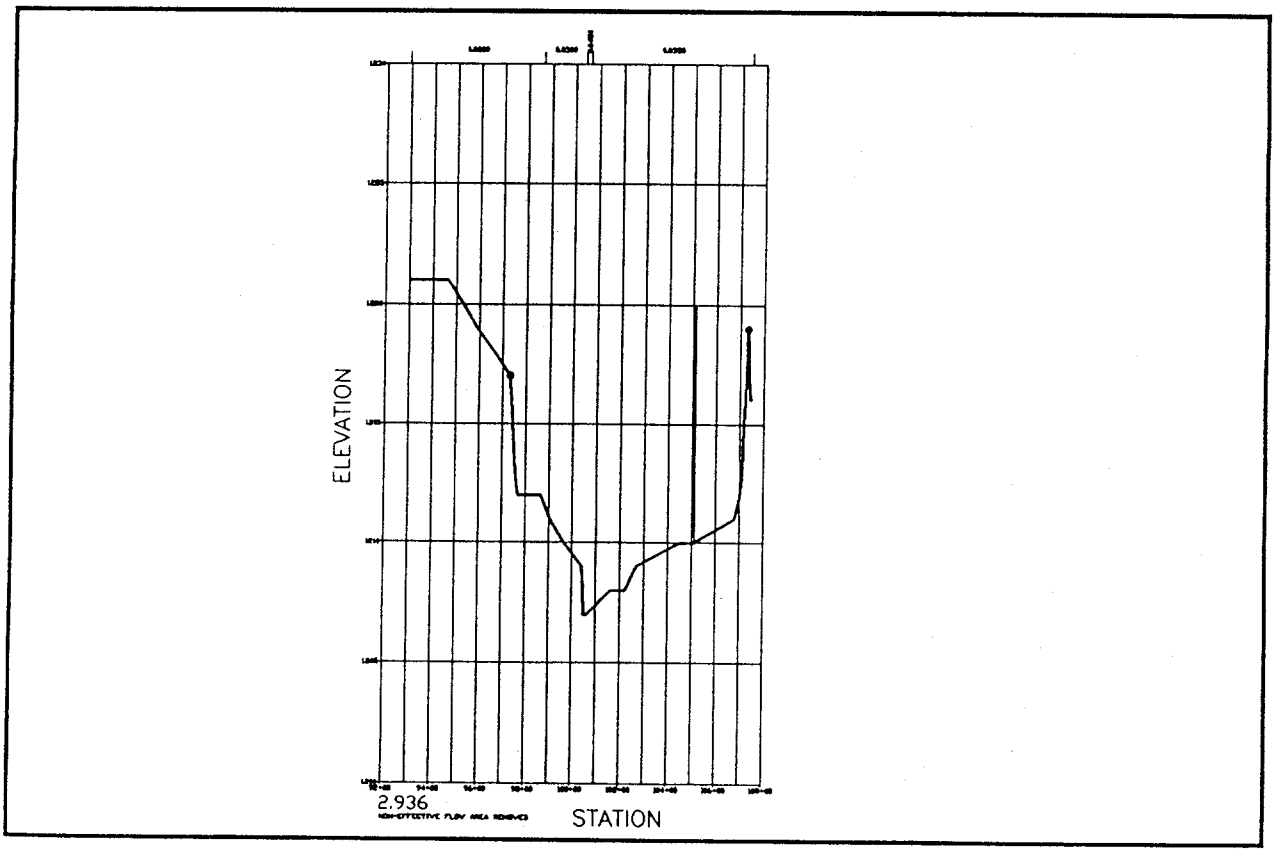

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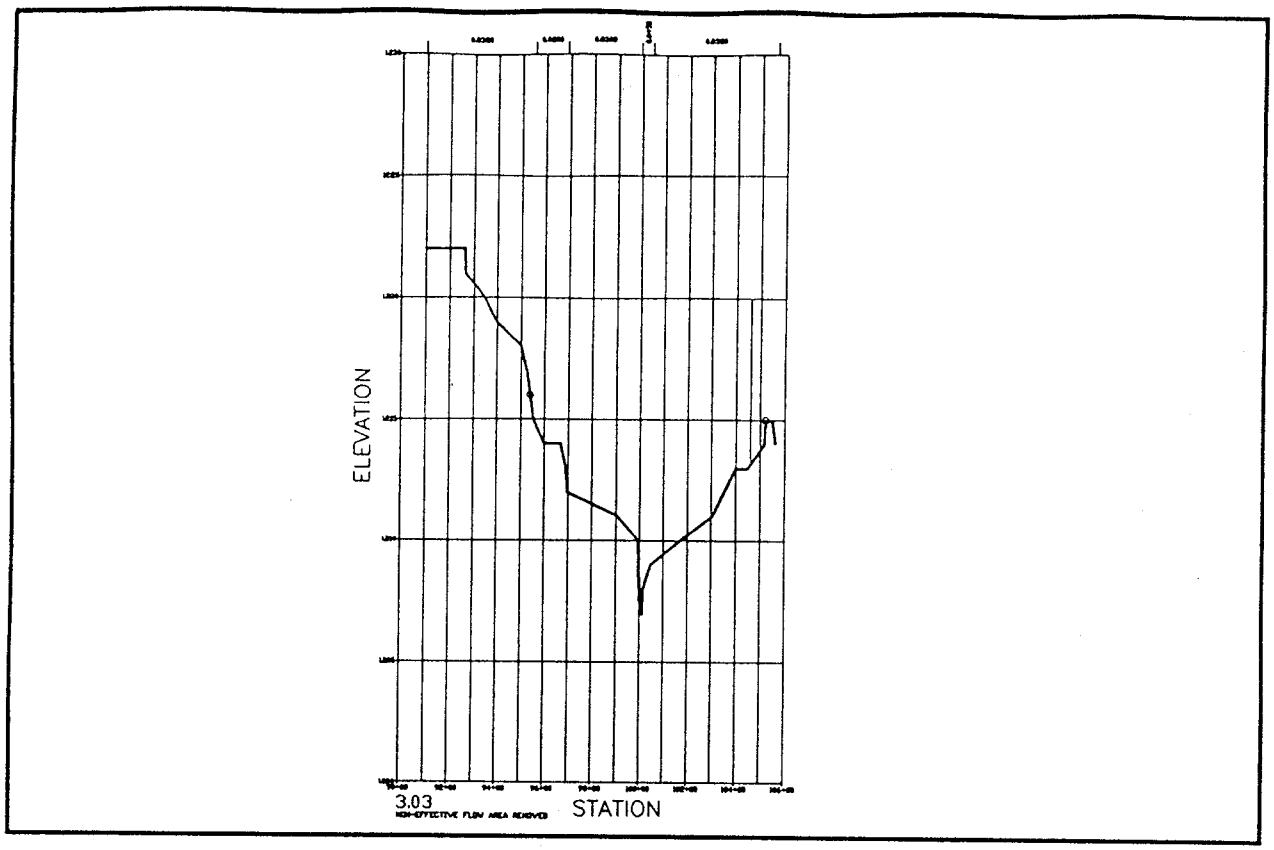

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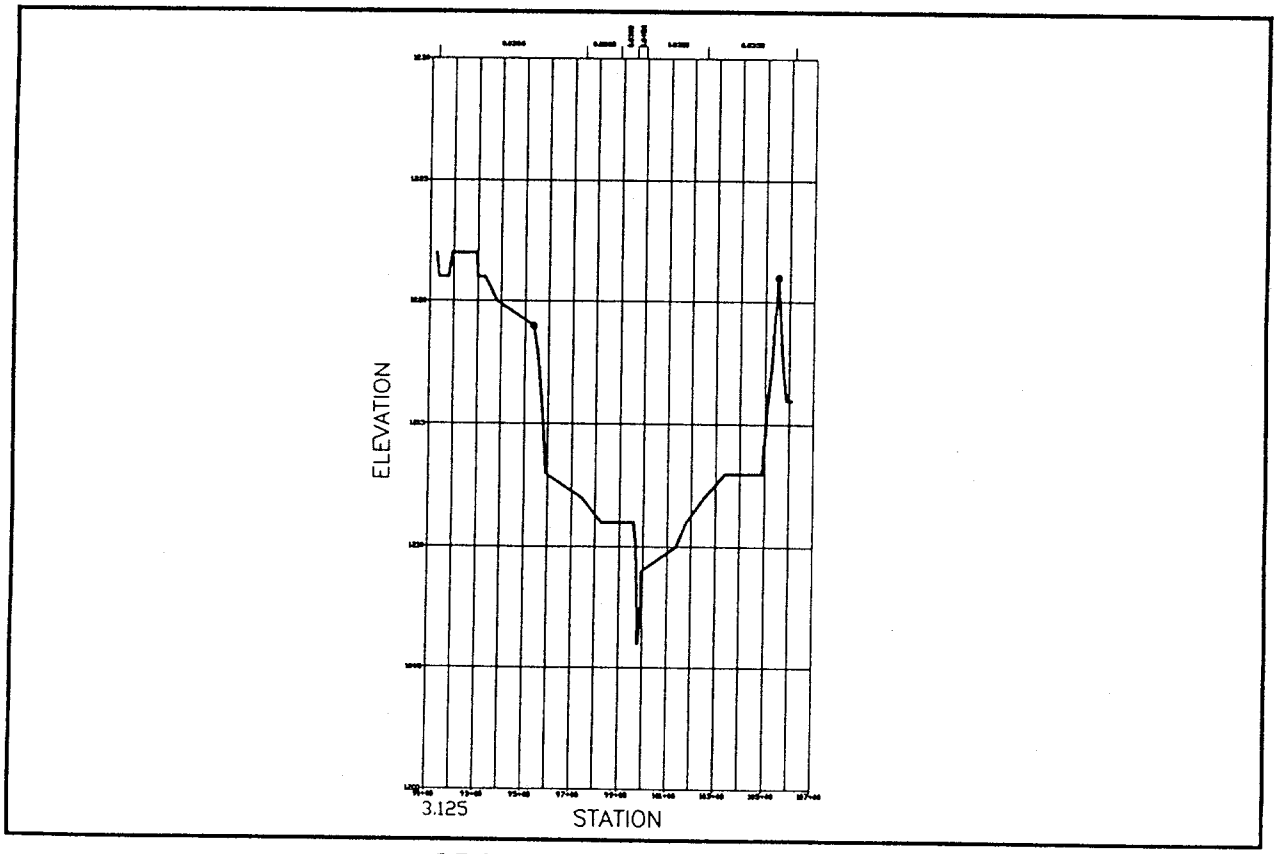

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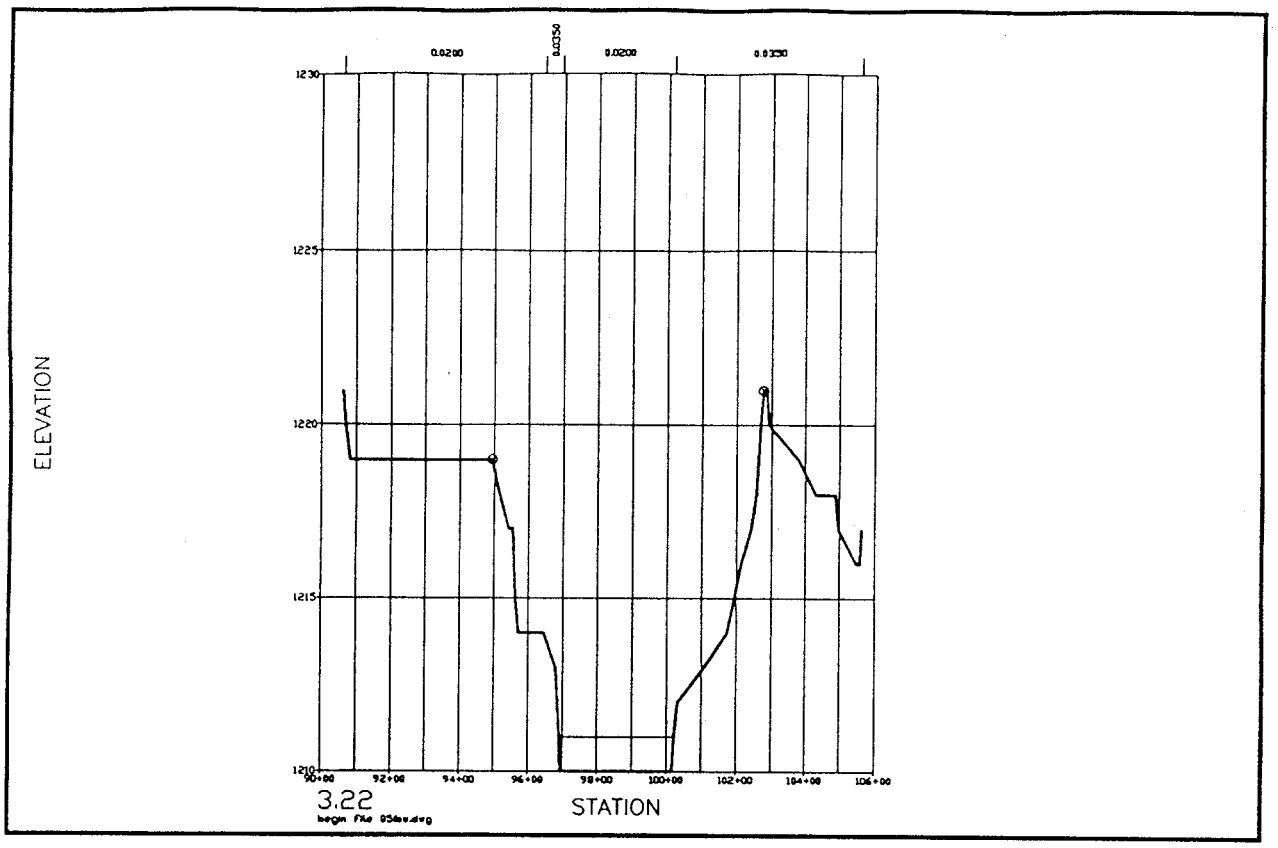

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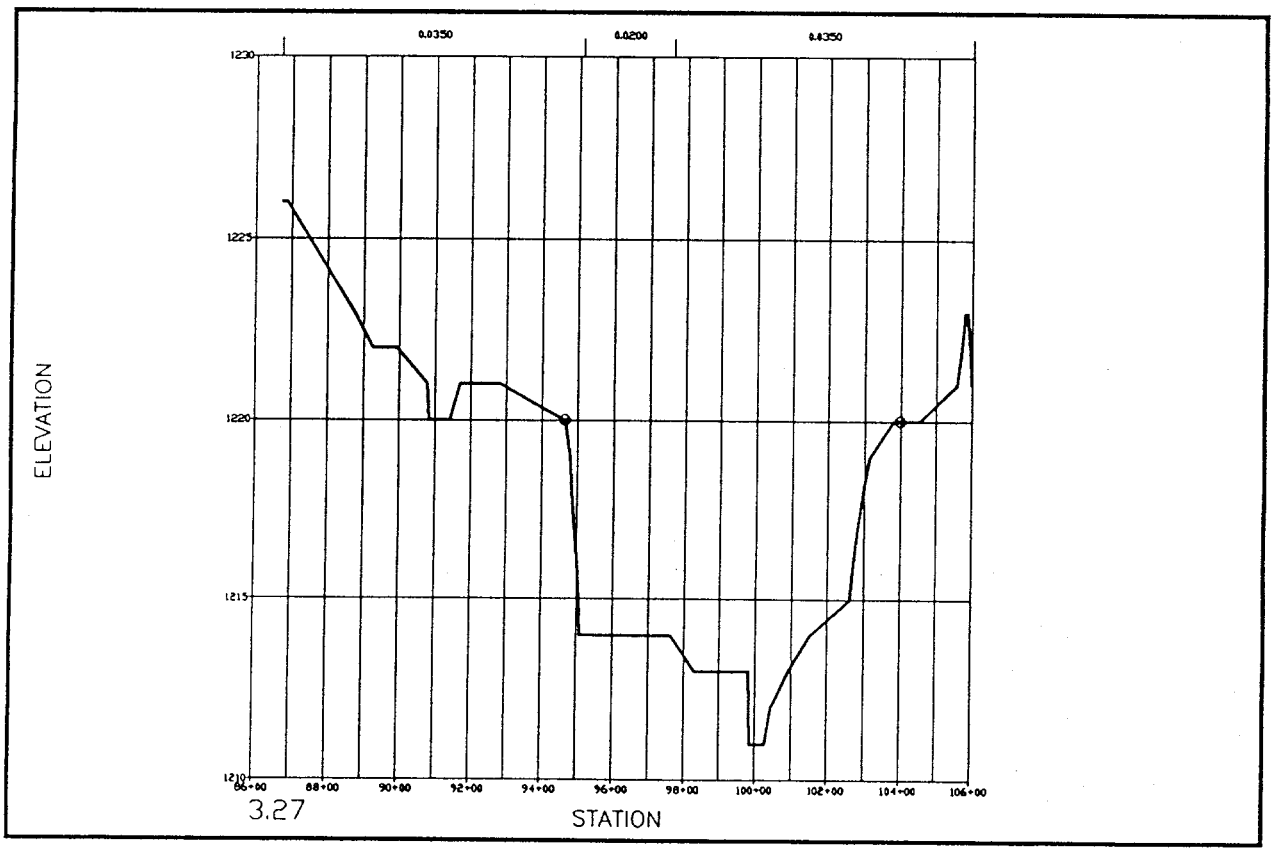

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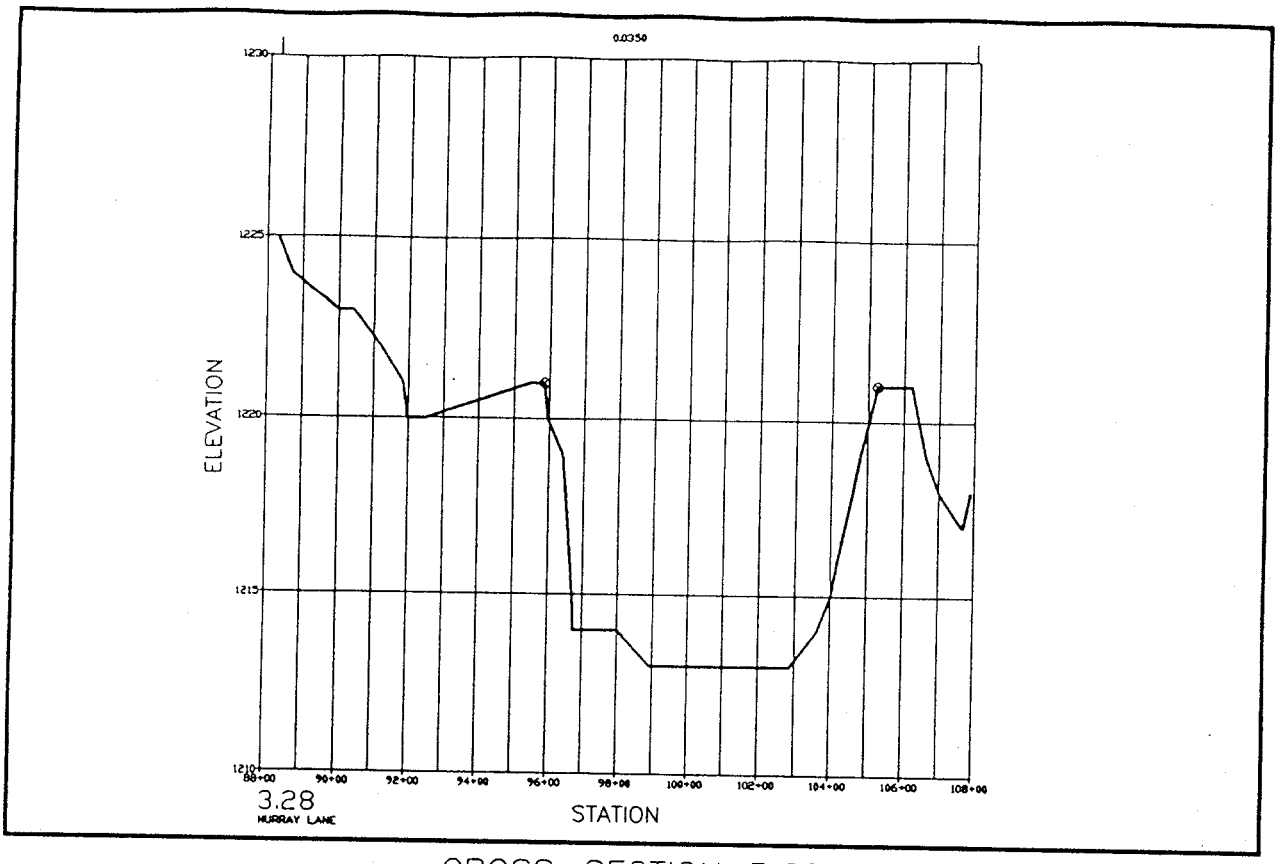

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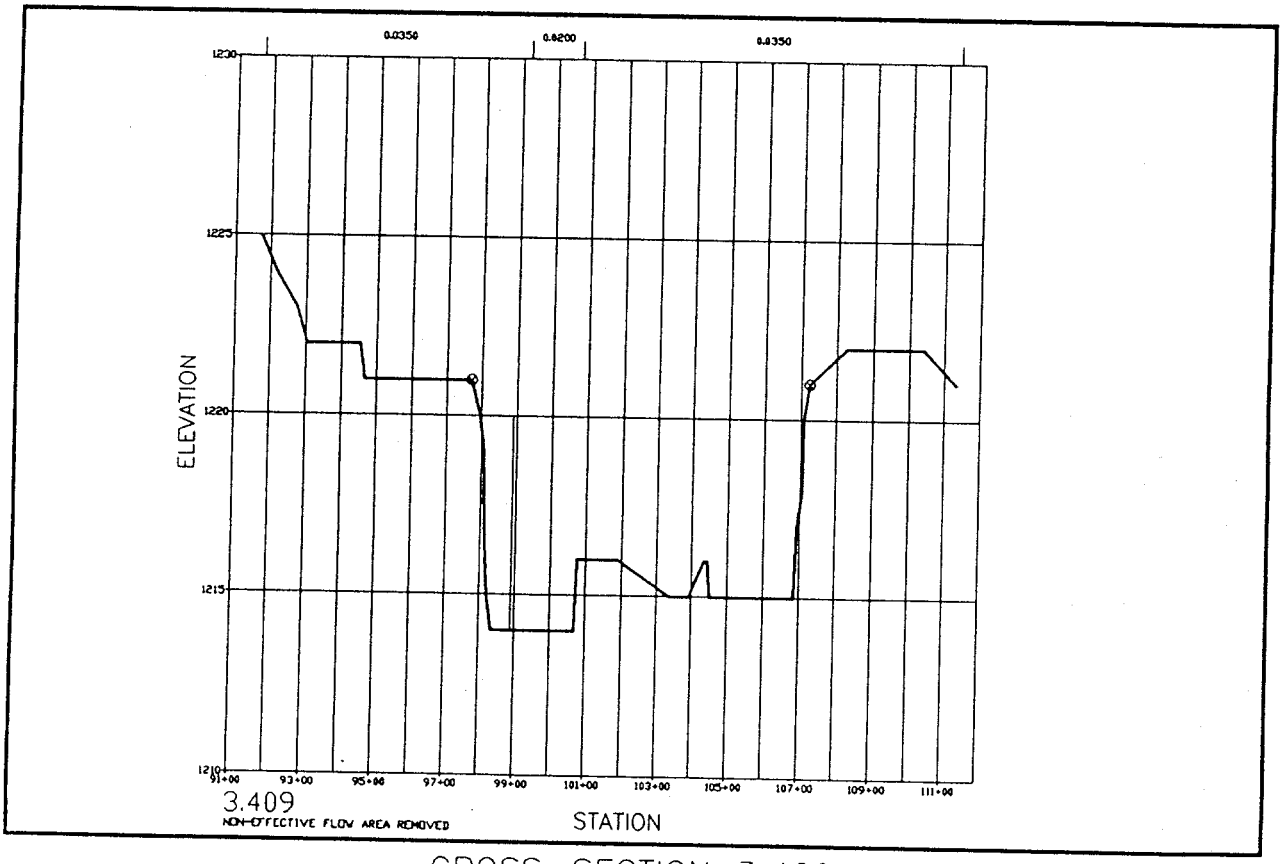

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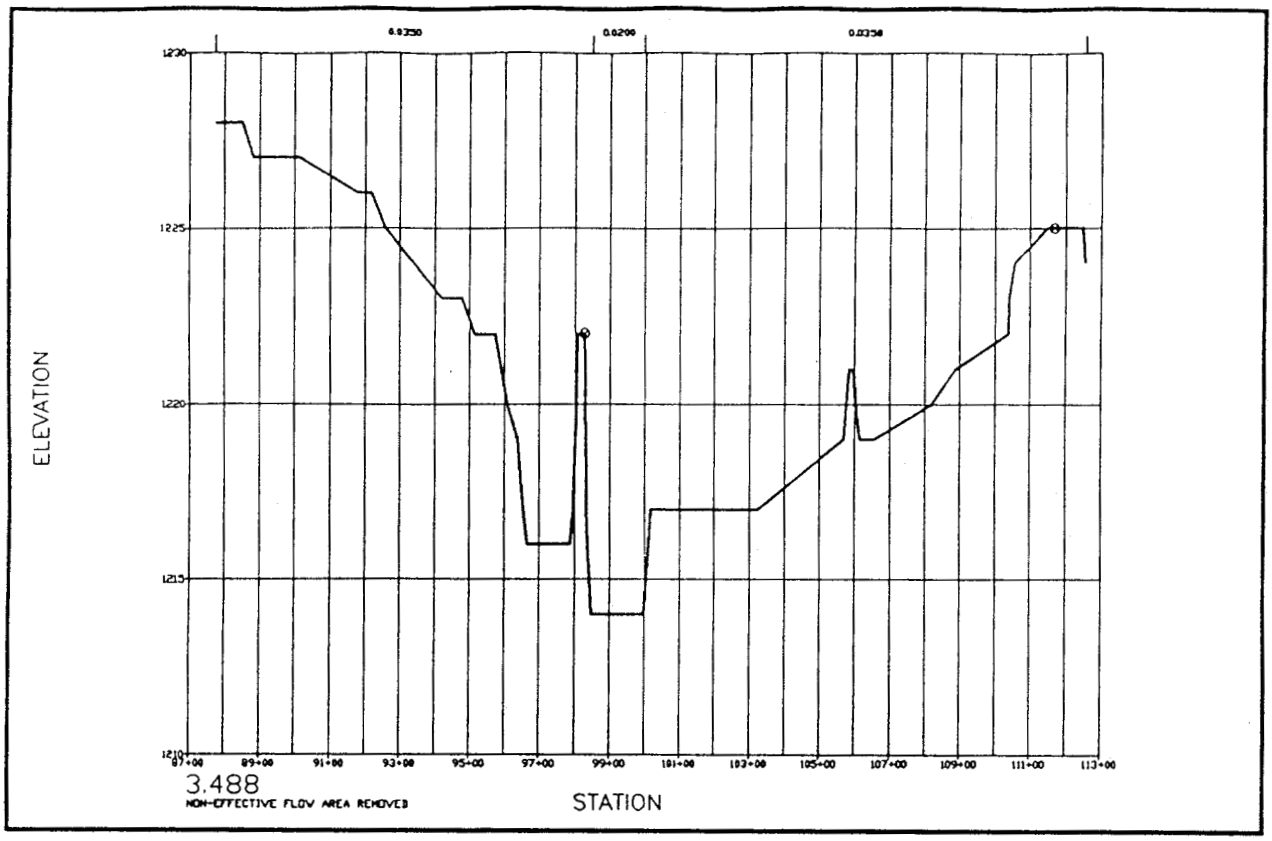

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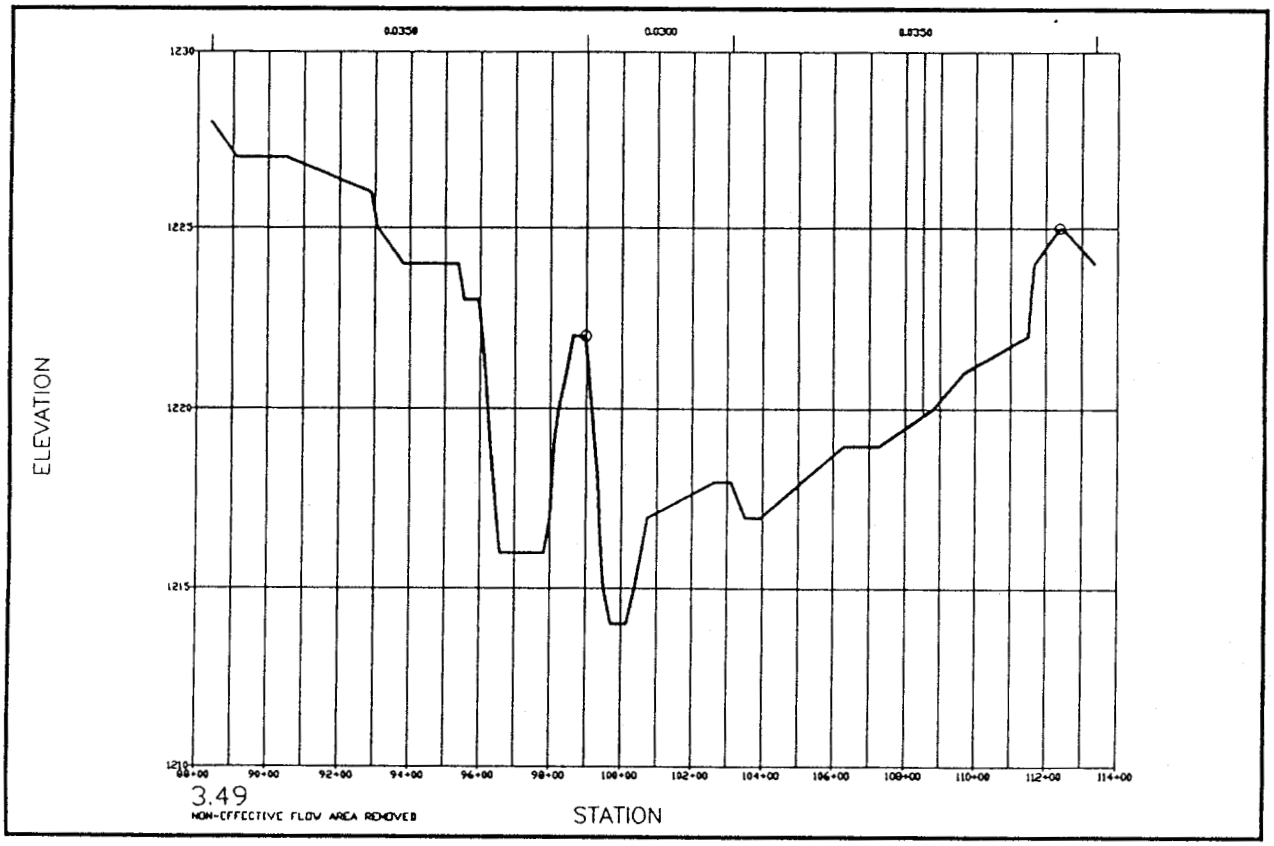

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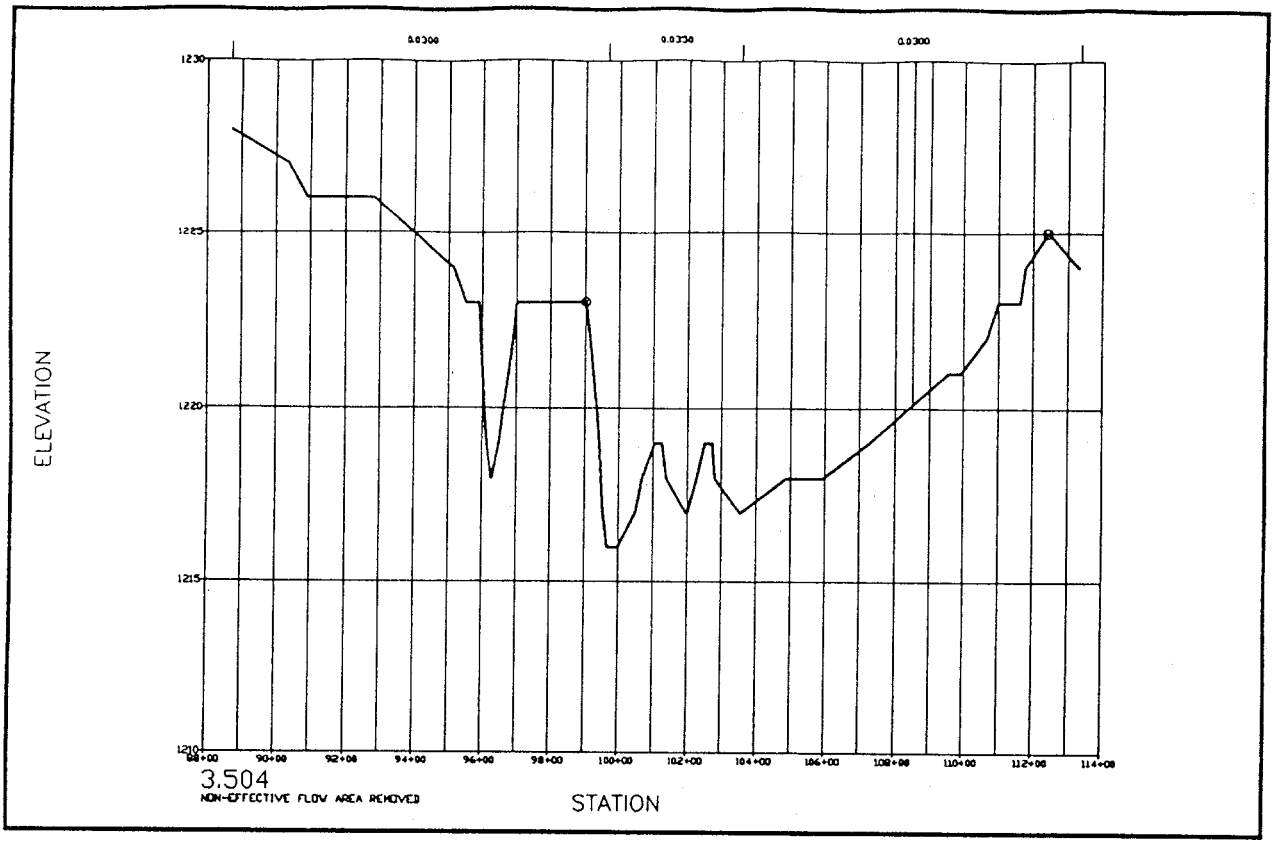

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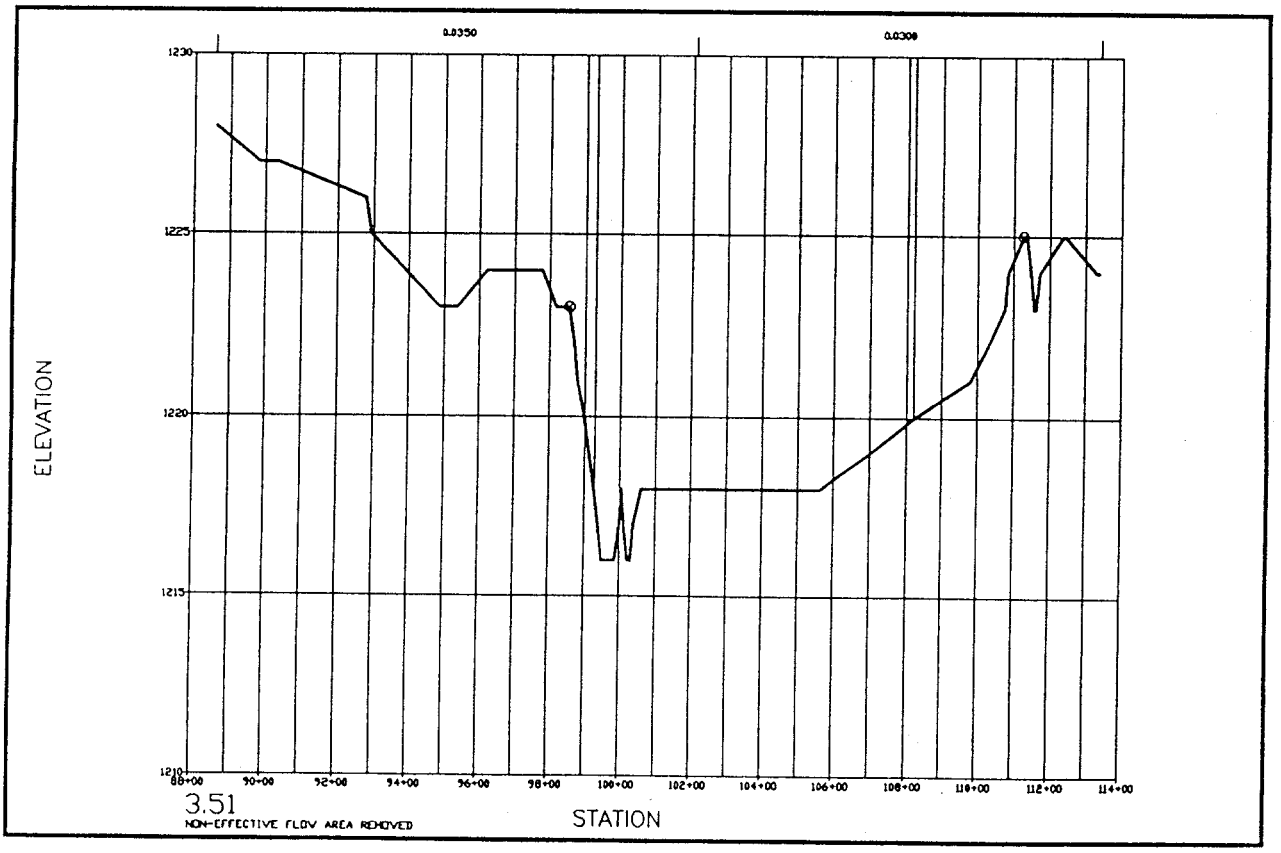

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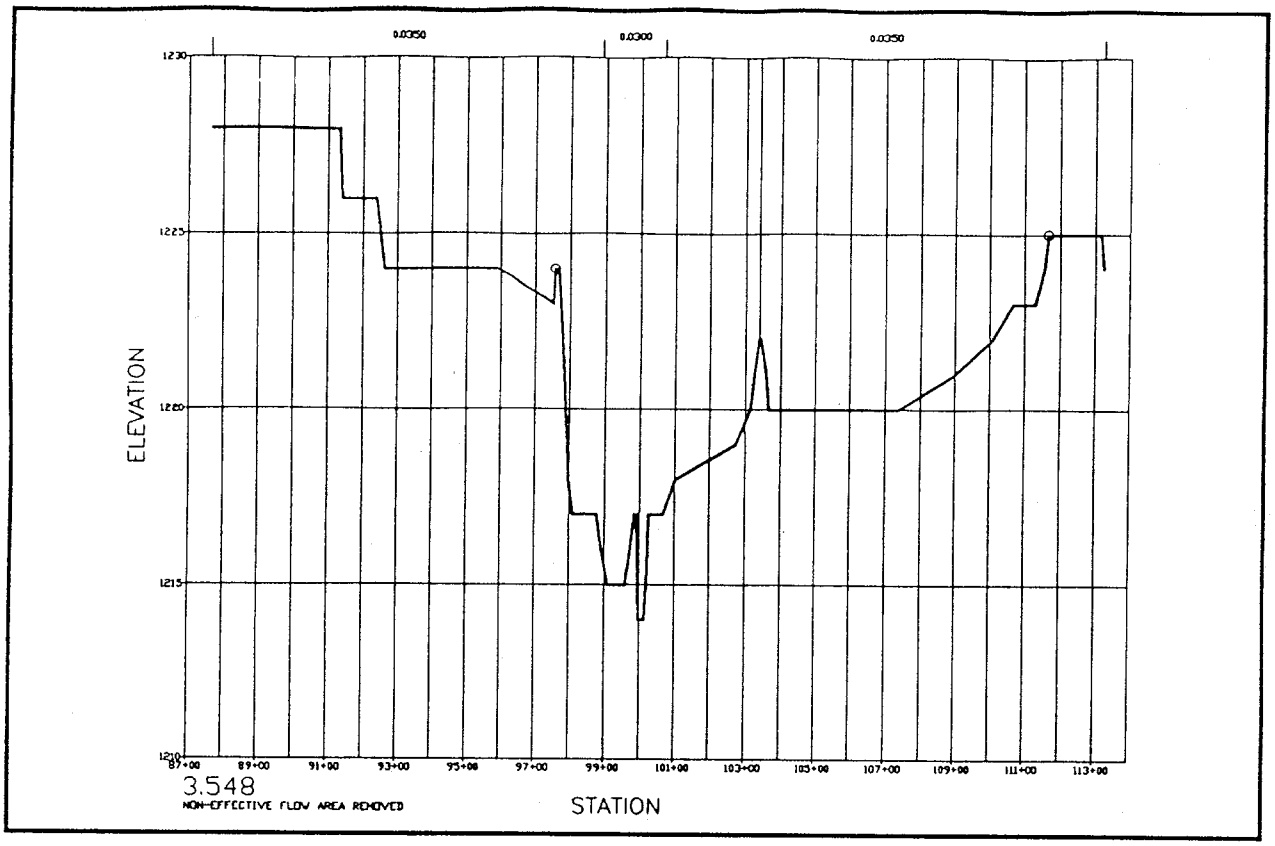

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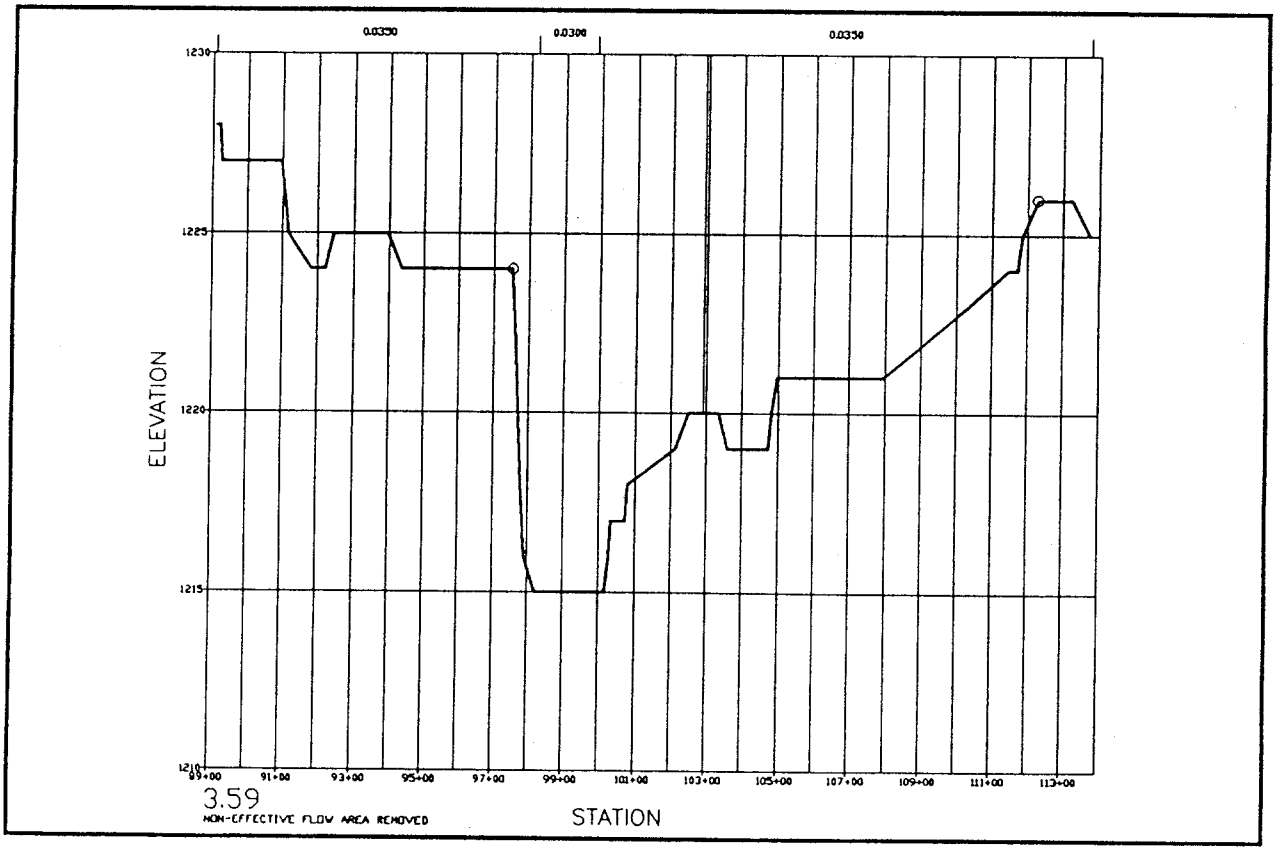

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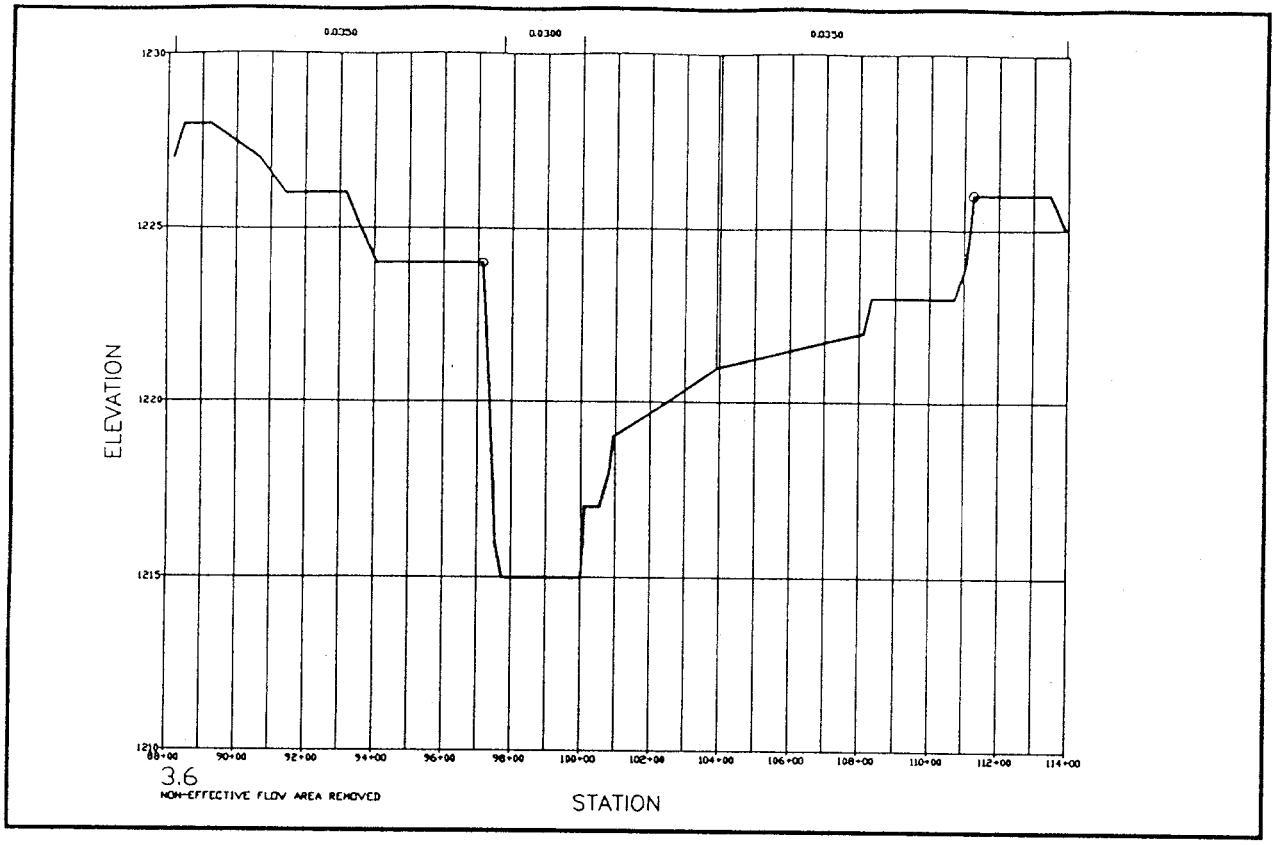

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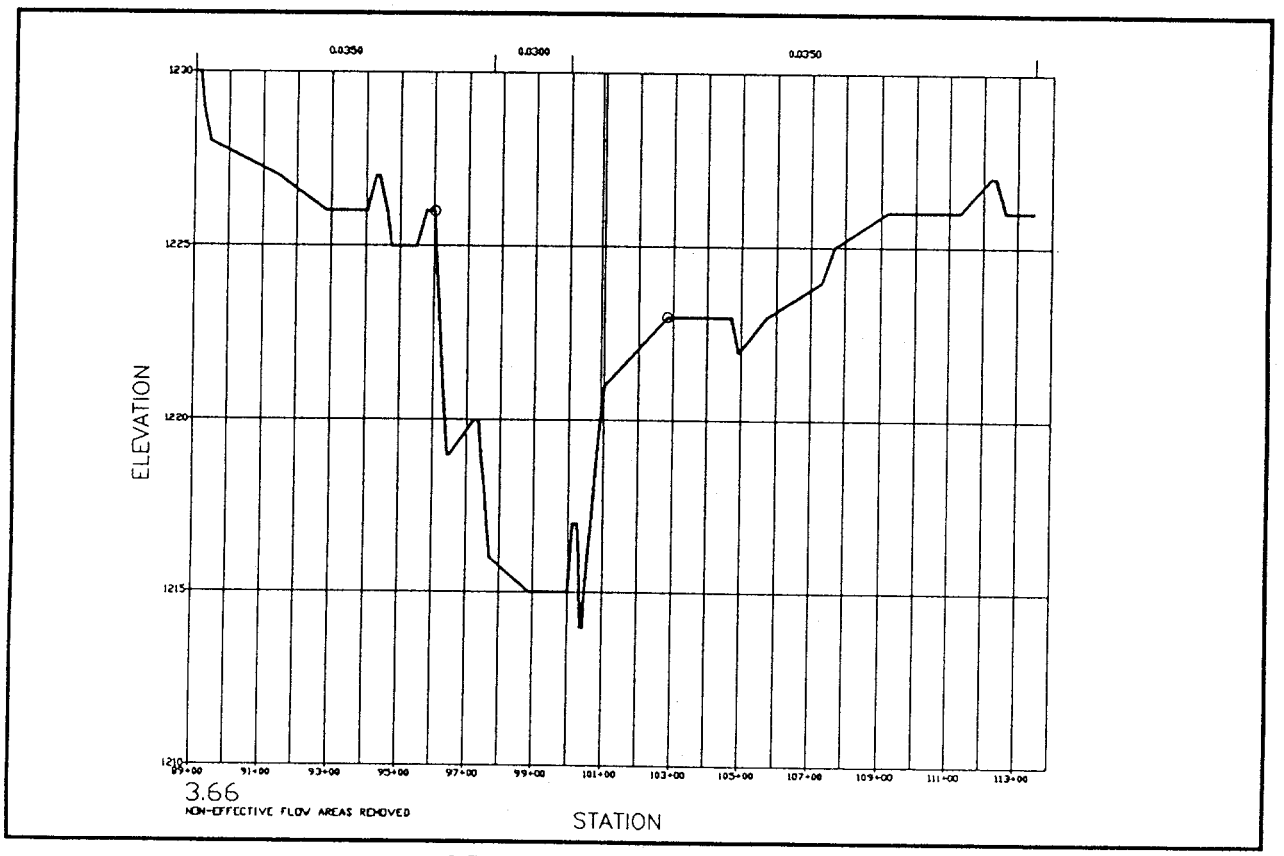

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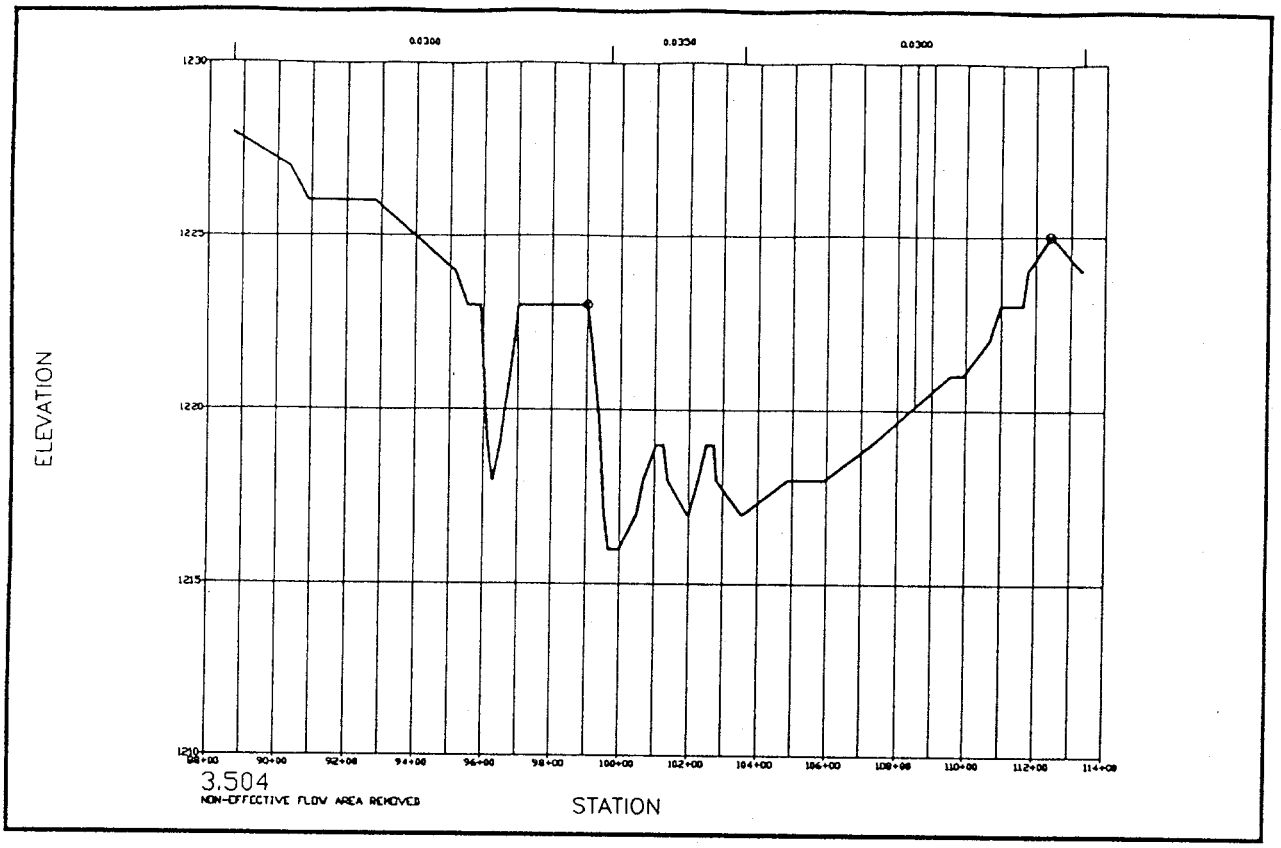

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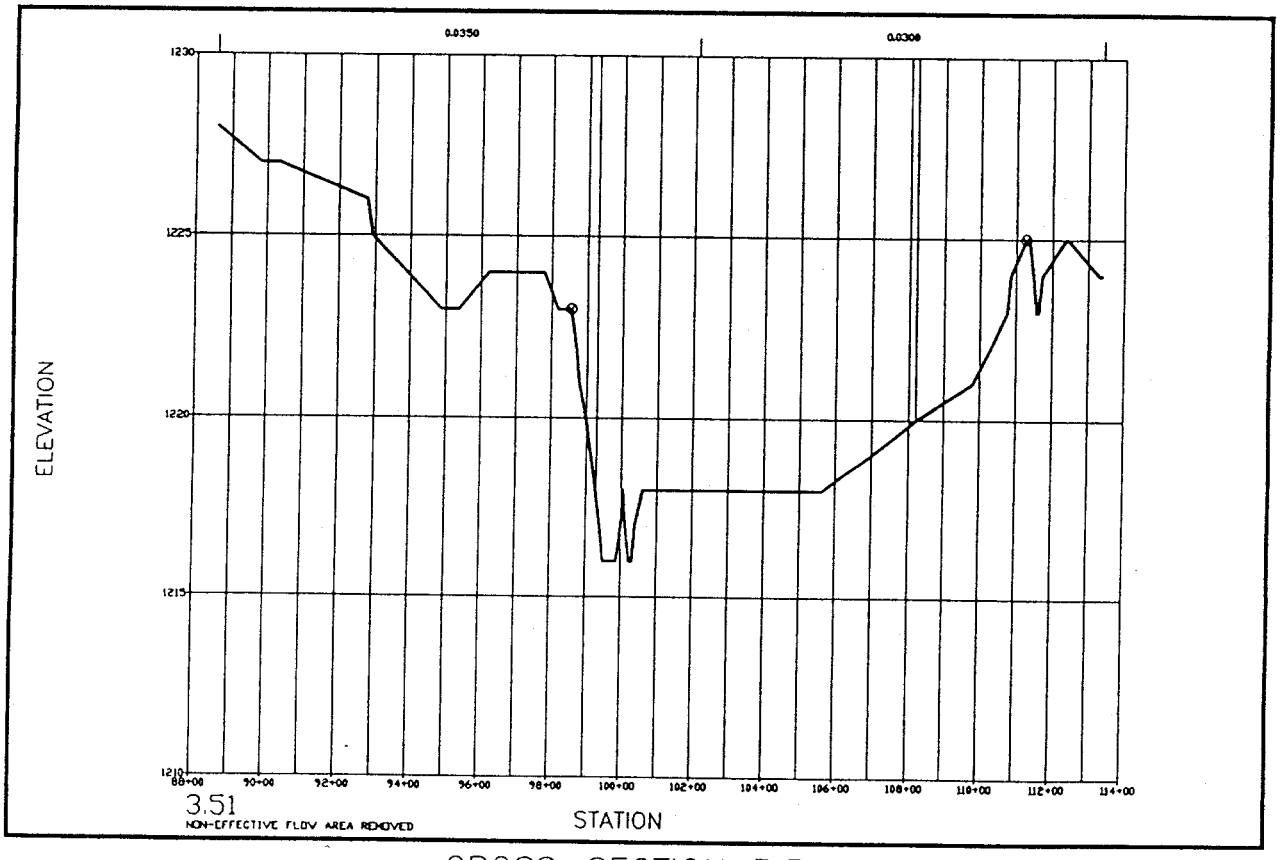

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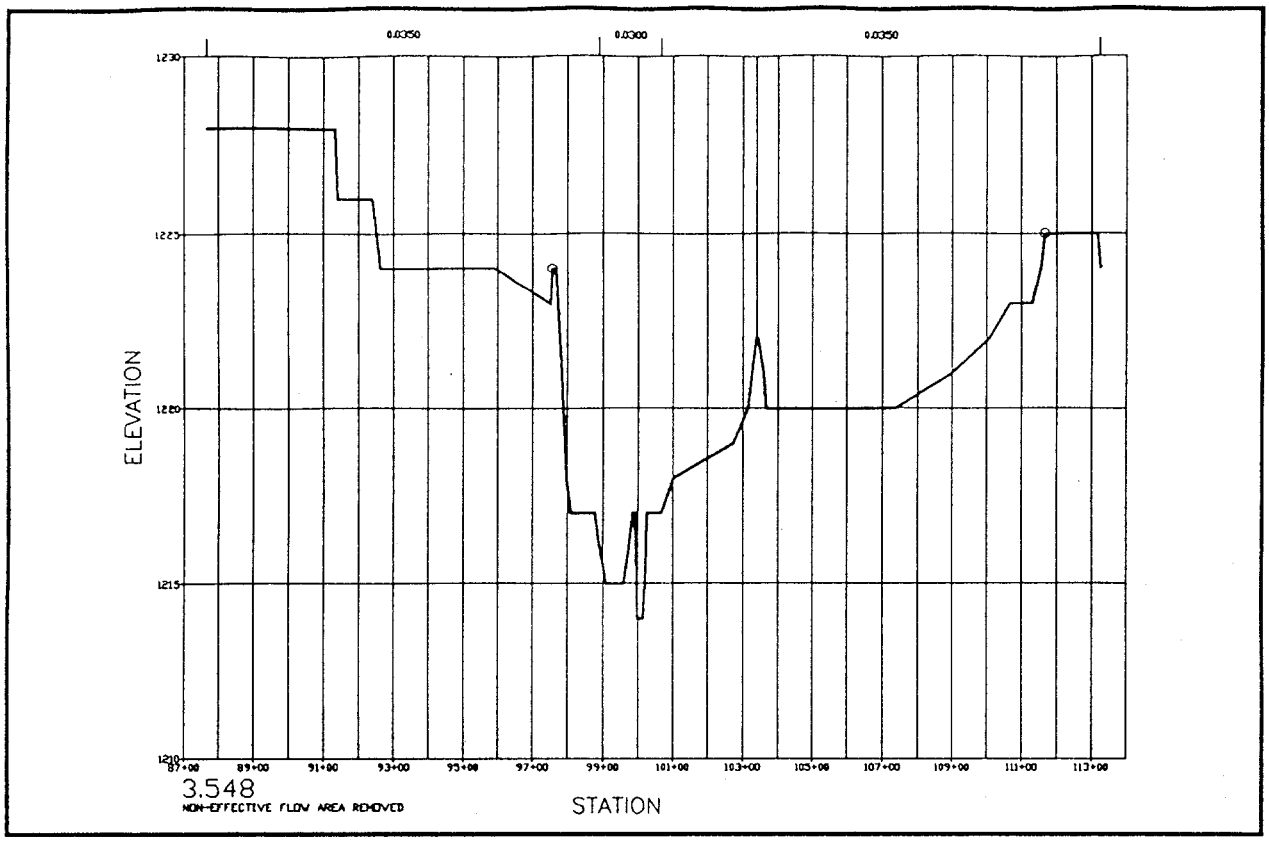

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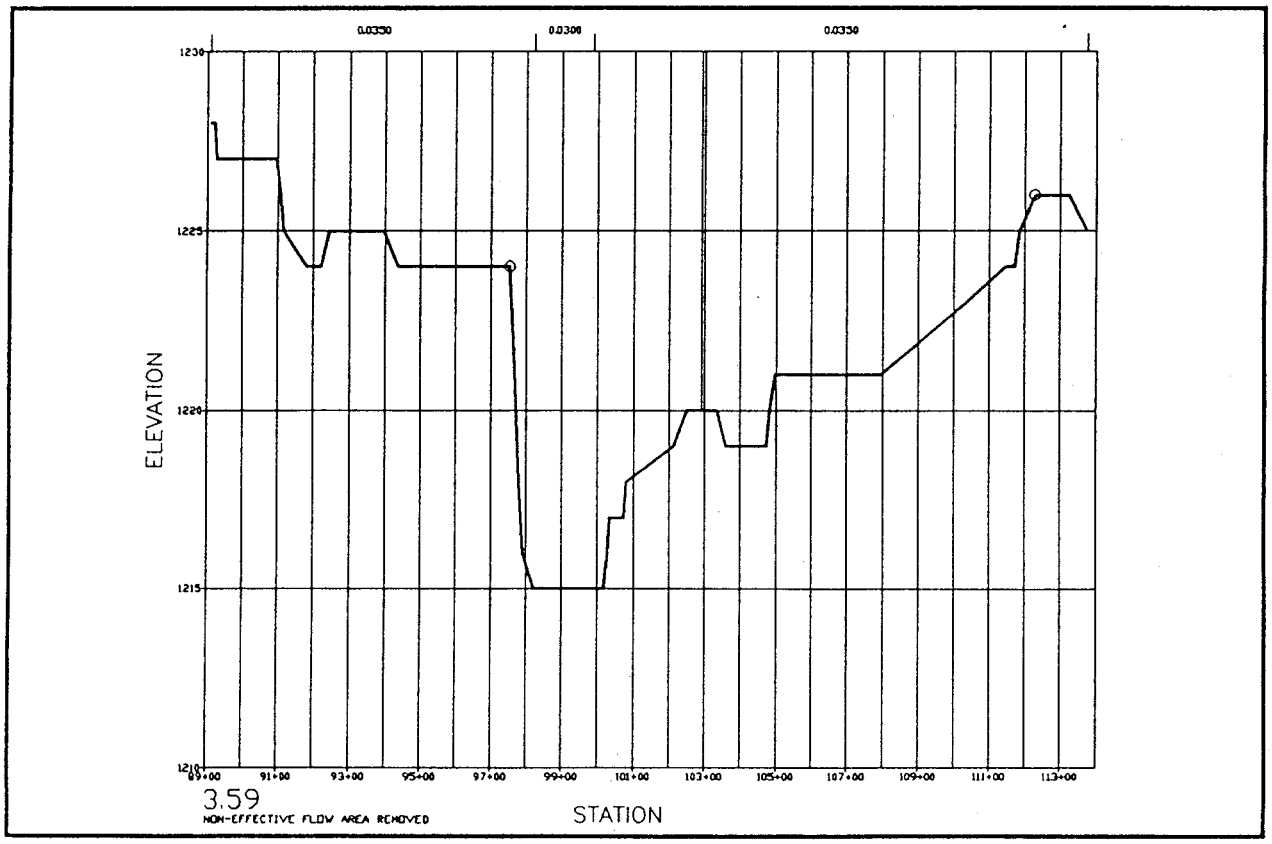

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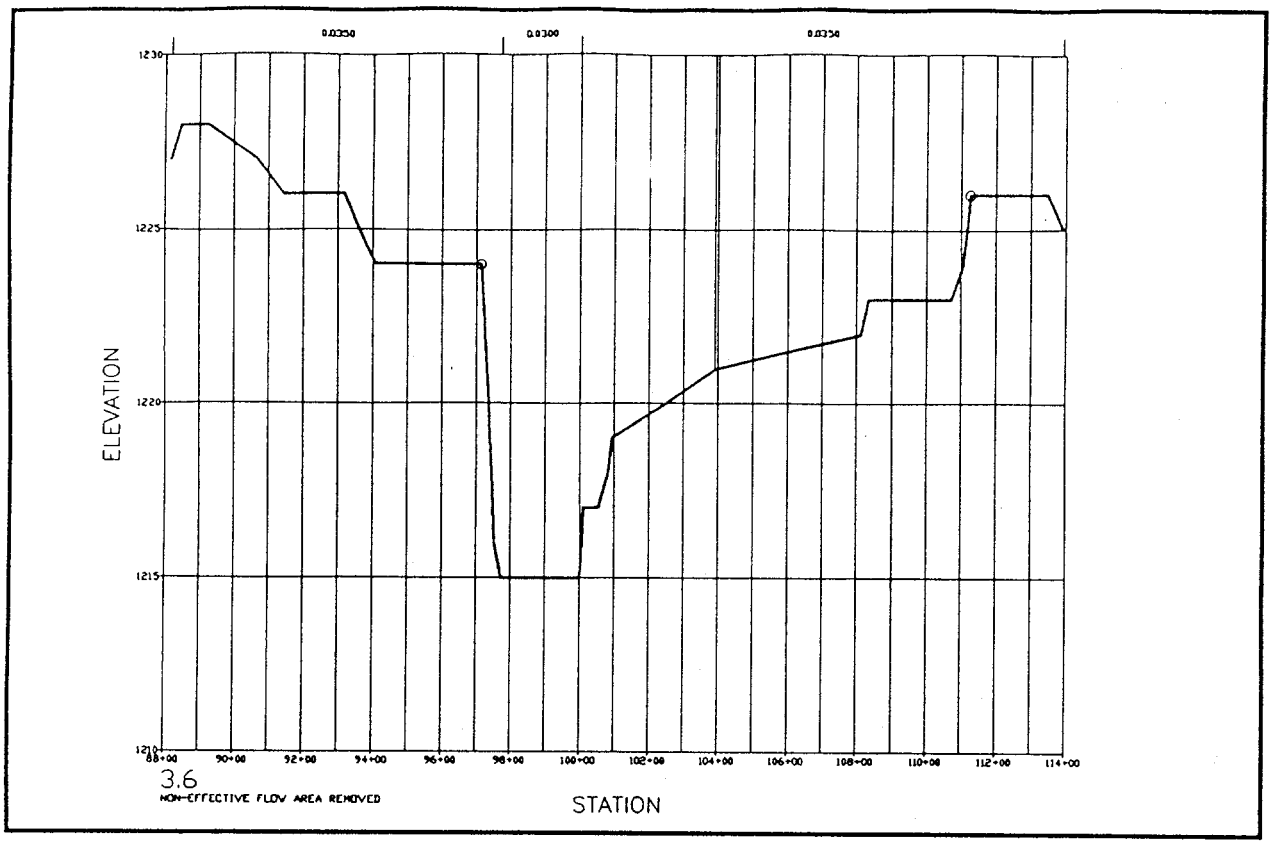

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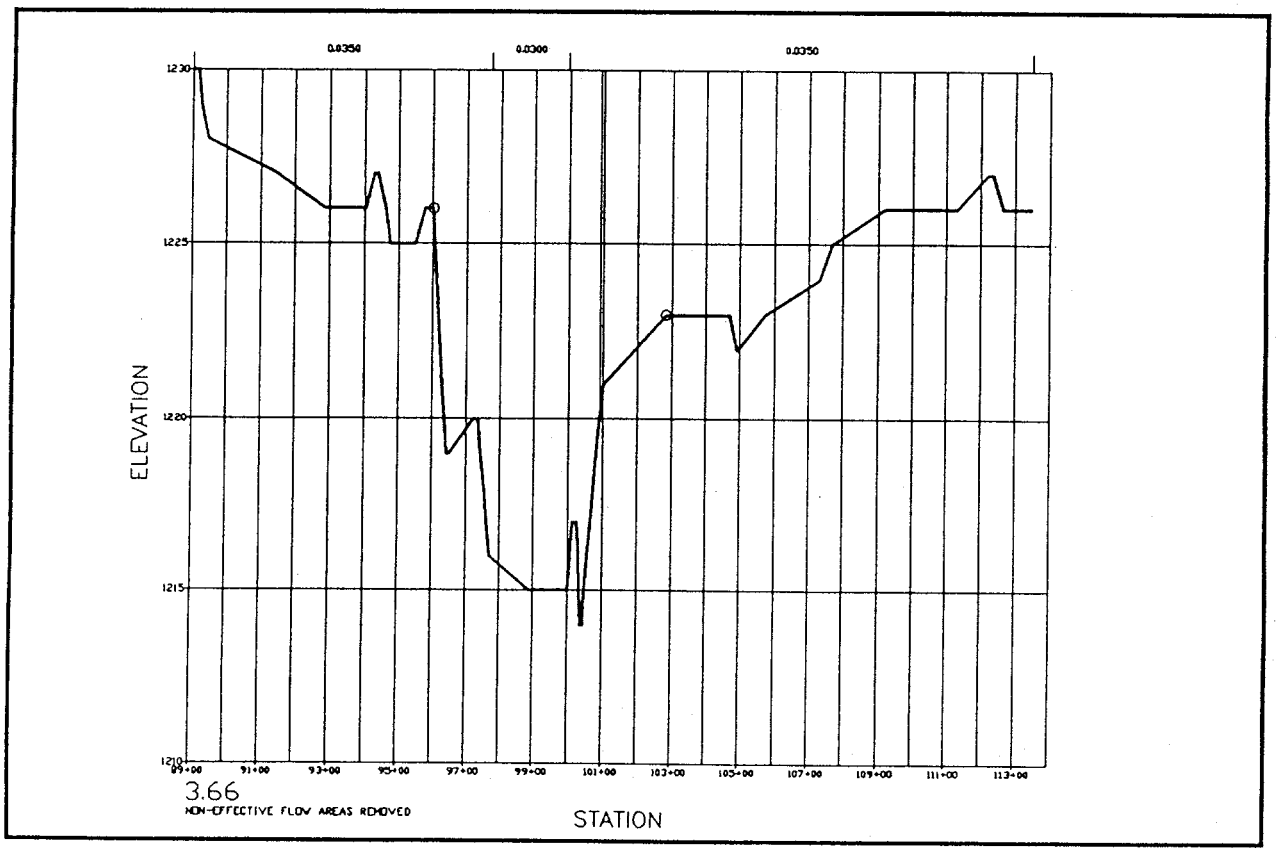

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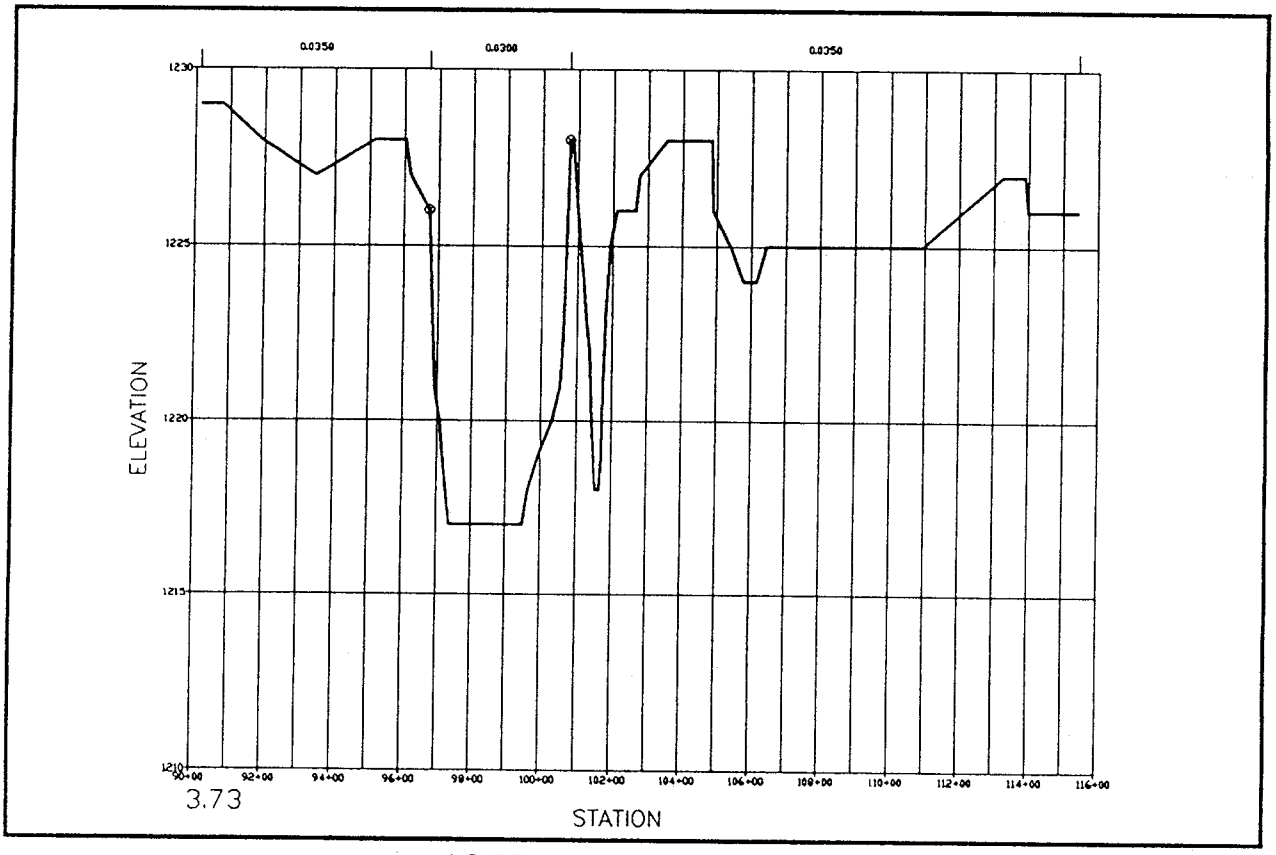

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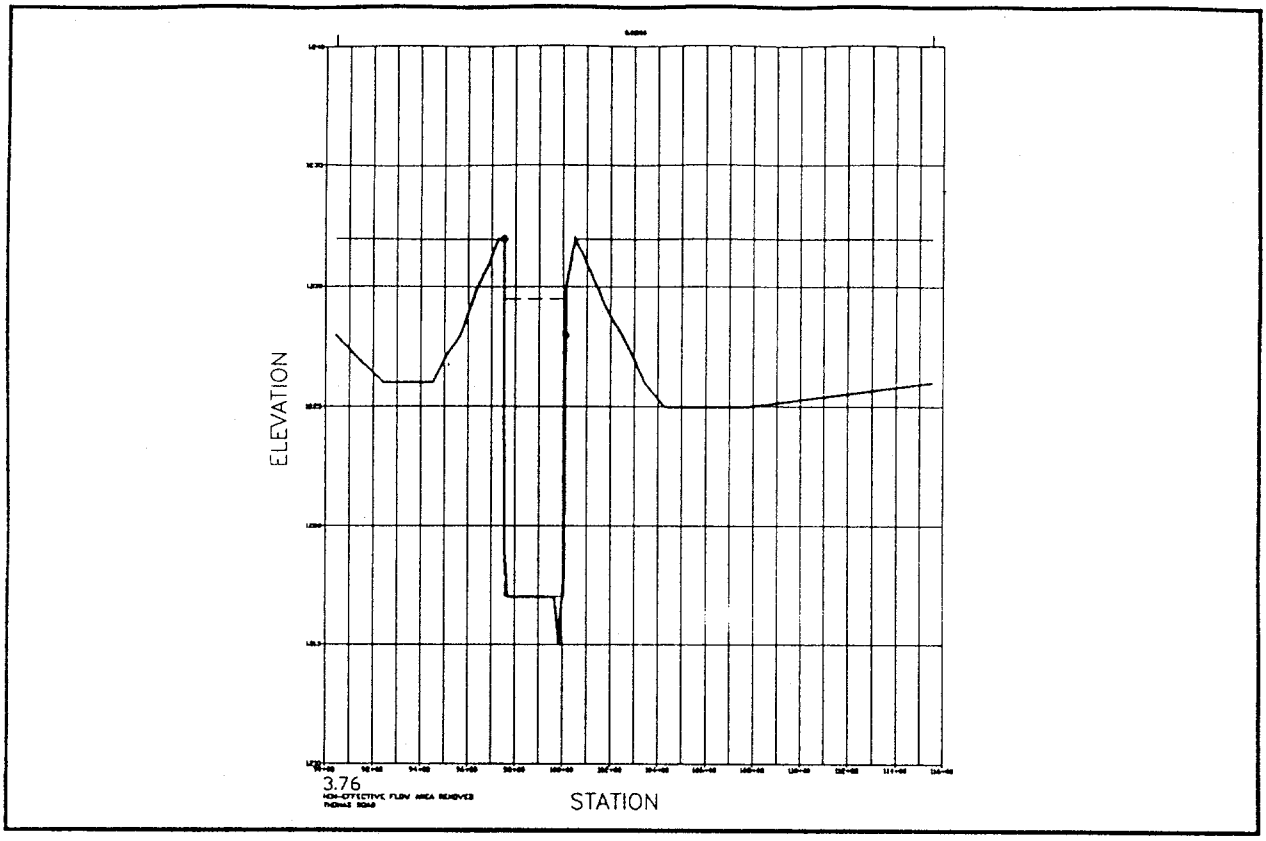

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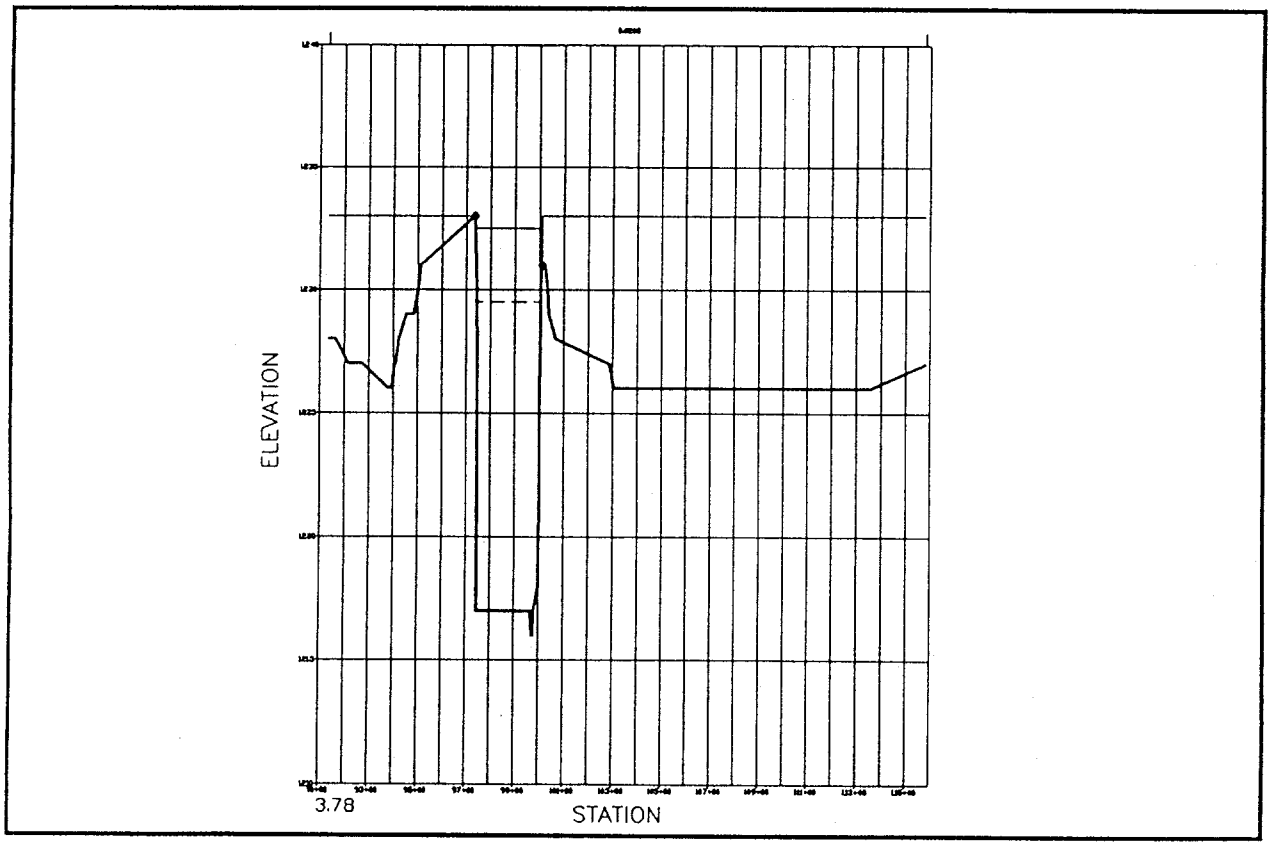

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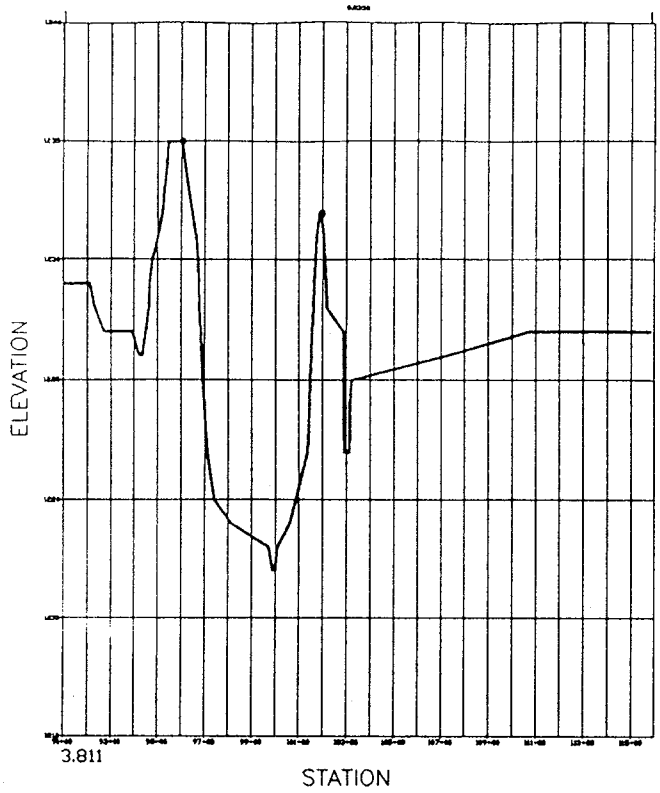

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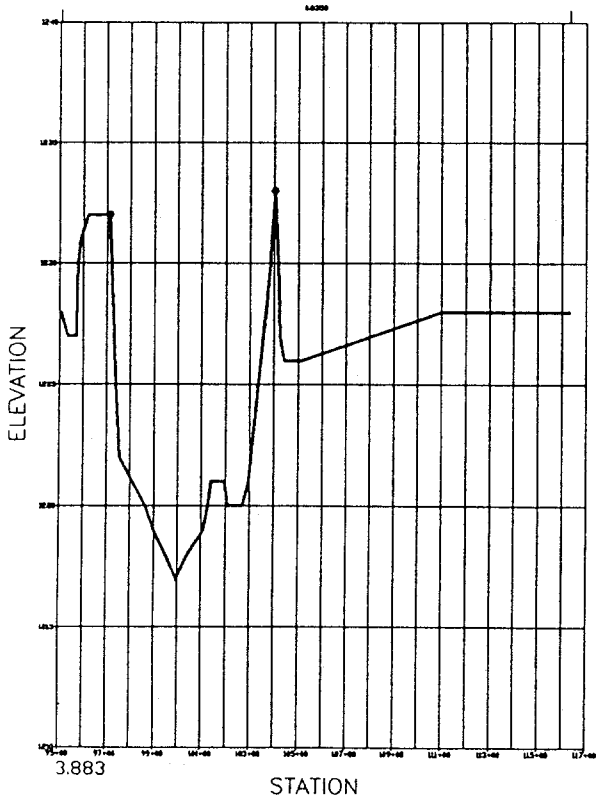

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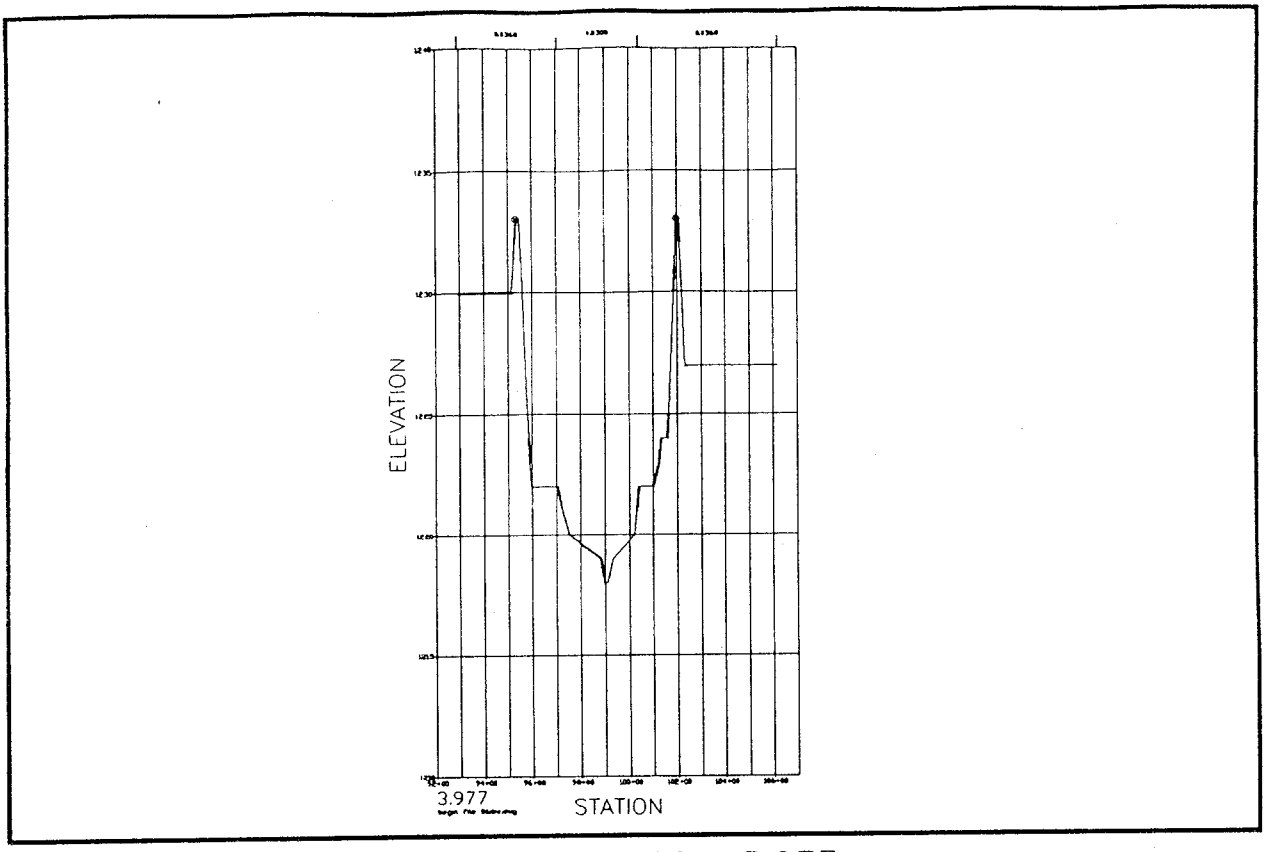

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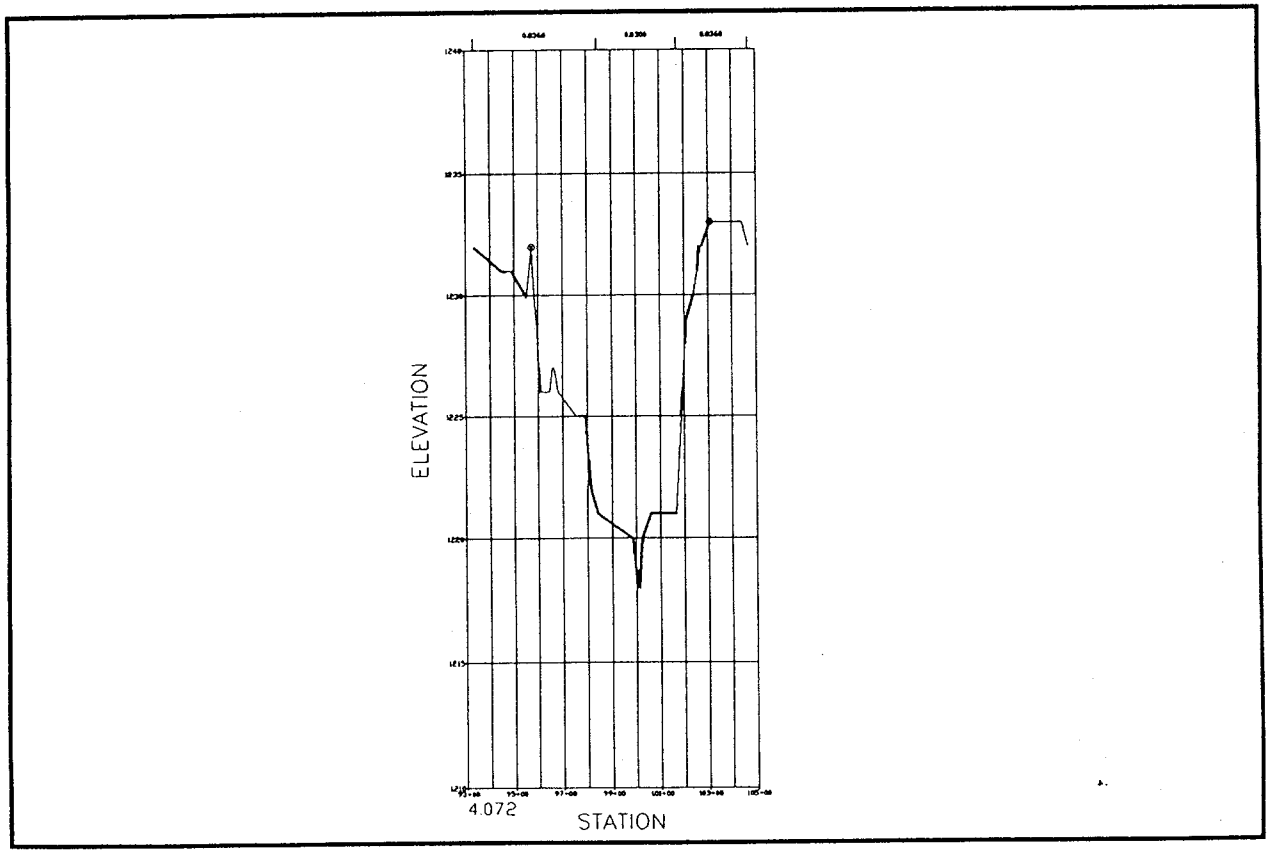

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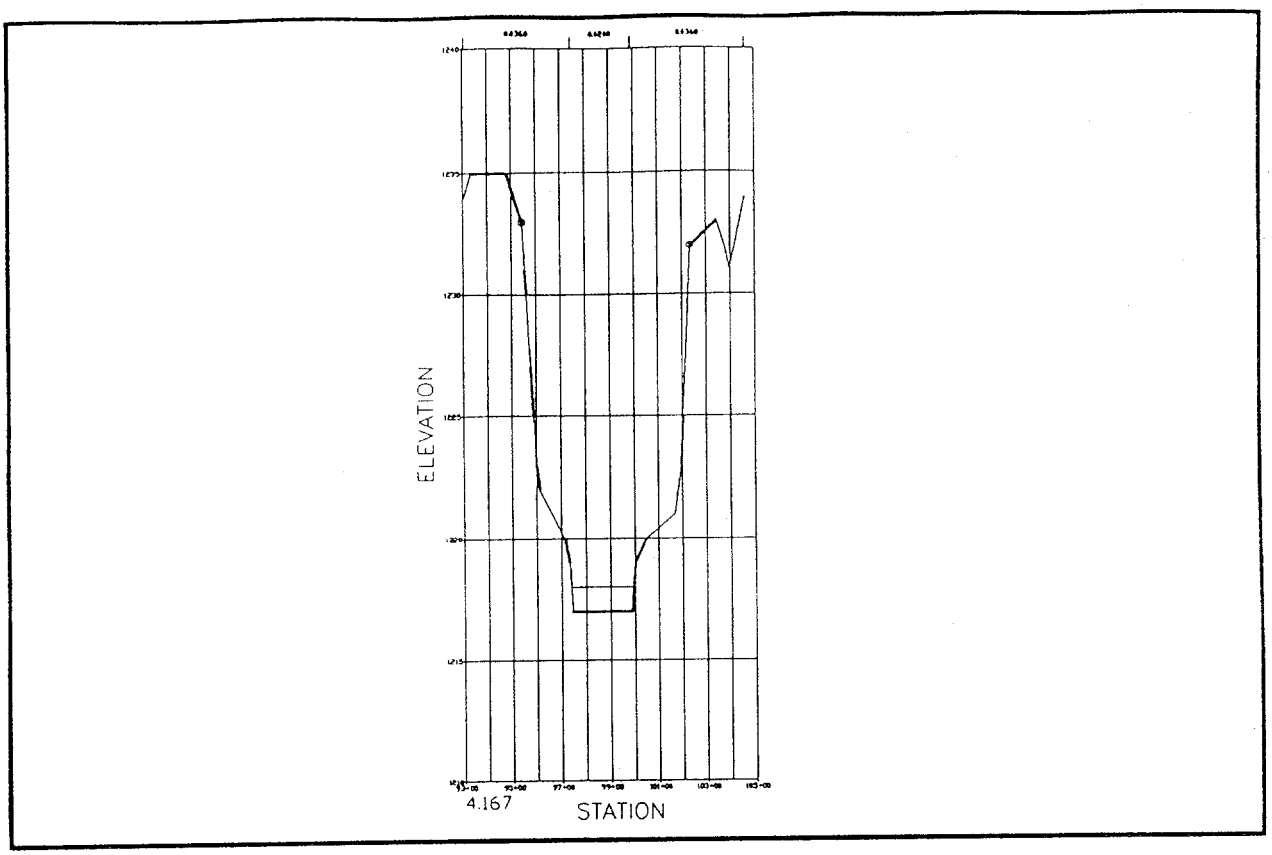

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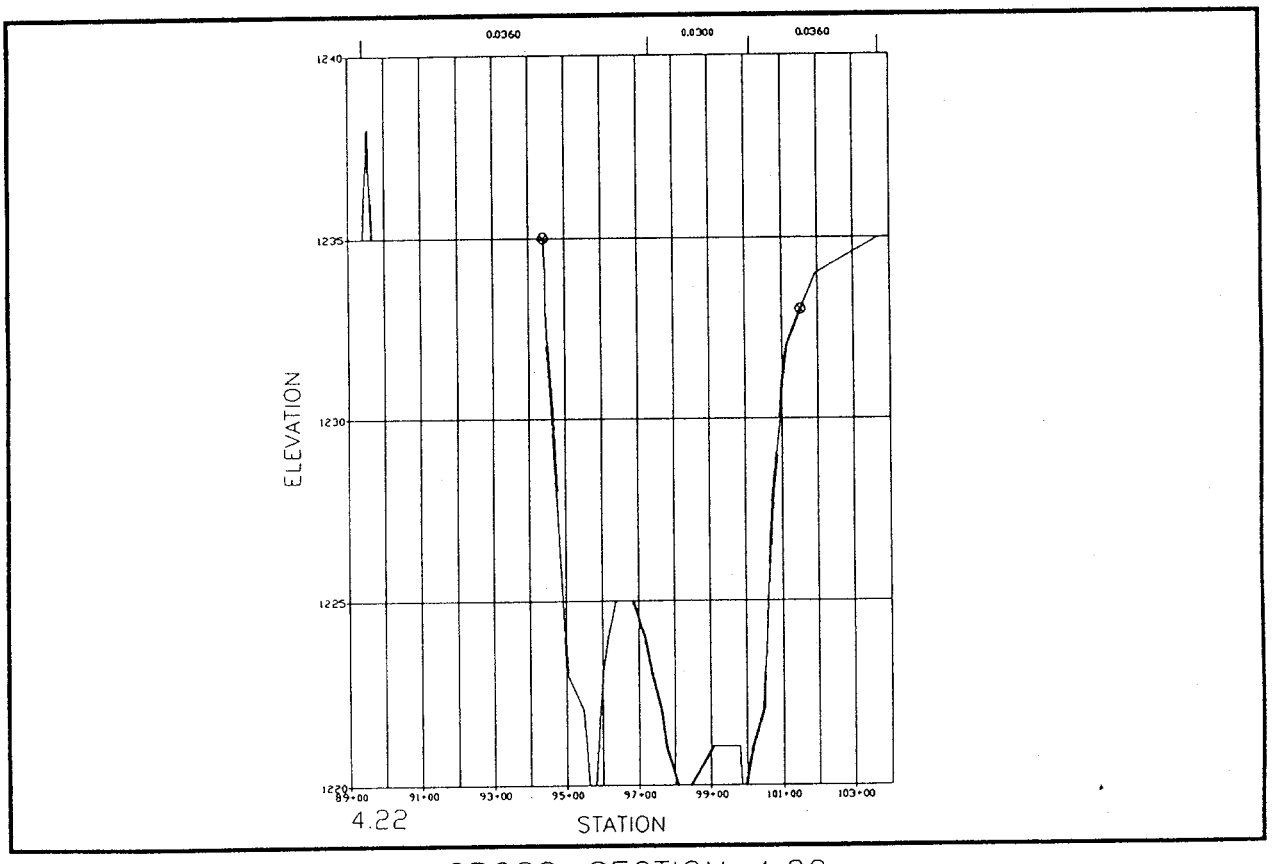

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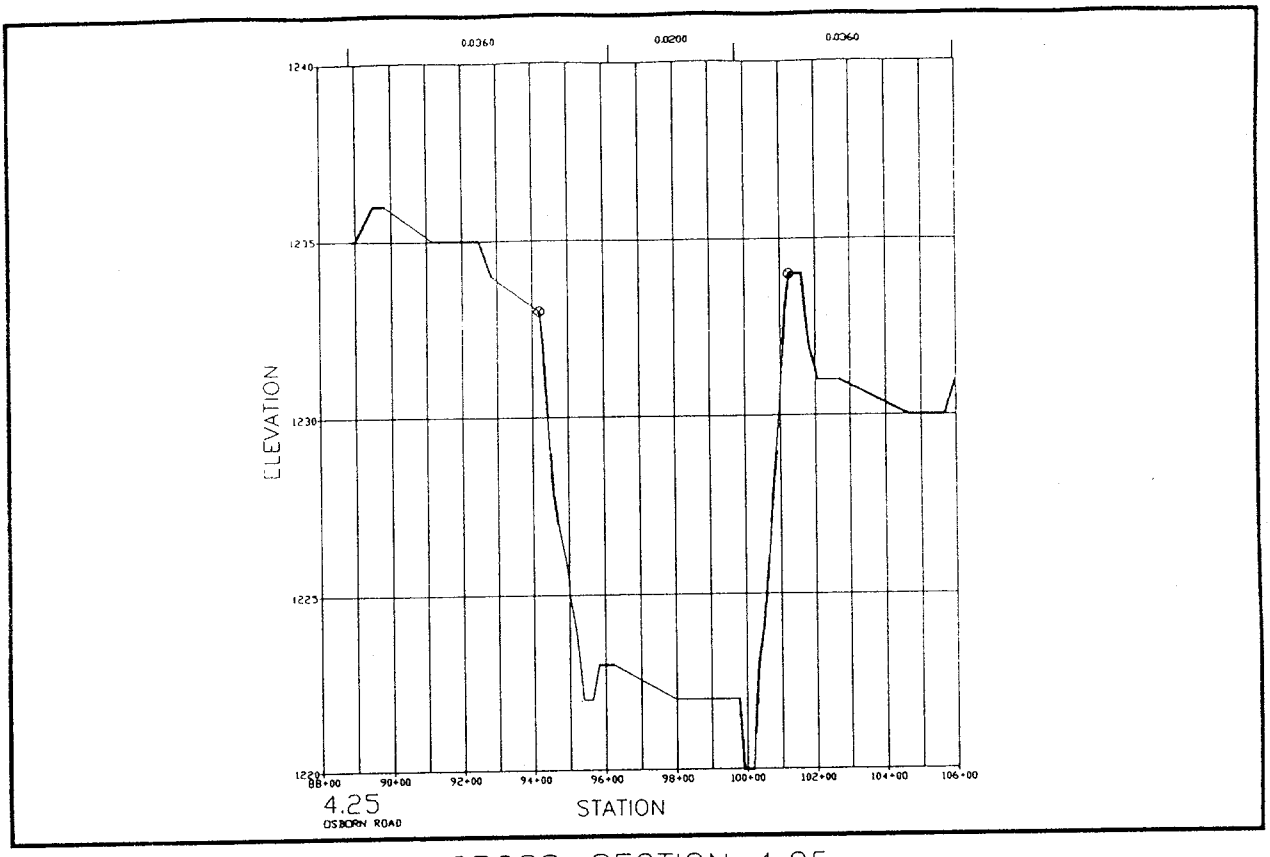

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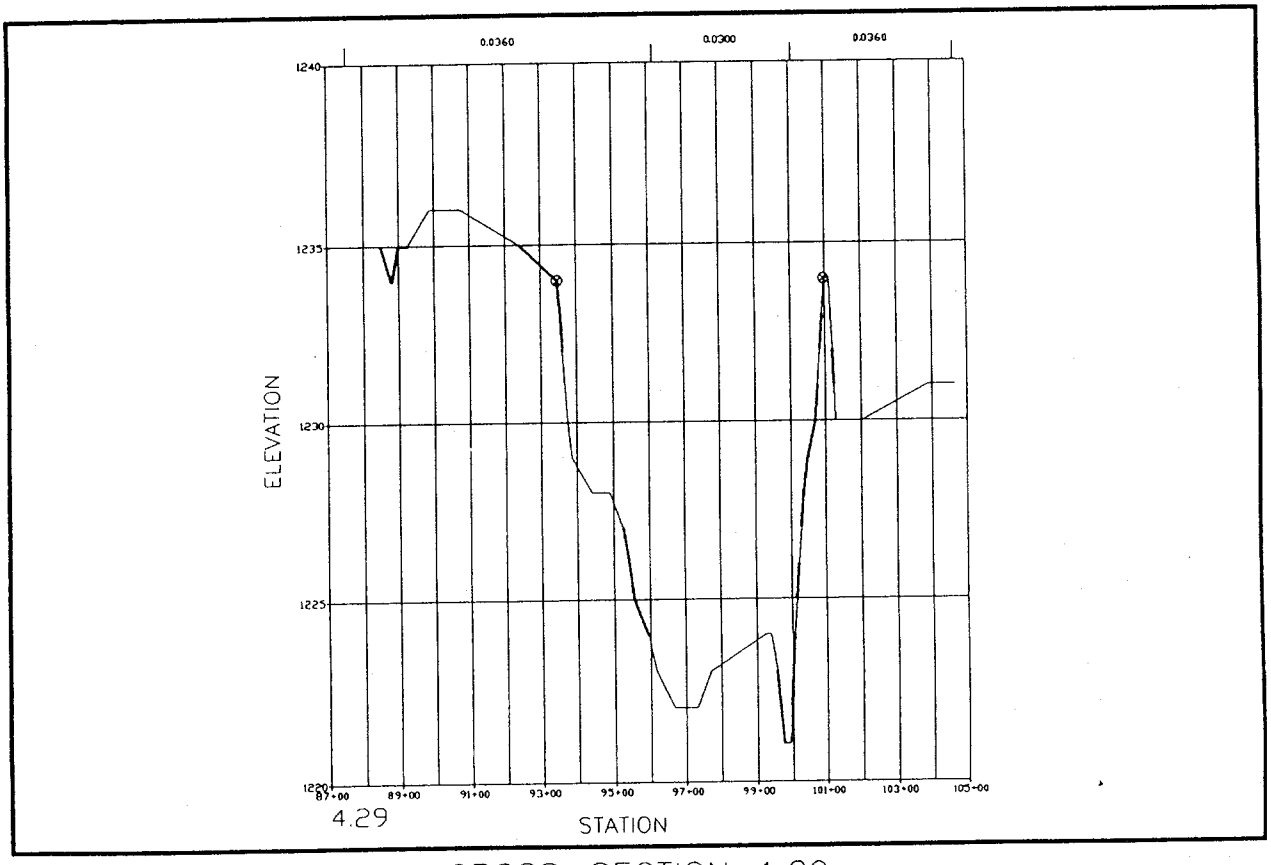

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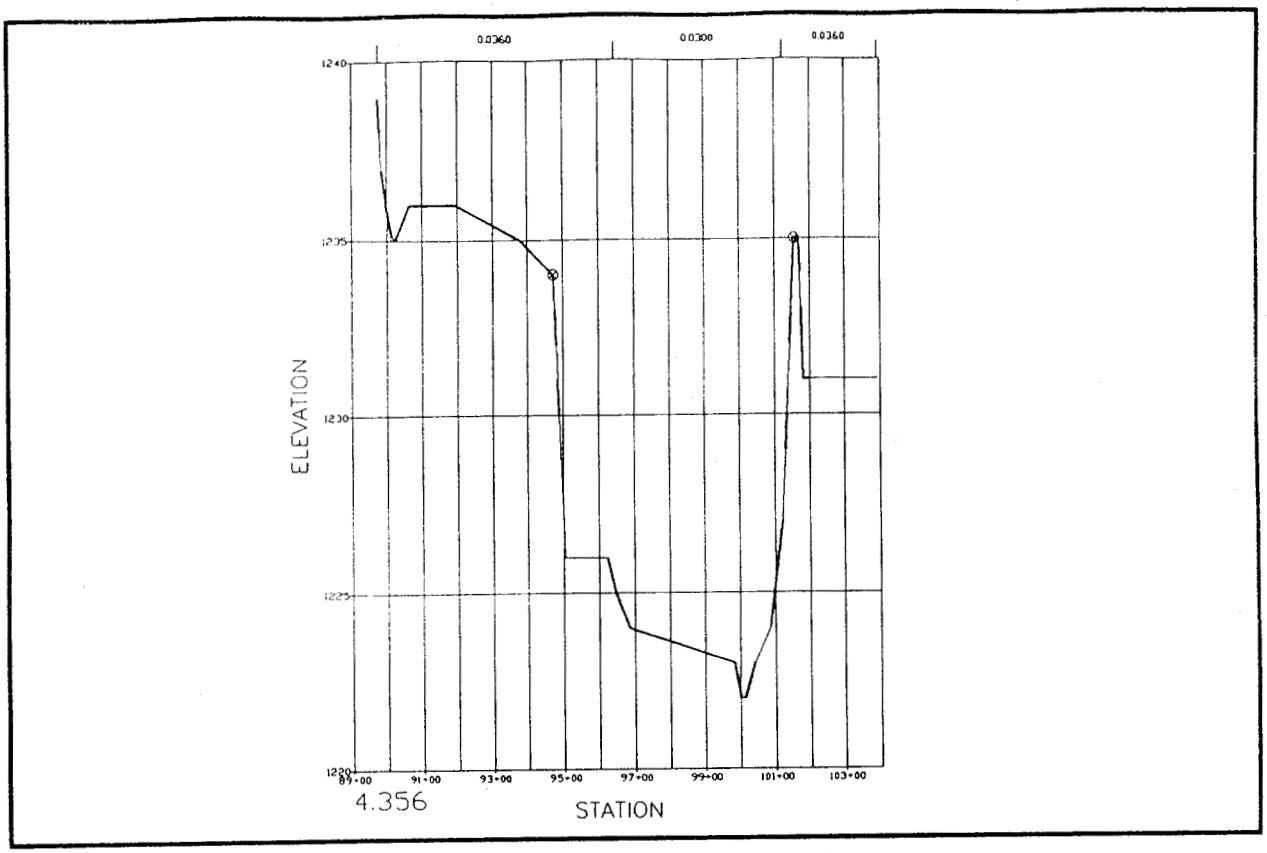

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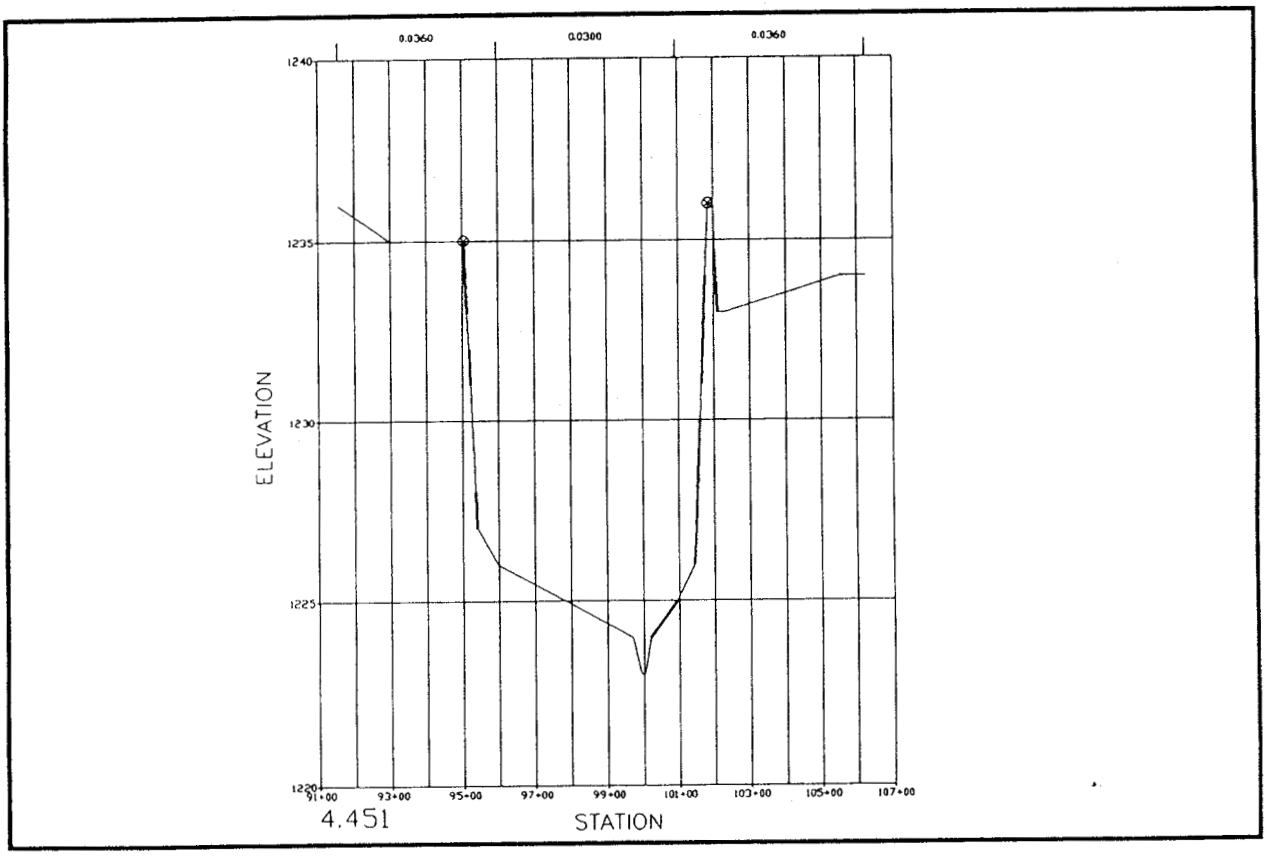

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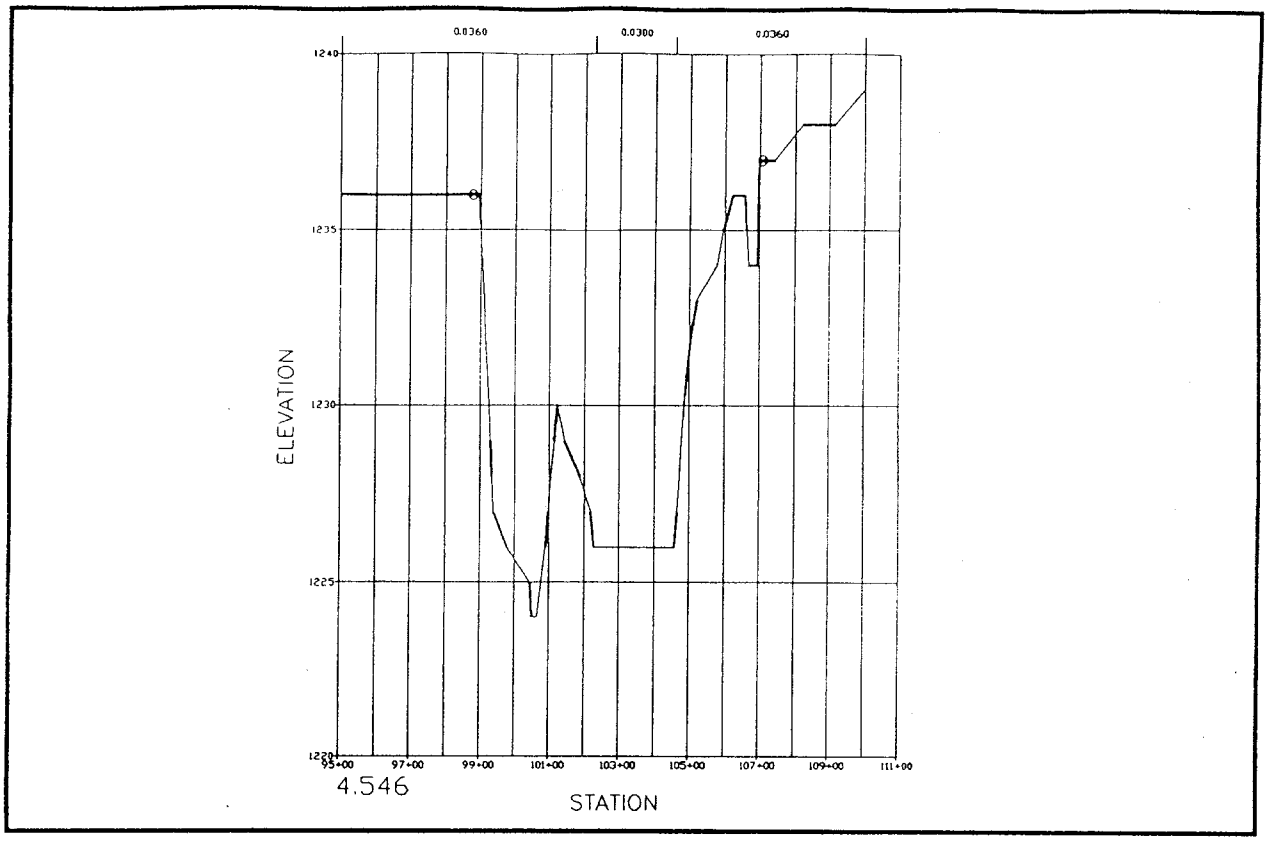

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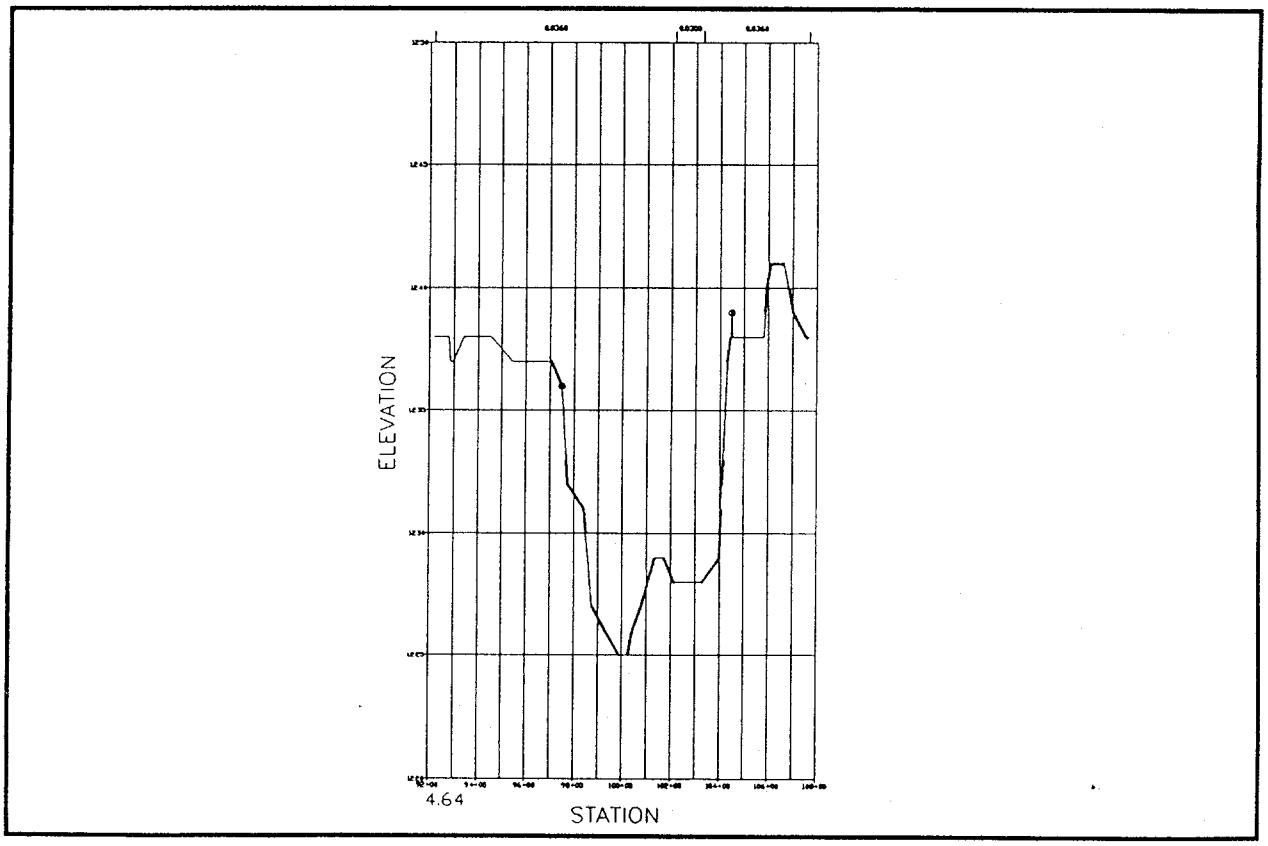

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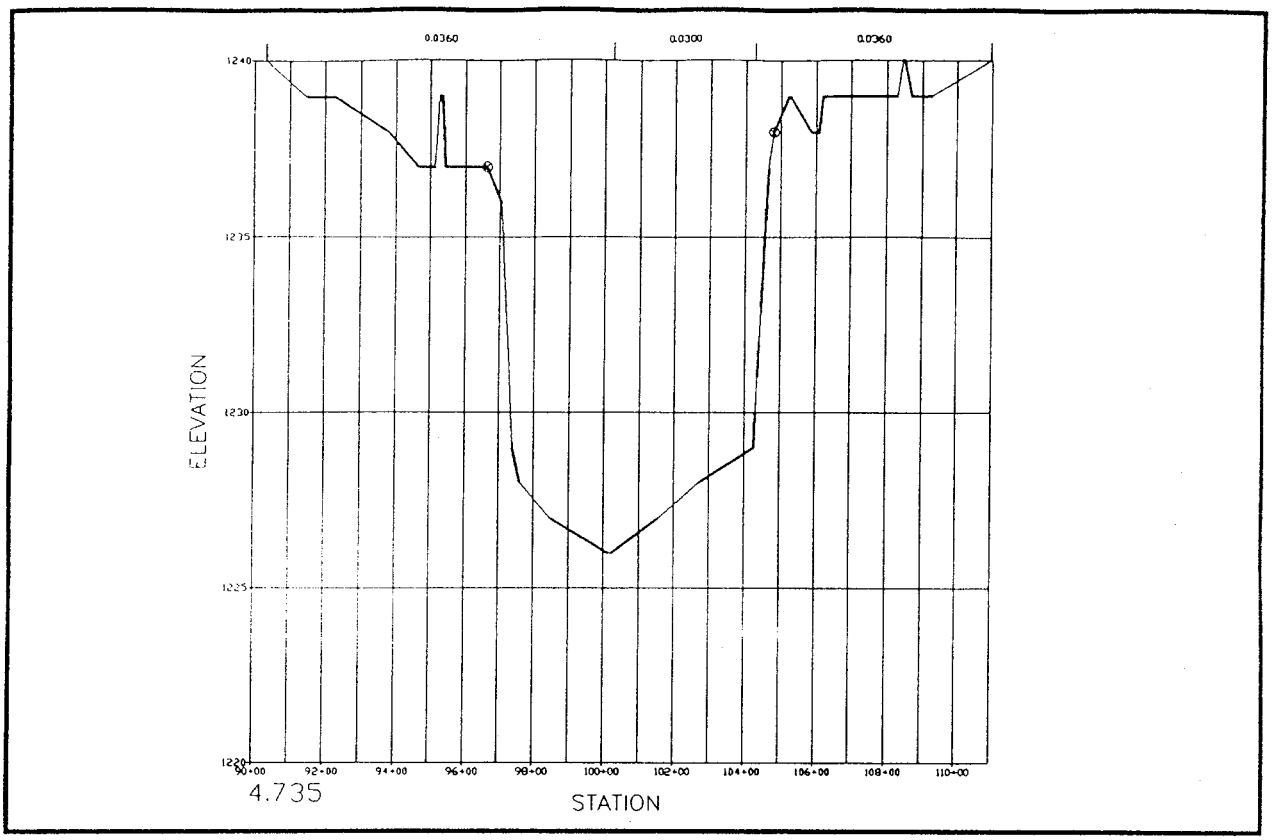

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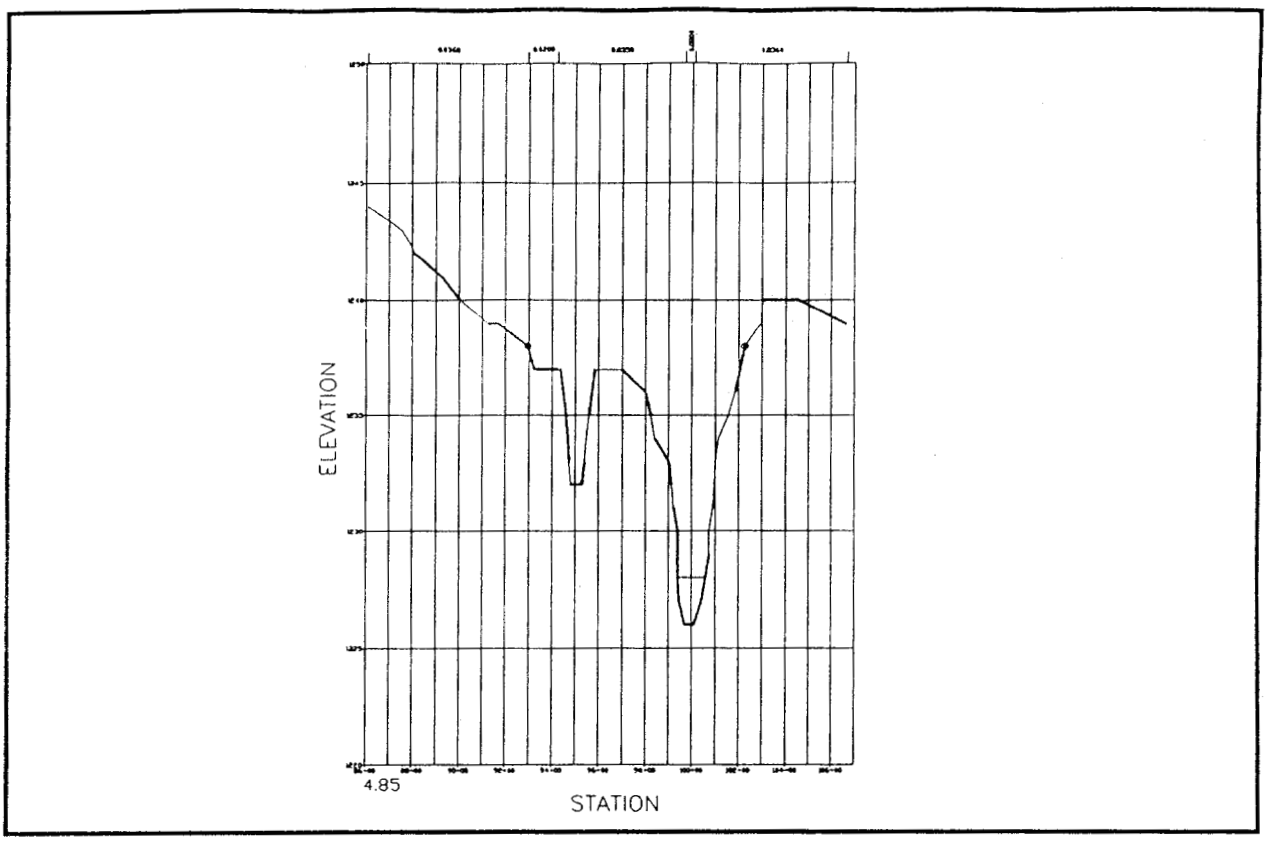

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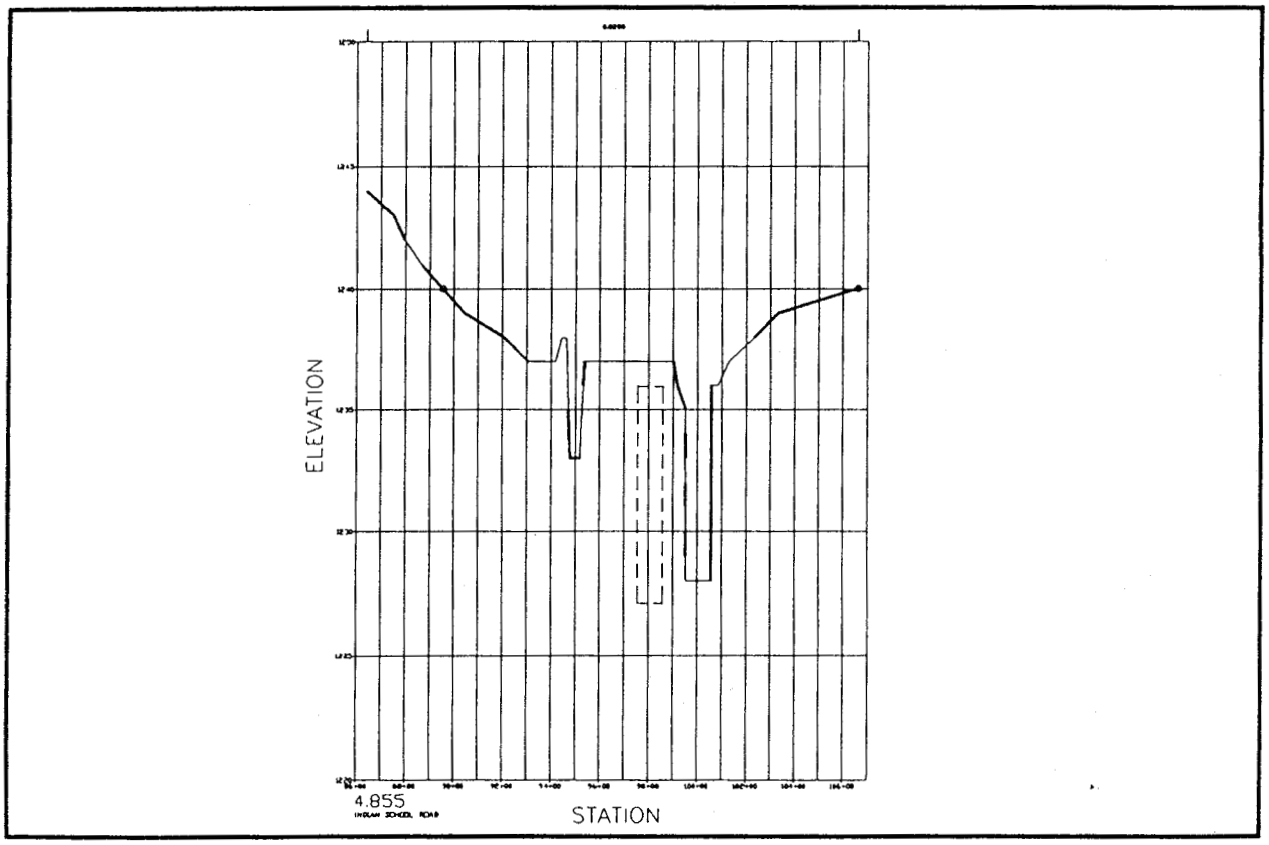

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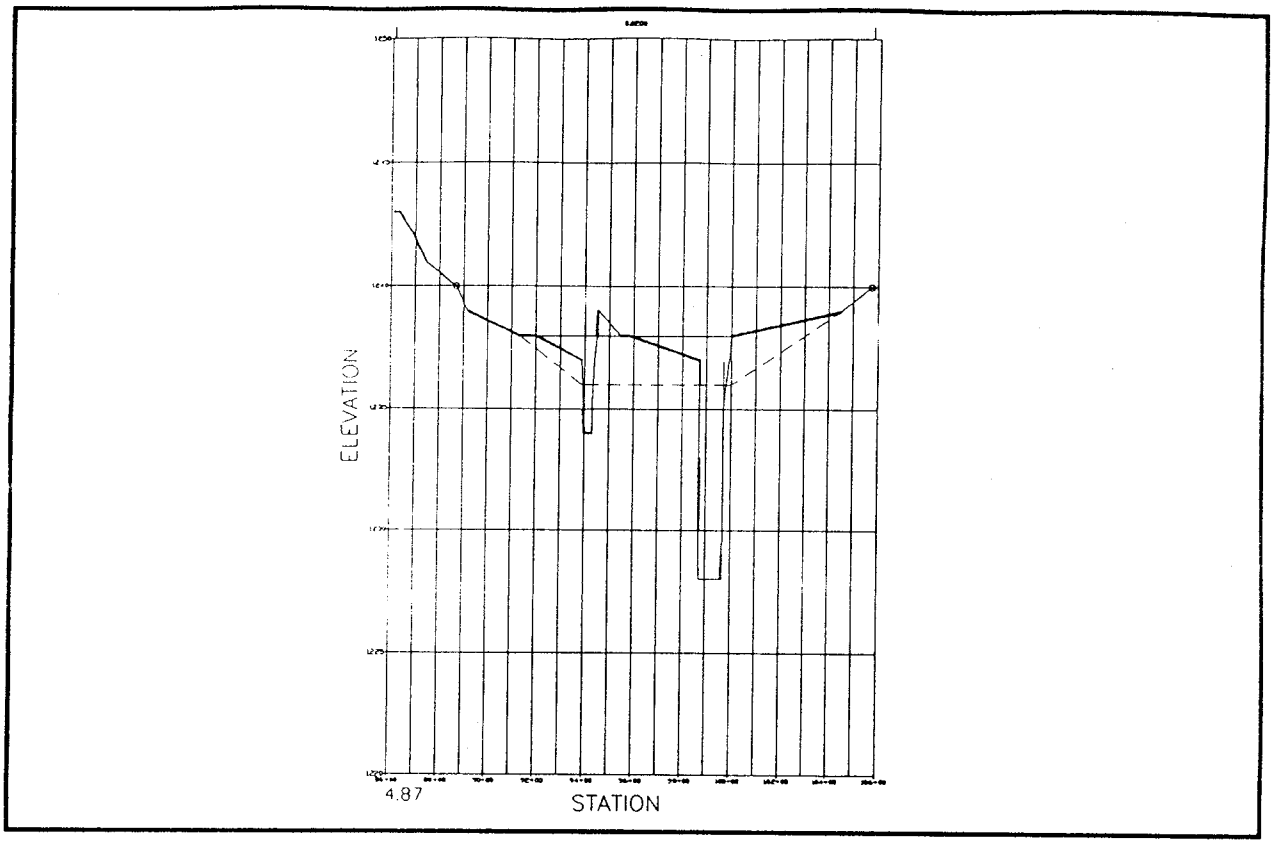

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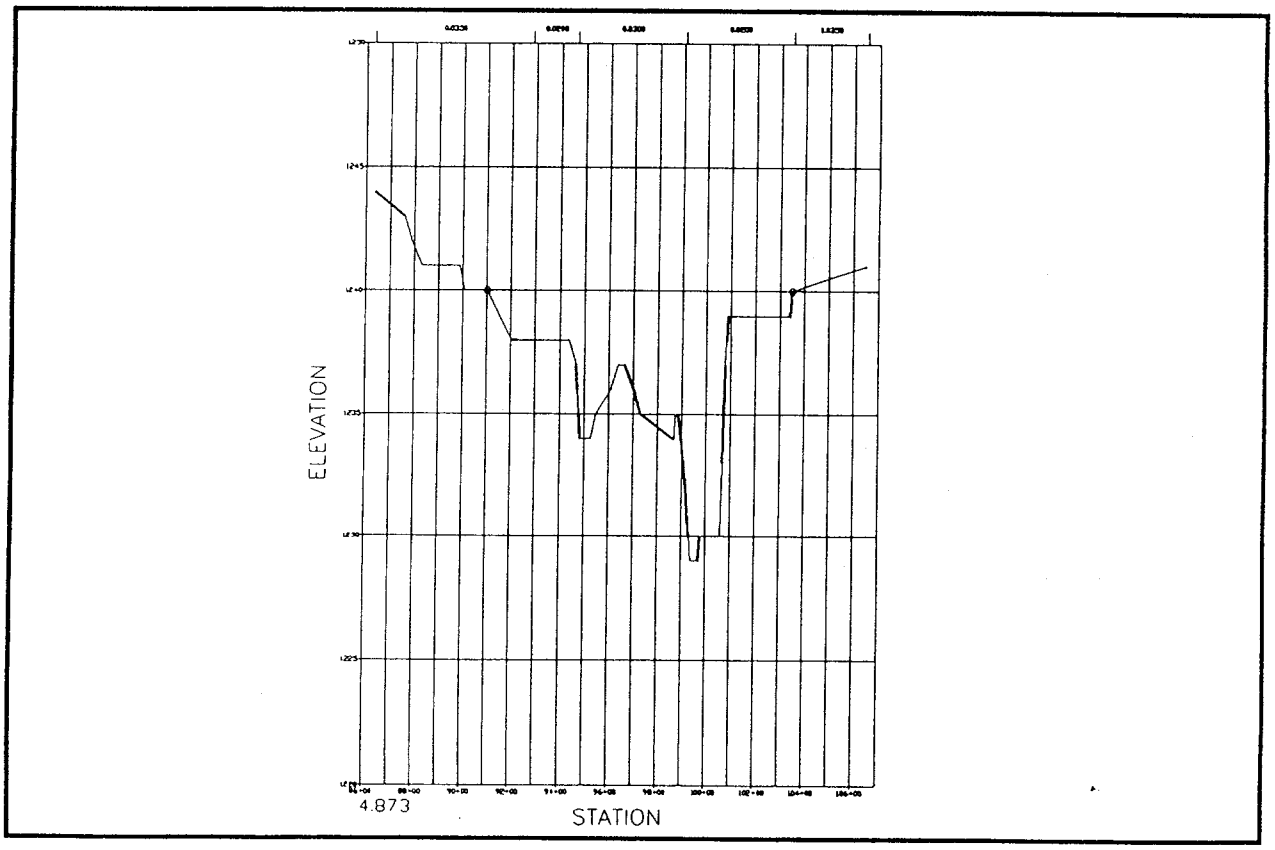

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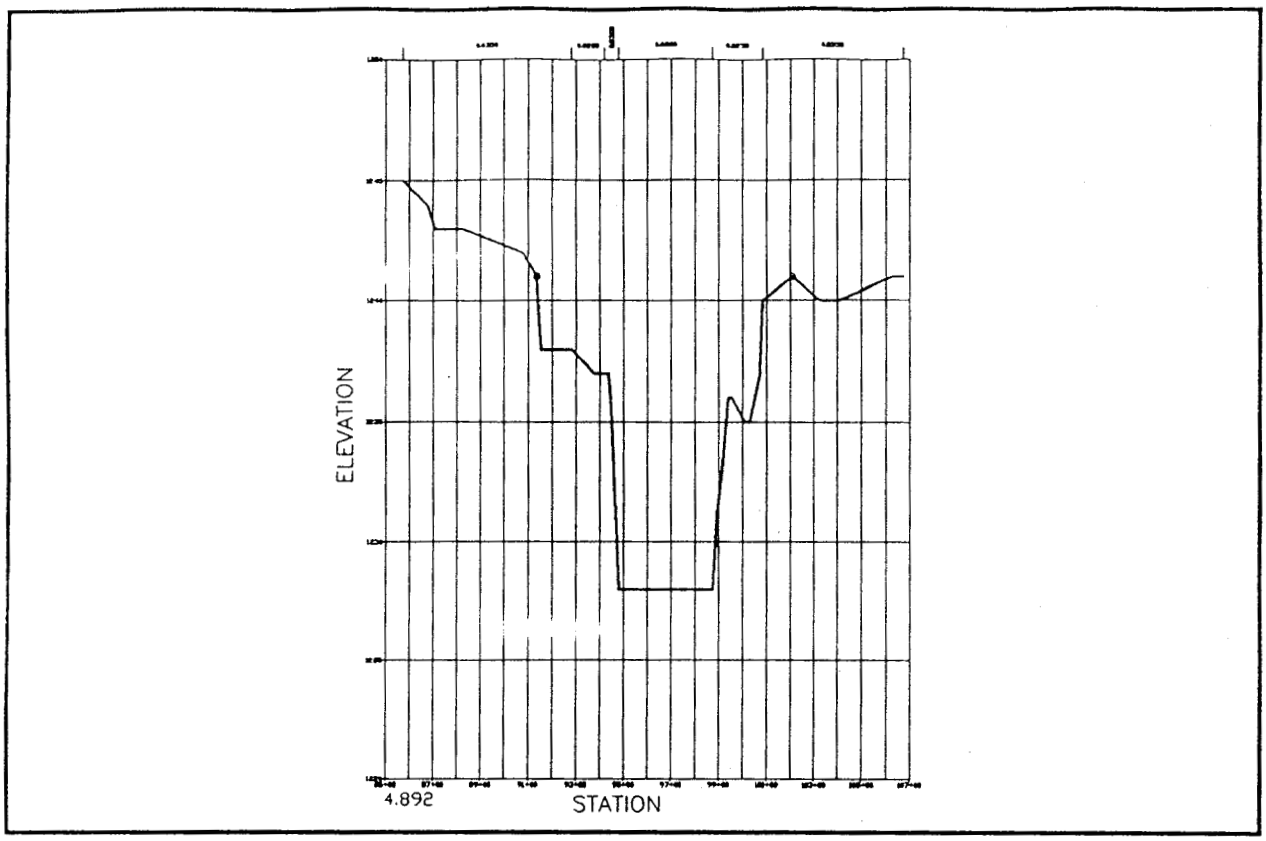

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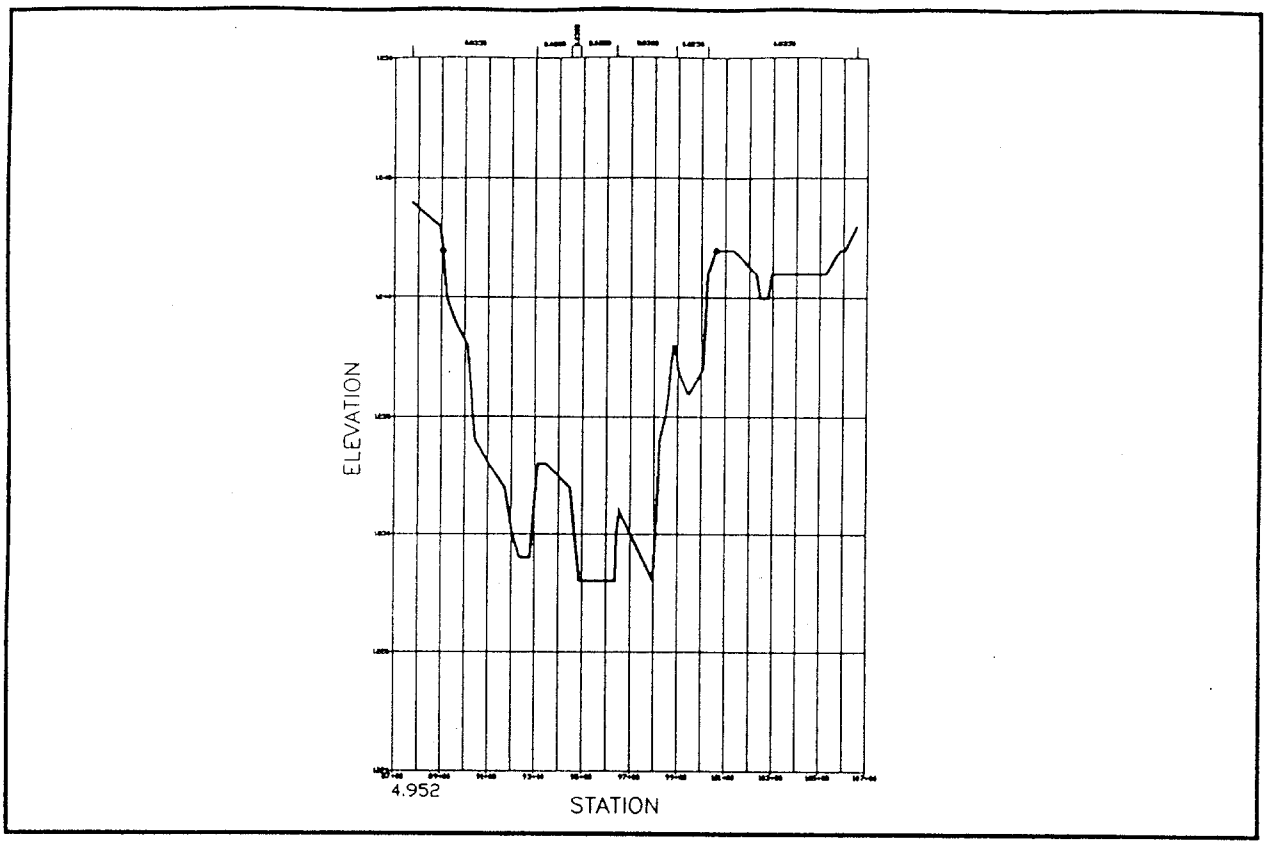

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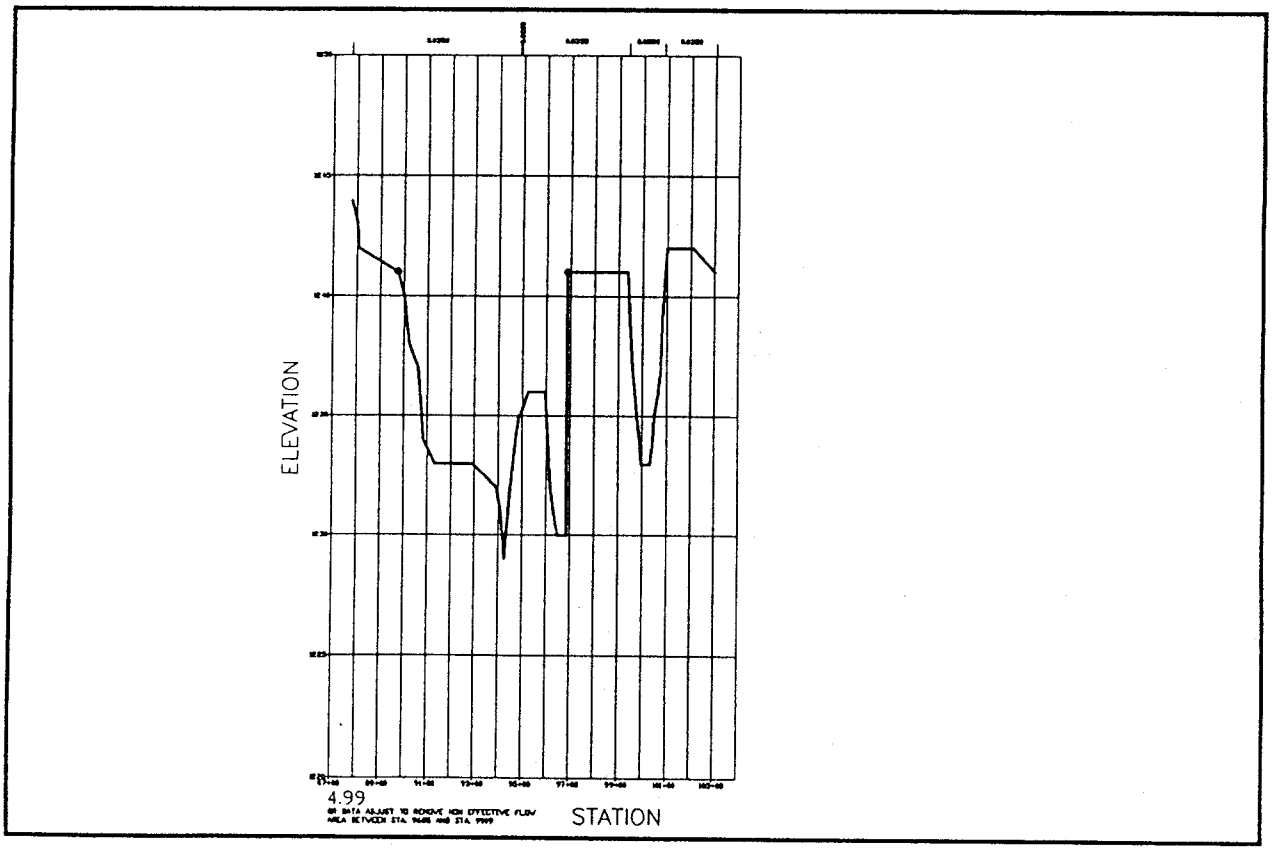

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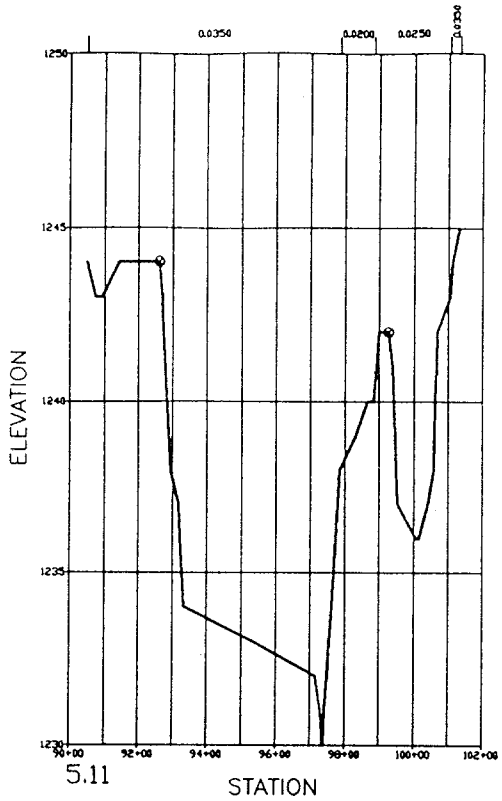

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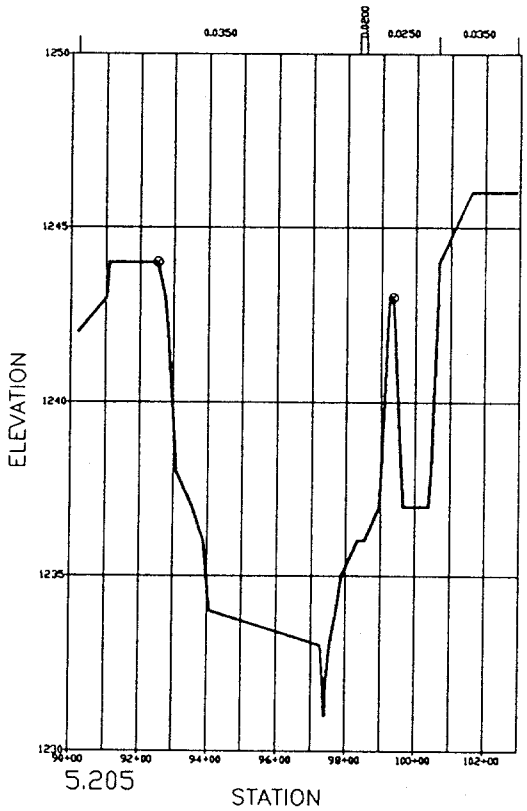

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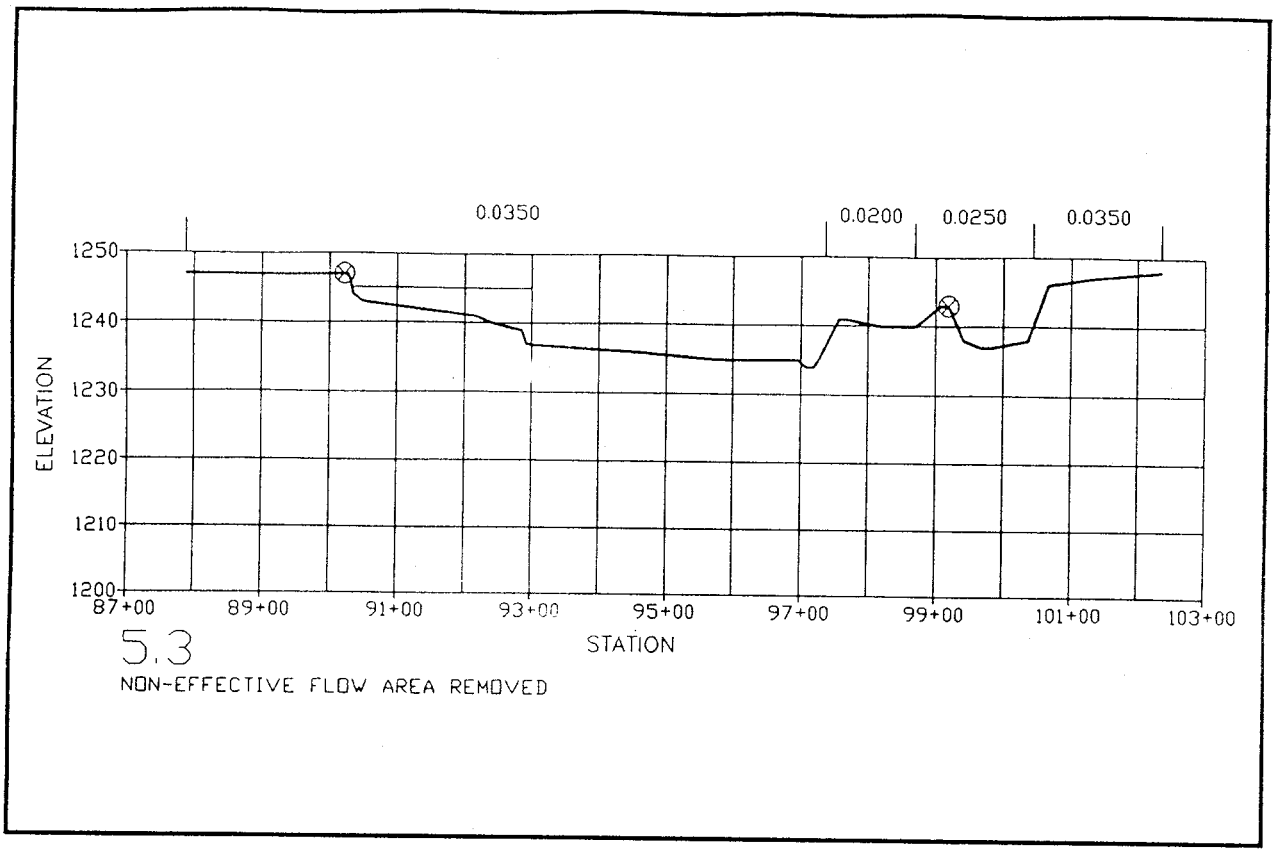

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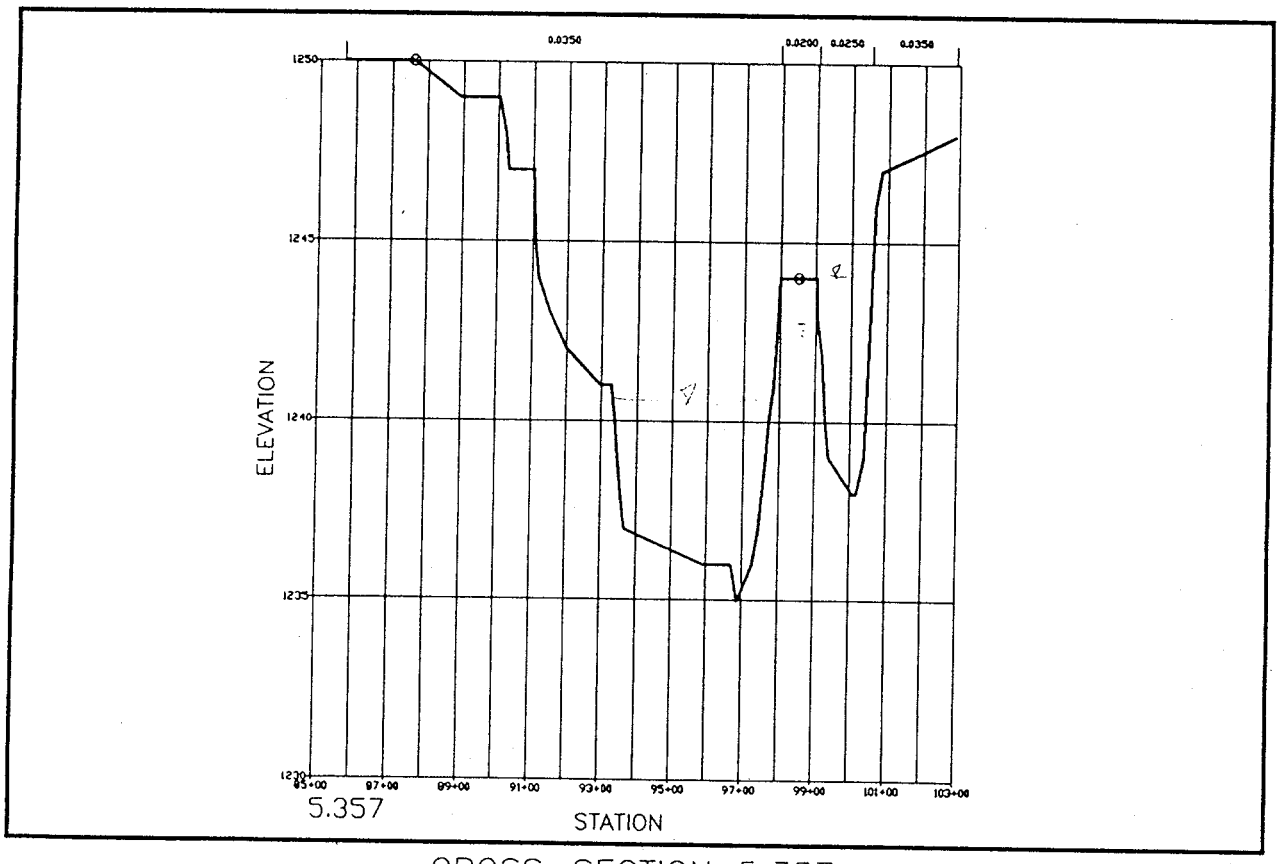

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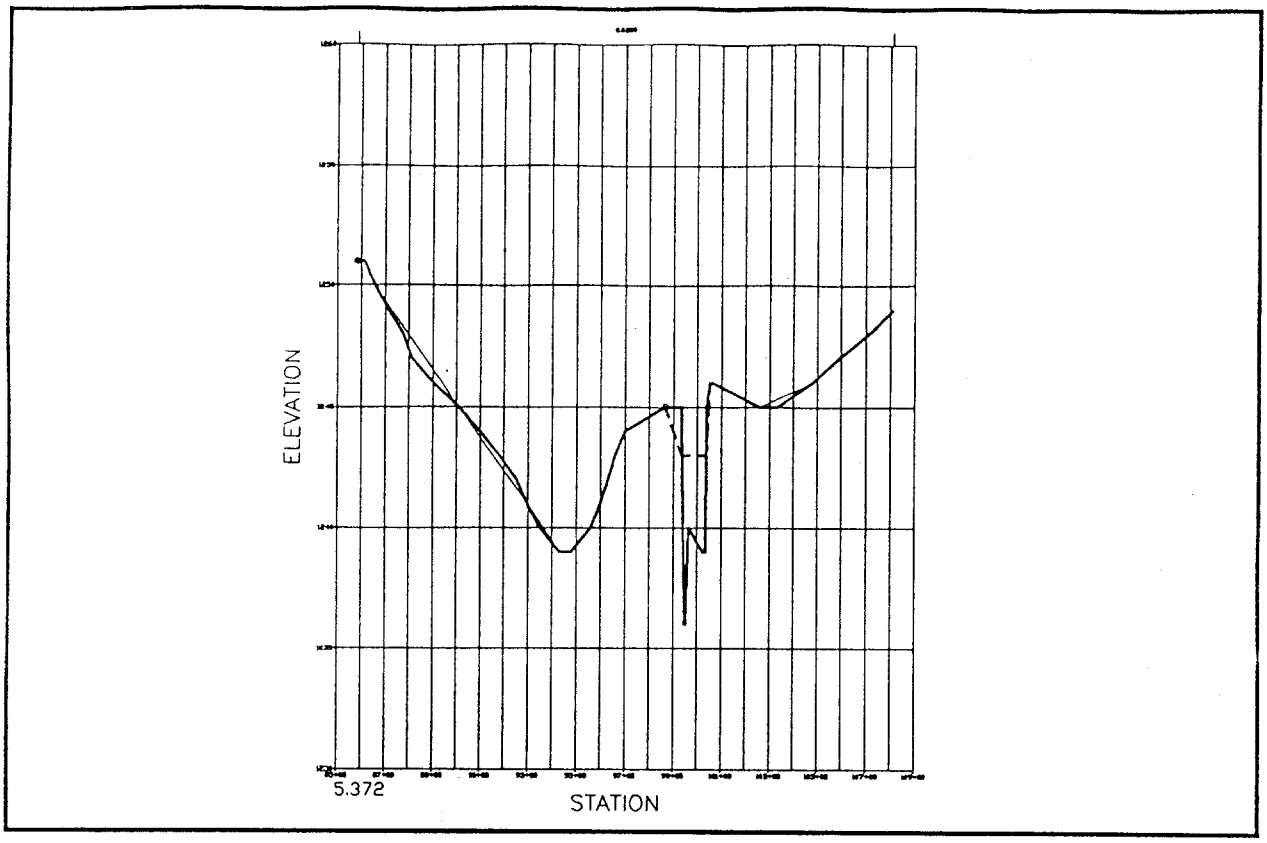

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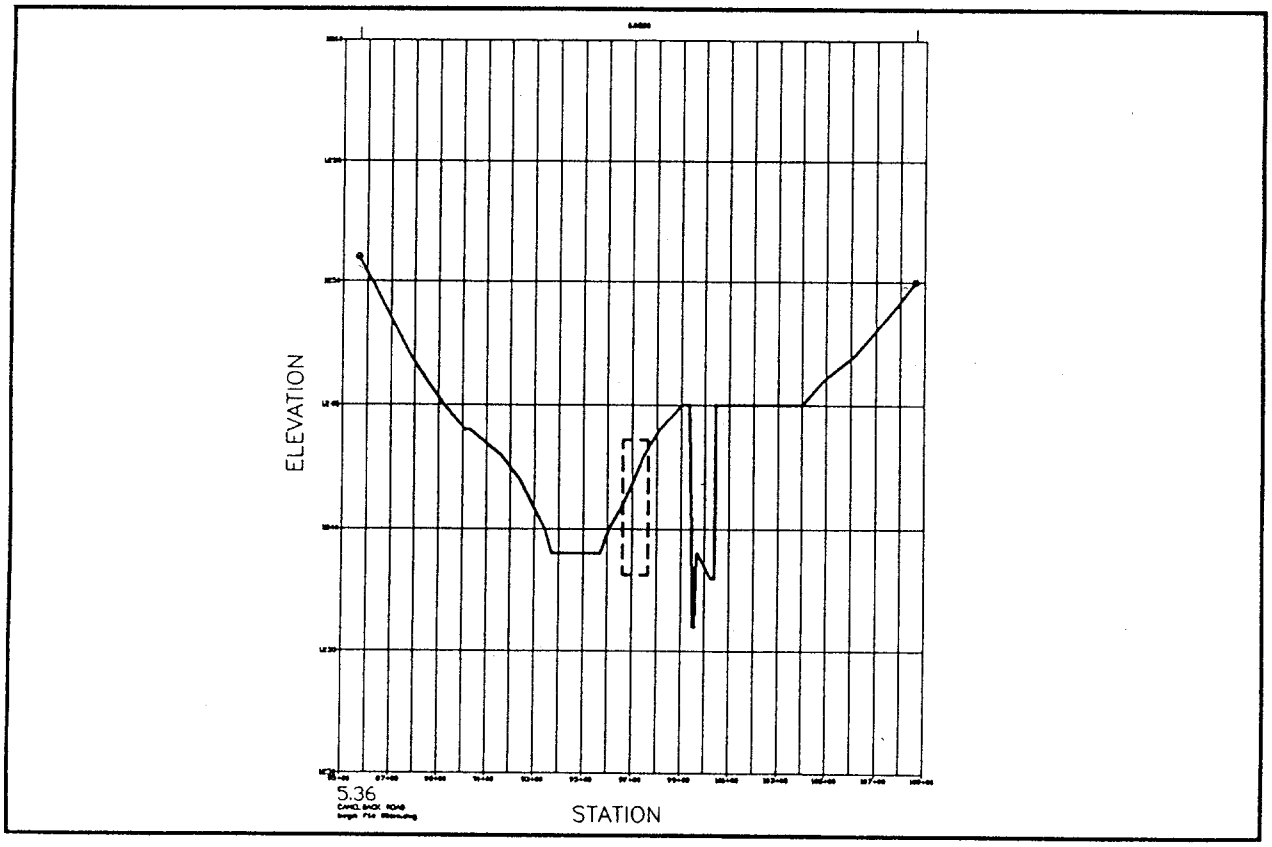

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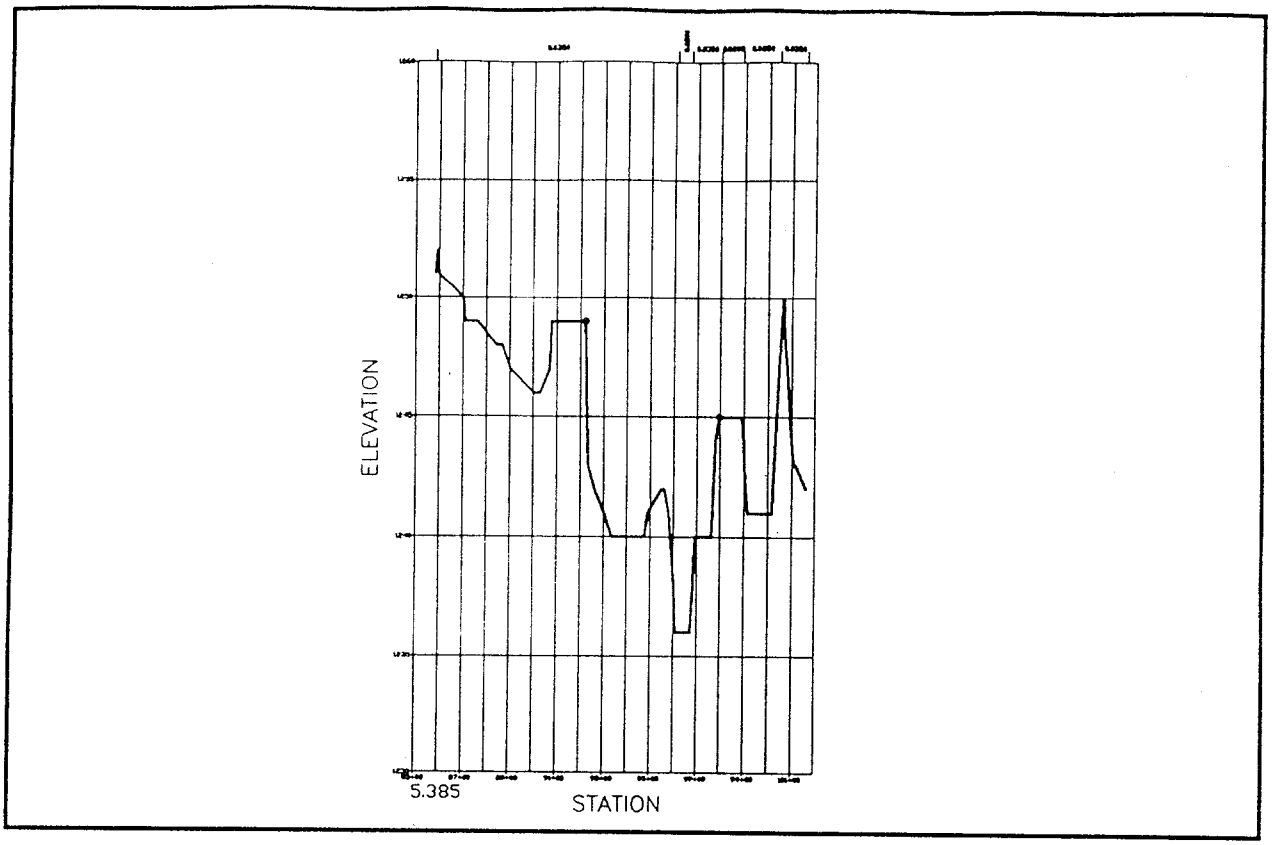

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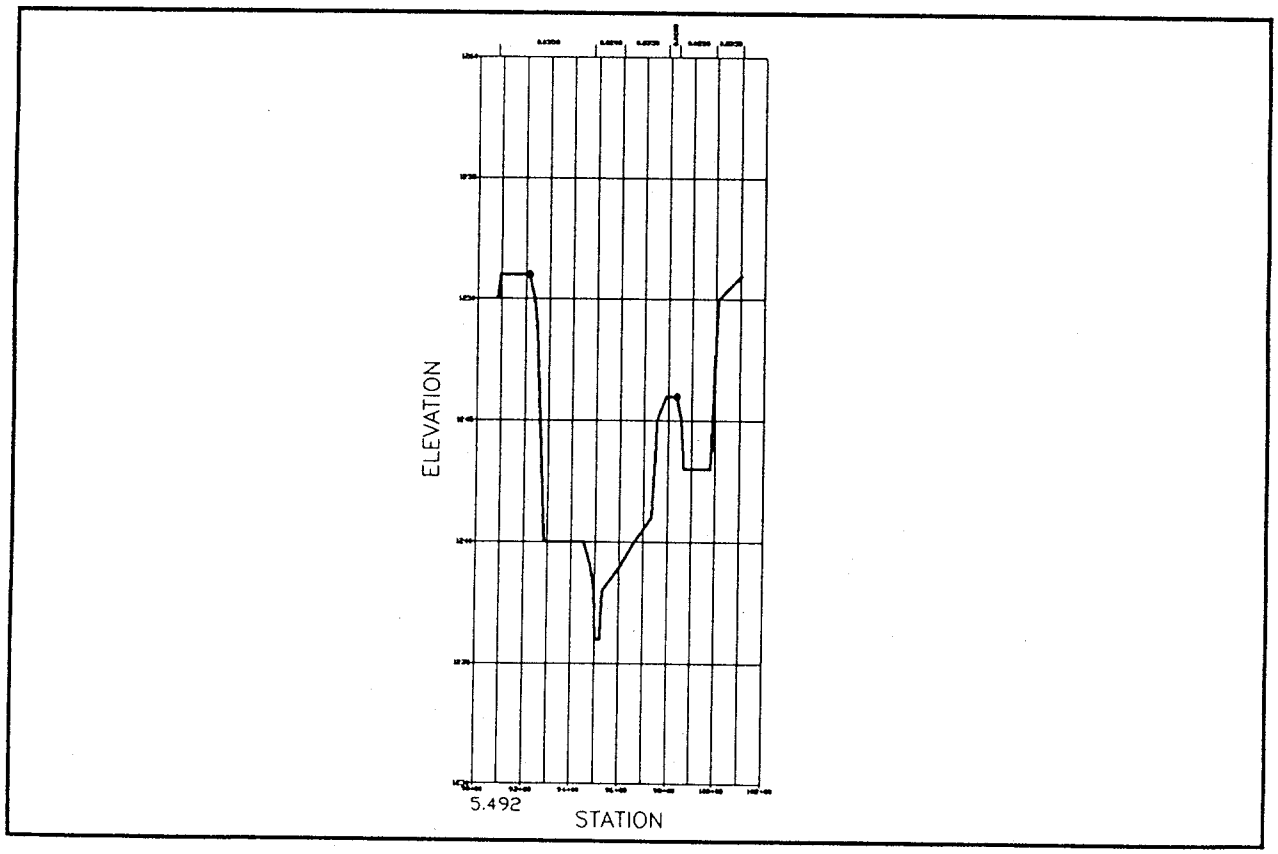

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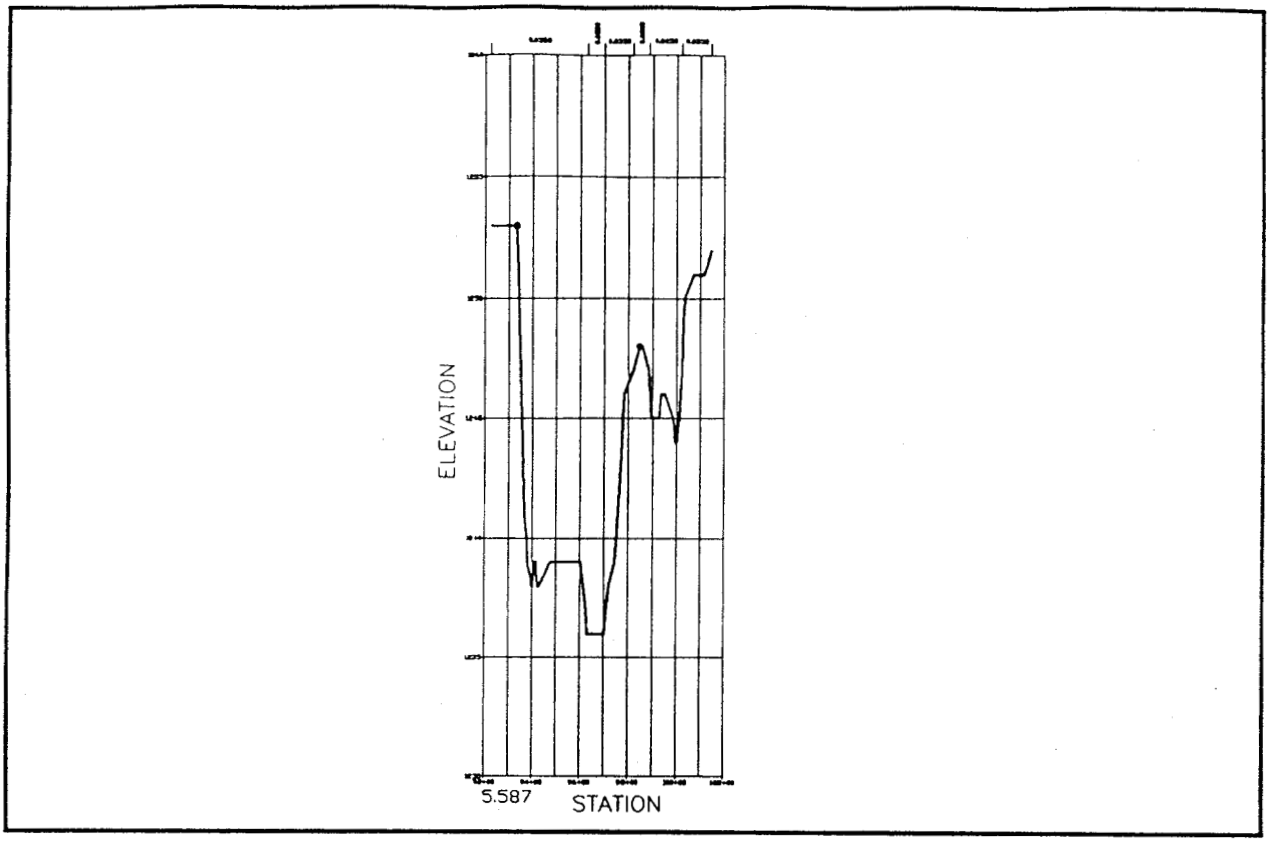

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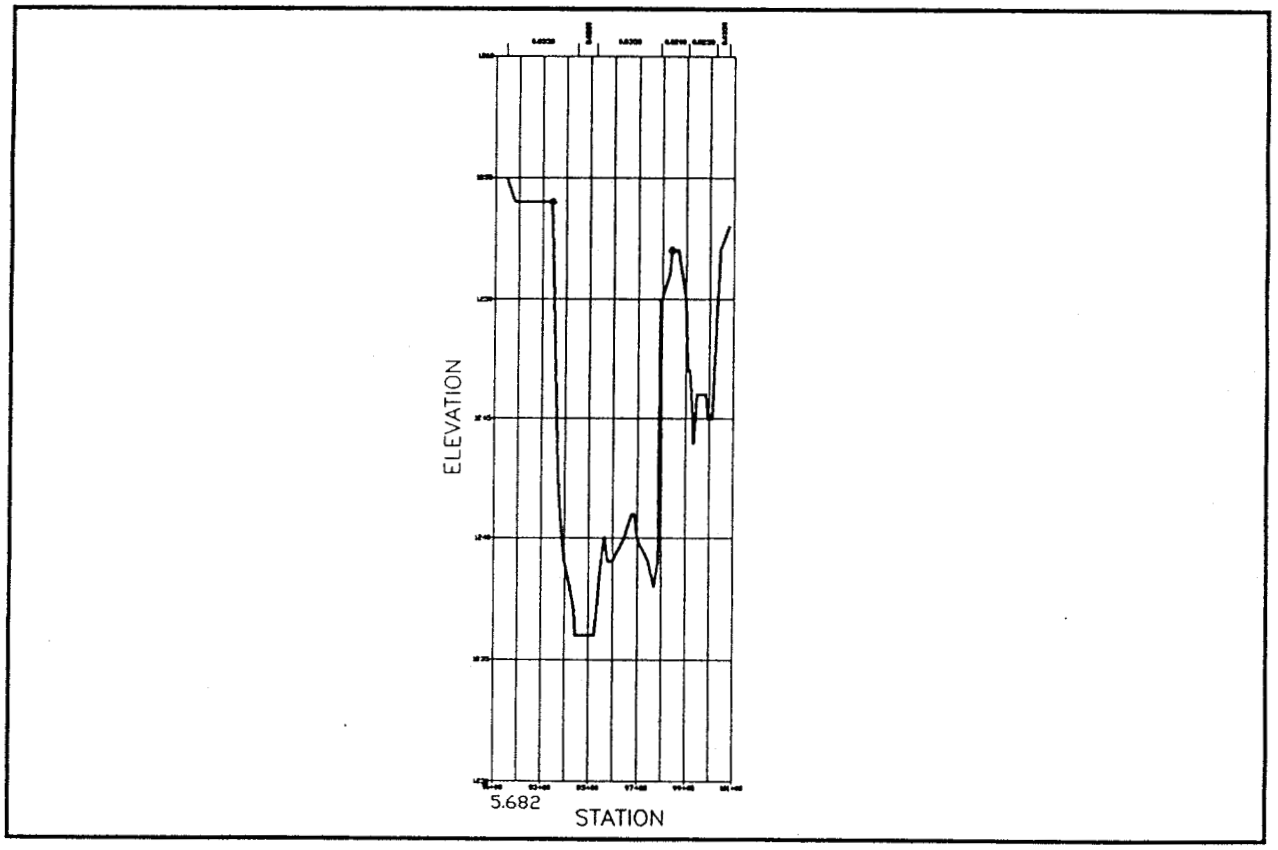

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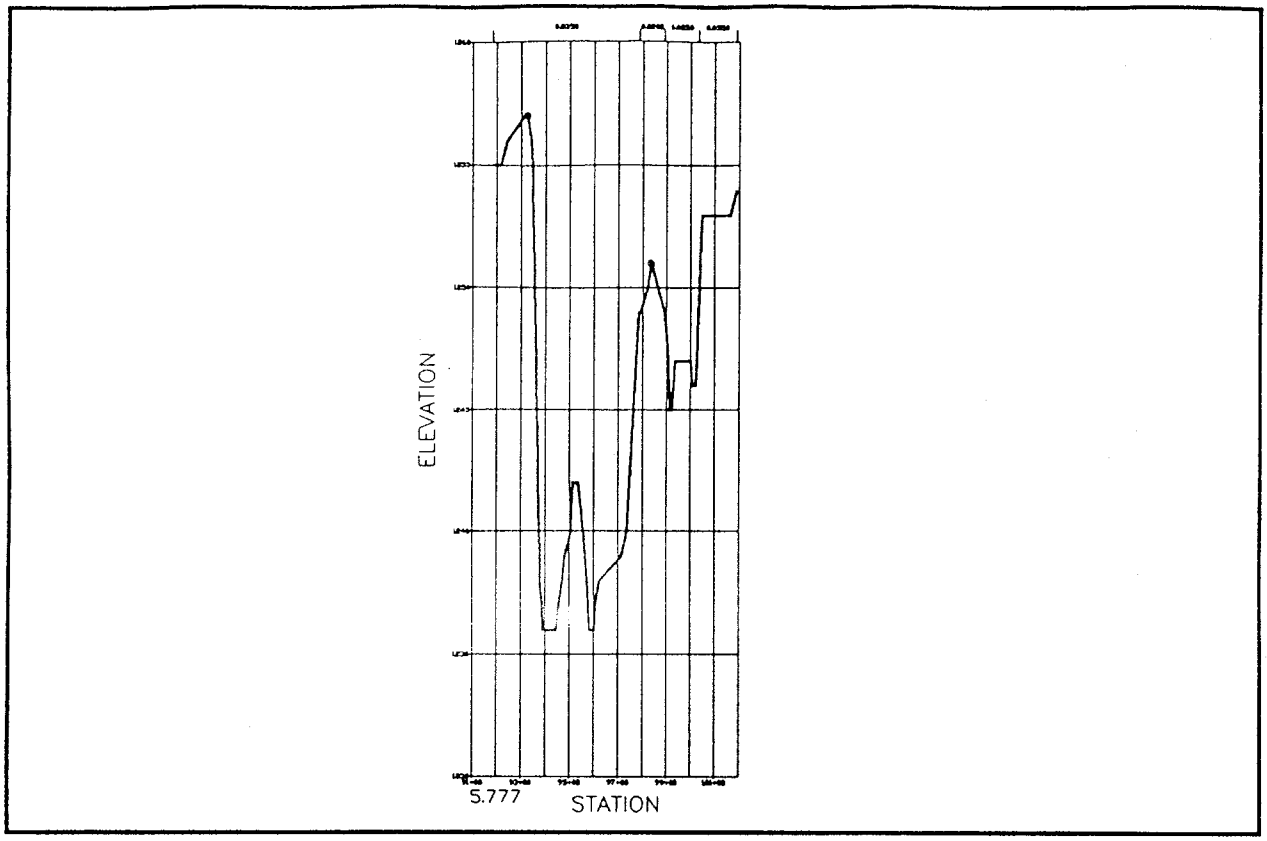

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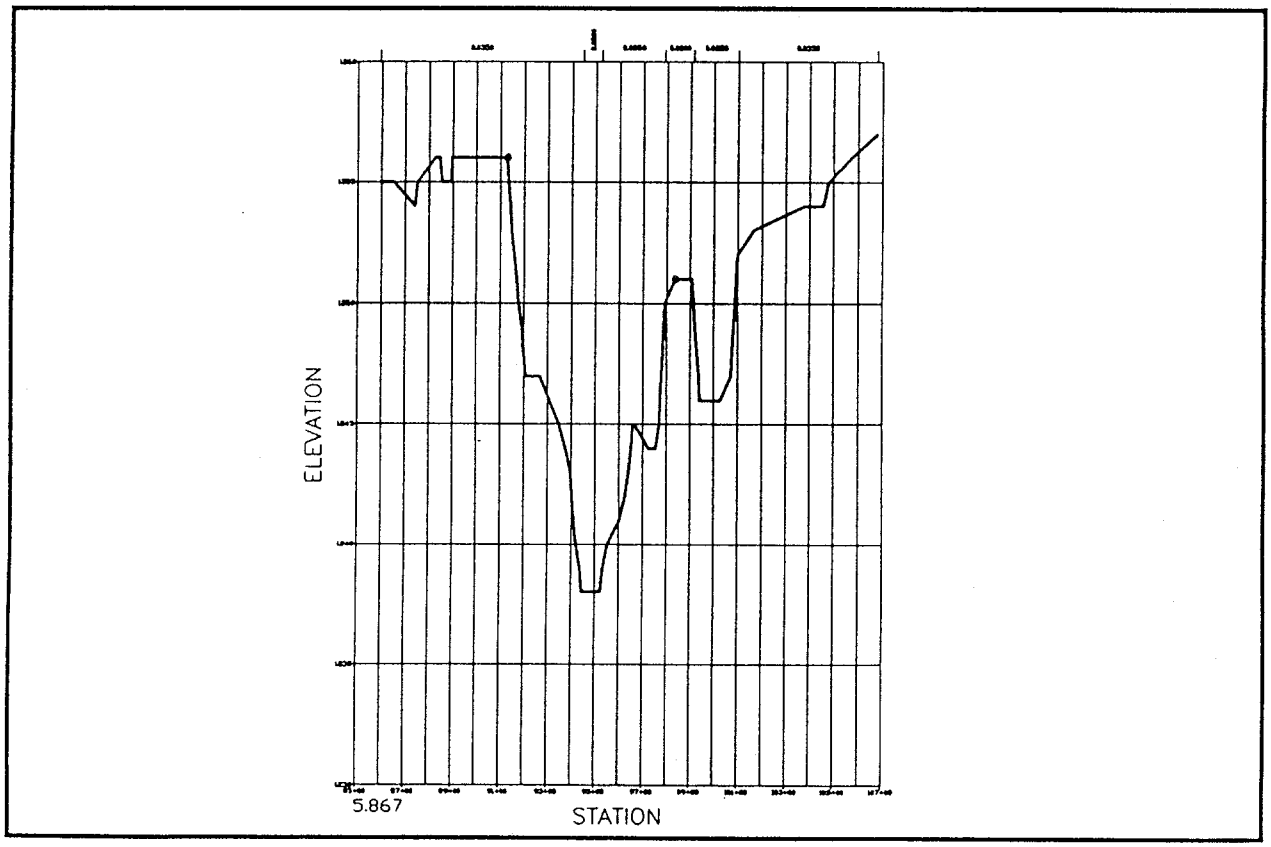

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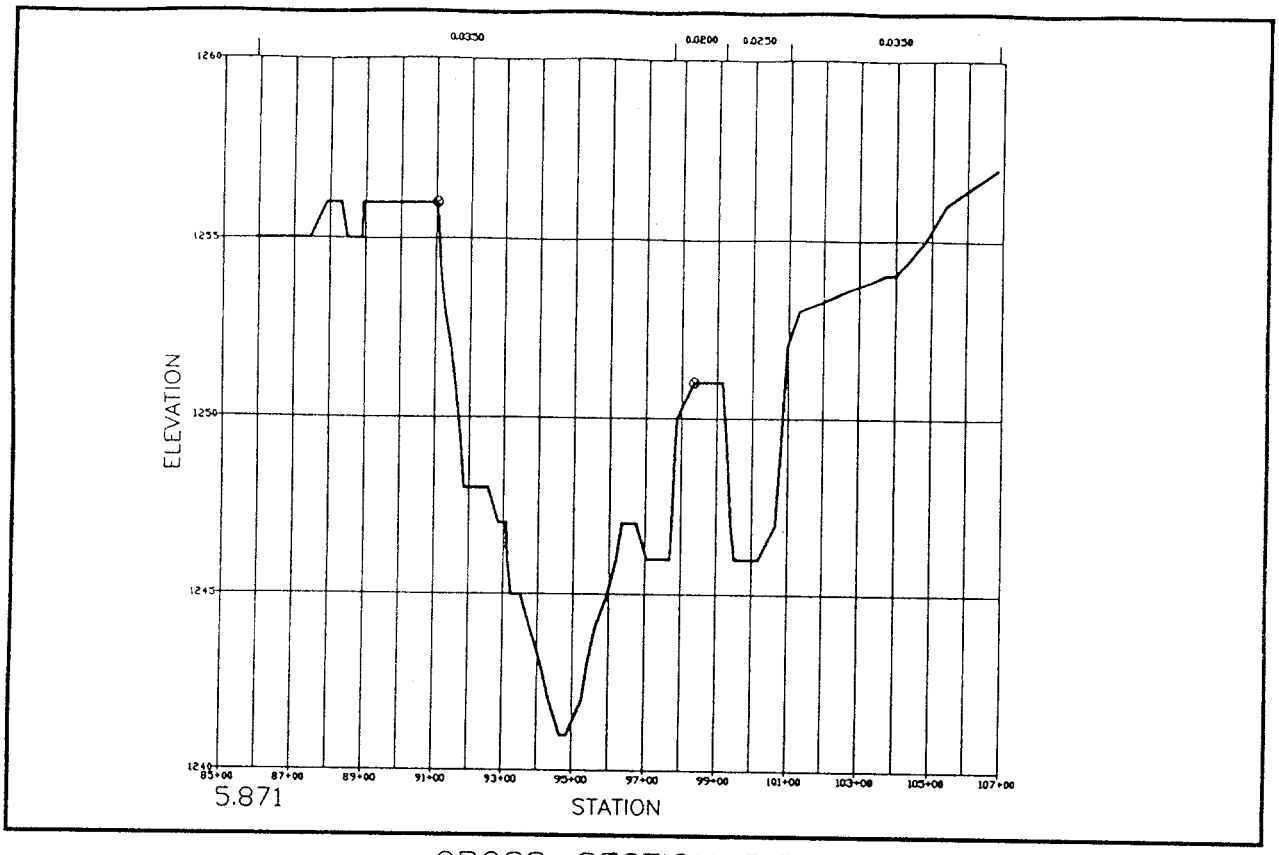

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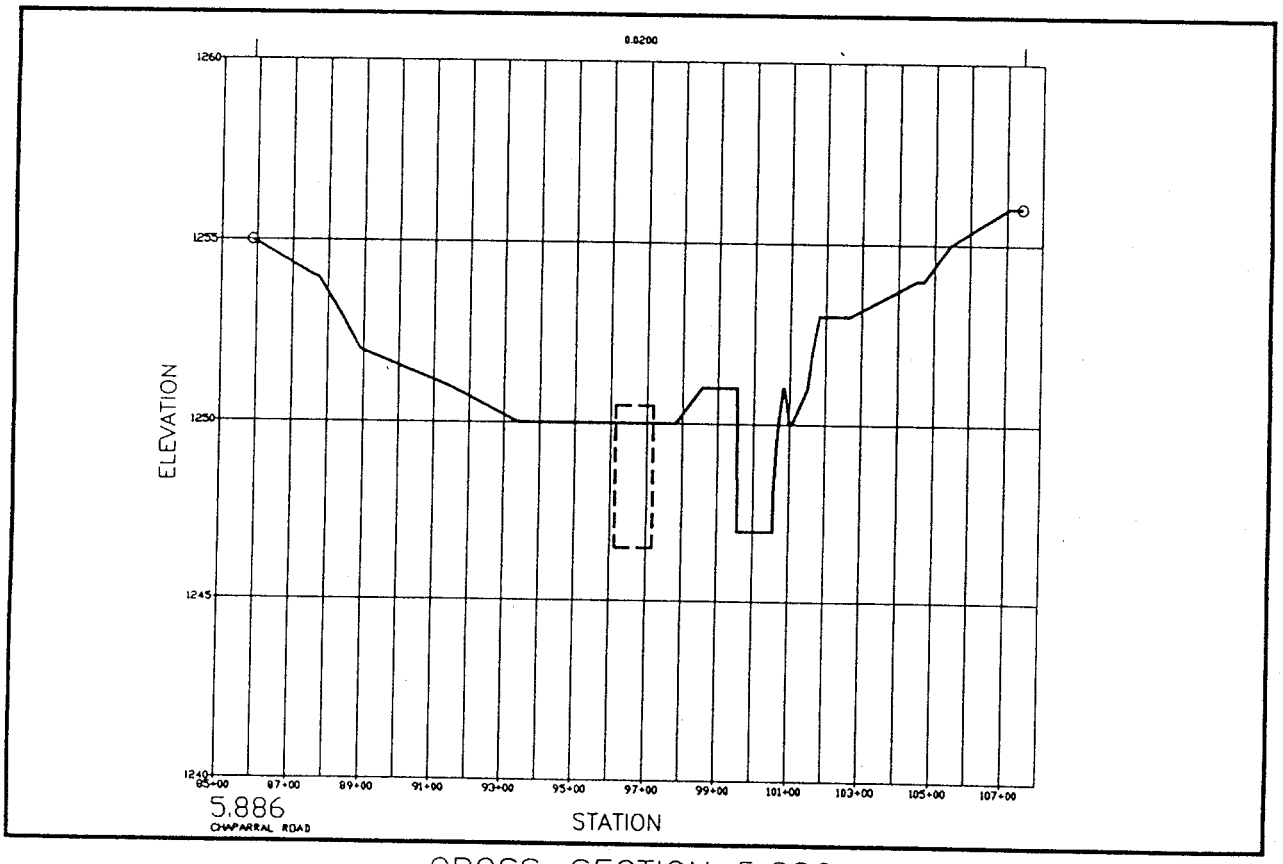

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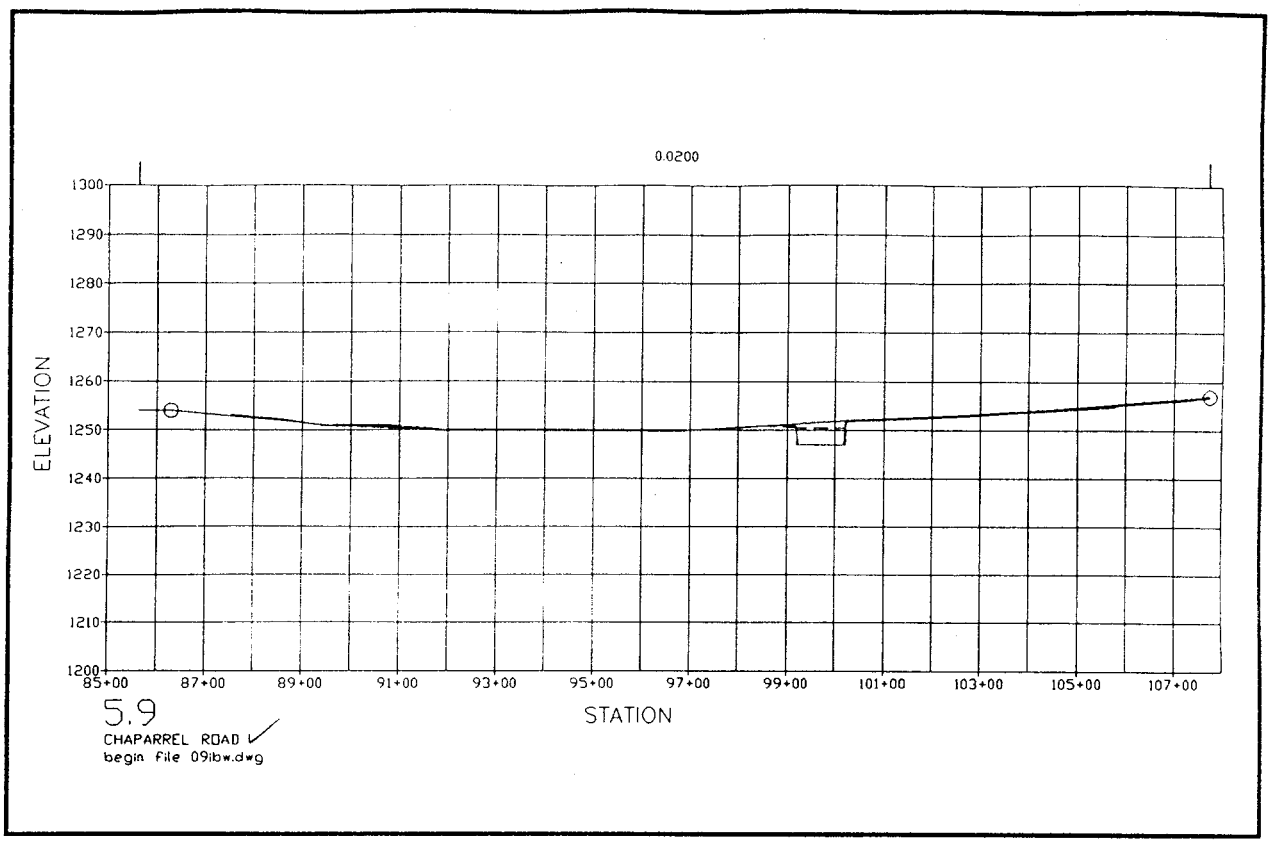

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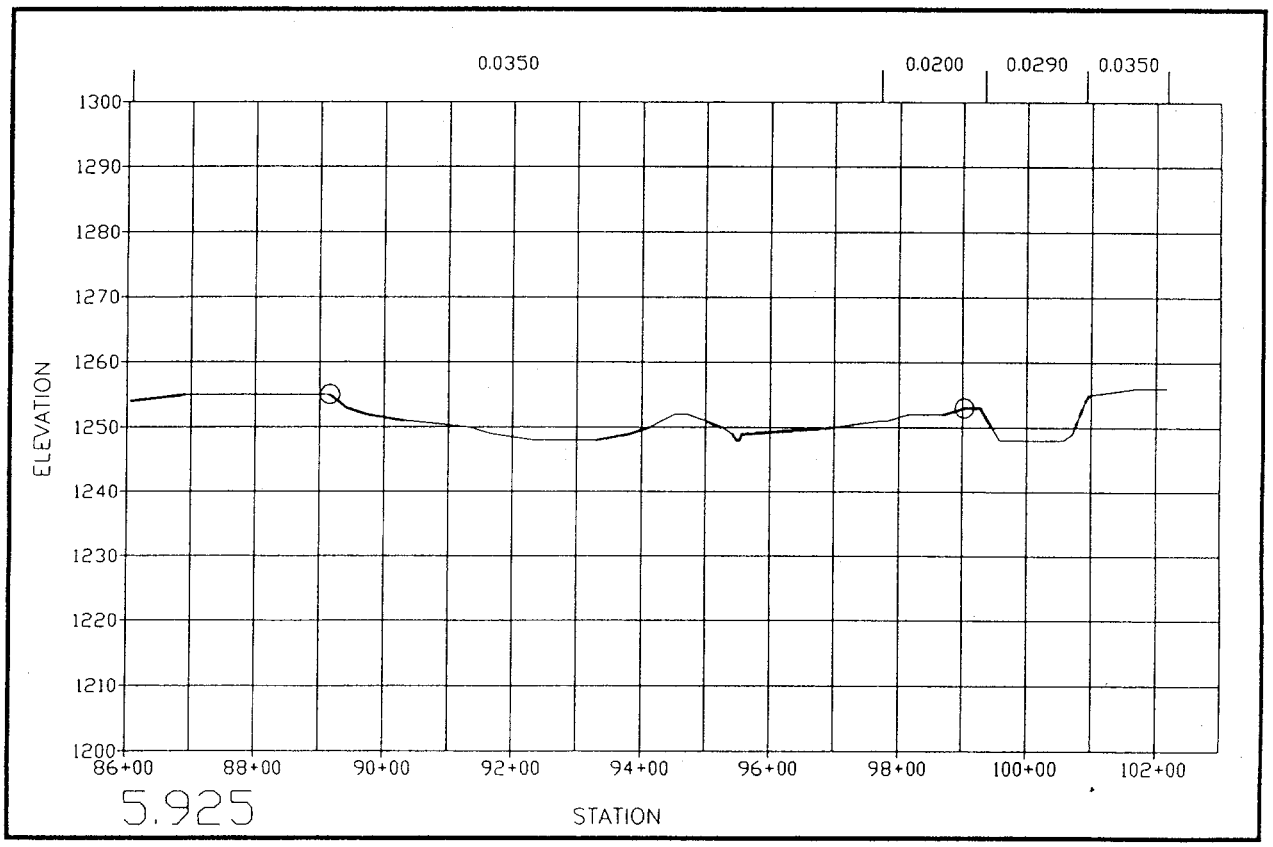

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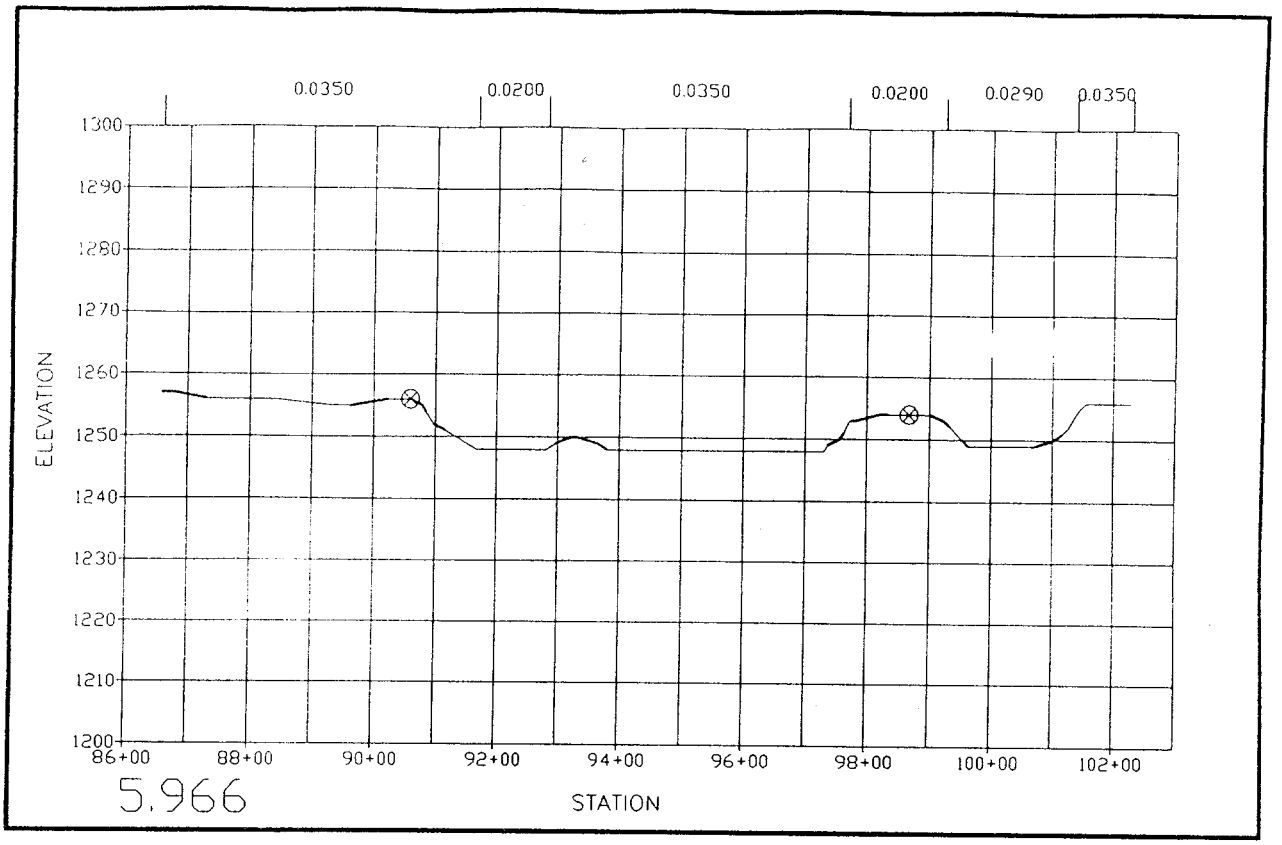

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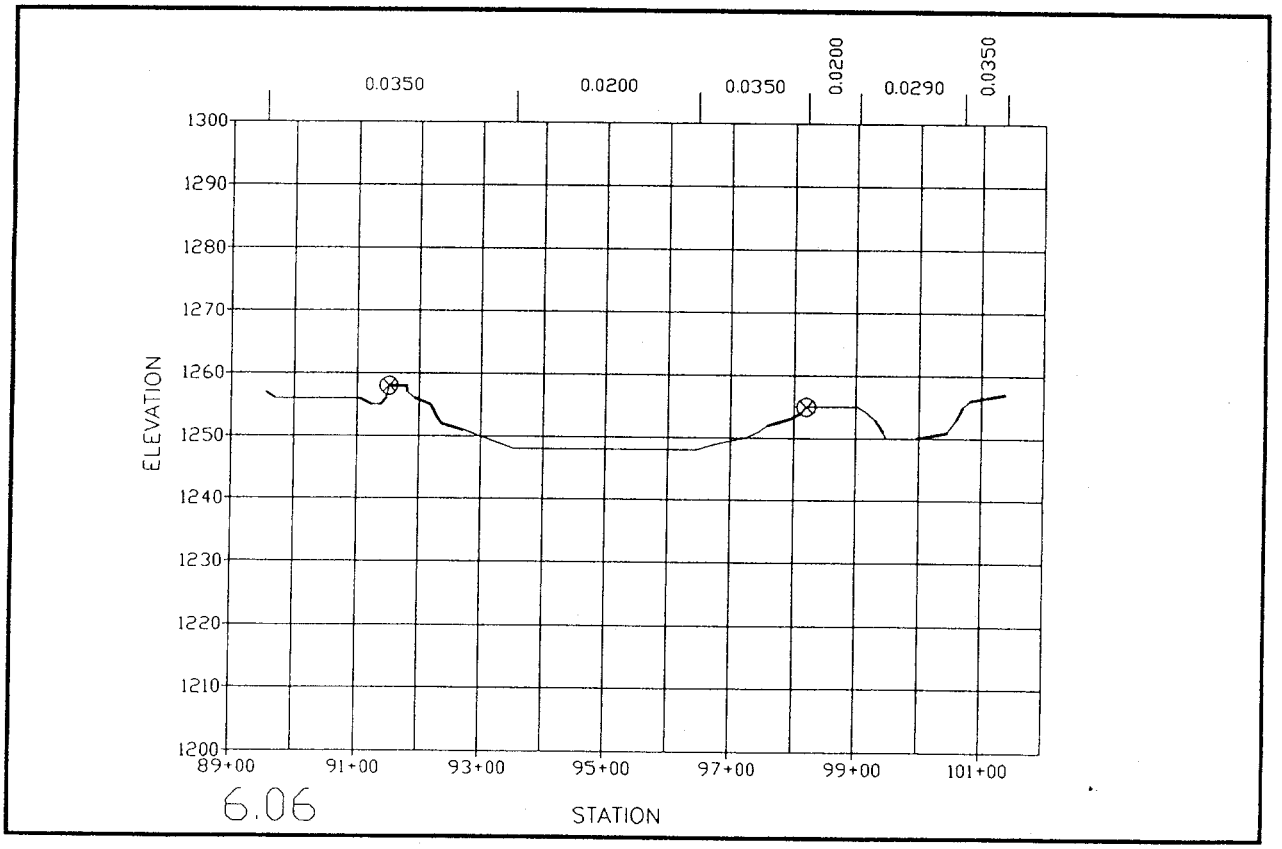

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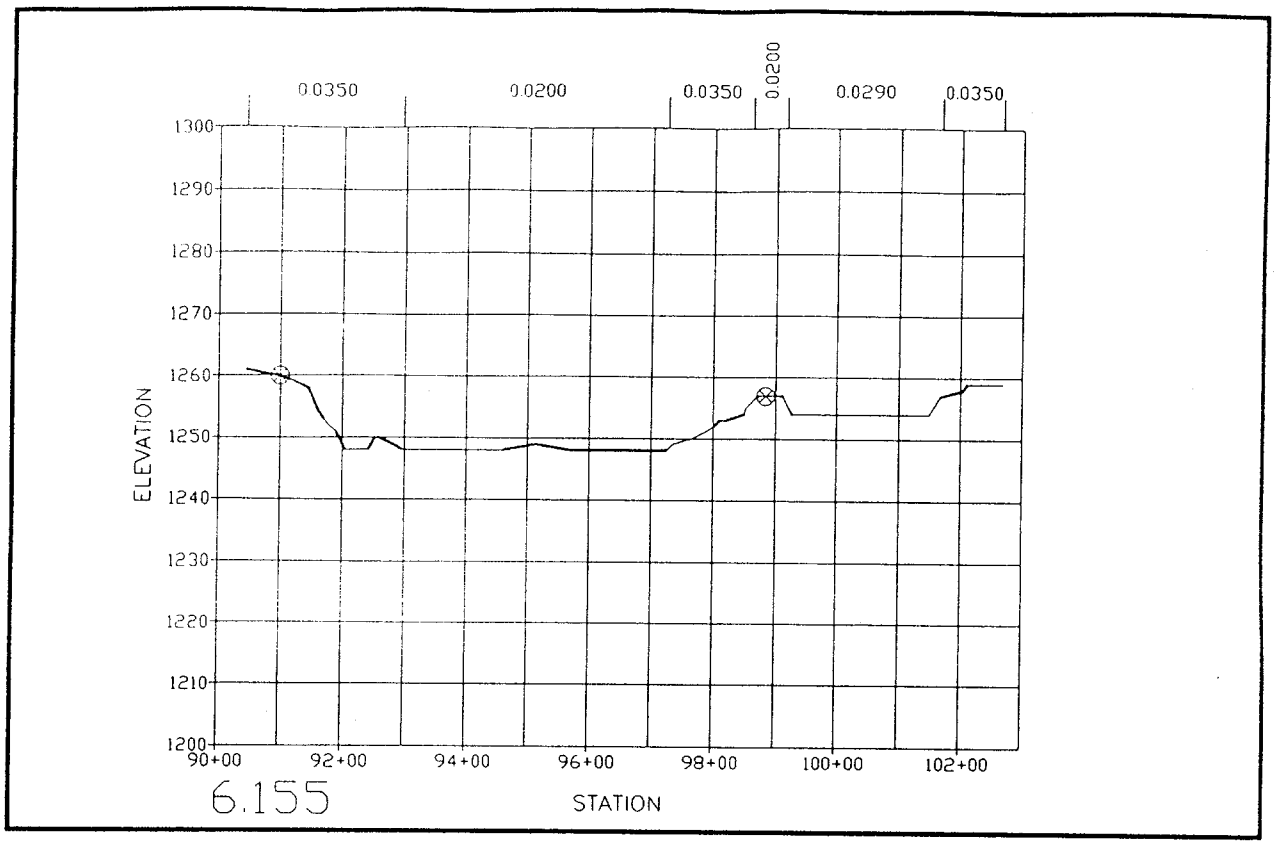

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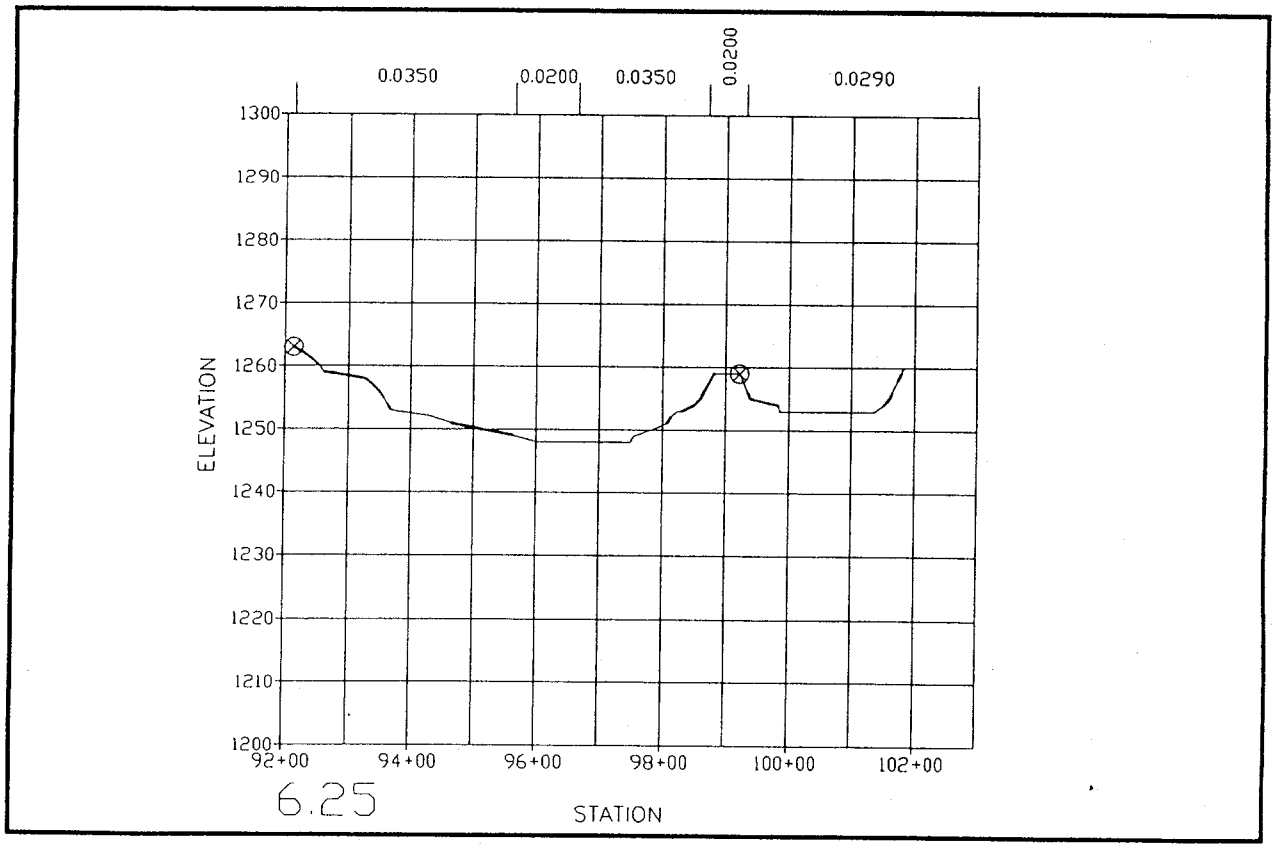

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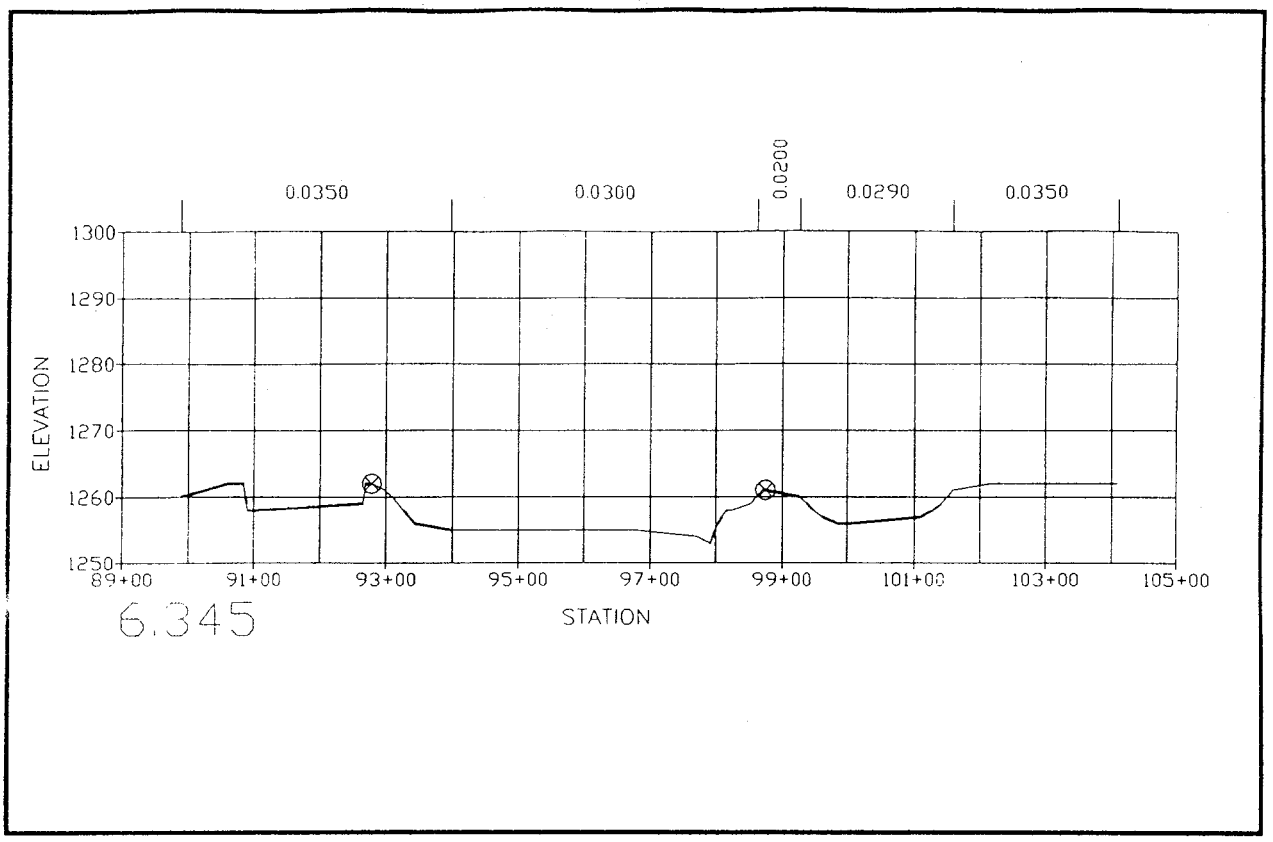

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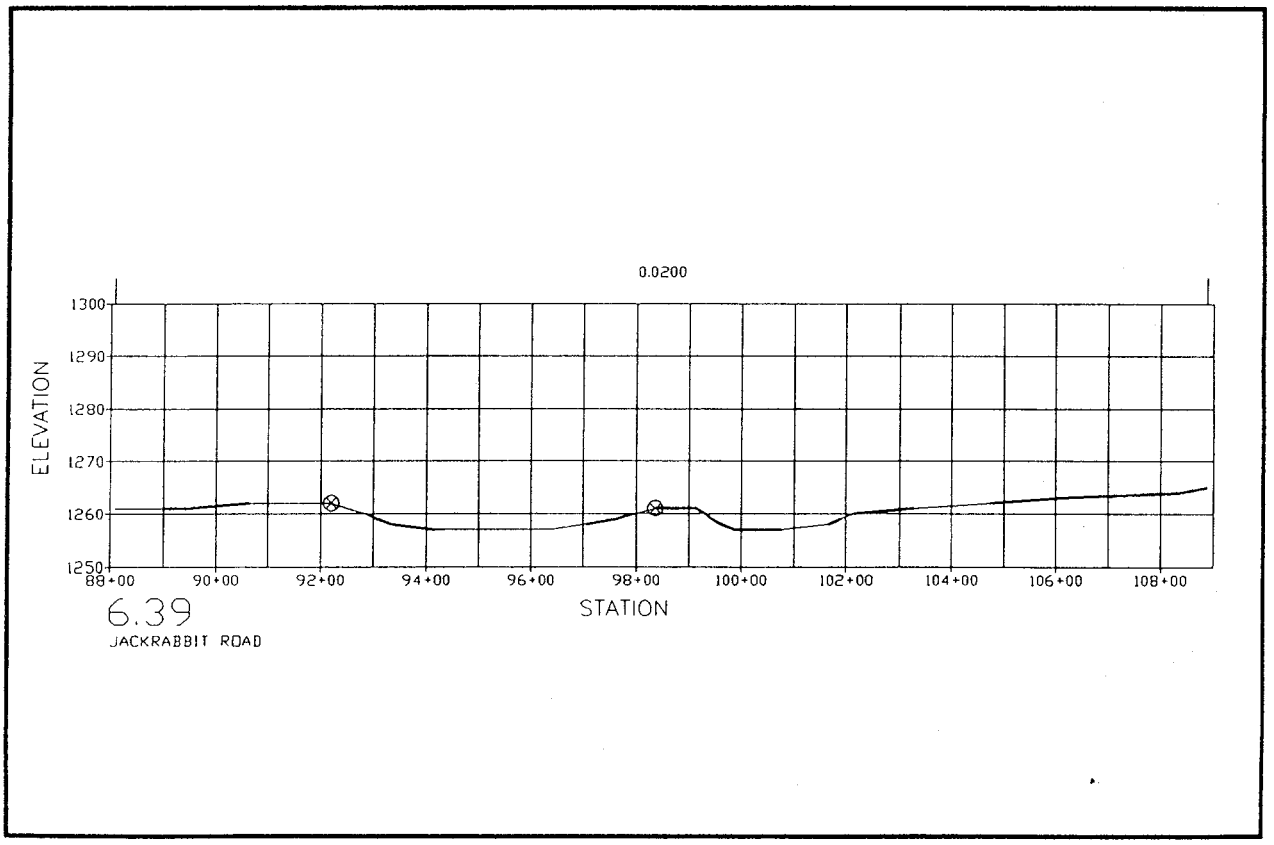

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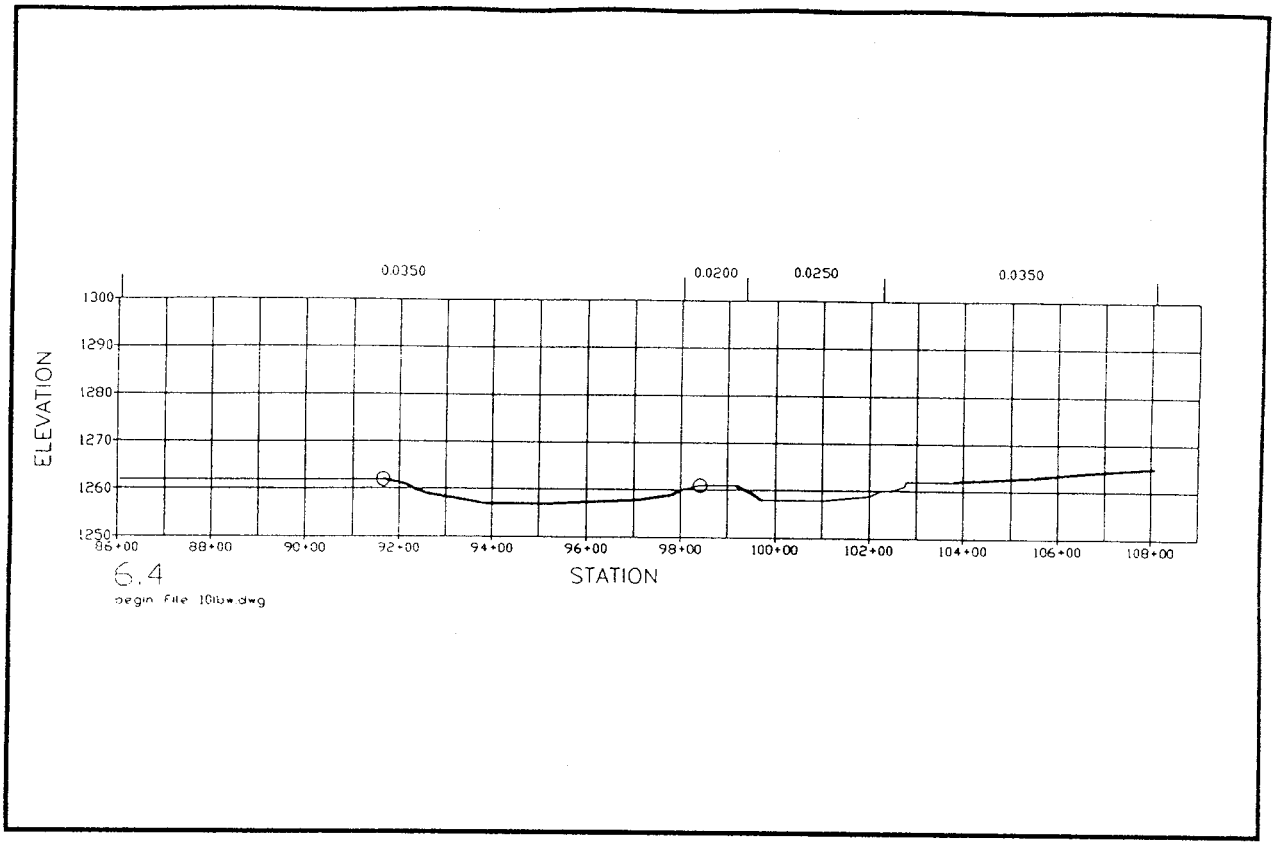

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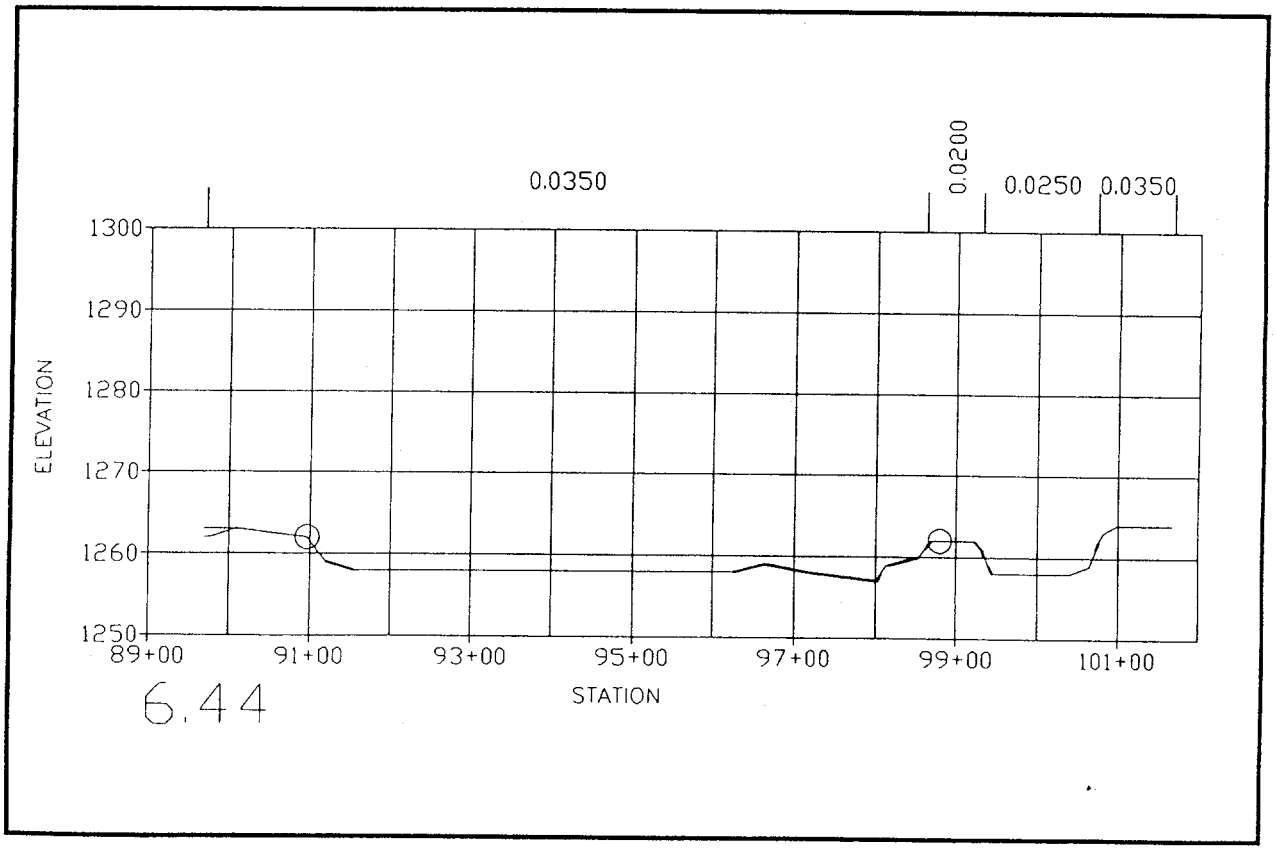

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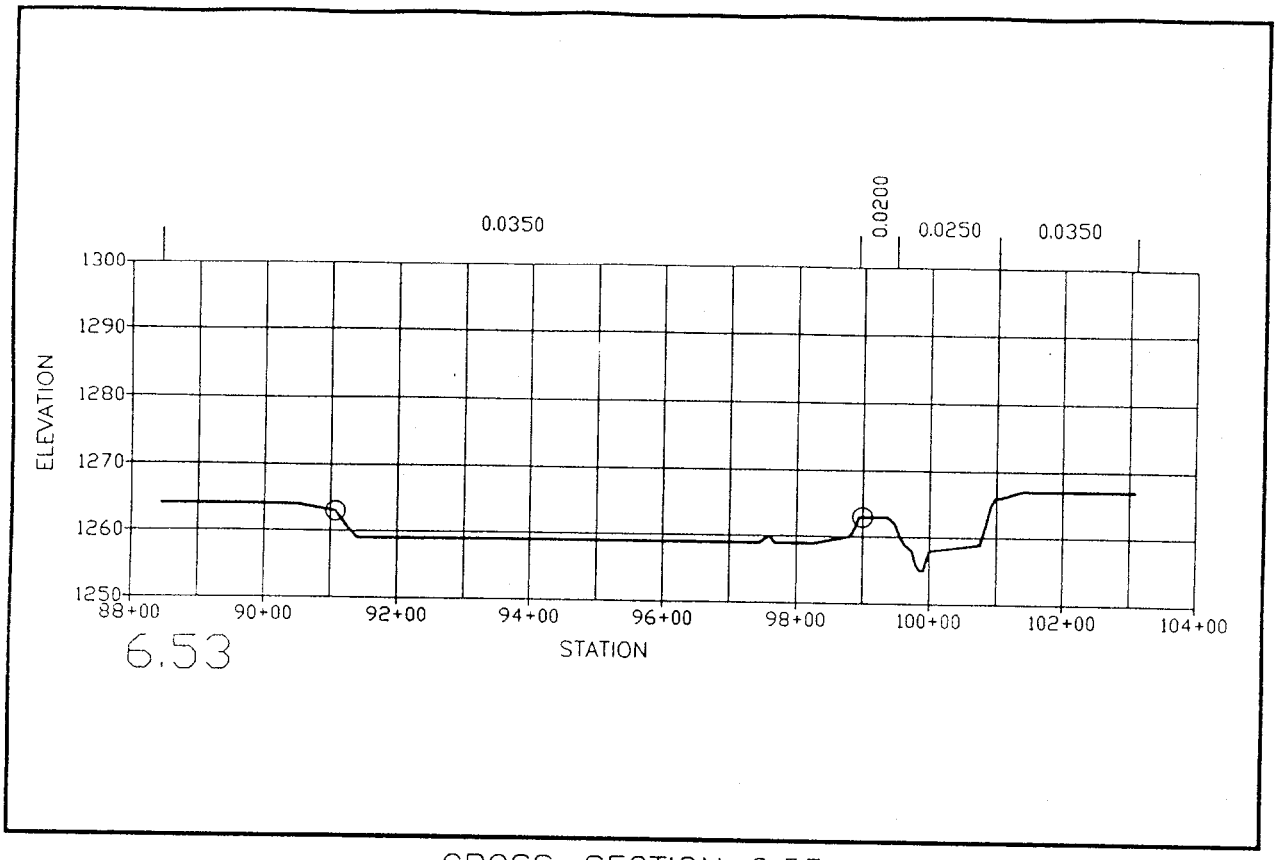

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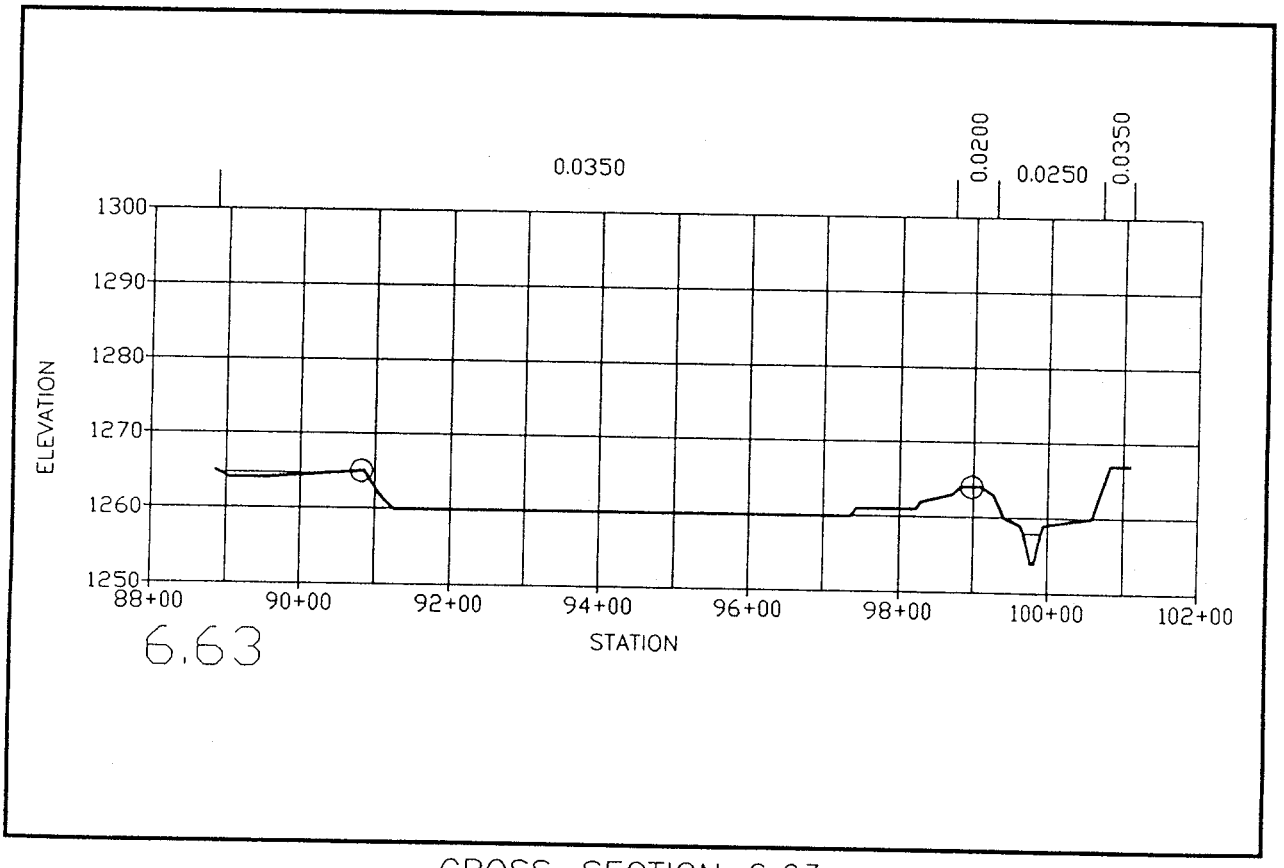

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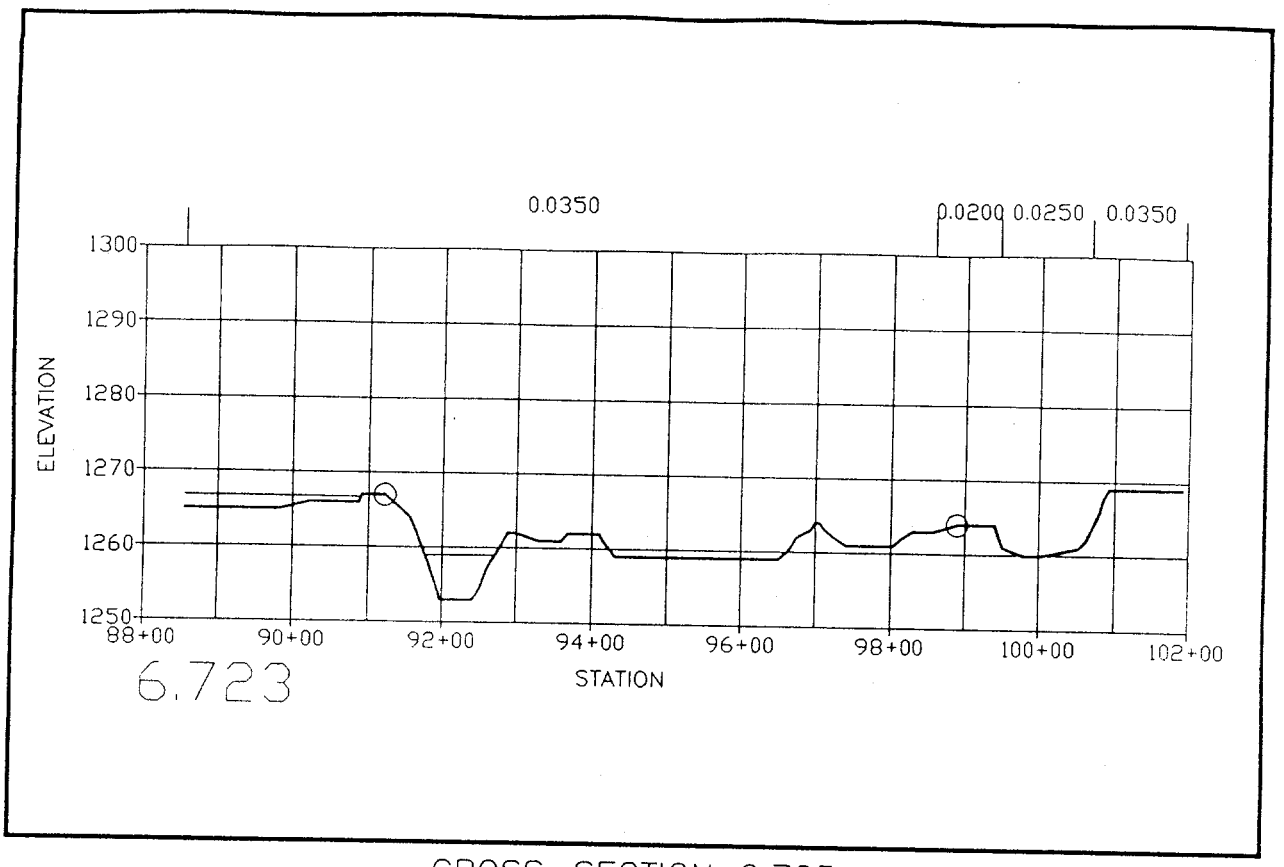

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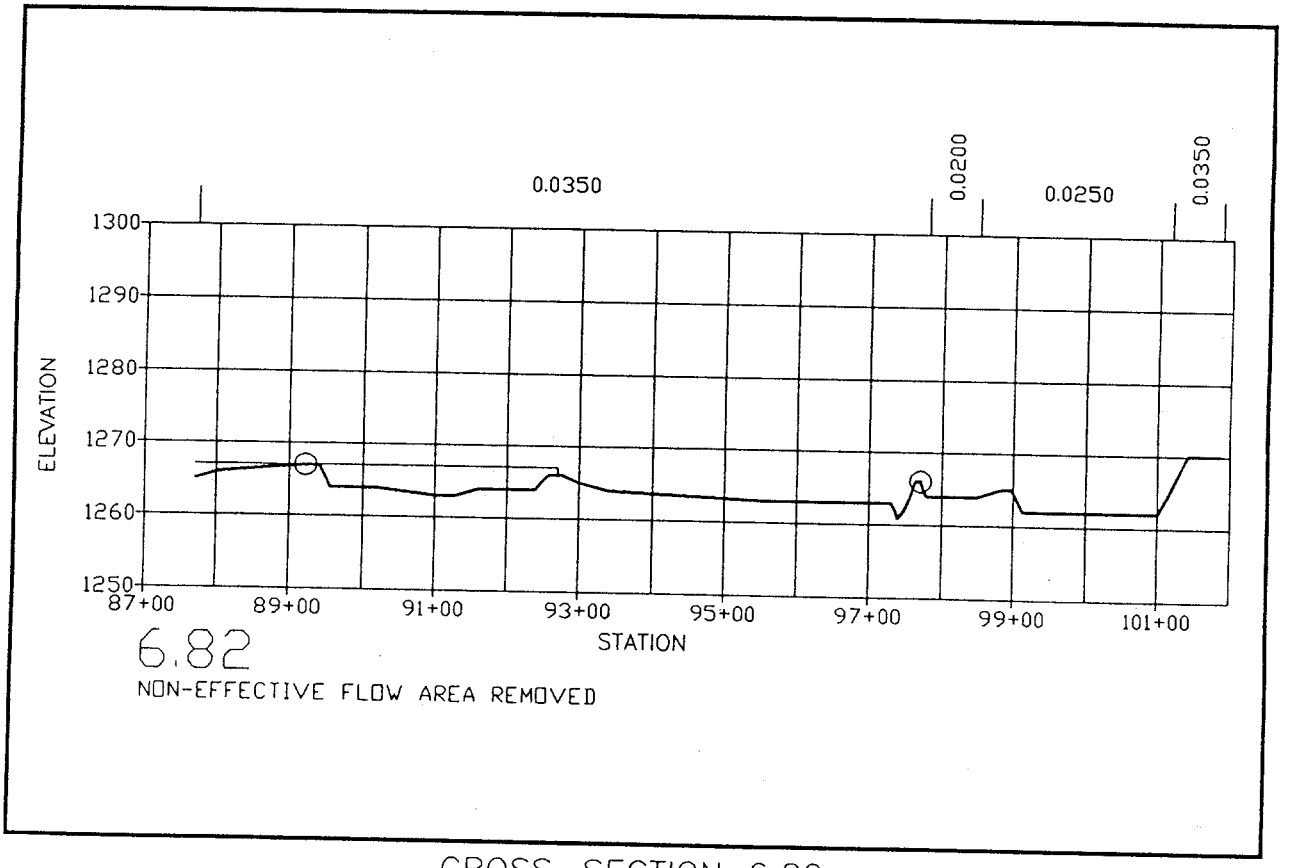

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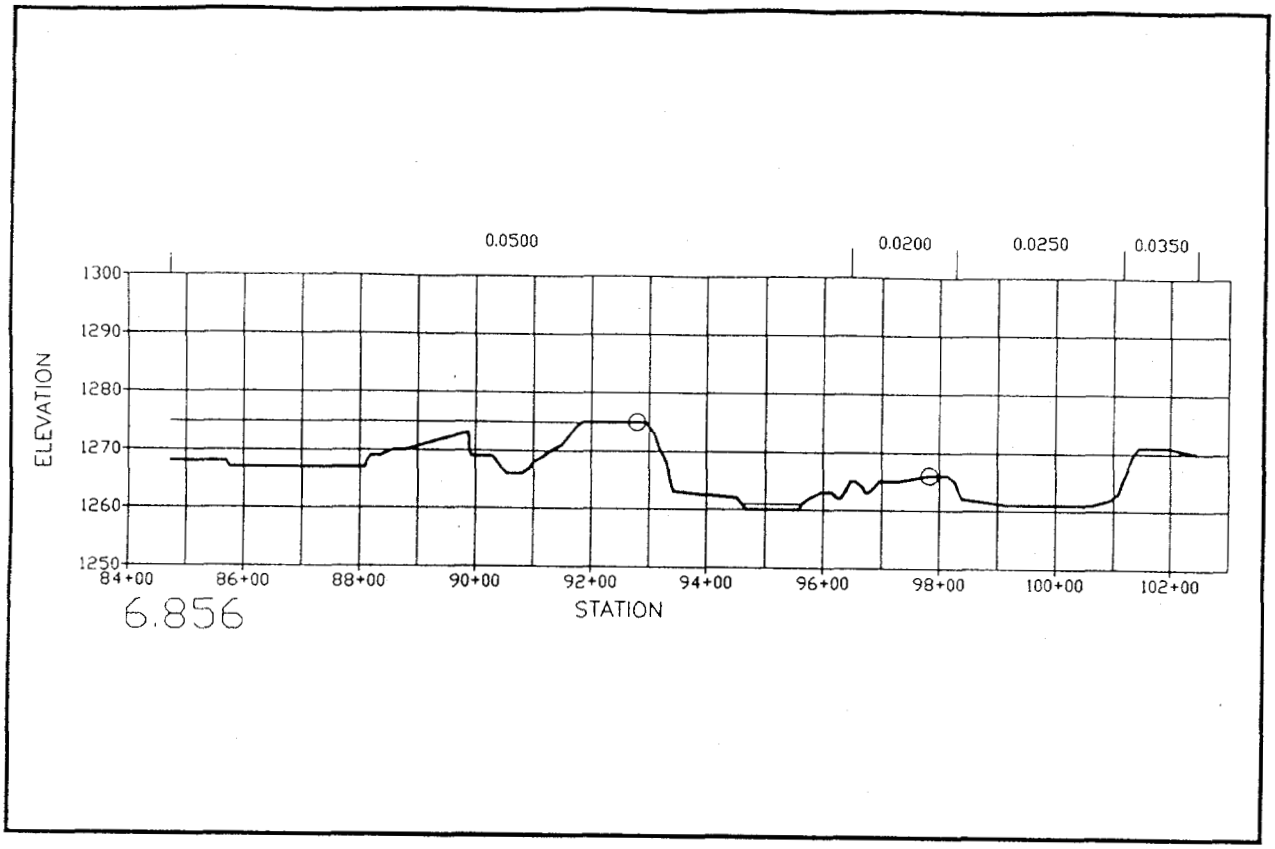

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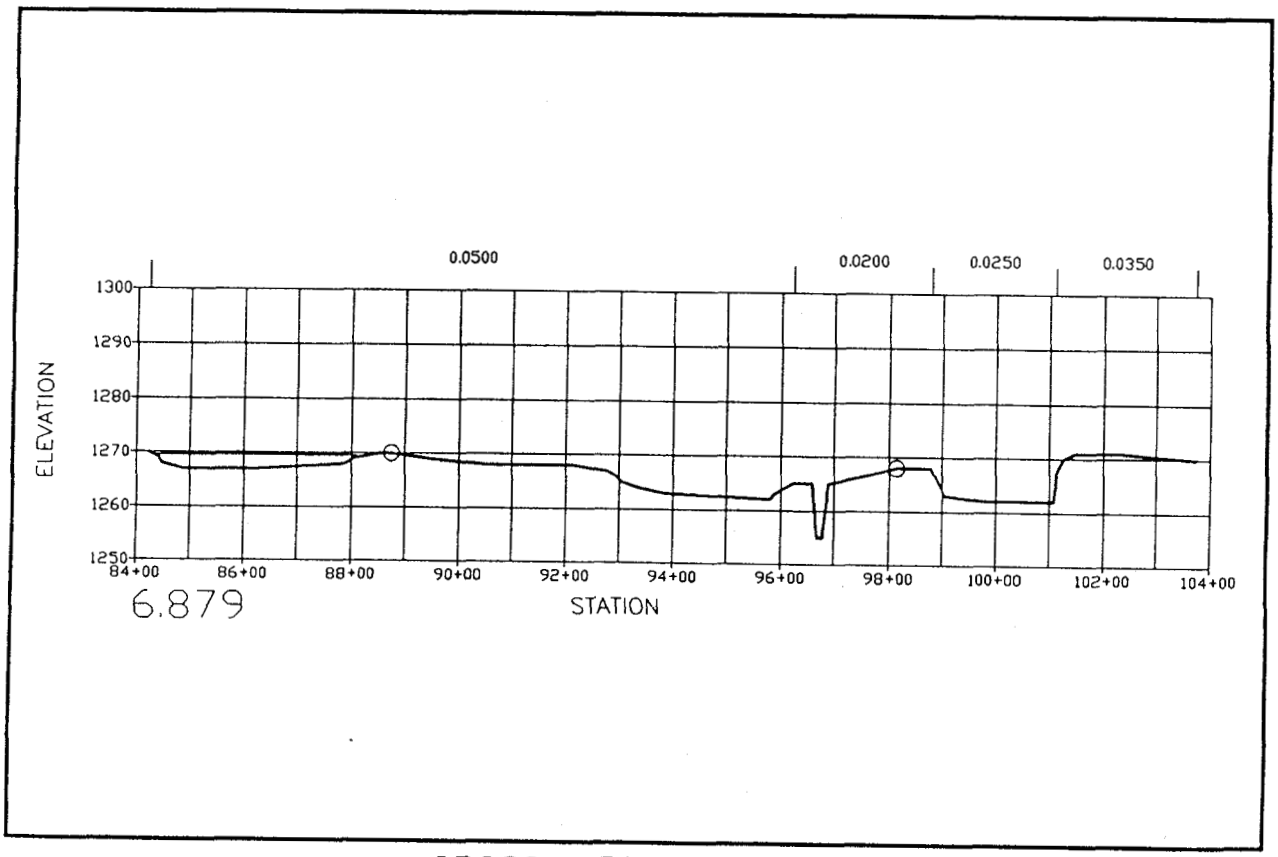

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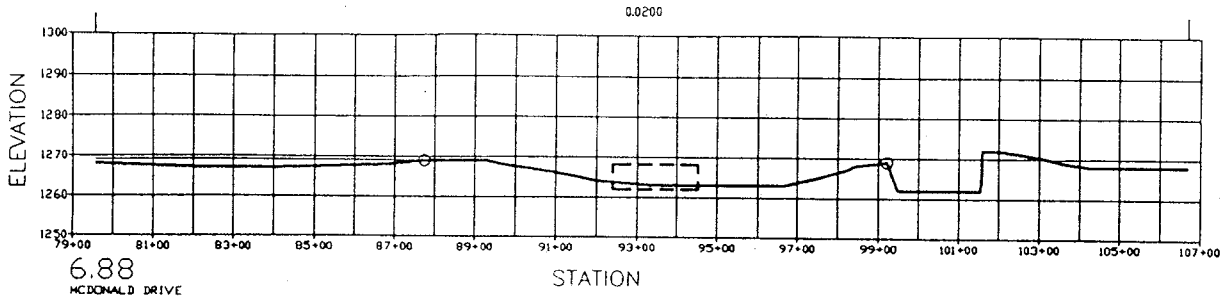

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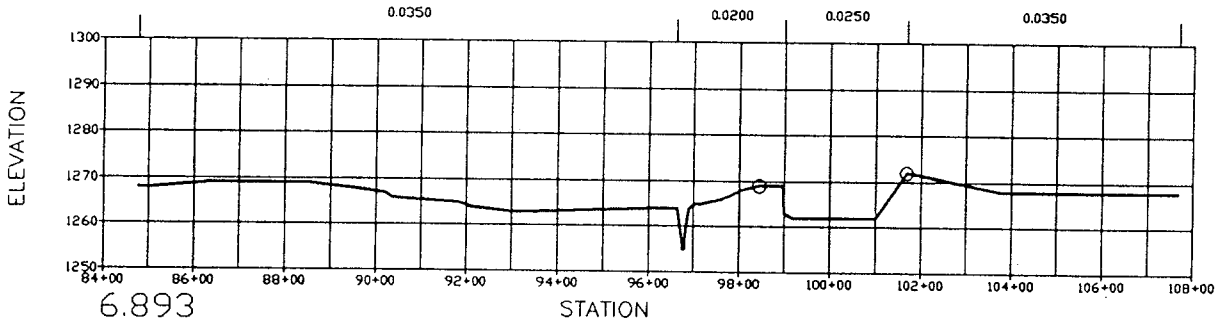

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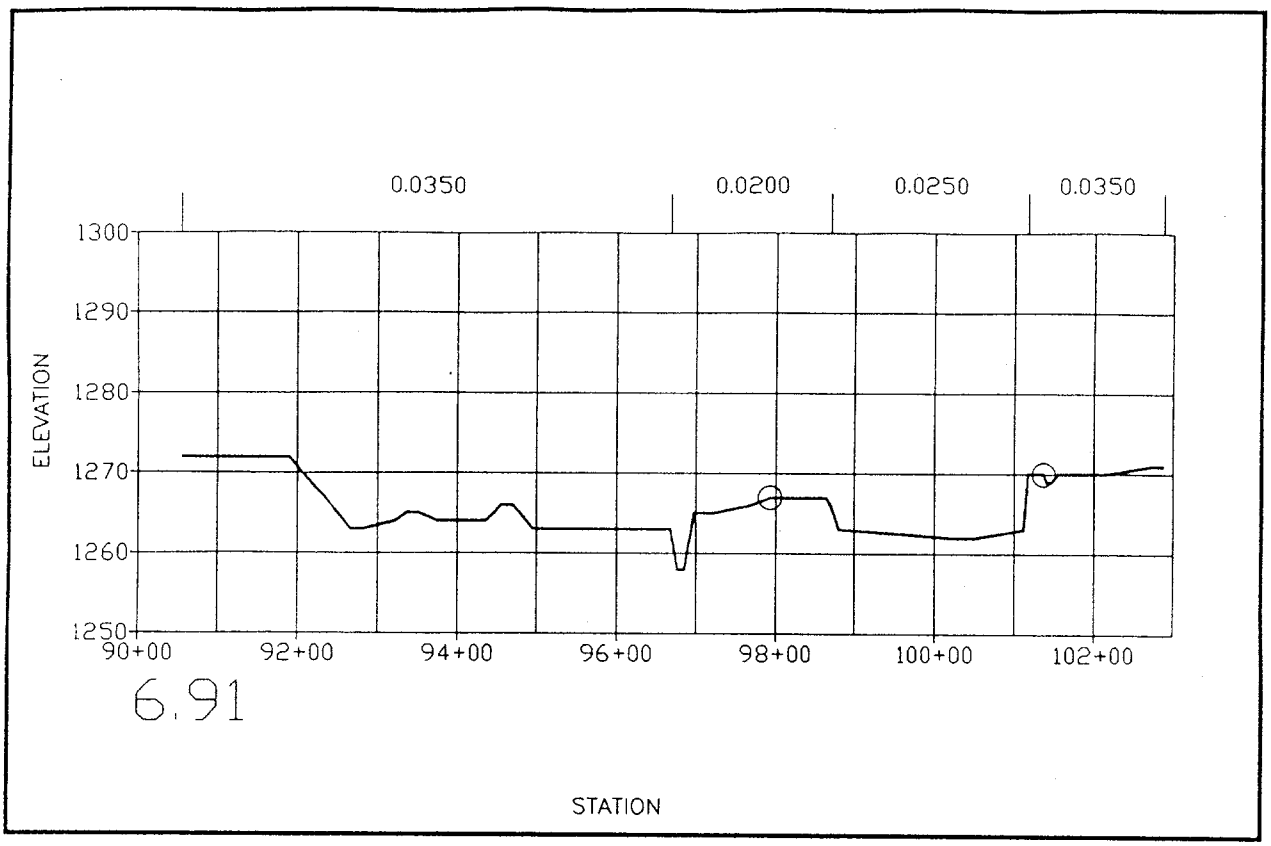

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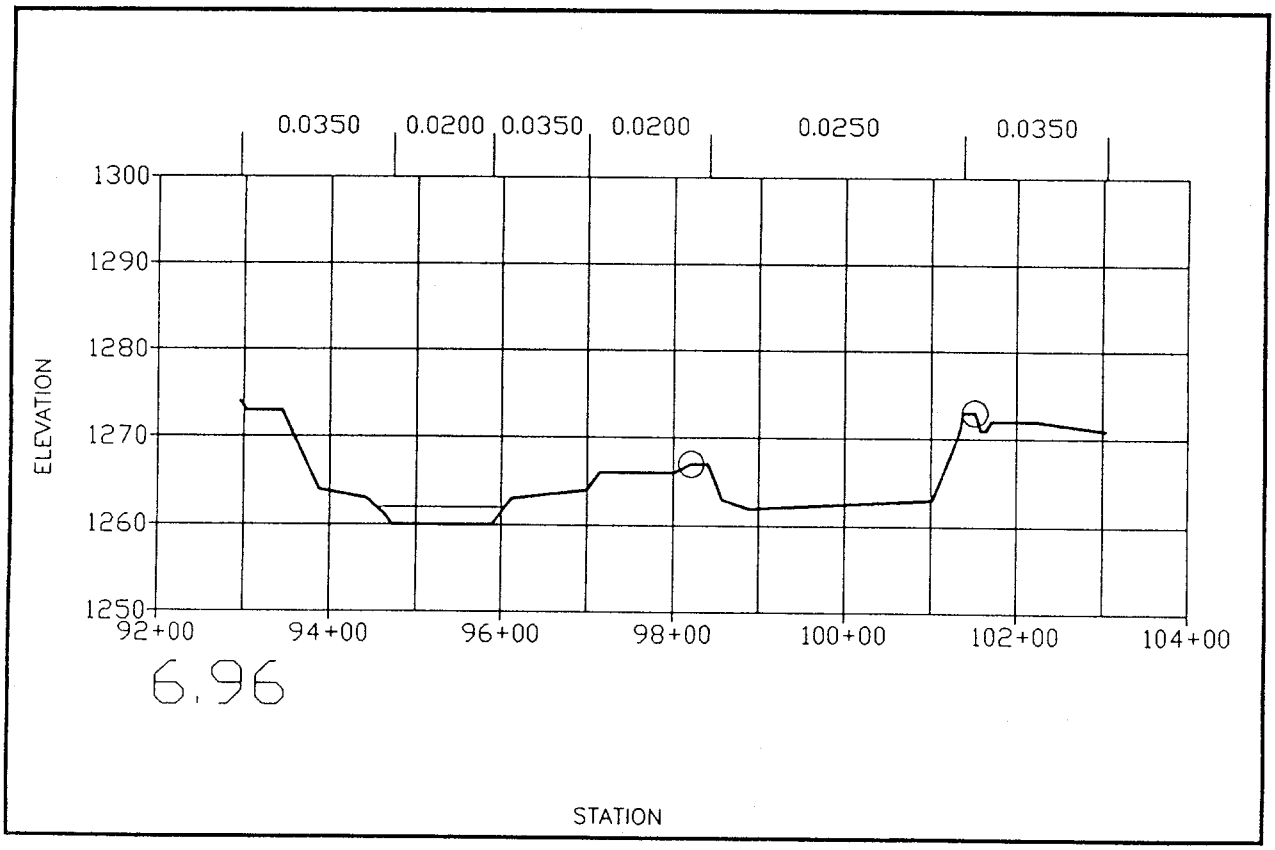

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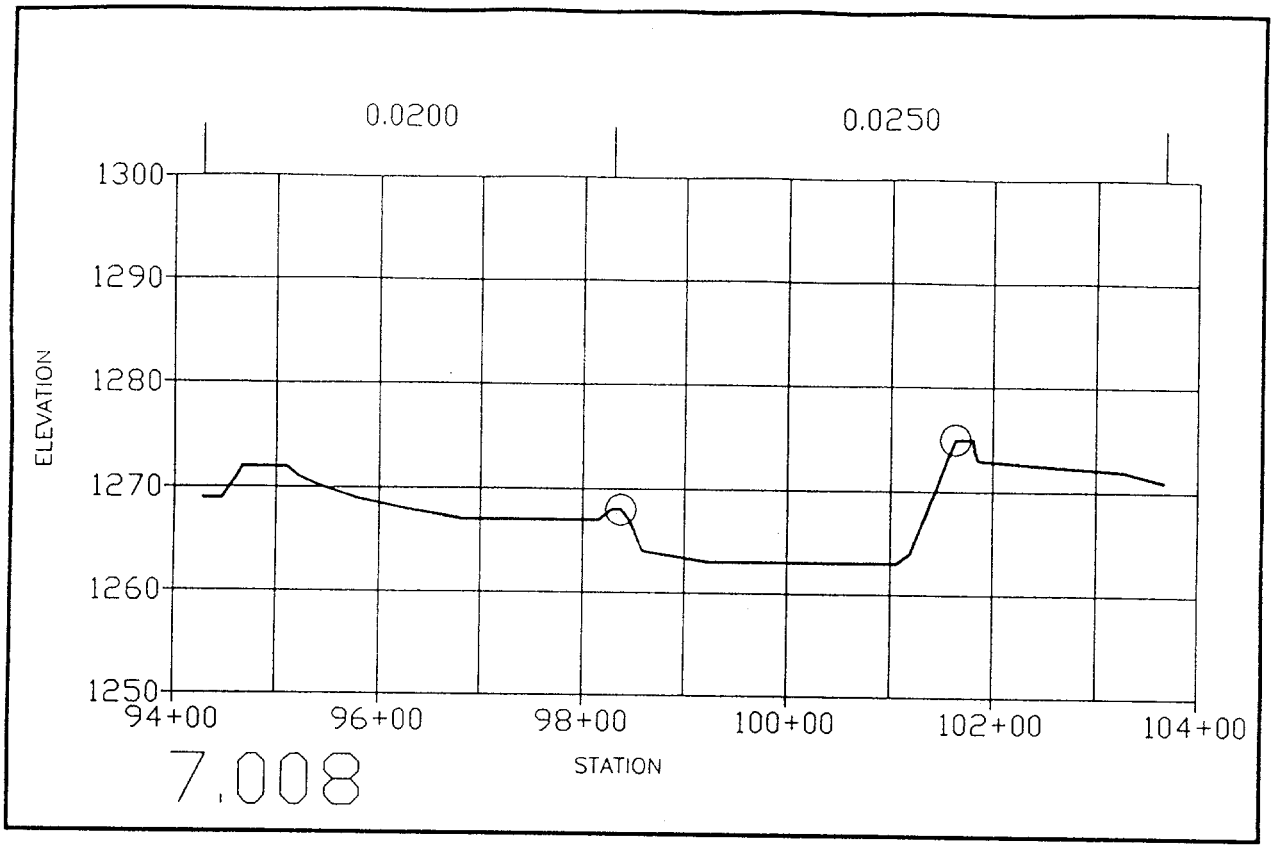

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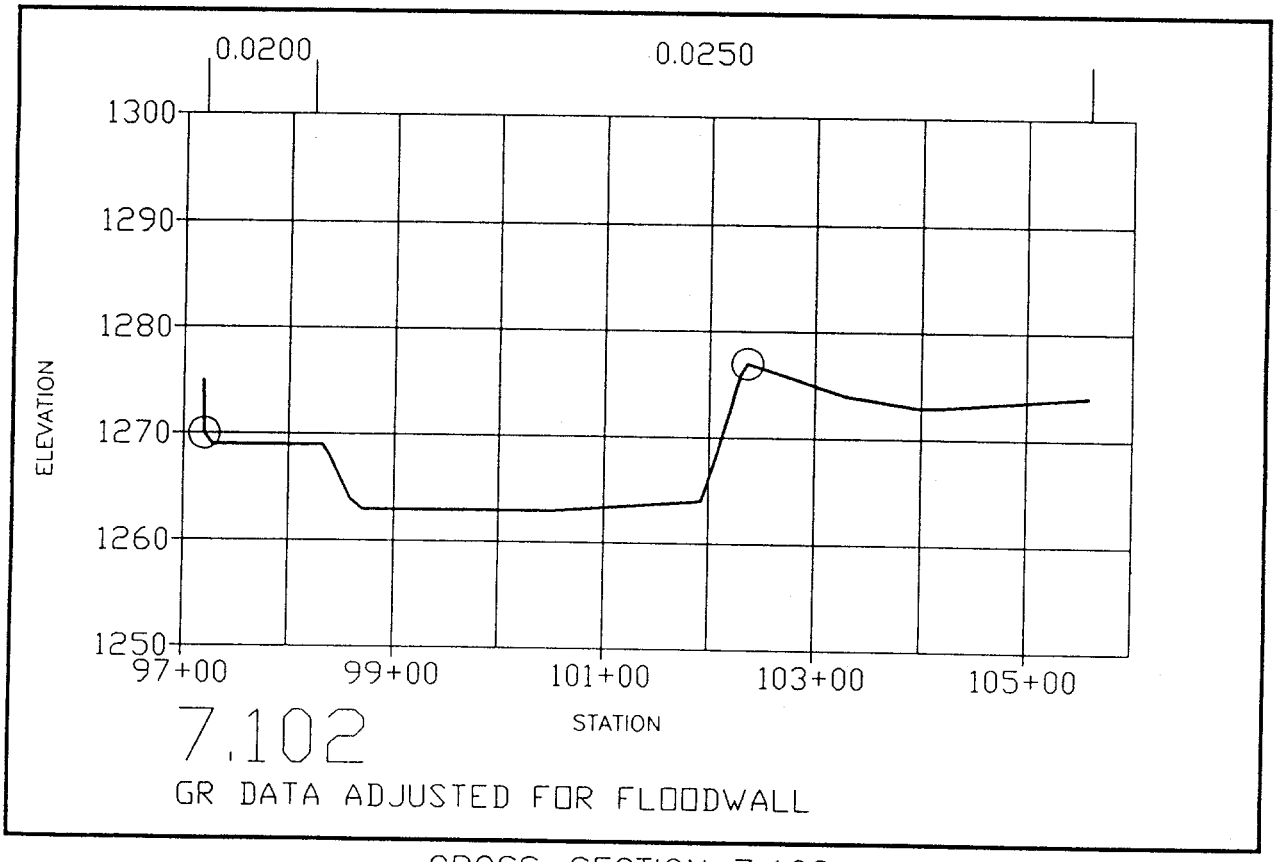

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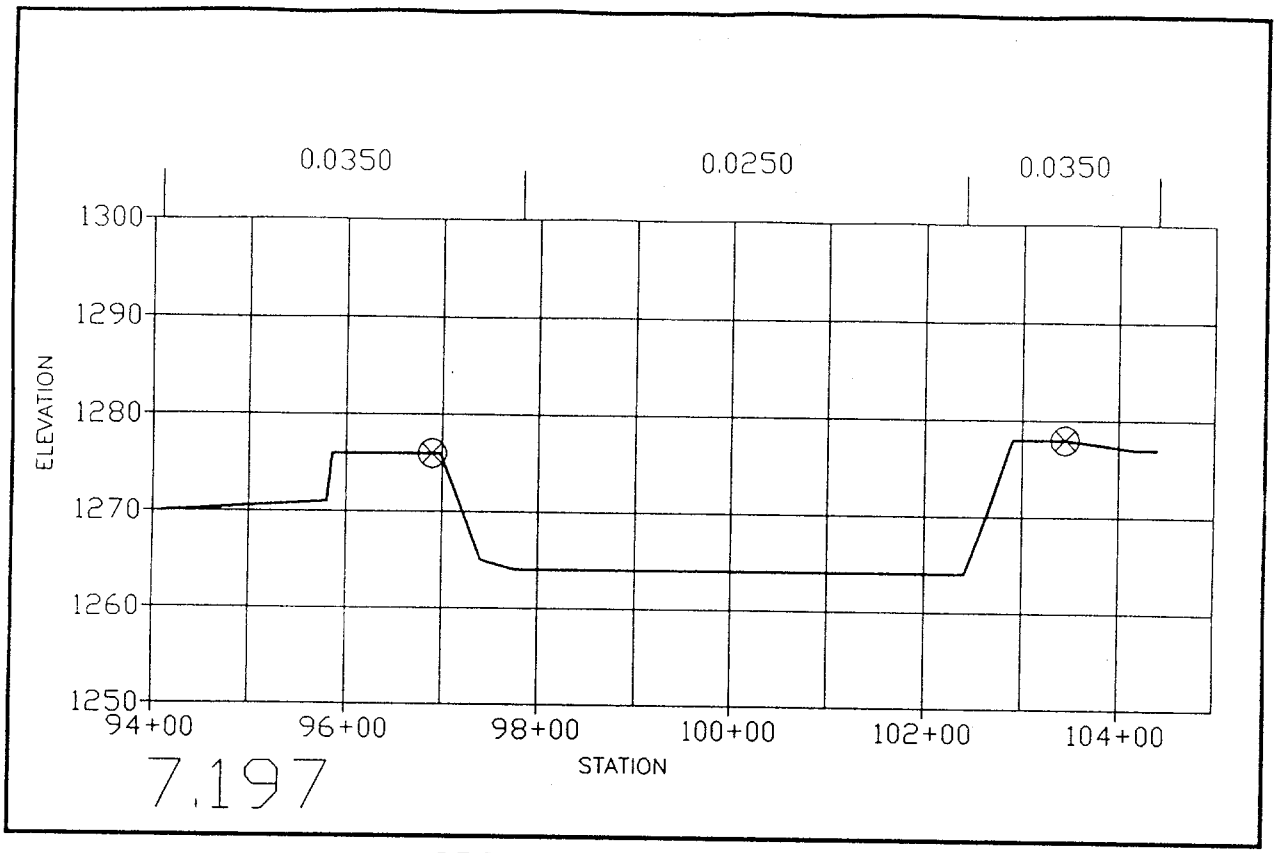

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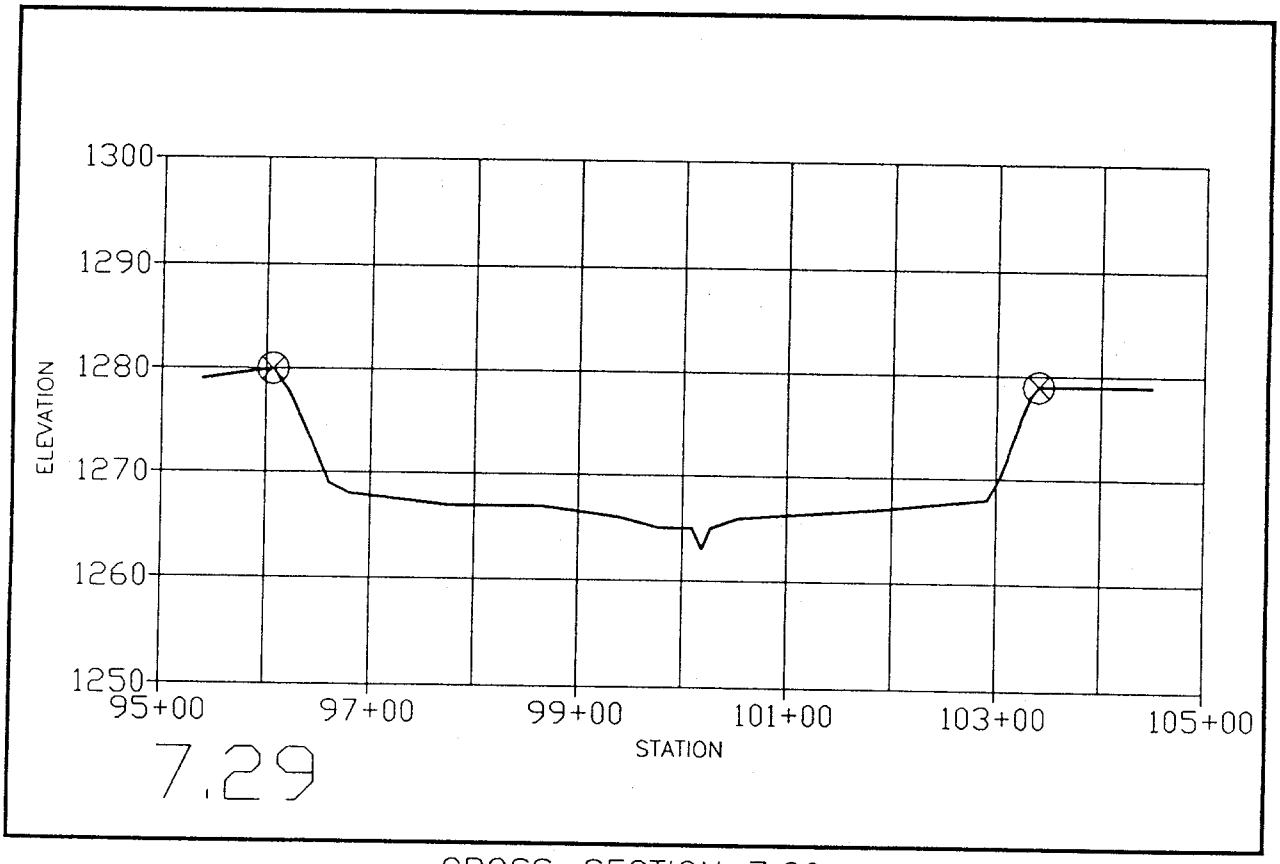

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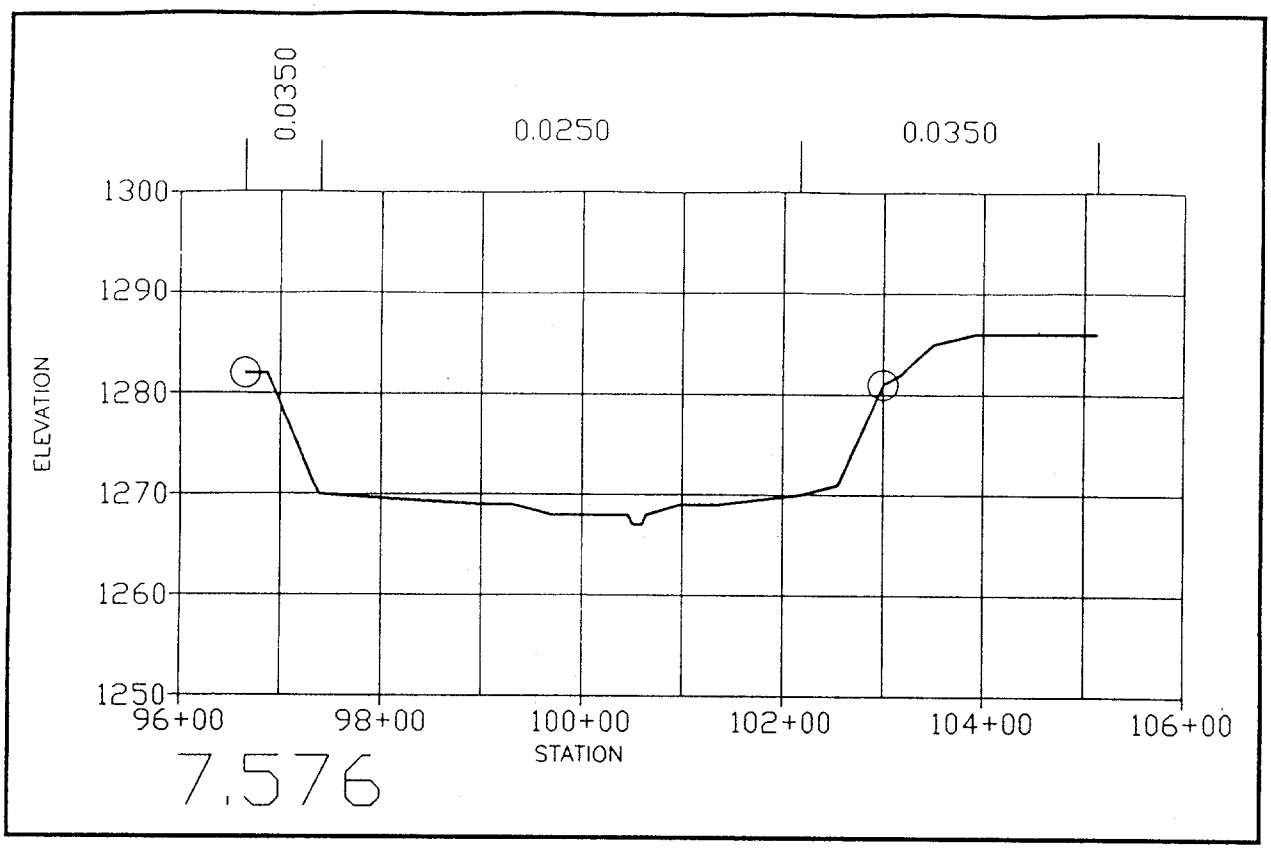

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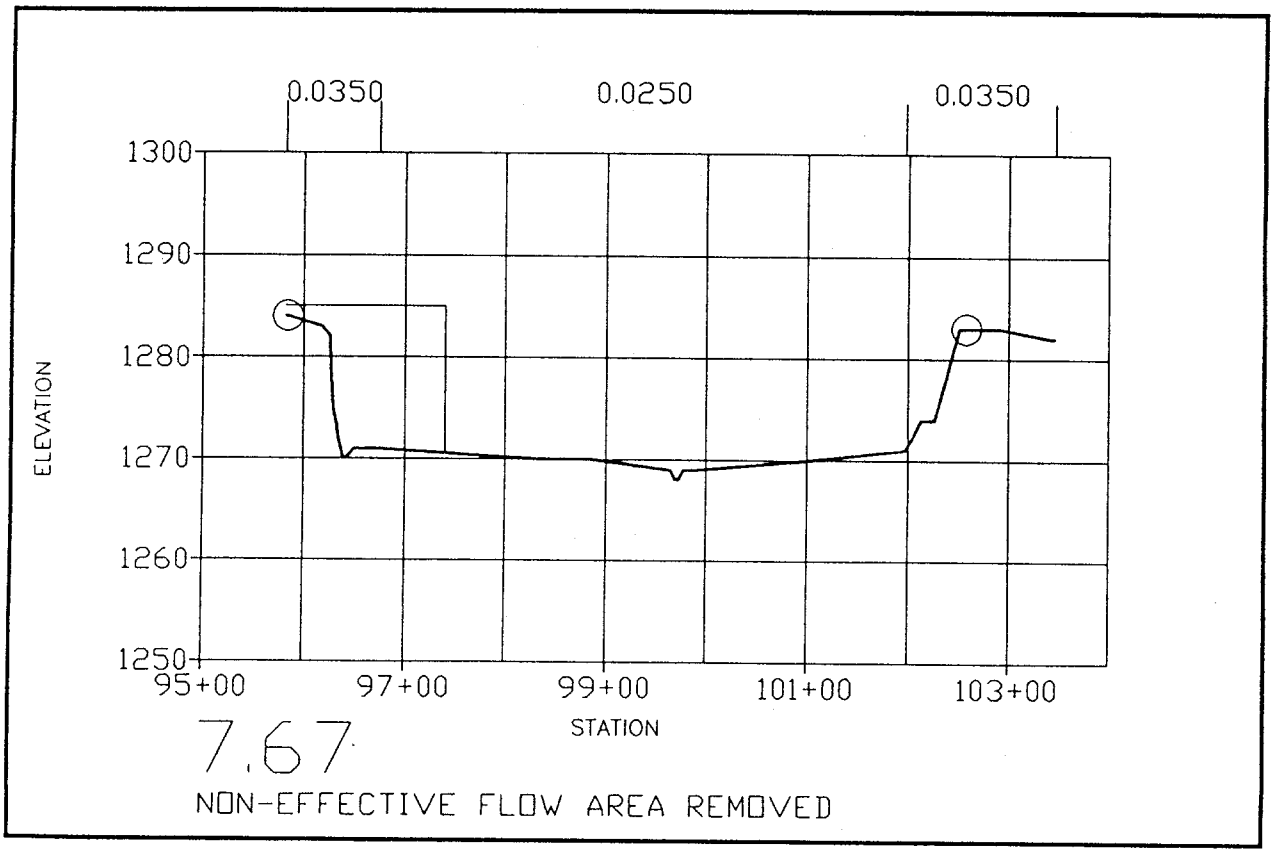

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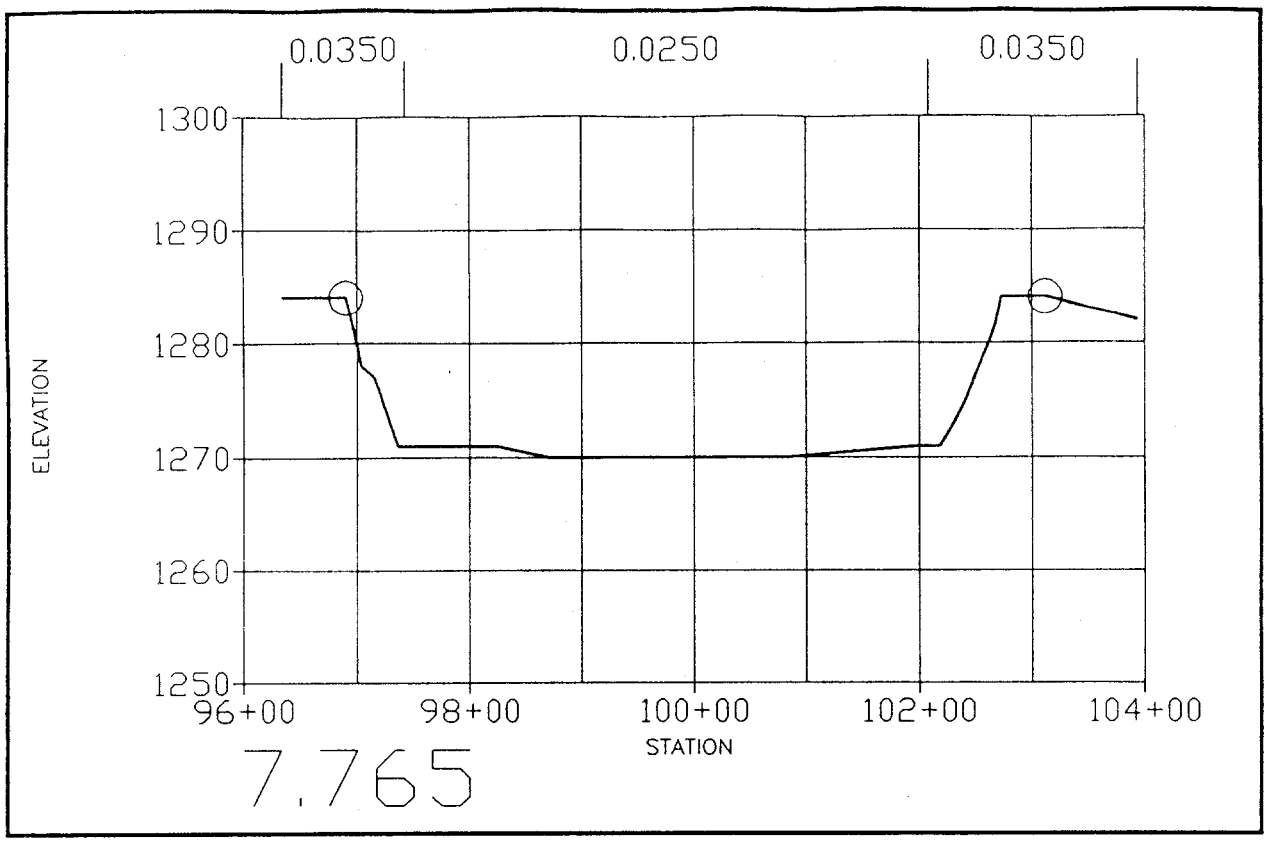

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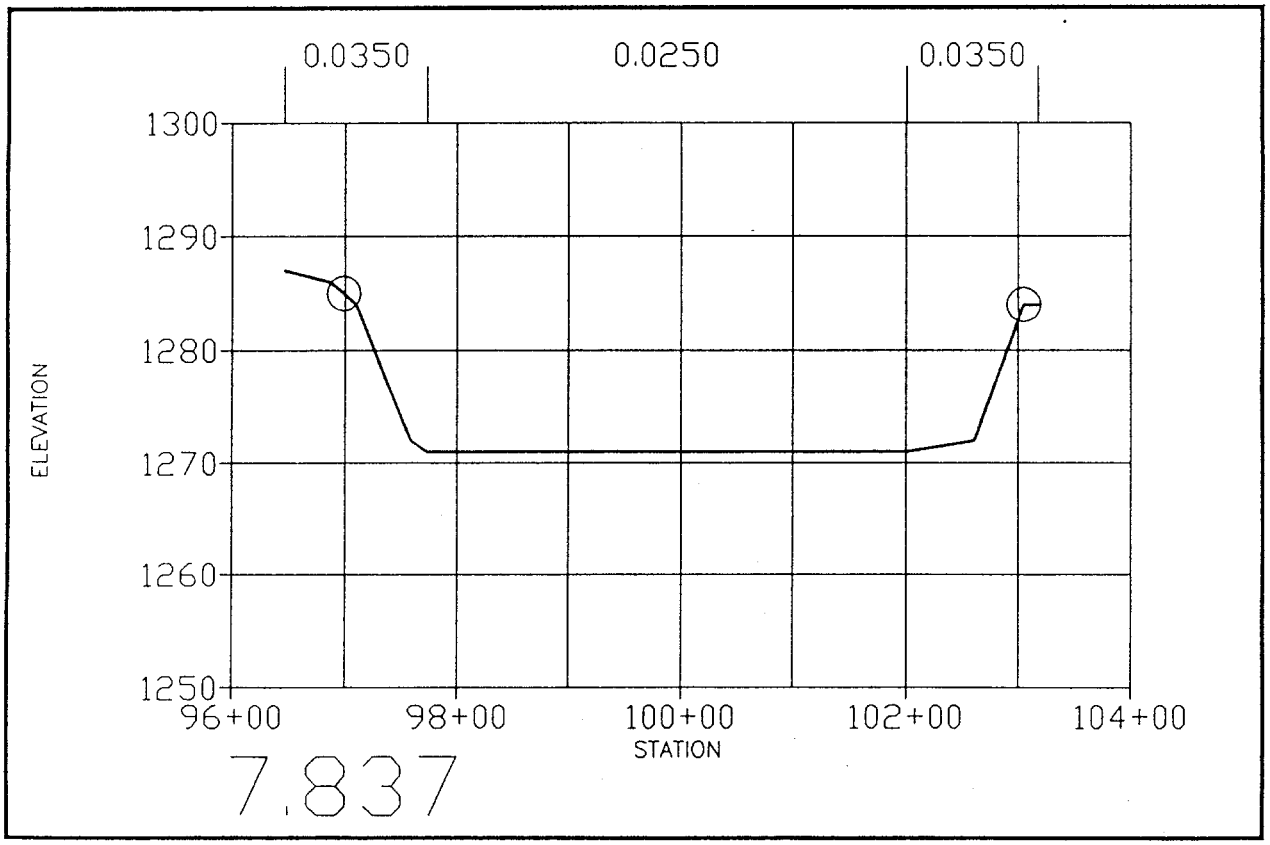

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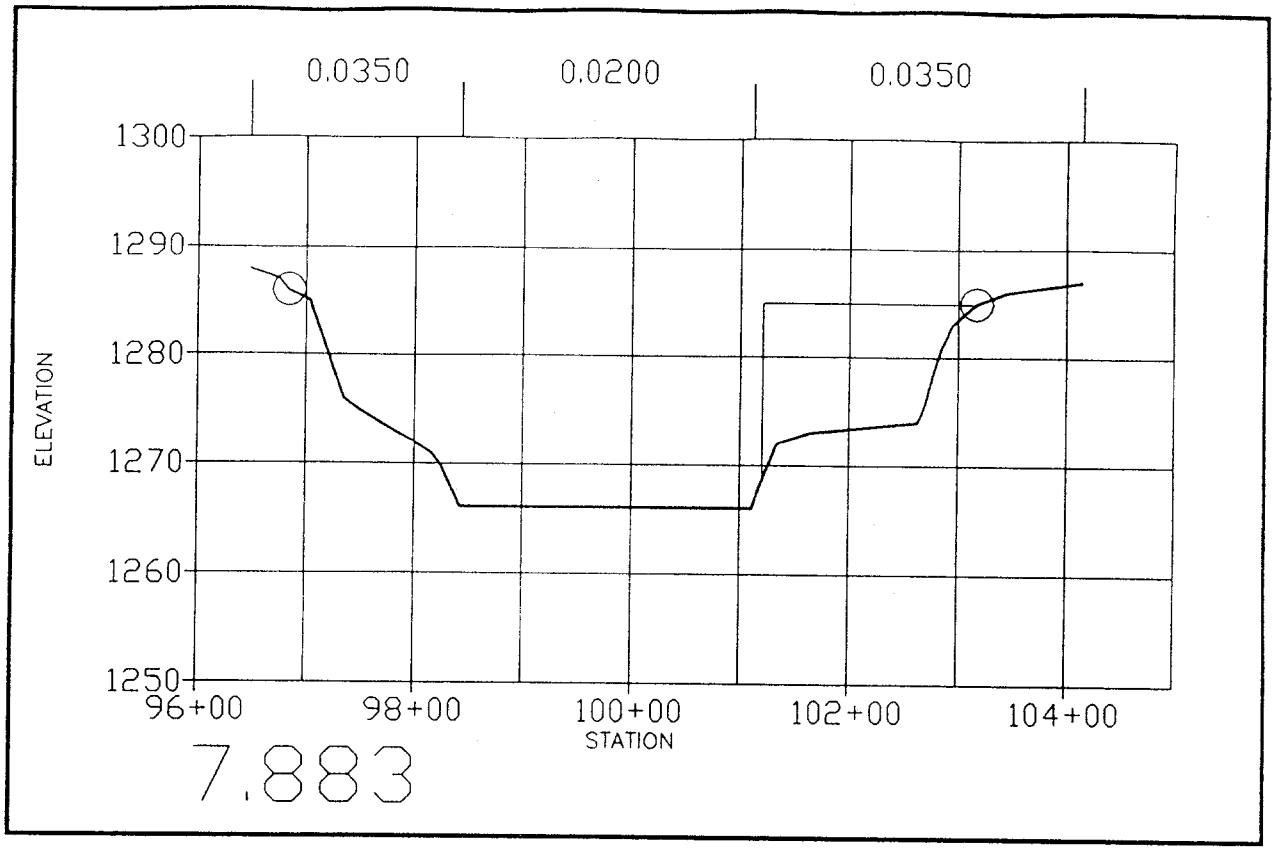

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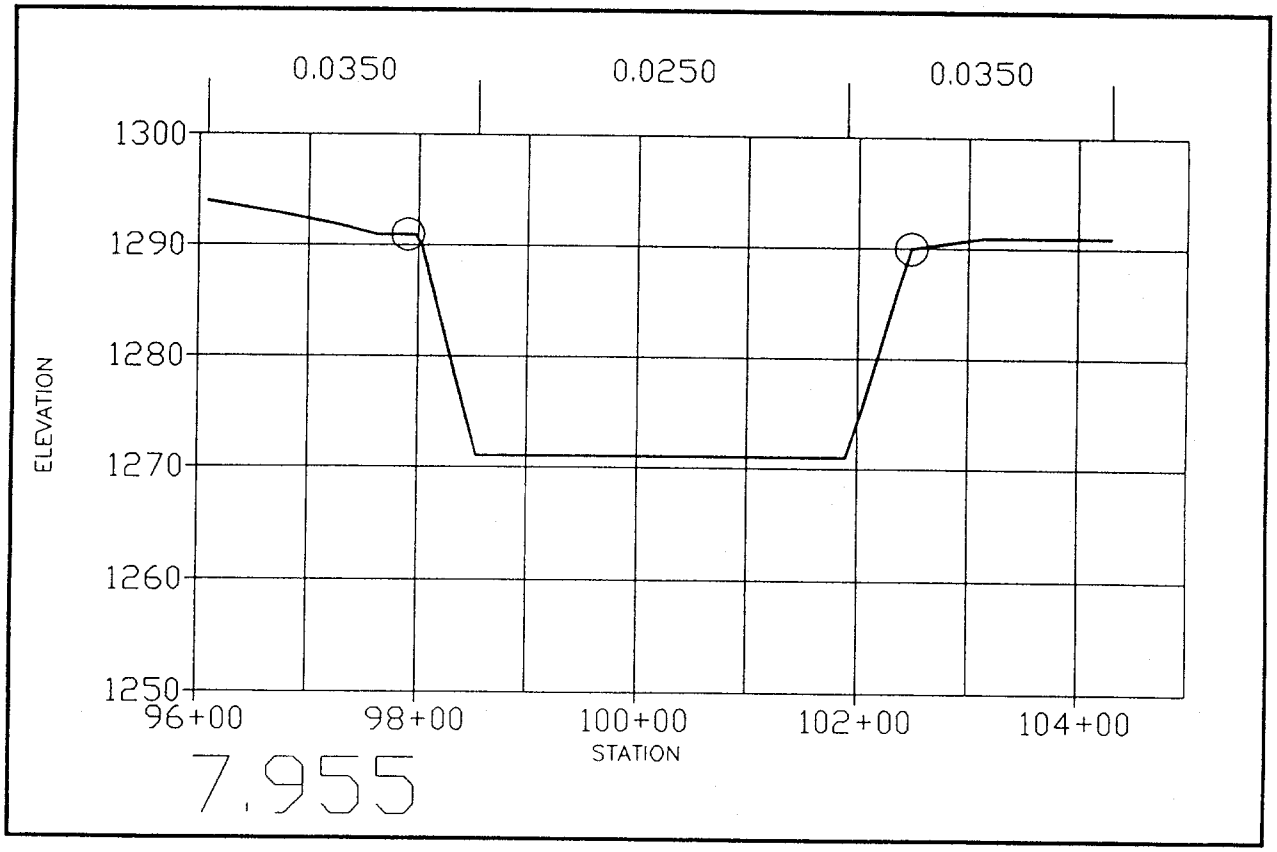

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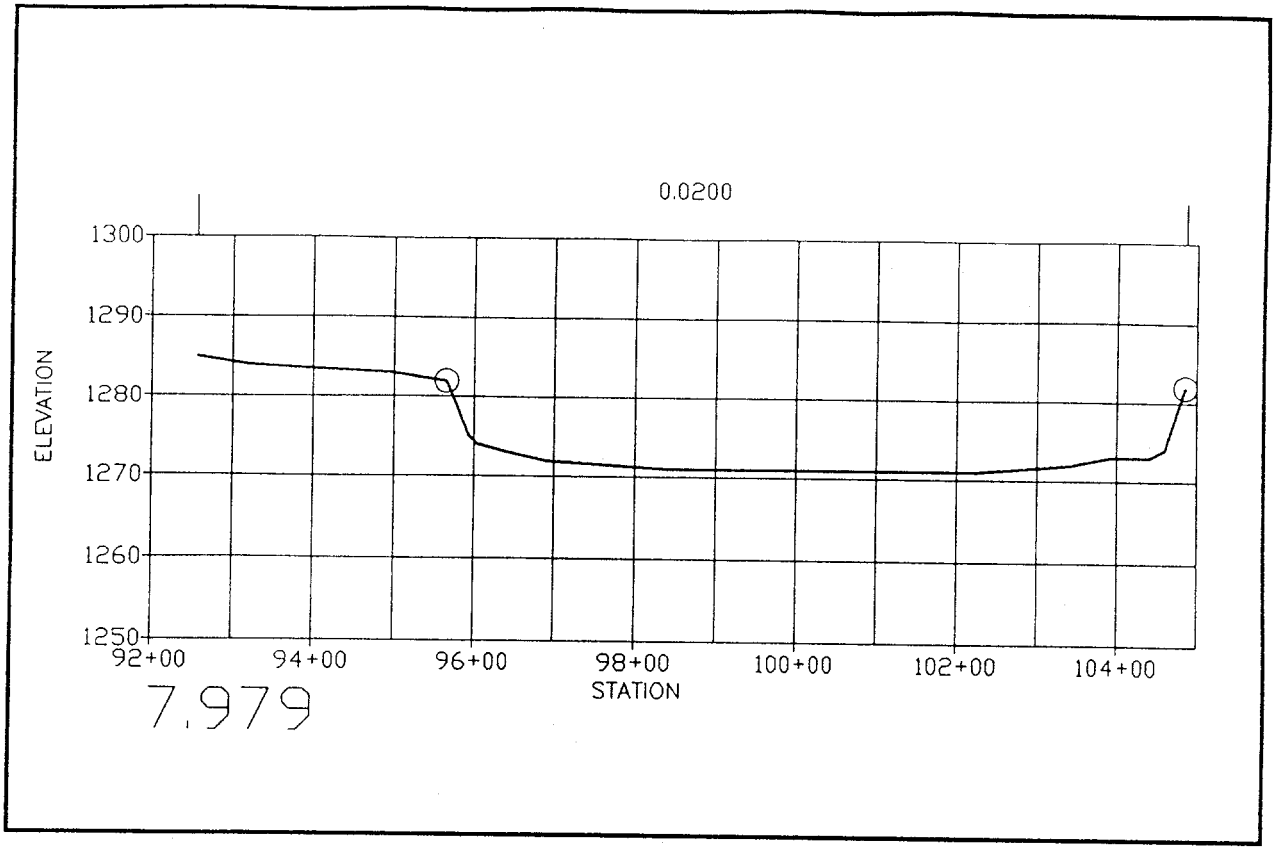

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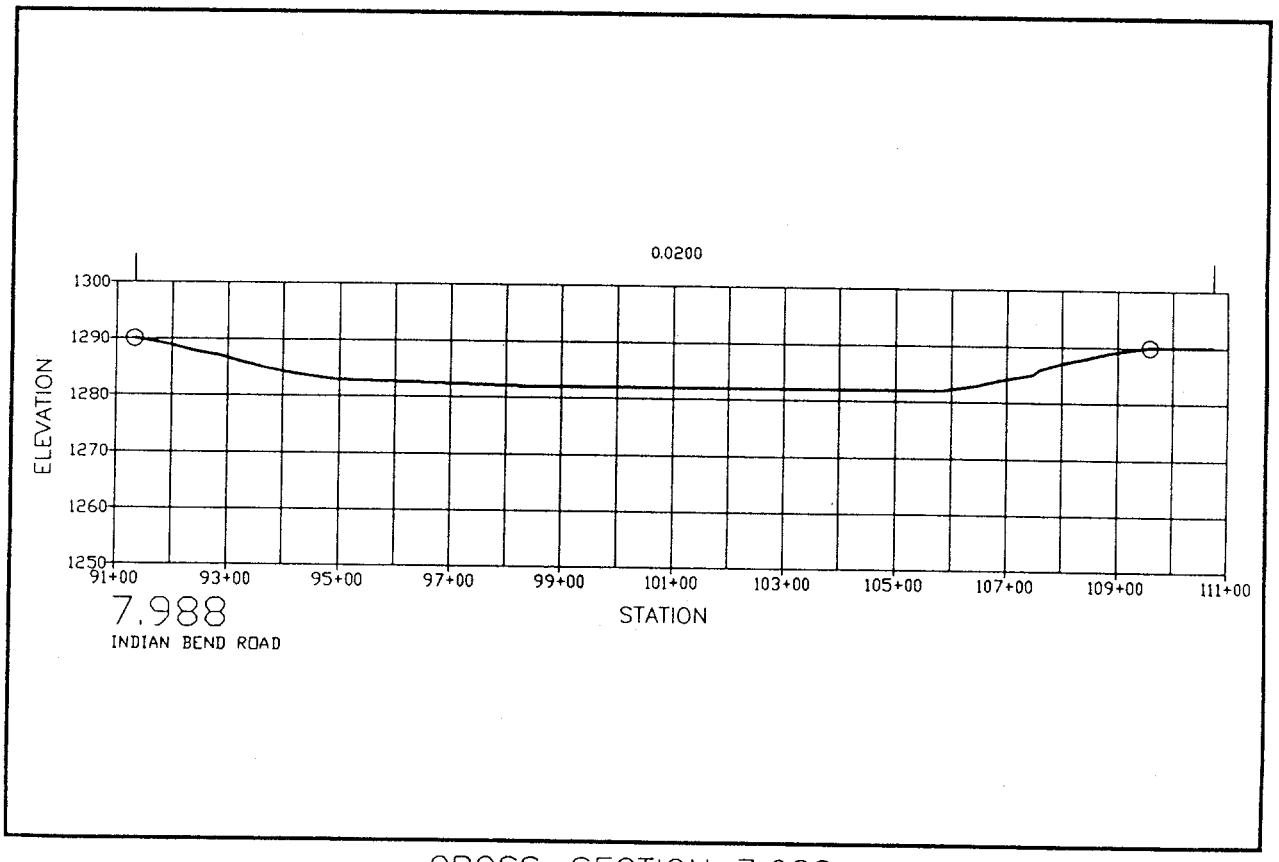

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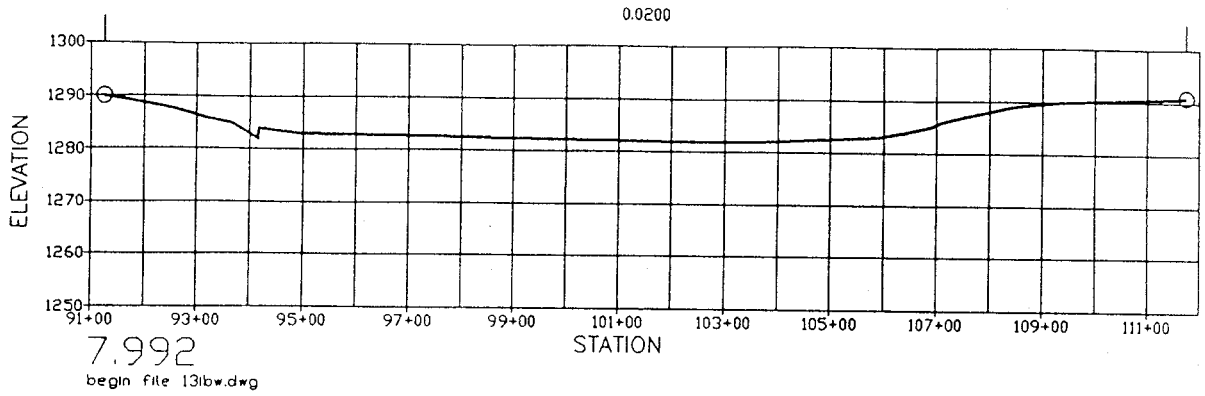

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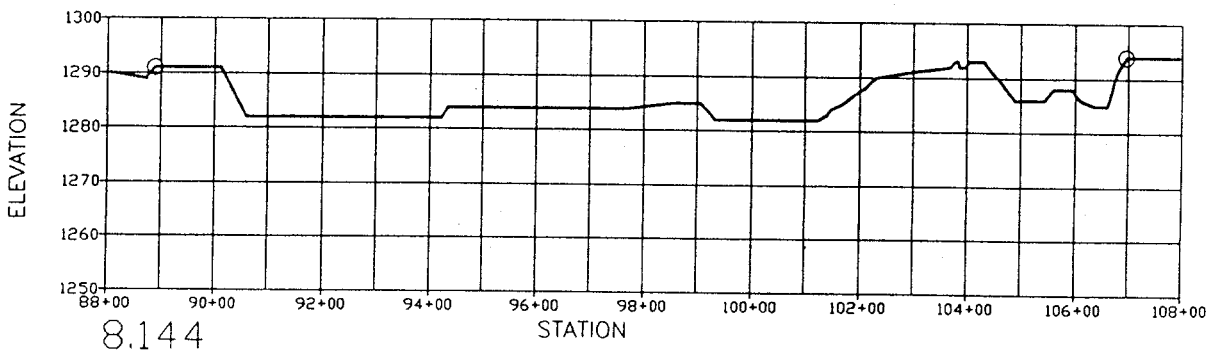

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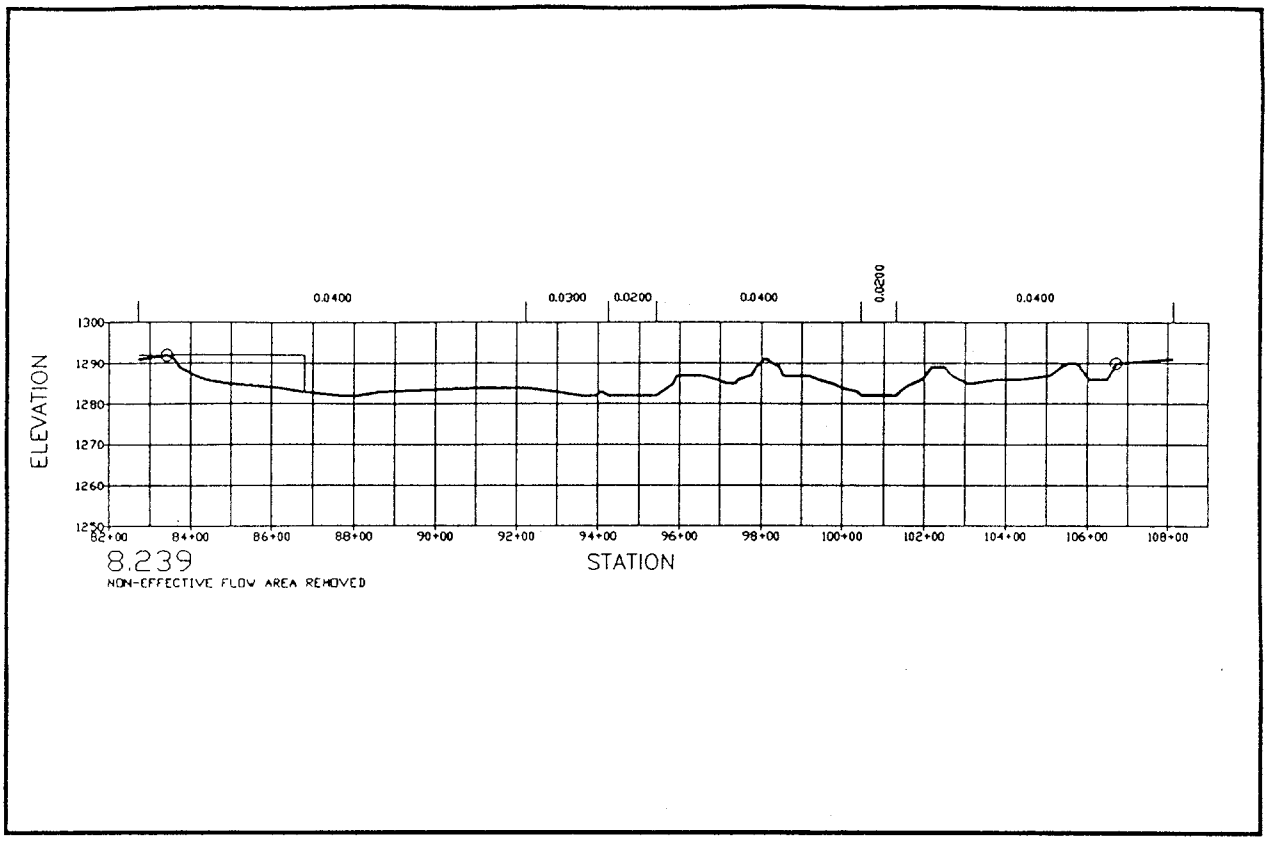

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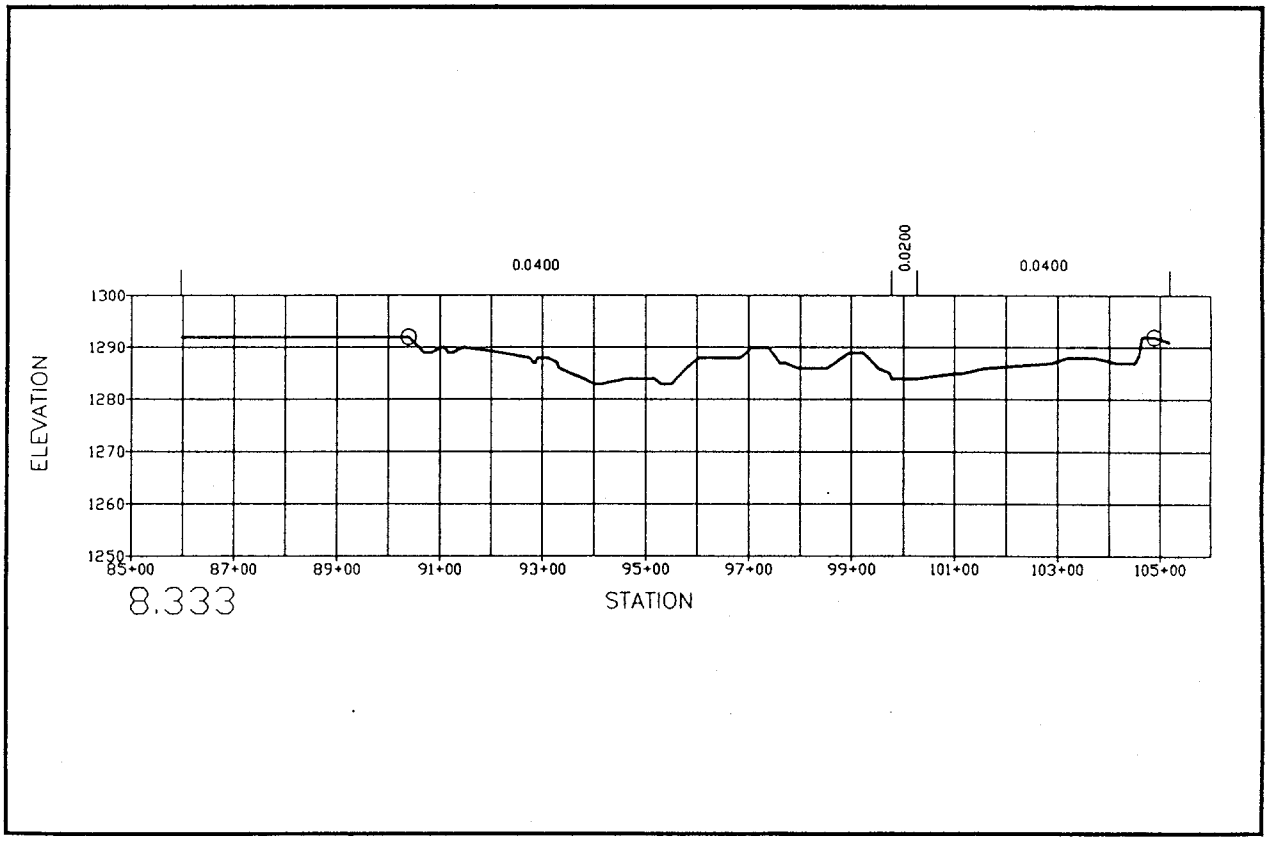

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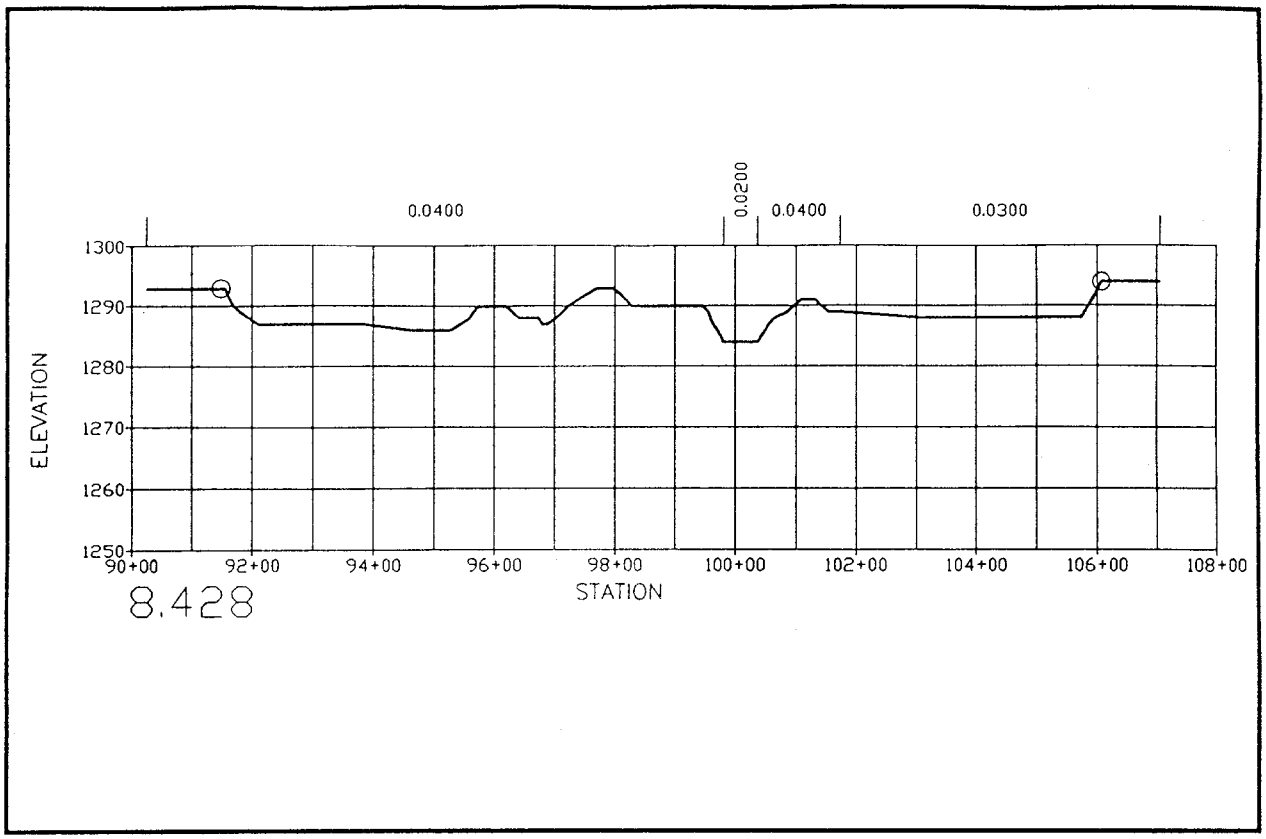

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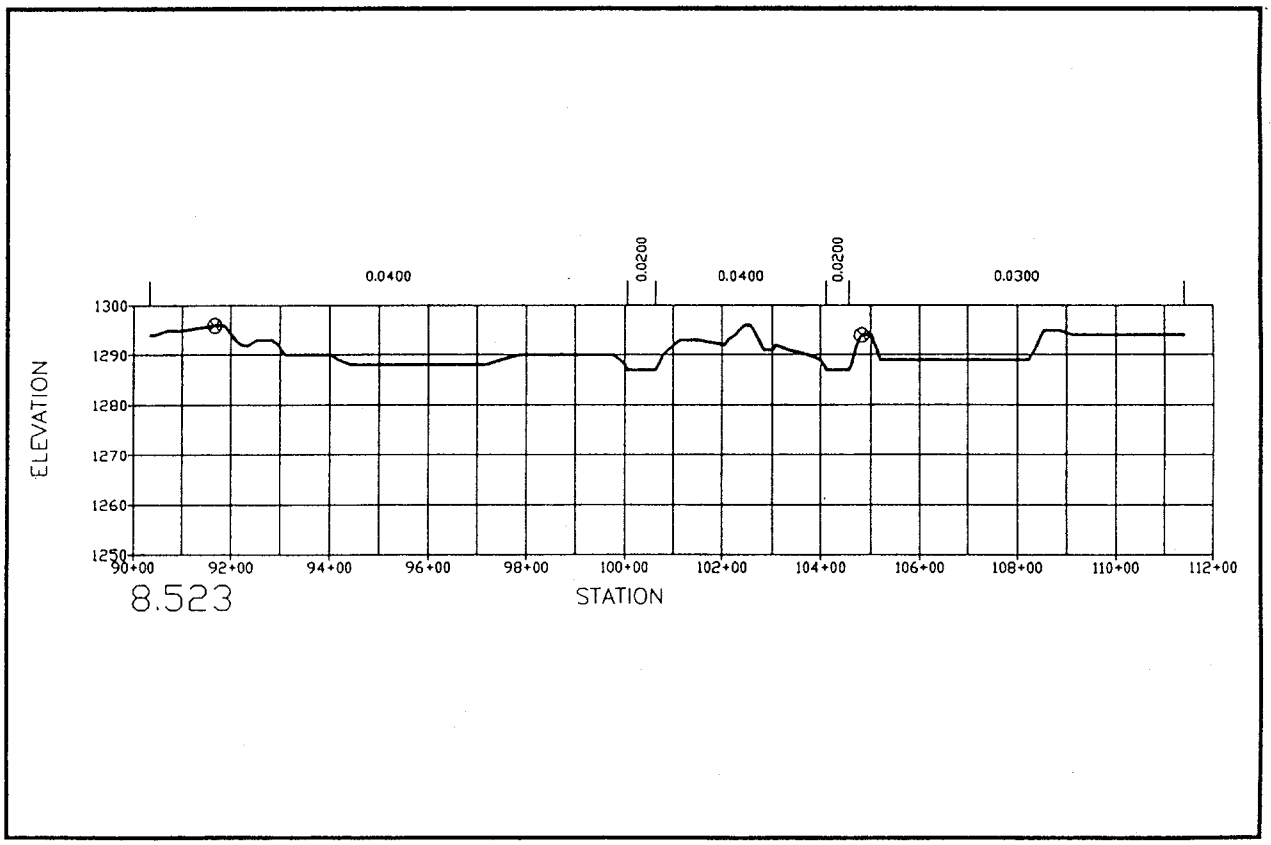

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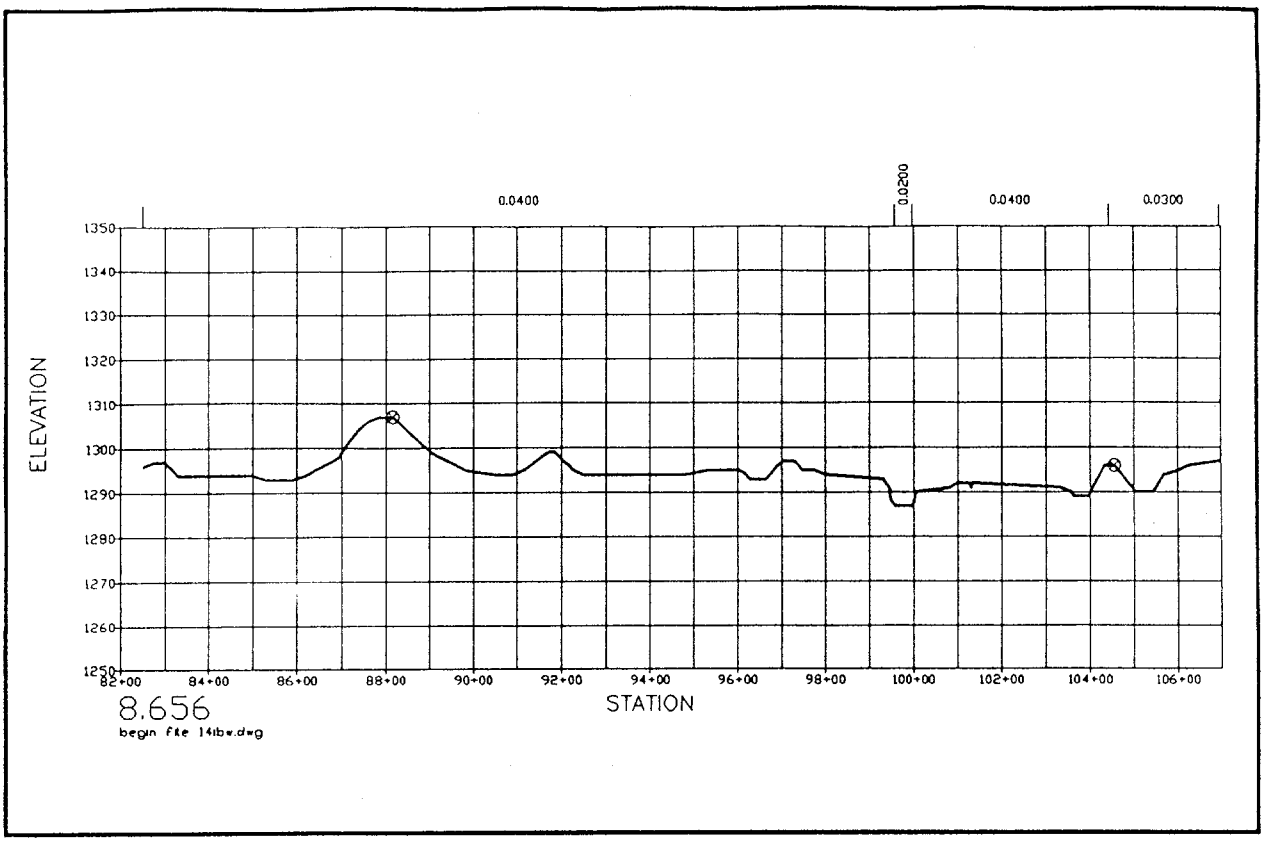

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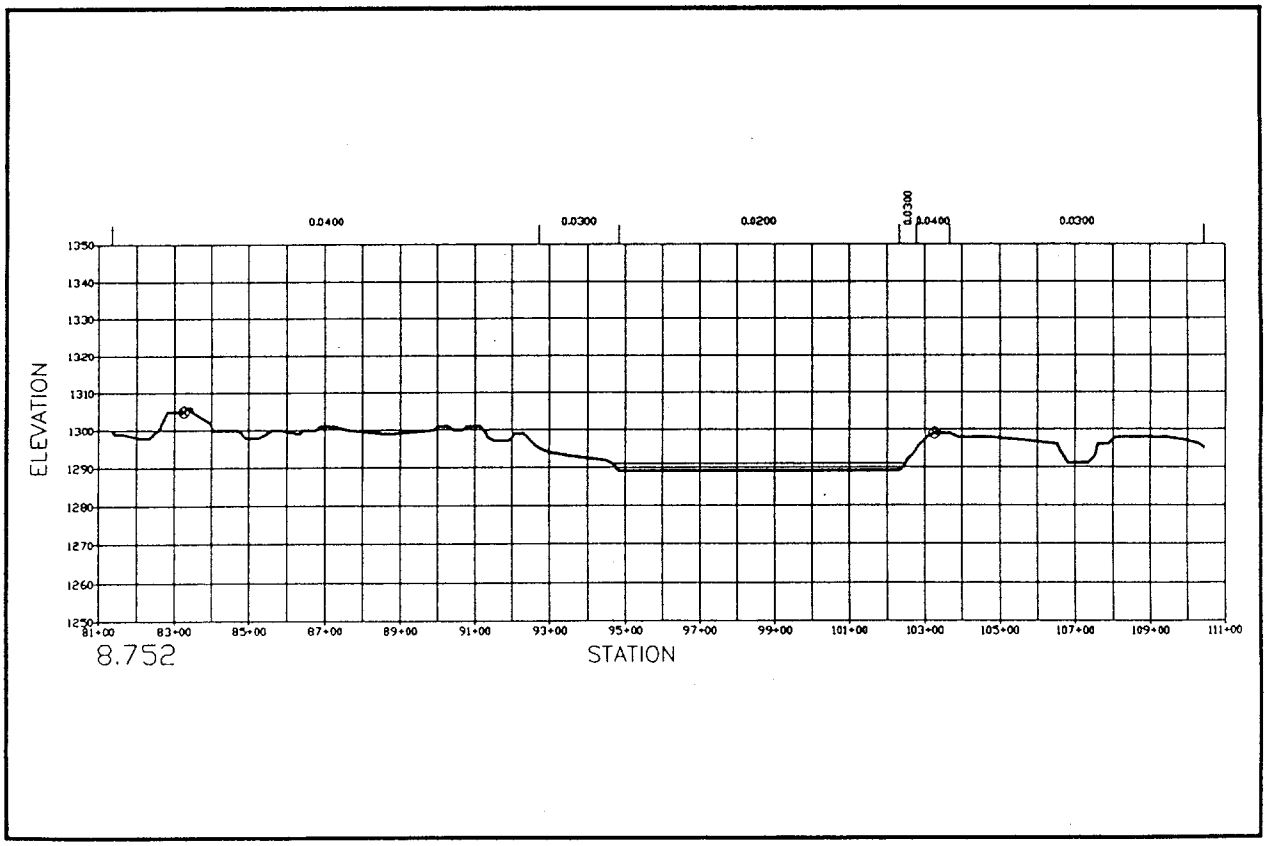

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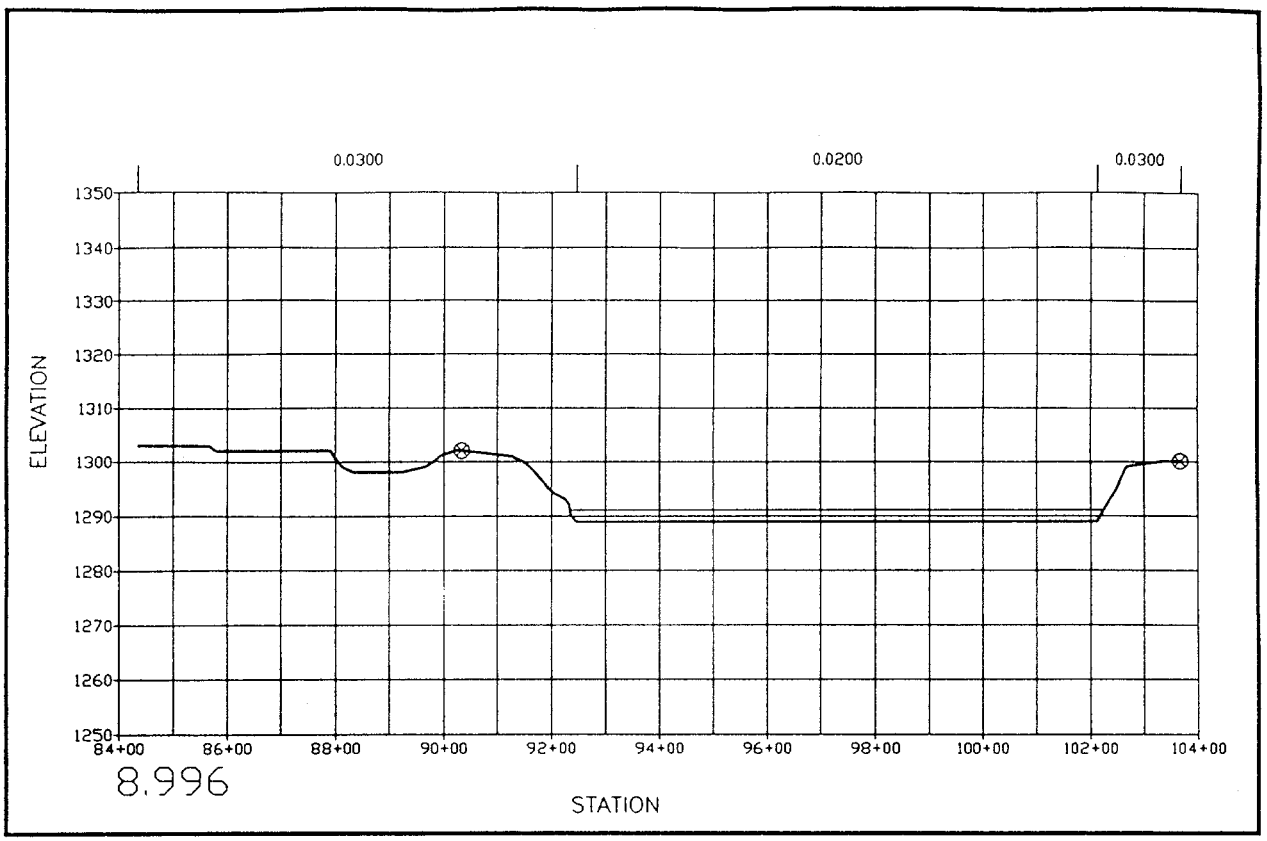

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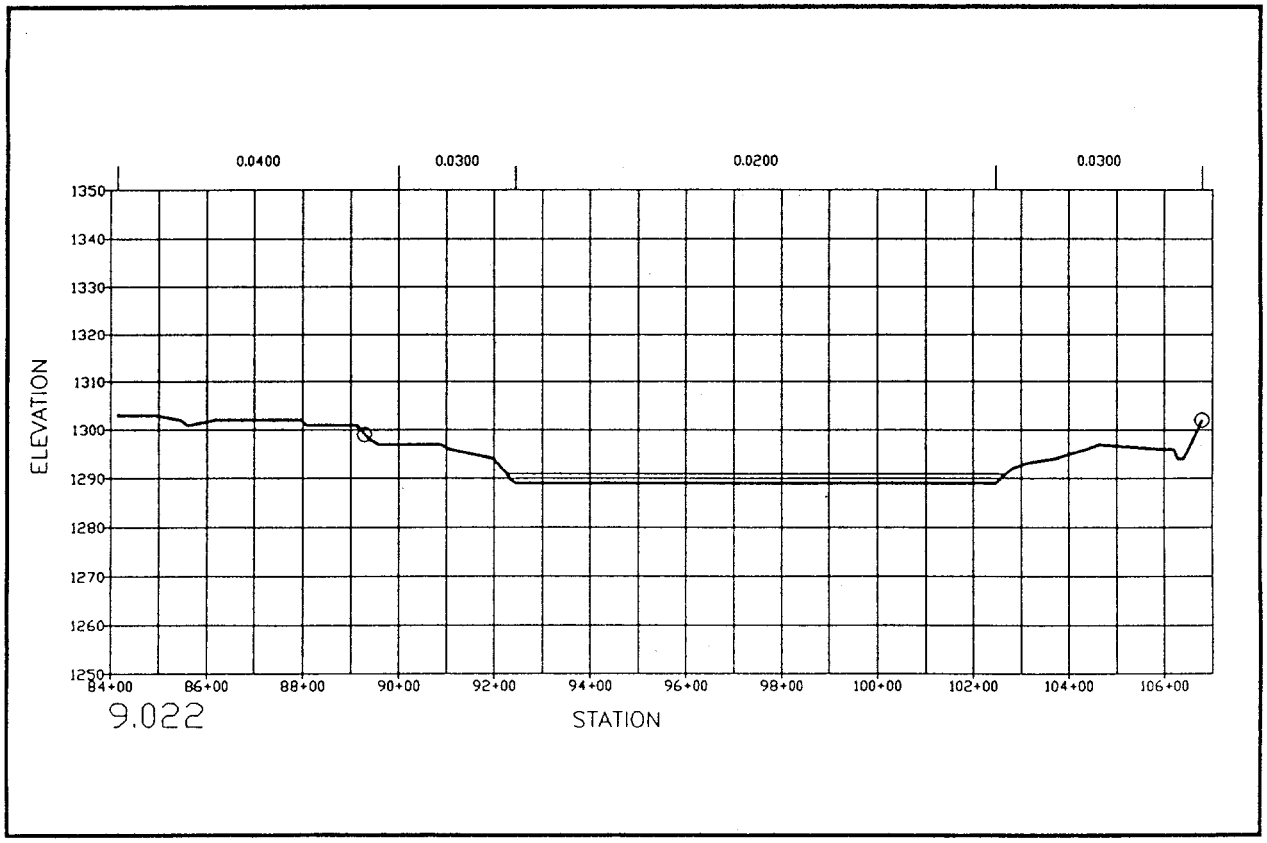

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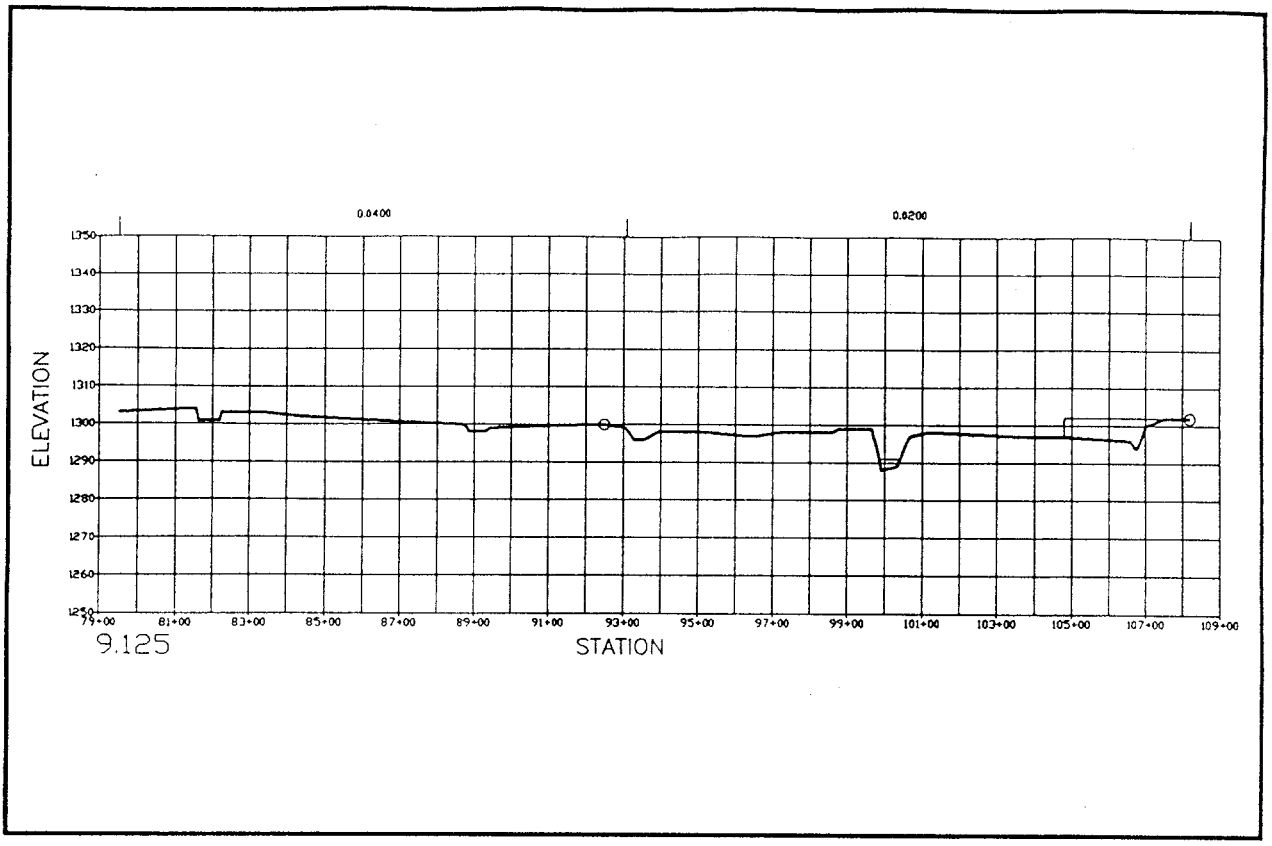

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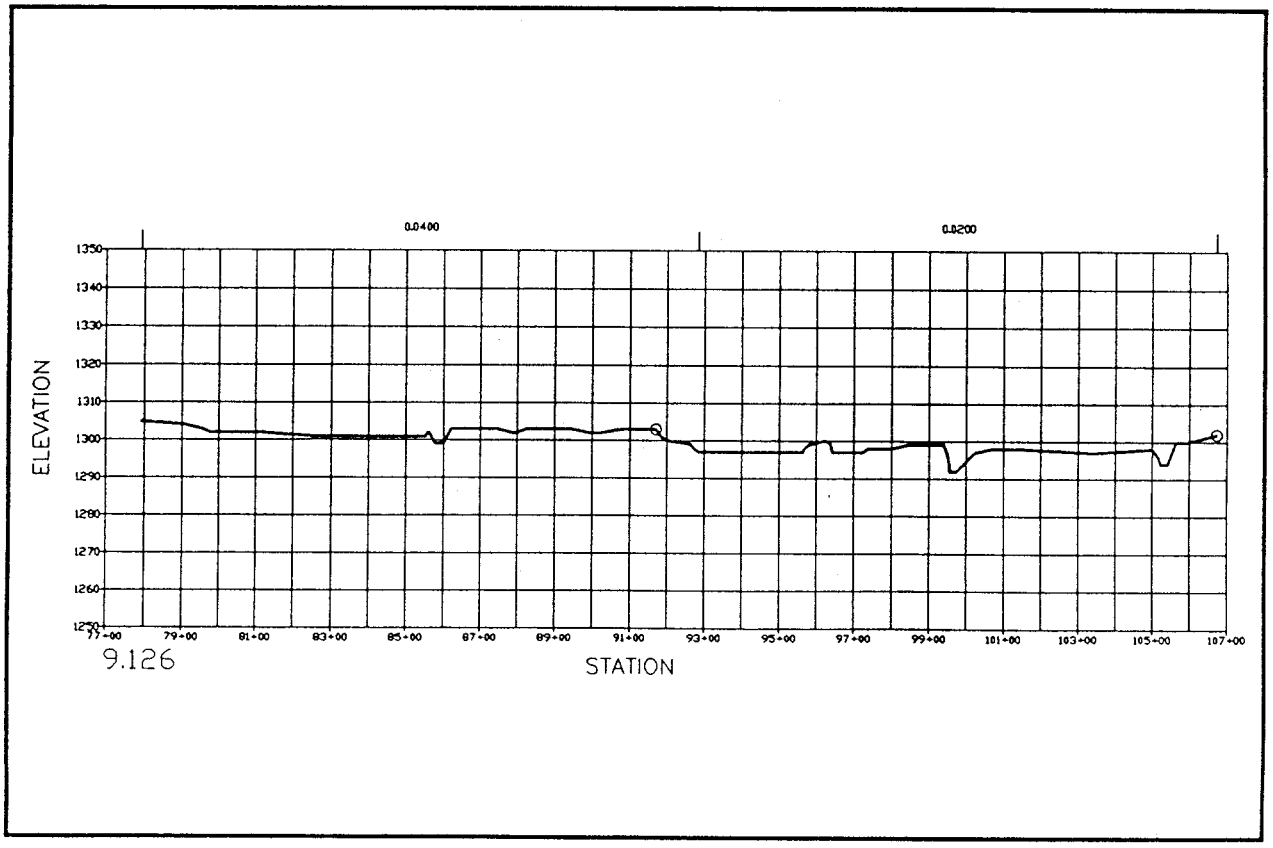

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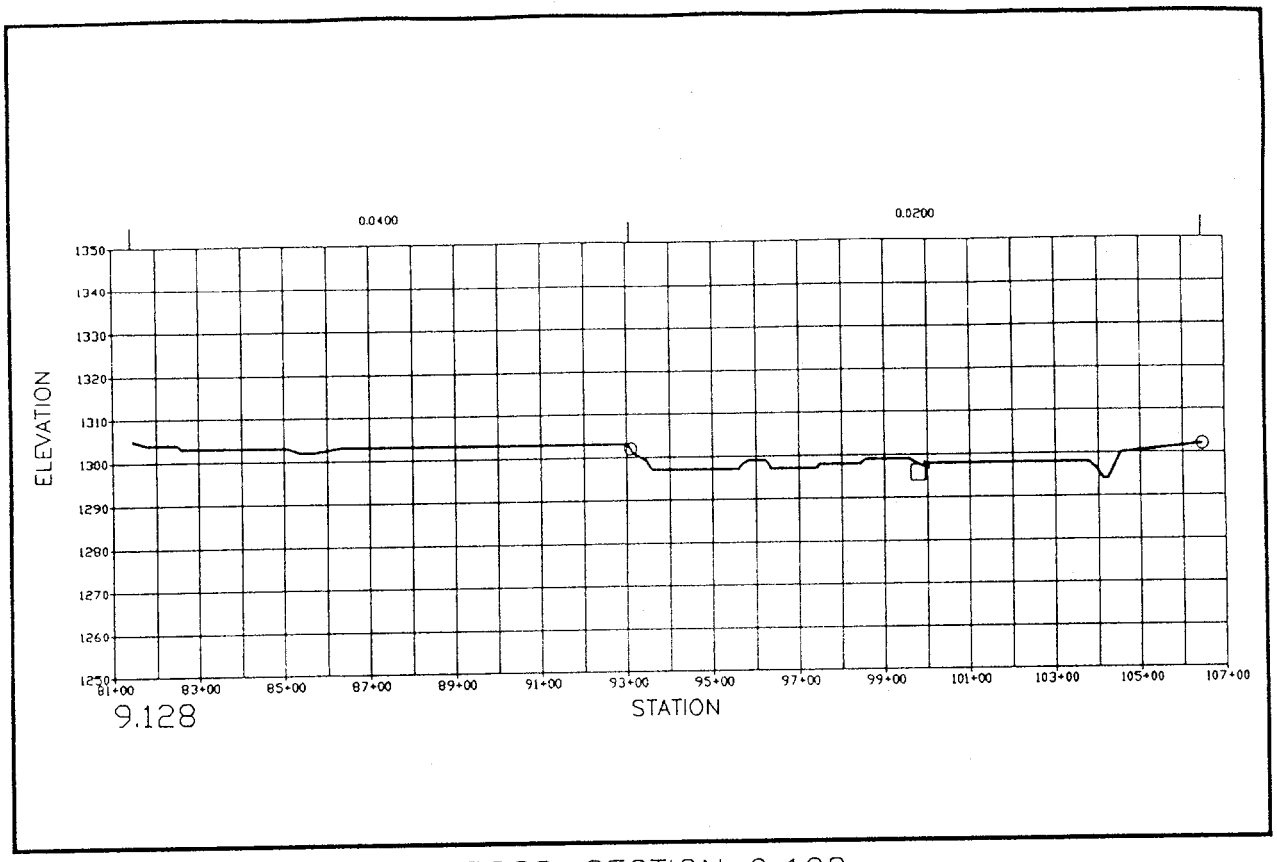
SECTION 4: Hydraulic Analysis

4.2.2. Expansion and Contraction Coefficients



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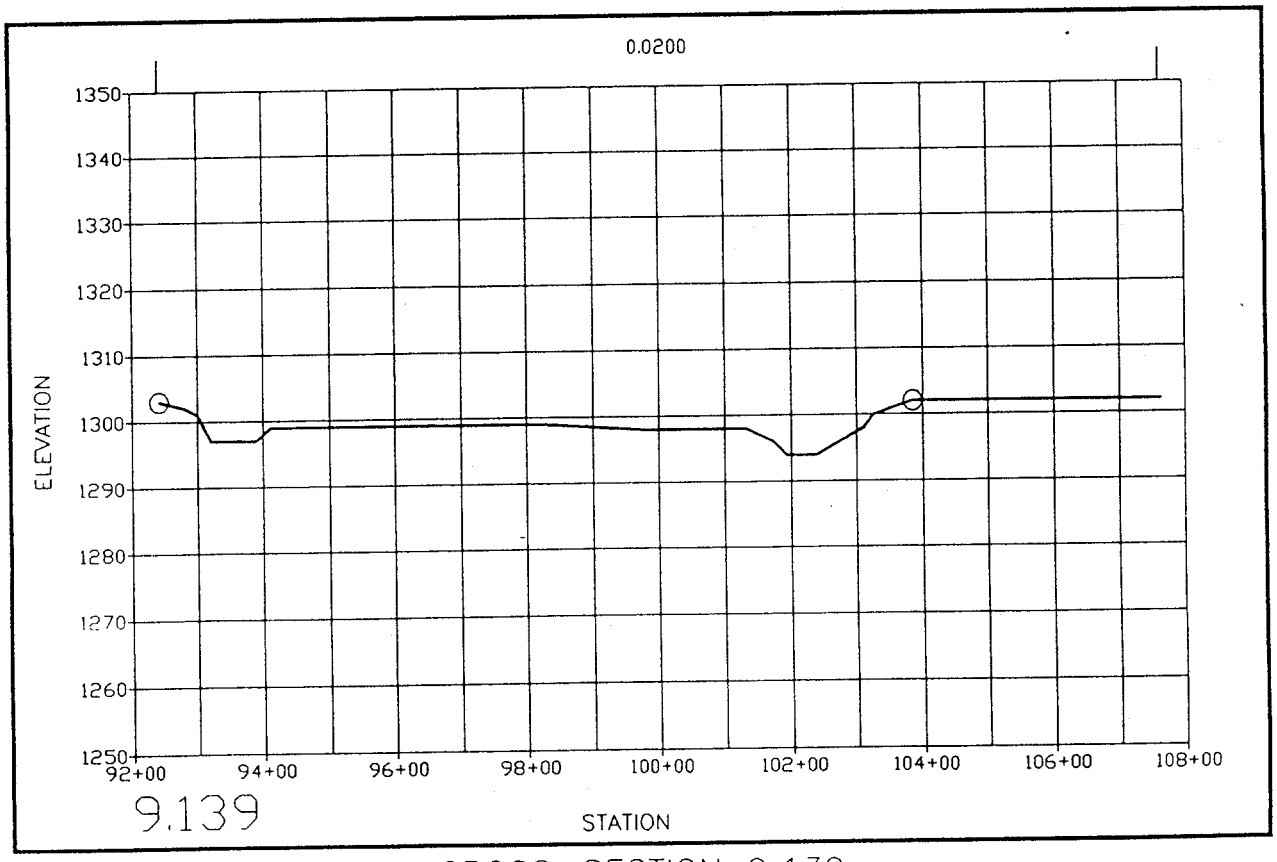

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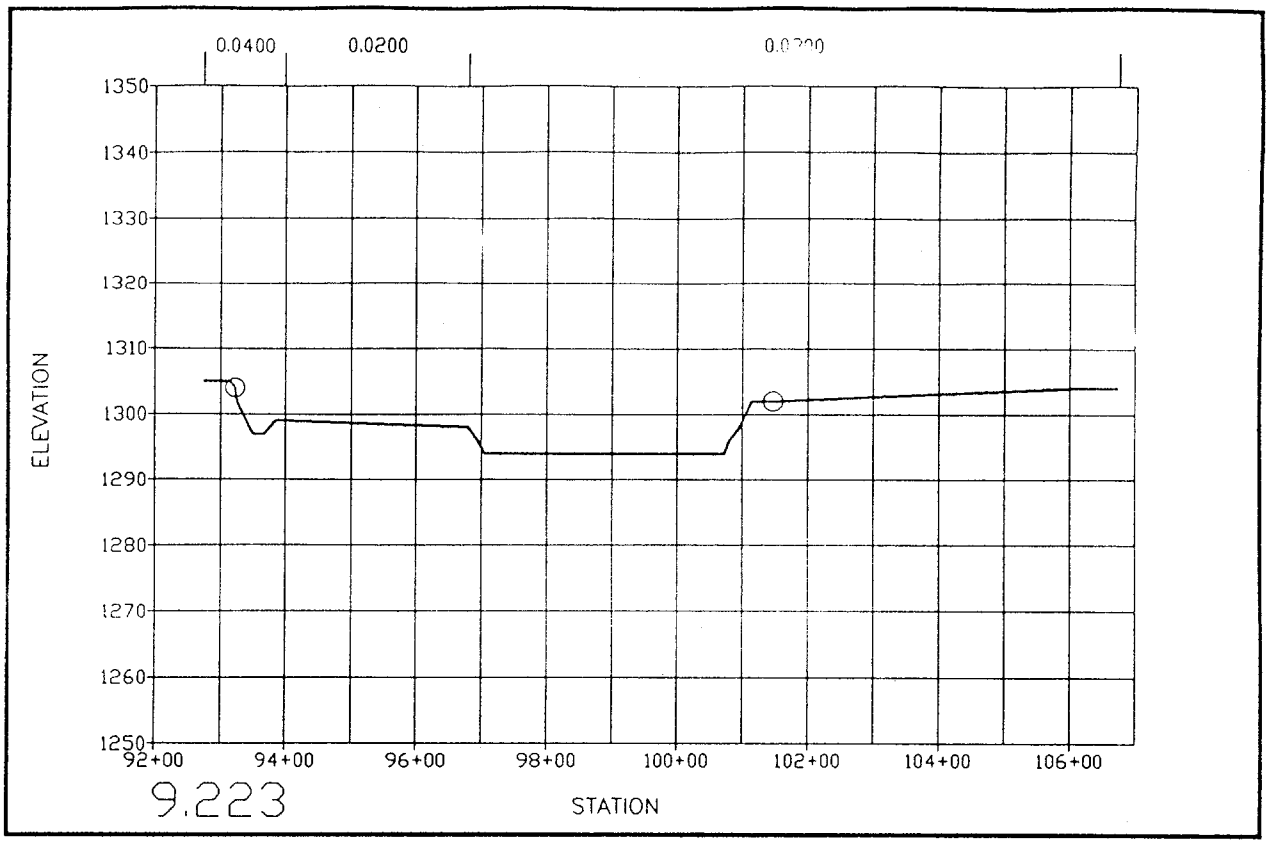

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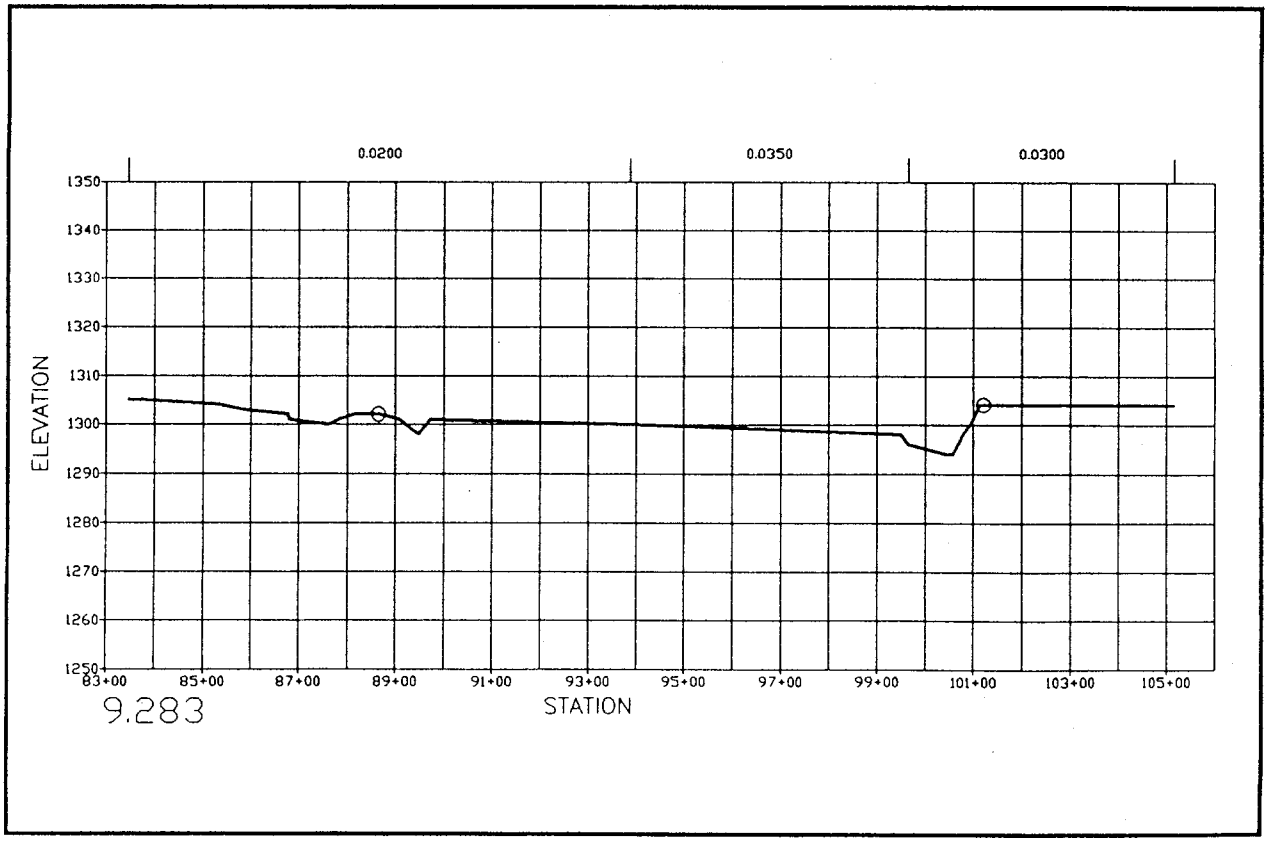

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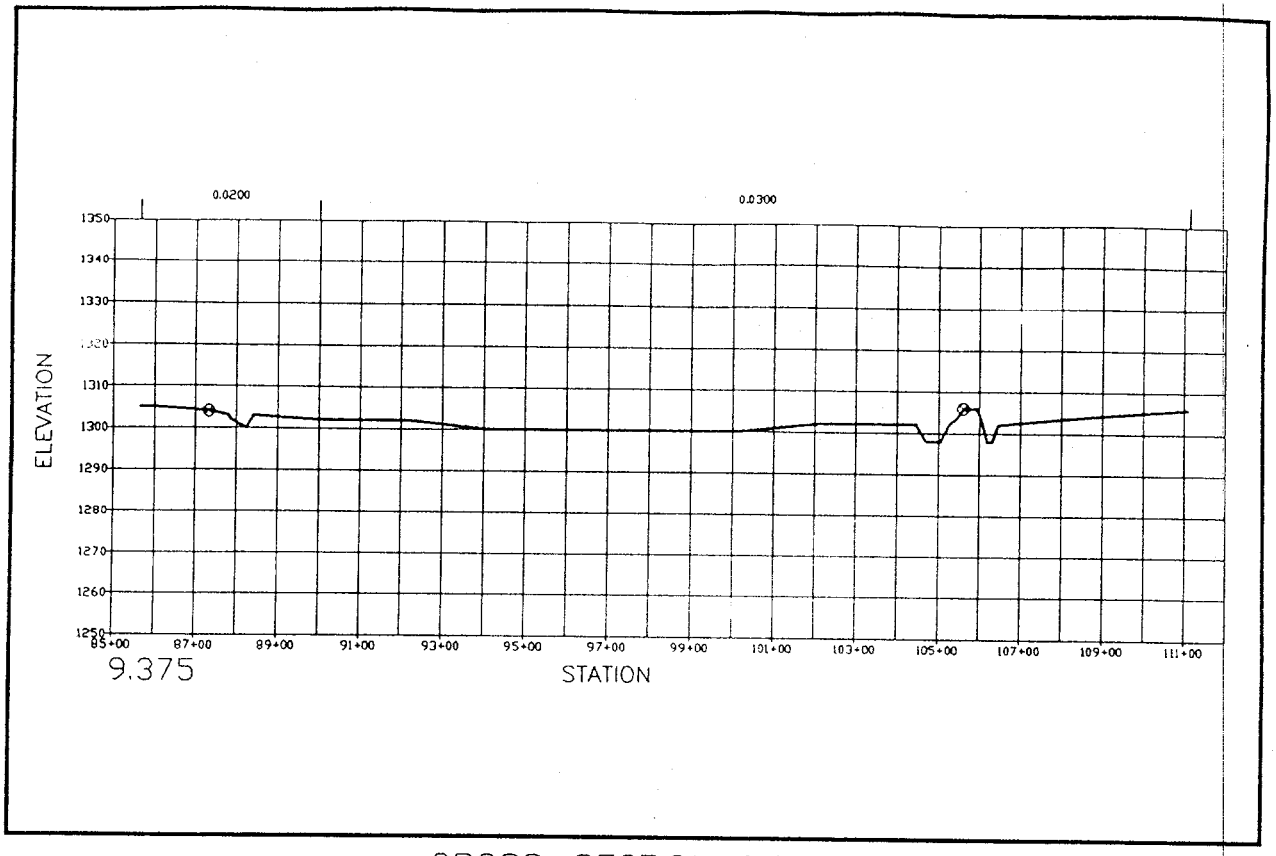

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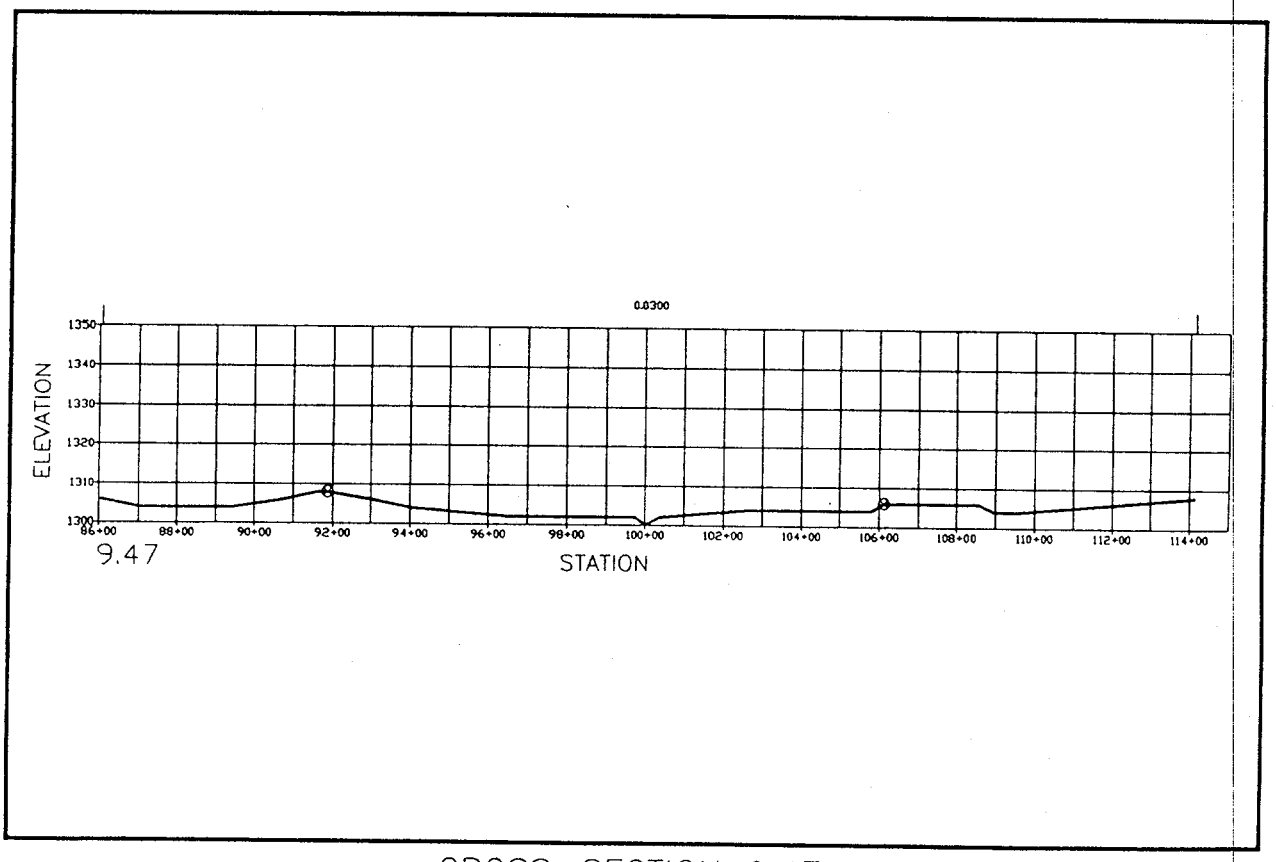

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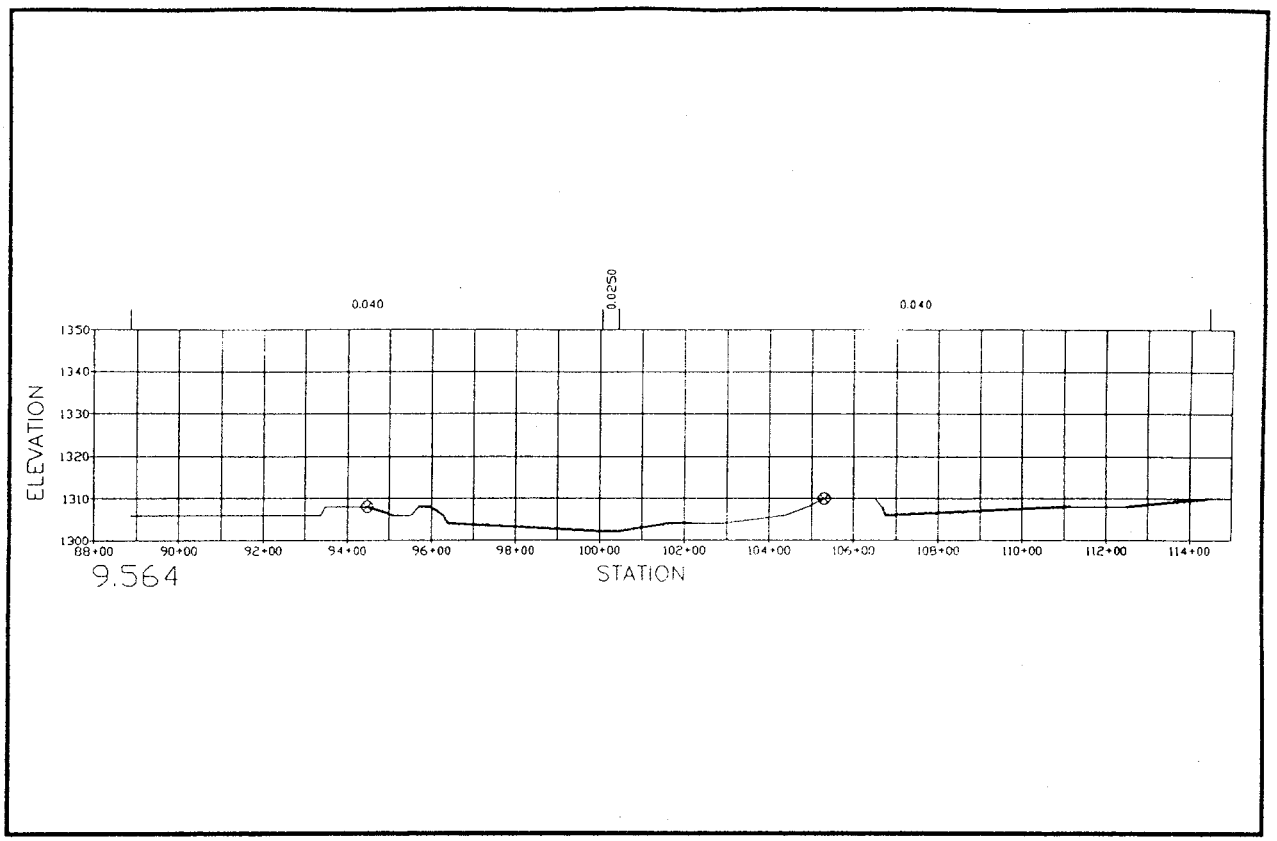

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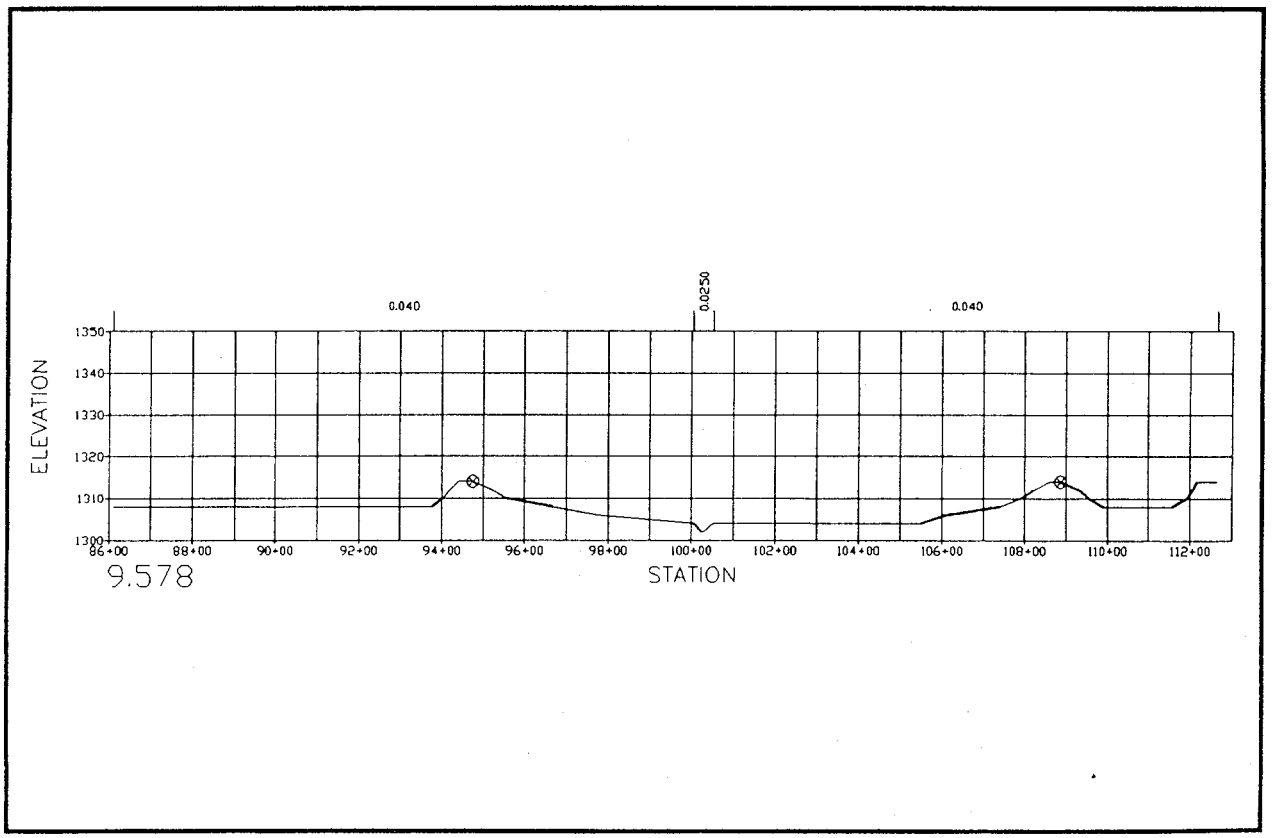

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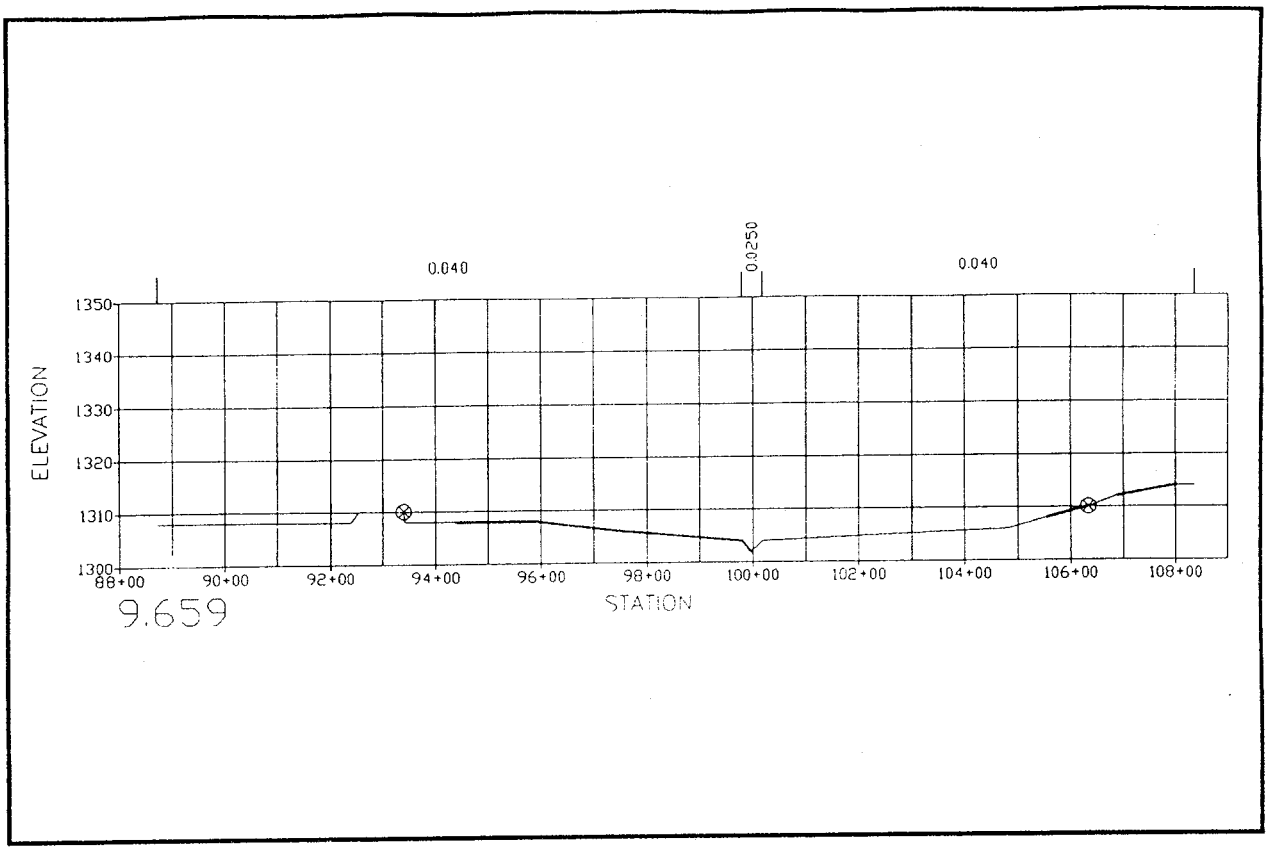

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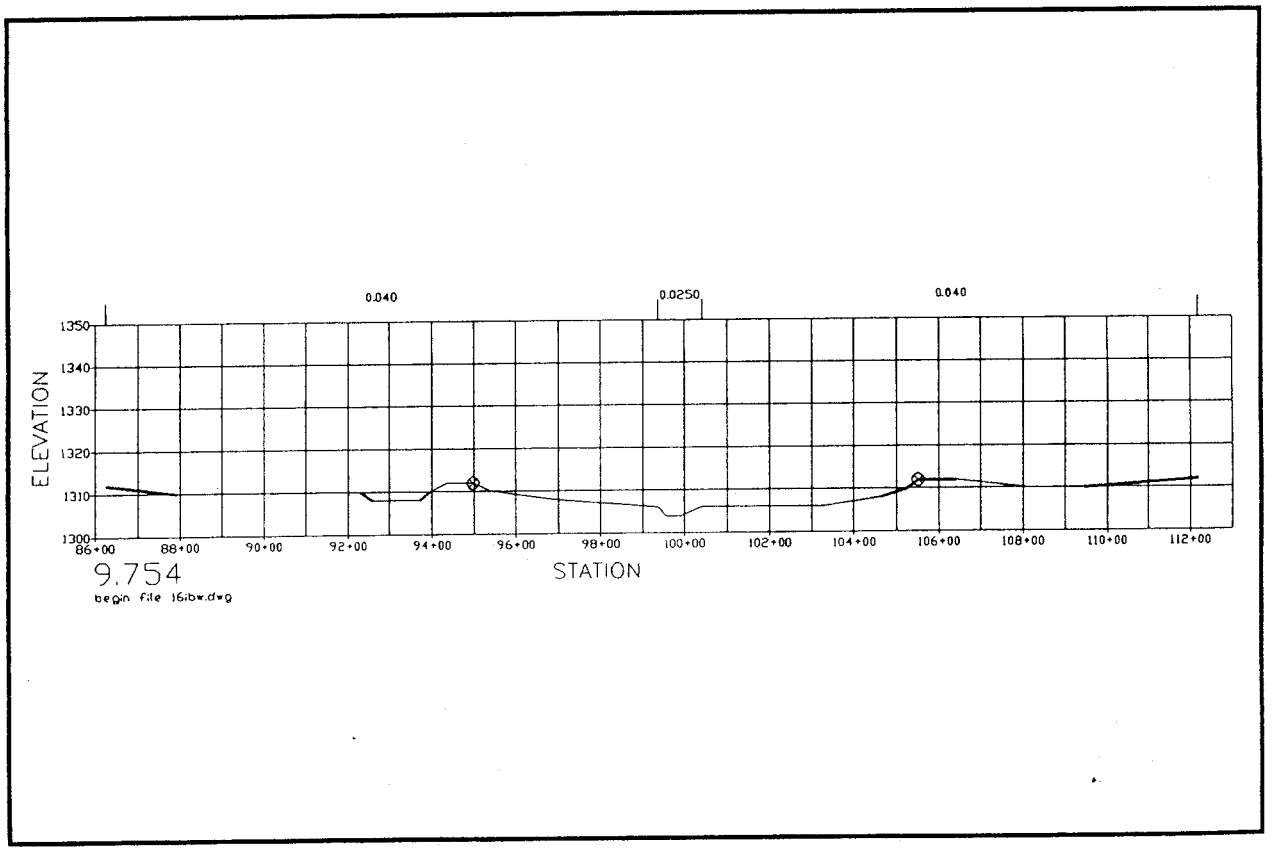

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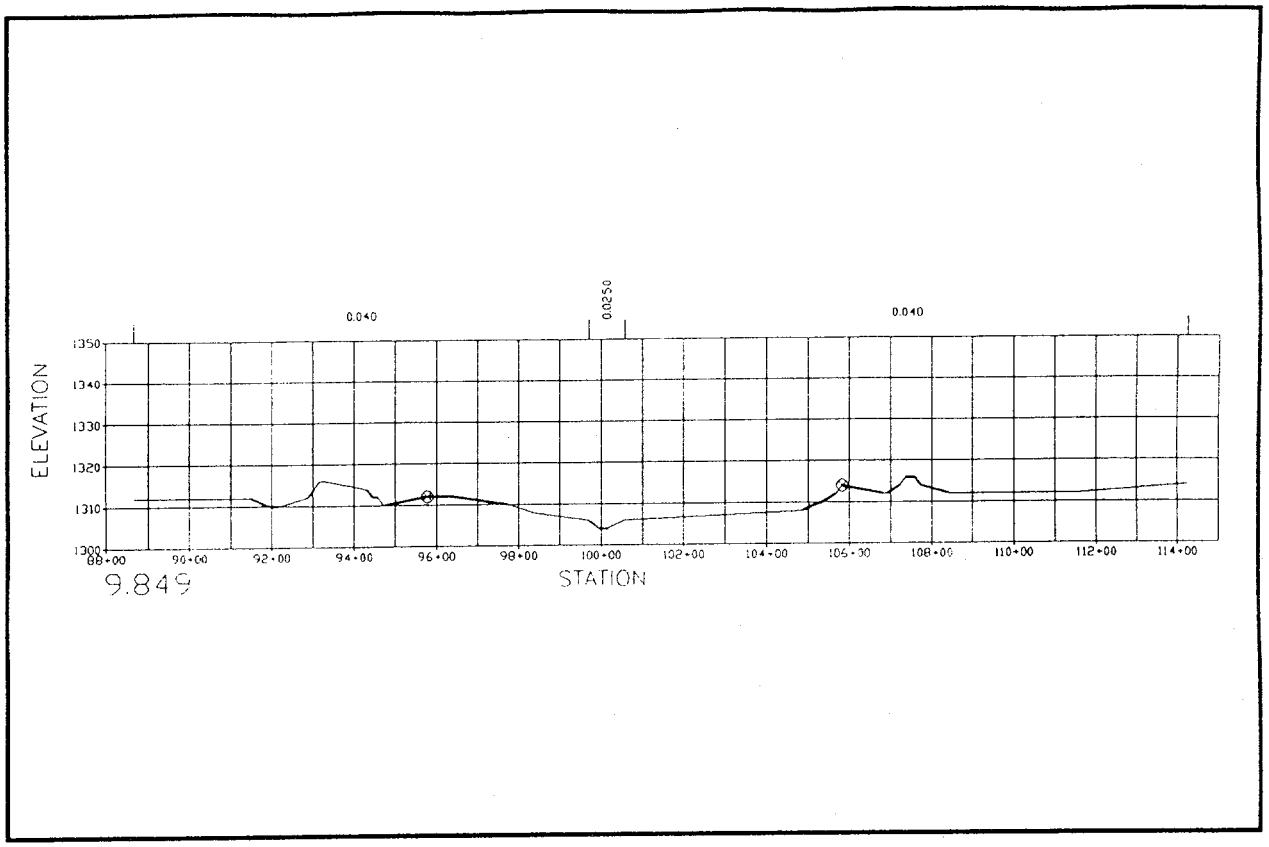

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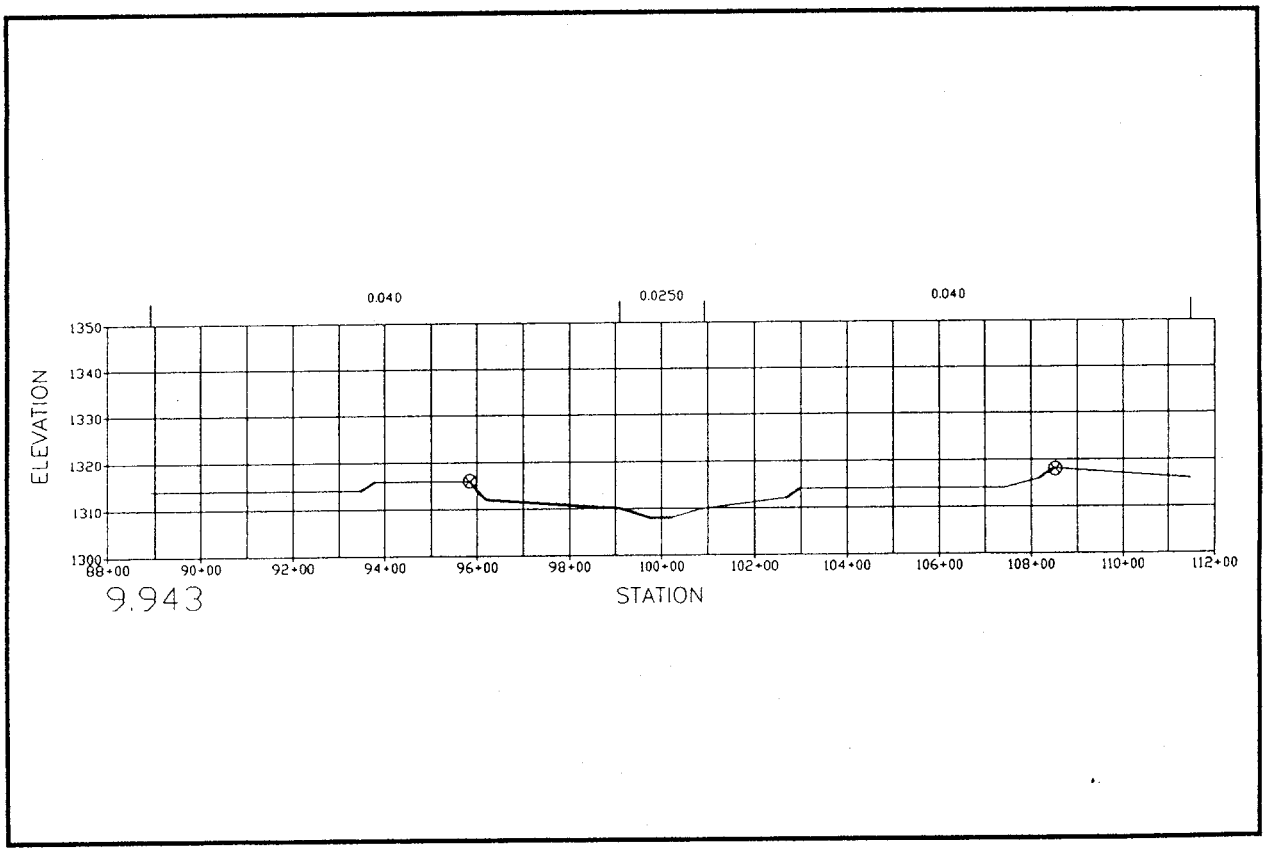

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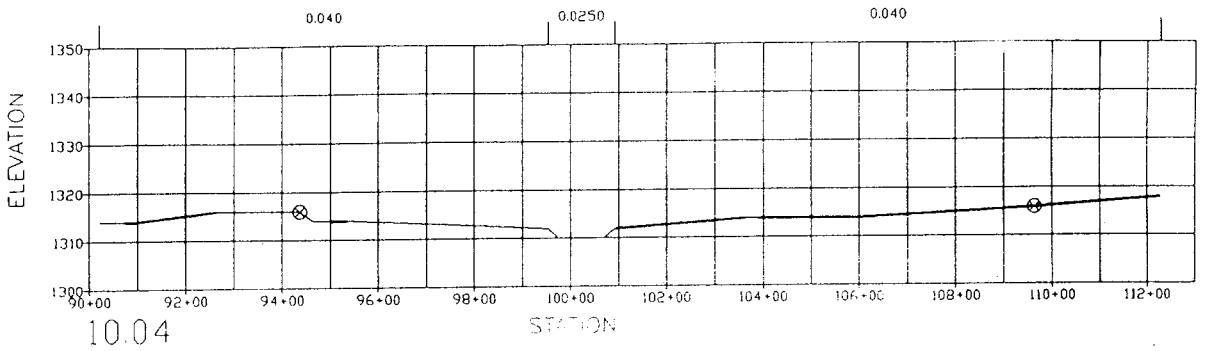

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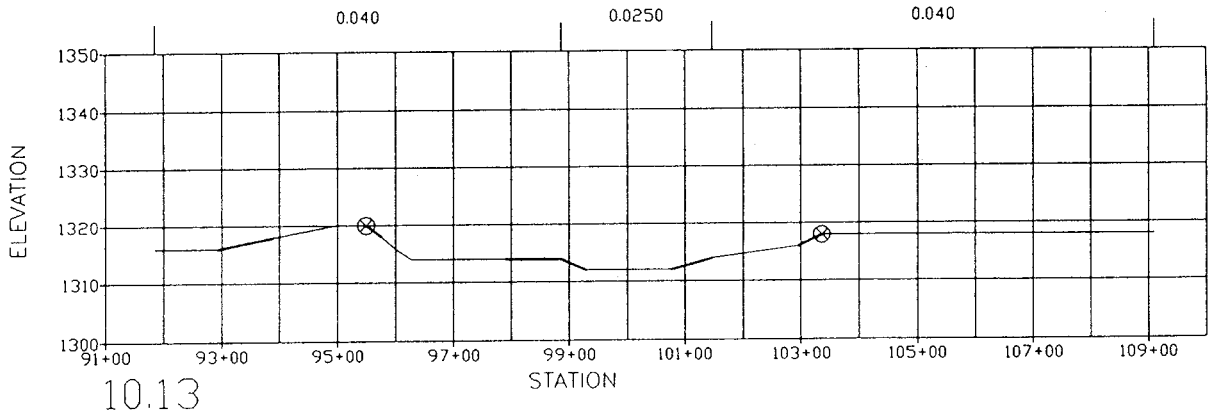

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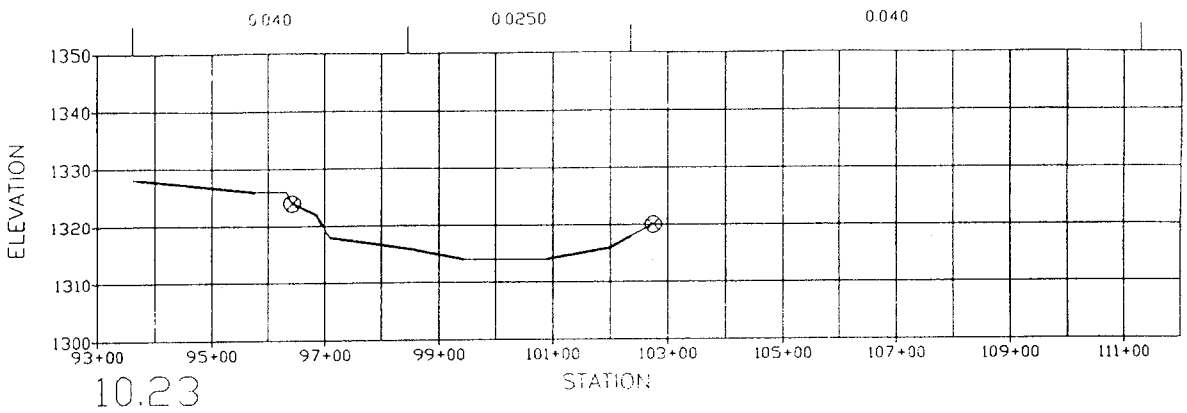

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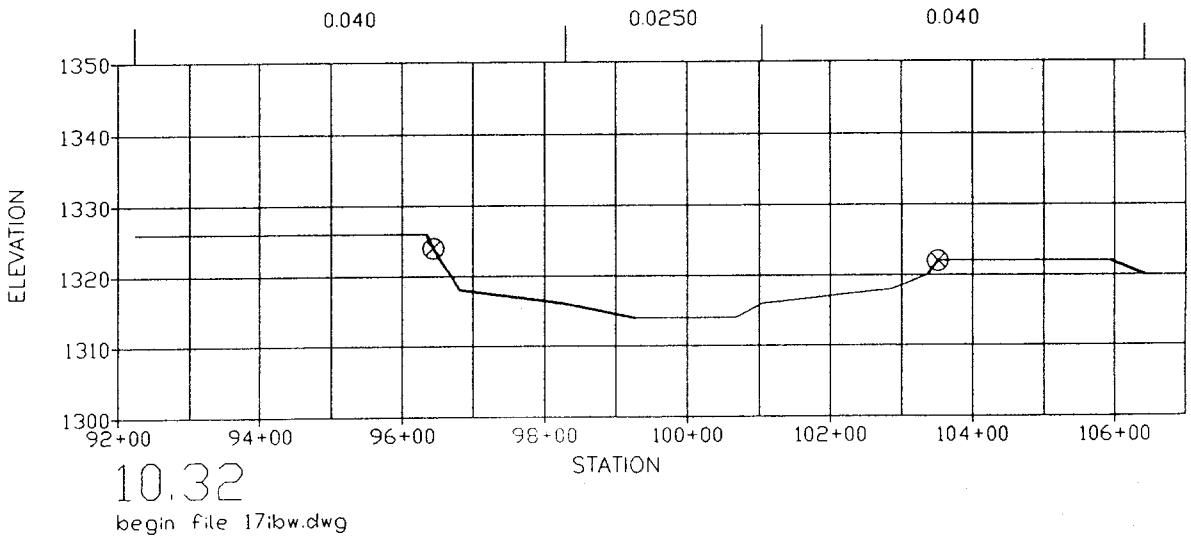

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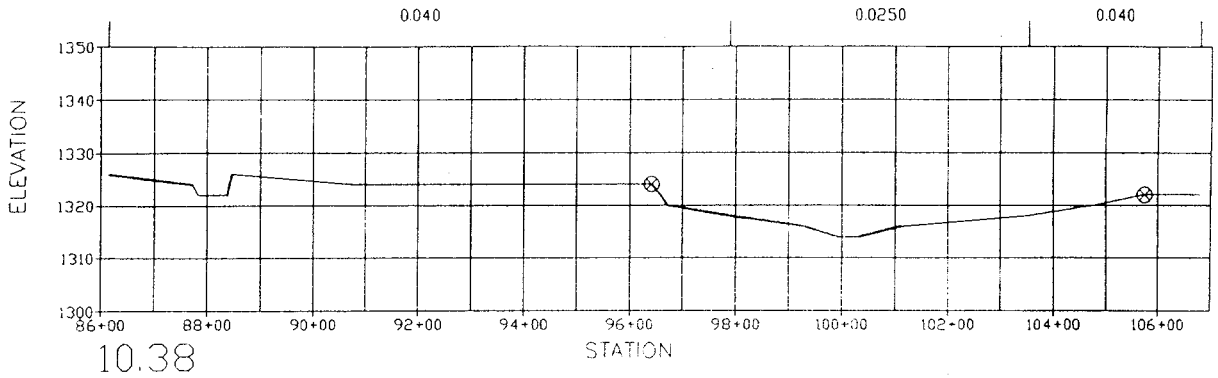

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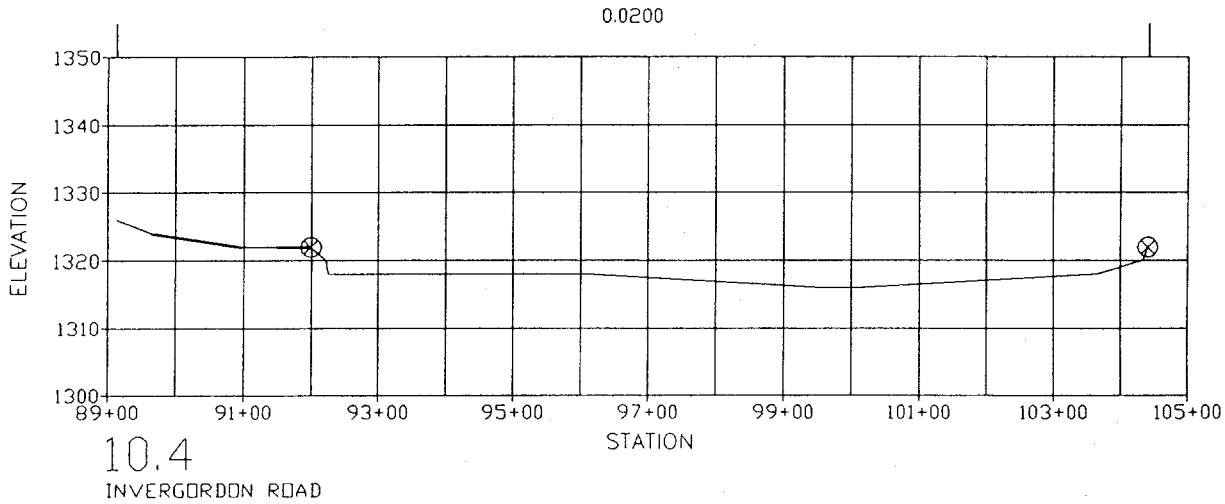

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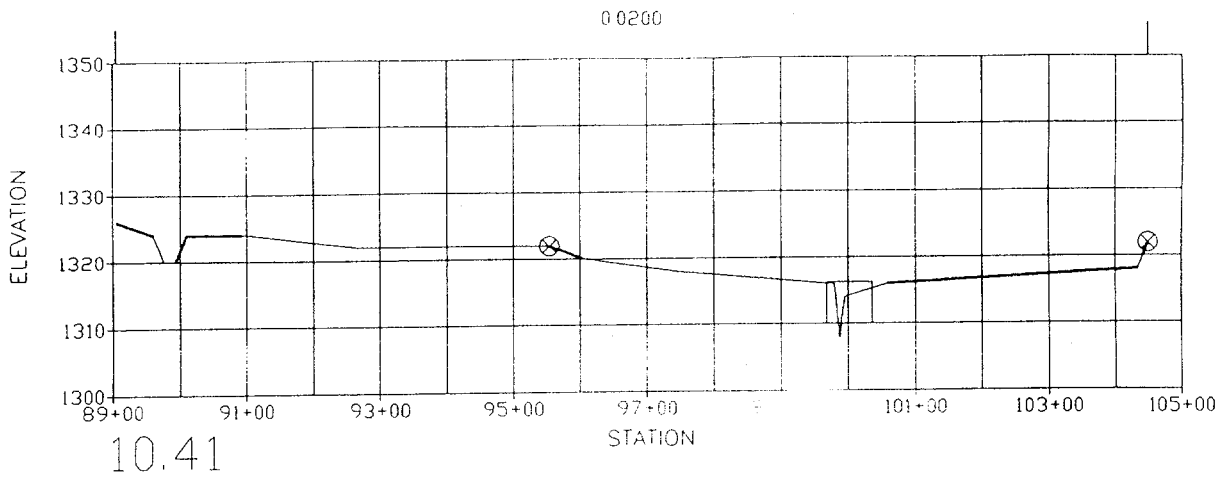

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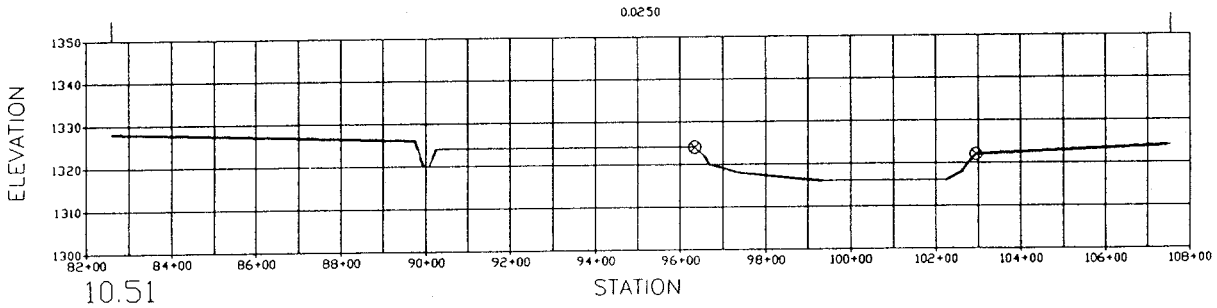

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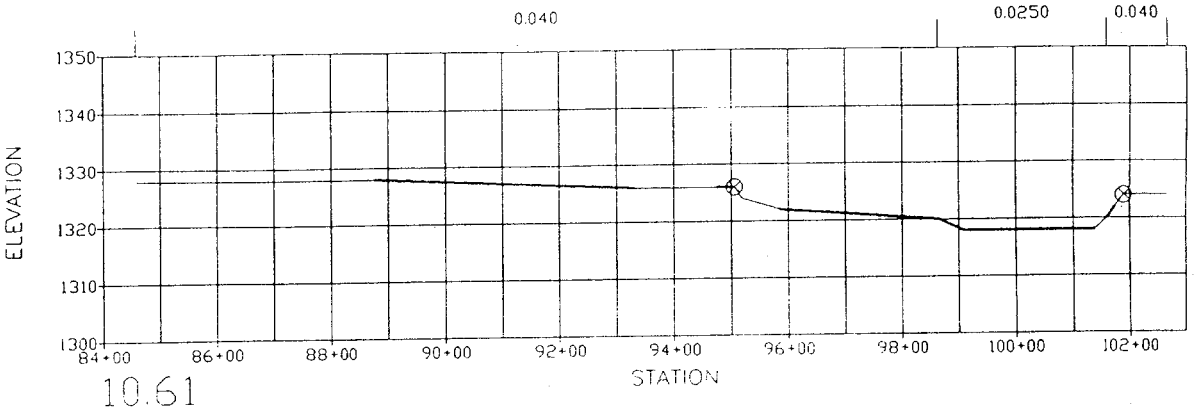

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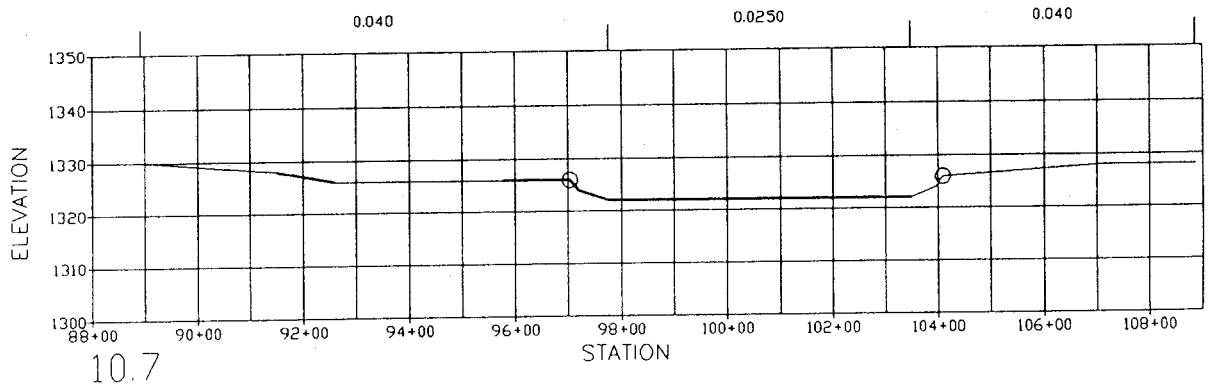

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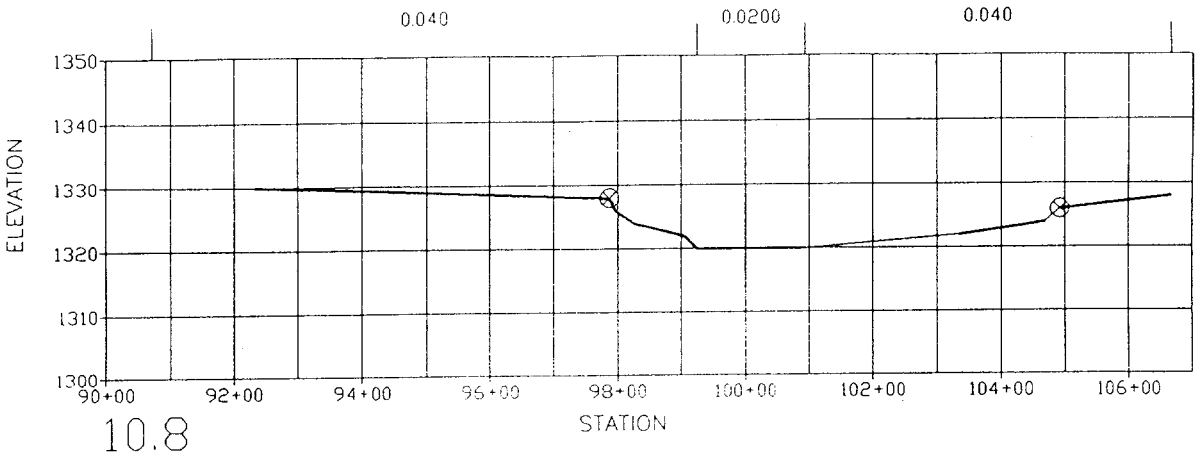

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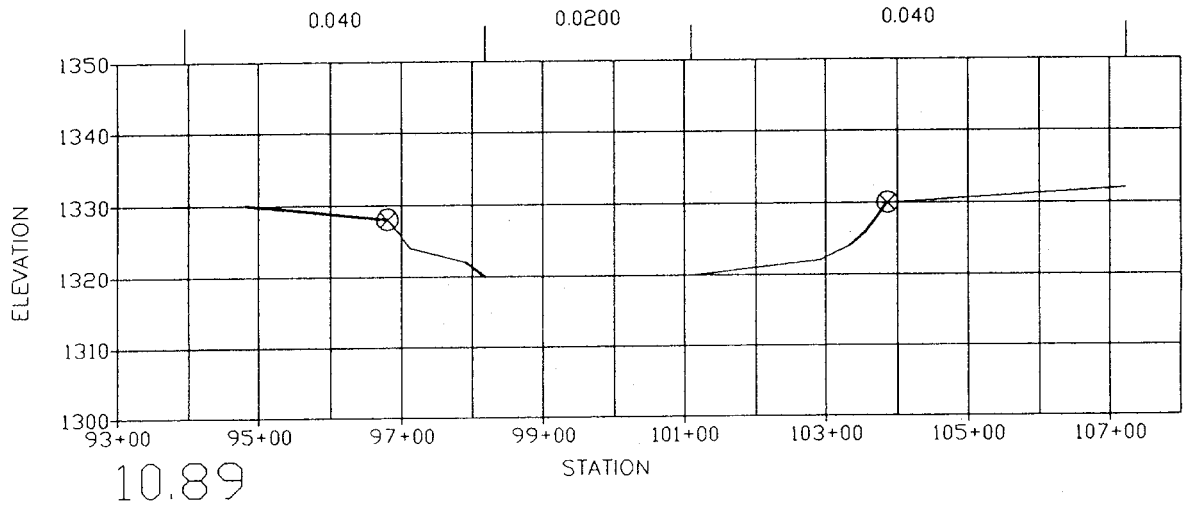

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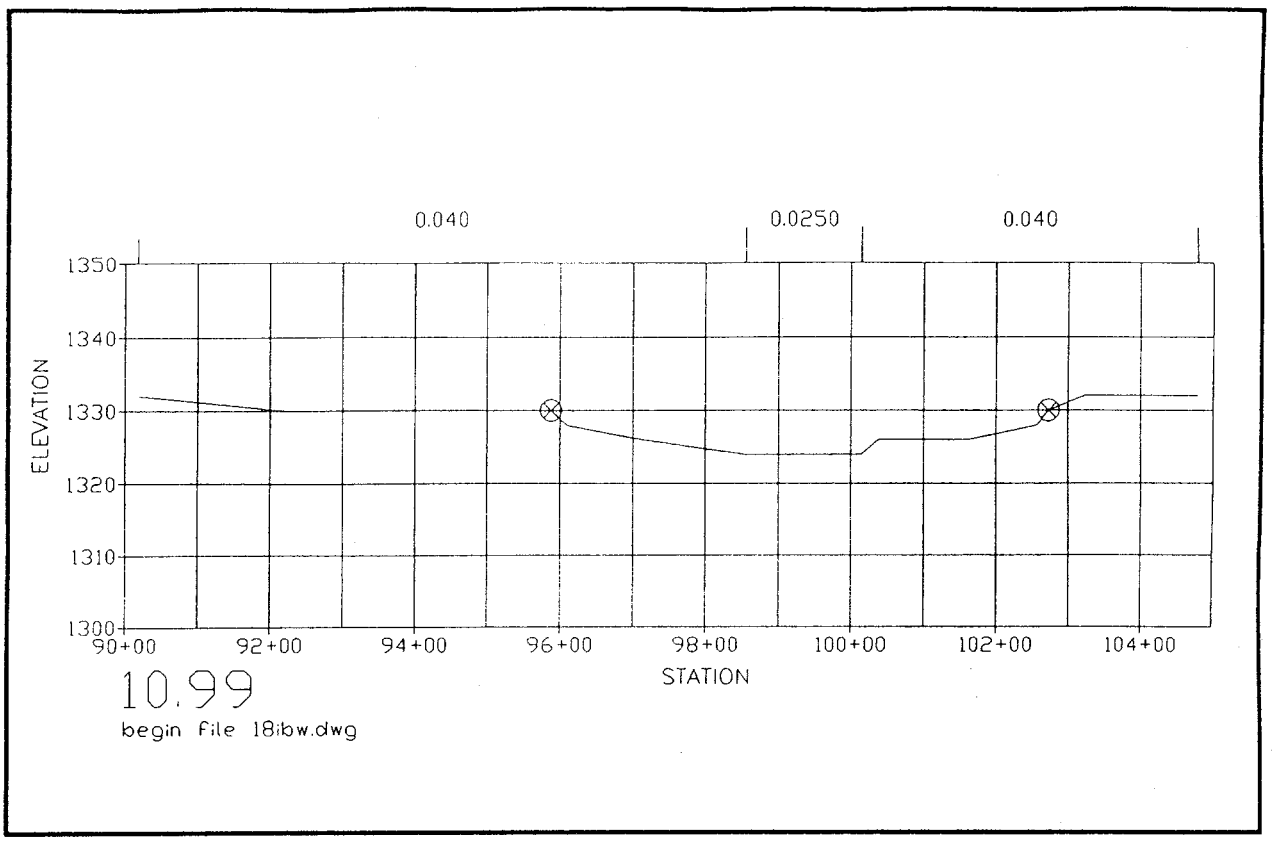

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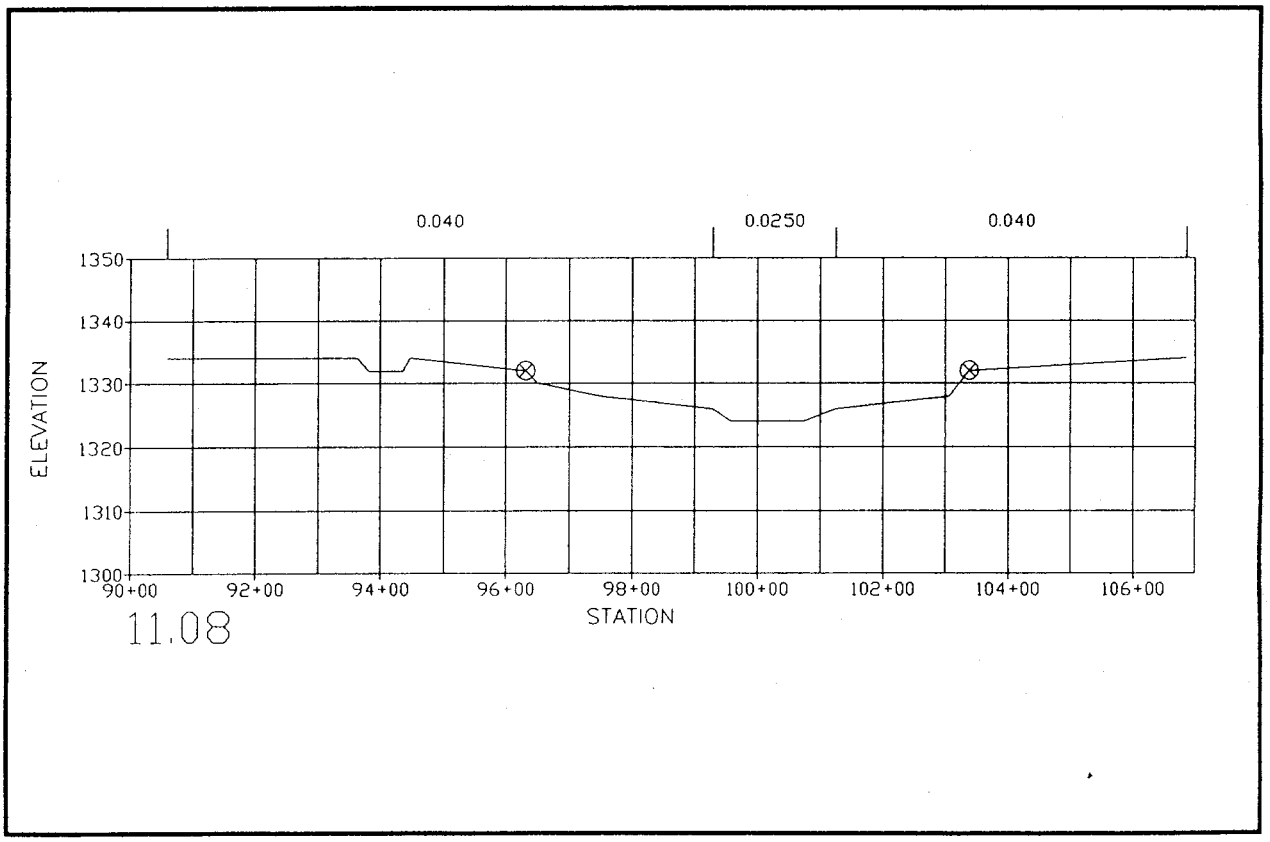

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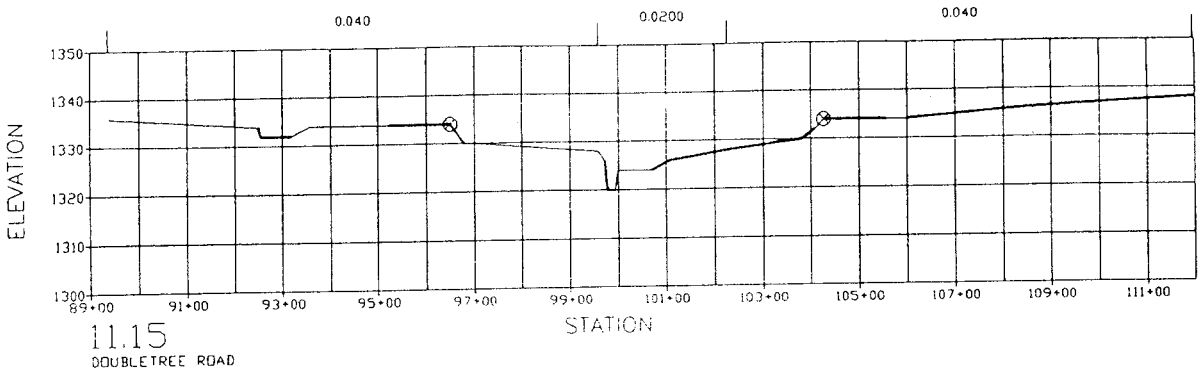

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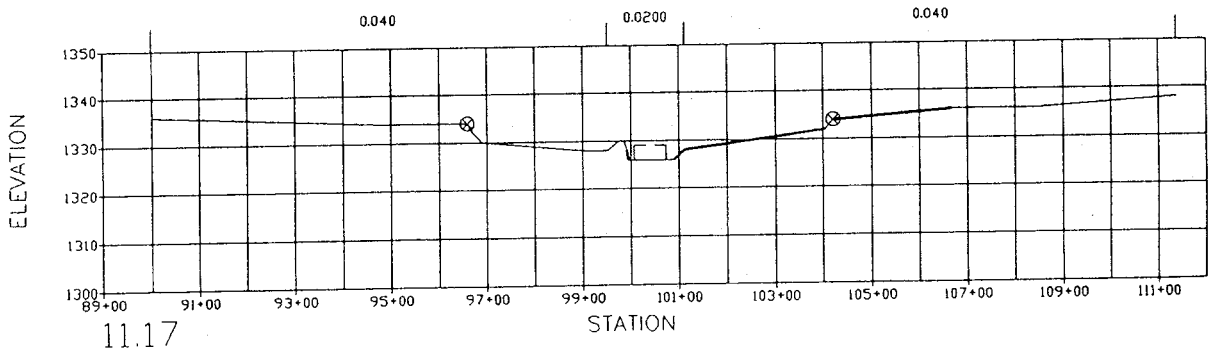

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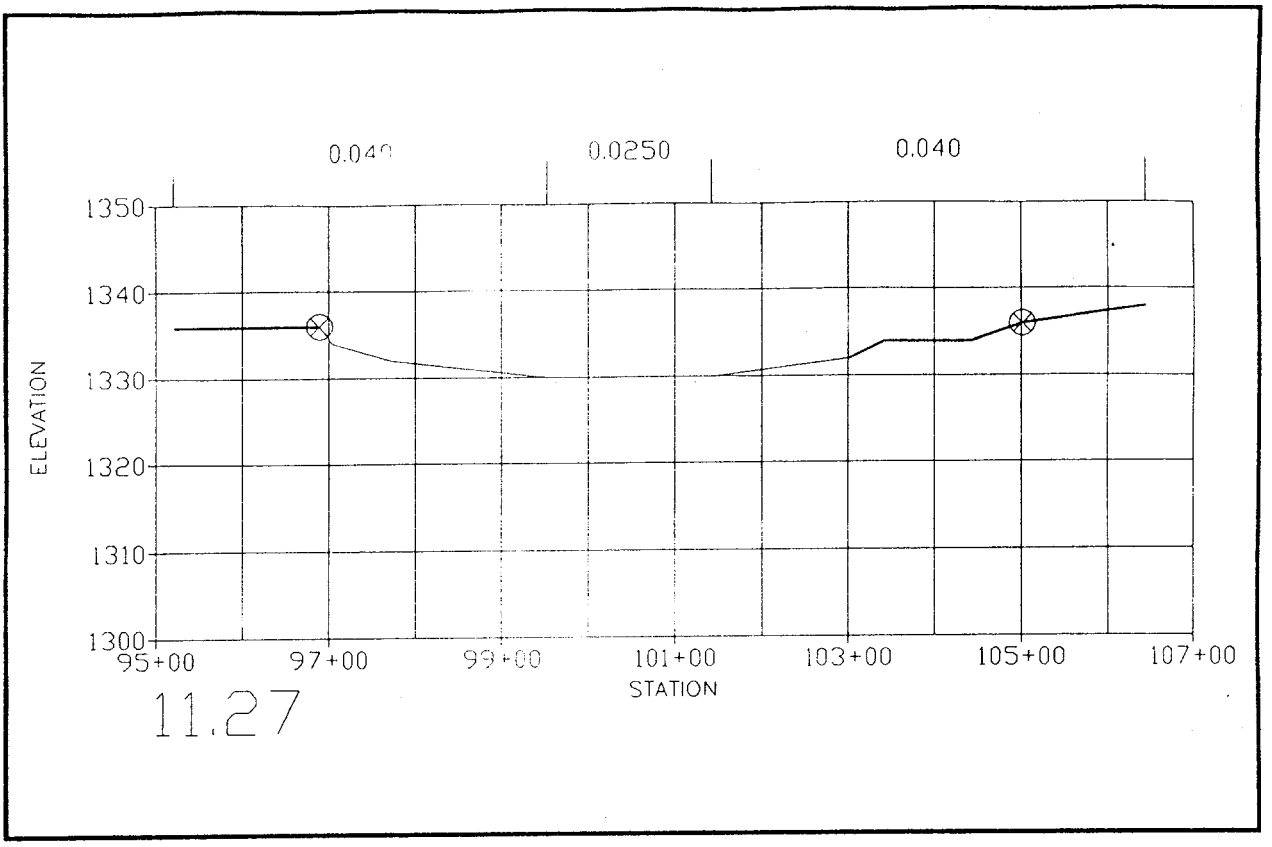

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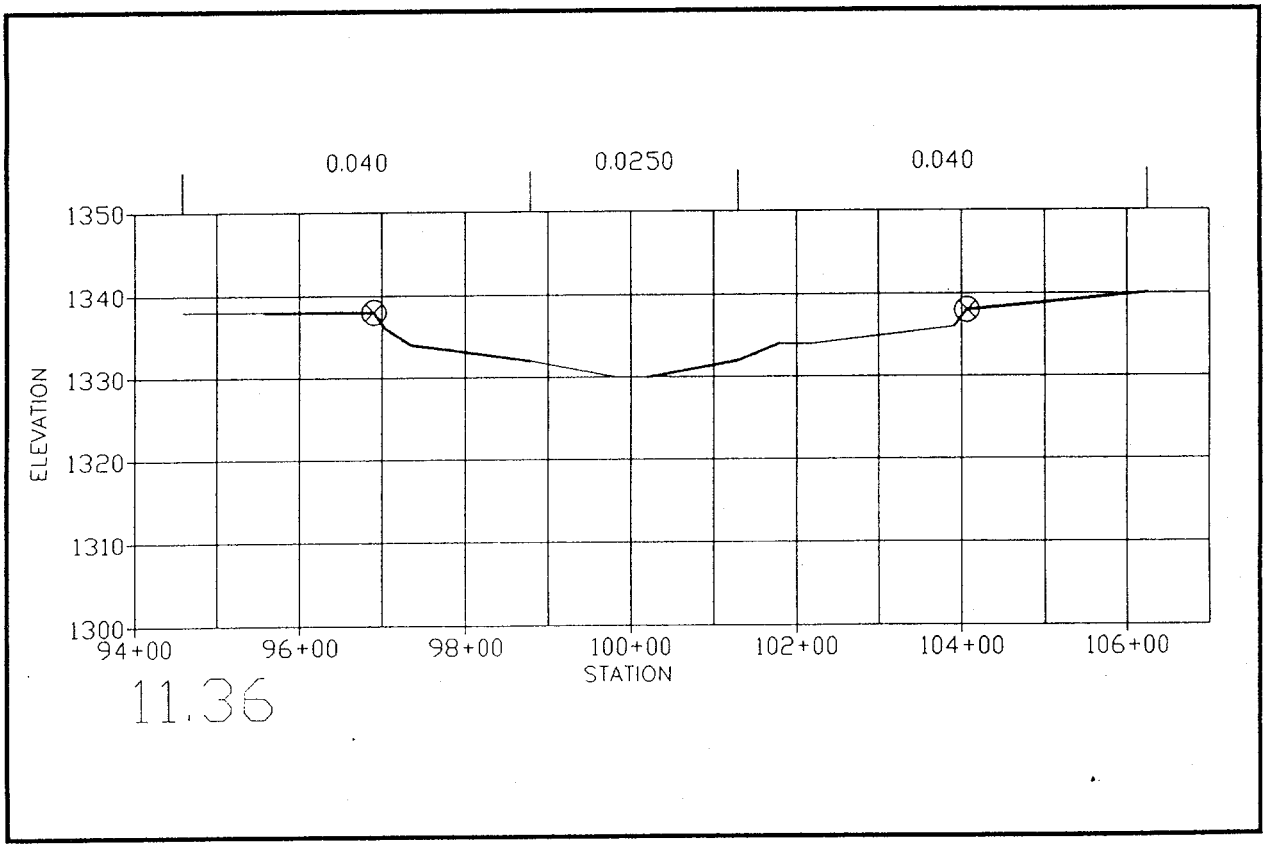

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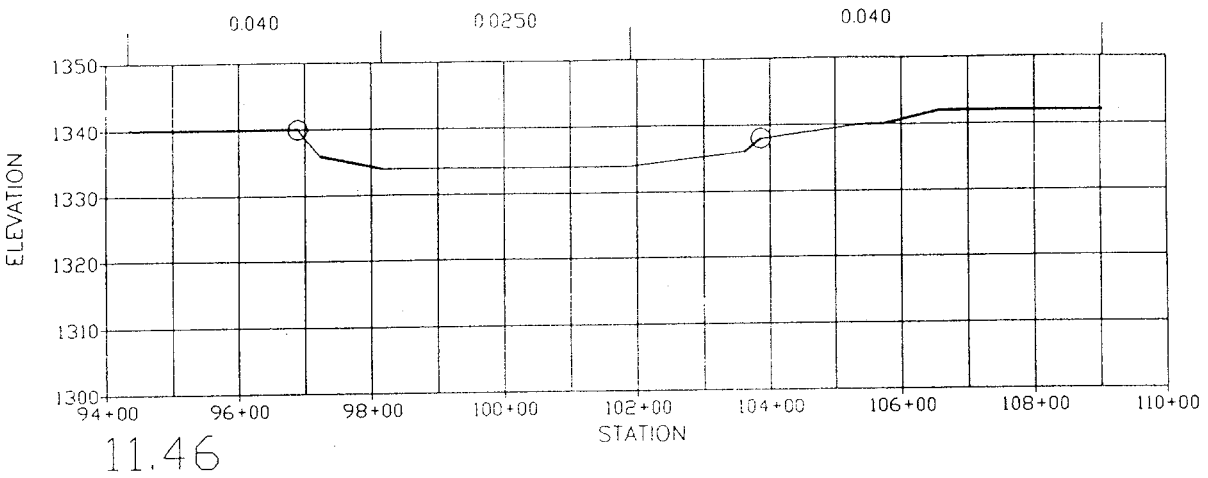

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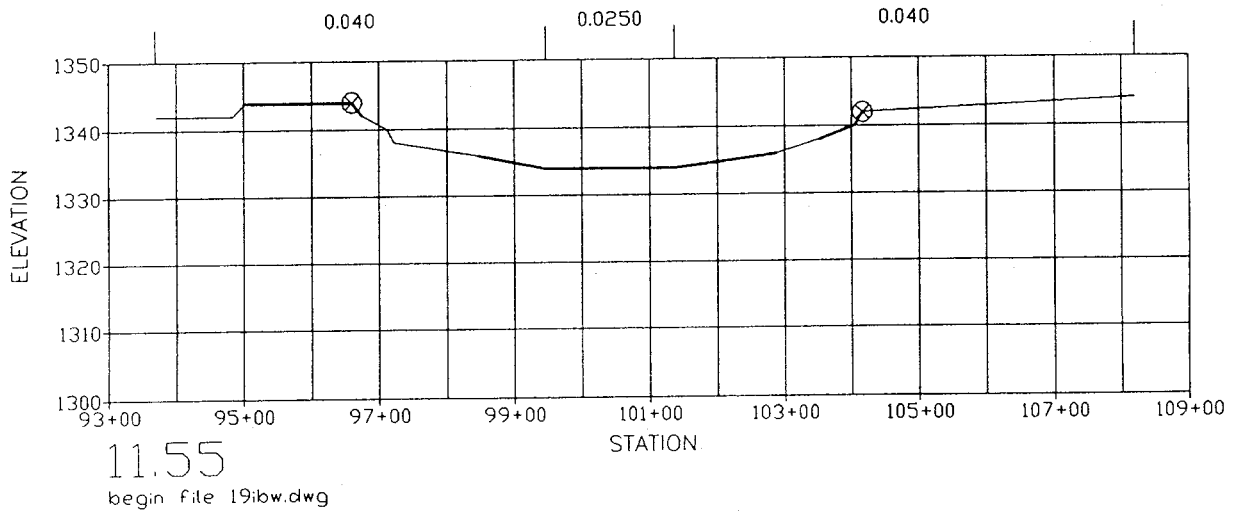

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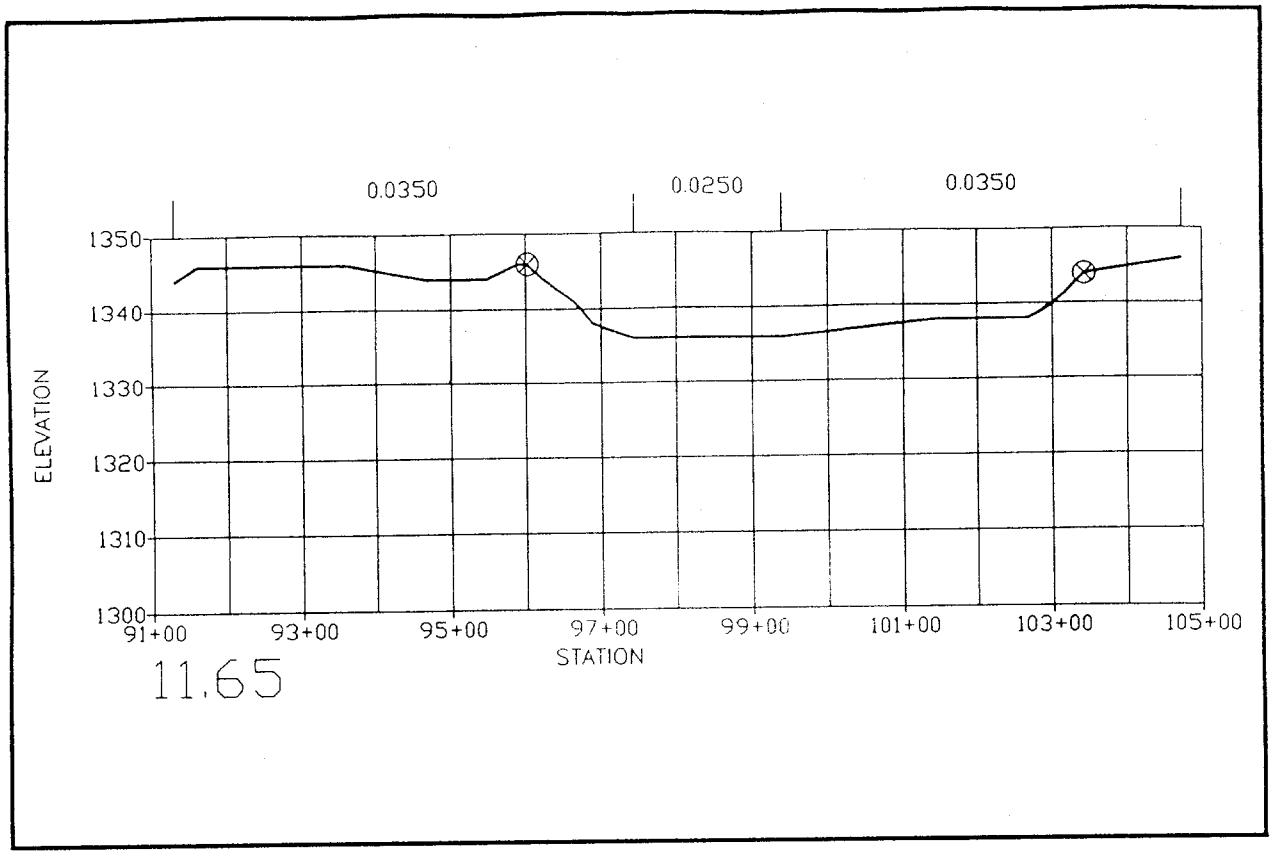

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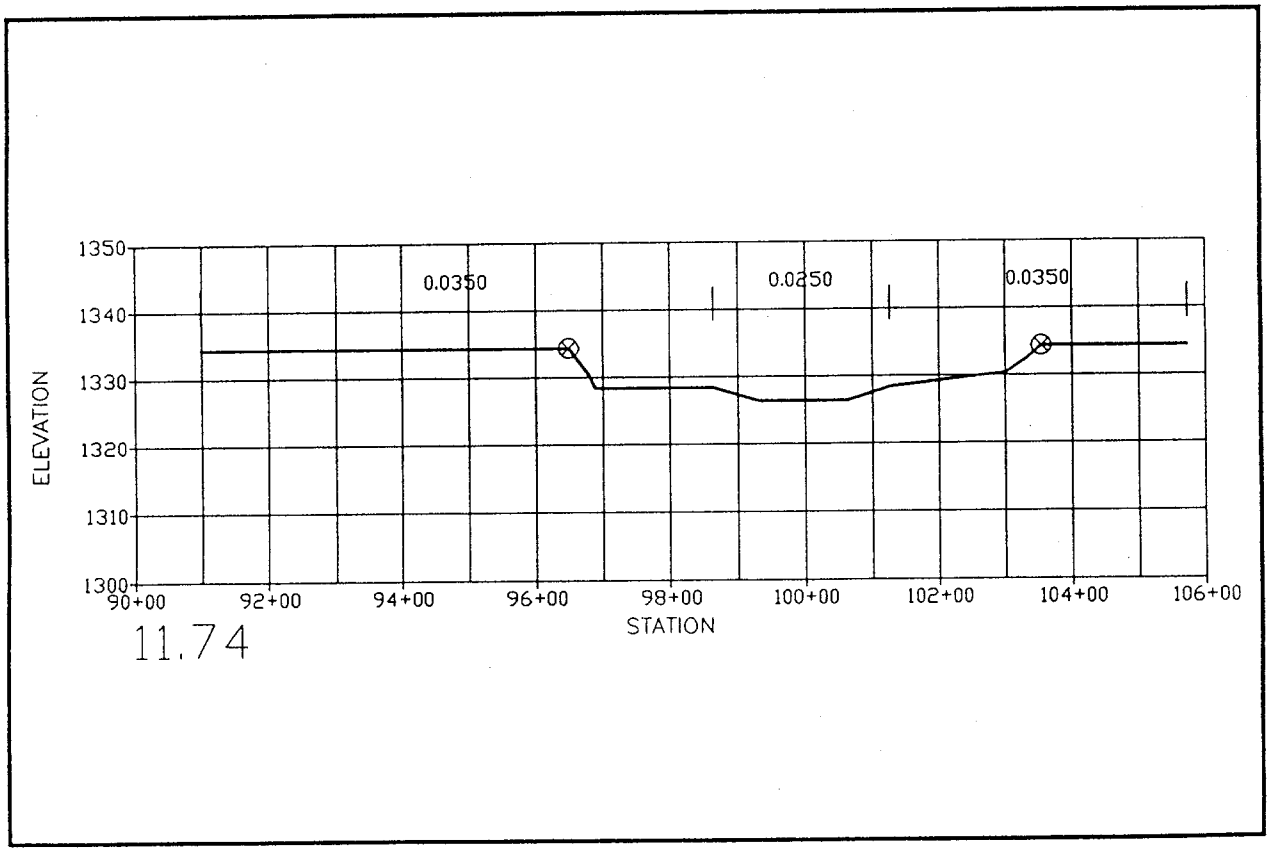

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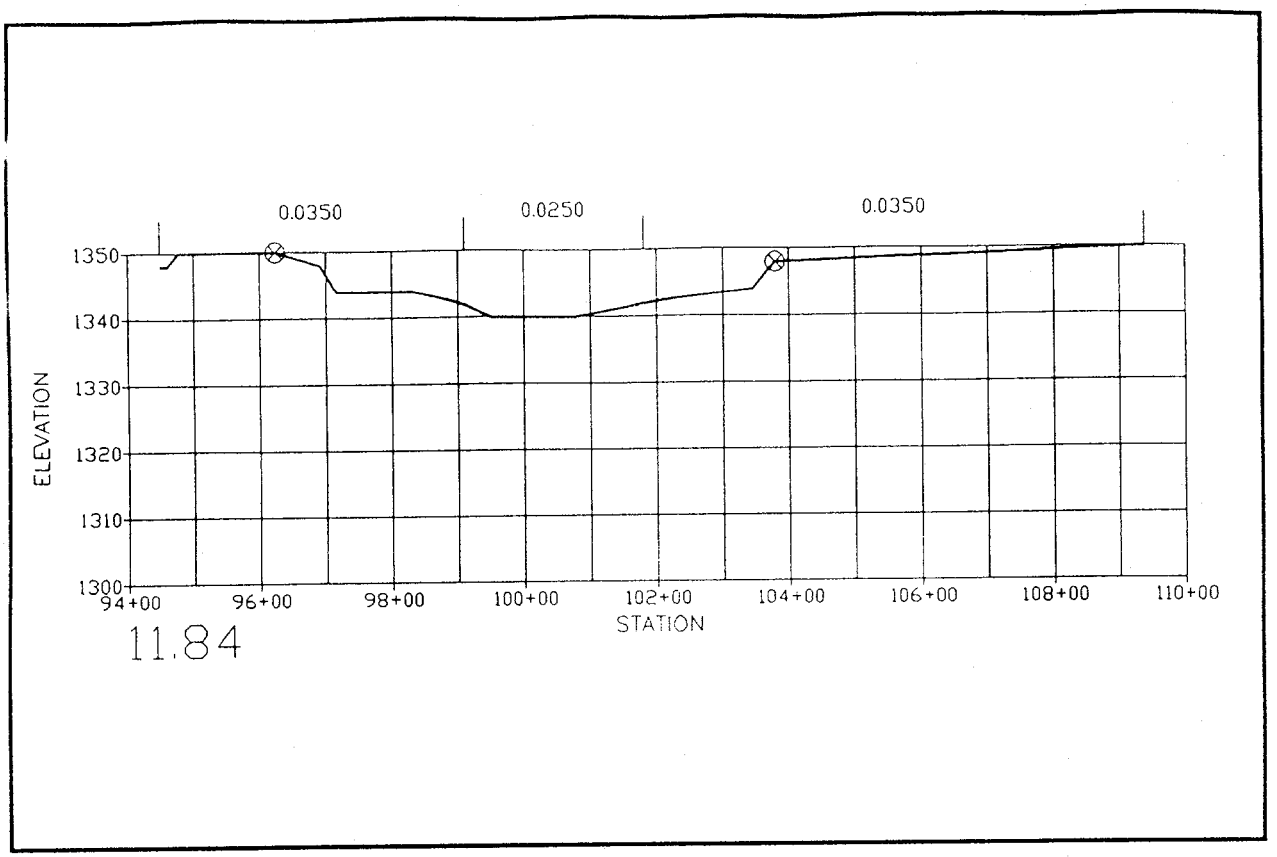

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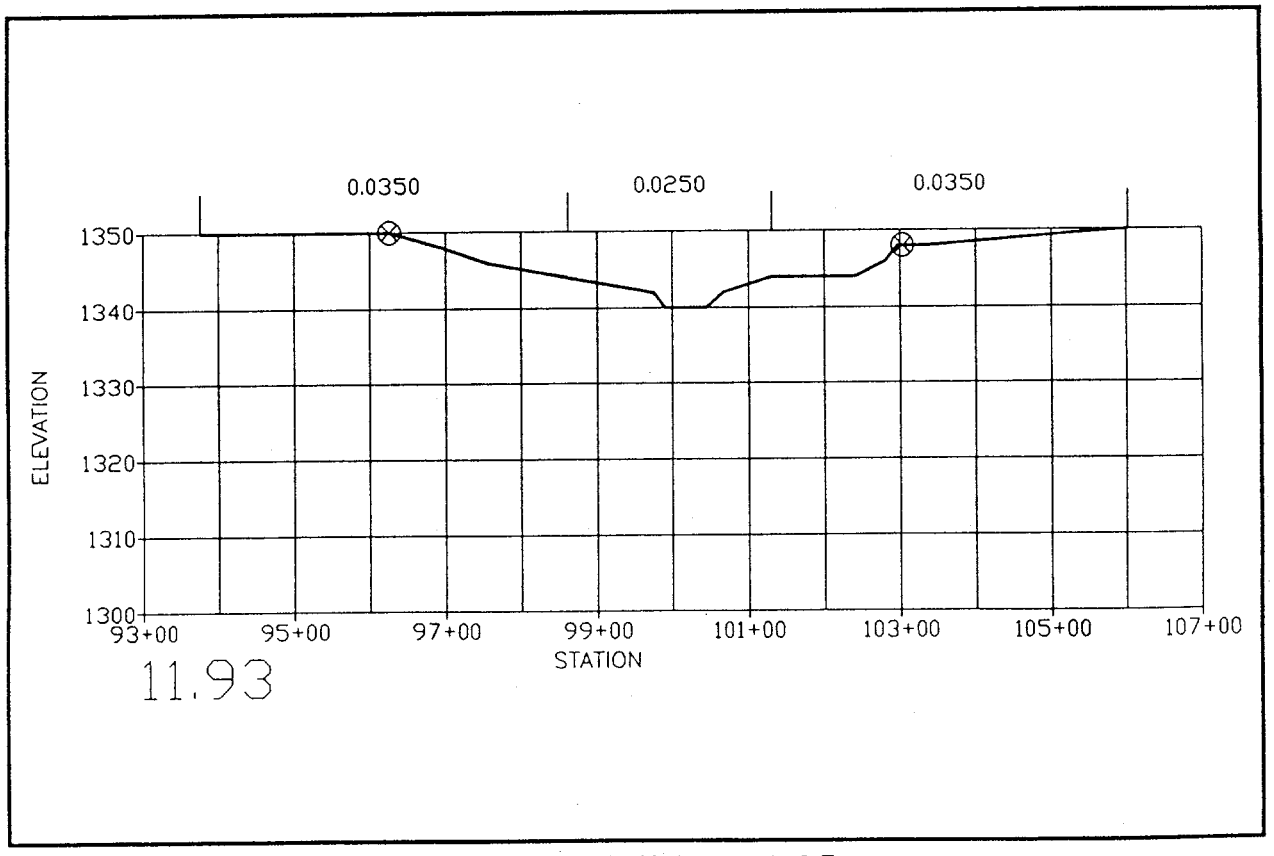

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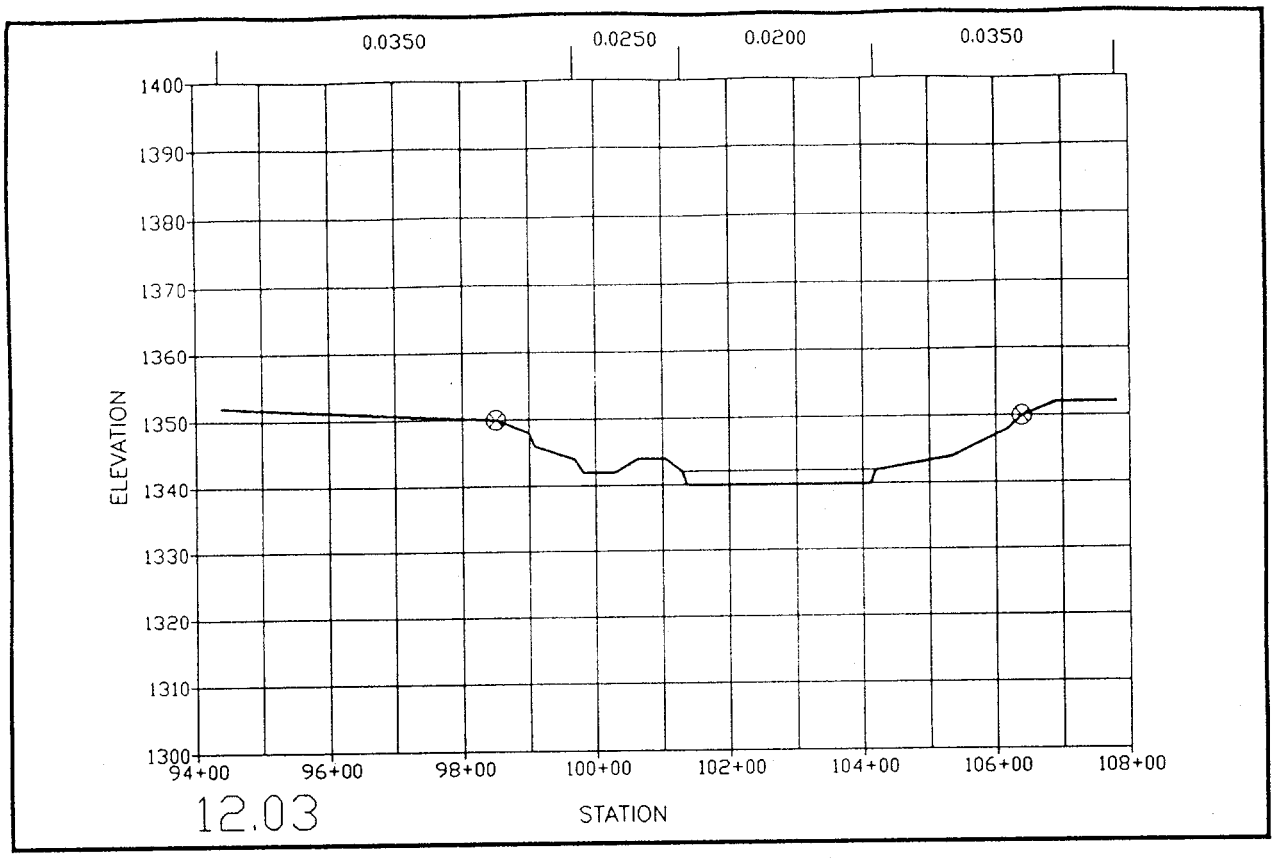

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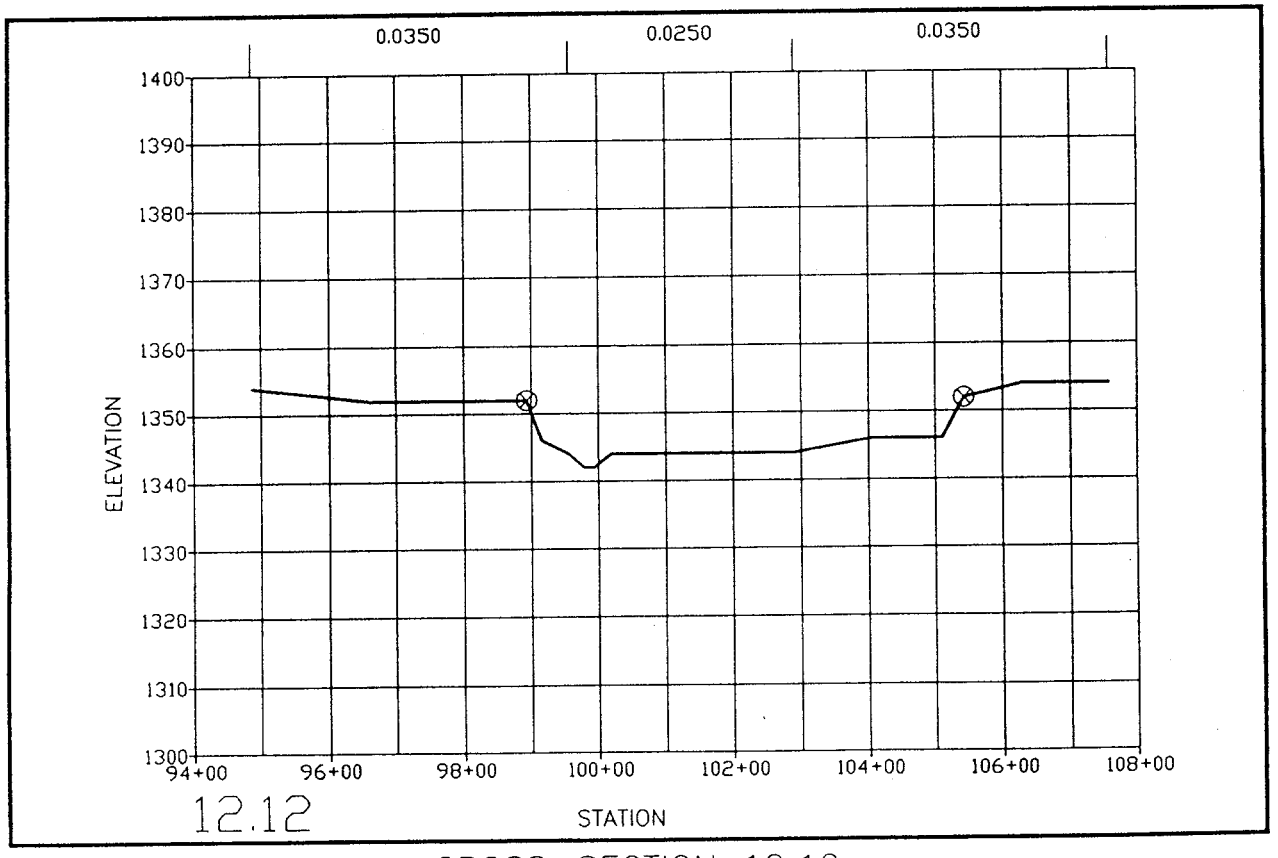

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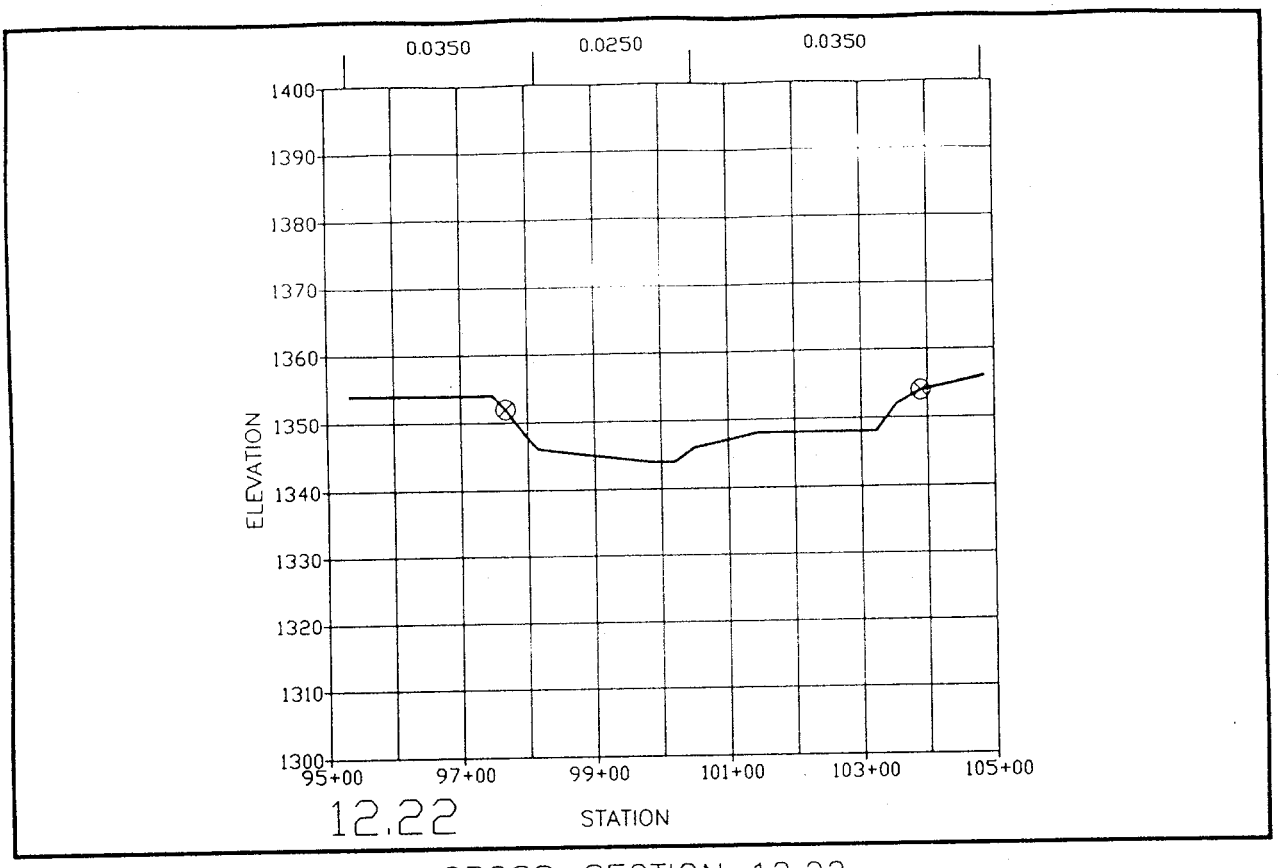

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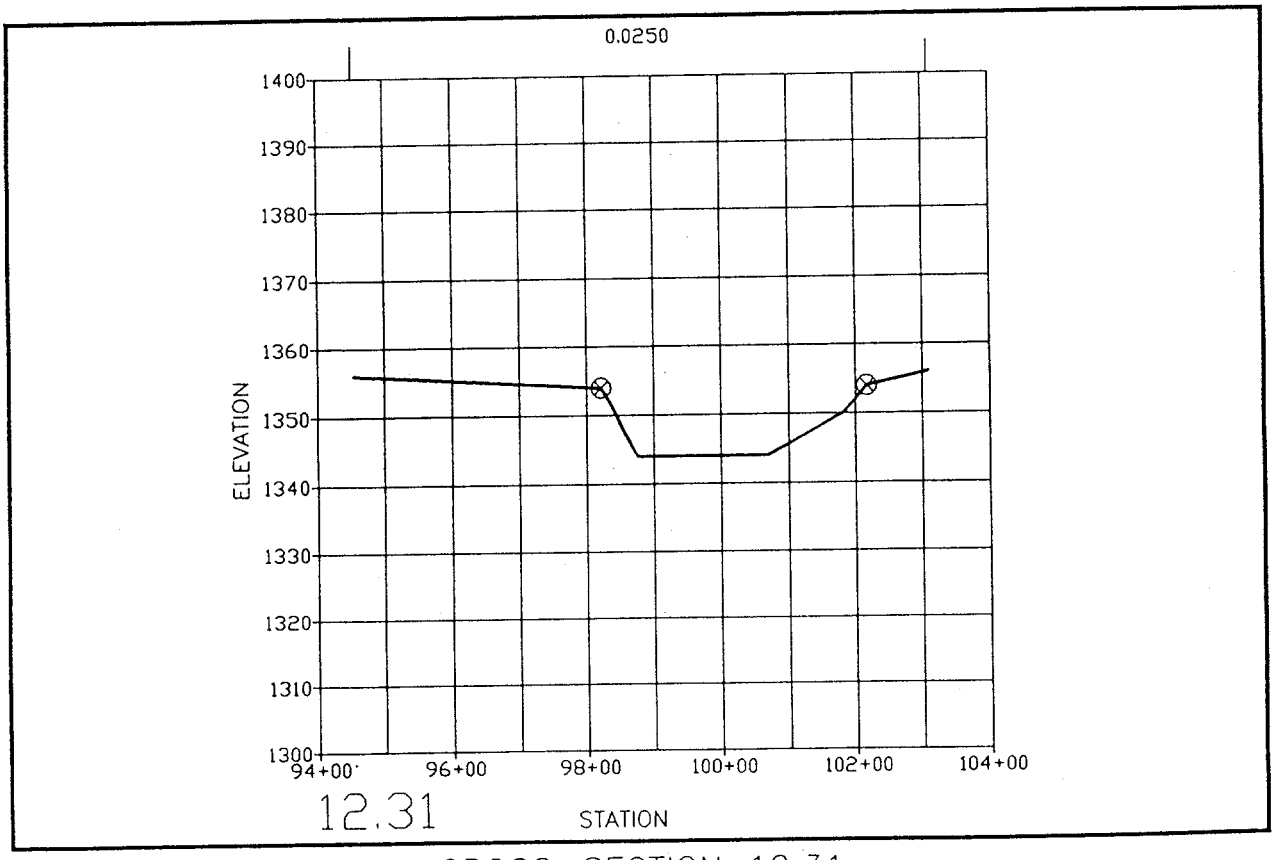

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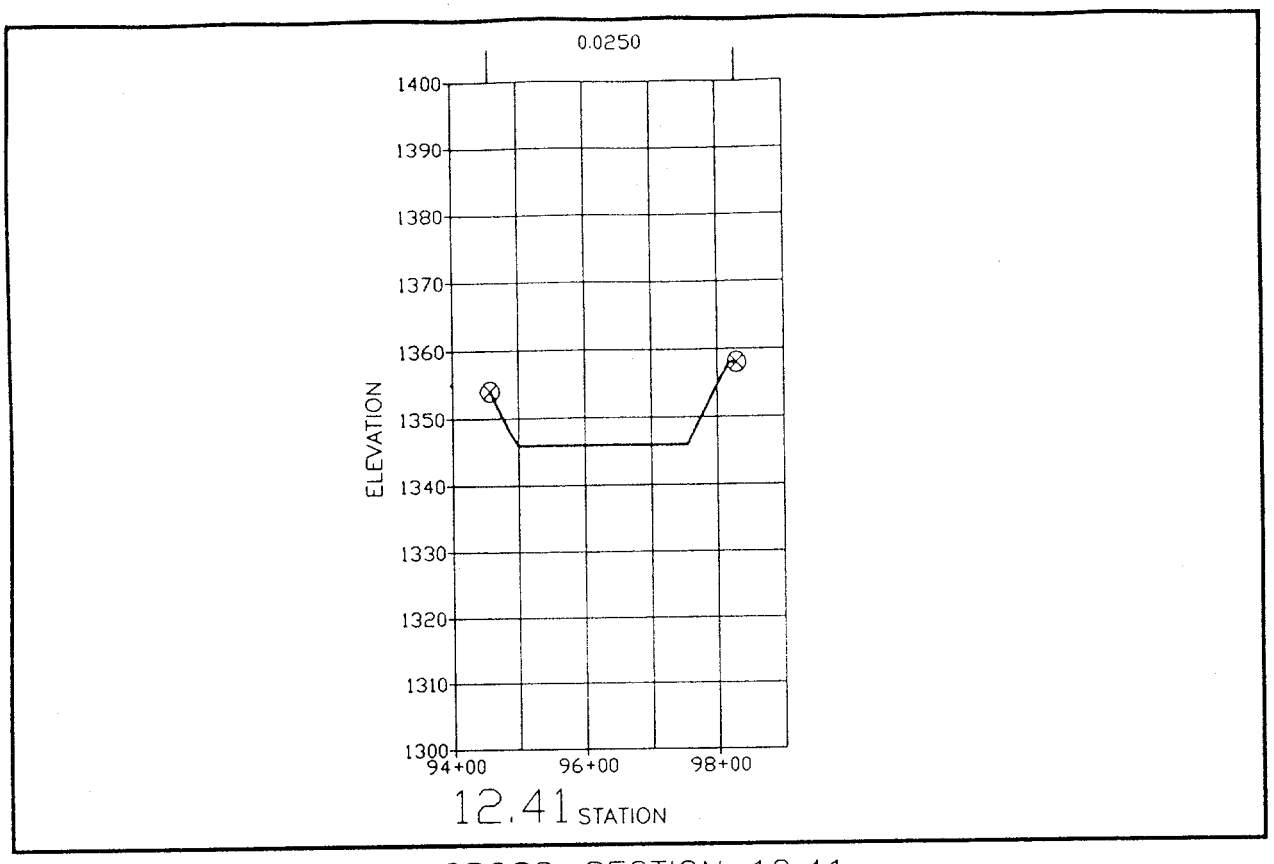

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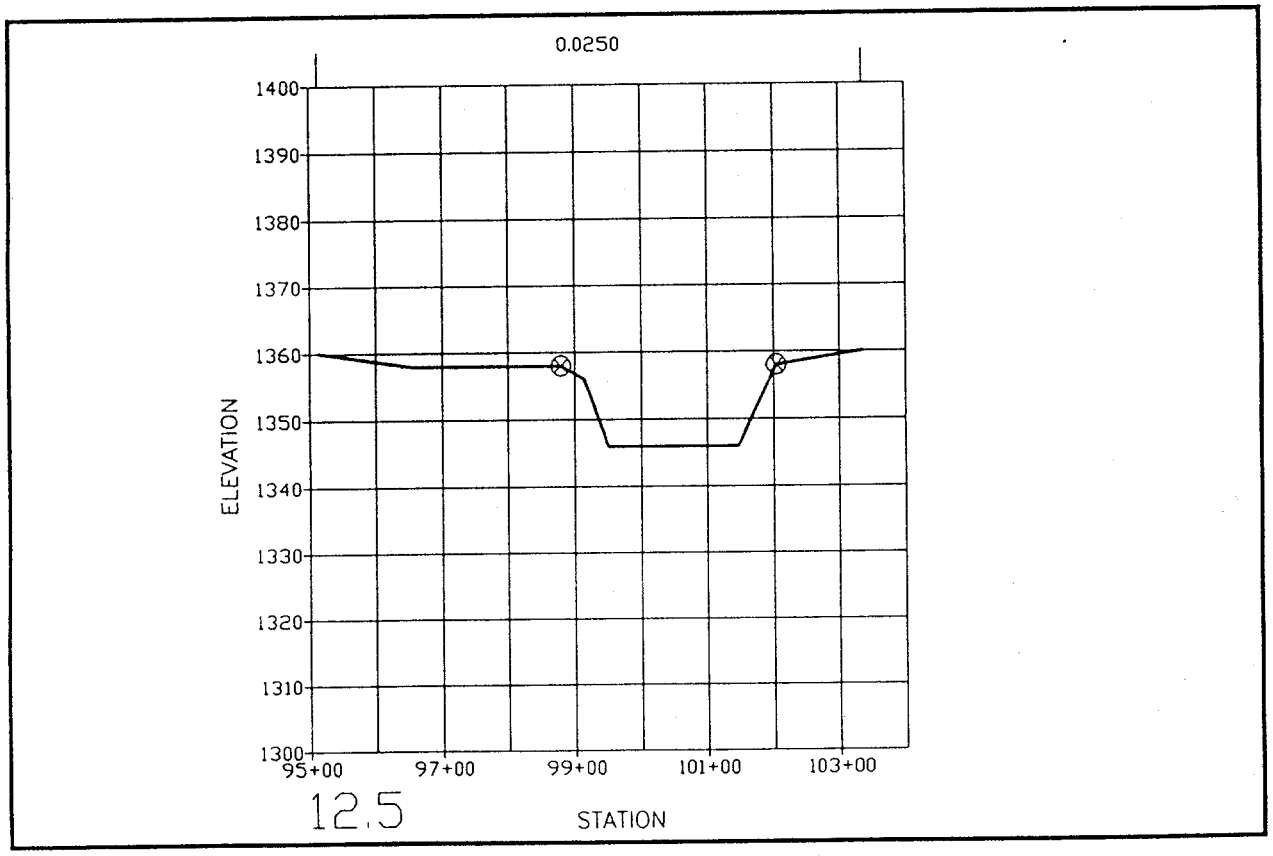

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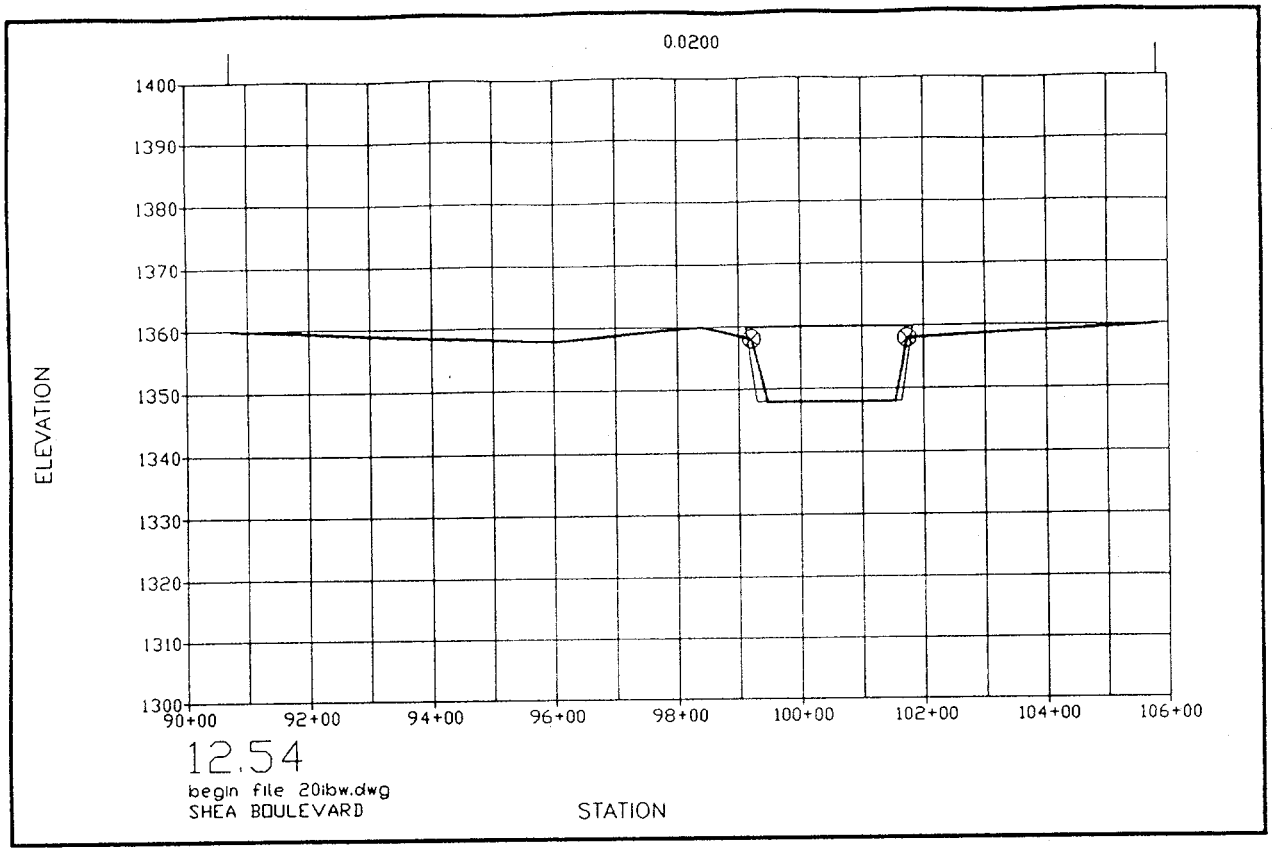

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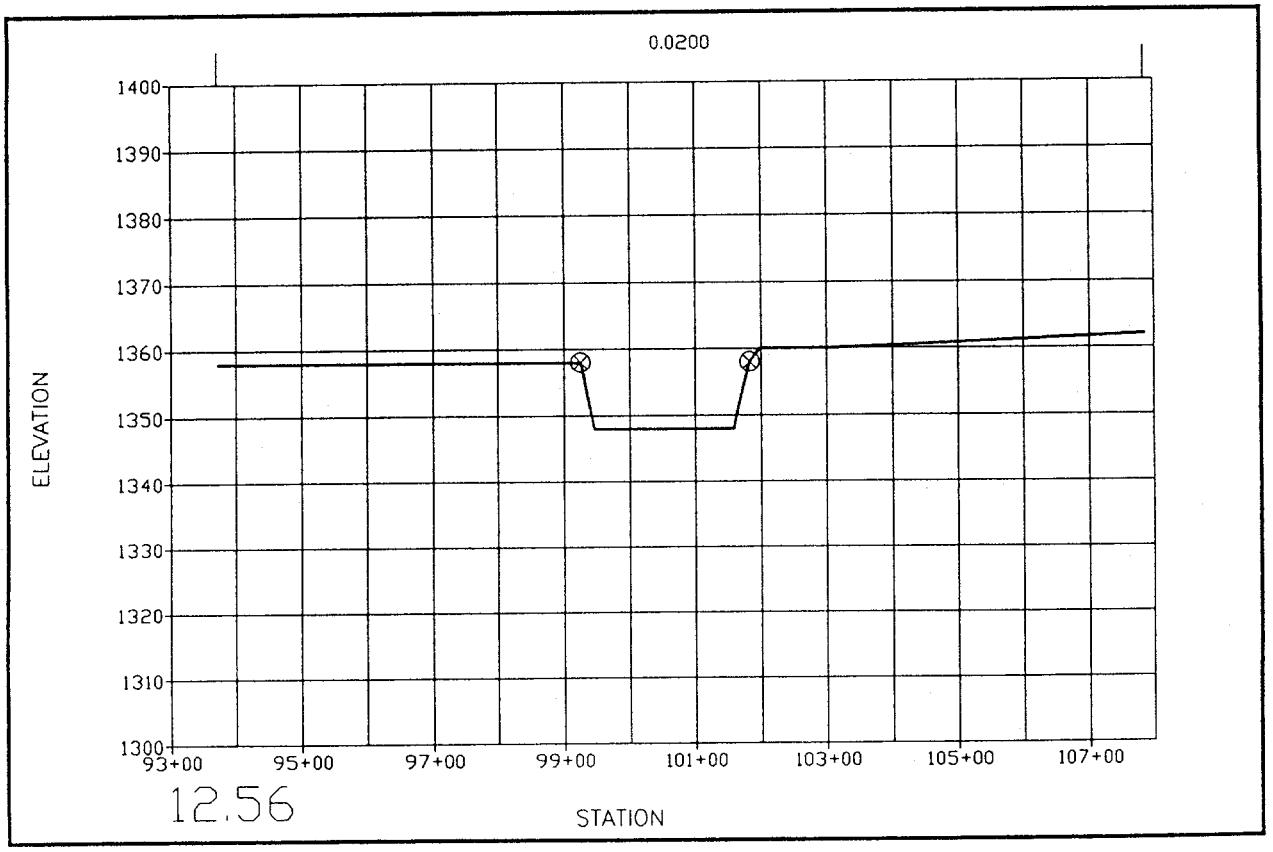

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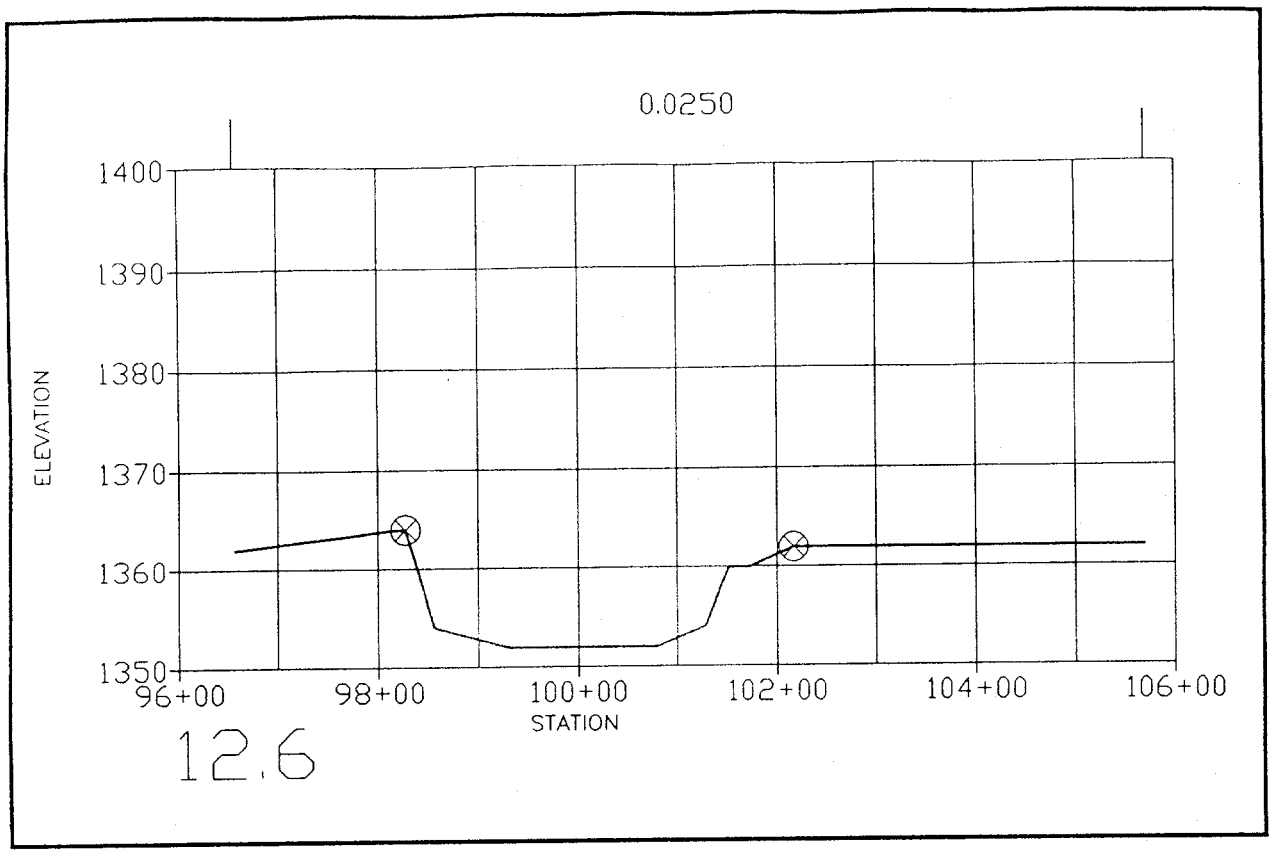

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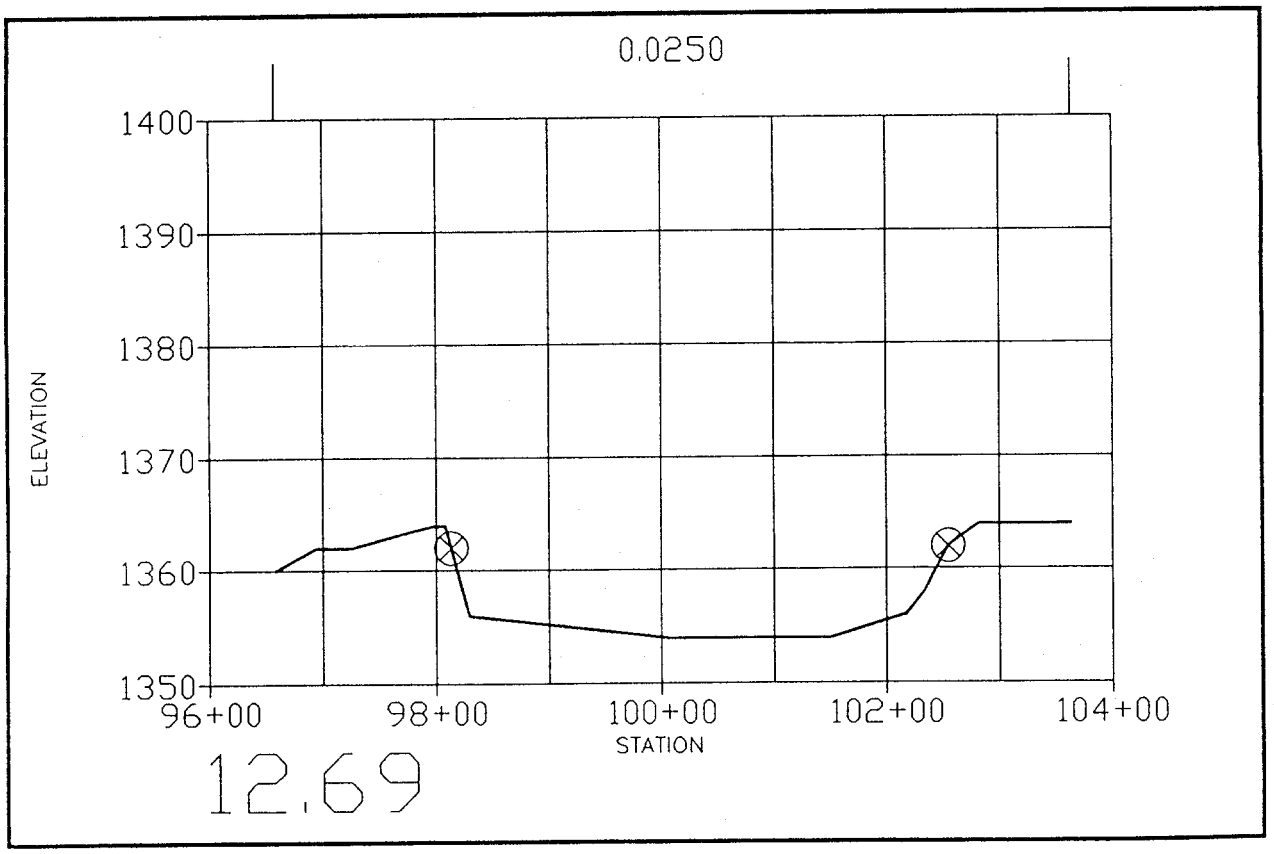

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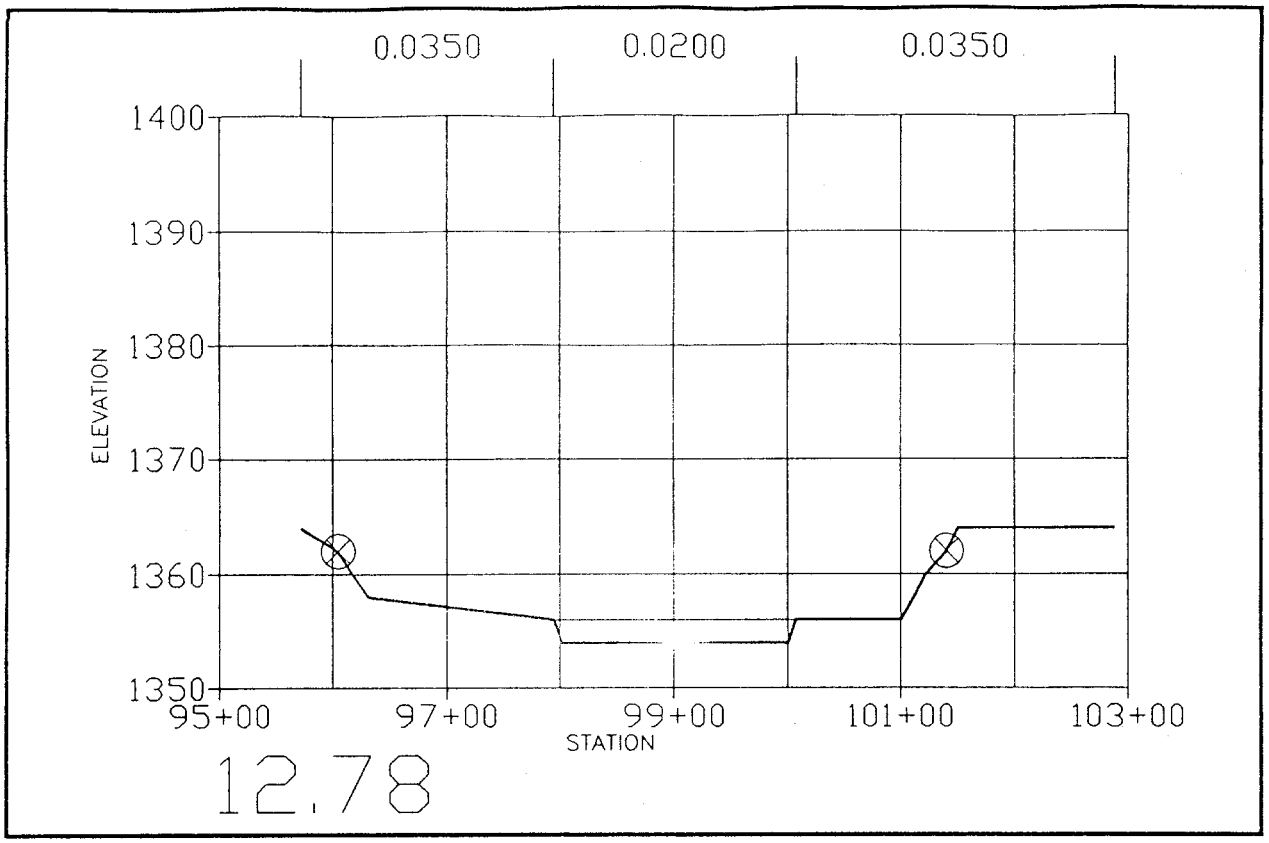

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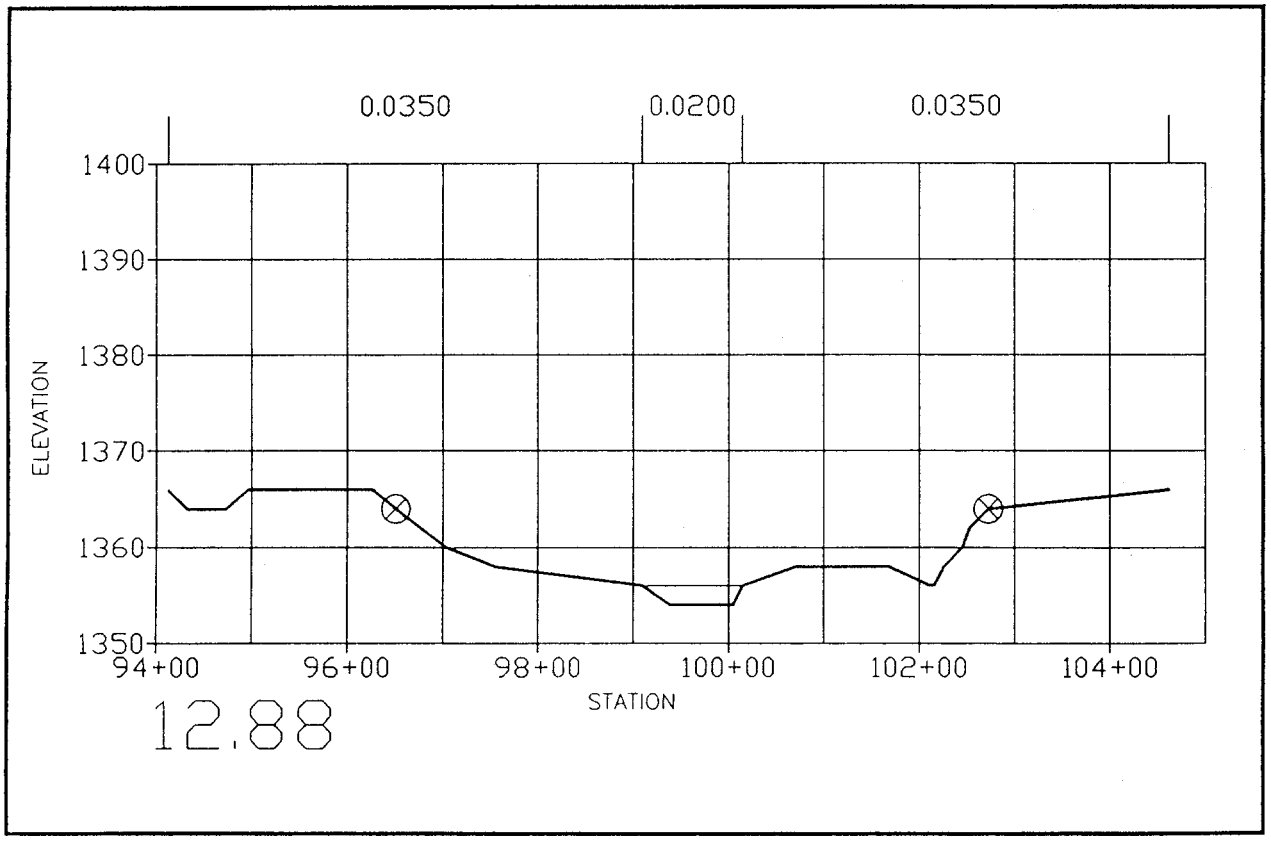

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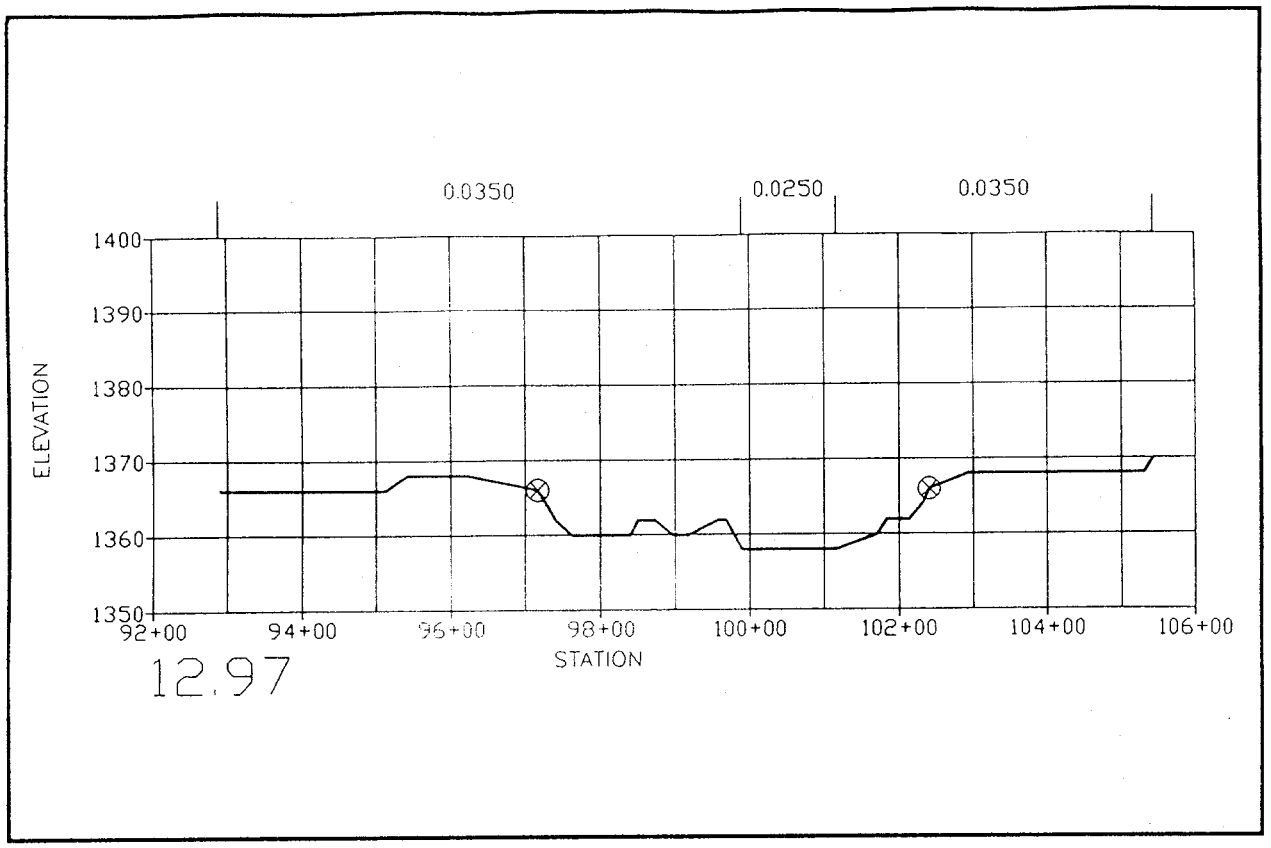

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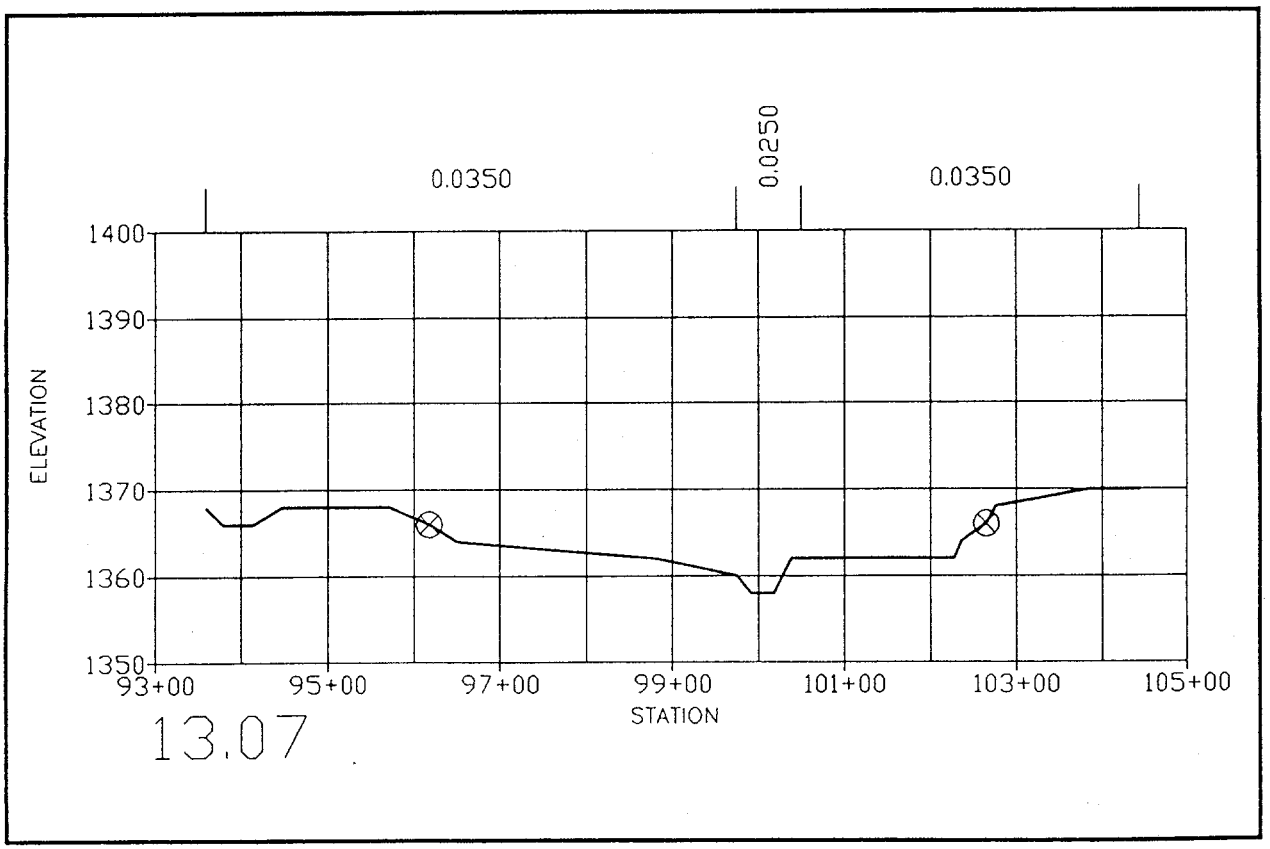

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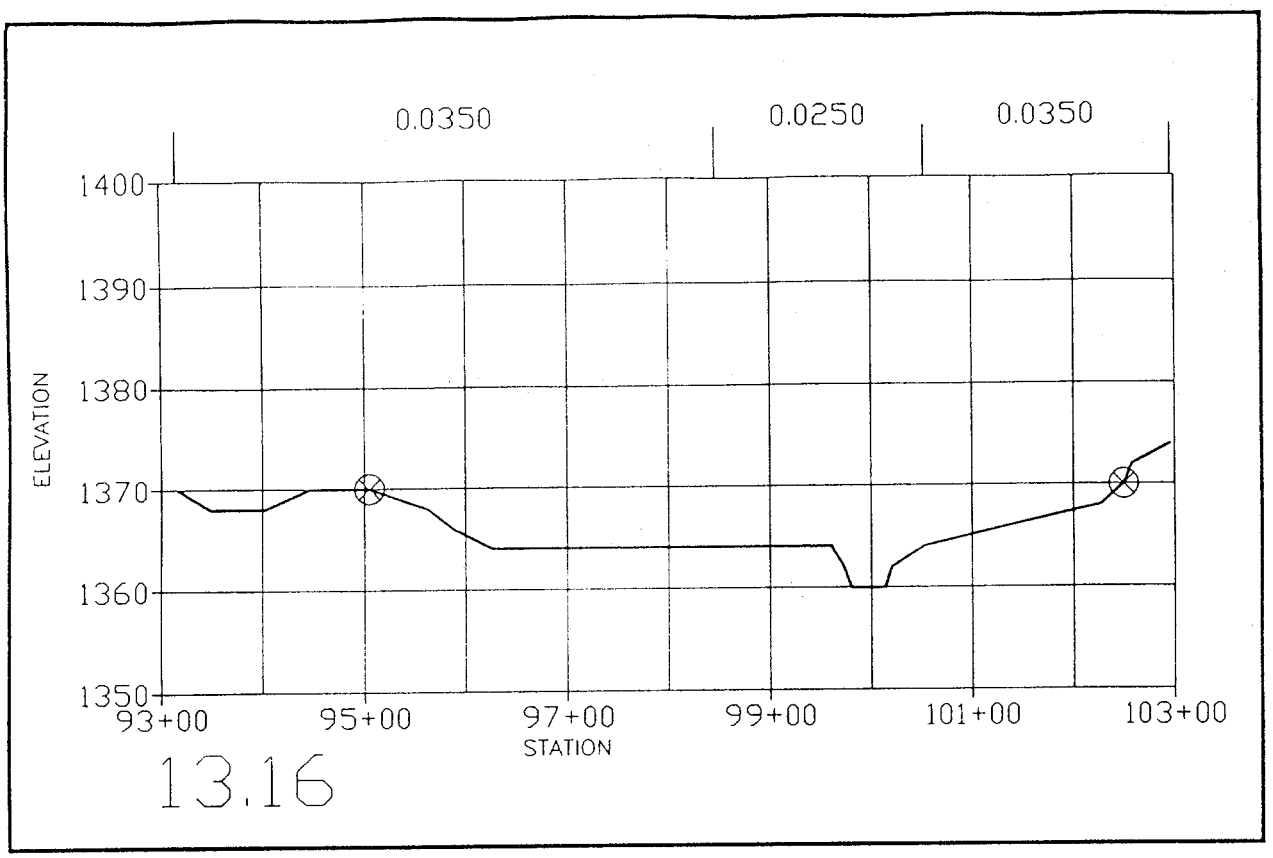

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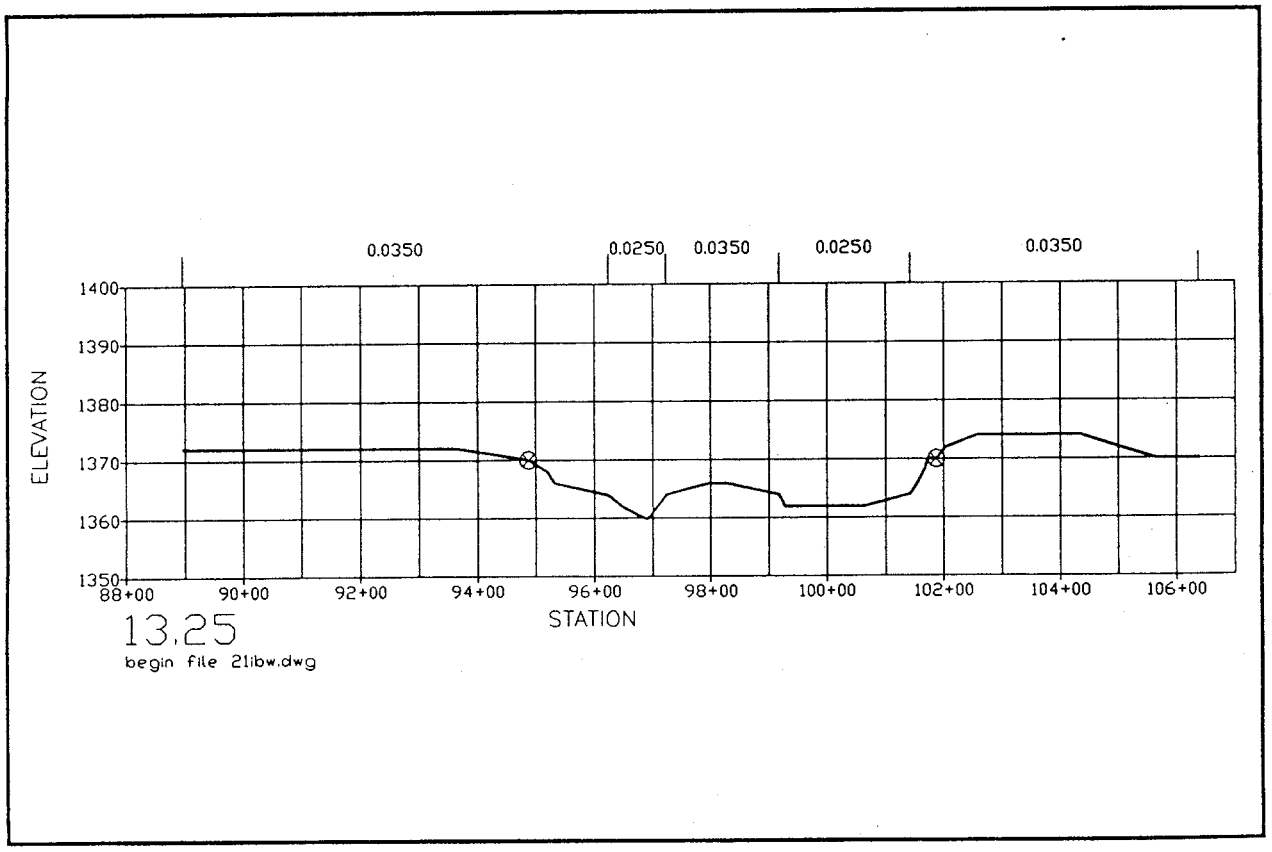

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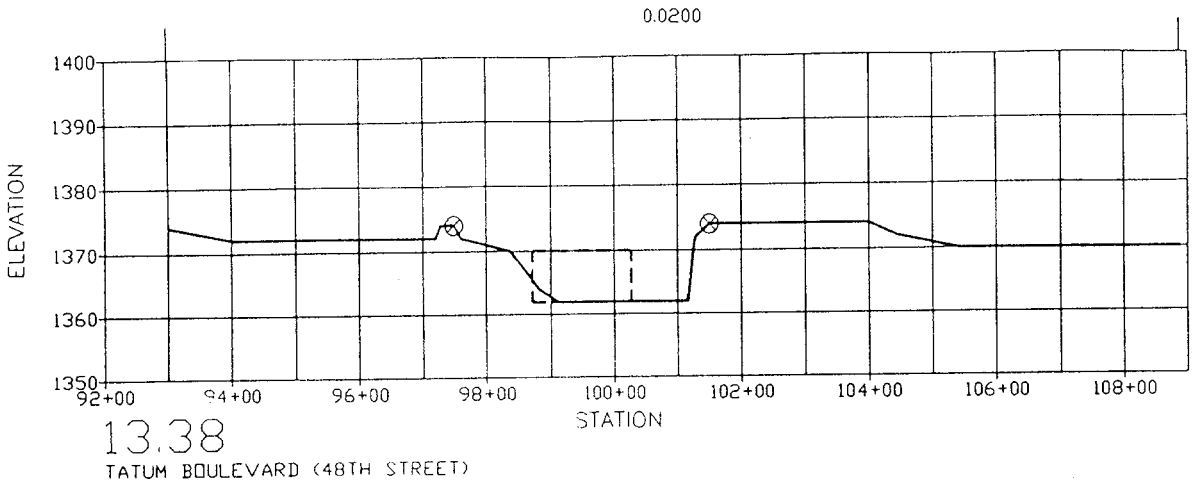

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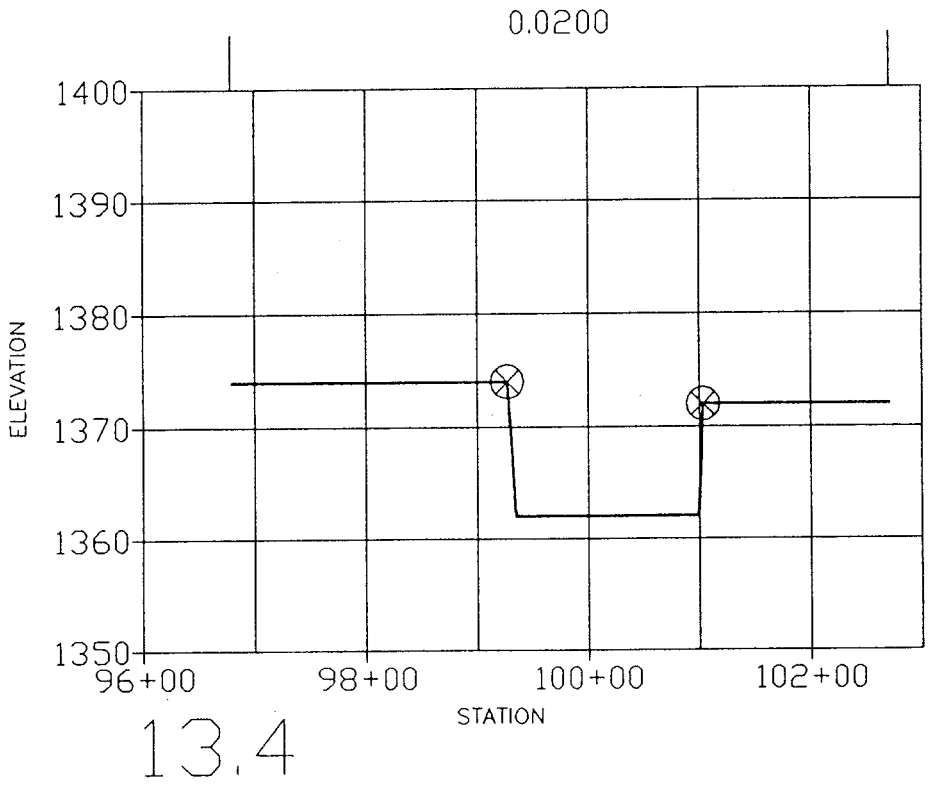

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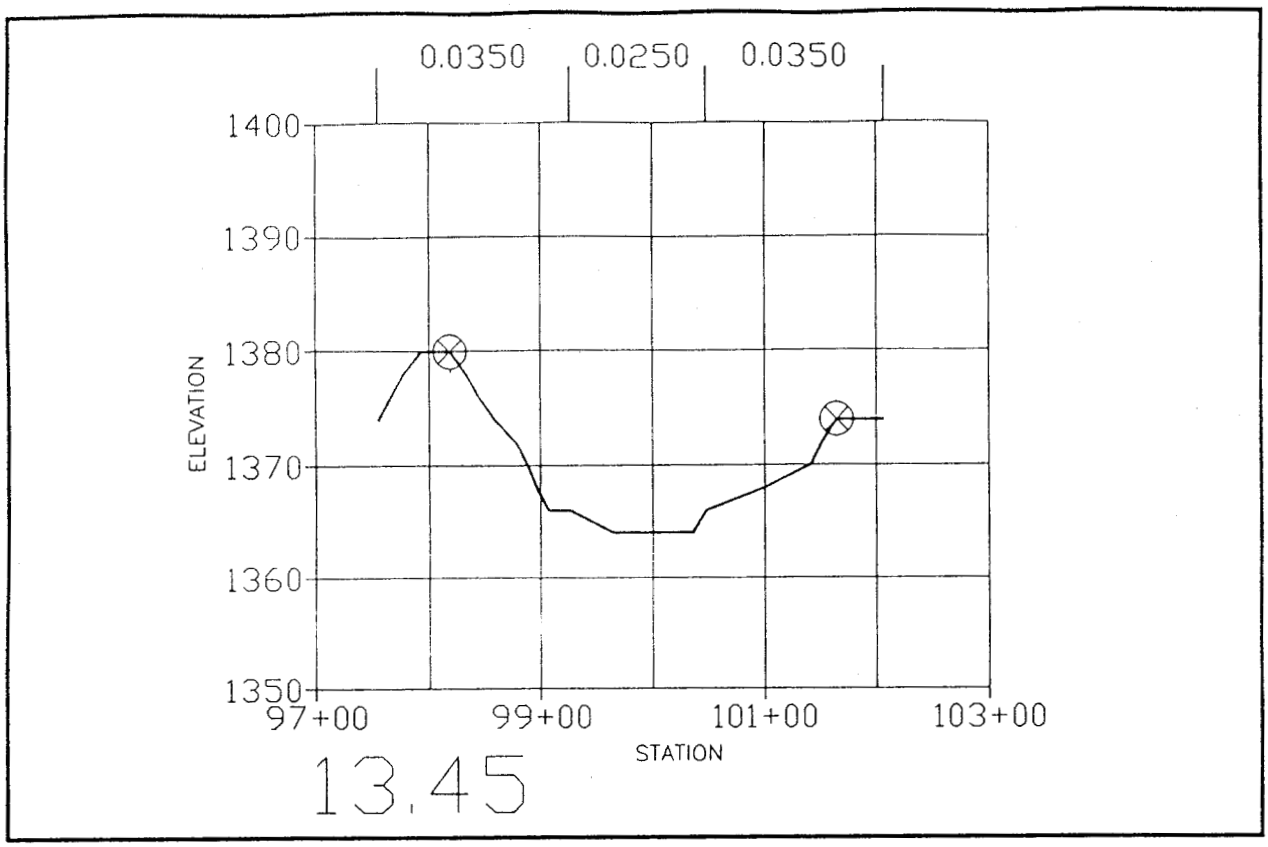

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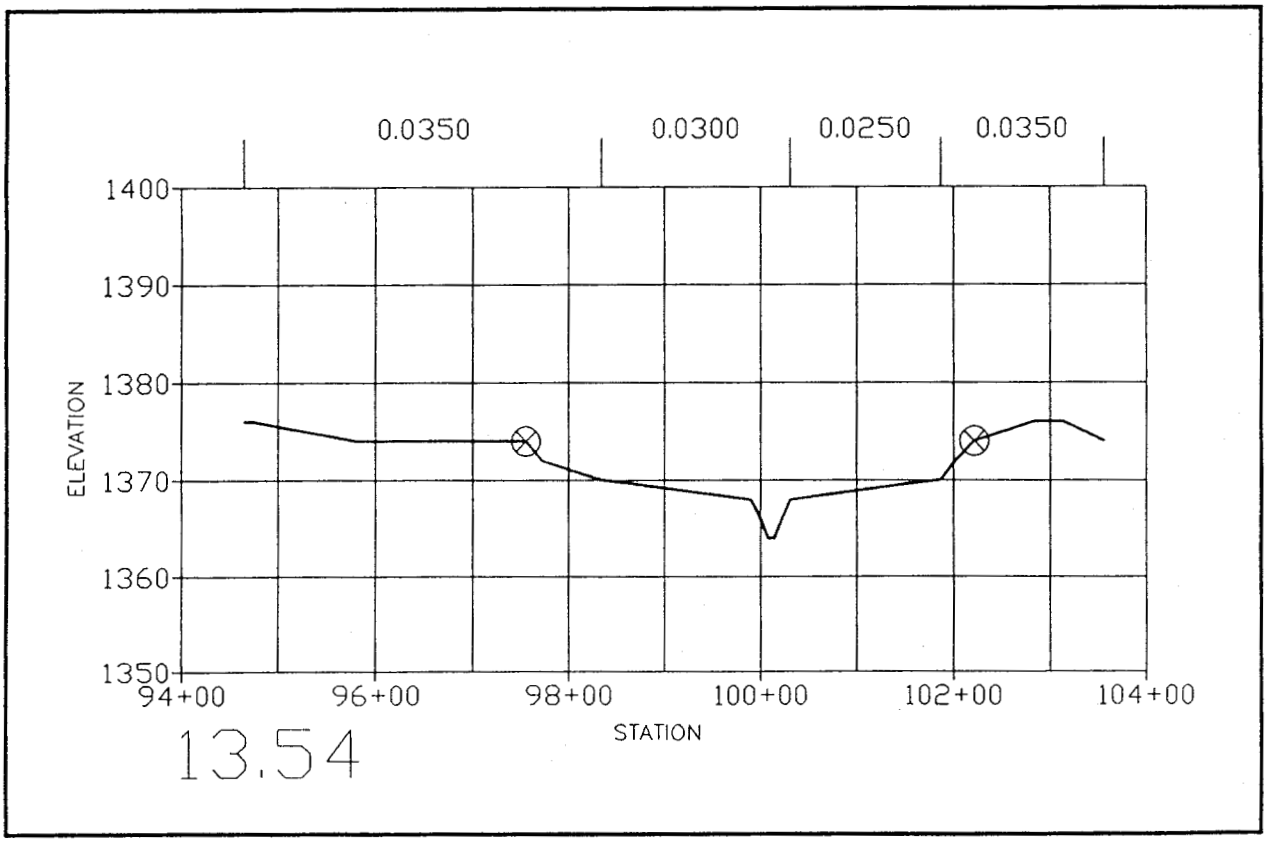

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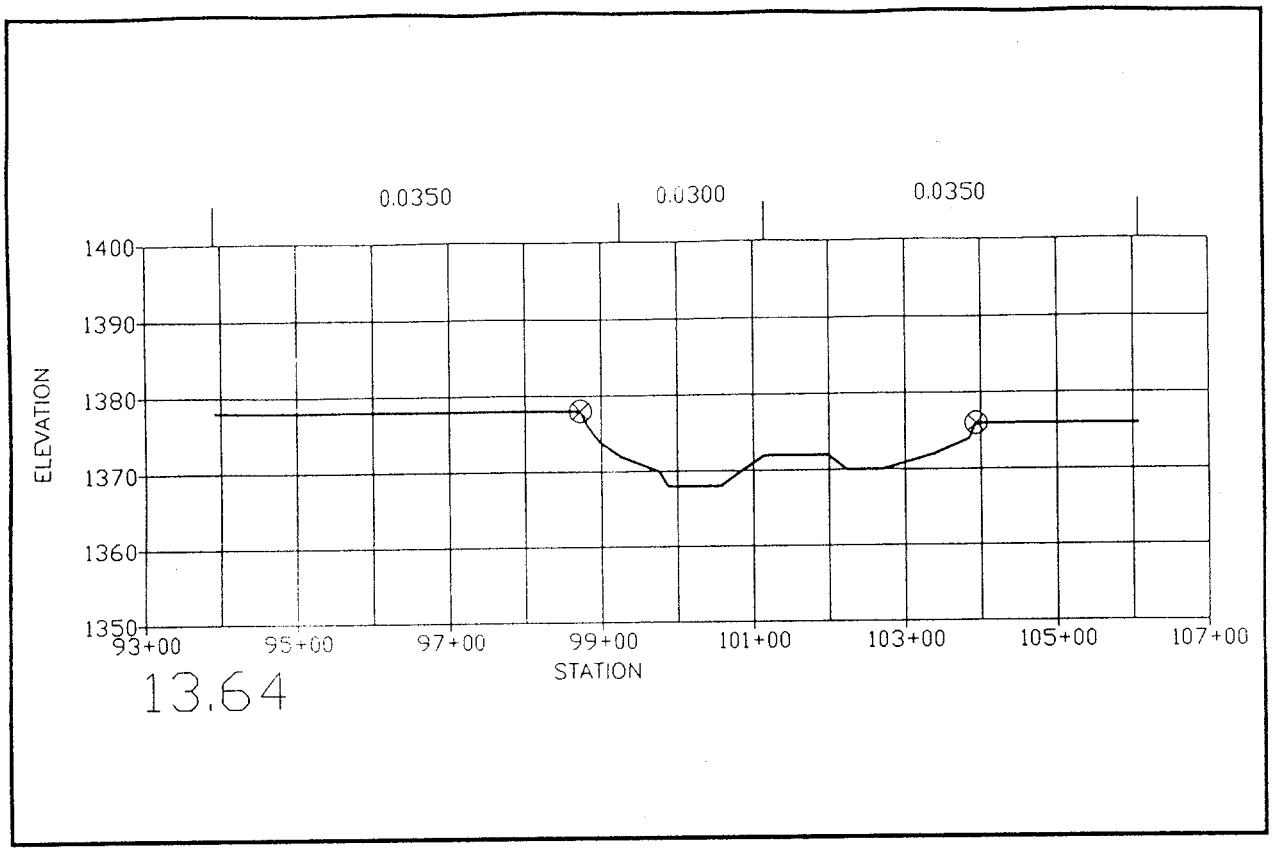

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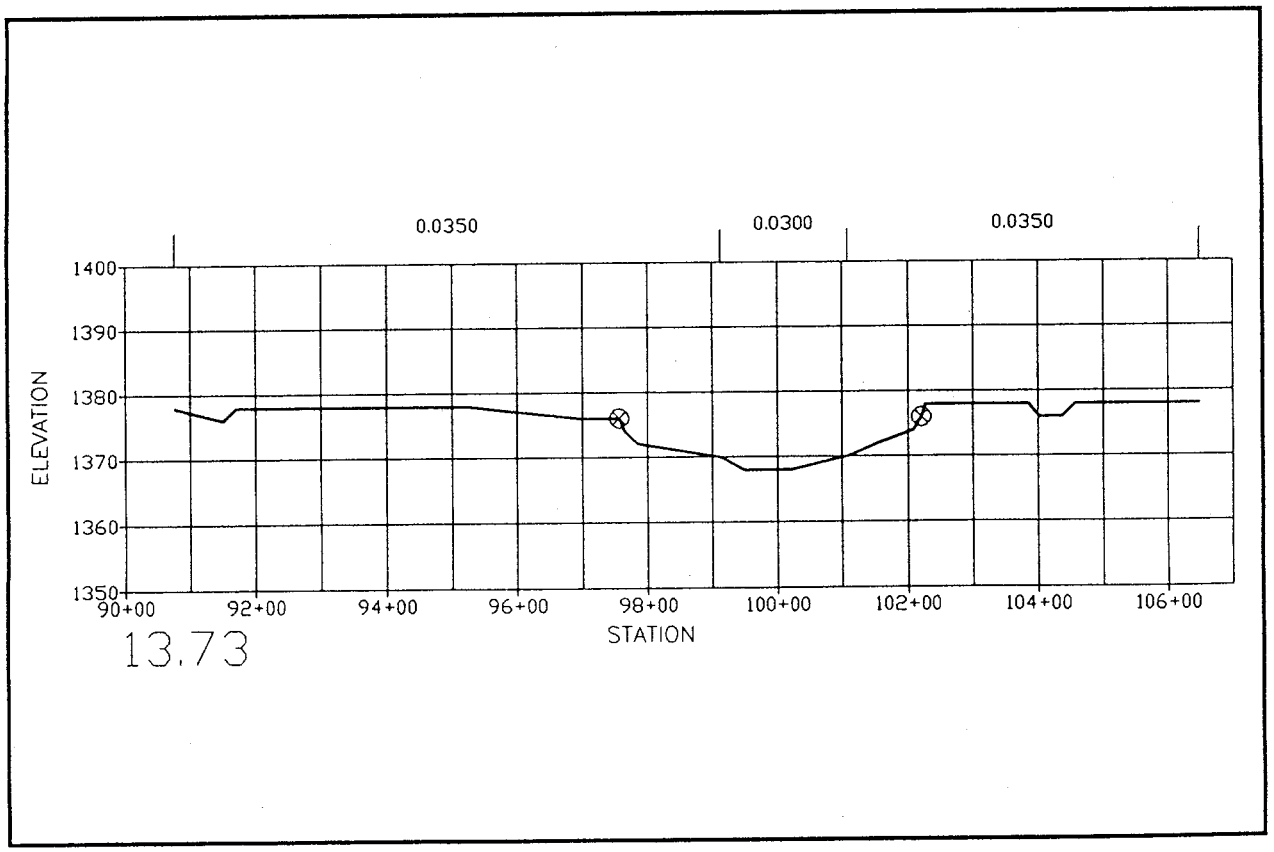

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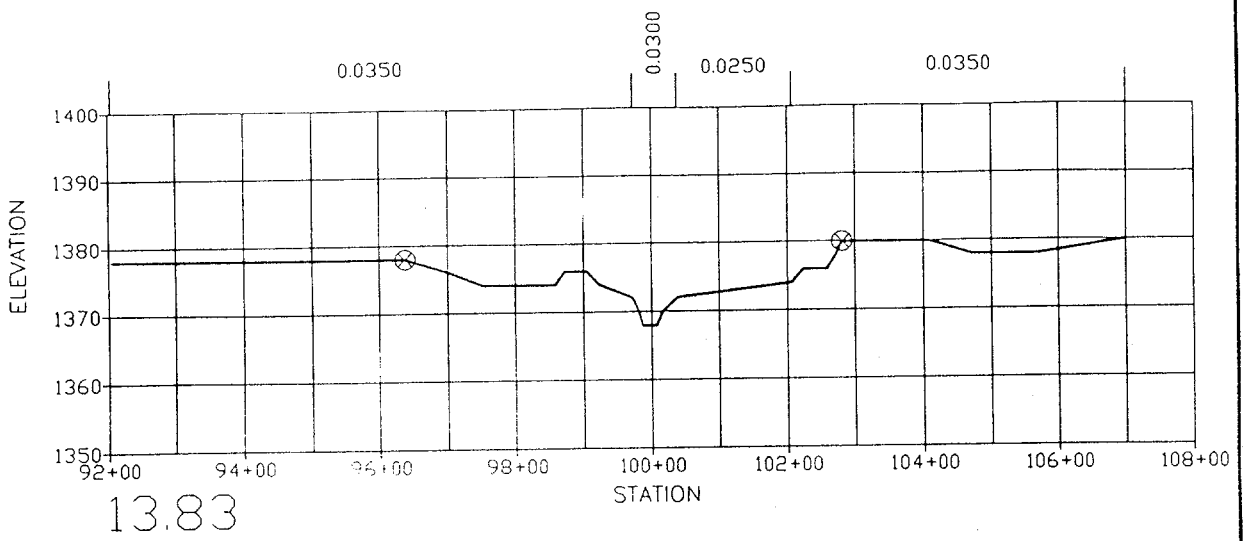

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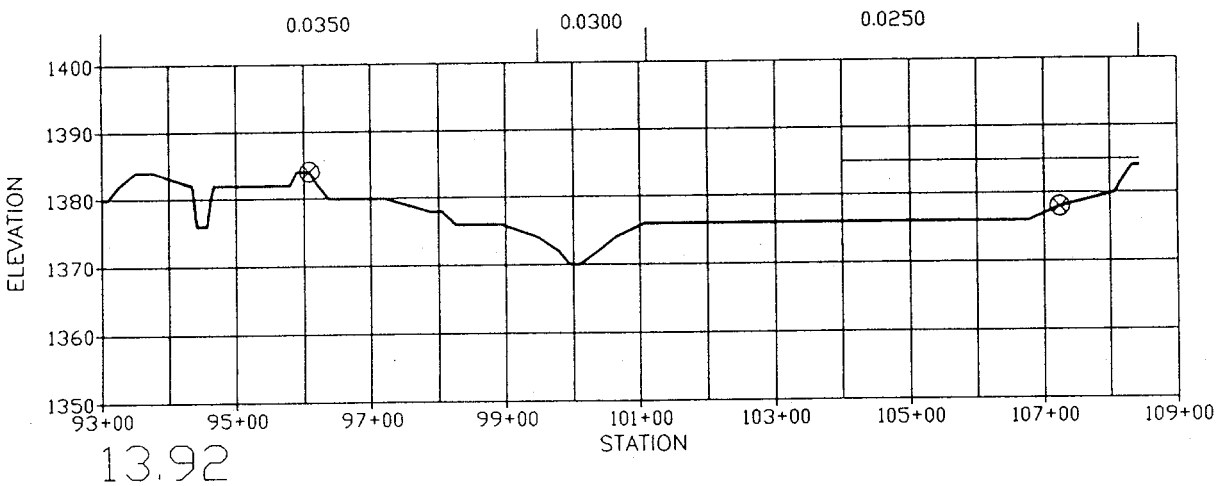

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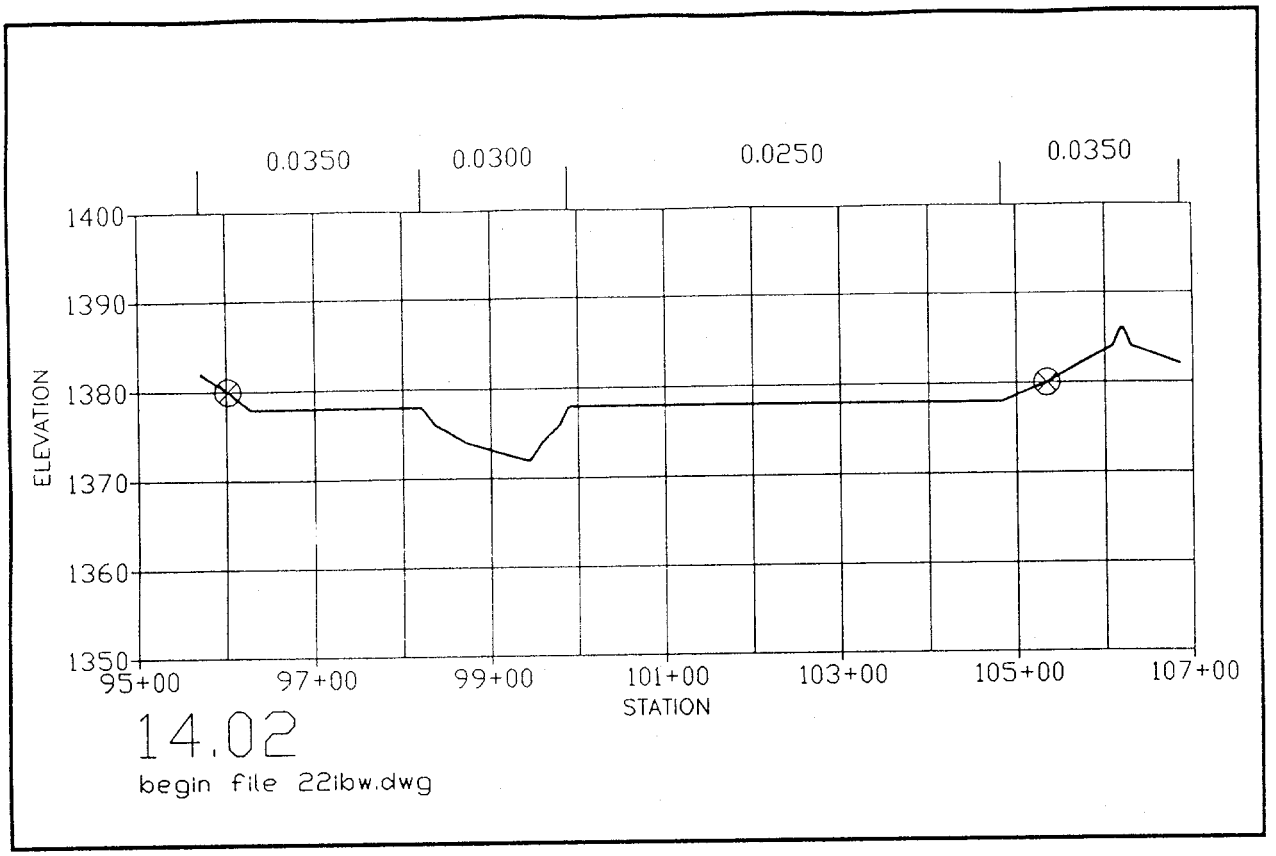

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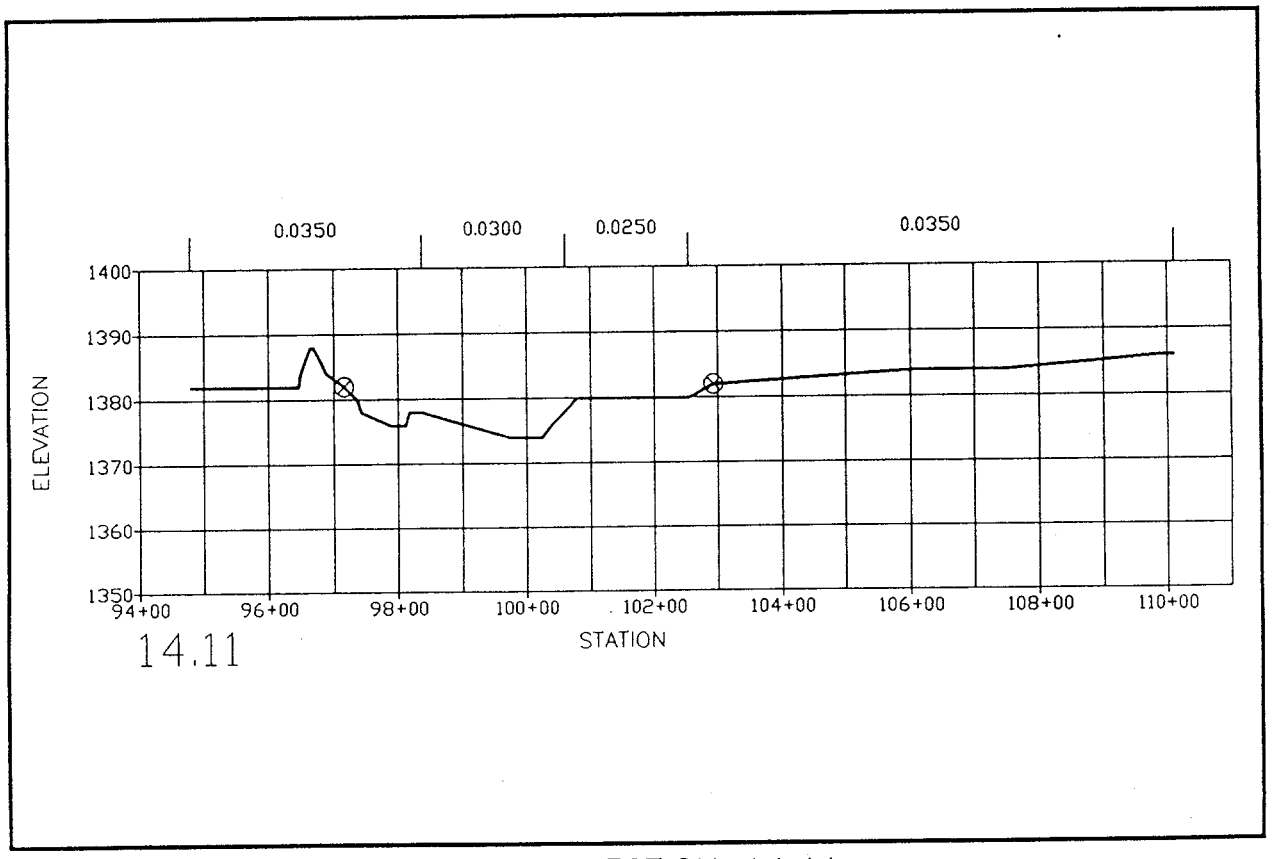

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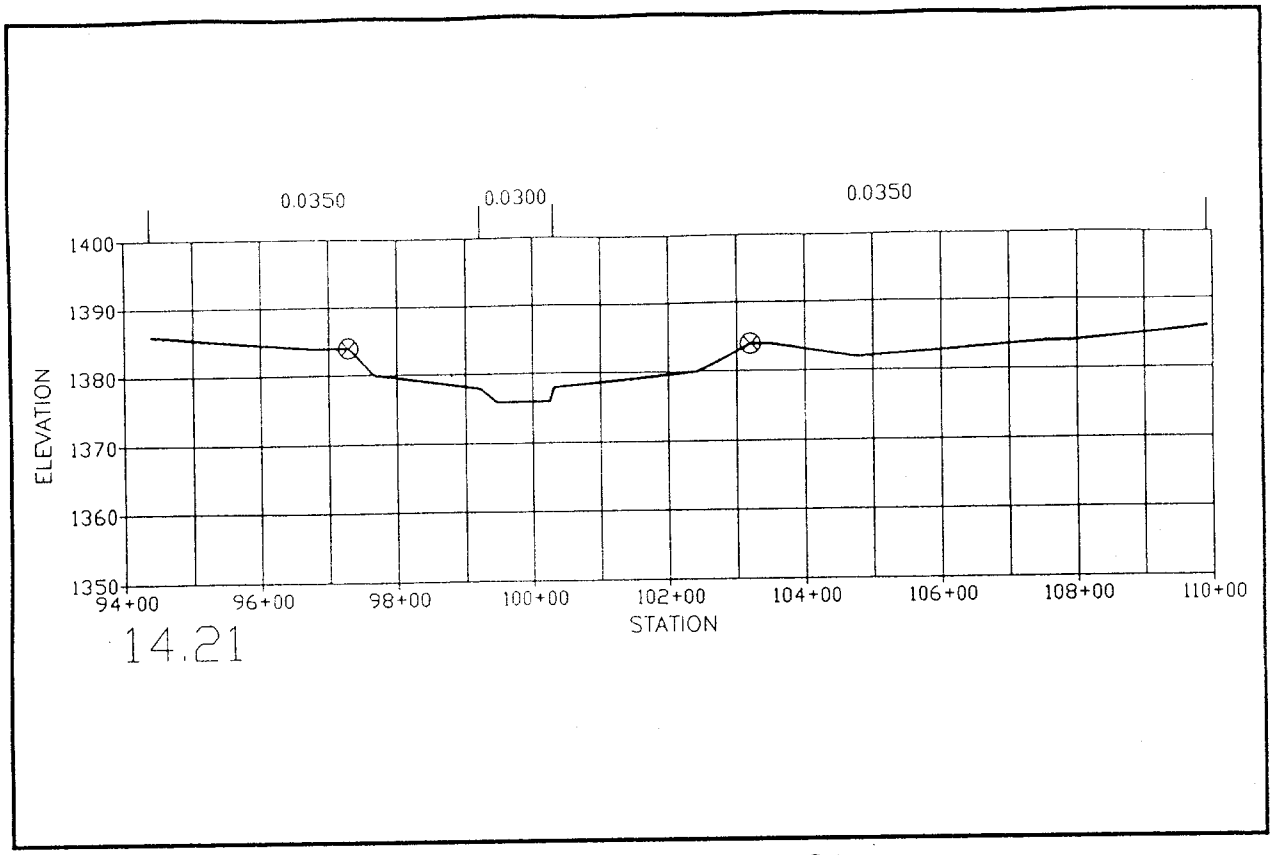

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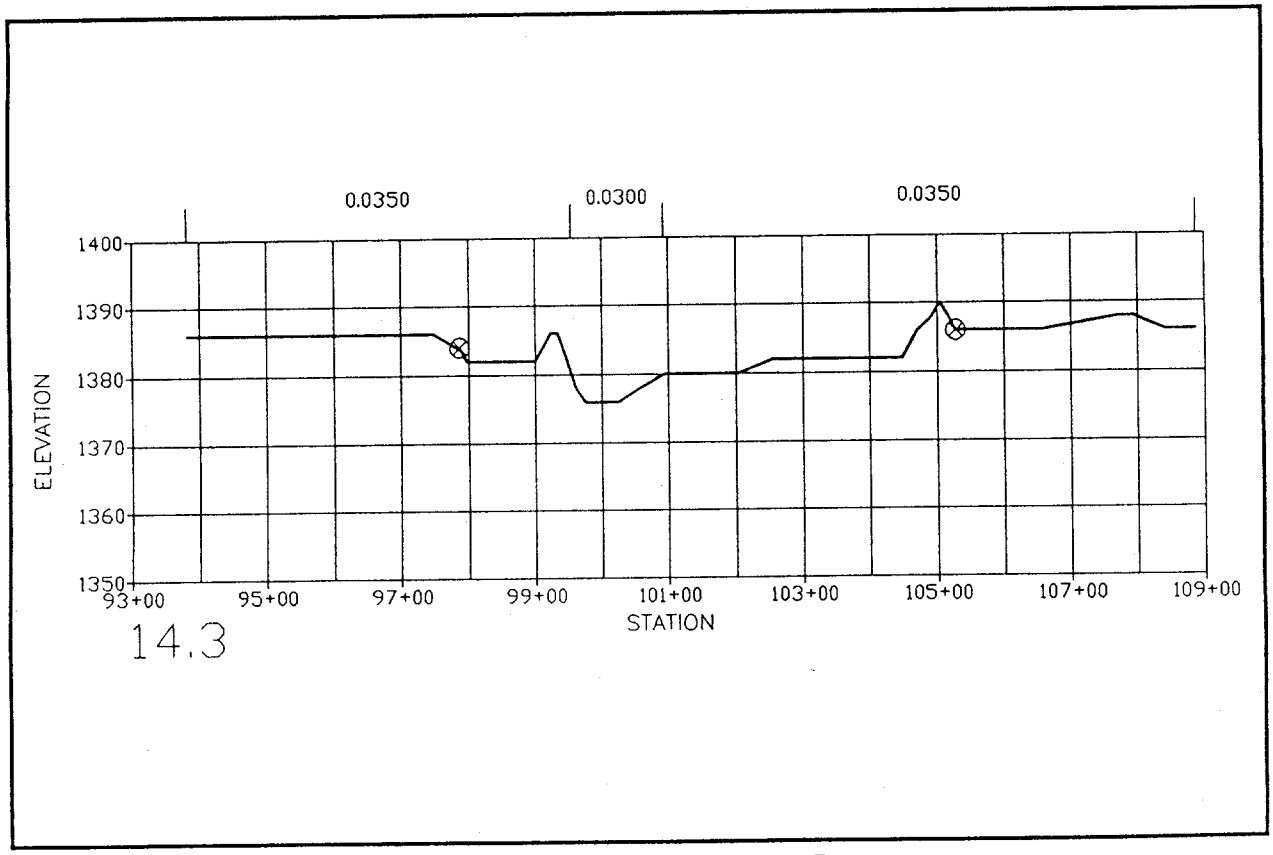

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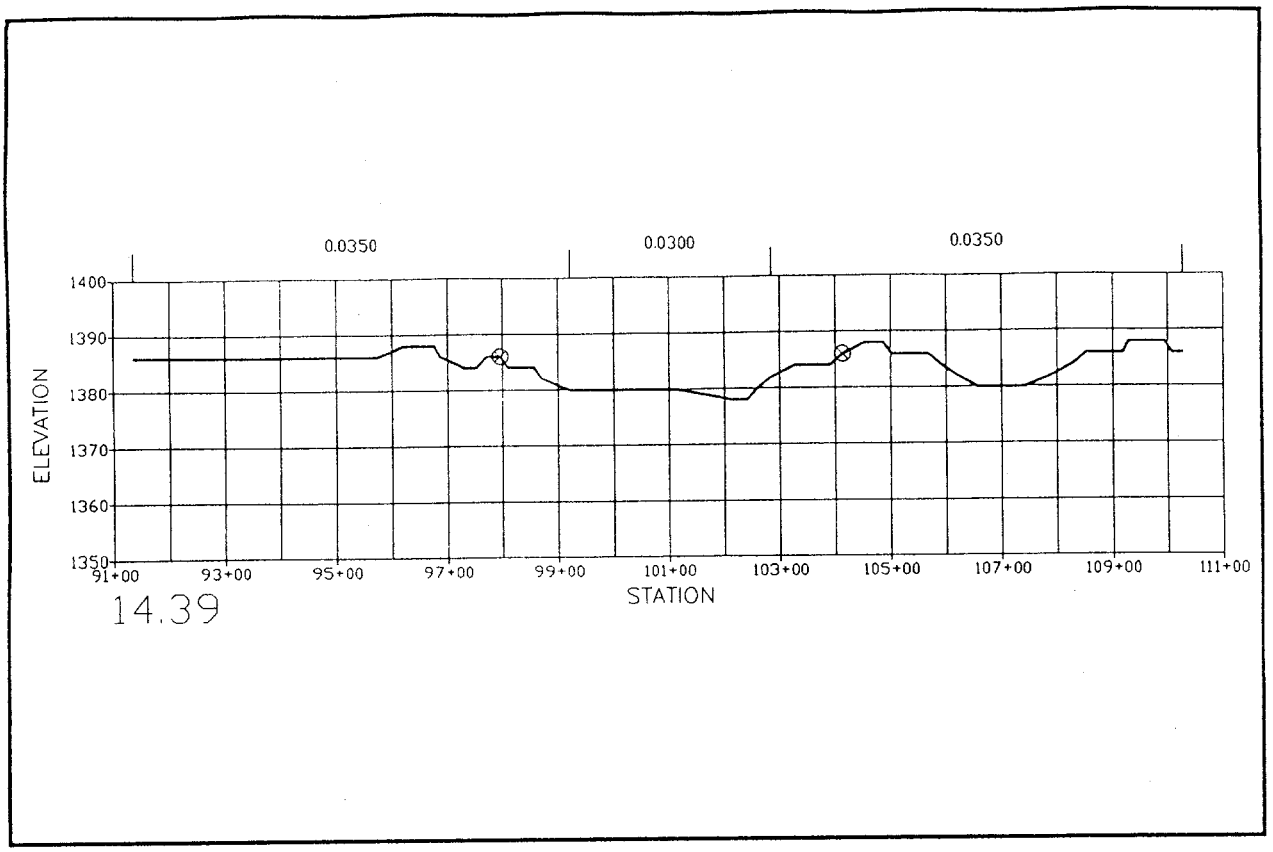

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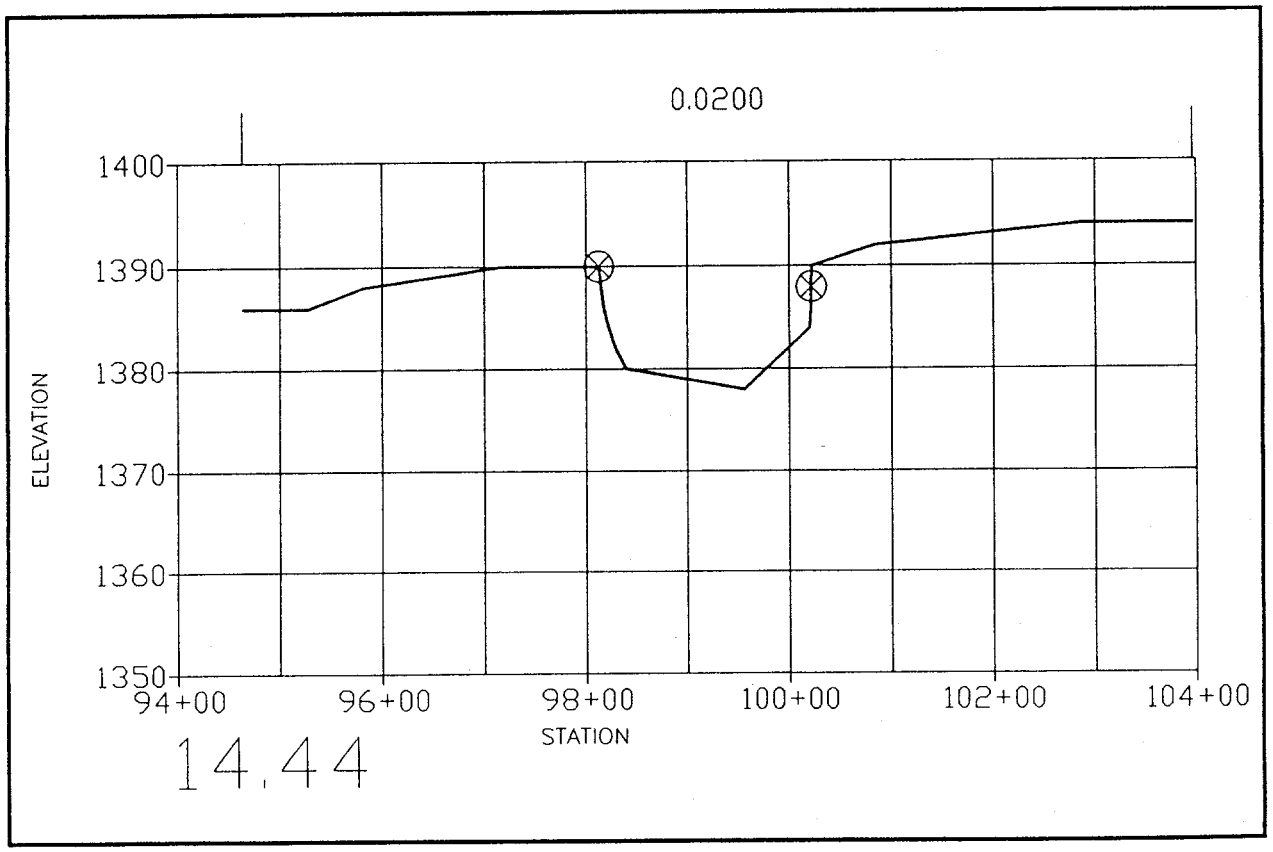

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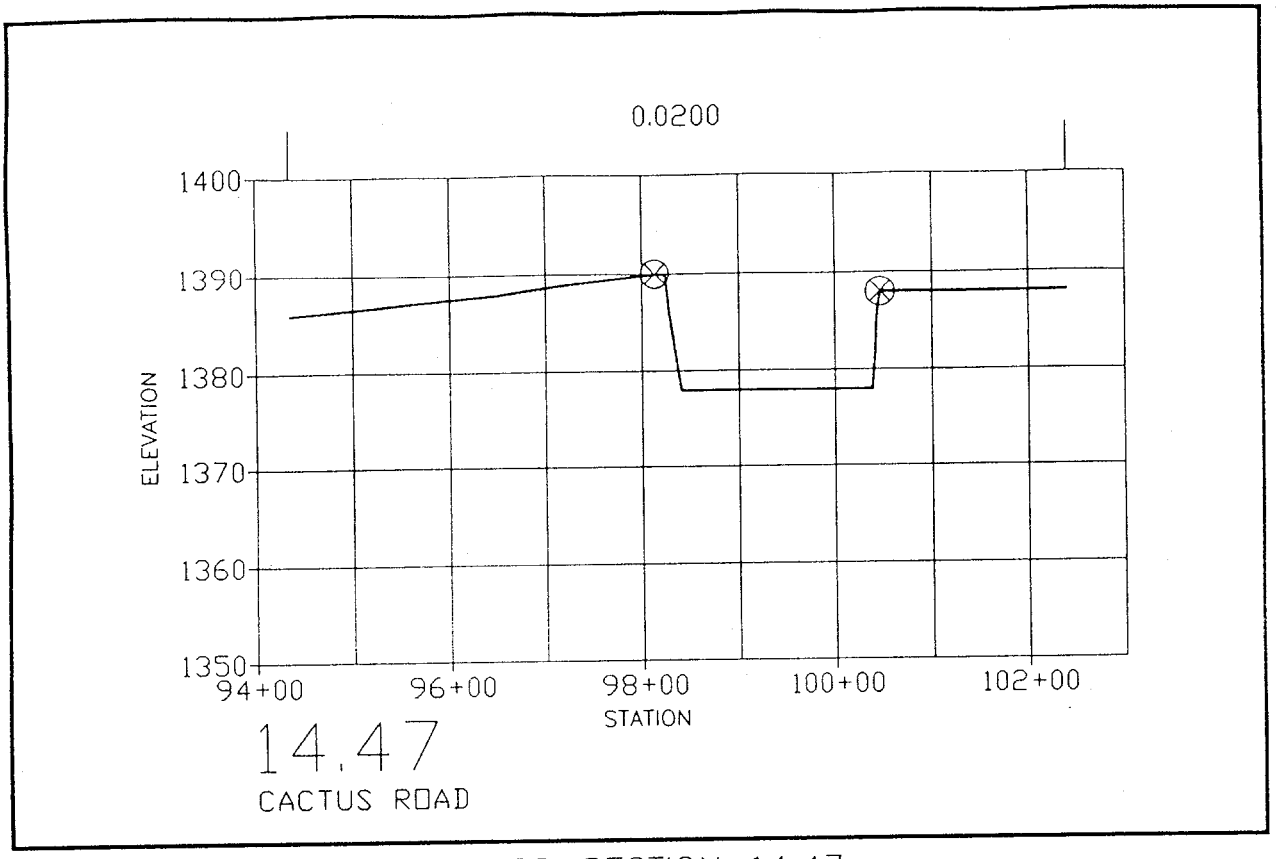

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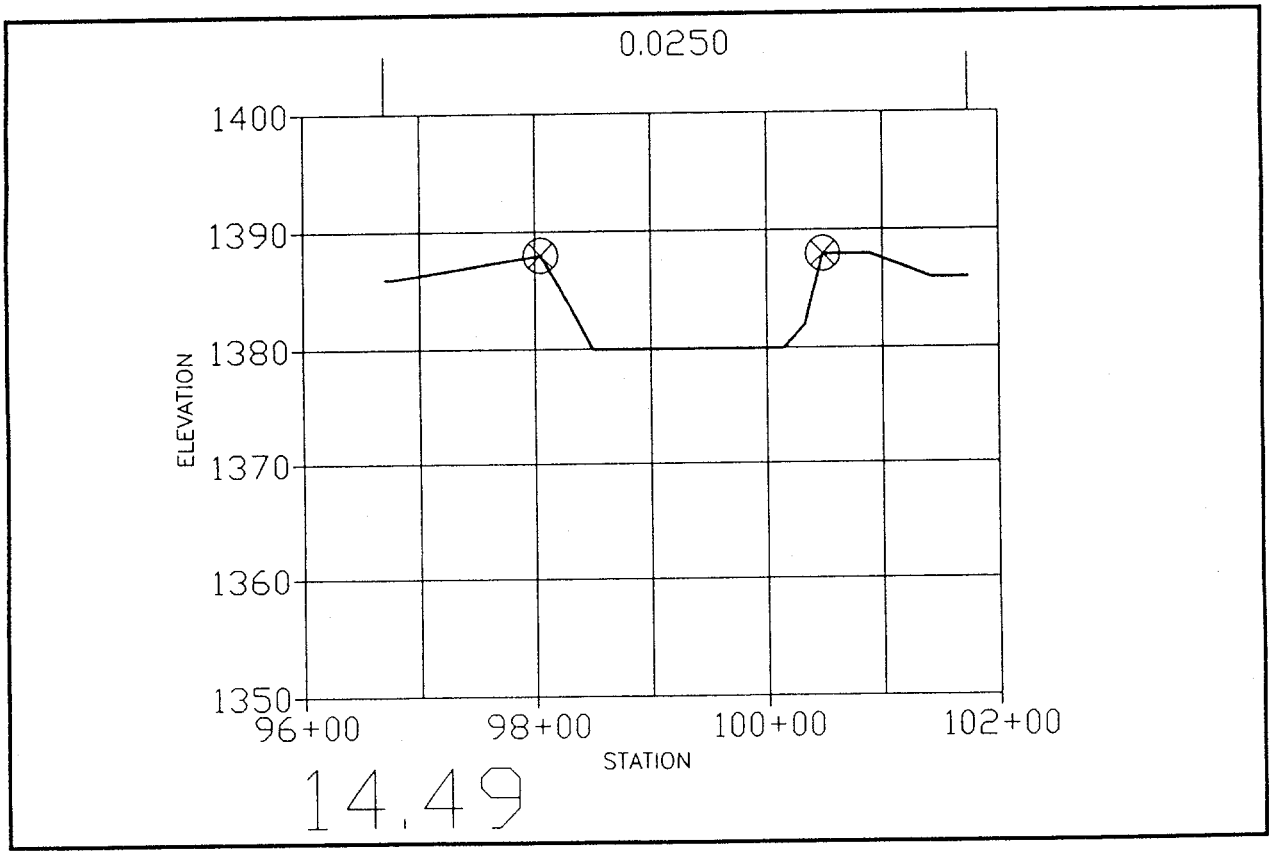

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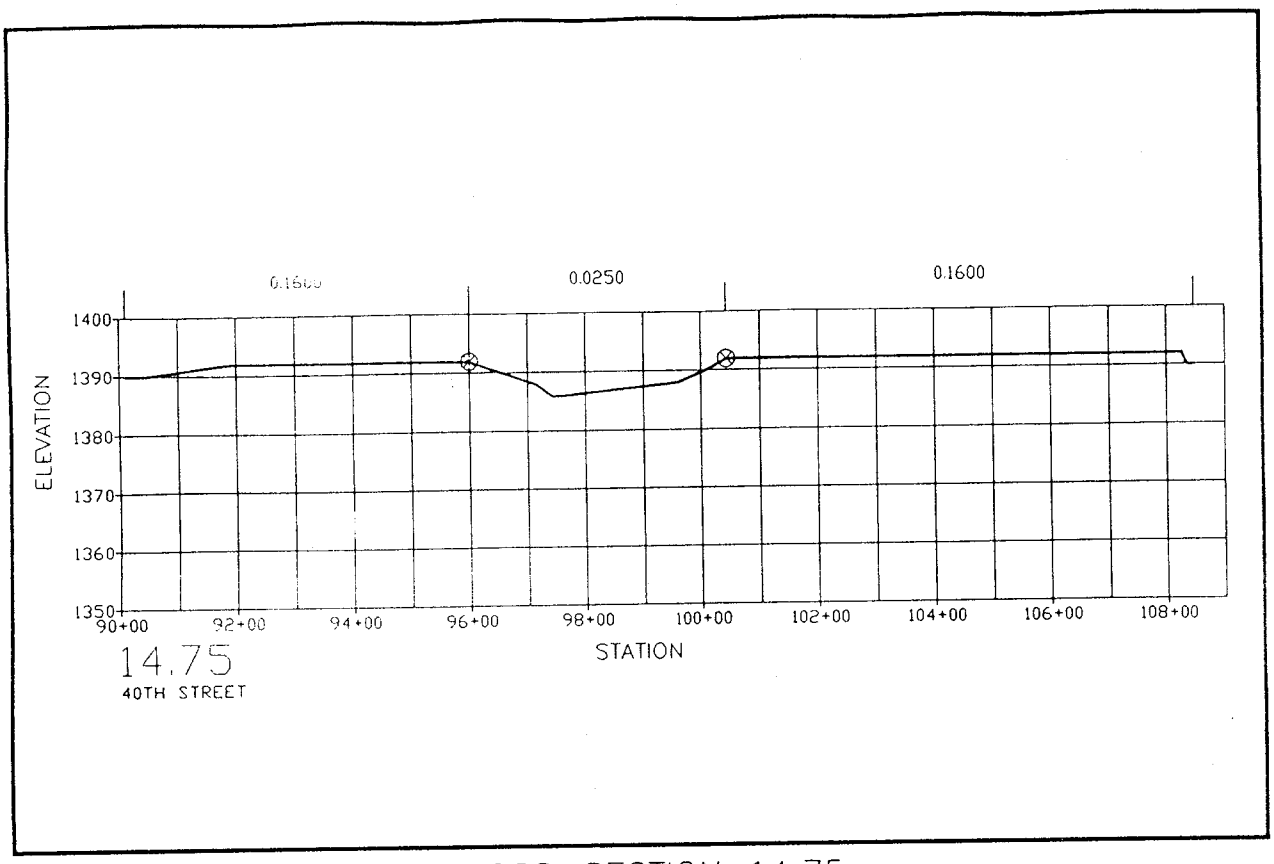

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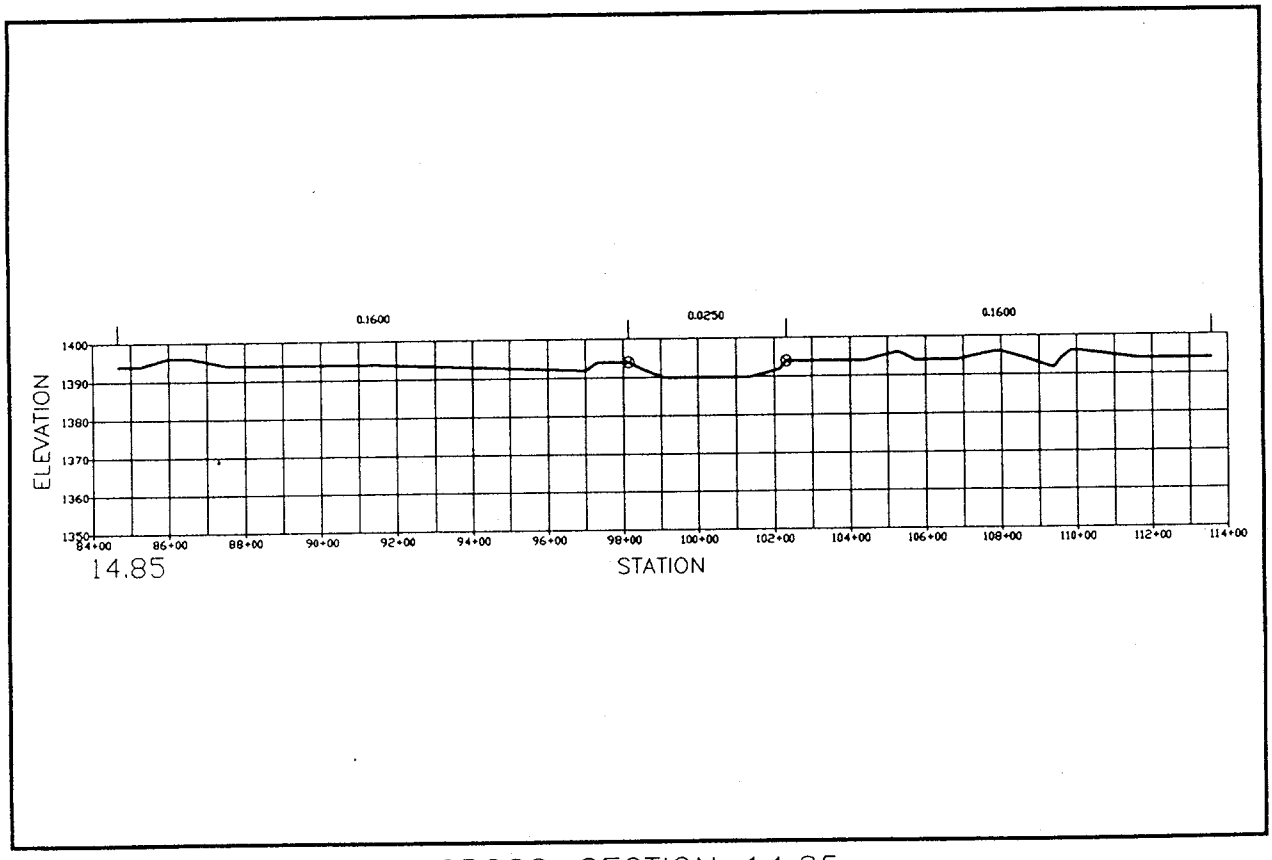

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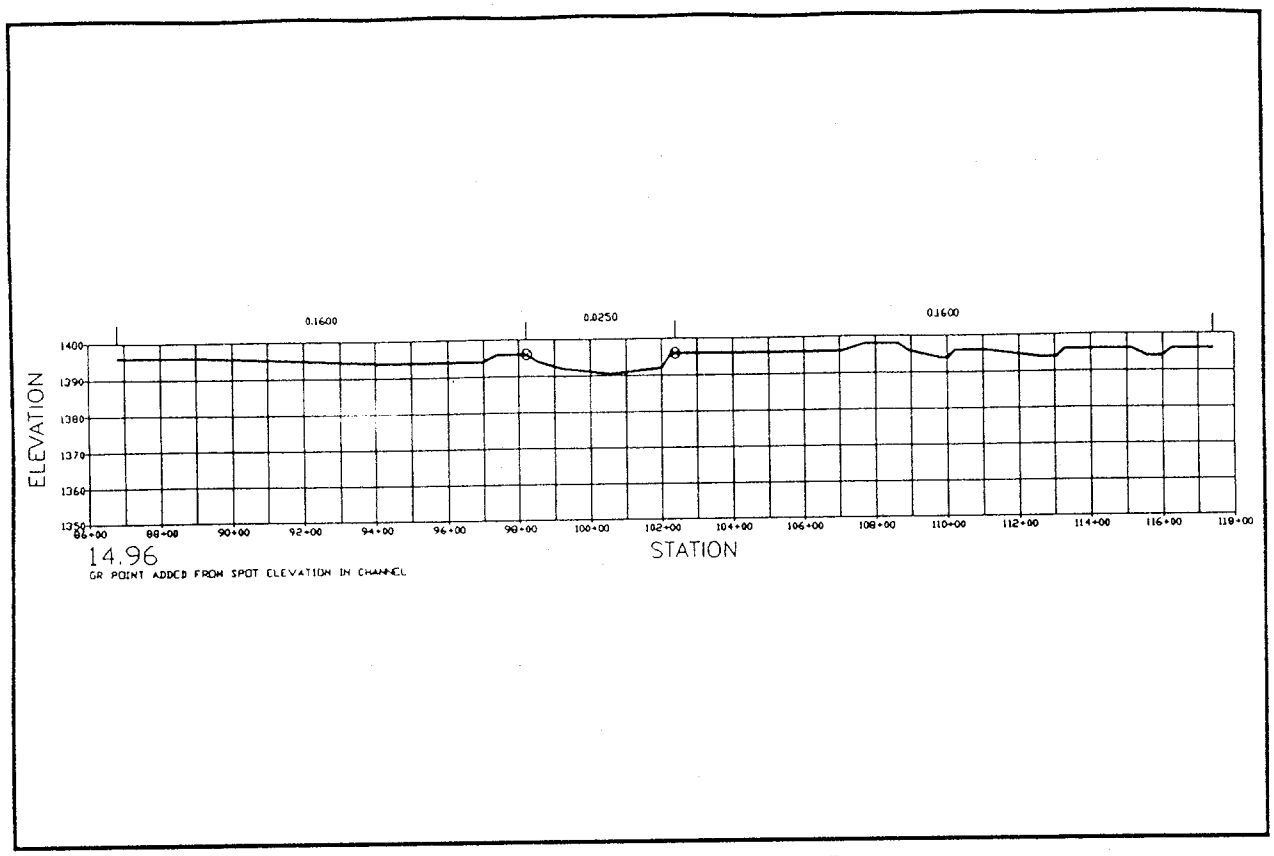

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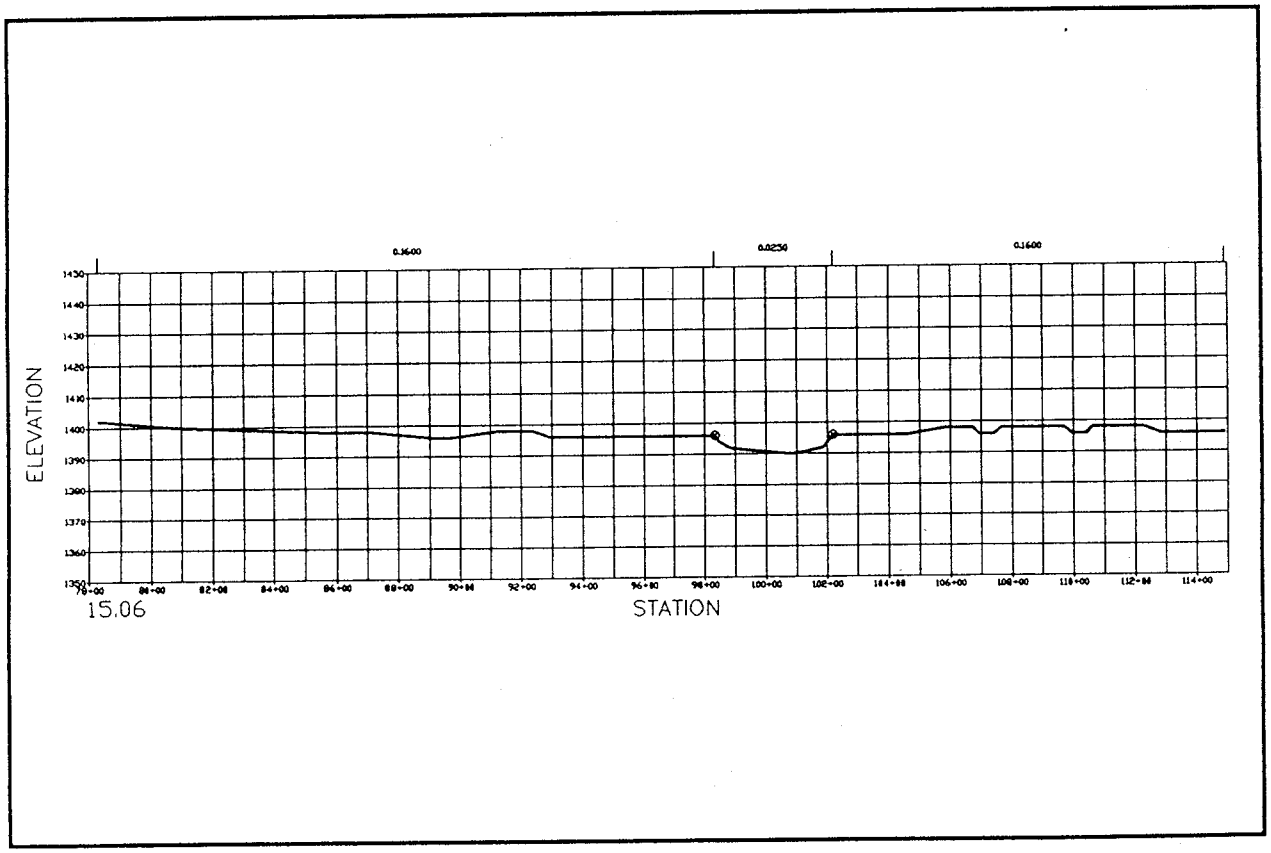

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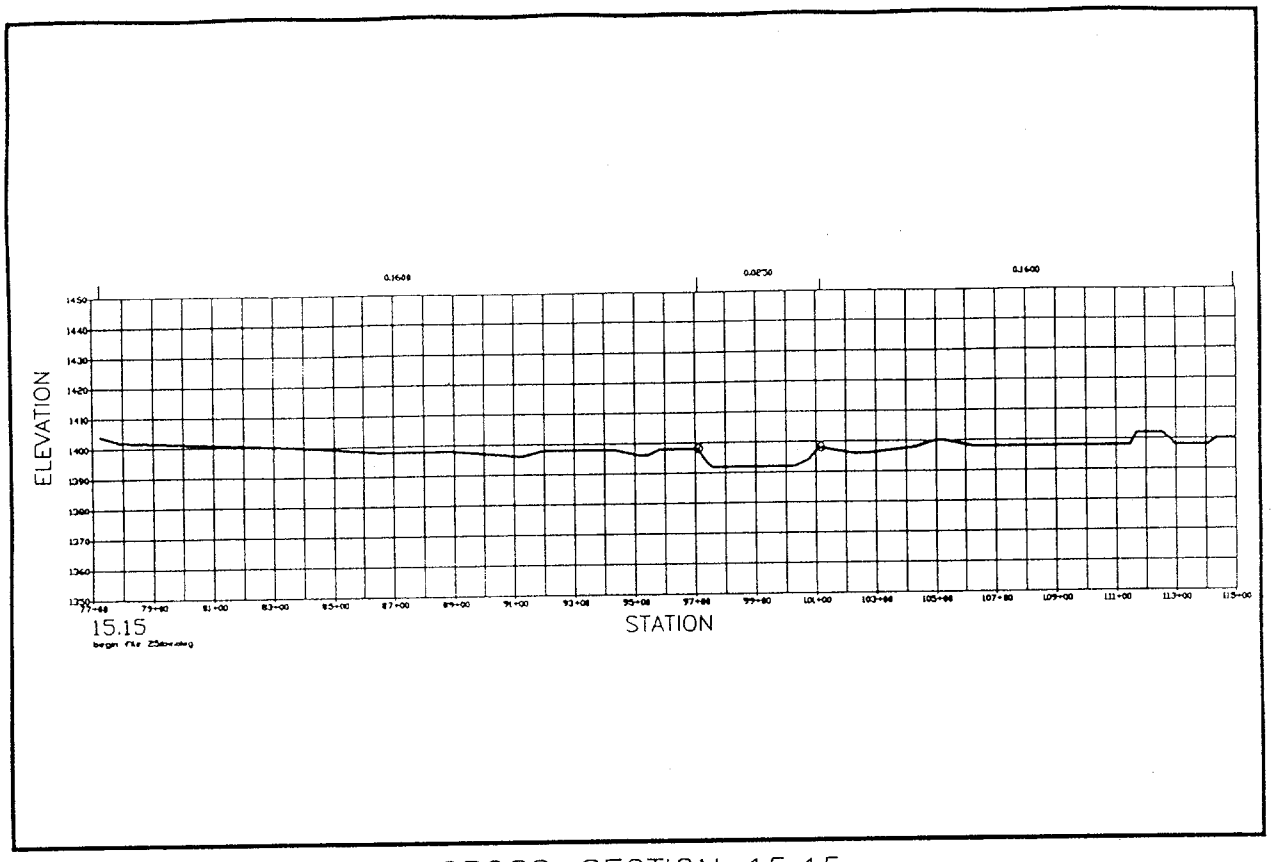

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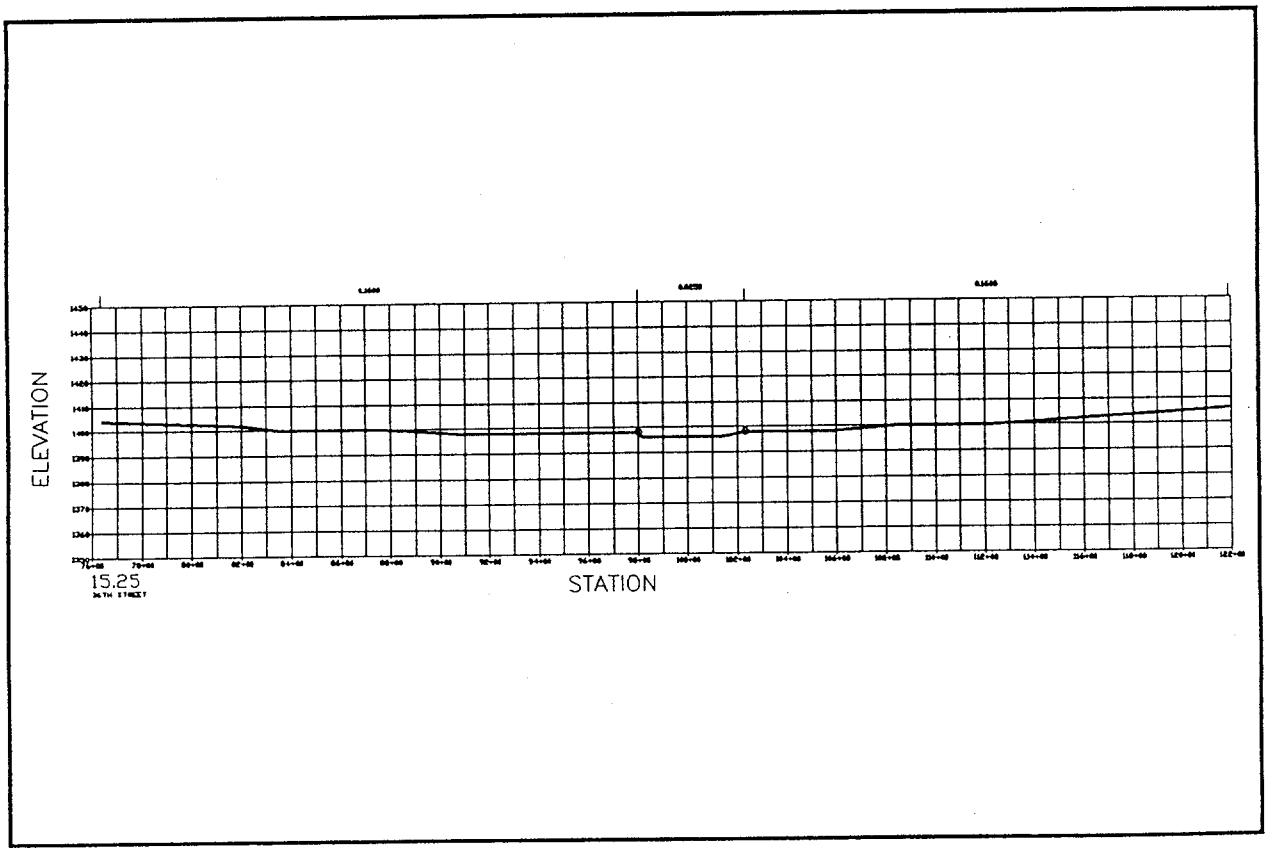

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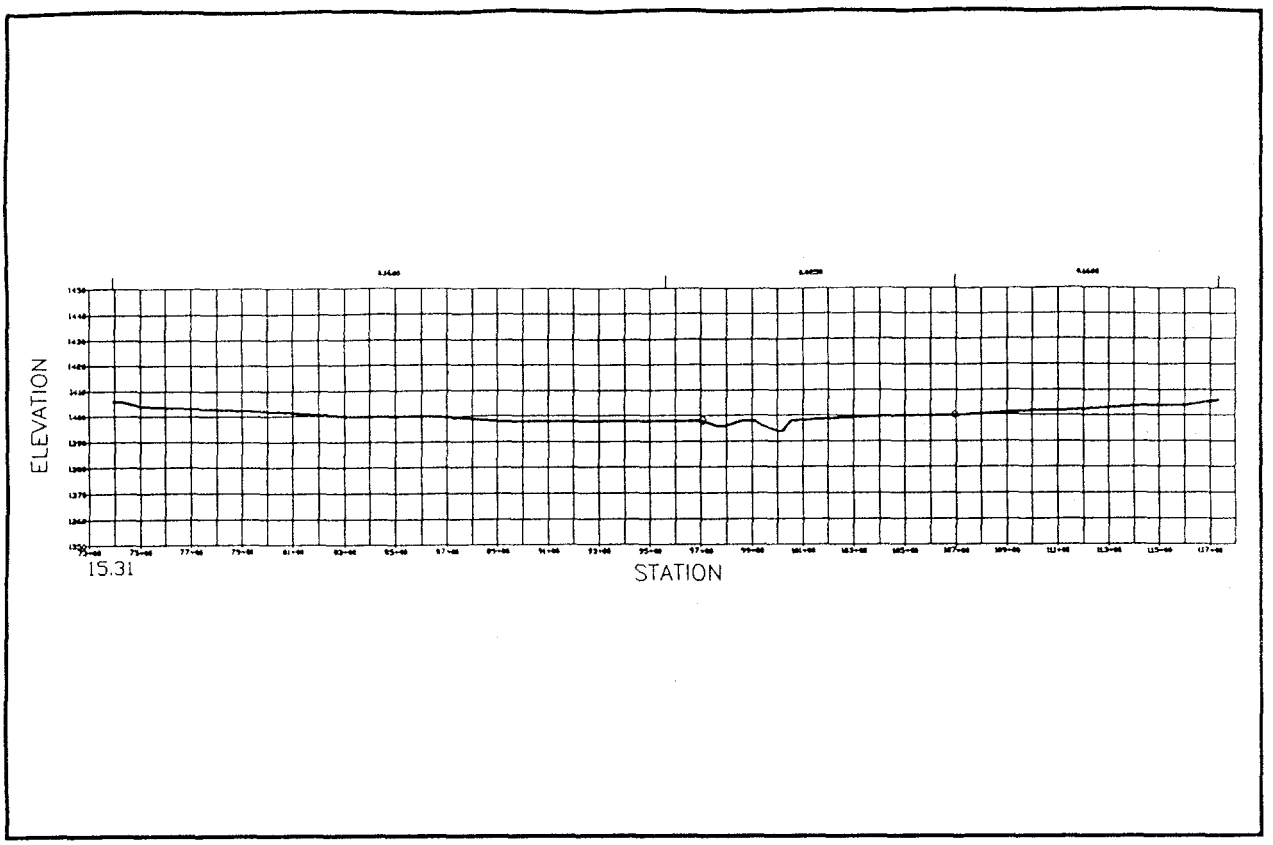

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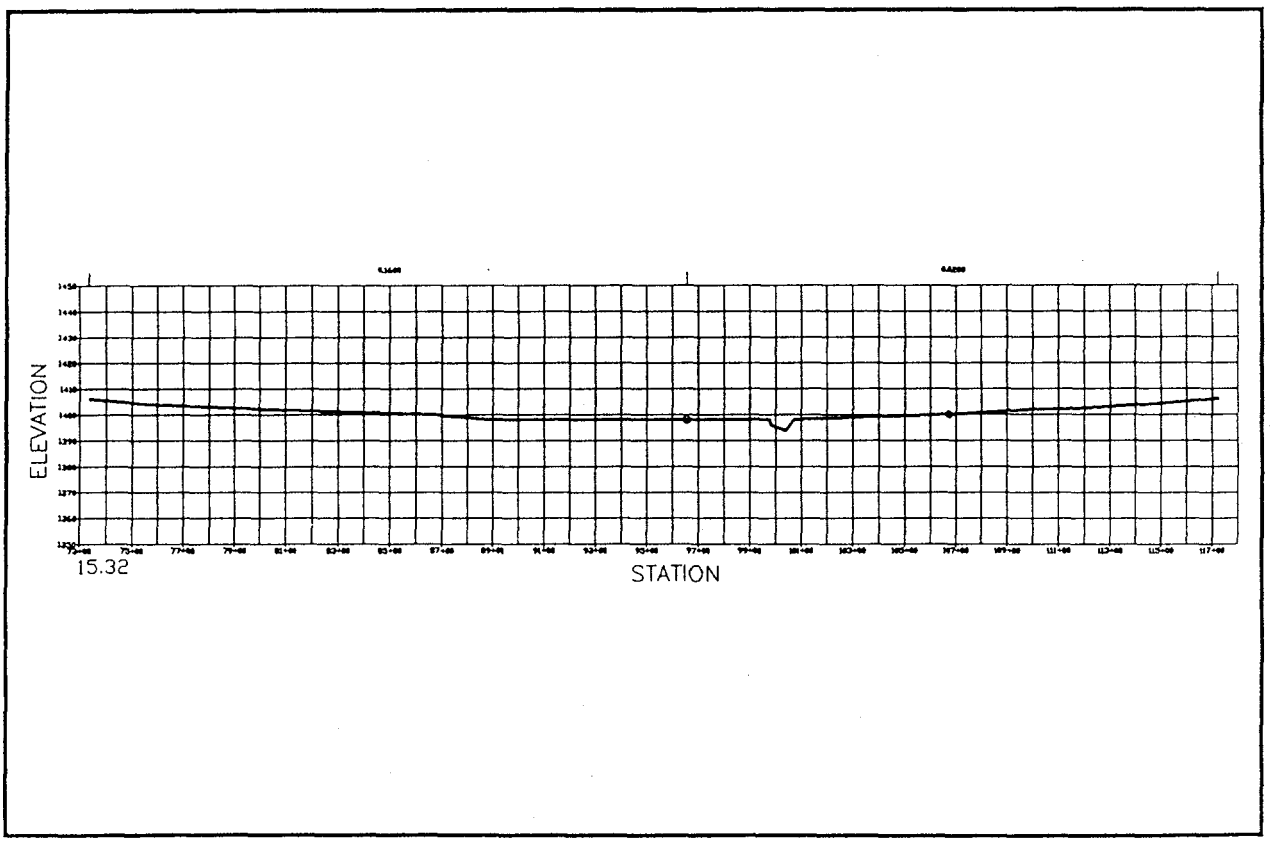

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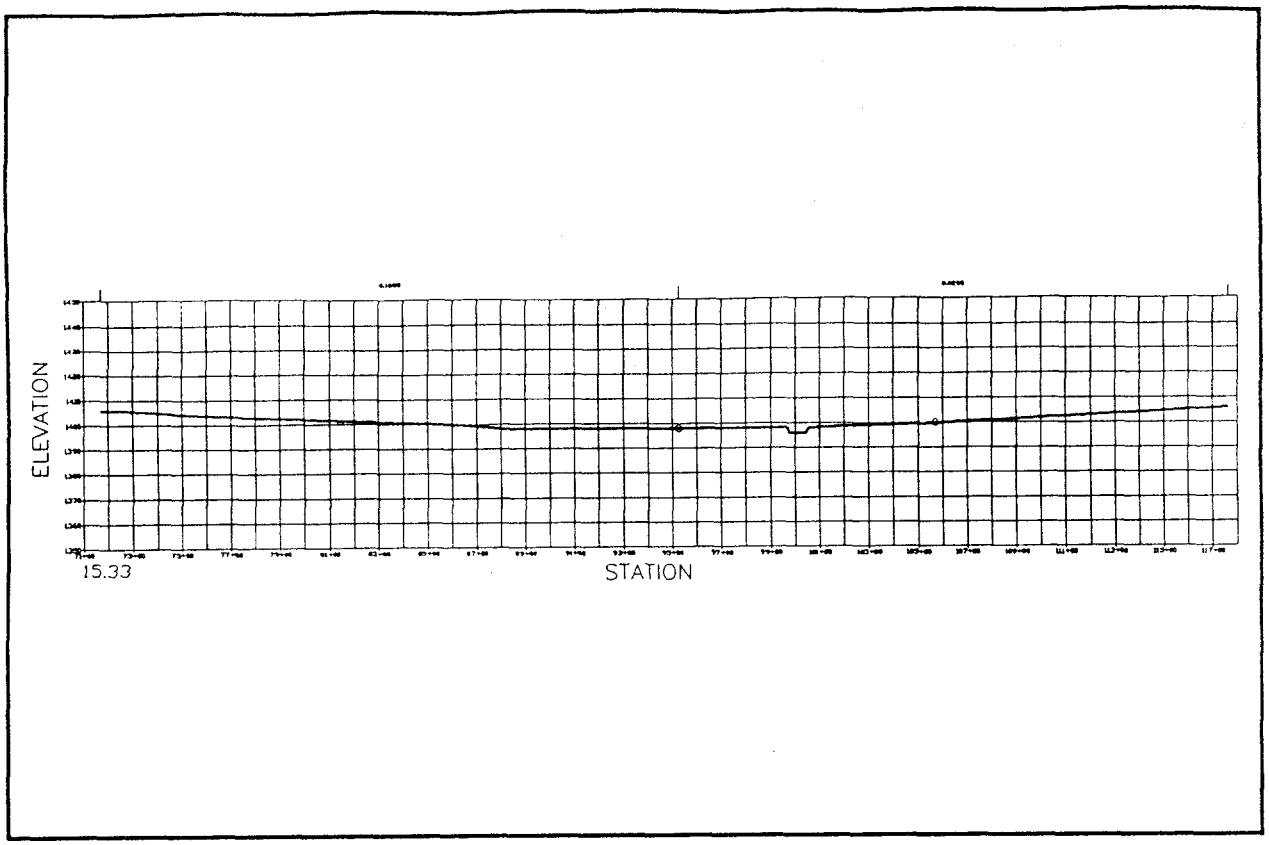

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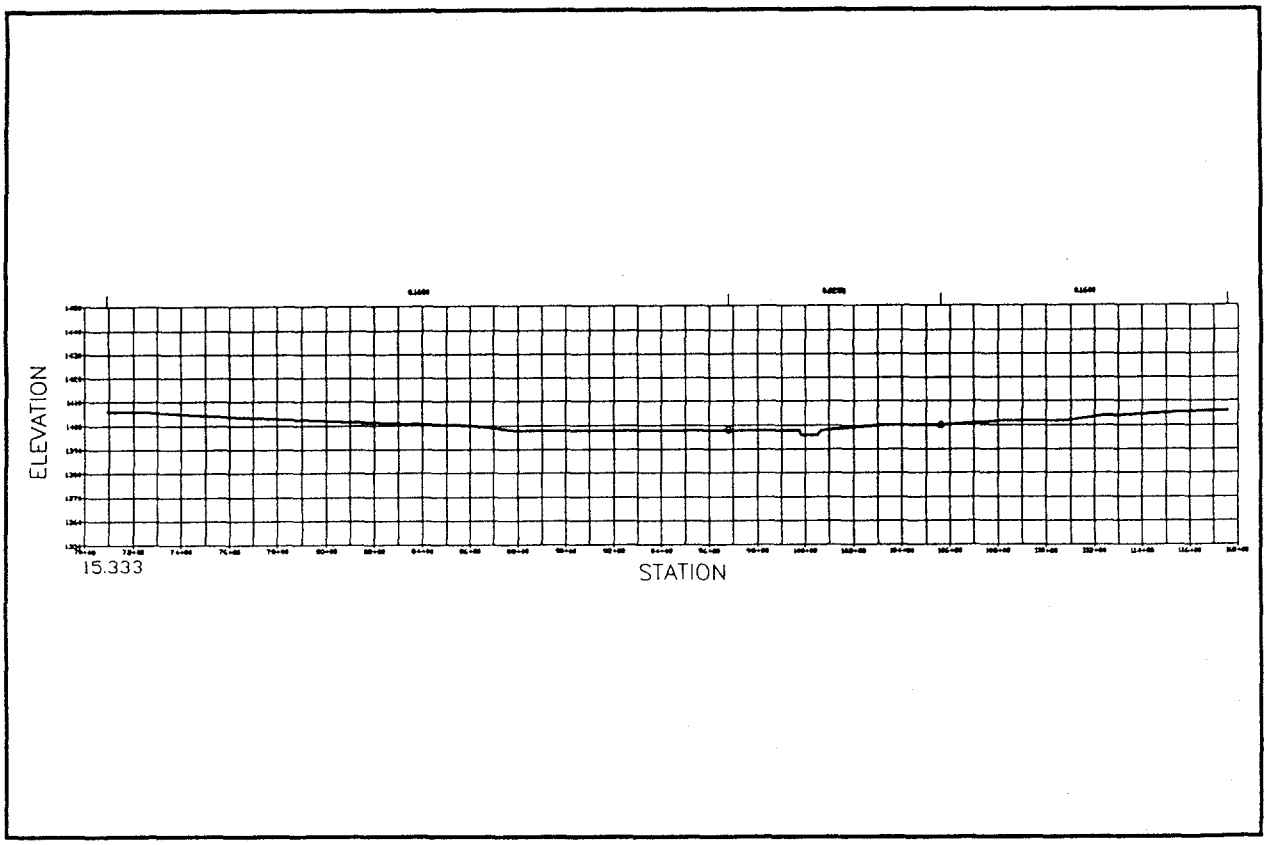

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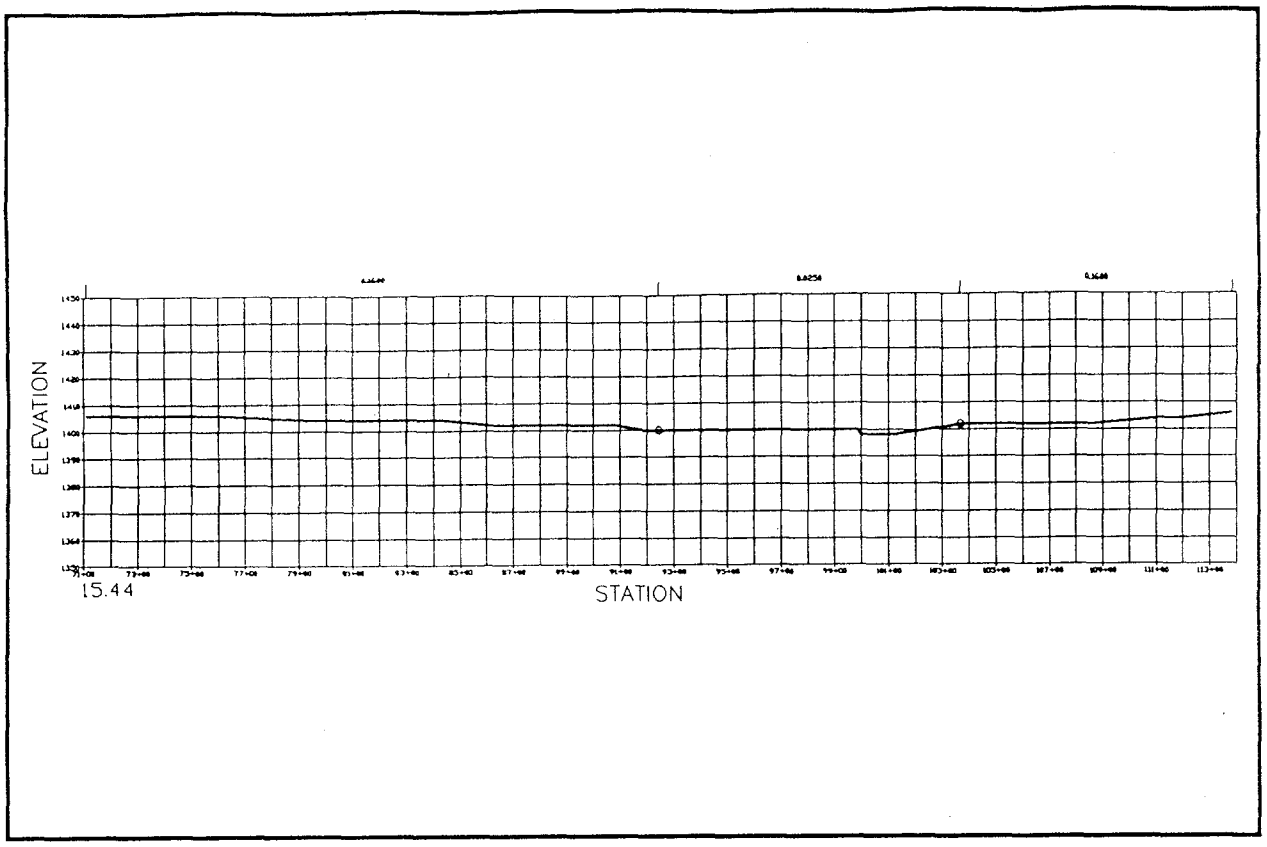

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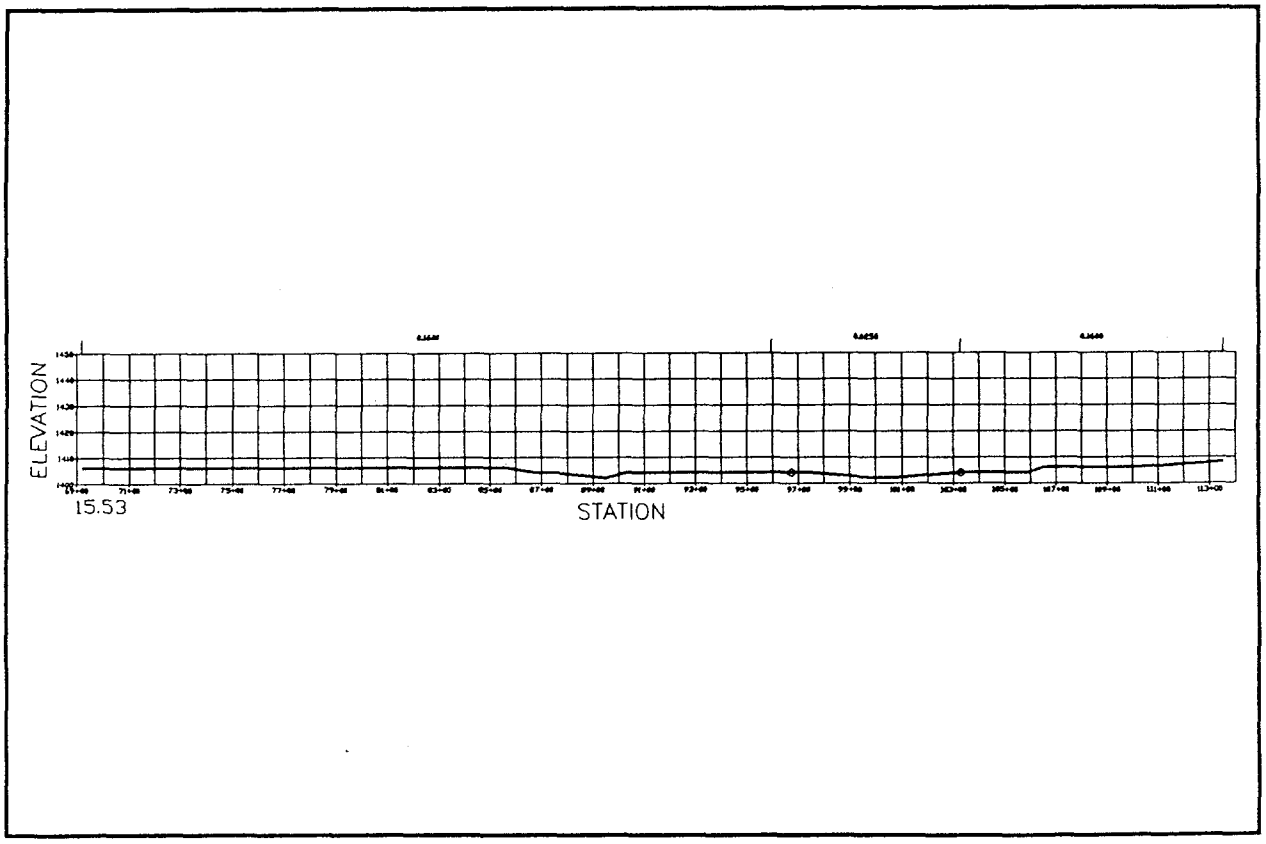

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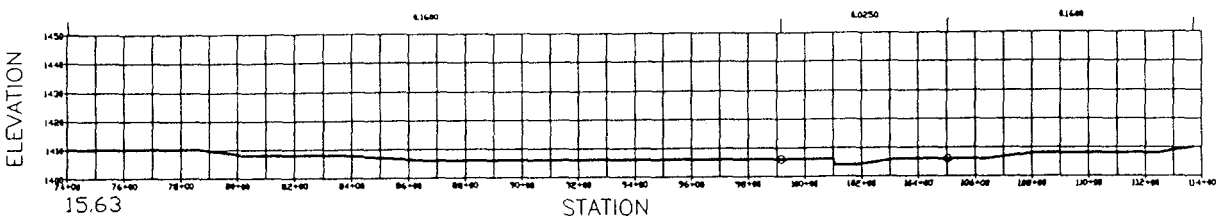

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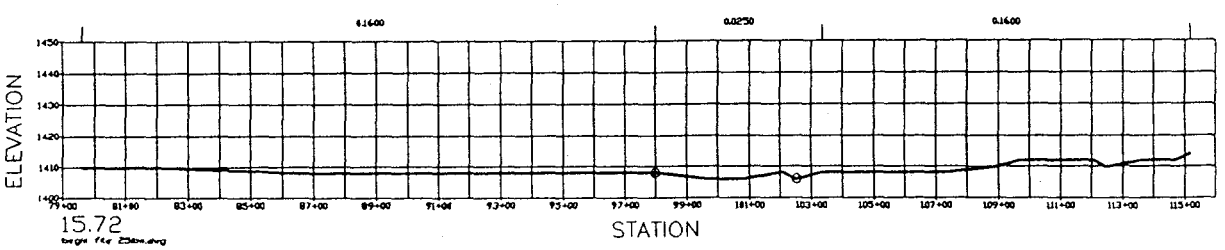

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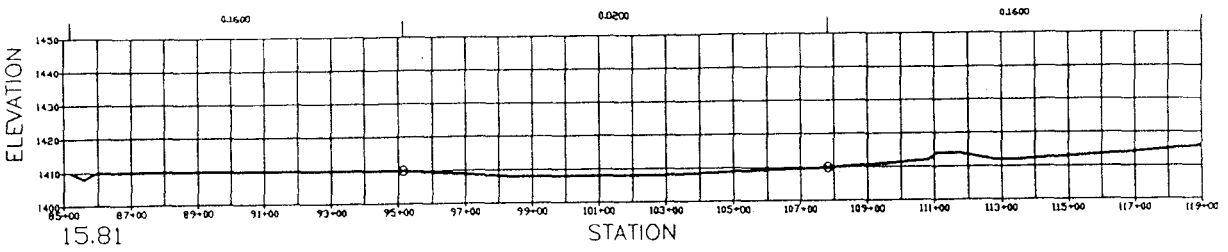

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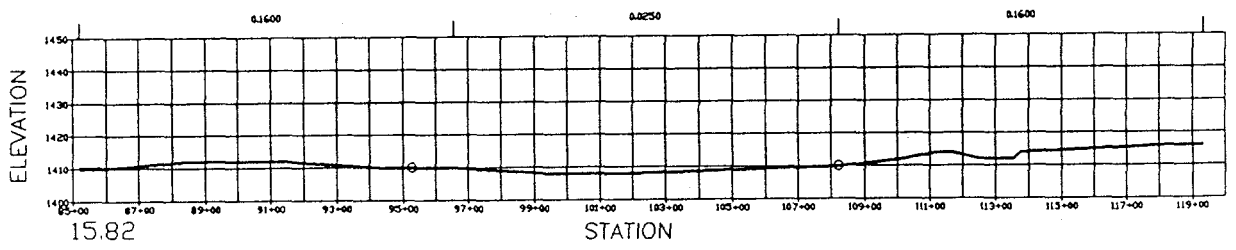

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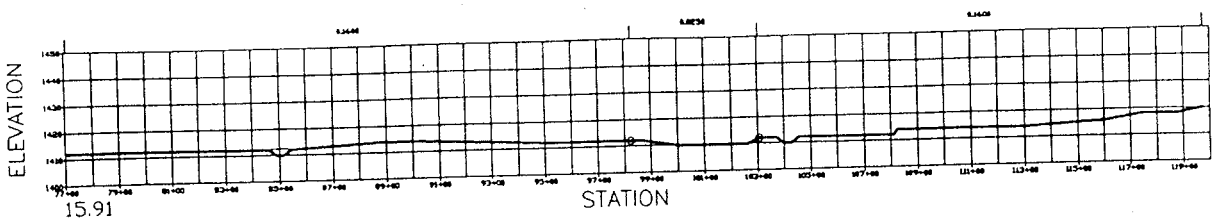

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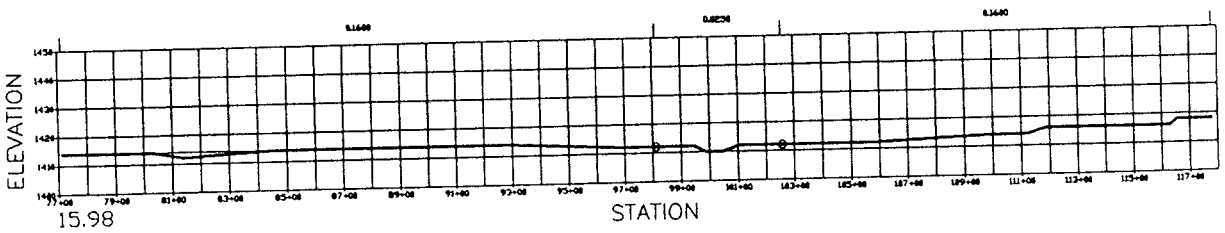

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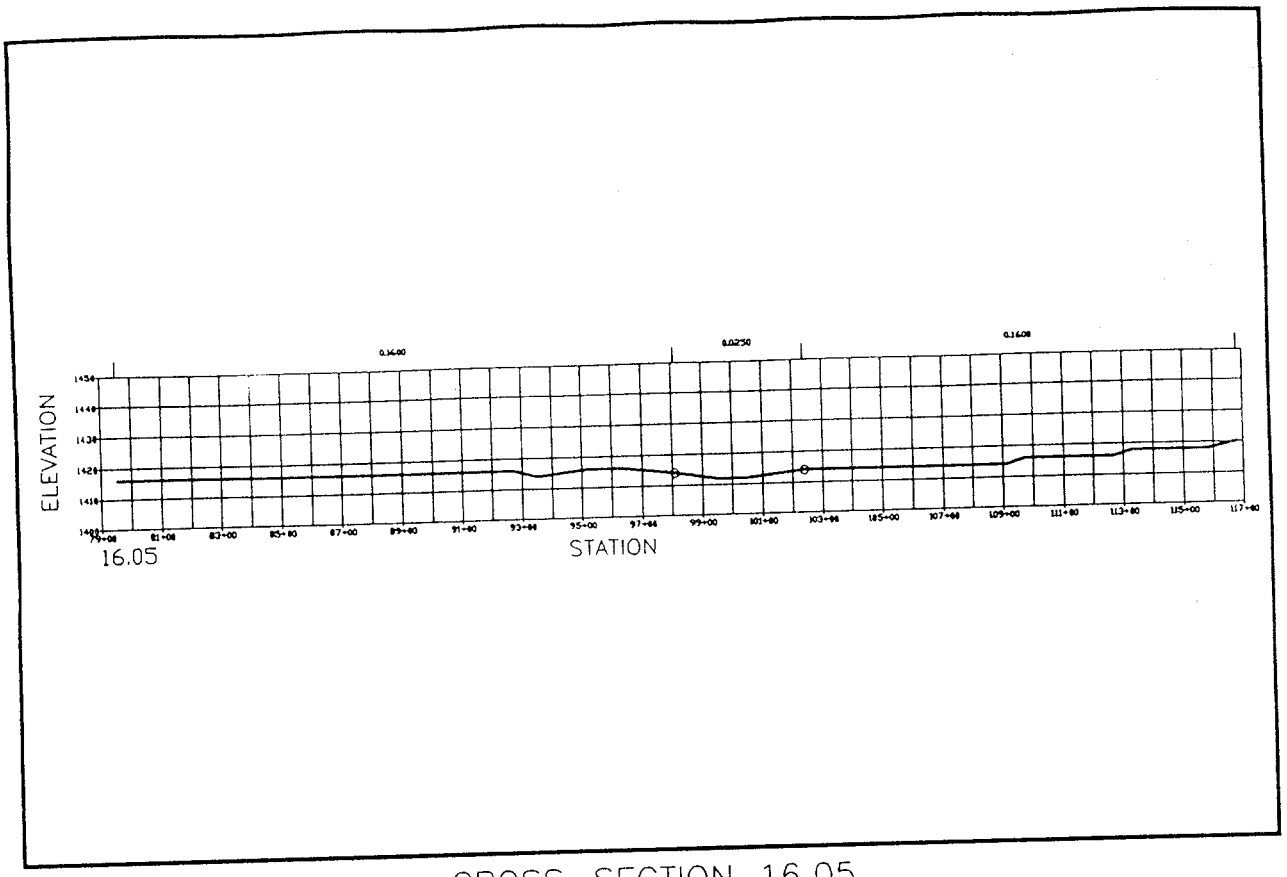

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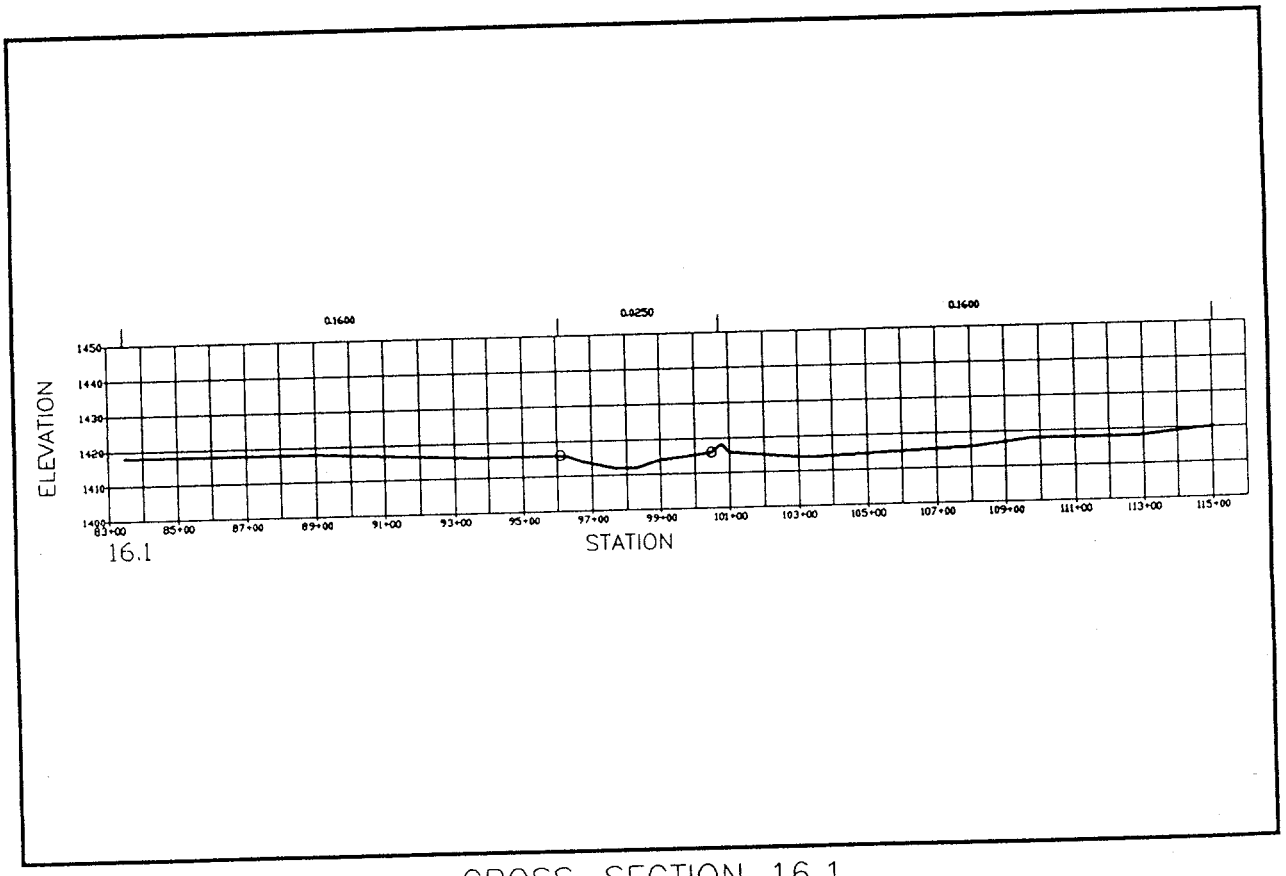

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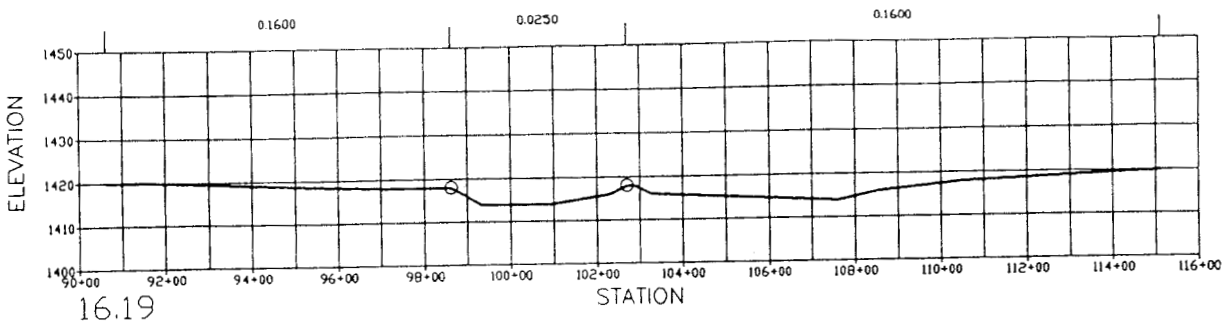

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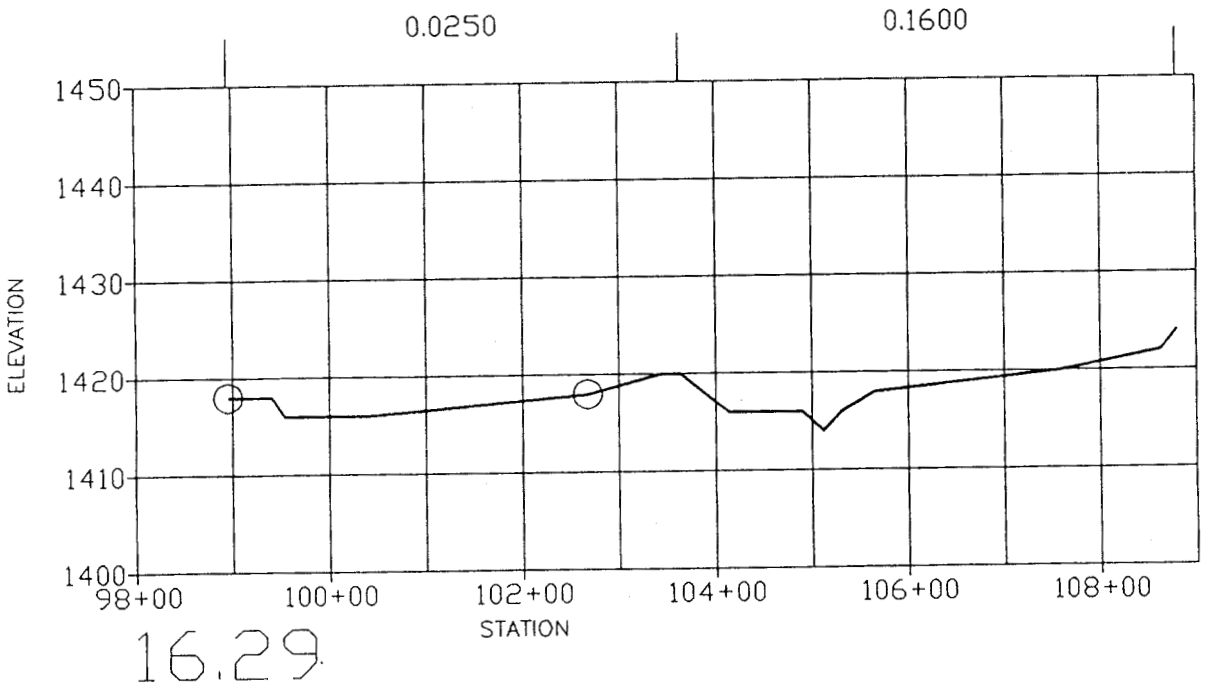
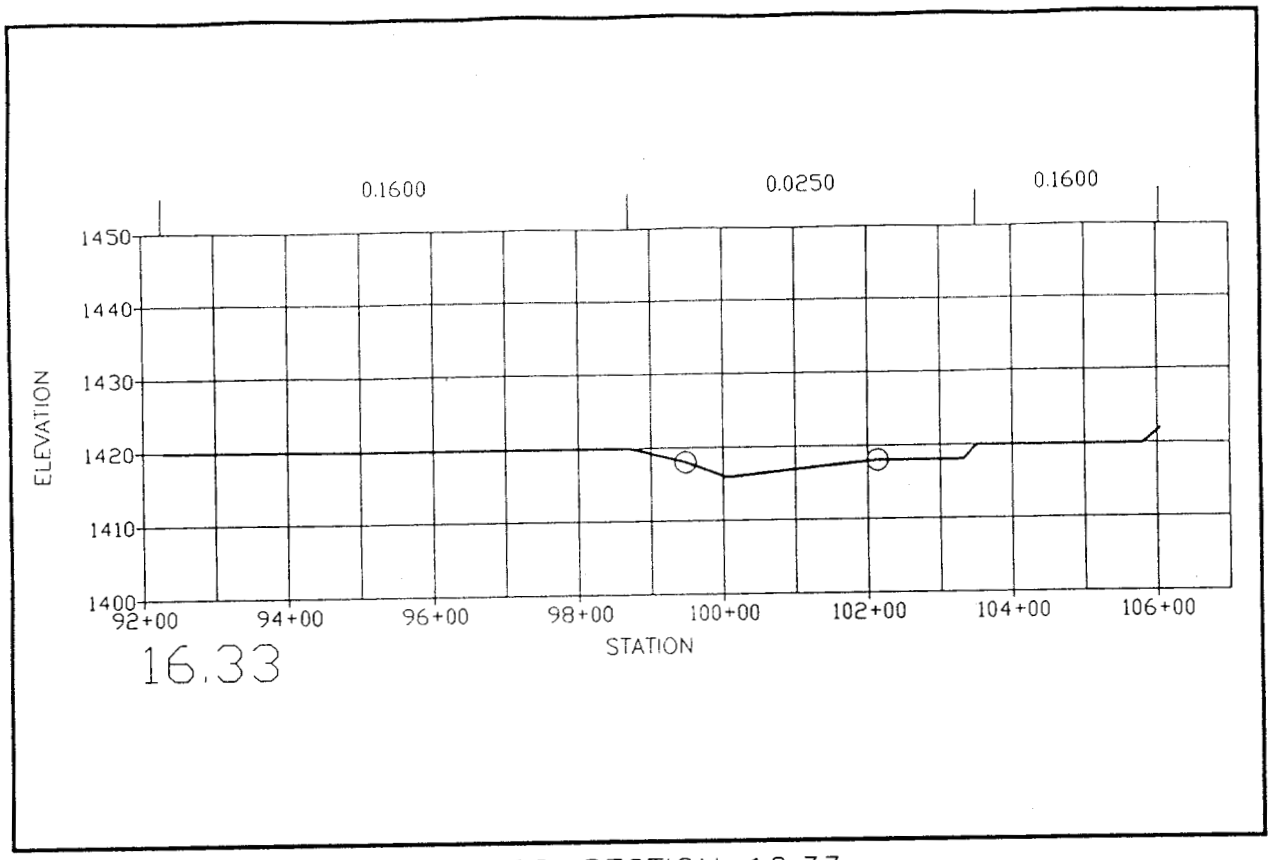


CROSS-SECTION 16.29



CROSS-SECTION 16.33

4.2.2 Expansion/Contraction Coefficients

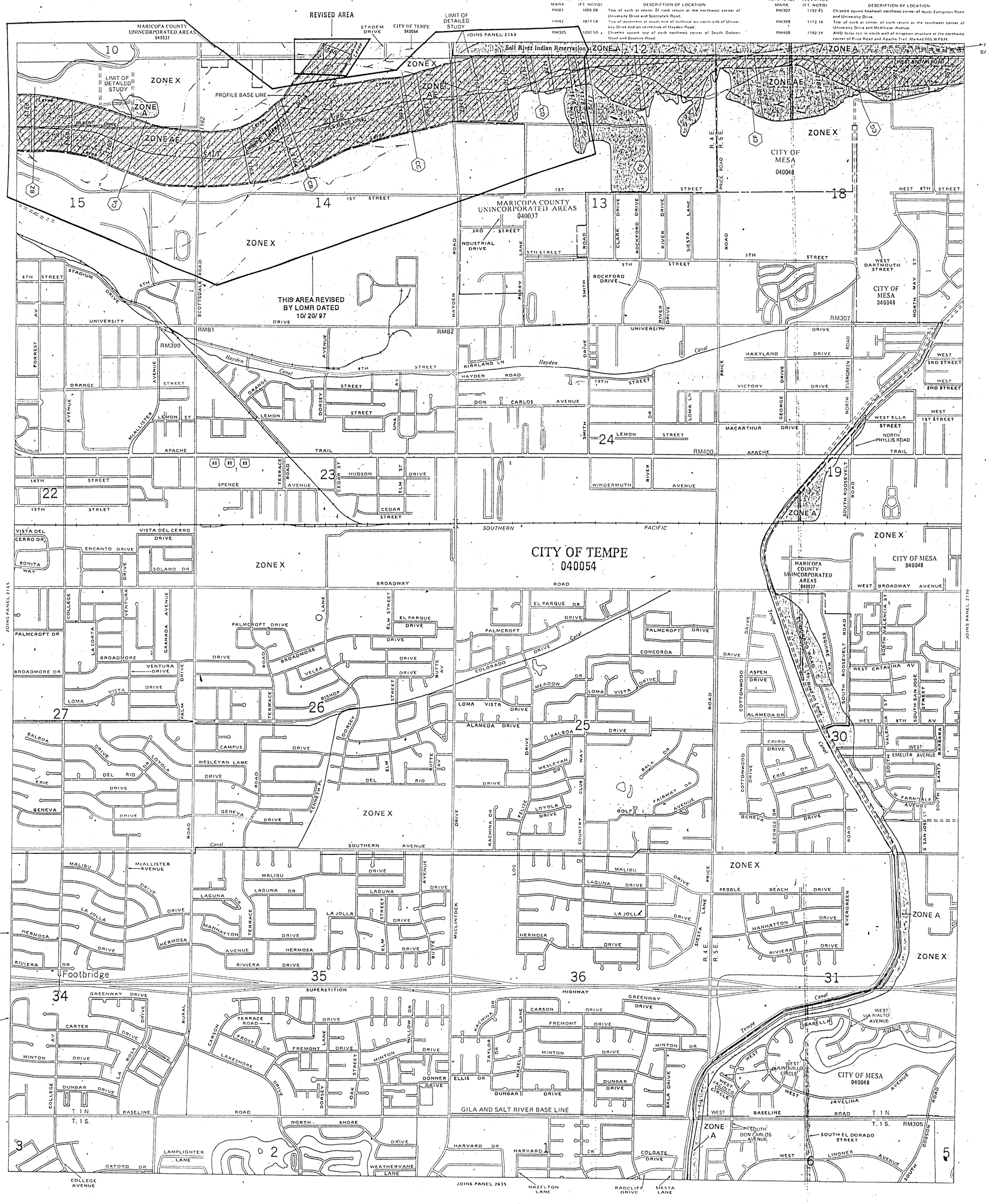
Due to the numerous man-made features, such as walkways, golf courses, and other recreational facilities within Indian Bend Wash, there are many abrupt horizontal and vertical changes in cross-section geometry. For this reason, the expansion and contraction coefficients were set at 0.4 and 0.2, which is slightly more conservative than normal. The expansion and contraction coefficients were modified to 0.5 and 0.3 through the various bridge crossings in the study reach. These values are consistent with the recommendations provided in the HEC-2 users manual.

SECTION 4: Hydraulic Analysis

4.2.3. Hydraulic Jump/Drop Analysis

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM81	1066.08	Top of curb at center of curb return at the northwest corner of University Drive and Scottsdale Road.
RM82	1074.58	Top of pavement at south end of bullnose on north side of University Drive and on centerline of Hayden Road.
RM305	1200.50	Chiseled square top of curb northeast corner of South Dobson Road and Baseline Road.
RM307	1192.45	Chiseled square headwall northeast corner of North Evergreen Road and University Drive.
RM399	1172.18	Top of curb at center of curb return at the southwest corner of University Drive and McAllister Avenue.
RM400	1192.14	AHD brass cap in north wall of irrigation structure at the northwest corner of Price Road and Apache Trail. Marked 665 N P&M.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

Identified 1983 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line, Elevation in Feet*

(D) — (D) Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM 7x — Elevation Reference Mark

•M1.5 — River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFEs, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1:20 inch.

Coastal base flood elevations apply only landward of 0.0 NGVD* and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see section 6.0 of the Flood Insurance Study Report.

For adjoining panels, see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

APRIL 15, 1988

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

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued letter of map revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2170 OF 4350

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	2170	F
MESA, CITY OF	040048	2170	F
TEMPE, CITY OF	040054	2170	F

REVISED TO REFLECT LOMR DATED MAY 15 1998

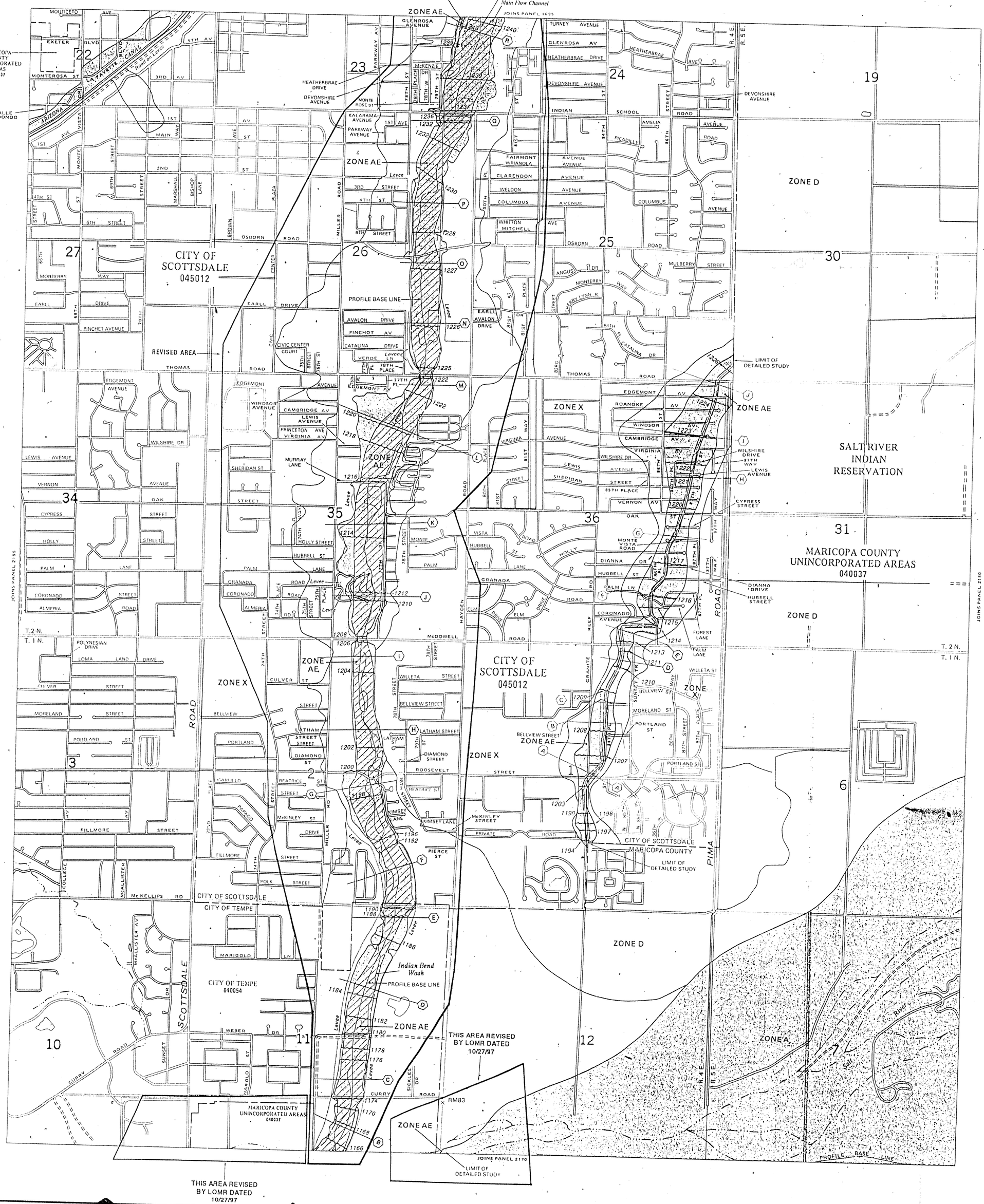
MAP NUMBER 04013C2170 F

MAP REVISED: SEPTEMBER 4, 1991

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
AM83	1174.96	Top of pavement at centerline intersection of Hayden Road and Princess Drive West.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year flood plain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

Identified 1983 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

(D) — (D) (EL 987) — Cross Section Line; Base Flood Elevation in Feet Where Uniform Within Zone*

RM 7x — Elevation Reference Mark

•M1.5 — River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on SFHAs, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE, and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1:20 inch.

Coastal flood elevations apply only landward of 0.0 (NGVD), and include the effects of wave action. These elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see section 8.0 of the Flood Insurance Study Report.

For adjoining panels, see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

APRIL 15, 1988

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

Map revised September 30, 1995 to updated corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE DATE shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2160 OF 4350

CONTAINS:

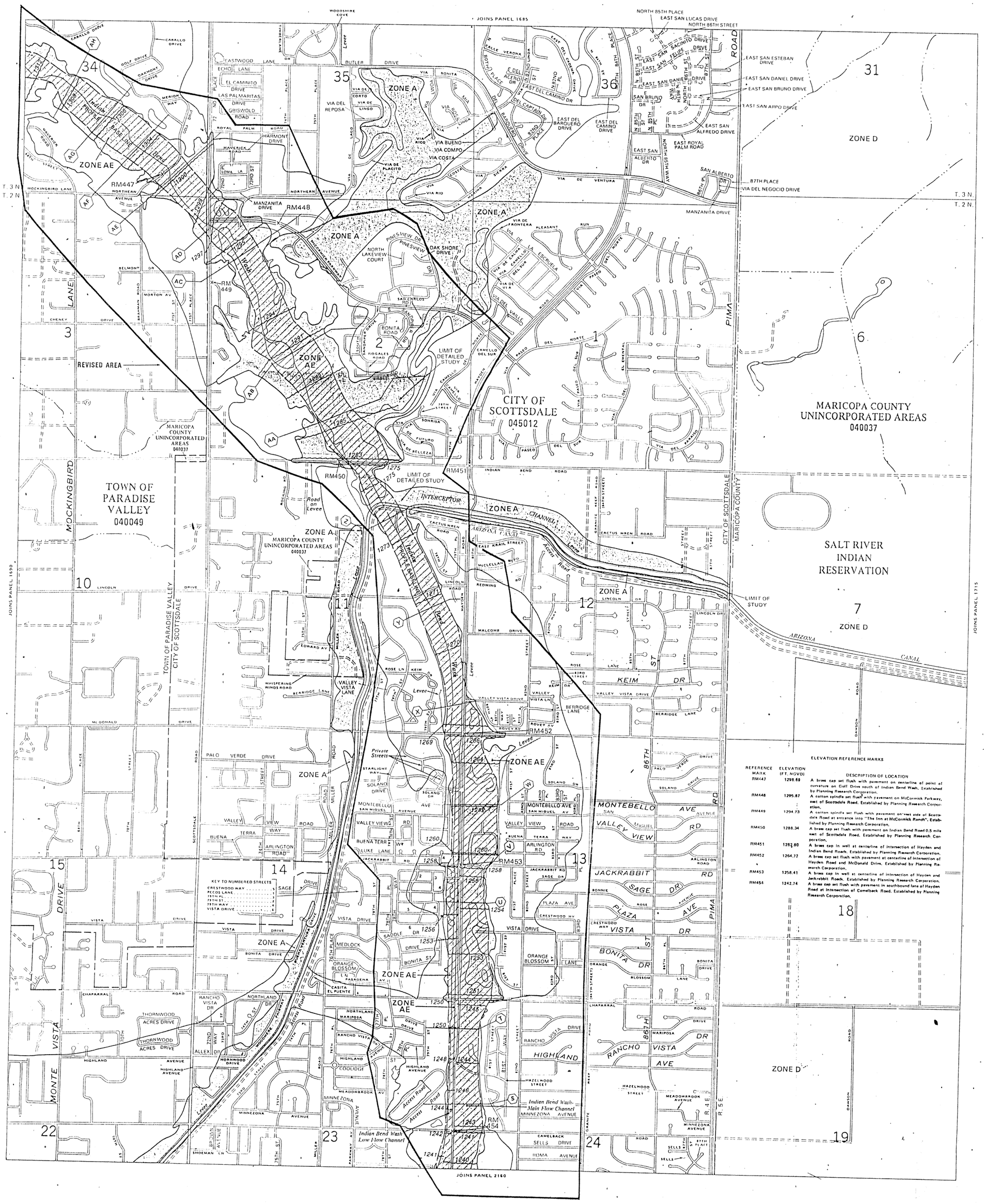
COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	2160	D
SCOTTSDALE, CITY OF	045012	2160	D
TEMPE, CITY OF	040054	2160	D

REVISED TO REFLECT LOMR DATED MAY 15 1998

MAP NUMBER 04013C2160 D

EFFECTIVE DATE: APRIL 15, 1988

Federal Emergency Management Agency



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

Identified 1983 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet*
- D — D Cross Section Line
- (EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*
- RM 7x Elevation Reference Mark
- •M1.5 River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFEs, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see section 6.0 of the Flood Insurance Study Report.

For adjoining panels, see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP

APRIL 15, 1988

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

DECEMBER 3, 1993

Map revised September 30, 1995 to updated corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET

1000 0 1000

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM447	1298.69	A brass cap set flush with pavement on centerline of point of curvature on Golf Drive south of Indian Bend Wash. Established by Planning Research Corporation.
RM448	1295.87	A cotton spindle set flush with pavement on McCormick Parkway, east of Scottsdale Road. Established by Planning Research Corporation.
RM449	1294.73	A cotton spindle set flush with pavement on east side of Scottsdale Road at entrance into "The Inn at McCormick Ranch". Established by Planning Research Corporation.
RM450	1288.34	A brass cap set flush with pavement on Indian Bend Road 0.5 mile east of Scottsdale Road. Established by Planning Research Corporation.
RM451	1283.80	A brass cap in well at centerline of intersection of Hayden and Indian Bend Roads. Established by Planning Research Corporation.
RM452	1264.77	A brass cap set flush with pavement at centerline of intersection of Hayden Road and McDonald Drive. Established by Planning Research Corporation.
RM453	1258.41	A brass cap in well at centerline of intersection of Hayden and Jackrabbit Roads. Established by Planning Research Corporation.
RM454	1242.74	A brass cap set flush with pavement in southbound lane of Hayden Road at intersection of Camelback Road. Established by Planning Research Corporation.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1695 OF 4350

CONTAINS:

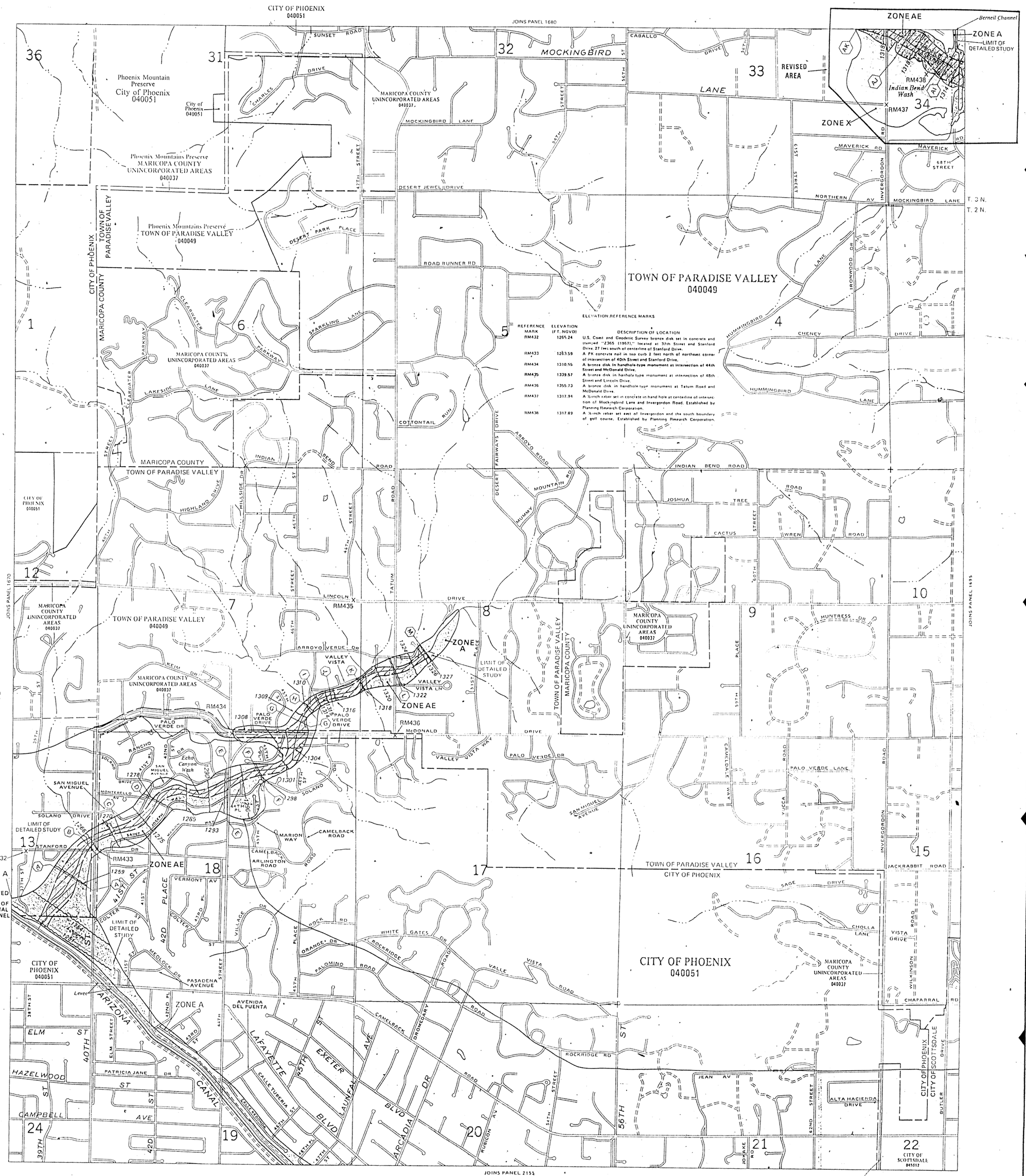
COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	1695	F
PARADISE VALLEY, TOWN OF	040049	1695	F
SCOTTSDALE, CITY OF	045012	1695	F

REVISED TO REFLECT LOMR DATED MAY 15 1996

MAP NUMBER
04013C1695 F

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM432	1265.24	U.S. Coast and Geodetic Survey bronze disk set in concrete and stamped "Z365 (1967)," located at 37th Street and Stanford Drive, 27 feet south of centerline of Stanford Drive.
RM433	1283.59	A PK concrete nail in top curb 2 feet north of northeast corner of intersection of 40th Street and Stanford Drive.
RM434	1310.55	A bronze disk in handhole-type monument at intersection of 44th Street and McDonald Drive.
RM435	1339.57	A bronze disk in handhole type monument at intersection of 48th Street and Lincoln Drive.
RM436	1355.73	A bronze disk in handhole-type monument at Tatum Road and McDonald Drive.
RM437	1317.94	A ½-inch rebar set in concrete in hand hole at centerline of intersection of Mockingbird Lane and Invergordon Road. Established by Planning Research Corporation.
RM438	1317.89	A ½-inch rebar set east of Invergordon and the south boundary of golf course. Established by Planning Research Corporation.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

Identified 1981 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet*
- (D)—(D) Cross Section Line
- (EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*
- RM 7x Elevation Reference Mark
- •M1.5 River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE, and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1:20 inch.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see section 6.0 of the Flood Insurance Study Report.

For adjoining panels, see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

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

Map revised September 30, 1995 to updated corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1690 OF 4350

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	1690	E
PARADISE VALLEY, TOWN OF	040049	1690	F
PHOENIX, CITY OF	040051	1690	E
SCOTTSDALE, CITY OF	045012	1690	E

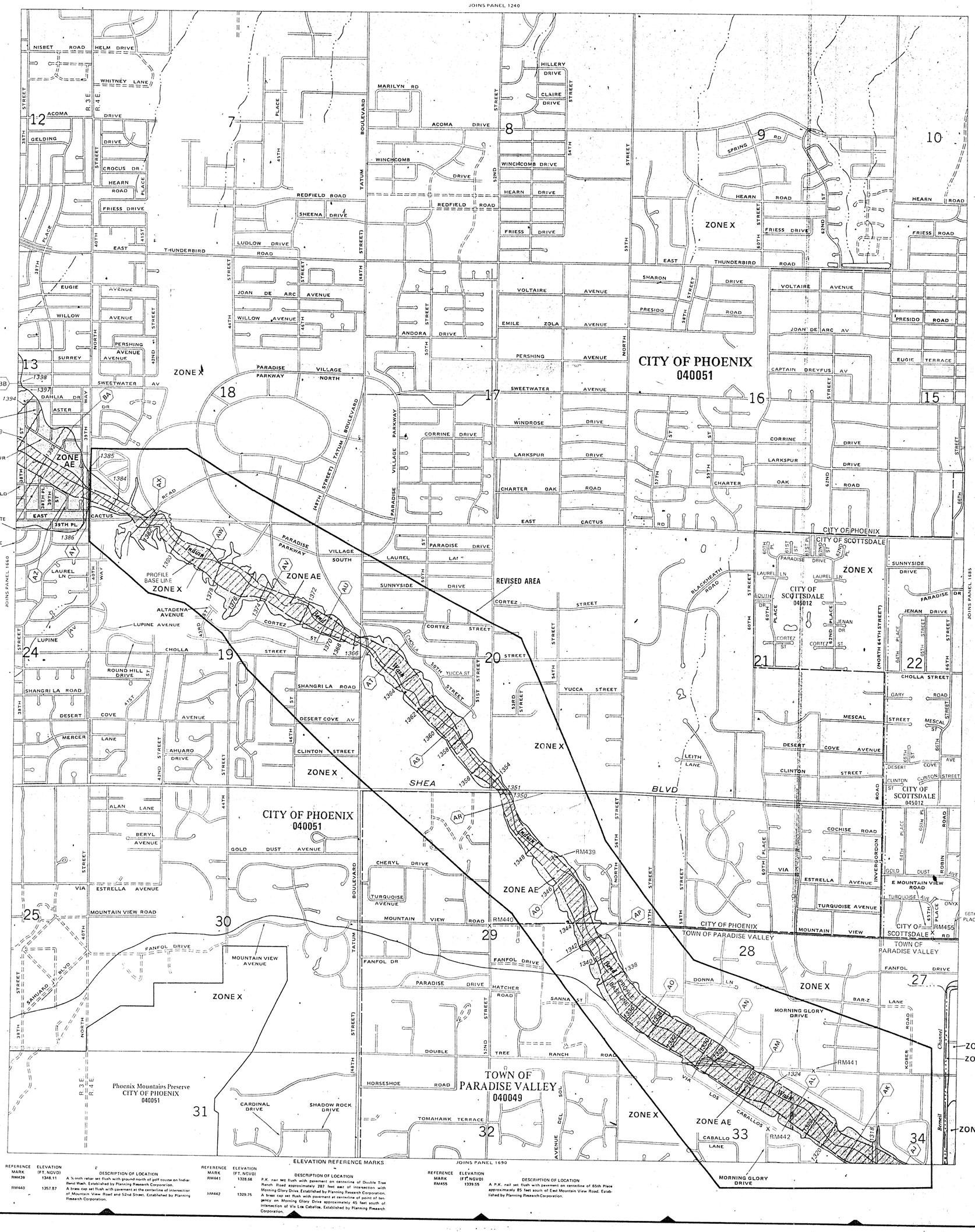
REVISED TO REFLECT LOMR DATED MAY 15 1998

MAP NUMBER
04013C1690 E

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 3 EAST AND TOWNSHIP 3 NORTH, RANGE 4 EAST



REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM439	1348.11	A ½-inch rebar set flush with ground north of golf course on Indian Bend Wash. Established by Planning Research Corporation.
RM440	1357.87	A brass cap set flush with pavement at the centerline of intersection of Mountain View Road and 52nd Street. Established by Planning Research Corporation.
RM441	1328.68	P.K. nail set flush with pavement on centerline of Double Tree Ranch Road approximately 287 feet east of intersection with Morning Glory Drive. Established by Planning Research Corporation.
RM442	1329.75	A brass cap set flush with pavement at centerline of point of tangency on Morning Glory Drive approximately 45 feet south of intersection of Via Los Caballos. Established by Planning Research Corporation.
RM455	1339.55	A P.K. nail set flush with pavement on centerline of 65th Place approximately 85 feet south of East Mountain View Road. Established by Planning Research Corporation.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding; velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

Identified 1983 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM 7x — Elevation Reference Mark

•M1.5 — River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL
SEPTEMBER 29, 1989

Map revised September 30, 1995 to updated corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

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APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1680 OF 4350

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
PARADISE VALLEY, TOWN OF	040049	1680	F
PHOENIX, CITY OF	040051	1680	F
SCOTTSDALE, CITY OF	045012	1680	F

REVISED TO REFLECT LOMR DATED MAY 1 5 1998

MAP NUMBER
04013C1680 F

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency