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REMARKS

HYDRAULIC INVESTIGATION

FOR WITTMANN WASH

WITTMANN, ARIZONA

Prepared for:

Flood Control District of Maricopa County
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MAP POCKET

Floodplain/Floodway Map.

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I. INTRODUCTION

A hydraulic investigation for a reach of Wittmann Wash, Wittmann, Arizona, has been conducted to address recent flooding problems in the area. The purpose of this study was to evaluate flood control alternatives and present a recommended alternative that would alleviate flooding problems identified in the project reach of Wittmann Wash. This report outlines the hydraulic investigation and flood control alternatives analyses.

1.1 Project Location and Description

Wittmann Wash is a braided, alluvial, desert wash with intermingling channels that flow through a wide, flat, floodplain. It is typical of washes found in alluvial areas of the desert southwest. At the present time the floodplain of Wittmann Wash is covered by sparse brush and shrubs with a few mesquite and palo verde trees adjacent to the main channel.

The community of Wittmann is shown on the Location Map provided as Figure 1. At Wittmann, the wash passes beneath the bridge for the Atchison-Topeka and Santa Fe Railroad, as well as the bridge for Grand Avenue (U.S. 60 and U.S. 89). Figure 2 provides a project vicinity map and identifies the reach of Wittmann Wash investigated in this study.

Stormwater runoff in Wittmann Wash flows through the study reach from north to south. The project area is relatively undeveloped with some scattered housing and strip commercial development along Grand Avenue.

1.2 Project Background

In 1986, floodplain and floodway delineations of desert washes and streams in the Wittmann area were conducted for the Flood Control District of Maricopa County (FCD). These delineations were conducted in conjunction with the Wittmann Area Drainage Master Study (ADMS). The purpose of the studies was to identify existing drainage problems and to plan for future development and stormwater management.

The efforts of the Wittmann ADMS established for the project reach the 100-year floodplain and floodway limits, including water surface elevations. The limits were determined using hydraulic modeling techniques similar to the approach used in this study. The results and information generated by the ADMS are useful to current and potential land owners, developers, as well as agencies with jurisdictional interests.

Concurrent with the Wittmann ADMS, a local land developer sought to establish a recreational vehicle (RV) - mobile home theme park within the floodplain and floodway of Wittmann Wash. The developer's efforts to establish the park included the retention of engineering services. The developer's engineer developed and provided plans that would channelize most of Wittmann Wash within the project reach. Grading and drainage plans were also provided to the County for review. Prior to approval or final review of the plans by the County, the developer proceeded to clear and grubb the proposed site. The County has since placed a stop work order on the RV development.

1.3 Objectives

The primary objective of this project was to develop a sound engineering solution that would return the wash to its "previous" conditions as mapped in the 1986 Flood Insurance Study. Specific elements of the project were as follows: (1) examine the existing and approved hydrologic and hydraulic analyses of Wittmann Wash; (2) develop a water surface profile model for current "post-flood" conditions of Wittmann Wash; (3) develop and evaluate flood control alternatives to restore the Wittmann Wash project area to pre-flood conditions as mapped in the existing (1986) Flood Insurance Study (FIS); and (4) recommend a flood control alternative that is economically justifiable and socially acceptable.

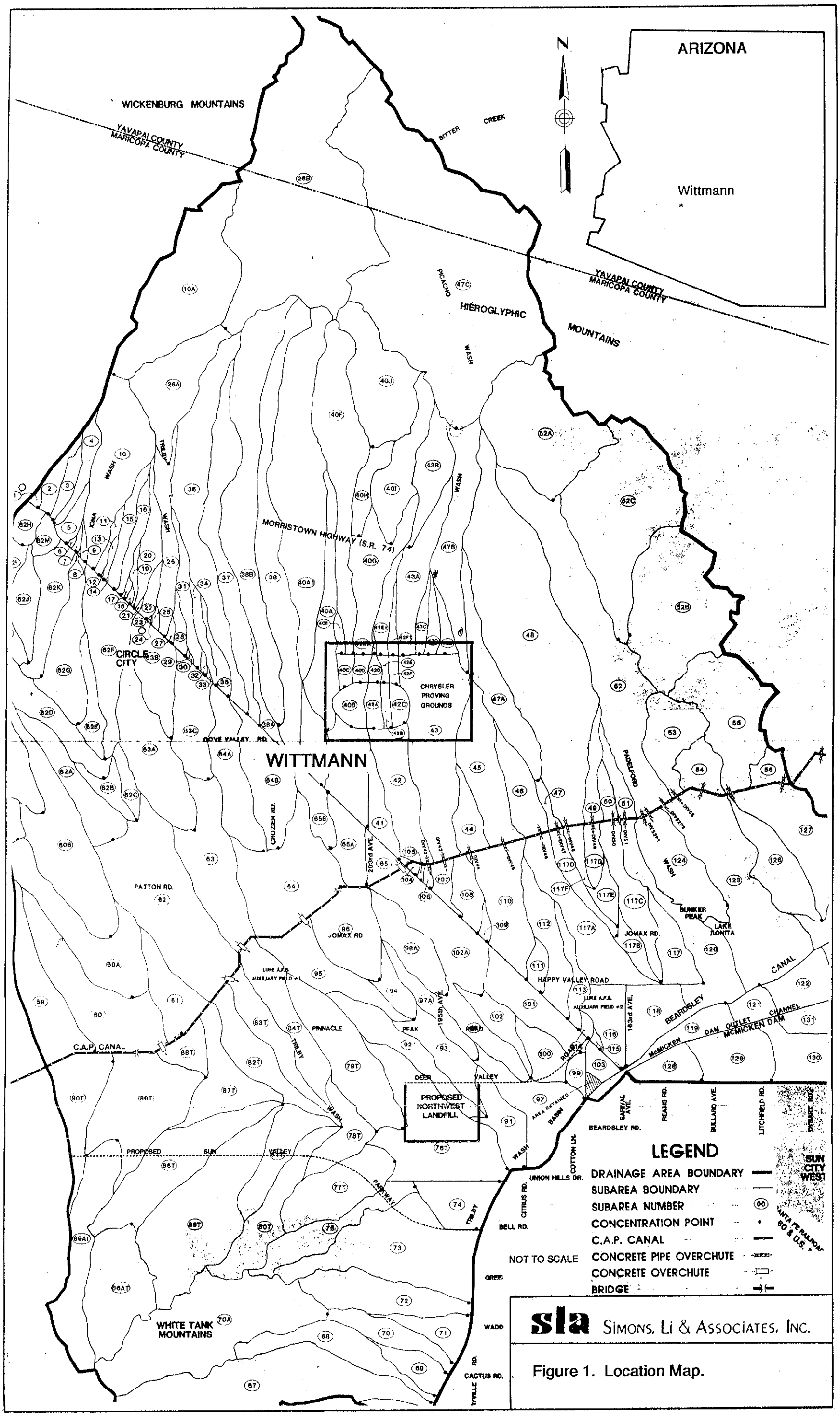

Figure 1. Location Map.

Reference 1.

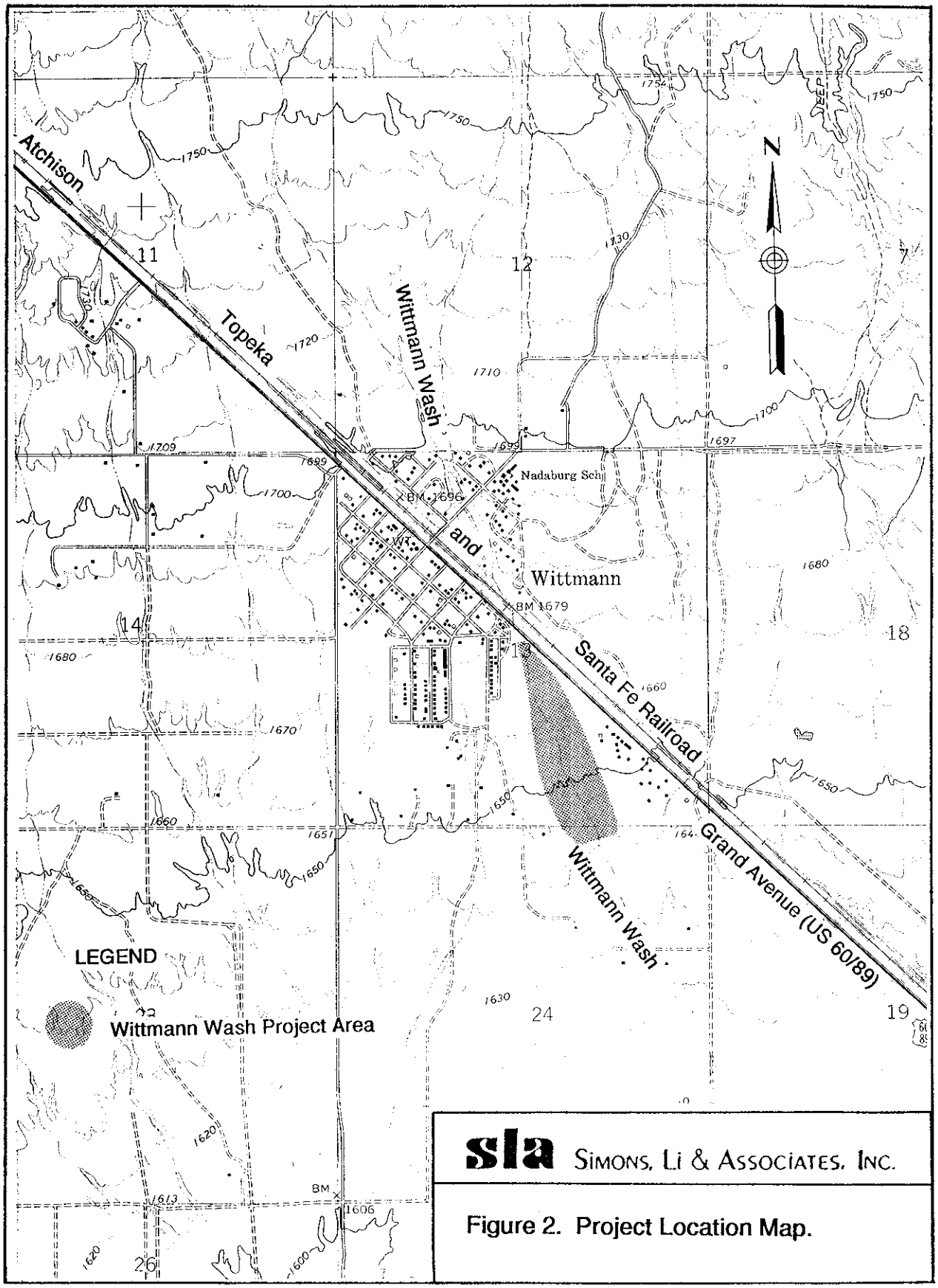

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Figure 2. Project Location Map.

Reference 3.

II. HYDRAULIC INVESTIGATION

The following section presents and discusses the hydraulic investigation and analyses for the pre-flood and post-flood conditions. Pre-flood conditions are defined as those hydraulic conditions and characteristics of Wittmann Wash identified in the Wittmann ADMS. Post-flood conditions are defined as those hydraulic conditions and characteristics of Wittmann Wash that existed after the flooding that occurred on or about Labor Day, 1990.

2.1 Pre-Flood Conditions and Results

The Wittmann ADMS and the existing HEC-2 model were examined to identify and define the "pre-flood" conditions of Wittmann Wash. Other available and pertinent information examined were:

- 1986 aerial photographs (Cooper Aerial)
- Flood Control District files
- Analysis reports prepared by developer's engineering consultant
- Wittmann Wash ADMS plan sheets W-2 and PC-2

From examination of the HEC-2 data file, WITWASH2.DAT, the ADMS assigned Manning's roughness coefficients ("n" values) of 0.06 to 0.07 for the left overbanks of cross sections 3.183 to 3.560. The assignment of these n values is due to the braided nature of the left overbank and to the significant amount of desert brush and trees. Roughness coefficients of 0.035 to 0.05 were assigned to the main channel of Wittmann Wash for the project reach.

Figure 3 provides a location map of HEC-2 cross sections used in the ADMS as well as the 100-year floodplain and floodway limits. The figure also shows the extent of vegetation adjacent to Wittmann Wash and the proposed location of the RV-mobile home park.

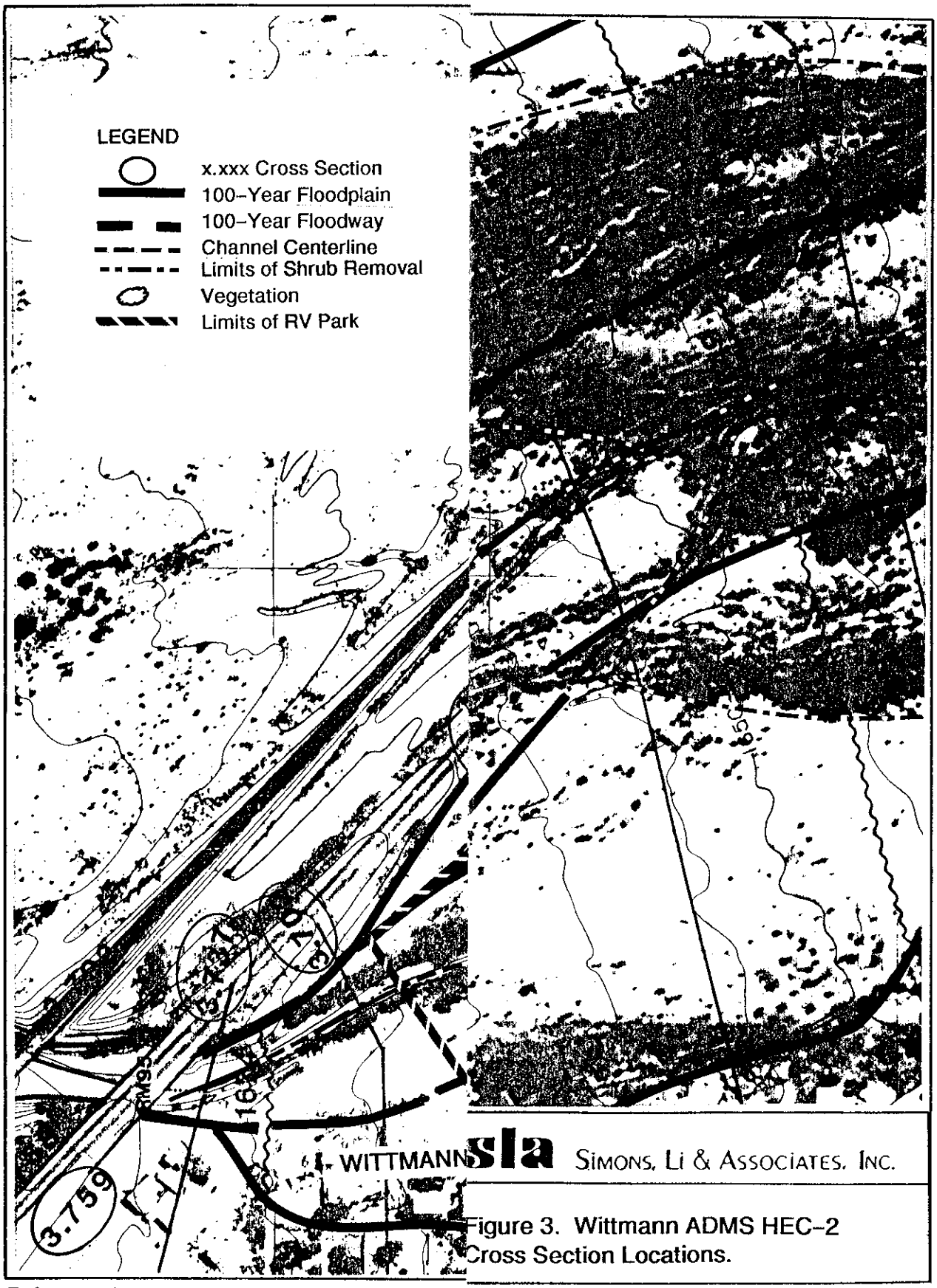

Figure 3. Wittmann ADMS HEC-2 Cross Section Locations.

Reference 1.

TABLE 1. SUMMARY OF HYDRAULIC PARAMETERS FOR PRE-FLOOD CONDITIONS.

CROSS SECTION	MANNING'S ROUGHNESS COEFFICIENTS			100-YEAR FLOWRATE	CHANNEL AND OVERBANK LENGTHS			EXPANSION AND CONTRACTION COEFFICIENTS	
	LEFT XNL	RIGHT XNR	CHANNEL XCH	Q (cfs)	XLCH	XLOBL	XLOBR	CCHV	CEHV
2.942	0.050	0.050	0.050	2,275.0	0.0	0.0	0.0	0.1	0.3
3.056	0.050	0.050	0.050	2,202.0	600.0	500.0	650.0	0.1	0.3
3.183	0.070	0.060	0.050	2,202.0	670.0	600.0	600.0	0.1	0.3
3.268	0.070	0.060	0.050	2,202.0	450.0	495.0	415.0	0.1	0.3
3.355	0.070	0.060	0.050	2,202.0	460.0	460.0	380.0	0.1	0.3
3.443	0.070	0.070	0.050	2,202.0	465.0	330.0	470.0	0.1	0.3
3.500	0.070	0.070	0.050	2,202.0	305.0	345.0	305.0	0.1	0.3
3.581	0.060	0.060	0.040	2,202.0	420.0	420.0	385.0	0.1	0.3
3.650	0.060	0.060	0.040	2,202.0	365.0	335.0	365.0	0.1	0.3
3.702	0.050	0.050	0.035	2,202.0	275.0	295.0	265.0	0.1	0.3
3.737	0.050	0.050	0.035	2,202.0	185.0	180.0	190.0	0.3	0.5
3.759	0.015	0.015	0.015	2,202.0	115.0	90.0	150.0	0.3	0.5

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TABLE 2. SUMMARY OF RESULTS FOR ADMS FLOODPLAIN CONDITIONS.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.51	2,275.0	2.51	727.76	689.90	2.90
3.06	1641.30	2,202.0	2.30	1,010.40	914.06	2.57
3.18	1647.36	2,202.0	2.86	1,241.46	853.42	3.90
3.27	1652.22	2,202.0	2.72	1,053.21	867.50	4.20
3.36	1656.97	2,202.0	1.97	1,314.22	926.35	3.88
3.44	1660.65	2,202.0	1.65	1,415.41	1199.55	2.34
3.50	1664.01	2,202.0	2.31	860.94	706.53	0.99
3.58	1668.39	2,202.0	2.39	970.97	968.85	2.31
3.65	1670.78	2,202.0	3.28	677.55	789.38	5.25
3.70	1672.94	2,202.0	4.44	366.49	505.97	9.49
3.74	1674.30	2,202.0	4.50	98.55	259.13	8.85
3.76	1674.94	2,202.0	4.44	96.49	276.91	7.95

TABLE 3. SUMMARY OF RESULTS FOR ADMS FLOODWAY CONDITIONS.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.93	2,275.0	2.93	527.03	656.38	3.12
3.06	1641.49	2,202.0	2.49	500.00	666.35	3.30
3.18	1647.96	2,202.0	3.46	400.00	587.16	4.86
3.27	1652.69	2,202.0	3.19	400.00	575.88	5.14
3.36	1657.49	2,202.0	2.49	450.00	624.83	4.66
3.44	1661.48	2,202.0	2.48	550.00	809.13	3.73
3.50	1664.85	2,202.0	3.15	513.81	616.67	3.14
3.58	1669.10	2,202.0	3.10	400.00	665.56	3.78
3.65	1671.72	2,202.0	4.22	300.00	489.13	7.79
3.70	1673.68	2,202.0	5.18	240.00	535.23	7.76
3.74	1674.45	2,202.0	4.65	102.94	273.64	8.43
3.76	1674.89	2,202.0	4.39	95.56	271.80	8.10

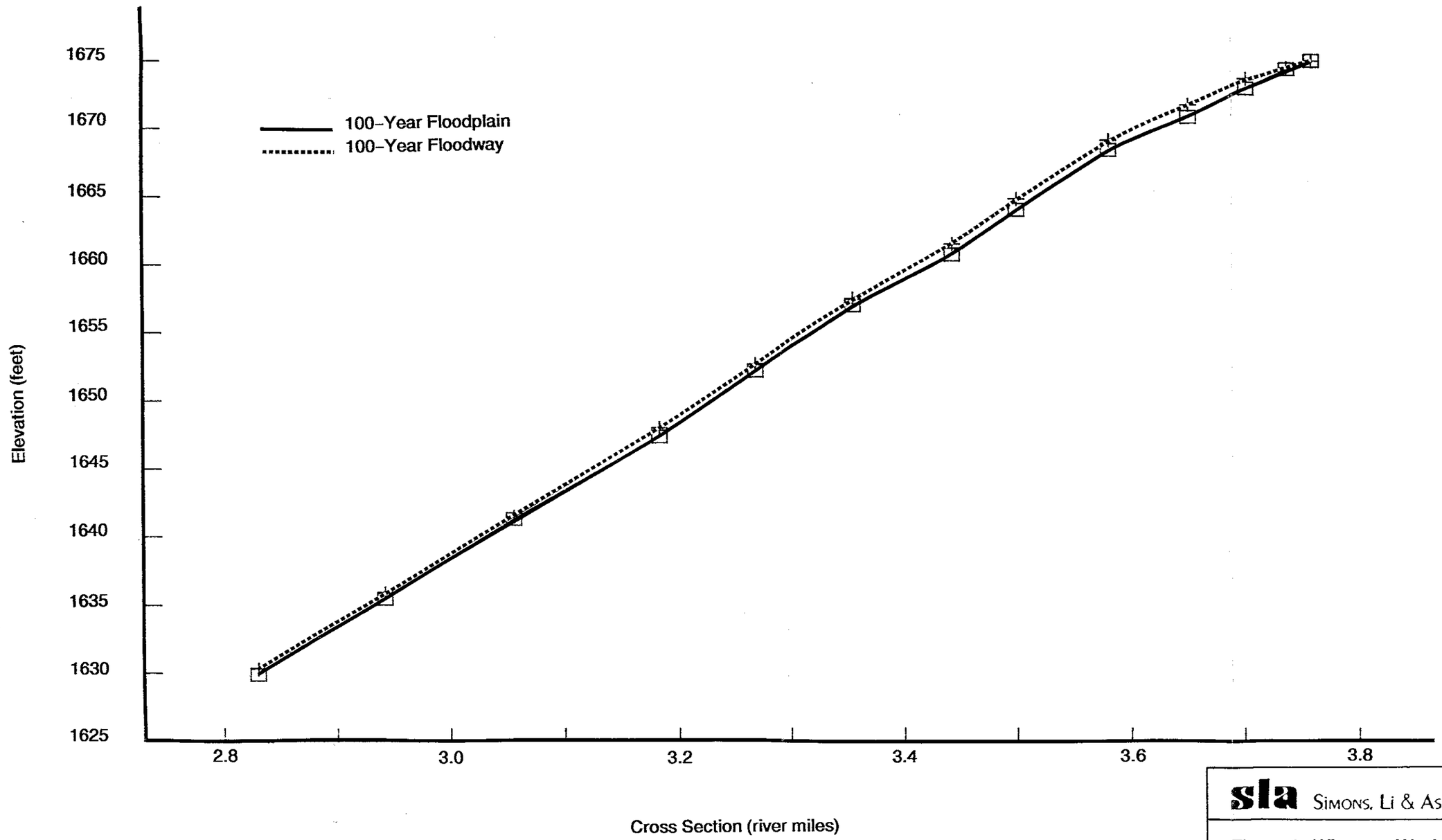

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Figure 4. Wittmann Wash Water Surface Profiles.

(Reference 1.)

Table 1 provides a summary of the hydraulic parameters assigned to each cross section of the project reach. The table includes contraction and expansion coefficients, distances between cross sections, and Manning's roughness coefficients. Table 2 provides a summary of results for the 1986 ADMS floodplain profile, and Table 3 provides the results for the floodway profile. Figure 3 delineates the limits of the 100-year floodplain and resulting floodway as defined in Table 2. Figure 4 provides a plot of the floodplain and floodway water surface profiles for the pre-flood (1986) conditions.

The results of the ADMS modelling study show a 100-year floodplain width for the project reach to range from 300 feet just downstream of the Grand Avenue bridge (cross section 3.702) to 1400 feet at the widest part of the floodplain (cross section 3.443). The floodplain corresponds to the 100-year discharge of 2,202 cubic feet per second (cfs). The width of the floodway ranges from 96 feet at the Grand Avenue bridge to 530 feet at cross section 2.942. Between cross sections 3.650 and 2.942 the floodway remains fairly consistent between 300 feet to 530 feet.

Mean channel velocities, flow depths, and flow areas are given in Table 2 and 3. The flow depths are greatest just downstream of the Grand Avenue bridge and gradually decrease downstream as the floodplain widens and more flow area is made available. The shallowest depth and widest part of the floodplain occurs at cross section 3.443.

2.2 Post-Flood Conditions and Results

Two HEC-2 computer models were used to simulate post-flood conditions. The development of two post-flood hydraulic models allowed comparison and evaluation of pre-flood conditions with post-flood conditions, both with and without the approved 100-year floodway. The first model, SLAFWY1.DAT, simulated the hydraulic conditions of the Wittmann Wash 100-year floodplain and floodway using the 1990 aerial topography and digitized cross sections. The model was constructed to aid in the delineation of the post-flood condition 100-year floodplain and floodway.

The second post-flood model, WLBFWY1.DAT, was developed using the post-flood floodplain and the pre-flood floodway encroachments. Pre-flood encroachments were used since the ADMS floodway is the approved 100-year floodway delineation. This approach allowed an evaluation of changes between the results of model WLBFWY1.DAT and the resulting water-surface profile of the ADMS study.

Data from field investigations and 1990 mapping and cross sections were used to determine the hydraulic conditions and the probable extent of flooding. Post-flood (1990) aerial topographic mapping and digitized cross sections were furnished by the Flood Control District. The cross sections provided were at the same locations as the ADMS cross sections. This allowed direct comparison of the two investigations for changes in cross section configuration (See Appendix A).

The digitized cross-sections were modified to reduce the number of GR data points (more than 100 points were provided for each cross section). The HEC-2 computer program accepts a maximum of 100 points per cross section. The digitized sections were also modified to smooth out and remove ineffective flow areas from the cross sections.

Manning's roughness coefficients were assigned at each cross section for the left and right overbanks, as well as the main channel. The assignment of roughness coefficients was based on field observations and from examination of post-flood aerial photographs. The NH record was used at several cross sections to adequately describe the lateral roughness in the section. The changes in cross section lateral coefficients reflect observations of field conditions (removal of vegetation and deposition of sediment on floodplain).

Cross sections 3.737 and 3.759 were adjusted by use of the variable PXSECR (X1 record, field 8) to define the cross sections to be perpendicular to the anticipated flow path. The two cross sections, as shown on ADMS plan sheet W-2 and the 1990 aerial topography, are not oriented in such a manner as to have the cross sections perpendicular to the flow line. The distances between adjacent GR stations are multiplied by the PXSECR factor to narrow the cross section (Reference 6).

Summaries of the hydraulic input parameters and results are presented in several tables and figures. The tables and figures provided are as follows:

- Table 4. Summary of Hydraulic Parameters for Post-Flood Model SLAFWY1.DAT
- Table 5. Floodplain Results for Post-Flood Model SLAFWY1.DAT
- Table 6. Floodway Results for Post-Flood Model SLAFWY1.DAT
- Table 7. Floodplain Results for Post-Flood Model WLBFWY1.DAT
- Table 8. Floodway Results for Post-Flood Model WLBFWY1.DAT
- Figure 5. Post-Flood Water Surface Profiles

2.3. Analyses of Results

This section compares and analyzes the post-flood model results with the ADMS results for the project reach. The primary aim of the discussion is to provide explanations and possible reasons for changes and differences between the two hydraulic investigations. Due to differences in modeling techniques between the two studies and to the changes in the physical characteristics of Wittmann Wash, between 1986 and 1990, some explanations offered will be subjective and speculative in nature.

2.3.1. Topographic and Cross-Section Comparison

As discussed previously, the 1990 digitized cross sections were provided by the Flood Control District at the same locations as in the ADMS. Cross section plots are provided in Appendix A (separate cover) to illustrate each cross section under 1990 configurations and under 1986 ADMS configurations. The plots show for each cross section where differences occur as well as shifts in the main channel and channel thalweg.

The 1990 cross sections 3.500, 3.581, and 3.650 show a drop in channel invert ranging from 1 to 4 feet. Cross section 3.650 shows a channel widening occurring as well as a drop. These three cross sections span the proposed mobile home park. From discussions with Flood Control District personnel, the mobile home park developer may have contributed to the lowering or channelization of the wash due to the clearing and grubbing operations. To what extent the developer altered the channel in this sub-reach cannot be positively ascertained.

TABLE 4. SUMMARY OF HYDRAULIC PARAMETERS FOR POST-FLOOD MODEL SLAFWY1.DAT.

CROSS SECTION	MANNING'S ROUGHNESS COEFFICIENTS			100-YEAR FLOWRATE (CFS) Q	CHANNEL AND OVERBANK LENGTHS			EXPANSION AND CONTRACTION COEFFICIENTS	
	LEFT XNL	RIGHT XNR	CHANNEL XCH		XLCH	XLOBL	XLOBR	CCHV	CEHV
2.942	0.050	0.050	0.050	2,275.0	0.0	0.0	0.0	0.1	0.3
3.056	0.060	0.060	0.060	2,202.0	600.0	510.0	650.0	0.1	0.3
3.183	0.060	0.060	0.050	2,202.0	640.0	640.0	640.0	0.1	0.3
3.268	0.060	0.055	0.040	2,202.0	450.0	480.0	410.0	0.1	0.3
3.355	0.060	0.046	0.035	2,202.0	430.0	480.0	410.0	0.1	0.3
3.443	0.060	0.047	0.035	2,202.0	460.0	360.0	440.0	0.1	0.3
3.500	0.060	0.060	0.035	2,202.0	290.0	340.0	320.0	0.1	0.3
3.581	0.060	0.060	0.035	2,202.0	400.0	410.0	380.0	0.1	0.3
3.650	0.060	0.060	0.035	2,202.0	380.0	280.0	360.0	0.1	0.3
3.702	0.060	0.060	0.035	2,202.0	270.0	330.0	220.0	0.1	0.3
3.737	0.060	0.060	0.030	2,202.0	250.0	200.0	280.0	0.3	0.5
3.759	0.000	0.030	0.000	2,202.0	50.0	20.0	80.0	0.3	0.5

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TABLE 5. SUMMARY OF FLOODPLAIN RESULTS FOR POST-FLOOD MODEL SLAFWY1.DAT.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.50	2,275.0	3.10	675.00	513.20	5.48
3.06	1641.67	2,202.0	3.17	1,236.52	1,046.98	2.47
3.18	1647.59	2,202.0	2.59	1,019.77	800.25	3.45
3.27	1652.64	2,202.0	1.64	1,569.06	940.24	4.42
3.36	1657.08	2,202.0	1.88	1,463.06	902.31	4.25
3.44	1660.94	2,202.0	1.74	1,587.60	980.30	4.55
3.50	1664.48	2,202.0	3.38	1,221.89	888.39	6.13
3.58	1668.32	2,202.0	4.22	978.35	818.67	6.65
3.65	1670.50	2,202.0	3.60	682.14	661.33	6.45
3.70	1673.48	2,202.0	4.98	430.32	558.43	7.31
3.74	1674.83	2,202.0	4.73	79.90	248.19	8.90
3.76	1675.92	2,202.0	5.22	94.84	380.43	5.79

TABLE 6. SUMMARY OF RESULTS FOR FLOODWAY POST-FLOOD MODEL SLAFWY1.DAT.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.93	2,275.0	3.53	530.00	595.76	4.66
3.06	1641.88	2,202.0	3.38	400.00	651.41	3.29
3.18	1648.48	2,202.0	3.48	265.00	500.92	5.01
3.27	1653.44	2,202.0	2.44	260.00	462.94	6.29
3.36	1657.94	2,202.0	2.74	310.00	537.32	6.22
3.44	1661.89	2,202.0	2.69	360.00	579.34	7.06
3.50	1665.22	2,202.0	4.12	300.00	440.53	7.81
3.58	1668.86	2,202.0	4.76	268.00	445.45	8.20
3.65	1671.32	2,202.0	4.42	145.00	343.00	7.21
3.70	1673.87	2,202.0	5.37	115.00	270.40	9.42
3.74	1675.72	2,202.0	5.62	89.52	325.73	7.00
3.76	1676.23	2,202.0	5.53	94.60	409.84	5.37

TABLE 7. SUMMARY OF RESULTS FOR FLOODPLAIN POST-FLOOD MODEL WLBFWY1.DAT.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.50	2,275.0	3.10	675.00	513.20	5.48
3.06	1641.67	2,202.0	3.17	1,236.52	1,046.98	2.47
3.18	1647.59	2,202.0	2.59	1,019.77	800.25	3.45
3.27	1652.64	2,202.0	1.64	1,569.06	940.24	4.42
3.36	1657.08	2,202.0	1.88	1,463.06	902.31	4.25
3.44	1660.94	2,202.0	1.74	1,587.60	980.30	4.55
3.50	1664.48	2,202.0	3.38	1,221.89	888.39	6.13
3.58	1668.32	2,202.0	4.22	978.35	818.67	6.65
3.65	1670.50	2,202.0	3.60	682.14	661.33	6.45
3.70	1673.48	2,202.0	4.98	430.32	558.43	7.31
3.74	1674.83	2,202.0	4.73	79.90	248.19	8.90
3.76	1675.92	2,202.0	5.22	94.84	380.43	5.79

TABLE 8. SUMMARY OF RESULTS FOR FLOODWAY POST-FLOOD MODEL WLBFWY1.DAT.

CROSS SECTION	COMPUTED WATER SURFACE ELEVATION CWSEL (feet)	100-YEAR FLOWRATE Q (cfs)	DEPTH D (feet)	TOPWIDTH T (feet)	AREA A (ft^2)	MEAN CHANNEL VELOCITY VCH (fps)
2.94	1635.93	2,275.0	3.53	530.00	595.76	4.66
3.06	1641.81	2,202.0	3.31	500.00	710.78	3.13
3.18	1648.14	2,202.0	3.14	400.00	608.49	4.29
3.27	1653.20	2,202.0	2.20	400.00	535.15	6.11
3.36	1657.72	2,202.0	2.52	450.00	653.01	5.45
3.44	1661.43	2,202.0	2.23	550.00	643.71	5.85
3.50	1664.94	2,202.0	3.84	535.00	605.61	6.96
3.58	1668.73	2,202.0	4.63	396.31	538.03	7.69
3.65	1671.04	2,202.0	4.14	300.00	469.01	6.79
3.70	1673.56	2,202.0	5.06	237.43	402.14	8.26
3.74	1675.15	2,202.0	5.05	77.85	244.19	9.15
3.76	1676.42	2,202.0	5.72	95.96	428.92	5.13

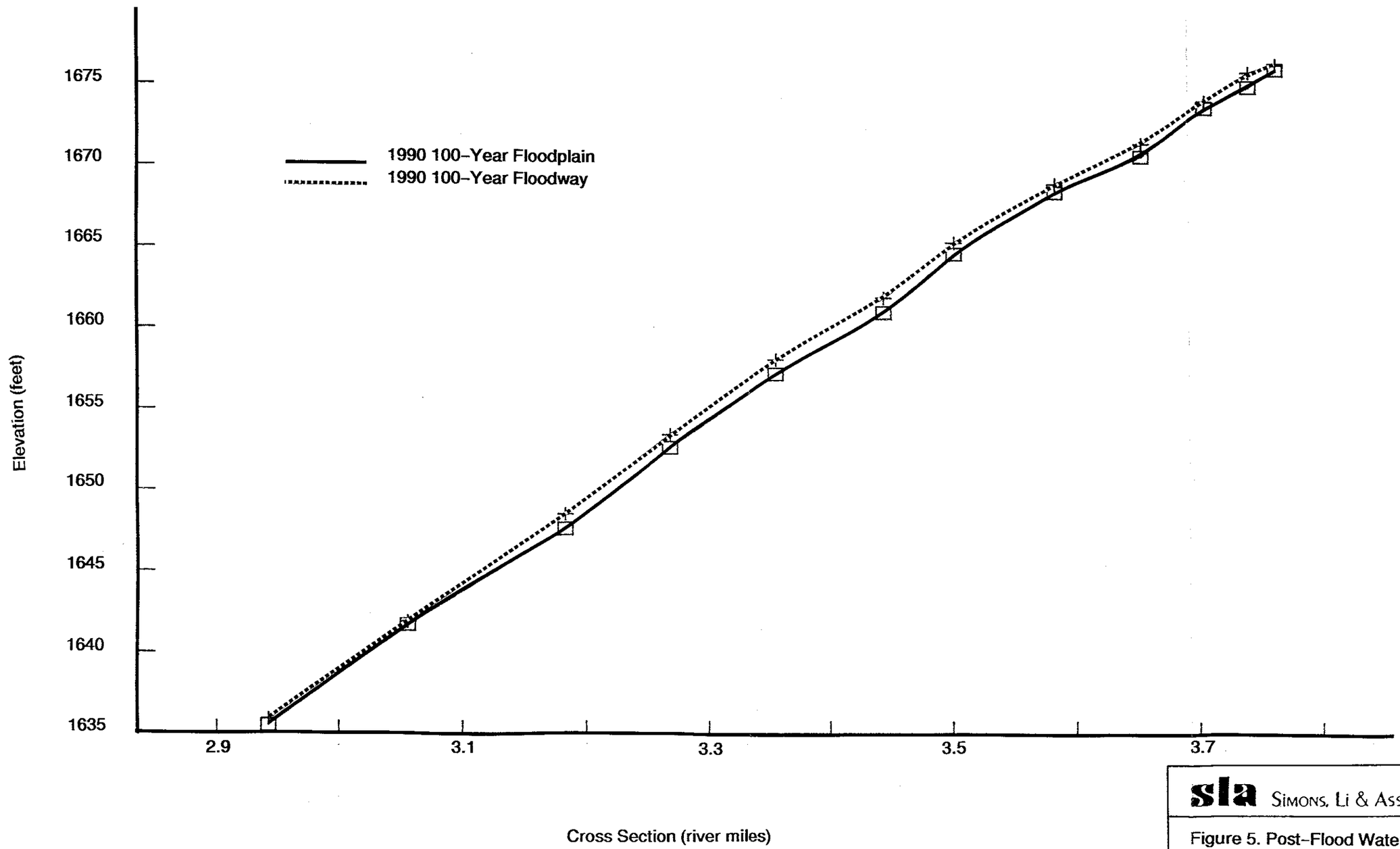

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Figure 5. Post-Flood Water Surface Profiles.

The increased channel depth can be attributed to a combination of two effects. Chronologically, the first effect was due to the contribution from the grubbing operations. The second effect can be linked to the degradation action of storm flows coursing through Wittmann Wash. The storm flows may have had a cascading effect on the channel bed, where the relatively fast moving water degraded further the already excavated channel. How much each effect contributed to the total resulting depth can not be determined.

Minor differences in cross section configuration between this investigation and the ADMS study can be attributed to the use of digitized cross sections (1990 mapping) versus constructing cross sections directly from the 1986 aerial topographic mapping. The digitized cross sections distinguishes ridges, banks, braiding, ruts, and other features in more detail than cross sections constructed by scaling and interpolation.

A transparency of the 1990 topographic map of the Wittmann Wash project area was overlain upon the 1986 ADMS plan sheet W-2. Plan sheet W-2 shows 1986 topography as well as the extent of channel and overbank vegetation at that time. Overlaying the 1990 topography on the 1986 topography provided the opportunity for direct observation of changes in land form and vegetation characteristics over the four year period.

The obvious physical changes in the Wittmann Wash project area was the extensive removal of vegetation and the grading of the left overbank area between cross sections 3.650 and 3.268. The clearing and grubbing of the vegetation and the rough grading of the left overbank had the effect of reducing Manning's roughness coefficient. The roughness coefficient used in the 1986 ADMS was 0.07 as compared to 0.06 for the 1990 study.

Another notable change in Wittmann Wash was the channel breakout between cross sections 3.581 and 3.500 that occurred as a result of the 1990 Labor Day floods. The breakout occurred approximately midway between the cross sections and is illustrated in Photograph 1.

The channel breakout may have been caused by a combination of interrelated factors. The first factor, discussed above, was the physical excisement and degradation of the channel. The second factor was the presence of a fence line that spanned the width of Wittmann Wash at or near the channel breakout. The remaining components of the fence may be seen in Photograph 2.

The contribution of the fence on the channel breakout may have been that the fence captured a large amount of debris from the stream flow. The captured debris consisted of tree limbs, branches, sticks, tumbleweeds, grasses, and assorted municipal paper and plastic products. The debris which caught up in the fence could have gradually blocked most of the effective flow area for the channel.

The blockage may have been sufficient enough to reduce conveyance within the channel at that point and upstream of the fence. As a result of the blockage, flow depths immediately upstream of the fence increased to the extent to overtop the right bank of Wittmann Wash. As more flows overtopped and were diverted to the right overbank, the flows gradually sought another available braided channel. As storm flows continued in Wittmann Wash, it is likely that the fence was gradually destroyed removing the channel blockage.

The 1650 foot contour line in the right overbank area between cross sections 3.183 and 3.268 appears to have been shifted southward. The shift is approximately 100 feet and may have been due to the construction of a small dike north of Lone Mountain Road. The material for the dike appears to have been scraped and hauled from the adjacent land.

The 1990 topo indicates that the 1670 contour line at cross section 3.650 and the main channel has been pushed further away (west) from the channel in the right overbank and extended downstream in the left overbank. The shift was likely due to the clearing and grubbing activity, with some minor contribution due to erosion caused by the overtopping of the right bank during the recent flood events.

PHOTOGRAPH 1. **Wittmann Wash Channel Breakout.**
(NOTE: Arrow is pointing to location of pre-flood channel. Breakout occurred at right side of photo. Predominant post-flood flows from left to right).

PHOTOGRAPH 2. **Flood Damaged Fence Line.**
(NOTE: Fence post located in middle of breakout looking downstream at post-flood channel).

2.3.2. Comparison of Results

A comparison of the results of the two studies (the post-flood versus the pre-flood study) examined differences in hydraulic parameters such as water surface elevations, flow velocities, flow distribution, and flow depth. The comparison was aided by compiling numerous tables and figures to highlight and evaluate the changes.

The first comparison between the ADMS study and this investigation examined changes in the floodplain characteristics. Table 9 summarizes, by cross section, selected hydraulic parameters that characterize the 1990 and ADMS floodplains. Table 10 lists the differences in the variables.

The largest change in computed water surface elevation occurs at cross section 3.759. This change can be attributable to an increase in the roughness coefficient for the channel from 0.015 to 0.030. Cross section 3.759 is located at the downstream face of the Grand Avenue bridge. The ADMS study assigned a channel coefficient of 0.015 which would be representative of a concrete lined channel. This study assigned a value of 0.03 for the channel roughness coefficient based on field observations.

Section 3.759 also had the largest change in average flow velocity. The change in flow velocity can, again, be attributable to the change in the roughness coefficient at the section and to the use of the variable PXSECR (discussed previously).

Figure 6 provides a plot of the channel thalweg and water surface profiles for the pre-flood and post-flood models of Wittmann Wash. The figure distinctly shows between cross sections 3.500 and 3.581 that the channel thalweg has lowered in elevation. Between cross sections 3.268 and 3.443 the thalweg has been raised in elevation slightly due to the shifting of the channel and possibly due to aggradation. It is unknown whether or not man's activity (clearing and grubbing) had a direct bearing on the channel invert within this sub-reach.

TABLE 9. 1990 AND ADMS FLOODPLAIN CHARACTERISTICS.

	1990 FLOODPLAIN CHARACTERISTICS				ADMS FLOODPLAIN CHARACTERISTICS			
CROSS SECTION	COMPUTED WATER SURFACE ELEVATION (feet)	AVERAGE FLOW VELOCITY (fps)	FLOOD-PLAIN WIDTH (feet)	CHANNEL FLOW VELOCITY (fps)	COMPUTED WATER SURFACE ELEVATION (feet)	AVERAGE FLOW VELOCITY (fps)	FLOOD-PLAIN WIDTH (feet)	CHANNEL FLOW VELOCITY (fps)
2.942	1635.50	4.43	842	5.48	1635.51	3.30	923	2.90
3.056	1641.67	2.10	1237	2.47	1641.30	2.41	1132	2.57
3.183	1647.59	2.75	1239	3.45	1647.36	2.58	1241	3.90
3.268	1652.64	2.34	1619	4.42	1652.22	2.54	1440	4.20
3.355	1657.08	2.44	1489	4.25	1656.97	2.38	1333	3.88
3.443	1660.94	2.25	1636	4.55	1660.65	1.84	1522	2.34
3.500	1664.48	2.48	1339	6.13	1664.01	3.12	1288	0.99
3.581	1668.32	2.69	1001	6.65	1668.39	2.27	982	2.31
3.650	1670.50	3.33	712	6.45	1670.78	2.79	725	5.25
3.702	1673.48	3.94	438	7.31	1672.94	4.35	369	9.49
3.737	1674.83	8.87	80	8.90	1674.30	8.50	99	8.85
3.759	1675.92	5.79	95	5.79	1674.94	7.95	96	7.95

TABLE 10. DIFFERENCES IN FLOODPLAIN CHARACTERISTICS.

CHANGE IN FLOODPLAIN CHARACTERISTICS (1990 - ADMS)				
CROSS SECTION	COMPUTED WATER SURFACE ELEVATION (feet)	AVERAGE FLOW VELOCITY (fps)	FLOODPLAIN WIDTH (feet)	CHANNEL FLOW VELOCITY (fps)
2.942	-0.01	1.14	-81	2.58
3.056	0.37	-0.31	104	-0.10
3.183	0.23	0.17	-3	-0.45
3.268	0.42	-0.20	179	0.22
3.355	0.11	0.06	155	0.37
3.443	0.29	0.41	114	2.21
3.500	0.47	-0.64	50	5.14
3.581	-0.07	0.42	20	4.34
3.650	-0.28	0.54	-13	1.20
3.702	0.54	-0.41	69	-2.18
3.737	0.53	0.37	-19	0.05
3.759	0.98	-2.16	-2	-2.16

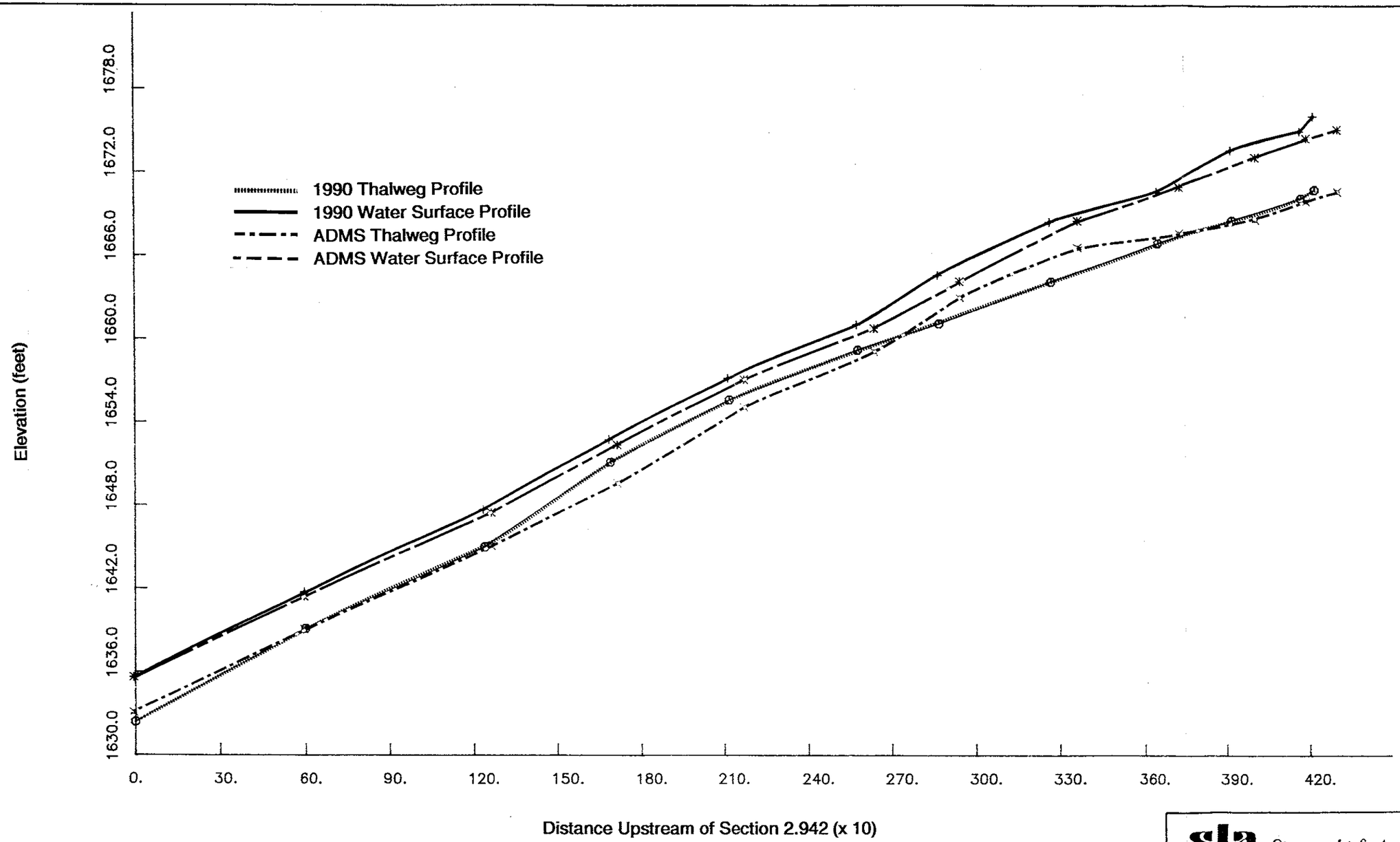

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Figure 6. Channel Thalweg and Water Surface Profile Comparison.

Figure 6 shows that the 100-year computed water surface elevations for 1990 have increased slightly over the ADMS study. It should be noted for clarification purposes that the two studies have slightly different thalweg alignments. The impact of the different thalweg alignments is most noted in the upstream cross sections of Figure 6. The data points between the two investigations are offset slightly because of the differing alignments.

For each cross section, Table 10 lists the differences in floodplain widths between the two investigations. The greatest increase in floodplain width occurs between cross sections 3.268 and 3.443. Changes in floodplain widths can be attributed primarily to changes in the floodplain physical characteristics.

The floodplain map located in the map pocket of this report delineates both the ADMS floodplain/floodway and the 1990 floodplain/floodway. The floodplain map shows where differences occur in the floodplain widths between the two delineation studies. Generally speaking, the 1990 100-year floodplain follows the same areal extent as the ADMS 100-year floodplain.

III. FLOOD CONTROL ALTERNATIVES

This section presents an engineering and economic evaluation of flood control alternatives to alleviate the flooding problems experienced on Wittmann Wash within the project reach. Qualitative and semi-quantitative evaluations of the alternatives developed have been made to provide general performance and cost comparisons.

3.1. Flood Control Alternatives

3.1.1. Alternative A

Flood control Alternative A provides for the construction of a flood control training dike located at the right bank between cross sections 3.443 and 3.581. The training dike would be constructed of material which would minimize erosion, within constraints, and maximize dike stability. Alternative A would also require minor regrading of the left (east) bank and left overbank area in the upper portions of the project reach. The regarding effort would reshape the 1990 topographic contours to the pre-flood conditions and topography.

Figure 7 illustrates the location of the low-flow training dike within the Wittmann Wash project reach. Figure 8 presents a typical section of the dike. The training dike would function to contain low flows up to the magnitude of the 10-year frequency within the re-established wash channel and train Wittmann Wash to return low flows to the pre-flood channel downstream of the release point.

3.1.2. Alternative B

Flood control Alternative B consists of providing a 100-year flood control levee in the right overbank area of the project reach. The alignment of the levee would parallel the pre-flood 100-year limits and would incorporate a freeboard of 0.5 feet. Alternative B would also include the training dike as described in Alternative A.

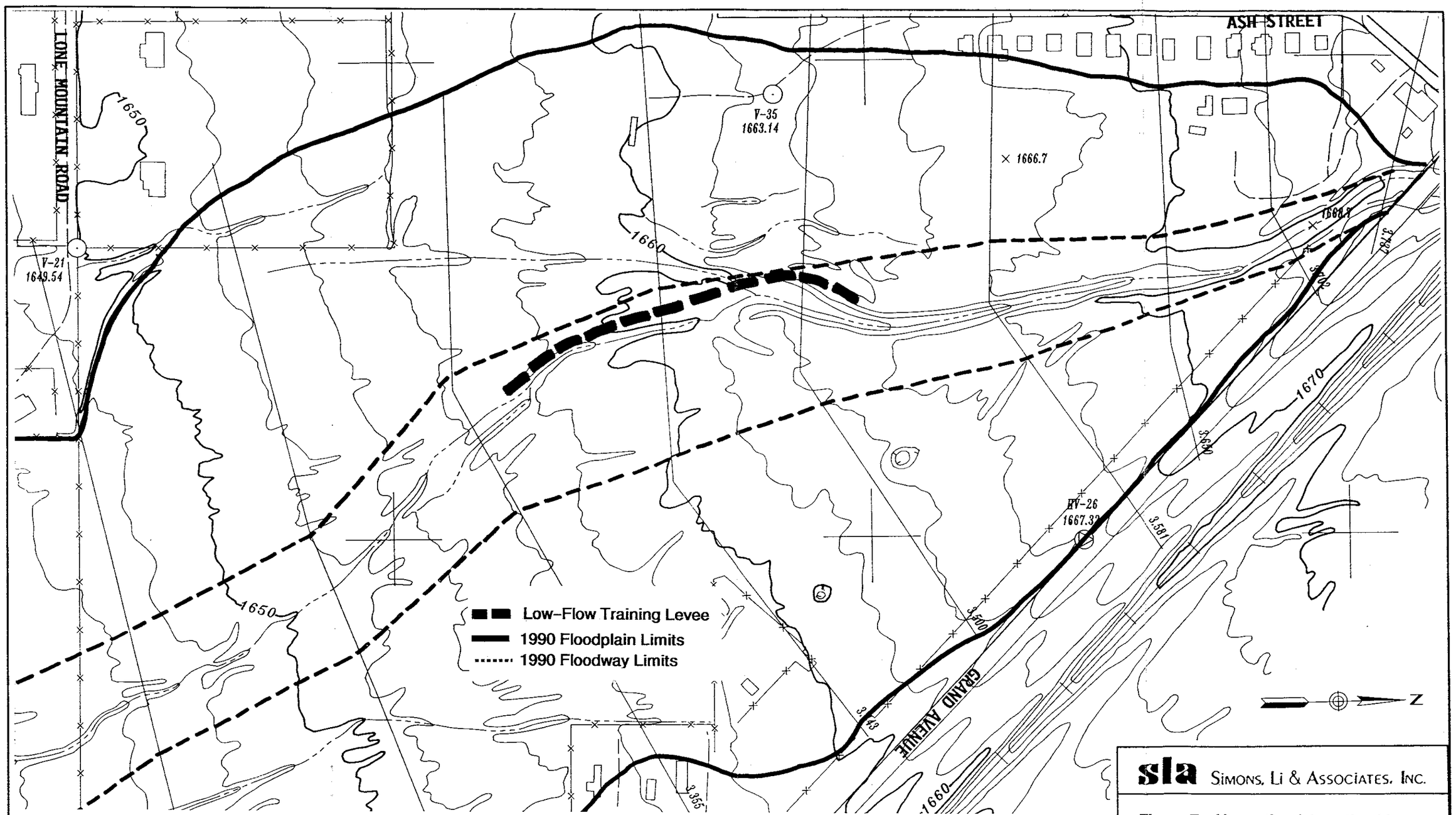

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Figure 7. Alternative A Location Map

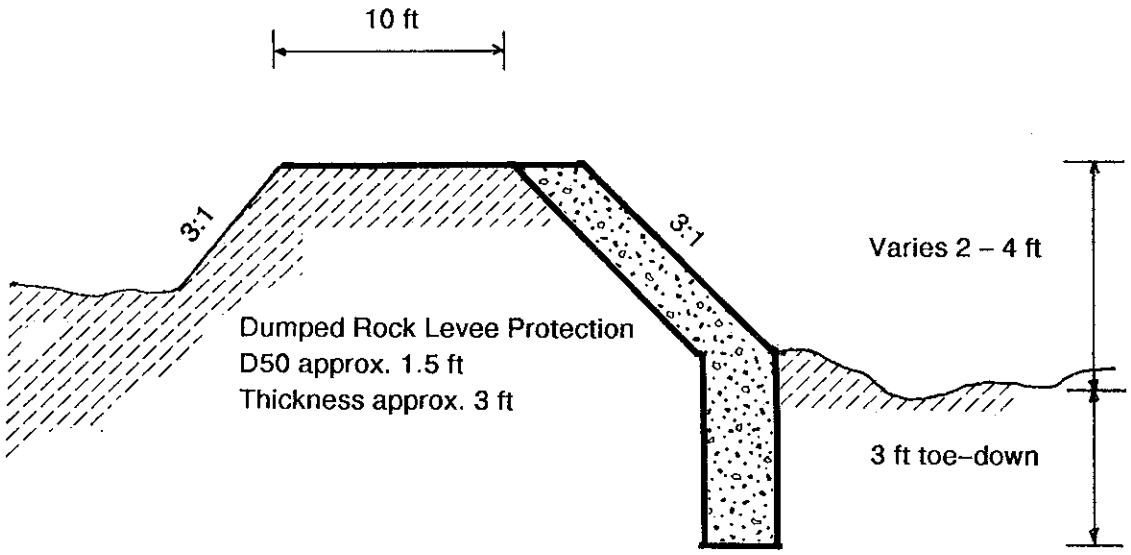

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Figure 8. Low-Flow Training Dike Typical Section

Figure 9 illustrates the location of Alternative B flood control features. Figure 10 presents a typical section of the levee. The typical section for the training dike was presented in Figure 8.

3.1.3. Alternative C

Flood control Alternative C consists of channelizing the main channel of Wittmann Wash to provide greater conveyance within the channel. The banks would be protected with rock rip-rap sized according to expected channel velocities. The main channel would be located at it's pre-flood location (See Figure 11). Figure 12 presents a typical cross section for the channelized portion of Wittmann Wash. Downstream of cross section 2.942 the channel would transition back to the existing natural channel.

3.2. Impact of Alternatives

The following summarizes the hydraulic impacts of each of the flood control alternatives. The impacts are evaluated in a qualitative as well as in a quantitative manner.

3.2.1. Alternative A.

The low-flow training dike, as shown in Figure 7, would span the break out section of the right channel bank. The dike would train the channel to release low flows to the pre-flood channel at the release point (upstream of cross section 3.355).

The training dike size and configuration was based on conducting a bankfull capacity analysis of Wittmann Wash for the reach just downstream of the Grand Avenue bridge. The banks of this reach appeared, from field inspections, to be relatively defined and more stable than the reach incorporating the proposed dike. The HEC-2 computer program was used to determine, by iteration, the approximate bankfull capacity of that reach. This capacity is estimated to be 750 cfs which corresponds to the 10-year discharge frequency as identified in the Wittmann ADMS (Q_{10} = 749 cfs).

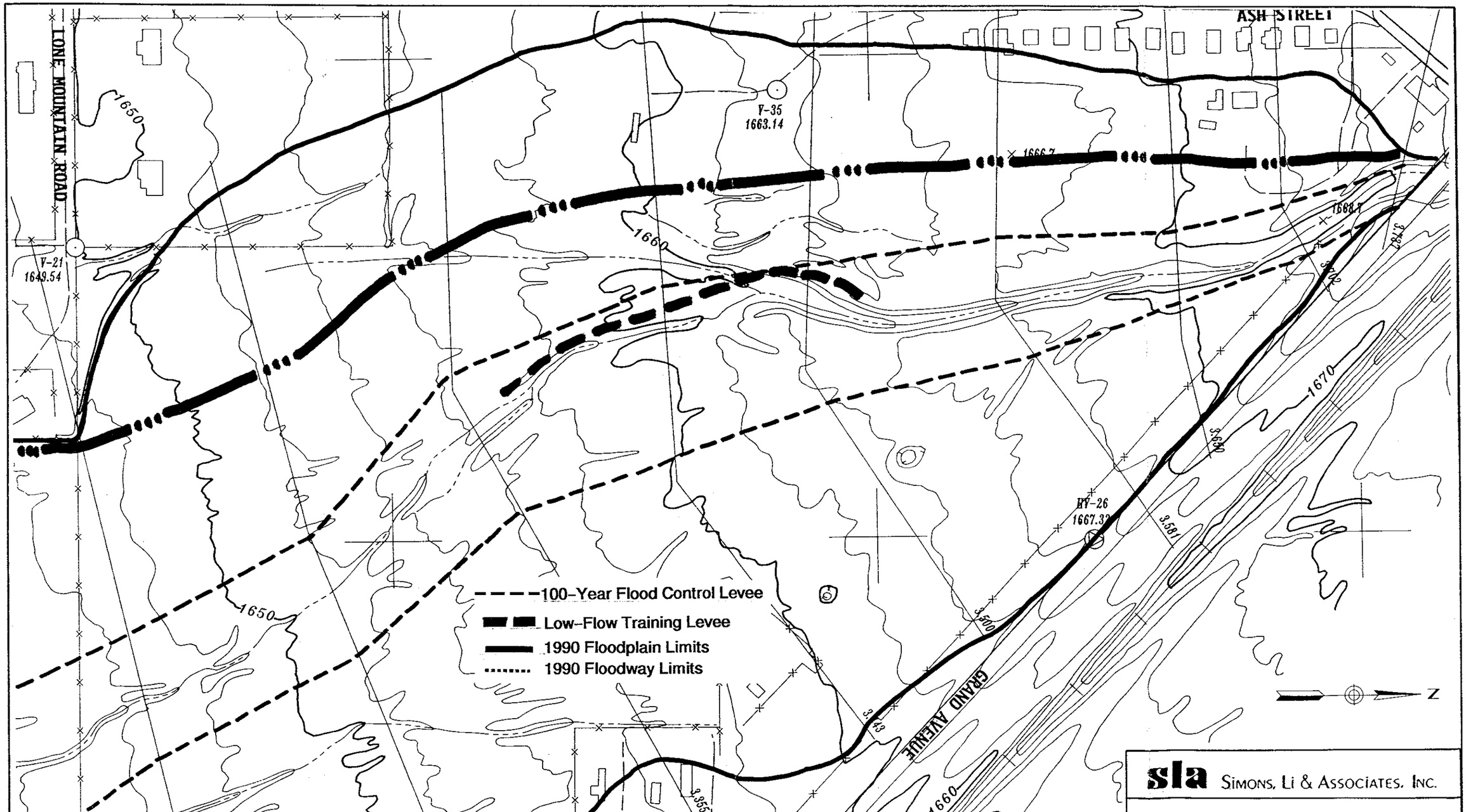

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Figure 9. Alternative B Location Map

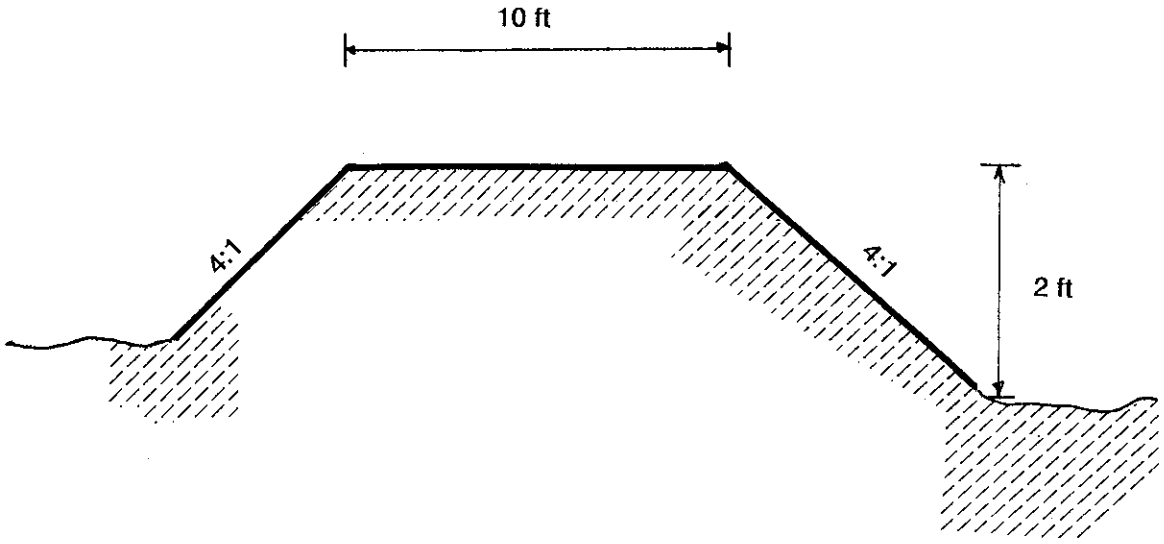

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Figure 10. 100–Year Flood Control Levee Typical Section

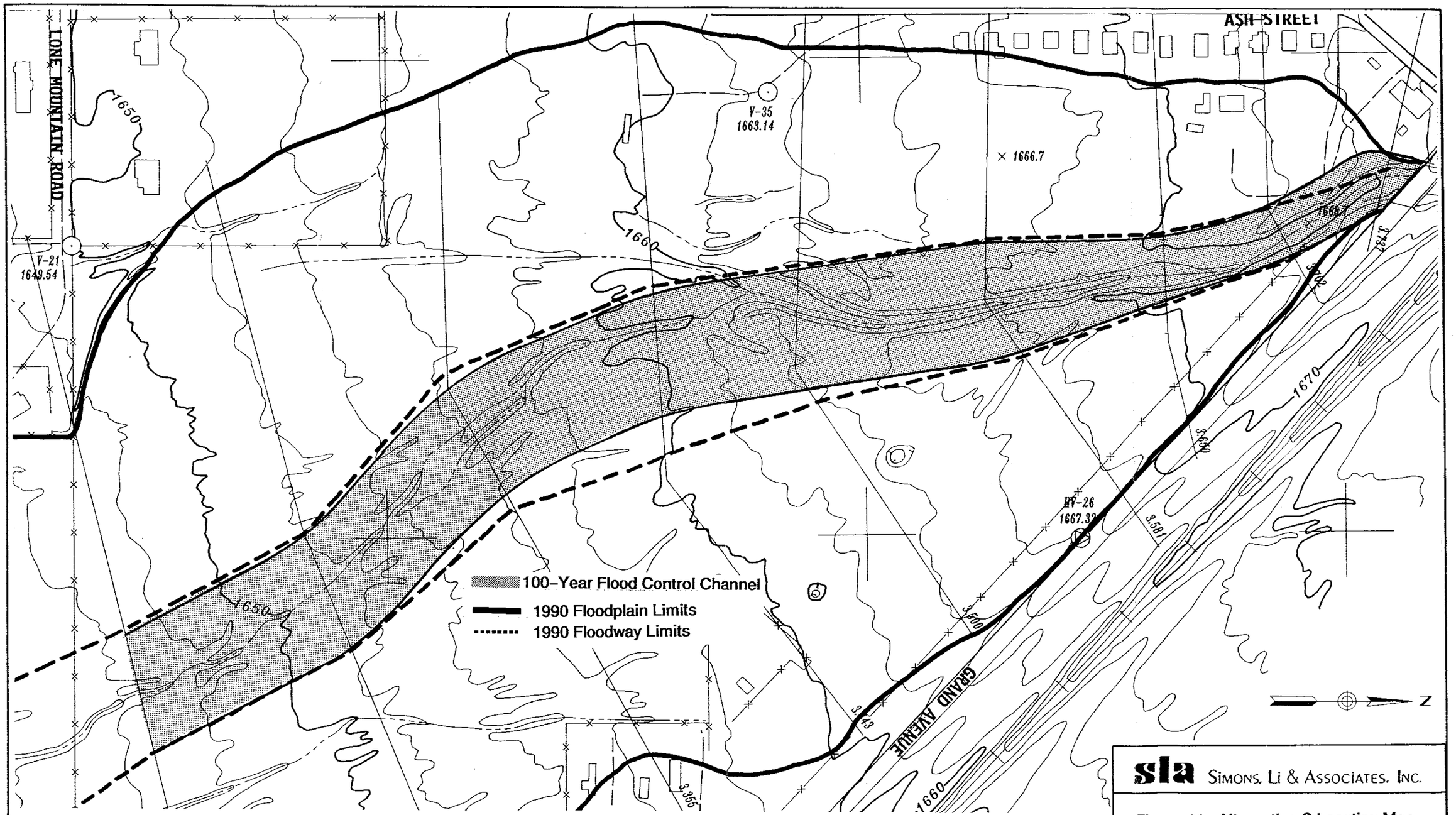

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Figure 11. Alternative C Location Map

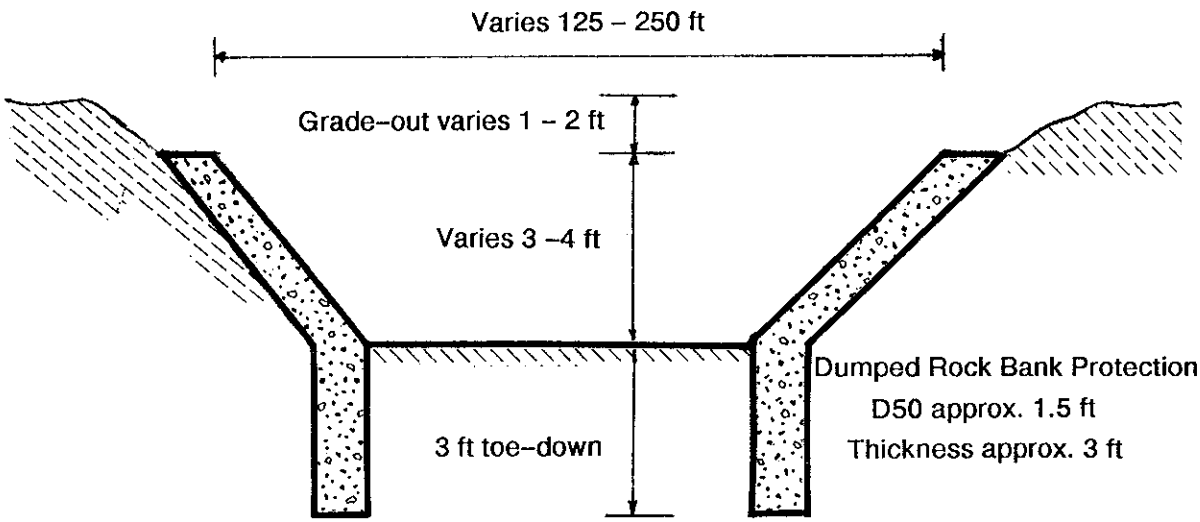

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Figure 12. Alternative C Typical Section

Normal flow hydraulic computations were performed to estimate the hydraulic characteristics of Wittmann Wash at the location of the proposed dike. Tables 11 and 12 summarize the results of the normal flow characteristics for the flowrates of 220 and 750 cfs, respectively. The 220 cfs flowrate was estimated to be the 2-year discharge based on plotting the 10, 25, 50 and 100-year peak discharges on probability paper. The hydraulics were determined assuming a wash bottom width of 20 feet.

The size of the dumped rock rip-rap (D_{50}) for the levee protection was determined to be approximately 1.5 feet (18 inches). This rip-rap size should be sufficient to withstand the channel velocities for the 10-year frequency (7.61 ft/s based on normal flow hydraulics). The size of the rip-rap should be capable of withstanding the expected 100-year channel velocities based on results from the hydraulic models.

The training dike should adequately handle a storm with a 10-year frequency (Q = 750 cfs). The determination of which frequency storm would wash the training dike out would involve an extensive analysis. For definition purposes, any frequency greater than the 10-year event that would cause overtopping of the dike could be considered a failure. However, this does not mean that the dike itself would fail. An analysis to determine the specific frequency of storm required to wash the dike out would include, but not be limited to, determination of the maximum permissible velocity for dumped rip-rap bank protection, scour analysis for channel bends, and general scour and long term degradation analyses for Wittmann Wash. If such a storm event were to occur, the natural channel banks of Wittmann Wash would most likely fail long before the training dike.

As stated previously, minor regrading of the project area would be necessary to return Wittmann Wash to its pre-flood conditions. The extent of the regrading limits was based on examination of pre-and post-flood topographic mapping. The regrading would be located primarily between cross sections 3.737 and 3.183, which is essentially the Groom and Peters parcels. A small amount of fill would be required particularly in filling in break out areas, filling in on the back side of the proposed dike, and regrading the left (east) bank of the wash.

TABLE 11. ALTERNATIVE A NORMAL FLOW HYDRAULICS

DESIGN PARAMETERS		
Discharge	=	220 cfs
n-value	=	0.03
Bottom width	=	20 ft
Slope	=	0.0073 ft/ft
Side Slope	=	3:1
NORMAL FLOW RESULTS		
Depth	=	1.68 ft
Velocity	=	5.23 fps
Froude no.	=	0.78
Critical depth	=	1.44 ft
Hydraulic depth	=	1.4 ft
Top width	=	30.08 ft
Sectional area	=	42 sq ft
Wetted perimeter	=	30.6 ft
Hydraulic radius	=	1.37 ft

TABLE 12. ALTERNATIVE A NORMAL FLOW HYDRAULICS		
DESIGN PARAMETERS		
Discharge	=	750 cfs
n-value	=	0.03
Bottom width	=	20 ft
Slope	=	0.0073 ft/ft
Side Slope	=	3:1
NORMAL FLOW RESULTS		
Depth	=	3.3 ft
Velocity	=	7.61 fps
Froude no.	=	0.85
Critical depth	=	3.01 ft
Hydraulic depth	=	2.48 ft
Top width	=	39.8 ft
Sectional area	=	98.5 sq ft
Wetted perimeter	=	40.9 ft
Hydraulic radius	=	2.4 ft

The locations and limits of the regrading areas are shown on the preliminary map (base map furnished by the Flood Control District) as Figure 13. Most of the regrading effort is on the east bank and east overbank. This regrading entails pulling contour lines back away from the channel.

The approximate quantity of fill required for regrading is 3,000 cubic yards. Fill placement is indicated on Figure 13. It is not anticipated that the regrading effort will produce any appreciable amount of suitable fill. Fill material will need to be imported.

3.2.2. Alternative B

A summary of the hydraulic characteristics for Alternative B are summarized in Table 13. Table 14 provides a difference comparison of hydraulic parameters between Alternative B and the 1990 floodplain characteristics.

Alternative B (100-year flood control levee) would substantially reduce the 1990 floodplain width. The resulting change in water surface elevation is greatest (0.2 foot) just downstream of the Grand Avenue bridge.

3.2.3. Alternative C

The primary hydraulic impact of Alternative C would be to reduce the 100-year floodplain and floodway to the channel limits shown in Figure 11. The hydraulic characteristics of Alternative C were estimated using normal flow calculations. Calculations for a 100 foot and 226 foot bottom width at both design and equilibrium slopes are given in Appendix E.

The results indicate that for a 100-year flowrate of 2200 cfs, a design slope of 0.0086 ft/ft would produce relatively higher flow velocities. These velocities would warrant bank and channel stabilization measures. Bank and channel stabilization measures were not investigated as part of this alternative.

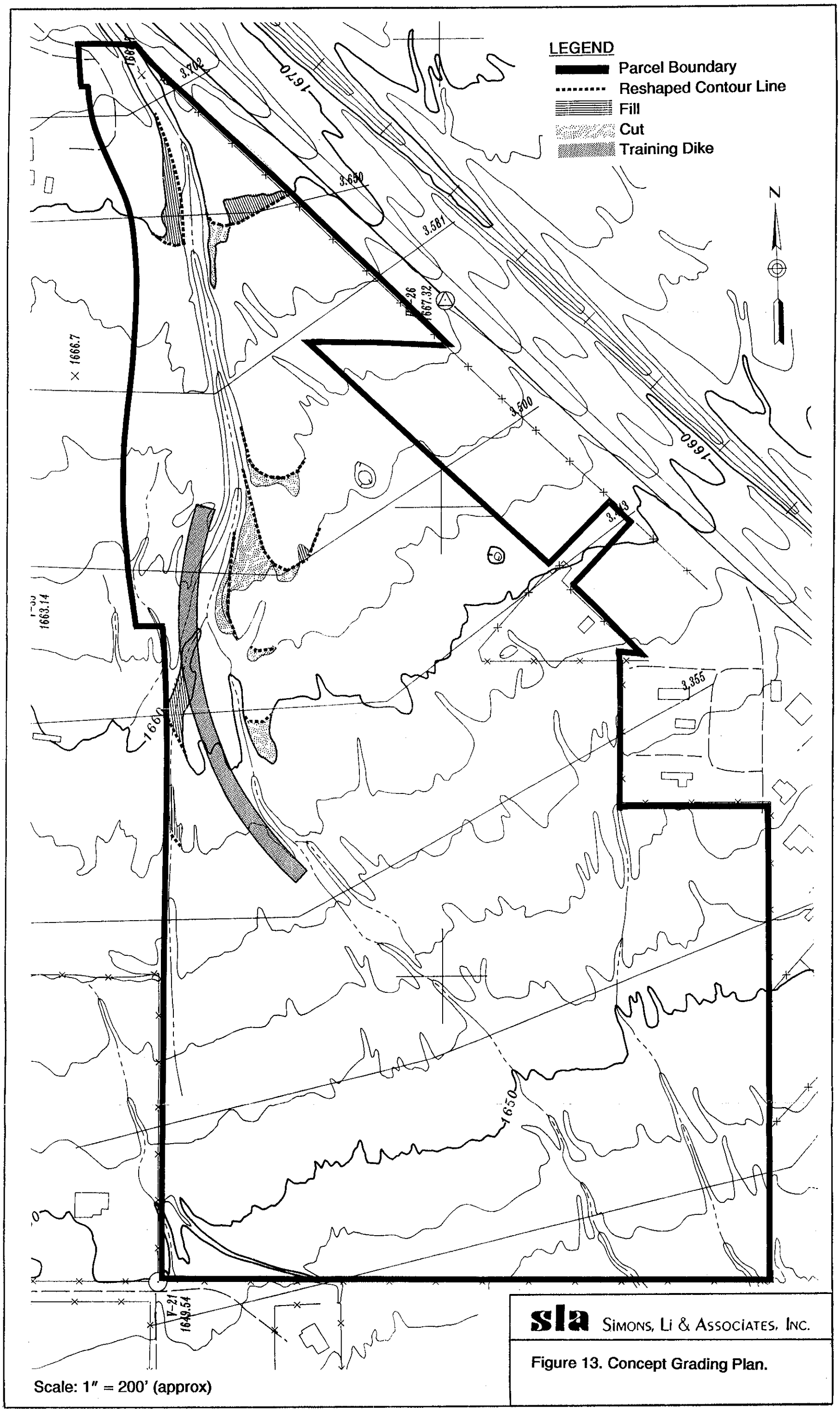

Figure 13. Concept Grading Plan.

Scale: 1″ = 200' (approx)

* boundary limits furnished by
Flood Control District of Maricopa County

2 acres

TABLE 13. ALTERNATIVE B FLOODPLAIN CHARACTERISTICS.

Section No.	Computed Water-Surface Elev. (ft)	Discharge in Left Overbank (cfs)	Discharge in Main Channel (cfs)	Discharge in Right Overbank (cfs)	Velocity in Left Overbank (fps)	Velocity in Main Channel (fps)	Velocity in Right Overbank (fps)	Flood Plain Starting Station (ft)	Flood Plain Ending Station (ft)	Flood Plain Width (ft)
2.942	1635.50	480	731	1064	3.2	5.48	4.63	1582	2424	842
3.056	1641.67	1272	362	568	2.29	2.47	1.65	1312	2549	1237
3.183	1647.59	1687	365	149	2.77	3.45	1.77	1137	2376	1239
3.268	1652.69	1069	625	508	2.22	4.54	1.89	1108	2350	1242
3.355	1657.15	1039	330	833	2.07	4.38	2.92	1143	2320	1177
3.443	1661.00	1338	184	680	2.02	4.82	3.56	1031	2280	1249
3.500	1664.47	945	1104	154	1.75	6.35	1.42	1000	2080	1080
3.581	1668.50	590	1139	472	1.69	6.82	1.91	1138	1920	782
3.650	1670.63	387	1544	271	1.87	6.62	1.83	1075	1625	550
3.702	1673.56	197	1597	408	2.38	8.05	2.87	1027	1290	263
3.737	1675.03	0	2200	2	0.72	8.41	0.75	1088	1173	86
3.759	1675.95	0	2202	0	0	5.74	0	1026	1121	95

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TABLE 14. DIFFERENCES IN ALTERNATIVE B FLOODPLAIN CHARACTERISTICS.

Section No.	Computed Water-Surface Elev. (ft)	Discharge in Left Overbank (cfs)	Discharge in Main Channel (cfs)	Discharge in Right Overbank (cfs)	Velocity in Left Overbank (fps)	Velocity in Main Channel (fps)	Velocity in Right Overbank (fps)	Flood Plain Starting Station (ft)	Flood Plain Ending Station (ft)	Flood Plain Width (ft)
2.942	0.00	0	0	0	0.00	0.00	0.00	0	0	0
3.056	0.00	0	0	0	0.00	0.00	0.00	0	0	0
3.183	0.00	-0	-0	0	0.00	0.00	0.00	0	0	0
3.268	0.05	90	34	-125	0.06	0.12	0.10	0	-377	-377
3.355	0.07	131	29	-160	0.08	0.13	0.27	-8	-320	-312
3.443	0.06	204	19	-223	0.14	0.27	0.92	0	-387	-387
3.500	-0.01	9	33	-42	0.05	0.22	0.22	0	-259	-259
3.581	0.18	197	94	-291	0.21	0.17	-0.02	-1	-221	-219
3.650	0.13	78	102	-181	0.13	0.17	0.10	-3	-165	-162
3.702	0.08	40	183	-223	0.33	0.74	0.68	-0	-175	-175
3.737	0.20	0	-2	1	0.14	-0.49	0.25	-1	5	6
3.759	0.03	0	0	0	0.00	-0.05	0.00	-0	0	0

NOTE: A negative value in the starting station column denotes an increase in the floodplain width.

A negative value in the ending station column denotes an decrease in the floodplain width.

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3.3. Economic Comparison

Tables 15, 16, and 17 provide construction cost estimates for each of the flood control alternatives. The cost estimates were developed assuming readily available construction materials, located within a relatively close hauling distance. A 10 percent contingency was added to allow for a measure of uncertainty.

3.4. Recommended Alternative

Based on the foregoing analyses and cost estimates, Alternative A is recommended as the flood control measure to be implemented at Wittmann Wash. Alternative A was selected for it's ease of construction, lower construction cost, and minimal effort to return Wittmann Wash to it's pre-flood channel and hydraulic conditions.

It is anticipated that the training dike should will the Wittmann Wash floodplain within the study reach to the Wittmann ADMS pre-flood conditions. This expectation is predicated on the following: (1) the Wittmann ADMS hydrologic analysis of peak discharges for Wittmann Wash are valid and are representative of the pre-flood basin characteristics; (2) the Wittmann ADMS floodplain delineation of Wittmann Wash is valid and representative of the pre-flood basin hydraulic characteristics; and (3) the training dike will return the alignment of the post-flood thalweg to its pre-flood thalweg alignment within the study reach.

TABLE 15. ALTERNATIVE A COST ESTIMATE

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Earthwork *	CY	4,689	$ 4.00	$ 18,756.00
Dumped Rock Levee Protection	CY	1,111	$ 20.00	$ 22,220.00
Subtotal				$ 40,976.00
10% Contingency				$ 4,097.00
Total Estimated Construction Cost				$ 45,000.00

* Includes fill material for regrading

TABLE 16. ALTERNATIVE B COST ESTIMATE

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Earthwork *	CY	8,956	$ 4.00	$ 35,824.00
Dumped Rock Levee Protection	CY	1,111	$ 20.00	$ 22,220.00
Subtotal				$ 58,044.00
10% Contingency				$ 5,804.00
Total Estimated Construction Cost				$ 64,000.00

* Includes fill material for regrading

TABLE 17. ALTERNATIVE C COST ESTIMATE

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Earthwork	CY	50,819	$ 4.00	$ 203,276.00
Dumped Rock Levee Protection	CY	7,761	$ 20.00	$ 155,220.00
Gabion Grade Control Structures	CY	1,308	$ 60.00	$ 78,480.00
Subtotal				$ 436,976.00
10% Contingency				$ 43,697.60
Total Estimated Construction Cost				$ 480,673.60

IV. REFERENCES

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2. Flood Control District of Maricopa County, 1988. "Wittmann Area Drainage Master Study, Part B: Stormwater Management Plans", Final Draft. Prepared by: The WLB Group, Inc. December, 1988.

3. United States Department of the Interior - Geological Survey, 1981. "Wittmann Quadrangle, Arizona - Maricopa County", 7.5 minute series (Topographic). Photo revised - 1981.

4. Flood Control District of Maricopa County. Wittmann Wash Office Files.

5. Chow, Ven Te, 1959. Open-Channel Hydraulics, McGraw-Hill Book Company, Inc. New York, 1959.

6. Hoggan, Daniel H., 1989. Computer-Assisted Floodplain Hydrology and Hydraulics, McGraw-Hill Publishing Company, Inc. New York, 1989.

7. U.S. Army Corps of Engineers, 1982. "HEC-2 Water Surface Profiles," Users Manual. Hydrologic Engineering Center. September, 1982.

8. Cooper Aerial Survey Company, Aerial Photographs.

9. Federal Management Agency, Federal Insurance Administrations, 1985. "Flood Insurance Study Guidelines and Specifications for Study Contractors". September, 1985.

10. U.S. Army Corps of Engineers, 1988. "Floodway Determination Using Computer Program HEC-2". Hydrologic Engineering Center. Training Document No. 5. January, 1988.

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APPENDIX A. Wittmann Wash Floodplain Cross-Sections

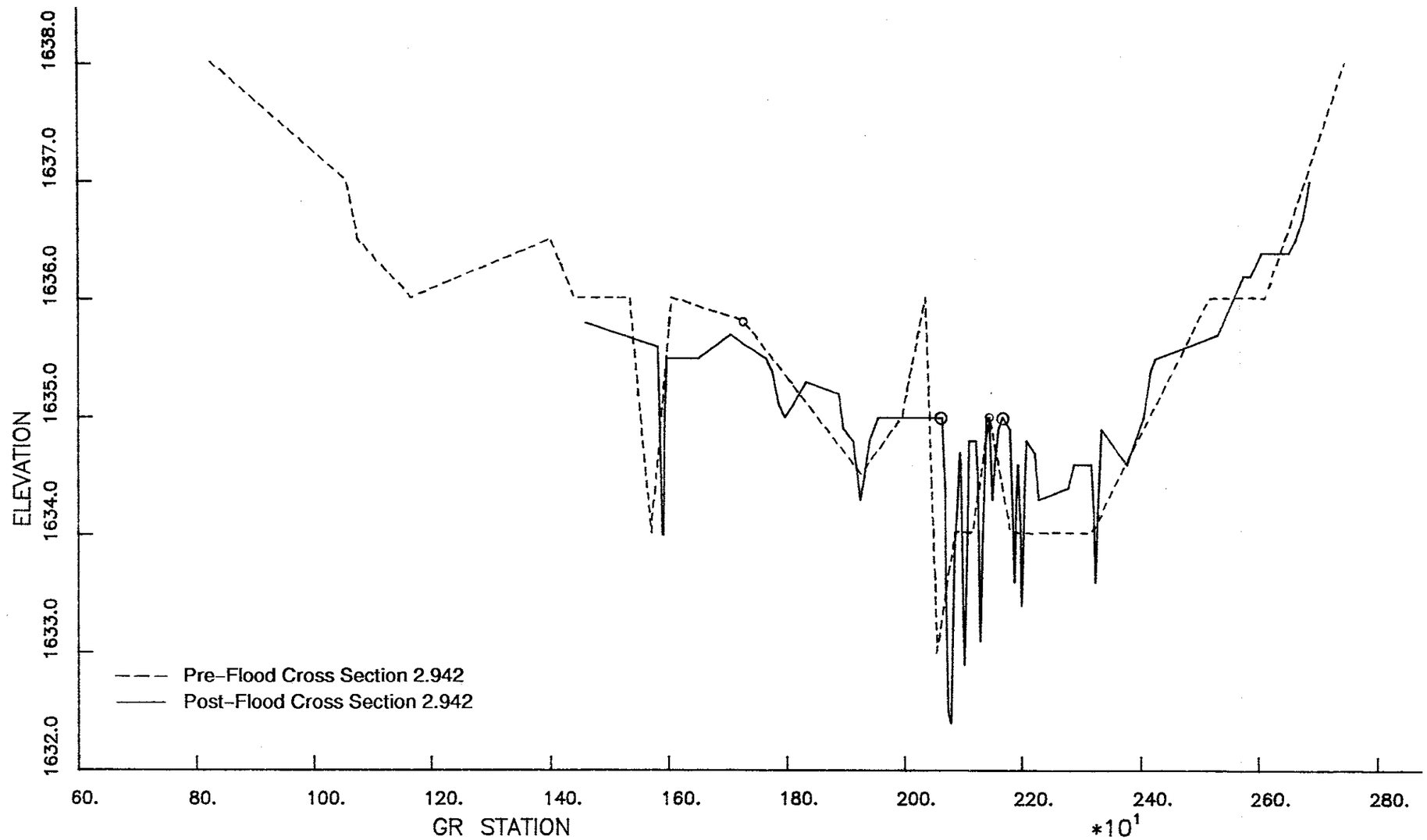
APPENDIX B. SLAFWY1.DAT HEC-2 Input/Output Listing

APPENDIX C. W-WASH2A.DAT HEC-2 Input/Output Listing

APPENDIX D. WLBFWY1.DAT HEC-2 Input/Output Listing

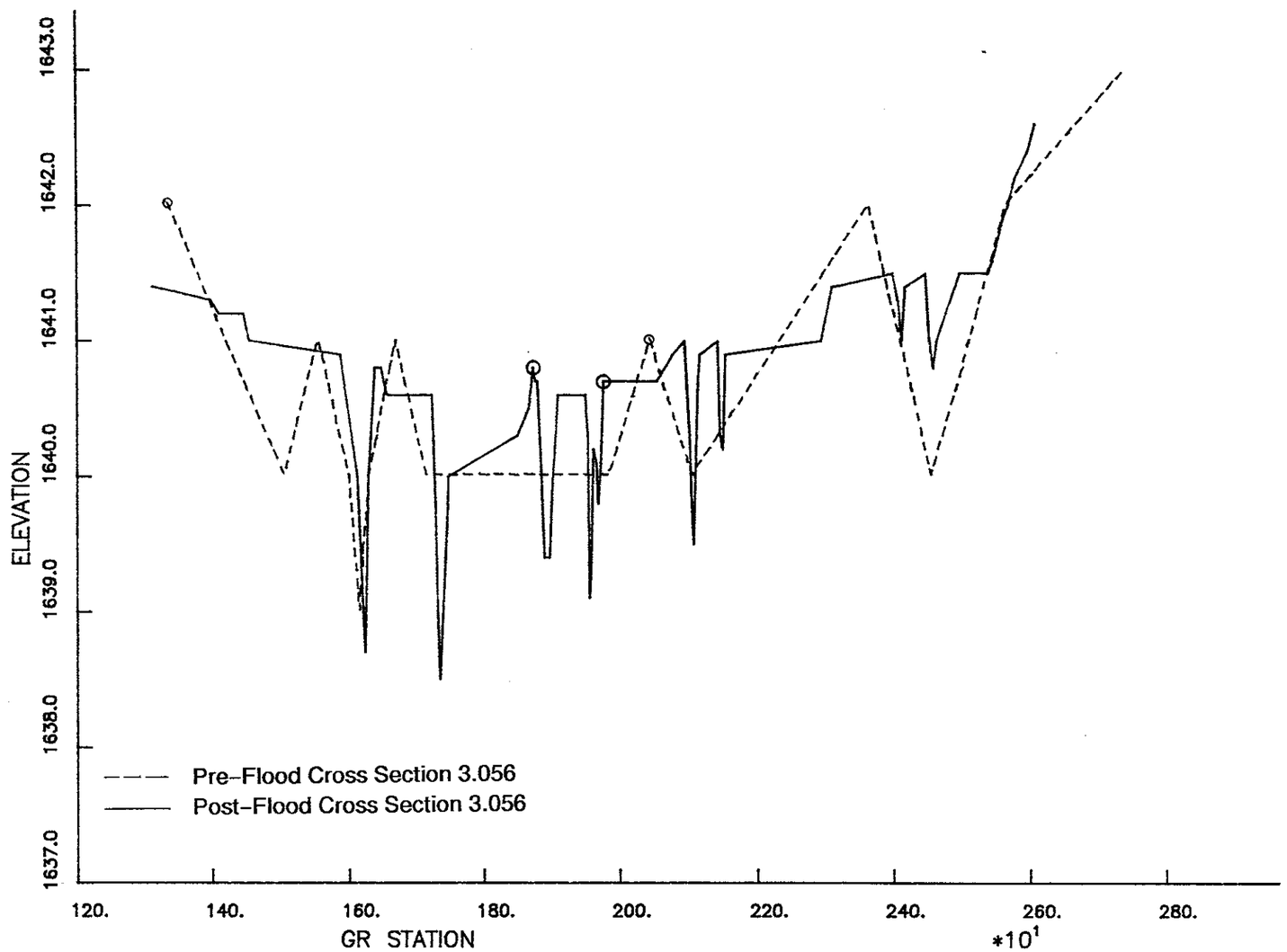
APPENDIX E. Alternative C Normal Flow Hydraulics

APPENDIX A. WITTMANN WASH FLOODPLAIN CROSS-SECTIONS



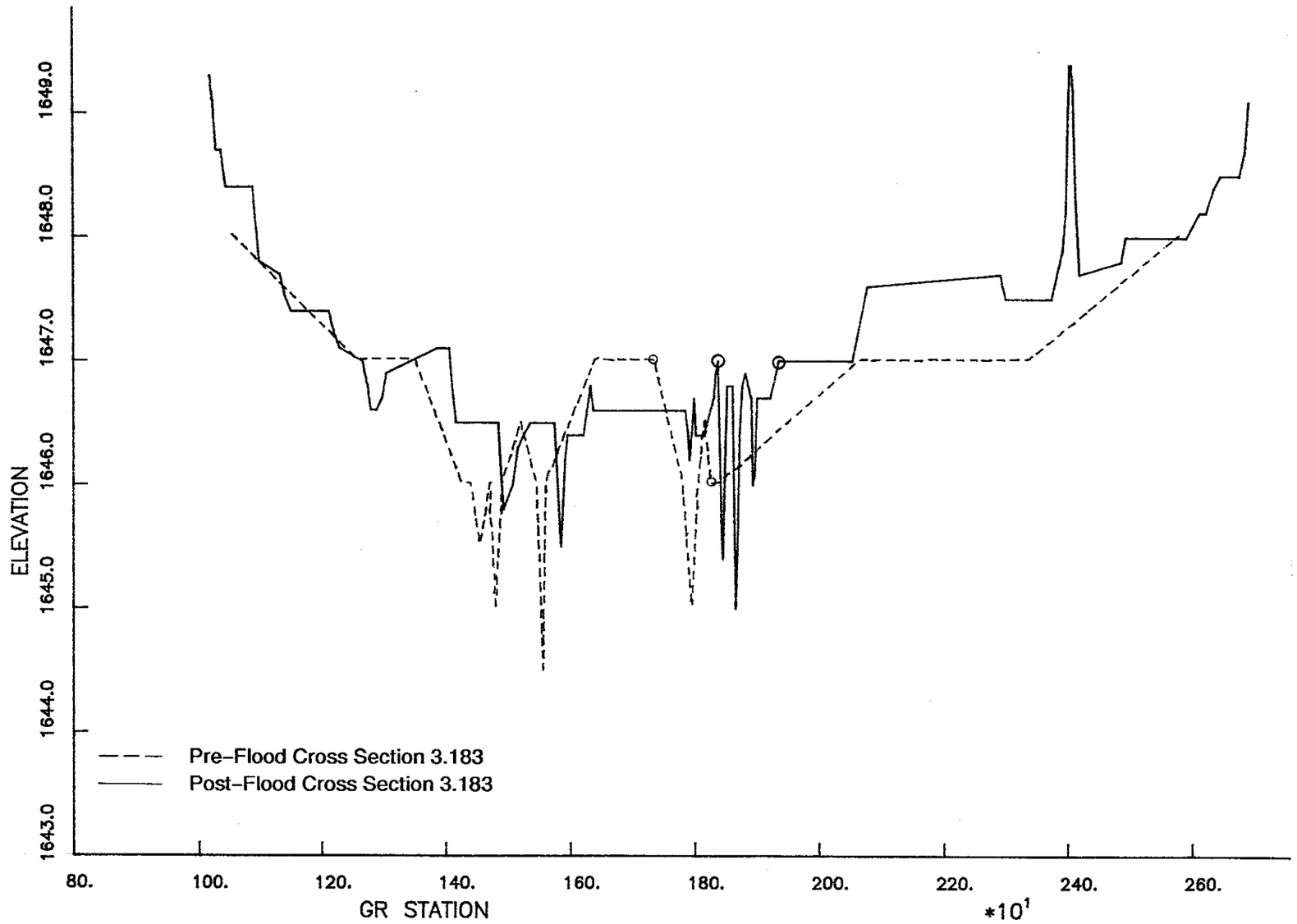
sla Simons, Li & Associates, Inc.

Figure A-1. Cross Section 2.942



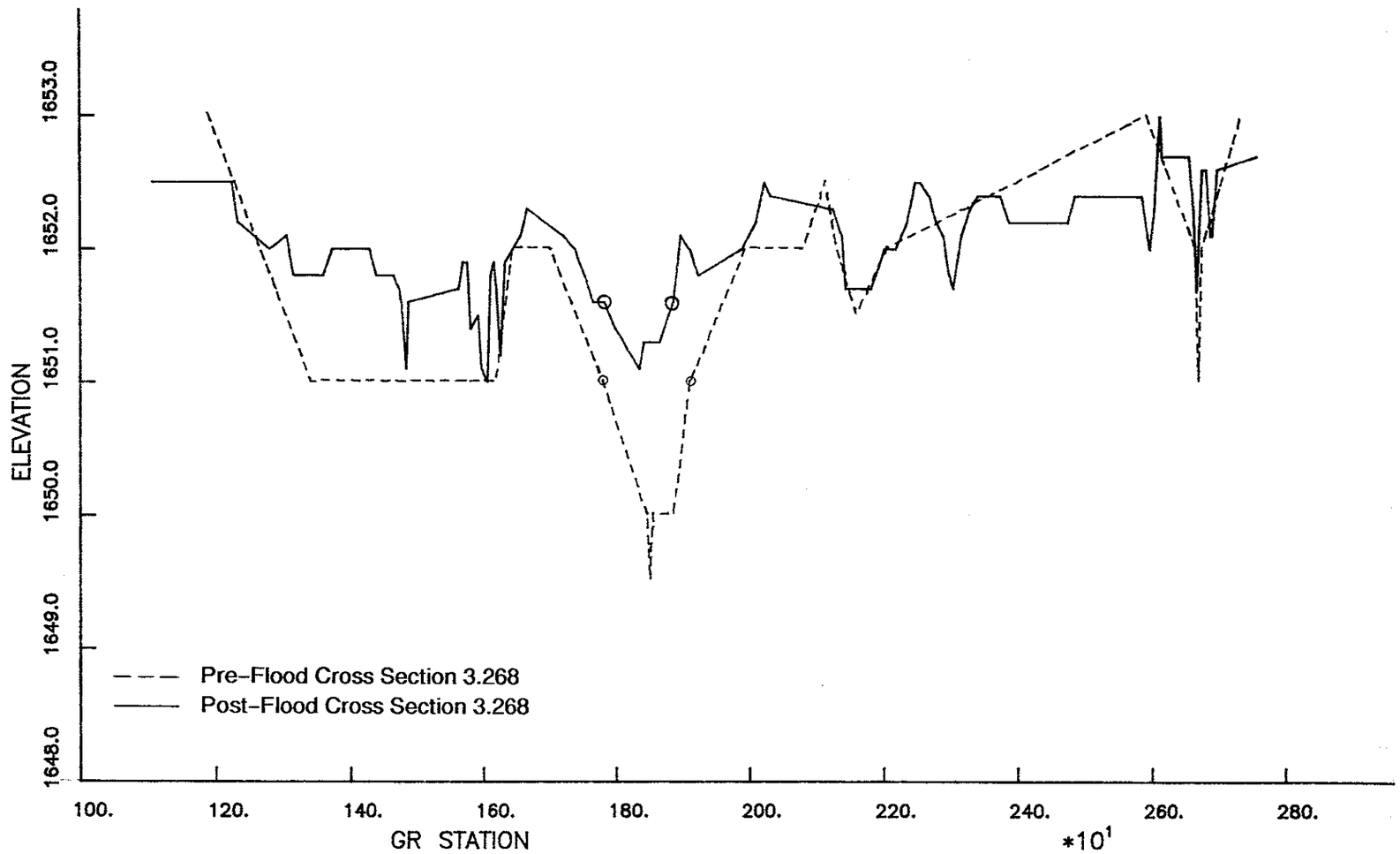
sla SIMONS, LI & ASSOCIATES, INC.

Figure A-2. Cross Section 3.056



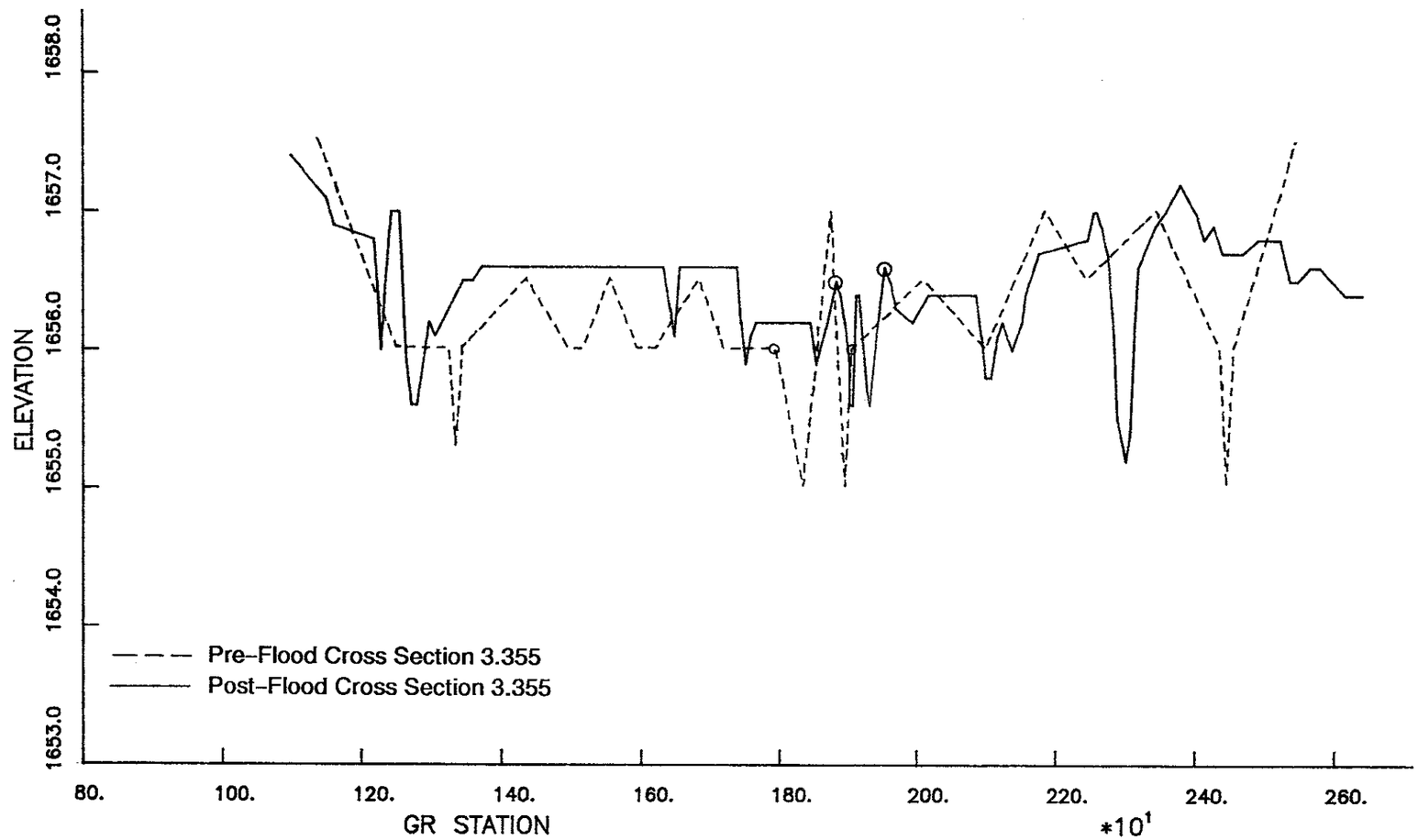
sla Simons, Li & Associates, Inc.

Figure A-3. Cross Section 3.183



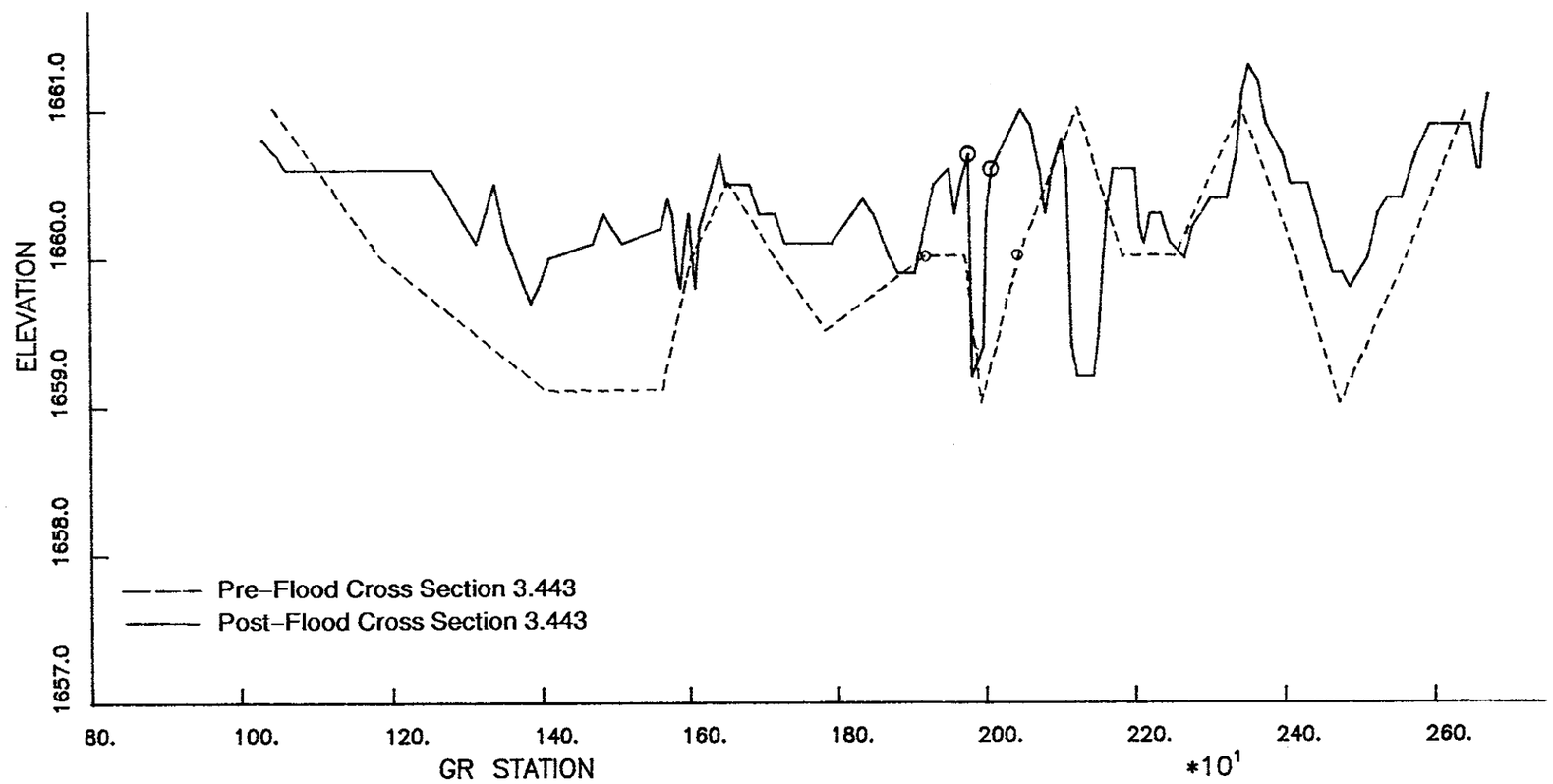
sla Simons, Li & Associates, Inc.

Figure A-4. Cross Section 3.268



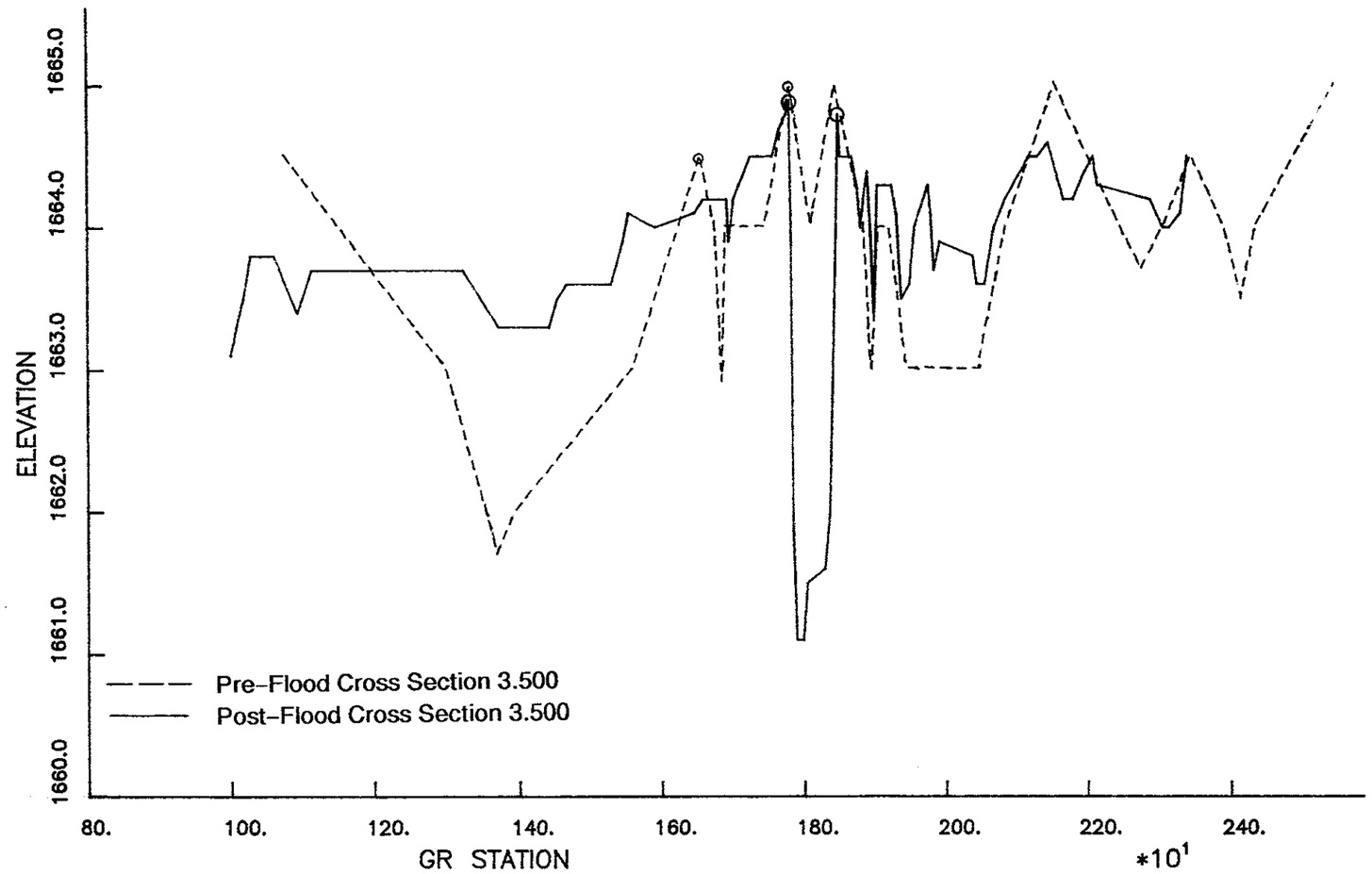
sla SIMONS, LI & ASSOCIATES, INC.

Figure A-5. Cross Section 3.355



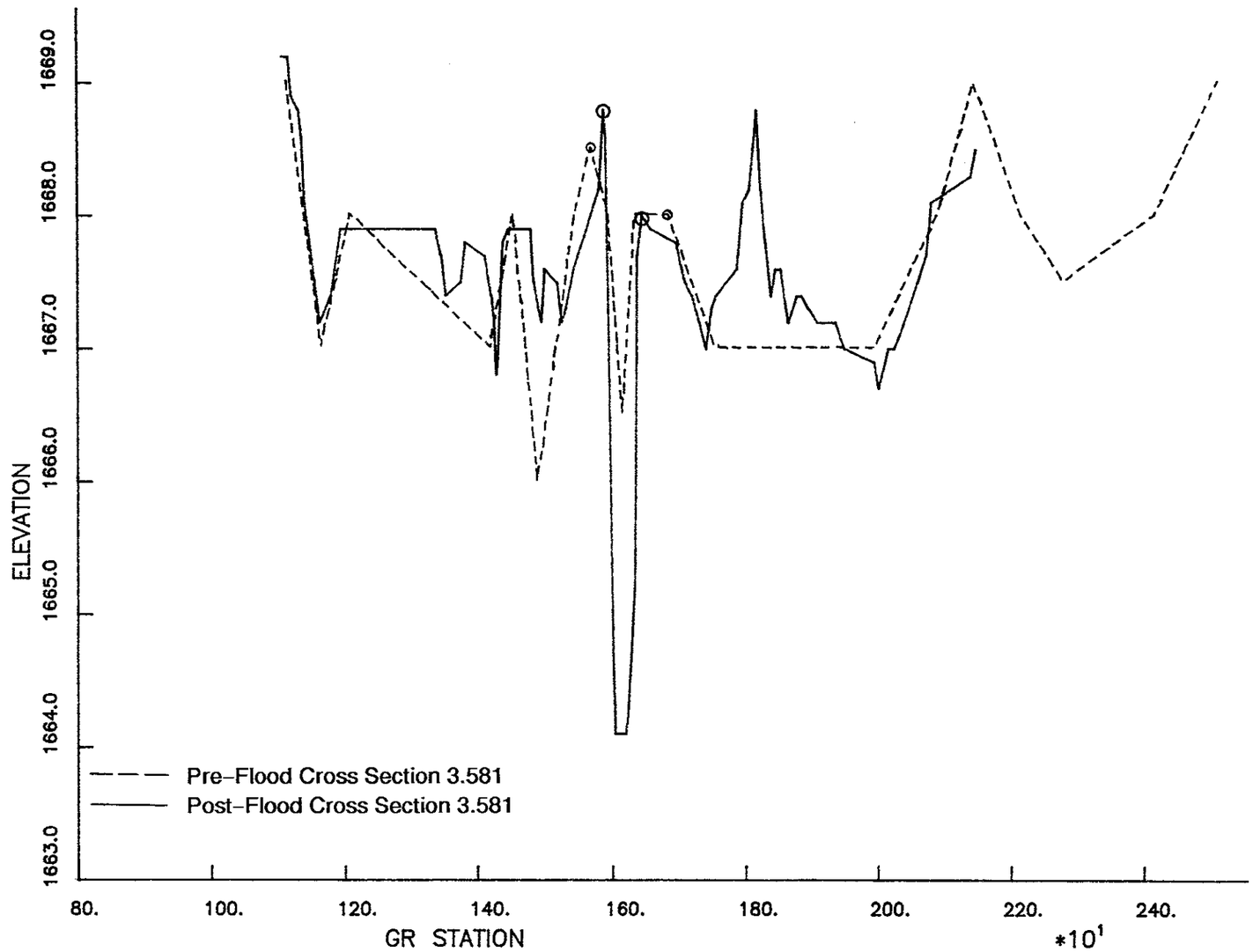
sla Simons, Li & Associates, Inc.

Figure A-6. Cross Section 3.443



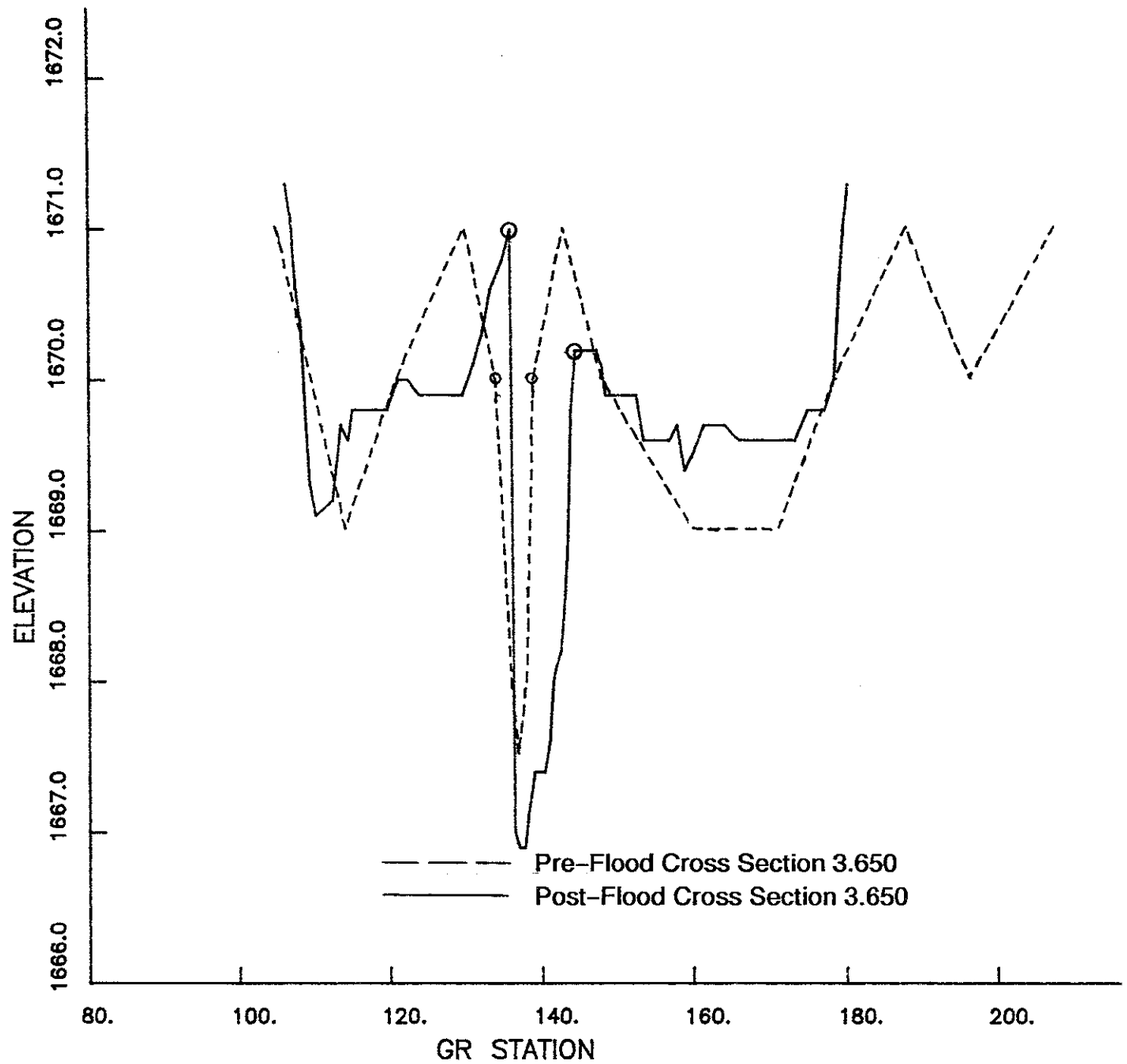
sla Simons, Li & Associates, Inc.

Figure A-7. Cross Section 3.500



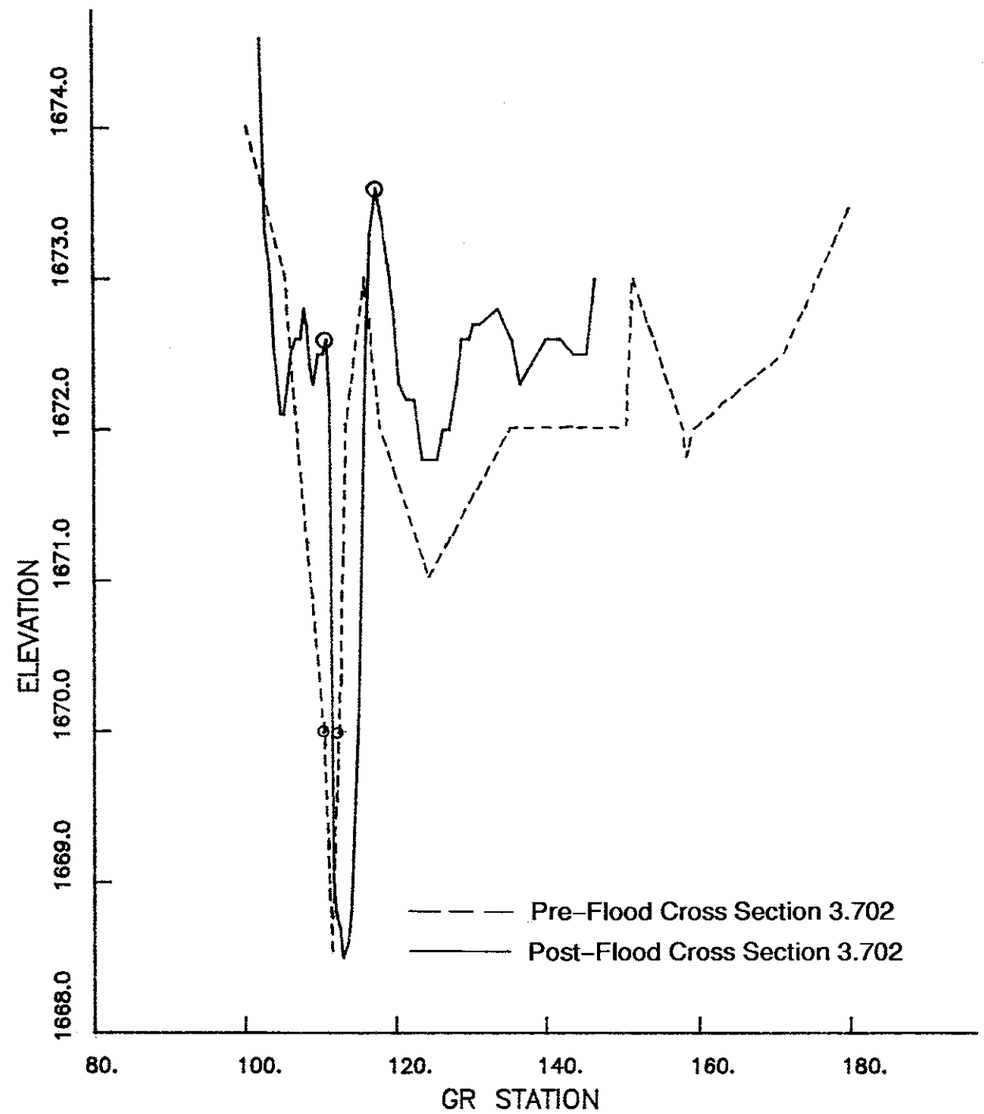
sla Simons, Li & Associates, Inc.

Figure A-8. Cross Section 3.581



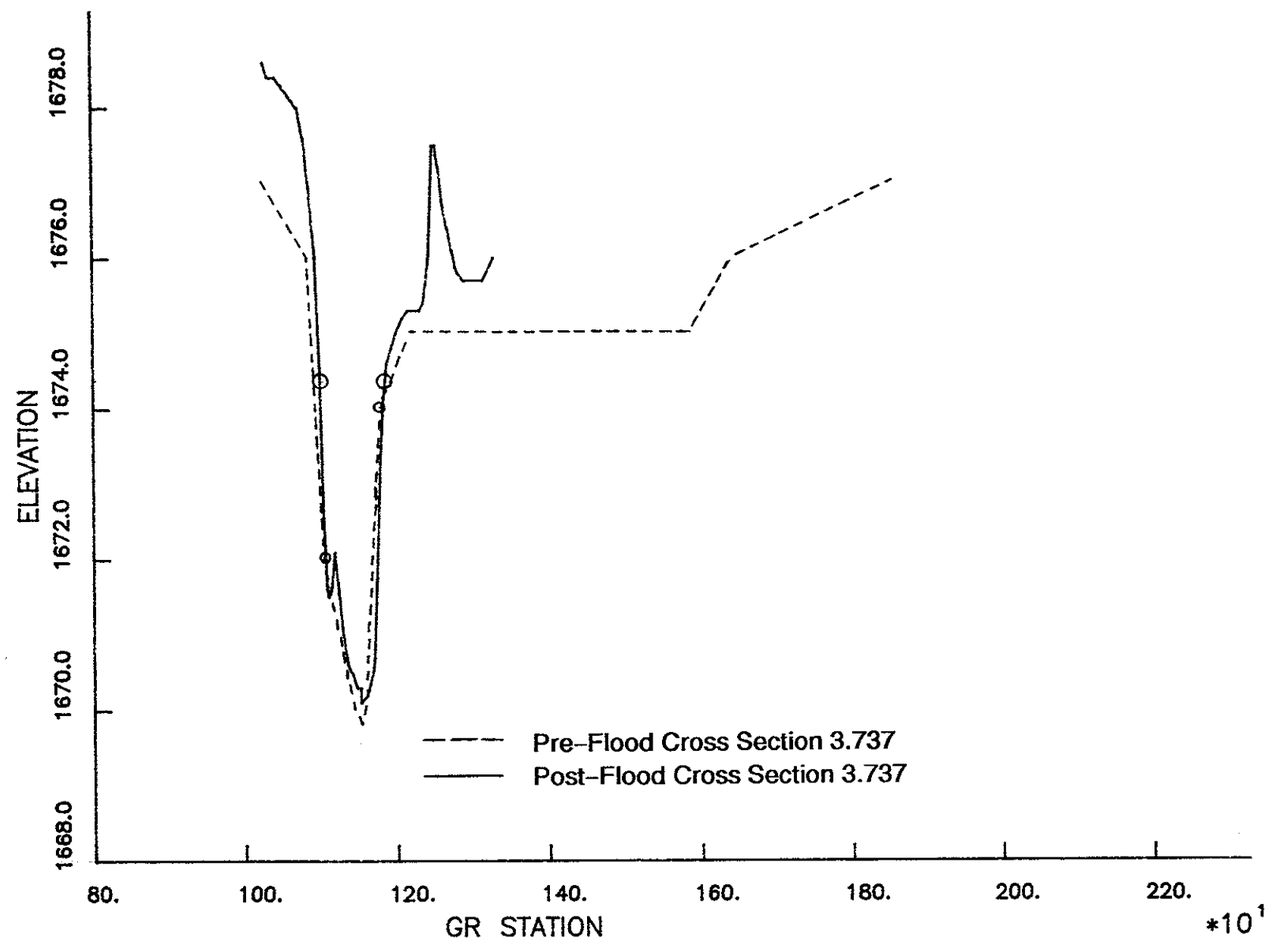
sla Simons, Li & Associates, Inc.

Figure A-9. Cross Section 3.650



sla SIMONS, LI & ASSOCIATES, INC.

Figure A-10. Cross Section 3.702



sla Simons, Li & Associates, Inc.

Figure A-11. Cross Section 3.737

APPENDIX B. SLAFWY1.DAT HEC-2 INPUT/OUTPUT LISTING

Simons, Li & Associates, Inc.

THIS RUN EXECUTED 1/16/91 12:56:18

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*****************************************
HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

ERROR CORR - 01,02,03
MODIFICATION -
*****************************************

T1      SIMONS, LI & ASSOCIATES, INC.
T2      WITWASH FLOODWAY ANALYSIS FOR FCDMC (PAZ-MC13)
T3      SLAFWY1.DAT

J1  ICHECK   INQ     NINV    IDIR    STRT    METRIC  HVINS   Q       WSEL    FQ

     0       2       0       0       0       0       0       0    1635.50    0

J2  NPROF    IPLOT   PRFVS   XSECV   XSECH   FN      ALLDC   IBW     CHNIM   ITRACE

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J3  VARIABLE CODES FOR SUMMARY PRINTOUT

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     12       5     33     53      54

J6  IHLEQ    ICOPY   SUBDIV  STRTDS  RMILE

     1

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QT        2    2275    2275
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GR	1647.1	1405.0	1646.7	1412.0	1646.5	1417.0	1646.5	1428.0	1646.5	1435.0
GR	1646.5	1484.0	1646.2	1487.0	1645.8	1492.0	1646.0	1507.0	1646.3	1515.0
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GR	1651.1	1834.0	1651.3	1841.0	1651.3	1864.0	1651.6	1884.0	1652.1	1895.0
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GR	1652.8	2608.0	1653.0	2611.0	1652.7	2614.0	1652.7	2655.0	1652.3	2662.0
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X1	3.355	85	1882	1953	480	410	430	0	0	0
GR	1657.4	1101.0	1657.1	1150.0	1656.9	1162.0	1656.8	1218.0	1656.4	1224.0
GR	1656.0	1228.0	1656.4	1233.0	1656.8	1239.0	1657.0	1243.0	1657.0	1254.0
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GR	1656.1	1305.0	1656.5	1345.0	1656.5	1359.0	1656.6	1372.0	1656.5	1632.0
GR	1656.3	1642.0	1656.1	1648.0	1656.6	1656.0	1656.6	1739.0	1656.2	1745.0
GR	1655.9	1752.0	1656.1	1759.0	1656.2	1767.0	1656.2	1844.0	1655.9	1853.0
GR	1656.0	1858.0	1656.2	1869.0	1656.5	1882.0	1656.4	1888.0	1656.2	1894.0
GR	1655.9	1901.0	1655.6	1901.0	1655.6	1906.0	1656.4	1911.0	1656.4	1915.0
GR	1655.7	1926.0	1655.6	1930.0	1656.6	1953.0	1656.5	1961.0	1656.3	1970.0
GR	1656.2	1994.0	1656.4	2017.0	1656.4	2085.0	1656.1	2093.0	1655.8	2099.0
GR	1655.8	2107.0	1656.1	2116.0	1656.2	2123.0	1656.0	2137.0	1656.2	2151.0
GR	1656.4	2156.0	1656.7	2176.0	1656.8	2246.0	1657.0	2255.0	1657.0	2259.0
GR	1656.9	2266.0	1656.7	2275.0	1656.1	2284.0	1655.5	2289.0	1655.2	2301.0
GR	1655.4	2307.0	1656.2	2314.0	1656.6	2319.0	1656.9	2344.0	1657.0	2358.0
GR	1657.2	2379.0	1657.0	2401.0	1656.8	2413.0	1656.9	2426.0	1656.7	2439.0
GR	1656.7	2468.0	1656.8	2490.0	1656.8	2521.0	1656.5	2536.0	1656.5	2547.0
GR	1656.6	2565.0	1656.6	2579.0	1656.5	2597.0	1656.4	2615.0	1656.4	2640.0
NH	5	0.060	1979	0.035	2009	0.060	2103	0.040	2277	0.060
NH	2673									
ET			9.1						1720.0	2080.0
X1	3.443	95	1979	2009	360	440	460	0	0	0
GR	1660.8	1031.0	1660.7	1048.0	1660.6	1061.0	1660.6	1255.0	1660.5	1268.0
GR	1660.1	1314.0	1660.5	1338.0	1660.1	1356.0	1659.7	1386.0	1659.8	1396.0
GR	1660.0	1411.0	1660.1	1471.0	1660.3	1485.0	1660.1	1511.0	1660.2	1563.0
GR	1660.4	1573.0	1660.3	1579.0	1659.9	1585.0	1659.8	1589.0	1660.1	1595.0
GR	1660.3	1601.0	1660.1	1604.0	1659.8	1609.0	1660.2	1615.0	1660.7	1643.0
GR	1660.5	1651.0	1660.5	1682.0	1660.3	1695.0	1660.3	1716.0	1660.1	1730.0
GR	1660.1	1793.0	1660.4	1836.0	1660.3	1850.0	1660.0	1873.0	1659.9	1883.0
GR	1659.9	1906.0	1660.2	1918.0	1660.5	1933.0	1660.6	1952.0	1660.3	1960.0
GR	1660.5	1968.0	1660.7	1979.0	1659.2	1982.0	1659.4	1997.0	1660.3	2002.0
GR	1660.6	2009.0	1661.0	2048.0	1660.9	2061.0	1660.6	2073.0	1660.3	2081.0
GR	1660.6	2090.0	1660.8	2103.0	1660.6	2109.0	1659.4	2115.0	1659.2	2123.0
GR	1659.2	2145.0	1659.5	2152.0	1659.9	2157.0	1660.3	2163.0	1660.6	2172.0
GR	1660.6	2201.0	1660.2	2207.0	1660.1	2213.0	1660.3	2221.0	1660.3	2235.0
GR	1660.1	2248.0	1660.0	2267.0	1660.2	2277.0	1660.4	2302.0	1660.4	2324.0
GR	1660.7	2337.0	1661.1	2344.0	1661.3	2354.0	1661.2	2366.0	1660.9	2377.0
GR	1660.7	2398.0	1660.5	2409.0	1660.5	2432.0	1660.3	2443.0	1660.1	2453.0
GR	1659.9	2465.0	1659.9	2477.0	1659.8	2488.0	1659.9	2500.0	1660.0	2512.0
GR	1660.3	2526.0	1660.4	2539.0	1660.4	2558.0	1660.7	2577.0	1660.9	2595.0

GR	1660.9	2648.0	1660.6	2658.0	1660.6	2662.0	1660.9	2665.0	1661.1	2673.0
NC	0.060	0.060	0.035							
ET			9.1						1585.0	1885.0
X1	3.500	73	1780	1849	340	320	290	0	0	0
GR	1663.1	1000.0	1663.3	1008.0	1663.5	1018.0	1663.8	1028.0	1663.8	1060.0
GR	1663.4	1093.0	1663.7	1113.0	1663.7	1323.0	1663.3	1373.0	1663.3	1443.0
GR	1663.5	1455.0	1663.6	1468.0	1663.6	1530.0	1663.9	1547.0	1664.1	1555.0
GR	1664.0	1592.0	1664.1	1646.0	1664.2	1659.0	1664.2	1692.0	1663.9	1694.0
GR	1664.2	1701.0	1664.5	1725.0	1664.5	1756.0	1664.7	1766.0	1664.8	1775.0
GR	1664.9	1780.0	1663.9	1782.0	1661.9	1784.0	1661.1	1789.0	1661.1	1798.0
GR	1661.5	1804.0	1661.6	1829.0	1662.0	1836.0	1662.8	1840.0	1663.9	1845.0
GR	1664.8	1849.0	1664.5	1852.0	1664.5	1868.0	1664.3	1875.0	1664.0	1880.0
GR	1664.2	1884.0	1664.4	1890.0	1664.0	1894.0	1663.4	1898.0	1664.3	1903.0
GR	1664.3	1924.0	1664.1	1931.0	1663.5	1937.0	1663.6	1949.0	1664.0	1956.0
GR	1664.3	1975.0	1664.1	1979.0	1663.7	1983.0	1663.9	1991.0	1663.8	2038.0
GR	1663.6	2044.0	1663.6	2055.0	1664.0	2068.0	1664.2	2084.0	1664.5	2118.0
GR	1664.5	2130.0	1664.6	2145.0	1664.2	2167.0	1664.2	2180.0	1664.4	2197.0
GR	1664.5	2208.0	1664.3	2215.0	1664.2	2287.0	1664.0	2305.0	1664.0	2314.0
GR	1664.1	2329.0	1664.3	2334.0	1664.5	2339.0				
ET			9.1						1490.0	1758.0
X1	3.581	75	1588	1645	410	380	400	0	0	0
GR	1669.2	1109.0	1669.2	1117.0	1668.9	1122.0	1668.8	1132.0	1668.6	1137.0
GR	1668.1	1141.0	1667.2	1163.0	1667.4	1180.0	1667.9	1195.0	1667.9	1338.0
GR	1667.7	1347.0	1667.4	1354.0	1667.5	1376.0	1667.8	1383.0	1667.7	1412.0
GR	1667.4	1422.0	1667.2	1426.0	1666.8	1429.0	1666.9	1431.0	1667.4	1435.0
GR	1667.8	1439.0	1667.9	1447.0	1667.9	1480.0	1667.5	1484.0	1667.2	1495.0
GR	1667.6	1500.0	1667.5	1518.0	1667.2	1525.0	1667.3	1531.0	1667.6	1543.0
GR	1668.2	1581.0	1668.8	1588.0	1668.6	1591.0	1664.7	1601.0	1664.1	1604.0
GR	1664.1	1619.0	1664.3	1623.0	1664.7	1628.0	1665.2	1633.0	1665.5	1634.0
GR	1667.7	1638.0	1668.0	1645.0	1667.9	1659.0	1667.8	1696.0	1667.5	1710.0
GR	1667.4	1720.0	1667.2	1731.0	1667.0	1741.0	1667.3	1749.0	1667.4	1756.0
GR	1667.6	1787.0	1668.1	1796.0	1668.2	1806.0	1668.8	1817.0	1668.2	1823.0
GR	1667.8	1830.0	1667.4	1838.0	1667.6	1845.0	1667.6	1853.0	1667.2	1864.0
GR	1667.4	1877.0	1667.4	1884.0	1667.3	1895.0	1667.2	1908.0	1667.2	1935.0
GR	1667.0	1950.0	1666.9	1994.0	1666.7	2001.0	1667.0	2016.0	1667.0	2024.0
GR	1667.1	2033.0	1667.7	2073.0	1668.1	2081.0	1668.3	2140.0	1668.5	2148.0
ET			9.1						1330.0	1475.0
X1	3.650	54	1359	1445	280	360	380	0	0	0
GR	1671.3	1061.0	1671.1	1068.0	1670.6	1075.0	1670.4	1081.0	1669.8	1087.0
GR	1669.3	1093.0	1669.1	1101.0	1669.2	1123.0	1669.7	1134.0	1669.6	1144.0
GR	1669.8	1150.0	1669.8	1196.0	1670.0	1211.0	1670.0	1224.0	1669.9	1240.0
GR	1669.9	1296.0	1670.1	1310.0	1670.3	1322.0	1670.6	1333.0	1670.8	1349.0
GR	1671.0	1359.0	1667.0	1364.0	1666.9	1370.0	1666.9	1377.0	1667.1	1381.0
GR	1667.4	1390.0	1667.4	1403.0	1667.6	1410.0	1668.0	1415.0	1668.1	1419.0
GR	1668.2	1425.0	1668.6	1431.0	1668.9	1434.0	1669.8	1439.0	1670.2	1445.0
GR	1670.2	1473.0	1670.1	1480.0	1669.9	1486.0	1669.9	1526.0	1669.6	1536.0
GR	1669.6	1569.0	1669.7	1579.0	1669.4	1589.0	1669.5	1599.0	1669.7	1614.0
GR	1669.7	1641.0	1669.6	1660.0	1669.6	1732.0	1669.8	1749.0	1669.8	1771.0
GR	1670.0	1784.0	1670.7	1792.0	1671.0	1796.0	1671.3	1803.0		

ET			9.1						1085.0	1200.0
X1	3.702	59	1109	1175	330	220	270	0	0	0
GR	1676.6	1000.0	1676.6	1009.0	1676.4	1011.0	1675.4	1017.0	1674.6	1022.0
GR	1673.3	1028.0	1673.1	1034.0	1672.5	1040.0	1672.1	1048.0	1672.1	1052.0
GR	1672.3	1057.0	1672.5	1062.0	1672.6	1069.0	1672.6	1075.0	1672.8	1080.0
GR	1672.7	1083.0	1672.4	1088.0	1672.3	1092.0	1672.5	1098.0	1672.5	1104.0
GR	1672.6	1109.0	1672.2	1113.0	1669.0	1117.0	1668.8	1120.0	1668.7	1125.0
GR	1668.5	1129.0	1668.6	1136.0	1668.8	1140.0	1670.1	1150.0	1671.0	1154.0
GR	1672.0	1158.0	1672.6	1161.0	1673.3	1167.0	1673.6	1175.0	1673.4	1182.0
GR	1673.1	1190.0	1672.8	1197.0	1672.3	1205.0	1672.2	1215.0	1672.2	1225.0
GR	1671.8	1236.0	1671.8	1256.0	1672.0	1264.0	1672.0	1272.0	1672.3	1282.0
GR	1672.6	1289.0	1672.6	1299.0	1672.7	1305.0	1672.7	1314.0	1672.8	1337.0
GR	1672.6	1356.0	1672.3	1367.0	1672.4	1378.0	1672.5	1390.0	1672.6	1401.0
GR	1672.6	1420.0	1672.5	1437.0	1672.5	1454.0	1673.0	1465.0		
NC	0.060	0.060	0.030	.3	.5					
ET			9.1						1075.0	1175.0
X1	3.737	48	1101	1188	200	280	250	0.84	0	0
GR	1678.6	1028.0	1678.4	1035.0	1678.4	1044.0	1678.3	1052.0	1678.2	1059.0
GR	1678.1	1066.0	1678.0	1073.0	1677.6	1081.0	1677.0	1087.0	1676.1	1095.0
GR	1674.5	1101.0	1672.6	1105.0	1671.6	1109.0	1671.5	1111.0	1671.6	1115.0
GR	1672.1	1119.0	1671.5	1125.0	1671.0	1130.0	1670.6	1136.0	1670.5	1141.0
GR	1670.3	1148.0	1670.3	1153.0	1670.1	1153.0	1670.2	1161.0	1670.4	1166.0
GR	1670.6	1170.0	1671.9	1175.0	1673.2	1179.0	1674.1	1183.0	1674.6	1188.0
GR	1674.8	1194.0	1675.0	1200.0	1675.2	1209.0	1675.3	1216.0	1675.3	1231.0
GR	1675.4	1236.0	1676.0	1243.0	1677.0	1247.0	1677.5	1249.0	1677.5	1253.0
GR	1677.2	1257.0	1676.7	1262.0	1676.4	1268.0	1676.1	1274.0	1675.8	1281.0
GR	1675.7	1289.0	1675.7	1314.0	1676.0	1329.0				
ET			9.1						1025.0	1120.0
X1	3.759	37	1028	1143	20	80	50	0.86	0	0
GR	1677.9	1000.0	1677.8	1011.0	1677.8	1023.0	1677.0	1028.0	1674.5	1033.0
GR	1672.8	1035.0	1673.1	1038.0	1673.3	1040.0	1673.6	1045.0	1673.6	1050.0
GR	1673.3	1056.0	1672.4	1061.0	1671.3	1068.0	1671.1	1072.0	1671.3	1079.0
GR	1671.3	1090.0	1671.2	1098.0	1670.8	1098.0	1670.9	1104.0	1670.9	1114.0
GR	1670.7	1120.0	1670.7	1126.0	1670.8	1131.0	1672.1	1135.0	1673.4	1138.0
GR	1675.1	1140.0	1676.9	1141.0	1677.4	1143.0	1677.8	1147.0	1678.1	1154.0
GR	1678.1	1166.0	1678.2	1179.0	1678.1	1190.0	1678.0	1201.0	1678.1	1236.0
GR	1678.0	1248.0	1677.9	1262.0						

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 2.942

3265 DIVIDED FLOW

2.942	3.10	1635.50	1635.46	1635.50	1635.84	.34	.00	.00	1635.00
2275.	480.	731.	1064.	150.	133.	229.	0.	0.	1635.00
.00	3.20	5.48	4.63	.050	.050	.050	.000	1632.40	1582.00
.024541	0.	0.	0.	0	4	0	.00	675.00	2424.00

CCHV= .100 CEHV= .300
*SECNO 3.056
3280 CROSS SECTION 3.06 EXTENDED .27 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.90

3.056	3.17	1641.67	1641.16	.00	1641.74	.07	5.88	.03	1640.80
2202.	1272.	362.	568.	557.	147.	344.	10.	13.	1640.70
.08	2.29	2.47	1.65	.060	.060	.060	.000	1638.50	1312.00
.006350	510.	600.	650.	10	12	0	.00	1236.52	2548.52

*SECNO 3.183

3265 DIVIDED FLOW

3.183	2.59	1647.59	1647.24	.00	1647.72	.12	5.96	.02	1647.00
2202.	1687.	365.	149.	610.	106.	84.	24.	29.	1647.00
.14	2.77	3.45	1.77	.060	.050	.060	.000	1645.00	1137.34
.012270	640.	640.	640.	7	13	0	.00	1019.77	2376.19

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1490 NH CARD USED
*SECNO 3.268

3265 DIVIDED FLOW

3280 CROSS SECTION 3.27 EXTENDED .15 FEET

3.268	1.64	1652.64	1652.50	.00	1652.77	.13	5.05	.00	1651.60
2202.	978.	591.	633.	454.	134.	353.	33.	43.	1651.60
.19	2.16	4.42	1.79	.060	.040	.055	.000	1651.00	1108.00
.009900	480.	450.	410.	5	14	0	.00	1569.06	2726.79

1490 NH CARD USED
*SECNO 3.355

3265 DIVIDED FLOW

3280 CROSS SECTION 3.36 EXTENDED .68 FEET

3.355	1.88	1657.08	1656.87	.00	1657.19	.11	4.42	.00	1656.50
2202.	908.	301.	993.	456.	71.	375.	43.	58.	1656.60
.23	1.99	4.25	2.65	.060	.035	.046	.000	1655.20	1151.19
.010012	480.	430.	410.	5	8	0	.00	1463.06	2640.00

1490 NH CARD USED
*SECNO 3.443

3265 DIVIDED FLOW

3280 CROSS SECTION 3.44 EXTENDED .14 FEET

3.443	1.74	1660.94	1660.74	.00	1661.04	.10	3.85	.00	1660.70
2202.	1133.	166.	903.	602.	36.	342.	51.	72.	1660.60
.28	1.88	4.55	2.64	.060	.035	.047	.000	1659.20	1031.00
.009031	360.	460.	440.	4	14	0	.00	1587.60	2666.60

*SECNO 3.500

3265 DIVIDED FLOW

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 3.50 EXTENDED 1.38 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.500	3.38	1664.48	1664.48	.00	1664.79	.30	1.90	.46	1664.90
2202.	936.	1071.	196.	551.	175.	163.	58.	83.	1664.80
.30	1.70	6.13	1.20	.060	.035	.060	.000	1661.10	1000.00
.005926	340.	290.	320.	0	12	0	.00	1221.89	2338.54

*SECNO 3.581

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.581	4.22	1668.32	1668.32	.00	1668.67	.35	2.39	.00	1668.80
2202.	393.	1045.	763.	267.	157.	395.	66.	93.	1668.00
.33	1.48	6.65	1.93	.060	.035	.060	.000	1664.10	1139.27
.005991	410.	400.	380.	0	8	0	.00	978.35	2140.67

*SECNO 3.650

3265 DIVIDED FLOW

3.650	3.60	1670.50	1670.47	.00	1670.94	.44	2.25	.03	1671.00
2202.	308.	1442.	452.	177.	223.	261.	72.	99.	1670.20
.35	1.74	6.45	1.73	.060	.035	.060	.000	1666.90	1077.73
.006538	280.	380.	360.	1	9	0	.00	682.14	1789.82

*SECNO 3.702

3265 DIVIDED FLOW

3280 CROSS SECTION 3.70 EXTENDED .48 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.702	4.98	1673.48	1673.48	.00	1674.04	.56	1.80	-.00	1672.60
2202.	157.	1414.	631.	77.	193.	289.	75.	102.	1673.60
.37	2.05	7.31	2.19	.060	.035	.060	.000	1668.50	1027.18
.006834	330.	270.	220.	0	12	0	.00	430.32	1465.00

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .300 CEHV= .500

*SECNO 3.737

3301 HV CHANGED MORE THAN HVINS

3.737	4.73	1674.83	1674.46	.00	1676.06	1.23	1.69	.34	1674.50
2202.	0.	2202.	0.	0.	247.	1.	78.	104.	1674.60
.37	.58	8.90	.50	.060	.030	.060	.000	1670.10	1088.28
.006535	200.	250.	280.	2	15	0	.00	79.90	1168.18

*SECNO 3.759

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.70

3.759	5.22	1675.92	1674.38	.00	1676.44	.52	.17	.21	1677.00
2202.	0.	2202.	0.	0.	380.	0.	78.	104.	1677.40
.38	.00	5.79	.00	.000	.030	.000	.000	1670.70	1025.95
.002248	20.	50.	80.	3	15	0	.00	94.84	1120.79

Simons, Li & Associates, Inc.

T1 SIMONS, LI & ASSOCIATES, INC.
T2 WITWASH FLOODWAY ANALYSIS FOR FCDMC (PAZ-MC13)
T3 SLAFWY1.DAT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	3	0	0	0	0	0	0	1635.93	0
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15	0	-1	0	0	0	-1	0	0	0

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 2

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 2.942

3470 ENCROACHMENT STATIONS= 1730.0 2260.0 TYPE= 1 TARGET= 530.000

2.942	3.53	1635.93	1635.63	1635.50	1636.18	.25	.00	.00	1635.00
2275.	860.	828.	587.	281.	178.	137.	0.	0.	1635.00
.00	3.06	4.66	4.27	.050	.050	.050	.000	1632.40	1730.00
.012125	0.	0.	0.	0	8	0	.00	530.00	2260.00

CCHV= .100 CEHV= .300
*SECNO 3.056

3470 ENCROACHMENT STATIONS= 1600.0 2000.0 TYPE= 1 TARGET= 400.000

3.056	3.38	1641.88	1641.27	1641.67	1642.06	.18	5.88	.01	1640.80
2202.	1573.	558.	71.	455.	169.	27.	8.	6.	1640.70
.05	3.46	3.29	2.59	.060	.060	.060	.000	1638.50	1600.00
.009302	510.	600.	650.	5	14	0	.00	400.00	2000.00

*SECNO 3.183

3470 ENCROACHMENT STATIONS= 1690.0 1955.0 TYPE= 1 TARGET= 265.000

3.183	3.48	1648.48	1647.93	1647.59	1648.79	.31	6.68	.04	1647.00
2202.	1134.	965.	103.	277.	192.	31.	16.	11.	1647.00
.09	4.09	5.01	3.32	.060	.050	.060	.000	1645.00	1690.00
.011728	640.	640.	640.	5	10	0	.00	265.00	1955.00

1490 NH CARD USED
*SECNO 3.268
3280 CROSS SECTION 3.27 EXTENDED .74 FEET

Simons, Li & Associates, Inc.

```
SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


3470 ENCROACHMENT STATIONS=    1730.0    1990.0  TYPE=     1  TARGET=     260.000
   3.268     2.44  1653.44  1653.10  1652.64  1653.89     .45     5.06      .04  1651.60
   2202.     309.    1349.     545.     87.     215.    162.      21.      13.   1651.60
     .11     3.56     6.29     3.37    .060     .040    .060     .000  1651.00  1730.00
 .010621     480.     450.     410.       4       14       0      .00   260.00  1990.00


1490 NH CARD USED
*SECNO 3.355
3280 CROSS SECTION      3.36 EXTENDED      1.54 FEET


3470 ENCROACHMENT STATIONS=    1740.0    2050.0  TYPE=     1  TARGET=     310.000
   3.355     2.74  1657.94  1657.48  1657.08  1658.28     .34     4.38      .01  1656.50
   2202.     880.     820.     501.     251.     132.    154.      26.      16.   1656.60
     .14     3.51     6.22     3.25    .060     .035    .060     .000  1655.20  1740.00
 .009425     480.     430.     410.       4       11       0      .00   310.00  2050.00


1490 NH CARD USED
*SECNO 3.443
3280 CROSS SECTION      3.44 EXTENDED      .79 FEET


3470 ENCROACHMENT STATIONS=    1720.0    2080.0  TYPE=     1  TARGET=     360.000
   3.443     2.69  1661.89  1661.50  1660.94  1662.20     .31     3.91      .00  1660.70
   2202.    1537.     459.     206.     436.      65.     78.      32.      19.   1660.60
     .16     3.53     7.06     2.62    .060     .035    .060     .000  1659.20  1720.00
 .010064     360.     460.     440.       4       15       0      .00   360.00  2080.00


*SECNO 3.500
3280 CROSS SECTION      3.50 EXTENDED      .72 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=    1585.0    1885.0  TYPE=     1  TARGET=     300.000
   3.500     4.12  1665.22  1665.22  1664.48  1665.99     .77     2.25      .52  1664.90
   2202.     387.    1760.      56.     185.     225.     30.      35.      22.   1664.80
     .18     2.09     7.81     1.87    .060     .035    .060     .000  1661.10  1585.00
 .007178     340.     290.     320.       0       11       0      .00   300.00  1885.00
```

Simons, Li & Associates, Inc.

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SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*SECNO 3.581
3280 CROSS SECTION      3.58 EXTENDED       .36 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     1490.0    1758.0  TYPE=      1  TARGET=      268.000
   3.581     4.76  1668.86  1668.86  1668.32  1669.62      .76     3.16     -.15  1668.80
   2202.     291.    1533.     378.     115.     187.     143.      39.      24.  1668.00
     .19     2.53     8.20     2.64     .060     .035     .060     .000  1664.10  1490.00
 .007902     410.     400.     380.        0        8        0      .00   268.00  1758.00


*SECNO 3.650
3280 CROSS SECTION      3.65 EXTENDED       .02 FEET


3470 ENCROACHMENT STATIONS=     1330.0    1475.0  TYPE=      1  TARGET=      145.000
   3.650     4.42  1671.32  1670.72  1670.50  1672.10      .78     2.47      .01  1671.00
   2202.      21.    2114.      67.      16.     293.      34.      43.      26.  1670.20
     .21     1.28     7.21     1.99     .060     .035     .060     .000  1666.90  1330.00
 .005768     280.     380.     360.        2       15        0      .00   145.00  1475.00


*SECNO 3.702
3280 CROSS SECTION      3.70 EXTENDED       .87 FEET


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     1085.0    1200.0  TYPE=      1  TARGET=      115.000
   3.702     5.37  1673.87  1673.87  1673.48  1675.17     1.30     2.77     -.54  1672.60
   2202.     104.    2062.      35.      34.     219.      17.      45.      27.  1673.60
     .22     3.08     9.42     2.02     .060     .035     .060     .000  1668.50  1085.00
 .010251     330.     270.     220.        0        8        0      .00   115.00  1200.00


CCHV=     .300 CEHV=     .500
*SECNO 3.737
```

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.86

3470 ENCROACHMENT STATIONS= 1075.0 1175.0 TYPE= 1 TARGET= 100.000

3.737	5.62	1675.72	1674.46	1674.83	1676.47	.76	1.14	.16	1674.50
2202.	2.	2186.	13.	2.	312.	11.	46.	27.	1674.60
.23	.94	7.00	1.22	.060	.030	.060	.000	1670.10	1085.48
.002960	200.	250.	280.	3	15	0	.00	89.52	1175.00

*SECNO 3.759

3470 ENCROACHMENT STATIONS= 1025.0 1120.0 TYPE= 1 TARGET= 95.000

3.759	5.53	1676.23	1674.38	1675.92	1676.68	.45	.11	.09	100000.00
2202.	0.	2202.	0.	0.	410.	0.	47.	28.	100000.00
.23	.00	5.37	.00	.000	.030	.000	.000	1670.70	1025.40
.001771	20.	50.	80.	2	14	0	.00	94.60	1120.00

Simons, Li & Associates, Inc.

THIS RUN EXECUTED 1/16/91 12:57:59

****
HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

ERROR CORR - 01,02,03
MODIFICATION -
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SLAFWY1.DAT

SUMMARY PRINTOUT

	SECNO	CWSEL	DEPTH	ELMIN	VLOB	VCH	VROB	HL	OLOSS	10*KS	K*CHSL	SSTA	ENDST
	2.942	1635.50	3.10	1632.40	3.20	5.48	4.63	.00	.00	245.41	.00	1582.00	2424.00
	2.942	1635.93	3.53	1632.40	3.06	4.66	4.27	.00	.00	121.25	.00	1730.00	2260.00
*	3.056	1641.67	3.17	1638.50	2.29	2.47	1.65	5.88	.03	63.50	10.17	1312.00	2548.52
	3.056	1641.88	3.38	1638.50	3.46	3.29	2.59	5.88	.01	93.02	10.17	1600.00	2000.00
	3.183	1647.59	2.59	1645.00	2.77	3.45	1.77	5.96	.02	122.70	10.16	1137.34	2376.19
	3.183	1648.48	3.48	1645.00	4.09	5.01	3.32	6.68	.04	117.28	10.16	1690.00	1955.00
	3.268	1652.64	1.64	1651.00	2.16	4.42	1.79	5.05	.00	99.00	13.33	1108.00	2726.79
	3.268	1653.44	2.44	1651.00	3.56	6.29	3.37	5.06	.04	106.21	13.33	1730.00	1990.00
	3.355	1657.08	1.88	1655.20	1.99	4.25	2.65	4.42	.00	100.12	9.77	1151.19	2640.00
	3.355	1657.94	2.74	1655.20	3.51	6.22	3.25	4.38	.01	94.25	9.77	1740.00	2050.00
	3.443	1660.94	1.74	1659.20	1.88	4.55	2.64	3.85	.00	90.31	8.70	1031.00	2666.60
	3.443	1661.89	2.69	1659.20	3.53	7.06	2.62	3.91	.00	100.64	8.70	1720.00	2080.00
*	3.500	1664.48	3.38	1661.10	1.70	6.13	1.20	1.90	.46	59.26	6.55	1000.00	2338.54
*	3.500	1665.22	4.12	1661.10	2.09	7.81	1.87	2.25	.52	71.78	6.55	1585.00	1885.00
*	3.581	1668.32	4.22	1664.10	1.48	6.65	1.93	2.39	.00	59.91	7.50	1139.27	2140.67
*	3.581	1668.86	4.76	1664.10	2.53	8.20	2.64	3.16	-.15	79.02	7.50	1490.00	1758.00
	3.650	1670.50	3.60	1666.90	1.74	6.45	1.73	2.25	.03	65.38	7.37	1077.73	1789.82
	3.650	1671.32	4.42	1666.90	1.28	7.21	1.99	2.47	.01	57.68	7.37	1330.00	1475.00
*	3.702	1673.48	4.98	1668.50	2.05	7.31	2.19	1.80	-.00	68.34	5.93	1027.18	1465.00
*	3.702	1673.87	5.37	1668.50	3.08	9.42	2.02	2.77	-.54	102.51	5.93	1085.00	1200.00
	3.737	1674.83	4.73	1670.10	.58	8.90	.50	1.69	.34	65.35	6.40	1088.28	1168.18
*	3.737	1675.72	5.62	1670.10	.94	7.00	1.22	1.14	.16	29.60	6.40	1085.48	1175.00

Simons, Li & Associates, Inc.

	SECNO	CWSEL	DEPTH	ELMIN	VLOB	VCH	VROB	HL	OLOSS	10*KS	K*CHSL	SSTA	ENDST
*	3.759	1675.92	5.22	1670.70	.00	5.79	.00	.17	.21	22.48	12.00	1025.95	1120.79
	3.759	1676.23	5.53	1670.70	.00	5.37	.00	.11	.09	17.71	12.00	1025.40	1120.00

SLAFWY1.DAT

Simons, Li & Associates, Inc.

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
	2.942	1635.50	.00	1635.84	675.00	480.39	731.08	1063.53	.00	.00	2064.00	2167.00	.00
	2.942	1635.93	.43	1636.18	530.00	860.02	828.44	586.55	530.00	1730.00	2064.00	2167.00	2260.00
*	3.056	1641.67	.00	1641.74	1236.52	1272.31	362.01	567.69	.00	.00	1873.00	1977.00	.00
	3.056	1641.88	.21	1642.06	400.00	1572.77	558.18	71.05	400.00	1600.00	1873.00	1977.00	2000.00
	3.183	1647.59	.00	1647.72	1019.77	1687.41	365.45	149.14	.00	.00	1836.00	1934.00	.00
	3.183	1648.48	.88	1648.79	265.00	1133.80	965.28	102.92	265.00	1690.00	1836.00	1934.00	1955.00
	3.268	1652.64	.00	1652.77	1569.06	978.42	590.72	632.85	.00	.00	1782.00	1884.00	.00
	3.268	1653.44	.80	1653.89	260.00	308.51	1348.81	544.68	260.00	1730.00	1782.00	1884.00	1990.00
	3.355	1657.08	.00	1657.19	1463.06	908.16	300.72	993.11	.00	.00	1882.00	1953.00	.00
	3.355	1657.94	.86	1658.28	310.00	880.43	820.36	501.21	310.00	1740.00	1882.00	1953.00	2050.00
	3.443	1660.94	.00	1661.04	1587.60	1133.21	165.82	902.97	.00	.00	1979.00	2009.00	.00
	3.443	1661.89	.95	1662.20	360.00	1537.13	459.01	205.86	360.00	1720.00	1979.00	2009.00	2080.00
*	3.500	1664.48	.00	1664.79	1221.89	935.54	1070.69	195.77	.00	.00	1780.00	1849.00	.00
*	3.500	1665.22	.74	1665.99	300.00	386.79	1759.52	55.69	300.00	1585.00	1780.00	1849.00	1885.00
*	3.581	1668.32	.00	1668.67	978.35	393.46	1045.22	763.31	.00	.00	1588.00	1645.00	.00
*	3.581	1668.86	.54	1669.62	268.00	291.02	1533.04	377.94	268.00	1490.00	1588.00	1645.00	1758.00
	3.650	1670.50	.00	1670.94	682.14	308.29	1441.55	452.16	.00	.00	1359.00	1445.00	.00
	3.650	1671.32	.82	1672.10	145.00	21.01	2114.00	66.98	145.00	1330.00	1359.00	1445.00	1475.00
*	3.702	1673.48	.00	1674.04	430.32	157.12	1413.61	631.27	.00	.00	1109.00	1175.00	.00
*	3.702	1673.87	.39	1675.17	115.00	104.24	2062.42	35.34	115.00	1085.00	1109.00	1175.00	1200.00
	3.737	1674.83	.00	1676.06	79.90	.10	2201.56	.33	.00	.00	1089.32	1162.40	.00
*	3.737	1675.72	.89	1676.47	89.52	2.20	2186.37	13.43	100.00	1075.00	1089.32	1162.40	1175.00
*	3.759	1675.92	.00	1676.44	94.84	.00	2202.00	.00	.00	.00	1024.08	1122.98	.00
	3.759	1676.23	.31	1676.68	94.60	.00	2202.00	.00	95.00	1025.00	1024.08	1122.98	1120.00

Simons, Li & Associates, Inc.

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=     3.056  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3.500  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.500  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     3.581  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.581  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3.581  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.581  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     3.702  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.702  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3.702  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.702  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     3.737  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     3.759  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

Simons, Li & Associates, Inc.

FLOODWAY DATA, SLAFWY1.DAT
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
2.942	530.	596.	3.8	1635.9	1635.5	.4
3.056	400.	651.	3.4	1641.9	1641.7	.2
3.183	265.	501.	4.4	1648.5	1647.6	.9
3.268	260.	463.	4.8	1653.4	1652.6	.8
3.355	310.	537.	4.1	1657.9	1657.1	.8
3.443	360.	579.	3.8	1661.9	1660.9	1.0
3.500	300.	441.	5.0	1665.2	1664.5	.7
3.581	268.	445.	4.9	1668.9	1668.3	.6
3.650	145.	343.	6.4	1671.3	1670.5	.8
3.702	115.	270.	8.1	1673.9	1673.5	.4
3.737	90.	326.	6.8	1675.7	1674.8	.9
3.759	95.	410.	5.4	1676.2	1675.9	.3

APPENDIX C. W-WASH2A.DAT HEC-2 INPUT/OUTPUT LISTING

Simons, Li & Associates, Inc.

THIS RUN EXECUTED 1/16/91 9:22: 2

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*****************************************************
 HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989


 ERROR CORR -  01,02,03
 MODIFICATION -
*****************************************************


T1      WITTMANN AREA DRAINAGE MASTER STUDY
T2      100-YEAR STORM EVENT
T3      W-WASH2A.DAT          WLB'S 100-YR FLOODPLAIN RUN

J1  ICHECK   INQ     NINV    IDIR    STRT    METRIC  HVINS   Q       WSEL    FQ

    -10      2       0       0       0       0       .5      0       1629.89 0

J2  NPROF    IPLOT   PRFVS   XSECV   XSECH   FN      ALLDC   IBW     CHNIM   ITRACE

    1        0       -1      0       0       0       -1      0       0       0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38       1       55      26      56      13      14      15      8       4
    53       54      0       38      1       2       3       11      12      42
    5        33      39      67      68      200

J5  LPRNT    NUMSEC                  ********REQUESTED SECTION NUMBERS********

    -10      -10
```

Simons, Li & Associates, Inc.

T1 WITTMANN ADMS
T2 100-YEAR STORM EVENT
T3 W-WASH2A.DAT WLB'S 100-YR FLOODWAY RUN

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	3	0	0	0	0	.5	0	1630.29	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15	0	-1	0	0	0	-1	0	0	0

Simons, Li & Associates, Inc.

THIS RUN EXECUTED 1/16/91 9:22:41

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HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

ERROR CORR - 01,02,03
MODIFICATION -

****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

W-WASH2A.DAT

SUMMARY PRINTOUT

	SECNO	CWSEL	VLOB	VCH	VROB	QLOB	QCH	QROB	DEPTH	TOPWID	SSTA	ENDST
	2.830	1629.89	2.69	2.26	.00	1326.38	948.62	.00	1.89	1010.33	4254.85	5294.60
	2.830	1630.29	2.92	3.44	.00	527.99	1747.01	.00	2.29	560.00	4600.00	5160.00
	2.942	1635.51	2.71	2.90	3.69	108.87	856.13	1310.00	2.51	727.76	4488.50	5411.42
	2.942	1635.93	.00	3.12	4.27	.00	1439.39	835.61	2.93	527.03	4670.00	5200.00
	3.056	1641.30	.00	2.57	1.95	.00	1726.81	475.18	2.30	1010.40	4779.26	5911.66
	3.056	1641.49	.00	3.30	.00	.00	2202.00	.00	2.49	500.00	4890.00	5390.00
	3.183	1647.36	2.52	3.90	2.15	1049.07	475.11	677.82	2.86	1241.46	4386.61	5628.07
	3.183	1647.96	2.42	4.86	3.73	356.40	881.02	964.58	3.46	400.00	4800.00	5200.00
	3.268	1652.22	2.00	4.20	1.44	970.80	1033.89	197.31	2.72	1053.21	4398.58	5838.13
	3.268	1652.69	2.13	5.14	2.48	276.65	1579.93	345.42	3.19	400.00	4800.00	5200.00
	3.355	1656.97	2.15	3.88	2.10	1039.25	508.29	654.46	1.97	1314.22	4284.35	5617.80
	3.355	1657.49	2.87	4.66	3.14	487.76	876.10	838.14	2.49	450.00	4775.00	5225.00
	3.443	1660.65	1.87	2.34	1.54	1476.99	270.06	454.95	1.65	1415.41	4099.70	5621.60
	3.443	1661.48	2.52	3.73	1.84	1104.65	818.99	278.36	2.48	550.00	4650.00	5200.00
*	3.500	1664.01	3.41	.99	2.29	1810.60	9.09	382.31	2.31	860.94	4463.02	5751.45
*	3.500	1664.85	3.94	3.14	3.18	1263.58	289.81	648.61	3.15	513.81	4775.00	5310.00
*	3.581	1668.39	2.13	2.31	2.39	878.50	160.25	1163.25	2.39	970.97	4515.14	5496.69
*	3.581	1669.10	3.19	3.78	3.15	884.08	568.40	749.51	3.10	400.00	4800.00	5200.00
	3.650	1670.78	1.95	5.25	2.55	392.24	598.80	1210.96	3.28	677.55	4689.76	5415.00
	3.650	1671.72	2.66	7.79	3.06	378.08	1255.80	568.12	4.22	300.00	4850.00	5150.00
*	3.702	1672.94	4.12	9.49	3.34	307.11	700.35	1194.54	4.44	366.49	4940.88	5310.00
*	3.702	1673.68	3.59	7.76	3.32	410.31	687.08	1104.61	5.18	240.00	4935.00	5175.00

	SECNO	CWSEL	VLOB	VCH	VROB	QLOB	QCH	QROB	DEPTH	TOPWID	SSTA	ENDST
	3.737	1674.30	3.07	8.85	.80	40.62	2159.92	1.45	4.50	98.55	4938.50	5037.04
	3.737	1674.45	3.22	8.43	.97	46.60	2151.51	3.89	4.65	102.94	4940.00	5042.94
*	3.759	1674.94	.00	7.95	.00	.00	2202.00	.00	4.44	96.49	4945.58	5042.07
*	3.759	1674.89	.00	8.10	.00	.00	2202.00	.00	4.39	95.56	4946.11	5041.67

W-WASH2A.DAT

Simons, Li & Associates, Inc.

SUMMARY PRINTOUT

	SECNO	OWSEL	CRIWS	EG	HL	OLOSS	ELMIN	10*KS	K*CHSL	XLCH	SHEAR	FRCH
	2.830	1629.89	1629.42	1629.99	.00	.00	1628.00	73.97	.00	.00	.37	.44
	2.830	1630.29	1629.83	1630.46	.00	.00	1628.00	93.23	.00	.00	.77	.53
	2.942	1635.51	1635.19	1635.69	5.68	.02	1633.00	121.08	8.47	590.00	.53	.61
	2.942	1635.93	1635.46	1636.13	5.66	.01	1633.00	96.77	8.47	590.00	.66	.53
	3.056	1641.30	1640.88	1641.40	5.70	.01	1639.00	72.11	10.00	600.00	.46	.45
	3.056	1641.49	1641.02	1641.66	5.52	.00	1639.00	84.92	10.00	600.00	.71	.50
	3.183	1647.36	1647.13	1647.48	6.08	.01	1644.50	133.03	8.21	670.00	1.01	.62
	3.183	1647.96	1647.52	1648.22	6.53	.03	1644.50	121.15	8.21	670.00	1.37	.64
	3.268	1652.22	1651.89	1652.38	4.89	.01	1649.50	85.56	11.11	450.00	1.01	.54
	3.268	1652.69	1652.34	1653.01	4.77	.02	1649.50	95.25	11.11	450.00	1.40	.59
	3.355	1656.97	1656.72	1657.08	4.69	.01	1655.00	133.60	11.96	460.00	.99	.63
	3.355	1657.49	1657.11	1657.71	4.69	.01	1655.00	120.89	11.96	460.00	1.29	.63
	3.443	1660.65	1660.12	1660.71	3.62	.01	1659.00	68.55	8.60	465.00	.40	.43
	3.443	1661.48	1660.85	1661.61	3.90	.01	1659.00	74.27	8.60	465.00	.81	.50
*	3.500	1664.01	1663.63	1664.18	3.44	.03	1661.70	170.46	8.85	305.00	.08	.64
*	3.500	1664.85	1664.43	1665.05	3.42	.02	1661.70	158.61	8.85	305.00	.73	.64
*	3.581	1668.39	1667.86	1668.47	4.29	.01	1666.00	71.35	10.24	420.00	.27	.52
*	3.581	1669.10	1668.41	1669.27	4.22	.00	1666.00	72.41	10.24	420.00	.59	.58
	3.650	1670.78	1670.34	1670.97	2.46	.03	1667.50	66.87	4.11	365.00	.95	.61
	3.650	1671.72	1671.63	1672.32	2.92	.13	1667.50	93.21	4.11	365.00	1.87	.76
*	3.702	1672.94	1672.94	1673.52	2.09	.12	1668.50	88.79	3.64	275.00	2.05	.87
*	3.702	1673.68	1673.18	1674.09	1.76	.02	1668.50	46.68	3.64	275.00	1.29	.65
	3.737	1674.30	1674.02	1675.50	1.67	.31	1669.80	90.80	7.03	185.00	1.84	.86
	3.737	1674.45	1674.04	1675.53	1.10	.33	1669.80	77.72	7.03	185.00	1.65	.81
*	3.759	1674.94	1674.50	1675.92	.36	.06	1670.50	15.96	6.09	115.00	.29	.83
*	3.759	1674.89	1674.51	1675.91	.36	.02	1670.50	16.77	6.09	115.00	.30	.85

SUMMARY OF ERRORS AND SPECIAL NOTES

```
WARNING SECNO=     3.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.500  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     3.581  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.581  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3.702  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.702  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=     3.702  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     3.759  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.759  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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Simons, Li & Associates, Inc.

FLOODWAY DATA, W-WASH2A.DAT
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
2.830	560.	689.	3.3	1630.3	1629.9	.4
2.942	530.	656.	3.5	1635.9	1635.5	.4
3.056	500.	666.	3.3	1641.5	1641.3	.2
3.183	400.	587.	3.8	1648.0	1647.4	.6
3.268	400.	576.	3.8	1652.7	1652.2	.5
3.355	450.	625.	3.5	1657.5	1657.0	.5
3.443	550.	809.	2.7	1661.5	1660.7	.8
3.500	535.	617.	3.6	1664.8	1664.0	.8
3.581	400.	666.	3.3	1669.1	1668.4	.7
3.650	300.	489.	4.5	1671.7	1670.8	.9
3.702	240.	535.	4.1	1673.7	1672.9	.8
3.737	103.	274.	8.0	1674.4	1674.3	.1
3.759	96.	272.	8.1	1674.9	1674.9	.0

APPENDIX D. WLBFWY1.DAT HEC-2 INPUT/OUTPUT LISTING

THIS RUN EXECUTED 1/16/91 13: 7:58

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*****************************************************
 HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989


 ERROR CORR - 01,02,03
 MODIFICATION -
*****************************************************


T1      SIMONS, LI & ASSOCIATES, INC.
T2      WITWASH FLOODWAY ANALYSIS FOR FCDMC (PAZ-MC13)
T3      ADMS FLOODWAY COMPARISON

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0        0   1635.50       0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1        0        0        0       -1        0        0        0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    110      200       38        1        8       42       55       26       56       11
     12        5       33       53       54

J6  IHLEQ     ICOPY    SUBDIV   STRTDS   RMILE

      1


NC    0.050    0.050    0.050      0.1      0.3
QT        2     2275     2275
ET                       9.1                                                        1730.0   2260.0
X1    2.942       77     2064     2167        0        0        0        0        0        0
GR   1635.8   1461.0   1635.5   1582.0   1634.0   1589.0   1634.0   1591.0   1635.0   1593.0
GR   1635.5   1597.0   1635.5   1649.0   1635.7   1702.0   1635.5   1764.0   1635.4   1774.0
GR   1635.1   1786.0   1635.0   1796.0   1635.1   1809.0   1635.3   1832.0   1635.2   1888.0
GR   1634.9   1896.0   1634.8   1912.0   1634.6   1917.0   1634.3   1924.0   1634.5   1931.0
GR   1634.8   1940.0   1635.0   1955.0   1635.0   2064.0   1634.4   2069.0   1633.6   2070.0
GR   1632.5   2074.0   1632.4   2079.0   1633.2   2082.0   1633.9   2085.0   1634.2   2089.0
GR   1634.7   2094.0   1634.6   2096.0   1633.3   2100.0   1632.9   2102.0   1633.8   2106.0
GR   1634.8   2110.0   1634.8   2122.0   1634.5   2125.0   1633.1   2129.0   1634.0   2133.0
GR   1635.0   2140.0   1635.0   2145.0   1634.3   2150.0   1634.6   2154.0   1634.9   2160.0
GR   1635.0   2167.0   1634.9   2180.0   1634.0   2185.0   1633.6   2187.0   1634.3   2190.0
GR   1634.6   2193.0   1634.1   2197.0   1633.4   2199.0   1634.4   2204.0   1634.8   2207.0
GR   1634.7   2221.0   1634.3   2228.0   1634.4   2277.0   1634.6   2287.0   1634.6   2316.0
GR   1634.2   2320.0   1633.6   2323.0   1634.2   2327.0   1634.9   2333.0   1634.6   2376.0
GR   1635.0   2404.0   1635.4   2416.0   1635.5   2424.0   1635.7   2528.0   1635.7   2529.0
GR   1636.2   2574.0   1636.2   2586.0   1636.4   2605.0   1636.4   2649.0   1636.5   2660.0
GR   1636.7   2674.0   1637.0   2685.0
```

NC	0.060	0.060	0.060	0.1	0.3					
QT	2	2202	2202							
ET			9.1						1510.0	2010.0
X1	3.056	69	1873	1977	510	650	600	0	0	0
GR	1641.4	1312.0	1641.3	1398.0	1641.2	1411.0	1641.2	1446.0	1641.0	1455.0
GR	1640.9	1588.0	1640.0	1613.0	1638.7	1624.0	1640.0	1629.0	1640.8	1639.0
GR	1640.8	1648.0	1640.6	1657.0	1640.6	1724.0	1639.8	1729.0	1639.0	1732.0
GR	1638.5	1735.0	1639.7	1746.0	1640.0	1748.0	1640.3	1850.0	1640.5	1867.0
GR	1640.8	1873.0	1640.7	1877.0	1640.7	1880.0	1640.1	1885.0	1639.4	1890.0
GR	1639.4	1897.0	1639.9	1901.0	1640.6	1910.0	1640.6	1950.0	1640.3	1954.0
GR	1639.1	1956.0	1639.3	1958.0	1640.2	1962.0	1640.1	1967.0	1639.8	1969.0
GR	1640.1	1973.0	1640.7	1977.0	1640.7	2055.0	1640.9	2078.0	1641.0	2095.0
GR	1640.3	2102.0	1639.9	2104.0	1639.5	2107.0	1640.2	2111.0	1640.7	2114.0
GR	1640.9	2117.0	1641.0	2143.0	1640.3	2146.0	1640.2	2150.0	1640.9	2154.0
GR	1641.0	2294.0	1641.4	2311.0	1641.5	2399.0	1641.3	2407.0	1641.0	2412.0
GR	1641.4	2417.0	1641.5	2447.0	1641.0	2452.0	1640.8	2457.0	1641.0	2462.0
GR	1641.5	2496.0	1641.5	2509.0	1641.5	2538.0	1641.6	2545.0	1641.9	2560.0
GR	1642.0	2568.0	1642.2	2578.0	1642.4	2597.0	1642.6	2608.0		

NC			0.050							
ET			9.1						1600.0	2000.0
X1	3.183	91	1836	1934	640	640	640	0	0	0
GR	1649.3	1019.0	1649.1	1023.0	1648.7	1029.0	1648.7	1036.0	1648.4	1045.0
GR	1648.4	1088.0	1647.8	1099.0	1647.7	1132.0	1647.5	1142.0	1647.4	1151.0
GR	1647.4	1211.0	1647.2	1221.0	1647.1	1229.0	1647.0	1265.0	1646.8	1273.0
GR	1646.6	1279.0	1646.6	1288.0	1646.7	1297.0	1646.9	1304.0	1647.1	1385.0
GR	1647.1	1405.0	1646.7	1412.0	1646.5	1417.0	1646.5	1428.0	1646.5	1435.0
GR	1646.5	1484.0	1646.2	1487.0	1645.8	1492.0	1646.0	1507.0	1646.3	1515.0
GR	1646.4	1524.0	1646.5	1535.0	1646.5	1574.0	1645.5	1584.0	1646.2	1591.0
GR	1646.4	1595.0	1646.4	1621.0	1646.8	1632.0	1646.6	1637.0	1646.6	1784.0
GR	1646.4	1789.0	1646.2	1791.0	1646.7	1798.0	1646.4	1801.0	1646.4	1814.0
GR	1646.7	1829.0	1646.9	1832.0	1647.0	1836.0	1645.7	1842.0	1645.4	1844.0
GR	1646.3	1848.0	1646.8	1851.0	1646.8	1859.0	1645.7	1862.0	1645.0	1864.0
GR	1645.8	1868.0	1646.4	1870.0	1646.8	1875.0	1646.9	1880.0	1646.7	1889.0
GR	1646.0	1891.0	1646.1	1894.0	1646.7	1898.0	1646.7	1920.0	1647.0	1934.0
GR	1647.0	2052.0	1647.2	2060.0	1647.6	2076.0	1647.7	2290.0	1647.5	2299.0
GR	1647.5	2372.0	1647.9	2390.0	1648.2	2395.0	1649.0	2399.0	1649.4	2402.0
GR	1649.4	2404.0	1649.2	2407.0	1648.9	2408.0	1648.3	2411.0	1647.7	2417.0
GR	1647.8	2484.0	1648.0	2491.0	1648.0	2589.0	1648.1	2600.0	1648.2	2611.0
GR	1648.2	2621.0	1648.4	2634.0	1648.5	2645.0	1648.5	2675.0	1648.7	2684.0
GR	1649.1	2691.0								

NH	5	0.060	1782	0.040	1884	0.060	2387	0.040	2614	0.060
NH	2758									
ET			9.1						1655.0	2055.0
X1	3.268	83	1782	1884	480	410	450	0	0	0
GR	1652.5	1108.0	1652.5	1224.0	1652.2	1233.0	1652.0	1280.0	1652.1	1305.0
GR	1651.8	1315.0	1651.8	1359.0	1652.0	1373.0	1652.0	1429.0	1651.8	1440.0
GR	1651.8	1465.0	1651.7	1474.0	1651.6	1477.0	1651.1	1484.0	1651.6	1488.0
GR	1651.7	1563.0	1651.9	1569.0	1651.9	1576.0	1651.4	1581.0	1651.5	1592.0
GR	1651.1	1597.0	1651.0	1606.0	1651.8	1611.0	1651.9	1616.0	1651.7	1620.0
GR	1651.2	1626.0	1651.9	1633.0	1652.1	1657.0	1652.3	1667.0	1652.1	1721.0
GR	1652.0	1738.0	1651.8	1753.0	1651.6	1766.0	1651.6	1782.0	1651.4	1799.0

GR	1651.1	1834.0	1651.3	1841.0	1651.3	1864.0	1651.6	1884.0	1652.1	1895.0
GR	1652.0	1909.0	1651.8	1922.0	1652.0	1988.0	1652.2	2009.0	1652.5	2022.0
GR	1652.4	2032.0	1652.3	2125.0	1652.1	2138.0	1651.7	2144.0	1651.7	2181.0
GR	1652.0	2201.0	1652.0	2217.0	1652.2	2234.0	1652.5	2246.0	1652.5	2254.0
GR	1652.4	2267.0	1652.2	2278.0	1652.1	2288.0	1651.8	2297.0	1651.7	2303.0
GR	1652.1	2315.0	1652.3	2328.0	1652.4	2340.0	1652.4	2373.0	1652.2	2387.0
GR	1652.2	2473.0	1652.4	2484.0	1652.4	2583.0	1652.0	2595.0	1652.3	2602.0
GR	1652.8	2608.0	1653.0	2611.0	1652.7	2614.0	1652.7	2655.0	1652.3	2662.0
GR	1651.7	2667.0	1652.2	2671.0	1652.6	2675.0	1652.6	2681.0	1652.1	2688.0
GR	1652.1	2690.0	1652.6	2698.0	1652.7	2758.0				
NH	4	0.060	1882	0.035	1953	0.060	2123	0.040	2640	
ET			9.1						1675.0	2125.0
X1	3.355	85	1882	1953	480	410	430	0	0	0
GR	1657.4	1101.0	1657.1	1150.0	1656.9	1162.0	1656.8	1218.0	1656.4	1224.0
GR	1656.0	1228.0	1656.4	1233.0	1656.8	1239.0	1657.0	1243.0	1657.0	1254.0
GR	1656.3	1260.0	1655.9	1264.0	1655.6	1271.0	1655.6	1279.0	1656.2	1296.0
GR	1656.1	1305.0	1656.5	1345.0	1656.5	1359.0	1656.6	1372.0	1656.5	1632.0
GR	1656.3	1642.0	1656.1	1648.0	1656.6	1656.0	1656.6	1739.0	1656.2	1745.0
GR	1655.9	1752.0	1656.1	1759.0	1656.2	1767.0	1656.2	1844.0	1655.9	1853.0
GR	1656.0	1858.0	1656.2	1869.0	1656.5	1882.0	1656.4	1888.0	1656.2	1894.0
GR	1655.9	1901.0	1655.6	1901.0	1655.6	1906.0	1656.4	1911.0	1656.4	1915.0
GR	1655.7	1926.0	1655.6	1930.0	1656.6	1953.0	1656.5	1961.0	1656.3	1970.0
GR	1656.2	1994.0	1656.4	2017.0	1656.4	2085.0	1656.1	2093.0	1655.8	2099.0
GR	1655.8	2107.0	1656.1	2116.0	1656.2	2123.0	1656.0	2137.0	1656.2	2151.0
GR	1656.4	2156.0	1656.7	2176.0	1656.8	2246.0	1657.0	2255.0	1657.0	2259.0
GR	1656.9	2266.0	1656.7	2275.0	1656.1	2284.0	1655.5	2289.0	1655.2	2301.0
GR	1655.4	2307.0	1656.2	2314.0	1656.6	2319.0	1656.9	2344.0	1657.0	2358.0
GR	1657.2	2379.0	1657.0	2401.0	1656.8	2413.0	1656.9	2426.0	1656.7	2439.0
GR	1656.7	2468.0	1656.8	2490.0	1656.8	2521.0	1656.5	2536.0	1656.5	2547.0
GR	1656.6	2565.0	1656.6	2579.0	1656.5	2597.0	1656.4	2615.0	1656.4	2640.0
NH	5	0.060	1979	0.035	2009	0.060	2103	0.040	2277	0.060
NH	2673									
ET			9.1						1650.0	2200.0
X1	3.443	95	1979	2009	360	440	460	0	0	0
GR	1660.8	1031.0	1660.7	1048.0	1660.6	1061.0	1660.6	1255.0	1660.5	1268.0
GR	1660.1	1314.0	1660.5	1338.0	1660.1	1356.0	1659.7	1386.0	1659.8	1396.0
GR	1660.0	1411.0	1660.1	1471.0	1660.3	1485.0	1660.1	1511.0	1660.2	1563.0
GR	1660.4	1573.0	1660.3	1579.0	1659.9	1585.0	1659.8	1589.0	1660.1	1595.0
GR	1660.3	1601.0	1660.1	1604.0	1659.8	1609.0	1660.2	1615.0	1660.7	1643.0
GR	1660.5	1651.0	1660.5	1682.0	1660.3	1695.0	1660.3	1716.0	1660.1	1730.0
GR	1660.1	1793.0	1660.4	1836.0	1660.3	1850.0	1660.0	1873.0	1659.9	1883.0
GR	1659.9	1906.0	1660.2	1918.0	1660.5	1933.0	1660.6	1952.0	1660.3	1960.0
GR	1660.5	1968.0	1660.7	1979.0	1659.2	1982.0	1659.4	1997.0	1660.3	2002.0
GR	1660.6	2009.0	1661.0	2048.0	1660.9	2061.0	1660.6	2073.0	1660.3	2081.0
GR	1660.6	2090.0	1660.8	2103.0	1660.6	2109.0	1659.4	2115.0	1659.2	2123.0
GR	1659.2	2145.0	1659.5	2152.0	1659.9	2157.0	1660.3	2163.0	1660.6	2172.0
GR	1660.6	2201.0	1660.2	2207.0	1660.1	2213.0	1660.3	2221.0	1660.3	2235.0
GR	1660.1	2248.0	1660.0	2267.0	1660.2	2277.0	1660.4	2302.0	1660.4	2324.0
GR	1660.7	2337.0	1661.1	2344.0	1661.3	2354.0	1661.2	2366.0	1660.9	2377.0
GR	1660.7	2398.0	1660.5	2409.0	1660.5	2432.0	1660.3	2443.0	1660.1	2453.0
GR	1659.9	2465.0	1659.9	2477.0	1659.8	2488.0	1659.9	2500.0	1660.0	2512.0
GR	1660.3	2526.0	1660.4	2539.0	1660.4	2558.0	1660.7	2577.0	1660.9	2595.0

GR	1660.9	2648.0	1660.6	2658.0	1660.6	2662.0	1660.9	2665.0	1661.1	2673.0
NC	0.060	0.060	0.035							
ET			9.1						1465.0	2000.0
X1	3.500	73	1780	1849	340	320	290	0	0	0
GR	1663.1	1000.0	1663.3	1008.0	1663.5	1018.0	1663.8	1028.0	1663.8	1060.0
GR	1663.4	1093.0	1663.7	1113.0	1663.7	1323.0	1663.3	1373.0	1663.3	1443.0
GR	1663.5	1455.0	1663.6	1468.0	1663.6	1530.0	1663.9	1547.0	1664.1	1555.0
GR	1664.0	1592.0	1664.1	1646.0	1664.2	1659.0	1664.2	1692.0	1663.9	1694.0
GR	1664.2	1701.0	1664.5	1725.0	1664.5	1756.0	1664.7	1766.0	1664.8	1775.0
GR	1664.9	1780.0	1663.9	1782.0	1661.9	1784.0	1661.1	1789.0	1661.1	1798.0
GR	1661.5	1804.0	1661.6	1829.0	1662.0	1836.0	1662.8	1840.0	1663.9	1845.0
GR	1664.8	1849.0	1664.5	1852.0	1664.5	1868.0	1664.3	1875.0	1664.0	1880.0
GR	1664.2	1884.0	1664.4	1890.0	1664.0	1894.0	1663.4	1898.0	1664.3	1903.0
GR	1664.3	1924.0	1664.1	1931.0	1663.5	1937.0	1663.6	1949.0	1664.0	1956.0
GR	1664.3	1975.0	1664.1	1979.0	1663.7	1983.0	1663.9	1991.0	1663.8	2038.0
GR	1663.6	2044.0	1663.6	2055.0	1664.0	2068.0	1664.2	2084.0	1664.5	2118.0
GR	1664.5	2130.0	1664.6	2145.0	1664.2	2167.0	1664.2	2180.0	1664.4	2197.0
GR	1664.5	2208.0	1664.3	2215.0	1664.2	2287.0	1664.0	2305.0	1664.0	2314.0
GR	1664.1	2329.0	1664.3	2334.0	1664.5	2339.0				
ET			9.1						1420.0	1820.0
X1	3.581	75	1588	1645	410	380	400	0	0	0
GR	1669.2	1109.0	1669.2	1117.0	1668.9	1122.0	1668.8	1132.0	1668.6	1137.0
GR	1668.1	1141.0	1667.2	1163.0	1667.4	1180.0	1667.9	1195.0	1667.9	1338.0
GR	1667.7	1347.0	1667.4	1354.0	1667.5	1376.0	1667.8	1383.0	1667.7	1412.0
GR	1667.4	1422.0	1667.2	1426.0	1666.8	1429.0	1666.9	1431.0	1667.4	1435.0
GR	1667.8	1439.0	1667.9	1447.0	1667.9	1480.0	1667.5	1484.0	1667.2	1495.0
GR	1667.6	1500.0	1667.5	1518.0	1667.2	1525.0	1667.3	1531.0	1667.6	1543.0
GR	1668.2	1581.0	1668.8	1588.0	1668.6	1591.0	1664.7	1601.0	1664.1	1604.0
GR	1664.1	1619.0	1664.3	1623.0	1664.7	1628.0	1665.2	1633.0	1665.5	1634.0
GR	1667.7	1638.0	1668.0	1645.0	1667.9	1659.0	1667.8	1696.0	1667.5	1710.0
GR	1667.4	1720.0	1667.2	1731.0	1667.0	1741.0	1667.3	1749.0	1667.4	1756.0
GR	1667.6	1787.0	1668.1	1796.0	1668.2	1806.0	1668.8	1817.0	1668.2	1823.0
GR	1667.8	1830.0	1667.4	1838.0	1667.6	1845.0	1667.6	1853.0	1667.2	1864.0
GR	1667.4	1877.0	1667.4	1884.0	1667.3	1895.0	1667.2	1908.0	1667.2	1935.0
GR	1667.0	1950.0	1666.9	1994.0	1666.7	2001.0	1667.0	2016.0	1667.0	2024.0
GR	1667.1	2033.0	1667.7	2073.0	1668.1	2081.0	1668.3	2140.0	1668.5	2148.0
ET			9.1						1225.0	1525.0
X1	3.650	54	1359	1445	280	360	380	0	0	0
GR	1671.3	1061.0	1671.1	1068.0	1670.6	1075.0	1670.4	1081.0	1669.8	1087.0
GR	1669.3	1093.0	1669.1	1101.0	1669.2	1123.0	1669.7	1134.0	1669.6	1144.0
GR	1669.8	1150.0	1669.8	1196.0	1670.0	1211.0	1670.0	1224.0	1669.9	1240.0
GR	1669.9	1296.0	1670.1	1310.0	1670.3	1322.0	1670.6	1333.0	1670.8	1349.0
GR	1671.0	1359.0	1667.0	1364.0	1666.9	1370.0	1666.9	1377.0	1667.1	1381.0
GR	1667.4	1390.0	1667.4	1403.0	1667.6	1410.0	1668.0	1415.0	1668.1	1419.0
GR	1668.2	1425.0	1668.6	1431.0	1668.9	1434.0	1669.8	1439.0	1670.2	1445.0
GR	1670.2	1473.0	1670.1	1480.0	1669.9	1486.0	1669.9	1526.0	1669.6	1536.0
GR	1669.6	1569.0	1669.7	1579.0	1669.4	1589.0	1669.5	1599.0	1669.7	1614.0
GR	1669.7	1641.0	1669.6	1660.0	1669.6	1732.0	1669.8	1749.0	1669.8	1771.0
GR	1670.0	1784.0	1670.7	1792.0	1671.0	1796.0	1671.3	1803.0		

Simons, Li & Associates, Inc.

ET			9.1						1055.0	1295.0
X1	3.702	59	1109	1175	330	220	270	0	0	0
GR	1676.6	1000.0	1676.6	1009.0	1676.4	1011.0	1675.4	1017.0	1674.6	1022.0
GR	1673.3	1028.0	1673.1	1034.0	1672.5	1040.0	1672.1	1048.0	1672.1	1052.0
GR	1672.3	1057.0	1672.5	1062.0	1672.6	1069.0	1672.6	1075.0	1672.8	1080.0
GR	1672.7	1083.0	1672.4	1088.0	1672.3	1092.0	1672.5	1098.0	1672.5	1104.0
GR	1672.6	1109.0	1672.2	1113.0	1669.0	1117.0	1668.8	1120.0	1668.7	1125.0
GR	1668.5	1129.0	1668.6	1136.0	1668.8	1140.0	1670.1	1150.0	1671.0	1154.0
GR	1672.0	1158.0	1672.6	1161.0	1673.3	1167.0	1673.6	1175.0	1673.4	1182.0
GR	1673.1	1190.0	1672.8	1197.0	1672.3	1205.0	1672.2	1215.0	1672.2	1225.0
GR	1671.8	1236.0	1671.8	1256.0	1672.0	1264.0	1672.0	1272.0	1672.3	1282.0
GR	1672.6	1289.0	1672.6	1299.0	1672.7	1305.0	1672.7	1314.0	1672.8	1337.0
GR	1672.6	1356.0	1672.3	1367.0	1672.4	1378.0	1672.5	1390.0	1672.6	1401.0
GR	1672.6	1420.0	1672.5	1437.0	1672.5	1454.0	1673.0	1465.0		
NC	0.060	0.060	0.030	.3	.5					
ET			9.1						1100.0	1220.0
X1	3.737	48	1101	1188	200	280	250	0.84	0	0
GR	1678.6	1028.0	1678.4	1035.0	1678.4	1044.0	1678.3	1052.0	1678.2	1059.0
GR	1678.1	1066.0	1678.0	1073.0	1677.6	1081.0	1677.0	1087.0	1676.1	1095.0
GR	1674.5	1101.0	1672.6	1105.0	1671.6	1109.0	1671.5	1111.0	1671.6	1115.0
GR	1672.1	1119.0	1671.5	1125.0	1671.0	1130.0	1670.6	1136.0	1670.5	1141.0
GR	1670.3	1148.0	1670.3	1153.0	1670.1	1153.0	1670.2	1161.0	1670.4	1166.0
GR	1670.6	1170.0	1671.9	1175.0	1673.2	1179.0	1674.1	1183.0	1674.6	1188.0
GR	1674.8	1194.0	1675.0	1200.0	1675.2	1209.0	1675.3	1216.0	1675.3	1231.0
GR	1675.4	1236.0	1676.0	1243.0	1677.0	1247.0	1677.5	1249.0	1677.5	1253.0
GR	1677.2	1257.0	1676.7	1262.0	1676.4	1268.0	1676.1	1274.0	1675.8	1281.0
GR	1675.7	1289.0	1675.7	1314.0	1676.0	1329.0				
X1	3.759	37	1028	1143	20	80	50	0.86	0	0
GR	1677.9	1000.0	1677.8	1011.0	1677.8	1023.0	1677.0	1028.0	1674.5	1033.0
GR	1672.8	1035.0	1673.1	1038.0	1673.3	1040.0	1673.6	1045.0	1673.6	1050.0
GR	1673.3	1056.0	1672.4	1061.0	1671.3	1068.0	1671.1	1072.0	1671.3	1079.0
GR	1671.3	1090.0	1671.2	1098.0	1670.8	1098.0	1670.9	1104.0	1670.9	1114.0
GR	1670.7	1120.0	1670.7	1126.0	1670.8	1131.0	1672.1	1135.0	1673.4	1138.0
GR	1675.1	1140.0	1676.9	1141.0	1677.4	1143.0	1677.8	1147.0	1678.1	1154.0
GR	1678.1	1166.0	1678.2	1179.0	1678.1	1190.0	1678.0	1201.0	1678.1	1236.0
GR	1678.0	1248.0	1677.9	1262.0						

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL ·	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IOC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 2.942

3265 DIVIDED FLOW

2.942	3.10	1635.50	1635.46	1635.50	1635.84	.34	.00	.00	1635.00
2275.	480.	731.	1064.	150.	133.	229.	0.	0.	1635.00
.00	3.20	5.48	4.63	.050	.050	.050	.000	1632.40	1582.00
.024541	0.	0.	0.	0	4	0	.00	675.00	2424.00

CCHV= .100 CEHV= .300
*SECNO 3.056
3280 CROSS SECTION 3.06 EXTENDED .27 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.90

3.056	3.17	1641.67	1641.16	.00	1641.74	.07	5.88	.03	1640.80
2202.	1272.	362.	568.	557.	147.	344.	10.	13.	1640.70
.08	2.29	2.47	1.65	.060	.060	.060	.000	1638.50	1312.00
.006350	510.	600.	650.	10	12	0	.00	1236.52	2548.52

*SECNO 3.183

3265 DIVIDED FLOW

3.183	2.59	1647.59	1647.24	.00	1647.72	.12	5.96	.02	1647.00
2202.	1687.	365.	149.	610.	106.	84.	24.	29.	1647.00
.14	2.77	3.45	1.77	.060	.050	.060	.000	1645.00	1137.34
.012270	640.	640.	640.	7	13	0	.00	1019.77	2376.19

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1490 NH CARD USED
*SECNO 3.268

3265 DIVIDED FLOW

3280 CROSS SECTION 3.27 EXTENDED .15 FEET

3.268	1.64	1652.64	1652.50	.00	1652.77	.13	5.05	.00	1651.60
2202.	978.	591.	633.	454.	134.	353.	33.	43.	1651.60
.19	2.16	4.42	1.79	.060	.040	.055	.000	1651.00	1108.00
.009900	480.	450.	410.	5	14	0	.00	1569.06	2726.79

1490 NH CARD USED
*SECNO 3.355

3265 DIVIDED FLOW

3280 CROSS SECTION 3.36 EXTENDED .68 FEET

3.355	1.88	1657.08	1656.87	.00	1657.19	.11	4.42	.00	1656.60
2202.	908.	301.	993.	456.	71.	375.	43.	58.	1656.60
.23	1.99	4.25	2.65	.060	.035	.046	.000	1655.20	1151.19
.010012	480.	430.	410.	5	8	0	.00	1463.06	2640.00

1490 NH CARD USED
*SECNO 3.443

3265 DIVIDED FLOW

3280 CROSS SECTION 3.44 EXTENDED .14 FEET

3.443	1.74	1660.94	1660.74	.00	1661.04	.10	3.85	.00	1660.70
2202.	1133.	166.	903.	602.	36.	342.	51.	72.	1660.60
.28	1.88	4.55	2.64	.060	.035	.047	.000	1659.20	1031.00
.009031	360.	460.	440.	4	14	0	.00	1587.60	2666.60

*SECNO 3.500

3265 DIVIDED FLOW

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 3.50 EXTENDED 1.38 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.500	3.38	1664.48	1664.48	.00	1664.79	.30	1.90	.46	1664.90
2202.	936.	1071.	196.	551.	175.	163.	58.	83.	1664.80
.30	1.70	6.13	1.20	.060	.035	.060	.000	1661.10	1000.00
.005926	340.	290.	320.	0	12	0	.00	1221.89	2338.54

*SECNO 3.581

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.581	4.22	1668.32	1668.32	.00	1668.67	.35	2.39	.00	1668.80
2202.	393.	1045.	763.	267.	157.	395.	66.	93.	1668.00
.33	1.48	6.65	1.93	.060	.035	.060	.000	1664.10	1139.27
.005991	410.	400.	380.	0	8	0	.00	978.35	2140.67

*SECNO 3.650

3265 DIVIDED FLOW

3.650	3.60	1670.50	1670.47	.00	1670.94	.44	2.25	.03	1671.00
2202.	308.	1442.	452.	177.	223.	261.	72.	99.	1670.20
.35	1.74	6.45	1.73	.060	.035	.060	.000	1666.90	1077.73
.006538	280.	380.	360.	1	9	0	.00	682.14	1789.82

*SECNO 3.702

3265 DIVIDED FLOW

3280 CROSS SECTION 3.70 EXTENDED .48 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.702	4.98	1673.48	1673.48	.00	1674.04	.56	1.80	-.00	1672.60
2202.	157.	1414.	631.	77.	193.	289.	75.	102.	1673.60
.37	2.05	7.31	2.19	.060	.035	.060	.000	1668.50	1027.18
.006834	330.	270.	220.	0	12	0	.00	430.32	1465.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .300 CEHV= .500

*SECNO 3.737

3301 HV CHANGED MORE THAN HVINS

3.737	4.73	1674.83	1674.46	.00	1676.06	1.23	1.69	.34	1674.50
2202.	0.	2202.	0.	0.	247.	1.	78.	104.	1674.60
.37	.58	8.90	.50	.060	.030	.060	.000	1670.10	1088.28
.006535	200.	250.	280.	2	15	0	.00	79.90	1168.18

*SECNO 3.759

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.70

3.759	5.22	1675.92	1674.38	.00	1676.44	.52	.17	.21	1677.00
2202.	0.	2202.	0.	0.	380.	0.	78.	104.	1677.40
.38	.00	5.79	.00	.000	.030	.000	.000	1670.70	1025.95
.002248	20.	50.	80.	3	15	0	.00	94.84	1120.79

Simons, Li & Associates, Inc.

T1 SIMONS, LI & ASSOCIATES, INC.
T2 WITWASH FLOODWAY ANALYSIS FOR FCDMC (PAZ-MC13)
T3 ADMS FLOODWAY COMPARISON

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0	0	0	0	1635.93	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15	0	-1	0	0	0	-1	0	0	0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 2

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 2.942

3470 ENCROACHMENT STATIONS= 1730.0 2260.0 TYPE= 1 TARGET= 530.000

2.942	3.53	1635.93	1635.63	1635.50	1636.18	.25	.00	.00	1635.00
2275.	860.	828.	587.	281.	178.	137.	0.	0.	1635.00
.00	3.06	4.66	4.27	.050	.050	.050	.000	1632.40	1730.00
.012125	0.	0.	0.	0	8	0	.00	530.00	2260.00

CCHV= .100 CEHV= .300
*SECNO 3.056

3470 ENCROACHMENT STATIONS= 1510.0 2010.0 TYPE= 1 TARGET= 500.000

3.056	3.31	1641.81	1641.24	1641.67	1641.96	.15	5.77	.01	1640.80
2202.	1609.	503.	90.	514.	161.	37.	8.	6.	1640.70
.05	3.13	3.13	2.46	.060	.060	.060	.000	1638.50	1510.00
.009013	510.	600.	650.	6	14	0	.00	500.00	2010.00

*SECNO 3.183

3470 ENCROACHMENT STATIONS= 1600.0 2000.0 TYPE= 1 TARGET= 400.000

3.183	3.14	1648.14	1647.65	1647.59	1648.36	.21	6.38	.02	1647.00
2202.	1303.	687.	212.	372.	160.	76.	18.	13.	1647.00
.10	3.50	4.29	2.80	.060	.050	.060	.000	1645.00	1600.00
.010929	640.	640.	640.	5	14	0	.00	400.00	2000.00

1490 NH CARD USED
*SECNO 3.268
3280 CROSS SECTION 3.27 EXTENDED .50 FEET

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IOC	ICONT	CORAR	TOPWID	ENDST

3470 ENCROACHMENT STATIONS= 1655.0 2055.0 TYPE= 1 TARGET= 400.000

3.268	2.20	1653.20	1653.00	1652.64	1653.57	.37	5.17	.05	1651.60
2202.	461.	1161.	579.	151.	190.	194.	24.	17.	1651.60
.13	3.06	6.11	2.98	.060	.040	.060	.000	1651.00	1655.00
.011789	480.	450.	410.	4	14	0	.00	400.00	2055.00

1490 NH CARD USED
*SECNO 3.355
3280 CROSS SECTION 3.36 EXTENDED 1.31 FEET

3470 ENCROACHMENT STATIONS= 1675.0 2125.0 TYPE= 1 TARGET= 450.000

3.355	2.52	1657.72	1657.27	1657.08	1657.95	.23	4.36	.01	1656.50
2202.	849.	631.	722.	291.	116.	246.	30.	22.	1656.60
.16	2.91	5.45	2.94	.060	.035	.060	.000	1655.20	1675.00
.008595	480.	430.	410.	4	12	0	.00	450.00	2125.00

1490 NH CARD USED
*SECNO 3.443
3280 CROSS SECTION 3.44 EXTENDED .33 FEET

3470 ENCROACHMENT STATIONS= 1650.0 2200.0 TYPE= 1 TARGET= 550.000

3.443	2.23	1661.43	1661.18	1660.94	1661.66	.23	3.71	.00	1660.70
2202.	1054.	298.	850.	386.	51.	206.	36.	26.	1660.60
.19	2.73	5.85	4.12	.060	.035	.043	.000	1659.20	1650.00
.009531	360.	460.	440.	4	14	0	.00	550.00	2200.00

*SECNO 3.500
3280 CROSS SECTION 3.50 EXTENDED .44 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1465.0 2000.0 TYPE= 1 TARGET= 535.000

3.500	3.84	1664.94	1664.94	1664.48	1665.45	.51	2.03	.48	1664.90
2202.	529.	1434.	238.	272.	206.	127.	41.	30.	1664.80
.21	1.94	6.96	1.87	.060	.035	.060	.000	1661.10	1465.00
.006428	340.	290.	320.	0	16	0	.00	535.00	2000.00

Simons, Li & Associates, Inc.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3.581

3265 DIVIDED FLOW

3280 CROSS SECTION 3.58 EXTENDED .23 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1420.0 1820.0 TYPE= 1 TARGET= 400.000

3.581	4.63	1668.73	1668.73	1668.32	1669.34	.61	2.86	-.12	1668.80
2202.	403.	1382.	417.	177.	180.	181.	46.	34.	1668.00
.23	2.27	7.69	2.30	.060	.035	.060	.000	1664.10	1420.00
.007162	410.	400.	380.	0	12	0	.00	396.31	1820.00

*SECNO 3.650

3470 ENCROACHMENT STATIONS= 1225.0 1525.0 TYPE= 1 TARGET= 300.000

3.650	4.14	1671.04	1670.82	1670.50	1671.65	.60	2.31	.00	1671.00
2202.	222.	1828.	152.	115.	265.	61.	50.	57.	1670.20
.24	1.87	6.79	1.88	.060	.035	.060	.000	1666.90	1225.00
.005707	280.	380.	360.	2	12	0	.00	300.00	1525.00

*SECNO 3.702

3265 DIVIDED FLOW

3280 CROSS SECTION 3.70 EXTENDED .56 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1055.0 1295.0 TYPE= 1 TARGET= 240.000

3.702	5.06	1673.56	1673.56	1673.48	1674.38	.82	2.36	-.39	1672.60
2202.	133.	1639.	430.	56.	198.	148.	52.	39.	1673.60
.25	2.36	8.26	2.92	.060	.035	.060	.000	1668.50	1055.00
.008795	330.	270.	220.	0	12	0	.00	237.43	1295.00

CCHV= .300 CEHV= .500

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3.737

3470 ENCROACHMENT STATIONS= 1100.0 1220.0 TYPE= 1 TARGET= 120.000

3.737	5.05	1675.15	1674.65	1674.83	1676.44	1.30	1.83	.24	100000.00
2202.	0.	2198.	4.	0.	240.	4.	54.	40.	1674.60
.26	.00	9.15	.93	.000	.030	.060	.000	1670.10	1100.00
.006195	200.	250.	280.	2	15	0	.00	77.85	1177.85

*SECNO 3.759

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.01

3.759	5.72	1676.42	1674.38	1675.92	1676.83	.41	.12	.27	1677.00
2202.	0.	2202.	0.	0.	429.	0.	55.	40.	1677.40
.26	.00	5.13	.00	.000	.030	.000	.000	1670.70	1025.07
.001539	20.	50.	80.	3	19	0	.00	95.96	1121.03

THIS RUN EXECUTED 1/16/91 13: 9:48

****
HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

ERROR CORR - 01,02,03
MODIFICATION -
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

ADMS FLOODWAY COMPARISON

SUMMARY PRINTOUT

	SECNO	CWSEL	DEPTH	ELMIN	VLOB	VCH	VROB	HL	OLOSS	10*KS	K*CHSL	SSTA	ENDST
	2.942	1635.50	3.10	1632.40	3.20	5.48	4.63	.00	.00	245.41	.00	1582.00	2424.00
	2.942	1635.93	3.53	1632.40	3.06	4.66	4.27	.00	.00	121.25	.00	1730.00	2260.00
*	3.056	1641.67	3.17	1638.50	2.29	2.47	1.65	5.88	.03	63.50	10.17	1312.00	2548.52
	3.056	1641.81	3.31	1638.50	3.13	3.13	2.46	5.77	.01	90.13	10.17	1510.00	2010.00
	3.183	1647.59	2.59	1645.00	2.77	3.45	1.77	5.96	.02	122.70	10.16	1137.34	2376.19
	3.183	1648.14	3.14	1645.00	3.50	4.29	2.80	6.38	.02	109.29	10.16	1600.00	2000.00
	3.268	1652.64	1.64	1651.00	2.16	4.42	1.79	5.05	.00	99.00	13.33	1108.00	2726.79
	3.268	1653.20	2.20	1651.00	3.06	6.11	2.98	5.17	.05	117.89	13.33	1655.00	2055.00
	3.355	1657.08	1.88	1655.20	1.99	4.25	2.65	4.42	.00	100.12	9.77	1151.19	2640.00
	3.355	1657.72	2.52	1655.20	2.91	5.45	2.94	4.36	.01	85.95	9.77	1675.00	2125.00
	3.443	1660.94	1.74	1659.20	1.88	4.55	2.64	3.85	.00	90.31	8.70	1031.00	2666.60
	3.443	1661.43	2.23	1659.20	2.73	5.85	4.12	3.71	.00	95.31	8.70	1650.00	2200.00
*	3.500	1664.48	3.38	1661.10	1.70	6.13	1.20	1.90	.46	59.26	6.55	1000.00	2338.54
*	3.500	1664.94	3.84	1661.10	1.94	6.96	1.87	2.03	.48	64.28	6.55	1465.00	2000.00
*	3.581	1668.32	4.22	1664.10	1.48	6.65	1.93	2.39	.00	59.91	7.50	1139.27	2140.67
*	3.581	1668.73	4.63	1664.10	2.27	7.69	2.30	2.86	-.12	71.62	7.50	1420.00	1820.00
	3.650	1670.50	3.60	1666.90	1.74	6.45	1.73	2.25	.03	65.38	7.37	1077.73	1789.82
	3.650	1671.04	4.14	1666.90	1.87	6.79	1.88	2.31	.00	57.07	7.37	1225.00	1525.00
*	3.702	1673.48	4.98	1668.50	2.05	7.31	2.19	1.80	-.00	68.34	5.93	1027.18	1465.00
*	3.702	1673.56	5.06	1668.50	2.36	8.26	2.92	2.36	-.39	87.95	5.93	1055.00	1295.00
	3.737	1674.83	4.73	1670.10	.58	8.90	.50	1.69	.34	65.35	6.40	1088.28	1168.18
	3.737	1675.15	5.05	1670.10	.00	9.15	.93	1.83	.24	61.95	6.40	1100.00	1177.85

Simons, Li & Associates, Inc.

	SECNO	CWSEL	DEPTH	ELMIN	VLOB	VCH	VROB	HL	OLOSS	10*KS	K*CHSL	SSTA	ENDST
*	3.759	1675.92	5.22	1670.70	.00	5.79	.00	.17	.21	22.48	12.00	1025.95	1120.79
*	3.759	1676.42	5.72	1670.70	.00	5.13	.00	.12	.27	15.39	12.00	1025.07	1121.03

Simons, Li & Associates, Inc.

ADMS FLOODWAY COMPARISON

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
	2.942	1635.50	.00	1635.84	675.00	480.39	731.08	1063.53	.00	.00	2064.00	2167.00	.00
	2.942	1635.93	.43	1636.18	530.00	860.02	828.44	586.55	530.00	1730.00	2064.00	2167.00	2260.00
*	3.056	1641.67	.00	1641.74	1236.52	1272.31	362.01	567.69	.00	.00	1873.00	1977.00	.00
	3.056	1641.81	.14	1641.96	500.00	1609.06	503.07	89.87	500.00	1510.00	1873.00	1977.00	2010.00
	3.183	1647.59	.00	1647.72	1019.77	1687.41	365.45	149.14	.00	.00	1836.00	1934.00	.00
	3.183	1648.14	.55	1648.36	400.00	1302.63	687.02	212.35	400.00	1600.00	1836.00	1934.00	2000.00
	3.268	1652.64	.00	1652.77	1569.06	978.42	590.72	632.85	.00	.00	1782.00	1884.00	.00
	3.268	1653.20	.56	1653.57	400.00	461.40	1161.17	579.42	400.00	1655.00	1782.00	1884.00	2055.00
	3.355	1657.08	.00	1657.19	1463.06	908.16	300.72	993.11	.00	.00	1882.00	1953.00	.00
	3.355	1657.72	.64	1657.95	450.00	849.06	630.89	722.05	450.00	1675.00	1882.00	1953.00	2125.00
	3.443	1660.94	.00	1661.04	1587.60	1133.21	165.82	902.97	.00	.00	1979.00	2009.00	.00
	3.443	1661.43	.49	1661.66	550.00	1053.90	298.21	849.89	550.00	1650.00	1979.00	2009.00	2200.00
*	3.500	1664.48	.00	1664.79	1221.89	935.54	1070.69	195.77	.00	.00	1780.00	1849.00	.00
*	3.500	1664.94	.46	1665.45	535.00	529.43	1434.49	238.08	535.00	1465.00	1780.00	1849.00	2000.00
*	3.581	1668.32	.00	1668.67	978.35	393.46	1045.22	763.31	.00	.00	1588.00	1645.00	.00
*	3.581	1668.73	.42	1669.34	396.31	403.36	1381.81	416.83	400.00	1420.00	1588.00	1645.00	1820.00
	3.650	1670.50	.00	1670.94	682.14	308.29	1441.55	452.16	.00	.00	1359.00	1445.00	.00
	3.650	1671.04	.54	1671.65	300.00	222.11	1827.77	152.11	300.00	1225.00	1359.00	1445.00	1525.00
*	3.702	1673.48	.00	1674.04	430.32	157.12	1413.61	631.27	.00	.00	1109.00	1175.00	.00
*	3.702	1673.56	.08	1674.38	237.43	132.66	1638.87	430.47	240.00	1055.00	1109.00	1175.00	1295.00
	3.737	1674.83	.00	1676.06	79.90	.10	2201.56	.33	.00	.00	1089.32	1162.40	.00
	3.737	1675.15	.32	1676.44	77.85	.00	2198.43	3.57	120.00	1100.00	1089.32	1162.40	1220.00
*	3.759	1675.92	.00	1676.44	94.84	.00	2202.00	.00	.00	.00	1024.08	1122.98	.00
*	3.759	1676.42	.51	1676.83	95.96	.00	2202.00	.00	.00	.00	1024.08	1122.98	.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO=	3.056	PROFILE=	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=	3.500	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.500	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	3.500	PROFILE=	2	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.500	PROFILE=	2	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	3.581	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.581	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	3.581	PROFILE=	2	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.581	PROFILE=	2	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	3.702	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.702	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	3.702	PROFILE=	2	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.702	PROFILE=	2	MINIMUM SPECIFIC ENERGY
WARNING SECNO=	3.759	PROFILE=	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=	3.759	PROFILE=	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Simons, Li & Associates, Inc.

FLOODWAY DATA, ADMS FLOODWAY COMPARISON
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
2.942	530.	596.	3.8	1635.9	1635.5	.4
3.056	500.	711.	3.1	1641.8	1641.7	.1
3.183	400.	608.	3.6	1648.1	1647.6	.5
3.268	400.	535.	4.1	1653.2	1652.6	.6
3.355	450.	653.	3.4	1657.7	1657.1	.6
3.443	550.	644.	3.4	1661.4	1660.9	.5
3.500	535.	606.	3.6	1664.9	1664.5	.4
3.581	400.	538.	4.1	1668.7	1668.3	.4
3.650	300.	469.	4.7	1671.0	1670.5	.5
3.702	240.	402.	5.5	1673.6	1673.5	.1
3.737	78.	244.	9.0	1675.1	1674.8	.3
3.759	96.	429.	5.1	1676.4	1675.9	.5

APPENDIX E. ALTERNATIVE C
NORMAL FLOW HYDRAULICS

TABLE E-1. ALTERNATIVE C NORMAL FLOW HYDRAULICS

DESIGN PARAMETERS		
Discharge	=	2200 cfs
n-value	=	0.03
Bottom width	=	100 ft
Slope	=	0.0086 ft/ft
Side Slope	=	3:1
NORMAL FLOW RESULTS		
Depth	=	2.52 ft
Velocity	=	8.1 fps
Froude no.	=	0.93
Critical depth	=	2.41 ft
Hydraulic depth	=	2.36 ft
Top width	=	115.2 ft
Flow area	=	271.6 sq ft
Wetted perimeter	=	116 ft
Hydraulic radius	=	2.34 ft

TABLE E-2. ALTERNATIVE C NORMAL FLOW HYDRAULICS

DESIGN PARAMETERS		
Discharge	=	2200 cfs
n-value	=	0.03
Bottom width	=	226 ft
Slope	=	0.0086 ft/ft
Side Slope	=	3:1

NORMAL FLOW RESULTS		
Depth	=	1.56 ft
Velocity	=	6.1 fps
Froude no.	=	0.87
Critical depth	=	1.42 ft
Hydraulic depth	=	1.53 ft
Top width	=	235.4 ft
Flow area	=	360.8 sq ft
Wetted perimeter	=	235.9 ft
Hydraulic radius	=	1.53 ft

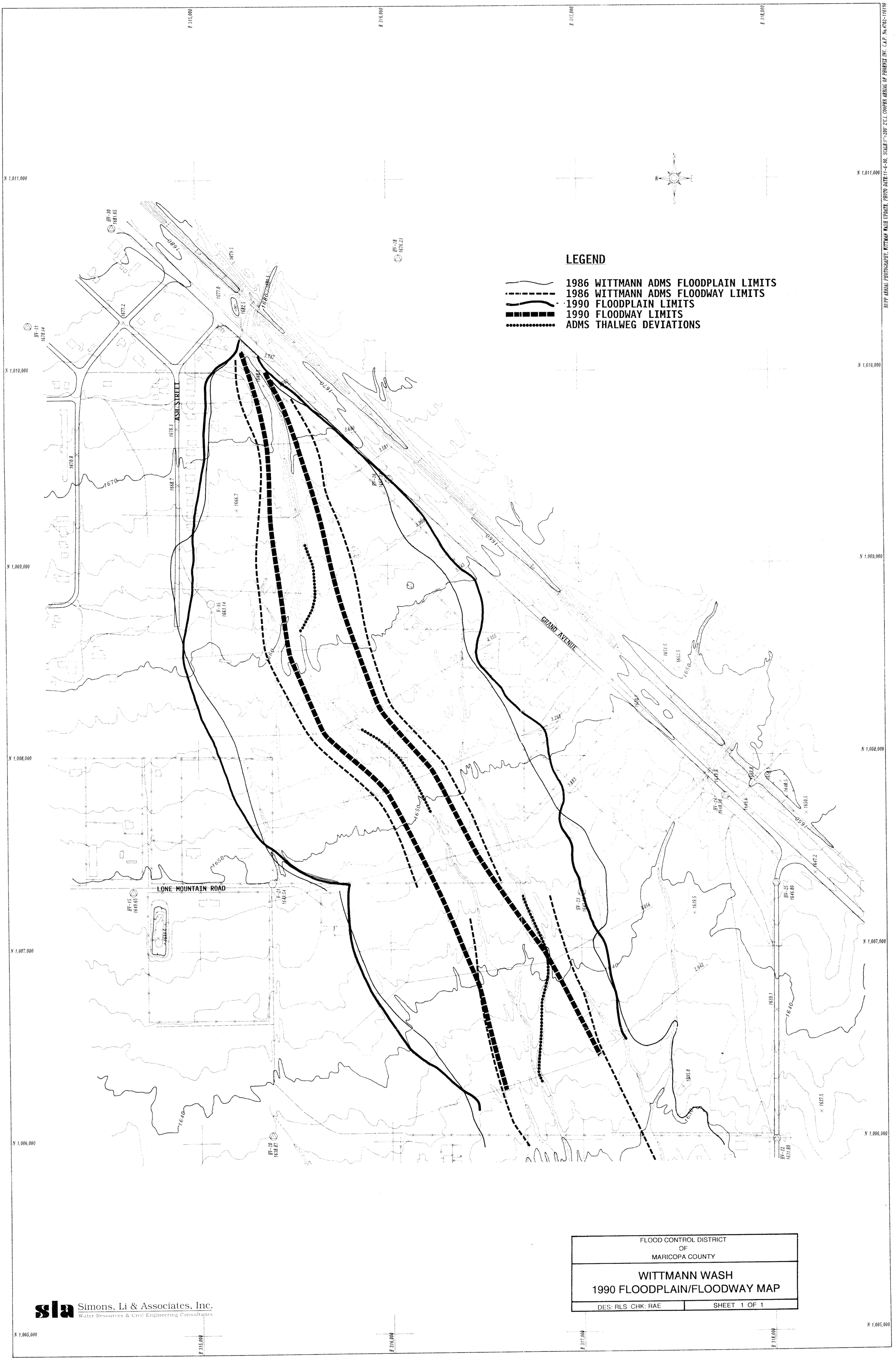
TABLE E-3. ALTERNATIVE C NORMAL FLOW HYDRAULICS

DESIGN PARAMETERS		
Discharge	=	2200 cfs
n-value	=	0.03
Bottom width	=	100 ft
Slope	=	0.0015 ft/ft
Side Slope	=	3:1

NORMAL FLOW RESULTS		
Depth	=	4.22 ft
Velocity	=	4.63 fps
Froude no.	=	0.42
Critical depth	=	2.41 ft
Hydraulic depth	=	3.79 ft
Top width	=	125.3 ft
Flow area	=	475 sq ft
Wetted perimeter	=	126.7 ft
Hydraulic radius	=	3.75 ft

TABLE E-4. ALTERNATIVE C NORMAL FLOW HYDRAULICS

DESIGN PARAMETERS		
Discharge	=	2200 cfs
n-value	=	0.03
Bottom width	=	226 ft
Slope	=	0.0015 ft/ft
Side Slope	=	3:1
NORMAL FLOW RESULTS		
Depth	=	2.63 ft
Velocity	=	3.57 fps
Froude no.	=	0.39
Critical depth	=	1.42 ft
Hydraulic depth	=	2.55 ft
Top width	=	241.8 ft
Flow area	=	616.1 sq ft
Wetted perimeter	=	242.7 ft
Hydraulic radius	=	2.54 ft



FLOOD CONTROL DISTRICT
OF
MARICOPA COUNTY

WITTMANN WASH
1990 FLOODPLAIN/FLOODWAY MAP

DES: RLS CHK: RAE | SHEET 1 OF 1

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